

Polarimeter **P3000**

User Manual



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Chapter - 1 Introduction

The Polarimeter P3000 is very easy to operate and is designed for the fully automated measurement of optical rotation.

The measurement sample is filled into the polarimeter tube, inserted into the sample chamber and measured. The results are shown on the display and, if connected, printed out on a printer.

The operator dialog is available in German and English.

1.1 Application Examples

Application areas for the polarimeter are, amongst others:

- Pharmaceutical Industry
 - Monitoring of chemical processes
 - Purity control and determination of concentrations
 - Testing of substances listed in the German Pharmacopoeia (DAB)
- Chemical Industry
 - Purity control and determination of concentrations
 - Analysis of optically active components (qualitative und quantitative)
 - Determination of configuration changes
 - Monitoring of chemical processes
- Food Industry
 - Determination of concentrations
 - Purity control
 - Quality control
- Sugar and Sweetener-Industry
 - Quality control of raw materials and end products
 - Determination of fructose and glucose
- Cosmetic Industry
- Beverage Industry / Breweries

1.2 Reading Information

Although instrument operation of the P3000 is easy, we recommend attentive reading of this manual to ensure correct and optimal use of all functions.

Symbols

This manual uses the following symbols:

- Listings
- Instructions to do something

Text in italics refers to text in dialog windows.

 Reference to further information in this manual.

Finding Information

- Look up in the table of contents.
- Should a problem occur, refer to Chapter - 9 Troubleshooting Table

Chapter - 2 General Safety Instructions

Hazards during normal specified operation:



Danger!

Electric shock by damaged instrument or power cable.

- ▶ Before switching on the instrument, make sure that the instrument and the power cable are undamaged.
- ▶ Only operate instruments that have been properly installed and maintained.



Danger!

Electric shock by entering liquids.

- ▶ Before cleaning, switch off the instrument and disconnect the power supply.
- ▶ Do not allow liquids to enter the instrument.
- ▶ Do not spray the instrument for cleaning.
- ▶ Make sure the instrument is completely dry before connecting to the power supply.



Danger!

Electric shock

- ▶ Before changing the fuse, switch off the instrument and disconnect the power cable.



Warning!

Damage to the retina by the LED light source.

- ▶ Do not look directly into the LED light source.



Careful!

Danger of pinching your hand.

- ▶ Close the sample chamber lid carefully.

**Careful!**

Damage to electrical components by condensate formation.

- ▶ Wait at least one hour after transporting the instrument in a cooler environment (e.g. cold room or outdoors) before connecting to the power supply.

**Careful!**

Overheating damage.

- ▶ Do not place the instrument near a heat source (e.g. heating).
- ▶ Do not expose to direct sunlight.
- ▶ Allow for unhindered air circulation.

**Attention!**

Aggressive chemicals may damage the instrument's paint or the plastic housing!

- ▶ Clean the instrument with neutral cleaning agents only.
- ▶ DO NOT use aggressive chemicals for cleaning, such as strong or weak acids or bases, acetone, formaldehyde, chlorinated hydrocarbons or phenols.
- ▶ If the instrument comes into contact with aggressive chemicals, clean immediately with a neutral cleaning agent.


Chapter - 3 Instrument Description

This chapter describes the following topics:

- Scope of delivery
- Optional accessories
- Instrument images
- Required reagents
- Screen description
- Measurement principle

3.1 Scope of Delivery

The following items are included in the delivery of the polarimeters P3000:

- Polarimeter P3000
- Power cable
- Touchscreen pen
- Polarimeter tubes:
 - 1 x 100 mm glass tube with middle funnel
 - 1 x 200 mm glass tube with middle funnel
-  User manual

3.2 Optional Accessories

- Printer
- various polarimeter tubes

3.3 Required Reagents

Calibration

For calibration of the instrument, quartz standards are used.

 See Ordering Information.

Accuracy Check

For checking the accuracy of the instrument's measurements you may use:

- Quartz standards
- Standard solutions with known concentrations

Sample Dilution

The solution used for sample dilution depends on the sample material to be measured and should not itself be optically active.

3.4 Instrument Images

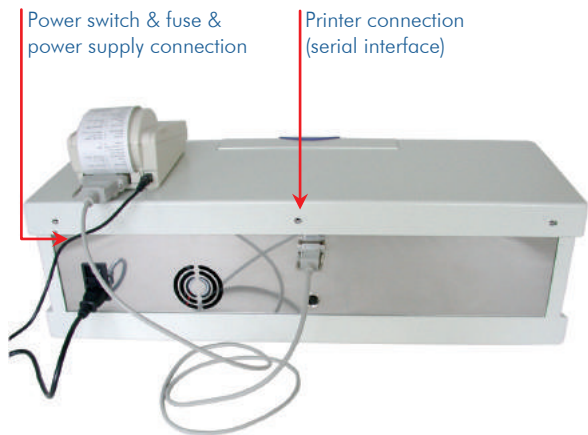
Instrument Front View of P3000



Instrument Back View of P3000

The P3000 provides the following connections:

- Printer connection (for direct result output)
- Power supply connection with power switch and fuse



Polarimeter Tubes

The polarimeter tube is available in two different lengths:

- 100 mm
- 200 mm
- various other types optionally available

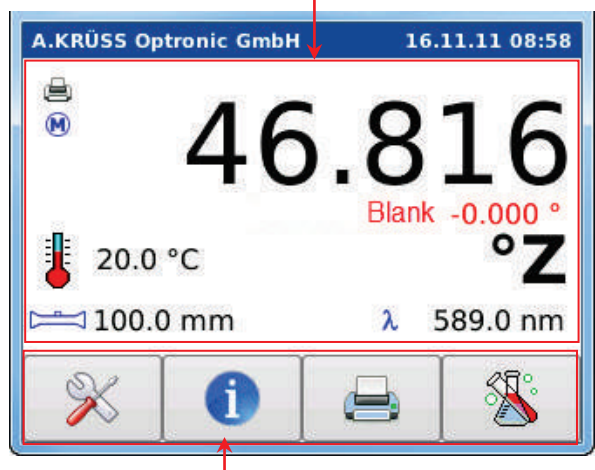
3.5 Screen Descriptions

This chapter briefly describes the following screens of the polarimeter P3000:

Main Menu

In the main menu the measurements are started and the results are displayed. The buttons lead to further submenus.

Display window for results, unit, blank as well as instrument and system settings.



Operation of buttons via touchscreen.

Explanation of Buttons



Opens the menus for :

- System settings
- Instrument settings
- Calibration (measurement range, temperature sensor)
- Blank



Provides the following information:

- Instrument and firmware settings
- Date of last calibration
- Version of user interface and data base



Prints the result shown on the display.



Starts the measurement.

Explanation of Display Window



11.000 °Z	Measurement result of the sample with unit.
Blank	Blank used for calculation of the sample result.
	Connected printer is switched on.
	The motor is switched on. No display: motor is switched off. It switches off automatically a few seconds after the measurement.
20.0 °C	The temperature sensor is connected to the sample polarimeter tube and the measured temperature during sample measurement is 20.0 °C in this example. Explanations: see Chapter 7.4 Calibrating the Temperature Sensor. No temperature display: no temperature sensor connected.
100.0 mm	Size of the employed polarimeter tube. Is selected in the instrument settings.
589.0 nm	Selected wavelength (fixed setting).

3.6 Measurement Principle

The polarimeter measures the optical rotation of the orientation of plane-polarized light caused by optically active substances. In principle, it consists of two polarization filters, the polarizer and the analyzer, each of which allows only a certain orientation of plane-polarized light to pass through.

The polarimeter measures the optical activity or the optical rotation of a chemical substance.

The following equation defines the relation between the optical rotation, the specific rotation and the sample concentration:

$$C = \frac{\alpha}{l [\alpha]_{\lambda}^T}$$

c = concentration [g/l]

α = measured optical rotation [°]

l = tube length [dm]

$[\alpha]^T$ = specific rotation, dependent on temperature (°C) and wavelength

The optical rotation is, amongst others, dependent on the following parameters:

- Type of sample
- Concentration of the optically active components
- Light wavelength
- Temperature of sample
- Tube length

Chapter - 4 Basic Operation

The instrument is operated by a touchscreen display using four touchscreen buttons.

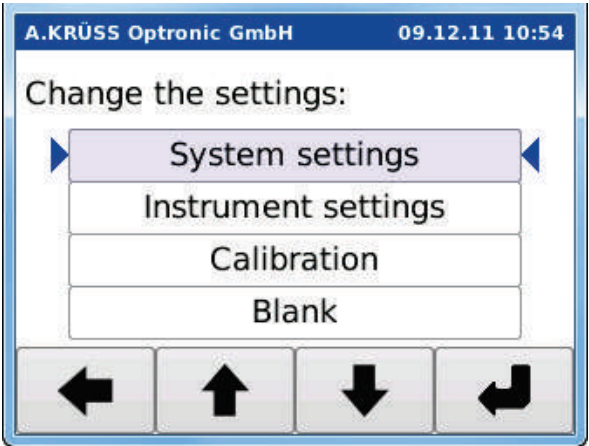
4.1 Buttons

Operation of the polarimeter is performed using these four buttons:



Opens the submenus for :

- System settings (printer, language, date/time)
- Instrument settings (scale, polarimeter tube, temperature)
- Calibration (measurement range, temperature sensor)
- Blank



Returns to the main menu.



Selection of desired settings (system settings, instrument settings, instrument calibration, blank).

