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Manual Viscometer PCE-RVI 4



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Contents

1	Introduction	3
2	Safety notes	3
3	Specifications	4
3.1	Technical specifications	4
3.2	Delivery contents	4
3.3	Optional accessories	4
4	System description	5
4.1	Button and display description	5
5	Setup	6
5.1	Insert / replace the batteries	6
5.2	Attach a spindle	6
5.3	Measuring vessel	6
6	Measurement	7
6.1	Turn on the viscometer	7
6.2	Select a spindle	7
6.3	Take a measurement	7
7	Further functions	8
7.1	Auto zero	8
8	Troubleshooting	9
9	Further information	9
9.1	Calibration	9
9.2	Reference substances and viscosities	9
10	Disposal	10
11	Contact	10
11.1	PCE Instruments UK	10
11.2	PCE Americas	10

1 Introduction

Thank you for purchasing a viscometer from PCE Instruments.

The PCE-RVI 4 viscometer measures the viscosity of fluids by using the Brookfield method. To increase its field of application, the viscometer comes with 6 different spindle attachments for different measuring purposes. The PCE-RVI 4 can be used as a laboratory viscometer or as a portable device, due to its simple construction and its low weight.

There are two versions of the PCE-RVI available, which differ in their rotational speed and measuring range. See chapter 3.1 for more information.

2 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. There is no warranty of damages or injuries caused by non-observance of the manual.

- The device may only be used in the approved temperature range.
- The case should only be opened by qualified personnel of PCE Instruments.
- The instrument should never be placed with the user interface facing an object (e. g. keyboard side on a table).
- 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.
- Do not expose the device or its components (except for the spindles) to water or other liquids. Do not operate the device with wet hands.
- Before replacing the batteries, please make sure the device is turned off and no spindle is attached to the engine shaft.
- The viscometer must not be operated in areas with explosive or inflammable atmospheres.
- The device should only be operated in a controlled electromagnetic environment. Transmitters, such as cell phones, should not be used near the viscometer.
- Before taking a measurement, make sure that the device is levelled properly. Use a water level to check and adjust.

This user's handbook is published by PCE Instruments without any guarantee.

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.

3 Specifications

3.1 Technical specifications

Rotational speed	PCE-RVI 4 VP 20: 20 rpm PCE-RVI 4 VP 60: 60 rpm
Measuring range	VP 20: 200 ... 200,000 mPa s VP 60: 66 ... 66,600 mPa s
Accuracy	±2 % f. s.
Repeatability	±1 %
Displayed data	RPM selected spindle dynamic viscosity (mPa s) full scale range full scale percentage battery level indicator
Spindles	standard spindle set (R2 ... R7)
Power supply	4 x AA LR6 or R6 batteries (6 V)
Battery life	24 ... 30 hours of continuous operation
Operating conditions	+10 ... +40 °C ≤80 % RH, non-condensing max. 2,000 m above mean sea level
Pollution degree	2
Protection class	IP 20
Dimensions	170 x 110 x 410 mm
Weight	1.8 kg

Viscosity table

Spindle	R1 (optional)	R2	R3	R4	R5	R6	R7
Model	Viscosity in mPa s						
PCE-RVI 4 VP20	500	2,000	5,000	10,000	20,000	50,000	200,000
PCE-RVI 4 VP60	66	660	1,600	3,300	6,600	16,600	66,600

3.2 Delivery contents

- 1 x viscometer PCE-RVI 4 (VP 20 or VP 60)
- 1 x set of spindles (R2 ... R7)
- 1 x calibration certificate
- 4 x 1.5 V AA batteries
- 1 x spindle protector
- 1 x measuring vessel
- 1 x instruction manual
- 1 x carrying case

3.3 Optional accessories

- Newtonian calibration oils (500 ml)
- R1 spindle
- Spindle rack

4 System description

4.1 Button and display description



5 Setup

5.1 Insert / replace the batteries

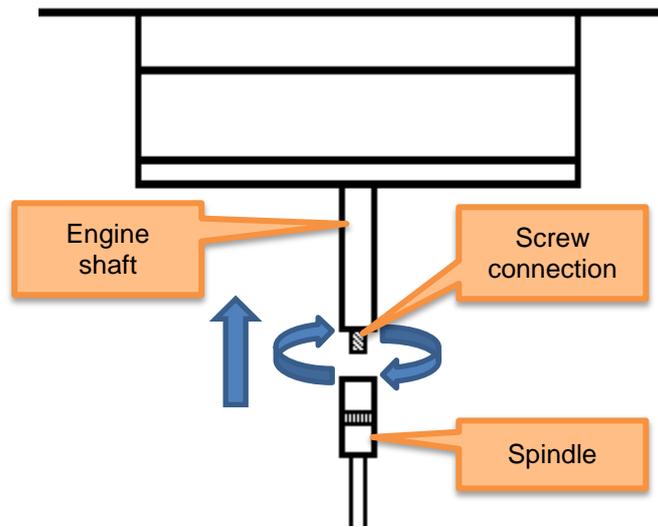
The battery compartment is located at the back of the display unit. To open it, you have to loosen 2 screws first. Then you can remove the cover.

Replace the old batteries with 4 new AA batteries and make sure you insert them properly before mounting the cover plate back on.

5.2 Attach a spindle

The spindles can be attached to the viscometer via a screw connection.

To do so, gently place the spindle at the bottom end of the engine shaft at the bottom of the display unit and carefully turn it clockwise.



Note: Be careful when attaching the spindle to prevent damage to the spindle and shaft.

Note: Always keep the engine shaft and spindles clean, especially the screw connection.

