

**Cross Contact 2.8mm ; 6.3mm; 9.5mm**

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## SCOPE

### 1.1 Content

This specification covers construction, performance, failure, tests and quality requirements for TE Connectivity Cross Contact.

### 1.2 Qualification

When tests are performed the following specified specifications and standards shall be used. All inspections shall be performed using the applicable inspection plan and product drawing. For qualification matrix see table in 4.4.

## 2. APPLICABLE DOCUMENTS

The following documents form a part of this specification to the extent specified herein. In the events of conflict between the requirements of this specification and the product drawing or of conflict between the requirements of this specification and the referenced documents, this specification shall take precedence.

### 2.1 TE Connectivity Documents

#### 2.1.1 Customer Drawings

C-1823667 Group drawing for Cross Contact

#### 2.1.2 Application Specification

114-94202 Application Specification for Cross Contact

114-18981 Cross Contact Cavity

114-18220 Cross Contact Connection Geometry

114-18511 Interface Drawing Contact PIN 4.8x0.8 5.8x0.8 6.3x0.8

### 2.2 Standards

IEC 60664 Insulation co-ordination within low-voltage systems including clearances and creepage distances for equipment

IEC 60068-2-30 Environmental testing - Part 2-30: Tests - Test DB: Damp heat, cyclic

IEC 60068-2-60 Environmental testing - Part 2: Tests - Test KE: flowing mixed gas corrosion test

IEC 60512-2 Electromechanical components for electronic equipment, basic testing and measuring methods – Part 2: Electrical continuity and contact resistance tests

IEC 60512-3 Electromechanical components for electronic equipment, basic testing and measuring methods – Part 3: Current – carrying capacity tests

IEC 60512-5 Electromechanical components for electronics equipment; basic testing and measuring methods - Part 5: Impact tests (free components), static load tests (fixed components), endurance tests and overload tests

IEC 60512-7 Electromechanical components for electronics equipment; basic testing and measuring methods - Part 7: Mechanical operating tests and sealing tests

IEC 60512-8 Electromechanical components for electronics equipment; basic testing and measuring methods - Part 8: Connector tests (mechanical) and mechanical tests on contacts and terminations

VDA Test Guideline for Motor Vehicle Connectors – February 1996

### 3. DESCRIPTION

#### 3.1 Design and Construction

The design and dimensions of the Cross Contacts are shown in the product drawings and are inspected in accordance with the TE Quality Guide-lines

The Cross Contact is a female terminal determined for usage in automobiles on a basis of connection to a tab of thickness 0.63 mm and 0,8 mm by the latches in its lower section. Shape of these latches allows a connection in defined orientation only. Four independent contact springs with four contact points with gap sizes provide long term mechanical and electrical stability. Mating of a counterpart can be done in two mutually perpendicular mating directions (except 9.5mm CC). Always only two contact points in appropriate line are functional together. Only the 9,5 mm Cross Contact must be mated in oriented position with the lead frame tab. (see Fig. 1). Leading chamfer on top of each contact spring ensures a correct mating of counterpart between the contact points. A short and wide contact body together with large-area contact points ensures a low contact resistance. The contact body is protected from opening by the body lock and two laser welding points.

The cross contact is attached to the carrier strip through the cut off tab from the stamping process. For final application the carrier strip is cut off from the cross contact.

Mating parts are male terminals with tab dimensions 2,8 x 0,8; 6,3 x 0,8 or 9,5 x 1,2 mm depending on type of cross contact (see product overview). Tabs with radius on both sides like the specification 114-18511 shall be used in preference.

