CONTENTS

Professional Instruments for a Variety of D.O. Applications

Dissolved Oxygen Meters

Dissolved Oxygen

Dissolved oxygen meters are instruments that measure the quantity of oxygen dissolved in water.

In normal condition at normal temperature and pressure in an aqueous solution that is allowed to equilibrate with room air, oxygen constitutes about 20.9% of the total dissolved gas with nitrogen being about 78% (some carbon dioxide is present as well). These proportions are similar in air and in solution equilibrated with room air. The atmospheric pressure on the water surface along with temperature are factors that modify the concentrations of DO and therefore have to be compensated for a correct reading.

Since dissolved oxygen determination is based on measurement of a current that is established between the anode and cathode, the salt content of water is another factor that can influence readings and must also be compensated.

Applications

Dissolved oxygen is an important indicator of the degree of usefulness of a sample of water for a specific application. Dissolved oxygen can exist in water in different concentrations and is important for the respiration of a wide variety of animals and aerobic bacteria in the aquatic environment.

Other applications include: water treatment plants, sewage treatment works, effluent activated sludge process, river monitoring, fish farming, and generally any other field where water quality is important.

Biotechnological processes, are another area of applications where dissolved oxygen measurements are essential to maintain quality of the finished product.

In water quality applications, such as aquaculture and fish farming, the level of DO must be kept high. If the DO level falls too low the fish will suffocate. For waste water treatment, in sewage treatment, bacteria decompose the solids, if the DO level is too low, the bacteria will die and decomposition stops; if the DO level is high, there is no need to spend energy in the aeration of the water.

For industrial applications like boilers or cooling towers, low DO levels prevent corrosion and scale build-up which inhibits heat transfer.

Polarographic and Galvanic Probes

HANNA dissolved oxygen meters utilize one of the two common types of dissolved oxygen sensing probes: polarographic sensors and galvanic sensors.

Polarographic sensor technology is based on the Ross and Clark polarographic measurement method. An oxygen probe is composed of a platinum electrode and a solid silver electrode. A concentrated potassium chloride solution is held in place over the surfaces of the electrodes by a PTFE membrane. An external voltage creates a difference in potential between the cathode and anode (less than 0.5 volts).

The external voltage applied to the platinum electrode cathode, silver electrode anode, KCl solution and gas-permeable membrane material establishes a current that is proportional with the concentration of oxygen.

In contrast, a galvanic probe requires no external voltage. The difference in potential between the cathode and anode is greater than 0.5 volts. Galvanic DO sensors consist of two electrodes, a zinc or lead anode and silver cathode, both of which are immersed in electrolyte. An oxygen permeable membrane separates the anode and cathode from the water being measured. Oxygen diffuses across the membrane and interacts with the probe internals to produce an electrical current.

Comparison Guide

GUIDE	Dissolved Oxygen Range	Barometric Pressure	% Saturation O_2	Salinity Compensation	Altitude Compensation	Temperature Range(s)	DO Calibration Points	Barometric Pressure Calibration Points	ATC	HOLD Feature	BEPS	PC Connectivity	Logging	Alarm	GLP	Page
Bench Meters																
HI 4421	•	•		•		°C/°F/K	2	1		•		•	•	•	•	7.4
HI 2400	•		•		•	°C	2		•			•	•		•	7.6
Portable Meters																
HI 98186	•	•	•	•		°C/°F	2	1	•	•	•	•	•		•	7.8
HI 9146	•		•	•	•	°C	2		•		•				•	7.10
HI 9147	•		•	•		°C/°F			•		•					7.11
HI 9142	•					°C/°F	2		•		•					7.12

HI 4421

Research Grade Dissolved Oxygen and BOD Meter

7.4

HANNA's research grade bench meter line expands to include HI 4421. The fully customizable HI 4421 features DO, BOD, OUR and SOUR measurement modes in a compact versatile instrument. The color graphic LCD is capable of displaying graphs, soft key menus, help screens and calibration reminders. HI 4421 also incorporates an intuitive menu system to help streamline your workflow process and provide accurate measurements quickly and efficiently. The large log memory offers 100 lots with 10,000 records per lot. Measurements can be transferred to a PC via USB or RS 232 with HANNA software.

HI 2400

Dissolved Oxygen Meter

7.6

HI 2400 is a dissolved oxygen benchtop meter with automatic calibration and an extended range to measure up to 300% or 45 ppm. This instrument allows for temperature and salinity compensation as well as altitude compensation up to 4000 m.

Dissolved oxygen measurements are displayed in parts per million (ppm=mg/L) or in % saturation.

The polarographic probe uses screw-on membranes for simple replacement. The automatic logging interval can be set to perform analysis and store data in non-volatile memory. All logged data can be transferred to your PC through the USB port. Memory can store up to 8000 samples.

HI 9147

Dissolved Oxygen Meter for Aquaculture

7.12

HI 9147 are specially designed for aquaculture applications. This unit is unique among our family of DO meters, it is supplied with a galvanic probe.

Unlike polarographic probes, galvanic DO probes require no conditioning time. When you need to measure multiple samples in a given period of time, pick it up and measure on demand.

HI 9147 is a must have for DO sensitive organisms or high bio-load environments.

HI 4421

Research Grade Dissolved Oxygen and BOD Meter

- **Extended DO range up to 90 ppm (mg/L) and 600%**
- **Measures DO, atmospheric pressure and temperature**
- **DO direct, DO direct/autohold**
  BOD: Biological Oxygen Demand
  OUR: Oxygen Uptake Rate
  SOUR: Specific Oxygen Uptake Rate
- **Temperature and atmospheric pressure automatic compensation**
- **Manual salinity compensation**
- **Fully customizable**
- **Large log memory using different logging methods**
- **Polarographic probe with built-in temperature sensor**

HI 4421 is a research grade dissolved oxygen bench meter with extensive capabilities in measuring DO as BOD (Biological Oxygen Demand), OUR (Oxygen Uptake Rate), SOUR (Specific Oxygen Uptake Rate), atmospheric pressure and temperature.

