INOGENI CAM230 User Guide

User guide

Version 1.1

June 2, 2023

VERSION HISTORY

Version	Date	Description
1.0	April 12, 2023	First release.
1.1	June 2, 2023	- Added new REMOTE connectivity. - Added power consumption limit for USB cameras. - Added RCM statement. - Added minor modifications to RESTAPI. - Added firmware update procedure.

CONTENTS

TYPICAL APPLICATION

Here is a typical connection diagram used for the CAM230 device in a videoconferencing setup.

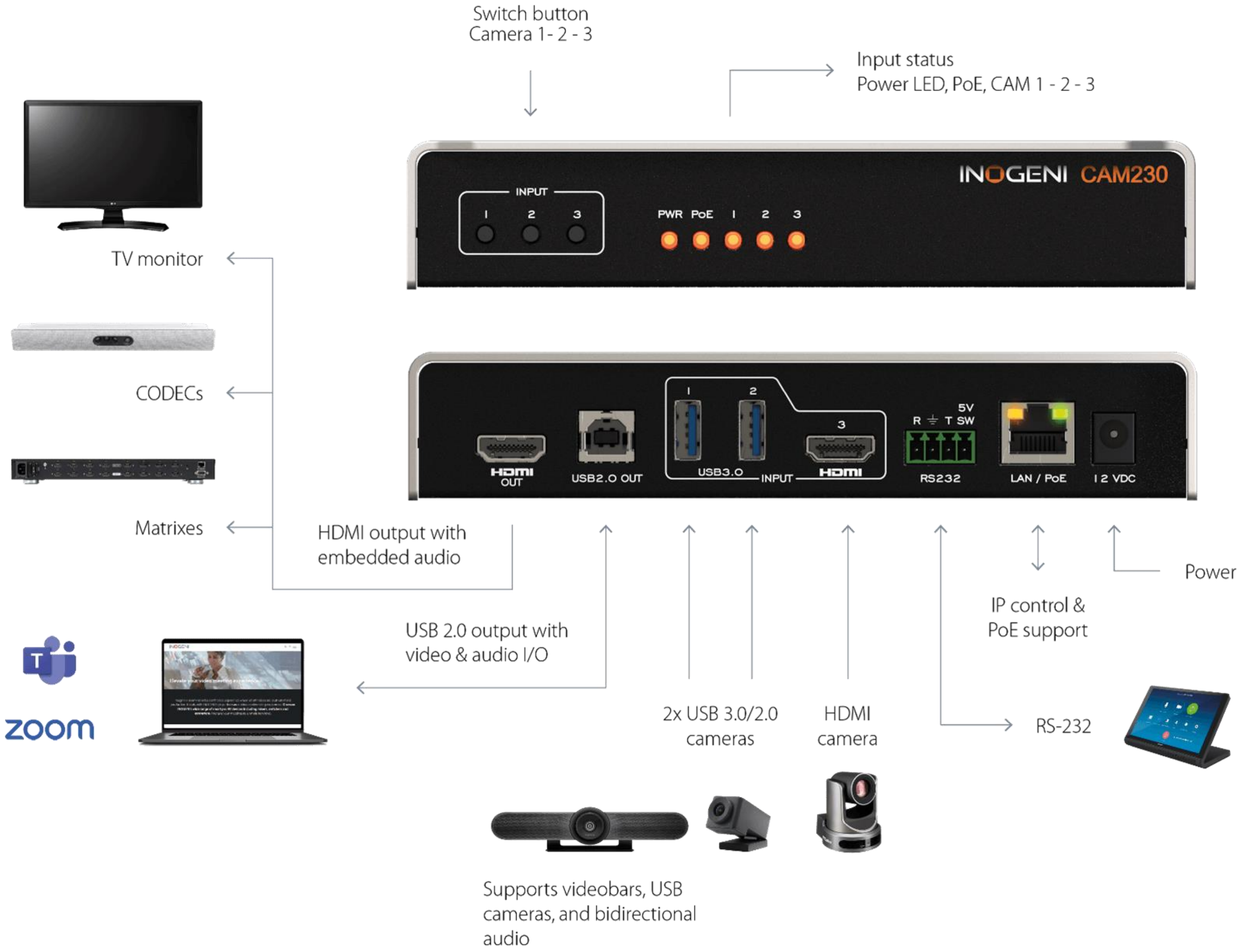


Figure 1: Common use case

BLOCK DIAGRAM

Here is a simple block diagram to better understand the usage of the product.

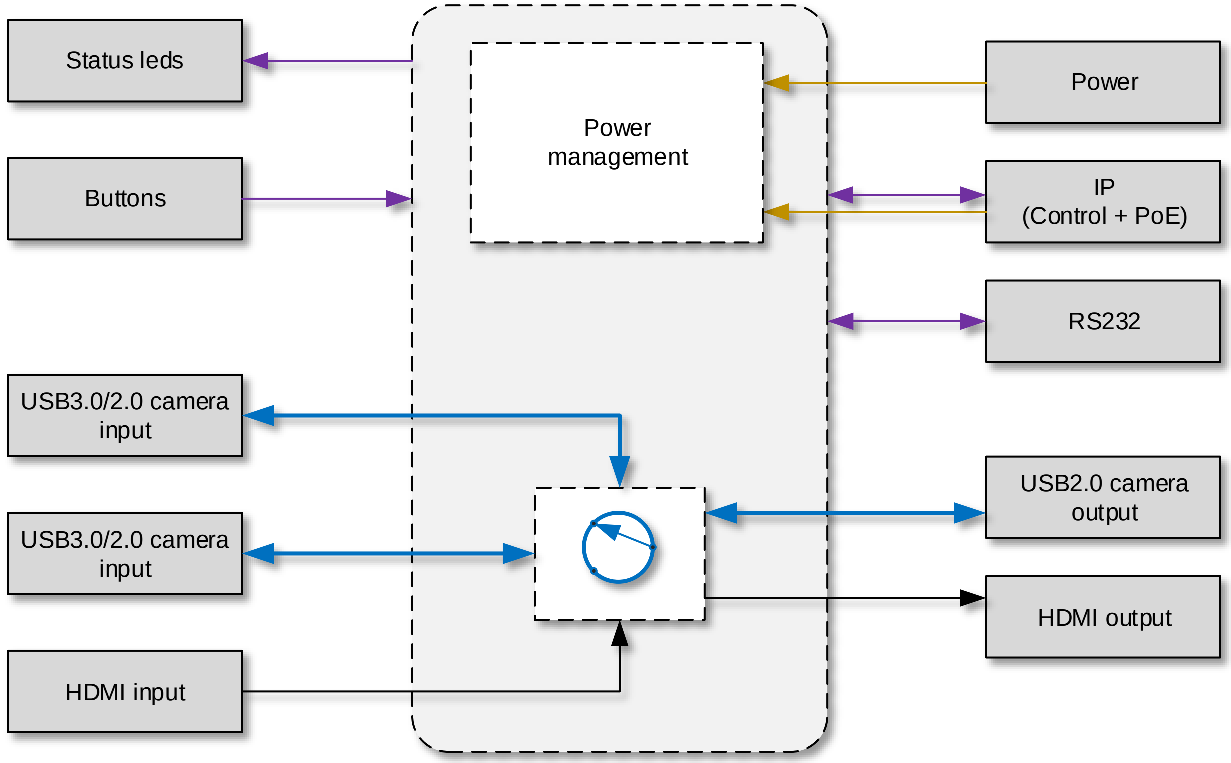


Figure 2: Basic block diagram

The device embeds a video switch that can connect to USB3.0/2.0 and HDMI cameras. The device will output video content from the selected source over HDMI and USB2.0 outputs simultaneously.

