



Pages 1 to 18

SWITCHES, THERMOSTATIC, BIMETALLIC, SPST, OPENING CONTACT

ESCC Detail Specification No. 3702/001

| | |
|---------|-----------|
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| DCR No. | CHANGE DESCRIPTION |
|--------------------------|--|
| 216, 282, 283, 296 | Specification upissued to incorporate technical and editorial changes per DCR. |

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APPENDIX A 18

1. GENERAL

1.1 SCOPE

This specification details the ratings, physical and electrical characteristics, test and inspection data for Switches, Thermostatic, Bimetallic, 4A, 30V, SPST, Opening Contact. It shall be read in conjunction with ESCC Generic Specification No. 3702 the requirements of which are supplemented herein.

1.2 TYPE VARIANTS AND RANGE OF COMPONENTS

Variants of the basic type switches specified herein, which are also covered by this specification are given in Table 1(a).

1.3 MAXIMUM RATINGS

The maximum ratings, which shall not be exceeded at any time during use or storage, applicable to the switches specified herein, are scheduled in Table 1(b).

1.4 PARAMETER DERATING INFORMATION

The current rating versus voltage shall be as shown in Figure 1.

1.5 PHYSICAL DIMENSIONS

The physical dimensions of the switches specified herein are shown in Figure 2.

1.6 FUNCTIONAL DIAGRAM

The functional diagram for the switches specified herein, is shown in Figure 3.

2. APPLICABLE DOCUMENTS

The following documents form part of this specification and shall be read in conjunction with it:

- (a) ESCC Generic Specification No. 3702, Switches, Thermostatic, Bimetallic, Hermetically Sealed.

3. TERMS, DEFINITIONS, ABBREVIATIONS, SYMBOLS AND UNITS

For the purpose of this specification, the terms, definitions, abbreviations, symbols and units specified in ESCC Basic Specification No. 21300 and IEC Publication 389-1, Thermostatic Switches Part 1, shall apply.

TABLE 1(a) - TYPE VARIANTS AND RANGE OF COMPONENTS
TYPE VARIANTS

| Variant | Mechanical Differences | Figure |
|---------|-------------------------------------|--------|
| 01 | Without mounting appliance | 2(a) |
| 02 | Mounting with 2 hole flange | 2(b) |
| 03 | Mounting with threaded stud (5.0mm) | 2(c) |

RANGE OF COMPONENTS (See Notes)
GRADE 1

| TNf Setting Range (°C) (Note 1) | Tolerance on TNf and TNr (°C) | Nominal Differential TNf - TNr (°C) (Note 1) | Differential Limits Tf - Tr (°C) | |
|---------------------------------|-------------------------------|--|----------------------------------|------|
| | | | Min. | Max. |
| -50 to -31 | ±5 | 10 | 8 | 18 |
| -30 to +79 | ±3 | 10 | 7 | 12 |
| | | 9 | 6.4 | 11.4 |
| | | 8 | 5.8 | 10.4 |
| | | 7 | 5.2 | 9.6 |
| | | 6 | 4.6 | 8.8 |
| | | 5 | 4 | 8 |
| +80 to +150 | ±5 | 15 | 10 | 19 |

GRADE Y

| TNf Setting Range (°C) (Note 1) | Tolerance on TNf and TNr (°C) | Nominal Differential TNf - TNr (°C) (Note 1) | Differential Limits Tf - Tr (°C) | |
|---------------------------------|-------------------------------|--|----------------------------------|------------------|
| | | | Min. | Max. |
| -50 to -31 | ±5 | ≥15 10 to 14 | Note 2 4 | Note 3 Note 3 |
| -30 to +79 | ±3 | ≥11 5 to 10 | Note 2 4 | Note 3 Note 3 |
| +80 to +150 | ±5 | ≥15 | Note 2 | Note 3 |

NOTES:

- The following definitions apply:
 TNf: Nominal Operating Temperature - Opening Contact
 TNr: Nominal Restoring Temperature - Closing Contact
 Tf: Actual Operating Temperature - Opening Contact.
 Tr: Actual Restoring Temperature - Closing Contact
- Minimum Differential Limit = Nominal Differential - (2x Tolerance).
- Maximum Differential Limit = Nominal Differential + (2x tolerance).

