USER MANUAL

MATERIAL THICKNESS GAUGE

PCE-TG 300

ENGLISH

User manuals in various languages (français, italiano, español, português, nederlands, türk, polski) can be found via our product search on:
www.pce-instruments.com

SAFETY NOTES

Please read this manual carefully and completely before you use the device for the first time. The device may only be used by qualified personnel and repaired by PCE Instruments personnel. Damage or injuries caused by non-observance of the manual are excluded from our liability and not covered by our warranty.

- The device must only be used as described in this instruction manual. If used otherwise, this can cause dangerous situations for the user and damage to the meter.
- The instrument may only be used if the environmental conditions (temperature, relative humidity, ...) are within the ranges stated in the technical specifications. Do not expose the device to extreme temperatures, direct sunlight, extreme humidity or moisture, strong magnetic fields, corrosive media or dust.
- Do not expose the device to shocks or strong vibrations.
- The case should only be opened by qualified PCE Instruments personnel.
- Never use the instrument when your hands are wet.
- You must not make any technical changes to the device.
- The appliance should only be cleaned with a damp cloth. Use only pH-neutral cleaner, no abrasives or solvents.
- The device must only be used with accessories from PCE Instruments or equivalent.
- Before each use, inspect the case for visible damage. If any damage is visible, do not use the device.
- Do not use the instrument in explosive atmospheres.
- The measurement range as stated in the specifications must not be exceeded under any circumstances.
- Non-observance of the safety notes can cause damage to the device and injuries to the user.

We do not assume liability for printing errors or any other mistakes in this manual.
We expressly point to our general guarantee terms which can be found in our general terms of business.

TECHNICAL SPECIFICATIONS

Specifications of the meter PCE-TG 300

Measurement range	P-E: pulse-echo mode 0.65 ... 600 mm (steel) E-E: echo-echo mode 2.50 ... 60 mm
Accuracy	±0.04 mm (<10 mm); ±0.4 % H [mm] (>10 mm); H refers to the material thickness of the workpiece
Resolution	0,1 mm / 0,01 mm / 0,001 mm (adjustable)
Measurable materials	Metals, plastics, ceramics, epoxy resin, glass and any material with a homogeneous structure
Operating modes	Pulse-echo mode (fault and cavity recognition) Echo-echo mode (hiding coating thicknesses, e. g. lacquers)
Calibration	Sound velocity calibration, zero point calibration, two-point calibration
View mode	Normal mode, scan mode, difference mode
Units	mm / inch
Data transfer	Printing via Bluetooth Data transfer via USB 2.0
Memory	Non-volatile memory with 100 data sets of 100 data records each
Operating time	Continuous operation 100 h Automatic Standby mode (adjustable) Automatic Power Off mode (adjustable)
Power supply	4 x AA battery (DC) 1.5 V
Display	320 x 240 TFT LCD colour display with adjustable brightness
Operating temperature	0 ... +50 °C
Storage temperature	-20 ... +70 °C
Relative humidity	≤80 % RH, non-condensing
Dimensions	185 x 97 x 40 mm
Weight	375 g

Specifications of the selectable probes

Model	Frequency [Mhz]	Ø [mm]	Measurement range [mm]	Minimum pipe diameter [mm]	Description
N02	2,5	14	3 ... 300 (Steel) 3 ... 40 (Cast steel HT200)	(not suitable for curved materials)	For damping / scattering materials (plastics, cast)
N05	5	10	1 ... 600 (Steel)	Ø 20 x 3	Normal measurement
N05 / 90°	5	10	1 ... 600 (Steel)	Ø 20 x 3	Normal measurement
N07	7	6	0,65 ... 200 (Steel)	Ø 15 x 2	For thin-walled or strongly curved pipes
HT5	5	12	1 ... 600 (Steel)	30	For high temperatures (max. 300 °C)
P5EE	5	10	P-E: 2 ... 600 E-E: 2,5 ... 100	Ø 20 x 3	Normal measurement and E-E testing

