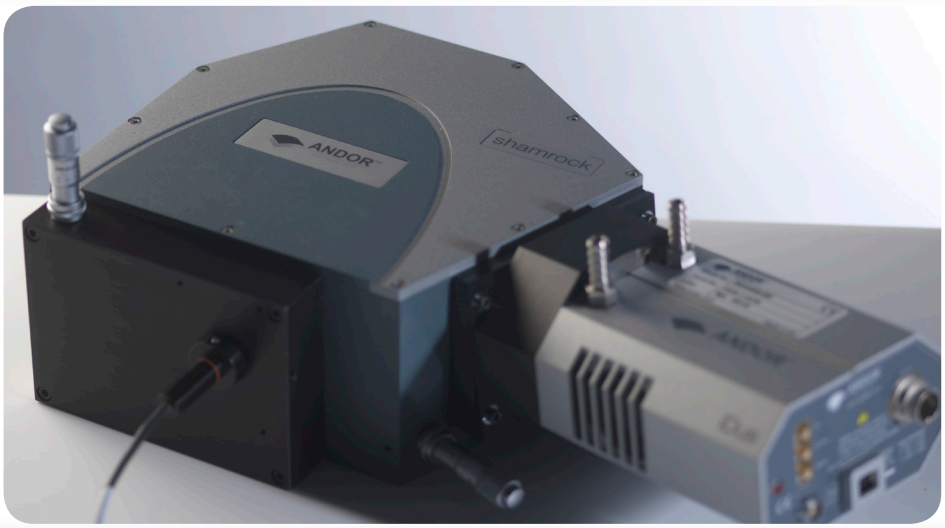


Spectroscopy

Features and Benefits

- **Compact & rugged design with horizontal and vertical mounting positions**
  Portability & ease of integration
- **Imaging-configurable platform for multi-track spectroscopy**
  Lens-based accessories enable optimisation of system performance for low cross-talk, multi-leg fibre signal simultaneous acquisition
- **Wide range of interchangeable gratings**
  With simple precision locking mechanism for seamless upgradability
- **Variety of fixed slits**
  Interchangeable laser-cut precision slits with widths ranging from 10 µm to 200 µm
- **Large choice of light coupling interfaces**
  Includes fibre-optics and C-mount microscope couplers
- **Calibrated micrometer drive for wavelength selection**
  Simple & rapid wavelength adjustment

Versatile compact benchtop spectrograph

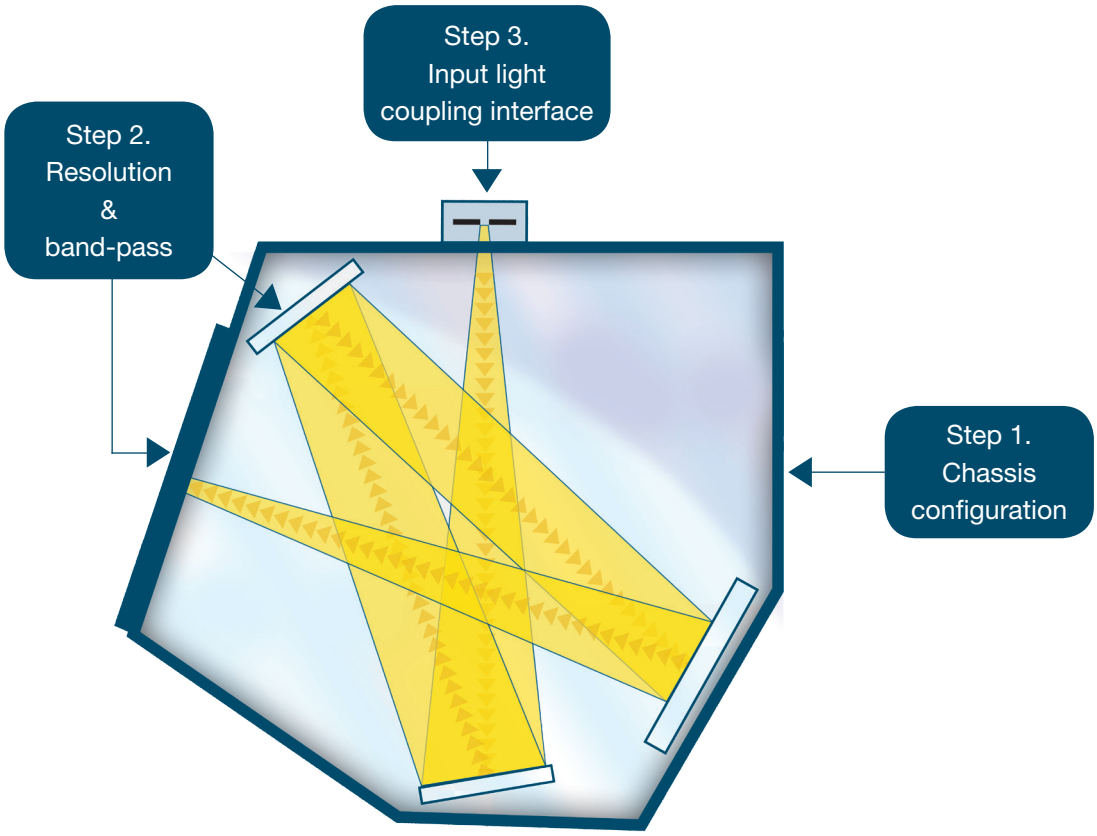
The Shamrock 163 is the most compact research-grade Czerny-Turner spectograph on the market. Its 163 mm focal length, high F/3.6 aperture and wide range of seamlessly interchangeable gratings, slits and light coupling accessories make it the ideal tool for general benchtop spectroscopy measurements.