This can give you a great asset to your videoconferencing equipment to switch camera interface easily without going into your UC settings.

AUDIO ROUTING

The device can connect to USB microphones/speakerphones and on a HDMI feed that includes audio. These sources can be sent over the HDMI output and to the USB2.0 output.

The USB2.0 interface embeds a digital audio interface which implements a microphone and a speaker device. Ultimately, the UC software connected to the USB2.0 camera interface can receive and transmit audio from/to the connected USB videobar.

DEVICE INTERFACES

Here are the devices interfaces.

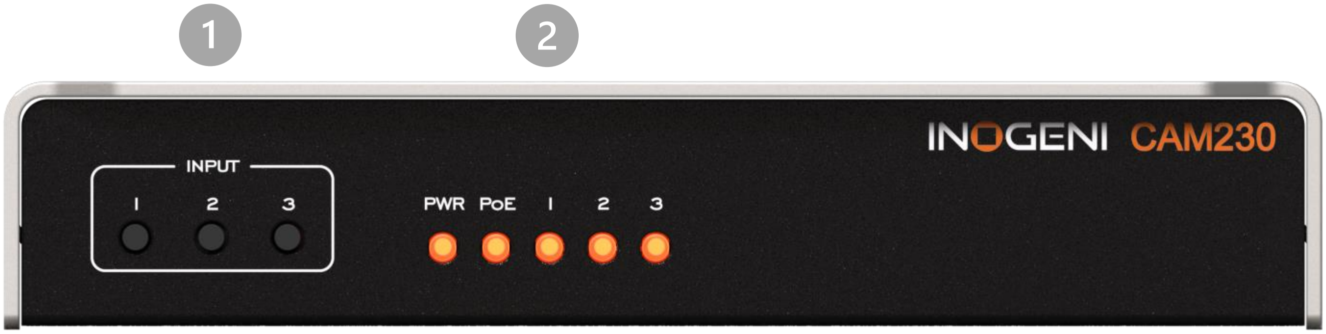


Figure 3: Front side connections

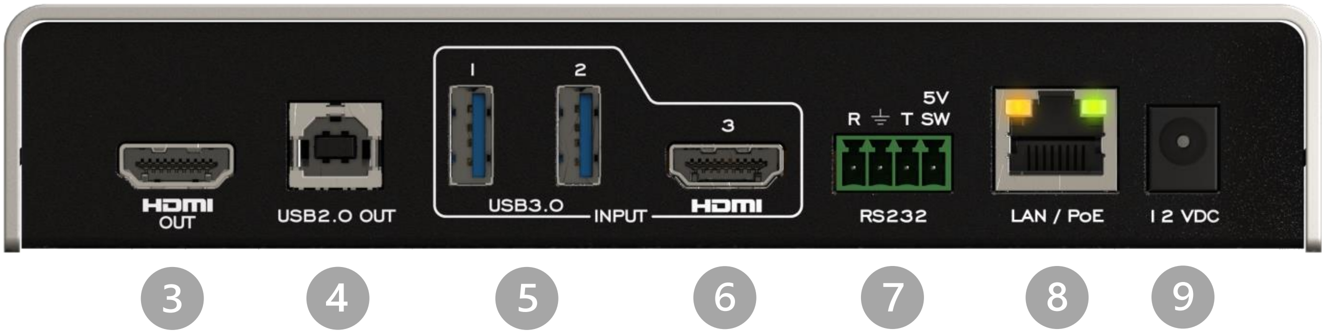


Figure 4: Back side connections

1 Input selection buttons
2 Input status LEDs
3 HDMI output
4 USB2.0 camera output
5 USB3.0 camera inputs
6 HDMI camera input
7 RS232 and remote interface
8 LAN/PoE interface
9 +12VDC power input

LEDS BEHAVIOR

Here are the LEDs behavior:

Power input	
OFF	No power.
SOLID	Device is powered up.
PoE	
OFF	Not powered from PoE.
SOLID	Powered from PoE.
Input led	
OFF	Input not detected and not selected.
LOW	Input detected and not selected.
FLASH-LOW	Input not detected and selected.
HIGH	Input detected and selected.

SPECIFICATIONS

Here is the complete specification.

Physical details	
Dimensions (W x L x H)	17.33 cm x 11.57 cm x 3.26 cm 6.82” x 4.55” x 1.28”
Power supply	12V (100-240 VAC 50/60Hz to 12V/1.2A DC) – or – PoE source compliant with IEEE 802.3af (802.3at Type 1)
Weight	606 g
Package content	1 x USB 2.0 Type-B to Type-A cable (3ft). 1 x terminal block connection. 1 x 12V power supply.
Operating temperature	0° to 45° C (32° to 113° F)
Storage temperature	-40° to 105° C (-40° to 221° F)
Relative humidity	0% to 90% non-condensing
UPC code	51497302825
Origin	Canada
Warranty	2 years

USB inputs	
2x USB 3.0 inputs	**1x USB 3.0/2.0 camera** Uncompressed, YUYV/NV12/I420 – 1080p30 MJPEG – 1080p30
USB Power	Up to 1.2A shared between the USB ports

HDMI input	
Resolution	1080p50/60 fps, 720p50/60 fps
Connector	HDMI

HDMI output	
Resolution	3840x2160p23.98/24/25/29.97/30 fps, 1080p50/60 fps, 720p50/60 fps
Connector	HDMI

USB 2.0 output	
USB-B Type-B connector	Device will expose a UVC interface over USB 2.0 up to 1080p30 MJPEG with a digital audio input and output interfaces

Audio	
Digital audio I/O	Embedded in HDMI or USB

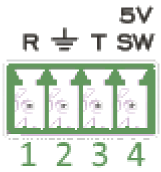
Control	
Control options	Front buttons RS-232 LAN USB
IP interface	100 Mbps half-duplex (autonegotiation not supported) Supports DHCP or static IP addressing
RS232 interface	Baud rate: 9600 Data bits: 8 Stop bits: 1 Parity: None Flow control: None

Certifications	
HDCP compliant	The device does not decrypt BD/DVD movies, satellite/cable receivers or other encrypted sources.
Certifications	FCC, CE, RoHS, IEC62368, SoV, RCM
TAA-compliant	Yes

Compatibility	
Operating system	NO driver installation necessary Windows 7 and above (32/64-bit) macOS 10.10 and above Linux (kernel v2.6.38 and above)
Cameras Supported	Cameras (or video Source) with a HDMI or USB outputs
Software Compatibility	UVC-compliant. Runs with all software compatible to DirectShow/MediaFoundation, V4L2, QuickTime and AVFoundation.

SERIAL COMMUNICATION PROTOCOL

Here is the complete list of commands provided through the serial connection.
As written on the back of the device, here is the pinout of the terminal block.



Pin 1: Receive
Pin 2: GND
Pin 3: Transmit
Pin 4: 5V supply (for INOGENI Remote)

Typically, commands will return ACK in case of success and NACK in case of failure.

Note that if serial interface was disabled using REST API, commands will not be parsed, and no response will be provided.

