TecniTest NDT

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A fully automated laser guided inspection robot for weld defect detection on ship hulls

SPECTRE-X

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Project Shiptest

- **Shiptest** is a collaborative project of 5 partners aiming to produce an NDT robotic inspection system focusing on inspecting ships' hulls.
- Shiptest follows the successfully completed **X-Scan** demonstrator robot
- SPECTRE-X is the name and logo given to the robotic NDT inspection system developed within the framework of the Shiptest project.
- Shiptest is an FTI project funded by the EU under the H2020 scheme.

The ShipTest Proposal

Carrying out:

Inspection of welded joints and corrosion mapping on ships' hulls using a robot to drive PAUT, ACFM and Laser Profilometer sensors

Employing:

Phased Array Ultrasonic Testing (PAUT)

Alternating Current Field Measurement (ACFM)

Laser profiling of the welded joint

With:

Laser guidance system to follow the welded joint and the software developed for the data capture and display of this technology.

The ShipTest Proposal

In Addition:

Using a PAUT Roller Probe Transducer for corrosion mapping of Ships' Plates

At Sea

The whole system is manufactured according to IP 68.

THE ROBOT

Functional specifications

- The robot can be driven by an operator through a means of a joystick.
- The operator drives the robot to access the weld to be inspected.
- The robot deploys the NDT equipment on the weld upon command by the operator.
- The robot can move along the weld with a constant speed of desired value.
- The robot corrects the lateral position “error” of the NDT equipment, i.e. the offset from the centre-line of weld, based on feedback from the on-board laser profilometer.
- The robot moves vertically and horizontally on steel plates.

