

Pages 1 to 20

# **CRYSTAL UNITS IN METAL HOLDER,**

# **BASED ON TYPE T807,**

# **FREQUENCY RANGE 4.0 - 140MHZ**

# ESCC Detail Specification No. 3501/018

(Follow-up specification to ESCC Detail Specification Nos. 3501/001, 3501/008, 3501/011 and 3501/012)

# ISSUE 4 November 2010



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



ESCC Detail Specification No. 3501/018

ISSUE 4

# LEGAL DISCLAIMER AND COPYRIGHT

European Space Agency, Copyright @ 2010. 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					
582	Specification upissued to incorporate technical changes per DCR.					

		PAGE	3
	<b>SSA</b>	ESCC Detail Specification	*
		No. 3501/018	4
2.4.93.303 (Carlos de Carlos de			
		TABLE OF CONTENTS	Page
1.	GENERAL		5
1.1	Scope		5
1.2	Range of Components		5
1.3	Maximum Ratings		5
1.4	Physical Dimensions		5
1.5	Functional Diagram		5
2.	APPLICABLE DOCUM	IENTS	5
3.	TERMS, DEFINITION	S, ABBREVIATIONS, SYMBOLS AND UNITS	5
4.	REQUIREMENTS		11
4.1	General		11
4.2	Deviations from Generi	c. Specification	11
4.2.1	Deviations from Specia		11
4.2.2	Deviations from Final P		11
4.2.3	Deviations from Burn-ir	1 Tests	11
4.2.4	Deviations from Qualific	cation Tests	11
4.2.5	Deviations from Lot Ac	ceptance Tests	11
4.3	Mechanical Requireme	nts	11
4.3.1	Dimension Check		11
4.3.2	Weight		11
4.3.3	Robustness of Termina	tions	11
4.4	Materials and Finishes		11
4.4.1	Case		12
4.4.2	Lead Material and Finis	h	12
4.5	Marking		12
4.5.1	General		12
4.5.2	Characteristics		12
4.5.3	Traceability Information		12
4.5.4	The ESCC Component		12
4.5.5	Manufacturer's Name,	*	13
4.6 4.6.1	Electrical Measuremen		13
4.6.2		ts at Reference Temperature	13
4.6.3	Circuits for Electrical M	ts at High and Low Temperatures	13
4.7	Burn-in Tests	reasurements	13
4.7.1	Parameter Drift Values		13
4.7.2	Conditions for Burn-in		13
4.7.3	Electrical Circuits for B	urn-in	13
4.8	Environmental and Enc		13 15
4.8.1		pections on Completion of Environmental Tests	15 15
4.8.2		pections at Intermediate Points and on Completion of Endurance Tests	15 15
4.8.3	Conditions for Operatin	g Life Test	15

		PAGE	4
ESCC	ESCC Detail Specification No. 3501/018	ISSUE	4

# TABLES

1(a) 1(b) 2 3 4 5 6	Format for Individual Tables 1(a) Maximum Ratings Electrical Measurements at Reference Temperature Electrical Measurements at High and Low Temperatures Parameter Drift Values Conditions for Burn-in and LAT Life Tests Measurements and Inspections on Completion of Environmental Tests and at Intermediate Points and on Completion of Endurance Testing	6 9 14 14 15 15 16
FIGURE		
1	Parameter Derating Information	N/A
2	Physical Dimensions	10
3	Functional Diagram	10
4	Circuits for Electrical Measurements	N/A
5	Electrical Circuit for Burn-in and Life Test	N/A
APPENI	DICES (Applicable to specific Manufacturers only)	
A	RAKON (F)	19
В	KVG Quartz Crystal Technology GmbH (D)	20



# ISSUE 4

# 1. <u>GENERAL</u>

#### 1.1 <u>SCOPE</u>

This specification details the values, physical and electrical characteristics, test and inspection data for Crystal Units in Metal Holder, based on Type T807, Frequency Range 4.0 - 140MHz.

It shall be read in conjunction with ESCC Generic Specification No. 3501, the requirements for which are supplemented herein.

This is a follow-up specification to ESCC Detail Specification Nos. 3501/001, 3501/008, 3501/011 and 3501/012 which should be consulted by:-

- (a) Users seeking information concerning the availability of variants previously ordered to these specifications.
- (b) Manufacturers before introducing a new specific crystal identification as outlined in Para. 1.2.

#### 1.2 RANGE OF COMPONENTS

The specific characteristics shall be negotiated between the Manufacturer and the Orderer on the basis of Table 1(a).

The contents of the individual tables shall relate to the design parameters of individual crystal units, optimised for the intended application.

The agreed table shall be held under configuration control by the Manufacturer who will allocate a specific crystal identification number sequentially when a request for a crystal is received.

#### 1.3 MAXIMUM RATINGS

The maximum ratings, which shall not be exceeded at any time during use or storage, applicable to the crystal units specified herein, are as scheduled in Table 1(b).

#### 1.4 PHYSICAL DIMENSIONS

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

#### 1.5 FUNCTIONAL DIAGRAM

The functional diagram showing lead identification of the crystal units specified herein is shown in Figure 3.

#### 2. <u>APPLICABLE DOCUMENTS</u>

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

(a) ESCC Generic Specification No. 3501 for Quartz Crystal Units.

# 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 following symbols are used:-

Resonance Frequency	= f <sub>r</sub>	Static Capacitance	=	Co
Load Resonance Frequency	= f <sub>1</sub>	Load Capacitance		CL
Reference Temperature	$= \tilde{T_0}$	Motional Capacitance	æ	$C_1$
Turning Point Temperature	= T <sub>TP</sub>	Motional Inductance	#	L <sub>1</sub>
Resonance Resistance	= R <sub>r</sub>	Response Resistance	8	Rp
Load Resonance Resistance	= R <sub>L</sub>	Response Impedance	=	lZpl
Rated Drive Level	= P <sub>o</sub>	Insulation Resistance	=	Ri



# TABLE 1(a) - FORMAT FOR INDIVIDUAL TABLES 1(a)

# SPECIFIC CRYSTAL IDENTIFICATION NUMBER -

<b>b</b> .t	Characteristic	0	Lin	nits	<b>د</b> د»،	<b>P</b>
No.	Characteristic	Symbol	Min.	Max	Unit	Remarks
1	Resonance Frequency	f, or fL			MHz	Note 1
2	Reference Temperature	To			°C	Note 2
3	Turning Point Temperature	T <sub>TP</sub>			°C	Note 3
4	Overtone Order	~				
5	Load Capacitance	CL			pF	Note 4
6	Rated Drive Level	Po	1	******	mW	Note 5
7	Frequency Adjustment Tolerance	<u>A f</u> f			10-6	At T <sub>a</sub> °C Note 6
8	Resonance Resistance	R <sub>r</sub> or R <sub>L</sub>			Ω	At To °C Note 7
9	Frequency Variation with Temperature over T <sub>op</sub>	<u>A</u> <u>f</u>			10-9	From frequency measured at T <sub>o</sub> °C Note 8
10	Resistance Variation with Temperature over T <sub>op</sub>	<u>∆R</u> R			%	From resistance measured at T <sub>o</sub> *C Note 8
11	Operating Temperature Range	T <sub>op</sub>			°C	
12	Frequency Variation with Drive Level	$\frac{\Delta f}{f}$			10-6	From $P_{S1} = mW$ to $P_{S2} = mW$ Note 9
13	Resistance Variation with Drive Level	A R R			%	From $P_{S1} = mW$ to $P_{S2} = mW$ Note 9
14	Motional Inductance	L <sub>1</sub>			mH	Notes 10 and 11
15	Motional Capacitance	C1			ſF	Note 10
16	Static Capacitance	Co			pF	Note 10
17	Q Factor	Q			~	Notes 10 and 12
18	Ratio of Unwanted: Response Resistance to Resonance Resistance or Response Impedance to Resonance Resistance	R <sub>p</sub> /R or iZ <sub>p</sub> i/R				In the frequency range: f - kHz to f + kHz Note 13
19	Ageing	$\frac{\Delta f}{f}$			10-6	Note 14
20	Physical Dimensions					Note 15
21	Intended Application					Note 16

NOTES: See Pages 7 and 8.



