

Automatic UT inspection of complex shapes and geometries



# P-scan 3D

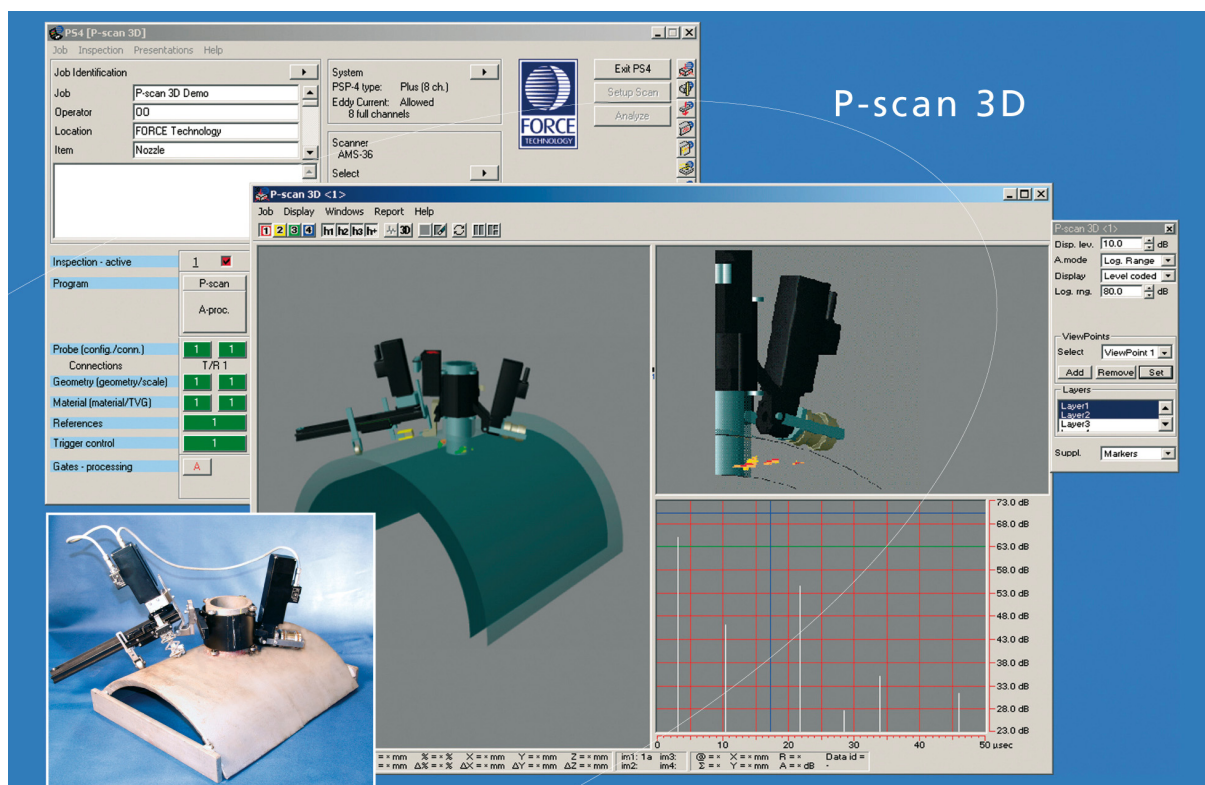


Illustration of some of the display features included in the **P-scan 3D** software for UT inspection of objects with shapes ranging from the simple to complex geometries

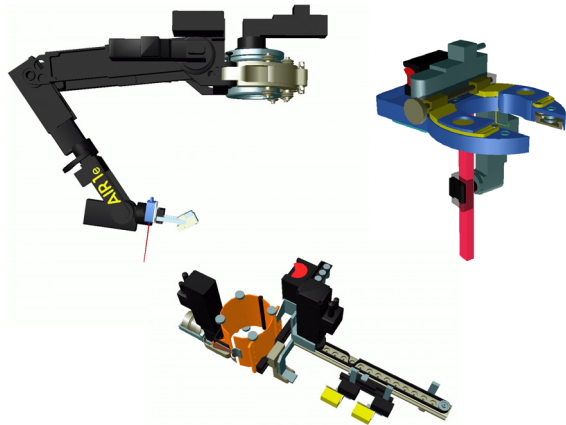
**P-scan 3D** is a complete PC-based software suite to take full advantage of the P-scan System 4 scanner and control capabilities. **P-scan 3D** allows for fully automated inspections of objects with simple or complex shapes and geometries. **P-scan 3D** provides the operator with 3D visualisation of P-scan data during preparation, scanning, evaluation and reporting.

