



Deutsch

English

# Bedienungsanleitung User Manual

PCE-BTM 2000 Riemenspannungsmessgerät | Belt Tension Meter



User manuals in various languages (français, italiano, español, português, nederlands, türk, polski, русский, 中文) can be found by using our product search on: [www.pce-instruments.com](http://www.pce-instruments.com)

Letzte Änderung / last change: 5 March 2020  
v1.0

# English Contents

<b>1</b>	<b>Safety notes</b> .....	<b>14</b>
<b>2</b>	<b>Specifications</b> .....	<b>15</b>
2.1	Technical specifications .....	15
2.2	Delivery contents .....	15
2.3	Optional accessories .....	16
<b>3</b>	<b>System description</b> .....	<b>18</b>
3.1	Device .....	18
3.2	Function keys .....	19
3.3	Display (in measurement mode) .....	19
<b>4</b>	<b>Getting started</b> .....	<b>20</b>
4.1	Power supply .....	20
4.2	Preparation .....	20
<b>5</b>	<b>Menu</b> .....	<b>20</b>
5.1	Force .....	20
5.2	Settings .....	21
5.3	Memory .....	22
5.4	Calibration .....	22
5.5	Info .....	22
<b>6</b>	<b>Measurement</b> .....	<b>22</b>
6.1	Measuring mode interface .....	22
6.2	Preparing a measurement .....	23
6.3	Making a measurement .....	23
6.4	Saving a measurement .....	23
<b>7</b>	<b>Calculation of trum length, belt weight and trum force</b> .....	<b>24</b>
7.1	Trum length .....	24
7.2	Belt weight.....	25
7.3	Trum force .....	25
<b>8</b>	<b>Warranty</b> .....	<b>26</b>
<b>9</b>	<b>Disposal</b> .....	<b>26</b>

# 1 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.
- 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.

If you have any questions please contact PCE Instruments. The contact details can be found at the end of this manual.

## Safety symbols

Safety-related instructions the non-observance of which can cause damage to the device or personal injury carry a safety symbol.

Symbol	Designation / description
	<b>General warning sign</b> Non-observance can cause damage to the device and injuries to the user.
	<b>Warning: electrical voltage</b> Non-observance can cause electric shock.
	<b>Warning: optical beam</b> Non-observance can cause injuries to the eyes.

## 2 Specifications

### 2.1 Technical specifications

Specification	Description
Measurement range	10 ... 900 Hz
Resolution	<100 Hz: 0.1 Hz >100 Hz: 1 Hz
Accuracy	$\pm(1\% \text{ of rdg.} + 4 \text{ digits})$
Operating conditions	Temperature: 0 ... +50 °C
Storage conditions	Temperature: -20 ... +65 °C Humidity: 10 ... 95 % RH, non-condensing
Memory	15 folders, 50 measuring points/folder
Power supply	3 x 1.5 V AAA battery
Dimensions	150 x 80 x 38 mm
Weight	200 g
Menu languages	English, German, Spanish, French, Italian, Dutch

### 2.2 Delivery contents

- 1 x belt tension meter PCE-BTM 2000
- 1 x sensor with short gooseneck
- 1 x magnetic holder
- 1 x PC calculation software
- 3 x AAA battery
- 1 x user manual
- 1 x calibration certificate

## 2.3 Optional accessories

### 2.3.1 Spare sensor with short gooseneck PCE-BTM 2000 SHS

You can simply screw the sensor with short gooseneck PCE-BTM 2000 SHS onto the meter PCE-BTM 2000, which will allow you to make measurements with only one hand. With the flexible sensor neck, you can even reach areas which are hard to access.



### 2.3.2 Sensor with long gooseneck and coiled cable PCE-BTM 2000 SHL

In order to reach measuring points in installed systems that are difficult to access, the sensor with flexible long gooseneck and coiled cable extension offers ideal conditions for obtaining the best possible measuring results.



### 2.3.3 Mallet PCE-BTM 2000 MALLET

The optional frequency mallet PCE-BTM 2000 MALLET makes it easy to generate a suitable frequency on the belt you wish to measure. While you have fixed the meter near the belt with the magnetic holder so that it is easy to read, you can comfortably make a measurement with a gooseneck sensor and at the same time tap the belt with the other hand.



