บก.06

แบบ บก.06 เลขที่ 24/66
ลงวันที่ 27 ธันวาคม 2565

ตารางแสดงวงเงินงบประมาณที่ได้รับจัดสรรและรายละเอียดค่าใช้จ่าย
การจัดซื้อจัดจ้างที่มิใช่งานก่อสร้าง

1. ชื่อโครงการ ซื้อกล้องบันทึกภาพด้วยซิปโลหะออกไซด์-เซมิคอนดักเตอร์ชนิด sCMOS จำนวน 1 ชุด (รายละเอียดตามเอกสารแนบท้าย)
2. หน่วยงานเจ้าของโครงการ สังกัดฝ่ายสถานีวิจัย
   สถาบันวิจัยแสงซินโครตรอน (องค์การมหาชน)
   วิธีจัดซื้อจัดจ้าง ○ วิธีประกาศเชิญชวน ○ วิธีคัดเลือก ⊘ วิธีเฉพาะเจาะจง
3. วงเงินงบประมาณที่ได้รับจัดสรร 1,470,000.00 บาท (ตามใบขอซื้อ/จ้าง พส 032/2566 ลว. 2 พ.ย. 2565)
4. วันที่กำหนดราคากลาง (ราคาอ้างอิง) ณ วันที่ 27 ธันวาคม 2565 เป็นเงิน 1,469,859.00 บาท
   ราคา/หน่วย (ถ้ามี) 1,469,859.00 บาทต่อชุด
5. แหล่งที่มาของราคากลาง (ราคาอ้างอิง)
   ใบเสนอราคา บริษัท เอเบ็คซ์ เทคโนโลยีส์ จำกัด
6. รายชื่อเจ้าหน้าที่ผู้กำหนดราคากลาง (ราคาอ้างอิง) ทุกคน
   6.1 นายสุรเชษฐ์ รัตนสุพร เจ้าหน้าที่ผู้กำหนดราคากลาง
   6.2 นายณัฏฐกฤศ สุวรรณทา เจ้าหน้าที่ผู้กำหนดราคากลาง
   6.3 นางสาวเฉลิมลักษณ์ ภูวสวัสดิ์ เจ้าหน้าที่ผู้กำหนดราคากลาง

หมายเหตุ :

แหล่งที่มาของราคากลาง (ราคาอ้างอิง) พิจารณาตามพระราชบัญญัติการจัดซื้อจัดจ้างและการบริหารพัสดุภาครัฐ พ.ศ. 2560 มาตรา 4 “ราคากลาง” หมายความว่า ราคาเพื่อใช้เป็นฐานสำหรับเปรียบเทียบราคาที่ผู้ยื่นข้อเสนอได้ยื่นเสนอไว้ ซึ่งสามารถจัดซื้อจัดจ้างได้จริง

พิจารณาราคากลาง ตามหลักเกณฑ์ข้อ (4) ราคาที่ได้มาจากการสืบราคาจากท้องตลาด โดยพิจารณาจากใบเสนอราคาตามท้องตลาดซึ่งมีผู้เสนอราคาเพียงรายเดียว

ประกาศ ณ วันที่ 28 ธันวาคม 2565

รายละเอียดคุณลักษณะเฉพาะพัสดุ

กล้องบันทึกภาพด้วยชิปโลหะออกไซด์-เซมิคอนดักเตอร์ชนิด sCMOS จำนวน 1 ชุด

1. **รายละเอียดทางเทคนิค**

1.1 กล้องบันทึกภาพด้วยชิปโลหะออกไซด์-เซมิคอนดักเตอร์ชนิด sCMOS (scientific complementary metal-oxide-semiconductor) ยี่ห้อ ANDOR รุ่น NEO 5.5 sCMOS

1.2 มีคุณสมบัติดังต่อไปนี้

Chipset	scientific complementary metal-oxide semiconductor
Field of view	ไม่ต่ำกว่า 2560 pixel x 2160 pixel (5.5 megapixels)
Dynamic range	30,000 : 1
Linearity	99%
Maximum framerate	ไม่ต่ำกว่า 50 fps at full frame (5.5 pixels)
Readout noise	1 e^-
Quantum efficiency	ไม่ต่ำกว่า 60%
Shutter mode	Roller shutter and Global shutter
Exposure time	ไม่ต่ำกว่า 5 วินาที
Max Cooling temp	-30 ^{o}C
Trigger mode	Internal, External, External Start, External Exposure, Software Trigger
Camera link	10 meter
Motorized stage	30mm Travel, Metric