# NOTES TO TABLE 1(a)

- 1. Resonance Frequency fr or fL
  - (a) If CL is not specified, Symbol and measurement shall be fr.
  - (b) If C<sub>L</sub> is specified, Symbol and measurement shall be f<sub>L</sub>.

#### 2. Reference Temperature To

(a) For a crystal unit functioning in a non-controlled temperature environment, the reference temperature is normally +25±2 °C.

#### 3. Turning Point Temperature TTP

- (a) For a crystal unit functioning in a temperature controlled environment (OCXO), the turning point temperature shall be within the limits specified for the reference temperature range.
- (b) To be specified for OCXO crystal units in addition to the reference temperature.

#### 4. Load Capacitance CL

- (a) When a crystal unit must function at its series resonance frequency, CL shall be infinite.
- (b) When a crystal unit must function with a load capacitance, the CL value shall be specified.
- (c) When a crystal unit must function with an adjustable load capacitance, the minimum and maximum limits shall be specified.

N.B.

The tolerance on the load capacitance shall be that value which results in a frequency change not exceeding 10% of the frequency tolerance at  $T_o$  or 1% of the nominal load capacitance, whichever is smaller.

#### 5. Rated Drive Level Po

The rated drive level shall be selected from the standard drive levels specified below:

- 0.25mW, 0.2mW, 0.1mW, 0.05mW, 0.02mW and 0.01mW at ±20%.
- 6. Frequency Adjustment Tolerance
  - (a) When a crystal unit must function at its series resonance frequency, the resonance frequency measured at  $T_0$  shall be within the tolerance specified. The standard value of the adjustment tolerance shall be  $\pm 10 \times 10^{-6}$ .
  - (b) When a crystal unit has to function with a fixed load capacitance, the resonance frequency measured with this load at  $T_{\alpha}$  shall be within the tolerance specified. The standard value of the adjustment tolerance shall be  $\pm 10 \times 10^{-6}$ .
  - (c) When a crystal unit is required to operate with an adjustable load capacitance with the limits indicated in Item 5 of the Table, the resonance frequency shall be adjustable to its correct T<sub>o</sub> value so the frequency adjustment tolerance does not need to be specified.
- 7. Resonance Resistance
  - (a) Generally, the maximum value only is specified.
  - (b)  $R_L$  may be calculated by  $R_L = R_r \left( 1 + \frac{C_0}{C_L} \right)^2$ .
- 8. Frequency and Resistance Variation with Temperature

These values shall be specified such that they are consistent with the operating temperature range.



# NOTES TO TABLE 1(a) (Continued)

### 9. Frequency and Resistance Variation with Drive Level

These limits and the Drive Level range ( $P_{S1}$  to  $P_{S2}$ ) shall be specified for very special crystals only (i.e. crystals used in very high stability oscillators).

### 10. Electrical Values

The electrical values shall be specified only when required for the correct functioning of the equipment in which the crystal is used.

# 11. Motional Inductance L1

Because the inductance value may be restricted by other chosen parameters, the Manufacturer shall propose the value of L1 in accordance with the Customer's requirements.

# 12. 'Q' Factor

If 'R' and 'L' have been already specified, it will not be necessary to specify the minimum value of the 'Q' factor.

The maximum value of the 'Q' factor is never specified.

# 13. Ratio of Unwanted Response Resistance to Resonance Resistance

The standard minimum value is 2, but it is possible to obtain higher values.

The frequency range within which the minimum value of the ratio is required shall also be specified.

#### 14. Ageing

Specify limits under appropriate column and ageing period under "Remarks".

#### 15. Physical Dimensions

The applicable Figure Number is to be specified.

#### 16. Intended Application

For definitions of the selected symbol to be added, see ESCC Generic Specification No. 3501, Para. 3.

#### 17. Not Applicable Items

For all items where limits are not specified, "Not applicable" shall be entered in the Limits column.



# TABLE 1(b) - MAXIMUM RATINGS

No.	Characteristic	Symbol	Values	Unit	Remarks
1	Nominal Frequency Range	f	4.0 to 140	MHz	Note 1
2	Drive Level Range	р	Note 1	mW	Note 1
3	Operating Temperature Range	T <sub>op</sub>	~	°C	Note 2
4	Storage Temperature Range	T <sub>sto</sub>	- 65 to + 125	°C	Note 3
5	Soldering Temperature	T <sub>sol</sub>	+ 260	*C	Note 4

7

#### NOTES 1.

FL	ındar	neni	ial a	nd
3				1

Fundamental and Overtone Order	Approx. Frequency Range (MHz)	Drive Level Range (mW)	
Fundamental	4 - 35	0.05 to 0.2	
3	30 - 100	0.05 to 0.25	
5	80 - 140	0.05 to 0.25	

T

In use, the rated drive level shall not be exceeded.

- 2. See Tables 1(a).
- 3. The duration at maximum storage temperature shall not exceed 16 hours.
- 4. Duration 10 seconds maximum at a distance of not less than 3.0mm from the device body and the same lead shall not be resoldered until 3 minutes have elapsed.



# FIGURE 1 - PARAMETER DERATING INFORMATION

Not applicable.

# FIGURE 2 - PHYSICAL DIMENSIONS

FIGURE 2(a) - 3-PIN PACKAGE Variant 01 FIGURE 2(b) - 4-PIN PACKAGE Variant 02

Cb.al	Millim	netres	Barmanita	
Symbol	Min.	Max.	Remarks	
ØA	~	10.70	~	
С	~	6.80	-	
Н	4.83	5.33	Pitch 5.08mm	
ØK	0.41	0.48	+	
L	12.70	~		
Р	÷	0.90	Note 2	
Q	~	0.90	Note 2	



́СА

Millimetres Symbol Remarks Min. Max. ØA 8.51 10.70 ~ С 6.10 6.90 \* ØD 7.75 8.50 ... Ε 0.25 1.00 \* Н 4.93 5.23 ~ ØK 0.41 0.48 \* L 12.70 ~ р ~ 0.90 Note 2 Q 0.90 Note 2 ~



#### NOTES

1. Lead No. 3 is grounded to case.

Z

2. The tag's position or presence is optional.

#### **FIGURE 3 - FUNCTIONAL DIAGRAM**

FIGURE 3(a) - 3-PIN PACKAGE

X



(Bottom View)

FIGURE 3(b) - 4-PIN PACKAGE



(Bottom View)



# 4. <u>REQUIREMENTS</u>

#### 4.1 <u>GENERAL</u>

The complete requirements for procurement of the crystal units specified herein shall be as stated in this specification and ESCC Generic Specification No. 3501 for Quartz Crystal Units. Deviations from the Generic Specification applicable to this specification only, are detailed 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 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 <u>Deviations from Final Production Tests (Chart II)</u> None.
- 4.2.3 <u>Deviations from Burn-in Tests (Chart III)</u> None.
- 4.2.4 <u>Deviations from Qualification Tests (Chart IV)</u> None.
- 4.2.5 <u>Deviations from Lot Acceptance Tests (Chart V)</u> None.
- 4.3 MECHANICAL REQUIREMENTS

# 4.3.1 Dimension Check

The dimensions of the crystal units specified herein shall be checked; they shall conform to those shown in Figure 2.

