## Shamrock 500i

High resolution, Extended Multi-track Czerny-Turner Spectrographs

<table>
<thead>
<tr>
<th>Key Specifications</th>
<th>Key Applications</th>
</tr>
</thead>
<tbody>
<tr>
<td>✓ 500 mm focal length</td>
<td>✓ Raman &amp; Luminescence/PL</td>
</tr>
<tr>
<td>✓ F/6.5 aperture</td>
<td>✓ Absorption/Transmission</td>
</tr>
<tr>
<td>✓ Resolution down to 0.03 nm</td>
<td>✓ LIBS/OES</td>
</tr>
<tr>
<td>✓ Dual input &amp; dual output configurations</td>
<td>✓ SFG/SHG</td>
</tr>
<tr>
<td>✓ Interchangeable triple grating turret</td>
<td>✓ Material Science</td>
</tr>
<tr>
<td>✓ 10 pm wavelength repeatability</td>
<td>✓ Plasma Science</td>
</tr>
<tr>
<td>✓ USB 2.0 connectivity</td>
<td>✓ Chemistry &amp; Catalysis</td>
</tr>
</tbody>
</table>

andor.oxinst.com
Introducing Shamrock 500i

The Shamrock 500i is the platform of choice for high resolution measurements with outstanding multi-track capabilities, but without compromise in configuration versatility and ease of use. This rugged platform features a comprehensive range of light coupling accessories and gratings, and combines ideally with Andor’s market leading CCD, Electron Multiplying CCDs, and InGaAs and Intensified CCDs.

### Specifications Summary

<table>
<thead>
<tr>
<th>Feature</th>
<th>Benefit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Resolution with Newton DU940 CCD</td>
<td>1200 l/mm @ 500 nm, 2400 l/mm @ 300 nm</td>
</tr>
<tr>
<td>Aperture</td>
<td>F/6.5</td>
</tr>
<tr>
<td>Focal length</td>
<td>500 mm</td>
</tr>
<tr>
<td>Magnification (Vertical @ centre of CCD)</td>
<td>1</td>
</tr>
<tr>
<td>Gratings</td>
<td>Interchangeable indexed triple turret</td>
</tr>
<tr>
<td>Slit widths range (input/output)</td>
<td>Manual or motorized 10 µm to 2.5 mm</td>
</tr>
<tr>
<td>Communication</td>
<td>USB 2.0</td>
</tr>
<tr>
<td>Wavelength accuracy</td>
<td>0.04 nm</td>
</tr>
<tr>
<td>Wavelength repeatability</td>
<td>10 pm</td>
</tr>
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</table>

### Features and Benefits

<table>
<thead>
<tr>
<th>Feature</th>
<th>Benefit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre-aligned, pre-calibrated detector &amp; spectrograph</td>
<td>Motorized, individually factory-calibrated systems – out-of-the-box operation and seamless integration to experimental set-ups</td>
</tr>
<tr>
<td>Image astigmatism correction</td>
<td>Optimized toroidal optics for high density multi-track capabilities</td>
</tr>
<tr>
<td>USB 2.0 interface</td>
<td>Plug and play connectivity, ideal for laptop operation alongside Andor USB cameras</td>
</tr>
<tr>
<td>Motorized, indexed triple grating turret</td>
<td>Easily upgradable in-the-field</td>
</tr>
<tr>
<td>Dual detector outputs</td>
<td>For extended wavelength coverage when combining Andor UV-Visible CCD and InGaAs cameras compatible with Andor’s range of CCD, ICCD &amp; EMCCD cameras</td>
</tr>
<tr>
<td>Wide range of accessories available</td>
<td>The ultimate in modular set-up and in-field upgradability, including: Motorized slits &amp; filter wheel, Microscope interfaces, Shutters, Fibre-optic &amp; lens couplers, Multi-way fibre-optic bundles, Light sources and optics</td>
</tr>
<tr>
<td>Monochromator capabilities</td>
<td>Extract best optical resolution while allowing use of single point detectors with sensitivity up to 12 µm</td>
</tr>
<tr>
<td>Silver-protected coated optics options</td>
<td>Most efficient for Near-Infrared detection when used in conjunction with Andor InGaAs cameras and single point detectors InGaAs, PbS, InSb &amp; MCT</td>
</tr>
<tr>
<td>Integrated in EPICS</td>
<td>Supported by EPICS control software</td>
</tr>
</tbody>
</table>
Step-by-Step System Configuration

How to customise the Shamrock 500i:

1 **Chassis configuration**
   a) Select combination of input and output ports (see page 4 for available options).
   b) Select type of optics coating required (aluminium + MgF₂ is standard, protected silver coated optics available on request for NIR detection).
   c) Select purge port option (for improved detection down to 180 nm), and shutter for background acquisition and detectors protection.

