

SOPHIA® 2048 CCD CAMERA

KEY FEATURES

- Large 2048 x 2048 sensor
- Teledyne e2V CCD42-40 or CCD230-42 sensor options
- Balanced 13.5 μm or 15 μm pixel options to maximize sensitivity
- Back-illuminated CCD with > 95% peak QE
- Liquid or air cooling down to -90 °C for low dark current
- ArcTec™ deep cooling
- High frame rates with up to 4-port readout
- Ultra-low 2 e⁻ read noise
- Ultra-flexible performance
- Complete triggering support
- Independently optimized clocking
- Field-replaceable internal mechanical shutter

TYPICAL APPLICATIONS

- Semiconductor failure analysis
- Astronomy
- Photometry
- Laser beam profiling
- Luminescence and fluorescence
- *In vivo* imaging
- Nanotechnology characterization

RELIABILITY

- One-year warranty
- Lifetime vacuum guarantee

Ultra-Low-Noise, Ultra-Large-Format CCD Camera

The SOPHIA® family of CCD cameras represents a breakthrough in high-performance CCD cameras designed from the ground up for the most demanding low-light applications. SOPHIA CCD cameras feature ultra-low-noise electronics, high sensitivity 95% quantum efficiency sensors, high-speed readout, and flexibility with multi-port readout capabilities up to 16 MHz. Additionally, they incorporate ArcTec™ technology, allowing for thermoelectric cooling without the need for chillers or cryocoolers.

This model is the SOPHIA 2048, which features either a Teledyne e2v CCD42-40 or CCD230-42, both 2048 x 2048 sensor arrays with a 13.5 μm or 15 μm pixels respectively. SOPHIA CCDs feature a large sensor with proprietary 2-port and 4 port readout modes, ultra-high-vacuum all-metal seal design for deep cooling, and the latest UHV technology with industry-standard CF interface.



