RELAYS, ELECTROMAGNETIC, NON-LATCHING

28Vdc, 1A, 2PDT, TO5 CAN

ESCC Detail Specification No. 3601/002

ISSUE 1

October 2002

Document Custodian: European Space Agency - see https://escies.org

LEGAL DISCLAIMER AND COPYRIGHT

european space agency
agence spatiale européenne

Pages 1 to 17

RELAYS, ELECTROMAGNETIC, NON-LATCHING

28Vdc, 1A, 2PDT, TO5 CAN

ESA/SCC Detail Specification No. 3601/002

space components
coordination group

Issue/Rev.	Date	Approved by	
		SCCG Chairman	ESA Director General or his Deputy
Issue 6	July 1995		
Revision 'A'	January 2001		

DOCUMENTATION CHANGE NOTICE

Rev. Letter	Rev. Date	Reference	CHANGE Item	Approved DCR No.
		This Issue supersedes Issue 5 and incorporates all modifications defined in Revisions 'A', 'B' and 'C' to Issue 5 and the following DCR's:-		
		Cover page		None
		DCN		None
		Para. 2	: Item (c) deleted	21025
		Table 1(b)	: No. 3, Note 1 reference added	221164
			: No. 7, Renumbered as "5" and Symbol corrected	23701
			: , Note 1 reference added	221164
			: New No. 6 added	23701
			: Nos. 5 and 6 renumbered as "7" and "8" respectively	23701
			: New No. 9 added	23701
			: Note 1 added	221164
			: Note 2 added	23701
		Figure 3	: Deleted in toto and Figure 4 renumbered as "3"	23701
		Para. 4.2.1	: New Para. 4.2.1 added	23701
		Paras. 4.2.1 & 4.2.2	: Renumbered as "4.2.2" and "4.2.3" respectively	23701
		Para. 4.2.3	: Renumbered as 4.2.4 and retitled	23701
			: Para. 9.11 deviation retitled as "Mechanical Shock"	23701
			: Para. 9.12.2 deviation deleted in toto	23701
		Para. 4.2.5	: New Para. 4.2.5 added	23701
		Para. 4.3.1	: Existing text deleted and new text added	23701
		Para. 4.3.3	: Imperial values deleted	23701
			: (b) "Test Condition 'C'" added	23701
		Para. 4.4.2	: Title and text standardised	23701
		Para. 4.5.1	: Existing text deleted and new text added	23701
		Para. 4.5.2	: Title and text changed from "Lead" to "Terminal"	23701
			: In text, "4" amended to "3"	23701
		Para. 4.5.3	: Type Variant entry amended	23701
			: Testing Level entry amended	23701
		Para. 4.5.4	: "Coil Resistance" column added to Table	23701
		Para. 4.6.1	: Text completed	23701
		Para. 4.7.3	: Title amended	23701
		Tables 2, 3, 4	: Title of 4th column and column details amended	23701
		Tables 2, 3	: Test sequence, Numbering and Symbols amended	23701
		Table 2	: Nos. 9 and 11 deleted	23701
		Figure 4	: Figure 4 entry added	23701
		Table 4	: No. amended	23701
		Table 5(b)	: Load Conditions added from Table 1	23701
		Figure 5(a)	: Figure 5(a) entry added	23701
		Figure 5(b)	: Figure 5(b) entry added	23701
		Para. 4.8	: Title amended	23701
		Paras. 4.8.1 to 4.8.3	: Titles and texts amended	23701
		Para. 4.8.2	: Second sentence added	23701
		Para. 4.8.6	: Deleted in toto	23701
		Table 6	: Title amended and Table reformatted	23701
'A'	Jan. '01	P1. Cover page	: Title amended	221599
		P2. DCN		None
		P5. Para. 1.1	: 2nd line text amended	221599
		P6. Table 1(b)	: No. 1, Symbol amended	221599
			: No. 2, Characteristics, Symbol and Maximum Ratings amended	221599

TABLE OF CONTENTS

Page

TABLES

FIGURES

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 a Relay, Electromagnetic, Non-Latching, 28Vdc, 1A, 2PDT in a TO5 Can. It shall be read in conjunction with ESA/SCC Generic Specification No. 3601, the requirements of which are supplemented herein.

1.2 COMPONENT TYPE VARIANTS

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

1.4 PARAMETER DERATING INFORMATION (FIGURE 1)

Not applicable.

1.5 PHYSICAL DIMENSIONS

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

1.6 CIRCUIT SCHEMATIC

The circuit schematic, showing lead identification etc. for the relays 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. 3601 for Relays, Electromagnetic, Non-Latching.

