

SMX-16Exx  
Camera  
Data Sheet

SMX-16Exx Series USB3.0 Camera Data Sheet

Revision 1.0

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# 1 Introduction

The **SMX-16Exx** Series cameras are suitable for any digital imaging applications like industrial, scientific, surveillance, medical, etc.

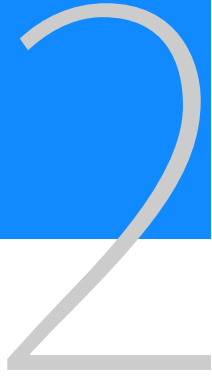
The **SMX-16Exx** Series cameras are based on CMOS sensor with an optical format of 1/1.8 inch that is manufactured by E2V and is available in five modifications:

- **SMX-16E1M** - monochrome 1.3 megapixel camera
- **SMX-16E1C** - color 1.3 megapixel camera
- **SMX-16E1IR** - monochrome 1.3 megapixel camera with near-infrared sensitivity
- **SMX-16E2M** - monochrome 2 megapixel camera
- **SMX-16E2C** - color 2 megapixel camera

Global Shutter, programmable general purpose TTL input/output and triggering options are available with the SMX-16Exx cameras. They can be easily integrated into your system or synchronized with other cameras.

Capturing of initial live streaming video images and still images are provided via USB 3.0 digital interface - no additional frame grabber is needed.

The cameras are provided with Software package, all needed drivers and API library allowing quick integration of camera functions into user's applications.



# Features and Benefits

TABLE 2.1

Global shutter:	The cameras are equipped with global shutter to obtain clear images of moving objects
High NIR sensitivity:	SMX-16E1IR camera enables you to see more than with your eyes. High sensitivity in near-infrared range provides contrast image in poor light conditions
HDR mode:	High dynamic range mode of SMX-16E cameras allows you to get a perfect image with no loss of details in highlights or extreme shadows
Low noise:	We offer one of the best signal/noise parameter among the cameras based on the same sensor
Easy to use:	Sumix camera application has automatic real-time Exposure and White Balance, Input and Output trigger functions allowing to control the camera even without human involvement
Simple system integration:	The SDK includes the set of examples for popular image processing libraries and third-party software like Labview, MATLAB, HALCON etc.
Compact and lightweight:	One of the smallest USB 3.0 cameras in the world — less than one cubic inch volume with the weight of only 20 grams
Robust:	Unibody aircraft-grade aluminum housing, as well as shockproof electronic design allows the camera to survive under high vibration and shock

## 3

# Specifications

## 3.1 Output Video and Camera Control

Output Video and Camera Control characteristics are shown in the table below.

TABLE 3.1

	SMX-16E1x	SMX-16E2x
Maximum resolutions of output window:	1280 × 1024	1600 × 1200
Frame rate at resolution (114 MHz):	60 fps at 1280 × 1024 82 fps at 1024 × 768 126 fps at 640 × 480	50 fps at 1600 × 1200 60 fps at 1280 × 1024 82 fps at 1024 × 768 126 fps at 640 × 480
Output bits per pixel:	Selectable, 8 bits or 10 bits	
Lookup table:	Downloadable for user selected 8 bits mode: converts 10 bits of imaging chip's ADC to 8 bits of output	
Pixel rates:	4-114 MHz	
Exposure range (at maximum resolution), ms:	min: 0.0308 (at 114 MHz); max: 1000 (at 4 MHz)	min: 0.0295 (at 114 MHz); max: 1000 (at 4 MHz)
Gamma, brightness and contrast control:	Programmable with lookup table	

## 3.2 Imaging Chip

SMX-16Exx Series cameras are based on E2V 1/1.8 inch CMOS sensor.

It incorporates sophisticated camera functions, such as windowing, column and row skip mode, snapshot mode. The SMX-16Exx Series camera sensor produces extraordi-

narily clear and sharp digital pictures. It is able to capture both continuous video and single frames.

TABLE 3.2

	SMX-16E1x	SMX-16E2x
Type:	Color or monochrome 1.3 megapixel CMOS sensor with an optical format of 1/1.8 inch manufactured by E2V	Color or monochrome 2 megapixel CMOS sensor with an optical format of 1/1.8 inch manufactured by E2V
Pixel size:	5.3 $\mu\text{m}$ $\times$ 5.3 $\mu\text{m}$	4.5 $\mu\text{m}$ $\times$ 4.5 $\mu\text{m}$
Image array size:	8.7 mm diagonal	9 mm diagonal
Shutter:	Rolling, Global Shutter	
Scanning mode:	Progressive	
ADC resolution:	10 bits	
Responsivity:	6600 LSB/lux-sec for SMX-16E1M and SMX-16E1C; 13000 LSB/lux-sec for SMX-16E1IR	7400 LSB/lux-sec
Dynamic Range:	>62 dB; >90 dB in HDR mode for SMX-16E1M and SMX-16E1C; >63dB; >90dB in HDR mode for SMX-16E1IR	>66 dB; >90 dB in HDR mode

