



**SWITCHES, THERMOSTATIC, BIMETALLIC,
SPST WITH SNAP ACTION,
WITH OPENING OR CLOSING CONTACT
BASED ON TYPE TH47
ESCC Detail Specification No. 3702/001**

| | |
|---------|------------|
| Issue 9 | March 2023 |
|---------|------------|



LEGAL DISCLAIMER AND COPYRIGHT

European Space Agency, Copyright © 2023. All rights reserved.

The European Space Agency disclaims any liability or responsibility, to any person or entity, with respect to any loss or damage caused, or alleged to be caused, directly or indirectly by the use and application of this ESCC publication.

This publication, without the prior permission of the European Space Agency and provided that it is not used for a commercial purpose, may be:

- copied in whole, in any medium, without alteration or modification.
- copied in part, in any medium, provided that the ESCC document identification, comprising the ESCC symbol, document number and document issue, is removed.

DOCUMENTATION CHANGE NOTICE

(Refer to <https://escies.org> for ESCC DCR content)

| DCR No. | CHANGE DESCRIPTION |
|---------|--|
| 1561 | Specification upissued to incorporate changes per DCR. |

TABLE OF CONTENTS

| | | |
|-------------------|--|-----------|
| 1 | GENERAL | 5 |
| 1.1 | SCOPE | 5 |
| 1.2 | APPLICABLE DOCUMENTS | 5 |
| 1.3 | TERMS, DEFINITIONS, ABBREVIATIONS, SYMBOLS AND UNITS | 5 |
| 1.4 | THE ESCC COMPONENT NUMBER AND COMPONENT TYPE VARIANTS | 5 |
| 1.4.1 | The ESCC Component Number | 5 |
| 1.4.2 | Component Type Variants and Range of Components | 6 |
| 1.5 | MAXIMUM RATINGS | 8 |
| 1.6 | PHYSICAL DIMENSIONS | 9 |
| 1.6.1 | Case without Fixings (Variant 01) | 9 |
| 1.6.2 | Case with 2 Hole Flange Mount (Variant 02) | 10 |
| 1.6.3 | Case with 5mm M4 Mounting Stud (Variant 03) | 11 |
| 1.7 | FUNCTIONAL DIAGRAM | 11 |
| 1.8 | MATERIALS AND FINISHES | 12 |
| 1.8.1 | Case | 12 |
| 1.8.2 | Terminal Material and Finish | 12 |
| 2 | REQUIREMENTS | 12 |
| 2.1 | GENERAL | 12 |
| 2.1.1 | Deviations from the Generic Specification | 12 |
| 2.2 | MARKING | 12 |
| 2.3 | ROBUSTNESS OF TERMINATIONS | 12 |
| 2.4 | THERMAL MEASUREMENTS | 13 |
| 2.5 | ELECTRICAL MEASUREMENTS | 13 |
| 2.6 | PARAMETER DRIFT VALUES | 14 |
| 2.7 | INTERMEDIATE AND END-POINT THERMAL AND ELECTRICAL MEASUREMENTS | 14 |
| APPENDIX A | | 16 |

1 GENERAL

1.1 SCOPE

This specification details the ratings, physical and electrical characteristics, and test and inspection data for the component type variants and/or the Component Type Variants and Range of Components specified below. It supplements the requirements of, and shall be read in conjunction with, the ESCC Generic Specification listed under Applicable Documents.

1.2 APPLICABLE DOCUMENTS

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

- (a) ESCC Generic Specification No. [3702](#).

1.3 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](#) shall apply. In addition the definitions specified in the Generic Specification shall apply.