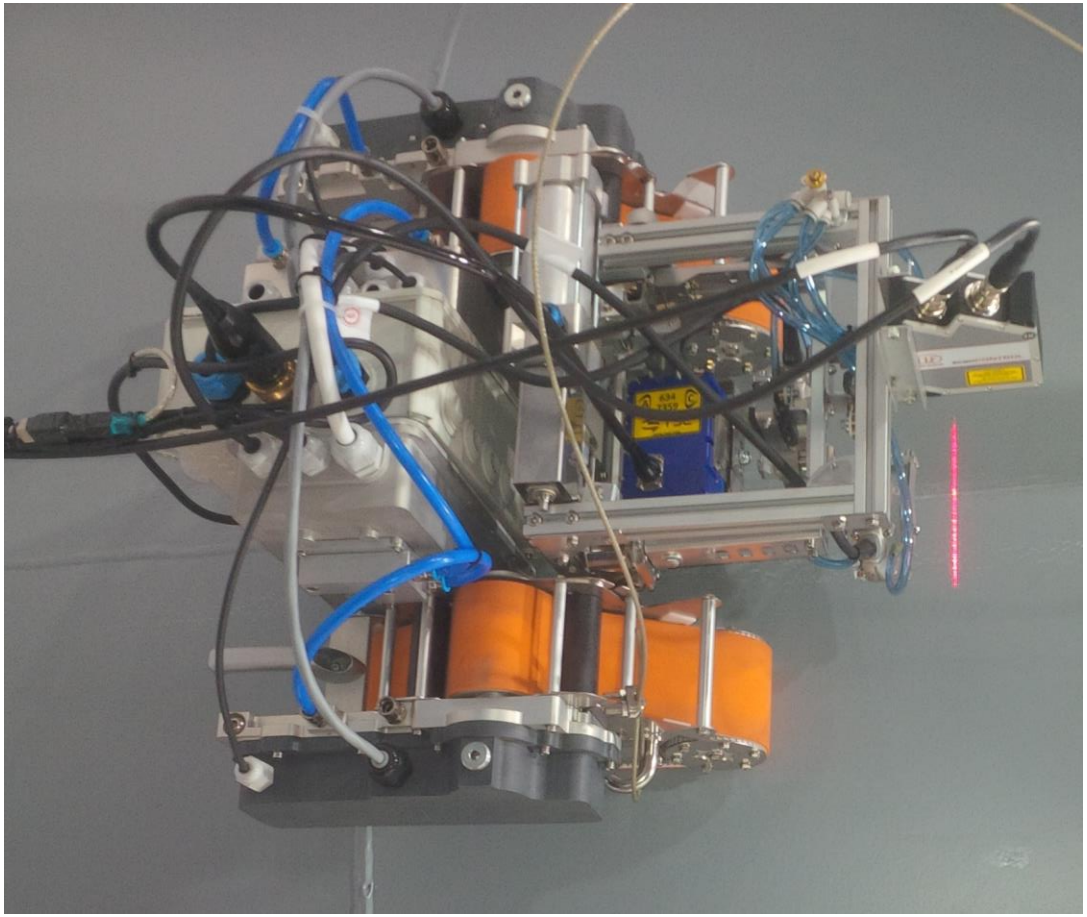
THE ROBOT

Functional specifications continued

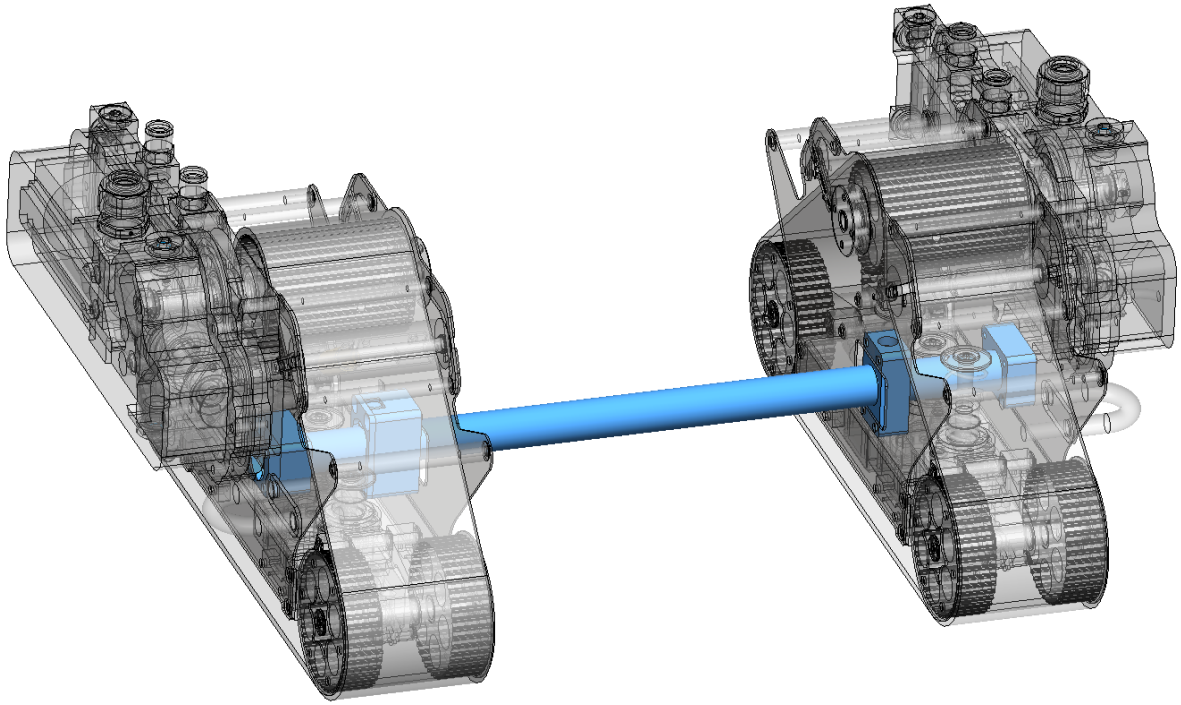
- The robot moves along the weld on significantly curved surfaces. The curvature set as target was 1m radius which is significantly more intense compared to the 2.5m that is required in most cases for hull inspection.
- The robotic system has ingress protection IP68, with 30m depth.
- The robot is able to overcome small profile obstacles such as welds in the case of cross-section and screws.
- The robot has integrated means for lifting the sensors in case the system detects that there is a possibility to damage them due to the variation of the surface where the robot operates.

THE ROBOT

Solution

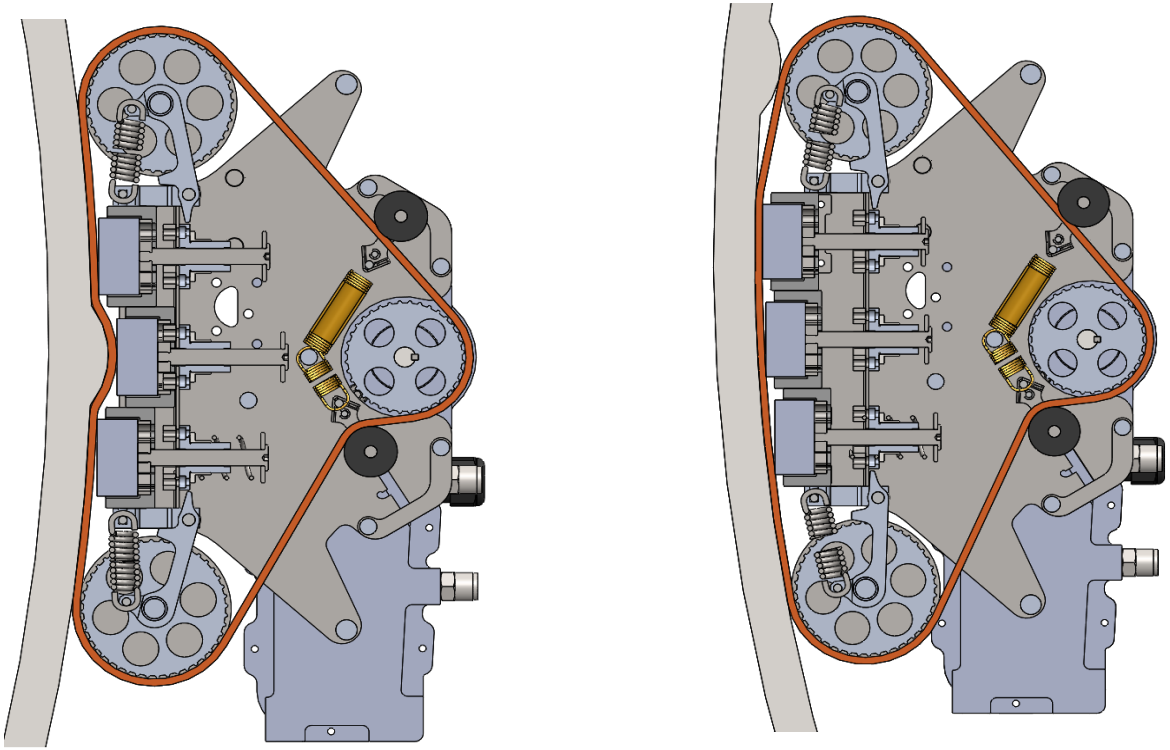


THE ROBOT CONTINUED



Maximum 5 degrees (±2.5 degrees) passive rotation between the two belt modules

THE ROBOT CONTINUED



Permanent magnets hold the crawler on convex and concave surfaces of any orientation

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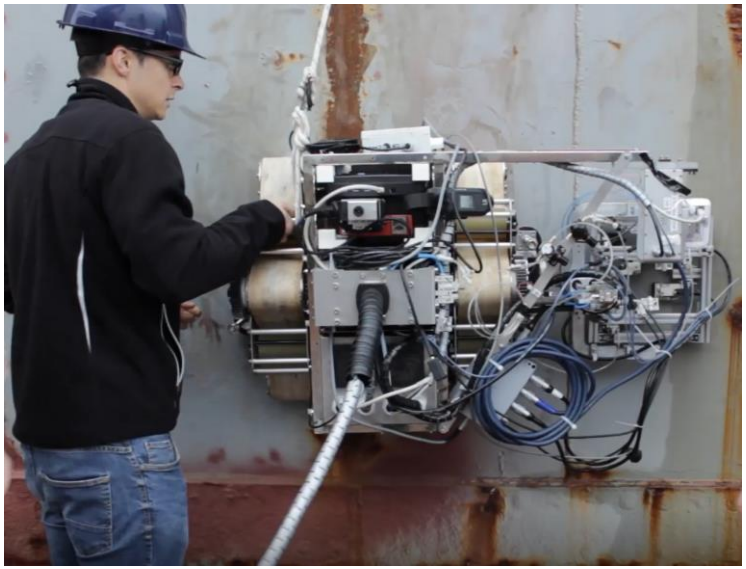
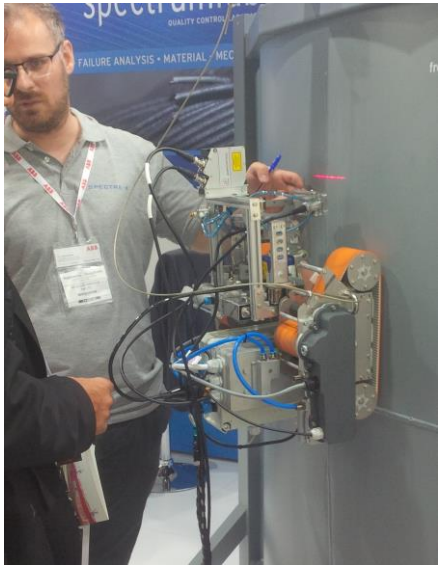
THE ROBOT - miniaturization



