# DISSOLVED OXYGEN CONTROLLER/MONITOR Model : PDO-8220





Your purchase of this DISSOLVED OXYGEN CONTROLLER /MONITOR MONITOR marks a step forward for you into the field of precision measurement. Although this pH controller is a complex and delicate instrument, its durable structure developed. Please read the following instructions carefully and always keep this manual within easy reach.

## **OPERATION MANUAL**

### **Caution Symbol**





#### Caution :

\* Risk of electric shock !

#### Caution :

- \* Do not use fingers or any tool to touch the Wire Terminals.
- Do not apply the relay contact load current > 0.5 Amp.
- \* The instrument contains no user serviceable parts and should not be opened by the user.
- \* Repair or after service should be done by a qualified technician only.
- \* Power supply should apply the correct ACV power voltage
- \* Cleaning Only use the dry cloth to clean the plastic case !
- \* Equipment protectted throughout by Double Insulation or Reinforced Insulation.

### **Environmental Condition**

- \* Comply with EN61010. Transient overvoltage at Mains Supply 2500V.
- \* Pollution Degree 2.
- \* Altitude up to 2000 meters.
- \* Indoor use.
- \* Relative humidity 80% max.

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### **1. FEATURES**

- \* One meter for multi purpose operation : Dissolved Oxygen, Air Oxygen, Temprature.
- \* Dissolved oxygen : 0 to 50.0 mg/L.
- \* Dissolved oxygen meter use the polar graphic type oxygen probe with temperature sensor, high precision measurement for Dissolved Oxygen ( DO ) and temperature measurement.
- \* Heavy duty dissolved oxygen probe, probe head can connect with BOD bottle.
- \* DO use the automatic Temp. compensation.
- \* DO meter build in " % SALT " & " Mountain Height " compensation value adjustment.
- \* Wide applications: water conditioning, aquariums, beverage, fish hatcheries, food processing, photography, laboratory, paper industry, plating industry, quality control, school & college, water conditioning.
- \* O2 calibration is easily to be done by push button on the front panel.
- \* Build in DO control relay and the Temp. control relay.
- \* Relay will be make action (On/Off) when the reading value reach high limit or low limit value.
- \* Temperature Offset value setting.
- \* Hysteresis value setting for high and low contral.
- \* °C, °F temp. unit setting with default.
- \* Large red LED display, high brightness and easy to read.
- \* RS232 computer interface, send out the DO and the temperature data at the same time.
- \* Optional data acquisition software.

- \* Microprocessor circuit ensures high accuracy and
- provides special functions and features.
   Standard 96 X 48 mm DIN case.

### 2. SPECIFICATIONS

#### 2-1 General Specifications

Display	4 digits red LED, digit size : 14 mm.		
Circuit	Custom chip of microprocessor LSI circuit.		
Range	Dissolved oxygen		0 to 50 mg/L
	Temp.		0 to 50 °C
Sampling Time	Approx. 1 second	J.	
Setting value	1. High limit value setting.		
	2. Low limit value setting.		
	3. Hysteresis value setting.		
	4. Temp. Offset value setting.		
	* 1, 2, 3 Setting for DO and Temp. function.		
Relay outputs	Number	2 relays	
	Function	Relay 1 :	
		DO control relay.	
		Relay 2 :	
		Temperature control relay.	
	Max load	0.5 ACA/250 ACV	
		0.5 DCA/24 DCV	
		* Do	not apply the relay
		co	ntact load current
		> 0	0.5 A, other wise the
		rel	ay may be damaged
		pe	rmanently without
	warranty.		

Data Output	RS 232 PC serial interface.	
Operating	0 to 50 °C.	
Temperature	* Meter	
Operating	Less than 80% R.H.	
Humidity	* Meter	
Power Supply	90 to 260 ACV, 50/60 Hz.	
Power	Approx. 4.7 VA/AC 110V.	
Consumption	Approx. 5.3 VA/AC 220V.	
Weight	384 g/ 0.84 LB. * Meter only.	
Dimension	DIN size : 96 x 48 mm.	
	Depth : 110 mm.	
Accessories	Instruction manual	1 PC
Included	Case holder with screw	2 PCS
	Oxygen probe(OXPB-11)	1 PC
	Spare Probe head with Diaphragm set	
	(OXHD-04)	2 PCS
	Probe-filling Electrolyte(OXEL-03)	1 PC
Optional	<ul> <li>* Data Acquisition software,</li> </ul>	
Accessories	SW-U801-WIN.	
	* RS232 cable, UPCB-02.	
	* USB cable, USB-01.	

