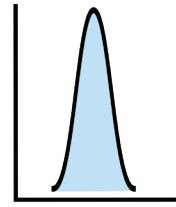
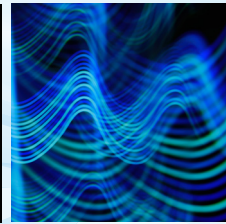
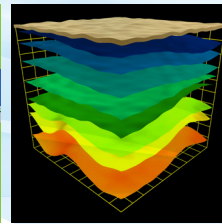
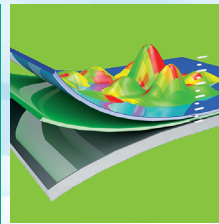
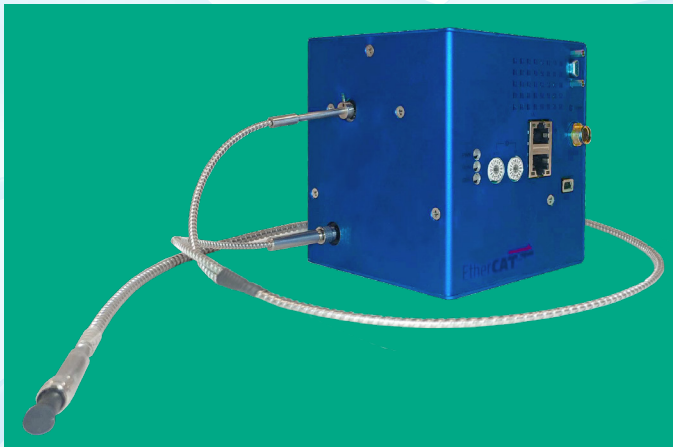


<6 nm  
Resolution

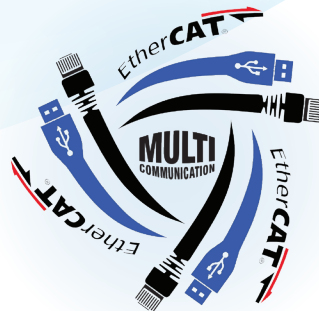


## INVIZU Cube

New Generation of Ultra Compact  
and Broad Range Spectrometer



For OEM  
Industrial Applications



# InVizU Cube Compact Broad Range Spectrometer

## Overview

InVizU Cube (Infrared-Visible-Ultraviolet) is the latest evolution of the ultra compact, high performance spectrometers from the HORIBA Scientific OEM team. This dual system for industrial applications uses a modified miniaturized VS70 optical engine optimized for the UV-VIS spectral range, along with the VS20 optimized for the NIR spectral range. The InVizU Cube is based on high performance aberration-corrected concave holographic gratings fitted with a custom multi-area order-sorting filter to eliminate higher orders.

This platform is specially designed to easily adapt to a large variety of detectors and electronic drivers. The optical design is optimized to minimize stray light and maximize optical performance. The InVizU Cube outperforms current generations of broad range mini-spectrometers thanks to its compact sleek design, high sensitivity, flat spectral response and resolution.

## Applications

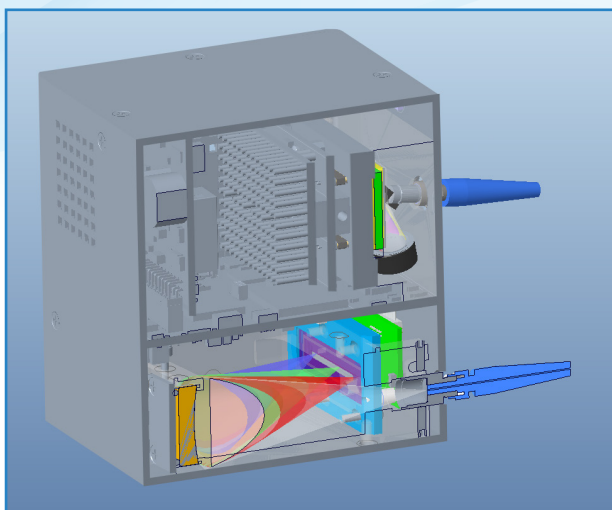
Ideal for industrial applications:

- Fluorescence
- Photoluminescence
- Reflectance
- Emission

Examples:

- Semiconductors
- Food Integrity and Pharma Production
- Life Sciences
- Analytical Chemistry
- Metrology
- Process Monitoring

## Optical and Mechanical Layout



InVizU Cube opto-mechanical layout showing an NIR VS20 with a UV-VIS VS70 integrated into a very compact cube design simultaneously covering 200 to 1700 nm

## Features

**Extended spectral coverage of 200 -1700 nm**

**Super compact size (100 x 100 x 108 mm) robustness and stability**

**High SNR CMOS sensor combined with cooled NIR IGA array**

**Simultaneous acquisition of UV-VIS and NIR spectra**

**Includes a custom-made bifurcated SMA fiber as a dual input to the spectrometer**

**Triple USB 2.0 Ethernet and EtherCAT communication**

**High throughput and ultra low stray light**

## General Spectrometer Specifications\*

|                             |  |
|-----------------------------|--|
| Spectral Coverage           | 200 - 1700 nm  |
| Spectral Input              | Input port: SMA for UV-VIS and custom-end ferrule for NIR (see drawing for details)          |
| Spectral Resolution         | < 6 nm   |
| Average Spectral Dispersion | 17 nm/mm for UV-VIS and 75 nm/mm for NIR   |
| Focal Length                | 70 mm for UV-VIS and 20 mm for NIR   |
| F/#                         | F/4 for UV-VIS and F/2.7 for NIR   |
| Stray Light                 | ± 0.1 nm   |
| Wavelength Accuracy         | < 0.4 nm (using multi-area wavelength calibration) for UV-VIS and 5 nm for NIR               |
| Software                    | LabVIEW acquisition software for initial evaluation (DLLs provided for software integration) |

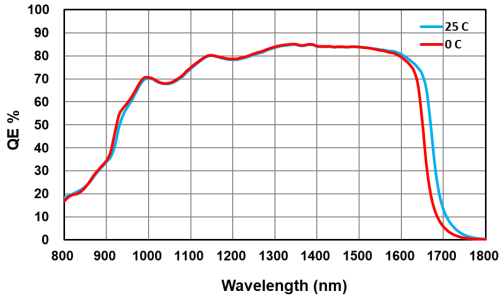
## Detector Options and Specifications\*

| High Speed Linear Front Illuminated CMOS Sensor  |  | TE Cooled Linear InGaAs Detector   |   |
|--|--|--|---|
| Detector Model                                   | Hamamatsu CMOS linear image sensor S11639 with active pixel structure and global e-shutter                                 | Hamamatsu InGaAs linear image sensor G11508 on a CMOS chip   |   |
| Detector Sensor Format                           | 2048 x 1 pixels  | 512 x 1 pixels (256 x 1 pixels, optional)  |   |
| Detector Active Area                             | 28.7 mm x 0.2 mm   | 12.8 mm x 0.5 mm   |   |
| Detector Pixel Size                              | 14 μm x 200 μm   | 25 μm x 500 μm (60 μm x 500 μm, optional)  |   |
| Detector QE                                      | Refer to graphs below  | Refer to graphs below  |   |
| Full Well Capacity                               | 100,000 e <sup>-</sup> (typical)<br>80,000 e <sup>-</sup> (minimum)  | Low-gain: 175,000,000 e <sup>-</sup> (typical)   | High-gain: 17,500,000 e <sup>-</sup> (typical)    |
| Readout Noise                                    | 16 e <sup>-</sup> (typical); 20 e <sup>-</sup> (maximum)   | Low-gain: 16,000 e <sup>-</sup> (typical)  | High-gain: 1,900 e <sup>-</sup> (typical)         |
| Dynamic Range (FW/RN)                            | 6,250:1 (typical)<br>75.9 dB (typical)   | Low-gain: 11,000:1 (typical)<br>80.8 dB (typical)  | High-gain: 9,000:1 (typical)<br>79.1 dB (typical) |
| SNR (SQRT FW)                                    | 316  | Low-gain: 13,228   | High-gain: 4,183                                  |
| Dark Current                                     | 375 e <sup>-</sup> /pixel/s (typical)<br>500 e <sup>-</sup> /pixel/s (maximum) @ 20°C                                      | Within ±250,000 e <sup>-</sup> /pixel/s (typical) @ 5° C   |   |
| Maximum Spectral Rate                            | 5,000 spectra/s (Single IGA Sensor Mode)<br>833 spectra/s (Single CMOS Sensor Mode, or Dual Sensor Mode of CMOS+IGA)       |  |   |
| ADC  | 16-bit   |  |   |
| Thermoelectric Cooling (1-Stage)                 | Uncooled   | 0°C @ T(ambient external) ≤ +30°C<br>+5°C @ T(ambient external) ≤ +35°C<br>+10°C @ T(ambient external) up to +40°C |   |
| Non-linearity                                    | <1% (corrected)  | <1% (uncorrected, will be smaller after correction)  |   |
| Sensor Operating Modes                           | Single CMOS Sensor (UV – VIS)<br>Single IGA Sensor (NIR)<br>Dual Sensor (CMOS & IGA)                                       |  |   |
| Exposure Time                                    | 20 μs up to 100 sec (limited only by dark current)   |  |   |
| Exposure Time Modes for Dual Sensor Operation    | Standard (equal sensor integration time values) and variable (different synchronized sensor integration time values)       |  |   |
| Communication Interface                          | Multi Communication (MC): USB 2.0 HS, Ethernet (10/100), or EtherCAT (Optional)  |  |   |
| Environmental Conditions                         | Operating temperature 15°C to 40°C ambient<br>Relative humidity <70% (non-condensing)<br>Storage temperature -25°C to 45°C |  |   |
| Power Requirements AC/DC Power Supply (provided) | 24VDC @ 0.36A typical (3-Pin M8 Connector)   |  |   |

