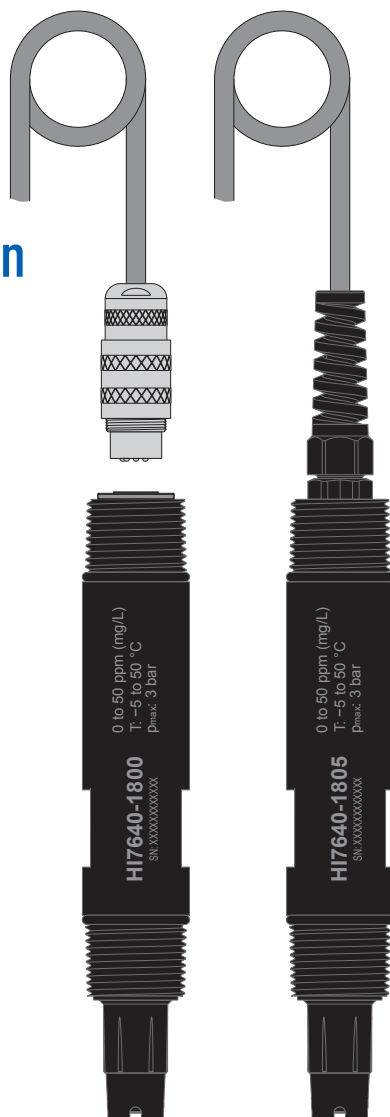


HI7640-18

Galvanic Dissolved Oxygen Industrial Smart Probes

HI510 Compatible



Hanna® is committed to developing and deploying digital solutions with a positive impact on the environment and climate.



Please scan the QR code or follow the link to download the HI510 controller user manual.
<https://manuals.hannainst.com/Hi510>



Dear Customer,

Thank you for choosing a Hanna Instruments® product.

Please read this instruction manual carefully before using this instrument as it provides the necessary information for correct use of this instrument as well as a precise idea of its versatility.

This release of the product manual contains information that applies to configuration, specification, installation, and calibration of Hanna Instruments industrial galvanic Dissolved Oxygen probes.

The HI510 controller is sold separately. Please refer to the controller manual for details on system configurations.

If you need additional technical information, do not hesitate to e-mail us at tech@hannainst.com. Visit www.hannainst.com for more information about Hanna Instruments and our products.

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1. PRELIMINARY EXAMINATION

Remove the probe and accessories from the packing and examine it carefully.

Each probe is supplied with:

- **HI7042BS** Galvanic DO electrolyte solution, 30 mL (2 pcs.)
- **HI7640-18A** Replacement membrane cap and O-ring (5 pcs. of each)
- Syringe and cone shaped plastic tip
- Electrolyte screw and fill hole O-ring (2 pcs. of each)
- Protective probe cap
- Quick reference guide with probe quality certificate

Note: Save all packing material until you are sure that the probe works correctly. Any damaged or defective item must be returned in its original packing material with the supplied accessories.

2. SAFETY MEASURES

General Safety & Installation Recommendations



- Electrical connection, installation, operation, and maintenance must be carried out by specialized personnel only.
The specialized personnel must read, understand, and adhere to the instructions in this manual.
- Before connecting the probe to the process controller, disconnect the controller from the power line.
- User serviceable connections are all accessible inside controller's enclosure.
- Before powering the controller, verify the probe wiring has been done following the instructions detailed in this manual.

3. GENERAL DESCRIPTION & INTENDED USE

The **HI7640-18** series are galvanic-style oxygen probes designed for use with the Hanna Instruments® **HI510** Universal Process Controller. The system is suited for continuous measurement of oxygen dissolved in water.

An integral **temperature sensor** measures water temperature and adjusts the probe signal over the specified temperature range. The result is reliable dissolved oxygen (DO) concentration or percent saturated measurements.

Suitable for control applications in municipal and industrial wastewater treatment, the probe can be submersed/immersed using the 3/4" NPT threads, or installed directly in-line or in a flow cell installation, using the lower sensor threads.

