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# 1 Important and general information

## 1.1 Important information

**Please follow these instructions before and during the use and application on any IPETRONIK product!**

### 1.1.1 Safety and Warning instructions

Please follow the instructions **and** information as contained in the user manual!

1. The user can **influence an electronic system by applying the IPETRONIK product**. This might cause risk of personal injury or property damages.
2. The **use and application of the IPETRONIK product is permitted only to qualified professional staff**, as well as, only in appropriate manner and in the designated use.
3. **Before using an IPETRONIK measurement system** in the vehicle it **has to be verified that no function of the vehicle, which is relevant for secure operation, might be influenced**:
  - by the installation of the IPETRONIK measurement system in the vehicle,
  - by an potential malfunction of the IPETRONIK system during the test drive.

In order to avoid possible danger or personal injury and property damages, appropriate actions are to be taken; such actions have to bring the entire system into a secured condition (e.g. by using a system for emergency stop, an emergency operation, monitoring of critical values).

Please check the following points to avoid errors:

- Adaption of sensors to components of the electrical system / electronics, brake system, engine and transmission control, chassis, body.
- Tap of one or several bus systems (CAN, LIN, ETHERNET) including the required electrical connection(s) for data acquisition.
- Communication with the vehicle's control units (ECUs), especially with such of the brake system and/or of the engine and transmission control (power train control system).
- Installation of components for remote data transmission (mobiles, GSM/GPRS modems, WiFi and Bluetooth components).



The products can be operated in extended temperature ranges greater 70 °C and therefore the operator has to take safety measures to avoid any skin burnings on hot surfaces while touching the products.

4. **Before** directly or indirectly using **the data acquired by an IPETRONIK measurement system to calibrate control units, please review the data regarding to plausibility**.
5. With regard to the application of IPETRONIK products in vehicles during use on public roads the manufacturer and/or registered user of the vehicle **has to ensure that all changes/modifications have no influence concerning the license of the vehicle or its license of operation**.
6. **User does agree to the instructions and regulations as mentioned above**. In case the user does not agree with the instructions and regulations as mentioned above, he has to notify this expressly and immediately in writing to IPETRONIK before confirming the sales contract.

## 1.2 Terms and conditions

See IPETRONIK website for details: <https://www.ipetronik.com/>

### 1.2.1 Legend of used icons

**Tip**

*This icon indicates a useful tip that facilitates the application of the software.*

**Information**

*This icon indicates additional information for a better understanding.*

**Attention!**

*This icon indicates important information to avoid potential error messages.*

### 1.2.2 Support

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**Technical support and product information**

[www.ipetronik.com](http://www.ipetronik.com)

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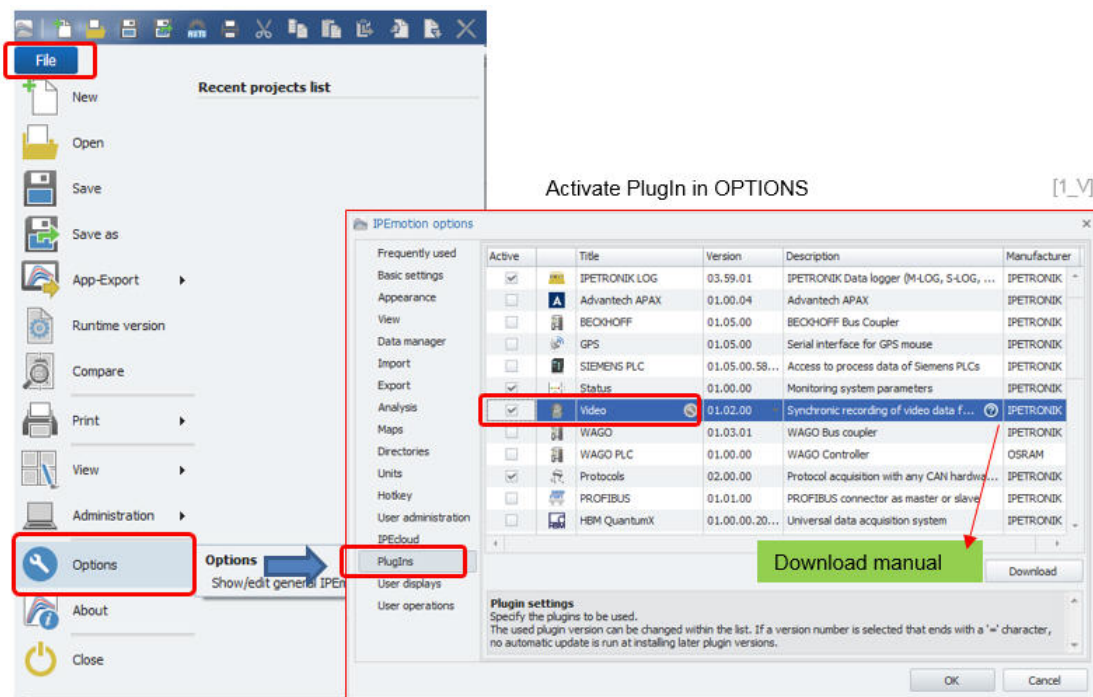
## 2 PlugIn overview

### 2.1 PlugIn description

With the Video PlugIn you have access to a large range of USB cameras supporting the Windows WDM driver and IP-Network cameras supporting the Real Time Streaming Protocol (RTSP).

### 2.2 PlugIn Installation

In order to use the PlugIn together with IPEmotion you need to install it. The PlugIn is available for download from the IPETRONIK website: <https://www.ipetronik.com/> When you have installed the PlugIn, you need to launch the IPEmotion software. Then you need to access the application menu and open the OPTIONS. In the OPTIONS you can activate the PlugIn as indicated below.



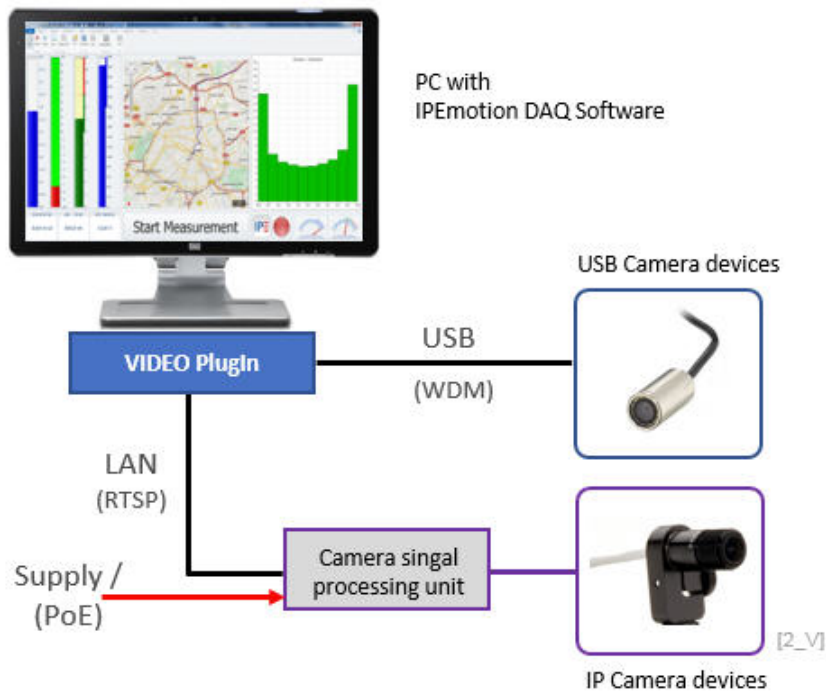
The PlugIn is supporting the following Windows operating systems:

- ▶ 32 bit
- ▶ 64 bit

## 3 PlugIn configuration

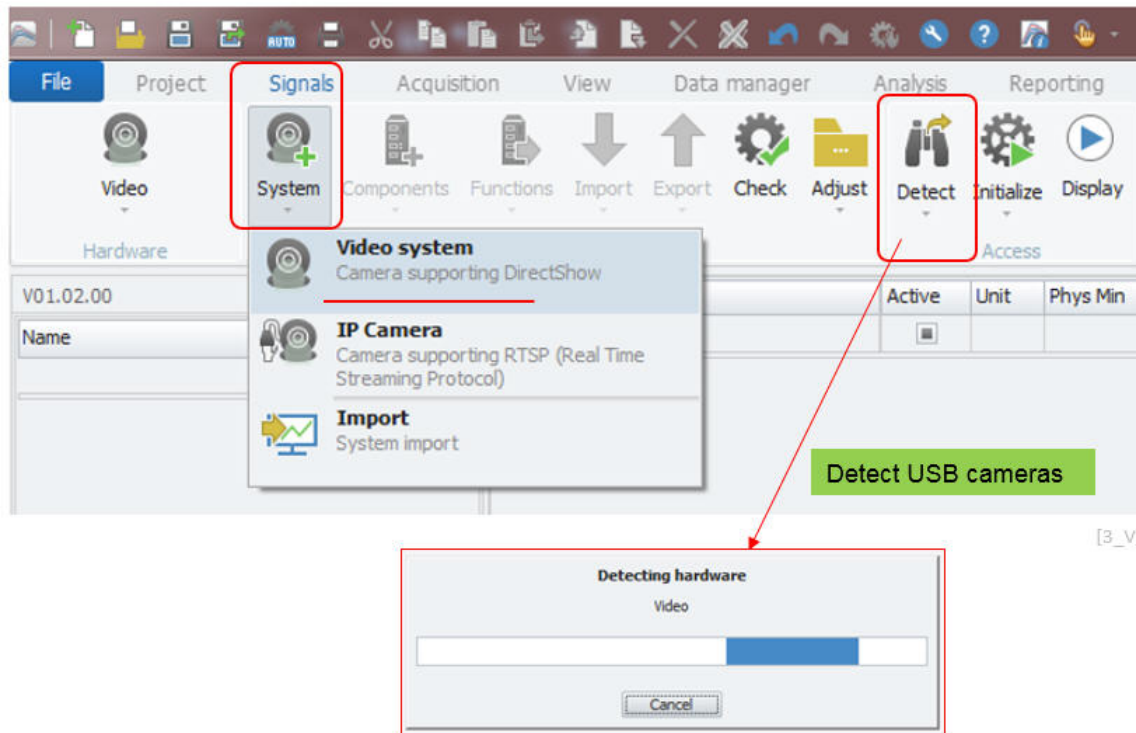
### 3.1 Functional architecture

You can interface multiple USB- and IP-cameras to your PC and record the data. The USB cameras get the power supply via the USB port of the computer and can be automatically detected. The IP-Cameras are connected to the Ethernet interface of the computer. They require more configuration settings using fixed IP-addresses for the camera and the Ethernet interface of the PC. Also, framerate, GOV size, codec, login authentication, stream link address and port numbers need to be defined.

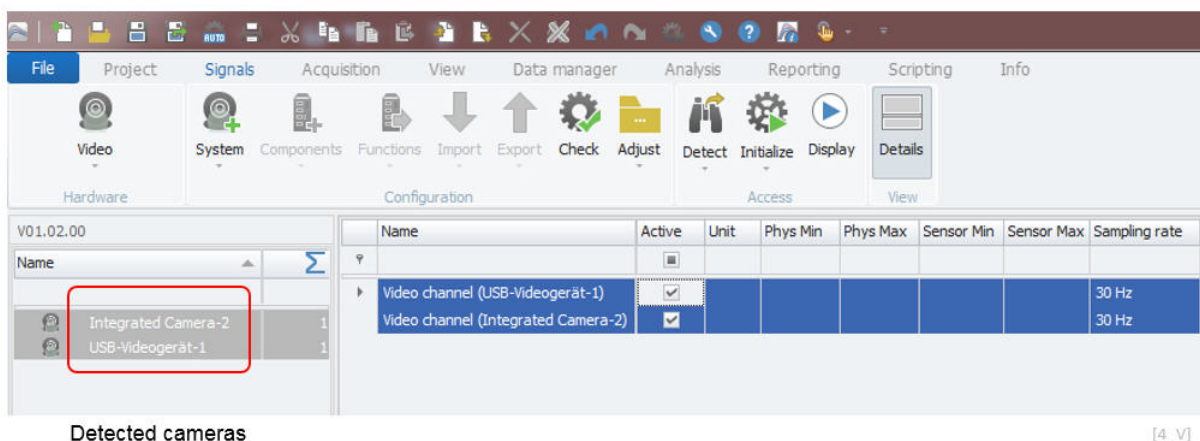


### 3.2 Create USB interface system

In the SIGNALS work space, you can create video interfaces manually. For USB cameras it is recommended to use the hardware detect function. Due to the standard USB drivers the cameras are automatically detected. Over the USB interface it is also possible to use the PlugIn settings to update frame rate, compression and picture pixel resolution on the USB camera. This is different to IP cameras where the setting have to be done in the web based configuration interfaces of the camera itself.