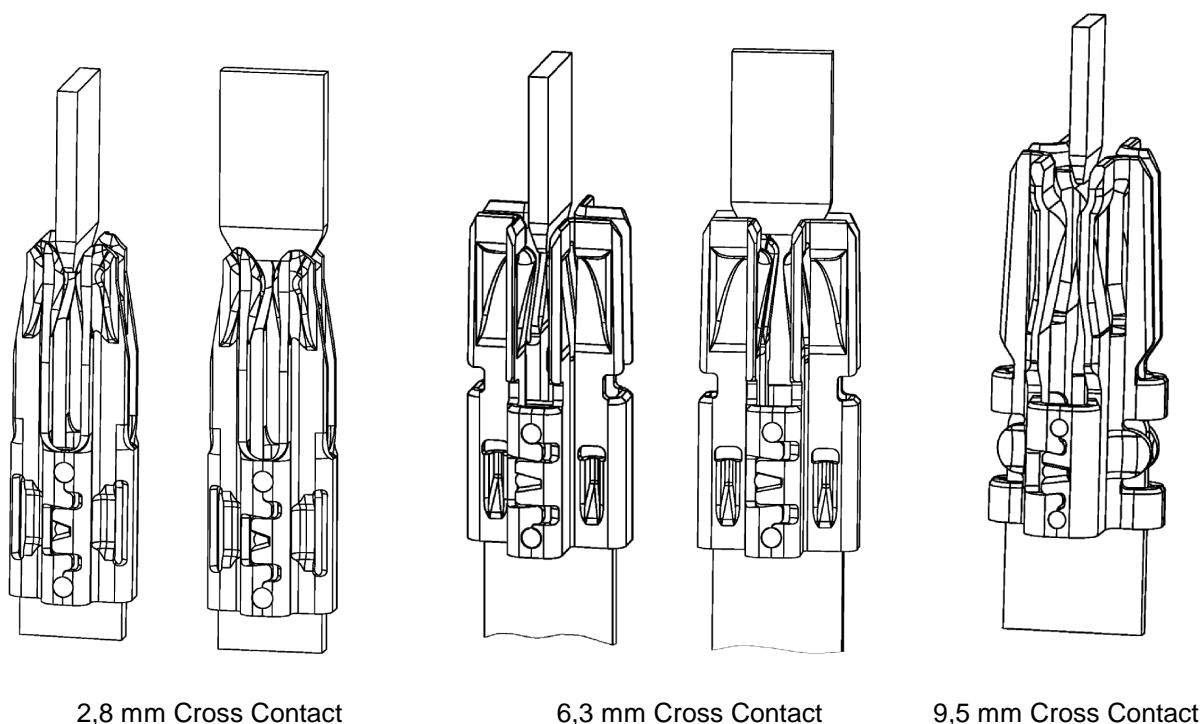


Fig. 1 – Two mating directions of 2,8 & 6,3 mm Cross Contacts and oriented mating direction of 9,5 mm Cross Contact