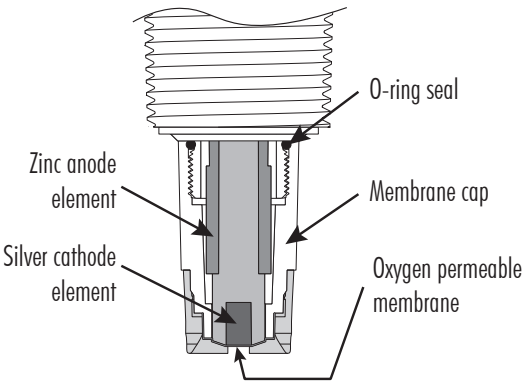
The probe is available with an **integral connector** that permits connections with no twisted cables as cables are connected after installation.

Patch cables may be purchased separately to connect between the probe and controller up to 50 meters (164 ft).

Principle of Operation

The galvanic probe functions in the same manner as a battery.

- The sensing elements consist of silver cathode and zinc anode, with a pretensioned membrane isolating the cell from the liquid being measured.
- The refillable electrolyte reservoir holds ample electrolyte to support the reaction.
- Oxygen diffuses through the membrane and is reduced on the surface of the cathode. This reaction generates a signal proportional to the oxygen concentration.



4. MAIN FEATURES

- Galvanic probe with digital processing
- Simple membrane-cap replacement
- Large electrolyte reservoir provides longer service life
- Rugged, chemically-resistant PVDF body
- Built-in temperature sensor for measurement and DO compensation
- Digital probe stores model, firmware, serial number, and calibration information
- ¾" NPT external thread for mounting
- 3 bar (43.5 psi) maximum pressure

5. SERIES CONFIGURATION

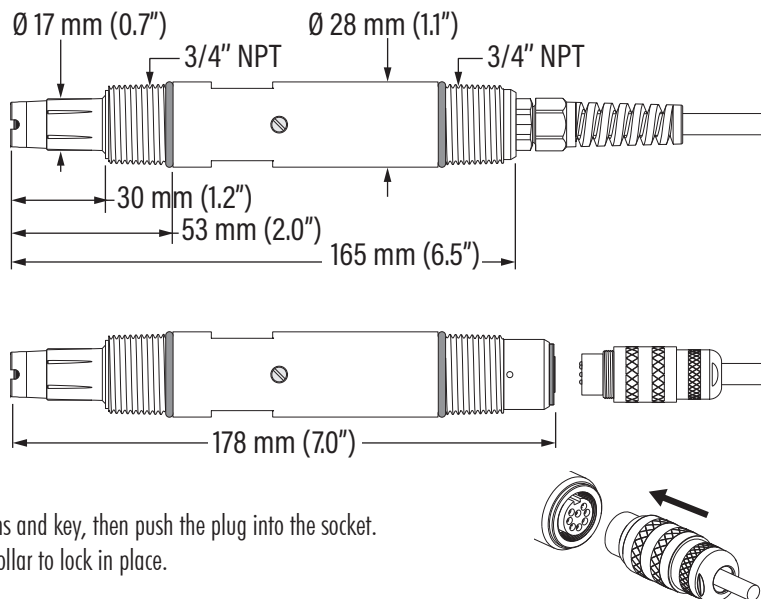
HI7640	—	1	8	z	z
1	Galvanic DO sensor				
8	Smart probe with RS485 connection				
zz	00, supplied with DIN connector (without cable)*				
	05, 10, 15, 25, 50 fixed cable length (in meters)				

* See Accessories section for patch cable ordering codes.

