


Ocean & River Instruments Products Guide

Vol.5

Ocean & River Instruments Division
 **JFE Advantech Co., Ltd.**
JFE

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 **JFE Advantech Co., Ltd.**
JFE

C	Conductivity
T	Temperature
P	Pressure / Depth
DO	Dissolved Oxygen
CHL	Chlorophyll
TBD	Turbidity
pH	pH
PAR	Photosynthetically Active Radiation
ORP	Oxidation-Reduction Potential
COMP	Compass
VEL	Velocity
WH	Wave Height
INCL	Inclination
FSI	Fluorescence Spectral Shift Index
SPECTRA	Spectra

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Harmful Algal Blooms (HABs) Detector **Patented**

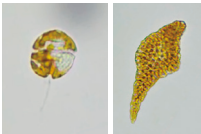
HAI Sensor

AHI-CAD



Features

- 1. Detects harmful species that were undetectable with conventional chlorophyll fluorometer. Target species: *Karenia mikimotoi*/*seriiformis*/*brevis*, *Chattonella antiqua*/*marina*.
- 2. Equipped with a depth sensor, allowing detection of harmful species layers every 10 cm through vertical measurement.
- 3. Estimates cell density using a proprietary algorithm.
- 4. A model equipped with a wiper is also available for telemetry use.
- 5. Effective for monitoring aquaculture fisheries. Early detection of harmful algal blooms (HABs) allows for prompt countermeasures such as stopping feeding and moving aquaculture rafts.
- 6. Utilizes a handy terminal with a proven track record in AAQ-RINKO, allowing immediate on-site confirmation of the presence of harmful species. *Detection results are not 100% guaranteed. Please confirm the presence of harmful species through water sampling and microscopy.



Overview

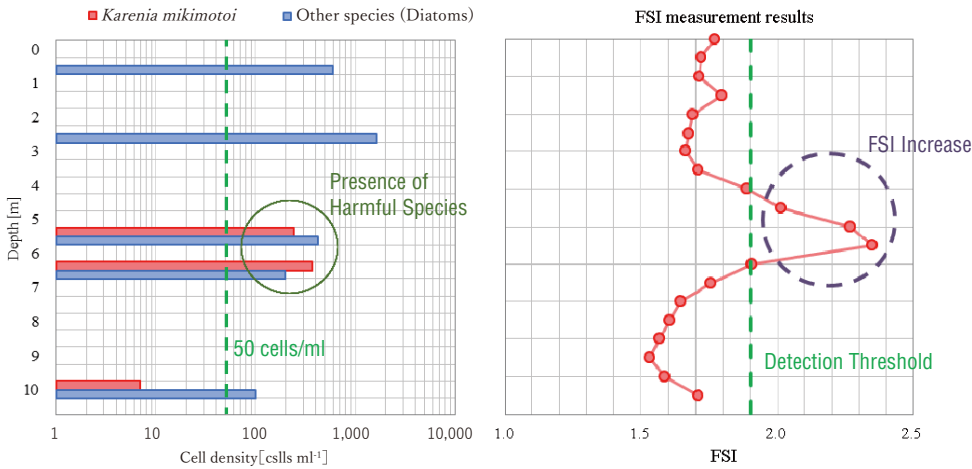
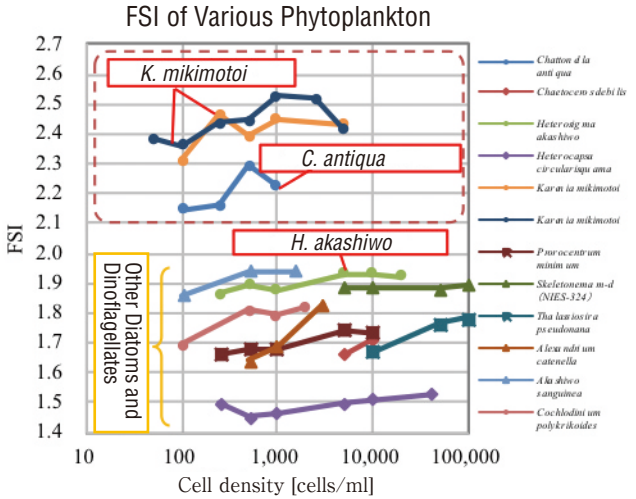
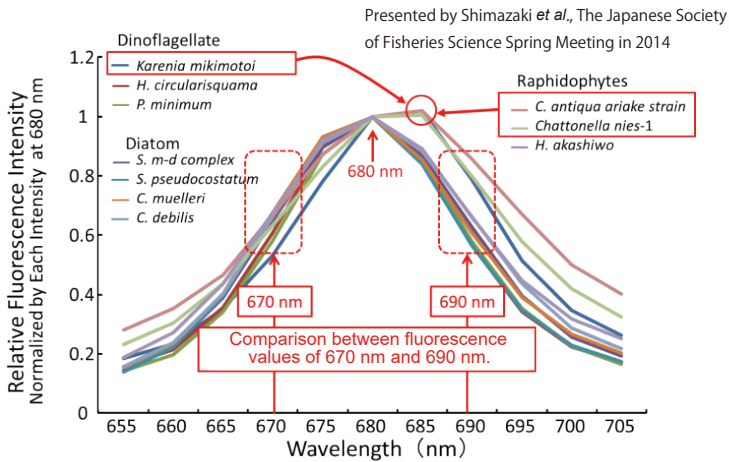
The HAI sensor utilizes the shift in the peak of the fluorescence spectrum to identify harmful phytoplankton species, specifically *Karenia mikimotoi*/*seriiformis*/*brevis*, and *Chattonella antiqua*/*marina*, which are representative of HABs. These HABs, particularly those caused by *Karenia mikimotoi*/*seriiformis* and *Chattonella antiqua*/*marina*, occur in coastal areas with active aquaculture and can cause massive mortality of farmed fish and shellfish, leading to significant damage to fisheries. Therefore, fishery operators need to exercise special vigilance. Previously, fisheries laboratories and research institutions took considerable time to determine the species by examining samples collected from the field under a microscope. However, with the introduction of this instrument, fishery operators can conduct observations themselves, enabling easy and rapid identification. This allows for preemptive measures to be taken, thereby reducing the damage caused by HABs. Additionally, the device allows for early prediction of the onset and cessation of HABs, leading to more accurate feeding decisions for farmed fish. This results in more efficient farming and is expected to increase the quantity of fish available for shipment.

Measurement Principle

The presence of *Karenia mikimotoi*/*seriiformis*/*brevis* and *Chattonella antiqua*/*marina* in the water is detected using an index that indicates the shift in the fluorescence spectrum (FSI*).
*FSI (Fluorescence Spectral Shift Index): Derived from the ratio of fluorescence intensities at wavelengths 670 nm and 690 nm.

Index Indicating the Shift in Fluorescence Spectrum "FSI (Fluorescence Spectral Shift Index)"

690 nm Fluorescence / 670 nm Fluorescence



The left graph shows relative fluorescence intensity for various phytoplankton species. The right graph shows an example of species composition analyzed by water sampling and microscope: a bloom of *Karenia mikimotoi* in the mid-water column (green circle), where the light green dashed line denotes a 50 cells/ml threshold. The right panel shows the FSI estimated using the HAI sensor for the same period. The light green dashed line denotes the FSI threshold of approximately 1.9, and the purple dashed circle denotes the FSI estimated when the concentration of *Karenia mikimotoi* surpasses 50 cells/ml, indicating a possible harmful algal bloom is on its way.
**Depending on conditions such as the density of other dominant species, the fluorescence spectral characteristics may not be detected well due to the influence of other species.

Sensor Specifications

Parameter	FSI	Chlorophyll	Pressure (Depth)	Temperature
Sensor Type	Fluorescence Intensity Ratio Measurement	Fluorescence Measurement	Semiconductor Pressure	Thermistor
Range	—	0 to 400 ppb (Uranine reference)	0 to 0.5 MPa (equivalent to 0 to 50 m)	-3 to 45°C
Accuracy	Reproducibility ±0.05 (0 to 200 ppb)	Non-linearity ±1% FS (0 to 200 ppb)	Non-linearity ±0.1% FS, Reproducibility ±0.3% FS	±0.02°C (3 to 31°C)
Pressure Resistance	Equivalent to 50 m depth			
Dimensions	Approx. $\phi 70$ mm \times 176 mm (excluding cable)			
Weight	Approx. 0.8 kg in air / Approx. 0.4 kg in water (excluding cable)			
Cable Length	30 m (maximum 50 m)			

Handy Terminal (D-10H)

Screen	5-inch color LCD
Operation Method	Touch panel and touch buttons on screen
Display Content	Time information, GPS information, measurement data
Memory Type	512 MB built-in memory (15 million data points)
Measurement Method	Continuous measurement (fixed 0.1 sec interval)
Calendar Information	Built-in (automatically corrected by GPS)
Power Supply	Built-in rechargeable lithium-ion battery
Dimensions	W126 mm \times H215.7 mm \times D33 mm
Weight	Approx. 0.7 kg
Dust and Waterproof Function	Protection rating IP 67 (when connector cap is tightened)
Alarm Function	Screen flashes when set values are exceeded (excluding temperature and chlorophyll)

Vertical Graph Sample

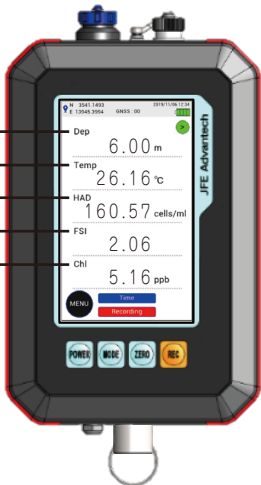
The vertical graph display allows you to check the depth of dispersal of harmful species at a glance. When the threshold (black line) is exceeded, the background color flashes yellow.



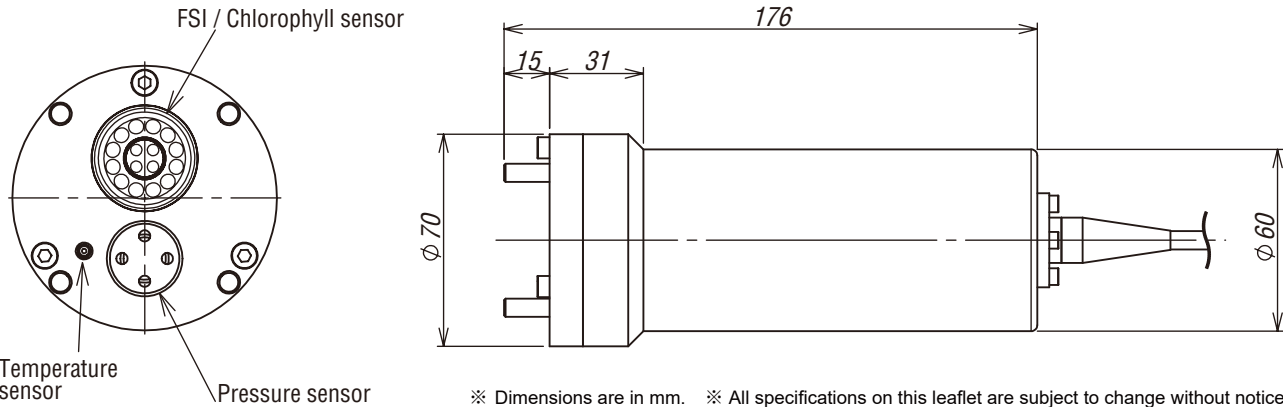
Screen Sample

Depth
Temperature
Estimated Cell Density (HAD)
FSI
Chlorophyll Concentration (Chl)

Chl is the output value of the HAI sensor converted to the equivalent of AAQ-RINKO.
*Chl is for reference only and is not guaranteed for accuracy."



Drawings



※ Dimensions are in mm. ※ All specifications on this leaflet are subject to change without notice

Multi-Exciter
INFINITY-ME



Chlorophyll Fluorometer Capable of Species Composition Classification

The multi-wavelength excitation fluorometer measures the fluorescence characteristics of phytoplankton, allowing you to determine not only the biomass but also the species (community) composition that constitutes the biomass. This multi-wavelength excitation fluorometer enables simultaneous measurement of "biomass and species composition," which was not possible with conventional chlorophyll fluorometers.

Measurement Principle

Unlike conventional chlorophyll fluorometers, this instrument excites phytoplankton using nine different wavelengths and measures their fluorescence characteristics (excitation fluorescence spectra). Phytoplankton exhibit characteristic pigment compositions for each community (group) and possess different fluorescence characteristics. Therefore, the measured fluorescence characteristics can provide information on species composition (such as diatom, dinoflagellate, cyanobacteria, cryptophyta, etc.). By inputting the fluorescence characteristics of each species obtained using this instrument into the software and performing mathematical processing, the biomass of each species can be estimated.

Sensor Specifications

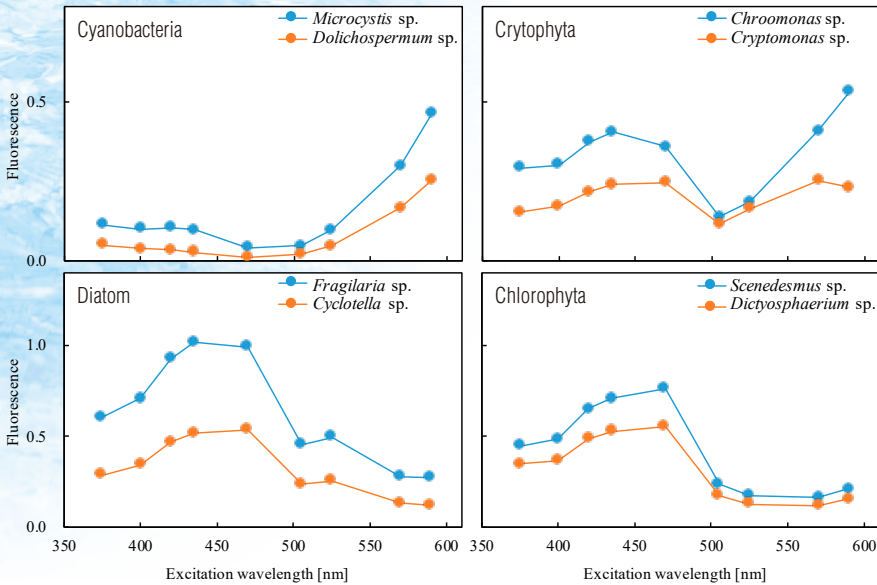
Table with 5 columns: Parameter, Excitation Spectrum, Turbidity, Pressure (Depth), Temperature. Rows include Sensor Type, Excitation Light Wavelengths, Range, and Accuracy (Reproducibility).

*1 The output at 570 nm excitation light wavelength for 100 ppb Rhodamine WT is set to 100, and other wavelengths are standardized according to the characteristics of Rhodamine WT.
*2 Calibration range is 3°C to 31°C

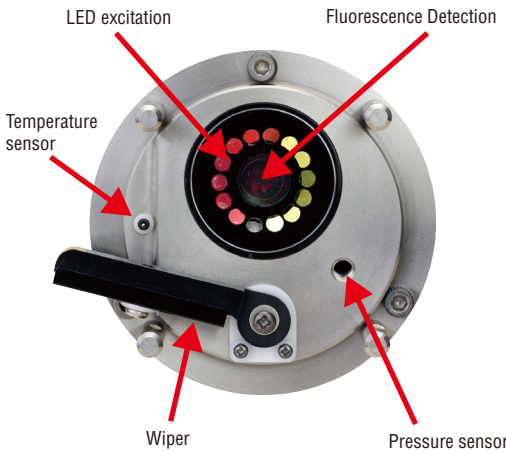
SPECTRA T P TBD

Features

- 1. Multi-wavelength excitation using 9 wavelengths
2. High-sensitivity fluorescence measurement even in high-concentration environments
3. Automatic species composition analysis via software
4. Fluorescence characteristics library function for species composition analysis
5. Standard equipped with biofouling prevention wiper
6. Equipped with turbidity, water temperature, and depth sensors
7. Enables simultaneous observation of "biomass and species composition," which was not possible with conventional chlorophyll fluorometers
8. Equipped with wavelengths suitable for the observation of algae (such as cyanobacteria), specifically 570 nm and 590 nm.



Excitation Fluorescence Spectra of Various Phytoplankton
*The basic spectra of plankton in the graph is available



More Accurate and Versatile

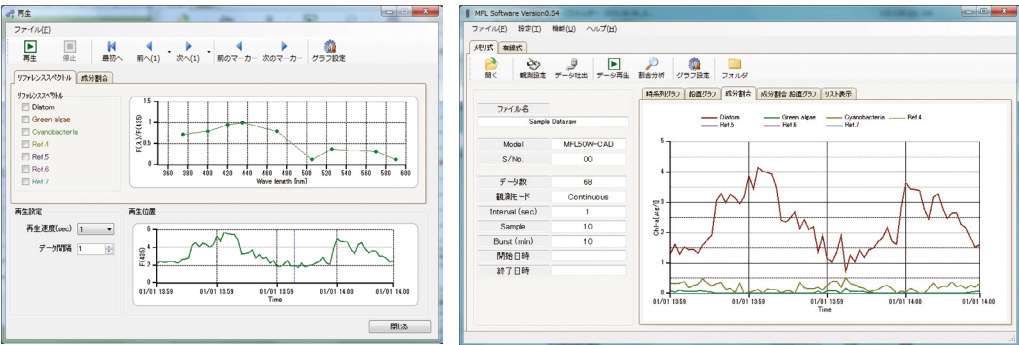
The use of 9 wavelengths for excitation light enhances the wavelength resolution of fluorescence characteristics, significantly reducing the impact of turbidity (scattered light), which can cause noise in fluorescence measurements. This allows for more accurate species composition analysis. The standard-equipped biofouling prevention wiper function ensures reliable long-term continuous measurements even in biologically active coastal areas. Additionally, the instrument is equipped with turbidity, water temperature, and pressure sensors, making it suitable for a wide range of observational purposes with a single unit. We offer a cable type digital output model for real-time observation and easy integration into other platforms, as well as a data logger model with memory for automatic measurement recording, catering to a broad spectrum of observational needs.

Main Specifications

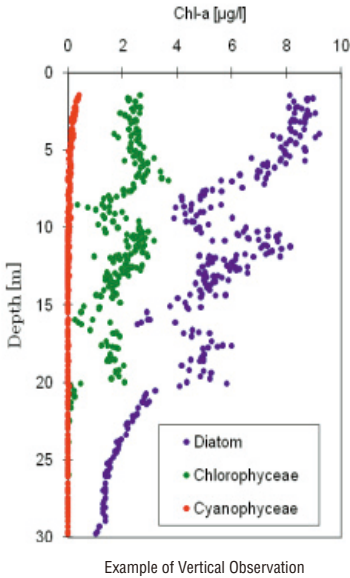
Table with 5 columns: Type, Logger Type, Cable Type *1, and two additional columns for depth ranges. Rows include Depth Range, Model, Communication Method, Recording Medium, Mode, Observation Conditions, Power Supply Voltage, Current Consumption / Power Consumption, Dimensions, Weight, Material, and Pressure Resistance.

*1 Capacity 3.3 Ah. Up to 4 batteries can be used.
*2 Except for the pressure sensor. The pressure resistance of the pressure sensor follows each measurement depth range.

Data Recording Software

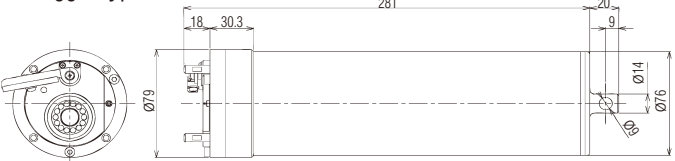


Measurement Data Screen
Excitation Spectrum (Top) and Time Series of Chlorophyll Fluorescence (Bottom)
Optimization Method: Non-Negative Least Squares (NNLS)
Species Composition Analysis Screen
Estimated Biomass of Diatom, Chlorophyta and Cyanobacteria

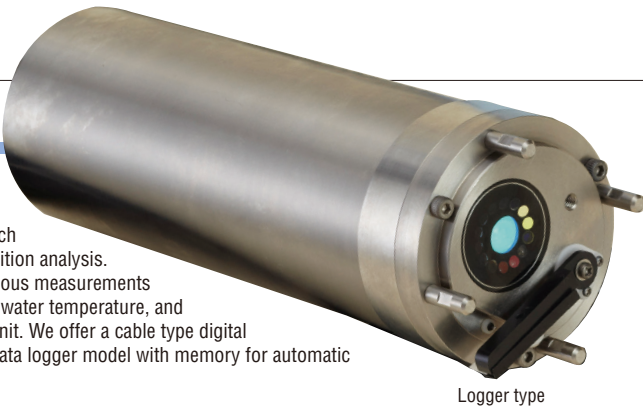
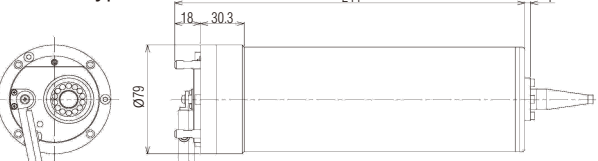


Drawing

Logger type



Cable type





INFINITY-EPSA

Easy Power Supply and Access

The INFINITY-EPSA is a compact, high-precision data logger that utilizes wireless LAN communication.

It does not require a dedicated cable for communication with a PC, nor does it necessitate removing the internal unit from the pressure-resistant housing.

This makes setting up observations and retrieving recorded data extremely convenient.

The power supply uses either AA alkaline batteries or lithium batteries, both of which are readily available.

Additionally, it is equipped with LEDs, allowing you to visually confirm the status while measuring

Wireless LAN Communication

Communication with the main unit is possible through the built-in wireless LAN function of the PC. There is no need to remove the internal unit from the pressure-resistant housing as was previously required. Using a wireless LAN adapter with an antenna allows for smooth communication without switching connections during use. Even while measuring, you can check the status (battery voltage, measuring or standby) via wireless communication without stopping the main unit. In environments where wireless LAN communication is not available, direct communication with the PC via a USB cable can be used.

As of January 2025, wireless communication is available in the United States and Canada.



for Standard Model

for Long Model

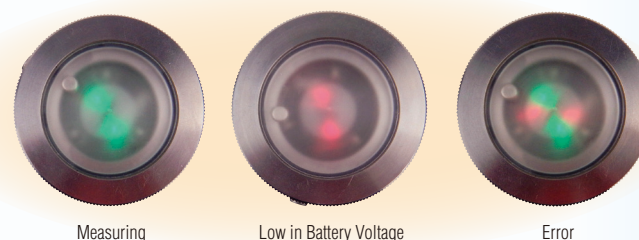


Battery

A detachable battery box is employed, making battery installation and replacement extremely easy. The device can use three types of commercially available batteries: AA 1.5 V alkaline batteries, 1.5 V lithium batteries, and 3.6V lithium batteries. We offer two models: the standard model, which can hold up to six batteries, and the long model, which can hold up to twelve batteries.

Operation Confirmation via LED

The green LED blinks during wireless LAN communication with the PC. The green LED stays lit while measuring (recording). When the battery voltage is low or an abnormality occurs, the red LED blinks to notify you of the instrument's status.



