


<div>Dodavatel:</div> <div></div> <div><b>OptiXs, s.r.o.</b> Křivoklátská 37/3 19900 Praha Česká republika IČO: 02016770, DIČ: CZ02016770, Telefon: Fax: Mobil: +420 607 014 276 E-mail: WWW: www.optixs.cz</div>	<div>Odběratel - sídlo: <b>Mezinárodní centrum klinického výzkum Pekařská 53 656 91 Brno Česká republika</b></div> <div>IČO: 00159816, DIČ: CZ00159816</div> <div><div>Poštovní adresa: <b>Mezinárodní centrum klinického výzkum Fakultní nemocnice u sv. Anny v Brně Pekařská 53 656 91 Brno Česká republika</b></div><div>Místo určení:</div><div>Číslo poptávky:</div></div>
<div>Forma úhrady: Způsob dopravy:</div> <div>Termín: Vystaveno: 19.06.2025</div>	

Označení dodávky	Množství MJ	Sleva [%]	Cena za MJ	Sazba DPH	Základ [Kč]	Celkem [Kč]
FLuorescenční kamera						
Sona-6 Extreme: 4.2 Megapixel Back Illuminated sCMOS,6.5 µm pixel, 95% QE, 135 fps, USB 3.0 and CoaXPress, C-mount, SRRF-Stream+ read	1,00 ks		710 997,00	21,00	710 997,00	860 306,37
A-SONA-4BV6X						
SRRF-STREAM-SONA-6 (CAMERA LOCKED)						
SRRF-Stream real time super-resolution functionality, compatible with Sona 4.2B-6 sCMOS camera.	1,00 ks		6 847,00	21,00	6 847,00	8 284,87
SRRF-STREAM-SONA-6						
SDK3 for Windows Windows software development kit - SDK3	1,00 ks		19 892,00	21,00	19 892,00	24 069,32
SDK3						
Spektrograf						
KYMERa BASE UNIT 328mm,slt in,slt & CCD out.	1,00 ks		389 480,00	21,00	389 480,00	471 270,80
KYMERa-328I-B1						
PURGE PLUG Kymera/Shamrock gas purge plug	1,00 ks		601,00	21,00	601,00	727,21
SR-ASM-8040						
KYMERa IRIS Kymera Iris sub assy side.	1,00 ks		33 459,00	21,00	33 459,00	40 485,39
SR-IRIS-SIDE						
KYMERa GTG 150-300 Kymera gtg 150l/mm 300nm blaze.	1,00 ks		33 982,00	21,00	33 982,00	41 118,22
SR-GRT-0150-0300						
KYMERa GTG 300-300 Kymera gtg 300l/mm 300nm blaze.	1,00 ks		33 982,00	21,00	33 982,00	41 118,22
SR-GRT-0300-0300						
Kymera grating mirror AL+ MGF2	1,00 ks		18 690,00	21,00	18 690,00	22 614,90
SR-GRT-MR-AL-MGF2						
KYMERa QUAD TURRET Kymera quad grating turret	1,00 ks		38 948,00	21,00	38 948,00	47 127,08
SR-ASZ-10398						
KYMERa GTG 600-300 Kymera gtg 600l/mm 300nm blaze.	1,00 ks		33 982,00	21,00	33 982,00	41 118,22
SR-GRT-0600-0300						

Označení dodávky	Množství MJ	Sleva [%]	Cena za MJ	Sazba DPH	Základ [Kč]	Celkem [Kč]
Kymera gtg 1649.5l/mm 375nm blaze SR-GRT-1650-0375	1,00 ks		57 507,00	21,00	57 507,00	69 583,47
KYMERA GTGH 2400/400 Kymera hologr 2400l/mm 400nm peak. SR-GRT-2400-GH	1,00 ks		33 981,00	21,00	33 981,00	41 117,01
KYMERA GTGH 1800/480 Kymera hologr 1800l/mm 480nm peak. SR-GRT-1800-FH	1,00 ks		33 981,00	21,00	33 981,00	41 117,01
Wide aper slit Kym/Sha wide aperture side entrance SR-ASZ-0086	1,00 ks		103 251,00	21,00	103 251,00	124 933,71
MOTORISED SLIT Kymera/Shamrock upgrade to motorized slit SR-ASZ-0032	1,00 ks		36 073,00	21,00	36 073,00	43 648,33
KYMERA SHUTTER Kymera 10Hz shutter (factory) SIDE INPUT SR-SHT-9006	1,00 ks		47 835,00	21,00	47 835,00	57 880,35
KYMERA SPEC FLG KIT Kymera spectroscopy flange kit. MFL-SR-CCD	1,00 ks		3 372,00	21,00	3 372,00	4 080,12
FILTER WHEEL Kymera 328i filter wheel (add filters). ACC-SR-ASZ-7006	1,00 ks		64 042,00	21,00	64 042,00	77 490,82
7897C-MOUNT ADAPT Kym/Sha C-mount adapter (on slits) SR-ASM-0021	1,00 ks		7 790,00	21,00	7 790,00	9 425,90
Olympus IX83 feet Ip Olympus IX83 feet left port 150 mm TR-OL83-MNT-150-LP	1,00 ks		53 586,00	21,00	53 586,00	64 839,06
KYMERA EXT. FEET 6mm extension feet (set of 4) SR-ASM-0098	1,00 ks		1 856,00	21,00	1 856,00	2 245,76
SDK2 for Windows Software Develop Kit - camera & spectro ANDOR-SDK-CCD	1,00 ks		19 892,00	21,00	19 892,00	24 069,32
SOLIS SPECTRO S/W Software for modular Spectroscopy and Imaging SOLIS (S)	1,00 ks		60 382,00	21,00	60 382,00	73 062,22
Dělič svazku TwinCam dual camera splitter with rectangular aperture - 1x magnification. Comes complete with 50/50 beamsplitter cube and two angled auxiliary filter holders.	1,00 ks		211 676,00	21,00	211 676,00	256 127,96
DCRN/P1075/010/000 F-mount input adapter for Cairn splitters range	1,00 ks		14 295,00	21,00	14 295,00	17 296,95
DCRN/ P1080/001/ FMT F-mount output clamp for Cairn splitter range	1,00 ks		11 164,00	21,00	11 164,00	13 508,44
DCRN/ P1080/000/ FMT C-mount output for splitter range DCRN/P1080/000/CMT	1,00 ks		3 676,00	21,00	3 676,00	4 447,96
Support jack for Cairn emission range DCRN/P1075/MNT/000	2,00 ks		8 550,00	21,00	17 100,00	20 691,00
EMCCD kamera Newton 970 EMCCD 1600x200,16um,EMCCD,BV,3MHz,-100C AF DU970P-BVF	1,00 ks		1 069 110,00	21,00	1 069 110,00	1 293 623,10

Označení dodávky	Množství MJ	Sleva [%]	Cena za MJ	Sazba DPH	Základ [Kč]	Celkem [Kč]
Další						
Instalation and user training INSTALLATION	1,00 h		18 000,00	21,00	18 000,00	21 780,00
Doprava (balné, transport, pojištění)						
DOPRAVA	1,00 ks		10 500,00	21,00	10 500,00	12 705,00

Rekapitulace DPH v Kč

Základ 0%	0,00	DPH 0%	0,00
Základ 12%	0,00	DPH 12%	0,00
Základ 21%	3 199 929,00	DPH 21%	671 985,09
Celkem	3 199 929,00		671 985,09

Základ [Kč]	3 199 929,00
Celkem [Kč]	3 871 914,09



— Registrace:

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Razítko a podpis



# Andor Sona sCMOS

## Now Even Faster and More Sensitive

### Key Specifications

- ✓ Sensitive: 95% peak QE
- ✓ Fast: up to 135 fps
- ✓ Productive: up to 32 mm field of view
- ✓ Accurate: >99.7% linearity
- ✓ Protected: UltraVac™ sensor enclosure
- ✓ Longevity: 5-year vacuum warranty

### Key Applications

- ✓ Developmental biology
- ✓ Neuroimaging
- ✓ Super-resolution
- ✓ Transcriptomics
- ✓ Intracellular trafficking
- ✓ Plasma membrane studies



[andor.oxinst.com](http://andor.oxinst.com)



# Introducing Sona

## The most sensitive back-illuminated sCMOS Cameras

Sona is Andor's high performance, vacuum-cooled sCMOS camera platform, specifically for fluorescence microscopy. It has been designed from the ground up to extract the very best performance from the latest back-illuminated sCMOS sensors with 95% quantum efficiency.

- 1 Extended QE Response**  
Back-illuminated sCMOS for highest possible photon collection. Capture every photon!

- 8 Permanent Vacuum Seal Technology**  
The only back-illuminated sCMOS with permanent vacuum technology. Deepest cooling and longevity with 5 year seal warranty.\*<sup>1</sup>



- 2 Market Leading Quantitative Accuracy**  
Have confidence in your data with superb data fidelity:
  - ✓ >99.7% Linearity
  - ✓ <0.5% PRNU



- 7 Uncompromised High Speeds**  
Capture dynamic events faster than ever. **New Sona-6 Extreme** high speed mode accelerates speeds up to 135 fps!

- 3 True Imaging Flexibility**  
Select between 6.5 and 11  $\mu\text{m}$  pixel options. Capture fast or weak signals with ease. Pre-set ROIs and flexible binning options.



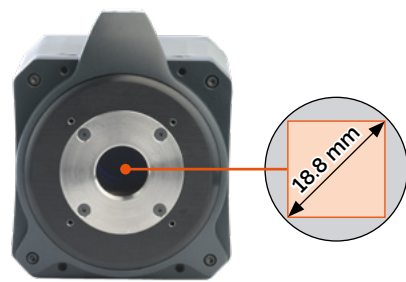
- 4 Largest Imaging Area**  
Up to 32 mm Field of View! Unique Antiglow technology lets you harness the full field of view without restrictions!

- 5 Camera based Super-resolution Capable**  
Unlock real-time cell friendly super-resolution from your microscope with SRRF-Stream+!

- 6 Extended Dynamic Range (EDR)**  
One snap imaging captures full 16-bit image detail. Low-and high-level information in a single image!

# Sona-6 Extreme: Extreme Sensitivity & Speed

Sona-6 Extreme features a back-illuminated sensor with **95% QE** and a **6.5 µm** pixel size. This sensor format provides a perfect balance of **sensitivity, speed, and resolution**. Exceptionally flexible, and ideally suited to 40x and 60x magnification and today's microscope port sizes. Compatible with SRRF-Stream+ Super-resolution.



Sona-6 Extreme

Summary	
Model	4.2B-6
Sensor Size	18.8 mm
Pixel Size	6.5 µm
Quantum Efficiency	up to 95%
Read Noise	1.0 e- (Low Noise, 12-bit) 1.6 e- (High Dynamic Range, 16-bit) 1.9 e- (High Speed, 11-bit)
Dark Current	0.1 e-/p/s
Max. Speed	135 fps

## NEW & IMPROVED Capture the dynamics of life with Sona-6 Extreme

- ✓ **Accelerated speeds:** new high-speed mode accelerates speeds to **135 fps** (full frame) via CoaXPress to capture the fastest cellular processes.
- ✓ **Improved sensitivity:** the noise floor has been reduced by **25%**. Sensitivity is thus improved for better detection of the weakest signals.
- ✓ **Enhanced image quality:** PRNU has been reduced by 25% under low light conditions
- ✓ **Python ready** - Updated camera SDK integrates a Python wrapper for speedy integration.

## Intracellular Trafficking

Fast and sensitive imaging is crucial for studies of endosome cycling, Golgi vesicles pathways, axonal transport, hormone release or synaptic vesicle pool replenishment. Sona-6 Extreme with sensitivity, resolution and speed, is ideal for tracking intricate events and dependencies occurring within the cell's vital transport and communications networks.

Read more in our [Learning Center](#).

## Developmental Biology

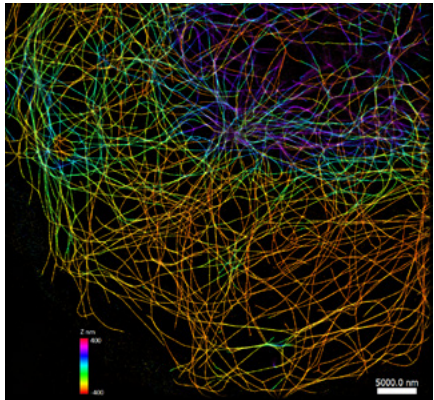
Imaging has been instrumental for following the entire lifespan of organisms to track fates of developing cells, tissues, and organs. Whole-embryo and whole-body imaging of well-established model organisms including the zebrafish and C. elegans can be captured in superb detail with the Sona-6 Extreme camera. Read more in our [Learning Center](#).

## Neuroimaging

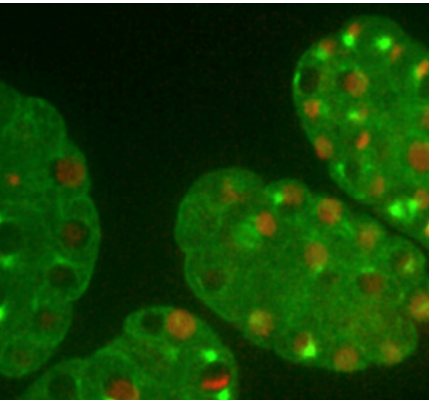
Imaging of neurons and other specialised cells of the nervous system can be challenging for many detectors. Experiments can require high dynamic range or very sensitive detectors. Sona cameras have the required sensitivity and dynamic imaging capabilities for neuroimaging experiments. Read more in our [Learning Center](#).

## Plasma Membrane Dynamics

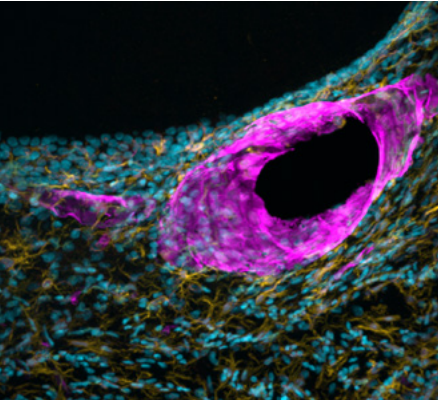
The plasma membrane can be imaged in many ways, which can involve direct membrane labelling with lipophilic or voltage sensitive dyes. Rapid remodelling of the plasma membrane can be imaged with the rapid frame rate, highly sensitive back-illuminated Sona cameras, perfectly suited to the low light conditions inherent to TIRF Microscopy. Read more in our [Learning Center](#).



Super-resolution image of microtubules with B-TIRF. Image credit: F. Rivera-Molina, Yale University.



The early development of C. elegans embryos labelled with GFP and mCherry, captured at 60x with Sona-6. Image Andor Technology.

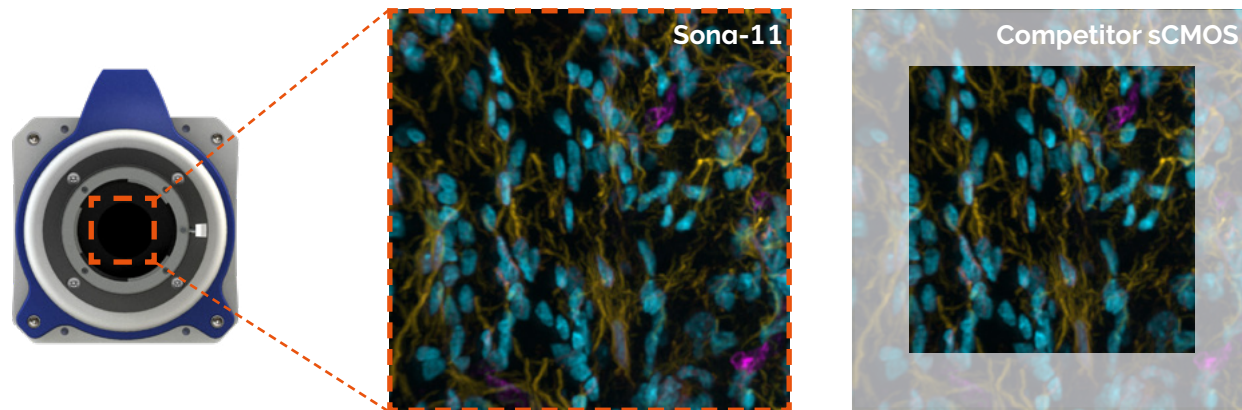


Organisation of neurons, astrocytes and glial cells within mouse brain, imaged with Sona at 40x. Image Andor Technology.