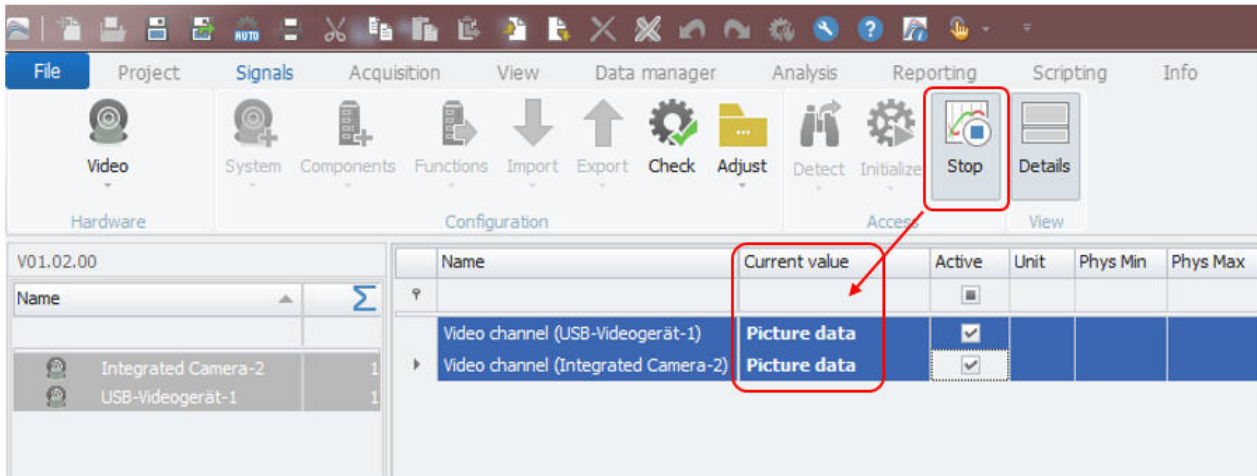
After successful detection the USB video interfaces is created and for every camera a video channel is created too. The frame rate is automatically detected from the camera device and set to the maximum value. The frame rate can be reduced but not increased.



Detected cameras

[4\_V]

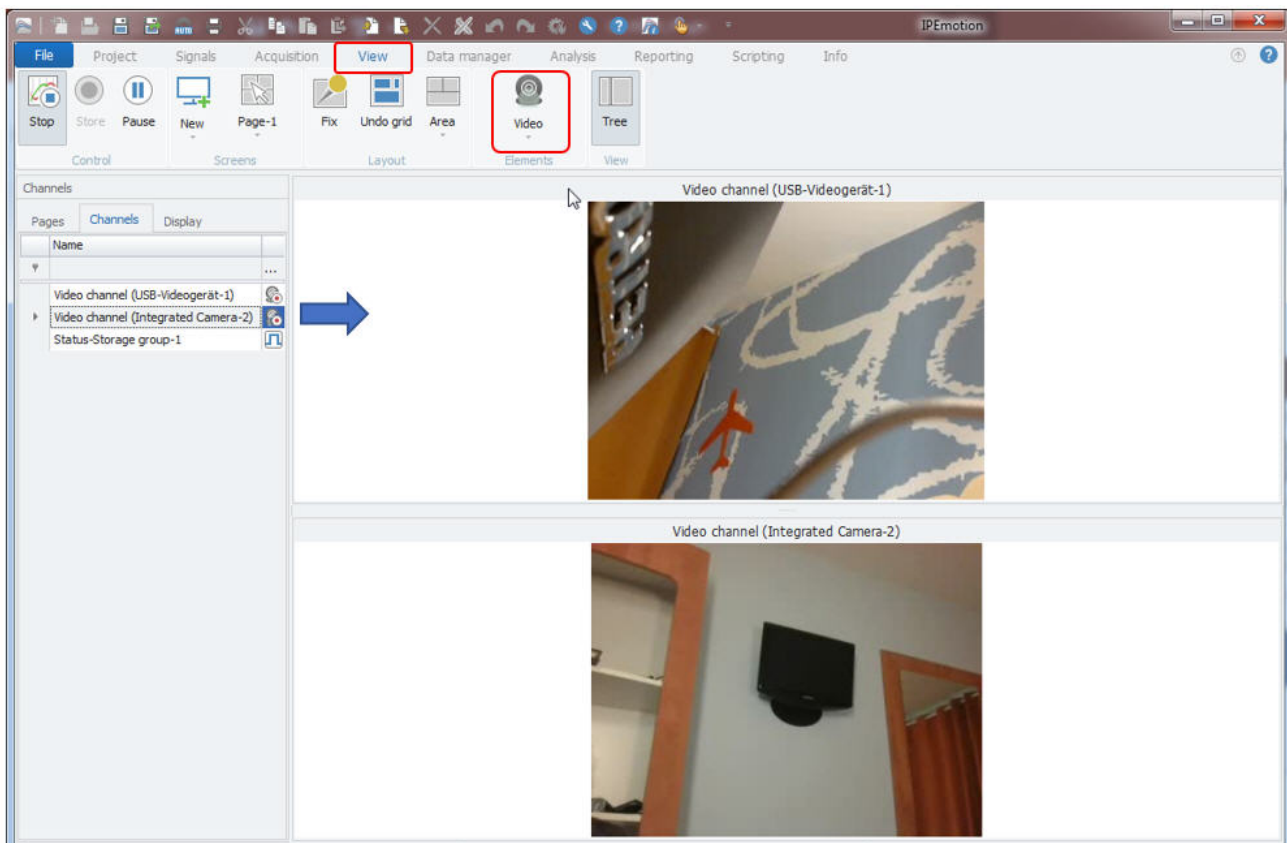
When you start the measurement you can see message picture data indicated as a measurement value on video channel level.



Start measurement

[5\_V]

You can view the video data in the VIEW workspace too. To see the online video stream, you can drag and drop the video channels into the video instrument.



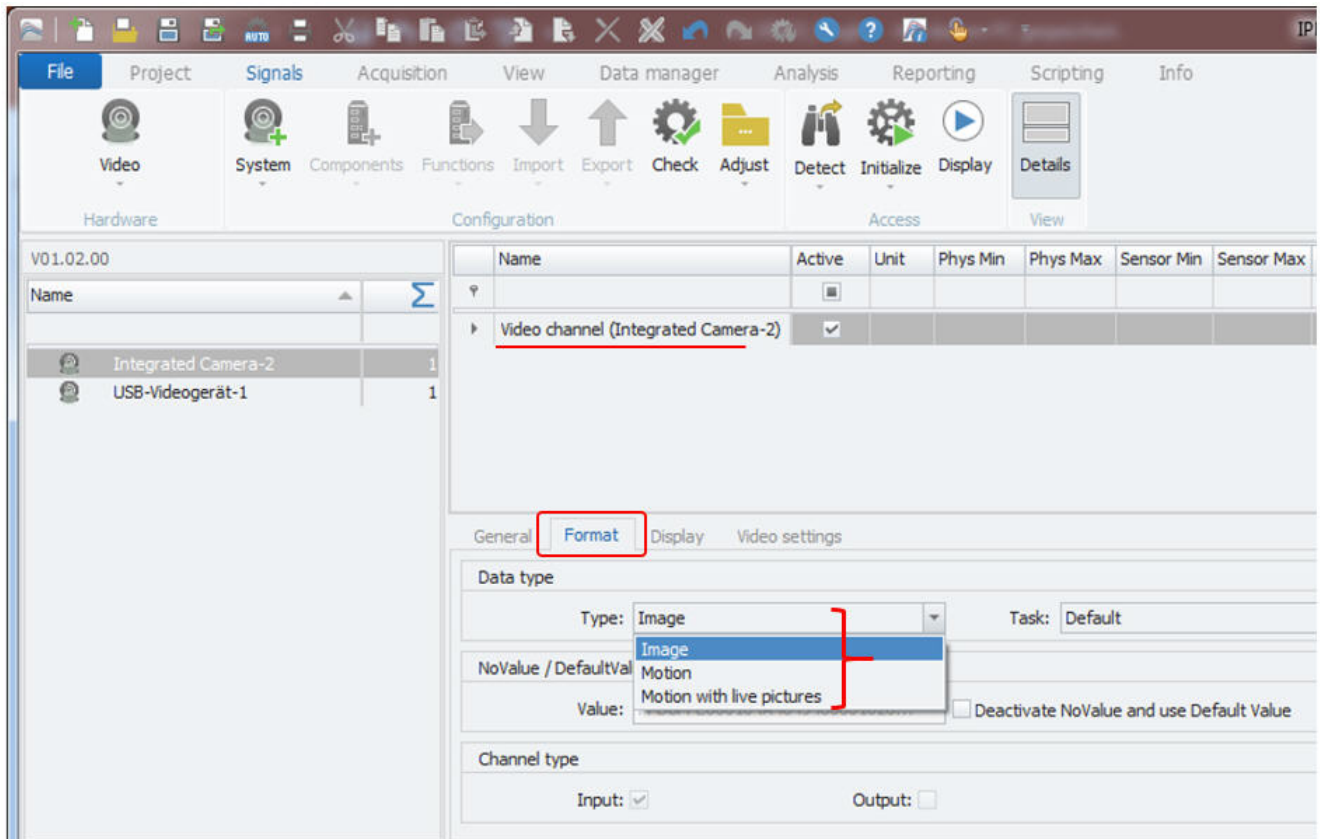
Display online data in video instrument

[6\_V]



### 3.3 USB channel settings

On video channel level you can select from the following 3 data formats. Additional information about the data processing mechanism are provided in the last chapter.



