

Operation Manual

DO5000 / DO5200

Dissolved Oxygen Controller / Transmitter

Preface

This manual serves to explain the use of CLEAN DO5000 / DO5200 controller / transmitter. This operation manual is written to cover as many anticipated applications of DO5000 / DO5200 controller / transmitter. If you have doubts in the use of the instrument, please do not hesitate to contact CLEAN local customer service center.

The information written in this manual is subject to change without notice as improvements are made, and does not represent a commitment of CLEAN brand from CLEAN Instruments.

CLEAN Instruments can not accept any responsibility for damage or malfunction of the unit due to improper use of the instrument.

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Safety Information

CLEAN DO5000 / DO5200 Controller / Transmitter should be installed and operated only in the manner specified in the operation manual. Only skilled, trained or authorized person should carry out installation, setup and operation of the instrument.

Before powering up the unit, make sure that power source is connected as specified in the top label. Failure to do so may result in a permanent damage to the unit.



Protect level against electric shock mainly depends on relevant installation rules.

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1 PREFACE

BEFORE USE

Thank you for selecting CLEAN DO5000 / DO5200 controller / transmitter.

Although DO5000 / DO5200 controller / transmitter use advanced technology and meet the requirements of current safety rules, improper use can also threaten the safety of users, and / or cause harmful influences to factory and other equipments. Therefore, before using DO5000 / DO5200 controllers / transmitter, relevant person must read and understand contents of this operation manual.

Following symbols used in this operation manual are to distinguish safety measures and appendix information :

	This symbol means contents and safety instructions and warning of potential dangerous. If they are neglected, person may be hunted and property may be damaged.
	This symbol indicates the useful tips that ease your meter operation.

Operation manual should be kept accessible within the person who use this DO5000 / DO5200 controllers / transmitters.

If you have problems which are not mentioned or can not be explained in this manual, please contact CLEAN local customer service center. They will be very glad to help you.



IN USE

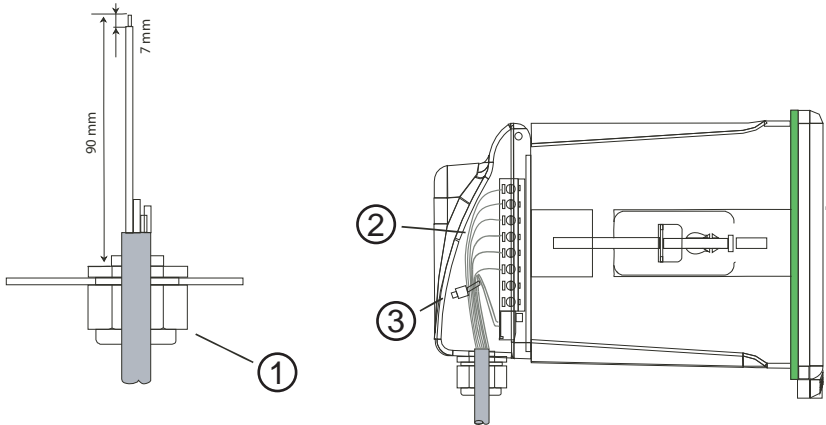
On any unmentioned use or the use that contradict with the technical parameters the operators should bear the responsibility.

Other conditions of right use include:

- Remarks and requirements stated in operation manual.
- Local safety regulations about safe operation.
- Information and warning of products that are used together with the transmitters in the contract. (chassis, electrode, etc.)
- Required using environment and working condition.

SAFETY INSTRUCTION

	Dissolved Oxygen transmitters may only be carried out by trained experts.
	Unqualified Transmitters should not be installed and used.
	Dissolved Oxygen transmitters should be used under the required working condition.
	Dissolved Oxygen transmitters should be open and repaired by clients themselves.
	Modified Dissolved Oxygen transmitters should not be used. Manufacturers and suppliers do not bear responsibility for the damage and lose caused by modifying instruments without permission. Clients should bear all the risks. This instrument is IP65 rated. Please use waterproof cable glands when you connect the line. Also, please loose it when you open the cover. After connecting the line, please tighten the cable conductor according to the following instruction with cable ties, or it will cause danger such as cable conductor or interface falls off when open the cover.  Please make sure to cut the power off when you open the cover to carry on any operation.



1. Waterproof cable glands
2. Cable (recommended stripping length for cables is at least 90mm, please use 0.5 to 1 square meter's wire)
3. Cable ties

2 PRODUCT DESCRIPTION

2.1 DESCRIPTION OF INSTRUMENT SPECIALITY

CLEAN DO5000 / DO5200 transmitters are used to measure Dissolved Oxygen and temperature value.

The transmitters can be panel-mounted or wall-mounted. They can be used as monitor in water treatment, controller in electrolytic water cleaning, in chemical industry, in food process, in cleaning water or waste water treatment and in neutralization process.

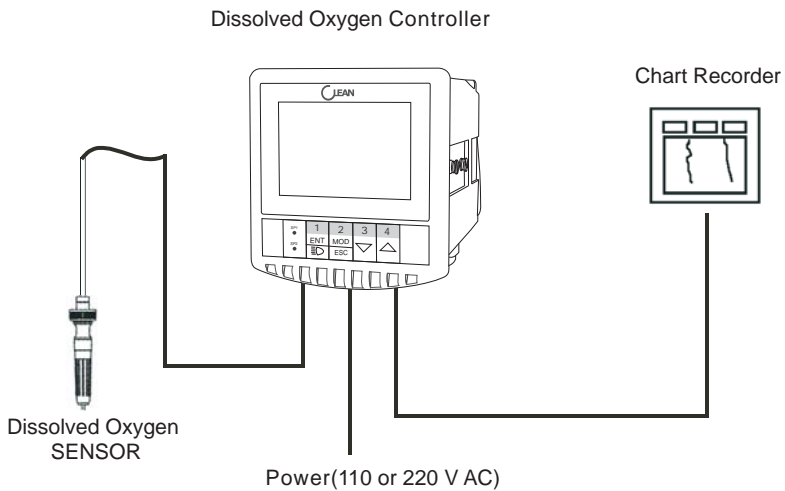
This transmitter has many user-friendly and safety features which include:

- Menu-driven program, that simplifies to set-up.
- High protection against electromagnetic interference.
- IP65 rated, waterproof and anti-gas, applicable in any extreme conditions.
- Built-in memory backup to ensure that setup parameter and calibration information are not erased in power-off condition.
- Independent setting for process temperature (TST1) and calibration temperature (TST2) in manual temperature compensation (MTC) mode. Under automatic temperature compensation mode, instrument will automatically switch to process temperature (TST1) in manual temperature compensation ensure that the instrument can working normally. Please refer to Item 5.1.
- Dissolved Oxygen measured value can make offset adjustment (adjusting scope ± 2 ppm) so that users can calibrate online. Please refer to Item 5.2.
- Scaleable isolated 0/4 -20 mA Outputs for pH/ORP. Please refer to Item 5.3.
- Two relay circuits, users can select high-low control freely.
- Separately adjustable high and low set point hysteresis (dead bands) prevent oscillating of relays around the set points.
- Two control modes: on/off limited control (LIT), proportion pulse length control (PLC). Two modes of relays can switch high-low point control freely. Please refer to Item 5.4.
- Two types of electrode input, symmetrical (under the strong interference industrial situation) or asymmetrical input. Please refer to Page 17.
- Large dual display LCD for easy reading with clear multiple annunciators, alarm status and operational message annunciators. Long-life micro-switch key ease the setting.
- Can set time of instrument and electrode to reduce person management. Instrument will automatically appear "CAL" at regular time reminding calibration and maintenance. Please refer to Item 5.7.
- Automatically clean relay design. Users themselves can set cleaning time and install cleaning equipment. Please refer to Item 5.7.
- During calibrating and setting, hold function freezes output current (0/4 - 20ma) and releases control relays.
- LED indicators signal control activities to monitor controller status from a distance.
- Large LCD, with high luminance LED orange backlight.
- RS-485 output.

