

Subsea P-scan



Photo: ROV with P-scan skid mounted below.

P-scan was developed for subsea inspection in the mid 90' and is today a versatile tool for inspection of structure and pipelines subsea. P-scan utilizes a magnetic wheel scanner which can be fitted with a wide selection of ultrasonic probes and/or eddy current probes pending on application,

weld inspection, crack detection or corrosion mapping. Scanner steering and data collection is controlled from the P-scan software. Two versions are available for either ROV or diver application.



Photo: P-scan diver skid.

Diver version

The system consists of a tool skid with the magnetic wheel scanner and an electronics bottle, the electronics bottle is connected to the surface with an umbilical cable. To the cable reel is connected power and a laptop PC for scanner control and data collection.

The tool skid is lowered into position and the diver moves the magnetic wheel scanner onto the object to be inspected. When the scanner is positioned on the object the scanner is controlled from the surface guided by the view from the diver's camera.

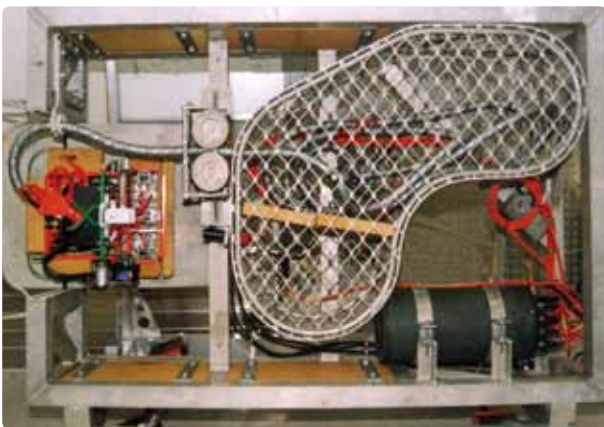


Photo: P-scan ROV skid.

ROV version

The system is fitted in a tool skid which is mounted below the ROV. The tool skid contains a docking bay for the magnetic wheel scanner, umbilical cable with storage basket and an electronics bottle. On the scanner and in the skid can be mounted cameras for surveillance.

The skid is connected to the ROV with a single mode fibre for communication, power supply and hydraulics for manipulation of the umbilical cable. The skid is neutral in water.

P-scan system, PS-4

The principal equipment for data collection of ultrasonic and/or eddy current signals is the P-scan system (PSP-4), which is a computerized ultrasonic system, developed by the FORCE Technology for automatic, mechanical or manual ultrasonic examination of welds and materials.

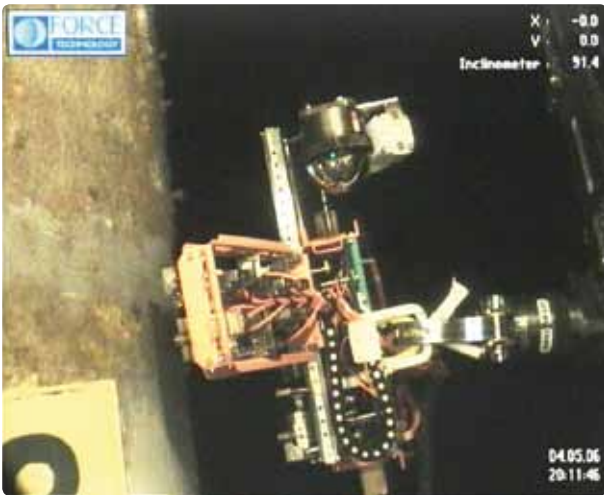
The P-scan system is in regular use in the industry for applications in power plants (conventional, nuclear), offshore industry, wind power industry, refineries, shipbuilding etc.

The P-scan processor is designed to meet the needs of industry for a reliable, portable, and highly advanced ultrasonic inspection system. In spite of the complexity and high performance of the system, the unit is compact.

The ultrasonic signals are amplified through a high-performance logarithmic amplifier in a front end unit, which may be located close to the search unit, and transmitted with high speed to the personnel computer for data presentation and storage.

The P-scan system has documentation and storage facilities (floppy, hard disk, optical disk etc.) for all data related to each inspection operation, and includes visualisation of the inspection results in the form of images of the material volume examined.

