Instruction Guide

PHOTON SYSTEMS INSTRUMENTS

SpectraPen mini

Please read the Guide before operating this product

Manual Version: 2024/04

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1 INFORMATION BEFORE USING SPECTRAPEN MINI DEVICE

Read this manual carefully before operating the device. If you are not sure about something in the manual, contact the manufacturer for clarification.

	By accepting the device, the customer agrees to follow the instructions in this guide.

Always follow corresponding manuals while working with the SpectraPen mini device or doing the maintenance.
It is forbidden to interfere with the hardware or software of the SpectraPen mini device in any way without previous agreement with the manufacturer.

The following table presents basic highlight symbols used in this manual:

Symbol	Description
	Important information, read carefully.
	Complementary and additional information.

Tab. 1 Used symbols.

2 GENERAL DESCRIPTION

SpectraPen mini is a small, portable and affordable calibrated spectroradiometer and quantum light meter, which is controlled via mobile application called SpectraPen accessible on Google Play. The communication with the mobile phone is provided by Bluetooth Low Energy module.
The SpectraPen mini measures Irradiance spectrum and light intensity in three units – Irradiance, Photon flux density and Illuminance. The device is calibrated for visible light in the range from 400 nm to 850 nm.
The SpectraPen mini serves for real-time measurement of light quality and intensity. It is ideal as a multi-purpose instrument for research, industrial and agricultural applications.

SpectraPen mini measures:

Spectrometer – quantitative light intensity at different wavelengths • Irradiance spectrum [µW.cm^{-2}.nm^{-1}] • Irradiance spectrum [W.cm^{-2}.nm^{-1}] • Photon flux density [µmol.m^{-2}.s^{-1}]
Light meter – absolute light intensity at defined range of wavelengths of the electromagnetic spectrum • Irradiance [W.m^{-2}] in user defined range of the electromagnetic spectrum • Photon flux density [µmol.m^{-2}.s^{-1}] in user defined range of the electromagnetic spectrum • Illuminance [Lux] total luminous flux incident on a surface per unit area

2.1 DEVICE DESCRIPTION

Sensor with cosine corrector

The optical part of the SpectraPen mini, cosine corrector, is placed in the middle of the white side of the device and is protected by sealing against dirt and moisture.
Integration time of the internal detector is set automatically according to the ambient light intensity.

⚠	The sensor part should be always dust and dirt free and maintained carefully as any scratches on the surface might interfere with the correct results of the measurement.

Connector for charging

USB connector is used for charging of the SpectraPen mini device using PC, USB wall adapter, USB power bank etc.

Power button

Power button is the main Switch ON/OFF button.

Magnetic holder

The magnetic holder is placed under the green cover and serves for attaching of the device to metal surface.

Fig. 1 Device description.

2.2 TECHNICAL SPECIFICATION

SpectraPen mini	
Spectral range	400 nm - 850 nm
Spectral response (FWHM)	15 nm max.
Wavelength reproducibility	+/- 0.5 nm
Integration time	Set automatically From 300 µs to 1 s
Number of pixels	288
Optical entrance	Cosine corrector
SpectraPen app compatibility	Android 5.0 and higher
Communication	Bluetooth Low Energy 4.2
Data transfer	Via an email, dropbox or other application
PC software	SpectraPen 1.1 (Windows 7 and higher)
Battery type	Li-Ion rechargeable battery
Battery capacity	650mAh
Max. charging current	0.5 A
Charging	Via USB port - PC, power bank, USB charger, etc.
Battery life	24 hours typical with full operation Low battery indicator
Size	50 x 70 x 28 mm
Weight	60 g
Operating conditions	Temperature: +5 to +55 °C Relative humidity: 0 to 95 % (non-condensing)
Storage conditions	Temperature: -20 to +70 °C Relative humidity: 0 to 95 % (non-condensing)
Warranty	1 year parts and labor

3 LIST OF EQUIPMENT AND CUSTOMER INFORMATION

Standard version of the SpectraPen mini device package consists:

- SpectraPen mini
- Carrying case
- Magnetic holder for tripods
- USB cable
- Box with QuickStart guide
- Other Accessories or Optional Features (according to your specific order)

	If any item is missing, please, contact the manufacturer. Also check the carton for any visible external damage. If any damage is found, notify the carrier and the manufacturer immediately. The carton and all packing materials should be retained for inspection by the carrier or insurer. For customer support, please write to: support@psi.cz

3.1 CARE AND MAINTENANCE

SpectraPen mini device

- Never submerge the device in water!
- The device should not come in contact with any organic solvents, strong acids or bases.
- Keep the optical sensor clean and dry. If cleaning is needed, use soft, non-abrasive tissue.

	It is recommended to re-calibrate the device by the manufacturer every 2 years.

Li-ion battery

- Avoid fully discharging of the battery.
- Do not keep the battery at full charge for long periods of time. Allow for it to discharge.
- High temperatures shorten battery life.

4 GETTING STARTED

1. **Download and install the application** to your smartphone or tablet. The **SpectraPen** application is free available on Google Play or can be also downloaded from product websites available via the QR code placed on the bottom of the device.

	The application is compatible with Android version 5.0 and higher.

2. Before you start operating the device, please connect the SpectraPen mini to USB charger to **charge the battery**.
3. To initialize the SpectraPen mini, please press the power button for about 10 seconds until the green indication light indicates initial state. The device can be switched on/off by short press the **power button** followed by green (power on) or red (power off) light flash.
4. While the SpectraPen mini is on, the state is indicated by light flashing. The device turns off automatically after 2 minutes or any time after pressing the power button.
5. Open the **SpectraPen application** and navigate in the side bar menu to **Connections** (Fig. 2). The application automatically searches the available SpectraPen mini devices, select the required one (Fig. 3). Last two numbers in the name of searched devices correspond to the last two numbers of serial number placed on the bottom of the device. Once the SpectraPen mini device is paired with the application the Bluetooth mark in the right corner of the application window changes to green  . If the device is not found (because, as a rule, Bluetooth and/or Location are not turned on in the phone), the application informs about it. If there are multiple active SpectraPens mini, all are listed in the app (Fig. 3).

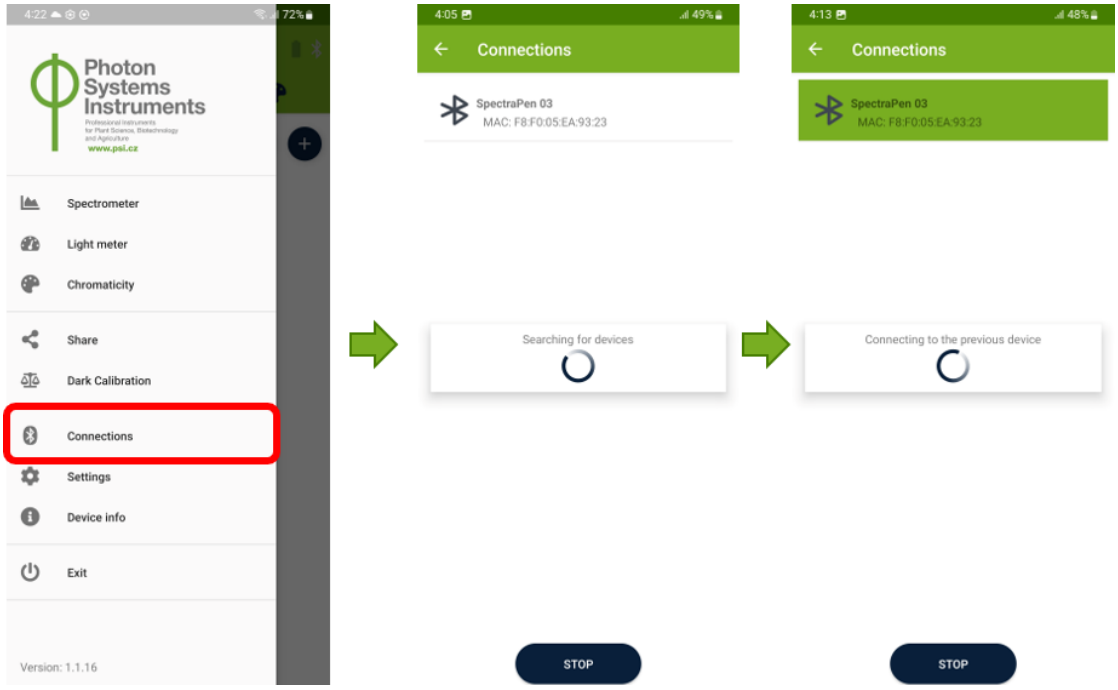

Fig. 2 Pairing of the SpectraPen mini with the mobile application.