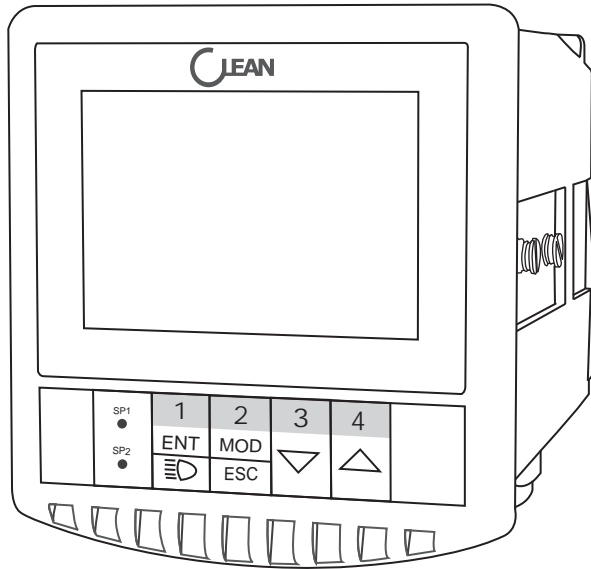
2.2 MEASUREMENT AND CONTROL SYSTEM

Typical measurement system includes:

- Dissolved Oxygen on-line transmitter.
- Dissolved Oxygen sensor with or without temperature probe NTC22K.
- Suitable Dissolved Oxygen measurement electric cable.
- Immersion, flow or processing parts with or without grounding electrode.
- Terminating controlling parts, eg. Pump or valve.
- 0/4~20mA can connect with recorder.
- RS-485 can be used as connector to many instruments.
- RL3 relay can be used as multi control or as alarm.



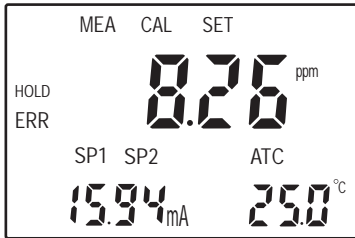
2.3 APPEARANCE



DO5000 / DO5200 Dissolved Oxygen Controller / Transmitter

2.3.1 DISPLAY INTRODUCTION

Two line LCD indicate measured value and various indications and parameters under different conditions.







Mode:

- **MEA**: measurement mode
- **SET**: set-up mode
- **CAL**: calibration mode

Status:

- **HOLD**: freeze relay actions and current output.
- **ATC**: automatic temperature compensation.
- **ERR**: error or warning indication

2.3.2 KEY INSTRUCTION

KEY	Description
	<ul style="list-style-type: none"> • Mode switch or Exit from current mode of operation
	<ul style="list-style-type: none"> • Confirm selection • Enter into function group in setting up mode. • Confirm setted parameter and value • Start calibration in calibration mode • Back light switch in measurement mode
 	<ul style="list-style-type: none"> • Select function group in setting up mode to set parameter and value (Hold the key ,value changing will be quicker)

2.3.3 LED

Relay Introduction

SP1 \ SP2 LED indicates relay's working status.

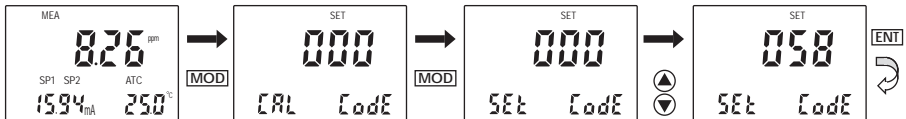
SP1 \ SP2 LED light luminating indicates that relays are under working status.

2.3.4 PASSWORD

When entering calibration mode and setting mode, there are passwords. Passwords are set by manufacturers and users can not modify them. Passwords are listed below:

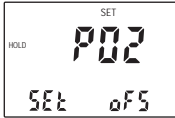
Password	Mode / Instruction
028	Calibration Mode
058	Set-up Mode

2.3.5 FUNCTION PREVIEW





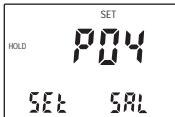
Temperature function: modify relevant temperature parameters, such as automatic temperature compensation or manual temperature compensation, set up of manual temperature compensation.



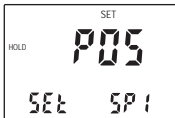
Offset set-up function: calibrate and modify measurement value.



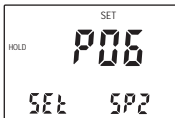
Current set-up function: set-up output circuit.



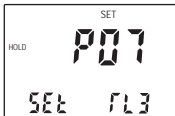
Salinity and atmospheric pressure set-up function: manual set-up salinity and atmospheric pressure, and automatically modified by instrument.



SP1 set-up function: set-up movement of relay 1, carry on automatic control through it.



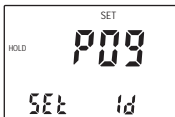
SP2 set-up function: set-up movement of relay 2, carry on automatic control through it.



RELAY 3 set-up function: set-up movement of relay 3, carry on functions of cleaning, calibration prompt, alarm, etc.



Configuration function: set up measurement parameter of instrument, type of electrode, and system of standard solution.



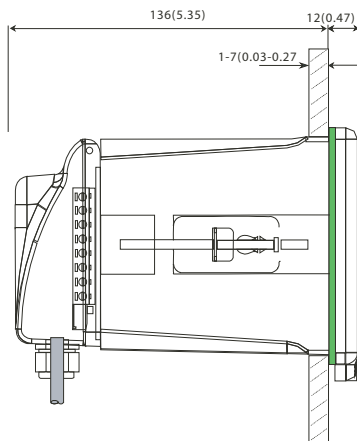
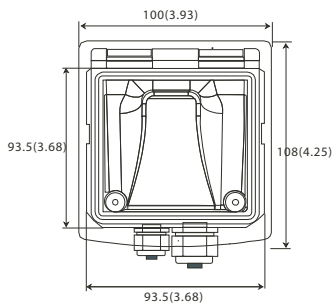
RS-485 Data output function: transmit information, such as measurement data of instrument, set-up parameter, and control status to computer system.



Reverting to factory default settings function: revert all setting values and calibration values to factory default settings.


3 INSTALLATION AND ACCESSORY

INSTALLATION



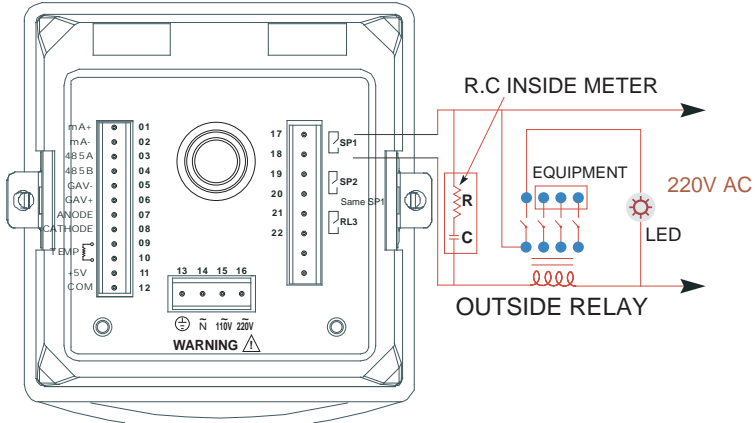
Panel cutout : 93.5*93.5mm
(panel installation)

DO5000 / DO5200 CONNECTION DIAGRAM



Warning: Make sure to power off before connecting. The rear panel consists of three connectors.

DO5000 / DO5200 connection diagram



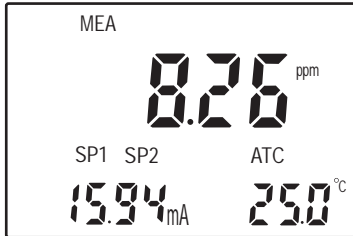
1. 4 - 20mA output, positive terminal	12. 5V positive terminal
2. 4 - 20mA output, negative terminal	13. Earth wire
3. 485A output	14. Alternation connect earth wire
4. 485B output	15. Power input 110VAC (220VAC unable)
5. GALVANIC DO electrode negative input terminal	16. Power input 220VAC (110VAC unable)
6. GALVANIC DO electrode positive input terminal	17. Relay A (SP1)
7. CLARK DO electrode positive input terminal	18. Relay A (SP1)
8. CLARK DO electrode negative input terminal	19. Relay B (SP2)
9. Temperature electrode input terminal (NTC22K)	20. Relay B (SP2)
10. Temperature electrode input terminal (NTC22K)	21. Clearing Relay (RL3)
11. +5V positive terminal	22. Clearing Relay (RL3)

MEASUREMENT MODE

When the controller is powered on, first the large dual LCD displays all icons briefly, then the controller will automatically enter into measurement mode.




Note: In order to get exact measurement information, users should calibrate measurement system (transmitter and electrode).




MEA on top of the LCD indicates that the instrument is under measurement mode. The upper display indicates Dissolved Oxygen value, while the lower display shows temperature value under Dissolved Oxygen measurement mode. Icon at the left lower side of the display show the value of transmitting output current, which is the way that users calibrate the output current. Such annunciators or icons, as ppm or % at the right side of the display show the current different measurement mode of transmitters.



