



Turner CYCLOPS-7 Sensor on AML Secondary Mount User Manual



**Chlorophyll A
(Blue Excitation)**

**Blue-Green Algae
Phycoerythrin (Marine
Cyanobacteria)**

**Version 1.02
19 May 2016**

Revision History

Revision	Date	Description	Author
1.0	15 December 2015	Document Created	ABT
1.01	19 May 2016	Updates	JZ & ABT
1.02	6 April 2017	Added regulatory information section	ABT

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General Description

Turner Designs' CYCLOPS-7 Submersible Sensor is a single-channel fluorometer available for a variety of applications. It outputs an analog voltage proportional to the concentration of the fluorophore, such as Chlorophyll A (Blue Excitation), Blue-Green Algae Phycocyanin (Fresh Cyanobacteria) or Blue-Green Algae Phycoerythrin (Marine Cyanobacteria). The analog voltage output must be correlated to concentration values by calibrating with a standard of known concentration.

The sensor is equipped with an AML Oceanographic black secondary Xchange™ connector. The black locking collar indicates the sensor outputs an analog voltage, and must be used on a dedicated port on the instrument that accepts an analog voltage and converts it to a digital voltage. To retain its calibration, it must remain with the original instrument and used on the port identified on its label.

The depth rating of the sensor is 600 m.



Sensor shown is configured for chlorophyll A detection in port 6 on the sensor endcap.

Shipping and Receiving

Receiving a Sensor

When receiving a new sensor, perform the following steps to ensure the sensor will be ready for deployment when required:

- Inspect the shipping container, looking for signs of damage. Damage to the shipping container could indicate damage to the sensor inside.
- Inspect for damage. The sensor contains fragile components.
 - Check the sensor face for cracks or bends
 - Check the connector for corrosion, dirt, and salt deposits

Returning a Sensor to the Factory

- If shipping for repair or recalibration, obtain an RMA number from the service centre.
- Pack the instrument in its original shipping box to prevent damage during shipping.

An RMA number can be requested using the contact options given in the Support section of this manual.

Communications

The CYCLOPS-7 outputs a signal between zero and five volts. This is fed into an analog interface board inside the instrument that has been calibrated to display this raw value. The equation that converts that voltage into a usable concentration value is listed in the next section.

An easy way to confirm which data stream column corresponds to a particular sensor is to do a simple finger test. Set the instrument to monitor in real-time and observe the outputs. Point the instrument at open space and place a finger 5-6 cm in front of the active LED. The voltage will register the obstruction, increasing as it approaches the sensor face.

Calibrating the Turner CYCLOPS-7

Direct Concentration Calibration

The Cyclops-7 can be calibrated using a single calibration standard which correlates the standard's concentration to the voltage measured for that specific standard:

1. Immerse the sensor in a fresh sample of the intended measurement medium.
2. Power up your instrument, ensuring that the CYCLOPS-7 is plugged into the correct port. Set a suitable sampling rate and enter *MONITOR* mode to stream data in real-time.
3. Measure the voltage from a blank sample. A good blank to use for this application is ultra pure or deionized water.
4. Use a standard of known concentration and create a correlation between the standard's concentration and its voltage output.
5. Once a correlation has been made, use the following equation to calculate concentration values for sample measurements for the calibrated gain:

$$C_{\text{sample}} = \frac{C_{\text{std}}}{\text{Volts}_{\text{std}} - \text{Volts}_{\text{blank}}} (\text{Volts}_{\text{sample}} - \text{Volts}_{\text{blank}})$$

C_{std} = Concentration value of standard used for calibration

C_{sample} = Concentration of sample

$\text{Volts}_{\text{std}}$ = Voltage reading from standard concentration

$\text{Volts}_{\text{sample}}$ = Voltage reading from sample(s)

$\text{Volts}_{\text{blank}}$ = Voltage reading from blank

Calibration Environment

The ideal conditions in which to take measurements and calibrate your sensor are as follows:

1. Sensed area is protected from external light contamination.
2. There are no fluorescing materials present to interfere with the sample readings.
3. There is a consistent spacing of at least 3 in. [7.6 cm] in front of the sensor face.

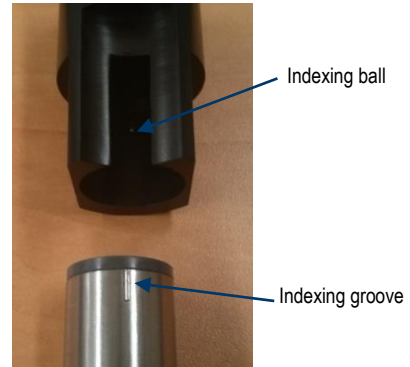
Recommended container materials include acetal and glass. Transparent or translucent containers should be supplemented with an opaque, non-reflective backing or wrap. A suitable example would be a glass beaker wrapped in electrical tape.