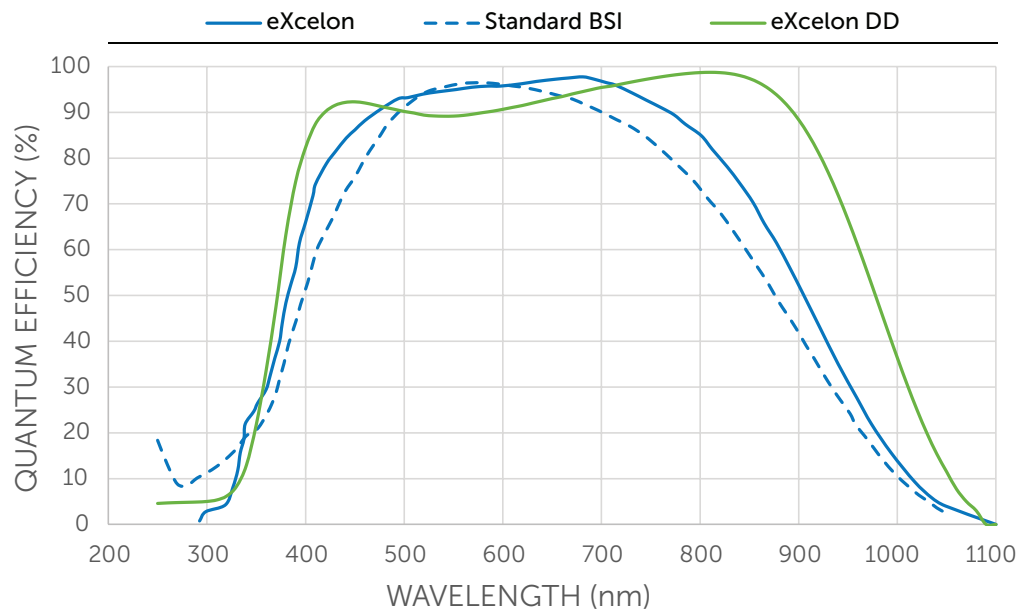
SOPHIA 2048 SPECIFICATIONS

SPECIFICATIONS	SOPHIA 2048-132	SOPHIA 2048-154
CCD Sensor Format	Teledyne e2v CCD42-40, Grade 1	Teledyne e2v CCD230-42, Grade 1
	Front/back-illuminated with eXcelon® coating; UV-optimized and deep-depleted options available	
Active Array Size	2048 x 2048 pixels	
Pixel Area	13.5 μm x 13.5 μm (182.25 μm^2)	15 μm x 15 μm (225 μm^2)
Sensor Area	27.6 mm x 27.6 mm (39 mm diagonal)	30.7 mm x 30.7 mm (43.4 mm diagonal)
Spectral Response	250 – 1100 nm	
Full Well Capacity	> 100,000 e ⁻ (single pixel)	> 150,000 e ⁻ (single pixel)
ADC Rates	8 MHz, 2 MHz, 200 kHz	16 MHz, 4 MHz, 400 kHz
Non-linearity	<1% @ 100 kHz	
System Read Noise (per port) (typical)	3.5 e ⁻ @ 100 kHz 7.0 e ⁻ @ 1 MHz 19 e ⁻ @ 4 MHz	3.6 e ⁻ @ 100 kHz 8.0 e ⁻ @ 1 MHz 22 e ⁻ @ 4 MHz
Dark Current (typical)	0.0001 e ⁻ /p/s @ -90 °C	0.00025 e ⁻ /p/s @ -90 °C
Cooling Options	Thermoelectric air or liquid cooling (liquid chiller required) < -90 °C (typical) with air or liquid	
Thermostating Precision	±0.05 °C across temperature range	
Vertical Shift Speed	24 μsec /row (programmable)	
Software Selectable Gains	1, 2, 4 e ⁻ /ADU (low-noise input, typical)	
I/O Signals	Two MCX connectors for programmable frame readout, shutter, trigger in	
Output Interface	USB 3.0 (5 m cable provided) Optional fiberoptic interface available for remote operation	
Digitization	16-bit	
Operating Temperature Range	5 °C to 30 °C (non-condensing)	
Camera Weight	14.3 lbs, 6.5 kg	
Camera Dimensions	251.6 x 129 x 142.8 mm (H x W x D)	
Bake-out Temperature	70 °C (maximum)	
Certification	CE	
Lens Mount	F-Mount with integral 45 mm shutter	

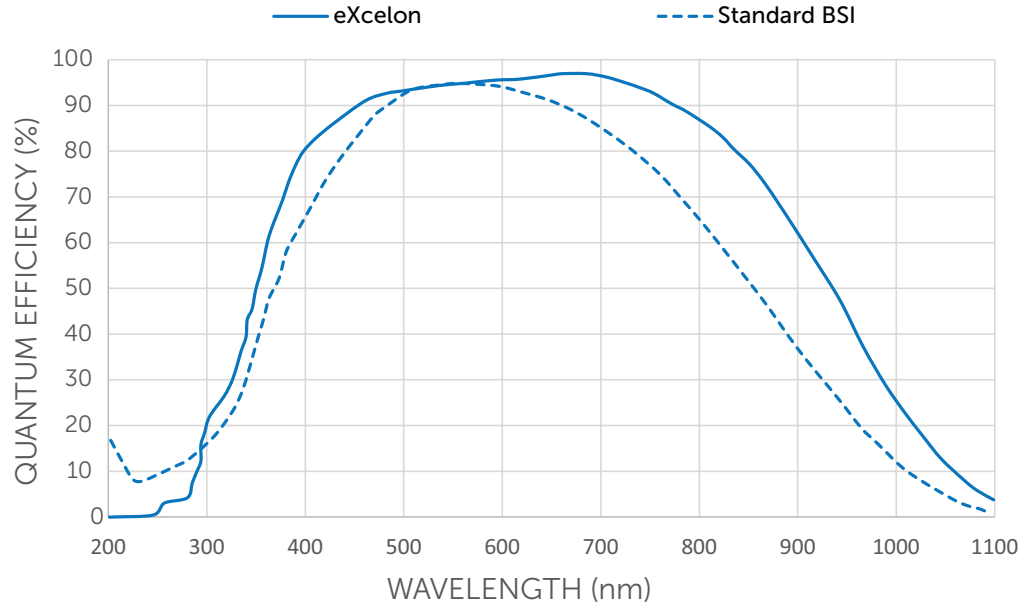
SOPHIA 2048 FRAME RATES

	SOPHIA 2048-132			SOPHIA 2048-154		
Binning	8 MHz	2 MHz	100 kHz	16 MHz	4 MHz	100 kHz
1 x 1	1.35	0.43	0.05	3.2	0.9	0.09
2 x 2	2.82	1.34	0.18	7.4	2.9	0.33
4 x 4	3.76	2.82	0.65	14.3	7.7	1.05
8 x 8	4.30	3.76	1.82	22.2	15.4	2.9