In measurement mode, you can press  key once or twice to enter into the function form of calibration or set password input.


Then input relevant password to enter into calibration mode or set up mode. Please refer to Item 3(Calibration Mode) or Item 4 (set up mode).



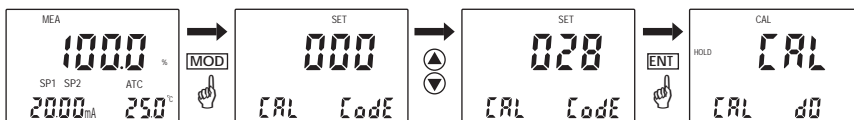
Press  key under measurement mode, you can open or close LCD backlight function.


4 CALIBRATION MODE




You can press  once under measurement mode and then input password 028 to get access to calibration mode. Please operate according to following procedures.

4.1 ENTERING CALIBRATION MODE



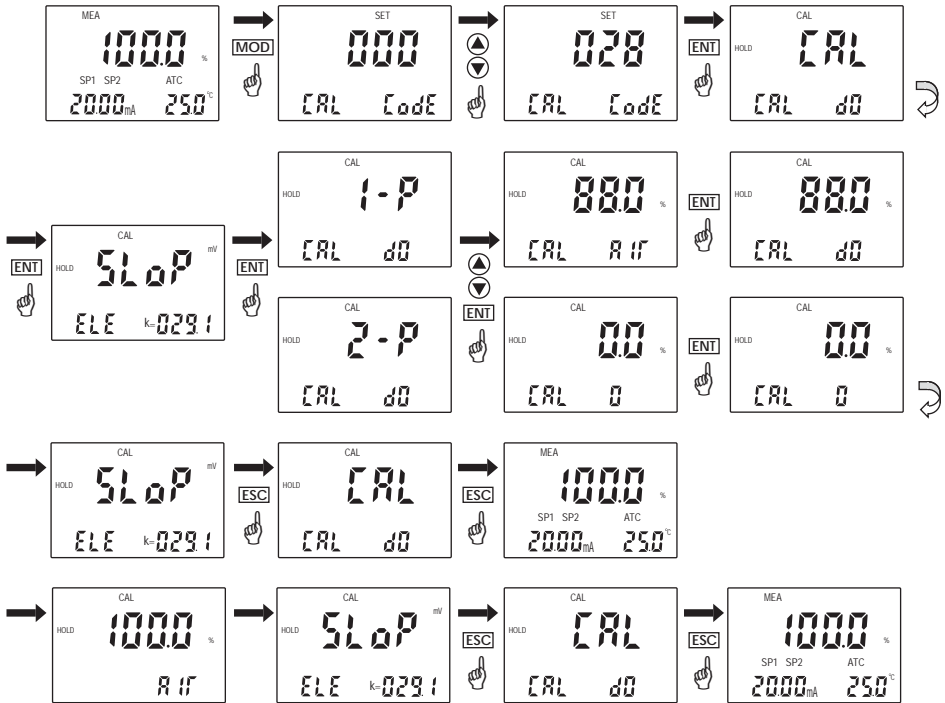
1. Press  once under measurement mode and enter into function form for password input of calibration mode.
2. After entering function form of calibration password input, LCD will ask you to input password. Press ▲ or ▼ to input calibration password 28, then press ENTER to confirm the password.
3. Press ENTER to enter into calibration function form, if instrument is set up as Dissolved Oxygen measurement mode, lower display will show CAL DO. Please refer to relevant items. (please refer to upper pictures).





NOTE: Anytime press  to exit from calibration mode and return to upper function. If return to measurement mode, old calibration information will be kept and used. After returning to measurement mode, password will automatically set up form 028 to 000 when entering calibration mode.

4.2 Dissolved Oxygen % CALIBRATION


This instrument can conduct one point or two points calibration in pre-set standard value, The value of standard value is based on 25°C at MTC (manual temperature compensation) status.




1. Entering calibration mode as Item 4.1 described. LCD will show CAL DO (Dissolved Oxygen Calibration mode).

2. Press  key to enter into calibration, LCD will show slope and function form. The lower display will show ELE K = 29.1 this function form shows the slope of last calibration. The upper display will show CAL and the main display zone will show SLOP. Press  key to enter into calibration procedures, LCD main display zone will show actual measured value, the right lower display will show 1-P (1 POINT CAL), user can press ▲ or ▼ to select 2-P (2 point cal). If select 1-P meter will calibrate the value in air directly, select 2-P meter will cal zero point first.

3. Put electrode into the zero point solution. You should put temperature electrode into the same solution under the automatic temperature compensation mode.

4. Press  key to calibrate at zero. The lower display shows CAL 0, BUFF will blink when calibrating. During calibrating process, instrument will automatically distinguish signals which electrode inputs. If the signal input in required time is stable and in the slope permit range of the formality, the instrument will regard the calibration as a legal calibration, it will record and modify


the calibration information of the electrode. Press  twice to exit from one-point calibration

and return to measurement mode. Press  to continue next point calibration, Take electrode out of the first standard solution, clean it and put it in air, lower line will shows CAL AIR. Press


 to confirm.

5. After finishing the second calibration of standard buffer solution, instrument will automatically show SLOP on LCD main display zone. The right lower display shows the slope of electrode. Parameter of zero point and slope will be refreshed after each calibration.



 key to exit from set up mode at any time.
Instrument will return to measurement mode automatically.



NOTE: Transmitter will show ERR when calibration is error. Under this situation, press  to exit and calibrate again from step 1. It will show ERR again under following situations:

- (1) Use wrong standard solution or standard solution has expired.
- (2) Electrode is aging or not clean or bubble is broken.
- (3) Electrode wire is broken or leakage because of joint corrosion.



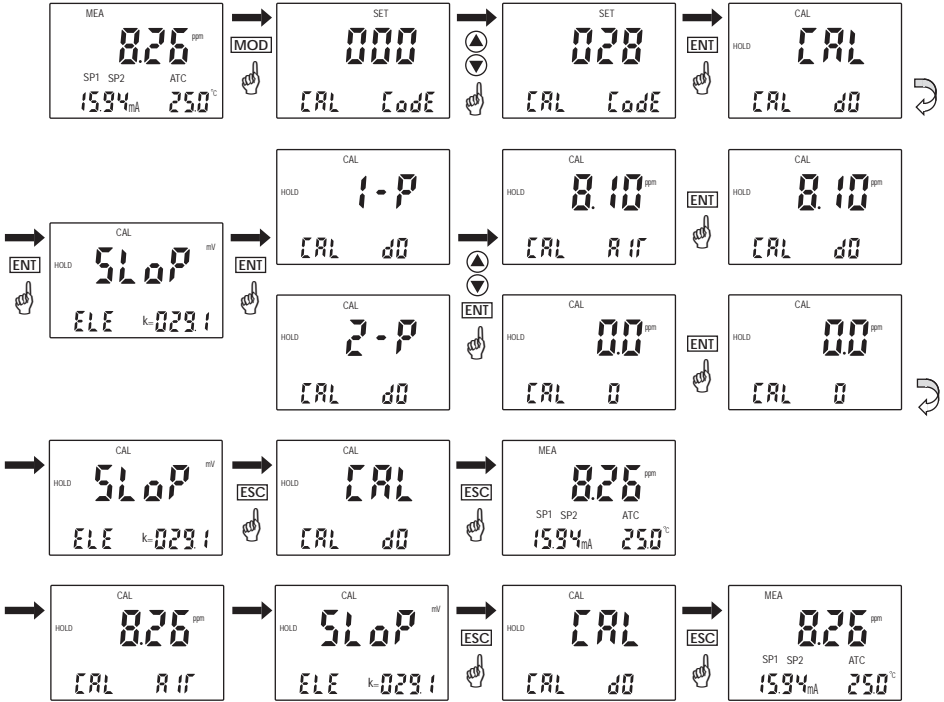
NOTE: When calibrating under manual temperature compensation, transmitter will automatically switch to calibration temperature from pre-set measurement temperature. When leaving calibration mode, transmitter will switch to measurement temperature again. (Please refer to Item 5.2 for setting measurement temperature and calibration temperature)



















NOTE: ELE K=29.1 presents the electrode conversation coefficient is 29.1mV/PH, which means each PH is converted by 29.1mV electric potential at 25°C. When slope is 100%, the conversation coefficient is 29.1mV: For example: when slope is 90%, the conversation coefficient is $29.1 * 90\% = 26.19$

4.3 DISSOLVED OXYGEN CALIBRATION

This instrument can have one point or two points calibration. Under manual temperature compensation, the temperature is based on 25°C.

