



**SWITCHES, THERMOSTATIC, BIMETALLIC,  
SPST WITH SNAP ACTION,  
OPENING OR CLOSING CONTACT,  
POTTED AND LEADED  
BASED ON TYPE TH473**

**ESCC Detail Specification No. 3702/002**

Issue 1	February 2018
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**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](#)
- (b) ESCC Detail Specification No. [3702/001](#)
- (c) ESCC Detail Specification No. [3901/001](#)
- (d) ESCC Detail Specification No. [3901/013](#)
- (e) ESCC Qualified Parts List: [REP005](#)

**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: 370200201B026020HY1.0

- Detail Specification Reference: 3702002
- 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 ( $\pm 3.5^\circ\text{C}$ ): H (as required)
- Characteristic code: grade: Y (as required)
- Characteristic code: nominal terminal lead length, L (1m): 1.0 (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 5). 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 5):

Temperature Tolerance Tol (± °C)	Code
2.5	B
3.5	H
5.5	J

- (d) Component grade expressed by the following codes (see Para. 1.4.2 Note 5):

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

- (e) The required nominal terminal lead length, L (see Para. 1.6), expressed by means of the following codes. The unit quantity shall be m.

Note: The available resolution on lead length is ±10cm.

Nominal Lead Length L (m)	Code
0.XX	0.X
X.XX	X.X
XX.XX	XX.X

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	Terminal Leads (Wires)			Thermal Switching Characteristics (TNF, TNR, Tol, Nom Diff, Act Diff)	Total Weight Max (g)
	Wire Type & Gauge	Wire ESCC Component Number	Lead Length (m) (Note 1)		
01	Polyimide insulated wire AWG26	390100124B (Note 2)	0.5 to 10	See Note 5	See Note 4
02	Polyimide insulated wire AWG24	390100125B (Note 2)	0.5 to 10	See Note 5	See Note 4
03	Polyimide insulated wire AWG22	390100126B (Note 2)	0.5 to 10	See Note 5	See Note 4
04	Polyimide insulated wire AWG20	390100127B (Note 3)	0.5 to 10	See Note 5	See Note 4
05	PTFE insulated wire AWG24	390101303B (Note 3)	0.5 to 10	See Note 5	See Note 4
06	PTFE insulated wire AWG20	390101305B (Note 3)	0.5 to 10	See Note 5	See Note 4

**NOTES:**

1. See Para. 1.6.
2. In accordance with ESCC Detail Specification No. [3901/001](#).
3. In accordance with ESCC Detail Specification No. [3901/013](#).
4. The total maximum weight of the component depends on the required terminal lead length. It includes the weight of the potted thermostatic switch unit plus that of the terminal leads, as follows:
  - Thermostatic switch unit with potting case: 11g maximum.
  - Terminal leads: as specified in the ESCC Detail Specification for the applicable wire; see Notes 2 and 3 above.

5. The following thermal switching characteristic details apply to the available range of components (ref. ESCC Detail Specification No. [3702/001](#)):

**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	5.5	9 to 14	4	Nom Diff + 2Tol
-30 to +99	-44 to +94	3.5	5 to 14	4	Nom Diff + 2Tol
	-40 to +94	2.5	5 to 10	4	Nom Diff + 2Tol
+100 to +150	+85 to +140	5.5	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	5.5	10	4	18
		3.5		4	14
	-44 to -40	3.5	9	4	13
	-43 to -39	3.5	8	4	12
-30 to +99	-40 to +89	3.5	10	4	13
		2.5		4	12
	-39 to +90	3.5	9	4	12
		2.5		4	11
	-38 to +91	3.5	8	4	11
		2.5		4	10
	-37 to +92	3.5	7	4	10
		2.5		4	9
	-36 to +93	3.5	6	4	9
		2.5		4	8
	-35 to +94	3.5	5	4	8
		2.5		4	7.5
+100 to +150	+90 to +140	5.5	10	4	17
		3.5		4	13
	+91 to +141	3.5	9	4	12
	+92 to +142	3.5	8	4	11
	+93 to +143	3.5	7	4	10

\* Due to the physical differences between the component and the thermostatic switch unit contained within it, the switching temperatures of the component under test can vary by up to ±0.5°C compared to those of the thermostatic switch unit. Accordingly, an additional 0.5°C has been included in the specified Tol value.



