

Sumix Video
Camera
User Guide

Sumix Video Camera User Guide

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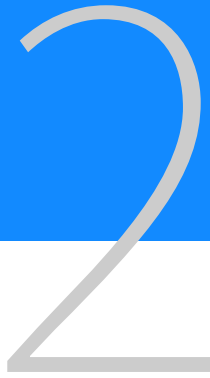
1

Restriction for Use

This product is not designed or manufactured to be used for control of equipment directly concerned with human life or equipment relating to maintenance of public services/functions involving factors of safety. Therefore, the product shall not be used for such applications.

- 1 Equipment directly concerned with human life refers to:
 - Medical equipment such as life-support systems, equipment for operating theaters
 - Exhaust control equipment for exhaust gases such as toxic fumes or smoke
 - Equipment mandatory to be installed by various laws and regulations such as the Fire act or Building standard Law
 - Equipment related to the above
- 2 Equipment relating to maintenance of public services/functions involving factors of safety refers to:
 - Traffic control systems for air transportation, railways, roads, or marine transportation
 - Equipment for nuclear power generation
 - Equipment related to the above

As well this Camera shouldn't be used without the lens.



Introduction

SMX-15M5x Series cameras are 5 megapixel CMOS cameras with USB 3.0 interface suitable for scientific and industrial application. The cameras are designed for capturing, streaming and storing of high quality digital images.

There are the following models available:

- SMX-15M5M (5 megapixel, monochrome)
- SMX-15M5C (5 megapixel, color)

The SMX-15M5x cameras feature:

- USB 3.0 communication interface
- Duralumin housing with C/CS-mount

The SMX-15M5x cameras have the following features:

- 2592 x 1944 active imaging pixels
- High speed: 14 fps at 2592 x 1944
- Pixel rate up to 96 MHz
- Rolling, Global Reset (only for Snapshot mode) shutter
- External trigger input/output mode
- Low power consumption
- No external power supply required
- Adjustable frame rate

Programmable functions include viewport window settings, adjustable exposure time and gain, selectable sensor clock frequency and image decimation, flipping image horizontally and vertically. The cameras can be used in any digital imaging application such as microscopy, video conferencing, webcasting, surveillance and security systems, etc.

3

Installation and Update

Before installing the camera software, install a USB 3.0 adapter if needed. Install all required drivers. Installation of the USB 3.0 adapter is beyond the scope of this document.

3.1 System Requirements

Camera System Requirements are shown in the table below

TABLE 3.1

Operating System:	Windows Server 2008 R2, Windows Server 2012, Windows Server 2012 R2, Windows 7, Windows 8, Windows 8.1	
Processor:	Recommended configuration Cameras will function with nominal frame rates Intel i7-3770	Minimal configuration Cameras will function with reduced frame rates PIV 2Ghz
RAM:	4GB DDR3	2048 Mb
Video Card:	Any with 24 bit True Color	Any with 24 bit True Color
Hardware Interface:	Intel integrated USB 3.0 Host Controller. At least one USB 3.0 port for connection	Any USB 2.0 Host Controller. At least one USB 2.0 port for connection
Hard Drive:	SSD (write speed 150 MB/s minimum)	N/A

3.2 Installation

To install the Sumix Video Camera application software:

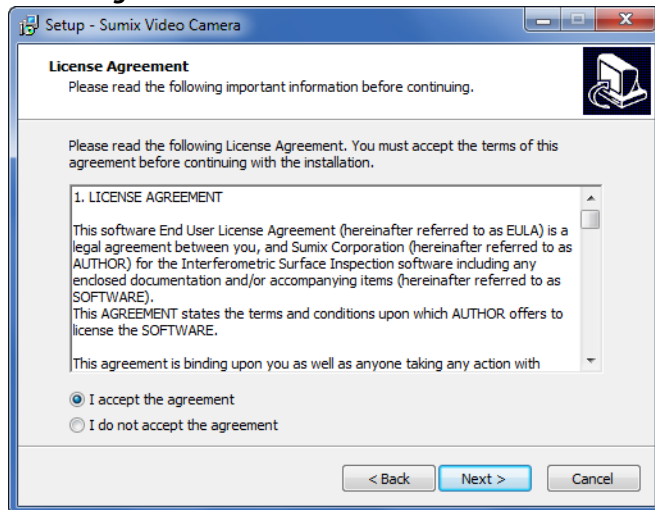
- 1 Run the **SMX_USB3CameraApp-<version>.exe** file downloaded via the URL provided by Sumix Corporation.
- 2 **Welcome to the Sumix Video Camera Setup Wizard** starts. The Wizard will guide you through the software and hardware drivers installation. Close all other applications that are running on your computer and then click the **Next** button to continue the installation.

FIGURE 3.1 **Welcome to the Sumix Video Camera Setup Wizard** screen



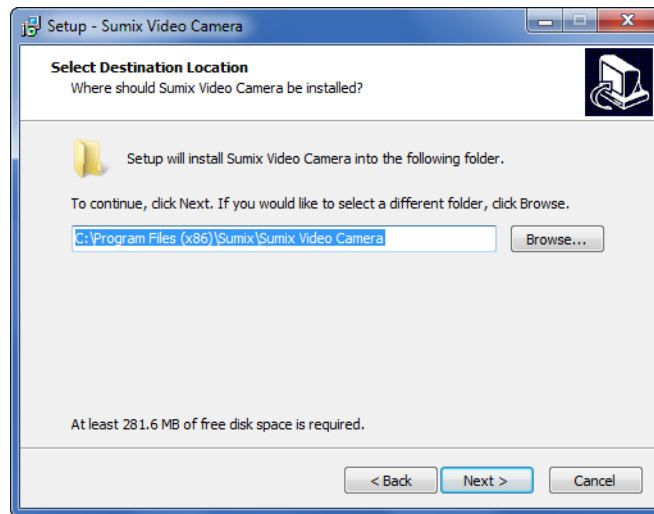
- 3 In the **License Agreement** box, read the license. Then select **I accept the agreement** and click **Next**.

FIGURE 3.2 **License Agreement** screen



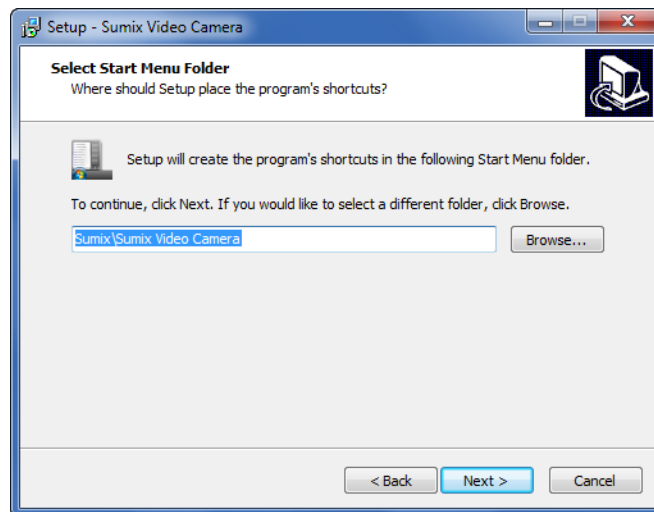
- 4 In the **Select Destination Location** screen, click **Browse** to change the folder in which the Sumix Video Camera application software will be installed, or leave the one suggested by the Wizard. Click **Next**.

FIGURE 3.3 **Select Destination Location** screen



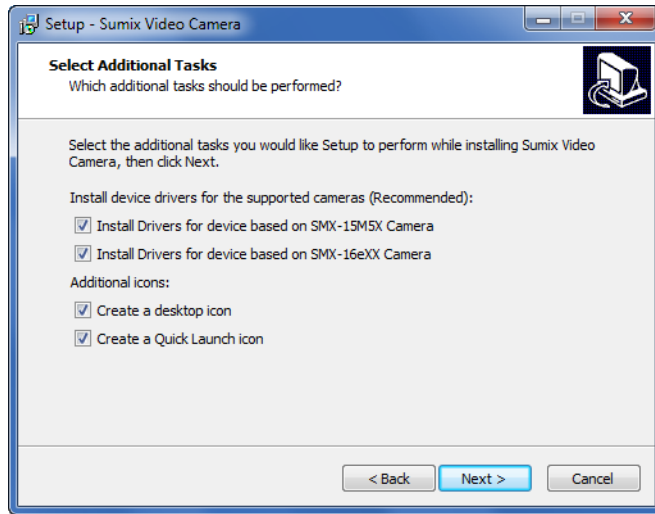
- 5 In the same way, in the **Select Start Menu Folder** screen, leave the suggested location or specify the folder you wish. Click **Next**.

FIGURE 3.4 **Select Start Menu Folder** screen



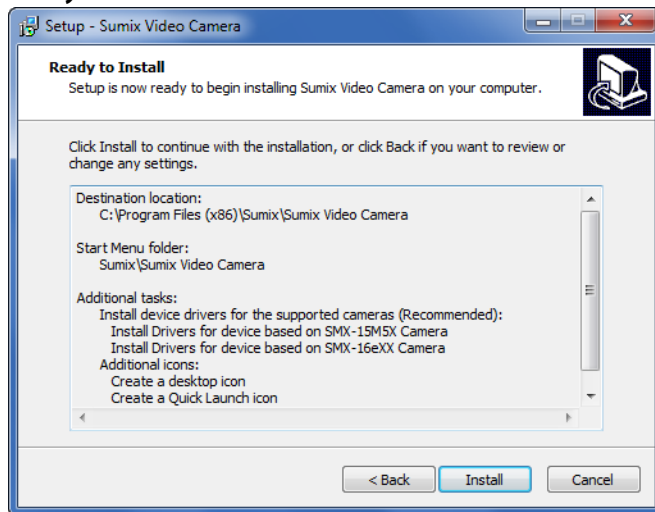
- 6 In the next Wizard screen install drivers for the supported cameras and select icons that you wish to create.