SOPHIA 2048-132 QE CURVES

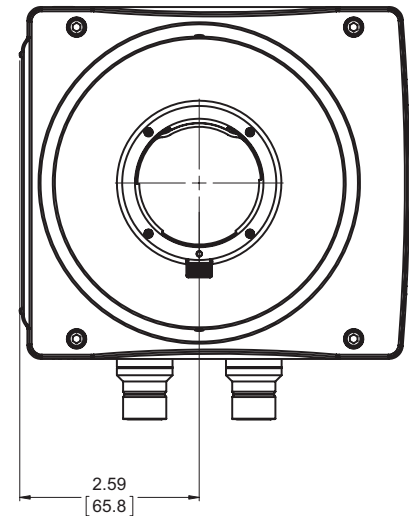
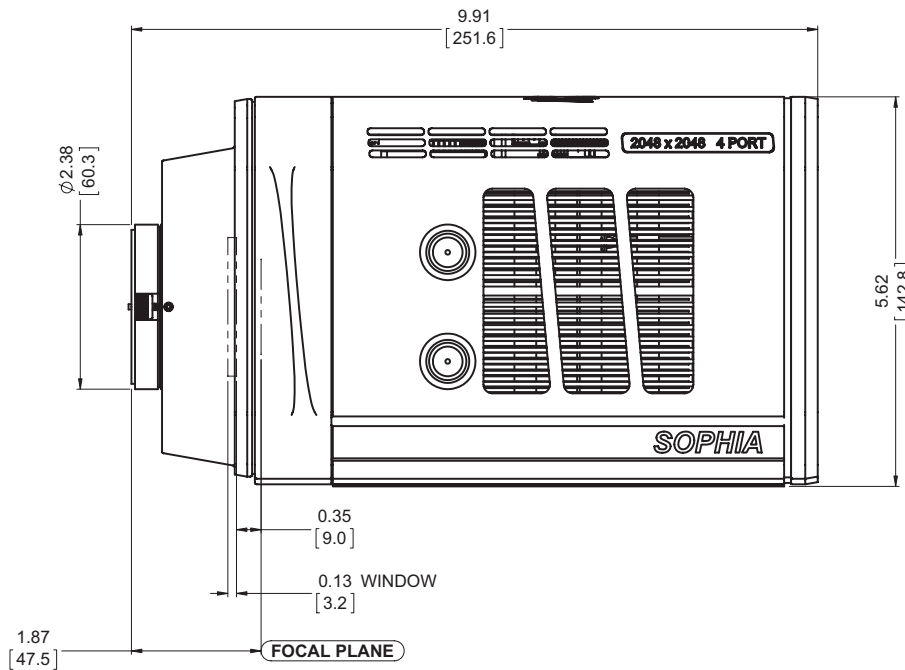
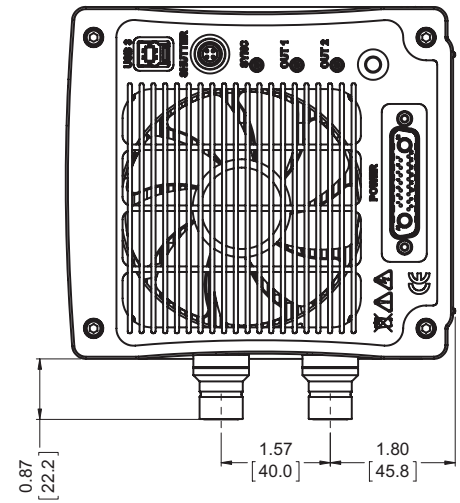
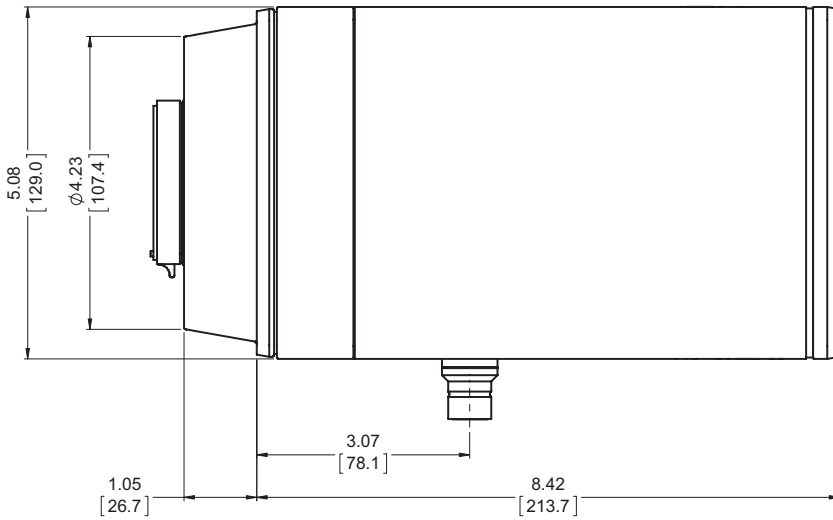