6. SPECIFICATIONS

Range	0.00 to 50.00 mg/L (ppm) concentration 0.0 to 500.0 % saturation	
Resolution	0.01 mg/L (ppm) 0.1 % saturation	
Accuracy	from 0.00 to 20.00 mg/L (ppm) from 20.00 to 50.00 mg/L (ppm) from 0.0 to 200.0 % from 200.0 to 500.0 %	± 2 % of reading or ± 0.2 mg/L (ppm), whichever is greater ± 6 % of reading 2% of reading or ± 2.0 %, whichever is greater ± 6 % of reading
Calibration	One or two points at Single point process calibration	100 % and/or 0 % or 8.26 mg/L and/or 0 mg/L in water-saturated air or zero-oxygen solution using value entered by the user in % saturation or mg/L
Temperature	Range Resolution Accuracy Calibration	-5.0 to 50.0 °C (23.0 to 122.0 °F) 0.1 °C / 0.1 °F ± 0.5 °C / ± 1.0 °F Single point offset (controller setting)
Temperature compensation	Automatic	
Temperature source	Automatic (from probe) Manual	
Pressure compensation	Automatic	420 to 850 mmHg
Salinity compensation	Automatic	0 to 70 g/L (salinity factor set by user)
Body	PVDF	
Sensor	Type Cathode Anode Diameter Insertion length	Galvanic cell Silver (Ag) Zinc (Zn) $\varnothing$ 17 mm (0.7") 30 mm (1.2")
Maximum pressure	3 bar (43.5 psi) at 25 °C (77 °F)	
Threaded connection	$\frac{3}{4}$ " NPT external thread for mounting	
Wetted parts	Sensor body Membrane cap O-ring	PVDF PEI and PTFE NBR
Protection rating	IP68	
Cable length	zz, see Series Configuration	

7. PROBE DIMENSIONS & CABLE CONNECTION

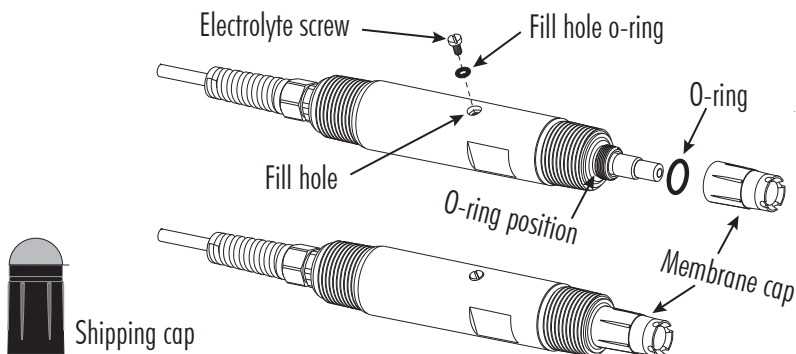


Align the pins and key, then push the plug into the socket.
Rotate the collar to lock in place.

Note: Probe connection (probe with integral DIN connector) and probe wiring (probe with attached cable) **must be** carried out with the controller **disconnected** from power.

8. PROBE PREPARATION & CONDITIONING

- Probes from Hanna Instruments[®] are shipped dry.
- Remove the red and black shipping cap before use.
- The membrane cap and the electrolyte reservoir need to be filled with [HI7042BS](#) galvanic DO electrolyte solution prior to first use. See Membrane cap replacement & electrolyte refilling (section 12. Maintenance).



Electrolyte (re)filling

1. Unscrew and remove the electrolyte screw and O-ring located on the side of probe body (see figure). Set aside.
2. Open the membrane package and remove one O-ring and one membrane cap.
3. Slide the O-ring onto the anode and over the cap's threads to rest flush against the probe body.
4. Rinse the new membrane cap with some electrolyte and discard.
5. Attach supplied cone shaped tip to the syringe.
6. Draw up a full syringe by pulling back on the plunger.
7. Dispense some of the electrolyte to fill half of the membrane cap with solution.
8. Tap the cap to release any trapped air bubbles. Allow bubbles to rise to the surface.
9. Point the probe downwards and screw on the cap, forcing electrolyte into reservoir and allowing remaining trapped air to escape through the electrolyte screw hole. Tighten the membrane cap so that it sits flush with the probe body.
10. Hold the probe sideways (slightly downwards) and use the syringe to fill up the reservoir with remaining amount of electrolyte solution. Draw and dispense more liquid until excess electrolyte flows out allowing trapped air to escape. The probe holds approximately 7 mL of electrolyte.
11. Replace the fill hole O-ring and tighten the screw in position.
12. Firmly tap the probe sides to ensure no trapped bubbles inside the cap.
13. Keep the probe in water for a few hours to acclimate.
14. Calibrate before installation.