Specifications Summary

Resolution with Newton DU940 CCD ***1200 l/mm @ 500 nm*** ***2400 l/mm @ 300 nm***	 **0.17 nm** **0.08 nm**
Aperture	**F/3.6**
Focal length	**163 mm**
Grating	**Single, interchangeable**
Slit width size options	**Fixed: 10, 25, 50, 75, 100, 200 µm** **Adjustable (manual): 10 µm to 3 mm**
Slit height options	**3 or 6 mm**
Size (L x W x H)	**198 x 216 x 96 mm** **7.8 x 8.5 x 3.8 in.**
Weight	**3.5 kg [7.71 lb]**

Step-by-Step System Configuration

How to customize the Shamrock 163 :



Step 1. - Chassis configuration

Select type of optics coating required (aluminium + MgF_2 is standard, protected silver coated optics available on request for NIR detection)

Step 2. - Resolution & band-pass

a) Select the appropriate Shamrock spectrograph platform, giving due consideration to bandpass and spectral range requirement.
b) Select gratings and detector to fulfill resolution requirements.
c) Select gratings for suitable wavelength coverage.

Step 3. - Input light coupling interface

Refer to accessory tree for available configurations (direct coupling, fibre coupling or 3rd party hardware connectivity).

Step 4. - Software interface

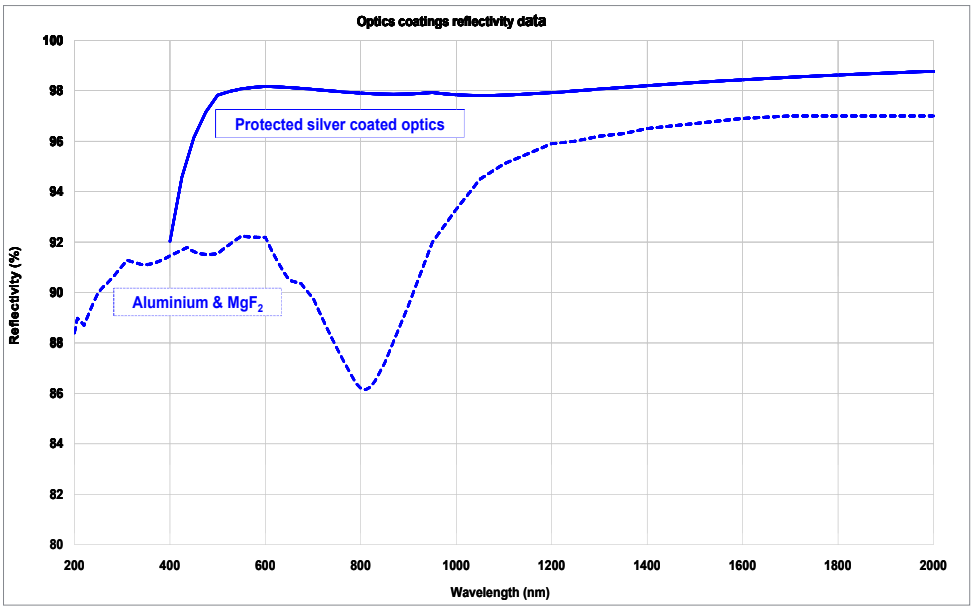
When used in conjunction with Andor detectors, select either state-of-the-art Solis software or Software Development Kit (SDK) option – please refer to appropriate section for futher information.