#### 2-2 Electrical Specifications (23 ±5 °C)

### A. Dissolved oxygen

Ovvden	Ontional			
Probe	The polarographic type oxygen probe with			
Measurement	Dissolved Oxygen	0 to 50.0 mg/L ( liter ).		
& Range	Oxygen in Air	0 to 100.0 %.		
	Temperature	0 to 50 °C.		
Resolution	Dissolved Oxygen	0.1 mg/L.		
	Oxygen in Air	0.1 % O2 .		
	Temperature	0.1 ℃.		
Accuracy	Dissolved Oxygen	±0.4 mg/L.		
(23±5 °C)	Oxygen in Air	±0.7% O2.		
	Temperature	±0.8 °C/1.5 °F.		
Probe	Temperature 0 to 50 ℃,			
Compensation	Automatic			
& Adj.	Salt	0 to 39 % Salt		
	Height (M. T.)	0 to 3900 meter		
Probe Weight	209 g/0.46 LB	209 g/0.46 LB		
Probe Size	190 mm x 28 mm Dia. ( 7	190 mm x 28 mm Dia.(7.5" x 1.1" Dia.)		

@ Above specification tests under the environment RF Field Strength less than 3 V/M & frequency less than 30 MHz only.

### **3. FRONT PANEL DESCRIPTION**



- 3-1 Display
- 3-2 PV (process value) indicator
- 3-3 SV (set value) indicator
- 3-4 Set Button
- 3-5 ▼ Button
- 3-6 ▲ Button
- 3-7 DO/Temp/O2 Button
- 3-8 DO control relay indicator
- 3-9 Temp. control relay indicator
- 3-10 DO indicator
- 3-11 Temp. indicator

- 3-12 O2 indicator Fig. 1
- 3-13 Wire terminals
- 3-14 RS232 terminal
- 3-15 DO Probe Input socket
- 3-16 Case holder
- 3-17 Oxyzen probe handle
- 3-18 Temprature sensor
- 3-19 Probe head with diaphragm
- 3-20 Protection cover for Probe head
- 3-21 DO Electrode plug

## **4. FUNCTION SELECTION**

The meter can select 3 kind Function as :

- a. Dissolved Oxygen measurement
- b. Temprature measurement
- c. Air Oxygen measurement

Pressing the "DO/Temp./O2 Button" (3-7, Fig. 1) once, the Function indicator LED will Light ,show the following in sequence :

DO	Dissolved Oxygen measurement
Temp.	red = $^{\circ}C$ or yallow = $^{\circ}F$
02	Air Oxygen measurement

Until the desired Function indicator LED Light , the meter will execute this Mode with default.

### 5. DO (Dissolved Oxygen) MEASURING and CALIBRATION PROCEDURE

#### 5-1 Dissolved Oxygen measurement

- 1) install the "Probe Plug " ( 3-21, Fig. 1 ) into the "DO Socket " ( 3-15, Fig. 1 ).
- 2) Select the Meter's Function to " DO " ( Dissolved Oxygen " measurement, refer to chapter 4, page 6.



Calibration at first !

If it is the first time to use the Dissolved Oxygen meter or after a certain period to use the meter again, then it should to execute the calibration procedures at the first. For the measurement precisely consideration, it recommend to make the calibration before each measurement. Calibration procedure, refer to chapter 5-2, page 10.

- a. Immersed the probe to a depth at least 10 cm of the measured liquid in order for the probe to be influenced by the temperature & automatic temperature compensation to take place.
  - b. As for the thermal equilibrium to occur between the probe & the measurement sample must be allowed to pass, which usually amounts to a few minutes if the Temp. difference between the two is only several Celsius degrees.
- a. In order to measure the dissolved oxygen content in any given liquid, it is sufficient to immerse the tip of the probe in the solution, making sure that velocity of the liquid coming into contact with the probe is at least 0.2 - 0.3 m/s or to shake the probe.
  - b. During laboratory measurements, the use of a magnetic agitator to ensure a certain velocity in the fluid is recommended. In this way, errors due to the diffusion of the oxygen present in the air in the solution are reduced to a minimum.
- 5) Display will show the Dissolved Oxygen values ( mg/L )
- 6) Rinsed the probe accurately with normal tap water after each series of measurement.

#### Oxygen in the air measurement

First DO Probe please Put in the air , use the "DO/Temp./O2 Button " ( 3-7, Fig. 1 ) select to O2 Function, the display will show the air Oxygen value.

