



# QUALIFICATION TEST REPORT

## DASH BOARD CONNECTION SYSTEM FOR FIAT 188 MODEL CAR

( MQS AND MULTILOCK 070 IDC CONNECTORS )

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## Table of contents

1.	INTRODUCTION	Page 3
1.1	Purpose	Page 3
1.2	Scope	Page 3
1.3	Conclusion	Page 3
1.4	Product Description	Page 4
1.5	Test Samples	Page 4
1.6	Qualification Test Sequences	Page 5
2.	SUMMARY OF TESTING	Page 6
2.1	Examination of Product	Page 6
2.2	Contact Engaging /Separating Force	
2.2.1	Contact Engaging Force	Page 6
2.2.2	Contact Separating Force	Page 6
2.3	Connector Mating / Unmating Force	
2.3.1	Connector Mating Force	Page 7
2.3.2	Connector Unmating Force	Page 8
2.4	Contact Insertion Force (only for crimp version )	Page 9
2.5	Contact Extraction Force (only for crimp version )	Page 9
2.6	Retention Force Housing/Frame	Page 10
2.7	Actuating Lever Resistance in close position	Page 10
2.8	Contact Extraction Force ( only for crimp version )	
2.8.1	Extraction Force with primary locking	Page 10
2.8.2	Extraction Force with secondary locking included	Page 10
2.8.3	Extraction Force with secondary locking only	Page 11
2.9	Polarization Effectiveness	Page 11
2.10	Vibration	
2.10.1	Vibration Sine	Page 11
2.10.2	Vibration Random	Page 12
2.11	Millivolt Drop	Page 14
2.12	Dielectric Withstanding Voltage	Page 14
2.13	Insulation Resistance	Page 15
2.14	Temperature Rise over Oven Temperature, with Current Load (Esercizio Gravoso)	Page 15
2.15	Temperature Rise over Ambient Temperature, with Current Overload, cycling.	Page 16
2.16	Thermal Cumulative Ageing	
2.16.1	Thermal Shocks	Page 17
2.16.2	Thermal Cycling	Page 17
2.16.3	Accelerated Ageing	Page 18
2.17	Salt Spray	Page 18

2.18	Industrial Atmosphere (Kesternich)	Page 19
2.19	Wire retention in housing	Page 20
3	Validation	Page 21

## **QUALIFICATION TEST REPORT**

### **1. INTRODUCTION**

#### **1.1 Purpose**

This document summarizes all Testing Activities made by AMP Italia performed on the Subject AMP Product and establishes its conformance to the requirements of the FIAT Customer specifications as reported below.

#### **1.2 Scope**

This report covers the requirements of AMP Specification 108-20182 rev 13, as mechanical, electrical and environmental performance for AMP MQS and MULTILOCK 070 Receptacle Contacts, IDC Version, as required by the FIAT-AUTO and AMP Product Specification.

#### **1.3 Conclusion**

The Dash Board Connector families, IDC Version, meet all the mechanical, electrical and environmental performance requirements of FIAT-AUTO and AMP Product Specification.

#### 1.4 Product Description

The Dashboard Connector family is made by MQS and MULTILOCK 070 Connector Housings. Samples for this Testing have been selected as Connector Housings for 9 MQS IDC Rec.contacts, 2,54 mm pitch, suitable to be mated with a MQS Pin Header with 18 Pins, solderable to pcb, in configuration Stright Angle; as well as Connector Housings for 6 MULTILOCK 070 IDC Rec.contacts, 3,5 mm pitch, suitable to be mated with a MULTILOCK 070 Pin Header with 6 and 9 Tabs.

There is also present a lever device which purpose is to make the Mating action with the counterpart, so reducing the mating unmating forces, required by the operator.

