

Operation Manual

PMT-360 Series Precision

Ultrasonic Thickness Gauge



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1. Product Overview

1.1 Instrument Features & Principle (or Operating Principle)

The PMT-360 series utilizes an all-new high-speed digital acquisition technology. Based on the ultrasonic pulse-echo method, it transmits ultrasonic signals into the test object and captures reflected signals to accurately measure the thickness of workpieces. This instrument integrates functions such as A-Scan mode and B-Scan mode. It features a lightweight body, simple operation, an ergonomic user interface, and is waterproof and dustproof, making it suitable for various applications requiring precision measurement.

1.2 Applications

The instrument is widely applicable for thickness measurement of pipelines and metallic materials, corrosion monitoring, thickness measurement of various dense materials such as forgings, cast parts, plastics, glass, and ceramics within industries including manufacturing, aerospace, marine, and special equipment. It can also be used to measure the thickness of non-metallic materials and accurately measure the thickness of coatings on non-metallic materials.

2. Instrument Specifications & Functions

2.1 Technical Specifications

PMT-360 Series Technical Parameter					
Model	PMT-360A	PMT-360B	PMT-360C	PMT-360 DL	PMT-360 DL PLUS
Type	Ultrasonic Thickness Gauge (thin components)	Ultrasonic Thickness Gauge (thick components)	Non-metallic Coating Thickness Gauge	Ultrasonic Thickness Gauge (think and thick components)	Ultrasonic/Non-metallic Coating Thickness Gauge
Measurement Range	0.05-600mm	1-2000mm	0.05-15mm	0.05—2000mm	
Measurement Unit	mm, inch, um				

Measurement Resolution	0.1mm/0.01mm/0.001mm (0.01inch/0.001inch/0.0001inch)				
Material Sound Velocity Range	300-30000m/s				
Bandwidth (Probe)	0-50 MHz, Continuously Adjustable				
Gain Range	0-120 dB (Ultra-wide)				
Measurement Mode	e-e/p-e/thin	e-e/p-e	e--e/ctm	e-e/p-e	e-e/p-e/thin /CTM
Scan Mode	A-Scan, B-Scan, Numerical Display				
Echo Capture Mode	Auto-Intelligent / Manual				
Calibration Mode	Manual / Automatic				
Waveform Display	RF (Radio Frequency) Wave POS (Positive Half-wave) NEG (Negative Half-wave) FULL (Full-wave)				
Echo Envelope	Supported				
Blank	Supported				
Lock	Supported (Lock measurement zone)				
Echo Pulse Width	50-1070 μ s, Continuously Adjustable				
Drive Pulse Width	5-500, Continuously Adjustable				
Drive Voltage	50-200V, Continuously Adjustable (High-pass)				
High-Pass Filter	0-20 MHz, Continuously Adjustable				
Low-Pass Filter	0-50 MHz, Continuously Adjustable				
Sampling Settings	Selectable: Single/1Hz/2Hz/5Hz/10Hz				
Key Beep	Configurable: On/Off				
Auto Save	Configurable: On/Off				
Auto Power-off	Configurable: On/Off				
Real-time Clock Display	Supported				
Timestamped Data Storage	Supported				