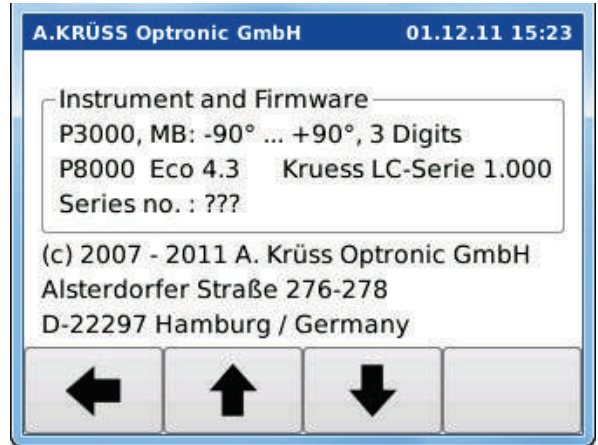


Opens the menu, e.g. for system settings.



Opens the window with the following information about the P3000:

- Instrument and firmware settings.
- Date of last calibration.
- Version of the user interface and data base.



Returns to the main menu.



Page up and page down in the information pages.

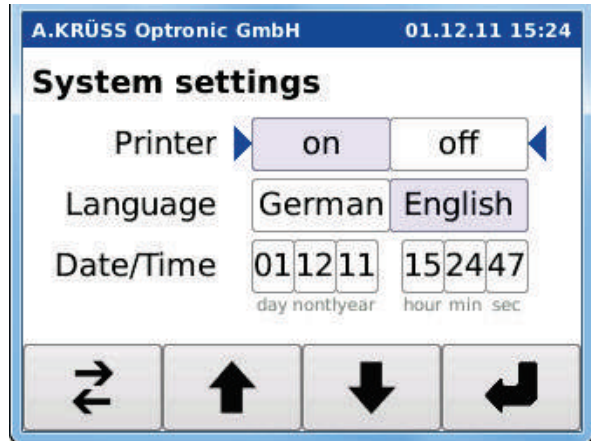


Prints the result shown in the display.



Starts the measurement.

4.2 Defining the System Settings



and



Switching between the parameters:

- *Printer,*
- *Language,*
- *Day, Month, Year, Hour, Min, Sec.*



Selection of the desired setting:

- *on/off (printer)*
- *German/English (language)*
- *Date/time:*
Counts up the respective selected parameter (Day, Month, Year, Hour, Min, Sec).



Accepts the set values and returns to the main menu.

4.3 Defining the Instrument Settings

A.KRÜSS Optronic GmbH 01.12.11 15:26

Instrument settings

Scale ▶ ◀

Polar. tube

Temp.

Navigation buttons: ◀→, ↑, ↓, ↶



Selection of parameters (scale, polarimeter tube, temperature).



Selection of parameter setting.

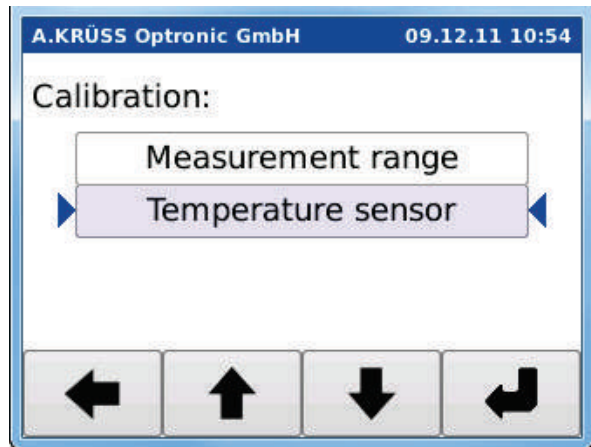


Accepts the set values and returns to the main menu.

4.4 Performing the Calibrations

The functions for performing the calibrations of the measurement range and the temperature sensor are accessed using the button **Calibration**.

 Performing the calibrations see Chapter 7.4 Calibrating the Temperature Sensor.



Selection of calibration functions (measurement range and temperature sensor).



Returns to the settings menu.



Accepts the set values and returns to the main menu.

Chapter - 5 Initial Startup

This chapter covers the following topics:

- Installation
- Preparing the instrument after installation

5.1 Installation

Choosing a Suitable Location

- Place the instrument on a level and stable surface.

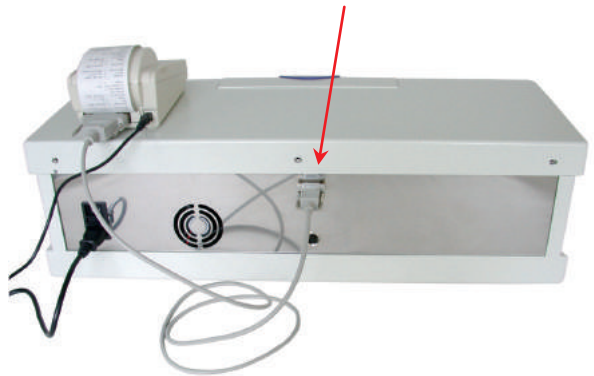


Please note!

The location should be free of vibrations and tremors.
Do not expose the instrument to direct sunlight.
Both can lead to faulty measurement results.

Connecting a Printer

- Connect the printer to the serial interface.



- Plug in the printer's power cable.

Connecting the Polarimeter to the Power Supply

Permitted power supply: 100 -240 V, 50/60 Hz.

- Connect the polarimeter's power cable.

5.2 Preparing the Instrument after Installation

After installation the instrument is basically ready for operation.

Only if a temperature sensor is used, the sensor must first be calibrated before performing the first measurement

A.Krüss recommends validation of the P3000 after transport and installation.



Warning!

Damage to the retina by the LED light source.

- ▶ Do not look directly into the LED light source in the sample chamber.

Switching on the Instrument

- ▶ Switch on the polarimeter (switch is located at the back of the instrument).











Stabilizing the light source!

After switching on the instrument the light source must reach thermal equilibrium, i.e. to achieve highest precision, you should wait approx. 10 - 15 minutes before starting the first measurement.

Switching on the Printer

If a printer is connected, it must be switched on in the system settings as follows:



- ▶ Open the settings menu with .
- ▶ Use the buttons  and  to select the **system settings** and press .
- ▶ Select the printer with the buttons  and .
- ▶ Switch the printer on with the button .
- ▶ Accept the settings with .

Connecting the Temperature Sensor

- If desired, connect the temperature sensor.




Calibrating the Temperature Sensor

If a temperature sensor is connected, the sensor must first be calibrated before operating the instrument.

The calibration consists of two temperature measurements:

- Temperature measurement with the connected temperature sensor
- Temperature measurement with a specified thermometer.

The P3000 determines the temperature difference between the sensor and the specified thermometer and corrects the deviation of the sensor for all following measurements.

 Performing the calibration: see Chapter 7.4 Calibrating the Temperature Sensor.

Checking (Validating) the Instrument

Although the P3000 is calibrated ex works, the instrument's accuracy should always be checked after transport.

The instrument check is carried out as follows:


- Set the instrument parameters
- Measure the blank
- Measure the quartz standard or a standard solution of known concentration.
- If the results show a significant deviation from the nominal values of the quartz standards or the test standards, the measurement range must be re-calibrated.

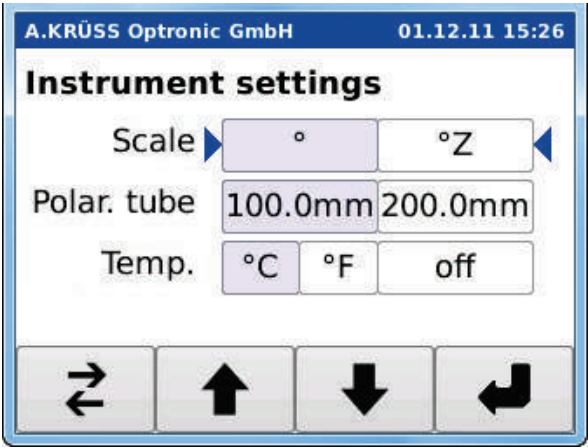
Setting the Instrument Parameters







The instrument's default settings are as follows:

- Scale = °
- Polarimeter tube = 100.0 mm
- Temperature °C

If desired, these settings can be changed as follows.

- ▶ Open the settings menu with .
- ▶ Select the *Instrument settings* with the buttons ↑ and ↓ and press ↵.






- ▶ Use the buttons  and  to select the desired instrument settings (scale, polarimeter tube or temperature).
- ▶ Set the desired parameter with the button .
- ▶ Exit the selected instrument setting with the buttons  and  and select the next instrument setting that you want to change.
- ▶ Exit the menu *Instrument Settings* with .

