IMAGO TECHNOLOGIES

Hardware Manual

Vision Sensor PV3
Vision Sensor LM
Vision Cam AI

Version 1.4 – September 2025

1 Handling and safety instructions

Depending on the operating conditions and mounting situation, the housing temperature can exceed 60 °C. There is a risk of injury!

***Universal Illumination Module*: Risk Group 2**

CAUTION. Possibly hazardous optical radiation emitted from this product. Do not stare at operating lamp. May be harmful to the eye.

EMC conformity according to EN/IEC 61000-6-2:2005 is qualified for cable lengths ≤ 30 m.

Electrical installation should be executed without power applied to the device and all connected devices.

Please take special note of the voltage range which may be applied to the device. Otherwise, permanent damage to the device may result!

Due to the characteristics and physical principles inside flash memory, **memory cards have a finite lifetime** dictated by the number of write operations.
Therefore, take care of the regular write operations to prevent an early flash damage.

2 Introduction

The heart of the Vision Sensor PV3 is a quad-core ARM Cortex-A53 SoC. We deliver the camera with a Debian based Linux OS, which gives the customer the capabilities to use popular Linux programs and libraries. Debian currently provides more than 40.000 packets. Therefore, the customer can use even very rare libraries in an easy way.

The Vision Sensor PV3 offers two digital inputs and four digital outputs. Furthermore, the Vision Sensor PV3 is available with different LED lighting options which can solve difficult lighting conditions.

The synergy of 2 MP and 5 MP sensors and the IMAGO Frame Grabber Library offer you a solid foundation for future machine vision applications.

2.1 Main features

- SoC: NXP i.MX8M Mini
  - 4× ARM Cortex-A53 1.8 GHz
  - 1 GB or 2 GB LPDDR4 RAM
- Image sensors
  - e2v Snappy 2 MP: 1920 × 1080 pixels
  - e2v Snappy 5 MP: 2560 × 1936 pixels
  - Sony IMX568 5 MP: 2472 × 2064 pixels
  - Monochrome or Bayer pattern
- 24 V_{DC} power supply
- Digital inputs / outputs
  - 4× digital output
  - 2× digital input
- Ethernet interface 1000 Mbit/s
- Main storage: µSD card (SD, SDHC, SDXC)
- Housing
  - Passive cooling without heat sink
  - S-Mount version with different lens options including Liquid Lens
  - C-Mount version
- Four integrated LEDs for S-Mount version
- S-Mount option: Universal Illumination Module (UIM)
  - Twelve high brightness LEDs
  - Four programmable LED channels for different lighting conditions
  - Adjustable LED current
- C-Mount option: LED ring light
  - Adjustable LED current
- Deep Learning accelerator option: Coral Edge TPU
- Optional I/O Expansion DIN rail module
  - Provides additional I/Os
  - Implements IMAGO's Real-Time Communication Controller

2.2 Configurations

The following table shows available features and interfaces for the different models of the Vision Sensor PV3:

	S-Mount		C-Mount	
Sensor	e2v Snappy 2 MP	Sony IMX568	e2v Snappy 2 MP e2v Snappy 5 MP	Sony IMX568
SoC	NXP i.MX8M Mini 4× Cortex-A53, 1.8 GHz			
RAM	2 GB (1 GB for early models)			
Main storage	µSD card ≥ 32 GB			
Ethernet	1× 1000 Mbit/s			
Dig. I/Os	2× IN / 4× OUT			
LED lighting	Four integrated LEDs		-	
Optional features	Universal Illumination Module (UIM)		LED ring light	
	Liquid Lens		Coral Edge TPU (4 TOPS)	-
	I/O Expansion DIN rail module			