The P-scan system provides **A-scan**, **B-scan**, **T-scan** (thickness measurement) and **TOFD** (time-of-flight diffraction) mode including averaging for sizing of defects. Furthermore, the system provides projection images of the object under examination, e.g. images of the weld or part of an object. In the three projection images, called **TOP**, **SIDE** and **END** views, the flaws which have been detected are automatically shown at their correct location.



Scanner positioning on tension leg

P-scan Inspection techniques

Several inspection techniques are available on the P-scan system and they can be combined independently, the limit is set by the number of channels on the systems, 8 on the diver version and 16 on the ROV version. Data can be collected as raw A-scan data and processed at a later time.

Corrosion Mapping (T-scan)

The P-scan system can be fitted with a single or a number of ultrasonic probes depending on the area to be examined. The scanning resolution can be set arbitrarily from 0.1 x 0.1 mm and hence the scanning speed. The measurements are displayed in a colour coded map with 9 levels as default.

Weld Inspection (P-scan)

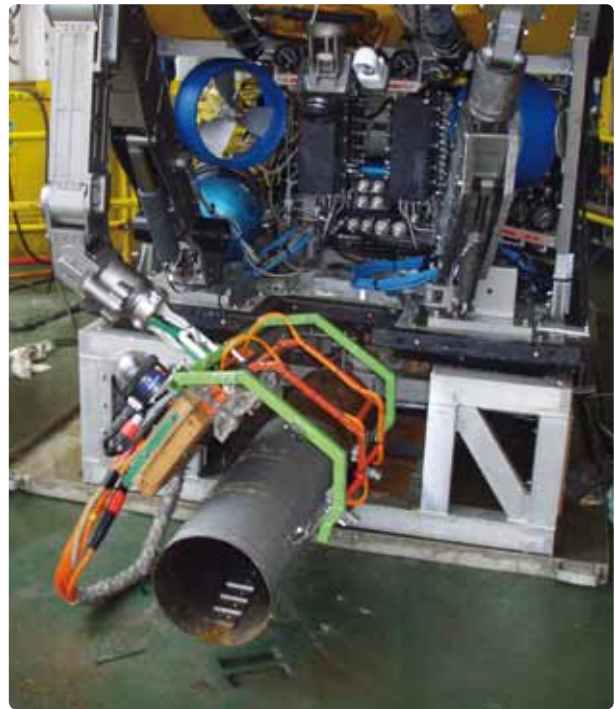
The P-scan system can be fitted with a number of different ultrasonic probes such as creeping wave probes, shear wave angle probes and normal probes. The probes can be setup to cover the most common weld geometries. The inspection is shown in a projection with top-, side- and end view. The weld geometry can be overlaid the presentation to ease the defect characterisation.

Time of Flight Diffraction (TOFD)

The TOFD ultrasonic technique can be used for detection and height sizing of defects and can also be used for corrosion inspection of the root side of a weld.

Crack Investigation

The P-scan system can be fitted with different probes both ultrasonic and eddy current probes, the ultrasonic probes can detect cracks in the full volume below the probes, where the eddy current probes are for detection of surface breaking cracks.



Setup for Corrosion Mapping of pipeline

Scanner

Both the ROV and the diver system utilizes the rugged versatile magnetic wheel XY-scanner AUS4. The scanner body which contains the motors can be fitted with a wide selection of setups depending on application. The movement is controlled by the P-scan software.

Surface requirements

The inspections require a clean surface free of marine growth and other materials which can prevent contact between probes and surface. The inspections can be carried out on paint coatings, plastic coatings or bare metal. Thick coatings reduce the attraction force of the magnetic wheels of the scanner and may require additional tools.

Technical specifications

Operational depth	Diver version ROV version	Umbilical cable length 250 m 1000 m
Power requirements	Diver version ROV version	100-240 VAC, 50-60 Hz, 250 W 100-240 VAC, 50-60 Hz, 500 W
Communication	Diver version ROV version junction box	Laptop PC directly to umbilical reel Single mode fibre connection in ROV
Hydraulics (umbilical)	ROV version	Min. 140 bar, 10 l/min.
Subsea operation	Diver version ROV version	Operated by diver. Umbilical cable for power and communication to topside control Operated by ROV manipulator arm and powered from ROV, umbilical cable operated by ROV hydraulics, communication to topside control via ROV main umbilical (optical fibre)
Ultrasonic / Eddy current channels	Diver version ROV version	8 channels 16 channels
Cable length (scanner to electronics)	Both versions	20 m

Further information

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