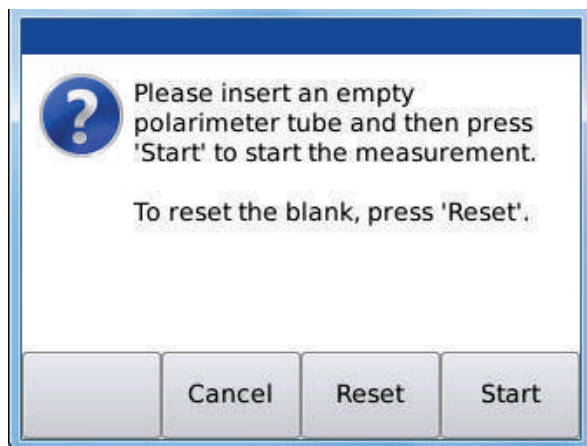
Determining the Blank

Depending on whether the accuracy is checked using a quartz standard or a standard solution, the blank determination is performed differently as follows:

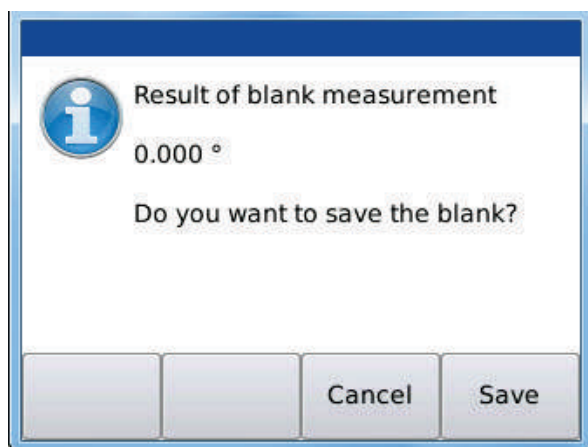
- When performing the accuracy measurement with a quartz standard, the blank measurement is carried out with the sample chamber empty.
- When performing the accuracy measurement with a standard solution, the blank measurement is carried out with an empty polarimeter tube (100 mm / 200 mm, selected in the instrument settings).

The determined blank is then subtracted from all following measurement results.

- ▶ Open the system settings with .
- ▶ Select *Blank* using the buttons  and .

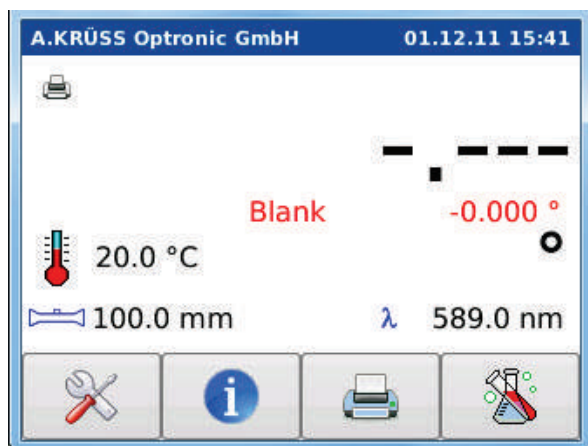


- ▶ Leave the sample chamber empty or insert an empty polarimeter tube into the sample chamber.
- ▶ Close the lid.
- ▶ Start the blank measurement with **Start**.



- ▶ To save the blank value press **Save**.

The blank is saved and the result is shown in the main menu.



Measuring the Standard

- ▶ Insert the quartz standard into the sample chamber.

or

- ▶ Fill the standard into the polarimeter tube.
- ▶ Close the sample chamber

- ▶ Start the measurement with



The measurement result is displayed.

If the result matches the value of the quartz standard or the value of the standard solution, you may start with routine operation.

If the results show larger deviations from the nominal values, the measurement range should be re-calibrated.

 See 7.3 Calibrating the Measurement Range.

Chapter - 6 Routine Operation

This chapter supplies information on the following topics:

- What to do after switching on the instrument.
- How to prepare measurements.
- How to start the measurement.
- What must be done after measuring.
- How to print out the results.

6.1 Preparing the Instrument

Switching on the Instrument



Warning!

Damage to the retina by the LED light source.

- Do not look directly into the LED light source in the sample chamber.

- Switch on the polarimeter.

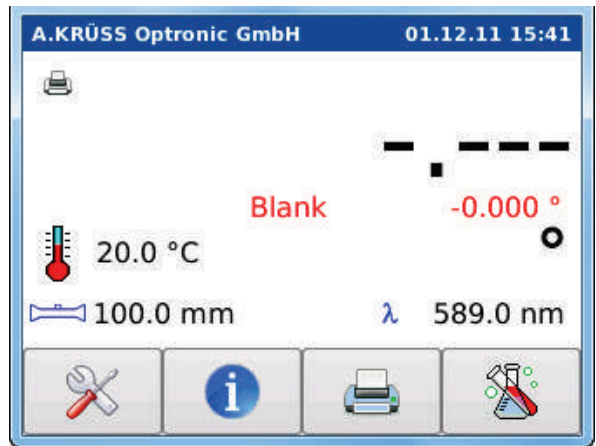


Stabilizing the light source!

After switching on the instrument the light source must reach thermal equilibrium, i.e. to achieve highest precision, you should wait approx. 10 - 15 minutes before starting the first measurement.

- Switch on the printer, if desired.

The main menu opens. The last selected instrument parameters are set.



Starting from the main menu, all necessary settings for a measurement are defined.

Changing the Instrument Parameters

Before starting a measurement, the following instrument parameters can be changed:

- Scale (unit)
- Polarimeter tube (100 mm / 200 mm)
- Temperature (°C / °F / off)

For a description of the instrument parameters see Chapter 7.2 Instrument Settings.

► Open the settings menu with .

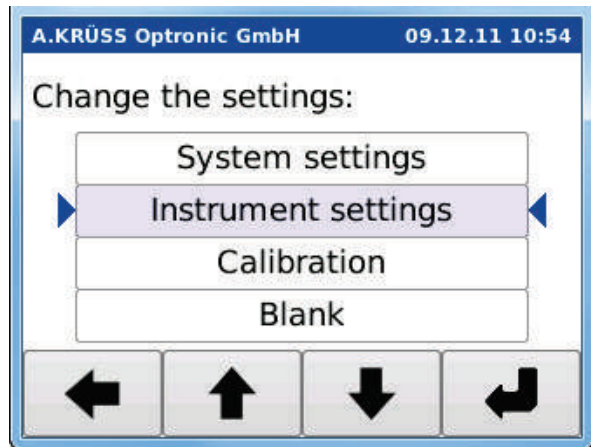
Select ***Instrument settings*** with the buttons and .




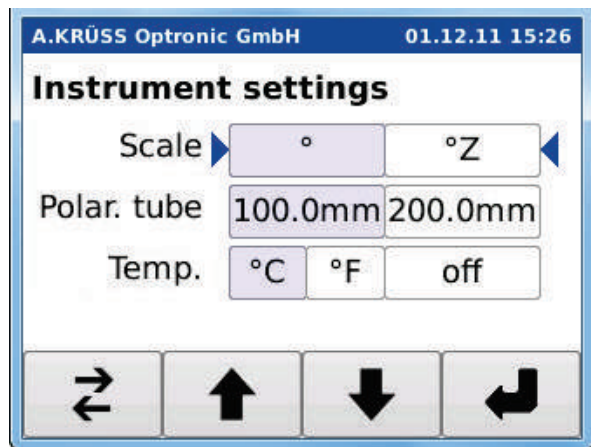
Please note!





After changing the polarimeter tube size, a new blank **must** be determined with the selected polarimeter tube.

See Chapter 7.5 Blank.



- Open the menu with the instrument settings with .






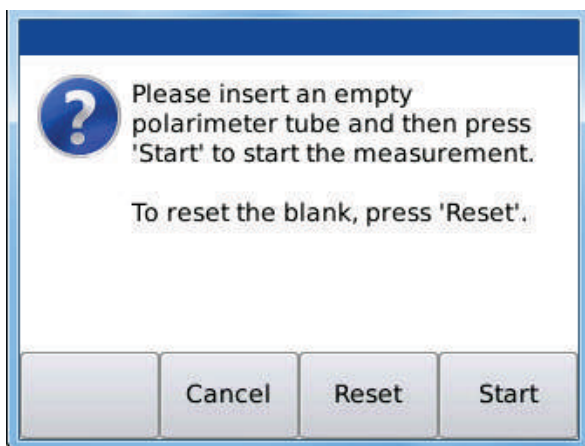
- Select the desired instrument settings (scale, polarimeter tube or temperature) using the buttons  and .
- Set the desired parameter with .
- Exit the menu *Instrument settings* with .

6.2 Executing a Measurement

After changing the polarimeter tube, changing of the dilution medium or after opening the polarimeter tube, a blank measurement of the polarimeter tube must be performed first.

Determining the Blank

- ▶ Open the system setting with .
- ▶ Select **Blank** with the buttons  and .







- ▶ Insert the empty polarimeter tube into the sample chamber.
- ▶ Close the lid of the sample chamber.
- ▶ Press **Start**.
- ▶ Accept the measured blank with **Save**.

The blank is saved and is subtracted from all following measurement results.

 For a detailed description see Chapter 7.5 Blank.

Resetting the Blank

If the saved blank should not be considered in the following sample measurements, the blank must be reset to zero.

- ▶ Open the system setting with .
- ▶ Select **Blank** with the buttons  and  and press .
- ▶ Press **Reset**.
- ▶ The blank is reset to zero.

Supplying a Sample

- ▶ Fill the sample into the polarimeter tube with which the blank has been determined.

The polarimeter tube must be completely filled and virtually free of air bubbles.



Please note!

Faulty measurement results are caused by air bubbles!

- ▶ A possibly existing air bubble must not interfere with the tube's optical path.

Connecting a Temperature Sensor

- ▶ If desired, connect the temperature sensor.



Careful!

Danger of pinching your hand.

- ▶ Close the sample chamber lid carefully.
- ▶ Close the lid of the sample chamber.

Starting the Measurement



After inserting the polarimeter tube filled with the sample, the measurement can be started.

Temperature control!

If there is a greater temperature difference between the sample and the ambient temperature, you should wait a while before starting the measurement. If the sample has not reached ambient temperature, faulty results are obtained.




- Press

The measurement is started.

Measurement



A single measurement is executed.

The motor is operating when the symbol  is displayed.

If the motor was switched off, a startup phase is required first.

