PCE Americas Inc.
711 Commerce Way
Suite 8
Jupiter
FL-33458
USA
From outside US: +1
Tel: (561) 320-9162
Fax: (561) 320-9176
info@pce-americas.com

PCE Instruments UK Ltd.
Units 12/13
Southpoint Business Park
Ensign way
Hampshire / Southampton
United Kingdom, SO31 4RF
From outside UK: +44
Tel: (0) 2380 98703 0
Fax: (0) 2380 98703 9
info@pce-instruments.com

www.pce-instruments.com/english
www.pce-instruments.com

Manual
Tensile and Compressive Force Meter PCE-FG 20SD

Version 1.0
Date of creation: 23.02.2016
Date of last change: 22.09.2016

Contents

1. Characteristics

- Measuring range 0 - 20 kg, highest resolution and accuracy
- Maximum value registration
- Adjustable memory interval
- Large LCD display with backlight
- Measured values can be transmitted to the computer as an Excel file
- 3 display units: kg, lb, N
- Measuring possibilities for tensile and compressive forces
- Maximum value can be held on the display
- Zeroing for all modes possible
- Display direction: forward / reverse
- The device can be attached to a test stand (optional)
- Low battery consumption / mains adaptor optional
- Battery indicator
- Microprocessor circuit
- Overload protection

2. Specifications

Display	5-digit, 16 mm LCD, backlight	
Display direction	Selectable via button on the front side	
Functions	Tensile and compressive force measurement	
Peak hold	Stores maximum value (max. load)	
ZERO	For normal and maximum value mode	
Measuring range	20 kg / 44.10 lb / 196.10 N	
Resolution	0.01 kg / 0.01 lb / 0.02 N	
Min. display value	0.02 kg / 0.07 lb / 0.3 N	
Accuracy	±(0.5 % of the display value + 2 digits) at 18 … 28 °C	
Units	Kg, N, lb	
Sampling rate	Every 0.2 s in quick mode / every 0.6 s in slow mode	
Overload protecion	Shows „- - - -“ in case of overload	
Max. load	30 kg / 66.10 lb / 294.10 N	
Power supply	6 x 1.5 V AA battery or DC 9V adaptor	
Operating temperature	0…50 °C	
Operating humidity	<80 % RH	
Dimensions	215 x 90 x 45 mm	
Weight	650 g	
Normal measuring mode Saving interval	Auto data acquisition	Adjustable, 1 s … 9 h (saving interval can be set to 1 second, but this may lead to data loss)
	Manual data registration	Measurement when the recording button is pressed (set the saving interval to 0 seconds) (in manual mode, the memory position numbers 1-99 can be selected)
Sampling rate in Peak Hold mode	10 ms …. 500 ms, in steps of 10 mS	
Memory capacity	1000 values	
Further settings	- SD card - Data / time (year / month / day / hour / minute / second) - Saving interval / sampling - Auto power off - Warning or beeper (on / off)	

	- Display units (kg / lb / N) - Decimal format (point / comma)
Data loss percentage	0.1 %
Memory card	SD card 1 GB … 16 GB
Transducer	Exclusive load cell
Circuit	Exclusive one-chip microprocessor LSI circuit
Delivery	1 x tensile and compressive force meter 1 x SD card 1 x 120 mm measuring extension 4 x measuring tips 1 x transportation case 1 x user manual 6 x 1.5 V AA battery