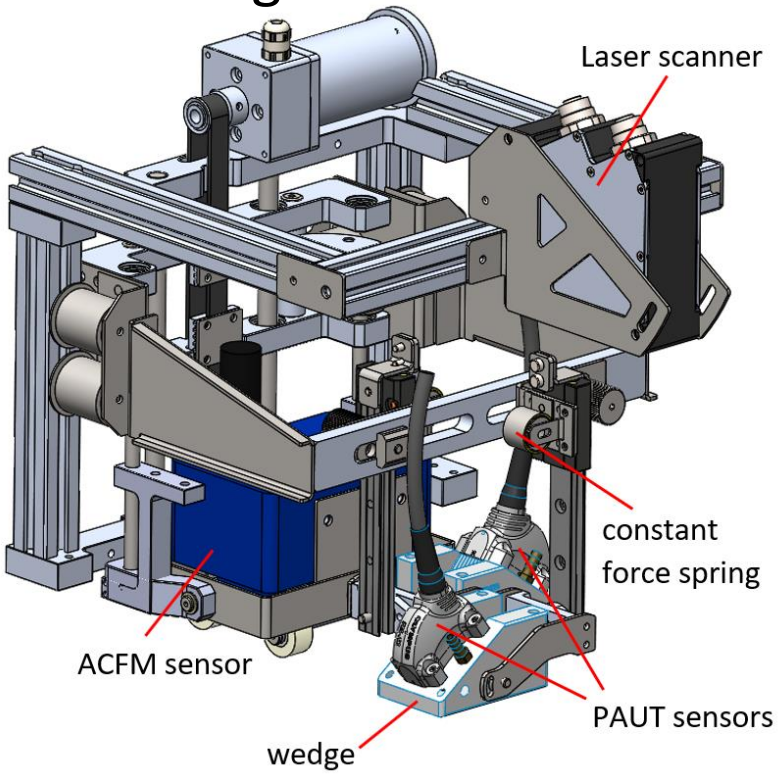
The old X-Scan with sensors outside the main structure



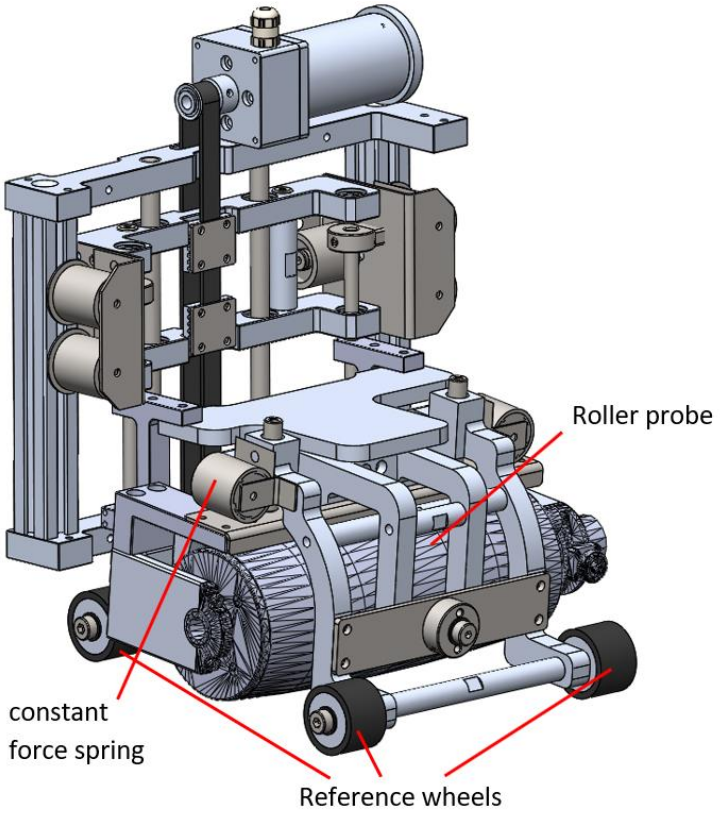
The all new spectre-X with sensors inline with the main structure