Step 1 - Chassis Configuration

Ordering Information

Model	Description
SR-163	Base unit for spectrally optimised or multi-track optimised configurations
SR-163-SIL	Base unit for spectrally optimised or multi-track optimised configurations, protected silver coated optics

Optics Coatings Reflectivity Graph

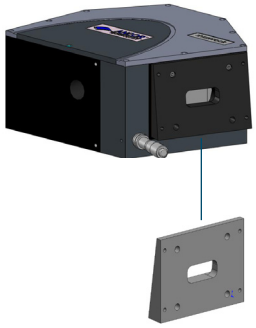


The graph shows the standard Al + MgF_2 optics coatings reflection efficiency versus wavelengths.

Protected silver coated optics option is also available on request for maximum efficiency in the NIR region and is recommended for working with Andor iDus InGaAs detectors.

When choosing protected silver coatings, it is strongly recommended to also order **protected silver coated gratings** for maximum efficiency throughout the system.

Chassis Accessories

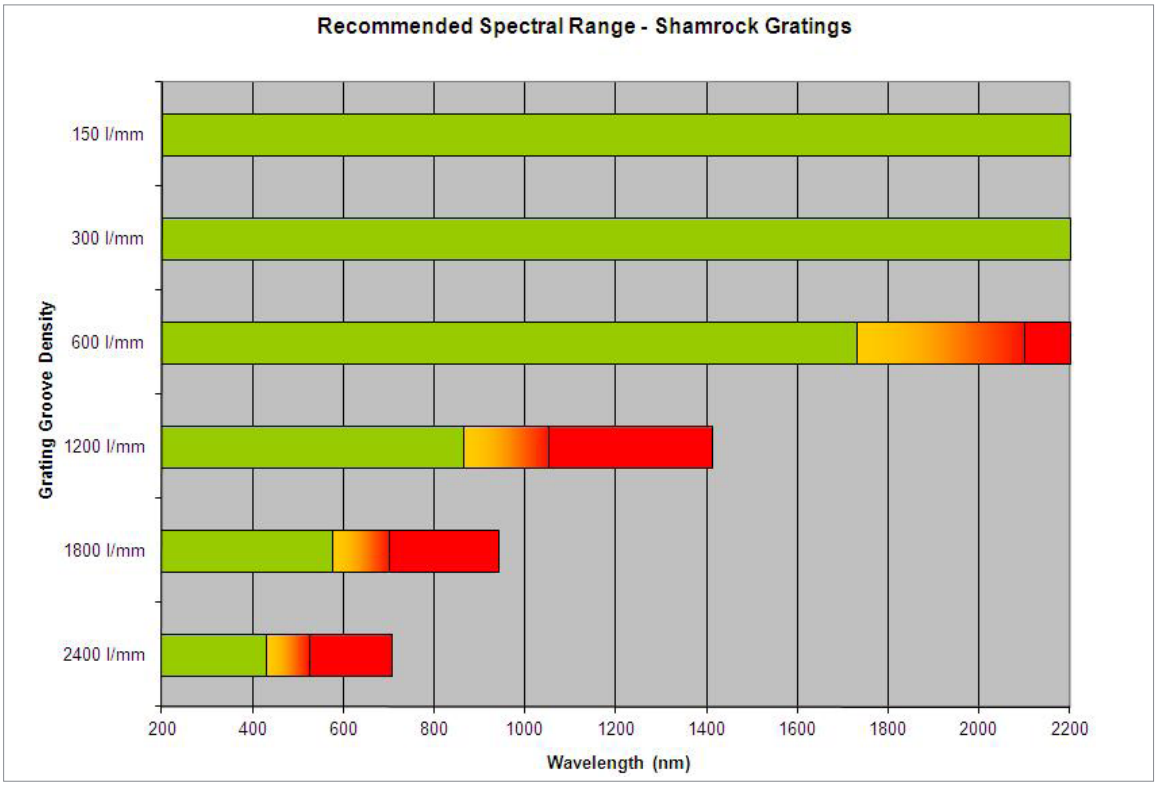


Flange
(Standard)

