

SPECIM IQ

HYPERSPECTRAL GOES MOBILE

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ATOS

Atoms to Stars



reddot design award
winner 2018

SPECIM IQ

DATA SHEET

Specim IQ is a portable carry on hyperspectral camera that contains features needed for hyperspectral data capturing, data processing, and result visualization.

MAIN FEATURES

Spectral camera
Viewfinder camera
Scanner & motor
Embedded data processing unit
Operating software for data acquisition and processing
Replaceable data storage
Touch screen display and physical buttons
Rechargeable battery power supply

MAIN FUNCTIONALITIES

Operational modes	Default recording mode
	Automatic Screening mode
	Application mode (user definable)
	Time lapse mode
User adjustments	Remote usage
	Integration time adjustment
	Focus adjustment (manual)
Data format	Metadata and tag addition
	Specim Dataset with ENVI compatible data files
Data export	With SD card, through USB or WiFi connection
Operational time	Appx. 100 measurements with one SD card and battery

TECHNICAL HW SPECIFICATIONS

DEVICE OPERATION

User interface SW	by Specim
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DEVICE HARDWARE

Viewfinder camera	5 Mpix
Focus camera	1.3 Mpix
Spectral camera	by Specim
Sd-card reader	UHS-1 SD (Max. 32 GB SD memory card)
Processor	NVIDIA Tegra K1
Cpu	Kepler Mobile
Memory	2GBytes DDR3L RAM and 8GB EMMC
Gps module	U-BLOX GPS/GNSS MAX-M8Q-0
Operating voltage	3.7 V
Battery	5200mAh Li-Ion battery (Type 26650)
WiFi	IEEE Std 802.11 b / g / n

USER INTERFACE

Buttons	12+1 physical buttons
Display & keyboard	4.3" touch screen
Buzzer	Indication sounds for the user
Usb connector	USB Type-C

DIMENSIONS

Size	207 x 91 x 74 mm (depth with lens 125,5 mm)
Weight	1.3 kg

SPECTRAL CAMERA SPECIFICATIONS

OPTICAL

Wavelength band	400 – 1000 nm
F/number at Sensor	F/1.7
F/number at Slit	F/2.2
Magnification (Sensor / slit)	1/1.3
Keystone	Corrected
Smile	Corrected
Spectral resolution	7 nm
Slit Length	11.70 mm
Slit Height	42 μ m

SENSOR

Sensor type	CMOS
Spatial Sampling	512 pix
Spectral Bands	204 (with Bin 2x: 102, Bin 3x: 68)
Image resolution	512 x 512 pix
Pixel size	17.58 μ m x 17.58 μ m
Data output	12 bit
QE peak	>45 %
Full-well capacity	>32000 e-
Peak SNR	>400:1

OBJECTIVE / FRONT LENS

Object distance	150 - ∞ mm
Focal length	21 mm
F/number at Slit	F/2.2
Full field of view (FOV)	31 x 31 deg
Full field of view (FOV) at 1 m	0.55 x 0.55 m
Filter thread	M40.5 x 0,5

ENVIRONMENTAL SPECIFICATIONS

DEVICE OPERATION

IP classification	IP5x
Temperature, operational	+5°C - +40°C
Temperature, storage	-20°C - +50°C
Humidity operational	95% non-condensing

STANDARDS

Shock	STD-810G Method 516.6 Procedure VI
EU directive	Radio Equipment Directive 2014/53/EU.



IMPROVE ACCURACY AND REDUCE COSTS

Specim FX17 camera is designed for industrial and laboratory use. It works in a line-scan mode, and collects hyperspectral data in the near-infrared NIR region (900 to 1700 nm).

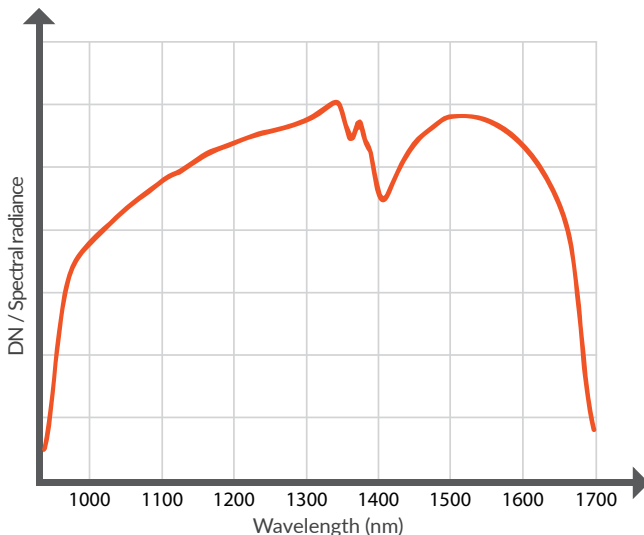
Specim FX17 is best suited for:

