MICROSWITCHES, SENSITIVE, 1PDT,

BASED ON SERIES T3

ESCC Detail Specification No. 3701/003

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Pages 1 to 21

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ESA/SCC Detail Specification No. 3701/003

space components
coordination group

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DOCUMENTATION CHANGE NOTICE

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		P2. DCN		None
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'B'	May '00	P1. Cover page		None
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		P5. Para. 1.4	: "Not applicable." deleted and text added	221556
		P6. Table 1(b)	: No. 2, in Remarks, "Figure 2" changed to "Figure 1"	221556
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			: "Not applicable." deleted and Table added	221556
		P9. Figure 2(c)	: Over-travel table deleted	221556
		P10. Figure 2(d)	: Over-travel table deleted	221556
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		Para. 4.2.5	: Item (e), second sentence amended	221556
		P15. Table 2(b)	: No. 4, Limits for Variant 04 amended	221555
			: No. 5, Note 3 reference added to Variants 03 and 04 in Characteristics	221556
			: Note 3 added	221556

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APPENDICES (Applicable to specific Manufacturers only)
None

1. GENERAL

1.1 SCOPE

This specification details the ratings, physical and electrical characteristics, test and inspection data for Microswitches, Sensitive, 1PDT, based on Series T3. It shall be read in conjunction with ESA/SCC Generic Specification No. 3701 the requirements of which are supplemented herein.

1.2 COMPONENT TYPE VARIANTS

Variants of the basic type microswitches 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 microswitches specified herein, are as scheduled in Table 1(b).

1.4 PARAMETER DERATING INFORMATION

The parameters derating information applicable to the microswitches specified herein, is given in Figure 1.

1.5 PHYSICAL DIMENSIONS

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

1.6 FUNCTIONAL DIAGRAM

The functional diagram showing terminal identification etc, 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) ESA/SCC Generic Specification No. 3701 for Electromechanical Switches.

3. TERMS, DEFINITIONS, ABBREVIATIONS, SYMBOLS AND UNITS

For the purpose of this specification, the terms, definitions, abbreviations, symbols and units specified in ESA/SCC Basic Specification No. 21300 and ESA/SCC Generic Specification No. 3701 shall apply. In addition, the following definitions and symbols shall apply:-

(a) Forces

- Actuation Force F_C
  It is the force applied to the actuation point (see Figure 2) necessary to operate the switch.
- Release Force F_R
  It is the force measured when the switch contact breaks.

(b) Travel distances

- Pre-travel distance C_A
  It is the distance travelled by the switch arm at the actuation point from its rest position to the position where the switch contact makes.
- Differential travel distance C_D
  It is the distance travelled by the switch arm at the actuation point from the position where the switch contact makes to the position where it breaks.
- Over-travel distance C_{XR}
  It is the distance travelled by the switch arm at the actuation point from the position where the switch contact makes and the maximum position of the switch arm.

TABLE 1(a) - TYPE VARIANTS

VARIANT	BASED ON TYPE	FIGURE
01	T6931	2(a)
02	T6932	2(b)
03	T6933	2(c)
04	T6934	2(d)

TABLE 1(b) - MAXIMUM RATINGS

NO.	CHARACTERISTICS	SYMBOL	LIMITS		UNITS	REMARKS
			MIN	MAX		
1	Actuation Force Variants 01 and 03 Variant 02 Variant 04	F_C	 6.0 5.0 2.8	 - - -	N	-
2	Over-travel Variant 01 Variant 02 Variant 03 Variant 04	C_R	 - - -	 0.2 0.2 1.2 4.2	mm	See Figure 1
3	Rated d.c. Current On Resistive Load	$I_{R(R)}$	- 100 (1) 10 (1)	4.0 - -	A µA mA	At 28 ± 2.0V At 3.0V At 30mV
4	Rated d.c. Current On Inductive Load	$I_{R(L)}$	-	1.0	A	At 28 ± 2.0V L/R ≤ 5ms
5	Rated a.c. Current On Resistive Load	$I_{R(AR)}$	-	1.0	A	At 115V, 400Hz
6	Overload d.c. Current On Resistive Load	I_{overl}	-	6.0	A	-
7	Operating Temperature Range	T_{op}	−55	+125	°C	T_{amb}
8	Storage Temperature Range	T_{stg}	−55	+150	°C	-
9	Soldering Temperature	T_{sol}	-	+350	°C	Note 2
10	Barometric Pressure	P	0	5.0	Bar	-

NOTES

1. The switches may be used at these low levels as long as they have not been submitted to a high level condition. If they have, new minimum rated d.c. current is 100mA.
2. Duration 5 seconds maximum at a distance of not less than 1.5mm from the case and the same terminal shall not be resoldered until 3 minutes have eleapsed.