- The measurement is then executed.

If a temperature sensor is connected, the actual temperature is measured at the polarimeter tube and displayed.

Symbol	Explanation
 **. * °C	Temperature sensor is connected to the polarimeter tube. No value available yet.
 20.0 °C	Actual temperature at the polarimeter tube. If the temperature sensor is calibrated, the corrected temperature is displayed. If the sensor is not calibrated, the uncorrected temperature is shown.
No display	No temperature sensor connected.

After Measurement

- Remove the polarimeter tube from the sample chamber.
- Clean the polarimeter tube **immediately** after measurement with dest. water or an appropriate solvent.

After cleaning, the sample tube is again available for the next sample measurement.

The motor of the polarimeter is automatically switched off after a few seconds.

6.3 Measurement Results

Measurement Result Display

The measurement result is displayed together with the unit.

Printing the Displayed Measurement Result

► Press .

The measurement result shown on the display is printed out on the connected printer.

Switching off the Instrument

- Switch off the printer.
- Switch off the polarimeter (switch located on the back of the instrument).

Chapter - 7 Settings

This chapter covers the following topics:

- How to switch the printer on and off.
- How to select the language.
- How to set date, time and language.
- How to set the scale and the polarimeter tube.
- How to switch the temperature measurement on and off.
- How to calibrate the measurement range.
- How to calibrate the temperature sensor.
- How to reset the measurement range (to ex works setting)
- How to perform a blank measurement.
- How to reset a blank.

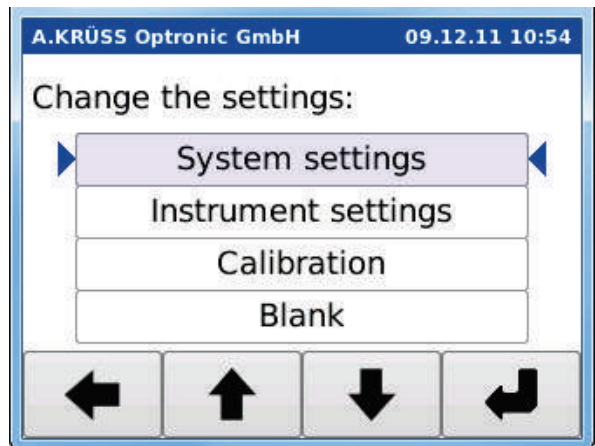
7.1 System Settings




All required system settings are defined in this menu:

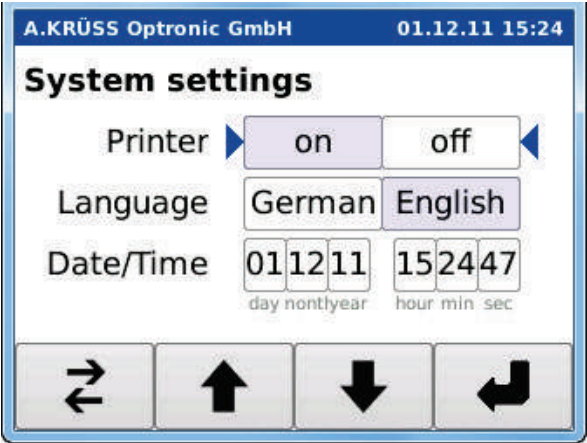
- Printer
- Language
- Date and time

Opening the Menu





- Open the settings menu with .



- ▶ Select *System settings* with  and .
- ▶ Open the system settings menu with .






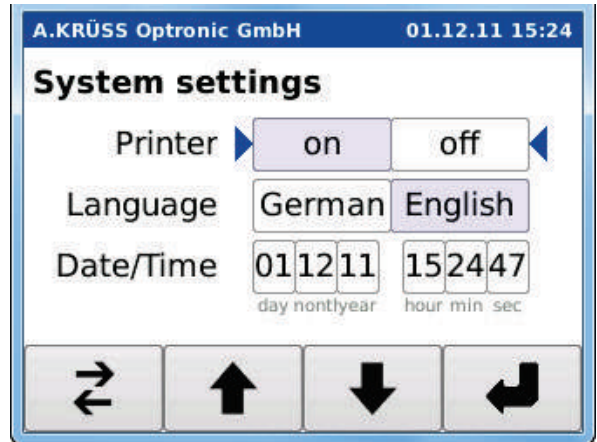
Explanations



Settings/Buttons	Explanations
<i>Printer</i>	The connected printer can be switched on and off.
<i>Language</i>	The languages German and English are available.
<i>Date/Time</i>	Date and time are set.
 and 	Switching between the various parameters: <i>Printer, Language, Day, Month, Year, Hour, Min, Sec.</i>
	Selection of the desired setting: on/off, German/English Exception <i>Date/Time</i> : counts up the selected respective parameter (<i>Day, Month</i> etc.).
	Accepts the settings, closes the dialog window and opens the main menu.

Switching the Printer on and off

If a printer is connected, it can be switched on and off with the P3000.

- ▶ Open the system settings with .
- ▶ Select *Printer* using the buttons  and .






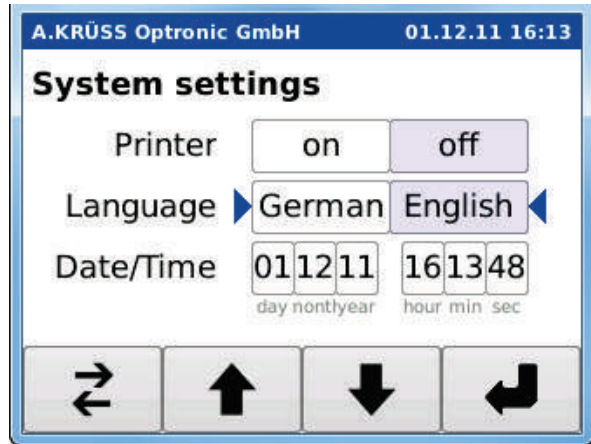
- ▶ Switch the printer on or off with the button .
- ▶ Exit the menu *System settings* with .



The selected parameter is accepted.

Selecting the Language

The languages German and English are available.

- ▶ Open the system settings with .
- ▶ Select *Language* using the buttons  and .








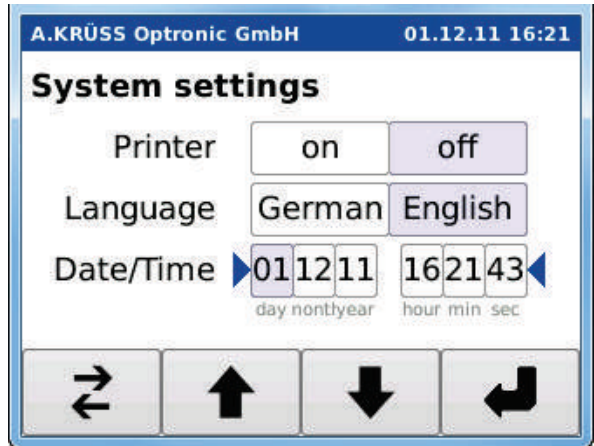
- ▶ Select the language *German* or *English* with the button .
- ▶ Exit the menu *System settings* with .






The selected parameters are accepted.

Input of Date and Time



- ▶ Open the system settings with .
- ▶ Select *Date/Time* using the buttons  and .
- ▶ Further select *Day*, *Month*, *Year* and *Hour*, *Min* as well as *Sec* with the buttons  and .



- ▶ Set the desired number with the button .
- ▶ Using the buttons  and  switch to the next desired setting (day, month, year, etc.).
- ▶ Exit the date/time setting with the button .
- ▶ Exit the menu *System settings* with .

The selected parameters are accepted.




7.2 Instrument Settings

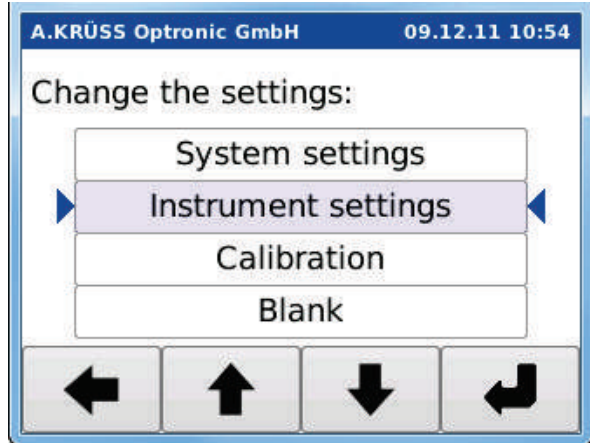
In the instrument settings the parameters for the measurement are set.
Parameters for the measurement are:


- Scale (unit)
- Length of the polarimeter tube [mm]
- Wavelength [nm]
Currently only the wavelength 589 nm is available.
- Actual temperature at the polarimeter tube [°C / °F / off]

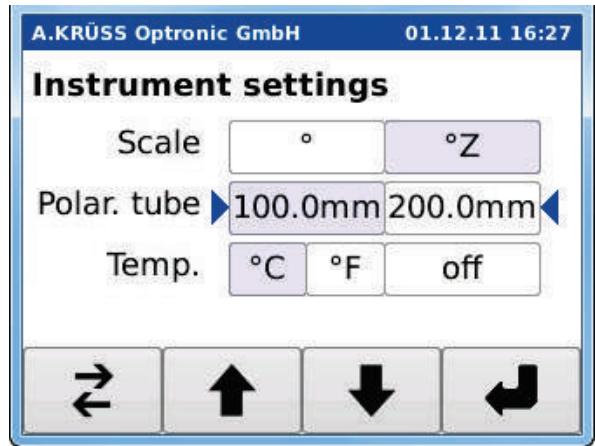
Except for the wavelength, all required parameters for the measurement are selected in the instrument settings.