THE ROBOT CONTINUED

Weld inspection Configuration



Corrosion inspection Configuration



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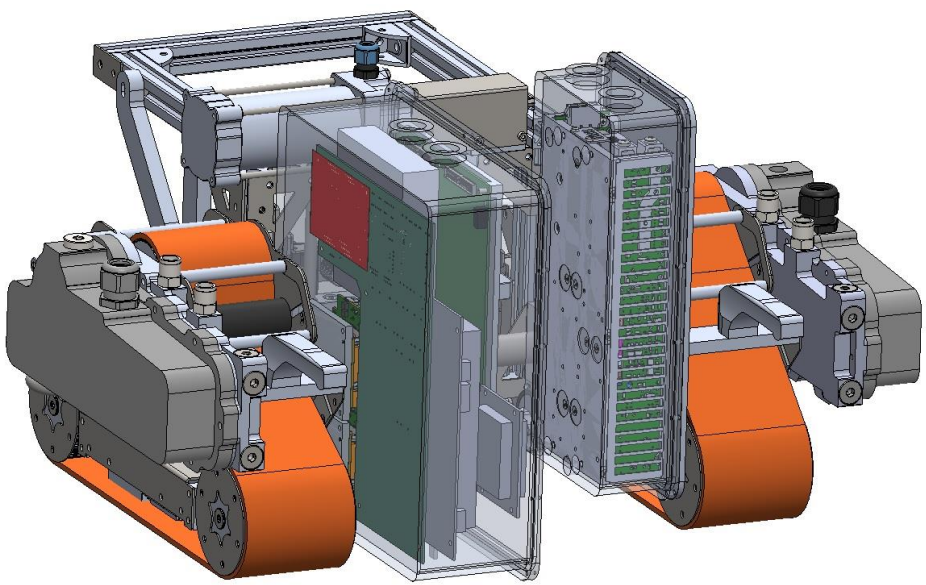
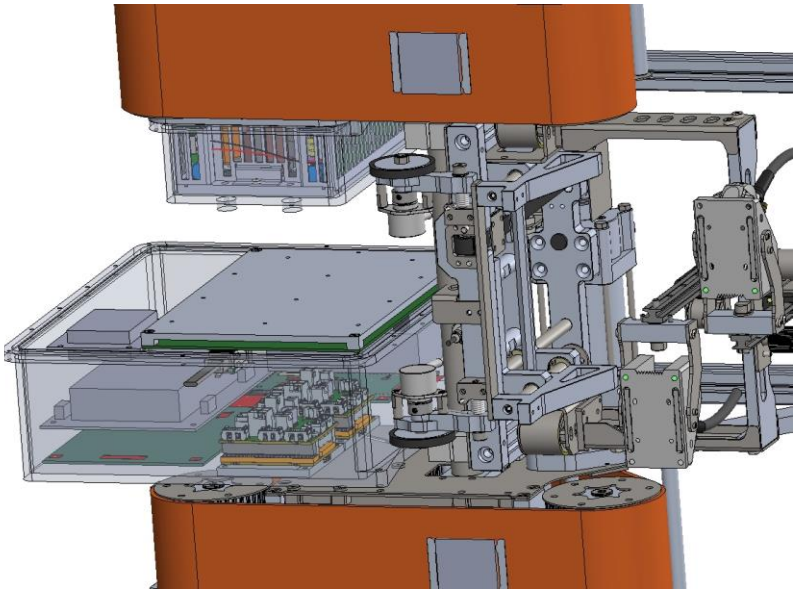
Electronic enclosures





Water Cooling for PCBs

Inspection Methods

Laser Tracking:

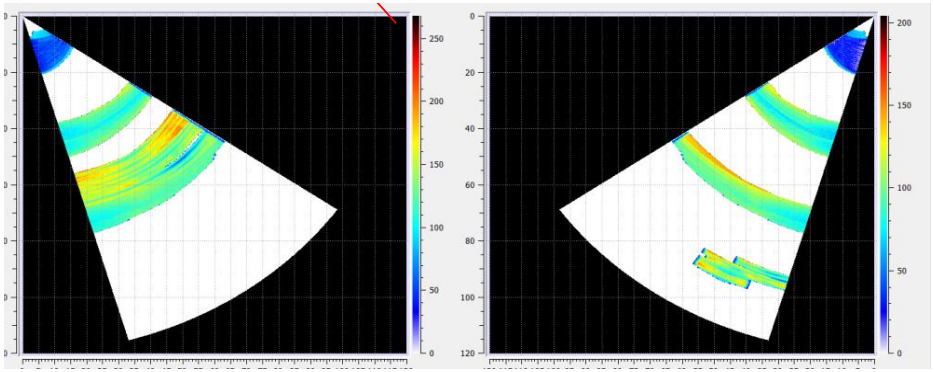
Laser to be used to track the weld. Keeping the Robot on track and the Sensors in the correct position for the inspection

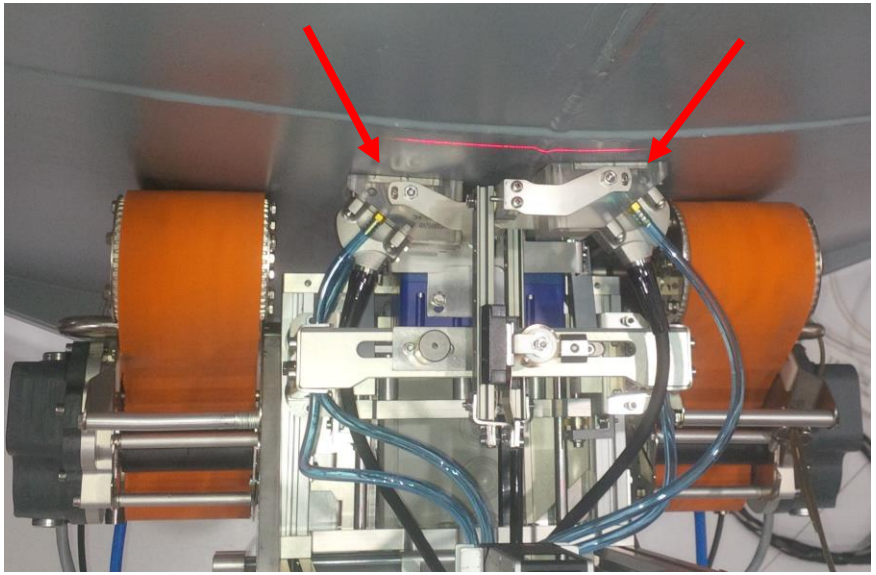
Laser data capture to give indications of surface defects iaw EN ISO 17637

