BI-680 Online Dissolved Oxygen Controller

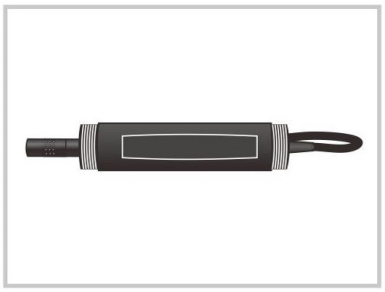
Instruction Manual

Introduction

Thank you for selecting the BI-680 online dissolved oxygen controller. This manual provides a step-by-step guide to help you operate the meter, please carefully read the following instructions before use.

Unpacking

The following list describes the standard components of the controller. After the unpacking, please check all components are complete. If any are damaged or missing, please contact nearest distributor.



IE-80T Industrial Dissolved Oxygen Probe

Electrolyte Solution

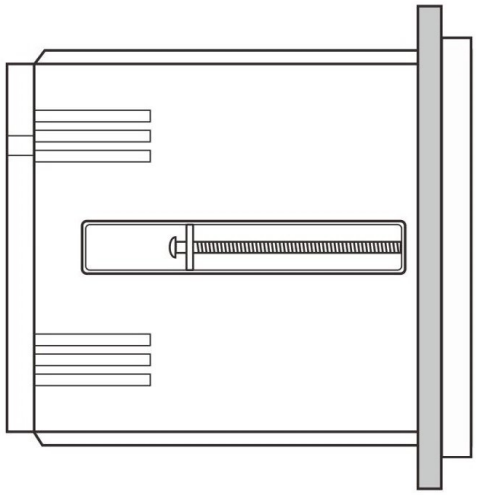
Membrane Cap

Safety Warning

- The controller shall be installed and operated only in the manner specified in this instruction manual.
- Only skilled, trained or authorized person should carry out installation, setup and operation of the controller.
- Do not install the controller in the following environmental conditions: relative humidity is greater than 80%, ambient temperature is higher than 60°C or strong magnetic fields around controller.
- The rear panel of the controller has two screw terminals that used for connecting the DC24V power supply. Make sure to cut off the main power before installation or maintenance.
- Once the power supply cables are connected to controller, do not touch any screw terminals on the rear panel of the controller.

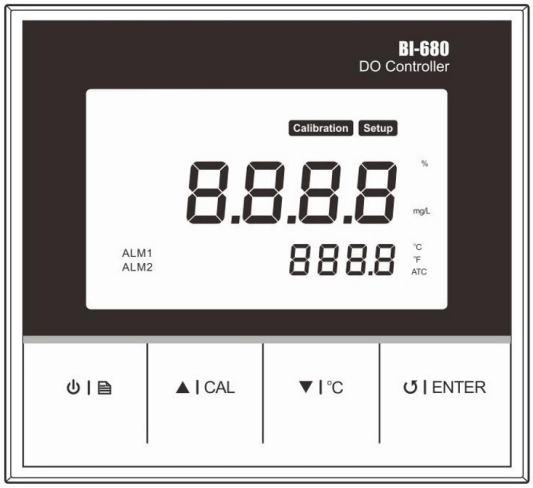
Installation

- Cut out a square hole approximately 91(W) × 91(H)mm in the mounting panel.
- Remove the mounting bracket from controller, place the controller into the square hole.
- Replace the mounting bracket and push the controller forward until it is fully seated on the mounting plate.



Display

The BI-680 online dissolved oxygen controller is equipped with an easy-read LCD display that used to show measured values and mode icons. The following table describes the function of each icon.



ICON	DESCRIPTION
Calibration	Indicates the meter is in the calibration mode.
Setup	Indicates the meter is in the setting mode.
ATC	Indicates the temperature compensation is enabled.
ALM1	Indicates the measurement exceeded the specified high limit.
ALM2	Indicates the measurement exceeded the specified low limit.

Keypad Information

KEY	FUNCTION
⏻ | 🖹	• Power the meter ON/OFF. • Enters the setup menu (Press and hold the key for 3 seconds). • Exits the calibration or setting and returns to measurement.
▲ | CAL	• Starts calibration. • Increase the setting value.
▼ | °C	• Sets the temperature. • Decrease the setting value.
↺ | ENTER	• Toggles between % saturation and concentration measurement modes. • Confirms the calibration, settings or displayed options.

