

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) |
|---------|---|

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 |
|--------------------|---------------|

Weight

| | |
|-----------|--------|
| In air: | 5.4 kg |
| In water: | 4.3 kg |



| 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) |
| .9x | 0.045 | 175 | 11 | 15 | 2 | 330 | 10 | 11.88 | 285 (L) |