### 2.3.4 Instrument case PCE-BTM 2000 CASE

The instrument case is used to safely store the meter PCE-BTM 2000, the different sensors and other accessories.



### 2.3.5 Spare magnetic holder PCE-MH

With the magnetic holder PCE-MH, you can attach the belt tension meter PCE-BTM 2000 to metal substrates, which enables you to work with both hands.



### 2.3.6 Tripod STAT

With the help of the tripod STAT, you have the possibility to mount the sensor with long gooseneck and coiled cable PCE-BTM 2000 SHL firmly in the measuring position to the belt. The rigid mounting of the sensor ensures particularly accurate measurements as well as constant repeatability of several measurements of the same belt.



### 3 System description










The PCE-BTM 2000 is a mobile test instrument for determining belt tension and trum forces in V-belts, toothed belts, ribbed belts, drive belts and conveyor belts. An ideal belt tension is required to optimise the service life and the working process of the belt. With the PCE-BTM 2000, you can record these values and compare them to the set point value. Due to a flexible sensor neck, measurements can be carried out even in narrow, difficult to access machine rooms. The belt tension is displayed in Hertz (Hz), the belt span force can be displayed in Newton (N) or optionally in pound-force (lbf).

#### 3.1 Device



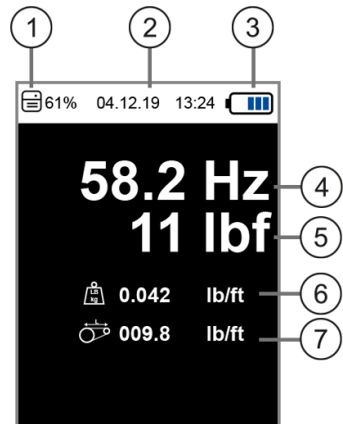
1. Display
2. Keypad
3. Sensor socket
4. Sensor head
5. Magnetic holder

### 3.2 Function keys

Key	Description	Functions
	On/Off	- On/Off
	Menu	- Open menu
	Back	- Cancel, back, exit
	OK	- Confirm
	Measuring mode	- Turn on measuring mode
	Up	- Navigate up
	Down	- Navigate down
	Right	- Navigate right
	Left	- Navigate left

### 3.3 Display (in measurement mode)

1. Memory capacity
2. Date & time
3. Battery level
4. Belt tension
5. Trum force
6. Set belt weight
7. Set trum length










## 4 Getting started








### 4.1 Power supply

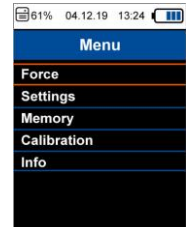
Three AAA alkaline batteries are required for power supply. The battery compartment is located on the back of the meter and is secured with two screws. Loosen the screws, lift off the cover, insert the batteries as indicated and close the battery compartment by tightening the screws. Before replacing the batteries, turn off the instrument.

### 4.2 Preparation

Before switching on the instrument, insert the sensor head into the sensor socket of the meter and fix the head by tightening the knurled nut. To start the instrument, press the On/Off key  until the instrument name appears on the display. To switch off the meter, press the On/Off key  until the display turns off. When the unit is switched on, the measuring mode  icon appears on the display together with a hand icon. Before first use and after each battery change, you should set the date and time (see 5.2.2). To enter measuring mode, press the Measuring mode key . If you would like to make settings, press the Menu key  to enter the menu.

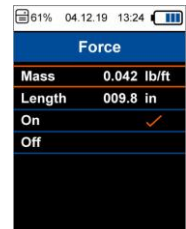
## 5 Menu

You can enter the menu of the meter by pressing the Menu key  after starting the meter. You can navigate through the menu with the arrow keys    . With the OK key , you can confirm your selection. With the Back key , you can navigate one step back.



### 5.1 Force

In the submenu "Force", you can enter the values required to measure the trum force. You can also choose whether or not the trum force will be displayed in measuring mode.



## 5.2 Settings



### 5.2.1 Units

In the submenu "Units", you can select either the international unit system (SI) or the Anglo-American unit system (US).

### 5.2.2 Date & Time

In this menu, you can set the date and time. In the "Format" tab you can also select how you want the date to be shown on the display.

