



Spectrometer

# CCS Series Spectrometer Operation Manual



2023

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Version: 2.3  
Date: 09-Mar-2023

# Contents

<b>Foreword</b>	<b>2</b>
<b>1 General Information</b>	<b>3</b>
1.1 Safety	3
1.2 Ordering Codes and Accessories	4
1.3 Requirements	4
<b>2 Getting Started</b>	<b>6</b>
2.1 Parts List	6
2.2 Software Installation	6
2.3 Operating Elements	7
2.4 Setup	7
<b>3 ThorSpectra with CCS</b>	<b>9</b>
3.1 Connecting CCSx to ThorSpectra	9
3.2 Device Setup in ThorSpectra	10
3.2.1 Common Settings	11
3.2.2 Amplitude Correction	11
3.2.3 Wavelength Calibration	14
<b>4 Write Your Own Application</b>	<b>17</b>
4.1 NI VISA Instrument driver 32bit on 32bit systems	18
4.2 NI VISA Instrument driver 32bit on 64bit systems	20
4.3 NI VISA Instrument driver 64bit on 64bit systems	22
<b>5 Maintenance and Service</b>	<b>24</b>
5.1 Version Information	24
5.2 Troubleshooting	25
<b>6 Appendix</b>	<b>26</b>
6.1 Technical Data	26
6.2 Dimensions	27
6.3 Certifications and Compliances	28
6.4 Return of Devices	28
6.5 Manufacturer/Importer Address	29
6.6 Warranty	29
6.7 Copyright and Exclusion of Liability	29
6.8 Thorlabs Worldwide Contacts	30

We aim to develop and produce the best solutions for your applications in the field of optical measurement techniques. To help us to live up to your expectations and constantly improve our products, we need your ideas and suggestions. We and our international partners are looking forward to hearing from you.

*Thorlabs GmbH*

## **Warning**

Sections marked by this symbol explain dangers that might result in personal injury or death. Always read the associated information carefully, before performing the indicated procedure.

## **Attention**

Paragraphs preceded by this symbol explain hazards that could damage the instrument and the connected equipment or may cause loss of data.

## **Note**

This manual also contains "NOTES" and "HINTS" written in this form.

Please read this advice carefully!

# 1 General Information

## CCS Spectrometers

Thorlabs' fiber-based, compact, Czerny-Turner [CCD spectrometers](#) are available in three models. Two models feature sub-nanometer accuracy and have a detection range of 350 nm - 700 nm (CCS110x) or 500 nm - 1000 nm (CCS175x). The CCS200 offers a wide 200 nm - 1000 nm spectral range with better than 2 nm accuracy.

With the small footprint (122 mm x 79 mm x 29.5 mm), all units share features with larger, more expensive spectrometers such as the ability to be synchronized via a TTL trigger input (up to 100 Hz) and to automatically compensate for noise created by dark current.

The CCS Series Spectrometer is designed for general laboratory use. Integrated routines allow averaging, smoothing, peak indexing, as well as saving and recalling data sets.

## ThorSpectra Application Software

The Thorlabs [ThorSpectra](#) software fully supports the remote control of the Thorlabs CCS series spectrometers in direct, transmittance, and absorbance measurements. Aside from the [CCD spectrometer](#) series, the ThorSpectra software supports the Thorlabs' [optical spectrum analyzers](#).

### Attention

Please find all safety information and warnings concerning this product in the chapter [Safety](#).

## 1.1 Safety

### Attention

The safety of any system incorporating the equipment is the responsibility of the assembler of the system.

All statements regarding safety of operation and technical data in this instruction manual will only apply when the unit is operated correctly as it was designed for.

The CCS Series Spectrometer must not be operated in explosion endangered environments!

Do not remove covers!

Do not open the cabinet. There are no parts serviceable by the operator inside!

This precision device is only serviceable if properly packed into the complete original packaging including the plastic foam sleeves. If necessary, ask for replacement packaging.

Refer servicing to qualified personnel!

Only with written consent from Thorlabs may changes to single components be made or components not supplied by Thorlabs be used.

### Attention

The following statement applies to the products covered in this manual, unless otherwise specified herein. The statement for other products will appear in the accompanying documentation.

### Note

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harm-

ful interference in which case the user will be required to correct the interference at his own expense.

Users that change or modify the product described in this manual in a way not expressly approved by Thorlabs (party responsible for compliance) could void the user's authority to operate the equipment.

Thorlabs is not responsible for any radio television interference caused by modifications of this equipment or the substitution or attachment of connecting cables and equipment other than those specified by Thorlabs. The correction of interference caused by such unauthorized modification, substitution or attachment will be the responsibility of the user.

The use of shielded I/O cables is required when connecting this equipment to any and all optional peripheral or host devices. Failure to do so may violate FCC and ICES rules.

### **Attention**

Mobile telephones, cellular phones or other radio transmitters are not to be used within the range of three meters of this unit since the electromagnetic field intensity may then exceed the maximum allowed disturbance values according to IEC 61326-1.

This product has been tested and found to comply with the limits according to IEC 61326-1 for using connection cables shorter than 3 meters (9.8 feet).

## 1.2 Ordering Codes and Accessories

<b>CCS100(/M)</b> <sup>1</sup>	CCS Spectrometer 350 nm - 700 nm; Optical Fiber SMA to SMA, 50 $\mu$ m / 0.22 NA
<b>CCS175(/M)</b> <sup>1</sup>	CCS Spectrometer 500 nm - 1000 nm; Optical Fiber, SMA to SMA, 50 $\mu$ m / 0.22 NA
<b>CCS200(/M)</b> <sup>1</sup>	CCS Spectrometer, 200 - 1000nm; Optical Fiber SMA to SMA, 50 $\mu$ m / 0.22 NA

<sup>1</sup>CCSxxx = Imperial Version, Mounting Holes 1/4-20  
CCSxxx/M = Metric Version, Mounting Holes M6x1

### Optional Accessories and Replacements

<b>M14L01</b>	1 m SMA MMF Patch Cable, 50 $\mu$ m / 0.22 NA. Replacement for Optical Fiber Included with CCS100 and CCS175.
<b>FG200UCC</b>	1 m SMA MMF Patch Cable, 200 $\mu$ m / 0.22 NA, High OH. Replacement for the Optical Fiber Included CCS200)
<b>CVH100; CVH100/M</b>	Cuvette Holder (Imperial and Metric Versions)

### **Attention**

Make sure to use your CCS spectrometer only with the included fiber (see above table). If using a different fiber, the Amplitude Correction Calibration will be affected!

## 1.3 Requirements

These are the requirements to the PC intended to be used for remote operation of the CCS Series Spectrometer. with the ThorSpectra software.

### Minimum Requirements

- Operating System: Windows<sup>®</sup> 7 SP1, Windows<sup>®</sup> 8, Windows<sup>®</sup> 10, or Windows<sup>®</sup> 11 (64 bit)

- Free USB 2.0 high speed port (Notice that a USB 1.1 port cannot be used)
- Processor: Intel Core i5™ or AMD Athlon II
- 8.0 GB RAM
- .NET framework 4.7.2 or higher
- Monitor Resolution: 800 x 600 Pixel

### **Recommended Requirement**

- Operating System: Windows® 11 (64 bit)
- Free USB 2.0 or 3.0 high speed port (Notice that a USB 1.1 port cannot be used)
- Processor: Intel™ Core i9 or AMD Athlon Ryzen
- 16.0 GB RAM
- .NET framework 4.7.2 or higher
- Java Runtime 1.6 or higher

### **Note**

An installer for .NET framework 4.7.2 is included in the full installer.

Please be aware that the ThorSpectra software requires a number of third party software installed on your system. The installer checks for these software components and, if necessary, will install them automatically. You will be notified accordingly.

### **Attention**

Do not connect the instrument to your PC before the software has been completely installed.

## 2 Getting Started

### 2.1 Parts List

Inspect the shipping container for damage. If the shipping container seems to be damaged, keep it until you have inspected the contents and you have inspected the CCS Series Spectrometer mechanically and electrically.