(b) MIL-STD-202, Test Methods for Electronic and Electrical Component Parts.

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 shall apply.

TABLE 1(a) - TYPE VARIANTS

VARIANT	MIN. TERMINAL LENGTH (mm)	TERMINAL MATERIAL AND FINISH
01	38	D2
02	4.75	D2
03	3.20	D2
04	38	D3
05	4.75	D3
06	3.20	D3

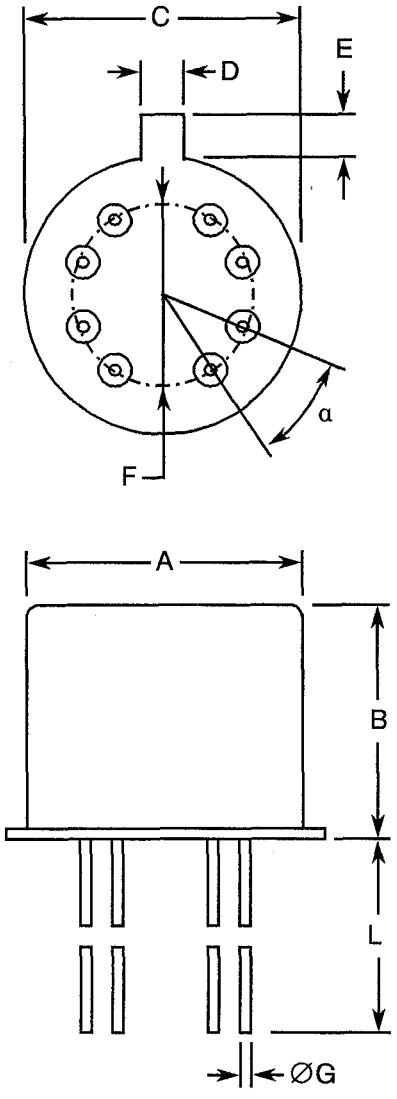
TABLE 1(b) - MAXIMUM RATINGS

No.	CHARACTERISTICS	SYMBOL	MAXIMUM RATING	UNIT	REMARKS
1	Rated Coil Voltage:- 26V 18V 12V 9V 6V 5V	V_{CR}	 26.5 18 12 9.0 6.0 5.0	Vdc	
2	Coil Voltage Range:- 26V 18V 12V 9V 6V 5V	V_{CR}	 25 to 32 17 to 24 11 to 16 8.5 to 12 5.5 to 8.0 4.5 to 5.8	Vdc	
3	Rated Contact Current Resistive Load	I_{CR}	1.0	A	28Vdc resistive Note 1
4	Overload Current Resistive	I_{overl}	2.0	A	28Vdc resistive See Table 6
5	Rated Contact Current Inductive Load	I_{CL}	0.2	A	28Vdc inductive Inductance 0.32 Henry Note 1
6	Contact Resistance	R_C	100	mΩ	
7	High Temperature	T_{amb}	+125	°C	
8	Low Temperature	T_{amb}	−65	°C	
9	Soldering Temperature	T_{sol}	+260	°C	Note 2

NOTES

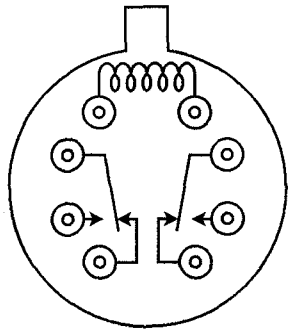
1. Relays should not be used in change-over mode where the potential difference between stationary contacts is greater than 10V and the switched current is greater than 0.1A.
2. Duration 10 seconds maximum at a distance of not less than 3.0mm from the device body and the same terminal shall not be resoldered until 3 minutes have elapsed.

FIGURE 2 - PHYSICAL DIMENSIONS



SYMBOL	MILLIMETRES	
	MIN.	MAX.
A	-	8.50
B	-	7.00
C	-	9.40
D	0.70	0.90
E	0.80	1.00
F	4.83	5.33
ØG	0.41	0.48
L	See Table 1(a)	
α	36°	

FIGURE 3 - CIRCUIT SCHEMATIC



AS VIEWED FROM TERMINAL SIDE

4. REQUIREMENTS

4.1 GENERAL

The complete requirements for procurement of the relays specified herein shall be as stated in this specification and ESA/SCC Generic Specification No. 3601 for Relays, Electromagnetic, Non-Latching. 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 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)

None.

4.2.3 Deviations from Screening Tests (Chart III)

(a) Para. 9.6, Vibration Scan: Frequency Range: 10 - 3000 Hz.

