



# 1024-LDH2 92 KHz InGaAs Linescan Camera

## High-Speed SD-OCT Imaging

The 1024-LDH2 is a 2nd generation high-speed 1024-pixel linescan InGaAs camera that increases the A-line rate to 91,911 lines per second. This enables spectral-domain optical coherence tomography (SD-OCT) at 1.04  $\mu\text{m}$  to capture detailed 3-D volumes of the retina, nerve head and choroid layer in a blink of the eye. For 1.31  $\mu\text{m}$  SD-OCT, diode-array based OCT systems offer superior phase stability for Doppler or Polarization-Sensitive OCT. The LDH2 provides 12-bit digital capture into base-format Camera Link<sup>®</sup> interface cards, while providing maximum dynamic range up over 2300:1 for high line rates. Two pixel apertures are available: 500- $\mu\text{m}$  tall pixels for easy alignment in SD-OCT systems, or 25- $\mu\text{m}$  square pixels for ultra-fast machine vision or dual-camera PS-OCT.

### Applications

- Spectral-Domain Optical Coherence Tomography (OCT)
- Ultra-fast absorption or emission spectroscopy for combustion research, moisture, lipids, proteins or other molecular vibration bands in the 0.8 to 1.7  $\mu\text{m}$  range
- Machine vision for ultra-high speed inspection, materials classification, sorting and/or monitoring of continuous processes, for example for food or agricultural product sorting

### FEATURES

- 91,911 lps for 1024 pixels at 12 bits
- Integrate-while-read snapshot acquisition
- Wavelength response over 0.8  $\mu\text{m}$  to 1.7  $\mu\text{m}$  with flat QE for 1.05 and 1.31  $\mu\text{m}$  OCT
- 25  $\mu\text{m}$  pixel pitch with aperture heights of 25  $\mu\text{m}$  (defined by on-chip mask) or 500  $\mu\text{m}$
- 12-bit base Camera Link<sup>®</sup> compatible output and control
- High quantum efficiency and dynamic range
- Operating temperature range of -10 to +50°C
- Mounts easily to spectrometers due to 5.7 mm image plane depth and O-ring light seal
- Mounts easily to optics benches or MV systems with tripod, front or side fastener hole patterns
- Optional adapters for F-mount or C-mount, lenses (C-mount lenses may not fully illuminate the full width of the 25.6 mm wide arrays)

Interfaces	
<b>Control:</b>	SDR 26-pin connector (Base Camera Link®)
<b>Image Data:</b>	SDR 26-pin connector (Base Camera Link®)
<b>Power:</b>	Hirose HR10-7R-6PA receptacle Mates with HR10-7P-6S or SN4-8-6 (P)
<b>Sync Output:</b>	SMA: 5 V, 50 Ω series terminated, active high: integration active
<b>Trigger: Input</b>	SMA, Low < 0.5, 3 V > high < 5 V
<b>Status LED:</b>	Green: TEC locked at setpoint Red: TEC unlocked Blinking: Timing or triggering error

ENVIRONMENTAL AND POWER	
<b>Operating temperature:</b>	-10°C to +50°C case temperature
<b>Storage temperature:</b>	-20°C to 70°C
<b>Humidity:</b>	Non-condensing
<b>Power requirements: AC adapter supplied DC (voltage/power) In-rush current</b>	100-240 VAC, 47-63 Hz, < 1.0 A 7-16 V, < 6 W at 25°C, < 9 W at 50°C < 1.5 A peak

REGULATORY COMPLIANCE	
<b>CE:</b>	Meets class A level for emission, immunity & ESD standards
<b>FCC:</b>	Meets requirements for Part 15, Subpart B, Class A, 2006

MECHANICAL	
<b>Length x Width x Height:</b>	6.1 cm x 7.37 cm x 7.62 cm 2.4 in x 2.9 in x 3.00 in Length excludes I/O connectors, and lens adapter
<b>Weight:</b>	< 450 g or 1 lbs (no lens or adapter)
<b>Threaded Lens Mount and optional lens mount adapters:</b>	M42x1-6H with 5.7 mm to image plane none, fixed distance C-Mount adapter or adjustable distance F-Mount adapter (see ordering info)
<b>Spectrometer mount:</b>	4 tapped 8-32 holes in 2 inch square pattern 4 tapped M4x0.7-6H holes spaced 5 cm x 4 cm (h x w) O-Ring light seal, 1.9 inch diameter, 1/16th thickness
<b>Camera Tripod mount:</b>	2 tapped ¼-20 holes alternating on ¾" (19 .05 mm) spacing with 2 tapped M6-6H holes
<b>Side wall mounts:</b>	4 tapped M4x0.7-6H holes, 5 x 4.5 cm spacing (h x d)

