

SR600 & SRpro

Instruction



Version 2.0.3E

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2 Foreword

Dear Customer!

Thank you for choosing a product manufactured by us!

Please take your time to read this manual carefully. Please pay special attention to the safety instructions.

This is the condition for safe handling and safe operation of the system and its components.

If you have any questions that you do not find answered in this manual, please call us and we will be pleased to assist you. In addition, we always welcome any suggestions or proposals for improvement.

Our products undergo constant advanced development; therefore there may be minor differences between your system and the illustrations given in this Operating Manual.

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This is a translation of the original operating manual.

3 Quick guide spectroradiometric measurement

The quick guide should demonstrate the function of the spectrometer to you with the help of an operating sequence. The objective of the quick guide is that you should have a measured spectrum on the screen at the end.

The goal of the Quick Start Guide is that you end up with a measured spectrum on your screen.

1. Start the SRpro program.

The program starts with a welcome screen and starts the connection to the spectrometer.



When starting for the first time, set the user to Power user if necessary. See Start > Options > User. The password can be found as an attachment to this manual.

2. Check in the main window that the following buttons are active:



Dark measurement (on)



Absolute calibration

3. Hold the diffuser against a light source



Start the measurement

A status window is opened. Here, the current integration time is displayed.

The integration time is changed several times in order to achieve a recording level of approx. 90%. When the correct integration time is found, the window disappears and the actual measurement is started.

4. Now, a spectrum should be displayed on your screen after a few seconds.
5. If necessary, continue with manual dark measurement.

After that, your spectrometer is ready for operation.

Notes for calibrated measurements:



In order to carry out a calibrated measurement, please select the button “Relative spectral correction” or “Absolute spectral correction”. The selection of one of these two buttons will release the drop-down list for the correction file . In this list, select one of the correction files that have been delivered with your spectrometer. Please note that the file must match with the input optics used (fibre optics cable, U-sphere, diffuser, etc.).

In case of absolute irradiance measurements, we recommend using dark measurement, scattered light correction and averaging over 3 to 20 measurements.



Dark measurement



Stray light correction



Averaging over 3 to 20 measurements

4 Quick guide transmission / reflection measurement

The short instructions are intended to demonstrate the function of the spectrometer by means of an operating sequence. The aim of the short instructions is that you have a measured spectrum on your screen at the end.

1. Start the SRpro program.

The program starts with a welcome screen and starts the connection to the spectrometer.



When starting for the first time, set the user to Power user if necessary. See Start > Options > UserThe password can be found as an attachment to this manual.

2. Check in the main window that the following buttons are active:



Dark measurement (automatic)



No calibration



Transmission measurement / Reflection measurement



Flash lamp on



Stray light correction on (only for reflection measurements)

3. Connect the light guide for transmission or reflection

4. Set the integration time and the number of measurements. Typical:

- a. for transmission measurements e.g. 200 ms and 10 measurements
- b. for reflection measurements with an integrating sphere e.g. 30000 ms and >3 measurements

5. Start the measurement



Start the measurement

After the dark measurement, which takes a few seconds, you will be prompted to start the 100% measurement (baseline).

6. Then insert the sample (Note Sample measurement).

7. After that, the measurement appears on the screen.

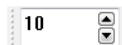
We recommend using dark measurement, stray light correction and averaging over 10 to 100 measurements.



Dark measurement (manual)



Stray light correction for irradiance and baseline measurements



Averaging

5 Guidelines and standards



The system is machinery under Annex II A of the Machinery Directive and is therefore delivered with a declaration of conformity and with a CE mark (in accordance with the Machinery Directive).

Directives	
EC Directives	06/42/EC (Machinery) (partially observed) 2014/30/EC (EMC) 2014/35/EC (Low voltage)
Harmonised standards	
EN ISO 12100:2010	Safety of Machinery – General Principles for Design Risk Assessment and Risk Reduction
EN 60204-1:2006 +A1:2009 +AC:2010	Safety of Machinery – Electrical Equipment of Machines – Part 1: General Requirements
EN 61000-6-2:2005	Electromagnetic Compatibility (EMC) – Part 6-2: Immunity for Industrial Environments
EN 61000-6-4:2007 + A1:2011	Electromagnetic Compatibility (EMC) – Part 6-4: Emission Standard for Industrial Environments

6 Identification

6.1 Manufacturer, Ordering of Spares and Customer Service

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6.2 Change history



We reserve the right to make changes in content. Opsytec Dr. Gröbel GmbH is not liable for any errors in this documentation. No liability shall be accepted for indirect damages arising from the delivery or use of this documentation, in as far as this is legally permissible.

Version	Changed by	Date	Change
1.43	Paravia	15.08.2014	Creation
1.44	Paravia	10.07.2015	Software update 4.0
2.0.1E	Paravia	21.08.2017	Software update 5.0, pixel count
2.0.2E	Paravia	19.12.2017	Software update 5.1, EXCEL export
2.0.3E	Paravia	26.03.2019	Red. Changes

6.3 Copyright



Opsytec Dr. Gröbel GmbH shall retain the copyright for these operating manual. The operating manual is intended for the owner/operator and his personnel.

Copyright in accordance with DIN ISO 16016:

Reproduction and copying of this document, use and disclosure of its contents are prohibited unless expressly authorized.

Non-compliance may result in a claim for damages. All rights reserved in case of registration of patent, utility patent, or design patent.

Contraventions may be subject to prosecution.

6.4 Device identifier

For internal use at customer site:

Description of machinery:
Year of construction:
Machine No.
Project no.

6.5 Intended use

The system is intended for industrial use only. It is forbidden to use the devices in explosive environments.

- Installation, commissioning, operation, maintenance and service works must solely be performed by trained and educated, qualified personnel, which observes all safety regulations and standards.
- Responsibility: Damages resulting from unintentional or unauthorized interventions terminate every right, to raise warranty or liability claims against the manufacturer.
- Guarantee exclusion: The use of any non-original parts voids the guarantee.
- Environmental protection: Defect parts, which may contain environmentally harmful substances, must be disposed of accordingly.
- Operation is only permitted in a dry environment. The installation is horizontal.
- Only suitable for indoor operation.
- Before opening, the system must be disconnected from the voltage and it must be checked that there is no voltage.
- Wear gloves for servicing, cleaning and replacing the light guides and optical components.
- Do not clean the system when it is in operation.
- The housing must not be opened by the user. The optically active surface must not be touched.
- Gloves must be worn for cleaning the optically active surface.
- The SR600 / SR900 is a highly sensitive optical measuring instrument. It must not be subjected to shocks.
- When using the system, light and UV radiation may be reflected and scattered by the measuring head. If necessary, suitable protective measures must be used to protect against radiation.
- Any other use than the above mentioned, results in damages to the product. Furthermore, it is associated with risks such as short circuits, fire and electric shocks. The entire device must not be changed and/or modified! The safety notes must be observed at all times.

6.6 Foreseeable misuse

The following is considered foreseeable misuse:

- Operation of the device without safety devices and equipment.
- Activities of uninstructed personnel on the device.
- Non-compliance with the operating instructions of the owner/operator.
- Ignoring of the operating manual.
- Any other use outside the intended specified use.

6.7 Legal information

6.7.1 Limitation of liability

All the information in this manual was compiled with consideration of the currently valid standards and regulations, of the technical standard and our long-standing knowledge and experience.

The manufacturer shall not be liable for damage in the event that:

- This manual is ignored,
- The device is improperly used,
- Untrained personnel is deployed,
- Untrained personnel operates the machine incorrectly,
- Unauthorized modifications are made,
- Technical changes are made,
- Non-approved spare parts are used.

We shall not be liable for common faults of the device caused by power outage or failure of the control system.

The actual scope of delivery may be different than the explanations and pictures in this manual in case of special versions, when additional options are ordered or due to the latest technical changes.

The obligations agreed in the delivery contract, as well as the legal requirements valid at the time the contract was concluded shall apply.

6.7.2 Declaration of Conformity

The declaration of conformity is in the annex or can be requested from the manufacturer.

6.7.3 Warranty condition en

The warranty terms and guarantee conditions are governed by the German Civil Code (BGB). The warranty period is one year unless otherwise agreed in the purchase documents.

7 General

7.1 Information about this manual

This manual intends to make handling of this system and its components safe and efficient. The manual is part of the system and must be kept in its immediate vicinity where it is accessible for the personnel at any time.

This documentation contains the necessary information for the intended use of the described system. It is intended for technically qualified personnel who have been especially trained for operation, laboratory use, quality assurance, service and repair.

The personnel must have read this manual carefully and understood its content before commencing any work. The basic condition for safe working is observation of all stated safety information and operating instructions in this manual.

Knowledge and technically faultless implementation of the instructions, safety requirements, safety information and warnings are a condition for safety in operation, service and repair. Only qualified personnel has the required professional knowledge to apply the safety requirements, safety information and warnings stated in this operating manual in a general way correctly in a concrete situation.

In addition, the local accident prevention regulations and general safety regulations apply for the area of application of the system.

Illustrations in this manual serve the purpose of general understanding; they may differ from the actual version.

Apart from this manual the instructions for the installed components included in the appendix apply.

This operating manual cannot take any possible case of maintenance into account. If you need further information or if special problems occur that are not treated extensively enough in this manual please request the required information from the manufacturer.



For ease of description, the above components are collectively referred to as the system.


7.2 Information about the symbols


7.2.1 Safety instructions


In this manual, safety information is indicated by means of symbols. Safety information is preceded by signal words that indicate the scope of risk.

To avoid accidents and damage to persons or property, always follow the information and act prudently.

Throughout the text, you will find the following pictograms with the following meanings:

	⚠ DANGER
	<p>Imminent danger Possible consequences: Death or most severe injuries.</p> <ul style="list-style-type: none"> • Prevention

	⚠ WARNING
	<p>Dangerous situation Possible consequences: Death or most severe injuries.</p> <ul style="list-style-type: none"> • Prevention

	⚠ CAUTION
	<p>Possible situation Possible consequences: Minor or slight injury. Sometimes also used as a warning of material damage.</p> <ul style="list-style-type: none"> • Prevention



Note

Information about the application or useful, important information

7.2.2 Prohibition signs



General "prohibition sign"

7.2.3 Warning signs



Warning against optical radiation
(such as UV, IR, or visible radiation).



Warning of electricity!

7.2.4 Attention



Wear eye protection!



Disconnect mains plug from electrical outlet!



Disconnect before carrying out maintenance or repair!



Use hand protection!



Refer to instruction manual/booklet

7.2.5 Optional function

* Optional functions, not available for every system

7.3 Owner/operator information

The System is used in the commercial sector. The owner/operator of the system is therefore subject to the legal obligations concerning work safety.

In addition to the safety information in this manual, the generally applicable regulations valid for the application area of the system concerning safety, prevention of accidents and for protection of the environment must be noted and complied with.

The following applies in particular:

The owner/operator must acquire information about the valid occupational health and safety information and in a risk assessment determine additional hazards incurred due to the special operating conditions at the location of use of the system. He must implement these in the form of operating instructions for operation of the system and specifically for the individual work stations.

The owner/operator is obliged to check during the entire lifetime of the system whether the operating instructions that he generated comply with the current status of the regulations and update them if necessary.

The owner/operator must assign and define the responsibilities for installation, operation, rectification of faults, service and cleaning unambiguously.

