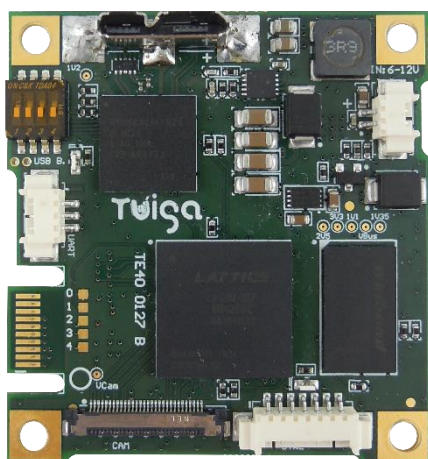




User Manual

4K to USB3 interface board



P/N – TV20 0008: 4K to USB3 interface board for Sony FCB-4K camera range

P/N – TV50 0027: Mounting kit for TV20 0008 - 4K to USB3 I/F board

Includes: 30-way micro-coax camera cable, 2-way cable (power supply), 3-way cable (UART TTL), 7-way cable (GPIOs), right angle black anodized bracket, screws and spacers

P/N – TV50 0026: Cable kit for TV20 0008 - 4K to USB3 I/F board

Includes: 30-way micro-coax camera cable, 2-way cable (power supply)

	Writing	Approval
Date	07/04/2023	10/04/2023
Name	Cédric BOULANGER	Cédric BOULANGER
Signature		

Revision History

Date	Revision	Description	Modified by	Note
17/02/2022	A	Creation of the document	CBO	
28/09/2022	B	Add internal registers	CBO	
07/04/2023	C	Update board and kit references	CBO	

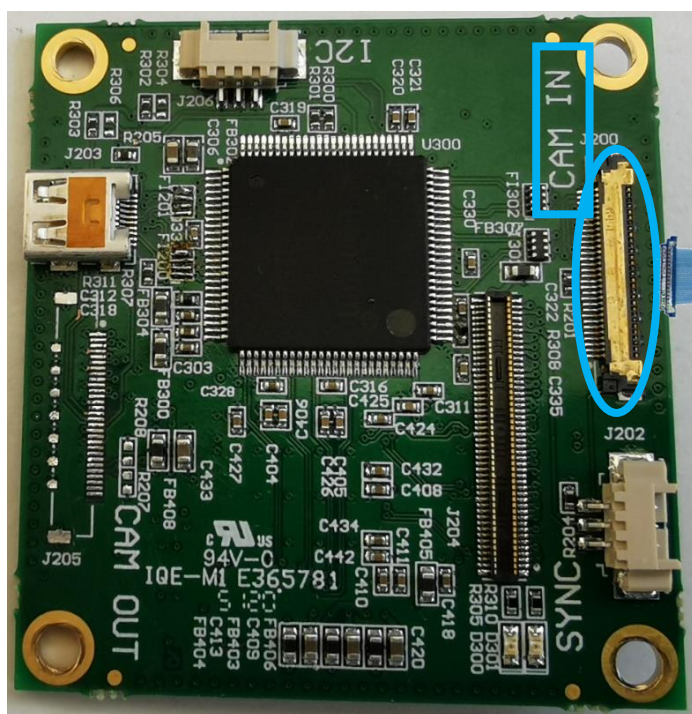
Table of content

Revision History	2
Table of content.....	3
1. Warning.....	4
2. Connections	5
2.1. Global setup	5
2.2. Power supply.....	6
3. Getting started	7
3.1. Video stream.....	7
3.1. Communication.....	7
3.2. Internal registers.....	9
3.3. Downscaling and FPS change	10
3.4. HDMI output	10
3.5. GPIOs.....	11
3.6. LED signalization	12
3.7. Multi switch.....	13
4. Annex	14
4.1. Annex 1: FPGA temperature table.....	14