Inspection Methods

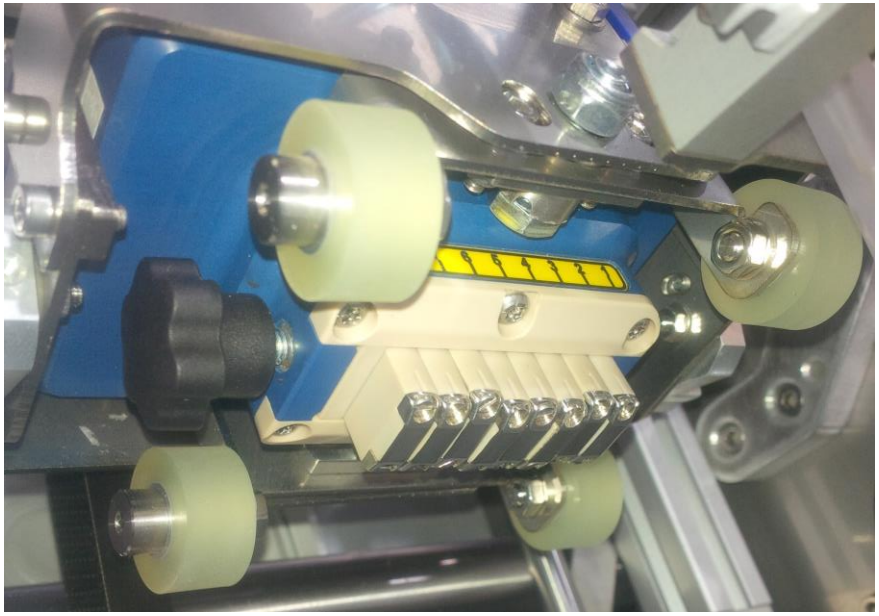
Phased Array Ultrasonics (PAUT):

- Used for the inspection of the weld for volumetric defects





Inspection Methods



Alternating Current Field Measurement (ACFM):

Used for the inspection of the Weld Cap for surface and near surface defects, cracking and porosity

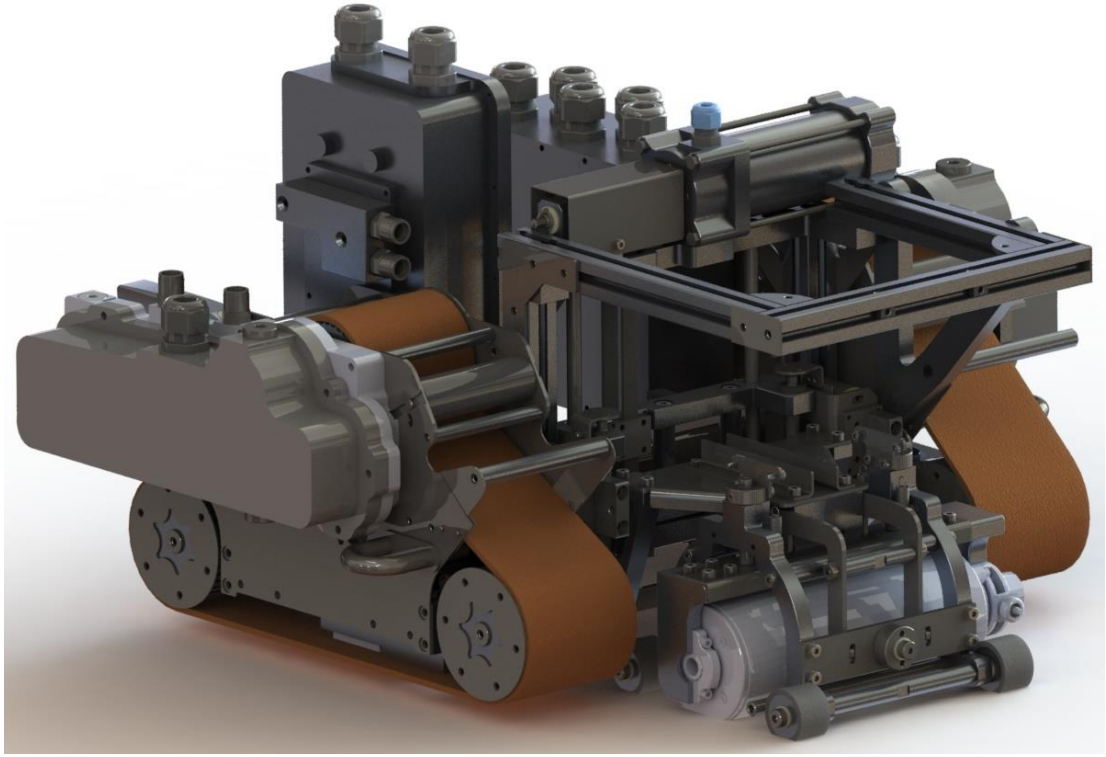
TecniTest NDT

Inspection Methods

PAUT in Roller Probe:

Used for Corrosion mapping inspection of ships plates.