TABLE 1(b) - MAXIMUM RATINGS

| No. | Characteristics | Symbol | Maximum Ratings | Unit | Remarks |
|-----|-----------------------------|--------------------|-----------------|------|--|
| 1 | Rated Current | I _R | 4.0 | A | 30Vdc resistive See Figure 1 for Derating |
| 2 | Overload Current | I _{overl} | 8 | A | 30Vdc resistive |
| 3 | Operating Temperature Range | T _{op} | -50 to +150 | °C | |
| 4 | Storage Temperature Range | T _{stg} | -65 to +175 | °C | |
| 5 | Soldering Temperature | T _{sol} | +260 | °C | Note 1 |

NOTES:

- Duration 10 seconds maximum, the same terminal shall not be resoldered until 3 minutes have elapsed.

FIGURE 1 - PARAMETER DERATING INFORMATION
Current versus Voltage

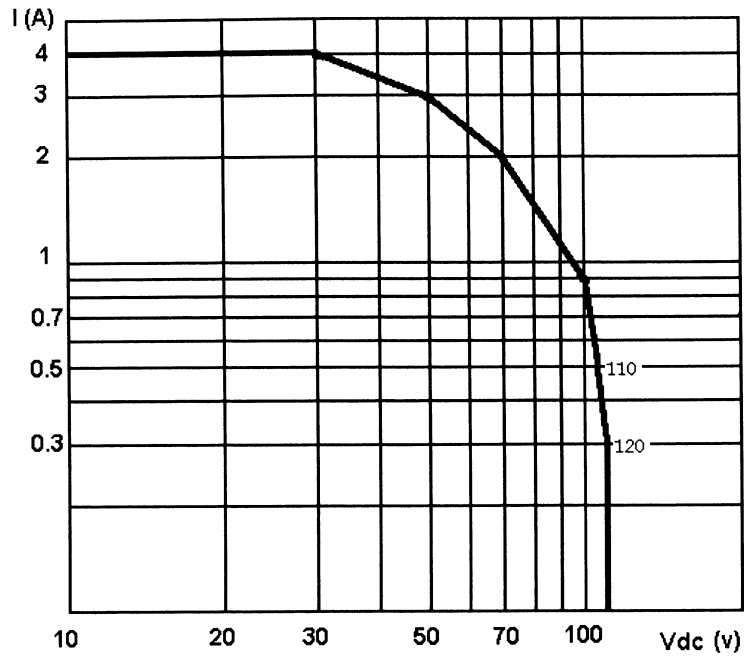
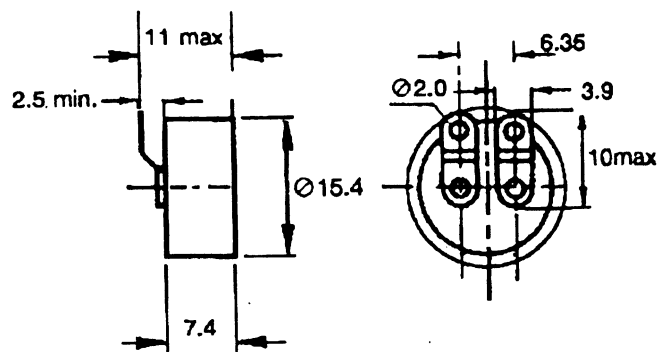