Verify that you have received the following items within the package:

1. 1x CCS Series Spectrometer
2. 1x USB 2.0 A-B mini cable, 1.5 m
3. CCS100 and CCS175: 1x Optical Fiber, SMA to SMA, 50  $\mu\text{m}$  / 0.22 NA, 1 m  
CCS200: 1x Optical Fiber, SMA to SMA, 50  $\mu\text{m}$  / 0.22 NA, 1 m
4. Trigger Input cable SMB to BNC
5. Quick Reference

#### Attention

Make sure to use the CCS spectrometer only with the included fiber (see above table). Use of a different fiber will affect the Amplitude Correction Calibration.

### 2.2 Software Installation

The ThorSpectra software can be downloaded from the Thorlabs website:

[https://www.thorlabs.de/software\\_pages/ViewSoftwarePage.cfm?Code=CCS](https://www.thorlabs.de/software_pages/ViewSoftwarePage.cfm?Code=CCS)

#### Note

Do not connect an instrument supported by the ThorSpectra software to the PC during software installation! The installation package includes CCS Series Spectrometer specific drivers and software that must be installed before the CCS Series Spectrometer is connected to the PC for the first time. Administrator privileges are required for installation.

Please make sure that the installation is carried out completely, including the reboot requests.

- Save the ZIP file to your computer and unpack the archive.
- Double click the setup.exe to start the Install Shield Wizard.
- Read and accept the End-User License Agreement and the GNU Lesser General Public License.
- After installing the ThorSpectra, connect the spectrometer to the PC.

#### Start Application

Start the ThorSpectra Software from the desktop icon:





## 2.3 Operating Elements

### CCS Spectrometer - Ports and Signal LEDs



- (1) USB Port
- (2) Fiber Input (SMA Connector)
- (3) Status LED
- (4) Trigger Input (SMB Connector)

#### Attention

Make sure to use your CCS spectrometer only with the included fiber. If using a different fiber, the Amplitude Correction Calibration will be affected.

## 2.4 Setup

Place this bench top device onto a stable, dry surface. The spectrometer needs to be positioned less than 1.5 m from the PC to be used and less than 1 m from the light source. This is due to the USB cable length and the optical fiber length, respectively.

1. Download the ThorSpectra Software from the [CCS-Website](#) website and install it on the PC that will be used with the CCS spectrometer.

**Note** Do not connect the spectrometer to the PC prior to installing the ThorSpectra software.

2. Connect the CCS spectrometer to the remote controlling PC using the included USB 2.0 cable. Use of alternative cables may result in aborted measurements or stalling of the software.
3. Start the ThorSpectra software.
4. The CCS Spectrometer is now ready for operation and is recognized by the ThorSpectra software. The operating system loads the appropriate USB drivers for the CCS spectrometer instrument.

### Note

Please find detailed instructions on the ThorSpectra Software in the [ThorSpectra manual](#) on the [optical spectrum analyzer](#) website. CCS specific features of the ThorSpectra software are described in section [ThorSpectra with CCS](#).

### 3 ThorSpectra with CCS

The [ThorSpectra software](#) provides a user friendly GUI for the CCS spectrometers and guides the user through the instrument setup with amplitude correction and wavelength calibration as well as acquisition and analysis of spectra.

This chapter explains features of the ThorSpectra software which are specific to the CCS spectrometers.

General operating instructions on the ThorSpectra software can be found in the [ThorSpectra manual](#).

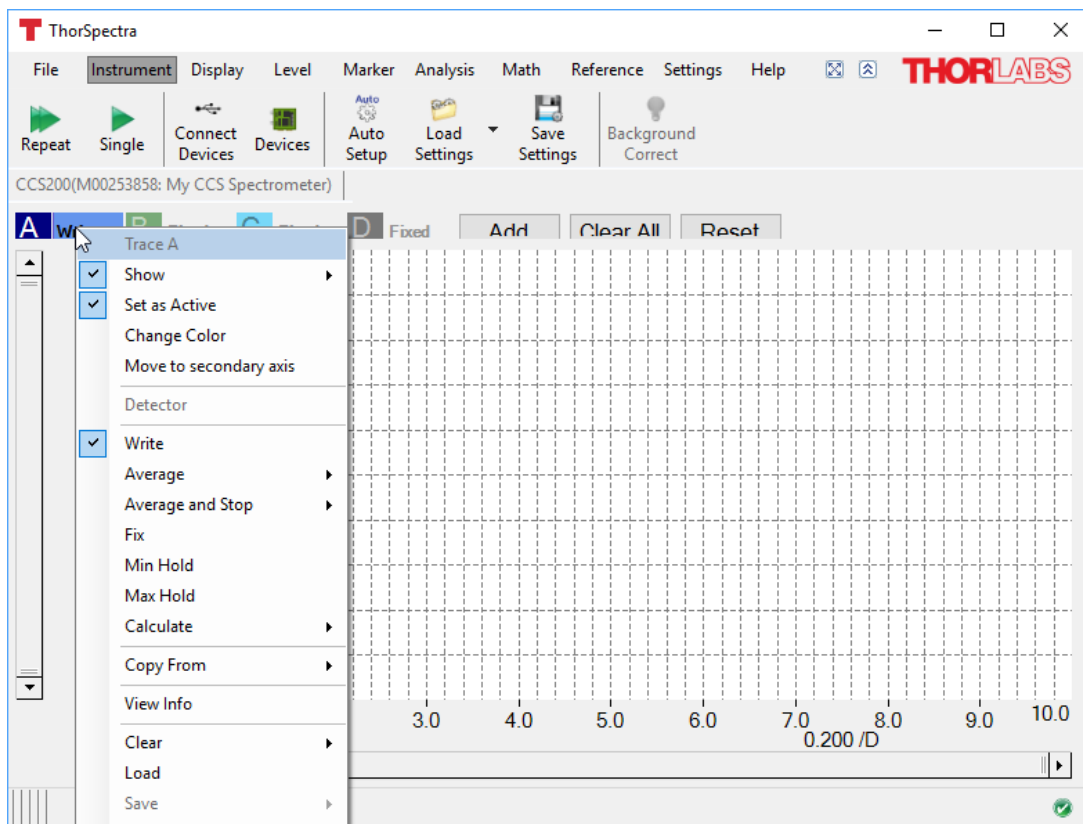
#### 3.1 Connecting CCSx to ThorSpectra

Connect the CCS spectrometer to the PC with the ThorSpectra software already installed and open the software. The CCS spectrometer will be immediately recognized.

**Note** Whenever the CCS spectrometer is connected while the software is open, select the button "Connect Devices" in the top panel.

1. Within the ThorSpectra software, click to trace A and make sure that the topics below are checked.

- Show
- Set as Active
- Write



2. Apply an optical input signal to the fiber input. Increase the integration time until the spectrum is displayed. A right click into the data display area zooms in the intensity axis to its best fit to the spectrum.