4.3.2 Weight

The maximum weight of the crystal units specified herein shall be 2.0 grammes.

4.3.3 Robustness of Terminations

The requirements for robustness of termination testing are specified in Section 9 of ESCC Generic Specification No. 3501.

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 crystal units 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 <u>Case</u>

4.4.1.1 Cap

Copper, nickel plated or nickel and gold plated.

4.4.1.2 Base

Kovar, nickel plated and gold plated.

#### 4.4.2 Lead Material and Finish

The lead material shall be Type 'D' with Type '2' finish in accordance with the requirements of ESCC Basic Specification No. 23500.

#### 4.5 <u>MARKING</u>

#### 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) Characteristics.
- (b) Traceability Information.
- (c) The ESCC Component Number.

#### 4.5.2 <u>Characteristics</u>

The characteristics to be marked are the frequency and the specific crystal identification number.

4.5.2.1 Frequency

The resonance frequency of the crystal units shall be clearly specified in MHz. Where necessary, it shall be specified to 6 decimal places.

#### 4.5.2.2 Specific Crystal Identification Number

This identification shall be allocated by the Manufacturer (see Para. 1.2) and shall consist of the following:

- Letter : First letter of the crystal manufacturer's name.
- 4 digit number : Sequentially allocated by each Manufacturer.

#### 4.5.3 Traceability Information

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

### 4.5.4 The ESCC Component Number

Each component shall bear the ESCC Component Number, which shall be constituted and marked as follows:-

Detail Specification Number	T
Type Variant, (see Figure 2)	
Testing Level (B or C, as app	licable)



# 4.5.5 Manufacturer's Name, Symbol or Code

The Manufacturer's marking shall be in accordance with the requirements of ESCC Basic Specification No. 21700.

### 4.6 ELECTRICAL MEASUREMENTS

# 4.6.1 <u>Electrical Measurements at Reference Temperature</u>

The parameters to be measured in respect of electrical characteristics are scheduled in Table 2.

The measurements shall be performed at the temperatures specified in the individual Tables 1(a), Item 2.

Measurements at reference temperature for OCXO crystal units shall be performed at TTP ± 1°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. These measurements shall only be performed if values are specified in Tables 1(a) Items 9 and/or 10.

### 4.6.3 Circuits for Electrical Measurements (Figure 4)

Not applicable.

#### 4.7 BURN-IN TESTS

#### 4.7.1 Parameter Drift Values

The parameter drift values applicable to burn-in are specified in Table 4 of this specification. Unless otherwise stated, measurements shall be performed at  $T_{amb} = T_o \pm 2$  °C. The parameter drift values (Delta) applicable to the scheduled parameters shall not be exceeded. In addition to these drift value requirements for a given parameter, the appropriate limit value specified in Table 2 shall not be exceeded.

#### 4.7.2 Conditions for Burn-in

The requirements for burn-in are specified in Section 7 of ESCC Generic Specification No. 3501.

The test shall be performed as a high temperature storage test and the temperature to be applied shall be as specified in Table 5 of this specification.

For a crystal unit functioning in a temperature controlled environment (OCXO), the test should preferably be performed as an operating life test in an oscillator, at the Turning Point Temperature, with a daily measurement of the resonance frequency of the oscillator.

#### 4.7.3 <u>Electrical Circuits for Burn-in (Figure 5)</u>

Not applicable.



# TABLE 2 - ELECTRICAL MEASUREMENTS AT REFERENCE TEMPERATURE

No.	Characteristics	Symbol	ESCC 3501 Test Method	Limits	Unit
1	Resonance frequency at reference temperature and rated drive level - with C <sub>O</sub> - with C <sub>L</sub>	f <sub>r</sub> (T <sub>o</sub> , P <sub>o</sub> ) f <sub>L</sub> (T <sub>o</sub> , P <sub>o</sub> )	Para. 9.2.1.1	Table 1(a), Item 1 ± Item 7	MHz
2	Resonance resistance at reference temperature and rated drive level - with C <sub>O</sub> - with C <sub>L</sub>	R <sub>r</sub> (T <sub>o</sub> , P <sub>o</sub> ) R <sub>L</sub> (T <sub>o</sub> , P <sub>o</sub> )	Para. 9.2.1.1	Table 1(a), Item 8	Ω
3	Frequency variation with Drive Level	$\frac{\Delta f}{f} (T_0, \Delta P)$	Para. 9.2.1.1	Table 1(a), Item 12	10-6
4	Resistance variation with Drive Level	$\frac{\Delta R}{R} (T_0, \Delta P)$	Para. 9.2.1.1	Table 1(a), Item 13	%
5	Motional Inductance	L <sub>1</sub>	Para. 9.2.1.3	Table 1(a), Item 14	mH
6	Static Capacitance	Co	Para. 9.2.1.4	Table 1(a), Item 16	pF
7	Unwanted response	Rp/R or IZpI/R	Para. 9.2.1.5	Table 1(a), Item 18	-
8	Insulation Resistance	Ri	Para. 9.2.1.6	500 Min.	MΩ

# **TABLE 3 - ELECTRICAL MEASUREMENTS AT HIGH AND LOW TEMPERATURES**

No.	Characteristics	Symbol	ESCC 3501 Test Method	Limits	Unit
9	Frequency variation with Temperature over T <sub>op</sub>	$\frac{\Delta f}{f} (\Delta T, P_0)$	Para. 9.2.1.2	Table 1(a) Item 9	10-6
10	Resistance variation with Temperature over T <sub>op</sub>	<u>Δ R</u> (ΔΤ, Ρ <sub>0</sub> ) R	Para. 9.2.1.2	Table 1(a) Item 10	%

# FIGURE 4 - CIRCUITS FOR ELECTRICAL MEASUREMENTS

Not applicable.



PAGE 15

# TABLE 4 - PARAMETER DRIFT VALUES

No.	Characteristics	Symbol	Spec. and/or Test Method	Test Conditions	Change Limits (Δ)	Unit
1	Resonance frequency drift	$\frac{\Delta f}{f}$	As per Table 2	As per Table 2	± 2	10-6
2	Resonance resistance drift	AR R	As per Table 2	As per Table 2	± 10 or (1) ± 1	% Ω

# NOTES

1. Whichever is the highest value.

# TABLE 5 - CONDITIONS FOR BURN-IN AND LAT LIFE TESTS

No.	Characteristics	Symbol	Condition (Note 1)	Unit
1	Ambient Temperature	T <sub>amb</sub>	+ 105 ( + 0-5)	°C

#### NOTES

1. See Para. 4.7.2.

### FIGURE 5 - ELECTRICAL CIRCUIT FOR BURN-IN AND LIFE TEST

Not applicable.