Measuring

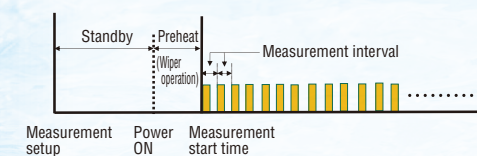
Low in Battery Voltage

Error

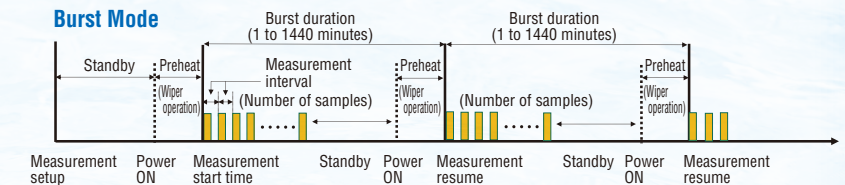
Measurement Modes

The INFINITY-EPSA offers two types of measurement modes: continuous mode and burst mode. It is capable of handling short-term observations as well as continuous observations for up to one year.

Continuous Mode



Burst Mode



Communication Speed

The time required to transfer three months' worth of data collected with a burst of 10 minutes and 10 samples per burst.

EPSA (USB communication) Approx. 85 sec

64% faster

EPSA (wireless communication) Approx. 159 sec

36% faster

INFINITY Approx. 237 sec

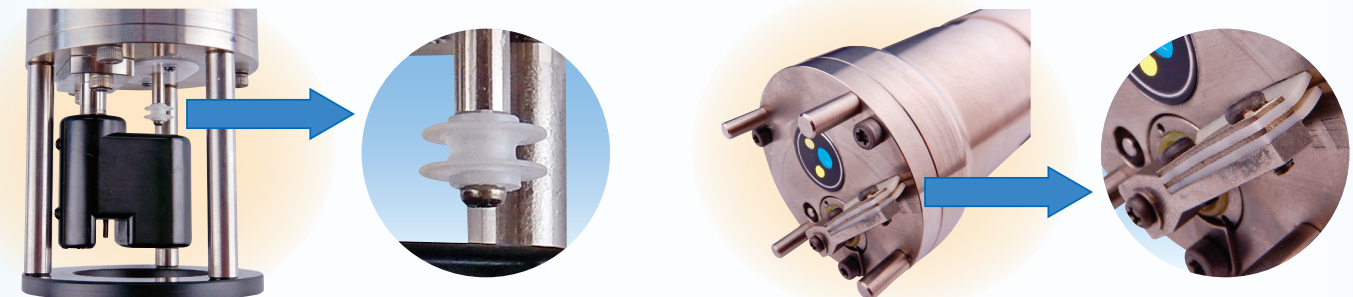
Measurable Duration

Model	Measurable Duration		
	Alkaline battery 1.5V	Lithium battery 1.5V	Lithium battery 3.6V
ACLW-WFU/WFUX	Approx. 56 days	Approx. 96 days	Approx. 120 days
ACLW-WFU-L/WFUX-L	Approx. 112 days	Approx. 193 days	Approx. 241 days
ACTW-WF/WFX	Approx. 34 days	Approx. 59 days	Approx. 74 days
ACTW-WF-L/WFX-L	Approx. 69 days	Approx. 118 days	Approx. 148 days
AROW-WFU/WFUX	Approx. 41 days	Approx. 71 days	Approx. 88 days
AROW-WFU-L/WFUX-L	Approx. 82 days	Approx. 142 days	Approx. 177 days
ATU75W-WF/WFX	Approx. 50 days	Approx. 86 days	Approx. 107 days
ATU75W-WF-L/WFX-L	Approx. 100 days	Approx. 172 days	Approx. 215 days

Burst mode: Burst 10 min, Interval 1 sec, 10 Samples, 10 min wiper, LED ON.

Anti-Biofouling Wiper

Dual-blade wiper has enhanced the cleaning capability.



Mooring Bracket (Optional)

dedicated mooring bracket that supports both horizontal and vertical mooring.



Option A



Option B



Usage examples

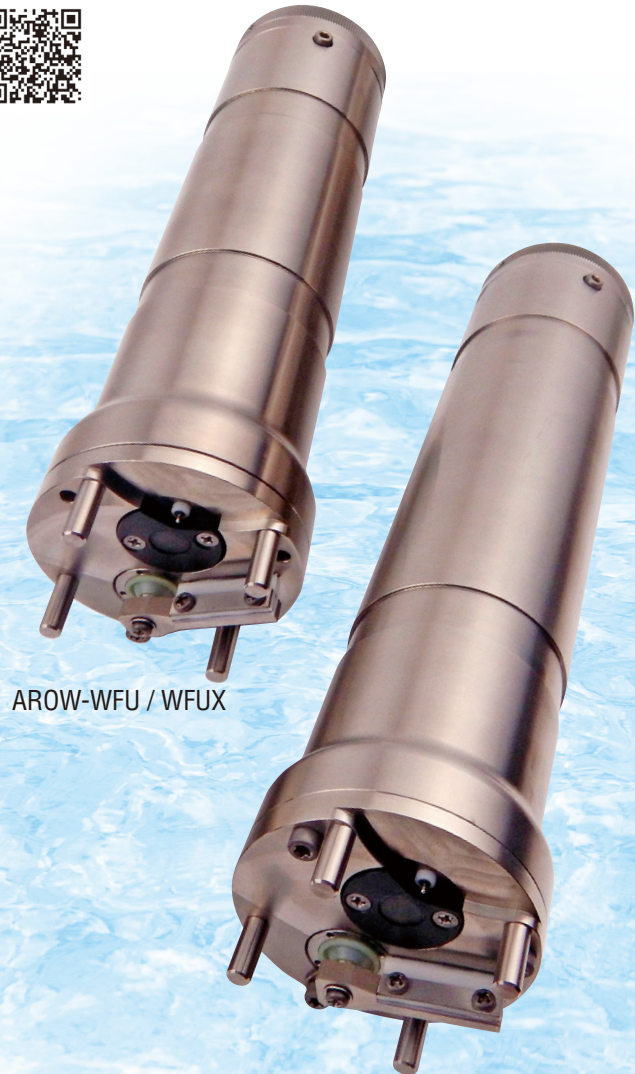
Optical Dissolved Oxygen Logger with Wiper

T

DO

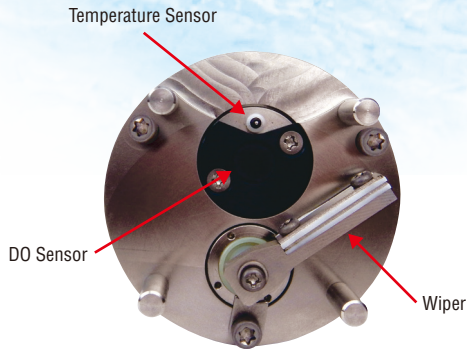
EPSA-RINKO

AROW-WFU / WFUX,
AROW-WFU-L / WFUX-L



AROW-WFU / WFUX

AROW-WFU-L / WFUX-L



Overview

The EPSA-RINKO is a logger type DO sensor with a wiper designed for long-term continuous observation, equipped to clean dirt, including biological fouling, from the optical DO sensor. It employs a long-term stable oxygen detection membrane, resulting in minimal changes over time and eliminating the need for frequent replacement of the electrolyte or membrane, as required by galvanic electrode-type DO sensors.

The EPSA-RINKO has improved cleaning capability by using dual wiper blades.

Sensor Specifications

Parameter	DO	Temperature
Sensor Type	Optical	Thermistor
Range	0 to 200%	-3 to 45°C
Resolution	0.01% *	0.001°C
Accuracy	Non-linearity ±2% FS	±0.02°C (3 to 31°C)

*Standard value near 100% saturation

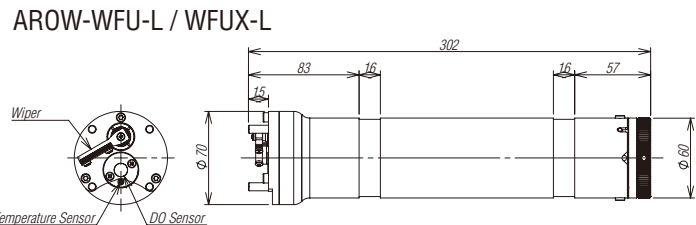
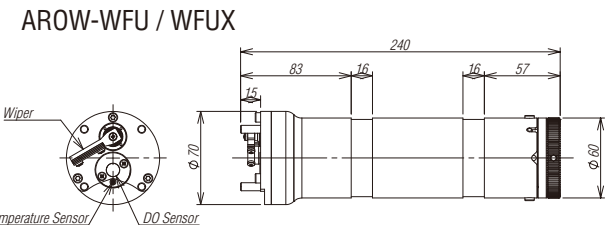
Logger Specifications

Model ¹	AROW-WFU / WFUX	AROW-WFU-L / WFUX-L
Memory Type	Built-in Flash Memory	
Memory Capacity	1GB / Approx. 15 million data	
Mode	Continuous Mode / Burst Mode	
Interval	0.5 to 600 sec	
Burst	1 to 1,440 min	
Number of Samples	1 to 18,000	
Battery	AA Alkaline Battery / AA Lithium Battery	
Number of Batteries	6 (Standard type)	12 (Long type)
Communication Method	Wireless LAN Communication (Compliant with IEEE802. 11n) ² , USB Communication (Compliant with Ver. 2.0, Equivalent to Ver. 1.1), Connector: USB Type-C	
Housing Material	Titanium Grade 2	
Dimensions	φ70 mm × 240 mm	φ70 mm × 302 mm
Weight	Approx. 1.4 kg in air, 0.8 kg in water	Approx. 1.8 kg in air, 1.0 kg in water
Pressure Resistance	Equivalent to 200 m depth	

¹ AROW-WFU and AROW-WFU-L are models having wireless LAN communication. AROW-WFUX and AROW-WFUX-L are models not having wireless LAN communication.

² As of January 2025, wireless communication is available in the United States and Canada.

Drawing



Conductivity and Temperature Logger with Wiper

C

T

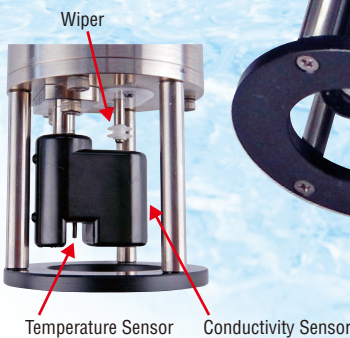
EPSA-CTW

ACTW-WF / WFX, ACTW-WF-L / WFX-L

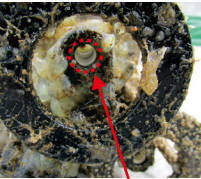


ACTW-WF / WFX

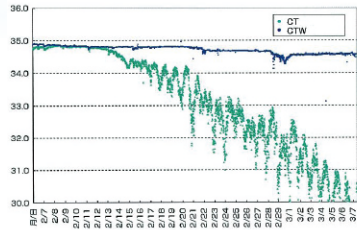
ACTW-WF-L / WFX-L



Wiper Effect Example Observation Result Example



Removal of Biofouling in the Inner Tube



Overview

In general, electrical conductivity sensors are highly sensitive to fouling, including biological fouling. Long-term continuous observation typically requires maintenance every 1 to 2 weeks, which can be labor-intensive.

The salinity sensor of the EPSA-CTW employs an in-tube electrode sensor that is completely unaffected by external fouling. Additionally, the in-tube area is automatically cleaned with a piston-type wiper after each measurement, allowing for stable data collection even without maintenance for 2 to 3 months.

The EPSA-CTW has improved cleaning capability by using dual wiper blades.

Sensor Specifications

Parameter	Temperature	Conductivity
Sensor Type	Thermistor	7-Electrode Type
Range	-3 to 45°C	0.5 to 70 mS cm ⁻¹ *
Resolution	0.001°C	0.001 mS cm ⁻¹
Accuracy	±0.01°C (0 to 35°C)	±0.01 mS cm ⁻¹ *

*Calibration is performed using seawater (in the range of 28 to 65 mS/cm). For use in freshwater, please contact us.

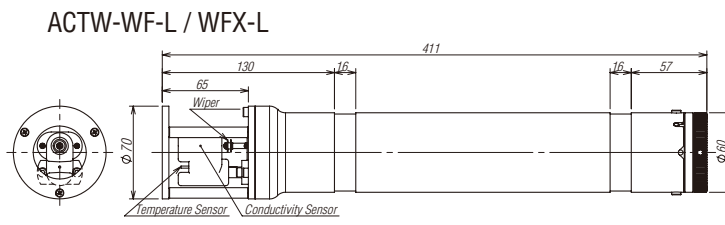
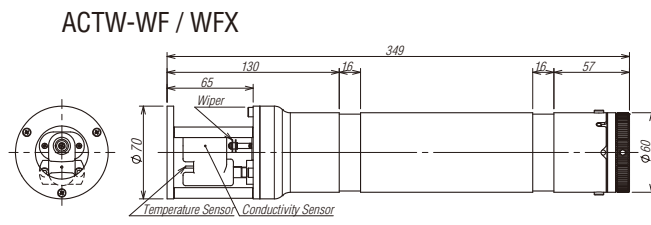
Logger Specifications

Model ¹	ACTW-WF / WFX	ACTW-WF-L / WFX-L
Memory Type	Built-in Flash Memory	
Memory Capacity	1GB / Approx. 15 million data	
Mode	Continuous Mode / Burst Mode	
Interval	0.1 to 600 sec	
Burst	1 to 1,440 min	
Number of Samples	1 to 18,000	
Battery	AA Alkaline Battery / AA Lithium Battery	
Number of Batteries	6 (Standard type)	12 (Long type)
Communication Method	Wireless LAN Communication (Compliant with IEEE802. 11n) ² , USB Communication (Compliant with Ver. 2.0, Equivalent to Ver. 1.1), Connector: USB Type-C	
Housing Material	Titanium Grade 2	
Dimensions	φ70 mm × 349 mm	φ70 mm × 411 mm
Weight	Approx. 1.7 kg in air, 0.9 kg in water	Approx. 2.2 kg in air, 1.2 kg in water
Pressure Resistance	Equivalent to 500 m depth	

¹ ACTW-WF and ACTW-WF-L are models having wireless LAN communication. ACTW-WFX and ACTW-WFX-L are models not having wireless LAN communication.

² As of January 2025, wireless communication is available in the United States and Canada.

Drawing



Chlorophyll and Turbidity Logger with Wiper

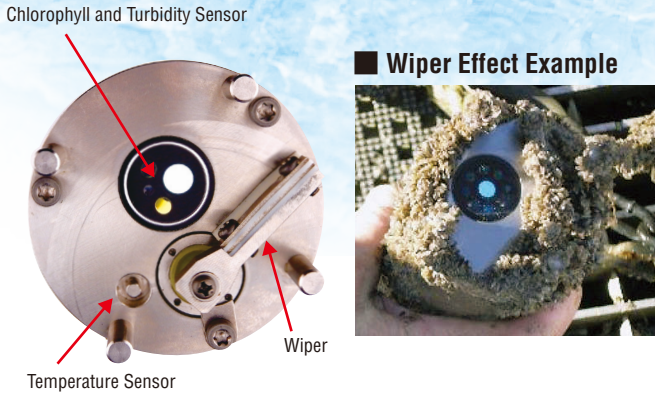
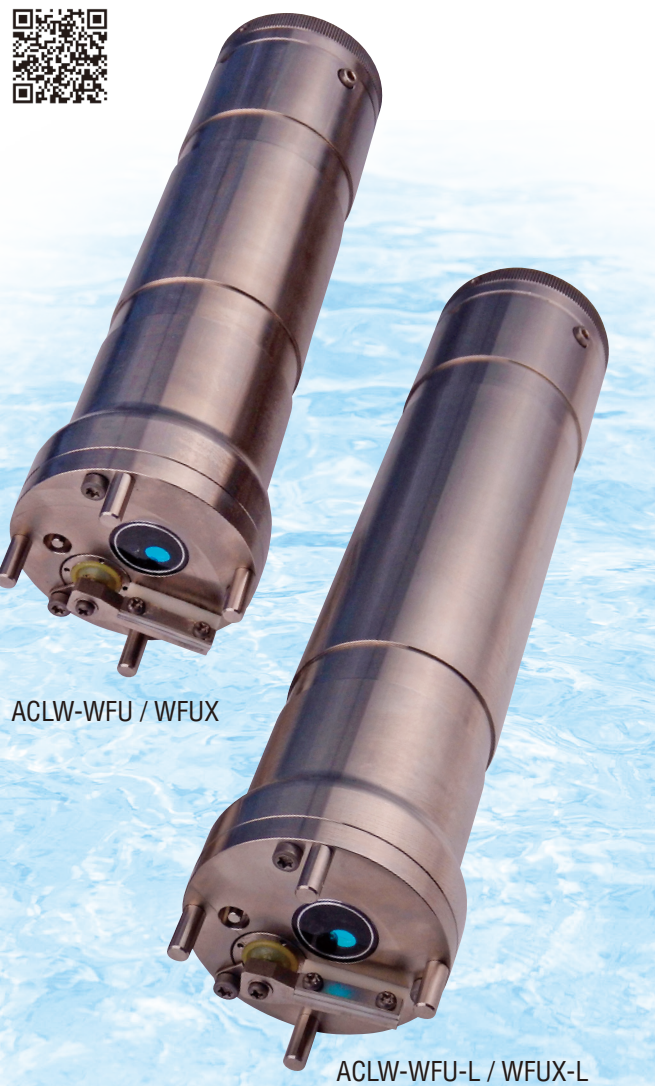
T

CHL

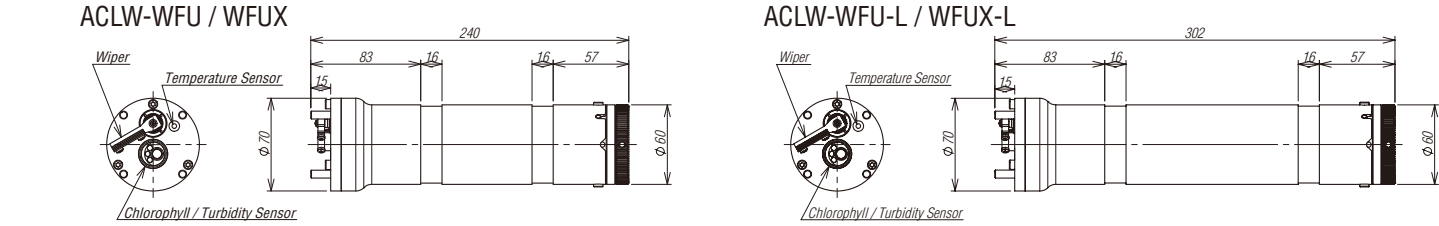
TBD

EPSA-CLW

ACLW-WFU / WFUX, ACLW-WFU-L / WFUX-L



Drawing



Wide Range Turbidity Logger with Wiper

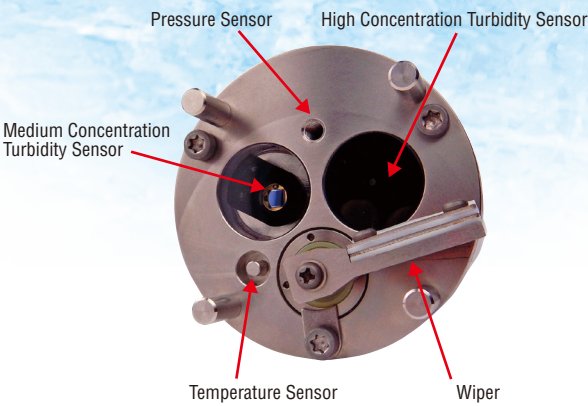
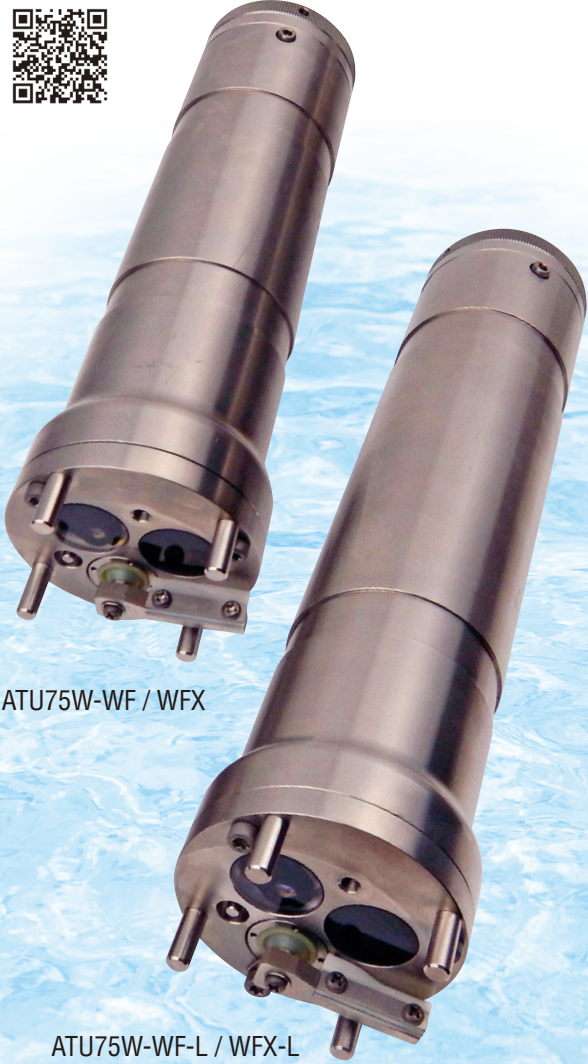
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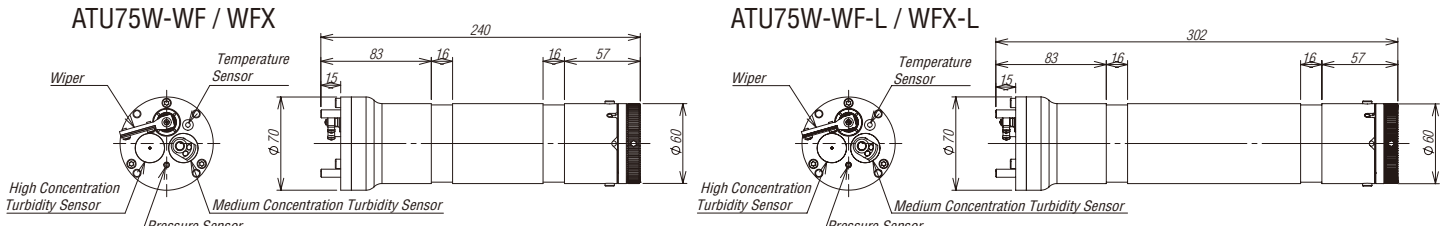
TBD

EPSA-Turbi

ATU75W-WF / WFX, ATU75W-WF-L / WFX-L



Drawing



UV Anti-Biofouling UV-C LED

AUL-BAT / CA

Overview

The UV-C LED is ultraviolet light (UV-C) irradiation equipment that can be attached to INFINITY-EPSA and INFINITY series (cable type). One of the major drawbacks of sensors in natural water is occurrence of biofouling – a phenomenon consisting of aggregation and adherence of organisms onto the sensing parts. This can negatively affect measurement accuracy.