InGaAs Flange
(SR1-ASZ-8044)

NOTE: Not to be used in conjunction with imaging corrected (multi-track enabling) input accessories

Step 2a - Choosing The Right Platform vs Dispersion Requirements



Resolution calculator

andor.com/calculators

Green
Aberration-free region
Orange
Possible impact on system resolution
Red
Likely impact on system resolution

Czerny-Turner spectrographs are designed to provide the best optical performance for a range of grating angles as reflected on the green parts of the graph above. Outside this range, the spectral lines may exhibit a degree of optical aberration (such as coma), which will become more prominent at the steeper angles. These configurations are reflected by the orange to red scales on the graph. In these regions, consideration should be given to higher spectrograph focal length models with lower groove density gratings to achieve the desired resolution.

	Grating (l/mm)					
Shamrock 163	150	300	600	1200	1800 (Holo)	2400 (Holo)
Bandpass (nm)*1,*3	1072	529	256	117	68	56*4
Resolution (nm)*2,*3	1.57	0.77	0.37	0.17	0.10	0.08*4
Shamrock 303i						
Bandpass (nm)*1,*3	600	297	144	67	39	32*4
Resolution (nm)*2,*3	0.88	0.43	0.21	0.10	0.06	0.05*4
Shamrock 500i						
Bandpass (nm)*1,*3	357	177	86	40	26	19*4
Resolution (nm)*2,*3	0.52	0.26	0.13	0.06	0.04	0.03*4
Shamrock 750						
Bandpass (nm)*1,*3	242	120	59	28	18	14*4
Resolution (nm)*2,*3	0.35	0.18	0.09	0.04	0.03	0.02*4

Where aberration is a concern for a particular experimental set-up, the table above shows resolution and band-pass performance for a variety of alternative configurations. This should be used in conjunction with the graph above to assist in selecting the most appropriate Shamrock spectrogrph platform to meet resolution and band-pass needs, whilst minimising the risk of potential aberration.

Step 2b - Choosing The Right Grating vs Resolution & Band-pass

The Shamrock 163 grating mount has been designed for easy integration and interchangeability. A simple finger-tight locking mechanism combined with a precision locating fixture ensure accurate and rapid system upgradability. Please select the grating or gratings you require from the selection in the table below.

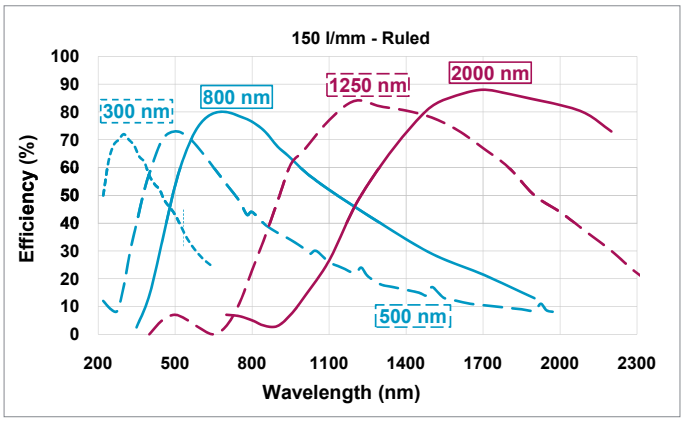
Lines/mm	Blaze (nm)	Nominal dispersion (nm/mm)•5	Bandpass (nm)•1,•5	Resolution (nm)•2,•5	Peak efficiency (%)	Andor part number	Maximum recommended wavelength (nm)	Maximum attainable wavelength (nm)
150	300	38.95	1077	1.58	72	SR1-GRT-0150-0300	6850	11205
150	500	38.77	1072	1.57	73	SR1-GRT-0150-0500		
150	800	38.45	1063	1.56	80	SR1-GRT-0150-0800		
150	1250	37.94	1049	1.54	84	SR1-GRT-0150-1250		
150	2000	37.00	1023	1.50	88	SR1-GRT-0150-2000		
300	300	19.33	534	0.78	88	SR1-GRT-0300-0300	3425	5600
300	500	19.12	529	0.77	81	SR1-GRT-0300-0500		
300	1000	18.50	511	0.75	72	SR1-GRT-0300-1000		
300	1200	18.21	503	0.74	92	SR1-GRT-0300-1200		
300	1700	17.42	482	0.71	89	SR1-GRT-0300-1700		
600	300	9.50	263	0.38	84	SR1-GRT-0600-0300	1715	2800
600	500	9.25	256	0.37	72	SR1-GRT-0600-0500		
600	1000	8.44	233	0.34	72	SR1-GRT-0600-1000		
600	1200	8.04	222	0.33	88	SR1-GRT-0600-1200		
600	1900	6.25	173	0.25•7	88	SR1-GRT-0600-1900		
	(@1600)•6	7.11	196	0.29				
1200	300	4.55	126	0.18	72	SR1-GRT-1200-0300	860	1400
1200	500	4.22	117	0.17	81	SR1-GRT-1200-0500		
1200	1000	2.97	82	0.12•7	69	SR1-GRT-1200-1000		
	(@ 800)•6	3.55	98	0.14	69			
1200	Holographic (500 nm peak)	4.22	117	0.17	81	SR1-GRT-1200-EH*		
1800	Holographic (250 nm peak)	2.96	82	0.12	62	SR1-GRT-1800-DH	570	935
1800	Holographic (380 nm peak)	2.45	68	0.10	70	SR1-GRT-1800-FH		
2400	300	2.01	56	0.08	68	SR1-GRT-2400-0300	430	700
2400	Holographic (220 nm peak)	2.17	60	0.09	68	SR1-GRT-2400-BH		
2400	Holographic (400 nm peak)	1.78	49	0.07	73	SR1-GRT-2400-GH		