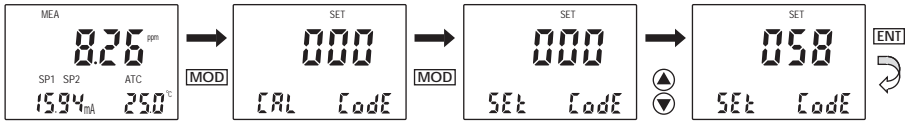






1. Entering calibration mode described as in Item 4.1. LCD will show CAL DO. (Dissolved Oxygen Calibration Mode)
2. Press  key to enter into calibration, LCD will show slope and function form. The lower display will show ELE K=29.1. The function form shows the last calibration slope value. The upper display will show CAL and the main display zone will show SLOP. Press  key to enter into calibration procedures, LCD main display zone will show 1-P to remind users to use one point calibration function. Users can press ▲ or ▼ to select 2-P (two point calibration function). If select 2-P, instrument will leap over zero point calibration and enter into full range calibration function form. If select 1-P, instrument will enter into zero point calibration.
3. Put electrode into the first prepared solution with no oxygen. You should put temperature electrode into the same ELE under the automatic temperature compensation mode.

<p>4. Press  key to process zero point calibration, the lower display shows CAL 0 to remind users the zero calibration and standard value. CAL will blink when calibrating. During calibrating process, instrument will automatically distinguish signals which electrode input. If the signal input in required time is stable and in the slope permit range of the formality, the instrument will regard the calibration</p> <p>as a legal calibration, it will record and modify the zero point information of the electrode. Press  </p> <p>twice to quit one point calibration and return to measuring status. If you now press  to continue next point calibration, take electrode out of the solution without oxygen, the lower display will show CAL AIR to remind the second calibration point and the standard value.</p>	
<p>5. If select one point calibration, instrument will show the slope, but zero point adopts new calibration value while the slope remains the value of last calibration. If select two point calibration, take</p> <p>electrode out of the first solution without oxygen, clean it and put it in the air. Press   key, CAL will blink. Instrument will modify the indication to the standard value.</p>	
<p>6. After finished the second standard calibration, instrument will automatically show SLOP on LCD main display zone. The right lower display shows the slope of electrode. Parameter of zero point and slope will be renewed after each calibration.</p>	
	<p> </p> <p>NOTE: Press  key to exit from set-up mode at any time. Instrument will return to measurement mode automatically.</p>
	<p>NOTE: Transmitter will show ERR when calibration is error. Under this situation, press   to quit and calibrate again from step 1. It will show ERR again under following situations:</p> <ol style="list-style-type: none"> (1) Use wrong standard solution or standard solution is expired. (2) Electrode is aging or not clean or bubble is broken. (3) Electrode wire is broken or leakage because of joint corrosion.
	<p>NOTE: When calibrating under manual temperature compensation, transmitter will automatically switch to calibration temperature from pre-set measurement temperature. When leaving calibration mode, transmitter will switch to measurement temperature again. (Please refer to Item 5.2 for setting measurement temperature and calibration temperature)</p>

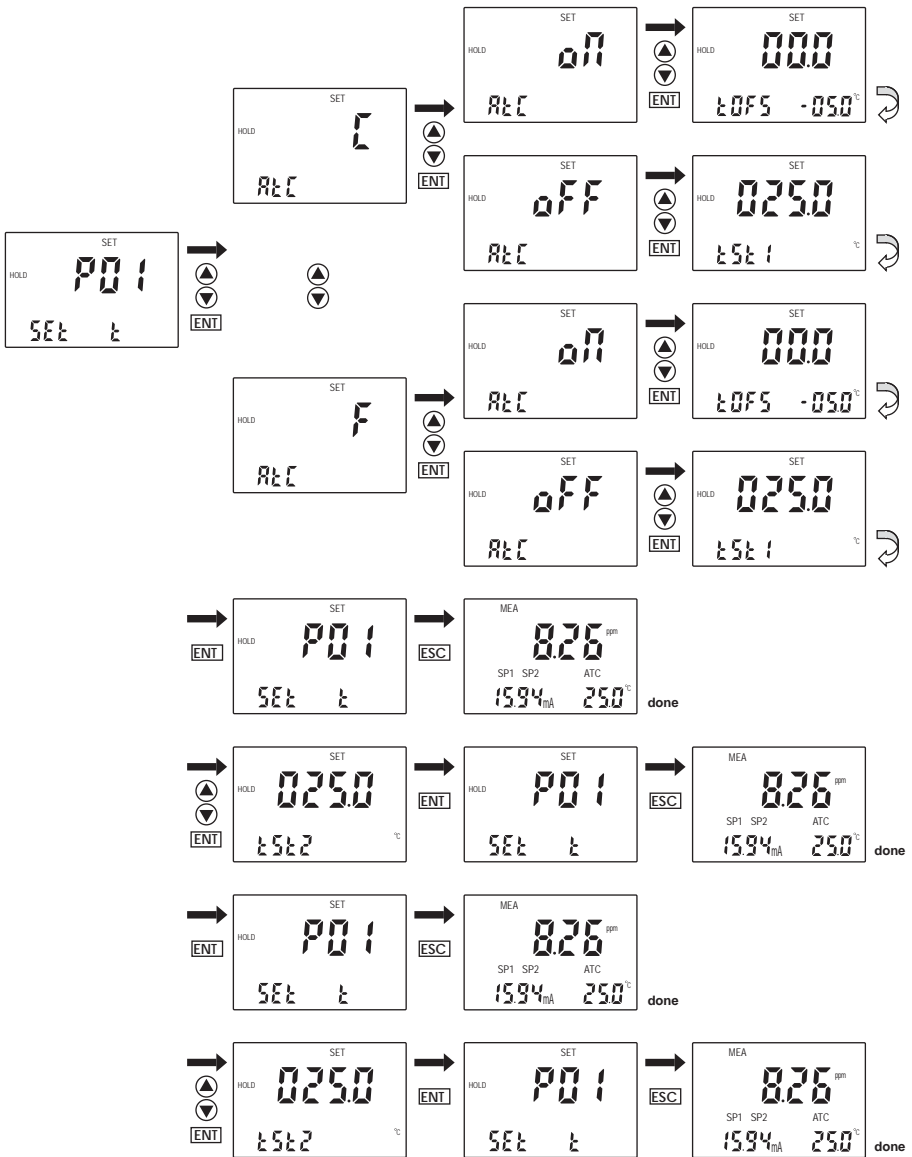
5 SET UP MODE



ENTERING SET UP MODE




	<p>1. Press  twice in measurement mode.</p>
	<p>2. LCD ask you to input password. Use ▲ or ▼ to input the password. –Input 058 to change parameter.</p>
	<p>3. Press to  confirm.</p>
	<p>NOTE: Press  twice to exit from set up mode at anytime. Instrument will return to measurement mode automatically.</p>


5.1 P01: TEMPERATURE SET-UP FUNCTION





1. Press  to enter from P01 screen. LCD main display zone show C, which means users can press ▲ or ▼ to switch to F, which means the temperature unit is degree Fahrenheit. Press  to confirm the choice and enter into the next setting.


2. LCD main display zone show ON, which means automatic temperature compensation function is open. User can press ▲ or ▼ to switch to OFF and close automatic temperature compensation

function. Press  when automatic temperature compensation function is open, instrument enter into modifying status of temperature measurement value. LCD main display zone show current measurement value of temperature. The lower display TOFS tell users that they can use ▲ or ▼ to

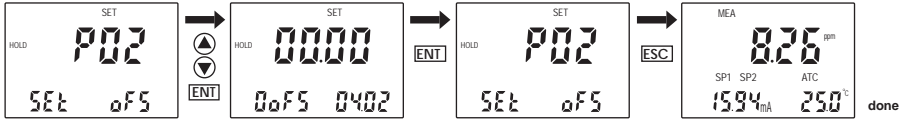
modify current temperature display value. Press  to confirm and return to P01 function form.









