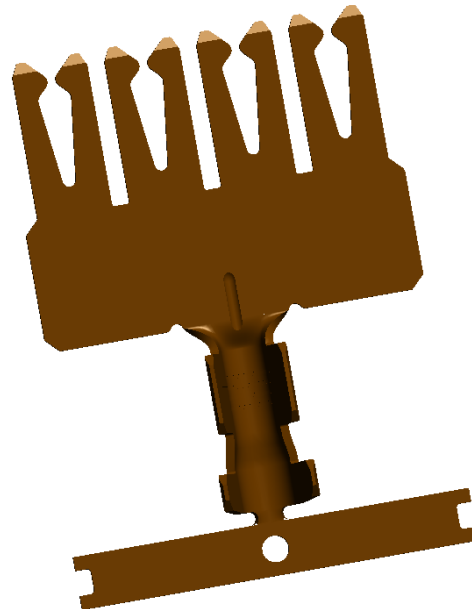
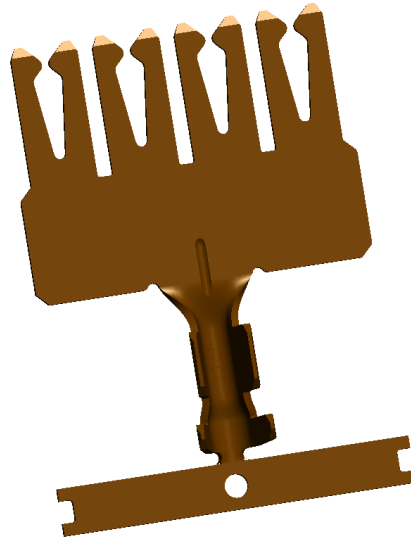


**CLIP SHUNT 4 WAYS**



Rédigé par/*Drawing by* : E.MINY    le 31-Jan-2011    Approuvé par/*Approved by* : J.J. REVIL    le 31-Jan-2011

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TABLE DES REVISIONS – *REVISION TABLE*

<b>Revision</b>	<b>Date</b>	<b>Modification</b>
1	31/01/2011	Initialisation
2	11/02/2011	Update

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## *SHORT TERM LIST*

<i>SHORT TERM</i>	<i>MODIFICATION DESCRIPTION</i>
Rci	<i>Initial connection resistance</i>
Rcf	<i>Final connection resistance</i>
$\Delta R_c = R_{cf} - R_{ci}$	<i>Connection resistance variation</i>
Rsi	<i>Initial crimping resistance</i>
Rsf	<i>Final crimping resistance</i>
$\Delta R_s = R_{sf} - R_{si}$	<i>Crimping resistance variation</i>
Tcontact	<i>Contact Temperature</i>
Tmax	<i>Maximum temperature of use of the contact</i>

Note :

The connection includes the crimping and the contact itself. The resistance of the wires between the 2 measurement points has to be deducted from the measured value.

The formulas could be written a follow:

- Connection resistance:  $R_c = R_{contact} + R_s$
- Connection resistance: (measured value)-(wire resistance between the 2 measurement points)

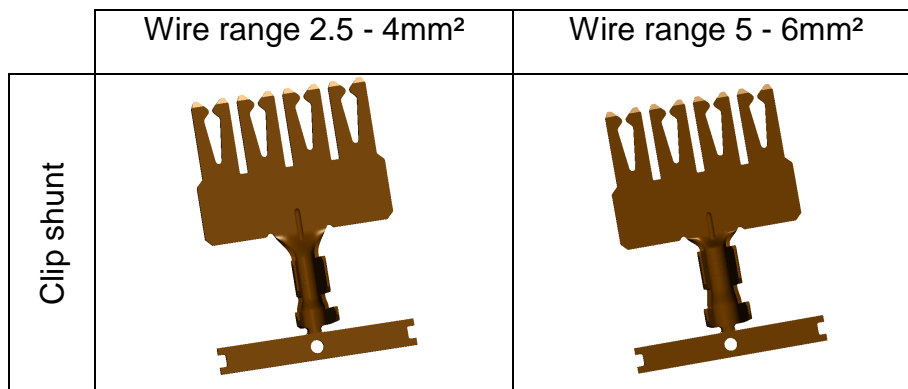
The product described in this document has not been fully tested to ensure conformance to the requirements outlined below. Therefore, TE makes no representation or warranty, express or implied, that the product will comply with these requirements. Further, TE may change these requirements based on the results of additional testing and evaluation. Contact TE Engineering for further details.

## 1. SCOPE

This document covers the performances, tests, and quality requirements for Clip Shunt.

## 2. DESCRIPTION

### 2.1. Clip Shunt



### 2.2. References

Tyco Electronics P/N	Description
1801614-3	Clip Shunt wire range 2.5 - 4 mm <sup>2</sup>
1801614-4	Clip Shunt wire range 5 - 6 mm <sup>2</sup>

## 3. REFERENCE DOCUMENTS

### 3.1. Usable document

In the event of conflict between the requirements of this specification and the drawing, the drawing shall take precedent.