### 5.2.3 Sound

Both the key sound and the sound when a measured value is recorded can either be activated or deactivated.

### 5.2.4 Brightness

In this tab, the display brightness can be adjusted between 10 and 100 %.

### 5.2.5 Language






You can select one of these languages: English, German, Spanish, French, Italian or Dutch.

### 5.2.6 Auto Power Off

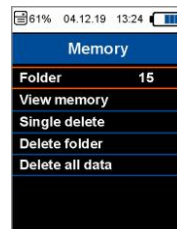
You can define an Auto Power Off time between one and five minutes. The Auto Power Off function can also be deactivated.

### 5.3 Memory

Select a folder in the first tab. This selected storage folder is used for the following measurements to save the measured values. When you navigate to the item "View memory", the contents of the currently selected folder will be displayed.

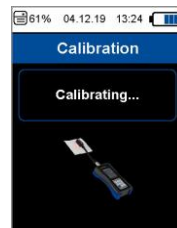
When you select one of the readings with the OK key , further details about the reading will be displayed. Within this detail view, you can navigate through the folders with the Up  and Down  keys. The arrow keys Left  and Right  can be used to navigate through the detail views of the individual readings within a folder.

Use the "Single delete" item to delete individual measurements in the selected folder. When you delete a measured value in the middle of the folder, the measured values within the folder are renumbered so that no numbering gaps occur in a folder. If you want to delete all files in a folder, select the menu item "Delete folder" and confirm that you want to delete the entire folder. Via the last menu item "Delete all data", you can delete the measured values in all folders. In total, 15 folders are available. 50 measured values can be saved to each folder so that a total of 750 measured data can be saved.



### 5.4 Calibration

By navigating to the "Calibration" item in the menu, you can calibrate the sensor with a zero point calibration. To do so, place the meter on a flat surface and place the sensor head over a flat, bright surface. Click on "Calibration" and wait until the calibration is completed. Now you can use the device for the next measurement.



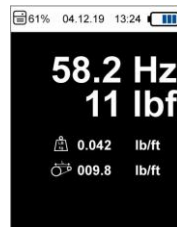
### 5.5 Info

In the "Info" menu, you can find some information about the firmware version of your meter.

## 6 Measurement


### 6.1 Measuring mode interface

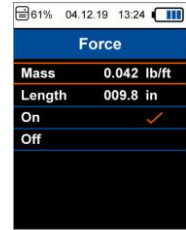
If you have opened the "Measurement Mode" user interface, the device automatically starts a measurement when a vibrating object is detected. Moving the meter may cause low-frequency human vibration which are then shown on the display as a measurement. In the standard settings, the first value displayed is the belt tension in Hertz (Hz). Below this value, the trum force is displayed in Newton (N). The lower part of the display shows the set values for the mass of the belt per meter (weight icon) and the trum length (belt icon). These values must be set individually for each belt but are not relevant if only the belt tension is to be determined.




## 6.2 Preparing a measurement

To be able to carry out a first measurement, you must first make some settings. It is recommended to calibrate the instrument after each restart. How to perform a calibration is described in chapter 5.4.


To be able to generate measurement data for the trum force, you must first enter the technical data of the belt. To do so, select the "Force" tab from the menu. First enter the mass of the belt in kilograms per metre (kg/m). Then enter the trum length in metres (m) angeben (see chapter **Fehler! V erweisquelle konnte nicht gefunden werden.**). Always confirm your selection with OK .