9. INSTALLATION

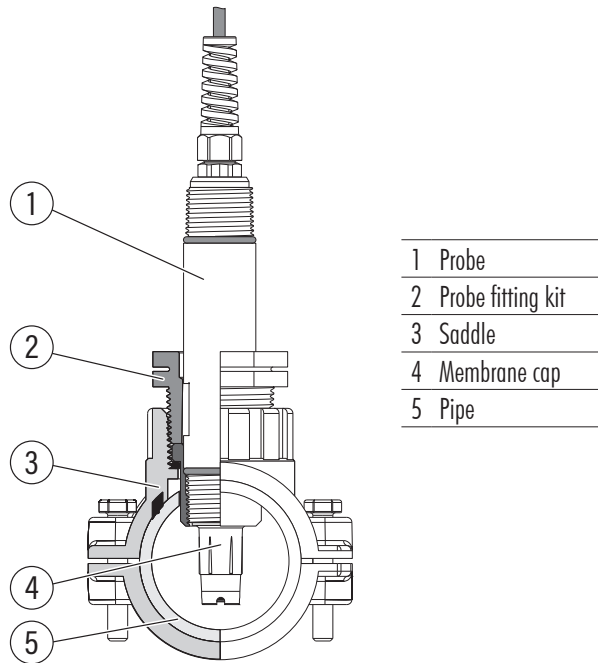
General considerations

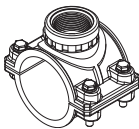
- Probes are easily installed using the 3/4" NPT external threads.
- Do not install the probe in an upside-down position.
- Hand tighten the probe in position. Then, depending on the process, tighten one or two turns with a wrench to secure in place. Do not exceed 10 N•m (7.3 lb-ft) torque specification for the probe sensor.
- The sensor consumes oxygen. Ensure an adequate water movement of around 0.03 m/second past the sensing area, regardless of installation type, to avoid local depletion of oxygen and erroneously low readings.
- The membrane should stay wetted to prevent water vapor crossing the membrane and depleting the electrolyte.
- Protect the probe and membrane from strong flow to prevent unstable readings. In turbulent aeration basin installations, place the probe in a weir for more accurate readings.
- Protect the membrane from blunt objects.
- Keep the membrane clean to allow free exchange of oxygen.
- Avoid fast flow rates (risk of cavitation) as well as slow flow rates (risk of oxygen depletion).
- Provisions must be made for removing the probe from the process.
- Consider probe accessibility for maintenance when selecting placement.

Installation examples with mounting accessories

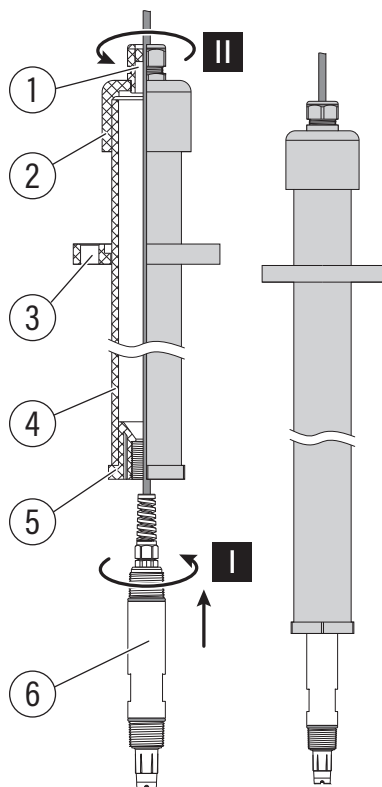
Accessories are sold separately.