2. **การรับประกัน** : 1 ปี

การจัดซื้อพัสดุส่งเสริมการผลิตภายในประเทศ (Made In Thailand) :

☑ ทำการตรวจสอบพัสดุ ตาม วส45 ลงวันที่ 30 สิงหาคม 2564 แล้วดังนี้

❍ 1. เป็นพัสดุที่ผลิตภายในประเทศ และรับรอง MIT

❍ 2. เป็นพัสดุที่ผลิตภายในประเทศ

⊘ 3. เป็นพัสดุที่ผลิตจากต่างประเทศ

(ลงชื่อ).....ผู้จัดทำรายละเอียดคุณลักษณะเฉพาะ

(ดร. แคทลียา โรจน์วิริยะ)

Abex Technologies Co.,Ltd.
บริษัท เอเบ็คซ์ เทคโนโลยีส์ จำกัด

หนังสือเสนอราคา
QUOTATION

Attn. : Dr.Catleya Rojviriya

Quotation No. : QT22-0192R4

CC :

Customer Code :

To :

Date : 8 Nov 22

Address : Synchroton Light Research Institute (Public Organization)
111 Moo 6, University Avenue, Muang District
Nakhon Ratchasima 30000 THAILAND

Email : catleya@slri.or.th

Tel. :

Fax :

We, thank you for your enquiry on the above and are very pleased to submit our quotation at below for your kind perusal and consideration.

รายการ Item	รายละเอียด Description	รหัสสินค้า Product Code	จำนวน Quantity	ราคาต่อหน่วย Unit Price	ราคารวม Total
1	NEO 5.5 MP CL 3-tap F mount ประกอบด้วย - 10 meter active Camera Link connector cable, including power supply. - Motorized Stage 30mm Travel, Metric	NEO-5.5-CL3-F	1 ชุด	1,373,700.00	1,373,700.00
				Sub Total (THB)	**1,373,700.00**
				VAT 7%	**96,159.00**
				Grand Total (THB)	**1,469,859.00**

Terms & Conditions

Note :

Validity : 30 Days from the date hereof

Delivery : 180 Days

Payment : 30 Days after Invoice Date

Warranty : 1 Year

Incoterms : DDP

Remark :

We sincerely hope that the above quotation will meet wih your requirement and look forward to your valued order in due course.
Assuring you of our utmost attention and services at all times

ยืนยันการสั่งซื้อ

.....

Customer Confirmation

ผู้เสนอราคา
Thrin Khunchaiwong
Marketing & Sales Engineering
0800632017
thrin_k@abextech.co.th

390 ซอยลาดพร้าว 94 ถนนลาดพร้าว แขวงพลับพลา เขตวังทองหลาง กรุงเทพฯ 10310 โทร. 02 559 3261-2 โทรสาร 02 559 0650

390 Soi Ladphrao 94, Ladphrao road, Phlap-phla, Wangthonglang, Bangkok, THAILAND 10310 Tel. (66)2 559 3261-2 Fax. (66)2 559 0650

ได้ตรวจสอบคุณสมบัติแล้ว
ลงชื่อ.....

OXFORD INSTRUMENTS ANDOR

Wednesday, 23 November 2022

LETTER FORM OF AUTHORITY FROM MANUFACTURER

To whom it may concern:

We, **Andor Technology Ltd.**, a manufacturer duly organised under the laws of Northern Ireland and having its principal of business at **7 Millennium Way, Springvale Business Park, Belfast, BT12 7AL** has made, constituted, and appointed **ABEX Technologies, Co., Ltd., 390 Soi Ladphrao 94, Plab-Pla, Wangtonglang, Bangkok, Thailand**, as our representative in the territory of **Thailand** for Andor Technology's scientific CMOS products for Synchrotron Light Research Institute Institute.

ABEX Technologies is fully authorised to submit the bids and entitled to negotiate the contract price, terms and conditions and to sign the contract for these products on our behalf. ABEX Technologies is also responsible for all technical information, technical support, commercial matters concerning our supplies, installation, warranty, maintenance, and for all the required after-sales service for our supplies.

