

TEST REPORT

AMP-Holland B.V.



ENVIRONMENTAL TESTING LABORATORY

Job Number E97.12.07	Project Number: 600023	Date of issue: March, 1998
Description: Housing and Hood of standard series HA3 HTS - Connectors		Part numbers: 1-1102371-7 1-1102537-7 1-1103337-7 1-1103342-6 1-1122449-3 1-1103103-3

Scope:

To determine the physical performance of the HTS-Housing and Hood standard Serie HA3 during the tests as described in Design Objective 108-74000 rev A.

Conclusions:

- After the water protection test, visual examination showed water leakage in one housing and hood combination of type 3. This seems to be an exemplary problem on the painted surface, where the sealing touches the counterpart. This subject is under consideration.
- The opening and closing forces of the actuators of types 1, 2, 4 and 6 were higher than the specified requirement. This problem can easily be solved by changing the requirement in the product specification, as the measured values are within ergonomic restrictions.

Test Specification:	AMP Design Objective 108-74000 Rev A.		
Test Carried Out:	1 See test sequence. 2 3		
Distribution:	1 T. Schnurpfeil, AMP-HTS. 2 Doc. center. 3 File Lab.		
Test Engineer:	R.L. Gerard.	Requested by: Product Engineering.	
Laboratory Manager:	D.M.J. Jooren.	Classification: Unrestricted.	
Disposal of Samples:	Returned to requester.	Report Number: 501-19006	Rev: O
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**SAMPLE DESCRIPTION**

Tested were 6 types of housings and hoods of the „heavy duty “ HTS product Series:

Type 1 :

P/N 1-1102371-7/ Rev.A, acc. product spec. 74014: Lot 1 to 5 each consist of :

-**Housing and Hood of HB-Serie;** Housing: HB 48.SG-LB.1.29.
Hood: HB.STS-GR1.29.

Type 2 :

P/N 1-1102537-7/ Rev.A, acc. product spec. 74009: Lot 1-5 each consist of :

-**Housing and Hood HA/HD-Serie standard;** Housing HB.25.STO.1.21.
Hood: HD.25.SG-LB.1.21.

Type 3 :

P/N 1-1103342-6/ Rev.B, acc. product spec. 74003 1): Lot 1-5 each consist of :

-**Housing and Hood HD/HB-Serie;** Housing HB.25.STO.1.21.
Hood; HD.64.STO.1.29.

Type 4 :

P/N 1-1103337-7/ Rev.B, acc. product spec. 74003 2): Lot 1-5 each consist of :

-**Housing and Hood HD/HB-Serie;** Housing HD.25.SG.PG29.
Hood HD.64.STS-GR129.

Type 5 :

P/N 1-1102449-3/ Rev.b, acc. product spec. 74003 3): Lot 1-5 each consist of :

-**Housing and Hood HD/HB-Serie,** Housing HD.25.SG.PG29.
Hood; HD.Z.64.STS- ZB.

Type 6 :

P/N 1-1103103-3/ Rev.B, acc. product spec.nr. 74000 : Lot 1-5 each consist of :

-**Housing and Hood HD/HB-Serie;** Housing HA.3.STO.PG11.
Hood; HA.3. SG-LB.1.11

General: In all (PG xx) cable entries in the housings and hoods, circular plastic plugs were mounted to simulate a cable.

**Test procedures:**

IEC 512-5-9a:

MECHANICAL OPERATION: (Enduration)

The locking of the HTS-housing was opened and closed for 100 times at a rate of 100 cycles per hour. Initial and after the durability cycles, the opening and closing forces were measured.

IEC 60529 IP X5 :

WATER PROTECTION-TEST:

The samples were, during 2 hours, sprayed with water with a temperature of 35 °C.

DIN/EN 50155 :

PHYSICAL SHOCK TEST:

Acceleration 50g, half sinewave pulses of 11 msec.
3 Shocks in each of three mutually perpendicular directions were executed.
After the shock test the samples were visual and dimensional examined.

IEC 512-4-6d:

VIBRATION:

The samples were mounted on a vibration table.
The frequency was traversed from 10-150-10 Hz with one octave per minute.
Below the cross-over frequency the samples were vibrated with an amplitude of 7,5 mm, above that frequency with an acceleration of 3 g. The duration was 2 hours in each of the three mutually perpendicular directions. The samples were provided with a circuit to detect interruptions of continuity longer than 1 micro-second.

IEC 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	: 80 °C for 30 minutes.
Lower temperature	: -40 °C for 30 minutes.
Condition	: unmated.
Number of cycles	: 100

IEC 512-6-11j:

COLD:

The samples were subjected to a temperature of -40 °C during 24 hours.