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.

3 **Input light coupling interface**
   Refer to accessory tree for available configurations (direct coupling, fibre coupling or third party hardware connectivity).

4 **2nd exit port configuration**
   Refer to accessory tree for available configurations, including camera flanges.

5 **Software interface**
   Select either state-of-the-art Solis software or Software Development Kit (SDK) option – please refer to appropriate section for further information.
Step 1 - Chassis Configuration

Ordering Information

<table>
<thead>
<tr>
<th>Model</th>
<th>Side input port</th>
<th>Direct input port</th>
<th>Direct output port</th>
<th>Side output port</th>
<th>Motorized flipper mirror</th>
</tr>
</thead>
<tbody>
<tr>
<td>SR-500i-A</td>
<td>Manual slit</td>
<td>-</td>
<td>Camera</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>SR-500i-B1</td>
<td>Manual slit</td>
<td>-</td>
<td>Camera</td>
<td>Manual slit</td>
<td>✓</td>
</tr>
<tr>
<td>SR-500i-B2</td>
<td>Manual slit</td>
<td>-</td>
<td>Camera</td>
<td>Camera</td>
<td>✓</td>
</tr>
<tr>
<td>SR-500i-C</td>
<td>Manual slit</td>
<td>Manual slit</td>
<td>Camera</td>
<td>-</td>
<td>✓</td>
</tr>
<tr>
<td>SR-500i-D1</td>
<td>Manual slit</td>
<td>Manual slit</td>
<td>Camera</td>
<td>Manual slit</td>
<td>✓</td>
</tr>
<tr>
<td>SR-500i-D2</td>
<td>Manual slit</td>
<td>Manual slit</td>
<td>Camera</td>
<td>Camera</td>
<td>✓</td>
</tr>
<tr>
<td>SR-500i-XX-SIL</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Optics Coatings Reflectivity Graph

The graph shows the standard Al + MgF₂ optics coatings reflection efficiency versus wavelength.

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 or IR single-point detectors, such as MCT, PbS and InSb.

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

Chassis Accessories

- Additional Grating Turret (SR-ASM-0085)
- New iStar i²C to BNC shutter cable (ELC-05323)
- Side Input (SR-SHT-9002)
- Direct Input (SR-SHT-9008)
- USB Cable (Standard)
- Purge Connector (SR-ASM-8040)
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.

### Recommended Spectral Range for Gratings

<table>
<thead>
<tr>
<th>Grating (l/mm)</th>
<th>150</th>
<th>300</th>
<th>600</th>
<th>1200</th>
<th>1800 (Holo)</th>
<th>2400 (Holo)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Kymera 193i</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bandpass (nm)</td>
<td>902</td>
<td>445</td>
<td>215</td>
<td>98</td>
<td>56</td>
<td>46</td>
</tr>
<tr>
<td>Resolution (nm)</td>
<td>1.96</td>
<td>0.96</td>
<td>0.47</td>
<td>0.21</td>
<td>0.12</td>
<td>0.10</td>
</tr>
<tr>
<td><strong>Kymera 328i</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bandpass (nm)</td>
<td>600</td>
<td>297</td>
<td>144</td>
<td>67</td>
<td>39</td>
<td>32</td>
</tr>
<tr>
<td>Resolution (nm)</td>
<td>0.88</td>
<td>0.43</td>
<td>0.21</td>
<td>0.10</td>
<td>0.06</td>
<td>0.05</td>
</tr>
<tr>
<td><strong>Shamrock 500i</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bandpass (nm)</td>
<td>357</td>
<td>177</td>
<td>86</td>
<td>40</td>
<td>26</td>
<td>19</td>
</tr>
<tr>
<td>Resolution (nm)</td>
<td>0.52</td>
<td>0.26</td>
<td>0.13</td>
<td>0.06</td>
<td>0.04</td>
<td>0.03</td>
</tr>
<tr>
<td><strong>Shamrock 750</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bandpass (nm)</td>
<td>242</td>
<td>120</td>
<td>59</td>
<td>28</td>
<td>18</td>
<td>14</td>
</tr>
<tr>
<td>Resolution (nm)</td>
<td>0.35</td>
<td>0.18</td>
<td>0.09</td>
<td>0.04</td>
<td>0.03</td>
<td>0.02</td>
</tr>
</tbody>
</table>

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 Kymera or Shamrock spectrograph platform to meet resolution and band-pass needs, whilst minimising the risk of potential aberration.
Step 2b - Choosing The Right Grating vs Resolution and Band-pass

The Shamrock 500i features an innovative triple grating turret, designed to offer flexibility and control over your choice and interchange of gratings. The triple grating turret can be easily and speedily removed, and replaced by an alternative turret with new gratings. The intelligent design of the 500i means that only a simple offset adjustment is required once the new turret and gratings are added. The 500i is shipped with the grating turret already in place, ensuring your system is ready for use straight out of the box. Additional grating turrets are available with up to three pre-installed gratings (see below for details). If the grating you require is not on the list, please contact Andor for further details. Additional grating turrets (part number SR-ASM-0085) can also be supplied on request.