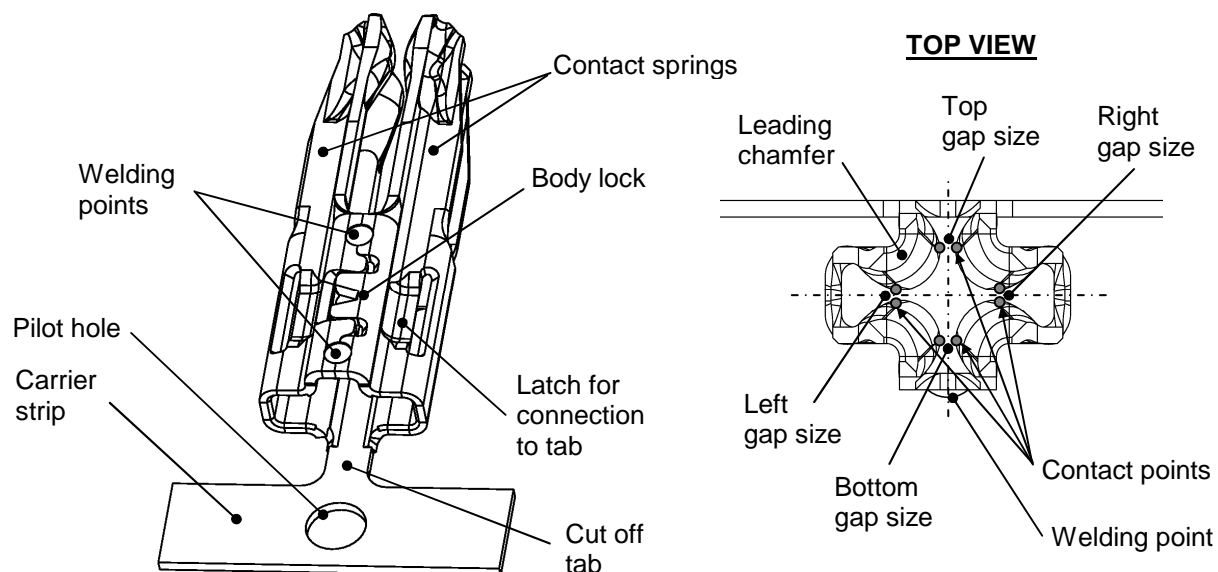


Fig. 2 - Description of Cross Contact features

### 3.2 Materials

Basic material is a wrought copper-nickel-silicon alloy with tin-silver and tin coating according to TE Connectivity specifications. See production and customer drawings for details.

### 3.3 Product Overview

Table 1  
Product overview for 0.63mm lead frame

TE Connectivity Part Number	Description	Packaging	Mating Tab Dimensions
0-968907-x	2,8 mm Cross Contact	paper reel	2,8 x 0,8 mm
1-968907-x		plastic reel	
2-968907-x		pallet reel Ø1200 mm	
0-968047-x	6,3 mm Cross Contact	paper reel	6,3 x 0,8 mm
1-968047-x		plastic reel	
2-968047-x		pallet reel Ø1200 mm	
0-968909-x	9,5 mm Cross Contact	paper reel	9,5 x 1,2 mm
1-968909-x		plastic reel	
2-968909-x		pallet reel Ø1200 mm	

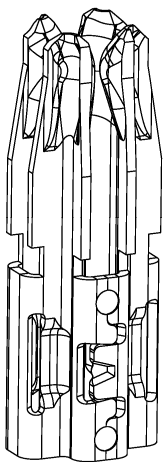
X=1 ... tin surface  
X=2 ... tin-silver surface

Product overview for 0.8mm lead frame

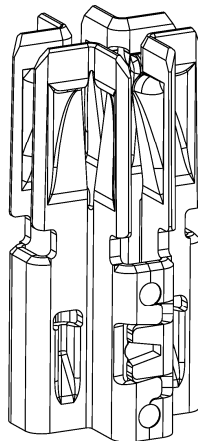
TE Connectivity Part Number	Description	Packaging	Mating Tab Dimensions
0-968908-x	2,8 mm Cross Contact	paper reel	2,8 x 0,8 mm
1-968908-x		plastic reel	
2-968908-x		pallet reel Ø1200 mm	
0-968048-x	6,3 mm Cross Contact	paper reel	6,3 x 0,8 mm
1-968048-x		plastic reel	
2-968048-x		pallet reel Ø1200 mm	
0-1670001-x	9,5 mm Cross Contact	paper reel	9,5 x 0.8 mm
1-1670001-x		plastic reel	
2-1670001-x		pallet reel Ø1200 mm	
0-968910-x	9,5 mm Cross Contact	paper reel	9,5 x 1,2 mm
1-968910-x		plastic reel	
2-968910-x		pallet reel Ø1200 mm	