In the event of conflict between the requirement of this specification and the referenced documents, this specification shall take precedent.

### 3.2. Tyco Electronics specifications

114-15124 rev 0

Application specification Clip shunt contact

### 3.3. Customer specifications

ISO 8092-3  
 CEI 60512-5  
 CEI 60352-2  
 CEI 68-2-60

## 4. SPECIFICATION

### 4.1. Design and Construction

The product, in its definition, its construction and its physical dimensions must satisfy the applicable product drawing.

### 4.2. Contact removal instructions

The tools to remove the contacts from their cavity depend on the housing which the contact is used with (see instruction for use of the used housing).

## 5. OPERATING CONDITIONS

### 5.1. Temperatures

Class(*)	Operating temperature	Test temperature *	
3	-40°C to 125°C	+150°C	For electrical connection a rea

(\*): Without current load

### 5.2. Watertightness & Protection rating

- Watertightness: Class 0 - Unsealed

### 5.3. Vibration

- Class 1 : Application on car body

## 6. TESTS

### 6.1. Test conditions:

- Supply voltage: 13.5V ± 0.5V
- Ambient temperature: 23°C ± 5°C
- Relative humidity: 60%± 15%
- Atmospheric pressure: 96kPa ± 10kPa
- If not otherwise specified :
  - Mechanical test: v = 50 mm/min
  - Wire section used : 4mm<sup>2</sup>
- The housing used during the validation is the fuse and relay holder, 36 Minifuses PN 1801613-1.

GENERAL INSPECTION				
	Test description	Ref. RSA <small>For indication</small>	Procedure	Requirement
V1	Visual inspection	36-05-019 § 6.1	Shall be performed with the naked eye.	No working damage No visible damage, cracking or defect.
V2	Crimp inspection	36-05-019 § 6.10.4.1	Cross section	According to 114-15124
MECHANICAL TESTS				
	Test description	Ref. RSA <small>For indication</small>	Procedure	Requirement
M1	Fuse insertion force	36-05-219 § 7.2.4.2	→ 1 cavity with clip shunt and other free (without contact). Fuse aligned with cavity : apply force in the contact's axis	$F \leq 40N$
M2	Fuse extraction force	36-05-219 § 7.2.4.2	→ 1 cavity with clip shunt and other free (without contact). Traction force in the contact's axis	$10N \leq F \leq 40N$
M3	Conductor / contact tensile strength Axial traction		→ Traction force on the wire in the contact's axis until break.	According to CEI 60352-2:  2.5 mm <sup>2</sup> : $F \geq 230N$ 3 mm <sup>2</sup> : $F \geq 260N$ 4 mm <sup>2</sup> : $F \geq 310N$ 5 mm <sup>2</sup> : $F \geq 345N$ 6 mm <sup>2</sup> : $F \geq 360N$
M4	Mechanical resistance of insulation crimping to bending	36-05-019 § 6.10.5.1	→ Bending test : see appendix 8	No damage of the connection or of the wire No sliding of the insulation out of the barrel
ELECTRICAL TESTS				
	Test description	Ref. RSA <small>For indication</small>	Procedure	Requirement
E1	Contact resistance	36-05-019 § 6.2	→ "MilliVolts" level method: <ul style="list-style-type: none"> <li>▪ Test voltage : 20 mV</li> <li>▪ Test current : <math>\geq 50</math> mA</li> </ul> Measurement method : appendix 1	$R_{ci} \leq 3$ m $\Omega$ for each contact connection
E2	Derating curve		→ Test performed following norm IEC 60512-5	$T_{contact} < T_{max}$ (125°C)
E3	Fuse blow up test	36-05-219 § 7.11	→ Test description in appendix 7	No deformation shall appear
E4	Crimping resistance	36-05-019 § 6.10.2.1	→ "MilliVolts" level method: <ul style="list-style-type: none"> <li>▪ Test voltage : 20 mV</li> <li>▪ Test current : <math>\geq 50</math> mA</li> </ul> Measurement method : appendix 1	$R_{si} \leq 0.3m\Omega$

