



INDUSTRIALHUB BD

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ULTRASONIC THICKNESS GAUGE

Choose, use and check ultrasonic thickness gauges for corrosion surveys.



How to use this guide

For engineers who measure wall thickness and corrosion loss on pipes, tanks, vessels and structures, from one side and without cutting.

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HOW TO USE IT

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Gauge with colour display



Gauge with echo display



Basic gauge, twin-lead probe

Data status

Values are typical catalogue data and general practice. Confirm range, probe and accuracy against the datasheet of your own gauge. Not stated means the documents we reviewed do not list it. Photos come from those documents; confirm usage rights before external use.

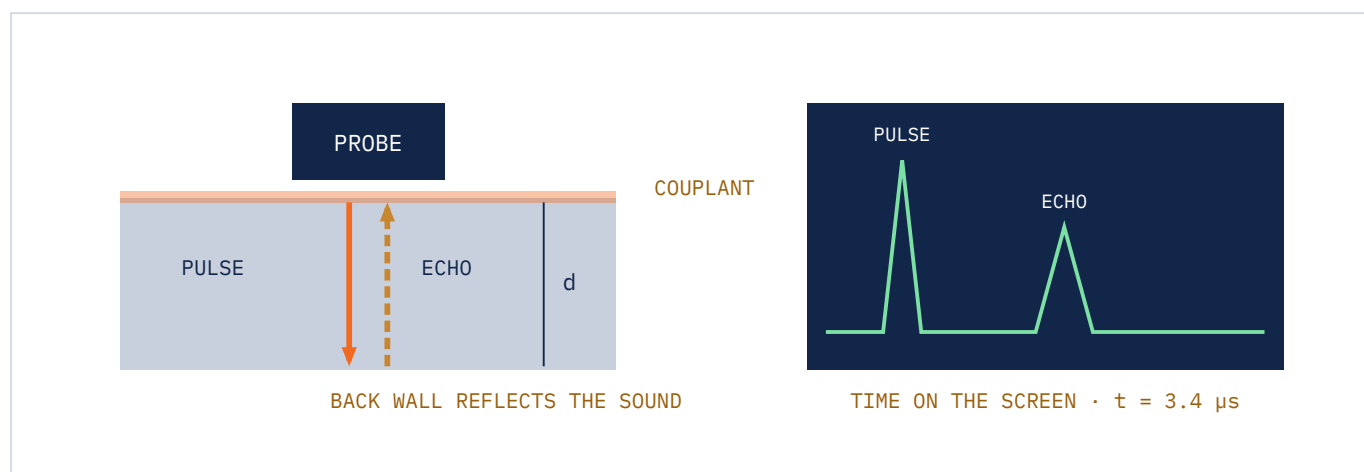
Read this first: most wrong readings come from the wrong sound velocity, poor coupling or a worn probe. Check these three first.

How an ultrasonic gauge works

An ultrasonic gauge sends a sound pulse into the metal and times the echo from the back wall. Time becomes thickness.

$$\text{THICKNESS} = \text{VELOCITY} \times \text{TIME} \div 2$$

Example: steel 5,900 m/s, echo in 3.4 μs → 10 mm



Dual element probe

One crystal sends, one receives.
Best for corroded and rough steel.

Single element probe

High resolution on thin or smooth parts. Can read through paint.

Echo to echo

Measures the metal only, and ignores the coating thickness.