Filling the Electrolyte Solution

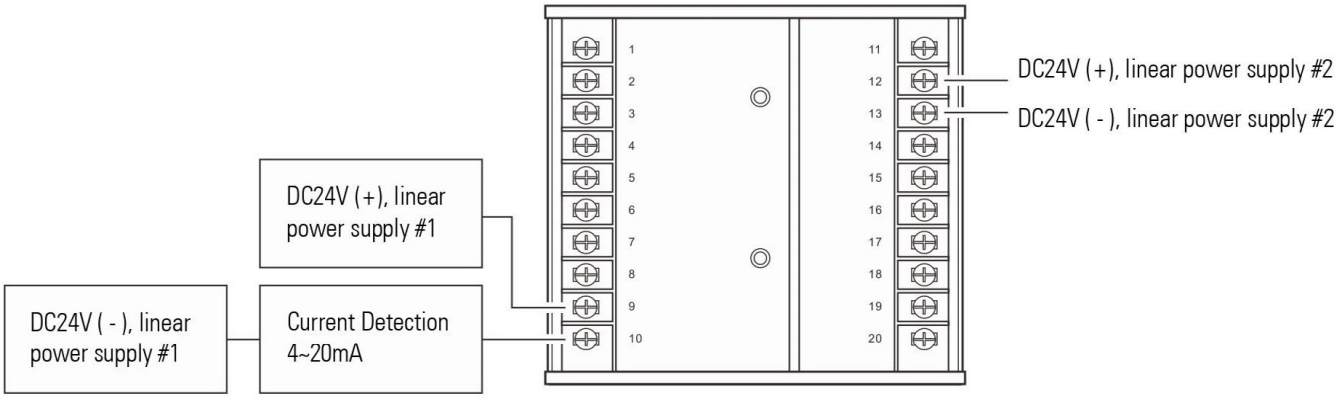
1. Take out the dissolved oxygen probe and electrolyte solution from the packaging. Unscrew the membrane cap.
2. Fill the membrane cap halfway with electrolyte solution.
3. Screw the membrane cap onto the probe, excess electrolyte solution will drain out.
4. Be sure the cathode of probe makes contact with membrane cap, the electrolyte solution in membrane cap should be without an air bubble.

Connecting the Cables

- Before proceeding, ensure the power supply cables are disconnected from the power source.
- The following list describes the definition of the each screw terminal on rear of the controller.

INDEX:

NO.	TERMINAL	DESCRIPTION
1	DO (-)	DO input
2	DO (+)	DO input
3	---	No connection
4	---	No connection
5	TC (-)	Temperature input (-)
6	TC (+)	Temperature input (+)
7	485 (B)	RS485 signal output (B)
8	485 (A)	RS485 signal output (A)
9	DC24 (+)	DC24V (+), linear power supply #1
10	DC24 (-), 4~20mA	DC24V (-), linear power supply #1, 4~20mA analog output
11	GND	Earth ground
12	DC24 (+)	DC24V (+), linear power supply #2
13	DC24 (-)	DC24V (-), linear power supply #2
14	NC2	Relay resting position (NC2)
15	NO2	Relay working position (NO2)
16	COM2	Relay Common (COM2)
17	NC1	Relay resting position (NC1)
18	NO1	Relay working position (NO1)
19	COM1	Relay Common (COM1)
20	---	No connection



Setup Menu

The BI-680 online dissolved oxygen controller contains an integrated setup menu that is used to customize the displayed option to meet measurement requirements. The following table describes the functions of the menu items.