Data formats

[7\_V]

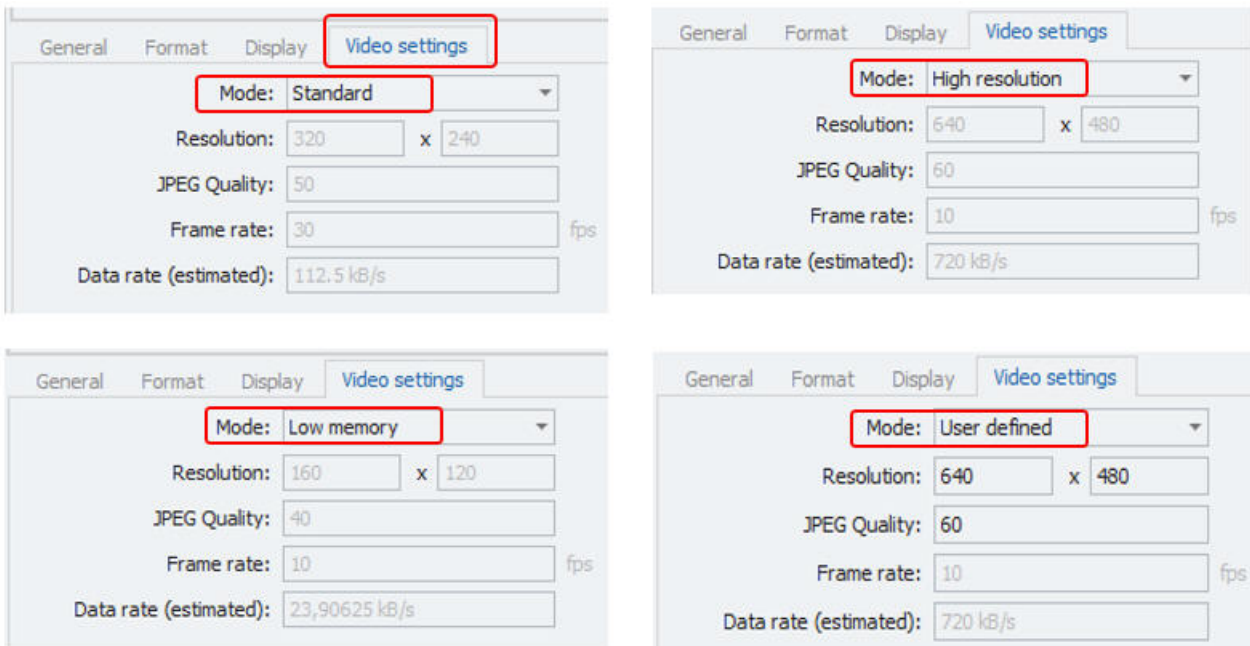
- ▶ **Image**

Every incoming frame is stored as a separate image (JPEG) picture in the data file. In incoming data stream from the camera (USB or Ethernet) can have various formats like h264 or JPEG, MJPEG, RAW, etc .At any case the PlugIn is transforming one common output format JPEG for display and data storage. This format is storing the data with lowest compression method.
- ▶ **Motion**

This format can process video streams in the h264 or MJPEG format. The data stream is directly stored in the incoming format e.g. (h264 or MJPEG). There no transformation done by the PlugIn. The data compression is depending on the incoming data stream. For h264 format the camera setting of the GOP (Group of Picture) factor has an impact on the data storage volume. Note: Data streams in the h264 format will cause a delay between the movements in front of the camera and the updates in the video instrument in the VIEW work space.
- ▶ **Motion with live picture**

This format is similar to the Motion format and the data is stored in h264 format in the data file which leads to lower stored data volumes as the GOP (Group of Picture) factor is considered. However, the PlugIn is internally processing additionally a MJPEG picture which will be used to display the live data on time to the user.

In the video settings tab sheet you have additional configuration functions to define the resolution of the stored pictures. 4 different modes with defined quality settings are provided. Depending on the selected quality rate an estimated data transfer rate is calculated. With the USB interface and the WDM driver it is possible to update the camera settings from the PlugIn



USB camera video settings

[8\_V]

## 4 Configure IP network cameras

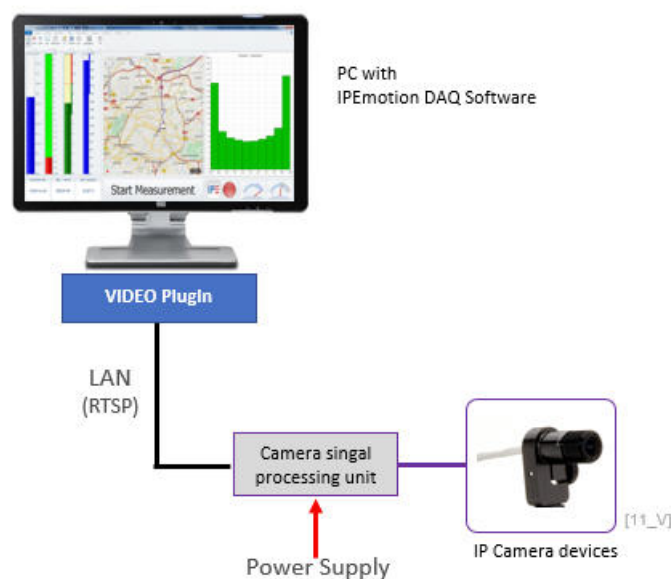
The Video PlugIn is supporting IP cameras too. In the following the configuration is explained based on a one channel AXIS IP camera model P1214-E. The picture below shows the camera including a suction cup mounting system which is not part of the standard delivery.



AXIS network camera

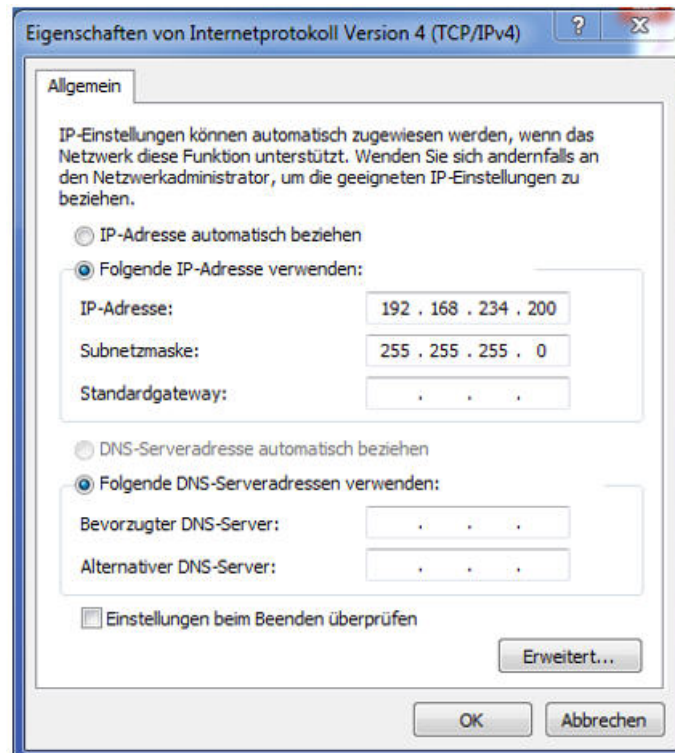
[10\_V]

In the first step you need to perform the hardware installation including power supply to the signal conditioning unit. Connecting the camera lenses unit and establishing an Ethernet connection between your PC and the conditioning unit. When the camera is powered up all LEDs on the signal conditioning unit are in green color.



### 4.1 PC network card settings

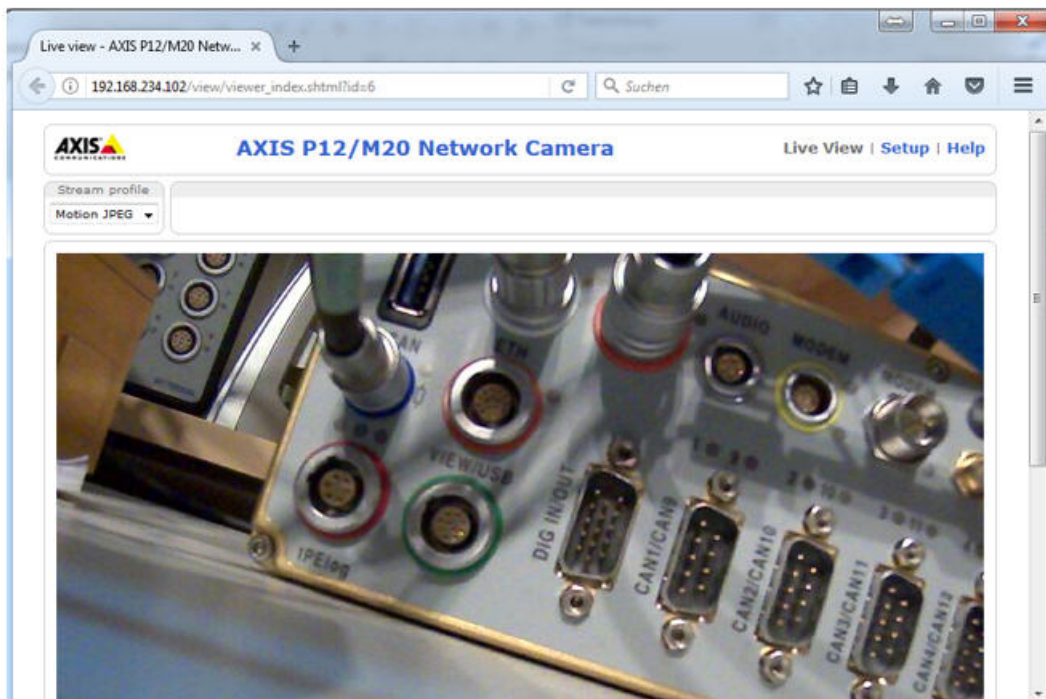
In order to establish a data communication connection to the camera, you need to define a static IP address on the LAN interface of your computer, which is connected to your network camera. The network IP and subnet mask should be in the same range to that of the IP-camera. The network address of the IP-camera is mentioned in the manual. In this example the address of the camera is this: 192.168.234.102 For the PC LAN network setting the IP-address 192.168.234.200 was selected.



Define static IP for PC LAN IPv4 network settings [12\_V]

With a web browser you can access the configuration interface. The link to the web browser is part of the manual. In this example you enter the static IP-address to the browser to the live picture:  
<http://192.168.234.102/>

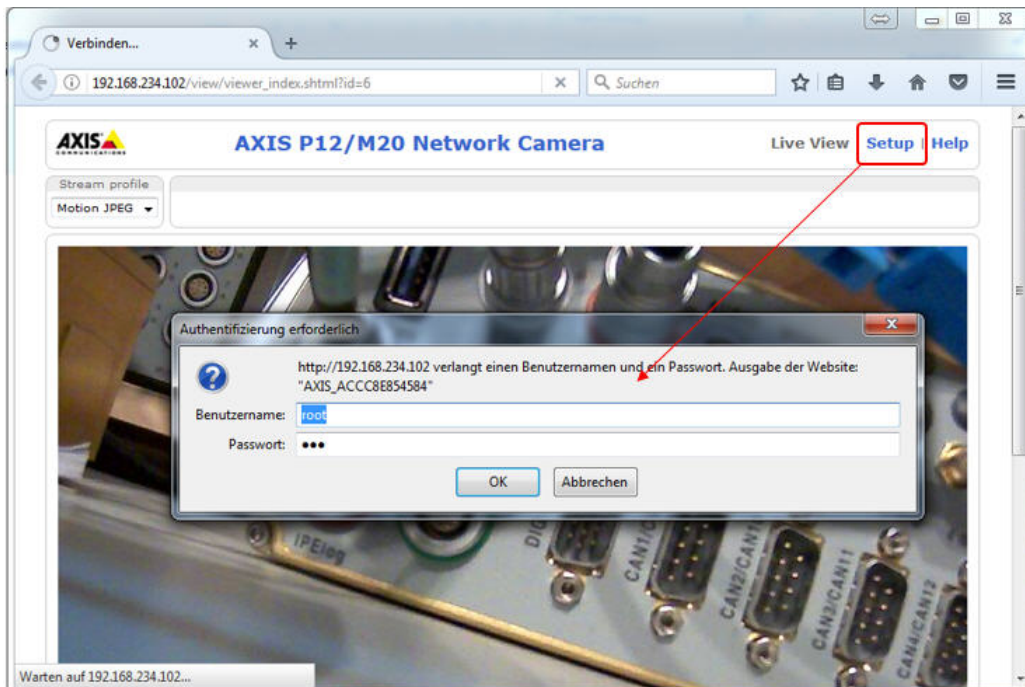
[http://192.168.234.102/view/viewer\\_index.shtml?id=6](http://192.168.234.102/view/viewer_index.shtml?id=6)



Data live view in browser [13\_V]

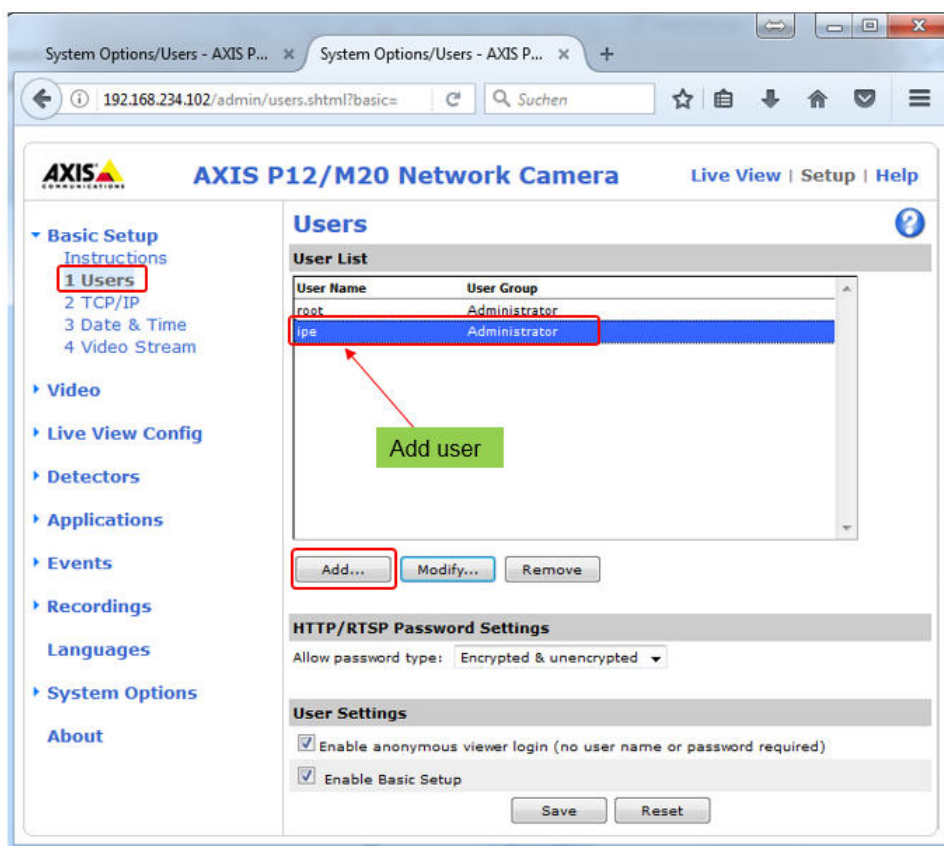
## 4.2 IP camera settings

From the web interface you can access the settings area. The default user name and password for this product is root.



