

Optical components OCOS



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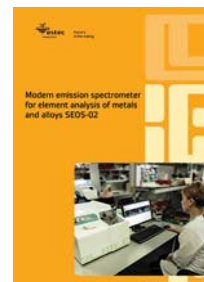
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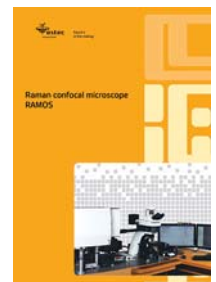
OUR other products:



Vibration Control Solutions AVOS



Emission Spectrometer SEOS-02



Confocal Raman Microscope RAMOS



Nanomechanical Testers NIOS



Light Measuring, Elemental Analysis and Nanoscale Microscopy Instrument LIOS



Spectral System: FTIR Spectrometer IROS 01 and IR Microscope IROS M2






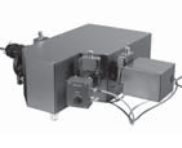



Accessories for Scanning Probe Microscopes

Content

Spectroscopy

Compact spectrometers.....	4
Monochromator-spectrographs.....	5
Monochromator-spectrograph MS0200	6
Monochromator-spectrograph MS0350	7
Monochromator-spectrograph MS0520	8
Monochromator-spectrograph MS0750.....	9
Monochromator-spectrograph MSDD01000.....	10
Monochromator DMO160.....	11
Spectrograph SLO100	12
Spectrograph NPO250.....	13
Accessories.....	14
Digital cameras.....	15
Single-channel detectors.....	16

COMPACT SPECTROMETERS					
model		SLO40-2-1024USB	SLO40-2-3648USB	SO150-2-1024USB	SO150-2-3648USB
Optical scheme	original mirror-lens two-channel desing	original mirror-lens two-channel desing	original mirror-lens two-channel desing	vertical – symmetric (two spectrographs in one housing)	vertical – symmetric (two spectrographs in one housing)
F/number	4.9	4.9	4.9	9.3	9.3
Focal length	40 mm	40 mm	40 mm	158 mm	158 mm
Optics					
Diffraction grating	1200 l/mm	1200 l/mm	1200 l/mm	1200 l/mm	1200 l/mm
Reciprocal linear dispersion	17.7 nm/mm	17.7 nm/mm	17.7 nm/mm	5 nm/mm	5 nm/mm
Spectral resolution	0.8 nm	0.5 nm	0.5 nm	0.15 nm	0.1 nm
Detectable range	205 nm	230 nm	230 nm	130 nm	150 nm
Detection system					
Detector model	S8378 - 1024Q	TCD 1304DG	TCD 1304DG	S8378 - 1024Q	TCD 1304DG
Number of pixels	1024	3648	3648	1024	3648
Pixel width	25 μm	8 μm	8 μm	25 μm	8 μm
Pixel height	500 μm	200 μm	200 μm	500 μm	200 μm
Spectral response	200 – 1065 nm	190 – 1065 nm	190 – 1065 nm	200 – 1065 nm	190 – 1065 nm
Min. exposure time	2.1 ms	7.4 ms	7.4 ms	2.1 ms	7.4 ms
Max. exposure time	5 s	3 s	3 s	5 s	3 s
Min. interval between scans	1 ms	1 ms	1 ms	1 ms	1 ms
Dynamic range for one scan	3600 : 1	1100 : 1	1100 : 1	3600 : 1	1100 : 1
Analogue – to – digital converter (ADC)	14 bit, 16384 counts	12 bit, 4096 counts	12 bit, 4096 counts	14 bit, 16384 counts	12 bit, 4096 counts
PC connection Interface	USB	USB	USB	USB	USB
Input	Fiber optics or optical condenser				
Overall dimensions	117 x 80 x 40 mm	117 x 80 x 40 mm	117 x 80 x 40 mm	200 x 143 x 72 mm	200 x 143 x 72 mm
Weight	0.47 kg	0.47 kg	0.47 kg	2.5 kg	2.5 kg