DO measurements can be performed in ppm (mg/L) range or in % and feature automatic or manual temperature and atmospheric pressure compensation and manual salinity compensation.

Automatic and manual calibration of DO can be performed in one or two points using standard or user defined standards. Users can set the reading stability criteria; three modes are available: Fast, Medium and Accurate. Direct/autohold auomatically holds the reading on display when measurement stability is reached. In direct reading mode, the user interface can be set to basic with or without GLP, graphic or logging information.

These instruments offer multi-language support and contextual help is available through a dedicated Help key. Clear tutorial messages and directions are available on-screen to quickly and easily guide users through all measurement and calibration procedures to ensure measurements and procedures are performed properly.

The BOD, OUR and SOUR methods are supported with a dedicated tutorial and step by step indication in order to assure a full and correct reading of DO using this specific measuring method.

The DO probe is using the polarographic principal of measurement and has a built-in temperature sensor.

Up to 10 profiles can be saved and recalled eliminating the need to reconfigure each time when a different electrode is used. User definable configurations can include reading mode: direct or BOD, OUR, and SOUR, measurement units, temperature units, stability criteria, and temperature, atmospheric pressure and salinity compensation.

Three selectable logging modes are available: Automatic, Manual and AutoHold logging. Up to 100 logging lots can be stored for automatic or manual modes. Automatic logging features a selectable area and sampling period while GLP information includes complete data about user calibration of each parameter and identification information for the instrument, user, and company. Data can be transferred to a PC via the opto-isolated PC interface via the RS232 or USB ports and HI 92000 software (optional).

Direct measurement

BOD (Biological Oxygen Demand)

OUR (Oxygen Uptake Rate)

SOUR (Specific Oxygen Uptake Rate)

SPECIFICATIONS		HI 4421
Range	Dissolved Oxygen	0.00 to 90.00 ppm; 0.0 to 600.0 % saturation
	Barometric Pressure	450 to 850 mmHg; 560 to 1133 mBar
	Temperature	-20.0 to 120.0°C; -4.0 to 248°F; 253.1 to 393.1 K
Resolution	Dissolved Oxygen	0.01 ppm; 0.1% saturation
	Barometric Pressure	1 mm Hg
	Temperature	0.1°C/°F/K
Accuracy	Dissolved Oxygen	±1.5% of reading ±1 digit
	Barometric Pressure	±3 mm Hg + 1 least significant digit
	Temperature	±0.2°C/K/°F (excluding probe error)
Measurement Modes		direct DO; BOD (biochemical oxygen demand); OUR (oxygen uptake rate); SOUR (specific oxygen uptake rate)
Calibration	Dissolved Oxygen	automatic/user standard, one or two points
	Barometric Pressure	single point
Temperature Compensation		0.0 to 50.0°C; 32.0 to 122.0°F; 237.1 to 323.1 K
Salinity Compensation		0 to 45 g/L (ppt)
Probe		thin body, polarographic dissolved oxygen probe with internal temperature sensor and 1 m (3.3') cable (included)
Logging	Record Samples	up to 100 lots; 10,000 samples/lot for automatic logging; 5000 samples/lot for manual logging
	Logging Interval	from one second and up
	Type	manual, automatic
GLP Features		yes (last calibration data, calibration info)
Alarm (DO, BOD, OUR, SOUR)		inside and outside limits
PC Connection		opto-isolated USB and RS232
Display		graphic color LCD with on-screen help, graphing, language selection and custom configuration
Power Supply		12 VDC adapter (included)
Dimensions		160 x 231 x 94 mm (6.3 x 9.1 x 3.7")
Weight		1.2 Kg (2.6 lbs.)

ORDERING INFORMATION

HI 4421-01 (115V) and **HI 4421-02** (230V) is supplied with HI 76408 DO probe, HI 76404N electrode holder, HI 7041S electrolyte solution (30 mL), HI 76407A membrane caps (2), 12 VDC adapter and instruction manual.

PROBES

HI 76408	Thin body, polarographic DO probe with internal temperature sensor, DIN connector and 1 m (3.3') cable
HI 76407/2	Polarographic DO probe with internal temperature sensor, DIN connector and 2 m (6.6') cable
HI 76407/4	Polarographic DO probe with internal temperature sensor, DIN connector and 4 m (13') cable
HI 76407/10	Polarographic DO probe with internal temperature sensor, DIN connector and 10 m (33') cable
HI 76407/20	Polarographic DO probe with internal temperature sensor, DIN connector and 20 m (67') cable

SOLUTIONS

HI 7040M	Zero oxygen solution, 230 mL
HI 7040L	Zero oxygen solution, 500 mL
HI 7041S	Electrolyte solution, 30 mL
HI 7041M	Refilling electrolyte solution (230 mL)
HI 7041L	Refilling electrolyte solution (500 mL)

ACCESSORIES

HI 76407A/P	Replacement membrane (5)
HI 76404N	Electrode holder
HI 92000	Windows® compatible software
HI 920013	USB cable for PC connection
HI 920010	Serial cable for PC connection

For a complete list of Solutions, Probes and Accessories, see the end of this section.

HI 2400

Dissolved Oxygen Meter

- DO range up to 300%
- Altitude compensation up to 4000 m
- Salinity compensation up to 40 g/L
- Automatic temperature compensation
- Automatic calibration in air
- PC compatible via USB
- Datalogging and storage up to 8000 samples
- GLP Features

HI 2400 is a dissolved oxygen benchtop meter with automatic calibration and % or mg/L (ppm) measurement range. The measurement is automatically compensated for altitude and salinity compensation based on the user settings for altitude up to 4000 m and 40 g/L for salinity.

