

USB Line Camera

Coptonix GmbH

Luxemburger Str. 31

D – 13353 Berlin

Phone: +49 – (0)30 – 61 74 12 48

Fax: +49 – (0)30 – 61 74 12 47

www.coptonix.com

support@coptonix.com

The *USB Line Camera* is an easy to use cost-effective board-level line scan camera. It consists of two circuit boards, the main circuit board and the sensor circuit board. The main board contains the high speed USB controller, the line sensor controller and Memory. The sensor board contains a CCD or a CMOS line sensor and a complete 16-Bit imaging signal processor (AFE), which consists of an input clamp, Correlated Double Sampler (CDS), offset DAC, Programmable Gain Amplifier (PGA) and high-performance 16-bit A/D converter. The main board supports multiple sensor boards for various sensors with different number of pixels. Thus it is possible to exchange the sensor board at any time.

Furthermore, the main board has an I2C interface, which allows the control of external hardware such as IO Expander, stepper motor, ADC, DAC, temperature sensors, etc.

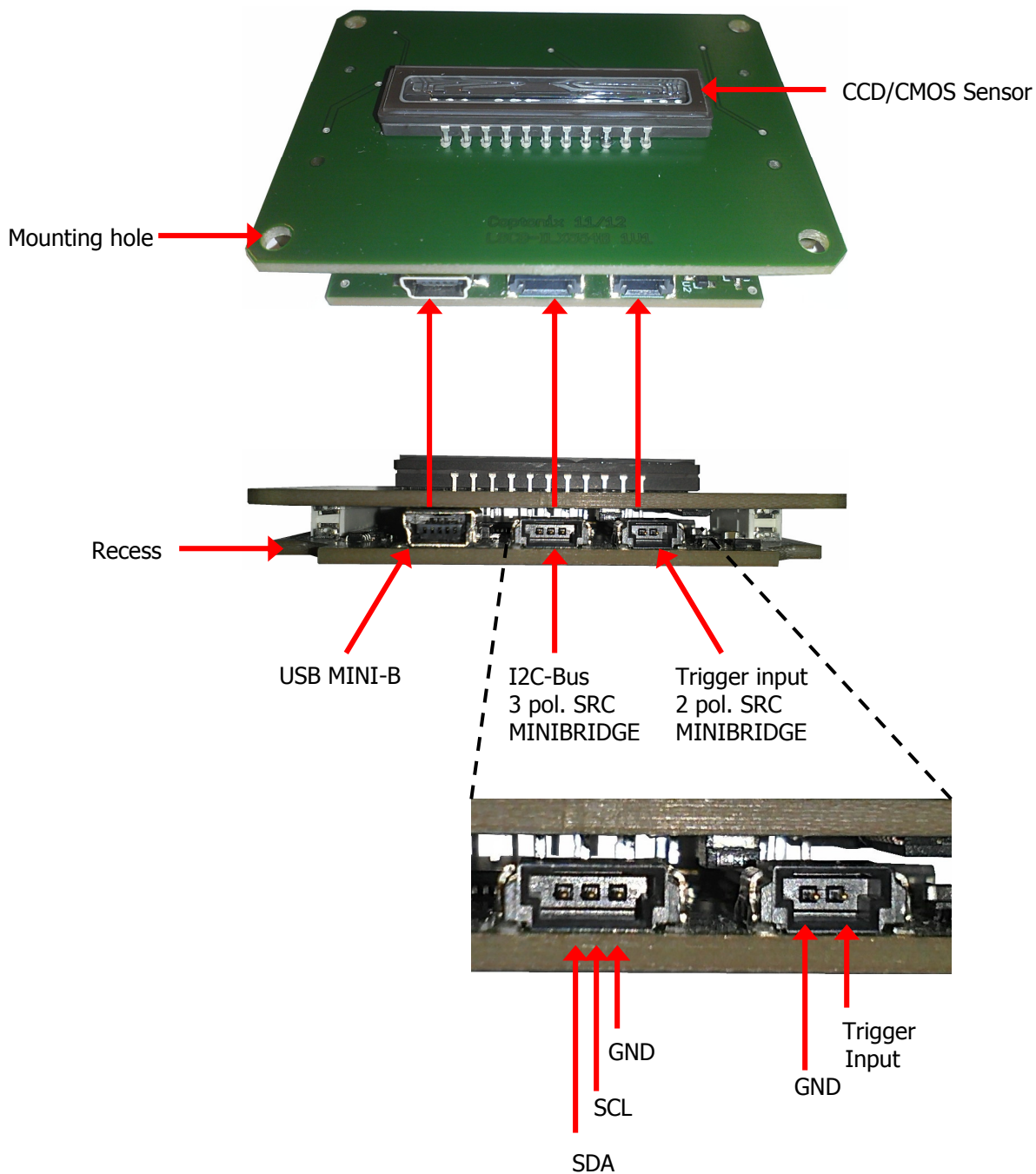
The *USB Line Camera* is USB Bus-powered, therefore no separate power packs for voltage supply are needed. The maximum power consumption is less than 500mA.

Ready to use software, drivers, DLL and sample programs are included in delivery.

Features:

- 480 Mbit/s high-speed USB 2.0
- USB Bus-powered
- Plug & Play
- Supports various CCD and CMOS line sensors
- 16-bit high-speed ADC
- Correlated Double Sampler (CDS)
- 1~6x Programmable Gain, 64 increments
- ± 300 mV Programmable Offset, 512 increments
- 2 programmable internal reference voltage 2V and 4V
- Trigger input
- 100kHz I2C-Master Interface
- Ready to use software, no installation required
- Software development kit with drivers, DLL and sample programs
- Supports WinXP, Vista and Windows 7
- Very compact design 66 x 48 x 7.7 mm³ (two circuit boards without the sensor)
- Integration time and frame rates are CCD/CMOS line sensor specific. For further information please refer to the manual of corresponding sensor circuit board.

