

Particle Imaging and Classification

Overview:

Our Continuous Particle Imaging and Classification Sensor (CPICS) provides unprecedented *in situ* aquatic microscopy of seawater, freshwater and laboratory samples. Using darkfield illumination, the CPICS-1000-e captures high-resolution color images, showing features as small as 0.04 mm and as large as 12 mm. Research has shown that color information is key to high-accuracy automated classification while also providing important physiological information such as pigmentation due to grazing on phytoplankton. Because of its open-flow approach to water sampling, delicate structures of plankton and particles remain completely intact as do predator-prey interactions.

Applications:

The CPICS-1000-e is the ideal choice for imaging particles and plankton in a stand-alone package that may be deployed on a CTD rosette or autonomous vehicle. The CPICS-1000-e configuration provides embedded Region of Interest (ROI) extraction, and optional ROI classification while cabled to shore and an external computer via Ethernet. Additional environmental sensors can be interfaced with CPICS-1000-e for a complete stand-alone package.

Combined with other sensors in our OceanCube® multi-instrument observatory, and using our ROI-CLASS® analysis software with state-of-the-art classifiers such as Convolutional Deep Neural Networks (CDNN), the CPICS-1000-e can provide scientists with greater insight into the aquatic environment. This can be used to investigate distributions of plankton species as a function of time, temperature, or other observational data.

Whether for scientific research, aquaculture, or municipal drinking water health and safety, the CPICS-1000-e is the tool that can help get results quickly and accurately.

Specifications:

Illumination

Source:	High output LED ring array
Duration:	50 µs

Pressure Rating

Model CPICS-1000-e:	1000 m
Model CPICS-10,000-e:	10,000 m

Camera system

Color resolution:	24-bits
Image resolution:	6 Megapixels (2736 x 2192)
Maximum frame rate:	Up to 10 fps

Target acquisition and storage (software included)

Camera control:	Exposure and frame rate
Target extraction:	Focus and size thresholds
Embedded processor:	NVIDIA TX2

Image analysis (requires ROI-CLASS® software)

Classification:	Taxon level (e.g. copepod)
Hardware:	Cloud-based or CPICS desktop processor

Data communication

Medium:	Ethernet, WiFi, or RS232 (for additional sensors)
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Power

DC input:	12 V cabled or battery
Current:	7 watts
Battery Life	Std. battery: 6 h (1.6 Ah)
Test cable:	Custom (1m long included)
Connector on housing:	SubConn DBH13M

Dimensions

Length x Diameter:	74 cm x 12 cm
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Weight

In air:	5.4 kg
In water:	4.3 kg



Lens Selection Guide

Magnification	NA	WD	Image Height (mm)	Image Width (mm)	Depth of Field (mm)	Liquid Sample			
						Volume (µL)	Rate (fps)	Hourly Volume (L)	Daily Volume (L)
.16x	0.008	180	40	44	19.7	34672	10	1248.192	29,956 (L)
.9x	0.045	175	11	15	2	330	10	11.88	285 (L)
10x	0.210	51	0.6	0.8	0.006	0.00288	10	0.00010368	2.4 (mL)
20x	0.600	11	0.2	0.13	0.001	0.000026	10	0.000001000	0.013 (mL)