1.5 MAXIMUM RATINGS

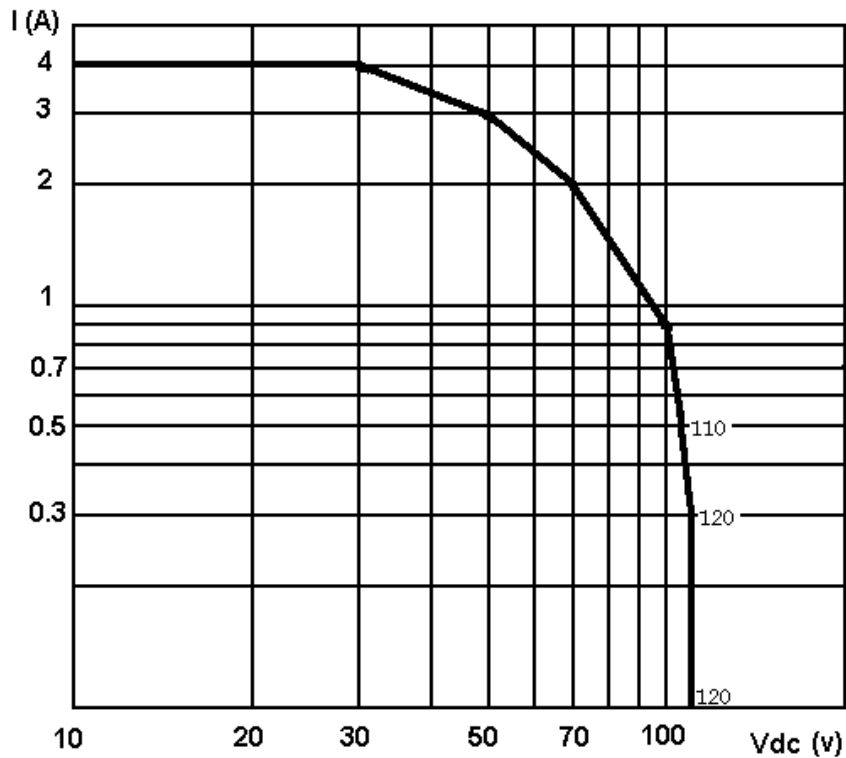
The maximum ratings shall not be exceeded at any time during use or storage.

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.

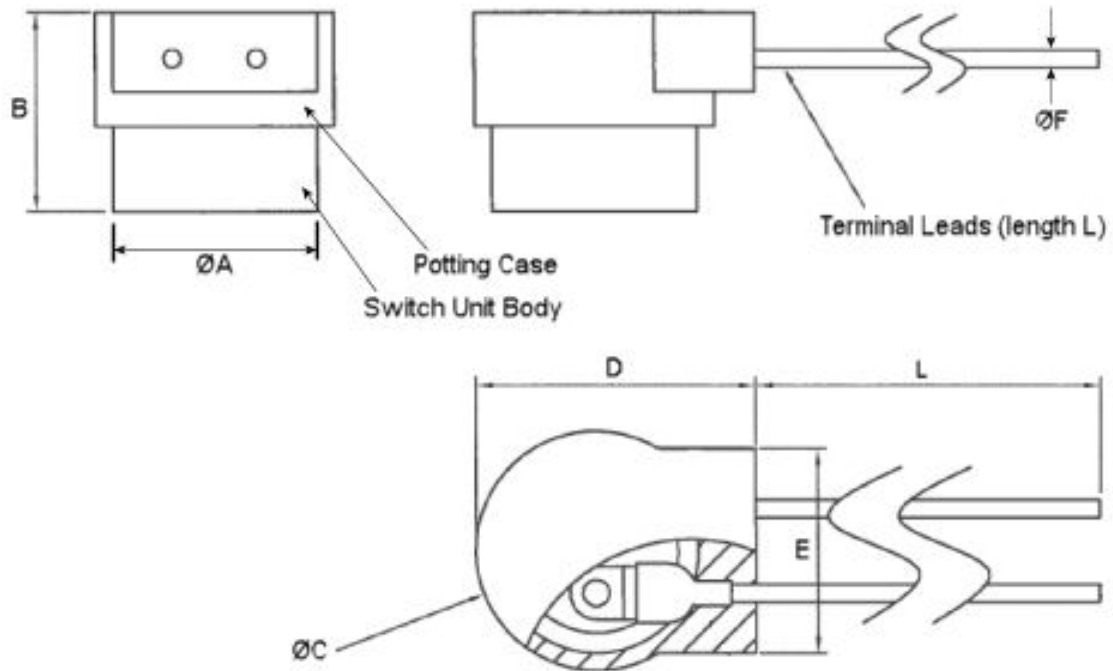
Characteristics	Symbols	Maximum Ratings	Units	Remarks
Rated Current	$I_R$	4	A	$V \leq 30V$ resistive 100000 switching cycles Note 1
Overload Current	$I_{\text{overload}}$	6	A	$V \leq 30V$ resistive
Rated Voltage	$V_R$	120	V	$I \leq 0.3A$ resistive 100000 switching cycles Note 1
Operating Temperature Range	$T_{\text{op}}$	-50 to +155	°C	
Storage Temperature Range	$T_{\text{stg}}$	-55 to +160	°C	