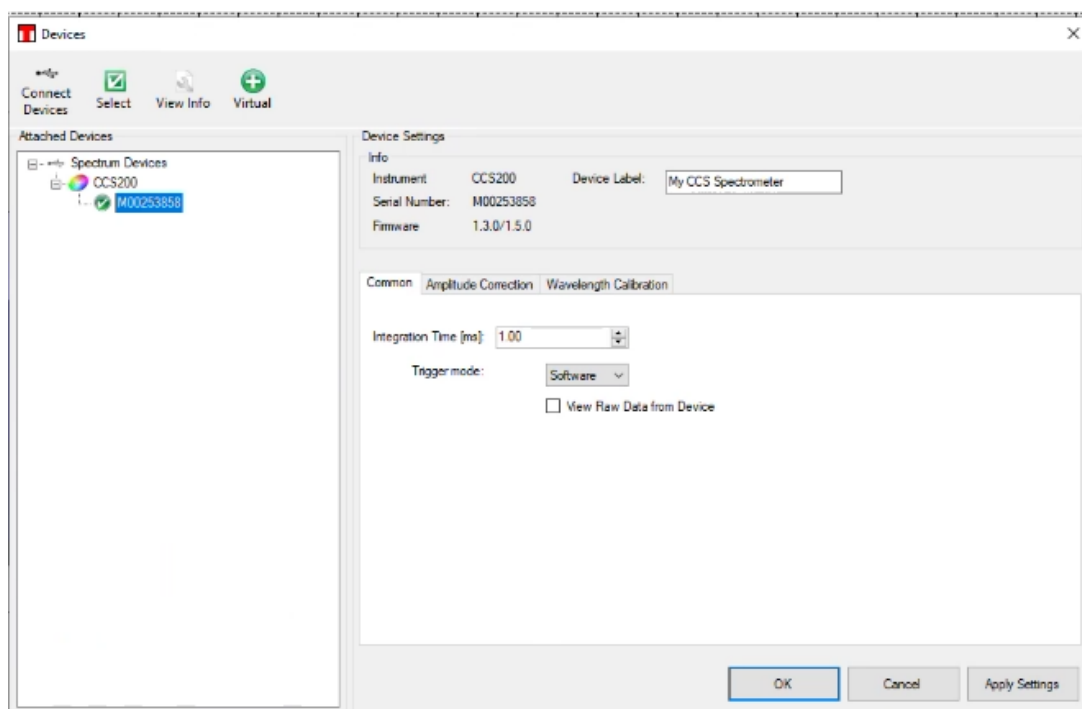
**Note**

If you are using a CCS200 broadband spectrometer and a continuous spectrum (e.g. of a white light lamp) shall be measured, please note the following recommendation:

Due to the eccentricity between the fiber core and the ferrule of the delivered FG200UCC MMF and the geometry of the input slit of the spectrometer, the displayed spectral intensity may vary when the SMA connector of the fiber is rotated within the input receptacle of the CCS200. Please find the maximum intensity by rotation and then fix the fiber connector with the lock bush. This ensures best measurement results.

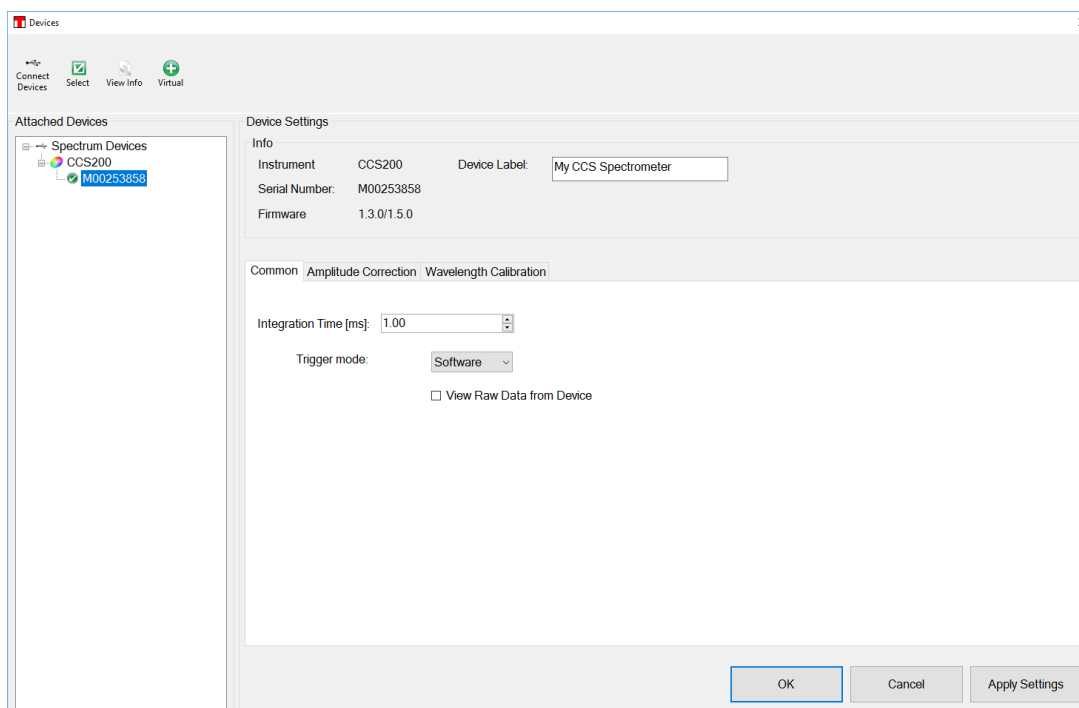
## 3.2 Device Setup in ThorSpectra

The CCS spectrometer can now be configured within the software for [common settings](#), [amplitude correction](#) and [wavelength calibration](#). Select the icon "Devices" in the main menu to reach the respective interfaces.



### 3.2.1 Common Settings

Select the icon "Devices" in the main menu to reach the following interface to set up the spectrometer.



In the Common interface, set integration time and trigger mode. The integration time can be set between 10 $\mu$ s and 60 s. The trigger source can be internal (software trigger) or external via the [SMB connector](#).

### 3.2.2 Amplitude Correction

The Amplitude Correction function corrects the displayed spectrum with respect to the wavelength dependent responsivity of the spectrometer.

Amplification solely based on the wavelength dependent responsivity causes increase in the noise at wavelength with lower responsivity, as not only the signal is amplified, but also the noise.

To focus on the wavelength range of interest or to exclude wavelength ranges with high amplification (also high noise amplification), the ThorSpectra software has two modes of amplification correction:

- [Noise Amplification](#)
- [Wavelength Calibration](#)

#### Note

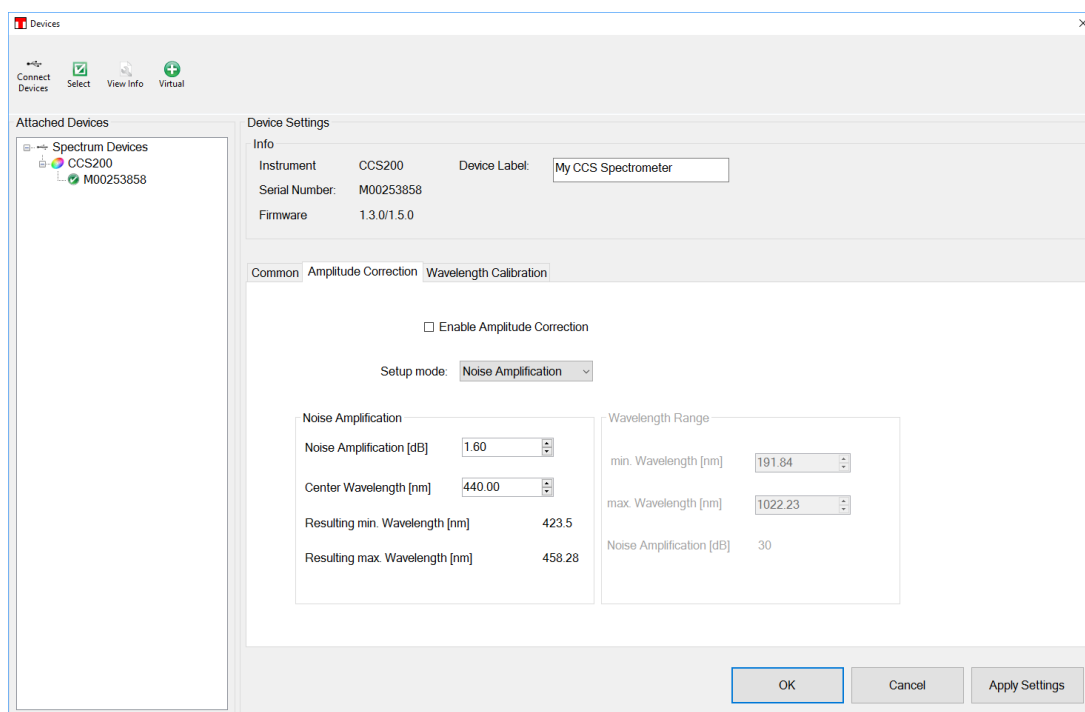
The amplitude correction will work properly only if the CCS spectrometer was factory calibrated for amplitude correction!