# Sona-11: For the Widest Field of View

Sona-11 has the **biggest sensor** on the market with a full **32 mm sensor diagonal**! Andor's unique technology usefully accesses the entire 2048 x 2048 array offering **62% larger** field of view than competing back-illuminated cameras. The **95% QE** and larger pixel size of **11  $\mu\text{m}$**  provides optimal photon collection, for the **most light-starved applications**. Study structures and processes within the cell in perfect resolution using techniques such as confocal, TIRF and Single Molecule Localization Microscopy (SMLM).



**See the full picture:** With a 32 mm sensor diagonal Sona-11 has a field of view advantage:

- ✓ **2.9x** larger field of view vs typical sCMOS
- ✓ **2.1x** larger field of view vs 22 mm format sCMOS
- ✓ **62%** larger field of view vs competing back-illuminated sCMOS (1608x1608 array)

- ✓ **Capture weak signals** – 95% QE is complemented by large 11  $\mu\text{m}$  pixel size for optimal photon collection
- ✓ **SRRF-Stream+ Super-Resolution** - Transform a standard microscope to super-resolution!
- ✓ **NEW Python ready** - Updated camera SDK integrates a Python wrapper for speedy integration.

Summary		
Model	4.2B-11	2.0B-11
Sensor Size	32 mm	22 mm
Pixel Size	11 x 11 $\mu\text{m}$	
Quantum Efficiency	up to 95%	
Read Noise	1.6 e- median [1.8 e- rms]	
Dark Current	0.3 e-/p/s	
Max. Speed	48 fps	70 fps

## Single Molecule Imaging

Single molecule imaging experiments provide insights into processes that are not possible via normal ensemble imaging. Sona-11 is an alternative to EMCCD cameras when working with brighter labels and stronger signals. Sona-11 can provide significantly wider fields of view, higher speeds and exceptional dynamic range. Read more in our [Learning Center](#).

## FCS

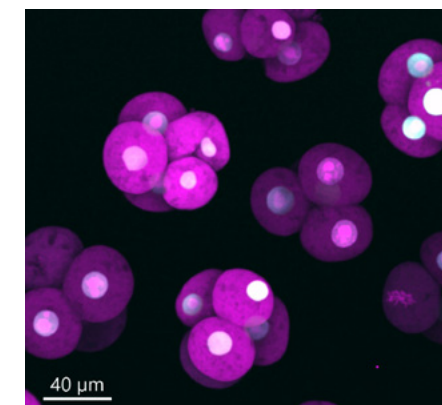
Sona-11 (32 mm) provides the best possible solution for many FCS experiments. The largest possible sensor area, high sensitivity and high speed are complemented by class leading linearity, which allow for the most accurate and precise measurements. Read more in our [Learning Center](#).

## Transcriptomics

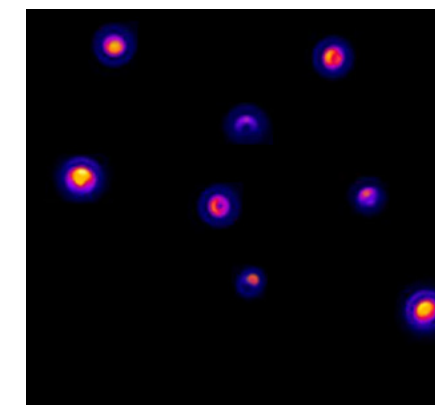
Detectors for such studies must have high sensitivity to help detection of the fluorescent RNA signal against the cell background. Large fields of view and high-speed are also important to maximise throughput of the image data using microarrays or tissue samples. Sona-11 (32 mm) is ideal for these studies with its combination of high sensitivity, speed and widest possible field of view. Read more in our [Learning Center](#).

## Gene Editing

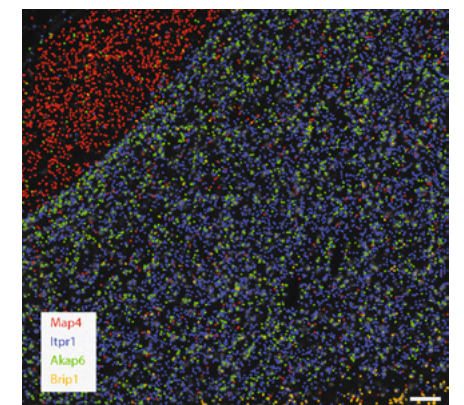
The best-in-class sensitivity offered by the back-illuminated deep cooled Sona sCMOS cameras are well suited to imaging of Crispr-Cas9 constructs, ideal for fast and sensitive detection of light emitted by labelled DNA/RNA or related proteins. Read more in our [Learning Center](#).



Mouse Fertilized eggs, Probe1: EGFP (EX/Em488nm/525-50nm), Probe2: Kusabira Orange (Ex/Em: 561/600-50nm) Microscope: Ti2-E (Nikon), Objective: 40x /1.25 (SiI), Camera: Sona-11, Pinhole Size 40  $\mu\text{m}$ . Sample courtesy of Dr. Eiichi Okamura, Shiga University of Medical Science



For the most demanding single molecule experiments EMCCD cameras are the most suitable. However, Sona-11 can be a viable option for stronger signals. Image from Andor Technology.



Decoded transcript locations of selected genes overlaid on stitched (n = 1 section per tissue). Scale bar, 100  $\mu\text{m}$ . Split-FISH imaging repeated on at least one additional section per tissue, with similar results. Brain tissue showing differential localisation of transcripts in regions with (Itpr1) and without (Map4) cell bodies. (Goh et al., 2020)



# Super-Resolution Ready

## SRRF-STREAM+

Want to enable fast and easy super-resolution down to 100 nm? Our exclusive camera-based technology enables super-resolution microscopy on conventional modern fluorescence microscopes in real-time.

SRRF (Super-Resolution Radial Fluctuations), is a highly effective approach to super-resolution developed by the Henriques research group (Gustafsson et al., 2016). Andor's unique and exclusive implementation of SRRF-Stream+ allows camera-based real-time super-resolution with low illumination intensities and normal fluorescent labels.



- ✓ **Capture vibrant images** – with stunning detail and high contrast.
- ✓ **Conventional fluorophores** – simple labelling, no photo-switching required.
- ✓ **Cost-effective** – convert conventional fluorescence microscopes to super-resolution microscopes.
- ✓ **Real time** – enhanced workflow, avoids post-processing. View in 'Live Mode'.
- ✓ **Low excitation intensities** – prolonged live cell observations & accurate physiology.

Read our [SRRF-Stream+ technical note](#) to find out more on how you can convert your microscope to super-resolution capabilities.

## STORM, PALM & DNA PAINT

The high sensitivity, low noise and high-speed capabilities of Sona are well suited to single molecule based 'STORM / PALM' and DNA PAINT approaches, revealing biological information down to ~10 nm.

*"I was impressed  
by how easy it is to  
produce beautiful super-  
resolution images with  
SRRF-Stream+ and  
Sona."*

*Motosuke Tsutsumi*

*"SRRF" super-resolution image taken with the Sona back-illuminated sCMOS camera, Andor Insight Awards, courtesy of Motosuke Tsutsumi, Research Institute for Electronic Science, Hokkaido University and National Institutes for Physiological Sciences, Aichi, Japan.*

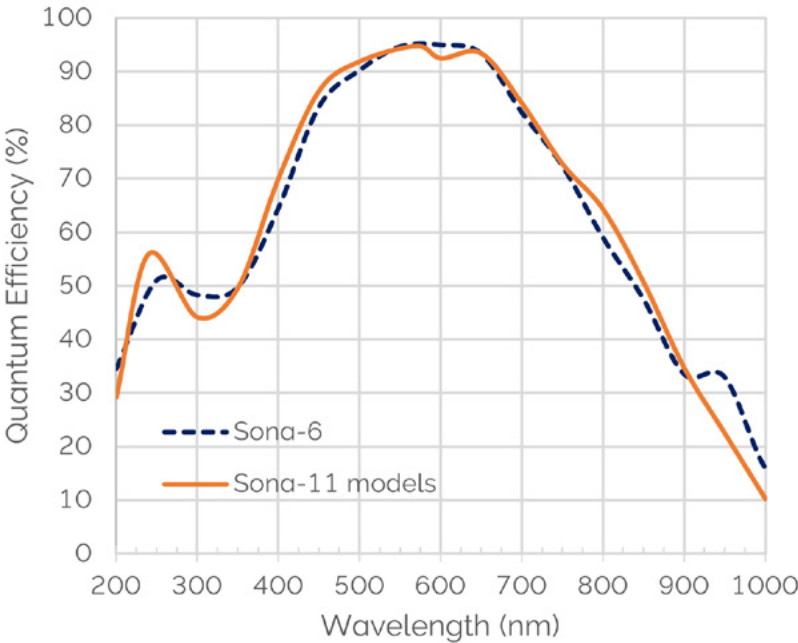


# Technical Data<sup>•2</sup>

Model	Sona-11 (32 mm)	Sona -11 (22 mm)	Sona-6 Extreme
Sensor Type	Back-Illuminated Scientific CMOS		
Array Size	2048 (W) x 2048 (H) 4.2 Megapixel	1400 (W) x 1400 (H) 2.0 Megapixel	2048 (W) x 2046 (H) 4.2 Megapixel
Pixel Size	11 x 11 µm		6.5 x 6.5 µm
Image Area	22.5 mm x 22.5 mm (31.9 mm diagonal)	15.5 mm x 15.5 mm (21.8 mm diagonal)	13.3 mm x 13.3 mm (18.8 mm diagonal)
Readout Modes	Rolling Shutter		
Pixel Readout Rates	100 MHz (High Dynamic Range, 16-bit) 200 MHz (Fast Speed, 12-bit)		180 MHz (Low Noise, 12-bit) 310 MHz (High Dynamic Range, 16-bit) 570 MHz (High Speed 11-bit)
Quantum Efficiency <sup>•3</sup>	up to 95%		
Read Noise (e <sup>-</sup> ) median	1.6 e <sup>-</sup> (at any readout rate)		1.0 e <sup>-</sup> (Low Noise, 12-bit) 1.6 e <sup>-</sup> (High Dynamic Range, 16-bit) 1.9 e <sup>-</sup> (High Speed, 11-bit)
Sensor operating temperature <sup>•4</sup> Air cooled Water/liquid cooled	+15°C, -25°C +15°C, -25°C, -45°C		+0°C, -25°C +0°C, -25°C, -45°C
Dark Current Air cooled (@-25°C) Water/liquid cooled (@-45°C)	0.7 e <sup>-</sup> /pixel/s 0.3 e <sup>-</sup> /pixel/s		0.15 e <sup>-</sup> /pixel/s 0.10 e <sup>-</sup> /pixel/s
Active area pixel well depth	85000 e <sup>-</sup> (High Dynamic Range, 16-bit) 2600 e <sup>-</sup> (Fast Speed, 12-bit, bit depth limited)		42000 e <sup>-</sup> (High Dynamic Range, 16-bit) 1100 e <sup>-</sup> (Low Noise, 12-bit, bit depth limited) 1900 e <sup>-</sup> (High Speed, 11-bit)
Dynamic Range	53000:1 (High Dynamic Range, 16-bit)		26250:1 (High Dynamic Range, 16-bit)
Data Range	16-bit (High Dynamic Range) 12-bit (Fast Speed)		16-bit (High Dynamic Range) 12-bit (Low Noise)
Linearity <sup>•5</sup>	> 99.7%		
PRNU	< 0.5% (@ half-light range)		< 0.3%
Region of Interest (ROI)	User-definable, 1 pixel granularity, min. size 25 (w) x 1 (h)		User-definable, 1 pixel granularity, min. size 9 (w) x 1 (h)
Pre-defined ROI	1608 x 1608, 1200 x 1200, 1024 x 1024, 512 x 512, 128 x 128	1024 x 1024, 512 x 512, 128 x 128	1608 x 1608, 1200 x 1200, 1024 x 1024, 512 x 512, 128 x 128
Pixel Binning (on FPGA)	2 x 2, 3 x 3, 4 x 4, 8 x 8 (user-definable binning also available)		

Model	Sona-11 (32 mm)	Sona -11 (22 mm)	Sona-6 Extreme
I/O	O: Fire Row 1, Fire Row n, Fire All, Fire Any, Arm, I: External		
Trigger Modes	Internal, External, External Start, External Exposure, Software		
Software Exposure Events <sup>•6</sup>	Start exposure - End exposure (row 1), Start exposure - End exposure (row n)		
Image Timestamp Accuracy	25 ns		
PC Interface	USB 3.0 <sup>•7</sup>		USB 3.0 <sup>•7</sup> and CoaXPRESS
Camera Window	AR coated UV grade fused silica window		
Lens Mount	F-mount	C-mount	

