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Dewesoft Video Acquisition



Video acquisition in Dewesoft X

Dewesoft X video acquisition module offers the possibility to acquire video signals together with other sources. A wide range of cameras are supported:

- Low-speed cameras (up to 30 FPS): any DirectX compatible camera
- Medium speed cameras (up to 600 FPS VGA resolution): Dewesoft DS-CAM cameras
- High-speed cameras (up to 20.000 FPS at VGA resolution): where we combine data and video in post-processing or directly use the Photron driver inside Dewesoft X (please consult the user's manual for details)
- Thermovision cameras: Optris thermovision cameras
- IP cameras featuring various TCP/IP streaming protocols like RTSP

Required hardware	Sirius, Dewe-43, Webcam, DS-CAM
Required software	Prof (for DS-CAM support)
Setup sample rate	At least 1 kHz

[Video available in the online version]

Dewesoft cameras

For applications requiring video which is truly synchronized to the dynamic sample rate, there is support for DS cameras. A high-quality image with the automatic shutter speed (selectable) is controlled directly by the A/D card, which generates a pulse to drive the camera. The result is a stunning correlation between each frame and the data.

Thermo cameras are supported by Optris, and Ultra-High-Speed cameras from Photron can acquire more than 2 million frames per second but in limited resolution.

[Video available in the online version]

DS-CAM-88c, DS-CAM-120c (gigabit-ethernet camera)



Image 1: DS-CAM-88c camera

A DS-CAM-88 has the following specifications:

- resolution
  - 640x480 at 88 fps
  - 320x240 at 167 fps
  - 160x120 at 289 fps
- auto-shutter
- auto-gain
- auto white-balance
- color

DS-CAM-175c, DS-CAM-320c (gigabit-ethernet camera)



Image 2: DS-CAM-175c camera

Specifications:

- power-over-ethernet option
- the best performance with SIRIUS S-BOX
- IP67 version available
- auto-shutter
- auto-gain
- auto white-balance
- color
- DS-CAM-175chas the following specifications:
  - 1456x1088 at 68 fps
  - 640x480 (VGA) at 178 fps

- DS-CAM-320chas the following specifications:
  - 728x544 at 266 fps
  - 640x480 (VGA) at 328 fps

DS-CAM-600m, DS-CAM-600c, DS-CAM-600cw (gigabit-ethernet camera)



Image 3: DS-CAM-600c camera

Specifications:

- full HD resolution (1920x1080)
- real-time onboard JPEG compression

- power-over-ethernet option
- the best performance with SIRIUS S-BOX
- IP67 version available
- color and monochrome
- DS-CAM-600bw/chas the following specifications:
    - 1920x1080 (HD) at 300 fps
    - 640x480 (VGA) at 600 fps

Applications

All DS-CAM cameras were designed to be high-shock and vibration resistant.

The DS-CAM cameras can run in triggered (sync) and free-run mode. The video is captured by real-time data streaming, even at full resolution! Therefore, a Gigabit-Ethernet port is required.

The system requirements for GigE cameras are:

- Gigabit Ethernet LAN port
- Dewesoft X
- (Clock possibility)
- Core2Duo CPU

The applications at which the cameras are used:

- machine diagnostic
- product quality check
- non-destructive testing
- research and development
- automotive crash testing
- impact tests
- logistics and transportation
- manufacturing

Specifications

If you have multiple DS-CAM cameras, we can provide adapters for syncing, powering, and connecting multiple cameras to Dewesoft instruments.

CAM-BOX

Adapter box for connecting one DS-CAM-88/120 to the Dewesoft instrument. Combines Sync and Power to the camera connector.

CAM-BOX1

Adapter box for connecting up to 4 DS-CAM-88/120 to the Dewesoft instrument. Combines Sync and Power to the camera connector. External GigE switch required.



Image 4: CAM-BOX1

CAM-BOX2

Distribution box for connecting up to 4 x DS-CAM-88/120 to the Dewesoft instrument. Wide range power supply input (9-36 VDC), integrated GigE switch.



Image 5: CAM-BOX2

CAM-BOX3

Distribution box for connecting up to 4 x DS-CAM-600 to the Dewesoft instrument. Wide range power supply input (9-36 VDC), integrated GigE switch with 4 x PoE; SIRIUS chassis with 1.5 U height.



Image 6: CAM-BOX3

3rd party camera support

If your application requires video you are not limited to using our own DS-CAM cameras.

Dewesoft X software supports all compatible **DirectX cameras** as well as 3rd party **Optris thermal** and Ultra-High-Speed cameras from Photron. See the complete list of supported cameras on Engineering support portal

- Known 3rd party GigE cameras that can be used in DewesoftX
- Supported Optris cameras in DewesoftX
- Supported Photron cameras in DewesoftX
- Supported IP cameras in DewesoftX



Image 7: Third-party cameras supported in Dewesoft

DS-CAM-88c, DS-CAM-120c

The DS-CAM-88c/DS-CAM-120c are high-speed Gigabit-Ethernet cameras with the following key data:

- DS-CAM-120c: 120 fps @ VGA (640x480)
- DS-CAM-88c: 88 fps @ VGA (640x480)
- Color
- Auto-gain
- Auto-shutter (also fixed shutter possible)
- Auto-white balance
- Triggered and free-run mode
- Standard C-Mount
- Small compact form factor
- Low power consumption
- Ruggedized (high-shock and vibration resistant, aluminum housing)
- Real-time data streaming with full resolution



Image 8: DS-CAM-88c

The camera supports the high-performance industrial standard GigE Vision. The standard introduced in 2006 provides a framework for transmitting high-speed video and related control over Ethernet networks.

The benefits are high-speed data transfer rates up to 1GBit/s (based on 1000Base-T) connectable to every standard GigE Ethernet port and cable lengths up to 100m.

Dewesoft uses OptoStream SDK for GigE communication with cameras that support the GigE Vision standard.

Important: For best performance, we recommended using an SSD for storing data. A disk write rate of 100 MByte/s should be established, especially if using more than 1 camera!

System requirements:

- 1 Gigabit-Ethernet port
- Good PC performance (Core i5 CPU or better recommended, 4 GB RAM)
- Dewesoft X
- The latest OptoMotive OptoStreamSDK
- The latest Dewesoft GigE driver (cdv)

Technical specifications

Optical

	DS-CAM-88c	DS-CAM-120c
Image sensor	Sony IT ICX414AL/AQ with HAD microlens, progressive scan	Sony IT ICX618AL/AQ with Exview HAD CCD II microlens
Sensor type	CCD	CCD
Optical size	1/2 "	1/4 "
Effective chip size	6.5 x 4.9 mm	4.46 x 3.80 mm
Cell size	9.9 x 9.9 um	5.6 x 5.6 um
Picture size (max)	656 x 492 pixel	646 x 492 pixel
ADC	14 bit	14 bit
Gain control	0 - 35 dB; auto-gain	0 - 32 dB; auto-gain
Exposure time	26 us - 60 s; auto-shutter	58 us - 60 s; auto-shutter
Smart functions	auto-white balance, color correction, edge filter (sharpness), hue, sat.	auto-white balance, color correction, edge filter (sharpness), hue, sat.
Max, frame rate (at full resolution)	88 fps	120 fps

Power

Supply voltage	8 to 30 VDC	8 to 30 VDC
Power consumption	<3,6 W (@ 12 VDC)	<3,7 W (@ 12 VDC)
Power-over-ethernet	optional	optional

Trigger input

Voltage level representing logical 0	0.0 ... 1.0 V DC
Undefined state between 0 and 1	1.0 ... 3.0 V DC
Voltage level representing logical 1	3.0 ... 24.0 V DC
Absolute maximum voltage (above Ã¢â€ â€™ damage!)	36 V (only with an external resistor of 3.3 kOhm in series)

Digital output

Maximum current source for output	20 mA, open emitter

Mechanical

External housing (h x w x l)	86.4 x 44.0 x 29.0 [mm]

Housing	aluminum case
Weight	< 200 g (without lens)
Storage temperature	-10 Â°C .. +70 Â°C (14 Â°F .. +158 Â°F)
Operating temperature	5 Â°C .. +45 Â°C (+41 Â°F .. +113 Â°F)
Operating humidity	25% .. 80% (no condensation)
Storage humidity	25% .. 95% (no condensation)
Lens mount	C-mount (CS-mount optional)
Connectors	Screw mount Ethernet RJ45; EIAJ (Hirose) 12 pin (matching part: Hirose HR10A-10P-12S(73))
Conformity	CE, FCC Class B, RoHS, GigE Vision, GenICam

Connections

On the rear side of the camera, there are two connectors. The 12pin HIROSE connector (matching part: Hirose HR10A- 10P-12S(73)) contains the power, trigger, and other digital pins. Ethernet connector pinout according to the standard.

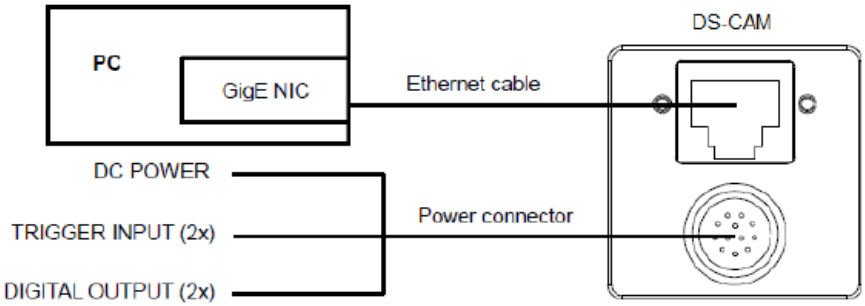


Image 9: Connection scheme for DS-CAM-88c or DS-CAM-175c

Power/trigger connector pinout

12pin Hirose connector (matching part: Hirose HR10A-10P-12S(73)) on camera rear side



Image 10: 12-pin Hirose connector

PIN #	SIGNAL
1	GND (for Power and RS232)

2	Power (+8...+30 V DC)
3	-
4	Camera In 1 (TRIGGER)
5	-
6	Camera Out 1 (open emiter, max. 20 mA)
7	Camera In GND
8	RxD (RS232)
9	TxD (RS232)
10	Camera Out Power (for digital outputs)
11	Camera In 2
12	Camera Out 2

SIRIUS connection example

In image 11, you see a typical SIRIUS measurement instrument, consisting of one SBOX unit (integrated PC) on the bottom and one SIRIUS slice on top (from the rear side).

The camera is directly connected to the Gigabit-LAN port. The second cable to the camera contains the power (from SBOX Power out) and the trigger, connected to the SYNC port of the SIRIUS slice. The camera frames are now in perfect sync with the analog data acquired by Dewesoft.

Note: Even if the camera is connected, syncing to other SIRIUS devices is still possible, because there are different pins used on the SYNC port for triggering/synching.



Image 11: Sirius connection example

Connecting multiple cameras

If you need to connect more than one camera, there is a special **CAM-BOX2** available, which consists of:

- wide-range voltage input (9-36V)
- an industrial Gigabit-Ethernet-Switch (without Power-over-Ethernet! No supply for DS-CAM-600!)
- Power and Sync distribution for up to 4 cameras.
- Small dimensions: 115 x 62 mm (front) and 135 mm deep



Image 12: Connection of three cameras

Camerabox connector (mating cable connector: FGG.1B.307CLAD52)

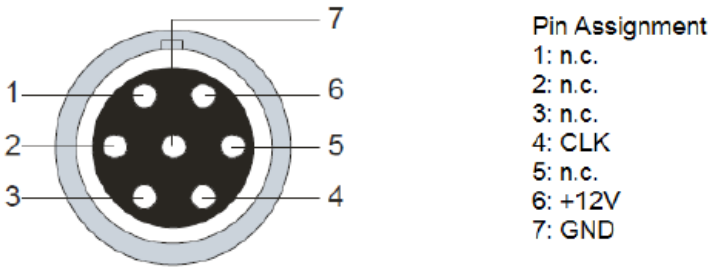
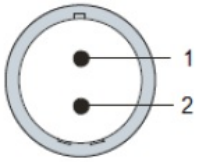


Image 13: Camerabox 7-pin connector

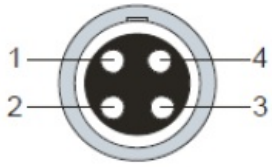
Power supply (mating cable connector: FGJ.1B.302CLLD42Z)



Pin Assignment
1: +9...36V in
2: GND

Image 14: Power supply 2-pin connector

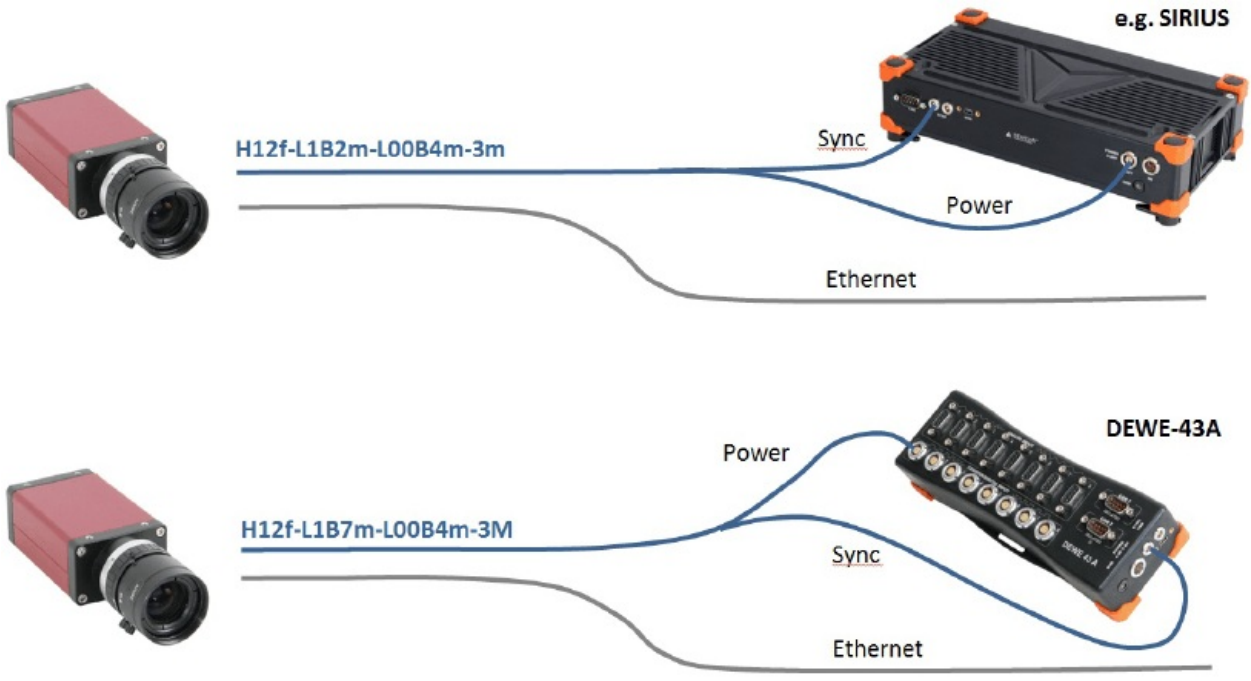
Sync connector (mating cable connector: FGG.00.304CLAD27Z)



Pin Assignment
1: n.c.
2: n.c.
3: CLK
4: GND

Image 15: Sync 4-pin connector

Connections overview



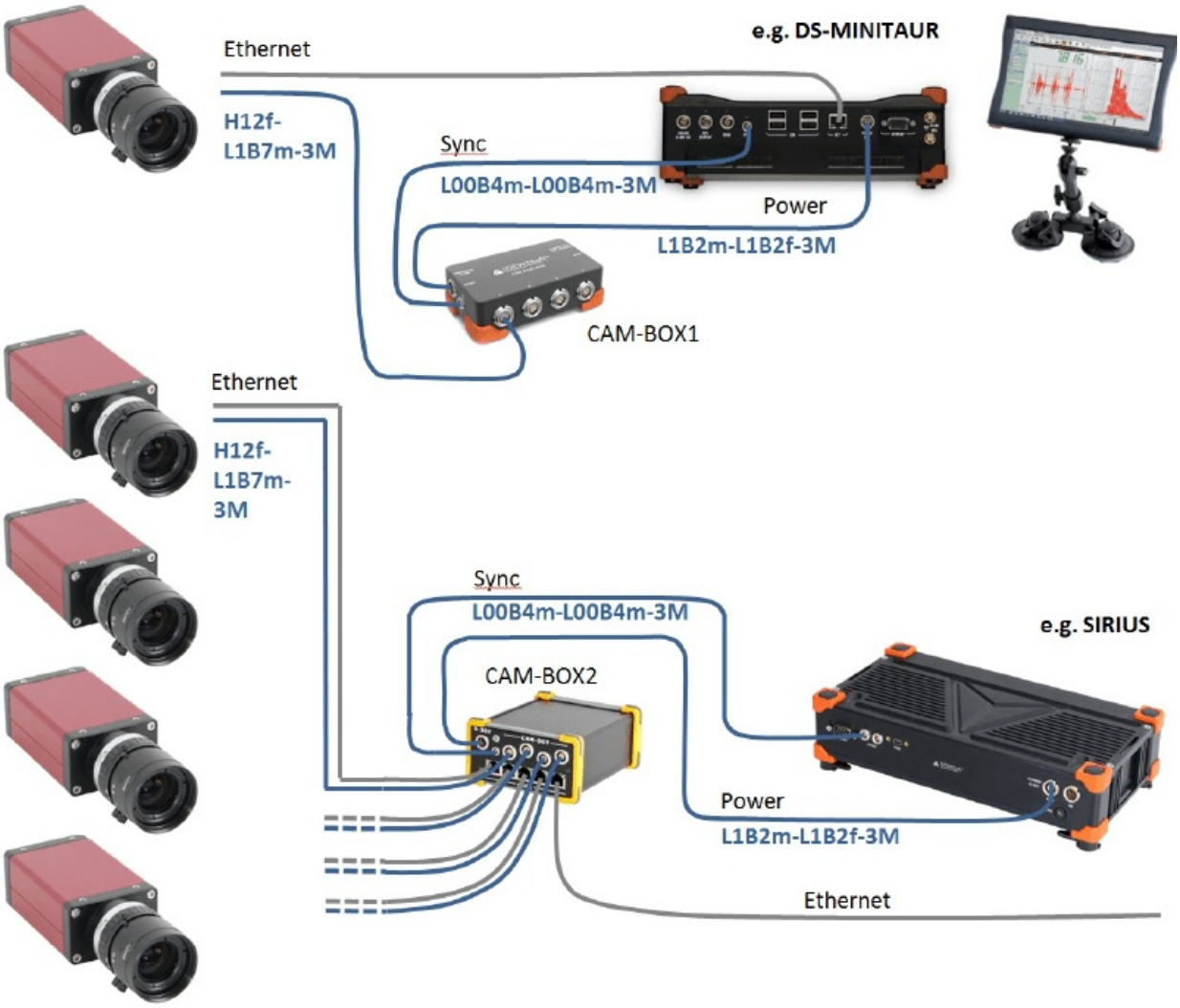


Image 16: Connection overview

Benchmarks

The following tests were done with SIRIUS SBOX and 1 to 4 cameras connected to the CAM-BOX2. Setup:

- 1 to 4 cameras connected over CAM-BOX2
- SBOX: 128GB SSD -> max 190 Mbyte/s write rate
- CPU: Intel Core i7 QM57; 2.0GHz; 4GB RAM
- camera(s) clocked by SIRIUS
- Dewesoft X
- OptoMotive OptoStreamSDK
- GigE Camera driver (Plugin)
- storing data to file, video buffer stable around 0.1%
- with checked "optimize for switched network"

Achieved frame rates (fps)

Number of Cameras	X res	Y res	DS-CAM 88c	DS-CAM-120c
1	640	480	88	120
	320	240	165	195
	320	120	280	300
2	640	480	88	120
	320	240	165	195
	320	120	280	210
3	640	480	88	90
	320	240	165	195
	320	120	280	210
4	640	480	88	60
	320	240	165	195
	320	120	280	210

Results (FPS) should be considered only as approximate MAX values. Writing speed of disk may be limiting factor (we used SSD). We recommend testing cameras with your setup at about 0.8*max FPS and higher to find where corrupted image, frame lost or buffer overrun will occur.

