台灣超微光學

OtO Photonics

CERTIFIED COMPANY
ISO
9001:2015
OtO Photonics Inc.

World's SmarTest Spectrometers

台灣超微光學
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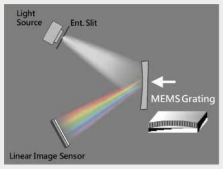
OtO Brand Story



OtO's business commenced with MEMS concave gratings, renowned for its exceptional focusing and dispersing capabilities, critical in the creation of miniature spectrometers. Our revolutionary design, the UltraMicro™ Series, delivers various advantages including compactness, high temperature and humidity stability, shock and drop resistance, and cost-effectiveness, making it an ideal solution for handheld product development.

2002 Fundamental research on MEMS gratings

2006 OtO founded

In 2013, OtO introduced the Czerny-Turner structure spectrometer, emphasizing "temperature & humidity stability with shock & drop resistance" as its primary advantage. An optional control board with CPU and memory facilitates quick spectral and color calculations, along with OtO's exclusive high-speed exposure mode that captures multiple sets of exposure data for batch transmission to the measurement system for verification. The SmartEngine™ Series, with selectable sensors (8 total), gratings (over 30), and software/hardware control models, caters to diverse industry needs, including LED, display, semiconductor thin-film inspection, biomedical detection, and environmental monitoring (water and air) analysis applications. With exceptional performance, flexible configuration for customization, wide-ranging applications, and excellent price-performance, SmartEngine™ series has become OtO's flagship product.

2008 2012 2016
Excellent Electro-Optical Product Award
National Industry Innovation Award
MOEA Innovative Research Award
Excellent Innovative Product Award
Taiwan Outstanding Photonics Product

In 2017, OtO expanded its product portfolio by introducing two high-end series: SideWinder™ and EagleEye™.
The SideWinder™ series focuses on near-infrared spectroscopy measurements, featuring an embedded InGaAs linear sensor that covers the full wavelength range (900-2500nm).
The EagleEye™ series adopts a TE-cooled back-thinned sensor to reduce noise baseline during long integration times, providing ultra-high sensitivity, high resolution, low noise, and a high signal-to-noise ratio. This makes it particularly suitable for applications such as Raman spectroscopy, ellipsometry, thin-film measurement, and advanced LED testing.

In 2018, OtO focused on miniaturizing Czerny-Turner spectrometers and introduced the HummingBird™ and PocketHawk™ series to meet the growing market demand for compact devices. Despite their smaller size, both series maintain excellent signal-to-noise ratio (SNR) and sensitivity, delivering outstanding system integration flexibility and product quality

2009 Mass production of MEMS series

2014 Mass production of Czerny-Turner spectrometer

2017 High-end infrared & TE-cooled series launched

2018 National Gold Invention Award

2020 ISO 9001:2015 Quality Management System Certified
2020 The Dun & Bradstreet Top 1000 Elite SME Award

In 2021-2022, OtO introduced several ultra-high resolution products: the Dubhe™ series, Merak™ series, and Phekda™ series, all named from prominent Chinese stars constellation. The Dubhe™ series is tailored for the core of OCT (optical coherence tomography) scans, featuring extreme high resolution (<0.04nm) and a fast scan of 80/130/250 KHz. The Merak™ series offers high resolution (<0.1nm) at 850nm & 940nm for VCSEL (Vertical-Cavity Surface-Emitting Laser) probing, 3D sensing, and Laser Diode probing. The Phekda™ series can achieve high spectral resolution < 0.1nm (VIS-NIR) & <0.2nm (NIR), and highly recognized for its flexible customization (grating, wavelength range and resolution). It designed for LIBS (Laser-Induced Breakdown Spectroscopy), Raman analysis, and thickness measurement.

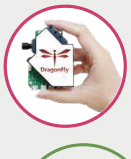
2021 2022 Ultra-high Resolution Series: DuBhe(DB), MeRak (MR) and PhekDa (PD)

In addition to ultra-high resolution products, OtO has developed new products based on TI DLP technology, launching the DragonFly series, which offers near-infrared spectroscopy measurement.
OtO remains dedicated to innovation in spectrometer miniaturization. In the end of 2022, we released the Bullet series spectrometers, comprising the SilverBullet ™ series (UV-VIS) and RedBullet™ series (NIR), featuring a very compact size of 40x36.3x25.1(mm) and 51.4x36.4x29(mm), respectively. They are the best choice for handheld applications, especially in water quality and color analysis; ground, food and textile analysis.

2023 TI DLP NIR Spectrometer
Micro spectrometer: Bullet series

2024 Ultra-high Resolution with TE-cooler models
New models for semi-conductor & NIR market

2025 Ultra-High Resolution TE-cooled Series: MeGrez (MG) Series
Ultra-Compact TE-cooled NIR Spectrometer: GoldenBullet (GB) Series



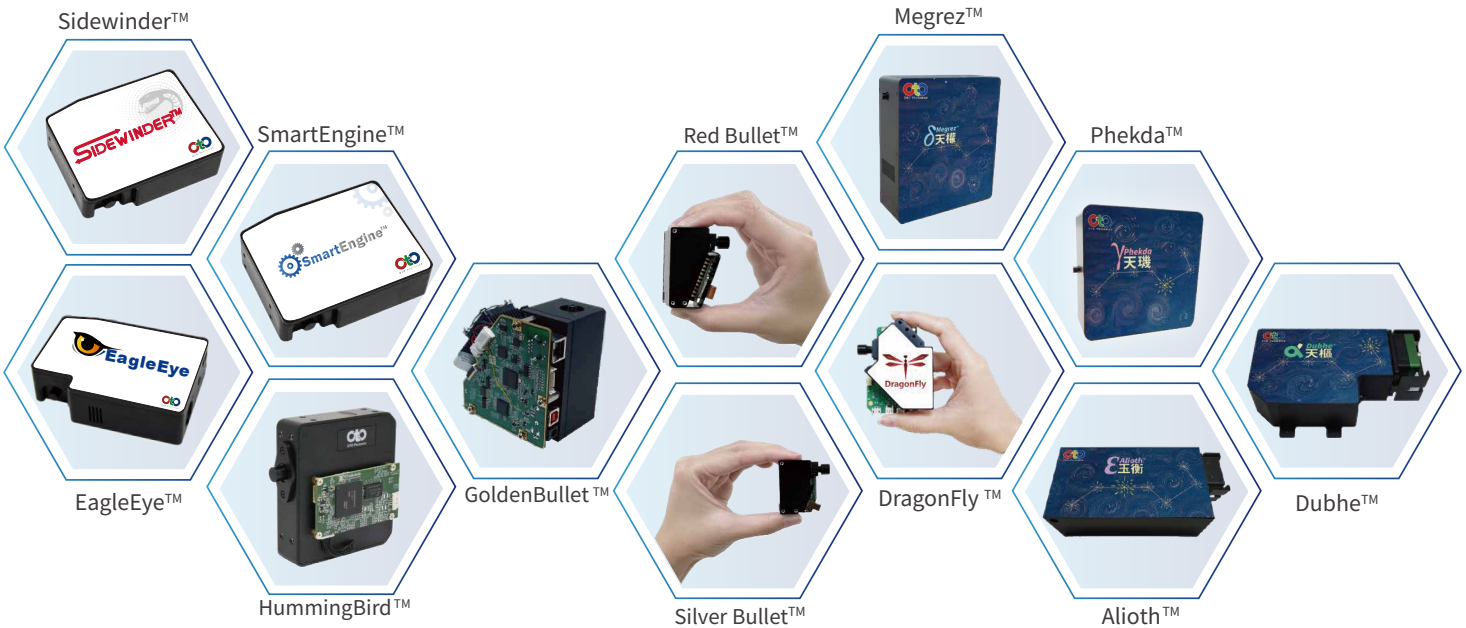
In 2024-2025, leveraging 20 years of experience in spectrometer research, development, and manufacturing, along with extensive in-depth communication with customers, OtO continued to achieve technological breakthroughs.
OtO introduced the MeGrez™ series, equipped with a TE-cooled back-illuminated sensor in its ultra-high-resolution transmission-type products. The MeGrez™ series is highly customizable according to customer specifications (grating, wavelength range, and resolution) within the 400-1700nm range, making it ideal for applications such as Raman spectroscopy, remote sensing, LIBS, LD, and NIR VCSEL measurements.
Additionally, OtO successfully developed the world's smallest TEC-cooled near-infrared spectrometer series, the GoldenBullet™, covering the 900-2200nm wavelength range. The GoldenBullet™ series features built-in transmission-type collimating and focusing lenses, achieving ultra-high sensitivity and exceptional wavelength stability. This innovative product entered mass production in 2025.

With over 20 years of dedication in the field of spectroscopy, OtO has persistently refined the specifications and performance of our spectrometers in 2024. We have embarked on a focused exploration of applications in the semiconductor and near-infrared markets and have continued to introduce high-value-added products, ensuring that our spectrometers not only meet but exceed the expectations of our customers. With high flexibility of customization, premium quality, timely delivery, and stringent cost controls as our guiding principles, we strive to offer the best spectrometers and services to customers.

We are confident to give you the best service to create the perfect model for you!

OtO has been completing a lot of successful development projects in various industries. In addition to the spectrometers listed on the website, we can also offer higher sensitivity sensors, higher optical resolution, specific wavelength range and grating, or even with customized software, hardware design. OtO is happy to discuss with customers and offering further specifications to meet your needs in the market.

