CARNEGIE ROBOTICS

MULTISENSE
S7

The rugged 3D stereo and video solution for all of your short-range applications and highly configurable for any lighting condition.

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PHYSICAL

Height:	6.5 cm
Width:	13 cm
Depth:	13 cm
Weight:	1.2 kg

ENVIRONMENTAL

Operating Temperature:	-10 to 50 C
Environmental Rating:	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.
Vibration Testing*:	• Frequency: 5 Hz to 500 Hz • Vertical Axis: 2.24 g RMS Transverse Axis: 1.48 g RMS • Longitudinal Axis: 1.90 g RMS • Test Duration: 2 hr/axis

Engineering samples of the MultiSense S7 have passed extended MIL-STD-810G vibration and shock tests and displayed no change in range measurements and no drift in calibration from before to after the tests.

ELECTRICAL

Voltage (nominal):	24 V
Voltage (range):	18–36 V
Power (nominal):	7 W
Power (full lighting)*: *7 W strobing / 19 W no strobing*	19 W
External Connector:	• Power: M12-A5/Male • Ethernet: M12-X8 Female • External Lighting: M12-A8/Female

IMAGE SENSORS

Model*:	CMV2000 or CMV4000

Monochrome, color, and IR sensitive filter options available.

Resolution:	2048 x 1088 or 2048 x 2048
Active Area:	• 11.2 x 6 mm (CMV2000) • 11.2 x 11.2 mm (CMV4000
Frame Rate:	30 FPS max
Sensitivity*:	5.56 V/lux-s

Value for monochrome imagers. Bayer filter on color imagers reduces sensitivity.

Color Filter Array:	Bayer

LENSES

Focal Length:	6.5 cm
Field of View:	• 80° x 49° (2MP sensor) • 80° x 80° (4MP sensor)
Aperture:	Fixed to f4.0 at factory
Focus:	Fixed at factory

ILLUMINATION

Number of LED Illuminators*:	2

Supports up to two additional external LEDs.

Color Temperature:	4100K
Brightness:	690 lm each
Power*:	6 W per LED

Light power is at 100% duty, no strobing. Strobing is user-adjustable.

Field of View:	• 1 @ 18° • 1 @ 44°
Synchronization:	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:	0.2 m

TRIGGERING/SYNCRONIZATION

External Opto-isolated Input:	1x
External Opto-isolated Output:	1x
Time-base*:	Internal timebase with sub-microsecond resolution

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

Time Syncronization*:	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).