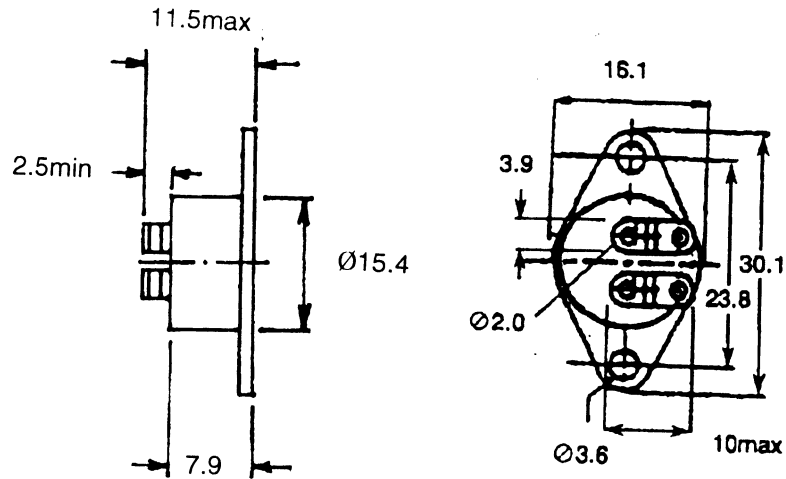
Figure 2 - PHYSICAL DIMENSIONS
Figure 2(a) VARIANT 01



NOTES:

1. All dimensions are in millimetres.
2. Tolerance ± 0.1 mm, unless otherwise specified.
3. Dimensions applicable to the body and terminals of Variant 01 shall also apply to Variants 02 and 03.

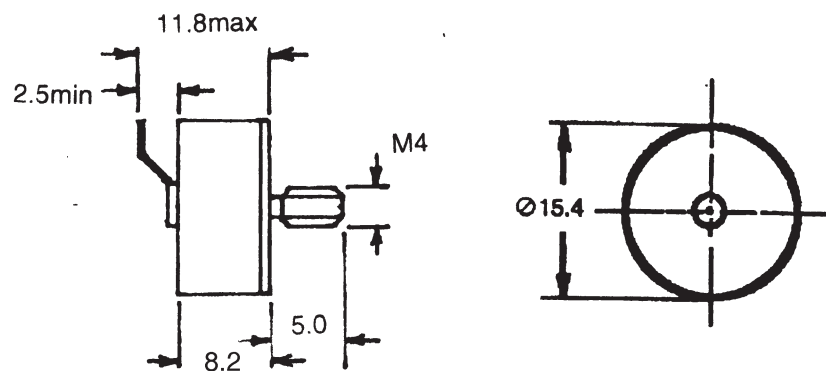
Figure 2(b) - VARIANT 02



NOTES:

1. All dimensions are in millimetres.
2. Tolerance ± 0.1 mm, unless otherwise specified.
3. Dimensions applicable to the body and terminals of Variant 01 shall also apply to Variants 02 and 03.

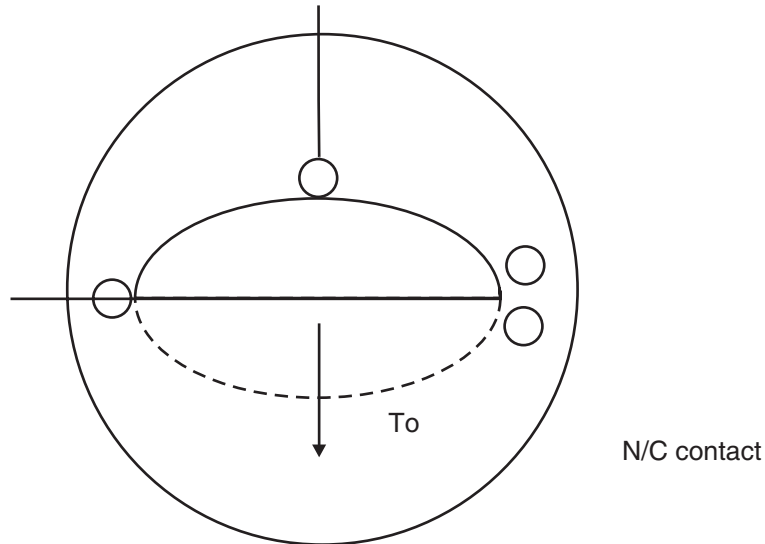
Figure 2(c) - VARIANT 03



NOTES:

1. All dimensions are in millimetres.
2. Tolerance ± 0.1 mm, unless otherwise specified.
3. Dimensions applicable to the body and terminals of Variant 01 shall also apply to Variants 02 and 03.