In the status of manual temperature compensation, press  and instrument enter set up status of manual temperature compensation user can use ▲ or ▼ to set up process temperature TST1

and calibration temperature TST2. Press  to confirm and return to P01 function form or

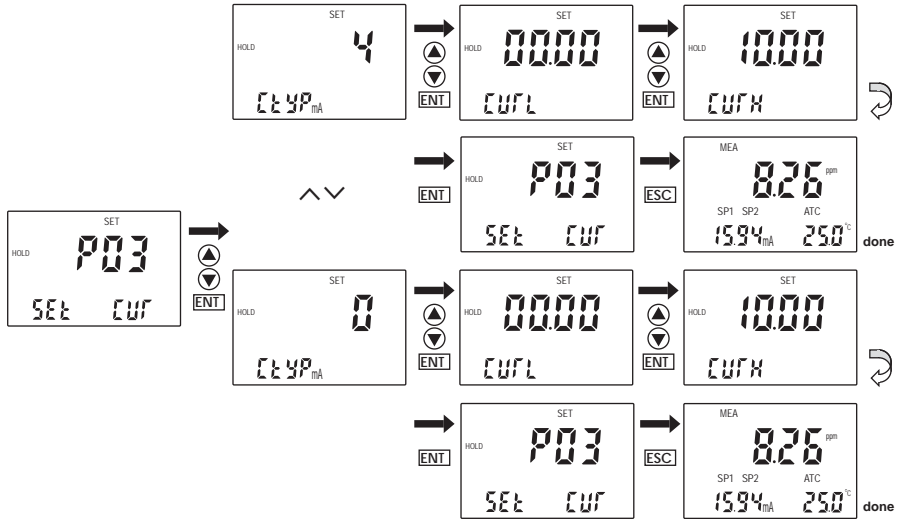
press ▲ or ▼ to select other functions to set up or press  to return to measurement status. TST1 is the compensation temperature under normal measurement while TST2 is the compensation temperature under calibration. Since temperatures are not the same in calibration and normal measurement when instrument is used, two set up values under manual temperature compensation status are convenient. Users will not set manual temperature compensation value back and forth.








5.2 P02: OFFSET SET-UP FUNCTION



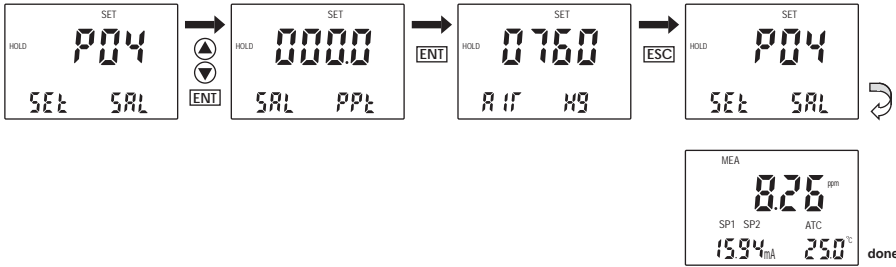
1. In P02 function form, Press . LCD main display zone shows Dissolved Oxygen measured value in Dissolved Oxygen measurement mode. The lower display shows DOFS. The right lower display show offset.
 2. User can press  or  to adjust offset to modify measurement value. Press  to confirm and return to P02 function form. Use  or  to select other function to set up.
-  **NOTE:** Press  to exit from set-up mode at anytime. Instrument will return to measurement mode automatically.

5.3 P03: OUTPUT CURRENT (SP1/SP2) FUNCTION



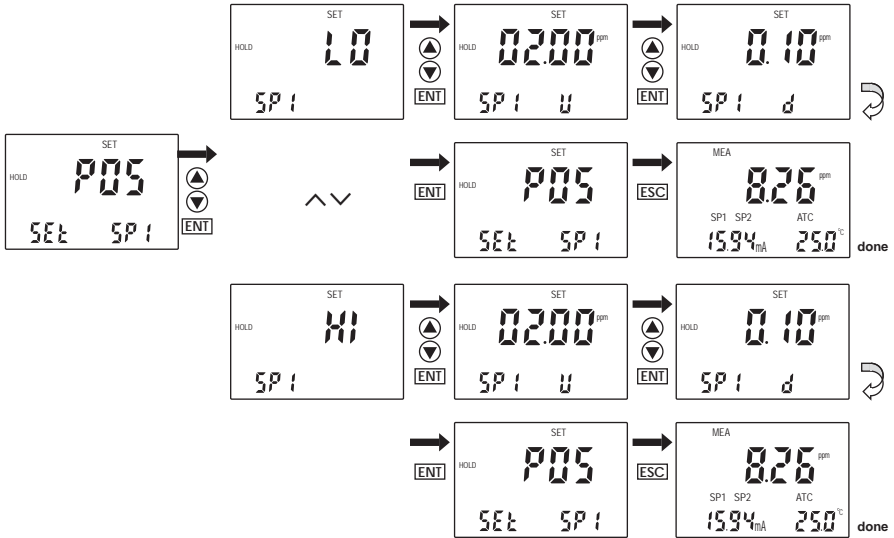
<p>1. Press  to confirm in P03 function. Entering set up of the function.</p>	
<p>2. The lower display shows CTYP. The upper display shows 4 (it means current output from 4 mA to 20 mA). User can press ▲ or ▼ select 0 (it means current output from 0 to 20 mA). Press  to confirm and enter into set-up of transmitting range.</p>	
<p>3. The lower display shows CURL while the upper display shows 0.00, which means that 0.00 mA transmitting range indicates 0.00pH. User can press ▲ or ▼ to adjust the actual value. Press  to confirm. The lower display shows CURH while the upper display shows 10.00, which means 20.00 mA transmitting range indicates 10.00pH. User can press ▲ or ▼ key to adjust the actual value. Press  to confirm and return to P03 function firm.</p>	
<p></p>	<p>NOTE: Press  to exit from set-up mode at anytime. Instrument will return to measurement mode automatically.</p>
<p></p>	<p>NOTE: This parameter allows you to set range of current output, but transmitting high point and low point can't be overlapped.</p>







5.4 P04: CONTROL MODE FUNCTION



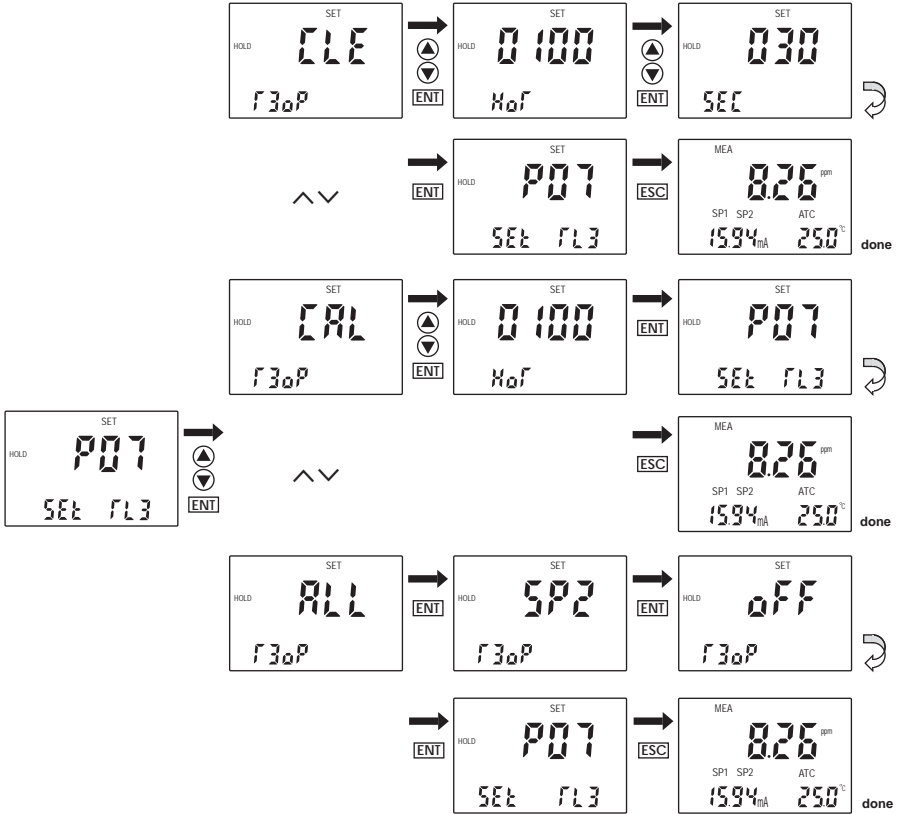
	<p>1. Press in P04 function form to enter into concrete set up procedure.</p>
	<p>2. The lower display shows SAL ppt, the upper display shows 000.0. This menu allows users to set up salinity to modify the influence to oxygen-dissolve reading. Users can press ▲ or ▼ to adjust. Press key to confirm and enter into next interface. The lower display shows AIR Hg, the upper display shows 0760. This menu allows users to set up atmospheric pressure value to modify the influence to oxygen-dissolve reading. Users can press ▲ or ▼ to adjust. Press to confirm and back to P04 function menu. Press ▲ or ▼ to select other function to setup.</p>
	<p>NOTE: Press to exit from set- up mode at any time. Instrument will return to measurement mode automatically.</p>