## Quantum Efficiency<sup>•3</sup>



Technical Data<sup>2</sup>

Frame Rates

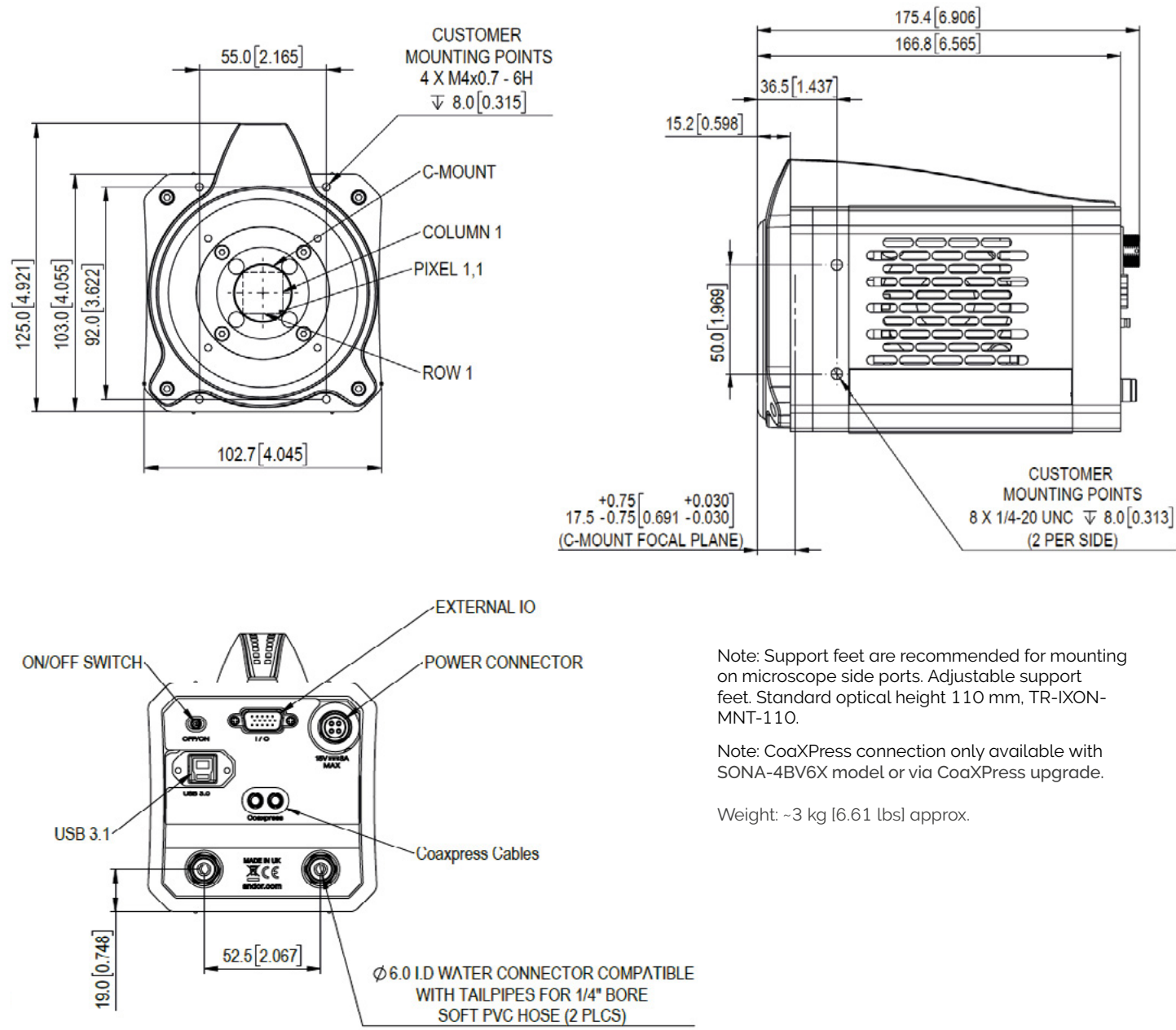
Max Frame Rate (fps)	Sona-11 (32 mm)		Sona -11 (22 mm)	
	16-bit	12-bit (Fast Speed)	16-bit	12-bit (Fast Speed)
ROI Size (W x H)				
2048 x 2048	24	48	-	-
1608 x 1608	30	61	-	-
1400 x 1400	35	70	35	70
1200 x 1200	41	81	41	81
1024 x 1024	48	95	48	95
512 x 512	95	190	95	190
256 x 256	190	378	190	378
128 x 128	378	750	378	750

Note: frame rates do not differ if partial or full rows are selected.

Sona-6 Extreme						
Max Frame Rate (fps)	Low Noise Mode 2-CMS (12-bit)		High Dynamic range Mode (16-bit)		High Speed Mode (11-bit)	
ROI Size (W x H)	USB	CXP	USB	CXP	USB	CXP
2048 x 2046	43	44	40	74	40	135
1024 x 1024	87	87	148	148	151	270
512 x 512	174	174	295	295	532	538
256 x 256	346	346	587	587	1046	1081
128 x 128	686	687	1165	1166	2032	2125

Mechanical Drawings

Dimensions in mm [inches]  
(shown for C-mount)



Note: Support feet are recommended for mounting on microscope side ports. Adjustable support feet. Standard optical height 110 mm, TR-IXON-MNT-110.

Note: CoaXPress connection only available with SONA-4BV6X model or via CoaXPress upgrade.


Weight: ~3 kg [6.61 lbs] approx.



# Creating the Optimum Product for you

Step 1.

Choose the camera type




Camera Type

Description	Code
Sona-11 (32 mm): 4.2 Megapixel Back-illuminated sCMOS, 11 µm pixel, 95% QE, 48 fps, USB 3.0, F-mount*, SRRF-Stream+ ready	SONA-4BV11
Sona -11 (22 mm): 2.0 Megapixel Back Illuminated sCMOS, 11 µm pixel, 95% QE, 70 fps, USB 3.0, C-mount, SRRF-Stream+ ready	SONA-2BV11
Sona-6 Extreme: 4.2 Megapixel Back Illuminated sCMOS, 6.5 µm pixel, 95% QE, 43 fps, USB 3.0, C-mount, SRRF-Stream+ ready	SONA-4BV6U
Sona-6 Extreme: 4.2 Megapixel Back Illuminated sCMOS, 6.5 µm pixel, 95% QE, 135 fps, USB 3.0 and CoaXPress, C-mount, SRRF-Stream+ ready	SONA-4BV6X

\* Optional user-switchable C-Mount accessory available for use with smaller ROI sizes.

Step 2.

Select the required accessories



Accessories

Description	Order Code
SRRF-Stream+ real time super-resolution for Sona-6* <sup>8</sup>	SRRF-STREAM-SONA-6
SRRF-Stream+ real time super-resolution functionality for Sona-11 (32 mm) or -11 (22 mm)* <sup>8</sup>	SRRF-STREAM-SONA-11
C-mount - convert Sona-11 (32 mm) to C-mount (for use with ROIs)	ACC-MEC-11936
F-mount - replacement F-mount kit	F-MOUNT-ADP-KIT
2x magnifying coupler unit for Sona-11 (32 mm) models for: Leica microscopes Nikon (TiE and Ti2) microscopes Olympus microscopes	MCU-SONA-LEI MCU-SONA-NIK-TI MCU-SONA-OLY
Support feet recommended for side port mounting. Standard optical height 110 mm	TR-IXON-MNT-110
Re-circulator for enhanced cooling performance (supplied with 2x2.5 m tubing as standard)	XW-RECR
Oasis 160 Ultra compact chiller unit (tubing to be ordered separately)	ACC-XW-CHIL-160
6 mm tubing options for Oasis 160 Ultra compact chiller (2x2.5 m or 2x5 m lengths)	ACC-6MM-TUBING-2X2.5 ACC-6MM-TUBING-2X5M
Pair of barbed hose inserts for 6 mm tubing	6MM-HOSE-BARBS

Step 3.

Select the required software



Software

Sona requires one of the following software options:


**Fusion** Fully featured yet intuitive acquisition software. Integrated workflow to Imaris.

**Solis Imaging** A 32-bit and fully 64-bit enabled application for Windows (8.1, 10 and 11) offering rich functionality for data acquisition and processing. AndorBasic provides macro language control of data acquisition, processing, display and export.

**Andor SDK3** A software development kit that allows you to control the Andor range of cameras from your own application. Available as 32/ 64-bit libraries for Windows (8.1, 10 and 11) and Linux. Compatible with C/C++, C#, Delphi, VB.NET, LabVIEW, MATLAB and Python..

**Third party software compatibility** Drivers are available for a variety of third party imaging packages. [See the Andor website for detail](#)

Upgrades



Upgrades

Order SRRF-Stream+ for Sona

Order codes for SRRF-Stream+ on your current Sona:

Sona-6:	SRRF UPGRADE SONA-6
Sona-11:	SRRF UPGRADE SONA-11

CoaXPress Upgrade

To upgrade USB 3.0 model to higher speed CoaXPress order **CHAM-UPG-CXP** code. Upgrade includes CoaXPress card, cables and remote session to upgrade camera firmware to unlock CoaXPress. Please contact your sales representative for more information.

# Order Today

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.oxinst.com/contact](http://andor.oxinst.com/contact)

Our regional headquarters are:

## Europe

Belfast, Northern Ireland  
Phone +44 (28) 9023 7126  
Fax +44 (28) 9031 0792

## North America

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

## Japan

Tokyo  
Phone +81 (3) 6744 4703  
Fax +81 (3) 3446 8320

## China

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



## Items shipped with your camera

- 1x USB 3.0 PCIe card\*
- 1x USB 3.0 Cable (3 m)\*
- 1x Multi I/O Timing Cable (BNC to D-type: 1.5 m)
- 1x 15 V PSU
- 1x Country specific power cord
- 1x User manuals in electronic format
- 1x Quickstart Guide
- 1x Individual system performance booklet
- Sona-6 with CoaXPress also includes:
- 1x CoaXPress 3.0 PCIe card with external trigger
- 1x CoaXPress Cable (3 m)
- 1x Multi I/O Timing Cable (BNC to SMB: 1.5 m)

## Minimum Computer Requirements:

- 3.0 GHz single core or 2.4 GHz dual or quad core processor
- 8 GB RAM
- Hard drive: 850 MB/sec write speed recommended for the data rate associated with the max. frame rates. 250 MB free hard disc to install software
- USB 3.0 slot (or x4 PCIe slot for USB 3.0 card)
- x8 PCIe slot for CXP PCIe card
- Windows (8.1, 10 and 11) or Linux

## Footnotes

1. Assembled in a state-of-the-art facility, Andor's UltraVac® vacuum process combines a permanent hermetic vacuum seal (no o-rings), with a stringent protocol and proprietary materials to minimise outgassing. Outgassing is the release of trapped gases that would otherwise degrade cooling performance and potentially cause sensor failure.
2. Figures are typical unless otherwise stated.
3. Quantum efficiency as supplied by the sensor manufacturer.
4. Coolant temperature must be above dew point.
5. Linearity is measured from a plot of Signal vs. Exposure Time over the full dynamic range.
6. Software Exposure Events provide rapid software notification (SDK only) of the start and end of acquisition.
7. The Sona connects to your control PC using a USB 3.0 connection. This may also be referred to as USB 3.1 (Gen 1). Andor provide a USB 3.0 card and cable, and recommend that these are used to ensure optimum performance.
8. Camera must be connected to suitable acquisition workstation with compatible Nvidia GPU card and supported software.

## Operating & Storage Conditions:

- Operating Temperature: 0°C to +30°C ambient
- Operating Altitude: up to 6000 m
- Relative Humidity: <70% (non-condensing)
- Storage Temperature: -10°C to 50°C

## Power Requirements:

- 100 - 240 VAC, 50 - 60 Hz
- Power consumption: 40 - 46 W typical / 114 W max (model dependent)



Windows is a registered trademark of Microsoft Corporation.  
LabVIEW is a registered trademark of National Instruments.  
MATLAB is a registered trademark of The MathWorks Inc.



# Andor Kymera 328i

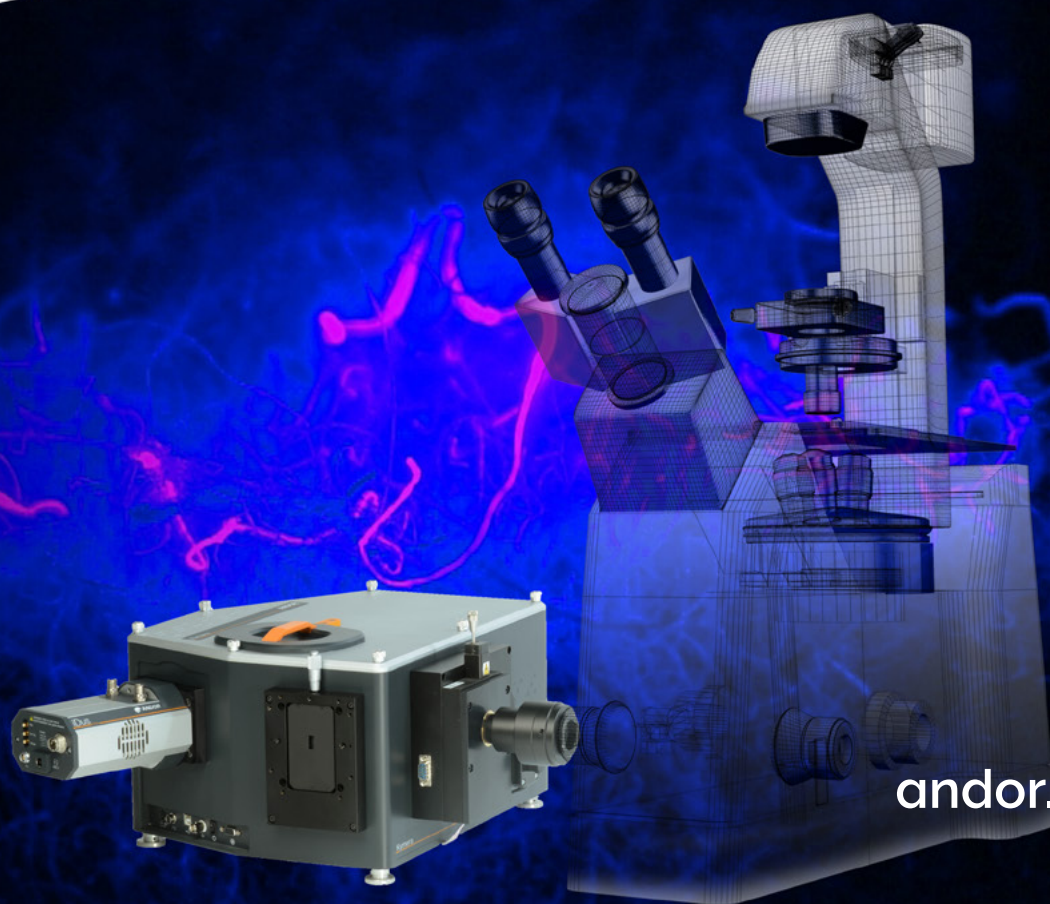
Intelligent and Multi-modal Spectrograph  
for Physical and Life Science

## Key Specifications

- ✓ 328 mm focal length
- ✓ F/4.1 aperture
- ✓ Adaptive Focus (Patented)
- ✓ Dual inputs and outputs
- ✓ Quad grating turret & eXpressID™
- ✓ TruRes™ technology
- ✓ Plug-and-Play USB interface

## Key Applications

- ✓ Raman & Luminescence/PL
- ✓ Absorption/Transmission
- ✓ SFG/SHG
- ✓ LIBS/OES
- ✓ Material Science
- ✓ Chemistry & Catalysis
- ✓ Life Science/Biomedical



[andor.oxinst.com](http://andor.oxinst.com)



## 1 Adaptive Focus\*

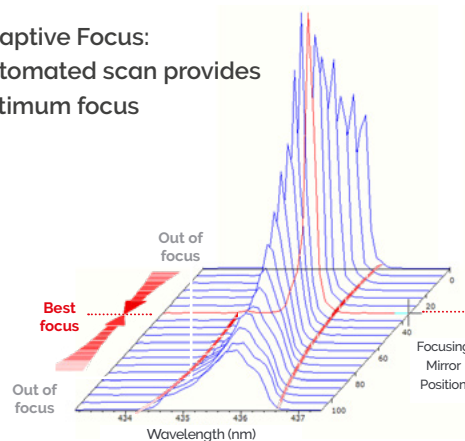


Automated optimization for the best quality of focus:

- Ensures the best resolution at any wavelength
- Automatic optimization when changing between gratings, or cameras
- Software-controlled, easy to switch on and off when required
- No need for tedious adjustment of camera position at the exit ports

\*Adaptive Focus Technology, patent WO2016012794 A3

Adaptive Focus:  
Automated scan provides  
optimum focus



## 2 TruRes™

True spectral resolution enhancement option

- **Better than 30% spectral resolution improvement** without the need to change grating or slit width
- Expands the range of spectral resolutions accessible on a single setup at the touch of a button
- Superior discrimination of complex spectral features from UV to SWIR
- No mathematical spectral deconvolution required

## 3 Quad Turret with RFID



Expand your system's flexibility

Combine up to 4 gratings for greater flexibility in one single setup:

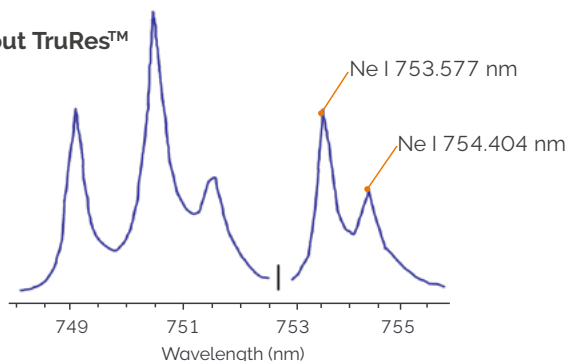
- Spectral resolution: Choice of high, medium or low options
- Blaze: Choice of UV, Visible, NIR or SWIR options
- Mirror for microspectroscopy



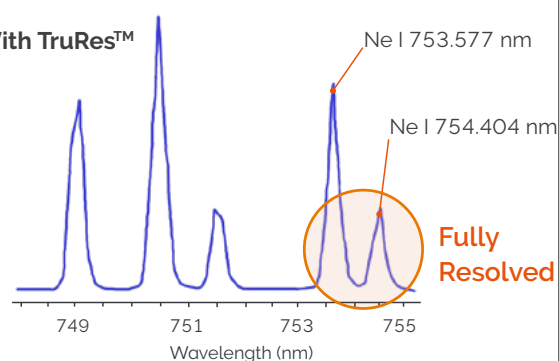
eXpressID™: RFID –based intelligence ensures automatic recognition and upload of all important turret parameters to the spectrograph.