3. Device description

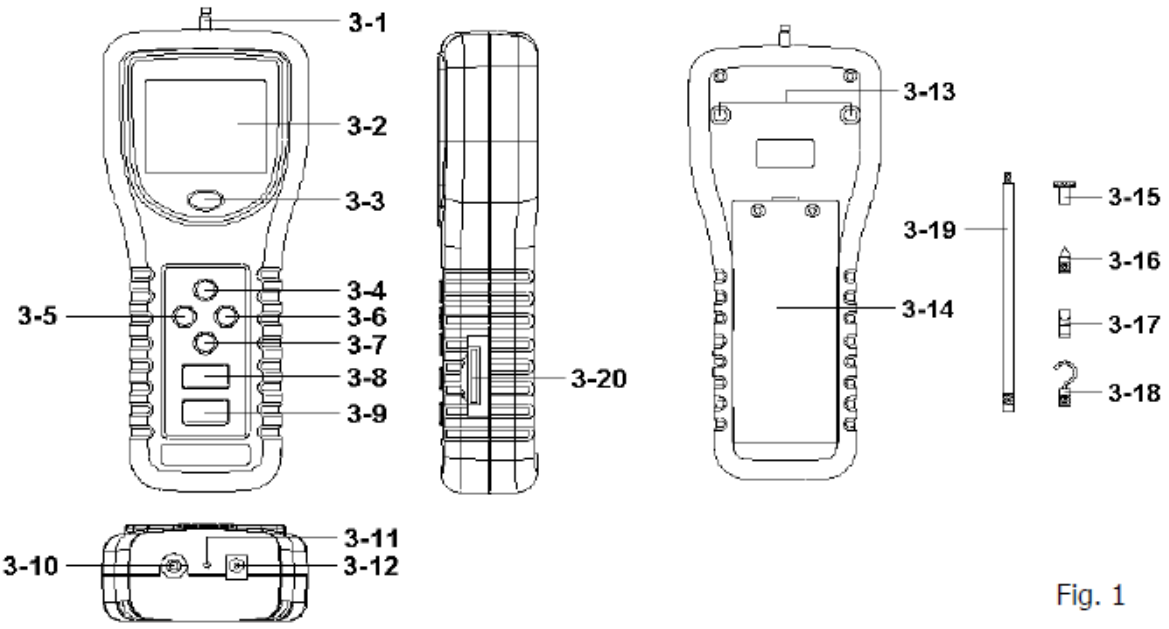


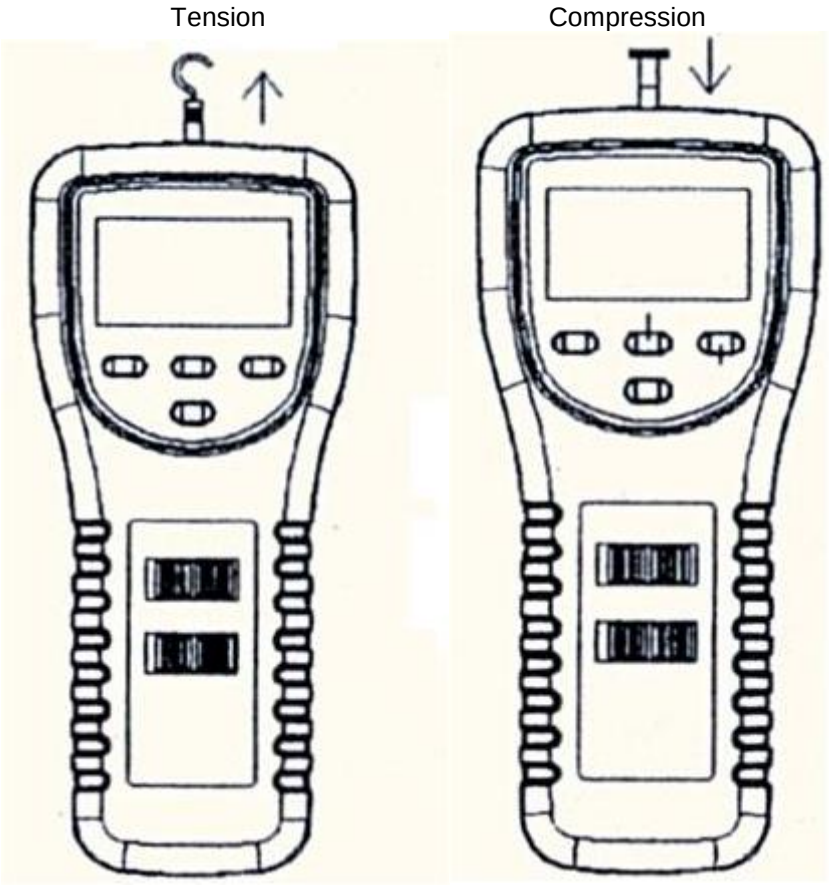
Fig. 1

3-1 universal measuring head	3-11 RESET
3-2 LC display	3-12 Mains adaptor connector
3-3 Power / BACKLIGHT button	3-13 Mounting holes
3-4 ZERO ▲ button	3-14 Battery compartment
3-5 FAST / SLOW / ESC button	3-15 Flat head adaptor
3-6 PEAK / ENTER button	3-16 Cone adaptor
3-7 DISPLAY REVERSE ▼ button	3-17 Chisel adaptor
3-8 TIME / SET button	3-18 Hook adaptor
3-9 SAMPLING CHECK / LOGGER button	3-19 120 mm extension
3-10 RS-232 port	3-20 SD card port

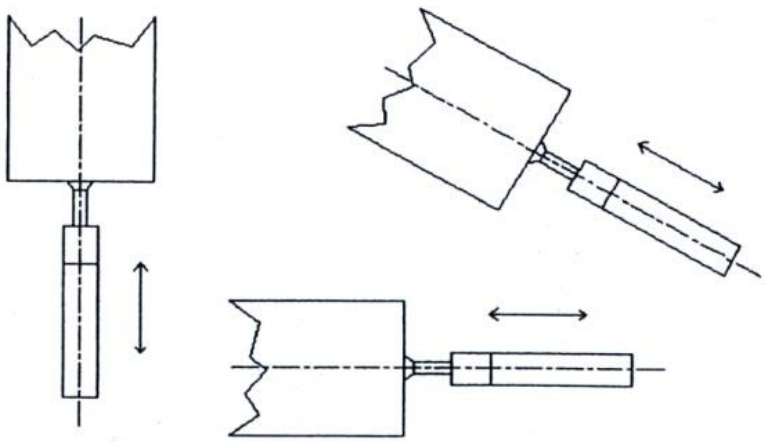
4. Manual

4.1 Precautions

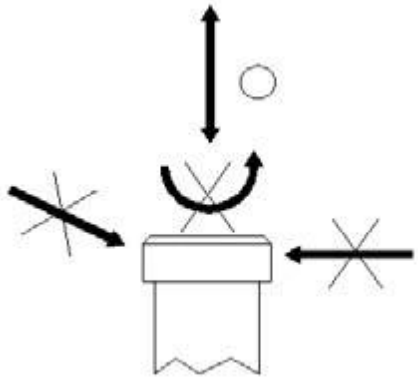
1. During the compressive force measurement, “–” is displayed automatically.



2. During the measurement, the meter and a measured object must give a straight line.



3. Torsional forces or forces which can affect the device at a slanted angle can lead to damages of the measuring tool.



4.2 Measuring procedure

1. Turn on / off the device.
   On: Press the "Power" button (3-3, Fig.1) once.
   Off: Press and hold the "Power" button (3-3, Fig.1) for more than 2 seconds.
2. Determine the standard display unit: kg, lb or N.
   For more information, see chapter 7, "Further Settings".
3. Connect the desired adaptor (3-15 ... 3-18 Fig.1).

   Note: In standby mode, do not apply any force to the device.
4. Before each measurement, press the "ZERO" button (3-4 Fig.1) to determine zero point.
5. Start the measuring process by applying tensile or compressive force (pushing or pulling). The display will show the measurement value.

   Note: During the measurement, you can switch the display direction using the "REVERSE" button (3-7 Fig.1).
6. Press the "FAST / SLOW" button (3-5 Fig.1) to select the desired sampling rate. The set mode is displayed below the measuring value.
   "FAST": Fast sampling, every 0.2 seconds
   "SLOW": Slow sampling, every 0.6 seconds

4.3 Maximum value registration

1. This function saves the maximum values of a series of measurements and shows them in the display. Press the “PEAK” button to start the function, the indication “PEAK” appears on the display. From this moment, the respective maximum value will be shown in the display.

