



DEUTSCH* Stamped and Formed (S&F) Contacts

1. SCOPE

1.1. Content

This specification covers performance, tests, and quality requirements for the TE Connectivity (TE) DEUTSCH Stamped and Formed Contact System.

1.2. Qualification

When tests are performed on the subject product line, procedures specified in Figure 2 shall be used. All inspections shall be performed using the applicable inspection plan and product drawing.

2. APPLICABLE DOCUMENTS

The following documents constitute a part of this specification to the extent specified herein. Unless otherwise indicated, the latest edition of the document applies.

2.1. TE Connectivity (TE) Documents

- [109-1](#) General Requirements for Testing
- [114-151000](#) DEUTSCH Size 16 S&F Pin & Socket (14-01, 14-10, 16-01, 16-06, 16-07, 16-09)
- [114-151001](#) DEUTSCH Size 16 S&F Pin & Socket (16-12, 16-14)
- [114-151002](#) DEUTSCH size 12 S&F Pin & Socket (12-01)
- [114-151003](#) DEUTSCH Size 20 S&F Pin & Socket (20-01, 20-02)
- [114-151006](#) DEUTSCH size 12 S&F Pin & Socket (12-02)
- Product Drawings. XX = plating codes. See individual product drawings for available plating.

| Product Drawing Pin | Size | Product Drawing Socket | Size |
|---------------------|------|------------------------|------|
| 1060-12-01XX | 12 | 1062-12-01XX | 12 |
| 1060-12-02XX | | 1062-12-02XX | |
| 1060-14-01XX | 16 | 1062-14-01XX | 16 |
| 1060-14-10XX | | 1062-14-10XX | |
| 1060-16-01XX | | 1062-16-01XX | |
| 1060-16-06XX | | 1062-16-06XX | |
| 1060-16-07XX | | 1062-16-07XX | |
| 1060-16-09XX | | 1062-16-09XX | |
| 1060-16-12XX | 20 | 1062-16-12XX | 20 |
| 1060-20-01XX | | 1062-16-14XX | |
| 1060-20-02XX | | 1062-20-01XX | |
| 1060-20-06XX | | 1062-20-02XX | |
| | | 1062-20-03XX | |
| | | 1062-20-06XX | |

2.2 Industry Documents

- DIN 72551-6: Road Vehicles—Low-Tension Cables—Part 6: Single-Core, Unscreened with Thin Insulation Wall; Dimensions, Materials, Marking
- ISO 6722: Road Vehicles—60 V and 600 V Single-Core Cables—Dimensions, Test Methods, and Requirements
- SAE J1128: Low Voltage Primary Cable
- SAE J2030: Heavy-Duty Electrical Connector Performance Standard
- USCAR-2: Performance Spec for Automotive Electrical Connector Systems

2.3 Safety Agency Approvals

- UL File Number: Not Applicable
- CSA File Number: Not Applicable
- IMDS: Available on request
- Product Compliance: [Available on te.com](http://te.com)

3. REQUIREMENTS

3.1. Design and Construction

Product shall be of the design, construction, materials, and physical dimensions specified on the applicable product drawing.

3.2. Ratings

- Voltage: See connector product specification
- Current (Amp): See Appendix A for current temperature rise (T-Rise) open air without housing

| Contact Size | Wire Size ⁽²⁾ AWG [mm ²] | Current Rating (A) |
|--------------|--|--------------------|
| 12 | 10 [6.00-5.00] | 25 |
| | 12 [4.00-2.50] | |
| | 14 [2.00] | 18 |
| 16 | 12 [2.50] | 13 |
| | 14 [2.00] | |
| | 16 [1.50-1.00] | 10 |
| | 18 [0.75-0.80] | |
| | 20 [0.50] | |
| 20 | 14 [2.00] | 7.5 |
| | 16 [1.50-1.00] | |
| | 18 [0.75-0.80] | |
| | 20 [0.50] | |
| | 22 [0.35] | 5 |

- Temperature⁽¹⁾ :
 - Nickel -55°C to +125°C
 - Tin -55°C to +125°C
 - Gold -55°C to +150°C
 - Palladium Nickel Gold -55°C to +150°C



NOTE

1. See connector product specification for connector temperature range.
2. Metric wire sizes are for references only. (All contacts were validated with AWG wires.)