FIGURE 3.5 **Select Additional Tasks screen**



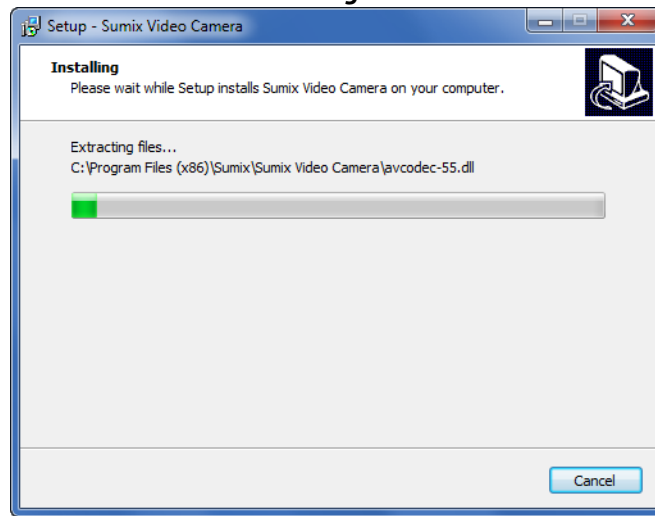
- 7 In the **Ready to Install** step, view the options you selected and click **Install**.

FIGURE 3.6 **Ready to Install screen**



- 8 The Wizard will start to install the application on your computer.

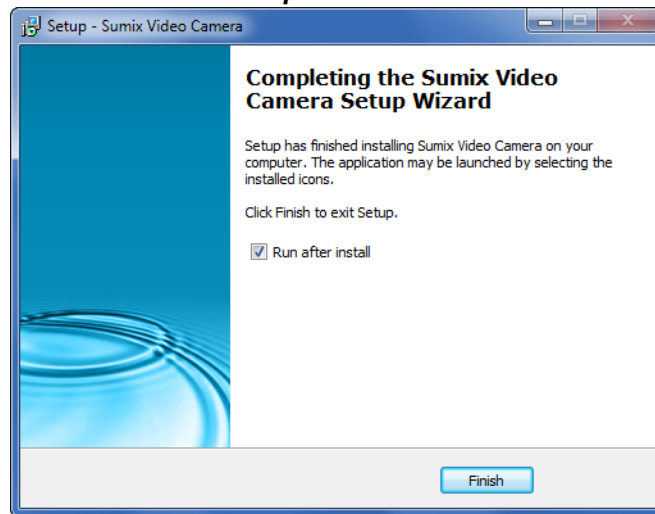
FIGURE 3.7 **Sumix Video Camera Installing screen**



During the installation, the system may ask you whether you want to install the device software. Press **Run** to proceed.

Press **Finish** to exit the Wizard after the installation.

FIGURE 3.8 **The Last Installation Step**



The installation of the camera driver will be completed when you first connect the camera to the computer's USB port.

Note: If you face problems during the camera installation, see [Troubleshooter](#)

3.3 Update

The camera application software is constantly developed and improved. We update software on our web site (www.sumix.com), so customers may check it and have new installer files.

The update procedure is exactly the same as the installation described in the previous section. Simply run the new installer **SMX_USB3CameraApp-<version>.exe** and follow the Wizard.

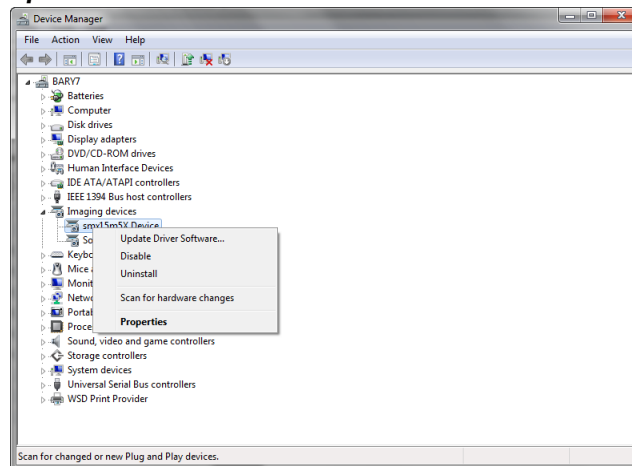
3.3.1 Driver Update

When a new camera driver version is available, you can update it via the Windows **Device Manager**.

To update the camera driver:

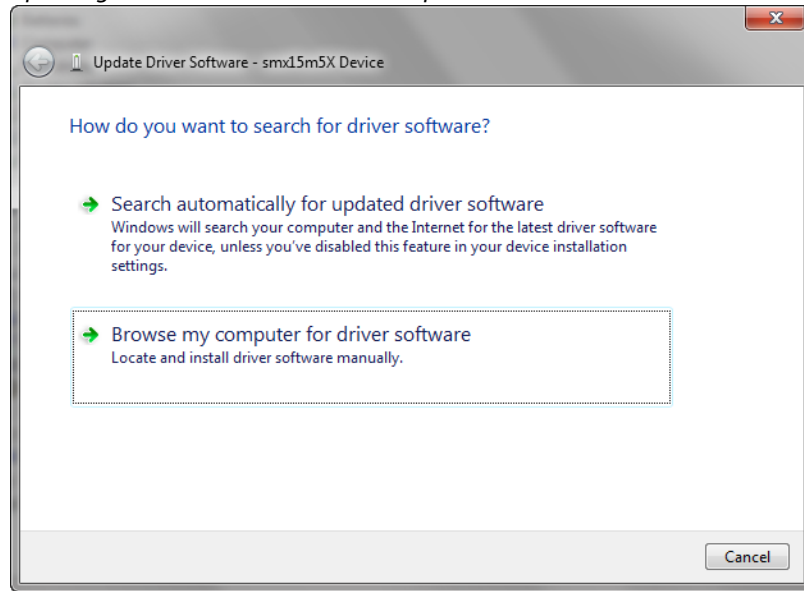
- 1 Connect the camera to the computer.
- 2 Open the **Hardware and Sound** section in the **Control Panel** window, select **Device Manager** window from the **Devices and Printers** subsection.
- 3 Double-click **Imaging devices**.
- 4 Right-click **SMX-15M5x Device** and select **Update Driver Software...**

FIGURE 3.9 *Update Driver Software screen*



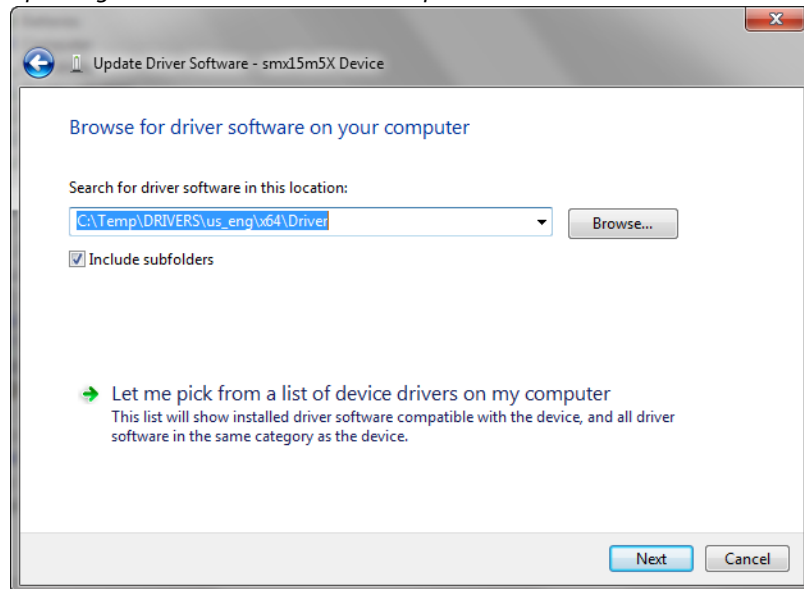
- 5 Follow the easy on-screen instructions. On the first step, select **Browse my computer for driver software**.

FIGURE 3.10 *Updating the Camera Driver screen: Step 1*



- 6 On the next step, browse for the location on your computer where the driver is saved and click **Next**.

FIGURE 3.11 *Updating the Camera Driver screen: Step 2*



- 7 The system will start installing the driver. In the end, a message that the installation is successful will appear. Press **Close** to finish.

3.4 Removal

To remove the Sumix Video Camera software, use the **Programs and Features** subsection of the **Programs** section in the Windows **Control Panel**. Remove the application according to the general Windows application uninstallation rules.

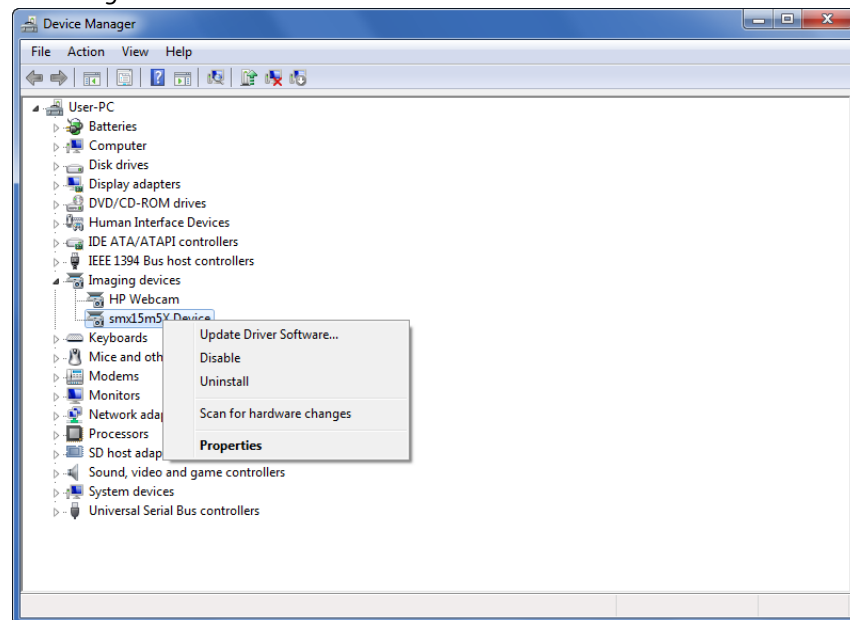
Alternatively, you can click the uninstallation shortcut in the application folder (**Start>All Programs > Sumix > SMX Video Camera> Uninstall SMX USB3.0 Camera**) and follow the uninstallation Wizard.

After removing the software, you need also to remove the camera driver.

To remove the camera driver:

- 1 Connect the camera to the computer.
- 2 Open the **Hardware and Sound** section in the **Control Panel** window, select **Device Manager** window from the **Devices and Printers** subsection.
- 3 Double-click **Imaging devices**.
- 4 Right-click **SMX15M5x Device** and select **Uninstall**.