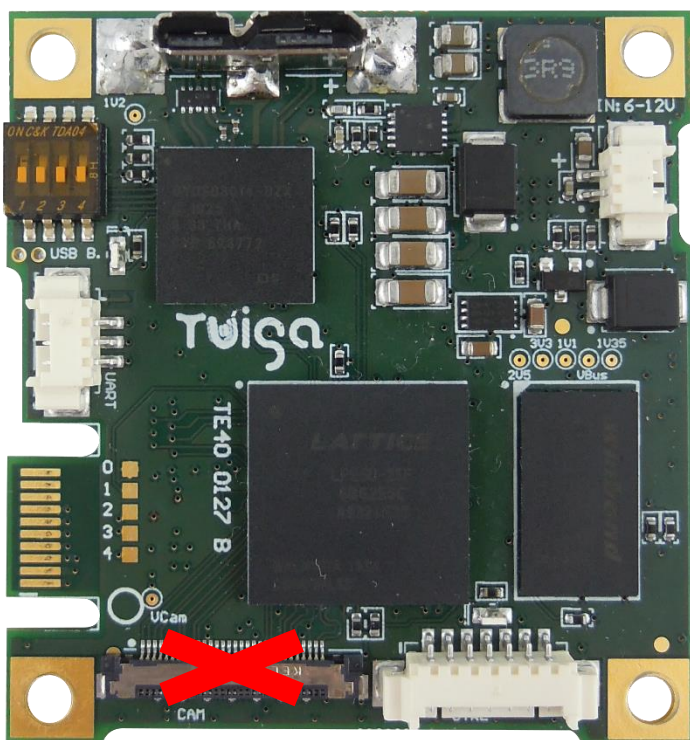
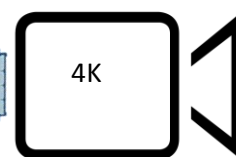
1. Warning



4K camera input is J200 available on the add-on board (P/N TS10 0089). If you connect the 4K camera block to another connector, you will break the camera.



Here connect your 4K camera block



2. Connections

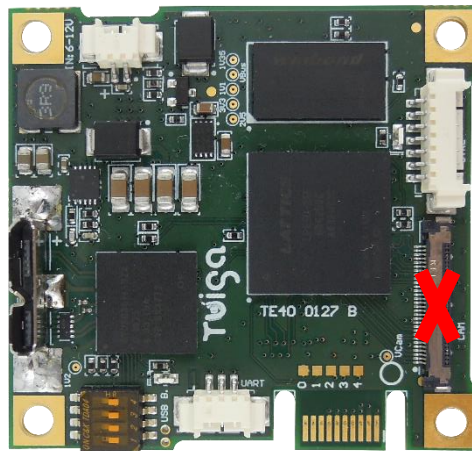
2.1. Global setup

Minimum requirements to connect a HDMI 4K camera module to Twiga HDMI 4K to USB3 module:

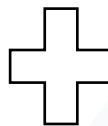
- HDMI 4K Sony ER Camera block
- Twiga USB 3.2 gen 1 Neo interface board
- Add-on 4K board
- 30 ways KEL USL type micro coaxial cable
- USB3 cable
- (Depending on the camera, a 2 ways cable for optional external camera power supply might be required)



USB3 type A cable



USB 3.2 gen 1 Neo



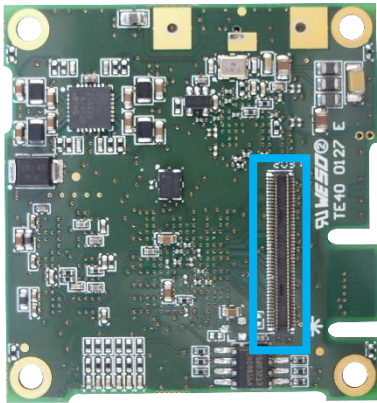
Add-on 4K



KEL cable

4K Camera block

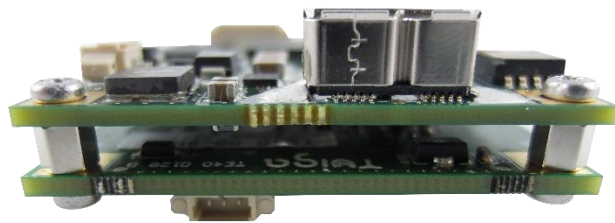
Note: Boards are connected via Hirose board-to-board connectors.



