USER MANUAL

PHOTOMETER

PCE-CP SERIES

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.
- 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 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.
- Always wear protective gloves and goggles and, if required, other mandatory protective equipment when handling chemicals.
- For work with reagents, the relevant safety data sheets must be observed. These can be found by scanning the QR code on the reagent boxes.
- Do not use the instrument in explosive atmospheres.
- 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.

GENERAL INFORMATION

Always use tablets marked „PHOTOMETER“, never those marked „RAPID“. Do not touch the tablets.
After each measurement, make sure that the cuvette is cleaned from all reagent residues, otherwise measuring errors will occur.
Only use clear water and a microfibre cloth to clean the cuvette.
Do not use any cleaning agents or (scrubbing) brushes.
After using the PHMB reagent, be sure to follow the instructions in section 10.12 PHMB as otherwise, discolouration of the cuvette may occur, which will falsify later measurement results.
The photometers of the PCE-CP series are also suitable for salt water pools / pools with salt electrolysis.

SYSTEM DESCRIPTION

Device

The photometers of the PCE-CP series are suitable for the determination of water quality on the basis of up to thirteen different parameters. The field of application ranges from maintenance and servicing of pool systems to more complex series of measurements in a laboratory environment. For the latter, the automatic storage of measured values which can be read out and documented via a Bluetooth interface using the provided software or app is of particular interest. In order to ensure a correct and error-free measuring procedure, the photometers are equipped with a timer which ensures that the reaction times of the reagents are met before the measurement.
The unit in which the measured values (except pH, alkalinity, total hardness and calcium hardness) are displayed can be switched between mg/l and ppm. The unit in which alkalinity, total hardness and calcium hardness are displayed can be selected from five different options.

1. Light protection cover / measuring chamber
2. Display
3. Membrane keypad

Function keys

Key	Description	Function
	ON/OFF	Meter on/off, stop countdown
	ZERO	Start ZERO measurement
	BACK	Back
	OK	Confirm, start measurement
	UP	Navigate up
	DOWN	Navigate down

SPECIFICATIONS

Technical specifications

Light source	530 nm / 570 nm / 620 nm LED
Light detector	Photodiode
Calibration	Zero point calibration
Standard unit	mg/l, ppm
Hardness units	mg/l CaCO3, ppm, mmol/l KS 4,3, °dH (German degrees of hardness), °e (English degrees of hardness / degrees Clark), °f (French degrees of hardness)
Menu languages	English, German, French, Spanish, Italian
Memory	255 readings
Power supply	4 x AA batteries (1.5 V, LR03)
Interface	Bluetooth connection to app / PC software
Auto Power Off	after 300 s of inactivity
Storage / operating conditions	5 ... 45 °C / 90 % RH, non-condensing
Dimensions of meter	167 x 92 x 40 mm
Dimensions of cuvette	36 x ø 21 mm (10 ml)
Weight without batteries	230 g
Measurement range / Accuracy / Resolution	see chapter „Specifications of parameters“

Delivery contents
The delivery contents are the same for all meters of the PCE-CP series

1 x Photometer PCE-CP 04 / 10 / 11 / 20 / 21 / 22 / 30 incl. cuvette
1 x Replacement cuvette
1 x Light protection cover
1 x Microfibre cloth
1 x Crushing/stirring rod
1 x 10 ml Dispensing pipette
4 x AA Battery
1 x Quick start guide
1 x Service bag
1 x App (free download)
1 x PC software (free download)
1 x Free cloud service
1 x Reagent starter kit
(20 x pH, 20 x free chlorine, 10 x combined / total chlorine, 10 x Alkalinity, 10 x cyanuric acid)
(only with PCE-CP 10 / 20 / 30)
1 x 25 ml Shaker **(only with PCE-CP 22)**

Warning: toxic substances:
Water analysis tablets are for chemical analysis only! Not for oral use! Keep out of reach of children! Store in a cool and dry place!
Munich Poison Centre: (24/7) +49 (0) 89-19240 (German and English)

BATTERY REPLACEMENT

ATTENTION:
Only replace the batteries in a dry environment, otherwise damage to the meter or injury to the user may occur. Also make sure that the meter is dry.

- Before replacing the batteries, turn off the power.
- Loosen the screws of the battery compartment at the bottom of the instrument.
- Remove the cover of the battery compartment and take out the flat batteries.
- Insert the new batteries as marked and close the battery compartment.

ON / OFF

To switch on the instrument, press and hold the ON/OFF key until the start screen is displayed. To switch off the device, press and hold the ON/OFF key.
The ON/OFF key can also be used to stop the countdown during the measurement (not recommended). To do this, briefly press the ON/OFF key once during the countdown.

ZERO

When the start screen appears, the display shows „ZERO“. Before you can enter the main menu, the ZERO procedure must be performed once. Proceed as follows:

» Before filling the cuvette, make sure that it is clean and that there are no reagent residues on it.

» Fill the cuvette with a 10 ml sample using the pipette.

» Place the light protection cover on the cuvette and press ZERO .

» Wait until the main menu item „SETTINGS“ appears on the display. Then you can make settings to the device or select a measurement parameter.

The ZERO procedure only needs to be performed once per test series. Once it has been carried out, all subsequent measurements (e. g. pH, chlorine...) can be carried out one after the other without the need for a new ZERO process. If desired, a ZERO process can still be performed before each measurement. This is useful whenever the sample source is changed or when the turbidity of the source changes.

