



# TEST REPORT

PRODUCT ENGINEERING LABORATORY	RL. <b>140062</b>	REVISION: <b>2</b>
Material / Parts description: <b>WIRE DRESS 7POS_VW          ASSY, 7 POSN., MCP/MQS, REC          MQS1.5, SOCKET CONTACT          AMP MCP 6.3/4.8K FLATCONTACT</b>		PN: <b>2133881-1          2133882-1          1355556-1          1241404-1</b>
Requirer: BRUNO RIGHETO		REVISION: <b>1 2 A4 A6</b>
Customer: <b>VW</b>		Dept: EPA
Supplier: <b>TE CONNECTIVITY</b>		

Confidentiality: <input type="checkbox"/> 1- CONFIDENTIAL <input type="checkbox"/> 2- TE RESTRICTED <input checked="" type="checkbox"/> 3- ADDRESSED CUSTOMER <input type="checkbox"/>	Distribution: <input checked="" type="checkbox"/> REQUESTER <input checked="" type="checkbox"/> DMTEC <input type="checkbox"/> <input type="checkbox"/>
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Purpose: 1 - NEW RAW MATERIAL	History:  DEVELOPMENT FOR VW CUSTOMER.
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Test(s) Made :  ACCORDING TO TEST PLAN ATTACHED.	Specification (s):  VW 75174.
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Conclusion:

Please see individual tests results.

Feb 14, 2014 <hr/> Date	*Signature on file <hr/> Executed by DIOGO BIASETTO ROJAS TEST ENGINEER	*Signature on file <hr/> Responsible PAULO S. ALMEIDA LABORATORY COORDINATOR
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**Accomplished tests according to attached Test Plan:**

PG0- Inspection of as-received condition..... pg. 03

PG6- Interaction between contact and housing..... pg. 06

    E 6.1..... pg. 06

    E 6.4 Actuation forces for secondary lock..... pg. 06

    E 6.1/ E6.2/ E6.3..... pg. 06

PG7- Handling and functional reliability of the housing..... pg. 07

    E 7.2..... pg. 08

    E 7.3..... pg. 09

    E 7.4..... pg. 09

PG8- Insertion and retention forces of the contact parts in the housing..... pg. 10

PG10- Conductor pull-out strength..... pg. 12

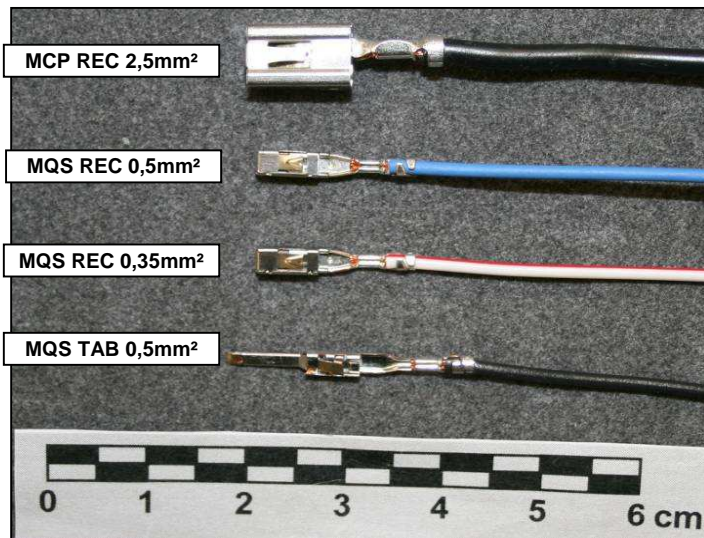
PG11-Insertion and removal forces, mating cycle frequency..... pg. 14

PG12-Current heating, derating..... pg. 15

PG17- Dynamic load..... pg. 20

**Samples Identification**

- 100 parts of WIRE DRESS 7POS\_VW PN: 2133881-1.
- 100 parts of 7 POSN., MCP/MQS, REC PN: 2133883-1.
- 100 parts of MQS 1.5, SOCKET CONTACT PN:1355556-1.
- 100 parts of AMP MCP 6.3/4.8K FLATCONTACT PN: 1241404-1.
- 100 parts of CPA, 7 POSN.,MCP/MQS, REC. PN: 2133884-1.
- 100 parts of ASS'Y 7 POSN., MCP/MQS, REC PN: 2133882-1.
- 100 Counterpart VW, PN: 6C0.905.865.



**Photo 1 - TERMINALS**



**Photo 2 - 7 POSN MCP/MQS, REC PN: 2133883-1**



Photo 3 - WIRE DRESS, 7 POSN.,MCP/QQS, REC. PN: 2133881-1



Photo 4 - CPA, 7 POSN.,MCP/QQS, REC. PN: 2133884-1

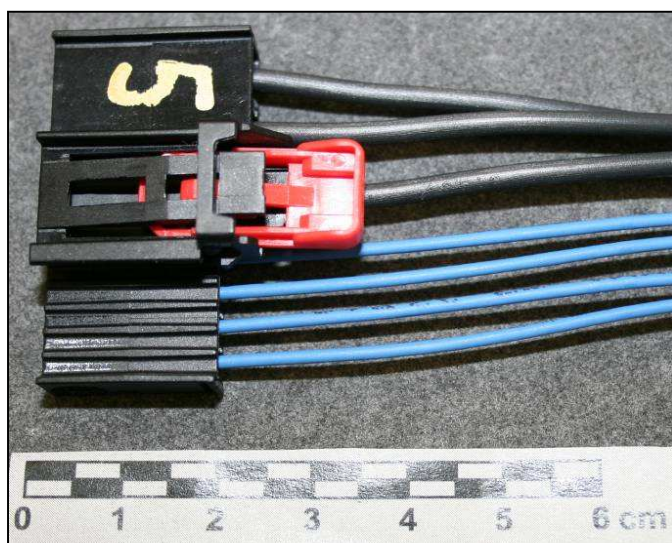


Photo 5 - ASS'Y 7POSN, MCP/QQS, REC PN: 2133882 with terminals connected



Photo 6 - VW COUNTERPART

## Results:

### PG 0 - INSPECTION OF AS- RECEIVED CONDITION:

#### Samples:

Samples nr. 11 to 20 - MCP terminal (2,50mm<sup>2</sup>);

Samples nr. 21 to 30 MQS terminal (0,35mm<sup>2</sup>);

Samples nr. 31 to 40 MQS terminal (0,50mm<sup>2</sup>).

Samples nr. 41 to 50 connector assembled with terminals in the minimum cross section.

Samples nr. 51 to 60 connector assembled with terminals in the maximum cross section.

#### Equipment:

Hypot ULTRA III Associated Research, Inc Serial number 9373007.

HP Digital Multimeter, model 34401A, nr. 93-339033-030.

AGILENT E 3641A DC POWER SUPPLY nr. 93-339036-019.

#### Procedure:

Visual inspection from contact parts (crimp analysis) and housings.

Measure the contact resistance of all cross-sections that occur;

Measure the insulation resistance between all adjacent contacts, by applying 500V per 60 seconds.