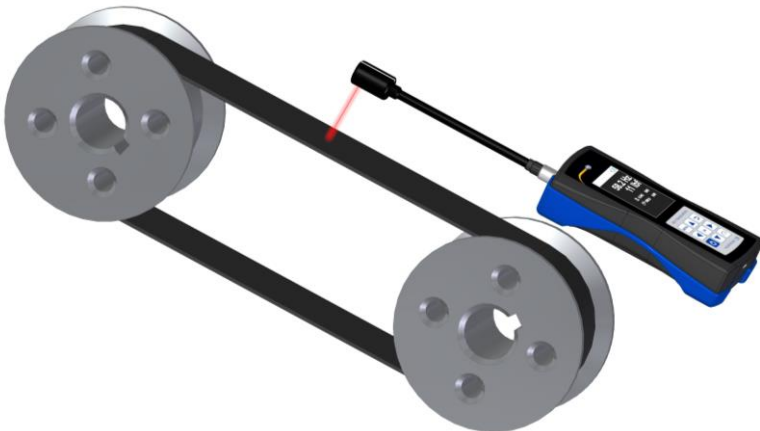


## 6.3 Making a measurement

If you are still in the menu of the instrument, press the Measuring mode key  twice. The meter has now entered the measuring interface and will start measuring as soon as vibration is detected. To obtain ideal measuring results, align the sensor head so that the two measuring diodes or the white sensor strip are parallel to the belt. You will obtain the most accurate measurement possible if the optionally available sensor with long gooseneck and coiled cable PCE-BTM 2000 SHL is placed above the belt by means of the tripod STAT as this avoids human vibration. In addition, the measuring probe should be placed in the middle of the load trum if possible (see figure). The distance from probe to belt should be between 10 and 25 mm. Now make the belt vibrate, e. g. with the optional mallet.

## 6.4 Saving a measurement

To save a measured value, press the OK key  after recording a measurement. The selected folder as well as the number of the reading will be displayed. This information will remain in the display for 4 seconds. During this time, the meter PCE-BTM 2000 does not record any new measurements. After this, you can proceed with your series of measurements.

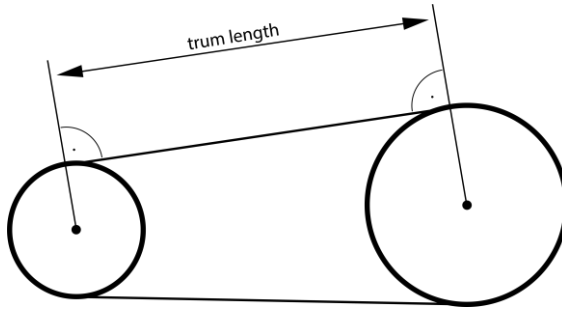


### Attention!

Before each measurement, make absolutely sure that the main switch of the system is off and secure it against being switched on again. Never carry out a measurement on running systems or rotating belts.

## 7 Calculation of trum length, belt weight and trum force

### 7.1 Trum length



As a rule, the trum length can be measured directly on the belt. Measure the length described above (trum length) and enter it in the "Force" menu as the length. Sometimes it is not possible to measure this length - then you can determine the length using the following formula:

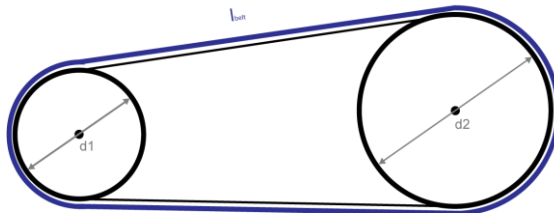
$$l_{trum} = \frac{l_{belt} - (\pi * d_1 + \pi * d_2)/2}{2}$$

$l_{trum}$  = Trum length

$l_{belt}$  = Belt length

$d_1$  = Diameter of belt pulley 1

$d_2$  = Diameter of belt pulley 2



## 7.2 Belt weight

If the mass per metre of the belt is not given, you have the possibility to determine it yourself. To do this, weigh the belt and divide the weight in kilogrammes by the total length of the belt in metres.

$$m_{meter} = \frac{m_{belt}}{l_{belt}}$$

$m_{meter}$  = Mass per belt metre

$m_{belt}$  = Masse of the belt

$l_{belt}$  = Total belt length

## 7.3 Trum force

With the specified mass per belt metre, the trum length and the measured frequency in Hertz, the trum force can now be determined. It is calculated on the basis of the following formula:

$$F_{trum} = 4 * m_{meter} * l_{trum}^2 * f^2$$

$F_{trum}$  = Trum force

$m_{meter}$  = Masse per belt metre

$l_{trum}$  = Trum length

$f$  = Frequency in Hertz

The determined trum force can be compared with the specifications of the drive manufacturers and the belt tension can then be adjusted according to the set point.

## 8 Warranty

You can read our warranty terms in our General Business Terms which you can find here: <https://www.pce-instruments.com/english/terms>.

## 9 Disposal

For the disposal of batteries in the EU, the 2006/66/EC 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.