The factory amplitude correction can be carried out only for wavelengths > 380 nm.

## Noise Amplification

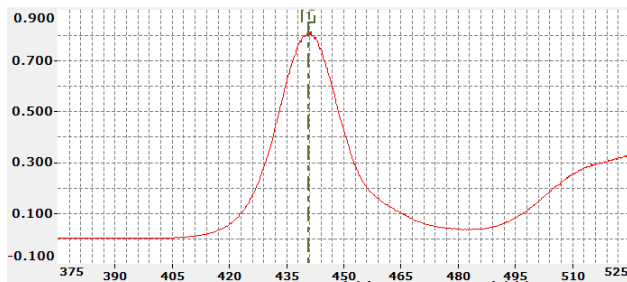
Noise amplification mode is recommended if weak intensities are measured and minimal noise interference is required. The level of amplification around a defined center wavelength can be set. In the interface shown below, configure the following:

1. Enable Amplitude Correction.
2. Select the Noise Amplification mode.
3. Set the maximum amplification to be permitted in "Noise Amplification (dB)".
4. Set the center wavelength around which to correct the signal with respect to the responsivity in "Center Wavelength (nm)".
5. The ThorSpecta software calculates the wavelength range within which the signal is not amplified by more than the defined "Noise Amplification" value defined above. This calculation is based on the spectrometer responsivity. This range is then noted in the interface under "Resulting min." and "Resulting max." Wavelength

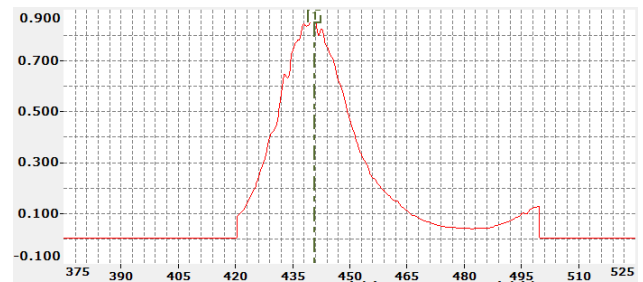


**Example:** The screenshots below illustrate how enabling the amplitude correction with the noise amplification mode affects the displayed spectrum. In this example, the spectrum of a cold-white LED with the settings shown above is displayed with or without noise amplitude correction.

For better visualization, a line marker is inserted at the center wavelength range:



Spectrum with Amplitude Correction disabled



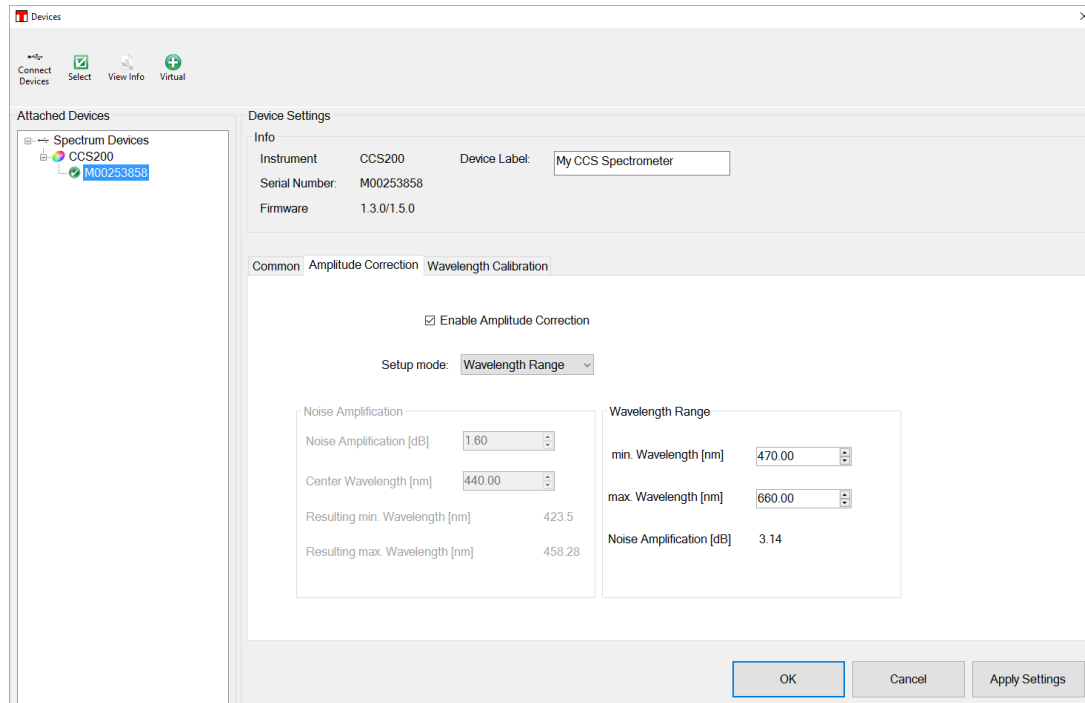
Spectrum with Amplitude Correction enabled

## Wavelength Range

The Wavelength Range mode is recommended for accurate intensity results within a user defined wavelength range.

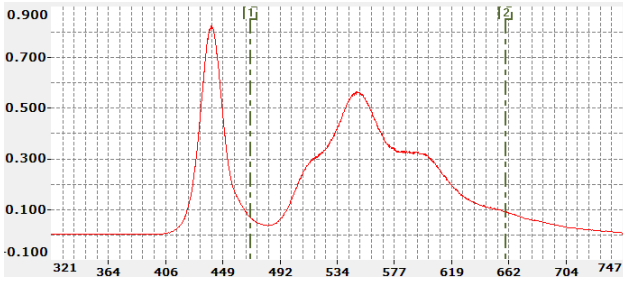
In the interface shown below, configure the following settings:

1. Enable Amplitude Correction.
2. Select the Wavelength Range mode.
3. Set the minimum wavelength in nanometer.
4. Set the maximum wavelength in nanometer.
5. The maximal signal amplification within this wavelength range as calculated based on the spectrometer responsivity is noted as the "Noise Amplification [dB]".

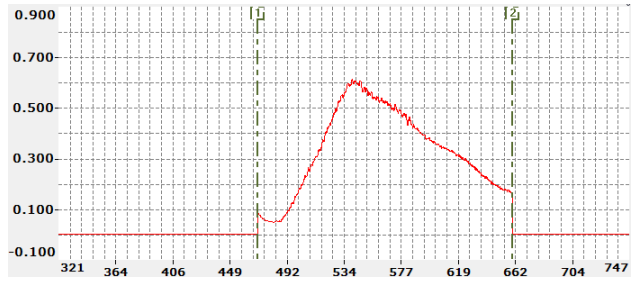


**Example:** The screenshots below illustrate how enabling the amplitude correction with the wavelength range mode affects the displayed spectrum. In this example, the spectrum of a cold-white LED with the settings shown above (intensities between 470 nm and 660 nm) is displayed with or without amplitude correction in wavelength range mode.

