A1201

ULTRASONIC THICKNESS GAUGE

Operation manual

Revision 1.0.0

Acoustic Control Systems – ACS Group
Saarbrücken, Germany 2025

This instruction manual contains essential information on how to use this ACS product safely and effectively.
Before using this product, thoroughly review this instruction manual. Use the product as instructed.

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1 Product information

1.1 Product description

The A1201 is an ultrasonic thickness gauge that measures thickness from 0.7 to 300 mm. The device features a simplified interface, making it easy to use. The instrument supports operation with transducers of different frequencies, significantly expanding its application range. I has a robust housing and can be used в суровых условиях

Specification

Parameter	Value
Ambient temperature range	-30 to +50 °C -20 to 122 °F
Minimum pipe diameter	20 mm 0.79 in
Supported probe	D1471-4MHz, D1771 - 5MHz), D1762 - 5MHz, D1763 - 5MHZ HT, D2763 - 10 MHz
Absolute error in thickness measurements (for steel)	±(0,01*thickness + 0,1) mm ±(0,01*thickness + 0,004) inch
Measuring range based on the probe used	0.6 – 300 mm 0.0236 – 11.8 in
Display resolution of measurement	0.01 up to 9.99 mm, 0.1 above 10 mm 0.01 up 0.3933 in, 0.1 above 0.3937
Display size	22 x 46 mm

	0.866 x 1.811 in
Weight	160 g
Dimensions	120 x 70 x 25 mm 4.724 x 2.756 x 0.984 in
Continuous operation time	max.16h
Battery operating time	max.40h
Adjustable range of ultrasound velocities (m/s)	from 1000 to 9999 m/s from 0.039 in/µs to 0.039 in/µs
Thickness measurement units	mm/in

1.2 Maintenance

Cleaning

- The A1201 must be regularly cleaned to remove dirt and dust using a cleaning agent suitable for plastics.
- If the screen's protective glass is dirty, wipe it with a soft cloth moistened with a household cleaning agent for plastic surfaces.
- Alcohol can be used to clean the keyboard.
- If dirt or foreign matter enters the arming connectors, clean them using a soft brush.

Storage

- Store the A1201 in the hard case provided in the delivery set.
- Alternatively, the A1201 can be stored on racks.
- Ensure that the arrangement of devices in storage allows for free movement and unrestricted access to them.

- The distance between devices and the walls, floor, and other stored items must be at least 100 mm.
- Maintain a minimum distance of 0.5 m between the devices and heating units in the storage area.
- The storage room should be free from conductive dust, aggressive gases, and corrosive vapors that could damage the instruments.

Transportation

- Transport the A1201 in the hard case provided in the delivery set.
- The packaged devices can be transported in any vehicle over any distance, without speed limitations.
- Securely fasten the package to prevent it from shifting during transportation.
- Protect the package from rain and water splashes when opening the vehicle.
- The arrangement and securing of the packaged devices in transport should ensure their stable position, preventing impact with each other or the walls of the transport vehicle.
- Transportation conditions must meet the applicable specifications, rules, and standards for each transport type.
- If transported by air, place the device in a sealed, heated compartment.
- If the transportation conditions differ from the operational conditions, allow the device to acclimate to normal weather conditions for at least 2 hours before operation.

1.3 Safety instructions

Please read this safety chapter very carefully

WARNING

Follow the instructions below to maintain water resistance and dust protection. Failure to do so may result in damage to the device.

- Never immerse the equipment in water
- After contact with water, wipe A1201 thoroughly with a clean, soft cloth.
- Contact with liquids other than water may adversely affect the performance and appearance of the device.
- Dropping the device may compromise its protection.
- The device should never be opened by untrained personnel

1.4 Environmental ratings

A1201 is a rugged and durable instrument that you may use in harsh environments. A1201 was designed to meet the requirement of the IP64 standard.

CAUTION

ACS Solutions GmbH cannot guarantee any level of ingress protection once the instrument seals have been tampered with or manipulated. You must exercise sound judgment and take appropriate precautions before exposing the instrument to harsh environments. To maintain the original ingress protection level, you are responsible for the proper care and maintenance of all seals that are routinely exposed. Furthermore, you are required to return the instrument to an authorized ACS Solutions GmbH service center annually to ensure that the seals are properly inspected and maintained.

1.5 Intended use

The A1201 can be applied to different materials, manufacturing processes, and a wide range of geometries, making it ideal for use in quality assessment at industry and laboratories.