UV-C is a non-toxic biofouling control for oceanographic sensors which is very effective to eliminate biofouling. Application of UV-C together with a mechanical wiper will not only keep sensors free of biofouling for a longer time, but it will also protect sensors from being covered by inorganics during long term observations.

Important Note

- 1) The UV-C LEDs can be only used with sensors that are treated against UV light degradation. If you wish to add UV-C LEDs to your existing instruments, please contact us in advance.
- 2) Do not look at the UV-C lighting part directly. Also, do not light the irradiated UV-C to your skin.

UV-C light Specifications

Peak wavelength	265 nm
Current consumption	Approx. 2 W (when irradiating)
Dimension	φ28 mm × 66 mm
Risk group	3 (IEC62471)
Depth rating	Equivalent to 200 m depth
Irradiation duty ¹	Approx. 2 % (standard setting)

¹Pulsed light is irradiated continuously at regular intervals. The irradiation interval is set at 2 % as default. However, the setting can be changed at our factory if requested.

Battery unit Specifications

Dimension	φ45 mm × 250 mm
Weight	Approx. 0.58 kg (excluding batteries)
Battery	3 D-cell lithium batteries (SAFT: LS33600STD)
Battery life ²	Approx. 6 months
Depth rating	Equivalent to 200 m depth

²Irradiation duty 2 % (at 25 °C at 1 atm in air)

Only wiper

Wiper+UV-C



Compatible Models and Attachment Examples

Compatible models

- ACLW-WFU/WFUX
- ACLW-WFU-L/WFUX-L
- AROW-WFU/WFUX
- AROW-WFU-L/WFUX-L

UV-C light + Battery unit

Compatible models

- ACTW-WF/WFX
- ACTW-WF-L/WFX-L

2×UV-C lights + Battery unit + Junction box

Compatible models

- ACTW-WF/WFX
- ACTW-WF-L/WFX-L

2×UV-C lights + 2×Battery units

Compatible models

- ACLW2-CARU/CADU
- AROW2-CARU/CADU

UV-C light + Junction box

Compatible models

- ACLW2-CARU/CADU
- AROW2-CARU/CADU

UV-C light + 20 m pigtailed cable

Compatible models

- ACTW-CAR/CAD

2×UV-C lights + Junction box

Compatible models

- ACTW-CAR/CAD

2×UV-C lights + 2×20 m pigtailed cables

Note: The actual connector type and cable length may differ from the illustrations.

Electro-Magnetic Current Meter INFINITY-EM

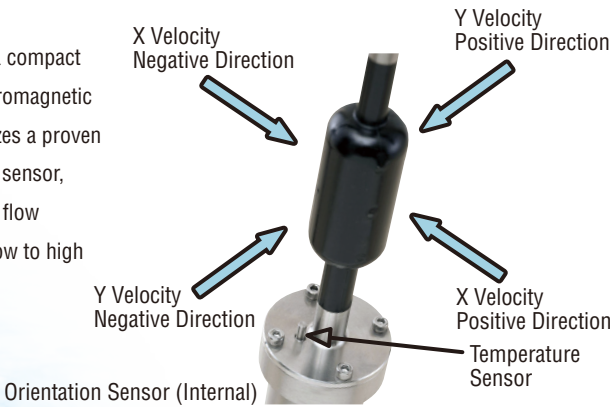
AEM-USB

VEL COMP T



Overview

The INFINITY-EM is a compact and lightweight electromagnetic current meter. It utilizes a proven electromagnetic flow sensor, allowing for accurate flow measurement from low to high flow velocities.



Sensor Specifications

Parameter	Velocity*	Orientation	Temperature
Sensor Type	2-axis Electromagnetic Induction	Hall Element	Thermistor
Range	0 to ±500 cm s ⁻¹	0 to 360°	-3 to 45°C
Resolution	0.02 cm s ⁻¹	0.01°	0.001°C
Accuracy	±1 cm s ⁻¹ or ±2% *	±2°	±0.02°C (3 to 31°C)

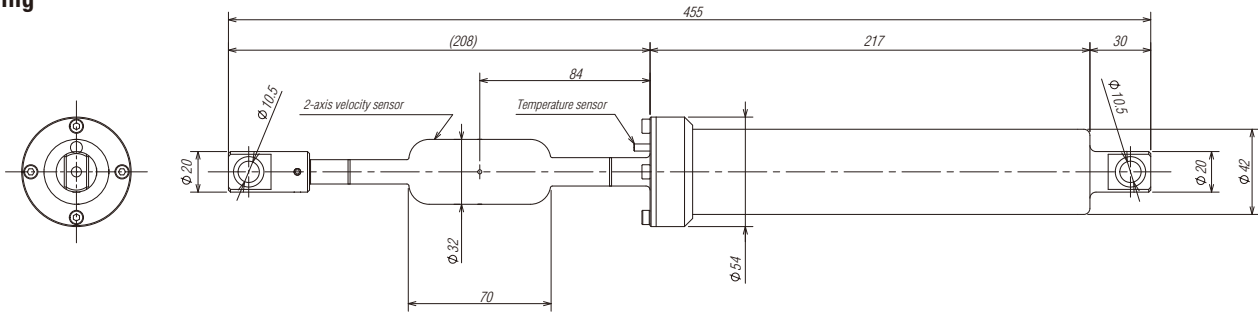
*Velocity calibration range is 0 to ±60 cm s⁻¹.

Logger Specifications

Memory Type	microSD card (waterproof high-speed spec)
Memory Capacity	1GB
Mode	Continuous Mode / Burst Mode
Interval	0.1 to 600 sec
Burst	1 to 1,440 min
Number of Samples	1 to 18,000
Battery	CR-V3 Lithium Battery / 3.3 Ah (Up to 2) AA Alkaline Battery (Up to 4) - Requires AA adapter kit AA Lithium Battery (Up to 4) - Requires AA adapter kit
Communication Method	USB Communication (Compliant with Ver. 2.0, Equivalent to Ver. 1.1)
Housing Material	Titanium Grade 2
Dimensions	φ42 mm (Flange part φ54 mm) × 455 mm
Weight	Approx. 1.0 kg in air / 0.6 kg in water
Pressure Resistance	Equivalent to 1,000 m depth
Tensile Strength	Approx. 2 kN (equivalent to 200 kg)

*Please use the flow velocity sensor in an upward-facing position.

Drawing

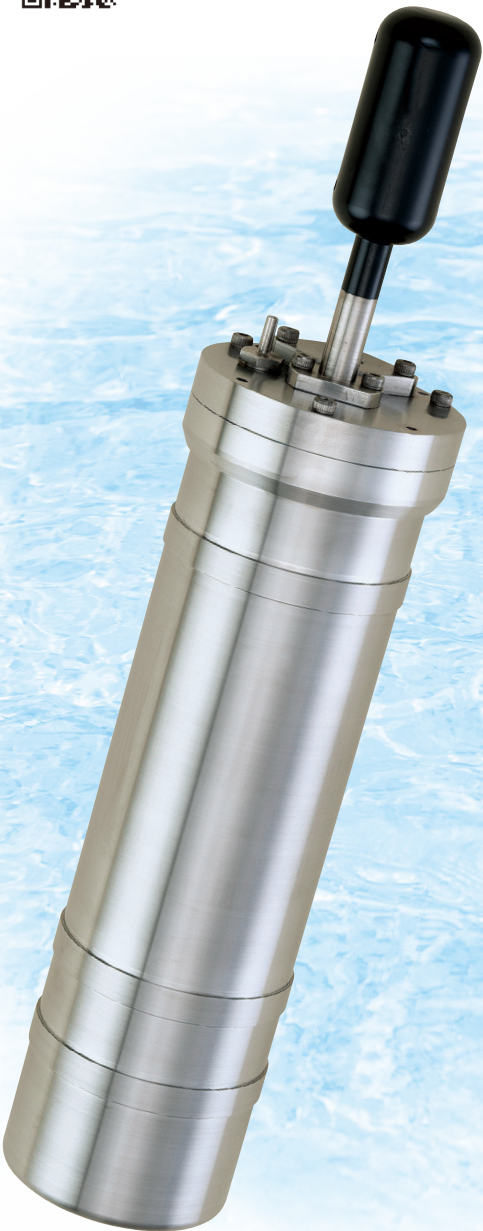


Electro-magnetic Current Meter for Deep Ocean

INFINITY-Deep

VELCOMPINCLTP

AEMD-USB



Overview

INFINITY-Deep is an autonomously deployable data logger for current speed measurements in deep oceans. The currents in deep oceans are very weak.

It is very difficult to accurately measure the deep-water currents using some ADVs that detect the Doppler-effect by scatter with the suspended particles in the water, because the concentration is very low. INFINITY-Deep measures 2-D current data through a magnetic field according to Faraday's law.

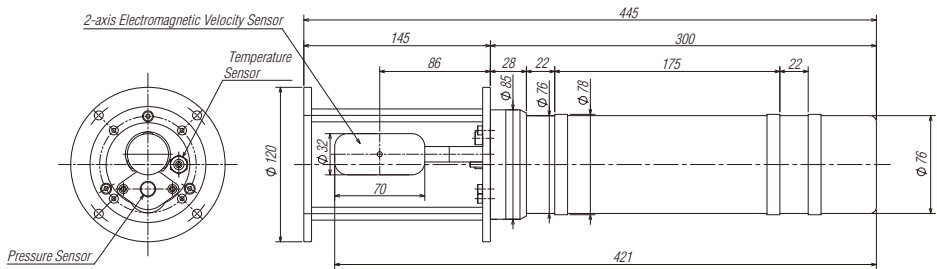
Therefore, even if the suspended particles do not exist around the sensor, it can provide the accurate current data. The depth rating is 6,000m. Compared to INFINITY-EM, the instrument has a depth and a tilt sensor to monitor mooring status. Also, the battery capacity doubles for long-term current velocity measurements.

Sensor Specifications					
Parameter	Velocity*	Orientation	Inclination	Pressure	Temperature
Sensor Type	2-axis Electromagnetic Induction	Hall Element	2-axis Type	Semiconductor Pressure	Thermistor
Range	0 to ±100 cm s ⁻¹	0 to 360°	0 to ±30°	0 to 60 MPa	-3 to 45°C
Resolution	0.02 cm s ⁻¹	0.01°	0.01°	0.002 MPa	0.001°C
Accuracy	±1 cm s ⁻¹ or ±2%*	±2°	±1°	±0.3% FS	±0.02°C (0 to 35°C)

*Velocity calibration range is 0 to ±60 cm s⁻¹.

Logger Specifications	
Memory Type	microSD card (waterproof high-speed type)
Memory Capacity	1GB
Mode	Continuous Mode / Burst Mode
Interval	0.1 to 600 sec
Burst	1 to 1,440 min
Number of Samples	1 to 18,000
Battery	CR-V3 Lithium Battery / 3.3 Ah (Up to 4) AA Alkaline Battery (Up to 8) - Requires AA adapter kit AA Lithium Battery (Up to 8) - Requires AA adapter kit
Communication Method	USB communication (compliant with Ver. 2.0, equivalent to Ver. 1.1)
Housing Material	Titanium Alloy (Ti-6Al-4V)
Dimensions	φ85 mm × 421 mm (excluding sensor guard)
Weight	Approx. 4.1 kg in air / Approx. 2.4 kg in water
Pressure Resistance	Equivalent to 6,000 m depth

Drawing



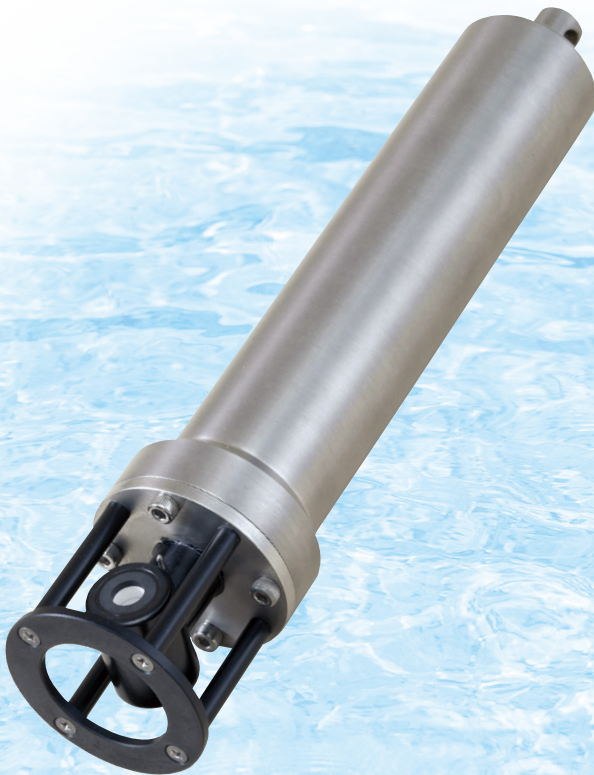
Logger Version Conductivity and Temperature Sensor

INFINITY-CT

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A7CT-USB



Overview

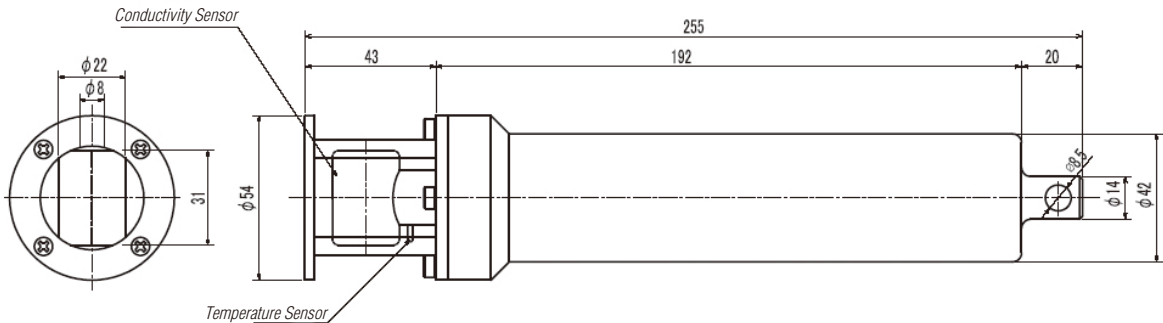
INFINITY-CT is an accurate conductivity and temperature meter that makes use of a 7-electrode sensor. This 7-electrode sensor generates an electric current only inside the conductivity cell, minimizing external influences and improving data quality. Thus, precise salinity measurements are possible under biofouling conditions. The compact design is suitable for deployment/integration with various sites/platforms.

Sensor Specifications		
Parameter	Temperature	Conductivity
Sensor Type	Thermistor	7-Electrode Type
Range	-3 to 45°C	0.5 to 70 mS cm ⁻¹ *
Resolution	0.001°C	0.001 mS cm ⁻¹
Accuracy	±0.01°C (0 to 35°C)	±0.01 mS cm ⁻¹ *

*Calibration is performed using seawater (in the range of 28 to 65 mS cm⁻¹). For use in freshwater, please contact us.

Logger Specifications	
Memory Type	microSD card (waterproof high-speed type)
Memory Capacity	1GB
Mode	Continuous Mode / Burst Mode
Interval	0.1 to 600 sec
Burst	1 to 1,440 min
Number of Samples	1 to 18,000
Battery	CR-V3 Lithium Battery / 3.3 Ah (Up to 2) AA Alkaline Battery (Up to 4) - Requires AA adapter kit AA Lithium Battery (Up to 4) - Requires AA adapter kit
Communication Method	USB communication (compliant with Ver. 2.0, equivalent to Ver. 1.1)
Housing Material	Titanium Grade 2
Dimensions	φ54 mm × 255 mm (including sensor guard)
Weight	Approx. 0.7 kg in air / Approx. 0.3 kg in water
Pressure Resistance	Equivalent to 2,000 m depth

Drawing



Logger Version Conductivity and Temperature Sensor with Wiper

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T

INFINITY-CTW

ACTW-USB



Overview

Generally, conductivity sensors are highly sensitive to contamination, including biological fouling. Long-term continuous observations typically require maintenance every 1 to 2 weeks, which can be labor-intensive. The salinity sensor of the INFINITY-CTW employs an in-tube electrode sensor, ensuring that external contamination does not affect the measurements at all. Additionally, the in-tube area is automatically cleaned by a piston-type wiper after each measurement, allowing for stable data acquisition even without maintenance for 2 to 3 months.

Sensor Specifications

Parameter	Temperature	Conductivity
Sensor Type	Thermistor	7-Electrode Type
Range	-3 to 45°C	0.5 to 70 mS cm ⁻¹ *
Resolution	0.001°C	0.001 mS cm ⁻¹
Accuracy	±0.01°C (0 to 35°C)	±0.01 mS cm ⁻¹ *

*Calibration is performed using seawater (in the range of 28 to 65 mS cm⁻¹). For use in freshwater, please contact us.

Logger Specifications

Memory Type	microSD card (waterproof high-speed type)
Memory Capacity	1GB
Mode	Continuous Mode / Burst Mode
Interval	0.1 to 600 sec
Burst	1 to 1,440 min
Number of Samples	1 to 18,000
Battery	CR-V3 Lithium Battery / 3.3 Ah (Up to 4) AA Alkaline Battery (Up to 8) - Requires AA adapter kit AA Lithium Battery (Up to 8) - Requires AA adapter kit
Communication Method	USB communication (compliant with Ver. 2.0, equivalent to Ver. 1.1)
Housing Material	Titanium Grade 2
Dimensions	φ70 mm × 342 mm (including sensor guard)
Weight	Approx. 1.5 kg in air / Approx. 0.7 kg in water
Pressure Resistance	Equivalent to 500 m depth

Observation Examples

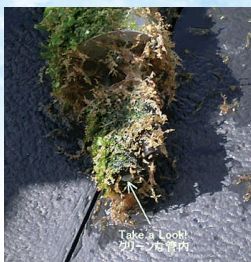
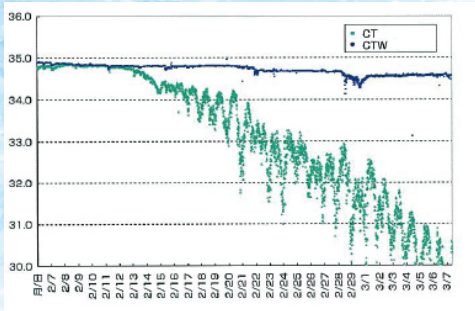
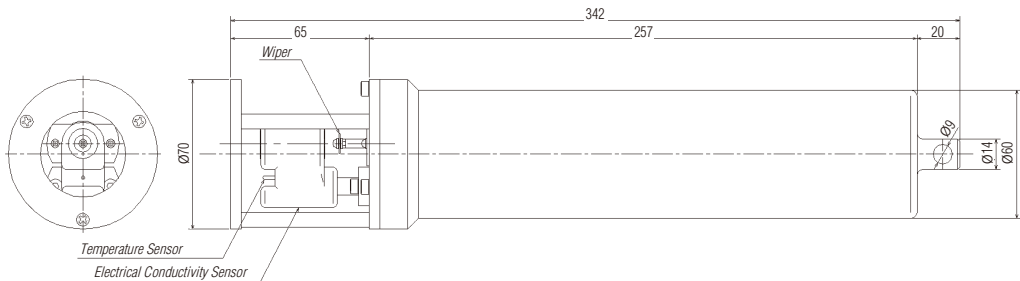


Photo After Retrieval

Drawing



Logger Version Chlorophyll and Turbidity Sensor with Wiper

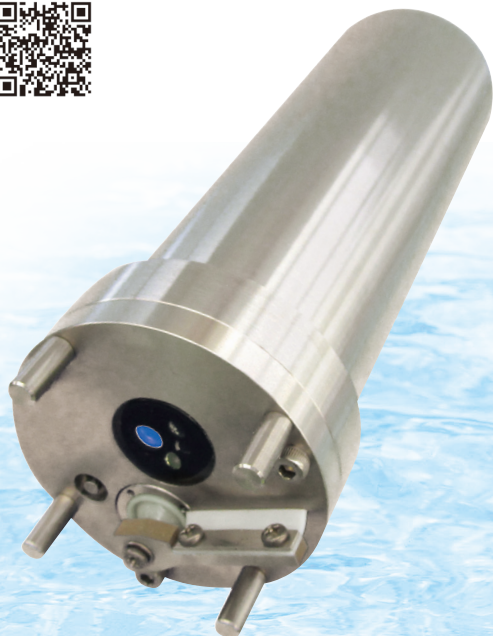
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INFINITY-CLW

ACLW2-USB



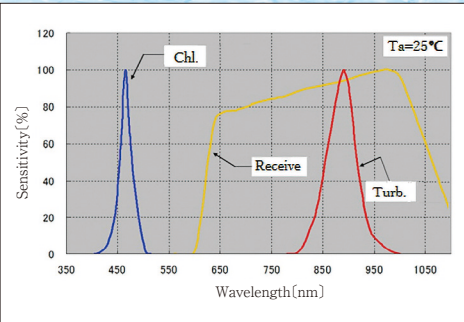
Overview

The INFINITY-CLW is a chlorophyll and turbidity sensor designed for long-term continuous observations, equipped with a wiper to clean any contamination on the optical sensor surface. The light sources for the chlorophyll and turbidity sensors use highly stable LEDs, resulting in minimal changes over time. The turbidity sensor, in particular, offers excellent stability in low concentration ranges and has a high correlation with suspended solids (SS) even in high concentration ranges. This makes it suitable not only for marine environments but also for surveys in dams and rivers.

