

# MULTIPURPOSE COMPACT MONOCHROMATOR/SPECTROGRAPH M150

The M150 is a compact short-focus instrument, flexible and multifunctional, featuring a unique combination of performance specifications and equipped with all the options essential for large-size spectrographs.

Upon your request, the M150 may be supplied with accessories for collecting light from the sample into the optical fiber, for matching apertures of the fiber and monochromator, etc.



## FEATURES

**High aperture ratio (F=1:3.6)** allows using the M150 for the widest range of routine purposes, including fluorescence, reflection and transmittance measurements in the wide spectral range from UV to IR, analysis of light sources, multi-channel spectroscopy and other applications.

**Low stray light**, due to high quality of the optical bench and careful engineering of the instrument housing, provides optimum signal-to-noise ratio.

**Up to three diffraction gratings** mounted on the automated turret cover a wide spectral range with the use of just one compact device.

**Both output ports of the M150 have fully functional flat field** 30x10 mm and allow connecting either two exit slits or an exit slit and a multi-channel detector, or two detectors simultaneously, at your choice.

**High degree of the M150 automation** provides scanning and change of diffraction gratings, change of order-separating filters, adjustment of entrance slit width and automated background subtraction through shutter control.

Both exit slits of the M150 are equipped with precise mechanisms for **slit focusing**. **Precise and easy detector** focusing is provided by detector adapters.

**The IMAGING Version** (Optional) ensures astigmatism compensation for the both output ports. This allows light delivery to the M150 with the set of optical fibers positioned along the entrance slit, as well as acquiring signal from array detectors not only in the Binning mode, but also in the Imaging mode).

**The SolarLS.LAB software** provides automated control over the M150 and its detector. It allows to stitch spectra obtained by several diffraction grating scans in order to get a panoramic spectrum. A lot of possibilities of spectra processing and analysis are provided as well.

**DLL program modules and/or LabVIEW drivers** are supplied at your request; they help to arrange the instrument handling within the general control program of your instrumentation system.

## APPLICATIONS

- Fluorescence and Raman Spectroscopy
- Measurements of Absorption, Reflection and Transmittance from UV to IR Range
- Multichannel Spectroscopy
- As a spectral selection device for user with a streak-camera

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## M150 ADVANTAGES

The M150 is a 142mm focal length asymmetric Czerny-Turner scanning spectrograph.

The M150 output ports may hold either two exit slits, or one exit slit and a detector, or two detectors simultaneously.

Direct (axial) and lateral (radial) output ports operate alternately. Switching between the output ports is effected manually with the Port Switcher located at the upper cover of the instrument. The switcher moves the folding mirror, which directs light to the lateral (radial) output port. If the switcher is off, light goes to the direct (axial) output port.

The instrument is also available with one axial output port. If the radial output port is not used, it is plugged.

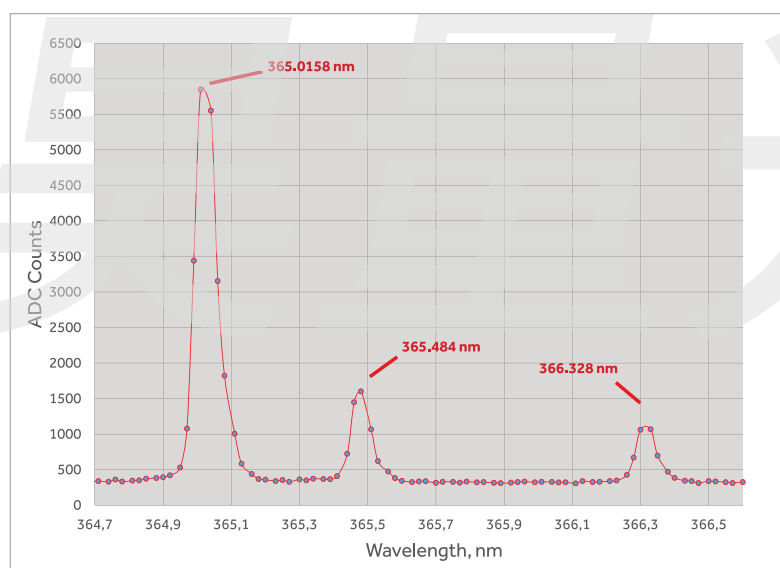
Large flat field on the output of the M150 30mm x 10mm ensures wide simultaneously detected spectral range and ability to stitch several scanned spectra automatically.

Generally, astigmatism is common to all spectral instruments; this is a phenomenon when the point on the entrance slit is displayed in the image plane as a vertical segment. The M150 astigmatic segment is 8mm in the center of the flat field, and 6.5 mm and 10 mm at the edges of the field respectively. Astigmatism does not usually impair the instrument resolution, but, depending on the height of the detector used, can affect the overall sensitivity of the system.

Astigmatism correction is imperative in the multichannel spectroscopy, in case you need to adequately convey the light distribution along the slit, as well as for the use of the spectrograph with 2D detectors in the Imaging mode.