FIGURE 1 - PARAMETER DERATING INFORMATION

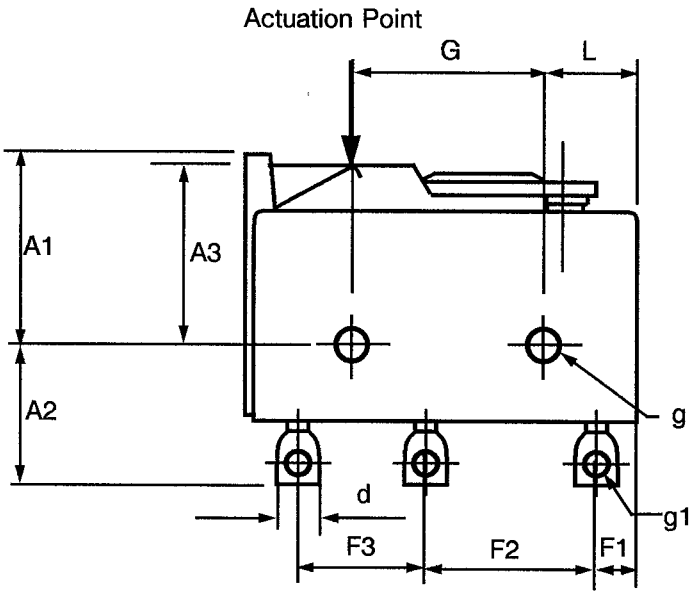
When a variant is used with the Outer-travel specified in this table, the number of operations allowed shall not exceed the maximum number of operations.

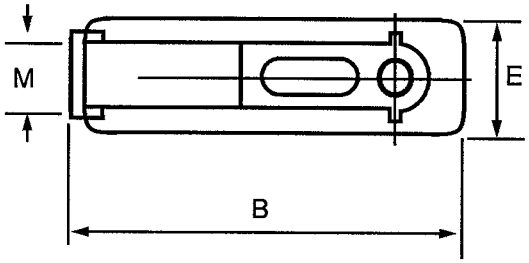
Variant	Over-Travel (mm)	Maximum Number of Operations
01	0.2	100 000
02	0.2	100 000
03	0.6 0.9 1.2	5 000 2 500 1 000
04	1.5 2.8 4.2	7 500 2 500 1 000

FIGURE 2 - PHYSICAL DIMENSIONS

FIGURE 2(a) - VARIANT 01

SYMBOL	MILLIMETRES		NOTES
	MIN	MAX	
A1	10.6	11	
A2	-	9.1	
A3	9.9	10.4	
B	21.2	21.6	
d	2.2	2.6	
E	6.6	6.8	
F1	2.7	3.2	
F2	8.1	8.3	
F3	6.4	6.6	
Øg	2.1	2.3	1
Øg1	1.3	1.4	2
G	9.4	9.6	
L	5.4	5.7	
M	4.0	4.1	