## P-scan 3D capabilities summarised

- On-line 3D visualisation of P-scan data
- Increased possibilities for UT inspection of complex shapes and geometries
- Data acquisition with standard 2-axis scanners, multi-axis scanners and 3D robots
- Unique capabilities for characterisation of defects and geometry
- Section view for easy evaluation and reporting
- Uses files from a library of scalable complex geometries or imports standard 3D CAD formats
- Automatic scan path generation.

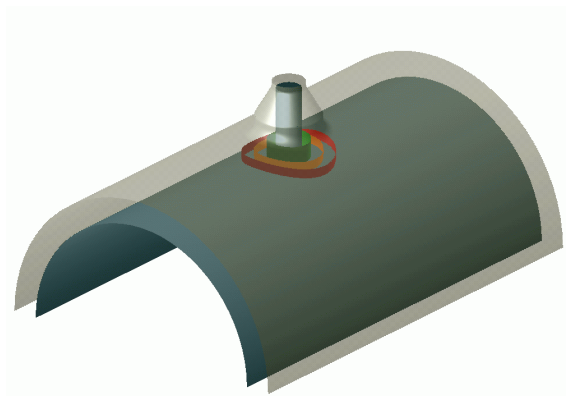
## Preparation

Unlike scanning flat surfaces or “predictable” conical or cylindrical shapes as in most ordinary pipe and weld inspections, complex geometries are a challenge for any UT inspection.



*The optimal configuration of FORCE scanners and the scan path for detection of specific defects can be assessed using dedicated **P-scan 3D** tools*

The scan path generation tool can assist the operator in planning an UT inspection. Shapes of objects can be defined by and imported from CAD systems or obtained from a library of available files of scalable standard geometries.



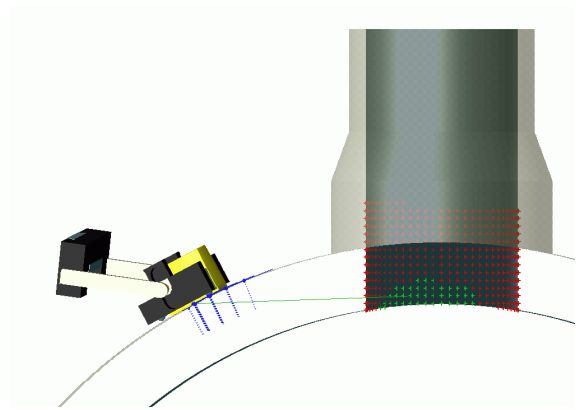
*Scalable 3D model of an object geometry included in the 3D library*

The simulation tool can assist in planning the examination of an object for specified defects in defined areas. Based on user-defined criteria for the optimal sound path in the focus area, the tool visualises in 3D where to place a specific type of transducer.

**P-scan 3D** generates the scan paths to be used by **P-scan 3D** during the real UT scan.

Simulating a mechanical “pre-scan” before the actual inspection sequence starts, the automated collision avoidance check in **P-scan 3D** can help the operator in selecting the optimal scanner configuration and scan path.

