

INCH-POUND

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SUPERSEDING

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COMMERCIAL ITEM DESCRIPTION

TEST SET, ULTRASONIC

The General Services Administration has authorized the use of this commercial item description for all federal agencies.

1. **SCOPE.** This commercial item description (CID) covers the minimum performance and technical requirements for a portable test set, ultrasonic (instrument) for nondestructive flaw testing and thickness gauging of metallic and nonmetallic materials suitable for nondestructive inspection (ndi) use in a military industrial maintenance environment, which may be at fixed military bases, deployed to austere forward operating locations, or naval vessels afloat.

2. **CLASSIFICATION.**

There are two types of ultrasonic flaw detectors.

Type 1 Basic test set kit with cases, charger, and accessories.

Type 2 Type 1 kit with transducers.

3. **SALIENT CHARACTERISTICS.**

3.1 **General.** The test set shall provide field and depot level nondestructive inspection technicians with a rugged, portable and reliable means for performing ultrasonic inspections for crack detection, corrosion testing, and thickness testing. The test set shall be capable of performing pulse-echo, through-transmission, and pitch-catch modes of ultrasonic inspections, using typical ultrasonic transducers found in general use. Particular emphasis shall be given to design features that maximize reliability, maintainability, and ease of use.

3.2 **Conformance inspection.** When specified, a sample shall be subjected to conformance inspection in accordance with [5.3](#).

3.3 **Pulser.** The test set shall have a spike and square wave pulser, with a minimum range of 150 V to 300 V peak pulse into a 100 ohm load.

3.3.1 **Pulse width.** The pulser shall generate the required amplitude pulse over an adjustable range of at least 30 nS to 1000 nS as measured at the half power (50 percent amplitude) points. The test set shall display the value of this parameter within 10 percent of its actual value, or 10 nS whichever is larger. Step size requirements are 10 nS minimum.

3.3.2 **Pulse repetition frequency.** Ranged from at least 50 to 2000 Hz automatically coupled to the display and gates or freely adjustable.

Beneficial comments, recommendations, additions, deletions, clarifications, etc. and any data that may improve this document should be sent to: AFLCMC/EZSS, 2145 Monahan Way, Area B, Bldg 28, Wright-Patterson AFB, OH 45433 or emailed to ENGINEERING.STANDARDS@US.AF.MIL. Since contact information can change, you may want to verify the currency of this address information using the ASSIST Online database at <https://assist.dla.mil/>.

- 3.3.3 Modes of operation. The pulser modes of operation are pulse-echo, through-transmission, and pitch-catch, which are user selectable.
- 3.4 Receiver.
- 3.4.1 Gain. Adjustable from 0 to 100 dB, minimum, in steps selectable between 0.1/0.5/1.0/2.0/6.0 and programmable from 2 to 12 dB minimum in 0.5dB steps.
- 3.4.2 Damping. The receiver shall have adjustable damping levels from at least 50 to 400 ohms.
- 3.4.3 Tuning and filtering. The receiver shall have narrow band filter selections encompassing frequencies at 0.5, 1, 2.25, 5, 10, and 15 MHz. It shall have wide band filter and high pass filter selections.
- 3.4.4 Horizontal linearity. The test set horizontal linearity shall be no greater than +0.5 percent full screen width.
- 3.4.5 Vertical linearity. The test set vertical linearity shall be no greater than 0.5 percent full screen height with an amplifier accuracy of ± 1 percent.
- 3.4.6 A-scan. The A-scan shall be displayed in one of the following user selectable modes: radio frequency (RF), full wave rectified, half wave positive, and half wave negative.
- 3.5 Gates. A minimum of two independent gates, one of which may act as an interface start gate, adjustable from 10 to 90 percent of the full screen height and fully adjustable in the displayed range. Each gate shall have positive and negative triggering. Triggering may also engage a light, high pitch sound, or both, and a TTL output signal for an external device.
- 3.6 Measurement. The test set shall provide numeric values of amplitude, thickness, time-of-flight, and sound path as a minimum.
- 3.6.1 Available gate values. These values shall be available from each gate, excluding interface gate, user selectable, and identified by gate and reading value.
- 3.6.2 Selectable values. At least two values from each gate shall be user selectable and available while the A-scan is visible.
- 3.6.3 Derived values. Values shall be derived from the signal zero crossing or peak amplitude, user selectable.
- 3.6.4 Thickness measurement resolution. The resolution of the thickness readings shall be a maximum 0.001 inch. An automatic calibration of thickness using two user input values shall be incorporated. Thickness readings shall be selectable from at least initial pulse (IP) to gate 1 and gate 1 to gate 2.
- 3.6.5 Distance amplitude correction. The test set shall have a distance amplitude correction (DAC) programmable feature. At least eight calibration points shall be available and the resultant curve displayed on the test set display.
- 3.7 Display. The test set shall have a color display with a minimum resolution of VGA (640 x 480 pixels) and vertical and horizontal dimensions of at least 3.40 inches.
- 3.7.1 Display brightness. The display shall be easily seen, both in bright light, (500 or greater foot-candles) or low light (10 or less foot-candles) conditions.
- 3.7.2 Brightness adjustment. The brightness level shall be adjustable.
- 3.7.3 Refresh rate. The refresh rate shall be a minimum of 60 Hertz.
- 3.7.4 Display type. The display shall be A-scan type display, with signal freeze, and peak hold.
- 3.7.5 Comparative display. Stored frames and active frame can be displayed simultaneously for comparative purpose.
- 3.7.6 Display correlation. The test set display shall provide a one-to-one correlation between the signal displayed and the actual ultrasonic test signal. The display rate may be less than the inspection repetition rate