1.4 THE ESCC COMPONENT NUMBER AND COMPONENT TYPE VARIANTS

1.4.1 The ESCC Component Number

The ESCC Component Number shall be constituted as follows:

Example: 370200101B026020HY

- Detail Specification Reference: 3702001
- Component Type Variant Number: 01 (as required)
- Characteristic code: contact type (opening): B (as required)
- Characteristic code: nominal functioning temperature, TNF (+26°C): 026 (as required)
- Characteristic code: nominal restoring temperature, TNR (+20°C): 020 (as required)
- Characteristic code: switching temperature tolerance, Tol ($\pm 3^\circ\text{C}$): H (as required)
- Characteristic code: grade: Y (as required)

1.4.1.1 Characteristics Codes

Characteristics to be codified as part of the ESCC Component Number shall be as follows:

- (a) Contact Type expressed by means of the following codes:

| Contact Type | Code |
|--|------|
| Switch with Opening Contact: A component where the switch contact will open when the temperature rises to a value equal to or greater than the upper of the two switching temperatures | B |
| Switch with Closing Contact: A component where the switch contact will close when the temperature rises to a value equal to or greater than the upper of the two switching temperatures | C |

- (b) Nominal functioning temperature, TNF, and nominal restoring temperature, TNR, each expressed by means of the following codes (see Para. 1.4.2 Note 2). The unit quantity shall be °C.

| Nominal Functioning and Restoring Temperature TNF, TNR (°C) | Code |
|---|------|
| +XXX | XXX |
| +XX | 0XX |
| +X | 00X |
| 0 | 000 |
| -X | 60X |
| -XX | 6XX |

- (c) The switching temperature tolerance, Tol, relative to TNF and TNR, expressed by the following codes (see Para. 1.4.2 Note 2):

| Temperature Tolerance Tol (± °C) | Code |
|--|------|
| 2 | B |
| 3 | H |
| 5 | J |

- (d) Component grade expressed by the following codes (see Para. 1.4.2 Note 2):

| Grade Description | Code |
|---|------|
| A switch designed to operate within the specified switching temperatures tolerance that also maintains a minimum actual temperature differential | Y |
| A switch designed to operate within the specified switching temperatures tolerance that also maintains both a minimum and a maximum actual temperature differential | Z |

1.4.2 Component Type Variants and Range of Components

The Component Type Variants and Range of Components applicable to this specification are as follows:

| Variant Number | Mounting Details (See Note 1) | Thermal Switching Characteristics (TNF, TNR, Tol, Nom Diff, Act Diff) | Weight Max (g) |
|----------------|--------------------------------|---|----------------|
| 01 | Case without Fixings | See Note 2 | 7.5 |
| 02 | Case with 2 Hole Flange Mount | See Note 2 | 7.5 |
| 03 | Case with 5mm M4 Mounting Stud | See Note 2 | 8 |

NOTES:

- See Para. 1.6.

2. The following thermal switching characteristic details apply to the available range of components:

Grade Y:

| Nominal Functioning Temperature TNF (°C) | Nominal Restoring Temperature TNR (°C) | Temperature Tolerance Tol (± °C) | Nominal Temperature Differential Nom Diff (TNF – TNR) (°C) | Actual Temperature Differential Act Diff (TF – TR) (°C) | |
|--|--|----------------------------------|--|---|-----------------|
| | | | | Min | Max |
| -36 to -31 | -45 to -40 | 5 | 9 to 14 | 4 | Nom Diff + 2Tol |
| -30 to +99 | -44 to +94 | 3 | 5 to 14 | 4 | Nom Diff + 2Tol |
| | -40 to +94 | 2 | 5 to 10 | 4 | Nom Diff + 2Tol |
| +100 to +150 | +85 to +140 | 5 | 10 to 15 | 4 | Nom Diff + 2Tol |