#### 1.5 Test Samples

Test samples were randomly selected from pre-production lots, and the following Part Numbers were used for tests :

TABLE 1

PN's	Connector Frames
284136-1 & -2	18 ways 2,54 mm pitch with lever mating device*
284137-1 & -2	36 ways 2,54 mm pitch with lever mating device*
284138-1	18 ways 3,50 mm pitch with lever mating device*
284142-1	6 ways in line with inertial lock mating device*
	<b>IDC Connectors</b>
284126-1 & -2	9 ways 2,54 mm pitch IDC type
284127-1	9 ways 3,50 mm pitch IDC type
284128-1	6 ways 3,50 mm pitch IDC type
	<b>IDC Contacts</b>
1-968065-1	M.Q.S. IDC Rec. Contact
284132-1	MULTILOCK .070 IDC Rec Contact

	Housings Crimp
284134-1 & -2	9 ways 2,54 mm pitch for MQS contact
284135-1	9 ways 3,50 mm pitch for .070 contact
953466-1	18 ways 2.54 mm pitch for MQS contact
	MULTILOCK .070 Header

### 1.6 Test Sequence

The following test sequence was carried out to assure compliance of the subject product to the FIAT Specifications :

ITEM	DESCRIPTION	A	B	C	D	E	F	G	H	K	I	J
2.1	Visual examination	1.3	1.6	1.5	1.5	1.5	1.5	1.8	1.5	1.5	1.5	1.5
2.2.1	contact engag force											
2.2.2	contact sep. force											
2.3.1	Connector mating force		2	2	2							
2.3.2	Connector unmating force			4	4							
2.6	Connect. locking strength			3	3							
2.10.	Retention housing/frame							7				
2.3	Durability ( 10 cycles )		4									
2.11a	Vibration test			6								
2.11b	Random vibration test				6							
2.12	Voltage drop		3.5	7	7	2.4	2.4	2.6	2.4	2.4	2.6	2.4
2.13	Dielectric strength							5				
2.14	Insulation resistance							4				
2.15	Temp. Rise ( in oven)					3						
2.16	Current over-load						3					
2.17a	Thermal Shocks										3	3
2.17b	Thermal cycling							3			4	
2.17c	Accelerated aging										5	
2.18	Salt spray								3			
2.19	Kesternick corrosion									3		
2.20	Wire retention	2										

The number inside each Test Group indicates the sequences in which Tests were performed.

## 2. SUMMARY OF TESTING

### 2.1 Examination of Product

All samples submitted for testing were selected from pre-production lots. They were inspected and accepted by Quality Assurance as conformal to Drawings.

### 2.2 Contact Engaging / Separating Force

#### 2.2.1 Contact Engaging Force

Test was performed as indicated at point 1.1A of the AMP Product Specification 108-20182, on 10 pieces, male-female contacts.

The following values were found:

Range of values of Engaging Force for samples of MQS Rec as received:

	from 1.37 to 1.64 N	Average	1.48 N
Target < 4.5N			

Range of values of Mating Force for samples of MULTILOCK 070 Rec as received:

	from 3.04 to 3.39 N	Average	3.23 N
Target < 8N			

#### 2.2.2 Contact Separating Force

Test was performed as indicated at point 1.2A of the AMP Product Specification 108-20182, on 10 pieces, male-female contacts.

The following values were found:

Range of values of Separating Force ( first cycle) for samples of MQS Rec as received:

	from 0.69 to 0.91 N	Average	0.80 N
Target < 4.0N			

Range of values of Separating Force ( tenth cycle) for samples of MQS Rec as received:

	from 1.01 to 1.3 N	Average	1.15 N
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Target > 1.0N

Range of values of Separating Force ( first cycle) for samples of MULTILOCK 070 Rec as received:

from 1.36 to 2.03 N	Average	1.66 N
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Target < 7N

Range of values of Separating Force (tenth cycle) for samples of MULTILOCK 070 Rec as received:

from 2.15 to 4.24 N	Average	2.97 N
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Target > 2.0N

### 2.3 Connector Mating / Unmating Force

#### 2.3.1 Connector Mating Force

Test was performed as indicated at point 1.3.A of the AMP Product Specification 108-20182, on 2 pieces, male-female connectors, 9 ways.