The owner/operator must ensure that all personnel dealing with the system have read and understood this manual. Furthermore, he is obliged to provide personnel training in regular intervals and provide information about risks.

The owner/operator must provide the required personal protective equipment for his personnel. Furthermore, the owner/operator is responsible that the system is always in faultless technical condition. To ensure this, the service intervals specified in this manual and in the technical documents for the individual systems must be observed and all safety installations must be checked regularly for function and completeness.

The owner/operator must have all safety devices checked regularly for function and completeness.

The owner/operator must ensure that the operating personnel have knowledge about first aid measures and local rescue installations.

7.4 Personnel requirements

7.4.1 Qualifications

Below, this manual lists the qualifications of the personnel for the various areas of activity:

7.4.2 Electrically skilled person

Due to their professional training, knowledge and experience and knowledge of the relevant standards and regulations, electrically skilled persons are able to carry out work on electrical systems and to recognize and avoid risks independently.

Electrically skilled persons are specially trained for the work environment where they are working and they know the relevant standards and regulations. Electrically skilled persons must fulfil the requirements of the valid legal regulations for accident prevention.

7.4.3 Qualified person

Qualified persons are trained or can be trained by Opsytec Dr. Gröbel GmbH in extended operation and parameterization of the system as well as in execution of preventive service work.

In addition, due to their technical training, knowledge and experience and knowledge of the relevant standards and regulations, they are able to carry out work they have been assigned and to recognize and avoid possible risks independently.

7.4.4 Operators

Operators use and operate the system in the scope of the intended use. They are trained by the owner/operator in the work assigned to them and informed about possible risks.

7.4.5 Training and Qualification of Personnel

In regular instructions and training, operating personnel must be informed about the special risks when working with and handling the system.

The instruction and training should have the following content:

- Hazards when working with the system in normal operation.

- Hazards in connection with service, repair and cleaning activities.

- Conduct to minimize consequences of accidents.

- Conduct in case of accidents.

- Rescue of injured persons.

- Working without personal protective equipment may cause health damage. The company supervisor is instructed to pay attention that personnel are wearing personal protective equipment.

- Particular hazards when working on the electrical system.

Instruction and training must be carried out in regular intervals by the owner/operator. For better tracking, execution of instruction and training should be recorded.

7.5 Personal Protective Equipment

The purpose of personal protective equipment is to protect the personnel from risks that might affect his safety or health when working.

When executing various activities on and with the system, the personnel must wear personal protective equipment. This will be pointed out again in the individual chapters of this manual. Below, personal protective equipment is explained:

7.5.1 Protective Gloves

Protective gloves are used to protect hands from visible and invisible radiation, friction, abrasion, stabs and deep injuries.

7.5.2 Protective Goggles


Protective goggles are used to protect eyes from intense visible and invisible radiation.

8 Safety instructions and residual risk


8.1 General


The system is state-of-the-art and has been built in compliance with recognized safety regulations. Nonetheless, its use may constitute risks for life and limb of the operating and repair personnel (service personnel) or third parties or impairments to the machine. Operate the system only when its safety devices are in faultless condition. Disruptions that impair its safety must be rectified at once.


The following safety information must be strictly observed to prevent damage to the machine and personal injury!


	⚠ WARNING
	<p>Risk of injury when personnel do not read the operation manual! Prior to commissioning and operation, read the operation manual completely. Read all safety information and instructions. Negligence concerning safety information and instructions may cause electric shock and/or severe injuries.</p>


8.2 Safety instructions relating to normal operation

	⚠ CAUTION
	<p>Risk of damage</p> <ul style="list-style-type: none"> • The SR600 is calibrated. Do not expose the instrument to shocks. • CAUTION: Opening the housing will result in loss of calibration.


	⚠ CAUTION
	<p>Risk of damage</p> <ul style="list-style-type: none"> • Skin grease and dirt are absorbent in the UV and visible spectral range. • Avoid fingerprints on the optically active sensor surface. If necessary, clean the components carefully with isopropanol.

	⚠ CAUTION
	<p>Risk of damage</p> <p>Special guidelines must be followed when using an optical fiber. Avoid:</p> <ul style="list-style-type: none"> • Touching the end faces with the fingers • Storage on dusty surfaces • Bumping against hard surfaces • Immersion in e.g. contaminated liquids. • small bending radii (200mm)

	⚠ CAUTION
	<p>Risk of damage</p> <ul style="list-style-type: none"> • Hand-tighten the knurled screws of the SMA-905 light guides.

	⚠ WARNING
	<p>Fire hazard!</p> <p>A high irradiance, which can ignite combustible materials in case of continuous irradiation, is achieved at the output of the <u>light guide of optional flash lamps</u>. Remove all combustible materials and observe the irradiation time and material temperature.</p>






8.3 Radiation safety

⚠ WARNING	
	<p>Risk of eye injury</p> <p>The SR600/SR900 can optionally be equipped with xenon flash lamps. There is then a risk of photochemical or thermal damage to the eye, retinal damage and burns. Visible (blue) light can cause photochemical damage to the eye. If necessary, use suitable protective goggles when operating the unit. The operating personnel must be trained appropriately.</p> <p>Recommended protective equipment:</p> <ul style="list-style-type: none"> - Gloves - Safety glasses, no transmission below 400 nm <p>Do not look into the light source and do not expose skin to radiation!</p> <p>Avoid reflections of the radiation into the eye!</p> <p>The installation should be designed in such a way as to prevent a direct view into the light guide receptacles and the light guides.</p> <p>The devices were classified in risk group 3 according to DIN EN 62471:2009-03 "Photobiological safety of lamps and lamp systems".</p>

The customer is responsible for the risk evaluation for the workplace. Therefore, measurements / evaluations in accordance with DIN EN 14255-1:2005-06 "Measurement and assessment of personal exposures to incoherent optical radiation - Part 1: Ultraviolet radiation emitted by artificial sources at the workplace" are required.

The DIN 14255-1 itself does not contain any thresholds. These are determined in the guideline "2006/25/EG of the European Parliament and the Council on the minimum health and safety requirements regarding the exposure of workers to the risks arising from physical agents (artificial optical radiation)".

8.4 Safety instructions relating to service and repair work

	⚠ WARNING
	<p>Risk of injury when touching live parts</p> <p>Before opening the system, disconnect all components from the supply voltage and check that no voltage is present.</p>
	⚠ CAUTION
	<p>Risk of damage</p> <ul style="list-style-type: none"> • The SR600 is calibrated. Do not expose the instrument to shocks. • CAUTION: Opening the housing will result in loss of calibration. • Switch off the control unit prior to connecting / disconnecting accessories. Due to the operating voltage of the unit, the accessories can get damaged.
	⚠ CAUTION
	<p>Risk of damage</p> <ul style="list-style-type: none"> • Skin grease and dirt are absorbent in the UV and visible spectral range. • Avoid fingerprints on the optically active sensor surface. If necessary, clean the components carefully with isopropanol.
	⚠ CAUTION
	<p>Risk of damage</p> <p>Special guidelines must be followed when using an optical fiber. Avoid:</p> <ul style="list-style-type: none"> • Touching the end faces with the fingers • Storage on dusty surfaces • Bumping against hard surfaces • Immersion in e.g. contaminated liquids. • small bending radii (200mm)
	⚠ CAUTION
	<p>Risk of damage</p> <ul style="list-style-type: none"> • Hand-tighten the knurled screws of the SMA-905 light guides.

Service, repair and cleaning work must only be carried out by authorized and specifically trained professionals. The system must be power-free and secured before major work is carried out (including cleaning).

Carry out the prescribed setting, service and inspection work according to schedule. If you need further information or if special problems occur that are not treated extensively enough in this manual The housing must not be opened by the user. The optically active surface must not be touched.

Gloves must be worn for cleaning the optically active surface.

The SR600/SR900 is a highly sensitive optical measuring instrument. It must not be subjected to shocks.

9 Description of the system and function overview

The compact SR900 spectroradiometer is a high-resolution measuring system for fast and precise measurements in the UV, visible spectral range and IR. The measuring range extends from 200 nm to 1100 nm. The spectroradiometer consists of an array spectrometer without moving parts and a silicon array with 2048 pixels. The spectral resolution is 2.3 nm (pixel pitch 0.4 nm).

The SR900 is combined with an SMA-905 quartz optical fiber and our radiometric probes for irradiance and illuminance measurements. With trigger input and output, the SR900 is also suitable for automated measurements.

The UV-VIS SR600 spectrometer is a modular measuring system for fast and precise measurements in the UV and visible spectral range. The main unit consists of a polychromator without any moving parts and a silicon photo diode array. We also offer a wide assortment of accessories for the SR600 spectrometer that can be combined with customer-specific extensions. The integrated shutter enables automatic dark current correction. Control and data evaluation are carried out with the SR600 spectral software.

The SR600 is also suitable for automated measurements with trigger input and output. A high dynamic range is achieved by a special multiple measurements of up to 105:1. The spectral resolution of the spectrometer permits the clear resolution of the two Hg lines at 577 and 579 nm.

The SR900 and SR600 are traceable to the PTB factory calibration. DAkkS testing in our accredited laboratory is optionally available. The devices thus allow accurate spectroradiometric measurements for the evaluation of irradiances and illuminances, biological efficacy and color measurements. Due to the low stray light design, a high sensitivity in the UV range is achieved. Control and data evaluation are performed with the SRpro spectral software.

With Version 4.0, an enhanced user management is introduced. Now, it's possible to switch the user interface between a main user, with all features, and a restricted user permanently. For switching a password is required, which accompanies this document. It is therefore possible to use the SR600 in a qualified environment.

The user rights differ as follows:

Right	User	Main user
Perform measurements	yes	yes
Change settings, that may change the result	no	yes
Change of integration time	yes	yes
Change calibration	no	yes
Saving erroneous measurements (pdf) (see threshold settings)	no	yes
Automatic Save as PDF	yes	no
Automatic review included in report (pdf)	yes	no
Manipulation of measurements / calculations of measurements	no	yes
Change user permanently	no	yes
Change Password	no	no

With (limited) user account it is not possible to change the following settings:

- Change correction file
- Change of spectral correction / relative / absolute
- Change offset correction
- Change Dark Measurement
- Perform data manipulation
- Change Dynamics Measurement
- Overwrite files accidentally
- Change printer settings and protocol settings

9.1 General Product Description:

- Spectral range 200-1100 nm or 200-800 nm
- Order filtering
- Spectral software for color measurement, radiometric and effect-related measurements
- Simple validation through user concept
- Extensive range of accessories

9.2 The following components are supplied:

- Spectroradiometer
- Spectrometer software SRpro
- USB cable
- this documentation
- optional: fiber optic cable
- optional: sensor head
- optional: integrating sphere reflection attachment





For ease of description, the above components are collectively referred to as the system.

The following components are required by the customer:

- PC with 10
- Free USB interface

10 Commissioning

- Unpack all components and remove the packing materials.
- Connect the light guide (end ferrule) to the SR600/SR900 and hand-tighten the knurled screw.
- Connect the SR600/SR900 to mains voltage and switch it on
- Install the drivers and software (see below)
- Connect the SR600/SR900 to the PC.

 WARNING	
	<p>Risk of damage</p> <p>The light conductors are very sensitive and must not be bent or severely bent.</p> <p>A minimum bending radius of 200 mm must be observed.</p>

10.1 Software installation

- Connect the USB stick or CD to the PC and double-click Setup.exe.
- Follow the installation instructions on the screen and confirm the installation of the drivers.