OtO Photonics Inc.
Ivan, General Manager



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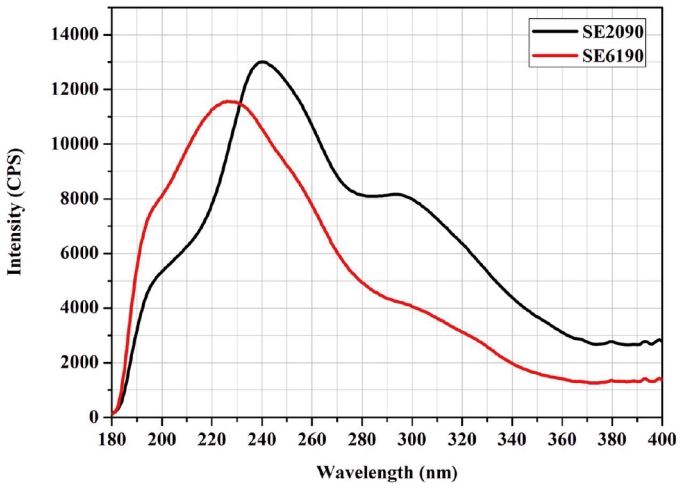
EagleEye™/SmartEngine™ Series for Semiconductor Applications

Thin-film Thickness measurement, Plasma Inspection, OES Applications
Wide Wangelength Range with High Resolution & High SNR, UV Sensitivity Enhanced Spectrometer

- Standard for Ellipsometric Detection Applications: Balanced Response in Full UV-VIS-NIR Wavelength Range.
- Standard for Plasma Inspection Applicaion: High Resolution 1-2nm within Wavelength Range 200-900nm.
- Using back-thinned CCD (TE-Cooled Function is Optional) with Low Noise and High Sensitivity Performance.
- OtO provides customized high resolution spectrometers with different transmissive gratings. Experts are welcome to explore various applications with us.



Sensitivity Response

SE6190/SE6194E

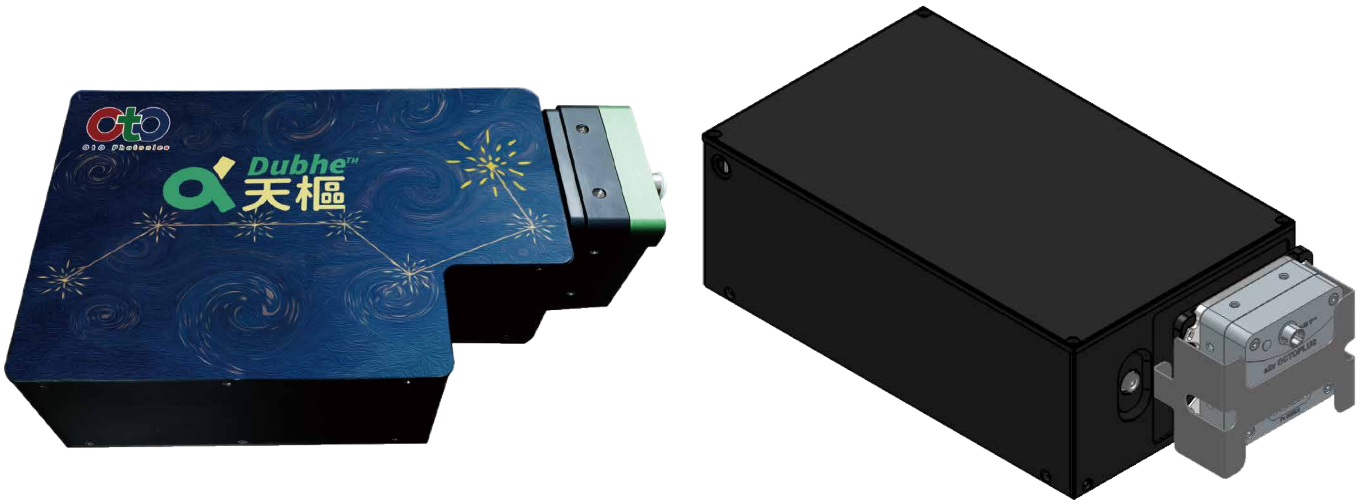
EE6148E

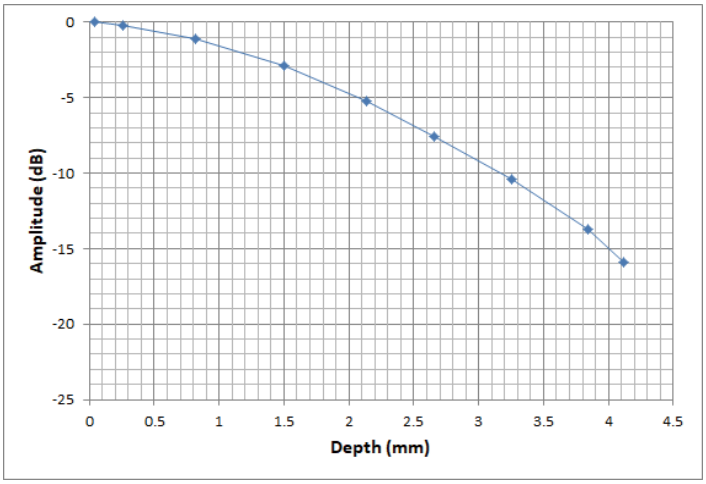
Model Name	SE6190/SE6194E	EE6148E
TE-Cooling	X	0°C at Ambient of 25°C
Wavelength Range	180-1100nm (configurable)	180-1100nm (configurable)
Slit Size	10/25/50/100/200 um	10/25/50/100 um
Resolution	<1.6nm@10um <2.3nm@25um	<1.7nm@10um* <2.3nm@25um*
Sensor	2048pixel High Speed CCD with UV-enhancement	1024pixel Back-thinned CCD with Low Noise
SNR	500	1000
Dynamic Range	6000	32000
Dark Noise	11	8
Integration Time	1.5ms~24sec.	na
Dimension	110*86*32.4 mm 110*86*35.4 mm	130*96*39.5 mm
Fiber Input Interface	SMA905	SMA905 or FC/PC
Data Transfer Interface	USB/Ethernet/UART	

*Simulated values are for reference only

Dubhe™ Series

Eye/Skin/Material OCT Application
Ultra-high Resolution (0.04nm) Spectrometer





Sensitivity fall-off with Depth

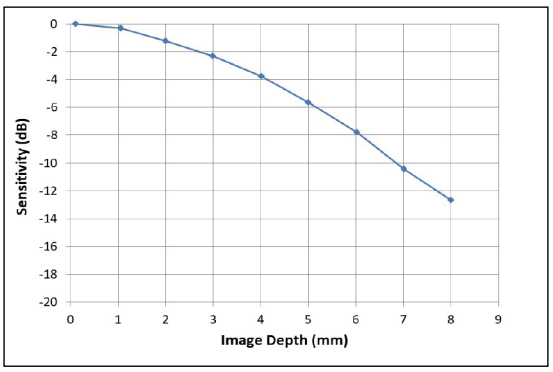
- High-resolution version: Wavelength range 800-880nm; Ultra-high spectral resolution 0.04nm. Wide-band version: Wavelength range 780-930nm & 800-950nm; Spectral resolution 0.075nm.
- Fully transmissive grating and own lens design, integrated system with patented adjustment mechanism.
- Using camera with frame rate 20kHz, 80kHz, 130kHz & 250kHz.
- OtO provides customized ultra-high resolution spectrometers with different transmissive gratings. Experts are welcome to explore various applications with us.

Model Name	DB1020FA	DB1080FA	DB1130FA	DB1250FA
Camera Speed	20kHz	80kHz	130kHz	250kHz
Wavelength Range	800-880nm, Resolution: 0.04nm, Imaging Depth: 4mm			
	780-930nm, Resolution: 0.075nm, Imaging Depth: 2.1mm			
	800-950nm, Resolution: 0.075nm, Imaging Depth: 2.1mm			
Input Fiber	5um single-mode fiber(FC/PC; FC/APC)			
Camera Model Name	e2V octoplus CMOS OCT Camera			
Camera Interface	USB 3.0 / Cameralink			
Camera Package	Ceramic / Organic			
Dimension (w/o camera)	180(L) x 120(W) x 63(H) mm			
	780-930nm & 800-950nm ver. 210(L) x 120(W) x 60(H)mm			
Weight (w/ camera)	1.65 kg			

*5um Singel-mode FC/PC or FC/APC optical fiber is recommended

Alioth™ Series

Eye/Skin/Material OCT Application
Ultra-High Resolution (0.02nm) SpectrometerSpectrometer



Expected Sensitivity fall-off with Depth

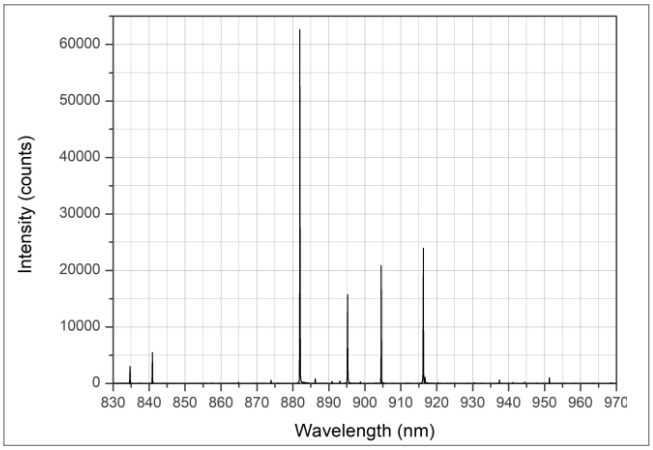
- Wavelength range 820-860nm; Ultra-high spectral resolution 0.02nm.
- Fully transmissive grating and own lens design, integrated system with patented adjustment mechanism.
- Using camera with frame rate 20kHz, 80kHz, 130kHz & 250kHz.
- OtO provides customized ultra-high resolution spectrometers with different transmissive gratings. Experts are welcome to explore various applications with us.