# 4.8 <u>ENVIRONMENTAL AND ENDURANCE TESTS (CHARTS IV AND V OF ESCC GENERIC</u> <u>SPECIFICATION NO. 3501)</u>

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  $T_{amb} = T_o \pm 2 \ ^{\circ}C.$ 

#### 4.8.2 Measurements and Inspections at Intermediate Points and on Completion of Endurance Tests

The parameters to be measured and inspections to be performed at intermediate points and on completion of endurance tests are scheduled in Table 6. Unless otherwise stated, the measurements shall be performed at  $T_{amb} = T_0 \pm 2$  °C.

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

The requirements for the operating life test are specified in Section 9 of ESCC Generic Specification No. 3501. The test shall be performed as a high temperature storage test and the test temperatures are specified in ESCC Generic Specification No. 3501 for Qualification Testing and in Table 5 of this specification for LAT Testing.

For a crystal unit functioning in a temperature controlled environment (OCXO), the test should preferably be performed as an operating life test in an oscillator, at the Turning Point Temperature, with a daily measurement of the resonance frequency of the oscillator.



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

	ESCC GENERIC SP	EC. NO. 3501	MEASUREMENTS A	ND INSPECTIONS		LIM	IITS	
NO.	ENVIRONMENTAL AND ENDURANCE TESTS (1)	TEST METHOD AND CONDITIONS	IDENTIFICATION	CONDITIONS	SYMBOL	Min.	Max.	UNIT
01	Electrical Measurements at Reference Temperature	Para. 9.2.4	Electrical Measurements	Table 2		Tabl	3 1(a)	
02	Shock	Para. 9.3	Initial Measurements Resonance Frequency Resonance Resistance Final Measurements Resonance Frequency Drift Resonance Resistance Drift	Table 2 Item 1 Table 2 Item 2 Table 2 Item 1 Table 2 Item 2	$ \begin{array}{c} f\\ R\\ \underline{\Delta 1}\\ f\\ \underline{\Delta R}\\ R\\ \underline{\Delta R}\\ \underline{\Delta R} \end{array} $	3	2 Item 1 2 Item 2 +1.0 +10 +1.0	10-8 % Ω
03	Vibration	Para. 9.4	Initial Measurements Resonance Frequency Resonance Resistance Final Measurements Resonance Frequency Drift Resonance Resistance Drift	Table 2 Item 1 Table 2 Item 2 Table 2 Item 1 Table 2 Item 2	1 R Δ <u>1</u> f Δ <u>R</u> R ΔR		2 Item 1 2 Item 2 + 1.0 + 10 + 1.0	10 <sup>-6</sup> % Ω
04	Seal Test	Para. 9.5	Fine Leak Gross Leak	Para. 9.5.1 Para. 9.5.2		{ · · · · · · · · · · · · · · · · · · ·	. 9.5.1 . 9.5.2	
05	Permanence of Marking	Para. 9.8	Final Measurements Visual Examination	No corrosion or obliteration of marking	÷	÷	·	×
06	External Visual Inspection	Para. 9.9	Final Measurements Visual Inspection	ESCC No. 20500	~	~	~	~
07	Solderability	Para. 9.13	~	÷	·	~	~	

# NOTES

The tests in this table refer to either Chart IV or V, and shall be used as applicable.
 Whichever is the highest value.



# TABLE 6 - MEASUREMENTS AND INSPECTIONS ON COMPLETION OF ENVIRONMENTAL TESTS AND AT INTERMEDIATE POINTS AND ON COMPLETION OF ENDURANCE TESTING (Cont.)