### 3.3 Camera Electrical

Camera Electrical characteristics are shown in the table below

TABLE 3.3

	SMX-16Exx
Supply voltage:	5V supplied by USB 3.0 interface
Power consumption:	Less than 1 W (depends on operating modes)

## 3.4 Trigger Connector

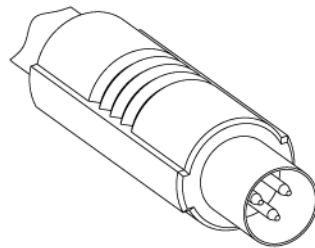
Camera has one configurable input and one configurable output, which could be used for synchronization of image shooting with external devices as well as for general purpose Input/Output.

Both input and output are 5V TTL compatible.

Maximum allowed voltage on trigger connector pins is 5.3V.

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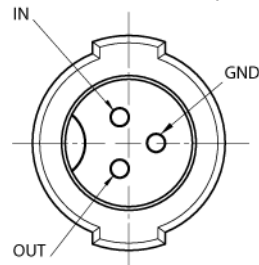
FIGURE 3.1 *3-pin Hirose trigger connector (without a cable)*



Trigger connector pin-out could be found on picture below, also on camera body.

---

FIGURE 3.2 *External connector pinout*



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

Trigger internal circuits are shown on figure below. Both input and output are equipped with internal 10 k $\Omega$  pull-up resistors and Transient Voltage Suppressor Diodes.



FIGURE 3.3 *Trigger Internal Circuits*

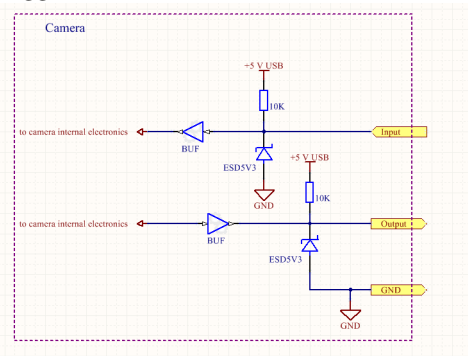
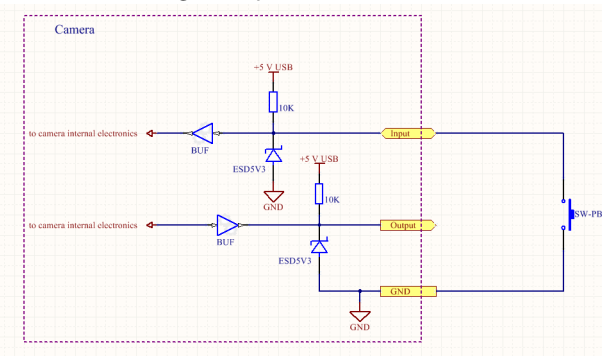


FIGURE 3.4 *Push Button Using Example*



## 3.5 Camera Interface

Camera Interface characteristics are shown in the table below

TABLE 3.4

SMX-16Exx	
Interface Type:	USB 3.0
Connector Type:	USB 3.0 micro-B with locking screws (USB3 Vision compliant) USB 2.0 HighSpeed interface, micro-B connector compatible

## 3.6 System Requirements

Camera System Requirements are shown in the table below

TABLE 3.5

	SMX-16Exx	
Operating System:	Windows Server 2008 R2, Windows Server 2012, Windows Server 2012 R2, Windows 7, Windows 8, Windows 8.1, Windows 10	
Processor:	<b>Recommended configuration</b> Cameras will function with nominal frame rates Intel i7-3770	<b>Minimal configuration</b> Cameras will function with <b>reduced</b> frame rates PIV 2Ghzi
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

## 3.7 Camera Physical Characteristics

Camera physical characteristics are shown in the table below

TABLE 3.6

	<b>SMX-16Exx</b>
Operating temperature *	0 to +50°C
Lens mount type	C/CS - mount
Weight (CS-mount, without lens, tripod adapter and lens cap):	20 g (0.71 oz)
Dimensions (L x D)	CS-mount - 22.6 × 28 mm (0.89 × 1.1 inches) C-mount - 27.6 × 28 mm (1.09 × 1.1 inches)
Camera housing material	Aircraft grade aluminum