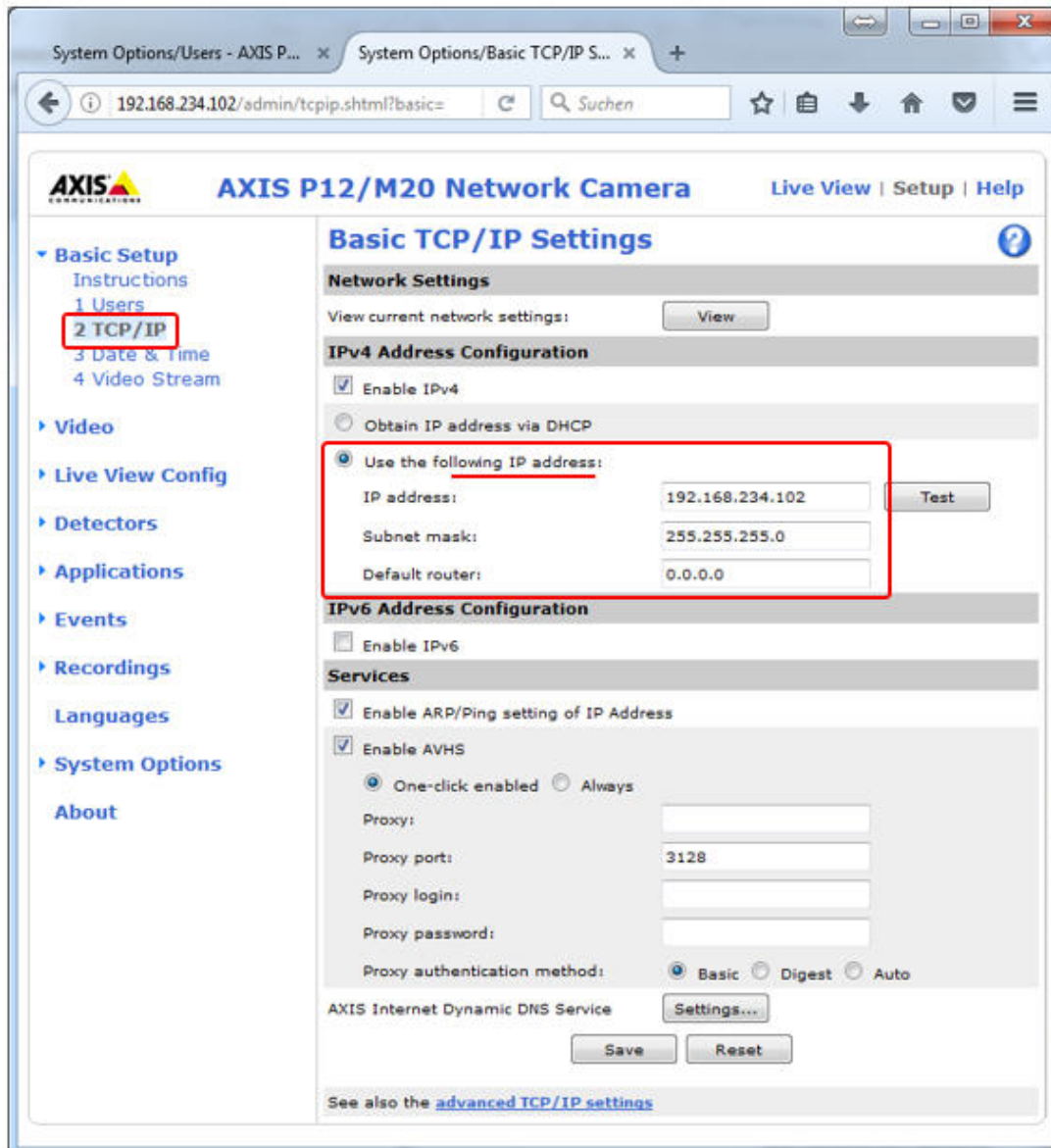
Login to device configuration browser [14\_V]

In the configuration menu you need to create an administrative user who is later used by IPEmotion to retrieve the data from the camera. In the example below the user is called ipe with the corresponding password ipe.



Create user [15\_V]

In the TCP/IP setup you may change the IP-address. However, in this example the default fixed IP is used. The fixed IP-address is an important setting to retrieve the video data in IPEmotion.



IP-address settings

[16\_V]

Another important configuration part are the image settings. Here you can define the image size in pixels and the compression. The compression is ranging in percent from 0 = no compression to 100 = maximum compression. In this example we will use 50 percent compression as an initial recommendation. As standard frame rate 15 Hz is selected. The frame rate has to be considered for the settings in the PlugIn too. The impact of the different settings will be explained at the end of the manual.

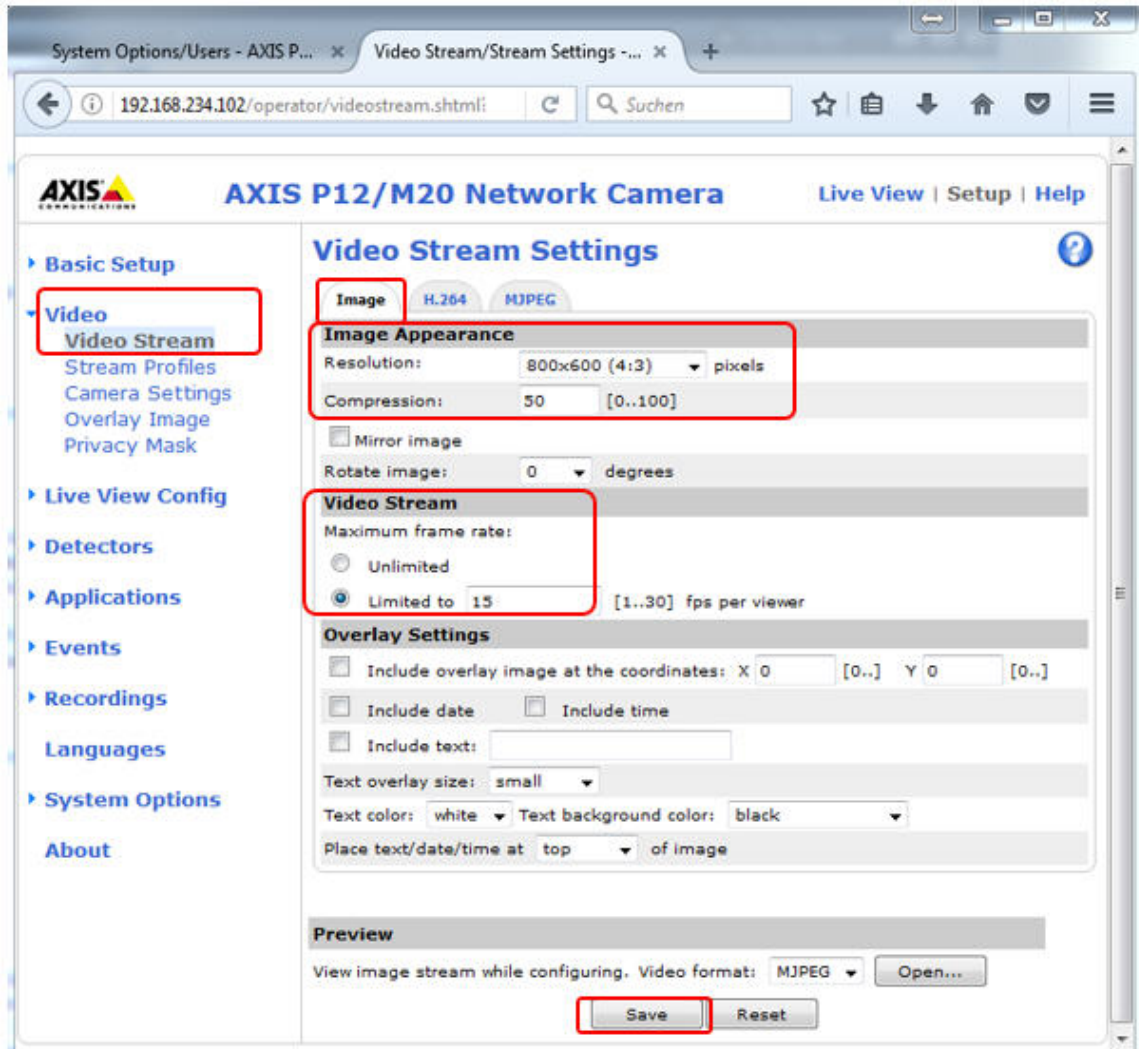


Image settings

[17\_V]