3.3. Test Requirements and Procedures Summary

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

VISUAL

3.3.1. Examination of Product

- A. Procedure: SAE J2030
- B. Method: Visually inspected for use of materials, proper construction, correct part number and insert markings and over-all quality of workmanship. Damaged or improperly manufactured contacts, galling of metal parts, nicks and burrs of metal parts were considered adequate basis for rejection.
- C. Requirement: The contacts shall be correctly constructed, marked and shall show good quality and workmanship

3.3.2. Low Level Contact Resistance (Dry Circuit)

- A. Procedure: SAE J2030
- B. Method: Test with applied voltage not to exceed 20 mV open circuit and the test current shall be limited to 100 mA. The resistance of the equal length of wire (reference wire) shall be subtracted from the same reel as used for the connector wiring. Gold and tin plated contacts
- C. Requirement:

| Wire Size AWG [mm ²] | Resistance mΩ max |
|-------------------------------------|----------------------|
| 16 [1.0] | 6.0 |
| 18 [0.80] | 7.5 |
| 20 [0.50] | 11.0 |
| 22 [0.35] | 17.0 |

3.3.3. Contact Resistance (Voltage Drop)

- A. Procedure: SAE J2030
- B. Method: Using test currents as defined. The resistance of an equal length wire (reference wire) shall be subtracted from the actual readings to determine the added resistance of the terminal. The reference wire shall be from the same reel as used for the connector wiring.
- C. Requirement:

| Contact Size | Wire Size AWG [mm ²] | Test Current Amp | Voltage Drop max mV |
|--------------|-------------------------------------|---------------------|------------------------|
| 12 | 10 [6.00-5.00] | 25 | 100 |
| | 12 [4.00-2.50] | | |
| | 14 [2.00] | 18 | |
| 16 | 12 [2.50] | 13 | |
| | 14 [2.00] | | |
| | 16 [1.50-1.00] | 10 | |
| | 18 [0.75-0.80] | | |
| | 20 [0.50] | | 7.5 |
| 20 | 14 [2.00] | 7.5 | |
| | 16 [1.50-1.00] | | |
| | 18 [0.75-0.80] | | |
| | 20 [0.50] | | |
| | 22 [0.35] | 5 | |

3.3.4. Maximum Current Capability (open air without housing)

- A. Procedure: USCAR-2
- B. Method: Samples shall be mounted in an enclosure which protects the immediate environment from external movement of air. Measure and record the voltage drop across 150mm of the conductor to be used for the test. Attach conductor ends of the terminal pairs to form one continuous series circuit and attach the thermocouples to each mated pair. Mount the circuit in the draft-free enclosure. Use at least 10 terminal pairs. Test samples at room temperature then slowly adjust the power supply until current level of 50% of the maximum expected value for the wire size. Wait at least 15 minutes for the circuit temperature to stabilize. Increase in increments or 10% of that value until a temperature rise over ambient of 55°C was achieved. Record ambient temperature, temperature of each terminal pair interface and millivolt drop across each mated pair.
- C. Requirement: Create T-rise curve graph at 20% above current rating per section 3.2.

MECHANICAL

3.3.5. Crimp Tensile

- A. Procedure: SAE J2030
- B. Method: The tensile strength of the crimped connection shall be tested by using suitable apparatus at a constant speed within the range of 25 mm/min. If the terminal has a cable insulation crimp it shall be rendered mechanically ineffective. Samples are pulled to destruction.
 - a. Size 12 Crimp Specification: 114-151002 or 114-151006
 - b. Size 16 Crimp Specification: 114-151000 or 114-151001
 - c. Size 20 Crimp Specification: 114-151003
- C. Requirement:

| Contact Size | Wire Size AWG | Wire Size mm ² | Tensile Strength Minimum lbf [N] |
|--------------|---------------|---------------------------|----------------------------------|
| 12 | | 6.00 | 70 [311] |
| | 10 | | |
| | | 5.00 | |
| | | 4.00 | |
| | 12 | | 50 [222] |
| | | 3.00 | |
| | 2.50 | | |
| 16 | 14 | | 25 [111] |
| | | 2.00 | |
| | 12 | | |
| | | 3.00 | |
| | | 2.50 | |
| | 14 | | |
| | | 2.00 | |
| | | 1.50 | |
| 20 | 16 | | 15 [67] |
| | | 1.00 | |
| | 18 | | |
| | | 0.75 | |
| | 20 | | |
| | | 0.50 | |
| | | 2.50 | 20 [89] |
| | 14 | | |
| | | 2.00 | |
| | | 1.50 | |
| 16 | | | |
| | 1.00 | | |
| 18 | | | |
| | 0.75 | | |
| | 2.00 | 15 [67] | |
| | 0.50 | | |
| | 2.2 | 5 [22] | |
| | 0.35 | | |

3.3.6. Contact Retention

- A. Procedure: SAE J2030
- B. Method: The contacts shall be subjected to a direct pull. The minimum value specified shall be applied for 1 minute. The pull is to be exerted on the conductor by means of a tension-testing machine or equivalent to prevent sudden or jerking force during test.
- C. Requirement: See table. The terminal shall maintain its original position in the connector throughout the test.

| Contact Size | Pull-Out Force lbf [N] min |
|--------------|----------------------------|
| 12 | 30 [133] |
| 16 | 25 [111] |
| 20 | 20 [89] |

3.3.7. Durability

- A. Procedure: SAE J2030
- B. Method: Test samples shall be mated and unmated complete cycles at room temperature.
 - a. Nickel: = 100 cycles
 - b. Gold: = 100 cycles
 - c. Palladium Nickel Gold: = 100 cycles
 - d. Tin: = 20 cycles
- C. Requirement: No evidence of damage to the contacts, contact plating which may be detrimental to reliable contact performance.

3.3.8. Terminal-Terminal Insertion Force

- A. Procedure: Not Applicable
- B. Method: Sockets shall be mounted in a suitable fixture for applying gradually increasing loads for the insertion using a test pin. Insert test pin .200 [5.08] deep into socket.
- C. Requirement: See table

| Contact Size | Insertion Force max lbf [N] | Test Pin Ø inch [mm] |
|--------------|-----------------------------|----------------------|
| 12 | 2.50 [11.1] | .0946 [2.403] |
| 16 | 2.50 [11.1] | .0615 [1.562] |
| 20 | 1.50 [6.7] | .0410 [1.041] |

3.3.9. Contact Overlap (electrical engagement)

- A. Procedure: Not Applicable
- B. Method: Theoretical proof by design calculation
- C. Requirement: ≥ .050 [1.27]. Depends on connector design

ENVIRONMENTAL

3.3.10. Temperature Life

- A. Procedure: SAE J2030
- B. Method: The wired mated connectors shall be subjected to 1000 hours at +125°C without current flowing.
- C. Requirement: Contact resistance not to exceed 100mV after test.

3.3.11. Thermal Cycle

- A. Procedure: Not Applicable
- B. Method: Cycle mated connectors from -55°C to +125°C. Connectors to remain at each temperature extreme for one (1) hour minimum. Mated connectors are to be cycled a total of 20 complete cycles.
- C. Requirement: Contact resistance not to exceed 100mV after test.

3.3.12. Thermal Shock

- A. Procedure: SAE J2030
- B. Method: Subjected test sample to 10 cycles. One cycle shall consist of a soak time at -55°C then a transition within 2 min to an ambient of +125°C, with a soak time there and then a transition back to -55°C within 2 min. The soak times shall be established as the time necessary to bring the internal connector temperature on test to within 5°C of each of the ambient temperatures.
- C. Requirement: Contact resistance not to exceed 100mV after test.

