INCH-POUND

MIL-C-3098B
AMENDMENT 4
23 February 1994
SUPERSEDING
AMENDMENT 3
14 September 1988

MILITARY SPECIFICATION

CRYSTAL UNITS, QUARTZ,
GENERAL SPECIFICATION FOR

This amendment forms a part of MIL-C-3098B, dated 12 October 1979, and is approved for use by all Departments and Agencies of the Department of Defense.

PAGE 1

1.2.1, delete and substitute:

"1.2.1 Type designation. The type designation applies only to crystal units meeting all requirements of the specification. The type designation shall be in the following form, and as specified (see 3.1, 3.21, and 6.2).

CR	15	/U	1M000000
Component (1.2.1.1)	Number (1.2.1.2)	Basic indicator (1.2.1.3)	Specified frequency (1.2.1.4) "

1.2.1.2, third line: Delete ", or one or more digits followed by a letter, and is preceded by a hyphen; the letter indicates a modification of the basic type, e.g., 15B".

Following 1.2.1.3, add:

"1.2.1.4 Specified frequency. The specified frequency expressed in hertz is identified by eight characters, consisting of seven digits and a letter. The letter is used simultaneously as a decimal point and as a multiplier. For frequency values:

a. Greater than or equal to 1,000 hertz but less than 1 megahertz, the letter "K" is used to represent a decimal point.

b. Greater than or equal to 1 megahertz, the letter "M" is used to represent a decimal point.

All digits preceding and following the letter (K or M) of the group represent significant figures. The following are examples of using the eight characters in constructing the specified frequency:

Designation	Frequency
1K000000 to 9K999999	1 to 9.999999 kilohertz, inclusive
10K00000 to 99K99999	10 to 99.99999 kilohertz, inclusive
100K0000 to 999K9999	100 to 999.9999 kilohertz, inclusive
1M000000 to 9M999999	1 to 9.999999 megahertz, inclusive
10M00000 to 99M99999	10 to 99.99999 megahertz, inclusive
100M0000 to 999M9999	100 to 999.9999 megahertz, inclusive "

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* 2.1, SPECIFICATIONS, FEDERAL: Delete "QQ-S-781 - Strapping, Steel, Flat and Seals."

2.1, SPECIFICATIONS, MILITARY: Delete "MIL-C-45662 - Calibration System Requirements."

2.1, SPECIFICATIONS, MILITARY: Add "MIL-E-55585(CR) - Electronics Equipment and Parts, Packaging of."

* 2.1, STANDARDS, MILITARY: Delete "MIL-STD-105 - Sampling Procedures and Tables for Inspection by Attributes."

* 2.1, STANDARDS, MILITARY: Delete "MIL-STD-1188 - Commercial Packaging of Supplies and Equipment."

2.1, STANDARDS, MILITARY: Add "MIL-STD-45662 - Calibration Systems Requirements."

* Add the following new paragraphs:

"2.2 Other publications. The following documents form a part of this specification to the extent specified herein. Unless otherwise specified, the issues of the documents which are DOD adopted shall be those listed in the issue of the DODISS specified in the solicitation. Unless otherwise specified, the issues of documents not listed in the DODISS shall be the issue of the non-Government documents which is current on the date of the solicitation.

AMERCIAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM D 3951 - Commercial Packaging.

ASTM D 3953 - Strapping, Flat Steel and Seals.

(Applications for copies should be addressed to the American Society for Testing and Materials, 1916 Race Street, Philadelphia, PA 19103.)

ELECTRONIC INDUSTRIES ASSOCIATION (EIA)

EIA-512 - Standard Methods for Measurement of the Equivalent Electrical Parameters of Quartz Crystal Units, 1kHz to 1GHz.

(Application for copies should be addressed to the Electronic Industries Association, 2001 Eye Street, N.W., Washington, DC 20005.)

INTERNATIONAL ELECTROTECHNICAL COMMISSION (IEC)

IEC-444-1 - Measurement of Quartz Crystal Unit Parameters by Zero Phase Technique in π-Network. Part 1: Basic Method for the Measurement of Resonance Frequency and Resonance Resistance of Quartz Crystal Units by Zero Phase Technique in π-Network.

(Application for copies should be addressed to the American National Industries, 1430 Broadway, New York, NY 10018.)

(Non-Government standards and other publications are normally available from the organizations which prepare or which distribute the documents. These documents also may be available in or through libraries or other informational services.)

"2.3 Order of precedence. In the event of a conflict between the text of this specification and the references cited herein (except for associated detail specifications or specification sheets) the text of this specification shall take precedence. Nothing in this specification, however, shall supersede applicable laws and regulations unless a specific exemption has been obtained."

