SPECIM FX10

IMPROVE ACCURACY AND REDUCE COSTS

Specim FX10 camera series is designed for industrial and laboratory use. Specim FX10 cameras work in a line-scan mode in the visible and near-infrared (VNIR) area; Specim FX10 in the 400-1000 nm region, and the color optimized Specim FX10c camera in the 400-780 nm region.

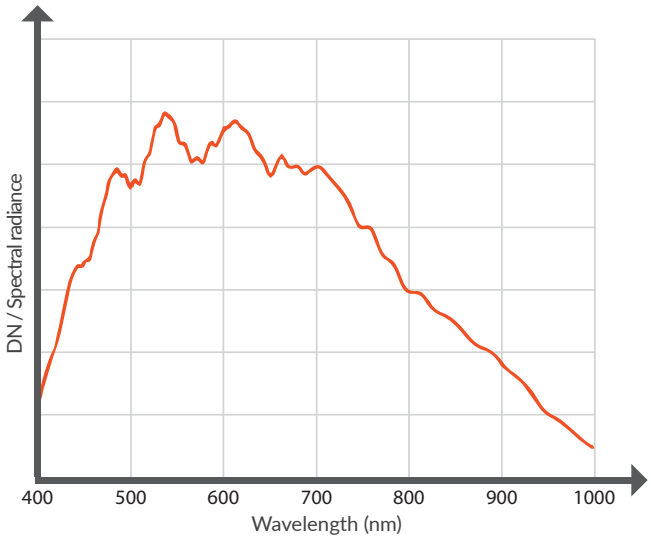
Specim FX10 cameras are best suited for:

- Vegetation & agriculture
- Phenotyping
- Color & density in printing
- Display & light source inspection
- Food quality

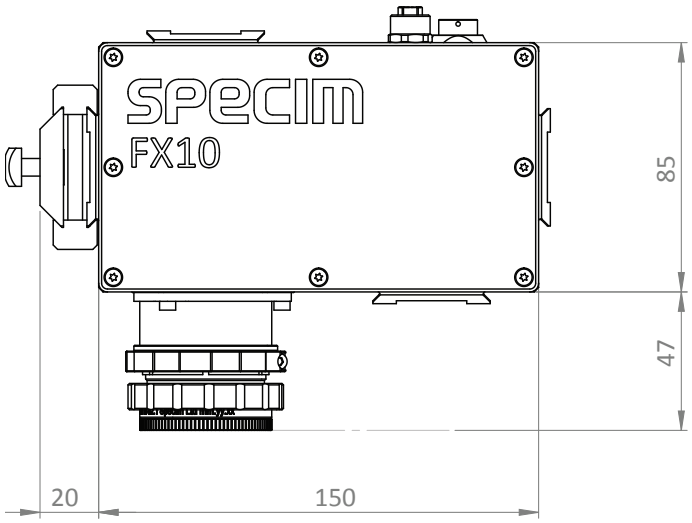
FEATURES

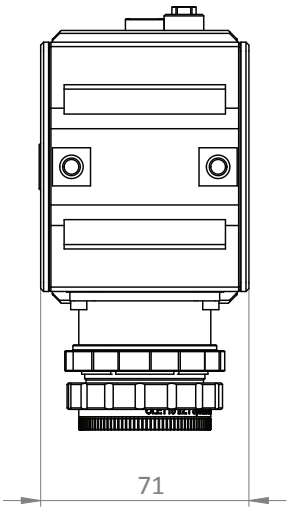
- Spectral range of 400-1000 / 400-780 nm
- High spatial resolution of 1024 pixels
- High image speed of 327 FPS (full range)
- Free wavelength selection from 224 bands within the camera coverage
- Built-in image correction
- Unified spectral calibration between units
- GigE or CameraLink standard interfaces
- Easy mounting to industrial environment