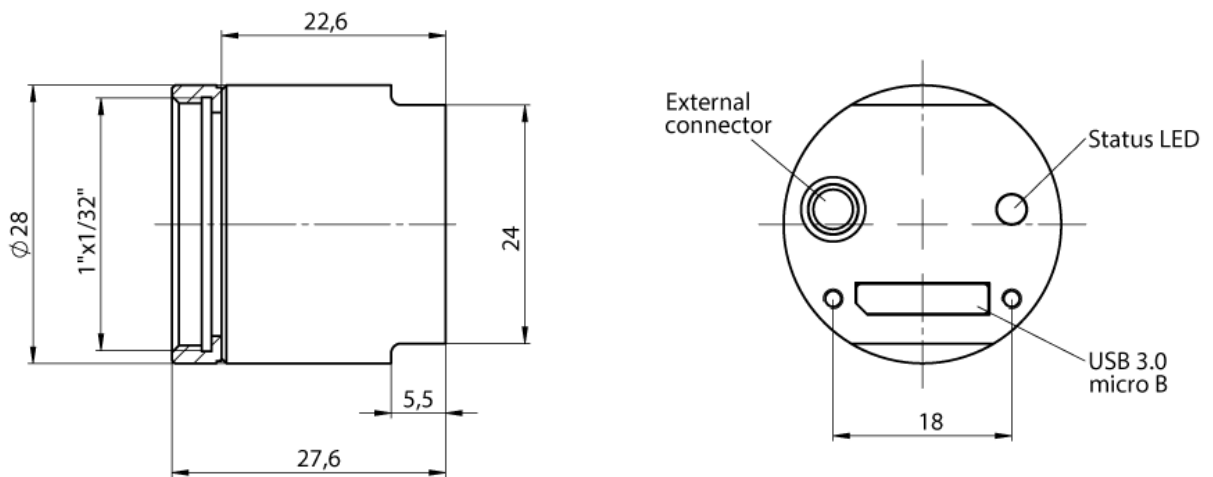
\*. camera case temperature should not rise above 60 degrees Celsius for normal operation. It's not recommended to power-on camera without lens or another heatsink. Any industrial C or CS-mount lens is enough for addition camera heat dissipation.

# 4 Camera Mechanicals

FIGURE 4.1 *SMX-16Exx Series Camera Case View*



FIGURE 4.2 *SMX-16Exx Series Camera Case Drawings. Units: mm*



## 5

# SMX-16Exx Software Package

Sumix camera software package contains a standard application, drivers, User Guide and SDK (API, examples, documentation).

Standard application is a ready solution covering basic user requirements.

API provides full control of all camera features from user applications using many programming languages and platforms (C/C++, C#, VB, LabView, MATLAB). Along with examples and documentation it enables easy integration of the camera into the custom-developed applications.

## 5.1 Camera Standard Application Controls

- Image sensor options (viewport, decimation, image, flip, exposure, gain, frequency)
- Selectable video data depth
- Frame rate control
- Auto Exposure
- Image correction (brightness, contrast, gamma)
- Input/Output trigger control
- Color balance (color models)
- Color Bayer algorithm selection
- White balance (color models)
- Histogram
- Image and video capture
- Software zoom

## 5.2 Compatibility With 3rd Party Software/IDE

- HALCON
- MATLAB IMAQ adapter
- MATLAB mex-file, extending basic MATLAB command set to control the camera parameters
- ActiveX component
- LabVIEW
- Streampix

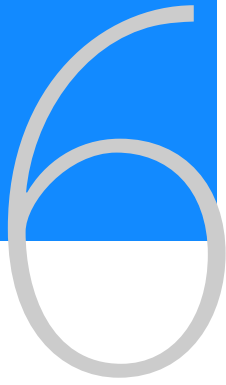
### **API allows:**

- getting camera/sensor identification information
- getting/setting all sensor parameters
- image grabbing
- image correction: white balance, hot pixel correction
- connectivity with external devices
- multi-camera configuration

### **A set of examples is included into the SDK as a tutorial for developing new applications in:**

- C/C++
- MATLAB
- C#
- LabView

Our developers are ready to advise and assist with the integration of the SDK into your application.



# Assistance and Help

Our developers are ready to advise and assist with integration of the SDK into relevant applications.

For questions/proposals contact us via [camera@sumix.com](mailto:camera@sumix.com)



# Camera Customization

Sumix Corporation offers hardware and software customization services to meet customers' specific needs. Recent camera custom development examples:

- Camera case mechanical modification
- External trigger output mode customization
- Unique sensor modification

For more information please contact us via [camera@sumix.com](mailto:camera@sumix.com)