Calibration is performed at one or two points at 0% using HANNA's HI 7040 solution or 100% in air.

Measurements are automatically temperature compensated by using the polarographic DO probe with built-in temperature sensor. This probe features screw cap membranes for easy replacement.

With a built-in logging function, measurements are stored in non volatile memory, and can be transferred to a PC through the USB port using the optional HI 92000 software and HI 920013 USB cable. The software is provided with an exclusive online guide of all the commands available and allows data printing, plotting and exporting.

The 8000 record logging interval allows the possibility of process and experimental monitoring of DO. The logging interval is automatic with user selectable intervals from 5 seconds to 180 minutes according with the speed of DO variation inside the process.

The HI 2400 also provides users with GLP (Good Laboratory Practice) capabilities. GLP is a set of functions that allow the storage and retrieval of data regarding calibration. The GLP feature provides data consistency and a calibration reminder which can be set to alert the user that too much time has elapsed since the last calibration and a new one should be performed.

7.13

HI 76407

Standard DO Probe

HI 76407 dissolved oxygen probe is extremely rugged making it ideal for both laboratory and field applications. Calibration is fast, simple and all DO measurements are temperature compensated. The pre-tensioned, ready-made PTFE membrane can be changed in a few seconds without the need to stretch and cut replacements.

Several cable lengths are available.

7.15

HI 76408

Thinner, Lighter DO Probe for Laboratories

The HANNA HI 76408 DO probe is rugged and perfect for both laboratory and field applications. Calibration is fast and simple, and measurements are temperature compensated. The sensitive PTFE membrane can be changed in a few seconds.

Polarographic DO Probe

The HI 2400 utilizes Polarographic sensor technology based on the Ross and Clark polarographic measurement type solution. An oxygen probe is composed of a platinum electrode and a solid silver electrode. A concentrated potassium chloride solution is held in place over the surfaces of the electrodes by a PTFE membrane. An external voltage creates a difference in potential between the cathode and anode (less than 0.5 volts). The external voltage applied to the platinum electrode cathode, silver electrode anode, KCl solution and gas-permeable membrane material establishes a current that is proportional with the concentration of oxygen.

SPECIFICATIONS		HI 2400
Range	DO	0.00 to 45.00 mg/L (ppm)
	% Saturation O_2	0.0 to 300.0 %
	Temperature	0.0 to 50.0°C
Resolution	DO	0.01 mg/L (ppm)
	% Saturation O_2	0.1%
	Temperature	0.1°C
Accuracy (@20°C/68°F)	DO	±1.5% F.S.
	% Saturation O_2	±1.5% F.S.
	Temperature	±0.2°C (excluding probe error)
Dissolved Oxygen Calibration		one or two points at 0% (HI 7040 solution) and 100% (in air)
Altitude Compensation		0 to 4000 m (with 100 m resolution)
Salinity Compensation		0 to 40 g/L (ppt) (with 1 g/L resolution)
Temperature Compensation		automatic, 0.0 to 50.0°C (32.0 to 122°F)
Probe		HI 76407/2 polarographic DO probe with internal temperature sensor, DIN connector and 2 m (6.6') cable (included)
Logging Interval		5, 10, 30 seconds or 1, 2, 5, 10, 15, 30, 60, 120, 180 minutes
PC Connection		opto-isolated USB
Power Supply		12 VDC adapter
Environment		0 to 50°C; RH max 95%
Dimensions		235 x 222 x 109 mm (9.2 x 8.7 x 4.3")
Weight		1.3 kg (2.9 lbs.)

ORDERING INFORMATION

HI 2400-01 (115V) and **HI 2400-02** (230V) are supplied with HI 76407/2 dissolved oxygen probe, HI 76407A membrane caps (2), HI 7041S electrolyte solution (30 mL), 12 VDC adapter and instructions.

PROBES

HI 76407/2	Polarographic DO probe with internal temperature sensor, DIN connector and 2 m (6.6') cable
HI 76407/4	Polarographic DO probe with internal temperature sensor, DIN connector and 4 m (13') cable
HI 76407/10	Polarographic DO probe with internal temperature sensor, DIN connector and 10 m (33') cable
HI 76407/20	Polarographic DO probe with internal temperature sensor, DIN connector and 20 m (67') cable
HI 76408	Thin body, polarographic DO probe with internal temperature sensor, DIN connector and 1 m (3.3') cable

SOLUTIONS

HI 7040M	Zero oxygen solution, 230 mL
HI 7040L	Zero oxygen solution, 500 mL
HI 7041S	Electrolyte solution, 30 mL
HI 7041M	Refilling electrolyte solution (230 mL)
HI 7041L	Refilling electrolyte solution (500 mL)

ACCESSORIES

HI 76407A/P	Replacement membranes (5)
HI 92000	Windows® compatible software
HI 920013	USB cable for PC connection

For a complete list of Solutions, Probes and Accessories, see the end of this section.

HI 98186

Dissolved Oxygen and BOD Meter

- **Extended DO range up to 50 ppm and 600% saturation**
- **Built-in barometer**
- **Salinity, pressure and temperature compensation**
- **Backlit, graphic LCD display**
- **Calibration reminder**
- **Log on demand** (400 samples)
- **Auto HOLD**
- **GLP features**
- **PC connectivity via USB**

BOD gives an indication of the biodegradable organic material present in a sample of water. The dissolved oxygen concentration is measured before and after an incubation period of 5 days and the BOD is calculated in mg per liter from the difference.

OUR and SOUR are used to determine the oxygen consumption or respiration rate. OUR is measured in mg of oxygen consumed per liter per hour, and SOUR is measured in mg of oxygen consumed per gram of volatile suspended solids per hour.

HI 98186 portable Dissolved Oxygen Meter has extended ranges of up to 50 ppm or 600% saturation. This instrument includes barometric pressure measurement and calibration with a user selectable unit (mmHg, atm, mbar, psi, kPa) as well as a 1 or 2 point temperature calibration. Salinity, pressure and temperature compensations enhance the precision of your readings.