Interfaces:

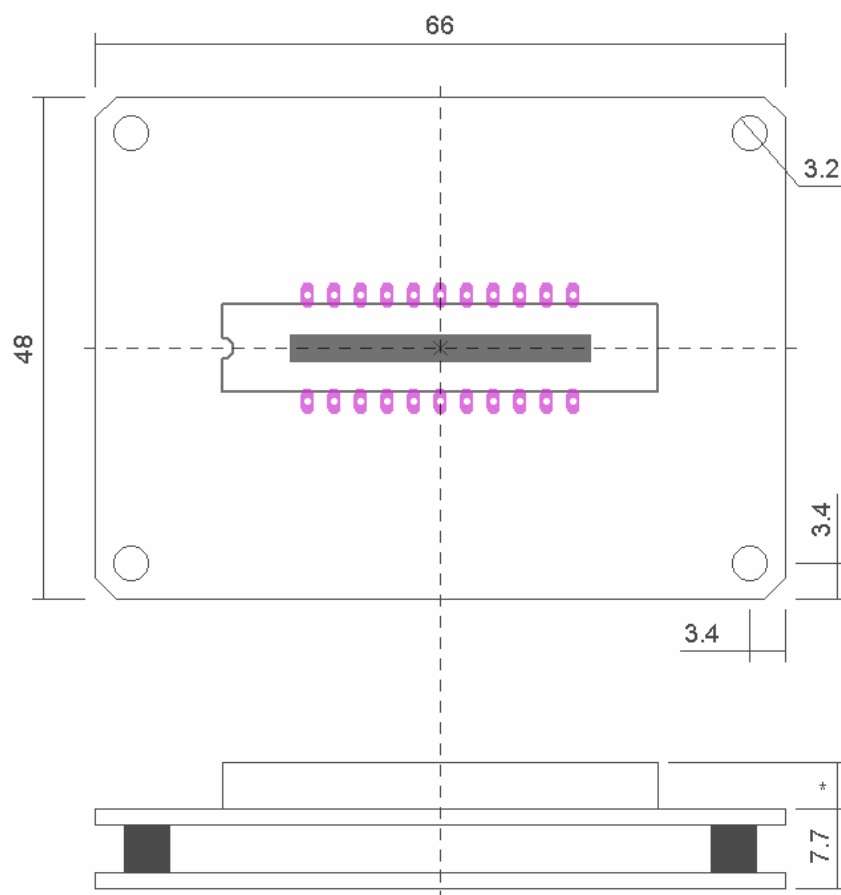


Characteristics

	Min.	Typ	Max.	Unit
Power-Supply				
Supply Voltage (USB Bus-Powered)	4.75	5.0	5.25	V
Current consumption	-	250	500 ¹	mA
I2C-Bus pins (5V tolerant I/O pins)				
V _{IH} Input HIGH Voltage	2	-	5.25	V
V _{IL} Input LOW Voltage	-0.5	-	0.8	V
V _{OH} Output HIGH Voltage	2.4	-	-	V
V _{OL} Output LOW Voltage	-	-	0.4	V
Trigger Input (active High)				
Input Voltage	0	-	5.5	V
A/D Converter				
ADC Resolution	-	16	-	Bits
Amplifier				
PGA Gain	1	-	6	V/V
PGA Gain Resolution	-	64	-	Increments
Programmable Offset	-300	-	+300	mV
Programmable Offset Resolution	-	512	-	Increments

1) Max. current consumption depends on used CCD/CMOS sensor.

Dimensions [mm]



*) Height depends on used sensor.

Installation

In order to use *USB Line Camera* you must install the corresponding driver supplied on the Installation CD. To install the driver for the "*USB Line Camera*" under Windows XP, follow the instructions below:

WIN XP

Insert the installation CD-ROM into the appropriate drive. Connect the device to a spare USB port on your PC. The computer should now recognize a new USB device and the Found New Hardware Wizard will launch.

Select "**No, not this time**" as shown in Figure 1.1 below and then click "**Next**".