**Requirements:**

Contact resistance  $\leq 15\text{m}\Omega$  (MQS).

Contact resistance  $\leq 8\text{m}\Omega$  (MCP).

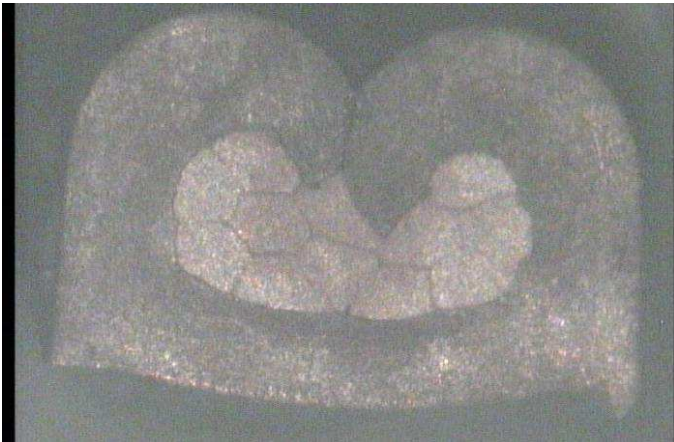
Insulation resistance  $> 100\text{M}\Omega$ .

**Results:**

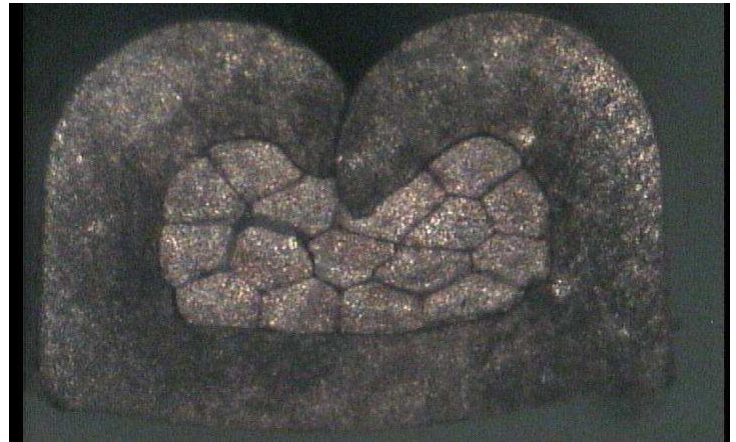
*MCP terminal (2,50mm<sup>2</sup>):*



*MOS terminal (0,35mm<sup>2</sup>):*



*MOS terminal (0,50mm<sup>2</sup>):*



**Contact resistance values:**

*MCP terminal (2,50mm<sup>2</sup>):*

Sample	Contact resistance [mΩ]
11	0,35
12	0,30
13	0,47
14	0,49
15	0,52
16	0,45
17	0,38
18	0,44
19	0,36
20	0,38
<b>Minimum</b>	0,30
<b>Average</b>	0,41
<b>Maximum</b>	0,52

MOS terminal (0,35mm<sup>2</sup>):

Sample	Contact resistance [mΩ]
21	1,65
22	1,08
23	1,40
24	1,41
25	1,95
26	0,75
27	1,25
28	1,95
29	1,75
30	1,85
<b>Minimum</b>	0,8
<b>Average</b>	1,5
<b>Maximum</b>	2,0

MOS terminal (0,50mm<sup>2</sup>):

Sample	Contact resistance [mΩ]
31	1,83
32	1,97
33	1,45
34	2,02
35	2,29
36	1,77
37	1,62
38	1,73
39	1,88
40	1,77
<b>Minimum</b>	1,5
<b>Average</b>	1,8
<b>Maximum</b>	2,3

Insulation resistance:

This test is performed in the connector assembled.

Minimum cross section:

Sample	Insulation resistance
41	>50GΩ
42	>50GΩ
43	>50GΩ
44	>50GΩ
45	>50GΩ
46	>50GΩ
47	>50GΩ
48	>50GΩ
49	>50GΩ
50	>50GΩ

Maximum cross section:

Sample	Insulation resistance
51	>50GΩ
52	>50GΩ
53	>50GΩ
54	>50GΩ
55	>50GΩ
56	>50GΩ
57	>50GΩ
58	>50GΩ
59	>50GΩ
60	>50GΩ



Photo 11 - Insulation resistance



Photo 12 - Voltage applied (500Vdc)

Conclusion:

All samples met the requirements.

**PG6 - INTERACTION BETWEEN CONTACT AND HOUSING:**

**E6.2 / E6.3 - Function of the primary lock/latch play and Function of the secondary lock/latch play.**

**E 6.4 Actuation forces for secondary lock.**

*Samples:*

Samples number 121 to 126.

*Equipment:*

Digital dynamometer IMADA, nr. 92-339017-076.

*Procedure:*

E6.2: Primary lock: Check if the latch is audible and pull the cable back.

E6.3: Secondary lock: Check the secondary lock function.

E6.4: Measure the force to actuate the secondary lock 3 times.

*Requirements:*

E6.2 / E6.3:

The primary lock must latch audibly and must be checked by pulling it back (max. 10N).

The secondary lock must be closable at the end stop. The secondary lock must not be closable until all contacts are properly locked in the housing cavity in the correct position.

E6.4:

The secondary lock actuation force must be less than 50N.

*Results:*

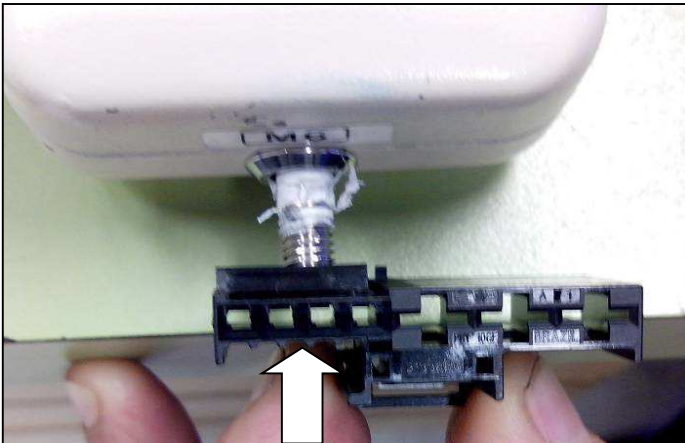
E6.2 / E6.3:

All primary lock latched audibly and withstand a 10N of pulling it back.

All secondary locks had their functions approved.

E6.4:

Sample	Cavity	Sec. Lock actuation force[N]		
		1st	2nd	3rd
121	1	42,59	40,39	35,74
122	1	46,50	40,77	36,30
123	1	41,86	35,22	31,44
124	2	45,76	37,02	35,72
125	2	48,89	32,54	32,03
126	2	40,98	34,13	31,12
<b>Minimum</b>		40,98	32,54	31,12
<b>Average</b>		44,43	36,68	33,73
<b>Maximum</b>		48,89	40,77	36,30



**Photo 13** - Before sec. Lock actuation force



**Photo 14** - After sec. Lock actuation force

*Conclusion:*

All samples met the requirements.