## Inspection



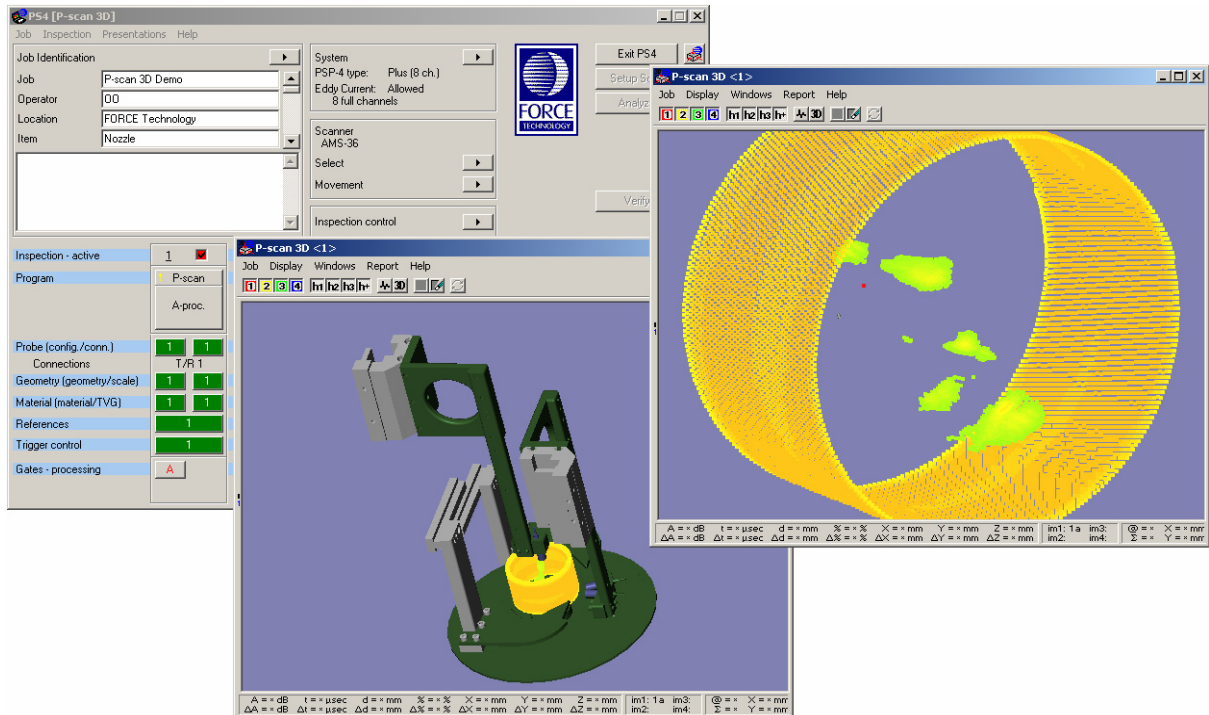
*Screen picture showing transducer position and simulated course of ultrasound propagation in a model of an object to be inspected*

**P-scan 3D** performs the scan fully automatically and along the selected path generated by the **P-scan 3D** simulation tool, while the visualisation tool accepts and displays scan data collected by standard two-axis, multi-axis scanners and 3D robots.

During the actual scan, **P-scan 3D** displays the scanner motion on a 3D image of the object in real time with scan data is displayed in separate windows that can be configured by the user.

## Data evaluation

Evaluation of scan data from complex object geometries is a complicated and time consuming process. The **P-scan 3D** Evaluation tool addresses the challenges and overcomes these limitations by automatically interpreting the scan data in correlation with the 3D positioning information of the transducer and the geometry of the object.



Screen picture with windows showing solid cylindrical object placed in scanner model and a presentation in 3D of the origin of indications

The **P-scan 3D** tool for the presentation of P-scan data is a unique and powerful system component. The object can be viewed in 3D from any angle and it is possible to zoom in to the object and locate the origin of fault indications. Colour coding of indications improve interpretation. The features of the 3D tool improve and simplify characterisation of defects. Operator controlled cursors can be used for measurements.

### P-scan 3D Lite

**P-scan 3D Lite** is intended for users who do not need the full suite of simulation and 3D capabilities to accommodate infinite variations in shape or geometry as offered by the full version of **P-scan 3D**. P-scan Lite is suitable for inspection of objects where the geometry changes are one-dimensional and easily modelled. P-scan Lite will offer users of P-scan System 4 for such applications significantly enhanced system capabilities.