DS-CAM-175c, DS-CAM-320c

The DS-CAM-175c, DS-CAM-320c are high-speed Gigabit-Ethernet cameras with the following key data:

- DS-CAM-175c: 178 fps @ VGA (640x480)
- DS-CAM-320c: 328 fps @ VGA (640x480)
- Color
- Auto-gain
- Auto-shutter (also fixed shutter possible)
- Auto-white balance
- Triggered and free-run mode
- Standard C-Mount
- Small compact form factor
- Low power consumption
- Ruggedized (high-shock and vibration resistant, aluminum housing)
- Real-time data streaming with full resolution



Image 17: DS-CAM-175c camera

The camera supports the high-performance industrial standard GigE Vision. The standard introduced in 2006 provides a framework for transmitting high-speed video and related control over Ethernet networks.

The benefits are high-speed data transfer rates up to 1GBit/s (based on 1000Base-T) connectable to every standard GigE Ethernet port and cable lengths up to 100m.

Dewesoft uses OptoStream GigE SDK for communication with cameras that support GigE Vision standard.

Important: For best performance, we recommended using an SSD for storing data. A disk write rate of 100 MByte/s should be established, especially if using more than 1 camera!

System requirements:

- 1 Gigabit-Ethernet port
- Good PC performance (Core i5 CPU or better recommended, 4 GB RAM)
- Dewesoft X
- The latest OptoMotive OptoStreamSDK
- The latest Dewesoft GigE driver (cdv)

Technical specifications

Optical

	DS-CAM-175c	DS-CAM-320c
Image sensor	Sony IMX273	Sony IMX287
Sensor Type	CMOS	CMOS
Max resolution	1456x1088	728x544
Optical size	1/2.9'' (6.3 mm diagonal)	1/2.9" (6.3 mm diagonal)
Pixel size	3.45 x 3.45 um	3.45 x 3.45 um
FPS	68 FPS @ 1456x1088 116 FPS @ 1280x720 145 FPS @ 800x600 178 FPS @640x480	266 FPS @ 728x544 328 FPS @640x480
Dynamic range	71.6 dB autogain function	74.4 dB autogain function
Shutter	Global	Global
Shutter time	Auto shutter function	Auto shutter function
Color correction	Auto white balance	Auto white balance
Max, frame rate (at full resolution)	175 fps	320 fps

Power

	DS-CAM-175c	DS-CAM-320c
Supply voltage	8 to 30 VDC or 802.3af PoE	8 to 30 VDC or 802.3af PoE
Power consumption	2,79 W @ 12 VDC; 3,26 W PoE	2,77 W @ 12 VDC; 3,23W PoE

Trigger input

Voltage level representing logical 0	0.0 ... 1.0 V DC
Undefined state between 0 and 1	1.0 ... 3.0 V DC
Voltage level representing logical 1	3.0 ... 24.0 V DC
Absolute maximum voltage (above Ãçâ€ â€™ damage!)	36 V (only with an external resistor of 3.3 kOhm in series)

Mechanical

External housing (h x w x l)	86.4 x 44.0 x 29.0 [mm]
Housing	aluminum case
Weight	< 200 g (without lens)
Operating temperature	5 Â°C .. +45 Â°C (+41 Â°F .. +113 Â°F)
Operating humidity	20% .. 80% (no condensation)
Lens mount	C-mount
Connectors	Screw mount RJ45 Ethernet connector, Hirose HR10-10R-12PA(73)

Connections

On the rear side of the camera, there are two connectors. The 12pin HIROSE connector (matching part: Hirose HR10A- 10P-12S(73)) contains the power, trigger, and other digital pins. Ethernet connector pinout according to the standard.

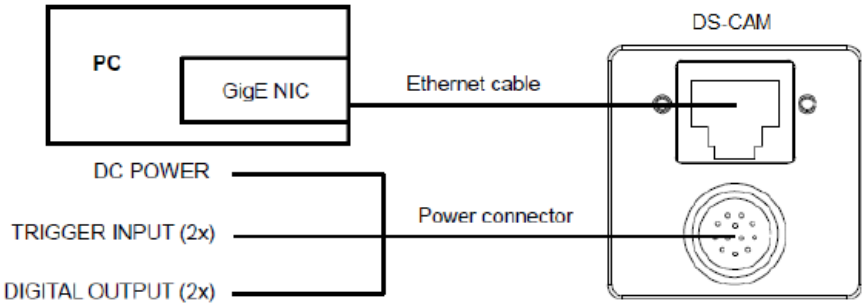


Image 18: DS-CAM connection example

Power/trigger connector pinout

12pin Hirose connector (matching part: Hirose HR10A-10P-12S(73)) on camera rear side



Image 19: 12-pin Hirose connector

PIN #	SIGNAL
1	GND (for Power and RS232)
2	Power (+8...+30 V DC)
3	-
4	Camera In 1 (TRIGGER)
5	-
6	Camera Out 1 (open emitter, max. 20 mA)
7	Camera In GND
8	RxD (RS232)
9	TxD (RS232)
10	Camera Out Power (for digital outputs)
11	Camera In 2
12	Camera Out 2

SIRIUS connection example

In this picture, you see a typical SIRIUS measurement instrument, consisting of one SBOX unit (integrated PC) on the bottom and one SIRIUS slice on top (from the rear side).

The camera is directly connected to the Gigabit-LAN port. The second cable to the camera contains the power (from SBOX Power out) and the trigger, connected to the SYNC port of the SIRIUS slice. The camera frames are now in perfect sync with the analog data acquired by Dewesoft.

Note: Even if the camera is connected, syncing to other SIRIUS devices is still possible, because there are different pins used on the SYNC port for triggering/synching.



Image 20: Sirius connection example

Connecting multiple cameras

If you need to connect more than one camera, there is a special **CAM-BOX2** available, which consists of:

- wide-range voltage input (9-36V)
- an industrial Gigabit-Ethernet-Switch (without Power-over-Ethernet! No supply for DS-CAM-600!)
- Power and Sync distribution for up to 4 cameras.
- Small dimensions: 115 x 62 mm (front) and 135 mm deep



Image 21: Connecting multiple cameras

Camerabox connector (mating cable connector: FGG.1B.307CLAD52)

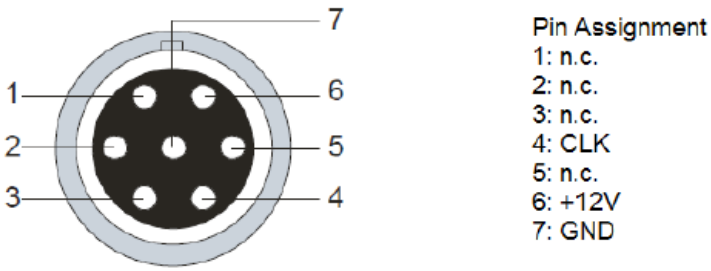


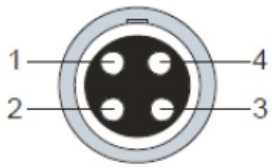
Image 22: 7-pin camerabox connector

Power supply (mating cable connector: FGJ.1B.302CLLD42Z)



Image 23: 2-pin power supply connector

Sync connector (mating cable connector: FGG.00.304CLAD27Z)



Pin Assignment
1: n.c.
2: n.c.
3: CLK
4: GND

Image 24: 4-pin sync connector

DS-CAM-600

The DS-CAM-600 is a high-speed Gigabit-Ethernet camera with following key data:

- 600fps @ VGA (640x480)
- Full HD resolution 1920x1080
- Real-time data streaming with full resolution
- Monochrome
- Power-over-Ethernet (PoE)
- Real-time JPEG compression
- Sync (Triggered and free-run mode)
- Adjustable shutter time
- Standard C-Mount
- Small compact form factor
- Ruggedized (high-shock and vibration resistant, aluminum housing)



Image 25: DS-CAM-600 camera

The camera supports the high-performance industrial standard GigE Vision. The standard introduced in 2006 provides a framework for transmitting high-speed video and related control over Ethernet networks.

The benefits are: high-speed data transfer rates up to 1GBit/s (based on 1000Base-T) connectible to every standard GigE Ethernet port and cable lengths up to 100m.

Dewesoft uses OptoMotive GigE SDK for communication with cameras that support the GigE Vision standard.

Important: For best performance, we recommend using a Core i5 CPU or better, 4 GB RAM, and SSD for storing data.

System requirements

- 1 Gigabit-Ethernet port
- Good PC performance (Core i5 CPU or better recommended, 4 GB RAM)
- Dewesoft X
- OptoMotive GigE Vision SDK
- Dewesoft GigE driver (cdv) 2.0

Technical specifications

Power

Supply voltage	Power-over-Ethernet (42-57V)
Power consumption	6 W

Digital I/O

Recommended input voltage	0 to 3,3 VDC
Voltage level representing logical 0	0 to +0,8 VDC
Undefined state between 0 and 1	> +0,8 VDC to +2,0 VDC
Voltage level representing logical 1	> +2,0 VDC to 3,3 VDC
Absolute maximum voltage (above Ã¢â€ â€™ damage!)	+/- 24 VDC

Optical

Image sensor	CMOSIS CMV2000 2E5M1PP
Sensor type	CMOS
Sensor resolution (H x W)	2048 x 1088
Optical size	Diagonal 12.7 mm (2/3")
Pixel size (in um)	5.5 x 5.5
Pixel data format	JPEG
Dynamic range	60 dB
Shutter	Electronic Global Shutter
Shutter time	210 ns - 90 s
Exposure	Linear, 3Slope High Dynamic Range
Scanning system	Progressive
Max. frame rate (at 640x480)	specified for 600 (in fact 748 are possible)
ADC bit depth	10 bit

Mechanical

External dimensions (H x W x L)	94 x 54 x 58 [mm] incl. C-Mount lense holder
Housing	Black anodized aluminum case
Weight	290g
Operating temperature	0Â°C .. +50Â°C
Protection	Up to IP67 with housing
Fixing holes	2 x M6
Lens mount	C-mount (1" 32G thread)
Connectors	Ethernet: RJ45, Sync: 4 pin LEMO EGG.00.304.CCL
Conformity	CE, EN55022, class A; EN61000-4-2; EN61000-4-3; EN61000-4-4; EN61000-4-6; FCC Part 15, class A , RoHS, GigE Vision 1.2

Connectors and pinout

On the backside of the camera, there are two connectors. For the trigger input, there is a 4 pin Lemo 00 (called "IO connector"), for the data transfer an Ethernet connector. The pinout of the Ethernet connector is according to the standard.

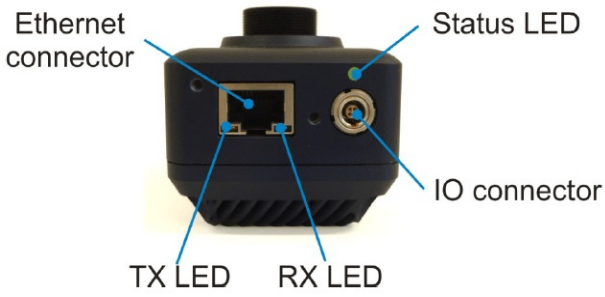


Image 26: Backside of the camera, connectors overview

Note that pins 3 and 4 are used for clocking the camera. Pins 1 and 2 are reserved for synching multiple Dewesoft instruments!

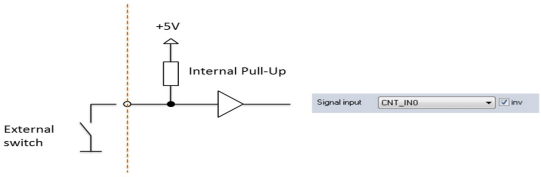


Image 27: Circuit scheme

SIRIUS connection example

In this picture, you see a typical SIRIUS device consisting of an S-BOX unit (integrated PC) on the bottom and one SIRIUS slice on top (from rear side).

The camera is powered via PoE (Power over Ethernet, via LAN connector), therefore, a Power injector is required (Gigabit-LAN port of computer / PoE injector / camera).

The second cable provides the trigger, connected to the SYNC port of the SIRIUS slice. The camera frames are now in perfect sync with the analog data acquired by Dewesoft.

Note: Even if the camera is connected, synching to other SIRIUS devices is still possible, because there are different pins used on the Synch-Connector for triggering/synching (see also IO connector pinout).



Image 28: SIRIUS connection example

SIRIUS S-Box with one SIRIUS on top, connected to the DS-CAM-600 (PoE injector in between)

Resolutions and framerates

HINT: Results (FPS) should be considered only as approximate MAX values. It depends on the system performance (CPU, JPEG compression, hard disk). We recommend testing cameras with your setup at about 0.8*max_FPS and higher to find where corrupted image, frame lost or buffer overrun will occur.

RESOLUTION	ACTIVE PIXELS	MAX. FRAMERATE
Full frame 4.2M	2048 x 2048	N/A
Full frame 2.2M	2048 x 1088	333 fps
2K	2048 x 1080	336 fps
HD 1080	1920 x 1080	336 fps
SXGA	1280 x 1024	355 fps
XGA	1024 x 768	471 fps
HD 720	1280 x 720	502 fps
SVGA	800 x 600	600 fps
PAL	768 x 576	625 fps
WVGA	752 x 480	748 fps
VGA	640 x 480	748 fps
QVGA	320 x 240	1460 fps

How to connect GigE camera?

Usually, all the drivers come with the Dewesoft X installer. To check if the drivers are installed, go to **Settings / Standard devices / Camera** and see if the GigE button is available. If not, execute the full installer again, select Modify and reinstall the option.



Image 29: Go to Dewesoft X Settings -> Standard devices -> Camera and find GigE

If there is no option to add GigE, run the Dewesoft installer once again, choose Modify Dewesoft and select the option GigE camera under the Extension section. The last Dewesoft X full installer can be downloaded from the following **webpage**.

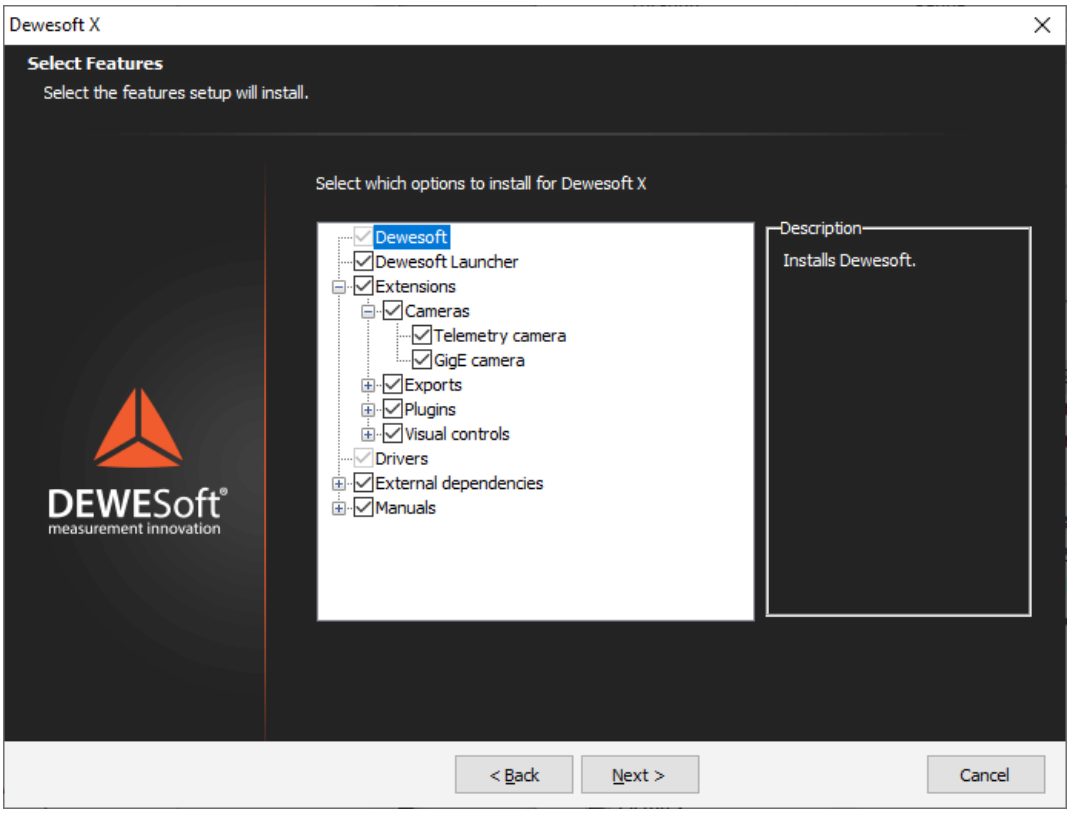


Image 30: In case you did not find the GigE camera in standard devices settings, run Dewesoft installer and modify Dewesoft

GigE driver, OptoStream and GigE manual

You can also find the newest version of the GigE driver for Dewesoft on the download webpage.

ZIP file includes:

- **GigE manual**
- **GigECamera.cdv** file
- **GigECameraDef.xml** file
- **OptoMotive OptoStreamSDK** exe file

Step by step instruction

- Install OptoStreamSDK. Note that you must be an administrator, not just a user with admin rights. After the installation be sure that **"OptoStream GEV Filter Driver"** is installed under Local area connection properties. Note that "filter driver" filters out all packages that are not GigE on the hardware level, so the camera will work much faster than without the filter.

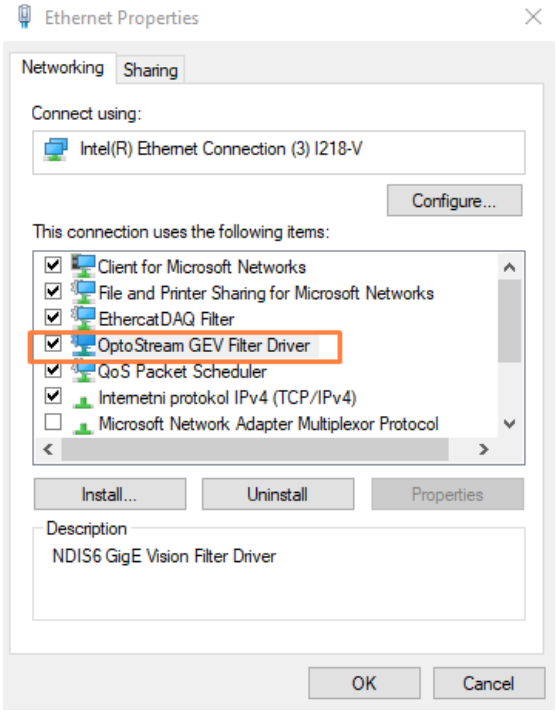


Image 31: After the installation be sure that **"OptoStream GEV Filter Driver"** is installed under Local area connection properties

- Connect the camera to the PC via Ethernet cable and PoE power injector in between.

- The DS-CAMsupports DHCP, so just set your computer's IP address to automatic and wait until the IP is assigned. To test if the camera is working you can run the OptoStreamViewer. By right-clicking on the camera you can also set IP to fix, if you prefer.

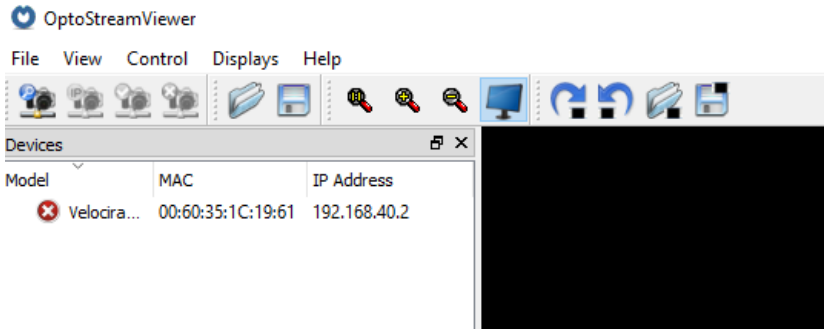


Image 32: OptoStreamViewer

- To enable the camera in Dewesoft X, copy the file GigECamera.cdv into the Dewesoft X Addons folder, usually located in Dewesoft\Bin\X3\Addons.

- Copy and replace your existing Dewesoft.exe with the one that you downloaded.