**PG7- HANDLING AND FUNCTIONAL RELIABILITY OF THE HOUSING:**

**E 7.2 Retention force of the housing latch/lock;**

**E 7.3 CPA Functional test;**

**E 7.4 Insertion force for insertion and removal aids;**

*Samples:*

Samples number 127 to 137.

*Equipment:*

Digital dynamometer IMADA, nr. 92-339017-076.

Universal tensile strength machine VERSATEST with digital dynamometer Mecmesin AFG 2500N, nr. 92-339017-090.

*Procedure:*

E7.2:  
Measure the retention force from housing to counterpart. The maximum force of the first displacement milimeter is defined as the retention force.

E7.3:  
CPA functional test.  
Measure the CPA actuation with the locked housing.

E7.4:  
Measure housing to counterpart insertion force.

*Requirements:*

E7.2:  
Retention force must be more than 80N.

E7.3:  
CPA functional test.  
CPA actuation force with the housing locked: between 5N and 30N.

E7.4:  
Max. Insertion force of fully equipped hsg 75N.

Results:

E7.2:

Retention force with CPA closed:

Retention force with CPA opened:

Sample	Retention force [N]
127	106,73
128	102,61
129	118,19
130	109,34
131	109,30
<b>Minimum</b>	102,61
<b>Average</b>	109,23
<b>Maximum</b>	118,19

Sample	Retention force [N]
132	95,48
133	90,03
134	95,5
135	97,31
136	105,32
<b>Minimum</b>	90,03
<b>Average</b>	96,73
<b>Maximum</b>	105,32

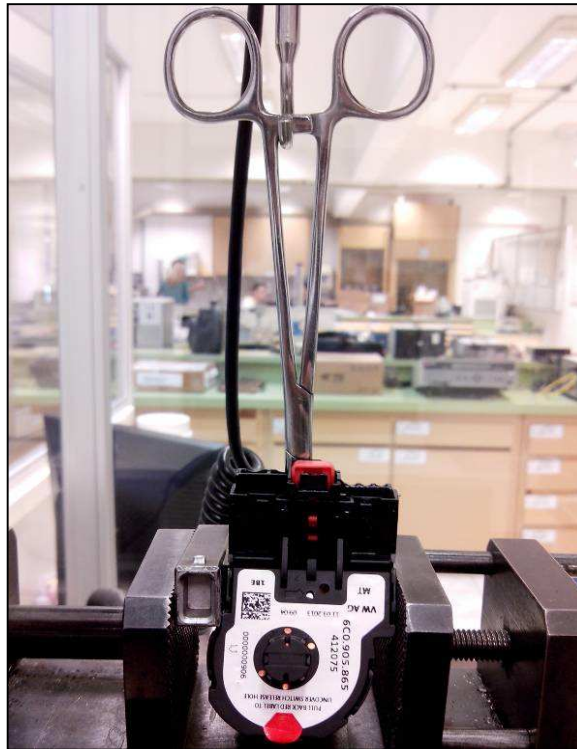


Photo 15 - Connector retention force from counterpart



E7.3:

CPA functional test - OK.

CPA actuation with the locked housing:

Sample	Actuation force [N]
127	13,5
128	<b>3,5</b>
129	9,0
130	15,5
131	<b>3,0</b>
132	6,5
133	14,0
134	<b>4,0</b>
135	9,5
136	<b>4,0</b>
<b>Minimum</b>	3,00
<b>Average</b>	8,25
<b>Maximum</b>	15,50

\***Note:** Bold values are under specification.

Comments:

The design of this connector do not allow that the CPA actuates from pre to final position without be matted to the counterpart. All sample met the specification of max of 30N and 4 samples did not meet the min of 5N.

E7.4:

Max. Insertion force of fully equipped hsg 75N.

Sample	Insertion force [N]
127	73,0
128	61,0
129	58,0
130	62,5
131	64,5
132	72,5
133	68,5
134	67,0
135	69,0
136	66,5
<b>Minimum</b>	58,0
<b>Average</b>	66,3
<b>Maximum</b>	73,0



**Photo 16** - Connector insertion force to counterpart

*Conclusion:*

Some values of test E7.3 are under specification. All other tests met the requirements.

### PG8 - INSERTION AND RETENTION FORCES OF THE CONTACT PARTS IN THE HOUSING:

*Samples:*

Samples number 137 to 154.

*Equipment:*

Digital dynamometer IMADA, nr. 92-339017-076.

Universal tensile strength machine VERSATEST with digital dynamometer Mecmesin AFG 2500N, nr. 92-339017-090.

*Procedure:*

*a) 2 fully equipped housings per mold cavity:*

Visual inspection;

Determination of the contact insertion force;

Measure contact removal force from the housing, primary lock only;

Measure contact removal force from the housing, secondary lock only;

Visual inspection.

*b) 1 fully equipped housings per mold cavity:*

Visual inspection;

Removal of the contacts three times with original release tools;

Contact pullout force from the housing, primary lock only.

Visual inspection.

(At least 10 contacts with the lowest values from item a).

*Requirements:*

Insertion force = informative values.

Retention force primary lock only > 80N.

Retention force secondary lock only > 80N.

Test (b) must be performed only for information.

*Results:*

*a) 2 fully equipped housings per mold cavity:*

Connector Way	Insertion force [N]							
	Cavity 1				Cavity 2			
	Sample 137	Sample 138	Sample 139	Sample 140	Sample 141	Sample 142	Sample 143	Sample 144
1 (MCP)	3,41	3,12	3,35	2,85	2,90	3,21	3,04	2,83
2 (MCP)	2,82	3,05	2,74	2,94	2,95	3,01	3,38	2,94
3 (MCP)	3,23	3,85	3,36	3,23	3,54	4,23	3,60	3,44
<b>Minimum</b>	2,82	3,05	2,74	2,85	2,90	3,01	3,04	2,83
<b>Average</b>	3,15	3,34	3,15	3,01	3,13	3,48	3,34	3,07
<b>Maximum</b>	3,41	3,85	3,36	3,23	3,54	4,23	3,60	3,44

Connector Way	Insertion force [N]							
	Cavity 1				Cavity 2			
	Sample 137	Sample 138	Sample 139	Sample 140	Sample 141	Sample 142	Sample 143	Sample 144
4 (MQS)	1,75	1,29	1,27	1,24	1,25	1,16	1,30	1,25
5 (MQS)	1,26	1,46	1,34	1,42	1,32	1,35	1,40	1,26
6 (MQS)	1,63	1,40	1,18	1,34	1,41	1,33	1,33	1,42
7 (MQS)	1,75	1,37	1,32	1,49	1,20	1,22	1,48	1,30
<b>Minimum</b>	1,26	1,29	1,18	1,24	1,20	1,16	1,30	1,25
<b>Average</b>	1,60	1,38	1,28	1,37	1,30	1,27	1,38	1,31
<b>Maximum</b>	1,75	1,46	1,34	1,49	1,41	1,35	1,48	1,42