#### **Temprature measurement**

When DO Probe Put in the air , use the "DO/Temp./O2 Button " (3-7, Fig. 1) select to "Temprature" Function, the display will show the air Temprature value.

When DO Probe Put in the water , use the "DO/Temp./O2 Button "( 3-7, Fig. 1 ) select to "Temprature" Function, the display will show the water Temprature value.

#### Change the Temp. unit to °F

If intend to change the Temp. unit from  $^{\circ}C$  to  $^{\circ}F$ , please refer to chapter 5-5, apge 19.

#### "% Salt" compensation value adjustment

If intend to change the % Salt compensation value, refer chapter 5-5, page 16.

#### "Height" compensation value adjustment

If intend to change the Height compensation value, refer to chapter 5-5, page 15.

#### 5-2 Calibration

- 1) Install the " Probe Plug " ( 3-21, Fig. 1 ) into the " DO Socket " ( 3-15, Fig. 1 ).
- Power on the meter, Then select the Meter's Function to " %O2 " Air Oxygen measurement.
- 3) Wait for approx. 5 minutes at least until the display reading values become stable & no fluctuation.
- 4) Use the two fingers to press the "▲ Button " ( 3-6, Fig 1 ) and ▼ Button " ( 3-5, Fig. 1 ) > 2 Sec. at the same time, the display will flash about 35 sec. then show the following screen as example

20.9

Calibration Consideration :

- a. As the oxygen in air is 20.9 % typically, so use the environment air O2 value for quick & precise calibration.
- b. Please process calibration procedures under wide and ventilating environment for best effect.

#### 5-3. Probe maintenance

#### User first time to use the meter

Intend to let the DO probe keep the best condition, when user receive the Oxygen Probe, it should fill the Probe's Electrolyte at first.

User already use the probe for a certain period :

Whenever user can not calibrate the meter properly or the meter's reading value is not stable, please check the oxygen probe to see if the electrolyte in the probe head container is run out or the diaphragm ( probe head with diaphragm set) exist problem ( dirty ). If yes, please fill the electrolyte or change the " Probe head with diaphragm set " and make the new calibration.

The consideration of Diaphragm (probe head with diaphragm set

The oxygen probe component is the thin Teflon diaphragm housed in the tip of the probe. The diaphragm is permeable by the oxygen molecules but not by the considerably larger molecules contained in the electrolyte. Due to this characteristic, the oxygen may diffuse throughout the electrolyte solution contained in the probe, and its concentration may be quantified by the measurement circuit.

#### Fill the electrolyte



- 1) Unscrew the "Probe head " (5-3, Fig 2).
- 2) Pour out the old Electrolyte from the container of the " Probe head ".
- Fill the new Electrolyte (OXEL-03) into the container of the "Probe head " (approx 2 cc).
- 4) Screw the "Probe head " (5-3, Fig 2) into the probe body.
- 5) When not use the probe, should insert the " Probe head " into the " Probe protection cover " ( 3-20, Fig. 1 )



Fig.2 5-1 Probe handle 5-2 Temp. sensing metal 5-3 Probe head

#### 5-4 1st layer setting procedures

LoLt	Low Limit	
HiLt	High Limit	

#### Low Limit Value Setting

 Press the "Set Button " (3-4, Fig. 1) once, the "Display " will show "LoLt ", now the meter is ready for the DO " Low Limit " value setting.

Press the "DO/Temp/O2 Button " (3-7, Fig. 1) once, the "Temp LED indicator "(3-11, Fig. 1) will light, now the meter is ready for the Temperature "Low Limit " value setting.

#### Remark :

- \* Under " Display " show " LoLt ", if " DO indicator " (3-10, Fig. 1) is lit, meter is ready for " DO Low Limit " setting.
- \* Under " Display " show " LoLt ", if " Temp. indicator " (3-11, Fig. 1) is lit, meter is ready for " Temperature Low Limit " value setting.
- \* The function of " Low Limit value " setting, refer to page 17, Fig. 3.
- 2) Use the "▼ Button " (3-5, Fig. 1) and the "▲
  Button " (3-6, Fig. 1) to adjust the desiring " Low Limit " value.
  - \* When adjust the value, the "SV indicator " (3-3, Fig. 1) will light.

#### High Limit Value Setting

 After set the "Low Limit "value, press the "Set Button " (3-4, Fig. 1) twice, the "Display "will show "HiLt ", now the meter is ready for the DO "High Limit "value setting.