Baud rate: 9600 // **Data bits**: 8 // **Stop bits:** 1 // **Parity:** None // **Flow control:** None

Command	Argument(s)	Description
HELP	None	Return command list with description
RSTR	None	Restore default settings (including password and rest api token)
RESET	None	Reset/reboot the device
IP	None	Returns IP address
VERSION	None	Returns firmware version
STATUS	None	Return devices, video/audio inputs and HDMI output status
PAN	1 argument (integer) The sign specifies the direction. We multiply the argument by the camera smallest step, and if the speed is too fast, we go as fast as the camera allow. We recommend using values between `-10` and `10`.	Relative pan of the selected camera
TILT	1 argument (integer) The sign specifies the direction. We multiply the argument by the camera smallest step, and if the speed is too fast, we go as fast as the camera allow. We recommend using values between `-10` and `10`.	Relative tilt of the selected camera
ZOOM	1 argument (integer) The sign specifies the direction. We multiply the argument by the camera smallest step, and if the speed is too fast, we go as fast as the camera allow. We recommend using values between `-10` and `10`.	Relative zoom of the selected camera

SETHDMI	1 argument (integer)
	Possible parameters:
	`0 => 1080P60`
	`1 => 1080P50`
	`2 => 720P60`
	`3 => 720P50`
	`4 => 4K24`
	`5 => 4K25`
	`6 => 4K30`
		Set HDMI output mode

SETVIDEOFORMAT	2 arguments (integer)
	1st arg: <inputPort>
	`1 => USB input #1`
	`2 => USB input #2`
	`4 => Test pattern`
	2nd arg: <formatIndex>
		Set video input format

GETVIDEOFORMATS	1 argument (integer)	Get video input format

	The argument specifies the port of the video input for which we want to get the available formats.
	`1 => USB input #1`
	`2 => USB input #2`
	`3 => HDMI input`
	`4 => Test pattern`	

SETAUDIOINPUT	1 argument (integer) The argument specifies the index (start at 0) of the audio input. To see available inputs, use STATUS command.	Set audio input

SETVIDEOINPUT	1 argument (integer)
	The argument specifies the port of the video input.
	`1 => USB input #1`
	`2 => USB input #2`
	`3 => HDMI input`
	`4 => Test pattern`
	To see available inputs, use STATUS command.
		Set video input

SETVIDEOINPUTMODE	1 argument (integer)
	The argument specifies if we want manual or automatic switching.
	`0 => automatic switching`
	`1 => manual switching`
		Set video input switching mode

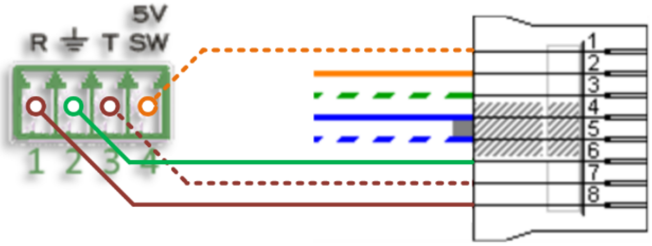
INOGENI REMOTE

The INOGENI Remote needs to be connected to the terminal block port in order to operate. Apply wiring accordingly. This remote is sending serial commands to the device. Make sure to set the **DIP SW6** below the device to ON in order to apply power to the remote before going further. See “DIP SWITCHES” section and user manual of the INOGENI REMOTE for more details.

Do not plug a RJ45 cable between the INOGENI device and the REMOTE.

Terminal block:
Pin 1: Receive
Pin 2: GND
Pin 3: Transmit
Pin 4: 5V supply

RJ45:
Pin 1: 5V supply
Pin 2,3,4,5: NC
Pin 6: GND
Pin 7: RX
Pin 8: TX



LAN COMMUNICATION PROTOCOL

You can access the device settings through its LAN interface. The LAN interface use DHCP and static IP addressing. You can obtain the IP from the Inogeni Control App or from the serial port IP command. Note that LAN is set to 100Mbps half-duplex.

CDC-NCM COMMUNICATION PROTOCOL

The device can also be controlled through CDC-NCM interface exposed on the USB2.0 device port.

This interface has the same functions as the LAN interface, except the requests are done through USB to ease configuration.

CDC-NCM IP address: 169.254.10.10

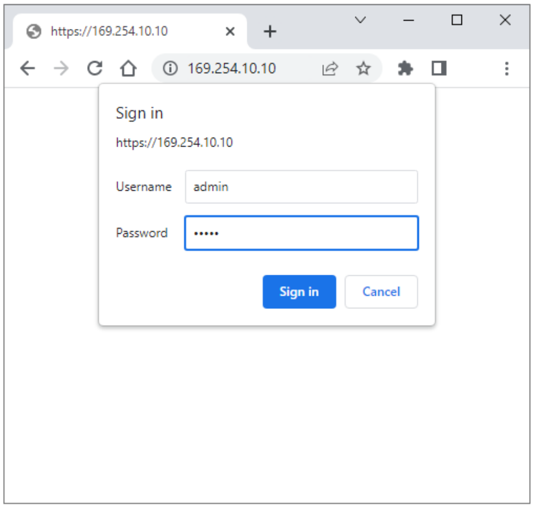
POE

The device can be powered from a 12V power supply or from a PoE compliant source. If the 12V power supply is connected, this one is taken in priority.

WEBPAGE

Here is the webpage that can be used to configure and upgrade the device. This webpage is accessible through IP or through the CDC-NCM interface over USB2.0.

The username is “**admin**”, and the default password is “**admin**”.



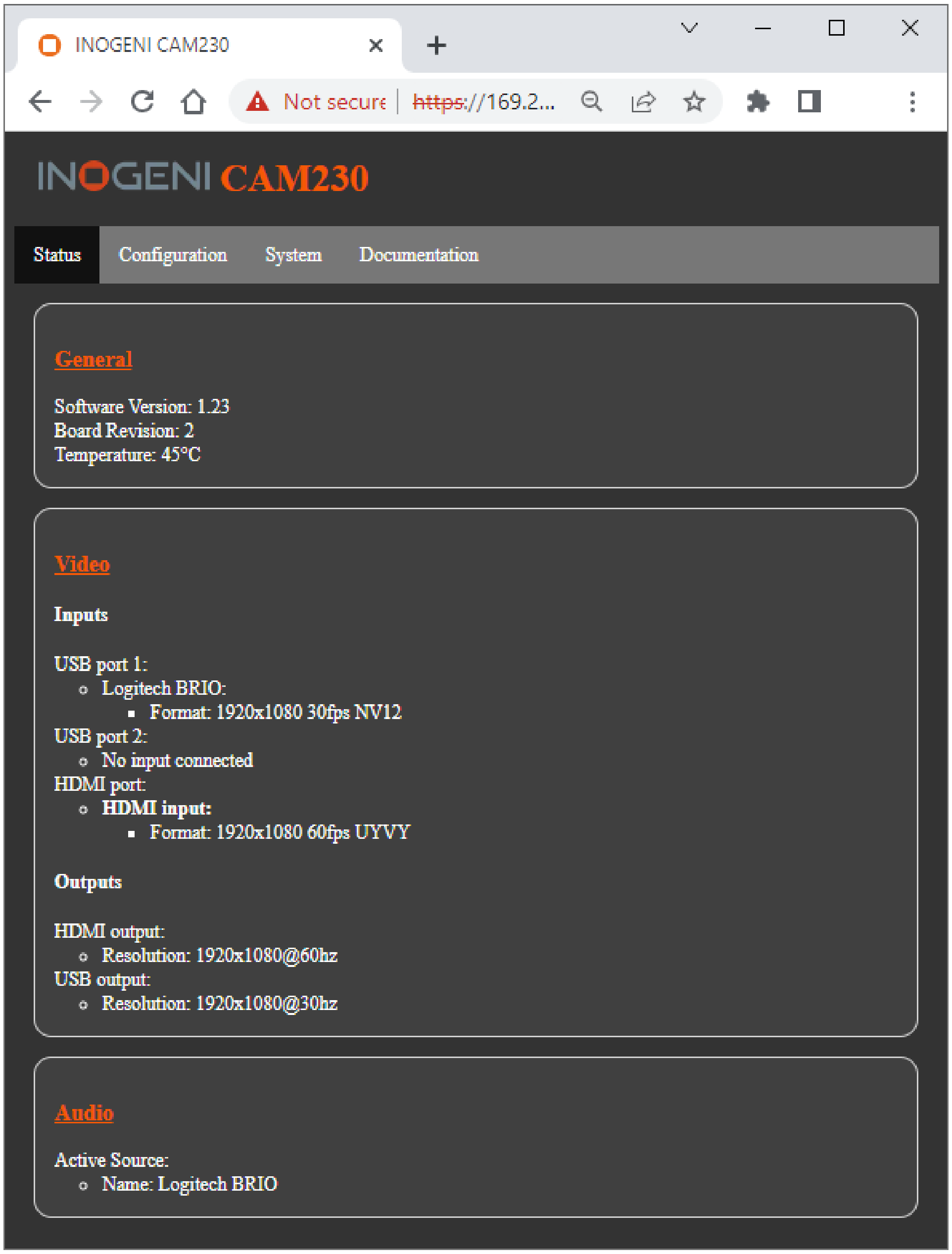
Sign in

https://169.254.10.10

Username admin

Password •••••

The **STATUS** page will give you information about the firmware installed. video and audio devices that you can monitor.