For better visualization, a line marker is inserted at the center wavelength range:



Spectrum with Amplitude Correction disabled



Spectrum with Amplitude Correction enabled

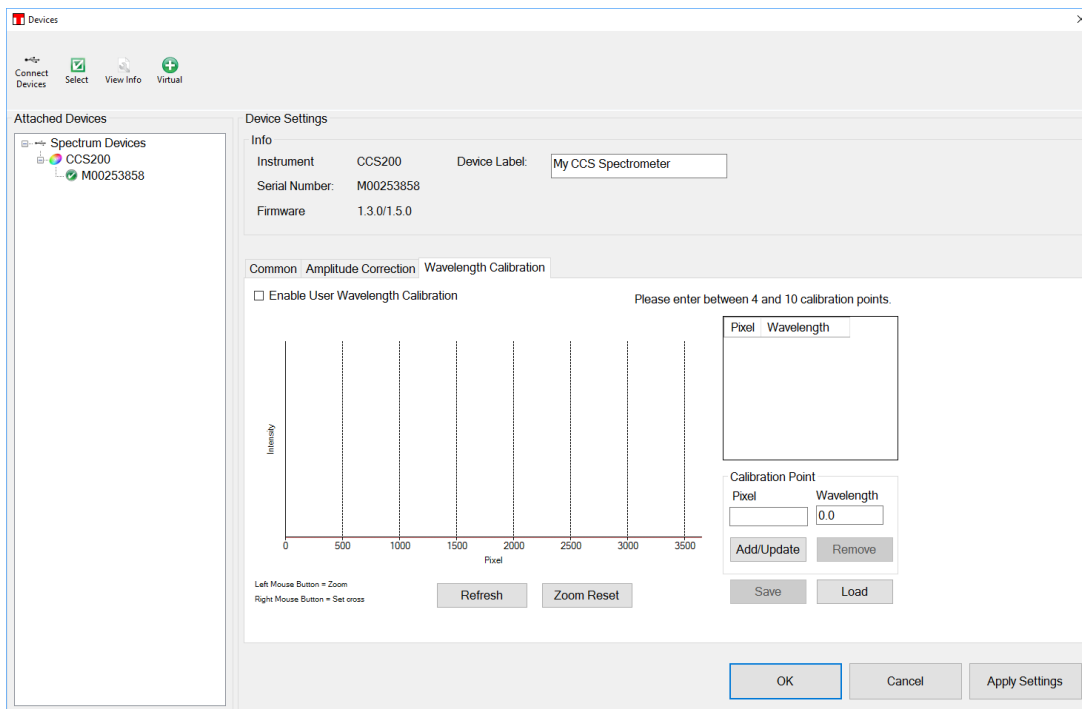
### 3.2.3 Wavelength Calibration

The sensor of the Thorlabs CCS spectrometers is a CCD line array. The spectrometer optics direct the light of a certain wavelength to a certain pixel on the CCD line. Each CCS spectrometer is factory calibrated, using a calibration source with well-known spectral lines. The factory calibration defines the exact wavelength for certain pixels. Between these pixels (or calibration points), the wavelength is interpolated. The calibration data are saved to the internal non-volatile memory of the CCS spectrometer

In certain cases a more detailed calibration, based on an available calibrated spectral source, might be desired. Within the ThorSpectra software, the user can calibrate the CCS spectrometer for 4 to 10 individual calibration points. This replaces the factory calibration with a user calibration.

In order to calibrate the spectrometer, please follow the direction below:

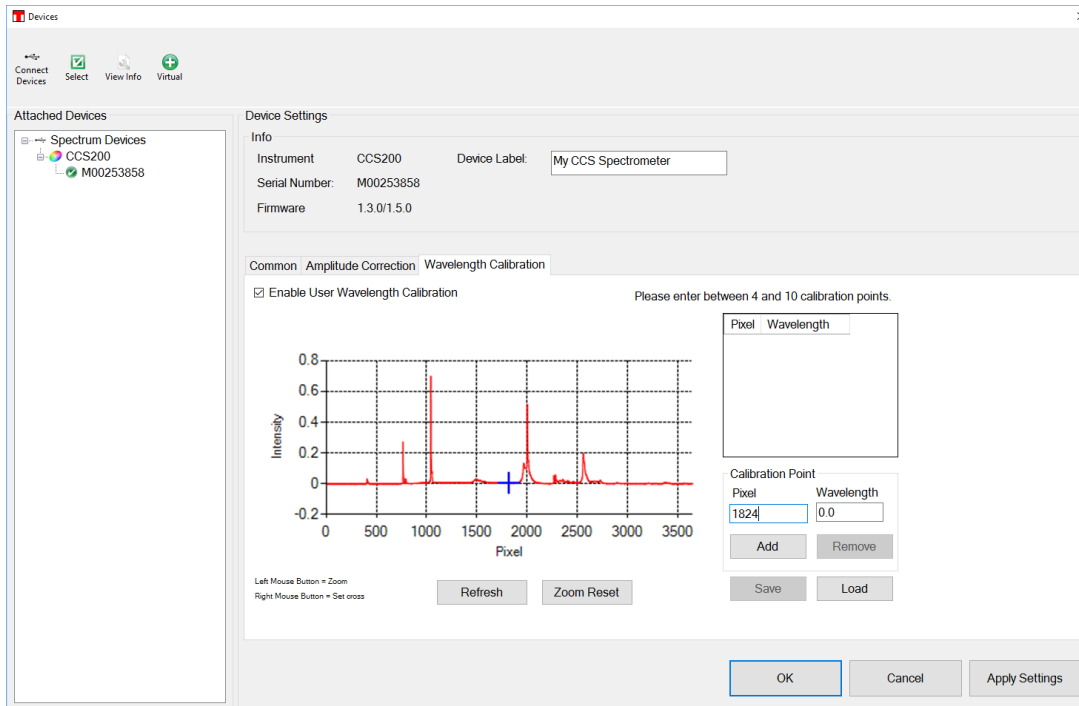
1. Apply the individual spectral source to the CCS spectrometer input.
2. Adjust the integration time in such way that maximum intensities are displayed without entering saturation.
3. Within the ThorSpectra software, open the interface "Device" in the main menu and activate the tab "Wavelength Calibration" (see below).





## 4. Enter between 4 and 10 calibration points as follows:

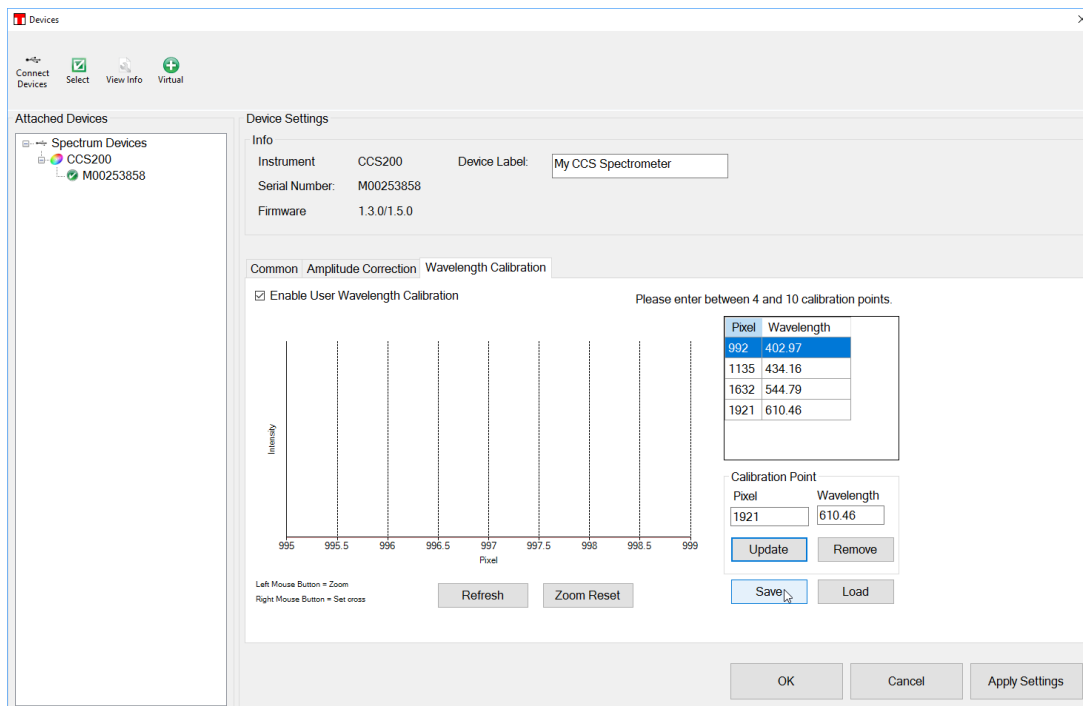
- a. Mark a calibration point in the spectrum to the left: Move the mouse to the peak and press right mouse button. The peak is marked by a blue cross and the related pixel number is displayed in the panel "Calibration Point":



- b. Enter the corresponding wavelength in the panel Calibration Point.

- c. Select "Add/ Update" - the table will be updated.

