Sonatest

ULTRASONIC PHASED ARRAY FLAW DETECTOR

Sonatest veo

Power & performance perfectly packaged.

16:64 Phased Array

Integrated TOFD

Superior Imaging

Full Data Recording

Fast Encoded Scans

Multi Scan

Simultaneous UT & PA

Instant Focal Law Calculations

Easy Report Generation

IP65 Enclosure

Calibration Wizards

3D ScanPlan

Probe & Wedge Databases

TCG and DAC

16 bit architecture

Unlimited Scan Lengths

Huge File size (2GB)

USB key Data Storage

WheelProbe Compatible

Hot Swap Battery Packs

sonatestveo.com

The **veo** Phased Array ultrasonic flaw detector reinforces Sonatest's reputation for innovative technician focussed product development. The **veo**'s simple controls, superior performance, advanced features and rugged enclosure deliver simplicity, capability and reliability to the technician's finger tips.

Ultrasonic Phased Array technology has become the established method for advanced NDT testing applications. Phased Array techniques allow the user to control parameters such as beam angle and focal distance to create an image of the test part, enhancing defect detection and speed of testing. In addition using the latest computer technology data can be permanently recorded for processing and report generation. The **veo**'s robust design, intuitive user interface and extensive online help brings the power of Phased Array to the field based technician. Typical applications include Weld Inspection, Corrosion Mapping, Aerospace and Composite testing.

Simplicity

The intuitive menu system is application and workflow driven, with set up and operation swiftly becoming second nature. Integrated Help and Wizards guide the user through scan set up whilst **Optimisation Tips** ensure the **veo** always performs at the highest level. The unique **3D ScanPlan** view gives immediate visual confirmation of correct set up and ultrasound coverage, even in complex multi-probe applications.

Fast and efficient wizards for sound velocity, wedge delay, TCG, DAC, TOFD setup and Encoder calibration are all provided as standard. Clear indication of the calibration status is provided on screen via a simple traffic light system, so that operators can check at a glance that the veo is calibrated for the inspection task.

Menu navigation uses Sonatest's second generation scroll wheel technology for fast parameter selection, with shortcut keys for the most used functions and alphanumeric entry. The familiar Start, Stop and Record keys switch quickly between set up, acquisition and recording modes.

Capability

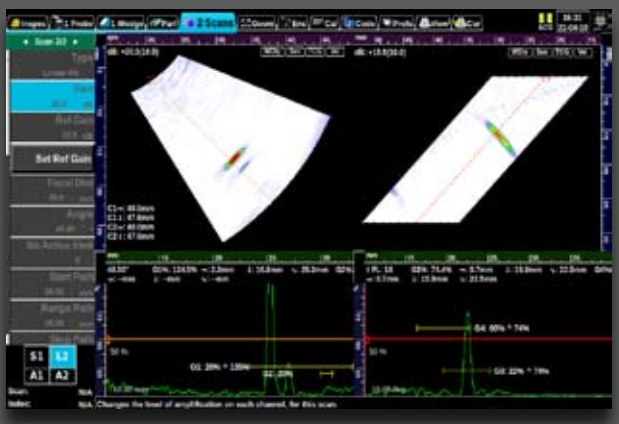
The powerful **veo** platform unlocks a new level of performance in a portable instrument, helping you to maximize your efficiency on-site. The Inspection Plan shows the operator in 2D and 3D where probes are positioned on the test part, simplifying the inspection setup and providing an inspection reference for reporting. All adjustments to focal laws are instantaneous, with angle resolution to 0.1^0 and up to 1024 focal laws without loss of performance. Multiple scans from different probes may be displayed and evaluated at the same time. Multiple sectorial scans, top, side and end view extractions plus C-Scans are all supported by the veo. TOFD and Phased array inspections can be carried out in tandem at full scanning speed and with up to 2GB data files large areas can be inspected more efficiently. Full resolution waveform data is stored directly to a removable USB data key for ease of back up and transfer to PC.

The **veo** has two dedicated mono element flaw detection channels for conventional UT inspection. Based on Sonatest's Masterscan flaw detectors the channels have 400 V pulsers, Time Corrected Gain and low noise amplifiers, for the most demanding applications.

