

## SRC 2.5mm<sup>2</sup> Blade & Receptacle Terminals



## 1) SCOPE

This Product Specification relates to the Silver plated SRC 2.5 mm<sup>2</sup> (13 AWG approx.) blade and receptacle terminals to be crimped with thin wall cable with outer insulation diameter in the range 2.7mm to 3.0mm.

## 2) PRODUCT DESCRIPTION

- A. PART NUMBERS
  - Male Blade: 2500036-2
  - Female Receptacle: 2500037-2
- B. DIMENSIONS, MATERIAL, PLATING AND MARKINGS
  - High performance copper alloy, silver over nickel underplate
  - High current carrying capability
  - See applicable product drawings for all dimensions, plating description and marking identification locations.

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1) Silver plated contacts are provided with an anti-tarnish protective coating. This protective coating loses its protective effect after 6 months to 2 years, depending on the respective ambient conditions. This leads to oxidation (tarnish) of the silver and discoloration be yellow, tan, blue, brown, or black. This discolored appearance is normal and does not affect product function. This oxide layer is composed of silver sulphide and is permeated during insertion upon final assembly of the contact system, so that the electrical properties generally continue to be comparable with those of a new part.

2) Use sulfur-free gloves, packaging, etc. when handling silver plated contacts

- C. SAFETY AGENCY APPROVALS
  - UL File Number: Not Applicable
  - CSA File Number: Not Applicable
  - TUV File Number: Not Applicable
  - IMDS: Available on request
  - Product Compliance: Available on request

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## 3) APPLICABLE DOCUMENTS AND SPECIFICATIONS

Product Drawings:

٠	Male Blade:	2500036			
•	Female Receptacle:	2500037			
Applica	ation Specification:	TEC-114-160021			
Test Standards:		SAE J2030			
		SAE/USCAR-2			
		SAE/USCAR-20			
		SAE/USCAR-21			
Shelf L	.ife:	122-160021			

#### 4) RATINGS

- Voltage: 20 VAC/VDC max
- Current: 20A max
  - The current rating is dependent on connector size, ambient temperature, terminal size, and related factors. Actual maximum current rating is application dependent and shall be evaluated for each use.
- Temperature (Operating): -40°C to +125°C
- Temperature (Non-Operating): -40°C to +125°C

#### 5) PACKAGING

The terminals are stored on cardboard reels with left reel payoff (i.e. left to right direction with terminal carrier on near side).

- Male Blade. 4 reels per box. Each reel is placed inside a plastic bag with sheet of silver saver paper. Reel has 3,000 terminals.
- Female Receptacle: 4 reels per box. Each reel is placed inside a plastic bag with sheet of silver saver paper. Reel has 3,000 terminals.
- Terminals on reels should be stored in original packaging until ready for use.
- Terminal are packaged to protect against damage during handling, transit, and storage.
- See 122-160021 for shelf life information from manufacturing date on the reel.

#### 6) TEST REQUIREMENTS AND PROCEDURE SUMMARY

Unless otherwise specified, all tests shall be performed at ambient environmental conditions.

#### GENERAL

#### 6.6.1. Visual Examination

- A. Procedure: SAE/USCAR-2, 5.1.8
- B. Method: Parts checked for: Identification, Workmanship Finish, Markings, Cosmetic issues, Tool marks, etc.
- C. Requirement: No evidence of deterioration, cracks, deformities, etc. that could affect functionality.
- 6.6.2. Connector and/or Terminal Cycling
  - A. Procedure: SAE/USCAR-2, 5.1.7
  - B. Method: Completely mate and unmate the terminal and/or connector 10 times. Re-mate the connector or terminals for one last time and continue test sequence.
  - C. Requirement: None



## ELECTRICAL

- 6.6.3. Dry Circuit Resistance
  - A. Procedure: SAE/USCAR-2, 5.3.1
  - B. Method: Measure and record resistance across 150 mm (reference SAE/USCAR-2 Figure 5.3.1.3)
  - C. Requirement: Reference SAE/USCAR-2, 5.3.1.4.
- 6.6.4. Voltage Drop
  - A. Procedure: SAE/USCAR-2, 5.3.2
  - B. Method: Reference 5.3.2.3 of SAE/USCAR-2
  - C. Requirement: Reference SAE/USCAR-2, 5.3.2.4.
- 6.6.5. Maximum Test Current Capability / Temperature Rise
  - A. Procedure: SAE/USCAR-2, 5.3.3
  - B. Method: Mate terminals: measure the temperature rise at the rated current.
  - C. Requirement: Temperature rise over ambient: +55°C maximum
- 6.6.6. Current Cycling
  - A. Procedure: SAE/USCAR-2, 5.3.4
  - B. Method: Using mated terminals, measure the temperature rise at the rated current after 1008 hours of bench top testing (45 minutes ON and 15 minutes OFF per hour).
  - C. Requirement: Temperature rise over ambient: +55°C maximum
- 6.6.7. Insulation Resistance
  - A. Procedure: SAE/USCAR-2, 5.5.1
  - B. Method: Connect a megohmeter set to 500 VDC to the bare conductor ends so that adjacent cavities have adjacent polarization.
  - C. Requirement: The resistance between every combination of two adjacent pairs must exceed 100  $M\Omega$  at 500 VDC.