TruRes™: Delivers enhanced spectral resolution

Without TruRes™



With TruRes™



Kymera 328i with 300 l/mm grating, iVac 316 with high resolution 15 µm pixels, full vertical binning.

## 4 Dual Input and Output Options



Convenient interfacing to complex experiments with multiple light paths, greatly minimizes switching time between setups.

Dual port setups include various combinations of:

- CCD cameras for UV, Vis and NIR spectroscopy
- ICCD cameras for time-resolved measurements from UV to NIR
- Exit slits for monochromator tuneable light source
- Fibre coupling at exit port to deliver output light/signal to another part of experiment



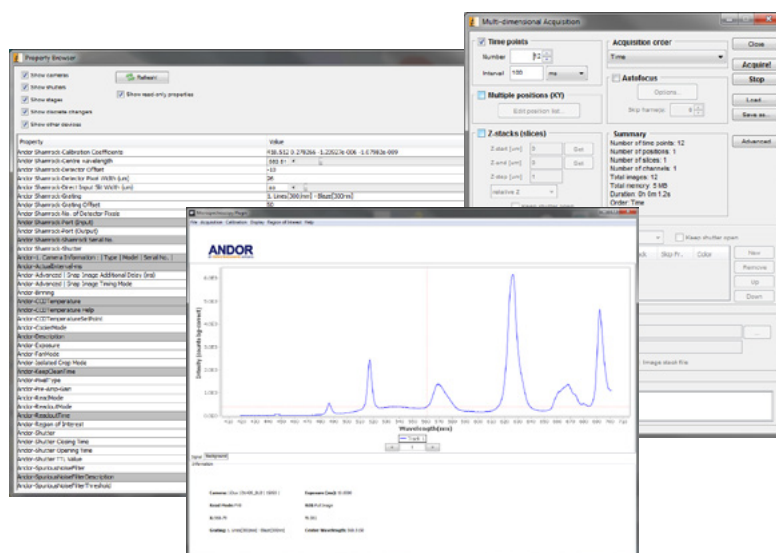
# Features and Benefits

Feature	Benefit
328 mm focal length, F/4.1 aperture	Ideal combination for a wide range of applications ranging from luminescence/ photoluminescence spectroscopy to more demanding, higher resolution Raman spectroscopy or plasma studies.
Adaptive Focus (patented)	Intelligent and user-friendly interface for uncompromised spectral resolution performance.
TruRes™	Intuitive, rapid and fully user-controlled option for greater than 30% true spectral resolution enhancement at the touch of a button. Enhance the discrimination power of your spectrograph without tedious grating or grating turret change.
Quad-grating turret with eXpressID™ RFID technology	Seamless field-upgradability with precise indexing interface and user-friendly hatch access. Automatic gratings recognition with embedded RFID tags - minimum user interaction. Maximum resolution and band-pass flexibility.
Astigmatism-corrected optical design	Toroidal optics enable multi-track fiber detection and excellent sample image relay from a microscope at the grating 'O' order.
Robust on-axis wavelength drive	High accuracy direct-drive delivers superb single-grating and grating-to-grating center wavelength repeatability down to 4 and 10 pm respectively.
Dual outputs	Extended wavelength coverage when combining Andor UV-NIR CCD, EMCCD, ICCD and InGaAs cameras. Slit option for monochromator operation.
Dual input ports	Great setup flexibility for complex, multi-samples or multi-light path experiments based on spectroscopy modalities combining for example Raman, Fluorescence, Optical Emission Spectroscopy (OES), Absorption or Second Harmonic Generation (SHG).
USB interface	Plug-and-play connectivity, ideal for laptop operation alongside Andor USB cameras.
Seamless connection to microscopes	Adjustable height feet and choice of direct, lens relay, or cage system-based interfaces. 15 mm wide-aperture input slit for extended sample image relay and spectral analysis through the same optical path.
Protected silver-coated optics option	Most efficient for NIR/SWIR detection when used in conjunction with Andor InGaAs cameras.
Pre-aligned, pre-calibrated instrument	Individually characterized spectrograph-detector systems for out-of-the box operation.
High repetition rate shutter	10 Hz continuous operation and 40 Hz burst mode for ultrafast acquisition.
μ-Manager software integration	Simultaneous control of Andor cameras, spectrographs and a wide range of microscopes and accessories through 1 single software platform. Dedicated, user-friendly spectrum handling interface.
Integrated in EPICS •20	Integration and operation at EPICS-based large research facilities.

## μ-Manager and Microspectroscopy







User-friendly simultaneous access to Andor Kymera spectrographs, low-light spectroscopy cameras and a wide range of microscopes and microscope accessories.

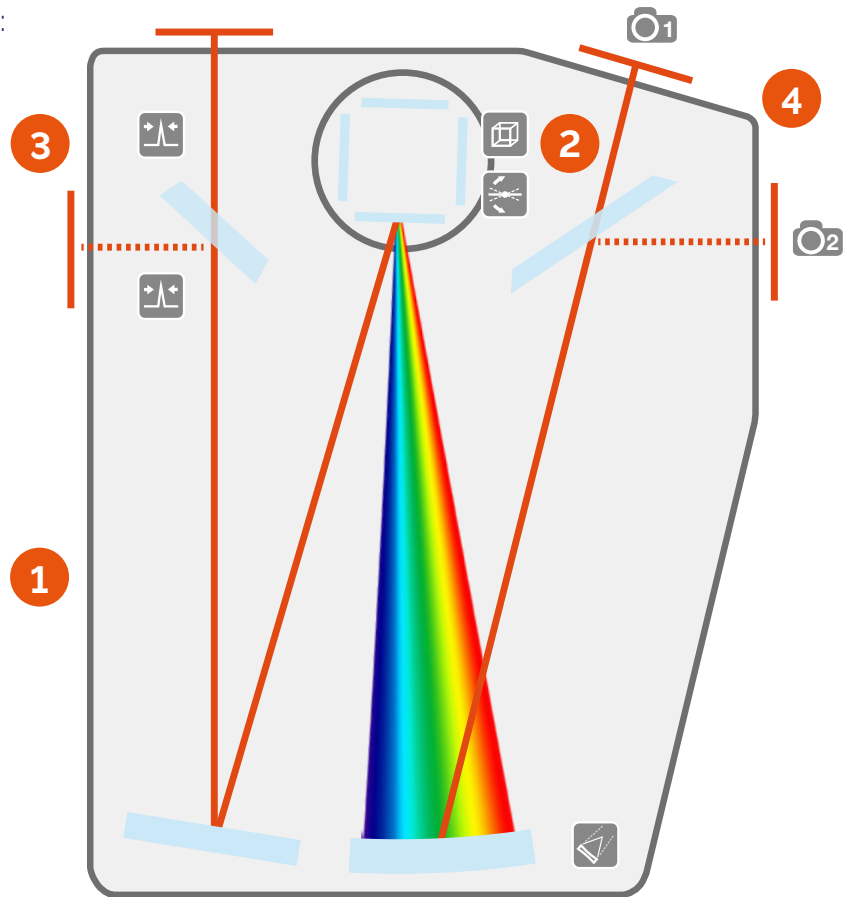
Andor's dedicated interface allows seamless spectral acquisition, display and manipulation, as well as facilitating 'spectral' mapping sequences with advanced metadata handling.



# Step-by-Step System Configuration

How to customise the Kymera 328i:

-  Resolution Boost
-  Quad Turret
-  On-axis Rotation
-  Auto Focus
-  Detector 1
-  Detector 2



## 1 Chassis configuration

- a) Select combination of input and output ports (see page 5 for available options).
- b) Select type of optics coating required (aluminium +  $\text{MgF}_2$  is standard, protected silver-coated optics available on request for NIR detection).
- c) Select purge port option (for improved detection down to 180 nm). Shutter for background acquisition and protection of the detector.

## 2 Resolution & band-pass

Select gratings and detector to fulfil resolution and wavelength requirements.

## 3 Input light coupling interface

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

## 4 2<sup>nd</sup> 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 the appropriate section for further information.

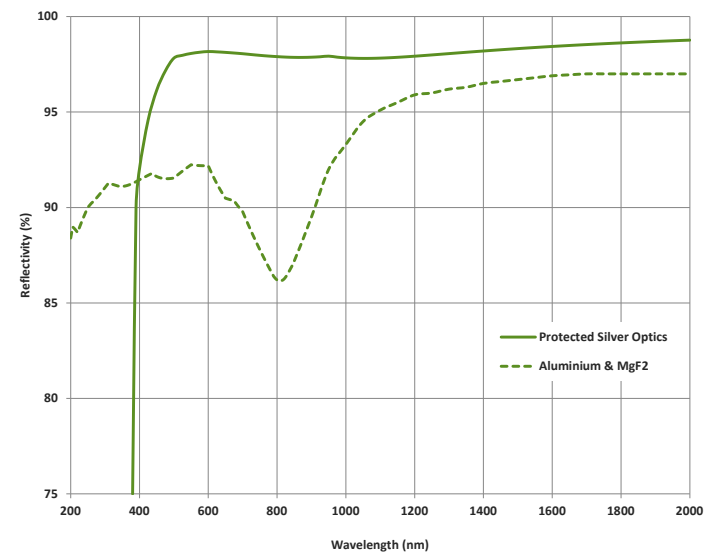


# Step 1 - Chassis Configuration

## Ordering Information

Model	Side input port	Direct input port	Direct output port	Side output port	Motorized port selection
KYMER-A-328i-A	Manual slit	-	Camera	-	-
KYMER-A-328i-B1	Manual slit	-	Camera	Manual slit	✓
KYMER-A-328i-B2	Manual slit	-	Camera	Camera	✓
KYMER-A-328i-C	Manual slit	Manual slit	Camera	-	✓
KYMER-A-328i-D1	Manual slit	Manual slit	Camera	Manual slit	✓
KYMER-A-328i-D2	Manual slit	Manual slit	Camera	Camera	✓
KYMER-A-328i-xx-SIL	Protected silver-coated optics options for models shown above (replace x with relevant model number)				

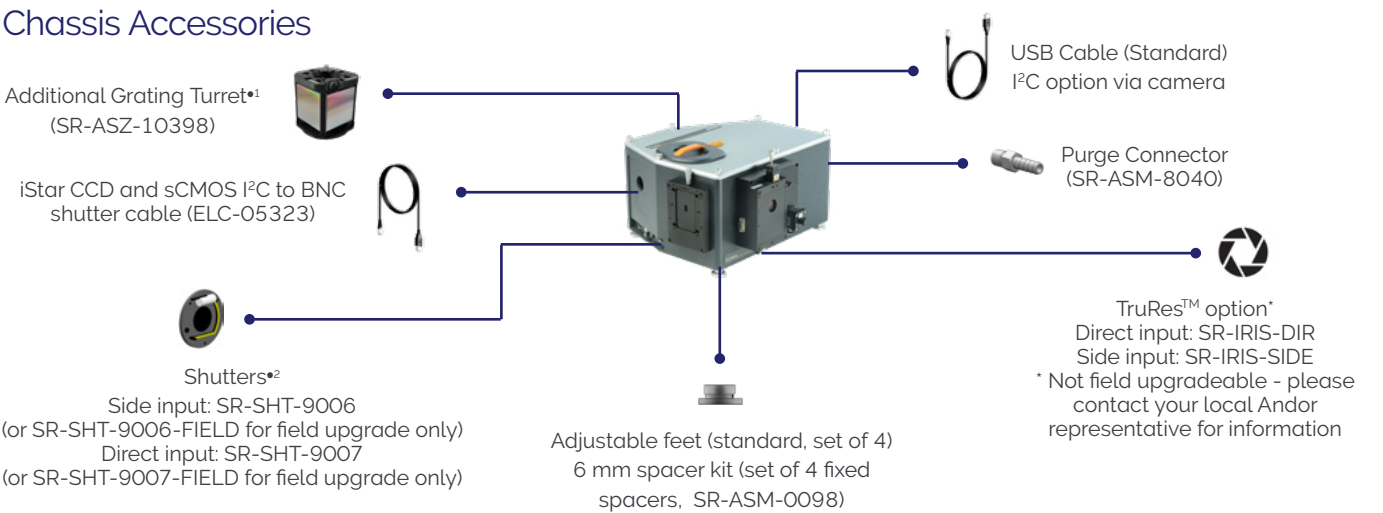
## Optical Coatings Reflectivity Graph



Standard systems use Al + MgF<sub>2</sub> coated optics. Protected silver optics are also available on request for maximum efficiency in the NIR region - recommended for working with Andor iDus InGaAs detectors or IR single-point detectors, such as MCT, PbS and InSb.

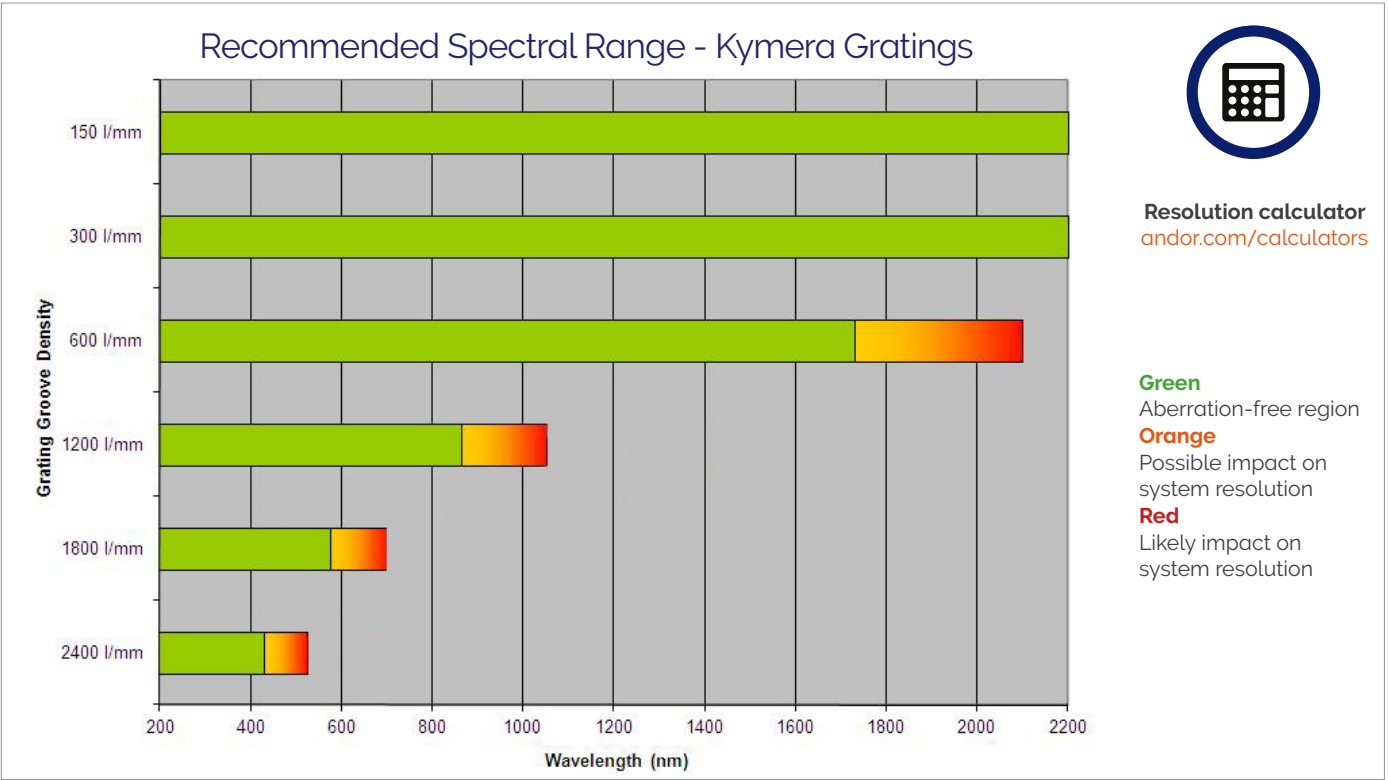
When choosing protected silver coatings, it is strongly recommended to also order **protected silver-coated gratings** for maximum efficiency throughout the system.