IEC 512-6-11i:

DRY HEAT:

The samples were subjected to a dry heat test under the following conditions:

Temperature : 80 °C.
 Condition : unmated.
 Duration : 120 hours.

IEC 512-5-7b:

IMPACT TEST:

Single free fall in all six room axes, from a height of 1,2 m onto an uncoated concrete floor, at room temperature.

IEC 512-6-11f:

SALT SPRAY:

The samples were placed in a salt spray chamber during 48 hours with a salt mist produced of a 5% salt solution at a temperature of 35 °C.

MIL-STD 810E TM 510.3:

DUST TEST:

The samples were subjected to a dust test, during 2 hours.
 After the dust test the samples were visual and dimensional examined.

TESTSEQUENCES**Testgroup A**

Visual and dimensional inspection
 Dry heat
 Rapid change of temperature
 Dust Test
 Visual and dimensional inspection

Testgroup B

Visual and dimensional inspection
 Dry heat
 Rapid change of temperature
 Water protection test
 Visual and dimensional inspection



Testgroup C

- Visual and dimensional inspection
 - a) Locking / unlocking force at room temp.
 - b) Locking / unlocking force at -40 °C.
- Mechanical operating
- Cold
 - a) Locking / unlocking force at room temp.
 - b) Locking / unlocking force at -40 °C.
- Visual and dimensional inspection

Testgroup D

- Visual and dimensional inspection
- Impact test
- Visual and dimensional inspection

Testgroup E

- Visual and dimensional inspection
- Vibration
- Physical shock
- Visual and dimensional inspection

Testgroup F

- Visual and dimensional inspection
- Salt spray test
- Visual and dimensional inspection

Equipment used:

<u>Equipment</u>	<u>Producer</u>	<u>Type</u>	<u>Series Nb</u>	<u>Cal Due.</u>
Climatic chamber (TS)	Weiss	64/80DUST	224/17413	11-98.
Climatic chamber	Weiss	125SBDU70	200776	11-98.
Climatic chamber	Weiss	125SBDU20	206083	11-98.
Saltmist chamber	Weiss	S450SSC	264347	12-99.
Dust Chamber	PTL	P14.18	9702049	N.C.
Oven	Heraeus	KT500	7991	12-99.
Accelero meter	B & K	4371	650308	01-99.
Exciter control	B & K	1050	1412882	01-99.
Vibrator	Ling+B&K	PA2000	S1165-002	01-99.
Shock tester	MTS-Monterey	IMPAC66	Mark II, 980.28	
Accelero meter	Endevco	AQ 20	F101024	12-98.



TESTRESULTS:

REQUIREMENT

MEASURED RESULTS

Testgroup A:

- In the dust-test (IP5X) no dust was indicated inside the housing .

Testgroup B:

After the water protection test (IPX4), in all types of connectors water was detected inside approx. 40% of the housings.

Testgroup C

-Operating force: Opening and closing of the locking system:

- *The results of the locking opening and closing force are listed on pages 8-12 in table 1 to 6.*

Testgroup D

- Impact test: after single free falls in all six room axes from a height of 1,2 m, no deformations or defects, that are detrimental to the connector housing functions, were detected.

Testgroup E

- Vibration:

- During and after the vibration test no physical damage was detected.

- Physical shock:

- During and after the physical shock no physical damage was detected.



Testgroup F

- Salt mist: after the salt mist test, no mechanical damage or corrosion was detected.

Testresults:

Operating Force Testgroup C (all values are represented in Newtons).

Table 1

Type I. Operation at ambient temperature				
Product name:		HTS connector 74000		
Column.	Group C	Lot	Test	
-1-:	C: nr 1 to 5	1.5	initial opening force of the locking	
-2-:	C: nr 1 to 5	1.5	initial closing force of the locking	
-3-:	C: nr 1 to 5	1.5	final opening force of the locking	
-4-:	C: nr 1 to 5	1.5	final closing force of the locking	
	-1-	-2-	-3-	-4-
1	109.50	86.50	56.50	58.00
2	73.50	51.00	50.00	49.50
3	83.00	46.00	49.00	52.00
4	91.00	56.00	34.50	40.00
5	58.50	77.00	49.00	41.00
Max.	109.50	86.50	56.50	58.00
Min.	58.50	46.00	34.50	40.00
Mean.	83.10	63.30	47.80	48.10

