

# Array Sensors



## Sliding Probe

The sliding probe features a 0.8mm pitch array with 64 elements in a small compact sensor. This hand held probe is designed to work with the Faro arm to scan areas with tight access, but has the same area coverage as a Wheel Probe. This sensor is designed to work with a water feed system to ensure excellent coupling for parts with tight radius of curvature.

Sonatest NDTs offer a range of sensors for the RapidScan2 and RapidScan3D instruments. Our proprietary rubber coupling allows for high quality Ultrasonic data to be captured without the need for coupling gels or large volumes of water. The rubber has been designed to closely match the properties of water, providing excellent low loss coupling into the part. The conformable Wheel Probe tyre provides good performance on rough surfaces, and rolls over debris or fasteners without causing damage. Good quality scan data is available even around bolt holes and rivet heads.

The sliding probe features two probe positions which allow horizontal and vertical parts to be scanned easily. The RapidScan3D software is able to work with a number of probe configurations which may be switched during an inspection making it easier to scan components with difficult access. Ergonomic design can reduce operator fatigue increasing productivity still further.

## Wheel Probe

Adapted from our patented Wheel Probe technology, the RapidScan3D wheel probe offers exceptional performance for fast large area coverage. It has been specifically designed for ergonomic handling, and incorporates a 0.8mm pitch array with 64 elements for high resolution C-Scan imaging, and a low pressure coupling tyre.



# RapidScan3D™

The RapidScan3D is an innovative solution to the need for Ultrasonic NDT of modern engineering structures. Using high speed electronics, an ergonomic scanning arm, and a set of array probes based on patented technology, the RapidScan3D offers true 3D scanning at a fraction of the cost of contour following scanning gantries.



RapidScan3D works with the full range of scanning arms from Faro. RapidScan3D also offers the full capability of the RapidScan2. For existing RapidScan2 customers we offer an upgrade option to RapidScan3D.



# RapidScan3D™



NDT Solutions Ltd      Tel    +44 (0) 1246 267550  
 Dunston Innovation Centre      Fax    +44 (0) 1246 269381  
 Dunston Road  
 Chesterfield, UK      E-mail    sales@ndtsolutions.com  
 S41 8NG      Web      www.ndtsolutions.com

© Copyright NDTs 2006. All rights reserved.



Part No: 147351

# RapidScan3D™



## Scan in 3D... ...Understand in Depth

Following the successful RapidScan2 instrument from Sonatest NDTs, the RapidScan3D now offers the capability to scan 3 dimensional structures quickly and accurately using a precision coordinate measurement arm. Using the same high performance ultrasonic system of the RapidScan2 and user friendly software, complex structures can be scanned and evaluated. The RapidScan3D offers a complete and integrated ultrasonic scanning system.

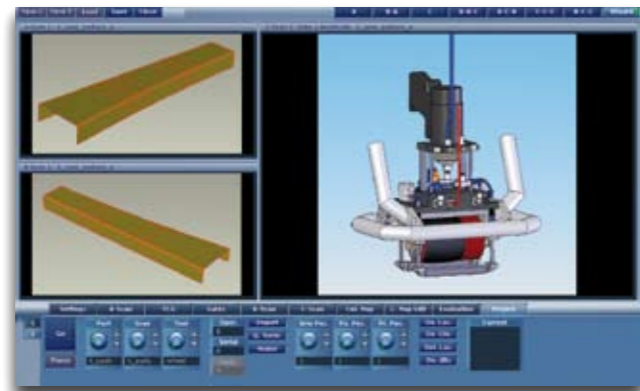
When scanning medium to large areas, full A-Scan capture is essential to avoid re-scanning regions during detailed analysis, whilst offline analysis tools improve production throughput. The RapidScan3D has full A-Scan capture as standard, and a complete suite of tools for Ultrasonic data review and post-processing. Complete control over gating and colour maps after scanning means that you will only ever need to scan a part once, and powerful defect analysis functions allow indications to be sized, annotated, saved and printed for reporting.