MENU

When the zero process has been completed, you will be taken to the main menu which contains the various measurement parameters of the device as well as the menu item „SETTINGS“. After the ZERO measurement, the first parameter that is always displayed is the one that was measured last. To select the measurement parameters, use the UP and DOWN arrow keys to navigate through the main menu. When you have selected the desired parameter, proceed as described in chapter „Measured parameters“.

SETTINGS

To enter the settings menu, use UP and DOWN to navigate through the main menu until the menu item „SETTINGS“ appears on the display. Now open the settings with OK. Press the BACK key to return to the main menu. The settings menu contains the following sub-menu items:

» Language
» Bluetooth
» Calibrate
» Standard Unit
» Hardness Unit

You can also navigate through the menu structure with the UP and DOWN keys. To select the highlighted sub-menu item, press OK. To return from a sub-menu to the settings menu, press BACK.

Language
You can select the following languages via the navigation: English, German, French, Spanish and Italian.

Bluetooth
To use the Bluetooth function, navigate through the settings menu until the item „Bluetooth“ is highlighted. Press OK to enable or disable Bluetooth. The Bluetooth status is indicated by the small circle in the top right-hand corner of the screen. When it is filled, Bluetooth is active. When it is not filled, Bluetooth is deactivated.

Calibrate
Navigate through the settings menu until the item „Calibrate“ is highlighted. Press OK to start the calibration process. After the calibration procedure, the display shows „CAL OK“ for about 2 seconds. You are then taken back to the settings menu. It is recommended to perform a calibration after each cuvette change.

Standard Unit
In this settings menu, you can change the unit of the parameters which are specified in mg/l or ppm. This does not affect the parameters pH (without unit), calcium hardness and total hardness (see hardness unit).

Hardness Unit
In this settings menu, you can change the unit in which the parameters calcium hardness, total hardness and alkalinity (TA) are displayed. The following unit systems are available: mg/l CaCO3, ppm, mmol/l KS 4.3, °dH (German degrees of hardness), °e (English degrees of hardness / degrees Clark) and °f (French degrees of hardness). The hardness units are not available with the PCE-CP 21 and PCE-CP 22 due to the lack of related parameters.

MEASURED PARAMETERS

Reagents marked with a superscript ‚!‘ are not included in the starter kit and therefore not part of the standard version.

pH value (all devices of the PCE-CP series)
6.50 ... 8.40 pH
Reagent: PCE-CP X0 Tab Phenol Red
The alkalinity value must be at least 50 mg/l to ensure a correct pH measurement.

» Clean the instrument as described in „General information“ and, if desired or necessary, perform the ZERO procedure.

» Navigate through the main menu until the parameter **pH** is displayed.

» Fill a 10 ml sample into the cuvette using the dispensing pipette.

» Add one Phenol Red tablet to the sample and crush the tablet using the crushing rod.

» When the tablet is completely dissolved, place the light protection cover on the cuvette and press OK to start the measurement.

» As soon as the countdown is completed, you will receive your measurement result.

Chlorine (PCE-CP 10, PCE-CP11, PCE-CP 20, PCE-CP 21, PCE-CP 30)

Free chlorine
0.00 ... 8.00 mg/l
Reagent: PCE-CP XO Tab DPD 1

» Clean the instrument as described in „General information“ and, if desired or necessary, perform the ZERO procedure.

» Navigate through the main menu until the parameter **fCl** is displayed.

» Fill a 10 ml sample into the cuvette using the dispensing pipette.

» Add one DPD N° 1 tablet to the sample and crush the tablet using the crushing rod.

» When the tablet is completely dissolved, place the light protection cover on the cuvette and press OK to start the measurement.

» As soon as the countdown is completed, you will receive your measurement result.

» If you additionally want to measure the total chlorine content, do not empty the cuvette and continue with the next step.

Total chlorine
0.00 ... 8.00 mg/l
Reagent: PCE-CP XO Tab DPD 3
Total chlorine is measured directly after the measurement of free chlorine without emptying the cuvette. The DPD N° 3 tablet is added to the cuvette in which the DPD N° 1 tablet is already dissolved. The combined chlorine is calculated by subtracting the free chlorine from the total chlorine.

» Navigate through the main menu until the parameter **tCl** is displayed.

» Add a DPD N° 3 tablet to the sample which already contains a dissolved DPD N° 1 tablet and crush it with the crushing rod.

» When the tablet is completely dissolved, place the light protection cover on the cuvette and press OK to start the measurement.

» As soon as the countdown is completed, you will receive your measurement result.

Cyanuric acid (PCE-CP 10, PCE-CP 20, PCE-CP 21, PCE-CP 30)
0 ... 160 mg/l
Reagent: PCE-CP XO Tab Cyanuric Acid

» Clean the instrument as described in „General information“ and, if desired or necessary, perform the ZERO procedure.

» Navigate through the main menu until the parameter **CYA** is displayed.

» Fill a 10 ml sample into the cuvette using the dispensing pipette.

» Add one Cyanuric Acid tablet to the sample and crush the tablet using the crushing rod.

» When the tablet is completely dissolved, place the light protection cover on the cuvette and press OK to start the measurement.

» As soon as the countdown is completed, you will receive your measurement result.

Alkalinity (PCE-CP 04, PCE-CP 10, PCE-CP 20, PCE-CP 30)
The unit in which the alkalinity is indicated can be set in the settings menu „Hardness Unit“, see chapter Hardness Unit.

0 ... 200 mg/l CaCO3
Reagent: PCE-CP XO Tab Alkalinity

» Clean the instrument as described in „General information“ and, if desired or necessary, perform the ZERO procedure.

» Navigate through the main menu until the parameter **Alka** is displayed.

» Fill a 10 ml sample into the cuvette using the dispensing pipette.