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* 3.4.1, last sentence, delete and substitute: "An alternative design, employing different construction features may be used only if prior approval is obtained from the qualifying activity."

PAGE 4

* Following 3.6.7, add:

"3.6.8 Tin plated finishes. Use of tin plating is prohibited as a final finish and as an undercoat effective 6 months from the date of this specification (see 6.10). Use of tin-lead (Sn-Pb) finishes are acceptable provided that the minimum lead content is 3 percent."

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Following 3.13.2, add:

"3.13.3 Method III (fundamental mode or overtone units) (when specified). When tested as specified in 4.9.9.3, all unwanted modes shall have a resistance that exceeds two times the main mode resistance but is not less than the specified main mode resistance value (see 3.1)."

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* 3.21, delete and substitute:

"3.21 Marking. The type designation, including specified frequency, and manufacturer's identification shall be marked on the crystal unit in accordance with method I of MIL-STD-1285. The marking shall be located on the largest visible surface of the crystal unit. The type designation specified in 1.2.1 shall not be marked on any crystal unit for which the contractual requirements shall be considered a deviation. Crystal units shall also be marked with the year and week of the final test in accordance with MIL-STD-1285. The manufacturer's designated symbol or CAGE code shall be as listed in NAVSHIPS 0967-190-4010 or Cataloging Handbook H4/H8 (see 6.9). Unless otherwise specified (see 6.2), no other marking shall be permitted on the crystal unit. The type designation, frequency, and manufacturer's code designation characters shall be not less than 1/16 inch in height (3/64 inch on HC-35/U, HC-44/U, and HC-45/U) located symmetrically with respect to the center axis of the crystal holder."

4.1.1, fifth line: Delete "MIL-C-45662" and substitute "MIL-STD-45662".

4.1.1.1, delete and substitute:

"4.1.1.1 Contractor's equivalent test set. The contractor's equivalent test set shall be furnished by the contractor, and shall be used for the performance of quality conformance inspection. It is not a requirement that the equivalent test set be identical to the reference standard test set only that the frequency and resistance be correlated prior to performing quality conformance inspection (see 4.1.1.1.1 and 4.1.1.1.2). The contractor's equivalent test set must be set to operate at the same drive current as the reference standard test set during correlation. In addition, the contractor's equivalent test set shall be designed to permit remote connections to the crystal unit since it is not intended that the test set be subjected to the ambient temperature range specified for the crystal unit."

4.1.1.1.1, delete and substitute:

"4.1.1.1.1 Frequency correlation. The frequency of a given crystal unit measured in the contractor's equivalent test set (see 4.1.1.1), shall be within 0.0005 percent (5 ppm) of the frequency (see 3.1) measured in the reference standard test set (see 4.1.2.1)."

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* 4.1.2.1 and 4.1.2.1.1, delete and substitute:

"4.1.2.1 Reference standard test sets. The reference standard test set shall be furnished by the contractor. The reference standard test set shall conform to IEC-444 or be correlatable to EIA-512. The contractor is responsible for certifying to the qualifying agency that the reference standard test set conforms to the appropriate standard (see 4.1.2.1.1). To insure continuity of supply, all Government standard test sets in use on the effective date of amendment 3 will be accepted as a reference standard test set for a period of 2 years from that date. The reference standard test set shall be used to check the characteristics and accuracy of the contractor's equivalent test set.

"4.1.2.1.1 Certification of reference standard test sets. Certification of compliance with IEC-444 or EIA-512 shall consist of the following:

a. Functional diagram of the contractor's system showing interconnections, equipment manufacturer, and model designations.

b. Flow charts and descriptions of all software modules used in the control of equipment and estimation of parameter values.

c. Flow charts and descriptions of instrument calibration and error correction routines.

d. Traceability documentation for test fixtures and reference impedance devices required for the calibration, verification, and use of the standard test set."

* TABLE I, Materials inspection, change "3.3.1" to "3.4.2".

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* TABLE III, Group A inspection, delete last two columns under, "AQL (percent defective)".

* 4.8.1.3.1, delete and substitute:

"4.8.1.3.1 Sampling plan. A sample of parts shall be randomly selected from each inspection lot in accordance with table IIIa. If one or more defects are found, the lot shall be rescreened and defects removed. After screening and removal of defects, a new sample of parts shall be randomly selected in accordance with table IIIa. If one or more defects are found in the second sample, the lot shall be rejected and shall not be supplied to this specification. When the lot, as defined in 4.8.1.2, consists of less than 90 units, two or more such lots may be combined into grand lots whose size does not exceed 90 units. The grand lots may contain inspection lots from different groups. The sample selected from those grand lots shall be, to the greatest extent possible, representative of the lead crystal types in all component lots commensurate with random sampling techniques. There shall be a minimum of one type from each group and the choice of samples shall be proportional."