- Food & feed quality
- Waste sorting
- Recycling
- Moisture measurement
- Threat detection, Security

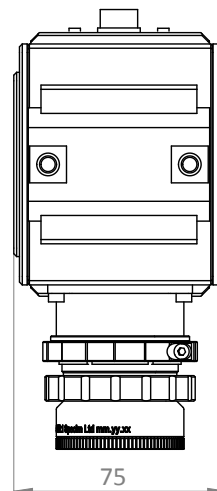
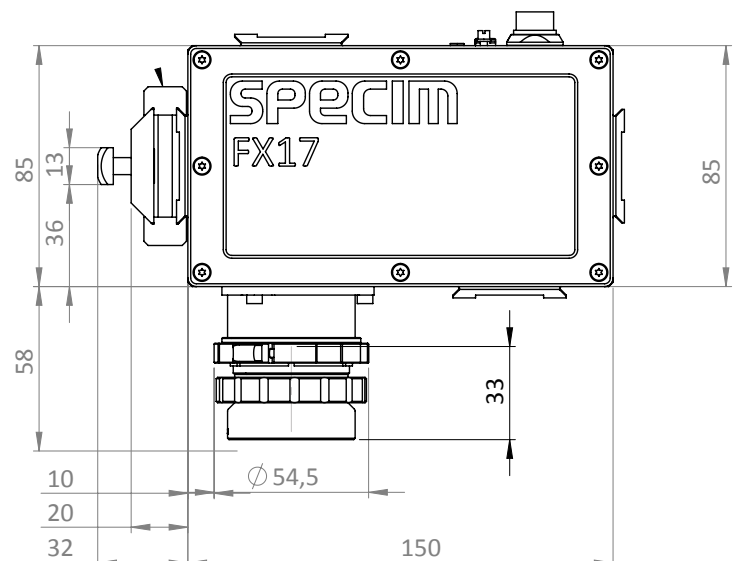
FEATURES

- Spectral range of 900-1700 nm
- High spatial resolution of 640 pixels
- High image speed
527 FPS (full range) for GigE version
670 FPS (full range) for CameraLink version
- Free wavelength selection from 224 bands within the camera coverage
- Built-in image correction
- Unified spectral calibration between units
- GigE or CameraLink standard interfaces
- Easy mounting to industrial environment

SPECTRAL RESPONSE



DIMENSIONS



Spectral Range	900-1700 nm	
Spectral resolution (FWHM)	8 nm (mean)	
Spectral sampling/pixel	3.5 nm	
Spectral bands	224	With default binning
Numerical aperture	1.7	With default lens
Optics magnification	0.80	
Effective pixel size	18.7 μm	At fore lens image plane
Effective slit width	Physical width 42 μm . Projection on sensor 32 μm (M=1.3)	At fore lens image plane
Effective slit length	12.0 mm	At fore lens image plane
SNR @ max. signal	1000:1	
Bit depth	12	
Maximum frame rate	670 (FX17) 527 (FX17e) FPS full range	
Binning	1,2,4 spectral and spatial	Default: 2 spectral x 1 spatial
ROI	Freely selectable multiple bands of interest	Minimum height of ROI is two 1-binned rows. Maximum frame rate is determined by total number of rows between first row of first mROI and last row of last mROI and the total number of rows included in the mMROI's.
Pixel operability	99.5% Allowed clusters: Size 2-6 pixels: N/A Size 7-12 pixels: ≤ 6 Size 13-19 pixels: ≤ 2 Size 20-35 pixels: ≤ 1 Size > 35: 0	
Image corrections	Non uniformity correction Bad pixel replacement Automatic Image Enhancement (AIE)	One point NUC AIE: Unified spectral calibration + corrected smile and keystone aberrations
Sensor material	InGaAs	
Sensor cooling	TEC	
Full well capacity	1.44 Me-	
Read-out modes	IWR / ITR	
Optics temperature	Passive	Default is 20 degrees Celsius
Lens mount	Custom mount	
Fore lens FOV options	12 deg 38 deg (default) 53 deg 69 deg 75 deg 92 deg	Only the default lens is specifically designed for FX17. With other lens options, optical parameters may vary.
Camera digital data output/control interface	GigE Vision, CameraLink	
Camera control protocols	GenICam, ASCII	
Power input	12 V DC (+-10%)	
Power consumption	Max 24 W	
Connectors	Industrial Ethernet OR CameraLink (standard MDR 26-pin) Power – Fischer 12pin DBPLU1031Z012 130G	
IP	IP52	
Dimensions (L x W x H)	150 x 75 x 85 mm	Mounting surface option on three sides. Mounting kit adds 24 mm distance on mounting side.
Weight	1.56 kg	
Storage temperature	-20 ... +50 $^{\circ}\text{C}$ (non-condensing)	
Operating temperature	+5 ... +40 $^{\circ}\text{C}$ (non-condensing)	
Relative humidity	5% – 95% (non-condensing)	