X=1 ... tin surface

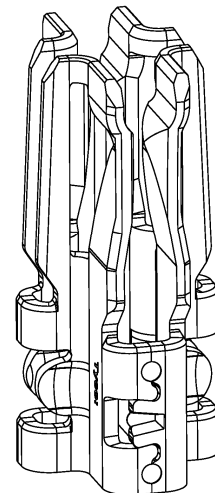
X=2 ... tin-silver surface



2,8 mm Cross Contact



6,3 mm Cross contact



9,5 mm Cross Contact

Fig. 3 – Cross Contact Overview

## 4. REQUIREMENTS

### 4.1 Ratings

Voltage:	according to IEC 60664
Current carrying capacity:	for 2,8 mm Cross Contact, see Para 4.3 limited to max. 40 A during testing
	for 6,3 mm Cross Contact, see Para 4.3 limited to max. 45 A during testing
	for 9,5 mm Cross Contact, see Para 4.3 limited to max. 65 A during testing
Temperature range:	-40 to 150°C for Tin-silver alloy -40 to 120°C for tin surface
Maximum mating cycles:	10

### 4.2 Performance and Test Description

The product is designed to meet the electrical, mechanical and environmental performance requirements specified in Para. 4.3. All tests are performed at ambient environmental conditions per IEC 60512 unless otherwise specified.

### 4.3 Test Requirements and Procedures

- a) 2,8 mm Cross Contact
- b) 6,3 mm Cross Contact
- c) 9,5 mm Cross Contact

Table 2 Test description

Test Description	Requirement	Procedure
<b>PG 0</b> Receiving inspection and testing  1. Contact resistance in contact area from mating side  2. Contact resistance in connection area from connection side	Contact resistance  $R_k \leq 2 \text{ m}\Omega$  a) $R_{KS} \leq 2 \text{ m}\Omega$ b) $R_{KS} \leq 1,5 \text{ m}\Omega$ c) $R_{KS} \leq 1,5 \text{ m}\Omega$	Acc. IEC 60512-2, Test 1a Test 2b  Current load 1A
<b>PG 5</b> Load deflection curve	Contact normal force  $F = 4 - 12 \text{ N}$	Test tab thickness 0,8 mm (always new single contact pair)  To be measured on unassembled cross contact!
<b>PG 8</b> Contact retention from lead frame's tab	Retention force  a) $F > 25 \text{ N}$ b) $F > 60 \text{ N}$ c) $F > 60 \text{ N}$	Acc. IEC 60512-8, Test 15b  Testing speed 25 mm/min

Test Description	Requirement	Procedure
<p><b>PG 11</b> Mating and unmating forces of single contacts</p>	<p>Mating force</p> <p>a) <math>F = 2 - 9 \text{ N}</math> b) <math>F = 4 - 12 \text{ N}</math> c) <math>F = 7 - 15 \text{ N}</math></p> <p>Unmating force</p> <p>a) <math>F = 1 - 4 \text{ N}</math> b) <math>F = 1 - 5 \text{ N}</math> c) <math>F = 2 - 7 \text{ N}</math></p>	<p>Acc. IEC 60512-7, Test 13b Acc. IEC 60512-5, Test 9a</p> <p>Testing speed 25mm/min</p> <p>a) test tab thickness 0,6 mm PN 1394056-1 b) test tab thickness 0,8 mm PN 965850-1 c) test tab thickness 1,2 mm PN 965851-1</p> <p>To be measured on unassembled cross contact!</p>
<p><b>PG 12</b> Current temperature rise, derating (without housing)</p>	<p>See applicable current carrying capability figures</p> <p>a) max. 40 A b) max. 45 A c) max. 65 A</p>	<p>Acc. IEC 60512-3, Test 5a Temperature rise curve see Fig. 4 Acc. IEC 60512-3, Test 5b Derating curve see Fig. 5</p> <p>5 contacts free in air</p>
<p><b>PG 15</b> Electrical stress test</p>	<p>Contact resistance</p> <p><math>R \leq 2,0 \times R_{\text{initial}}</math></p> <p>At the end of the entire test the total contact resistance shall not be more than 200% of initial value</p> <p>Change of temperature <math>\Delta T \leq 20 \text{ K}</math></p>	<p>Acc. IEC 60068-2-30</p> <p>1. Damp heat -40°C/+80°C, 1 Cycle = 6 h, 60 Cycles Profile see Fig. 6</p> <p>2. Temperature/current change – long term <math>T_u = 25^\circ\text{C}, T_o = 55^\circ\text{C}</math>, Relat. humidity 95%, 1 Cycle = 24 h, 21 cycles</p>
<p><b>PG 17</b> Dynamic stress – only in combination with application</p> <p>1. Thermal shock 2. Mechanical stress 3. Mechanical shock</p>	<p>Contact resistance</p> <p><math>R \leq 3,0 \times R_{\text{initial}}</math></p> <p>At the end of the entire test the total contact resistance shall not be more than 300% of initial value.</p> <p>Inspect cross contact for any signs of damage or degradation</p>	<p>Thermal shock -40°C/+85°C for 90 min, change over time max.30 s, 100 cycles</p> <p>Mechanical stress Vibration class I, Random vibration 5-2000 Hz, acceleration density <math>31 \text{ (m/s}^2\text{)}^2\text{/Hz}</math>, 20h per axis with superimposed temperature -40°C/+85°C with gradient 1 – 1,5 °C/min. Temperature and vibration profile see Fig. 7 &amp; Fig. 8</p> <p>Mechanical shock 2x 10 Shocks per axis (60 shocks in total), acceleration <math>500 \text{ m/s}^2</math> for 11 ms</p>