## Chassis Accessories



Nominal optical height	Optical height adjustment range	Adjustable feet set
142.6 mm	142.6 – 148.6 mm (standard feet)	SR-ASM-0098: 6 mm spacer set

# Step 2a - Choosing The Right Platform vs Dispersion Requirements



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)						
	150	300	600	1200	1800 (Holo)	2400 (Holo)

## Kymera 193i

Bandpass (nm) <sup>•3,•5</sup>	902	445	215	98	56	46 <sup>•6</sup>
Resolution (nm) <sup>•4,•5</sup>	1.96	0.96	0.47	0.21	0.12	0.10 <sup>•6</sup>

## Kymera 328i

Bandpass (nm) <sup>•3,•5</sup>	542	268	131	61	41	29 <sup>•6</sup>
Resolution (nm) <sup>•4,•5</sup>	0.88→0.62	0.44→0.31	0.21→0.15	0.10→0.07	0.06→0.04	0.05→0.04 <sup>•6</sup>

## Shamrock 500i

Bandpass (nm) <sup>•3,•5</sup>	357	177	86	40	26	19 <sup>•6</sup>
Resolution (nm) <sup>•4,•5</sup>	0.52	0.26	0.13	0.06	0.04	0.03 <sup>•6</sup>

## Shamrock 750

Bandpass (nm) <sup>•3,•5</sup>	242	120	59	28	18	14 <sup>•6</sup>
Resolution (nm) <sup>•4,•5</sup>	0.35	0.18	0.09	0.04	0.03	0.02 <sup>•6</sup>

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 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 Kymera 328i features an on-axis, quadruple grating turret, designed to offer flexibility and control over your choice and interchange of gratings. The 'Quad' grating turret can be easily and speedily removed, and replaced by an alternative turret with new gratings. The intelligent design of the 328i with xPressID™ RFID technology, means that only a simple offset adjustment is required once the new turret and gratings are added. The 328i 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 four 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-ASZ-10398) can also be supplied on request.

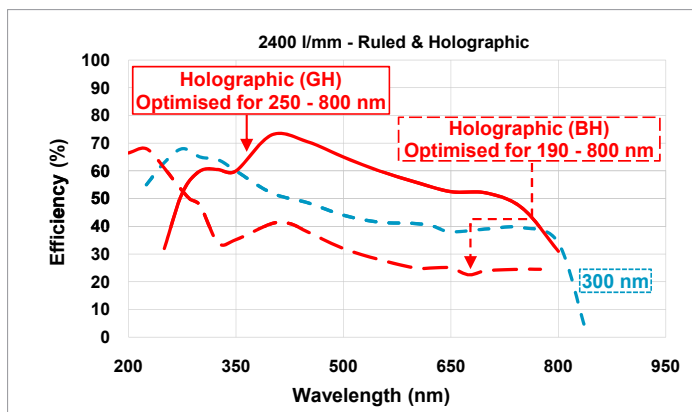
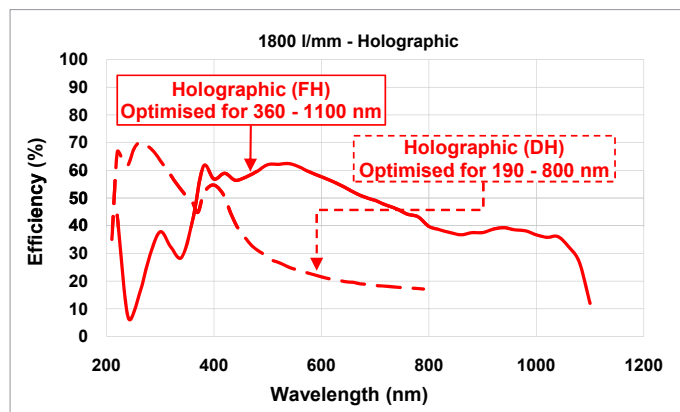
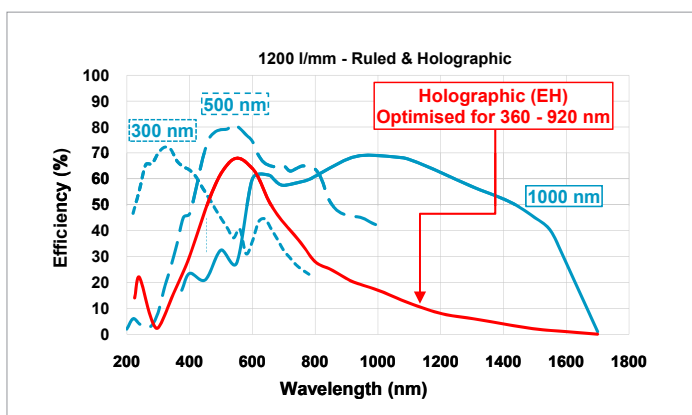
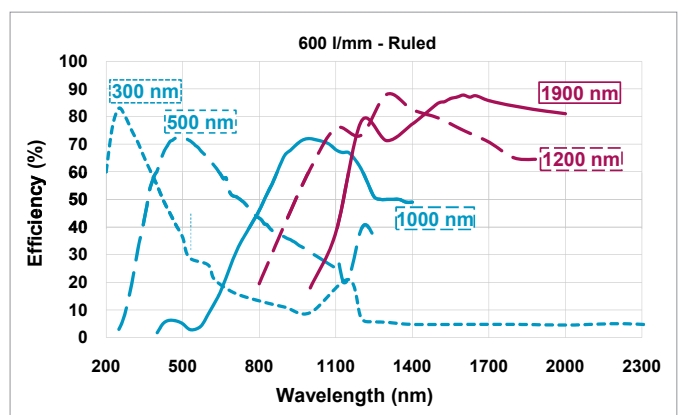
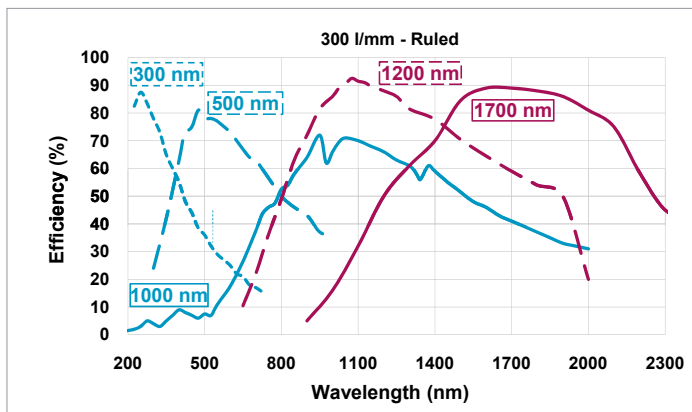
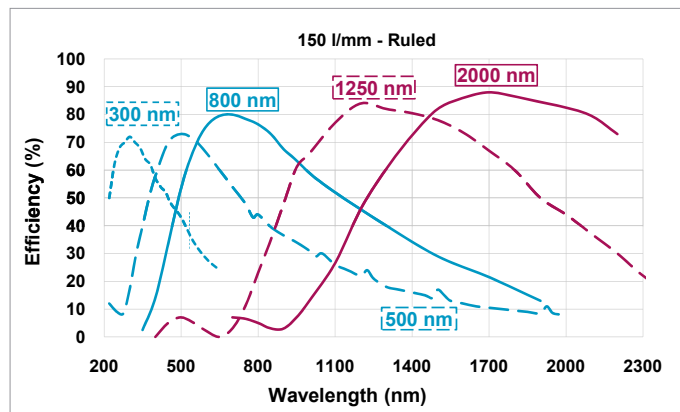


Lines/mm	Blaze (nm)	Nominal dispersion (nm/mm)*7	Bandpass (nm)*3,•7	Resolution (nm)*4,•7,•10	Peak efficiency (%)	Andor part number	Maximum recommended wavelength [nm] •5
150	300	19.70	545	0.89→0.62	72	SR-GRT-0150-0300	6820
150	500	19.60	542	0.88→0.62	73	SR-GRT-0150-0500	
150	800	19.50	539	0.88→0.62	80	SR-GRT-0150-0800	
150	1250	19.30	534	0.87→0.61	84	SR-GRT-0150-1250	
150	2000	18.90	523	0.85→0.60	88	SR-GRT-0150-2000	
300	300	9.80	271	0.44→0.31	88	SR-GRT-0300-0300	3410
300	500	9.71	268	0.44→0.31	81	SR-GRT-0300-0500	
300	1000	9.46	262	0.43→0.30	72	SR-GRT-0300-1000	
300	1200	9.34	258	0.42→0.29	92	SR-GRT-0300-1200	
300	1700	9.00	249	0.41→0.29	89	SR-GRT-0300-1700	
600	300	4.83	134	0.22→0.15	84	SR-GRT-0600-0300	1705
600	500	4.73	131	0.21→0.15	72	SR-GRT-0600-0500	
600	1000	4.38	121	0.20→0.14	72	SR-GRT-0600-1000	
600	1200	4.20	116	0.19→0.13	88	SR-GRT-0600-1200	
600	1900 (@1600)*8	3.39 3.78	94 105	0.15→0.11 •9 0.17→0.12	88	SR-GRT-0600-1900	
830	820	3.08	85	0.14→0.10	87	SR-GRT-0830-0820	1230
830	1200	2.68	74	0.12→0.08	83	SR-GRT-0830-1200	
1200	300	2.33	64	0.10→0.07	72	SR-GRT-1200-0300	850
1200	500	2.19	61	0.10→0.07	81	SR-GRT-1200-0500	
1200	1000 (@ 800)*8	1.62 1.89	45 52	0.07→0.05 •9 0.09→0.06	69 69	SR-GRT-1200-1000	
1200	Holographic (500 nm peak)	2.19	61	0.10→0.07	81	SR-GRT-1200-EH*	
1800	Holographic (250 nm peak)	1.30	36	0.06→0.04	70	SR-GRT-1800-DH	
1800	Holographic (380 nm peak)	1.52	42	0.07→0.05	62	SR-GRT-1800-FH	
2400	300	1.05	29	0.05→0.04	68	SR-GRT-2400-0300	425
2400	Holographic (220 nm peak)	1.12	31	0.05→0.04	68	SR-GRT-2400-BH	
2400	Holographic (400 nm peak)	0.95	26	0.04→0.03	73	SR-GRT-2400-GH	
Mirror	UV-VIS	-	-	-	-	SR-GRT-MR-AL+MGF2	-
Mirror	VIS-NIR	-	-	-	-	SR-GRT-MR-SILVER	

\*Option for minimized scattered light.

## 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.

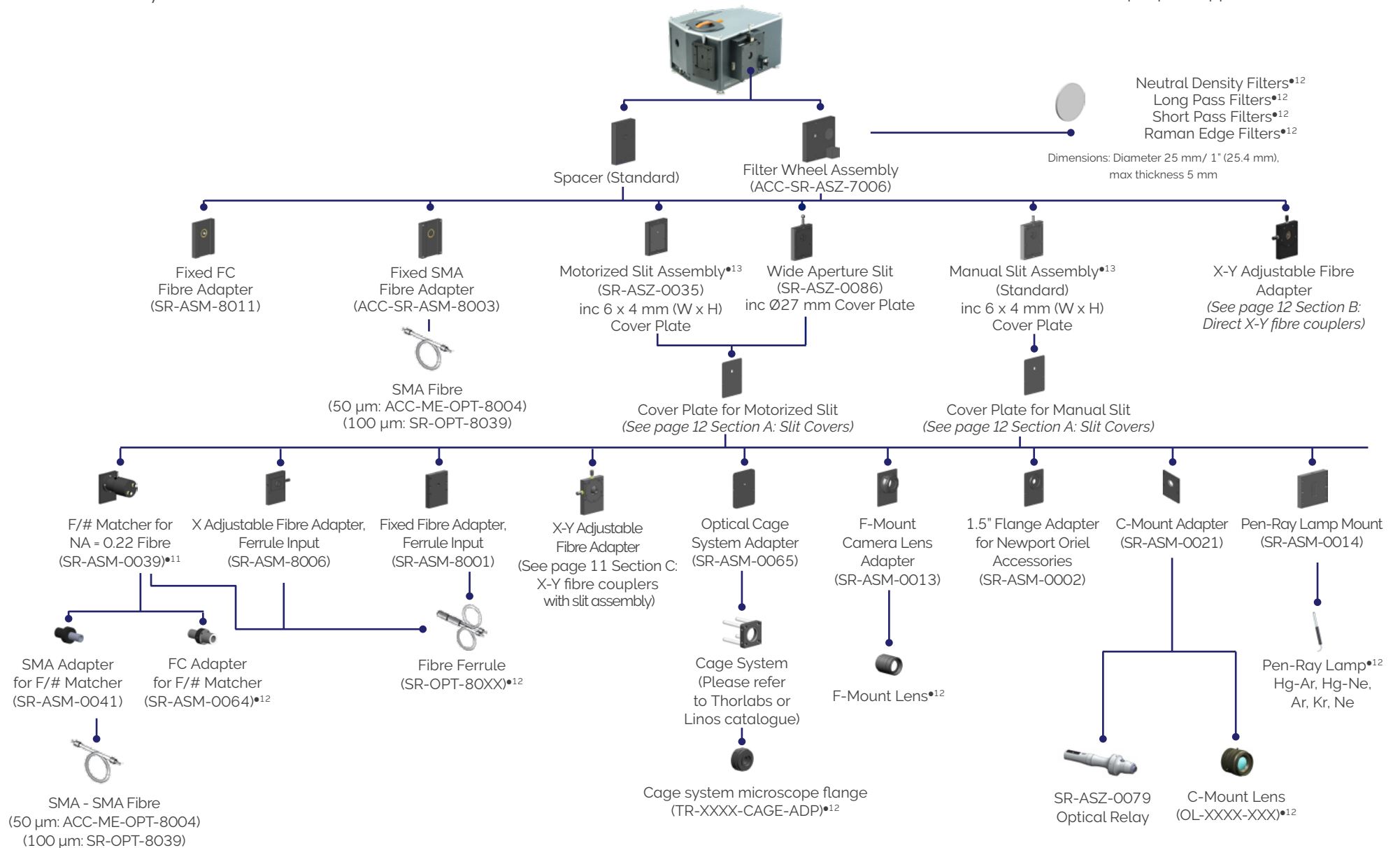
**Need to have maximum collection efficiency in the NIR/SWIR?** All gratings are also available with protected silver coating. Please contact your local representative for further information.