FIGURE 3.12 *Removing Camera Driver screen*



- 5 Confirm removing the driver: check the **Delete the driver software for this device** box and click **OK**.

FIGURE 3.13 *Driver Removal Confirmation*


- 6 After the driver is uninstalled, the **Sumix Video Camera** will disappear from the **Imaging Devices** section of the **Device Manager**.

3.5 Troubleshooter

If you face problems with installation and detection of the camera, use this Troubleshooter. If you face problems that are not described below, contact Sumix Technical Department via camera@sumix.com.

Note: Tasks and problems in this section are demonstrated in Windows 7 Ultimate operating system.

3.5.1 Camera Was Not Detected or Recognized

If after connecting the camera to your computer the system does not detect it: there is no icon  on the Taskbar or the camera was not recognized by the system, try doing the following:

- 1 Check if the device was installed successfully: open system folder **WINDOWS\system32\drivers** and check if there is the **SMX15M5x.sys** file (normally it is located on the **C:** hard disk). If not, run the driver installation again. Be sure that no camera is connected during installation.
- 2 If the problem still persists, manually save the **SMX15M5x.sys** file to the **\WINDOWS\system32\drivers** folder (the **SMX15M5x.sys** file is located in the **\Sumix\SMX USB 3.0 Camera\Drivers** folder).
- 3 If the problem still persists, try one of the following:
 - Reconnect the camera.
 - Use other USB 3.0 port of your computer — the problem might be due to the USB 3.0 port malfunction.

- Use another USB 3.0 cable — the problem might be due to the USB 3.0 cable malfunction.
- Connect other SMX-15Mxx camera (if any) to the same USB 3.0 port — the problem might be due to the camera malfunction.
- Disconnect the camera and restart your computer.

If none of the above has helped and the device is not recognized yet, then try the following:


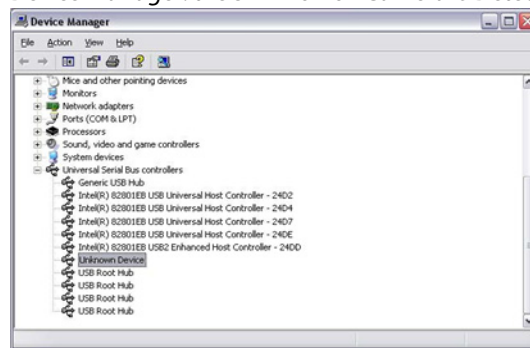
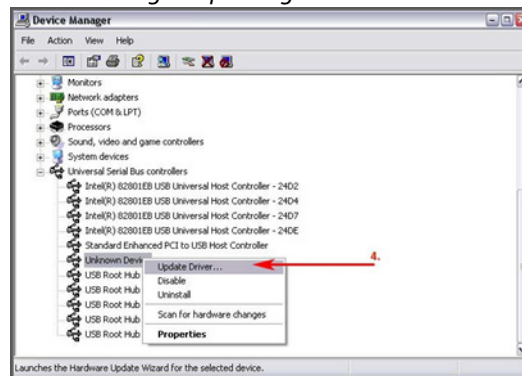
- 1 Connect the problematical camera to the computer.
- 2 Open the **Device Manager** window (right-click **Computer** desktop icon, select **Properties**, and then click **Device Manager**).
- 3 In **Device Manager**, select one of the following:
 - **Imaging devices**> **SMX-15M5x Device** with  Warning status, if it is available there:
or
 - **Universal Serial Bus controllers**> **Unknown device**:

FIGURE 3.14 *Device Manager: the SMX-15M5x Camera is Detected as Unknown Device*



- 4 Right-click and select **Update Driver...**

FIGURE 3.15 *Device Manager: Updating the SMX-15M5x Camera Driver*



- 5 Run the **Hardware Update Wizard** the same way as the **Found New Hardware Wizard** by choosing the **Install the software automatically (Recommended)** option.

- 6 If some problems occur during the manual hardware installation, read the next section of this Troubleshooter.

3.5.2 Cannot Install the Hardware

If the **Found New Hardware Wizard\ Hardware Update Wizard** failed to install the hardware (the **Wizard** that starts after the first connection of the camera or the **Wizard** that starts for updating the hardware; failure occurs after you browse to the files needed for the installation), try doing the following:

- 1 Click **Back** in the **Found New Hardware Wizard** and select **Install from a list or specific location (Advanced)**.
- 2 Click **Next**.
- 3 Select **Search for the best driver in these locations**.
- 4 Check the **Include this location in the search** box.
- 5 Browse to the **Drivers** folder on the **SMX-M15M5x Camera CD** or in the **Sumix\SMX USB 3.0 Camera** folder (located on the hard disk where you installed the **Sumix Video Camera Software**, normally it is the **C:\Program Files\Sumix\Sumix Video Camera**).
- 6 Click **Next**.
- 7 In the list select the last item.
- 8 Click **Next**.
- 9 Wait till the Wizard installs all files.
- 10 Click **Finish** when installation passed successfully.

4

Getting Started

4.1 Installing Lens

To use a lens with the camera, remove the cover from the camera and install a lens as described below.

It is recommended to remove the cover and install a lens (as well as remove a lens and put on the cover) when the camera is faced down, to prevent the sensor contamination.

To install the lens:

- 1 Face the camera down.
- 2 Remove the camera cover.
- 3 Screw the lens in.

FIGURE 4.1 *Installing the Lens*



To remove the lens

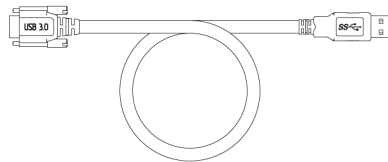
- 1 Face the camera down.
- 2 Screw the lens out.
- 3 Put on the cover.

Note: Before screwing the lens in or putting on the cover, make sure that the surfaces are free from dust.
When you remove the cover, put it facing down to keep dust out.

4.2 Plugging in the Camera

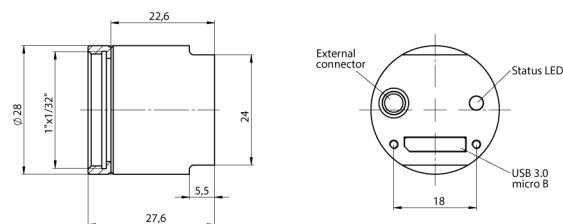
Connect SMX-15M5x camera with USB 3 cable from camera package.

FIGURE 4.2 *USB 3 Cable from Camera Package*



Below, at the right drawing, you can see the camera's rear view. The place to screw-in USB 3 cable is shown.

FIGURE 4.3 *SMX-15M5x Series Camera Case drawings*



Connect the other end of the USB cable to USB 3.0 port of your computer.

4.3 Installing Driver Software

After you connect the camera to the USB port of your computer, a Found New Hardware message will appear in the notification area of the task bar, and Windows will install the hardware driver. When the installation is finished, a message about successful camera driver installation will appear in the notification area.

Note: If you experience problems during the driver software installation, refer to the Installation Troubleshooter and learn how to fix such problems (See [Troubleshooter](#)).

4.4 Starting the Application

After the camera hardware has been installed, you can start the application.

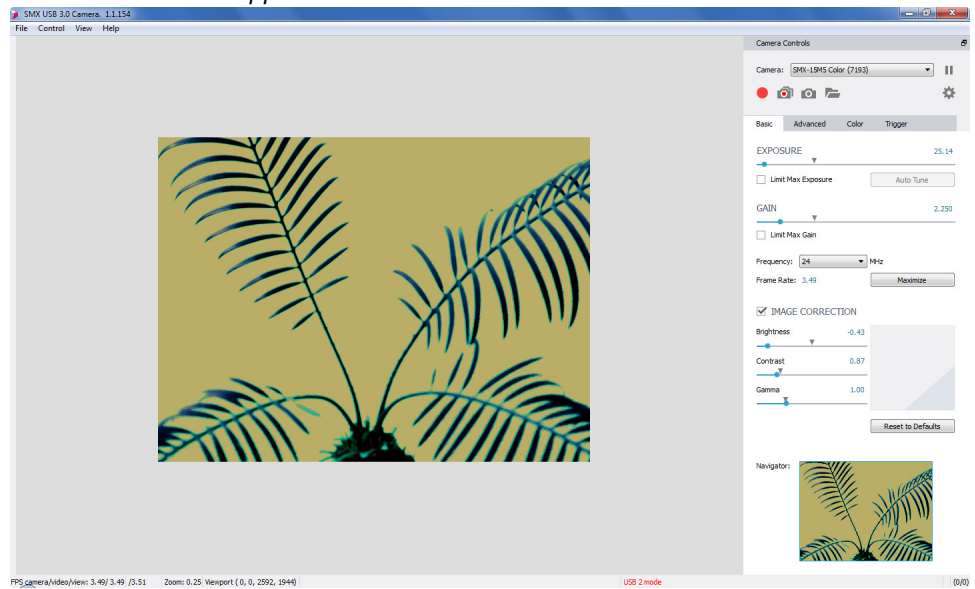
To start the camera application:


Click **Start > All Programs > Sumix > Sumix Video Camera > Sumix Video Camera** application Program. If during the installation you chose to install a desktop icon and/or a quick launch icon, you can as well click the icon to launch the application. The Sumix Video Camera application will start with its main window.

This window is subdivided vertically into 2 parts:

- Left part of it contains the Sumix Video Camera application **View mode** window with live view from the camera and main menu. **Video mode** window reflects all settings of the image
- Right part contains **Camera Controls** options. To tune camera settings select required part of Controls: **Basic**, **Advanced**, **Color**, or **Trigger**

FIGURE 4.4 *Sumix Video Camera Application Main Window*



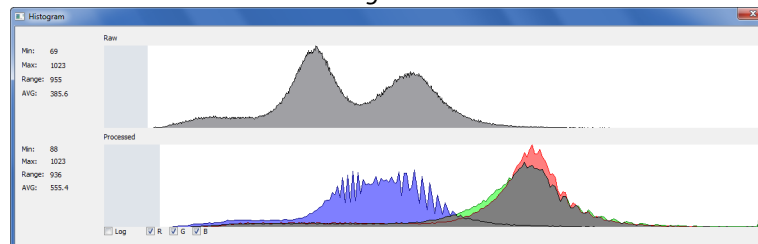
The main window may be divided into two separate windows: left part of the main window and right part of it. To have possibility of work with two separate windows click  at the top right angle of the main window.

