

DOUBLE DISPERSIVE AUTOMATED MONOCHROMATOR-SPECTROGRAPH

M833

M833 is a unique high-aperture double dispersive monochromator-spectrograph whose compact design combines high spectral resolution intrinsic for long-focus instruments and extremely low stray light that is an essential requirement for Raman spectroscopy, as well as for any other low-light-level applications.



FEATURES

The compact high-aperture (F# 1:5.5) long-focus instrument allows you solving tasks demanding high spectral resolution, yet occupies little space in your laboratory and, besides, is mobile.

Extremely low stray light due to the unique double-dispersion scheme and absence of re-reflections greatly extends your opportunities in working with low signals. You will be able to register Stokes and anti-Stokes components within 20 cm⁻¹ from the excitation line (for 1200 gr/mm gratings) without using notch or edge filters.

M833i in the Imaging mode (optional) ensures absolute astigmatism compensation and extraordinary resolution along the exit slit while maintaining ideal line quality. IMAGING version is arranged by an automated folding mirror switching radiation between two output ports. This allows obtaining Imaging effect at the lateral output port, keeping the standard configuration of the axial output port.

Three pairs of gratings (grating type and blaze are at Customer's choice) are supplied in a standard set and ensure the widest range of applications.

Two input and two output ports can be completed with the full set of accessories manufactured by SOLAR LS: standard and crossed entrance slits, order separating filter wheels, aperture matching units and optical fibers, CCD detectors and adapters for them.

Two output slits in M833 feature precise slit focusing units.

Detector adapters in M833 feature ability for fine through focus adjustment.

Fully automated computer control: slits, grating turrets and filter wheels, input/output port switching is controlled via Full-Speed USB interface.

The SolarLS.LAB software provides automated control over the M833 and its detector. It allows to stitch spectra obtained by several diffraction grating scans in order to get a panoramic spectrum. Many possibilities of spectra processing and analysis are provided as well.

At your request, **DLL and/or VI program modules** are supplied for controlling the instrument via the individually designed software or LabVIEW.

APPLICATIONS

- Raman spectroscopy
- Emission and fluorescent spectroscopy
- Multi-channel & imaging spectroscopy
- Analytical tasks in the range from UV to IR

M833 ADVANTAGES

The M833 is a unique double dispersive monochromator-spectrograph consisting of two Czerny-Turner monochromators. Its key difference from any conventional double monochromator is that the M833 features the (30x10) mm flat field and allows attaching not only a single detector (PMT), but also a multichannel array for simultaneous detection of a wide spectrum range.

The optical matching system provides an optical coupling between the two monochromators-spectrographs located one above the other in a two-level optical design. Thus, we achieve compactness and mobility of the long-focus monochromator-spectrograph M833.

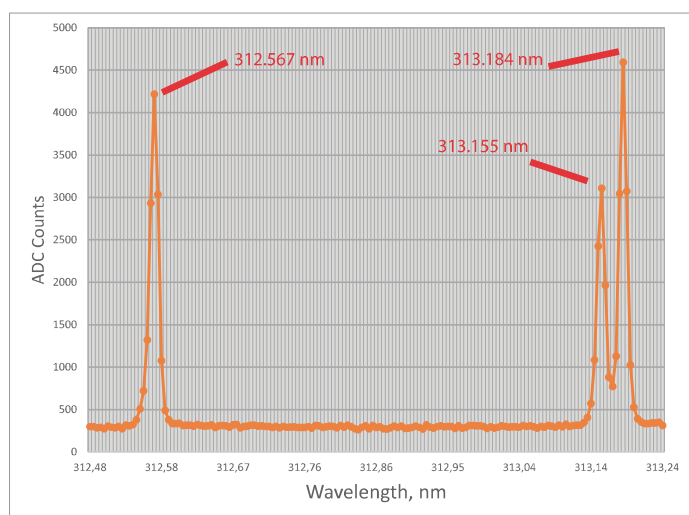
The optical matching system ensures the complete coma compensation for any wavelength in the center of the exit slit (or in the center of a multichannel array). As a result the M833 does not have the spectral region of primary coma compensation. The M833 demonstrates its unique spectral resolution and high spectral line quality for any wavelength within the spectral range of gratings diffraction efficiency.

The M833 optical layout and design completely exclude the possibility of re-reflections in specified spectral regions of the device operation, and reduce

stray light by two orders of magnitude as compared to single monochromators having similar dispersion/focal length.