In-line mounting with probe saddle



In-line mounting accessories			
	Pipe size	Saddle code	HI7640-18zz
	Ø 50 mm (2")	BL120-550	☒
	Ø 63 mm (2½")	BL120-563	☒
	Ø 75 mm (3")	BL120-575	☒

Top thread immersion, user supplied



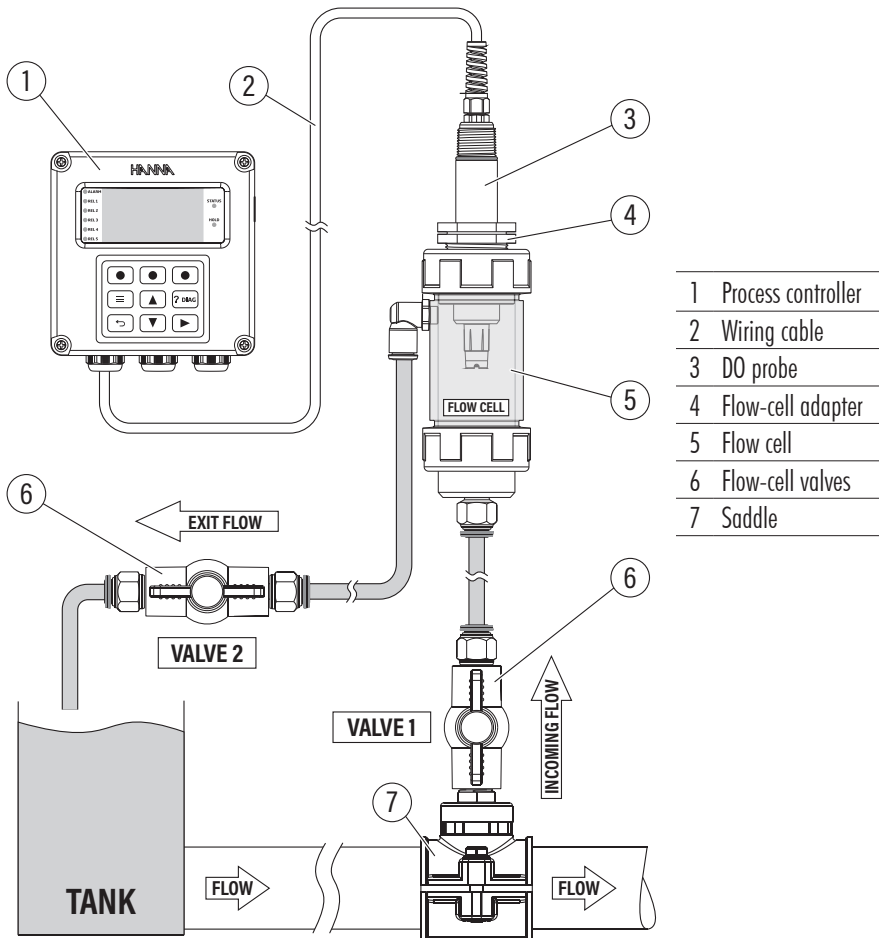
1	Cable gland
2	Pipe cap (socket connect or threaded)
3	Van Stone flange (one size smaller than pipe)
4	2", or similar, PVC pipe (schedule 80 PVC)
	Reducer bushing
5	• internal threads to fit probe's $\frac{3}{4}$" NPT threads • external threads to fit pipe or socket-connect
6	Galvanic DO probe

- Wrap Teflon™ tape around the probe's (6) top $\frac{3}{4}$ " NPT threads.
- Attach a user-supplied reducer bushing (5) to the probe's (6) top threads (**step I**).
- Feed the probe cable through the length of the NPT externally-threaded, user-supplied pipe (4), matched to the reducer.
- Thread the pipe into the upper threads of the reducer (5).
- Seal the top part of the pipe (**step II**) to prevent ingress of water if installation is outdoor.
- Attach the pipe to a handrail.

Note: Use a bracket or a user-supplied elbow-threaded fitting (to the pipe) to orient the probe such that the membrane cap is facing the incoming flow.