Opening the Menu

- ▶ Open the settings menu with .
- ▶ Select **Instrument settings** using the buttons  and .







- ▶ Open the menu with .



Explanations

Settings/Buttons	Explanations	
<i>Scale</i>	Selection of the unit:	
	°	Opt. Rotation. Actual measured value.
	°Z	International sugar scale. For this unit the weighted sugar sample in g/cm ³ is selected: <ul style="list-style-type: none"> • 6.5 g/cm³ • 13.0 g/cm³ • 26.0 g/cm³
<i>Polarimeter tube</i>	Selection of the pre-defined polarimeter tube length: <ul style="list-style-type: none"> • 100.0 mm • 200.0 mm 	
<i>Temperature</i>	If a temperature sensor is connected, the temperature at the polarimeter tube is measured. The temperature unit is selectable.	
	°C / °F	Selection of the temperature unit for temperature display. Selecting the unit automatically activates temperature display.
	off	No temperature sensor connected or no temperature display.




 and 	Switching between the parameters: <i>Scale</i> , <i>Polarimeter tube</i> , <i>Temperature</i> .
	Selection of the desired parameter settings: °/°Z, 100.0 mm/200.0 mm, °C/°F/off.
	The settings are accepted, the dialog window is closed and the main menu opens.

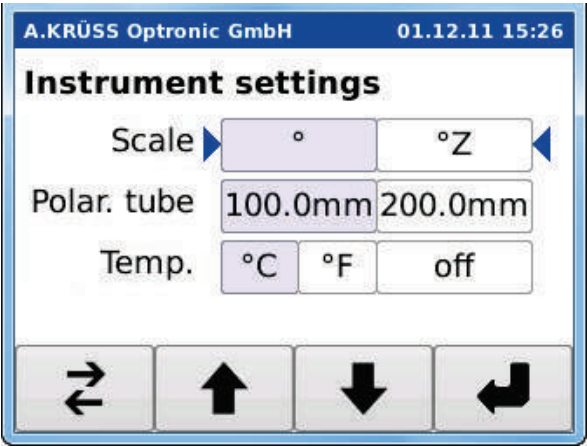
Selecting the Scale



Selection of the scale. There are two scales available:

- Opt. Rotation (°)
- International Sugar Scale (°Z).

If you choose the international sugar scale, you must also select an additional weighted sugar sample.

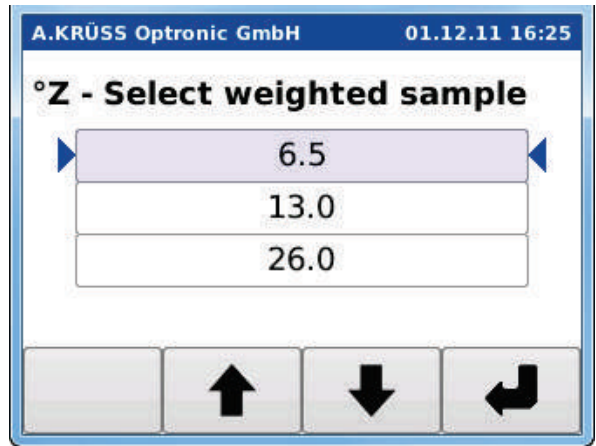
- ▶ Open the instrument settings with .
- ▶ Select *Scale* using the buttons  and .






- ▶ Select the desired scale (°/°Z) with the button .
- ▶ Select the scale °Z with the button .

Selecting the Weighted Sugar Sample

After selecting the scale °Z the dialog window for selection of the weighted sugar sample in g/cm³ opens:



- ▶ Select the desired weighted sugar sample with the buttons  and .
- ▶ Accept the selection with .




The dialog window closes and the menu *Instrument settings* opens again.

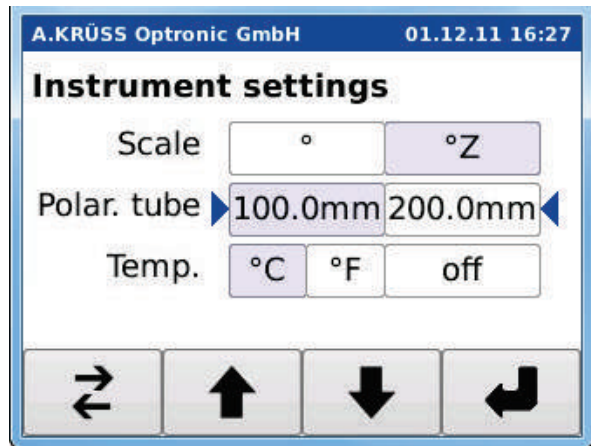
- ▶ Exit the menu *Instrument settings* with .



The selected unit is accepted.

Selecting the Polarimeter Tube

There are two pre-defined polarimeter tube lengths (100.0 mm und 200.0 mm) available.

- ▶ Open the instrument settings with .
- ▶ Select *Polarimeter tube* using the buttons  and .






- ▶ Select the desired polarimeter tube with the button .
- ▶ Exit the menu *Instrument settings* with .

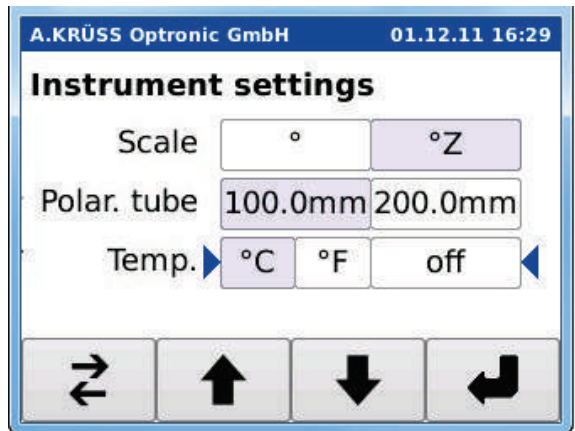
The polarimeter tube selection is accepted.



Selecting the Temperature

If a temperature sensor is connected, the temperature at the polarimeter tube is measured. The temperature unit is selectable. Unit selection automatically activates the display, e.g.:

the display, e.g.:  20.0 °C.

- ▶ Open the instrument settings with .
- ▶ Select *Temperature* using the buttons  and .



- ▶ Select the desired temperature unit with the button .
- ▶ Exit the menu *Instrument settings* with .

The temperature settings are accepted.

7.3 Calibrating the Measurement Range




The calibration consists of two measurements:

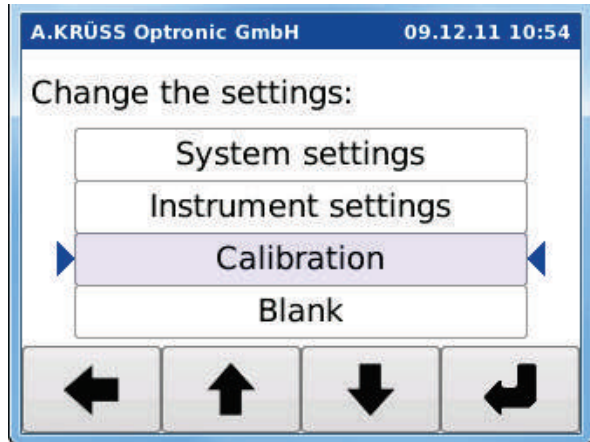
- Blank measurement of the empty sample chamber.
- Quartz standard measurement.


For the quartz standard measurement the optical rotation of the quartz standard at 20 °C and the actual temperature of the quartz are entered. Using this data the polarimeter automatically determines the nominal value for the optical rotation at the prevailing actual temperature.

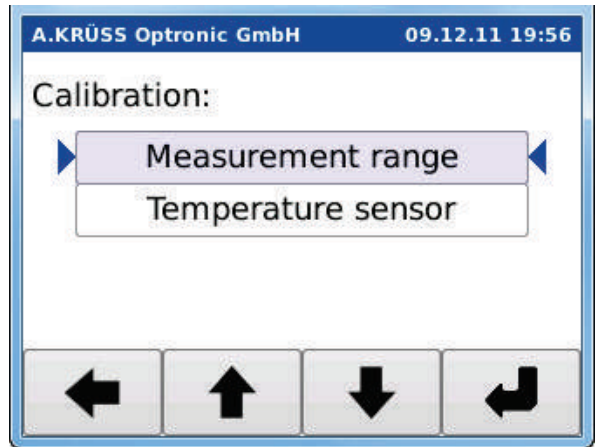
Calibration should be performed in regular intervals. Calibration should be performed immediately, if result accuracy fails to lie in the desired range.

Opening the Menu

- ▶ Open the settings menu with .
- ▶ Select *Calibration* with the buttons  and .

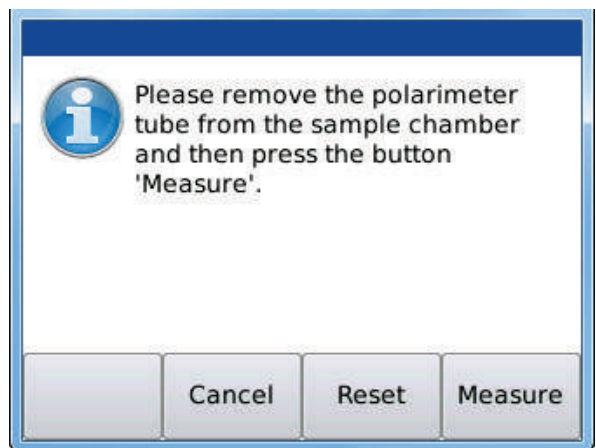


- ▶ Open the dialog window *Calibration* with .