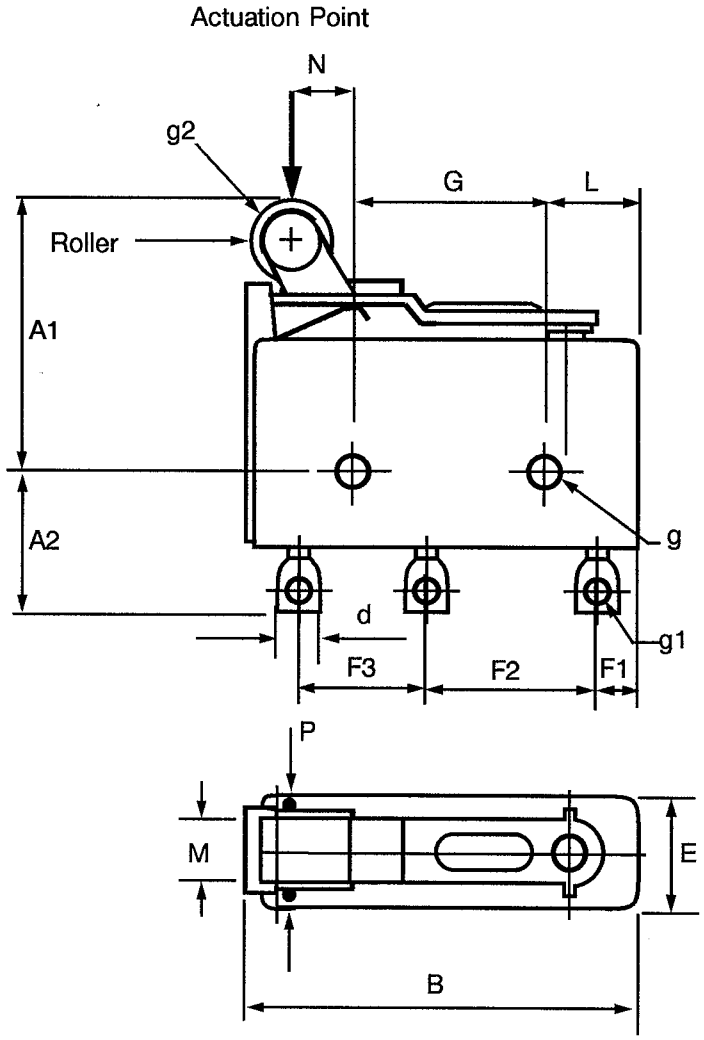
NOTES

1. 2 holes.
2. 3 holes.

FIGURE 2 - PHYSICAL DIMENSIONS

FIGURE 2(b) - VARIANT 02

SYMBOL	MILLIMETRES		NOTES
	MIN	MAX	
A1	14.9	15.5	
A2	-	9.1	
B	21.2	21.6	
d	2.2	2.6	
E	6.6	6.8	
F1	2.7	3.2	
F2	8.1	8.3	
F3	6.4	6.6	
Øg	2.1	2.3	1
Øg1	1.3	1.4	2
Øg2	3.95	4.05	
G	9.4	9.6	
L	5.4	5.7	
M	3.9	4.0	
N	3.3	3.7	
P	-	6.0	

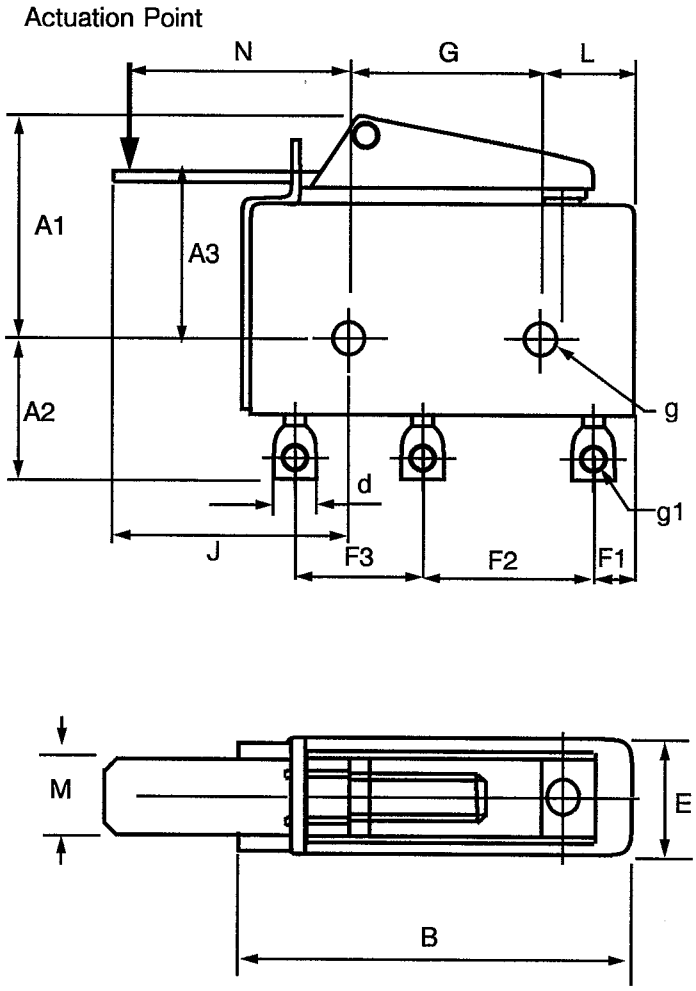


NOTES
1. 2 holes.
2. 3 holes.