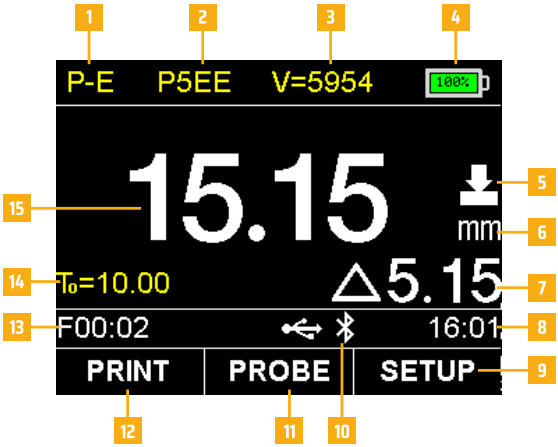
Delivery contents
1 x material thickness gauge PCE-TG 300
1 x probe P5EE (5 MHz)
1 x 118 ml coupling gel
1 x carrying case
1 x user manual
4 x AA batteries

Optional accessories
- Probe N02 (2.5 MHz)
- Probe N05 / 90° (5 MHz)
- Probe N05 (5 MHz)
- Probe N07 (7 MHz)
- Probe HT5 (5 MHz)
- High-temperature coupling gel
- PC software with USB cable
- Portable Bluetooth printer (incl. charger and user manual)
- Calibration certificate

SYSTEM DESCRIPTION

Measuring device
1 - TFT LCD color display
2 - Membrane keyboard
3 - Calibration disc
4 - Bluetooth LED
5 - Battery compartment
6 - Receiver socket
7 - Pulse generator socket
8 - USB 2.0 connection

Display
1 - Mode: E-E (echo-echo mode) or P-E (pulse-echo mode)
2 - Probe indication
3 - Sound velocity
4 - Battery level
5 - Coupling status
6 - Unit
7 - Difference (in difference mode only)
8 - Time
9 - Main menu with general settings
10 - USB and Bluetooth communication status
11 - Probe setting
12 - Print
13 - Name of data record of selected data set
14 - Nominal thickness of workpiece (in difference mode)
15 - Measured material thickness



Function keys

Key	Description	Measurement mode	Menu mode	Sound velocity settings	Probe selection
	On/off	Off (2 s) Back	Off (2 s) Back	Off (2 s) Back	Off (2 s) Back
	Enter	Main menu	Entry	Entry	Entry
	Zero	Zero point calibration		Material selection	
	Save	Save reading			
	Up	Calibration (One- or two-point)	Up / plus	Up / plus	Up / plus
	Down	Calibration (One- or two-point)	Down / minus	Down / minus	Down / minus
	Selection F1/F2/F3	Respective icon on the display	Respective icon on the display	Respective icon on the display	Respective icon on the display

Bluetooth communication status

Bluetooth Mode	LED Status	Bluetooth Status
Master Mode	Fast flashing (150 ms)	Search and connect
	5 x fast flashing, off after 2 seconds	Connect
	Continuous glowing	Connected
Slave Mode	Slow flashing (800 ms)	Connect
	Continuous glowing	Connected

GETTING STARTED

Power supply
To establish power supply, four AA Alkaline batteries are needed. The battery compartment is located at the rear side of the meter and is affixed with two screws. Loosen the screws, remove the cover, insert the batteries as illustrated and close the battery cover again by tightening the screws.

Starting the instrument
To start the meter, press POWER until the display reacts. While the device loads the software, the language can be set by using the F1 key. After loading, the meter will display the main screen. To switch off the meter, press and hold POWER for 2 seconds. The meter will save all settings and automatically load these when it is switched on again. Even when the batteries are removed, all settings will remain saved.

System Configuration
The following settings can be found in the sub-menu System Configuration.

Function	**Explanation**
Bluetooth	Off / Slave mode / Master mode
Key Sound	On / off
Warn Sound	On / off
LCD Brightness	Display brightness setting (0 ... 100 %)
Display Standby	Delay time setting (5 s / 15 s / 30 s / 1 min / 2 min / deactivate)
Auto Power Off	Power off delay time setting (2 min / 5 min / 10 min / deactivate)
Unit	mm / inch
Date / Time Set	Date and time setting
Language	English / German / French / Spanish /Italian

Connect probe
Connect the desired probe to the receptor / pulse generator sockets. It does not matter what plug is connected to what socket. For flawless operation, make sure that the plugs are properly engaged. To configure the meter, turn it on and select the probe with the F2 key. All available probes will be displayed. Go to the connected probe by using the UP/DOWN keys and confirm your selection by pressing the F2 key. The name of the probe should now be shown in the main display.