- ▶ Select *Measurement range* with the buttons  and .
- ▶ Start the calibration with .

The first calibration dialog window opens.



Canceling the Calibration

- ▶ Press **Cancel**.

The calibration is canceled and the previous calibration is maintained.

Resetting the Calibration

- ▶ Press **Reset**.

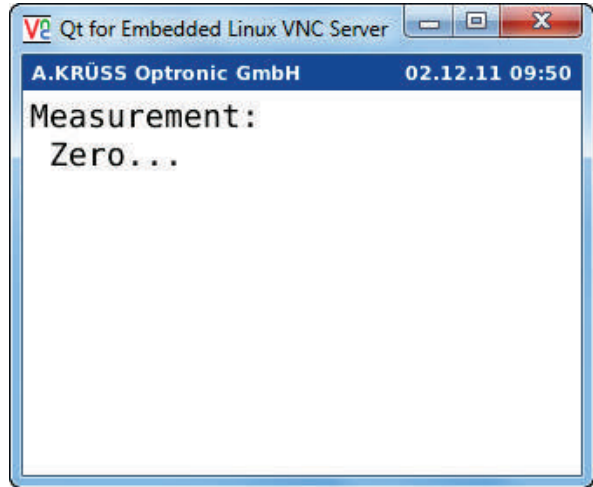
The calibration is reset to the ex works setting.

Performing the Calibration

For calibration the polarimeter blank is measured with the empty sample chamber first.

- ▶ Remove the polarimeter tube from the sample chamber and close the lid.
- ▶ Start the blank measurement with **Measure**.

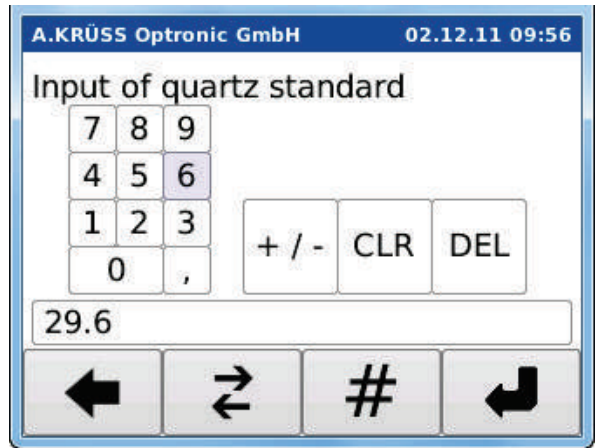
Blank Measurement









The polarimeter blank is determined.

Input of the Quartz Standard

After the measurement the dialog window for input of the quartz standard opens first:

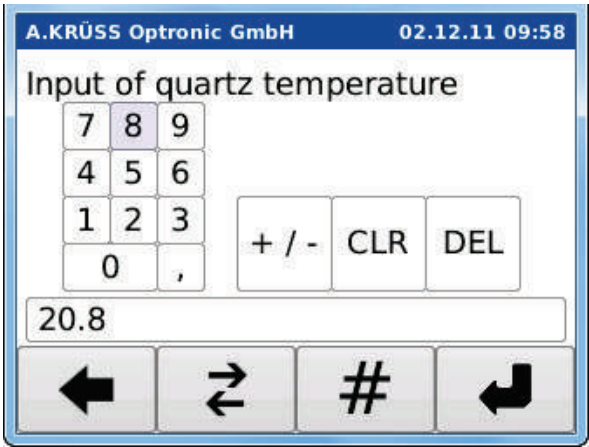


-  Exits the calibration menu and returns to the main menu. The previous calibration is maintained.
-  Selection of the desired
 - value, decimal point, sign
 - functions:
 - CLR = Deletion of the complete value.
 - DEL = Deletion of the last input character.
-  Accepts the value selected with the button  or executes the function (CLR / DEL).
-  Accepts the input value, closes the window and opens the dialog window for input of the quartz temperature.

- Input of the quartz standard's optical rotation.
- Accept the value with .

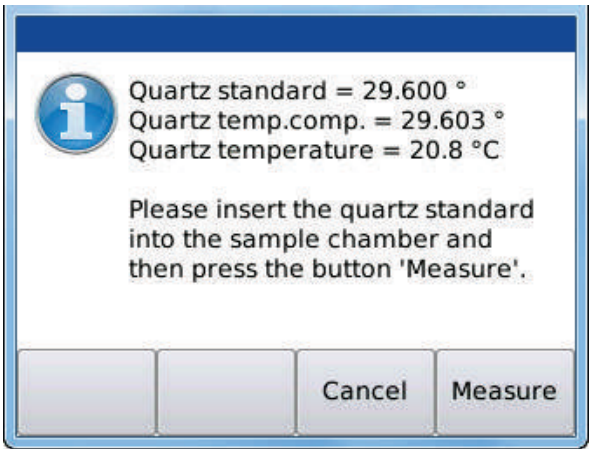
The dialog window for input of the quartz temperature opens.

Input of the Quartz Temperature



- ▶ Enter the actual temperature of the quartz.
Input as described above.
- ▶ Finish the entry with ↵.

The input values (standard and temperature) including the compensated quartz value are shown in the following window.



Quartz Standard Input value of the quartz-standard (nominal temperature 20°C)

Quartz temp.comp. Opt. rotation of the quartz standard at the actual temperature.

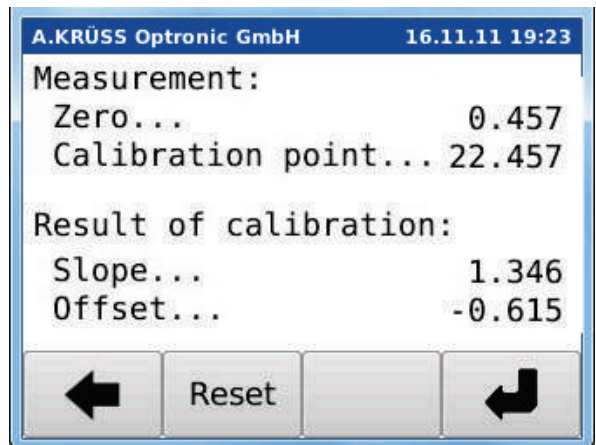
Quartz Temperature Input actual temperature of the quartz standard.

Measuring the Quartz Standard

- ▶ Insert the quartz standard into the sample chamber.
- ▶ Close the sample chamber.
- ▶ Press **Measure**.

The quartz standard is measured.

The measured result is calculated and displayed.




The calibration results are not directly connected with the nominal values of the quartz standards.

Example:

Nominal Value of quartz standard = $29,600^\circ$, but
calibration point found = $22,457^\circ$


Accepting the Calibration

- ▶ Accept the calculated calibration values shown on the display with .

The old calibration value is overwritten with the new value. The date of the calibration is saved in the instrument.



Please note!

The date of the last calibration can be called up any time with the button  in the main menu.

Rejecting the Calibration

- ▶ Press **Reset** to reject the calculated calibration value shown on the display.

The old calibration remains valid. The new calibration is discarded.

7.4 Calibrating the Temperature Sensor

The calibration consists of two temperature measurements:

- Temperature measurement with the temperature sensor
- Temperature measurement with a specified thermometer.

The temperature difference between the sensor and the specified thermometer is determined and compensated.

The temperature sensor must be calibrated:





- before the first use of the sensor
- once a year
- if necessary, i.e. when result accuracy lies outside of the expected range.

Prerequisites

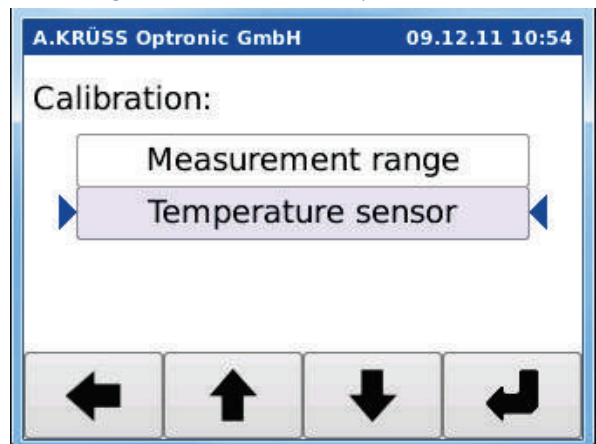
For calibration you need:

- a temperature sensor
- a certified thermometer
- a vessel with water

Calling the Function

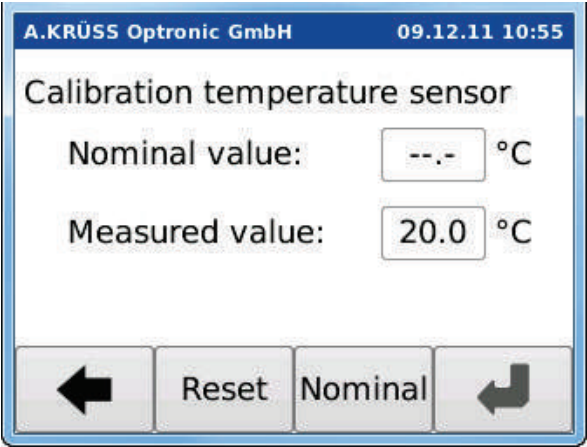
- ▶ Open the settings menu with .
- ▶ Select *Calibration* with the buttons  and  and press .