PHYSICOCHEMICAL TESTS				
	Test description	Ref. RSA <small>For indication</small>	Procedure	Requirement
PC1	Thermal shocks	36-05-019 § 6.17	<ul style="list-style-type: none"> <li>▪ → Number of cycles : 100</li> </ul> Test method : appendix 4	No mechanical or electrical damage of the contact  $R_{ci} \leq 3 \text{ m}\Omega$ $\Delta R_{c} \leq 4 \text{ m}\Omega$
PC2	Atmospheric corrosion	36-05-019 § 6.7	→ Method regarding CEI 68-2-60 with <ul style="list-style-type: none"> <li>▪ Preconditioning : 1 H</li> <li>▪ Method : C</li> <li>▪ Duration : 4 h</li> </ul>	$R_{ci} \leq 3 \text{ m}\Omega$ $\Delta R_{c} \leq 4 \text{ m}\Omega$
AGEING TESTS				
	Test description	Ref. RSA <small>For indication</small>	Procedure	Requirement
A1	Resistance to vibrations	36-05-019 § 6.9	→ Test current : 100 mA  Measurement and assembly method according to appendix 1 and 2  Vibration: Class 1 see appendix 3	No mechanical damage. During the test, no micro-cuts allowed $\Delta R_{c} \leq 4 \text{ m}\Omega$ at the end of each axis
A2	Current cycle	36-05-019 § 6.15	→ Test method : appendix 5	$R_{ci} \leq 3 \text{ m}\Omega$ $\Delta R_{c} \leq 4 \text{ m}\Omega$
A3	Temperature humidity cycle	36-05-019 § 6.16	→ 10 cycles of 24 Hrs. Cycles described in appendix 6	$R_{ci} \leq 3 \text{ m}\Omega$ $\Delta R_{c} \leq 4 \text{ m}\Omega$
A4	Climatic endurance	36-05-019 § 6.19	→ 240 Hrs at 150°C (Oven thermo ventilated)	No mechanical or electrical contact damage. $R_{ci} \leq 3 \text{ m}\Omega$ $\Delta R_{c} \leq 4 \text{ m}\Omega$
A5	Insertion/ extraction endurance	36-05-219 § 7.2.4.4	→ Manual operation 10 mating and unmating cycles	$R_{ci} \leq 3 \text{ m}\Omega$ $\Delta R_{c} \leq 4 \text{ m}\Omega$

(1): Peeling: Peeling off of the plating



## 7. QUALITY INSURANCE MEASURE

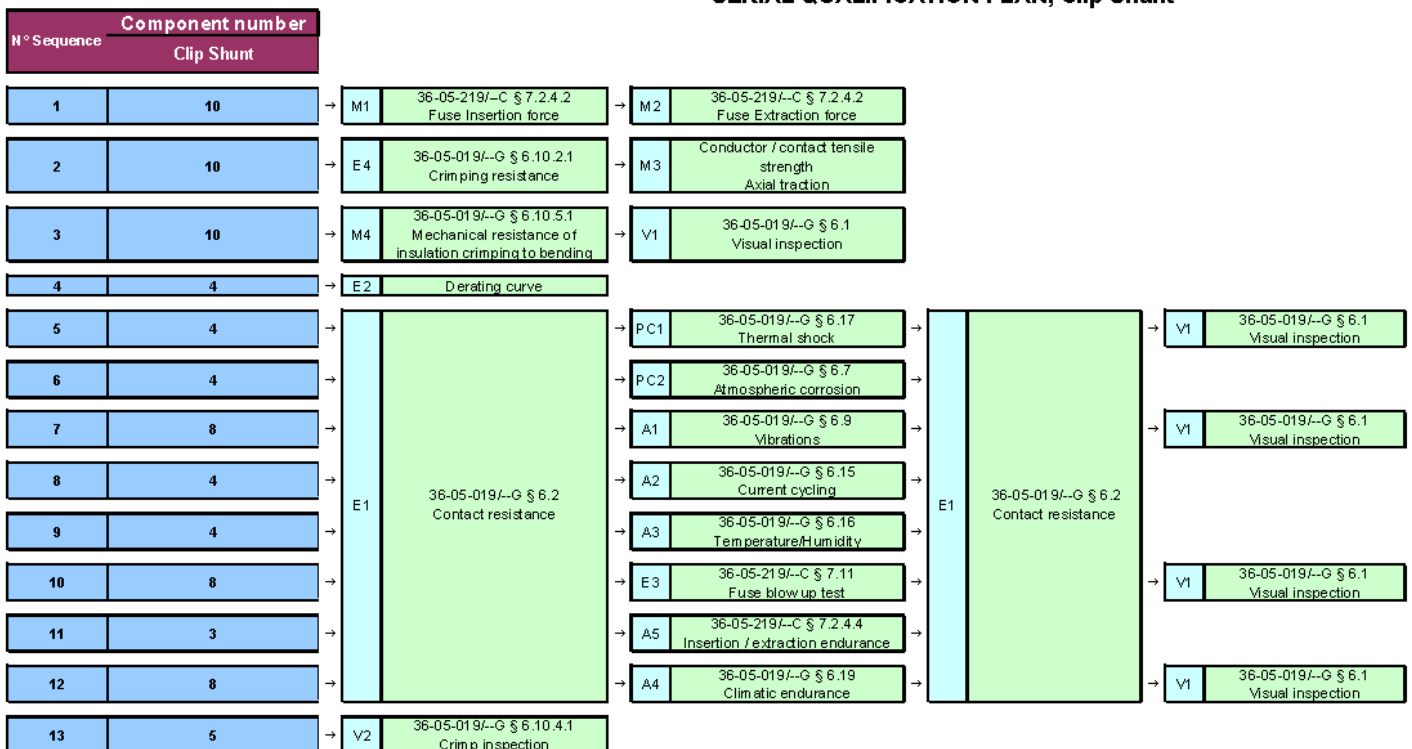
### 7.1. Qualification test

Samples must be in accordance with drawings and be taken in a random way in the production in progress.