SOPHIA 2048-154 QE CURVES



SOPHIA 2048 ACCESSORIES

AIR COOLING ACCESSORIES (included)		LIQUID COOLING ACCESSORIES (included)	
Power supply/cables	Data acquisition software	Power supply/cables	Coolant hoses
MCX to BNC cables (x3)	Certificate of Performance	MCX to BNC cables (x3)	Certificate of Performance
USB 3.0 interface cable		USB 3.0 interface cable	Data acquisition software
		External coolant circulator	

DIMENSIONAL OUTLINES (Unit: mm)

FOR MORE INFORMATION REACH OUT ONLINE:

CONTACT US: www.teledynevisionsolutions.com/contact/contact-us

FOR OEM INQUIRIES: www.teledynevisionsolutions.com/solutions/custom-oem

CONTACT SUPPORT: www.teledynevisionsolutions.com/support/support-center

Specifications in this datasheet are subject to change.
Refer to the Teledyne Princeton Instruments website for most current specifications.

Copyright © 2026 Teledyne Princeton Instruments, Inc.
All rights reserved.

Revision Date: 2026 07 29

SOPHIA® 4096 CCD CAMERA

KEY FEATURES

- Huge 4096 x 4096 sensor
- Large 15 μm pixels to maximize sensitivity
- Back-illuminated CCD with > 95% peak QE
- Liquid or air cooling down to -90 °C for low dark current
- ArcTec™ deep cooling
- High frame rates with up to 4-port readout
- Ultra-low 2 e⁻ read noise
- Ultra-flexible performance
- 18-bit digitization
- Complete triggering support
- Large dynamic range
- Multi-TEC design

TYPICAL APPLICATIONS

- Fluorescence imaging
- Astronomy
- Luminescence and Fluorescence
- *In vivo* imaging
- Nanotechnology characterization