Test Description	Requirement	Procedure
<b>PG 19</b> Environmental simulation – only in combination with application  Mixed flowing gas	Contact resistance  $R \leq 3,0 \times R_{initial}$  At the end of the entire test the total contact resistance shall not be more than 300% of initial value	Acc. IEC 60068-2-60 Method 4  Industrial climate 0,2 ppm SO <sub>2</sub> , 0,01 ppm H <sub>2</sub> S, 0,2 ppm NO <sub>2</sub> , 0,01 ppm Cl <sub>2</sub> 14 days at 25°C and 75% rel. humidity

#### 4.4 Qualification and Requalification Test Sequence

Table 3

Test	Test Group <sup>1)</sup>							
	PG 0	PG 5	PG 8	PG 11	PG 12	PG 15	PG 17	PG 19
	Test Sequence <sup>2)</sup>							
Visual- and dimensional inspection Acc. IEC 60512-2 Test 1a	1	1	1	1, 4	1, 3	1, 11	1, 8	1, 4
Contact resistance Acc. IEC 60512-2 Test 2b	2					2, 5, 7, 9	2, 4, 7	2, 5
Normal force of the contact		2						
Mating and unmating force Acc. IEC 60512-7 Test 13b				2				
Thermal shock							3	
Derating without housing Acc. IEC 60512-3 Test 5b					2	3, 10		
Contact retention Acc. IEC 60512-8 Test 15b			2					
Frequency of insertions				3				
Change of temperature/current - endurance test						4, 8		
Mechanical stress							5	
Mechanical shock							6	
Damp heat, cyclic Acc. IEC 60068-2-30						6		
Industrial climate Acc. IEC 60068-2-60 Method 4								3

1) See Paragraph 4.3

2) Numbers indicate sequence in which tests are performed



## **5. QUALITY ASSURANCE PROVISIONS**

### **5.1 Qualification Testing**

#### **A Sample Selection**

The samples shall be prepared in accordance with product drawings. They shall be selected at random from current production.

#### **B Test Sequence**

Qualification inspection shall be verified by testing samples as specified in Paragraph 4.4.

### **5.2 Re-qualification Testing**

If changes significantly affecting form, fit, or function are made to the product or to the manufacturing process, product assurance shall coordinate re-qualification testing, consisting of all or part of the original testing sequence as determined by development/product, quality, and reliability engineering.