0.01 mm

typical resolution

0.5–635 mm

range in steel, by probe

60 Hz

scan update rate, up to

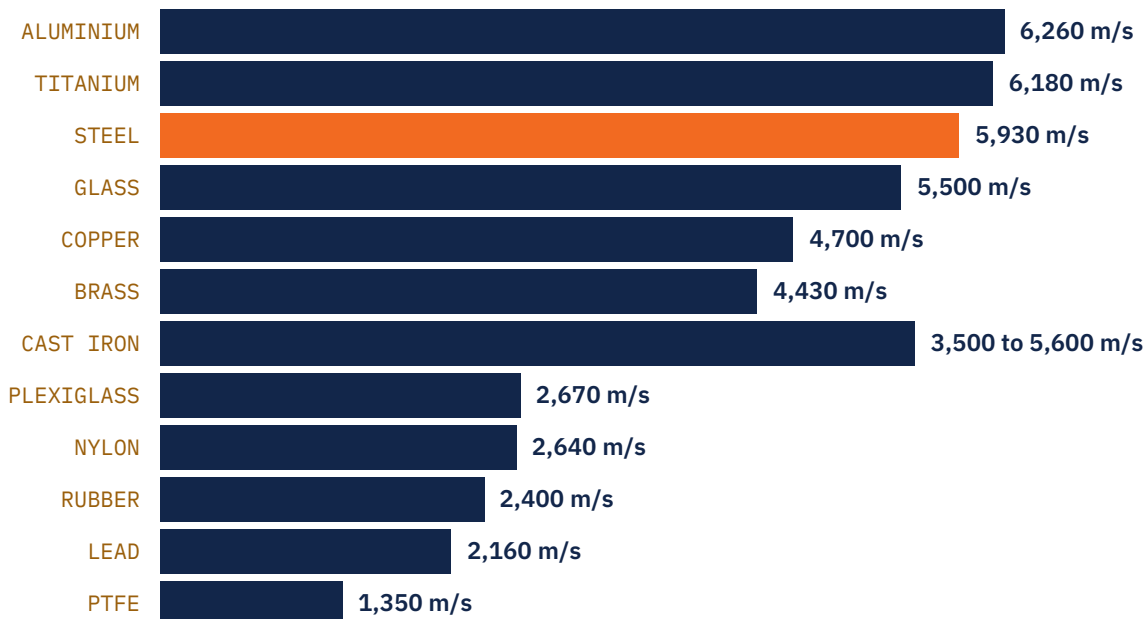
KEY NOTE • HOW IT WORKS

The gauge does not measure length. It measures how long a sound pulse takes to go through the metal and back, and then multiplies by the speed of sound in that metal. If the speed you set is wrong, the answer is wrong by the same proportion. The couplant fills the tiny air gap between probe and metal, because sound does not cross air.

One side is enough. No cutting and no shutdown for a corrosion survey, as long as you can reach the outer surface.

Sound velocity and materials

The gauge turns time into thickness with one number: the sound velocity of the material. Set it right.



WRONG VELOCITY, WRONG THICKNESS (TRUE 20 MM, GAUGE SET TO STEEL)

Material	Velocity	Reads	Error
Aluminium	6,260 m/s	21.2 mm	+6 %
Copper	4,700 m/s	15.9 mm	-20 %
Brass	4,430 m/s	15.0 mm	-25 %
Plexiglass	2,670 m/s	9.1 mm	-55 %
Nylon	2,640 m/s	8.9 mm	-55 %

Measure velocity

Put a sample of known thickness on the probe, then read the velocity. Use the same material and temperature.

Use a table

Pick steel, aluminium, copper and so on from the preset list. Alloy and heat treatment move the value.

KEY NOTE · HOW IT WORKS

Each material carries sound at its own speed, and the gauge needs that speed to turn time into millimetres. A gauge set for steel but used on copper reads about one fifth too thin, because sound is slower in copper. Cast iron and plastics vary from batch to batch, so a table value is only a start and a known sample of the same material is better.

Cast iron and plastics vary. Always calibrate on a sample of the same material as the part.

Choose the right gauge

Eight checks pick the right gauge. Work through them in order.

1 Thickness range

Match the gauge and probe to the thinnest and thickest wall.

2 Material

Steel, cast iron, aluminium, plastic or glass sets velocity and probe.

3 Surface condition

Rough, corroded or painted: use a dual element or echo-to-echo mode.

4 Temperature

Hot pipe needs a high-temperature probe and short contact time.

5 Resolution

0.01 mm is typical. 0.001 mm needs a single element probe.

6 Display and data

A-scan, memory, Bluetooth, USB or PC software for reports.

7 Case and battery

Sealed keypad, IP65 case, long battery life for the field.

8 Standards

Check the code you inspect to, for example EN 15317.



Corrosion gauge



Large-probe gauge



Compact gauge



Rugged field gauge

KEY NOTE • HOW IT WORKS

Work down the list in order, because the first checks narrow the choice for the rest. The wall range and material decide the probe. The surface and temperature decide the probe type. Only then do display, memory and case matter. Skipping the surface check is the usual reason a good gauge gives no reading on a rough, painted pipe.

Rule of thumb: dual element for corrosion on steel, single element for thin, smooth or coated parts.

Gauges in detail

Four typical gauge types, from a basic hand-held to a full-feature flagship.