## Step 3 - Selecting The Correct Light Coupling Interfaces

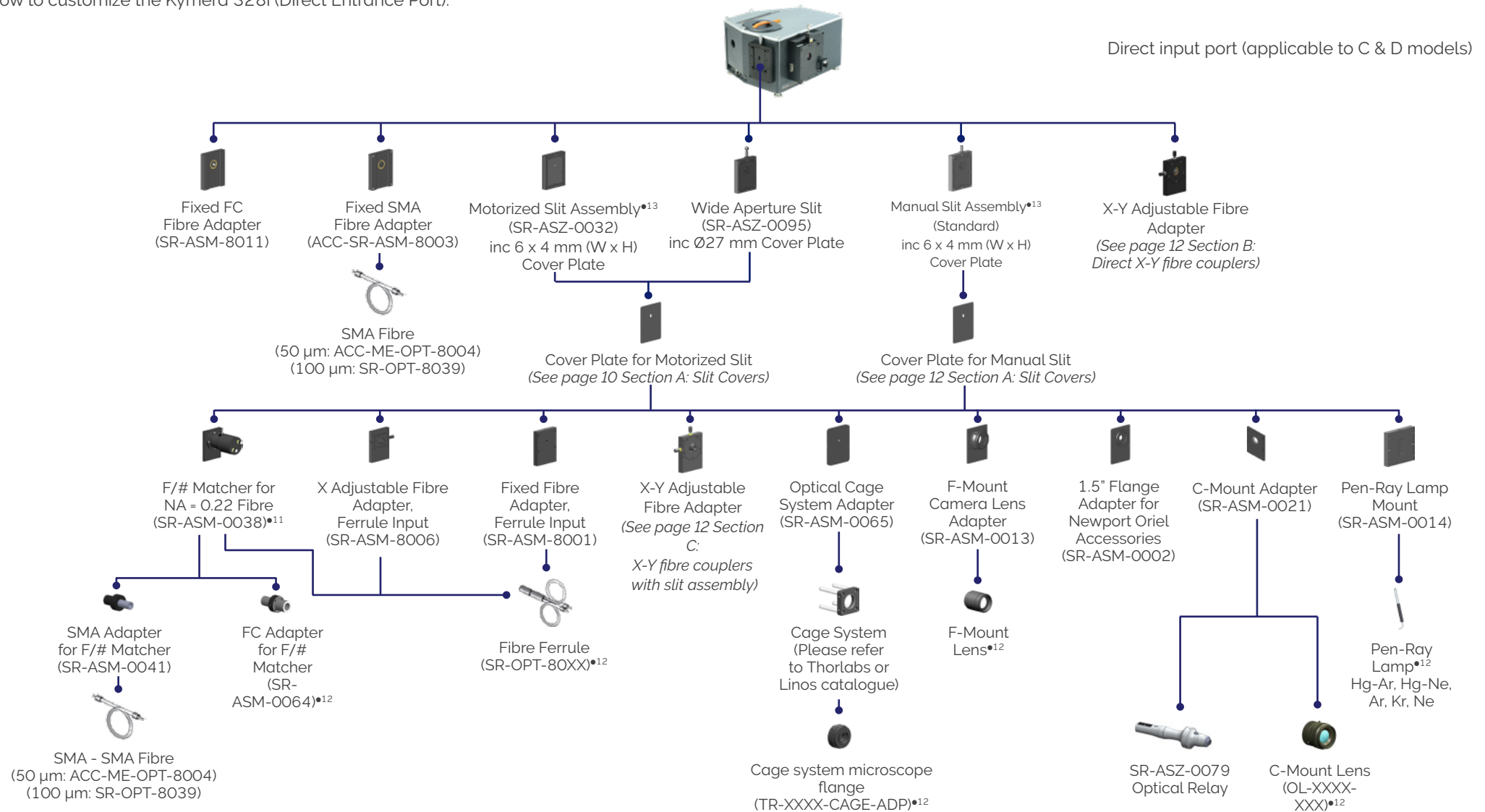
How to customize the Kymera 328i (Side Entrance Port):

Side input port (applicable to all models)



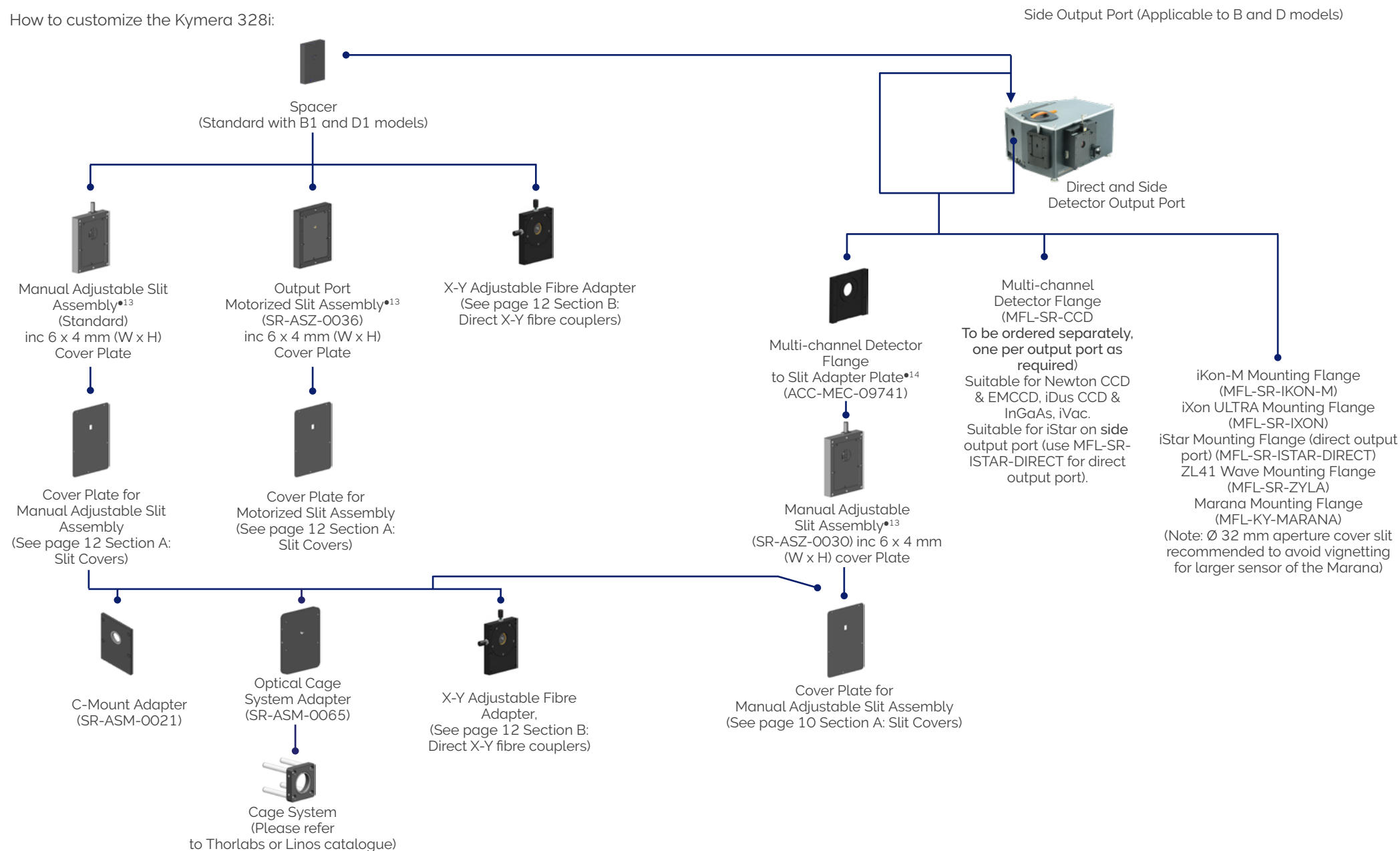
## Step 3 - Selecting The Correct Light Coupling Interfaces

How to customize the Kymera 328i (Direct Entrance Port):



## Step 4 - Cameras and Output Port Flanges

How to customize the Kymera 328i:



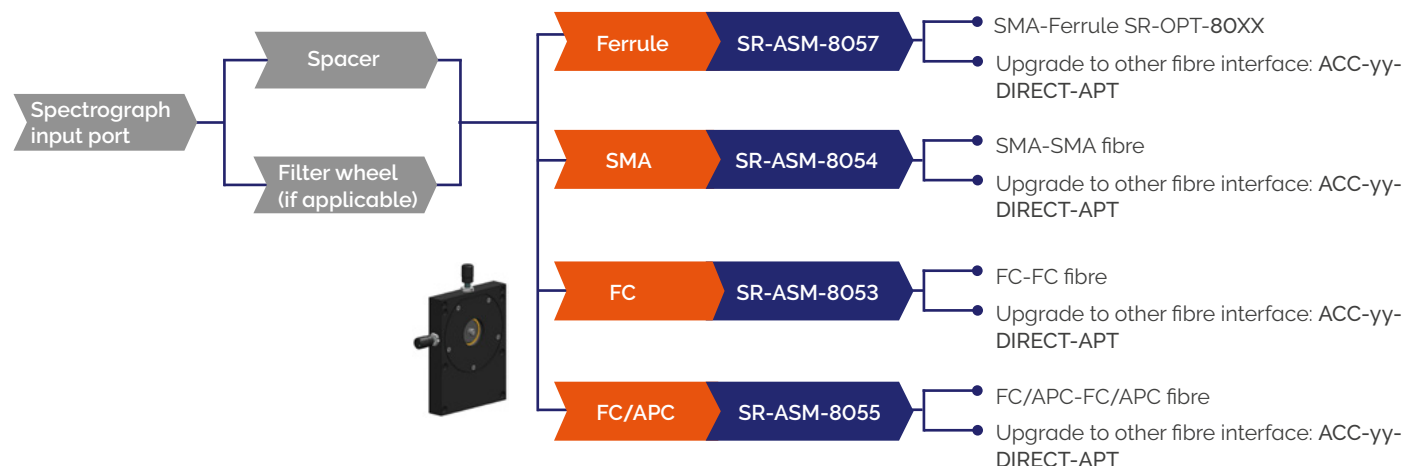
**Note: a flange MUST be ordered separately for any configuration involving a multichannel or InGaAs detector.**



## Step 4A: Slit Covers

Size	Motorised Slit	Manual Slit
6 x 4 mm (W x H)	SR-ASM-0016 <sup>•14</sup>	SR-ASM-0025
6 x 6 mm (W x H)	SR-ASM-0017	SR-ASM-0026
6 x 8 mm (W x H)	SR-ASM-0010	SR-ASM-0027
6 x 14 mm (W x H)	SR-ASM-0011	SR-ASM-0029 <sup>•14</sup>
Ø 27 mm	SR-ASM-0072 <sup>•15</sup>	SR-ASM-0100 <sup>•15</sup>
(Ø 32 mm aperture)	SR-ASM-0107	SR-ASM-0106

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



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

## 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)

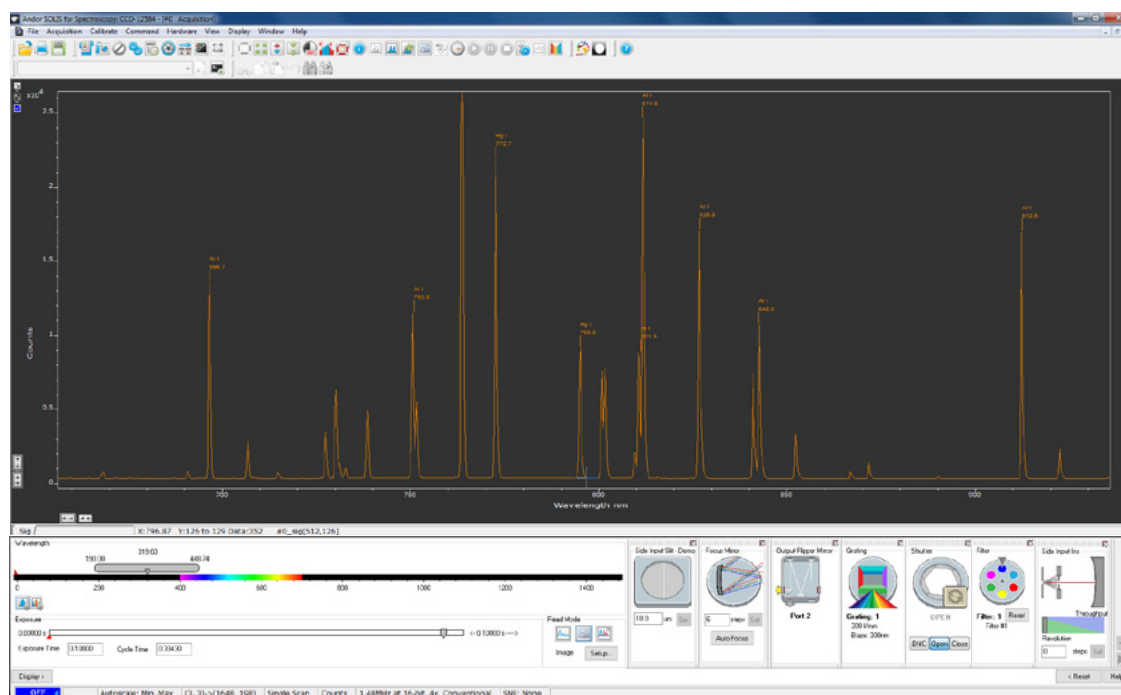
Where zz = SMA, FC or FERRULE, option not available

## Step 5 - Selecting A Software Option

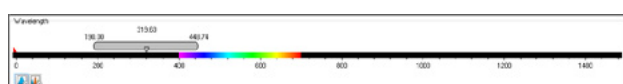
The Kymera 328i requires at least one of the following software options:

- 1 - **Solis Spectroscopy** A 32-bit and fully 64-bit enabled application for Windows (8, 8.1, 10 and 11) 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 - **Kymera and 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 and 64-bit libraries for Windows (8, 8.1, 10 and 11). Compatible with C/C++, C#, VB.NET and LabVIEW for Windows/Linux.

## Solis Spectroscopy: Dedicated spectroscopy acquisition software



### Wavelength selection and step-and-glue



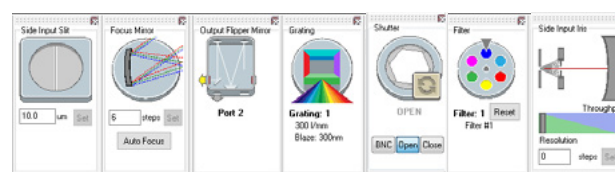
Set the wavelength of interest by dragging slider or typing the desired value. For step-and-glue, select wavelength range for extended bandpass and high resolution acquisition.