Grade Z:

| Nominal Functioning Temperature TNF (°C) | Nominal Restoring Temperature TNR (°C) | Temperature Tolerance Tol (± °C) | Nominal Temperature Differential Nom Diff (TNF – TNR) (°C) | Actual Temperature Differential Act Diff (TF – TR) (°C) | |
|--|--|----------------------------------|--|---|-----|
| | | | | Min | Max |
| -35 to -31 | -45 to -41 | 5 | 10 | 4 | 18 |
| | | 3 | | 4 | 14 |
| | -44 to -40 | 3 | 9 | 4 | 13 |
| | -43 to -39 | 3 | 8 | 4 | 12 |
| -30 to +99 | -42 to -38 | 3 | 7 | 4 | 11 |
| | | 3 | | 4 | 11 |
| | -40 to +89 | 3 | 10 | 4 | 13 |
| | | 2 | | 4 | 12 |
| | -39 to +90 | 3 | 9 | 4 | 12 |
| | | 2 | | 4 | 11 |
| | -38 to +91 | 3 | 8 | 4 | 11 |
| | | 2 | | 4 | 10 |
| | -37 to +92 | 3 | 7 | 4 | 10 |
| | | 2 | | 4 | 9 |
| | -36 to +93 | 3 | 6 | 4 | 9 |
| | | 2 | | 4 | 8 |
| -35 to +94 | 3 | 5 | 4 | 8 | |
| | 2 | | 4 | 7.5 | |
| +100 to +150 | +90 to +140 | 5 | 10 | 4 | 17 |
| | | 3 | | 4 | 13 |
| | +91 to +141 | 3 | 9 | 4 | 12 |
| | +92 to +142 | 3 | 8 | 4 | 11 |
| | +93 to +143 | 3 | 7 | 4 | 10 |

1.5 MAXIMUM RATINGS

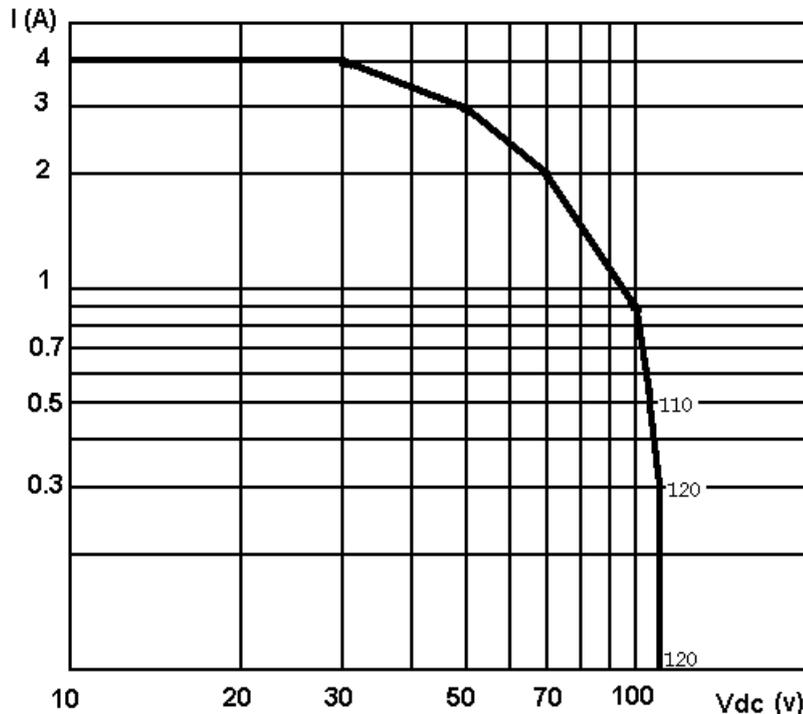
The maximum ratings shall not be exceeded at any time during use or storage.