SPECTRAL RESPONSE



DIMENSIONS





Spectral Range	400-1000 / 400-780 (c-version)	
Spectral resolution (FWHM)	5.5 nm (mean)	
Spectral sampling/pixel	2.7 nm	With default binning
Spectral bands	224 / 140 (c-version)	With default binning
Numerical aperture	1.7	With default lens
Optics magnification	0.80	
Effective pixel size	19.9x9.97 µm	At fore lens image plane
Effective slit width	42 µm	At fore lens image plane
Effective slit length	10.2 mm	At fore lens image plane
SNR @ max. signal	420 : 1	
Spatial samples	1024	
Bit depth	12	
Maximum frame rate	327 FPS full range / 514 FPS full range (c-version)	
Binning	2,4,8 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 the total number of rows included in the mMROI's
Pixel operability	99.993%	
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	CMOS	
Sensor cooling	Passive	
Full well capacity	90 ke-	
Read-out modes	IWR / ITR	
Optics temperature	Passive	
Lens mount	Custom mount	
Fore lens FOV options	12 deg 38 deg (default) 47 deg 51 deg 83 deg	Only the default lens is specifically designed for FX10. 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 4 W	
Connectors	Industrial Ethernet OR CameraLink 26-pin, 0.5" MDR	
IP	IP52	
Dimensions (L x W x H)	150 x 85 x 71 mm	Mounting surface option on three sides. Mounting kit adds 24 mm distance on mounting side.
Weight	1.3 kg	
Storage temperature	-20 ... +50°C (non-condensing)	
Operating temperature	+5 … +40°C (non-condensing)	
Relative humidity	5% – 95% (non-condensing)	

SPECIM FX17

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).

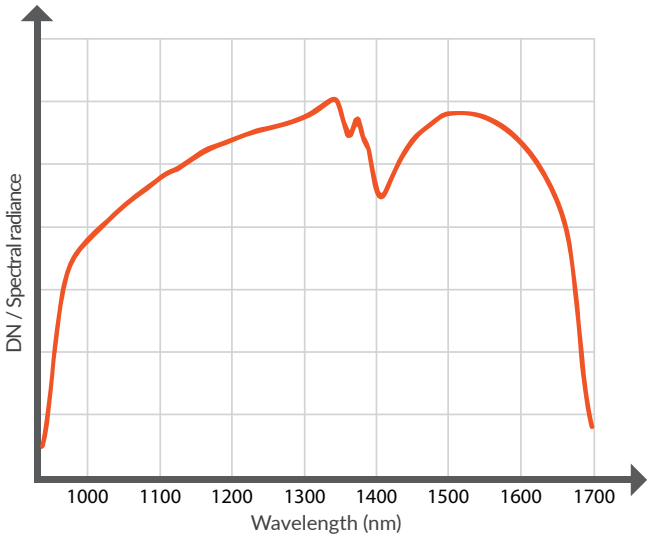
Specim FX17 is best suited for:

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

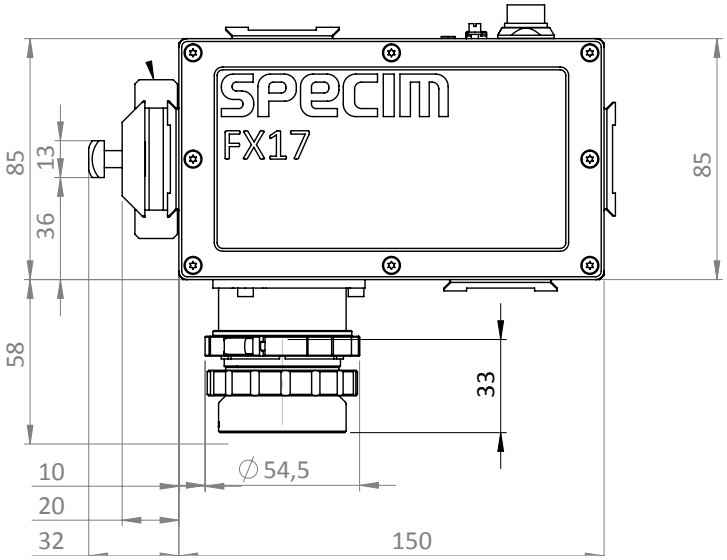
FEATURES

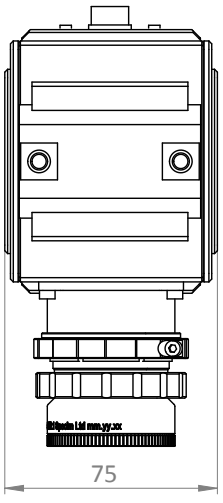
- Spectral range of 900-1700 nm
- High spatial resolution of 640 pixels
- High image speed
  527 FPS (full range) for GigE version
  670 FPS (full range) for CameraLink version
- Free wavelength selection from 224 bands within the camera coverage
- Built-in image correction
- Unified spectral calibration 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 42µm. 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 °C (non-condensing)	
Operating temperature	+5 ... +40 °C (non-condensing)	
Relative humidity	5% – 95% (non-condensing)	