4.5 Histogram

Histogram represents the tonal distribution of the image.

To open the histogram: Press the **H** button on the keyboard or select **Show Histogram** from the **View** option of the main menu. **Camera Raw and Processed** histograms will appear at the **Histogram** separate screen, showing signals for different (**R, G, B**) colors.

FIGURE 4.5 *Camera Raw and Processed Histograms*



For color cameras you may select color(s) to show by checking box(es) of required color(s) at the bottom of the **Histogram** screen.

Note: The histogram window is empty when the video is not started.

Check **Log** box at the bottom of **Histogram** screen to use logarithmic scales for the axes, it makes the histogram easier to read.

In the left part of **Histogram** screen you may see statistics for **Raw** and **Processed** diagrams (**Min**, **Max**, **Range** and **Average** values).

After launching the application video from the camera is started automatically. If you need to stop video stream press **|| Stop Video** button in the top right angle of **Camera Controls** screen section or select **Stop Video** from **Control** option of the main menu. To start video press **▶ Start Video** button in the top right angle of **Camera Controls** screen section or select **Start Video** from **Control** option of the main menu.

4.6 LED Indicator

A multi-function LED that illuminates in green, orange or red to provide additional information that can be interpreted by the camera operator. Check the table below for the LED appearance and status:

TABLE 4.1 LED appearance and status

LED Status	Typical meaning
Turned off	Camera is not connected or Device driver failed to load
Blinks green	Camera is ready (operating in USB 3.0 mode)
Solid green	Camera is streaming (operating in USB 3.0 mode)
Blinks orange	Camera is ready (operating in USB 2.0 mode)
Solid orange	Camera is streaming (operating in USB 2.0 mode)
Blinks red	Camera is in Speed Test mode
Solid red	Camera error, contact the Sumix Support team

4.7 Grid

To see grid at the video you may use **Ctrl+G** shortcut or select **View>Show Grid** option from the main menu. Grid square size is 100x100 pixels.

4.8 Actual Pixels

Actual pixels mode displays the image on your monitor so that 1 image pixel uses exactly 1 monitor pixel.

To see actual pixels on your monitor you may use **Ctrl+1** shortcut or select **View>Actual Pixels** option from the main menu.

4.9 Other View Options

Sumix Video Camera application enables you to see it at Full screen, to Zoom Video In and Zoom Video Out, to Fit Video on Screen.

You may expand application to fill your entire screen with its **Full Screen** feature. Simply use **F** shortcut or select **View>Full Screen** option from the main menu.

To Zoom Video In use **Ctrl++** shortcut or select **View>Zoom Video In** option from the main menu.

To Zoom Video Out use **Ctrl+-** shortcut or select **View>Zoom Video Out** option from the main menu.

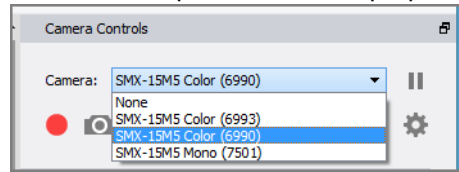
To Fit Video on Screen use **Ctrl+D** shortcut or select **View> Fit on Screen** option from the main menu.

4.10 Switching Between Cameras

If you have more than one SMX-15M5x Series camera connected to your PC, the camera application allows you to switch between them.

To switch between multiple cameras:

Click the list of present cameras, proposed at the top right part of the main window

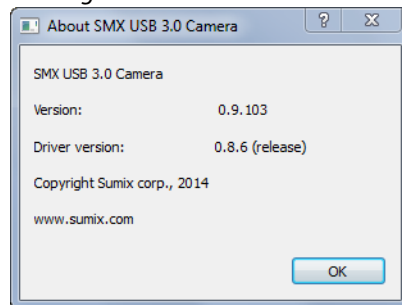


and select the desired one. Camera ID is shown in the brackets.

4.11 Viewing Sumix Video Camera Application Info

To view information about Camera application and driver version select **Help>About** from the main menu.

FIGURE 4.6 *Viewing Camera Info*



5

Tuning Guidelines

5.1 Initial Settings

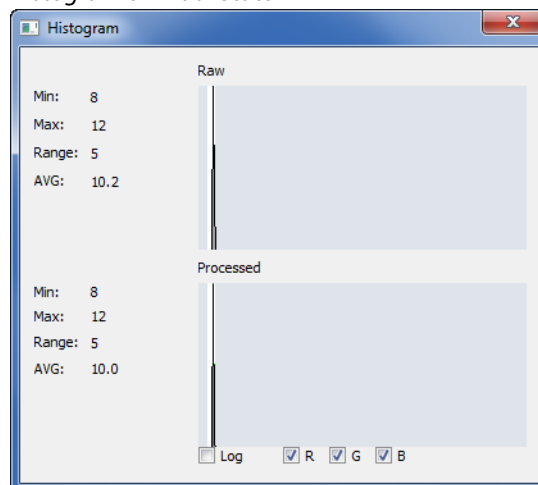
Check that video is running. If it is not, check the list of all available cameras at the top of **Camera Controls** screen, click **Camera** list to select the connected camera. If the list is empty, check if the camera is connected and if the driver is installed correctly.

The illumination of the camera's image depends on the values of frequency, exposure, gain, the image dimensions (resolution), and decimation factor.

The recommended initial settings are:

- **GAIN** and **EXPOSURE** sliders (**Basic** screen) are in the lowest position
- **Decimation** (**Advanced** screen) is 1:1
- **Viewport** (**Advanced** screen) size is 2592 x 1944
- **Color reconstruction** mode (**Color** screen) is set to **Nearest color** for SMX-15M5C color model and to **Monochrome** for SMX-15M5C monochrome model
- **Histogram** is active (from the main menu **View>Show Histogram** is selected or **H** is pressed)

FIGURE 5.1 *Histogram of Initial State*



- The **Brightness, Contrast, Gamma** sliders under the **IMAGE CORRECTION** box (**Basic** screen) are in the marked position (their values are 0, 1, 1 respectively).

To reset the values for all these sliders at one go, click the **Reset to Defaults** button. To reset one of them, click on its value at the right end of the slider bar and make changes.

Minimum, maximum and default values for every parameter are shown on hover.

To restore default settings for all parameters select **File > Restore Default Settings** from the main menu.

5.2 Tuning Light in the Image

To tune illumination, install a lens (see [Installing Lens](#)).

To tune light in the image:

- 1 Use maximum diaphragm aperture of your lens.
- 2 Try to get enough light using the **EXPOSURE** slider (**Basic** screen). Minimum, maximum and camera maximum values of exposure are shown on hover.
- 3 If illumination is not enough, use the **Gain** slider. Minimum, analog maximum and digital maximum values of gain are shown on hover.
- 4 Use **Auto Tune** button under the **EXPOSURE** slider at the **Basic** screen to adjust automatically the exposure or exposure and gain simultaneously (see [Auto Tune](#)).

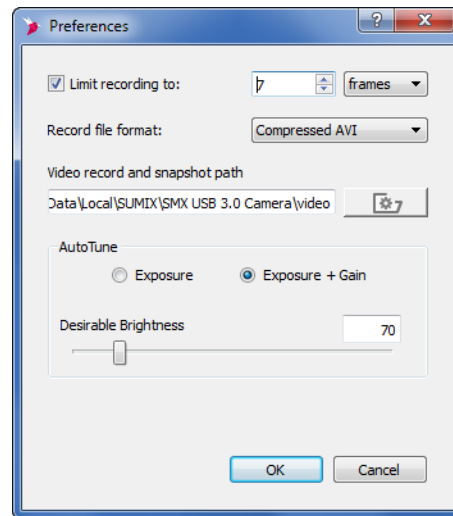
5.3 Auto Tune

Auto Tune option is accessible by clicking **Auto Tune** button under the **EXPOSURE** slider at the **Basic** screen.

This function works in real time. Exposure or Exposure and Gain are changed on every change of illumination.

To adjust Auto Tune option according to your preferences:

- Select **File > Program Preferences** from the main menu or click **Auto Tune** button under the **EXPOSURE** slider at the **Basic** screen
- In the **Preferences** screen

FIGURE 5.2 **Preferences screen**

select one of two modes for Auto Tune function: **Exposure** or **Exposure + Gain**.

To auto tune only Exposure select **Exposure** option.

To auto tune Exposure and Gain select **Exposure + Gain** option.

- To set the required brightness level for Auto Tune option use the **Desirable Brightness** slider or box to key in the value of desirable brightness.

If you need to use Auto Tune option only once just click **Auto Tune** button one more time after all parameters, required for auto tune, were set.

Note: Auto Tune function operates in Limited range of Exposure and Gain.

5.4 Color Tuning

Color tuning options are available for color SMX-5M5C camera.

To tune color of the image:

Select **Auto White balance** from the **White Balance** list at the **Color** screen.

To control the color components, check the **COLOR CORRECTION** box at the **Color** screen and use the **Red**, **Green**, **Blue** sliders, and the **Hue**, **Saturation**, **Lightness** sliders. Minimum, maximum and default values of color components are shown on hover.

5.5 Contrast Tuning

Activate the **Histogram** (select **View>Show Histogram** from the main menu or press **H** on keyboard), check the **IMAGE CORRECTION** box at the **Basic** screen, and use the **Brightness, Contrast, and Gamma** sliders to get the histogram as wide as possible (ideal min = 0, max = 255 provided there are no red points at the extremities of the histogram window). Minimum, maximum and default values of **Brightness, Contrast, and Gamma** are shown on hover.

5.6 Camera Controls

The camera control options are located at the **Basic** and **Advanced** screens of the **Camera Controls** part of application main window. They are as follows.