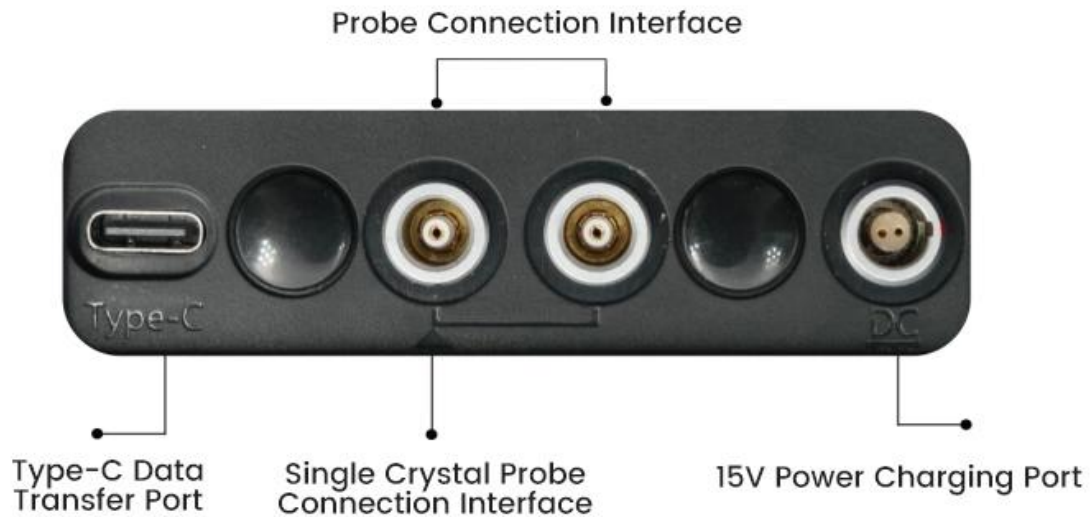
Stored Data with Waveform Display	Supported
Stored Parameters	Customizable: Parameter naming, Hotkey save/recall
Memory	32GB standard; DLplus version supports up to 1TB
Storage	Standard Version: Supports 240,000 datasets with waveforms and 10,000 parameter configurations DLplus Version (Custom): Supports up to 8 million datasets with waveforms and 50,000 parameter configurations
Data Export	Direct USB-C export (No PC software required)
Anti-slip Wrist Strap	Included
Dustproof/Shockproof Silicone Case	Optional
IP Rating (Ingress Protection Rating)	IP67 Certified
Lithium Battery Cell	Panasonic 10.8V/3450mAh cell Battery Life: 18 hours (continuous operation)
Display	3.5-inch color LCD Dimensions: 193×115×54mm
Weight	/
Temperature Range	Operating temp: -10°C to 60°C; RH <90%

2.2 Key Functions

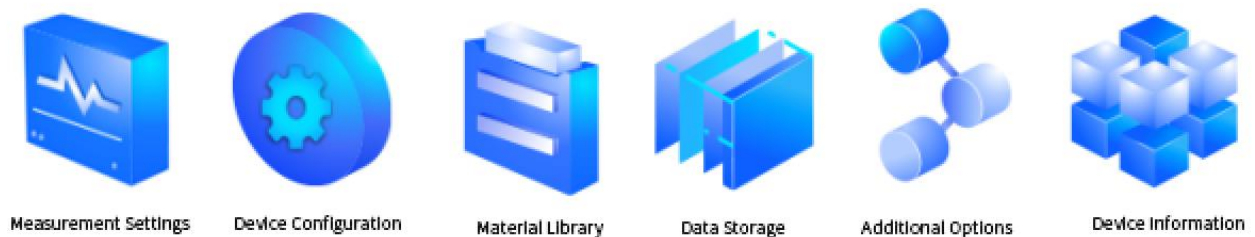


- **A-Scan Waveform Display:** Displays real-time echoes from the test object in the secondary inspection zone.
- **Thickness Value Display:** Shows real-time thickness measurements of the test object in this zone.
- **Manual Echo Capture Setting:** If automatic echo capture fails due to special conditions, press this key for manual capture. Short-press to cycle through detected echoes. When the indicator frame flashes, press ◀▶ arrows to align with the correct echo. The thickness values will synchronize automatically.
- **Menu Navigation Arrows:** Three horizontal arrows correspond to the upper menu tabs. Press the first ▲ to switch between A-Scan, B-Scan, Blank, Lock, etc. Function key details are provided below.
- **B-Scan Function:** When "B-Scan" is displayed: Press [OK] to enter B-Scan mode. Press [Start] to initiate scanning. Press [Pause] to stop. Press [Save] to store data. Press [ESC] to exit.
- **Blank Function:** When "Blank" is active: Press ◀▶ arrows to set the blanking region (red zone). Echo capture is disabled within this area.
- **Lock Function:** When "Lock" is active: Press ◀▶ arrows to define the locked gate region. Echo capture is restricted to this range.
- **Settings Menu:** Press the ▲ below "Settings" to access configuration interface and select parameters to modify.
- **Storage Function:** Short press [Save] to store current measurement results. Long-press [Save] to directly accesses parameter menu. Save or recall measurement parameters here.