Sensor Specifications

Parameter	Chlorophyll	Turbidity	Temperature
Sensor Type	Fluorescence Measurement	Infrared Backscatter	Thermistor
Range	0 to 400 ppb (Uranine reference)	0 to 1,000 FTU (Formazin reference)	-3 to 45°C
Resolution	0.01 ppb	0.03 FTU	0.001°C
Accuracy	Non-linearity ±1% FS (0 to 200 ppb)	±0.3 FTU or ±2%	±0.02°C (3 to 31°C)

Spectral Sensitivity Characteristics



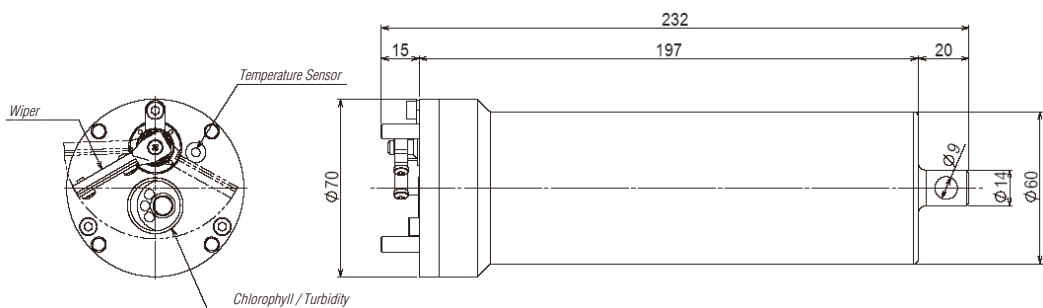
Wiper Effect Example



Logger Specifications

Memory Type	microSD card (waterproof high-speed type)
Memory Capacity	1GB
Mode	Continuous Mode / Burst Mode
Interval	0.1 to 600 sec
Burst	1 to 1,440 min
Number of Samples	1 to 18,000
Battery	CR-V3 Lithium Battery / 3.3 Ah (Up to 4) AA Alkaline Battery (Up to 8) - Requires AA adapter kit AA Lithium Battery (Up to 8) - Requires AA adapter kit
Communication Method	USB communication (compliant with Ver. 2.0, equivalent to Ver. 1.1)
Housing Material	Titanium Grade 2
Dimensions	φ70 mm × 232 mm
Weight	Approx. 1.2 kg in air / Approx. 0.6 kg in water
Pressure Resistance	Equivalent to 200 m depth

Drawing

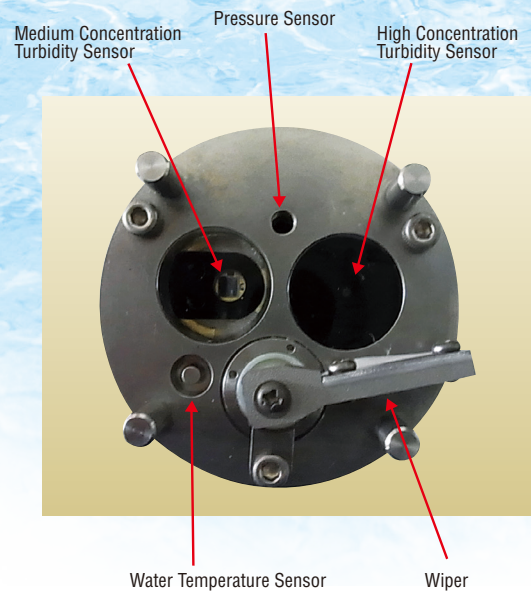


Wide Sensing Range Turbidity Sensor with Wiper

TPTBD

INFINITY-Turbi

ATU75W2-USB



Overview

The INFINITY-Turbi is a logger type turbidity sensor equipped with two turbidity sensors: one for medium concentration measurements and one for high concentration measurements. This allows for accurate measurements across a wide range of turbidity levels, from normal conditions to high turbidity events.

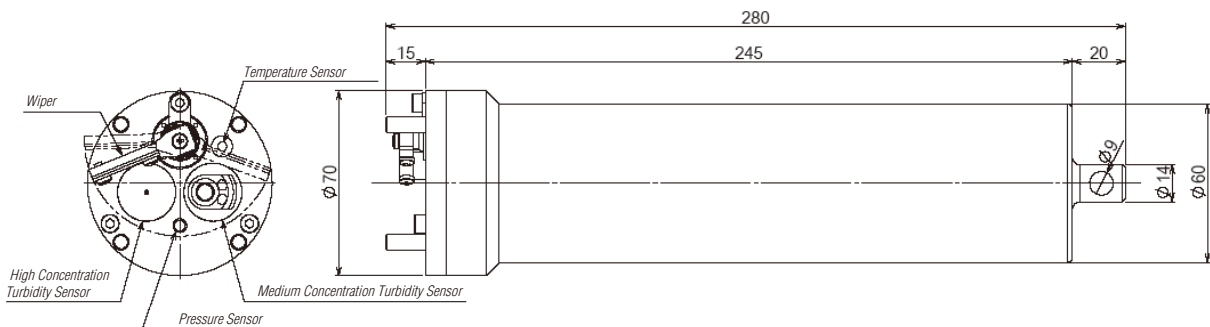
The device also comes standard with water temperature and depth sensors, making it versatile for various measurement needs. Additionally, the optical sensor section is equipped with a wiper to remove contamination, enabling long-term continuous observations.

Sensor Specifications				
Parameter	Medium Concentration Turbidity	High Concentration Turbidity	Pressure	Temperature
Sensor Type	Infrared Backscatter	Infrared Backscatter (Optical Fiber)	Semiconductor Pressure	Thermistor
Range	0 to 1,000 FTU (Formazin reference)	0 to 100,000 ppm (Kaolin reference)	0 to 25 m	-3 to 45°C
Resolution	0.03 FTU	2 ppm	0.001 m	0.001°C
Accuracy	±0.3 FTU or ±2%	±10 ppm or ±5%	Non-linearity ±0.14% FS, Repeatability ±0.2% FS	±0.02°C (3 to 31°C)

Logger Specifications	
Memory Type	microSD card (waterproof high-speed type)
Memory Capacity	1GB
Mode	Continuous Mode / Burst Mode
Interval	0.1 to 600 sec
Burst	1 to 1,440 min
Number of Samples	1 to 18,000
Battery	CR-V3 Lithium Battery / 3.3 Ah (UP to 4) AA Alkaline Battery (Up to 8) - Requires AA adapter kit AA Lithium Battery (Up to 8) - Requires AA adapter kit
Communication Method	USB communication (compliant with Ver. 2.0, equivalent to Ver. 1.1)
Housing Material	Titanium Grade 2
Dimensions	φ70 mm × 280 mm
Weight	Approx. 1.4 kg in air / Approx. 0.7 kg in water
Pressure Resistance	Equivalent to 25 m depth*

*By changing the range of the pressure sensor, it can support depths up to 200 m.

■ Drawing



Turbidity and Temperature Sensor for Deep Ocean

T TBD

ATUD-USB



ATUD-USB
ATUD-USB-S39

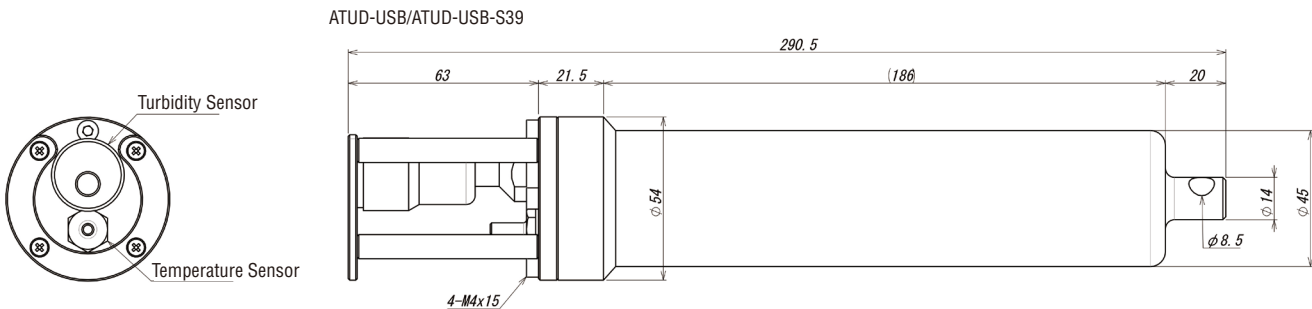
Overview

The ATUD-USB is a logger-type turbidity sensor developed for deep-sea observations. It uses a large-capacity SD card and commercially available batteries, enabling long-term observations. It can be utilized in various applications, such as vertical observations when attached to a deep-sea CTD, measuring marine snow with sediment traps, monitoring during seabed drilling, and observing hydrothermal deposits.

Sensor Specifications				
Model	ATUD-USB		ATUD-USB-S39	
	Temperature	Turbidity	Temperature	Turbidity
Parameter	Temperature	Turbidity	Temperature	Turbidity
Sensor Type	Thermistor	Infrared Backscatter	Thermistor	Infrared Backscatter
Range	-3 to 45°C	0 to 1,000 FTU (Formazin reference)	-3 to 45°C	0 to 40 FTU (Formazin reference)
Resolution	0.001°C	0.03 FTU	0.001°C	0.0008 FTU
Accuracy	±0.02°C	±0.3 FTU or ±2%	±0.02°C	±0.3 FTU or ±2%

Logger Specifications	
Model	ATUD-USB / ATUD-USB-S39
Memory Type	microSD card (waterproof high-speed type)
Memory Capacity	1GB
Mode	Continuous Mode / Burst Mode
Interval	0.1 to 600 sec
Burst	1 to 1,440 min
Number of Samples	1 to 18,000
Battery	CR-V3 Lithium Battery / 3.3 Ah (Up to 2) AA Alkaline Battery (Up to 4) - Requires AA adapter kit AA Lithium Battery (Up to 4) - Requires AA adapter kit
Communication Method	USB communication (compliant with Ver. 2.0, equivalent to Ver. 1.1)
Housing Material	Titanium Alloy (Ti-6Al-4V)
Dimensions	φ54 mm × 290.5 mm
Weight	Approx. 1.2 kg in air / Approx. 0.8 kg in water
Pressure Resistance	Equivalent to 6,000 m depth

■ Drawing



Logger Version Temperature and Pressure Sensor

INFINITY-TD

ATD-USB



Overview

The INFINITY-TD is a compact, battery-powered logger-type water temperature and pressure (depth) sensor. It is suitable for long-term observations through mooring and installation, as well as for profiling water temperature. It can be used independently or attached to other observation equipment for measurements.

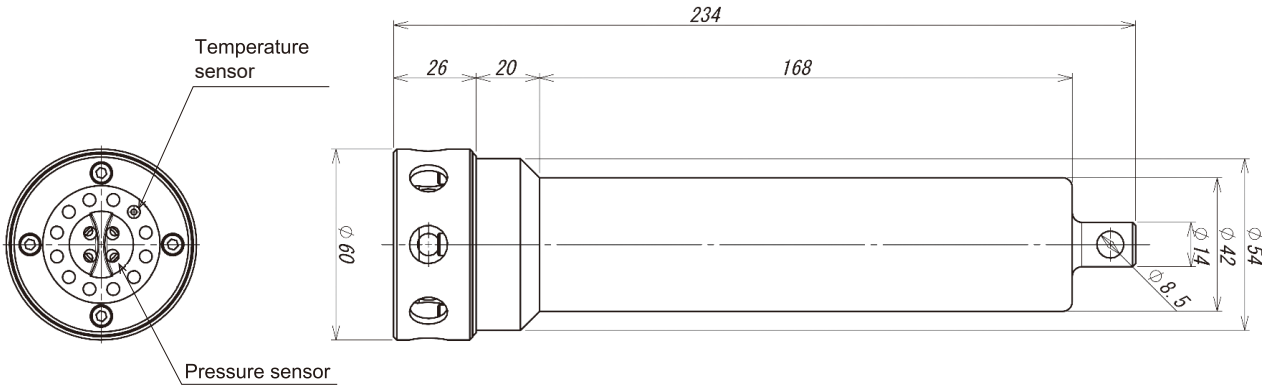
Sensor Specifications

Model	Common	ATD05-USB	ATD5-USB	ATD20-USB
Parameter	Temperature	Pressure		
Sensor Type	Thermistor	Semiconductor Pressure		
Range	-3 to 45°C	0 to 0.5 MPa (equivalent to 0 to 50 m)	0 to 5 MPa (equivalent to 0 to 500 m)	0 to 20 MPa (equivalent to 0 to 2,000 m)
Resolution	0.0001°C	0.000005 MPa (equivalent to 0.0005 m)	0.00005 MPa (equivalent to 0.005 m)	0.0002 MPa (equivalent to 0.02 m)
Accuracy	±0.01°C (0 to 35°C)	Non-linearity ±0.05% FS Repeatability ±0.1% FS		
63% Response Time (Typ)	0.7 sec	0.1 sec		

Logger Specifications

Model	ATD05-USB	ATD5-USB	ATD20-USB
Memory Type	microSD card (waterproof high-speed type)		
Memory Capacity	1GB		
Mode	Continuous Mode / Burst Mode		
Interval	0.1 to 600 sec		
Burst	1 to 1,440 min		
Number of Samples	1 to 18,000		
Battery	CR-V3 Lithium Battery / 3.3 Ah (Up to 2) AA Alkaline Battery (Up to 4) - Requires AA adapter kit AA Lithium Battery (Up to 4) - Requires AA adapter kit		
Communication Method	USB communication (compliant with Ver. 2.0, equivalent to Ver. 1.1)		
Housing Material	Titanium Grade 2		
Dimensions	φ60 mm × 234 mm		
Weight	Approx. 0.7 kg in air / Approx. 0.4 kg in water		
Pressure Resistance	Equivalent to 50 m depth	Equivalent to 500 m depth	Equivalent to 2,000 m depth

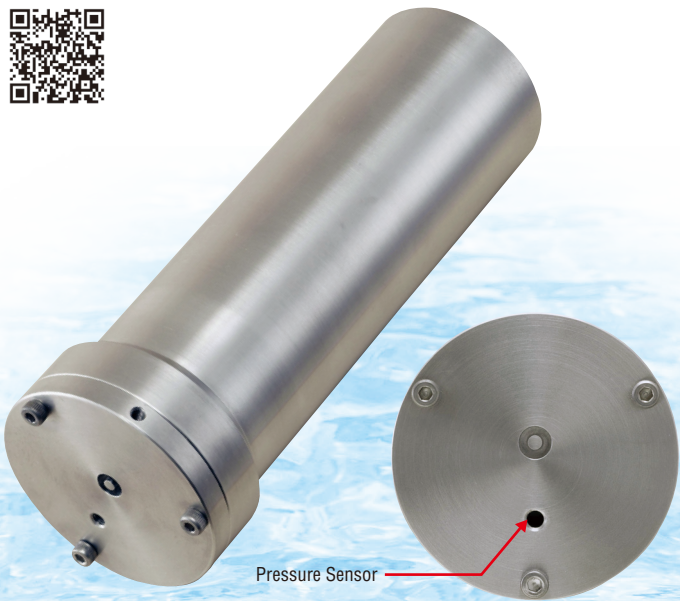
Drawing



Water Pressure Principle Wave Height Meter

INFINITY-WH

AWH-USB



Overview

With a large-capacity storage medium, 0.1-second sampling is now possible, enabling wave height observation from short to long periods. Twenty-minute measurement in a 1-hour burst allows for continuous observation for one month (with 12,000 samples).

Sensor Specifications

Parameter	Pressure
Sensor Type	Semiconductor Pressure
Range	0 to 25 m
Resolution	0.001 m
Accuracy	Non-linearity ±0.14% FS, Repeatability ±0.2% FS

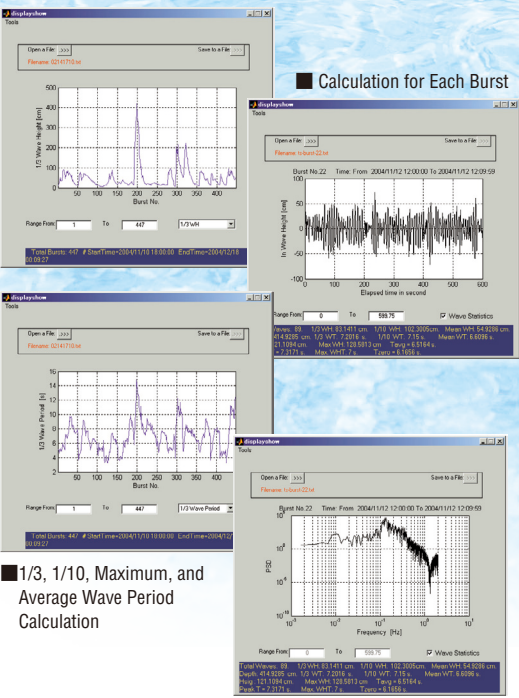
Logger Specifications

Memory Type	microSD card (waterproof high-speed spec)
Memory Capacity	1GB
Mode	Continuous Mode / Burst Mode
Interval	0.1 to 600 sec
Burst	1 to 1,440 min
Number of Samples	1 to 18,000
Battery	CR-V3 Lithium Battery / 3.3 Ah (Up to 4) AA Alkaline Battery (Up to 8) - Requires AA adapter kit AA Lithium Battery (Up to 8) - Requires AA adapter kit
Communication Method	USB Communication (Compliant with Ver. 2.0, Equivalent to Ver. 1.1)
Housing Material	Titanium Grade 2
Dimensions	φ70 mm × 215 mm
Weight	Approx. 1.2 kg in air / 0.6 kg in water
Pressure Resistance	Equivalent to 25 m depth

*Please ensure installation at a depth of 25 meters or deeper. Set the number of samples so that the interval is less than 1/10 of the wave period of the measurement target and 100 waves can be measured.

Pressure Sensor Wave Analysis Software (Optional)

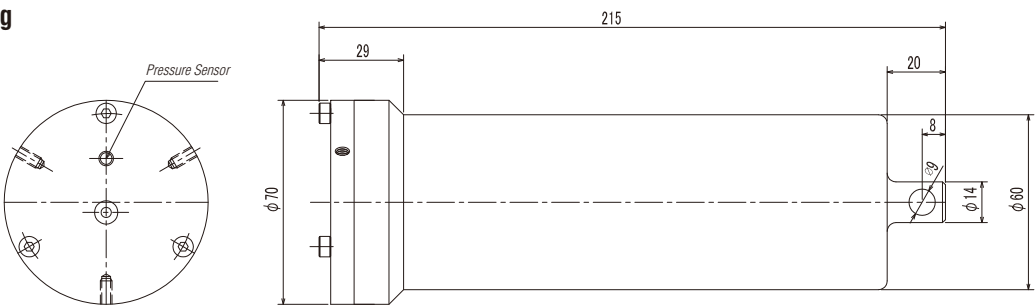
1/3, 1/10, Maximum, and Average Wave Height Calculation



1/3, 1/10, Maximum, and Average Wave Period Calculation

Spectral Calculation

Drawing



Cable Type Sensor Series

This series consists of digital output sensors designed for integration into system products, such as telemeters. They offer the same performance as our logger-type sensors and provide highly accurate measurements through power supply and command control from the system side. The standard communication output is RS-485, but customization to RS-232C is available if needed. Additionally, the main unit features detachable cable connectors, making it easy to remove for maintenance.

Electro-Magnetic Current Meter

■ Sensor Specifications

Parameter	Velocity	Direction	Temperature
Sensor Type	2-axis Electromagnetic Induction	Hall Element	Thermistor
Range	0 to ±500 cm s ⁻¹	0 to 360°	-3 to 45°C
Resolution	0.02 cm s ⁻¹	0.01°	0.001°C
Accuracy	±1 cm s ⁻¹ or ±2%*	±2°	±0.02°C (3 to 31°C)
Dimensions	φ54 mm × 381 mm (excluding connector)		

* Velocity calibration range is 0 to ±100 cm s⁻¹.

■ Communication Specifications

Model	AEM-CAD
Communication Interval	0.1 sec or more
Preheat Time	3 sec
Power Supply	DC 12 to 24 V
Current Consumption	50 mA during measurement (using standard 20 m cable, with DC 12 V supply)

Fast Optical DO Sensors / RINKO II

■ Instruments Specifications

Parameter	DO	Temperature
Sensor Type	Optical	Thermistor
Range	0 to 200%	-3 to 45°C
Resolution	0.01%	0.001°C
Accuracy	Non-linearity ±2% of full scale (3 to 30°C)	±0.02°C (0 to 35°C)
Dimensions	φ54 mm x 185 mm (excluding connector)	

■ Communication Specifications

Model	ARO-CAD
Communication Interval	0.5 sec or more
Preheat Time	5 sec
Power Supply	12 to 24 V DC
Current Consumption	35 mA (using standard 20 m cable, with DC 12 V supply)

Water Pressure Principle Wave Height Meter

■ Sensor Specifications

Parameter	Pressure
Sensor Type	Semiconductor Pressure
Range	0 to 0.25 MPa
Resolution	0.00001 MPa
Accuracy	Non-linearity ±0.14% FS Reproducibility 0.20% FS
Dimensions	φ70 mm × 162 mm (excluding connector)

■ Communication Specifications

Model	AWH-CAD
Communication Interval	0.1 sec or more
Preheat Time	1 sec
Power Supply	DC 12 to 24 V
Current Consumption	20 mA during measurement (using standard 20 m cable, with DC 12 V supply)

Conductivity and Temperature Sensor with Wiper

■ Sensor Specifications

Parameter	Temperature	Electrical Conductivity
Sensor Type	Thermistor	7-Electrode Type
Range	-3 to 45°C	0.5 to 70 mS cm s ⁻¹ *
Resolution	0.001°C	0.001 mS cm s ⁻¹
Accuracy	±0.01°C (0 to 35°C)	±0.01 mS cm s ⁻¹ *
Dimensions	φ70 mm × 285 mm (excluding connector)	

*Calibration is performed using seawater (range of 28 to 65 mS/cm).
Please contact us if you intend to use it in freshwater.

■ Communication Specifications

Model	ACTW-CAD
Communication Interval	0.5 sec or more
Preheat Time	15 sec
Power Supply	DC 12 to 24 V
Current Consumption	50 mA during measurement (using standard 20 m cable, with DC 12 V supply)

Harmful Plankton Detector with Wiper

■ Sensor Specifications

Parameter	FSI	Chlorophyll	Temperature
Sensor Type	Fluorescence Intensity Ratio	Fluorescence	Thermistor
Range	—	0 to 400 ppb (Uranine reference)	-3 to 45°C
Resolution	—	0.01 ppb	0.001°C
Accuracy	Repeatability ±0.05 (0 to 200 ppb)	Non-linearity ±1% FS (0 to 200 ppb)	±0.02°C (3 to 31°C)
Dimensions	φ70 mm × 176 mm (excluding cable)		

FSI must be calculated using the individual outputs of F670nm and F690nm from this sensor.
Please refer to the user manual for details.