» Add one Alkalinity tablet to the sample and crush the tablet using the crushing rod.

» When the tablet is completely dissolved, place the light protection cover on the cuvette and press OK to start the measurement.

» As soon as the countdown is completed, you will receive your measurement result.

Active oxygen (PCE-CP 30)
0.0 ... 30.0 mg/l
Reagent: PCE-CP XO Tab DPD 4

» Clean the instrument as described in „General information“ and, if desired or necessary, perform the ZERO procedure.

» Navigate through the main menu until the parameter **Act. O2** is displayed.

» Fill a 10 ml sample into the cuvette using the dispensing pipette.

» Add one DPD N° 4 tablet to the sample and crush the tablet using the crushing rod.

» When the tablet is completely dissolved, place the light protection cover on the cuvette and press OK to start the measurement.

» As soon as the countdown is completed, you will receive your measurement result.

Chlorine dioxide (PCE-CP 30)
0.00 ... 11.40 mg/l
Only if the water sample contains chlorine in addition to chlorine dioxide (e. g. if both disinfectants (chlorine and chlorine dioxide) are used), procedure A with the Glycine tablet must be followed. If the sample contains only chlorine dioxide and no chlorine, follow procedure B.

Procedure A
Reagents: PCE-CP XO Tab Glycine[!], PCE-CP XO Tab DPD 1 **or** PCE-CP XO Tab Kit ClO2 Br2 Cl[!]

» Clean the instrument as described in „General information“ and, if desired or necessary, perform the ZERO procedure.

» Navigate through the main menu until the parameter **CLO_2** is displayed.

» Fill a 10 ml sample into the cuvette using the dispensing pipette.

» Add one Glycine tablet to the sample and crush the tablet using the crushing rod.

» Now add a DPD N° 1 tablet to the sample and crush it with the crushing rod.

» When both tablets are completely dissolved, place the light protection cover on the cuvette and press OK to start the measurement.

» As soon as the countdown is completed, you will receive your measurement result.

Procedure B
Reagent: PCE-CP XO Tab DPD 1

» Clean the instrument as described in „General information“ and, if desired or necessary, perform the ZERO procedure.

» Navigate through the main menu until the parameter **CLO_2** is displayed.

» Fill a 10 ml sample into the cuvette using the dispensing pipette.

» Add one DPD N° 1 tablet to the sample and crush the tablet using the crushing rod.

» When the tablet is completely dissolved, place the light protection cover on the cuvette and press OK to start the measurement.

» As soon as the countdown is completed, you will receive your measurement result.

Bromine (PCE-CP 21, PCE-CP 30)
0.0 ... 13.5 mg/l
Only if the water sample contains chlorine as well as bromine (e. g. if both disinfectants (chlorine and bromine) are used), procedure A with the Glycine tablet must be followed. If the sample contains only bromine and no chlorine, follow procedure B.

Procedure A
Reagents: PCE-CP XO Tab Glycine[!], PCE-CP XO Tab DPD 1 **or** PCE-CP XO Tab Kit ClO2 Br2 Cl[!]

» Clean the instrument as described in „General information“ and, if desired or necessary, perform the ZERO procedure.

» Navigate through the main menu until the parameter **Br_2** is displayed.

» Fill a 10 ml sample into the cuvette using the dispensing pipette.

» Add one Glycine tablet to the sample and crush the tablet using the crushing rod.

» Now add a DPD N° 1 tablet to the sample and crush it with the crushing rod.

» When both tablets are completely dissolved, place the light protection cover on the cuvette and press OK to start the measurement.

» As soon as the countdown is completed, you will receive your measurement result.

Procedure B
Reagent: PCE-CP XO Tab DPD 1

» Clean the instrument as described in „General information“ and, if desired or necessary, perform the ZERO procedure.

» Navigate through the main menu until the parameter **Br_2** is displayed.

» Fill a 10 ml sample into the cuvette using the dispensing pipette.

» Add one DPD N° 1 tablet to the sample and crush the tablet using the crushing rod.

» When the tablet is completely dissolved, place the light protection cover on the cuvette and press OK to start the measurement.

» As soon as the countdown is completed, you will receive your measurement result.

Ozone (PCE-CP 30)
0.00 ... 4.00 mg/l
Only if the water sample contains chlorine in addition to ozone (e. g. if both disinfectants (chlorine and ozone) are used), procedure B, using the Glycine tablet, must be followed. If the sample contains only ozone and no chlorine, follow procedure A.

Procedure A
Reagents: PCE-CP XO Tab DPD 1, PCE-CP XO Tab DPD 3 **or** PCE-CP XO Tab Kit Cl2 O3[!]

» Clean the instrument as described in „General information“ and, if desired or necessary, perform the ZERO procedure.

» Navigate through the main menu until the parameter **O_3 Ozone** is displayed.

» Fill a 10 ml sample into the cuvette using the dispensing pipette.

» Add one DPD N° 1 and one DPD N° 3 tablet to the sample and crush these with the crushing rod.

» When both tablets are completely dissolved, place the light protection cover on the cuvette and press OK to start the measurement.

» As soon as the countdown is completed, you will receive your measurement result.

Procedure B
Reagents: PCE-CP XO Tab Glycine[!], PCE-CP XO Tab DPD 1, PCE-CP XO Tab DPD 3 **or**
PCE-CP XO Tab Kit O3 Cl[!]

» Clean the instrument as described in „General information“ and, if desired or necessary, perform the ZERO procedure.

» Navigate through the main menu until the parameter **O_3 Ozone ipo. Cl2** is displayed.