Press the "DO/Temp/O2 Button " (3-7, Fig. 1) once, the "Temp indicator "(3-11, Fig. 1) will light, now the meter is ready for the Temperature "High Limit " value setting.

#### Remark :

- \* Under " Display " show " HILt ", if " DO indicator " ( 3-10, Fig. 1 ) is lit , meter is ready for " DO High Limit value " setting.
- \* Under " Display " show " HILt ", if " Temp. indicator " (3-11, Fig. 1) is lit, it meter is ready for " Temperature High Limit value " setting.
- \* The function of " High Limit value " setting, refer to page 17, Fig. 3.
- 2) Use the "▼ Button " (3-5, Fig. 1) and the " ▲
  Button " (3-6, Fig. 1) to adjust the desiring " High Limit " value.
  - \* When adjust the value, the "SV indicator "(3-3, Fig. 1) will light.

After adjust the "High Limit value, press the Set Button "(3-4, Fig. 1) twice, "Display will return to the normal measuring screen.

#### 5-5 2nd layer setting procedures

HiGH	Set DO height compensation value
SALt	Set DO salt% compensation value
FiLt	DO or Temp, Filter setting
HySt	Hysteresis setting
oFSt	Temp. Offset setting
GAin	DO or Temp, Gain setting
Unit	Temp. unit ( $^{\circ}\!\!\mathbb{C}$ or $^{\circ}\!\!\mathbb{F}$ )setting

Pressing the "SET Button" (3-4, Fig. 1) > 2 sec. the meter Function will into 2nd layer setting, then release the "SET Button", and use the "SET Button" agin to select ,as shown in the table above project.

#### When the display show " HiGH "

#### DO height ( meter ) compensation value setting

- This function only for the DO (Disolved oxygen) Function of adjusting the probe's height compensation value in meter unit. The default value is 0 meter.
- 2) Use the "▲ Button " (3-6, Fig. 1) or "▼ Button " (3-5, Fig. 1) to select the upper value to the desired height compensation value (meter), then press the "SET Button " (3-4, Fig. 1) will save the setting value temporally.
  - When adjust the height (meter) compensation value, the
     "SV indicator " (3-3, Fig. 1) will light.

#### DO salt% compensation value setting

- This function only for the DO (Disolved oxygen) Function of adjusting the probe's salt% compensation value. The default value is 0% salt.
- 2) Use the "▲ Button " (3-6, Fig. 1) or "▼ Button "
  (3-5, Fig. 1) to select the upper value to the desired salt% compensation value, then press the "SET Button "
  (3-4, Fig. 1) will save the setting value temporally.
  - When adjust the DO salt% compensation value, the "SV indicator" (3-3, Fig. 1) will light.

When the display show " FiLt "

#### Filter( stable ) value setting

Due to environmental reasons or other reasons, which caused the measurement value is not stable, can adjust this setting, in order to get a more stable measurement

- 1) Use the " DO/Temp./O2 Button " ( 3-7, Fig. 1 ) to select the desired to set the project ( DO or Temp. )
- Use the "▲ Button " (3-6, Fig. 1) or "▼ Button " (3-5, Fig. 1) to adjustment desired filter value, then press the "SET Button " (3-4, Fig. 1) will save the setting value temporally.
  - \* When adjust the Filter( stable ) value, the " SV indicator " ( 3-3, Fig. 1 ) will light.

#### Hysteresis value setting

- 1) Use the " DO/Temp./O2 Button " ( 3-7, Fig. 1 ) to select the desired to set the project ( DO )
- 2) Use the "▼ Button " (3-5, Fig. 1) and the "▲ Button " (3-6, Fig. 1) to adjust the desiring Hysteresis setting value. then press the "SET Button " (3-4, Fig. 1) will save the setting value temporally.
- 3) Then use the "DO/Temp./O2 Button " ( 3-7, Fig. 1 ) to select the desired to set the project ( Temp. )
- 4) Use the "▼ Button " (3-5, Fig. 1) and the "▲ Button " (3-6, Fig. 1) to adjust the desiring Hysteresis setting value. then press the "SET Button " (3-4, Fig. 1) will save the setting value temporally.
  - \* When adjust the Hysteresis value, the "SV indicator " (3-3, Fig. 1) and the " will light.

Remark :

- \* Under " Display " show " HySt ", if " DO indicator " ( 3-10, Fig. 1 ) is lit, meter is ready for " DO Hysteresis value " setting.
- \* Under " Display " show " HySt ", if " Temp. indicator " (3-11, Fig. 1) is lit, meter is ready for " Hysteresis value " setting.
- \* The function of "Hysteresis value " setting, refer to page 17, Fig. 3.