■ Communication Specifications

Model	AHIW2A-CAD
Communication Interval	1 sec or more
Preheat Time	10 sec
Power Supply	DC 12 to 24 V
Current Consumption	120 mA (using standard 20 m cable, with DC 12 V supply)

Chlorophyll and Turbidity Sensor with Wiper

■ Sensor Specifications

Parameter	Chlorophyll	Turbidity	Temperature
Sensor Type	Fluorescence	Infrared Backscatter	Thermistor
Range	0 to 400 ppb (Uranine reference)	0 to 1,000 FTU (Formazin reference)	-3 to 45°C
Resolution	0.01 ppb	0.03 FTU	0.001°C
Accuracy	Non-linearity ±1% FS (0 to 200 ppb)	±0.3 FTU or ±2%	±0.02°C (3 to 31°C)
Dimensions	φ70 mm × 173 mm (excluding connector)		

■ Communication Specifications

Model	ACLW2-CADU
Communication Interval	0.1 sec or more
Preheat Time	10 sec
Power Supply	DC 12 to 24 V
Current Consumption	30 mA during measurement (using standard 20 m cable, with DC 12 V supply)

Wide Sensing Range Turbidity Sensor with Wiper

■ Sensor Specifications

Parameter	Medium Concentration Turbidity	High Concentration Turbidity	Pressure	Temperature
Sensor Type	Infrared Backscatter (LED)	Infrared Backscatter (Optical Fiber)	Semiconductor Pressure	Thermistor
Range	0 to 1,000 FTU	0 to 100,000 ppm	0 to 0.25 MPa	-3 to 45°C
Resolution	0.03 FTU	2 ppm	0.00001 MPa	0.001°C
Accuracy	±0.3 FTU or ±2%	±10 ppm or ±5%	Non-linearity ±0.14% FS Repeatability 0.20% FS	±0.02°C (3 to 31°C)
Dimensions	φ70 mm × 238 mm (excluding connector)			

■ Communication Specifications

Model	ATU75W2-CAD
Communication Interval	0.1 sec or more
Preheat Time	10 sec
Power Supply	DC 12 to 24 V
Current Consumption	40 mA during measurement (using standard 20 m cable, with DC 12 V supply)

Optical DO Sensor with Wiper

■ Sensor Specifications

Parameter	DO	Temperature
Sensor Type	Optical	Thermistor
Range	0 to 200%	-3 to 45°C
Resolution	0.01%*	0.001°C
Accuracy	Non-linearity ±2% FS	±0.02°C (3 to 31°C)
Dimensions	φ70 mm × 173 mm (excluding connector)	

*Standard value near 100% saturation

■ Communication Specifications

Model	AROW2-CADU
Communication Interval	0.5 sec or more
Preheat Time	10 sec
Power Supply	DC 12~24 V
Current Consumption	40 mA during measurement (using standard 20 m cable, with DC 12 V supply)

Water Quality Profiler with Fast Optical DO Sensor

AAQ-RINKO



Overview

The AAQ-RINKO is a direct-reading multiparameter water quality meter equipped with a high-speed response DO sensor (RINKO®) with a typical response time of 0.4 seconds. For DO measurements, previous sensors required the device to be held at the measurement depth for a certain period due to slow response times. However, with the AAQ-RINKO, vertical measurements can be conducted at a descent rate of 0.5 m/second, similar to CTD observations, significantly reducing work time and allowing for more detailed vertical profiles of dissolved oxygen. In addition to the existing seven parameters—water temperature, depth, salinity, chlorophyll, turbidity, DO, and pH—the meter can also be equipped with PAR and ORP sensors simultaneously. Three types of processing units are available to suit different observation needs. *DO measurements comply with JIS K 0102 standards.

Sensor Specifications

Parameter	Sensor Type	Range	Resolution	Accuracy	Response Time (typ)
Pressure	Semiconductor Pressure	0 to 1 MPa	0.00002 MPa	Non-linearity ±0.1% FS, Repeatability ±0.3% FS	0.2 sec
Temperature	Thermistor	-3 to 45°C	0.001°C	±0.01°C (0 to 35°C)	0.2 sec
Seawater Conductivity ^{*2} (Salinity)	7-Electrode (Practical Salinity Scale)	0.5 to 70 mS cm ⁻¹ (2 to 42)	0.001 mS cm ⁻¹ (0.001)	±0.01 mS cm ⁻¹	0.2 sec
Freshwater Conductivity ^{*2}	7-Electrode	0 to 2,000 µS cm ⁻¹	0.1 µS cm ⁻¹	±5 µS/cm (0 to 200 µS cm ⁻¹), ±10 µS/cm (200 to 2,000 µS cm ⁻¹)	0.2 sec
Chlorophyll	Fluorescence Measurement	0 to 400 ppb (Urine reference)	0.01 ppb	Non-linearity ±1% FS (0 to 200 ppb)	0.2 sec
Turbidity	Infrared Backscatter	0 to 1,000 FTU (Formazin reference)	0.03 FTU	±0.3 FTU or ±2%	0.2 sec
DO	Optical	0 to 200% (0 to 20 mg L ⁻¹)	0.01% ^{*3} (0.001 mg L ⁻¹)	Non-linearity ±2% FS (±0.4 mg L ⁻¹)	0.4 sec ^{*4}
pH ^{*5}	Glass Electrode (Composite Electrode)	0 to 14	0.01	±0.2	10 sec
Photosynthetically Active Radiation (PAR)	Photodiode	0 to 5,000 µmol m ⁻² S ⁻¹	0.1 µmol m ⁻² S ⁻¹	±4% FS (0 to 2,000 µmol m ⁻² S ⁻¹)	0.2 sec
ORP	Platinum Electrode (Composite Electrode)	0 to ±1,000 mV	0.1 mV	—	10 sec

*1 Calibration is performed using seawater (range of 28 to 65 mS cm⁻¹). *2 Either seawater conductivity or freshwater conductivity can be selected. *3 Standard value near 100% saturation. *4 Standard 63% response value in a gaseous atmosphere (1 atm, 25°C).

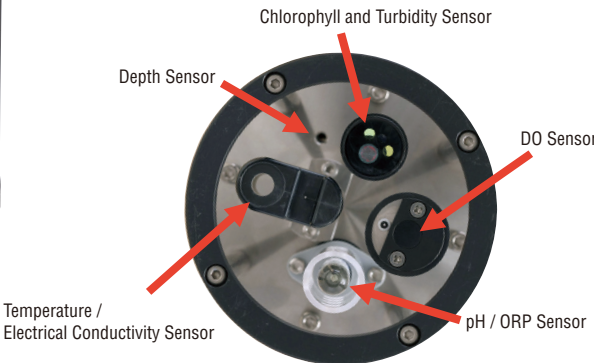
Model and Observation Items

	Depth	Temperature	Electrical Conductivity	Chlorophyll	Turbidity	DO	pH	(PAR)	ORP
AAQ170	●	●	●	●	●	●	●		
AAQ171	●	●	●	●	●	●	●		
AAQ172	●	●	●	●	●	●	●	●	●
AAQ175	●	●	●	●	●	●	●	●	
AAQ176	●	●	●	●	●	●	●	●	●
AAQ177	●	●	●	●	●	●	●	●	●

Please select either seawater or freshwater for electrical conductivity.

Probe specifications

Communication	RS-485
A / D conversion	16 bit digitia conversion
Dimensions	φ108 x 293 mm
Weight	Approx.2.4 kg in air,1.1 kg in water
Housing material	Titanium (grade 2)
Cable	50 m or 100 m



- C
- T
- P
- DO
- CHL
- TBD
- pH
- PAR
- ORP



Portable Interface Unit (AIF-CAD)

This compact interface unit allows for real-time monitoring and data recording on a PC. Communication is possible via a USB cable (Type C).

Splash-Proof interface (AAQ-IF)

This splash-proof interface unit connects to a user's computer, allowing for real-time monitoring and data recording on the computer.

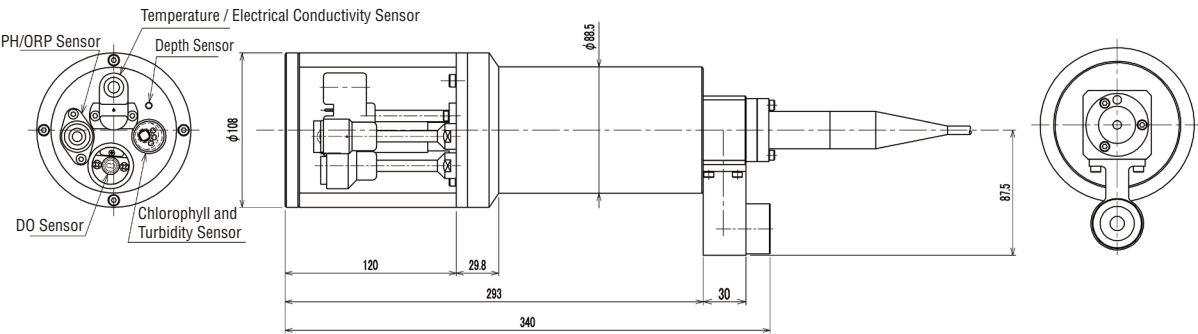
Handheld Terminal (D-10)

This compact, high-performance model is easy to carry and records measurement data in its internal memory while displaying it. It can also generate vertical profiles and time series graphs on the spot. Equipped with GPS as a standard feature, it simultaneously acquires location information. Its excellent dust and water resistance make it ideal for field observations.

Specifications

Model Name	Portable Interface Unit (AIF-CAD)	Splash-Proof interface (AAQ-IF)	Handheld Terminal (D-10)
Screen	None	3 LEDs	5-inch color LCD
Operation Method	None	None	Touch panel and touch buttons on screen
Display Content	None	Voltage level	Time information, GPS information, measurement data, vertical graphs, time series graphs
Memory Type	None	None	512MB internal memory (15 million data points)
Method	Data recording on PC, measurement at selected intervals via application software	Data recording on PC, measurement at selected intervals via application software	1. Continuous measurement (selectable intervals of 0.1, 0.2, 0.5, 1, 2, 5, 10 sec) 2. Automatic vertical measurement by selected depth pitch (selectable at 0.1, 0.2, 0.5, 1 m) 3. Spot recording of measurement data at arbitrary depths
Printing Function	None	None	None (connectable to external printer)
Calendar Information	None	None	Built-in (auto-corrected by GPS)
Power Supply	4 AA batteries 1.5 V (alkaline, lithium) / USB power supply (5 V) *Sensor performance is not guaranteed when powered via USB due to dependency on power quality from the source	8 AA alkaline batteries / AC 100 V / DC 12 V	Built-in rechargeable lithium-ion battery
Dimensions	W112 mm × H110 mm × D30 mm	W83 mm × H199 mm × D46 mm	W126 mm × H191 mm × D33 mm
Weight	Approx. 275 g (excluding batteries)	Approx. 0.5 kg (excluding batteries)	Approx. 725 g (including built-in battery)
Dust and Water Resistance	None	Simple splash-proof	Protection rating IP67 (when connector cap is tightened)
Other	None	None	Equipped with GPS

Drawing



Logger Type CTD with Fast Optical DO Sensor

RINKO-Profiler

C T P DO CHL TBD



Models and Parameters

	Depth	Temperature	Conductivity	Chlorophyll	Turbidity	DO
ASTD100	●	●	●			
ASTD101/151	●	●	●	●	●	
ASTD102/152	●	●	●	●	●	●
ASTD103/153	●	●	●			●

Please select either seawater or freshwater for electrical conductivity.
The ASTD10X model is rated for 600 m, and the ASTD15X model is rated for 1,000 m

Features

1. Standardly equipped with high-speed response DO sensor
 - Significantly reduces observation time
 - Enables acquisition of more detailed vertical DO distribution
2. Large-capacity internal memory eliminates the need for cables
3. Built-in rechargeable lithium-ion battery
4. Immersion-type connector eliminates water leakage concerns (patented)
5. Allows for vertical observations at a minimum pitch of 10 cm (depth trigger mode)
6. Enables short-term time-series observations (time trigger mode)
7. Titanium body eliminates corrosion concerns
8. Compact and lightweight, with an air weight of approximately 2.0 kg and an underwater weight of approximately 1.0 kg
9. Complies with JIS K 0102 standards for DO measurements

Overview

The RINKO-Profiler is a DO profiler equipped with a high-speed response DO sensor as standard on its CTD. With a standard DO response time of just 0.4 seconds, it significantly reduces observation time and enables more detailed vertical DO distribution measurements. Weighing approximately 1.0 kg underwater, it is very lightweight and features built-in recording, eliminating the need for dedicated cables. Simply lowering it into the water with a rope allows for easy vertical profile measurements of water temperature, salinity, and DO at any desired depth pitch. The ASTD102 model can also measure chlorophyll and turbidity.

The internal memory is equipped with 1GB of storage, allowing for approximately 1,000 profile recordings at 0.1m pitch up to a depth of 100m. Each profile data set is filed internally and managed by the internal calendar time information. The power source is a rechargeable lithium-ion battery, which allows for 10 hours of continuous use with a 3-hour charge.

The communication connector is an immersion type, so there is no need to open the main unit. Communication between the interface and a computer, as well as charging, can be done via a dedicated cable. Two types of interfaces are available: a model for computer communication and a model with a printer for on-site data verification.



Immersion-type connector and easy-to-see pilot lamp



Observation scenery

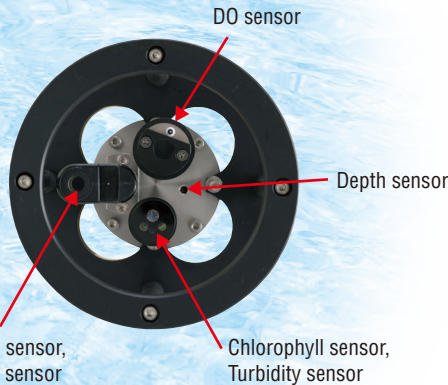
Sensor Specifications

Parameter	Pressure	Temperature	Seawater Conductivity ^{*1} (Salinity)	Freshwater Conductivity ^{*1}	Chlorophyll	Turbidity	DO
Sensor Type	Semiconductor Pressure	Thermistor	7-Electrode (Practical Salinity Scale)	7-Electrode	Fluorescence Measurement	Infrared Backscatter	Optical
Range	0 to 6 MPa 0 to 10 MPa ^{*2}	-3 to 45°C	0.5 to 70 mS cm ⁻¹ (2 to 42)	0 to 2,000 µS cm ⁻¹	0 to 400 ppb (Uranine reference)	0 to 1,000 FTU (Formazin reference)	0 to 200% (0 to 20 mg L ⁻¹)
Resolution	0.0002 MPa 0.0004 MPa	0.001°C	0.001 mS cm ⁻¹ (0.001)	0.1 µS cm ⁻¹	0.01 ppb	0.03 FTU	0.01% (0.001 mg L ⁻¹) ^{*3}
Accuracy	Non-linearity ±0.1% FS Repeatability ±0.3% FS	±0.01°C (0 to 35°C)	±0.01 mS cm ⁻¹ ^{*4}	±5 µS cm ⁻¹ (0 to 200 µS cm ⁻¹), ±10 µS cm ⁻¹ (200 to 2,000 µS cm ⁻¹)	Non-linearity ±1% FS (0 to 200 ppb)	±0.3 FTU or ±2%	Non-linearity ±2% FS (±0.4 mg L ⁻¹)
Response Time (typ)	0.2 sec	0.2 sec	0.2 sec	0.2 sec	0.2 sec	0.2 sec	0.4 sec ^{*5}

^{*1} Either seawater conductivity or freshwater conductivity can be selected. ^{*2} Select one of the ranges. ^{*3} Standard value near 100% saturation.
^{*4} Calibration is performed using seawater (range of 28 to 65 mS cm⁻¹). ^{*5} Standard 63% response value in a gaseous atmosphere (1 atm, 25°C).

Logger Specifications

Mode	Depth Trigger Mode	Time Trigger Mode
Interval	0.1 / 0.2 / 0.5 / 1 m	0.1 to 600 sec
Memory Type	1GB Built-in Memory	
Storage Capacity	Approx. 1,000 times for 100 m at 0.1 m intervals	Approx. 8,000,000 data points
Power Supply	Lithium-ion battery (approximately 10 hours of continuous use)	
Case Material	Titanium Grade 2	
Dimensions	φ136 mm × 491 mm	
Weight	Approx. 2.0 kg in air / Approx. 1.0 kg in water	
Pressure Resistance	Equivalent to 1,000 m depth	

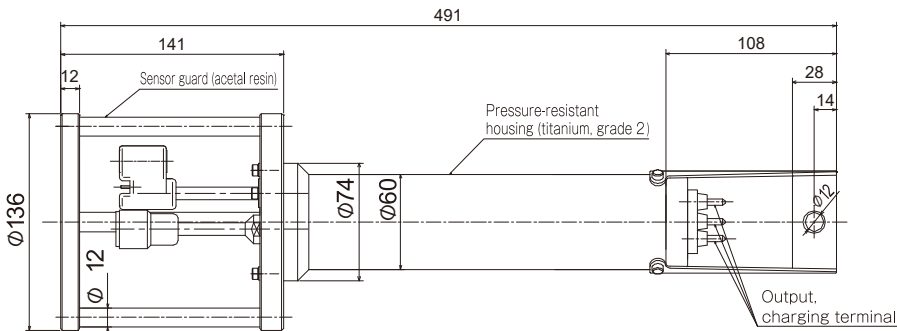


Interface Specifications

Model	ASTD-IF
Power Supply	AC 100~240 V / 4 AA alkaline batteries
Dimensions	W170 mm × H66 mm × D169 mm (excluding protrusions)
Weight	Approx. 1.0 kg



Drawing



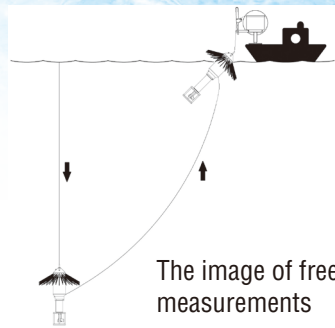
Protective Cage (AA3-02956) *Sold separately

Yoing Ocean Data Acquisition Profiler

YODA Profiler

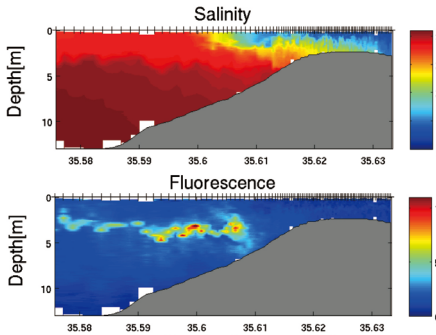
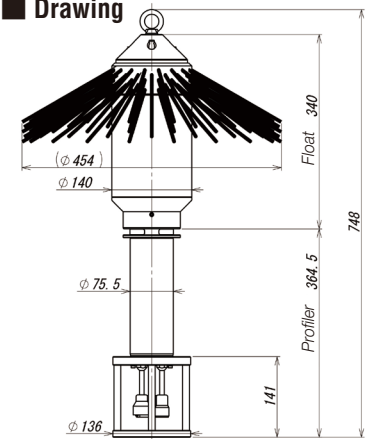
ASTD102-SY

C T P DO CHL TBD



The image of free-fall measurements

Drawing



Masunaga, E., & Yamazaki, H. (2014). A new tow-yo instrument to observe high-resolution coastal phenomena. Journal of Marine Systems, 129, 425-436.

•Special software for analysis data is released. The graph shown above is not outputted by this software.
•YODA Profiler is an instrument co-developed with Professor Hidekatsu Yamazaki, Professor Emeritus of Tokyo University of Marine Science and Technology.

Overview

The YODA Profiler (Yoing Ocean Data Acquisition Profiler) is a towed profiling observation system composed of a water quality meter (measuring conductivity, water temperature, depth, DO, chlorophyll, and turbidity) and a winch. The profiler, equipped with a brush, can descend stably at a rate of approximately 0.2 m/sec. Additionally, the winch allows for repeated descending and ascending movements, enabling continuous measurement of water quality parameters. Both the YODA Profiler and the winch are compact and lightweight, making them easy to install on vessels. Observation data is recorded in the internal data logger and can be downloaded to a computer without opening the pressure-resistant case by connecting a communication cable to the immersion-type connector (patented). The YODA Profiler is equipped with a high-speed response DO sensor, providing high-precision and high-resolution spatial distribution of dissolved oxygen through free-fall measurements.

Sensor Specifications

Parmeter	Pressure	Temperature	Electrical Conductivity	Salinity	Chlorophyll	Turbidity	DO
Sensor Type	Semiconductor Pressure	Thermistor	7-Electrode	Practical Salinity	Fluorescence	Infrared Backscatter	Optical
Range	0 to 6 MPa	-3 to 45°C	0.5 to 70 mS cm ⁻¹	2 to 42	0 to 400 ppb (Uranine reference)	0 to 1,000 FTU (Formazin reference)	0 to 200% (0 to 20 mg L ⁻¹)
Resolution	0.0002 MPa	0.001°C	0.001 mS cm ⁻¹	0.001	0.01 ppb	0.03 FTU	0.01% (0.001 mg L ⁻¹) ^{*2}
Accuracy	Non-linearity ±0.1% FS, Repeatability ±0.3% FS	±0.01°C (0 to 35°C)	±0.01 mS cm ⁻¹ ^{*1}	—	Non-linearity ±1% FS (0 to 200 ppb)	±0.3 FTU or ±2%	Non-linearity ±2% FS (±0.4 mg L ⁻¹)
Response Time (typ)	0.2 sec	0.2 sec	0.2 sec	0.2 sec	0.2 sec	0.2 sec	0.4 sec ^{*3}

*1 Calibration using seawater (range 28 to 65 mS cm⁻¹). *2 Standard value near 100% saturation.
*3 Standard 63% response value in a gaseous atmosphere (1 atm, 25°C).

Logger Specifications

Mode	Depth Trigger	Time Trigger
Interval	0.1, 0.2, 0.5, 1 m	0.1 to 600 sec
Memory Type	1GB Internal Memory	
Recording Capacity	Approx. 1,000 times for 100m at 0.1 m intervals	Approx. 8,000,000 data points
Power Supply	Lithium-ion battery (approximately 10 hours of continuous use)	
Pressure-resistant Case Material	Titanium Grade 2	
Dimensions	φ454 mm × 748 mm (including brush and float sections)	
Weight	Approx. 6 kg	
Pressure Resistance	Equivalent to 600 m depth	
Accessories	Weight for descent speed adjustment	

Interface Specifications

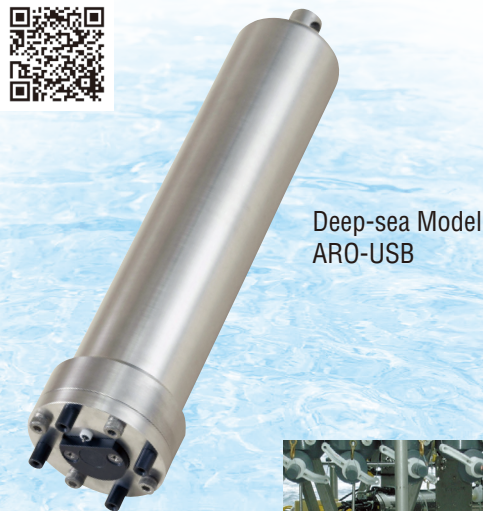
Model	ASTD-IF
Power Supply	AC 100 to 240 V or 4 AA alkaline batteries
Dimensions	170 mm × 66 mm × 169 mm
Weight	Approx. 1.0 kg

Winch Specifications

Configuration	1) Main Unit, 2) Controller, 3) Bobbin
Lifting Capacity	Maximum 30 kg
Standard Rotation Speed	100 to 160 rpm
Power Supply	DC 24 V
Material	SUS304
Weight	Approx. 15 kg
Dimensions	W360mm × H480 mm (maximum) × D430 mm
Rope	φ3 mm × 300 m, Dyneema Rope (Polyethylene Fiber)

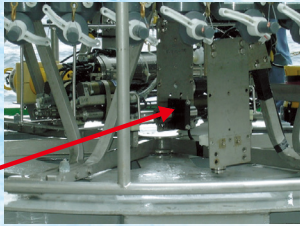
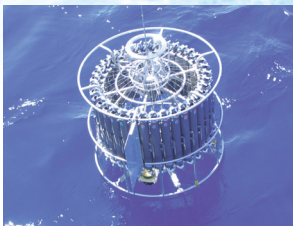
Fast Optical DO Sensor

RINKO I



Deep-sea Model ARO-USB

Sampler with RINKO I Attached



(Image provided by Dr. Uchida, Japan Agency for Marine-Earth Science and Technology)

Overview

The INFINITY Data Logger Series DO Meter is a model that uses an SD card recording system. Various measurement settings are available, allowing for simultaneous observations when attached to mooring systems, existing water samplers, CTDs, and other equipment. The high-speed response DO sensor enables vertical profiles, which previously took a long time, to be observed in a short period.