Maximum ratings shall only be exceeded during testing to the extent specified in this specification and when stipulated in Test Methods and Procedures of the ESCC Generic Specification.

| Characteristics | Symbols | Maximum Ratings | Units | Remarks |
|-----------------------------|-----------------------|-----------------|---------------------------|--|
| Rated Current | I_R | 4 | A | $V \leq 30V$ resistive 100000 switching cycles Note 1 |
| Overload Current | I_{overload} | 6 | A | $V \leq 30V$ resistive |
| Rated Voltage | V_R | 120 | V | $I \leq 0.3A$ resistive 100000 switching cycles Note 1 |
| Temperature Gradient | $\Delta T/t$ | 0.33 minimum | $^{\circ}C/\text{minute}$ | Only applies between T3 and T2; see Notes 2, 3 |
| Operating Temperature Range | T_{op} | -50 to +155 | $^{\circ}C$ | |
| Storage Temperature Range | T_{stg} | -65 to +175 | $^{\circ}C$ | |
| Soldering Temperature | T_{sol} | +260 | $^{\circ}C$ | Note 4 |

NOTES:

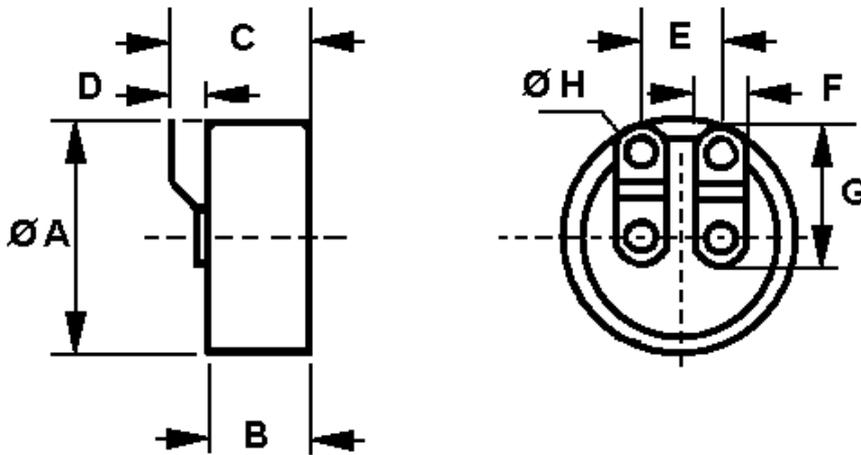
- Derate as follows:



- The minimum permitted temperature gradient applied to the component between T3 and T2 shall be as specified (see the Generic Specification for definition of T2 and T3).
- In order for the component to meet the thermal characteristics specified in Para. 2.4, the maximum temperature gradient applied to the component between T3 and T2 shall be: $1^{\circ}C/\text{minute}$ (see the Generic Specification for definition of T2 and T3).
- Duration 10 seconds maximum, greater than 1.5mm from the body; the same terminal shall not be resoldered until 3 minutes have elapsed.