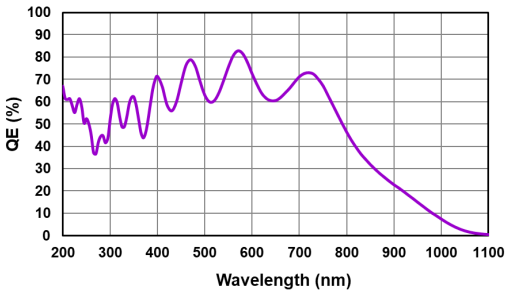
\* HORIBA Instruments has a policy of continuous product development, and reserves the right to amend part numbers, descriptions and specifications without prior notice.

# Quantum Efficiencies

Quantum Efficiency for G11508 Sensor

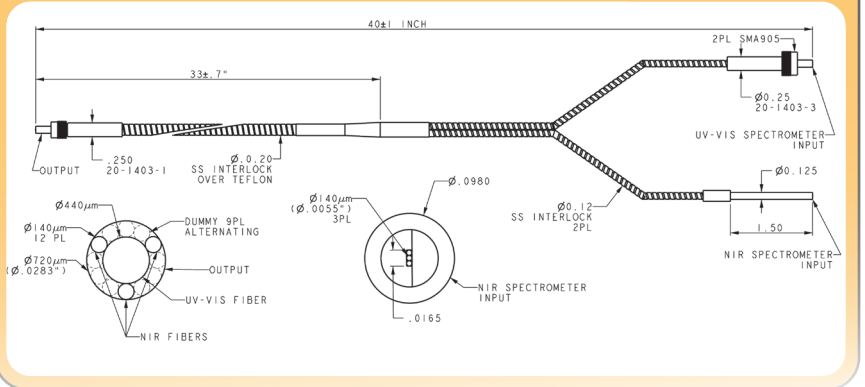


Quantum Efficiency for S11639 Sensor

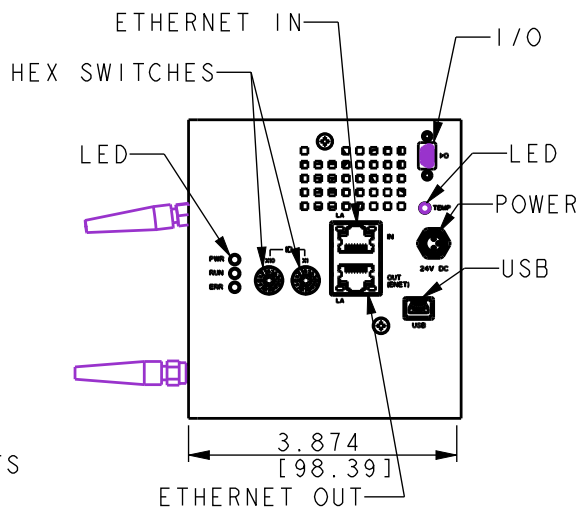
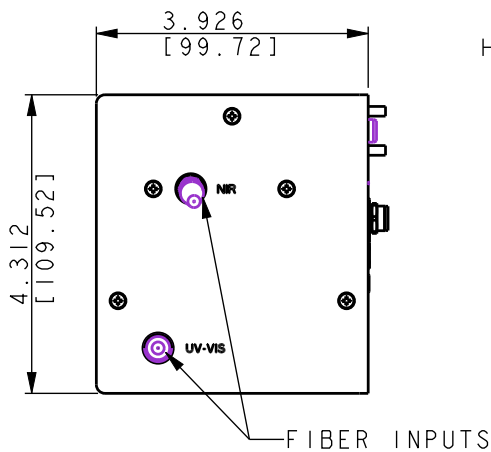
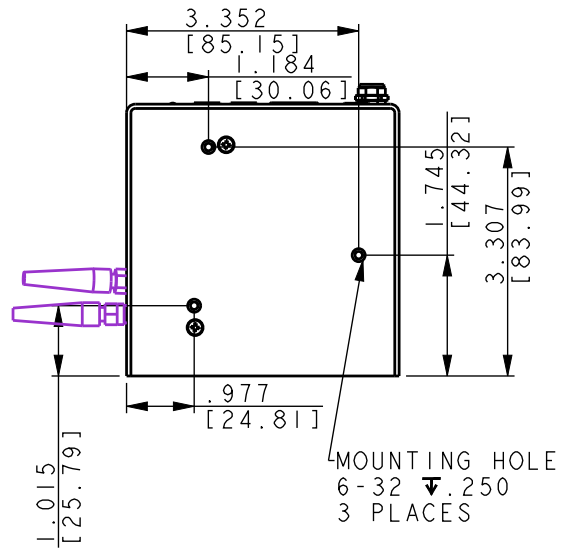
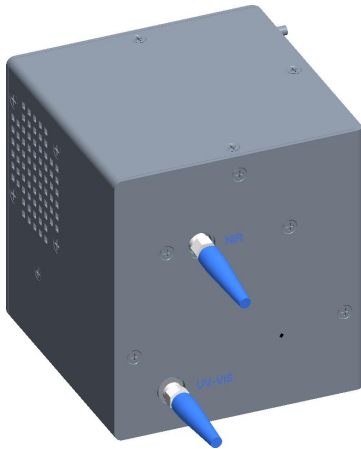


# Custom Fiber Drawing

Drawing of a custom one-to-dual input fiber designed to maximize light collection into the InVizU Cube two detector spectrometer



# System Mechanical Drawings



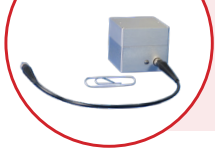
ALL UNITS IN INCHES[MM] UNLESS NOTED

# Best Selling Miniature Spectrometers for OEM Industrial Applications

## Fiber-coupled USB Spectrometers:

### MiniVS20 Spectrometer with Linear UV-VIS CMOS or NIR InGaAs Sensor

5 nm resolution

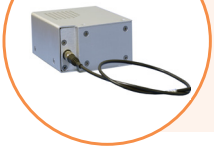


OEM hand-held spectrometer covering 190 to 1,700 nm for various low stray light applications

- Aberration-corrected concave holographic grating options
- VIS configuration featuring a 1.7" x 1.9" x 2" size combined with full F/2.3 optics for high signal-to-noise
- High throughput, compactness and long term reliability

### MiniVS70 VIS Spectrometer with FI CMOS or BI CCD

1 nm resolution



NEW miniaturized VS70 configuration

- Based on high performance aberration-corrected concave gratings fitted with a custom order-sorting filter to eliminate higher orders
- Low cost combined with high performance and low stray light
- Long term opto-mechanical stability and choice of front-illuminated linear CMOS or back-illuminated CCD sensors