TV10 0083 USB 3.2 gen 1 Neo



TS10 0089 Add-on 4K



2.2. Power supply

There are two ways to power supply the board and camera:

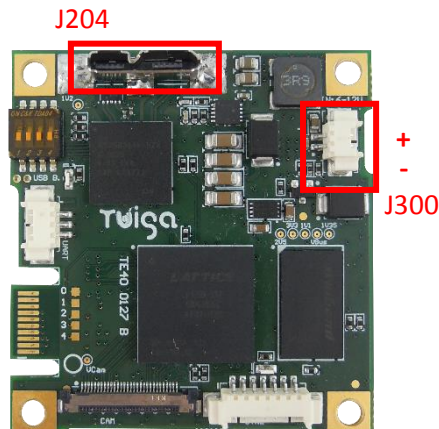
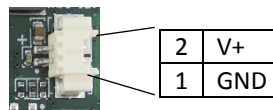
1. Via USB3 cable

J204: USB3 connector



2. External camera power supply (6V-12V): it can be useful if the USB power (1A) is not enough. You could need this external power if you are using a laptop.

J300: 2 ways external power supply connector



3. Getting started

You can consult our support website to find all information about USB3 Neo: <https://www.twiga-support.com/Documentation>, latest software, 3D file can be downloaded and a wiki will guide you through your first steps with the USB3 Neo. Feel free to contact us for further information.

3.1. Video stream

OS support:

- Windows 7 / Windows 8 / Windows 8.1 / Windows 10
- Linux (tested on Ubuntu 16.04)

Using Windows:

Use 4K compatible software to display the video:

- VLC (tested with 3.0.8): in Media select “Open a capture device” and chose TWIGA USB3 NEO as Video device name

Using Linux:

The board is automatically detected as a device video in /dev/, to found it use “ls /dev/”. By default, the device is called video0. To display the stream, you can use a Gstreamer pipeline:

```
gst-launch-1.0 v4l2src device=/dev/video0 ! autovideosink
```

Supported software:

- VLC
- Gstreamer
- OBS
- Debut from NCH Software
- Camera application on Windows
- Virtual Dub

3.1. Communication

There are two ways to communicate with the camera:

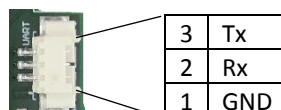
1. **CDC protocol:** it allows you to send commands (VISCA) to the camera through the USB3 cable. You can change video format, zoom, manage camera parameters such as focus, iris, shutter... You can use basic communication software (Termite) or specific software according to the camera block you use.

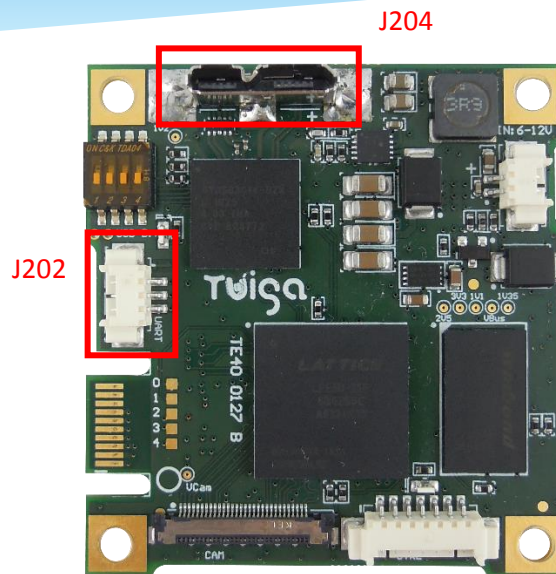
J204: USB 3 connector



2. **UART TTL:** you can also use the J202 connector to send VISCA commands to the camera.