4.4 Turn on / off the backlight

Press the “BACKLIGHT” button (3-3 Fig.1) to turn the backlight on / off.

4.5 Alarm

If the measuring value exceeds the maximum value (20 kg / 44.10 lb / 196.10 N), an acoustic alarm will sound. In addition, one of the following will be shown on display:
“ - - - - - ” when tensile force is applied; “ - - - - - ” when compressive force is applied.

5. Data recording

5.1 Preparation

1. Insert an SD card into the appropriate slot (3-20 Fig.1). The capacity of the SD card should be between 1 and 16 GB.
2. Format the SD card before the first use. More information can be found in chapter 7.1.
3. Set time and date before the first use of the device. You can find some more information in chapter 7.2.
4. The decimal point can be formatted as a “point” or as a “comma”, as in many parts of the world a point is used as a decimal point (e. g. 523.25) and in Europe, the decimal point is mostly a comma (e.g.523,25). For more information, see chapter 7.8.

5.2 Automatic data recording

1. **Start the data logger**
   - Set the saving interval to ≥ 1 second, see chapter 7.3.
   - Keep the “LOGGER” button (3-9 Fig.1) pressed for 2 seconds. “DATA RECORD” should flash in the display. The measurement values will now be saved to the SD card automatically.

2. **Pause the data logger**
   - When the data logger is activated, you can pause it via the “LOGGER” button (3-9 Fig.1). In this case, the “DATA RECORD” icon stops flashing.
   - Press the “LOGGER” button again to continue the recoding process.

3. **Stop the data logger**
   - Keep the “LOGGER” button pressed for 2 seconds during the pause to stop the data logger. “DATA RECORD” will disappear from the display.

5.3 Manual data recording

1. **Start the data logger**
   - Set the saving interval to 0 seconds.
   - Keep the “LOGGER” button pressed for 2 seconds (3-9 Fig.1). “DATA RECORD” will now appear in the display.
   - Every time you press the “LOGGER” button (3-9 Fig.1), the “DATA RECORD” icon will start flashing, the beeper will sound and a data record is stored to the memory of the SD card. Also, the number of the data record in the memory will be displayed for you.

Note: During manual data recording, you can select the individual memory locations 1 to 99, using the “▼” (3-7 Fig.1) and “▲” (3-4 Fig.1) buttons. These will be shown on the lower display as P x (where x = 1 to 99).

2. **Stop the data logger**
   To finish this function, keep the „LOGGER“ button pressed for 2 seconds. The “DATA RECORD” icon will disappear.

5.4 Maximum value registration (test stand required)

1. Turn on the device and press the “PEAK” button (3-6 Fig.1), the icons “PEAK” and “FAST” appear in the display.
2. Press the “ZERO” button (3-4 Fig.1) to set the display value to 0.
3. Press the “LOGGER” button (3-9 Fig. 1), the icon “DATA RECORD” now appears in the display, along with the sampling rate in milliseconds. Now, the device is ready for the maximum value acquisition.

Note: When the maximum value is reached, the icon “DATA RECORD” disappears and the icon “PEAK” appears. Simultaneously, the maximum value will be shown in the display.

5.5 Retrieve the time information

Note: This function is not available when the automatic data logger is turned on.

1. Press the “TIME” button once (3-8 Fig.1). The following values: “hour / minute / second” now appear in the display.
2. Press the “Time” button (3-8 Fig.1) one more time. The following values: “year / month / day” appear on the display.
3. Press the “TIME” button (3-8 Fig.1) one more time. The display returns to normal display.

5.6 Check recording interval

Note: This function is not available when the automatic data logger is switched on.

Press the button “SAMPLING CHECK” (3-9 Fig.1) one time. Now the save interval in seconds appears on the display.

5.7 SD card data structure

1. When you insert the SD memory card into the device for the first time, the device creates a folder on the memory card: **FGB01**
2. When you start the data logger function for the first time, the device creates a file under the folder **FGB01** named: **FGB01001.xls**. The data is written into this file. When there are 30,000 records in this file, a new file is created which will be named **FGB01002.xls**.
3. When 99 files are stored under the folder **FGB01**, the device creates a new folder with the name: **FGB02 ** ...
4. This results in the following structure:

**FGB01 **
FGB01001.xls
...
FGB01099.xls
**FGB02 **
FGB02001.xls
...
FGB02099.xls
**FGBXX **
...

Note: XX = maximum 10.