10.2 Removing SRpro

If necessary, you can remove SRpro from your computer.

The following options are available for this purpose:

- Click on "Start" in the Windows Start menu and select "Programs > SRpro > Remove SRpro".
- Select "Settings > Control Panel" in the Windows "Start" menu. Double-click
- click on "Software" in the Control Panel. Select "SRpro" in the dialog box
- "Software Properties" on the "Install/Uninstall" tab and click the "Add/Remove" button.

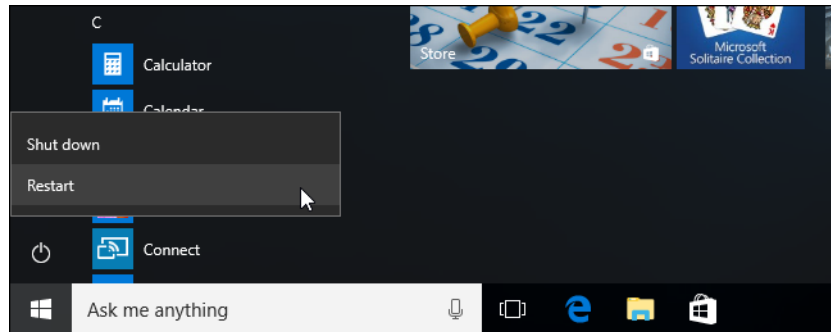
10.3 Installing device drivers under Windows 8 / 10

In case of problems:

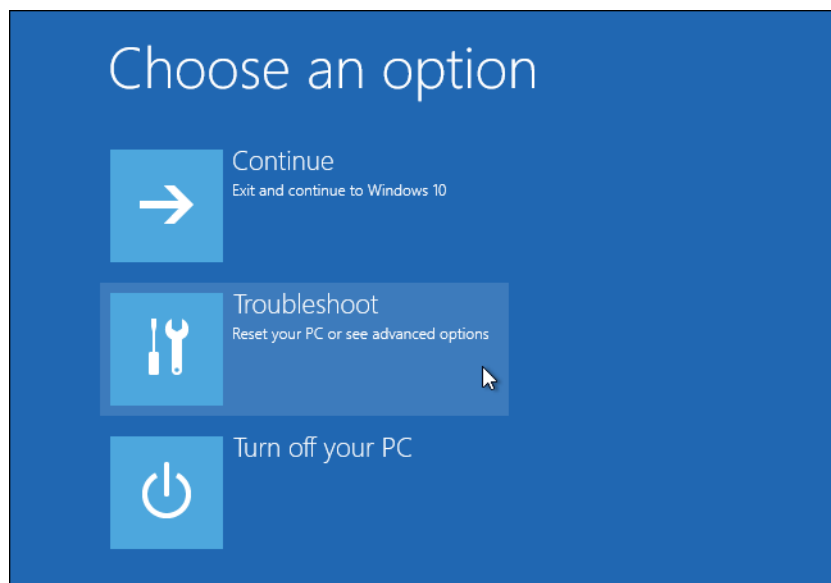
64-bit versions of Windows 10 and 8 include a "driver signature enforcement" feature. They'll only load drivers that have been signed by Microsoft. To install less-than-official drivers, old unsigned drivers, or drivers you're developing yourself, you'll need to disable driver signature enforcement.

You can use the advanced boot options menu to boot Windows 10 with driver signature enforcement disabled. This isn't a permanent configuration change. The next time you restart Windows, it will boot with driver signature enforcement enabled—unless you go through this menu again.

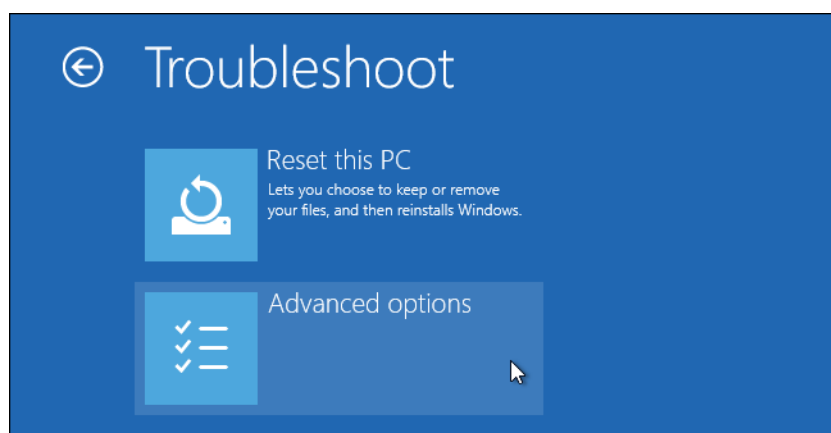
To do this, get to the Windows 8 or 10 advanced boot options menu. For example, you can hold down the Shift key while you click the “Restart” option in Windows. Your computer will restart into the menu.



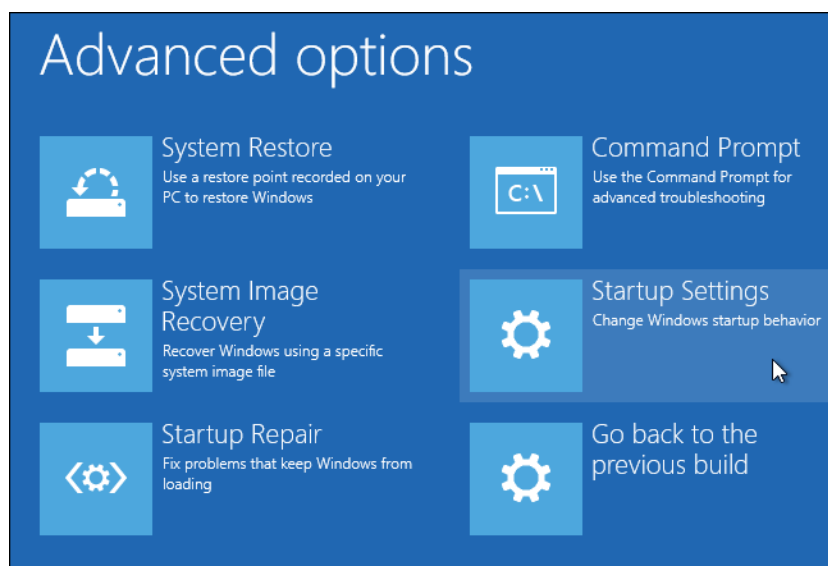
Select the “Troubleshoot” tile on the Choose an option screen that appears.



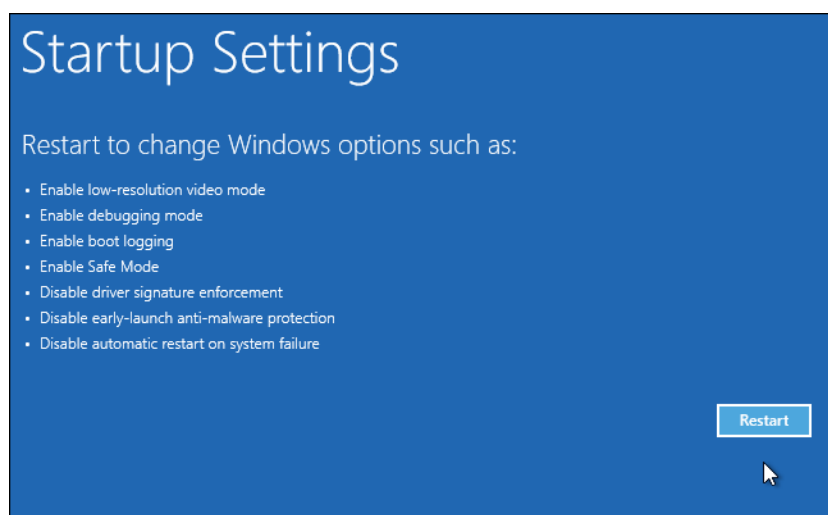
Select “Advanced options”.



Click the “Startup Settings” tile.



Click the “Restart” button to restart your PC into the Startup Settings screen.



Type “7” or “F7” at the Startup Settings screen to activate the “Disable driver signature enforcement” option.

Startup Settings

Press a number to choose from the options below:

Use number keys or functions keys F1-F9.

- 1) Enable debugging
- 2) Enable boot logging
- 3) Enable low-resolution video
- 4) Enable Safe Mode
- 5) Enable Safe Mode with Networking
- 6) Enable Safe Mode with Command Prompt
- 7) Disable driver signature enforcement
- 8) Disable early launch anti-malware protection
- 9) Disable automatic restart after failure

Press F10 for more options

Press Enter to return to your operating system

Your PC will boot with driver signature enforcement disabled and you'll be able to install unsigned drivers. However, the next time you restart your computer, driver signature enforcement will be disabled—unless you go through this menu again. You're now free to install drivers that haven't been officially signed by Microsoft.

During the installation of the driver you will be prompted. Press "Install this driver software anyway".

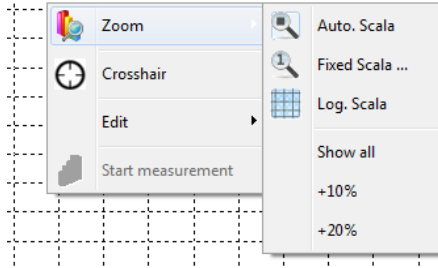


Pan function

The Pan function is used to move the graphic. To activate the pan function, the CTRL key must be held. When the mouse pointer is in the graphic, it changes the shape to a cross. Now the graphic can be moved by pressing and holding the left mouse button.

Context menu of the spectral window

Clicking the right mouse button within the graphic opens the context menu.



Under Zoom Auto. Scale can be switched on/off, return to the full range or display the ordinate 10% or 20% larger than the maximum signal.

If the menu item "Scan graph" is selected, a crosshair is displayed as soon as the mouse is in the spectral display. This crosshair follows the mouse movement and is always assigned to the wavelength of the mouse position.

Under the item "Edit" the spectral graph can be copied to the clipboard or saved as a bitmap file. Using these functions, it is possible to transfer the spectral display to a word processing program for documentation purposes.

The bottom item "Start measurement" starts a new measurement.

If the menu item "Scan graph" is selected, a crosshair is displayed as soon as the mouse is in the spectral display. This crosshair follows the mouse movement and is always assigned to the wavelength of the mouse position.


Under the item "Edit" the spectral graph can be copied to the clipboard or saved as a bitmap file. Using these functions, it is possible to transfer the spectral display to a word processing program for documentation purposes. With the function "Copy data to clipboard" the measurement data are comfortably available for a spreadsheet.

11.3 Working with multiple spectra

The SRpro software offers the possibility to display several spectra simultaneously. The current spectrum is always displayed with thicker lines. Bottom right appears



Selection of the active spectrum

Click on the  bottom right of the spectrum name to expand the list of open spectra.

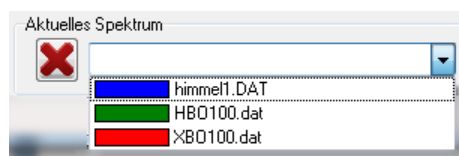


Figure 1: Selection list for active spectrum

Select a spectrum from the list and click on the name. This spectrum is now taken over as the current spectrum. All displays, such as integral values and weights, are now displayed from this spectrum



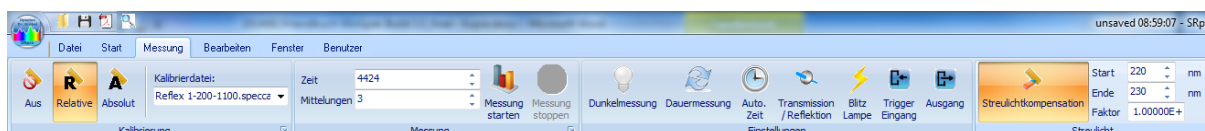
Delete a spectrum

To delete a spectrum, select the spectrum as the active spectrum. Now press the button to the left of the name. This will delete the active spectrum from the memory.