The following values were found:

Connector Pitch 2,54 mm

Range of values of Mating Force for samples of 9 positions as received:

from 10,6 to 15,1 N	Average	12.9 N
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Target < 40N (18 pos. )

Range of values of Mating Force for samples of 36 positions as received:

from 32.6 to 52.7 N	Average	44.4 N
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Target < 75N

Connector Pitch 3,50 mm

Range of values of Mating Force for samples of 18 positions as received:

from 23.4 to 25.6 N	Average	24.8 N
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Target < 55N

Range of values of Mating Force for samples of 6 positions as received:

target < 90N                      from 73,6 to 87,5 N                      Average 80.6 N

### 2.3.2 Connector Unmating Force

Test was performed as indicated at point 1.4 A of the AMP Product Specification 108-20182, on 5 pieces, male-female connectors, both 18 and 36 ways, both 2,54 and 3,50 mm pitch.

The following values were found:

Pitch 2,54 mm

Range of values of Unmating Force for samples of 9 positions as received:		
	from 7,1 to 7,4 N	Average 7.3 N
Range of values of Unmating Force for samples of 9 positions after durability:		
	from 13.8 to 14.9 N	Average 14.4 N
Target < 40 N (18 pos. )		

Range of values of Unmating Force for samples of 36 positions as received:		
	from 20.4 to 28.9 N	Average 23.6 N
Range of values of Unmating Force for samples of 36 positions after durability:		
	from 18.9 to 20.4 N	Average 19.6 N
Target < 65 N (36 pos )		

Pitch 3,50 mm

Range of values of Unmating Force for samples of 18 positions as received:		
	from 15.7 to 21.9 N	Average 18.2 N
Range of values of Unmating Force for samples of 18 positions after durability:		
	from 14.4 to 21.4 N	Average 16.7 N
Target < 55N		
Range of values of Unmating Force for 4 samples of 6 positions as received:		
	from 63,2 to 67,7 N	Average 65.5 N
Range of values of Unmating Force for 4 samples of 6 positions after durability:		
	from 28.4 to 29.2N	Average 28.8 N



Target < 70N

#### 2.4 Contact Insertion Force into Housing ( ONLY FOR CRIMP VERSION )

Test was performed as indicated at the point 1.5A of the AMP Product Specification 108-20182

Range of contact insertion force ( MQS ) from 2,86 to 5,62 N Average: 3,84 N

Range of contact insertion force ( MLK 070 ) from 3.92 to 9.45 N Average 5.47 N

Target : 15N Max for .070 Multilock Contact

Target : 10N Max for MQS Contact

All tested samples were within specification limits.

#### 2.5 Connector Locking Strength

Test was performed as indicated at point 1.7A of the AMP Product Specification 108-20182, on 2 complete connector pairs, 9 positions.

The tested samples withstood a force of 100N for 60 sec, without loosing the Receptacle Housing from the Header, in both directions, axial and right angle.

Target : 100N for 60 sec.

Test was performed on IDC connector only.

#### 2.6 Retention Force Housing / Frame

Test was performed as indicated at point 1.8A of the AMP Product Specification 108-20182, on 2 complete connector pairs, 9 positions, both pitch connectors.

The tested samples withstood a force of 100N for 60 sec, without loosing the Housing from the Frame-slot, in axial directions.

## 2.7 Actuating Lever Resistance In "Close"Position.

Also if not required by the Product Specification, Test was performed as indicated below on 3 pieces, female connectors, both 18 and 36 ways.

On mated assembly an extra Force has been applied in the direction of closed position , up to the value of 80N.

All the tested samples withstood the requested force, for 30 sec without damage.

Target : 80N Min

## 2.8 Contact Extraction Force from Housing (ONLY FOR CRIMP VERSION)

### 2.8.1 Contact Extraction Force with primary locking

Test was performed as indicated at point 1.6A of the AMP Product Specification 108-20182, pulling on single contacts with the primary locking only. 10 pieces for each contact styles have been tested.

