



# MULTISENSE S21

*A second-generation stereo computer sensor with an on-board processing system, intelligently designed to facilitate complete and stand-alone sensor solutions.*

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## PHYSICAL

<b>Height:</b>	8.2 cm
<b>Width:</b>	28.5 cm
<b>Depth:</b>	10 cm
<b>Weight:</b>	1.5 kg

## ENVIRONMENTAL

<b>Operating Temperature:</b>	-10 to 50 C
<b>Environmental Rating:</b>	IP 68

## RUGGEDIZATION

### Corning® Gorilla® Glass Lens Shields:

The unique composition of Gorilla® Glass allows for a deep layer of high compressive stress, that acts as “armour”, making the lens shields exceptionally tough and resistant to chips and scratches.

## ELECTRICAL

<b>Voltage (nominal):</b>	24 V
<b>Voltage (range):</b>	18–36 V
<b>Power (nominal):</b>	7 W
<b>External Connector:</b>	<ul style="list-style-type: none"> <li>• Power: M12-A5/Male</li> <li>• Ethernet: M12-X8/Female</li> </ul>

## IMAGE SENSORS

<b>Model*:</b>	CMV2000
<i>*Monochrome and color options available.</i>	
<b>Resolution:</b>	2048 x 1088
<b>Active Area:</b>	11.2 x 6 mm
<b>Frame Rate:</b>	30 FPS max
<b>Sensitivity*:</b>	5.56 V/lux-s
<i>*Value for monochrome imagers. Bayer filter on color imagers reduces sensitivity.</i>	
<b>Color Filter Array:</b>	Bayer

## LENSES

<b>Focal Length*:</b>	4.8–8.0 mm
<i>*4.8 mm standard.</i>	
<b>Field of View:</b>	Varies with lens
<b>Aperture:</b>	Fixed to f4.0 at factory
<b>Focus:</b>	Fixed at factory

## ILLUMINATION

<b>Number of LED Illuminators*:</b>	2
<i>*Supports up to two additional external LEDs.</i>	
<b>Color Temperature:</b>	4100K
<b>Brightness:</b>	690 lm each
<b>Power*:</b>	6 W per LED
<i>*Light power is at 100% duty, no strobing. Strobing is user-adjustable.</i>	
<b>Field of View:</b>	<ul style="list-style-type: none"> <li>• 1 @ 18°</li> <li>• 1 @ 44°</li> </ul>
<b>Synchronization:</b>	Continuous illumination or synchronized to camera exposure.



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## INTERFACE

**Network Interface\*:** 1 Gigabit ethernet port (1000BASE-T)

*\*Full-duplex only. Can auto-negotiate down to 10/100 speeds at significant impact to sustained camera framerate.*

**Throughput\*:** Up to 120 MB/s

*\*Achievable throughput depends on quality of host side ethernet adapter/drivers.*

**Jumbo Frames\*:** Up to 9000 bytes

*\*Full frame rates may not be achievable without use of jumbo-frames.*

**Low-level Protocol:** UDP/IP; IPv4 only

**IP Address Assignment:** Static

**Device Discovery:** Direct connect to known IP

**Application Interface (C++):** High-performance C++ API with support for blocking, polled and asynchronous (callback based) methods

**Application Interface (ROS):** ROS-based API and tool set

*\*View live image and 3D range data, adjust camera and stereo parameters, log and playback data, check calibration, and change IP address.*

**Image Formats\*:** Grayscale, YCbCr; packed, planar; various bit depths

*\*Formats may be selected to optimize use of available network bandwidth. API can provide efficient automatic conversion to standard byte-aligned formats on host side.*

**Image Streams\*:** Unrectified (left/right), rectified (left/right), and disparity (depth)

*\*ROS API streams point clouds, depth images, and RGB images.*

## STEREO VISION

**Algorithm:** SGM (Semi-global stereo matching)

**Maximum Disparities:** 256

**Sub-pixel Resolution:** 1/16th pixel

**Peak Throughput:** 2 GPxD/s (Giga-pixel disparities/second)

**Performance @ 2048 x 1088:** 7.5 FPS with up to 128 disparities

**Performance @ 2048 x 544:** 15 FPS with up to 128 disparities

**Performance @ 1024 x 544:** 30 FPS with up to 128 disparities

**Minimum Range:** 0.4 m

## TRIGGERING/SYNCRONIZATION

**External Opto-isolated Input:** 2x

**External Opto-isolated Output:** 2x

**Time-base\*:** Internal timebase with sub-microsecond resolution

*\*Used to timestamp all outgoing data (including disparity maps and captured images).*

**Time Synchronization\*:** External pulse input (e.g. pulse-per-second) time system with host

*\*PPS mutually exclusive with external trigger (due to limit of one external input). PPS signal sets sub-second time, while network message sets absolute time.*

**Camera Trigger Sources:** Internal free-running; network message; external trigger input

**Opto-isolated Output Sources\*:** Synchronized to camera exposure; pulse-per-second

*\*Allows external cameras and illumination devices to be synchronized with internal camera exposure. Alternatively, external devices may be synchronized such that their exposures never overlap with internal camera exposure (for example, in order to support a structured illumination device that is only visible to some of the cameras).*