2.3 Port Functions



2.4 Menu Interface



2.4.1 Measurement Settings

- Probe Selection: Select probe type(refer to Appendix 2 for specifications)
- Sound Velocity Setting: Press ◀▶ to set value(300-30000m/s, continuously adjustable)
- Measurement Mode: Press ◀▶ to select E-E/P-E/Thin/Thin-pe/CTM
- Resolution: Press ◀▶ to set : 0.1mm/0.01mm/0.001mm
(0.01inch/0.001inch/0.0001inch)
- Waveform Display: Press ◀▶ to select RF/POS/NEG/FULL
- Peak Detection: Press ◀▶ to set: peak/trough

- Echo Pulse Width: Press ◀▶ to set (50-2000, continuously adjustable)
- Drive Pulse Width: Press ◀▶ to set (5-500, continuously adjustable)
- Drive Voltage: Press ◀▶ to set (50-200V, continuously adjustable)
- High-Pass Filter: Press ◀▶ to set (0-20Mhz, continuously adjustable)
- Low-Pass Filter: Press ◀▶ to set (0-50Mhz, continuously adjustable)
- Measurement Unit: Press ◀▶ to select: mm/inch/um
- Sampling Settings: Press ◀▶ to configure
- Sampling Settings: Press ◀▶ to select: Single/1Hz/2Hz/5Hz/10Hz *Note: In Single mode, press [Freeze] per measurement*

2.4.2 Device Settings

- Language: Press ◀▶ to select language
- Key Beep: Press ◀▶ to toggle On/Off
- Auto Save: Press ◀▶ to toggle On/Off
- Auto Power-off ◀▶ to toggle On/Off
- Device ID: 000000000
- Time Setting: Press [Freeze] to enter edit mode. Select field (YYYY/MM/DD/HH:MM) with ◀▶ Press [Freeze] to confirm
- Parameter Profiles: Save/recall preset configurations for rapid measurement setup
- Data Management: View or delete stored measurement data
- Other Settings: A-Scan configuration

3. Instrument Operation

3.1 Pre-measurement Preparation

Firstly, insert the probe into the instrument port. Note: For single-crystal probes (single-cable type), use the △-marked port. And Long-press the [call] key to power on.

3.2 Instrument Calibration

Pre-saved parameters can be directly recalled for measurement. Calibration is required for first-time use or measurement inaccuracy.

1. Calibration Methods

Power on → Press [call] → Enter calibration interface. Select: Zero Calibration or Sound Velocity Calibration

2. Zero Calibration

- a. Apply couplant to probe → Place on instrument's circular calibration block

- b. Press [call] → Select "Zero Calibration"
- c. Hold probe steady until "Calibration Complete" appears
- d. Press [Enter] to unfreeze screen **Now ready for steel/iron measurement**

3. Sound Velocity Calibration

For materials with unknown sound velocity, locate a reference point of known thickness (e.g., mechanically measured). Input the measured thickness value in the "Material Thickness" field. Apply couplant to the probe and measure this reference location. Press [Arrow Keys] and hold the probe steady until "Calibration Complete" appears. The calibrated sound velocity can now be applied to measurements of this material type.

3.3 Gate Reset

During measurement: Press [ESC] to reset gate (if misoperation occurs)

3.4 Reset to Factory Defaults

Long-press [ESC] to restore factory parameters

4. Precautions During Measurement

4.1 General Measurement Procedure

1. Single-Point Measurement

Perform two thickness measurements at the identical location. For dual-crystal probes, rotate the probe 90° between readings. Record the lower value as the workpiece thickness.