FIGURE 5.3 Camera Controls at the **Basic** Window

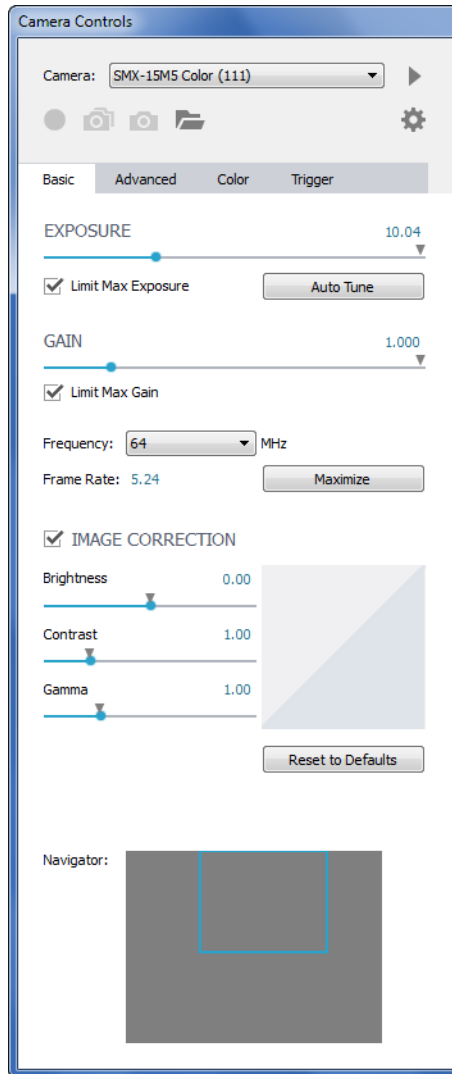
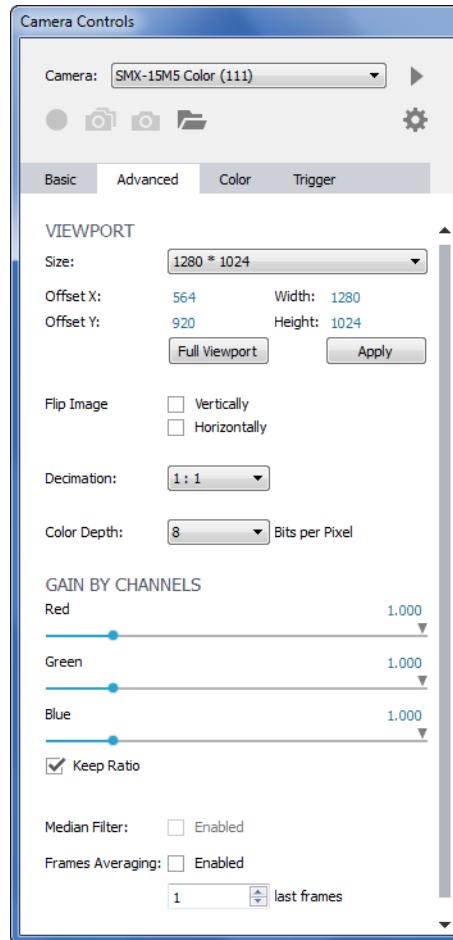


FIGURE 5.4 Camera Controls at the **Advanced** Window

5.6.1 Exposure

The exposure parameter defines time during which the sensor will consume light energy before starting to record data. Use the **EXPOSURE** slider to adjust the camera exposure time manually. The current exposure time in milliseconds is displayed above the control. This value depends on viewport height, decimation and sensor frequency. If you need to set exposure even higher than the maximum slider value, uncheck the **Limit Max Exposure** box. The maximum slider value will become higher, but it will reduce the frame rate.

5.6.2 Gain

The **GAIN** slider at the **Basic** screen controls the camera's hardware gain amplifier.

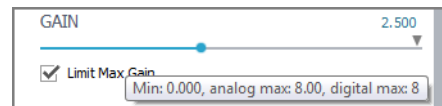
For color camera at the **Advanced** screen of main window gain can be controlled independently for **Red**, **Green**, and **Blue** channels (**R**, **G**, **B**). The **Red**, **Green**, and **Blue** sliders control the hardware gain for each color channel.

Checking the **Keep Ratio** box in the **GAIN BY CHANNELS** section of **Advanced** screen allows controlling gain on three channels simultaneously and keeping the fixed **Red**; **Green**; **Blue** gain ratio.

You can limit the maximal gain value. Use the **Limit Max Gain** check box in the **Basic** window. Before limit the value of gain is analog, after limit it is digital.

Minimum, analog maximum and digital maximum values for gain are shown on hover.

FIGURE 5.5 *Limit Max Gain Control*



5.6.3 Frequency

The **Frequency** drop-down box at the **Basic** screen provides values for the pixel clock frequency of the sensor. The lower the frequency, the higher the maximum possible exposure time and the less the frame rate is. This control defines the frequency of polling the camera for its image stream.

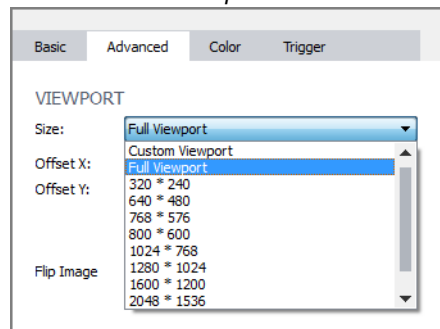
Note: When using camera in USB 2.0 mode default frequency is 12 MHz. If you set too big frequency for USB 2.0 channel bandwidth video is restarted and frequency is set to 12 MHz

5.6.4 Viewport

Viewport is a rectangular area of the sensor on which the image is scanned. It can have variable size: from the full sensor field of view to the small area. The smaller vertical size (in lines) of the viewport, the faster the scan process and the higher the frame rate is.

You may change the viewport in one of the following ways:

- 1 Select required predefined value from the **VIEWPORT size** drop-down box at the **Advanced** screen

FIGURE 5.6 **VIEWPORT Size** drop-down box

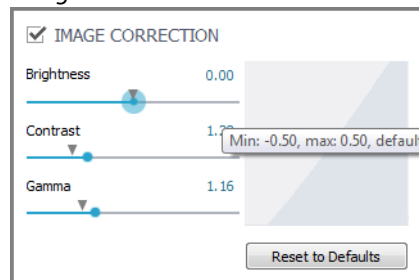
- 2 You can have full viewport as well by clicking **Full Viewport** tab below the **VIEWPORT Size** drop-down box
- 3 Alternatively you can change values in the following fields:
 - **Offset X, Offset Y** fields with coordinates of the top left corner of the rectangle
 - **Width, Height** fields with the values of the viewport's rectangle width and heightClick **Apply** button to apply changed values
- 4 You may change viewport manually as well by dragging sides and/or edges of the picture in **Navigator** that is at the bottom of **Basic** screen.

5.6.5 Decimation

Use the **Decimation** drop-down box at the **Advanced** screen to decimate (subsample) the picture by 2, 3, 4, 6 (according to Skipping method), or 2 binn, 4 binn (according to Binning method). The decimation means excluding pixels and rows from the scan process (for example, every second pixel and second row for the 1:2 decimation). This mode thus allows viewing the picture at the higher frame rate and preserving desired field of view. The higher decimation can be used for preview, when 1600 x 1200 image can be displayed as 800 x 600 with the frame rate two times higher.

5.7 Image Correction

At the **Basic** screen you can see the **IMAGE CORRECTION** check box. Image correction controls (the **Brightness, Contrast, and Gamma** sliders) are available when this check box is checked. These controls are designed for setting up the camera brightness, contrast, and gamma. These corrections are programmable with the conversion (lookup) table of the values. They do not affect any electrical settings of the camera. The visual image of this table of values according to selected values of image correction controls is shown to the right of **the Brightness, Contrast, and Gamma** sliders.

FIGURE 5.7 *Image Correction Controls*

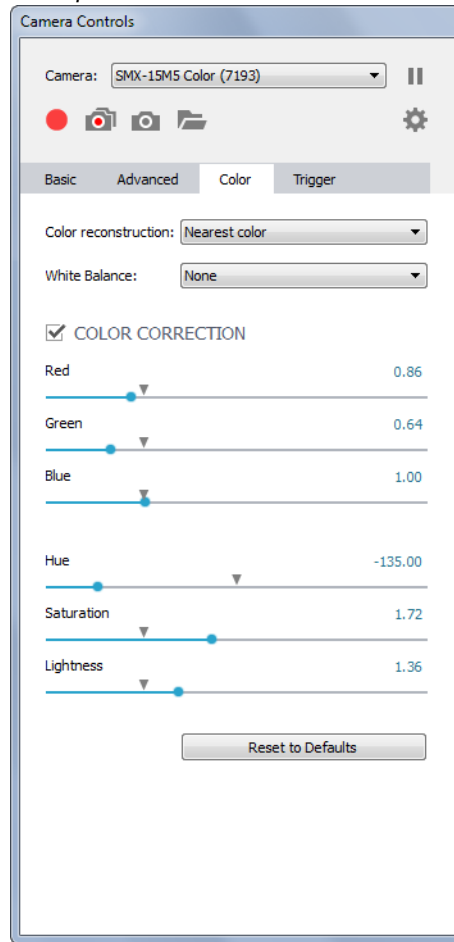
By default, the values of **Brightness**, **Contrast**, and **Gamma** are set to **0**; **1,00**; **1,00** respectively. Default value is marked for every slider. You can restore the default values at any step, just click the **Reset to Defaults** button below the **Brightness**, **Contrast**, and **Gamma** sliders.

With every change of any image correction control, you can view a graphical interpretation of dependence of the image's changes from the changes of the image correction controls.

5.8 Color Balance

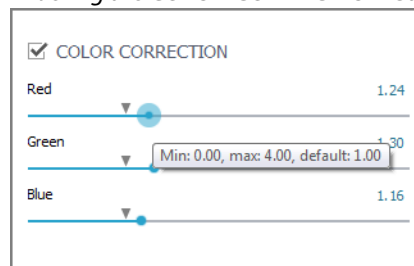
The **COLOR CORRECTION** controls at the **Color** screen are designed for the SMX-15M5C color model to adjust the ratio of the main induced color components (**Red**, **Green**, and **Blue**) of the image.

FIGURE 5.8 **Color part of Camera Controls screen**



This correction is performed on the software level and does not affect any electrical settings of the camera. To use the **COLOR CORRECTION** controls, select the **None** option from the **White Balance** drop-down list, required Color reconstruction mode from the **Color reconstruction** drop-down list, check the **COLOR CORRECTION** box at the **Color** screen. Now **Red**, **Green**, and **Blue** sliders become editable.