4.2.4 Deviations from Qualification Tests (Chart IV)

(a) Para. 9.10, Vibration: Frequency Range: 10 - 3000 Hz.

(b) Para. 9.11, Mechanical Shock: Test Condition: 'C'.

4.2.5 Deviations from Lot Acceptance Tests (Chart V)

(a) Para. 9.10, Vibration: Frequency Range: 10 - 3000 Hz.

(b) Para. 9.11, Mechanical Shock: Test Condition: 'C'.

4.3 MECHANICAL REQUIREMENTS

4.3.1 Dimension Check

The dimensions of the relays specified herein shall be verified in accordance with the requirements set out in Para. 9.23 of ESA/SCC Generic Specification No. 3601 and shall conform to those shown in Figure 2.

4.3.2 Weight

The maximum weight of the relays specified herein shall be 2.55 grammes.

4.3.3 Terminal Strength

The requirements for terminal strength testing are specified in Section 9 of ESA/SCC Generic Specification No. 3601. The test conditions shall be as follows:-

(a) **Pull Test**

Applied Force: 4.4 Newtons.

Duration: 10 seconds.

(b) **Bend Test**

Test Condition: 'C'.

Load: 227 grammes.

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 relays 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

Copper nickel, hermetically sealed.

4.4.2 Terminal Material and Finish

The terminal material shall be Type 'D' with either Type '2' or Type '3' finish in accordance with the requirements of ESA/SCC Basic Specification No. 23500. (See Table 1(a) for Type Variants).

4.5 MARKING

4.5.1 General

The marking of components delivered to this specification shall be in accordance with the requirements of ESA/SCC 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) Terminal Identification.

(b) The SCC Component Number.

(c) Electrical Characteristics.

(d) Traceability Information.

4.5.2 Terminal Identification

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

4.5.3 The SCC Component Number

Each component shall bear the SCC Component Number which shall be constituted and marked as follows:

360100202B

Detail Specification Number

Type Variant (see Table 1(a))

Testing Level (B or C, as applicable)

4.5.4 Electrical Characteristics

The electrical characteristic to be marked is the rated coil voltage. The information shall be constituted and marked as follows:-

Coil Voltage	Coil Resistance	Code
26.5Vdc	1560Ω	26V
18Vdc	880Ω	18V
12Vdc	390Ω	12V

Coil Voltage	Coil Resistance	Code
9.0Vdc	220Ω	9V
6.0Vdc	98Ω	6V
5.0Vdc	50Ω	5V

4.5.5 Traceability Information

Each component shall be marked in respect of traceability information as defined in 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. Unless otherwise specified, the measurements shall be performed at $T_{amb} = +22 \pm 3$ °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.

4.6.3 Circuits for Electrical Measurements (Figure 4)

Not applicable.

4.7 SCREENING

4.7.1 Miss Test

During the miss test, the contact resistance shall be continuously monitored and shall not exceed the values specified in Table 4 of this specification.

4.7.2 Conditions for Screening

The requirements for screening are specified in Section 7 of ESA/SCC Generic Specification No.▮3601. The conditions for screening shall be as specified in Table 5(a) of this specification.

4.7.3 Electrical Circuits for Screening (Figure 5(a))

Not applicable.

TABLE 2 - ELECTRICAL MEASUREMENTS AT ROOM TEMPERATURE

No.	CHARACTERISTICS	SYMBOL	ESA/SCC 3601 TEST METHOD	TEST CONDITION	LIMITS		UNIT
					MIN.	MAX.	
1	Pick-up Voltage:- 26V 18V 12V 9V 6V 5V	U_C	Para. 9.3.1	Para. 9.3.1	 - - - - - -	 14.2 10.7 7.0 5.3 4.5 2.7	V
2	Drop-out Voltage:- 26V 18V 12V 9V 6V 5V	U_d	Para. 9.3.2	Para. 9.3.2	 1.37 0.91 0.63 0.54 0.28 0.22	 8.0 6.0 4.0 3.0 2.0 1.4	V
3	Operate Time	t_C	Para. 9.3.4	Para. 9.3.4	-	2.0	ms
4	Release Time	t_d	Para. 9.3.4	Para. 9.3.4	-	2.0	ms
5	Bounce Time	t_b	Para. 9.3.4	Para. 9.3.4	-	1.5	ms
6	Insulation Resistance	Ri	Para. 9.3.7	Para. 9.3.7 At 100Vdc	10 000	-	MΩ
7	Voltage Proof	VP	Para. 9.3.6	Para. 9.3.6	500	-	Vrms
8	Contact Voltage Drop	V_d	Para. 9.3.3	Para. 9.3.3	-	100	mV
9	Coil Resistance:- 26V 18V 12V 9V 6V 5V	R_B	Para. 9.3.5	Para. 9.3.5	 1400 792 350 198 88 45	 1720 968 430 242 108 55	Ω

