

REQUIREMENT 12

DETAILED REQUIREMENTS FOR QUARTZ CRYSTALS

12. General. This section describes detailed requirements for a DPA of commonly used quartz crystals. These requirements supplement the general requirements in section 4. Examples of typical configuration sketches are included. When applicable, specification numbers or types are referenced to assist in identification. Pre-DPA tests, such as functional tests and solderability tests, are assumed to have been satisfied by normal inspection and testing and are therefore not addressed.

12.1 Crystal units, quartz (MIL-PRF-3098). A typical crystal is shown on figure 12-1.

12.1.1 Method.

12.1.1.1 External visual. Visual inspection at 30X minimum magnification shall be conducted with the crystal being illuminated with a light source of at least 300 foot-candle intensity and a grazing angle of about 20 degrees. Units exhibiting one or more of the following anomalies shall be rejected.

- a. Adherent weld splatter exceeding 0.80 millimeters (.031 inches) dimension in any plane.
- b. Crack or holes in any welded joint.
- c. Indications of corrosion or discoloration on any metal surface.
- d. Any dents or protrusions into the case.
- e. Cracks, fractures, misalignments, or bends in case-to-lead or case-to-stud joints.

12.1.1.2 Hermeticity. Verify hermetic seal in accordance with the requirements of part specification.

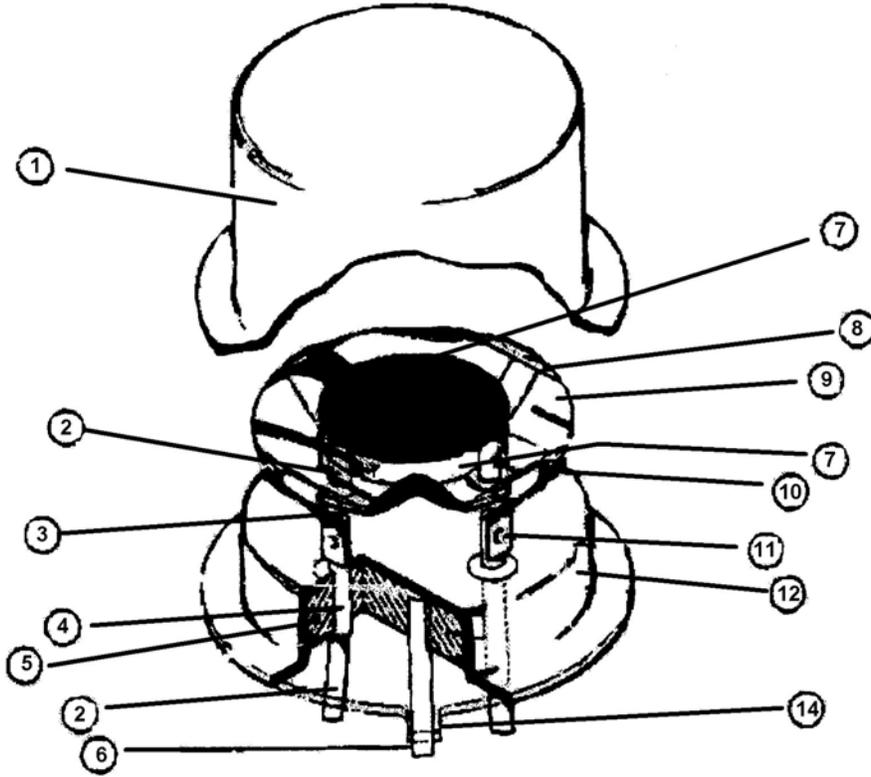
12.1.1.3 Radiographic examination. Perform radiographic examination on all samples in accordance with method 209 of MIL-STD-202.

12.1.1.4 Particle impact noise detection (PIND). Perform PIND testing on all samples in accordance with method 2020 of MIL-STD-883, condition A.

12.1.1.5 Internal water vapor testing/residual gas analysis (RGA). Perform internal water vapor /RGA testing in accordance with method 1018 of MIL-STD-883. The sample size for this testing will be one for QPL/QML devices and three for non-QPL devices with zero failures or five devices with a maximum of one failure (3/0, 5/1).