Model Name	AL1020FA	AL1080FA	AL1130FA	AL1250FA
Camera Speed	20kHz	80kHz	130kHz	250kHz
Wavelength Range	820-860nm			
Spectral Resolutio	0.02nm			
Imaging Depth	8mm			
Input Fiber	5um single-mode fiber (FC/PC; FC/APC)			
Camera Model Name	e2V octoplus CMOS OCT Camera			
Camera Interface	USB 3.0 / Cameralink			
Camera Package	Ceramic / Organic			
Dimension (w/o camera)	267(L) x 135(W) x 79.8(H) mm			
Weight (w/ camera)	2.3 kg			

*5um Singel-mode FC/PC or FC/APC optical fiber is recommended

Merak™ Series

VCSEL, Laser Diode, 3D sensing Application
High-Resolution and High-Sensitivity Spectrometer



(Xenon lamp resolution spectrum)

Wavelength	840nm	881nm	937nm
Resolution	0.076	0.088	0.079

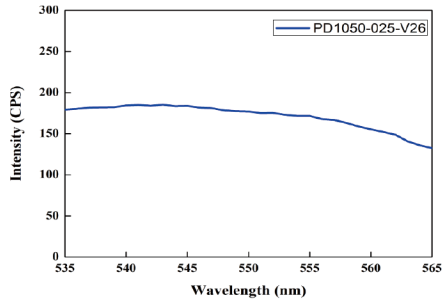
- Wavelength range 830-970nm; High spectral resolution < 0.1nm.
- Fully transmissive optical design, integrated system with patented adjustment mechanism. Using fast exposure CMOS sensor which provides high pixel-resolution at the same time.
- OtO provides customized high resolution spectrometers with different transmissive gratings. Experts are welcome to explore various applications with us.

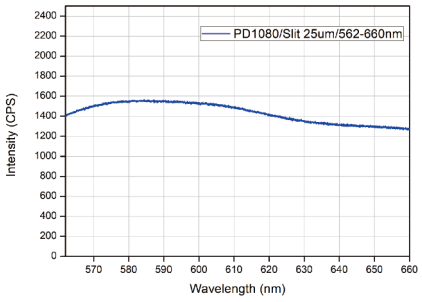
Model Name	MR1080
Wavelength Range	830~970nm
Slit	5um
Resolution	< 0.1nm
Sensor	4096 pixel CMOS
SNR	350
Dynamic Range	3700
Dark Noise	18
Integration Time	100μs~65sec.
Dimension	230(L) x 170(W) x 60(H) mm
Fiber Input Interface	SMA905 or FC/PC
Data Transfer Interface	USB 2.0 / UART

Phekda™ / Phekda-NIR Series

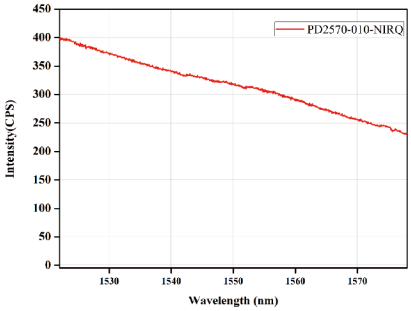
OCT, LIBS, VCSEL, Thin-film, Raman Application Customized High-Resolution Spectrometer

- Wavelength range 400-1100nm & 900-1700nm configurable; High spectral resolution < 0.1nm (VIS-NIR) & <0.2nm (NIR) .
- New T-R-T (Transmissive-Reflective-Transmissive) optical design.
- Using back-thinned 2048pixels CCD/ 4096pixels CMOS sensor for 400-1100nm; 512pixels InGaAs sensor for 900-1700nm.
- OtO provides customized high resolution spectrometers with different relective gratings. Experts are welcome to explore various applications with us.





PD Series Wavelength Response with Halogen Lamp



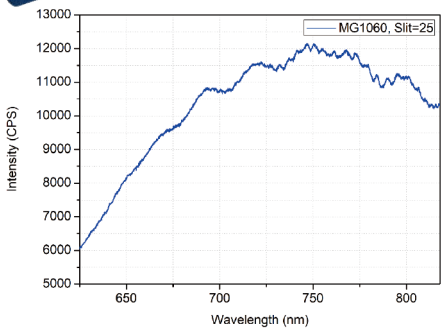
PD-NIR Series
Wavelength Response with Halogen Lamp

Model Name	PD1050	PD1080	PD2570	
Wavelength Range	535~650nm、548~658nm、625~818nm、750~925nm、802~878nm Configurable within the wavelength range of 400 to 1100nm.		1522~1578nm、1270~1350nm 1060~1200nm、1500~1600nm Configurable within the wavelength range of 900 to 1700nm	
Slit	25um	10um/ 25um	10um	
Resolution	<0.15nm	<0.1nm / <0.2nm	<0.2nm	
Sensor	Back-thinned 2048pixel CCD	4096pixel CMOS	512 pixel InGaAs	
SNR	500	350	High Gain 2500	Low Gain 4000
Dynamic Range	4700	3500	High Gain 5600	Low Gain 8200
Dark Noise	14	19	High Gain 11	Low Gain 7
Integration Time	5ms~65sec.	0.1ms~65sec.	0.1ms~24sec.	
Dimension	180(L) x 175(W) x 60.7(H) mm			
Fiber Input Interface	SMA905 or FC/PC or FC/APC			
Data Transfer Interface	USB 2.0 / UART			

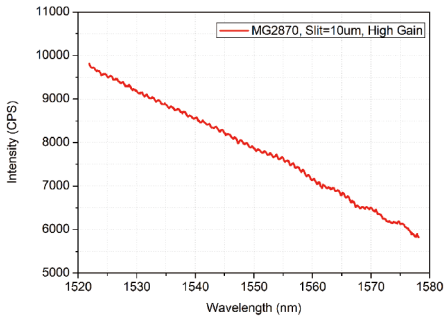
Megrez™ / Megrez-NIR™ Series

Raman, LIBS, VCSEL, Thin-film Application
Customized Thermoelectric Cooling & High-Resolution

- Wavelength range 400-1100nm & 900-1700nm configurable; High spectral resolution < 0.1nm (VIS-NIR) & <0.2nm (NIR) .
- New T-R-T (Transmissive-Reflective-Transmissive) optical design with thermo-electric cooling dector embedded (Default: 0°C at Ambient of 25°C).
- Extremely low thermal noise, TE-Cooler effectively controls dark background under long measurement time.
- Using 2048pixels back-thinned CCD sensor for 400-1100nm; 512 & 1024 (coming soon) pixels InGaAs sensor for 900-1700nm.
- OtO provides customized high resolution spectrometers with different relec-tive gratings. Experts are welcome to explore various applications with us.



MG Series Wavelength Response with Halogen Lamp

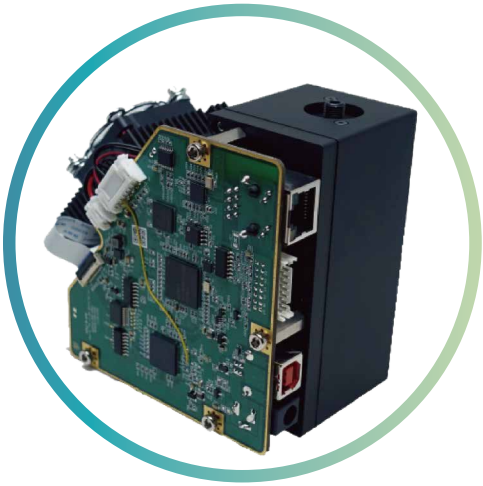


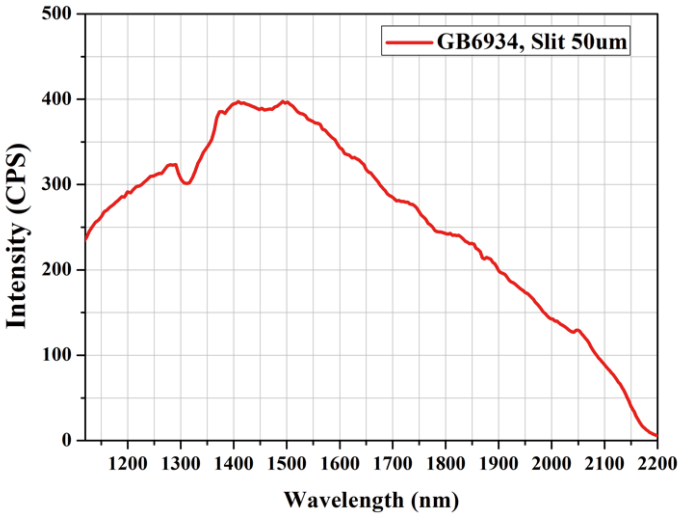
MG-NIR Series Wavelength Response with Halogen Lamp

Model Name	MG1060S	MG1110S	MG2870S		MG6870ES	
Wavelength Range	535~650nm ; 548~658nm ; 560~635nm ; 625~818nm ; 750~925nm ; 790~960nm ; 802~878nm ; 790-1050nm Configurable within the wavelength range of 400 to 1100nm		**900~1050nm ; 1522~1578 nm 1270~1350 nm ; 1060~1200 nm 1500~1600 nm** Configurable within the wavelength range of 900 to 1700nm			
Slit	10um/ 25um/ 50um					
Resolution	0.31nm@slit 50um (560-635nm) 0.3nm@slit 25um (625-818nm) 0.33nm@slit 25um (790-960nm)	0.35nm@slit 10um (790-1050nm)	2.9nm@slit 150um(900-1050nm) 0.4nm@slit 10um(1060-1200nm) 0.2nm@slit 10um(1522-1578nm)			
Sensor	TE-cooled Back-thinned 2048pixel CCD		512 pixel TE-cooled InGaAs			
CCD Cooling	One Stage TEC (Default: 0°C at Ambient of 25°C)					
SNR	500		High Gain 2700	High Gain 4900	High Gain 2700	Low Gain 4900
Dynamic Range	5000		High Gain 7300	High Gain 9300	High Gain 7300	Low Gain 9300
Dark Noise	13		High Gain 9	High Gain 7	High Gain 9	Low Gain 7
Integration Time	5ms~65sec.		0.1ms~24sec.		6us~24sec.	
Dimension	199(L) x 170(W) x 64.5(H) mm					
Fiber Input Interface	SMA905 or FC/PC or FC/APC					
Data Transfer Interface	USB 2.0 / UART / Ethernet					