### **5.3 Acceptance**

Acceptance is based on verification that the product meets the requirements of Paragraph 4.3. Failures attributed to equipment, test setup, or operator deficiencies shall not disqualify the product. When product failure occurs, corrective action shall be taken and samples resubmitted for qualification. Testing to confirm corrective action is required before resubmittal.

### **5.4 Quality Conformance Inspection**

The applicable TE Connectivity quality inspection plan will specify the sampling acceptable quality level to be used. Dimensional and functional requirements shall be in accordance with the applicable product drawing and this specification.

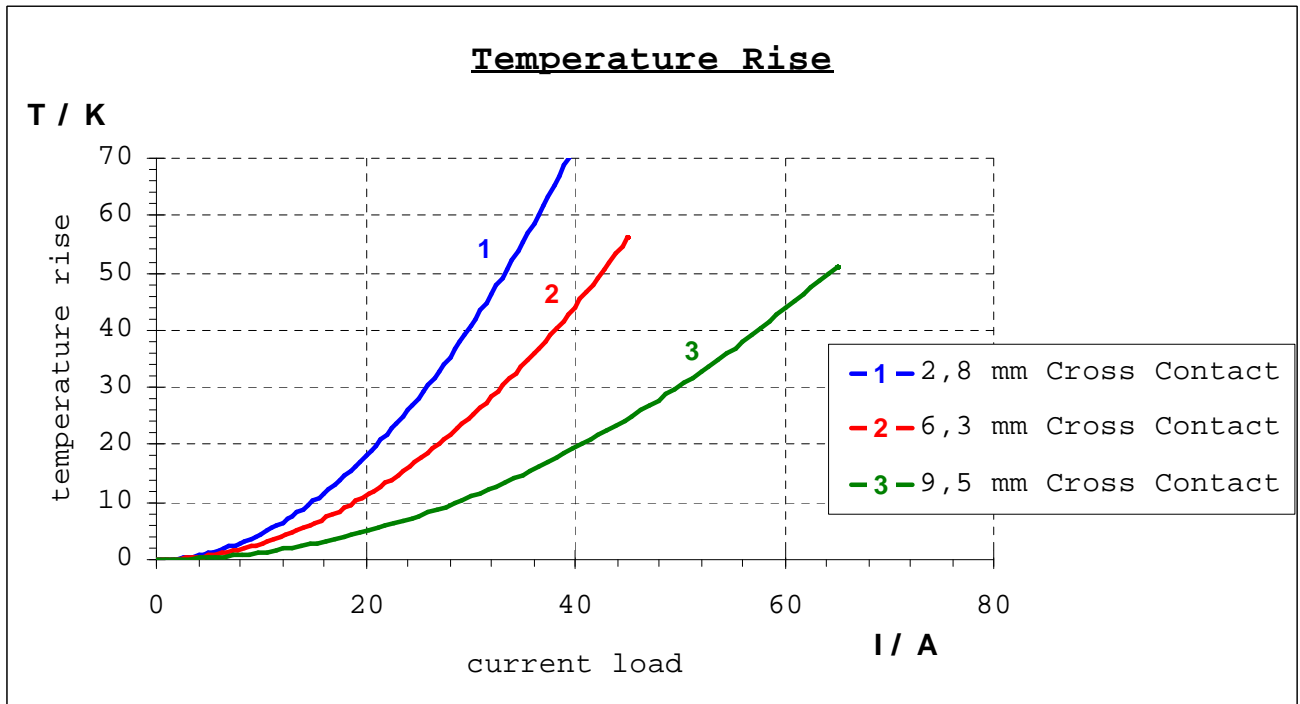


Fig. 4 - Temperature rise curves for tin-silver surface

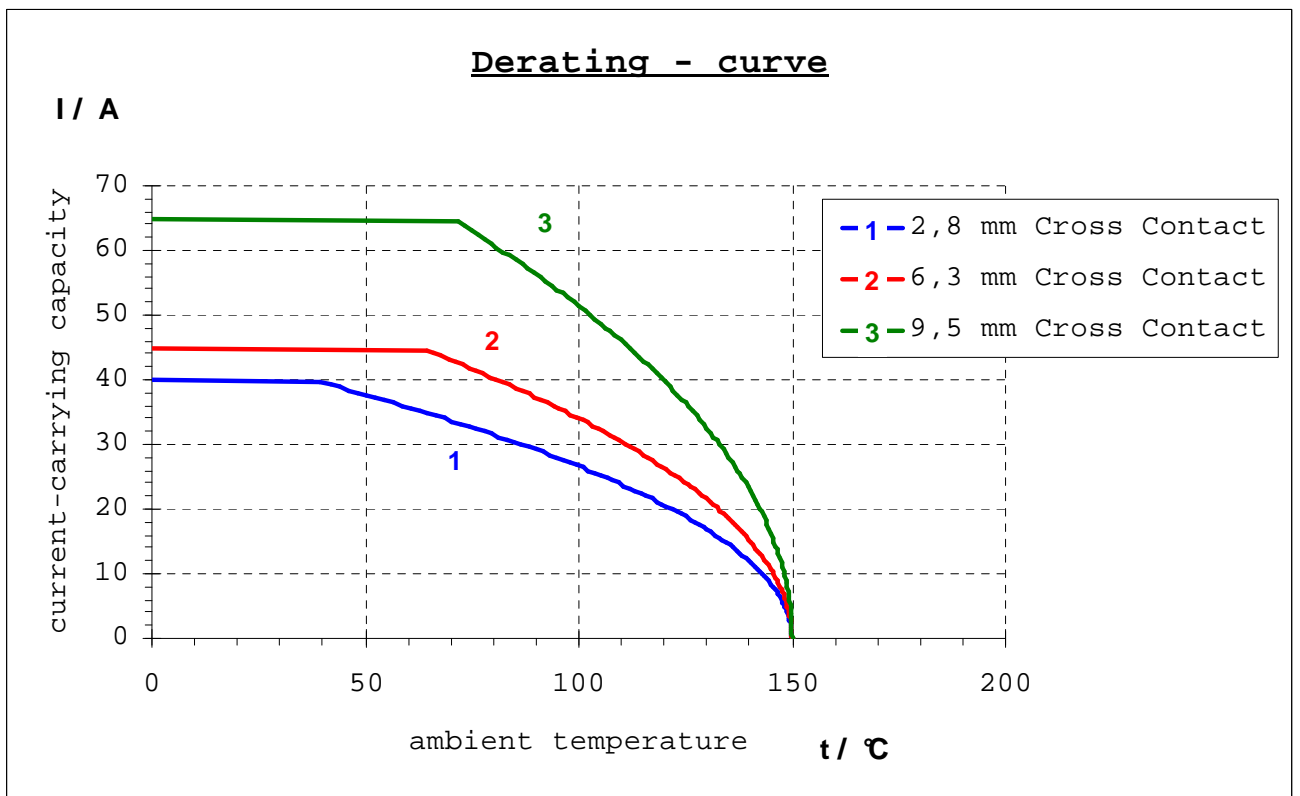


Fig. 5 - Derating curves for tin-silver surface

Note: Temperature rise and Derating curves for tin surface will be measured on request (ask responsible Product Engineer).