Basic



Corrosion



Through coating



Flagship

TYPICAL CATALOGUE DATA

Item	Basic	Corrosion	Through coating	Flagship
Range, steel	0.9 to 350 mm	0.5 to 635 mm	0.15 to 700 mm	0.08 to 635 mm
Resolution	0.01 mm	0.01 mm	0.01 / 0.001 mm	0.01 mm, 0.001 option
Accuracy, typical	$\pm(0.5 \% H + 0.01 \text{ mm})$	Per probe	$\pm 0.02 \text{ mm} / 0.3 \% H$, probe dependent	Per probe
Velocity range	500 to 9,000 m/s	0.5 to 18.7 mm/ μ s	1 to 19,999 m/s	Wide, material based
Special modes	Preset velocities	Min / Max, differential, alarm	Through coating, 1,000 readings	60 Hz, B-scan, multilayer
Data	Optional PC	Alarms and freeze	Bluetooth, USB	Wi-Fi, Bluetooth, USB, microSD
Power, weight	4 AAA, 145 g	3 AA, 340 g	Li-ion, 260 g	Rechargeable pack

Through-coat mode

Measures the metal only, in one pass, with paint or coating left on.

Scan and B-scan

Fast scan finds the thin spot. B-scan shows a thickness cross-section.

KEY NOTE • HOW IT WORKS

Pick the type by the job, not the price. A basic gauge is enough for plain plate with a clean surface. A corrosion gauge adds alarms and min/max to find the thinnest point. A through-coating gauge saves stripping paint. A flagship adds scanning and B-scan for mapping a corroded area.

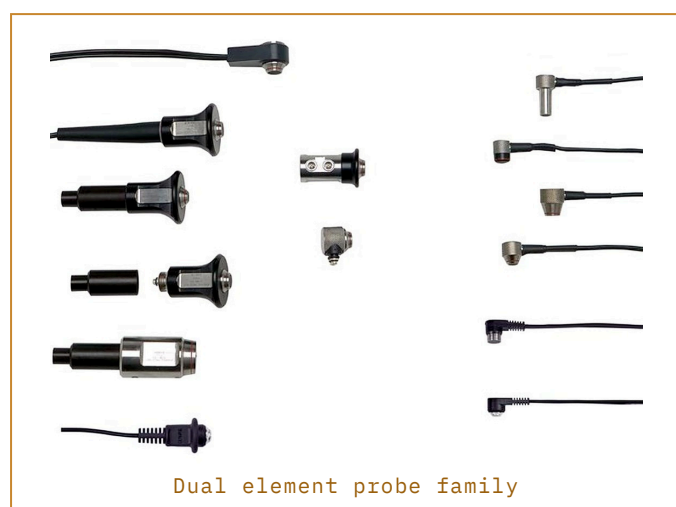
H means the measured thickness. At 50 mm, $\pm(0.5 \% H + 0.01 \text{ mm})$ is about $\pm 0.26 \text{ mm}$.

Probes and transducers

The probe sets what the gauge can measure. Higher frequency sees thin walls. Lower frequency goes deep.

MEASURING RANGE IN STEEL, MM (LOG SCALE)

10 MHz • thin	0.5 – 25
7.5 MHz • small pipe	0.71 – 50
5 MHz • general	1 – 254
5 MHz • hot surface	1 – 500
2 MHz • thick and cast	3.8 – 635



TYPICAL PROBE DATA

Frequency	Range, steel	Surface temp	Use
10 MHz	0.5 to 25 mm	0 to 50 °C	Thin steel and plate
7.5 MHz	0.71 to 50 mm	–20 to 150 °C	Small and curved pipes
5 MHz	1 to 254 mm	0 to 50 °C	General corrosion work
5 MHz, hot	1 to 500 mm	–20 to 500 °C	Hot surfaces, short contact
2 MHz	3.8 to 635 mm	–20 to 400 °C	Thick walls and castings

KEY NOTE • HOW IT WORKS

A high-frequency pulse has a short wavelength, so it can resolve a thin wall but fades quickly in thick metal. A low-frequency pulse travels deeper but cannot separate close echoes. That is why thin plate takes 10 MHz and thick castings take 2 MHz. Hot probes are built with a delay line that keeps the crystal from overheating.

Hot surface? Use the hot probe, touch for a few seconds only, and use high-temperature couplant.

Measure and calibrate

Six steps give a repeatable reading. Always measure the same marked points.

1 Prepare

Clean off loose scale, rust and dirt.
Smooth a rough spot.

2 Couplant

Put a drop of gel or oil on the surface. No gap, no bubbles.

3 Zero

Zero the probe on the test block or built-in sample.