FIGURE 5.9 **Enabling the COLOR CORRECTION Controls**

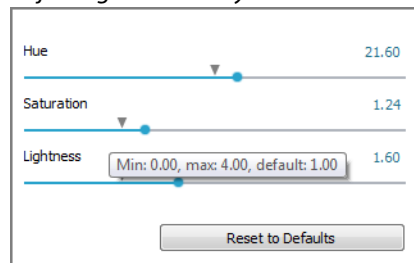


Select the **Auto White Balance** mode from the **White Balance** drop-down list for white color balancing at the software level. It changes only the **COLOR CORRECTION** controls. The **Reset to Defaults** button returns the **COLOR CORRECTION** controls to their default values: 1.00; 1.00; 1.00 respectively. Single step of the **COLOR CORRECTION** controls is 10 times smaller than **GAIN BY CHANNELS>Red, Green, and Blue** of the sensor controls, that are under the **Advanced** tab, so all changes of **COLOR CORRECTION** controls can be performed with more accuracy than it can be done using **GAIN BY CHANNELS>Red, Green, and Blue** of sensor controls.

5.9 Color Correction

The lower part of **COLOR CORRECTION** controls at the **Color** screen are designed for the SMX-15M5C color model as well to adjust the intensity of the color properties (**Hue**, **Saturation**, and **Lightness**) of the image. This correction is performed on the software level and does not affect any electrical settings of the camera. To use these **COLOR CORRECTION** controls, select the required color reconstruction mode from the **Color reconstruction** drop-down box.

FIGURE 5.10 *Adjusting the Intensity of the Color Properties*



Use the **Reset to Defaults** button as well to restore the default values of Hue, Saturation and Lightness – 0,0; 1,00; 1,00, respectively.

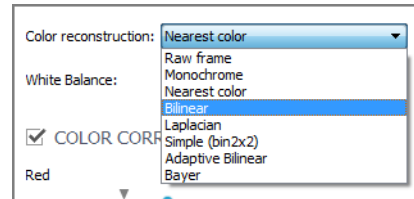
5.10 Advanced Camera Controls

5.10.1 Color Reconstruction Modes

The **Color reconstruction** drop-down list contains several modes with different rules for decoding the stream of source pixels from the sensor and transforming it into the output image. Most of this modes are available only for the SMX-15M5C color model.

Only Raw frame and Monochrome modes are available as well for SMX-15M5M monochrome model.

FIGURE 5.11 *Color Reconstruction Modes*



Select required color mode from the proposed list that contains: the Raw frame mode, the Monochrome mode, the Nearest color mode, the Bilinear mode, the Laplacian mode, the Simple (bin2x2) mode, the Adaptive Bilinear mode, the Bayer mode.

The **Monochrome** mode forces the transformation of the sensor pixels data into monochrome stream.

The **Nearest Color** mode: Bayer matrix from the sensor is transformed into destination stream using the Nearest Color algorithm (the fastest algorithm that gives the worst, compared to other algorithms, image quality).

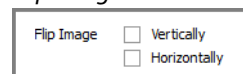
The **Bilinear** mode: Bayer matrix from the sensor is transformed into destination stream using the Bilinear algorithm (a slower algorithm that gives better quality).

The **Laplacian** mode: Bayer matrix from the sensor is transformed into destination stream using the Linear Interpolation with Laplacian second-order correction terms (the slowest algorithm that gives the best quality).

5.10.2 Flip image

You can flip the image in the **Video** mode window horizontally and/or vertically. Check the corresponding **Flip image** box/boxes of the **Advanced** window. Using the flip controls, you can flip the image without changing the camera position itself.

FIGURE 5.12 *Flip Image boxes*



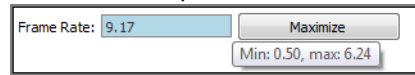
5.10.3 Frame Rate

You can change the frame rate for the current camera parameters (for example, frequency or viewport) using the **Frame Rate** box of the **Basic** window.

To change frame rate:

- 1 Open the **Basic** window.

FIGURE 5.13 *Frame Rate Setup*



- 2 The **Frame Rate** box by default shows the maximum value for the current camera parameters.
- 3 Type in the new value in the **Frame Rate** field, then press **Enter**.

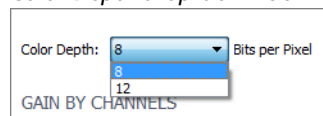
You will not be able to set frame rate lower or greater than limits. Minimum and maximum values for frame rate are shown on hover. If entered value is higher than maximum, maximum possible frame rate will be set. When entered value is lower than minimum, minimum possible frame rate will be set. To set maximum frame rate for current settings, click the **Maximize** button to the right of the **Frame Rate** field. Check the Frame Rate value when running video: it will be displayed at the bottom-left corner of the status bar in the application's main window. Camera application displays frame rates as: FPS (Frames per seconds) produced by camera/displayed by application.

Note: When running the camera on a system that does not meet the minimal requirements, the frame rate value can be less than it is set in the Frame Rate field, especially when running with full viewport and with high frequencies.

5.10.4 Output Bits per Pixel

You can select 12 bits in Color depth drop-down box at the **Advanced** screen if you want the software to transmit 12 bit images from the camera as opposed to regular 8 bit.

FIGURE 5.14 *Color Depth drop-down box*



5.10.5 Filtering

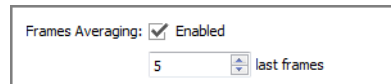
The **Median Filter** option turns on pixel averaging. The brightness of every single pixel becomes affected by the brightness of its neighbor pixels and the whole image becomes smoother.

FIGURE 5.15 *Median Filter checkbox*

5.10.6 Frames averaging

You may increase the image quality by compensating the random noise of the sensor.

For this purpose, use the **Frames Averaging** control at the bottom of **Advanced** screen:



- 1 Check the **Frames Averaging** box
- 2 Select or key in the number (N) of the last frames to be averaged. The currently displayed frame is the average of the last N frames set. The picture is updating every frame

Note: Use the averaging only for static pictures. Displaying moving objects in the average mode will lead to the image blurring.

5.11 Saving and Loading Camera Video Settings

The Sumix Video Camera application automatically stores most of the camera settings on exit and restores them on startup. You can also store current settings in profile files and load them whenever you need. Profiles store all current settings.

To save current camera video settings into a profile:

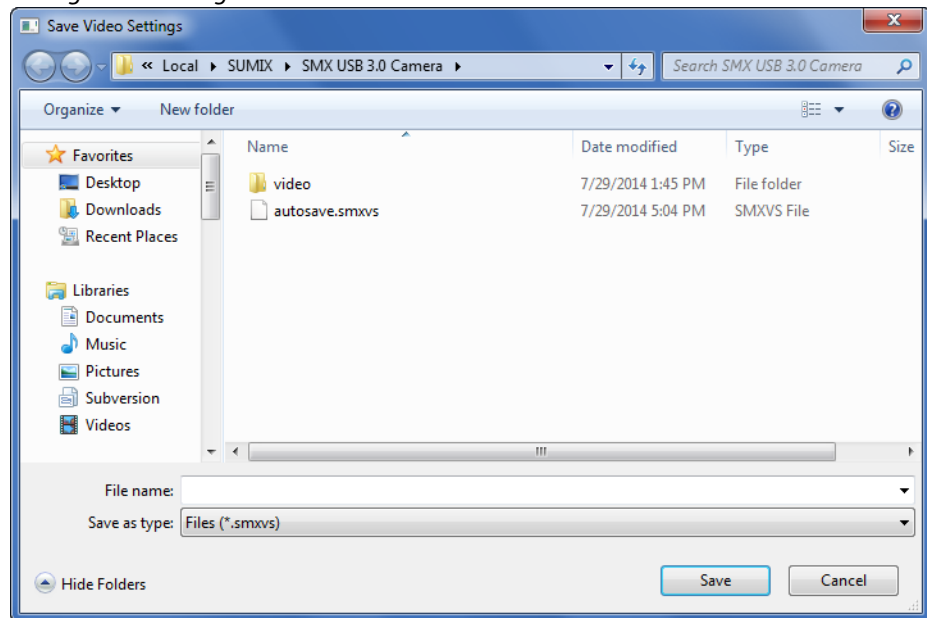
- 1 Press **Ctrl+S**

or

In the **File** menu select the **Save Video Settings...** command

- 2 **Save Video Settings** box appears. Type in profile title and select a folder where you want to save the file.

FIGURE 5.16 *Saving Video Settings*

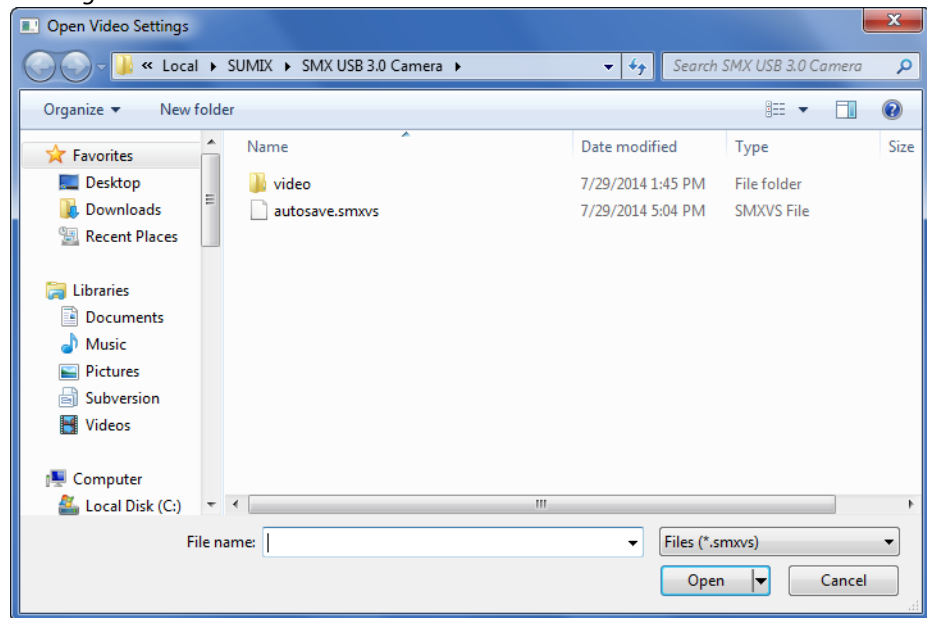


3 Press **Save**.

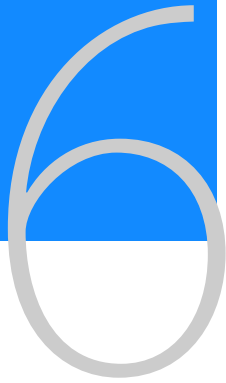
To load camera video settings:

- 1 Press **Ctrl+R** or in the **File** menu, select the **Read Video Settings...** command
- 2 **Open Video Settings** window appears. Browse to a folder with profile files and select one you want to load

FIGURE 5.17 *Loading Camera Profile*



3 Press **Open**.





Capturing


The Sumix Video Camera application enables you to record frames, capture images from the camera and to record video.