### Exposure time



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

### Real Time Control

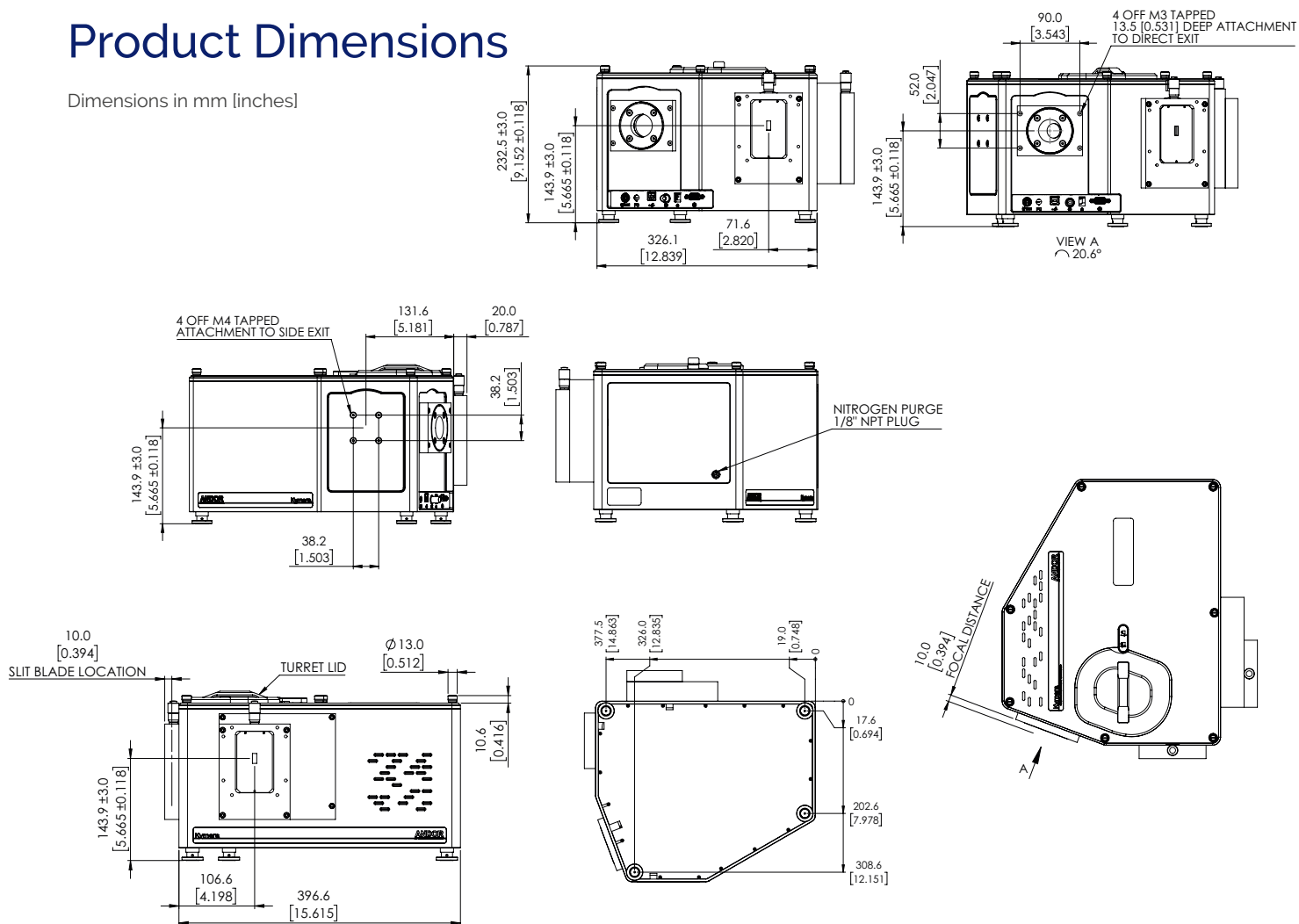


(a) (b) (c) (d) (e) (f) (g)

- (a) Slit drive: Control the spectrograph slit width - drag blades on icon or type in required slit width
- (b) Adaptive focus: Used for automatic fine focus optimization
- (c) Turning mirror: Used to select the appropriate exit port
- (d) 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
- (e) Shutter: Synchronization mode selection for shutter operation
- (f) Filter wheel: Used to select a particular filter on the filter wheel - just click on the desired filter position
- (g) TruRes™: Used for spectral resolution enhancement - simply type in the setting that is best suited to the resolution target.

# Product Dimensions

Dimensions in mm [inches]



Standard configuration shown with manual slit on input, CCD flange on straight output.

Weight: 18 kg [39.7 lbs] approx

### Optical Axis

Standard feet: Nominal optical axis height: 143.9 mm +/- 3.0 mm, increments of 6 mm with stackable spacer kit (SR-ASM-0098).

Connecting to the Kymera 328i

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

**I<sup>2</sup>C Connector**  
For connection to camera/detector via I<sup>2</sup>C connection (replaces USB cable connection to spectrograph).

**Shutter Control**  
Connector type: BNC Female, 50 Ω

## Shutter Specifications

Maximum repetition rate	40 Hz - burst; 10 Hz - sustained
Minimum open/close time	6 ms
Minimum lifetime	1 Million cycles

## Optical Property

Focal plane size (mm, W x H)	30 x 14
Grating size (mm)	68 x 68
Stray light • <sup>16</sup>	
1 nm from laser	3.8 x 10 <sup>-4</sup>
10 nm from laser	4.7 x 10 <sup>-5</sup>
20 nm from laser	8.9 x 10 <sup>-6</sup>
Magnification	1.1:1

## Wavelength Drive Performance

Wavelength accuracy center • <sup>17</sup>	0.04 nm
Wavelength repeatability • <sup>18</sup>	
Single grating	4 pm
Grating-to-grating	10 pm

## Wavelength Side Accuracy

Wavelength side accuracy • <sup>19</sup>	0.2 nm
--	--------

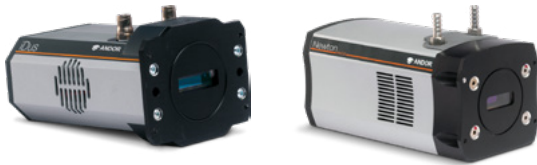


# Our Cameras for Spectroscopy

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

iDus CCD & InGaAs | Newton CCD & EM

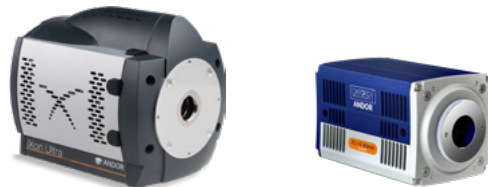
## ns to $\mu$ s Time-Resolution



- ✓ Nanosecond gating
- ✓ High sensitivity down to single photon
- ✓ On-head DDG with ps accuracy

iStar CCD & sCMOS

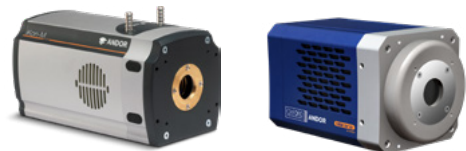
## kHz Spectral Rates



- ✓  $\mu$ s to ms time-resolution
- ✓ High sensitivity down to single photon
- ✓ High resolution matrix

Newton CCD & EMCCD | iXon EMCCD |  
ZL41 Wave sCMOS | Marana sCMOS

## Extended Multi-fibre Spectroscopy



- ✓ Large area sensors
- ✓ Ultrafast sCMOS and EMCCD options
- ✓ High sensitivity down to single photon

iKon-M CCD | iXon EMCCD | ZL41 Wave sCMOS  
| Marana sCMOS | iStar CCD & sCMOS

Learn more about our detector range [here](#).

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Fax +1 (860) 290 9566

## China

Beijing | Shanghai | Guangzhou  
Phone +86 (400) 678 0609  
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. Shutter operation can be achieved directly through the I2C interface between cameras and spectrograph, or through a BNC-to-SMB cable when the spectrograph is operated through USB.
3. Typical values quoted with 27.6 mm wide CCD, e.g. Newton DU940.
4. Typical values quoted with 10  $\mu$ m slit and 13.5  $\mu$ m pixel CCD, e.g. Newton DU940. Illustrates resolutions achievable with iris opening range (optional).
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. Useful signal is assumed to be imaged on the entire height of a 6.9 mm sensor (i.e. Newton DU940) 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  $\mu$ m to 2.5 mm.
14. Provided as standard.
15. Recommended for use with fibre-optics and C-mount accessories.
16. 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.
17. Average measurements using > 30 calibration lines, covering the recommended grating angle operating range with a 1200 l/mm grating.
18. The standard deviation of 20 measurements of a peak's centre-of-mass position: - each measurement is taken after switching back and forth between a given centre wavelength and a lower or higher centre wavelength (single grating) or between two gratings set at the same centre wavelength (grating-to-grating).
19. Side accuracy measured using a 27.6 mm wide sensor, reflecting the dispersion calibration and step-and-glue accuracy.
20. Only Andor CCD platforms (e.g. 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 (10 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 (+24V, 5A) with 3 m mains cable
- 1x I<sup>2</sup>C to I<sup>2</sup>C cable
- 1x Andor user guides in electronic format
- 1x Individual system performance booklet
- 1x Solis software or SDK in electronic format (if requested at time of order)
- 1x hex key set (2 mm, 3 mm and 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, and Machinery Directive 2006/42/EC.

### 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 (8.1, 10 and 11)



pManager



Windows is a registered trademark of Microsoft Corporation.  
LabVIEW is a registered trademark of National Instruments.  
MATLAB is a registered trademark of The MathWorks Inc.



# Andor Newton EMCCD

## Market Leading Platform for Ultra-Sensitive & Ultrafast Spectroscopy

### Key Specifications

- ✓ < 1 e- readout noise
- ✓ Peak QE up to 95%
- ✓ TE cooling down to -100°C
- ✓ Ultravac™ technology
- ✓ 16 µm pixel size
- ✓ 1600 x 200 or 400 pixel matrix
- ✓ Up to 1,515 spectra per second

### Key Applications

- ✓ Raman
- ✓ Fluorescence/Luminescence/Photoluminescence
- ✓ Absorption/Transmission/Reflection
- ✓ Non-linear spectroscopy (SFG/SHG)
- ✓ Single Molecule Spectroscopy
- ✓ Chemical mapping



Available with  
**Anti-fringing**  
Back-Illuminated  
Technology



# Introducing Newton EMCCD

## Market Leading Platform for Ultra-Sensitive and Ultrafast Spectroscopy



EM technology enables charge from each pixel to be multiplied on the sensor before readout, providing single photon sensitivity. The Newton EM platform combines a 1600 x 200 (or 1600 x 400) array of 16  $\mu\text{m}$  pixels, thermoelectric cooling down to  $-100^{\circ}\text{C}$  for negligible dark current, 3 MHz readout and USB 2.0 plug-and-play connectivity to provide unrivalled performance for spectroscopic applications. The dual output amplifiers allow software selection between either a conventional CCD or Electron Multiplying outputs to suit a broad range of photon regime conditions. This makes the Newton EMCCD the ideal choice for ultrafast chemical mapping applications e.g. SERS, TERS or luminescence mapping.

## Features & Benefits

Feature	Benefit
EM sensor technology	< 1 e <sup>-</sup> read noise
Fringe suppression technology as standard (970-BVF only)	Fringing minimized for NIR applications
Multi-Megahertz Readout	High repetition rates achievable with low noise electronics
Crop Mode	Up to 1,515 spectra per second rates
TE cooling to $-100^{\circ}\text{C}$	Negligible dark current without the inconvenience of $\text{LN}_2$
UltraVac™	Critical for sustained vacuum integrity and to maintain unequalled cooling and QE performance, year after year
16 x 16 $\mu\text{m}$ pixel size	Optimized pixel size for high resolution spectroscopy
Dual output amplifiers	Software-selectable between conventional CCD output (low light) or an Electron Multiplying output (ultra-low light) – two cameras in one for best broad photon fluxes coverage
USB 2.0 connection	Ideal for laptop operation Seamless operation alongside USB-based Shamrock spectrograph family
Solis software for Spectroscopy	Comprehensive, user-friendly interface for simultaneous detector & spectrograph control
Software Development Kit (SDK)	Ease of control integration into complex setups: Matlab, Labview, Visual Basic or C/C++

## Key Specifications <sup>•1</sup>

Model number	DU970P	DU971P
Sensor options	<ul style="list-style-type: none"> <li>BVF: Back Illuminated CCD, Vis-optimized and anti-fringing</li> <li>FI: Front Illuminated CCD</li> <li>UVB: Back Illuminated CCD with UV coating</li> </ul>	<ul style="list-style-type: none"> <li>BV: Back Illuminated CCD, Vis-optimized</li> <li>FI: Front Illuminated CCD</li> <li>UVB: Back Illuminated CCD with UV coating</li> </ul>
Active pixels <sup>•2</sup>	1600 x 200	1600 x 400
Pixel size	16 x 16 $\mu\text{m}$	
Image area	25.6 x 3.2 mm with 100% fill factor	25.6 x 6.4 mm with 100% fill factor
Minimum temperatures <sup>•3</sup> Air cooled Coolant recirculator Coolant chiller, coolant @ 10°C, 0.75L/min	-80°C -95°C -100°C	
Max spectra per second <sup>•4</sup>	649 (Full Vertical Bin), 1,515 (Crop Mode - 20 rows)	396 (Full Vertical Bin), 1,515 (Crop Mode - 20 rows)
System window type	BV, BVF, FI, UVB sensors: UV-grade fused silica, 'Broadband VUV-NIR', unwedged (Various AR coatings & MgF <sub>2</sub> options available)	
Blemish specifications	Grade 1 sensor from supplier. Camera blemishes as defined by Andor Grade A <a href="https://www.andor.oxinst.com/learning/view/article/ccd-blemishes-and-non-uniformities">andor.oxinst.com/learning/view/article/ccd-blemishes-and-non-uniformities</a>	

## Advanced Specifications <sup>•1</sup>

Dark current, e <sup>-</sup> /pixel/sec @ max cooling	0.00007		
FI	0.00020		
BV, UVB	0.00010		
BVF	0.00010		
Output node well depth			
Conventional mode	300,000 e <sup>-</sup>		
Electron Multiplying mode	1,300,000 e <sup>-</sup>		
Register well depth			
Conventional mode	400,000 e <sup>-</sup>		
Electron Multiplying mode	800,000 e <sup>-</sup>		
Active area pixel well depth	200,000 e <sup>-</sup> <sup>•5</sup>		
Read noise (e <sup>-</sup> ) <sup>•6</sup>	50 kHz	1 MHz	3 MHz
Conventional mode: Typ (Max) - EM off	2.8 (5)	6.7 (9)	8.5 (12)
Electron Multiplying mode: Typ (Max) - EM off	8 (15)	25 (35)	38 (50)
Electron Multiplying mode: Typ (Max) - EM on	< 1	< 1	< 1
Sensitivity (e <sup>-</sup> /count)			
Conventional mode	Adjustable from 0.8 - 3		
Electron Multiplying mode	Adjustable from 5 - 20		
Electron Multiplier gain	1 - 1,000 times (software controlled)		
Linearity <sup>•6</sup>	Better than 99%		
Digitization	16 bit		
Vertical clock speed <sup>•8</sup>	4.9, 9.8, 19, 38, 57 (software selectable)		

## Applications & Techniques Guide

	BV models	BVF models	FI models	UVB models
Absorption/Transmittance/Reflection	●	●		○
Fluorescence & Luminescence	●	●	○	●
Raman Spectroscopy (244 – 488 nm)	○	○		●
Raman Spectroscopy (514, 532 nm)	●	●		○
Raman Spectroscopy (633 nm)	○	●	○	
Photon Counting	●	●		○
Single Molecule Spectroscopy	●	●		○

○ = Suitable    ● = Optimum

## Have you found what you are looking for?

**Need to work further into the NIR?** The [iDus InGaAs series](#), with up to 1024 pixel linear array with transmission to 2.2  $\mu\text{m}$ .