FIGURE 2 - PHYSICAL DIMENSIONS

FIGURE 2(c) - VARIANT 03

SYMBOL	MILLIMETRES		NOTES
	MIN	MAX	
A1	13.5	13.9	
A2	-	9.1	
A3	9.7	10.3	
B	21.2	21.6	
d	2.2	2.6	
E	6.6	6.8	
F1	2.7	3.2	
F2	8.1	8.3	
F3	6.4	6.6	
Øg	2.1	2.3	1
Øg1	1.3	1.4	2
G	9.4	9.6	
J	8.4	9.4	
L	5.4	5.7	
M	3.9	4.0	
N	7.0	7.0	



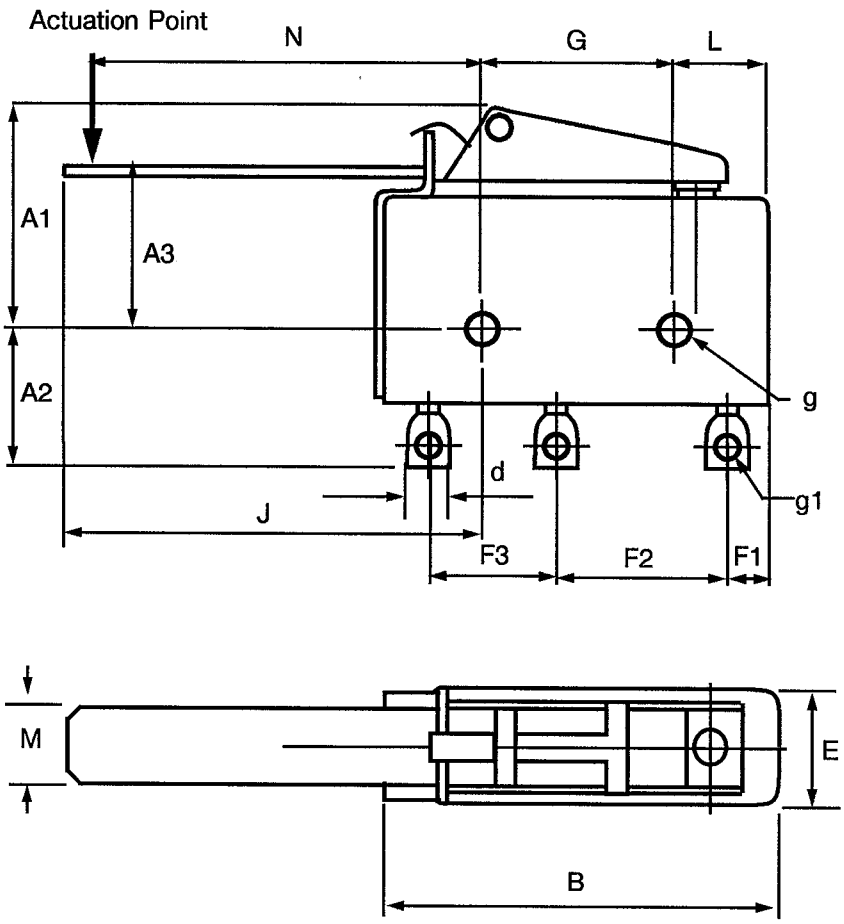
NOTES

1. 2 holes.
2. 3 holes.

FIGURE 2 - PHYSICAL DIMENSIONS

FIGURE 2(d) - VARIANT 04

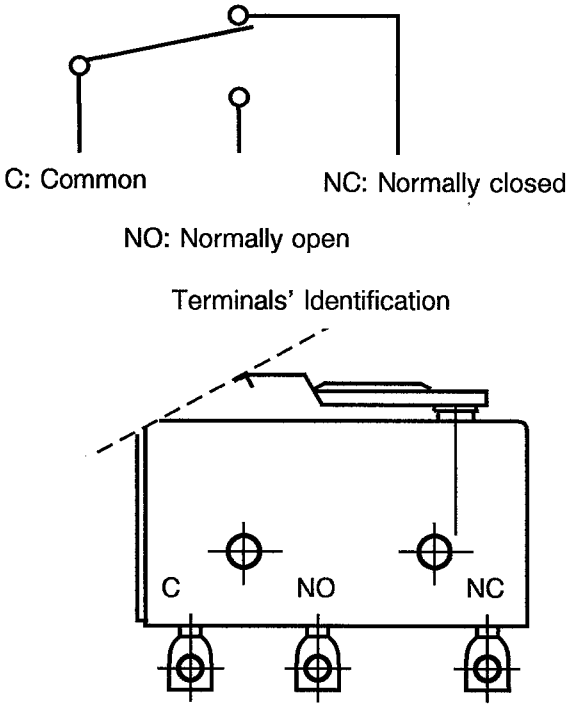
SYMBOL	MILLIMETRES		NOTES
	MIN	MAX	
A1	13.5	13.9	
A2	-	9.1	
A3	9.7	10.3	
B	21.2	21.6	
d	2.2	2.6	
E	6.6	6.8	
F1	2.7	3.2	
F2	8.1	8.3	
F3	6.4	6.6	
Øg	2.1	2.3	1
Øg1	1.3	1.4	2
G	9.4	9.6	
J	18.4	19.4	
L	5.4	5.7	
M	3.9	4.0	
N	17.5	17.5	



