

CCT-8320

Reverse Osmosis Controller

Operation Manual

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Reverse Osmosis Controller CCT-8320 is a combined control instrument of a single-stage reverse osmosis controller and double-channels on-line conductivity instrument. It can perform the operational test, status control and the on-line monitoring of inlet water, producing water, the temperature of the water and desalinization ratio of the water quality conductivity, displayed by LCD large screen. The interface is friendly, menu-driven operation is used; multiple group parameter can be set and modified. The requirement of automatic operation of the multiple controlling ways of the reverse osmosis system can be met.

1、 Main Specification:

- I. LCD big screen with backlight, monitor and display double-channel conductivity (conductivity of the one-grade producing water and inlet water) at the same time, Temperature of the medium, desalinization can be displayed on the same screen. The measurement range of the conductivity of the producing water 0~20.00、0~200.0 ($\mu\text{S}/\text{cm}$) can be switched automatically.
- II. Intelligent microchip for data processing, friendly and easy operation interfaces; menu-style operation, multiple parameters needed can be inputted or modified; kinds of requirement can be satisfied. Multifunction, simply operation, supports kinds of executors and running modes.
- III. Three protections (dampness, static, rot) make the controlling system strongly enough to endure the high damp and rugged environment. Test ports of the reverse osmosis controller adopt low pressure up-draw electrical bit. Photoelectricity input isolated, high anti-jamming capability. reference point adopts passive output to drive the contact device directly.
- IV. RS485 isolated data interface, standard Modbus communication agreement (RTU), connecting with PLC, epigyny device configuration expediently, epigyny device can send reading orders. of the inflow water conductivity , output water conductivity, controlling status of the relay, alarm input status and system running status, baud rate 2400,4800,9600 can be set by keyboard.