Connector Way	Retention force [N]							
	Cavity 1				Cavity 2			
	Primary lock only		Secondary lock only		Primary lock only		Secondary lock only	
	Sample 137	Sample 138	Sample 139	Sample 140	Sample 141	Sample 142	Sample 143	Sample 144
1 (MCP)	137,0	134,5	Not applicable	Not applicable	130,0	133,5	Not applicable	Not applicable
2 (MCP)	147,5	148,0	Not applicable	Not applicable	152,5	142,5	Not applicable	Not applicable
3 (MCP)	157,0	141,0	Not applicable	Not applicable	150,0	132,5	Not applicable	Not applicable
<b>Minimum</b>	137,00	134,50	-	-	130,00	132,50	-	-
<b>Average</b>	147,17	141,17	-	-	144,17	136,17	-	-
<b>Maximum</b>	157,00	148,00	-	-	152,50	142,50	-	-

Connector Way	Retention force [N]							
	Cavity 1				Cavity 2			
	Primary lock only		Secondary lock only		Primary lock only		Secondary lock only	
	Sample 137	Sample 138	Sample 139	Sample 140	Sample 141	Sample 142	Sample 143	Sample 144
4 (MQS)	<b>64,0</b>	<b>66,4</b>	109,0	117,5	<b>63,5</b>	<b>65,6</b>	108,0	105,0
5 (MQS)	<b>64,5</b>	<b>70,0</b>	91,0	121,5	<b>70,0</b>	<b>70,5</b>	125,0	120,0
6 (MQS)	<b>67,7</b>	<b>69,5</b>	125,0	112,0	<b>70,0</b>	<b>69,0</b>	122,0	120,5
7 (MQS)	<b>67,0</b>	<b>67,5</b>	98,5	84,1	<b>68,5</b>	<b>68,0</b>	88,0	86,0
<b>Minimum</b>	64,0	66,4	91,0	84,1	63,5	65,6	88,0	86,0
<b>Average</b>	65,8	68,4	105,9	108,8	68,0	68,3	110,8	107,9
<b>Maximum</b>	67,7	70,0	125,0	121,5	70,0	70,5	125,0	120,5

\*Note: Bold values are under specification.

b) 1 fully equipped housings per mold cavity:

After removal of the contacts three times with original release tools (only for information).

Sample	Retention force [N] (primary lock only)			
	Cavity 1		Cavity 2	
	Way 1	Way 4	Way 1	Way 4
<b>145</b>	113,5	62,0	108,0	56,0
<b>146</b>	110,0	48,5	116,0	61,0
<b>147</b>	105,0	65,0	106,0	52,5
<b>148</b>	115,0	59,5	110,0	65,0
<b>149</b>	111,5	63,0	120,0	53,0
<b>150</b>	106,5	55,0	109,0	55,0
<b>151</b>	110,0	62,0	111,0	54,0
<b>152</b>	105,5	58,3	112,5	62,0
<b>153</b>	106,0	62,5	113,0	60,0
<b>154</b>	107,0	62,0	105,0	59,0
<b>Minimum</b>	105,0	48,5	105,0	52,5
<b>Average</b>	109,0	59,8	111,1	57,8
<b>Maximum</b>	115,0	65,0	120,0	65,0

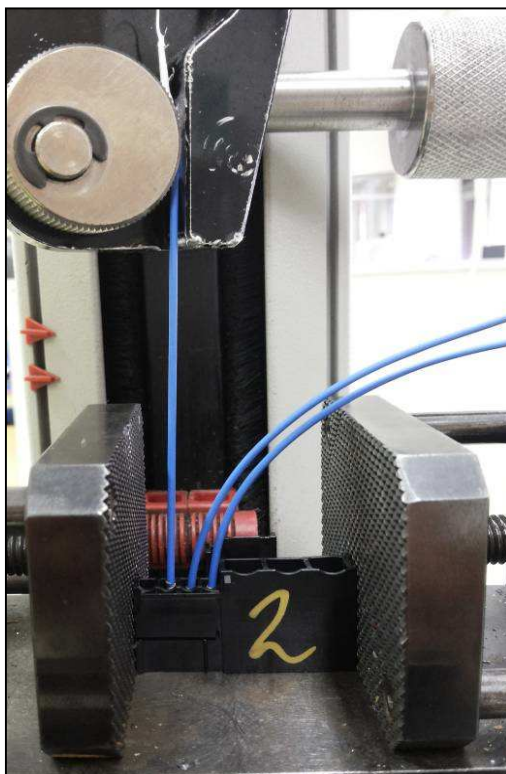


Photo 17 - Terminal retention force from connector

*Conclusion:*

Retention force with primary lock only didn't met the requirements. All other tests met the requirements.

**PG10 - CONDUCTOR PULL-OUT STRENGTH:**

**Samples:**

Samples nr. 61 to 70 MQS terminal (0,35mm<sup>2</sup>);  
Samples nr. 71 to 80 MQS terminal (0,50mm<sup>2</sup>);  
Samples nr. 81 to 90 - MCP terminal (1,0mm<sup>2</sup>);  
Samples nr. 91 to 100 - MCP terminal (2,50mm<sup>2</sup>).

**Equipment:**

Universal tensile strength machine VERSATEST with digital dynamometer Mecmesin AFG 2500N, nr. 92-339017-090.

**Procedure:**

Measure the conductor pull-out strength.

**Requirements:**

0,35mm<sup>2</sup> > 75N.  
0,50mm<sup>2</sup> > 85N.  
1,00mm<sup>2</sup> > 125N.  
2,50mm<sup>2</sup> > 235N.

**Results:**



**Photo 18 - Crimp pull-out test**

MOS terminal (0,35mm<sup>2</sup>):

Sample	Pull-out strength [N]
61	110,0
62	105,0
63	93,0
64	94,0
65	94,5
66	95,0
67	98,0
68	97,5
69	98,0
70	100,0
<b>Minimum</b>	93,0
<b>Average</b>	98,5
<b>Maximum</b>	110,0

MOS terminal (0,50mm<sup>2</sup>):

Sample	Pull-out strength [N]
71	122,0
72	119,0
73	119,0
74	118,0
75	117,5
76	117,0
77	116,5
78	119,0
79	120,1
80	120,5
<b>Minimum</b>	116,5
<b>Average</b>	118,9
<b>Maximum</b>	122,0

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## 140062

*MCP terminal (1,0mm<sup>2</sup>):*

*MCP terminal (2,50mm<sup>2</sup>):*

Sample	Pull-out strength [N]
81	208,5
82	188,5
83	207,0
84	198,5
85	182,5
86	187,0
87	189,5
88	200,5
89	201,5
90	188,5
<b>Minimum</b>	182,5
<b>Average</b>	195,2
<b>Maximum</b>	208,5

Sample	Pull-out strength [N]
91	429,5
92	443,5
93	416,0
94	427,0
95	439,5
96	435,0
97	438,0
98	439,6
99	410,0
100	405,0
<b>Minimum</b>	405,00
<b>Average</b>	428,31
<b>Maximum</b>	443,50

*Conclusion:*

All samples met the requirements.

### PG11 - INSERTION AND REMOVAL FORCES, MATING CYCLE FREQUENCY:

Samples number 101 to 110.