6. Data transfer to a PC

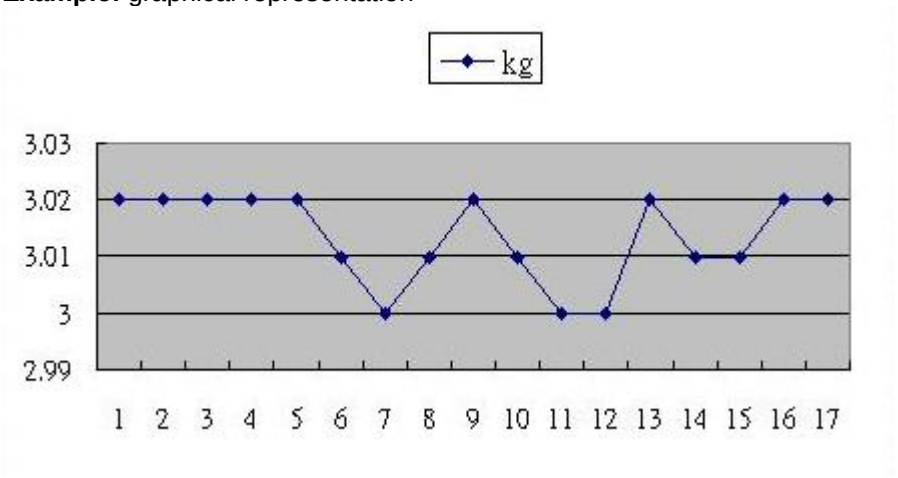
1. After you have stored the data on the SD card, please remove the memory card from its compartment (3-20 Fig.1).
2. Insert the SD memory card into the card reader of your computer (if available).
3. Turn on the computer and start Microsoft Excel. Now you can open the files of the memory card. Then, Excel allows further processing (for example, creating graphics) of the data.

Example: chart

H16 =

	A	B	C	D	E
1	Position	Date	Time	Ch1_Value	Ch1_Unit
2	1	2010/12/21	10:12:19	3.02	Kg
3	2	2010/12/21	10:12:20	3.02	Kg
4	3	2010/12/21	10:12:22	3.02	Kg
5	4	2010/12/21	10:12:24	3.02	Kg
6	5	2010/12/21	10:12:26	3.02	Kg
7	6	2010/12/21	10:12:28	3.01	Kg
8	7	2010/12/21	10:12:30	3	Kg
9	8	2010/12/21	10:12:32	3.01	Kg
10	9	2010/12/21	10:12:34	3.02	Kg
11	10	2010/12/21	10:12:36	3.01	Kg
12	11	2010/12/21	10:12:38	3	Kg
13	12	2010/12/21	10:12:40	3	Kg
14	13	2010/12/21	10:12:42	3.02	Kg
15	14	2010/12/21	10:12:44	3.01	Kg

Example: graphical representation



7. Further settings

Note: This function is not available if the automatic data logger is enabled.

Press the “SET” button (3-8 Fig.1) for 2 seconds to enter the settings menu.
Then press the "SET" button (3-8 Fig.1) several times in a row in order to choose between the following functions.

Sd F	format SD card
dAtE	date / time (year / month / day, hour / minute / second)
SP-t	recording interval (normal recording mode)
HSPt	sampling rate (maximum value registration)
PoFF	automatic power off function (on / off)
bEEP	warning sound or beeper (on / off)
unit	display unit (kg / lb / N)
dEC	decimal point format (point / comma)
ESC	exit the settings menu

Note: Press the “ESC” button (3-5 Fig.1) to exit the settings menu.