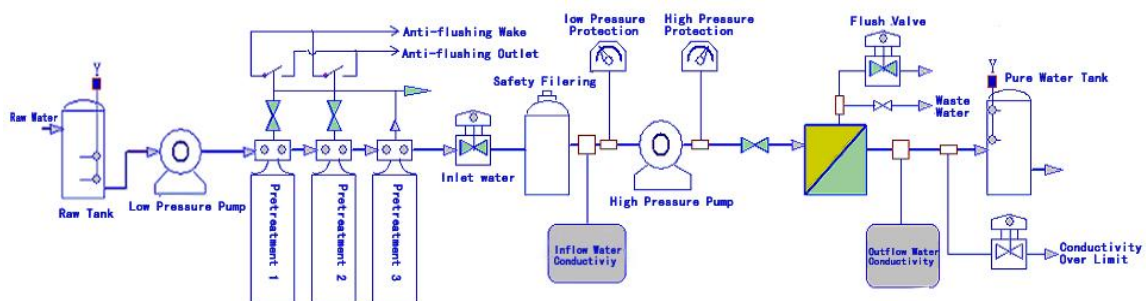


Fig.1a First -stage reverse osmosis flow with raw water reserve tank

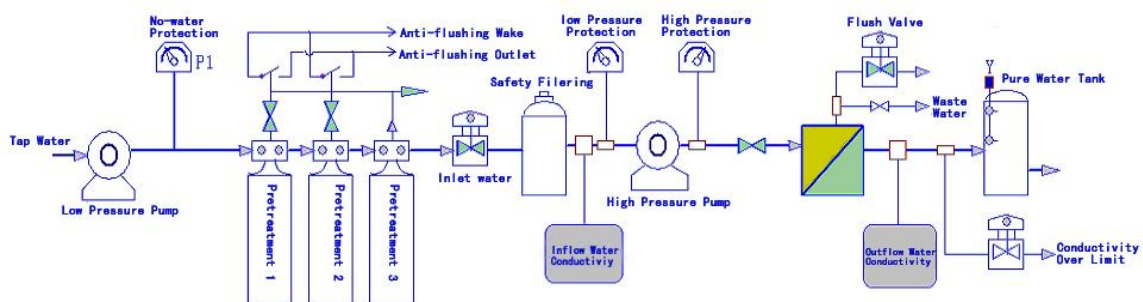


Fig.1b First-stage reverse osmosis flow with direct pipeline water supply

2、Functions and Main Technical Indexes

- (1) Output controlling function: low-pressure pump ,inlet water valve, high-pressure pump, flushing valve, over-limit output water drain valve can be controlled according to the alarm signal and flowtime parameters such as .the start time of the low-pressure pump, start-flushing time ,normal-flushing time, running flushing time , waiting flushing time, timing interval etc. can be set by the user.
- (2) Main input signal: feed tank high level, low feed tank low level, low pressure alarm, high pressure alarm, pure water high level, pure water low level, pretreatment enter the backflush process.
- (3) Pretreatment backflush linkage function: when pretreatment steps into backflush status, if no standby system input, the water supply is hardly to ensure. By closing the status signal contact point, the RO system will answer the pretreatment backflush status, realizing linkage stopping the machine automatically. The RO system will start working only the backflush is over. When the pretreatment mode is low-pressure pump on, the low-pressure pump will open till the signal disappears. And when the pretreatment mode is low-pressure pump off, all the output will be closed in the pretreatment process.
- (4) Automatic flushing function: the system will start flushing automatically when the appointment of the system start, full-water stop, and continuous service can be set. Flushing time and interval can be set by menu and the functions can be closed respectively.
- (5) Waiting flushing function: when the water is full and RO system stop, the system will wait till the interval set and then film flushing will start to avoid the growing of the bacteria in the film cavity. And the waiting flushing time can be closed by the menu too. The waiting -flushing mode is low-pressure flushing mode.
- (6) No-water protection function: the alarm information bar of the displaying interface will show No water alarm with buzz, if the raw water is stopping. RO controller will stop the system realizing no-water protection. The controller will scan and test the water-supply on-off status with no interval till the pressure of the untreated water is resumed, then the system will start again. There are 2 kinds of the No water alarm of the raw water signal, reference to the Feed Tank Level type setting.
- (7) Low-pressure protection function: To avoid failures of pretreatment and security filter ,high-pressure pump appearing empty, system without low-pressure protection function, such as low-pressure shortage ,the system will stop the machine, display ‘low-pressure alarm’ in the alarm information bar with buzz. Though the low-pressure on-off has already been on. RO controller will try to start only one minute later, if the water pressure is satisfying, the process of producing water will go on. if three times try all fail, the system will be on a deadlock status and the info-bar will show ‘system locked automatically’, the system waits until the failure being removed by the workers , then the system stop and power-on again ,or press the ‘ C ’key to stop the machine and start it again.
- (8) High pressure protection functions: if high temperature appears at the high-temperature side (before the film) .RO controller sends out high-pressure alarm, close the RO system, the controller try to start one minute later. If the pressure is normal, the water-producing process will go on. If three times try all fail, the system will be on a deadlock status. Do as the steps of low pressure. Protection function
- (9) Controlling of the liquid level of purity water box: RO controller starts the RO system according to

the condition of the liquid level of purity water tank realizing stopping the machine at a high liquid level, starting automatically at a low liquid level, stopping the machine continuous running. The controlling mode of the liquid level of purity water box can be set by the user according to the system. Reference to the purity water tank liquid level setting.

- (10) Conductivity over-limit alarm function: if the measuring value of the conductivity exceeds the set-value, the normally open contact point of the controlling relay will switch to On from Off, a solenoid valve will be driven to discharge the unqualified water. When the measuring value reduces to the low limit value .the solenoid valve closed

Main Technical Indexes:

- (1) Conductivity Measurement Range :
 - 1) inflow water 0~4000 μ S/cm
 - 2) Outflow water 0~20.00; 0~200.0 μ S /cm (switched automatically)
- (2) Accuracy:1.5 level
- (3) Auxiliary electrode: 1.0 cm^{-1}
- (4) Working pressure of conduct cell:0~0.5 MPa
- (5) Automatic temperature compensation:1~49° C
- (6) Effective distance: $\leq 30\text{m}$ (standard 5 m ,or ordered ahead)
- (7) Displaying mode: LCD 128*64 backlight.
- (8) Load capability of the relay contact point:3A/250 V AC(the solenoid valve enlarges the drive capability by intermediate relay)
- (9) Power : $\leq 3\text{W}$
- (10) Power supply : AC18V $\pm 2\text{V}$ DC24V $\pm 4\text{V}$
- (11) Application environment : temperature 0~50 °C; humidity $\leq 85\%$ RH
- (12) Outline dimension:96 \times 96 \times 103mm(height \times width \times depth)
- (13) Installation dimension:91 \times 91mm(height \times width)

3、Instructions of Front panel and Setting Function

(1) Displaying panel:

LCD displaying of window. Five groups of information explanation as follows:

Inflow water conductivity-----1000 μ S value of the inflow water conductivity .

measurement range: 0~4000 μ S/cm

Outflow water conductivity---- 10.00 μ S value of the outflow water conductivity

measurement range :0~200.0 μ S/cm

Liquid temperature---- 22.1 °C medium temperature. Modifying range :0~49.9°C

Desalinization---- 99% percents of the desalinization

Information status----- Operating is the information status, displaying the operating system status and alarm information.