*Equipment:*

Digital dynamometer IMADA, nr. 92-339017-076.

*Procedure:*

- Visual inspection;
- Contact opening dimensions;
- Plugging and removal force;
- Mating cycle frequency (20 insertion/withdrawal cycles);
- Contact opening dimensions;
- Plugging and removal force;
- Visual inspection.

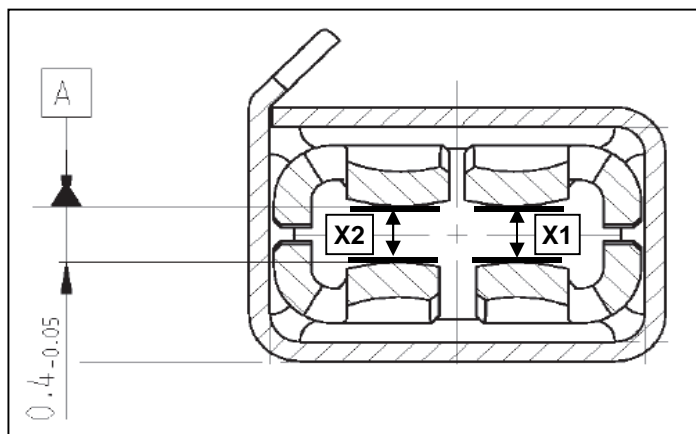
*Requirements:*

The insertion force may change by at most 25% compared to the initial value.

The insertion value must be between 2N and 5N and the removal force between 1N and 5N.

Results:

Sample	Initial contact opening dimensions [mm]		After mating cycles contact opening dimensions [mm]		Insertion force [N]		Removal force [N]	
	X1	X2	X1	X2	Initial	After 20 cycles	Initial	After 20 cycles
101	0,369	0,378	0,407	0,421	2,16	1,88	2,08	2,01
102	0,375	0,377	0,423	0,422	2,42	1,91	2,20	1,50
103	0,374	0,371	0,41	0,435	2,43	2,16	2,45	2,35
104	0,369	0,37	0,425	0,436	2,07	2,13	2,08	2,06
105	0,373	0,38	0,403	0,45	2,53	1,93	2,31	1,83
106	0,368	0,385	0,402	0,411	2,04	1,77	2,44	1,97
107	0,379	0,397	0,407	0,411	2,49	1,88	2,19	1,71
108	0,37	0,39	0,408	0,412	2,27	2,37	1,97	1,98
109	0,381	0,392	0,416	0,424	2,21	1,86	1,87	1,62
110	0,374	0,386	0,409	0,416	2,38	2,34	2,13	2,04
Minimum	0,368	0,370	0,402	0,411	2,04	1,77	1,87	1,50
Average	0,373	0,383	0,411	0,424	2,30	2,02	2,17	1,91
Maximum	0,381	0,397	0,425	0,450	2,53	2,37	2,45	2,35



Conclusion:

All samples met the requirements.

**PG12- CURRENT HEATING, DERATING:**

Samples:

Samples number 111 to 120.

Equipment:

HP Digital Multimeter, model 34401A, nr. 93-339033-030.

AGILENT E 3641A DC POWER SUPPLY nr. 93-339036-019.

Data acquisition AGILENT, model 34972A, nr. 93-339048-872.

Procedure:

- Visual inspection;
- Voltage drop measurement;
- Derating without housing
- Visual inspection.

*Requirements:*

The measured values must correspond to the manufacturer's specifications.

Contact resistance  $\leq 15\text{m}\Omega$  (MQS).

Contact resistance  $\leq 8\text{m}\Omega$  (MCP).

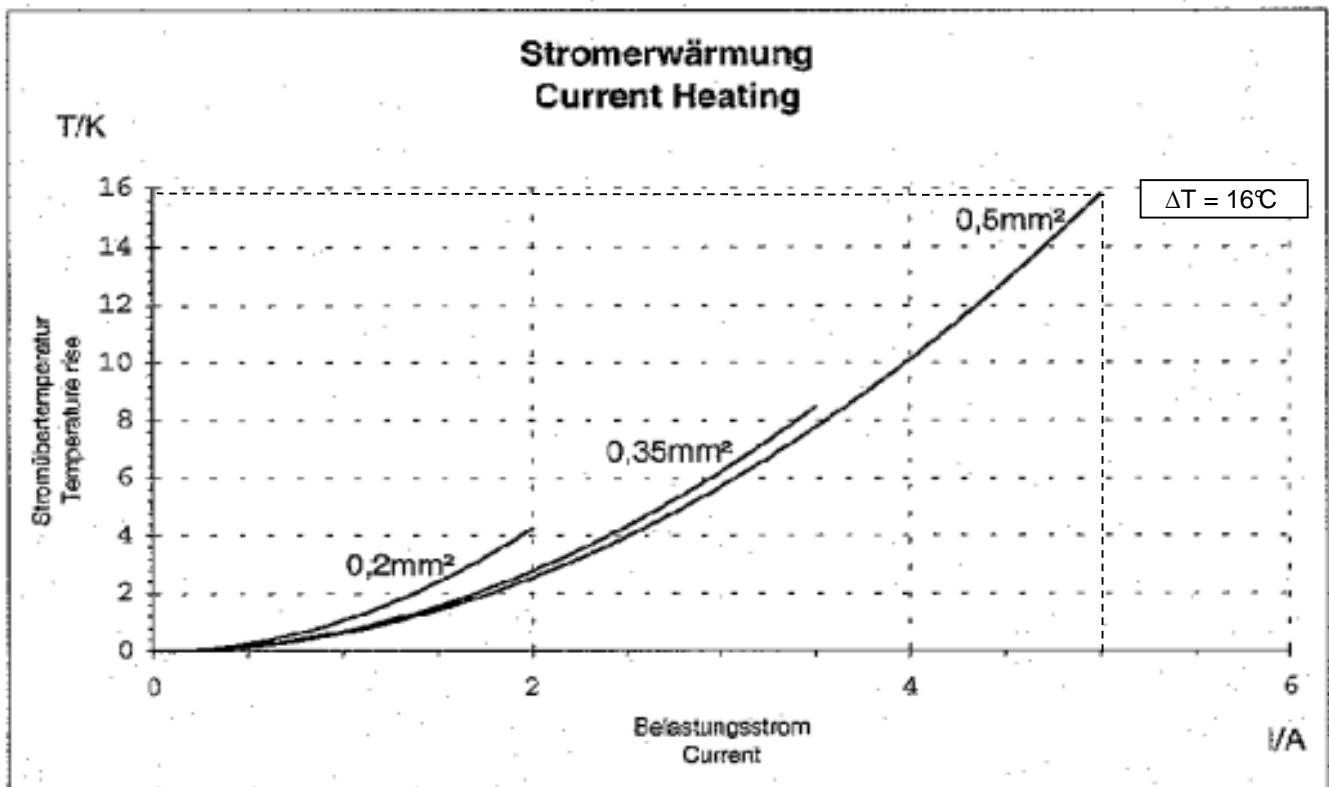
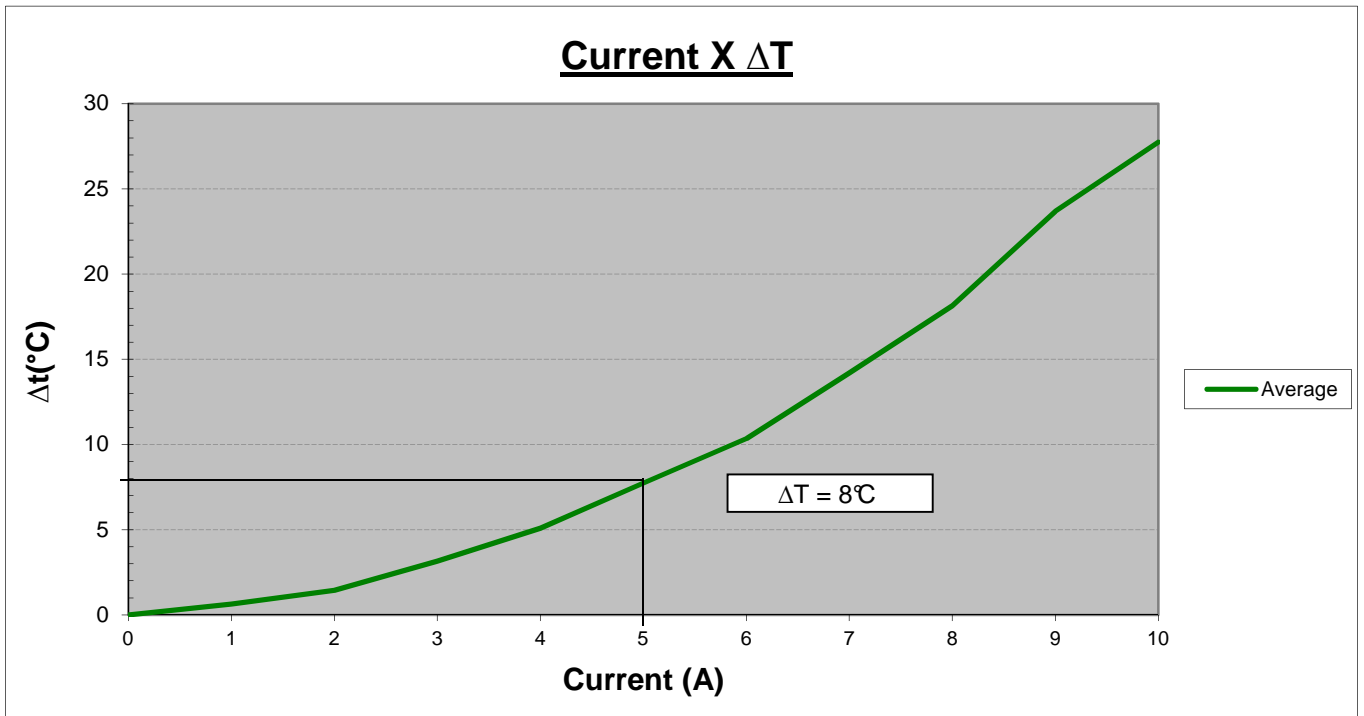
*Results:*