5.5 P05: RELAY 1 SET-UP FUNCTION



	<p>1. In P05 function form. Press  to enter into concrete set-up procedure.</p>
	<p>2. The lower display shows SP1 while the upper display shows HI, which means set point 1 is under high-point control status. Press  to confirm and enter into next set up procedure.</p>
	<p>3. The lower display shows SP1 U while the upper display shows concrete value. User of the function form can press ▲ or ▼ to adjust the value to confirm concrete set up value. Press  to confirm and enter into next set up procedure.</p>
	<p>4. This function form sets hysteresis band under limited control mode to protect relay, which may oscillate frequently around set point and be damaged. Press  to confirm and return to P05 function form. Use ▲ or ▼ select other function and to set up.</p>
	<p>NOTE: Press  to exit from set up mode at any time. Instrument will return to measurement mode automatically.</p>

5.7 P07: ALARM RELAY 3 SET-UP FUNCTION






1. Select P07 function, Press  to confirm. Enter into concrete set-up procedure.


2. Select concrete working mode. Press ▲ or ▼ to select suitable control mode.

- **CLE** = relay 3 as cleaning control relay
- **CAL** = relay 3 as calibration alarm relay
- **ALL** = move with two relays simultaneously
- **SP1** = relay 3 moves with SP1 (limited control mode only)
- **SP2** = relay 3 moves with SP2 (limited control mode only)
- **OFF** = relay 3 is off (factory default)



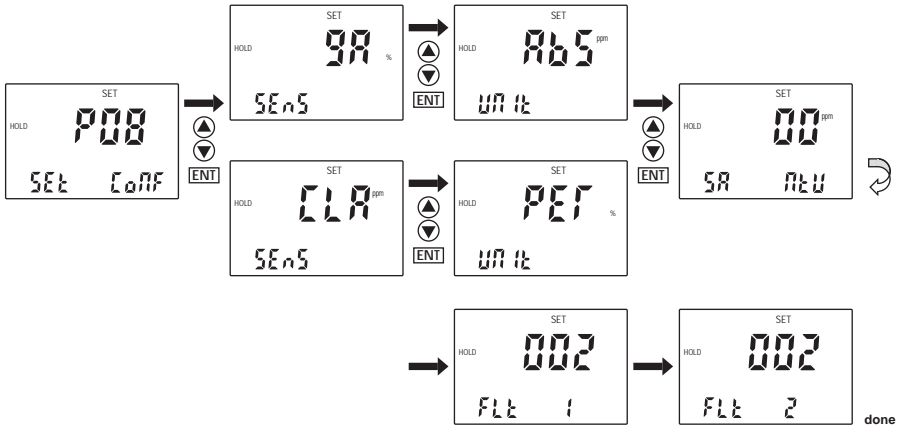
Press  to confirm and return to P07 function form. Use ▲ or ▼ to select other functions to set up.




NOTE: Press  to exit from set-up mode at any time.


Instrument will return to measurement mode automatically.


5.8 P08: ELECTRODE SELECTION AND CONFIGURATION FUNCTION





1. In P08, press to confirm and enter into concrete set-up procedures.
2. In this function, you can set up GA (GALVANIC) or CLA (CLARK) mode. Press ▲ or ▼ to

select electrode mode, then press  to confirm. Instrument will automatically enter into function form of unit selecting. The lower display shows UNIT and the upper display

shows ABS ppm or PER %. Use ▲ or ▼ to select the unit, then press  to confirm. The lower display now shows AL NTU and the upper display shows 0 0. According to compensation type, users can select salinity and temperature compensation mode by pressing ▲ or ▼. In this menu, 0 means not compensated while 1 means compensated.


Then press  to confirm and meter lower display shows FLT1 002 (TEMP) , Press

▲ or ▼ to adjust this value and press  to confirm and meter lower display shows

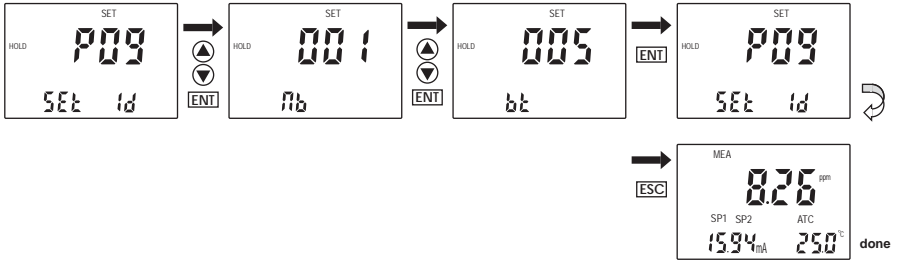
FLT2 002 (DO) to set-up Press ▲ or ▼ to adjust this value and press  to confirm and return to P08 function form. Use ▲ or ▼ to select other functions to set up.




SAL	NTU	SAL	NTU	SAL	NTU	SAL	NTU
0	0	0	1	1	0	1	1
Non salinity compensation		Non salinity compensation		Salinity compensation		Salinity compensation	
Non temperature compensation		Temperature compensation		Non temperature compensation		Temperature compensation	



NOTE: Press  to exit from set-up mode at any time. Instrument will return to measurement mode automatically.



5.9 P09: TRANSMITTING RATE FUNCTION



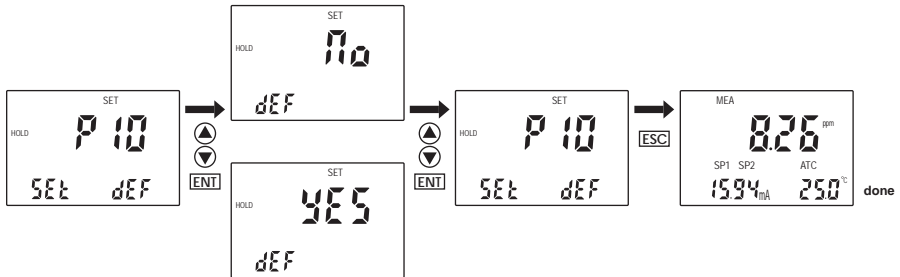
1. Press  to confirm in P09 and enter in concrete set-up procedures.
2. The lower display shows nb while the upper display shows 001, which indicates that user is setting communication address ID NO. of the instrument, from 001 to 128. Use ▲ or ▼ to select necessary ID and press  to confirm. Then enter into next set up function form.
3. The lower display of the instrument shows bt while the upper display shows 005, which indicates that user is setting communication rate function. Use ▲ or ▼ to select necessary communication rate. Press  to confirm and return to P09 function form. Use ▲ or ▼ to select other function to set up.






4. Corresponding communication rate to codes.

bt	000	001	002	003	004	005	006	007
baud rate	300	600	1200	2400	4800	9600	19200	38400

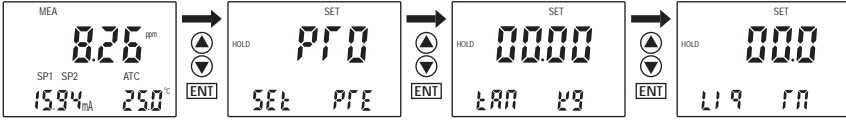
 **NOTE:** Press  to exit from set- up mode at any time.
Instrument will return to measurement mode automatically.










5.10 P10: REVERTING TO FACTORY DEFAULT SETTINGS



	<p>1. Press  in P10 to enter into concrete set-up procedures.</p>
<p>2. The lower display of the instrument shows DEF while the upper display shows NO (YES). User can press ▲ or ▼ to select necessary items. If select YES, all settings will be reset to factory default. User's setting will be lost.</p>	
	<p style="text-align: center;">  NOTE: Press  to exit from set-up mode at any time. Instrument will return to measurement mode automatically. </p>

* 5.11 PROCESS PRESSURE COMPENSATION FUNCTION (DO5200 ONLY)



<p>1. Press  and  key at the same time in measurement mode. Meter will enter the function.</p>	
<p>2. Press  key to confirm, user can press ▲ or ▼ key to adjust the pressure rate value, press  key to confirm.</p>	
<p>3. Meter entering liquid level compensation menu, press ▲ or ▼ key to adjust the value of liquid level , press  key to confirm.</p>	
<p>4. Meter return to this function menu, user can press  key to return to measure mode.</p>	
	<p>NOTE: Press  to exit from set-up mode at any time. Instrument will return to measurement mode automatically.</p>
	<p>NOTE: How to get the pressure rate (% only) Vm: meter display value Pressure rate = (Vm-100) / 100</p>

5.11 COMMUNICATION PROTOCOL

1. Protocol Setting

This instrument uses RS-485 communication. It's can be connected with 1 to 64 instruments in 2 wires at the same time and communicate with PC. The distance of communication is around 1200M.