An impressive hardware specification provides the user with high quality ultrasonic data via a full 16 bit high speed architecture and 12 bit ADC technology whilst digital signal processing based smoothing and averaging enhances image interpretation.

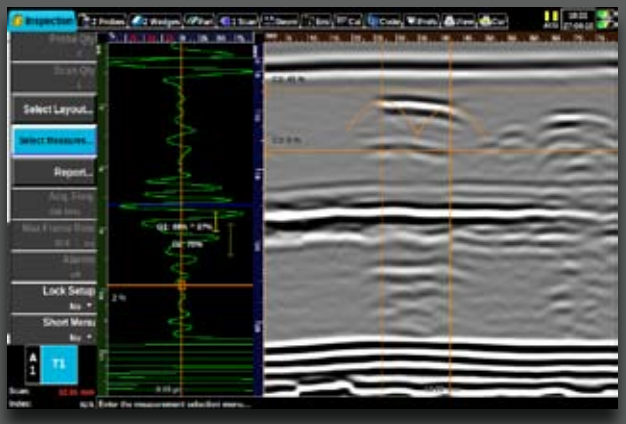
Measurement and sizing of indications can be quickly achieved through the use of advanced measuring tools such as Hyperbolic Cursors for TOFD and Peak Signal measurements from the 2D cursors. Reports can be quickly generated on board and stored as PDFs to the USB data key.

For any flaw detector the display is a crucial element. The Sonatest **veo** has a colour transflective TFT LCD, providing high visibility in all conditions, with the highest display to size ratio of any field instrument.



Multi Scans

The **veo** can be quickly configured to display a large range of multi scan views. This allows the user to select the views important for the inspection and to get best use from the display. Sector scan, top, side and end views can all be combined with multiple A-Scan views and TOFD. Cursors and rulers are used to identify indications in the views, whilst measurement tools give size and annotation.



TOFD

The **veo** has a dedicated analogue architecture for TOFD inspection, using analogue filters developed from the Sonatest range of flaw detectors. Coupled with the lowest noise amplifiers, high speed data acquisition and a high definition display, superior quality TOFD scans can be viewed live at the same time as Phased Array. Phased Array and TOFD inspections can be evaluated together for added confidence during weld inspection. Built in evaluation tools allow quick and accurate evaluation of the TOFD inspection, which can be included in a test report.

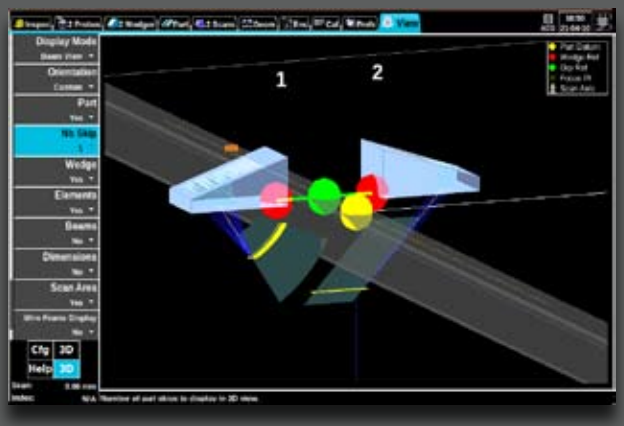
Reliability

Robust design and proven reliability are essential attributes in demanding NDT environments. Down time is expensive and should be minimized to ensure maximum productivity. Sonatest's reputation for rugged construction and high quality products has been earned over 50 years serving the industry. The **veo** is constructed to exacting standards using a rigid, shock mounted, internal chassis surrounded by an impact absorbing enclosure and sealed to IP65. Designed to incorporate many features to make site work easier the veo is fitted with standard camera mount fittings underneath and four attachment points on the back for tripods and other equipment accessories. Additionally the four corner D-rings allow the **veo** to be attached to carry straps and 4 point body harnesses for easy movement and freeing hands for scanning. The **veo** has a two battery design which is “hot swappable”, therefore minimising down time and heightening the reliability of performance in the field.

