

PALM Scanner

Weld assessment of difficult-to-access,
small diameter pipes

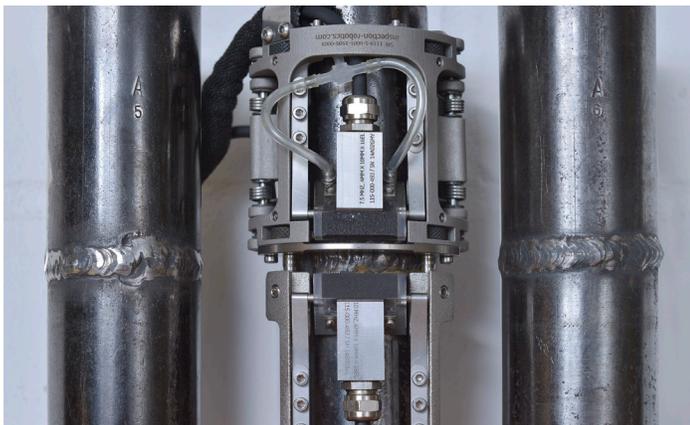


NDT inspections of circumferential butt welds are a complex task. This type of joint is found in various structures including small diameter tubes in boilers. Experts inspect these to find defects which could result in the failure of a component, possibly inducing a human or environmental hazard.

Four factors define the quality of these inspections:

- Safety
- Inspection duration
- Measurement precision and reliability
- Quality data management

PALM Scanner



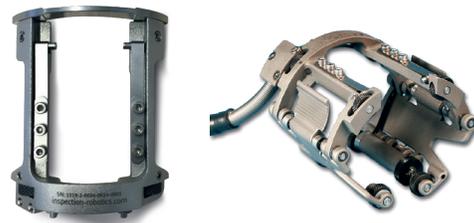
PALM Scanner with double-sided extension

Operating information

The PALM Scanner family inspects pipes of diameters from 1.5" up to 3.5". The tools are adaptable with various wedges and phased array probes to suit any inspection procedures regardless of tube thickness, material or acceptance criteria.

The PALM Scanners are delivered with a wide selection of accessories in order to make inspection and/or equipment handling even simpler.

Product offering



| | |
|---------------------------------------------------------------------|---------|
| PALM 50 Scanner (1.5" – 2.0" diameter tube) | 0600140 |
| PALM 64 Scanner (2.0" – 2.5" diameter tube) | 0600141 |
| PALM 90 Scanner (2.5" – 3.5" diameter tube) | 0600142 |
| PALM 50 Double-sided Extension Offering only with MUX reasonable | 0161925 |
| PALM 64 Double-sided Extension Offering only with MUX reasonable | 0161926 |
| PALM 90 Double-sided Extension Offering only with MUX reasonable | 0161927 |

Outline

- Compact, rigid and lightweight
- Easy access between gaps as narrow as 12 mm
- Optimum spring-loaded open clamp system
- No axial slip
- Excellent UT signal
- Reliable measurements
- Fast and easy translations between measurements
- Suitable for ferromagnetic and non-ferromagnetic pipes
- Adapts to various probes and wedges
- Provides optimum circumferential weld measurement for each tube size
- Operated by a single person
- Easy to set up
- Parallel mounting for inspection from both sides

- CE compliant (waterproof and rust-free)
- Need MUX for this product offering

When NDT inspection of circumferential butt welds are performed manually, it is difficult to achieve high standards on safety, inspection duration, measurement precision and reliability and quality data management simultaneously. New or repaired welds are usually inspected by radiography (RT). The technology requires the evacuation of the workers on site, as well as considerable time for developing the RT films.

Waygate Technologies present the field-proven PALM scanners that offer unparalleled ease-of-use experience to operators with superb mechanical design and quality. The ultrasonic PA probes and wedges crafted specifically for this application ensure the outstanding inspection quality. The probes and scanners are delivered with Mentor UT probe connector and encoder adapter as well.

Low profile focused array probes

Angle beam probes with flat transducers on convex surfaces like tubes, suffer from the fact that the sound tends to become defocused. This is especially true if the transducer's width is relatively large compared to the bending radius of the curved surface. Therefore, Waygate Technologies has developed laterally focused array probes with concave curvature in elevation (CCEV) for the use with the PALM Scanner, where the focus not only countervails the defocussing effect of the surface, but even increases lateral defect resolution compared to unfocused probes.