This authority supersedes any and all Distributor Authority Letters that may have been issued for these products before the above date.

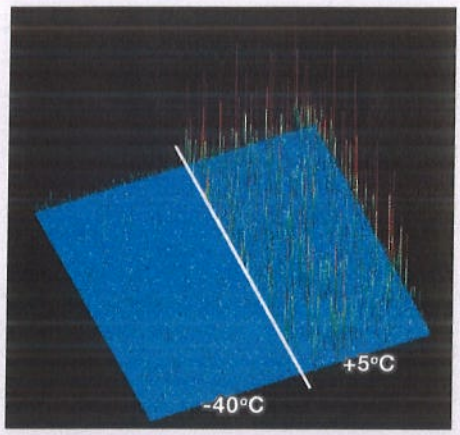
Yours faithfully,

Eric S. Suh
Head of Sales ROA, Asia Pacific
Andor Technology Ltd.
Oxford Instruments company
e.suh@andor.com

Neo 5.5 sCMOS

5.5 Megapixel, -40°C, 1 e⁻ Noise
Rolling and Global Shutter
Scientific CMOS

ANDOR
an Oxford Instruments company



-40°C Vacuum Cooling

- Lowest dark current
- Lowest hot pixels
- Fan-off capability

Features and Benefits

- **TE cooling to -40°C**
  Minimization of dark current and pixel blemish
- **1 e⁻ read noise**
  Lower detection limit than any CCD
- **5.5 megapixel sensor format and 6.5 µm pixels**
  Extremely sharp resolution over a 22 mm field of view: Ideal for cell microscopy and astronomy
- **Rolling and Global (Snapshot) shutter**
  Maximum flexibility across all applications
- **Rapid frame rates**
  Sustained: 30 fps full frame
  Burst: 100 fps full frame
- **Dual-Gain amplifiers**
  Extensive dynamic range of 30,000:1 @ 30 fps
- **UltraVac™** [*1]
  Sustained sensor protection and unequalled cooling with 5 year warranty
- **ROI and pixel binning**
  User-defined ROI (1 pixel granularity) and hardware binning
- **Data flow monitor**
  Innovatively manage acquisition capture rates vs data bandwidth limitations
- **4 GB on-head memory**
  Acquire data bursts at frame rates faster than PC write speed
- **Dynamic Baseline Clamp**
  Ensures quantitative stability
- **Software Exposure Events**
  Rapid software notification via SDK of start / end of exposure synchronization
- **iCam**
  Fast exposure switching
- **Fan-off capability**
  Turn off fan for extended periods for zero vibration

Vacuum cooled Scientific CMOS with 1 e⁻ read noise - Rolling and Snapshot exposure

In a unique -40°C vacuum cooled platform, loaded with FPGA intelligence, Andor's Neo 5.5 sCMOS camera is designed exclusively to drive highest possible sensitivity from this exciting and innovative new technology development.

Unlike any CMOS or CCD technology to come before it, Neo 5.5 sets radical new benchmarks in its unique ability to simultaneously deliver highest specifications in sensitivity, resolution, speed, dynamic range and field-of-view: true scientific imaging, without compromise. Choice of Rolling and Global (Snapshot) exposure mechanisms ensure maximum application flexibility, the latter providing a 'freeze frame' capture capability that emulates that of an interline CCD.

Specifications Summary [*2]

Active pixels (W x H)	2560 x 2160 (5.5 Megapixel)
Sensor size	16.6 x 14.0 mm (21.8 mm diagonal)
Pixel size (W x H)	6.5 µm
Pixel well depth (typical)	30,000 e⁻
Pixel readout rate (MHz)	560, 200
Read noise (min)	1 e⁻
Maximum cooling	-40°C
Maximum burst frame rate	100 fps @ full frame
Readout Modes	Rolling and Snapshot shutter

Neo 5.5 sCMOS

5.5 Megapixel, -40°C, 1 e⁻ Noise
Rolling and Global Shutter
Scientific CMOS

ANDOR
an Oxford Instruments company

System Specifications[*2]