» Fill a 10 ml sample into the cuvette using the dispensing pipette.

» Then add one Glycine tablet to the sample and crush the tablet with the crushing rod.

» When the tablet is completely dissolved, place the light protection cover on the cuvette and press OK to start the first measurement.

» “Step 2“ is displayed.

» Now empty and clean the cuvette.

» Fill a 10 ml sample into the cuvette using the dispensing pipette.

» Now add one DPD N° 1 and one DPD N° 3 tablet to the sample and crush these with the crushing rod.

» When both tablets are completely dissolved, place the light protection cover on the cuvette and press OK to start the final measurement.

» As soon as the countdown is completed, you will receive your measurement result.

Hydrogen peroxide (PCE-CP 30)

Hydrogen peroxide low range
0.00 ... 2.90 mg/l
Reagent: PCE-CP XO Tab Hydrogen Peroxide LR[1]

» Clean the instrument as described in „General information“ and, if desired or necessary, perform the ZERO procedure.

» Navigate through the main menu until the parameter **H_2O_2 LR** is displayed.

» Fill a 10 ml sample into the cuvette using the dispensing pipette.

» Add one Hydrogen Peroxide LR tablet to the sample and crush the tablet using the crushing rod.

» When the tablet is completely dissolved, place the light protection cover on the cuvette and press OK to start the measurement.

» As soon as the countdown is completed, you will receive your measurement result.

Hydrogen peroxide high range
0 ... 200 mg/l
Reagents: PCE-CP XO Tab Kit Hydrogen Peroxide HR[1]

» Clean the instrument as described in „General information“ and, if desired or necessary, perform the ZERO procedure.

» Navigate through the main menu until the parameter **H_2O_2 HR** is displayed.

» Fill a 10 ml sample into the cuvette using the dispensing pipette.

» Add one Hydrogen Peroxide HR tablet to the sample and crush the tablet using the crushing rod.

» When the tablet is completely dissolved, place the light protection cover on the cuvette and press OK to start the measurement.

» As soon as the countdown is completed, you will receive your measurement result.

Water hardness
The unit in which the water hardness is indicated can be set in the settings menu „Hardness unit“, see chapter Hardness Unit.

Total hardness
0 ... 500 mg/l
Reagents: PCE-CP XO Tab Kit Total Hardness[1]

» Clean the instrument as described in „General information“ and, if desired or necessary, perform the ZERO procedure.

» Navigate through the main menu until the parameter **TH** is displayed.

» Fill a 10 ml sample into the cuvette using the dispensing pipette.

» Shake the liquid reagents before use.

» Add ten drops of Total Hardness 1 and four drops of Total Hardness 2 to the sample and stir it with the crushing/stirring rod.

» When a uniformly coloured solution is obtained, place the light protection cover on the cuvette and press OK to start the measurement.

» As soon as the countdown is completed, you will receive your measurement result.

Calcium hardness
0 ... 500 mg/l
Reagents: PCE-CP XO Tab Kit Calcium Hardness[1]

» Clean the instrument as described in „General information“ and, if desired or necessary, perform the ZERO procedure.

» Navigate through the main menu until the parameter **CH** is displayed.

» Fill a 10 ml sample into the cuvette using the dispensing pipette.

» Shake the liquid reagents before use.

» Add ten drops of Calcium Hardness 1 and Calcium Hardness 2 to the sample and stir it with the crushing/stirring rod.

» When a uniformly coloured solution is obtained, place the light protection cover on the cuvette and press OK to start the measurement.

» When the countdown is completed, open the cuvette and stir the solution again.

» Repeat step five. As soon as the countdown is completed, you will receive your measurement result.

Hardness conversion

	$CaCO_3$ mg/l	°dH* (KH)	°e* (CH)	°f* (DC)
1 mg/l $CaCO_3$	1	0.056	0.07	0.1
1 mmol/l $K_{S\,4,3}$	50	2.8	3.5	5.0

Urea (PCE-CP 22, PCE-CP 30)
0.1 ... 2.5 mg/l
Reagents: PCE-CP XO Tab PL Urea N°1[!], PCE-CP XO Tab PL Urea N°2[!], PCE-CP XO Tab Ammonia N°1[!], PCE-CP XO Tab Ammonia N°2[!] **or** PCE-CP XO Tab Kit Urea[!]

- Clean the instrument as described in „General information“ and, if desired or necessary, perform the ZERO procedure.
- Navigate through the main menu until the parameter **UREA** is displayed.
- Fill a 10 ml sample into the cuvette using the dispensing pipette.
- Shake the liquid reagents before use.
- Add two drops of PL Urea N°1 to the sample and stir it with the crushing/stirring rod. Then press OK to proceed.
- Add one drop of PL Urea N°2 to the sample and stir it with the crushing/stirring rod. Then press OK to proceed.
- Place the light protection cover on the cuvette and press OK .
- Open the cuvette, add a bag of Ammonia N°1 and mix the reagent with the sample.
- Repeat step eight with a bag of Ammonia N°2.
- When both bags are completely dissolved, place the light protection cover on the cuvette and press OK to start the measurement. After the countdown, the measurement result is displayed.

The reagent Ammonia N° 1 only dissolves completely after you add the reagent Ammonia N° 2. Ammonia and chloramine are detected together. The displayed result is therefore the sum of the two. The temperature of the sample must be between 20 °C and 30 °C. The test must be performed no later than one hour after taking the sample. When testing seawater, the sample must be pre-treated with a special conditioning powder before adding the Ammonia N° 1 tablet. Do not store PL Urea 1 below 10 °C. It could otherwise granulate. PL Urea 2 must be stored between 4 °C and 8 °C.