With its internal barometer, the instrument is able to automatically compensate for changes in barometric pressure so there is no need for charts, altitude information or external barometric pressure information. Salinity compensation in water allows direct determination of dissolved oxygen in saline waters.

Other features include measurement and methods for BOD (biochemical oxygen demand), OUR (oxygen uptake rate), and SOUR (specific oxygen uptake rate).

The HI 98186's log on-demand features allows users to store up to 400 samples that can be later transferred to a PC with the HI 920013 USB cable and HI 92000 software.

An "Out Of Calibration Range Warning" can be activated to alert the user in the event that a reading is taken too far from the calibration's periphery. A combination of dedicated and soft keys allows easy, intuitive operation in a choice of languages. Comprehensive GLP data is directly accessible by pressing the GLP key and a contextual Help menu can be access to obtain on-screen information and assistance about each feature at the touch of a button.

Designed for field use, this instrument can be easily operated with one hand and is housed in a rugged carrying case. The inductive charger can either be plugged into a standard 115V socket with the adapter included or a 12 VDC source, such as a car's 12 V accessory outlet.

BOD results

BOD is calculated in mg per liter from the difference between the initial and final dissolved oxygen concentration readings.

OUR results

Measured in mg of oxygen consumed per L per hour.

SOUR results

Measured in mg of oxygen consumed per g of volatile suspended solids per hour.

BOD parameters and records

All necessary parameters for BOD testing can be set and displayed at once.

A list of all saved BOD data can be easily retrieved and shown on the LCD display.

SPECIFICATIONS		HI 98186
Range	Dissolved Oxygen	0.00 to 50.00 mg/L (ppm); 0.0 to 600.0 % saturation
	Barometric Pressure	450 to 850 mmHg
	Temperature	-20.0 to 120.0°C (-4.0 to 248.0°F)
Resolution	Dissolved Oxygen	0.01 mg/L (ppm); 0.1% saturation
	Barometric Pressure	1 mm Hg
	Temperature	0.1°C/°F
Accuracy (@20°C/68°F)	Dissolved Oxygen	±1.5% of reading ±1 digit
	Barometric Pressure	± 3 mmHg within ±15% from the calibration point
	Temperature	±0.2°C/±0.4°F (excluding probe error)
Measurement Modes		direct DO; BOD (biochemical oxygen demand); OUR (oxygen uptake rate); SOUR (specific oxygen uptake rate)
Calibration	Dissolved Oxygen	automatic one or two point at 100 % (8.26 mg/L) and 0 % (0 mg/L).; manual one point using a value entered by the user in % saturation or mg/L
	Barometric Pressure	one point at any in range pressure value
	Temperature	one or two point at any in range temperature value
Compensation	Barometric	automatic from 450 to 850 mmHg
	Salinity	automatic from 0 to 70 g/L
	Temperature	automatic from 0.0 to 50.0 °C (32.0 to 122.0 °F)
Probe		HI 76407/4F polarographic DO probe with protective sleeve, internal temperature sensor, DIN connector and 4m (13') cable (included)
Logging		log on demand, 400 samples
PC Connectivity		opto-isolated USB (with HI 92000 software)
Battery Type / Life		1.2V (4) AA rechargeable batteries/approximately 200 hours of continuous use without backlight
Auto-off		user selectable: 5, 10, 30, 60 min or can be disabled
Environment		0 - 50 °C (32 - 122 °F) RH max 100%
Dimensions		226.5 x 95 x 52 mm (8.9 x 3.75 x 2")
Weight		525 g (1.1 lbs.)

HI 76407A/P

Easy, Screw Cap DO Membranes

Carry Extras for Assurance

When the PTFE (PolyTetraFluoro-Ethylene) membrane of the protective cap wears, it is always good to have a back-up.

HI 76407A/P Contains 5 ready-to-use, replacement membranes.

ORDERING INFORMATION

HI 98186-01 (115V) and **HI 98186-02** (230V) are supplied with HI 76407/4F DO probe, spare membranes (2), HI 7041S electrolyte solution (30 mL), rechargeable batteries, HI 710042 inductive battery charger with power adapter, 12 VDC adapter, instructions and rugged carrying case.

PROBES

HI 76407/4F Polarographic DO probe with protective sleeve, internal temperature sensor, DIN connector and 4 m (13') cable

HI 76407/10F Polarographic DO probe with protective sleeve, internal temperature sensor, DIN connector and 10 m (33') cable

HI 76407A/P Replacement membranes (5)

SOLUTIONS

HI 7040M Zero oxygen solution, 230 mL

HI 7040L Zero oxygen solution, 500 mL

HI 7041S Electrolyte solution, 30 mL

HI 7041M Refilling electrolyte solution (230 mL)

HI 7041L Refilling electrolyte solution (500 mL)

For a complete list of Solutions, Probes and Accessories, see the end of this section.

HI 9146

Dissolved Oxygen Meter

- **On-screen tutorial messages**
- **Two point calibration**
- **Auto endpoint**
- **DO range up to 300%, temperature compensated**
- **Altitude compensation up to 4000 m**
- **Salinity compensation up to 80 g/L**
- **Automatic calibration in air**
- **GLP features**
- **Low battery indicator**

HI 9146 is a water-resistant, dissolved oxygen meter that measures up to 300% saturation or 45 ppm (mg/L) with temperature compensation and automatic calibration. It has been developed for DO and temperature measurement in water, wastewater, and applications such as fish farming.

This instrument also allows altitude compensation up to 4000 m and the ppm and % saturation are both compensated for changes in solubility of oxygen in water and for permeability of the membrane as well as the temperature effect.

The included polarographic probe features built-in temperature compensation and removable protective membrane cover.

