PALM Scanner
Operating Instructions
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1 Safety

The design of the PALM Scanner family is intrinsically safe. Its characteristic features are as follows:

1) The PALM Scanner does not contain any actors or other force generating elements that could harm the operator

2) The PALM Scanner is operated with voltages smaller than 48V. For the probes please refer to the corresponding instructions.

3) In the event of faults the PALM Scanner can be removed from the support by hand.

These operating instructions are intended for operators of the PALM Scanner. Certain items are not described in detail in these operating instructions. It is assumed that the operators of the PALM Scanner are qualified professionals possessing well-founded technical knowledge and experience.

These instructions cover the operation of the PALM Scanner. Items such as UT probes, UT device and couplant supply are not covered by these operating instructions. Refer to the specific instruction for those elements.
2 General

The PALM Scanner comprises of different sizes of scanners.

If not specifically mentioned this manual describes the PALM 64 (tube diameter 50mm to 64mm). However, the instructions given in this manual can applied to all scanners without any significant impact on safety, performance or handling.

If all scanners are meant this manual refers to them as PALM Scanner.
3 Technical Data

3.1 Dimensions & Weight

<table>
<thead>
<tr>
<th>Model</th>
<th>Storage temperature</th>
<th>Operating temperature</th>
<th>Dimensions (L x B x H)</th>
<th>Test object min. Ø (OD)</th>
<th>Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>General</td>
<td>-20...+70 °C</td>
<td>0...+50 °C</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PALM 50</td>
<td></td>
<td></td>
<td>82 x 71 x 57 mm (max.)</td>
<td>1.5”-2.0”</td>
<td>~0.3kg</td>
</tr>
<tr>
<td>PALM 64</td>
<td></td>
<td></td>
<td>82 x 79 x 71 mm (max.)</td>
<td>2.0”-2.5”</td>
<td>~0.3kg</td>
</tr>
<tr>
<td>PALM 90</td>
<td></td>
<td></td>
<td>82 x 100 x 85 mm (max.)</td>
<td>2.5”-3.5”</td>
<td>~0.4kg</td>
</tr>
<tr>
<td>PALM Flat</td>
<td>See separate PALM Flat manual</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
3.2 Principle Dimensions

PALM Scanner 50

PALM Scanner 64

PALM Scanner 90
### 3.3 Clearance needed

<table>
<thead>
<tr>
<th></th>
<th>PALM50</th>
<th>PALM64</th>
<th>PALM90</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Tube dim.</strong></td>
<td><strong>Encoderwheel Ø12mm</strong></td>
<td><strong>Encoderwheel Ø15mm</strong></td>
<td><strong>Encoderwheel Ø12mm</strong></td>
</tr>
<tr>
<td>1.5 inch</td>
<td>38 mm</td>
<td>16.4 mm</td>
<td>16.4 mm</td>
</tr>
<tr>
<td>2.0 inch</td>
<td>51 mm</td>
<td>14.2 mm</td>
<td>15.0 mm</td>
</tr>
<tr>
<td>2.5 inch</td>
<td>64 mm</td>
<td>18.0 mm</td>
<td>18.0 mm</td>
</tr>
</tbody>
</table>

### 3.4 Encoder

Encoder resolution: **1024 counts per turn**

Pin assignment for 15 pin D-Sub connector:

<table>
<thead>
<tr>
<th>connector type male</th>
<th>encoder interface (Omniscan™)</th>
</tr>
</thead>
<tbody>
<tr>
<td>signal</td>
<td>pin</td>
</tr>
<tr>
<td>Supply (5V)</td>
<td>3</td>
</tr>
<tr>
<td>A, encoder</td>
<td>9</td>
</tr>
<tr>
<td>B, encoder</td>
<td>10</td>
</tr>
<tr>
<td>Key</td>
<td>13</td>
</tr>
<tr>
<td>Gnd</td>
<td>15</td>
</tr>
</tbody>
</table>
4 Scope of supply

4.1 Transport and Packing

The PALM Scanner may only be transported in its associated hard shell case.