2.3 Block diagram

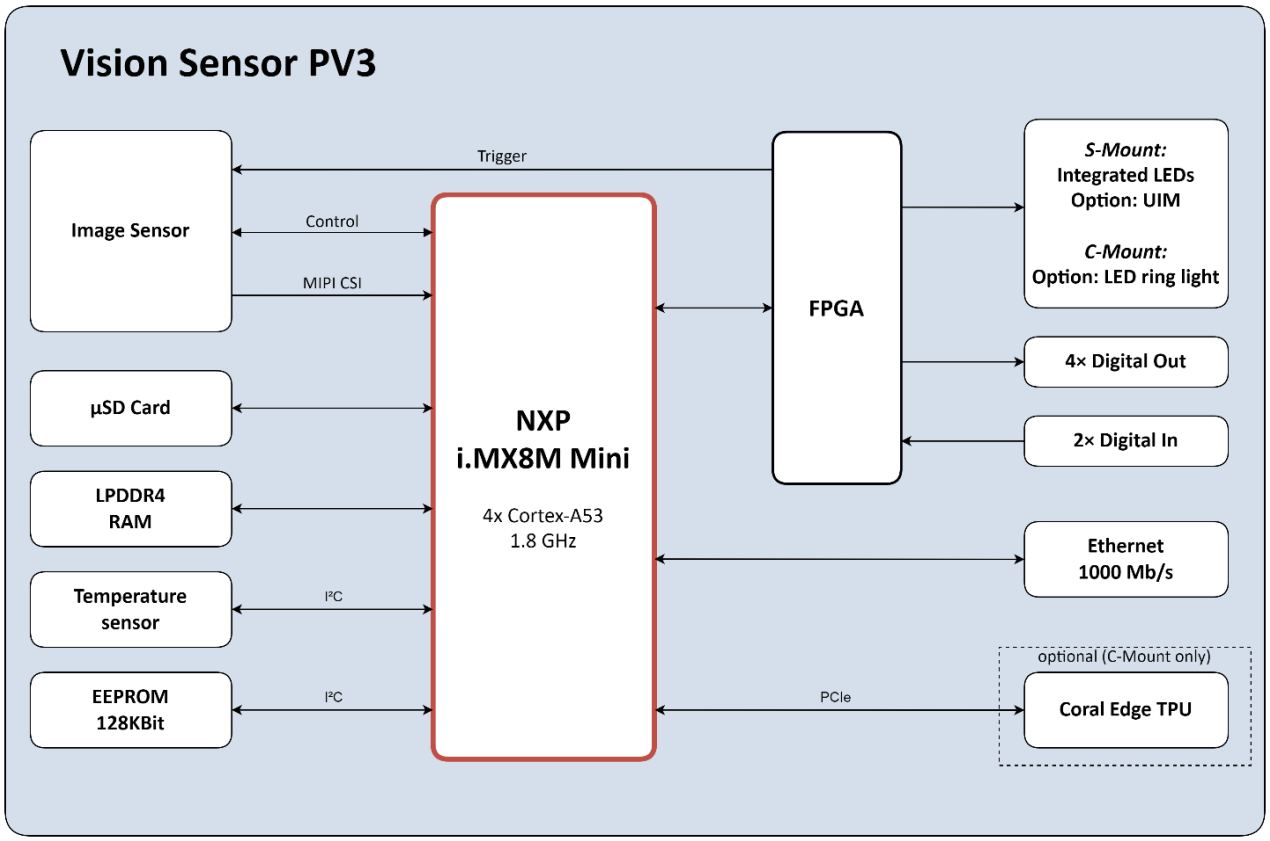


Figure 1: Vision Sensor PV3 block diagram

3 Operating Conditions

Power Supply:

Model	Supply voltage	Peak current at 24 V
S-Mount with integrated LED unit (four LEDs)	21…28 V	0.5 A
C-Mount standard		0.4 A
C-Mount with Coral Edge TPU		0.6 A
C-Mount with LED ring light (default LED current)		0.7 A
C-Mount with LED ring light (max. LED current)		1.8 A
S-Mount with Universal Illumination Module (max. LED current)	23…28 V	2.3 A

Environment:

Parameter	Value	Unit
Weight, including cable	125	g
Operating temperature	5 … 45	°C
Operating humidity, relative, non-condensing	5 … 95	%
Storage temperature	-30 … +70	°C
Storage humidity, relative, non-condensing	5 … 95	%

Digital Input:

Parameter	Min.	Typ.	Max.	Unit
Input voltage range	0		25	V
Rising edge threshold voltage	7.4		9.4	V
Falling edge threshold voltage	4.7		6.3	V
Input resistance		15.5		kΩ

Digital Output:

Parameter	Min.	Typ.	Max.	Unit
Output current			50	mA
Output high voltage		V_{Supply} - 0.2		V

4 Status LEDs

The Vision Sensor PV3 is equipped with two dual-color status LEDs. The meaning of each LED is listed in the tables below.

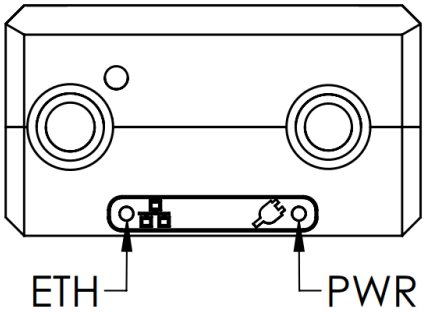


Figure 2: Status LEDs

PWR LED	State
Off	Power off
Green	Power on
Red	Digital IN0 signal is high

Table 1: PWR LED states

ETH LED	State
Green	Ethernet link is up
Red	Ethernet activity

Table 2: ETH LED states

5 Interfaces

5.1 Power and I/O

A non-shielded, 0.5 meter cable with an M12 8-pin connector is used for power supply and I/O signals.

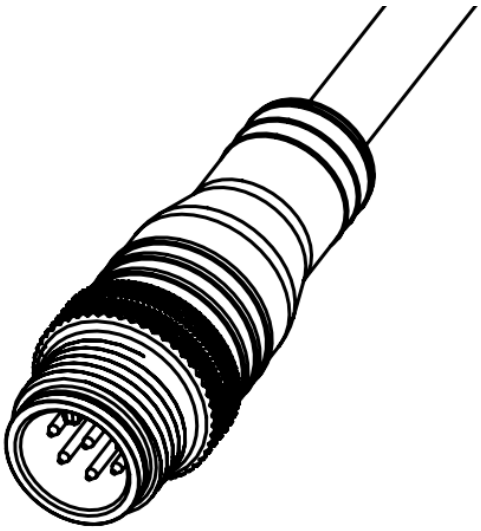


Figure 3: Power supply and I/O cable

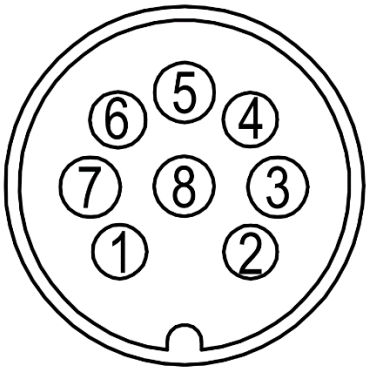


Figure 4: Pin assignment M12 connector

Pin	Function
1	Power Supply (+)
2	GND
3	Digital IN0
4	Digital IN1
5	Digital OUT3
6	Digital OUT0
7	Digital OUT1
8	Digital OUT2

Table 3: Pin assignment M12 connector

5.1.1 Digital I/Os

The following illustration shows the electrical equivalent circuit for the digital input and output signals:

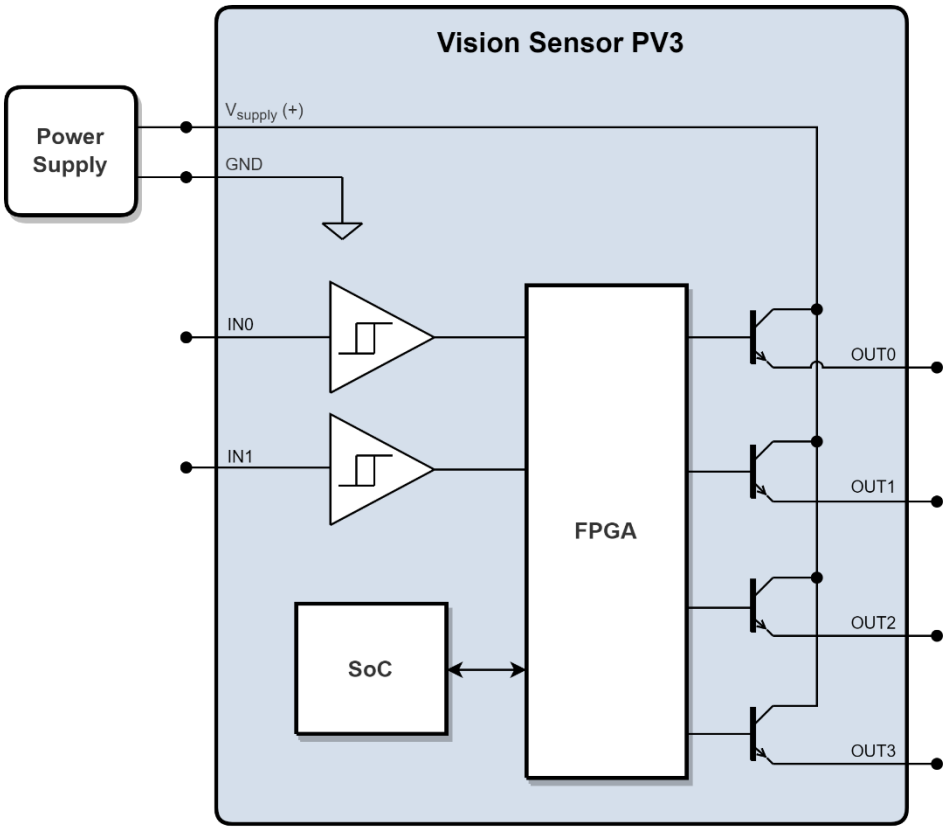


Figure 5: Simplified digital I/O circuit

The input signals use a Schmitt trigger circuit with the power supply GND as voltage reference.

The digital output circuit uses open-emitter configuration. All outputs are driven by the power supply voltage.

5.2 1000 Mbit/s Ethernet

A shielded 0.5 m Ethernet cable with a M12 8-pin X-coded connector is used for the 1000BASE-T interface.

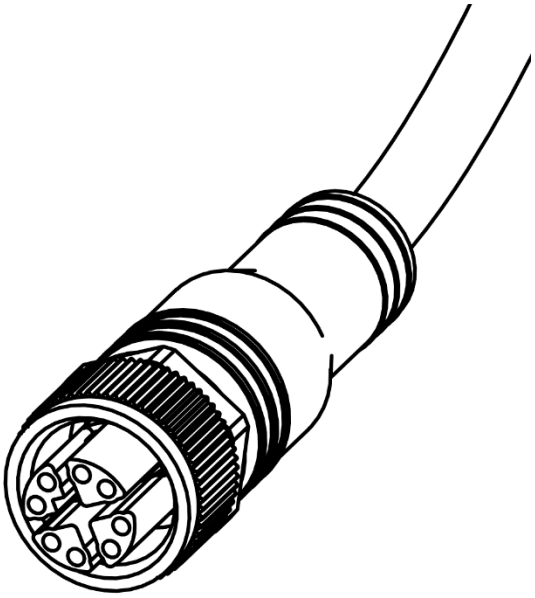


Figure 6: Ethernet cable

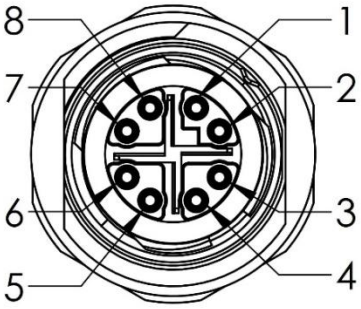


Figure 7: Pin assignment M12 connector

PIN	Function
1	D1+
2	D1-
3	D2+
4	D2-
5	D4+
6	D4-
7	D3-
8	D3+

Table 4: Pin assignment M12 connector

We recommend using shielded cables, for example:

Length	Product	IMAGO order code
1 m	Phoenix contact 1407471 “NBC-MSX/ 1,0-94F/R4AC SCO”	10007049
2 m	Phoenix contact 1407472 “NBC-MSX/ 2,0-94F/R4AC SCO”	10007050
5 m	Phoenix contact 1407473 “NBC-MSX/ 5,0-94F/R4AC SCO”	10008076

6 Image sensors

This chapter will give you a short overview of the available sensors for the Vision Sensor PV3. On the next pages, you will find more detailed information for each sensor.

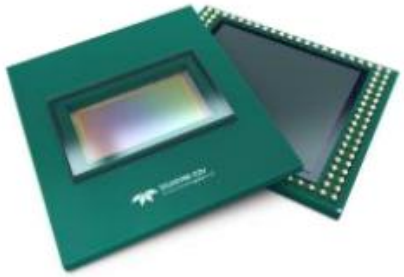
	e2v Snappy 2M EV2S02MB / EV2S02MC	e2v Snappy 5M EV2S05MB / EV2S05MC	Sony Pregius S IMX568
Size	1/3”	1/1.8”	
Resolution	1920 × 1080	2560 × 1936	2472 × 2064
Framerate (full resolution)	115 fps	54 fps	96 fps
Framerate (VGA)	256 fps	262 fps	337 fps
Type	Monochrome or Bayer pattern		

Table 5: Sensor overview

6.1 e2v Snappy

Overview:

- 2 M-pixel and 5 M-pixel version available
- Monochrome or RGB Bayer pattern
- Global shutter
- Partial scan function (ROI) to increase frame rate
- 12-bit ADC with 8-bit image readout
- External synchronization via digital inputs
- Easy-to-use software API

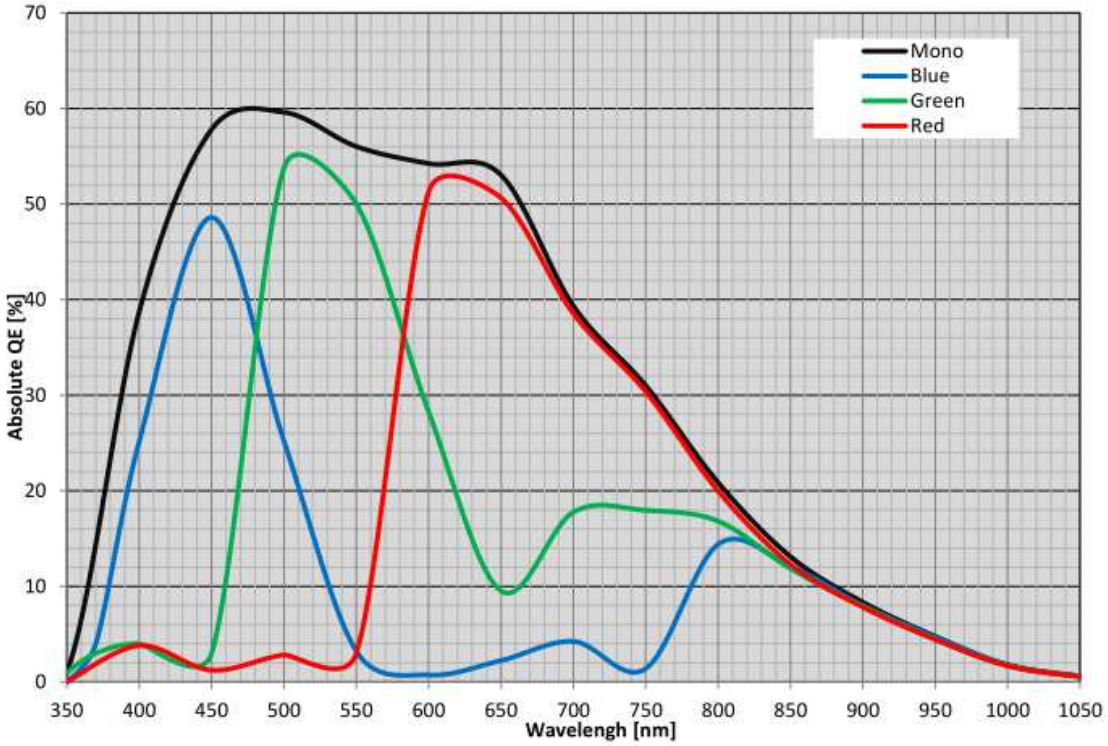


Details:

		EV2S02M	EV2S05M
Sensor	Technology	CMOS	
	Sensor Size	1/3"	1/1.8"
	Resolution	1920 x 1080 pixels	2560 × 1936 pixels
	Framerate (full resolution)	115 fps	54 fps
	Partial Scan	Yes	
	Color	Monochrome or Bayer pattern	
	Pixel Size	2.8 µm x 2.8 µm	
	A/D Converter	12-bit ADC with 8 bit image readout	
	Exposure	16 µs … 0.5 s	19 µs … 0.5 s

Trigger	Acquisition Modes	Global shutter with overlapped integration and readout
	Trigger Modes	Free run, SW trigger or HW trigger
	Exposure Indicator Output	Controlled by software

Quantum Efficiency



Note for RGB sensors:

An IR cut-off filter in the optical path is necessary to obtain good color separation when using light with an NIR component.

6.2 Sony IMX568

Overview:

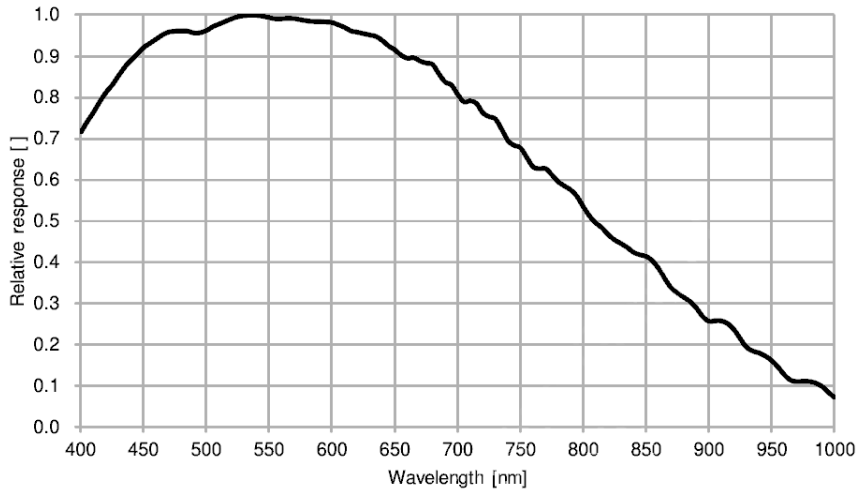
- 5 M-pixel Monochrome or RGB Bayer pattern
- Global shutter
- Partial scan function (ROI) to increase frame rate
- 10-bit ADC with 8-bit image readout
- External synchronization via digital inputs
- Easy-to-use software API

Details:

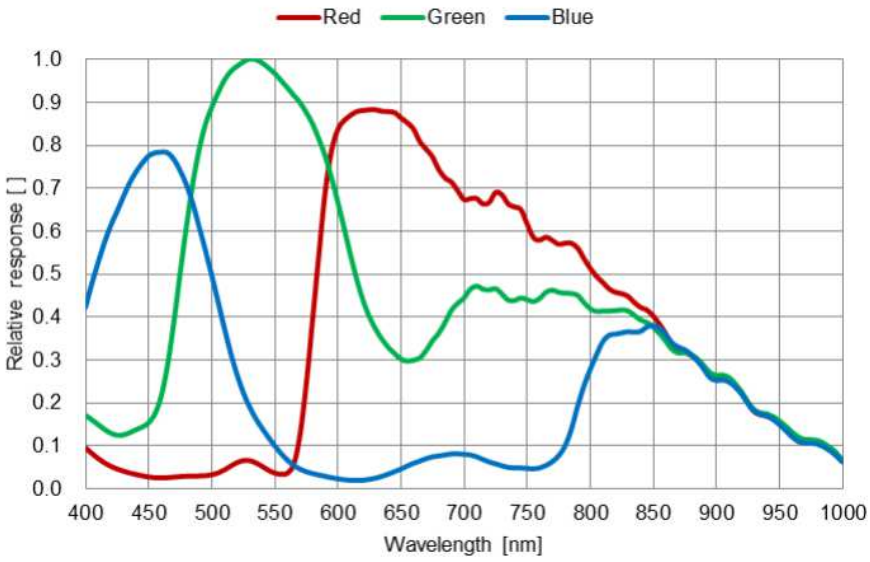
Sensor	Technology	CMOS
	Sensor Size	1/8"
	Resolution	2572 x 2064 pixels
	Framerate (full resolution)	96 fps
	Partial Scan	Yes
	Color	Monochrome or Bayer pattern
	Pixel Size	2.74 µm x 2.74 µm
	A/D Converter	10-bit, with linear or compressed mapping to 8 bit
	Analog Gain	0 … 24 dB

Trigger	Acquisition Modes	Global shutter Overlapped integration and readout in free-run mode
	Trigger Modes	Free run, Software trigger, Hardware trigger
	Exposure Indicator Output	Controlled by software

Total Quantum Efficiency – Monochrome sensor



Color Filter Response – Color sensor



Note for RGB sensor:

An IR cut-off filter in the optical path is necessary to obtain good color separation when using light with an NIR component.

7 Optional features

7.1 Lighting

The following lighting options are available:

	Integrated LEDs	Universal Illumination Module	Ring Light
Device model	S-Mount	S-Mount	C-Mount
Number of LEDs	4	12 / four channels	6
LED color	White	White	White
LED current	Constant	Adjustable	Adjustable[1]
Flash duration	Same as sensor exposure	Programmable for each channel (1 µs … 16.3 ms)	Same as sensor exposure
Duty cylce at max. current	25%	Channel 0/1: 12.5% Channel 2/3: 6.25%	16%

Table 6: Lighting options

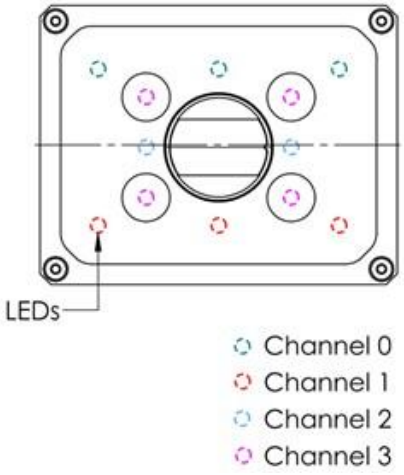
[1] The LED current is not adjustable for old hardware revisions. New hardware revisions can provide higher current settings. The default setting is comparable to the old revision for software compatibility.

7.1.1 Universal Illumination Module

Risk Group 2

CAUTION. Possibly hazardous optical radiation emitted from this product. Do not stare at operating lamp. May be harmful to the eye.

The Universion Illumination Module provides four programmable LED channels:



A diffuser is used for LED channels 0…2 to create uniform illumination. Channel 3 uses four focused LED spots. A polarizer option is also available.

A programmable sequencer controls the activity and flash duration for each channel.

All channels use the same LED current setting. The current may be reduced if multiple channels are active simultaneously. Two of the channels 0…2 may be active simultaneously to achieve maximum current.

7.2 Liquid Lens (S-Mount)

The plane of focus for the Liquid Lens is controlled by software. The algorithm is implemented in the *ViewIT* software. For custom applications, the algorithm must be implemented by the user.

Note

The plane of focus depends on the temperature of the device. Therefore, the lens must be adjusted regularly by the application.

7.3 I/O Expansion module

The Vision Sensor I/O Expansion is a DIN rail module which can be connected to the Vision Sensor PV3. It provides additional I/Os and implements IMAGO's Real-Time Communication Controller.

The device is connected to the Power and I/O cable of the Vision Sensor. The I/O Expansion module provides power to the Vision Sensor. The digital I/O signals between both devices are used for internal communication and for transmission of trigger signals.

A standard M12-8 A-coded extension cable up to 20 meters can be used to allow long distance between the Vision Sensor and the I/Os.

Refer to the Hardware Manual for the I/O Expansion module for more information.