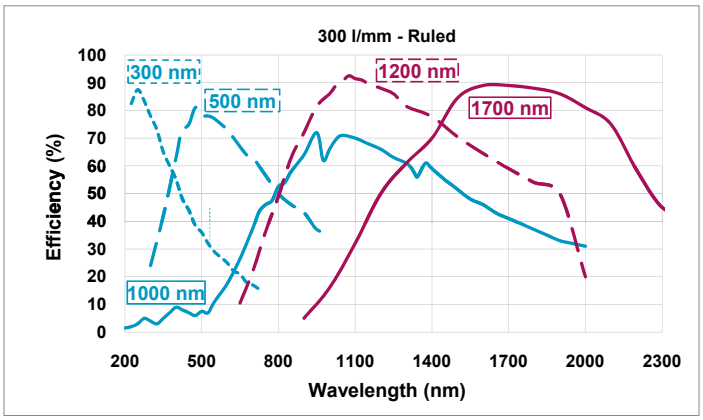
***Option for minimized scattered light.**

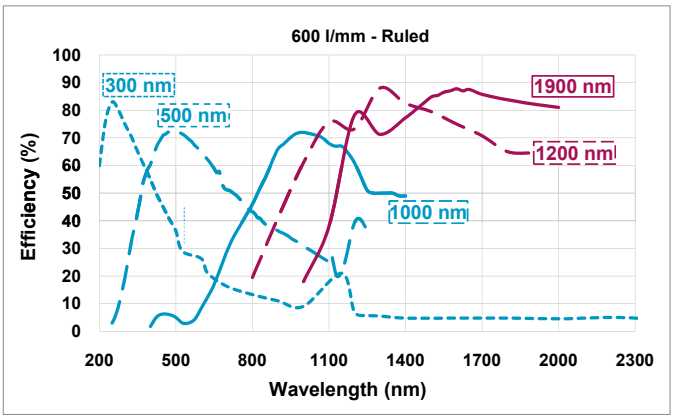
Need to have maximum collection efficiency in the NIR/SWIR? All gratings are also available with protected silver coating. Please contact your local representative for further information.