ENVIROMMENTAL AND ENDURANCE TESTS (1)         Para Not AND CONDITIONS         IDENTIFICATION         CONDITIONS         Min, Conditional Max         Max           08         Dry Heat         Para 9.14 Para 9.14.1         Initial Measurements Resonance Resistance Drit         Table 2 Item 1 Table 2 Item 2 Para 9.14.3         1 Table 2 Item 1 Resonance Resistance Drit         1 Table 2 Item 1 Tab		ESCC GENERIC SP	EC. NO. 3501	MEASUREMENTS AN	ID INSPECTIONS		LIM	ITS	
08       Dry Heat       Para. 9.14.1       Initial Measurements Resonance Frequency Drit       Table 2 Item 1       f       Table 2 Item 1       Table 2 Item 1         09       Cold       Para. 9.14.3       Initial Measurements Resonance Resistance Drit       Table 2 Item 1       Aft f      10       +10       %         09       Cold       Para. 9.14.3       Initial Measurements Resonance Resistance Drit       Table 2 Item 1       Aft f      10       +10       %         09       Cold       Para. 9.14.3       Initial Measurements Resonance Resistance Final Measurements Resonance Resistance Drit       A	NO.			IDENTIFICATION	CONDITIONS	SYMBOL	Min,	Max.	UNIT
09     Cold     Para. 9:14.3     Resonance Frequency Final Measurements Resonance Resistance Dritt     Table 2 Item 1 Table 2 Item 1 Table 2 Item 1     Table 2 Item 1 Table 2 Item 1     Table 2 Item 1 Table 2 Item 2       09     Cold     Para. 9:14.3     Initial Measurements Resonance Resistance Dritt     Table 2 Item 1     Table 2 Item 1     Table 2 Item 1       10     Damp Heat (Accierated) Remaining Cycles     Para. 9:14.4     Initial Measurements Resonance Resistance Dritt     Table 2 Item 1     1     Para. 9:14.4       11     Rapid Change of Temporature     Para. 9:14.4     Initial Measurements Resonance Frequency Dritt     Table 2 Item 1     1     Para. 9:14.4       11     Rapid Change of Temporature     Para. 9:14.4     Initial Measurements Resonance Frequency Dritt     Table 2 Item 1     1     Para. 9:14.4       11     Rapid Change of Temporature     Para. 9:14.4     Initial Measurements Resonance Frequency Dritt     Table 2 Item 1     1     Para. 9:14.2.2       11     Rapid Change of Temporature     Para. 9:15     Initial Measurements Resonance Frequency Dritt     Table 2 Item 1     1     Para. 9:14.4.2       11     Rapid Change of Temporature     Para. 9:15     Initial Measurements Resonance Frequency Dritt     Table 2 Item 1     1     Para. 9:14.4.2       12     Resonance Frequency Dritt     Table 2 Item 1     1     1     Para. 9:14.4.2		Climatic Sequence	Para. 9.14						
OB         Cold         Para. 9.14.3         Resonance Preguency Dritt         Table 2 Item 1 Table 2 Item 1         A_f f         -2.0         +2.0         10.4           09         Cold         Para. 9.14.3         Initial Measurements Resonance Resistance Dritt         Table 2 Item 1         A_f f         -2.0         +2.0         10.4           09         Cold         Para. 9.14.3         Initial Measurements Resonance Resistance Dritt         Table 2 Item 1         A_f f         -10         +1.0         Ω           10         Damp Heat (Acclerated) Remaining Cycles         Para. 9.14.4         Initial Measurements Resonance Resistance Final Measure	08	Dry Heat	Para. 9.14.1						
$ \begin{array}{ c c c c c c c c c c c c c c c c c c c$									
$ \begin{array}{ c c c c c c c c c c c c c c c c c c c$					Table 2 Item 2	R	Table 2	2 Item 2	
09ColdPara. 9.14.3Dritt Resonance Resistance DritTable 2 Item 2 $\frac{1}{A}$ R R able 2 Item 2 $-10$ or (2) $\Delta R$ $+10$ or (2) $-1.0$ $\%$ $+1.0$ 09ColdPara. 9.14.3Initial Measurements Resonance Frequency DritTable 2 Item 1 Table 2 Item 1T R R Resonance Resistance Table 2 Item 2Para. 9.14.1.310Damp Heat (Acclorated) Remaining CyclesPara. 9.14.4Initial Measurements Resonance Resistance DritTable 2 Item 1 Table 2 Item 1 $\frac{A}{R}$ R R Or (2) Cl $-2.0$ $+2.0$ Para. 9.14.0 $10^{\circ6}$ 10Damp Heat (Acclorated) Remaining CyclesPara. 9.14.4Initial Measurements Resonance Resistance DritTable 2 Item 1 Table 2 Item 1 $\frac{A}{R}$ R R Cr (2) Cl $-1.0$ $+1.0$ Para. 9.14.3.211Rapid Change of TemperaturePara. 9.15Initial Measurements Resonance Resistance DritTable 2 Item 1 Table 2 Item 2 $\frac{A}{R}$ R R R Cr (2) Cl $-1.0$ $+1.0$ Para. 9.1511Rapid Change of TemperaturePara. 9.15Initial Measurements Resonance Resistance DritTable 2 Item 1 Table 2 Item 1 Table 2 Item 1 Table 2 Item 2 $\frac{A}{R}$ R R R Cr (2) Cl $-1.0$ $+1.0$ Para. 9.16.111Rapid Change of TemperaturePara. 9.16Para. 9.16Table 2 Item 1 R R R Cr (2) $f$ Para. 9.16.1 $-2.0$ Para. 9.16 $-2.0$ Para. 9.1612Robustness of TerminationsPara. 9.16 <td></td> <td></td> <td></td> <td></td> <td>Table O Here *</td> <td>5.4</td> <td></td> <td>1.20</td> <td>10.8</td>					Table O Here *	5.4		1.20	10.8
09     Cold     Para. 9.14.3     Resonance Resistance Drift     Table 2 Item 1     Δ R AR     -10 or (2) ΔR     +10 or (2) ΔR     %       09     Cold     Para. 9.14.3     Initial Measurements Resonance Frequency Para. 9.14.4     Table 2 Item 1     .1     Para. 9.14.1.3       10     Damp Heat (Acclerated) Remaining Cycles     Para. 9.14.4     Initial Measurements Resonance Resistance Final Measurements Resonance Resistance Final Measurements Resonance Frequency Drift     Table 2 Item 1     .1     Para. 9.14.1.3       10     Damp Heat (Acclerated) Remaining Cycles     Para. 9.14.4     Initial Measurements Resonance Resistance Final Measurements Resonance Resistance Fin						- <u>11</u>	~ 4.0	+ L.U	10~
09ColdPara. 9.14.3Initial Measurements Resonance Frequency Resonance Resistance DriftTable 2 Item 1 Table 2 Item 1 $f$ Para. 9.14.1.3 $\Omega$ 10Damp Heat (Acclerated) Remaining CyclesPara. 9.14.4Initial Measurements Resonance Resistance DriftTable 2 Item 1 Table 2 Item 1 $f$ Para. 9.14.4 $\Omega$ 10Damp Heat (Acclerated) Remaining CyclesPara. 9.14.4Initial Measurements Resonance Resistance DriftTable 2 Item 1 Table 2 Item 1 $f$ Para. 9.14.4 $\Omega$ 11Damp Heat (Acclerated) Remaining CyclesPara. 9.14.4Initial Measurements Resonance Resistance Final Measurements Resonance Resistance DriftTable 2 Item 1 Table 2 Item 1 $f$ Para. 9.14.3.211Report College Resonance Resistance DriftPara. 9.14.4Initial Measurements Resonance Resistance DriftTable 2 Item 1 Table 2 Item 1 $f$ Para. 9.14.3.211Report College Resonance Resistance DriftPara. 9.15Initial Measurements Resonance Resistance DriftTable 2 Item 1 Table 2 Item 1 Table 2 Item 1 Table 2 Item 1 $f$ Para. 9.14.4.211Report College Resonance Resistance DriftPara. 9.15Initial Measurements Resonance Resistance Fraul Measurements $f$ Para. 9.14.4.211Report College Resonance Resistance DriftPara. 9.15Initial Measurements Resonance Resistance Fraul Measurements $f$ Para. 9.14.4.212Robustness of TerminationsPara. 9.16Tensile Strength Visu					Table 2 Item 2		- 10	+10	%
09ColdPara. 9.14.3Initial Measurements Resonance Resistance Drit $\Delta R$ $-1.0$ $\pm 1.0$ $\Omega$ 10Damp Heat (Acclorated) Remaining CyclesPara. 9.14.4Initial Measurements Resonance Resistance DritTable 2 Item 1 Table 2 Item 1 $\Delta f$ $-2.0$ $\pm 2.0$ $10^6$ 10Damp Heat (Acclorated) Remaining CyclesPara. 9.14.4Initial Measurements Resonance Resistance DritTable 2 Item 1 Table 2 Item 1 $\Delta f$ $-10$ $\pm 1.0$ $R$ $\Omega$ 10Damp Heat (Acclorated) Remaining CyclesPara. 9.14.4Initial Measurements Resonance Resistance DritTable 2 Item 1 Table 2 Item 1 $\Delta f$ $-10$ $\pm 1.0$ $\Omega$ $\Omega$ 11Rapid Change of TemporaturePara. 9.15Initial Measurements Resonance Frequency DritTable 2 Item 1 Table 2 Item 1 $A f$ $-2.0$ $\pm 2.0$ $\Omega$ $10^6$ 11Rapid Change of TemporaturePara. 9.15Initial Measurements Resonance Frequency DritTable 2 Item 1 Table 2 Item 1 Table 2 Item 1 $f$ $R f$ $-1.0$ $\pm 1.0$ $\Omega$ $\Omega$ 11Rapid Change of TemporaturePara. 9.15Initial Measurements Resonance Resistance Final Measurements Resonance Resistance $A f$ Table 2 Item 1 Table 2 Item 1 Tabl							3		