3.4. Appendix A. Current Temperature Rise (T-Rise) Open Air Without Housing.

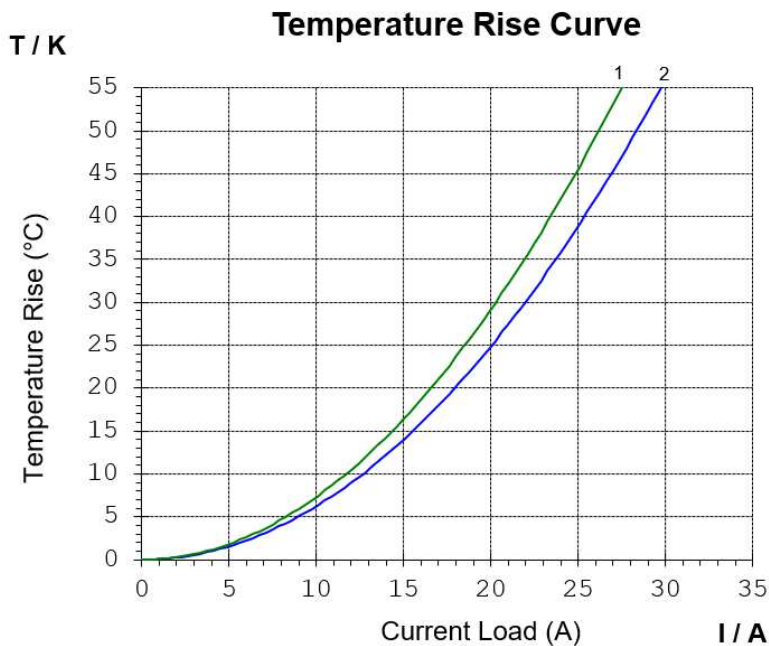
See Appendix B for Test Sequence

| Size 12 - Nickel | | | |
|------------------|-----------------|-----------|-------|
| Pin Part Number | Soc Part Number | Conductor | Curve |
| 1060-12-0166 | 1062-12-0166 | 12 AWG | 1 |
| 1060-12-0222 | 1062-12-0222 | 10 AWG | 2 |



NOTE

T-rise curves indicate testing at 20% above rated current per section 3.2.

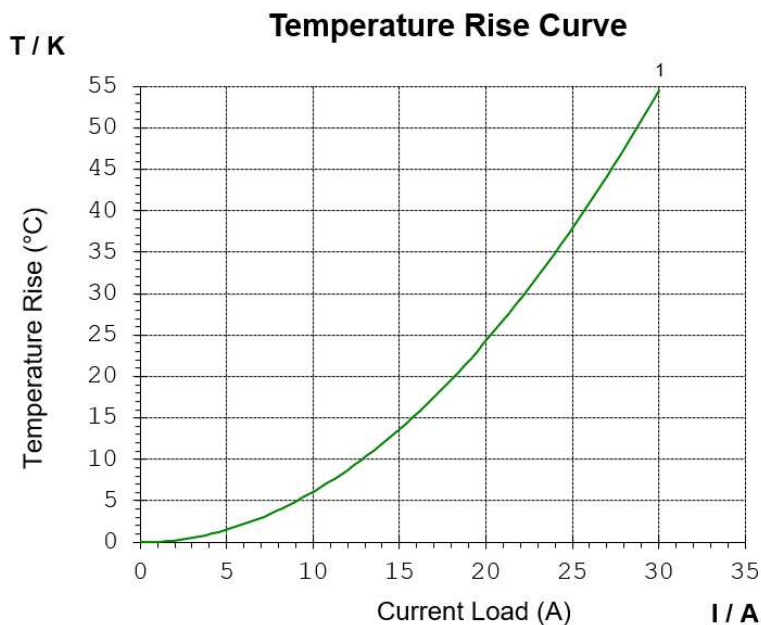


| Size 12 - Gold | | | |
|-----------------|-----------------|--------|-------|
| Pin Part Number | Soc Part Number | Wire | Curve |
| 1060-12-0144 | 1062-12-0144 | 12 AWG | 1 |