	Last two numbers in the name of SpectraPen mini device visible in the application corresponds to serial number written on the bottom green side of the device.

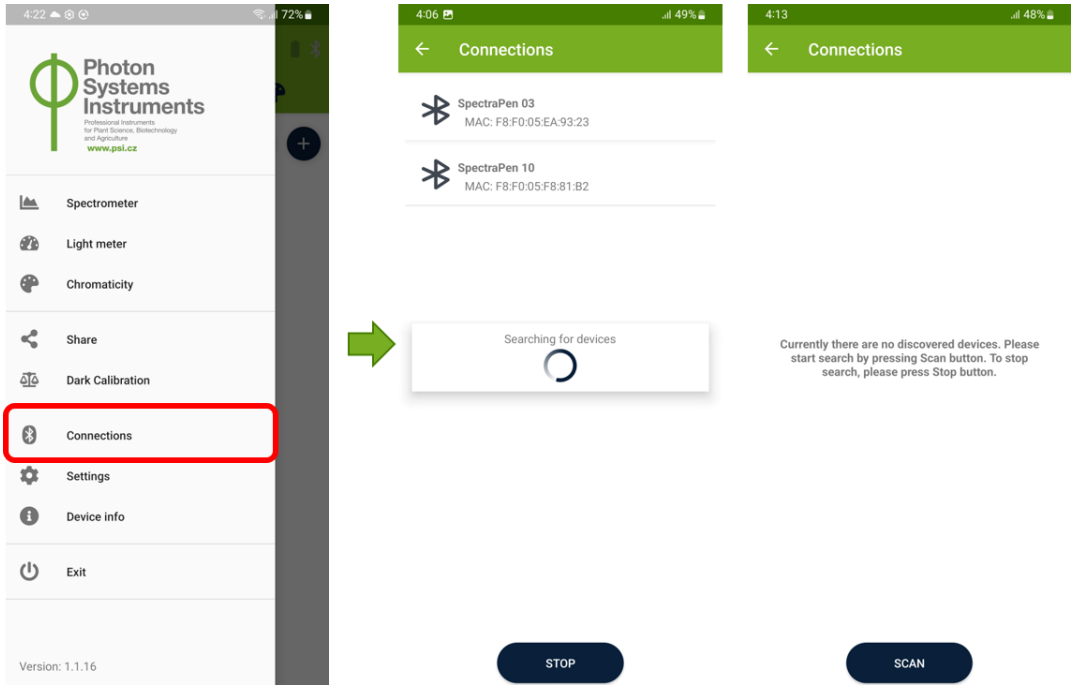

Fig. 3 Multiple and/or no devices are visible in the application.

6. After connecting the device, a request for dark calibration will appear. The warning sign in the right corner indicates an uncalibrated device (Fig. 4) and the readings may not be accurate.

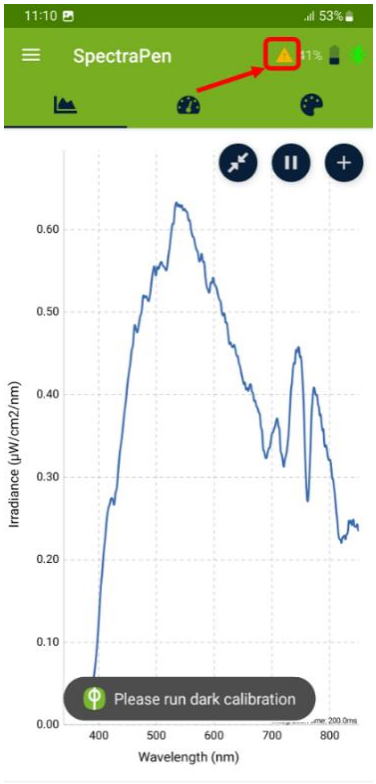

Fig. 4 Device is not calibrated.

From the side bar menu select the **Dark calibration** (Fig. 5). Before you start calibration process, please make sure that the sensor is completely covered. Please note that covering by finger is insufficient for the infrared part of the spectrum. It is recommended to place the SpectraPen mini e.g. to the closed carrying case. Once the sensor is covered, click on **Calibrate** and wait the required time for calibration. The application will confirm that the calibration was finished successful.

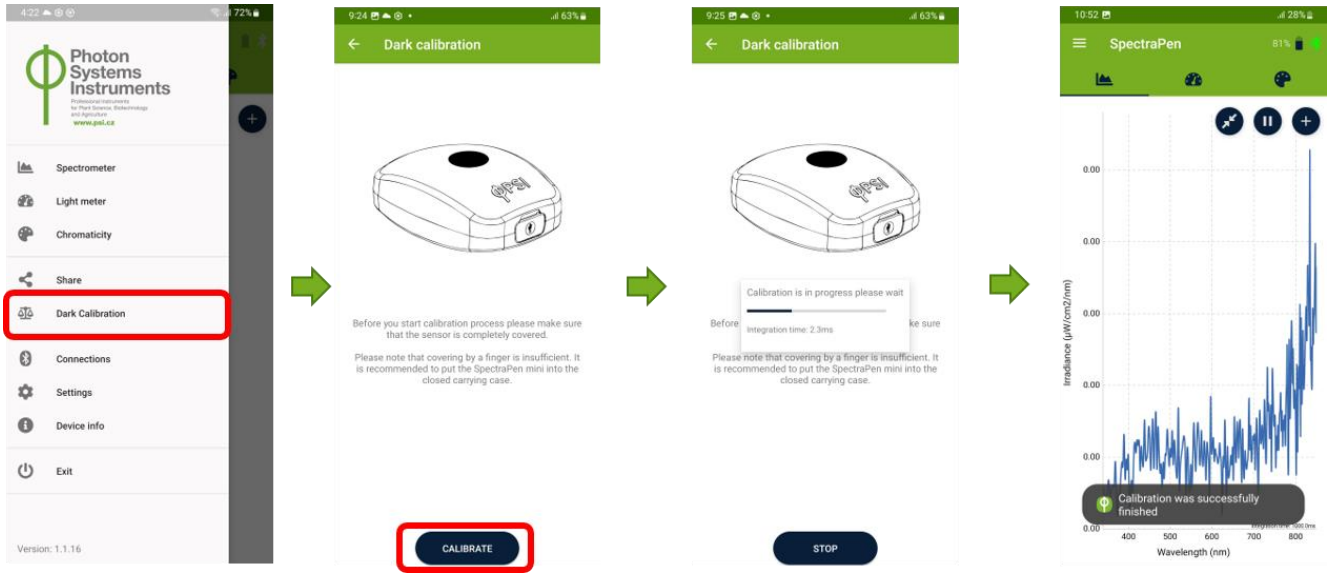

Fig. 5 Dark calibration.

	Please note that the dark calibration is temperature dependent. Perform the calibration always at the temperature you want to measure.

	Performing **dark calibration** is highly recommended before every measurement with the SpectraPen mini device or significant temperature changes. Dark calibration gets the instrument to the zero state.

7. Select between the real-time reading measurement of Irradiance spectrum – **Spectrometer,** light intensity reading as Irradiance, Photon flux density and Illuminance - **Light meter** and objective specification of the quality of a color regardless of its luminance – **Chromaticity** (Fig. 6).