<table>
<thead>
<tr>
<th>Dimension</th>
<th>Measurements</th>
</tr>
</thead>
<tbody>
<tr>
<td>External dimensions</td>
<td>360 x 304 x 194 mm</td>
</tr>
<tr>
<td>Internal dimensions</td>
<td>330 x 234 x 102 mm</td>
</tr>
<tr>
<td>Weight empty</td>
<td>2.51 kg</td>
</tr>
<tr>
<td>Weight full</td>
<td>3.33 kg</td>
</tr>
</tbody>
</table>
### 4.2 Scope of delivery

The complete scope of supply comprises the following objects:

<table>
<thead>
<tr>
<th>Item.</th>
<th>Designation</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>PALM XX</td>
<td>1</td>
</tr>
<tr>
<td>2</td>
<td>Spring assembly left</td>
<td>1</td>
</tr>
<tr>
<td>3</td>
<td>Spring assembly right</td>
<td>1</td>
</tr>
<tr>
<td>4</td>
<td>Encoder wheel Ø12 and Ø15</td>
<td>1</td>
</tr>
<tr>
<td>5</td>
<td>Tool set</td>
<td>1</td>
</tr>
<tr>
<td>6</td>
<td>Option: extension for Double Sided Version (DS)</td>
<td>1</td>
</tr>
</tbody>
</table>

1) PALM xx  
2) Spring assembly left  
3) Spring assembly right  
4) Encoder wheel Ø12 and Ø15  
5) Tool set  
6) DS extension
5 Setup & preparation

5.1 Overview

The main task of the PALM Scanner is the circumferential scanning of tube to tube welds (TTW) or tube to header welds (THW). For this task the PALM Scanner carries a phased array (PA) ultrasonic (UT) probe and guides it around the tube on a circumferential path. The scanning process is performed manually.

The probe itself is spring-loaded to ensure a continuous contact to the surface.

The PALM Scanner is equipped with an encoder, which is preloaded with springs in order to guarantee a steady contact with the surface.

The PALM Scanner is configured for use in work-shops as well as on site in facilities such as power plants, or refineries. It is characterized by the following features:

1) The PALM Scanner can be transported, connected, operated and removed by one person.

2) The PALM Scanner is designed to leave behind no damage to the object under test, providing it is correctly operated.

Operation described in this chapter generally refers to weld testing on tubes.

5.2 Test Object

It is highly recommended to clean scan path prior the inspection. Furthermore a visual check for damages should be performed.

Tube diameters and PALM Scanner to use:

<table>
<thead>
<tr>
<th>Tube diameter (OD)</th>
<th>PALM Scanner</th>
</tr>
</thead>
<tbody>
<tr>
<td>inches</td>
<td>mm</td>
</tr>
<tr>
<td>1.5</td>
<td>38</td>
</tr>
<tr>
<td>1.75</td>
<td>44</td>
</tr>
<tr>
<td>2</td>
<td>51</td>
</tr>
<tr>
<td>2.25</td>
<td>57</td>
</tr>
<tr>
<td>2.5</td>
<td>64</td>
</tr>
<tr>
<td>2.75</td>
<td>70</td>
</tr>
<tr>
<td>3</td>
<td>76</td>
</tr>
<tr>
<td>3.25</td>
<td>83</td>
</tr>
<tr>
<td>3.5</td>
<td>89</td>
</tr>
<tr>
<td>&gt;3.5</td>
<td>&gt;89</td>
</tr>
</tbody>
</table>
5.3 Preparing the PALM Scanner

1) Unpack scanner from the safety case and unroll the cable

Risk of damage:
Unroll the cable WITHOUT twisting it.

2) Check the scanner and cables for damage, do not use when damaged.

3) Check the guide rolls (8 passive + 1 encoder roll) for easy rotation

5.4 Preparing wedge and probe

Wedges for the PALM Scanner are shaped to fit the right tube diameter. Information for the right choice of wedge and the setup is engraved on the wedge itself. This information can also be obtained from the wedge data sheet.
Wedges are equipped with threaded holes to mount the PA probe. Couplant between wedge and probe is needed to ensure proper ultrasound propagation and minimize attenuation.

### 5.5 Mounting probe and wedge

After selecting the right probe & wedge for the diameter to scan follow these points to mount it to the PALM Scanner.