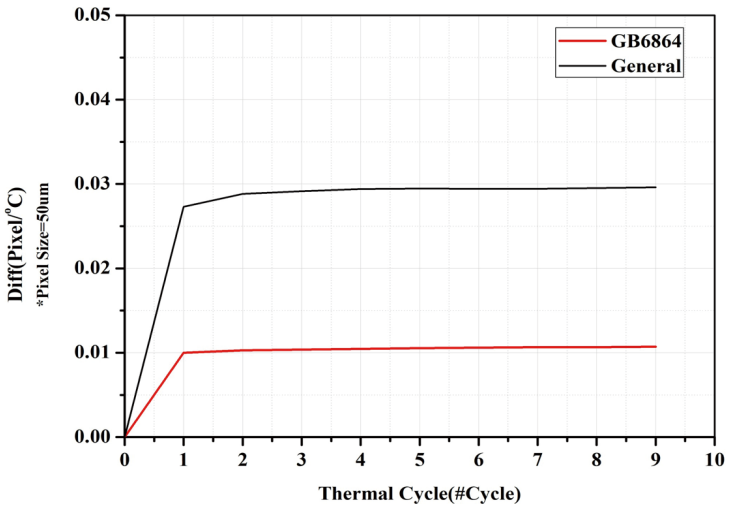
GoldenBullet™ Series

Ground/ Food/ Textile Analysis, NIR Application
Advanced Thermoelectric Cooling NIR Spectrometer





GB Series Wavelength Response with Halogen Lamp



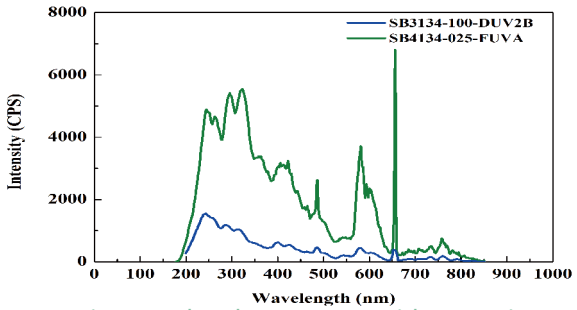
Excellent Wavelength Stability Under Thermal Test

- Wavelength range 900-1700nm & 900-2200nm ; Resolution 8.1nm & 10.2nm (Slit: 50um).
- Czerny-Turner optical design, the most compact NIR spectrometer with thermoelectric cooling InGaAs dector embedded.
- Very excellent wavelength stability under thermal expansion.
- Transmissive lens embedded to have high sensitivity performance.

Model Name	GB6884ES	GB6934ES
Wavelength Range	900-1700nm	900-2200nm
Slit	50um	50um
Resolution	<8.1um (average 5.1)	<10.2um (average 7.3)
TE-Cooled InGaAs Sensor	256 pixels InGaAs One Stage (Ambient temperature 25°C can be reduced to 0°C)	256 pixels InGaAs Two Stage (Ambient temperature 25°C can be reduced to-20°C)
SNR (@0。C/ -20。C)	5000@1x gain 3000@10x gain 2500@20x gain 1600@58x gain	5000@1x gain 3000@10x gain 2500@20x gain 1500@58x gain
Dynamic Range (@0。C/ -20。C)	8200@1x gain 6500@10x gain 5000@20x gain 3400@58x gain	8200@1x gain 6500@10x gain 5000@20x gain 1800@58x gain
Dark Noise	<8@1x gain <10@10x gain <13@20x gain <19@58x gain	<8@1x gain <10@10x gain <13@20x gain <35@58x gain
Integration Time	6us~24s	
Dimension(mm)	109.8(L) x 97.5(W) x 69.8(H) mm	
Fiber Input Interface	SMA905, FC/PC	
Data Transfer Interface	USB2.0 480Mbps/ UART/ Ethernet 100Mbps	

SilverBullet™ Series

Water Quality/ Color Analysis, Handheld Miniature Application Micro UV-VIS-NIR Spectrometer



SB series Wavelenght Response with Deuterium Lamp

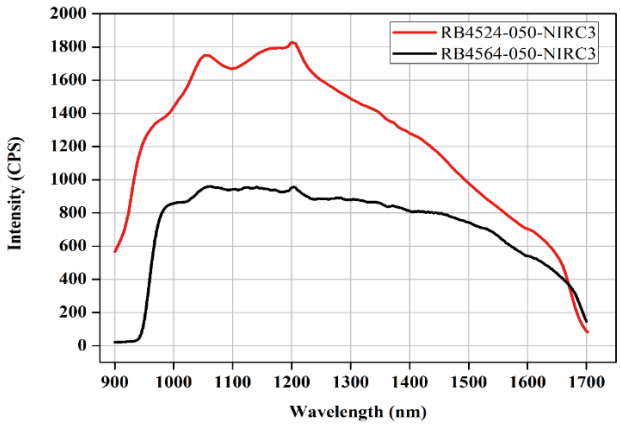
Garting groove (line/mm)	Wavelength Range(nm)	Resolution(nm) (slit 50um)	Resolution(nm) (slit 25um)
300	300~1100	10.8	6.5
400	250~1070	7.8	5
500	200~850	6.2	4.2
600	180~700	5.8	3.5
700	180~600	5	3
768	180~550	4.5	2.7
900	180~470	3.9	2.3
1000	180~430	3.5	2.1
1200	180~350	2.9	1.7

- Wavelength range 180-1100nm configurable ; Resolution 1.7nm~ 6.5nm (Slit: 25um).
- New concave mirror Czerny-Turner optical design.
- 1024pixels CMOS Sensor; High Speed CPU.

Model Name	SB2134/ SB3134/ SB4134	SB4130	SB4234
Wavelength Range	180~1100nm Configurable		
Slit	25um / 50um		
Resolution	1.7~10.8nm (depending on the combination of various gratingsand and slits)		
Sensor	1024pixels CMOS		2048pixels CMOS
SNR	350		350
Dynamic Range	5000		5000
Dark Noise	12.5		13
Integration Time	6us (Sensor Clock rate 10mHz)~65sec. 21us (Sensor Clock rate 2.5mHz)~65sec.		
Dimension	40(L) x 36.3(W) x 25.1(H) mm	49(L) x 43(W) x 28.5(H) mm	40(L) x 36.3(W) x 25.1(H) mm
Fiber Input Interface	SMA905		
Data Transfer Interface	Micro USB / UART		

RedBullet™ Series

Ground/ Food/ Textile Analysis,NIR Handheld Miniature Application Micro NIR Spectrometer



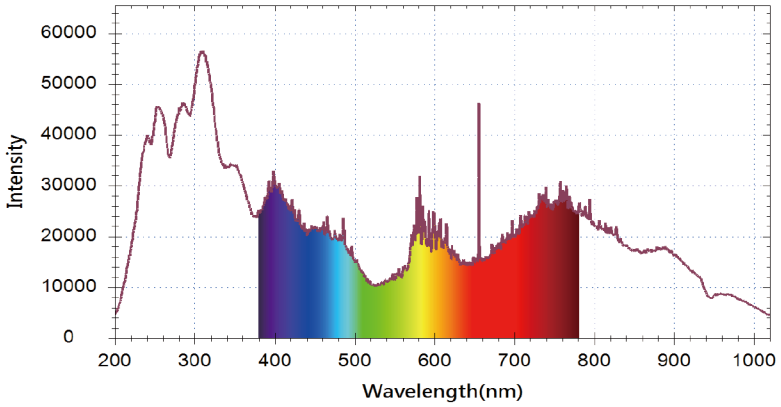
RB Series Wavelength Response with Halogen Lamp

- Wavelength range 900~1700nm; Resolution 10~16nm (Slit : 50um)
- New concave mirror Czerny-Turner optical design.
- 128 & 256pixels InGaAs Sensor; High Speed CPU.

Model Name		RB2524/ RB4524 /RB4520	RB4564
Wavelength Range		900~1700nm	
Slit		50um	25um
Resolution		13.5nm (Typical value)	8.5nm (Typical value)
Sensor		128 pixels InGaAs	256 pixels InGaAs
SNR	High gain	2500	3000
	Low gain	6500	6700
Dynamic Range	High gain	6500	7300
	Low gain	8200	9300
Dark Noise	High gain	10	9
	Low gain	8	7
Integration Time		6us~24sec.	
Dimension		50(L) x 36.4(W) x 28.4(H) mm 60(L) x 43.5(W) x 33.79(H) mm (w/ case)	
Fiber Input Interface		SMA905	
Data Transfer Interface		Micro USB / UART	

SmartEngine™ Series

LED/ Display/ Semiconductor Thin-film Inspection, Biomedical Detection
Environmental Monitoring (Water and Air) Analysis Application
Best-selling UV-VIS-NIR Spectrometer



SE Series 200-1025nm Wavelength Response with Deuterium-Halogen Lamp

- Wavelength range 180-1100nm configurable; Spectral resolution 0.2nm~13nm depends on various grating and slit combination.
- Standard unfold Czerny-Turner optical design.
- More than 10 different sensors and 30 different gratings for selection.
- Excellent thermal (<0.04nm/°C), humidity, vibration and shock stability.
- Support continuous high-speed & multiple exposures and trigger modes.
- Proprietary stray light calibration algorithm (stray light can be eliminated to 0.01%).
- On-board CPU supports optical and color parameters calculation.
- A single-chip processer with faster data transfer rate, using along with a high sensitivity sensor achieves a min. exposure time: 6 us and a max. frame rate: 0.2 ms /frame.
- Pixel Binning mode supports to increase sensitivity, 2/4/8/16 pixel binning optional.
- Dimension: 110 (L) x 86 (W) x 35.4 (H) mm. Fiber input: SMA905 or FC/PC (optional).