PHMB (PCE-CP 30)
5 ... 60 mg/l
Reagent: PCE-CP XO Tab PHMB[1]

» Clean the instrument as described in „General information“ and, if desired or necessary, perform the ZERO procedure.

» Navigate through the main menu until the parameter **PHMB** is displayed.

» Fill a 10 ml sample into the cuvette using the dispensing pipette.

» Then add one PHMB tablet to the sample and crush the tablet with the crushing rod.

» When the tablet is completely dissolved, place the light protection cover on the cuvette and press OK to start the measurement.

» As soon as the countdown is completed, you will receive your measurement result.

It is essential that you clean the objects used for the measurement (cuvettes, cover, crushing rods) that come into contact with the tested water mixed with reagent thoroughly with a (soft) brush, water and then with distilled water as otherwise the measuring equipment may turn blue over time. Alkalinity values (M) <> 120 mg/l and calcium hardness values <> 200 mg/l can cause measurement deviations.

Nitrite (PCE-CP 22)
0 ... 1.46 mg/l NO_2
Reagent: PCE-CP XO Tab Nitrite

» Clean the instrument as described in „General information“ and, if desired or necessary, perform the ZERO procedure.

» Navigate through the main menu until the parameter **NO_2** is displayed.

» Fill a 10 ml sample into the cuvette using the dispensing pipette.

» Then add a bag of nitrite powder reagent to the sample and stir it with the crushing/stirring rod.

» When the powder has completely dissolved, place the light protection cover on the cuvette and press OK to start the measurement.

» As soon as the countdown is completed, you will receive your measurement result.

Nitrate (PCE-CP 22)
1 ... 100 mg/l NO_3
Reagent: PCE-CP XO Tab Kit Nitrate

» Clean the instrument as described in „General information“ and, if desired or necessary, perform the ZERO procedure.

» Navigate through the main menu until the parameter **NO_3** is displayed.

» Fill a 20 ml sample (fill dispensing pipette twice) into the 25 ml shaker.

» Add the reagents Nitrate N° 1 and Nitrate N° 2 from the reagent kit to the sample, one after the other.

» Close the shaker and shake the sample for approx. 15 seconds, until the reagents have completely dissolved.

» Press OK to start the reaction countdown and wait until it is completed.

» Use the dispensing pipette to fill a 10 ml sample from the shaker into the cuvette.

» Place the light protection cover on the cuvette and press OK to start the measurement.

» As soon as the countdown is completed, you will receive your measurement result.

Phosphate (PCE-CP 22)
0.00 ... 2.00 mg/l PO_4
Reagent: PCE-CP XO Tab Kit Phosphate

» Clean the instrument as described in „General information“ and, if desired or necessary, perform the ZERO procedure.

» Navigate through the main menu until the parameter **PO_4** is displayed.

» Fill a 10 ml sample into the cuvette using the dispensing pipette.

» Then add a bag of Phosphate N°1 powder reagent to the sample and stir it with the crushing/stirring rod.

» As soon as the Phosphate N°1 reagent has completely dissolved, add the Phosphate N°2 reagent to the sample and stir it with the crushing/stirring rod.

» When the reagents are completely dissolved, place the light protection cover on the cuvette and press OK to start the measurement.

» As soon as the countdown is completed, you will receive your measurement result.

The pH value of the sample should be between pH 6 and pH 7.
The following components of the sample can falsify the measurement result - if the content is correspondingly high: chromium >100 mg/l, copper >10 mg/l, iron >100 mg/l, nickel >300 mg/l, zinc >80 mg/l, silicon dioxide >50 mg/l, silicate >10 mg/l.
The order in which the powder is added must be strictly adhered to.

Ammonia (PCE-CP 22)
0.00 ... 1.21 mg/l NH_3
Reagents: PCE-CP XO Tab Ammonia N°1!, PCE-CP XO Tab Ammonia N°2!

» Clean the instrument as described in „General information“ and, if desired or necessary, perform the ZERO procedure.

» Navigate through the main menu until the parameter **NH_3** is displayed.

» Fill a 10 ml sample into the cuvette using the dispensing pipette.

» Then add a tablet of Ammonia N°1 to the sample and crush it with the crushing rod.

» As soon as the Ammonia N°1 reagent has spread in the sample, add the Ammonia N°2 reagent to the sample and stir it with the crushing/stirring rod.

» When the reagents are completely dissolved, place the light protection cover on the cuvette and press OK to start the measurement.

» As soon as the countdown is completed, you will receive your measurement result.

The order in which the tablets are added must be strictly adhered to.
The Ammonia N°1 tablet only completely dissolves completely after adding Ammonia N°2 tablet.
The temperature of the sample is important for colour development. At temperatures below 20 °C, the reaction time is15 minutes.

Iron (PCE-CP 11, PCE-CP 21, PCE-CP 22)
0.00 ... 1.00 mg/l Fe
Reagent: PCE-CP XO Tab FE

» Clean the instrument as described in „General information“ and, if desired or necessary, perform the ZERO procedure.

» Navigate through the main menu until the parameter **Fe+** is displayed.

» Fill a 10 ml sample into the cuvette using the dispensing pipette.

» Then add an Iron photometer tablet to the sample and crush it with the crushing rod.

» When the tablet has completely dissolved, place the light protection cover on the cuvette and press OK to start the measurement.

» As soon as the countdown is completed, you will receive your measurement result.

Unless dissolved iron is expected in the water, filter the test water before measurement
(0.45 µ filter paper and special filter accessories required).
This method determines total dissolved FE2+ and FE3+.