The data form is "N81" (1 start bit, 8 data bits, 1 stop bit, NO verify check code).

The baud rate is 300 to 38400 bit/s (usually is 9600 bit/s).

Users have to set the ID (NB) of the instruments and the baud rate (BT) before connecting to RS-485.

Bt	0	1	2	3	4	5	6	7
speed	300	600	1200	2400	4800	9600	19200	38400

Usually, the instrument is stand by in receiving status. Once it receives the correct ID then it will send out the data to PC. Finished sending it will enter to receive status again.

To avoid the conflict, each instrument has to use different ID (decided by NB).

All of the instruments and PC must use the same baud rate (decided by BT).

2. Data form

All one-word data is from -32767 to +32767, using the hexadecimal number system, the high bit is sign.

All one-byte is integer.

The data is ASCII code :the start sign is @ (40H), the end sign is CR (0DH).

The other data use the ASCII code to express the hexadecimal number system.

All data should be between 30H to 39H and 41H to 46H. the instructions are form 41H to 5AH.

Double-byte sending: the low byte is the first, the high byte is the second.

One-byte sending: the high nibble is the first, the low nibble is the second.

A full communication form is :40 ,ID, the sequence of the instruction,CRC,0D.

The ID is the number of the instrument (NB).

CRC (Circulation Redundant Codes) Verification is the bitwise XOR assignment of ID code and the sequence of instruction.

3. The communication instructions

1) RD: read floating data.

2) RE: read the appointment data by start address and bytes (the large byte can not over 28 bytes).

3) RR: read all of data (8-word, 12-byte), totally 28 bytes.

4. Introduce the instructions (the ID is 1)

1) RD (read the floating data): PC send: 40,30,31,52,44,CRCH,CRCL,0D (8 bytes)

40: start byte

30 31: the ID of instrument (the hexadecimal: 0~3FH, ASCII: 30 30~33 46);

52 44: instruction of R, D

CRCH, CRCL: Verification Byte, 2~5 bitwise XOR assignment

CRCH, CRCL: bitwise XOR assignment starting from Byte 2 to the byte before CRCH.

0D: the end byte

the response by instrument is "40, 30, 31, 52, 44, 30, 30, V1LH, V1LL, V1HH, V1HL, 3X, V2LH, V2LL, V2HH, V2HL, 3X, 3X, 3X, 3X, 3X, CRCH, CRCL, 0D"

40: the start byte

30 31: the ID of instrument

52 44 30 30: the fixed data

V1LH, V1LL, V1HH, V1HL: pH/ORP/DO/Dd value

3X: the position of decimal (30-33, correspondent with 0-3 decimal)

IOLH, IOLL, IOHH, IOHL (output current value)

FATC (30: OFF; 31H: ON)

V2LH, V2LL, V2HH, V2HL: temperature value
 JD1: the status of relay 1, 30: open; 31: close
 JD2: the status of relay 2, 30: open; 31: close
 JD3: the status of relay 3, 30: open; 31: close
 FKER: KERR status, 30: correct; 31: error
 FCHG: parameter modify, 30: no modify; 31: modify
 CRCH, CRCL: bitwise XOR assignment starting from Byte 2 to the byte before CRCH.
 0D: the end byte
 Total: 27 bytes

2) RE (read the appointment data)

The PC send: 40, 30, 31, 52, 45, 30, 30, adrH, adrL, lthH, lthL, CRCH, CRCL, 0D (total 14 bytes)

40: the start byte

30 31: the ID of instrument (the hexadecimal: 0~3FH, ASCII: 30 30~33 46);

52 45: the instruction R, E;

30 30: reserve

adrH adrL: the address of the start parameter byte (the hexadecimal: 0~1BH; ASCII: 30 30~31 42);

1thH 1thL: the count of the parameters (the hexadecimal: 1~1CH; ASCII: 30 31~31 43);

CRCH, CRCL: Verification Byte, 2~11 bitwise XOR assignment.

0D: the end byte

The adr is the start address(00~1BH),1th is the count of the byte. The table is the relation of the adr and parameter.

adr	00	01	02	03	04	05	06	07	08	09	0A	0B	0C	0D
para	TST1	TST1	TST2	TST2	SP1U	SP1U	SP2U	SP2U	CURL	CURL	CURH	CURH	POFS	POFS
adr	0E	0F	10	11	12	13	14	15	16	17	18	19	1A	1B
para	HOR	HOR	AAA	FUNC	R3OP	TOFS	SEC	SP1D	SP1T	SP2D	SP2T	NB	BT	CONF

If adr>1BH or adr+1th>1BH, the return the error code: 40, 30, 31, 52, 45, 2A, 2A, CRCH, CRCL, 0D

The 2A 2A is the error sign

If the address range is correct then the instrument will send back data :

40, 30, 31, 52, 45, D1, D2, D3, Dn, CRCH, CRCL, 0D

40: the start byte

30 31: the ID

52 45: the fix data

D1~Dn: parameters from instrument to PC (n=2*lth)

CRCH, CRCL: bitwise XOR assignment starting from Byte 2 to the byte before CRCH.

0D: the end byte

Total Byte = 5 + 2 × lth + 3

3) RR (read all of parameters) the PC send: 40, 30, 31, 52, 52, CRCH, CRCL, 0D (8 bytes)

40: the start byte

30 31: the ID

52 52: the instruction of R, R

CRCH, CRCL: Verification Byte, 2~5 bitwise XOR assignment

0D: the end byte

The instrument response: 40, 30, 31, 52, 52, D1, D2, D55, D56, CRCH, CRCL, 0D (64 bytes)

40: the start byte

30 31: ID

52 52: the fix data

D1~D56: the parameter of sending (8 double byte, 12 byte, total 28 bytes)

CRCH, CRCL: Verification Byte, 2~5 bitwise XOR assignment

CRCH, CRCL: bitwise XOR assignment starting from Byte 2 to the byte before CRCH.

CRC

0D: the end byte

Total Byte = 5 + 2 × n + 3

5. Notice for programming the communication program:

- 1) If the instrument receives the data with the start byte is 40 and the count of sequence data over 16 bytes and did not find the 0D then the data is invalid. The instrument will not do any response.
- 2) If the sequence data is not between 00H to 0FH, the sequence data is invalid. The instrument will not do any response. But the other errors, ex: the wrong instruction, the wrong address, the wrong parameter counts, the wrong CRC and so on, the instrument will response the wrong information.
- 3) All parameters, please see the following table, some parameters include decimal.

para	TST1	TST2	SP1U	SP2U	CURL	CURH	POFS	HOR	KUSE	SP1D
decimal	1	1	1~3	1~3	1~3	1~3	1~3	0	3	1~3
para	SP2D	TOFS	SEC	R3OP	REFT	TCOE	CABR	RNGE	SP1T	SPTT
decimal	1~3	1	0	0	1	2	1	0	0	0

The PC display the reading values should be include the decimal.