**NOTES:**

- Derate as follows:



1.6 PHYSICAL DIMENSIONS

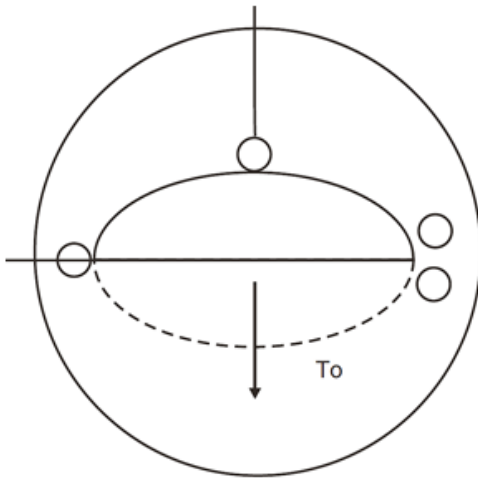


Symbol	Dimension (mm)		Remarks
	Min	Max	
$\varnothing A$	15.3	15.5	Thermostatic switch unit body diameter. Note 1
B	14	16	
$\varnothing C$	17	19	Potting case diameter
D	20	22	
E	14.4	16.4	
$\varnothing F$	Note 2	Note 2	
L	L - 10	L + 10	L = required nominal terminal lead length in mm (i.e. 500mm minimum; 10000mm maximum) Note 3

**NOTES:**

1. See ESCC Detail Specification No. [3702/001](#) for this and other switch unit dimensions.
2. See ESCC Detail Specification No. [3901/001](#) or [3901/013](#), as applicable, for lead diameter.
3. The required nominal terminal lead length, L, shall be specified by the Customer by means of the coded characteristic in the ESCC Component Number; see Para. 1.4.1. The resolution is  $\pm 10$ mm.

## 1.7 FUNCTIONAL DIAGRAM



### **NOTES:**

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

## 1.8 MATERIALS AND FINISHES

### 1.8.1 Thermostatic Switch Unit

The thermostatic switch unit shall be ESCC type 370200101 in accordance with ESCC Detail specification No. [3702/001](#). One or more production lots of thermostatic switch units may be used in the manufacture of a single inspection lot of the components specified herein. Traceability to each production lot of thermostatic switch units shall be maintained.

For ESCC qualified components, the thermostatic switch unit shall be ESCC qualified as evidenced by a listing in the current ESCC Qualified Parts List, [REP005](#).

### 1.8.2 Potting Case

The thermostatic switch unit including its terminals shall be potted in a suitable non-conductive epoxy resin moulding.

### 1.8.3 Terminal Leads

See Para. 1.4.2.

Leads shall be soldered using Sn62Pb36Sn2 solder to the terminals of the thermostatic switch unit which shall then be covered by a suitable thermo-retractable sheath prior to potting of the thermostatic switch unit.

For ESCC qualified components, the leads shall be ESCC qualified as evidenced by a listing in the current ESCC Qualified Parts List, [REP005](#).

## 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 Customer Source Inspection*

- (a) The Orderer may perform Pre-Encapsulation Customer Source Inspection and/or Final Source Inspection on both the components specified herein, and the related thermostatic switch unit lot(s) used in the manufacture of the components specified herein.