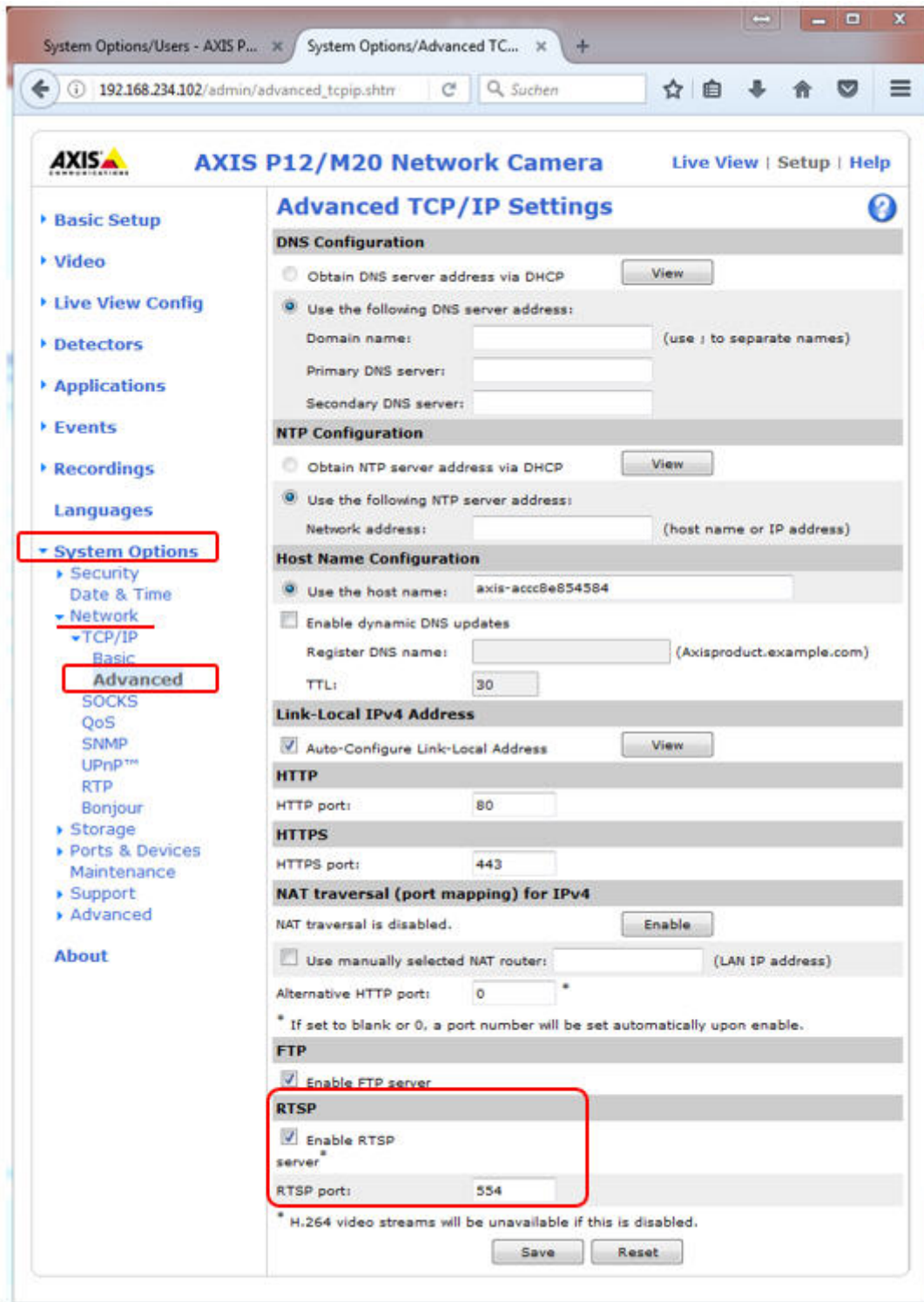
This camera is providing a h264 video stream. For the h264 codec you can define a GOV length. GOV is a setting for the Group of Pictures. This factor has a considerable impact on the amount of data you store. The factor is determining how many differential frames are transferred together with a full picture. Large GOV factor will group many different frames together with one full frame. If configure the GOV factor to one ever frame transferred is a full frame including all data which will cause high data storage volumes. In our example we will use a GOV factor of 16. The GOV factor will be configured in IPEmotion too.

The screenshot shows the web interface for an AXIS P12/M20 Network Camera. The page title is "AXIS P12/M20 Network Camera" and the URL is "192.168.234.102/operator/videostream.shtml". The "Video Stream Settings" section is active, with the "H.264" tab selected. Under "Encoder Settings", the "GOV length" is set to 16. A red box highlights the "H.264" tab and the "GOV length" field. A green box labeled "GOV" has an arrow pointing to the value 16. The "Bit Rate Control" section shows "Use: Variable bit rate" selected. The "Save" button is highlighted with a red box.

GOV = Group of Picture for h264 codec settings [18\_V]



Finally, we need to enable the RTSP stream and define the port number. This are important settings so that data is retrieved by the IPEmotion. The Port number will be used for the connection parameters in IPEmotion too.



The screenshot displays the 'Advanced TCP/IP Settings' page for an AXIS P12/M20 Network Camera. The left sidebar shows the navigation menu with 'System Options' expanded and 'Advanced' selected. The main content area is divided into several sections:

- DNS Configuration:** Includes options for obtaining DNS server address via DHCP and using a specific DNS server address with fields for Domain name, Primary DNS server, and Secondary DNS server.
- NTP Configuration:** Includes options for obtaining NTP server address via DHCP and using a specific NTP server address with a field for Network address.
- Host Name Configuration:** Includes options for using a host name (set to 'axis-acc8e854584') and enabling dynamic DNS updates, with fields for Register DNS name and TTL.
- Link-Local IPv4 Address:** Includes an option to auto-configure Link-Local Address.
- HTTP:** Shows the HTTP port set to 80.
- HTTPS:** Shows the HTTPS port set to 443.
- NAT traversal (port mapping) for IPv4:** Shows NAT traversal is disabled, with an option to enable it and fields for manually selected NAT router and alternative HTTP port.
- FTP:** Includes an option to enable the FTP server.
- RTSP:** This section is highlighted with a red box. It includes an option to enable the RTSP server (checked) and a field for the RTSP port set to 554. A note below states: '\* H.264 video streams will be unavailable if this is disabled.'

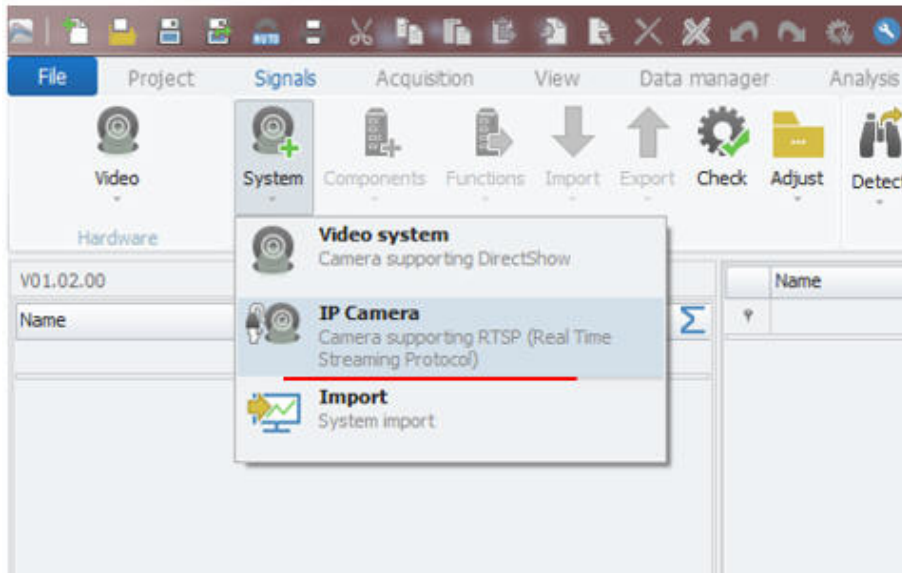
At the bottom of the page, there are 'Save' and 'Reset' buttons.

RTSP settings [19\_V]

## 5 PlugIn configuration for IP camera

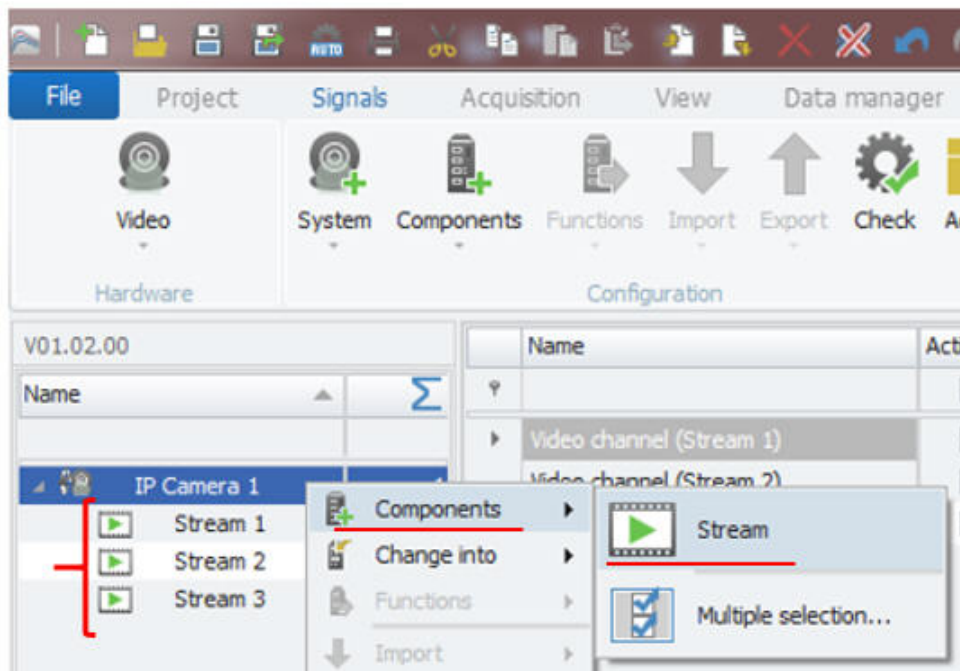
### 5.1 Create IP camera interface

For IP cameras you need to create manually an interface system. An automatic hardware dietetic is not supported for IP camera devices.



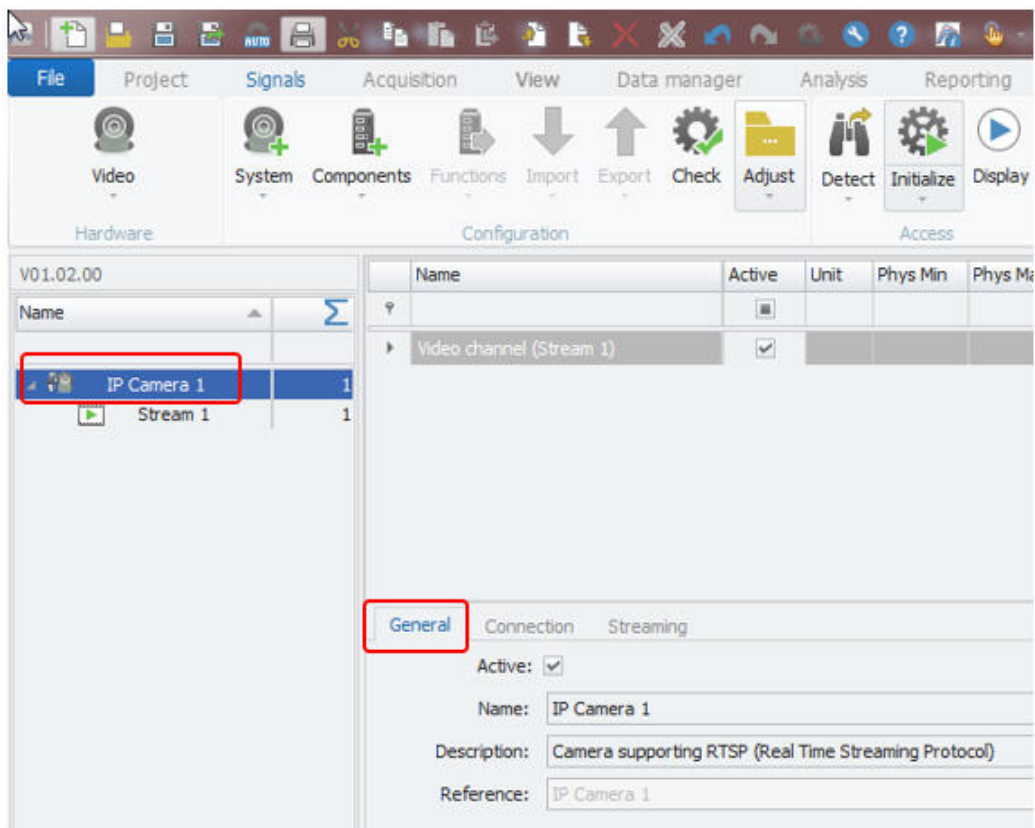
Create IP Camera system [25\_V]

If the camera system is supporting several video streams you can create additional streams in the IP camera system.