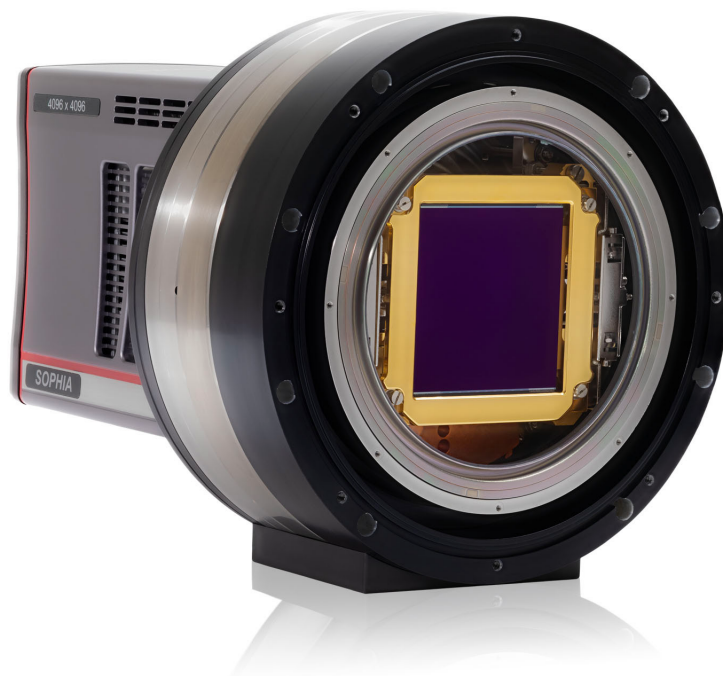
RELIABILITY

- One-year warranty
- Lifetime vacuum guarantee

Ultra-Low-Noise, Ultra-Large-Format CCD Camera

The SOPHIA® family of CCD cameras represents a breakthrough in high-performance imaging, designed from the ground up for the most demanding low-light applications. SOPHIA CCD cameras feature ultra-low-noise electronics, high-sensitivity sensors with 95% quantum efficiency, high-speed readout, and flexibility with multi-port readout capabilities up to 4 MHz. Additionally, they incorporate ArcTec™ technology, allowing for thermoelectric cooling without the need for chillers or cryo coolers.

The SOPHIA 4096 model boasts a massive 4096 x 4096 sensor array with 15 μm pixels. This camera includes all the breakthrough features of the SOPHIA line, along with an improved optical design featuring a field flattener to reduce the window-to-CCD distance, repeatable CCD positioning, a multi-TEC design, and an expansive 86.8 mm diagonal sensor size for high-throughput imaging.