General

Software Version: 1.23
Board Revision: 2
Temperature: 45°C

Video

Inputs

USB port 1:
- Logitech BRIO:
  - Format: 1920x1080 30fps NV12

USB port 2:
- No input connected

HDMI port:
- **HDMI input:**
  - Format: 1920x1080 60fps UYVY

Outputs

HDMI output:
- Resolution: 1920x1080@60hz

USB output:
- Resolution: 1920x1080@30hz

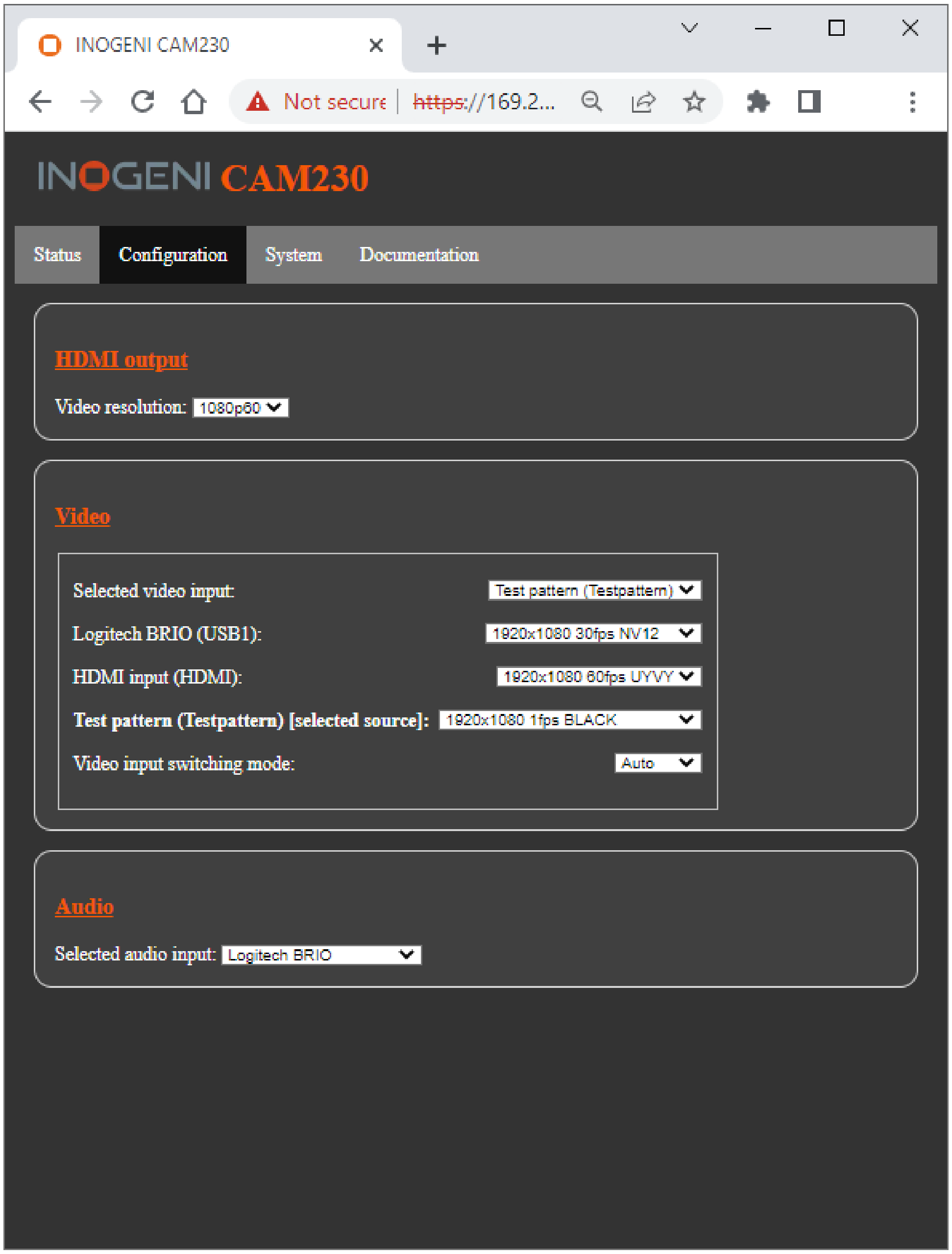
Audio

Active Source:
- Name: Logitech BRIO

Figure 5: Status preview

The **CONFIGURATION** tab will allow you to :

- Set the HDMI resolution over HDMI
- Set the selected camera source
- Set the video input switching mode
  - AUTO : Device will switch to newly detected video source
  - MANUAL : Device will only switch when we get the control to do it.
- Set the audio input from USB sources or HDMI input.



HDMI output

Video resolution: 1080p60

Video

Selected video input: Test pattern (Testpattern)

Logitech BRIO (USB1): 1920x1080 30fps NV12

HDMI input (HDMI): 1920x1080 60fps UYVY

Test pattern (Testpattern) [selected source]: 1920x1080 1fps BLACK

Video input switching mode: Auto

Audio

Selected audio input: Logitech BRIO

Figure 6: Configuration preview

The **SYSTEM** tab will allow you to :

- Change the current password for accessing device settings.
- Get/Set REST API access token needed using REST API interface.
- Change network settings of your device.
- Restore default settings and reboot the system.
- Update your system.

