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**QHYCCD**

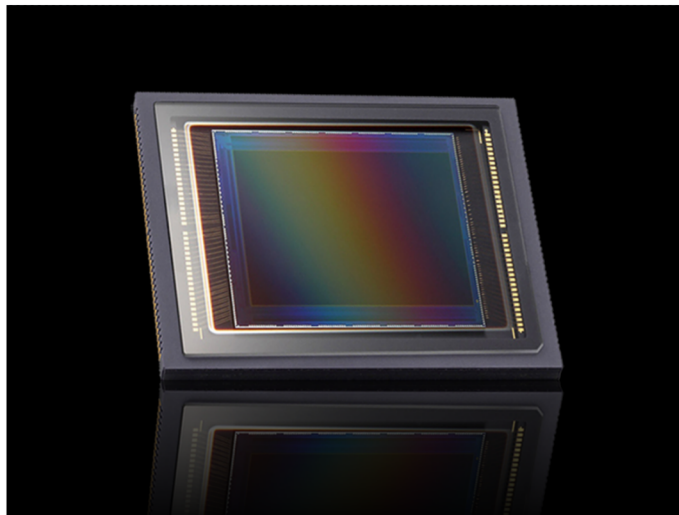


**QHY461**  
**102 Megapixel**  
**Scientific CMOS**



## QHY461

**102 Megapixels**  
**Back-Illuminated**  
**16-bit A/D**  
**1e- Read Noise**  
**Mono or Color**



### Features:

- 102 Megapixels, 3.76um
- 44x33mm, 55mm Diagonal
- Native 16-bit A/D
- Ultra-Low 1e- Read Noise
- Deep Full Well, High Dynamic Range
- Back-Illuminated High QE Sensor
- Low Dark Current
- USB 3.0 and 10GigaE
- Air and Water Cooling

### High Resolution Scientific CMOS with 102 Megapixels

The QHY461 uses a Sony IMX461 Exmore R scientific CMOS sensor with similar architecture as the larger IMX411. The QHY461 has 102 Megapixels in a 11656 x 8742 array with 3.76um pixels. The IMX461 is back-illuminated for high QE and dynamic range. The sensor size is 44mm x 33mm, 55mm diagonal. The QHY461 is available in both mono and color versions.

### Native 16-bit A/D, 65536 levels

The QHY461 is also the world's first scientific CMOS camera with native 16-bit A/D on-chip. The output is real 16-bits with 65536 levels. Most CMOS sensors are 12-bit or 14-bit. This means that the conversion ratio cannot achieve 1e-/ADU and weak signals are not very highly sampled. Photometric measurements of low signals in such case are not as accurate. Some cameras combine two 12-bit outputs to create 16-bit images, but the actual number of levels is still  $4096 \times 2 = 8192$  levels, significantly less than native 16-bits.



### **Ultra Low Read Noise, 1 Electron at High Gain**

The QHY411 has only one electron of read noise at high gain and 1 FPS (16-bit), 2 FPS (8-bit) high readout speed. One electron of read noise means the camera can achieve a  $SNR > 3$  at only 3 to 4 photons. This is perfect performance when conditions are photon limited, i.e., short exposures, narrow band imaging, etc., making this large area sensor ideal for sky surveys and time domain astronomy.

### **Full Well Capacity of 44ke- at 3.76um, 396ke- at 11um**

One benefit of the back-illuminated CMOS structure is improved full well capacity. This is particularly helpful for sensors with small pixels. The QHY411 has a full well capacity of 44ke- even with unbinned 3.76um pixels. When binned 2x2 to 7.5um the full well is 176ke- and when binned 3x3 to 11um the full well is 396ke-.