### 7.2. Program approval tests

In the groups defined below, the boxes undergo all the tests in the chronological order of the figure

**SERIAL QUALIFICATION PLAN, Clip Shunt**



### 7.3. General conditions of test

Unless otherwise specified, the tests are conducted in the following conditions.

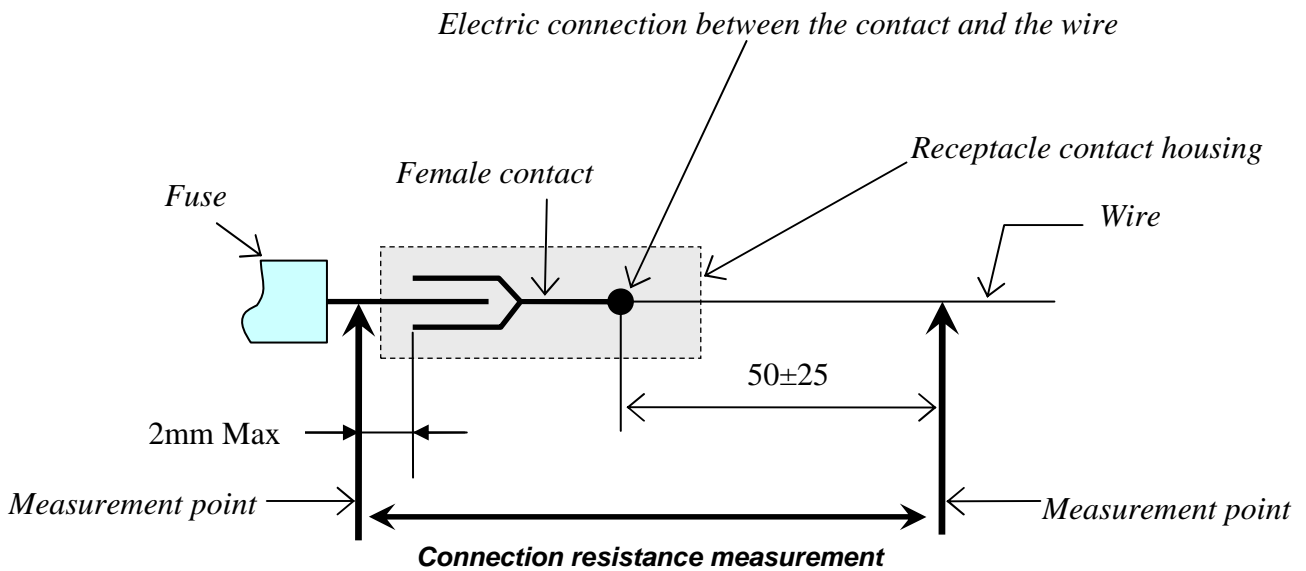
### 7.4. Test and conformity

Conformity test is made regarding specific Tyco Electronics quality inspection plan which define acceptable quality limit based on number of samples.

Dimensional and functional requirement must meet production drawing and that specification.

**APPENDIX 1: Connection**

Comment: There are 4 connections (fuse with female contact) on clip shunt.



The value given as a result is:

$$R_c = (\text{connection resistance measured as described on the scheme above}) - (\text{resistance of the } 50 \pm 25 \text{ mm of wire})$$

The  $R_c$  must to be measure on each connection.