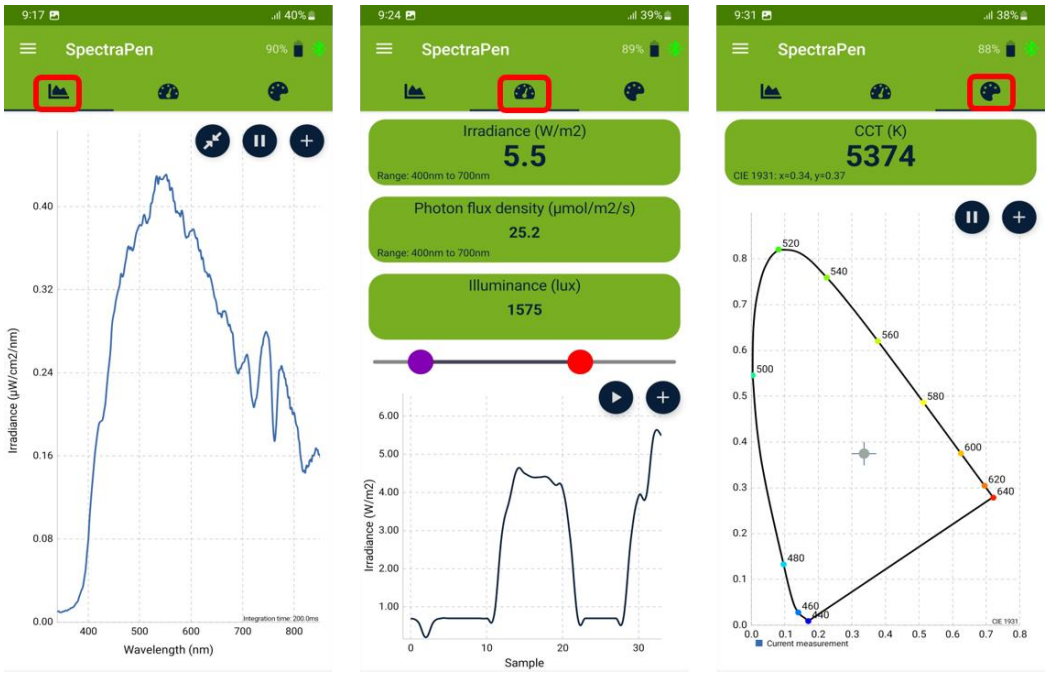

Fig. 6 Real-time reading measurement of light spectrum, light intensity and chromaticity.

5 DEVICE OPERATION

The SpectraPen mini device is operated by one button. Each action is signalized by different light mode or light color.

Action	Initialization	Light signalization
Switch on	Short press of Power button	Short green flash
Waiting for Bluetooth pairing	Automatically after switch on the device	Light flickering with the color corresponding battery level (green 100% to red 0%)
Switch off	Short press of Power button	Short red flash
Reset	Press of Power button for about 10 seconds	Long green flash
Charging	Connection to PC using the USB cable	Only when the device is switched on and not paired with the phone. More in chapter 5.1

	The device turns off automatically after 2 minutes of inactivity.

5.1 CHARGING

SpectraPen mini is charged via the USB cable connected to PC, USB power adapter, power bank etc. The device can be charged in three modes:

The device is switched off

Charging without light signalization. No information about the battery status.

The device is switched on and not paired with the mobile phone

Charging is signalized by pulsing light. The battery status is demonstrated by color of the light: red – yellow – green. Once the battery is fully charged the light is brightly green and shines continuously.

The device is switched on and paired with the mobile phone

Charging without light signalization. The battery status is showed in the mobile application (Fig. 7). When charging the icon changes to  .

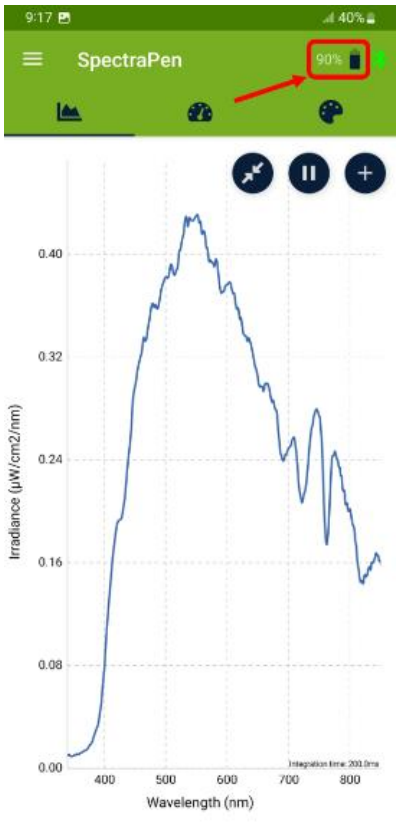

Fig. 7 Battery level and battery status in the mobile application.

6 MENU DESCRIPTION

6.1 MAIN MENU

Main menu displays the app main navigation options on the left edge of the screen like sliding menu (Fig. 8). And it is revealed when the user swipes a finger from the left edge of the screen or tap to menu icon.

Spectrometer
Real-time spectra measurement

Light meter
Real-time light intensity measurement

Chromacity
Real-time chromacity diagram

Share
Sharing of saved data via an email, dropbox or other application (see more in chapter 6.2)

Dark calibration
Dark calibration of the sensor (see more in chapter 4, step 6- 8)

Connections
Shows available devices and serves for pairing with selected SpectraPen mini device

Settings
Customizing behaviour of the SpectraPen app (see more in chapter 6.5)

Device Info
Information about connected SpectraPen mini and link to operating manual (Fig 7)

Exit
Quit the application

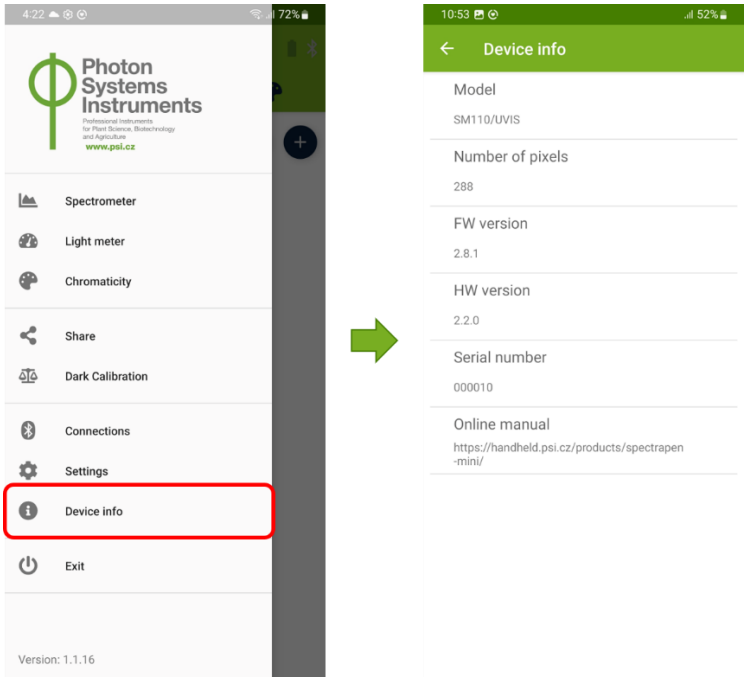

Fig. 8 Navigation panel with main menu.

6.2 SPECTROMETER

Real-time light spectrum reading is visualized in Spectrometer window (Fig. 9).