Type I. Cold operation				
Product name:		HTS connector 74000		
Column.	Group C	Lot	Test	
-1-:	C: nr 1 to 5	1.5	initial opening force of the locking	
-2-:	C: nr 1 to 5	1.5	initial closing force of the locking	
-3-:	C: nr 1 to 5	1.5	final opening force of the locking	
-4-:	C: nr 1 to 5	1.5	final closing force of the locking	
	-1-	-2-	-3-	-4-
1	151.00	84.00	120.00	71.50
2	102.00	96.50	85.00	83.00
3	68.00	69.00	88.00	65.00
4	74.00	45.00	90.00	75.00
5	77.00	47.00	87.50	61.50
Max.	151.00	96.50	120.00	83.00
Min.	68.00	45.00	85.00	61.50
Mean.	94.40	68.30	94.10	71.20



Table 2

Type 2. Operation at ambient temperature.

Product name: HTS connector 74003 - 1

Column.	Group C	Lot	Test	
-1-	C: nr 1 to 5	1..5	initial opening force of the locking	
-2-	C: nr 1 to 5	1..5	initial closing force of the locking	
-3-	C: nr 1 to 5	1..5	final opening force of the locking	
-4-	C: nr 1 to 5	1..5	final closing force of the locking	
	-1-	-2-	-3-	-4-
1	58.00	61.00	104.00	87.25
2	61.75	82.50	99.00	60.00
3	58.50	64.75	120.00	90.50
4	53.75	63.20	106.25	98.75
5	62.75	54.00	132.25	94.00
Max.	62.75	82.50	132.25	98.75
Min.	53.75	54.00	99.00	60.00
Mean.	58.95	65.09	112.30	86.10

Type 2. Cold operation.

Product name: HTS connector 74003 - 1

Column.	Group C	Lot	Test	
-1-	C: nr 1 to 5	1..5	initial opening force of the locking	
-2-	C: nr 1 to 5	1..5	initial closing force of the locking	
-3-	C: nr 1 to 5	1..5	final opening force of the locking	
-4-	C: nr 1 to 5	1..5	final closing force of the locking	
	-1-	-2-	-3-	-4-
1	150.50	75.80	119.75	76.75
2	118.25	214.50	94.50	91.25
3	159.75	84.75	136.00	136.12
4	105.75	76.75	92.75	77.00
5	164.75	140.00	138.50	85.50
Max.	164.75	214.50	138.50	136.12
Min.	105.75	75.80	92.75	76.75
Mean.	139.80	118.36	116.30	93.32



Table 3

Type 3. Operation at ambient temperature

Product name: HTS connector 74003 -2

Column.	Group C	Lot	Test	
-1-:	C: nr 1 to 5	1..5	initial opening force of the locking	
-2-:	C: nr 1 to 5	1..5	initial closing force of the locking	
-3-:	C: nr 1 to 5	1..5	final opening force of the locking	
-4-:	C: nr 1 to 5	1..5	final closing force of the locking	
	-1-	-2-	-3-	-4-
1	60.50	79.50	108.00	143.00
2	58.00	91.50	118.00	149.50
3	42.00	60.50	118.50	200.50
4	71.50	108.00	137.00	191.50
5	77.50	128.00	98.00	158.00
Max.	77.50	128.00	137.00	200.50
Min.	42.00	60.50	98.00	143.00
Mean.	61.90	93.50	115.90	168.50

Type 3. Cold operation.

Product name: HTS connector 74003 -2

Column.	Group C	Lot	Test	
-1-:	C: nr 1 to 5	1..5	initial opening force of the locking	
-2-:	C: nr 1 to 5	1..5	initial closing force of the locking	
-3-:	C: nr 1 to 5	1..5	final opening force of the locking	
-4-:	C: nr 1 to 5	1..5	final closing force of the locking	
	-1-	-2-	-3-	-4-
1	129.00	154.50	98.00	138.50
2	118.00	144.50	110.50	182.50
3	109.00	102.00	88.50	102.50
4	106.00	147.00	100.00	154.50
5	105.00	135.00	45.00	73.00
Max.	129.00	154.50	110.50	182.50
Min.	105.00	102.00	45.00	73.00
Mean.	113.40	136.60	88.40	130.20

Table 4

Type 4. Operation at ambient temperature

Product name: HTS connector 74003 nr.3

Column.	Group C	Lot	Test	
-1-:	C: nr 1 to 5	1..5	initial opening force of the locking	
-2-:	C: nr 1 to 5	1..5	initial closing force of the locking	
-3-:	C: nr 1 to 5	1..5	final opening force of the locking	
-4-:	C: nr 1 to 5	1..5	final closing force of the locking	
	-1-	-2-	-3-	-4-
1	99.00	130.50	134.00	183.50
2	114.50	164.50	128.00	179.50
3	112.20	136.50	155.00	167.50
4	97.50	124.50	118.50	140.50
5	114.50	164.00	156.00	181.50
Max.	114.50	164.50	156.00	183.50
Min.	97.50	124.50	118.50	140.50
Mean.	107.54	144.00	138.30	170.50