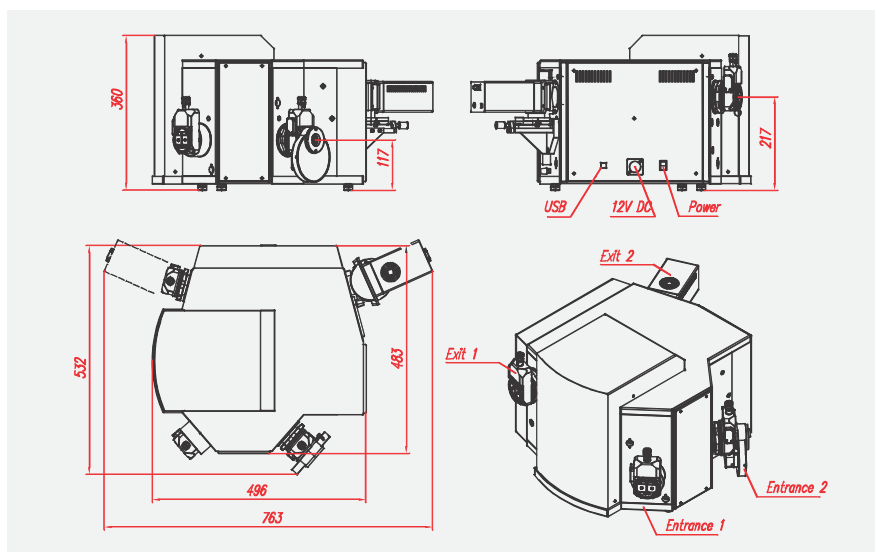
The M833 astigmatic segment is 7.7 mm in the center of the flat field, and respectively 7.4 mm and 8.2 mm at the edges of the field. Astigmatism does not usually impair the instrument resolution, but, depending on the height of the detector used, can affect the overall sensitivity of the system:

M833 magnification	Horizontal	Vertical
without astigmatism compensation	1.08	1.08
with astigmatism compensation	1.08	0.8



Mercury lamp lines (312.567 nm, 313.155 nm, 313.184 nm) registered with the M833 (diffraction grating 1800 gr/mm) demonstrate high optical quality of the instrument.

Monochromator-spectrograph M833 is fully compatible with all Solar LS optics & accessories and detectors. Possible types of detectors and PMT for monochromator-spectrograph M833 are listed on the page 53.



M833 dimensions.

M833 SPECIFICATIONS

Optical scheme	Optimized Czerny-Turner with double dispersion					
Spectral range	- Typical 180–4800 nm (refer to the specifications below) - Up to 40µm when the appropriate gratings are used					
Imaging	Option. Available for the lateral output port					
Optical ports	2 inputs and two outputs					
F/Number	1:5.5					
Effective focal length, mm	833					
Flat field, mm	30 x 10					
Diffraction gratings	70x70x10mm, automated turret with three pairs of gratings from the list below ¹⁾					
Grooves/mm	2400	1800	1200	900	600	300
Blaze wavelength, nm	225	400	600	600	1000	2000
Effective spectral range ²⁾	190–600	253–800	380–1200	506–1600	760–2400	1500–4800
Mechanical scanning range	0–640	0–850	0–1280	0–1710	0–2560	0–5120
Reciprocal linear dispersion on the edges of the spectral range, nm/mm	0.46–0.27	0.61–0.36	0.92–0.54	1.22–0.72	1.84–1.08	3.68–2.16
Average value, nm/mm	0.39	0.52	0.78	1.04	1.56	3.12
Output bandwidth on the edges of the spectral range, nm	13.3–7.9	19.95–11.8	26.6–15.8	39.9–23.7	23.5–13.8	47.0–27.6
Average value, nm	11.28 ³⁾	16.92 ³⁾	22.57 ³⁾	33.84 ³⁾	20 ⁵⁾	40 ⁵⁾
Spectral resolution on the edges of the spectral range, nm	0.015–0.009	0.02–0.012	0.03–0.017	0.04–0.024	0.12–0.07	0.24–0.14
Average value, nm	0.012 ³⁾ 0.024 ⁴⁾	0.016 ³⁾ 0.033 ⁴⁾	0.024 ³⁾ 0.048 ⁴⁾	0.032 ³⁾ 0.066 ⁴⁾	0.1 ⁵⁾	0.2 ⁵⁾
Average value, cm ⁻¹	0.8 ³⁾ 1.56 ⁴⁾	0.57 ³⁾ 1.17 ⁴⁾	0.4 ³⁾ 0.78 ⁴⁾	0.3 ³⁾ 0.6 ⁴⁾	0.43 ⁵⁾	0.2 ⁵⁾
Wavelength tuning accuracy, nm	± 0.03	± 0.04	± 0.06	± 0.08	± 0.12	± 0.24
Wavelength tuning repeatability, nm	± 0.006	± 0.008	± 0.012	± 0.016	± 0.024	± 0.048
Step of grating rotation, nm	0.0017	0.0023	0.0035	0.0046	0.007	0.014
Scanning rate, nm/s	32	43	65	86	130	260
Entrance/Exit slits	Automatic and manual adjustment					
Slit width, mm	0–2					
Slit height, mm	12					
Parallelism, µm	± 1					
Step size, µm	0,5					
Precision, µm	± 10					
Shutter ⁶⁾	Integrated, software-controlled					
Filter wheel	Automatic and manual adjustment					
Max number of filters	8					
Filter size, mm	20					
Light aperture, mm	18					
Computer interface	Full Speed USB					
Dimensions, mm	496 x 483 x 360					
Weight, kg	53					

¹⁾ A set of installed diffraction gratings is confirmed while placing the order. Upon your request, diffraction gratings with another number of grooves per mm and another blaze wavelength can be used.

²⁾ Effective spectral range of the grating covers the range with diffraction efficiency 40% of the peak efficiency.

³⁾ For detector with 8 µm pixel size and 29.1 mm active area (resolution is 4 pixels).

⁴⁾ For detector with 25 µm pixel size and 25.6 mm active area (resolution is 2.5 pixels).

⁵⁾ For detector with 25 µm pixel size and 12.8 mm (resolution is 2.5 pixels).

⁶⁾ Designed to measure background automatically and to protect a detector against zero-order light.