Copper (PCE-CP 22)
0.00 ... 5.00 mg/l Cu
Reagent: PCE-CP XO Tab CU

» Clean the instrument as described in „General information“ and, if desired or necessary, perform the ZERO procedure.

» Navigate through the main menu until the parameter **Cu** is displayed.

» Fill a 10 ml sample into the cuvette using the dispensing pipette.

» Then add an Iron photometer tablet to the sample and crush it with the crushing rod.

» When the tablet has completely dissolved, place the light protection cover on the cuvette and press OK to start the measurement.

» As soon as the countdown is completed, you will receive your measurement result.

The sample must be brought into the pH range between 4 and 6.
Only free copper is determined by the measurement, no combined copper.

Potassium (PCE-CP 22)
0.8 ... 12.0 mg/l K
Reagent: PCE-CP XO Tab Potassium

» Clean the instrument as described in „General information“ and, if desired or necessary, perform the ZERO procedure.

» Navigate through the main menu until the parameter **K** is displayed.

» Fill a 10 ml sample into the cuvette using the dispensing pipette.

» Then add a Potassium photometer tablet to the sample and crush it with the crushing rod.

» When the tablet has completely dissolved, place the light protection cover on the cuvette and press OK to start the measurement.

» As soon as the countdown is completed, you will receive your measurement result.

By adding the „Potassium” reagent, a milky solution is formed. Individual particles are not an indication of the presence of potassium.

Iodine (PCE-CP 21)
0.0 ... 21.4 mg/l I_2
Reagent: PCE-CP XO Tab DPD 1

» Clean the instrument as described in „General information“ and, if desired or necessary, perform the ZERO procedure.

» Navigate through the main menu until the parameter **I_2** is displayed.

» Fill a 10 ml sample into the cuvette using the dispensing pipette.

» Then add a DPD N°1 tablet to the sample and crush it with the crushing rod.

» When the tablet has completely dissolved, place the light protection cover on the cuvette and press OK to start the measurement.

» As soon as the countdown is completed, you will receive your measurement result.

All oxidising agents present in the sample react like iodine, which leads to multiple findings.

TROUBLESHOOTING

OR-UR / dilution
OR = Overrange / UR = Underrange
The test result is outside the measurement range of this method. OR results can be brought into the measurement range by dilution. Use the dispensing pipette to take a 5 ml (or 1 ml) sample.
Fill the sample into the cuvette and add 5 ml (9 ml) of distilled water. Perform the measurement and multiply the result by 2 (or 10). Dilution is not applicable to the parameter „pH".

Error codes

Error code	Descripton
BAT!	Replace batteries
Err02	(too dark) Clean measuring chamber and dilute water sample
Err03	(too bright) Do not forget the light protection cover during the measurement
Err04	Repeat ZERO and TEST procedure
Err05	Environmental temperature below 5 °C or above 60 °C

CUVETTE REPLACEMENT

» Before replacing the cuvette, make sure that the instrument is dry and clean.
» Remove the old cuvette and dispose of it appropriately.
» Make sure that the new cuvette is clean.
» Insert the new cuvette and turn it until it locks into the holder. This may require some force.
» To calibrate the instrument to the new cuvette, follow the procedure in chapter „Calibrat".

ACCESSORIES

Reagents

Order code	Description
PCE-CP XO Tab DPD 4	50 DPD N° 4 Tablets active oxygen
PCE-CP XO Tab Alkalinity	50 Tablets for alkalinity m value
PCE-CP XO Tab Cyanuric Acid	50 Tablets for cyanuric acid
PCE-CP XO Tab DPD 1	50 Tablets DPD N° 1
PCE-CP XO Tab Glycine	50 Tablets glycine
PCE-CP XO Tab Hydrogen Peroxide LR	50 Tablets for hydrogen peroxide low range
PCE-CP XO Tab Phenol Red	50 Tablets for pH value Phenol Red
PCE-CP XO Tab PHMB	50 Tablets for polyhexanide
PCE-CP XO Tab PL Urea No1	30 ml PL urea N° 1 (375 tests)
PCE-CP XO Tab PL Urea No2	10 ml PL urea N° 2 (250 tests)
PCE-CP XO Tab DPD 3	50 Tablets DPD N° 3
PCE-CP XO Tab Nitrite	50 Powder reagents for nitrite
PCE-CP XO Tab FE	50 Reagent tablets for iron
PCE-CP XO Tab CU	50 Reagent tablets for copper
PCE-CP XO Tab Potassium	50 Reagent tablets for potassium
PCE-CP XO Tab Starter Kit	Tablets 20 x DPD N° 1, 10 x DPD N° 3, 20 x pH value, 10 x alkalinity, 10 x CYA
PCE-CP XO Tab Kit Cl2 O3	Reagent kit 50 tests chlorine or ozone in chlorinefree water
PCE-CP XO Tab Kit O3 Cl	Reagent kit 50 tests ozone in water containing chlorine
PCE-CP XO Tab Kit ClO2 Br2 Cl	Reagent kit 50 tests bromine or chlorine dioxide in water containing chlorine
PCE-CP XO Tab Kit Hydrogen Peroxide	Reagent kit 50 tests hydrogen peroxide high range
PCE-CP XO Tab Kit Total Hardness	Reagent kit 50 tests total hardness
PCE-CP XO Tab Kit Calcium Hardness	Reagent kit 50 tests calcium hardness
PCE-CP XO Tab Kit Ammonia	Reagent kit 50 tests ammonia
PCE-CP XO Tab Kit Urea	Reagent kit urea
PCE-CP XO Tab Kit Nitrate	Reagent kit 50 tests nitrate
PCE-CP XO Tab Kit Phosphate	Reagent kit 50 tests phosphate

