SWITCHES, THERMOSTATIC, BIMETALLIC, SPST, OPENING CONTACT

ESCC Detail Specification No. 3702/001

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DCR No.	CHANGE DESCRIPTION
874	Specification upissued to incorporate editorial changes per DCR.

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

GRADE Y

TNf Setting Range (^{o}C) (Note 1)	Tolerance on TNf and TNr (^{o}C)	Nominal Differential TNf - TNr (^{o}C) (Note 1)	Differential Limits Tf - Tr (^{o}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:

1. 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
2. Minimum Differential Limit = Nominal Differential - (2x Tolerance).
3. 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	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	^oC	
4	Storage Temperature Range	T_{stg}	-65 to +175	^oC	
5	Soldering Temperature	T_{sol}	+260	^oC	Note 1

NOTES:

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

FIGURE 1 - PARAMETER DERATING INFORMATION

CURRENT VERSUS VOLTAGE

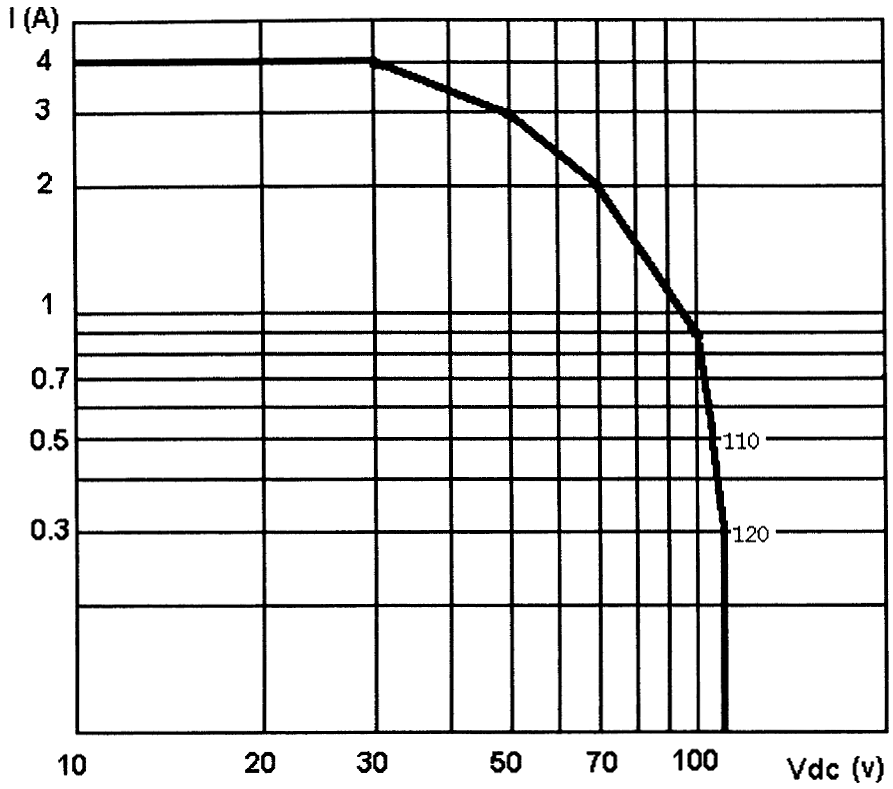
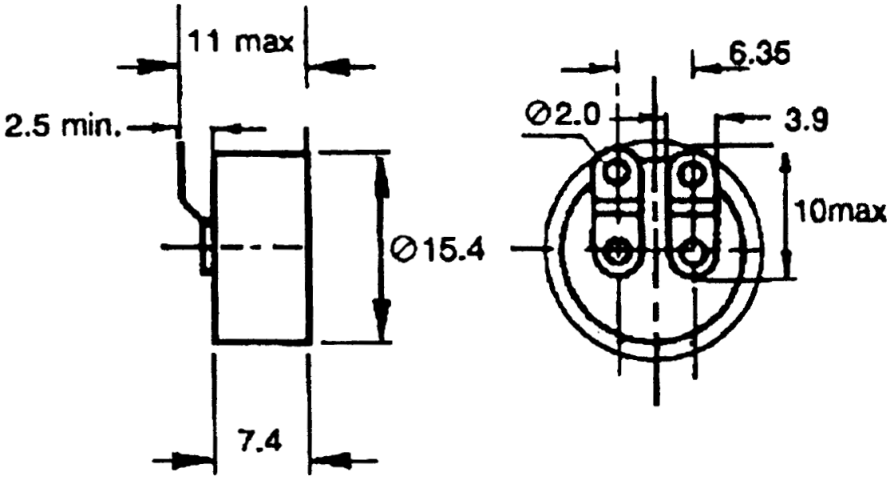