ORDERING INFORMATION

HI 9146-04 is supplied complete with HI 76407/4F probe with 4 m (13.1') cable, HI 76407A membranes (2), HI 7041S electrolyte solution (30 mL), batteries, instructions and rugged carrying case.
HI 9146-10 is supplied complete with HI 76407/10F probe with 10 m (32.8') cable, HI 76407A membranes (2), HI 7041S electrolyte solution (30 mL), batteries, instructions and rugged carrying case.

PROBES

HI 76407/4F	Polarographic DO probe with protective sleeve, internal temperature sensor, DIN connector and 4 m (13') cable
HI 76407/10F	Polarographic DO probe with protective sleeve, internal temperature sensor, DIN connector and 10 m (33') cable

SOLUTIONS

HI 7040M	Zero oxygen solution, 230 mL
HI 7040L	Zero oxygen solution, 500 mL
HI 7041S	Electrolyte solution, 30 mL
HI 7041M	Refilling electrolyte solution (230 mL)
HI 7041L	Refilling electrolyte solution (500 mL)

ACCESSORIES

HI 76407A/P	Replacement membranes (5)

SPECIFICATIONS		HI 9146
Range	O_2	0.00 to 45.00 mg/L (ppm)
	% Saturation O_2	0.0 to 300.0%
	Temperature	0.0 to 50.0°C
Resolution	O_2	0.01 mg/L (ppm)
	% Saturation O_2	0.1%
	Temperature	0.1°C
Accuracy (@ 20°C/68°F)	O_2	±1.5% F.S.
	% Saturation O_2	±1.5% F.S.
	Temperature	±0.2°C (excluding probe error)
Dissolved Oxygen Calibration		one or two points at 0% (HI 7040 solution) and 100% (in air)
Temperature Compensation		automatic, 0 to 50°C (32 to 122°F)
Altitude Compensation		0 to 4000 m (resolution 100 m)
Salinity Compensation		0 to 80 g/L (ppt) (resolution 1 g/L)
Probe		HI 76407/4F polarographic DO probe, internal temperature sensor, DIN connector and 2 m (6.6') cable (included)
Battery Type / Life		1.5V AAA (3) /approximately 200 hours of continuous use without backlight (50 hours with backlight on)
Environment		0 to 50°C (32 to 122°F); RH max 95%
Dimensions		185 x 72 x 36 mm (7.3 x 2.8 x 1.4")
Weight		300 g (10.6 oz.)

For a complete list of Solutions, Probes and Accessories, see the end of this section.

HI 9147

Dissolved Oxygen Meter for Aquaculture

Galvanic Probe for Fish Farming

- **Designed specifically for aquaculture**
- **Galvanic DO probe**
- **Backlit LCD**
- **Automatic Temperature Compensation**
- **Manual salinity and altitude compensation**
- **Water-resistant**

HI 9147 is designed for aquaculture applications. This unit is unique among our family of DO meters as it is supplied with a galvanic probe.

Unlike polarographic probes, galvanic DO probes require no conditioning time. When you need to measure multiple samples in a given period of time, pick it up and measure on demand.

HI 9147 is a must have for DO sensitive organisms or high bio-load environments.

DO Levels at 100% Saturation

	Salinity (ppt)				
Temperature	0	10	20	30	40
10°C / 50°F	13.0	12.2	11.4	10.6	9.8
15°C / 59°F	10.3	9.7	9.2	8.6	8.1
20°C / 68°F	9.4	8.8	8.4	7.9	7.4
25°C / 77°F	8.5	8.0	7.6	7.2	6.7
30°C / 86°F	7.8	7.4	7.0	6.6	6.2

SPECIFICATIONS		HI 9147
Range	O_2	0.0 to 50.0 mg/L (ppm)
	% Saturation O_2	0 to 600 %
	Temperature	-5.0 to 50.0°C (32.0 to 122.0°F)
Resolution	O_2	0.1 mg/L (ppm) or 1%
	Temperature	0.1°C (1°F)
Accuracy (@ 20°C/68°F)	O_2	±1% of reading
	Temperature	±0.2°C (1°F) (excluding probe error)
Calibration		manual, in saturated air
Temperature Compensation		automatic, -5 to 50°C (23°F to 122°F)
Altitude Compensation		0 to 4000 m (resolution 100 m)
Salinity Compensation		0 to 51 g/L (ppt) (1 g/L resolution)
Probe		HI 76409/4 galvanic DO probe (fixed) with internal temperature sensor, DIN connector and 4 m (13') cable (HI 9147-04), 10 m (33') cable (HI 9147-10), 15 m (49') cable (HI 9147-15) or 20 m (66') cable (HI 9147-20) (included)
Battery Type / Life		1.5V AAA (3) / approx. 1,000 hours of continuous use without backlight
Environment		0 to 50°C (32 to 122°F); RH max 95% non-condensing
Dimensions		185 x 72 x 36 mm (7.3 x 2.8 x 1.4")
Weight		450 g (15.9 oz.)

ORDERING INFORMATION

HI 9147-04 is supplied with HI 76409/4 probe with 4 m (13') cable and spare membranes (2), electrolyte solution (30 mL), batteries, screwdriver and instructions.
HI 9147-10 is supplied with HI 76409/10 probe with 10 m (32.8') cable and spare membranes (5), electrolyte solution (30 mL), batteries, screwdriver and instructions.
HI 9147-15 is supplied with HI 76409/15 probe with 15 m (49.2') cable and spare membranes (5), electrolyte solution (30 mL), batteries, screwdriver and instructions.
HI 9147-20 is supplied with HI 76409/20 probe with 20 m (65.6') cable and spare membranes (5), electrolyte solution (30 mL), batteries, screwdriver and instructions.

SOLUTIONS

HI 7042S	Electrolyte solution for galvanic probes, 30 mL
HI 7040M	Zero oxygen solution, 230 mL
HI 7040L	Zero oxygen solution, 500 mL

ACCESSORIES

HI 76409-0	Protective sleeve for HI 76409 probes
HI 76409A/P	Membranes for HI 76409 probes (5)

For a complete list of Solutions, Probes and Accessories, see the end of this section.