FIGURE 3 - FUNCTIONAL DIAGRAM



4. REQUIREMENTS

4.1 GENERAL

The complete requirements for procurement of the components specified herein are stated in this specification and ESCC Generic Specification No. 3702 For Thermostatic Switches. Deviations from the Generic Specification, applicable to this specification only, are detailed in Para. 4.2.

Deviations from the Generic Specification and this Detail Specification, formally agreed with specific Manufacturers on the basis that the alternative requirements are equivalent to the ESCC requirements and do not affect the components' reliability, are listed in the appendices attached to this specification.

4.2 DEVIATIONS FROM GENERIC SPECIFICATION

4.2.1 Deviations from Special In-Process Controls

None

4.2.2 Deviations from Final Production Tests (Chart II)

(a) Para. 9.2, Seal Test: See Table 6, No. 1 for value.

4.2.3 Deviations from Run-in and Electrical Measurements (Chart III)

(a) Para. 9.2, Seal Test: See Table 6, No. 1 for value.

4.2.4 Deviations from Qualification Tests (Chart IV)

- (a) Para. 9.12, Robustness of Terminations: Tests Ub and Ud are not applicable.
- (b) Para. 9.16, Overload: Overload current shall be 2 times rated current.

(c) Para. 9.18, Solderability: Soldering Iron Size B for Method 2.

4.2.5 Deviations from Lot Acceptance Tests (Chart V)

- (a) Para. 9.12, Robustness of Terminations: Tests Ub and Ud are not applicable.
- (b) Para. 9.16, Overload: Overload current shall be 2 times rated current.
- (c) Para. 9.18, Solderability: Soldering Iron Size B for Method 2.

4.3 MECHANICAL REQUIREMENTS

4.3.1 Dimension Check

The dimensions of the switches specified herein shall be verified in accordance with the requirements set out in Para. 9.4 of ESCC Generic Specification No. 3702 and shall conform to those shown in Figure 2.

4.3.2 Weight

The maximum weight of the switches specified herein shall be 7.5 grammes for Variants 01 and 02, 8 grammes for Variant 03.

4.3.3 Robustness of Termination

The requirements for robustness of termination testing are specified in Section 9 of ESCC Generic specification No. 3702. The test conditions shall be as follows:-

- (a) Test Ua1: Tensile, applied in the axis of the terminals, Force: 20N.

4.4 MATERIALS AND FINISHES

The materials and finishes shall be as specified herein. Where a definite material is not specified, a material which will enable the connectors specified herein to meet the performance requirements of this specification shall be used. Acceptance or approval of any constituent material does not guarantee acceptance of the finished product.

4.4.1 Case

Nickel-iron alloy, with electroless nickel plating, welded construction. Neither electro-deposited tin nor any paint shall be used.

4.4.2 Terminals

The terminal material shall be Type D with Type 3 finish in accordance with the requirements of ESCC Basic Specification No. 23500.

4.5 MARKING

4.5.1 General

The marking of all components delivered to this specification shall be in accordance with the requirements of ESCC Basic Specification No. 21700 and the following paragraphs. When the component is too small to accommodate all of the marking specified, as much as space permits shall be marked and the marking information, in full, shall accompany the component in its primary package.

The information to be marked and the order of precedence, shall be as follows:

- (a) The ESCC Component Number.
- (b) Temperature Characteristics.
- (c) Traceability Information.

4.5.2 Terminal Identification

Not applicable.