SPECIM FX50

SPECTRAL IMAGING

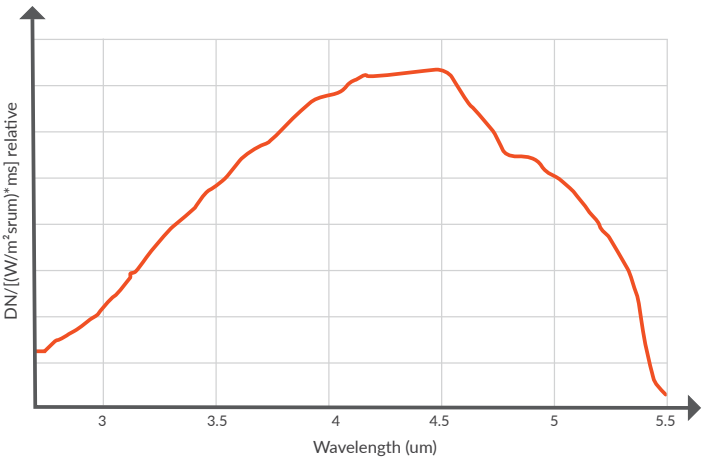
IMPROVE ACCURACY AND REDUCE COSTS

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.

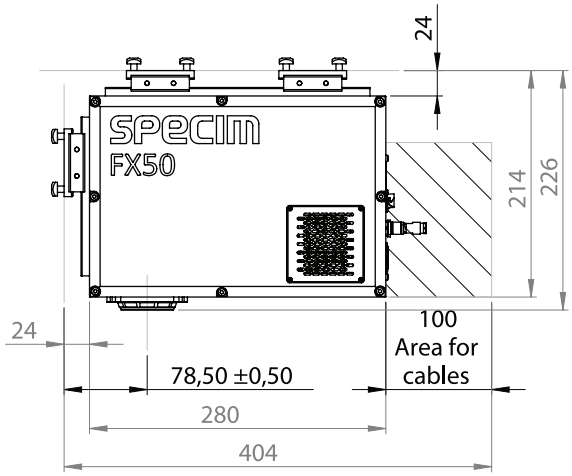
FEATURES

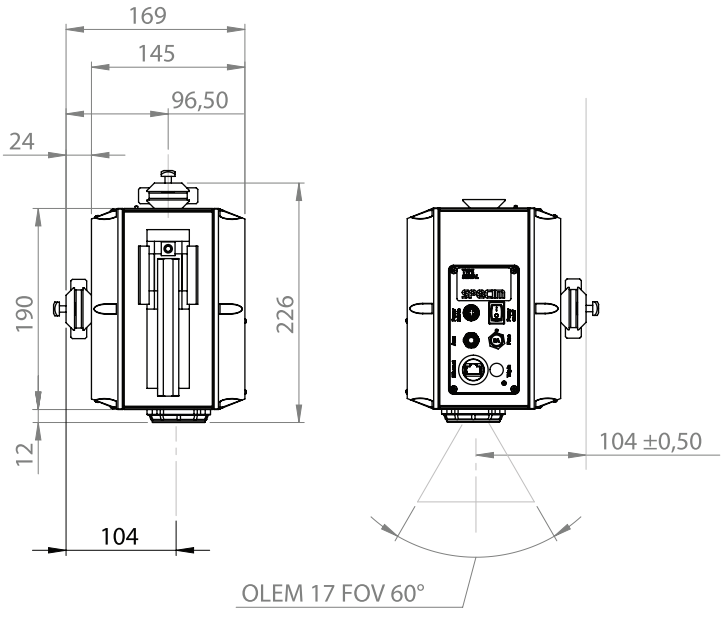
- Complete spectral camera with compact form factor
- Spectral range of 2.7 – 5.3 µm
- High spatial resolution of 640 pixels
- High image speed of 380 Hz
- Temperature stabilized optics
- Built-in image correction
- Unified spectral calibration between units
- GigE Vision standard interface
- Easy mounting 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 °C	
Operating temperature	+5 ... +40 °C	
Relative humidity	5% – 95% (non-condensing)	

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SPECIM
SPECTRAL IMAGING

spectral camera SWIR

SPECIM launches a new fully redesigned and re-engineered hyperspectral SWIR camera with breakthrough features. It has more spatial pixels (384) and still achieves much faster image rates up to 450 frames per second using CameraLink connection. To assure indoor/outdoor usage in varying conditions it now has rugged weather-proof IP54 casing and temperature stabilized optics but still uses less power than before, only 50W nominal.