MONOCHROMATOR-SPECTROGRAPHS					
series	MSO200	MSO350	MSO520	MSO750	MSD01000
Optical scheme	Czerny-Turner	Czerny-Turner	Czerny-Turner	Czerny-Turner	Czerny-Turner with dispersion doubling
Ports	1 input, 2 output	1 input, 2 output	1 input, 2 output	1 input, 2 output	2 input, 2 output
F-number	3.6	3.8	5.4	8.9	5.9
Focal length	200 mm	350 mm	520 mm	750 mm	1000 mm (2*500 mm)
Flat field	26 x 10 mm	28 x 10 mm	28 x 10 mm	28 x 10 mm	28 x 10 mm
Stray light (20 nm from 632.8 nm laser line)	3×10^{-5}	1×10^{-5}	1×10^{-6}	5.5×10^{-7}	1×10^{-8}
Optics					
Reciprocal linear dispersion	4.12 nm/mm	2.37 nm/mm	1.55 nm/mm	1.02 nm/mm	0.74 nm/mm
Spectral resolution	0.12 nm	0.07 nm	0.034 nm	0.02 nm	0.017 nm
Scanning range (limited by grating rotation angle)	0 - 1300 nm	0 - 1280 nm	0 - 1500 nm	0 - 1270 nm	0 - 1280 nm
Scanning step	0.012 nm	0.01 nm	0.002 nm	0.0015 nm	0.0015 nm
Wavelength accuracy	± 0.12 nm	± 0.125 nm	± 0.05 nm	± 0.05 nm	± 0.05 nm
Astigmatism compensation (for models with imaging option)					
Horizontal magnification	1.18	1.09	1.07	1.08	1.01
Vertical magnification	1.48	1.49	1.29	1.125	1.15
Astigmatism	< 40 μ m	< 35 μ m	< 20 μ m	< 15 μ m	< 15 μ m
Dimensions and weight					
Overall dimensions	300x200x160 mm	510x395x200 mm	635x340x270 mm	950x360x345 mm	555x325x340 mm
Weight	9 kg	19 kg	25 kg	45 kg	35 kg

All specifications measured with grating 1200 l/mm, wavelength 546 nm, entrance slit width 15 μ m and detector pixel size 12 μ m



Monochromator-spectrographs MSO200 series are general-purpose spectral instruments which can be used as monochromators or spectrographs with a large flat focal field. They are completely automated spectral devices with focal length of 200 mm and F-number of 3.6.

Model MSO2001i and model MSO2004i have the astigmatism-corrected optics what makes these devices applicable in multi-channel spectroscopy.

In model MSO2001 and model MSO2001i a single-position holder is used for easy manual switching of gratings.

Automated four-grating turret (model MSO2004 and model MSO2004i) provides a fast switching of gratings with high repeatability of the set wavelength.

Optical system	
Optical scheme	Czerny-Turner
Wavelength range	185 nm - 60 μ m
F-number	3.6
Focal length	200 mm
Scanning range (limited by grating rotation angle)	0 - 1300 nm
Stray light	3×10^{-5}
Flat field	26 x 10 mm
Astigmatism compensation	
Horizontal magnification	1.18
Vertical magnification	1.48
Astigmatism	< 40 μ m
Drive	
Motor type	microstepper
Drive	worm
Step	1.6 arc sec
Accuracy	± 1 step
Max. speed	10 000 steps/s
Ports	
Number of ports	1 input, 1 or 2 output
Output switching repeatability	± 0.03 nm
Port switching time	5 s

Optics	
Reciprocal linear dispersion	4.12 nm/mm
Wavelength repeatability	± 0.036 nm
Wavelength accuracy	± 0.122 nm
Spectral resolution	0.12 nm
Wavelength step	0.012 nm
Gratings	
Grating dimensions	40 x 40 x 6 mm
Grating positioning repeatability	
- wavelength	± 0.04 nm
- vertical image position	± 40 μ m
Control	
External control	PC
Interface	RS-232
Dimensions and weight	
Overall dimensions	300 x 200 x 160 mm
Weight	9 kg

All specifications measured with grating 1200 l/mm, wavelength 546 nm, entrance slit width 15 μ m and detector pixel size 12 μ m.



Monochromator-spectrographs MSO3500 series are general-purpose spectral instruments which can be used as monochromators or spectrographs with a large flat focal field. They are completely automated spectral devices with focal length of 350 mm and F-number of 3.8.

Model MSO3501i and model MSO3504i have the astigmatism-corrected optics what makes these devices

applicable in multi-channel spectroscopy.

Automated four-grating turret (model MSO3504 and model MSO3504i) provides a fast switching of gratings with high repeatability of the set wavelength.

In model MSO3501 and model MSO3501i a single-position holder is used for easy manual switching of gratings.