4.5.3 The ESCC Component Number

The ESCC Component Number shall be constituted and marked as follows:

370200101B

- Detail Specification Number: 3702001
- Type Variant Number (see Table 1(a)): 01
- Testing Level (B or C, as applicable): B

4.5.4 Temperature Characteristics

The temperature characteristics and ratings to be marked in the following order of precedence are:-

- (a) Opening Temperature (TNf).
- (b) Closing Temperature (TNr).
- (c) Tolerance.
- (d) Grade.

The information shall be constituted and marked as follows:-

026020HY

- Opening Temperature (+26°C): 026
- Closing Temperature (+20°C): 020
- Tolerance ($\pm 3^\circ\text{C}$): H
- Grade: Y

4.5.4.1 *Temperatures*

The opening and closing temperatures shall be written in clear and each temperature shall be comprised of 3 digits.

For negative temperatures the first digit shall be 6.

4.5.4.2 *Tolerance*

The tolerance on nominal operating temperatures shall be indicated by the code letters specified hereafter.

| Tolerance (± °C) | Code Letter |
|---------------------|-------------|
| 3.0 | H |
| 5.0 | J |
| None | X |

4.5.4.3 *Grade*

The grade of thermostat characteristics shall be indicated by the code letters specified hereafter.

| Grade | Code Letter |
|-------|-------------|
| 1 | None |
| Y | Y |

4.5.5 Traceability Information

Each component shall be marked in respect of traceability information in accordance with the requirements of ESCC Basic Specification No. 21700.

4.6 ELECTRICAL MEASUREMENTS

4.6.1 Electrical and Thermal Measurements

The parameters to be measured are scheduled in Table 2.

4.6.2 Electrical Measurements at High and Low Temperatures

Not applicable.

4.7 RUN-IN

4.7.1 Measurements during Run-in

Not applicable.

4.7.2 Conditions for Run-in

The requirements for run-in are specified in Section 7 of the ESCC Generic Specification No. 3702. The conditions for run-in shall be as specified in Table 5(a) of this specification.

4.7.3 Electrical Circuits for Run-in

Not applicable.

TABLE 2 - ELECTRICAL MEASUREMENTS AT ROOM TEMPERATURE

| No. | Characteristics | Symbol | ESCC 3702 Test Method | Test Condition | Limits | | Unit |
|-----|---|--------|-----------------------|----------------------------------|----------------|-----|------|
| | | | | | Min | Max | |
| 01 | Voltage Proof at $T \geq T_2$ (1) | V | Para. 9.5.1.1 | Between con- tacts and ground | 1000 | - | Vrms |
| | | | | Between open contacts | 100 | - | Vrms |
| 02 | Insulation Resistance at $T \geq T_2$ (1) | Ri | Para. 9.5.1.2 | Test Voltage 100 Vdc | 500 | - | MΩ |
| | | | | Between con- tacts and ground | | | MΩ |
| 03 | Contact Resistance at $T \leq T_3$ (1) | Rc | Para. 9.5.1.3 | Between open contacts | - | 50 | mΩ |
| | | | | Between con- tacts and ground | - | 50 | mΩ |
| 04 | Operating Temperature (Opening Contact) | Tf | Para. 9.5.1.4 | Para. 9.5.1.4 (Note 2) | See Table 1(a) | | °C |
| 05 | Restoring Temperature (Closing Contact) | Tr | Para. 9.5.1.4 | Para. 9.5.1.4 (Note 2) | See Table 1(a) | | °C |
| 06 | Tf - Tr | - | - | - | See Table 1(a) | | °C |

NOTES:

1. T1, T2, T3, T4 as defined in ESCC Generic Specification No. 3702, Para. 9.5.1.
2. Temperature gradient for measurements:
1/3 °C/minute minimum
1.0 °C/minute maximum.

Table 3 - ELECTRICAL MEASUREMENTS AT HIGH AND LOW TEMPERATURES

Not applicable.