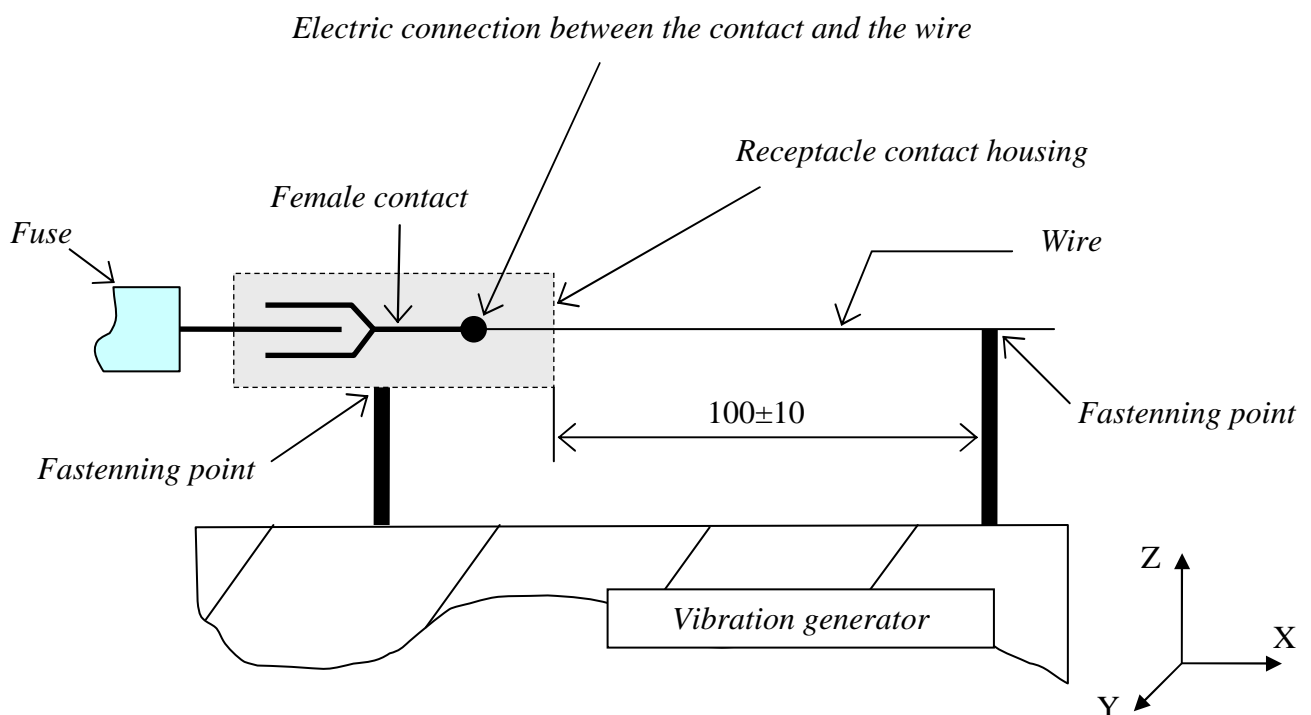
**APPENDIX 2: Setup Principle For Vibration Tests**

a) Pre conditioning before vibration test

The connectors are pre-conditioned during 48h in a ventilated oven at the maximum temperature of the temperature class (125°C in that case).

The connectors are then fastened on vibrating equipment before being tested with vibrations (See following paragraph).

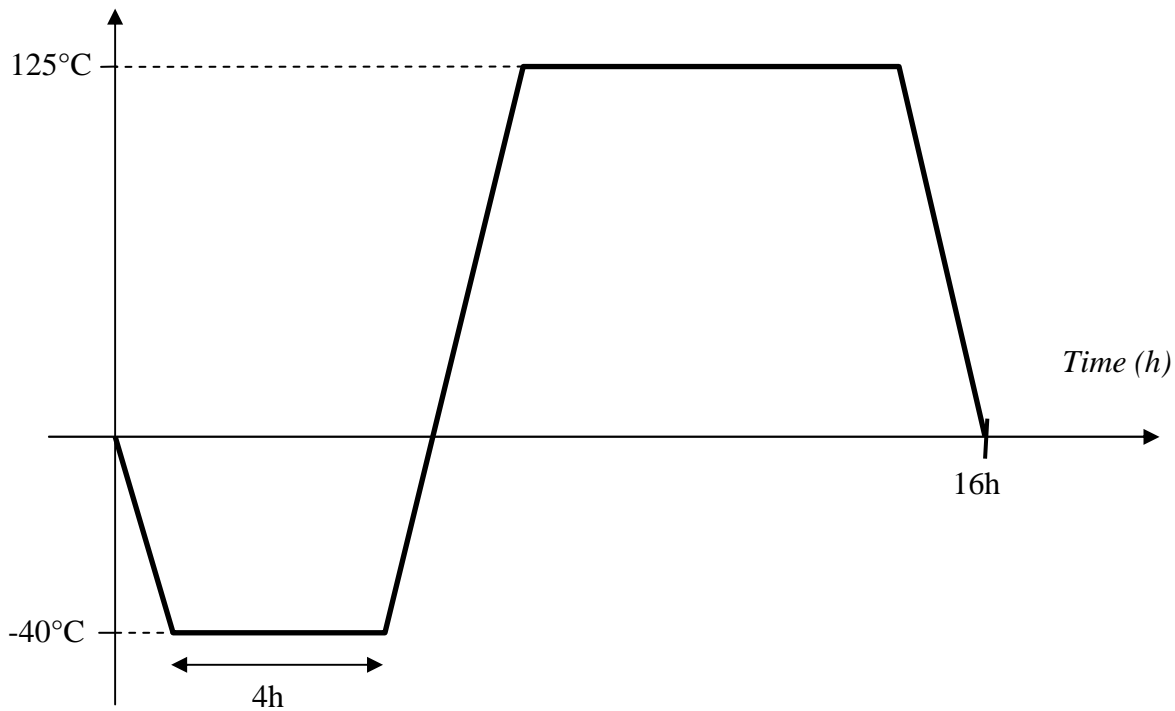
b) Setup Principle For Vibration Tests



c) Temperature variation during the vibration test

During the vibration test, the connectors are submitted to the following temperature cycling:

Temperature ( $^{\circ}\text{C}$ )