11.4 Symbol overview

The toolbars provide grouped, context-sensitive access to the most important functions.

The toolbar is the central control element for performing a measurement. Example:



It is important to know about the functions of each switch and to check the correct setting before performing a measurement.



Open spectrum

Files from previous measurements can be selected and the spectra displayed on the screen.



Save automatically

All measurements can be saved automatically. The file name is given a three-digit number at the end, which is increased by one for each measurement. So names like test001, test002, ... are possible.



Save spectrum

Only one measurement will be saved by entering a name.



Export spectrum

It will save the measurement as an EXCEL file of the CSV file. See options



Print

Here the spectrum is printed. After the spectral diagram, the comment from the info window and the settings during the measurement are printed. The values from the displayed evaluation window (integration, weightings and color measurement) are also printed.



Set printer

Calls up the "Set up protocol" dialog. There you have the possibility to set the Customize the content of the PDF export. You can find a sample protocol in the appendix.



PDF Export

Saves the print output in a pdf. The included evaluations and data can be configured via the printer settings.

A sample protocol can be found in the appendix.



Integration time

In this input window the integration time is set in milliseconds. Depending on the computer speed, the smallest possible value is 30 ms. If the spectrum is displayed incorrectly, the computer speed is too low for the integration time. Then select a longer integration time.

With uncooled array the maximum reasonable integration time is between 30000 and 60000 ms. With cooled array 60000 ms are always possible. Here the value Amax right under the spectrum window should be between 50% and just under 100%, otherwise the integration time should be changed.



Start measurement

Starts a new measurement with the set parameters.



Dark measurement on/off

Here you select whether the dark signal is to be determined before each measurement in a dark measurement with the same integration time and subtracted from the light measurement. Each photodiode array has a temperature-dependent dark current. This means that the photodiodes show a value greater than zero at large integration times, even at complete darkening. This effect can be fully compensated by subtracting a dark measurement from the measurement signal. We recommend, except for test measurements, to always switch on this item.



Continuous measurement on/off

With the set parameters, the measurements are made as fast as possible one after the other (i.e. as fast as the computer speed allows). In order to make a defined pause between two measurements, a corresponding time can be set in the "Settings->Device options" menu in the "Measurement interval" tab. With **automatic save** on, the number at the end of the file name is incremented. In the upper line a button "Stop" appears on the right, with which one ends the continuous measurement.



Automatic integration time on/off

The button determines whether the integration time should be determined automatically. If the button is pressed, the program increases the integration time until the largest value of the spectrum is between 80 and 90 %.

In the case of radiation sources operated with AC voltage, beatings can occur with the measurement time determined in this way, since parts of the period duration are not completely recorded. In this case, an integration time should be selected which is a multiple of the period duration.



Transmission reflection measurement on/off

Both transmission measurements and reflection measurements can be performed. For this purpose, two spectral images are taken in each case: first the measurement of the radiation source, then the measurement with specimen. For the reflection measurement, a reference standard is inserted during the measurement of the radiation source.

Note that the division only produces meaningful values if the lamp also emits radiation in the corresponding spectral range. The noise increases strongly with decreasing intensity.

For transmission and reflectance measurements, a baseline and dark measurement must be performed. These measurements must be repeated when changing the integration time, the number of averages or changing the light guide.

For the same measurements, the 100% measurement (baseline) and the dark measurement can be saved automatically, so that they are not have to be performed again. Consequently, the measurement is faster.

To do this, select in the menu Settings

Baseline correction and USE

Correct for dark

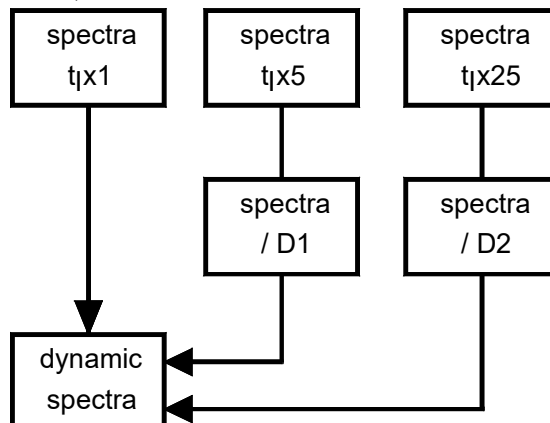


Dynamic measurement on/off *

The button "Dynamic measurement" determines whether several measurements are performed to improve the dynamics. If the button is pressed, 3 measurements are performed. The first measurement with the normal integration time, the second measurement with the 5-fold integration time and the last measurement with the 25-fold integration time. Subsequently, a spectrum is assembled from the three measurements.

The measurements with multiple integration time are divided by a previously determined correction value. All values of a spectrum with increased integration time, which are smaller than 90% of the saturation value, are divided

and further



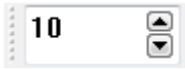
by the determined correction value then fed to the calculation.

D_n = arithmetic mean of all correction values. The correction values are determined at the points where the intensity is

between 10% and 90%.

t_i = integration time

Figure 2: The calculation of the dynamic spectrum



Averages

In the **Averaging** window, the number of averages performed during a measurement is specified. Averaging over several measurements can improve the signal-to-noise ratio. The value for averaging can be between 1 and 65000. However, values between 10 and 100 are realistic in order not to make the total measurement time too long. If the value 1 is entered as the averaging number, no averaging is performed.



Flash on/off (not available for all spectrometers) *

By means of the switch Flash you determine whether trigger pulses are to be given to the output Flash during the measurement. The number of flashes depends on the integration time. The flash signals have a frequency of 100 Hz.



External triggering* on/off

After starting the measurement via "Start measurement" the following status window is displayed.



Figure: Waiting for external trigger

The activated trigger input is now monitored. As soon as the trigger signal comes, the measurement is started. If both trigger inputs are activated, a logical "or" operation is performed between the two inputs during evaluation.



Spectral correction off

The spectrum is referred to the level of the A/D converter. 100% means full modulation of the A/D converter. As soon as the A/D converter has full modulation at a point, the value of the spectrum is set to 100% at this point.



Spectral correction relative

The sensitivity of the spectrometer is not constant over the wavelength. This is due to the diffraction characteristic of the diffraction grating, the spectral sensitivity of silicon and the sensitivity differences of the individual photodiodes. Furthermore, the spectral response of the light guide and the other input optics used enters here. This wavelength dependence is compensated by assigning a correction value to each photodiode. Each measured value is multiplied by a correction factor. Thus, the calculation of color coordinates, color rendering indices and color temperature becomes meaningful.

Spectral correction absolute



The spectrum is given in physical units, e.g. $\mu\text{W}/(\text{cm nm})$ from this further quantities are calculated, e.g. irradiances & illuminances. At saturation, the values jump to the largest value of the spectrum that is not yet in saturation.

Correction file

LWL.KOR ▾

The correction file used is displayed in the window. It must always be the file that belongs to the input optics used.

Start	220	nm
Ende	230	nm
Faktor	1.00000E+	

Stray light correction

From the measured spectrum you can subtract the offset that was determined in a certain wavelength range. To do this, enter the cutoff wavelengths of the range in which you want to determine the stray light component in the window. The stray light correction may be activated only if you know from a radiator that it has no signal in a certain range. In the later measurement, the average value that results in this range is subtracted from the measurement.

After entering the wavelength range for the stray light correction, an offset correction factor can be specified. This factor is used to multiply the stray light offset before it is subtracted from the spectrum. The default value for the offset correction factor is 1.

Stray light arises from diffraction at the entrance slit, from grating defects, from the 0th diffraction order at the grating, as well as all diffraction orders except the 1st order incident on the array, and finally from reflections at the array, window, and filter in front of the array.

Calculator & Data Manipulation



With this function you can manipulate the spectra. The basic arithmetic operations are possible. It is also possible to manipulate with constants. Constants are entered in the left under two input windows in the "Mathematics" window. If the result is to be displayed as a new spectrum, the name is entered in the lower right input window.

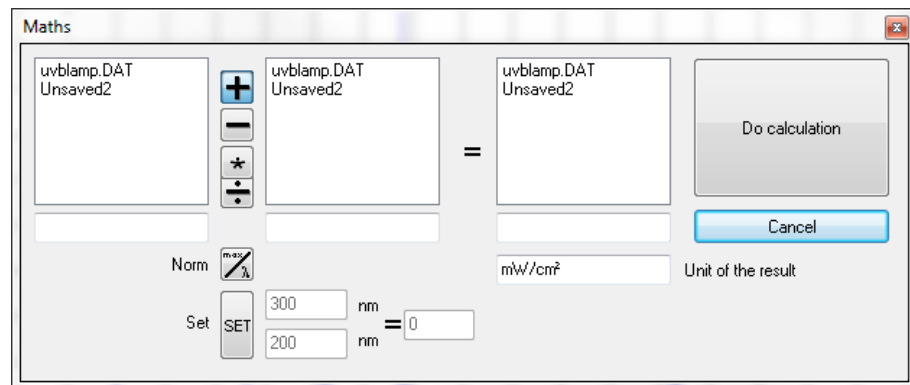


Figure: The math window for data manipulation

Please note that the spectra to be used must be displayed as marked in the figure. If they are only marked with a frame, the program does not recognize this selection. A corresponding message will be displayed.

Information about current spectrum



The instrument settings for the measurement appear in the information window. In addition, text lines for further information can be entered. The contents of this window are always output when printing.



Integral

Irradiance values can be calculated under "Settings -> Evaluations".



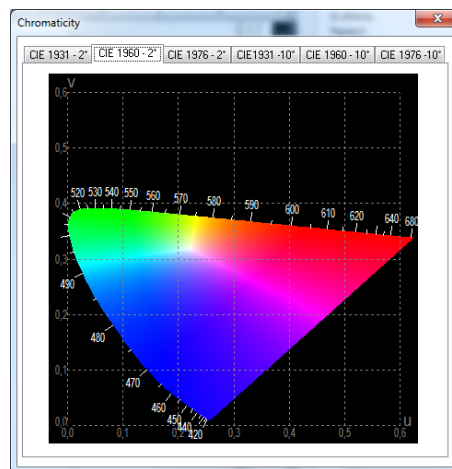
Weightings

Weighted irradiances can be calculated under "Settings -> Evaluations" selected.



Color coordinates

The values specified in "Settings -> Evaluations" tab Colors are calculated and output.



Window Settings Color

Cursor	
Wellenlänge	372,8 nm
Messwert	0,0065W/m ² /nm
Bestrahlungsstärken	
UV-A	0,256 W/m ²
UV-B	0,029 W/m ²
UV-C	-0,034 W/m ²
CIE 2°	
Farbtemperatur	3211 K
Meldung	
<input checked="" type="checkbox"/> CIE 1931	[0,4230,0,3995,0,1775]
x	0,4230
y	0,3995
z	0,1775
<input checked="" type="checkbox"/> CIE 1960	[0,2436,0,3450]
u	0,2436
v	0,3450



Viewer

The standard observer is set 2° or 10° according to the CIE.