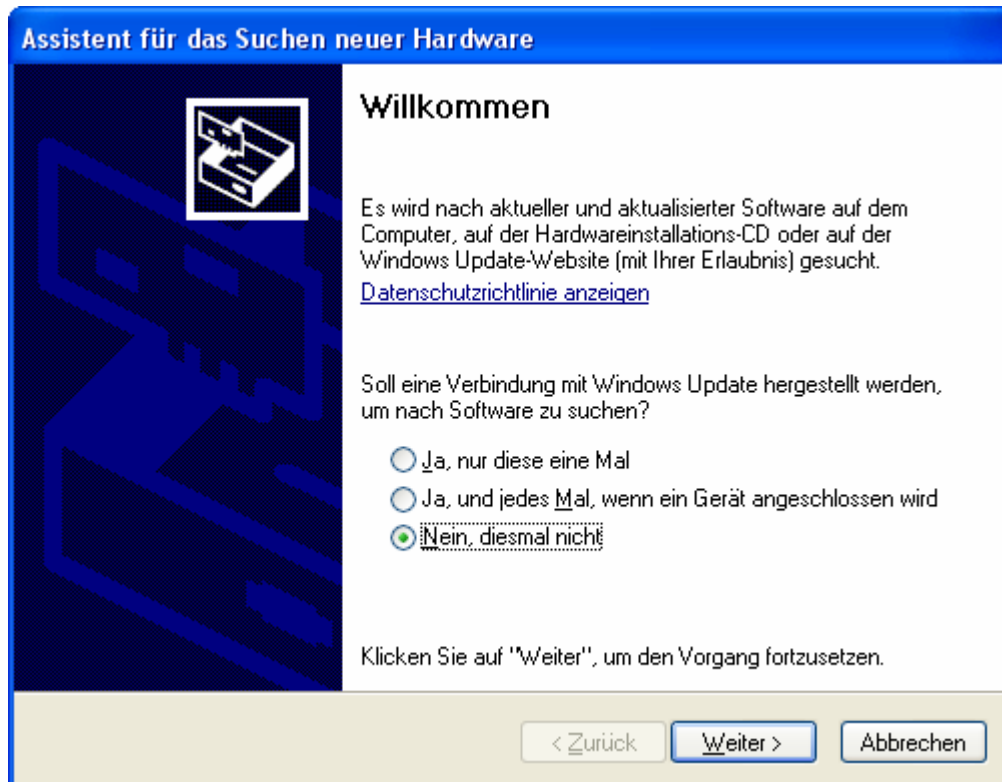


Figure 1.1

Select "**Install from a list or specific location (Advanced)**" as shown in Figure 1.2 below and then click "**Next**".

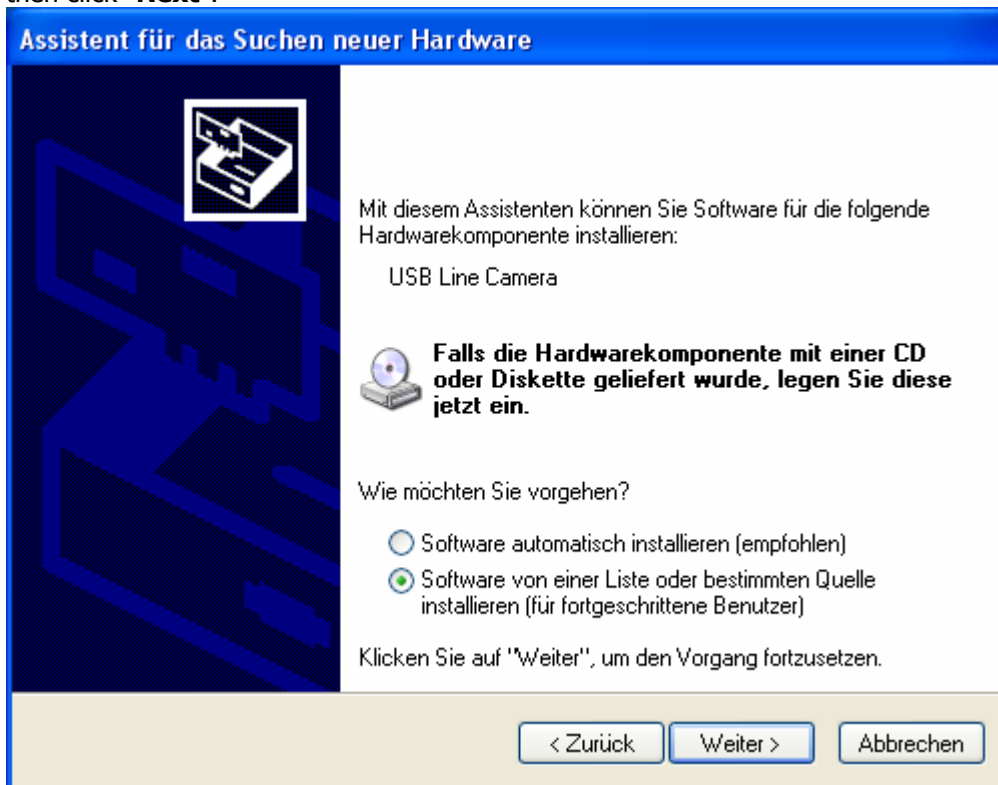


Figure 1.2

Select "**Search for the best driver in these locations**", and enter the path in the combo-box e.g. "**D:\USBLineCamera\Driver**".