Sensor type	Front Illuminated Scientific CMOS	
Active pixels (W x H)	2560 x 2160 (5.5 Megapixel)	
Sensor size	16.6 x 14.0 mm, 21.8 mm diagonal	
Pixel size (W x H)	6.5 µm	
Pixel readout rate (MHz)	560 (280 MHz x 2 sensor halves) 200 (100 MHz x 2 sensor halves)	
Read noise (e⁻) Median [rms] [*3]	Rolling Shutter	Global Shutter
200 MHz	1.0 [1.5]	2.3 [2.6]
560 MHz	1.3 [1.7]	2.5 [2.8]
Minimum temperature air cooled [*4] **Minimum temperature coolant**	-30°C -40°C	
Dark current, e⁻/pixel/sec [*5]		
@ -30°C	0.015	
@ -40°C	0.007	
Data range	12-bit and 16-bit	
Peak Quantum Efficiency	60 %	
Readout modes	Rolling Shutter and Global (Snapshot) Shutter	
System window type	UV-grade fused silica, 'Broadband VUV-NIR', unwedged	
Internal memory buffer size	4 GB	
Maximum burst frame rates		
2560 x 2160 (full frame)	100 fps Rolling Shutter, 49 fps Global (Snapshot) Shutter	
128 x 128 ROI	1,639 fps Rolling Shutter, 716 fps Global (Snapshot) Shutter	
Pixel well depth (e⁻)	30,000	

Advanced Performance Specifications[*2]

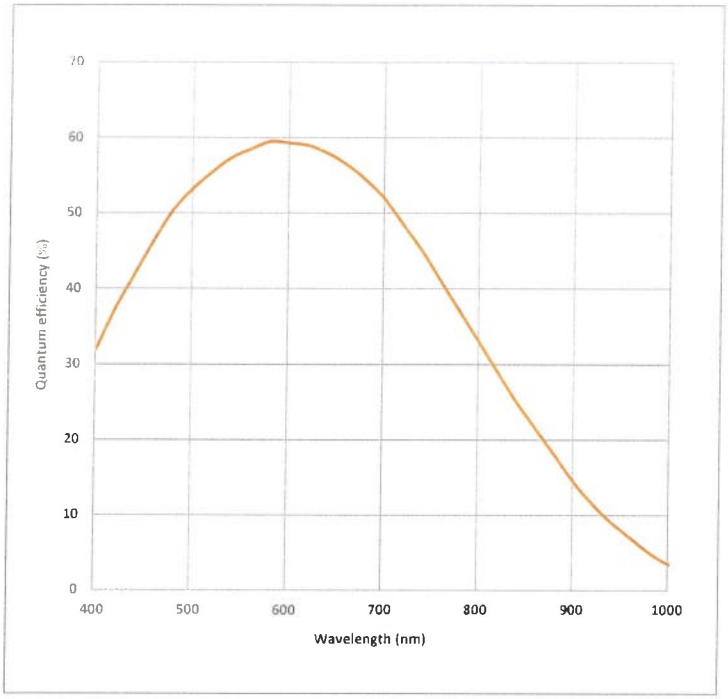
Maximum dynamic range	30,000:1
Linearity (%, maximum) [*6]	Better than 99%
MTF (Nyquist @ 555 nm)	45%
Photon Response Non-Uniformity (PRNU)	< 0.5%
Pixel binning	Hardware binning: 2 x 2, 3 x 3, 4 x 4, 8 x 8
Pre-defined Region of Interest	2560 x 2160, 2048 x 2048, 1920 x 1080, 512 x 512, 128 x 128
User defined ROI granularity	1 pixel *
I/O	External Trigger, Fire, Fire n, Fire All, Fire Any, Arm
Trigger modes	Internal, External, External Start, External Exposure, Software Trigger
System Exposure Events[*7]	Start / End exposure (row 1), Start / End exposure (row n)
Hardware timestamp accuracy	25 ns
Anti-blooming factor	x 10,000

* Minimum ROI size possible is as follows: 16 x 12 in 12-bit mode and 12 x 12 in 16-bit mode.