2. Multi-Point Measurement

When readings fluctuate, define a $\approx \phi 30\text{mm}$ -diameter circle centered on the target point. Take multiple measurements within this area and record the minimum value.

3. Precision Measurement

Increase measurement density around the specified point. Represent thickness variations using thickness contour lines.

4. Continuous Measurement

Conduct single-point measurements along a designated path with $\leq 5\text{mm}$ interval spacing.

4.2 Preventing Measurement Errors / Avoiding Measurement Errors

1. Material Influences

Ultrasonic velocity varies significantly in many materials (e.g., non-metals, plastics), affecting measurement accuracy. For non-isotropic materials, sound velocity differs across orientations. In such cases, calculate the average sound velocity within the inspection range. This average is obtained by measuring reference blocks with equivalent average sound velocity to the test material.

2. Ultra-Thin Materials

When material thickness falls below the probe's lower limit, measurement errors occur. If necessary, determine the minimum thickness limit via the reference block comparison method. When measuring ultra-thin materials, two errors may occur: Double Refraction(Displays twice the actual thickness), Pulse Envelope Cycle Skipping(Yields values exceeding true thickness)

To prevent such errors: Closely monitor waveform displays. Eliminate erroneous readings by adjusting the Blank function. For ultra-thin workpieces (<1mm): Use specialized probes, and employ dedicated modes like metals (thin mode) , Non-metals(thin-ee or thin-p mode)

3. Effect of Surface Cleanliness

Remove all dust, grease, rust, and coatings (e.g., paint) from the test surface before measurement.

4. Effect of Surface Roughness

Excessive roughness causes measurement errors or null readings. Mitigation methods: Smooth surfaces via grinding, polishing, or filing. Apply high-viscosity couplant

5. Rough Machined Surfaces

Rough machined surfaces (e.g., from turning or planing) produce regular grooves that cause measurement errors. Mitigation methods are identical to Section 4. Additionally, adjust the angle between the probe's isolation layer (metallic film through the probe center) and the material's grooves. Align the isolation layer perpendicular or parallel to the grooves. Record the minimum reading as the measured thickness.

4.3 Measurement on Pipes

During pipe measurement, orient the probe crystal orientation parallel or perpendicular to the pipe axis. Readings will vary systematically—select the minimum reading as the true thickness. For large-diameter pipes: Measure perpendicular to the axis. For small-diameter pipes: Measure both parallel and perpendicular to the axis. Record the minimum value as the workpiece thickness.

4.4 Measurement on Castings

1. Cast materials present unique challenges. Their coarse-grained and porous structure, combined with frequent measurement on unmachined surfaces, significantly complicates

testing. Always use sub-2.5MHz low-frequency probes for castings.

2 . When measuring castings with severely rough and textured surfaces:

Apply high-viscosity couplant (engine oil, grease, or sodium silicate).

3 . For optimal accuracy: Perform Sound Velocity Calibration using reference blocks identical to the test material.

5. Maintenance and Care

5.1 Maintenance

Clean the instrument using water, mild detergent, or alcohol with a soft damp cloth. Do not use organic solvents. Never clean the instrument or probe with metal brushes or abrasive tools.

5.2 Power Supply

When the battery icon indicates low power, charge promptly or replace batteries to maintain measurement accuracy.

5.3 Care

This instrument requires minimal maintenance. Contact your authorized distributor for servicing if issues occur.

5.4 Precautions

1. Handle with care – this precision instrument requires dedicated probes and the original charger.
2. Worn probes cause unstable readings. Replace immediately when detected.