- d. Repeat this procedure for up to 10 calibration points. The example below shows a table for 4 calibration points:



5. After the calibration table is completed, press "Save". The user calibration points are now stored to the CCS spectrometer EEPROM in addition to the factory calibration. Following the user calibration procedure, the wavelength calibration can be switched between Factory and

User Calibration by checking the box "Enable User Wavelength Calibration". A new user calibration will overwrite the previous user calibration.

## 4 Write Your Own Application

In order to write your own application, you need a specific instrument driver and some tools for use in different programming environments. The driver and tools are being installed to your computer during software installation.

In this section the location of drivers and files, required for programming in different environments, are given for installation under Windows® 10 (32 bit and 64 bit).

### Note

OSA software and drivers are available as 32 bit and 64 bit applications. As for this reason, in 32 bit systems only the 32 bit versions are installed, they are installed to

C:\Program Files\... (executables)  
C:\Windows\System32\... (libraries/DLLs)

while in 64 bit systems – both the 32 bit and the 64 bit versions are installed to:

C:\Program Files\... (64bit executables)  
C:\Windows\System32\... (64bit libraries/DLLs)  
C:\Program Files (x86)\... (32bit executables)  
C:\Windows\SysWOW64\... (32bit libraries/DLLs)

In the table below you will find a summary of what files you need for particular programming environments.

Programming environment	Necessary files
<b>C, C++, CVI</b>	*.h (header file) *.lib (static library)
<b>C#</b>	.net wrapper dll
<b>Visual Studio</b>	*.h (header file) *.lib (static library) or .net wrapper dll
<b>LabView</b>	*.fp (function panel) and NI VISA instrument driver Beside that, LabVIEW driver vi's are provided with the *.llb container file

### Note

All above environments require also the NI VISA instrument driver dll !

In the next sections the location of above files for all hardware, supported by OSA CCS drivers, is described in detail.

## 4.1 NI VISA Instrument driver 32bit on 32bit systems

C:\Program Files\IVI Foundation\VISA\WinNT\Bin\TLCCS\_32.dll

### Note

This instrument driver is required for all development environments!

The source code of this driver can be found in

C:\Program Files\IVI Foundation\VISA\WinNT\Thorlabs CCSseries\TLCCS.c

### Online Help for NI VISA Instrument driver:

C:\Program Files\IVI Foundation\VISA\WinNT\Thorlabs CCSseries\...  
...Manual\TLCCS.html

### NI LabVIEW driver (including an example VI)

C:\Program Files\National Instruments\LabVIEW xxxx\Instr.lib\...  
...TLCCS\TLCCS.llb

(LabVIEW container file with driver vi's - "LabVIEW xxxx" stands for actual LabVIEW installation folder.)

### Header file

C:\Program Files\IVI Foundation\VISA\WinNT\include\TLCCS.h

### Static Library

C:\Program Files\IVI Foundation\VISA\WinNT\lib\msc\TLCCS\_32.lib

### Function Panel

C:\Program Files\IVI Foundation\VISA\WinNT\Thorlabs CCSseries\...  
...TLCCS.fp

### .net wrapper dll

C:\Program Files\Microsoft.NET\Primary Interop Assemblies\...  
...Thorlabs.ccs.interop.dll

### Example for C

C:\Program Files\IVI Foundation\VISA\WinNT\Thorlabs CCSseries\...  
...Examples\C

sample.c - C program how to communicate with a CCS series spectrometer

sample.exe - same, but executable

### Example for C#

Solution file:

C:\Program Files\IVI Foundation\VISA\WinNT\Thorlabs CCSseries\...  
...Examples\CSharp\CCS100\_CSharpDemo.sln

**Project file**

C:\Program Files\IVI Foundation\VISA\WinNT\Thorlabs CCSseries\...  
...Examples\CSharp\CCS100\_CSharpDemo\CCS100\_CSharpDemo.csproj

**Executable sample demo**

C:\Program Files\IVI Foundation\VISA\WinNT\Thorlabs CCSseries\...  
...Examples\CSharp\CCS100\_CSharpDemo\bin\Release\CCS100\_CSharpDemo.exe

**Example for LabView**

Included in driver llb container

## 4.2 NI VISA Instrument driver 32bit on 64bit systems

C:\Program Files (x86)\IVI Foundation\VISA\WinNT\Bin\TLCCS\_32.dll

### Note

This instrument driver is required for all development environments!

The source code of this driver can be found in

C:\Program Files (x86)\IVI Foundation\VISA\WinNT\...  
...Thorlabs CCSseries\TLCCS.c

### Online Help for NI VISA Instrument driver:

C:\Program Files (x86)\IVI Foundation\VISA\WinNT\...  
...Thorlabs CCSseries\Manual\TLCCS.html

### NI LabVIEW driver (including an example VI)

C:\Program Files (x86)\National Instruments\LabVIEW xxxx\...  
...Instr.lib\TLCCS\TLCCS.llb

(LabVIEW container file with driver vi's - "LabVIEW xxxx" stands for actual LabVIEW installation folder.)

### Header file

C:\Program Files (x86)\IVI Foundation\VISA\WinNT\include\TLCCS.h

### Static Library

C:\Program Files (x86)\IVI Foundation\VISA\WinNT\lib\msc\TLCCS\_32.lib

### Function Panel

C:\Program Files (x86)\IVI Foundation\VISA\WinNT\...  
...Thorlabs CCSseries\TLCCS.fp

### .net wrapper dll

C:\Program Files (x86)\Microsoft.NET\Primary Interop Assemblies\...  
...Thorlabs.ccs.interop.dll

### Example for C

C:\Program Files (x86)\IVI Foundation\VISA\WinNT\Thorlabs CCSseries\...  
...Examples\C

sample.c - C program how to communicate with a CCS series spectrometer

sample.exe - same, but executable

### Example for C#

Solution file:

C:\Program Files (x86)\IVI Foundation\VISA\WinNT\Thorlabs CCSseries\...  
...Examples\CSharp\CCS100\_CSharpDemo.sln

### Project file

```
C:\Program Files (x86)\IVI Foundation\VISA\WinNT\Thorlabs CCSseries\...  
...Examples\CSharp\CCS100_CSharpDemo\CCS100_CSharpDemo.csproj
```

### Executable sample demo

```
C:\Program Files (x86)\IVI Foundation\VISA\WinNT\Thorlabs CCSseries\...  
...Examples\CSharp\CCS100_CSharpDemo\bin\Release\CCS100_CSharpDemo.exe
```

### Example for LabView

Included in driver llb container.

## 4.3 NI VISA Instrument driver 64bit on 64bit systems

C:\Program Files\IVI Foundation\VISA\Win64\Bin\TLCCS\_64.dll

### Note

This instrument driver is required for all development environments!

The source code of this driver can be found in

C:\Program Files (x86)\IVI Foundation\VISA\WinNT\...  
...Thorlabs CCSseries\TLCCS.c

### Online Help for NI VISA Instrument driver:

C:\Program Files (x86)\IVI Foundation\VISA\WinNT\...  
...Thorlabs CCSseries\Manual\TLCCS.html

### NI LabVIEW driver (including an example VI)

C:\Program Files\National Instruments\LabVIEW xxxx\...  
...Instr.lib\TLCCS\TLCCS.llb

(LabVIEW container file with driver vi's - "LabVIEW xxxx" stands for actual LabVIEW installation folder.)