High-speed hyperspectral camera in the range 1 000 - 2 500 nm. With its temperature stabilized optics, it provides the stability and sensitivity required in today's most challenging near-infrared chemical imaging applications, from pharmaceutical quality assurance to food and agriculture analysis. The camera meets the highest requirements in lab, industry and field.

Applications

Chemical and Material Sorting
Pharmaceutical manufacture
Recycling
Mineral mapping
Food and agriculture
Moisture content distribution
Art research and archiving
Forensics

SPECIM
SPECTRAL IMAGING

Spectral Camera SWIR

OPTICAL CHARACTERISTICS	TYPICAL SPECIFICATIONS
Spectral range	1 000 - 2 500 nm
Spectral resolution FWHM	12 nm (30 µm slit)
Spectral sampling	5.6 nm
Spatial resolution	rms spot radius < 15 µm
F/#	F/2.0
Slith width	30 µm (50 or 80 µm optional)
Effective slit length	9.2 mm
ELECTRICAL CHARACTERISTICS	
Detector	Cryogenically cooled MCT detector
Spatial pixels	384
Spectral bands	288
Pixel size	24 x 24 µm
Detector cooling	Stirling, 25 000 h MTTF
Optics temperature stabilization	Yes
Camera output	16 bits CL
SNR	1 050:1 (at max. signal level)
Data cable	Length 5 meters
Frame grabber	National Instruments NI 1427
Camera control	USB / RS232
Frame rate	450 fps (maximum full frame)
Exposure time range	0.1 - 20 ms
Power consumption	Nominal < 50 W
Input voltage	Wide 24 V
MECHANICAL CHARACTERISTICS	
Size (L x W x H)	Sensor: 470 x 176 x 178 mm; Power supply & Control Unit: 300 x 190 x 130 mm
Weight	Sensor: 14 kg; Power supply & Control Unit: approx. 5 kg
Body	Anodized aluminium with mounting screw holes
Lens mount	Standard C-mount
User adjustments	None
Shutter	Electro-mechanical shutter for dark image acquisition
ENVIRONMENTAL CHARACTERISTICS	
Storage	- 20 ... +50 °C
Operating	+ 5 ... +40 °C, non-condensing
SpectralDAQ support	Yes
SDK support	Yes
Mounting	Standard mounting see illustration, for other mounting options ask SPECIM
Accessories	Lenses, radiometric calibration, white calibration tile, scanner stages

ACCESSORIES

SPECIM provides various accessories for the Spectral Cameras to broaden their applicability.

Fore objective lenses, specifically designed for optimized performance in 900-2500 nm.

Lens	Focal length	FOV
OLES 15	15 mm	34 degrees
OLES 22,5	22,5 mm	23 degrees
OLES 30	30 mm	17 degrees
OLES 56	56 mm	9 degrees
OLES Macro	1:1 imaging	

Fiber optics with collection lenses or SMA connectors: from 4 to 110 input channels in one spectrometer without a moving multiplexer.

Various scanning systems: mirror scanner on rotary stage for scanning static target and outdoor scenes, and X-stage sample mover for desktop and microscope applications.

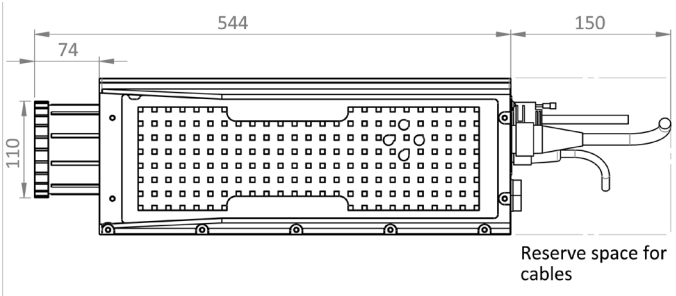
ACQUISITION SOFTWARE

SPECIM Spectral Camera SWIR is supported by Lumo software, which allows for:

- data acquisition and saving data in the hard disk
- to set camera parameters
- image visualization in real time
- to control scanner systems

Datacubes are saved in non-proprietary ENVI, Matlab and R compatible format that allows further image processing with several commercial software packages. SPECIM can also provide SDK for quick and efficient application development.

Side view



Bottom view