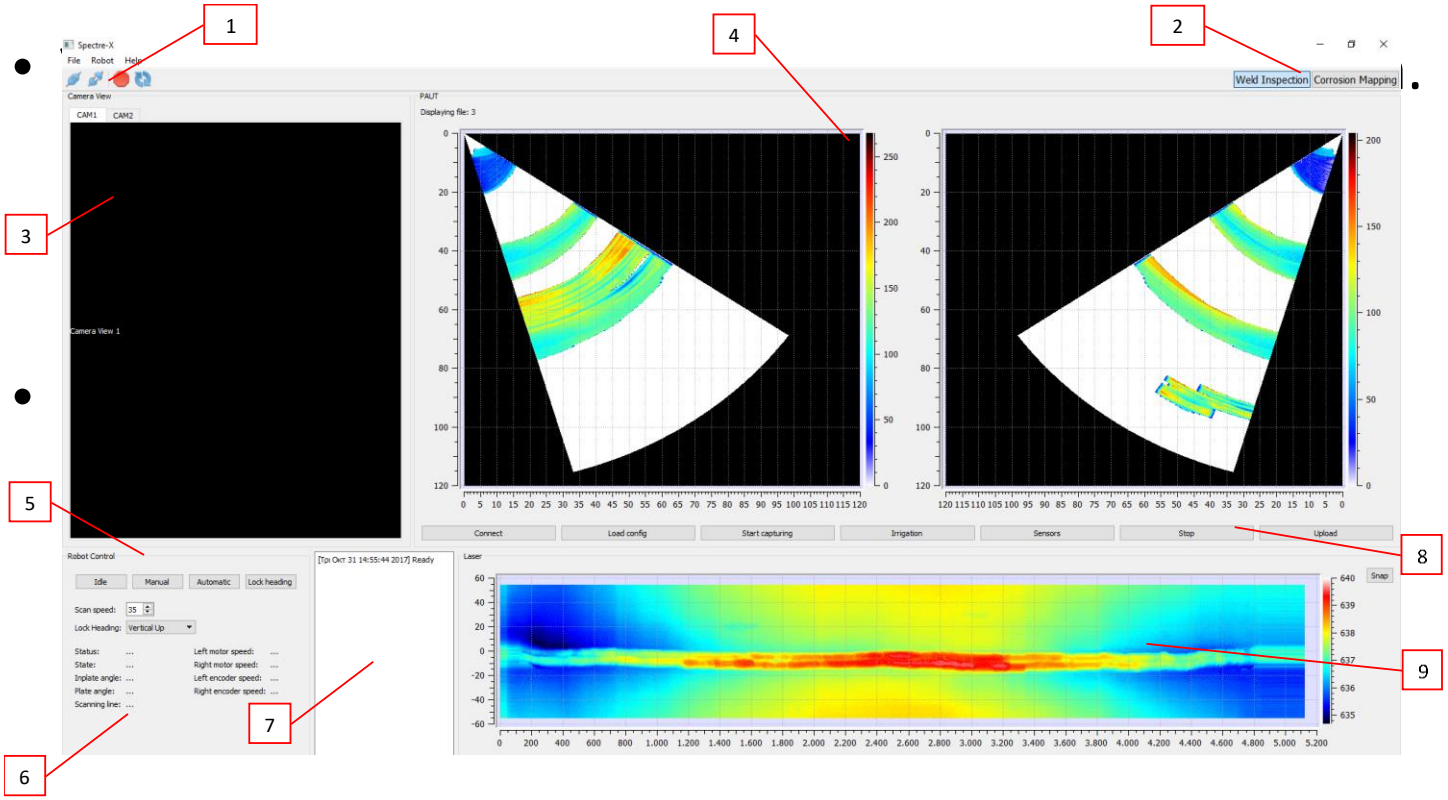
128 element PAUT Probe.



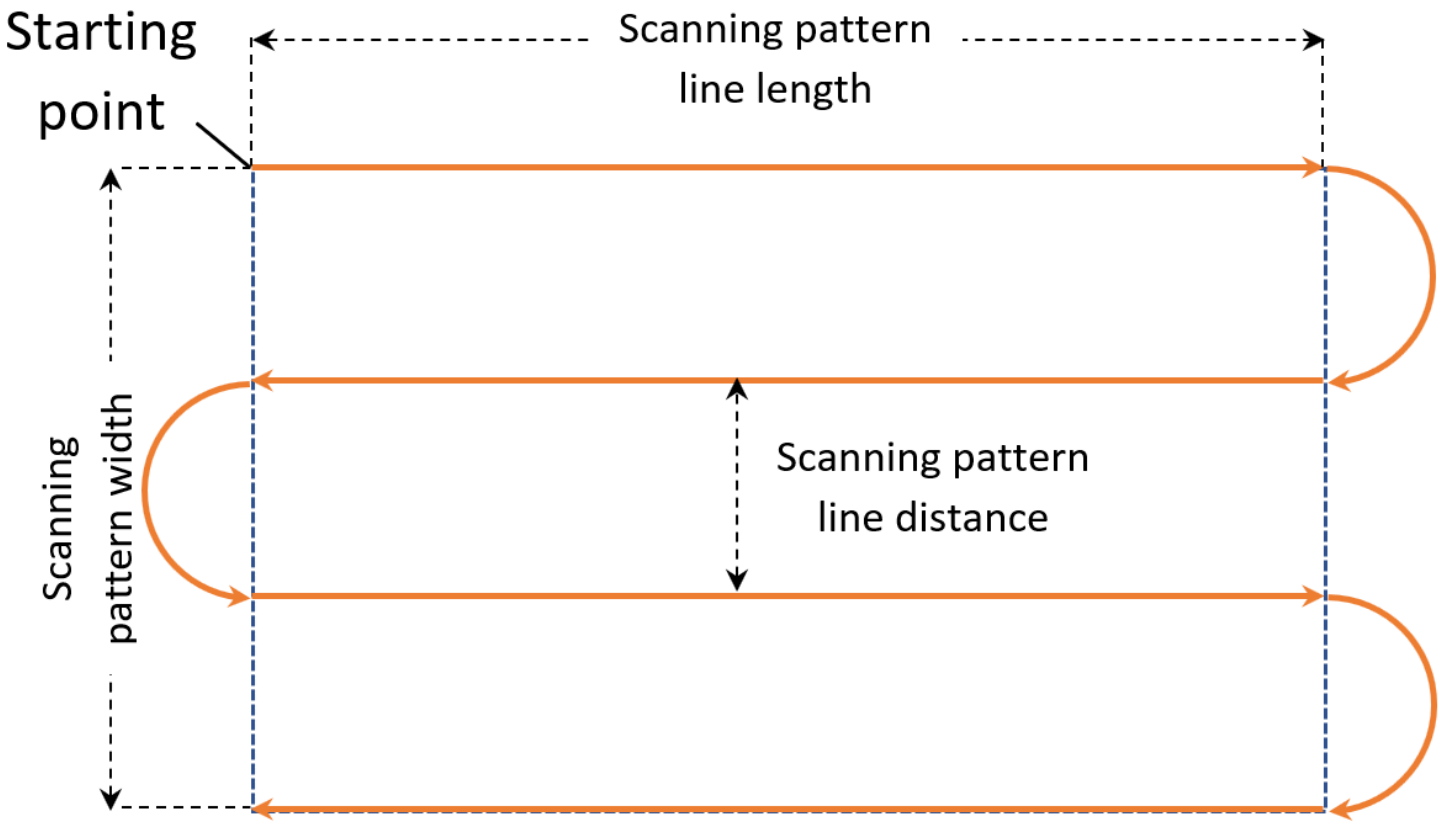
The Control

- A Base station to be placed on the dock or on the ships deck with Joystick control.
- Deployment by 2 personnel onto the hull Surface, via ramp system.
- Driven to the start of the inspection site using a Graphical User Interface (GUI)
- Laser guided system to ensure Weld always in centre of inspection, via feedback system.
- For corrosion inspection a pattern to be employed from the software.