### Header file

C:\Program Files (x86)\IVI Foundation\VISA\WinNT\...  
...include\TLCCS.h

### Static Library

C:\Program Files\IVI Foundation\VISA\Win64\lib\_x64\...  
...msc\TLCCS\_64.lib

### Function Panel

C:\Program Files (x86)\IVI Foundation\VISA\WinNT\...  
...Thorlabs CCSseries\TLCCS.fp

### .net wrapper dll

C:\Program Files (x86)\Microsoft.NET\Primary Interop Assemblies\...  
...Thorlabs.ccs.interop64.dll

### Example for C

C:\Program Files (x86)\IVI Foundation\VISA\WinNT\...  
...Thorlabs CCSseries\Examples\C

sample.c - C program how to communicate with a CCS series spectrometer

sample64.exe - same, but 64bit executable



**Example for C#**

Solution file (same as 32bit on 64bit systems):

```
C:\Program Files (x86)\IVI Foundation\VISA\WinNT\...  
...Thorlabs CCSseries\Examples\CSharp\CCS100_CSharpDemo.sln
```

Project file (same as 32bit on 64bit systems):

```
C:\Program Files (x86)\IVI Foundation\VISA\WinNT\...  
...Thorlabs CCSseries\Examples\CSharp\CCS100_CSharpDemo\...  
...CCS100_CSharpDemo.csproj
```

Executable sample demo (same as 32bit on 64bit systems):

```
C:\Program Files (x86)\IVI Foundation\VISA\WinNT\...  
...Thorlabs CCSseries\Examples\CSharp\CCS100_CSharpDemo\...  
...bin\Release\CCS100_CSharpDemo.exe
```

**Note**

To get a 64bit executable you can set your project options to compile for 64bit targets. You have to set the references for the executable to the 64bit DLLs (see above, Thorlabs.ccs.interop64.dll).

**Example for LabView**

Included in driver llb container.

## 5 Maintenance and Service

Protect the CCS Series Spectrometer from adverse weather conditions. The CCS Series Spectrometer is not water resistant.

### Attention

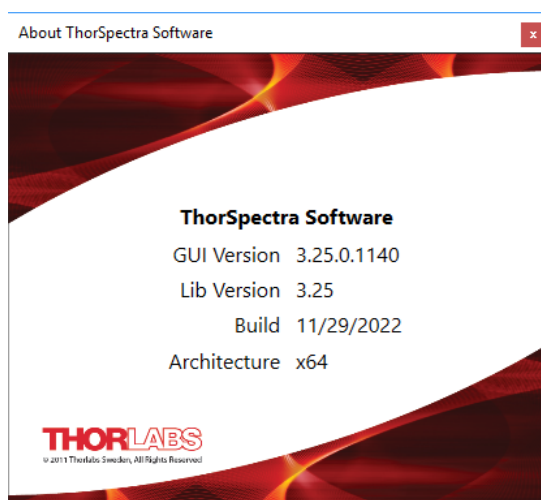
**To avoid damage to the instrument, do not expose it to spray, liquids or solvents!**

The unit does not need a regular maintenance by the user. It does not contain any modules and/or components that could be repaired by the user himself. If a malfunction occurs, please contact [Thorlabs](https://www.thorlabs.com) for return instructions.

Do not remove covers!

### 5.1 Version Information

The software version information can be retrieved via the menu Help -> About:



## 5.2 Troubleshooting

The Intensity of the measured signal does not increase linearly with the integration time:

- The CCD array applies an electronic shutter function, if integration times below 4 ms are used. In that case the pixels are sequentially recharged, until the time to the next CCD readout matches the wanted integration time. Unfortunately the manufacturer of the CCD does not guarantee this recharging/resetting of the array to be 100% effective. Therefore it cannot be guaranteed that all photons are ignored, before the actual integration time starts. This might cause peak heights to in- or decrease to a higher degree than the integration time was changed.
- If you want to make relative comparisons of signal heights or areas beneath the curve, try using integration times above 4 ms and use the dark current correction.

## 6 Appendix

### 6.1 Technical Data

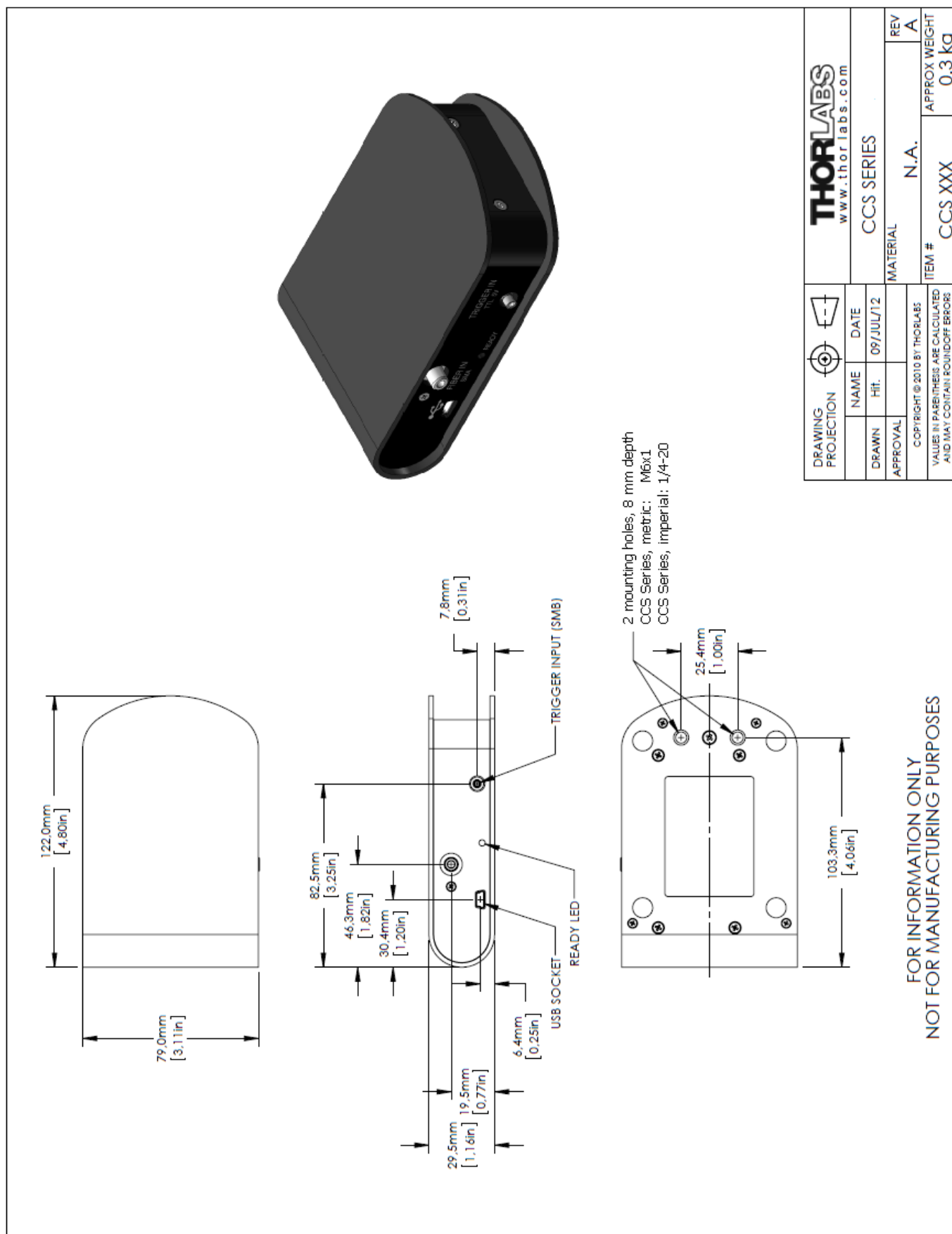
Item #	CCS100	CCS175	CCS200
<b>Optical Specs</b>			
Wavelength Range	350 – 700 nm	500 – 1000 nm	200 – 1000 nm
Spectral Accuracy	<0.5 nm FWHM @ 435 nm	<0.6 nm FWHM @ 633 nm	<2 nm FWHM @ 633 nm
Slit (W x H)	20 µm x 2 mm		
Grating	1200 Lines/mm, 500 nm Blaze	830 Lines/mm, 800 nm Blaze	600 Lines/mm, 800 nm Blaze
<b>Sensor Specs</b>			
Detector Range (CCD Chip)	350 - 1100 nm		200 - 1100 nm
CCD Pixel Size	8 µm x 200 µm ( 8 µm pitch )		
CCD Sensitivity	160 V / ( lx · s )		
CCD Dynamic Range	300		
CCD Pixel number	3648		
Resolution	10 px/nm	6 px/nm	4 px/nm
Integration Time	10 µs – 10 s <sup>3)</sup>		
Scan Rate Max.	200 Scans/s <sup>2)</sup>		
S/N ratio	≤ 2000 : 1		
<b>External Trigger</b>			
Fiber Connector	SMA 905		
Trigger Input	SMB		
Trigger Signal	TTL		
Trigger Frequency Max.	100 Hz		
Trigger Pulse Length Min.	0.5 µs		
Trigger Delay	8.125 µs ± 125 ns		
<b>General Specs</b>			
Interface	Hi-Speed USB2.0 (480 Mbit/s)		
Dimensions (L x W x H)	122 x 80 x 30 mm		
Weight	< 0.4 kg		

All technical data are valid at 23 ± 5°C and 45 ± 15% rel. humidity (non condensing)

- <sup>1)</sup> 220 - 440 nm version available
- <sup>2)</sup> integration time 5 ms
- <sup>3)</sup> software allows to set up to 60 s. Hot pixels and noise may increase drastically.