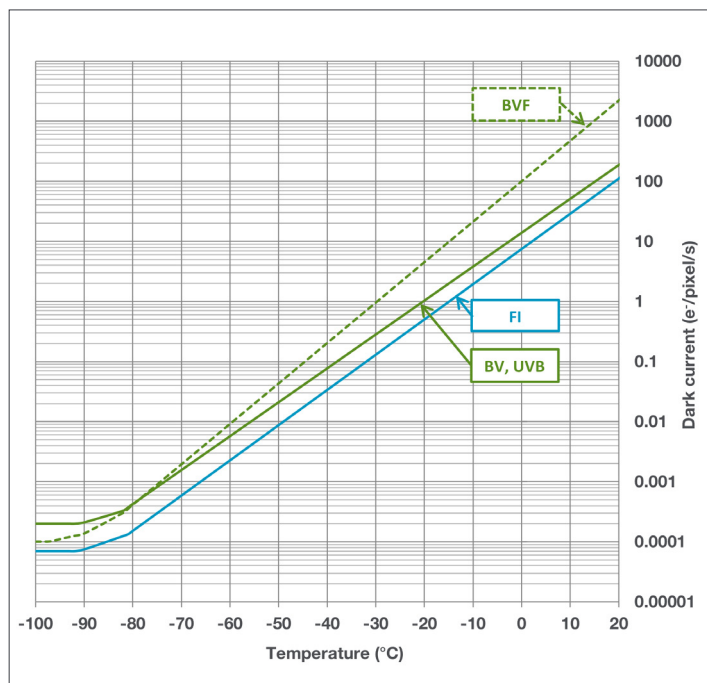
**Need high sensitivity in the NIR and/or higher dynamic range?** The [Newton CCD](#) platform provide back-illuminated deep-depletion and 26  $\mu\text{m}$  pixel options

**Need a customized version?** Please contact us to discuss our Customer Special Request options.

The Newton series combines seamlessly with Andor's research grade Kymera and Shamrock Czerny-Turner spectrographs.

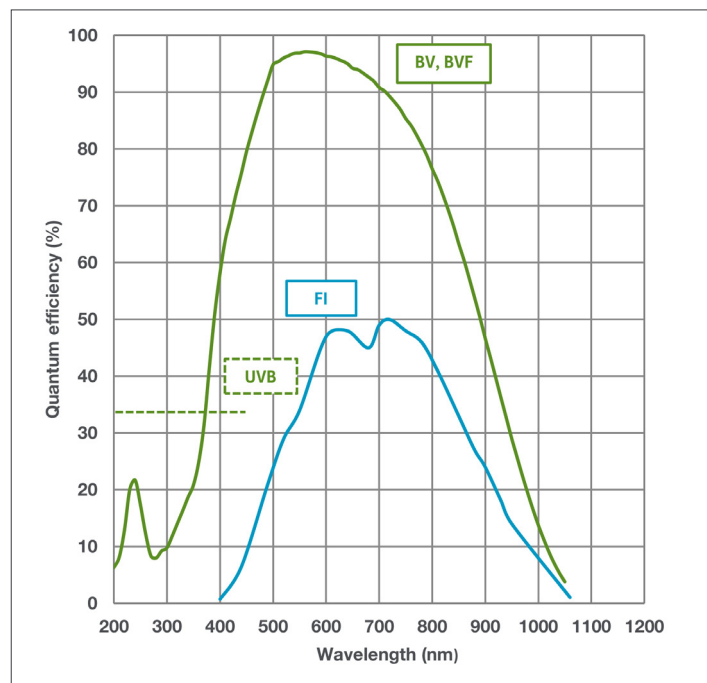


## Dark Current •<sup>9</sup>

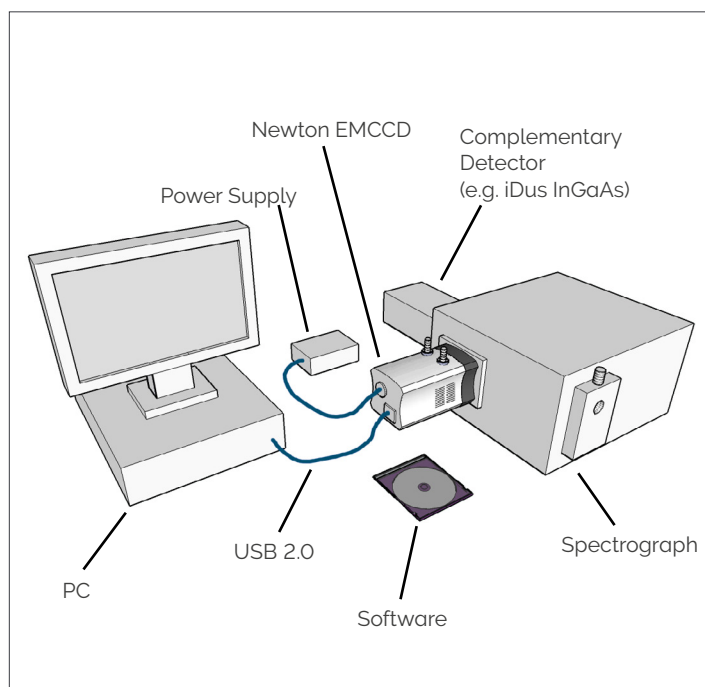


## Quantum Efficiency Curves •<sup>10</sup>

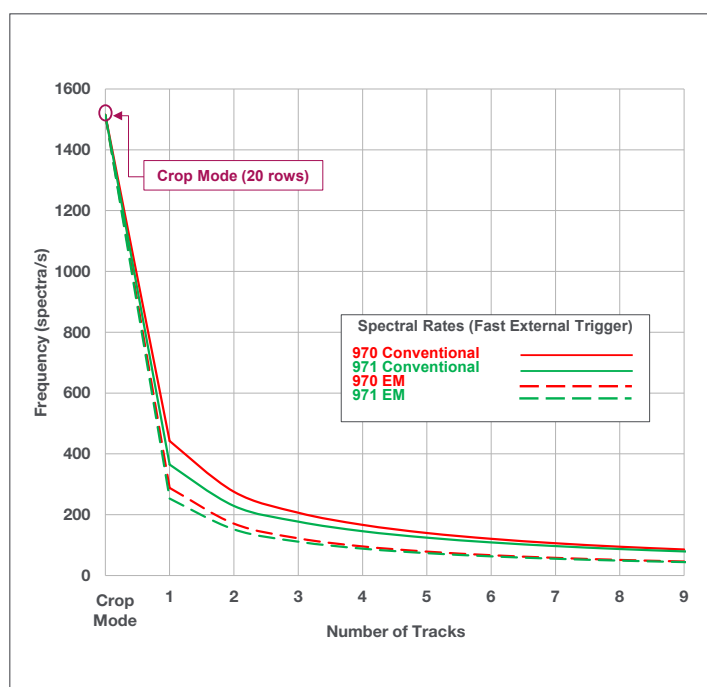
25°C



## Typical Setup



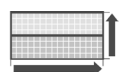
## Readout Rate & Speed •<sup>11</sup>



# Creating the Optimum Product for you

DU 970 P- BVF example shown

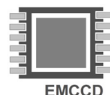
## Step 1. Choose the sensor array size



Array Size

Description	Code
1600 x 200 array	970
1600 x 400 array	971

## Step 2. Choose the sensor type option



Sensor Type

Description	Code
Back Illuminated CCD, Vis-optimized	BV
Back Illuminated CCD, Vis-optimized and anti-fringing (970 model only)	BVF
Front Illuminated CCD	FI
Back Illuminated CCD with UV coating	UVB

## Step 3. Select an alternative camera window (optional)

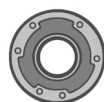


Camera Window

The standard window has been selected to satisfy most applications. However, other options are available. The alternative camera window code must be specified at time of ordering.

To view and select other window options please refer to the [Camera Windows Selector Tool](#). Further detailed information on windows can be found in the technical note – [How to Select a Window for your Camera](#).

## Step 4. Select the required accessories and adapters



Accessories & Adapters

Description	Order Code
Coolant re-circulator for enhanced cooling performance	XW-RECR
Oasis 160 Ultra Compact Chiller Unit (tubing to be ordered separately)	ACC-XW-CHIL-160
6 mm tubing options for ACC-XW-CHIL-160 (2x2.5 m or 2x5 m lengths)	ACC-6MM-TUBING-2X2.5 / ACC-6MM-TUBING-2X5M
C-mount lens adaptor	ACC-LM-C
F-mount lens adaptor	ACC-LM-NIKON-F
Nikon F-mount lens adaptor with shutter	LMS-NIKON-F-NS25B
Shutter Driver for NS25B Bistable Shutter ( <u>not</u> needed for Kymera/Shamrock spectrographs)	ACC-SD-VED24
Bistable Shutter, Standalone ( <u>not</u> needed for Kymera/Shamrock spectrographs)	ACC-SHT-NS25B

### Spectrograph Compatibility

The Newton series is fully compatible with Andor's Kymera and Shamrock spectrographs (193 - 750 nm focal lengths). Spectrograph mounting flanges and software control are available for a wide variety of 3<sup>rd</sup> party spectrographs including, McPherson, JY/Horiba, PI/Acton, Chromex/Bruker, Oriel/Newport, Photon Design, Dongwoo, Bentham, Solar TII and others.

## Step 5. Select the required software



Software

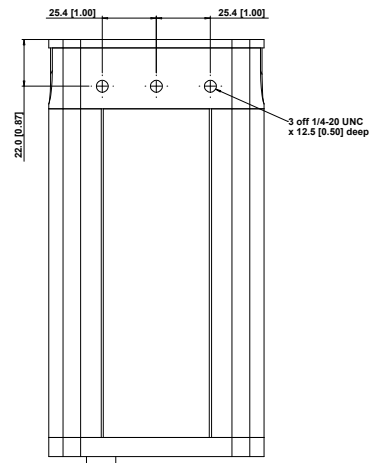
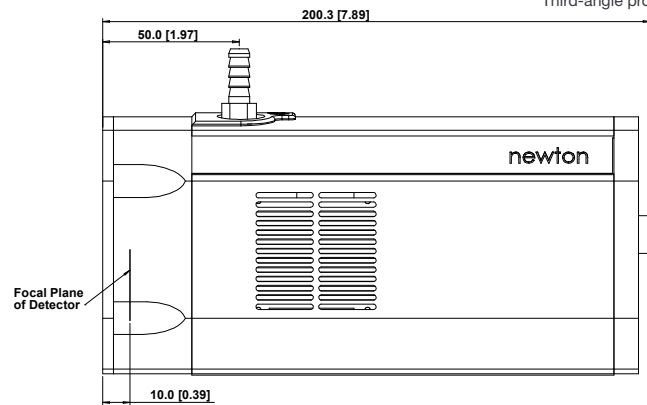
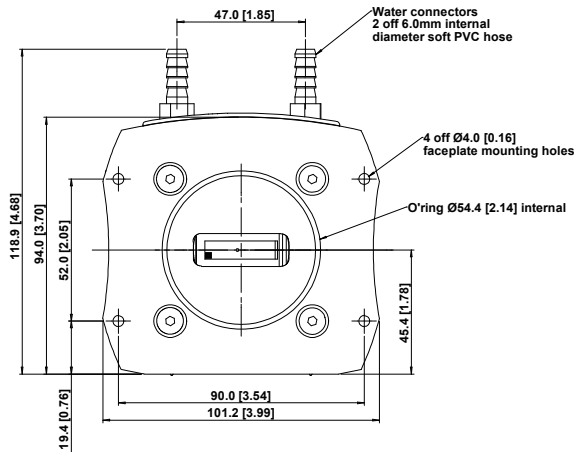
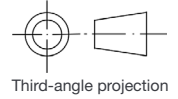
**The Newton EMCCD requires at least one of the following software options:**

**Solis for Spectroscopy** A 32-bit and fully 64-bit enabled application for Windows (8.1, 10 and 11) offering rich functionality for data acquisition and processing. AndorBasic provides macro language control of data acquisition, processing, display and export. Control of Andor Kymera and Shamrock spectrographs and a very wide range of 3<sup>rd</sup> party spectrographs is also available, see list in step 4 above.

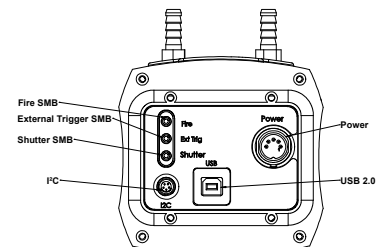
**Andor SDK** A software development kit that allows you to control the Andor range of cameras from your own application. Available as 32/ 64-bit libraries for Windows (8.1, 10 and 11) and Linux. Compatible with C/C++, C#, Delphi, VB.NET, LabVIEW, MATLAB and Python.

# Product Drawings

Dimensions in mm [inches]



Mounting hole locations



Rear connector panel

■ = position of pixel 1,1

Weight: 2.7 kg [5 lb 15 oz]

## Connecting to the Newton

### Camera Control

Connector type: USB 2.0

### TTL / Logic

Connector type: SMB, provided with SMB - BNC cable

1 = Fire (Output), 2 = External Trigger (Input), 3 = Shutter (Output)

### I<sup>2</sup>C connector

Compatible with Fischer SC102A054-130

1 = Shutter (TTL), 2 = I<sup>2</sup>C Clock, 3 = I<sup>2</sup>C Data, 4 = +5 V<sub>DC</sub>, 5 = Ground

Minimum cable clearance required at rear of camera: 100 mm



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Fax +81 (3) 3446 8320

## China

Beijing | Shanghai | Guangzhou  
Phone +86 (400) 678 0609  
Fax +86 (10) 5884 7901



### Items shipped with your camera:

- 1x 2 m BNC - SMB connection cable
- 1x 3 m USB 2.0 cable Type A to Type B
- 1x Set of hex keys (7/64", 3/32" & 3 mm)
- 1x Power supply with mains cable
- 1x User manuals in electronic format
- 1x Individual system performance booklet
- 1x Copy of Solis software or SDK (if ordered)

### Minimum Computer Requirements:

- 3.0 GHz single core or 2.4 GHz multi core processor
- 2 GB RAM
- 100 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 (8.1, 10 and 11) or Linux

### Operating & Storage Conditions

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

### Power Requirements

- 100 - 240 VAC, 50 - 60 Hz

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

1. Figures are typical unless otherwise stated.
2. Edge pixels may exhibit a partial response.
3. Cooling is provided by the use of an external mains driven power supply. Minimum temperatures listed are typical values with ambient temperature of 20°C. Systems are specified in terms of minimum dark current achievable rather than absolute temperature.
4. Based on horizontal pixel readout rate of 3 MHz and a vertical shift speed (in conventional mode) of 4.9  $\mu$ s. Achievable spectral rates will vary with selected trigger mode.
5. Shown for EM mode. For Conventional mode the measurable well depth value will be lower, as a result of the combination of higher sensitivity values and A/D 16 bits digitization.
6. Readout noise is for the entire system. It is a combination of CCD readout noise and A/D noise. Measurement is for Single Pixel readout with the CCD at a temperature of -80°C and minimum exposure time under dark conditions. Noise values will change with readout mode.
7. Linearity is measured from a plot of counts vs exposure time under constant photon flux up to the saturation point of the system.
8. Vertical speeds are software selectable. All sensors are designed to give optimum Charge Transfer Efficiency (CTE) at 9.7  $\mu$ s vertical pixel shift, some decrease in CTE may be observed at faster shift speeds.
9. The graph shows typical dark current level as a function of temperature. The dark current measurement is averaged over the CCD area excluding any regions of blemishes.
10. Quantum efficiency of the sensor as supplied by the sensor manufacturer.
11. The chart shows the maximum possible readout rates available when using Multi-track mode, each track being defined as 20 rows. Crop mode is a specific single-track readout method optimized for rapid kinetic-type acquisition.



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Matlab is a registered trademark of The MathWorks Inc.

SNewtonEMSS 1224 R1