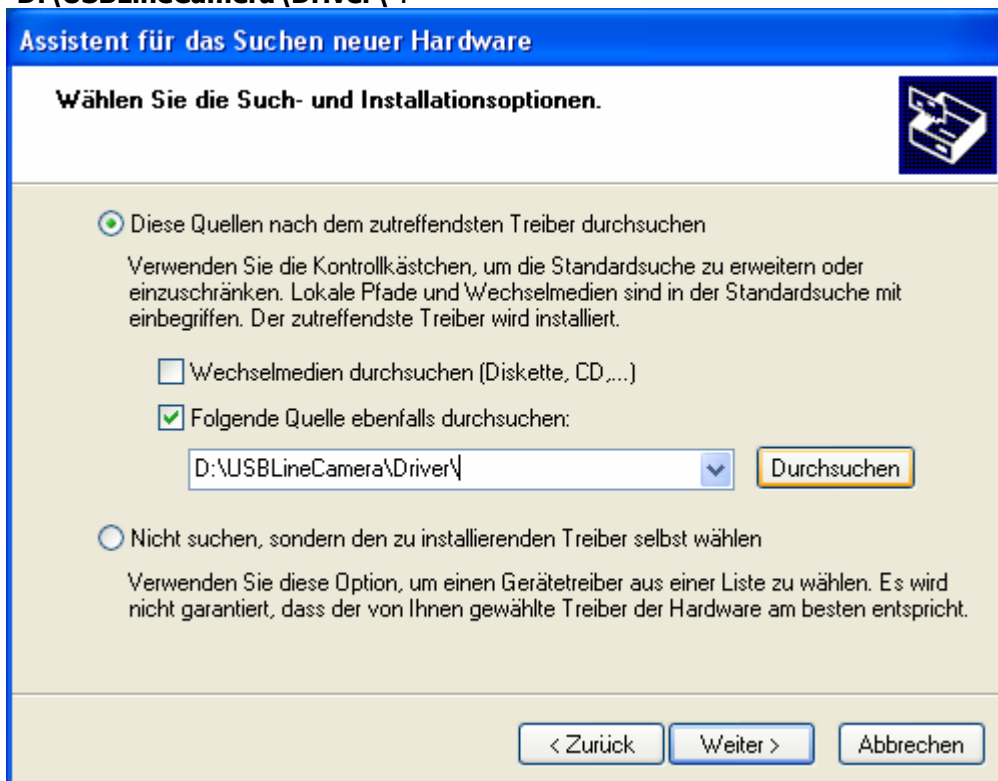


Figure 1.3

Or browse to it by clicking the browse button. Select the folder and click **OK**.

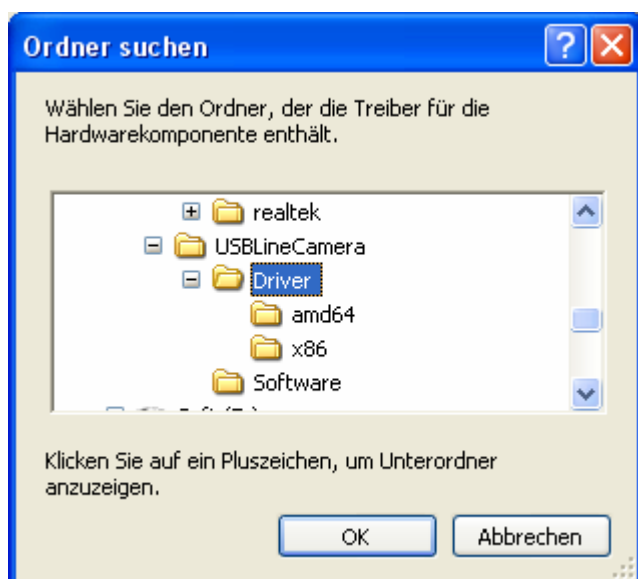


Figure 1.4

Once the file path has been entered in the box, click **Next** to proceed. Windows copies and installs the required driver files.

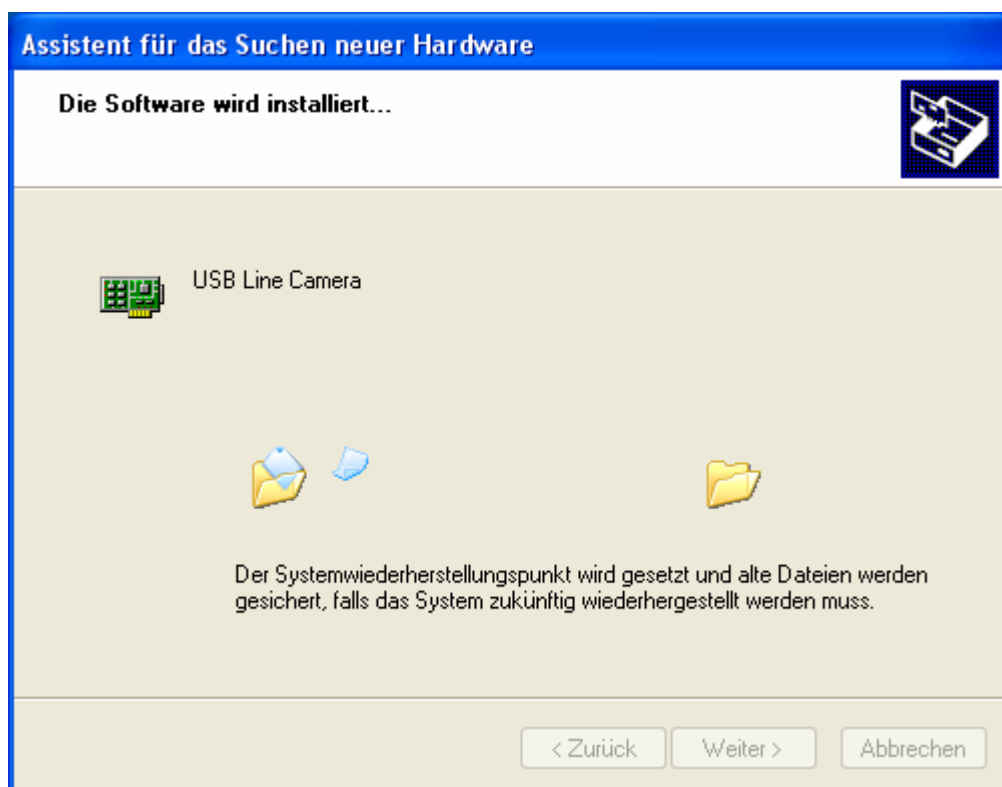


Figure 1.5

Windows should then display a message indicating that the installation was successful. Click "**Finish**" to complete the installation.



Figure 1.7

If needed, click "**Yes**" to restart the system and to complete the installation.