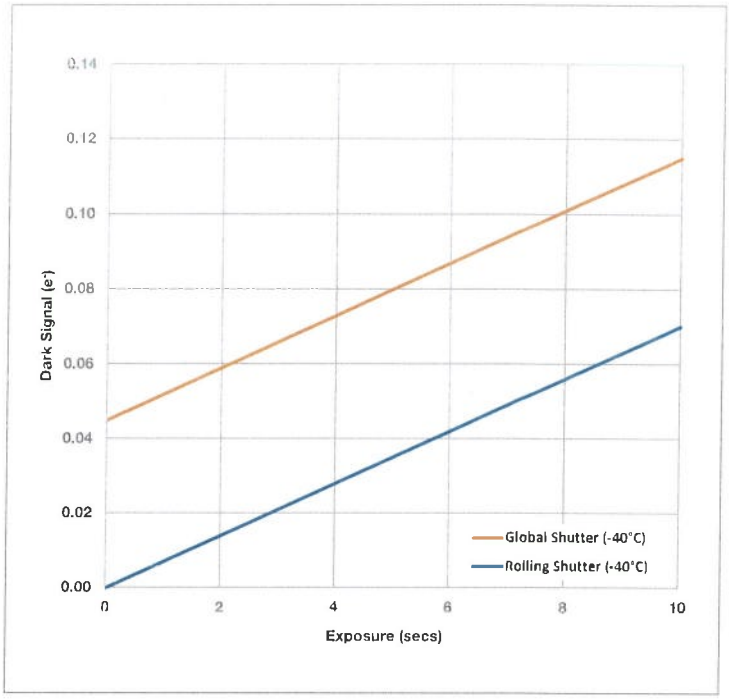
Maximum Frame Rate Table[*8]

Array Size	Cameralink - 3-tap		Burst to 4 GB Internal Memory	
	Rolling Shutter	Global (Snapshot) Shutter	Rolling Shutter	Global (Snapshot) Shutter
2560 x 2160 (full frame)	30	30	100	49
2048 x 2048	39	39	105	52
1920 x 1080	79	79	199	97
1392 x 1040	115	101	206	101
512 x 512	374	201	419	201
128 x 128	1,470	716	1,639	716

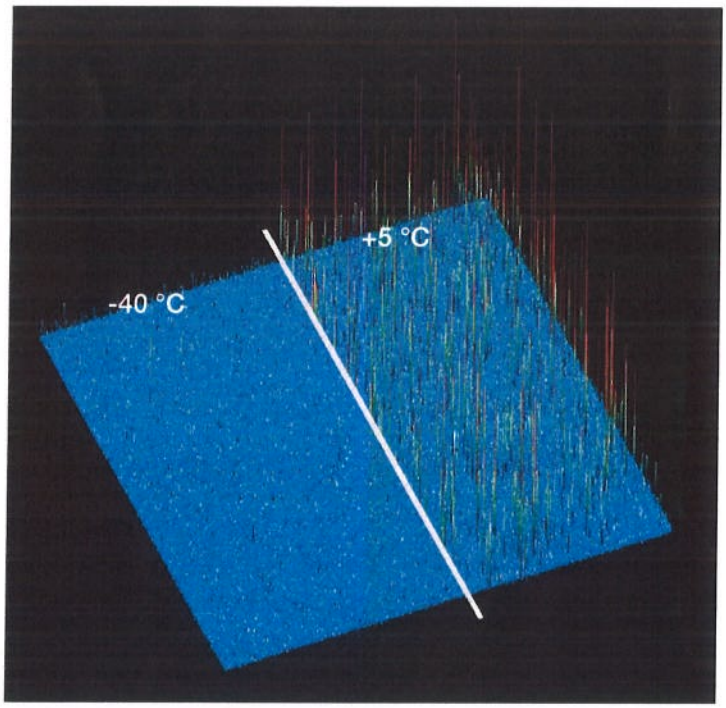
Quantum Efficiency (QE) Curve[9]



Dark Signal vs Exposure Time (Rolling and Global Shutter Modes)[10]