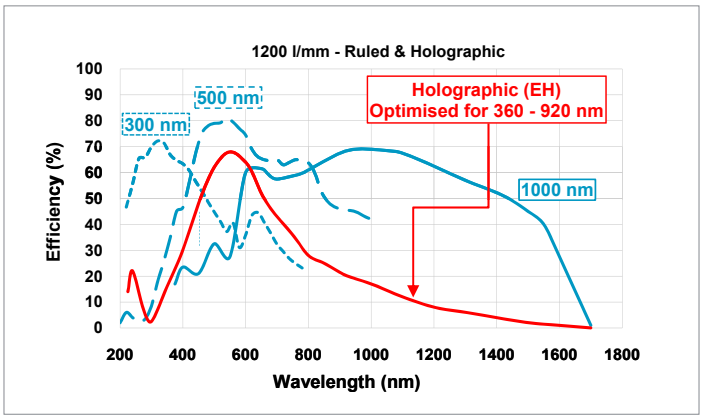
Step 2c - Selecting The Correct Grating Efficiency Option

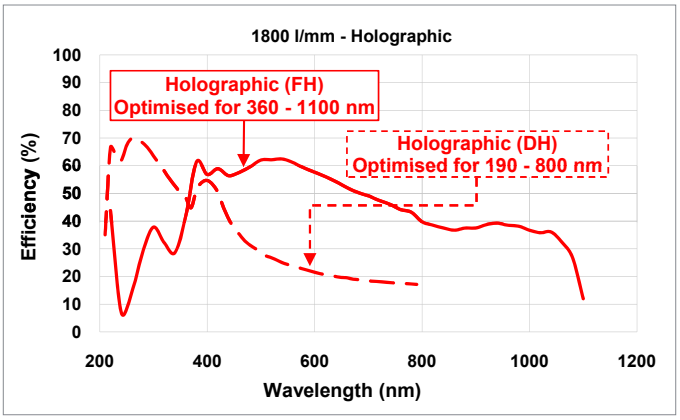
All graphs shown below represent efficiency for 45° polarisation

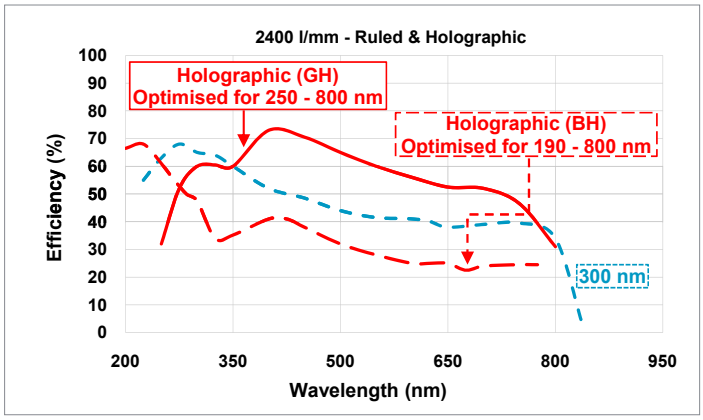










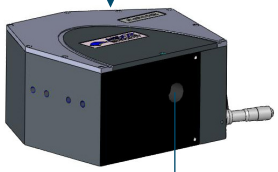


Important Consideration

System throughput is dependent on the grating's angle of operation and may decrease with higher grating operating angles.

Step 3 - Selecting The Correct Light Coupling Interfaces

Lens-corrected accessory for multi-track applications



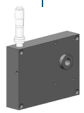
Grating & Grating Holder
(SR1-GRT-XXXX)

Fixed Slit Dimensions

Standard Slit*8	Shutter Slit *8	Size
SR1-SLT-0010-3	SR1-SLH-0010-3	10 µm x 3 mm (W x H)
SR1-SLT-0025-3	SR1-SLH-0025-3	25 µm x 3 mm (W x H)
SR1-SLT-0050-3	SR1-SLH-0050-3	50 µm x 3 mm (W x H)
SR1-SLT-0075-3	SR1-SLH-0075-3	75 µm x 3 mm (W x H)
SR1-SLT-0100-3	SR1-SLH-0100-3	100 µm x 3 mm (W x H)
SR1-SLT-0200-3	SR1-SLH-0200-3	200 µm x 3 mm (W x H)

Fixed Slit Holder, Imaging Corrected
(SR1-ASZ-8034)

Fixed Slit Holder
(SR1-ASM-8038)



Adjustable Slit*10
(SR1-ASM-0020)

Shutter Assembly
(iDus / Newton / USB iStar = SR1-SHT-9003)
(PCI iStar = SR1-SHT-9004)

Fixed Fibre Ferrule Adapter
(SMA option: SR1-ASM-8035)
(FC option: SR1-ASM-8048)*9
(FC-APC option: SR1-ASM-8052) *9

Fixed Fibre Ferrule Adapter Imaging Corrected
(SMA option: SR1-ASZ-8033)