4 Set velocity

Pick the material, or calibrate on a known sample.

5 Measure

Press the probe flat and steady.
Wait for the coupling mark.

6 Record

Mark the spot and store the reading with its ID.

Flat and steady

Press the probe flat on the surface.

Tilted: no reading

A tilted probe loses the echo.

Small pipe: turn the probe

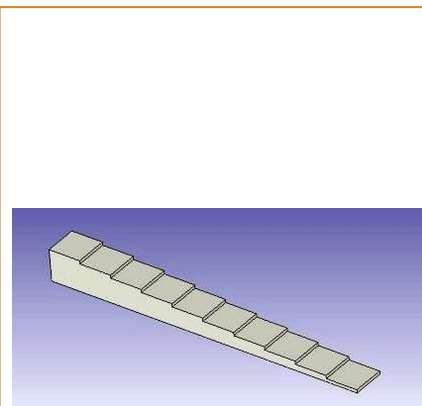
Split line across the pipe.



Probe with couplant on metal



Zero on a test block



Step block for calibration

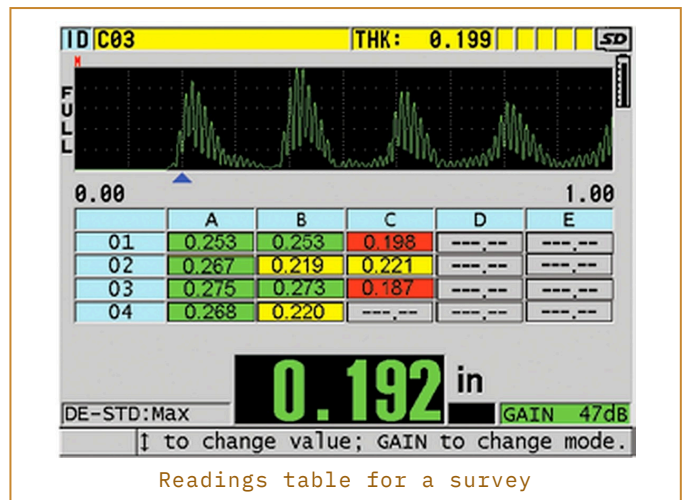
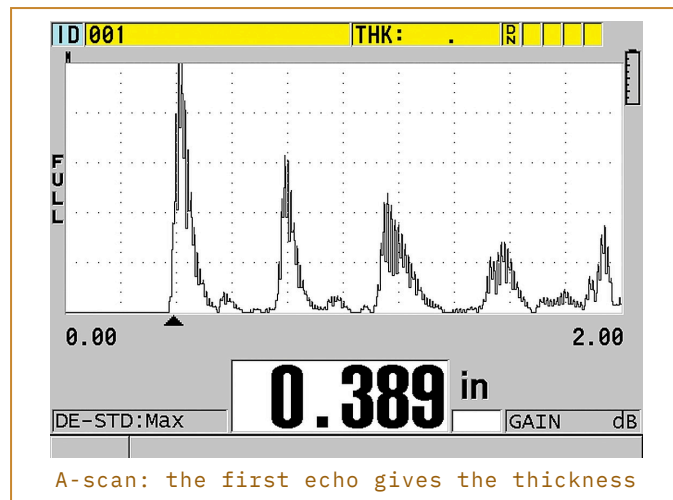
KEY NOTE • HOW IT WORKS

Repeatable readings come from repeatable habits: the same marked spot, the same couplant, the same pressure and the same zero. Zero on the block first, set the velocity, then measure. If the part is a pipe, turn the probe so the split line lies across the pipe, so both crystals look at the same patch of wall.

Calibrate on your own material. Use a block of the same steel, at the same temperature, before you start a survey.

Check, accuracy and fix

Check the gauge on a block. Compare the A-scan with what you expect before you trust a thin reading.