TABLE 4 - PARAMETER DRIFT VALUES

| No. | Characteristics | Symbol | Spec and/or Test Method | Test Condition | Change Limits (Δ) | Unit |
|-----|---|--------|-------------------------|----------------|-------------------|------|
| 04 | Operating Temperature (Opening Contact) | Tf | As per Table 2 | As per Table 2 | ±1.0 | °C |
| 05 | Restoring Temperature (Closing Contact) | Tr | As per Table 2 | As per Table 2 | ±1.0 | °C |

TABLE 5(a) - CONDITIONS FOR RUN-IN

| No. | Characteristics | Symbol | ESCC 3702 Test Method | Test Condition | Unit |
|-----|-----------------|--------|-----------------------|------------------------|------|
| 01 | Temperature | T | Para. 9.7 | T3 → T2 T2 → T3 (1) | °C |

NOTES:

1. T2 and T3 as defined in ESCC Generic Specification No. 3702, Para. 9.5.1.

TABLE 5(b) - CONDITIONS FOR OPERATING LIFE TEST

| No. | Characteristics | Symbol | Test Condition | Unit |
|-----|------------------------|--------|------------------------------|--------|
| 01 | Temperature | T | $T2 \leq T \leq T_{Nf} + 30$ | °C |
| 02 | Temperature | T | $T_{Nr} - 30 \leq T \leq T3$ | °C |
| 03 | Contact Load Resistive | V I | 30 4.0 | V A |

4.8 ENVIRONMENTAL AND ENDURANCE TESTING (CHARTS IV AND V OF ESCC GENERIC SPECIFICATION NO. 3702)

4.8.1 Measurements and Inspections on Completion of Environmental Tests

The parameters to be measured and inspections to be performed on completion of environmental testing are scheduled in Table 6.

4.8.2 Measurements and Inspections During Endurance Tests

The parameters to be measured and inspections to be performed during endurance tests are scheduled in Table 6. The measurements shall be performed at the applicable test temperature.

4.8.3 Measurements and Inspections on Completion of Endurance Tests

The parameters to be measured and inspections to be performed on completion of endurance tests are scheduled in Table 6.

4.8.4 Conditions for Operating Life Test (Part of Endurance Testing)

The requirements for operating life testing are specified in Section 9 of ESCC Generic Specification No. 3702. The conditions for operating life testing shall be as specified in Table 5(b) of this specification.

4.8.5 Electrical Circuit for Operating Life Test

Not applicable.

Table 6 - MEASUREMENTS AND INSPECTIONS ON COMPLETION OF ENVIRONMENTAL TESTS AND AT INTERMEDIATE POINTS AND ON COMPLETION OF ENDURANCE TESTING

| No. | ESCC Generic Spec. No. 3702 | | Measurements and Inspections | | Symbol | Limits | | Unit |
|-----|---------------------------------------|----------------------------|------------------------------|-------------------------|--------|-----------------|--------|----------|
| | Environmental and Endurance Tests (1) | Test Method and Conditions | Identification | Conditions | | Min | Max | |
| 01 | Seal Test | Para. 9.2 | Seal Test | Fine leak Gross leak | - - | - No Bubbles | 1.10-8 | atm/cc/s |