HI 9142

Manual Calibration Dissolved Oxygen Meter

- **Automatic Temperature Compensation**
- **Affordable and efficient**
- **DO probe and carrying case included**

The ever increasing demand for instant on-site analysis results has created a need for innovative and rugged portable, waterproof meters.

Field work can subject instrumentation to the inclemency of weather. Cold, rain, snow, dust and humidity can cause condensation to breech the housing. Once the housing has been compromised, the meter is susceptible to diminishing performance and life. The rugged, waterproof housing of the HI 9142 solves many of the problems of field use.

Calibration is performed with HI 7040 zero oxygen solution, while 100% calibration is done in air.

The polarographic probe (HI 76407/4) is accurate to 0.3 ppm and is supplied with a 4 m (13') cable that allows measurements to be taken even in hard to reach places.

ORDERING INFORMATION

HI 9142 is supplied with HI 76407/4 probe with 4 m (13') cable, 2 spare membranes, HI 7041S electrolyte solution (30 mL), calibration screwdriver, batteries, instructions and rugged carrying case.
HI 9142/10 is supplied with HI 76407/10 probe with 10 m (32.8') cable, 2 spare membranes, HI 7041S electrolyte solution (30 mL), calibration screwdriver, batteries, instructions and rugged carrying case.
HI 9142/20 is supplied with HI 76407/20 probe with 20 m (65.6') cable, 2 spare membranes, HI 7041S electrolyte solution (30 mL), calibration screwdriver, batteries, instructions and rugged carrying case.

PROBES

HI 76407/4	Polarographic DO probe with protective sleeve, internal temperature sensor, DIN connector and 4 m (13') cable
HI 76407/10	Polarographic DO probe with internal temperature sensor, DIN connector and 10 m (32.8') cable
HI 76407/20	Polarographic DO probe with internal temperature sensor, DIN connector and 20 m (65.6') cable

SOLUTIONS

HI 7040M	Zero oxygen solution, 230 mL
HI 7040L	Zero oxygen solution, 500 mL
HI 7041S	Refilling electrolyte solution (30 mL)
HI 7041M	Refilling electrolyte solution (230 mL)
HI 7041L	Refilling electrolyte solution (500 mL)

ACCESSORIES

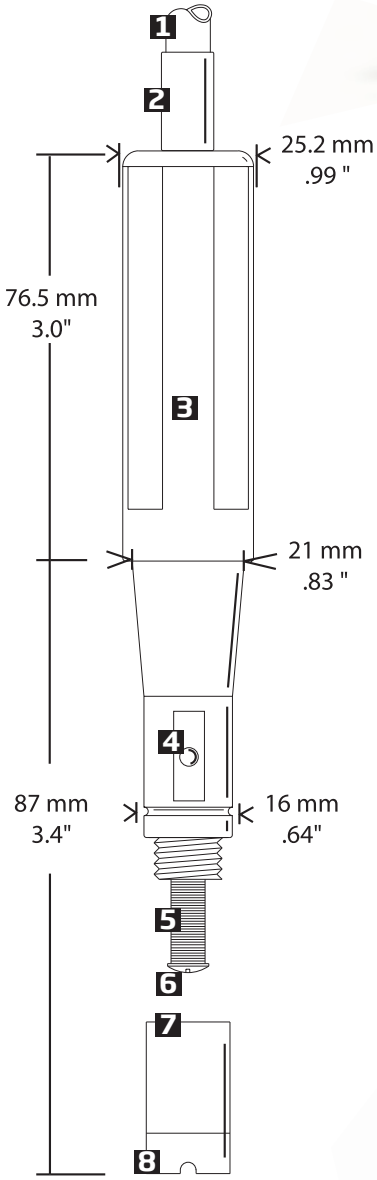
HI 76407A/P	Replacement membranes (5)
HI 721317	Rugged carrying case

SPECIFICATIONS		HI 9142
Range	O_2	0.0 to 19.9 mg/L (ppm)
	Temperature	-5.0 to 50.0°C (32.0 to 122.0°F)
Resolution	O_2	0.1 mg/L (ppm)
	Temperature	0.1°C (1°F)
Accuracy (@ 20°C/68°F)	O_2	±1.5% F.S.
	Temperature	±0.2°C (±1°F) (excluding probe error)
Calibration		manual, at one or two points (zero and slope)
Temperature Compensation		automatic, 0 to 50°C (32 to 122°F)
Probe		HI 76407/4 polarographic DO probe with internal temperature sensor, DIN connector and 4 m (13') cable
Battery Type / Life		1.5V AAA (3) / approximately 1,000 hours of continuous use
Environment		0 to 50°C (32 to 122°F); RH max 95%
Dimensions		185 x 72 x 36 mm (7.3 x 2.8 x 1.4")
Weight		300 g (10.6 oz.)

For a complete list of Solutions, Probes and Accessories, see the end of this section.

HI 76407

Standard DO Probe



The HI 76407 dissolved oxygen probe is extremely rugged, making it perfect for both laboratory and field applications. Calibration is fast, simple and all DO readings are temperature compensated.

The pre-tensioned, ready-made PTFE membrane can be changed in a few seconds without the need to stretch and cut replacements.

The HI 76407 is offered with several cable lengths to meet your specific needs.