Optical system	
Optical scheme	Czerny-Turner
Wavelength range	185 nm - 60 μm
F-number	3.8
Focal length	350 mm
Scanning range (limited by grating rotation angle)	0 - 1280 nm
Stray light	1 x 10 ⁻⁵
Flat field	28 x 10 mm
Astigmatism compensation	
Horizontal magnification	1.09
Vertical magnification	1.49
Astigmatism	< 35 μm
Drive	
Motor type	microstepper
Drive	worm
Step	1.6 arc sec
Accuracy	± 1 step
Max. speed	10 000 steps/s
Ports	
Number of ports	1 input, 1 or 2 output
Output switching repeatability	± 0.03 nm
Port switching time	4 s

Optics	
Reciprocal linear dispersion	2.37 nm/mm
Wavelength repeatability	± 0.03 nm
Wavelength accuracy	± 0.125 nm
Spectral resolution	0.07 nm
Wavelength step	0.01 nm
Gratings	
Grating dimensions	70 x 70 x 10 mm
Grating positioning repeatability	
- wavelength	± 0.03 nm
- vertical image position	± 50 μm
Control	
External control	PC
Interface	RS-232
Dimensions and weight	
Overall dimensions	510 x 395 x 200 mm
Weight	19 kg

All specifications measured with grating 1200 l/mm, wavelength 546 nm, entrance slit width 15 μm and detector pixel size 12 μm.



Monochromator-spectrographs MSO520 series have a unique combination of high-intensity, accuracy and spectral resolution. Large angle of the grating rotation allows to use Echelle grating, providing extremely high spectral resolution (up to 0.002 nm), as well as extended operating wavelength range for the other gratings. MSO520 are completely automated spectral devices with focal length of 520 mm and F-number of 5.4. Model MSO5201i and model MSO5204i have the astigmatism-corrected optics what makes these devices applicable in multi-channel spectroscopy.

Automated four-grating turret (model MSO5204 and model MSO5204i) provides a fast switching of gratings with high repeatability of the set wavelength.

In model MSO5201 and model MSO5201i a single-position holder is used for easy manual switching of gratings.

Optical system	
Optical scheme	Czerny-Turner
Wavelength range	185 nm - 60 μm
F-number	5.4
Focal length	520 mm
Scanning range (limited by grating rotation angle)	0 - 1500 nm
Stray light	1 x 10 ⁻⁶
Flat field	28 x 10 mm
Astigmatism compensation	
Horizontal magnification	1.07
Vertical magnification	1.29
Astigmatism	< 20 μm
Drive	
Motor type	microstepper
Drive	sine mechanism
Step	0.22 arc sec
Accuracy	± 1 step
Max. speed	10 000 steps/s
Ports	
Number of ports	1 input, 1 or 2 output
Output switching repeatability	± 0.03 nm
Port switching time	4 s

Optics		
Diffraction grating	1200 l/mm λ = 546 nm	Echelle 75 l/mm λ = 200 nm 120 order
Reciprocal linear dispersion	1.55 nm/mm	0.11 nm
Wavelength repeatability	± 0.008 nm	± 0.0006 nm
Wavelength accuracy	± 0.05 nm	± 0.004 nm
Spectral resolution	0.034 nm	0.0024 nm
Wavelegth step	0.002 nm	0.00014 nm
Gratings		
Grating dimensions	80 x 70 x 10 mm	
Grating positioning repeatability		
- wavelength	± 0.02 nm	
- vertical image position	± 50 μm	
Control		
External control	PC	
Interface	RS-232	
Dimensions and weight		
Overall dimensions	635 x 340 x 270 mm	
Weight	25 kg	



Monochromators-spectrographs MS0750 series – spectrographs are general-purpose spectral instruments which can be used as monochromators or spectrographs with a large flat focal field. They are completely automated spectral devices with focal length of 750 mm and F-number of 8.9.

Model MS07501i and model MS07504i have the astigmatism-corrected optics what makes these devices applicable in multi-channel spectroscopy.

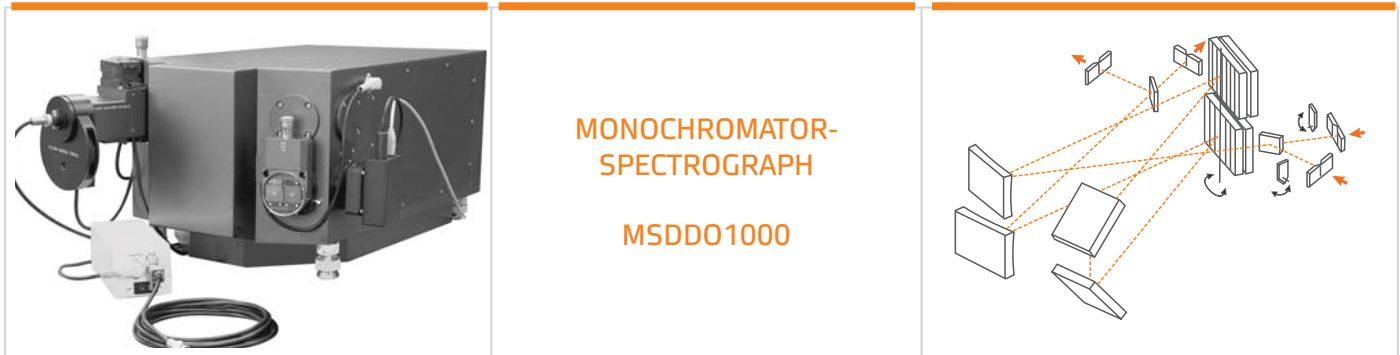
Automated four-grating turret (model MS07504 and model MS07504i) provides a fast switching of gratings with high repeatability of the set wavelength.