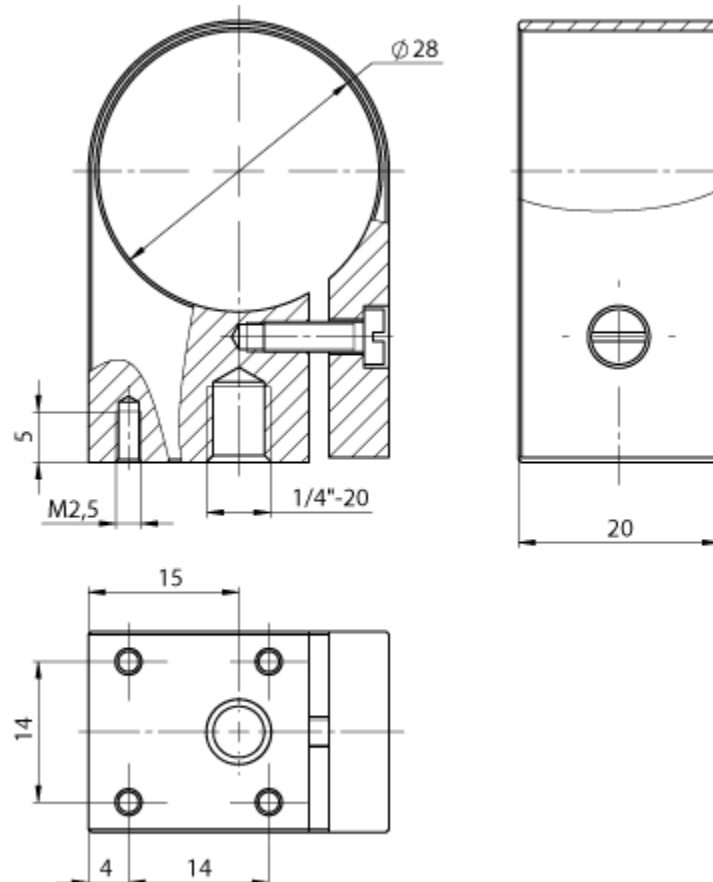


# Camera Accessories

The SMX-16Exx Series USB3.0 Cameras usually go with:

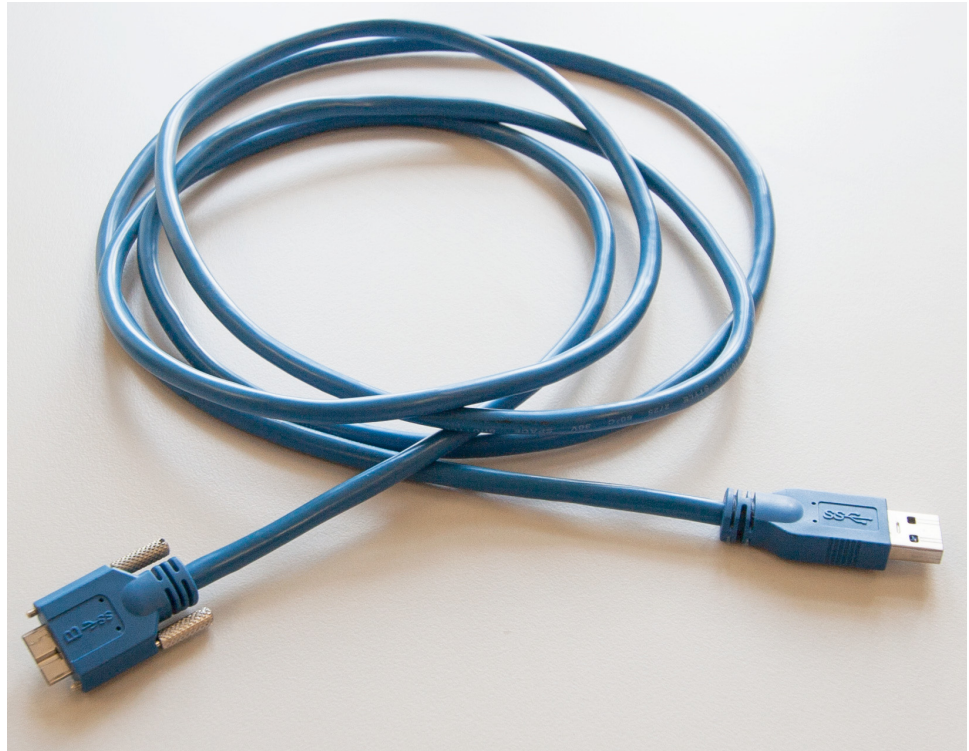
- Tripod adapter:

FIGURE 8.1 *The lightweight aluminum adapter allows quick and easy camera fixing to the tripod or other surfaces (with 4 M2.5 screws), offering additional protection and heat sink for the camera.*



- USB 3.0 A to Micro B screwable cable 2 m long

FIGURE 8.2 *USB 3.0 A to Micro B Screwable Cable*



- C-mount Adapter allows compatibility of converting the camera from the CS-mount to C-mount lens.

FIGURE 8.3 *C-mount Adapter*