7.1 Format the SD card

Display value: "Sd F"

1. To format the SD card, enter the relevant menu, use the "▲" (3-4 Fig.1) and "▼" buttons (3-7 Fig.1) to choose "yES" or "no" and confirm with the “ENTER” button (3-6 Fig.1). By selecting "yES", you confirm the formatting; by "no" you stop the process.
2. “yES Enter” will appear in the display. Confirm again with ENTER. All existing data will be removed from the memory card.

7.2 Date / Time

Display value: “dAtE”

1. Enter the relevant menu, use the “▲” (3-4 Fig.1) and “▼” buttons (3-7 Fig.1) to change the value. Confirm every entry with the “ENTER” button (3-6 Fig.1). The cursor will then switch to the next digit.

Note: the entry sequence is year / month / day / hour / minute / second.

2. Finally, confirm with the “SET” button (3-8 Fig.1) to save the value. The display will now switch to the next menu item automatically.

Note: the internal clock keeps running even when the device is off (for as long as the batteries supply sufficient voltage).

7.3 Recording interval (normal recording mode)

Display value: "SP-t"

1. Enter the relevant menu and use the “▲” (3-4 Fig.1) and “▼” buttons (3-7 Fig.1) to change the value. Confirm every entry with the "ENTER" button (3-6 Fig.1). The cursor will then switch to the next digit automatically.

Note: The entry sequence is hour / minute / second.

2. Finally, press the "SET" button (3-8 Fig.1) to save the values. The display will now switch to the next item automatically.

7.4 Sampling rate (maximum value registration)

Display value: “HSPt”

1. Enter the sampling rate menu and use the “▲” (3-4 Fig.1) and “▼” buttons (3-7 Fig.1) to change the value. Confirm the entry with the “ENTER” button (3-6 Fig.1).

Note: The minimum value is 10 ms and the maximum value is 500 ms.

2. Finally, press the “SET” button (3-8 Fig. 1) to save the values. The display will now switch to the next menu item automatically.

7.5 Automatic shutdown

Display value: "PoFF"

1. Enter the automatic shutdown menu and use the “▲” (3-4 Fig.1) and “▼” buttons (3-7 Fig.1) to choose between "yES" or "no". By selecting "yES," you turn the function on, by selecting "no", you turn the function off.
2. Confirm and save your selection by pressing the "ENTER" button (3-6 Fig.1).

7.6 Warning sound (on / off)

Display value: "bEEP"

1. Enter the beeper menu, use the “▲” (3-4 Fig.1) and “▼” buttons (3-7 Fig.1) to choose between "yES" or "no". By pressing "yES", you turn the function on, by pressing "no" you turn the function off.
2. Confirm and save your choice by pressing the "ENTER" button (3-6 Fig.1).

7.7 Display unit (kg / lb / N)

Display value: "unit"

1. Enter the relevant menu, use the “▲” (3-4 Fig.1) and “▼” buttons (3-7 Fig.1) to choose between "kg", "lb" or "N". Now, the maximum value of each unit is displayed.

Note: The maximum values are 20.00 kg / 44.09 lb / 196.13 N.

2. Confirm and save your choice by pressing the "ENTER" button (3-6 Fig.1).

7.8 Decimal point format (point / comma)

Display value: “dEC”

1. Enter the relevant menu, use the “▲” (3-4 Fig.1) and “▼” buttons (3-7 Fig.1) to choose between “USA” (for the “point”) or “Euro” (for the “comma”).
2. Confirm and save you choice by pressing the “ENTER” button (3-6 Fig.1).

7.9 Exit the settings menu

Display value: “ESC”

Press the “SET” button (3-8 Fig.1) several times to exit the settings menu. Alternatively, you can exit the settings menu at any time by pressing the “ESC” button.

8. Power supply

In addition to the operation with batteries, the meter can also be operated with a 9 V DC mains adaptor. For this, please, use the 9 V input socket (3-12, Fig.1). If you operate the device with the mains adaptor, the device is constantly on and the “Power” button (3-3 Fig.1) is therefore without function.

9. Battery replacement

If the symbol “  ” appears in the left corner of the display, the batteries should be replaced.