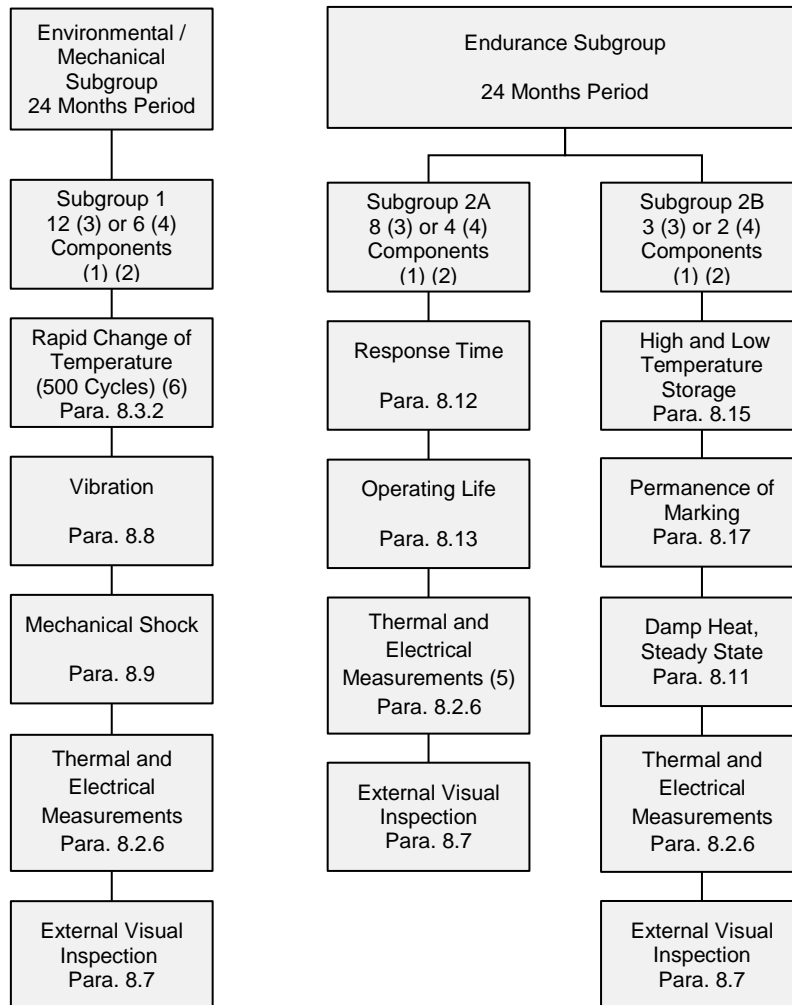
##### 2.1.1.2 *Deviations from Special In-Process Controls – Chart F2*

- (a) Internal Visual Inspection: shall be performed in accordance with ESCC Basic Specification No. 20500, prior to potting, as an external visual inspection of each thermostatic switch unit plus its terminals and its seals. The inspection shall be performed both before and after application of the thermo-retractable sheath, after the terminal leads have been attached.
- (b) Serialisation: The serial number already allocated to each respective thermostatic switch unit during its own ESCC Screening Tests shall be maintained and used for all tests.
- (c) Thermal Measurements: shall be guaranteed but not tested.

##### 2.1.1.3 *Deviations from Screening Tests - Chart F3*

- (a) Parameter Drift Values (Initial and Final Measurements): shall be guaranteed but not tested.
- (b) Rapid Change of Temperature: shall be guaranteed but not tested.
- (c) Run-in: shall be guaranteed but not tested.
- (d) Thermal Measurements: shall be guaranteed but not tested.
- (e) Creepage: shall be guaranteed but not tested.
- (f) Seal (Fine and Gross Leak): shall not be performed.
- (g) Check for Lot Failure: No failures are allowed.

2.1.1.4 *Deviations from Qualification and Periodic Testing - Chart F4*  
 Chart F4 shall be replaced in its entirety by the following:



**NOTES:**

1. For distribution within the subgroups, see Para. 7.1.2 for Qualification Testing, Para. 7.3 for Periodic Testing, and Para. 7.4 for Lot Validation Testing.
2. No failures are permitted.
3. Applicable to Qualification Testing, and to Periodic Testing for renewal of qualification after lapse.
4. Applicable to Periodic Testing for extension of qualification.
5. Optional at the Manufacturer's discretion.
6. For Rapid Change of Temperature, the number of cycles shall be 500.