HI 76407

1. Shielded, waterproof cable
2. Protective sleeve
3. PEI probe for best field protection
4. Linearized and accurate thermistor temperature sensor protected behind a stainless steel cover
5. Silver wire anode element
6. Glass encapsulated platinum cathode
7. Potassium chloride electrolyte solution (HI 7041S)
8. Thin permeable PTFE membrane isolates the sensor elements from the testing solution, but allows oxygen to enter (HI 76407A/P)

PROBE	CABLE LENGTH	METER
HI 76407/2	2 m (6.6')	HI 4421 HI 2400
HI 76407/4	4 m (13')	
HI 76407/10	10 m (33')	
HI 76407/20	20 m (67')	
HI 76407/30	30 m (98.4')	
HI 76407/50	50 m (164')	
HI 76407/60	60 m (196.8')	

HI 76407A/P

Easy, Screw Cap DO Membranes

When the PTFE (PolyTetraFluoro-Ethylene) membrane of the protective cap wears, it is always good to have a back-up.

HI 76407A/P Contains 5 ready-to-use, replacement membranes.

HI 7041

Electrolyte Solution

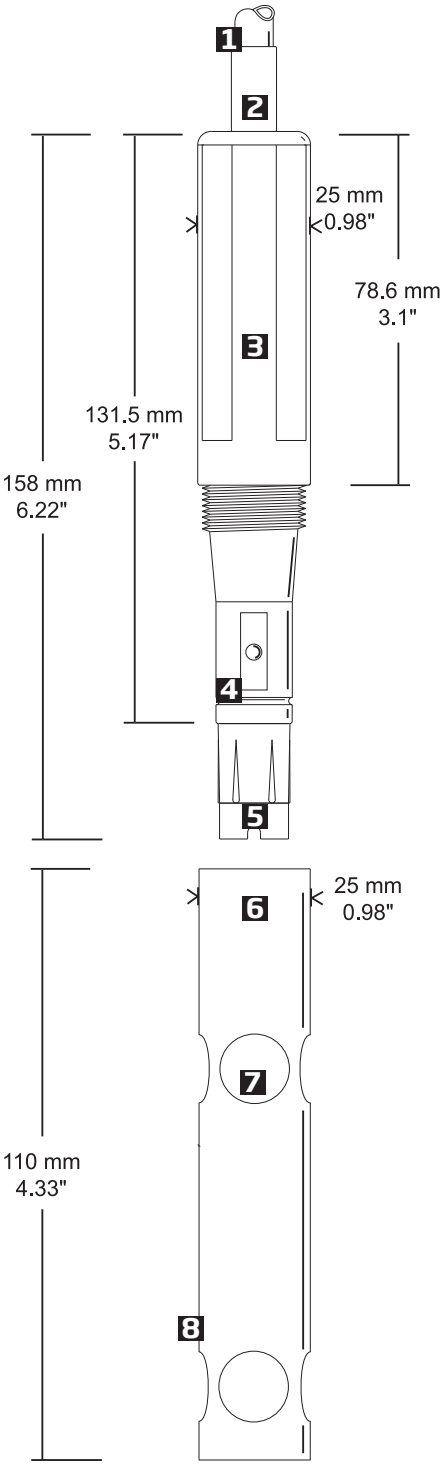
It is crucial to the performance of your DO probe, to keep the sensor active with regular maintenance. For this purpose, HANNA has developed HI 7041 electrolyte solution to refill the membrane cap.

HI 7041S	Refilling electrolyte solution (30 mL)
HI 7041M	Refilling electrolyte solution (230 mL)
HI 7041L	Refilling electrolyte solution (500 mL)

HI 76407F Series

DO Probe with Protective Sleeve

Perfect for laboratory and field applications, HANNA HI 76407 F Series DO probes are extremely rugged with a screw on protective sleeve. Calibration is fast and simple, and measurements are temperature compensated. The sensitive PTFE membrane can be changed in a few seconds.



1. Shielded, waterproof cable
2. Protective sleeve
3. PEI probe for best field protection
4. Linearized and accurate thermistor temperature sensor protected behind a stainless steel cover
5. Permeable membrane
6. Glass encapsulated platinum cathode
7. Hole for solution cycling
8. Protective sleeve for field applications

PROBE	CABLE LENGTH	METER
HI 76407/4F	4 m (13')	HI 98186 HI 9146 HI 9142
HI 76407/10F	10 m (33')	
HI 76407/20F	20 m (65.6')	
HI 76407/30F	30 m (98.4')	
HI 76407/50F	50 m (164')	

HI 7040 • HI 7041

DO Solutions

It is crucial to the performance of your DO probe, to keep the sensor active with regular maintenance.

HI 7040M	Zero oxygen solution, 230 mL
HI 7040L	Zero oxygen solution, 500 mL
HI 7041S	Refilling electrolyte solution (30 mL)
HI 7041M	Refilling electrolyte solution (230 mL)
HI 7041L	Refilling electrolyte solution (500 mL)

