



**INTERNAL VISUAL INSPECTION OF QUARTZ**


**CRYSTAL UNITS**

**ESCC Basic Specification No. 2043501**

**ISSUE 1**

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**INTERNAL VISUAL INSPECTION OF QUARTZ**


**CRYSTAL UNITS**

**ESA/SCC Basic Specification No. 2043501**



**space components  
coordination group**

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**DOCUMENTATION CHANGE NOTICE**

Rev. Letter	Rev. Date	Reference	CHANGE Item	Approved DCR No.
'A'	Sept. '97	P1. Cover Page P2. DCN P5. Para. 3.4(p) P9. Figure VIII	: Existing text deleted and new text added : Lead eccentricity drawing deleted and new drawing added	None None 221407 221407

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**1. SCOPE**

This specification, to be read in conjunction with ESA/SCC Basic Specification No. 20400, 'Internal Visual Inspection', contains additional specific requirements for Quartz Crystal Units. They shall apply, where relevant, to each component inspected.

**2. GENERAL REQUIREMENTS****2.1 APPLICABILITY**

The following criteria may not be varied or modified after commencing any inspection stage. Any ambiguity or proposed minor deviation shall be referred to the Qualifying Space Agency for resolution and approval.

**2.2 PROCEDURE**

All components shall be submitted to examination immediately prior to sealing or encapsulation, or immediately after decapping, in an area where the standard of cleanliness is not less than that of the assembly area.

All items shall be examined in such a manner that a minimum of handling and movement of the component is involved.

**2.3 MAGNIFICATION**

All items shall be examined with a binocular or stereoscopic microscope under a magnification of X15 to X20.

**2.4 MOUNTING FIXTURES**

Suitable fixtures may be used to assist in the inspection process provided they do not of themselves cause damage to the device.



**3. DETAILED REQUIREMENTS****3.1 GENERAL**

A component shall be rejected if it exhibits one or more of the defects listed in any of the following paragraphs.

**3.2 QUARTZ ELEMENT DEFECTS**

(D = Quartz element diameter)

- (a) Cracked quartz element (see Figure I).
- (b) Quartz element with scratch(es), the total length of which is greater than D/3 (see Figure II).
- (c) Quartz element chipped more than 2% of total area (see Figure III).
- (d) Quartz element notched such that future cracks are possible (see Figure IV).
- (e) Chip with crack starting from it.
- (f) Scratches presenting one or more chips.
- (g) Scratch(es) starting or ending at quartz element periphery.
- (h) Non-detachable chip.
- (i) Chip on quartz element periphery greater than 1% of quartz element surface.
- (k) Incorrect cutting (see Figure V).

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### 3.3 METALLISATION DEFECTS


- (a) Reduction in metallisation greater than 10% of metallised surface (see Figure VI).
- (b) Scratches across metallisation.
- (c) Scratches on metallisation greater than one-third of the electrode's diameter.
- (d) Total pin-hole surface greater than 0.2mm<sup>2</sup> (a pin-hole is a hole whose surface is greater than or equal to 0.1mm<sup>2</sup>).
- (e) Bubbles and depressions.
- (f) Lifting of metallisation and peeling.
- (g) Oxidation.
- (h) Misalignment between the two metallised surfaces with 'd' greater than DE/5 (see Figure VII).
- (i) Foreign materials.

### 3.4 HEADER DEFECTS AND PRESENCE OF FOREIGN MATERIAL (SEE FIGURE VIII)

- (a) Any glass on the flange or side of the header.
- (b) Any quartz element or part of a quartz element on the flange or side of the header.
- (c) Gold or nickel plating showing evidence of blistering or flaking.
- (d) Any solder preform on the flange which still resembles a preform.
- (e) Posts bent more than 10 degrees.
- (f) Any metal shavings on the flange or side of the header longer than the width of the flange.
- (g) Bent or deformed header flanges.
- (h) Any metallic particle on top of the header which is larger than 25 microns and not firmly attached to the header.
- (i) Any non-metallic particle larger than 25 microns in the major dimension on top of the header or on the insulating glass between post and header.
- (j) Gold overlapping the seals.
- (k) Cracked or chipped glass seals.
- (l) Non-uniformity of finish or lead or post, particularly at the glass seal.
- (m) Nicks or bulges in the lead diameter outside stated lead tolerances.
- (n) Bubbles or an area of adjacent bubbles in the seal area larger than 12.5% of the seal area.
- (o) Foreign particles enclosed in the glass seal.
- (p) The minimum distance between the lead and the body shall be 0.13mm.
- (q) Lead tilted by more than 5 degrees.