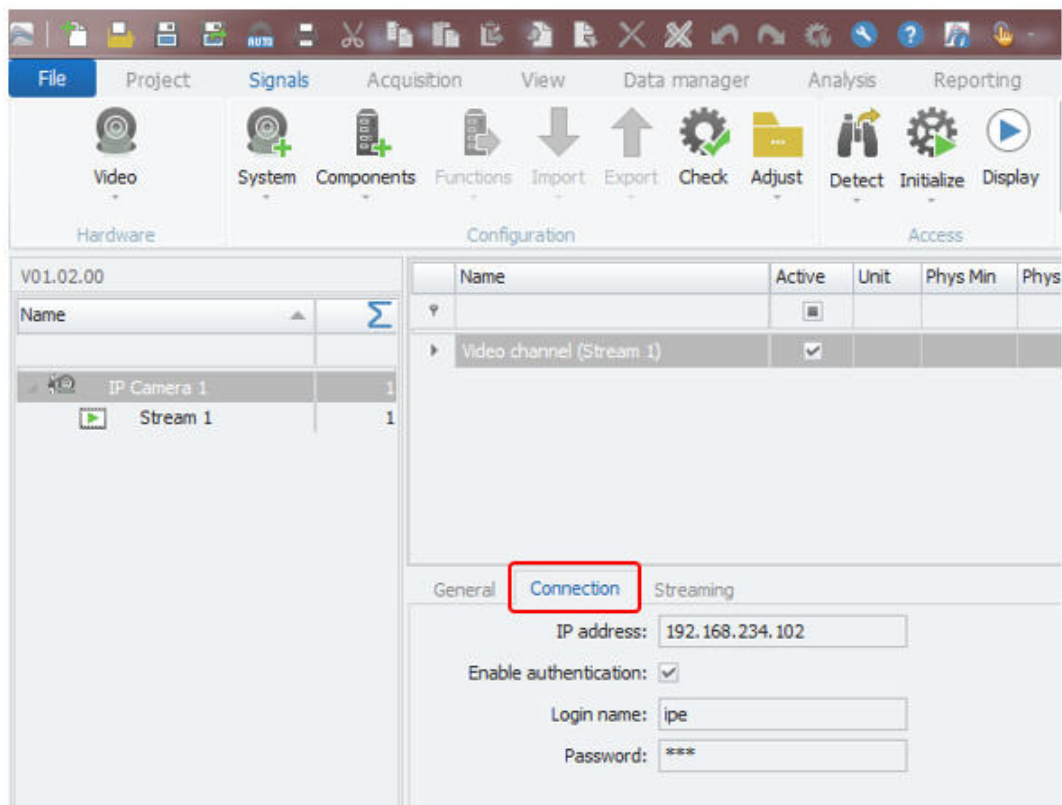
Add multiple streams [26\_V]

In the General tab sheet you define interface name and description.



System - General [27\_V]

In the Connection tab sheet you define the fixed IP-ddress of the camera, the user and the password, which was defined in the web interface of the camera. See section 4.2

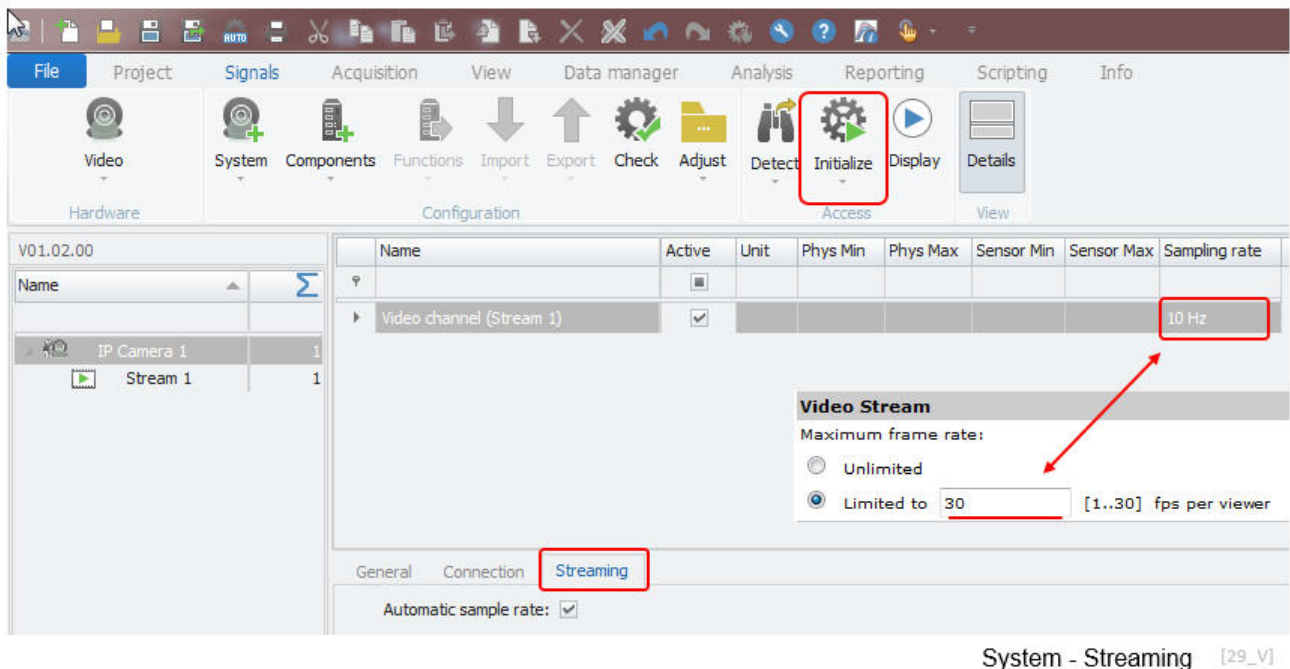


System - Connection [28\_V]

In the Streaming tab sheet you have a check box to activate a function called

► Automatic sample rate

When this check box is activated the PlugIn will check during an initialization process which is the sample rate setting of the camera.



**Information**

*It is recommended to deactivate this check box because it extends the initialization time for each measurement. You can only identify the defined frame rate of the camera when all connection parameters which are discussed below are defined.*

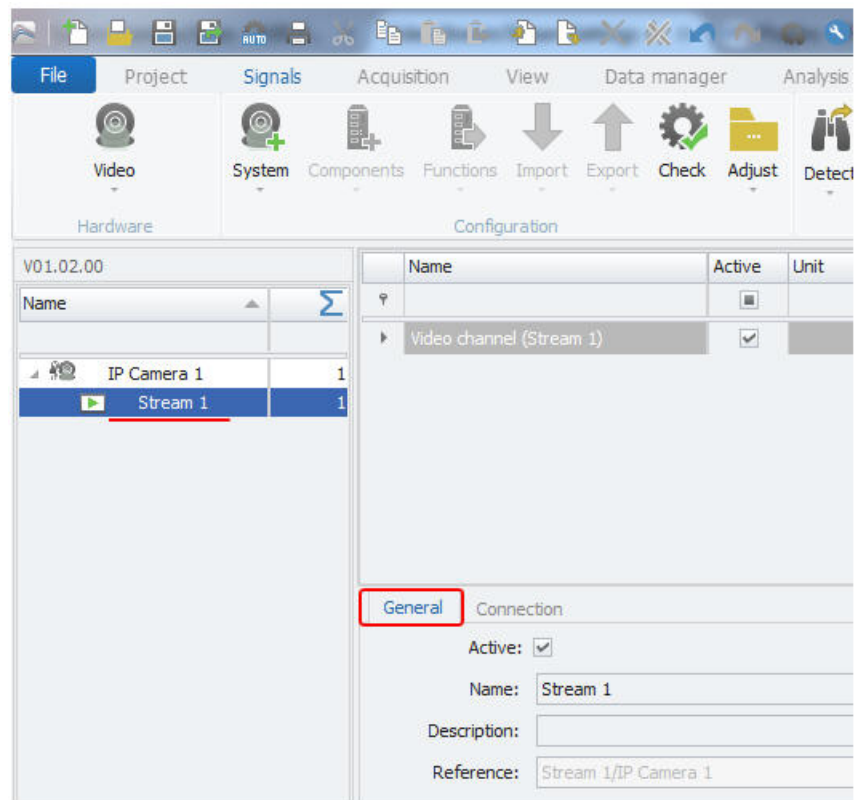


**Information**

*When you make any updates in the web interface of the camera like frame rate, compression, GOP factor, resolution, etc you have to execute the initialize function in IPEmotion to make the changes in the web interface also affective to the PlugIn.*

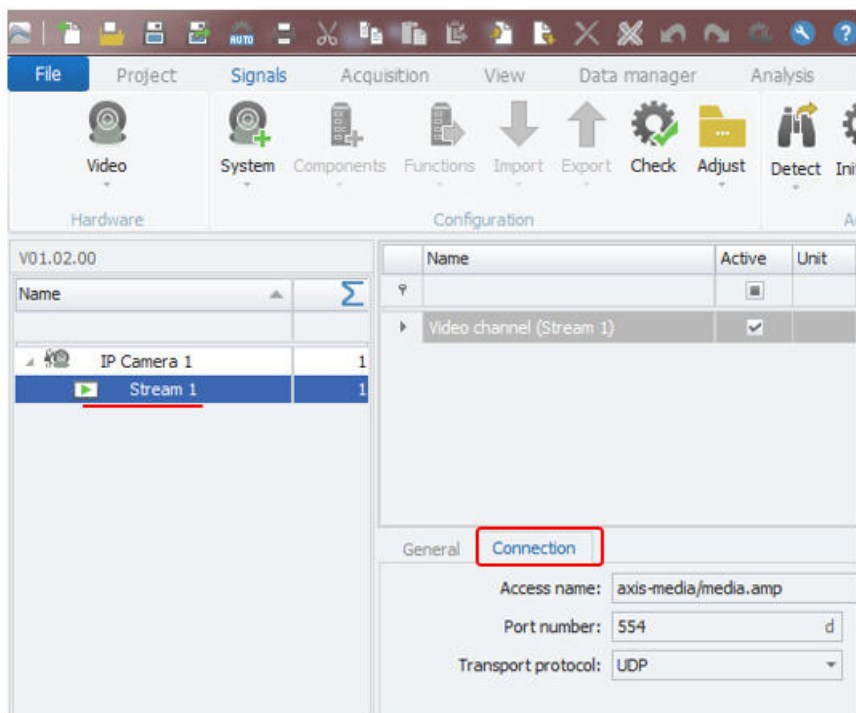
## 5.2 Stream configuration

On Stream level you have to define the stream configuration setting. When you use e.g. AXIS F44 camera you have 4 cameras in one IP interface system. In this case you need to add 3 more streams to your configuration as discussed above. In the General tab sheet you define stream name and description.



Stream - General [30\_V]

In the Connection tab sheet the stream specific parameters are defined.



Stream - Connection [31\_V]

- ▶ Access name                      The access name cannot be directly obtained from the web interface of the AXIS camera. To identify the correct access name, you must consult the camera vendors user manual. In this example the stream is defined as: axis-media/media.amp
- ▶ Port number                      The port number was defined in the advanced settings of the web interface of the AXIS camera 4.2.
- ▶ Transport protocol              The transport protocol can be selected UPD or TCP. The default setting for RTSP protocols is the UPD protocol. However, the correct setting of the transport protocol is depending on the camera vendor. In some cases both TCP or UPD work alike.

When the settings are all defined you can use the initialize function to test the communication to the camera. When the automatic sample rate check box is still active, the PlugIn retrieves the sample rate / frame rate setting of the camera. Which match quite close to the setting in the web interface.

Name	Active	Unit	Phys Min	Phys Max	Sensor Min	Sensor Max	Sampling rate
Video channel (Stream 1)	<input checked="" type="checkbox"/>						29,98 Hz

Frame rate from the camera is identified by the PlugIn.