In model MS07501 and model MS07501i a single-position holder is used for easy manual switching of gratings.

Optical system	
Optical scheme	Czerny-Turner
Wavelength range	185 nm - 60 μm
F-number	8.9
Focal length	750 mm
Scanning range (limited by grating rotation angle)	0 - 1270 nm
Stray light	5.5×10^{-7}
Flat field	28 x 10 mm
Astigmatism compensation	
Horizontal magnification	1.08
Vertical magnification	1.25
Astigmatism	< 15 μm
Drive	
Motor type	microstepper
Drive	sine mechanism
Step	0.18 arc sec
Accuracy	± 1 step
Max. speed	10 000 steps/s
Ports	
Number of ports	1 input, 1 or 2 output
Output switching repeatability	± 0.01 nm
Port switching time	10 s

Optics	
Reciprocal linear dispersion	1.02 nm/mm
Wavelength repeatability	± 0.005 nm
Wavelength accuracy	± 0.05 nm
Spectral resolution	0.020 μm
Wavelength step	0.0015 nm
Gratings	
Grating dimensions	80 x 70 x 10 mm
Grating positioning repeatability	
- wavelength	± 0.05 nm
- vertical image position	± 75 μm
Control	
External control	PC
Interface	RS-232
Dimensions and weight	
Overall dimensions	950 x 360 x 345 mm
Weight	45 kg

All specifications measured with grating 1200 l/mm, wavelength 546 nm, entrance slit width 15 μm and detector pixel size 12 μm.



Double Dispersion Monochromator-Spectrograph MSDDO1000 series is designed around the modified Cherny-Turner configuration with the two-level arrangement of optical components to allow dispersion doubling. With a relatively small size, the monochromator-spectrograph MSDDO1000 series ensures the high resolution typical of instruments with a focal length of 1000 mm. Model MSDDO1002i and model MSDDO1004i have the astigmatism-corrected optics what makes these devices applicable in multi-channel spectroscopy.

Two pairs of automated of gratings turret (model MSDDO1004 and model MSDDO1004i) provides a fast switching of gratings with high repeatability of the set wavelength.

In model MSDDO1001 and model MSDDO1001i a single pair of gratings position holder is used for easy manual switching of gratings.

Optical system	
Optical scheme	two-level arrangement, dispersion doubling
Wavelength range	185 nm - 60 μ m
F-number	5.9
Focal length	1000 mm (2 x 500 mm)
Scanning range (limited by grating rotation angle)	0 - 1280 nm
Stray light	1×10^{-8}
Flat field	28 x 10 mm
Astigmatism compensation	
Horizontal magnification	1.01
Vertical magnification	1.15
Astigmatism	< 15 μ m
Drive	
Motor type	microstepper
Drive	sine mechanism
Step	0.18 arc sec
Accuracy	± 1 step
Max. speed	10 000 steps/s
Ports	
Number of ports	1 or 2 input, 1 or 2 output
Output switching repeatability	± 0.01 nm

Optics	
Reciprocal linear dispersion	0.74 nm/mm
Wavelength repeatability	± 0.005 nm
Wavelength accuracy	± 0.05 nm
Spectral resolution	0.017 nm
Wavelegth step	0.0015 nm
Gratings	
Grating dimensions	80 x 70 x 10 mm
Grating positioning repeatability	
- wavelength	± 0.05 nm
- vertical image position	± 75 μ m
Control	
External control	PC
Interface	RS-232
Dimensions and weight	
Overall dimensions	555 x 325 x 340 mm
Weight	35 kg

All specifications measured with grating 1200 l/mm, wavelength 546 nm, entrance slit width 15 μ m and detector pixel size 12 μ m.