### VS70 UV-VIS-NIR Spectrometer with Uncooled / TE-cooled CCD

1-2 nm resolution

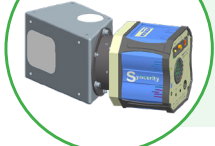


Compact, versatile most popular VS70 OEM spectrometer and OES configurations

- Based on high performance aberration-corrected concave gratings with full F/2.3 aperture
- Affordable, high throughput, robust and stable
- Electronics drivers ranging from **USB-2 to Ethernet and EtherCAT**

### CiCi-Raman-NIR with Scientific Camera Optimized for 785 nm

6 cm<sup>-1</sup> resolution



Most compact OEM Raman spectrometer with aberration-corrected holographic grating

- Covers 150-3,300 cm<sup>-1</sup>
- High efficiency and low stray light
- Available in F/2.3 and in compact F/5 configurations
- -50° C deep-cooled scientific CCD camera with minimized etaloning and high NIR QE

### PoliSpectra® Quad Spectrometer for Simultaneous Acquisition of 4 VIS Spectra

1 nm resolution



CCD spectrometer for simultaneous acquisition from 4 fiber inputs (470-730 nm)

- High-speed electronics (as fast as <1.5 msec readout time for 4 spectra)
- QUAD-channel high throughput system (f/2.3) and ultra-low stray light
- Industrial low-light applications from low light fluorescence to reflectance

### PoliSpectra® M116 8-32 Channel MultiTrack UV-VIS-NIR CMOS Spectrometer

1 nm resolution



Fiber-coupled multi-spectra system with 8- to 32-channel simultaneous measurements

- Concentric optical design with UV extended spectral range provides minimized crosstalk
- High throughput USB-3 system featuring a fast 2D scientific BI CMOS running at 94 to 188 frames per second, acquiring 8, 16 or 32 simultaneous spectra (2048 pixels per spectrum)