Materials

Ferrous and non-ferrous metals, Plastics, Composite materials

Manufacturing processes

Rolling, Forging, Molding, Milling, Welding/soldering

Geometries

Plates, Pipes, Bends, Elbows, Free-form parts,

Industries / laboratories

Power plants, Pipelines, Chemical plants, Rolling mills, Quality assessment laboratories, Research facilities, Manufacturing companies

WARNING

A1201should only be used by trained personnel who have a strong understanding of the physical principles involved, as well as an awareness of the challenges and pitfalls of ultrasonic testing (UT). For reference, see DIN EN ISO 9712, ASNT SNT-TC-1A, or other national standards for personnel qualification and certification in nondestructive testing.

1.6 Packaging layout

Depending on the delivery configuration, various components may be included with A1201, such as additional transducers, calibration blocks, extra cables, and other accessories. To provide maximum flexibility for different delivery options, the protective inlay inside the box features several dedicated compartments:

Compartment for the instrument

Compartment for cables

Compartment for the power supply unit

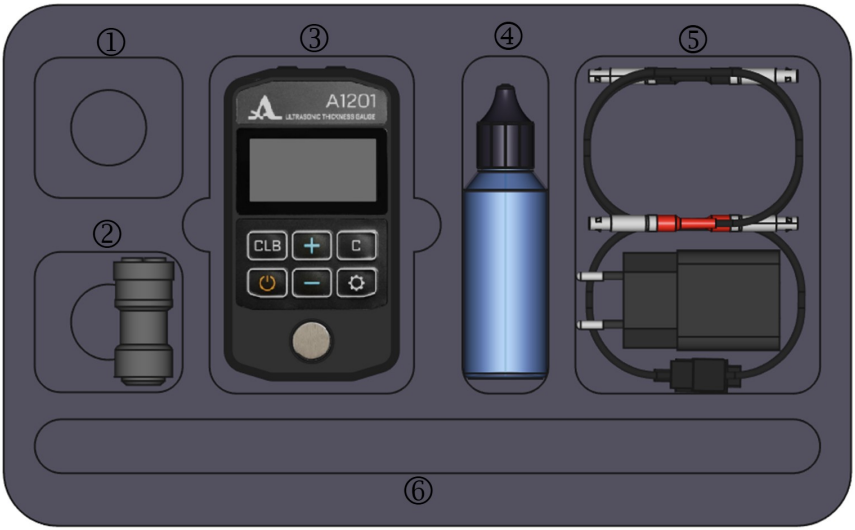
Compartment for coupling agent

Compartment for transducer

Compartment for additional transducer

Compartment for various additional items (e.g. calibration blocks, cables, holders) — according to user requirements.

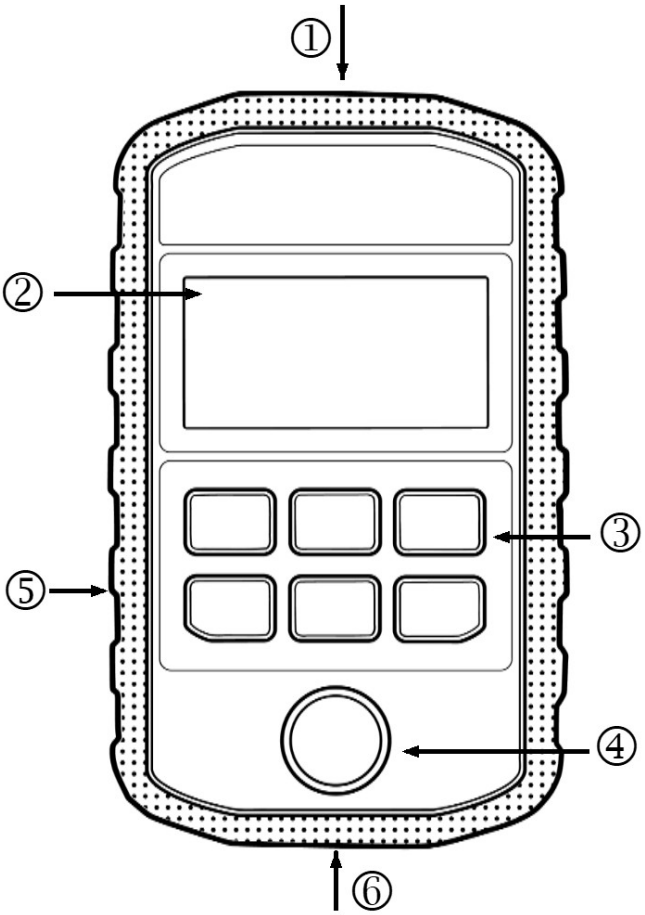
This layout ensures that all components are securely stored and protected during transportation.