- Start Dewesoft X and go to Settings -> Devices. For triggered mode, when Dewesoft X is clocking the camera, check if your device is set to Standalone or Clock/Trigger.

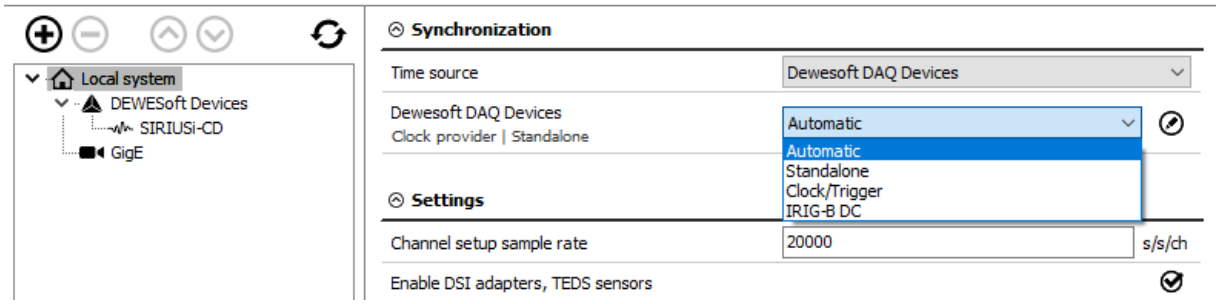


Image 33: Select Standalone or Clock/Trigger Clock provider

- Go to the video tab (GigE) and check the **Use trigger** checkbox:

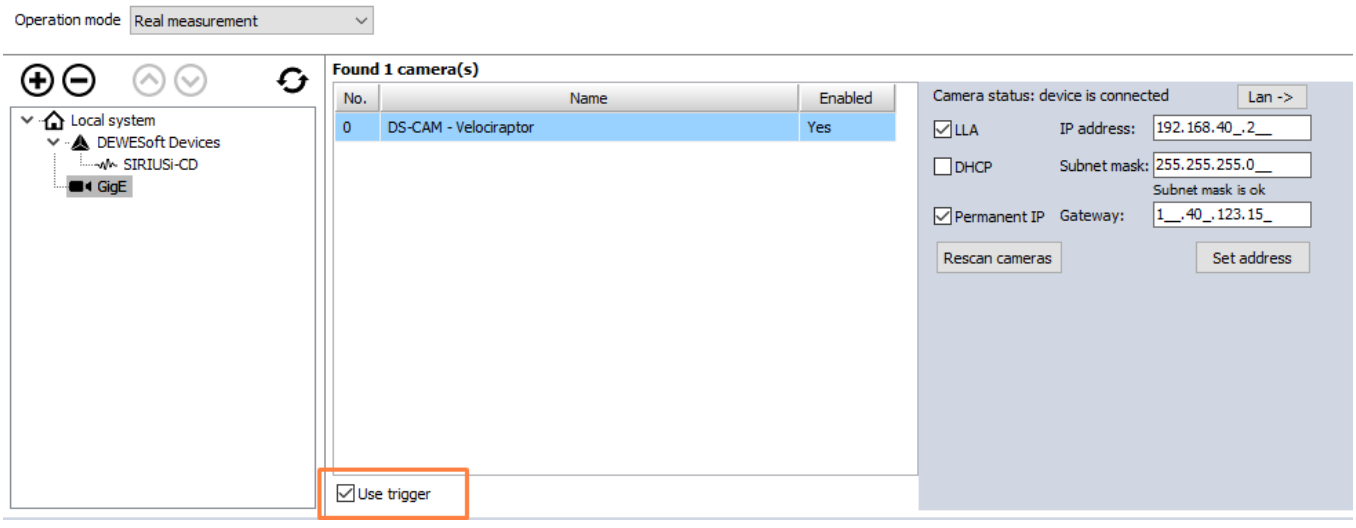


Image 34: Enable Use trigger checkbox

- **File types for storing** should be set to DVI which is the uncompressed Dewesoft X video format. The CPU will not have

enough power to additionally do the online compression.

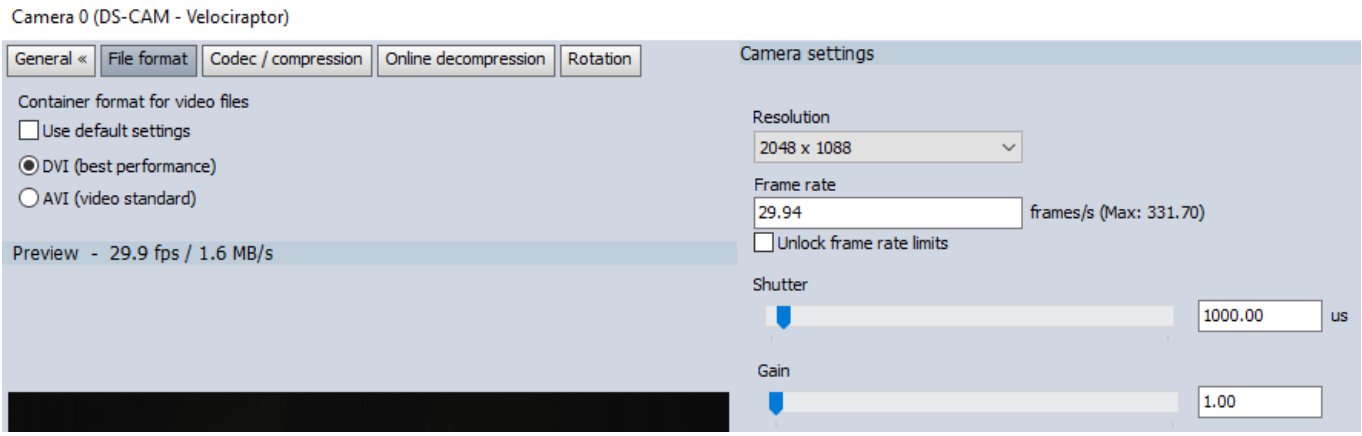


Image 35: File types for storing should be set to DVI

- Depending on the measurement duration, the video file can get very big. For compression after the measurement set the appropriate compressor in AVI file type for compression. We recommend downloading the XVID codec. In Analysis mode you can then select your datafile and click AVI compress.

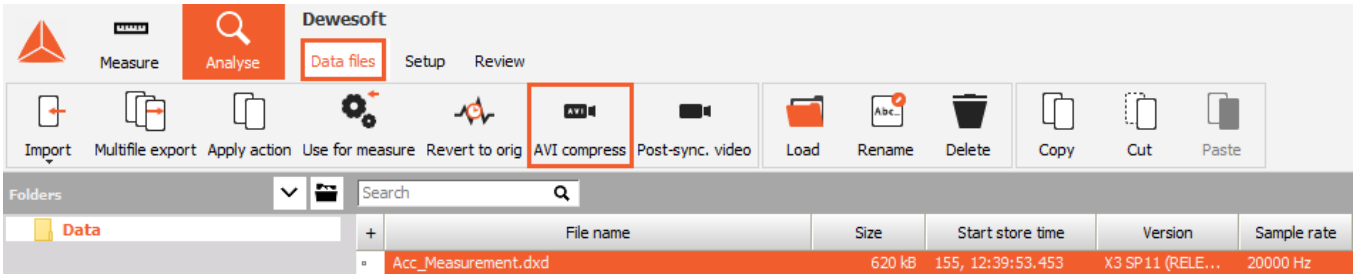


Image 36: For compression after the measurement set the appropriate compressor in AVI file type for compression

- Go to Channel setup, click the Video button and enable the video channel - change the Unused to **Used**.

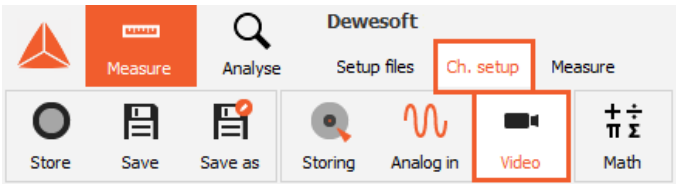


Image 37: Video tab in a channel setup

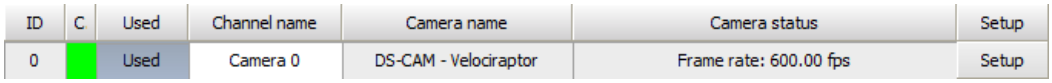


Image 38: Enable Camera 0 channel by switching the status to Used

- Enter the channel setup, a picture should be shown:

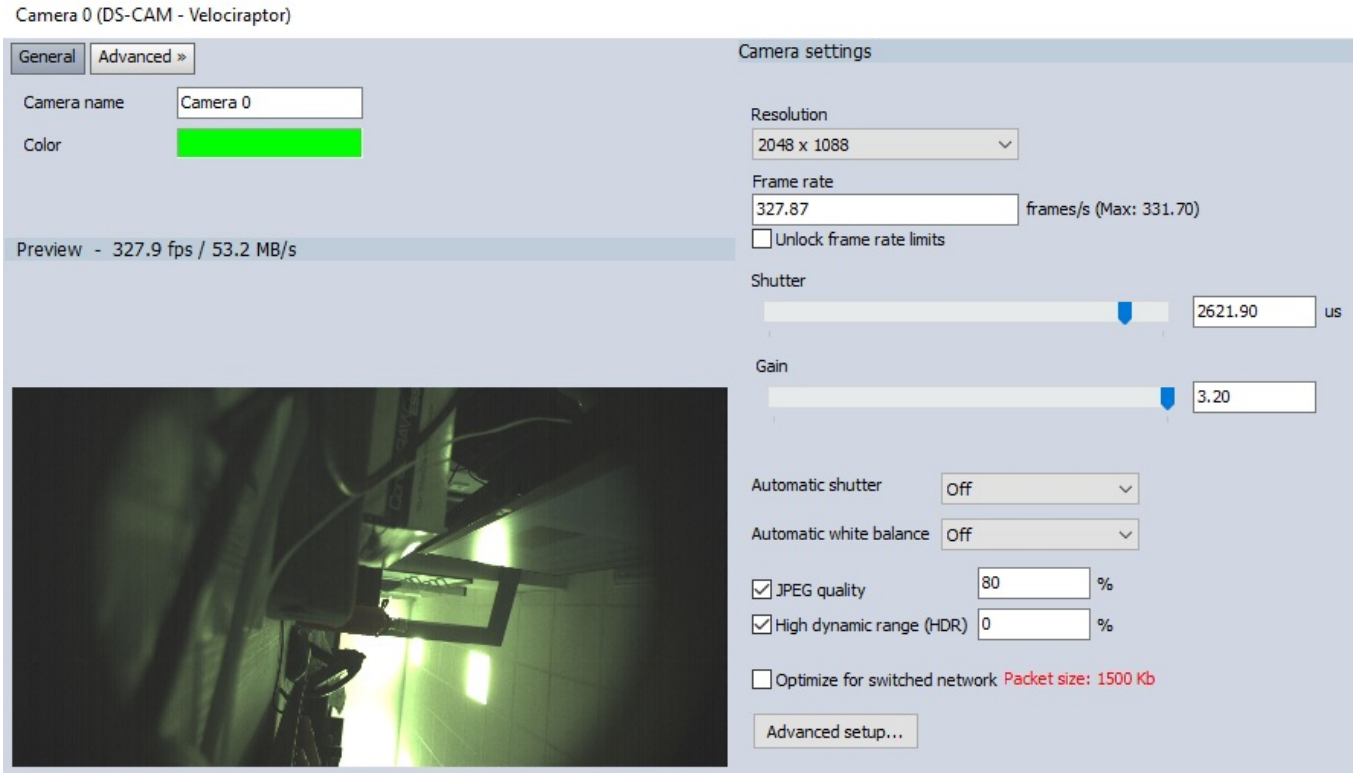


Image 39: Enter the channel setup

- The shutter bar determines the light exposure duration (brightness).
- If the light is too dark, use the gain bar to increase brightness by software.
- The JPEG quality is inverse to the compression. 80% means good quality and low compression.



Image 40: JPEG quality

- With the HDR option, you are able to increase the dynamic from 60dB up to 120dB if you have an image with a low dynamic range (e.g. only light grey and dark shapes).
- To improve the performance if using the camera on and ethernet switch, use **"Optimize for switched network"**.
- Use the **"Advanced setup"**, if you want to change a specific parameter of the camera, such as the custom resolution.

HINT: If you change the frame rate, after typing the value, the input gets a yellow color. Confirm the value by pressing the Enter key.

FAQ - GigE Camera

GigE checkbox in Dewesoft settings missing / Support for 64 bit Windows

For 64-bit Windows, all three OptoMotive GigE paths needed to be set to Win32_i86 in Environment variable PATH. Go to My Computer and click System properties > Advanced system settings > Advanced tab > Environment Variables >System variables > select Path > Edit. Make the following changes:

- %GIGE_VISION_SDK_PATH%\bin\Win32
- %GENICAM_ROOT_V2_0%\bin\Win32_i86
- %GENICAM_ROOT_V2_0%\bin\Win32_i86\GenApi\Generic

Save and reset Windows. Path correctness can be checked by GetEnviromentVariable('PATH');

GigE plugin is not found in Dewesoft

Issue: In 2.7.0.0 driver Optomotive does not run file hard link to GigEVisionSDK_32bit_dll.bat during installation.

Solution: So it needs to be done manually; run CMD as Admin and run the file from the folder \Program files\OptoMotive\GigeVisionSDK\bin\

When this is done, Dewesoft normally recognizes the GigE plugin.

No picture shown, No frames receivederror

If you receive the error NO FRAMES RECEIVED, check:

- Is the Trigger cable connected?
- Try decreasing the Shutter value
- Check-in hardware setup if the Dewesoft USB device is set to Master or Standalone
- Disable Trigger in hardware setup and check if it's working in free-run mode (cable problem?)

Camera not found (not in OptoStreamViewer, not in Dewesoft)

Check Windows Firewall settings.

Cameras not found in Dewesoft X (yellow mark in OptoStreamViewer)

Not able to use the cameras. Please wait a little bit (until IP is assigned). If that does not help, ensure the computer network IP is set to automatic, as the camera supports DHCP.

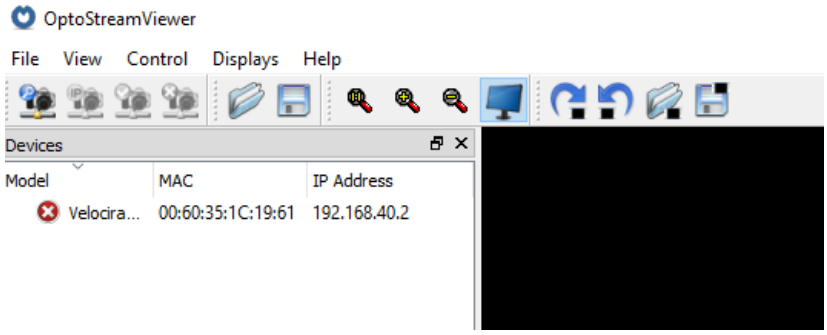


Image 41: OptoSreamViewer

If the cameras are found, close GigEVisionClient and start Dewesoft X.

Change the IP address of the camera

If you manually change the IP address, please close Dewesoft X, start the GigEVisionClient, right-click on the camera and select Set IP to device; use the same subnet as the computer, example:

	IP	Subnet
PC	192.168.1.100	255.255.255.0
Camera	192.168.1.101	255.255.255.0

The IP is ok if the cameras are found with a red mark, close OptoStream viewer, and start Dewesoft X.

OptoStream viewer does not start, error message when starting

You can get it working by doing the following: Check if the operating system of your computer is 32bit or 64bit.

Copy the 64-bit dll's (otherwise take the ones from the 32bit directories) from

C:\Program Files\OptoMotive\GigEVisionSDK\bin\Win64 and **C:\Program Files\OptoMotive\GigEVisionSDK\GenICam\bin\Win64_x64** to **\Windows\system32 (**respectively **\Windows\SysWOW64).**

Then start the GigEVisionClient from C:\Program Files\OptoMotive\GigEVisionSDK\bin\Win64

Cameras are not working in Dewesoft X

If you followed the step-by-step installation procedure, but still the camera is not working in Dewesoft X, you can try to copy the used dll's manually:

Copy the 32-bit dll's from **C:\Program Files\OptoMotive\GigEVisionSDK\bin\Win32** and **C:\Program Files\OptoMotive\GigEVisionSDK\GenICam\bin\Win32_i86** to Dewesoft X's Addons folder. Then restart Dewesoft X.

Maximum frame rate at VGA resolution only 36 fps

When you adjust the frame rate higher than 36 fps, and it is always reset to 36 fps, the Ethernet card in your computer is most probably only 100 Mbit/s. Please check the control panel Ã¢â€ â€™ network card properties. Gigabit-Ethernet (1000 Mbit/s) is required!

Performance improvements (e.g. in case of frames lost, CPU overload or buffer overrun)

A loss of a few frames during a measurement is normal, due to collisions on the Ethernet network. Here are some useful hints to improve the performance:

- Do not operate the camera in a fully-loaded network (e.g. office computers). Just use the direct connection or one switch (with no additional participants).
- Disable all anti-virus, firewall, indexing and synchronization programs running in the background.
- Also check if you really have a Gigabit-Ethernet network card, not only 100Mbit/s.
- Check if the LAN cable is at least of CAT5 quality, if you have longer cable lengths it should be even better.
- For this camera, the main improvement can be done by using an SSD (disk writing speed about 100...150 Mbyte/s. One camera at 640x480 @ 120fps takes about 35MByte/s, multiply the value with the number of cameras used)
- Disable any online compression in Hardware setup Ã¢â€ â€™ Video. Codec may take CPU load.
- Try to decrease the frame rate/resolution
- Use the Windows resource monitor (can be found in Task manager) to check for bottlenecks.
- For optimal performance, we recommend to enable Jumbo frames on your PC network card. Jumbo frames are Ethernet packets larger than 1500 bytes. This way less CPU time is spent for data reception, therefore, increasing performance and minimizing data loss. (Control panel -> network and internet -> view network status and tasks (network and sharing center) -> change adapter settings -> right-mouse-click on LAN connection -> Properties -> Configure -> Advanced -> Jumbo Frame -> set to highest value (e.g. 9kB MTU)).
- Also, an overloaded Dewesoft X setup (many displays, e.g. high-resolution FFT instruments) will take system power. Try at first only with camera video instruments.
- Press <Ctrl>+<Shift>+<P> in Dewesoft X's Measure mode. On the right side, the performance monitor will appear. Watch the

Cam video buffer. It should stay stable at low values.

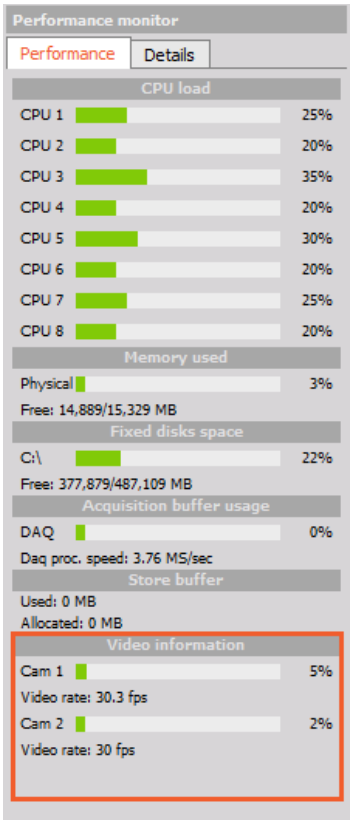


Image 42: Performance monitor

Testing 6 cameras DS-CAM-600

System requirements:

- 6 x independent Gigabit-Ethernet ports. Used network cards at the testing:
    - Intel PRO/1000 PT Quad Port Low Profile Server Adapter
    - Tenda TEL9901

- Good PC performance (Core i5 CPU or better recommended, 4 GB RAM)
- Dewesoft X or 7.1
- OptoMotive GigE Vision SDK
- Dewesoft GigE driver (CDV)
- SIRIUS
- 2 x SYNC BOX (for synchronization)

We have measured the difference between SSD and HDD.

- WD Black 1 TB SATA Hard Drives (WD1002FAEX) with 64 MB buffer size
- Intel SSD 520 Series (480GB)

Software setup

After we have connected the hardware, we have set the proper network properties.