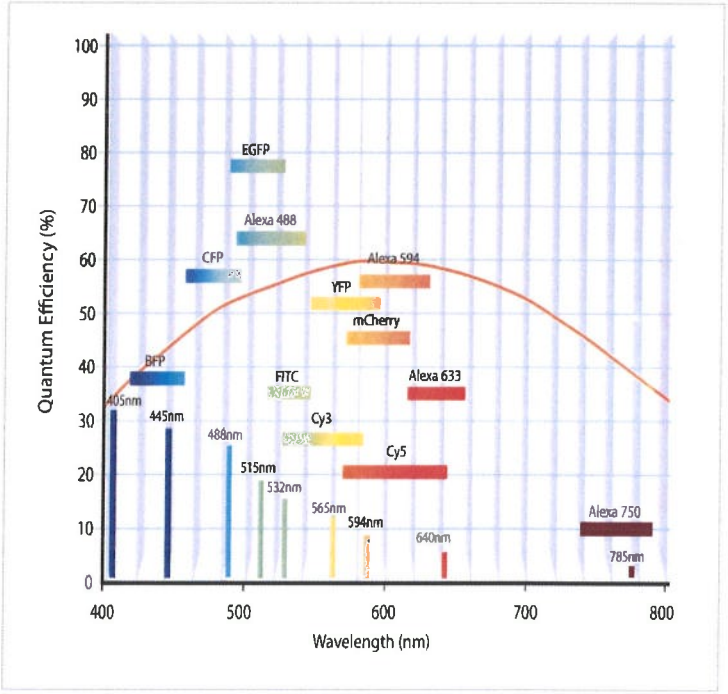


Hot Pixels vs Cooling Temperature



Comparison of hot pixel blemishes at cooling temperatures of +5°C and -40°C @ 1s exposure time; rolling shutter readout mode.

QE vs Fluorophore Emissions



Creating The Optimum Product for You

How to customize the Neo 5.5:

Step 1.
Verify lens mount suitability.

Step 2.
Please indicate alternative window option if required.

Step 3.
Please indicate which software you require.

Step 4.
For compatibility, please indicate which accessories are required.

DC-152Q-C 00-FI
example shown

Step 1.
Choose lens mount option
C: C-mount
F: F-mount

Step 2.
Select alternative camera window (optional)
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 Supplementary Specification Sheet**' which gives the transmission characteristics, product codes and procedure for entering the order. Further detailed information on the windows can be found in the Technical note – '**Camera Windows: Optimizing for Different Spectral Regions**'.

Step 3.
The Neo 5.5 also requires at least one of the following software options:
Solis Imaging A 32-bit and fully 64-bit enabled application for Windows (XP, Vista, 7 and 8) offering rich functionality for data acquisition and processing. AndorBasic provides macro language control of data acquisition, processing, display and export.

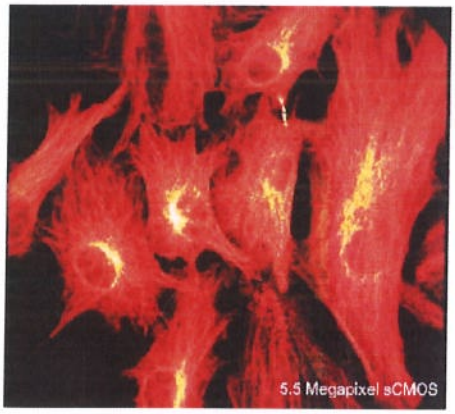
Andor iQ A comprehensive multi-dimensional imaging software package. Offers tight synchronization of camera with a comprehensive range of microscopy hardware, along with comprehensive rendering and analysis functionality. Modular architecture for best price/ performance package on the market. Compatible with 32-bit Windows (XP, Vista, 7 and 8).

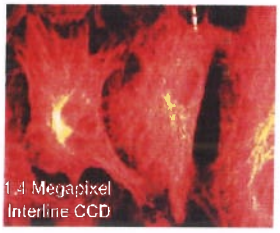
Andor SDK Andor's 32-bit and 64-bit Software Developers Kit DLL allows you to control the Andor range of cameras from your own application. Available for 32-bit and 64-bit Windows (XP, Vista, 7 and 8) and Linux.

Step 4.
The following accessories are available:
XW-RECR Re-circulator for enhanced cooling performance
ACC-XW-CHIL-160 Oasis 160 Ultra compact chiller unit
OA-CNAF C-mount to Nikon F-mount adapter
OA-COFM C-mount to Olympus F-mount adapter
OA-CTOT C-mount to T-mount adapter
OA-ECAF Auto extension tubes (set of 3) for Canon AF
OA-ECMT Auto extension tubes (set of 3) for C-mount
OA-ENAF OA-ENAF Auto extension tubes (set of 3) for Nikon AF
ACC-ASE-02992 5 meter Camera Link connector cable.
ACC-ASE-06931 10 meter active Camera Link connector cable, including power supply.
ACC-NEOFOX-3TAP-30M 30 meter fibre-optic extender solution for use with Neo 5.5.
ACC-NEOFOX-3TAP-100M 100 meter fibre-optic extender solution for use with Neo 5.5.
WKST-1 WIN - PC Workstation for up to 100 fps continuous spooling to hard drives, acquiring up to 120,000 12-bit full resolution images: Dell T7610, 2.3 GHz Six Core, 8 GB RAM, 4 x 250GB SSD hard drive configured in RAID 0.
WKST-2 WIN - PC Workstation for up to 30 fps continuous spooling to RAM, acquiring up to 60,000 12-bit full resolution images: Dell T3610, 3.6 GHz Quad Core, 8 GB RAM, 2 x 250 GB SSD hard drives configured in RAID 0.
WKST-3 WIN - PC Workstation for up to 100 fps continuous spooling to RAM, acquiring up to 6,000 12-bit full resolution images: Dell T3610, 3.6 GHz Quad Core, 64 GB RAM