### **Back-Illuminated, Electric Rolling Shutter, Low Dark Current**

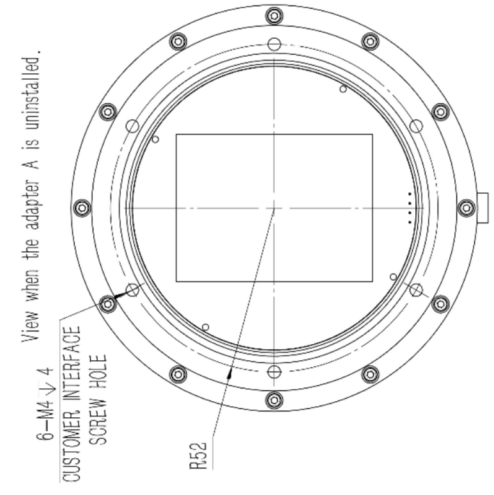
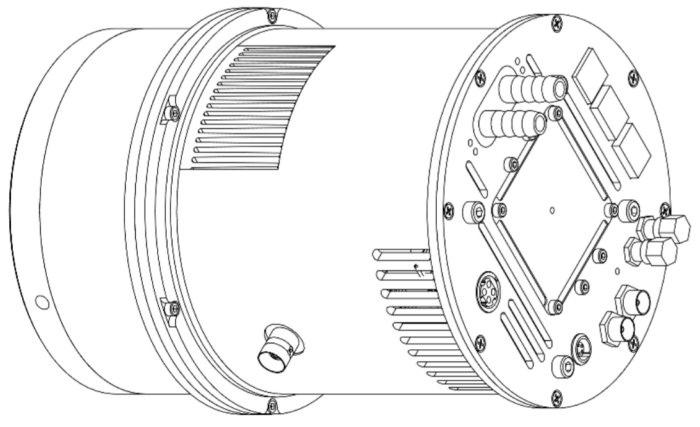
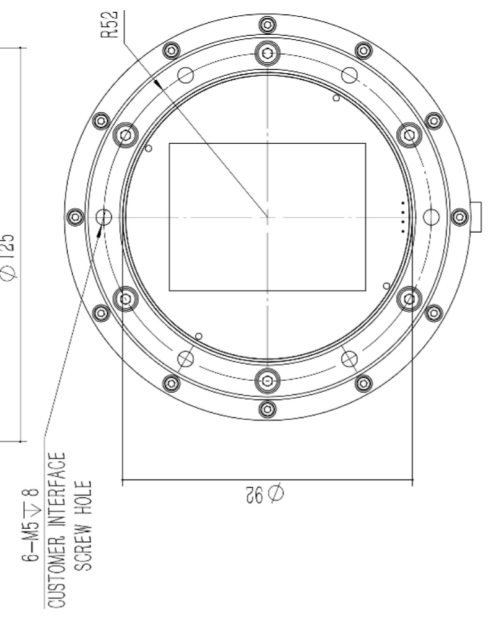
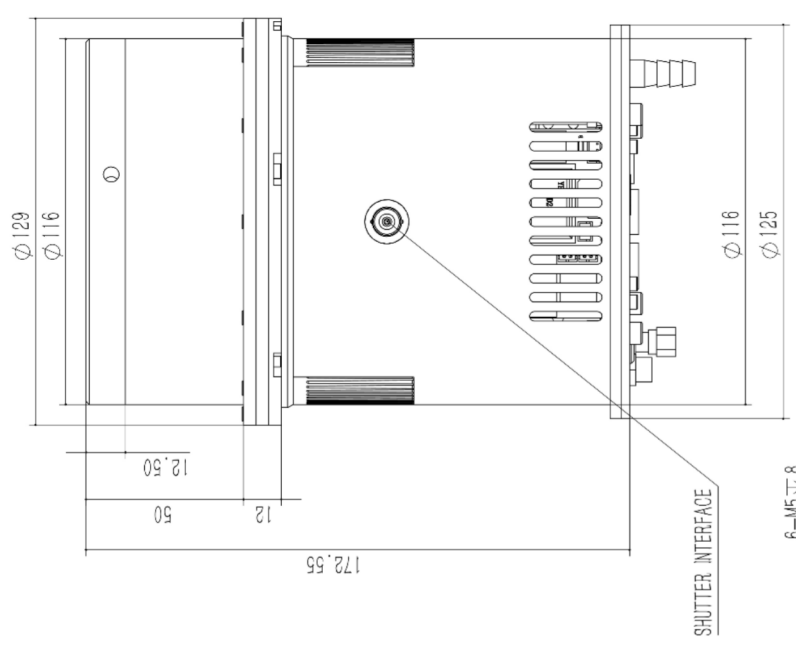
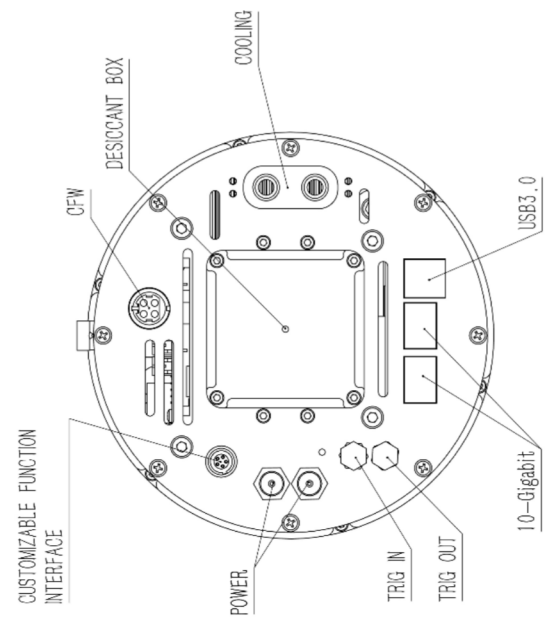
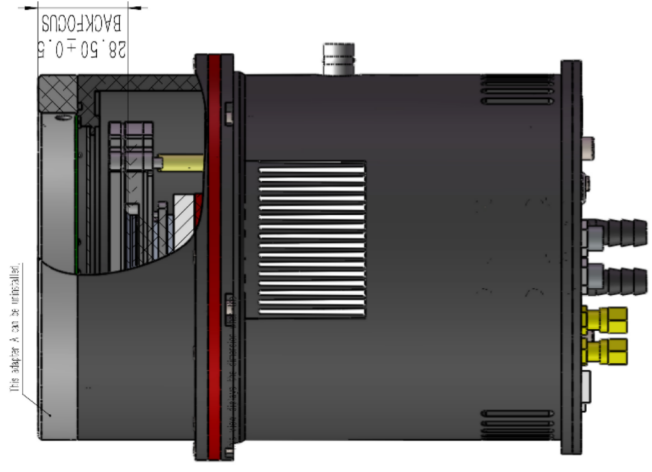
The QHY411 sensor is back-illuminated and has extremely low dark current using SONY's Exmor BSI sCMOS technology. This means the camera is not only ideal for short exposures due to its low read noise, but is also ideal for long exposures where dark current noise often dominates. To further reduce the dark current noise, the QHY411 incorporated QHYCCD's proprietary thermal noise reduction technology and two-stage thermoelectric cooling to reduce the temperature of the sensor.