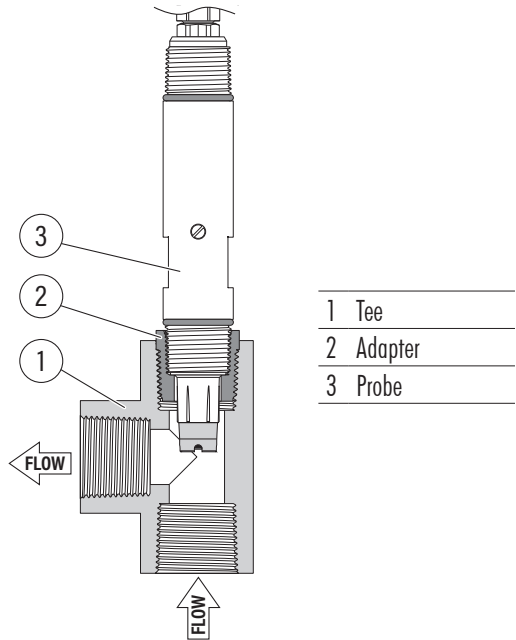
Flow-cell installation

- Position the probe so that it does not trap air bubbles at membrane cap.
- Adjust the flow rate to around 150 L/hour (40 gallon/hour) to provide the DO sensor with the required water movement.
- The circulation pipes (from the tank to the flow-cell) must be thermally insulated. Avoid temperature differences greater than 2 °C (36 °F) between tank content and flow-cell sample.
- Shade the assembly from direct sunlight.
- Do not allow deposits to accumulate within membrane area.



Installation tee, user supplied

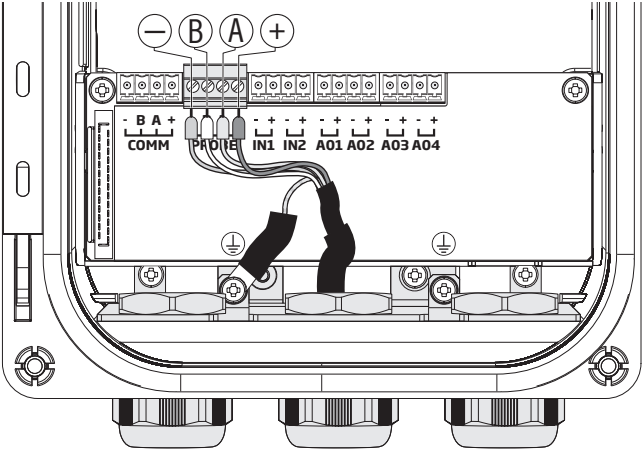
- Orient the probe with the sensor facing the flow.
- Wrap Teflon™ tape around the probe's top threads and fittings before mounting.



Mounting accessories	
Tee fitting size	Adapter size
1"	from 1" to ¾" NPT
1 ¼"	from 1 ¼" to ¾" NPT
1 ½"	from 1 ½" to ¾" NPT
2"	from 2" to ¾" NPT

10. WIRING THE PROBE TO THE CONTROLLER

1. With the controller disconnected from power, run the probe cable through the conduit opening.
2. Connect the probe leads to the removable terminal connector marked PROBE. Follow the lead markings (+) positive / (–) negative to ensure correct wiring position for output leads.
3. Carefully put the wired terminal connector into place on the board.
4. Position excess cable through the cable gland, before tightening the nut.
5. Remove the ground screw and hardware located below the PROBE connector and attach ground lead (⊕).



Probe cabling color code

Marking	Attached cable	Patch cable *	Functionality
—	GREEN	BLACK	0V
B	WHITE	WHITE	RS485 D —
A	YELLOW	BLUE	RS485 D +
+	BROWN	RED	5V
⏏	GREEN-YELLOW		Protective ground connection

* See Accessories section for cable ordering codes.

Note: Ensure wiring regulations are correctly followed when controller unit is part of a larger industrial installation.