<table>
<thead>
<tr>
<th>Lines/mm</th>
<th>Blaze (nm)</th>
<th>Nominal dispersion (nm/mm)</th>
<th>Bandpass (nm)</th>
<th>Resolution (nm/mm)</th>
<th>Peak efficiency (%)</th>
<th>Andor part number</th>
<th>Maximum recommended wavelength (nm)</th>
<th>Maximum attainable wavelength (nm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>150</td>
<td>300</td>
<td>12.96</td>
<td>358</td>
<td>0.53</td>
<td>72</td>
<td>SR5-GRT-0150-0300</td>
<td>6915</td>
<td>11310</td>
</tr>
<tr>
<td>150</td>
<td>500</td>
<td>12.91</td>
<td>357</td>
<td>0.52</td>
<td>73</td>
<td>SR5-GRT-0150-0500</td>
<td></td>
<td></td>
</tr>
<tr>
<td>150</td>
<td>800</td>
<td>12.83</td>
<td>355</td>
<td>0.52</td>
<td>80</td>
<td>SR5-GRT-0150-0800</td>
<td></td>
<td></td>
</tr>
<tr>
<td>150</td>
<td>1250</td>
<td>12.69</td>
<td>351</td>
<td>0.51</td>
<td>84</td>
<td>SR5-GRT-0150-1250</td>
<td></td>
<td></td>
</tr>
<tr>
<td>150</td>
<td>2000</td>
<td>12.43</td>
<td>344</td>
<td>0.50</td>
<td>88</td>
<td>SR5-GRT-0150-2000</td>
<td></td>
<td></td>
</tr>
<tr>
<td>300</td>
<td>300</td>
<td>6.44</td>
<td>178</td>
<td>0.26</td>
<td>88</td>
<td>SR5-GRT-0300-0300</td>
<td></td>
<td></td>
</tr>
<tr>
<td>300</td>
<td>500</td>
<td>6.38</td>
<td>177</td>
<td>0.26</td>
<td>81</td>
<td>SR5-GRT-0300-0500</td>
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<tr>
<td>300</td>
<td>1000</td>
<td>6.20</td>
<td>172</td>
<td>0.25</td>
<td>72</td>
<td>SR5-GRT-0300-1000</td>
<td></td>
<td></td>
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<tr>
<td>300</td>
<td>1200</td>
<td>6.14</td>
<td>170</td>
<td>0.25</td>
<td>92</td>
<td>SR5-GRT-0300-1200</td>
<td></td>
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<tr>
<td>300</td>
<td>1700</td>
<td>5.92</td>
<td>164</td>
<td>0.24</td>
<td>89</td>
<td>SR5-GRT-0300-1700</td>
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</tr>
<tr>
<td>600</td>
<td>300</td>
<td>3.18</td>
<td>88</td>
<td>0.13</td>
<td>84</td>
<td>SR5-GRT-0600-0300</td>
<td></td>
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</tr>
<tr>
<td>600</td>
<td>500</td>
<td>3.11</td>
<td>86</td>
<td>0.13</td>
<td>72</td>
<td>SR5-GRT-0600-0500</td>
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<tr>
<td>600</td>
<td>1000</td>
<td>2.88</td>
<td>80</td>
<td>0.12</td>
<td>72</td>
<td>SR5-GRT-0600-1000</td>
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<td>600</td>
<td>1200</td>
<td>2.77</td>
<td>77</td>
<td>0.11</td>
<td>88</td>
<td>SR5-GRT-0600-1200</td>
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<tr>
<td>600</td>
<td>1900</td>
<td>2.24</td>
<td>62</td>
<td>0.09</td>
<td>88</td>
<td>SR5-GRT-0600-1900</td>
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<tr>
<td>600</td>
<td>1600&lt;sup&gt;1&lt;/sup&gt;</td>
<td>2.49</td>
<td>69</td>
<td>0.10</td>
<td>88</td>
<td>SR5-GRT-0600-1900</td>
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<tr>
<td>1200</td>
<td>300</td>
<td>1.54</td>
<td>42</td>
<td>0.06</td>
<td>72</td>
<td>SR5-GRT-1200-0300</td>
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<tr>
<td>1200</td>
<td>500</td>
<td>1.44</td>
<td>40</td>
<td>0.06</td>
<td>81</td>
<td>SR5-GRT-1200-0500</td>
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<tr>
<td>1200</td>
<td>1000</td>
<td>1.07</td>
<td>30</td>
<td>0.05&lt;sup&gt;1&lt;/sup&gt;</td>
<td>69</td>
<td>SR5-GRT-1200-1000</td>
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<td></td>
</tr>
<tr>
<td>1200</td>
<td>800&lt;sup&gt;2&lt;/sup&gt;</td>
<td>1.25</td>
<td>34</td>
<td>0.05&lt;sup&gt;1&lt;/sup&gt;</td>
<td>69</td>
<td>SR5-GRT-1200-1000</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1200</td>
<td>Holographic (500 nm peak)</td>
<td>1.44</td>
<td>40</td>
<td>0.06</td>
<td>81</td>
<td>SR5-GRT-1200-EH&lt;sup&gt;1&lt;/sup&gt;</td>
<td></td>
<td></td>
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<tr>
<td>1800</td>
<td>Holographic (250 nm peak)</td>
<td>1.00</td>
<td>28</td>
<td>0.04</td>
<td>62</td>
<td>SR5-GRT-1800-DH</td>
<td>575</td>
<td>945</td>
</tr>
<tr>
<td>1800</td>
<td>Holographic (380 nm peak)</td>
<td>0.93</td>
<td>26</td>
<td>0.04</td>
<td>70</td>
<td>SR5-GRT-1800-FH</td>
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</tr>
<tr>
<td>1800</td>
<td>Holographic (380 nm peak)</td>
<td>0.93</td>
<td>26</td>
<td>0.04</td>
<td>70</td>
<td>SR5-GRT-1800-FH</td>
<td></td>
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<tr>
<td>2400</td>
<td>300</td>
<td>0.69</td>
<td>19</td>
<td>0.03</td>
<td>68</td>
<td>SR5-GRT-2400-0300</td>
<td>435</td>
<td>705</td>
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<td>2400</td>
<td>Holographic (220 nm peak)</td>
<td>0.74</td>
<td>20</td>
<td>0.03</td>
<td>68</td>
<td>SR5-GRT-2400-BH</td>
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<tr>
<td>2400</td>
<td>Holographic (400 nm peak)</td>
<td>0.62</td>
<td>17</td>
<td>0.03</td>
<td>73</td>
<td>SR5-GRT-2400-GH</td>
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</tr>
<tr>
<td>Mirror UV-VIS</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>SR5-GRT-MR-AL-MGF2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mirror VIS-NIR</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>SR5-GRT-MR-SILVER</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<sup>1</sup>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 3a - Selecting The Correct Light Coupling Interfaces