Graphical User Interface

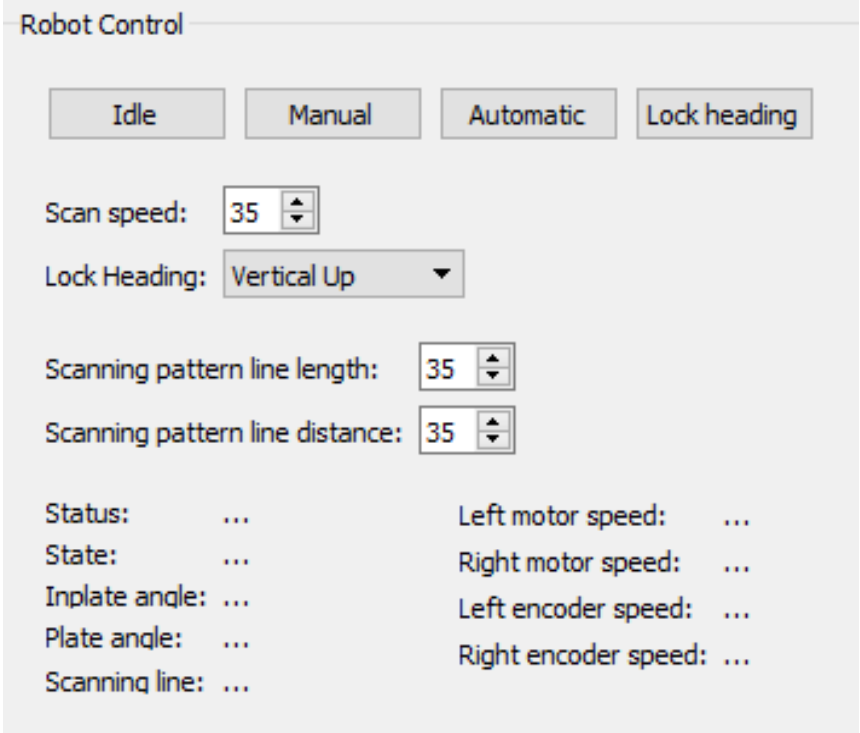


Corrosion Mapping Control



Corrosion Mapping Control

- Scan speed for automatic mode can be set for 5 to 50 mm/s.
- Scanning pattern line length
- Scanning pattern line distance
- Scanning pattern width
- Lock direction can be set Status of the robot
- Inplate angle: The angle that indicates the direction of the robot on the plate measured by the inclinometer.
- Plate angle: The angle of the plate with relation to the gravity measured by the second inclinometer.



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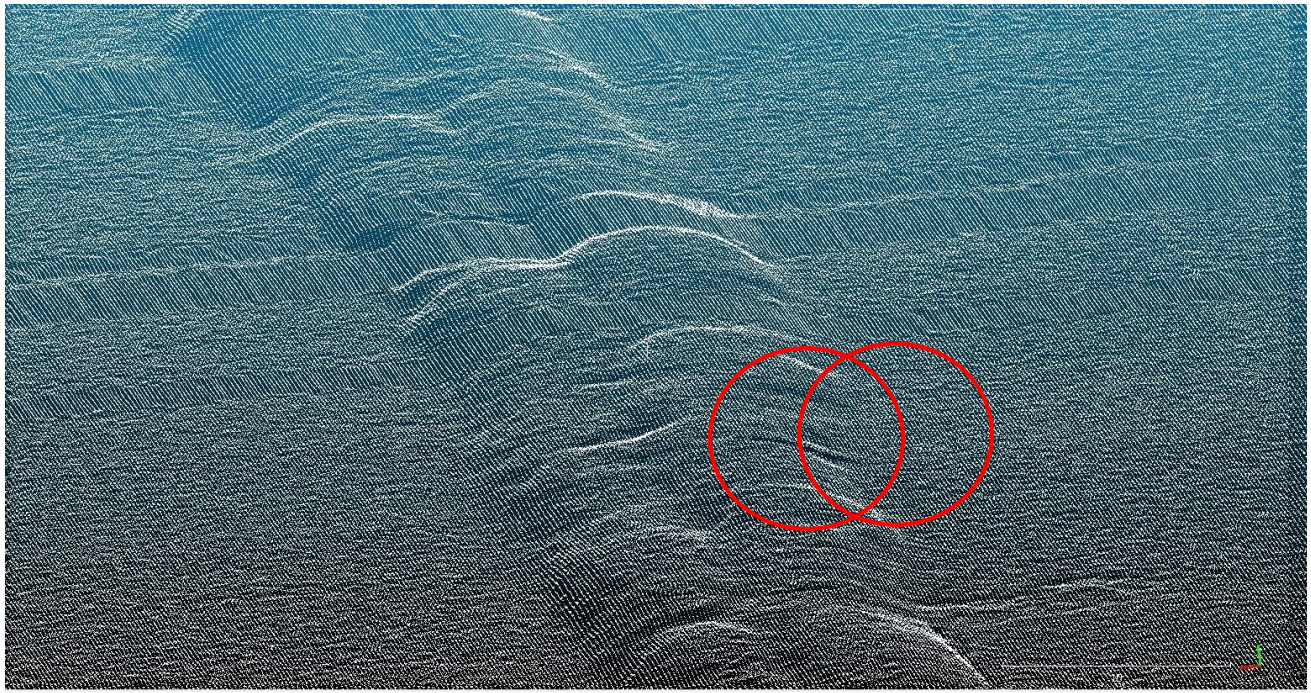
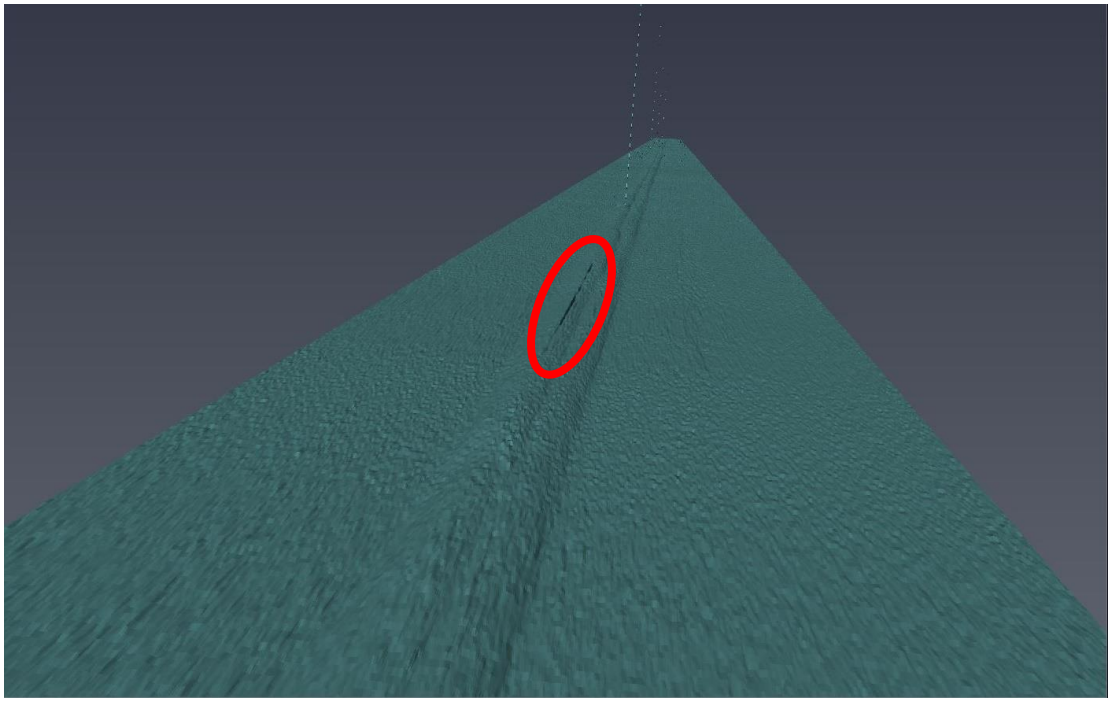
Post Inspection Analysis
Weld Inspection