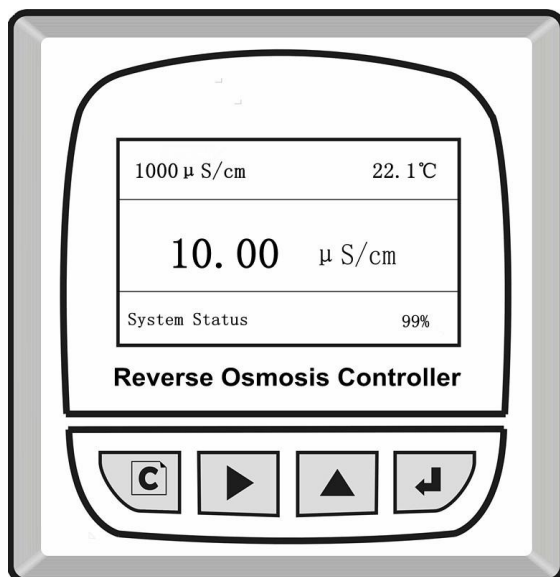


Fig.2 Front panel

Set and key operation explanation as below

[C]--setting key, choose the parameter need modified or looked up and enter the password.

[▶]---right-move key, select the unit's order, tens place, hundreds place and kilobit by circular

[▲] ---Add key, select the No. from 0~9.

[↵]---enter key. While modifying the parameter .execute the selected function. On running /measurement status, it acts as the system's on-off key (last for 2 seconds) on 'off' status, press to start; on other status, press to close.

Usage method

Under the running /measurement status, press **[C]** to enter the Password verify status as chart 3,

Use **[C]** to enter the password or return to the measuring. Use the **[▶]** and **[▲]** to enter password, and then press **[↵]**. Enter the Main Menu (as picture 4.) if enter the correct password, if not there is a Alarm note;

Press **[C]** select the item or return to the former menu. Enter the relative menu to select the needed item after press **[↵]**.

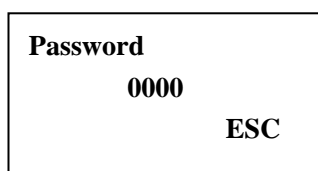


Fig.3

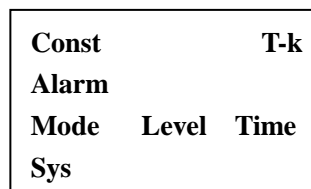


Fig.4

(1) Electrode constant setting:

Select constant under the main menu, press **[↵]** enter the electrode constant setting see Picture 5. Select the item need modified by **[C]** and **[▶]** to select the digit, **[▲]** to modify the data, when the modification completed, press **[C]** to 'return' or press **[↵]** to return to the main menu. All the following settings of the menus, please refer to the above step. C1 is the electrode constant of the inflow .C2 is the electrode constant of the outflow. The constant range is 0.900~1.200 if exceed this range, the windows default is 1.000

Notice: the coefficient input subject to the one on the electrode

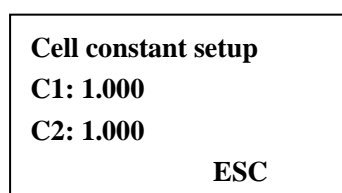


Fig.5

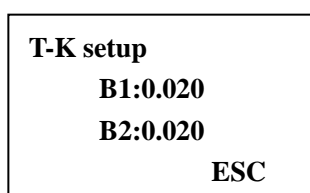



Fig.6

(2) Coefficient of Temperature Compensation Setting

select 'temperature compensation' in the main menu, press  entering into the electrode constant setting ,as picture 6 , to ensure the medium temperature range in 5~49.9 ° C ,displaying the conductivity value based on 25° C directly.