NOTES

1. 2 holes.
2. 3 holes.

FIGURE 3 - FUNCTIONAL DIAGRAM



4. REQUIREMENTS

4.1 GENERAL

The complete requirements for procurement of the microswitches specified herein are stated in this specification and ESA/SCC Generic Specification No. 3701 for Electromechanical Switches. Deviations from the Generic Specification, applicable to this specification only, are listed in Para. 4.2.

Deviations from the applicable Generic Specification and this Detail Specification, formally agreed with specific Manufacturers on the basis that the alternative requirements are equivalent to the ESA/SCC requirements and do not affect the component's 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, Functional Test: Not applicable.

4.2.3 Deviations from Screening Tests (Chart III)

(a) Para. 9.21, Run-in: The cycling rate shall be 30 cycles per minute.

4.2.4 Deviations from Qualification Tests (Chart IV)

(a) Para. 9.11.2, Strength of Mounting Bushing: Not applicable.

(b) Para. 9.14.1, Resistive Endurance: For Variant 04, see Figure 2 for maximum number of operations.

(c) Para. 9.14.2, Inductive Endurance: This test shall be performed at ambient pressure. For Variant 04, see Figure 2 for maximum number of operations.

(d) Para. 9.14.3, Capacitive Endurance: Not applicable. The corresponding switches will be tested according to resistive endurance.

(e) Para. 9.20, Low Level Life: The cycling rate shall be 30 cycles per minute. For Variants 03 and 04, see Figure 1 for maximum number of operations.

4.2.5 Deviations from Lot Acceptance Tests (Chart V)

(a) Para. 9.11.2, Strength of Mounting Bushing: Not applicable.

(b) Para. 9.14.1, Resistive Endurance: For Variant 04, see Figure 2 for maximum number of operations.

(c) Para. 9.14.2, Inductive Endurance: This test shall be performed at ambient pressure. For Variant 04, see Figure 2 for maximum number of operations.

(d) Para. 9.14.3, Capacitive Endurance: Not applicable. The corresponding switches will be tested according to resistive endurance.

(e) Para. 9.20, Low Level Life: The cycling rate shall be 30 cycles per minute. For Variants 03 and 04, see Figure 1 for maximum number of operations.

4.3 MECHANICAL REQUIREMENTS

4.3.1 Dimension Check

The dimensions of the microswitches specified herein shall be verified in accordance with the requirements set out in Section 9 of ESA/SCC Generic Specification No. 3701 and shall conform to those shown in Figure 2.

4.3.2 Weight

The maximum weight of the microswitches specified herein shall be 5.0 grammes for Variant 01, 5.4 grammes for Variant 02, 5.7 grammes for Variant 03 and 5.9 grammes for Variant 04.

4.3.3 Travels and Forces

The travels and forces of the microswitches specified herein shall be as specified in Table 2(b) of this specification.

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 microswitches 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

Stainless-steel.

4.4.2 Terminals

The terminal material shall be Type 'D' in accordance with the requirements of ESA/SCC Basic Specification No. 23500. The finish shall be a 3.0µm to 5.0µm nickel plating.

4.4.3 Accessories

All accessories shall be made of stainless-steel except that for Variant 02, the roller axis shall be made of brass.

4.5 MARKING

4.5.1 General

The marking of all components delivered to this specification shall be in accordance with the requirements of ESA/SCC Basic Specification No. 21700. Each component shall be marked in respect of:-

(a) Terminal Identification.