### PoliSpectra® H116 Imaging Spectrometer for Hyperspectral Work from UV to NIR

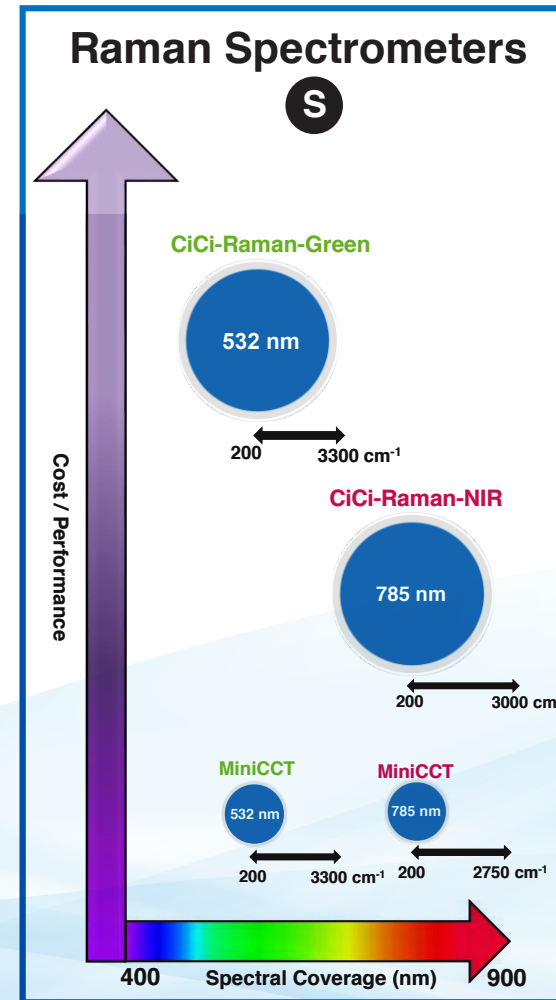
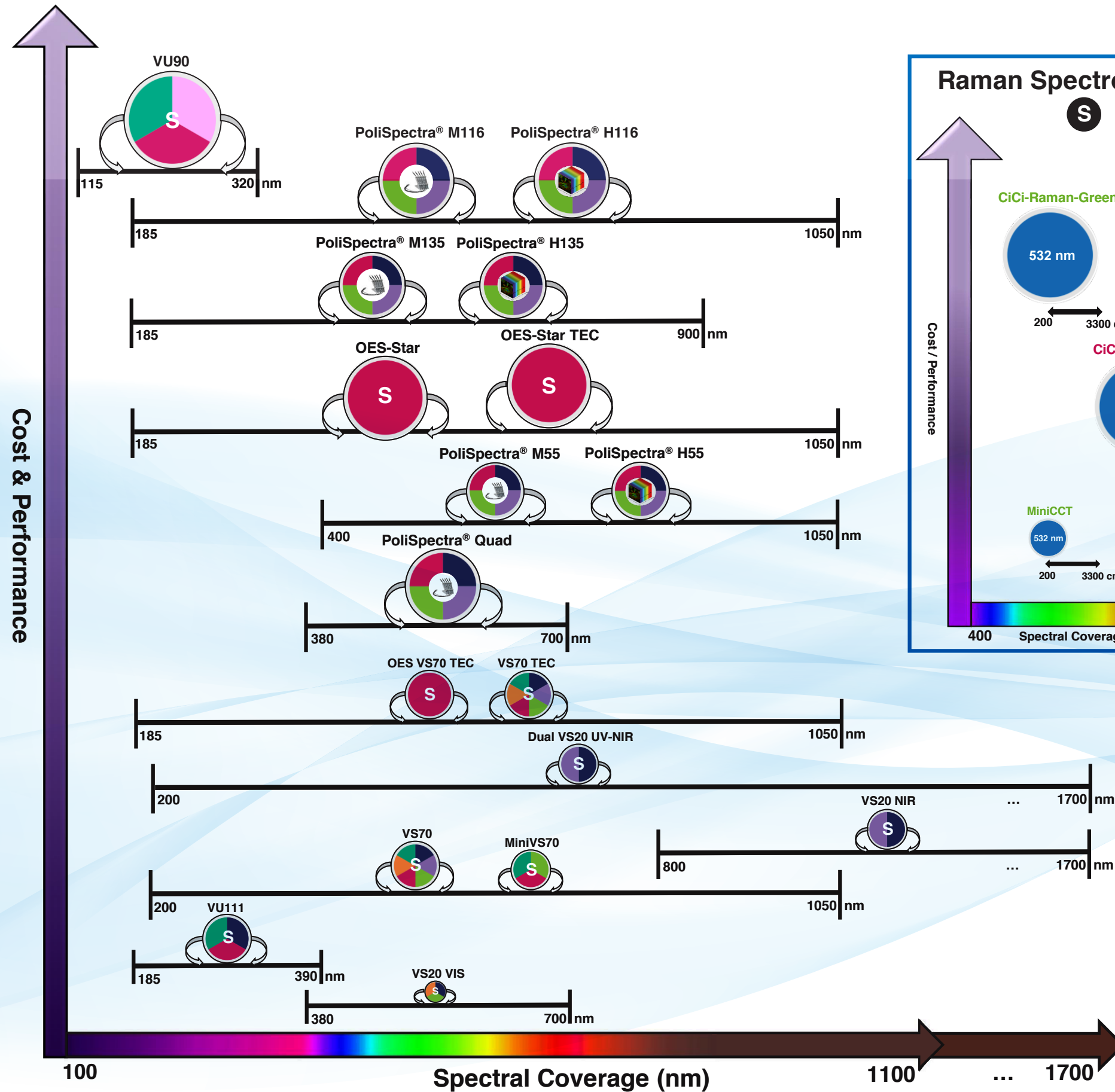
Free-space coupled  
1 nm & 40 μm resolution



Ultra-high performance rugged spectrometer for hyperspectral imaging with a 2D sCMOS Camera

- For line-image scanning, in a push-broom hyperspectral configuration
- High throughput, USB-3 system featuring a fast 2D scientific BI CMOS with rolling shutter, running at 94 (HDR) to 188 (Standard Mode) frames per second (2048 pixels per spectrum)

# OEM Spectrometer Selection Guide



### Legend

**Spectrometer Input Type**

- S** Single-fiber Input
- Multi-fiber Input
- Hyperspectral Imager

**Technique & Application**

- Emission (OES)
- Absorbance
- Fluorescence
- Reflectance
- Raman
- Metrology
- Photoluminescence
- Colorimetry

**Spectrometer Size**

- ≤ 10.5x9x7 inches
- ≤ 8x8x8 inches
- ≤ 7.5x4.5x5 inches
- ≤ 7.5x4.5x3 inches
- ≤ 6x6x7.5 inches
- ≤ 5x5x5 inches
- ≤ 5x5x2 inches
- ≤ 2x2x2 inches

# OEM Philosophy and Mission

## 3 Centers of Excellence Dedicated to OEM Spectroscopy and Camera Solutions in US, EU, and Asia

Our mission is to provide a complete development and manufacturing experience, from optical simulations to opto-mechanical design and prototyping of spectroscopic and camera systems extending to, and including, electronics, firmware, software design and first articles.