NOTE

T-rise curves indicate testing at 20% above rated current per section 3.2.



| Size 16 - Nickel | | | |
|------------------|-----------------|--------|-------|
| Pin Part Number | Soc Part Number | Wire | Curve |
| 1060-16-0622 | 1062-16-0622 | 20 AWG | 1 |
| 1060-16-0622 | 1062-16-0622 | 18 AWG | 2 |
| 1060-14-0122 | 1062-14-0122 | | |
| 1060-16-0122 | 1062-16-0122 | | |
| 1060-16-0722 | 1062-16-0722 | | |
| 1060-16-0622 | 1062-16-0622 | 16 AWG | 3 |
| 1060-14-0122 | 1062-14-0122 | | |
| 1060-16-0122 | 1062-16-0122 | | |
| 1060-16-0722 | 1062-16-0722 | | |
| 1060-14-0122 | 1062-14-0122 | 14 AWG | 4 |
| 1060-16-0122 | 1062-16-0122 | | |
| 1060-16-0722 | 1062-16-0722 | | |

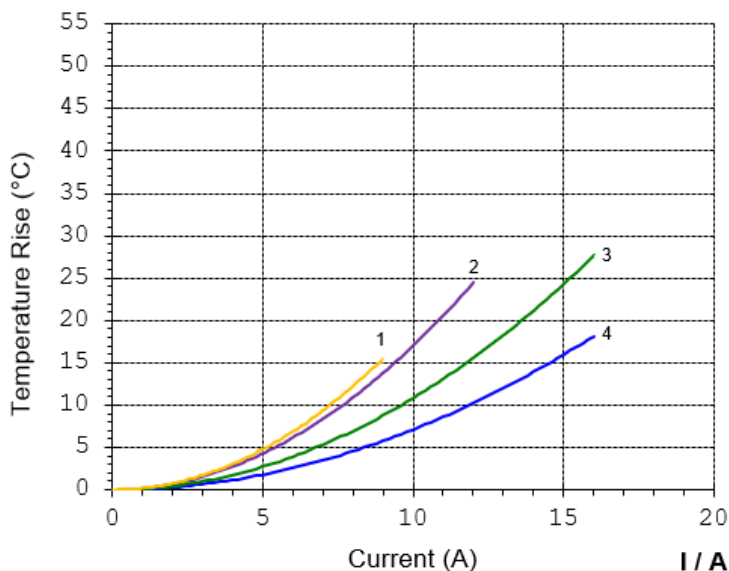


NOTE

T-rise curves indicate testing at 20% above rated current per section 3.2.

T / K

Temperature Rise Curve



| Size 16 - Gold | | | |
|-----------------|-----------------|--------|-------|
| Pin Part Number | Soc Part Number | Wire | Curve |
| 1060-16-0644 | 1062-16-0644 | 20 AWG | 1 |
| 1060-16-0644 | 1062-16-0644 | 18 AWG | 2 |
| 1060-14-0144 | 1062-14-0144 | | |
| 1060-16-0144 | 1062-16-0144 | | |
| 1060-16-0744 | 1062-16-0744 | | |
| 1060-16-0644 | 1062-16-0644 | 16 AWG | 3 |
| 1060-14-0144 | 1062-14-0144 | | |
| 1060-16-0144 | 1062-16-0144 | | |
| 1060-16-0744 | 1062-16-0744 | | |
| 1060-14-0144 | 1062-14-0144 | 14 AWG | 4 |
| 1060-16-0144 | 1062-16-0144 | | |
| 1060-16-0744 | 1062-16-0744 | | |