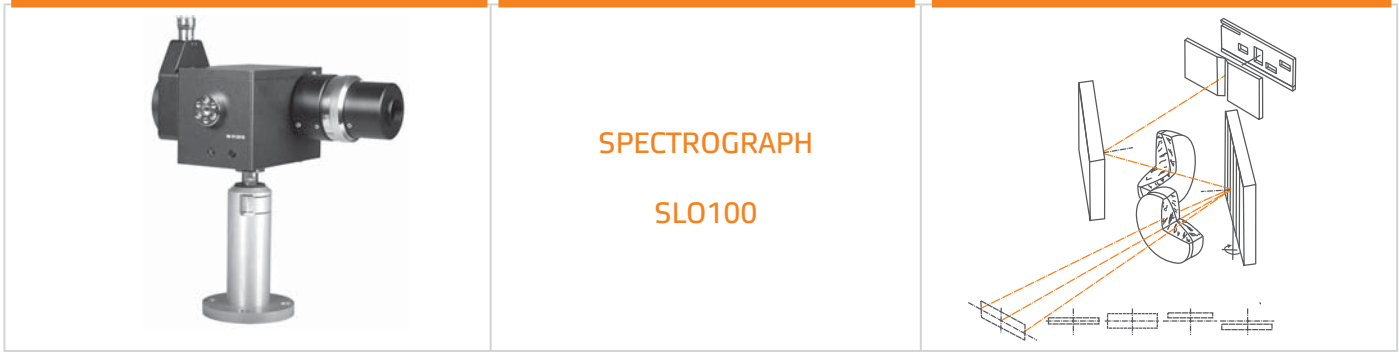
DM0160 is a high-aperture double monochromator with dispersion subtraction. It is an instrument with F-number of 3.5 and input focal length of 160 mm.

The wavelength tuning is motorized and controlled by PC via RS-232 interface.

The monochromator uses the optical schematic with as few as four optical components and an intermediate slit ensuring low stray light and high aperture ratio. The concave diffraction gratings with a variable lines density allow astigmatism compensation in the DM0160 double monochromator.

Optical system	
Optical scheme	with dispersion subtraction
F-number	3.5
Focal length	160 mm
Stray light (using halogen lamp with 350 nm cut-off filter)	0.01%
Spectral slits	
Slit width	
- entrance and intermediate	0.22; 0.54; 1.1; 1.6 mm
- output	0.44; 1.08; 2.2; 3.2 mm

Optics	
Reciprocal linear dispersion	6.58 nm/mm
Spectral resolution	1.45 nm
Dimensions and weight	
Overall dimensions	420 x 140 x 175 mm
Weight	8 kg

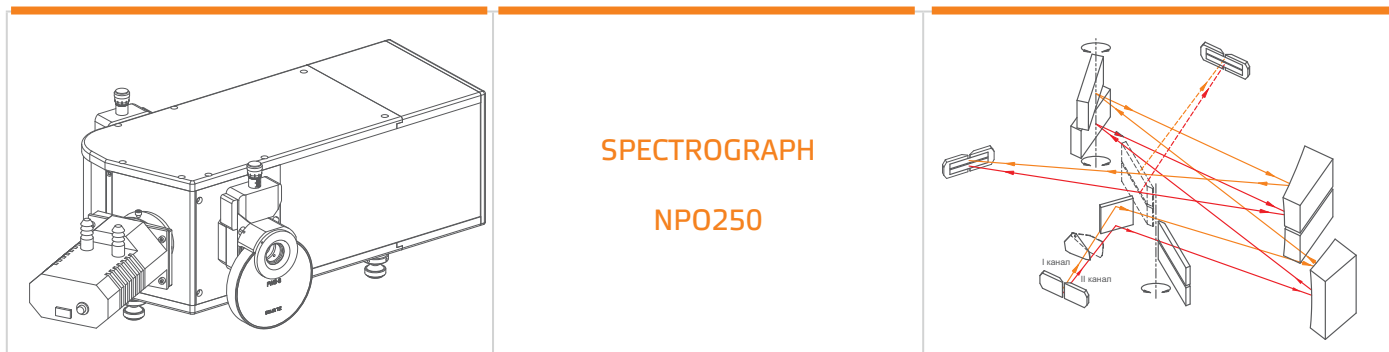


Imaging spectrograph SLO100M with F-number of 3.3 and focal length of 100 mm uses a horizontal-symmetric configuration with two objectives.
To provide wavelength scanning SLO100M Spectrograph is furnished with a micrometer screw.
Basic configuration includes "C-mount" output flange.

There are two models of SLO100M spectrograph:
SLO100M is optimized for VIS-NIR spectral range (360-1100 nm)
SLO100M-UV is optimized for UV range (200-600 nm).