Range of Extraction Force for the tested samples:

Values :

( MQS )

from 74,1 to 125,5 N    Average :    88,77 N                      Target > 60 N

( MLK 070 )

from 36,5 to 45,2 N    Average :    41,4 N                      Target > 40 N (\*)

All tested samples were within specification limits (\*)

(\*) The results are below the target by FIAT.

Anyway with the connector assembled into the relative cover (with sec.lock fully operated)  
the contact extraction force achieve values above FIAT target for a safe connector  
handling. (see para 2.8.2)

### 2.8.2 Contact Extraction Force with secondary locking included

Test was performed as indicated at point 1.6A of the AMP Product Specification 108-20182, pulling on single contact with the primary and secondary locking in action. 10 pieces for each contact styles have been tested

Range of values of Retention Force

Values :    from 146,7    to    183,6 N                      Average :    167,5 N

Target > 80 N

2.8.3 Contact Extraction Force with secondary locking only

Test was performed as indicated at point 1.6A of the AMP Product Specification 108-20182, pulling on single contact with the secondary locking only. 10 pieces for each contact styles have been tested

Range of values of Retention Force

Values : from 74,5 to 105,3 N                      Average : 98,5 N

Target > 70 N

2.9 Polarization Effectiveness

Test was performed as indicated at point 1.9A of the AMP Product Specification 108-20182, on 5 pieces, both IDC type and Crimp style.

All tested samples withstood a force of 100 N for 60 sec without mating the parts with incorrect polarization.

2.10 Vibration

2.10.1 Vibration Sine

Test was performed as indicated at point 1.10A of the AMP Product Specification 108-20182, on 2 complete connector pairs, 9 positions, both 2,54 and 3,5 mm pitch.

The following values were found:

MQS IDC Contacts with Pitch 2,54 mm

For contacts with 0,35 sqmm

Samples as received :

After vibration :	from 9,5 to 10,1 mV/A*	Average 9,8 mV/A*
	from 9,9 to 12,9 mV/A*	Average 10,7 mV/A*

For contacts with 0,5 sqmm

Samples as received :

from 7,1 to 8,0 mV/A\*      Average 7,5 mV/A\*

After vibration :

from 7,2 to 9,6 mV/A\*      Average 7,7 mV/A\*

\*It must be considered that the measurements are normally including the WIRE bulk resistance that is ranging from 5,0 to 2,4 mV/A, according to the wire size and possibility of access from the header.  
( wire length = 100 mm )

Multilock IDC Contacts, with Pitch 3,5 mm

For contacts with 0,35 sqmm

Samples as received :

from 6.4 to 9.2 mV/A\*      Average 7.1 mV/A\*

After vibration :

from 6.5 to 8.8 mV/A\*      Average 7.1 mV/A\*

For contacts with 0,75 sqmm

Samples as received :

from 3.9 to 5.9 mV/A\*      Average 4.8 mV/A\*

After vibration :

from 3.8 to 5.2 mV/A\*      Average 4.4 mV/A\*

All the tested samples have not shown micro discontinuities greater than 1 microsecond with an increase greater than 100 ohms.

#### 2.10.2 Vibration Random

Test was performed as indicated at point 1.11A of the AMP Product Specification 108-20182, on 2 complete connector pairs, 9 positions, both pitch 2,54 and 3,5 mm.