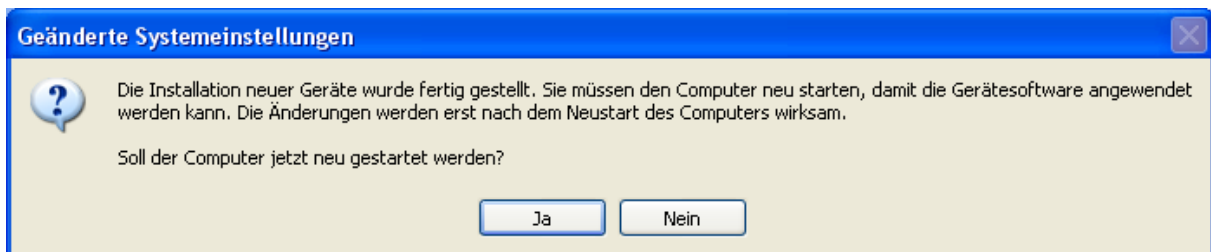


Figure 1.8

A new Device "USB Line Camera" is now added to the device manager.



Figure 1.9

Software installation

- Create a new folder on your hard disk.
- Copy the executable file „usblsc.exe“ and the DLL „usblc32.dll“ into that folder.
- Create a shortcut to the desktop.
- Run the software by double-clicking the EXE-File or the shortcut.

The software starts...

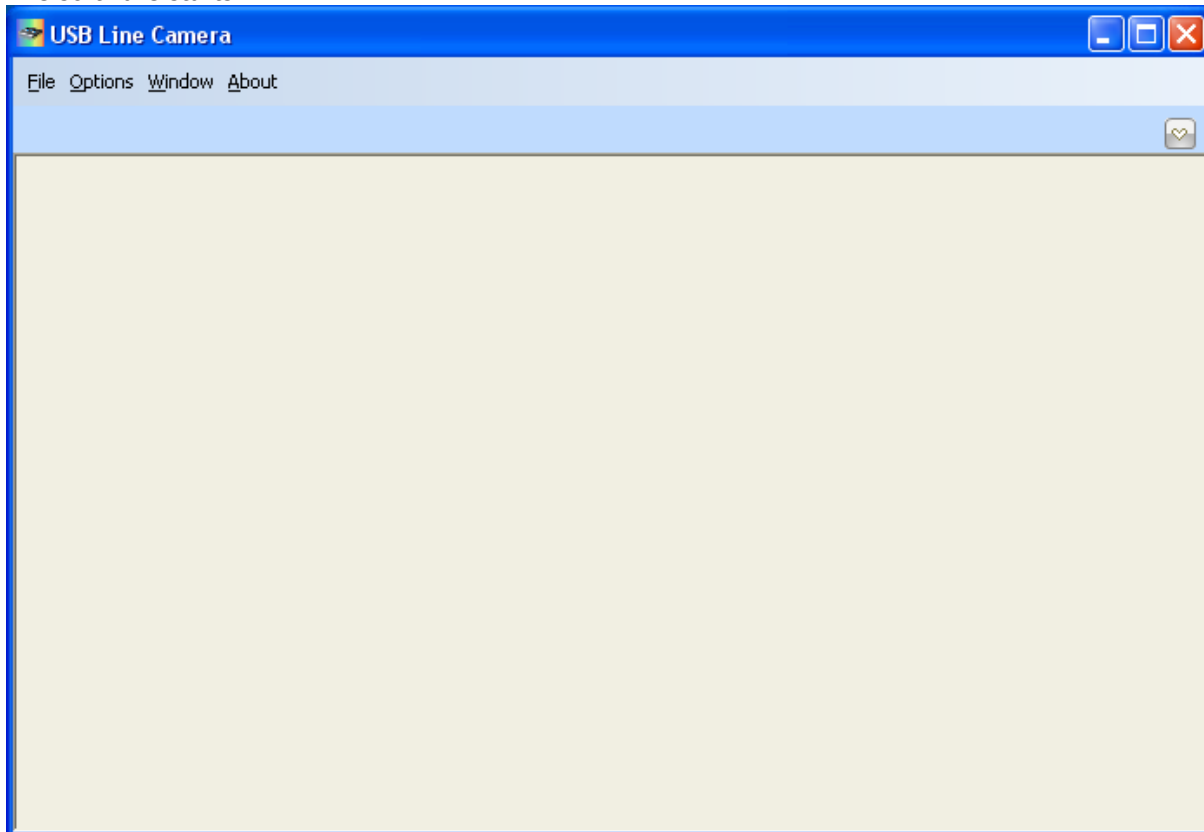


Figure 1.10

Menu - File

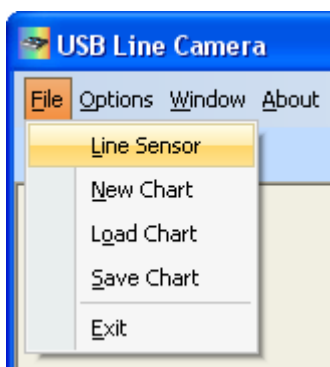


Figure 1.11

Line Sensor:

Opens the window for reading data from the camera (Page 9, Fig.1.13).

New Chart:

Opens a new chart window (Page 13, Fig. 1.14).

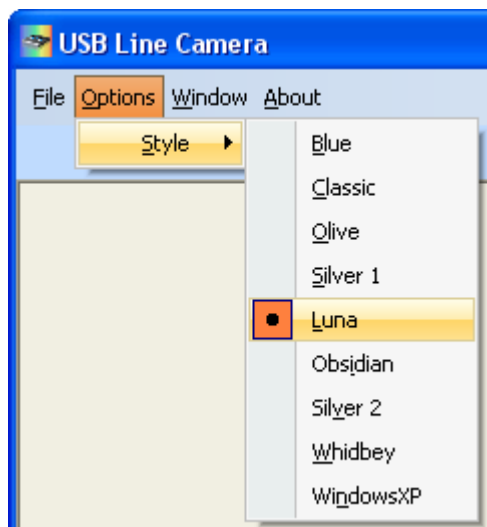
Load Chart:

Loads a chart from an XML-file to a new chart window.
Only XML-files can be loaded.