  Data interface: USB 2.0, UART, Ethernet.

Make A Spectrometer for Your Own Special Need

Detector Selections

Model Name	Detector Type	Characteristic	SNR	Dynamic Range
SE2010	Front-illuminated CCD	Entry-level model	200	2200
SE2030 / SE4134	CMOS with Fast Exposure	Shortest Exposure Time (0.2ms)	350	4300 (2.5MHz) 3000 (10MHz)
SE2020/ SE2040	Front-illuminated CCD	Excellent Cost Performance Value	250/ 200	1700/ 2200
SE2070	High Pixel-Resolution CCD	High Pixel-Resolution	400	2200
SE2080	CMOS with Fast Exposure	Short Exposure Time (0.4ms) &High Pixel-Resolution Choice	350	3200
SE2090	Back-thinned CCD with Fast Exposure	Full Wavelength Range with Fast Exposure Time (1.5ms)	500	6000
SE2110	Back-thinned CCD with NIR-enhancement	High NIR sensitivity with High SNR	500	4600
SE2120/ SE4120	CMOS with Fast Exposure	High Sensitivity &Shortest Exposure Time (6us)	350	4300 (2.5MHz)
SE6190/ SE6190E	Back-thinned CCD with Deep UV-enhancement	High Deep UV sensitivity & Support Ethernet Interface	500	6000

Grating/ Range/ Slit and Resolution Combination

Groove Density (g/mm)	Best Efficiency Wavelength (nm)	Band width (nm)	Selectable band (nm)	Resolutions (nm) Under Different Slit Sizes				
				10(um)	25(um)	50(um)	100(um)	200(um)
2400	240/400	100 UV 150	180-520	0.2	0.3	0.4	0.7	1.2
1800	180/250/500	150 UV 210	180-700	0.3	0.4	0.6	1.0	1.8
1600	200	160 UV 240	180-780	0.3	0.4	0.7	1.2	2.0
1400	230	180 UV 260	180-900	0.4	0.5	0.8	1.6	3.0
1200	200/300/500/600/750/850	220 UV 320	180-1010	0.4	0.6	0.9	1.7	3.4
1000	250/900	300 UV 400	180-1100	0.6	0.7	1.1	1.9	3.0
950	1000	330 UV 420	180-1100	0.7	0.9	1.4	2.4	3.5
900	500	360 UV 450	180-1100	0.6	0.8	1.3	2.3	4.6
830	800	410 UV 490	180-1100	0.9	1.0	1.5	2.5	4.5
600	250/300/400/500/800/1000	660 UV 680	180-1100	1.0	1.2	1.9	3.3	6.7
500	300/330/560/770	820 UV 830	180-1100	1.1	1.4	2.4	3.7	7.5
300	230/300/422/500	920	180-1100	1.7	2.3	3.2	6.0	12.8

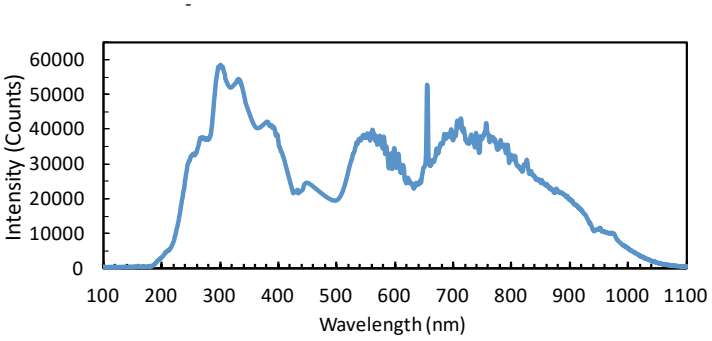
Recommended Models

Application	Model Name	Wavelength Range (nm)	Resolution (nm) @ Slit: 50um	Min. Exposure Time
LED Test	SE2030/4030, SE2090, SE2120/4120	350-1020	1.9	100 /6, 1500, 100 /6 us
Display Detection	SE2030, SE2120	380-780	1.3	0.1ms
Water Quality Analysis	SE2030	180- 850	1.9	0.1 ms
Air Analysis	SE2030, SE2090	180-500	0.2-0.6	0.1, 1.5 ms
Raman Detection	SE2030, SE2110, SE2120	790-1090	1.1	0.1, 5, 0.1 ms
Educational Requirement	SE1040	350-1020	1.9	1 ms
Film Thickness Measurement	SE6030, SE6090	180-1100	3.2	0.1, 1.5 ms
Gem Stone Examination	SE2030	400-500	0.5	0.1 ms
Food Analysis	SE2030	180-1100	3.2	0.1 ms
Blood Analysis	SE2030, SE2120	300-850	1.9	0.1 ms
Fluorescence Detection	SE2030, SE2080, SE2120	340-850	1.9	0.1, 0.42, 0.1 ms
OCT Application	SE2030, S2080	790-1010	0.9	0.1, 0.42 ms

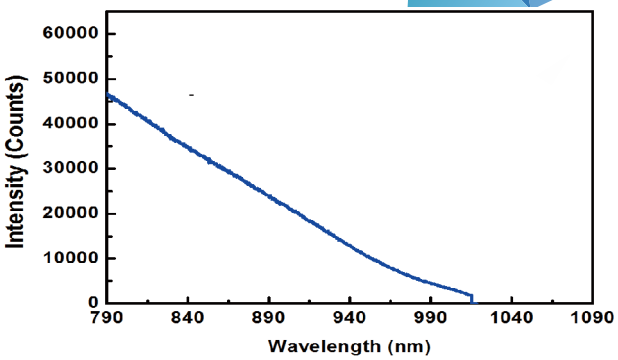
HummingBird™ Series

Display/ Raman/ Semiconductor Thin-film Inspection, Bio-medical Detection
OCT/ Environmental Monitoring (Water and Air) Analysis Application
Best-selling Handheld UV-VIS-NIR Spectrometer

- Wavelength range 180-1100nm configurable; Spectral resolution 0.3nm~15nm depends on various grating and slit combination.
- Folded star-shape Czerny-Turner optical design which is miniaturized and optimized for size and weight, best choice for handheld high-resolution measurement.
- More than 3 different sensors and 20 different gratings for selection.
- The new HummingBird Advance TE-cooled unit (HA Series), model name is HA6114S, capable of reducing the temperature from room temperature (25°C) down to 0°C.
- Excellent thermal (<0.04nm/°C), humidity, vibration and shock stability.
- Support continuous high-speed & multiple exposures and trigger modes.
- Proprietary stray light calibration algorithm (stray light can be eliminated to 0.01%).
- On-board CPU supports optical and color parameters calculation.
- Pixel Binning mode supports to increase sensitivity, 2/4/8 pixel binning optional.
- Dimension (including control board): HB: 83 (L) x 75.5 (W) x 26.75 (H) mm; HA: 95 (L) x 109.5 (W) x37.1 (H) mm.
- Fiber input: SMA905 or FC/PC (optional). Data interface: USB 2.0, UART.



HB Series 180-1100nm Wavelength Response with Deuterium-Halogen Lamp



HB Series 790-1010nm Wavelength Response with Halogen Lamp

Make A Spectrometer for Your Own Special Need

Detector Selections

Model Name	Detector Type	Characteristic	SNR	Dynamic Range
HB2034 / HB2030	CMOS with Fast Exposure	Shortest Exposure Time (0.2ms)	350	5040 (2.5MHz) 4370 (10MHz)
HB2094/ HB2090	Back-thinned CCD with Fast Exposure	Full Wavelength Range with Fast Exposure Time (1.5ms)	500	3800
HB2114	Back-thinned CCD with NIR-enhancement	High NIR sensitivity with High SNR	500	4100
HA6114	Back-thinned TE-cooled CCD with NIR-enhancement	High NIR sensitivity with High SNR	500	5000

Grating/ Range/ Slit and Resolution Combination

Groove Density (g/mm)	Best Efficiency Wavelength (nm)	Band width (nm)	Selectable band (nm)	Resolutions (nm) Under Different Slit Sizes				
				10(um)	25(um)	50(um)	100(um)	200(um)
2400	240	140	180-540	0.3	0.4	0.5	0.9	1.4
1800	250	200	190-380	0.3	0.4	0.6	1.0	1.8
1400	230	250	180-920	0.5	0.6	0.8	1.6	3.0
1200	200/250/850	220 UV 320	180-1010	0.6	0.7	1.0	1.9	3.6
1000	900	300	180-1100	0.6	0.8	1.1	1.9	4.0
900	550	400	180-1100	0.8	0.9	1.3	2.5	5.0
600	300/500	670	180-1100	1.2	1.4	1.9	3.7	7.0
500	300/330/560/770	825	180-1100	1.5	1.5	3.0	6.7	8.7
300	230/300	920	180-1100	1.7	2.5	3.9	8.0	15.0

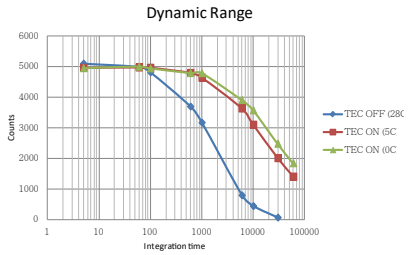
Recommended Models

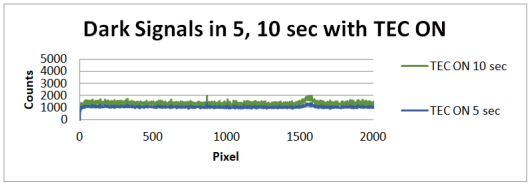
Application	Model Name	Wavelength Range (nm)	Slit (um)	Resolution (nm)
LED Test	HB2034/ HB2094	350-1020	50	1.9
Display Detection	HB2034/ HB2094	380-780	300	8.0
Film Thickness Measurement	HB2034/ HB2094	180- 1100	50	3.9
Water Quality/ DNA Detection	HB2034/ HB2094	180- 850	50	1.9
Air Analysis	HB2034/ HB2094	180-500	10/25	0.6~0.7
Food Analysis	HB2034	350- 1020	200	7.0
Raman Detection	HB2034/ HB2114/ HA6114	790- 1010	25	0.7
OCT Application	HB2034/ HB2094	790- 1090	25	0.8