How to customize the Shamrock 500i (Side Entrance Port):

- Spacer (Standard)
- Filter Wheel Assembly (ACC-SR-ASZ-7005)
- Neutral Density Filters
- Long Pass Filters
- Short Pass Filters
- Raman Edge Filters
- X-Y Adjustable Fibre Adapter (See page 11 Section B: Direct X-Y fibre couplers)

- Fixed SMA Fibre Adapter (ACC-SR-ASM-8003)
- Fixed FC Fibre Adapter (SR-ASM-8011)
- Motorized Slit Assembly (SR-ASZ-0035) inc 6 x 4 mm (W x H) Cover Plate
- Manual Slit Assembly (Standard) inc 6 x 4 mm (W x H) Cover Plate
- Wide Aperture Slit (SR-ASZ-0086) inc Ø27 mm Cover Plate
- X-Y Adjustable Fibre Adapter (See page 11 Section C: X-Y fibre couplers with slit assembly)

- SMA Fibre (50 µm: ACC-ME-OPT-8004) (100 µm: SR-OPT-8039)
- Cover Plate for Motorized Slit (See page 11 Section A: Slit Covers)
- Cover Plate for Manual Slit (See page 11 Section A: Slit Covers)

- Sample Chamber (ACC-SR-ASZ-0056)
- F/# Matcher for NA • 0.22 Fibre (SR-ASM-0039)
- X-Adjustable Fibre Adapter, Ferrule Input (SR-ASM-8006)
- Fixed Fibre Adapter, Ferrule Input (SR-ASM-8001)
- X-Y Adjustable Fibre Adapter (See page 11 Section C: X-Y fibre couplers with slit assembly)
- Optical Cage System Adapter (SR-ASM-0065)
- F-Mount Camera Lens Adapter (SR-ASM-0013)
- 1.5” Flange Adapter for Newport Oriel Accessories (SR-ASM-0002)
- C-Mount Adapter (SR-ASM-0021)