UT Studio

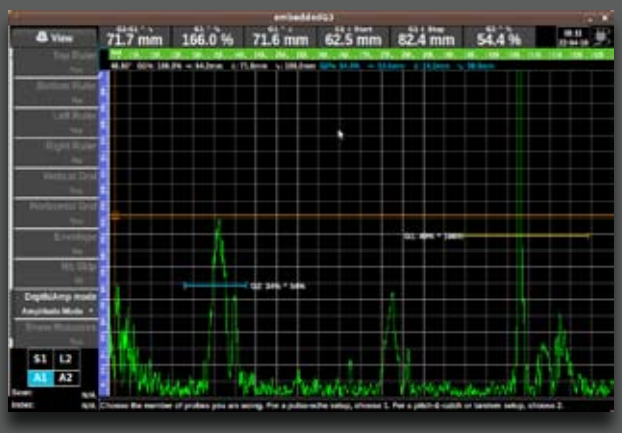
UT Studio is a PC based software package for Phased Array analysis and report generation. Recorded **veo** data files are easily transferred from the USB data key and used to generate new views and projections. Using a familiar windows drag and drop interface, the user can create multiple views such as Top, End and B-Scan by simply dragging **veo** data files onto templates for display.

Powerful measurement cursors and extractors are used to identify indications, size and annotate defects. Reports are easily generated and can be exported into PDF format for review and circulation.



3D Scanplan

The **veo** Scanplan supports multiple probes and scans, enabling the set up of inspection plans from a number of sources quickly and efficiently. Choose from a range of weld geometries and visualise the probes on the part in the locations you choose. Multiple skip paths are shown on the 3D Scanplan allowing the user to ensure coverage for weld inspections. Simple reference points are indicated for easy interpretation and locations of probes on the part can be quickly defined. Mixtures of probe types are supported in pulse echo and pitch and catch: phased array; TOFD or conventional UT. The Scanplan is an invaluable reference for your inspection report, communicating the results of your inspection more clearly, and saved as part of your inspection for future use.



A-Scan

The **veo** supports traditional ultrasonic testing with mono transducers. The high definition LCD and fast graphics rendering ensure both a high level of accuracy and a fast interactive waveform display. Thanks to the high resolution of the LCD display, measurements are clear and easy to read, and the wide screen format provides a huge viewing area for the scan. The A-Scan display ensures the peak signal is always displayed so that you never miss a defect.

16:64 Specifications (specifications are subject to change)

PHASED ARRAY

Pulsers

Configuration	16:64 (16 pulser/receivers; driving up to 64 elements)
Test Mode	Pulse-Echo and Transmit/Receive
Transducer Socket	I-PEX
Pulse Voltage	-50 V to -150 V (in steps of 10 V)
Pulse Shape	Negative square wave (with ActiveEdge)
Pulse Width	10 ns to 500 ns
Edge Time	<10 ns in 50 ohms load
Output Impedance	<16 ohms
Trigger	
Synchronisation	Encoder or free-running (time based)
Tx/Rx Focus	
Delay Range	0 to 10 µs (2.5 ns resolution)

Receivers

Gain Range	0-80 dB, in steps of 0.5 dB
Input Impedance	50 ohms
Bandwidth	300 KHz - 30 MHz (-3 dB)

Data Acquisition

Architecture	Full digital delay and sum architecture
Sampling Rate	50/100 MSPS
ADC Resolution	12 bits/sample
Data sample width	16 bits/sample
Data recording	Full raw data recorded
Max A-Scan Length	8192 samples (32 metres in steel LW, sampling rate 50 MSPS, sub sampling 1:128)
Maximum PRF	20 kHz
Focal Law Qty	Up to 1024
Focussing Type	Constant Depth, Constant Sound Path, Constant Offset
Processing	Smoothing, Averaging, Scaling, Keep Max
Filters	Multiple narrow bands and broadbands
Sub-sampling	1:1 to 1:128
Rectifier	RF, Full, Positive, negative.
Synchronization	Referenced on initial pulse or gate, IFT supported
Multi-Group	Multiple Sector scans and 1 TOFD Scan