Our products provide superior performance, reliability and stability, combined with robust cost reduction. Capable of flexible high volume production capacity in quantities of hundreds to thousands per year, we offer full confidentiality providing "Black Boxes" or private labelling, using your logo or graphics.

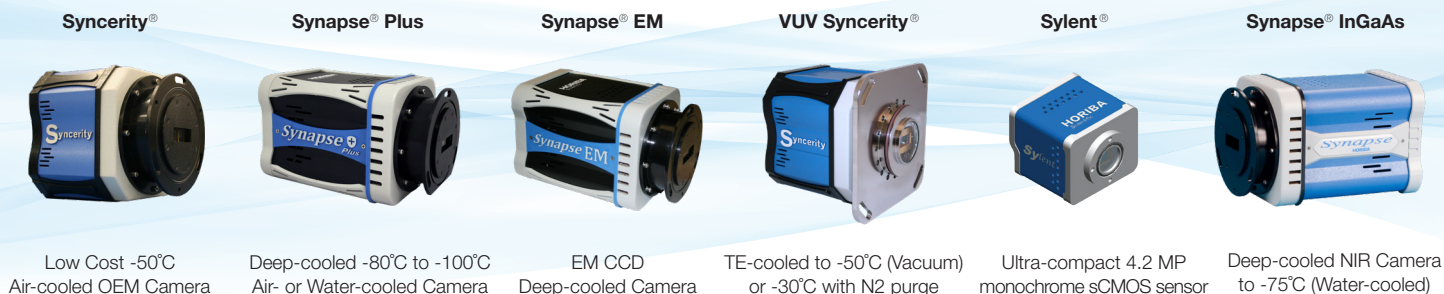
Unmatched customer service is provided by our exceptionally experienced workforce featuring on-time delivery and flexibility, allowing scheduling modifications.

Adhering to Copy Exactly! (CE!) processes, our fully trained staff from engineering to manufacturing form a dedicated OEM engineering force that supports you over the lifetime of the product.

### Scientific Segment - OEM Products and Capabilities:

- Custom master optical diffraction gratings
- Diffraction grating replicas (concave, convex and flat)
- Spectrometers, optical assemblies with pre-aligned sensors (CCD, PDA, CMOS, InGaAs) using either customers' or HORIBA's OEM electronics
- OES spectrometers
- Spectroscopy systems or modular engines, such as mini fluorometers and mini Raman systems
- Single and double scanning monochromators
- Imaging spectrographs and spectrometers with CCD or CMOS cameras
- Multispectra spectrometers with multiple fiber inputs / MultiTrack spectroscopy
- Hyperspectral system with HORIBA or customer provided camera (Push-broom configurations)
- Cameras: Spectroscopic deep-cooled scientific cameras (1D and 2D CCD & InGaAs – FI and BI)
- OEM electronics for optosensors ranging from PD and PDA to CCD and CMOS sensors
- Imaging cameras: Uncooled and cooled with FI and BI high-end scientific CMOS
- VUV/FUV spectrometers and CCD vacuum and N2-purged cameras

## Scientific Deep Cooled CCD, InGaAs and CMOS Cameras



|  |  |  |  |
|--|--|--|--|
|  | USA & Canada   | Japan  | Europe & Asia  |
|  | <a href="mailto:OEM.US@horiba.com">OEM.US@horiba.com</a> | <a href="mailto:OEM.JAPAN@horiba.com">OEM.JAPAN@horiba.com</a> | <a href="mailto:OEMSALES.JYFR@horiba.com">OEMSALES.JYFR@horiba.com</a> |
|  | +1 732 494 8660 Ext. 7733                                | +81 (75) 313 8121  | +33 (0) 1 69 74 72 00  |