ELECTRO-OPTICAL PERFORMANCE						
<b>Sensor format</b> <sup>1</sup>	1024 pixels on 25 µm pitch with 8 readout ADCs					
<b>Optical aperture (pixel height)</b>	500 µm or 25 µm (square pixel sharply defined by mask on detector surface)					
<b>Peak quantum efficiency</b>	> 70%					
<b>Gain capacitor setting</b>	0.1 pF		1 pF		10 pF	
	Typical	Specification	Typical	Specification	Typical	Specification
<b>Net full well capacity (Me-)<sup>2</sup></b>	2.0	>1.4	8.7	>7.7	85	>70
<b>Gain (e-/cnt)<sup>1 3</sup></b>	540	< 620	2200	< 2450	21400	< 24500
<b>Temporal noise (rms counts)<sup>1 2</sup></b>	2.0	< 2.4	1.6	<1.8	1.3	<1.4
<b>Dynamic range<sup>1 2 4</sup></b>	1900:1	> 1350:1	2600:1	> 2100:1	3100:1	> 2600:1
<b>Differential non-linearity<sup>1 2</sup></b>	+/- 0.8%	< +/- 1.2%	+/- 0.8%	< +/- 1.2%	+/- 0.8%	< +/- 1.5%
<b>Bad pixel specification</b>	White, dark, noisy or pixels exceeding +/- 10 of the mean value when illuminated at 50% of full well Number of bad pixels limited to a maximum of 1% of array total; no bad neighbors within 5 pixels					
<b>Exposure time<sup>1 3</sup></b>	0.007 ms to 1 ms in preset modes or to > 1 s with user programmed or via the width of the ext. trigger					
<b>Trigger modes<sup>3</sup></b>	Free run, single line per trigger, variable exposure, or gated burst					
<b>Sync output</b>	SMA connector: digital signal, high during integration					
<b>External trigger<sup>3</sup></b>	Three modes via CC1 or SMA					
<b>External variable ET</b>	User set by the duration of trigger input signal (minimum ET pulse: 10 µs)					
<b>External trigger jitter</b>	+/-1 clock cycle: nominally 80 ns with internal ET					
<b>Pixel rate</b>	100 Mpix/s max with 2 x 12-bit words transferred on each Camera Link strobe clock at 50 MHz					
<b>Digital output format</b>	12-bit base Camera Link®; recommend NI PCIe-1427 or equivalent frame grabber					
<b>Readout mode</b>	Integrate while read, differential double sampling					
<b>Corrections (preset OPR)</b>	Factory calibrated gain, offset, and bad pixel replace, applicable to the center 90% of the array					

<sup>1</sup> Actual formats and performance governed by user-selected SUI linear array purchased with camera (dark current may limit longest usable ET)

<sup>2</sup> Camera readout noise limited for low & medium gain settings; dark shot noise limited for high gain settings

<sup>3</sup> User selectable by command over Camera Link® serial lines

<sup>4</sup> Dynamic range limited to maximum values listed when camera operated at exposure times shorter than 28 µs due to reduced full well capacity

ORDERING INFORMATION							
Camera Model <sup>1</sup>	Part Number	Max. Line Rate <sup>1</sup>	Pitch	Pixels	FPA Length	Aperture (Height)	Classification
SU1024-LDH2-1.7RT-0500/LC	8000-0480	91,911 lps	25 µm	1024	25.6 mm	500 µm	EAR99
SU1024-LDH2-1.7RT-0025/LC	8000-0484	91,911 lps	25 µm	1024	25.6 mm	25 µm	6A003.b.4.a

<sup>1</sup> Cameras include the photodiode array, whose characteristics dominate camera performance; see the array datasheet for more information

Accessory Kits: Include power supply, carrying case, SMA-BNC trigger in and sync out cables, o-ring, carrying case, mini-CD with manual and free SUI Image. Analysis software for National Instruments Camera Link frame grabbers.

Part Numbers: Kit with F-mount adapter: 8000-0528. Kit with C-mount: 8000-0530. Kit without lens adapter: 8000-0529



**For additional information:**  
Sensors Unlimited, Inc.  
330 Carter Road, Suite 100  
Princeton, New Jersey 08540 USA  
Ph: +1.609.333.8200  
sui\_sales@utas.utc.com  
www.sensorsinc.com