General    Connection

Access name: axis-media/media.amp

Port number: 554    d

Transport protocol: UDP

Test the settings

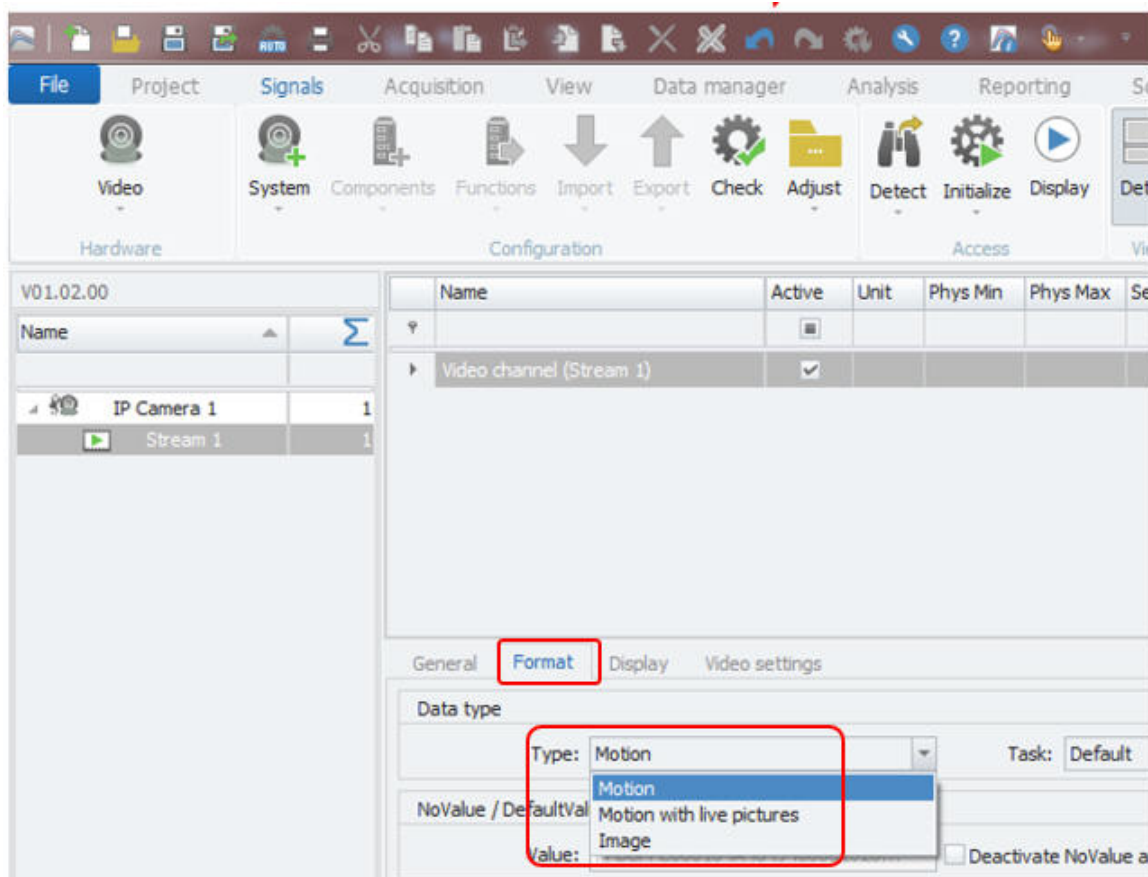
[32\_V]

### 5.3 Video channel settings

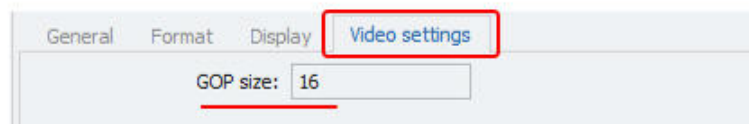
Similar to the USB cameras you can define on channel level the data format. For IP cameras the following 3 formats are supported.

- ▶ Motion
- ▶ Motion with live picture
- ▶ Image

The default setting is the Motion format. With the Motion (Motion with live picture) format the h264 stream is stored in the data file considers the GOP factor. The GOP factor (Group of Picture) was defined in the web interface of the camera and should match with the PlugIn settings. In this example the GOP factor was set 16. See chapter: 4.2

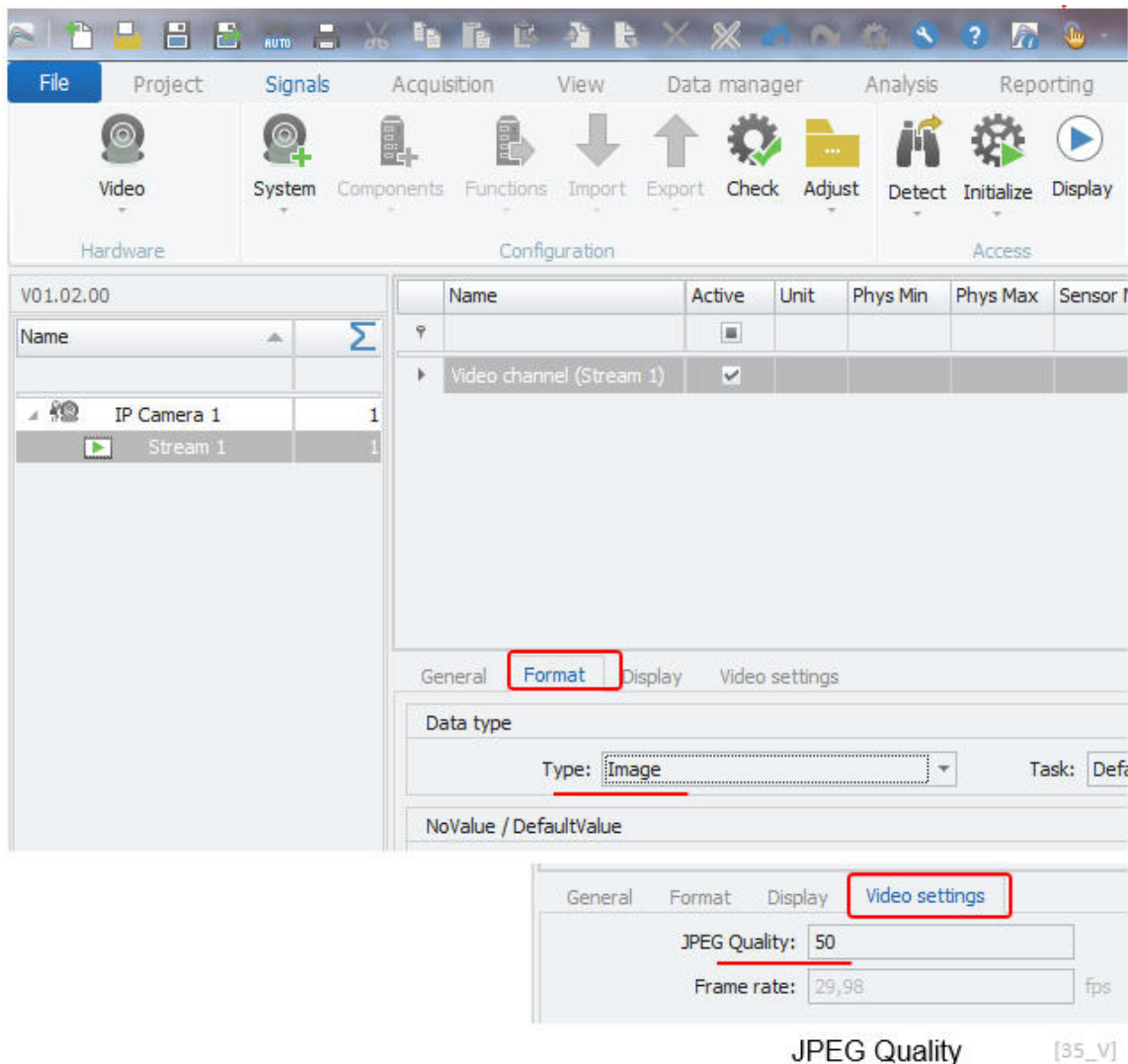


Data formats



GOP factor for h264 streams [34\_V]

When you select the Image format for the channel, you have in the video settings tab sheet a configuration function of the JPEG quality. The quality factor is ranging between 0 and 100 percent. High quality settings will lead to higher stored data volumes and better pictures in the video instrument. However, the picture quality can be influenced with the compression setting in the web interface of the camera too. Some test data file are presented in section 6.4.2



The Image data format is not supporting a GOP factor setting. The Image format requires more processing CPU resources because h264 stream from the IP camera in this case is transformed into MJPEG picture data stream for storage.

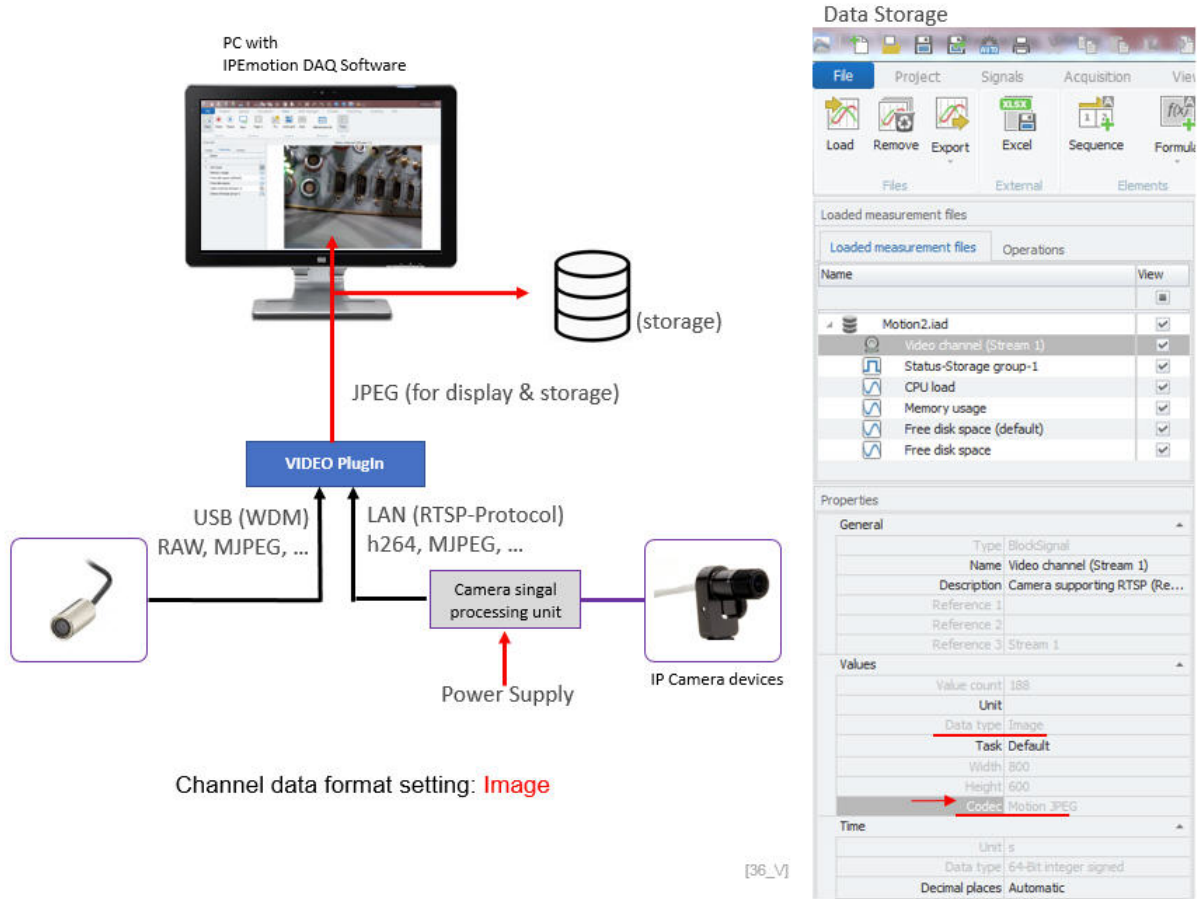


## 6 Video stream processing examples

Depending on the camera interface (USB / Ethernet) and the related drivers (WDM / Direct X) for USB cameras or protocols like RTSP (Real Time Streaming) for IP cameras different processing mechanisms can be applied. Not all drivers and data formats are compatible from all camera vendors. Therefore it is recommended to test the camera together with the video PlugIn before to purchase the product.