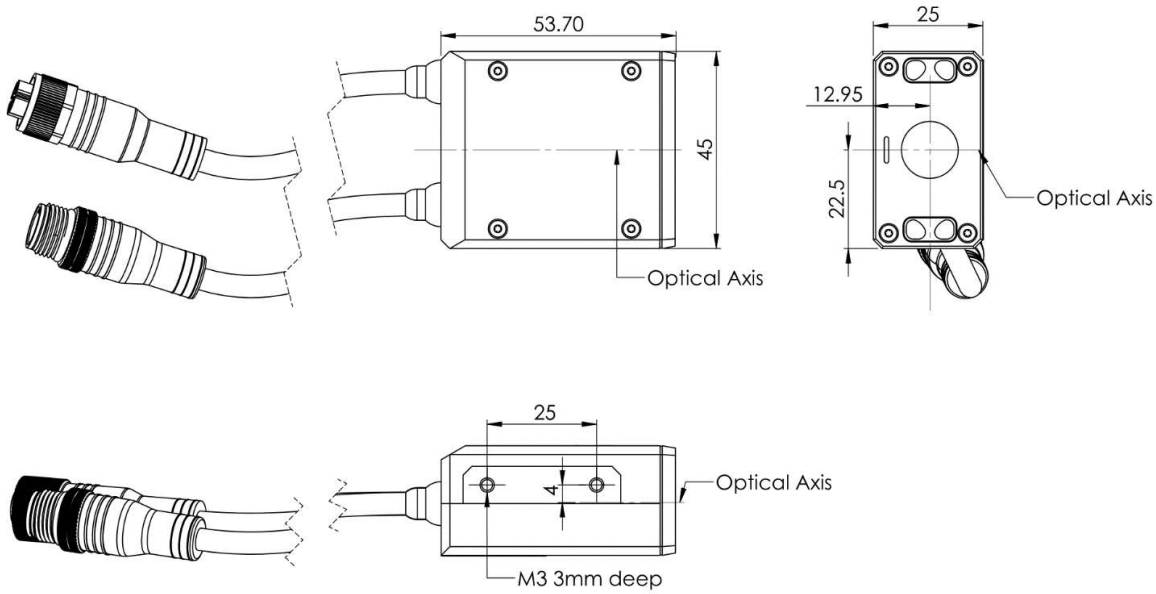
7.4 Coral Edge TPU

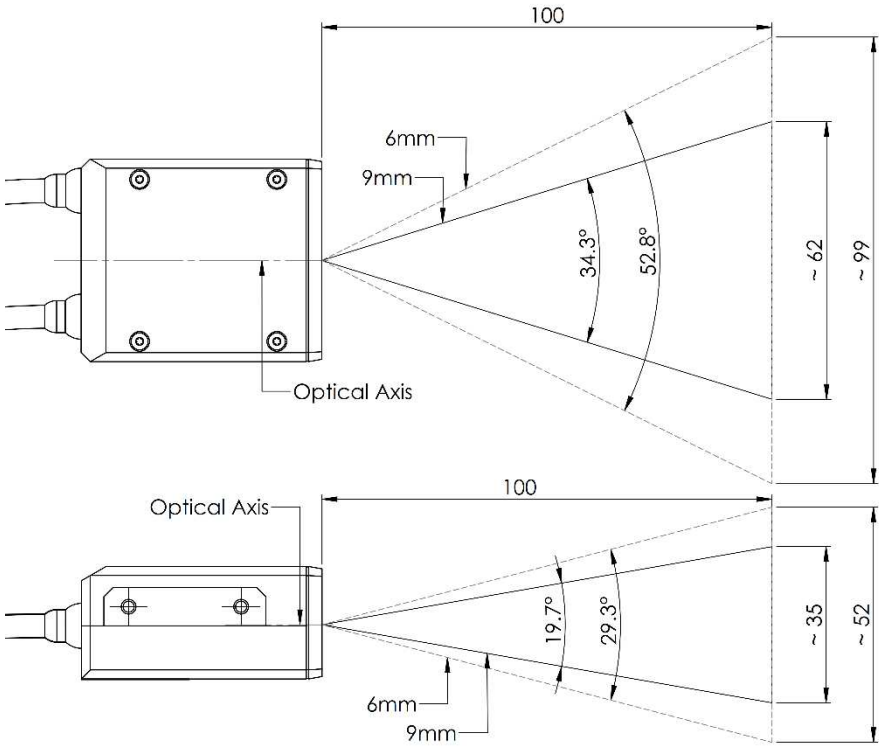
The Vision Cam AI includes the Coral Edge TPU for acceleration of Machine Learning inferencing. The power efficient TPU can compute 4 trillion operations per second (TOPS) and supports TensorFlow Lite models.

8 Mechanical information

8.1 S-Mount

8.1.1 Mechanical drawing





8.1.2 Focus adjustment

Note

Mechanical focus adjustment is not provided for the Liquid Lens option.

To adjust the focus, the hexagon socket set screw located on the back of the camera must be removed:

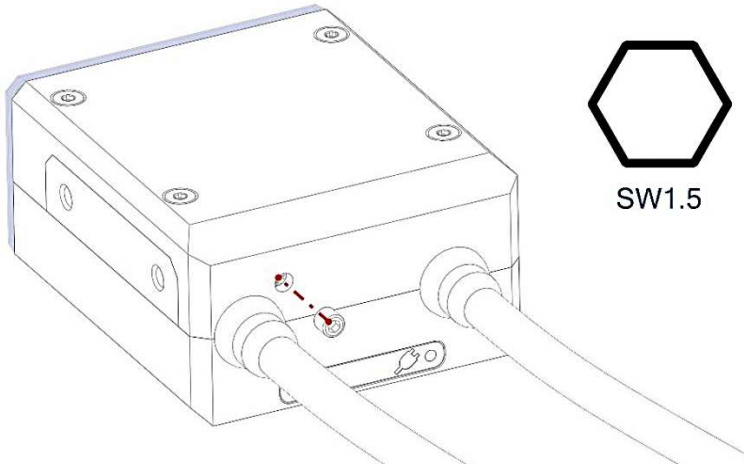


Figure 8: Removing the hexagon socket set screw

Screw clockwise to bring the plane of focus closer to the camera. Screw counterclockwise to bring the plane of focus away from the camera.