#### MECHANICAL

- 6.6.8. Terminal to Terminal Engage / Disengage Force
  - A. Procedure: SAE/USCAR-2, 5.2.1
  - B. Method: Insert and withdraw terminal (male to female) at a rate of  $25 \pm 6$  mm per minute.
  - C. Requirement:
    - a. 10.0 N maximum engage force
    - b. 1.0N minimum disengage force
    - c. Visual Inspection per SAE/USCAR-2
- 6.6.9. Terminal Bend Resistance
  - A. Procedure: SAE/USCAR-2, 5.2.2
  - B. Method: Bend according to SAE/USCAR-2 Table 5.2.2.4
  - C. Requirement:
    - a. 7 N minimum for blade terminal
    - b. 10 N minimum for receptacle terminal
    - c. Straighten back up
    - d. Visually Inspect per SAE/USCAR-2



- 6.6.10. Terminal to Connector Insertion/Extraction Force
  - A. Procedure: SAE/USCAR-2, 5.4.1
  - B. Method:
    - a. Axial insertion force on the terminal into connector housing at a rate of  $25 \pm 6$  mm per minute.
    - b. Axial extraction force on the terminal into connector housing at a rate of  $25 \pm 6$  mm per minute.
  - C. Requirement:
    - a. 15 N (one per connector), 30 N (fully populated) maximum insertion force. Must not buckle
    - b. 50 N minimum forward stop force
    - c. 50 N (TPA in pre-lock), 90 N (TPA in final lock) minimum retention force
- 6.6.11. Terminal Crimp Strength
  - A. Procedure: SAE J2030, 6.26
  - B. Method: Axial pull force on the terminal at a rate of  $25 \pm 6$  mm per minute. Cable insulation crimp shall be rendered mechanically ineffective.
  - C. Requirement: 210 N [47.3 lbf] minimum
- 6.6.12. Terminal / Cavity Polarization
  - A. Procedure: Not Applicable
  - B. Method: Insert terminal at a rate of  $25 \pm 6$  mm per minute in all possible incorrect orientations with a force equaling 1.5 times the maximum recorded in step 6.7.8 or 15 N whichever is greater.
  - C. Requirement: Terminal shall not fit and lock into a connector cavity beyond the insulation crimp or cable seal & no visible damage to either the terminal or connector that would prevent subsequent correct insertion and function following any attempt at incorrect insertion
- 6.6.13. Vibration
  - A. Procedure: SAE/USCAR-20
  - B. Method: Random vibration.
    - a. 12 hours (4 hours/plane)
    - b. 3.2 RMS maximum
    - c. G level shall be limited to 3 times the RMS level
  - C. Requirement: Verify conformance per following section identified in the test group sequence

#### ENVIRONMENTAL

- 6.6.14. Thermal Shock
  - A. Procedure: SAE/USCAR-20
  - B. Method: Mate connectors, expose to 72 cycles
    - a. Temperature: -40 °C to either +85 °C or +125 °C
    - b. Duration: 30 minutes at low temperature, with less than 30 second transition time to high temperature for 30 minutes with less than 30 second transition time to the low temperature; this is one cycle.
  - C. Requirement: Verify conformance per following section identified in the test sequence
- 6.6.15. High Temperature Exposure
  - A. Procedure: SAE/USCAR-2, 5.6.3
  - B. Method: 1008 hours at 125 °C (maximum operating temperature)
  - C. Requirement: Verify conformance per following section identified in the test sequence



- 6.6.16. Temperature/Humidity Cycling
  - A. Procedure: SAE/USCAR-2, 5.6.2
  - B. Method: Mate connectors; expose to 40 cycles of:
    - a. Temperature: T3 category (-40 °C to +125 °C)
    - b. Duration: 8 hours
    - c. Humidity: See figure 5.6.2.3 of USCAR-2
  - C. Requirement: Verify conformance per following section identified in the test sequence
- 6.6.17. Field Correlated Life Test (FCLT)
  - A. Procedure: SAE/USCAR-20
  - B. Method:
    - a. Step 1: Thermal Aging, 72 hours at X °C
    - b. Step 2: Random Vibration, 12 hours
    - c. Step 3: Thermal Shock, 72 hours, -40 °C to X°C
    - d. Step 4: Temperature-Humidity, 24 hours, +65 °C, -40 °C, +85 °C, +25 °C
    - e. Repeat steps 1-4: FCLT @ 85 °C and FCLT @ 125 °C
  - C. Requirement:
    - a. 20 milliohms maximum (change from initial test cycle)
    - b. 3 milliohms maximum (change from initial crimp resistance)