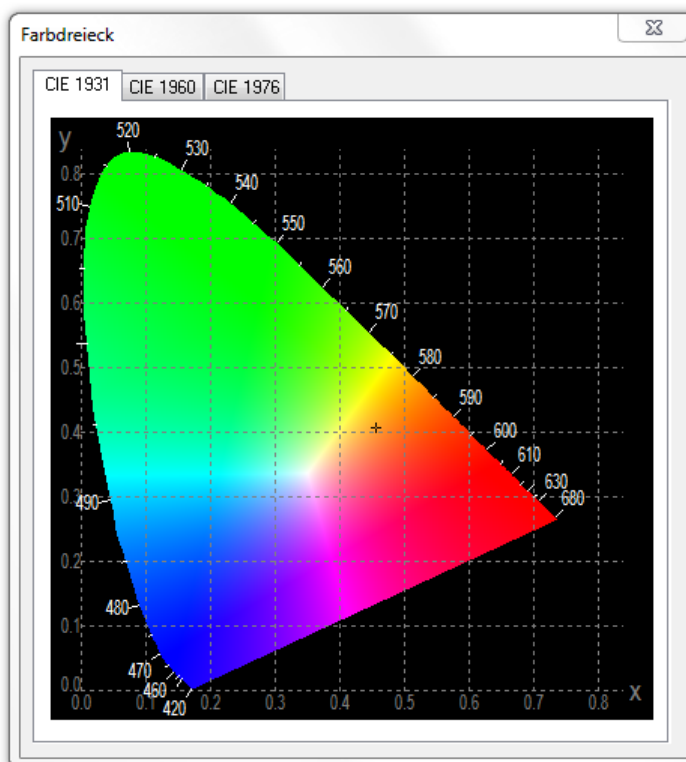
Color rendering indices

If the color measurement is switched on, the color rendering indices can be calculated and output. Only the values specified in the "Settings -> Evaluations" tab Colors are output.



Color triangle

If the color measurement is switched on, the position of the color location in the CIE 1931, CIE 1960 or CIE 1976 color triangle can be displayed in the corresponding color triangle.



11.5 File menu

Other settings are available via the menu that have not already been described as an icon. The menu is shown below:

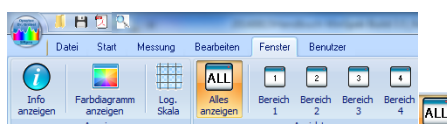


It is possible to save and load an existing settings file. In a settings file (*.ssf), all settings such as integration time, averaging, dark measurement, integration ranges, etc. are saved. The use of settings files is especially useful if you have to perform different measurements again and again.

Switching the program language is possible between German and English. After the language change, all menu items are displayed in the new language and this is permanently saved.

11.6 Window menu

Other settings are available via the menu that have not already been described as an icon. The menu is shown below:



The menu items in detail:



If this function is checked, the graph will be adjusted each time it is redrawn to make maximum use of the spectral graph.



Zooms into the predefinable areas



If this function is selected, the ordinate of the graph is scaled logarithmically.



Displays the CIE color triangles

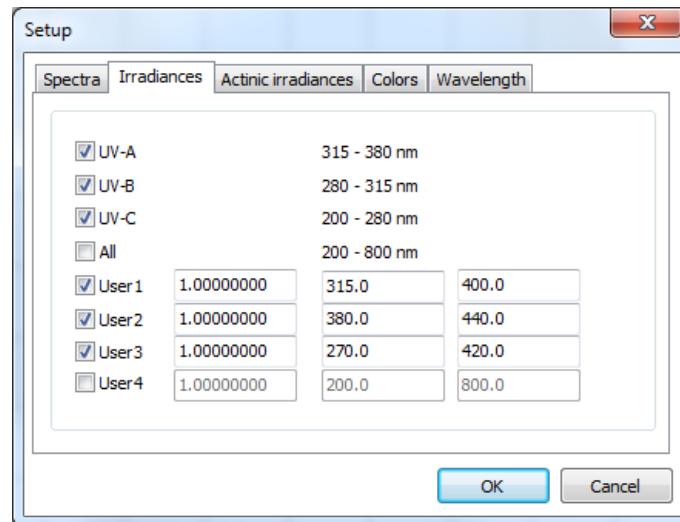
11.7 Analysis menu

Other settings are available via the menu that have not already been described as an icon. The menu is shown below:



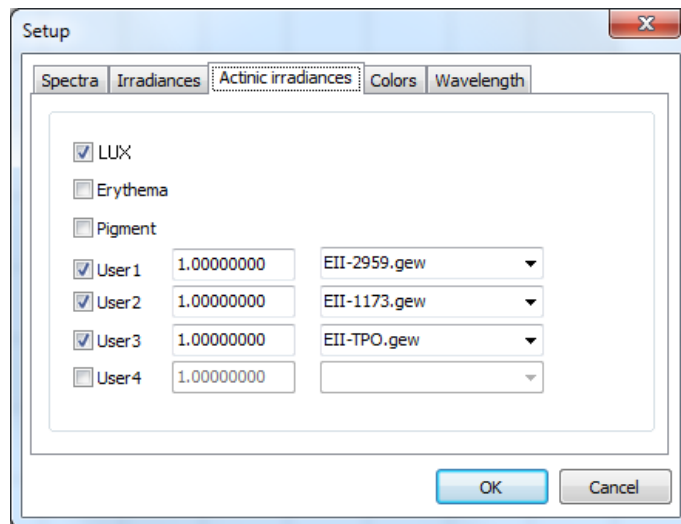
With the point "Analysis" an option window is opened. In this window 4 tabs are available, in which settings for the evaluation of the spectra can be made.

The start and end wavelengths of the display are defined under the **"Spectrum"** tab. The unit to be displayed can be selected here and will be converted automatically. "Fill Graph" fills the area under the spectrum in the output.

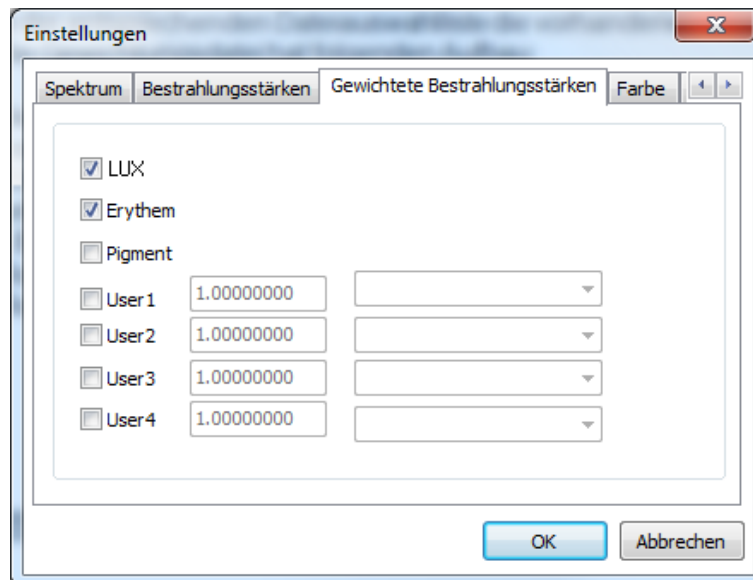


In the **"Irradiances"** tab, you can switch the calculation of the standard integrals on or off. Also a calibration of the integral is possible.

Furthermore, 4 user integrals are available. As soon as you switch on a user integral, the calibration factor and the start and end wavelength of the integral are enabled.



In the " Actinic irradiances" **tab**, the default weights are LUX ($V(\lambda)$), erythema weighting and pigment weighting provided.



User weighting files can be selected for User1 to User4. These files must exist in the WEIGHTS directory and have the file extension GEW. If a user weighting is switched on, the existing weightings are displayed in the corresponding file selection list. The weighting file has the following structure:

The LUX ($V(\lambda)$) weighting, erythema weighting and pigment weighting are usually provided in the "Weightings" tab. For User1 to User4, user weighting files can be selected. These files must be available in the WEIGHTINGS directory and have the file name ending GEW. If a user weighting is switched on, then the available weightings are displayed in the corresponding file selection list. The weighting file has the following structure:

The weighting files are ASCII files, which show the weightings in the Real format, followed by a [CR] character. The weightings start at 200 nm and end at 800 nm. The step size between the individual values is 0.6 nm.

E.g.

[Real value] [CR]	6.0754321E-002
[Real value] [CR]	5.3765211E-002

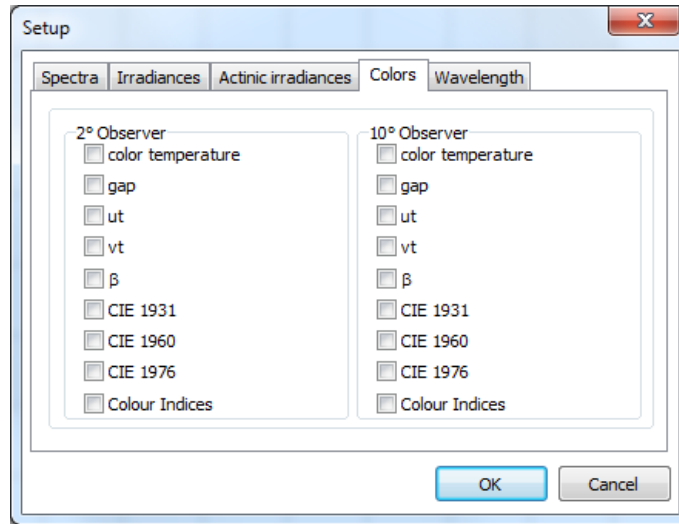
.

.

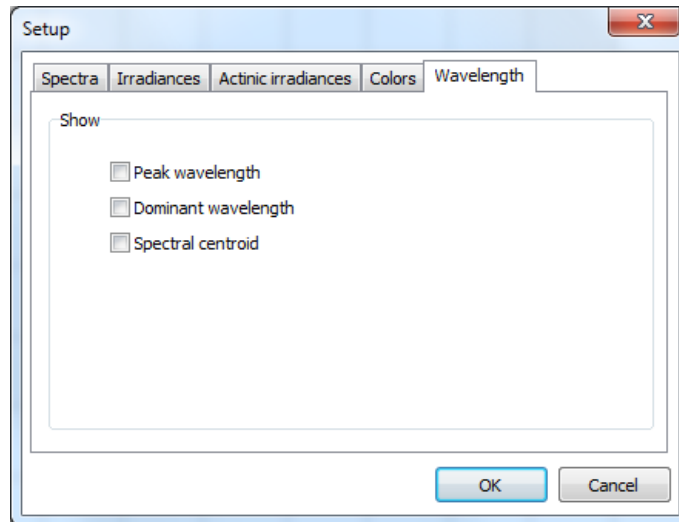
[Real value] [CR] 1.5987988E+001

The file names ERYTHEM.GEW, LUX.GEW and PIGMENT.GEW are standard weightings. Any names can be used for the user functions (e.g. USER1.GEW – USER4.GEW).

The **"Colors"** tab allows to show/hide color relevant calculation data (color coordinates, color temperature, distance from the Planck train for the 2 degree and the 10 degree observer respectively).