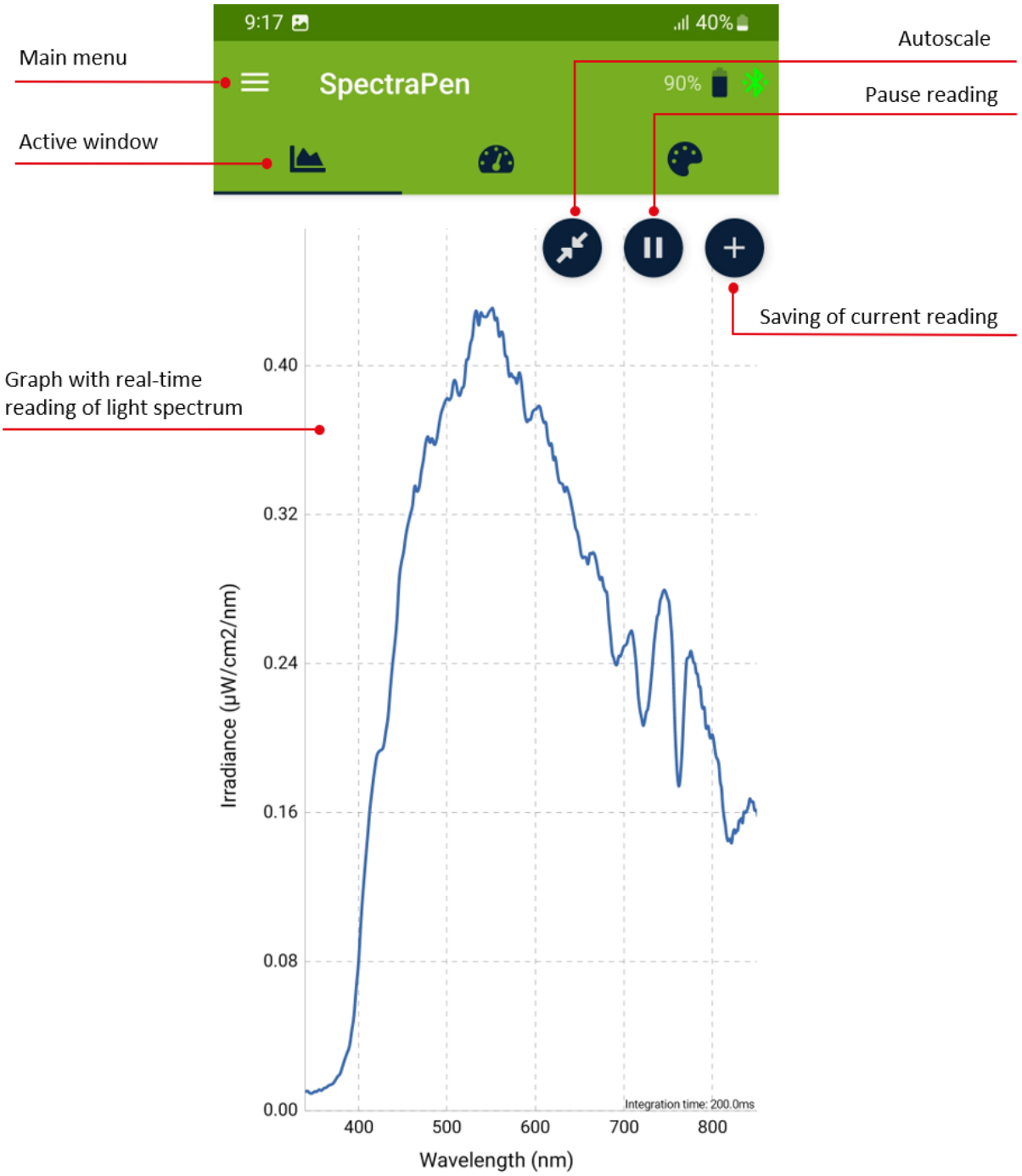

Fig. 9 Spectrometer window.

In the graphic part of the application, information notifications appear about the insufficient intensity of the measured light, about a change in the integration time during the measurement or that the detector has been saturated (Fig. 10).

Fig. 10 Notifications in Spectrometer window

Pause reading stops the real-time reading. The last measured spectrum is showed in the graph.

For resumption of real-time reading click on .

Marker serves for displaying of a numeric value of wavelengths. This function is activated by single tap in the graph (Fig. 11). For reading of the exact peak wavelength, you can tap or slide the marker in the graph.

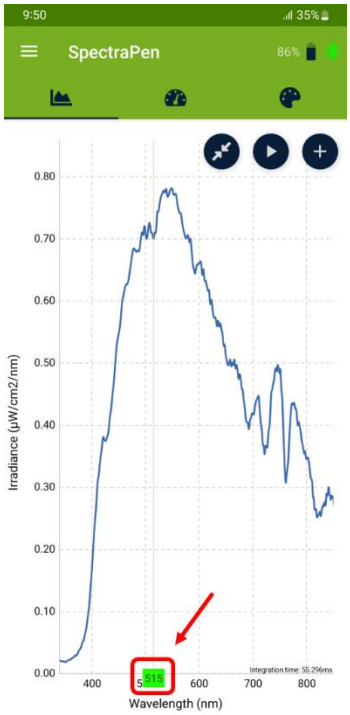

Fig. 11 Wavelength marker.

Zoom in the graph by spread by fingers in the graph. To move in the zoomed graph swipe left/right.
For return to full graph size click on autoscale .

Saving of current reading enables storage of measured spectrum (Fig. 12). Saved spectra are available in the list under the graph. The application displays a notification about adding a saved measurement (Fig. 12). To display the whole list, slide the panel up. To hide the list, slide the panel down. The individual measurements can be hidden/shown in the graph using the checkboxes on the right side in the list (Fig. 13).

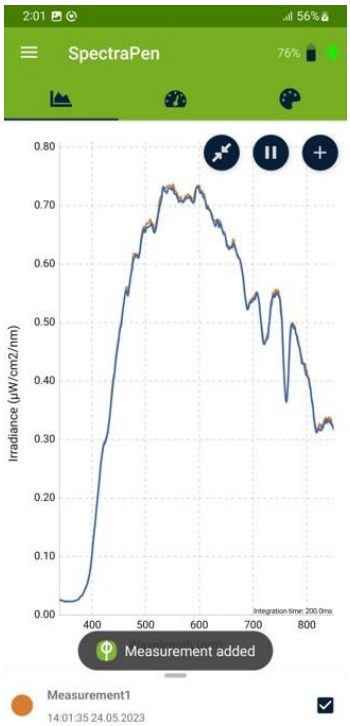

Fig. 12 Measurement added.

Fig. 13 Saved measurements.

Rename measurement is done by swipe right on the selected measurement (Fig. 14).

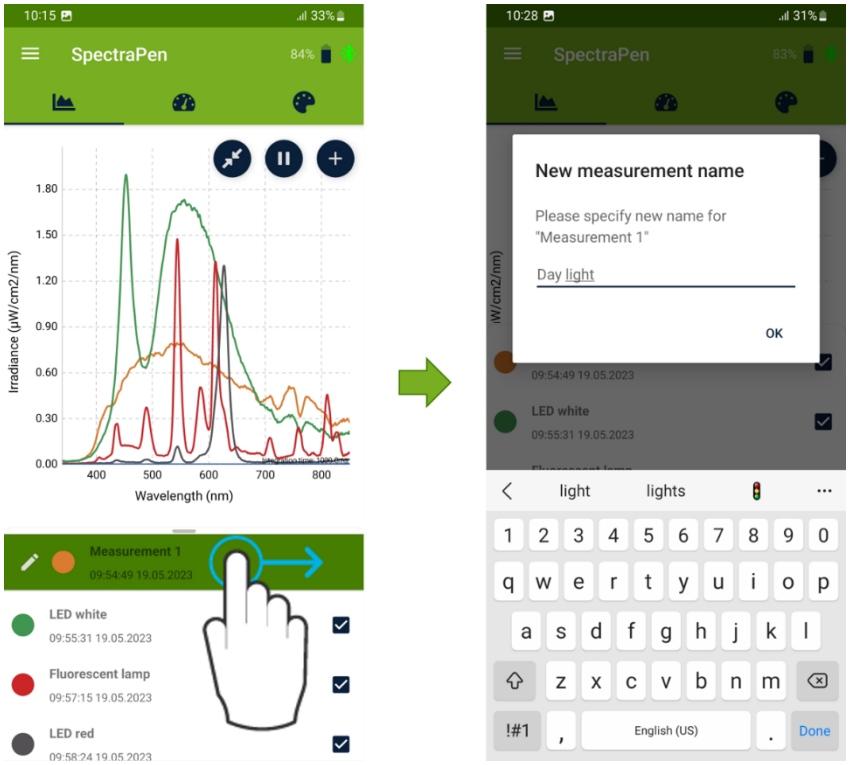

Fig. 14 Rename measurement.

Delete measurement

is done by swipe left on the selected measurement (Fig. 15).

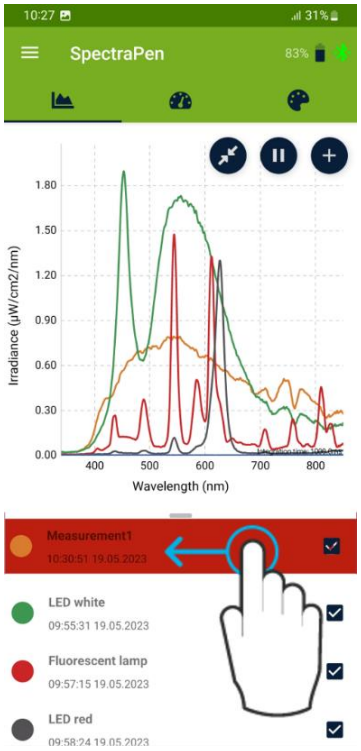

Fig. 15 Delete measurement.