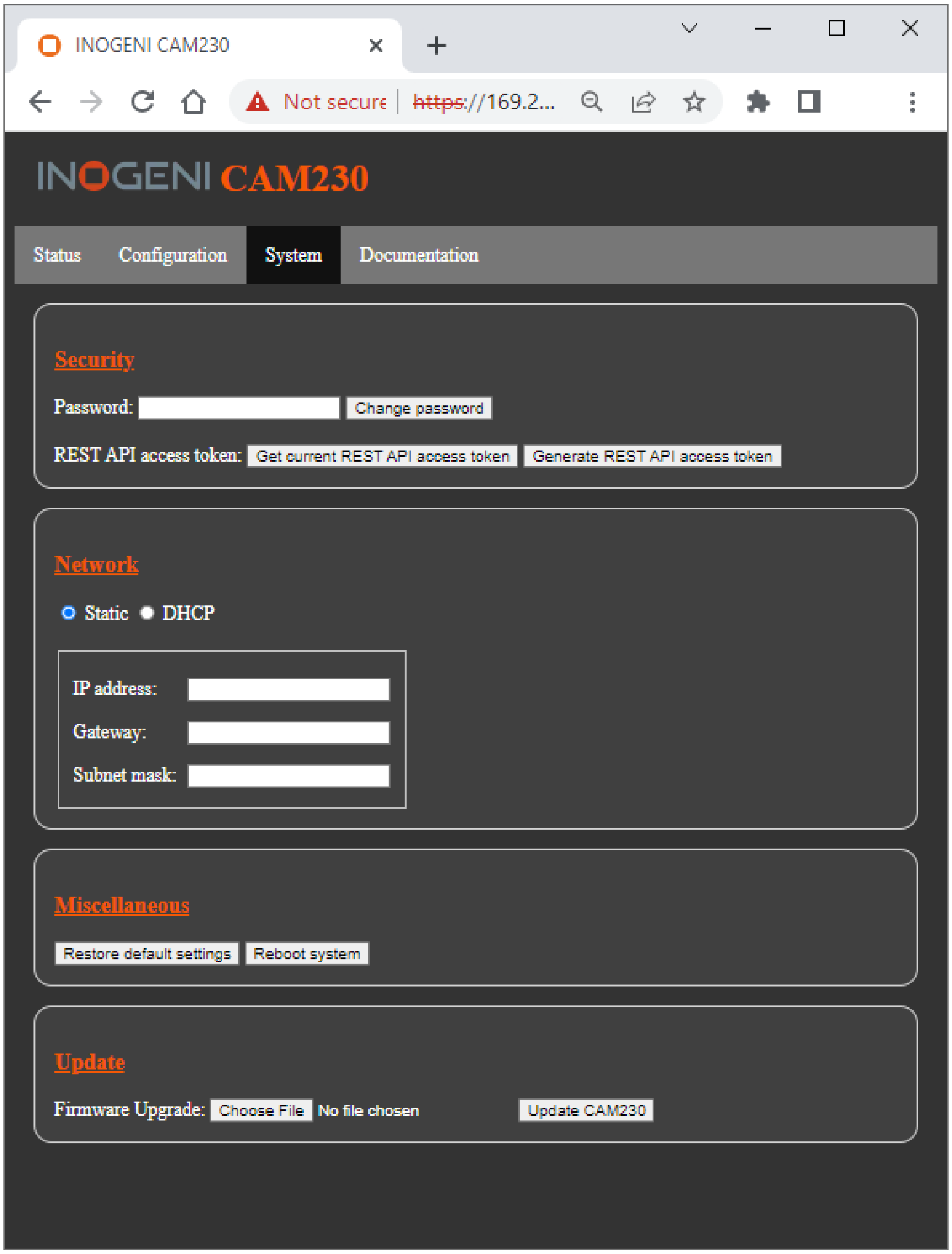
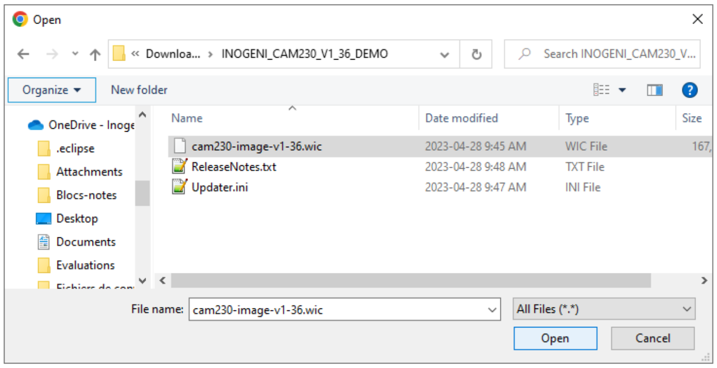


Figure 7: System preview

To update your system, please do the following :

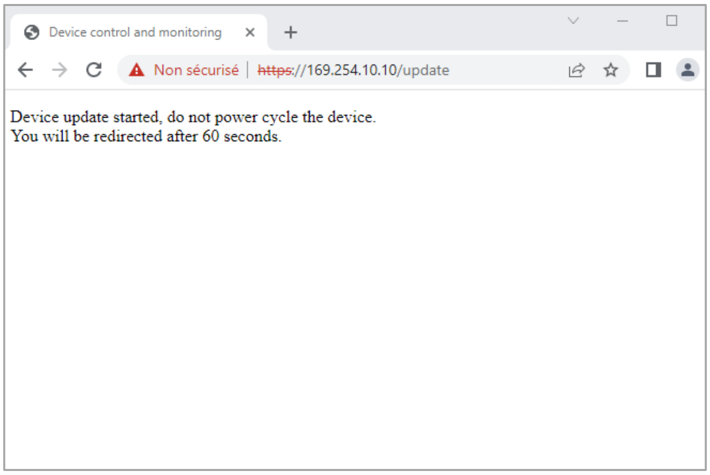
- Click on the “Choose File” button and browse to the WIC file downloaded from our website.



Name	Date modified	Type	Size
cam230-image-v1-36.wic	2023-04-28 9:45 AM	WIC File	167,
ReleaseNotes.txt	2023-04-28 9:48 AM	TXT File	
Updater.ini	2023-04-28 9:47 AM	INI File	

File name: cam230-image-v1-36.wic

- Click on “Update CAM230” button to proceed to the update. The operation can take up to 1 minute. The device will reboot and browser will be refreshed.


Device control and monitoring
Non sécurisé | ~~https~~://169.254.10.10/update

Device update started, do not power cycle the device.
You will be redirected after 60 seconds.

The **DOCUMENTATION** tab will allow you :

- Get to the latest user guide.
- Go to product webpage.