Pitch 2,54 mm

For contacts with 0,35 sqmm

Samples as received :

from 9,2 to 10.1 mV/A\*      Average 9.6 mV/A\*

After vibration :

from 9.0 to 10.7 mV/A\*      Average 9.6 mV/A\*

For contacts with 0,5 sqmm

Samples as received :

from 7.1 to 7.8 mV/A\*      Average 7.3 mV/A\*

After vibration :

from 7.0 to 7.8 mV/A\*      Average 7.4 mV/A\*

Pitch 3,5 mm

For contacts with 0,35 sqmm

Samples as received :

from 6.2 to 8.4 mV/A\*      Average 7.4 mV/A\*

After vibration :

from 6.3 to 9.2 mV/A\*      Average 7.7 mV/A\*

For contacts with 0,75 sqmm

Samples as received :

from 3.9 to 4.8 mV/A\*      Average 4.4 mV/A\*

After vibration :

from 4.0 to 5.3 mV/A\*      Average 4.5 mV/A\*

All the tested samples have not shown micro discontinuities greater than 1 microsecond with an increase greater than 100 ohms.

\*It must be considered that the measurements are normally including the WIRE bulk resistance that is ranging from 5,0 to 2,4 mV/A, according to the wire size and possibility of access from the header.

### 2.11 Millivolt Drop

Test was performed as indicated at point 2.1A of the AMP Product Specification 108-20182 on 20 contacts crimped onto 0,5 and on 20 contacts crimped onto 0,35 sq. mm wire ,each contact styles.

The following values were found:

Samples as received :

Pitch 2,54 mm

For contacts crimped onto 0,35 sqmm : from 3,2 to 3,9 mV/A                      Average 3,5 mV/A

For contacts crimped onto 0,5 sqmm : from 1,9 to 2,8 mV/A                      Average 2,3 mV/A

Pitch 3,5 mm

For contacts crimped onto 0,35 sqmm : from 3,6 to 5,4 mV/A                      Average              4,3 mV/A  
Target < 6mV/A

For contacts crimped onto 0,50 sqmm : from 3,1 to 4,1 mV/A                      Average              3,6 mV/A  
Target <4,5mV/A

For contacts crimped onto 0,75 sqmm : from 1,2 to 3,2 mV/A                      Average              2,3 mV/A  
Target < 3,5mV/A

All tested samples were within acceptable limits.

For the other results after the other environmental tests see next points.

### 2.12 Dielectric Strength

Test was performed as indicated at point 2.2A of the AMP Product Specification 108-20182, on 3 complete connector pairs, 9 positions both 2,54mm pitch and 3,5 mm pitch.

Both connector styles succeeded to pass the requirement of 1000 Vac

### 2.13 Insulation Resistance

Test was performed as indicated at point 2.3A of the AMP Product Specification 108-20182, on 3 complete connector pairs, 9 positions both 2,54mm pitch and 3,5 mm pitch.

Both connector style succeeded to pass the requirement of 10 Mohm , min.

### 2.14 Temperature Rise over Oven Temperature with Current Load - ( ESERCIZIO GRAVOSO )

Test was performed as indicated at point 2.4 A of the AMP Product Specification 108-20182, on 5 connector pairs 9 positions , 2,54 mm pitch, wire size 0,35 sqmm; on 2 connector pairs 9 positions, of the previous 5, the test has been repeated 4 additional times.

Test was also performed, on 2 connector pairs 9 positions , 3,5 mm pitch, wire size 0,75 sqmm, and the test has been repeated 4 additional times.

Results:

Contact MilliVolt drop after five cycles of Temperature Rise over Oven Temperature,

for 2,54 mm pitch

from 9,9 to 12.7 mV/A\*

Maximum Average 11.0 mV/A\*

for 3,50 mm pitch

from 4,4 to 6,2 mV/A\*

Maximum Average 5.0 mV/A\*

All the Temperature values have been found within the specification limit.

Target < 50 °C of temperature rise

All tested samples were within acceptable limits.