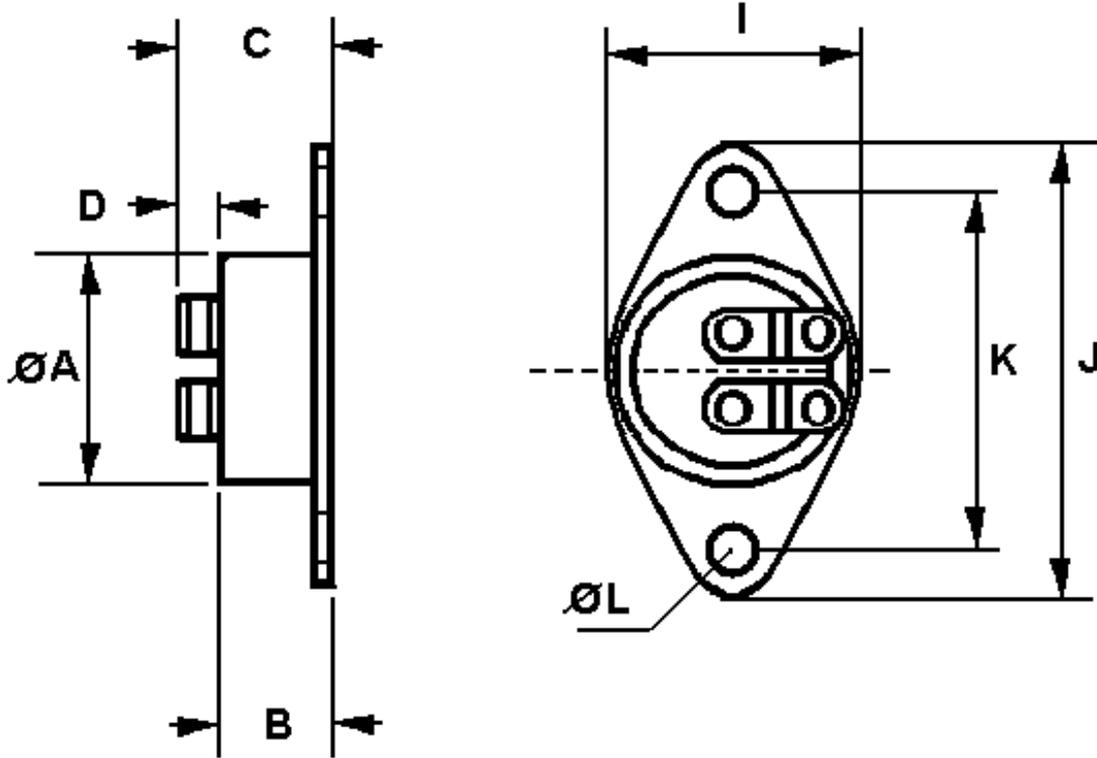
1.6 PHYSICAL DIMENSIONS

1.6.1 Case without Fixings (Variant 01)



| Symbol | Dimension (mm) | |
|-----------------|----------------|------|
| | Min | Max |
| $\varnothing A$ | 15.3 | 15.5 |
| B | 7.3 | 7.5 |
| C | - | 11 |
| D | 2.5 | - |
| E | 6.25 | 6.45 |
| F | 3.8 | 4 |
| G | - | 10 |
| $\varnothing H$ | 1.9 | 2.1 |

1.6.2 Case with 2 Hole Flange Mount (Variant 02)

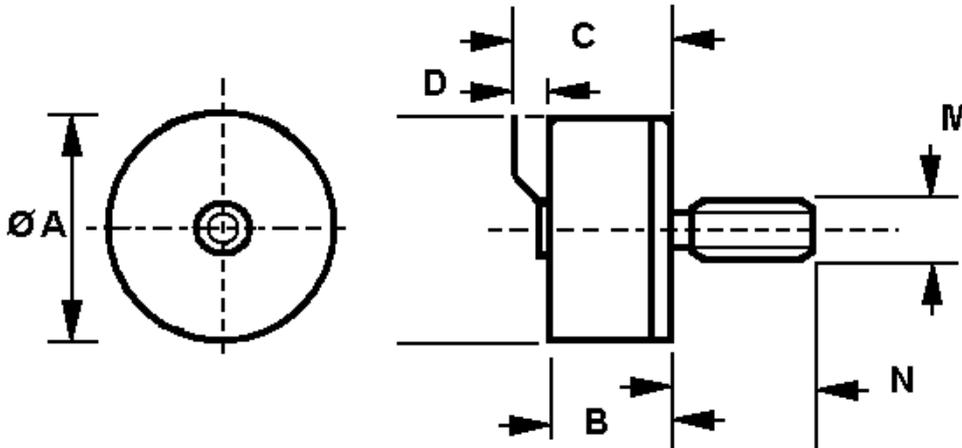


| Symbol | Dimension (mm) (Note 1) | |
|--------|----------------------------|------|
| | Min | Max |
| ØA | 15.3 | 15.5 |
| B | 7.8 | 8 |
| C | - | 11.5 |
| D | 2.5 | - |
| I | 16 | 16.2 |
| J | 30 | 30.2 |
| K | 23.7 | 23.9 |
| ØL | 3.5 | 3.7 |

NOTES:

1. Dimensions E, F, G, ØH from Para. 1.6.1 also apply.

1.6.3 Case with 5mm M4 Mounting Stud (Variant 03)

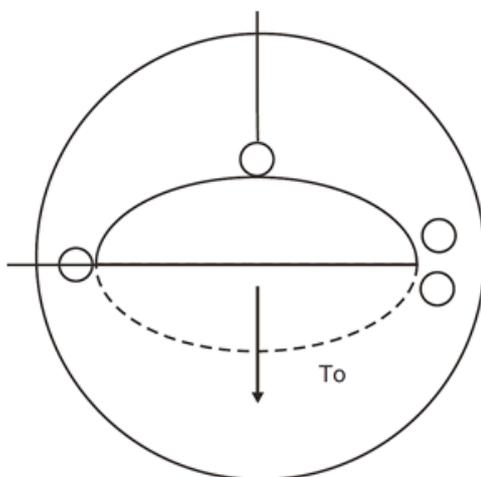


| Symbol | Dimension (mm) | |
|-----------------|----------------|------|
| | Min | Max |
| $\varnothing A$ | 15.3 | 15.5 |
| B | 8.1 | 8.3 |
| C | - | 11.8 |
| D | 2.5 | - |
| M | M4 | |
| N | 4.9 | 5.1 |

NOTES:

1. Dimensions E, F, G, $\varnothing H$ from Para. 1.6.1 also apply.

1.7 FUNCTIONAL DIAGRAM



NOTES:

1. Contact opens or closes with increasing temperature (see Para. 1.4.1.1(a)).
2. The terminals are isolated from the case.

1.8 MATERIALS AND FINISHES

1.8.1 Case

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

1.8.2 Terminal Material and Finish

Terminal material shall be Type D with Type 19 finish in accordance with the requirements of ESCC Basic Specification No. [23500](#).

2 REQUIREMENTS

2.1 GENERAL

The complete requirements for procurement of the components specified herein are as stated in this specification and the ESCC Generic Specification. Permitted deviations from the Generic Specification, applicable to this specification only, are listed below.

Permitted 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 requirement and do not affect the component's reliability, are listed in the appendices attached to this specification.

2.1.1 Deviations from the Generic Specification

2.1.1.1 *Deviations from Screening Tests - Chart F3*

- (a) Seal, Fine Leak: The maximum helium measured leak rate shall be:
 $R = 1 \times 10^{-8}$ atm.cm³/s maximum.

2.1.1.2 *Deviations from Qualification and Periodic Testing - Chart F4*

- (a) Seal, Fine Leak: The maximum helium measured leak rate shall be:
 $R = 1 \times 10^{-8}$ atm.cm³/s maximum.
- (b) Solderability: For test method 2, soldering iron size B shall apply.

2.2 MARKING

The marking shall be in accordance with the requirements of ESCC Basic Specification No. [21700](#). The information to be marked shall be:

- (a) The ESCC qualified components symbol (for ESCC qualified components only).
(b) The ESCC Component Number (see Para. 1.4.1).
(c) Traceability information.

2.3 ROBUSTNESS OF TERMINATIONS

The test conditions for Robustness of Terminations, tested as specified in the Generic Specification, shall be as follows:

- Test Ua₁ (tensile): applied force: 20N, in the axis of the terminals.

2.4 **THERMAL MEASUREMENTS**

| Characteristics | Symbols | Test Method and Conditions | Limits (Note 1) | | Units |
|---------------------------------|----------|----------------------------|--------------------|--------------|-------|
| | | | Min | Max | |
| Functioning Temperature | TF | ESCC No. 3702 Note 1 | TNF – Tol | TNF + Tol | °C |
| Restoring Temperature | TR | ESCC No. 3702 Note 1 | TNR – Tol | TNR + Tol | °C |
| Actual Temperature Differential | Act Diff | = TF – TR | Act Diff Min | Act Diff Max | °C |

NOTES:

- See Para. 1.4.2 Note 2 for characteristic limits
- The following temperature gradient shall apply for measurements:
 - 0.33°C/ minute minimum; 1°C/ minute maximum.