- SR-ASZ-0079 Optical Relay
- C-Mount Lens (OL-XXXX-XXX)
- Pen-Ray Lamp Mount (SR-ASM-0014)
- Pen-Ray Lamp
- Hg-Ar, Hg-Ne, Ar, Kr, Ne

- F/# Matcher for F/# Matcher
- FC Adapter for F/# Matcher (SR-ASM-0064)
- Fixed Fibre Adapter, Ferrule Input (SR-ASM-8001)
- X-Y Adjustable Fibre Adapter (See page 11 Section C: X-Y fibre couplers with slit assembly)
- Optical Cage System Adapter (SR-ASM-0065)
- F-Mount Camera Lens Adapter (SR-ASM-0013)
- 1.5” Flange Adapter for Newport Oriel Accessories (SR-ASM-0002)
- C-Mount Adapter (SR-ASM-0021)

- SMA Adapter for F/# Matcher (SR-ASM-0041)
- FC Adapter for F/# Matcher (SR-ASM-0064)
- Fixed Fibre Adapter, Ferrule Input (SR-ASM-8001)
- X-Y Adjustable Fibre Adapter (See page 11 Section C: X-Y fibre couplers with slit assembly)
- Optical Cage System Adapter (SR-ASM-0065)
- F-Mount Camera Lens Adapter (SR-ASM-0013)
- 1.5” Flange Adapter for Newport Oriel Accessories (SR-ASM-0002)
- C-Mount Adapter (SR-ASM-0021)

- Cage System (Please refer to Thorlabs or Linos catalogue)
- F-Mount Lens
- F-Mount Lens
- Pen-Ray Lamp
- Hg-Ar, Hg-Ne, Ar, Kr, Ne

- Cage system microscope flange (TR-XXXX-CAGE-ADP)
- SR-ASZ-0079 Optical Relay
- C-Mount Lens (OL-XXXX-XXX)
- Pen-Ray Lamp
- Hg-Ar, Hg-Ne, Ar, Kr, Ne

- SMA - SMA Fibre (50 µm: ACC-ME-OPT-8004) (100 µm: SR-OPT-8039)
- SMA Adapter for F/# Matcher (SR-ASM-0041)
- FC Adapter for F/# Matcher (SR-ASM-0064)
- Fixed Fibre Adapter, Ferrule Input (SR-ASM-8001)
- X-Y Adjustable Fibre Adapter (See page 11 Section C: X-Y fibre couplers with slit assembly)
- Optical Cage System Adapter (SR-ASM-0065)
- F-Mount Camera Lens Adapter (SR-ASM-0013)
- 1.5” Flange Adapter for Newport Oriel Accessories (SR-ASM-0002)
- C-Mount Adapter (SR-ASM-0021)

- Pen-Ray Lamp
- Hg-Ar, Hg-Ne, Ar, Kr, Ne

- Cage system microscope flange (TR-XXXX-CAGE-ADP)
- SR-ASZ-0079 Optical Relay
- C-Mount Lens (OL-XXXX-XXX)
- Pen-Ray Lamp
- Hg-Ar, Hg-Ne, Ar, Kr, Ne
Step 3b - Selecting The Correct Light Coupling Interfaces

How to customize the Shamrock 500i (Direct Entrance Port):

- Motorized Slit Assembly (SR-ASZ-0032) inc 6 x 4 mm (W x H) Cover Plate
- Wide Aperture Slit (SR-ASZ-0095) inc Ø27 mm Cover Plate
- Manual Slit Assembly (Standard) inc 6 x 4 mm (W x H) Cover Plate
- X-Y Adjustable Fibre Adapter (See page 11 Section A: Slit Covers)
- Cover Plate for Motorized Slit (See page 11 Section A: Slit Covers)
- Cover Plate for Manual Slit (See page 11 Section A: Slit Covers)
- F/# Matcher for NA - 0.22 Fibre (SR-ASM-0039)•11
- X Adjustable Fibre Adapter, Ferrule Input (SR-ASM-8006)
- Fixed Fibre Adapter, Ferrule Input (SR-ASM-8001)
- X-Y Adjustable Fibre Adapter (See page 11 Section C: X-Y fibre couplers with slit assembly)
- F-Mount Camera Lens Adapter (SR-ASM-0013)
- 1.5” Flange Adapter for Newport Oriel Accessories (SR-ASM-0002)
- C-Mount Adapter (SR-ASM-0021)
- Pen-Ray Lamp Mount (SR-ASM-0014)
- SMA Adapter for F/# Matcher (SR-ASM-0041)
- FC Adapter for F/# Matcher (SR-ASM-0064)•12
- Fibre Ferrule (SR-OPT-8000)•12
- F-Mount Lens•12
- 15 µm Fibre Ferrule (50 µm: ACC-ME-OPT-8004) (100 µm: SR-OPT-8039)
- SMA - SMA Fibre
- Pen-Ray Lamp•12 Hg-Ar, Hg-Ne, Ar, Kr, Ne
- C-Mount Lens (OL-XXXX-XXX)•12
- SR-ASZ-0079 Optical Relay
- Wide Aperture Slit (SR-ASM-8001