Export of measured data is possible using the option Share in the main menu. Before sharing the data, it is necessary to add the data in the mobile application (Fig. 16). The data can then be exported/shared via different applications (Fig. 17). The data are exported in a proprietary format *.spec, which is compatible with SpectraPen software available on product websites.

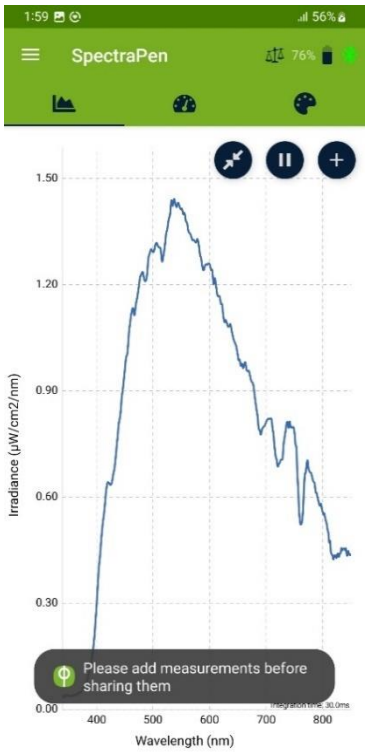

Fig. 16 Notice to add data before sharing.

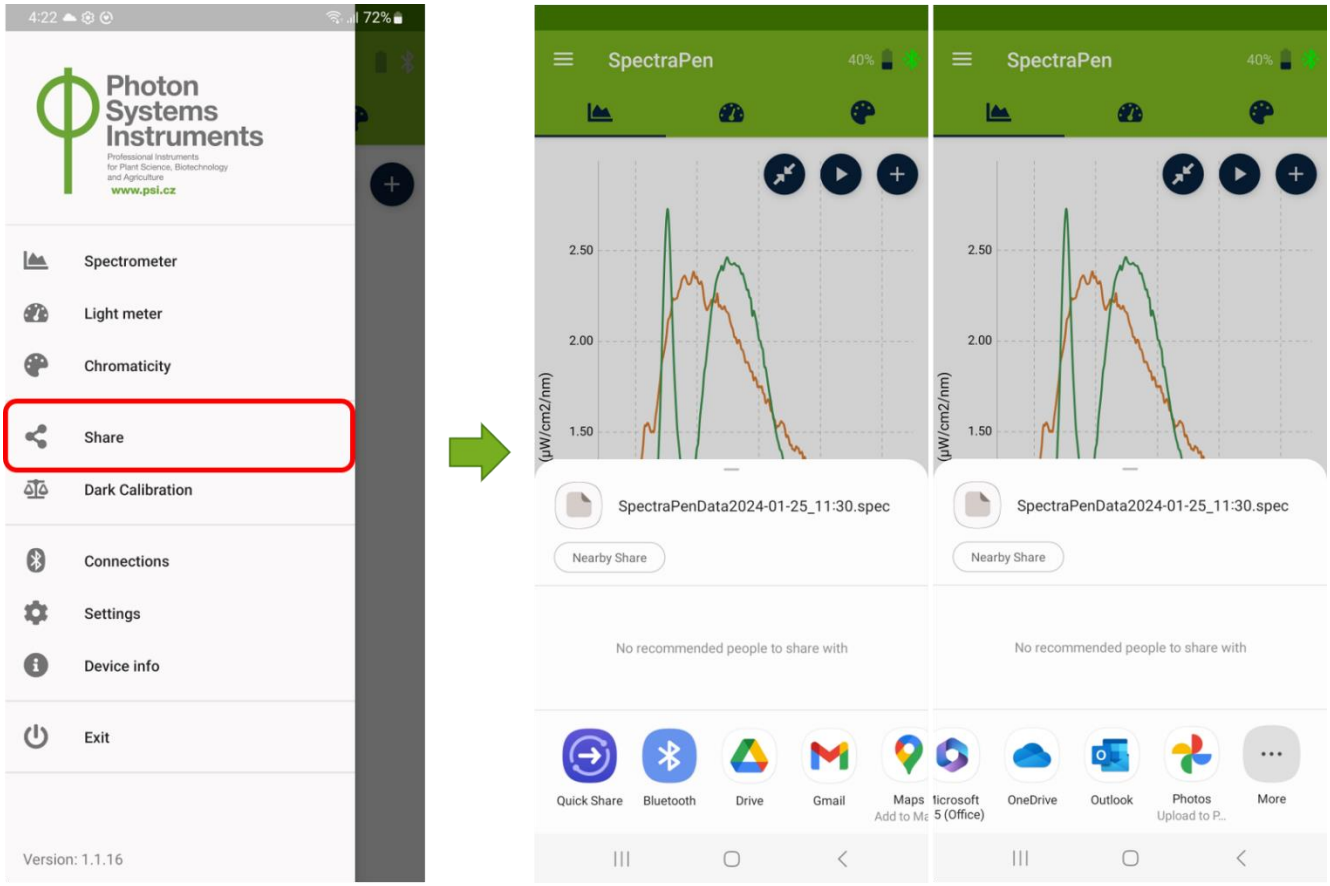

Fig. 17 Data export and sharing via available communication channels.

6.3 LIGHT METER

Light meter is intended for real-time light intensity reading of Irradiance, Photon flux density and Illuminance in predefined spectral range (Fig. 18).

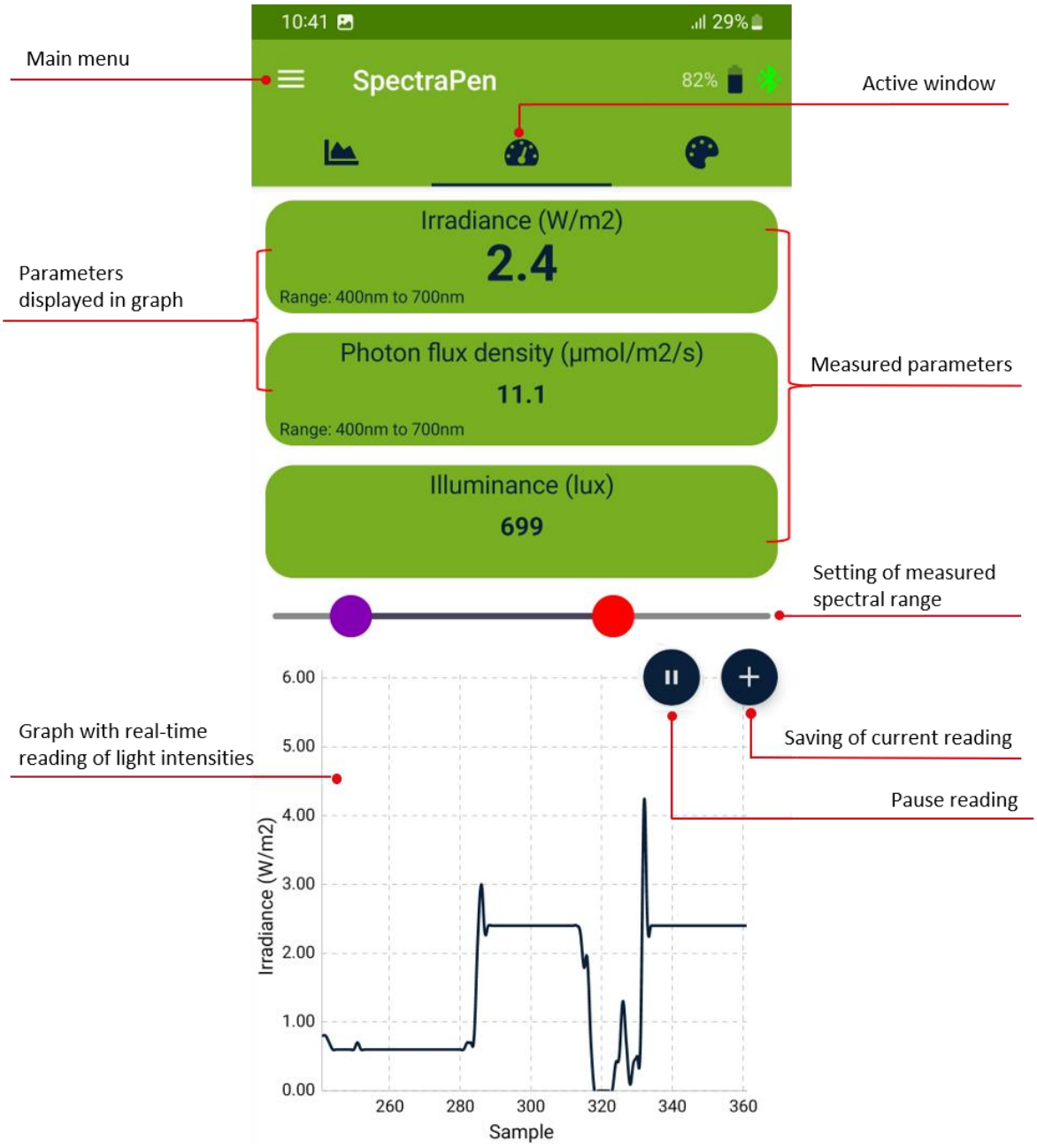

Fig. 18 Light meter window.