TABLE 3 - ELECTRICAL MEASUREMENTS AT HIGH AND LOW TEMPERATURES

No.	CHARACTERISTICS	SYMBOL	ESA/SCC 3601 TEST METHOD	TEST CONDITION	LIMITS		UNIT
					MIN.	MAX.	
1	Pick-up Voltage:- 26V 18V 12V 9V 6V 5V	U_C	Para. 9.3.1	Para. 9.3.1	 - - - - - -	 18 13.5 9.0 6.8 4.5 3.5	V
2	Drop-out Voltage:- 26V 18V 12V 9V 6V 5V	U_d	Para. 9.3.2	Para. 9.3.2	 0.89 0.59 0.41 0.35 0.18 0.14	 13 10 6.5 4.9 3.2 2.3	V
3	Operate Time	t_C	Para. 9.3.4	Para. 9.3.4	-	2.5	ms
4	Release Time	t_d	Para. 9.3.4	Para. 9.3.4	-	2.5	ms
5	Bounce Time	t_b	Para. 9.3.4	Para. 9.3.4	-	1.5	ms
6	Insulation Resistance	Ri	Para. 9.3.7	Para. 9.3.7 At 100Vdc Note 1	100	-	MΩ
8	Contact Voltage Drop	V_d	Para. 9.3.3	Para. 9.3.3	-	100	mV

NOTES

1. This measurement shall be made only at the high temperature condition.

FIGURE 4 - CIRCUITS FOR ELECTRICAL MEASUREMENTS

Not applicable.

TABLE 4 - MEASUREMENTS DURING SCREENING

No.	CHARACTERISTICS	SYMBOL	ESA/SCC 3601 TEST METHOD	TEST CONDITIONS	MAXIMUM LIMIT	UNIT
10	Miss Test, Contact Resistance	R_C	Para. 9.8	Para. 9.8	50	Ω

TABLE 5(a) - CONDITIONS FOR SCREENING

No.	CHARACTERISTICS	SYMBOL	CONDITION	UNIT
1	Ambient High Temperature	T_{amb}	+125(+0−3)	°C
2	Ambient Low Temperature	T_{amb}	−65(+3−0)	°C
3	Ambient Room Temperature	T_{amb}	+22±3	°C

TABLE 5(b) - CONDITIONS FOR OPERATING LIFE TEST

No.	CHARACTERISTICS	SYMBOL	CONDITION	UNIT
1	Ambient Temperature	T_{amb}	+125(+0−3)	°C
2	Contact Load, Resistive	V I	28 1.0	Vdc Adc

FIGURE 5(a) - ELECTRICAL CIRCUITS FOR SCREENING

Not applicable.

FIGURE 5(b) - ELECTRICAL CIRCUITS FOR OPERATING LIFE TESTS

Not applicable.

4.8 ENVIRONMENTAL AND ENDURANCE TESTS (CHARTS IV AND V OF ESA/SCC GENERIC SPECIFICATION No. 3601)

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 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 Tests (Part of Endurance Testing)

The requirements for operating life testing are specified in Section 9 of ESA/SCC Generic Specification No. 3601. The conditions for operating life testing shall be as specified in Table 5(b) of this specification.