To set the right configuration of Local Area Connections, we have changed the IP address and Subnet mask in Internet Protocol's (TCP/IP) Properties.

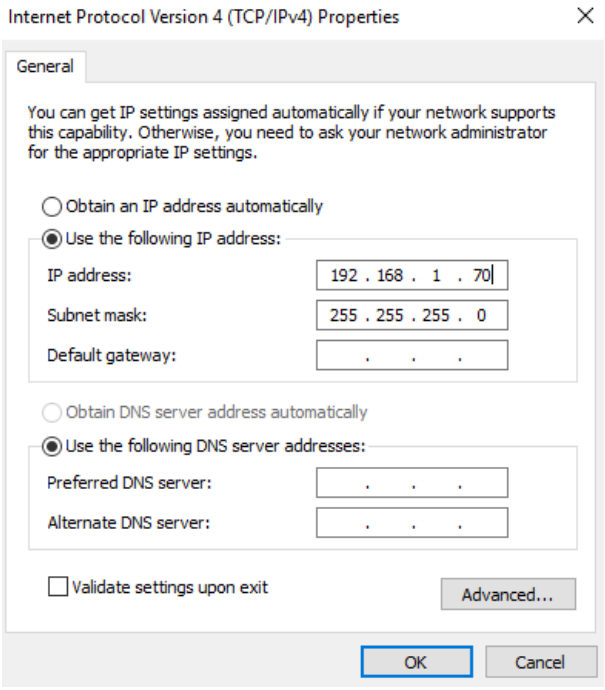


Image 43: Change IP

Connect cameras one by one, otherwise, you don't know on which ports they are.

Then we ran GigEVisionClient, where the camera is already connected, but with the wrong IP address. So we have changed the IP address of the camera to 192.168.1.71.

The last numbers have to be different in GigEVisionClient and Internet Protocol setup

For the next camera, we have changed the 3rd number of IP address, because the Subnet mask is 255.255.255.0, which means it changes only 3 numbers.

	TCP/IP address	GigEVisionClient IP address
Local Area Connection 1	192.168.1.70	192.168.1.71
Local Area Connection 2	192.168.2.70	192.168.2.71
Local Area Connection 3	192.168.3.70	192.168.3.70
Local Area Connection 4	192.168.4.70	192.168.4.71
Local Area Connection 5	192.168.5.70	192.168.5.71
Local Area Connection 6	192.168.6.70	192.168.6.71

After we have done this part, we were ready for testing.

Testing

For testing purposes, we have done a special table, with which we can measure a single point with 6 cameras.



Image 44: Setting up the cameras

On that point, we have used a tuning fork, so we could actually see the synchronization of 6 cameras. Our goal of testing was to measure different resolutions and then search for the highest frame frequency at each resolution. For each setup, we have done at least 3 measurements. We have stopped the measurement when buffer usage was over 80%.

Results: Synchronization

To see that cameras are really synchronized we have compared 2 following frames. In the picture below is a display from Dewesoft X software with 6 x camera with 600 fps with a tuning fork.

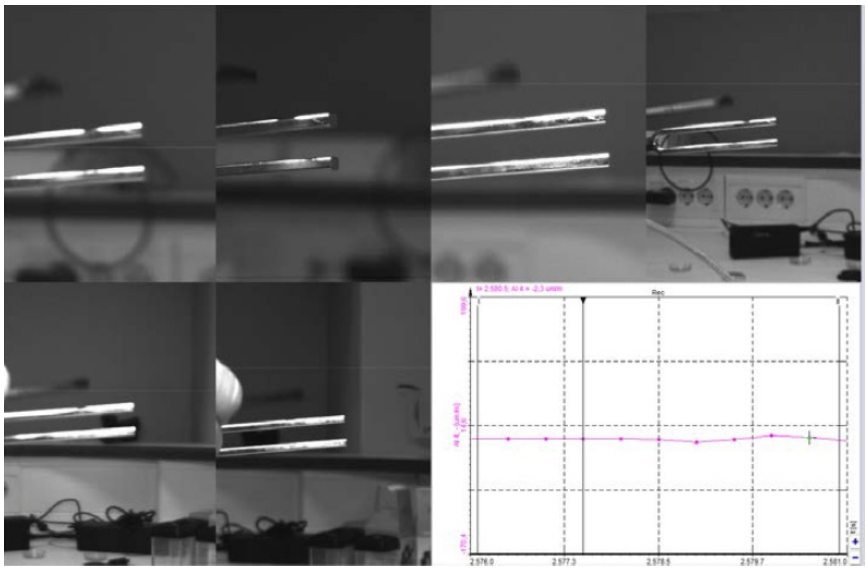


Image 45: 1st frame acquired with 6 cameras of 600 fps

Next frame of the same result:

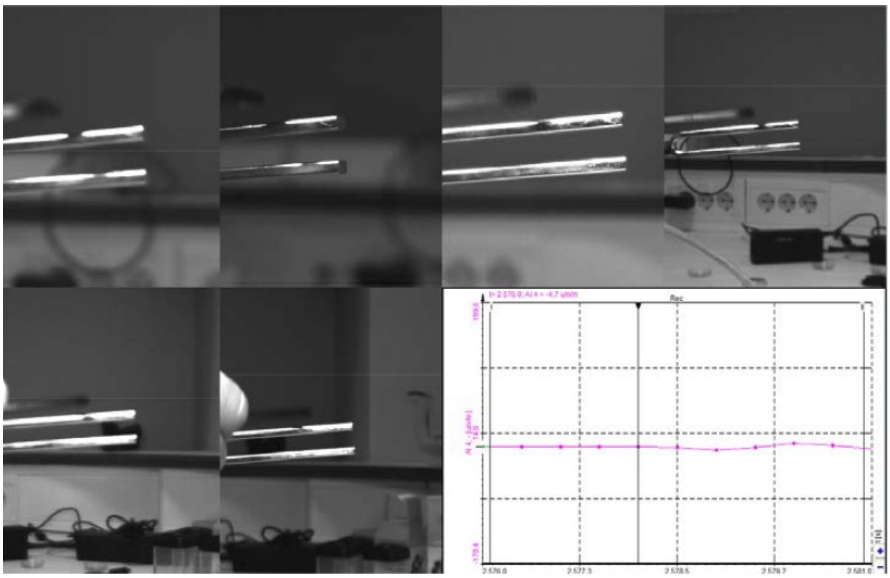


Image 46: 2nd frame

If we look at pictures above closely we can see **perfect synchronization** of all 6 cameras.

Resolution and frame frequency - HDD vs. SSD

At this part, we have done 2 separate measurements. One was with HDD (Hard Disk Drive) and the other was with SSD (Solid State Drive).



Image 47: HDD versus SSD

Results for HDD (Hard Disk Drive)

Number of cameras	Resolution	Frame frequency [fps]	Storing time [1 Analog ch. - 10 kHz]	Storing time [1 Analog ch. - 100 kHz]
6	640x480	600	Working*	Working*
6	800x600	600	Up to 5 s	/
		550	Up to 10 s	/
		500	Up to 15 s	/

		450	Working*	Working*
6	1024x768	500	Not for use - picture is jumping	
		450	Up to 5 s	/
		400	Up to 10 s	/
		350	Up to 15 s	/
		300	Working*	Working*
6	1280x720	300	Up to 10 s	
		250	Up to 15 s	
		200	Working*	Working*
5	192x1080	150	Up to 10 s	
		100	Working*	Working*
* storing time was longer than 1 minute, with stable buffer				

For resolutions of 640x480, 800x600, and 1024x768 we were using 2 Ports on motherboard and 4 on Intel network card.
For resolutions of 1280x720, and 1920x1080 we were using 2 Ports on motherboard, 2-3 on Intel network card, and 1 on Tenda network.

For tests, we have also used 1 color camera in different combinations with black-white camera. For all tests, we have used 2 ports on motherboard, 2-3 on Intel network card, and 1 on Tenda network card.

Number of cameras	Resolution	Frame frequency [fps]	Storing time [1 Analog ch. - 10 kHz]	Storing time [1 Analog ch. - 100 kHz]
6 (5+1)	640x480	600	More than 1 minute	Working*
6 (5+1)	1280x720	300	Not for use	/
		250	Up to 15 s	/
		200	More than 1 minute	Working*
5 (4+1)	**	150	Up to 15 s	
		100	More than 1 minute	Working*
* storing tested longer than 1 minute - buffer stable ** 1920x1080 for black and white, 2048x2048 for color camera				

In 5+1 cases, there were 5 black and white cameras, while 1 camera was a color camera.

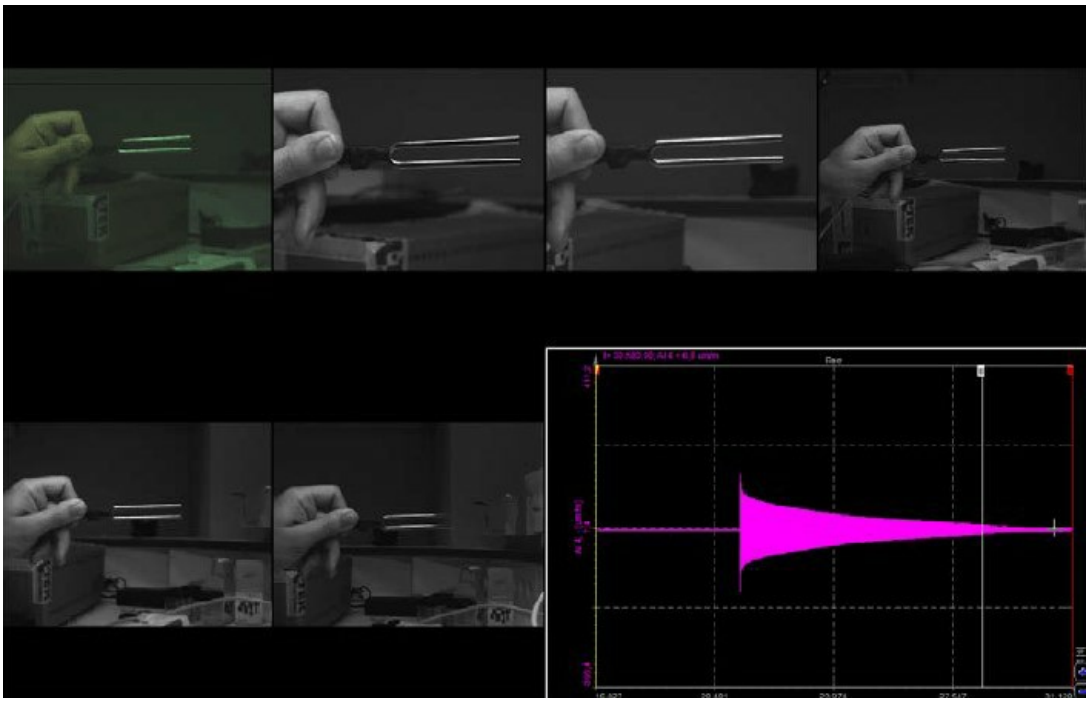


Image 48: One color camera and 5 black and white cameras result

Results for only one color camera:

Resolution	Frame frequency [fps]	Storing time [1 Analog ch. - 10 kHz]	Storing time [1 Analog ch. - 100 kHz]
640x480	600	Working*	Working*
1280x720	500	Not for use - picture is jumping	
	497	Working*	Working*
	450	Working*	Working*
2084x2084	178	Working*	Working*
* storing tested longer than 1 minute - buffer stable			

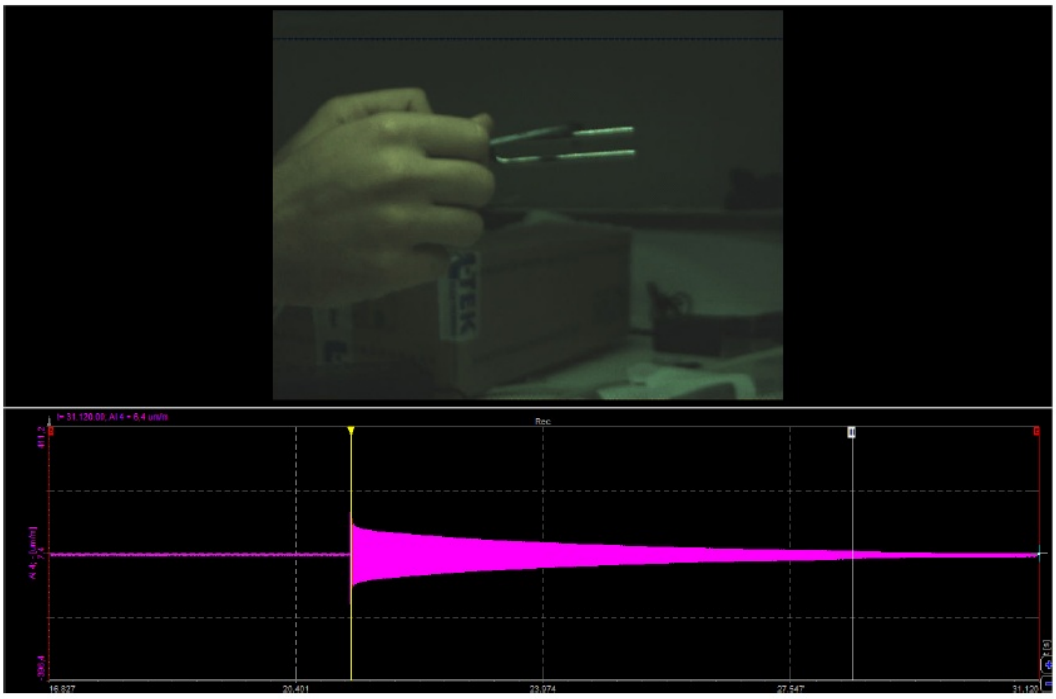


Image 49: Result for one color camera

An important finding: no difference in the size of files between the black&white camera and the color camera

Additional testing with HDD

We were searching for a maximum 24 x analog channel frequency with the highest performance of 6 x cameras:

Number of camera	Resolution	Frame frequency [fps]	Storing time [kHz] (>3 minutes + buffer stable)
6	640x480	600	150
6	800x600	450	10
		350	150
6	1024x768	200	50
		150	150
5	1280x720	250	150
4	1920x1080	150	150

Results for SSD (Solid-State Drive)

6 x Camera 1280x720 - 500 fps - 150 kHz with SSD:

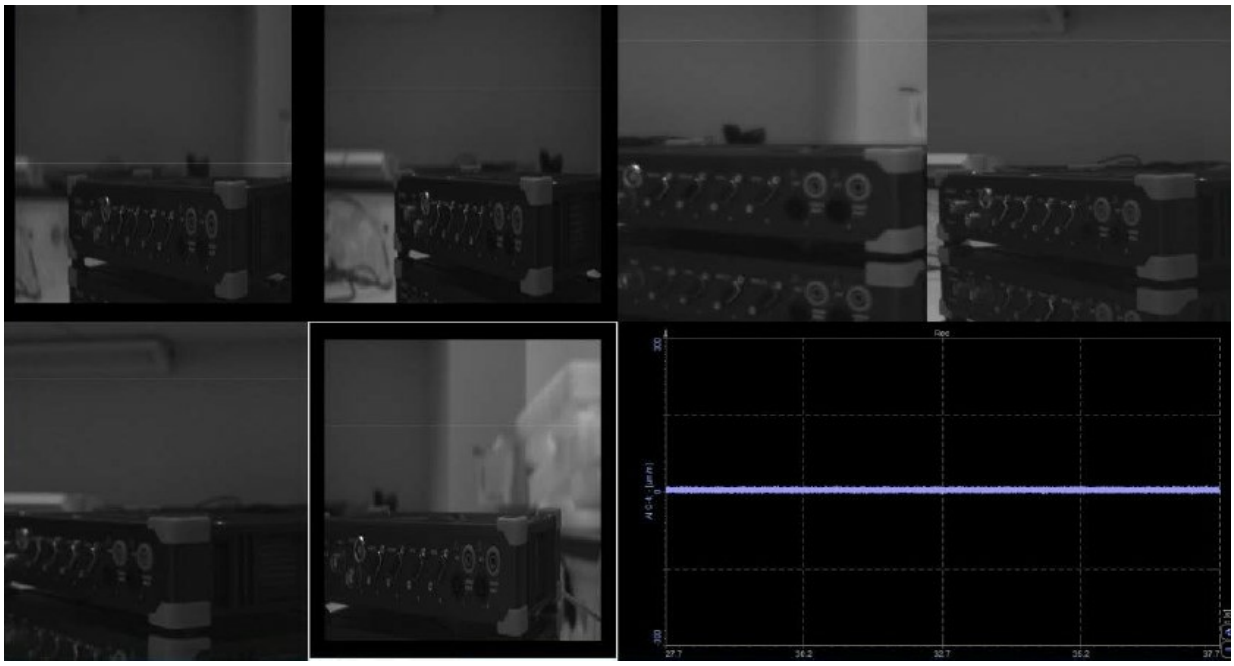


Image 50: 6 x camera 1280x720 with 500 fps and SSD

With SSD inside the PC, we have done tests only with black-white cameras:

Number of cameras	Resolution	Frame frequency [fps]	Storing time [1 Analog ch. - 10 kHz]	Storing time [1 Analog ch. - 100 kHz]
6	640x480	600	Working*	Working*
6	800x600	600	Working*	Working*
6	1024x768	500	Not for use - picture is jumping	
		472	Working*	Working*
6	1280x720	550	Not for use - picture is jumping	
		500	Working*	Working*
5	1920x1080	350	Not for use - picture is jumping	
		335	Working*	Working*
* storing tested longer than 1 minute - buffer stable				

In all cases, we were using 2 Ports on motherboard, 3-4 on Intel network card.

Additional testing with SSD

We were searching for a maximum 24 x analog channel frequency with the highest performance of 6 x cameras:

Number of cameras	Resolution	Frame frequency [fps]	Storing time [kHz] (> 3 minutes + buffer stable)
6	640x480	600	150
6	800x600	600	150
6	1024x768	473	150
6	1280x720	500	150
5	1920x1080	335	150

How to choose the right camera

So which camera to choose for a certain application? It is clear that the thermo vision cameras have their special applications while the high-speed cameras are used to acquire short triggered snapshots where we need extreme video rates to capture crashes, explosions, and other fast events.

The decision between a good camcorder and a medium speed camera is not that easy. The main difference between these types of cameras and the high-speed ones is that with the medium and low-speed cameras we can continuously store video stream to the disk until we run out of disk space. We can also use software triggering on the video to reduce the amount of data or perform the online compression.

However, the system needs to have a good performance to stream video. We will need high-performance hard disks and a very well built system, as we might still run to the limit of performance. We have to know that the typical VGA size image takes 300 kB. If we have 100 frames per second, we need to store 30 MB/s for one camera.

Clearly, if we want to make a high-speed video, we need to use either DS-CAM 120 or DS-CAM 600.

- **DS-CAM 120** has a slightly higher speed (120 FPS in VGA).
- **DS-CAM 600** compresses the picture in camera and we can achieve 600 FPS in VGA mode.

A big advantage of both camera types is that they can be triggered from the analog card and therefore the data and video are perfectly consisted. If 25 or 30 pictures per second are enough, we might consider using a camcorder. I would suggest progressive scan cameras, so as not to have interlaced pictures. Web cameras are usually low price/low speed/low quality but are an extremely helpful tool to document the experiment. We had lots of feedback from customers telling us that a simple, even poor picture helped them to understand the recorded data much better.

How to connect a Webcam?

We connect the webcam to our computer via USB cable.



Image 51: Connect a webcam

To see the webcam in Dewesoft X, we have to enable the DirectX camera devices in Settings.