### Reporting

#### P-scan Job : Nozzle

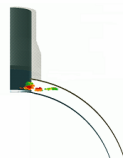
PS4 3D

Defect No. 1

X\_Start : 230,0°

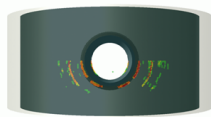
Positioned at radius : 185,1 mm

Length : 53,2 mm



Y-position : -8,0 mm

Extend in Y-direction : 5,4 mm

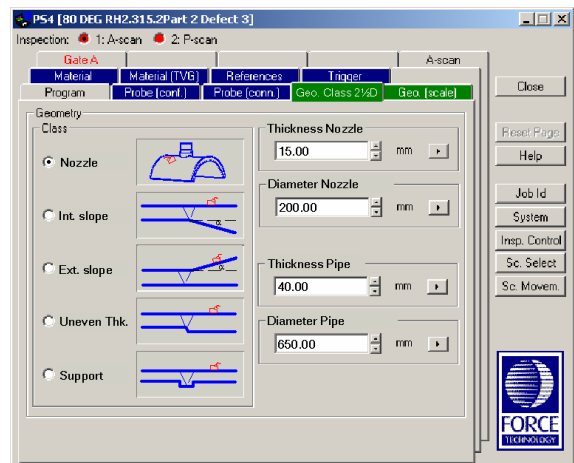


Z-position : 3,3 mm

Extend in Z-direction : 9,6 mm

Screen picture with cross sections and data selected for the printed report

The **P-scan 3D** makes reporting clearer and more distinct. The 3D display of processed scan data allows for the selection of the viewing angle and zoom level for section views that give the best information in a printed report.



**P-scan 3D Lite** has a Geometry Module including only a library of such geometries but no simulation tool or CAD capabilities. The package includes a pre-programmed scan path for inspection planning of known geometries. Scan data is displayed using the actual model geometry and reporting features include presentations in user-defined 2D cross sections.

## P-scan 3D - Product Description and Specifications, Preliminary

The **P-scan 3D** software is structured in operational modules.

The **P-scan 3D** software is available in packages composed of modules for specific customer uses. All packages include a Geometry Module.

### Geometry Module

The Geometry Module is the visualization foundation used by all other 3D modules.

The Geometry Module includes:

- Library of standard 3D geometries that can be sized via the user interface
- Library of 3D models of selected FORCE Technology scanners in standard configurations.

In addition the Geometry Module is available with the following options:

- 3D models and 2D models suited for specific customer needs
- Features to import a numerical model of an object from a CAD system.

### Simulation Module

The simulation tool has capabilities to assist in planning the examination of an object for specified defects and in defined areas.

Based on user-defined criteria for optimal sound paths in the focus area, the tool uses backward calculations to determine where on the object a specific type of transducer may be placed to generate such sound path.

The computed result is displayed in 3D. **P-scan 3D** generates the path to be used by the P-scan System 4 integrated scanner control electronics during the actual UT scan.

### Data handling modules

The data handling modules use and interpret scan data (A-scans) collected by ultrasound inspections performed with P-Scan System 4 Units.

*The Data Handling Modules can operate with data collected with 3D scanners and data collected with 2D scanners as well.*

### On-line Scanning Module

The On-line Scanning Module includes a model of the scanner used and displays the actual scanner position on the object on-line and in real time in 3D.

The Scanning Module has a feature that can pre-examine the planned scanner path and display warnings if there is risk of collision with obstacles or a tolerance distance being exceeded.

The operator can monitor and control scanner motions. This module also includes features with windows for on-line data presentation.

### Reconstruction Module

The Reconstruction Module displays processed A-scans of the scanned object in 3D geometry. This module uses pre-processed A-scan data to display the location from where a specific indication originates - inside the object. Different indications are shown colour-coded. The geometry can be turned infinitely and viewed from any point in space. The specific indications can be dimensionally measured.

### Reporting Module

The Reporting Module generates inspection reports suited for printing on paper. The module includes features to select the most informative cross-sections of the object geometry for presentation of scan data.

### Archiving Module

Running on a Windows platform, archiving of raw data as well as evaluation results and reports is done on the computer.

#### P-scan Job : Nozzle

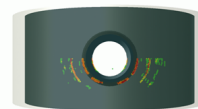
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