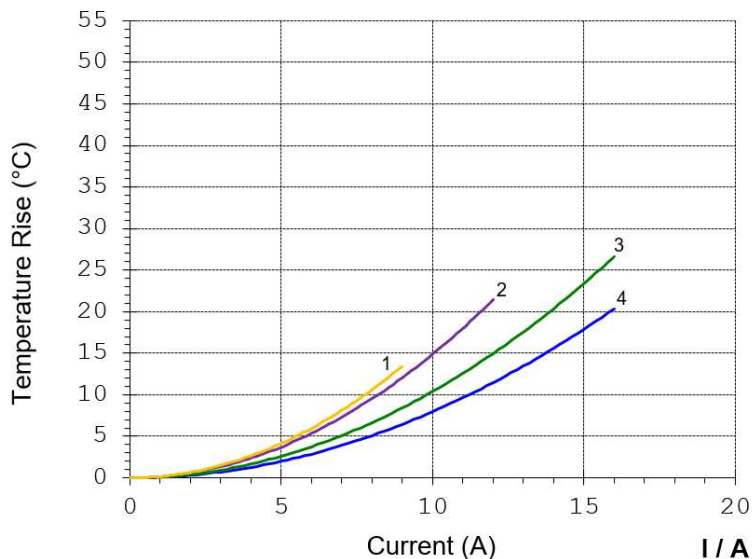


NOTE

T-rise curves indicate testing at 20% above rated current per section 3.2.

T / K

Temperature Rise Curve

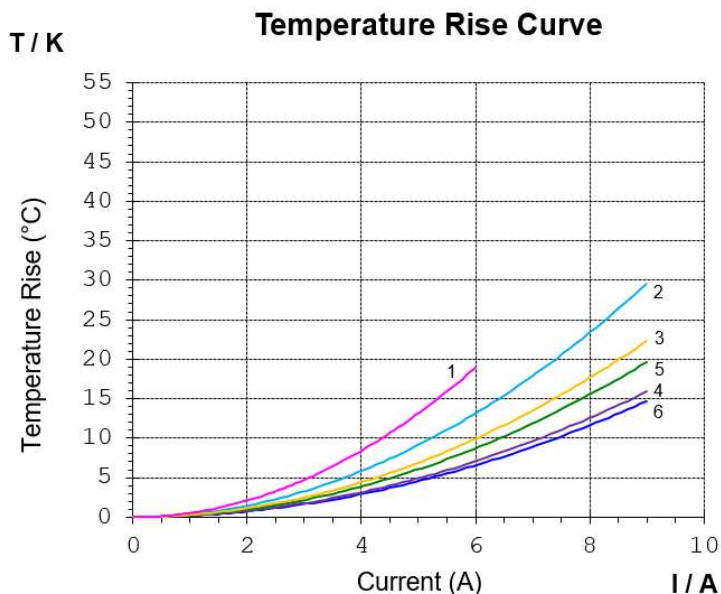


| Size 20 - Nickel | | | |
|------------------|-----------------|------|-------|
| Pin Part Number | Soc Part Number | Wire | Curve |
| 1060-20-0122 | 1062-20-0122 | 22 | 1 |
| 1060-20-0222 | 1062-20-0222 | | |
| - | 1062-20-0322 | 20 | 2 |
| 1060-20-0122 | 1062-20-0122 | | |
| 1060-20-0222 | 1062-20-0222 | 18 | 3 |
| - | 1062-20-0322 | | |
| 1060-20-0122 | 1062-20-0122 | 16 | 4 |
| 1060-20-0222 | 1062-20-0222 | | |
| - | 1062-20-0322 | 16 | 5 |
| 1060-20-0622 | 1062-20-0622 | | |
| 1060-20-0622 | 1062-20-0622 | 14 | 6 |



NOTE

T-rise curves indicate testing at 20% above rated current per section 3.2.