1. Loosen the screws on the battery compartment cover (3-14 Fig.1) on the rear panel.
2. Remove the batteries and insert 6 new AA batteries. Pay attention to the correct polarity when inserting the batteries.
3. Put the battery compartment cover back and secure it with the screws.

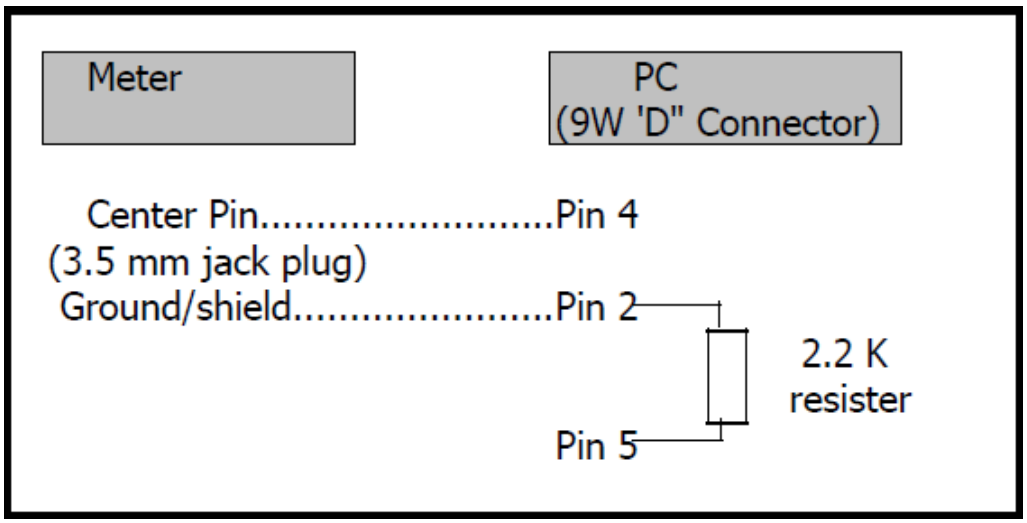
10. Reset the system

If you have a problem with the operation of the device, for example, if the device does not respond to any keystroke, you can reset the device to its original state.

This can be done as follows:
While the device is on, press the RESET button (3-11 Fig. 1) by inserting a pointed object. The device is now reset to its original state.

11. RS-232 interface

The device has got an RS-232 interface (3.5 mm jack plug) (3-10 Fig.1). The data output is a 16-digit data string which can be used according to the user’s preferences. Below, you can see a circuit diagram of the interface:



The 16-digit data stream will be displayed in the following format:
D15 D14 D13 D12 D11 D10 D9 D8 D7 D6 D5 D4 D3 D2 D1 D0

D0	End word
D1 bis D8	Display, D1 = LSD, D8 = MSD Example: When the display indicates 1234, D1 to D8 is 1234
D9	Decimal point (DP), position from right to left 0 = no DP, 1 = 1 DP, 2 = 2 DP, 3 = 3 DP
D10	Polarity 0 = positive, 1 = negative
D11 & D12	Display element: g = 57, N = 59, oz = 58, Kg = 55, LB = 56
D13	1
D14	4
D15	Start word

RS232 Format, 9600, N 8, 1

Baud rate	9600
Parity	No
Start bit	8
Stop bit	1

12. Test stands (optional)

The best measurement results are achieved when you use the device with one of the optional test stands. For secure mounting on the test stand, there are two mounting drill-holes on the rear side of the device (3-13 Fig.1). You may find more information on the available test stands on www.pce-instruments.com/english.

13. 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.

14. Contact

If you have any questions about our range of products or measuring instruments please contact PCE Instruments.

14.1 PCE Instruments UK

By post:
PCE Instruments UK Ltd.
Units 12/13 Southpoint Business Park
Ensign Way, Southampton
Hampshire

United Kingdom, SO31 4RF

By phone:
02380 987 035

14.2 PCE Americas

By post:
PCE Americas Inc.
711 Commerce Way
Suite 8
Jupiter
33458 FL
USA

By phone:
561 320 9162