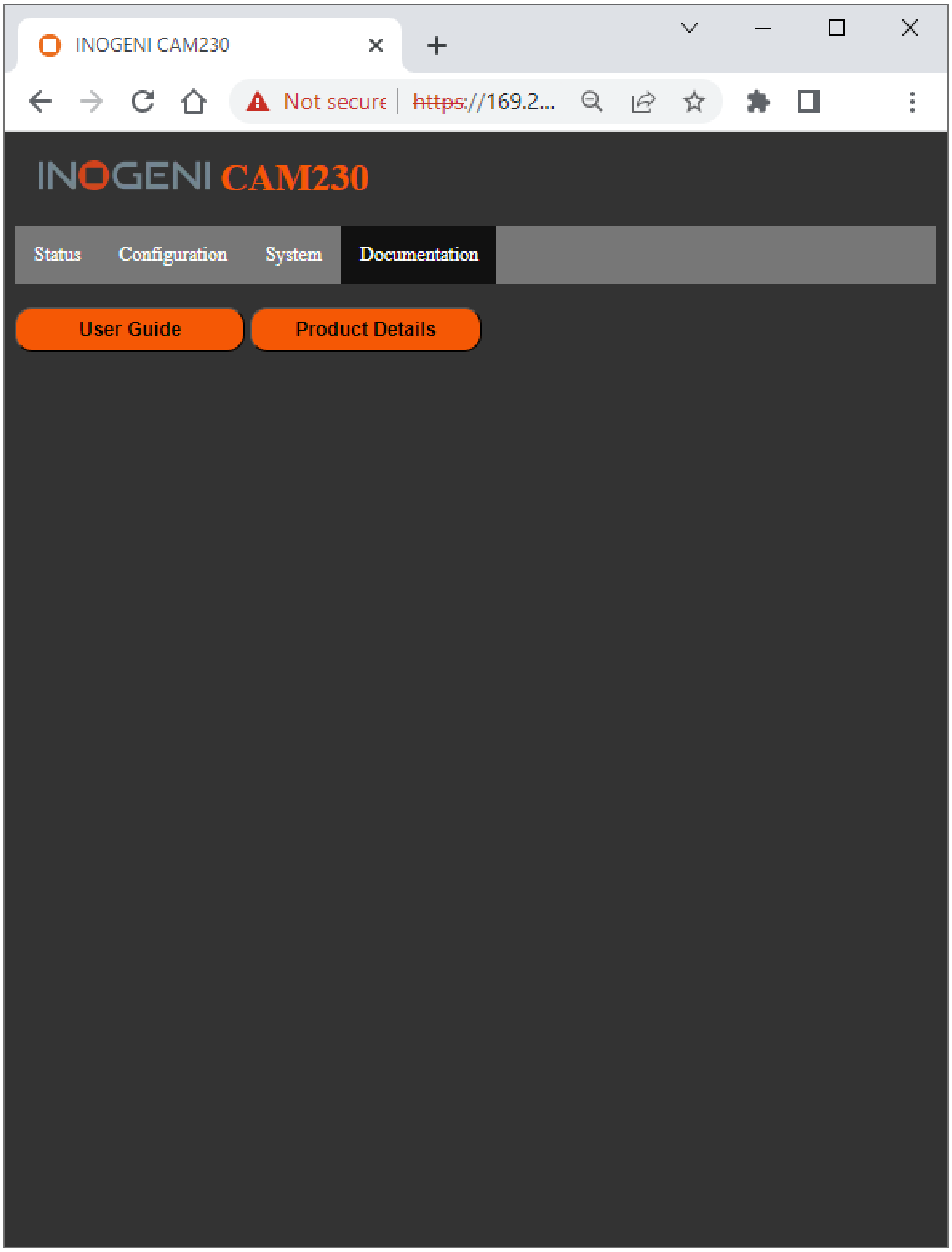


Figure 8: Documentation preview

The first time you access the webpage, your web browser is likely to complain that the connection is insecure. The reason for this is because we are using self-signed HTTPS certificate, because certificate providers will not provide certificates for address that are not globally accessible.

The webpage can set HDMI resolution, USB video input format, webpage password, or the REST API access token. Please note that in the case of the REST API token, we can only ask for the device to generate a new randomly generated token. It can also be used to upgrade the device firmware.

REST API

The response will usually be JSON formatted with a “message” field containing a JSON string explaining the cause of the error or “success” in case of success. Note that we are using self-signed certificate.

You can enable a bearer authentication in the HTTP header (Authorization: Bearer <token>) through our configuration page to increase security on the API.

Here is the complete list of commands supported through the REST API (excluding password change, firmware update, bearer token get/set):

Command URL / Description	Body arguments	Return code	Return body

GET/POST
https://<IP>/api/v1/rstr
 	
Restore default settings (including password and rest api token)
		200 => success
		400 => error
		401 => authorization error
			`{`
			`"message": <String>`
			`}`

GET/POST
https://<IP>/api/v1/reset
 	
Reset/reboot the device
		200 => success
		400 => error
		401 => authorization error
			`{`
			`"message": <String>`
			`}`

GET
https://<IP>/api/v1/version
 	
Returns firmware version
		200 => success
		401 => authorization error
			`{`
			`"major": <Integer>,`
			`"minor": <Integer>`
			`}`

GET **https://<IP>/api/v1/status** Return devices, video/audio inputs and HDMI output status		200 => success 401 => authorization error	JSON object with multiple fields

GET/POST
https://<IP>/api/v1/pan
 	
Relative pan of the selected camera
	`pan=<Integer>`
	
	The sign specifies the direction. We multiply the argument by the camera smallest step, and if the speed is too fast, we go as fast as the camera allow. We recommend using values between `-10` and `10`.
		200 => success
		400 => error
		401 => authorization error
			`{`
			`"message": <String>`
			`}`

GET/POST
https://<IP>/api/v1/tilt
 	
Relative tilt of the selected camera
	`tilt=<Integer>`
	
	The sign specifies the direction. We multiply the argument by the camera smallest step, and if the speed is too fast, we go as fast as the camera allow. We recommend using values between `-10` and `10`.
		200 => success
		400 => error
		401 => authorization error
			`{`
			`"message": <String>`
			`}`

GET/POST
https://<IP>/api/v1/zoom
 	
Relative zoom of the selected camera
	`zoom=<Integer>`
	
	The sign specifies the direction. We multiply the argument by the camera smallest step, and if the speed is too fast, we go as fast as the camera allow. We recommend using values between `-10` and `10`.
		200 => success
		400 => error
		401 => authorization error
			`{`
			`"message": <String>`
			`}`

GET/POST
https://<IP>/api/v1/setHdmi
 	
Set HDMI output mode
	`mode=<hdmiModeIndex>`
	
	Possible `<hdmiModeIndex>` parameters:
	`0 => 1080P60`
		200 => success
		400 => error
		401 => authorization error
			`{`
			`"message": <String>`
			`}`

	1 => 1080P50 2 => 720P60 3 => 720P50 4 => 4K24 5 => 4K25 6 => 4K30		

GET/POST
https://<IP>/api/v1/setVideoFormat
Set video input format
	x-www-form-urlencoded
	input=<inputPort>
	format=<formatIndex>
	Possible <inputPort> parameters:
	1 => USB input #1
	2 => USB input #2
	4 => Test pattern
		200 => success
		400 => error
		401 => authorization error
			{
			"message": <String>
			}

GET **https://<IP>/api/v1/getVideoFormats** Get video input format	input=<Integer> If input argument is not provided, will use currently selected input Possible <Integer> parameters: 1 => USB input #1 2 => USB input #2 3 => HDMI input 4 => Test pattern	200 => success 400 => error 401 => authorization error	JSON array containing all formats for requested input.

GET/POST
https://<IP>/api/v1/setAudioInput
Set audio input
	input=<Integer>
	The argument specifies the index of the audio input. To see available inputs, use “status” command.
		200 => success
		400=> error
		401 => authorization error
			{
			"message": <String>
			}

GET/POST
https://<IP>/api/v1/setVideoInput
Set video input
	input=<Integer>
	Possible <Integer> parameters:
	1 => USB input #1
	2 => USB input #2
	3 => HDMI input
	4 => Test pattern
	The argument specifies the index of the video input.
	To see available inputs, use “status” command.
		200 => success
		400=> error
		401 => authorization error
			{
			"message": <String>
			}

GET/POST
https://<IP>/api/v1/setVideoInputMode
Set video input switching mode
	mode=<mode>
	Possible <mode> parameters:
	0 => automatic switching
	1 => manual switching
			{
			"message": <String>
			}

GET/POST
https://<IP>/api/v1/disableSerialInterface
Disable serial interface
	disable=<Integer>
	If integer is not 0, will disable serial interface, otherwise will enable it.
	This function must be used when using the “serialRead” and “serialWrite” commands.
		200 => success
		400 => error
		401 => authorization error
			{
			"message": <String>
			}

GET
https://<IP>/api/v1/serialRead
Read serial data from RS232
		200 => success
		400 => error
		401 => authorization error
			{
			"message": <String>
			}
			Message field contains characters read from RS232

GET/POST
https://<IP>/api/v1/serialWrite
Write serial data to RS232. Giving content to write in URL is not supported.
	<Content to write>	200 => success
		400 => error
		401 => authorization error
			{
			"message": <String>
			}

GET/POST https://<IP>/api/v1/setNetwork
Configure network settings
	`x-www-form-urlencoded`
	`mode=<static,dhcp>`
	If mode is static, must provide following args:
	`ip=<ipv4 address>`
	`netmask=<ipv4 netmask>`
	If mode is static, you can also specify a gateway:
	`gateway=<ipv4 gateway>`
		200 => success
		400 => error
		401 => authorization error
			`{ "message": <String> }`

It is also possible to embed arguments to an API call inside the URL to ease configuration with some control systems with the following topology:

GET https://<IP>/api/v1/**COMMAND**?**ARG1=value**&**ARG2=value**

For example, using the **SETVIDEOFORMAT**, you can issue the following request:

GET https://<IP>/api/v1/**setVideoFormat**?**input=1**&**format=0**

This request will set the input #1 to format index 0.