J202: 3 ways UART TTL connector





Note: For custom application, you can also communicate via the board-to-board connector (J204 of the TS10 0089). These different communication ways have the same priority level.

On Windows:

The first time please refer to the driver installation procedure.

You can use Termite or putty to open the communication with the dedicated COM port and send VISCA commands.

On Linux:

The communication port is recognized on LINUX as a `/dev/ttyACMx` device, where `x` is the number of the device.

When a **ttyACM** device appears on Linux, some daemons software analyze it and it will not be available for 10sec. After that the device is released and the communication works as a COM Port on Windows.

You can use a serial communication terminal to send commands to the camera (e.g. `gtkterm`).

You can also use the “**echo**” command with a Linux terminal:

- Configure the tty with the correct baud rate: `stty 9600 -F /dev/ttyACMx`
- For checking the configuration use: `stty -a -F /dev/ttyACMx`
- Send commands like zoom plus as it `echo -en '\x81\x01\x04\x07\x02\xff' > /dev/ttyACMx` where `x` is the device number and `8101040702FF` the zoom in command in hexadecimal

3.2. Internal registers

You can access to internal registers via both communications (CDC and UART TTL).

To get a register value you need to send the command 0x82090420XXFF with XX the register you want to read.

To set a register to a new value you need to send the command 0x82010420XXYYFF with XX the register you want to modify and YY the value you want to set in the register.

Here a list of the registers available and their utility:

Utility	Register	Read / Write	Value
FPGA status	0x00	Read only	0bxxxxxx01: FPGA ok 0bxxxxxx10: unavailable format Else: not initialized
Format width low	0x01	Read only	Low part of the width
Format width high	0x02	Read only	High part of the width
Format height low	0x03	Read only	Low part of the height
Format height high	0x04	Read only	High part of the height
FPS low	0x05	Read only	Low part of the FPS
FPS high	0x06	Read only	High part of the FPS
Fx3 ready flag	0x11	Read only	0x00: not ready 0x01: ready
Led use (Please see the note)	0x13	Read / Write	0x00: standard flash 0x01: modified video format 0x02: start reinitialization 0x03: video detected 0x04: Hblank 0x05: Vblank 0x06: camera TX 0x07: camera RX 0x08: FX3 stream 0xFF: leds off
FPGA temperature	0x15	Read only	See Annex 1: FPGA temperature table
Firmware version minor	0x1E	Read only	Get the minor value of the software version
Firmware version major	0x1F	Read only	Get the major value of the software version
Serial number 1	0x36	Read only	Ascii value of the 1 st digit of the serial number (X0000)
Serial number 2	0x37	Read only	Ascii value of the 2 nd digit of the serial number (0X000)
Serial number 3	0x38	Read only	Ascii value of the 3 rd digit of the serial number (00X00)
Serial number 4	0x39	Read only	Ascii value of the 4 th digit of the serial number (000X0)
Serial number 5	0x3A	Read only	Ascii value of the 5 th digit of the serial number (0000X)

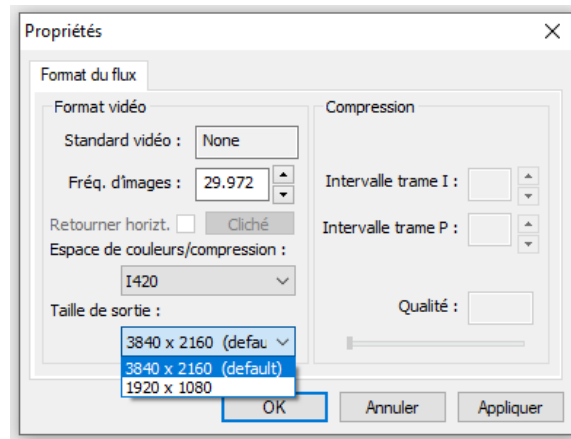
This is the answer format: 0x0A41FF0A5100XXFF with XX the read value for a get or the value written for a set.