- 4) TOFS is the correct value of temperature, the setting range is 0~200, the display range is -100~100, so the PC should be subtract 100 and display with sign.
- 5) FUNC is the display mode of instrument: 0=mV; 1=ORP; 2=pH/
0=CON; 1=TDS; 2=RES / 0=DO / 0=FCL.
- 6) R3OP is the mode of relay 3: 0=NOR; 1=SP1; 2=SP2; 3=ALL; 4=CAL; 5=CLE.
- 7) AAA is the reserve parameters.
- 8) CONF is a byte parameter, the define is following,
Bit 7: temperature compensation: 1=°F 0=°C
Bit 6: current output, 1=4~20mA; 0=0~20mA;
Bit 5: SP1, 1=HI; 0=LO;
Bit 4: SP2, 1=HI; 0=LO;
Bit 3: control mode, 1=PLC; 0=Lit;
Bit 2: electrode selection, 1=ANTI; 0=GLAS;
Bit 1: buffer, 1=NST; 0=USA;
Bit 0: reserve

6 TECHNICAL PARAMETERS

6.1 TECHNICAL PARAMETERS FORM

DO5000 Transmitter / Controller	
DO Range	0.0 to 40.00 ppm 0.0 to 400.0 %
Analytical degree & precision	0.01 ppm and 0.1 % 2% full range
Temperature	- 5.0 to 100 °C
Analytical degree & precision	0.1 & ± 0.5 °C
Temperature electrode	NTC22K
Temperature compensation	Automatic (± 10 °C offset adjustment) / Manual
Set point and control function	
Control function	Limited point
Cleaning circle	1 to 999 hours
Cleaning time	1 to 999 seconds
Control hysteresis band	0.01 to 2.00 ppm 0.1 to 20.0%
Relay output	3 SPST relays, 250V/1A
Communication	
RS-485	Client Program
Electric current information and connection	
Electric source	110 or 220 V AC
Signal output / load	0 / 4 - 20 mA isolated current output, set up by user
Signal output load	600 Ω
Connection type	Removable plug-in unit
Main fuse wire	250 mA, anti-surge
Alarm function	
Function (switch able)	Close
Display	
LCD	Big-size screen of crystal display, orange back light
EMC Specification	
Electromagnetic emission	EN 50081-1
Electromagnetic induction	EN 50082-1
Environmental conditions	
Working temperature	- 10 to 50 °C (14 to 122 °F)
Humidity	10 to 95% (no frozen dew)
Protection grade	NEMA 4X, IP 65

6.2 PARAMETER SETTING AND FACTORY PRELIMINARY VALUE

NO.	Indication	Parameter	Symbol	Contents	Remark	Valid range	Factory value
01		LOCK	LOC	Password for entering function form		0~200	0
02	P1 TC	ATC	AtC	Auto/manual temperature compensation		ON/OFF	OFF
03		TSET1	tSt1	Temperature set up of manual check	Only valid for manual	-10~100℃	25.0
04		TSET2	tSt2	Calibration temperature set up		0.0~60.0℃	25.0
05		TOFS	tOFS	Temperature measurement offset	Only valid for automatic	-10.0~10.0℃	0.0
06		P2 OFS	POFS	POFS	DO value measurement offset		000~20.00
07	P3 CUr	CTYP	CtyP	Type of electric circuit output		0/4~20mA	4
08		CURL	CUrL	Lower limit of transmitting output	ppm mode 0.01unit % mode 0.1unit	0.00~40.00	0
09		CURH	CUrH	Upper limit of transmitting output		0.0~400.0	1000
10	P4 SAL	SAL	SAL	Salinity	ppt unit	0.0~45.1	0.0
		AIR	AIR	Atmospheric pressure	mmHG unit	500~768	760
11	P5 SP1	SP1	SP1	Way set up of relay 1		HI/LO	LO
12		SP1U	SP1U	Setting value of relay 1	ppm mode 0.01unit % mode 0.1unit	0.00~40.00	2.00
13		SP1D	SP1d	Relay 1 hysteresis / proportion		0.00~2.00 (2.00)	0.10
14	P6 SP2	SP2	SP2	Way set up of relay 2		HI/LO	HI
15		SP2U	SP2U	Setting value of relay 2	ppm mode: 0.01unit % mode 0.1unit	0.00~40.00	6.00
16		SP2D	SP2d	Relay 2 hysteresis / proportion		0~2.00 (2.00)	0.10
17	P7 rL3	R3OP	r3OP	Working mode of relay 3		OFF/SP1/SP2/ ALL/CAL/CL E	OFF
18		INT	HO r	Interval (hour)	Only valid for calibration and cleaning mode	0~999	100
19		DUR	SEC	Operating time (second)	Only valid for cleaning mode	0~200	30
20	P8 CONF	SENS	SENS	GA/CLASelect		GA/CLA	GA
21		UNIT	UNIT	Unit select		ppm/%	ppm
22		SAL NTU	SAL NTU	Compensation setup of salinity and pressure		0 0, 0 1, 1 0, 1 1	0 0
23		FLT1		Digit filter		000~200	002
24		FLT2		Digit filter		000~200	002
25	P9 ID	NB	nb	Set ID number for 485		0~63	1
26		BT	bt	Communication rate		0~7	5
27	P10 DEF	DEF	dEF	Reverting to factory default setting	After revering to factory default parameter, return to table of contents function form automatically	YES/NO	NO
28	PRO PRE	TAN Liq	TAN Liq	Pressure compensation inside can and height compensation of liquid level		0.00~4.00 0.0~20.0m	0.00 0.0m

7 GENERAL INFORMATION

WARRANTY

CLEAN Instruments warrants this product to be free from significant deviations in material and workmanship for a period of one year from the date of purchase. If repair is necessary and has not been the result of abuse or misuse within the warranty period, please return to CLEAN Instruments and amendment will be made without any charge.

CLEAN Instruments Customer Service Center will determine if product problem is due to deviations or customer abuse. Out of warranty products will be repaired on a charge basis.

RETURN OF MALFUNCTION INSTRUMENTS

Authorisation must be obtained from CLEAN Instruments Customer Service Center to issue a RIR number before returning items for any reason. When applying for authorisation, please include date requiring the reason of return. Instruments must be carefully packed to prevent damage in shipment and insured against possible damage or loss. CLEAN Instruments will not be responsible for any damage resulting from careless or insufficient packing.

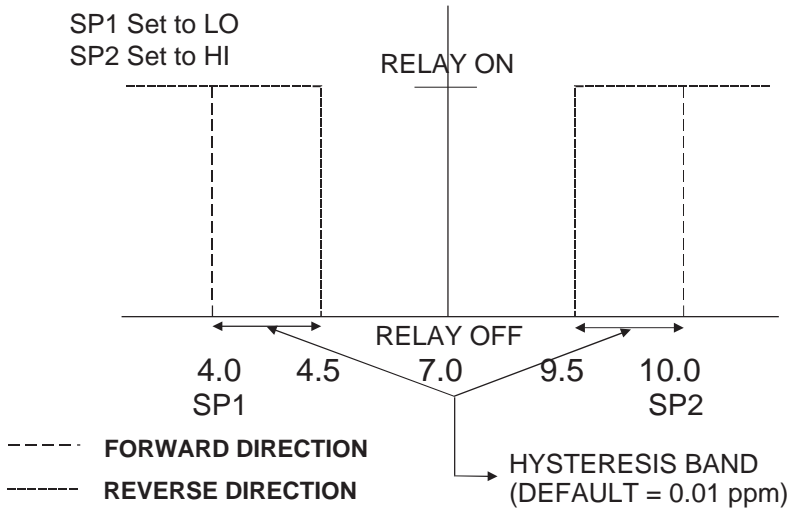
Warning: Damage as a result of inadequate packaging is the User / distributor's responsibility. Please follow the guidelines below before transporting.

GUIDELINES OR RETURNING UNIT FOR REPAIR

Use the original packaging material, if possible when transporting back the unit for repair. Otherwise wrap it with bubble pack and use a corrugated box for better protection. Include a brief description of any faults suspected for the convenience of Customer Service Center, if possible.

APPENDIX 3 – HYSTERESIS BAND

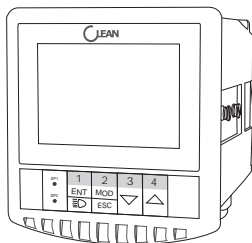
Simple Explanation on the Function of Hysteresis Band



The controller relay activates when the set-point is reached. In the reverse direction, it closes. Relay continues to be active till the value reaches the amount set by hysteresis band.

ACCESSORY 5 - ABBREVIATIONS IN FUNTION FORM

Character	Meaning	Character	Meaning
MEA	Measurement mode	C	Centigrade
CAL	Calibration mode	F	Fahrenheit
ENT	Confirm	UNIT	Unit
OFS	Zero point offset	SAL	Salinity
SET	Set up	PPt	Salinity Unit
ATC	Automatic temperature compensation	AIR	Atmospheric pressure
SP1	Set point 1	Hg	Millimeter mercury column
SP2	Set point 2	SENS	Electrode
LO	Low limit	GA	GALVANIC DO electrode
HI	High limit	CLA	CLARK DO electrode
CNtr	Control	AbS	Display of absolute value
LIt	Limited point control	PER	Display of relative value (Percent)
PLC	Pulse length control	NTV	Temperature Compensation
RL3	Relay 3	FLT1	Number filter 1
OUT	Output signal	FLT2	Number filter 2
CONF	Configuration		
CLE	Clean		
DEF	Default		
CUR	Output electric circuit 1		



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Manufacturer:

CLEAN Instruments - CISC

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