

Technical specification for Supply, commissioning of Phased Array Ultrasonic testing (PAUT) equipment as per standard ISO 18563(latest) and relevant accessories with ISO 9712 PAUT weld training & certification.

1. Scope: The Phased array ultrasonic testing (PAUT) equipment (supply Quantity: one number) shall comply to standard EN ISO-18563 (latest). The PAUT equipment shall be capable of detecting the defects in the weld structure of thickness from 2 mm to 40 mm. The equipment shall be such that it can be operated in Pulse-Echo mode, as well as in (multi- element) Phased Array Mode to detect defects in weld, cast and forged components. The PAUT equipment shall be supplied along with encoder, probes and accessories as per the following technical specification.

2. Technical Specification:

S. NO.	Parameter	Requirement
2.1	Phased Array Configuration	
2.1.1	32:128 elements or better with minimum 2 channels for pitch catch mode and additional 2 channels for pulse echo mode	
2.1.2	Minimum No. of active aperture:	32
2.1.3	Total No. of channels:	128
2.1.4	Compatible phased array probes:	Linear, dual linear, Dual Matrix Array (DMA) and dual linear array (DLA probes).
2.1.5	Focusing Mode:	True Depth Projection & Sound Path
2.1.6	Inspection mode	Phased array, pulse echo, Dual, Pitch catch, TOFD, TFM
2.2	Pulser specifications	
2.2.1	No. of independent pulsers:	32
2.2.2	Input Impedance:	60 Ω or less
2.2.3	Pulse Type	Negative square pulse, width: 30ns to 1000ns, resolution 2.5ns, fall time <10ns
2.2.4	Pulse Voltage:	Pulser voltage: 40 V to 115 V or better for PA channel 100 V to 295 V or better for UT channel
2.2.5	Pulse Repetition Frequency (PRF):	20 KHz or better Pulser should be able to fire transducer in the frequency range of 0.5 to 18 MHz or better
2.3	Receiver Specifications	
2.3.1	Number of independent receiver channels.	128
2.3.2	Bandwidth:	For PAUT 0.4 to 20MHz or better, For conventional UT 0.25 to 28 MHz or better
2.3.3	Gain	Upto 120 dB (0.1 dB step)
2.3.4	Wave form	Rectification: HW, FW, RF RF waveform (un-rectified should be available)
2.4	Digitizer Specifications	
2.4.1	Sampling Frequency	Max Sampling frequency 100 MHz
2.4.2	Digitization Resolution	16 bit amplitude resolution
2.4.3	Signal Types	RF Rectified and Envelope

2.4.4	PRF	Upto 20 KHz
2.4.5	Scan type	Single, linear, sectorial, compound, pitch & catch PAUT and TFM, A Scan, B Scan, C-Scan, D-Scan, Echo dynamics, Top View, Side view and merged B scan view are required
2.4.6	Scan plan	On board scan plan for UT, PAUT and TFM/FMC
2.5	Onboard Data Acquisition Equipment Software Features	
2.5.1	Onboard Focal law calculation on plate, cylinder, T&Y Nozzle	
2.5.2	Maximum 8 groups for the PAUT or TOFD and Maximum 4 groups for the TFM or PCI Groups	
2.5.3	Number of Focal laws 1024 or better (512 maximum per group)	
2.5.4	Support for linear & dual matrix probes	
2.5.5	Electronic Focusing, Electronics Scanning, Sectorial Scanning	
2.5.6	Remote Control and data transfer through Ethernet & Wi-Fi with GPS	
2.5.7	Acquisition files/data files should be readable in NDT simulation software	
2.5.8	Part & Weld overlay	On-board focal law calculator on plates, pipes, fillet welds, nozzles
2.5.9	Amplitude Range	Greater than or equal to 800%
2.5.10	Delay Range Transmission	0 μ s to 10 μ s in 2.5 ns increments
2.5.11	Delay Range Reception	0 μ s to 6.4 μ s in 2.5 ns increments
2.6	User Interface or I/O	
2.6.1	Number of USB (Type 2.0/3.0)	Minimum of 3 Nos with at least one USB 3.0
2.6.2	Number of Ethernet ports	01 no. minimum.
2.6.3	Display Size	Greater than or equal to 10 inch and minimum 1280 x 768 pixels
2.6.4	Display Type	TFT/LCD with resistive Touch Screen
2.6.5	Number of encoder input	2-axis encoder line (quadrature or clock/direction), 3rd encoder ready. Encoder type to be selected in the system
2.6.6	Internal Memory	1 TB Minimum. USB External memory drive capacity of 128 GB to be provided with SDHC/SDXC card
2.6.7	TTL I/O	Minimum 6 Nos.
2.6.8	Video output port	HDMI
2.6.9	Memory card port	SDHC / SDXC
2.6.10	On board file size	Minimum 25 GB
2.6.11	No. of alarms	Minimum 3
2.7	Total Focusing Method (TFM)/Full Matrix Capture (FMC)	
2.7.1	Supported wave sets	Pulse echo: L-L, T-T and TT-TT Self-Tandem: TT-T, LL-L, LT-T, TL-T, TT-L, TTT-TT, and TL-L
2.7.2	Firing Modes	Elementary TFM, Plane Wave Imaging(PWI)
2.7.3	Maximum Aperture	32 elements extended aperture
2.7.4	Parallel Multimode TFM	Up to 4 simultaneous TFM groups (wave sets) for models 32:128PR, live TFM envelope
2.7.5	TFM Image Resolution	Up to 1024 \times 1024 (1 MM points) (for each TFM wave set)
2.7.6	Display refresh rate	A-scan: 60 Hz; S-scan: 20 Hz to 30 Hz or better