Fixed Slit
(SR1-SLT-XXXX-X)

Fixed Fibre Ferrule Adapter
(SR1-ASM-8032)

Fibre Adapter
(SR1-ASM-8036)

Filter Holder
(SR1-ASM-7004)

Fibre Adapter
(SR1-ASM-8036)

Fixed Slit for Shutter
(SR1-SLH-XXXX-X)

SMA Fibre
(50 µm: ACC-ME-OPT-8004)
(100 µm: SR-OPT-8039)

Filter Holder
(SR1-ASM-7003)

C Mount Adapter
(SR1-ASM-0023)

Neutral Density Filters*9
Long Pass Filters*9
Short Pass Filters*9
Raman Edge Filters*9

C-Mount Lens
(OL-XXXX-XXX)*9

Fibre Ferrule
(SR-OPT-80XX)*9

Filter Holder
(SR1-ASM-7004)

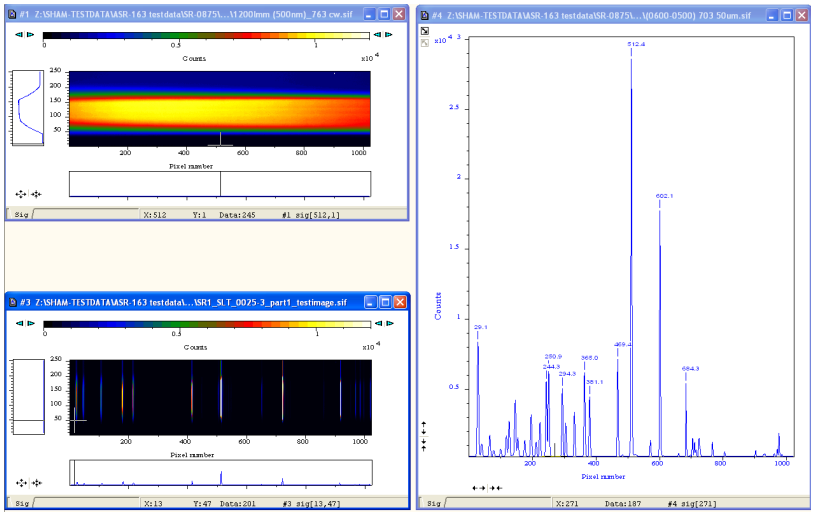
Neutral Density Filters*9
Long Pass Filters*9
Short Pass Filters*9
Raman Edge Filters*9

Step 4 - Selecting A Software Option

The Shamrock 163, used in conjunction with Andor detectors, requires at least one of the following software options:

1 - Solis Spectroscopy A 32-bit Windows application (XP, Vista and 7) offering rich functionality for data acquisition and processing. AndorBasic provides macro language control of data acquisition, processing, display and export.

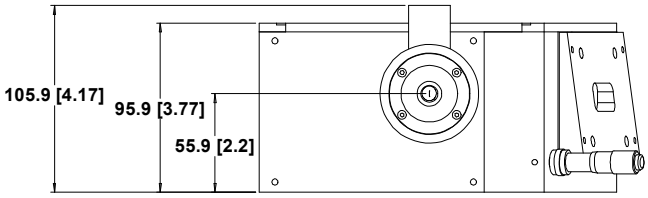
2 - Andor SDK A software development kit that allows you to control the Andor range of cameras from your own application. Compatible with 32 and 64-bit libraries for Windows (XP, Vista and 7). Compatible with C/C++, C#, Delphi, VB6, VB.NET, LabVIEW and Matlab.

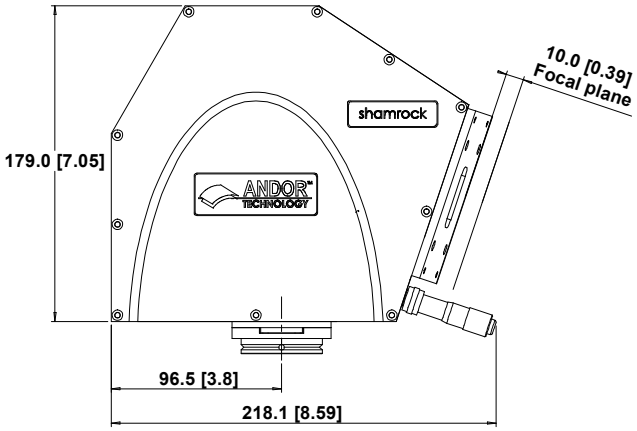


Example of Solis sofware multi-window interface

Product Drawings

Dimensions in mm [inches]