2.1.1.5 *Deviations from Data Documentation*

- (a) General: For each inspection lot of components, the full data documentation package for the related production lot or lots of thermostatic switch units (see Para. 1.8.1) used in the manufacture of the delivered components shall be included in the data documentation package and be available for delivery.
- (b) Component Procurement and Delivery: either the documentation cover sheet or the Certificate of Conformity shall include the production lot(s) identification of the thermostatic switch units (see Para. 1.8.1) used in the manufacture of the delivered components.

2.2 **MARKING**

The marking shall be in accordance with the requirements of ESCC Basic Specification No. 21700. The information to be marked on the top of the potting case of the component 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 (as a minimum: inspection lot identification).

**NOTES:**

- 1. The original ESCC marking on the body of the thermostatic switch unit, in accordance with ESCC Detail specification No. 3702/001, shall still be present and fully visible (including: ESCC qualified components symbol (for ESCC qualified components only), relevant ESCC Component Number, serial number, production lot number, etc.).
- 2. The serial number already allocated to each respective thermostatic switch unit during its own ESCC Screening Tests shall be maintained for each component specified herein. This serial number may not be marked on the potting case of the component.

2.3 **THERMAL MEASUREMENTS**

Characteristics (Note 1)	Symbols	Test Method and Conditions	Limits (Note 2)		Units
			Min	Max	
Functioning Temperature	TF	ESCC No. 3702. Note 3	TNF – Tol	TNF + Tol	°C
Restoring Temperature	TR	ESCC No. 3702. Note 3	TNR – Tol	TNR + Tol	°C
Actual Temperature Differential	Act Diff	= TF – TR	Act Diff Min	Act Diff Max	°C

**NOTES:**

- 1. These characteristics are guaranteed but not tested during Charts F2 and F3 of the Generic Specification.
- 2. See Para. 1.4.2 Note 5 for characteristic limits.
- 3. The following temperature gradient shall apply for measurements:
  - 0.33°C/ minute minimum; 1°C/ minute maximum.

2.4 ELECTRICAL MEASUREMENTS

Characteristics	Symbols	Test Method and Conditions	Limits		Units
			Min	Max	
Voltage Proof	V <sub>P</sub>	ESCC No. <a href="#">3702</a> T ≥ T2 or T ≤ T3 (Note 1) Between contacts & case: Between open contacts:	1000 100	- -	Vrms
Insulation Resistance	R <sub>I</sub>	ESCC No. <a href="#">3702</a> T ≥ T2 or T ≤ T3 (Note 1) V = 100Vdc Between contacts & case: Between open contacts:	500 500	- -	MΩ
Contact Switching	-	ESCC No. <a href="#">3702</a> T ≥ T2 and T ≤ T3 (Note 1)	Verify Correct Switching		-
Contact Resistance (Note 2)	R <sub>C</sub>	ESCC No. <a href="#">3702</a> T ≥ T2 or T ≤ T3 (Note 1)	-	50	mΩ

**NOTES:**

1. See the Generic Specification for definition of T2 and T3.
2. Contact Resistance of the thermostatic switch unit only (i.e. without leads). Contact Resistance is guaranteed but not tested during Chart F3 of the Generic Specification.

2.5 PARAMETER DRIFT VALUES

The test methods and test conditions shall be as per the corresponding test defined in Para. 2.3 Thermal Measurements.

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

Characteristics (Note 1)	Symbols	Drift Value $\Delta$	Limits		Units
			Absolute		
			Min	Max	
Functioning Temperature	TF	±1	TNF – Tol	TNF + Tol	°C
Restoring Temperature	TR	±1	TNR – Tol	TNR + Tol	°C

**NOTES:**

1. These characteristics are guaranteed but not tested during Chart F3 of the Generic Specification.

2.6 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. 2.3 Thermal Measurements and Para. 2.4 Electrical Measurements.