Optical system	
Optical scheme	horizontal-symmetric
F-number	3.3
Focal length	100 mm
Flat field	28 x 8 mm
Astigmatism compensation	
Horizontal magnification	1.2
Vertical magnification	1
Vertical spatial resolution	50 μ m
Spectral slits	
Width	0 - 2 mm
Height	10 mm

Optics	
Grating	400 l/mm
Reciprocal linear dispersion	18.5 nm/mm
Wavelength accuracy	\pm 1 nm
Spectral resolution	0.35 nm
Dimensions and weight	
Overall dimensions	190 x 175 x 160 mm
Weight	2 kg



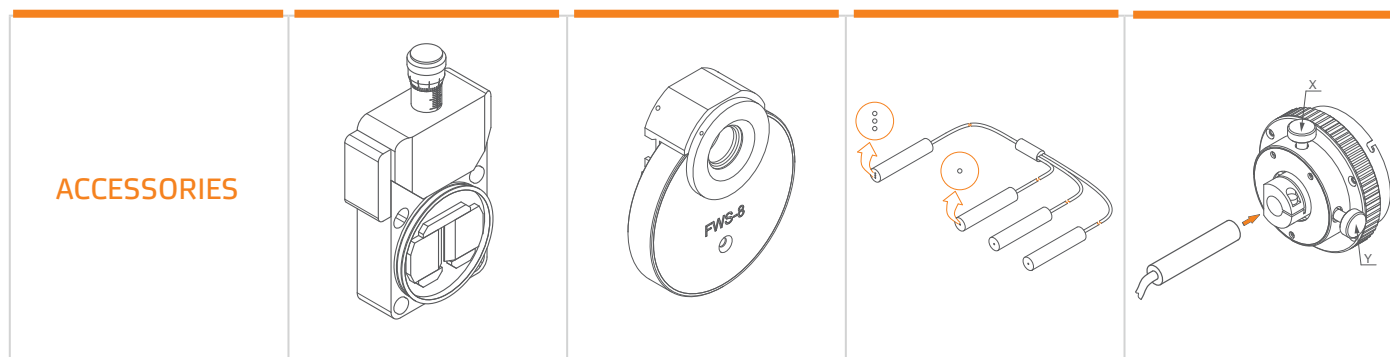
Each NPO250 model with F-number of 3.9 and focal length of 270 mm uses an original optical configuration with two independent optical channels. The collimating and focusing mirrors are off-axis parabolic, that ensures high spectral resolution and excellent image quality.

Besides selection of two spectrum intervals by grating rotation, the instrument allows quick manual gratings change-over in each channel. NPO250-2 is a completely automated spectrograph with two independent channels. NPO250-2M is a two-channel spectrograph with manual control.

Optical system	
Optical scheme	Original configuration with two independent channels
F-number	
- common	3.8
- each channel	5.3
Focal length	270 mm
Scanning range (limited by grating rotation angle)	0 - 1500 nm
Main mirrors	off-axis parabolic
Stray light	2×10^{-5}
Flat field	25 x 8 mm
Astigmatism compensation	
Horizontal magnification	1
Vertical magnification	1.09
Vertical spatial resolution	
- at the field center	2 μ m
- at 10 mm from the field center	200 μ m
Ports	
Number of ports	1 input, 2 output
Output switching repeatability	± 0.03 nm
Port switching time	30 s

Drive	
Motor type	microstepper
Drive	worm
Step	1.62 arc sec
Accuracy	± 1 step
Max. speed	10 000 steps/s
Optics	
Reciprocal linear dispersion	2.77 nm/mm
Wavelength repeatability	± 0.03 nm
Wavelength accuracy	± 0.125 nm
Spectral resolution	0.07 nm
Wavelength step	0.01 nm
Gratings	
Grating dimensions	50 x 40 x 10 mm
Grating positioning repeatability	
- wavelength	± 0.02 nm
- vertical image position	± 0.2 mm
Control	
External control / Interface	PC / RS-232
Dimensions and weight	
Overall dimensions	510 x 280 x 215 mm
Weight	14 kg

All specifications measured with grating 1200 l/mm, wavelength 546 nm, entrance slit width 15 μ m and detector pixel size 12 μ m, for model NPO250-2