(b) The SCC Component Number.

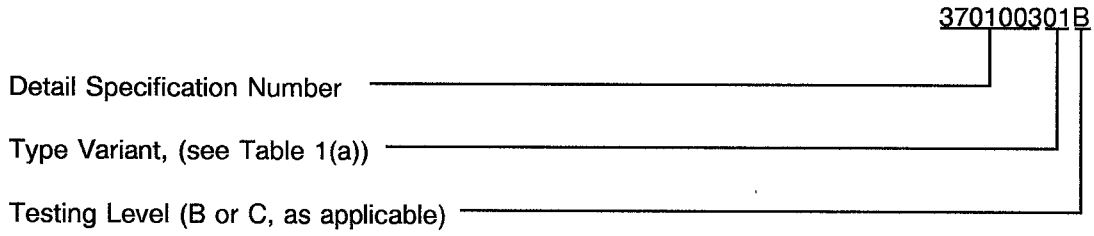
(c) Traceability Information.

4.5.2 Terminal Identification

Terminal identification shall be marked on the microswitches in accordance with Figure 3.

4.5.3 The SCC Component Number

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



4.5.4 Traceability Information

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

4.6 ELECTRICAL MEASUREMENTS

4.6.1 Electrical Measurements at Room Temperature

The parameters to be measured at room temperature are scheduled in Table 2(a). Unless otherwise specified, the measurements shall be performed at T_{amb} = +22 ± 3 °C.

4.6.2 Electrical Measurements at High and Low Temperatures

The parameters to be measured at high and low temperatures are scheduled in Table 3. The measurements shall be performed at T_{amb} = +125(−5+0) °C and −55(+5−0) °C respectively.

4.6.3 Circuits for Electrical Measurements (Figure 4)

Not applicable.

4.7 RUN-IN TESTS

4.7.1 Parameter Drift Values (Table 4)

Not applicable.

4.7.2 Conditions for Run-in

The requirements for run-in are specified in Section 7 of ESA/SCC Generic Specification No. 3701. The conditions for run-in shall be as specified in Table 5(a) of this specification.

4.7.3 Electrical Circuits for Run-in (Figure 5)

Not applicable.

TABLE 2(a) - MEASUREMENTS AT ROOM TEMPERATURE - ELECTRICAL MEASUREMENTS

No	CHARACTERISTICS	SYMBOL	SPEC. AND/OR TEST METHOD	TEST CONDITION	LIMITS		UNIT
					MIN	MAX	
1	Contact Resistance	Rc	ESA/SCC No. 3701	Para. 9.4.1.1	-	50	mΩ
2	Insulation Resistance	Ri	ESA/SCC No. 3701	Para. 9.4.1.4 At 500Vdc	1 000	-	MΩ
3	Stabilised Transfer Time	Tb	ESA/SCC No. 3701	Para. 9.4.1.2	-	10	ms
4	Voltage Proof Between open contacts Between terminals and case	VP	ESA/SCC No. 3701	Para. 9.4.1.3	 500 1 200	 - -	Vrms

TABLE 2(b) - MEASUREMENTS AT ROOM TEMPERATURE - TRAVELS AND FORCES

No	CHARACTERISTICS	SYMBOL	LIMITS		UNIT
			MIN	MAX	
1	Actuation Force (1) Variants 01and 03 Variant 02 Variant 04	F_C		 6.0 5.0 2.8	N
2	Release Force (1) Variants 01-02-03 Variant 04	F_R	 1.0 0.4		N
3	Pre-Travel Variant 01 Variant 02 Variant 03 Variant 04	C_A	 0.30 0.35 0.50 0.90	 0.55 0.70 0.90 2.20	mm
4	Differential Travel Variant 01 Variant 02 Variant 03 Variant 04	C_D	 0.05 0.05 0.05 0.05	 0.35 0.45 0.40 0.40	mm
5	Over-Travel (2) Variants 01-02 Variant 03 (3) Variant 04 (3)	C_R	 0.2 0.6 4.2		mm

NOTES

1. This value is a minimum value for the operating force to be applied in use. (See Table 1(b)).
2. This value is a maximum value not to be exceeded in use. (See Table 1(b)).
3. See the maximum number of operations in Figure 1.