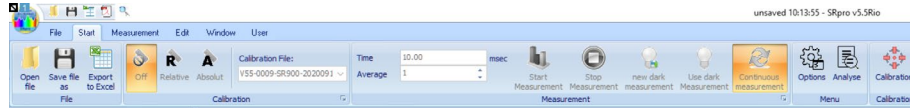


In the **"Wavelength"** tab, you can set the peak wavelength, the dominant wavelength. Display the wavelength and the center of gravity wavelength.



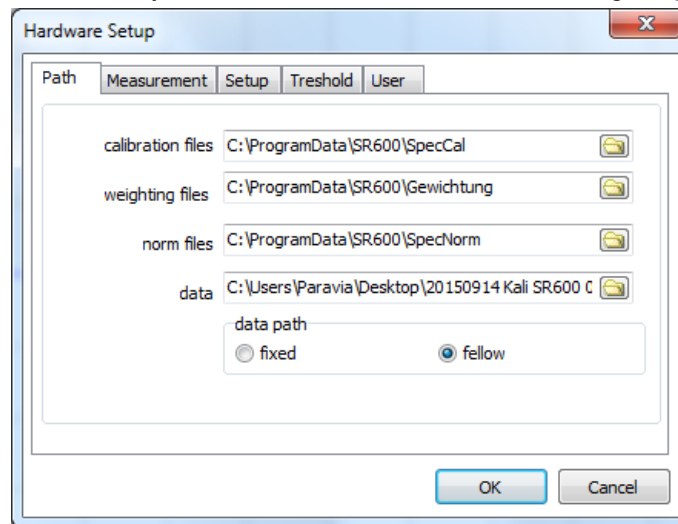
11.8 Options menu

Other settings are available via the menu that have not already been described as an icon. The menu is shown below:

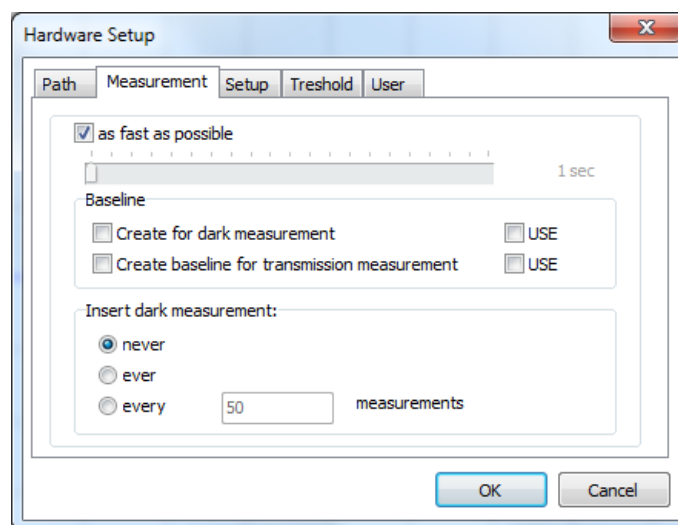


After clicking on "Options" a window is opened which contains further tabs. These tabs can be used to define device settings.

The **"Path"** tab can define the directories to the files used. These directories are created and entered during the installation. However, if you have different directories, the change is possible here.



The **"Measurement"** tab allows to change the pause between two measurements in case of continuous measurement. If the check mark is removed, you can change the pause between two measurements between 1 and 300 seconds using the slider



In addition, the baseline (for 100%) and the dark measurement can be saved for transmission and reflection measurement so that the same settings do not have to be measured again. To do this, select "Create baseline ..." and "Use" respectively

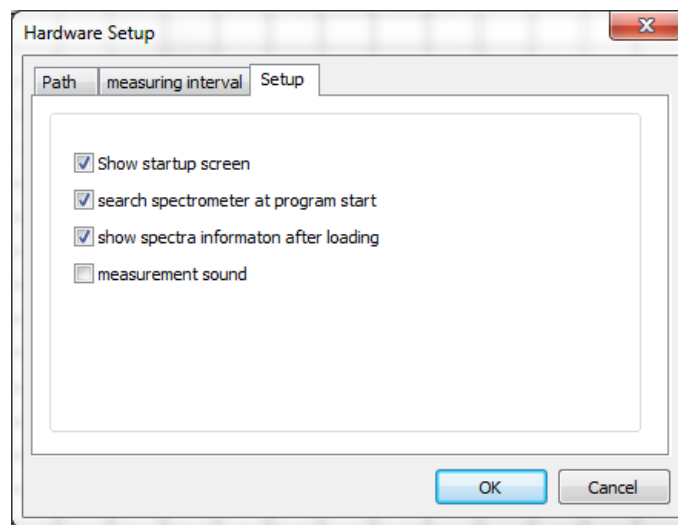
The stray light correction is selected via "Manual Range" or Auto. In the manual range, an offset determined in a certain wavelength range can be subtracted from the measured spectrum. To do this, enter the cutoff wavelengths of the range in which you want to determine the stray light component in the menu. The stray light correction may only be activated if you know from a radiator that it has no signal in a certain range. In the later measurement, the average value that results in this range is subtracted from the measurement.

After entering the wavelength range for the stray light correction, an offset correction factor can be specified. This factor is used to multiply the stray light offset before it is subtracted from the spectrum. The default value for the offset correction factor is 1.

Stray light arises from diffraction at the entrance slit, from grating defects, from the 0th diffraction order at the grating, as well as all diffraction orders except the 1st order incident on the array, and finally from reflections at the array, window, and filter in front of the array.

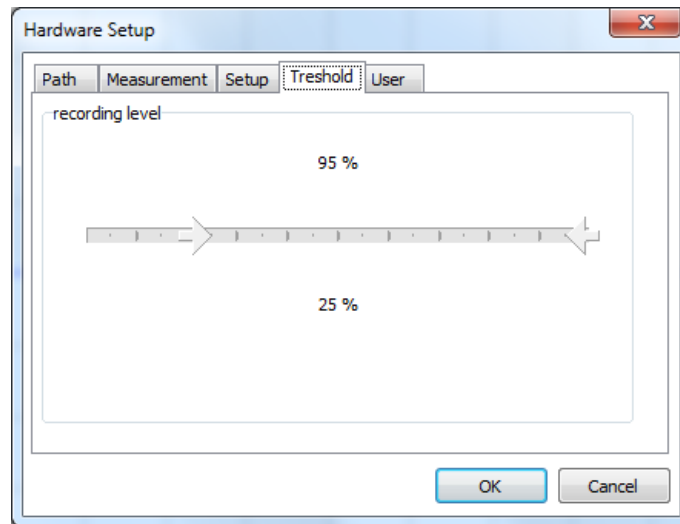
The "Auto" option corrects the stray light by evaluating and subtracting the first pixel.

General settings can be made in the "**Settings**" tab. For example, the start screen can be hidden or the search for the spectrometer at program start can be prevented. Also the possibility to output a sound after the end of a measurement can be switched on here.



In the "Threshold" tab, how to define the range of a valid measurement based on the level. If the level of the measurement is within the thresholds, the measurement is evaluated as OK in the PDF protocol for (standard) users. Note: For power users there is no evaluation.

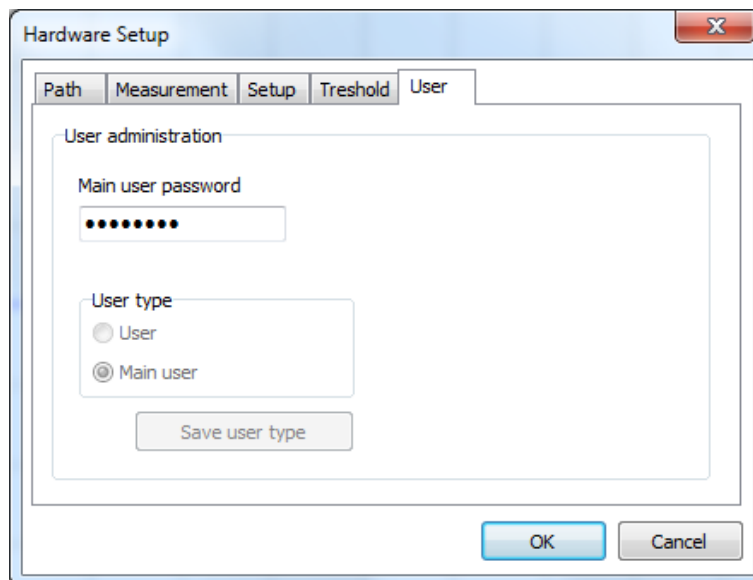
Recommended settings: 30% to 90%



In the **"Users" tab**, it is possible to switch between the restricted (default) user and the main user once or permanently.

Enter the password for the main user and confirm with "Save user" to activate the main user permanently, i.e. at every system start.

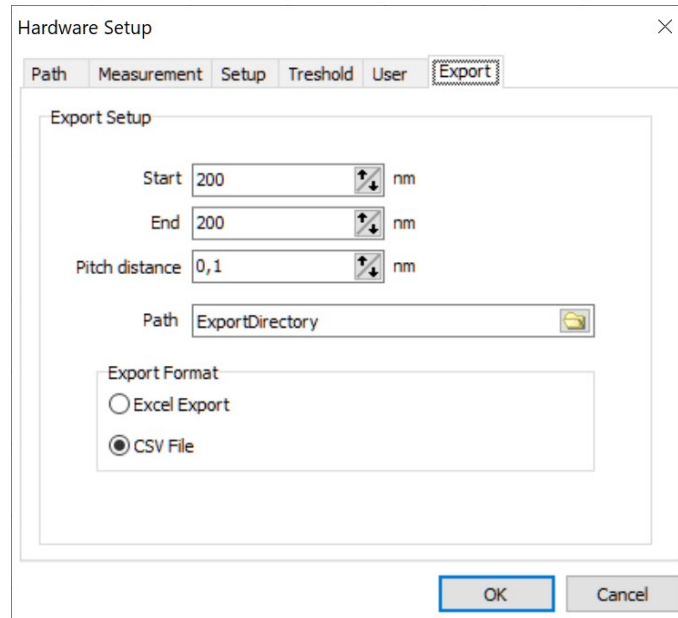
Note: The default setting is restricted user. For one-time setting changes, it is sufficient to enter the password. In this case, do not click on "Save user".



In the **"Export" tab**, the export function can be parameterized. Available are:

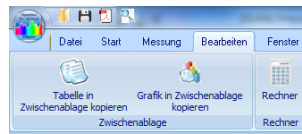
- The wavelength range
- The interpolation distance (interpolation points)
- The path
- File format.

Note: Microsoft EXCEL 2010 or later must be installed for EXCEL export.



11.9 Edit menu

Under the item "Edit" the spectral graph can be copied to the clipboard or saved as a bitmap file. Using these functions, it is possible to transfer the spectral display to a word processing program for documentation purposes. With the function "Copy data to clipboard" the measurement data are comfortably available for a spreadsheet.



11.10 Calibration menu*

With the delivery of the spectrometer you will receive the calibration file as well as a calibration certificate. This calibration data must be transferred to the software in order to obtain an exact measurement.