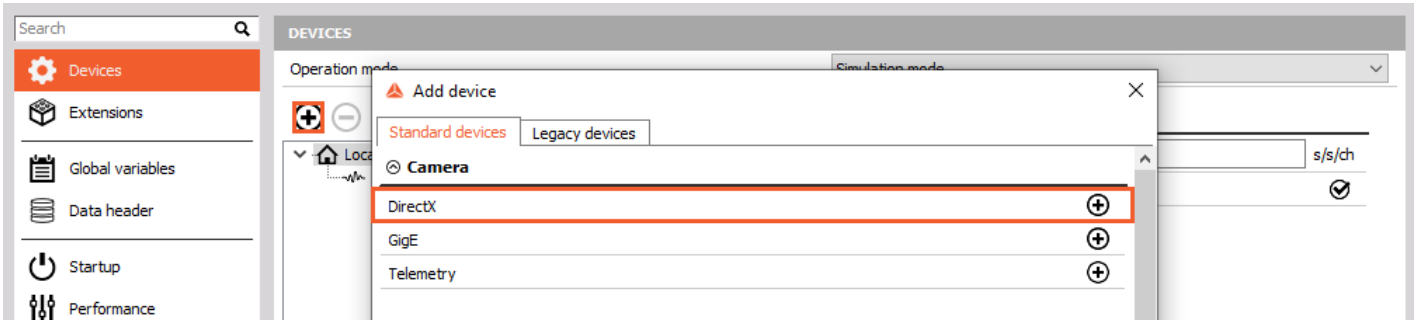


Image 52: Add DirectX camera

In the DirectX, we can see the list of all the cameras that were found.

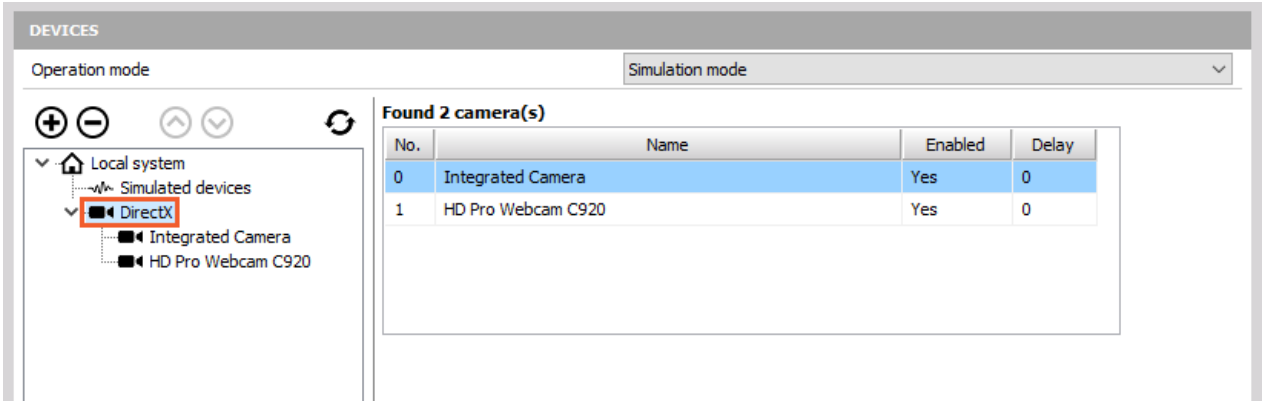


Image 53: Recognized cameras

The delay defines the difference between the actual event and the event shown on the video display, recorded by a camera. We can define the delay for each connected camera separately. The delay is defined in milliseconds (ms). We enter the wanted value and to confirm the number, we press enter.

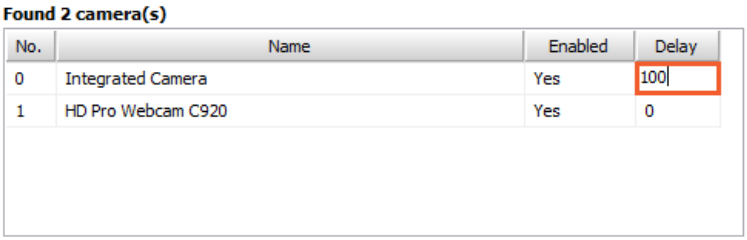


Image 54: Specify the delay

To enable a Video module, click the plus button (More...) and select the Video.

HINT: Instead of searching for the Video module, start typing the word Video. The search for the wanted module is much easier and faster.

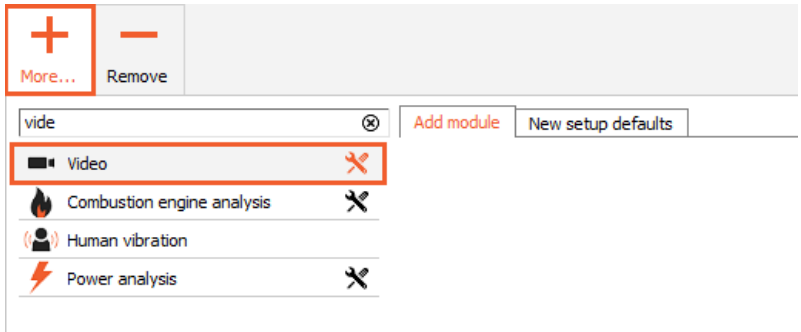


Image 55: In channel setup add Video tab in a drop-down menu of the More button

Video

When we enter the Video section, we see our connected cameras, along with some other quick settings.

ID column shows the consecutive number of the connected camera. In the color column, we can change the color of the camera signal (recorder, ...).

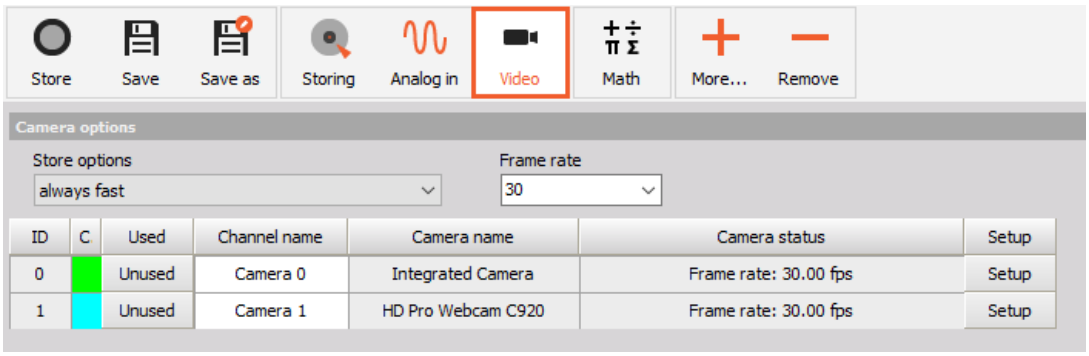


Image 56: Video tab

Store options:

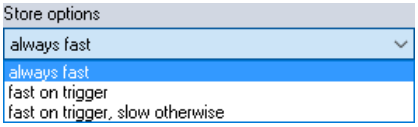


Image 57: Store options

There are three storing options - **always fast**, *fast on trigger*, and *fast on trigger, slow otherwise*.

Setting up the Camera

Enter the camera setup.

ID	C	Used	Channel name	Camera name	Camera status	Setup
0		Unused	Camera 0	Integrated Camera	Frame rate: 30.00 fps	Setup
1		Unused	Camera 1	HD Pro Webcam C920	Frame rate: 30.00 fps	Setup

Image 58: Camera setup

General settings

Under general setup, you can adjust several picture parameters (pan, tilt, zoom, exposure, focus, brightness, contrast, saturation, sharpness, white balance, ...).

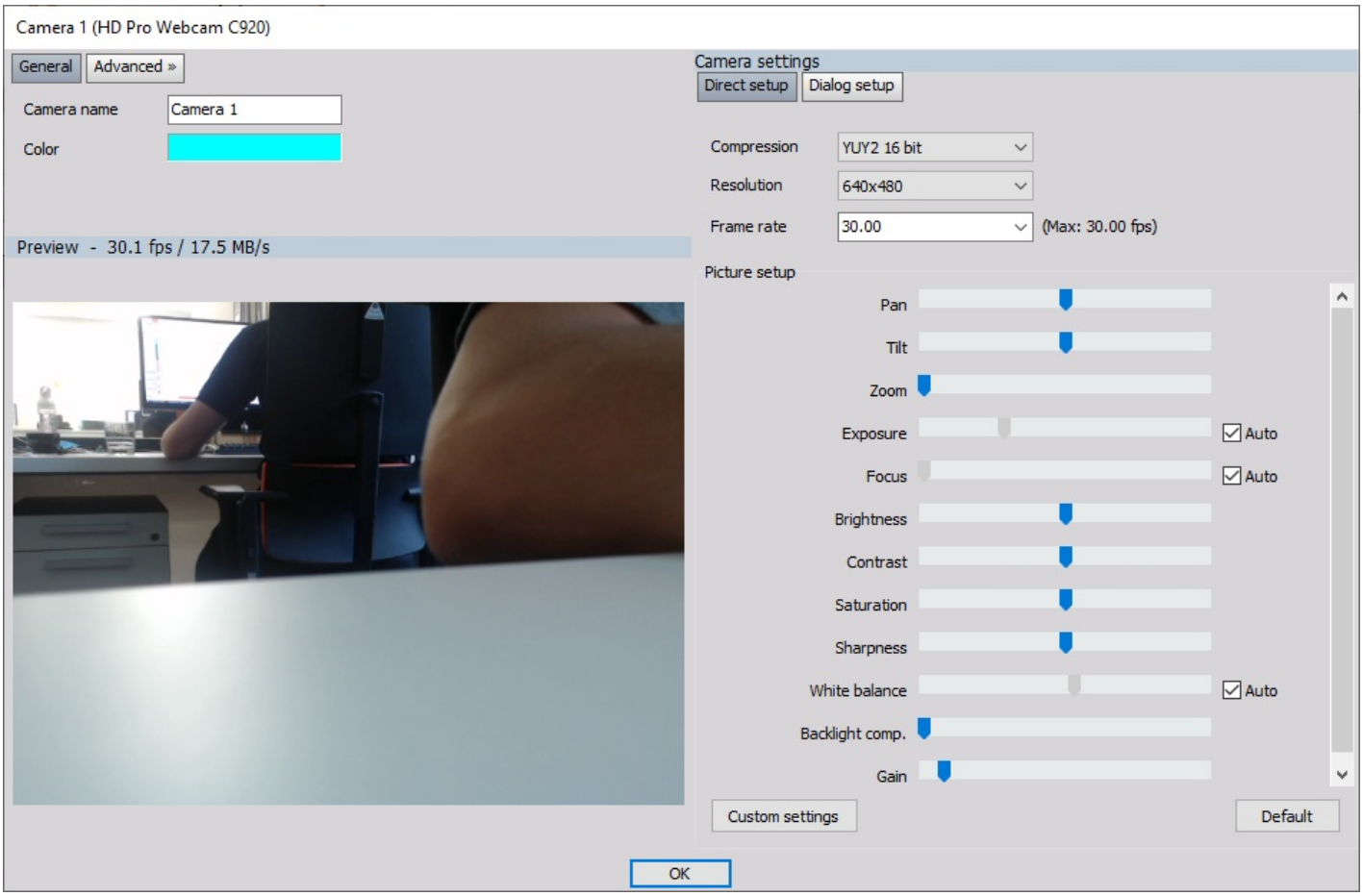


Image 59: General settings

File format

Click on the button Advanced in the Camera setup, and you will be able to see File format settings. There you can choose between two file formats:

- DVI (best performance)
- AVI (video standard)

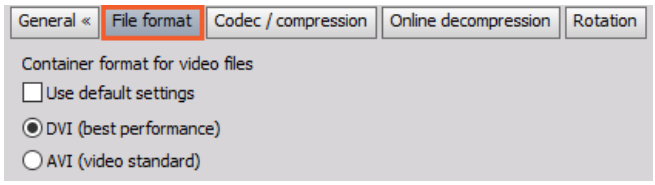


Image 60: Choose the right file format

Codec/compression and Online decompression

For a Video compression setup you can choose between:

- direct / raw / uncompressed
- H.264 / MPEG-4 AVC
- MPEG4 / DivX / XviD
- MJPEG

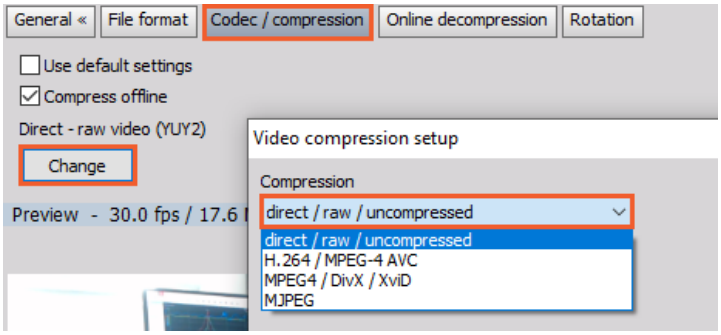


Image 61: You can change Codec/compression

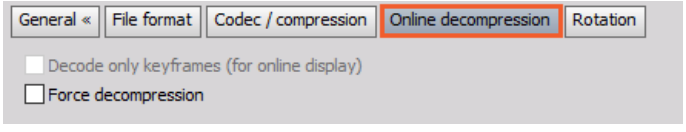


Image 62: Online decompression

Rotation

The picture from the camera can also be rotated. The default angle is 0Â°. We can enter any number we want, to confirm the selection press the Enter button.

The angle is defined from 0Â° to 359Â°(0Â° and 360Â° are the same point). If we enter the rotation angle of 450Â°, the picture will be rotated for 90Â° (450Â° - 360Â°=90Â°).

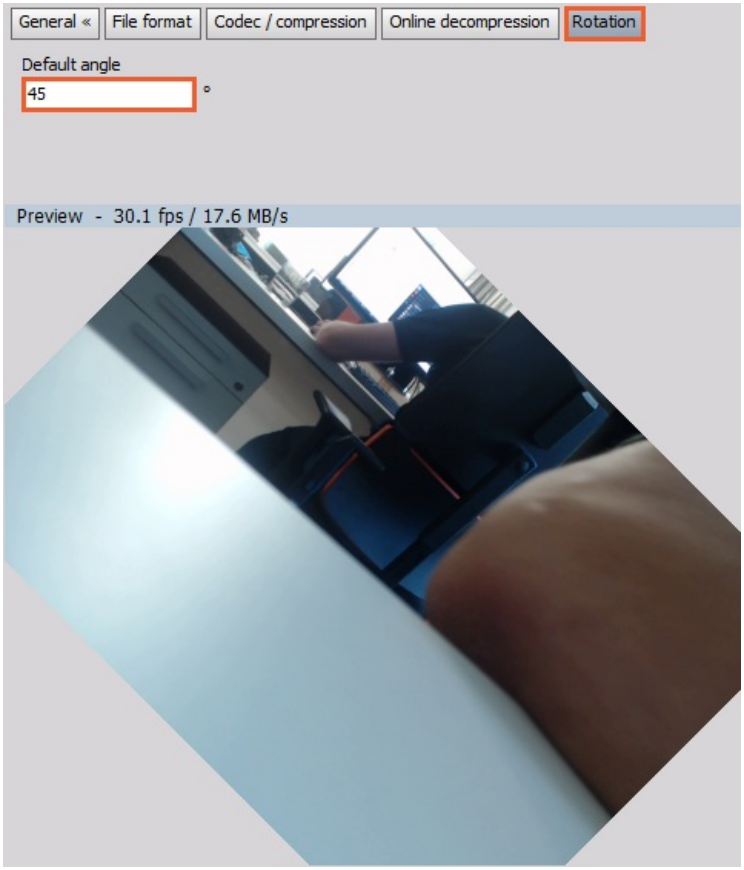
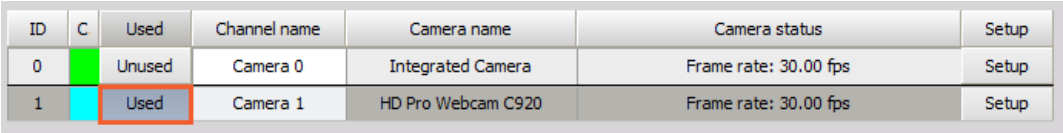


Image 63: Set the rotation angle

[Video available in the online version]

How to setup the Video?

The next step is to set up the video channel. Go to the Video section. In the **Camera options** section where the webcam should be displayed if it is installed correctly. Click the Unused button to switch on the camera (turn it into Used) and end setup with the Setup button.



ID	C	Used	Channel name	Camera name	Camera status	Setup
0		Unused	Camera 0	Integrated Camera	Frame rate: 30.00 fps	Setup
1		Used	Camera 1	HD Pro Webcam C920	Frame rate: 30.00 fps	Setup

Image 64: Enable camera with switching to Used mode

We can enter the Camera **Setup** and there we can change the frame rate, resolution, compression, and other properties of the camera.

[Video available in the online version]

How to setup the Channel?

In this test, we will measure voltage and current at the output of the 0.5 A fuse. With the help of a hairdryer, we will switch off the fuse. The video will be recorded with a high-speed camera and regular webcam.

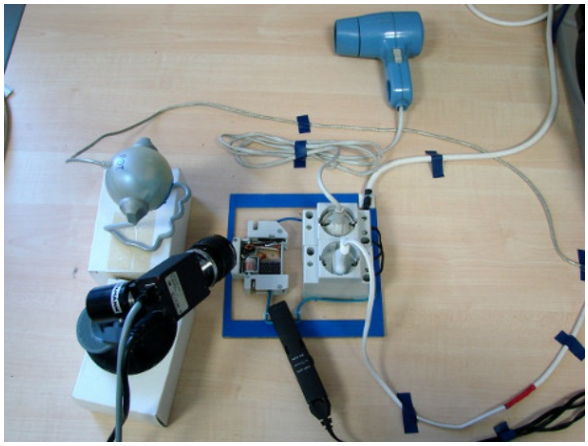


Image 65: Testing setup of a high-speed camera and fuse

We have two camera types connected, DirectX (which recognizes webcams and camera phones) and GigE.

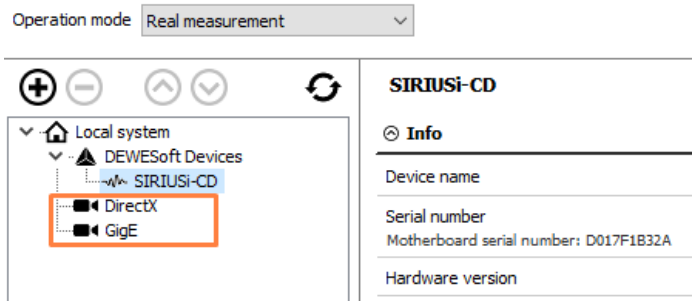


Image 66: Project settings

In the setup screen of Dewesoft X, we see all connected cameras. We select needed cameras.

ID	C	Used	Channel name	Camera name	Camera status	Setup
0		Used	Camera 0	Logitech HD Pro Webcam ...	Frame rate: 30.00 fps	Setup
1		Used	Camera 1	DS-CAM - Velociraptor	Frame rate: 588.24 fps	Setup

Image 67: Enable both cameras

First we set up the camera. We set the frame rate to and resolution. The next step is to set the shutter speed. Higher shutter speeds will reduce the smearing of picture with fast movements, but will also reduce the brightness of the picture. Therefore we will need

either a strong light or we will need to increase the gain. On the other hand, this will increase the noise in the picture and will reduce the picture quality.