For low and high registers, you need both to get the full value. For example, if the format width low returns 0x80 and format width high returns 0x07, the final value is 0x780 = 1920.

Note: to change the Leds use you need first to set the standard use to initialize (0x820104201300FF). Then you can send a second command with another use like Leds off (0x8201042013FFFF).

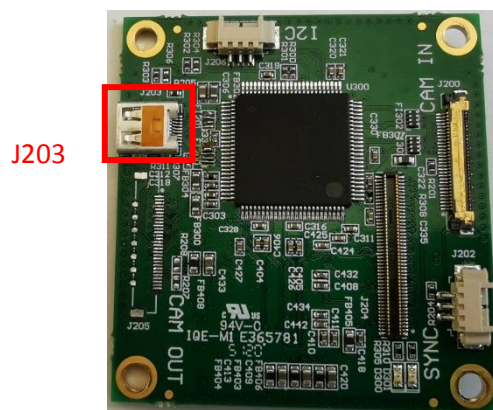
3.3. Downscaling and FPS change

You can use the UVC protocol to downscale from 4K to full HD and to change the FPS of the stream. Two video formats are available: 4K (3840x2160) and full HD (1920x1080). Five FPS setting are available: full fps, fps/2, fps/4, fps/8, and fps/16.



3.4. HDMI output

Twiga 4K to USB3 module features an HDMI output through J203 Micro HDMI connector. You can get a 4K video stream over any 4K compliant devices. HDMI 2.0 standard cable is recommended.

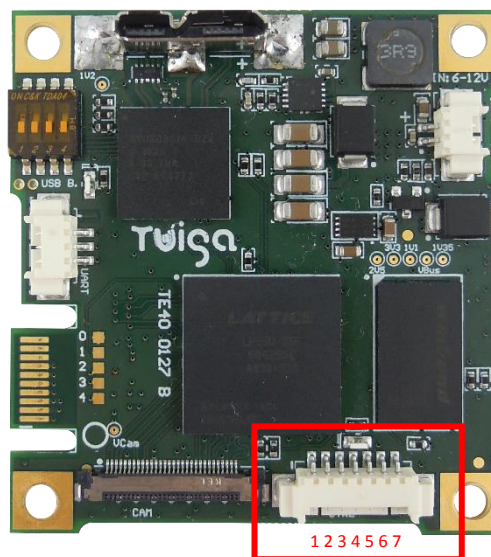


3.5. GPIOs

For each GPIO corresponds a VISCA command to send to the camera.

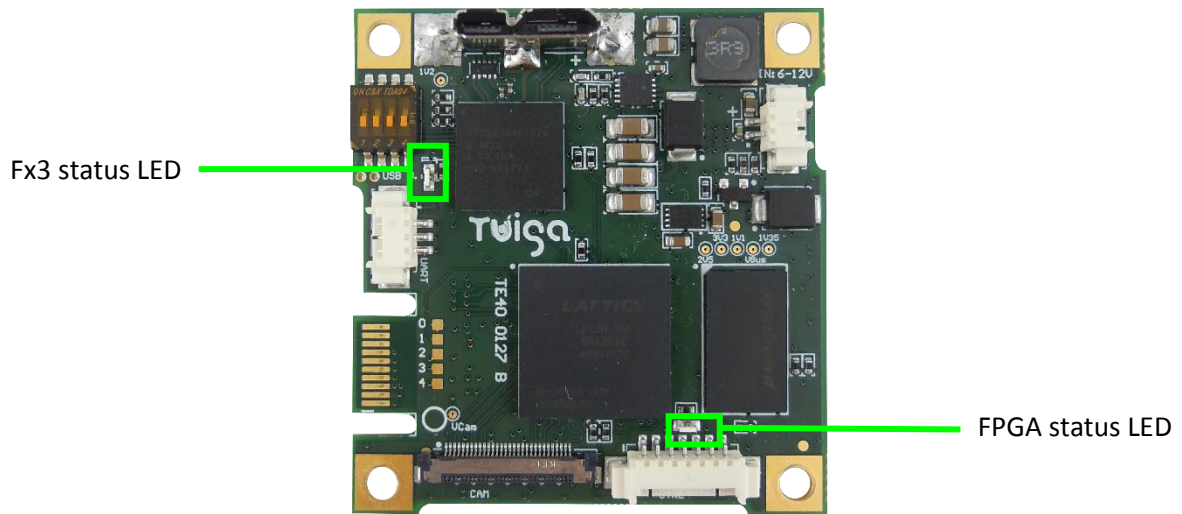
To active the GPIO you must connect it to GND.