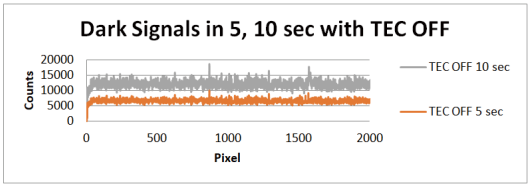
EagleEye™ Series-TE-cooler Model

LED/ Raman Measurement, Semiconductor Thin-film Inspection Thermoelectric Cooling UV-VIS-NIR Spectrometer

- Wavelength range 180-1100nm configurable; Spectral resolution 0.2nm~13nm depends on various grating and slit combination.
- Standard unfold Czerny-Turner optical design with thermoelectric cooling dector embedded (Default: 0°C at Ambient of 25°C).
- Different sensors and different gratings for selection. (The resolution table for gratings and corresponding slits can be referenced in the SmartEngine Series Page)
- Extremely low thermal noise, TE-Cooler effectively controls dark background under long measurement time.
- Support continuous high-speed & multiple exposures and trigger modes.
- Proprietary stray light calibration algorithm (stray light can be eliminated to 0.01%).
- Pixel Binning mode supports to increase sensitivity, 2/4/8/16 pixel binning optional.





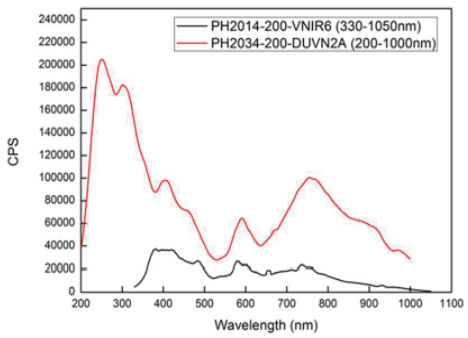


Model	EE2113	EE2063	EE2093
Wavelength Range	500~1100nm	180-1100nm	
Slit	10/ 25/ 50/ 100/ 200/ 300um		
Resolution	0.2nm~13nm *		
Sensor	2048 pixels back-thinned CCD with NIR-enhancement	2048 pixels back-thinned CCD with UV-enhancement	
CCD Cooling	0℃ at Ambient of 25℃		
SNR	500		
Dynamic Range	5000	4000	
Dark Noise	13	17	
Integration Time	5ms~65sec.		1.5ms~65sec.
Shutter	Optional		
Dimension	130 (L)*96(W)*57.65(H) mm		
Fiber Input Interface	SMA905 or FC/PC		
Data Transfer Interface	USB2.0 / UART/ Ethernet		

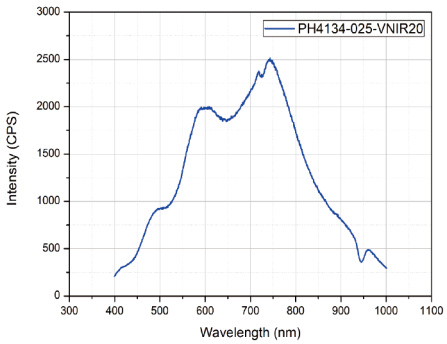
* Depends on various grating and slit combination.

PocketHawk™ Series

Thin-film/ Biomedical Analysis, Handheld Miniature Applications
Compact UV-VIS-NIR Spectrometer with Good Performance & Price



PH2014/2034 Wavelength Response
(Deuterium-Halogen Lamp)



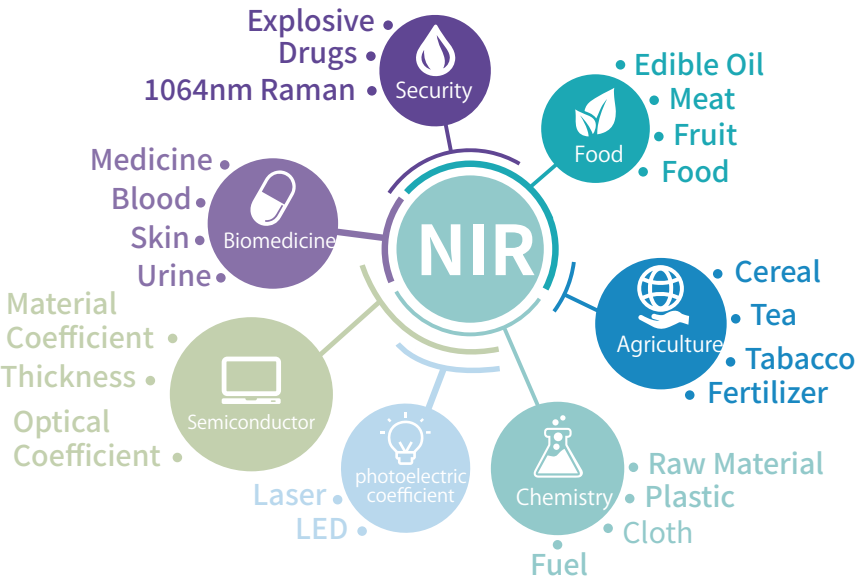
PH4134 Wavelength Response
(Halogen Lamp)

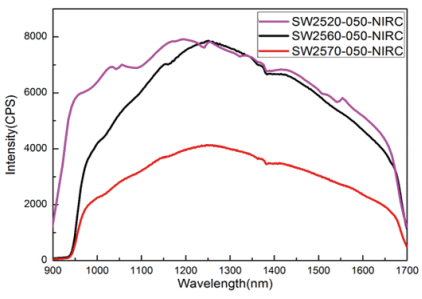
- Wavelength range: Configurable from 180nm to 1100nm.
- Folded star-shape Czerny-Turner optical design which is miniaturized and optimized for size and weight, best choice for handheld measurement.
- Support continuous high-speed & multiple exposures and trigger modes.
- Proprietary stray light calibration algorithm (stray light can be eliminated to 0.01%).
- On-board CPU supports optical and color parameters calculation.
- Attractive cost to implement micro & smart spectral application systems.

Model Name	PH2014	PH2034	PH4134	PH4234
Wavelength Range	330-1050nm	200-1050 nm		
	Configurable from 180nm to1100nm			
Slit	10/25/50/100/200 um			
Resolution	2.2/2.5/3.1/6/12 nm	NA/NA/10/18.3/36 nm	2.7/3.3/4.7/8.8/20 nm	
Sensor	3000 Pixels	512 Pixels	1024 Pixels	2048 Pixels
SNR	200	350	350	350
Dynamic Range	2200	5500	5000	5000
Dark Noise	30	12	13	13
Integration Time	1.5ms~65sec.	0.1ms~65sec.	0.1ms~65sec.	20us~65sec.
Dimension	65 (L)x 65 (W) x 29.8 (H) mm			
Fiber Input Interface	SMA905			
Data Transfer Interface	Micro USB / UART			

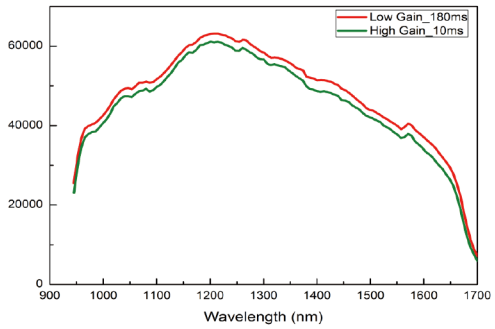
SideWinder™ Series

Film Thickness Inspection/ F ood, Pharma, and Bio-chemistry Analysis/ Fabric Material Analysis Applications Excellent Performance & Robust Design NIR Spectr ometer

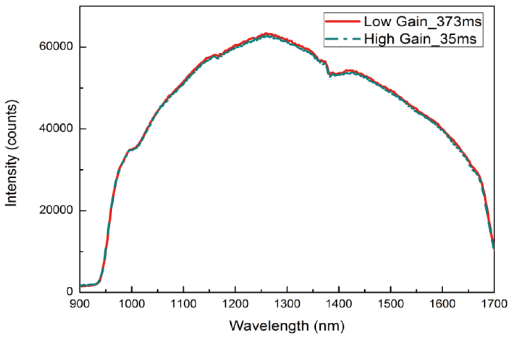




SW2520 & SW2560 & SW2570 Wavelength Response with Halogen Lamp



High Gain vs Low Gain (SW2520)



High Gain vs Low Gain (SW2560/2570)

- Specially designed for Near Infrared region covering from 900~1700nm.
- Standard unfold Czerny-Turner optical design. Compact size and convenient to carry for NIR measurement.
- High SNR, high sensitivity and high resolution.
- High gain mode & low gain mode for options. Sensitivity of high gain mode is at average 10 or 18 times higher than low gain mode.
- Enterance shutter can be built in as an option.
- OtO provides customized higher resolution SW2570 with different relective gratings. Experts are welcome to explore various applications with us.