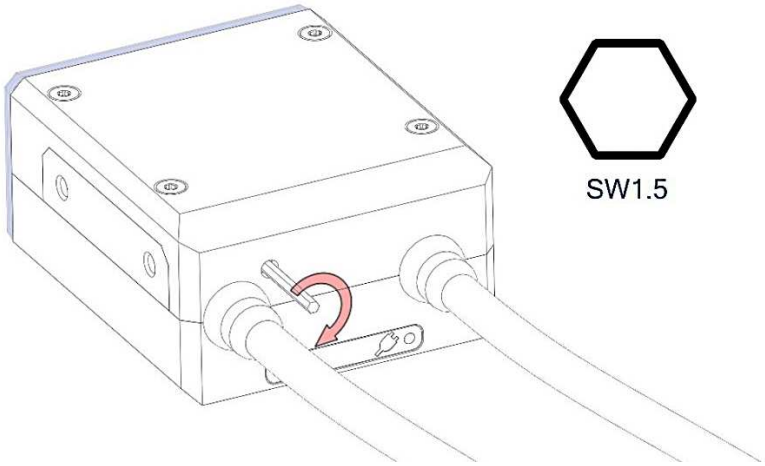


Figure 9: Adjusting the focus

8.1.3 SD Card access

Note

Access to the µSD card is only provided for the S-Mount version without Universal Illumination Module.

Every Vision Sensor is shipped with a preinstalled µSD card containing the Linux operating system. Software updates are normally installed remotely over Ethernet.

First, the lens / LED cover must be removed as shown in the picture below:

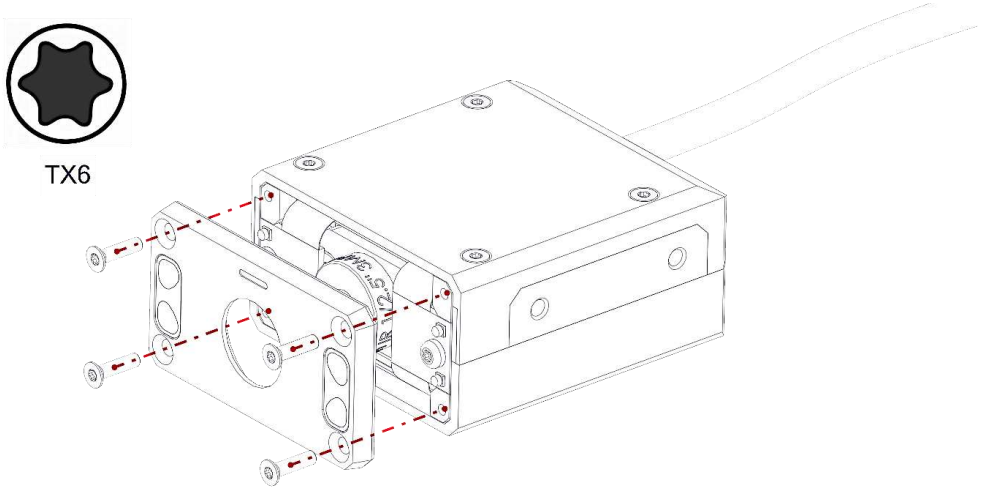


Figure 10: Removing the lens / LED cover

Push the µSD card carefully to release it from the socket:

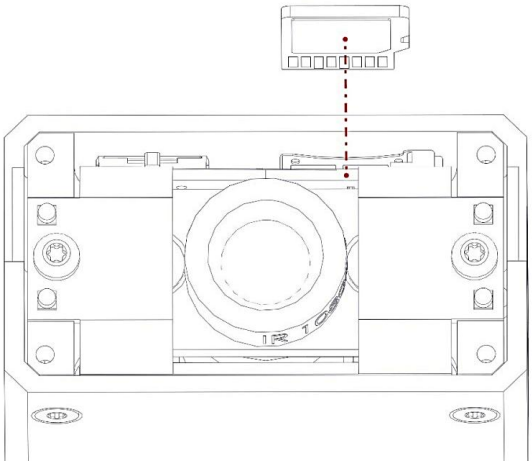
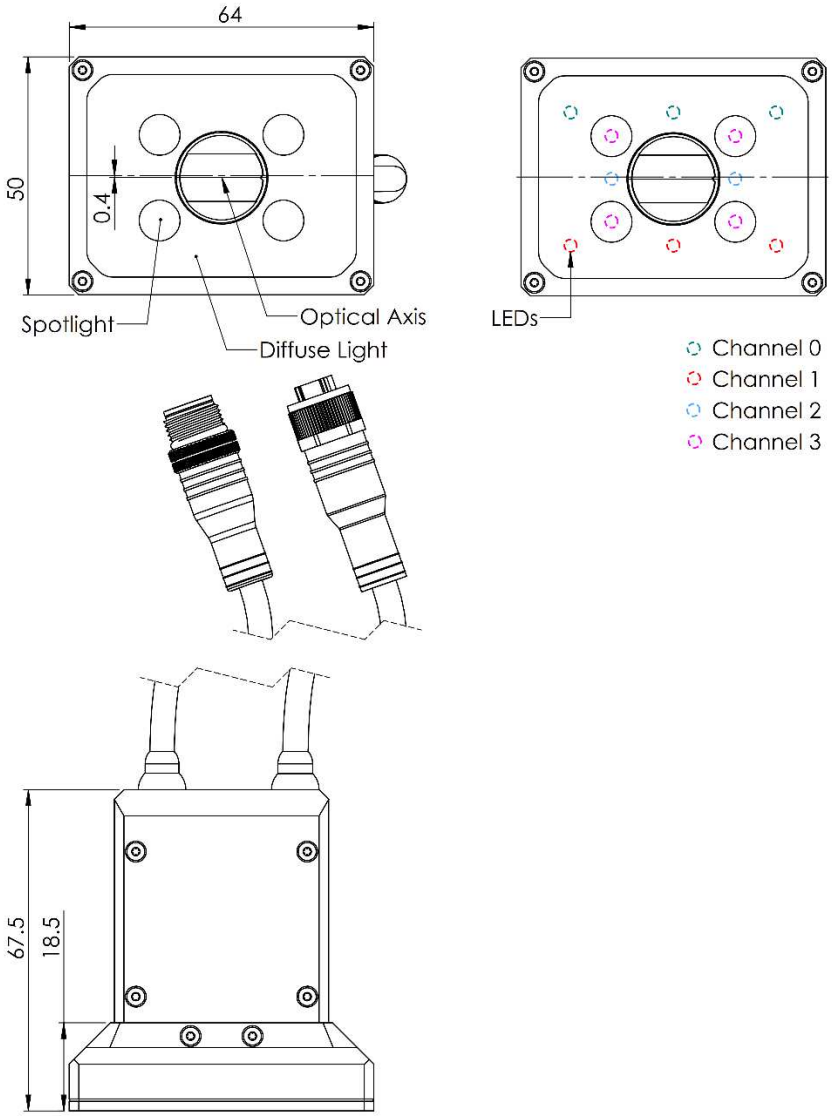