Click on **variable** to want to be displayed **in graph.** Selected variable is displayed with bigger letters.

Pause reading stops the real-time reading. The last measured values are showed. For resumption of real-time reading click on .

Saving of current reading allows saving the entire measured spectrum, not only the selected spectral part.

	Light meter does not allow to save measured values.

Zoom in the graph by spread by fingers in the graph. To **move in the zoomed graph** swipe left/right. Pinch for return to full graph size. **Sliders** above the graph serve for definition of measured spectral range. The selected spectral range is specified in Irradiance and Photon flux density windows (Fig. 19).

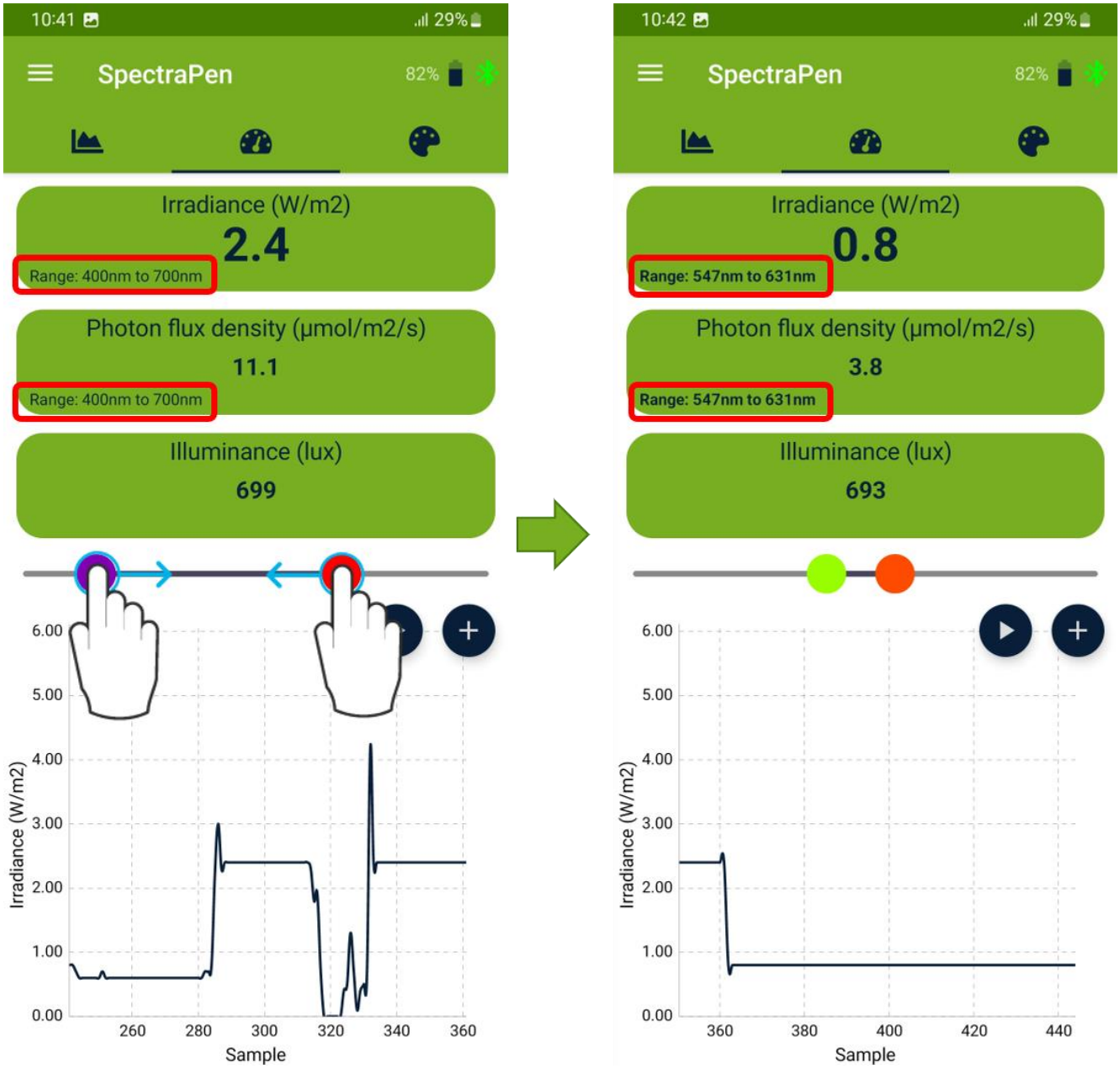

Fig. 19 Spectral range selection.

6.4 CHROMATICITY

Real-time chromacity diagram is visualized in Chromaticity window (Fig. 20)

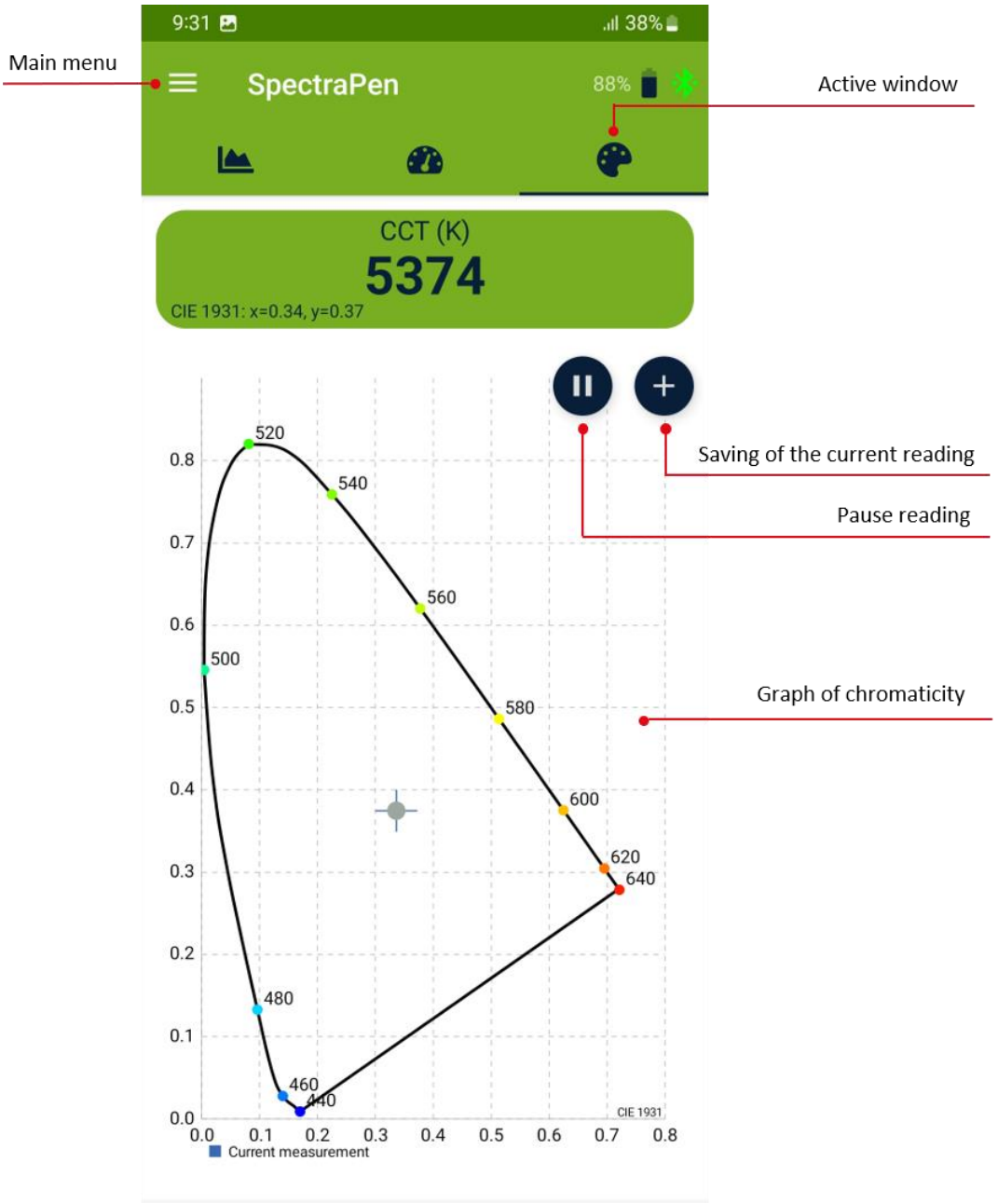

Fig. 20 Chromaticity diagram.