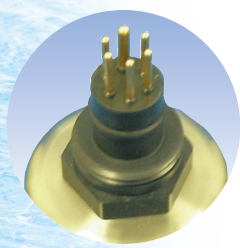
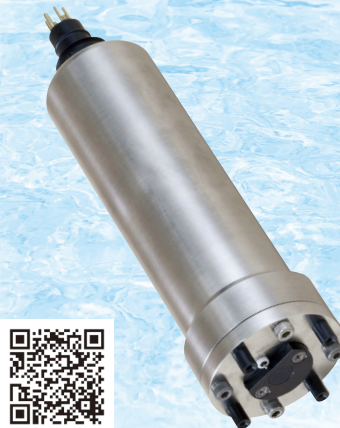
Specifications

Model Name	RINKO I	
Model Number	ARO-USB	
Parameter	DO	Temperature
Sensor Type	Optical	Thermistor
Range	0 to 200%	-3 to 45°C
Resolution	0.01% ^{*1}	0.001°C
Accuracy	Non-linearity ±2% FS	±0.02°C (0 to 35°C)
Memory Type	microSD Card (waterproof high-speed type)	
Memory Capacity	1 GB	
Mode	Continuous Mode / Burst Mode	
Interval	0.1 to 600 sec	
Burst	1 to 1,440 min	
Number of Samples	1 to 18,000	
Battery	CR-V3 Lithium Battery/3.3Ah (Up to 2) AA Alkaline Battery (Up to 4) - Requires AA adapter kit AA Lithium Battery (Up to 4) - Requires AA adapter kit	
Communication Method	USB Communication (Compliant with Ver. 2.0, equivalent to Ver. 1.1)	
Current Consumption	125 mA	
Housing Material	Titanium Alloy (Ti-6Al-4V)	
Dimensions	φ54 mm × 235.5 mm	
Weight	Approx. 0.9 kg in air / Approx. 0.6 kg in water	
Pressure Resistance	Equivalent to 7,000m depth	

*1 Standard value near 100% saturation

Fast Optical DO Sensor

RINKO III



Underwater connector

The connector in the photo is manufactured by Impulse (current models are manufactured by SubConn).

Overview

This model was developed with the theme of integration into deep-sea multi-bottle water samplers' CTD systems. It operates on a DC 12V power supply and outputs DO and water temperature data as 0 to 5V analog signals. By connecting it to the external input channels of your CTD system, you can utilize it effectively. The high-speed response allows for continuous high-precision profile data to be obtained without imposing restrictions on the operation of the water sampling system.

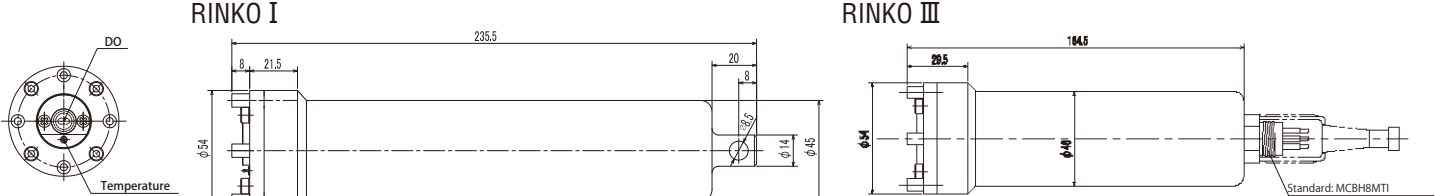
Specifications

Model Name	RINKO III	
Model Number	ARO-CAV-CM	
Parameter	DO	Temperature
Sensor Type	Optical	Thermistor
Range	0 to 200%	-3 to 45°C
Resolution	0.01% ^{*1}	0.001°C
Accuracy	Non-linearity ±2% FS	±0.02°C (3 to 31°C)
Output	Analog Voltage (0 to 5 V)	
Power Supply	DC 12 V	
Current Consumption	35 mA	
Case Material	Titanium Alloy (Ti-6Al-4 V)	
Dimensions	φ54 mm × 165 mm (excluding connector)	
Weight	Approx. 0.8 kg in air / Approx. 0.5 kg in water	
Pressure Resistance	Equivalent to 6,700 m depth	
Underwater Connector	MCBH8M (SubConn)	

Please prepare the connection cable (signal cable) yourself.

*1 Standard value near 100% saturation

Drawing



Logger Version Optical DO Sensor with Wiper

RINKO W AROW2-USB



Overview

Rinko W is an autonomously deployable data logger for long-term DO measurements. In order to protect the sensing foil against accumulating bio-fouling, the instrument has a mechanical wiper to sweep the optical window. The optical sensor does not need membrane replacement or stirring, thus, it requires less maintenance than galvanic sensors.

Sensor Specifications

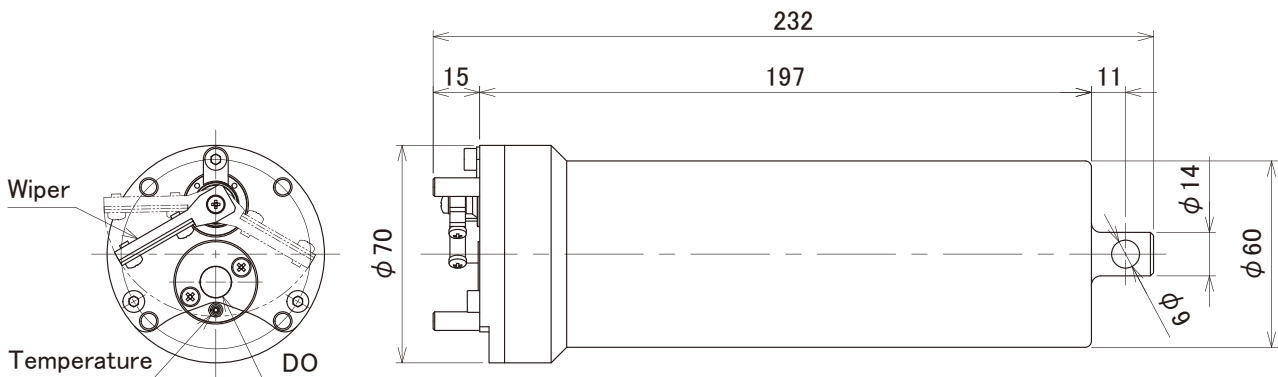
Model	AROW2-USB	
Parameter	DO	Temperature
Sensor Type	Optical	Thermistor
Range	0 to 200%	-3 to 45°C
Resolution	0.01% *	0.001°C
Accuracy	Non-linearity ±2% FS	±0.02°C (3 to 31°C)

*Standard value near 100% saturation

Logger Specifications

Memory Type	microSD card (waterproof high-speed type)
Memory Capacity	1GB
Mode	Continuous Mode / Burst Mode
Interval	0.5 to 600 sec
Burst	1 to 1,440 min
Number of Samples	1 to 18,000
Battery	CR-V3 Lithium Battery / 3.3 Ah (Up to 4) AA Alkaline Battery (Up to 8) - Requires AA adapter kit AA Lithium Battery (Up to 8) - Requires AA adapter kit
Communication Method	USB communication (compliant with Ver. 2.0, equivalent to Ver. 1.1)
Housing Material	Titanium Grade 2
Dimensions	φ70 mm × 232 mm
Weight	Approx. 1.2 kg in air / Approx. 0.6 kg in water
Pressure Resistance	Equivalent to 200 m depth

Drawing



Fast Optical DO Sensor for Integration

RINKO FT ARO-FT / AROD-FT



ARO-FT
Pressure Resistance:
Equivalent to 2,000 m depth



AROD-FT
Pressure Resistance:
Equivalent to 6,700 m depth

Overview

The ARO-FT/AROD-FT is a sensor developed for use with Argo floats, which are employed in oceanographic observations worldwide. Once deployed, Argo floats can automatically perform regular vertical observations for up to approximately five years. The ARO-FT/AROD-FT maintains high-speed response while offering excellent long-term stability. It supports RS-232C/UART communication, making it compatible with various observation equipment, including AUVs, in addition to Argo floats.

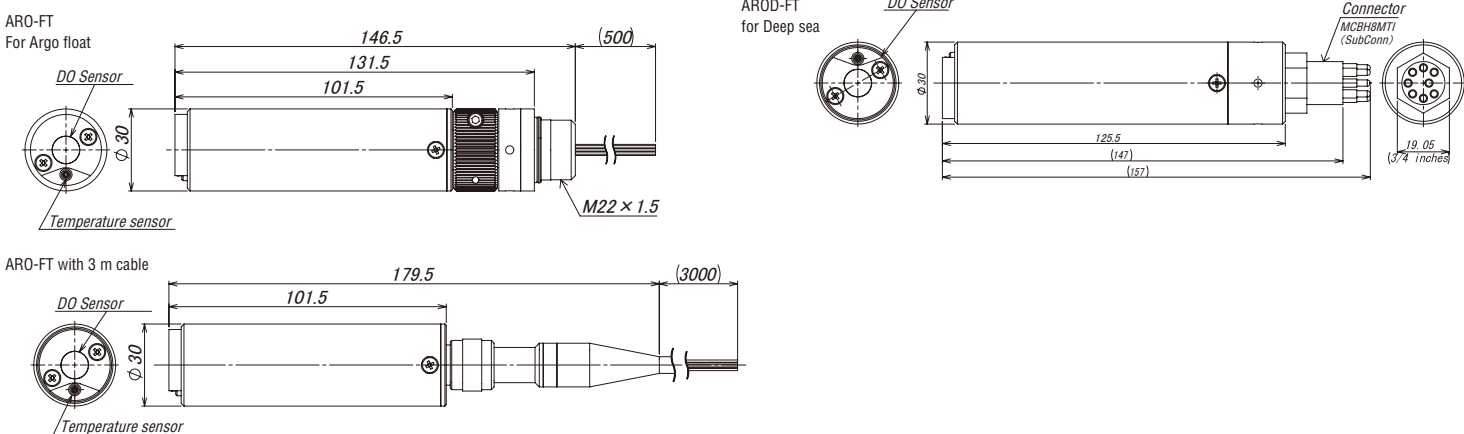
Specifications

Parameter / Sensor Type	DO	Optical
	Temperature	Thermistor
Range	DO	0 to 425 μmol L ⁻¹ (0 to 200% saturation)
	Temperature	-3 to 45°C
Resolution	DO	0.02 μmol L ⁻¹ (0.01%) ^{*2}
	Temperature	0.001°C
Initial Accuracy	DO	±2% of reading or ±2.0 μmol L ⁻¹ (1 to 30°C, 0 to 120%)
	Temperature	±0.01°C (0 to 35°C)
Repeatability	DO	Drift: ±5% of reading or ±5.0 μmol L ⁻¹ within 4,000,000 samples ^{*3}
		Temperature Dependency: ±2% of reading or ±2.0 μmol L ⁻¹
		Pressure Dependency: ±2% of reading or ±2.0 μmol L ⁻¹ ^{*4}
63% Response Time (25°C, standard value)	DO	≤1 sec (in water)
External Output Content	Temperature	≤1 sec (in water)
Communication Interval	DO (μmol L ⁻¹), Temperature (°C), AD Value, LED Accumulated Time	
Preheat Time	1 sec	
Communication Type	5 sec	
Communication Speed	RS-232C or UART (3.3 V logic) ^{*5}	
Communication Speed	38,400 bps	
Power Supply	DC 6 to 26 V, standard DC 12 V	
Current Consumption (when using 12 VDC)	During Measurement: ≤30 mA, Standby: ≤0.1 mA	

Model	ARO-FT	AROD-FT
Material	Titanium Grade 2	Titanium Alloy (Ti-6Al-4V)
Connector	8-pin LEMO Connector	SubConn MCBH-8-MP
Dimensions	Refer to the diagram below	Refer to the diagram below
Weight	Approx. 265 g in air (with locknut communication cable) Approx. 162 g in water (with locknut communication cable)	Approx. 265 g in air Approx. 175 g in water ^{*6}
Pressure Resistance	Equivalent to 2,000 m depth	Equivalent to 6,700 m depth

*1 When measuring air-saturated water at 25°C and 34 PSU salinity
*2 Standard value near 100% at 25°C
*3 Based on accelerated testing
*4 Pressure hysteresis is not considered
*5 UART output is limited to ARO-FT with standard attachment
*6 Underwater weight is a design value

Drawing



Fast Optical DO Sensor for Microscale Measurements

DO T

RINKO-EC

ARO-EC-CM



Overview

The RINKO-EC is optimally designed for eddy correlation measurements by combining a miniaturized detection tip with RINKO's hallmark high-speed response (90% response in 0.5 seconds) DO membrane. The main body is made of titanium, providing robustness despite its compact size. The DO detection membrane allows for continuous measurement for up to 200 hours and can be replaced and calibrated by the user, ensuring excellent maintainability.

The connector in the photo is manufactured by Impulse (current models are manufactured by SubConn).

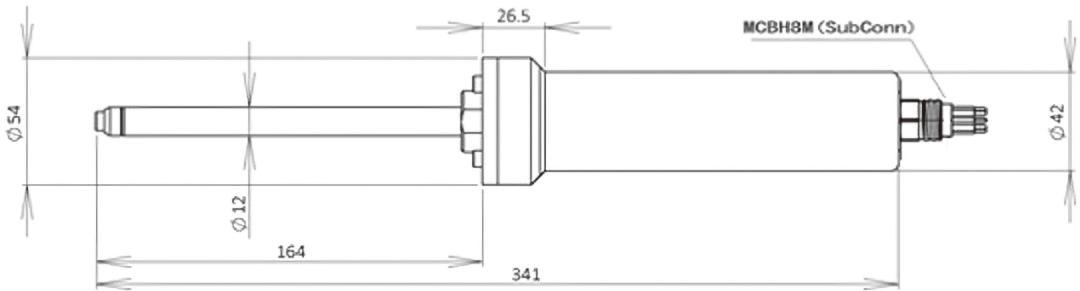
Specifications

Name	RINKO-EC	
Model	ARO-EC-CM	
Parameter / Sensor Type	DO	Optical
	Temperature	Thermistor
Range	DO	0 to 200%
	Temperature	-3 to 45°C
Accuracy / Repeatability	DO Repeatability	±0.5% FS*1
	Temperature Accuracy	±0.02°C (3 to 31°C)
90% Response Time (Physical Quantity Conversion) (Air to Water at 25°C)	DO	≤0.5 sec
	Temperature	≤0.5 sec
DO Membrane Lifetime	200 hours (continuous use)	
External Output	Analog Voltage (0 to 5 V)	
Preheat Time	5 sec	
Power Supply	DC 12 to 24 V	
Current Consumption (when supplied with DC 12 V)	≤20 mA	
Material	Titanium Grade 2	
Dimensions	φ54 mm × 341 mm (excluding connector)	
Weight	Approx. 0.6 kg in air / Approx. 0.3 kg in water	
Pressure Resistance	Equivalent to 50 m depth	
Connector Specification*2	MCBH8M (SubConn)	

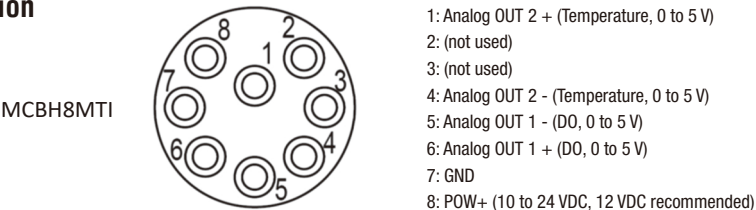
*1 For more accurate DO values, it is recommended to perform two-point calibration (zero and span) before measurement.

*2 Please prepare the connection cable (signal cable) yourself.

Drawing



Pin configuration

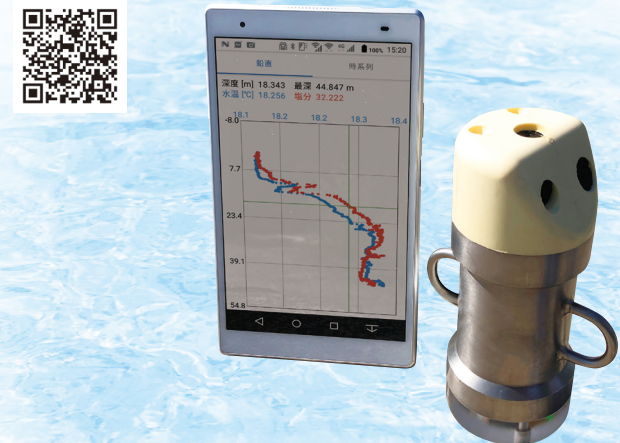


Affordable CTD for Coastal Ocean

C T P

Tegaru CTD

ACTDf-BT / ACTDf5-BT



Overview

Leveraging our extensive experience in CTD technology, we have developed an affordable CTD with general-purpose accuracy. The device has been miniaturized to the size of a 500 ml PET bottle, eliminating the need for cumbersome observation settings. Observation data can be transferred with a single touch to a smartphone or tablet paired via Bluetooth, allowing you to view vertical and time-series graphs on the spot.

Features

1. Easy power ON-OFF operation with a magnet.
2. Data transfer to Android devices*, such as smartphones and tablets via Bluetooth.
3. Contactless charging.
4. The unique sensor head design allows unrestricted descent direction.
5. Simple operation enables observation even during fishing activities.
6. Robust structure that can be attached to fishing gear.

* Compatible with Android™ OS versions 9.0 to 12. Android is a trademark of Google LLC.

Sensor Specifications

Model	ACTDf-BT	ACTDf5-BT	Common to ACTDf-BT/ACTDf5-BT		
Parameter	Depth		Temperature	Electrical Conductivity	Salinity
Sensor Type	Semiconductor Pressure		Thermistor	5-Electrode	Practical Salinity
Range	0 to 2 MPa (equivalent to 0 to 200 m)	0 to 5 MPa (equivalent to 0 to 500 m)	-3 to 45°C	0.5 to 70 mS cm ⁻¹	2 to 42
Accuracy	±1% FS (equivalent to ±2 m)	±1% FS (equivalent to ±5 m)	±0.2°C (3 to 31°C)*1	±0.2 mS cm ⁻¹ (20 to 50 mS cm ⁻¹)*1	—
Response Time (63% response standard value)	0.1 sec	0.1 sec	0.2 sec	0.2 sec	—

*1 Calibration range

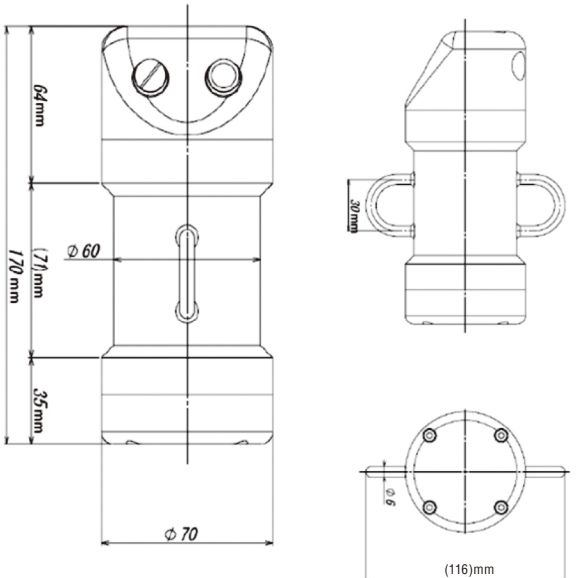
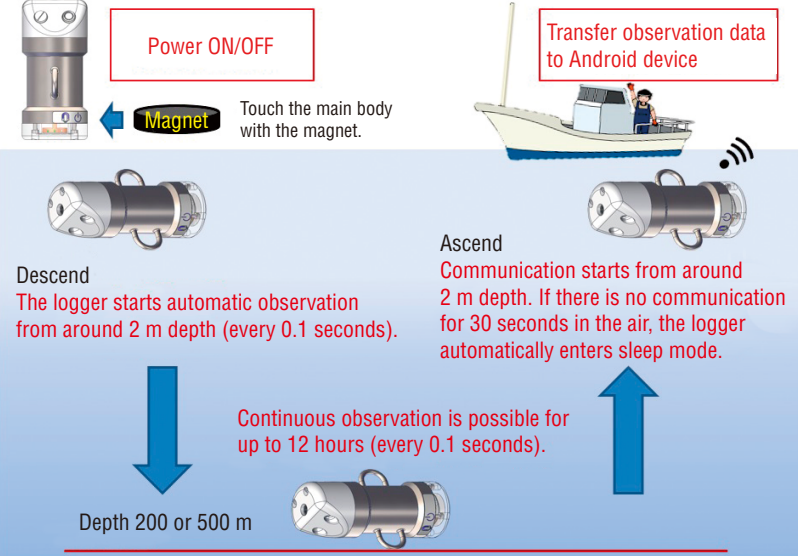
Logger Specifications

Case Material	Titanium Grade 2
Mode	Time Trigger
Interval	0.1 sec (fixed)
Memory Type	Internal Memory
Recording Capacity	Up to 12 hours per block, up to 12 blocks (overwrites oldest data)
Power Supply	Built-in rechargeable lithium-ion battery
Charging Method	Contactless charging (charging time within 5 hours when new)
Observation Time	Approx. 12 hours continuous (when battery is new)
Communication Method	Bluetooth
Dimensions	Approx. φ70 × 170 mm (including handle: 116 mm)
Weight	Approx. 870 g in air / Approx. 310 g in water
Pressure Resistance	Equivalent to 300 m depth (ACTDf-BT), Equivalent to 600 m depth (ACTDf5-BT)

*Since Bluetooth is included, please contact us before purchasing to ensure compliance with local radio regulations.



Observation Image



*Depth zero adjustment is performed when the power is turned ON. Observation starts afterward, but if the depth does not reach 2m within 30 seconds, the logger automatically enters sleep mode.