Spare parts

Order code	Description
PCE-CP XO Cal-Set	Calibration set chlorine, cyanuric acid, pH value, alkalinity for PCE-CP XO
PCE-CP XO Case	Carrying case for meters of the PCE-CP Series
PCE-CP XO Cuvette	Replacement cuvette for PCE-CP XO
PCE-CP XO Cuvette Cover	Light protection cover made of flexible plastic for the PCE-CP XO
PCE-CP XO Impact Protection	Impact protection for PCE-CP XO
PCE-CP XO Microfibre Cloth	White microfibre cleaning cloth 10 x 15 cm
PCE-CP XO PIP	10 ml dispensing pipette with flat end
PCE-CP XO Spurtle	Crushing/stirring rod made of plastic (10.5 cm) for the PCE-CP XO
PCE-CP XO Shaker 25 ml	25 ml shaker for the parameter nitrate

SOFTWARE / APP

When Bluetooth is activated, you can connect the photometer to your device via the software or the app.
Download software (Windows / Mac OS):
https://www.pce-instruments.com/software/PCE-CP-Series.zip

App for Android:

App for iOS:

Connect a meter of the PCE-CP Series to the app or software before using it for the first time, after replacing the batteries and after each update to set the date and time automatically.
After the first connection of the software / app to a meter of the PCE-CP Series, the software / app automatically adjusts to the selectable parameters of the PCE-CP Series.

Structure and navigation
The structure of the software and the app only differs in a few details.
After starting the software / app, you will see the LabCom logo and the software version in the main screen. In the software, you will find the main menu on the left-hand side in the form of a navigation column. In the app, the main menu can be reached by pressing the menu button in the upper left corner. In the software, the main menu remains visible in the navigation column at any time whereas in the app, you can navigate back to the main menu at any time by using the back button in the top left corner. The individual menu items and their contents are explained in detail below.
The software is available for Windows 7 and Windows 10. However, the Bluetooth function can only be used with Windows 10. When using Windows 7, measurements can only be imported from the cloud service or measurements from the device must be entered manually in „New measurement".

Accounts
Here, you can manage your user accounts. By creating an account, you can transfer your measurements from the instrument to your smartphone or PC and save them sorted by account. It is also possible to have a report created (.xlsx or .pdf) for the selected account, using the menu field in the top right-hand corner.

New measurement
In addition to the automatic transfer function of measurements to the software / app, measurements can also be added manually to the various accounts in the „New measurement" area. To do this, select the method (the substance to be measured in water). You can enter the measurement value in a pop-up window as soon as you click on the „Add result" button. Once you have entered the measured value, click on „OK" to add the measurement to the selected account.

Cloud service
In the „Cloud service" area, you can see an overview if you have registered with an account. In the overview, you can see how many accounts are registered in this software client and how many measurements have been saved. You can also see when you last synchronised and when the last change was made to the data.

Connect photometer
Via this menu item, you can connect your photometer to your software. To establish a connection, Bluetooth must be activated in the menu of the device (see chapter Bluetooth). Then press the „scan“ button in the app and the device should appear in the selection below the button. Now you can connect the meter to the software / app via the „Connect“ button that appears in the selection. In Windows, when connecting the device to the software for the first time, you must pair the photometer with Windows in the Windows Bluetooth settings. Afterwards, the search for the device in the software will show a result. Proceed as follows:

» Enter the keyword „Settings“ in the search bar.

» The first result should be the app „Settings“ which can be used to configure the Windows settings. Open it.

» Click on the chapter „Devices“.

» Now click on the first button „Add Bluetooth or other devices“.

» Enable the Bluetooth function of your PCE-CP XO as described in chapter „Bluetooth“.

» In Windows, click on “Bluetooth“.

» Windows will now search for Bluetooth devices in its environment. Select the meter which should appear with the name „PCELab“ and pair it with your PC.

» Now open the software and start a search in the „Connect photometer“ area. The photometer should now also be available here.

After connecting the meter, the following device data will be displayed:

» Name of the meter
» Serial number
» Firmware version
» Memory usage
» Time on the meter

The contrast of the display can also be adjusted in this screen. To do this, use the two buttons „Decrease“ and „Increase“ below the heading „LCD contrast“.
If you no longer need the instrument to be connected to the software, click on the „Disconnect“ button at the bottom of the window to terminate the connection.

Chemistry
In this main menu item, you will find various calculators which are especially intended for use in water/ pool maintenance. There is one calculator each for the RSI/LSI index, for active chlorine and for different water care products. Furthermore, there is a list of the ideal ranges of all parameters measurable by the PCE-CP Series.

Settings
In the settings, you can change the language of the application. You can also reset the database here, which means that all measurements and accounts are deleted. In the PC software, you can also export or import the database, for example in order to transfer it to another PC.

Support
In the main menu item Support, you will find two tabs. The first tab, marked by an open book, contains a download link for this manual. The second tab which shows a stylized globe, contains links which lead you to the product and support websites of PCE Instruments.