Sample	Contact resistance [mΩ]
111	1,13
112	2,40
113	1,60
114	1,80
115	2,21
116	2,48
117	1,75
118	1,93
119	1,35
120	1,00
Minimum	0,90
Average	0,98
Maximum	1,05

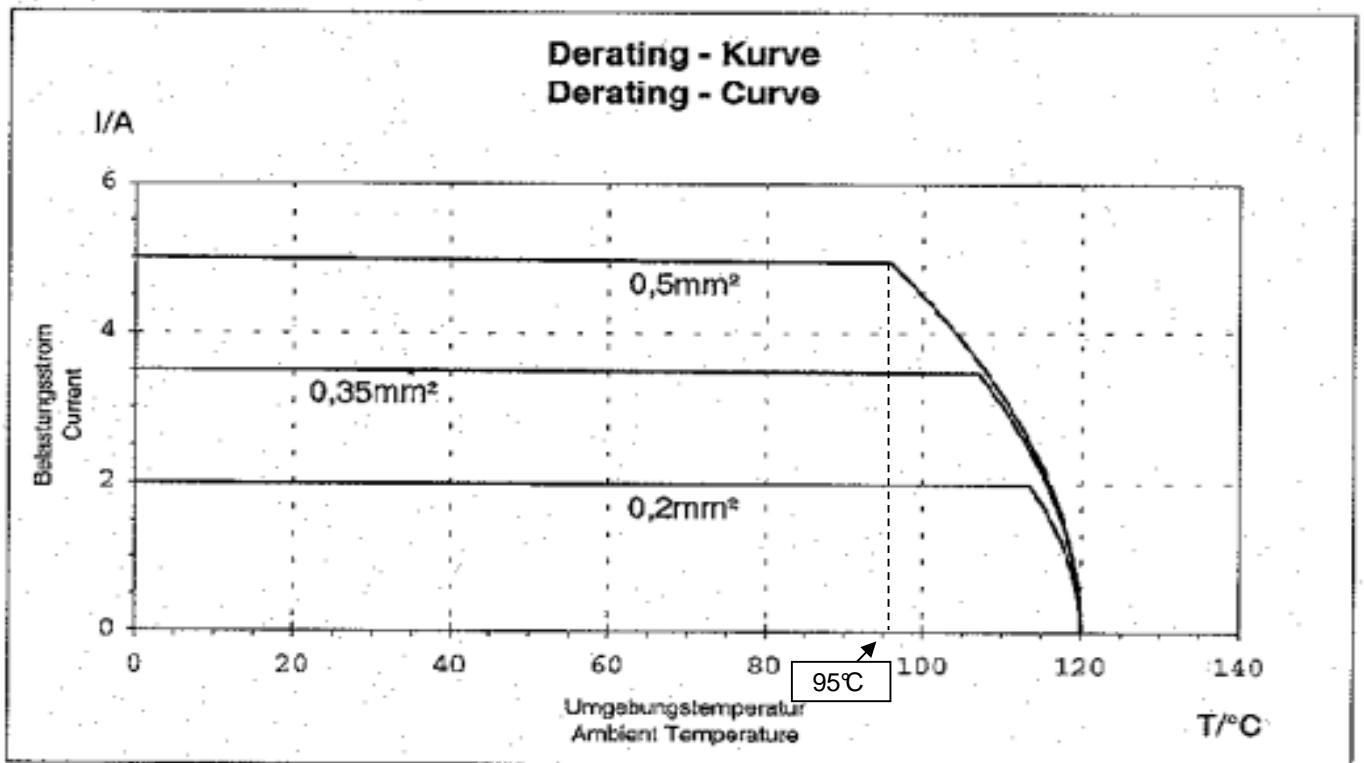
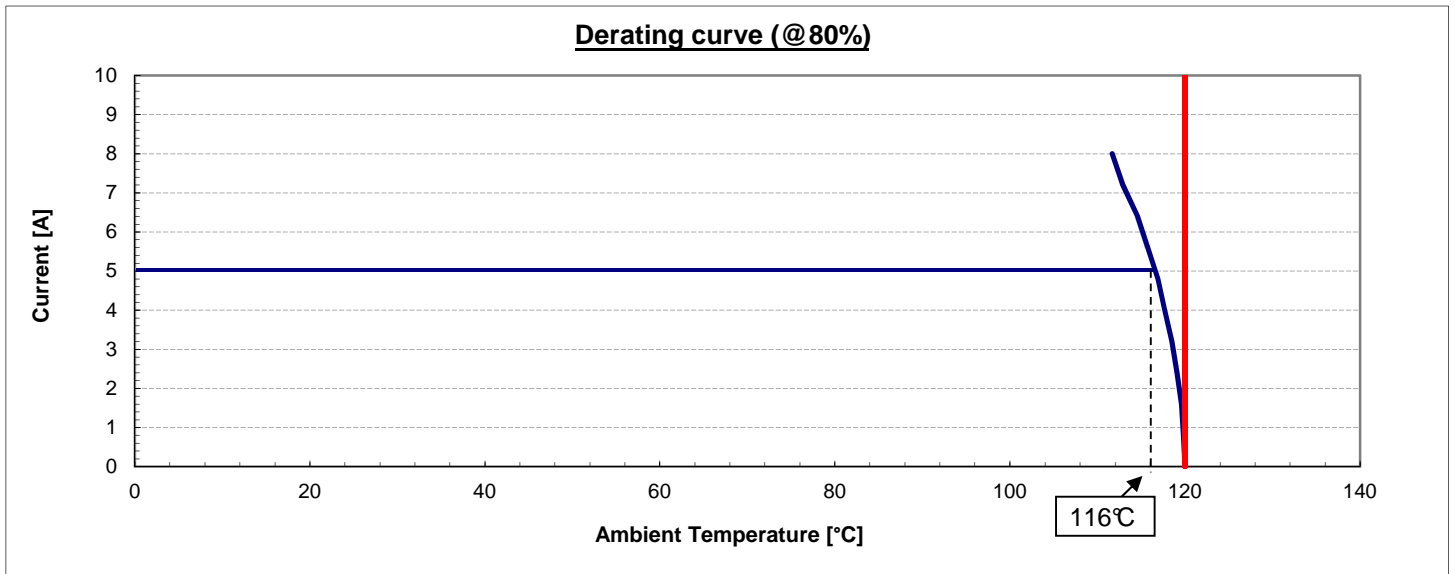
Derating:

Current (A)	Temperature Rise (°C)		
	Terminal 1	Terminal 9	Terminal 10
0	0	0	0
1,0	0,6	0,6	0,6
2,0	1,5	1,4	1,4
3,0	3,4	3,0	3,0
4,0	5,6	4,9	4,8
5,0	8,5	7,4	7,3
6,0	11,3	9,8	10,0
7,0	15,2	14,0	13,5
8,0	19,4	17,7	17,4
9,0	24,5	23,8	22,7
10,0	28,6	27,6	26,9





**Note:** Graph extracted from 108-18030\_A1 MQS Product Spec.



**Note:** Graph extracted from 108-18030\_A1 MQS Product Spec.

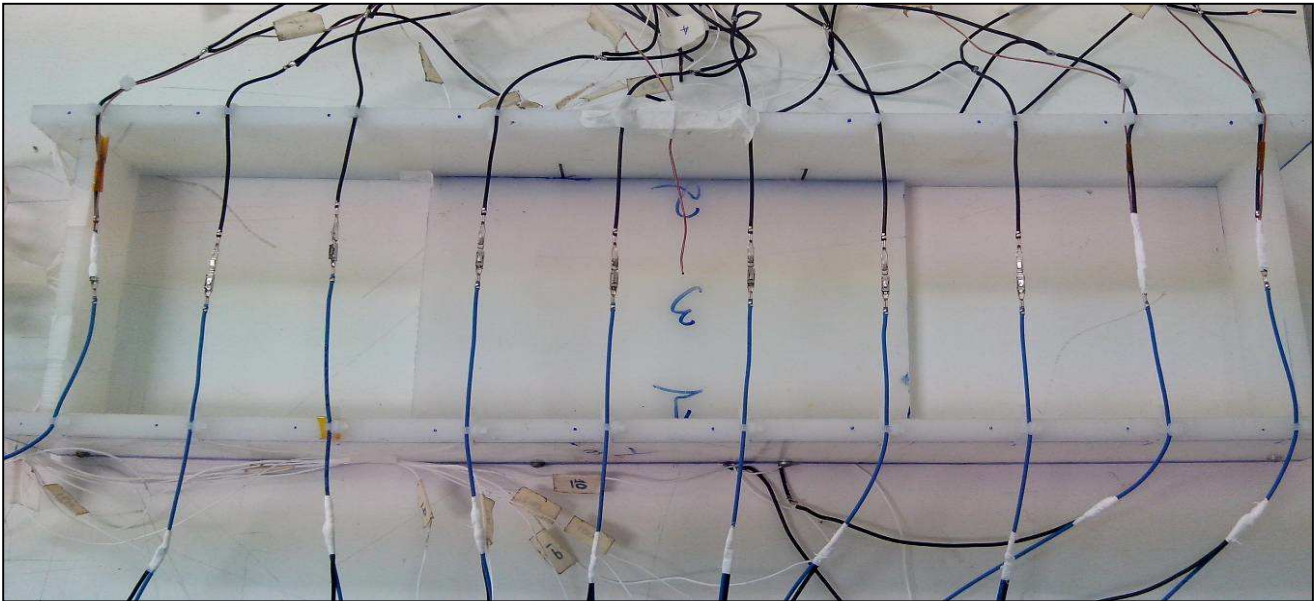


Photo 19 - Test overview

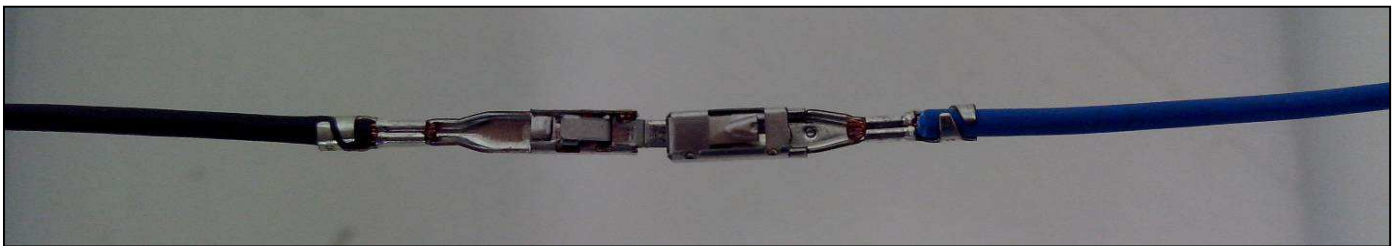


Photo 20 - Contact detail

*Conclusion:*

All samples met the requirements.

PRODUCT ENGINEERING LABORATORY	RL. <b>140062</b>
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**PG17 - DYNAMIC LOAD (TEST PERFORMED AT MAGNETI MARELLI LABORATORY):**

*Samples:*

Samples number 155 to 160.