Pocket size Logger

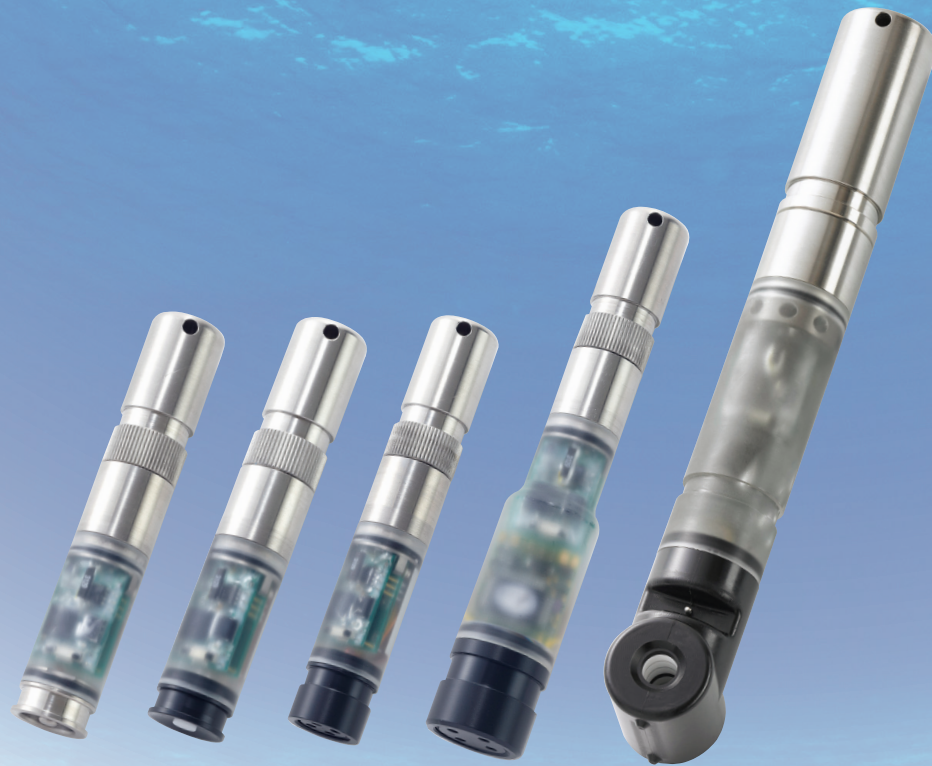
DEFI series

The DEFI series consists of compact, lightweight, high-precision memory-integrated measuring instruments.

With infrared communication with the interface unit and high-speed USB communication with a computer, as well as internal circuit boards molded in resin, these instruments offer quick, safe, and easy handling, achieving unprecedented high precision and high resolution.

The series includes five models tailored to different applications: temperature and salinity meter, temperature meter, PAR meter, pressure meter, and high-precision pressure meter.

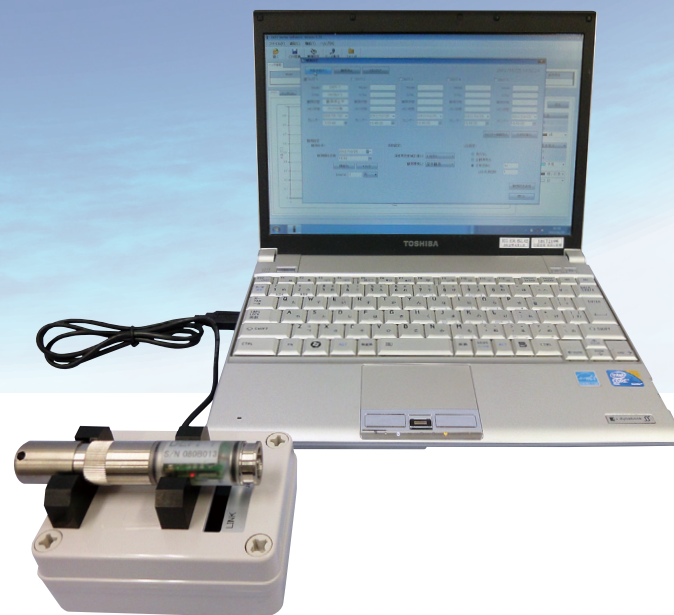
- Infrared communication allows interaction with a computer without opening the instrument.
- Equipped with an LED lamp to confirm the observation status of the instrument.
- Utilizes commercially available alkaline batteries, reducing running costs and ensuring easy procurement.



T L D DHG CT

Interface Unit Common Specifications

Model	DEFI2-IF
Number of Connections to Main Unit	1
Communication Type	USB connection to PC (compliant with Ver. 2.0) / Infrared communication with instrument
Power Supply	USB bus power
Main Material	ABS resin, Acrylic resin
Dimensions	W80 mm × H 110 mm × D 66 mm
Weight	230 g ±20 g



DEFI2-IF

Logger Common Specifications

Communication Type	Infrared communication with interface unit
Data Transfer Method	RS-232C compliant, 115,200 bps
Transfer Time	Approx. 22 min (for full data transfer)
Memory Type	Built-in flash memory 8 MB
Data Storage Capacity	Up to approximately 820,000 data points (approximately 500,000 data points for DEFI2-CT)
AD Conversion Resolution	16-bit
Measurement Mode	Continuous mode
Observation Interval	1 sec to 59 sec, 1 min to 60 min
Power Supply	Alkaline batteries (AA for CT, AAA for others)
Main Material	Housing: Titanium Grade 2 / Optical Window: Polycarbonate

Pocket-Size Conductivity and Temperature Recorder DEFI2-CT

C

T



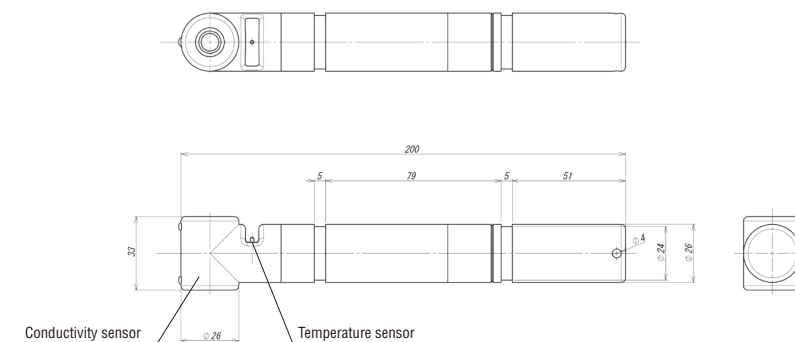
Overview

The DEFI2-CT is a logger-type temperature and salinity meter designed for long-term continuous observation (up to approximately 35 days of continuous observation at 1-minute intervals). In addition to standard installation observations, it can measure salinity stratification variations through the use of multiple moorings.

Sensor Specifications

Model	DEFI2-CT	
Parameter	Temperature	Electrical Conductivity
Sensor Type	Thermistor	7-Electrode
Range	-3 to 45°C	2 to 70 mS cm ⁻¹
Resolution	0.001°C	0.001 mS cm ⁻¹
Accuracy	±0.05°C (3 to 31°C)	±0.05 mS cm ⁻¹ (20 to 50 mS cm ⁻¹)
Response Time (63% response typ)	10 sec	1 sec
Pressure Resistance	Equivalent to 200 m depth	
Weight	Approx. 220 g in air / Approx. 114 g in water (including battery)	
Dimensions	ø26 mm × 200 mm (excluding protrusions)	

Drawing



Digital Conductivity and Temperature Sensor ACTf-CAD

C

T

Sensor Specifications

Model	ACTf-CAD		
Parameter	Temperature	Electrical Conductivity	Salinity
Sensor Type	Thermistor	7-Electrode Type	Practical Salinity
Range	-3 to 45°C	2 to 70 mS cm ⁻¹	2 to 42
Resolution	0.01°C	0.01 mS cm ⁻¹	0.01
Accuracy	±0.05°C (3 to 31°C)	±0.05 mS cm ⁻¹ (20 to 50 mS cm ⁻¹)	—
Pressure Resistance	Equivalent to 100 m depth		
Weight	Approx. 1 kg (including 10 m cable)		
Dimensions	ø27.2 mm × 240 mm (excluding protrusions)		

Communication Specifications

Communication Cycle	1 sec or more
Preheat Time	1 sec
Power Supply	DC 12 to 24 V
Current Consumption	40 mA during measurement (using standard 10 m cable, with DC 12 V supply)

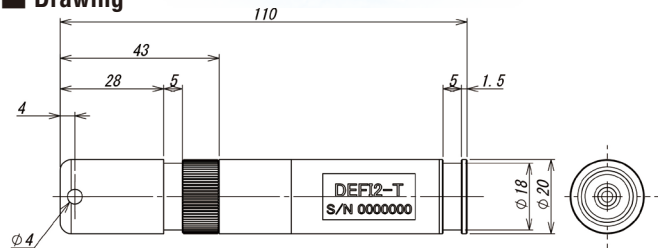


Pocket-Size Temperature Logger

DEFI2-T



Drawing

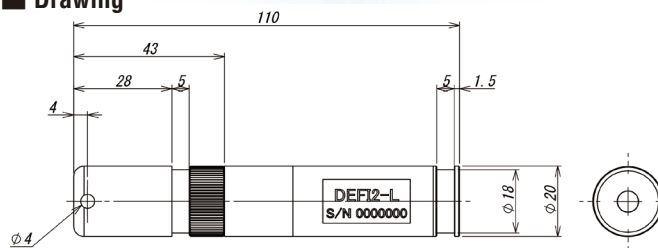


Pocket-Size PAR Logger

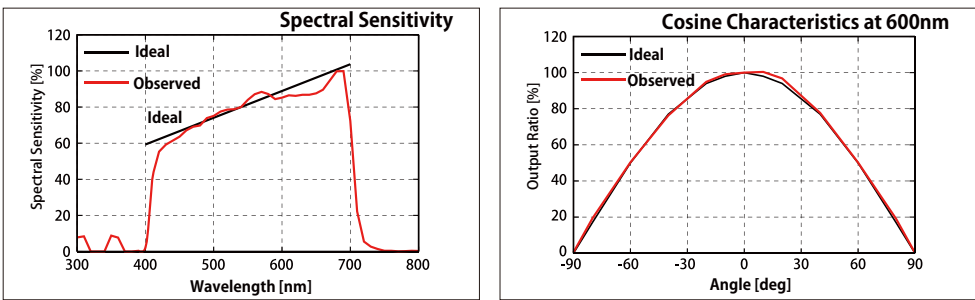
DEFI2-L



Drawing



Sensor Characteristics



Overview

The DEFI2-T is a high-precision water temperature logger designed for long-term continuous monitoring. It is a memory-type device capable of continuous observation for up to approximately 573 days at 1-minute intervals. Due to its compact size, it can be used not only for standard installation monitoring but also for measuring vertical distribution variations through the deployment of multiple units.

Sensor Specifications

Model	DEFI2-T
Parameter	Temperature
Sensor Type	Thermistor
Range	-3 to 45°C
Resolution	0.001°C
Accuracy	±0.01°C (0 to 35°C)
Response Time	12 sec (90% response standard value)
Pressure Resistance	Equivalent to 2,000 m depth
Weight	Approx. 99 g in air / Approx. 65 g in water (including battery)
Dimensions	φ20 mm × 110 mm

Overview

The DEFI2-L is a high-precision quantum sensor designed for long-term continuous monitoring. It is a memory-type device capable of continuous observation for up to approximately 573 days at 1-minute intervals. The quantum sensor employs a cosine-type sensor, which excels in spectral sensitivity specification.
*For underwater quantum measurements, it is recommended to simultaneously measure the quantum of light in the air.

Sensor Specifications

Model	DEFI2-L
Parameter	Quantum of Light
Sensor Type	Photodiode
Range	0 to 5,000 μmol/(m ² ·s)
Resolution	0.2 μmol/(m ² ·s)
Accuracy	±4.0% FS (0 to 2,000 μmol/(m ² ·s))
Response Time	0.007 sec (90% response standard value)
Pressure Resistance	Equivalent to 500 m depth
Weight	Approx. 94 g in air / Approx. 61 g in water (including battery)
Dimensions	φ20 mm × 110 mm

Pocket-Size Pressure Logger

DEFI2-DHG & DEFI2-D



Overview

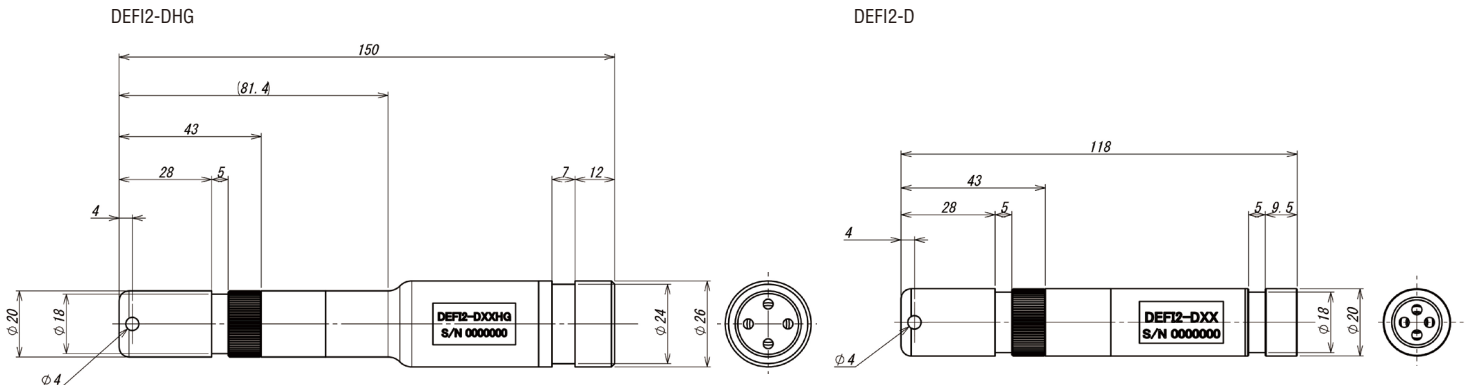
The DEFI2-D and DEFI2-DHG are memory-type pressure loggers (depth gauges) designed for long-term continuous monitoring. The DEFI2-D can perform continuous observations for up to approximately 573 days at 1-minute intervals, while the DEFI2-DHG can do so for up to approximately 52 days. These devices are ideal for monitoring water depth and tidal levels, as well as for behavior studies when attached to fishing nets and for mooring depth monitoring when attached to other underwater measuring instruments. Additionally, the high-precision compact memory pressure loggers include models rated for 2,000 m, enabling observations at great depths.

Sensor Specifications

	High accuracy pocket-size pressure logger				Pocket-size pressure logger		
Model	DEFI2-D5HG	DEFI2-D20HG	DEFI2-D50HG	DEFI2-D2XHG	DEFI2-D10	DEFI2-D20	DEFI2-D50
Parameter	Pressure (Depth)						
Sensor Type	Semiconductor Pressure Sensor						
Range (*equivalent)	0 to 0.5 MPa	0 to 2 MPa	0 to 5 MPa	0 to 20 MPa	0 to 1 MPa	0 to 2 MPa	0 to 5 MPa
	(0 to 50 m)*	(0 to 200 m)*	(0 to 500 m)*	(0 to 2,000 m)*	(0 to 100 m)*	(0 to 200 m)*	(0 to 500 m)*
Resolution (*equivalent)	0.00005 MPa	0.0002 MPa	0.0005 MPa		0.0001 MPa	0.0002 MPa	0.0005 MPa
	(0.005 m)*	(0.02 m)*	(0.05 m)*		(0.01 m)*	(0.02 m)*	(0.05 m)*
Accuracy	±0.3% FS				±1.0% FS (25°C)		
Response Time	0.05 sec (90% response standard value)						
Pressure Resistance	Corresponds to each measurement range						
Weight	Approx. 132 g in air / Approx. 72 g in water (including battery)				Approx. 98 g in air / Approx. 62 g in water (including battery)		
Dimensions	φ26 mm × 150 mm				φ20 mm × 118 mm		

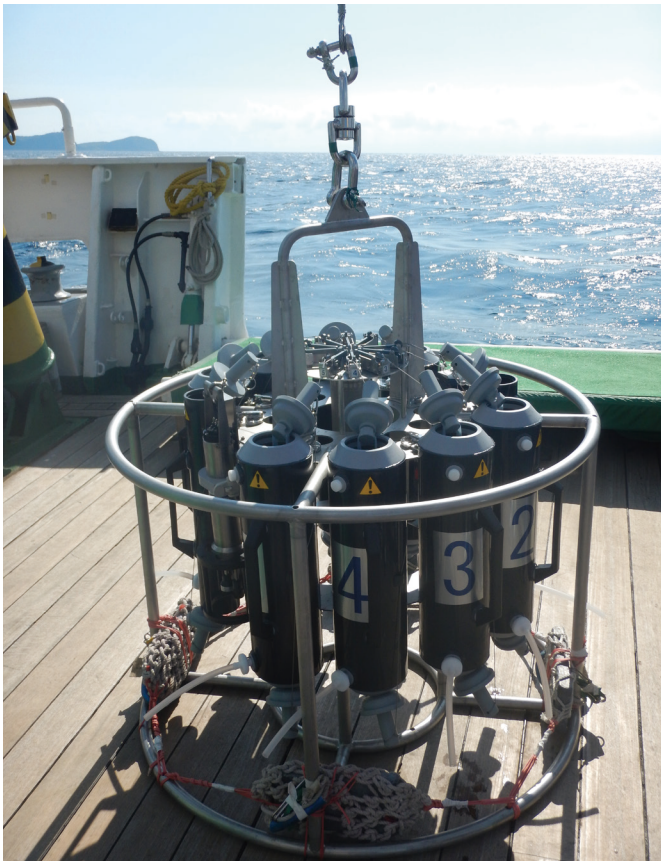
*When measuring tidal level fluctuations, we recommend installing one unit in the air for atmospheric pressure correction.

Drawing



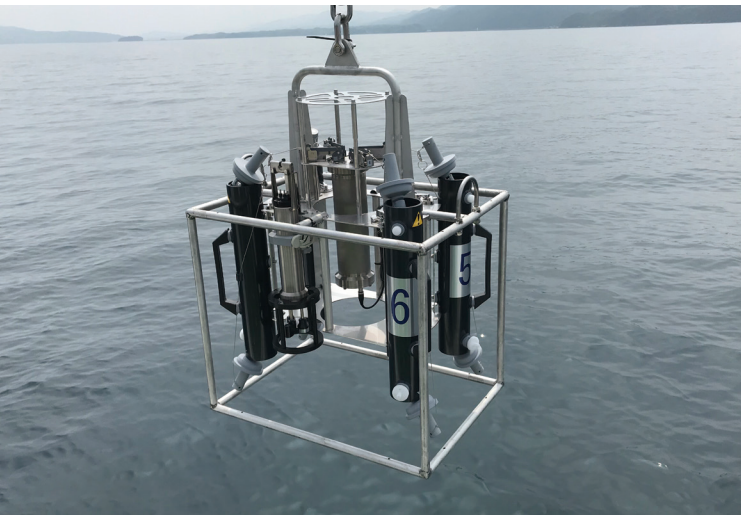
Pre-Programmed Autonomous Water Sampler

AWS1000 / AWS1000-Z67



Features

1. Autonomous (battery-powered) operation, no winch cable required
2. Reliable water sampling at any depth with high-precision pressure sensor
3. Can be equipped with ten 5-liter or 2-liter bottles
4. Capable of simultaneous sampling of 2 bottles
5. Compatible with our CTD (RINKO-Profiler)
6. 2,000m depth version also available as AWS2000, 10-bottle type only



Overview

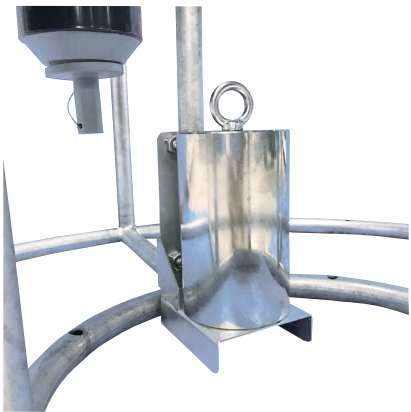
This instrument is a multi-bottle water sampler capable of being equipped with either 10 or 4 water sampling bottles. As it is autonomous, it does not require a dedicated winch, making it suitable for use on small vessels. The sampling depth for each bottle is pre-set by connecting the device to a computer onboard the vessel. When the sampler reaches the set depth, the bottles are automatically sealed. Our CTD (RINKO-Profiler) can be easily attached, and we also provide software that allows linking sampling information.



Power Switch Section



When Attaching CTD (RINKO-Profiler)



When Attaching 10kg Weights *Optional set of 4

Frame / Water Sampling Bottle Specifications

Model	AWS 1000		AWS1000-Z67
Water Sampling Bottle Capacity	2 L	5 L	2 L only
Weight(with water sampling bottles attached, empty)	Approx. 65 kg	Approx. 75 kg	Approx. 40 kg
Frame Material	SUS316		
Water Sampling Bottle Material	PVC (internally fluorine-coated)		
Number of Water Sampling Bottles	10 bottles		4 bottles

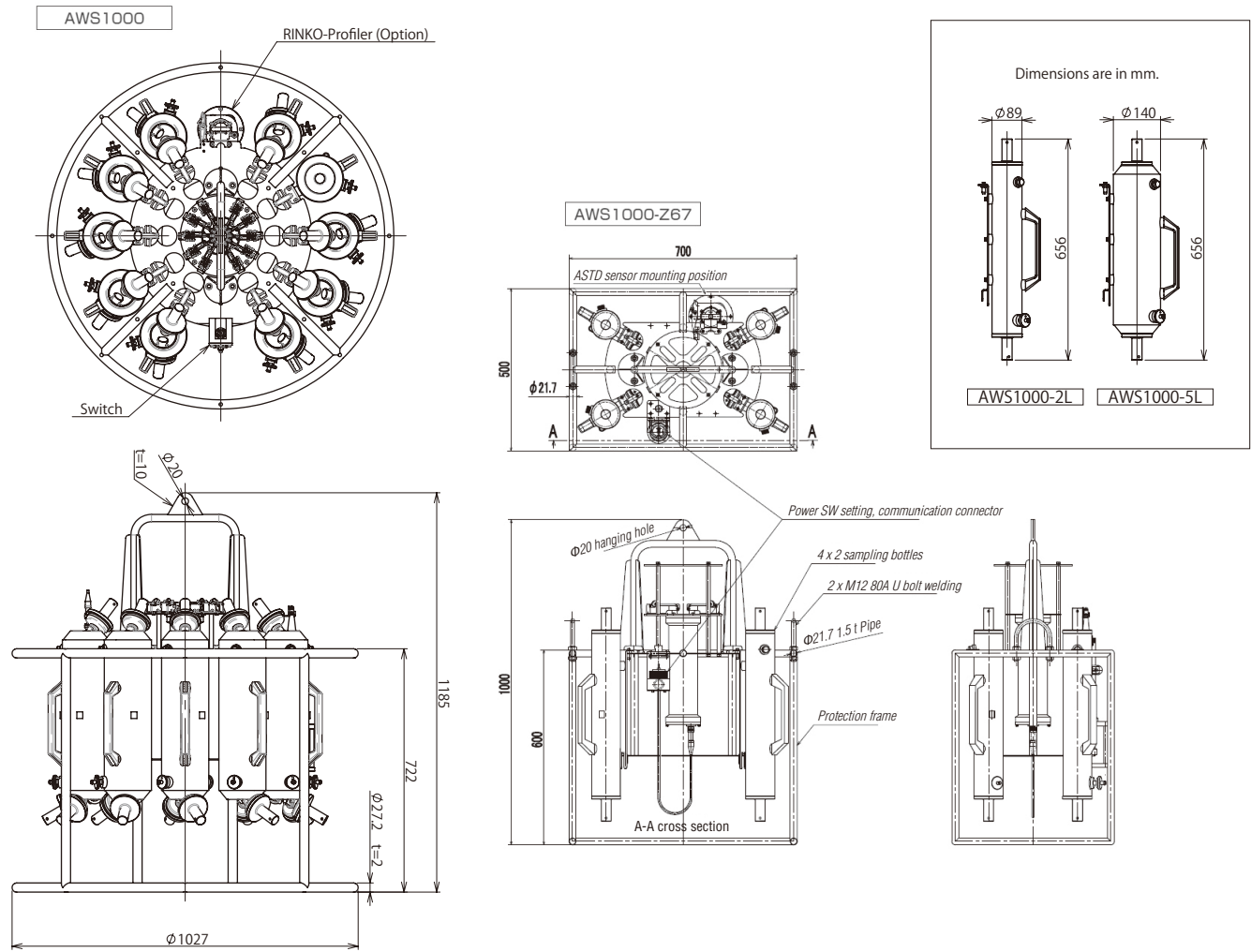
Water Sampling Configuration Specifications