To the account of compensation higher or lower than 25° C , the general water supply adopts 2% or so. One-stage or two-stage adopts 2% ~ 3%

β 1: coefficient of inflow temperature compensation

β 2:coefficient of outflow temperature compensation.(this coefficient need not modified, the default is 0.020/° C

Notice: if the coefficient is set as 0, the displaying conductivity is the value at the current temperature, no 25° C compensation.

(3) alarm setting

Select 'alarm' in the main menu, press  entering into the alarm item. As picture 7.

- I. Alarm limit value ,if the conductivity value exceeds the limit value, CD max indicator light on ,the alarm carrying out action, the side solenoid valve start to act. Unqualified water being discharged
- II. Alarm valve value, alarm relieve return-difference value which decides cancelling the alarm value. The conductivity value exceeding the limit value, the alarm stopped. The sketch map of alarm and alarm-relieve please refer to the picture.

III. Buzzer:

- 1) If buzz is selected, when there is alarm, the buzzer will send out buzz alarm.
- 2) If mute is selected, on the status of alarm, the buzzer will keep silent.

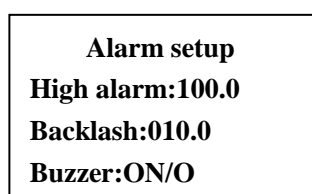


Fig.7

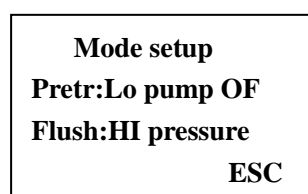


Fig.8

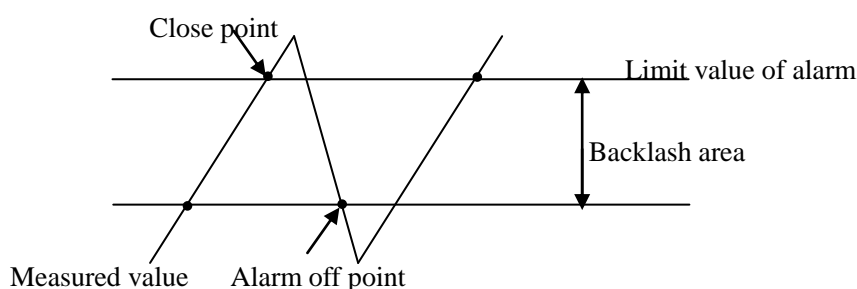


Fig.9

(4) mode setting

Select 'mode' in the main menu, press  to enter the mode setting, as picture 8

a) Pretreatment mode setting,


- ① Low pressure pump off, controller will close all the output controlling and waiting for pretreatment signal canceling when there is a pretreatment signal.
- ② Low pressure pump on, when there is a pretreatment signal ,the controller will turn on the Low pressure pump , and close other controlling output to work with the customer pretreatment backflushing raw water pump controlling.

b) Setting of the Flushing mode:

① Low pressure flushing mode, when starting the membrane flushing, turn on the low pressure pump, not high pressure pump, in operation or full water flushing, close the high pump first and then start membrane flushing.

② High pressure flushing mode, the system is in flushing, start the high and low pressure pump, make high pressure pump start membrane flushing.

(5) Liquid level mode setting

To satisfying the uses' liquid level, the users need to set the liquid level on-off of the raw-water tank and pure water tank .select liquid level under the main menu, press  entering into the interface of liquid level on-off set. As picture 10

(6) Liquid level set of raw water tank

1) Set as 'return difference on-off', if the raw water tank liquid level on-off has liquid level adjust difference itself(such as double-bobber digging rope on-off) as picture 11.only a crunode signal 'Y' be put out. If the water level is higher than the high liquid level(as picture 11 point 'a'),the on-off crunode close., there is water in the water tank at this moment ,the system is ready to start; if the water level is lower than the low liquid level(as picture 11 point 'b'),the on-off crunode disconnect. The no-water alarm being sent out. If a pressure on-off is used as no-water alarm signal, it also need to be set as return difference on-off. On this condition, connect the alarm crunode with the raw water low liquid level, the high level suspended.