MENU	DESCRIPTION	OPTIONS	DESCRIPTION	DEFAULT
SALt	Set the salinity coefficient	0.0	Range: 0~35ppt	0.0ppt
PrES	Set the barometric pressure coefficient	760	Range: 450~850mmHg	760mmHg
CAL	Set the number of calibration points	1	1 point	1 point
		2	2 points	
UNIt	Set the default measurement unit	mg/L	Concentration Unit	mg/L
		ppm	Concentration Unit	
		%	% saturation	
		°C	Degrees Celsius	°C
		°F	Degrees Fahrenheit	
AL-L	Set the Low Alarm Limit	4.00	Range: 0.00~20.00mg/L	4.00mg/L
AL-H	Set the High Alarm Limit	10.00	Range: 0.00~20.00mg/L	10.00mg/L
ALH	Set the hysteresis value	0.1	Range: 0.01 ~0.10mg/L	0.1mg/L
AO-L	Set the analog output (low)	0.00	Range: 0.00~20.00mg/L	4.00mg/L
AO-H	Set the analog output (high)	20.00	Range: 20.00~0.00mg/L	10.00mg/L
rSt	Reset	YES	Restores the controller back to factory default settings	Disable
		nO	Disable	

Additional information

- Select a High/Low limit setting value will activate the controller when the measuring value goes above or below the setting value. Note, both setting values cannot input the same value.
- Hysteresis prevents rapid contact switching if the measuring value is fluctuating near the set point. Example: You have set the high alarm point at 20.00mg/L and hysteresis value at 0.1mg/L. If the measuring value overshoots the 20.1mg/L, the controller will activate an external device. When the measuring value drops to 19.9mg/L, the external device will switch off.
- The controller has RS485 communication function, the default is 4.00~10.00mg/L corresponds to 4.00~20.00mA.
- Reset function will restore the controller back to factory default settings, all calibration values and selected parameters will be reset.

Setting the default option

1. Press and hold the ▤ key for 3 seconds to enter the setup menu, the display shows the menu item and page number.

2. Press the ▲ or ▼ key to scroll through menu, select the parameter you want to set (Refer to Setup Menu).
3. Press the **Enter** key, the display shows an option in the submenu.
4. Press the ▲ or ▼ key to set the value or select an option.
5. Press the **Enter** key to confirm, the controller returns to the measurement mode. Setting is completed.

ⓘ If you want to exit the setting, press the ⏻ | ▤ key.

Temperature Compensation and Calibration

The BI-680 online dissolved oxygen controller supplied with an industrial DO probe with a built-in temperature sensor. When the wires of the sensor are connected to controller, the display will immediately show "ATC" icon. The controller is now switched to automatic temperature compensation mode.

Temperature calibration

During the measurement process, if the temperature reading displayed differs from that of an accurate thermometer, the controller needs to be calibrated.

1. Press the **°C** key to enter the temperature setting mode, the display shows current temperature reading.
2. Press the ▲ or ▼ key to set the value.
3. Press the **Enter** key confirm. Calibration is completed.

DO Calibration in % Saturation Mode

The BI-680 online dissolved oxygen controller is able to perform either 1 or 2 points calibration in the dissolved oxygen mode. For single point calibration, we recommend that you perform 100% saturation calibration in the air-saturated water. If the 2 points calibration is selected, the zero oxygen solution needs to be used.

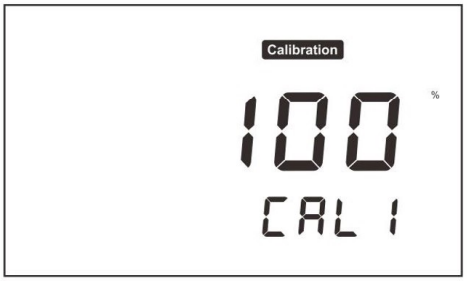
Single point calibration - 100% saturation

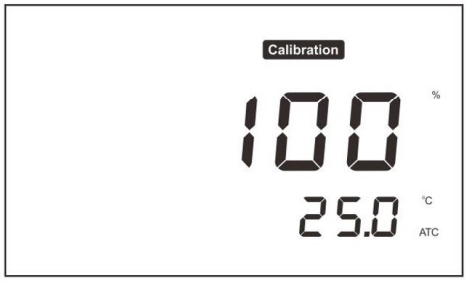
1.1 Make sure that you have selected 1 point calibration in the setup menu.