### 3.5 ASSEMBLY DEFECTS

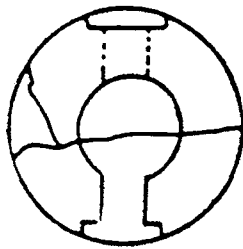
- (a) Crystal units with metal-plated quartz elements shall have intimate metal-to-metal continuity from lead to quartz element. Interference, friction, crimped or similar joining of parts, not reinforced by solder, welding, etc., shall not be acceptable (see Figure IX).

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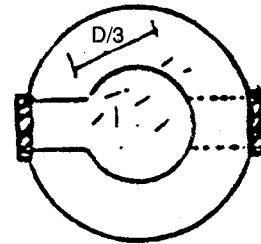
- (b) Eccentricity of quartz element with  $X_{\min}$  less than  $X_{\max}/2$  (see Figures X(a) and X(b)).
- (c) Quartz element not aligned to within  $10^\circ$  of normal horizontal plane of the header.
- (d) Internal leads not within  $10^\circ$  of vertical and not uniform in length and construction.
- (e) Improper weld position of internal leads to post (see Figure XI):
  - A - weld spot placed partially on internal lead.
  - B - overlap between lower edge of internal lead and top of post less than 1 post diameter or 1.0 mm, whichever is greater.



**FIGURE I - CRACKED QUARTZ ELEMENT**



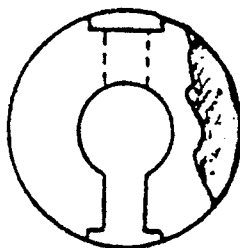
**FIGURE II - QUARTZ ELEMENT WITH SCRATCHES**