2) Set as single point on-off as picture 12. The tank has two independent liquid levels on-off and the two will both close if the liquid level is higher than the on-off. Connect the high liquid level with new water high liquid level and low liquid level with new water low liquid level. When the controller is started, if liquid level is higher than high liquid level (crunode close), the system will start, otherwise no-water alarm being sent out. While the system running, no-water alarm will be sent out if the water level is lower than the low liquid level (crunode disconnect).

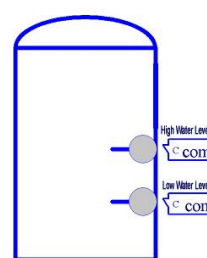
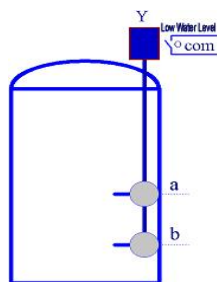
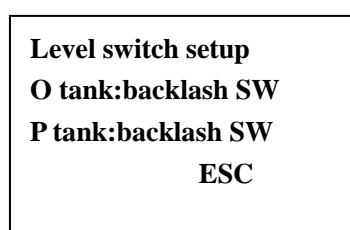


Fig.10

Fig.11 (new water tank) Fig.12 (new water tank)

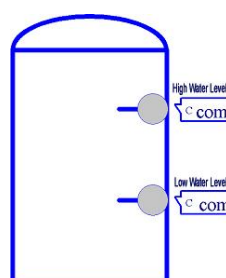
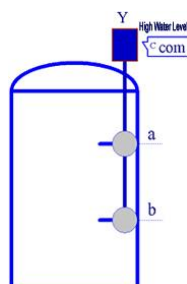


Fig.13 (pure water tank)

Fig.14 (pure water tank)

(7) Liquid level set of pure water tank

1) set as 'return difference on-off', (sketch map see picture 13).the water level is higher than the high level (as picture 13 point 'a') ,the on-off crunode 'Y' disconnect, the pure water tank is full; the water level is lower than the low liquid level (see chart 13 point 'b') ,the on-off crunode 'Y' close, the pure water tank is empty, the system starts up to run. Connect the on-off crunode 'Y' to 'out of water high liquid level', the 'out of water low liquid level' being suspended.

2) Set as 'single point on-off' (as picture 14), the tank has two independent liquid level on-off and the two will both close if the liquid level is higher than the on-off . Connect the high liquid level with outflow water high liquid level and low liquid level with out of water low liquid level. When start the machine, the liquid level is lower than 'low liquid level'(the low liquid level crunode close), the system start, otherwise wait with full-water; while running, the liquid level is higher than 'high liquid level'(high liquid level crunode disconnected) ,the pure water tank is full, the system flushing stop.

(8) The parameter set of system running time

Select 'time' in the main menu, press  entering into 'system time setting'(see chart 15)

press  consecutively entering into the second page of the system time set (see chart 16)

You can select 'back' to return to the first page.

- I. Start time: after the low pressure pump starting ,the high pressure pump will start in the time set. range 5~99 seconds to fit the different capacity of the system devices and flushing type of set. The set is high pressure flushing and the default is 10 seconds.
- II. Start-up flushing :the time of the first time star-machine flushing after power-on, range 0~300 seconds. if the value set is'0', it won't flush when the power on.the default is 15 seconds.
- III. Normal flushing: the time of system-start flushing ,full-water, machine-stopped flushing range 0~300 seconds. if the value set is'0', it won't flush ,so if the water is full.
- IV. Running flushing: after running for the set time , the controller stops to flush. Range 0~300 seconds. if the set value is'0', the controller will not carry out the running flushing, the default is 15 seconds.
- V. Wait to run flushing: when the water is full and the controller wait to run, after 'the time interval', film flushing will be carried out to clean the deteriorated water in the tube. 'wait to run flushing 'is namely the flushing time. Range 0~300 seconds. .if the set value is'0', the controller will not carry out the flushing.
- VI. Flushing interval: after continuously running or wait to run 'flushing interval', the controller will carry out one film flushing. Flushing interval is the namely the time interval range 0~99 hours. When the value is 0 ,no time interval account will be made.