| No. | ESCC Generic Spec. No. 3702 | | Measurements and Inspections | | Symbol | Limits | | Unit |
|-----|---------------------------------------|---|--|---------------------------|-------------------------|-----------------------|------|------|
| | Environmental and Endurance Tests (1) | Test Method and Conditions | Identification | Conditions | | Min | Max | |
| 02 | External Visual Inspection | Para. 9.3 | External Visual Inspection | - | - | - | - | - |
| 03 | Creepage | Para. 9.6 | Creepage | Para. 9.6 | - | No Creepage | | - |
| 04 | Response Time | Para. 9.8 | Response Time | Para. 9.8 | trp | - | 20 | s |
| 05 | Rapid Change of Temperature | Para. 9.9 | Last Cycle: Electrical Measurements | Table 2 Items 1, 2, 3 | - | Table 2 Items 1, 2, 3 | | - |
| | | | Visual Examination | - | - | - | - | - |
| 06 | Vibration | Para. 9.10 | Visual Examination | - | - | - | - | - |
| 07 | Shock | Para. 9.11 | Visual Examination | - | - | - | - | - |
| | | | Electrical Measurements | Table 2 Items 1, 2, 3 | - | Table 2 Items 1, 2, 3 | | - |
| | | | Thermal Measurements | Table 2 Items 4, 5 | $\Delta T_f/\Delta T_r$ | -2.7 | +2.7 | °C |
| 08 | Robustness of Terminations | Para. 9.12 and Paras. 4.2.4 and 4.2.5 of this spec. | Visual Examination | - | - | - | - | - |
| 09 | Permanence of Marking | Para. 9.13 | Visual Examination | - | - | - | - | - |
| 10 | Resistance to Soldering Heat | Para. 9.14 | Visual Examination | - | - | - | - | - |
| | | | Thermal Measurements | Table 2 Items 4, 5 | $\Delta T_f/\Delta T_r$ | -1.7 | +1.7 | °C |
| 11 | Damp Heat (Steady State) | Para. 9.15 | - | - | - | - | - | - |
| 12 | Overload | Para. 9.16 Res. 6A & 30Vdc. | Electrical Measurements | Table 2 Item 3 | - | Table 2 Item 3 | | - |
| | | | Thermal Measurements | Table 2 Items 4, 5 | $\Delta T_f/\Delta T_r$ | -1.7 | +1.7 | °C |
| | | | External Visual Inspection | Para. 9.2 of Generic 3702 | - | - | - | - |
| 13 | Operating Life Resistive | Para. 9.17 | Electrical Measurements | Table 2 Items 1, 2, | - | Table 2 Items 1, 2, | | - |
| | | Table 5(b) of this spec. | | Table 2 Item 3 | - | - | 100 | mΩ |
| | | | Thermal Measurements | Table 2 Items 4, 5 | $\Delta T_f/\Delta T_r$ | -1.7 | +1.7 | °C |
| | | | Visual Examination | - | - | - | - | - |
| 14 | Solderability | Para. 9.18 and Paras. 4.2.4 and 4.2.5 of this spec. | Visual Examination | - | - | - | - | - |
| 15 | High Temperature Storage | Para. 9.19 Zero dissipation | | After < 96 hours recovery | | | | |
| | | | Electrical Measurements | Table 2 Items 1, 2, 3 | - | Table 2 Items 1, 2, 3 | | - |
| | | | Thermal Measurements | Table 2 Items 4, 5 | $\Delta T_f/\Delta T_r$ | -1.7 | +1.7 | °C |
| 16 | Low Temperature Storage | Para. 9.20 Not used | - | - | - | - | - | - |
| 17 | Salt Mist | Para. 9.21 | Visual Examination | - | - | - | - | - |

| No. | ESCC Generic Spec. No. 3702 | | Measurements and Inspections | | Symbol | Limits | | Unit |
|-----|---------------------------------------|----------------------------|------------------------------|-----------------------|--------|-----------------------|-----|------|
| | Environmental and Endurance Tests (1) | Test Method and Conditions | Identification | Conditions | | Min | Max | |
| 18 | Electrical and Thermal Measurements | Para. 9.5.4 | Electrical Measurements | Table 2 Items 1, 2, 3 | - | Table 2 Items 1, 2, 3 | | - |
| | | | Thermal Measurements | Table 2 Items 4, 5, 6 | - | Table 2 Items 4, 5, 6 | | - |

NOTES:

1. The tests in this table refer to either Chart IV or V and shall be used as applicable.

APPENDIX A

AGREED DEVIATIONS FOR COMEPA (F)

| ITEMS AFFECTED | DESCRIPTION OF DEVIATIONS |
|---|---|
| Deviations from Generic Specification - Run-in and Electrical Measurements (Chart III) - Lot Acceptance Tests (Chart V) | Para. 9.6 - Creepage The manufacturer may use his own creepage detection instrument for this test according to his specification POT4711 with Creepage Limit: 5ms max. |
| Deviations from Detail Specification - Table 6 | |