TABLE 3 - ELECTRICAL MEASUREMENTS AT HIGH AND LOW TEMPERATURES

No	CHARACTERISTICS	SYMBOL	SPEC. AND/OR TEST METHOD	TEST CONDITION (NOTE 1)	LIMITS		UNIT
					MIN	MAX	
1	Contact Resistance	Rc	ESA/SCC No. 3701	Para. 9.4.1.1	-	100	mΩ
2	Insulation Resistance	Ri	ESA/SCC No. 3701	Para. 9.4.1.4 (2) At 500Vdc	100	-	MΩ

NOTES

1. On 20 units. If the lot is smaller than 20 units, this test shall be performed 100%.
2. Insulation Resistance is to be performed only at high temperature.

FIGURE 4 - CIRCUITS FOR ELECTRICAL MEASUREMENTS

Not applicable.

TABLE 4 - PARAMETER DRIFT VALUES

Not applicable.

TABLE 5(a) - CONDITIONS FOR RUN-IN

NO	CHARACTERISTICS	SYMBOL	CONDITIONS	UNIT
1	Ambient Temperature	T_{amb}	+22 ± 3	°C
2	Duration Cycling Rate Monitoring Resistive Load DC Current DC Voltage	 I_{DC} V_{DC}	500 cycles 30 cycles/minute Detection of misses 1.0 2.0	 mA V

TABLE 5(b) - CONDITIONS FOR ENDURANCE AND LOW LEVEL LIFE

NO	CHARACTERISTICS	SYMBOL	CONDITIONS	UNIT
1	DC Resistive Endurance Resistive Load Duration Cycling Rate DC Current DC Voltage	 I_{DC} V_{DC}	 10 000 cycles 30 cycles/minute 4.0 28	 A V
2	AC Resistive Endurance Resistive Load Duration Cycling Rate AC Current AC Voltage	 I_{AC} V_{AC}	 10 000 cycles 30 cycles/minute 1.0 115Vrms, 400Hz	 A
3	DC Inductive Endurance Inductive Load Duration Cycling Rate DC Current DC Voltage	 I_{DC} V_{DC}	 L/R = 5.0 10 000 cycles 30 cycles/minute 1.0 28	 ms A V
4	DC Capacitive Endurance		Not applicable	
5	Operating Life Duration Cycling rate Monitoring Resistive Loads DC Current/Voltage		 40 000 cycles for Lot Acceptance 100 000 cycles for Qualification 30 cycles/minute Detection of misses - 10mA/30mV - 100µA/3.0V - 35mA/28V	

4.8 ENVIRONMENTAL AND ENDURANCE TESTING (CHARTS IV AND V OF ESA/SCC GENERIC SPECIFICATION No. 3701)

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 tests are scheduled in Table 6. Unless otherwise stated, the measurements shall be performed at $T_{amb} = +22 \pm 3$ °C.

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. Unless otherwise stated, the measurements shall be performed at $T_{amb} = +22 \pm 3$ °C.

4.8.3 Measurements and Inspections on Completion of Endurance Tests

The parameters to be measured and inspections to be performed on completion of the endurance tests are scheduled in Table 6. Unless otherwise stated, the measurements shall be performed at $T_{amb} = +22 \pm 3$ °C.

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

The requirements for operating life testing are specified in Section 9 of ESA/SCC Generic Specification No. 3701. The conditions for operating life testing shall be as specified in Table 5(b) of this specification.

4.8.5 Electrical Circuits for Capacitive Endurance Test

Not applicable.

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

No.	ESA/SCC GENERIC SPECIFICATION NO. 3701		MEASUREMENTS AND INSPECTIONS	SYMBOL	LIMITS		UNIT
	ENVIRONMENTAL AND ENDURANCE TESTS (1)	TEST METHOD AND CONDITIONS	IDENTIFICATION AND CONDITIONS		MIN.	MAX.	
01	Functional Test	Para. 9.2	3 Switching Actions Continuity Check	- 	 -	 10	 mA
02	Seal Test	Para. 9 .6	Gross Leak Fluorinert +125°C Fine Leak	-	No bubbling	10^{-8}	$atm/cm^3/s$
03	External Visual Inspection	Para. 9.7	-	-	-	-	-
04	Rapid Change of Temperature	Para. 9.8	Visual Examination	-	-	-	-
05	Vibration	Para. 9.9	Intermittent contact Visual Examination	- 	- 	10 	µs
06	Shock	Para. 9.10	Intermittent contact Voltage Proof: Between open contacts Between terminals and case Contact Resistance Visual Examination	- VP Rc 	- 500 1 200 - 	10 - - 50 	µs Vrms Vrms mΩ
07	Mechanical Measurements	Para. 9.11.1 Para. 9.11.2 Para. 9.11.3	Robustness of Terminations Visual Examination Strength of Mounting Bushing: Not applicable Strength of Actuator: Variants 01 and 03 Variant 02 Variant 04 Functional Test Travels and Forces	-	20 12 10 6.0 Table 2(b)	- - - - 	N N N N
08	Damp Heat	Para. 9.12	Travels and Forces Voltage Proof: Between open contacts Between terminals and case Visual Examination	 VP 	Table 2(b) 500 1 200 	 - - 	 Vrms Vrms
09	Current Carrying Capability	Para. 9.13	Contact Resistance Functional Test	Rc	-	100	mΩ

