

# Malin Space Science Systems

*Exploration Through Imaging*

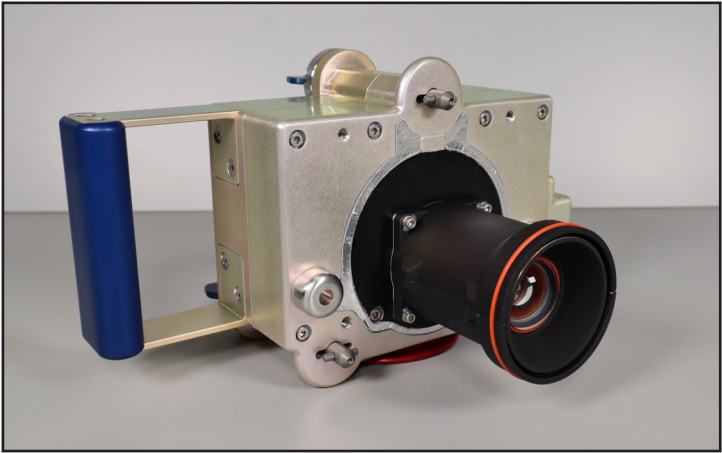
## Docking Camera (DCAM)

Color/Monochrome Gigabit Ethernet CMOS Camera,  
Global Shutter, 2592x2048, 4.8µm pitch

Electro-Optical	
Band	Visible
Color Band	Monochrome or RGB Bayer Color Filter
Wavelength Range	350-850 nm (mono) 400-515 nm (blue) 485-595 nm (green) 575-550 nm (red)
Peak QE	>57% at 550nm (mono)
Electronic Shutter Modes	Global
Pixels	5.3 Mpixel
Horizontal Resolution	2592 pixels
Vertical Resolution	2048 pixels
Pixel Pitch	4.8 µm
Array Diagonal	15.9 mm
Conversion Bit Depth	10 bits
Temporal Noise	14 e-
Full Well	10,000 e-
Dynamic Range	57.1 dB
Frame Rate, Native Format	14 fps
Optics	22mm EFL, F/3.5 [25 x 32 deg FOV] (also compatible with P50/ L50 lens options)

Power	
Supply Voltage	5V (4.5 to 5.5V)
Power, Idle	12 W
Power, Imaging	15 W

Thermal	
Operating Temperature	-30 to +40 °C
Protoflight Qualification	-40 to +55 °C
Non-Operating Temperature	-50 to +70 °C
Temperature Sensing	Internal ISL71590 available for readout on J2, On-Sensor Temperature Register



Docking Camera (DCAM)

### Features

- Target vehicle acquisition
- Star navigation
- Centerline docking target camera
- Gigabit Ethernet interface
- Designed and rated for crew handling

### Programmability

- Sensor Clock Rate
- Gain
- Integration
- Companding Table
- Summing/Upsampling Mode
- Automatic Exposure Control
- Region of Interest
- Frame Rate
- Test Patterns
- h.264 Compression

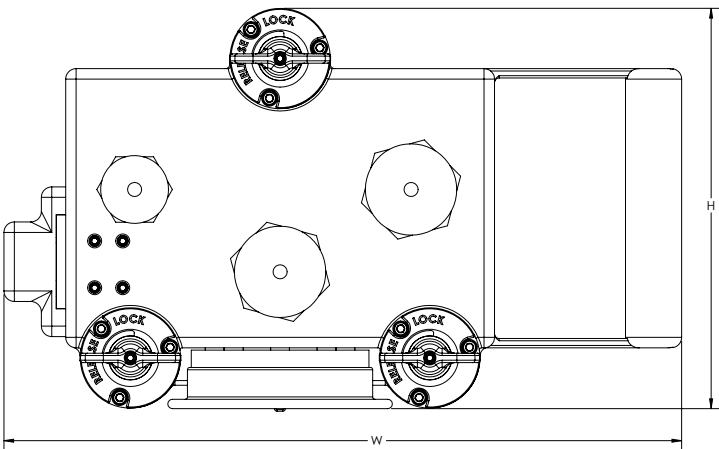
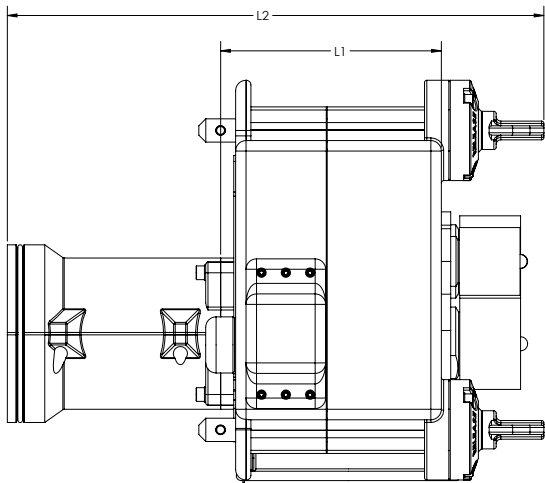
Optics			
Effective Focal Length	F/#	FOV (V° x H°)	Bandpass
5.8 mm	F/2.7	90 x 109	425-675 nm
7 mm	F/5.6	78 x 96	425-675 nm
9 mm	F/5.6	60 x 74	425-675 nm
12.6 mm	F/5.6	44 x 56	425-675 nm
22 mm	F/5.6 or F/3.5	26 x 32	425-675 nm

Digital	
Internal Memory	768 MB DDR2 (Volatile) 500 GB NAND Flash (Non-Volatile)
Digital Processing	Summing/Upsampling 12 to 8 bpp Companding (Table Lookup) h.264 Compression
Data Interface	Gigabit Ethernet



## Docking Camera (DCAM)

Dimensional Envelope, 22 mm Optics



Mechanical/Interfaces	
Mass w/22 mm optics, no baffle	2400 g
Dimensional Envelope w/22 mm optics, no baffle	H: 136 mm W: 231 mm L1: 75 mm L2: 183 mm
Connectors	MIL-DTL-D38999 Series III J1 (power): 4-contact J2 (data): 22-contact J3 (aux): 6-contact
Crew Handling Features	<ul style="list-style-type: none"><li>• Handle</li><li>• Lens Cover with Stowage Ring</li><li>• Quarter-Turn Fasteners</li><li>• Alignment Cube Cover</li><li>• Rated for Intra-Vehicular Crew Loading</li></ul>
Survivability	
Radiation Design Environment	5 years GEO standard, up to 15 years GEO optional
NASA TRL	8



Technicians and astronaut Don Pettit (holding a DCAM 3d-printed mock-up) tested the crew's ability to perform Orion docking tasks inside a rotating docking tunnel mockup. The newly constructed tunnel can rotate 360-degrees, allowing for evaluation of a variety of orientations and angles Orion will experience in deep space. Pettit also performed a series of tasks, including removing the mockup's hatch and docking camera to allow travel through Orion into the docked vehicle. The hardware was then reinstalled to simulate preparation for Orion's undocking.

Credit: NASA