Save Chart:

Saves current chart to file.

Menu – Options



Style:

Sets the style & color of the application.

Figure 1.12

Line Sensor Window

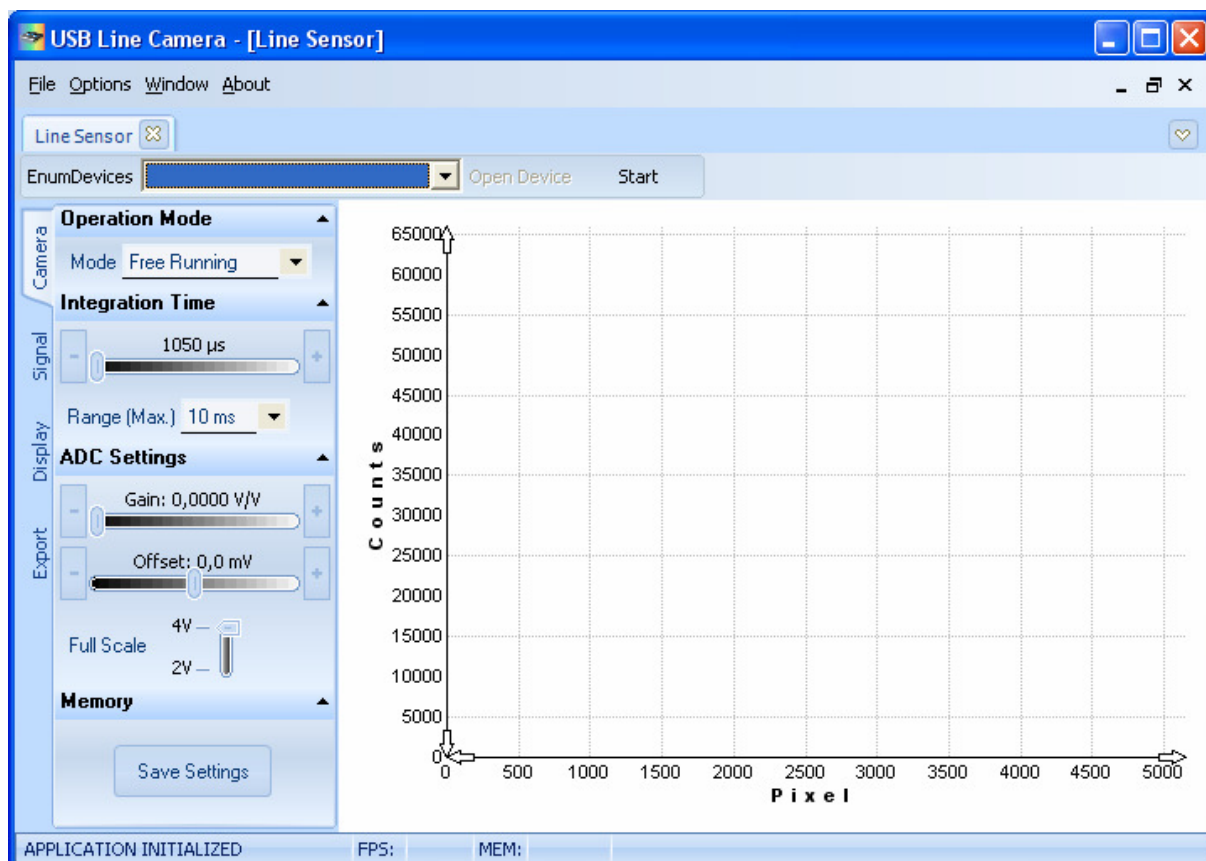
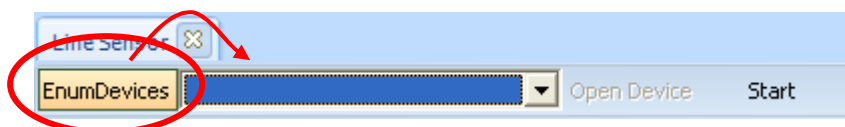
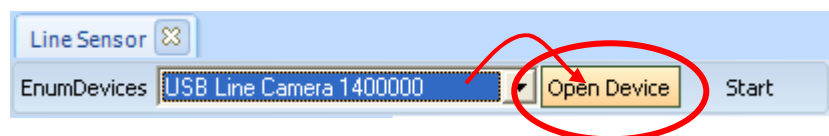


Figure 1.13

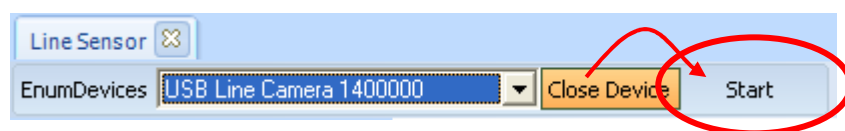
The window "Line Sensor" enables the communication with the USB Line Camera.



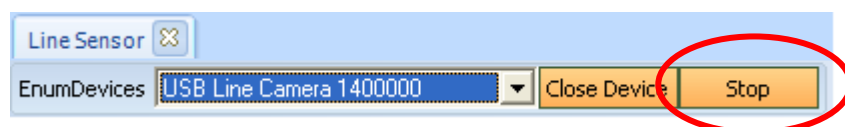
"**EnumDevices**" enumerates all connected devices. If enumeration is done successfully, all connected devices will be listed in the combo-box.