Pause reading stops the real-time reading. The last measured values are showed. For resumption of real-time reading click on

Saving of current reading allows to temporarily save the current measured values (Fig. 21). Temporarily visualized data cannot be shared.

Fig. 21 Chromaticity data visualization.

6.5 SETTINGS

The application settings are used to change the calibration correction, filter and integration time - parameters affecting the measured spectrum (Fig. 22).

Calibration correction enables a fine adjustment of the device signal (Fig. 23).

Filter serves to increase the time stability of the spectrum and light parameters (Fig. 23).

Integration time allows manual setting of the integration time for a specific light spectrum (Fig. 23). Automatic integration time setting is the default.

The setting of any of these parameters is displayed in the mobile app using special icons. The new integration time value is written in the bottom right corner (Fig. 24).

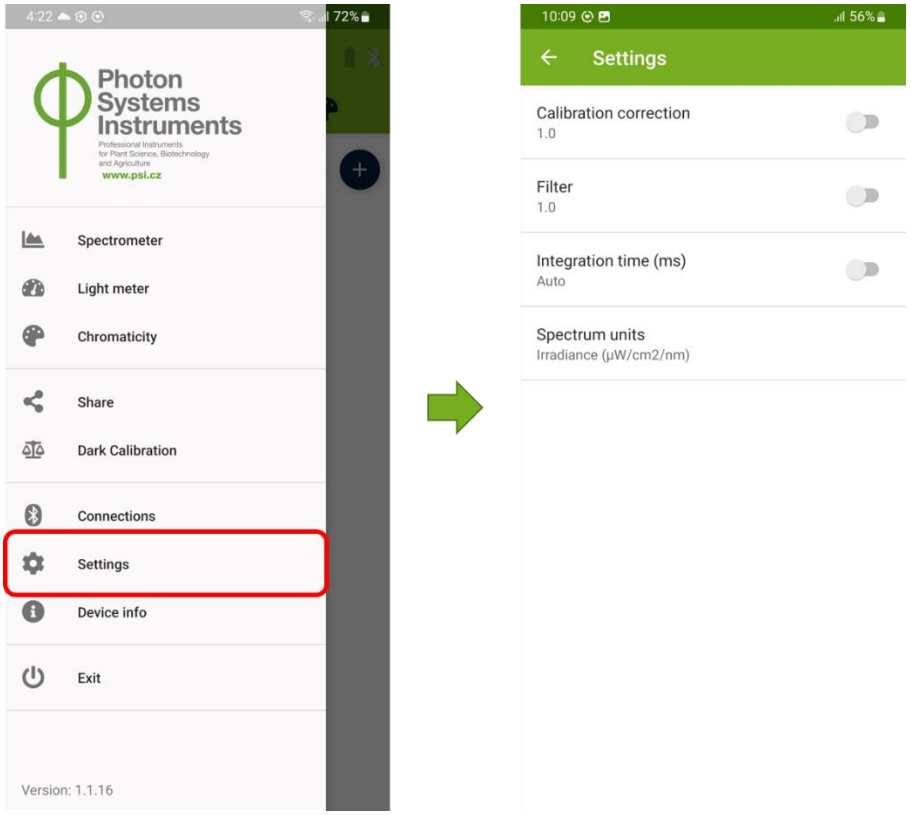

Fig. 22 Parameter settings menu.

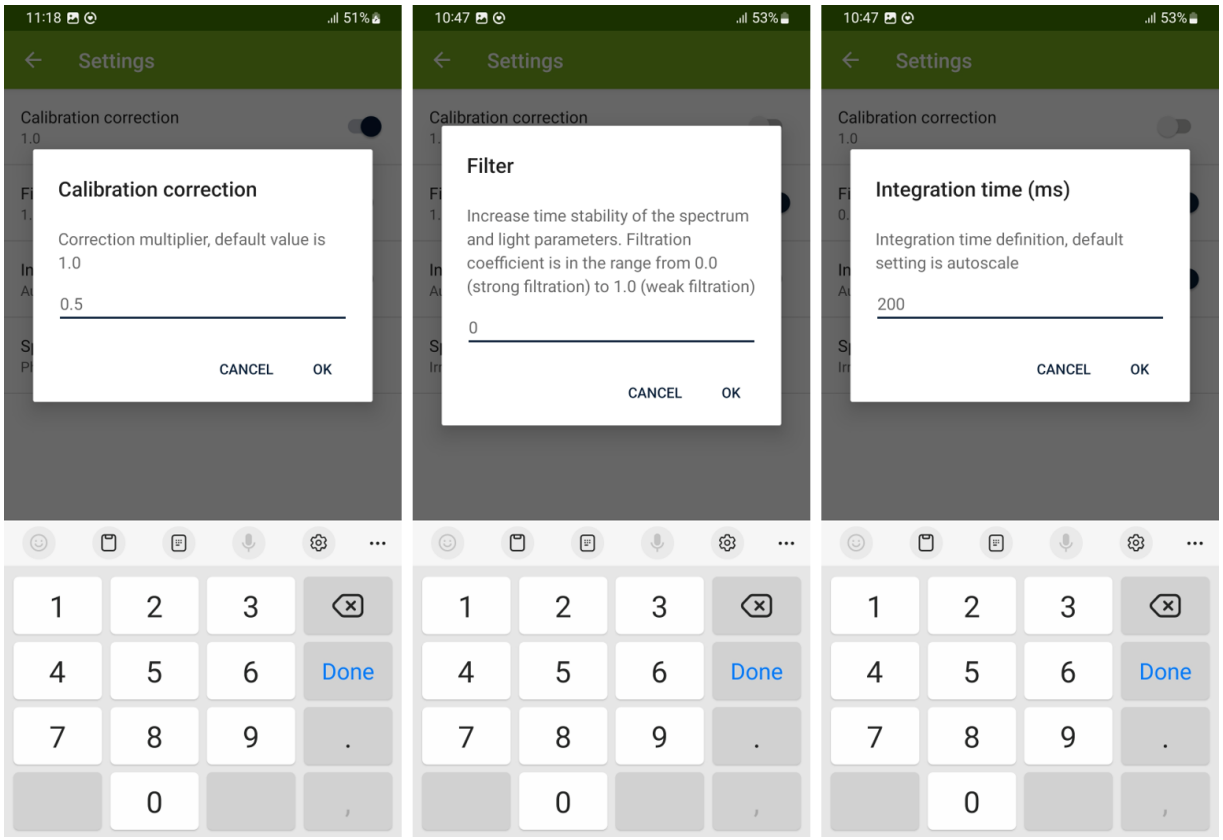

Fig. 23 Individual setting parameters.