Type 4. Cold operation

Product name:		HTS connector 74003 nr.3		
Column.	Group C	Lot	Test	
-1-:	C: nr 1 to 5	1..5	initial opening force of the locking at -40°C	
-2-:	C: nr 1 to 5	1..5	initial closing force of the locking at -40°C	
-3-:	C: nr 1 to 5	1..5	final opening force of the locking at -40°C	
-4-:	C: nr 1 to 5	1..5	final closing force of the locking at -40°C	
	-1-	-2-	-3-	-4-
1	71.00	69.00	34.00	40.00
2	71.00	69.00	85.00	73.00
3	66.00	64.00	50.00	48.50
4	84.00	110.00	73.00	64.50
5	93.00	70.00	43.00	50.00
Max.	93.00	110.00	85.00	73.00
Min.	66.00	64.00	34.00	40.00
Mean.	77.00	76.40	57.00	55.20

Table 5

Type 5. Operation at ambient temperature.

Product name:		HTS connector 74009		
Column.	Group C	Lot	Test	
-1-:	C: nr 1 to 5	1..5	initial opening force of the locking	
-2-:	C: nr 1 to 5	1..5	initial closing force of the locking	
-3-:	C: nr 1 to 5	1..5	final opening force of the locking	
-4-:	C: nr 1 to 5	1..5	final closing force of the locking	
	-1-	-2-	-3-	-4-
1	68.00	63.50	123.50	87.50
2	77.50	72.50	116.50	70.50
3	91.50	73.50	121.00	62.50
4	74.40	70.00	114.00	60.00
5	82.00	70.50	118.00	65.00
Max.	91.50	73.50	123.50	87.50
Min.	68.00	63.50	114.00	60.00
Mean.	78.68	70.00	118.60	69.10

Type 5. Cold operation.

Product name:		HTS connector 74009		
Column.	Group C	Lot	Test	
-1-:	C: nr 1 to 5	1..5	initial opening force of the locking	
-2-:	C: nr 1 to 5	1..5	initial closing force of the locking	
-3-:	C: nr 1 to 5	1..5	final opening force of the locking	
-4-:	C: nr 1 to 5	1..5	final closing force of the locking	
	-1-	-2-	-3-	-4-
1	106.50	69.50	103.00	86.00
2	137.00	92.50	122.00	80.00
3	178.00	81.50	115.00	94.50
4	135.00	89.00	94.50	80.00
5	118.00	86.00	105.50	81.00
Max.	178.00	92.50	122.00	94.50
Min.	106.50	69.50	94.50	80.00
Mean.	134.90	83.70	108.00	84.30



Table 6

Type 6. Operation at ambient temperature.

Product name: HTS connector 74014

Column.	Group C	Lot	Test	
-1-	C: nr 1 to 5	1..5	initial opening force of the locking	
-2-	C: nr 1 to 5	1..5	initial closing force of the locking	
-3-	C: nr 1 to 5	1..5	final opening force of the locking	
-4-	C: nr 1 to 5	1..5	final closing force of the locking	
	-1-	-2-	-3-	-4-
1	35.00	57.50	56.00	70.00
2	24.00	28.50	31.00	39.00
3	26.00	34.50	37.00	44.00
4	21.00	26.00	26.00	38.00
5	22.00	23.50	22.50	40.00
Max.	35.00	57.50	56.00	70.00
Min.	21.00	23.50	22.50	38.00
Mean.	25.60	34.00	34.50	46.20

Type 6. Cold operation.

Product name: HTS connector 74014

Column.	Group C	Lot	Test	
-1-	C: nr 1 to 5	1..5	initial opening force of the locking	
-2-	C: nr 1 to 5	1..5	initial closing force of the locking	
-3-	C: nr 1 to 5	1..5	final opening force of the locking	
-4-	C: nr 1 to 5	1..5	final closing force of the locking	
	-1-	-2-	-3-	-4-
1	140.00	100.00	80.00	85.50
2	88.00	81.00	112.00	69.50
3	94.00	65.00	99.00	74.00
4	92.00	63.00	107.00	64.00
5	93.00	60.00	94.50	61.00
Max.	140.00	100.00	112.00	85.50
Min.	88.00	60.00	80.00	61.00
Mean.	101.40	73.80	98.50	70.80