Scan & Views

Supported Scans	S-Scan & L-Scan
Real Time Views	S, L, B, C-Scan, Top and End view.
Colour Maps	Rainbow, Grayscale, Spectrum

Cursors

Type	Cartesian, 2D Box, Angular
Measurements	Path Length, Depth, Surface Distance, Angle Peak in 2D Box and 2D Angular Box

CONVENTIONAL UT/TOFD (MONO ELEMENT CHANNELS)

Pulsers

No. of Channels	2 TX/RX (2 multiplexed channels) 2 RX
Test Mode	Pulse-Echo, transmit/receive, TOFD
Transducer Socket	BNC or LEMO 1 (factory option)
Pulse Voltage	-400 V (adjustable from -100 to -400 V in steps of 10 V)
Pulse Shape	Negative Square Pulse (with ActiveEdge)
Pulse Width	Adjustable from 25 ns to 2000 ns, resolution 2.5 ns
Edge Time	<20 ns in 50 ohms load
Output Impedance	<10 ohms

Receivers

Gain Range	110 dB (-30 dB to 80 dB)
Input Impedance	400 ohms
Filter Bands	Narrow bands centred at 0.5 MHz, 1 MHz, 2.25 MHz 5 MHz, 10 MHz and 15 MHz Broadband at 1 MHz to 18 MHz (-6dB)

Data Acqusition

Sampling Rate	50/100/200 MSPS
ADC resolution	10 bits/sample
Data sample width	16 bits/sample
Data recording	Full raw data
Max. A-Scan Length	8192 samples
Maximum PRF	12 kHz
Processing	Smoothing, Filter, Keep max
Sub-sampling	1:1 to 1:128
Rectifier	RF, Full, Positive, Negative
Synchronization	External digital input, encoder or internal

Scans & Views

Supported Scans	A-Scans,
Views	A, B-Scan, TOFD

Cursors

Type	Cartesian, Hyperbolic
Measurements	Path Length, Depth, Surface Distance

CONVENTIONAL AND PHASED ARRAY

DAC

Number of Points	16
DAC Quantity	1 with 3 sub-DAC (per focal law in PA)

Time Corrected Gain (TCG)

Number of Points	16
Gain Range	0 to 60 dB
Max Gain Slope	>50 dB/µs

Gates

A-Scan Gates	4 gates per A-scan (3 extracted A-scans per S/L-scan)
Gate Trigger	Flank/Peak
S/L-Scan	2 “2D gates” per S/L-scan
Alarm LED	1 (sync on all gates & DACs)
Measurements	Available in A-Scan view 1D Peak (FSH, dB, D, PL, SD) 1D Flank (FSH, dB, D, PL, SD) Echo to Echo

GENERAL

Data Storage

Internal	6 GB (standard)
External	Hot removable “User” USB 8 GB (standard) Only limited by USB key capacity
Transfer Rate	To User Key - Up to 23 MB/s Write mode Up to 27 MB/s Read mode
Data File size	2GB (FAT32 file system)
Typical Scanning Speed	10 to 15 cm/s
Typical Scan Length	>10 m

Display

Size	25.9 cm (10.2 in) Wide aspect ratio
Resolution	1024 x 600 pixels
Colour	260k (65535 colours for scan palettes)
Type	TFT LCD

I/O Ports

USB Ports	3 x USB certified ports (480 Mbps)
Ethernet	Gbit Ethernet (1000 Mbps)
Video Output	VGA Analog (1024 x 600)

I/O

Encoder	1 or 2 axis quadrature encoder (LEMO connectors) Single ended and differential input
Digital Input/Output	2 input lines (5V TTL) for trigger or sync (Shared between Conventional and PA module) 4 output lines (5V TTL, 20 mA) for alarm or other external control (Shared between Conventional and PA module) 8 pin LEMO socket
Power Output	5 V, 500 mA, current limited
Integrated Help	Active parameter description and Optimisation Tips.
Language Support	Six user selectable languages from: English, German, French, Spanish, Russian, Chinese.

Batteries & Power Supply

Battery Type	Intelligent Li-ion batteries
Number of Batteries	2
Operation	1 battery or 2 batteries, DC Power pack
Battery Replacement	Hot swappable - no tools required
Battery Recharge	Batteries recharge in unit, operating or not
Battery Life	6+ hours (typical operation).