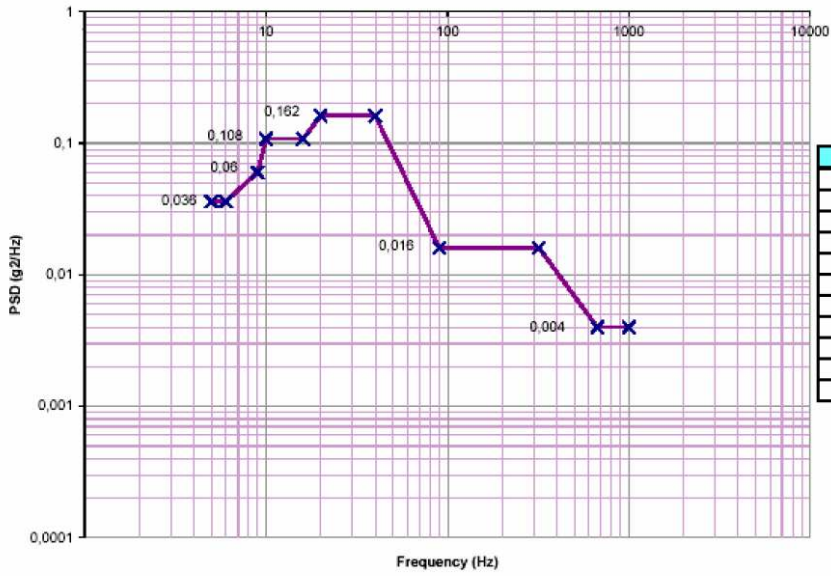


Temperature variation speed is 40°C per hour.

d) Test procedure

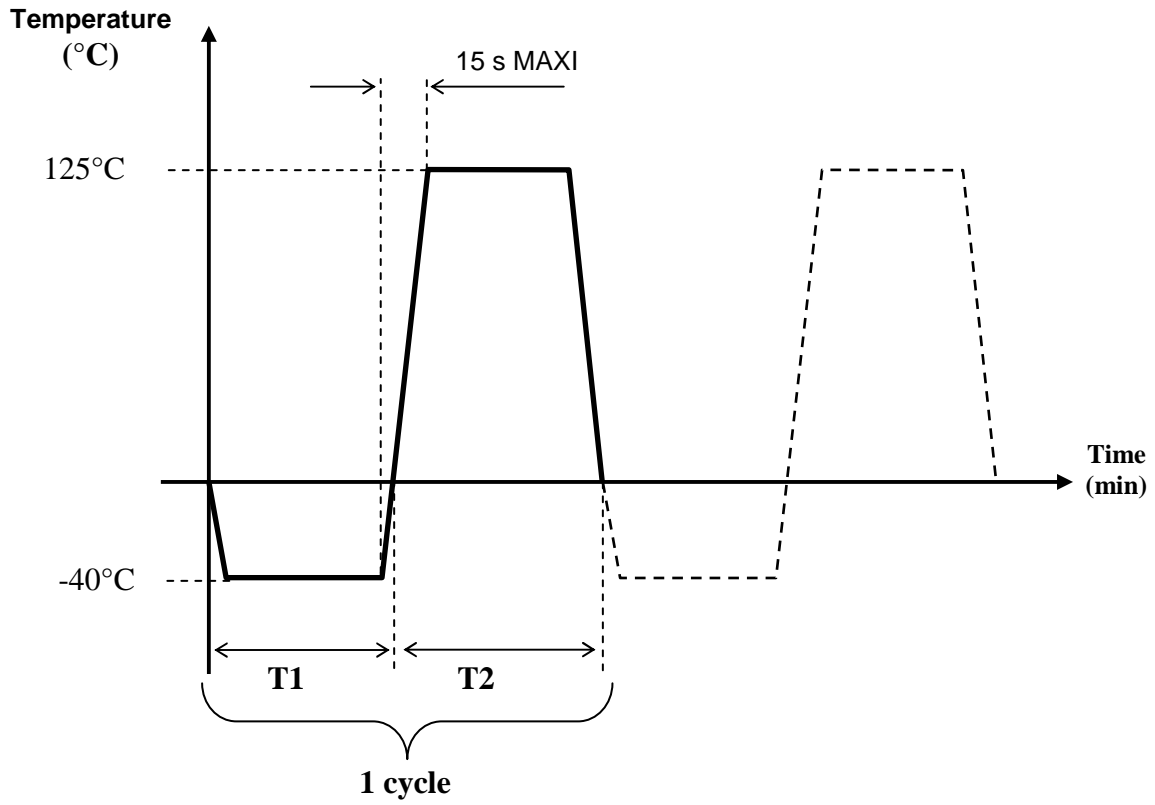
- Apply the vibration stress during 16h following each directions with a micro cut detection device
- Measure the contact resistance at the end of each test following one direction
- When the vibration stress has been applied following the 3 directions, put the device under test during 12h at 85°C and 75% of humidity with an electric controller without unmounting the connection
- Measure the final contact resistance at the end of this test