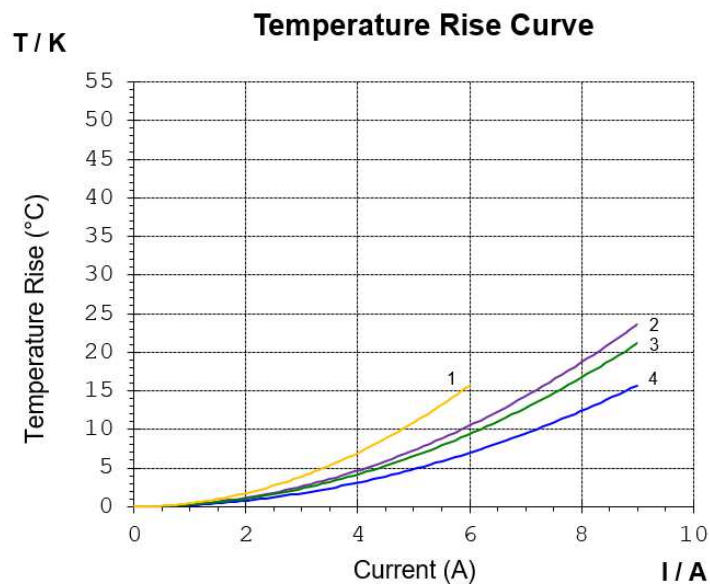


| Size 20 - Gold | | | |
|-----------------|-----------------|------|-------|
| Pin Part Number | Soc Part Number | Wire | Curve |
| 1060-20-0144 | 1062-20-0144 | 22 | 1 |
| 1060-20-0244 | 1062-20-0244 | | |
| - | 1062-20-0344 | 20 | 2 |
| 1060-20-0144 | 1062-20-0144 | | |
| 1060-20-0244 | 1062-20-0244 | 18 | 3 |
| - | 1062-20-0344 | | |
| 1060-20-0144 | 1062-20-0144 | 16 | 4 |
| 1060-20-0244 | 1062-20-0244 | | |
| - | 1062-20-0344 | | |



NOTE

T-rise curves indicate testing at 20% above rated current per section 3.2.

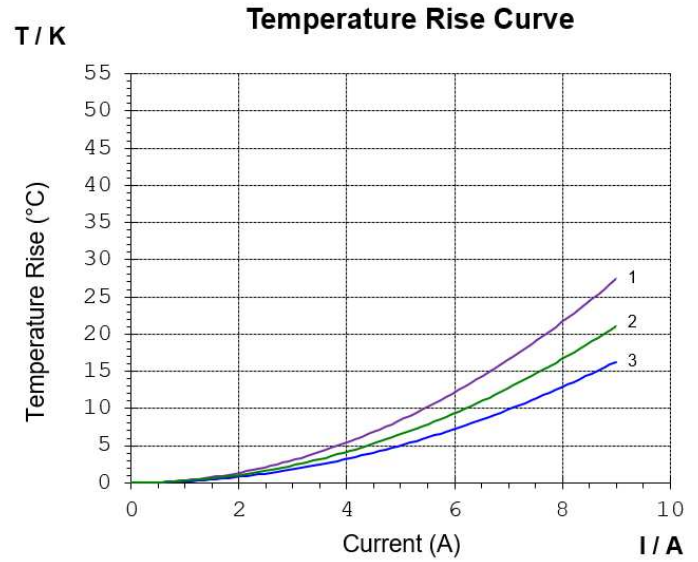


| Size 20 - Tin | | | |
|-----------------|-----------------|------|-------|
| Pin Part Number | Soc Part Number | Wire | Curve |
| 1060-20-0177 | 1062-20-0177 | 20 | 1 |
| 1060-20-0277 | 1062-20-0277 | | |
| - | 1062-20-0377 | | |
| 1060-20-0177 | 1062-20-0177 | 18 | 2 |
| 1060-20-0277 | 1062-20-0277 | | |
| - | 1062-20-0377 | | |
| 1060-20-0177 | 1062-20-0177 | 16 | 3 |
| 1060-20-0277 | 1062-20-0277 | | |
| - | 1062-20-0377 | | |



NOTE

T-rise curves indicate testing at 20% above rated current per section 3.2.