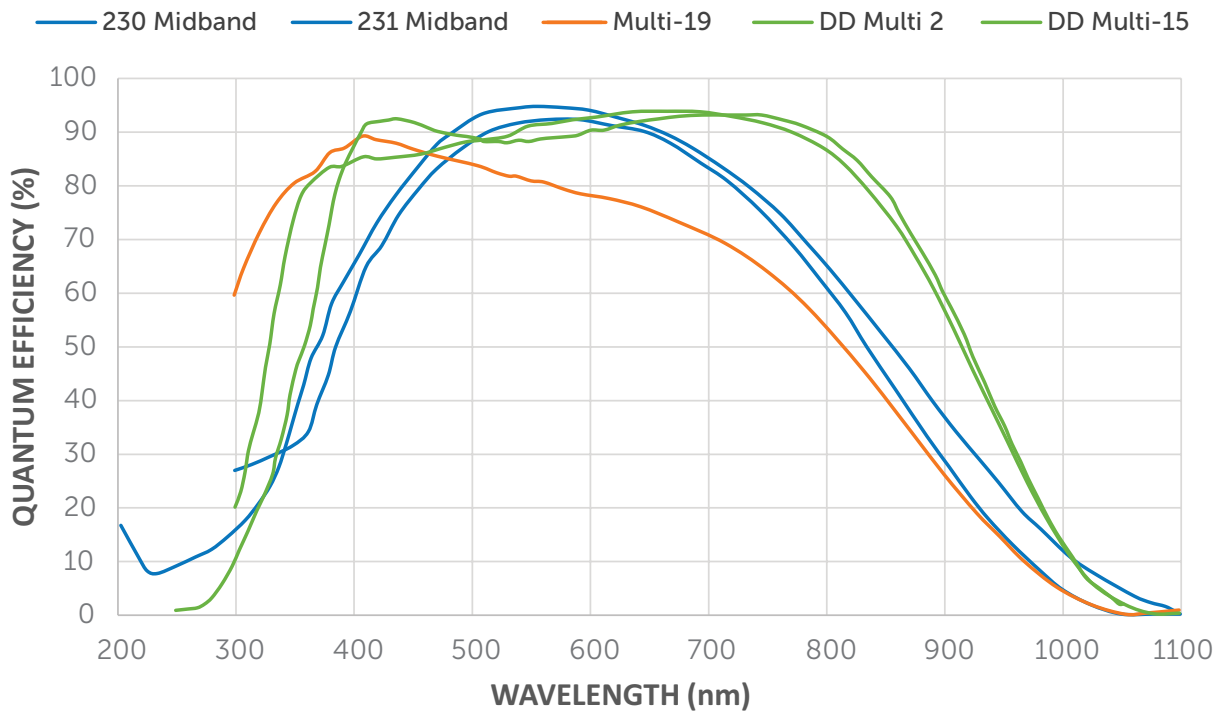
SOPHIA 4096 SPECIFICATIONS

SPECIFICATIONS	SOPHIA 4096-154	SOPHIA 4096-154A
CCD Sensor Formats	Teledyne e2v CCD230-84 back-illuminated, AIMO	Teledyne e2v CCD231-84, back-illuminated, NIMO
Active Array Size	4096 x 4096 pixels (16.8 megapixels)	
Pixel Area	15 x 15 μm (225 μm^2)	
Sensor Area	61.4 x 61.4 mm (86.8 mm diagonal)	
Full Well Capacity	> 150,000 e^- (typical)	> 300,000 e^- (typical)
ADC Rates	16-bit: 4 MHz, 2 MHz, 1 kHz, 100 kHz; 4-port readout 18-bit: 1 MHz and 100 kHz	16-bit: 3 MHz, 1 MHz, 500 kHz, 100 kHz; 4-port readout 18-bit: 500 kHz and 100 kHz
System Read Noise (per port), (typical)	< 22.0 e^- rms @ 4 MHz < 8.5 e^- rms @ 1 MHz < 4.0 e^- rms @ 100 kHz	< 8.0 e^- rms @ 3 MHz < 4.0 e^- rms @ 1 MHz < 2.7 e^- rms @ 100 kHz
Dark Current (typical)	.0001 e^- /p/s @ -90°C	0.01 e^- /p/s @ -90 °C
Cooling Options	Thermoelectric air or liquid cooling (liquid chiller required) < -60 °C (typical) with air; < -90°C typical with liquid chiller	
Thermostating Precision	± 0.15 °C across temperature range	
Readout Modes	4-port, 2-port, or 1-port readout; kinetics; external sync	
Nonlinearity	< 1% @ 100 kHz	
Software Selectable Gains	1, 2, 4 e^- /ADU	
I/O Signals	Two MCX connectors for programmable frame readout, shutter, trigger in	
Output Interface	USB 3.0 (5 m cable provided) Optional fiber optic interface available for remote operation	
Digitization	16-bit or 18-bit	
Internal Shutter	90 mm mechanical shutter with internal control or TTL	
External Shutter	90 mm mechanical shutter with TTL control	
Operating Temperature Range	5°C to 30°C (non-condensing)	
Camera Weight	15.8 lbs, 7.2 kg	
Camera Dimensions	202.4 x 202.4 x 253.9 mm (H x W x D)	
Certification	CE	

SOPHIA 4096 FRAME RATES

SOPHIA 4096-154					SOPHIA 4096-154A			
ARRAY SIZE	4 MHz	2 MHz	1 kHz	100 kHz	4 MHz	2 MHz	1 kHz	100 kHz
4096 x 4096	0.44	0.29	0.18	0.023	0.50	0.21	0.11	0.02
2048 x 2048	0.66	0.47	0.32	0.044	0.81	0.37	0.20	0.05
1024 x 1024	0.88	0.70	0.51	0.086	1.17	0.63	0.38	0.09
512 x 512	1.05	0.91	0.74	0.16	1.51	0.98	0.64	0.17