The RapidScan3D operates in pulse-echo mode, and synchronizes with the scanning arm to achieve the fastest scanning rates possible. Having a 128 channel architecture allows large, high resolution Ultrasonic arrays to be employed for large area coverage. Fast, integrated data capture and high quality analogue electronics ensures the best possible data quality, resulting in enhanced defect detection.

The patented Array Wheel Probe is available for use with the RapidScan3D as well as a growing range of sensors designed for collecting the highest quality data, quickly and efficiently, for rapid analysis of parts for aerospace and other highly demanding applications. Using Sonatest NDTs proprietary coupling material, the ultrasonic probe does not require coupling gels or large volumes of water. A fine water mist is all that is needed to ensure consistent high quality coupling to most surfaces.

### Productivity

Traditional NDT scanning can be time consuming and difficult to set up, sometimes requiring expensive tooling designed for the inspection of a part, especially for 3 dimensional scanning. The RapidScan3D provides the capability to scan 3D objects previously only found in expensive contour following scanning systems. The RapidScan3D software wizard



(shown opposite) allows the operator to quickly choose a part to scan from a library on the instrument. These can be a mixture of parts with 3D CAD models and parts generated from pre-defined "stock" objects. The wizard then presents compatible inspection tools for different regions of the part. Some regions will require fast large area coverage using a large Wheel Probe, where other regions may require smaller probes for radius or stringer inspections. The instrument settings are then automatically set up for the inspection and the part can be scanned immediately.

Using the scanning arm to inspect the part is fast and efficient, ergonomically designed specifically to follow complex 3D shapes: the time taken to perform the inspection is as short as possible. Different arm sizes are available with working envelopes from 0.6m to 1.8m, all with exceptional accuracy and repeatability. The RapidScan3D also supports multiple part and arm positions, so large parts can be scanned in one session by repositioning the arm or moving the part if necessary.

After scanning, there is no need to re-scan the part again. All the A-Scan data for the inspection has been stored, and can be reprocessed as with the RapidScan2. All the inspection gates can be adjusted after the scan, and even completely new C-Scans can be made. The evaluation tools are designed to be fast and intuitive to use enabling quick evaluation of the part.

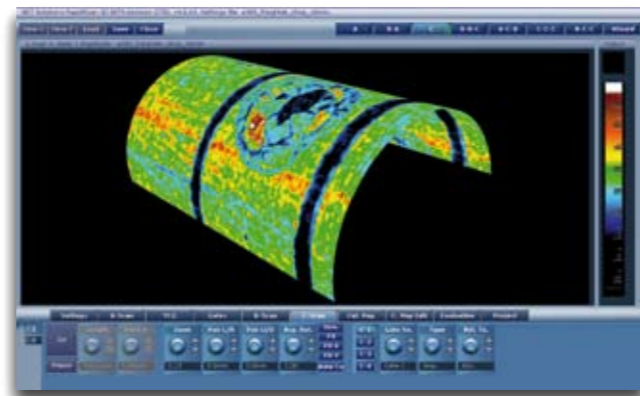
The Ultrasonic scan can be shown mapped onto the 3D part, allowing a truly intuitive method for quickly qualifying defects based on their position within the mechanical structure. Results can easily be disseminated, and interpreted by colleagues without NDT experience.

### RapidScan3D workflow

For many structures, a stock object can be used to generate a model for a region of the structure to be inspected. However for applications where added value is gained from correlating the scan data with the detailed geometry of the part, the RapidScan3D can work with your 3D CAD data.