10Damp Heat (Acclerated) Remaining CyclesPara. 9.14.4Resonance Frequency Drit Resonance Resistance Final Measurements Resonance Resistance DritTable 2 Item 1 Table 2 Item 1 Table 2 Item 1 Table 2 Item 2 R Final Measurements Resonance Resistance DritPara. 9.14.3.2 Final Measurements Resonance Resistance Final MeasurementsPara. 9.14.3.2 R Final Measurements10Damp Heat (Acclerated) Remaining CyclesPara. 9.14.4Initial Measurements Resonance Resistance DritTable 2 Item 1 Table 2 Item 1 Table 2 Item 1 Table 2 Item 2 AR R Table 2 Item 1 Table 2 Item 2 AR R R Covery of 2 hours Table 2 Item 2 R Final MeasurementsPara. 9.14.3.2 Final Measurements11Rapid Change of TemperaturePara. 9.15Initial Measurements Resonance Resistance Final MeasurementsPara. 9.14.4.2 R Covery of 2 hours R Resonance Resistance Final MeasurementsPara. 9.14.4.2 R Final Measurements12Robustness of TerminationsPara. 9.16Tensile Strength Visual Examination BendingGen. 3501 Para. 9.16.1AR R R Covery of 2 hours R R R R R R R R R R RAR R R R R R R								+1.0	Ω
10Damp Heat (Acclorated) Remaining CyclesPara. 9.14.4Resonance Resistance Final Measurements Resonance Resistance Drift Resonance Resistance Resonance Resistance Final Measurements Resonance Resistance Final Measurements Resonance Resistance Resonance Resistance Final Measurements Resonance Resistance Final Measurements Resonance Resistance Resonance Resistance DriftTable 2 Item 1 Aft Table 2 Item 1 Table 2 Item 1 Final MeasurementsFinal Measurements Resonance Resistance Resonance Resistance Resonance Resistance Table 2 Item 1 Table 2 Item 1 Resonance ResistanceResonance Resistance Resonance Resistance Resonance Resistance Table 2 Item 1 Resonance ResistanceAft Resonance Resistance Resonance ResistancePara. 9.14.3.2 Resonance Resistance Resonance Resistance11Rapid Change of TemperaturePara. 9.15Initial Measurements Resonance Resistance Resonance Resistance Resonance Resistance Resonance Resistance Resonance Resistance Resonance Resistance Resonance Resistance Table 2 Item 1 Resonance Resistance Resonance Resistan	09	Cold	Para. 9.14.3						
10Damp Heat (Acclerated) Remaining CyclesPara. 9.14.4Final Measurements Resonance Frequency DriftTable 2 Item 1Δf f-2.0+2.010-610Damp Heat (Acclerated) Remaining CyclesPara. 9.14.4Initial Measurements Resonance Resistance Final Measurements Resonance Resistance DriftTable 2 Item 1Δf R-1.0+1.0Ω11Rapid Change of TemporaturePara. 9.15Initial Measurements Resonance Resistance DriftTable 2 Item 1Δf R-2.0+2.010-611Rapid Change of TemporaturePara. 9.15Initial Measurements Resonance Resistance DriftTable 2 Item 1Δf R-2.0+2.010-611Rapid Change of TemporaturePara. 9.15Initial Measurements Resonance Resistance DriftTable 2 Item 1f RPara. 9.14.4.212Rapid Change of TemporaturePara. 9.15Initial Measurements Resonance Resistance Final Measurements Resonance Resistance Final MeasurementsTable 2 Item 1 Table 2 Item 2f R R R-1.0+1.0 *M212Robustness of TerminationsPara. 9.16Tensile Strength Visual Examination BendingGen. 3501 Para. 9.16.1J No visible damage Gen. 3501-4.2 R R-12Robustness of TerminationsPara. 9.16Tensile Strength Visual Examination BendingGen. 3501 Para. 9.16.24.2 R-		с. 							
10Damp Heat (Acclerated) Remaining CyclesPara. 9.14.4Resonance Frequency DritTable 2 Item 1 Table 2 Item 2 $\Delta f \\ f \\ Table 2 Item 2$ $-2.0 \\ f \\ Table 2 Item 2$ $+2.0 \\ Table 2 Item 2$ $10^{-6} \\ f \\ Table 2 Item 2$ 10Damp Heat (Acclerated) 					Table 2 Item 2	R	Final Mea	usurements	
$ \begin{array}{ c c c c c c c c c c c c c c c c c c c$					Tahia 2 liam 1	A #		420	10-6
10Damp Heat (Acclerated) Remaining CyclesPara. 9.14.4Resonance Resistance DriftTable 2 Item 2Δ R A-10+10% or (2) ΔR-10+10% or (2) ΔRΩ10Damp Heat (Acclerated) Remaining CyclesPara. 9.14.4Initial Measurements Resonance Resistance Final Measurements Resonance Resistance DriftTable 2 Item 1fPara. 9.14.3.2Final Measurements Final Measurements10Damp Heat (Acclerated) Resonance Resistance DriftPara. 9.14.4Initial Measurements Resonance Resistance DriftTable 2 Item 1fPara. 9.14.3.211Rapid Change of TemperaturePara. 9.15Initial Measurements Resonance Resistance Final Measurements Resonance Frequency Table 2 Item 1 Table 2 Item 1 Resonance Resistance Final Measurements Resonance Resistance Final Measurements Resonance Resistance Final Measurements Resonance Resistance Final Measurements Resonance Resistance DriftTable 2 Item 1 Table 2 Item 1 R Table 2 Item 1 R CPara. 9.14.4.2 Final Measurements R Final Measurements Resonance Resistance Table 2 Item 2Para. 9.14.4.2 R R CPara. 9.14.4.2 Final Measurements R R CPara. 9.14.4.2 R R CPara. 9.14.4.2 R R CPara. 9.14.4.2 R R CPara. 9.14.4.2 R R CPara. 9.14.4.					HOUR & NOW H		v	* 24.07	,0
10Damp Heat (Acclerated) Remaining CyclesPara. 9.14.4Drift Initial Measurements Resonance Frequency Final Measurements Resonance Frequency Drift Resonance Resistance DriftTable 2 Item 1 Table 2 Item 1R f F Para. 9.14.3.2Or (2) +1.09210Damp Heat (Acclerated) Remaining CyclesPara. 9.14.4Initial Measurements Resonance Frequency Drift Resonance Resistance DriftTable 2 Item 1 Table 2 Item 1Initial Measurements F A RPara. 9.14.3.2 Final Measurements11Rapid Change of TemperaturePara. 9.15Initial Measurements Resonance Frequency Drift Resonance Frequency Resonance Frequency Drift Table 2 Item 1Table 2 Item 1 Final Measurements Resonance Frequency Table 2 Item 1111Rapid Change of TemperaturePara. 9.15Initial Measurements Resonance Frequency Drift Resonance Frequency Drift Resonance Resistance DriftTable 2 Item 1 Table 2 Item 1 Table 2 Item 1 Table 2 Item 1 Table 2 Item 2Para. 9.14.4.2 Final Measurements Resonance Frequency Drift Resonance Resistance DriftPara. 9.14.4.2 Resonance Frequency Table 2 Item 1 Table 2 Item 1 Resonance Frequency Drift1Para. 9.14.4.2 Final Measurements Resonance Frequency Table 2 Item 1 Table 2 Item 1 Table 2 Item 1 Table 2 Item 1 Resonance Frequency Table 2 Item 1 Table 2 Item 2 Table 2 Item 1 Table 2 Item 2 Table 2 Item 1 Table 2 Item 2 Table 2				5	Table 2 Item 2	1 · · ·	- 10	+10	%
10Damp Heat (Acclerated) Remaining CyclesPara. 9.14.4Initial Measurements Resonance Frequency DritTable 2 Item 11Para. 9.14.3.211Rapid Change of TemperaturePara. 9.15Para. 9.14.4Initial Measurements Resonance Frequency DritTable 2 Item 111Para. 9.14.3.211Rapid Change of TemperaturePara. 9.15Para. 9.15Initial Measurements Resonance Resistance DritTable 2 Item 114f-2.0+2.010*611Rapid Change of TemperaturePara. 9.15Para. 9.15Initial Measurements Resonance Resistance DritTable 2 Item 1f-2.0+2.010*612Robustness of TerminationsPara. 9.16Para. 9.16Tensile Strength Visual Examination BendingGen. 3501 Para. 916.2Gen. 3501 Para. 916.2-1.0+1.0Ω				Drift			or (2)		
Remaining CyclesResonance Frequency Resonance Resistance Final Measurements Resonance Frequency Dritt Resonance Frequency Dritt Resonance Resistance DrittTable 2 Item 1 Table 2 Item 2 Rf Para. 9.14.3.2 Final Measurements11Rapid Change of TemperaturePara. 9.15Initial Measurements Resonance Resistance DrittTable 2 Item 1 Table 2 Item 1f F Para. 9.16-2.0 +2.0+2.010-6 911Rapid Change of TemperaturePara. 9.15Initial Measurements Resonance Resistance Para. 9.15Table 2 Item 2 Initial Measurements Resonance Resistance Resonance Resistance Final MeasurementsA Para. 9.14.4.2-10 +1.0+2.011Rapid Change of TemperaturePara. 9.15Initial Measurements Resonance Resistance Final MeasurementsTable 2 Item 1 Table 2 Item 1 Table 2 Item 2f Para. 9.14.4.211Rapid Change of TemperaturePara. 9.15Initial Measurements Resonance Resistance Final Measurementsf Para. 9.16Para. 9.14.4.212Robustness of TerminationsPara. 9.16Tensile Strength Visual Examination BendingGen. 3501 Para. 9.16.2-10 +1.0+1.0 Para. 9.16.2						۵R	- 1.0	+1.0	Ω