provided the complete ultrasonic signal is generated and processed, and the flaw alarm operates at the specified inspection rate, and not at the display rate.

3.7.7 Display grid. The A-scan shall be displayed, as minimum, in a 10x10 grid with rectified signals displayed by user selection, as an outline trace or filled solid.

3.7.8 Grid area. The A-scan grid shall be displayed on at least 50 percent of the available screen area, or the entire screen area, user selectable.

3.7.9 Display freeze feature. The test set shall have a feature to freeze/unfreeze the live A-scan.

3.7.10 Range. The display start range shall be capable of receiving signals from 0 to 200 inches of aluminum.

3.7.11 Delay. The display delay range shall be from at least 0 to 400 inches of aluminum.

3.7.12 Zero offset/Delay. A zero offset or delay shall be adjustable from 0 to 700 microseconds, minimum.

3.7.13 Velocity. Material velocity shall be adjustable from at least 25,000 to 600,000 inches per second.

3.8 Memory. The test set shall contain sufficient internal or external memory, or both, for the following.

3.8.1 Store and recall option. The test set shall be able to store and recall a minimum of 100 calibration configurations, alphanumerically.

3.8.2 Store and recall format. The test set shall be able to store and recall a minimum of 50 A-scan images with instrument parameters. The images shall be exportable in a common image (i.e., PNG, JPEG, or TIFF) format, or PDF to an external storage device. If required, software shall be supplied to export images.

3.8.3 Real-time data storage. The test set shall be able to store and recall a minimum of 30 seconds of real-time A-scan screen data with instrument parameters.

3.8.4 Default settings. The test set shall have a means to load default settings upon powering the test set, or user selectable from a menu selection. Minimum default setting shall include:

- a. Gain – 30 dB
- b. Range – 5 inch
- c. Gates – All off
- d. Velocity – 0.25 inch per microsecond
- e. Frequency – 5 MHz
- f. Damping – 50 ohm
- g. Delay – 0
- h. Pulser – Square
- i. Zero/Probe delay - 0
- j. Mode – Pulse echo
- k. Rectification – Negative half wave
- l. Screen – 10 by 10 grid

3.9 External connections. The test set shall accommodate the following external connections.

3.9.1 Transducer. The test set shall incorporate two BNC connectors. One shall be used for transmit or transmit/receive, and the other for receive mode.