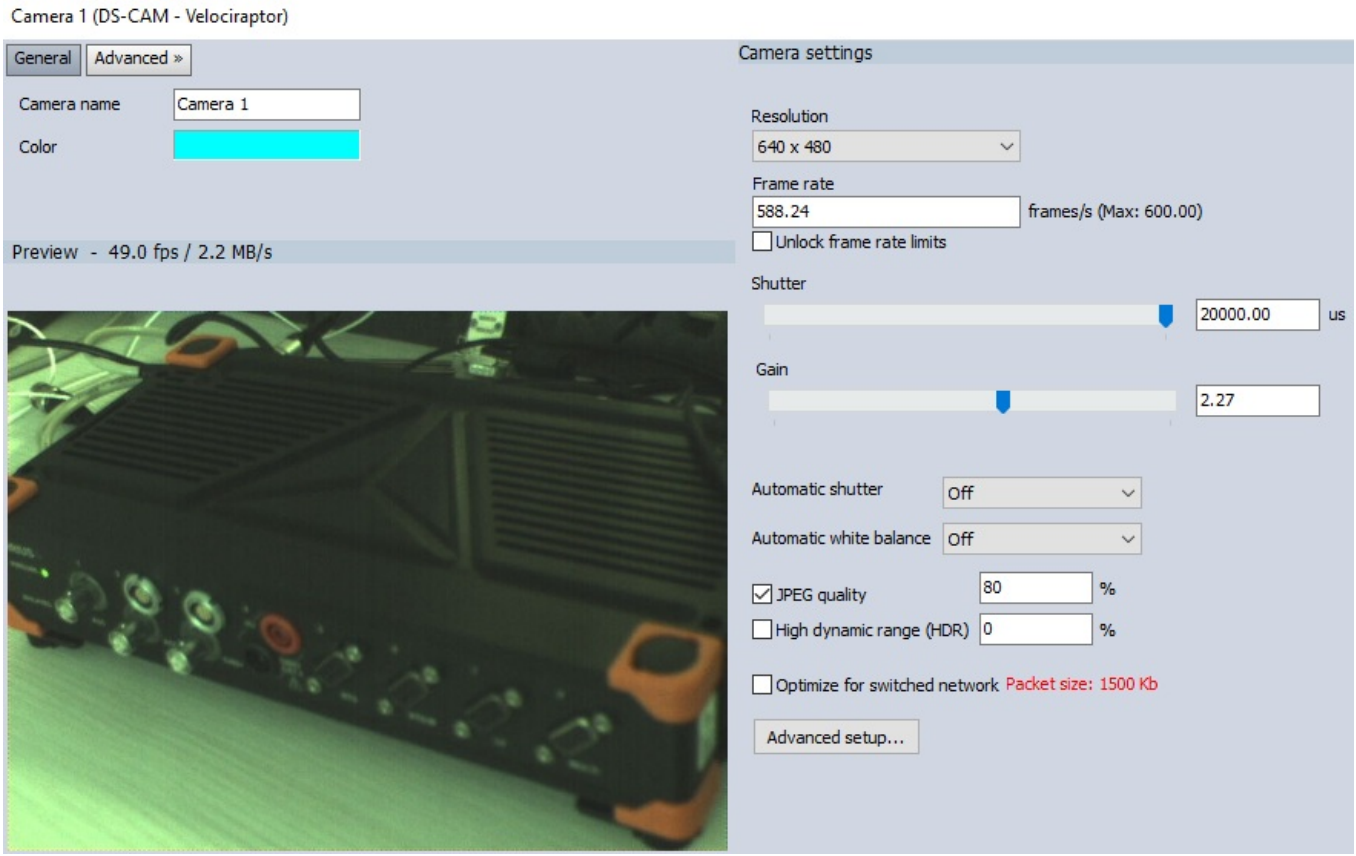


Image 68: Setup the DS-CAM - Velociraptor camera

The settings of the camera depend on the capabilities of the camera. There are huge differences between one webcam and the next in terms of speed, picture quality, and available functions. Some cameras have automatic shutter and automatic gain, there are even a few with automatic focus.

Some cameras have different compression types like YUV or I420. This means that each pixel will not have 24 bits of data (8 bits of data per color), but less. In short, using such modes will result in smaller picture sizes and will reduce the data file size in the end, but the colors might not be as perfect as with RGB (uncompressed). However, the human eye is much more sensitive to scales of gray than to shades of colors. These compression algorithms use exactly this fact, therefore we might not even see any difference.

Usually, the cameras also offer **Advanced setup**, which will show all the special functions of the specific cameras, such as flipping, rotating picture, and more.



Image 69: Use default compression settings

How to perform a Measurement?

So let's acquire the data and see the results. The high-speed camera is synchronized exactly to the analog data therefore we can compare the switching times with analog voltage and current. The current is flowing through the fuse for approximately 20 msec before it really switches off and we can see nicely when the spark switches the fuse off. It is also very nice to see the position of the switch (on the left side of the fuse) as it goes to the off position.

The picture from the webcam is nice but doesn't show this at all. Because the webcam is neither clocked nor synchronized with analog data, it is time-stamped as the picture comes into the computer. Therefore, we can see the switch off with a delay of approximately 60 ms. In conclusion, webcams have two limitations: speed and time accuracy.

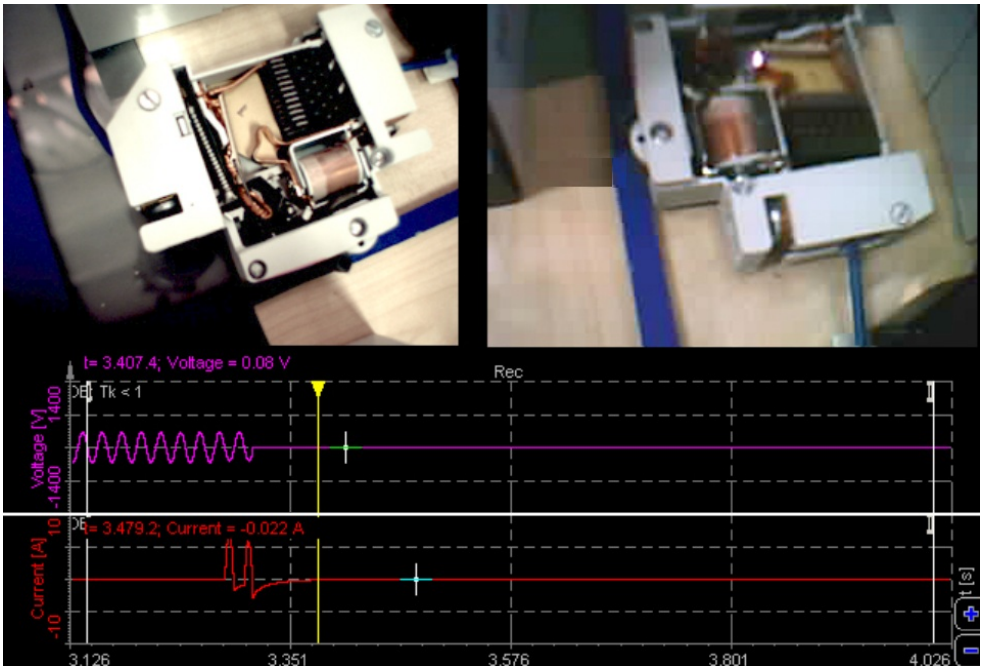


Image 71: Fuse testing

However, there is a way to reduce the timing inaccuracy by entering a camera delay. Usually, this delay is quite constant and can be compensated. We can do this in the Settings by entering this value in the Delay field in the table. We will still have a time jitter of each frame, which can be in the range of 30 ms or even more when the system is at the limit its performance, but here we can't compensate it. If time accuracy is needed, we should look for clocked cameras like DS-CAM.

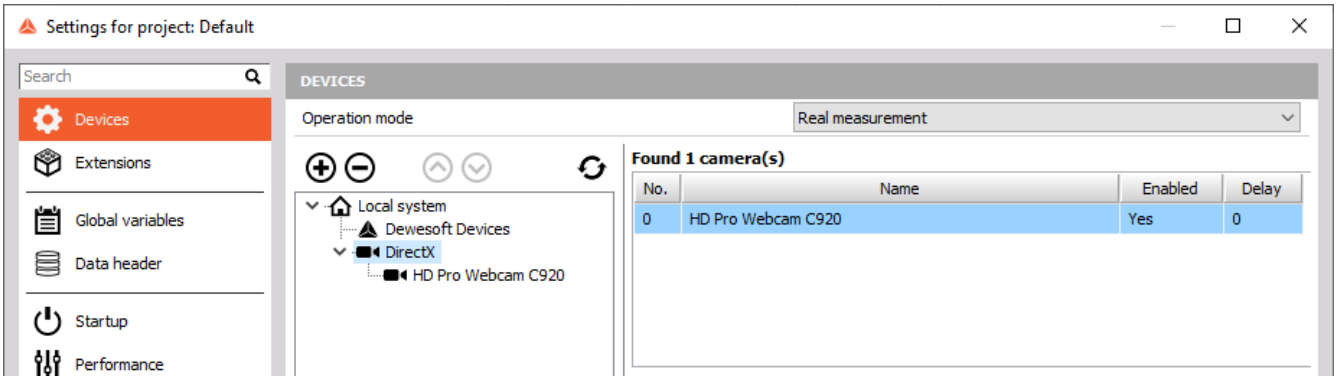


Image 72: How to add a DirectX

Now if we look at the repeated measurement, both cameras show approximately the same time of the event, however, the webcam shows only one frame when the fuse switched off while the DS-CAM camera shows quite a several frames to be able to also see the spark, the movement of the coil and the switch.

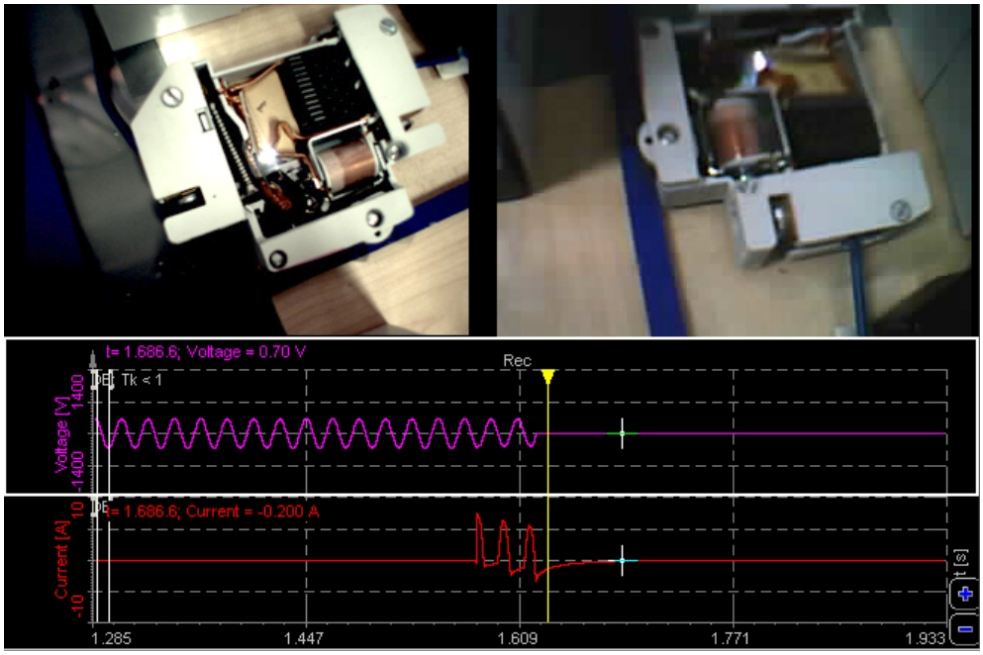


Image 73: Fuse testing

This solution, however, is limited to 600 frames per second. Some events require much faster cameras. These cameras store the picture in internal memory and after that to the video file, so we need to combine the picture and video in post-processing.

Video post synchronization

To include the high speed video in Dewesoft X, only few steps are necessary. After acquisition of the video file and the Dewesoft data, please copy the *.avi camera file to the directory where the Dewesoft data file is located.

[Video available in the online version]

After this, open Dewesoft X and enter the Analysis mode. Select the data file and option **Post-sync. video**.

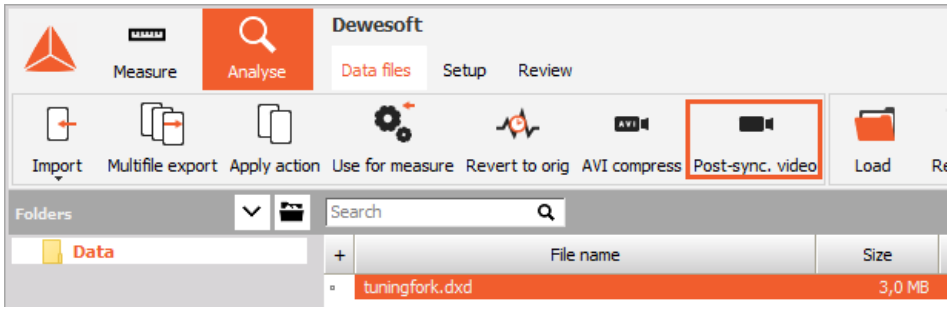


Image 74: Post synchronization of the data file

The next step is to select the video file that you want to import.

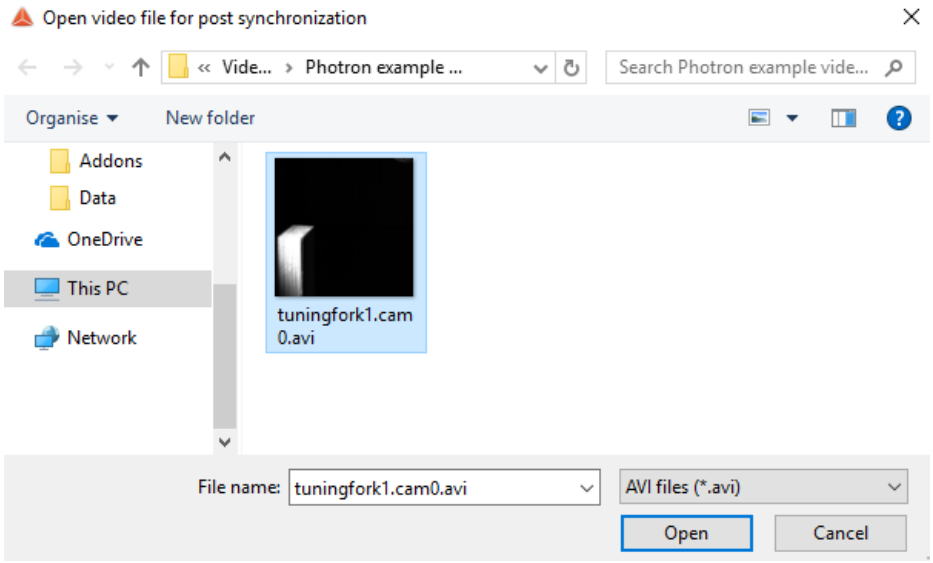


Image 75: Open video file for post synchronization

Double click on the file to open it and Dewesoft X will recognize that this file has no synchronization information included and will ask to synchronize it manually.

It will automatically recognize how many frames are stored in the file. Please enter the correct Frame rate of the camera (sometimes the .avi files hold the correct values, but most of the time not). In the info field Video size, you will enter the video length in seconds. Also, enter how many pictures were taken before the video trigger - Pre trigger - occurred. You can enter it in frames, seconds, or milliseconds.

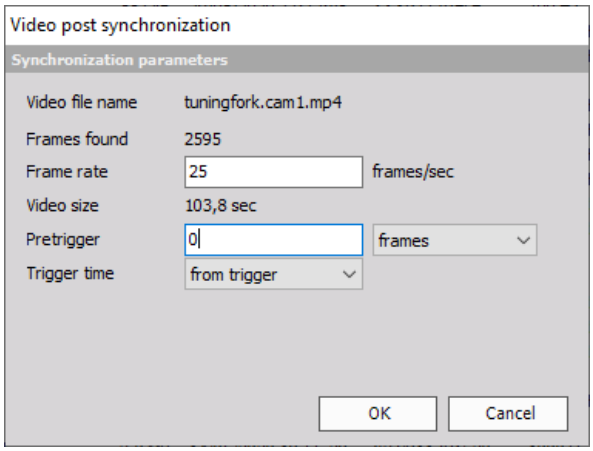


Image 76: Video post synchronization

Trigger time can initially be selected from trigger (so long as the storing of analog data has been triggered from the same trigger source) or in the relative time from start of measurement in seconds. When finished, Dewesoft X will go to the video screen to see the result of the synchronization and the recorder will show the video frame ticks aligned with the analog data.

You can go back and forth with the yellow cursor to observe the quality of the synchronization.

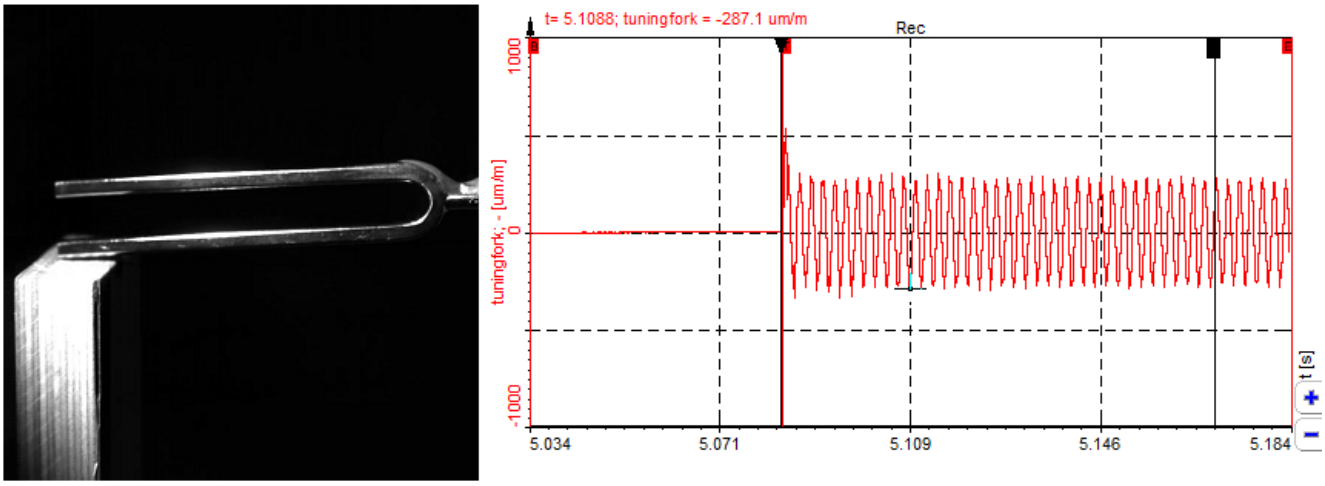


Image 77: Move the yellow cursor to observe the quality of synchronization

If you need to realign the video, please select menu item Post sync. Here you can change the parameters. Also, there is the option to select the start of the video from the current position. In this case, the yellow cursor will be taken as the origin of synchronization.

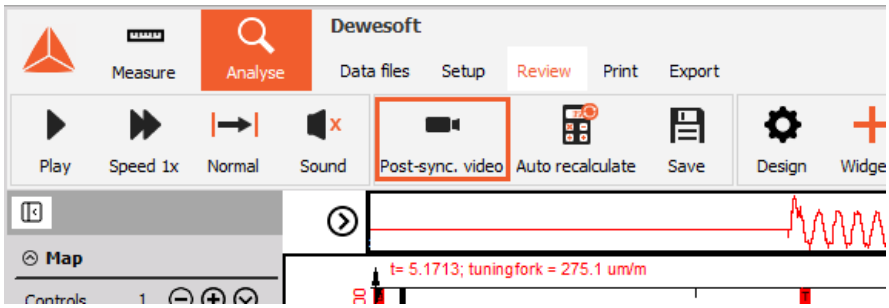


Image 78: Post-sync. video

In order to store the synchronization info for future post-processing once you are done and satisfied don't forget to choose Save.

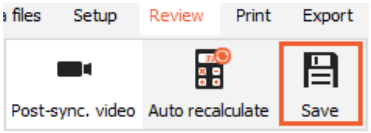


Image 79: Save synchronization

Photron Highspeed-Camera

Usually, the camera is operated in the Start on Dewesoft trigger mode, using a Dewesoft Counter input for the highest precision.

System requirements

- Dewesoft measurement instrument
- PHOTRON highspeed camera (e.g. FASTCAM Mini UX100, 10 000 fps @ 896 x 488)
- 1 free Ethernet port on the computer
- 1 Dewesoft Counter input
- an additional light source

The example below shows a PHOTRON camera (connected over Ethernet) and a DEWE-43 (connected over USB to the notebook). The accelerometer (blue cable) is used to measure the hit of the fingertip, this is also the trigger. The camera puts out a start pulse on the TRIG_TTL_OUT port, which is measured back on one of the Counter inputs of the DEWE-43.

In the photo below, you can see the high-speed camera with the Dewesoft data acquisition instrument (DEWE-43).