Model Name	Groove Density (g/mm)	Best Efficiency Wavelength (nm)	Bandwidth (nm)	Selectable Band (nm)	Resolutions (nm) under different slit sizes *				
					25 (um)	50 (um)	100 (um)	150 (um)	200 (um)
SW2520	120	1000	800	900-1700	-	15.9	21.8	26.1	29.9
SW2560	236.8	1350	800	900-1700	-	7.2	10	12.7	16.5
SW2570	236.8	1350	800	900-1700	4.1	5.2	8.4	12.2	16.2

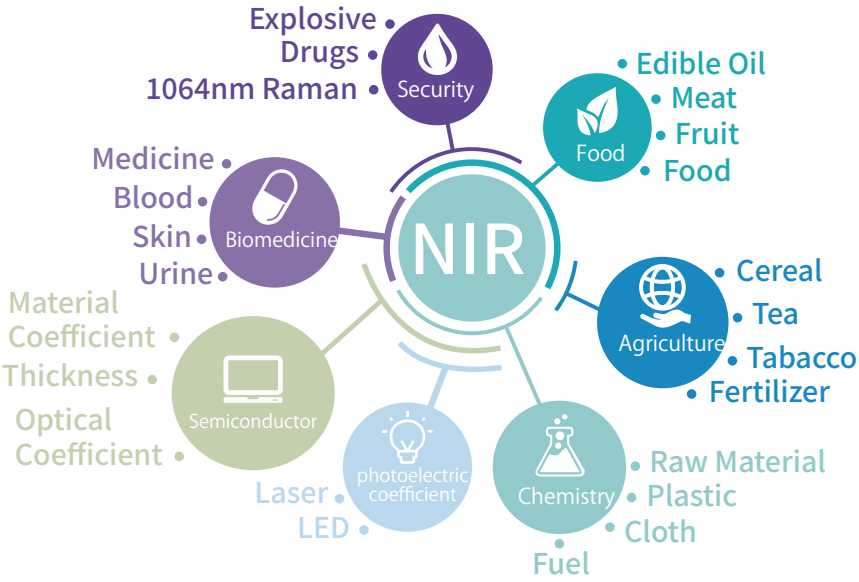
*Typical value, Small deviations are possible.

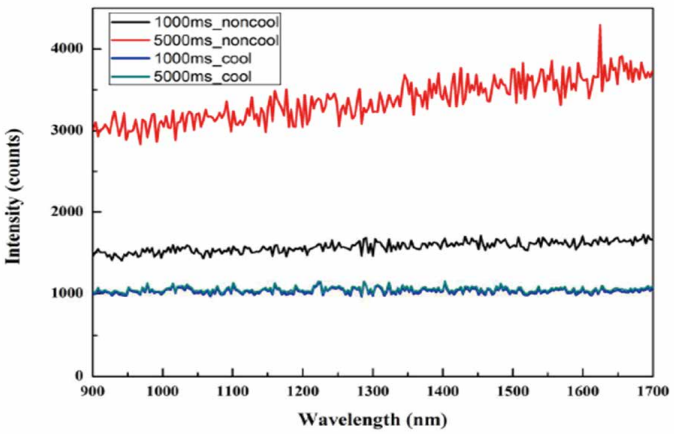
Model Name		SW2520	SW2560	SW2570
Wavelength Range		900~1700nm		
Slit		50/ 100/ 150/ 200um		25/ 50/ 100/ 150/ 200um
Resolution@slit 50um (1083.84nm, 1262.34nm & 1473.28nm of Xenon lamp.)		15.9nm*	7.2nm*	5.2nm*
InGaAs Sensor		128 pixels	256 pixels	512 pixels
SNR (Single acquisition)	High Gain	2000	2400	2500
	Low Gain	4000	4500	4000
Dynamic Range (avg.)	High Gain	6500	6000	6000
	Low Gain	8200	9300	9300
Dark Noise (Upper Limit)	High Gain	10	11	11
	Low Gain	8	8	8
Integration Time		100 µs~24 sec. depending on sensors		
Dimension		110(L) x 86(W) x 35.4(H) mm		
Fiber Input Interface		SMA905		
Data Transfer Interface		USB2.0 / UART		

*Typical value, Small deviations are possible.

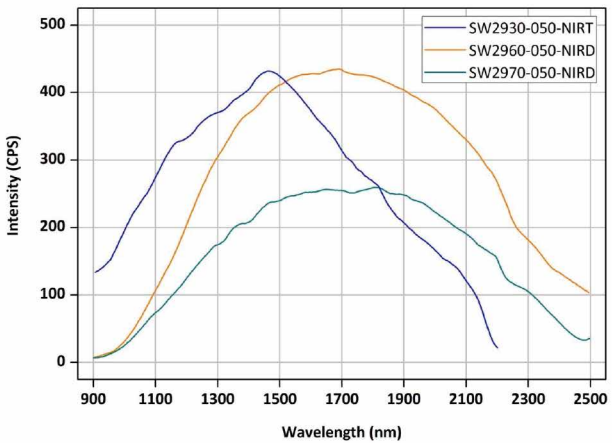
SideWinder™ Series with TE-cooler

Enviromental Detection/ Film Thickness Inspection/ Food, Pharma, and Bio-chemistry Analysis/ Fabric Material Analysis Applications
Excellent Performance TE-cooled NIR Spectrometer





Dark Noise of TEC ON vs TEC OFF
under different integration time (SW2860)



Spectral Respond of SW2930/2960/2970

- Wavelength range 900-1700nm, 910-2200nm & 900-2500nm.
- Standard unfold Czerny-Turner optical design with thermoelectric cooling InGaAs dector embedded.
- TEC One-Stage: SW2860、SW2870 (shutter is optional);
  TEC Two-Stage: SW2930、SW2960、SW2970 (shutter is included).
- High SNR, high sensitivity and high dynamic range.
- High gain mode & low gain mode for options. Sensitivity of high gain mode can be selected as 10x, 20x, or 58x higher than low gain mode.
- Enterance shutter can be built in as an highly recommended option.

Model	Groove Density (g/mm)	Best Efficiency Wavelength(nm)	Bandwidth (nm)	Selectable Band (nm)	Resolutions (nm) under different slit sizes *				
					25 (um)	50 (um)	100 (um)	150 (um)	200 (um)
SW2860	236.8	1350	800	900-1700	-	7.2	10	12.7	16.5
SW2870	236.8	1350	800	900-1700	4.1	5.2	8.4	12.2	16.2
	400	1200	340	1090~1450	2	3	5	6	7
SW2930	150	1250	1290	910-2200	-	7	12	-	-
SW2960	120	1800	1600	900-2500	-	10.5	18	-	30
SW2970	120	1800	1600	900-2500	-	9	15	-	28
	400	1600	350	1600-1950	1.5	2	4	6	7

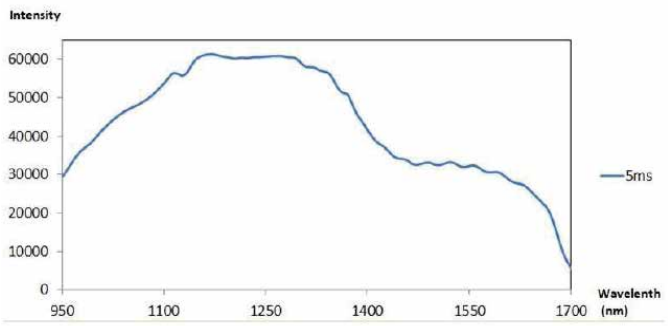
(*Typical value, Small deviations are possible.)

Model Name		SW2860	SW2870	SW2880	SW2930	SW2960	SW2970
Wavelength Range		900-1700nm			910-2200nm	900-2500nm	
Slit		50um/100um/ 150um/200um	25um/50um/ 100um/150um/ 200um	50um/100um/ 150um/200um	50um/100um/ 150um/200um		25um/50um/ 100um/150um/ 200um
Resolution (*Typical value, Small deviations are possible.)	Slit : 50um	7.2nm	5.2nm	7.2nm	7nm	10.5nm	9nm
	Slit : 100um	10nm	8.4nm	10nm	12nm	18nm	15nm
TE-Cooled InGaAs Sensor		256 pixels	512 pixels	256 pixels	256 pixels		512 pixels
		One Stage(Ambient temperature 25°C can be reduced to 0°C)			Two Stage(Ambient temperature 25°C can be reduced to-20°C)		
SNR	High Gain*	3200			3000	2200	3000
	Low Gain	4500			5300	4300	6000
Dynamic Range	High Gain*	8000	7200	8000	6000	7000	6000
	Low Gain	13000	9300	13000	9300	12000	9300
Dark Noise	High Gain*	8	9	8	11	8.5	11
	Low Gain	5	7	5	7	5.5	7
Integration Time	High Gain*	100 µs ~ 24sec. (suggest max.100ms)			100 µs ~ 300ms	100 µs ~ 20ms	
	Low Gain	100 µs ~ 24sec. (suggest max. 1sec.)			100 µs ~ 3sec.	100 µs ~ 200ms	
Dimension		130(L) x 96(W) x 57.65(H) mm					
Fiber Input Interface		SMA905					
Data Transfer Interface		USB2.0 / UART/ Ethernet					

*High Gain is collected with a 10x gain setting

PocketHawk-NIR™ Series

Thin-film/ Food Analysis, Handheld Miniat ure Application Compact NIR Spectrometer with Good P erformance & Price



PH2524 Wavelength Response (Halogen Lamp)

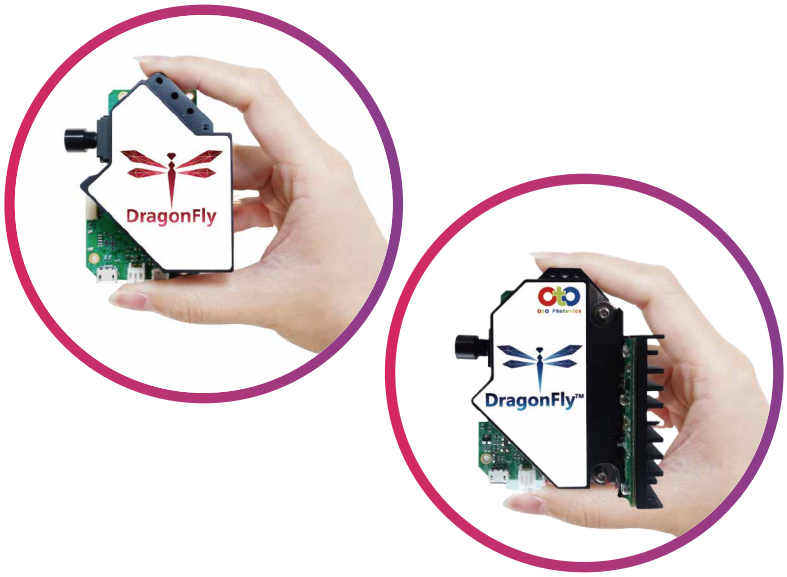
- Wavelength range: 900-1700nm.
- Folded star-shape Czerny-Turner optical design which is miniaturized and optimized for size and weight, best choice for handheld measurement.
- Support continuous high-speed & multiple exposures and trigger modes.
- Proprietary stray light calibration algorithm (stray light can be eliminated to 0.01%).
- On-board CPU supports optical and color parameters calculation.
- Attractive cost to implement micro & smart spectral application systems.