6.1 Recording Frames

The Sumix Video Camera application allows recording sequences of frames from the camera.

To record sequence of frames:

- 1 You may set limit on duration of recording in seconds or in number of frames (see [Limit Recording](#)).
- 2 Make sure that video is running.
- 3 Press the  **Record Frames** button under the name of the camera at the **Camera Controls** screen. If you set limit on duration of recording, the process of recording will stop automatically, in other case to stop recording frames press the  **Record Frames** button one more time.
- 4 The frames are recorded according to selected duration of recording. Every frame is saved as Bitmap Image File to the folder. Every session of recording is saved to its own folder.
- 5 The address of the folder that contains folders with frames is specified in **Video record and snapshot path**. To change folder for saving folders with frames follow the instructions in [Setting Recording Folder](#). Every new folder with frames is named automatically, according to the time when it was created. The name of the folder looks like: **Year_Month_Day_Hours_Minutes_Seconds.bmp**


To open folder that contains folders with frames click  **Open recording folder** icon at the top of **Camera Controls** screen.

6.2 Capturing Images


The Sumix Video Camera application allows capturing images from the camera.

6.2.1 Making Snapshots

To make snapshot:

- 1 Make sure that video is running
- 2 Press **Control+Space** or the  **Make Snapshot** button under the name of the camera at the **Camera Controls** screen; you may as well select **Control>Make Snapshot** from the main menu
- 3 The snapshot is made immediately. It is shown at the screen and saved as Bitmap Image File in the folder, specified in **Video record and snapshot path**. To change folder for saving captured frames follow the instructions in [Setting Recording Folder](#). The file is named automatically, according to the time when file was created. The name looks like:

Year_Month_Day_Hours_Minutes_Seconds.bmp

To open folder with saved snapshot click  **Open recording folder** icon at the top of **Camera Controls** screen.

6.2.2 Copying Images to Buffer


To copy image to buffer:

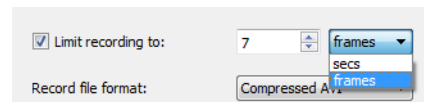
- 1 Make sure that video is running.
- 2 Click application screen to make it active
- 3 From the main menu select **View >Copy to Buffer** or use shortcut **Ctrl+C** to make the copy of snapshot

You may paste this copy into your files by using **Paste** option or **Ctrl+V** shortcut.

6.3 Limit Recording

You may set limit in seconds or in number of frames on duration of recording.

- 1 Click the  **Preferences** icon below the name of the camera at the **Camera Controls** screen or select **File>Program Preferences...** from the main menu
- 2 At the **Preferences** screen check **Limit recording to** box



- 3 Key in or select the number of seconds or frames in the corresponding field
- 4 Select in what units you would like to limit duration: in seconds or in frames

6.4 Recording Video

Before recording you should select format for saving video to memory.


6.4.1 Video Record Formats

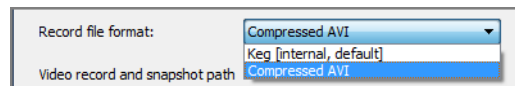
Camera application allows to record Video in two formats:

- **Keg video file (.kvf)** – internal video format which can be replayed with the help of **SMX USB3 Video Viewer** utility that goes with the standard **Sumix Video Camera software package**. This utility as well gives possibility to change parameters of your video (see SMX USB3 Video Viewer User Guide)
- **Compressed AVI**

By default video will be saved in **.kvf** file.

To change video record format:

- 1 Click the  **Preferences** icon below the name of the camera at the **Camera Controls** screen, or select **File>Program Preferences...** from the main menu
- 2 Select desirable format from **Record file format** drop-down list



6.4.2 Recording Video

To record a video:


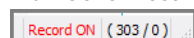
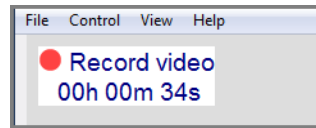

- 1 Make sure that video is running.
- 2 Press **Space**, or the  **Record Video** button below the name of the camera at the **Camera Controls** screen, or select **Control>Record Video** from the main menu. In the lower right corner of **Camera Controls** screen during video recording you may see the data on the number of recorded frames/the number of missed frames

FIGURE 6.1 *Number of Recorded Frames/the Number of Missed Frames*




During video recording you may see the **Timer** that shows duration of recording in hours, minutes and seconds in the upper-left corner of Video window.

FIGURE 6.2 *Timer*

- 3 Press **Space** to stop video recording or click the  **Stop Recording** button below the name of the camera at the **Camera Controls** screen, or select **Control>Stop Recording** from the main menu
- 4 The video is recorded and saved in selected format and in the folder specified as described in [Capturing Images](#).

The file is named automatically, according to the time when file was created. The name looks like:

Year_Month_Day_Hours_Minutes_Seconds

To open folder with saved video click  **Open recording folder** icon at the top of **Camera Controls** screen. To change folder for saving video follow the instructions in [Setting Recording Folder](#).

6.5 Setting Recording Folder

To set folder for saving video and snapshots do the following:


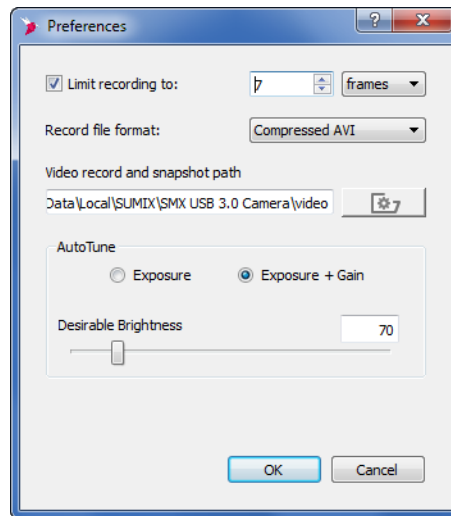
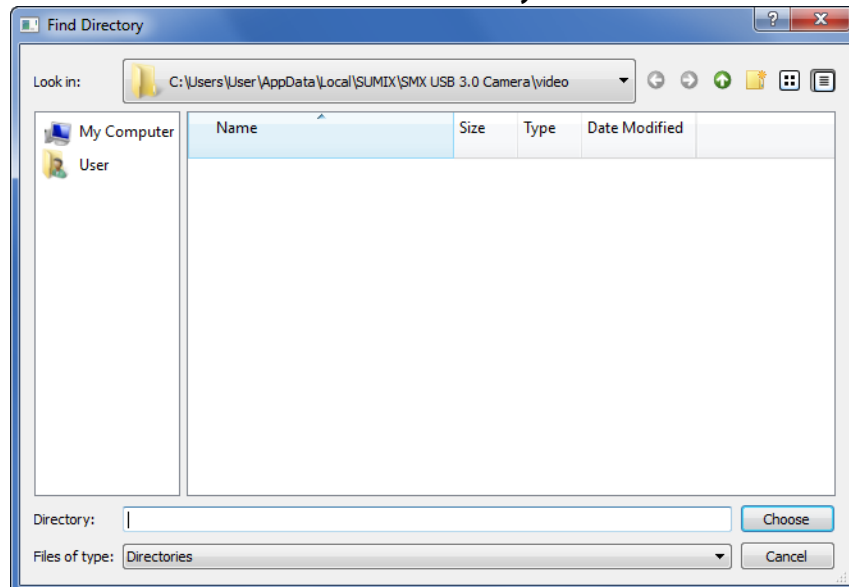
- 1 Click the  **Preferences** icon below the name of the camera at the **Camera Controls** screen, or select **File>Program Preferences...** from the main menu.
- 2 At the **Preferences** screen

FIGURE 6.3 **Preferences screen**

select the directory for saving your files in the **Video record and snapshot path** field (you may key in the path)

or

select it by clicking  **Set recording folder** button to the right of the field and pressing **Choose** button after directory selection with the help of the **Find Directory** screen.

FIGURE 6.4 **Select Folder to Save File into with Find Directory screen**

Now all video and snapshots will be stored in this selected folder till the moment you decided to change the folder for storing video and snapshots.



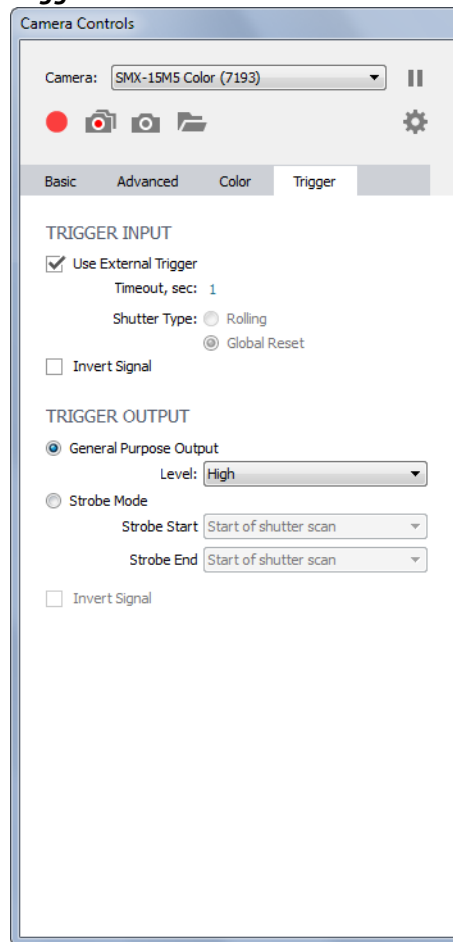
Using External Trigger

SMX-15M5x camera supports synchronization with an external device.

Camera application allows showing frames that are produced by camera when triggering pulse is applied. To operate in this mode:

- 1 Make sure the video is running
- 2 Connect an external device
- 3 Go to **Trigger** tab at the **Camera Controls** screen
- 4 Check **Use External Trigger** box

FIGURE 7.1 **Trigger Part of Camera Controls screen**

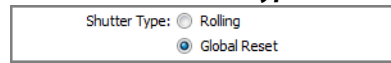


If the **Use External Trigger** box is checked application shows frames that are produced by camera when triggering pulse is applied

It's possible to record video or make snapshot as it was described in [Capturing](#).