Sys time setup
Start time:15
Start flush:015
Normal flush:015

Fig.15

Sys time setup
Operate flush:015
Standby flush:015
Time interval:03

Fig.16

(9) System Setting

Select 'system' in the main menu, press  entering into the system setting, see chart 17

- I. Baud, the setting of the communication baud ratio. support 3 types of baud ratio 2400 4800 9600
- II. Address: in the serial communication ,the controller's address, range 0~255

III. Code: the code modifying when the user enter into the menu, the default is 0000

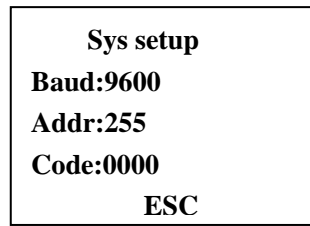


Fig.17

4. The instructions of the rear panel and connection

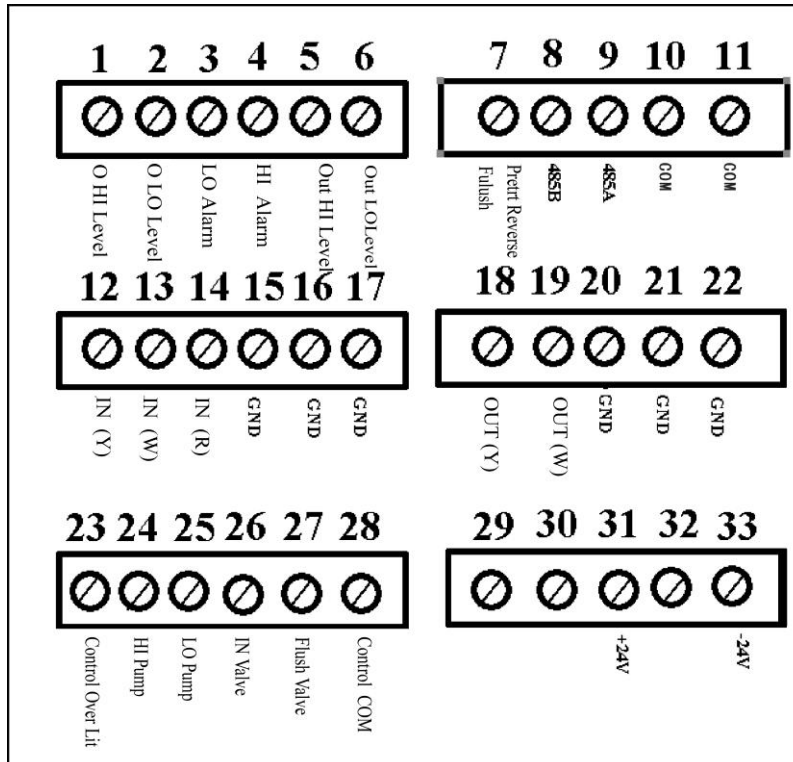


Fig.18

Since small relay is used in the controller, when driving larger inductive load, intermediate relay or contactor must be used, direct driving is not allowed.

The rear connecting terminals are shown in the diagram, the definitions of the terminals are:

- 1---Connection terminal of high liquid level switch of raw water tank (normally open, close in case of the water level exceeding the crunode) . It will be used while selecting the single point switch, connect with the high liquid level as picture 12. This terminal will be suspended
 - 2---Connection terminal of low liquid level switch of raw water tank (normally open, close in case of the water level exceeding the crunode) .it will be used while selecting the type of single point switch ,as picture 12 The low liquid level ;
- When select the return difference switch ,connect with the Low liquid level as picture 11.

3---Connection terminal of the low pressure alarm detection switch (normally open, close when the pressure preconcerted is reached

4---Connection terminal of the high pressure alarm detection switch (normally close, disconnect in case of exceeding the pressure)

5-- Input the switch of high water level of pure water tank to the terminal (normally close, open in case of the water level exceeding the crunode) it will be used while selecting the type of Pure water tank

liquid level as single point switch, connect to the high liquid level as picture 14; if 'return difference switch' is chosen, connect to 'high liquid level' as chart 13

6---Input terminal of low water level of pure water tank with the terminal (normally close, open in case of the water level exceeding the crunode) it will be used while selecting the type of single point switch, connect to 'low liquid level' as picture 14; if 'return difference switch' is chosen, this terminal will be suspended

7---Terminal of Pretreatment backflush signal input (Normally open , closed when pretreatment

8---485 communication B

9---485 communication A

10,11---Public terminal for collection of 1to 9

12---In-flow water conductivity probe (yellow)

13---In-flow water conductivity probe (white)

14---Red wire of conductivity probe (temperature compensation)