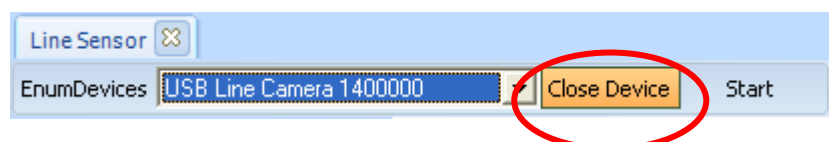
"**Open Device**" opens selected device for communication. After connecting to the device, the caption of that button changes to "Close Device".



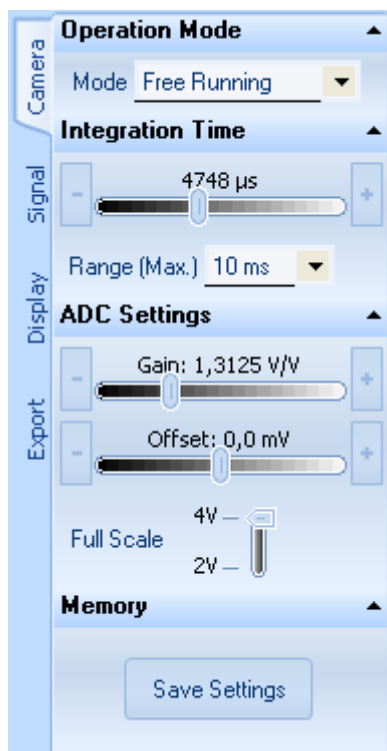
"**Start**" starts reading data from the camera. The button's caption changes to "Stop", when reading data starts.



"**Stop**" stops reading data from the camera. The button's caption changes to "Start", when reading data is stopped.



"**Close Device**" disconnects device. After disconnecting the device, the caption of that button changes to "Open Device".



Camera settings:

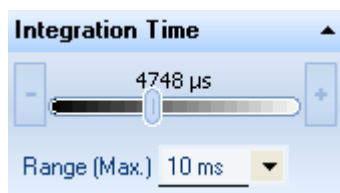
- Operation Mode
- Integration (Exposure) Time
- Gain
- Offset
- Full Scale.



Operation Mode:

There are three operation modes available:

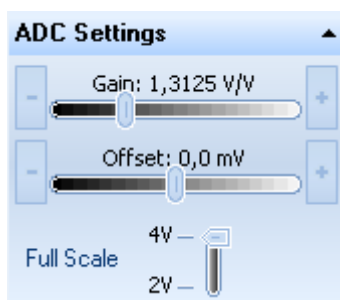
- One Shot: data acquisition is started by software.
- Ext. Trigger: data acquisition is started by external trigger.
- Free Running: data acquisition is done continuously.



Integration (Exposure) Time:

Integration is adjusted using the slider in 1 μs steps.

Integration time is CCD/CMOS line sensor specific. For further information please refer to the manual of corresponding sensor circuit board.



A/D Converter settings:

Gain: 1~6x Programmable Gain, 64 steps.

Offset: ± 300 mV Programmable Offset, 512 steps.

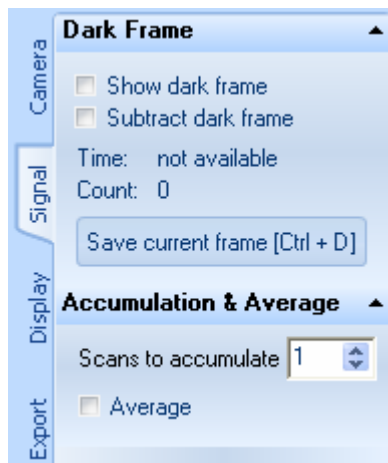
Full Scale: 2 programmable internal reference voltage 2V and 4V.



Memory:

Save Settings: Save all camera settings into onboard EEPROM.

After power-on the camera is initialized with the previously saved settings from the EEPROM.

**Dark Frame:**

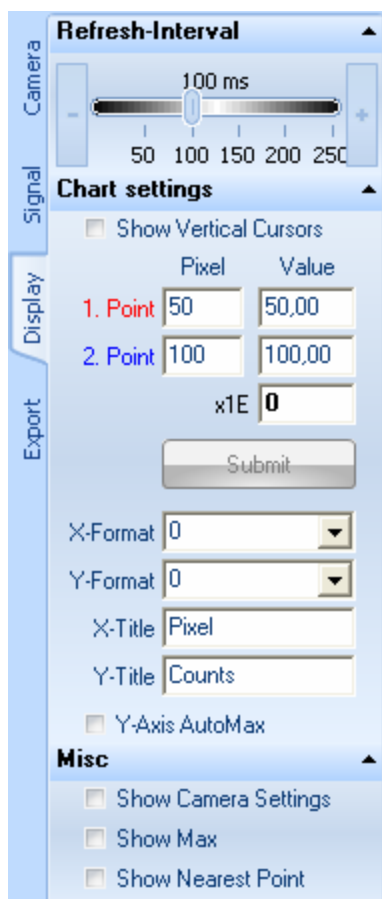
Press the button "Save current frame" to save the last frame as dark frame.

When "Subtract dark frame" is checked, the dark frame will be subtracted from next acquired frames.

Accumulation & Average:

Specify the number of frames to be accumulated.

If "Average" is checked, then the average of the accumulated frames will be calculated.

**Refresh-Interval:**

Is the rate [ms] at which the screen data is refreshed.