3.9.2 Computer interface. A minimum of either USB or secure digital (SD)/compact flash card.

3.9.3 Gate alarm output. Each gate shall have an independent output.

3.9.4 VGA display output. The test set shall have a video output of the test set display and supplied with cable.

3.9.5 Printer output. The test set shall be capable of printing screen presentations and test procedures. This may be accomplished either directly to a USB printer, or through a Microsoft Windows (10 or later version) compatible computer, with supplied software.

3.10 Wireless communication. Wireless communication capabilities shall be hardware and/or software

disabled at the factory and a certificate of compliance provided with each test set unless otherwise specified in the contract.

3.11 Power requirements. The test set shall operate on 100-250 Volt Alternating Current – 50 or 60 Hertz, automatically selected and connected directly, through a means of a battery charger. The test set shall also operate on batteries/battery pack(s) as described below.

3.11.1 Battery charger. The test set shall be supplied with a separate battery charger that is able to charge the batteries/battery pack(s), and provide power to operate the test set, and charge the installed batteries/battery pack.

3.11.2 Battery duration. The cells in the rechargeable battery pack(s) shall not have a charge “memory” limitation (that causes the test set to operate for less than the specified time), and shall provide at least 6 hours of continuous use without display backlighting (if equipped) at 68 degrees Fahrenheit. The test set must incorporate a visible means of indicating the charge condition of the battery pack(s), and shall provide a low battery warning.

3.11.3 Batteries. A minimum of two complete sets of batteries/battery pack(s) shall be provided.

3.11.4 Battery charging. The batteries shall be easily rechargeable without tools and require no longer than 4 hours to charge from 50 to 100 percent capacity, no more than 8 hours for a complete charge.

3.11.5 Battery replacement. The test set shall be capable of 24 hour per day, 7 day per week, operation by swapping rechargeable battery packs. The user shall be able to swap the battery packs without tools and within 90 seconds. If the battery packs are a proprietary design, the government shall acquire the design specifications and a limited license for manufacture after contract expiration.

3.11.6 Battery safety. The test set shall incorporate Underwriter Laboratories (UL) or equivalent certified batteries.

3.11.7 Air transport. The extra sets of batteries/battery pack shall have a protective case to permit airline transport (see <http://www.faa.gov/> for additional information).

3.12 Test set support. The test set shall be equipped with high impact supports (e.g., feet, legs, pads, rails, etc.) on the bottom surface normally in direct contact with the supporting surface. The supports shall be fabricated from a material that will not scratch or mar aircraft surfaces yet will provide sufficient friction to prevent the test set from slipping off a bare aluminum, as rolled, surface tilted 20° from horizontal. The supports shall be securely fastened to the test set to preclude loosening or detachment during field operations. An adjustable support shall be incorporated to allow tilting adjustment of the test set to a least 45 degrees from vertical.

3.13 Controls/menu structure. All controls used to adjust the inspection parameters shall be menu driven with regard to function and values of adjustment, not to exceed two sub-menu level and must be operable with gloved hands.

3.13.1 Language and units. Control functions shall be available in the English language and inch-pound units.

3.14 Dimensions. The test set shall be a maximum 12 inches high, 12 inches in width, 6.5 inches deep.

3.15 Weight. The weight of the test set shall be a maximum of 8 pounds with battery pack.

3.16 Protective carry cases. The test set shall include soft-shell and hard-shell carrying cases. The soft shell case shall be ergonomically designed and protect the test set from damage during use while still allowing access to all external connections and have appropriate hand/neck straps to help prevent accidental loss. The hard-shell case shall be suitable for storing and shipping the test set with accessories. If the hard-shell case with test set and accessories weighs in excess of 25 pounds, the hard shell-case shall include rollers and collapsible handle typically found on luggage. The hard-shell case size and total weight shall be limited to airline checked baggage restrictions of 50 pounds and dimensions of 62 total inches (length plus width plus height). The cases shall be designed to protect the test set from an 18 inch drop in soft case and a 36 inch drop in the hard case. A soft-shell

case may be excluded if the test set has features equivalent to the damage prevention features mentioned. Hand/neck straps will be included if not integral to the test set.