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* After 4.8.1.3.1, add table IIIa as follows:

* " TABLE IIIa. Group A, zero defect sampling plan.

Lot Size	Sample Size
1 to 13	100 percent
14 to 150	13
151 to 280	20
281 to 500	29
501 to 1,200	34
1,201 to 3,200	42
3,201 to 10,000	50
10,001 to 35,000	60
35,001 to 150,000	74
150,001 to 500,000	90
500,001 and over	102

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* 4.8.1.3.2, delete in its entirety.

* 4.8.1.3.3, change paragraph number to "4.8.1.3.2".

* 4.8.2.1, at the end of the paragraph add: "The sample shall be representative of the lot with respect to crystal unit types and frequency distribution, containing as far as practicable, proportions equivalent to those of the lot."

* TABLE IV, Group B inspection, delete last two columns under, "AQL (percent defective)".

* 4.8.2.1.1, delete in its entirety.

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4.8.2.1.2, delete and substitute:

"4.8.2.1.2 Disposition of sample units. Sample units which have been subjected to subgroup 2 inspection may be delivered on the contract, prior to completion of subgroup 1 inspection. Sample units which have been subjected to subgroup 1 inspection shall not be delivered on the contract."

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* TABLE V, title, delete and substitute: "Defects for visual and mechanical inspection (external)."

* TABLE V, delete last column titled "Defect classification".

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* TABLE VI, delete footnote 1/ in its entirety.

4.9.6, paragraph title, delete and substitute: "Reduced drive level (overtone units, and when specified, fundamental units, see 3.1 or 4.9.6.3) (see 3.10)."

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Following 4.9.6.2, add:

"4.9.6.3 Drive sensitivity (of frequency and resistance) (see 3.10). The crystal units shall be conditioned at a temperature of at least 125°C for a duration of at least 1 hour. After conditioning, the units shall be stored at room temperature for 3 to 6 hours. Measurement of the resonant frequency and resistance shall be made at no fewer than 4 drive levels between 5 microamperes or less and the rated drive level using the contractor's equivalent test set. The levels shall be chosen at nominally equal intervals on a logarithmic scale. The sequence of measurements shall be from lowest drive current to highest drive current. The crystal unit shall not have been operated from the beginning of the conditioning period to the start of the frequency and resistance measurements at the lowest drive level."

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Following 4.9.9.2, add:

"4.9.9.3 Method III (fundamental mode or overtone unit) (see 3.15.3). The resistance of any unwanted mode in the frequency range of ±20 percent around the specified frequency (see 1.2.1.4) shall be measured in the same manner as the desired mode (see 4.9.1)."

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5.2, delete and substitute:

"5.2 Packing. Packing shall be level A, B, or C, or as specified (see 6.2). For the U.S. Army Communications-Electronics Command (CR), packing shall be in accordance with MIL-E-55585(CR)."

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* 5.4.3.2 and 5.4.3.3, delete "QQ-S-781, type I, finish A" and substitute with, "ASTM D 3953".

* 5.4.3.4, delete "MIL-STD-1188" and substitute "ASTM D 3951".

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6.9, delete and substitute:

"6.9 Manufacturer's code. Manufacturer's code is listed in publication NAVSHIPS 0967-190-4010, "Manufacturer's Designating Symbol" or Cataloging Handbook H4/H8, "Commercial and Government Entity (CAGE)". All requests for these publications should be directed to the Commanding Officer, Naval Publications and Forms Center, 5801 Tabor Avenue, Philadelphia, PA 19120."

* 6.10, delete and substitute:

"6.10 Tin plated finishes. Tin plating is prohibited (see 3.6.8) since it may result in tin whisker growth. Tin whisker growth could adversely affect the operation of electronic equipment systems. For additional information on this matter, refer to ASTM B545 (Standard Specification for Electrodeposited Coating of Tin).

"6.11 Subject term (keyword) listing.

Crystal blank
Crystal holder
Quartz crystal
Quartz resonator"

"6.12 Changes from previous issue. Marginal notations are not used in this revision to identify changes with respect to the previous issue due to the extensiveness of the changes. "

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CONCLUDING MATERIAL

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Army - ER
Navy - EC
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Review activities:
Army - AR, MI, SM
Navy - AS, CG, MC, OS, SH
Air Force - 17, 19, 99
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Preparing activity:
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