Chart settings:

In order to calibrate the X-axis check "Show Vertical Cursors", and move the cursors to a certain pixel, and then input the corresponding value e.g. the wavelength into the Value-fields.

When values are entered, press "Submit" to accept changes.

X- and Y-Axis formatting settings.

e.g. "0.0", "000.00E-0"

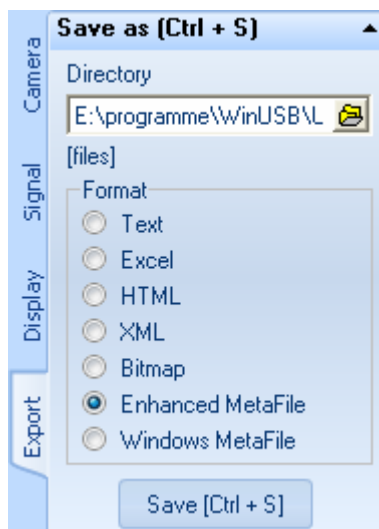
Specify the titles of the X- and Y-Axis.

If checked, the Y-Axis has an automatic maximum.

Misc:

If checked, then

- camera settings is shown on upper right corner.
- Peak value is displayed on the top of the current peak.
- Mouse/Cursor's nearest point is displayed (pixel & value).



Save as:

Use the shortcut [Ctrl + S] to save current frame to the working directory. The file name is auto-generated.

"Directory" is the working directory.

"Format" is the format of the file to be saved.

Chart Window

A chart window gives the possibility to save, load, edit and print frames. Several of the chart windows can be open simultaneously.

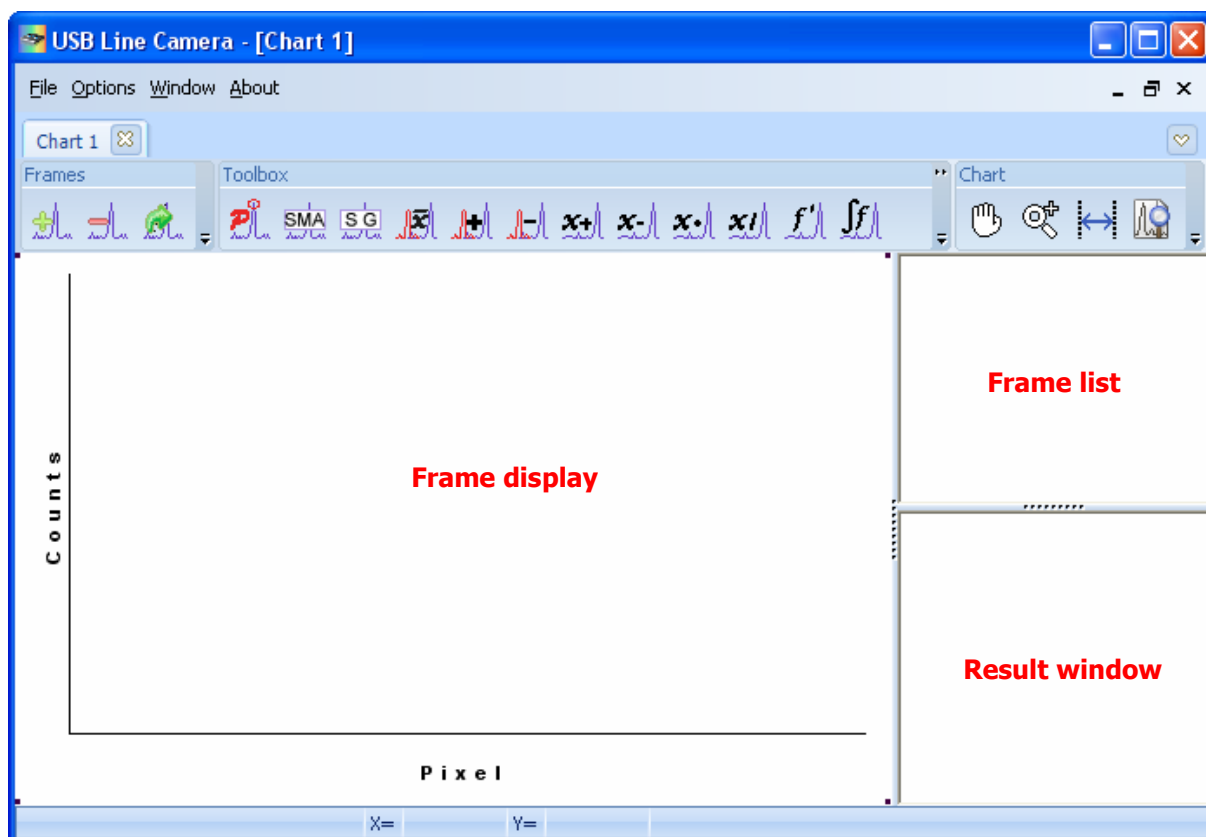


Figure 1.14

A set of functions are available within a chart window.

Frames:



Adds the current frame from the "Line Sensor" window.



Removes selected frames.



Imports one or more frames from an XML-file into current chart window.

Toolbox:



Peak finder



Simple Moving Average (SMA) – Smoothing filter



Savitzky-Golay Smoothing filter



Calculate the average of two or more frames



Calculate the sum of two or more frames



Subtract one or more frames from the upper frame



Add a constant value to selected frame



Subtract a constant value from selected frame



Multiply a constant value with selected frame



Divide selected frame by a constant value



Calculate the 1. derivative of selected frame



Calculate the integral of selected frame



Normalize frame values

Chart:



Enable / Disable scroll function



Enable / Disable zoom function



Enable / Disable bands



Chart preview and print dialog