The dialog window *Calibration* opens.



- ▶ Select *Temperature sensor* with the buttons  and  and press .



The dialog window *Calibration temperature sensor* opens.



Display Explanation

<i>Nominal value:</i>	Input field for the temperature measured with the certified thermometer.
<i>Measured value:</i>	Display of the temperature measured by the temperature sensor. This value cannot be changed.

Explanation of the Buttons

	Opens the dialog window for input of the nominal value (temperature measured with the certified thermometer).
	Calibration of the temperature sensor is reset.

Measuring the Temperature

- ▶ Connect the temperature sensor.
- ▶ Position the temperature sensor and the certified thermometer in a beaker with water.
- ▶ Wait until the display *Measured value* is stable over a longer period of time.



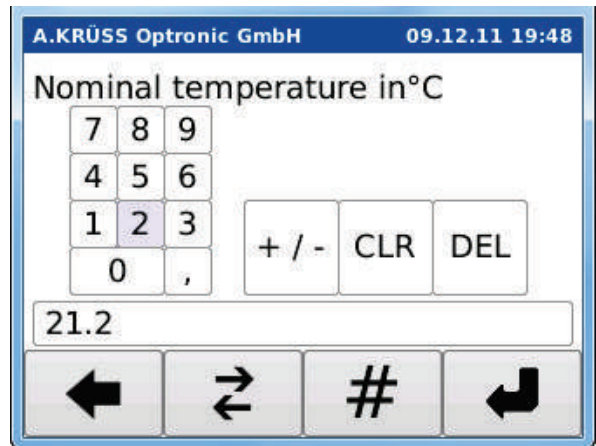
Wait for thermal equilibrium!

If thermal equilibrium has not been reached when entering the nominal value, the calibration may lead to faulty results.

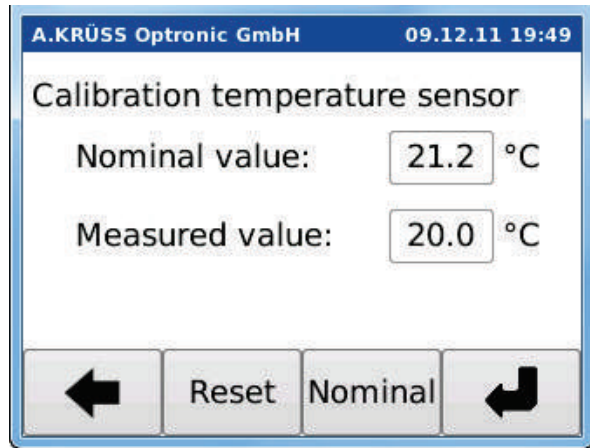
Sensor, thermometer, water and room temperature must be the same. If the temperature display is stable over a longer period of time, thermal equilibrium is given.

Input of the Thermometer Temperature

- ▶ Make a note of the temperature measured with the specified thermometer.
- ▶ Press the button **Nominal**.
- ▶ Enter the temperature measured with the specified thermometer as follows:



- ▶ Select the number with the button ↵ and accept the selected number with #.
- ▶ Repeat this procedure until the value has been completely entered.
- ▶ Save the nominal temperature with ↩.



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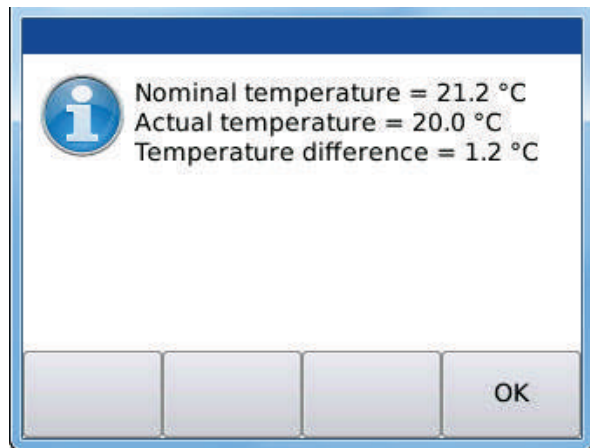
Calibration temperature sensor

Nominal value: 21.2 °C

Measured value: 20.0 °C

Navigation buttons: Left arrow, Reset, Nominal, Right arrow

- Accept the nominal temperature with .



Information icon

Nominal temperature = 21.2 °C
Actual temperature = 20.0 °C
Temperature difference = 1.2 °C

Navigation buttons: Four buttons, the last one is labeled OK

Nominal
temperature

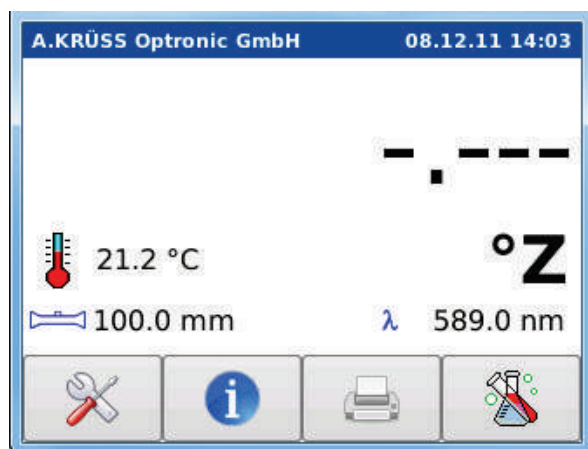
Input of the value measured with the
specified thermomter.

Actual
temperature

Value measured with the temperature
sensor.

- Press **Ok**.

The temperature difference is calculated and all
following temperatures measured with the sensor are
corrected with this value. The program returns to the
main menu.



The currently measured corrected temperature is displayed.




7.5 Blank

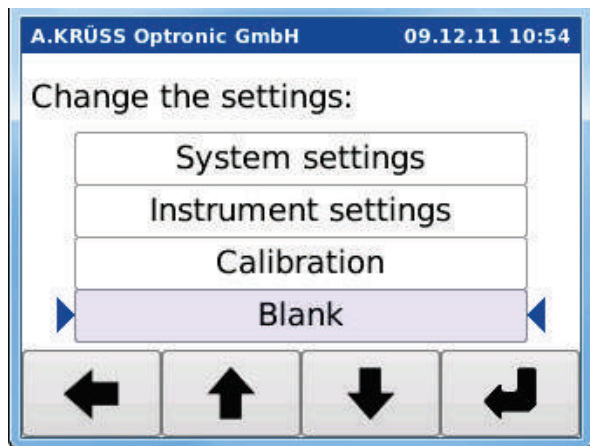
The function *Blank* allows you to perform a new blank measurement and to reset a saved blank value to zero.

A blank measurement must be performed:

- after each change of the polarimeter tube
- after changing the dilution medium
- after opening the polarimeter tube

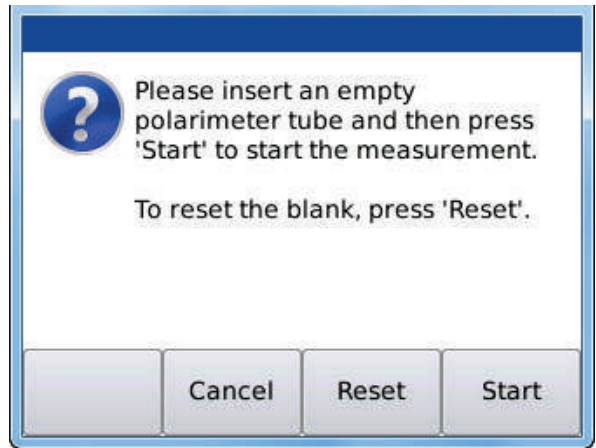
Calling the Blank Function

- Open the setting menu with .
Select *Blank* using the buttons  and .



- Start the function *Blank* with .

The first dialog window opens:



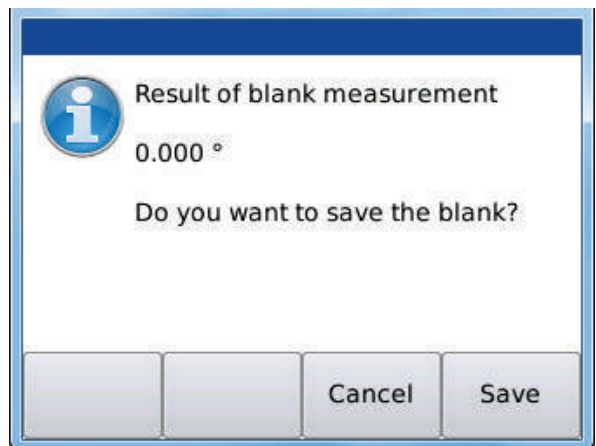
Resetting the Blank

If the saved blank should not be considered in the following sample measurements, the blank must be reset to zero.

- ▶ Press **Reset**.

Measuring the Blank

- ▶ Insert the empty / with dilution medium filled polarimeter tube which will be used for the following measurements into the sample chamber.
- ▶ Close the lid.
- ▶ Start the blank measurement with **Start**.



Saving the New Blank

If you would like to accept the new blank shown on the display:

- ▶ Press **Save**.

The new blank is saved and the main menu showing the new blank value opens.

Rejecting the New Blank

If you **do not** want to accept the blank value shown on the display:

- ▶ Press **Cancel**.

The new blank is discarded and the old blank is maintained.




Chapter - 8 Maintenance, Care & Inspection

This chapter covers the following topics:

- What to do daily / weekly / yearly / when necessary
- Changing the fuse
- Maintenance by service

8.1 Regular Maintenance and Care

The instrument is virtually maintenance-free.