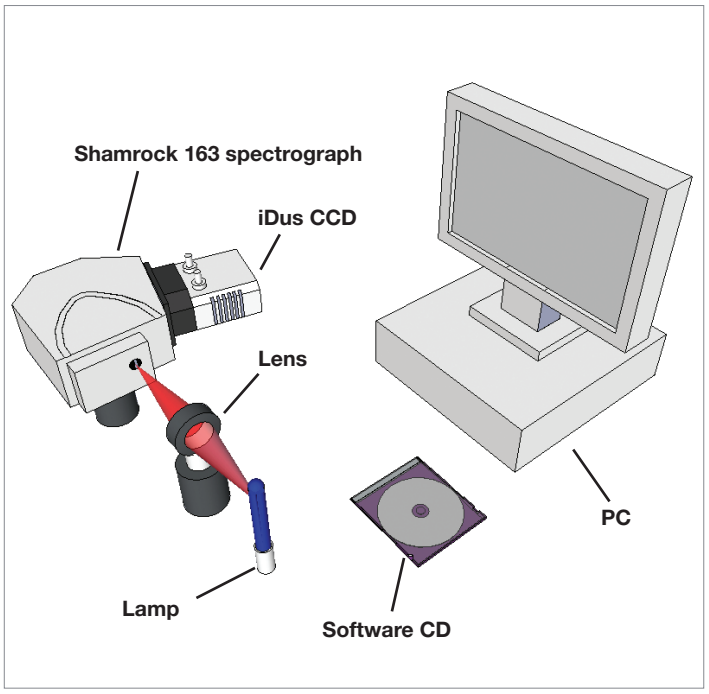




Screw Type Requirements

Camera attachment to CCD flange	4 off, 6/32 x 3/8 UNC

Typical Setup - Spectroscopy



Applications Guide

Absorption-Transmission-Reflection
Raman (Stimulated, Resonance, CARS, SERS, SORS)
Fluorescence-Luminescence
Micro-Fluorescence
Photon Counting
Single Molecule Spectroscopy
Plasma Studies & LIBS

Shutter Specifications

Maximum repetition rate	1 Hz
Minimum open/close time	0.1 s

Optical Property

Focal plane size (mm, W x H)	28 x 10
Magnification @ centre of CCD (independent of line elongation due to spectrograph astigmatism) *Vertical, multi-track configuration*	1.8

Order Today

Need more information? At Andor we are committed to finding the correct solution for you. With a dedicated team of technical advisors, we are able to offer you one-to-one guidance and technical support on all Andor products. For a full listing of our local sales offices, please see: andor.com/contact

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Phone +1 (860) 290 9211
Fax +1 (860) 290 9566

China
Beijing
Phone +86 (10) 5129 4977
Fax +86 (10) 6445 5401

Items shipped with your spectrograph

1x CD containing Andor user guides
1x Individual system performance booklet
1x Set of Allen keys (1.5 mm, 2 mm & 2.5 mm)

Footnotes: **Specifications are subject to change without notice**

1. Typical values quoted with 27.6 mm wide CCD, e.g. Newton DU940.
2. Typical values quoted with 10 µm slit and 13.5 µm pixel CCD, e.g. Newton DU940. Useful signal is assumed to be imaged on the entire height of the 6.9 mm sensor and fully vertically binned.
3. Typical values quoted @ 500 nm centre wavelength.
4. Typical values quoted @ 300 nm centre wavelength.
5. Typical values quoted at maximum efficiency wavelength or blaze wavelength unless otherwise stated.
6. Wavelength within the recommended operating spectral region.
7. Indicative values; the working range of these gratings is principally in the region where optical aberrations may alter the system resolution performance quoted.
8. 6 mm high options available on request.
9. Please refer to the local sales representative or website for further information on available options and complimentary accessories.
10. Slit width ranges from 10 µm to 2.5 mm.

Operating & Storage Conditions
Operating Temperature 0°C to 30°C ambient
Relative Humidity < 70% (non-condensing)
Storage Temperature -25°C to 50°C

ISO14001: 2004 EMS91062
ISO9001: 2008 FM40520

SShamrock163SS 1112 R1