*Equipment:*

HP Digital Multimeter, model 34401A, nr. 93-339033-030.

AGILENT E 3641A DC POWER SUPPLY nr. 93-339036-019.

Data acquisition AGILENT, model 34972A, nr. 93-339048-872.

Other equipments, please see Magneti Marelli test report nr. LTC/P&D - DFI051/13 attached.

*Procedure:*

- Visual inspection;
- Contact resistance;
- Dynamic load (contact resistance continuous during the test);
- Discontinuity monitoring during the test
- Contact resistance;
- Visual inspection.

**Dynamic load procedure:**

- |  |  |                   |
|--|--|-------------------|
| B 17.1   | Dynamic load, sinusoidal<br>Severity: see Table 7<br>Sweep speed: 1 oct./min | DIN EN 60068-2-6  |
| B 17.2   | Dynamic load, broad-band random vibration<br>Severity: see Table 7           | DIN EN 60068-2-64 |
| NOTE B 17.1 and B 17.2 can also be performed simultaneously (SOR). |  |                   |
| B 17.3   | Endurance shock test<br>Severity: see Table 7                                | DIN EN 60068-2-27 |

**Table 7 Severity**

Severity	TC (temperature cycle)	Random vibration with TC	Sine wave with TC	No. of shocks
1) "Body" unsealed	0 min/20 °C	8 h per axis	No sine wave	A = 30 g T = 6 ms sinusoidal half-wave No. of shocks: 6 000
	60 min/-40 °C	RMS value of acceleration		
	150 min/-40 °C	19,7 m/s <sup>2</sup>		
	300 min/105 °C	Hz		
	420 min/105 °C	(m/s <sup>2</sup> )/Hz		
	480 min/20 °C	10		
		55		
		180		
	300			
	360			
	1 000			

**Requirements:**

No function-relevant damage must occur.

Discontinuity bigger than  $7\Omega/1\mu s$  must not occur

Contact resistance  $\leq 15m\Omega$  (MQS).

Contact resistance  $\leq 8m\Omega$  (MCP).

**Results:**

**Initial contact resistance:**

Way	Contact resistance [mΩ]					
	Sample 155	Sample 156	Sample 157	Sample 158	Sample 159	Sample 160
1	0,45	0,41	0,37	0,37	0,43	0,37
2	0,39	0,41	0,36	0,37	0,34	0,39
3	0,50	0,39	0,42	0,44	0,39	0,40
4	1,24	1,36	1,31	1,45	1,43	1,49
5	1,77	1,51	1,64	1,61	1,22	1,54
6	1,92	1,70	1,80	1,90	1,80	1,35
7	2,67	1,35	3,03	2,16	1,39	1,44

**After vibration test contact resistance:**

Way	Contact resistance [mΩ]					
	Sample 155	Sample 156	Sample 157	Sample 158	Sample 159	Sample 160
1	0,43	0,42	0,39	0,34	0,38	0,34
2	0,48	0,36	0,38	0,38	0,36	0,38
3	0,39	0,41	0,42	0,45	0,41	0,39
4	1,68	1,34	1,39	1,26	1,49	1,43
5	1,40	1,43	1,45	1,51	1,36	1,51
6	1,35	1,51	1,46	1,39	1,53	1,29
7	1,19	1,40	2,84	1,33	1,22	1,43

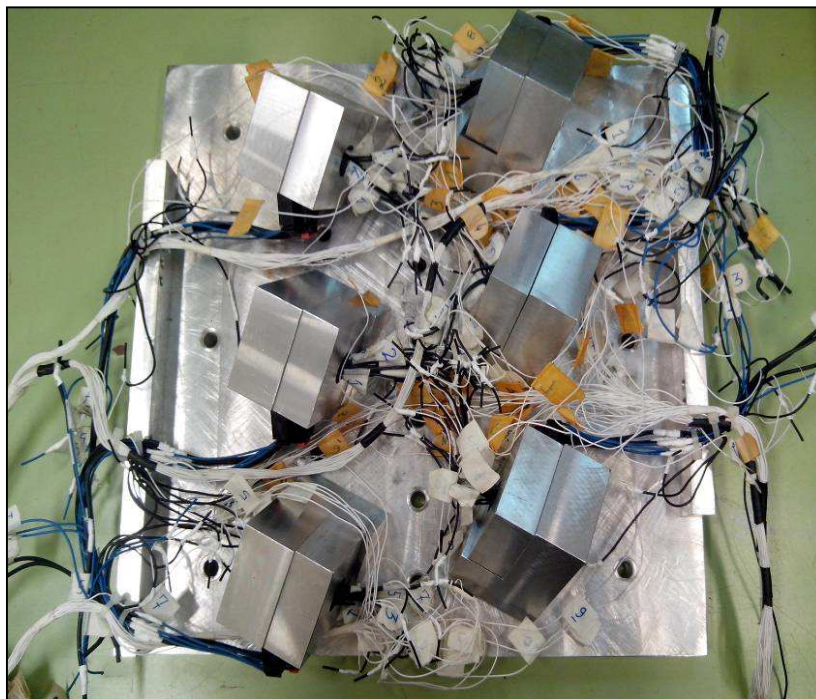
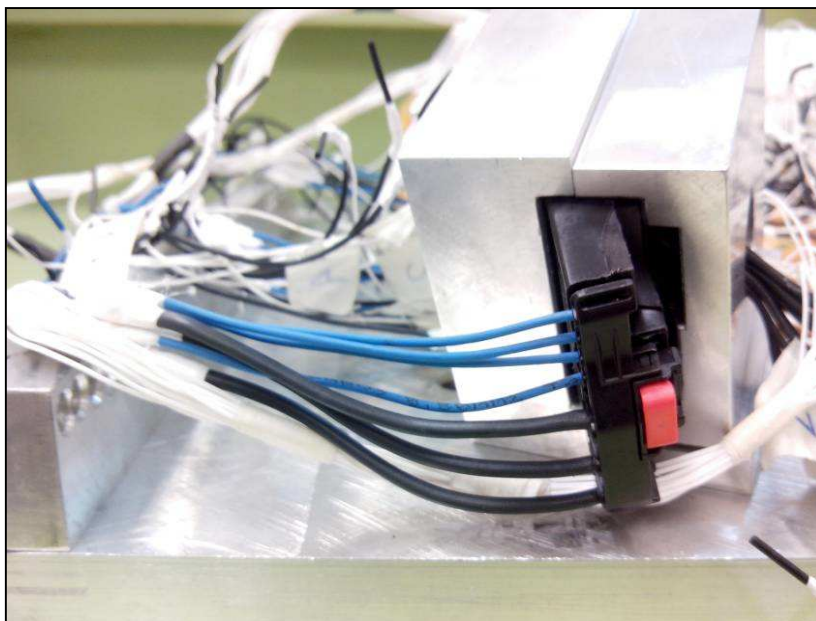


Photo 21 - Test overview



**Photo 22** - Connector detail positioned to the vibration fixture

*Conclusion:*

All samples met the requirements.