3.17 Transducers. The following transducers, wedges and cables shall be provided in Type 2 kits. Transducers shall have microdot connectors. Straight beam transducers shall have side connector. Angle beam transducers and wedges shall be screw in and miniature style.

- a. 1 Straight Beam Transducer, 0.5MHz, 0.5 inch
- b. 1 Straight Beam Transducer, 1MHz, 0.5 inch
- c. 1 Straight Beam Transducer, 2.25MHz, 0.5 inch
- d. 1 Straight Beam Transducer, 5MHz, 0.5 inch
- e. 1 Straight Beam Transducer, 10MHz, 0.5 inch
- f. 3 Delay Line Transducer, 15MHz, 0.25 inch with delay line
- g. 2 Angle Beam Transducer, 2.25MHz, 0.25 inch
- h. 2 Angle Beam Transducer, 5MHz, 0.25 inch
- i. 2 Angle Beam Transducer, 10MHz, 0.25 inch
- j. 2 Wedge, 30 Degrees in Steel
- k. 2 Wedge, 45 Degrees in Steel
- l. 2 Wedge, 60 Degrees in Steel
- m. 2 Wedge, 70 Degrees in Steel
- n. 2 Wedge, 30 Degrees in Aluminum
- o. 2 Wedge, 45 Degrees in Aluminum
- p. 2 Wedge, 60 Degrees in Aluminum
- q. 2 Wedge, 70 Degrees in Aluminum
- r. 2 BNC to Microdot Cables, 6 feet

3.18 Environmental conditions. The test set shall be operable in the following environmental conditions.

3.18.1 Operating conditions. The test set and accessories shall perform to the specification in this CID throughout temperatures from 15 to 120 °F at up to 90 percent relative humidity and from sea level to 5280 feet above sea level. For use below 50 °F, the test set shall start at an ambient temperature of 50 °F, and then shall operate on battery power for a minimum of 30 minutes at temperatures of 15 to 32 °F, and similarly for a minimum of 60 minutes at temperatures from 32 to 50 °F.

3.18.2 Storage conditions. The test set and accessories shall perform to the specifications in this CID following a 7-day exposure to temperatures from 0 to 150 °F at up to 95 percent relative humidity with the test set in shipping cases.

3.18.3 Explosive atmospheres. The test set shall be tested and certified by a reputable laboratory for safe use, while operating on batteries, in an explosive atmosphere as defined by Class 1, Division 2, Group D, in the National Fire Protection Association 70 Chapter 5, Article 500. The testing method shall be in accordance with MIL-STD-810, Method 511.7, Explosive Atmosphere, Procedure I, using a standard common longitudinal wave probe and cable attached, in a typical operating condition.

3.18.4 Ingress protection (IP) rating. The test set shall have a minimum IP65 rating.

3.18.5 Drop test. The test set shall meet MIL-STD-810 Transit Drop Test, Method 516.8, Procedure IV.

3.18.6 Vibration test. The test set shall meet MIL-STD-810, Method 514.8, Annex C, Table 514.8C-IX General Exposure, 1 hour each axis, test set outside case and powered.

3.18.7 Shock test. The test set shall meet MIL-STD-810, Method 516.8, Procedure I Functional Shock Test, half-sine at 15G, 11ms with six positive/negative shocks per axis, with the test set outside the case and powered.

NOTE: Equipment certified to earlier versions of MIL-STD-810 may be acceptable upon review by a Government official.

3.19 Calibration. The test set shall be user calibrated without the need for manufacturer's periodic calibration.

No factory recalibration decals shall be applied to the test set.

3.20 Software/Firmware revisions. Software/firmware revisions shall be user installable from a Microsoft Windows-based (10 or later versions) personal computer, and from an external memory device such as a USB drive or compact flash drive. All software revisions made during the life of the contract shall be included at no additional charge. A copy of revisions, and any necessary executable software, released during the life of the contract shall be provided to AFLCMC/EZPT, 5295 Warehouse Road, Bldg 2211; Room 1, Tinker AFB, OK 73145, or as specified in the solicitation or contract, to ensure proper configuration management.