**APPENDIX 3: Vibration Profile**



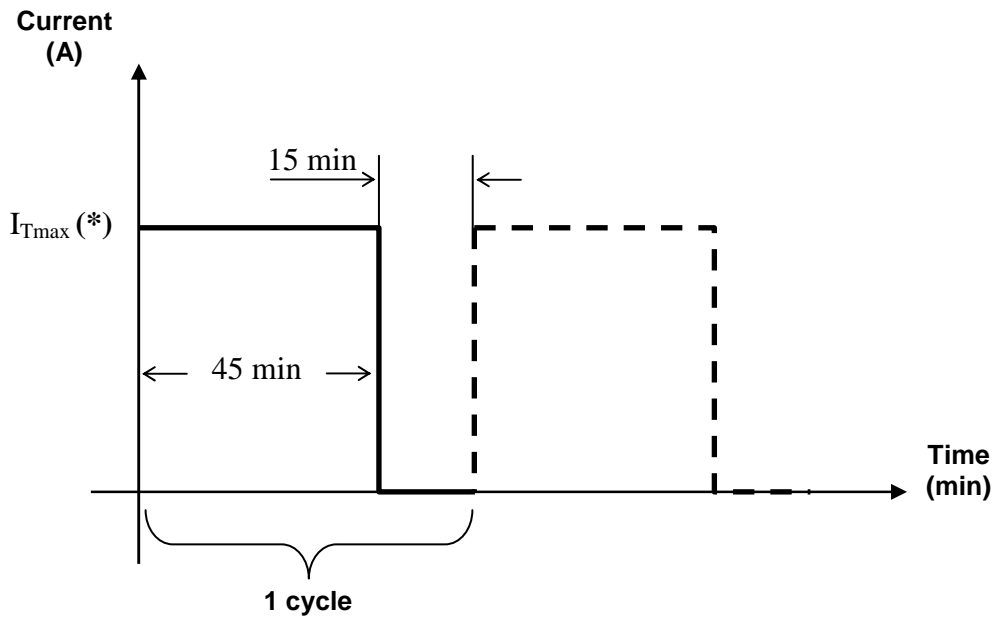
Fréquence (Hz)	DSP (g²/Hz)
5	0,036
6	0,036
9	0,06
10	0,108
16	0,108
20	0,162
40	0,162
90	0,016
320	0,016
670	0,004
1000	0,004

**APPENDIX 4: Thermal Shock**



Test	T1 (min)	T2 (min)
Crimping pre-conditioning by thermal shock	30	30
Thermal shock	60	60

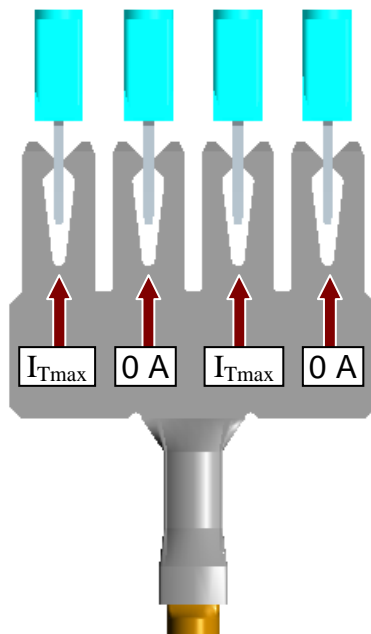
**APPENDIX 5: Current Cycling Profile**



a) Test to be performed

The test is performed at 85°C

Apply  $I_{Tmax}$  on 50% of fuse (see below).