Note: When calibrating or taking measurements, ensure that no small bubbles have formed on the sensor face, as these can distort readings. This can be accomplished by wiping the sensor with a non-abrasive cloth once it has entered the sampling medium.

Calibrating Using a Solid Secondary Standard

A Turner Designs Solid Secondary Standard (SSS) is a mechanical enclosure that can be placed over the tip of a CYCLOPS-7 to provide a very stable fluorescent signal. It can be tuned with an adjustment screw to match the signal of a specific sample. Once a correlation between a primary standard and the solid standard has been established, it can be used in place of the liquid primary.

1. Before installing the SSS, ensure that the optical surface of the CYCLOPS-7 is completely clean and dry. The SSS is indexed and must be installed so that the indexing is aligned precisely for proper use.
2. Place the SSS onto the optical end of the CYCLOPS-7.
3. With the SSS fully pressed on, rotate in either direction until you feel the indexing ball click into place on the sensor.
4. Use a flathead screwdriver to unscrew the locking nut as far as it will go.
5. To change the signal level, use the provided green screwdriver and insert the blade through the hole in the locking nut. Use to adjust the signal level as necessary.
6. Once the desired reading has been obtained, screw the locking nut down so that the adjustment screw is held firmly in place.
7. Finish by noting the output voltage and gain setting used in the "Value" space on the SSS label.
8. Note that the response of every SSS is unique. Hence, a new correlation must be determined for every sensor. For future identification, use the "ID" space on the label as a unique identifier for the SSS.



Flush with sensor face and rotated into place.



Small screwdriver to adjust signal screw.



Larger screwdriver to lock signal screw with nut.

Using the Sensor

Pressure Ratings

The CYCLOPS-7 is rated for 600 m deployments, however, the instrument the sensor is used on may be depth limited by its pressure case. **Any deployment should never exceed the lower of these two pressure ratings.**

Caution: Do not exceed the specified pressure ratings of the CYCLOPS-7 sensor or the instrument housing. Overpressure can result in damage to the sensor and the instrument.

Removing the Sensor

- If the sensor has been used in salt water, rinse it in fresh water.
- Dry the sensor before removal to protect the connector.
- Unscrew the locking sleeve.
- Lift the sensor out of the mount.
- Ensure that the instrument socket is dry and clean, using compressed air if necessary.
- Immediately insert the replacement sensor in the open socket

Installing the Sensor

- Match the sensor to its designated port on the instrument.
- Ensure that the instrument socket is clean and dry.
- Check the sensor's O-rings for cleanliness (see below, Inspecting and Replacing the O-Rings).
- Align the sensor to the sensor mount.
- Place the sensor into the mount.
- Rotate the sensor until it drops down into the mount enough to allow the locking sleeve threads to engage the mount threads.
- Screw down the locking sleeve until it stops. The bottom of the sleeve should be within 1 mm of the instrument end cap.

Maintaining the Sensor

Periodic Maintenance

Periodic maintenance will prolong the life of the sensor. The following is recommended:

- If the sensor is dirty or oily, leave it on the instrument. Allow the instrument to soak in warm, soapy water before cleaning with a rag or soft brush. Rinse with fresh water.
- Before each deployment
 - Ensure the sensor is properly seated on the instrument.
 - Ensure the sensor is clean and undamaged.
- After each deployment
 - Clean and rinse the sensor using fresh water.

Care for the Optics

The optical window should be visually inspected after each deployment following a soaking in fresh water. If cleaning is needed, use optical tissue to clean the window with soapy water.

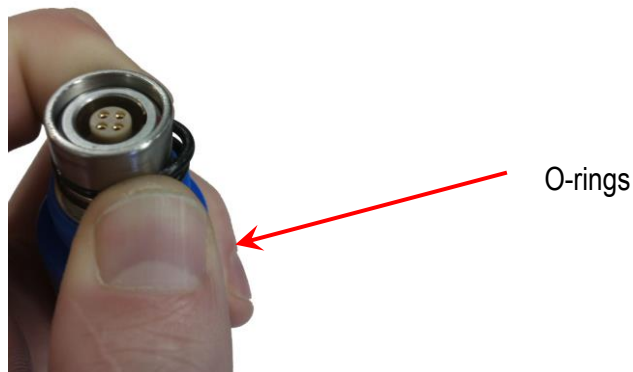
Note: the sensor should not come in contact with any organic solvents (i.e. acetone, methanol) or strong acids or bases.