\*It must be considered that the measurements are normally including the WIRE bulk resistance that is ranging from 5,0 to 2,4 mV/A, according to the wire size and possibility of access from the header.  
( wire length = 100mm )

As supplementary investigation, the same samples have been submitted to HUMIDITY TEST  
( 500 hours )

**RESULTS:**

for 2,54 mm pitch

from 9,7 to 12,6mV/A\*

Maximum Average 10,8 mV/A\*

for 3,50 mm pitch

from 4,5 to 6,8 mV/A\*

Maximum Average 5,2 mV/A\*

**2.15 Temperature Rise over Ambient Temperature with Current Overload cycling**

Test was performed as indicated at point 2.5A of the AMP Product Specification 108-20182, on 6 contact pairs in free air of 3,5 mm pitch applied onto 0,75 sqmm wires.

Contact MilliVolt drop before Temperature Rise over Ambient

from 1,7 to 2,0mV/A@

Maximum Average 1,8 mV/A@

Contact MilliVolt drop after Temperature Rise over Ambient Temperature, with Overload Current

from 1,7 to 2,1 mV/A@

Maximum Average 1,9 mV/A@

@ These actual readings have been made with pin of short length respect to the ones used in the headers.

All the Temperature values have been found within specification limit.

Target < 60°C of temperature rise

All tested samples were within acceptable limits.



## 2.16 Thermal Cumulative Ageing

### 2.16.1 Thermal Shocks

Test was performed as indicated at point 3.1 of the AMP Product Specification 108-20182, on 5 complete connector pairs, 9 positions, 3,5 mm pitch with wire of 0,75 sqmm , and 2 other same connectors, with wire of 0,35.

Also 4 connectors 9 positions, 2,54 mm pitch with 0,35 sqmm were tested.

No evidence of physical damage to either the contacts or the connectors was visible as a result of Thermal Shocks

MilliVoltDrop after Thermal Shocks, :

for 0,35 sq mm wires and 2,54 mm pitch:

from 3,3 to 5,1 mV/A\* Average 4,1 mV/A\*

for 0,35 sq mm wires and 3,5 mm pitch:

from 3,4 to 5,1mV/A\* Average 4,3 mV/A\*

for 0,75 sq mm wires and 3,5 mm pitch:

from 1,9 to 2,4 mV/A\* Average 2,1 mV/A\*

\* It must be considered that these measurements were obtained with 30 mm of wire

All tested samples were within acceptable limits.

### 2.16.2 Thermal Cycling

Test was performed as indicated at point 3.1 of the AMP Product Specification 108-20182, on same samples as point 2.17 a.

No evidence of physical damage to either the contacts or the connectors was visible as a result of Thermal Cycling

MilliVoltDrop after Thermal Cycling, :

for 0,35 sq mm wires and 2,54 mm pitch:

from 3,5 to 6,7 mV/A\* Average 4,6 mV/A\*

for 0,35 sq mm wires and 3,5 mm pitch:

from 3,7 to 7,0 mV/A\*      Average 5,2 mV/A\*

for 0,75 sq mm wires and 3,5 mm pitch:

from 1,9 to 2,4 mV/A\*      Average 2,1 mV/A\*

\* It must be considered that these measurements were obtained with 30 mm of wire  
All tested samples were within acceptable limits.

### 2.16.3 Accelerated Ageing

Test was performed as indicated at point 3.1 of the AMP Product Specification 108-20182, on same connectors of point 2.17a and b

No evidence of physical damage to either the contacts or the connectors was visible as a result of exposure to the Accelerated Ageing.

MilliVoltDrop after Accelerated Ageing:

for 0,35 sq mm wires and 2,54 mm pitch:

from 3,5 to 8,30 mV/A\*      Average 5,0 mV/A\*

for 0,35 sq mm wires and 3,5 mm pitch:

from 4,0 to 11,6 mV/A\*      Average 6,2 mV/A\*

for 0,75 sq mm wires and 3,5 mm pitch:

from 2,0 to 2,9 mV/A\*      Average 2,4 mV/A\*

\* It must be considered that these measurements were obtained with 30 mm of wire

All tested samples were within acceptable limits.