Operating Temperature	0 to +40 °C
Storage Temperature	-40 to +70 °C
Relative Humidity	Max. 80% up to 31 °C; decreasing to 50% at 40 °C
Operation Altitude	< 3000 m

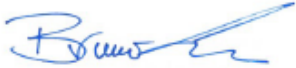
## 6.2 Dimensions



DRAWING PROJECTION		THORLABS www.thorlabs.com	
NAME	DATE	CCS SERIES	REV
Hit.	09/JUL/12	MATERIAL	N.A.
APPROVAL		ITEM #	CCS XXX
COPYRIGHT © 2010 BY THORLABS VALUES IN PARENTHESES ARE CALCULATED AND MAY CONTAIN ROUND-OFF ERRORS		APPROX WEIGHT	0.3 kg

FOR INFORMATION ONLY  
NOT FOR MANUFACTURING PURPOSES

## 6.3 Certifications and Compliances

<i>EU Declaration of Conformity</i>		
<i>in accordance with EN ISO 17050-1:2010</i>		
<b>We:</b>	Thorlabs GmbH	
<b>Of:</b>	Münchner Weg 1, 85232 Bergkirchen, Deutschland	
<i>in accordance with the following Directive(s):</i>		
2014/30/EU	Electromagnetic Compatibility (EMC) Directive	
2011/65/EU	Restriction of Use of Certain Hazardous Substances (RoHS)	
<i>hereby declare that:</i>		
<b>Model:</b>	<b>CCSxxx(/M)</b>	
<b>Equipment:</b>	<b>CCS Spectrometer Series</b>	
<i>is in conformity with the applicable requirements of the following documents:</i>		
EN 61326-1	Electrical Equipment for Measurement, Control and Laboratory Use - EMC Requirements	2013
EN 61010-1	Safety requirements for electrical equipment for measurement, control and laboratory use	2010
<i>and which, issued under the sole responsibility of Thorlabs, is in conformity with Directive 2011/65/EU of the European Parliament and of the Council of 8th June 2011 on the restriction of the use of certain hazardous substances in electrical and electronic equipment, for the reason stated below:</i>		
does not contain substances in excess of the maximum concentration values tolerated by weight in homogenous materials as listed in Annex II of the Directive		
<i>I hereby declare that the equipment named has been designed to comply with the relevant sections of the above referenced specifications, and complies with all applicable Essential Requirements of the Directives.</i>		
<b>Signed:</b>		<b>On:</b> 19 November 2019
<b>Name:</b>	Bruno Gross	
<b>Position:</b>	General Manager	<b>CE</b>
		<i>FDC - CCSxxx(/M) - 2019-11-19</i>

## 6.4 Return of Devices

This precision device is only serviceable if returned and properly packed into the complete original packaging including the complete shipment plus the cardboard insert that holds the enclosed devices. If necessary, ask for replacement packaging. Refer servicing to qualified personnel.

## 6.5 Manufacturer/Importer Address

### Manufacturer Address Europe

Thorlabs GmbH  
Münchener Weg 1  
D-85232 Bergkirchen  
Germany  
Tel: +49-8131-5956-0  
Fax: +49-8131-5956-99  
[www.thorlabs.de](http://www.thorlabs.de)  
Email: [europe@thorlabs.com](mailto:europe@thorlabs.com)

### EU-Importer Address

Thorlabs GmbH  
Münchener Weg 1  
D-85232 Bergkirchen  
Germany  
Tel: +49-8131-5956-0  
Fax: +49-8131-5956-99  
[www.thorlabs.de](http://www.thorlabs.de)  
Email: [europe@thorlabs.com](mailto:europe@thorlabs.com)

### UK-Importer Address

Thorlabs, LTD.  
204 Lancaster Way Business Park  
Ely, CB6 3NX  
UK  
Tel: +44-1353-654440  
Fax: +44 (0)1353-654444  
[www.thorlabs.com](http://www.thorlabs.com)  
Email: [techsupport.uk@thorlabs.com](mailto:techsupport.uk@thorlabs.com)

## 6.6 Warranty

Thorlabs warrants material and production of the CCS Series Spectrometer for a period of 24 months starting with the date of shipment in accordance with and subject to the terms and conditions set forth in Thorlabs' General Terms and Conditions of Sale which can be found at:

General Terms and Conditions:

[https://www.thorlabs.com/Images/PDF/LG-PO-001\\_Thorlabs\\_terms\\_and\\_%20agreements.pdf](https://www.thorlabs.com/Images/PDF/LG-PO-001_Thorlabs_terms_and_%20agreements.pdf)

and

[https://www.thorlabs.com/images/PDF/Terms%20and%20Conditions%20of%20Sales\\_Thorlabs-GmbH\\_English.pdf](https://www.thorlabs.com/images/PDF/Terms%20and%20Conditions%20of%20Sales_Thorlabs-GmbH_English.pdf)

## 6.7 Copyright and Exclusion of Liability

Thorlabs has taken every possible care in preparing this document. We however assume no liability for the content, completeness or quality of the information contained therein. The content of this document is regularly updated and adapted to reflect the current status of the product.

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Please refer to the general terms and conditions linked under [Warranty](#).

## 6.8 Thorlabs Worldwide Contacts

For technical support or sales inquiries, please visit us at <https://www.thorlabs.com/locations.cfm> for our most up-to-date contact information.



### USA, Canada, and South America

Thorlabs, Inc.  
sales@thorlabs.com  
techsupport@thorlabs.com

### UK and Ireland

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sales.uk@thorlabs.com  
techsupport.uk@thorlabs.com

### Europe

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europe@thorlabs.com

### Scandinavia

Thorlabs Sweden AB  
scandinavia@thorlabs.com

### France

Thorlabs SAS  
sales.fr@thorlabs.com

### Brazil

Thorlabs Vendas de Fotônicos Ltda.  
brasil@thorlabs.com

### Japan

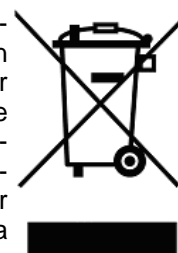
Thorlabs Japan, Inc.  
sales@thorlabs.jp

### China

Thorlabs China  
chinasales@thorlabs.com

### Thorlabs 'End of Life' Policy (WEEE)

Thorlabs verifies our compliance with the WEEE (Waste Electrical and Electronic Equipment) directive of the European Community and the corresponding national laws. Accordingly, all end users in the EC may return "end of life" Annex I category electrical and electronic equipment sold after August 13, 2005 to Thorlabs, without incurring disposal charges. Eligible units are marked with the crossed out "wheelie bin" logo (see right), were sold to and are currently owned by a company or institute within the EC, and are not disassembled or contaminated. Contact Thorlabs for more information. Waste treatment is your own responsibility. "End of life" units must be returned to Thorlabs or handed to a company specializing in waste recovery. Do not dispose of the unit in a litter bin or at a public waste disposal site. It is the users responsibility to delete all private data stored on the device prior to disposal.







**THORLABS**

[www.thorlabs.com](http://www.thorlabs.com)

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