If you need to invert input signal, check the **Invert Signal** box.

In mode of Using External Trigger you may use **Global Reset Shutter Type** to decrease motion blur of moving objects. Just check **Global Reset** option in **Shutter Type** section.

FIGURE 7.2 **Global Reset Shutter Type selection**

Note: When **Use External Trigger** box is checked all the parameters that affect the frame rate changing (Exposure, Frequency, Frame Rate, Viewport parameters) are disabled.

7.1 Taking Snapshots Using Hardware Trigger

To take a snapshot using a hardware trigger:


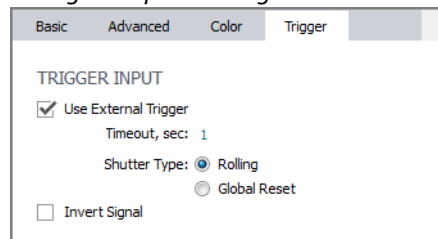
- 1 Connect an external device (equipment) such as external camera
- 2 Check the **Use External Trigger** box
- 3 Click the  **Make Snapshot** button at the top of **Camera Controls** part of screen

FIGURE 7.3 **Taking a Snapshot Using the Hardware Trigger**

- 4 Apply triggering pulse (see [External Trigger Connector Pinout](#))
- 5 As a result, in the moment of applying triggering pulse the snapshot will be saved

Snapshots are saved in the folder, specified in **Video record and snapshot path**. To change Recording Folder see [Setting Recording Folder](#).

To open folder with saved snapshot click  **Open recording folder** icon at the top of **Camera Controls** screen.

7.2 Recording Video Using Hardware Trigger

To record video using hardware trigger:


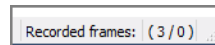
- 1 Make sure video is running
- 2 Connect an external device
- 3 Check **Use External Trigger** box
- 4 Press  **Record Video** button: all frames that are produced by camera when triggering pulse is applied will be saved to the video file. Timer in the top left corner of Video window shows total time after pressing **Record Video**, frame counter in the bottom right part of the main screen shows number of frames that are recorded

FIGURE 7.4 *Frame Counter*



- 5 Press  **Stop Recording** button to finish recording

Video is recorded and saved in the file of selected format (see [Video Record Formats](#)) in the folder specified in **Video record and snapshot path** (to change the folder see [Setting Recording Folder](#))

If you need to limit the video duration see [Recording Video](#).

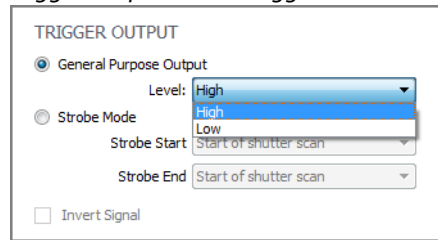
7.3 Using Trigger Output Functions

You can control external hardware (for example, flash lamp, mechanical shutter, slave camera, etc.) by using trigger output signal produced by camera.

For this purpose use **TRIGGER OUTPUT** part of **Trigger** subscreen.

There are two different modes of trigger output signals:

- General Purpose Output
- Strobe Mode

FIGURE 7.5 *Trigger Output Part of Trigger subscreen*

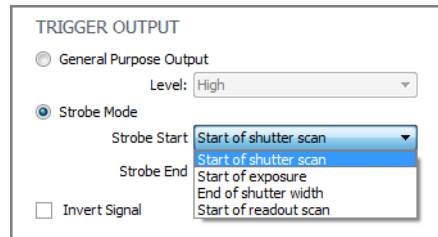
To setup **High** or **Low** level in **General Purpose Output** mode:

- Check **General Purpose Output** at the **TRIGGER OUTPUT** part of **Trigger** subscreen
- From proposed **Level** drop-down list select required level of signal

In **Strobe Output Mode** the camera produces the pulse with every frame.

To use **Strobe Output Mode** :

- Check **Strobe Mode** at the **TRIGGER OUTPUT** part of **Trigger** subscreen
- Select mode of **Strobe Start** from proposed drop-down list



- Select the value of **Strobe End** from proposed drop-down list

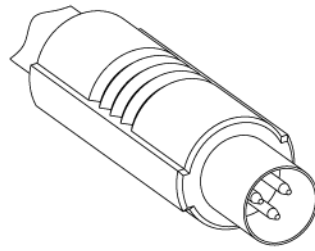
Last two options are proposed for advanced users.

If you need inverted signal, check the **Invert Signal** box below.

7.4 External Trigger Connector Pinout

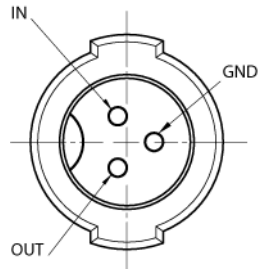
At the drawing below you can see pinout of external trigger connector.

FIGURE 7.6 *External 3-pin Trigger Connector Pinout*



The drawing below helps you to understand how to connect trigger to camera.

FIGURE 7.7 *External Connector Pinout*



Where: Common (GND), External trigger input (IN), External trigger output (OUT).

For better understanding see rear view of the USB 3.0 Camera at [Figure 4.3 on page 18](#).

8

Use of Accessories

SMX-15M5x Series can be supplied with the following accessories:

- 1 C-mount adapter
- 2 Tripod adapter
- 3 USB 3 cable

This chapter will show how to use the cameras with adapters.

8.1 C-mount

C-mount adapter is shown below:

FIGURE 8.1 *C-mount Adapter*



Converting the Camera from CS-mount to C-mount or from C-mount to CS-mount:
Usually the SMX-15M5x Camera goes with the C-mount adapter already screwed in.

- To use the SMX-15M5x Camera as CS-mount, screw the C-mount adapter out
- To use the SMX-15M5x Camera as C-mount, screw the C-mount adapter in

FIGURE 8.2 *Camera with CS-mount*



FIGURE 8.3 *Camera with C-mount*



Note: It is recommended to screw in (as well as screwing out) the C-mount adapter, lens, or the Camera's cover when the Camera is facing down or when the Camera is in horizontal position – to prevent the sensor contamination.

FIGURE 8.4 *Camera Positions before Screw in and Screw out of the C-mount Adapter, Lens, or the Camera's Cover*



8.2 Tripod Adapter

Tripod adapter is shown below.

FIGURE 8.5 *Tripod Adapter*



To put the tripod adapter on the Camera:

- 1 Loosen the screw of the adapter
- 2 Put the Tripod adapter on the camera. Locate the tripod on the camera as shown in the image below
- 3 Screw in

FIGURE 8.6 *Putting the Tripod Adapter on the Camera*



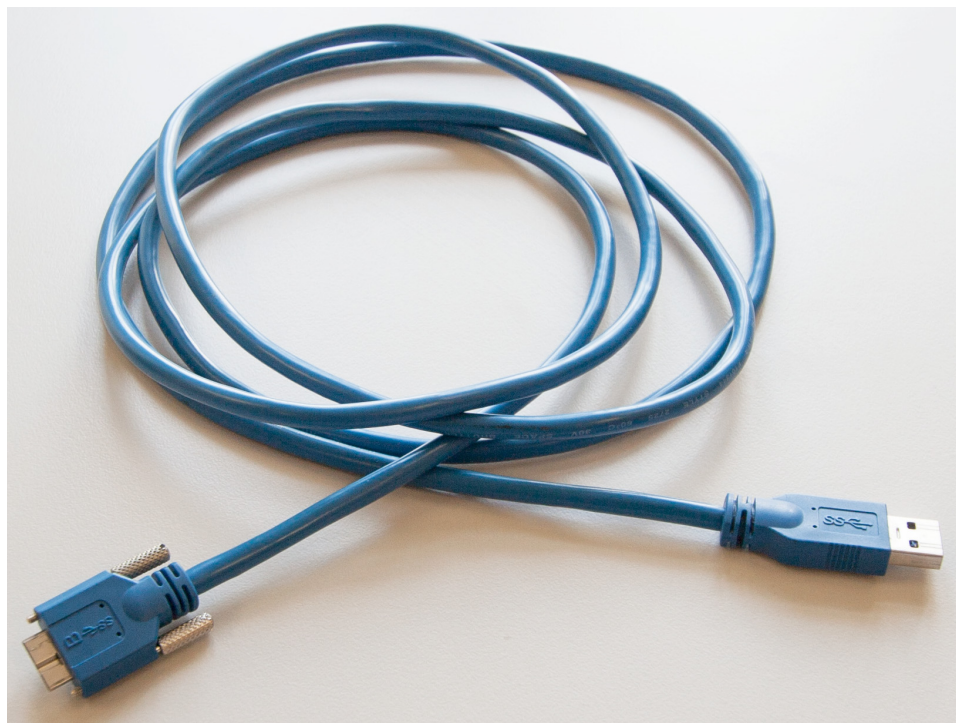
To remove the tripod adapter from the Camera:

- 1 Loosen the screw of the adapter
- 2 Remove it from the camera

8.3 USB 3 Cable

USB 3 cable that is supplied with the camera is shown below.

FIGURE 8.7 *USB 3 cable*



Icons Overview

The most common menu commands are duplicated to the right and below the camera name at the Camera Controls screen:



Starts live video display in the View window



Stops live video display in the View window



Record Video



Record Frames



Stop Recording



Make Snapshot



Select folder to save file into



Open recording folder



Preferences

10 Keyboard Shortcuts

TABLE 10.1 Keyboard Shortcuts

Keyboard shortcut	Description
H	Show Histogram
C	Show Control Panel
S	Show System Info Window
F	Full Screen
Ctrl++	Zoom Video In
Ctrl+-	Zoom Video Out
Ctrl+D	Fit on Screen
Ctrl+1	Actual Pixels
Ctrl+G	Show Grid
Ctrl+C	Copy to Buffer
Ctrl+L	View Log
Space	Record Video
Space	Stop Recording
Ctrl+Space	Make Snapshot
Ctrl+O	Open Recording Folder...
Ctrl+R	Read Video Settings...
Ctrl+S	Save Video Settings...
Ctrl+Q	Exit
F1	User Manual