SPECIFICATIONS OF PARAMETERS

Active oxygen

Measurement range (mg/l)	Accuracy ±	Resolution
0.0 ... 5.0	0.5 mg/l	0.1 mg/l
5.0 ... 15.0	1.3 mg/l	
15.0 ... 25.0	3.8 mg/l	
25.0 ... 30.0	5.0 mg/l	

Alkalinity

Measurement range (mg/l)	Accuracy ±	Resolution
0 ... 30	3 mg/l	1 mg/l
30 ... 60	7 mg/l	
60 ... 100	12 mg/l	
100 ... 200	18 mg/l	

Bromine

Measurement range (mg/l)	Accuracy ±	Resolution
0.0 ... 2.5	0.2 mg/l	0.1 mg/l
2.q5 ... 6.5	0.6 mg/l	
6.5 ... 11.0	1.7 mg/l	
11.0 ... 13.5	2.3 mg/l	

Calcium hardness

Measurement range (mg/l)	Accuracy ±	Resolution
0 ... 25	8 mg/l	1 mg/l
25 ... 100	22 mg/l	
100 ... 300	34 mg/l	
300 ... 500	45 mg/l	

Chlorine (free / total)

Measurement range (mg/l)	Accuracy ±	Resolution
0.00 ... 2.00	0.10 mg/l	0.01 mg/l
2.00 ... 3.00	0.23 mg/l	
3.00 ... 4.00	0.75 mg/l	
4.00 ... 8.00	1.00 mg/l	

Cyanuric acid

Measurement range (mg/l)	Accuracy ±	Resolution
0 ... 15	1 mg/l	1 mg/l
15 ... 50	5 mg/l	
50 ... 120	13 mg/l	
120 ... 160	19 mg/l	

Chlorine dioxide

Measurement range (mg/l)	Accuracy ±	Resolution
0.00 ... 2.00	0.19 mg/l	0.01 mg/l
2.00 ... 6.00	0.48 mg/l	
6.00 ... 10.00	1.43 mg/l	
10.00 ... 11.40	1.90 mg/l	

Hydrogen peroxide – (LR)

Measurement range (mg/l)	Accuracy ±	Resolution
0.00 ... 0.50	0.05 mg/l	0.01 mg/l
0.50 ... 1.50	0.12 mg/l	
1.50 ... 2.00	0.36 mg/l	
2.00 ... 2.90	0.48 mg/l	

Hydrogen peroxide – (HR)

Measurement range (mg/l)	Accuracy ±	Resolution
0 ... 50	5 mg/l	1 mg/l
50 ... 110	6 mg/l	
110 ... 170	11 mg/l	
170 ... 200	13 mg/l	

Ozone

Measurement range (mg/l)	Accuracy ±	Resolution
0.00 ... 1.00	0.07 mg/l	0.01 mg/l
1.00 ... 2.00	0.17 mg/l	
2.00 ... 3.00	0.51 mg/l	
3.00 ... 4.00	0.68 mg/l	

pH

Measurement range (mg/l)	Accuracy ±	Resolution
6.50 ... 8.40	0.11	0.01

PHMB

Measurement range (mg/l)	Accuracy ±	Resolution
0 ... 30	3 mg/l	1 mg/l

Total hardness

Measurement range (mg/l)	Accuracy ±	Resolution
0 ... 30	3 mg/l	1 mg/l
30 ... 60	5 mg/l	
60 ... 100	10 mg/l	
100 ... 200	17 mg/l	
200 ... 300	22 mg/l	
300 ... 500	58 mg/l	

Urea

Measurement range (mg/l)	Accuracy ±	Resolution
0.00 ... 0.30	0.05 mg/l	0.01 mg/l
0.30 ... 0.60	0.06 mg/l	
0.60 ... 1.00	0.09 mg/l	
1.00 ... 1.50	0.12 mg/l	
1.50 ... 2.50	0.19 mg/l	

Nitrite

Measurement range (mg/l)	Accuracy ±	Resolution
0. 00 ... 0.25	0.02 mg/l	0.01 mg/l
0.25 ... 0.40	0.06 mg/l	
0.40 ... 1.30	0.09 mg/l	
1.30 ... 1.64	0.12 mg/l	

Nitrate

Measurement range (mg/l)	Accuracy ±	Resolution
0 ... 20	2 mg/l	1 mg/l
20 ... 40	4 mg/l	
40 ... 60	6 mg/l	
60 ... 100	10 mg/l	

Phosphate

Measurement range (mg/l)	Accuracy ±	Resolution
0.00 ... 0.40	0.04 mg/l	0.01 mg/l
0.40 ... 1.20	0.12 mg/l	
1.20 ... 2.00	0.20 mg/l	

Ammonia

Measurement range (mg/l)	Accuracy ±	Resolution
0.00 ... 0.12	0.02 mg/l	0.01 mg/l
0.12 ... 0.25	0.04 mg/l	
0.25 ... 0.57	0.06 mg/l	
0.57 ... 1.21	0.09 mg/l	

Iron

Measurement range (mg/l)	Accuracy ±	Resolution
0.00 ... 0.20	0.02 mg/l	0.01 mg/l
0.20 ... 0.60	0.04 mg/l	
0.60 ... 1.00	0.08 mg/l	

Copper

Measurement range (mg/l)	Accuracy ±	Resolution
0.00 ... 2.00	0.20 mg/l	0.01 mg/l
2.00 ... 3.00	0.31 mg/l	
3.00 ... 5.00	0.44 mg/l	

Potassium

Measurement range (mg/l)	Accuracy ±	Resolution
0.8 ... 3.0	0.3 mg/l	0.1 mg/l
3.0 ... 7.0	0.4 mg/l	
7.0 ... 10.0	0.5 mg/l	
10.0 ... 12.0	1.0 mg/l	

Iodine

Measurement range (mg/l)	Accuracy ±	Resolution
0.0 ... 5.0	0.5 mg/l	0.01 mg/l
5.1 ... 10.0	0.8 mg/l	
10.1 ... 15.0	2.7 mg/l	
15.1 ... 21.4	3.6 mg/l	

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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