3.21 Manual. One copy, printed and on CD/DVD of the commercial operation and maintenance instructions, including calibration procedures and adjustments, as applicable, following MIL-PRF-32216 shall be shipped with each item. The documentation shall include information for battery safety and known environmental restrictions on battery disposal. The manual shall provide instructions for the users to replace the internal battery for clock and memory functions.

3.22 Warranty. A minimum one-year warranty, to include parts, labor, and two-way shipping, shall be included against manufacturing defects.

3.23 Foreign object damage. The test set shall be designed to prevent loss of components, which could generate foreign object damage to weapon systems or engines.

4 REGULATORY REQUIREMENTS.

4.1 Recoverable materials. The offeror/contractor is encouraged to use recovered materials to the maximum extent practical, in accordance with paragraph 23.403 of the Federal Acquisition Regulation (FAR).

4.2 Metric products. Products manufactured to metric dimensions will be considered on an equal basis with those manufactured using inch-pounds test sets, provided they fall within specified tolerances using conversion tables contained in the latest revision of FED-STD-376, and all other requirements of this CID are met. If a product is manufactured to metric dimensions and those dimensions exceed tolerances specified in the inch-pound test sets, a request should be made to the contracting officer to determine if the product is acceptable. The contracting officer has the option of accepting or rejecting the product.

5. QUALITY ASSURANCE PROVISIONS.

5.1 Product conformance. The products provided shall meet the salient characteristics of this CID, conform to the producer's own drawings, specification, standards, and quality assurance practices, and be the same product offered for sale in the commercial market. The government reserves the right to require proof of such conformance.

5.2 Market acceptance. The following market acceptance criteria are necessary to document the quality, reliability and supportability of the product to be provided under this CID: (1) The company producing the item must have been producing ultrasonic flaw detectors for at least the past 3 years; (2) The company must have sold the basic commercial test set in the industrial market for a minimum of 2 years; (3) The company must have sold at least 100 test sets similar to the test set being offered, with no major defects within the last year. A major defect is a defect, which affects the performance of the test set and requires an engineering change to the test set's original configuration in order for the test set to perform the requirements of this CID; and (4) the test set shall be at least 50 percent repairable in the continental US with an average repair time of two weeks or less. A list of authorized repair centers shall be supplied with the offer.

5.3 Conformance inspection. A production article shall be tested to conform to paragraph 3. Specifications not readily measurable can be verified by manufacturers' certified documentation or independent third-party compliance documentation. Conformance inspection may be performed by a Government official, Government authorized contractor, or independent agent.

6. PACKAGING. Preservation, packaging, and marking shall as be specified in the contract or order.

7. NOTES.

7.1 Procurement data. The procuring activity should specify the preferred options permitted herein and include the following information in procurement documents:

7.1.1 Title. Title, number, and date of this CID.

7.1.2. Packaging requirements. Specify special packaging requirements.

7.1.3. Certification. The certification of commercial item prior to first contract delivery.

7.2 National Stock Number(s). The following is a list of NSNs assigned that correspond to prior versions of this CID. The list may not be indicative of all possible NSNs associated with the CID.

NSN	Class	Part Number	CAGE Code
6635-01-363-6674	Type 2	A-A-58073	81348

7.3 Sources of documents.

7.3.1 ASSIST. Copies of government documents are available online at <https://quicksearch.dla.mil>.

7.3.2 Federal Acquisition Regulations (FAR). Copies of the Federal Acquisition Regulations documents are available online at <https://acquisition.gov/far/index.html>.

7.3.3 Federal Standards. <https://fedspecs.gsa.gov/>.

7.3.4 National Fire Protection Association documents. Copies of NFPA document are available online at <http://www.nfpa.org>.

7.4 Subject term (Key word) listing.

Pulser

Flaw detection

Thickness testing

MILITARY INTEREST

Custodian:

Air Force – 184

Review Activities

DLA – GS

Preparing activity:

Air Force – 184

Agent:

Air Force – 110

(Project number: 6635-2020-003)

NOTE: The activities listed above were interested in this document as of the date of this document. Since organizations and responsibilities can change, you should verify the currency of the information above using the ASSIST Online database at <https://assist.dla.mil/>.