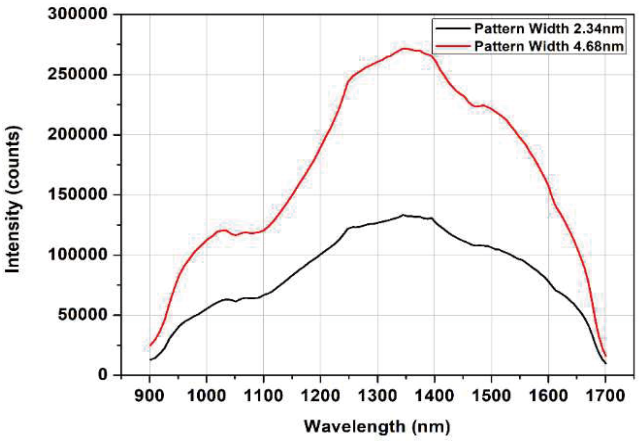
Model Name		PH2524	PH2534
Wavelength Range		900-1700 nm	
Slit		50/100/200 um	
Resolution		14/ 18 nm *	6/ 9 nm *
Sensor		128 Pixels InGaAs	256 Pixels InGaAs
SNR	High Gain	2500	
	Low Gain	6500	
Dynamic Range	High Gain	6500	6000
	Low Gain	8000	6500
Dark Noise	High Gain	10	11
	Low Gain	8	10
Integration Time		100us~15sec.(suggest max. 1sec.)	
Dimension		65 (L)x 65 (W) x 29.8 (H) mm	
Fiber Input Interface		SMA905	
Data Transfer Interface		Micro USB / UART	

(*Typical value, Small deviations are possible.)

DragonFly™ Series

Grain measurement/ Fabric material analysis application
Digital Light Processing (DLP™) NIR Spectrometer





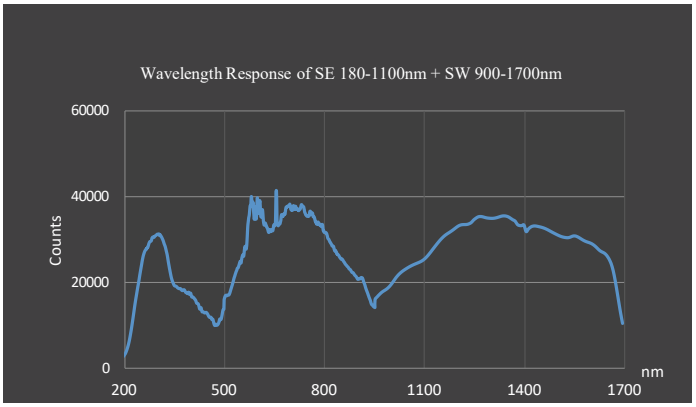
DF1514 wavelength response with
Halogen Lamp, integration time 0.635 ms

- Wavelength range 900-1700nm (non-cooled or 2-stage TEC); 1340-2280nm, 1500-2280nm & 1250-2050nm (2-stage TEC).
- Developed base on Texas Instrument DLP™ Digital Micromirror Device.
- The most cost-effective near-infrared spectrometer.
- Excellent signal-to-noise ratio performance which improves measurement stability.
- Fully technical support in firmware/software for customized system development.

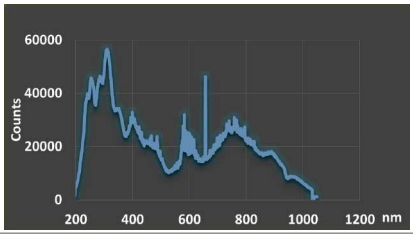
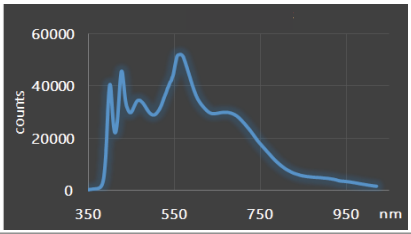
Model Name	DF1514	DF1914	DF1924	DF1934
Wavelength Range	900-1700nm		1250-2050nm	1340-2280nm
Slit	25um			
Resolution	<12nm (Pattern Width 2.34nm)		<14nm (Pattern Width 2.34nm)	<12nm (Pattern Width 2.34nm)
Sensor	1mm InGaAs PD	2 stage TEC InGaAs PD		
SNR	7000			
Scanning Mode	Colunm mode / Hadamard mode/ Slew scan			
Dimension	71.5(L) x 57(W) x25(H) mm including the PCB	76.7(L)x 60(W)x 40(H) mm including the PCB		
Fiber Input Interface	SMA905			
Data Transfer Interface	Micro USB/ UART			

PKG-SE12/SW12-DH/BA/HA

The Best Choice for Teaching, Laboratory and R&D Research and Optical Analysis Applications Spectral Measurement Kit

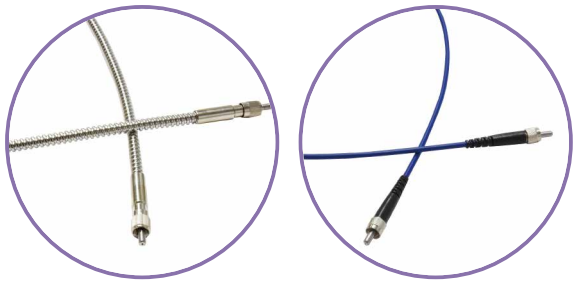


- Provide a complete, cost effective, wide wavelength range (180-1700nm) spectral measurement solution.
- An excellent measurement platform with OtO SmartEngine (SE) & SideWinder (SW) series spectrometer.
- Free sprectra processing software: SpectraSmart provides you with the best user experience, technology and support. SpectraSmart calculates color temperature, color rendering, color values, transmittance, absorbance ... and many different spectral & color parameters.
- Deuterium-halogen light source : high alignment accuracy, stable and built-in shutter control.
- Offer complete accessories that can fully meet the absorbance, transmittance, fluorescence, color, concentration and other measurement needs

Model	PKG-SE12-DH	PKG-SE12-BA	
Light Source	LS-DH-2 Deuterium-Halogen Light	LS-BA Balance Light	
Spectrum			
Collimator	1	2	pcs
Short Fiber	1	1	pcs
Fiber Collimator	1	1	pcs
Adapter	1	1	pcs
Cuvette Holder	1	1	pcs
Square Cuvette	Quartz*1	Quartz*1, Plastic*1	pcs
RGB Color Film	0	1	set
ND Filter(15%, 50%, 75%)	1	1	set
Multi-function Measurement Platform	1	1	set
Waterproof Outer Box	1	1	pcs
Software(SpectraSmart)	1	1	set

Collimator & Optical Fiber

COL-1 & COL-2 has a f/2 fused silica lens for 200-1000 nm or a K9 glass for 400-2500nm. When focused for collimation, beam divergence is 2° or less, depending on the fiber diameter. The COL can be adjusted for UV-VIS or VIS-NIR setups.



Model	COL-1-UV	COL-2-UV	COL-1-NIR
Connector	SMA 905, 3/8-24 external thread	SMA 905 Fiber Stub, 3/8-24 external thread	SMA 905, 3/8-24 external thread
Back Focal Length (mm)	10		
Clear Aperture (mm)	5		
Material	UV Grade Fused Silica		K9 glass
Range	200 nm~1000 nm		400~2500nm
Numerical Aperture (N.A)	0.2		

OtO Photonics provides optical fibers for customers to satisfy the various needs of spectrum measurement. We offer the optical fibers with excellent optical performance, wide-band spectral transmittance, good bending and mechanical properties.
All of our Optical fibers are terminated with standard SMA-905 connecter and easily to connect with OtO Photonics spectrometers, light sources and other accessories. These fibers belong to multimode step Index and are available with fused silica optical fibers.
Base on different waveband, fiber length and numerical aperture, we offer various optical fiber models as below. OtO Photonics also offer customized products, but can not guarantee the transmittances.

For UV-VIS Waveband Optical Fibers • Better transmission in the UV-VIS range (200-1100 nm) • High OH ion concentration • Assembly length 1m	OF-600-100-UVS OF-600-100-UVB
For UV-VIS Waveband Short Optical Fibers • Better transmission in the UV-VIS range (200-1100 nm) • High OH ion concentration • Assembly length 25.4mm & 40mm (double nut)	OF-S-0400-UV OF-S-0600-UV OF-S-1000-A OF-DS-1000-A
For VIS-IR Waveband Optical Fibers • Better transmission in the VIS-IR range (400-2200 nm) • Low OH ion concentration • Two types of numerical aperture(NA) : NA 0.22 fiber and NA 0.37 • Assembly length 1m	OF-600-100-NIRS2 OF-600-100-NIRS3
For VIS-IR Waveband Short Optical Fibers • Better transmission in the VIS-IR range (400-2200 nm) • Low OH ion concentration • Assembly length 25.4mm	OF-S-1000-NIR

Customized Y-type Optical Fibers & Multicore Optical Fiber

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