Daily	<p>► After completing the measurements clean the polarimeter tube.</p>
Weekly	<p>► Clean the display and housing with a commercial cleaning or disinfecting agent.</p>
Yearly	<p>► Calibrate the temperature sensor.</p> <p> To perform see Chapter 7.4 Calibrating the Temperature Sensor.</p>
When necessary	<p>► Check the accuracy of the polarimeter.</p> <p> To perform see Chapter 6.1 Preparing the Instrument.</p>
	<p>► Calibrate the polarimeter.</p> <p> To perform see Chapter 7.3 Calibrating the Measurement Range.</p>

8.2 Changing the Fuse



Please note!

Disconnect the power plug before changing the fuse.



- ▶ Disconnect the power plug.
- ▶ Change the fuse above the power switch.
- ▶ Re-connect the power plug.

8.3 Maintenance by Service

The Polarimeter P8000 requires no regular maintenance by service.
If the instrument is malfunctioning, please contact:

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Internet: www.kruess.com Email: service@kruess.com

Chapter - 9 Troubleshooting Table

This chapter offers help to eliminate possibly occurring errors quickly.

Error	Possible causes	Remedy
Faulty measurement results	<ul style="list-style-type: none"> Glass plates at the ends of the polarimeter tube are dirty or stained. 	<ul style="list-style-type: none"> Clean the glass plates.
	<ul style="list-style-type: none"> Polarimeter tube dirty. 	<ul style="list-style-type: none"> Clean the polarimeter tube.
	<ul style="list-style-type: none"> Air bubbles in the optical path of the polarimeter tube. 	<ul style="list-style-type: none"> Fill in additional sample into the polarimeter tube.
	<ul style="list-style-type: none"> Sample liquid extremely dark. 	<ul style="list-style-type: none"> Dilute the sample.
	<ul style="list-style-type: none"> Saved blank was not measured with the current polarimeter tube. 	<ul style="list-style-type: none"> Measure the blank with the currently used polarimeter tube. <p> See Chapter 7.5 Blank.</p>
	<ul style="list-style-type: none"> Calibration data is obsolete. 	<ul style="list-style-type: none"> Re-calibrate the measurement range. <p> See Chapter 7.3 Calibrating the .</p>
	<ul style="list-style-type: none"> Calibration data of the temperature sensor faulty 	<ul style="list-style-type: none"> Re-calibrate the temperature sensor. <p> See Chapter 7.4 Calibrating the Temperature Sensor.</p>
Inferior precision	<ul style="list-style-type: none"> Polarimeter was not cleaned thoroughly between sample measurements. 	<ul style="list-style-type: none"> Clean the polarimeter tube thoroughly after each measurement with dest. water or an appropriate solvent.
	<ul style="list-style-type: none"> Sample has not yet reached room temperature. 	<ul style="list-style-type: none"> Wait until the sample has reached room temperature.
Instrument cannot be switched on	<ul style="list-style-type: none"> Fuse blown 	<ul style="list-style-type: none"> Change the fuse. <p> See Chapter 8.2 Changing the Fuse.</p>

Chapter - 10 Transport, Storage and Disposal

Transport

- ▶ For transport purposes use the original packaging only.
- ▶ Transport must be carried out at ambient temperatures between -20°C and +60°C and at max. 95% relative humidity.

Storage

Storage for longer periods of time must be carried out at ambient temperatures between +5°C and +45°C and at max. 95% relative humidity.

Disposal

For disposal of the product please observe the corresponding legal regulations.

Information for disposal of electrical and electronic equipment in the European Community.

Electrical devices are disposed of according to national regulations on the basis of the EC Directive 2002/96/EC on waste electrical and electronic equipment (WEEE).

Accordingly, all equipment delivered in the business-to-business sector after August 13, 2005, which applies to this product, cannot be disposed of as municipal or domestic waste.

These devices are marked with the adjoining symbol. Please observe the corresponding legal regulations for disposal.



Because regulations differ from country to country, we recommend contacting your supplier, if necessary.

In Germany, compulsory labeling is in effect since March 23, 2006. For all equipment delivered from August 13, 2005 onwards, the manufacturer must offer an appropriate option for returns.

For all equipment delivered before August 13, 2005 the last user is responsible for proper disposal.




Chapter - 11Appendix

11.1 Technical Specifications

P3000	
Measurement range	$\pm 90^\circ$ $\pm 259^\circ\text{Z}$
Measurement unit	Opt. rotation [°] Int. sugar scale [°Z]
Resolution	0.01° 0.01°Z
Accuracy	$\pm 0.01^\circ$ $\pm 0.01^\circ\text{Z}$
Reproducibility	0.01°
Measurement time	approx. 1 bis 3 sec.
Light source	1 LED with filter 589 nm
Wavelength	589 nm others optional
Wavelength selection	one fixed wavelength
Connection for temperature sensor	Special polarimeter tube with temperature sensor PT100 required
Temperature measurement	$0..99.9^\circ\text{C}$
Temperature resolution	0.1°C
Temperature accuracy	$\pm 0.2^\circ\text{C}$
Temperature measurement point	Sample in tube
Max. tube length	220 mm

Sample transmissibility	min 0.1% (OD3)
Calibration	automatically (menu guided)
Display	LCD TFT 5.7" 320x240 Pixel
User interface	Touchscreen
Interfaces	RS232 (Printer)
Power supply	100 - 240 V –, 50/60 Hz
Printer connection	RS-232 serial interface
Dimensions	65 x 20 x 36 cm

11.2 Ordering Information

Name of Item	Description	Order no.
Polarimeter P3000		P3000
Glass tube (length 100mm)		P1000-100
Glass tube (length 200mm)		P1000-200
Glass tube (length 100mm with funnel)		P1000-110
Glass tube (length 200mm with funnel)		P1000-210
Stainless steel tube with filler tube, temperature-controllable (length 100mm)		P8-100ET
Stainless steel tube with filler tube, temperature-controllable (length 200mm)		P8-200ET
Flow-thru tube, temperature-controllable, with temperature sensor PT-100 (length 100mm)		P8-100ETT
Flow-thru tube, temperature-controllable, with temperature sensor PT-100 (length 200mm)		P8-200ETT
Stainless steel flow-thru tube with funnel and overflow pipe (length 100mm)		P1000-D100
Stainless steel flow-thru tube with funnel and overflow pipe (length 200mm)		P1000-D200
Premium quartz control plate for polarimeter calibration	certifiable In °: -10° (+/- 1°). In °Z: -30° (+/- 1 °Z)	P8000-410
Premium quartz control plate for polarimeter calibration	certifiable In °: +8° (+/- 1°). In °Z: +25° (+/- 1 °Z)	P8000+408
Premium quartz control plate for polarimeter calibration	certifiable In °: +17° (+/- 1°). In °Z: +50° (+/- 1 °Z)	P8000+417
Premium quartz control plate for polarimeter calibration	certifiable In °: +26° (+/- 1°). In °Z: +75° (+/- 1 °Z)	P8000+426
Premium quartz control plate for polarimeter calibration	certifiable In °: +34° (+/- 1°). In °Z: +99° (+/- 1 °Z)	P8000+434
Premium quartz control plate for polarimeter calibration	certifiable In °: +33° (+/- 1°). In °Z: +95° (+/- 1 °Z)	P8000+433
Economy quartz control plate for polarimeter calibration	+34° (+/- 1°) . +99 °Z (+/- 1 °Z) not certifiable	P1000+534

Economy quartz control plate for polarimeter calibration in °:	+17° in °Z: +49 °Z not certifiable	P1000+517
Economy quartz control plate for polarimeter calibration in °:	-17° in °Z: -49 °Z not certifiable	P1000-517
Economy quartz control plate for polarimeter calibration in °:	-34° in °Z: -99 °Z not certifiable	P1000-534
Please contact us if you require a different type of polarimeter tube.		
Glass coverplate for polarimeter tube	Pack with 2 pcs.	P1000-150
Spare sodium lamp		P1000-300

11.3 Consumables

Name of Item	Description	Order no.
Printer for normal paper	24-characters	CBM 910
Paper roll	for printer CBM910	CBM910P
Ink ribbon	for printer CBM910	CBM910F

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Warranty Conditions

A. KRUESS Optronik warrants that the instruments of the digital polarimeter family will be free from defects in materials and workmanship after the date of delivery for a time period of 24 months. During this warranty period A. KRUESS Optronik will repair or replace products which fall under the warranty conditions. For warranty repairs or service the instrument must be returned to A. KRUESS Optronik. In the case of warranty repairs A. KRUESS Optronik will bear the delivery costs. For all other deliveries the customer will bear the delivery costs.

A. KRUESS Optronik warrants that the hardware which A. KRUESS Optronik has determined for use with this instrument will operate free from defects when applied according our manufacturer's instructions.

A. KRUESS Optronik does not warrant error-free and uninterrupted operation of the instrument or that this user manual is free of error. A. KRUESS Optronik will not be liable for consequential damages.

Limited Warranty:

The preceding warranty does not apply to errors and defects caused by improper handling, software not supplied by A. KRUESS Optronik, modification, abuse or by operation outside of the stated environment or by unauthorized maintenance.

Further claims are excluded and will not be accepted. A. KRUESS Optronik explicitly does not warrant the applicability or the economic use for certain applications.

A. KRUESS Optronik reserves the right to change this user manual and the technical specifications of the described instrument at any time.

This digital polarimeter is only then ready for shipment when it is appropriately packed in the complete original packaging including the plastic moldings. If necessary, please order a replacement packaging from your supplier.

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