Note: The document contains a diagram illustrating the components and their configurations for customizing the Shamrock 500i.
Step 4 - Cameras & Output Port Flanges

How to customize the Shamrock 500i:

Direct Detector Output Port

- iXon ULTRA Mounting Flange
  (MFL-SR500-IXON)

- Marana Mounting Flange
  (MFL-SR-MARANA)

  (Note: Ø 32 mm aperture cover slit recommended to avoid vignetting for larger sensor of the Marana)

- X-Y Adjustable Fibre Adapter
  (See page 11 Section C: X-Y Fibre Couplers [With Slit Assembly])

- Multi-channel Detector Flange
  (MFL-SR500)

  (To be ordered separately. 2 flanges required per -B2 and D2 models)

- C-Mount Adapter
  (SR-ASM-0021)

- Sample Chamber
  (ACC-SR-ASZ-0056)

- Manual Adjustable Slit Assembly
  (Standard)
  inc 6 x 4 mm (W x H)
  Cover Plate

- Output Port Motorized Slit Assembly
  (SR-ASZ-0036)
  inc 6 x 4 mm (W x H)
  Cover Plate

- Multi-channel Detector Flange to Slit Adapter Plate
  (SR-ASM-0062)

- X-Y Adjustable Fibre Adapter
  (See page 11 Section C: X-Y Fibre Couplers [With Slit Assembly])

- Manual Adjustable Slit Assembly
  (SR-ASZ-0030)
  inc 6 x 4 mm (W x H)
  Cover Plate

- Cover Plate for Manual Adjustable Slit Assembly
  (See page 11 Section A: Slit Covers)

- Cover Plate for Motorized Slit Assembly
  (See page 11 Section A: Slit Covers)

- Cover Plate for Manual Adjustable Slit Assembly
  (See page 11 Section A: Slit Covers)

Note: a flange MUST be ordered separately for any configuration involving a multichannel or InGaAs detector.
Step 4A: Slit Covers

<table>
<thead>
<tr>
<th>Size</th>
<th>Motorised Slit</th>
<th>Manual Slit</th>
</tr>
</thead>
<tbody>
<tr>
<td>6 x 4 mm (W x H)</td>
<td>SR-ASM-0016‡‡</td>
<td>SR-ASM-0025</td>
</tr>
<tr>
<td>6 x 6 mm (W x H)</td>
<td>SR-ASM-0017</td>
<td>SR-ASM-0026</td>
</tr>
<tr>
<td>6 x 8 mm (W x H)</td>
<td>SR-ASM-0010</td>
<td>SR-ASM-0027</td>
</tr>
<tr>
<td>6 x 14 mm (W x H)</td>
<td>SR-ASM-0011‡</td>
<td>SR-ASM-0029‡</td>
</tr>
<tr>
<td>Ø 27 mm</td>
<td>SR-ASM-0072‡‡</td>
<td>SR-ASM-0100‡</td>
</tr>
<tr>
<td>Ø 32 mm aperture</td>
<td>SR-ASM-0107</td>
<td>SR-ASM-0106</td>
</tr>
</tbody>
</table>

Step 4B - X-Y Fibre Coupler (with NO slit)

Step 4C - X-Y Fibre Coupler (with slit assembly)

Notes:
- For connection to manual slits, please also order Ø27 mm slit cover plate SR-ASM-0100
- For connection to motorized slits, please also order Ø27 mm slit cover plate SR-ASM-0072
- For connection to manual slits, please also order Ø32 mm slit cover plate SR-ASM-0106 (Marana sCMOS)
- For connection to motorized slits, please also order Ø32 mm slit cover plate SR-ASM-0107 (Marana sCMOS)

Where yy = SMA, FC, FC/APC or FERRULE

Where zz = SMA, FC or FERRULE, option not available
The Shamrock 500i requires at least one of the following software options:

1 - **Solis Spectroscopy A 32**-bit and fully 64-bit enabled application for Windows (8, 8.1 and 10) offering rich functionality for data acquisition and processing, as well as Andor cameras, spectrograph and motorized accessories simultaneous control. AndorBasic provides macro language control of data acquisition, processing, display and export.