1.7 Instrument

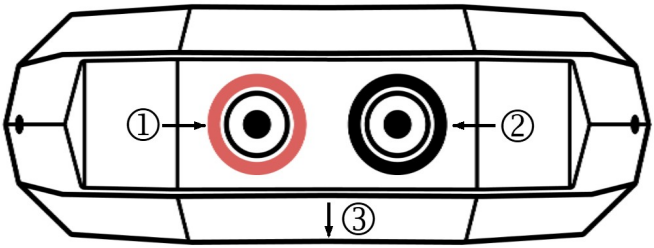
Overview

A1201 `transducer connectors` are located at the top of the instrument ①.The front panel also features a monochrome `display` ②and a `Keypad` ③. The `calibration block` is integrated into the device and is located on the front panel ④. The device is enclosed in a `rubber case` that protects it from impacts ⑤. The rubber flat seal protects the `USB Type-C` connector ⑥.



Transducer connectors

A1201 has two LEMO sockets on its top side (see transducer connectors in the overview). The transmitter is connected to LEMO-1 ①, which is marked with a read circle (under the rubber case), and the receiver is connected to LEMO-2 ②.



WARNING

Make sure the color coding of the cable and connector matches. If you are using sensors with detachable cables, also ensure that the color coding is correctly followed. The red connector should be connected to the red cable, both on the device and on the sensor.

For better understanding of the device's orientation ③ points to the side with the display on the image.

Power supply unit

A1201 is charged via a `USB cable` using a standard 5V AC/DC wall adapter. On the power adapter side, a `USB-A` connector ① is used, while on the instrument side ③, either a `micro-USB` or `USB TYPE-C` connector is used, depending on the board version. To connect the cables to the instrument, bend the rubber cover to the side ③.

- Lemo cables were added
- Snesor Holder UPVT R2
- S18xx Brige 20, 50, L and T parts added
- H01 Body and Cap added
- Inlay SoloA122[illegible]tc added
- Info A00753 and A00752 added
- A00107 Calibration certificate A4_BLANKO was added
- Sticker Info Added
- A00043 warranty sticker were added
- A01285 LEMO connecto files were added
- A00054 was added
- A00050 Supporting Loop specification was added

CAUTION

To avoid the risk of injuries or equipment damage, use only the `USB cable` and `power supply unit` delivered with A1201

After connecting the tool to the power supply unit, A1201 starts the battery charging process. The charging process can be monitored on Indicator ①.

Keypad

Key	Description
	powers the instrument on or off, and switches between millimeter and inch units
	increases the selected sound velocity
	decreases the selected sound velocity
	starts the calibration 20 of the instrument
	Switches between four preset custom 23 velocities
	Opens the transducer selection 19 menu.

2 Product usage

In this chapter, you will learn how to operate the device, configure its settings, perform calibration, and explore key usage tips and considerations to ensure optimal performance.

2.1 Coupling agents

A1201 is originally delivered with a multipurpose couplant suitable for a temperature range from -35°C to 100°C.

Use of Third-Party Coupling Agents

When using non-ACS coupling agents, please note that the couplant can affect the proper functioning of the device and the object under test. Choose a non-corrosive couplant to avoid damaging the probe or the test object.

WARNING

Always follow the safety instructions provided in the safety data sheet

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Proper use of ultrasonic couplant

To ensure accurate ultrasonic testing results, apply only the necessary amount of couplant to create effective acoustic contact between the probe and the test surface. Excessive use of couplant may negatively impact the measurement accuracy. After the inspection is complete, always clean the probe and the test object thoroughly to remove any remaining couplant residues. This helps maintain equipment performance and prevents potential damage or contamination.

2.2 Probe connection

The dual-crystal transducers are equipped with two LEMO00 that must be connected to A1201 in the correct configuration. To ensure proper connection, the LEMO00 connectors on the device are color-coded: one connector socket is black, and the other is red.

WARNING

Incorrect connection of the cables may lead to reduced signal quality, inaccurate measurement results, or failure of the device to operate properly. Always double-check the color codes and connector orientation before powering on the system

The transducer must be connected in accordance with the markings on the transducer cables. The cable with the red plug marking must be connected to the red-marked device connector. Follow this connection sequence:

- First, connect the LEMO00 cable to the device by inserting the plug into the corresponding socket. The plugs at both ends of the cable are identical.

- If the cable is not integrated into the transducer housing, repeat the same procedure to connect the cable to the transducer.