ACCURACY, $\pm(0.5 \% H + 0.1 \text{ mm})$

Thickness H	Error	Percent
5 mm	$\pm 0.13 \text{ mm}$	$\pm 2.5 \%$
10 mm	$\pm 0.15 \text{ mm}$	$\pm 1.5 \%$
50 mm	$\pm 0.35 \text{ mm}$	$\pm 0.7 \%$
100 mm	$\pm 0.60 \text{ mm}$	$\pm 0.6 \%$

CHECK EVERY DAY

- Zero and test block
- Cable and plug
- Probe face not worn
- Battery level
- Couplant bottle full

FIND THE FAULT

Symptom	Likely cause	Fix
Reading jumps	Poor coupling	Add couplant; press flat
Reads too thin or thick	Wrong velocity	Calibrate on a sample
No reading	Rough or very thick scale	Clean; raise gain; use a lower frequency
Reads high on hot pipe	Velocity falls with heat	Zero hot; use a hot probe
Sudden thin spot	Lamination or pit	Scan around it; confirm

KEY NOTE · HOW IT WORKS

The error is a fixed part plus a part that grows with thickness, so the same gauge is relatively less accurate on thin wall: $\pm 0.13 \text{ mm}$ on 5 mm is 2.5 %, but $\pm 0.6 \text{ mm}$ on 100 mm is only 0.6 %. When a reading looks thin, look at the A-scan: a clean first echo is believable, a noisy or doubled echo is not.

Still wrong? Measure a block of known thickness. If the block reads right, the fault is in the surface, the velocity or the coupling.

Global brands and cross-reference

IndustrialHub BD helps engineering teams choose ultrasonic thickness gauges by material, thickness range, surface, temperature, probe and reporting needs.

Olympus

FLAGSHIP-CLASS GAUGES · PROBES

Brand shown on the flagship gauge photo in this guide.
Model and data not stated.

Waygate Technologies

THICKNESS GAUGES · PROBES

Global maker of ultrasonic inspection instruments, also known by its Krautkrämer heritage. Model data not stated.

Sonatest

THICKNESS GAUGES · PROBES

Global maker of ultrasonic instruments and probes.
Model data not stated.

Cygnus

MULTIPLE-ECHO GAUGES

Maker of ultrasonic thickness gauges for coated and corroded steel. Model data not stated.

CROSS-REFERENCE RULE

Never mix probes, cables or couplant between brands. Match these points against the maker's own data first, then compare the offers.

Thickness range, steel	Probe frequency	Resolution	Accuracy, per probe	Surface temperature
Through-coating mode	Display and A-scan	Memory and software	Case rating, battery	Calibration and support

Maintenance team

Start from the job: material, wall range, surface condition and temperature. Cross out the gauges and probes that miss one of these, then shortlist on page 11.

We support solutions from recognized brands including Olympus, Waygate Technologies, Sonatest and Cygnus, subject to technical suitability, product availability and specific customer requirements.

Global brand comparison statement

Four documented gauge types on the points that decide most selections. Use it to shortlist by job, then ask each supplier for the full data sheet.

MAJOR KEY POINTS

	Basic	Corrosion	Through coating	Flagship
Range, steel	0.9 to 350 mm	0.5 to 635 mm	0.15 to 700 mm	0.08 to 635 mm
Resolution	0.01 mm	0.01 mm	0.01 / 0.001 mm	0.01 mm, 0.001 option
Accuracy	±(0.5 % H + 0.01 mm)	Per probe	±0.02 mm / 0.3 % H	Per probe
Special modes	Preset velocities	Min / Max, differential, alarm	Through coating, 1,000 readings	60 Hz, B-scan, multilayer
Data	Optional PC	Alarms and freeze	Bluetooth, USB	Wi-Fi, Bluetooth, USB, microSD
Power	4 AAA, 145 g	3 AA, 340 g	Li-ion, 260 g	Rechargeable pack
Best for	Plain plate, clean surface	Corrosion on steel	Painted or coated steel	Mapping and reporting

How maintenance and procurement use this page

Maintenance picks the gauge type by wall range, surface and the data it needs. Procurement then asks every supplier for the model and revision, probes in the kit, calibration block, software, calibration certificate, warranty, training and delivery time. Brand data for Olympus, Waygate Technologies, Sonatest and Cygnus were not in the documents we reviewed; ask for current data sheets.

Not stated means the document we used does not list it. Ask for the current data sheet before you order. We support solutions from recognized brands including Olympus, Waygate Technologies, Sonatest and Cygnus, subject to technical suitability, product availability and specific customer requirements.



REQUEST A QUOTATION

Send the material, thickness range, surface temperature, probe type and quantity. We reply with the right gauge, probes, price and delivery time, and an engineer who stays with you after delivery.

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WHAT WE SUPPLY AND SUPPORT

PARTS

- Thickness gauges, probes
- Calibration blocks, couplant
- Cables, cases, accessories
- Calibration and service

SUPPORT

- Pick the right gauge
- Range and probe advice
- Calibration and survey advice
- Quotation and delivery follow-up