ACCESSORIES

Entrance or exit slit of spectral instruments

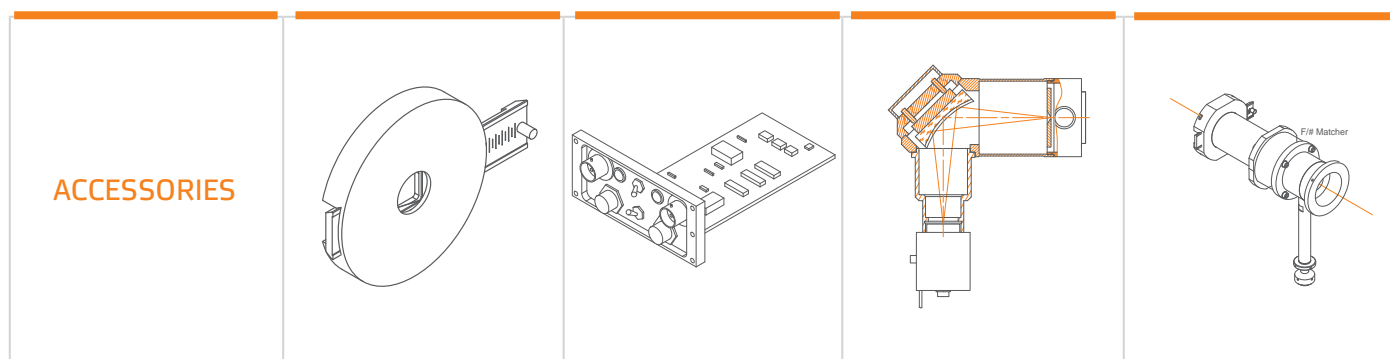
For order sorting filters

Fiber optics bundles for spectroscopy applications

Universal fiber optics light delivery adapter for spectral device entrance slit

Control	auto / manual	Control	auto / manual	Spectral range		Mounting diameter	6 or 10 mm
Width	0 - 2 mm	Number of filters	6 or 8	- UV-VIS	190-1200 nm	Adjustment range	
Height	10 mm	Filter thickness	up to 3 mm	- VIS-NIR	360-2500 nm	- X	± 2 mm
Parallelism	± 1 µm	Filter diameter	25 mm / 25.4 mm	Fiber diameters	200 µm; 400 µm	- Y	± 2 mm
Repeatability	1.5 µm / 2 µm			NA	0.12; 0.22		

Spectral slits		Filter wheels		Fiber optics		Fiber optics adapter	
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ACCESSORIES

Diaphragm for smooth slit height adjustment





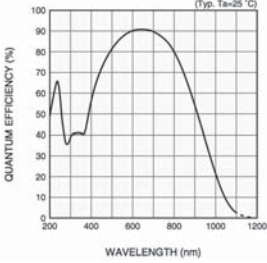
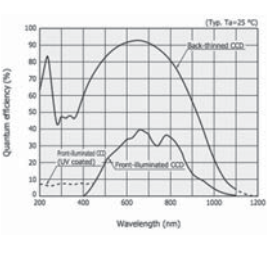
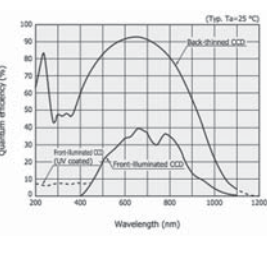
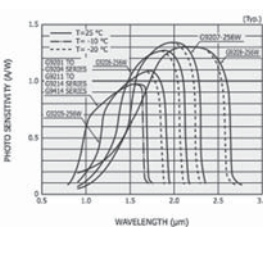
ADC electronic board for output signal

Opto-mechanical unit for coupling monochromator with a single channel detectors with small active area. Toroidal mirror allows to collect light from the whole height of the spectral slit.



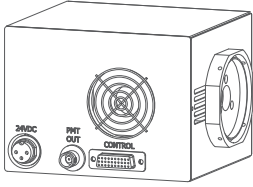
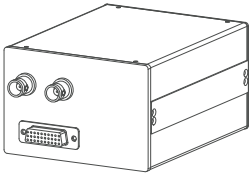

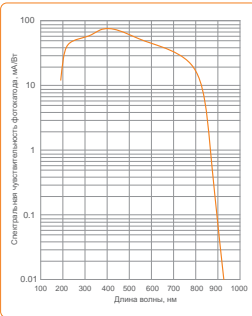
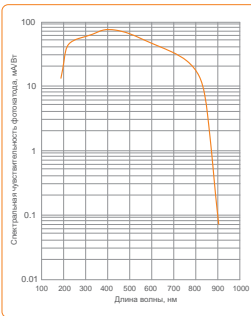
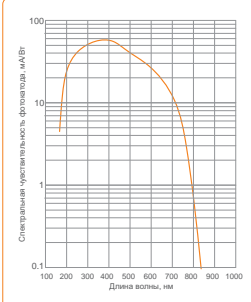
Designed to match apertures of an optical fiber and a spectral instrument in order to reduce stray light and optimize light throughput.