Image: heat of the second constraints of the second c	10		Para. 9.14.4	5				1	
Final Measurements Resonance Frequency Drift Resonance Resistance DriftTable 2 Item 1Δ f f-2.0+2.010-610-6 TemperatureResonance Resistance DriftTable 2 Item 2Δ R F-10+10%11Rapid Change of TemperaturePara. 9.15Initial Measurements Resonance ResistanceTable 2 Item 1f Table 2 Item 1-2.0+2.010-611Rapid Change of TemperaturePara. 9.15Initial Measurements Resonance Resistance Final Measurements Resonance ResistanceTable 2 Item 1 Table 2 Item 1f F Para. 9.14.4.2Para. 9.14.4.211Rapid Change of TemperaturePara. 9.15Initial Measurements Resonance Resistance Final Measurements Resonance Resistance DriftTable 2 Item 1 Table 2 Item 2f Para. 9.14.4.2Para. 9.14.4.211Rapid Change of TemperaturePara. 9.15Initial Measurements Resonance Resistance DriftTable 2 Item 1 Table 2 Item 2f Para. 9.14.4.2Para. 9.14.4.212Robustness of TerminationsPara. 9.16Tensile Strength Visual Examination BendingGen. 3501 Para. 9.16.2s Para. 9.1		Hemaining Cycles				3			
$ \begin{array}{ c c c c c c c c c c c c c c c c c c c$					Fable 2 nem 2		rinai Mea	asurements I	
Drift Resonance Resistance DriftTable 2 Item 2Image: Constraint of the second				* · · · · · · · · · · · · · · · · · · ·	Table 2 Item 1	AT	~ 2.0	+20	10-6
Drift Insulation ResistanceR AB Table 2 Item 8or (2) AB Fi+ 1.0 MΩ11Rapid Change of TemperaturePara. 9.15Initial Measurements Resonance Frequency Presonance Frequency Drift Resonance Frequency Drift Resonance ResistanceTable 2 Item 1 Table 2 Item 1 Table 2 Item 2 ABfPara. 9.14.4.2 Final Measurements After minimum Recovery of 2 hours Table 2 Item 1 ffPara. 9.14.4.2 Final Measurements11Rapid Change of TemperaturePara. 9.15Initial Measurements Resonance Frequency Drift Resonance Resistance DriftTable 2 Item 1 Table 2 Item 1 Table 2 Item 2fPara. 9.14.4.2 Final Measurements12Robustness of TerminationsPara. 9.16Tensile Strength Visual Examination BendingGen. 3501 Para. 9.16.2AB-1.0+1.0Ω									1
ΔR-1.0+1.0Ω11Rapid Change of TemperaturePara. 9.15Initial Measurements Resonance Frequency Drit Resonance ResistanceTable 2 Item 8AR-1.0+1.0Ω11Rapid Change of TemperaturePara. 9.15Initial Measurements Resonance Resistance DritTable 2 Item 1 Table 2 Item 2 After minimum Resovery of 2 hours Table 2 Item 1f Para. 9.14.4.2Para. 9.14.4.211Resonance Frequency Drit Resonance Resistance DritTable 2 Item 2 After minimum Resonance Resistance Drit-2.0+2.010.612Robustness of TerminationsPara. 9.16Tensile Strength Visual Examination BendingGen. 3501 Para. 9.16.1 No visible damage Gen. 3501 Para. 9.16.2-10+1.0Ω				Resonance Resistance	Table 2 Item 2	<u>AR</u>	- 10	+ 10	%
Image: constraint of the second of the se				Drift			or (2)		
11Rapid Change of TemperaturePara. 9.15Initial Measurements Resonance Frequency Final Measurements Resonance Resistance Final MeasurementsTable 2 Item 1 Table 2 Item 2 After minimum Table 2 Item 1 Table 2 Item 1 Table 2 Item 2 After minimum Recovery of 2 hours Table 2 Item 1 Table 2 Item 1 Table 2 Item 2 After minimum Recovery of 2 hours Table 2 Item 1 Table 2 Item 1 Table 2 Item 2 After minimum Recovery of 2 hours Table 2 Item 1 Table 2 Item 1 Table 2 Item 1 Table 2 Item 1 Table 2 Item 2 Table 2 Item 2 After minimum Recovery of 2 hours Table 2 Item 1 Table 2 Item 2 After minimum Recovery of 2 hours Table 2 Item 1 Table 2 Item 2 After minimum Recovery of 2 hours Table 2 Item 1 After minimum Recovery of 2 hours Table 2 Item 2 AR After minimum Recovery of 2 hours Table 2 Item 2 AR After minimum Recovery of 2 hours Table 2 Item 2 AR After minimum Recovery of 2 hours Table 2 Item 2 After minimum Recovery of 2 hours After minimum Recovery of 2 hours Table 2 Item 2 After minimum After minimum Recovery of 2 hours Table 2 Item 2 After minimum After minimum Recovery of 2 hours After minimum After minimum Recovery of 2 hours After minimum After minimu						\$	3	3	3
TemperatureResonance Frequency Resonance ResistanceTable 2 Item 1 Table 2 Item 2 After minimum Recovery of 2 hours Table 2 Item 1fPara. 9.14.4.2 RPara. 9.14.4.2 Final MeasurementsImage: Large constraintsFinal Measurements Resonance Frequency Drift Resonance ResistanceTable 2 Item 2 Table 2 Item 1 Table 2 Item 2 After minimum Recovery of 2 hours Table 2 Item 1fPara. 9.14.4.2 RPara. 9.14.4.2 Final Measurements12Robustness of TerminationsPara. 9.16Tensile Strength Visual Examination BendingGen. 3501 Para. 9.16.1 No visible damage Gen. 3501 Para. 9.16.2Image: Constraint of the strength Para. 9.16.1Image: Constraint of the strength Para. 9.16.2Image: Constraint of the st	ļ			Insulation Hosistance	Table 2 Item 8	HI	500	×	MΩ
Resonance Resistance Final MeasurementsTable 2 Item 2 After minimum Recovery of 2 hours Table 2 Item 1R After minimum Fecovery of 2 hours Table 2 Item 1Final Measurements -2.0Final Measurements +2.010-8 Drift Personance Resistance DriftResonance Frequency Drift Resonance Resistance DriftTable 2 Item 1After minimum Table 2 Item 1-2.0+2.010-812Robustness of TerminationsPara. 9.16Tensile Strength Visual Examination BendingGen. 3501 Para. 9.16.1 No visible damage Gen. 3501 Para. 9.16.2Second Para. 9.16.1Second Para. 9.16.1	11	Rapid Change of	Para. 9.15	Initial Measurements					
Final MeasurementsAfter minimum Recovery of 2 hours Table 2 Item 1Δ f f-2.0+2.010-8Para. 9.16Para. 9.16Tensile Strength Visual Examination BendingGen. 3501 Para. 9.16.2Gen. 3501 Para. 9.16.2-1.0+1.0Ω		Temperature				2			
Resonance Frequency Drift Resonance Resistance DriftRecovery of 2 hours Table 2 Item 1-2.0 t+ 2.010-610-8-10 Prit-10 Prit+ 10 Prit-10 Prit+ 10 Prit%12Robustness of TerminationsPara. 9.16Tensile Strength Visual Examination BendingGen. 3501 Para. 9.16.1 No visible damage Gen. 3501 Para. 9.16.2-10 Prit+ 1.0 Prit0						R	Final Me	asurements	
$\begin{bmatrix} 1 & 1 & 1 & 1 & 1 & 1 & 1 & 1 & 1 & 1 $						]			
$\begin{bmatrix} Drit \\ Resonance Resistance \\ Drit \end{bmatrix} Table 2 Item 2 \begin{bmatrix} T \\ \Delta R \\ R \\ \Delta R \end{bmatrix} -10 +10 +10 - \%$ $\begin{bmatrix} 12 \\ Robustness of \\ Terminations \end{bmatrix} Para. 9.16 \\ Para. 9.16 \\ Termination \\ Bending \end{bmatrix} Para. 9.16 +1.0 - 10 +1.0 - \%$		ł					-20	490	10-8
Resonance Resistance DriftTable 2 Item 2 BΔ R B B ΔR-10 or (2) +1.0+10 % %12Robustness of TerminationsPara. 9.16Tensile Strength Visual Examination BendingGen. 3501 Para. 9.16.1 No visible damage Gen. 3501 Para. 9.16.2-10 or (2) +1.0+10 %%					1000 2 1010 1		2	1 40.10	,0
DriftR ΔRor (2) -1.0+1.0Ω12Robustness of TerminationsPara. 9.16Tensile Strength Visual Examination BendingGen. 3501 Para. 9.16.1 No visible damage Gen. 3501 Para. 9.16.2				1	Table 2 Item 2	A R	- 10	+ 10	%
Image: second						\$	¥ · · ·		
Terminations     Para. 9.16.1       Visual Examination     No visible damage       Bending     Gen. 3501       Para. 9.16.2						۵R	~ 1.0	+1.0	Ω
Terminations     Para. 9.16.1       Visual Examination     No visible damage       Bending     Gen. 3501       Para. 9.16.2	12	Robustness of	Para. 9.16	Tensile Strength	Gen. 3501				
Bending Gen. 3501 Para. 9.16.2	1	Terminations			Para. 9.16.1			l	
Para. 9.16.2	1			7					
				Bending					I
I I IVISUSI EXAMPLE IN INC. VISION INC. VI				Visual Examination	No visible damage				