12.1.1.6 Sample preparation. During the process of opening the crystal enclosure, care must be exercised to assure that external liquid, gaseous, particulate, or other types of contamination do not enter the interior areas. Enclosures similar to the TO-5 type and other round-type quartz crystal holders; should be opened by using a special can opener device, designed specifically for that purpose. The TO-5 can opener device (also called Head Remover, Silicon) is commercially available. For other types of hermetically sealed, cold weld holders; a flat grinding wheel may be used to grind off the flange where the cover is joined by cold weld to the base. During each application of grinding the enclosure, precautions shall be taken to prevent penetration of the case. The grinding operation should only remove sufficient material to allow the can to be readily cut through with a sharp cutting instrument such as an Exacto knife blade. To avoid damage, the crystal enclosure and inner assembly should be firmly held by hand during each step of the opening procedure. Devices such as vises, clamps, pliers, or similar instruments should not be used. After completion of the grinding operation, and just prior to penetration or opening of the crystal enclosure, all external surfaces shall be cleaned to remove any particulate or other contaminants from the case. The hands and instruments used in the final opening step should also be thoroughly cleaned and free of any contaminants. The final opening step should be done over a clean white contaminant-free bench or paper surface.

12.1.1.7 Internal visual. All exposed inner surfaces of the device shall be examined at a minimum magnification of 30X and in accordance with the procedure in 12.1.1.1 for configuration compliance and existence of anomalies.



<u>ITEM</u>	<u>ITEM NAME</u>
1	Cover
2	Lead
3	Support
4	Lead
5	Glass Seal
6	Lead
7	Electrode
8	Fired Silver
9	Resonator (Quartz)
10	Bonding Cement
11	Weld
12	Base
14	Index Tab

FIGURE 12-1. Typical quartz crystal unit.

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12.1.2 Data records. DPA findings that deviate from the specified configuration or other requirements or exhibit anomalies shall be documented as defects.

12.1.3 Evaluation criteria. When the DPA is being conducted as a lot conformance test, the associated production lot shall be rejected if the DPA sample parts exhibit any of the following defects:

- a. Cracks or holes in the weld contact area where crystal support members are welded to the holder base terminal pins.
- b. Loose, distorted, or broken terminal pins or crystal mounting supports.
- c. Cracks or separation in silver-epoxy electrically conductive bonding cement between quartz crystal and support member.
- d. Fractures of any size in any location in the crystal quartz resonator, cracked or flaked edges, and fractures, cracks, peeling, or voids in electrodes.
- e. Loose weld spatter, bonding cement, extraneous epoxy, or other foreign matter found on the header, the crystal and support structure, or inside the cover.
- f. Less than 0.125 millimeters (.005 inches) clearance between the quartz crystal holder cover and the quartz crystal with its mounting support.
- g. Cracks or visible bubbles in glass headers.
- h. Chemical corrosion of any metallic surfaces in crystal can or associated support structure.
- i. Quartz crystal resonator not perpendicular or parallel to the base within the requirements of the procurement specification.
- j. Seal leakage in excess of specification requirements.
- k. Joining of packages by interface that reduces part reliability.
- l. Any surface, including cover, exhibiting contamination (adhering particulate, film, flux residue, or other type).
- m. Nonuniform quantities of bonding cement at mounting points or bonding cement in areas other than mounting points.
- n. Adhering weld splatter with a dimension exceeding 0.80 millimeters (.031 inches) through any plane. Weld splatter shall be considered adherent when it cannot be removed with a gas blow of dry oil-free nitrogen from a 150 kilopascal (22 psi) gauge pressure source.
- o. Base terminal and crystal mounting support exhibiting nicks, misalignment, cuts, cracks, or distortion.
- p. Quartz crystal not centered within  $\pm 0.80$  millimeters ( $\pm 0.031$  inches) in its mounting with respect to the quartz crystal holder base.
- q. Any other defect that reduces part reliability, such as evidence of peeling plateback metallization, voids, or missing metallization on either side of the crystal.