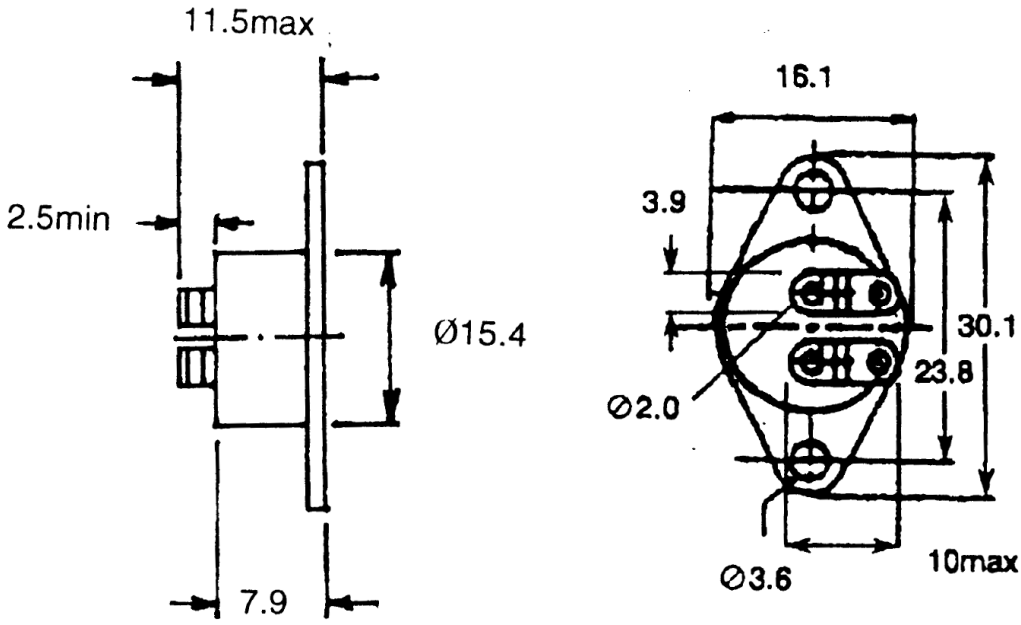
FIGURE 2 - PHYSICAL DIMENSIONS

FIGURE 2(a) - VARIANT 01



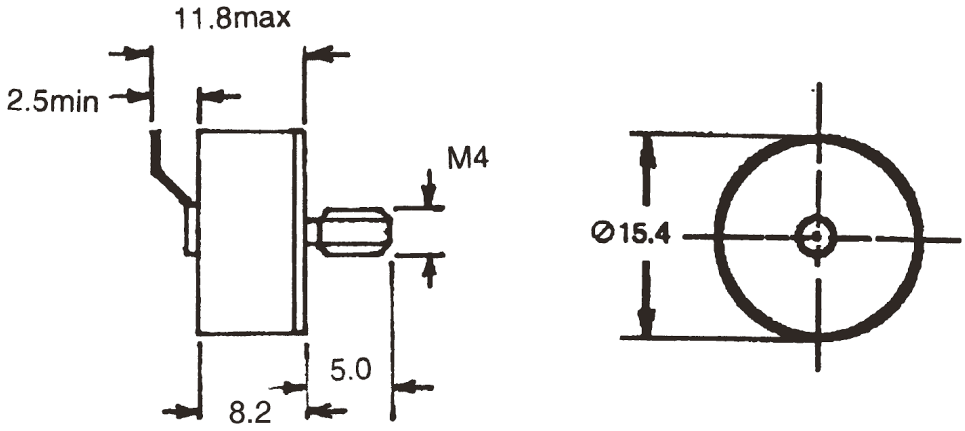
NOTES:
1. All dimensions are in millimetres.
2. Tolerance ±0.1mm, unless otherwise specified.
3. Dimensions applicable to the body and terminals of Variant 01 shall also apply to Variants 02 and 03.