2.8	Phased Array Wizard	
2.8.1	CAD overlay import facility required	
2.8.2	Real time phased array calculator	
2.8.3	Scanner resolution calibration	
2.8.4	Calibration method: Programmable Time corrected gain (TCG), 32- One TCG curve per focal law , Distance Amplitude correction(DAC)	
2.8.5	Wedge calibration angle, height, angle	
2.8.6	Specimen velocity calibration	
2.9	Other specifications	
2.9.1	Overall weight of the instrument including battery	Should not exceed 6 Kg.
2.9.2	Dust and water resistance	IP65 or better rated enclosure
2.9.3	Battery & Operating time with battery Power	Rechargeable Li-ion battery pack of minimum 90Wh capacity. Operating time minimum 4 Hours.
2.9.4	No of batteries	Total of 2 battery packs to be provided (one battery with the equipment and another battery with external charger to be provided). Battery life at least 05 hours using 2 batteries (hot swap capable)
2.9.5	Hot swap facility for batteries (Loading/removing battery while under operation without hindering the work)	
2.9.6	Power Supply	AC Main 220-240 V at 50 Hz
2.9.7	Operational Temperature Range	0° to 45° C
2.9.8	Process & Wedges	Standard Phased Array Probe with total active aperture, Impedance, Pitch, suitable standard wedge for Angle beam, PA probe to be provided with the equipment
2.10	Software	
2.10.1	System Software	Companion software, perpetual license setup creation, data and reporting capabilities.
2.10.2	Interpretation software	In the PAUT equipment and in the laptop, the interpretation software installation & upgrades applicable to the phased array system shall be provided at no extra cost for life time. A-scan b-scan, c-scan, D-scan and merge B-scan view option required
2.11	Probe	
2.11.1	Phased Array Probe, 16- Element linear array probe-5MHz, Active aperture 9.6 mm to 10 mm Pitch:0.60mm , Elevation: 10mm, A10 casing, 2.5 m cable IPEX Connector 5.0 MHz Linear Array, 64 Elements, 32x10 mm Total Active Aperture, 0.5 mm Pitch, 10 mm Elevation, A32 case type, Impedance Matching to Rexolite, PVC Sheathing, 2.5 m Cable Length, Equipment Connector	
2.11.2	Phased Array Probe, 5 MHz, Dual 32 Element Arrays, 9.6x5 mm Total Active Aperture, 0.3 mm Pitch, 5 mm Elevation, A28 Case Type, Impedance Matching to Rexolite, PVC Sheathing, 2.5 m Cable Length, 1X equipment Connector with DN65L-FD25-IHC wedge.	
2.11.3	Single crystal probe : 20 mm dia , 2.5 MHz – 1 No Dual crystal probe : 10 mm dia, 5 MHz – 1 No	
2.11.4	All the probes shall be provided with compatible individual cables	

2.12	Probe connectors
2.12.1	Probe connectors Phased array- Industry standard Suitable conventional Lemo 00 - BNC adaptors
2.13	Wedge
2.13.1	Standard wedge for phased array probe designed for linear scanning for Sr no : 2.11.1 at 0 degree LW-0 deg LW nominal angle-20mm delay (0 degree, 55 deg , 65 deg angle wedge each - 01 No)
2.13.2	Standard wedge for phased array probe Designed for azimuthal Scanning from 40 to 70 degree using SW-55 deg SW normal angle-Irrigation, probe holder fixture & carbides. This is for Sr no : 2.11.1
2.15	Encoder
2.15.1	Mini encoder, resolution 12 steps/mm or better – Quantity 2 nos with 5 m cable, waterproof with Lemo connector for current Generation of equipment and Focus instruments. Includes bracket kit and fixing tools
2.16	Laptop
2.16.1	One number suitable laptop of brand Dell / HP / Lenovo with windows 11 and supporting software for Scanned image processing & spot report preparation with minimum configuration of Intel i5, 15 inches screen, 8GB RAM, 512 GB SSD with built in battery, charger and laptop protective bag

3. Accessories:

- 3.1 Magnetic strip to be provided for the scanning max 10 meters required – 1 No
3.2 Portable manual water pump to be provided for the irrigation in the wedge- 1 No
3.3 PAUT setup/ reference / calibration block as per the standard ISO 18563 and IIW
V1 and IOW block to be provided each 1 no.

4. Technical Literature and operating manual:

4.1 Technical Literature

The tenderer shall submit three copies of technical literature of the equipment in original clearly describing all the technical details and specification of the equipment along with electrical circuit diagrams.

4.2 operating manual

The tenderer shall submit three copies of operating manual with trouble shooting details. All necessary spare parts which are frequently required are to be supplied free of cost with the equipment.

5. Supply, commissioning and training.

5.1 Supply & Commissioning

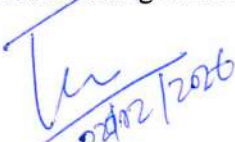
Supply, Commissioning, demonstration and training of PAUT equipment shall be carried out at ICF and to be provided by the firm during installation and commissioning of the equipment.

5.2. External Training

In Chennai, under a reputed ISO 9712 accredited training center, ISO 9712 PAUT training and certification on weld testing shall be provided for one staff of ICF. Training cost and examination fees shall be borne by the PAUT equipment supplier

5.3. Internal Training

Hands-on Training for 15 working days shall be provided in ICF with training manual to seven ICF staff about PAUT equipment, specification, reference blocks, operation, troubleshooting and testing of weld joints and other cast / forged components.


20/02/2026
CMS/NDT Lab


20/02/2026
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