11. CALIBRATION

HI510 controller allows two types of dissolved oxygen calibration procedures:

- **Standard** single or two-points calibration using water-saturated air or air-saturated water and a zero oxygen solution to verify that the probe is working correctly and establish a slope
- **Process** single-point calibration performed with the calibrated probe (two points) installed in the process. Process calibration allows the user to adjust the measured dissolved oxygen value to match the value determined with a reference device.

Standard calibration

Preparation

- Ensure (visual inspection) no bubbles are trapped between the cathode and membrane, and the probe is correctly wired and connected to controller.
- Verify the temperature is reading correctly.
The temperature value can be adjusted from the controller’s Probe Setting menu, in Channel Setup.
- Verify the controller’s barometric pressure reading with a reference meter. Pressure value can be adjusted from controller’s Technical Menu.

- Go to Probe Setting in Channel Setup for measurement mode (Meas.Mode) and measurement unit (Meas.Unit) configuration. Option to select between:
 - DO_Sat (% saturation) with unit displayed in %Sat
 - DO_Conc (Concentration) with unit displayed in mg/L or ppm
- Set Salinity value if the probe will be exposed to ocean or brackish waters.

Procedure

- Set the controller to desired measurement unit.
Go to Probe Setting in Channel Setup and set required measurement mode (Meas.Mode): DO_Sat (% saturation) or DO_Conc (Concentration).
- Press the  key then **CAL** virtual key. The controller recognizes the currently selected measuring unit.

Calibration at 100 % and 0 % saturation

1. To calibrate at 100 % saturation (or 8.26 mg/L) suspend the probe in air above a water surface and wait at least 15 minutes for the air to become saturated with water vapor.
This condition corresponds to 100 % air saturated water at the temperature of measurement.
2. Press **CAL** to start the calibration.
The reading, temperature, atmospheric pressure (mmHg), calibration point and "Wait" message are displayed.
3. Once the reading has stabilized the **CFM** virtual key is displayed.
Press **CFM** to accept the calibration point.
"Wait" followed by "Calibration point is accepted and saved" are displayed.
Exit and **Next** virtual keys are available. Pressing **Exit** saves a single point calibration.
4. Press **Next** to follow with second-point calibration.
5. To calibrate at 0 % (or 0 mg/L), place the probe in the **HI7040** zero oxygen solution and stir gently for 2-3 minutes. "Wait" message and stability indicator (blinking) are displayed.
6. Press **CFM** to accept the calibration point.
"Calibration point is accepted and saved" message followed by "Calibration DONE" are displayed.

Process calibration

A process calibration is a single-point calibration performed with the probe installed in the process. This type of calibration allows the user to adjust the measured DO value to match the value determined with the reference meter.

Preparation

- Determine process DO value using a calibrated reference meter and probe.
- The process controller and the probe should have previously been calibrated with two standards (probe slope determined).

Procedure

1. Press the  key then **CAL** virtual key.
2. Press **Process** when displayed.
3. Use the   keys to adjust the process value in agreement with the predetermined value.
4. Press **CFM** to confirm and save the calibration.

Note: Process calibration evaluates probe offset if input reading is less than 20%, or probe slope, if values are over 20%.

12. MAINTENANCE

Probe & membrane cap cleaning

- Inspect, clean, and calibrate the probe at regular intervals.
- Rinse the probe with clean water. Blot the probe with a soft cloth or tissue. Handle the probe and membrane carefully to avoid damage.
- Replace the membrane cap and electrolyte if coatings persist or membrane damage is evident.
- Mechanical cleaning of the membrane with abrasives is not recommended.
- Wipe probe's exterior with an aqueous soapy mixture. Gently rub persistent spots off. Rinse with clean water.

Membrane cap replacement & electrolyte refilling

The membrane cap and electrolyte are designed to provide trouble-free operation for about eight weeks.