J200 pin out	Function
1	GND
2	Zoom +
3	Zoom -
4	Focus Auto/Manual
5	Focus Near
6	Focus Far
7	Freeze On/Off



J200

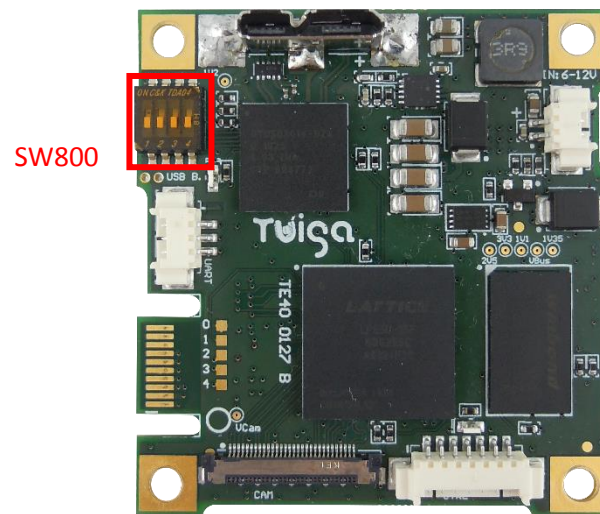
3.6. LED signalization



Number of Fx3 Status LED blink per 2 seconds	Meaning
1	Error
2	Communication error
3	Format error
4	Configuration ok

Number of FPGA Status LED blink per 3 seconds	Meaning
2	FX3 not detected
4	Video error
6	Configuration Ok

3.7. Multi switch



Switch number	Meaning
1	Unused
2	Unused
3	Unused
4	Unused

4. Annex

4.1. Annex 1: FPGA temperature table

Here the table to get the FPGA temperature (°C) from the value read in the register 0x15.

Register value read	FPGA temperature (°C)
0x00	-58
0x01	-56
0x02	-54
0x03	-52
0x04	-45
0x05	-44
0x06	-43
0x07	-42
0x08	-41
0x09	-40
0x0A	-39
0x0B	-38
0x0C	-37
0x0D	-36
0x0E	-30
0x0F	-20
0x10	-10
0x11	-4
0x12	0
0x13	4
0x14	10
0x15	21
0x16	22
0x17	23
0x18	24
0x19	25
0x1A	26
0x1B	27
0x1C	28
0x1D	29
0x1E	40
0x1F	50
0x20	60
0x21	70
0x22	76
0x23	80
0x24	81
0x25	82
0x26	83
0x27	84
0x28	85
0x29	86
0x2A	87
0x2B	88

0x2C	89
0x2D	95
0x2E	96
0x2F	97
0x30	98
0x31	99
0x32	100
0x33	101
0x34	102
0x35	103
0x36	104
0x37	105
0x38	106
0x39	107
0x3A	108
0x3B	116
0x3C	120
0x3D	124
0x3E	128
0x3F	132