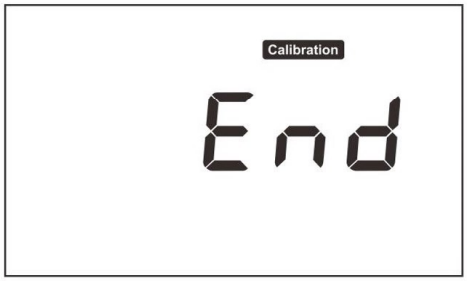
1.2 Connect the dissolved oxygen probe to controller and wait for 15 minutes to polarize the probe.

1.3 Press the **Cal** key, the controller shows "CAL1/100%".

1.4 Hold the dissolved oxygen probe in the air at 100% relative humidity or place the probe into the air-saturated water for 15 minutes. Press the **Enter** key. Wait for the reading to stabilize, the display automatically shows "END". Single point calibration is completed.





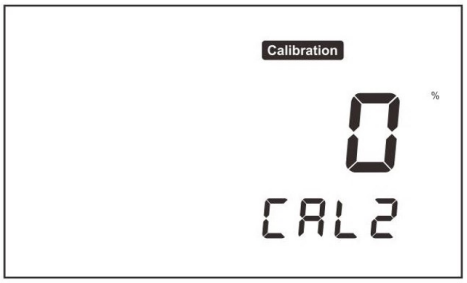


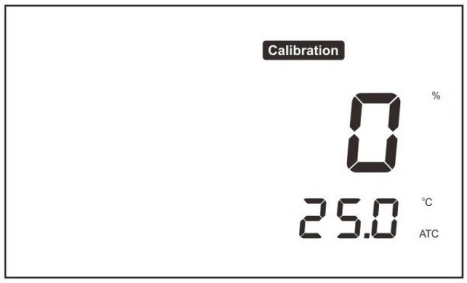
2 points calibration

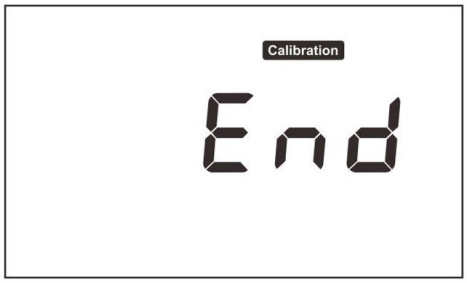
2.1 Make sure that you have selected 2 points calibration in the setup menu.

2.2 Repeat steps 1.2 to 1.4 above. When the first calibration point is completed, the display will show "CAL2/0%". The controller prompts you to continue with second point calibration.

2.2 Immerse the dissolved oxygen probe into the zero oxygen solution for at least 10 minutes, press the **Enter** key to begin the calibartion. Wait for the reading to stabilize, the display automatically shows "END" and returns to the measurement mode. Calibration is completed.







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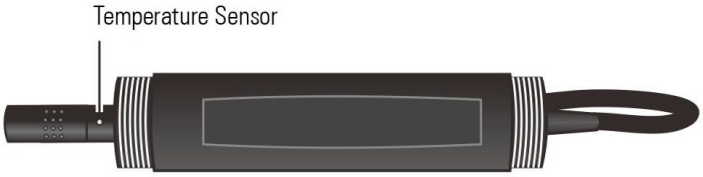
- Performing a percentage saturation calibration will simultaneously calibrate the corresponding mg/L (or ppm) concentration value. Therefore, additional mg/L calibration isn't required in most circumstances.
- During the calibration process, press the ⏻ | 🖹 key, the controller will exit the calibration and return to the measurement mode.

Measurement

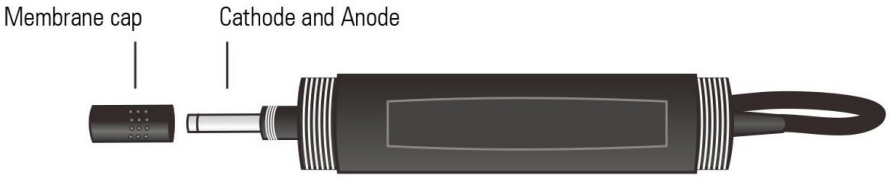
The BI-680 online dissolved oxygen controller is suitable for measuring the water, wastewater, brine and other liquids. If the sample is belong to the seawater or other water containing large amounts of salt, please setting the salinity coefficient before measurement. Some gas and steam such as chloride, sulfur dioxide, sulfureted hydrogen, ammonium, carbon dioxide and iodin can permeate the membrane via diffusion. So their existence will influence the measurement of dissolved oxygen. If the sample contains the solvent, grease, sulfide and alga, the membrane on the probe will be blocked, damaged or eroded.