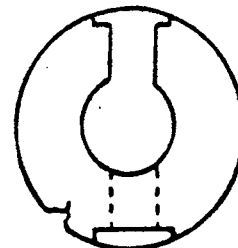
**NOTES**

1. Total length exceeding D/3.

**FIGURE III - QUARTZ ELEMENT CHIPPED MORE THAN 2% OF TOTAL AREA**

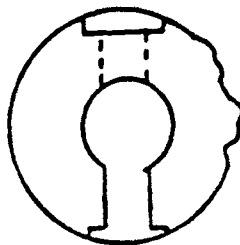


**FIGURE IV - QUARTZ ELEMENT NOTCHED SUCH THAT FUTURE CRACKS ARE POSSIBLE**

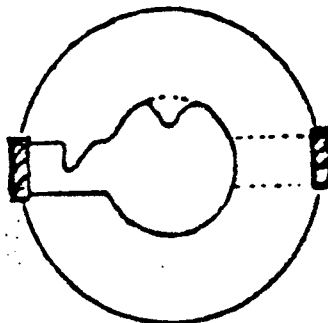




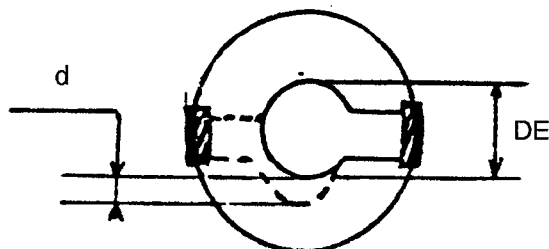
**FIGURE V - INCORRECT CUTTING**



**FIGURE VI - REDUCTION IN METALLISATION**

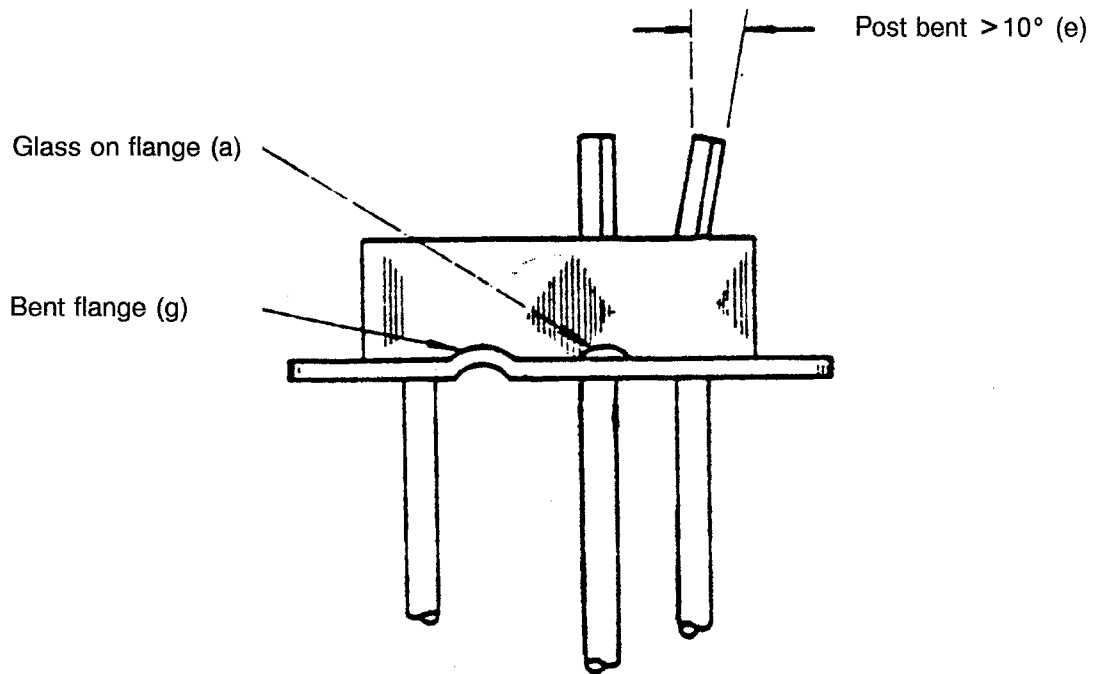


**FIGURE VII - MISALIGNMENT**



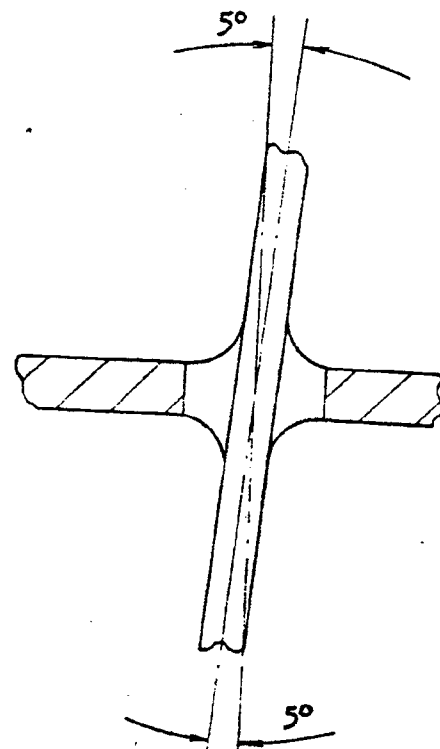
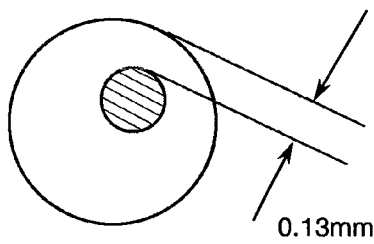


**FIGURE VIII - HEADER DEFECTS**



OFF-CENTRE LEADS (p)

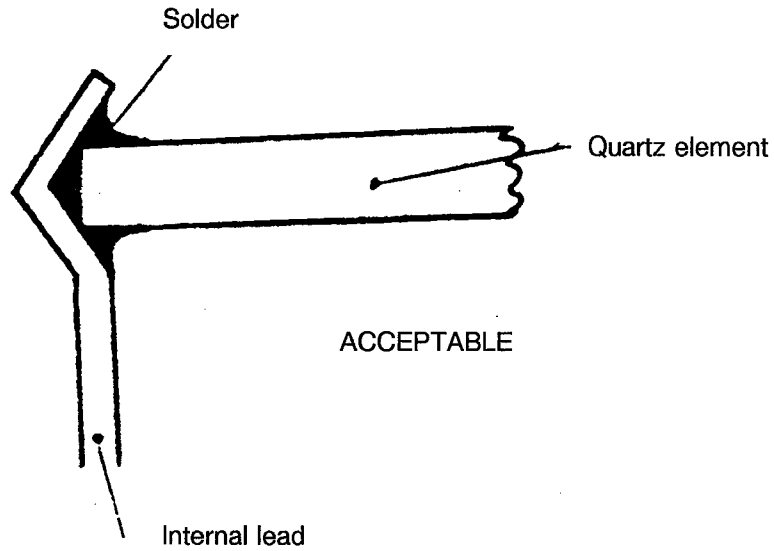
LEAD TILT (q)



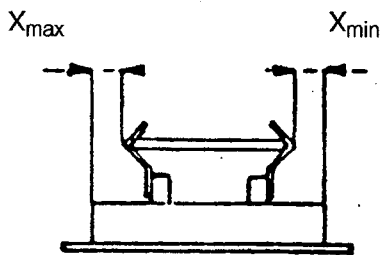
**NOTES**

1. References (a), (g), (p) and (q) relate to corresponding items of Para. 3.4.

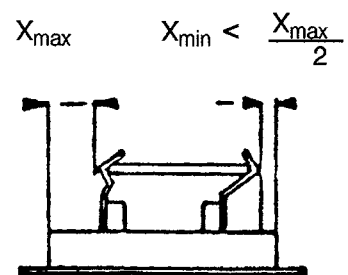
**FIGURE IX - INTERNAL LEAD TO QUARTZ ELEMENT JUNCTION**



**FIGURE X(a) - ACCEPTED**



**FIGURE X(b) - REJECTED**





**FIGURE XI - IMPROPER WELD POSITION**