15---Public connect earth terminal 16.17.20.21.22

18---Out-flow conductivity probe (yellow)

19---Out-flow conductivity probe (white)

23---Normally open power supply) Connection terminal of Conductivity exceeds limited controlling output (Normally open , no power)

24---Connection terminal of Hi-pressure pump On/Off controlling output. (Normally open , no power)

25---Connection terminal of the Lo-pressure On/Off controlling output (Normally open , no power)

26-- Connection terminal of in-flow water solenoid valve On/Off controlling output. (Normally open , no power)

27---Connection terminal of flushing solenoid valve ON/OFF controlling output (Normally open , no power)

28---Public terminal 23.24.25.26.27 for controlling signal.

31---Connection terminal of +24V power

33--Connection terminal of -24V power

5、Communication Agreement

The format of data: start bit 1 bit ; data bit 8 bits : stop bit 2 bits

Communication agreement: agreement uses Modbus(RTU) , the agreement rules as below:

(1) receive data of the instrument

the instrument acts as hypogyny device ,it can only visit passively and receive Modbus 04 order only.

The format as below:

T1	AR	04	00,00	00,09	CRCH,CRCL	T2
start	address	Command word	Register address	Read the number of register	CRC check cell	finish
	1byte	1byte	2byte	2byte	2byte	

T1: the start bit of communication, more than 3.5 character time.

AR: the input address of the instrument keys.

04: read input register

00, 00 : read the address of the register

00, 09 : read the length of the register

CRCH, CTCL: CRC check cell, CRCH, CTCL 2 byte

T2: stop bit of communication more than 3.5 character time

(2) The data format the instrument sends the format of data information frame

T1	AR	04	09	μS 1	N1	μS2
start	address	Command word	Length of data	Inlet conductivity	Decimal of inlet conductivity	Output water conductivity
	1byte	1byte	1byte	2byte	1byte	2byte

N2	T	N3	STA1	STA2	CRC	T2
Decimal of output conductivity	temperature	Temperature decimal	Alarm signal	Relay status	CRCcheck cell	finish
1byte	2byte	1byte	1byte	1byte	2byte	

T1: start bit of communication more than 3.5 character time

AR: the input address of the instrument keys

04:read input register command,1 byte

06:length of the data (valid data) 1 byte

μ S 1:inlet conductivity μ S 1H、μ S 1L 2 byte, 16 scale

N1: the scaling position of the inlet conductivity, 1 byte, the caculated value as below:

$\mu S = (\mu S H * 256 + \mu S L) 10^{N1}$, $N1=0$ (0 decimal) in DCK3900

μ S2: output water conductivity , μ S 2H、μ S 2L 2 byte, 16 scale

N2: the scaling position of output water conductivity, 1 byte , the caculated value as below:

$\mu S = (\mu S 2H * 256 + \mu S 2L) 10^{N2}$

T: temperature, TH,TL,2 byte ,16 scale

N3: the scaling position of temperature,1 byte ,the caculated value as below:

$T = (TH * 256 + TL) 10^{N3}$, $N3=1$ (1 decimal)

STA1: the status of alarm signal, 1 byte, the input signal is 0 in case of disconnection, and 1 in case of close.

STA1.0 pretreatment signal

STA1.1 high liquid level signal of raw water

STA1.2 low liquid level signal of pure water

STA1.3 pressure high signal

STA1.4 low liquid level signal of raw water

STA1.5 pressure low signal

STA1.6 high level signal of pure water

STA2:output status of the relay ,each byte is one relay, 1 in case of action

STA2.0 control relay for flush valve

STA2.2 control relay for inlet valve

STA2.3 control relay for low pressure pump

STA2.4 control relay for high pressure pump

STA2.5 control relay for conductivity overrun.

Others not used

CRC:CRC check cell, CRCH,CTCL 2 byte

T2:stop bit of communication, more than 3.5 character time

Please contact our company if CRC check program is wanted.