Inspecting and Replacing the O-rings

It is crucial to keep the sensor's O-rings clean and greased. Any fibres or dirt on or around the O-rings and grooves will allow water into the connector and damage both the sensor and the sensor mount. To gain access to the O-rings, perform the following steps:

- Remove the sensor from the instrument
- The O-rings should be slick with grease. If they are dry, apply silicone grease.
- Inspect the O-rings for dirt. Clean and reapply grease, if necessary
- Inspect the O-rings for nicks and cracks. If any are found, the O-rings must be replaced. Use 2-015-N70D Buna Nitrile O-rings. Apply silicone grease to the new O-rings before using them.

Caution: Do not use a sharp instrument to remove the O-rings. If the O-ring grooves are scratched, the O-rings will not provide a waterproof seal. The O-rings can be removed easily with bare hands as shown below.



O-Ring Removal

Support

Troubleshooting

Instrument fails to detect the sensor:

- Is the sensor properly mounted on the instrument?
- Check the connector on both the sensor and the instrument for corrosion or damaged contacts.
- Cycle the instrument power.

Sensor data is noisy:

- Check the connector on both the sensor and the instrument for corrosion or damaged contacts.
- Is there a nearby source of electromagnetic interference? Examples are arcing brushes on electric motors, radio transmitters, switching power supplies, and faulty cathode ray tube monitors.
- Check the power supply to the sensor for noise. Ideally, the power supply should have less than 30mV of noise.

Contact AML Oceanographic

Service

To request an RMA or technical support

Email: service@AMLOceanographic.com

Phone: 1-250-656-0771

Phone: 1-800-663-8721 (NA)

Fax: 1-250-655-3655

Sales

For all general sales inquiries

Email: sales@AMLOceanographic.com

Phone: 1-250-656-0771

Phone: 1-800-663-8721 (NA)

Fax: 1-250-655-3655

Website

<http://www.AMLOceanographic.com>

Customer Portal

My AML Oceanographic is AML's online data centre. This secure area within our website is designed to offer one easy location for interested individuals and organizations - distributors, customers, prospects, and other members of our community - to manage their interactions with AML. *My AML Oceanographic* will allow you to:

- View and manage your assets (instruments and sensors)
- Consult instrument diagnostic summaries
- View and download calibration and conformity certificates
- View and manage your technical support cases
- Consult and download sales estimates, sales orders, and invoice copies
- View account balances and generate account statements
- Assess inventory availability at AML

To access the Customer Portal, please navigate to the *Support* button - located on the top right of the AML Oceanographic home page - select *Customer Centre* from the options on the drop down menu and follow the instructions provided.

Mailing and Shipping Address

AML Oceanographic
2071 Malaview Ave.
Sidney, BC, Canada
V8L 5X6

Technical Specifications

Fluorometer Performance		
Linearity: 0.99R ²		
Application	Minimum Detection Limit	Static Range
CDOM/FDOM	0.15 ppb** 0.5 ppb***	0-125 ppb** 0-500 ppb***
Chlorophyll in vivo Blue excitation (A) Red excitation (B)	0.025 µg/L 0.5 µg/L	0-50 µg/L >50 µg/L
Fluorescein Dye	0.01 ppb	0-50 ppb
Oil – Crude	0.2 ppb***	0-270 ppb***
Oil – Fine	10 ppb* 10 ppm****	>1,000 ppb* >10 ppm****
Optical Brighteners	0.6 ppb***	0-1,500 ppb***
BGA-Phycocyanin	2 ppb ^{PC}	0-4,000 ppb ^{PC}
BGA-Phycoerythrin	0.15 ppb ^{PE}	0-75 ppb ^{PE}
PTSA Dye	0.1 ppb***	0-65 ppb***
Rhodamine Dye	0.01 ppb	0-100 ppb
Tryptophan	3 ppb	>2,000 ppb
Turbidity	0.05 NTU	0-300 NTU