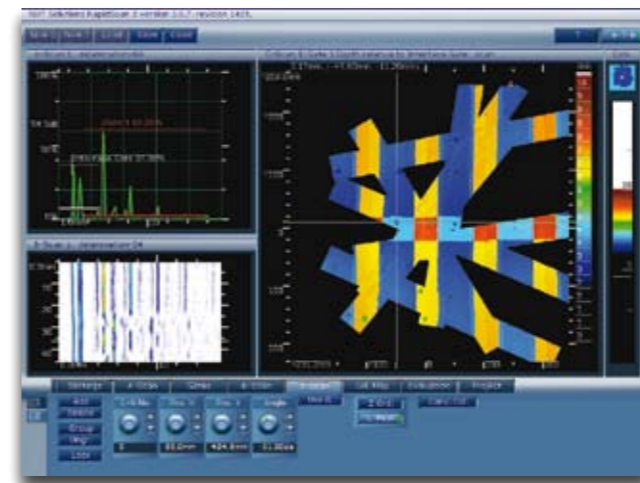
For inspections where CAD data is not available or not required, the RapidScan3D allows stock object parts to be created which in many cases gives an excellent 3D representation of the part to inspect. Planar surfaces are found on many structures, and often surfaces with mild curvature can be approximated to planes without any loss of accuracy. Cylindrical surfaces are found in leading and trailing edges, and fuselage sections in aerospace structures, as well as tubes and pressure vessels. Radome structures and pressure vessel end caps are scanned using the Dome surface model.

The software wizard allows the operator to adapt any of the parts in the stock object library to provide the best fit to the structure to be inspected. By positioning the Wheel Probe, or other inspection tool at certain points on the part, the software will fit the stock object to the position and geometry of the structure. The example below shows a C-Scan mapped onto a portion of a cylinder.

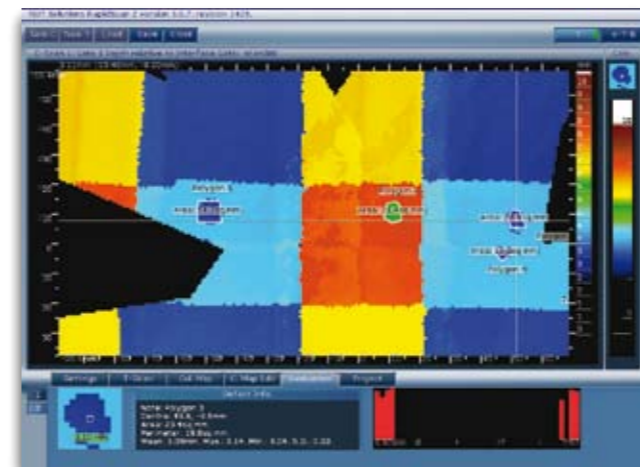
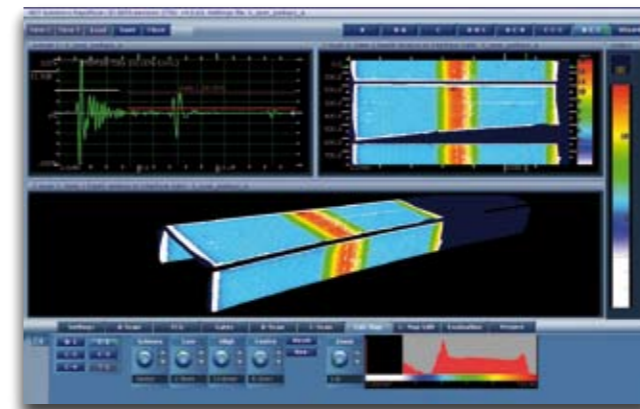


For demanding production NDT it can be critical that faithful defect sizes are reported. Sonatest NDTs offer a service to convert the surfaces of interest on your 3D model into 2D C-Scan maps which guarantee the best possible preservation of defect size and shape using our novel Finite Element algorithms. RapidScan3D uses novel surface unwrapping algorithms to ensure that the C-Scan you evaluate is mapped exactly to the surface of the part you have inspected. This model is then provided as an object that can be installed in the RapidScan3D wizard.

As the part is scanned, the ultrasonic data is automatically presented in a large area 2D C-Scan for easy interpretation, ready for use with evaluation procedures as found with conventional 2D Ultrasonic scanning. The live C-Scan presentation shows areas scanned to ensure 100% part coverage. The instrument always selects the highest quality raw data for the C-Scan by choosing the A-Scan with the highest amplitude, even if a location on the scan is covered many times from different directions.