When disconnecting the cable from the device or the probe, carefully grasp the LEMO00 plug by the knurled sleeve and pull it straight out. Do not twist or pull on the cable itself.

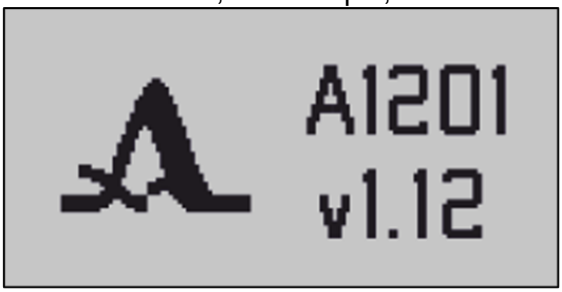
WARNING

Ensure smooth movement when making the plug connection. Before connecting, check that there is no dirt or foreign objects in the sockets. Likewise, ensure ease of movement when disconnecting the plug. Excessive force can damage the connection. Avoid bending, twisting, or prying on the plug connectors.

2.3 Powering on/off

Powering on

Power on the A1201, by pressing the power button  for a few seconds. A splash screen will appear briefly, showing the identification name of the software (firmware) and the current firmware version, for example, 1.12.



The device switches to measurement mode. The screen displays horizontal bars, the selected velocity number and value, the battery level, and the current thickness units.

NOTE

The A1201 starts with the previously set sound velocity from the last shutdown. If the same transducer that was used before the last shutdown is connected when the device is powered on, it will be immediately ready for operation. If a different transducer is connected, the device must first be configured accordingly to ensure proper functionality.

Powering off

A1201 is turned off manually by pressing the ON/OFF key  for a few seconds or automatically after 5 minutes without pressing any keys.

WARNING

Residual coupling agent may prevent the device from shutting down automatically. Please clean the probe after operation

2.4 Transducer selection

A1201 is compatible with the following transducers: D1471, D1771, D1762, D1763, and D2763. To select a transducer, press and hold  . The transducer List window will appear.

The currently calibrated probe is indicated by a marker  . Use  and  to navigate through the list of available probes.

If there is no need to change the current probe, pressing  will return A1201 to measurement mode, regardless of which probe is currently highlighted. To change the current probe, navigate

(highlight) to the desired probe and press 

. The selected probe will be marked accordingly, and the calibration process for that probe will start automatically

2.5 Calibration

This chapter describes the transducer calibration procedure. It is essential to calibrate the system to match the specific characteristics of the connected transducer. This is done via the calibration mode. Without proper calibration, the device may not function correctly or may produce inaccurate measurement results.

Air calibration

Air calibration of the transducer is necessary to determine the noise characteristics of the device. Before performing air calibration, the transducer must be cleaned of any remaining couplant. The following window informs the user that air calibration is starting.

Begin the calibration by pressing pressing 

.

 **WARNING**

The operator must confirm the message on the screen by pressing 

within 15 seconds. If this is not done, A1201 will display an error message, and the calibration procedure will need to be repeated.

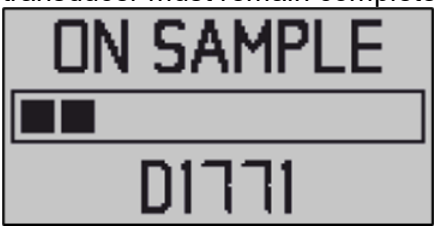
During calibration, place the transducer on a flat surface so that its piezo-element is free. Alternatively, the transducer can be held in your hand. The calibration process is displayed with a progress bar:

Sample calibration

The calibration sample is embedded into the instrument front pannel. While calibration please use coupling agent 14.

Place the transducer exactly in the center of the reference sample. Gently press it against the surface and slightly rotate it left and right to ensure proper coupling. Once the transducer is well seated, press 

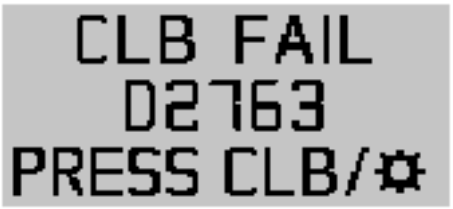
to start the calibration process. During calibration, the transducer must remain completely still.



Successful Calibration

A successful calibration will be confirmed by the following screen.
A1201

Calibration error
If the calibration was not successful, A1201 will display the error:



In this case, repeat the procedure by pressing CLB.

Recalibration
The operator can perform transducer calibration directly from the measurement mode.

To start the calibration, press and hold CLB.