3.5. Appendix B. T-Rise Test Sequence

| TEST OR EXAMINATION | USCAR-2 rev 6 paragraph | TEST GROUP (a) |
|-------------------------------------|-------------------------|-------------------|
| | | 1 |
| | | TEST SEQUENCE (b) |
| Visual Inspection | 5.1.8 | 1 |
| Voltage Drop (c) | 5.3.2 | 2, 4 |
| Terminal Cycling | 5.1.7 | 3 |
| Maximum Test Current Capability (d) | 5.3.3 | 5 |
| Current Cycling | 5.3.4 | 6 |
| Visual Inspection | 5.1.8 | 7 |



NOTE

- a) *Specimens were prepared in accordance production drawings and were selected at random from current production.*
- b) *Numbers indicate sequence that tests were performed.*
- c) *Voltage Drop Resistance: 100mV max.*
- d) *Do not perform step 10.*
- e) *Specimens shall consist of DEUTSCH stamped & formed size 12-20 nickel, gold, tin pin & socket contacts.*
- f) *Size 12 crimped with 10-12 AWG wire; Size 16 crimped with 14-20 AWG wire; Size 20 crimped with 14-22 AWG wire*
- g) *Crimp characteristics (i.e. height, width, etc.) shall be checked prior to testing.*

4. REVISION HISTORY

| Rev Ltr | Brief Description of Change | Date | Dwn | Apvd |
|---------|---|--------------|-----|------|
| A | Initial Release | 01-Sept-2018 | DM | DM |
| B | 1) Page 2, Section; 3.2, Temperature, changed Tin max to +125°C and added Palladium Nickel Gold. 2) Page 4, Figure 2, Durability row, added Palladium Nickel Gold: = 100 cycles. | 07-Sep-2018 | DD | DM |
| C | 1) Section 3.2. (is) Current (Amp). See Appendix A for current temperature rise (t-rise) without housing (was) Current (Amp) 2) Section 3.2 in table (is) Current Rating (A) (was) Maximum Current (A) 3) Section 3.3 Converted tabulated performance requirements to paragraph style. 4) Added 3.3.4. Maximum Current Capability test 5) Added Appendix A: T-Rise curves | 06-May-2020 | DM | DM |
| C1 | 1) Page 2. Section 3.2 Current Rating. Corrected typo for size 16 16 AWG (is) 13A (was) 16A 2) Page 2. Section 3.2. Added note 2 to clarify metric wires are ref only | 16-Oct-2020 | DM | IG |
| C2 | 1) Page 2. Section 3.2 Current Rating. Added missing 14 [2.00] for size 20. 2) Page 3. Section 3.3.3 Contact Resistance. Added missing 14 [2.00] for size 20. 3) Page 4. Section 3.3.5. Crimp Tensile. Added missing 14 [2.00] for size 20. | 07-May-2021 | DM | IG |
| D | 1) Page 2. Section 2.2 Added USCAR-2 2) Page 8 & 9. Section 3.4 Added size 20 T-Rise curves | 07-Jun-2021 | DM | IG |
| E | 1) Page 5. Sec. 3.3.8 (is) .200 [5.08] deep (was) .250 [6.35] deep. 2) Page 5. Sec. 3.3.8 Size 16 Test Pin (is) 2.50 [11.1] & Ø.0615 [1.562] (was) 2.80 [12.5] & Ø.0625 [1.588]. 3) Page 5. Sec. 3.3.8 Size 20 Test Pin (is) 1.50 [6.7] & Ø.0410 [1.041] (was) 1.50 [6.7] & Ø.0402 [1.021]. | 18-Feb-2022 | DM | IG |
| F | 1) Page 4. Sec 3.3.5 Crimp Tensile. Separate AWG & mm ² columns | 20-May-2022 | DM | IG |
| F1 | 1) Page 9. Sec 3.4 Correct plating code error for Size 20 Gold PN Table. Gold plating code (is) 44 (was) 22 2) Page 10. Sec 3.4 Correct plating code error for Size 20 Tin PN Table. Tin plating code (is) 77 (was) 22 | 27-Jan-2023 | DM | IG |
| G | 1) Page 2. Added section 2.3 Safety Agency Approvals 2) Page 7. Added See Appendix B for Test Sequence under title 3) Pages 7-10. Added ...section 3.2 to t-rise 20% note. 4) Page 11. Added Section 3.5 | 09-Aug-2023 | DM | CB |