6、 Electrode Installation

To ensure the real measurement result, data distortion caused by air bubble or dead water in conductance cell should be avoided. The installation should be performed strictly according to the following drawing:

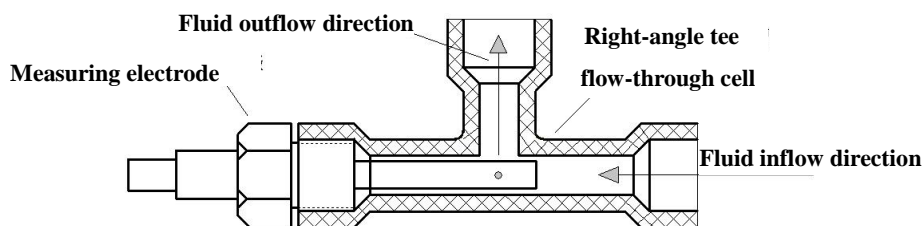


Fig.19 Pipeline installation method

Notes: (1) The electrode should be installed at a lower location in the pipe where the flow speed is steady and air bubbles are seldom generated.

(2) No matter the conductance cell is horizontally or vertically installed, it should be deeply inserted into the moving water.


(3) The conductivity signal is weak electronic signal and its collecting cable should be separately installed. They should not be connected to the same group of cable joint or terminal board with the power line.

(4) When the measurement cable needs to be lengthened, it's recommended to use the cable provided by the original manufacturer, When a longer distance is involved, the length of the cable (<30m) should be agreed on before delivery, and if the length is over 30m, a transmitter should be used.

7、 Maintenance

1. The conductance cell, as a sophisticated component, can not be disassembled. Unless necessary the electrode cell should not be taken out of measurement cell .Conductance cell should be cleaned regularly for keeping surface clean. (when the electrode platinum black coating is dirty, soak it in 10% dilute hydrochloric acid for two minutes , then rinse it with pure water to keep the surface clean.)
2. The measurement cable is special cable and should not be changed at will or it will cause significant error.
3. The special auxiliary electrode should be used in case of damage.

8、Instruction for clews of the controller:

prompt	Instruction
system close down	The controller doesn't on, press  for two seconds to start
full-water wait	system has been on, pure water box is full, start to produce water when pure water box is empty
no water alarm	raw water is empty , system sends out alarm
boot-strap start	controller start up the inlet valve, low power pump, flush valve, expand time waiting flush
boot-strap flush	film flush will wait when the controller is starting
system running	flush completed, produce water as usual, check all the alarm set point.
Low pressure alarm	high pressure pump water stress alarm, start again one minute later
High pressure alarm	RO film under pressure alarm, start again one minute later
system self locking	controller will not start if high pressure or low pressure alarm more than three times ,close down and start up again ,the self locking will release
system stop	close down key, controller is going to close down
wait flush	The time that the machine wait to run exceeds time interval, the process of flushing the RO film
running flush	controller run exceeding the time interval, process of flushing the RO film

9、Check Measure

Item	Check measure
1	Electrode constant C1、C2 set as 1.000。
2	Compensation coefficient β_1 、 β_2 set as 0.000。
3	A. inlet conductivity connection: terminal 12.13 connect to standard alternating current resistance box; B. output conductivity connection: terminal 14.15 connect to 10K (0.5%) resistivity, terminal 18.19 connect to standard alternating current resistance box;
4	Indication =equal conductivity the resistance box sends $\times 1$

10、Fault Diagnose

Fault	Settlement
boot-strap display 'no-water alarm'	check whether the raw water liquid level switch or the connection of he pressure switch is correct ,the type of the raw water liquid level is set correctly or the liquid level switch is inversed.
boot-strap display 'water full'	check whether the connection of the pure water liquid level switch is correct, the type of the pure water liquid level is set correctly and the liquid level switch is inversed
low pressure alarm after start-up	Check the low pressure switch (the crunode close when the pressure is reached) or check whether the system tube, water pump are matched.The opening of the flush valve is too big , the type selected is not proper, descompression because of the big hole, select a proper solenoid valve or series in needle type adjusting valve before the solenoid valve
high pressure alarm after start-up	Check the high pressure switch (the crunode normally close, disconnection when pressure on) or check whether the system tube, water pump are matched.
solenoid valve can't been open	the solenoid valve selected is not proper, high pressure solenoid valve should be selected.。
temperature display '0.	Probably the sensor is open circuit.
Temperature display '1	temperature is higher than 50.0℃ or the sensor is short circuit
Conductivity display '1	exceed the measurement range or the sensor circuitry is short circuit
conductivity display '0	the sensor is open circuit or not in water

11、Complete Instrument

Panel meter	1	Sensor	2
Fixing clamp	1	Operation manual	1
Certificate	1		