NOTES

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

TABLE 6 - MEASUREMENTS AND INSPECTIONS ON COMPLETION OF ENVIRONMENTAL TESTS AND AT INTERMEDIATE POINTS AND ON COMPLETION OF ENDURANCE TESTING (CONT'D)

No.	ESA/SCC GENERIC SPECIFICATION NO. 3701		MEASUREMENTS AND INSPECTIONS	SYMBOL	LIMITS		UNIT
	ENVIRONMENTAL AND ENDURANCE TESTS	TEST METHOD AND CONDITIONS	IDENTIFICATION AND CONDITIONS		MIN.	MAX.	
10	Resistive Endurance	Para. 9.14.1 and Paras. 4.2.4 and 4.2.5 of this specification	**Initial Measurements**				
			Contact Resistance	Rc	-	50	mΩ
			Intermediate Measurements				
			Contact Resistance	Rc	-	100	mΩ
			Final Measurements				
			Contact Resistance	Rc	-	100	mΩ
			Travels and Forces		Table 2(b)		
			Voltage Proof:	VP			
			Between open contacts		500		Vrms
			Between terminals and case		1 200		Vrms
11	Inductive Endurance	Para. 9.14.2 and Paras. 4.2.4 and 4.2.5 of this specification	**Initial Measurements**				
			Contact Resistance	Rc	-	50	mΩ
			Intermediate Measurements				
			Contact Resistance	Rc	-	100	mΩ
			Final Measurements at Room Conditions				
			Contact Resistance	Rc	-	100	mΩ
			Travels and Forces		Table 2(b)		
			Voltage Proof:	VP			
			Between open contacts		500		Vrms
			Between terminals and case		1 200		Vrms
12	Capacitive Endurance	Para. 9.14.3		-	Not applicable		
13	Temperature Rise	Para. 9.15	Temperature Rise Measurement	ΔT	-	30	°C
14	Resistance to Soldering Heat	Para. 9.16	Visual Examination	-			
			Voltage Proof:	VP			
			Between open contacts		500	-	Vrms
			Between terminals and case		1 200	-	Vrms
			Contact Resistance	Rc	-	50	mΩ

NOTES

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

TABLE 6 - MEASUREMENTS AND INSPECTIONS ON COMPLETION OF ENVIRONMENTAL TESTS AND AT INTERMEDIATE POINTS AND ON COMPLETION OF ENDURANCE TESTING (CONT'D)

No.	ESA/SCC GENERIC SPECIFICATION NO. 3701		MEASUREMENTS AND INSPECTIONS	SYMBOL	LIMITS		UNIT
	ENVIRONMENTAL AND ENDURANCE TESTS	TEST METHOD AND CONDITIONS	IDENTIFICATION AND CONDITIONS		MIN.	MAX.	
15	Solderability	Para. 9.17	Visual Examination	-	-	-	-
16	Permanence of Marking	Para. 9.18	Visual Examination	-	-	-	-
17	Low Level Life	Para. 9.20 and Paras. 4.2.4 and 4.2.5 of this specification	**Initial Measurements**				
			Contact Resistance	Rc	-	50	mΩ
			Intermediate Measurements				
			Contact Resistance	Rc	-	100	mΩ
			Final Measurements				
			Number of Contacts		No misses		
			Opening/Closing Contact Resistance	Rc	-	100	mΩ
			Travels and Forces		Table 2(b)		
			Voltage Proof:	VP			
			Between open contacts		500	-	Vrms
			Between terminals and case		1 200	-	Vrms
18	Overload	Para. 9.22	Contact Resistance	-	-	100	mΩ

NOTES

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