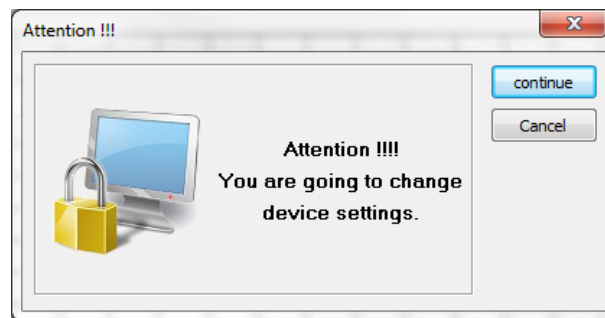
It is nevertheless possible to calibrate the spectrometer itself to absolute irradiances via the "Calibration" menu item. A relative display of the spectra is still possible despite absolute calibration. The setting of the desired correction type is done via the toolbars. The spectrometer is calibrated at delivery. To increase the accuracy of the measurement result, the program has the possibility to perform its own calibration. For this purpose, a standard lamp or two standard lamps with spectral characteristics guaranteed by the manufacturer are required. The calibration is performed by default in the range of

360-800nm with a halogen lamp and in the range of 200-360 nm with a deuterium lamp. If only one measuring range is required, a partial calibration can also be performed. In this case, the calibration of the other range remains active. The link point at which the two partial calibrations are joined can be shifted from 360 nm to any position in the spectral range. The calibration procedure for a range is described below.



After calling up the menu item "Calibration", a security query is first carried out.

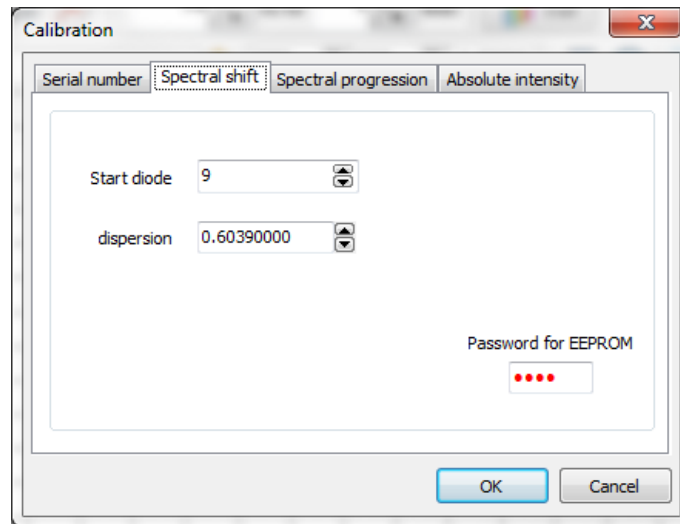
This safety query is performed because an accidental change of the calibration values is not reversible when the subsequent window is closed with "Next". A calibration measurement cannot be reversed under any circumstances.



If an existing calibration file is overwritten by the calibration measurement, this is not reversible.

If you do not have the equipment (measured calibration lamp, deuterium lamp, ...) for the calibration, please cancel the confirmation prompt by pressing the "Cancel" key.

After the security prompt, you are in the "Serial number" tab. Enter the serial number of your device here. You will find the serial number on the back of the device. As soon as you have entered the serial number, a check is made in the parameter files to see whether your device is already registered. If this is not the case, a corresponding message will be displayed and you can register your device again. If your device is already in the list, the settings for your device are loaded.



(SR600 only)

Now switch to the "Move" tab.

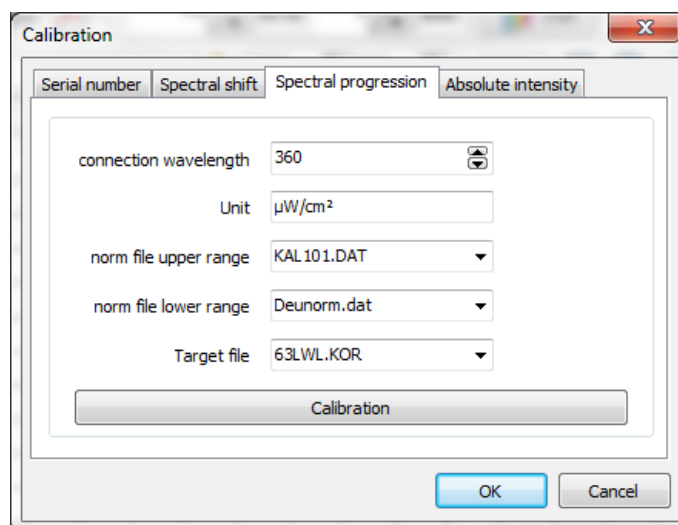
In the "Displacement" tab you have two setting options:

- Start diode:
By changing the start diode number, the position of the spectrum is changed. A fine calibration of the wavelength assignment is possible via this value.
- Dispersion:
Dispersion sets the spread of the spectrum. This value also influences the wavelength assignment.

Only change both values with the greatest care. Make a note of the set values before changing them. After making changes, always take measurements again and evaluate the result. Please note that the window is not displayed modally. I.e. you can use the "Start measurement" icon of the main window at any time without closing the window.

The mercury lines at 253.6 nm, 577.0 nm and 579.0 nm are well suited for setting the start diode number and dispersion. Very good values can be achieved by successively changing the start diode number and dispersion.

When you are satisfied with the wavelength assignment, please switch to the "Spectral Response" tab. "Course" tab.



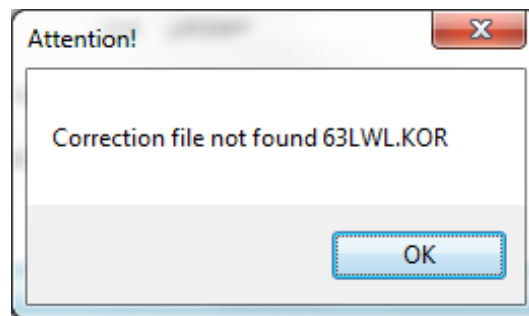
In the register "spec. Course" the spectral sensitivity of the receiver is corrected. The calibration lamps are required for this. The register has the following setting options:

- Link wavelength: The link point of the two partial calibrations can be set here.

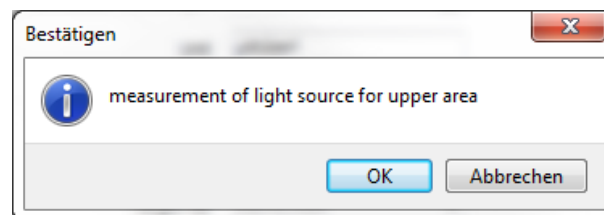
- Unit:
Here the unit can be changed. This function allows, for example, to change the calibration to Anglo-Saxon units of measurement.
- Standard file for the upper range:
File name of the standard file for the range from the link wavelength to 800nm. The structure and generation of the standard file is explained in chapter 11.11.
- Norm file for the lower range:
File name of the norm file for the range from 200nm up to the link wavelength. The structure and generation of the standard file is explained in chapter 11.11.

Target file: The file name for the calibration file to be created can be specified here. Please check if the file already exists. If necessary, use date coding in the file name to avoid accidentally overwriting an existing calibration file.

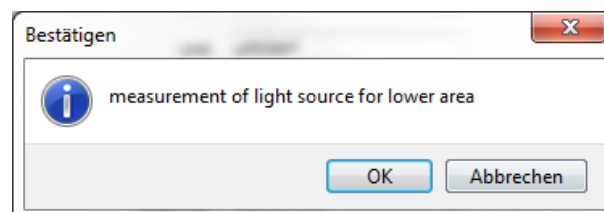
The actual calibration measurement is started with the "Calibration" button. The parameters of the measurement are taken over from the main window. First, it is checked whether the target file already exists. If it is available, it will be loaded. This serves for the fact that with partial calibrations automatically the other partial range is taken over. If the target file is not available, the following message is displayed.



The target file is then recreated and all values are set to zero. The query for the upper spectral range then takes place. If the calibration measurement for the upper spectral range is to be skipped, this can be done by pressing the "Cancel" key.

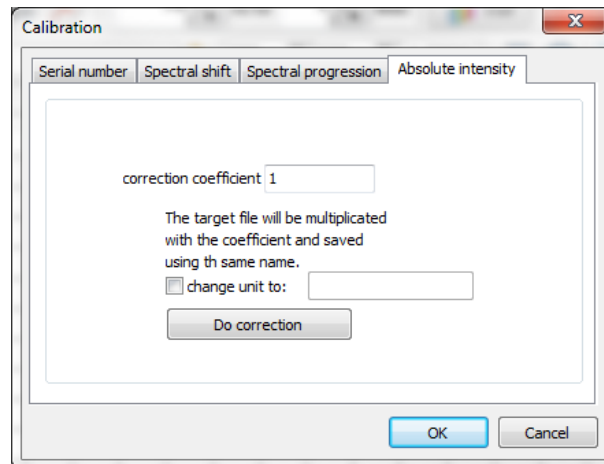


After confirming with "OK", the correction measurement for the upper spectral range is performed. The calibration file is then calculated from the raw data in such a way that the raw data multiplied by the calibration file results in the standard file for the upper spectral range. Values in the calibration file that are below the link wavelength are not changed by this process.



Subsequently, the measurement for the lower spectral range takes place. After the measurement, the values are adjusted so that the correct measured value is present at the connection wavelength.

After calibration has been completed, switch to the "Absolute Intensity" tab.



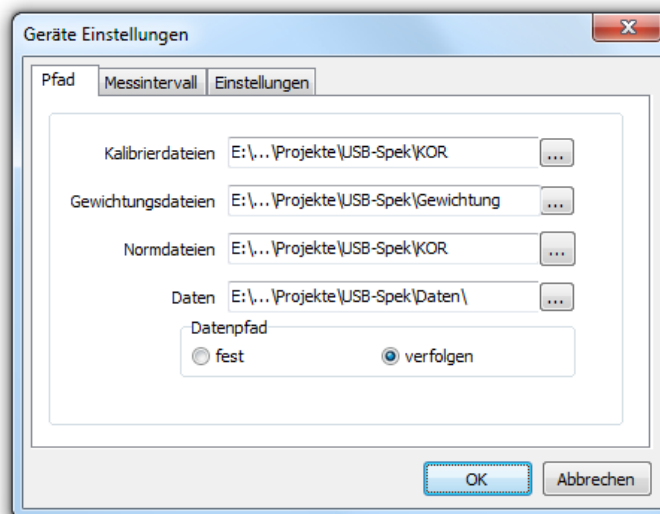
In the "Absolute Intensity" tab, you can correct the absolute intensity. This may be necessary if you have been given the absolute intensities and the irradiance at a certain distance for your calibration lamp but have not carried out the calibration at this distance. Then you can e.g. determine the irradiance ratio between target and actual irradiance at the nominal position and calculate it into the correction file with the button "Perform correction". The target file from the "Spectral course" tab is used as the correction file. Course" tab is used as the correction file.

10.8 Handling and saving the calibration files

To complete the transfer of the calibration, the calibration files must still be transferred.

With the delivery you will also receive the calibration files. These calibration files (*. SpecCal) must be copied to the corresponding directory (default: C:\ProgramData\SR600 \SpecCal). Use the Windows Explorer for this purpose.

If this path does not exist on your computer, you can look up the path for the calibration files in the menu item "Settings -> Device options" tab sheet "Directories".



Please copy the calibration files, then into the appropriate directory.



If protection against accidental manipulation or handling of user rights is desired, change the Windows security settings to **"Deny folder contents"**, as shown below as an example:



If protection against accidental manipulation or handling of user rights is desired, change the Windows security settings to **"Deny writing"** as shown below as an example:

The image displays two side-by-side screenshots of the Windows Security dialog box, titled "Berechtigungen für 'secure'" and "Berechtigungen für 'ini'". Both dialog boxes show the "Sicherheit" tab and the "Benutzer" group selected. The "secure" dialog shows "Ordnerinhalt anzeigen" checked under the "Verweigern" column. The "ini" dialog shows "Schreiben" checked under the "Verweigern" column.