1) unmount the lever springs  
2) Insert the pivot pins attached to the springs into the pivot holes in the wedge.  
3) Mount the probe/spring assembly to the PALM Scanner. 2 Screws per spring are sufficient  
4) Check if the probe / springs can move freely by pressing the probe up 1…2mm (not more!)  
5) connect the couplant tubes to the wedge

The springs can easily be overloaded. Do not tension the springs excessively.
6) fix probe cable and couplant tube and mount the cable clamp
5.6 Option: PALM Scanner Double Sided (DS)

The PALM Scanner can be equipped with the optional PALM Scanner Double Sided (DS) extension. This extension enables the operator to inspect both sides of a weld at the same time. As two PA probes are operated simultaneously either an UT multiplexing unit or an UT controller with two probe connections is required.

The PALM DS is easily mounted to the PALM Scanner:

1) Attach the PALM DS to the PALM Scanner by fixing the two Head cap screws. Use the appropriate holes on the PALM scanner.

2) Adjust the distance between the probes by loosening and tightening the socket set screws; maximum distance is 34mm.

3) Follow the points in the previous chapters to mount probe, wedge and couplant supply as well as cable and tubing management.
6 Operation

6.1 Functional Test

On completion of the connection the complete system should undergo a function test.

1) Connect the probe to the UT controller
2) Connect the tubes to the couplant supply unit
3) Switch on couplant supply and check if couplant escapes from the contact surface of the wedge
4) Connect the PALM Scanner Encoder cable to the UT controller
5) Switch on UT controller
6) Check the direction of motion and compare the distance travelled with the distance displayed.
7) Calibrate probe & controller according to calibration procedure.

6.2 Performing a scan

Place the scanner smoothly on the tube by opening the 2 clamps manually and engaging the scanner around the tube.

Move the scanner manually around the tube. The encoder detects the position automatically. Thus the UT controller will take a correct C-scan as long as the maximum scan speed (typically 50mm/s) is not exceeded.

Use inspection procedure to perform inspection.

Danger of damage:
Do not let the scanner snap to the tube or into its resting position.
Handle cables and couplant tubes with care

After operation clean the PALM Scanner according to section 7.1. Coil up the cable carefully and store the scanner in the safety case

Danger of damage:
Do NOT twist the cables when coiling up.
7 Maintenance

7.1 Cleaning

The PALM Scanner should be cleaned after each operation with couplant.

![Risk of destruction]

Risk of destruction:
The cleaning should be done with smoothly running water and a soft brush only.
Do NOT clean not with direct compressed air – or water pressure acting on to the encoder unit or any bearing.

7.2 Inspection Interval

It is recommended for the PALM Scanner to be inspected by the manufacturer after 200 hours of operation or 12 months, whichever is the sooner.

7.3 Exchanging the Encoder Cable

The PALM Scanner Encoder cable consists of 2 parts. One part is fixed to the housing, this does not need maintenance. The second part is the cable; it is available as spare part and can be exchanged by the operator. Please follow these steps:

1) Unmount the three screws that hold the encoder on the bottom of the PALM Scanner

2) Loosen the screw that holds the encoder cable cap; unplug the cap and replace the cable.
3) Remove the clip and push the shaft to the position shown in the picture.

4) Guide the encoder cable through the slot as shown in the picture.

5) Push the shaft back in and guide the cable around the shaft; fix the shaft with the circlip.

6) The cable is marked with three white dots; depending on the PALM Scanner size align the appropriate dot with the edge of the scanner frame.

7) Fix the cable by remounting the bracket and tightening the screws.
7.4 Exchanging the Encoder wheel

The encoder wheel can be easily replaced by removing the circlip. Once the wheel is mounted, check if the circlip fits tightly. If damaged, replace the circlip.
8 Disposal

The PALM Scanner contains metal, electronic, cables, plastic, oils and other material. Dispose it according to local law and procedures.

The PALM Scanner can be returned to the manufacturer. To learn the exact procedure, contact our support service, E-Mail: support@inspection-robotics.com.
9 Technical Support

9.1 Fault Rectification

For fault rectification or technical support, contact the manufacturer’s support service:

support@inspection-robotics.com

ALSTOM Inspection Robotics Ltd
Technoparkstrasse 1
8005 Zürich, Switzerland
www.inspection-robotics.com

9.2 Replacement Part

If replacement parts are required, these can be ordered directly from the manufacturer. To provide a speedy service we require the following information:

1) Contact person and access data (telephone, E-Mail etc.)
2) Delivery address
3) Invoicing address
4) Exact designation of the replacement part (see drawings/parts list)
5) Article number (see drawings/parts list)
6) Quantity

You can E-Mail your order to support@inspection-robotics.com.