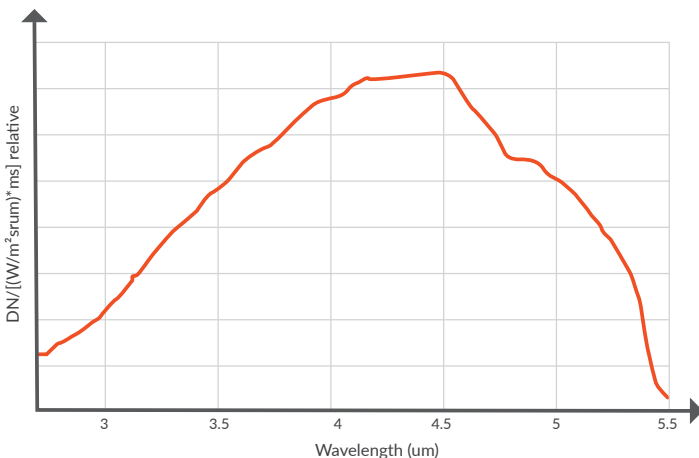
IMPROVE ACCURACY AND REDUCE COSTS

Specim FX50 is a high-speed, accurate and efficient spectral camera specifically designed to industrial environments. It operates on MWIR region and can be used to identify and sort the difficult black plastics, analyze hydrocarbons and minerals, and detect contamination on metal surfaces quickly and reliably.

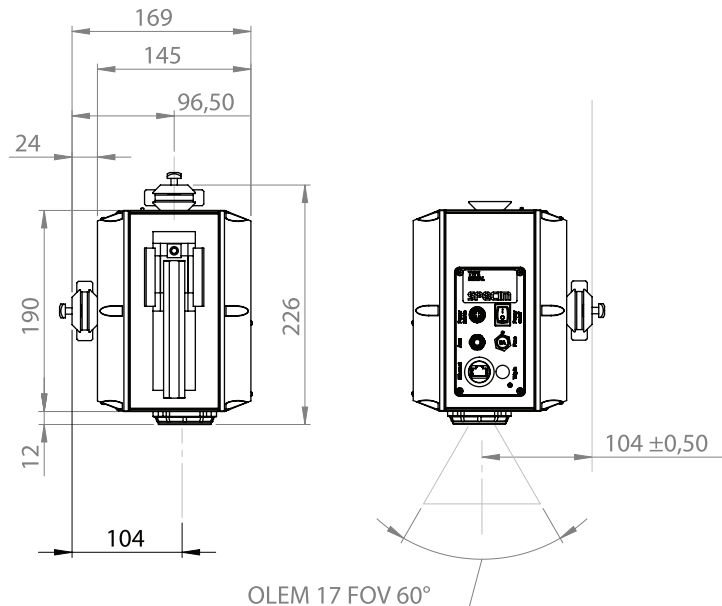
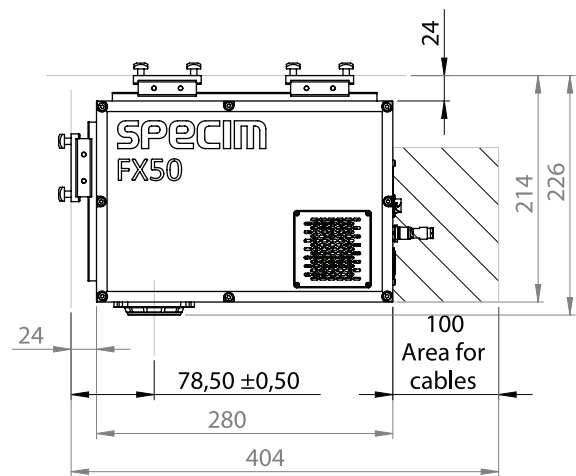
FEATURES