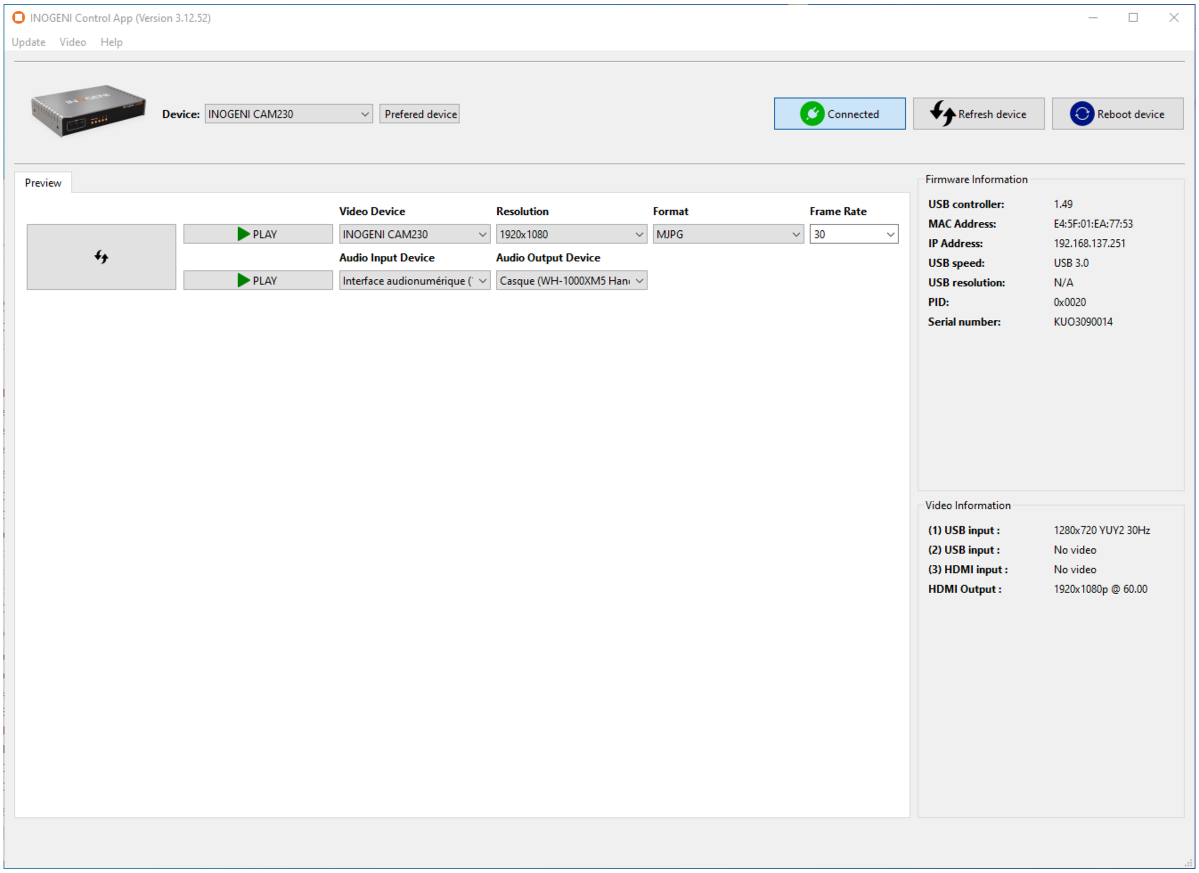
The following commands allow to perform password management, bearer token management and firmware update. The authentication used is basic auth, and we use the same user and password as the webpage (default user=admin password=admin).

Command URL / Description	Body arguments	Return code	Return body
POST https://<IP>/api/v1/changePassword?password=<newPassword> Change the webpage password to <newPassword>		200 => success 400 => error 401 => authorization error	`{ "message": <String> }`
GET https://<IP>/api/v1/getAccessToken Return the bearer token		200 => success 400 => error 401 => authorization error	`{ "token": <String> }` If no bearer token is set, the "token" field will be null.
POST https://<IP>/api/v1/generateAccessToken		200 => success 400 => error 401 => authorization error	`{ "message": <String> }`
POST https://<IP/api/v1/update	Must use formdata body. The key must be myFile, and the value is of type file. We expect a .wic file that should be present in our official update packages	200 => success 400 => error 401 => authorization error	`{ "message": <String> }`

INOGENI CONTROL APP

You can use our Control App to monitor firmware information and upgrade your unit.

NOTE: You need to use the USB-B to USB-A cable provided with the box for the Control App to detect the unit.



Device: INOGENI CAM230

Video Device	Resolution	Format	Frame Rate
INOGENI CAM230	1920x1080	MJPG	30

Audio Input Device	Audio Output Device
Interface audionumérique (	Casque (WH-1000XM5 Han

Firmware Information

USB controller:	1.49
MAC Address:	E4:5F:01:EA:77:53
IP Address:	192.168.137.251
USB speed:	USB 3.0
USB resolution:	N/A
PID:	0x0020
Serial number:	KUO3090014

Video Information

(1) USB input :	1280x720 YUY2 30Hz
(2) USB input :	No video
(3) HDMI input :	No video
HDMI Output :	1920x1080p @ 60.00

Figure 9: INOGENI Control App preview

MECHANICAL SPECIFICATIONS

You can find the mechanical specification here that lists the holes. All dimensions are in **mm [in]**.