After scanning the part, the C-Scan map can be displayed on the 3D image. This powerful feature allows defects in the C-Scan to be accurately and intuitively referenced to the 3D structure. The example below has been provided with the kind permission of Airbus UK, and is a RapidScan3D scan of a composite spar structure. In this example, the part is scanned in three positions and the time of flight C-Scan is rendered onto the CAD model of the part. The 3D view may be rotated and zoomed by the operator, and cursors on the conventional 2D scan also appear on the 3D model so that it is easy to reference the NDT data to the structure.



## RapidScan3D™

### Technical Specifications

#### General

Power supply Voltage: Universal power supply (110-240V)  
Dimensions: 620 x 375 x 210mm (W x D x H)  
Weight: 15 Kg

#### Scanning arm

Working reach per arm position: 0.6m to 1.8m depending on model  
Number of arm positions: Unlimited  
Positional accuracy (X, Y and Z): <0.1mm  
Number of axes: 7  
Scanning speed: 180mm/s @ 1mm scan pitch  
Weight: 9.3kg to 10.2kg depending on model  
Calibration test method: to B89.4.22  
Operating conditions: 10°C to 40°C  
(0% to 95% humidity non-condensing)  
Interface: USB

#### Processing Electronics

##### Pulsar

Pulsar type: Negative square wave  
Pulsar amplitude: -70 V  
Pulse width: 25 ns to 250 ns, adjustable in 0.5 ns steps  
Max prf: 100 kHz  
Active Channels: 32  
Max no. of Channels: 128

##### Receiver

System bandwidth: 1 MHz to 22 MHz  
Receiver gain: 80 dB  
TCG: No. of points: 16  
Amplitude resolution: 0.3 dB  
Time resolution: 10 ns  
Total correction: 80 dB  
Slope range: 0 - 40 dB/μs

##### Digitiser

Data Capture: FPGA based DSP engine  
Rate: 100 MHz  
Dynamic range: 12 bits  
Memory: 4 Msamples  
Processing: Rectification and inspection gates in real-time

##### Wheel Probe Sensor

##### Ultrasonic Array

Centre freq.: 2, 5, 10 MHz  
Bandwidth: > 60% (-6 dB)  
Element pitch: 0.8mm\*  
Active array width: 50mm\*  
No. of elements: 64\*  
Aperture: 8, 16, 24 and 32 channel beam formation supported  
Max. cable length: 10 m @ 5 MHz  
Connector: Cannon ZIF 260 pins

##### Wheel probe

Water filled low attenuation rubber tyre  
Rotary quadrature encoder for positional information  
Spring loaded buggy for fast scanning

##### Application Software

Simultaneous live A, B, C-scan  
Simultaneous capture of multiple C-scans  
Large area mapping capability  
Powerful post processing capability using full waveform capture  
Rectification: RF, Full Wave, Half Wave Positive, Half Wave Negative  
High frame rate B-scan display (>200 Hz typical)  
Up to 6 gates with multiple peak detection, triggering and measurement  
Evaluation tools for data analysis: Line, Rectangle, Circle, Ellipse, Polygon tools  
Histogram analysis: Min, Max, Mean, Std. Dev.  
Fully user definable colour palette interface  
Scan speed: 200 mm/s (64 elements, 2 gates, 1000 A-scan points, 0.8 mm resolution)  
Up to 2Gb data file size

##### User Interface

Laptop Processor: Intel Core 2 Duo  
Operating system: Windows XP/2000  
User input: Standard laptop keyboard with regional variations  
Display: 15.4" Widescreen TFT 1680x1050  
Hard Drive: 120GB/byte  
Interfaces: 10/100 baseT Ethernet, USB, Wi-Fi, Bluetooth  
DVD+-RW  
Memory: 2Gb  
Optional user inputs: Head up display, Wireless optical mouse

\* Custom Wheel probe options available