Test Reference per ESCC No. <a href="#">3702</a>	Characteristics	Symbols	Limits		Units
			Min	Max	
Rapid Change of Temperature Initial Measurements	Functioning Temperature Restoring Temperature Actual Temperature Differential	TF TR Act Diff	See Para. 2.3		°C °C °C
Vibration During Testing	No intermittent contact ≥ 1ms, or improper open or short circuit	-	-		-
Mechanical Shock During Testing	No intermittent contact ≥ 1ms, or improper open or short circuit	-	-		-
Thermal and Electrical Measurements	Voltage Proof Insulation Resistance Contact Resistance (Note 1) Functioning Temperature Change of Functioning Temperature Restoring Temperature Change of Restoring Temperature Actual Temperature Differential Change of Actual Temperature Differential	V <sub>P</sub> R <sub>I</sub> R <sub>C</sub> TF ΔTF TR ΔTR Act Diff ΔAct Diff	See Para. 2.4 See Para. 2.4 See Para. 2.4 See Para. 2.3 -1.7   +1.7 See Para. 2.3 -1.7   +1.7 See Para. 2.3 -1.7   +1.7		V <sub>rms</sub> MΩ mΩ °C °C °C °C °C °C
Response Time Initial Measurements	Functioning Temperature	TF	See Para. 2.3		°C
During Testing	Response Time	trp	-	20	s



Test Reference per ESCC No. <a href="#">3702</a>	Characteristics	Symbols	Limits		Units
			Min	Max	
Operating Life (4A, 30Vdc, resistive)					
Initial Measurements	Functioning Temperature	TF	See Para. 2.3		°C
	Restoring Temperature	TR	See Para. 2.3		°C
	Actual Temperature Differential	Act Diff	See Para. 2.3		°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. 2.3		°C
	Change of Functioning Temperature	$\Delta TF$	-1.7	+1.7	°C
	Restoring Temperature	TR	See Para. 2.3		°C
	Change of Restoring Temperature	$\Delta TR$	-1.7	+1.7	°C
Final Measurements	Voltage Proof	$V_P$	See Para. 2.4		Vrms
	Insulation Resistance	$R_i$	See Para. 2.4		M $\Omega$
	Contact Resistance (Note 1)	$R_c$	-	100	m $\Omega$
	Functioning Temperature	TF	See Para. 2.3		°C
	Change of Functioning Temperature	$\Delta TF$	-1.7	+1.7	°C
	Restoring Temperature	TR	See Para. 2.3		°C
	Change of Restoring Temperature	$\Delta TR$	-1.7	+1.7	°C
	Actual Temperature Differential	Act Diff	See Para. 2.3		°C
Change of Actual Temperature Differential	$\Delta Act Diff$	-1.7	+1.7	°C	
High and Low Temperature Storage					
Initial Measurements	Functioning Temperature	TF	See Para. 2.3		°C
	Restoring Temperature	TR	See Para. 2.3		°C
	Actual Temperature Differential	Act Diff	See Para. 2.3		°C

**NOTES:**

- Contact Resistance of the thermostatic switch unit only (i.e. without leads). This characteristic is guaranteed but not tested during Chart F4 of the Generic Specification.

**APPENDIX A**  
**AGREED DEVIATIONS FOR COMEPA (F)**

Items Affected	Description of Deviations
Para. 2.1.1.3, Deviations from Screening Tests – Chart F3	External Visual Inspection: Minor visual defects related to the encapsulation process, as specified in the Comepa PID, are considered acceptable.
Para. 2.1.1.4, Deviations from Qualification and Periodic Testing - Chart F4	External Visual Inspection: Minor visual defects related to the encapsulation process, as specified in the Comepa PID, are considered acceptable.
Para. 2.1.1.5, Deviations from Data Documentation	Para. 9.3, List of Equipment Used The list of equipment used shall not be delivered to the Orderer but shall be available for review at Comepa’s facilities.
Para. 2.2(a), Marking - The ESCC Component Number	The marking of the ESCC Component Number on the top of the potting case of the component may be reduced to include only the following details (see Para. 1.4.1):  Example: 3702002 01 1.0m <ul style="list-style-type: none"> <li>• Detail Specification Reference: 3702002</li> <li>• Component Type Variant Number (e.g. 01) (as required)</li> <li>• Nominal terminal lead length (e.g. 1.0m) (as required)</li> </ul>