### **10GigaE / USB3.0**

The QHY461 comes in two versions, USB3.0 and 10GigaE. The USB3.0 supports 1FPS readout speed. The 10GigaE version supports 2.6FPS readout speed.

### **Air / Liquid Cooling**

The QHY461 has air or liquid cooling with 2-stage TE Cooler.



View when the adapter A is uninstalled.

**PRELIMINARY SPECIFICATIONS**

Model	QHY461U3G20
Image Sensor	SONY IMX461 BSI CMOS Sensor
Mono / Color Version	Both Available (QHY461U3G20M / QHY461U3G20C)
Pixel Size	3.76um x 3.76um
Effective Pixels	102 Megapixels
Sensor Diagonal Size	55mm
Effective Image Area	44mm x 33mm
Full Well Capacity (1x1, 2x2, 3x3)	44ke- / 176ke- / 396ke-
A/D	16-bit (0-65535 greyscale)
Sensor Optical Format	TYPICAL 4.2inch
Full Frame Rates	USB3.0 2.7 FPS at 8-bits 1.3 FPS at 16-bits 2x10Gigabit Fiber 2.7 FPS at 16-bits 6 FPS at 14-bits
Read Noise	1e- to 3.7e- (in HGC mode)
Dark Current	Approx. 0.003e-/pixel/sec @ -20C
Exposure Time Range	50us -3600sec
Shutter Type	Electronic Rolling Shutter
Computer Interface	USB 3.0 and 2x10Gigabit Fiber (in development)
Trigger Port	Trigger In / Out, High Speed Sync Port
Built-in Image Buffer	2 GByte (16Gb)
Internal Image Storage	Total 64MByte Flash Memory. 10MBytes user-accessible for stellar ROI frames for analysis of exoplanet investigation, occultations, atmospheric seeing measurement, focus , optic analysis etc. Support 100x100 image x 500 frames, 50x50 image x 4000 frames, 25x25 image x 16000 frames, 10x10 image x 250000 frames
FPGA Upgrade Via USB	Supported
Cooling System	Dual Stage TEC. -45C from ambient with water, -30C with fan only
Anti-Dew Heater	Yes
Telescope Interface	Six Screw Holes + Tilt Adjust Ring
Optical Window	AR+AR High Quality Multi-Layer Anti-Reflection Coating
Power Requirements	12VDC, 5A