USB3 Vision models - xiQ and xiC cameras

FAQ

What does the USB 3.0 SuperSpeed stand for?

USB 3.0 is the latest major revision of the Universal Serial Bus (USB) standard which offers a transfer speed of 5Gb/s and enables delivery of up to 4.5 Watt of power to the target device.

It uses communication technology similar to that of PCI Express Gen2.

The latest USB 3.0 and USB 3.1 news can be also found HERE

Do xiQ and xiC cameras support USB3 Vision Standard?

Yes. XIMEA is a member of USB3 Vision Technical Committee and xiQ/xiC cameras support the standard being designed to be compliant with USB3 Vision from the moment of its release.

xiQ/xiC camera's firmware can be updated in the field, and even cameras delivered before the release of the standard have the possibility to update its firmware to fully comply with benefits of USB3 Vision standard.

Speaking of benefits, USB3 Vision has the following advantages over simple USB 3.0 devices: higher bandwidth, more power, CPU efficiency and mainly reliability.

First models have already been tested successfully by the Committee and its members during plugfests and therefore comply with USB3 Vision Standard.

List of xiQ models : MQ003MG-CM, MQ003CG-CM, MQ013MG-E2, MQ013CG-E2, MQ013RG-E2, MQ013CG-ON, MQ013MG-ON, MQ013RG-ON, MQ020CG-E2, MQ020MG-E2, MQ022CG-CM, MQ022MG-CM, MQ022RG-CM, MQ042CG-CM, MQ042MG-CM, MQ042RG-CM

List of xiC models : MC023MG-SY, MC023CG-SY, MQ031MG-SY, MQ031CG-SY, MQ050MG-SY, MC050CG-SY, MC089MG-SY, MC089CG-SY, MC124MG-SY, MC124CG-SY

What is the difference between USB 3.0 and USB 3.1 ?

Interface that is defined as USB 3.0 has been developed for several recent years and in the last five of them became a widespread, mainstream option for various applications in different fields of machine vision industry, scientific areas like medicine, consumer electronics or even sports.

Now there is a new term "USB 3.1" which may confuse people since there are two versions that have a completely different connotation.

First, there is an option called: **USB 3.1 Gen 1**

This is a currently available version which has no significant differences from USB 3.0 - cable lengths, power supply, connectors and 5 Gbits bandwidth etc. are all identical.

The name is simply a decision by the USB Implementers Forum to change the label.

Second, there is an option called: **USB 3.1 Gen 2** (USB Superspeed+)

The biggest change here is the increase in speed - it more than doubles the speed that USB 3.0 can provide which results in 10 Gbits theoretical or up to 900 MB/s effective bandwidth.

Second major change is the power delivery of 100 Watts.

At the moment the USB 3.1 Gen 2 is not available yet and won't be available for at least a year, until the respective chips will be released.

You can check the latest updates HERE

How will my application benefit from using USB 3.0 camera?

USB3 provides many different advantages like:

・Increased performance with the bandwidth much higher than USB 2.0, Firewire and GigE interfaces

・Remarkable miniaturization of size and footprint

・Lower power consumption and heat dissipation through better design and management

・No frame grabbers needed

・Newest sensors and components as well as accessories and software

・Multiple cameras support

・Acceptance and standardization

・Reliability and low CPU usage

・Plug and play simplified integration

・Resulting in overall reduced system cost.

What is the real transfer speed?

xiQ and xiC cameras being the fastest among USB 3.0 equivalents can deliver up to 400 MB/sec.

Maximum transfer speeds and other aspects to compare:

Interface	Transfer speed	Cable length	Multiple cameras	CPU Usage
IEEE1394A	45 MB/s	10 m	Place 1	Low
CameraLink base	255 MB/s	10 m	Place 2	Medium
GigE	100 MB/s	100 m	Place 3	Medium
USB 2.0	49 MB/s	5 m	Place 2	High
USB 3.0	400 MB/s	100 m	Place 1	Low

Please note: some of the information in the table is subjective

Maximum speed and reliability require that certain conditions are being met:

Please verify that you are using compatible hardware and software.