2.5 **ELECTRICAL MEASUREMENTS**

| Characteristics | Symbols | Test Method and Conditions | Limits | | Units |
|-----------------------|----------------|--|-------------|--------|------------------|
| | | | Min | Max | |
| Voltage Proof | V _P | ESCC No. 3702 T ≥ T2 or T ≤ T3 (Note 1) Between contacts & case: Between open contacts: | 1000 100 | - - | V _{rms} |
| Insulation Resistance | R _I | ESCC No. 3702 T ≥ T2 or T ≤ T3 (Note 1) V = 100Vdc Between contacts & case: Between open contacts: | 500 500 | - - | MΩ |
| Contact Resistance | R _C | ESCC No. 3702 T ≥ T2 or T ≤ T3 (Note 1) | - | 50 | mΩ |

NOTES:

- See the Generic Specification for definition of T2 and T3.

2.6 PARAMETER DRIFT VALUES

The test methods and test conditions shall be as per the corresponding test defined in Para. 2.4 Thermal Measurements.

The drift values (Δ) shall not be exceeded for each characteristic specified. The corresponding absolute limit values for each characteristic shall not be exceeded.

| Characteristics | Symbols | Limits | | Units | |
|-------------------------|---------|----------------------|-----------|-----------|--------------------|
| | | Drift Value Δ | Absolute | | |
| | | | Min | | Max |
| Functioning Temperature | TF | ± 1 | TNF – Tol | TNF + Tol | $^{\circ}\text{C}$ |
| Restoring Temperature | TR | ± 1 | TNR – Tol | TNR + Tol | $^{\circ}\text{C}$ |

2.7 INTERMEDIATE AND END-POINT THERMAL AND ELECTRICAL MEASUREMENTS

Unless otherwise specified the test methods and test conditions shall be as per the corresponding test defined in Para. 2.4 Thermal Measurements and Para. 2.5 Electrical Measurements.

| Test Reference per ESCC No. 3702 | Characteristics | Symbols | Limits | | Units |
|--|---|-------------|---------------|--------------------|--------------------|
| | | | Min | Max | |
| Rapid Change of Temperature Initial Measurements (Note 1) | Functioning Temperature | TF | See Para. 2.4 | | $^{\circ}\text{C}$ |
| | Restoring Temperature | TR | See Para. 2.4 | | $^{\circ}\text{C}$ |
| | Actual Temperature Differential | Act Diff | See Para. 2.4 | | $^{\circ}\text{C}$ |
| Vibration During Testing | No intermittent contact $\geq 1\text{ms}$, or improper open or short circuit | - | - | | - |
| Mechanical Shock During Testing | No intermittent contact $\geq 1\text{ms}$, or improper open or short circuit | - | - | | - |
| Thermal and Electrical Measurements | Voltage Proof | V_P | See Para. 2.5 | | V_{rms} |
| | Insulation Resistance | R_i | See Para. 2.5 | | $M\Omega$ |
| | Contact Resistance | R_c | See Para. 2.5 | | $m\Omega$ |
| | Functioning Temperature | TF | See Para. 2.4 | | $^{\circ}\text{C}$ |
| | Change of Functioning Temperature | ΔTF | -1.7 | +1.7 | $^{\circ}\text{C}$ |
| | Restoring Temperature | TR | See Para. 2.4 | | $^{\circ}\text{C}$ |
| | Change of Restoring Temperature | ΔTR | -1.7 | +1.7 | $^{\circ}\text{C}$ |
| | Actual Temperature Differential | Act Diff | See Para. 2.4 | | $^{\circ}\text{C}$ |
| Change of Actual Temperature Differential | $\Delta \text{Act Diff}$ | -1.7 | +1.7 | $^{\circ}\text{C}$ | |
| Resistance to Soldering Heat Initial Measurements (Note 1) | Functioning Temperature | TF | See Para. 2.4 | | $^{\circ}\text{C}$ |
| | Restoring Temperature | Tr | See Para. 2.4 | | $^{\circ}\text{C}$ |
| | Actual Temperature Differential | Act Diff | See Para. 2.4 | | $^{\circ}\text{C}$ |