2.6 Unit selection

A1201 allows you to choose between the metric and imperial systems of measurement:

- Metric (displayed as "mm"): Thickness is measured in millimeters, and sound velocity is set in meters per second (m/s)
- Imperial (displayed as "in"): Thickness is measured in inches, and sound velocity is set in inches per microsecond (in/µs)

To change the measurement units, press and hold  while powering on the device. Continue holding the button until the device enters measurement mode. The display will indicate the currently selected unit `mm` for the metric system or `in` for the imperial system. To switch the measurement units, repeat the power on procedure while holding the button.

2.7 Custom velocity setting

A1201 has four memory cells for storing user-defined velocities, `C1–C4`. The default values are: `C1 = 5950`, `C2 = 6074`, `C3 = 6300`, and `C4 = 5400`. B

Memory cell selection

Use a short press of the 

to switch between memory cells. The number of the active memory cell and the corresponding velocity value are displayed at the bottom of the screen.

Memory cell editing

To edit the value of the cell press and hold the  or  until the velocity value starts flashing, and then use the  and  keys to change the value. To reset C1-C4 to defaults, turn off the device. Then turn it on by pressing and holding both  and  simultaneously.

NOTE

The velocity values are saved to the device's non-volatile memory after it is turned off

2.8 Guidelines

This chapter outlines various factors affecting ultrasonic thickness measurement, including geometry, dispersion, surface curvature, and probe coupling conditions etc.

Eccentricity effects

If the outer and inner surfaces of the test object are not parallel or exhibit eccentricity, the reflected ultrasound wave (echo) may be deflected, leading to reduced measurement accuracy and reliability.

Sound dispersion

In some materials—such as cast stainless steel, cast iron, or composite materials ultrasound energy may be dispersed due to grain boundaries or embedded particles. This dispersion impairs the quality of the echo signal received from the back wall of the test object, thereby limiting the effectiveness of ultrasonic thickness measurements.

Materials

Inhomogeneous materials may exhibit significant variations in sound velocity across different regions. This is especially true for certain types of cast stainless steel and copper, where large grain sizes and grain orientation–dependent anisotropy can cause velocity fluctuations, affecting measurement consistency.

Certain materials exhibit high scattering and sound attenuation, which can significantly reduce measurement accuracy, limit the measurable thickness range, and increase overall measurement uncertainty.

Probe placement

To ensure effective ultrasound penetration into the material, the probe should be positioned as perpendicular to the test surface as possible and pressed lightly against it. Improper placement can reduce signal quality and compromise measurement accuracy.

Avoiding probe wear

When operating the device, it is not recommended to slide the probe's wear plate across the surface of the test object unless

necessary. If measurements are required at multiple points on a large surface, the probe should be lifted and repositioned accordingly. Continuous scanning significantly accelerates probe wear.

If scanning is necessary, for example, when searching for areas of localized thinning, it should be carried out with extreme care. Avoid applying excessive pressure to the transducer, and ensure a clean coupling agent is used on a pre-ground and thoroughly cleaned surface.

Temperature considerations

Keep in mind that sound velocity depends on the temperature of the object under test. To ensure maximum measurement accuracy, the device should be calibrated using a sample that is at the same temperature as the test object. A suitable coupling agent must also be selected based on the temperature. In the case of hot surfaces, the contact time of the transducer should be minimized to prevent unnecessary wear.

Sound velocity calibration

The accuracy of thickness measurements in ultrasonic testing strongly depends on the correct setting of the sound velocity. To achieve precise results, the operator should use a calibration sample made of the same material as the test object. The sample should be plane-parallel, with smooth surfaces and a known thickness. The operator can adjust the sound velocity on this sample until the instrument displays the correct thickness value. All further measurements should then be performed using this calibrated velocity setting.

Surface Conditioning

When taking measurements, the transducer/material interface must be cleaned, and an appropriate amount of coupling agent 14 must be applied. Coarse protrusions or depressions that prevent proper

contact between the transducer and the surface can affect the measurement results. Gaps between the probe's wear plate and the material surface exceeding 0.5 mm will prevent measurement; in such cases, the surface must be adjusted by grinding or another suitable process. After reworking, the surface must always be cleaned of any particles.

Curved Surfaces

The inspection of curved (radius) surfaces is significantly more complex than that of flat or parallel objects. A schematic of the inspection setup for radius surfaces is shown below. The probe should be positioned as perpendicular to the radius as possible. Slight tilting of the probe may help improve the contact quality. In laboratory conditions, acceptable results have been achieved on radii as small as 10 mm.

The gap ① (or screen) separating the wear plates of the combined transducer should be oriented perpendicular to the pipe axis.