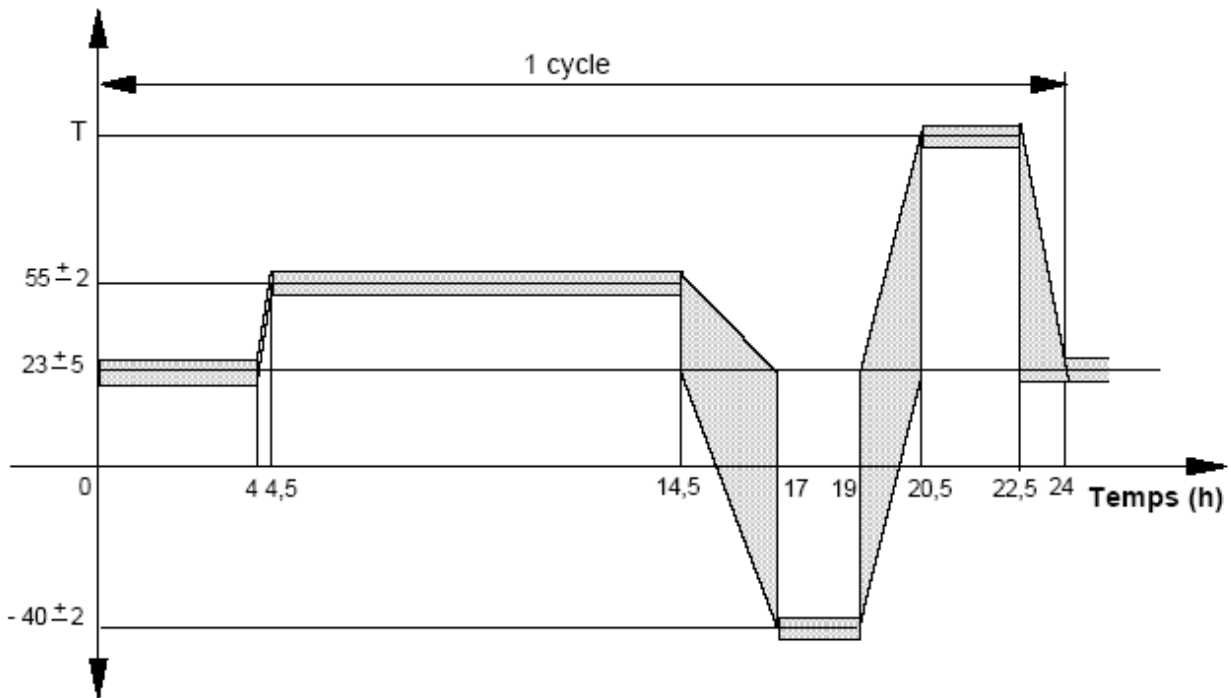


(\*):  $I_{Tmax}$  is the current that heat up the contact zone at 125°C (Given by the derating curve). In that case,  $I_{Tmax}$  is equal to the rated current.

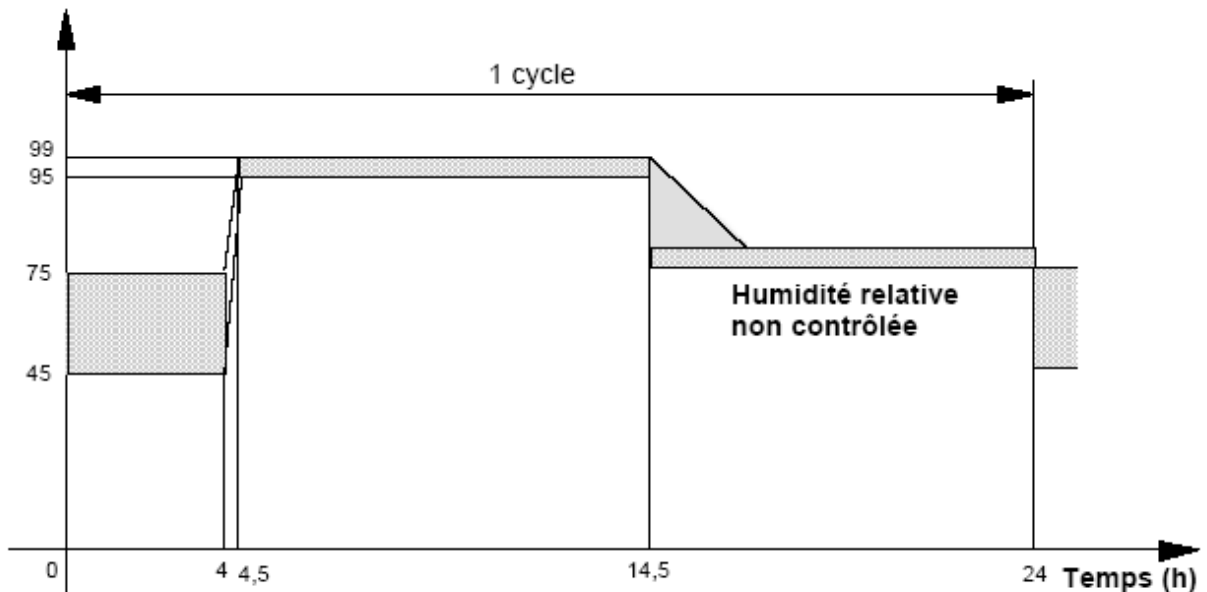
**APPENDIX 6: Temperature / Humidity Endurance Test**

Temperature / humidity cycle:  
Maximum test temperature: 125°C

**Température (°C)**



**Humidité relative (%)**





**APPENDIX 7: Fuse Blow Up Test (for information only)**

The test is performed at ambient temperature.  
A 30A "Mini" fuse is mounted in the housing  
Then receptacle contact is crimped on a 6 mm<sup>2</sup> wire.

## Test N°1:

- The initial contact resistance (Rci) is measured with the millivolts method
- A current of 40A (135% of the fuse rated current) is applied to the fuse until it blows up. The blow up duration has to be below 1800s
- The damaged fuse is replaced by a new one
- The contact resistance is measured with the millivolts method

## Test N°2:

- The initial contact resistance (Rci) is measured with the millivolts method
- A current of 60A (200% of the fuse rated current) is applied to the fuse until it blows up. The blow up duration has to be below 5s
- The damaged fuse is replaced by a new one
- The contact resistance is measured with the millivolts method

The resistance variation of the contact is given for information.

**APPENDIX 8: Setup For Insulation Resistance Test**

Perform 5 bending cycles