* 1,5 Naphthalene Disulfonic Disodium Salt

** Quinine Sulfate

*** PTSA (1, 3, 6, 8 - Pyrenetetrasulfonic Acid Tetrasodium Salt)

**** BTEX (Benzene, Toluene, Ethylbenzene, Xylenes)

^{PC} Phycocyanin pigment from Prozym diluted in Deionized water

^{PE} Phycoerythrin pigment from Prozym diluted in Deionized water

Physical Dimensions	Environmental Characteristics
Length x Diameter: 5.7 in (145 mm) x 0.92 in (23 mm)	Temperature Range: Ambient: 0 to 50 °C Water Temp: -2 to 50 °C
Weight: 90 g (0.2 lbs)	Depth Rating: 600 meters

Ordering Codes

Product Code	Description
SEN-CDO-XAN-06	CDOM/FDOM, Turner Cyclops-7 , Analog Output, AML Connector
SEN-CHA-XAN-06	Chlorophyll A (Blue Excitation), Turner Cyclops-7 , Analog Output, AML Connector
SEN-PHYE-XAN-06	Phycoerythrin (Marine Cyanobacteria) Blue-Green Algae, Turner Cyclops-7 E, Analog Output, AML Connector

Other parameters available. Please contact AML for details.

Regulatory Information

This product is compliant within the requirements of CE standards.



Warranty

AML warrants the instrument for a period of TWO YEARS from the date of delivery. AML will repair or replace, at its option and at no charge, components which prove to be defective. The warranty applies only to the original purchaser of the instruments and only to instruments and sensors manufactured by AML Oceanographic. The warranty of third party sensors will apply as per the specific vendor's warranty policy. The warranty does not apply if the instrument has been damaged, by accident or misuse, and is void if repairs or modifications are made by other than authorized personnel.

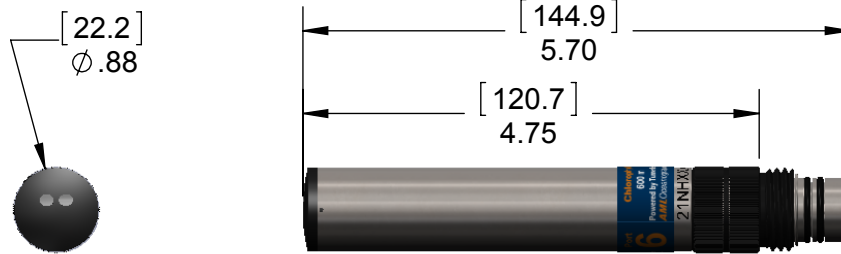
This warranty is the only warranty for new product given by AML. No warranties implied by law, including but not limited to the implied warranties of merchantability and fitness for a particular purpose shall apply. In no event will AML be liable for any direct, indirect, consequential or incidental damages resulting from any defects or failure of performance of any instrument supplied by AML.

DISCLAIMER

AML reserves the right to make any changes in design or specifications at any time without incurring any obligation to modify previously delivered instruments. Manuals are produced for information and reference purposes and are subject to change without notice.

Technical Overview Drawing

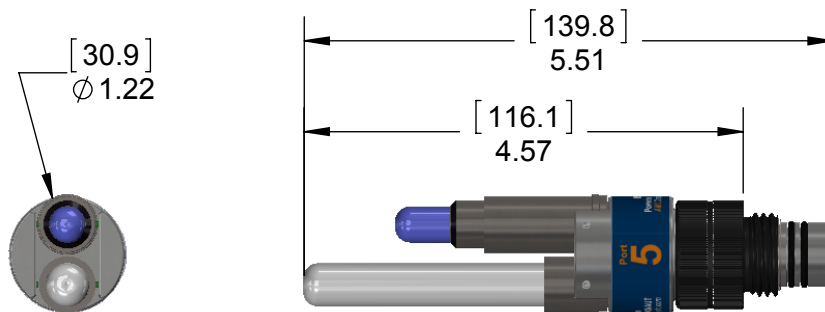
TURNER CYCLOPS-7



NOTES:

1. WEIGHT = 90g (0.20lbs)
2. CHLOROPHYLL AND PORT 5 LABELS SHOWN

IDRONAUT PH




NOTES:

1. WEIGHT = 130g (0.29lbs)
2. PORT 5 LABEL SHOWN

REV	DESCRIPTION	BY	DATE

NOTE: DIMENSIONS ARE IN INCHES [MM]

 <p>2071 MALAVIEW AVE. W., SIDNEY, B.C. CANADA V8L 5X6 PH:(250) 656 0771 FAX: (250) 655 3655 www.AMLoceanographic.com</p>	TITLE SECONDARY OEM MECHANICAL OVERVIEW	
	SYSTEM SENSORS	AML PART NO. VARIOUS
	DATE 09NOV2015	SLDRW NO. SNS-GA-04094
	(Empty space for additional information)	