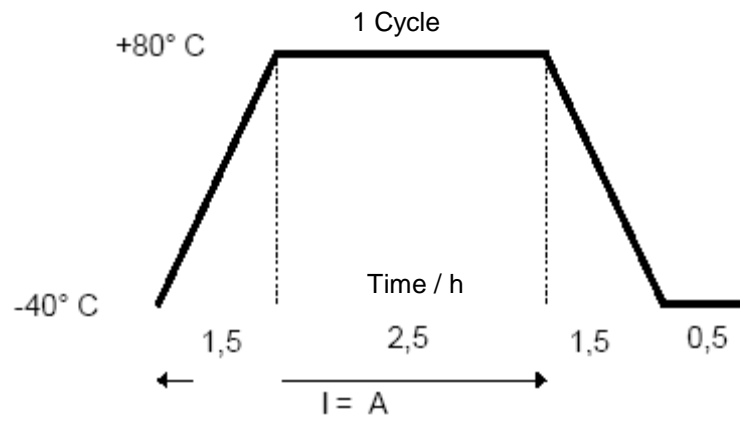


Fig. 6 – Damp heat temperature profile

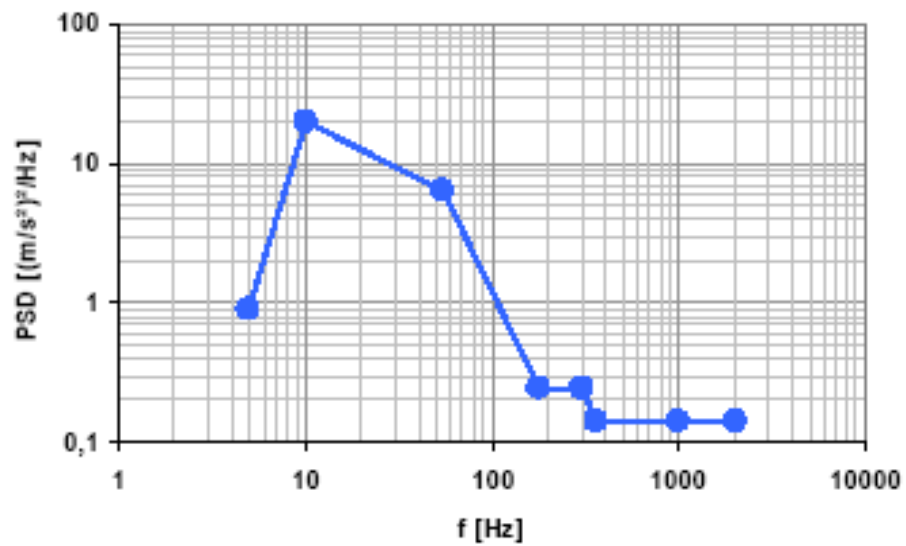


Fig. 7 – Vibration profile for mechanical stress

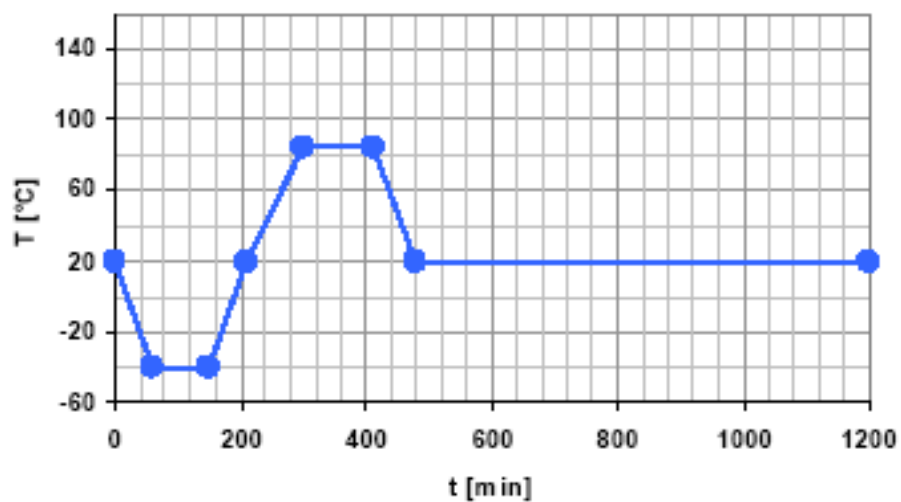


Fig. 8 – Temperature profile for mechanical stress

**6.1 REVISION HISTORY:**

Revision	Description	Name	Date
A	Initial release	Pavlicek Martin	12-FEB-14