- Complete spectral camera with compact form factor
- Spectral range of 2.7 - 5.3 μm
- High spatial resolution of 640 pixels
- High image speed of 380 Hz
- Temperature stabilized optics
- Built-in image correction
- Unified spectral calibration between units
- GigE Vision standard interface
- Easy mounting to industrial environment

SPECTRAL RESPONSE



DIMENSIONS



Spectral Range	2.7 - 5.3 μm	
Spectral resolution (FWHM)	35 nm	
Spectral sampling/pixel	8.44 nm	Without binning
Spectral bands	154	With default binning
Numerical aperture	2.0	
Optics magnification	0.5	
Effective pixel size	30 μm	At fore lens image plane
Effective slit width	104 μm	At fore lens image plane
Effective slit length	19.2 mm	At fore lens image plane
Dynamic Range	1600:1 with 1.5 ms exposure time	Usable dynamic range / noise
Spatial samples	640	
Bit depth	16	
Maximum frame rate	380 fps	Full image with default binning
Binning	1,2,4 spectral and spatial	Default: 2 spectral x 1 spatial
ROI	Freely selectable multiple bands of interest	Minimum height of ROI is two 1-binned rows. Maximum frame rate is determined by total number of rows between first row of first mROI and last row of last mROI – not the total number of rows included in the mMROI's.
Pixel operability	Number of operable pixels >99.7% Allowed clusters: Size 4-8 pixels: <= 12 Size 9-12 pixels: 2 Size 13-19 pixels: 1 Size >19 pixels: 0	
Image corrections	Non uniformity correction Bad pixel replacement Automatic Image Enhancement (AIE)	One point NUC AIE: Unified spectral calibration + corrected smile and keystone aberrations
Sensor material	InSb	
Integrated cooler	Stirling	Up to 25000 hours
Full well capacity	5.1 Me-	
Read-out modes	IWR / ITR	
Optics temperature	TEC-stabilized	Default is 20 degrees Celsius
Lens mount	Custom mount	
Fore lens options	OLEM43, OLEM23, OLEM17	
Field of view	24 deg, 45 deg, 60 deg	
Camera digital data output/control interface	GigE Vision, Custom ethernet	
Camera control protocols	GenICam, JSON-RPC	
Power input	24 V DC	
Power consumption	Max 90 W Typical 40 W	During simultaneous cool-down of optics and detector
Connectors	Ethernet Aux - 0306423 (09-0428-90-08) Binder 8pin Power - 0306627 (LF10WBR-4P) Hirose 4pin Trigger in	
IP	IP40	
Dimensions (L x W x H)	280 x 202 x 169 mm	Mounting surface option on three sides. Mounting kit adds 24 mm distance on mounting side.
Weight	7 kg	
Storage temperature	-20 ... +50 $^{\circ}\text{C}$	
Operating temperature	+5 ... +40 $^{\circ}\text{C}$	
Relative humidity	5% – 95% (non-condensing)	



ImSpector V8 / V10H



ImSpector V10E



ImSpector N17E

OPTIONS, FORE OPTICS

- Fore optics, Standard series: OL8, OL12, OL17, OL23 and OL35 for 2/3" or smaller detector.
- Fore optics, Enhanced series: OLE9, OLE18.5, OLE23 and OLE140 for 2/3" or larger detector. Optimized for Enhanced series.
- Fore optics, OLES15, OLES22.5, OLES30 and OLES56 for N17E

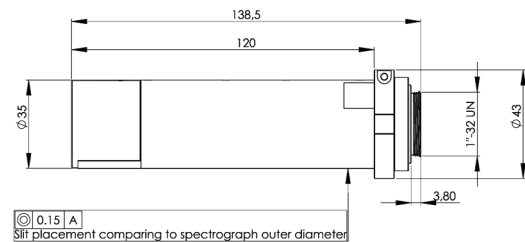
OPTIONS, ACCESSORIES

- Mechanical shutter (Enhanced series)
- Collection fiber optics
- Order blocking filters; OBF 570 (rectangular 14 x 12mm or circular 20mm Ø and 17mm Ø) for V10 and V10E
- Fiber optic diffuse irradiance sensor (FODIS) for light source monitoring (Enhanced series)