6. Packing List

【Standard Accessories】

Number	Name	Qty
1	PMT-360 host	1

2	Lithium battery	1
3	Test piece	1
4	Manual	1
5	PMT-360 Charging Adapter	1
6	Shockproof Carrying Case	1
7	Warranty Card / Certificate of Conformity	1
8	Wrist Strap	1
9	Portable Integrated Stand	1

【Optional Accessories】

Number	Name	Qty
1	Probe	See Appendix III for specifications
2	Probe Cable	selected based on probes
3	Lithium Battery Charging Dock + AC Adapter	1
4	Couplant (High/Low-Temperature)	selected based on probes
5	Multi-interface Waterproof Silicone Cover	/
6	Waterproof & Shockproof Protective Case	/

Appendix I: Material Sound Velocity Reference Table

Material	Speed of Sound	
	In/us	m/s
Aluminum	0.250	6340-6700
Steel, common	0.233	5920
Steel, stainless	0.226	5740

Brass	0.173	4399
Copper	0.186	4720
Iron	0.233	5930
Cast Iron	0.173-0.229	4400—5820
Lead	0.094	2400
Nylon	0.105	2680
Silver	0.142	3607
Gold	0.128	3251
Zinc	0.164	4170
Titanium	0.236	5990
Tin	0.117	2960
Acrylic Resin	0.109	2760
Epoxy Resin	0.100	2540
Ice	0.157	3988
Nickel	0.222	5639
Plexiglass	0.106	2692
Porcelain	0.230	5842
PVC	0.094	2388
Quartz Glass	0.222	5639
Rubber, vulcanized	0.091	2311
Water	0.058	1473

Optional Probes:

Series Name	Probe No.	Measurement Range	Temperature Range
V Series	V-15	0.11-30mm	/
	V-15H Hight Temperature	0.15-30mm	-5~300 degrees Celsius
	V-10	0.25-30mm	/
BV Series	BV-15(0 degree)	0.25-15mm	/
	BV-15(45 degree)	0.25-15mm	/
	BV-15(90 degree)	0.25-15mm	/
S Series	S-509	1-600mm	/
	S-509H Hight Temperature	1-600mm	-10~500 degrees Celsius
D Series	D-510	1-1200mm	/
	D-220	4-2000mm	/

[illegible]

Factory Inspection Report

1. Appearance, Probe, Display, and Assembly Accuracy: Verified compliant
2. Indication Error & Repeatability:

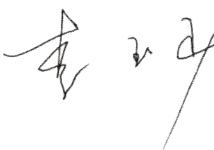
Nominal Value (mm)	Measured Value (mm)
1	1.01
5	5.01
10	10.03

3. Sound Velocity Indication Measurement

Nominal Value (m/s)	Measured Value (m/s)
1000	999
5000	4997
9000	8997

This ultrasonic thickness gauge complies with all technical requirements specified in JJF 1059.1-2012 (National Metrological Verification Regulation of the People's Republic of China) and is released for delivery.

Inspector: 

Certifier: 

Conclusion: **PASSED. Approved for factory release.**

Quality Inspection Seal:
Guangzhou Botech Testing Instrument Co., Ltd.

Product Warranty Card

Instrument Name: Ultrasonic Thickness Gauge

Mode: PMT-360

Serial No.:

Purchase Date:

User Address:

Contact Person:

User Phone Number:

Postal Code:

For the series of ultrasonic thickness gauges produced by our company, we provide the following warranty services:

1. Free warranty service for the main unit and key components is valid for 1 year. Customers can present this warranty card for free repairs. For repairs beyond the warranty period, please contact our Technical Service Department directly.
2. Instruments used correctly according to the user manual are covered under this warranty.
3. Damage caused by misuse, unauthorized repairs, or modifications is not covered under warranty.
4. Consumables such as probes, cables, and batteries are not included in the warranty. During the warranty period, the customer is responsible for shipping costs to the repair center, while our company covers return shipping. After the warranty expires, the customer bears all round-trip shipping fees for repairs.
5. Our company reserves the right to modify product designs but is not obligated to update previously shipped units. Since environmental factors are beyond our control, we do not assume liability for consequences arising from special installation or usage conditions.
6. Customers must return this warranty card; otherwise, no warranty service will be provided.

Certificate of Compliance

Serial No.			
Product Name	Ultrasonic Thickness Gauge	Manufacture Date	
Model	PMT	Inspector	03
Inspection Result	Passed		