Fig. 3

- The control relay will On when measuring value up to 10.0. The control relay will Off again when measuring value down to 9.5.
- b. The control relay will On when measuring value down to 2.0 The control relay will Off when measuring value up to 2.5.

#### When the display show " oFSt "

#### offset value setting

- 1) Use the " DO/Temp./O2 Button " ( 3-7, Fig. 1 ) to select the desired to set the project ( DO )
- 2) Use the "▼ Button " ( 3-5, Fig. 1 ) and the "▲ Button " ( 3-6, Fig. 1 ) to adjust the desiring offset setting value. then press the " SET Button " ( 3-4, Fig. 1 ) will save the setting value temporally.
- 3) Use the "DO/Temp./O2 Button " (3-7, Fig. 1) to select the desired to set the project (Temp.)
- 4) Use the "▼ Button " ( 3-5, Fig. 1 ) and the "▲ Button " ( 3-6, Fig. 1 ) to adjust the desiring offset setting value. then press the " SET Button " ( 3-4, Fig. 1 ) will save the setting value temporally.
  - \* When adjust the Temp. offset, the "SV indicator " (3-3, Fig. 1) will light.

#### When the display show " GAin "

#### Gain value setting

1) Use the " DO/Temp./O2 Button " ( 3-7, Fig. 1 ) to select the desired to set the project ( DO )

- 2) Use the "▼ Button " (3-5, Fig. 1) and the "▲ Button " (3-6, Fig. 1) to adjust the desiring Gain setting value. then press the " SET Button " (3-4, Fig. 1) will save the setting value temporally.
- 3) Then use the "DO/Temp./O2 Button " ( 3-7, Fig. 1 ) to select the desired to set the project ( Temp. )
- 4) Use the "▼ Button " (3-5, Fig. 1) and the "▲ Button " (3-6, Fig. 1) to adjust the desiring Gain setting value. then press the " SET Button " (3-4, Fig. 1) will save the setting value temporally.
  - \* When adjust the Gain, the "SV indicator "(3-3, Fig. 1) will light.

When the display show " Unit "

#### Temperature Unit setting

- Use the "▼ Button " (3-5, Fig. 1) and the "▲ Button " (3-6, Fig. 1) to select Tenprature unit °C or °F then press the " SET Button " (3-4, Fig. 1) will save the setting value temporally.
  - \* When adjust the Temp. unit, the "SV indicator " (3-3, Fig. 1) will light.

### 6. RS232 PC SERIAL INTERFACE

The instrument has RS232 PC serial interface via a 3.5 mm terminal ( 3-14, Fig. 1 ).

The data output is a 16 digit stream which can be utilized for user's specific application.

A RS232 lead with the following connection will be required to link the instrument with the PC serial port.

Meter (3.5 mm jack plug)	PC (9W 'D" Connector)
Center Pin	Pin 4
Ground/shield	Pin 2

The 16 digits data stream will be displayed in the following format :

D15 D14 D13 D12 D11 D10 D9 D8 D7 D6 D5 D4 D3 D2 D1 D0

Each digit indicates the following status :

D15	Start Word			
D14	4			
D13	When send the upper display data = 1			
	When send the	lower disp	olay data = 2	
D12 & D11	Annunciator for Display			
	°C = 01	°F <b>= 02</b>	%O2 =06	mg/L = 07
D10	Polarity			
	0 = Positive	1 = Neg	ative	
D9	Decimal Point(DP), position from right to the			
	left			
	0 = No DP, 1=	1 DP, 2 = 2	2 DP, 3 = 3 DP	
D8 to D1	Display reading	l, D8 = MS	D, D1 = LSD.	
	For example :			
	If the display	/ reading is	s 1234, then D8	to
	D1 is : 0000	1234		
D0	End Word			

#### **RS232 setting**

Baud rate	9600
Parity	No parity
Data bit no.	8 Data bits
Stop bit	1 Stop bit

### 7. SYSTEM RESET

Power on the meter, use the two fingers to press " Set Button " (3-4, Fig. 1) and "  $\checkmark$  Button " (3-6, Fig. 1) continuously more than 5 seconds until the Display show the text " rSt ", release the buttons. After " rSt " text flashing 2 times will return to the normal screen. The meter system will be reset, all the calibration data will be cleared, the meter's internal function will return the default value.

### 8. THE ADDRESS OF AFTER SERVICE CENTER

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