Field of View (FoV) Comparison

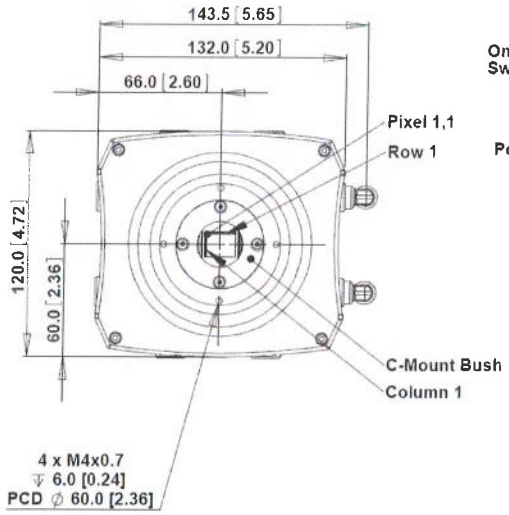
Comparison of Field of View offered by 5.5 megapixel sCMOS technology and a 1.4 megapixel interline CCD.

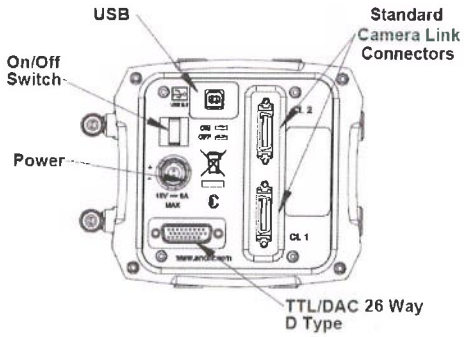


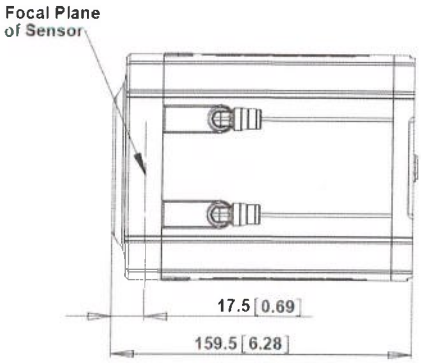


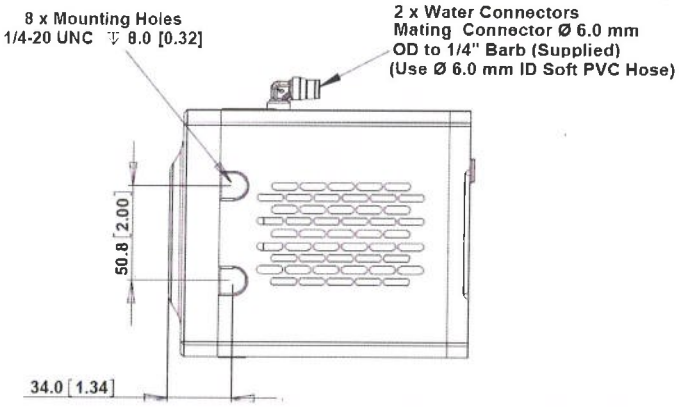
Product Drawings

Dimensions in mm [inches]
Weight: 3.4 kg [7 lb 8 oz]









Connecting to the Neo 5.5

Camera Control
Connector type: 3 meter Camera Link 3-tap (longer cable lengths available as accessories).