OPERATION

Work Mode
The work mode must be set in advance for each measuring and calibration mode. You can choose either echo-echo mode (E-E) or pulse-echo mode (P-E). Echo-echo mode should be used if you want to measure coated workpieces as the coatings (varnishes/paints) will be ruled out to avoid material thickness errors. Pulse-echo mode is used for all other measurements, especially for the detection of faults and cavities and for calibration of the meter. The selected mode will be displayed on the main screen.

Zero point calibration
Note: For a zero point calibration, the meter must be in pulse-echo mode (P-E).
A zero point calibration is carried out by calibrating the meter to the correct zero point by using the internal calibration disc. A zero point calibration is recommended whenever the device is restarted and when the probe is changed.
Procedure:
» Connect the probe.
» Press ZERO to enable zero point calibration.
» Apply some coupling gel to the calibration disk.
» Evenly press the probe onto the calibration disk until the progress bar is complete.
» Remove the probe from the calibration disk.
» Your meter is now successfully zero point calibrated.

Sound velocity calibration
Note: Before doing a one- or two point calibration, the varnish or paint layers must be removed from the workpiece to be measured. In the following sub-chapters, you can find three possibilities to perfom the calibration.

Calibration to a known sound velocity
This calibration procedure assumes that the operator knows the correct sound velocity of the workpiece to be measured. The next chapter contains a table listing the materials and their corresponding sound velocities.
Procedure:
» Press F1 to select the velocity.

» Use the keys F1 and F2 to select the decimal place and set the sound velocity with the keys UP/DOWN. You can also select some preset sound velocities from a chart by pressing the Zero key.

» Press F3 to confirm your entry.

Calibration to a certain material thickness (one point calibration)
For this calibration procedure, a workpiece of the material to be measured is needed. The exact material thickness of the workpiece must be known or must be measured with an external meter.
Procedure:
» Make a zero point calibration as described in chapter 5.2.1.

» Apply some coupling gel to the workpiece.

» Evenly press the probe onto the workpiece. (The coupling status and a material thickness value should now be displayed)

» Remove the probe when a stable value has been reached. If the value changes while the probe is removed, repeat step 3.

» Press UP/DOWN to be able to enter the nominal thickness.

» Select the decimal place with F1 and F2 and set the material thickness with the UP/DOWN keys.

» Confirm your entry with F3 . The meter will display the main screen and show the calculated sound velocity in the upper part of the display. The meter is now ready to measure.

Calibration to a certain material thickness (two point calibration)
For this calibration procedure, two workpieces of the material to be measured are needed. The exact material thickness of the workpieces must be known or must be measured with an external meter.
Procedure:

» Make a zero point calibration.

» Apply some coupling gel to the workpiece.

» Evenly press the probe onto the workpiece. (The coupling status and a material thickness value should now be displayed)

» Remove the probe when a stable value has been reached. If the value changes while the probe is removed, repeat step 3.

» Press UP/DOWN to be able to enter the nominal thickness.

» Select the decimal place with F1 and F2 and set the material thickness with the keys.

» Press Zero to calibrate the second point. Then repeat steps 2 to 6 with the second workpiece.

» Confirm your entry with F3. The meter will display the main screen and show the calculated sound velocity in the upper part of the display. The meter is now ready to measure.

Measurement
Procedure:

» Before starting a measurement, carry out a calibration.

» Set the work mode in line.

» Apply some coupling gel to the workpiece.

» Evenly press the probe onto the workpiece (the coupling status and material thickness value should now be displayed in white letters).

» If a correct measurement is not possible, double-check the coupling gel and evenly and firmly press the probe onto the workpiece. If the problem persists, try a different probe (different size/ frequency).

» If desired, you can save the measured value.

» Four measurements per second are made. When the probe is removed, the last reading will remain displayed.

View Mode
You have three different options to view measured values: normal mode, scan mode, difference mode
Normal mode: In normal mode, only the current material thickness value will be displayed.
Scan mode: In scan mode, the material thickness value will be displayed as in normal mode. In addition, the minimum and maximum values will be displayed. The minimum and maximum values can be reset by means of the On/off key.
Difference mode: In this mode, the material thickness value is displayed along with the difference to the set nominal thickness T_0.
The nominal thickness T_0 of the workpiece must be set in advance. To do so, go to the main menu by pressing F3 and select Test Settings where you can find the Nominal Thickness setting. You can select the decimal place with F1 and F2 and with UP/DOWN, you can set the nominal thickness. Confirm your entry with F3.