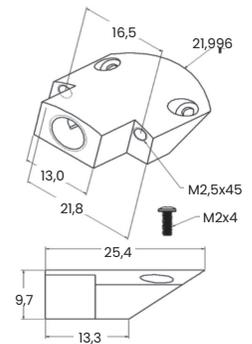


Laterally focused array

| Part number | Internal focus | Frequency | Element count | Pitch | Elev | Cable with Omniscan™ connector |
|-------------|----------------|-----------|---------------|-------|------|--------------------------------|
| | (mm) | (MHz) | | (mm) | (mm) | |
| 115-130-047 | 35 | 7,5 | 16 | 0,5 | 10 | 3 |
| 115-130-048 | 35 | 10 | 32 | 0,3 | 7 | 3 |

Laterally focused twin arrays with Y-cabling

| | | | | | | |
|-------------|----|-----|--------|-----|----|---|
| 115-001-335 | 35 | 7,5 | 2 x 16 | 0,5 | 10 | 3 |
|-------------|----|-----|--------|-----|----|---|



Low profile laterally focused array

| Wedge part number | Material | Velocity | | Incident angle | Curvature | | Curvature orientation | Used on |
|-------------------|----------|----------|---------|----------------|-----------|------|-----------------------|---------|
| | (mm) | (m/s) | (in/us) | (deg) | (mm) | (in) | | |
| 360-142-239 | Rexolite | 2337 | 0.092 | 38.5 | 38.10 | 1.50 | Axial O.D. | PALM 50 |
| 360-142-240 | Rexolite | 2337 | 0.092 | 38.5 | 44.45 | 1.75 | Axial O.D. | PALM 50 |
| 360-142-241 | Rexolite | 2337 | 0.092 | 38.5 | 50.80 | 2.00 | Axial O.D. | PALM 50 |
| 360-142-242 | Rexolite | 2337 | 0.092 | 38.5 | 50.80 | 2.00 | Axial O.D. | PALM 64 |
| 360-142-243 | Rexolite | 2337 | 0.092 | 38.5 | 63.50 | 2.50 | Axial O.D. | PALM 64 |
| 360-142-247 | Rexolite | 2337 | 0.092 | 38.5 | 63.50 | 2.50 | Axial O.D. | PALM 90 |
| 360-142-248 | Rexolite | 2337 | 0.092 | 38.5 | 76.20 | 3.00 | Axial O.D. | PALM 90 |
| 360-142-249 | Rexolite | 2337 | 0.092 | 38.5 | 88.90 | 3.50 | Axial O.D. | PALM 90 |



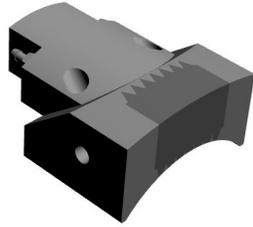
Laterally focused twin array with Y-cabling makes a splitter unnecessary and is ideal for double-sided inspections. MUX option is required to support twin arrays.

| Wedge part number | Reference point | | Primary offset | | Secondary offset | | Height of first el. | | Wedge front | | Zoff | |
|-------------------|-----------------|-------|----------------|-------|------------------|-------|---------------------|-------|-------------|-------|------|-------|
| | (mm) | (in) | (mm) | (in) | (mm) | (in) | (mm) | (in) | (mm) | (in) | (mm) | (in) |
| 360-142-239 | 10,92 | 0.430 | 18,82 | 0.741 | 0,00 | 0.000 | 3,43 | 0.135 | 15,69 | 0,618 | 5,92 | 0,233 |
| 360-142-240 | 10,92 | 0.430 | 18,82 | 0.741 | 0,00 | 0.000 | 4,52 | 0.178 | 15,69 | 0,618 | 7,0 | 0,276 |
| 360-142-241 | 10,92 | 0.430 | 18,82 | 0.741 | 0,00 | 0.000 | 5,33 | 0.210 | 15,69 | 0,618 | 7,82 | 0,308 |
| 360-142-242 | 10,92 | 0.430 | 19,76 | 0.778 | 0,00 | 0.000 | 3,56 | 0.140 | 16,62 | 0,654 | 6,04 | 0,238 |
| 360-142-243 | 10,92 | 0.430 | 19,76 | 0.778 | 0,00 | 0.000 | 4,45 | 0.175 | 16,62 | 0,654 | 6,94 | 0,273 |
| 360-142-247 | 10,92 | 0.430 | 18,52 | 0.729 | 0,00 | 0.000 | 4,65 | 0.183 | 15,39 | 0,606 | 7,14 | 0,281 |
| 360-142-248 | 10,92 | 0.430 | 18,52 | 0.729 | 0,00 | 0.000 | 5,26 | 0.207 | 15,39 | 0,606 | 7,75 | 0,305 |
| 360-142-249 | 10,92 | 0.430 | 18,52 | 0.729 | 0,00 | 0.000 | 5,64 | 0.222 | 15,39 | 0,606 | 8,13 | 0,320 |