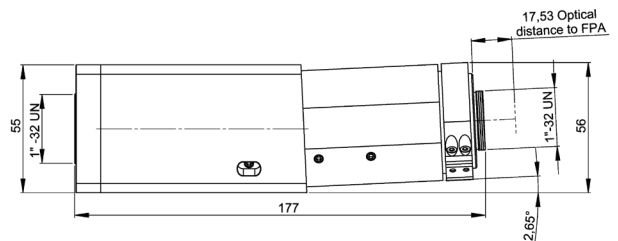
Specim ImSpectors are designed for the VIS (380 - 800 nm), VNIR (400 - 1000 nm) and NIR (900 - 1700 nm) wavelength ranges. These spectrographs provide a straightforward, high performance, yet cost-effective method of integration. When combined with scientific grayscale CCD or CMOS cameras or InGaAs sensor, the combination provides a line-scan Spectral Imaging device.

DIMENSIONS

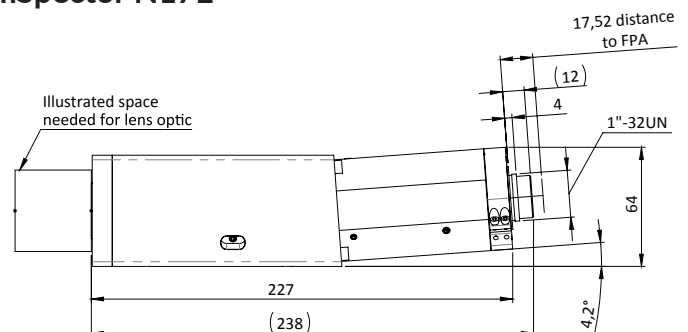
ImSpector V8 / V10H



ImSpector V10E



ImSpector N17E



ImSpector	V8	V10E	V10H	N17E
Optical characteristics				
Spectral range	380 - 800 nm *1	400 - 1000 nm *1	400 - 1000 nm *2	900 - 1700 nm *2
Dispersion	66 nm / mm	97.5 nm / mm	139 nm / mm	110 nm / mm
Spectral resolution	6 nm (with 80 µm slit) *2	2.8 nm (with 30 µm slit) *2	11.2 nm (with 80 µm slit)	5 nm (with 30 µm slit)
Image size	6.6 (spectral) x 8.8 (spatial) mm corresponding to standard ⅜" image sensor	Max 6.15 (spectral) x 14.2 (spatial) mm	4.3 (spectral) x 6.6 (spatial) mm, corresponding to standard ½" image sensor	Max 7.6 (spectral) x 14.2 (spatial) mm
Spatial resolution	Rms spot radius < 30 µm	Rms spot radius < 9 µm	Rms spot radius < 40 µm	Rms spot radius < 15 µm
Aberrations	Insignificant astigmatism	No astigmatism	Insignificant astigmatism	No astigmatism
Bending of spectral lines across spatial axis	Smile < 45 µm	Smile < 1.5 µm	Smile < 30 µm	Smile < 5 µm
Bending of spatial lines across spectral axis	Keystone < 40 µm	Keystone < 1 µm	Keystone < 20 µm	Keystone < 5 µm
Numerical aperture	F/2.8	F/2.4	F/2.8	F/2.0
Slit width, default	50 µm (30, 80 and 150 µm on request)	30 µm (18, 50 ,80 and 150 µm on request)	50 µm (30, 80 and 150 µm on request)	30 µm (50, 80 and 150 µm on request)
Slit length	9.6 mm	14.2 mm	9.8 mm	14.2 mm
Optical input	N/A	Telecentric	N/A	Telecentric
Efficiency	> 50% independent of polarization			
Stray light	< 0.5% (halogen lamp, 590 nm long-pass filter)		< 0.5% (halogen lamp, 633 nm notch filter)	< 0.5% (halogen lamp, 1400 nm long-pass filter)
Mechanical characteristics				
Size	D 35 x L 139 mm	W 60 x H 60 x L 175 mm	D 35 x L 139 mm	W 60 x H 60 x L 220 mm
Weight	300 g	1100 g	300 g	1500 g
Body	Anonized aluminium tube			
Lens and camera mount	Standard C-mount adapter			
User adjustments	Image axis relative to detector rows, adjustable back focal length +/- 1mm			
Environmental characteristics				
Storage	-20 ... +85 °C			
Operating	+5 ... +40 °C, non-condensing			

*1 Order blocking filter is available for mounting in front of the detector window.

*2 System spectral and spatial resolutions also depend on the discrete imaging nature of detector and lens quality.