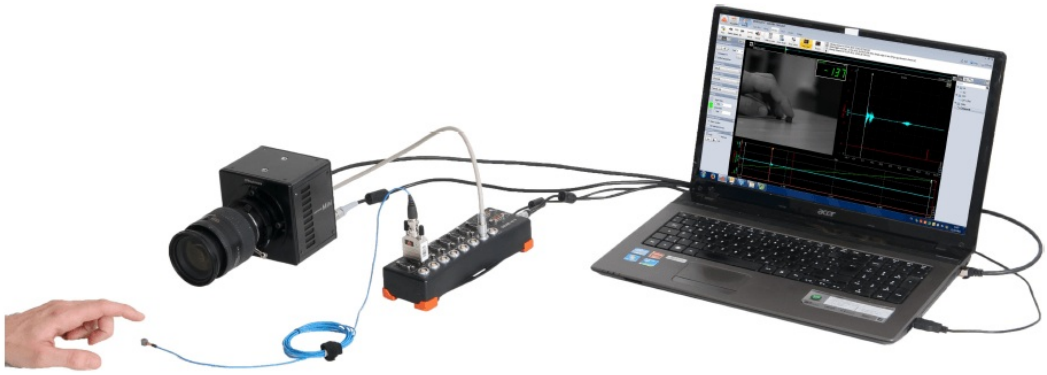


Image 80: High-speed camera setup

DEWE-43 to PHOTRON connection in detail:



Image 81: Photron camera connection detail

System preparation

Windows network configuration

Please enter the Control Panel, go to the Network Connections and right-click on the Port, where your Photron camera is connected to. Go to Properties and select the TCP/IPv4 protocol. Depending on the model the default IP address is usually:

- camera IP: 192.168.0.10 / set computer to 192.168.0.XXX. If a connection cannot be established, please try:
- camera IP: 192.168.10.0 / set computer to 192.168.10.XXX

The subnet is always 255.255.255.0. This is the default for the currently available cameras. Please refer to the Photron camera manual for further information about the default IP address. Please enter

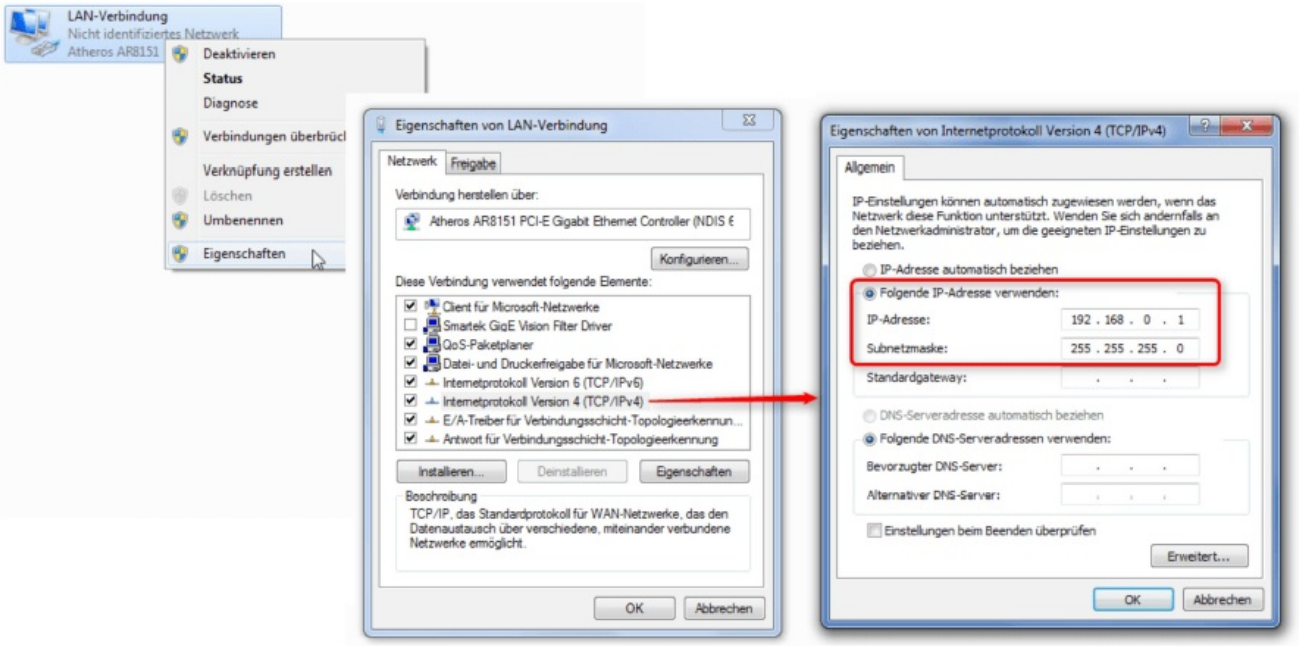


Image 82: Network connection settings

Camera IP reset (factory default)

In case you have troubles connecting to the camera, you can try to set it to factory default by the following routine:

- Press and hold the RESET switch at the camera's backside.
- All of the LEDs on the camera's back sidelight, then they turn off sequentially from right to left. In the end, all LEDs together blink twice, then stay on. This takes several seconds, hold the button pressed all the time.
- Then reboot the camera. The IP address is reset to the factory setting.

Photron FASTCAM Viewer

For checking the network connection (and changing the camera settings), you can use the previously installed Photron FASTCAM Viewer to get a live picture. Please enter the IP address mask as shown above, then click Detect, an auto-search will be performed. Alternatively, click File / Camera open.

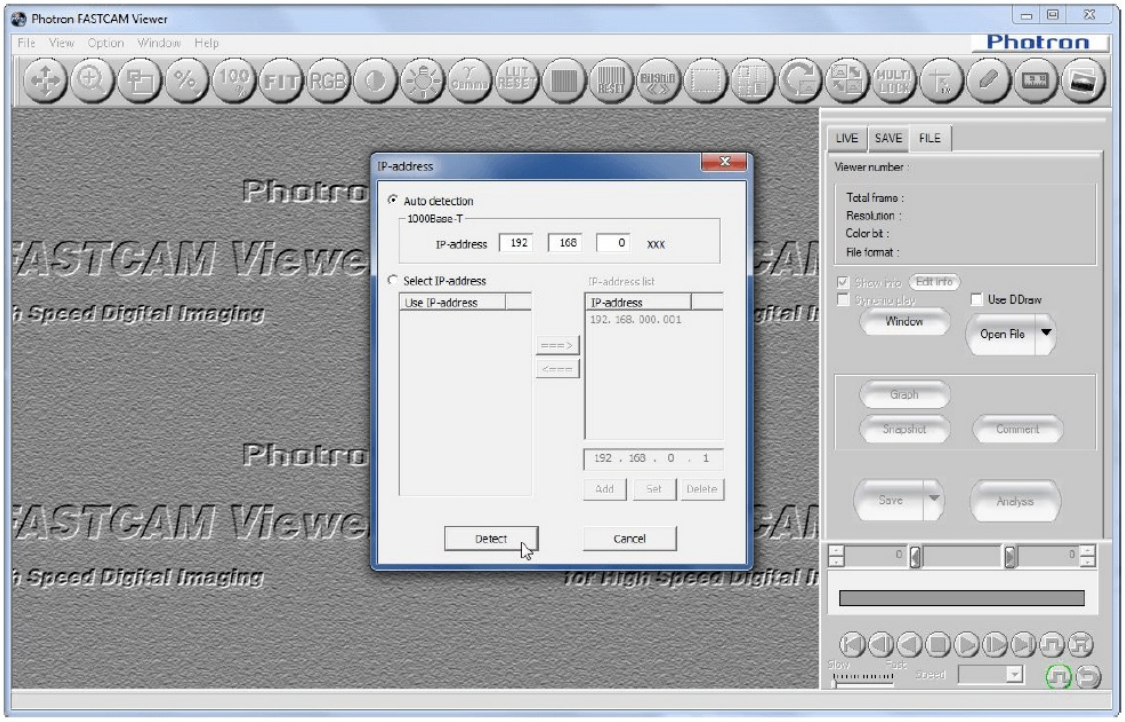


Image 83: Photron Fastcam Viewer

Camera TRIG_TTL_OUT pulse duration

When using the Start on Dewesoft trigger option inside Dewesoft, Dewesoft does the synchronization based on the first frame captured by the camera. In the Photron FASTCAM Viewer, please go to Camera Option and increase the pulse output time from 100 nsec (default) to 100 usec, in order to guarantee a proper triggering under any circumstances.

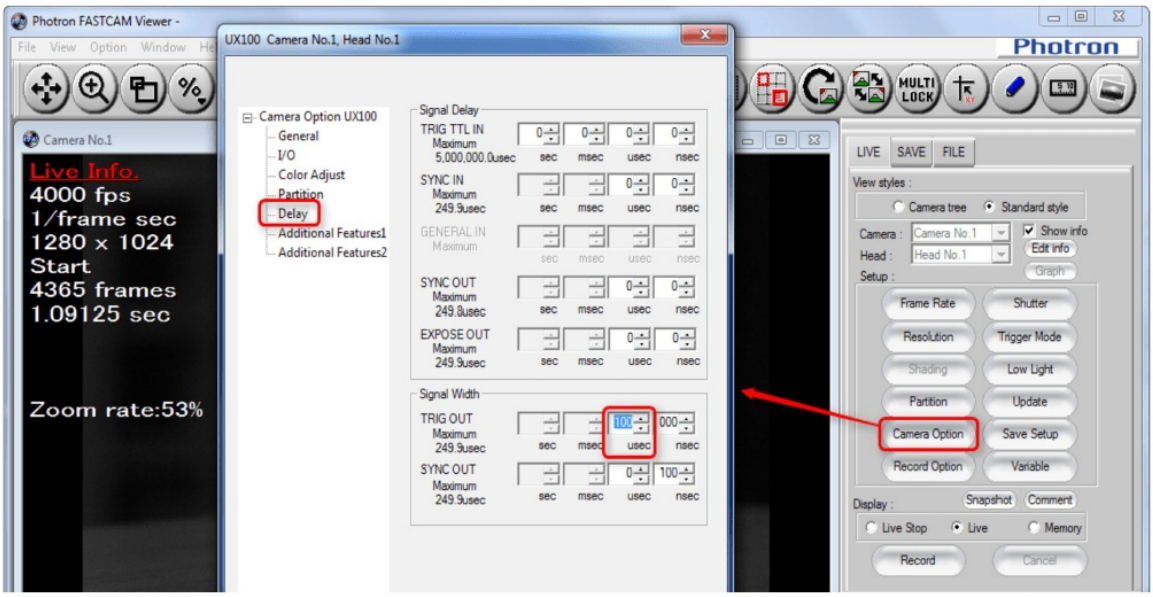


Image 84: TRIG_TTL_OUT setup in PFV

Setup in Dewesoft

Photron.ini file

During installation, we have copied Photron.ini into the Dewesoft X Addons folder (e.g. C:\DewesoftX\X3\Addons64\). This file contains the interface type and IP address of the camera, please set it accordingly.

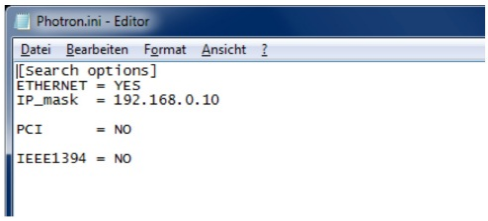


Image 85: Photron.ini file

Enabling the camera

In Dewesoft X go to Settings / Settings / Devices, click the add button and add the Photron FastCam.

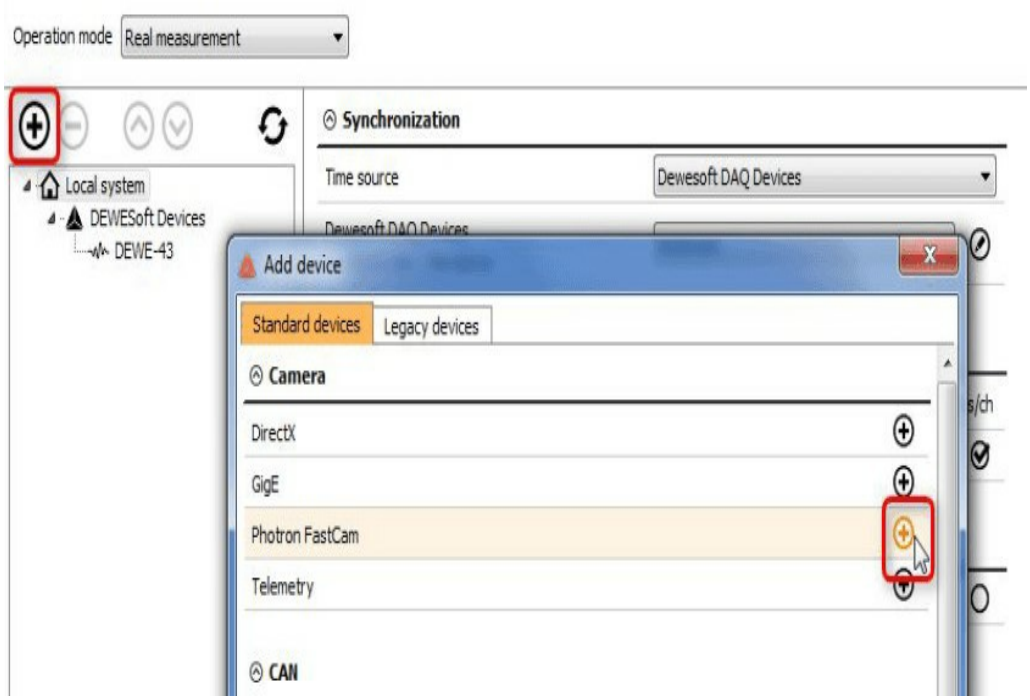


Image 86: Enable the camera in Dewesoft

The Photron FastCam camera is successfully found.

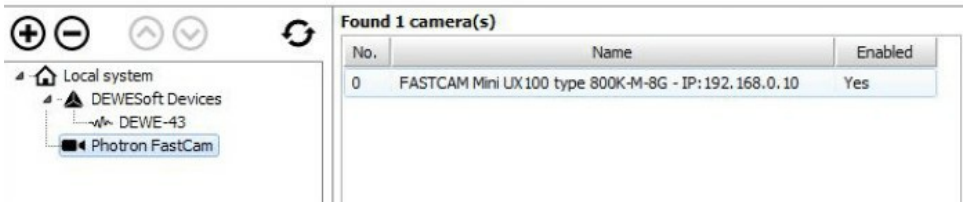


Image 87: Camera successfully found

When you click on the camera, you should be able to see the model and it's IP address.

Trigger setup

There are three different types of camera trigger:

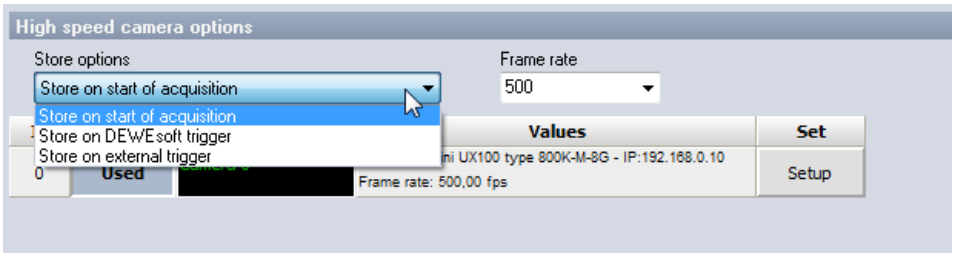


Image 88: Store trigger options

Store on Dewesoft trigger

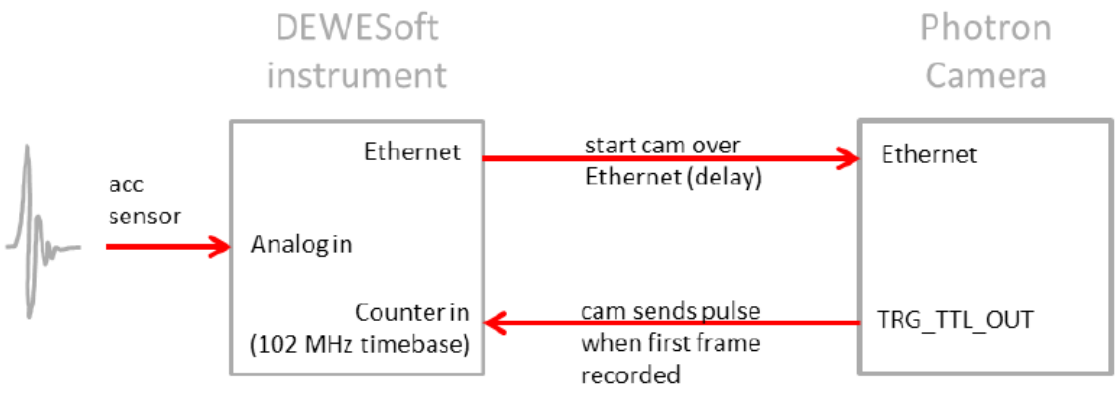


Image 89: Store on Dewesoft trigger

This is the most commonly used wiring. The software triggers even on complex trigger conditions on analog input, and sends the start impulse over Ethernet. The camera sends a pulse, when the first frame is recorded, this is measured back with the very accurate Dewesoft super-counters (102 MHz timebase) for synchronization.

Store on external trigger

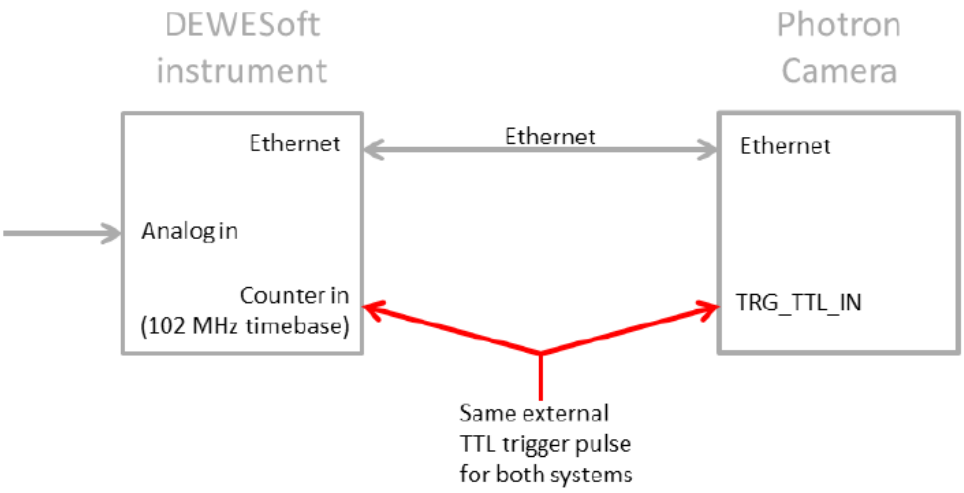


Image 90: Store on an external trigger

If the camera is triggered with an external trigger, then the same signal can also be used for synchronization.

Store on start of acquisition

The camera will start with the beginning of data recording (streaming). This is of less practical usage, because depending on the framerate, measurement duration and camera onboard memory, the acquisition time is limited.

Store on Dewesoft trigger - example

For connection example, we want to acquire both analog and video data of a hit of an accelerometer with the fingertip.

The analog input sampling rate we set to 200 kS/s (this does not affect the 102 MHz counter sampling rate).

ID	Used	C	Name	Ampl. name	Measurement	Range	Physical quantity	Units	Sensitivity	Min	Values	Max	Z...	Setup
0	Unused		AI 0	DW43	Voltage	10 V		V	1,00	-10,00	-0,023	10,00	Zero	Setup
1	Used		acc	MSI-BR-ACC	IEPE	10000 mV	Acceleration	g	100,00 mV/g	-100,00	0,001	100,00	Zero	Setup
2	Unused		AI 2	DW43	Voltage	10 V		V	1,00	-10,00	-0,127	10,00	Zero	Setup
3	Unused		AI 3	DW43	Voltage	10 V		V	1,00	-10,00	-0,100	10,00	Zero	Setup
4	Unused		AI 4	DW43	Voltage	10 V		V	1,00	-10,00	-0,106	10,00	Zero	Setup
5	Unused		AI 5	DW43	Voltage	10 V		V	1,00	-10,00	0,021	10,00	Zero	Setup
6	Unused		AI 6	DW43	Voltage	10 V		V	1,00	-10,00	-0,277	10,00	Zero	Setup
7	Unused		AI 7	DW43	Voltage	10 V		V	1,00	-10,00	-0,032	10,00	Zero	Setup

Image 91: Set the analog input channel on used

We enter the channel setup to get a preview of the signal and check the appropriate trigger level. In the picture below, there is an

example of a signal when knocking with a finger on the sensor.