2 - **Standalone Solis Spectroscopy** GUI for standalone spectrograph operation.

3 - **Shamrock SDK** A software development kit that allows you to control the Andor range of Kymera and Shamrock spectrographs from your own application. Compatible as 32 bit libraries for Windows (8, 8.1 and 10). Compatible with C/C++, C#, VB.NET and LabVIEW for Windows/Linux.

4 - **Solis Scanning** Dedicated interface for scanning monochromator acquisitions, including comprehensive experimental set-ups builder. Simultaneous control of single point detector Kymera and Shamrock monochromator and motorized accessories.

---

**A - Selecting A Software Option**

The Shamrock 500i requires at least one of the following software options:

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---

**Solis Spectroscopy: Dedicated spectroscopy acquisition software**

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**Wavelength drive**

Set the wavelength range for the current grating - drag slider to desired wavelength or just type in appropriate value.

**Exposure time**

Set the exposure time for the detector - quick access for easy acquisition optimization.

**Real Time Control**

(a) Slit drive: Control the spectrograph slit width - drag blades on icon or type in required slit width
(b) Flippet motor: Used to select the appropriate exit port
(c) Shutter: Synchronization mode selection for shutter operation
(d) Filter wheel: Used to select a particular filter on the filter wheel - just click on the desired filter position
(e) Grating turret: Used for setting grating turret to a new position and bringing desired grating in the optical path - just click on the desired grating.
Weight: 25 kg [55.12 lbs approx]
Note: Output flanges & filterwheel are for illustration purposes only (sold separately).
Please refer to accessory tree diagrams or contact your local sales representative.

### Shutter Specifications

<table>
<thead>
<tr>
<th>Specification</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maximum repetition rate</td>
<td>2 Hz</td>
</tr>
<tr>
<td>Minimum open/close time</td>
<td>15 ms</td>
</tr>
<tr>
<td>Minimum lifetime</td>
<td>Better than 100K cycles</td>
</tr>
</tbody>
</table>

### Optical Property

<table>
<thead>
<tr>
<th>Property</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Focal plane size (mm, W x H)</td>
<td>30 x 14</td>
</tr>
<tr>
<td>Stray light *1</td>
<td></td>
</tr>
<tr>
<td>FVB (1 nm from laser)</td>
<td>$1.1 \times 10^{-4}$</td>
</tr>
<tr>
<td>FVB (10 nm from laser)</td>
<td>$2.6 \times 10^{-5}$</td>
</tr>
<tr>
<td>1 mm strip (1 nm from laser)</td>
<td>$1.1 \times 10^{-4}$</td>
</tr>
<tr>
<td>1 mm strip (10 nm from laser)</td>
<td>$2.6 \times 10^{-5}$</td>
</tr>
</tbody>
</table>

### Screw Type Requirements

<table>
<thead>
<tr>
<th>Requirement</th>
<th>Requirement Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>CCD flange to Spectrograph flange</td>
<td>4 off, M4 x 16</td>
</tr>
<tr>
<td>Camera to CCD flange</td>
<td>4 off, M3 x 10</td>
</tr>
<tr>
<td>iXon camera to iXon flange</td>
<td>4 off, M5 x 10, countersunk, hex head</td>
</tr>
</tbody>
</table>

### Wavelength Drive Performance

<table>
<thead>
<tr>
<th>Performance</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wavelength accuracy *2</td>
<td>0.04 nm</td>
</tr>
<tr>
<td>Wavelength repeatability *2</td>
<td>10 pm</td>
</tr>
</tbody>
</table>

### Wavelength Side Accuracy

<table>
<thead>
<tr>
<th>Accuracy</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wavelength side accuracy *2</td>
<td>0.05 nm</td>
</tr>
</tbody>
</table>

### Connecting to the Shamrock 500i

**USB Shamrock Control**
- Connector type: USB 'B' type

**Shutter Control**
- Connector type: BNC Female, 50 Ω
Our Cameras for Spectroscopy

Spectroscopy-based diagnostics in the fields of Material Science, Chemistry, Life Science or Fundamental Physics & Optics rely on the capture and analysis of optical and chemical signatures with a high degree of precision.

Andor’s range of detectors offer a wide range of sensitivity, time-resolution and sensor formats to best suit specific experimental conditions from UV to SWIR, nanosecond to hours time resolution, high photon flux to single photon with super dynamic range and resolution.