Adjustable range	0 - 10 mm	Digit capacity	16 bit, 65535 count
		Input voltage	0 - 2 V
		ADC rate	100 kHz

Slit height adjustment diaphragm		ADC board		Adapter for detector		Condenser F-matcher	
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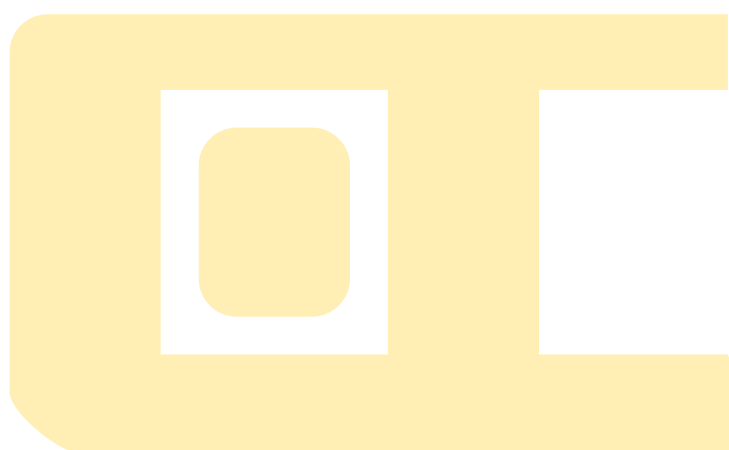
<p>DIGITAL SPECTROSCOPY CAMERAS</p>				
<p>Spectral response</p>				
	<p>HS 103H</p>	<p>HS 101H</p>	<p>HS 101H (HR)</p>	<p>HLS 190IR</p>

Specifications				
Spectral range	200 - 1100 nm	200 - 1100 nm	200 - 1100 nm	0.9 - 2.55 µm
Readout rate	up to 500 kHz	up to 1 MHz	up to 500 kHz	up to 416 kHz
Sensor type	Back-Thinned CCD	Back-Thinned or Front-Illuminated CCD	InGaAs linear sensor	Back-Thinned or Front-Illuminated CCD
Number of pixels	2048 x 64	from 1024 x 58 to 1024 x 1024	from 2048 x 122 to 2048 x 506	256 or 512
Pixel size (width x height)	14 x 14 µm	24 x 24 µm	12 x 12 µm	from 25 x 250 µm to 50 x 500 µm
Exposure time	from 10 µm to 7.5 h	from 10 µm to 7.5 h	from 10 µm to 7.5 h	from 1 ms to 7.5 h
ADC	16 bit	16 bit	16 bit	16 bit
Built-in thermoelectric Peltier cooling	-	+	+	+
Readout camera noise				
- full vertical binning mode	15 counts			15 counts
- full image mode		12 counts / 6 counts	12 counts / 6 counts	
Dynamic range	not less than 7400	not less than 10000	not less than 13000	not less than 5000
Dimensions	100 x 164 x 105 mm	100 x 164 x 105 mm	100 x 164 x 105 mm	100 x 164 x 105 mm
Weight	1.5 kg	2.0 kg	2.0 kg	2.0 kg
Power consumption	(24 ± 5) V, AC-DC adapter			

<p>SINGLE-CHANNEL DETECTORS</p>				
<p>Spectral response</p>				
	<p>SDA-010</p>	<p>PTA-928</p>	<p>PTM-7844</p>	<p>PTM-6780</p>

Specifications				
Spectral range	200 – 1100 nm	185 – 900 nm	185 - 900 nm	185 - 850 nm
Highest sensivity wavelenght	960 nm	400 nm	400 nm	400 nm
Active area	7 x 7 mm	8 x 24 mm	9 x 14 mm	ø 8 mm
Spectral sensitivity	9.5 x 10 ⁵ V/W	2.2 x 10 ¹¹ V/W	2.3 x 10 ¹¹ V/W	9 x 10 ⁹ V/W
Output shift voltage	50 mV	30 mV	1 mV	0.12 mV
Maximal output voltage	+5 V	+5 V	+5 V	+5 V
Bandwidth (-3 dB)	0 - 4.5 kHz	0 - 50 kHz	0 - 50 kHz	0 - 50 kHz
Sensitivity adjustment	magnification coefficients 1; 10; 100; 1000	from 0 to max, by software controlled	from 0 to max, by software controlled	from 0 to max, by software controlled
Dimensions	70 x 50 x 50 mm	90 x 80 x 150 mm	120 x 130 x 100 mm	95 x 145 x 80 mm
Weight	0.3 kg	0.8 kg	1.2 kg	0.9 kg

For detection of light signals in near infrared (from 0.9 to 2.6 μm), infrared (from 1.5 to 5.5 μm) and far infrared (up to 40 μm) spectral range we offer single-channel detector of Electro-Optical Systems Inc. company, USA. For more information please contact us.





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