SOPHIA 4096 QE CURVE

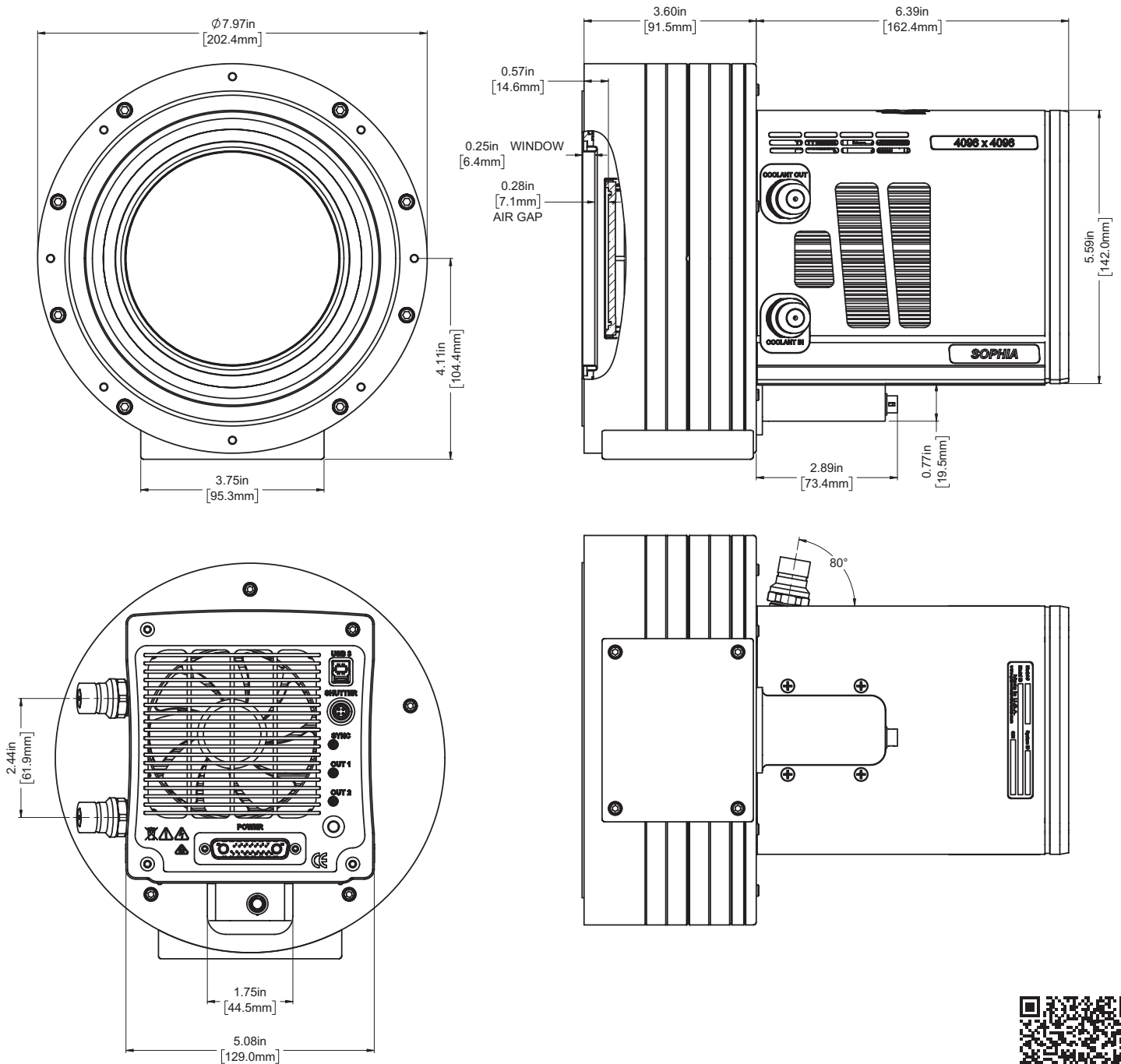


SOPHIA 4096-15 (CCD230-84 option): Only '230 midband' available
SOPHIA 4096-15A (CCD231-84 option): All versions available (midband version is '231 midband')

SOPHIA 4096 ACCESSORIES

ACCESSORIES (AIR COOLING)		ACCESSORIES (included)	
Power supply/cables	Data acquisition software	Power supply/cables	Coolant hoses
MCX to BNC cables (x3)	Certificate of Performance	MCX to BNC cables (x3)	Certificate of Performance
USB 3.0 interface cable		USB 3.0 interface cable	Data acquisition software
		External coolant circulator	

SOPHIA 4096 DIMENSIONAL OUTLINES (Unit: mm)



FOR MORE INFORMATION REACH OUT ONLINE:

CONTACT US: www.teledynevisionsolutions.com/contact/contact-us

FOR OEM INQUIRIES: www.teledynevisionsolutions.com/solutions/custom-oem

CONTACT SUPPORT: www.teledynevisionsolutions.com/support/support-center

Specifications in this datasheet are subject to change.
Refer to the Teledyne Princeton Instruments website for
most current specifications.

Copyright © 2026 Teledyne Princeton Instruments, Inc.
All rights reserved.

Revision Date: 2026 07 29