# **NOTES**

- 1. The tests in this table refer to either Chart IV or V, and shall be used as applicable.
- 2. Whichever is the highest value.



**ESCC Detail Specification** 

No. 3501/018

# TABLE 6 - MEASUREMENTS AND INSPECTIONS ON COMPLETION OF ENVIRONMENTAL TESTS AND AT INTERMEDIATE POINTS AND ON COMPLETION OF ENDURANCE TESTING (Cont.)

		ESCC GENERIC SP	EC. NO. 3501	MEASUREMENTS AND IN	SPECTIONS		LIM		
NU.	NO.	ENVIRONMENTAL AND ENDURANCE TESTS (1)	TEST METHOD AND CONDITIONS	IDENTIFICATION	CONDITIONS	SYMBOL	Min.	Max.	UNIT
â	13	Life Test	Para. 9.17	Initial Measurements Resonance Frequency Resonance Resistance Intermediate Measurements	Table 2 Item 1 Table 2 Item 2 At 500 hours	t R	Table 2 Table 2		
				Resonance Frequency Drift	Table 2 Item 1		- 2.0	+ 2.0	10-6
				Resonance Resistance Drift	Table 2 Item 2	<u>д</u> В Д	- 10 or (2) - 1.0	+10+1.0	% Ω
		www.co.co.co.co.co.co.co.co.co.co.co.co.co.		Intermediate Measurements (Chart IV) and Final Measurements (Chart V)	At 1000 hours		,		va
				Resonance Frequency Drift	Table 2 Item 1		- 2.5	+ 2.5	10 <sup>-6</sup>
				Resonance Resitance Drift	Table 2 Item 2	AR R	- 10 or (2)	+ 10	%
				Final Measurements (Chart IV)	At 2000 hours	٩۵	- 1.0	+1.0	Ω
				Resonance Frequency Drift	Table 2 Item 1		~ 3.0	+ 3.0	10-6
				Resonance Resistance Drift	Table 2 Hern 2	AB R	- 10 or (2)	+ 10	%
				l		ΔR	~ 1.0	+ 1.0	Ω

# NOTES

The tests in this table refer to either Chart IV or V, and shall be used as applicable.
 Whichever is the highest value.



# APPENDIX 'A'

Page 1 of 1

# AGREED DEVIATIONS FOR RAKON (F)

ITEMS AFFECTED DESCRIPTION OF DEVIATION	
Para. 4.2.2 Para. 9.3, Shock: Shall not be performed.	
Para. 4.2.3	Para. 9.11, Radiographic Inspection: Shall not be performed.



# APPENDIX 'A'

Page 1 of 1

# AGREED DEVIATIONS FOR RAKON (F)

ITEMS AFFECTED DESCRIPTION OF DEVIATION	
Para. 4.2.2	Para. 9.3, Shock: Shall not be performed.
Para. 4.2.3	Para. 9.11, Radiographic Inspection: Shall not be performed.



# APPENDIX 'B'

# Page 1 of 1

# AGREED DEVIATIONS FOR KVG Quartz Crystal Technology GmbH (D)

ITEMS AFFECTED	DESCRIPTION OF DEVIATION
Para. 4.2.2 Para. 4.2.3 Para. 4.2.4 Para. 4.2.5	Para. 9.5.1, Seal Test Fine Leak: The crystal units shall be subjected to MIL-STD-202, Method 112, Procedure Illa.