## 7) TERMINAL CURRENT DERATING CURVE

This test is used to determine the maximum test current at which a terminal system can operate in a room temperature environment  $(23^{\circ}C \pm 3^{\circ}C)$  before excessive thermal degradation and/or increase in resistance begins to occur.



Figure 1: Temperature de-rating curve

**CAUTION:** This curve is not to be used to determine actual application in a vehicle. This test is conducted on terminals alone, thus, eliminating the variation that will be introduced by variations in the heat dissipation characteristics of differing connector housing designs and sizes. This test cannot determine the maximum current capability of a specific terminal application. For specific applications, several factors other than current load must be considered (see SAE/USCAR-2 appendix F for more information).

## 8) QUALIFICATION TEST GROUP AND SEQUENCES

No.	Item	Test Group									
		Α	В	С	D	Е	F	G	н	J	К
	Sample Size	10	15	6	6+48	10	3+10	10+10*	10+10*	х	Х
1	Visual Inspection	1,3	1,3	1,5	1,3	1,3	1,3	1,7	1,8		
2	Terminal and/or Connector Cycling			2				2	2		
3	Dry Circuit Resistance (3)							3(1),5(1)	3(1),5(1)		
4	Voltage Drop (3)							6 <sup>(1)</sup>	6 <sup>(1)</sup>		
5	Temperature Rise (Maximum Current Capability)			3							
6	Current Cycling			4							
7	Insulation resistance								7		
8	Terminal Engage / Disengage forces	2									
9	Terminal Bend Resistance		2								
10	Terminal Insertion / Withdrawal Stop Forces				2			8	9		
11	Terminal Crimp Strength					2					
12	Terminal / Cavity Polarisation						2				
15	High Temperature Exposure							4			
16	Temperature/Humidity Cycling								4		
13,14 17	Field Correlated Life Test @ 85°C									1	
	Field Correlated Life Test @ 125°C										1

## NOTES

- 1) It is permissible to use separate sample sets for dry circuit resistance, voltage drop, and insulation resistance due to differences in sample preparation methods. (Note 2, SAE/USCAR-2, section 5.9.6).
- 2) It is permissible to divide the test sample in to two groups. The first group shall be used for dry circuit resistance measurement. The second group shall be used for voltage drop measurement and circuit continuity monitoring.
- *3)* For any test group where sample size is not specified in any test in the sequence, use 10 connected terminal pairs across a minimum of 3 separate connectors like SAE/USCAR 2 sections 5.4.1.3 and 5.10.4.3.
- 4) Where "X" is 30 terminals pairs and at least 4 connector assemblies.
- 5) \* = populated connectors.

For any sections referred to in the notes section, please refer to SAE/USCAR-2.



## 9) FIELD CORRELATED LIFE TEST (SAE/USCAR-20)

Using a base temperature of either 85°C or 125°C - new samples required for each test

- 1. Prepare samples
- 2. Measure deduct sample resistance
- 3. Measure initial crimp & cable resistance

4. Assemble terminals in connecter housings, mate connector assemblies and measure overall resistance

- 5. Cycle conditioning steps
  - a. Thermal aging 72 hours
  - b. Random vibration 12 hours
  - c. Thermal shock 72 hours
  - d. Temperature / Humidity 24 hours
- 6. Measure overall resistance
- 7. Repeat step 5 and 6 for a total of 2 cycles for each sample set

8. Disassemble terminals and Measure final crimp & cable resistance as necessary for analysis of results and failure modes.



## **10) REVISION HISTORY**

Rev Ltr	Brief Description of Change	Date	Dwn	Apvd
А	Initial Release	2022-06-03	David Meyer	llina Grantcharova
В	Corrected document number (is) TEC-108-160021 (was) 108-151021	2022-08-12	David Meyer	llina Grantcharova
С	Page 4, Para 6.6.11 (is) 210 N [47.3 lbf] (was) 306 N. Align with TEC-114-160021	2023-03-30	David Meyer	Chinmay Bhatt
D	Page 2, Sec 3). Added Shelf Life 122-160021 Page 2, Sec 5). Added last three bullets Page 6, Replaced packaging section with Sec 5).	2023-04-08	David Meyer	Chinmay Bhatt