Also available with IPEX probe connector

Wedges

All wedges are compatible to the low profile probes in this brochure. They are designed with integrated irrigation channels and all the curvatures are crafted to fit the PALM scanner seamlessly.



Low profile probe with wedge

Scanner packages

Complete set of tools you need for the inspection is delivered in one package. The scanner packages include a PALM scanner, a 7.5 MHz laterally focused array probe with Mentor UT connector, three wedges, an encoder adapter to Mentor UT and all the equipment is packed in a safety case.



PALM Scanner in a safety case

| Scanner packages | |
|------------------------------------------------------------------------------------|---------|
| PALM 50 package (PALM 50, 7,5 MHz Probe, 3 x Wedges, Safety Case, Encoder Adapter) | 0600392 |
| PALM 64 package (PALM 64, 7,5 MHz Probe, 2 x Wedges, Safety Case, Encoder Adapter) | 0600393 |
| PALM 90 package (PALM 90, 7,5 MHz Probe, 3 x Wedges, Safety Case, Encoder Adapter) | 0600394 |

Please note that double-side scanner extension is not included in packages and has to be ordered separately.

Why laterally focused arrays for small diameter tube inspection?

Angle beam probes with flat transducers on convex surfaces like tubes, suffer from the fact, that the sound tends to become defocused because of refraction at the interface between wedge and specimen. This is especially true if the transducer's width is relatively large compared to the bending radius of the curved surface (Fig. 1).

Thus, Waygate Technologies' new low-profile phased array probe for testing small diameter tubes have concavely curved transducers to reduce the width of the sound-field in the region of flaws of typical components. With curved transducers the width of the sound-field can be reduced significantly (Fig.2).

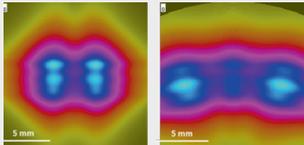


Fig.1: Qualitative comparison of sound-fields after 1st skip of 45° transversal wave angle beam conventional probes. Both specimen had a thickness of 10 mm with flat geometry (left) and R=25 mm curvature (right).

Pictures show sound pressure distribution perpendicularly to the acoustical axis.

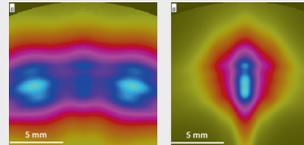


Fig.2: Qualitative comparison of sound-fields after 1st skip of 45° transversal wave angle beam conventional probes. Both transducers have the same width of 10 mm, whereas one is flat (left) and the other is concavely curved (right).

Pictures show sound pressure distribution perpendicularly to the acoustical axis.

One application where this scenario becomes necessary to understand is the testing of welds of thin walled boiler tubes. This tubes normally have diameters in the range of 1,5 to 3,5 inch and wall-thicknesses of only a couple of millimeter. Flaws that normally have to be characterized in these welds are also only couple of millimeters in width and thus comparable to the width of the sound-field of commonly used probes (Fig. 1). Since -6dB drop-down is the most prevalent sizing technique flaws will always be characterized larger than they are because the operator detects the overlap of sound-field and flaw.

Although pictures show sound-pressure distributions of conventional single element probes, the same applies for phased array probes.