Berechtigungen für "Benutzer"	Zulassen	Verweigern
Vollzugriff	<input type="checkbox"/>	<input type="checkbox"/>
Ändern	<input type="checkbox"/>	<input type="checkbox"/>
Lesen, Ausführen	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Ordnerinhalt anzeigen	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Lesen	<input checked="" type="checkbox"/>	<input type="checkbox"/>

Berechtigungen für "Benutzer"	Zulassen	Verweigern
Lesen, Ausführen	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Ordnerinhalt anzeigen	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Lesen	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Schreiben	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Spezielle Berechtigungen	<input type="checkbox"/>	<input type="checkbox"/>

11.11 Standards files

With the optional program NormFile ASCII files are converted by linear interpolation into a standard file for the calibration measurement. The step size as well as the start and end values of the source data are arbitrary. The source ASCII file must have the following format:

```
E.g.
[step size in nm] [CR]          5
[initial wavelength in nm] [CR] 300
[terminal wavelength in nm] [CR] 900
[Real value] [CR]              4.95029144673026E+0001
[Real value] [CR]              5.10178270335309E+0001
.
.
.
[Real value] [CR]              5.10178270335309E+0001
```

Press the Open button to load a corresponding source file. The step size, the start wavelength and the end wavelength will be displayed in the left fields.

Now you can change the step size and the wavelength range for the target data in the right input fields. These depend on the type of instrument used. For the standard spectrometer, these are already predefined.

Now press the "Save" button. The program then performs the interpolation and sets target values that could not be interpolated to 0. This is the case if the wavelength range of the source file does not cover the complete wavelength range of the target file. After the interpolation, the file name can be entered in a selection window. Please note that the program SPEKTROMETER.EXE can only process files of the type .DAT. Therefore you should always enter the type .DAT at this point. The standard files must be located in the subdirectory KOR.

ATTENTION! An already existing file will be overwritten without confirmation. Therefore, backup copies should be created.

The destination file has the following format.

e.g. Halnorm.dat

```
[Number of spectra(always 1)] [CR] 1
[Real value] [CR]                  4.95029144673026E+0001
[Real value] [CR]                  5.10178270335309E+0001
.
.
.
[Real value] [CR]                  5.10178270335309E+0001
```

12 Technical data

Spectral ranges	
Classification of spectral ranges	According to CIE
UV-C	200 - 280 nm
UV-B	280 - 315 nm
UV-A	315 - 400 nm
VIS	380 - 780 nm

General data SR600	
Dimensions (L x W x H)	145 x 260 x 315 mm
Weight	approx. 6.8 kg
Supply voltage	110 -230 VAC
Power consumption	15 W
Ambient temperature	+5 to 40 °C
Storage temperature, approx.	-10 to +50 °C
Humidity	0% to 80% rel. humidity
Cooling	Air cooling

Radiometric measurements SR600	
Spectral range	200 - 800 nm \pm 2nm
Spectral bandwidth	1.2 nm to 4 nm
Sampling Rate	7 ms - 60000 ms, automatically and manually adjustable
Cosine correction	yes
Calibration	yes, traceable to PTB
Calibration interval-, recommended	12 months

Mounting position, minimum distances	
Body position	horizontal
Minimum distances, top	2 cm
Minimum distances, lateral	2 cm

Optical parameters SR600	
Focus	140mm
Aperture	F/2
Grid	holographic concave grating, flat field type
Line count	285/mm
Dispersion	24 nm/mm
Step size	0.6 nm
Blaze wavelength	250 nm
Digital resolution	16 bit
Dark current at 20°C	ti = 60sec < 45% ti = 6sec < 4.5% ti = 0.6sec < 2.0% The dark current must be compensated during the measurement.
Shutter	integrated
Measuring frequency	max. 33Hz (30ms/spectrum)
Graphic structure	up to 2 frames/s (continuous measuring mode)
Fiber optic cable connection	Fiber optic cable connection
Fiber optic cable connection, bending radius	> 200 mm

Array SR600	
Array type	linear silicon photodiode array
Pixel count	1024
Pixel height	2.5 mm
Pixel width	25 µm
Receiver length	25.6 mm
Sensitivity	200 - 1000 nm (10% of the max. value)
Dynamic range, an integration time	Type. 4000 : 1
Dynamic range, max	10 ⁵
Sensitivity uniformity	+/- 3 % typical
Saturation charge	Type. 25pC

Connection SR600

Mit dem Menüpunkt **Triggerung von außen** legen Sie fest ob die Messung über den Steuereingang IN1 gestartet werden soll. Der Eingang IN1 befindet sich auf der Rückseite des Spektrometers an der 9-poligen Sub-D Buchse. Die Ein- bzw. Aus- Gänge an dem I/O-Port werden mit TTL-Level betrieben. Bild 34 zeigt die Lage und die Bedeutung der einzelnen Pins.

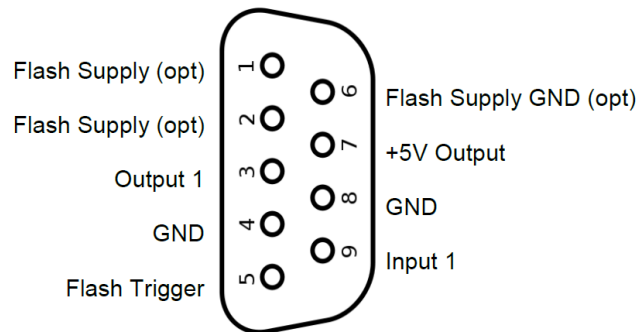


Abbildung 28: Die Pins des I/O-Ports

Vom Programm werden folgende Pins direkt angesteuert:

- 5 Triggerausgang für Blitz 1 (Flash Trigger 1)
- 3 Triggerausgang OUT1 (Output1)

Folgende Eingänge werden vom Programm gelesen:

- 9 Triggereingang IN1 (Input1)

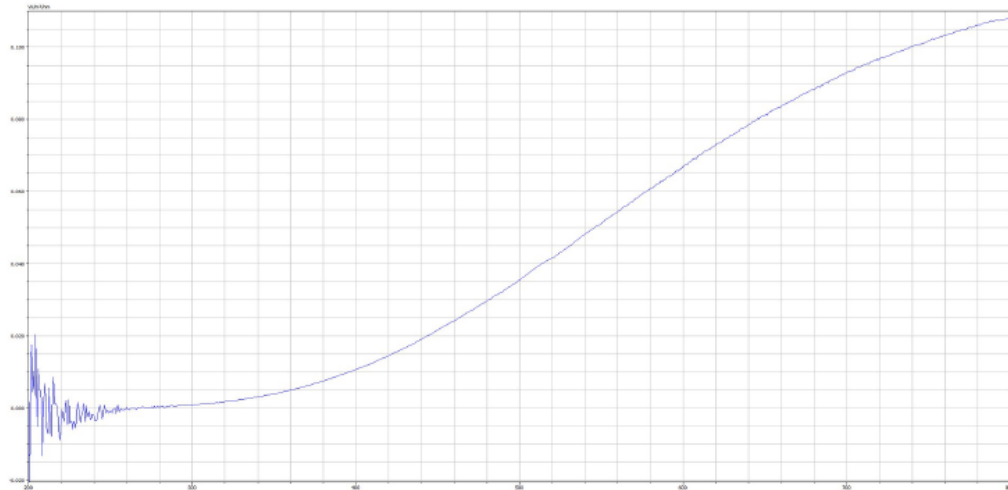
General data SR900	
Spectral range	200 - 1100 nm
versions:	measurement range
Standard	~ 1 - 200 mW/cm ²
High-Sensitive	~ 0,01 - 10 mW/cm ²
High-Power	~0,01 - 10 W/cm ²
Spectral resolution	0,44 nm (pixel pitch)
Spectral bandwidth	2,3 nm (FWHM)
Gratting	300 l/mm, holografic
Focal length	75 mm
Blaze wavelength	250 nm
Detector	SI
Pixel size	14 x 200 µm
Number of pixel	2048
Resolution	16 bit
Integrations time	0,1 ms to 60 s
Max. Dynamic range	105:1 with 3 measurements
Interface	USB
Trigger	rear connection
Dimensions	177 x 125 x 45 mm
Weight	1.2 kg
Supply voltage	5 V, 500 mA
Power	< 3 W
Operating temperature	5 to 40 °C
Storage temperature	-10 to 60 °C
Humidity	<80%, non-condensating
System requirements	Win 7/10, min 1 GB RAM

13 Appendix PDF protocol

Opsytec Dr. Gröbel GmbH



Ausgang mit FEL 860300101 nach Faktor 0.1.spec
24.10.2017 16:38:57



Irradiances

UV-A:	0,256 W/m ²
UV-B:	0,029 W/m ²
UV-C:	-0,034 W/m ²
All:	

Actinic irradiances

Lux:	0,000 Lux
Erythema:	

Wavelength

Peak wavelength:	800,00 nm	Dominant wavelength:	581,90 nm
Spectral centroid:	668,24 nm		

Colour coordinates 2°

x: 0,4230	y: 0,3995	z: 0,1775	Color temperature: 3211
-----------	-----------	-----------	-------------------------

Comment:	
<input type="checkbox"/> Ok	<input type="checkbox"/> not OK
Main user	
Editor	Signature
Date / Time	

Integration time: 4000,89 ms
Average: 2

Darkmeasurement: on
Offset: 200 nm - 220 nm

Correction file: XXSISE20171023 - 4_SpecCal
Recording level: 19,06 %

O:\Labor\20171020 KIT SR600\20171023 nach Diffusorkopfwechsel\Ausgangsmessung_final\Ausgang mit FEL 860300101 nach Faktor 0.1.spec

1 Spare parts , calibration and maintenance



When ordering spare parts, please contact:

Opsytec Dr. Gröbel GmbH

Am Hardtwald 6-8

76275 Ettlingen

Germany

Phone +49 - 7243 - 94 783 - 50

Fax +49 - 7243 - 94 783 - 65

Visit us on the Internet: www.opsytec.de

14 Declaration of Conformity



Manufacturer :	Company name: Opsytec Dr. Gröbel GmbH Street: Am Hardtwald 6-8 City: 76275 Ettlingen Country: Deutschland
Person authorized to compile the technical documentation	Company name: Opsytec Dr. Gröbel GmbH Street: Am Hardtwald 6-8 City: 76275 Ettlingen Country: Deutschland
Product:	Spektrometer SR600 with Software SRpro Spektrometer SR900 with Software SRpro
Type designation:	SR600 / SR900 / SRpro

The manufacturer hereby declares that we have developed, designed and manufactured the above product(s) under our sole responsibility and that the product complies with the following standard(s) or directive(s) in this declaration:

2014/35/EU

“Directive of the European Parliament and of the Council on the harmonization of the laws of the Member States regarding the provision of electrical equipment for use within certain voltage limits on the market (Low-Voltage Directive)“.

2006/42/EG

“Directive of the European Parliament and of the Council on machinery and amending Directive 95/16/EG (Machinery Directive)“.

2014/30/EU

Directive of the European Parliament and of the Council relating to electromagnetic compatibility (EMC Directive, recast)“.

Ettlingen, 19.10.2019

gez. Dr. Mark Paravia