1. Connect the dissolved oxygen probe to controller and wait for 15 minutes to polarize the probe.
2. If necessary, to set the barometric pressure and salinity coefficient in the setup menu (Refer to Setup Menu).
3. Immerse the probe in the sample solution, make sure the temperature sensor on the probe is fully immersed.
4. Stir the probe gently. Record the measured value when the reading is stable.



Dissolved Oxygen Probe Care and Maintenance

- Always keep the membrane of the dissolved oxygen probe is wet or moist.
- If you do not use the probe for long periods, please screw off membrane cap and rinse the cathode, anode and membrane with deionized water, then soak up residual water on them with filter pape. Install the probe again.



Troubleshooting

LCD DISPLAY	CAUSE	CORRECTIVE ACTION
- - -	Measured value is out of range	Check the DO membrane whether clogged, dirty or broken
Err	Electrolyte solution is depleted	Refilling electrolyte solution
	Zero oxygen solution is contaminated	Replace the calibration solution

Specifications

Dissolved Oxygen	Model	BI-680
	Range	0.0~20.0mg/L
	Accuracy	±0.5mg/L
	Resolution	0.1mg/L
% Saturation of Oxygen	Range	0.0~200.0%
	Accuracy	±2.0%
	Resolution	0.1%
Transmitter Function	Signal Output	4~20mA
	Load	500Ω
	Low and high alarm limits	0.00~20.00mg/L, Selectable
	Communication Interface	RS485
General	Temperature Compensation	0~40°C, 32~104°F
	Barometric Pressure Correction	60.0~112.5kPa, 450~850mmHg
	Salinity Correction	0~35g/L
	Power Requirements	DC24V
	Ambient Temperature	< 60°C
	Relative Humidity	< 80%
	Dimensions	96 (L) × 96 (W) × 75 (H)mm
	Weight	350g

Addendum 1: Pressure VS Altitude Table

ALTITUDE (m)	kPa	mmHg	ALTITUDE (m)	kPa	mmHg
0	101.3	760	1600	82.9	622
100	100.1	750	1700	81.9	614
200	98.8	741	1800	80.9	607
300	97.6	732	1900	79.9	599
400	96.4	723	2000	78.9	592
500	95.2	714	2100	77.9	584
600	94.0	705	2200	76.9	577
700	92.8	696	2300	76.0	570
800	91.7	688	2400	75.0	563
900	90.5	679	2500	74.1	556
1000	89.4	671	2600	73.2	549
1100	88.3	662	2700	72.3	542
1200	87.2	654	2800	71.4	536
1300	86.1	646	2900	70.5	529
1400	85.0	638	3000	69.6	522
1500	84.0	630	3100	68.7	515

Addendum 2: Preparation of the Zero Oxygen Solution

Dissolve 500mg of sodium sulfate (Na_2SO_3) reagent and a small amount of cobalt(II) chloride hexahydrate ($CoCl_2 \bullet 6H_2O$) in the 250mL distilled water, mix the solution until the reagent is completely dissolved.

Hazardous Substance Statement

Instruments is committed to the reduction and eventual elimination of all hazardous substances in both the manufacturing process and finished products we supply. We have an active manufacturing and procurement program to minimize and eliminate the use of harmful heavy metals such as cadmium, lead, mercury and the like. New technologies and design parameters are also promoting these efforts and we expect to have little or no such materials in our product in the coming years. We welcome our customer suggestions on how to speed up these efforts.

Warranty

The warranty period for controller is one year from the date of shipment. Above warranty does not cover the sensor and calibration solutions. Out of warranty products will be repaired on a charged basis. The warranty on your controller shall not apply to defects resulting from:

- Improper or inadequate maintenance by customer.
- Unauthorized modification or misuse.
- Operation outside of the environment specifications of the products.

For more information, please contact the nearest authorized distributor.