**High Sensitivity & Dynamic Range**
- Long exposure
- High sensitivity UV-SWIR
- Large pixel well depths
- High resolution matrix

**ns to µs Time-Resolution**
- Nanosecond gating
- High sensitivity down to single photon
- On-head DDG with ps accuracy

**kHz Spectral Rates**
- µs to ms time-resolution
- High sensitivity down to single photon
- High resolution matrix

**Extended Multi-fibre Spectroscopy**
- Large area sensors
- Ultrafast sCMOS and EMCCD options
- High sensitivity down to single photon

<table>
<thead>
<tr>
<th>iDus CCD &amp; InGaAs</th>
<th>Newton CCD &amp; EM</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>iStar CCD &amp; sCMOS</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Newton CCD &amp; EMCCD</th>
<th>iXon EMCCD</th>
<th>Zyla sCMOS</th>
<th>Marana sCMOS</th>
</tr>
</thead>
<tbody>
<tr>
<td>iKon-M CCD</td>
<td>iXon EMCCD</td>
<td>Zyla sCMOS</td>
<td>Marana sCMOS</td>
</tr>
<tr>
<td>iStar CCD &amp; sCMOS</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Learn more about our detector range [here].

Learn more about our spectrograph solutions [here].
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.

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Tokyo
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Fax +81 (3) 6732 8939

North America
Concord, MA, USA
Phone +1 (860) 290 9211
Fax +1 (860) 290 9566

China
Beijing
Phone +86 (10) 5884 7900
Fax +86 (10) 5884 7901

Footnotes: Specifications are subject to change without notice
1. In the case of a multiple grating turret order, please specify desired grating configuration for each turret.
2. SR-SHT-9002 calls for 1x shutter. For dual input port options (C, D1 & D2) it is recommended to order a shutter for each port. Shutter operation only requires BNC to SMB cable from USB cameras.
3. Typical values quoted with 27.6 mm wide CCD, e.g. Newton DU940.
4. Typical values quoted with 10 μm slit and 13.5 μm pixel CCD, e.g. Newton DU940.
5. Typical values quoted at 500 nm centre wavelength.
6. Typical values quoted at 300 nm centre wavelength.
7. Typical values quoted at maximum efficiency wavelength or blaze wavelength unless otherwise stated.
8. Wavelength within the recommended operating spectral region.
9. Indicative values: the working range of these gratings is principally in the region where optical aberrations may alter the system resolution performance quoted.
10. Values shown are representative of a triple grating system, where resolution has been optimized to give the best performance for the three gratings and across the full recommended wavelength range. Useful signal is assumed to be imaged on the entire height of a 6.9 mm sensor (i.e. Newton DU940i) and fully vertically binned.
11. Please refer to F/# matcher specification sheet for magnification considerations.
12. Please refer to the local sales representative or website for further information on available options and complimentary accessories.
13. Slit widths range from 10 μm to 2.5 mm.
14. For B2 and D2 configurations only - to be ordered separately.
15. Please specify relevant port at time of order.
16. Provided as standard.
17. Recommended for use with fibre-optics and C-mount accessories.
18. Measured with a 633 nm laser and a 1200 l/mm grating for Full Vertical Binning (FVB) on a 6.9 mm high sensor, and a 1 mm strip vertically centred on the optical axis.
19. Average measurements using > 30 calibration lines, covering the recommended grating angle operating range with a 1200 l/mm grating.
20. The standard deviation of 20 measurements of a peak’s centre-of-mass position: between each measurement the drive is moved 10x including both wavelength and grating changes to reflect typical use.
21. Side accuracy measured using a 27.6 mm wide sensor; reflecting the dispersion calibration and step-and-glue accuracy.
22. Only Andor CCD platforms (Newton, iDus, iKon) can be controlled in conjunction with Kymera and Shamrock spectrographs in EPICS software.

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

Power Requirements
- 100 - 240 VAC 50 - 60 Hz
- Max. power consumption: 21 W (30 Hz shutter and grating turret operation)

Items shipped with your spectrograph:
- 1x 3 m USB 2.0 cable Type A to Type B
- 1x Power supply with 3 m mains cable
- 1x User guides in electronic format
- 1x Individual system performance booklet
- 1x Software in electronic format (if ordered)
- 1x Hex key set (2 mm, 3 mm & 5 mm)

Regulatory Compliance
Compliant with the requirements of the EU EMC and LVD Directives, compliant with the international EMC and safety standards IEC 61326-1 and IEC 61010-1.

Minimum Computer Requirements:
- 3.0 GHz single core or 2.4 GHz multi core processor
- 2 GB RAM
- 250 MB free hard disc to install software (at least 1 GB recommended for data spooling)
- USB 2.0 High Speed Host Controller capable of sustained rate of 40 MB/s
- Windows (8, 8.1 and 10)

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- Max. power consumption: 21 W (30 Hz shutter and grating turret operation)