Limit value setting
In order to see whether the material thickness value is within the tolerance, a top limit and a bottom limit can be set. When the limits are exceeded / fallen below, the reading will be shown in red instead of green when the probe is removed. To set the limit values, go to the main menu with F3 Setup and select Test Settings. Here, you can find the settings Bottom Limit and Top Limit. With F1 and F2, you can select the decimal place and the limit can be set with UP/DOWN. Confirm your entry with F3.

Resolution
You can select one of these three resolutions: 0.1 mm / 0.01 mm / 0.001. If you select 0.001 mm, the surface of the workpiece should be very smooth. When the surface is coarse, a low resolution is recommended.
To set the limit values, go to the main menu with F3 Setup and select Test Settings. Here, you can find the resolution setting. Select the desired resolution with F2. Confirm your entry with F3.

MEMORY MANAGER
Save
When you press the Save key, the current reading will be saved to the selected data set as the last data record.

View
The saved data records can be viewed on the meter's display. To view these records, go to the main menu with F3 Setup and select Memory Manager. With the UP/DOWN keys, you can navigate to the data set and select it by pressing F3. In the data set, all data records are shown and can be deleted individually by pressing F3 or completely by pressing F2.

Select data set
To select a data set, go to the main menu by pressing F3 Setup and select Memory Manager where you can navigate to the desired data set with the UP/DOWN keys and press F2. In the menu that opens, select Set. The readings will now be saved to the data set. In the menu, you can also delete the sets or an individual set.

System Reset
Press F3 Setup to enter the main menu. Navigate to the function System Reset. Confirm the reset by pressing F3 or exit by pressing F1.
Note: When you reset the meter, all settings, calibrations and readings will be deleted completely.

Printing via Bluetooth (only possible with the optional Bluetooth printer)
How to set up a Bluetooth connection with the printer
» Turn on the portable Bluetooth printer.

» Select Master mode as Bluetooth mode for the meter.

» You will be asked if you wish to search for Bluetooth printers nearby. Select Yes if you are setting up the printer for the first time. Otherwise, select No.

The meter will try to establish a Bluetooth connection with the printer. Wait for a few seconds. When the Bluetooth status LED glows continuously, this means that the meter is connected to the printer.
Note: When the meter is switched off and back on, the Bluetooth function will be disabled automatically to save power.

Print
In the Memory Manager, the saved data sets can be printed by using the portable Bluetooth printer. Choose Print to print the selected data set. You can also print all saved data sets via Print All.
You can also print the current measured value directly via F1 after each measurement.

USB communication (only possible with optional software)
The meter can be connected to a PC via the USB 2.0 Mini connector for communication. To do so, first install the software and the driver for the meter. After this, connect the meter to the computer by using the USB cable. Now you can organise, format, print or copy the measuring data on your PC.

SOUND VELOCITY OF COMMON MATERIALS

Material	**Sound velocity (longitudinal)**	
	inch / µs	m / s
Aluminium	0,250	6340 ... 6400
Simple steel	0,233	5920
Stainless steel	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
Tim	0,117	2960
Epoxy resin	0,100	2540
Ice	0,157	3988
Nickel	0,222	5639
Perspex	0,106	2692
Polystyrene	0,092	2337
Porcelain	0,230	5842
PVC	0,094	2388
Quartz glass	0,222	5639
Vulcanised rubber 0.091	0,091	2311
Teflon ™	0,056	1422
Water	0,058	1473

DISPOSAL

For the disposal of batteries in the EU, the (EU) 2023/1542 directive of the European Parliament applies. Due to the contained pollutants, batteries must not be disposed of as household waste. They must be given to collection points designed for that purpose. In order to comply with the EU directive 2012/19/EU we take our devices back. We either re-use them or give them to a recycling company which disposes of the devices in line with law. For countries outside the EU, batteries and devices should be disposed of in accordance with your local waste regulations. If you have any questions, please contact PCE Instruments.

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