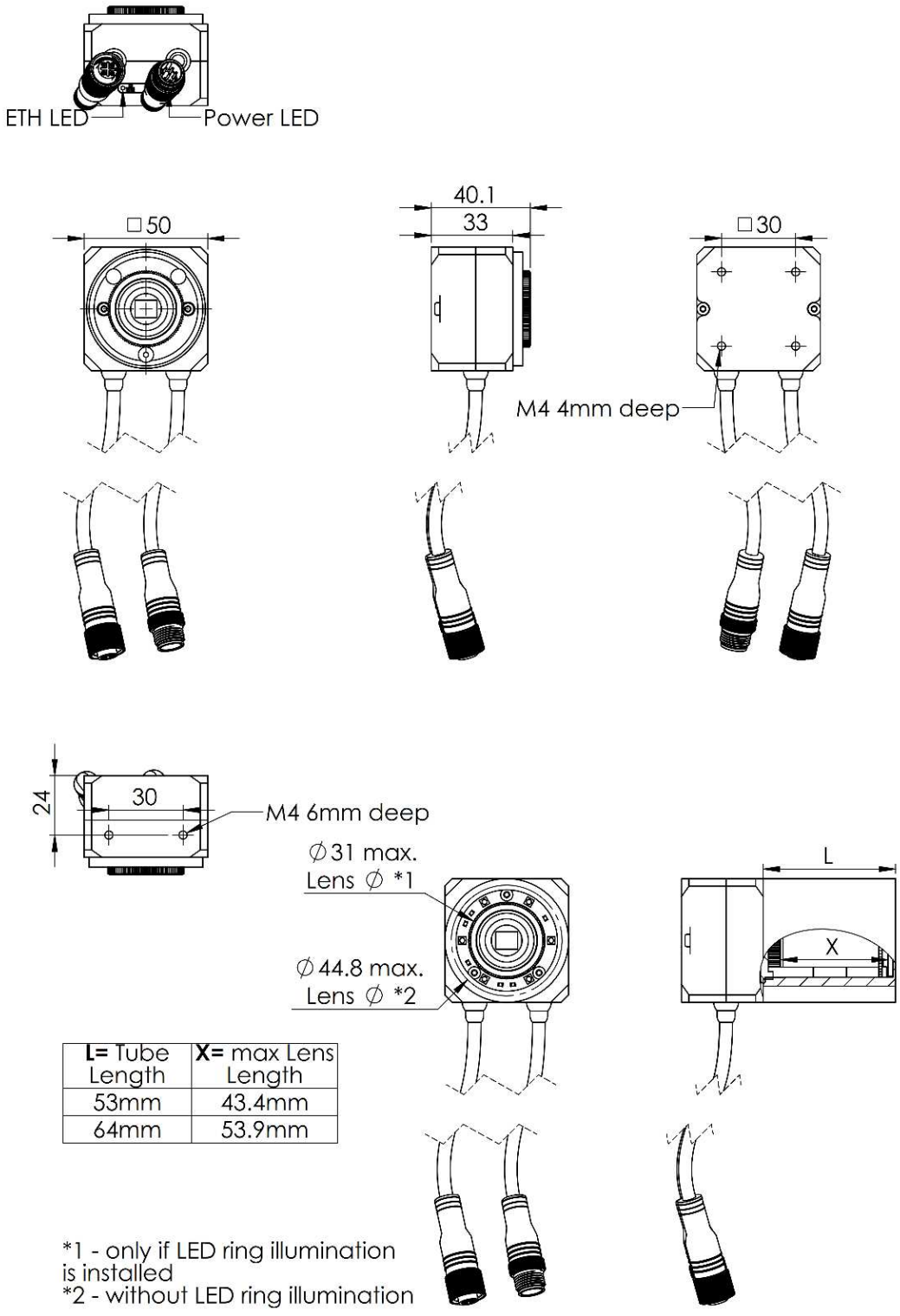
Figure 11: Changing the µSD card

8.1.4 Universal Illumination Module



8.2 C-Mount

8.2.1 Mechanical drawing



L= Tube Length	X= max Lens Length
53mm	43.4mm
64mm	53.9mm

*1 - only if LED ring illumination is installed
*2 - without LED ring illumination

9 Support

Finally, if you have any open questions, the IMAGO support team is happy to assist you in any cases. For direct contact to the support, please use the ticket system: https://imago-technologies.com/rma/

Visit the IMAGO Download Portal to get access to the latest SDKs, documentation, and Linux releases: https://imago-technologies.com/technical-documentation/

Software documentation is available at https://api.imago.tech.

10 Document history

Revision	Date	Changes
1.4	September-2025	- Add Sony IMX568 sensor
1.3	May-2024	- Add Universal Illumination Module - Add Liquid Lens - Add I/O Expansion Module - Add power supply operating conditions for different configurations - Update Snappy 5 MP information
1.2	January-2021	- Add Snappy 5 MP version - Update Operating conditions
1.1	August-2020	- Added new drawings and C-Mount version
1.0	June-2020	- First release