TecniTest NDT

Post Inspection Analysis
Weld Inspection



Reconstruction of Weld Inspection showing the location of Defects

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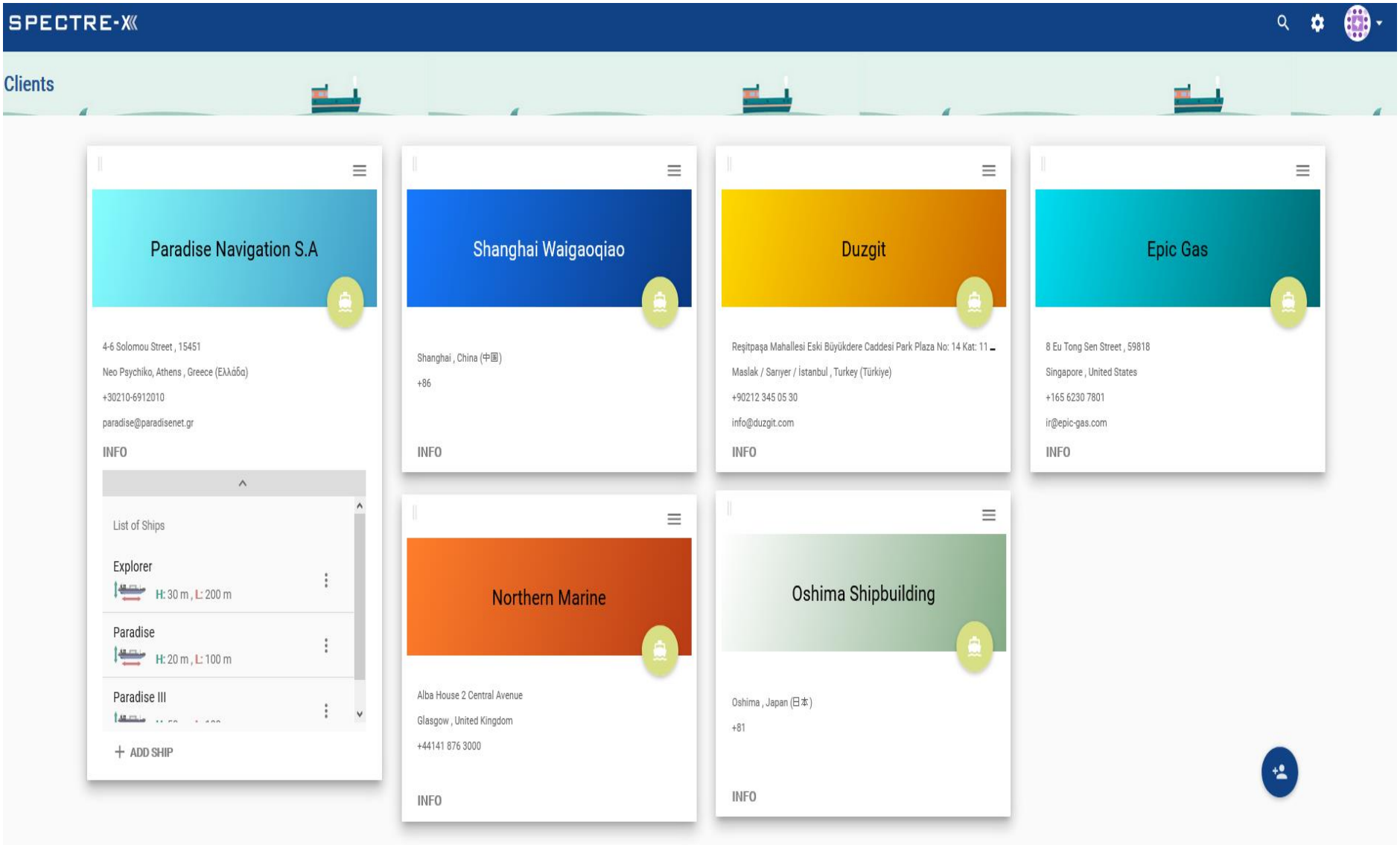
Software – cloud platform



More Information

www.shiptest.eu

Thank you for your attention

QUESTIONS??