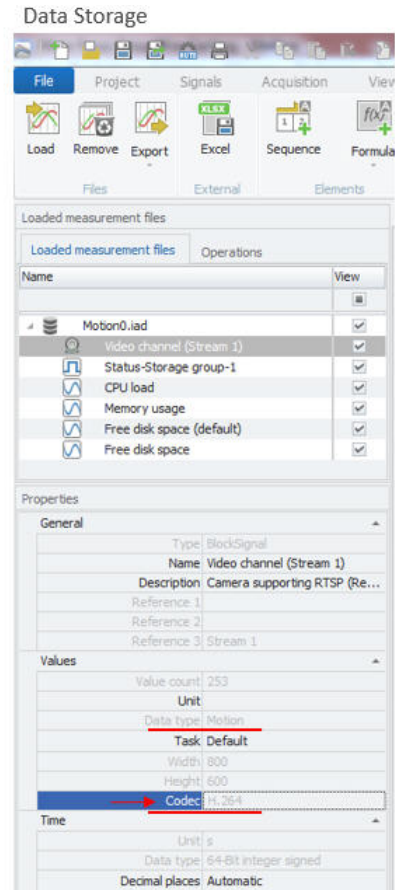
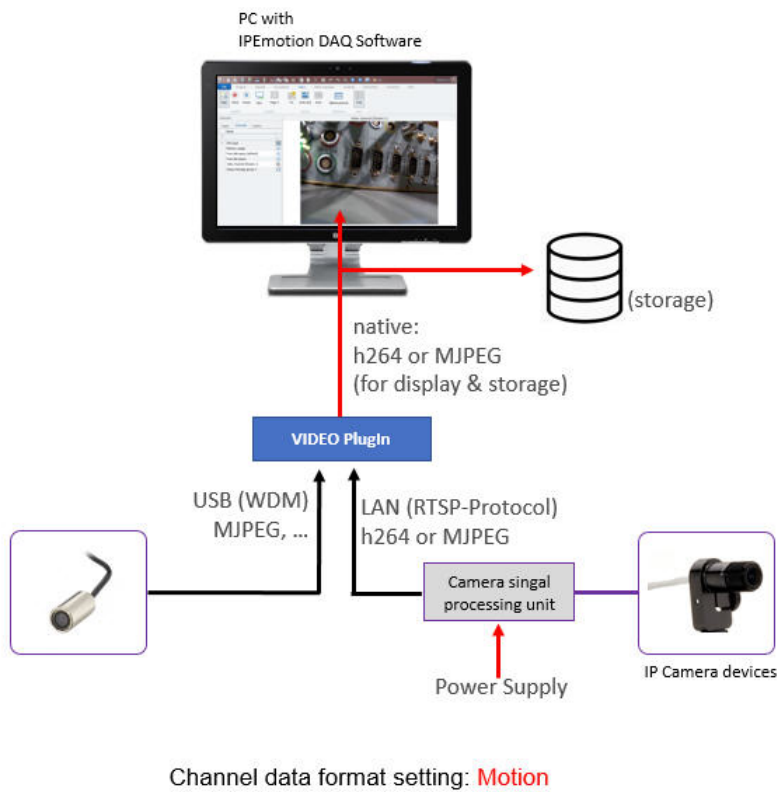
### 6.1 Image format

The Image format is taking incoming data streams and converting them to JPEG pictures. However, this format is consuming plenty of storage space.



## 6.2 Motion format

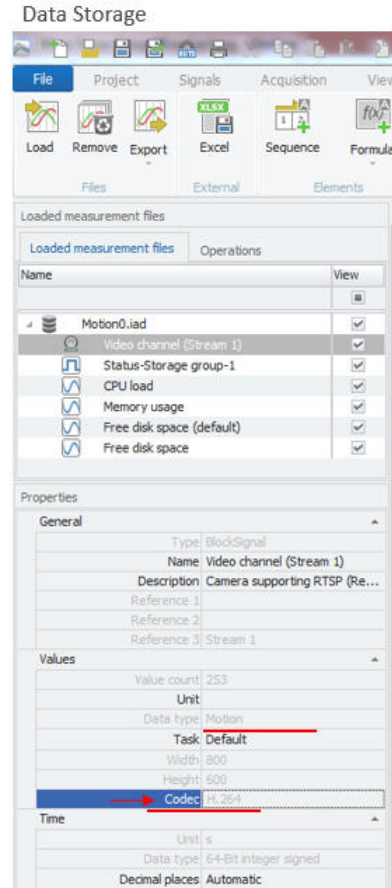
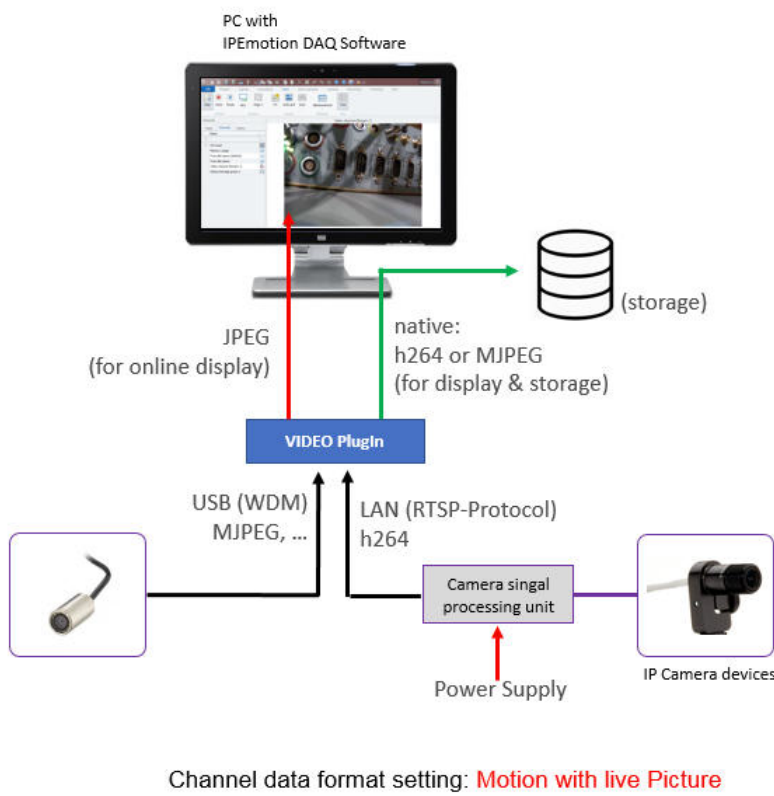
The Motion format is basically routing the incoming data stream in the same format to the data storage. That means incoming h264 data streams are also stored in the format. An incoming MJPEG stream will be stored in the MJPEG format. However, the driver of the camera hardware and the PlugIn must be compatible. Not all cameras support the Motion format.



[37\_V]

### 6.3 Motion with live picture format

This format is a derivate from the Motion format. The main difference is that the PlugIn is processing the incoming data stream to an additional MJPEG picture in order to have a good update rate of the online picture for the user. The Motion format supports for h264 streams the GOP factor. The GOP factor is a good setting to save storage capacity, but it is causing on the downside a delay in the online picture screen update.

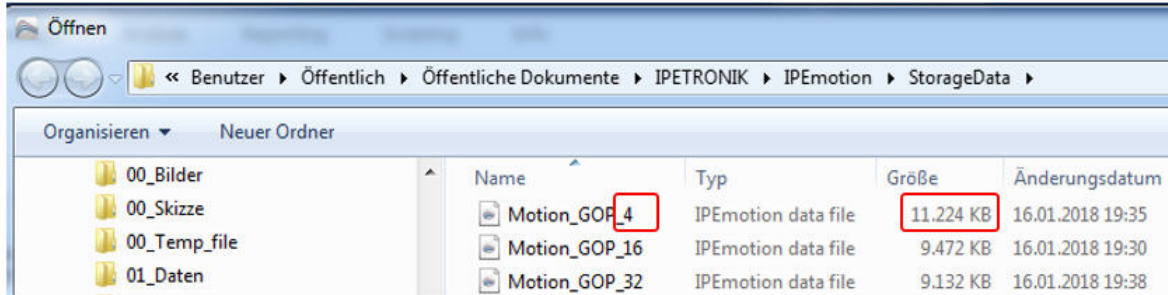


[38\_V]

## 6.4 Examples of IP camera settings

### 6.4.1 GOP factor

In the example below a data files was recorded for 30 second with the resolution of 800x 600 pixel. As you can see an increased GOP/GOV factor leads to smaller data files. However, when the GOP factor is getting larger than for example 32 the impact on the storage volume is not much lower compared to the factor 16.



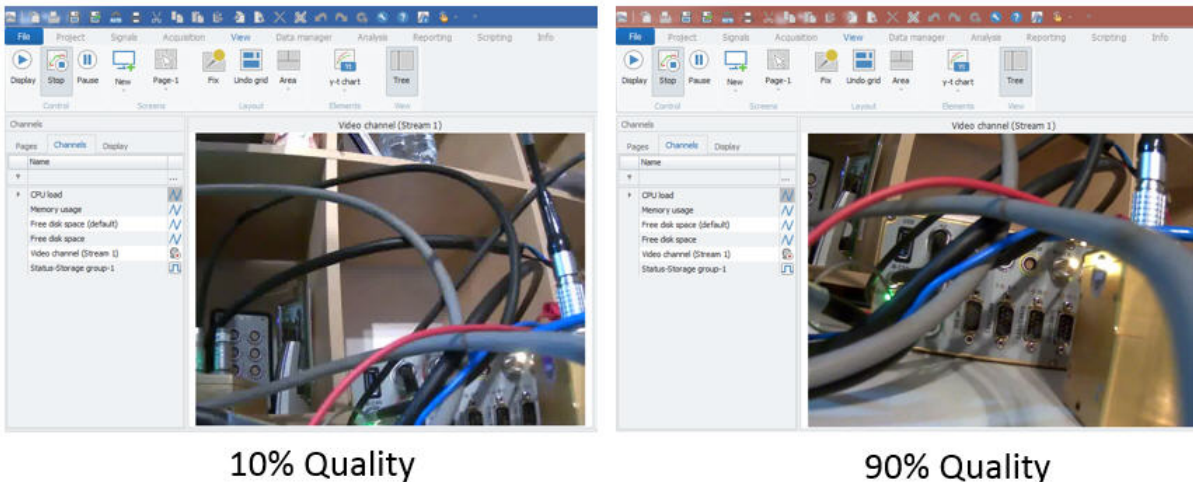
Name	Typ	Größe	Änderungsdatum
Motion_GOP_4	IPEmotion data file	11.224 KB	16.01.2018 19:35
Motion_GOP_16	IPEmotion data file	9.472 KB	16.01.2018 19:30
Motion_GOP_32	IPEmotion data file	9.132 KB	16.01.2018 19:38

GOP factor - impact to data file size

[39\_V]

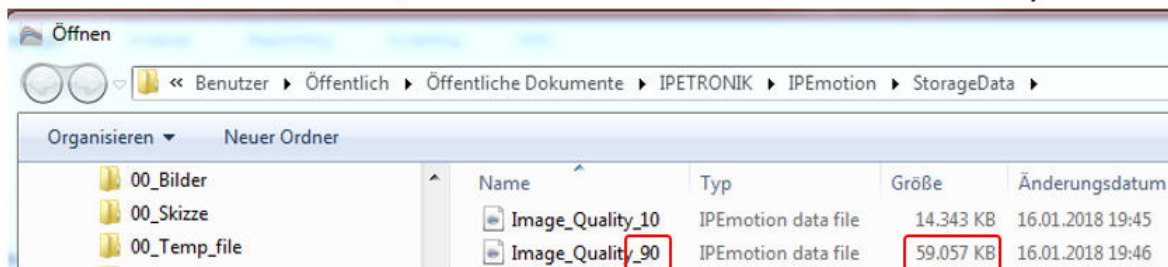
### 6.4.2 Quality factor

Another setting is the quality when you store the data in the Image (MJPEG format). In this case the h264 stream is converted to MJPEG pictures by the PlugIn and you can change the storage and online display quality. The data was stored again from a 800 x 600 pixel picture for 30 seconds duration. As you can see the quality has a significant impact on the storage volume.



10% Quality

90% Quality



Name	Typ	Größe	Änderungsdatum
Image_Quality_10	IPEmotion data file	14.343 KB	16.01.2018 19:45
Image_Quality_90	IPEmotion data file	59.057 KB	16.01.2018 19:46

Quality – impact to data file size

[40\_V]

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