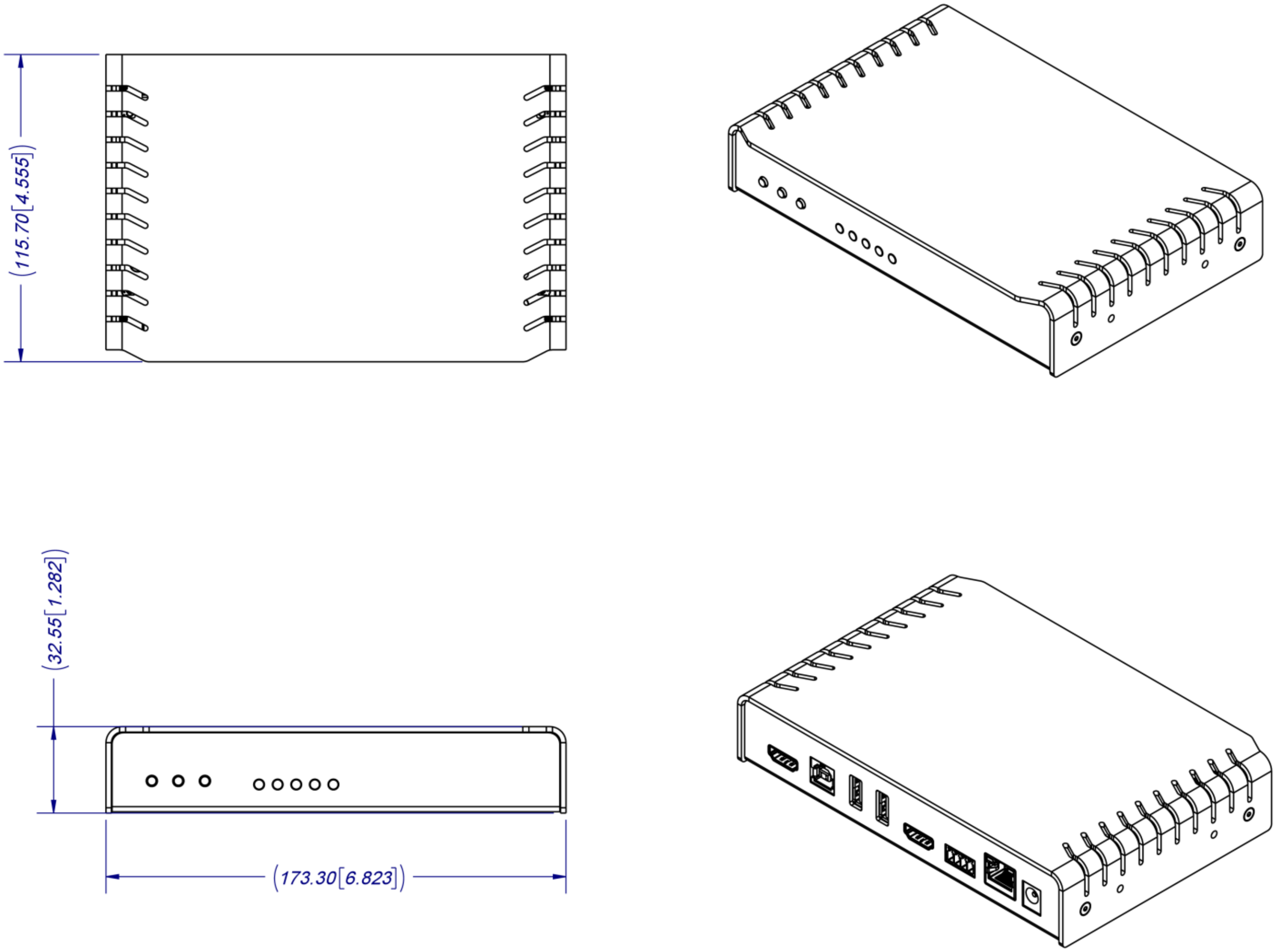


Figure 10: Top plate dimensions

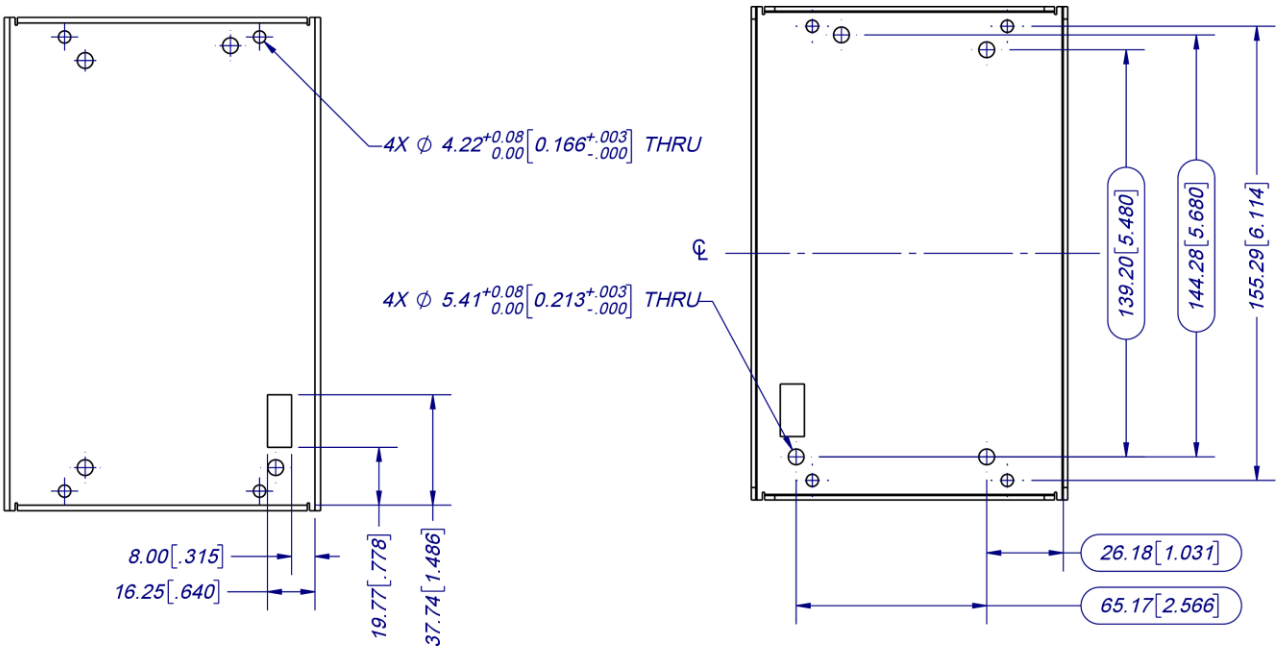


Figure 11: Bottom plate dimensions and holes positions

DIP SWITCHES

Here you can find the behavior of the DIP switches located at the back of the unit.

Switch	Position	Description
SW1	OFF	For future use.
	ON	
SW2	OFF	For future use.
	ON	
SW3	OFF	For future use.
	ON	
SW4	OFF	For future use.
	ON	
SW5	OFF	Reserved.
	ON	
SW6	OFF	Disable 5V on terminal block
	ON	Enable 5V on terminal block. This switch must be set to power up the connected remote.

TROUBLESHOOTING SECTION

Here is the troubleshooting section for the device.

Problem	Resolution
The device keeps rebooting when we connect USB powered cameras. The device is connected to a PoE switch.	If you connect high consuming USB cameras that are powered by the USB bus, we recommend using the provided power supply to accommodate for the power demand.
We cannot detect the USB output on the PC when using it with a USB extender	The device has a USB2.0 interface only. Make sure that the USB extender you intend to use supports USB2.0. You can use our own set of USB extenders that are proven to work with our devices. https://inogeni.com/support/compatible-usb-extenders/
We cannot get the HDMI feed to go through the device.	Please do the following checklist : - Make sure HDMI connection is correct. HDMI cable should be within 30ft. Otherwise, you need to have an active HDMI extension. - Monitor if the HDMI led is ON. - Monitor the video resolution through our app or through the web interface if it is detected properly. - Make sure that the HDMI feed is not an encrypted HDCP source like a blu-ray or set-top box. The HDMI input is compatible with HDMI cameras.
My camera software running on my computer is not detecting the camera while the CAM230 is connected in line.	Unfortunately, this is the expected behavior since the PC is agnostic of the USB camera. However, the device supports all UVC controls (pan, tilt and zoom controls) and can route them to the selected camera.
LAN interface is not working properly. **Firmware updates from LAN interface takes a long time or hang/timeout.**	Make sure the port that is connected to the LAN interface is using 100Mbps half-duplex. Slow updates through LAN interface can be caused by duplex mismatch. The LAN interface does not do any autonegotiation.

SUPPORT

Engineered by video professionals, for video professionals, it is your most compatible USB 3.0 device. INOGENI expertise at your fingertips:

- **Expert Technical Support team** at support@inogeni.com for immediate help or if you have any technical question about our products.
- Extensive **Knowledge Base** to learn from other customers experiences.

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CERTIFICATIONS

FCC Radio Frequency Interference Statement Warning
This device complies with Part 15 of the FCC rules. Operation is subject to the following two conditions:
(1) this device may not cause harmful interference, and
(2) this device must accept any interference received including interference that may cause undesired operation.

IC Statement
This Class A digital apparatus complies with Canadian CAN ICES-3(A)/NMB-3(A).

CE Statement
We, INOGENI Inc., declare under our sole responsibility that the CAM230, to which this declaration relates, is in conformity with European Standards EN 55032, EN 55035, and RoHS Directive 2011/65/EU + 2015/863/EU.

WEEE Statement
The European Union has established regulations for the collection and recycling of all waste electrical and electronic equipment (WEEE). Implementation of WEEE regulations may vary slightly by individual EU member states. Please check with your local and state government guidelines for safe disposal and recycling or contact your national WEEE recycling agency for more information.

RCM Statement
This device is compliant with Regulator Compliance Mark (RCM) certification.