The M150i astigmatism compensator is a cylindrical mirror which is installed after the entrance slit instead of a flat folding mirror. Astigmatism is compensated at the both output ports. Introducing the astigmatism compensator in the optical scheme allows correcting astigmatism in the exit slit plane to the value of about 50 $\mu$ m. This fact must be considered when calculating the expected optical resolution of the M150 with a specific grating. Astigmatism compensation also affects the M150 vertical magnification:

M150 magnification	Horizontal	Vertical
Without astigmatism compensation	1.15	1.0
With astigmatism compensation	1.15	1.35



Mercury lamp lines (365.0158 nm, 365.484 nm, 366.328 nm) registered with M150 (diffraction grating 1800 gr/mm) demonstrate high optical quality of the instrument.

## OPTICS & ACCESSORIES

The M150 monochromator-spectrograph has a wide range of options and accessories that provide efficient light collection from the sample located at a finite distance and at infinity, delivering light to the monochromator with and without an optical fiber, effective aperture matching of the optical fiber and monochromator.

- Order Separating Filters Wheels
- Aperture Matching Adapters
- Condensers for collecting light into the fiber
- Condensers for collecting light into the monochromator
- Crossed Entrance Slit (optionally installed instead of the Standard Entrance Slit)
- Optical Fibers
- Adapters for attaching CCD detectors
- CCD detectors
- Cassegrain lenses

Possible types of detectors and PMT for monochromator-spectrograph M150 are listed on the page 53.

## M150 SPECIFICATIONS

Optical scheme	Optimized Czerny-Turner with one optical input and two outputs									
Spectral range	Typical 190–3600 nm; extended up to 15 $\mu\text{m}$ at your request									
F/Number	1 : 3,6									
Focal length, mm	142									
Flat field, mm	30 x 10									
Imaging	Optional; Available on both output ports									
Diffraction gratings	40x40x10 mm; Turret with 3 grating from list below <sup>1)</sup>									
Grooves/mm <sup>1)</sup>	1800	1200	900	600	600	400	300	200	100	100
Blaze wavelength	270	400	600	750	1000	800	1500	1500	2000	500
Reciprocal linear dispersion (average) nm/mm	3.2	4.9	6.4	9.8	9.4	15.2	20.1	30.4	63	68
Spectral range <sup>2)</sup> , nm	190–540	265–800	400–1200	500–1500	660–2000	530–1600	1000–3000	1000–3000	1330–4000	330–1000
Multichannel array bandpass (average), nm	81 <sup>3)</sup>	126 <sup>3)</sup>	165 <sup>3)</sup>	250 <sup>3)</sup>	120 <sup>4)</sup>	194 <sup>4)</sup>	257 <sup>4)</sup>	388 <sup>4)</sup>	800 <sup>4)</sup>	870 <sup>4)</sup>
Spectral resolution (average), nm	0.2 <sup>3)</sup> 0.13 <sup>5)</sup>	0.3 <sup>3)</sup> 0.2 <sup>5)</sup>	0.4 <sup>3)</sup> 0.27 <sup>5)</sup>	0.6 <sup>3)</sup>	0.6 <sup>4)</sup>	0.95 <sup>4)</sup>	1.25 <sup>4)</sup>	1.9 <sup>4)</sup>	3.8 <sup>4)</sup>	4.2 <sup>4)</sup>
Entrance slit	Software-controlled adjustment from 0 to 3 mm, 10 mm height									
Exit slits	Micrometer-driven from 0 to 3 mm, 10 mm height									
Integrated shutter	Software-controlled, serves for dark signal measuring									
PC connection	Full-Speed USB interface									
Dimensions and weight	308 x 226 x 188 mm, 8 kg									

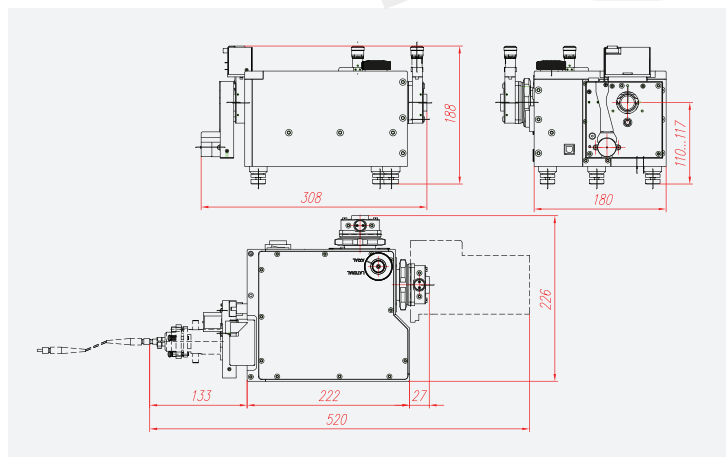
1) Upon your request diffraction gratings with an alternate number of grooves per mm and blaze angle can be used.

2) Wavelength range with diffraction efficiency higher than 40%.

3) For the detector with 25  $\mu\text{m}$  pixel size and 25.6 mm of active area.

4) For the detector with 25  $\mu\text{m}$  pixel size and 12.8 mm of active area.

5) For the detector with 8  $\mu\text{m}$  pixel size and 29.1 mm of active area.



M150 dimensions.