Enclosure

Size	H220 mm x W335 mm x D115 mm (8.66 in x 13.19 in x 4.52 in)
Weight	5.28 kg(11.6 lb) 1 battery/ 5.75 kg (12.6 lb) 2 batteries

Environmental

Temperature	Operating -10 °C to 40 °C (14 °F -104 °F). Storage -25 °C to 70 °C (-13 °F -158 °F)
Relative Humidity	5 to 95% non-condensing
Environmental	Meets IP65
Warranty	1 year.
Calibration Standard	EN12668.

Supported Inspection Codes

Other relevant Code are also met.

- ASME Code Case 2235-9 Use of Ultrasonic Examination in Lieu of Radiography
- ASME Code Case 2541 Use of Manual Phased Array Ultrasonic Examination Section V ASME
- ASTM E2491 Standard Guide for Evaluating Performance Characteristics of Phased-Array Ultrasonic Examination Instruments and Systems
- ASTM E2700 Standard Practice for Contact Ultrasonic Testing of Welds Using Phased Array
- CEN EN 583-6 - Nondestructive testing - Ultrasonic examination - Part 6 -TOFD as a Method for Defect Detection and Sizing
- BSI BS7706 - Guide to Calibration and Setting-Up of the Ultrasonic TOFD Technique for the Detection, Location, and Sizing of Flaws

veo Kits & Accessories

Standard veo Kit

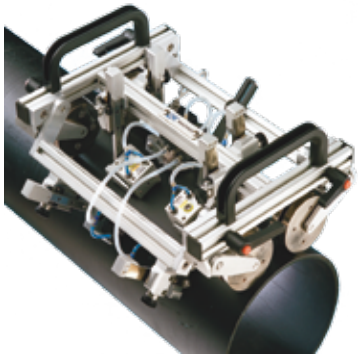
veo 16:64
Calibration Certificate
UT Studio Single user licence
• Conventional Views (A/B/C/D)
• Phased Array Views (S/L-Scan)
• Viewing Reports
USB Memory Stick (8GB)
Lithium-Ion Battery packs x 2
Power Cord & Power Supply adaptor
Couplant
Quick Start Guide & User Manual CD
Screen Protector (Anti-Glare)
Carry Strap
4-point Neck Harness
Transport Case (Airplane carry on size)

veo Accessories

Splash Proof USB Keyboard
Waterproof Mouse
Battery Charger
Tripod
Lithium-Ion Battery pack
UT Studio - Professional edition
QuickTrace Encoder
Rapidscan to veo Encoder Adapter
DAAH Array probe cable
Screen Protector
USB Memory Stick (8GB)
Phased Array Cable Y-Splitter
TOFD 40 dB Pre-amp
Phased Array Test Block Steel
Phased Array Test Block Aluminium
HD15 Encoder Adapter

veo Kits

•veo & Magman Scanner
•veo & Corrosion WheelProbe
•veo & Manual TOFD
•veo & Manual Weld



veo Transducers

Further transducer models available, enquire for full range.

Frequency (MHz)	Model Number	No.of Elements	Pitch (mm)	Wedge
2.25	T1-PE-2.25M20E1.2P	20	1.2	External
2.25	T1-PE-2.25M14E1.2P-35W0D	14	1.2	35º Integral
2.25	T1-PE-2.25M18E1.2P-17W0D	18	1.2	17º Integral
5	T1-PE-5.0M32E0.8P	32	0.8	External
5	T1-PE-5.0M22E0.8P-35W0D	22	0.8	35º Integral
5	T1-PE-5.0M26E0.8P-17W0D	26	0.8	17º Integral
7.5	T1-PE-7.5M44E0.6P	44	0.6	External
7.5	T1-PE-7.5M30E0.6P-35W0D	30	0.6	35º Integral
7.5	T1-PE-7.5M40E0.6P-17W0D	40	0.6	17º Integral
5 MHz	CWP-05-64-08-05-veo	64	0.8	WheelProbe
2 MHz	CWP-02-64-08-05-veo	64	0.8	WheelProbe

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