| Test Reference per ESCC No. 3702 | Characteristics | Symbols | Limits | | Units |
|--|--|-------------------|---------------|------|------------|
| | | | Min | Max | |
| Response Time | | | | | |
| Initial Measurements (Note 1) | Functioning Temperature | TF | See Para. 2.4 | | °C |
| During Testing | Response Time | trp | - | 20 | s |
| Operating Life (4A, 30Vdc, resistive) | | | | | |
| Initial Measurements (Note 1) | Functioning Temperature | TF | See Para. 2.4 | | °C |
| | Restoring Temperature | TR | See Para. 2.4 | | °C |
| | Actual Temperature Differential | Act Diff | See Para. 2.4 | | °C |
| During Testing | Monitor for correct switching and voltage during 50% of closure period | - | - | | - |
| Intermediate Measurements (25000 and 50000 cycles) | Functioning Temperature | TF | See Para. 2.4 | | °C |
| | Change of Functioning Temperature | ΔTF | -1.7 | +1.7 | °C |
| | Restoring Temperature | TR | See Para. 2.4 | | °C |
| | Change of Restoring Temperature | ΔTR | -1.7 | +1.7 | °C |
| Final Measurements | Voltage Proof | V_P | See Para. 2.5 | | Vrms |
| | Insulation Resistance | R_i | See Para. 2.5 | | M Ω |
| | Contact Resistance | R_c | - | 100 | m Ω |
| | Functioning Temperature | TF | See Para. 2.4 | | °C |
| | Change of Functioning Temperature | ΔTF | -1.7 | +1.7 | °C |
| | Restoring Temperature | TR | See Para. 2.4 | | °C |
| | Change of Restoring Temperature | ΔTR | -1.7 | +1.7 | °C |
| | Actual Temperature Differential | Act Diff | See Para. 2.4 | | °C |
| | Change of Actual Temperature Differential | $\Delta Act Diff$ | -1.7 | +1.7 | °C |
| Overload (6A, 30Vdc, resistive) | | | | | |
| Initial Measurements (Note 1) | Functioning Temperature | TF | See Para. 2.4 | | °C |
| | Restoring Temperature | TR | See Para. 2.4 | | °C |
| | Actual Temperature Differential | Act Diff | See Para. 2.4 | | °C |
| High and Low Temperature Storage | | | | | |
| Initial Measurements (Note 1) | Functioning Temperature | TF | See Para. 2.4 | | °C |
| | Restoring Temperature | TR | See Para. 2.4 | | °C |
| | Actual Temperature Differential | Act Diff | See Para. 2.4 | | °C |

NOTES:

- Final measurements from Thermal Measurements in Chart F3, Screening Tests, of the Generic Specification may be used as initial measurements.

APPENDIX A
AGREED DEVIATIONS FOR COMEPA (F)

| Items Affected | Description of Deviations |
|--|--|
| Para. 2.1.1.1, Deviations from the Generic Specification: Screening Tests - Chart F3 | Creepage: may be performed using creepage detection equipment in accordance with Comepa specification POT4711 with Creepage limit: 5ms maximum. |
| Para. 2.1.1.2, Deviations from the Generic Specification: Deviations from Qualification and Periodic Testing - Chart F4 | Para. 8.17, Permanence of Marking This test is not applicable as all marking uses a permanent engraving process. |
| Para. 2.1.1, Deviations from the Generic Specification: Data Documentation | Para. 9.3, List of Equipment Used The list of equipment used shall not be delivered to the Orderer but shall available for review at Comepa's facilities. |