Sampling Mode	Depth Trigger	Time Trigger
Simultaneous Sampling Capacity	Up to 2 bottles	
Minimum Setting Unit	0.1 m	1 sec (for single bottle sampling) 2 sec (for simultaneous sampling of 2 bottles)
Minimum Setting Interval	0.5 m	—

Control Unit Specifications

Model	AWS 1000
Pressure Sensor Accuracy	Non-linearity $\pm 0.1\%$ FS, Reproducibility $\pm 0.3\%$ FS
Pressure Resistance	10 MPa (equivalent to 1,000 m depth)
Continuous Usage Count	Approx. 15 times for 10-bottle sampling at 1,000 m depth

Drawing



Interface Specifications

Model	ASTD-IF
Power Supply	AC 100 to 240 V / 4 AA alkaline batteries
Dimensions	W170 mm × H66 mm × D169 mm (excluding protrusions)
Weight	Approx. 1.0 kg



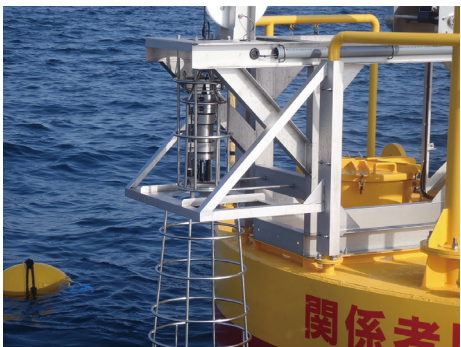
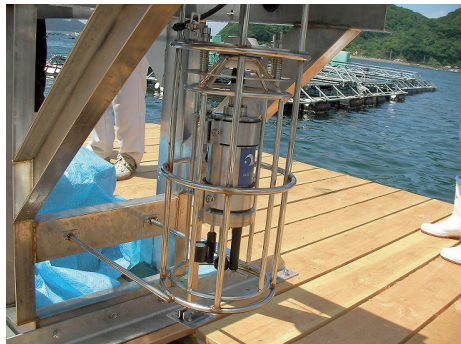
Enables Precise Vertical Automatic Quality Monitoring

Auto Profiling System

C T P DO CHL TBD PAR

Examples of Actual Operation

The Auto Profiling System using a Buoy or a Raft



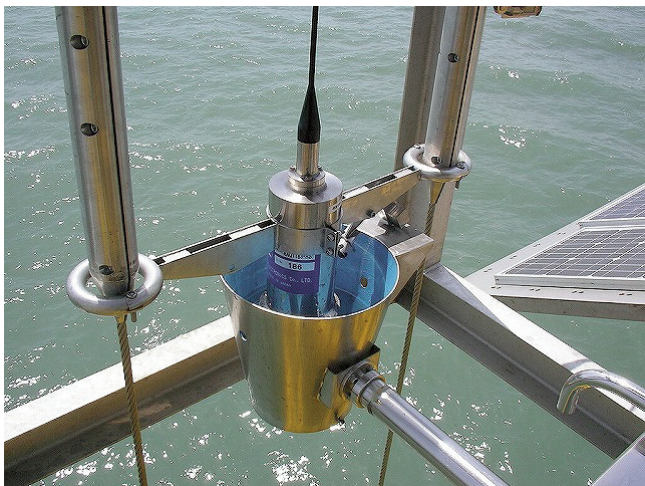
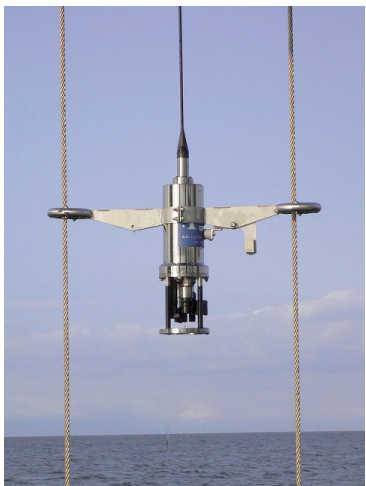
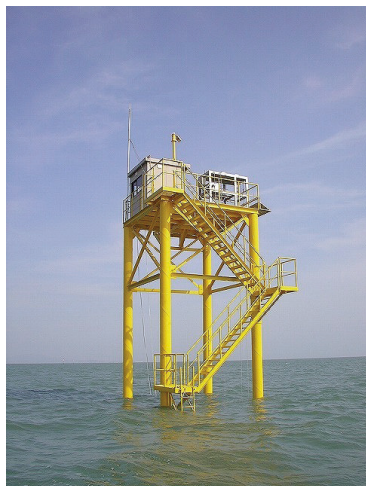
Overview

The Auto Profiling System is an automated observation system that uses a winch lifting device to automatically raise and lower water quality measurement sensors at specified intervals. It measures water quality at various depths and transmits the data via RS-232C communication.

Features

- Vertical Water Quality Measurement with 0.1 m Intervals:
 - Enables precise water quality monitoring at 0.1-meter pitch intervals.
- Air Standby Method:
 - Reduces biofouling and other interferences by keeping the sensors in the air when not in use.
- Single Sensor Measurement:
 - Eliminates the need for instrument error correction.
 - Ensures no discrepancies between different instruments.

The Auto Profiling System using a Tower



Laboratory Electro-Magnetic Current Meter

ACM series

ACM2-RS / ACM3-RS

VEL



2-D velocity sensor ACM2-RS

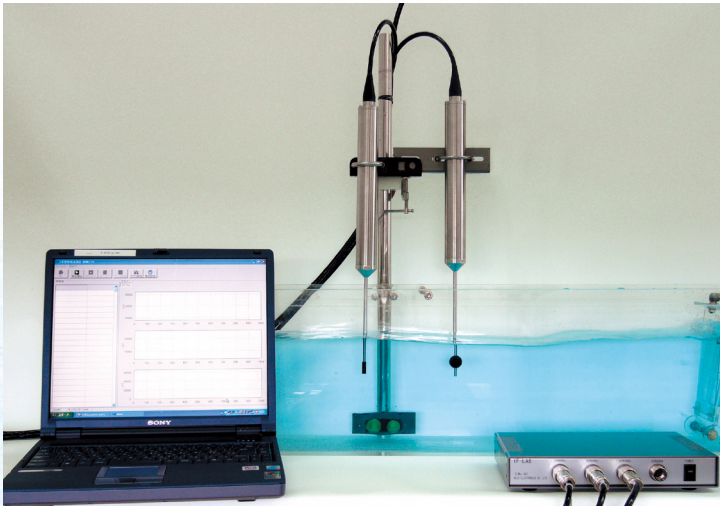
XY Digital Output
Sensor Diameter: 6 mm

3-D velocity sensor ACM3-RS

XYZ Digital Output
Sensor Diameter: 20 mm

Overview

ACM2-RS and ACM3-RS are 2-D and 3-D electro-magnetic current meters for laboratory experiments. The models provide digital output, a high-speed sampling rate and insusceptibility to electro-magnetic noise. With the new system, a maximum of four different sensors can be connected to the compact interface unit, enabling simultaneous recording on a personal computer. Additionally, the system can provide analog output as well as necessary.



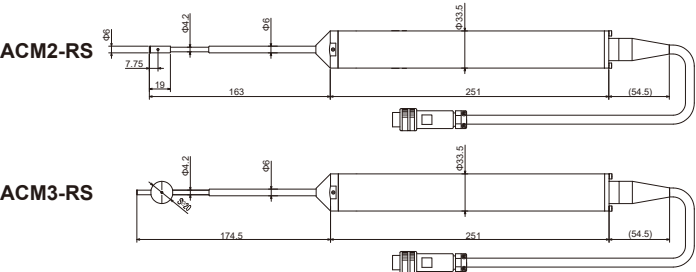
Measurements can be obtained through power supply and command control from the system side.

Sensor Specifications

Sensor Type	2-axis Electromagnetic Induction	3-axis Electromagnetic Induction
Model	ACM2-RS	ACM3-RS
Items	X-Y Horizontal 2-Direction Flow Velocity	X-Y-Z Horizontal and Vertical 3-Direction Flow Velocity
Range	±250 cm s ⁻¹ per axis	±250 cm s ⁻¹ per axis
Accuracy	±0.5 cm s ⁻¹ or ±2% *	±0.5 cm s ⁻¹ or ±2% *
Resolution	0.1 cm s ⁻¹	0.1 cm s ⁻¹
Zero Point Stability	Within 0.1 cm s ⁻¹	Within 0.1 cm s ⁻¹
Response Speed	0.05, 1, 5 sec (switchable)	0.05, 1, 5 sec (switchable)
Sampling Rate	15 to 60 Hz (depending on the number of sensors)	15 to 60 Hz (depending on the number of sensors)
Digital Output Signal	RS-232C	RS-232C
Analog Output Signal	-1 to +1 V	-1 to +1 V
Power Supply	DC 12 V	DC 12 V
Overall Dimensions	Max diameter 34 mm, total length 420 mm	Max diameter 34 mm, total length 420 mm
Sensor head Dimensions	φ6 mm × 19 mm	φ20 mm spherical
Sensor head Pressure Resistance Depth	5 m within 24 hours	5 m within 24 hours
Cable	φ6 mm polyurethane sheath, 6-core cable	φ6 mm polyurethane sheath, 6-core cable

*Flow velocity calibration range is 0 to ±100 cm s⁻¹. The calibration range of Z is 0 to -100 cm s⁻¹.

Drawing



Interface Specifications

Model	Maximum Number of Connections	Power Supply	Dimensions	Weight
ACM-4IF	Up to 4 sensors	AC 100 to 120 V or AC 200 to 230 V (set at shipment)	260 mm × 227 mm × 55 mm	Approx. 2.4 kg

Handheld 2-D Electro-Magnetic Current Meter

AEM213-DA



Built-in Sensor Specifications

Parameter	Sensor Type	Range	Resolution	Accuracy
Flow Velocity ^{*1}	2-axis Electromagnetic Induction	0 to ±250 cm s ⁻¹	0.1 cm s ⁻¹	±1 cm s ⁻¹ or ±2% ^{*2}
Direction	Hall Element	0 to 360°	0.1°	±2°
Pressure (Depth)	Semiconductor Pressure	0 to 50 m	0.01 m	Non-linearity ±0.1% FS Repeatability ±0.3% FS
Temperature	Thermistor	-3 to 40°C	0.01°C	±0.02°C (3 to 31°C)

*1 The flow velocity can be shown in kt (knots). Please specify when ordering.
*2 Flow velocity calibration range is 0 to ±50 cm s⁻¹.

Sensor Specifications

Cable	Kevlar Fiber Reinforced Cable (standard length 50 m)
Dimensions	φ42 mm × 307 mm
Material	Titanium Grade 2
Weight	Approx. 1.0 kg in air (excluding vane) / Approx. 0.65 kg in water (excluding vane)
Pressure Resistance	Equivalent to 200 m depth

Display Unit Specifications

Display Items	Flow Direction, Flow Velocity, Temperature, Depth
Memory	2 MB Flash Memory, approx. 180,000 data points
Power Supply	Four C-size alkaline batteries (approx. 10 hours of continuous use), AC 100 V, DC 12 V
Material	PVC (case)
Waterproof Performance	Equivalent to IPX5
Dimensions	W225 mm × D100 mm × H90 mm (excluding protrusions)
Weight	Approx. 1 kg (excluding batteries)



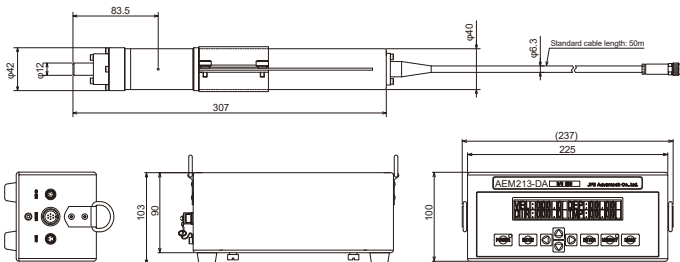
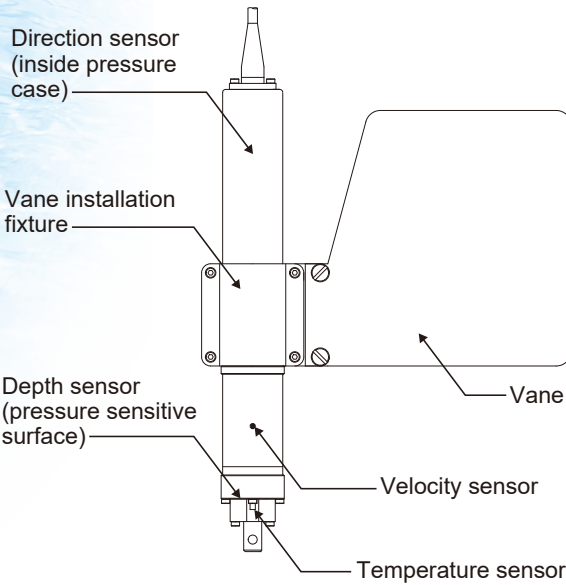
VEL COMP T P

Overview

The AEM213-DA is a direct-reading flow direction and velocity meter equipped with a 2-axis electromagnetic flow velocity sensor and an internal compass. It comes standard with a depth sensor and a water temperature sensor, ensuring accurate flow velocity measurements at the target water depth. This compact and lightweight device is convenient to carry and can be used in various fields such as oceanographic observations, rivers, lakes, and dams.

The display unit, featuring an easy-to-read LCD, also includes a memory function. Observation data can be transferred to a computer after being recorded in the field, allowing for easy execution of various computational processes. The device is powered by C-size alkaline batteries, enabling approximately 10 hours of observation.

Drawing



Handheld 1-D Electro-Magnetic Current Meter

AEM1-DA

Overview

The AEM 1-DA is a portable, field-use 1-axis electromagnetic flow velocity meter developed for easy and accurate measurement of flow velocity in rivers and various waterways. It can be used in locations with water depths starting from 3 cm. Compared to traditional propeller-type meters, it has fewer malfunctions, is very easy to handle and maintain, and provides digital output of flow velocity values from low to high flow velocities.

Additionally, it features a new memory function. It can record data up to 255 measurement points along with calendar information. This eliminates the need for manual entry into field notebooks, allowing data processing to be done on a computer indoors.

Calibration certificate

Compatible with Ceres calibration.
Additional charge will apply.

Sensor Specifications

Sensor Type	1-axis Electromagnetic Induction
Direction	1-axis, 1-direction
Range	0 to 5 m s ⁻¹
Resolution	0.002 m s ⁻¹
Accuracy	±0.005 m s ⁻¹ or ±2% *
Minimum Depth	3 cm
Dimensions	φ30 mm × 77 mm
Cable Length	10 m (extendable up to 50 m)
Pressure Resistance	Equivalent to 30 m depth

* Velocity calibration range is 0 to 0.5 m s⁻¹.

Display Unit Specifications

Display	LCD, 20 characters x 2 lines
Display Item	Current time, Flow velocity (m/s), Block No.
Averaging Time	Selectable: 1, 5, 10, 20, 40, 60 sec
Memory Capacity	2MB, capable of recording up to 255 blocks (maximum approximately 1 million data points)
Recorded Item	Block No., Measurement time, Flow velocity values, Averaging time
External Output	RS-232C output 1. Transfer of memory data 2. Real-time data transmission
Power Supply	Four C-size alkaline batteries (approx. 18 hours of continuous use)
Dimensions	W225 mm × D100 mm × H90 mm (excluding protrusions)
Weight	Approx. 1 kg (excluding batteries)
Material	PVC (case)
Waterproof Performance	Equivalent to IPX5
Operating Temperature Range	0 to 40°C



VEL



Measurement Methods

1. Measurement Using Extension Support Rod
2. Suspended Measurement Using Vane Set



Vane Set (Optional)



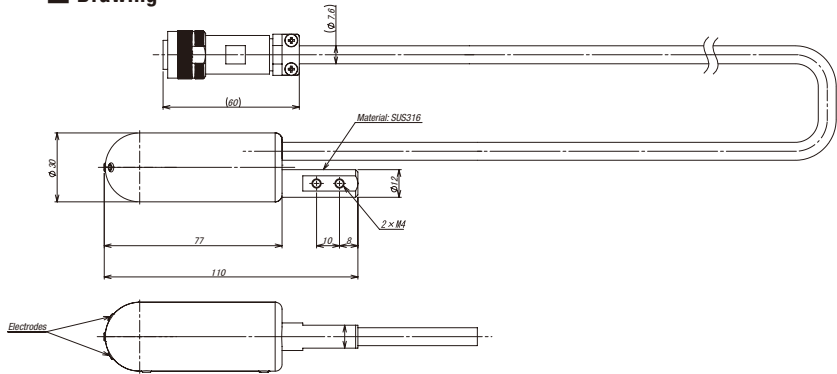
*Contents <Vane, Weights <approx. 1.3 kg, approx. 2.5 kg>, Suspension Bracket, 2 Shackles, Swivel>

Low Water Level Mounting Bracket (Optional)



Available in locations with water depths from 3 cm in minimum.

Drawing



OEM Single Axis Electromagnetic Speed Sensor

VEL

AEM1-G

Overview

The AEM1-G is an OEM electromagnetic speed sensor designed for integration on different types of underwater vehicles (e.g. gliders and AUVs). This sensor directly measures the axial speed of the vehicle, which is a necessary parameter to accurately infer about spatialization of variables observed in the time-domain, and also to understand vehicle's flight dynamics. The sensor automatically output digital and analog signal after being powered on.

Sensor Specifications

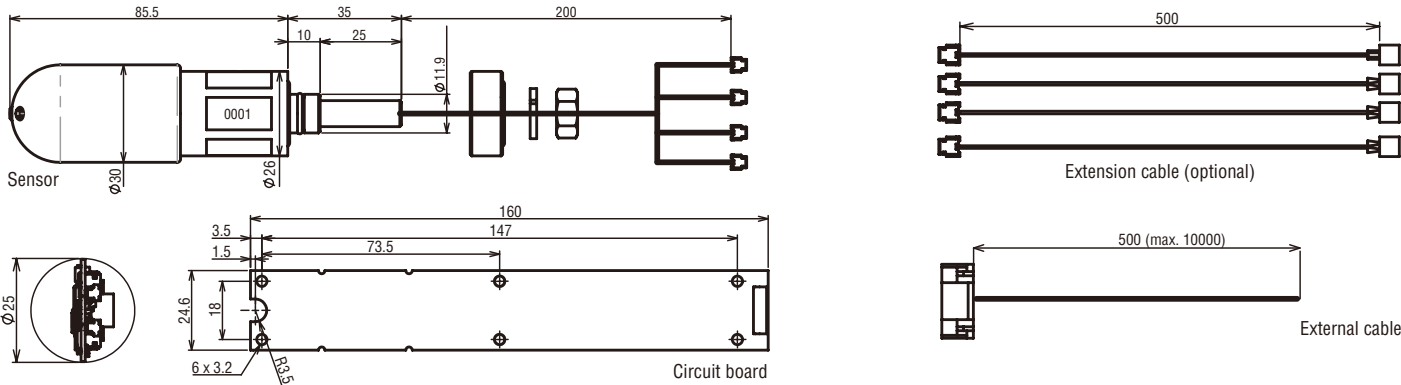
Sensor	Single axis electromagnetic speed sensor
Range	0 to 500 cm s ⁻¹
Accuracy	±0.5 cm s ⁻¹ or ±2% MV (0 to 100 cm s ⁻¹)
Resolution*1	0.01 cm s ⁻¹

*1 typical

Instrument Specifications

Communication	RS-232C	
A/D converter	16 bit digital conversion	
Sampling frequency	10Hz	
Analog output	0 to 5 V	
Operating voltage	DC 4.75 to 5.25 V	
Power consumption	80 to 95 mA	
Materials	Flange and Sensor Shaft: Titanium (grade 2)	
Dimensions	Circuit board	L160 mm x W24.6 mm x H17.6 mm
	Sensor	L85.5 mm x D26 mm (flange) / D30 mm (head)
Weight	167 g (sensor + circuit board)	
Depth rating	1,500 m depth equivalent	
Cable length	Between the sensor and circuit board	20 cm (standard) / 50 cm (optional)
	External (from the circuit board)	50 cm (standard) / 10 m (max.)

Drawing



CTD OEM Sensor

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ACTD-OEM

Overview

The CTD OEM Sensor is designed to be integrated into various types of platforms and allows for measurements of conductivity, temperature and pressure. The conductivity sensor has 7 electrodes with both ends of the sensor having same polarity, ensuring that no interference is caused to the sensor by the proximity of metals or any kind of material. Additionally, its compact size allows this sensor to be integrated into a variety of platforms. Three models are available with different communication protocols: ACTD-OEMR (RS-232C), ACTD-OEMD (RS-485) and ACTD-OEMU (3.3 V logic UART).

Sensor Specifications

Sensor	Conductivity	Temperature	Pressure (Option)
Range	0.5 to 70 mS cm ⁻¹	-3 to 45°C	0 to 2,000 dbar
Accuracy	±0.01 mS cm ⁻¹ *1	±0.01°C (0 to 35°C)	±0.1% FS
Resolution	0.001 mS cm ⁻¹	0.001°C	0.001 dbar

*1 Calibration using seawater (from 28 to 65 mS cm⁻¹).

Instrument Specifications

Communication	RS-232C (ACTD-OEMR), RS-485 (ACTD-OEMD) and 3.3 V logic UART (ACTD-OEMU).	
A/D converter	16 bit digital conversion	
Sampling frequency	Min. 0.1 sec (Default setting)	
Operating voltage	DC 12 to 24 V	
Power consumption*1	ACTD: < 35 mA / ACT: < 30 mA	
Materials	Flange and sensor shaft: titanium (grade 2)	
Dimensions (CT sensor)	Circuit board	L102 mm x W45 mm x H14.7 mm
	Sensor	L18 mm x W34 mm (flange) / L38 x W40 mm (head)
Dimensions (Pressure sensor)	Circuit board	L26 mm x W17 mm
	Sensor	Ø13 mm x W8 mm
Weight	103 g (sensors + circuit board)	
Depth rating	2,000 m depth equivalent (sensor only)	
Cable length	Between the sensor and circuit board	CT sensor: 210 mm (standard), pressure sensor: 407 mm (standard)
	External (from the circuit board)	385 mm (standard)

*1 at 12 V DC

Drawing