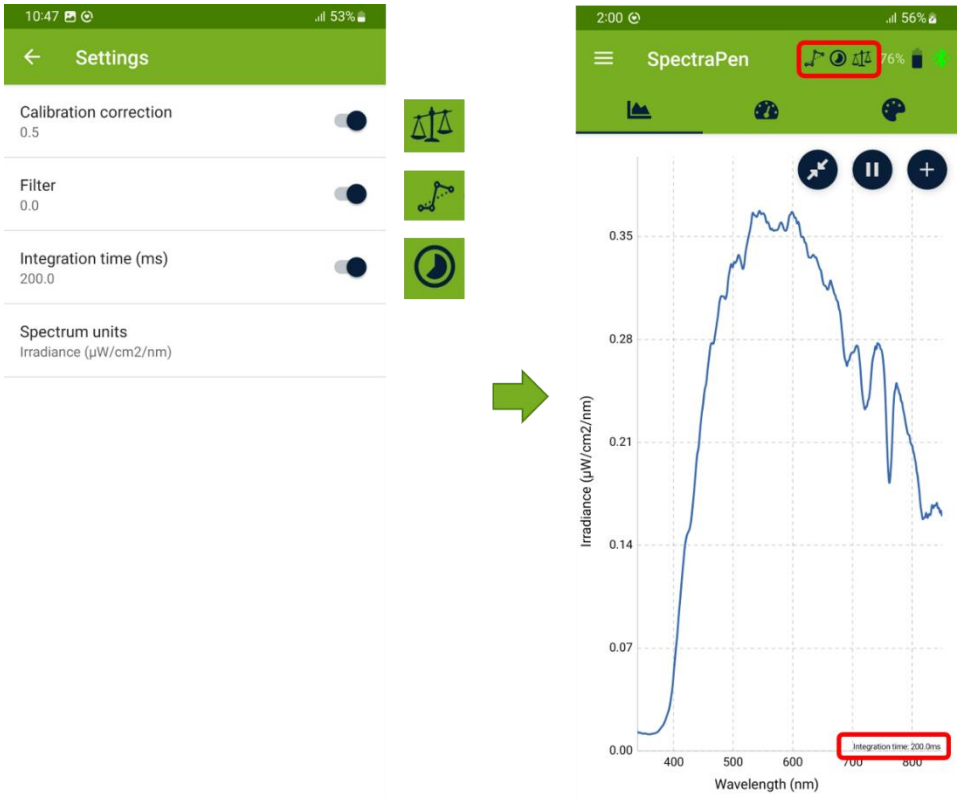

Fig. 24 Special setting parameter icons.

The y-axis unit in the spectrum plot can also be changed in the Settings section (Fig. 25). After changing the unit, the measured data temporarily stored in the application is erased.

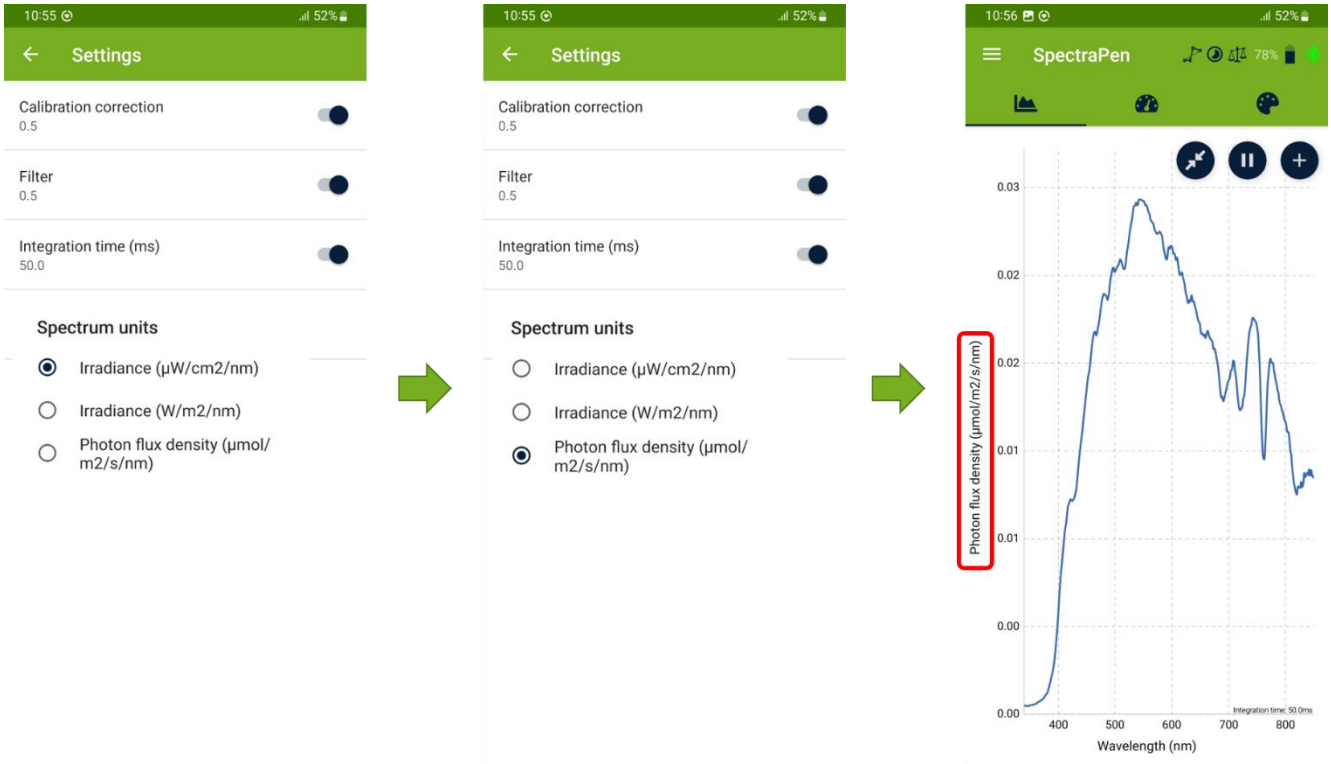

Fig. 25 Unit of y-axis in spectrum plot.

7 TROUBLESHOOTING AND CUSTOMER SUPPORT

The device does not response short press of the power button

- Press the power button for more than 10 seconds to reinitialize the device.

The device does not response to long press (more than 10 seconds) of the power button

- Connect the charger and wait 10 minutes to refresh the battery.
- Make sure that the power source is able to feed the device with sufficient current. Some PC USB are limited to 100 mA. If you are not sure about the power limits, please use any common USB wall adapter.
- Press the power button about 10 seconds until you see initial green light indication.

The device is not available in the search list

- Press the power button about 10 seconds until you see initial green light indication.
- Stop the searching and scan the devices again.

The device is connected SpectraPen application shows "Measurement is in progress…" but nothing happens

- Press the power button about 10 seconds until you see initial green light indication.
- Restart the SpectraPen app.

The SpectraPen application cannot connect the SpectraPen mini device

- Press the power button about 10 seconds until you see initial green light indication.
- Restart the SpectraPen app.
- Check that Bluetooth and/or location are turned on in the mobile phone.

There is no SpectraPen application available on Google play

- Please make sure that your Android version is 5.0 or higher.
- Contact the support to make sure that the SpectraPen application is available in your country.

The SpectraPen application does not start even the install/update went correctly

- In the Android setting navigate to Applications -> SpectraPen and clear application cache.
- In the Android setting navigate to Connections -> Bluetooth and unpair the SpectraPen device.
- Reinstall the SpectraPen application from the Google Play.

In case of unsolved troubles, please, contact us on support@psi.cz or contact your local distributor.

8 WARRANTY TERMS AND CONDITIONS

- This Limited Warranty applies only to the SpectraPen mini device. It is valid for one year from the date of shipment.
- If at any time within this warranty period the instrument does not function as warranted, return it and the manufacturer will repair or replace it at no charge. The customer is responsible for shipping and insurance charges (for the full product value) to PSI. The manufacturer is responsible for shipping and insurance on return of the instrument to the customer.
- No warranty will apply to any instrument that has been (i) modified, altered, or repaired by persons unauthorized by the manufacturer; (ii) subjected to misuse, negligence, or accident; (iii) connected, installed, adjusted, or used otherwise than in accordance with the instructions supplied by the manufacturer.
- The warranty is return-to-base only and does not include on-site repair charges such as labor, travel, or other expenses associated with the repair or installation of replacement parts at the customer's site.
- The manufacturer repairs or replaces faulty instruments as quickly as possible; the maximum time is one month.
- The manufacturer will keep spare parts or their adequate substitutes for a period of at least five years.
- Returned instruments must be packaged sufficiently so as not to assume any transit damage. If damage is caused due to insufficient packaging, the instrument will be treated as an out-of-warranty repair and charged as such.
- PSI also offers out-of-warranty repairs. These are usually returned to the customer on a cash-on-delivery basis.
- Wear & Tear Items (such as sealing, tubing, padding, etc.) are excluded from this warranty. The term Wear & Tear denotes the damage that naturally and inevitably occurs as a result of normal use or aging even when an item is used competently and with care and proper maintenance.

9 LIST OF FIGURES