Note: Every spindle has a mark with its name on it at the top end.

5.3 Measuring vessel

The included measuring vessel has 3 pins at the bottom side, which fit into the 3 holes on the base plate of the viscometer. This prevents the measuring vessel from moving when you are taking a measurement. To prepare a measurement, fill the vessel with a fluid up to the filling mark (370 ml) and place it on the base plate.

Note: Make sure the viscometer is levelled properly before taking a measurement.

6 Measurement

6.1 Turn on the viscometer

To turn on the viscometer, you have to press and hold the Enter button for 2 seconds.

First, the display shows an information screen where you can see the version of your viscometer and its firmware, as well as the battery status.

After that, you are redirected to the main screen. Here you can see the rotational speed, the current viscosity, the selected spindle, the battery status and the full scale percentage.

To turn off the device, press and hold the Enter button for a few seconds.

Note: The full scale percentage refers to the maximum viscosity reading, which can be achieved with the attached spindle.

6.2 Select a spindle

If the selected spindle on the display does not match with the one you attached to the engine shaft, you have to select a different spindle.

To do so, press the Up / Down buttons when you are in the main screen. Now you can navigate through all spindles available. The display shows the name of the spindle on the left side and its measuring range on the right side.



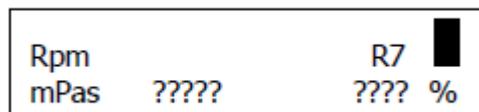
By pressing the Up or Down button you can go to the next or previous spindle. Once you have found the attached spindle, press Enter to confirm the selection.

6.3 Take a measurement

First, please make sure that the viscometer is levelled properly. Next, use the height adjustment at the side of the viscometer and adjust it so that the measuring vessel can be placed on the base plate without touching the spindle. After you placed the vessel on the base, use the height adjustment again and set it to the lowest position possible. The wheel of the spindle should now be inside of the measuring vessel and covered with the fluid to be measured.

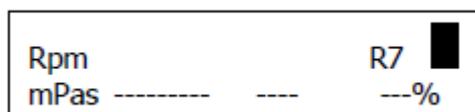
Now, turn on the viscometer, select the attached spindle and press the Enter button to start the measurement.

You will see the following screen:



The question marks mean that the device is waiting for the viscosity reading. After a short time, the reading will show on the display.

If the viscosity of the fluid exceeds the measuring range of the spindle or the device, the display shows the following:



Note: The full scale percentage can show readings between 5 and 100 % of the full scale. The optimum lies between 10 and 90 % f.s. When below 5 %, the display shows "0" viscosity.

When you have finished your measurement, press Enter to stop the measurement and the rotation.

7 Further functions

7.1 Auto zero

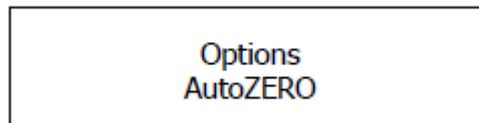
If you start a measurement and initiate rotation without immersing the spindle into a fluid and the display does not show zero, you have to use the auto zero function.

To do so, follow these steps:

Turn on the device by pressing and holding the Enter button for 2 seconds.

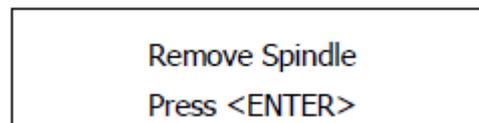
When the information screen appears, press the Down button and then the Enter button shortly, one after the other.

Now you will see this screen:



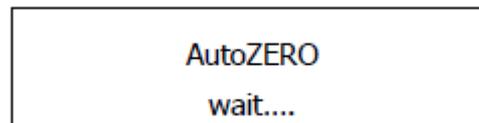
Options
AutoZERO

Press Enter to get to the next screen:



Remove Spindle
Press <ENTER>

Now, remove the spindle and press Enter again to start the zeroing procedure. During the zeroing, the display shows the following screen:



AutoZERO
wait....

After the zeroing was successful, the viscometer automatically goes back to the information screen.

8 Troubleshooting

Problem	Possible solution
The viscometer does not work	Check the batteries
The instrument does not show "zero" without any fluids	Use the auto zero function
Viscosity speed is unstable and inaccurate	Check the rheological characteristics of the fluid
	Perform a calibration check by using calibration standards
	Check if the spindle disk rotates steadily
	Check if the temperature of the sample is stable

9 Further information

9.1 Calibration

The viscometer comes factory-calibrated and with a calibration certificate.

We recommend checking the accuracy of the viscometer on a regular basis by using optional calibration oils.

Model	Viscosity standard (suggested)
PCE-RVI 4 VP 20	Approx. 5,000 mPa s
PCE-RVI 4 VP 60	Approx. 2,500 mPa s

For the verification, we recommend using the R4 spindle. Perform at least 5 measurements and compare the reading to the viscosity of the calibration oil.

Note: Keep in mind that the viscosity is greatly influenced by the temperature. Therefore, you should perform the verification under the specified conditions of the calibration oil.

9.2 Reference substances and viscosities

Substance	Approx. viscosity (mPas)
Motor oil SAE 10	65
Olive oil	84
Coatings (airbrushed)	100
Yoghurt	150
Sugar solution 70 %	400
Lubricating oil	50 – 1,000
Concentrated juice	1,500
Inks	550 – 2,200
Honey	10,000
Nanocellulose (common additive)	8,000 – 10,000
Toothpaste	100,000

10 Disposal

For the disposal of batteries, 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.

If you have any questions, please contact PCE Instruments.



11 Contact

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

11.1 PCE Instruments UK

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