To achieve the maximum bandwidth of the camera follow the High Performance Hardware notes.

xiCOP - XIMEA Control Panel is a free software tool that facilitates the task of verification of XIMEA USB3 Vision camera installations, helping to find bottlenecks and achieve the best results.

What operating systems and software are supported?

XIMEA puts a lot of emphasis on the support and interoperability with different software and hardware vendors, which is why our USB3 cameras support not only the usual Windows, but also popular Linux and specific macOS. Recently added due to customer requests - ARM.

From our wide range of supported Libraries these 4 currently comply with the USB3 Vision Standard: National Instruments with LabView, MVTec with Halcon, Matrox with MIL and A&B Software with ActiveUSB .

Are xiQ and xiC cameras Backward compatible to USB 2.0?

Some of them could be connected to USB 2.0 port with a slower data speed. For more information see USB 20 support of xiQ USB3 cameras

What are the maximum cable lengths?

There is a popular myth going around which originates from the early days of USB 3.0 and is kept alive by vendors of devices with other interfaces.

It states that maximum cable length for USB3 is 3m or 5m at most.

This is not true though and the situation has been different for some time already.

XIMEA offers passive cable lengths ranging to 5m, together with active repeaters capable of lengths from 10m up to 55m and tested the fiber extenders which are effective to 100m distances.

How to synchronize multiple cameras?

First some overview:

Theoretically, the maximum number of devices on a network can be up to 255 units.

Of course as with the speed and other parameters, in practice, the number depends on the setup and specifically on the host controller.

Host controllers presently available can support around 30 devices - where hubs are considered a device.

To successfully synchronize, you can use the camera's GPIO trigger.

XIMEA cameras support both hardware and software triggering.

How to handle multiple cameras can be found **HERE** and description of the synchronization process can be followed **HERE**

Note: The maximum rate at which you can trigger the camera may be lower than the maximum overall frame rate of the camera model.

What voltage should be applied to Digital Input for turn on/off?

The following table shows different levels of Voltage on Digital Input (VDI) on xiQ cameras and their logical interpretation.

Logical level	VDI 24V GPI	VDI 5V-24V GPI
Off (zero)	0-5Vdc	0-2 Vdc
Undefined	5-15Vdc	2-4 Vdc
On (one)	15-24Vdc	4-24 Vdc

Maximal input voltage 24Vdc.

All inputs and outputs are opto-isolated

More details

What is the implementation of Digital Output (VDO) of xiQ cameras?

VDO is an opto-isolated NPN open collector type, max. load current 25mA, max. open voltage 24Vdc.

More details

How to optimize software performance on high frame rates?

In order to get all captured frames in extreme conditions - buffering setup in the application should be optimized.

To implement it please read our How to optimize software performance on high frame rates article.

What effect does USB3 have on EMC ?

EMC = Electromagnetic Compatibility

Interestingly, the effect is - Positive.
USB 3.0 devices have so called SSC (spread spectrum clocking) that adjusts the signal spreading the energy over a wider frequency band.

SSC is effective in lowering electromagnetic emissions.

What type of transfer do XIMEA USB3 cameras use ?

For image streaming, xiQ and xiC line of cameras use bulk because it guarantees delivery, instead of isochronous that guarantees bandwidth.

Why are certain cameras getting hot and how to deal with it ?

The high packing density of components of especially xiC cameras can lead to elevated temperatures.

The cameras rely on adequate surface contact with a thermal mass (tripod, lens, heat sink) of sufficient size for heat dissipation and this must be provided and ensured from the user side.

Housing temperature should not exceed +65°C, lower temperatures do not affect the image quality.

For more details, please take a look on chapter 3.2 of the xiC manual.
For monitoring actual temperature of your camera, you can use xiCamTool ("Temperature" box on right hand side) as you can see HERE.