4.8.5 Electrical Circuits for Operating Life Tests (Figure 5(b))

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 SPEC. NO. 3601		MEASUREMENTS AND INSPECTIONS		SYMBOL	LIMITS		UNIT
	ENVIRONMENTAL AND ENDURANCE TESTS (1)	TEST METHOD AND CONDITIONS	IDENTIFICATION	CONDITIONS		MIN.	MAX.	
01	Vibration	Para. 9.10 and Para. 4.2.4 of this spec.	**Measurements during Test** Contact Monitoring	ESA/SCC 3601 Para. 9.10	-	-	-	-
			Final Measurements Visual Examination	-	-	-	-	-
02	Mechanical Shock	Para. 9.11 and Para. 4.2.4 of this spec.	**Measurements during Test** Contact Monitoring	ESA/SCC 3601 Para. 9.11	-	-	-	-
			Final Measurements Electrical Measurements	Table 2 Items 7-8-1-2		Table 2		
			Visual Examination	-	-	-	-	-
03	Overload	Para. 9.12 and Table 1(b) Item 4 of this spec.	**Measurements during Test** Contact Voltage Drop	ESA/SCC 3601 Para. 9.12.1	V_d	Para. 9.12.1		mV
			Final Measurements Fuse Continuity	-	-	Continuity		
			Contact Voltage Drop	Table 2 Item 8	V_d	-	200	mV
			Insulation Resistance	Table 2 Item 6	Ri	5000	-	MΩ
			Voltage Proof (all Points)	Table 2 Item 7	VP	Table 2		Vrms
			Electrical Measurements	Table 2 Items 1-2-3-4-5-9		Table 2		
04	Thermal Shock	Para. 9.13	**During 5th Cycle**	In Conditioning Chamber				
			Electrical Measurements at +125°C	Table 3 Items 1-2-3-4-7		Table 3		
			Electrical Measurements at −65°C	Table 3 Items 1-2-3-4		Table 3		
			Final Measurements Visual Examination	-	-	-	-	-
			Voltage Proof (all Points)	Table 2 Item 7	VP	Table 2		Vrms
05	Salt Spray	Para. 9.14	**Final Measurements** Visual Examination	-	-	-	-	-
			Electrical Measurements	Table 2 Items 1-2-3-4-5-6-8-9		Table 2		
			Voltage Proof (all Points)	Table 2 Item 7	VP	Table 2		Vrms
06	Intermediate Current	Para. 9.16	**Measurements during Test** Contact Voltage Drop	ESA/SCC 3601 Para. 9.16.1	V_d	Para. 9.16.1		mV
			Final Measurements Insulation Resistance	Table 2 Item 6	Ri	5000	-	MΩ
			Voltage Proof (all Points)	Table 2 Item 7	VP	Table 2		Vrms
			Electrical Measurements	Table 2 Items 1-2-3-4-5-9		Table 2		
			Contact Voltage Drop	ESA/SCC 3601 Para. 9.16.1	V_d	Para. 9.16.1		mV
07	Terminal Strength	Para. 9.17 and Para. 4.3.3 of this spec.	Visual Examination	ESA/SCC 3601 Para. 9.17.3	-	-	-	-

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 SPEC. NO. 3601		MEASUREMENTS AND INSPECTIONS		SYMBOL	LIMITS		UNIT
	ENVIRONMENTAL AND ENDURANCE TESTS (1)	TEST METHOD AND CONDITIONS	IDENTIFICATION	CONDITIONS		MIN.	MAX.	
08	Resistance to Soldering Heat	Para. 9.18	Electrical Measurements	Table 2 Items 1-2-6-8-9		Table 2		
09	Operating Life Resistive	Para's 9.19, 9.19.1 and Table 5(b) of this spec.	**Measurements during Test**					
			Contact Voltage Drop	ESA/SCC 3601 Para. 9.19.1	V_d	Para. 9.19.1		mV
			Final Measurements					
			Fuse Continuity	-	-	Continuity		
			Contact Voltage Drop	Table 2 Item 8	V_d	-	200	mV
			Insulation Resistance	Table 2 Item 6	Ri	5000	-	MΩ
			Voltage Proof (all Points)	Table 2 Item 7	VP	Table 2		Vrms
			Electrical Measurements	Table 2 Items 1-2-3-4-5-9		Table 2		
10	Operating Life Low Level Load and Mechanical Life	Para. 9.19.2	**Measurements during Test**					
			Contact Voltage Drop	ESA/SCC 3601 Para. 9.19.2	V_d	Para. 9.19.2		mV
			Final Measurements					
			Contact Voltage Drop	Table 2 Item 8	V_d	-	200	mV
			Insulation Resistance	Table 2 Item 6	Ri	5000	-	MΩ
			Voltage Proof (all Points)	Table 2 Item 7	VP	Table 2		Vrms
			Electrical Measurements	Table 2 Items 1-2-3-4-5-9		Table 2		
11	Coil Life	Para. 9.20	**Initial Measurements**					
			Electrical Measurements	Table 2 Items 8-9		Table 2		-
			After 100 hours					
			Electrical Measurements	Table 2 Item 8		Table 2		
			at −65°C	Table 3 Items 3-4		Table 3		
			At 250, 500, 750 hours					
			Electrical Measurements	Table 2 Items 8-9		Table 2		
			During Last Cycle					
			Electrical Measurements at +125°C	Table 3 Items 1-2		Table 3		
			Electrical Measurements at −65°C	Table 3 Items 1-2		Table 3		
			Final Measurements					
			Electrical Measurements	Table 2 Items 3 to 9		Table 2		
			Visual Examination	-	-	-	-	-

NOTES

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