TTL / Logic
Connector type: 26 way D Type with TTL I/Os for External Trigger, Fire Pulse and Arm

Firmware updates through USB

Minimum cable clearance required at rear of camera 90 mm

Regulatory Compliance

Compliant with the requirements of the EU EMC and LV Directives through testing to EN 61326-1 and EN 61010-1

External power supply PSE-approved

26-way D-type pinouts

1	External Trigger
2	Reserved
3	GND
4	Reserved
5	Reserved
6	GND
7	Reserved
8	Fire
9	AUX_OUT_1
10	Reserved
11	Reserved
12	Reserved
13	Reserved
14	Reserved
15	Reserved
16	Reserved
17	Reserved
18	GND
19	+5V Output
20	GND
21	Reserved
22	Reserved
23	AUX_OUT_2
24	Arm
25	GND
26	GND

*Aux_Out_1 is configurable as Fire, Fire n, Fire All or Fire Any. Refer to the Neo 5.5 hardware manual.

Order Today

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

Our regional headquarters are:

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

Japan
Tokyo
Phone +81 (3) 3518 6488
Fax +81 (3) 3518 6489

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

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

Items shipped with your camera

1x Camera Link card and 3 meter connector cable.
1x Andor ACZ-02991: 3m Multi I/O timing cable, offering External Trigger, Arm, Fire, Aux_Out_1 and Aux_Out_2
1x 3m USB 2.0 cable Type A to Type B
1x Power supply with mains cable
1x Quick launch guide
1x CD containing Andor user guides
1x Individual system performance sheet

Footnotes: Specifications are subject to change without notice

1. Assembled in a state-of-the-art Class 1,000 clean room facility, Andor's UltraVac™ vacuum process combines a permanent hermetic vacuum seal (no o-rings), with a stringent protocol to minimize out-gassing, including use of proprietary materials. Outgassing is the release of trapped gases that would otherwise prove highly problematic for sensor longevity.
2. Figures are typical unless otherwise stated.
3. Readout noise is defined as the median over the sensor area excluding any regions of blemishes. It is a combination of sensor readout noise and A/D noise.
4. Specified minimum air cooled temperature assumes ambient temperature of 25°C. Specified minimum temperature with coolant assumes coolant temperature of 16°C.
5. Dark current measurement is taken as a median over the sensor area excluding any regions of blemishes in Rolling Shutter mode.
6. Linearity is measured from a plot of Signal vs. Exposure Time over the full dynamic range.
7. Software Exposure Events provide rapid software notification (SDK only) of the start and end of acquisition, useful for tight synchronization to moving peripheral devices e.g. Z-stage.
8. Maximum speed at which the camera can acquire images at full resolution and a range of sub-array sizes. The tables present (a) frame rates which can be sustained until the limit imposed by the storage capacity; (b)frame rates achieved during burst to 4 GB on-head camera memory. Note that the write speed of hard drive and additional processing overheads can impact these figures. See technical note entitled *'PC Recommendations for sCMOS'* for further detail on speed tests, PC recommendations and sustained acquisition performance.
9. Quantum efficiency of the sensor at 20°C as supplied by the sensor manufacturer.
10. Total darksignal in Global Shutter mode carries an additional fractional fixed 'Global Shutter Darksignal' (GSD) contribution that is imposed during readout and is therefore independent of exposure time. GSD is equal to 0.11 e⁻ @ -30°C; 0.045 e⁻ @ -40°C. Darksignal for a given exposure time in Global Shutter mode is thus calculated by (dark current x exposure) + GSD. GSD represents the offset between the two curves shown for -40°C.

Minimum Computer Requirements:

- 2.4 GHz Quad Core + 4 GB RAM (1600MHz DDR3)
- Hard drive: Minimum 250 MB/sec continuous write for Spooling
- PCIe x4 slot for Frame Grabber card
- Windows (XP, Vista, 7 or 8) or Linux
- USB 2.0 (for future firmware upgrades): Intel 82801 (or equivalent) I/O controller hub to provide interface for USB 2.0

* Refer to technical note: '*PC Recommendations for sCMOS*'
** Note: Andor supply PC workstations for Neo, see page 4

Operating and Storage Conditions

- Operating Temperature: 0°C to 40°C ambient
- Relative Humidity: <70% (non-condensing)
- Storage Temperature: -25°C to 55°C

Power Requirements

- 110 - 240 VAC, 50 - 60 Hz

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