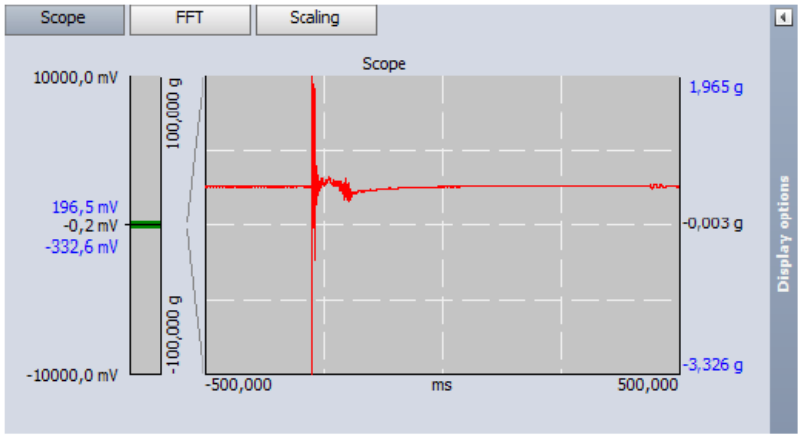


Image 92: Preview the signal in channel settings

If the Counter section is not visible in the first place, please add them with the plus button from the top. The Counter is set to **Event Counting, Basic Event Counting** by default, which is ok. Please *enable the button* on the left of e.g. CNT2/IN0.

+	Used	C	Name	Counter type	Min	Values	Max	Unit	Setup
			CNT1						Setup
	Unused		CNT1	Events	0.00	42	10000.00	-	...
	Unused		CNT1/IN0	Digital	0.00	0	1.00	-	...
	Unused		CNT1/IN1	Digital	0.00	0	1.00	-	...
	Unused		CNT1/IN2	Digital	0.00	0	1.00	-	...
			CNT2						Setup
	Unused		CNT2	Events	0.00	810	10000.00	-	...
	Used		CNT2/IN0	Digital	0.00	0	1.00	-	...
	Unused		CNT2/IN1	Digital	0.00	0	1.00	-	...
	Unused		CNT2/IN2	Digital	0.00	0	1.00	-	...
			CNT3						Setup
	Unused		CNT3	Events	0.00	830	10000.00	-	...
	Unused		CNT3/IN0	Digital	0.00	0	1.00	-	...
	Unused		CNT3/IN1	Digital	0.00	0	1.00	-	...
	Unused		CNT3/IN2	Digital	0.00	0	1.00	-	...

Image 95: Counters

The trigger setup looks like shown below. We select fast on trigger, rising edge with a level of 1g. The pre-time is 100ms, post time 500ms. Dewesoft supports complex trigger conditions, such as simple edge, filtered edge, window, pulse width, slope, delta amplitude, as well as any logical combination on any analog / digital / math channel.

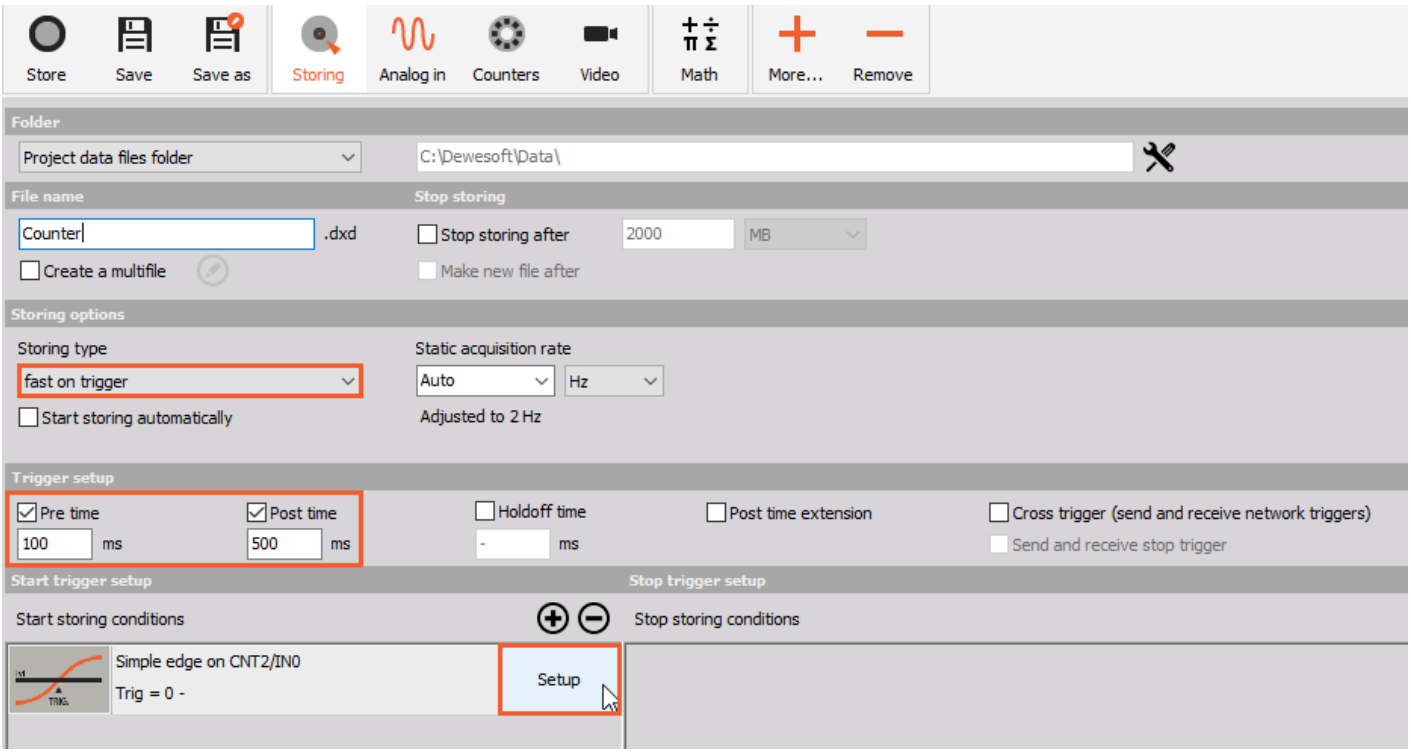


Image 94: Set storing type on fast on trigger

Camera setup

In the video setup, you can see all available cameras. Set the camera to **Used**, then enter the **Setup**.

The screen on the next page shows the Trigger setup and the Camera settings, as well as a live preview for adjusting the setup (focus, light source, etc).

Here you can set Resolution, Frame rate, Shutter speed and Sensor gain (if the camera supports hardware sensor gain) parameters. You can also calibrate the camera sensor here. The options depend on the camera model in use and also from each other. For example, if you increase the frame rate, the shutter time will be limited.

The camera settings are applied to the camera as soon as something is changed, so the preview is always up to date with current settings.

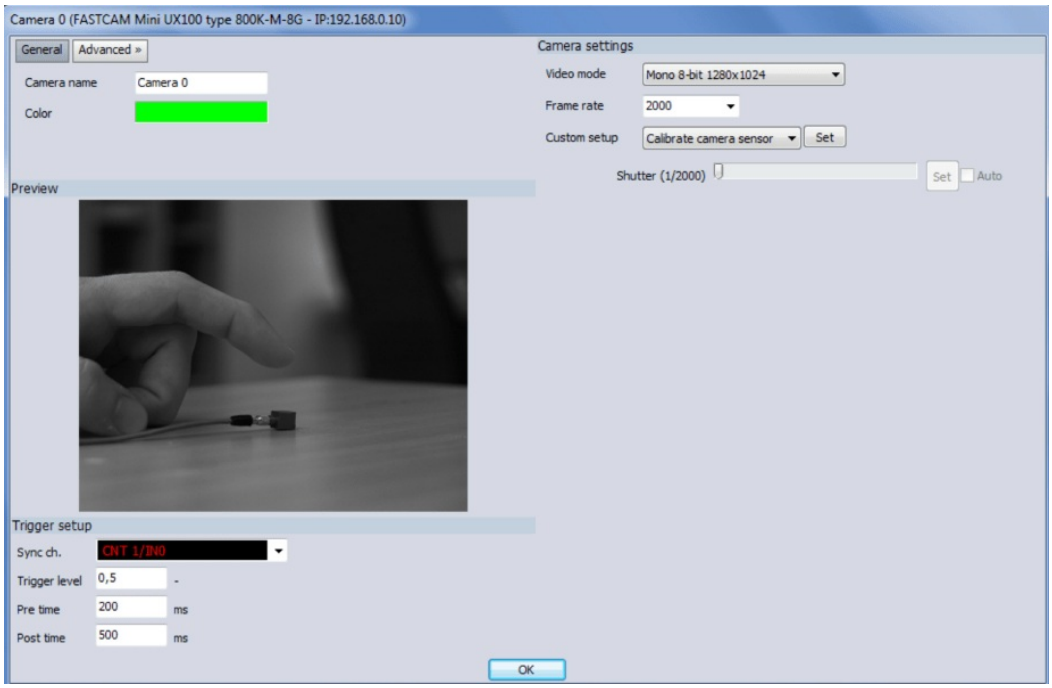


Image 95: Camera setup

Please select the Counter and adjust the level to 0.5, as this is a digital channel (0 to 1). When the camera is started over Ethernet, depending on system load and operating system there will be a delay to the storing trigger. This is usually around 50...100ms (in the example below around 70ms, red line). Therefore, we have to set the camera buffer a little bit higher to capture the whole time window.

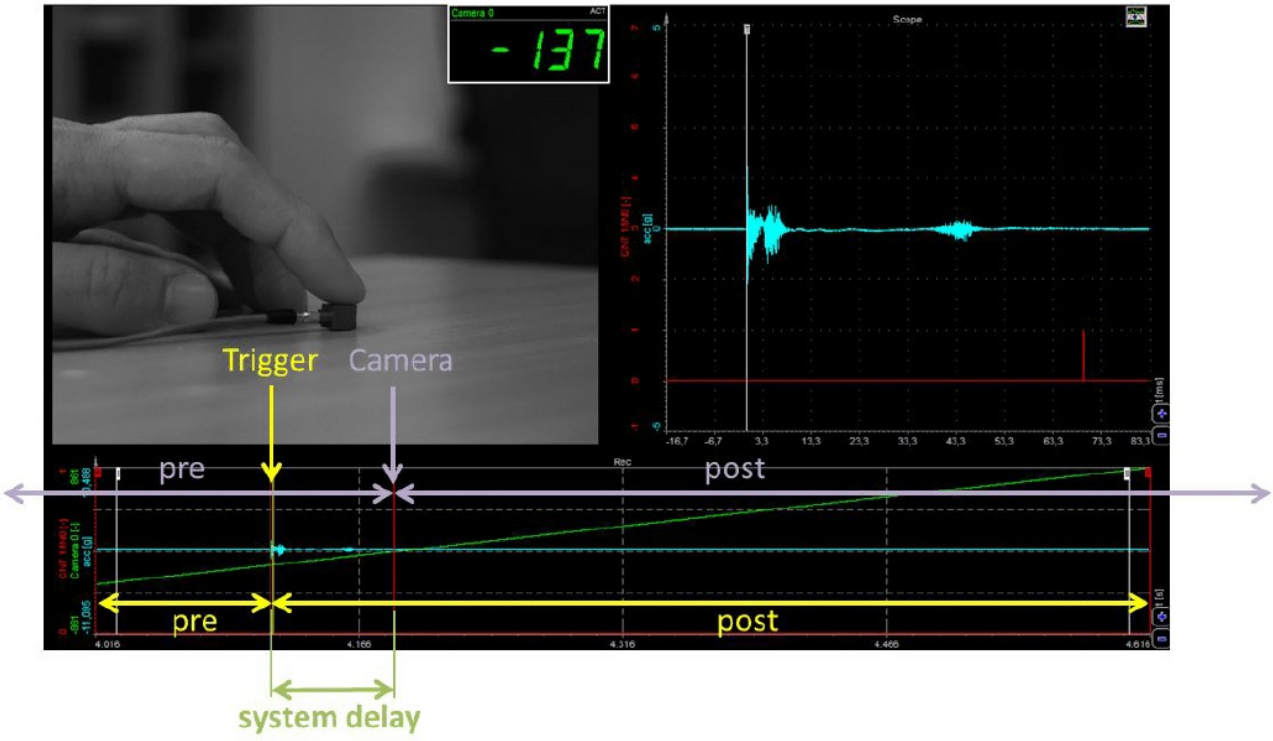


Image 96: Trigger explanation

Camera sensor calibration

Each camera comes with two sensor calibration files. Here is an example of how the calibration files are named (e.g. for FastCam 1024 PCI):

- PixelGainData_Default_1024PCI_1455_0009_0164.gdf
- shadingdata_1024pci_1455_0009_0164.gdf

If you copy these files from the Photron CD to Dewesoft Addons folder, they will be used automatically. Files are optimized for 1000 fps frame rate and picture will not be optimal when other frame rates are selected. If you do not have these files or factory calibration data is not satisfying or for any other reason the picture is grainy and/or contains fixed shading pattern, you have to calibrate the sensor to get a better picture. You can do that by selecting Calibrate camera sensor from Custom setup and press the Set button. The Calibrate camera window will pop up. Just follow the instructions (Close camera lens and then press OK) and the sensor will get calibrated.

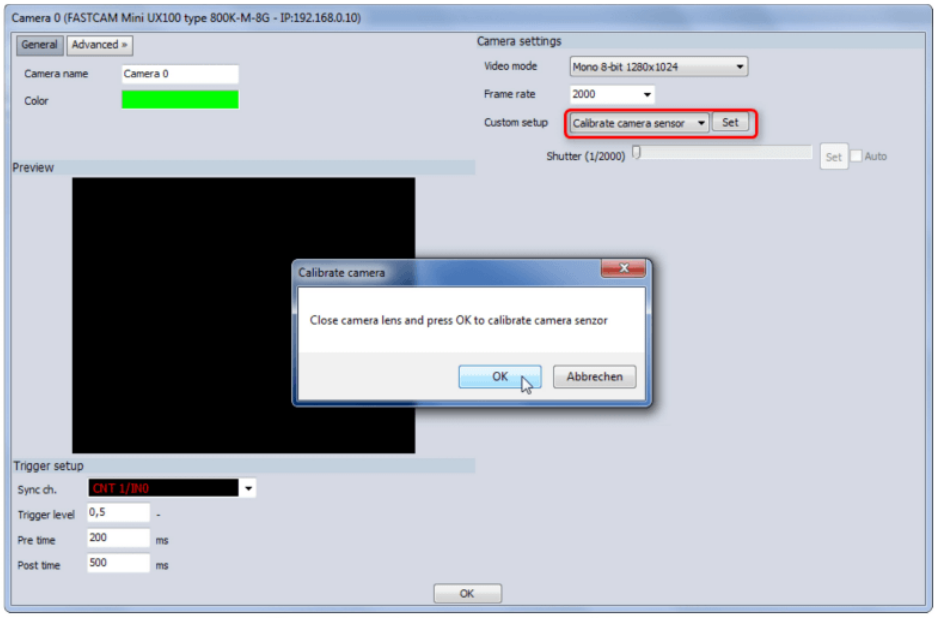


Image 97: Camera calibration

In the picture below, there is a picture from the camera before (left) and after (right) calibration.

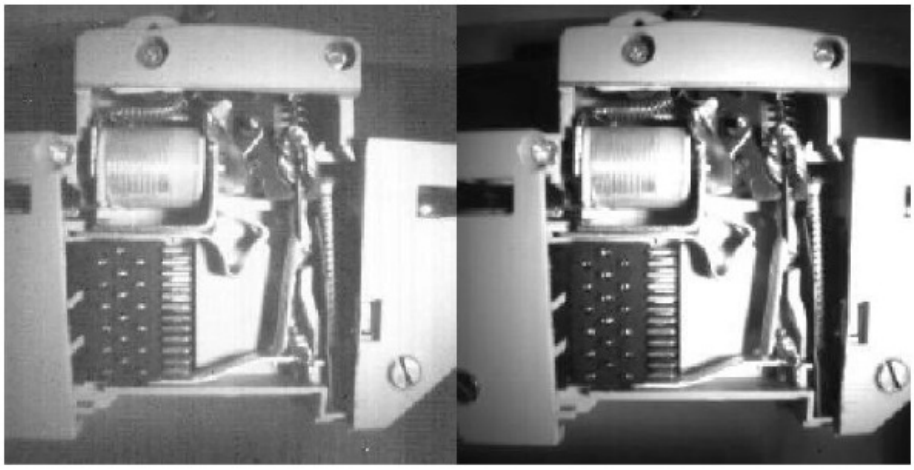


Image 98: Right picture shows better visibility after calibration in comparison to the first one

Video download

After the measurement, Dewesoft will show the whole recorded video data. You can navigate without noticeable delay, however, it is only accessing the camera onboard memory. If you have verified the data to be good, you can finally download the video file to the computer. This can take from minutes to hours, depending on the file size.

Example data file

The example below shows the explosion of the firecracker.



Image 99: Image shows the explosion of the firecracker

Frequently asked questions

Camera not detected in PFV

Camera model type not checked in PFV device list:

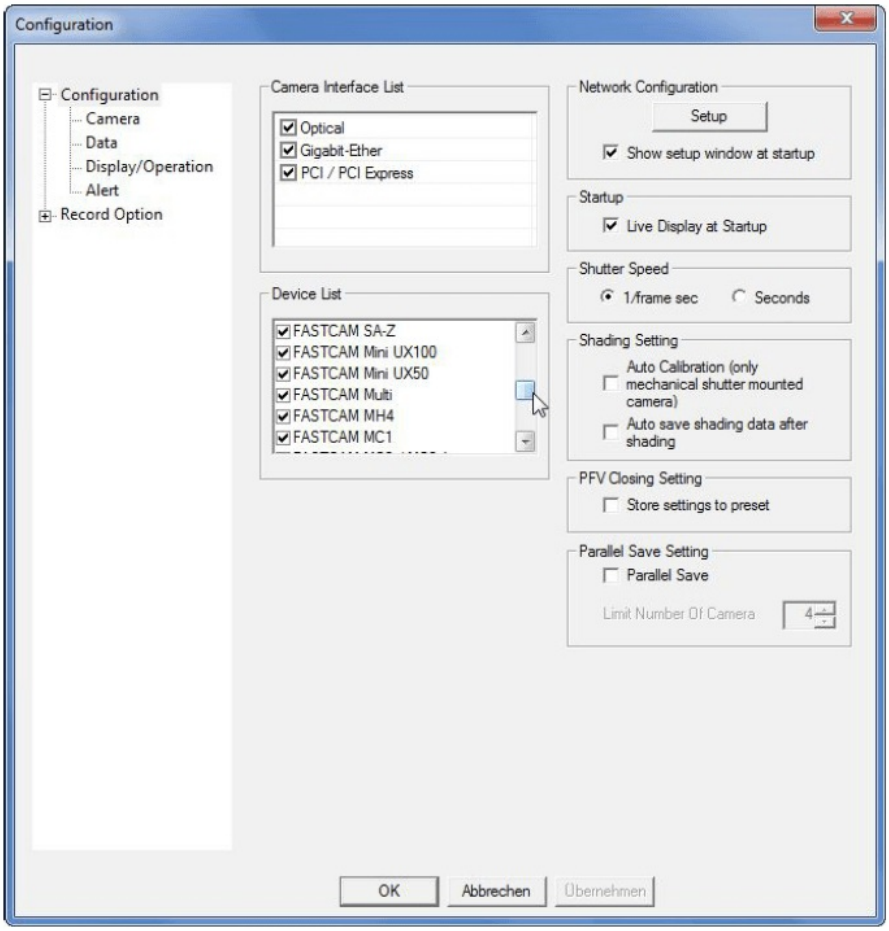


Image 100: PDV

In Photron FASTCAM Viewer, go to Configuration and select all camera models from the Device List. Now it will search for all of them.

Try connecting multiple times

Sometimes when connecting with PFV, the camera is not found in the first place. Please try again several times.

Network troubles

Disable Windows firewall, disable anti-virus, check IP, reset the camera to factory defaults.