Replacements are required when:

- The membrane cap is physically damaged
- Probe response is slow
- DO probe calibration or readings exhibit greater than normal drift
- The membrane cap remains coated after cleaning

Procedure

1. Remove the probe from installation.
2. Unscrew and remove electrolyte screw and fill hole O-ring located on the side of probe body.
3. Hold the probe in a vertical position (sensing tip down) and unscrew the membrane cap. Discard used cap.
4. Remove the O-ring off probe body and shake the probe down to empty the electrolyte reservoir.
5. Flush the probe body and reservoir with tap water.
6. Ensure the channel to the electrolyte reservoir is not clogged.
7. Gently clean the deposits off the zinc anode using a lint-free cloth or tissue.
8. Inspect O-rings for nicks or wear. Replace and discard damaged O-ring.
9. If tarnished or stained, gently clean the silver cathode with a lint-free cloth.
10. Follow section 8 of this manual for **refilling** instructions.

Long term storage

Discard any electrolyte solution from the reservoir, flush probe body and reservoir with water.

Store the probe dry with the protective cap on.

13. ACCESSORIES

Ordering Information	Product Description
DO Solutions	
HI7040L	Zero oxygen solution set, 500 mL + 12 g
HI7042BS	Galvanic DO electrolyte solution, 30 mL
Other Accessories	
HI60542	In-line electrode holder, direct pipe installation
HI731350	Plastic tip (25 pcs.)
HI740226	5 mL graduated syringe
HI7640-18A/P	Replacement membrane cap (5 pcs.)
HI76510-05	Patch cable, 5 m (16'5")
HI76510-10	Patch cable, 10 m (32'9")
HI76510-15	Patch cable, 15 m (49'2")
HI76510-25	Patch cable, 25 m (82')
HI76510-50	Patch cable, 50 m (164')
BL120-400	Flow-cell probe adapter kit
BL120-401	Flow-cell valve
BL120-402	Flow-cell tubing, 10 m (32'9")
BL120-410	Flow cell
BL120-450	Flow-cell kit for Ø 50 mm (2") pipe
BL120-463	Flow-cell kit for Ø 63 mm (2.5") pipe
BL120-475	Flow-cell kit for Ø 75 mm (3") pipe
BL120-500	Probe fitting kit
BL120-550	Probe saddle for Ø 50 mm (2") pipe, 1 ¼" thread
BL120-563	Probe saddle for Ø 63 mm (2.5") pipe, 1 ¼" thread
BL120-575	Probe saddle for Ø 75 mm (3") pipe, 1 ¼" thread
For additional accessories information contact your local sales office.	

14. ABBREVIATIONS

HDPE	High Density Polyethylene
NBR	Nitrile Butadiene Rubber
NPT	American National Pipe Standard Taper Pipe Thread
PEI	Polyetherimide
PTFE	Polytetrafluoroethylene
PVDF	Polyvinylidene Fluoride

CERTIFICATION

All Hanna® instruments conform to the CE European Directives.



RoHS
compliant



Disposal of Electrical & Electronic Equipment. The product should not be treated as household waste. Instead, hand it over to the appropriate collection point for the recycling of electrical and electronic equipment, which will conserve natural resources. Ensuring proper product disposal prevents potential negative consequences for the environment and human health.

For more information, contact your city, your local household waste disposal service, or the place of purchase.

RECOMMENDATIONS FOR USERS

Before using this product, make sure it is entirely suitable for your specific application and for the environment in which it is used. Any variation introduced by the user to the supplied equipment may degrade its performance. Do not use or store the product in hazardous environments.

WARRANTY

The probes are warrantied for six months against defects in workmanship and materials when used for its intended purpose and maintained according to instructions. This warranty is limited to repair or replacement free of charge. Damage due to accidents, misuse, tampering, or lack of prescribed maintenance is not covered. If service is required, contact your local Hanna Instruments® office. If under warranty, report the model number, date of purchase, serial number, and the nature of the problem. If the repair is not covered by the warranty, you will be notified of the charges incurred. If the instrument is to be returned to Hanna Instruments, first obtain a Returned Goods Authorization (RGA) number from the Technical Service department and then send it with shipping costs prepaid. When shipping any product, make sure it is shipped back in compliance with shipping regulations, thoroughly cleaned and free of any chemicals, and is properly packaged for complete protection.