### 2.17 Salt Spray

Test was performed as indicated at point 3.2 of the AMP Product Specification 108-20182 on 10 contacts pairs in free air for each connector style and 5 modules without cover, 9 positions for 3,5 mm pitch with 0,75 sqmm wires, plus 3 modules with 0,35 sqmm wires.  
4 modules without cover, 9 positions for 2,54 mm pitch with 0,35 sqmm wires.

After Test no physical damage or corrosion products from base material were visible on the samples tested.

The Millivolt Drops after Salt Spray:

for 0,35 sq mm wires and 2,54 mm pitch: ( Contact pairs in free air )

from	2,7	to	6,0 mV/A*	Average	3,6 mV/A*
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for 0,35 sq mm wires and 2,54 mm pitch: ( modules in free air )

from	2,9	to	4,2 mV/A*	Average	3,7 mV/A
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for 0,35 sq mm wires and 3,5 mm pitch: ( modules in free air )

from	3,6	to	4,6 mV/A*	Average	3,9 mV/A*
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for 0,75 sq mm wires and 3,5 mm pitch: ( contacts in free air )

from	1,7	to	2,7 mV/A*	Average	1,90 mV/A*
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for 0,75 sq mm wires and 3,5 mm pitch: ( modules in free air )

from	1,7	to	4,7 mV/A*	Average	2,0 mV/A*
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\* It must be considered that these measuraments were obtained with 30 mm of wire

All tested samples were within acceptable limits.

## 2.18 Industrial Atmosphere - Kesternich Test

Test was performed as indicated at point 3.3 of the AMP Product Specification 108-20182 on 10 contacts pairs in free air for each connector style and 4 modules without cover, 9 positions for 3,5 mm pitch with 0,35 sqmm wires, plus 5 modules with 0,75 sqmm wires, and other 10 contact pairs. 4 modules without cover, 9 positions for 2,54 mm pitch with 0,35 sqmm wires.

No evidence of physical damage to either the contact or the connector was visible as a result of exposure to the corrosive gas.

The Millivolt Drops after Kesternich:

for 0,35 sq mm wires and 2,54 mm pitch:

from	3,6	to	8,6 mV/A*	Average	5,0 mV/A*
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for 0,35 sq mm wires and 3,5 mm pitch: ( contact pairs in free air )

from	2,8	to	4,4 mV/A*	Average	3,6 mV/A*
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for 0,35 sq mm wires and 3,5 mm pitch: (modules in free air )

from	3,2	to	8,7 mV/A*	Average	5,3 mV/A*
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for 0,75 sq mm wires and 3,5 mm pitch: ( contact pairs in free air )  
from 1,8 to 2,4 mV/A\* Average 2,1 mV/A\*

for 0,75 sq mm wires and 3,5 mm pitch: ( modules in free air )  
from 2,2 to 5,9 mV/A\* Average 3,3 mV/A\*

\* It must be considered that these measuraments were obtained with 30 mm of wire

All tested samples were within acceptable limits.

#### 2.19 Wire Retention in Housing (ONLY FOR IDC VERSION)

Test was performed as indicated at point 1.1B of the AMP Product Specification 108-20182, on 2 complete connector pairs, 9 positions, both 2,54mm pitch and 3,5 mm pitch, axial and 90 degree directions.

Results :

##### 2,54 mm Pitch

0,35 sqmm wire	axial	min	43.0 N	90 degr	min	19.0 N
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Target : 30N min axial

##### 3,5 mm Pitch

0,75 sqmm wire	axial	min	65.5 N	90 degr	min	22.8 N
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Target : 60 N min axial

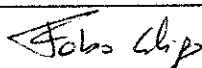
All tested samples were within acceptable limits.

3. VALIDATION

Prepared by:

Laboratory Test Engineer F. GHIGO

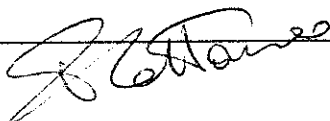
05 / 03 / 1998



Reviewed by:

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10 / 03 / 1998



Approved by:

Project Engineering Manager A. GENTA

15 / 03 / 1998