HI 76407A/P

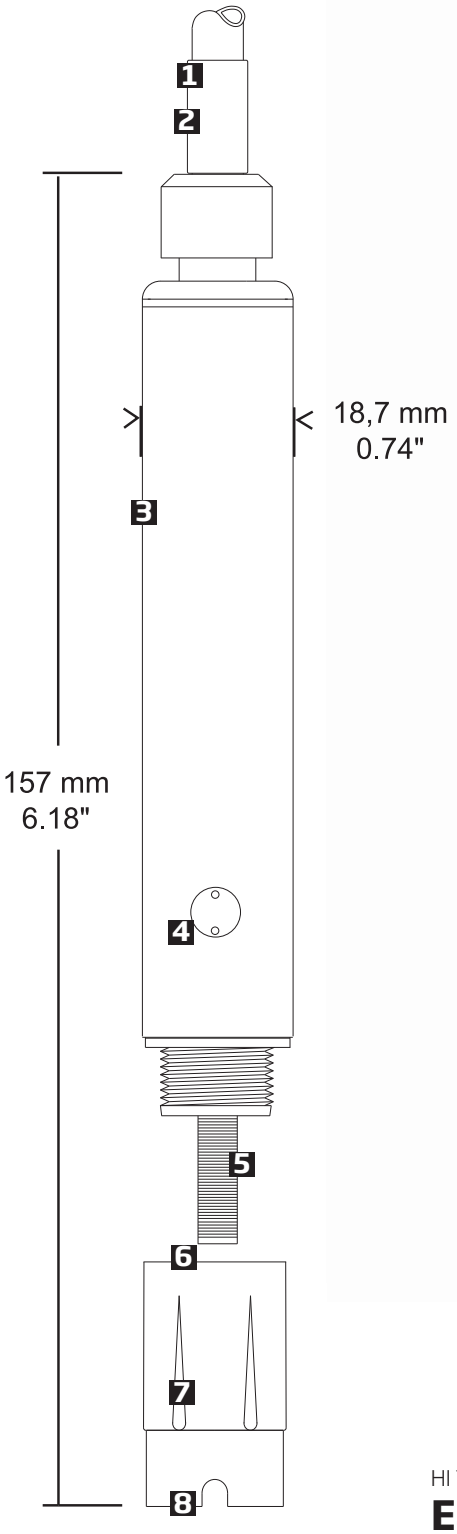
Easy, Screw Cap DO Membranes

When the PTFE (PolyTetraFluoro-Ethylene) membrane of the protective cap wears, it is always good to have a back-up.

HI 76407A/P Contains 5 ready-to-use, replacement membranes.

HI 76408

Thinner, Lighter DO Probe for Laboratories



Thin and Light

The HANNA HI 76408 DO probe is rugged and perfect for both laboratory and field applications. Calibration is fast and simple, and measurements are temperature compensated. The sensitive PTFE membrane can be changed in a few seconds.

1. Shielded, waterproof cable
2. Protective sleeve
3. PEI probe for best field protection
4. Linearized and accurate thermistor temperature sensor protected behind a stainless steel cover
5. Silver wire anode element
6. Glass encapsulated platinum cathode
7. Potassium chloride electrolyte solution (HI 7041S)
8. Thin permeable PTFE membrane isolates the sensor elements from the testing solution, but allows oxygen to enter (HI 76407A/P)

PROBE	CABLE LENGTH	METER
HI 76408	1 m (3.3')	HI 4421 HI 2400

HI 76407A/P

Easy, Screw Cap DO Membranes

When the PTFE (PolyTetraFluoro-Ethylene) membrane of the protective cap wears, it is always good to have a back-up.

HI 76407A/P Contains 5 ready-to-use, replacement membranes.

HI 7040 • HI 7041

DO Solutions

It is crucial to the performance of your DO probe, to keep the sensor active with regular maintenance.

HI 7040M	Zero oxygen solution, 230 mL
HI 7041S	Refilling electrolyte solution (30 mL)
HI 7041M	Refilling electrolyte solution (230 mL)
HI 7041L	Refilling electrolyte solution (500 mL)

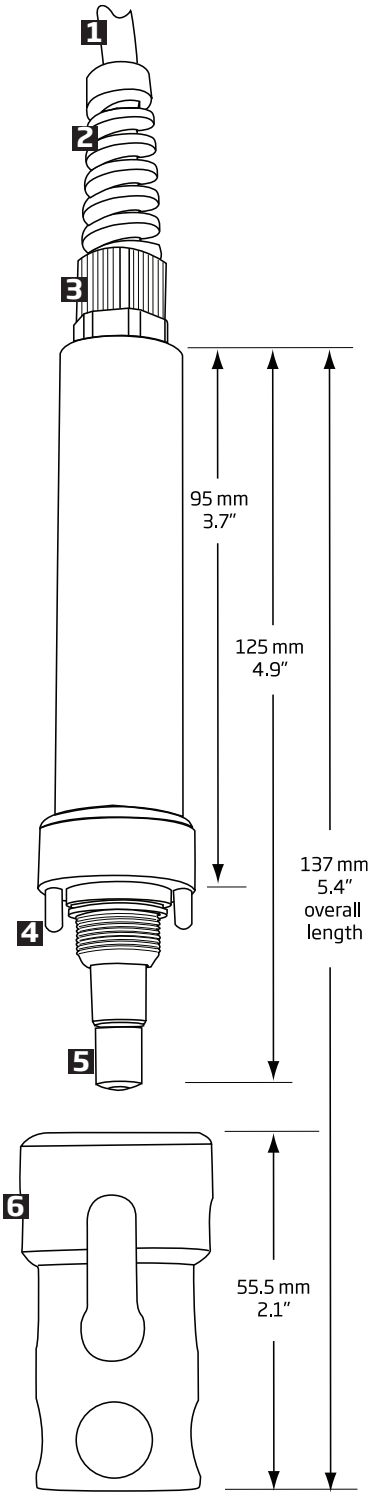
HI 76409

Galvanic DO Probe with Protective Cap

Unlike polarographic probes, galvanic DO probes require no conditioning time. When you need to measure multiple samples in a given period of time, pick it up and measure on demand.

1. Shielded, waterproof cable
2. Flex protect
3. Strain relief for cable
4. Temperature sensors
5. Cathode (3.5 mm), pure silver
6. Protective cap

PROBE	CABLE LENGTH	METER
HI 76409/4	4 m (13')	HI 9147 (meter specific, fixed probe)
HI 76409/10	10 m (33')	
HI 76409/15	15 m (49')	
HI 76409/20	20 m (65.6')	



HI 7040 • HI 7042

DO Solutions

It is crucial to the performance of your DO probe, to keep the sensor active with regular maintenance.

HI 7040M Zero oxygen solution, 230 mL
HI 7040L Zero oxygen solution, 500 mL
HI 7042S Electrolyte solution for galvanic probes, 30 mL

HI 76409A/P

Easy, Screw Cap DO Membranes

When the PTFE (PolyTetraFluoro-Ethylene) membrane of the protective cap wears, it is always good to have a back-up.

HI 76409A/P Contains 5 ready-to-use, replacement membranes.