FIGURE 2(b) - VARIANT 02



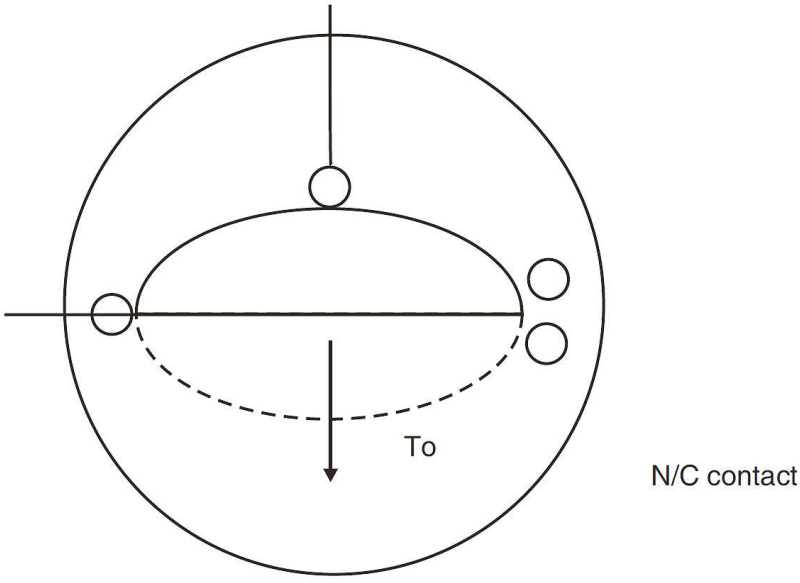
NOTES:
1. All dimensions are in millimetres.
2. Tolerance ±0.1mm, unless otherwise specified.
3. Dimensions applicable to the body and terminals of Variant 01 shall also apply to Variants 02 and 03.

FIGURE 2(c) - VARIANT 03



NOTES:
1. All dimensions are in millimetres.
2. Tolerance ±0.1mm, 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:

Example: 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:

Example: 026020HY

- Opening Temperature (+26 °C): 026
- Closing Temperature (+20 °C): 020
- Tolerance (±3 °C): H
- Grade: Y

4.5.4.2 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.

4.5.4.3 Tolerance

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

Tolerance (± ^{o}C)	Code Letter
3	H
5	J
None	X

4.5.4.4 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 Conditions	Limits		Unit
					Min	Max	
01	Voltage Proof at T ≥ T2 (1)	V	Para. 9.5.1.1	Between contacts and ground Between open contacts	1000 100	- -	Vrms Vrms
02	Insulation Resistance at T ≥ T2 (1)	Ri	Para. 9.5.1.2	Test Voltage: 100 Vdc Between contacts and ground Between open contacts	 500 500	 - -	 MΩ MΩ
03	Contact Resistance at T ≤ T3 (1)	Rc	Para. 9.5.1.3		-	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 ºC/minute minimum
   1 ºC/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	^{o}C
05	Restoring Temperature (Closing Contact)	Tr	As per Table 2	As per Table 2	±1	^{o}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)	^{o}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 ≤ T ≤ TNf+30	^{o}C
02	Temperature	T	TNr – 30 ≤ T ≤ T3	^{o}C
03	Contact Load Resistive	V I	30 4	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	-	-	1×10^{-8}	atm/cc/s
				Gross leak	-	No Bubbles		
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	$\Delta Tf/\Delta Tr$	-2.7	+2.7	^{o}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	$\Delta Tf/\Delta Tr$	-1.7	+1.7	^{o}C
11	Damp Heat (Steady State)	Para. 9.15	-	-	-	-	-	-

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	
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	ΔTf/ΔTr	-1.7	+1.7	°C
			External Visual Inspection	Para. 9.2 of Generic 3702	-	-	-	-
13	Operating Life Resistive	Para. 9.17 and Table 5(b) of this spec.	Electrical Measurements	Table 2 Items 1, 2,	-	Table 2 Items 1, 2,		-
				Table 2 Item 3	-	-	100	mΩ
			Thermal Measurements	Table 2 Items 4, 5	ΔTf/ΔTr	-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	ΔTf/ΔTr	-1.7	+1.7	°C
16	Low Temperature Storage	Para. 9.20 Not used	-	-	-	-	-	-
17	Salt Mist	Para. 9.21	Visual Examination	-	-	-	-	-
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	