Pyxis

MA-CIP-2
Turbidity Detection System
with
Chemical Clean-In-Place
User Manual

July 2023

Pyxis

General Information

In no event will the manufacturer be liable for direct, indirect, special, incidental or consequential damages resulting from any defect or omission in this manual. The manufacturer reserves the right to make changes in this manual and the products it describes at any time, without notice or obligation. Revised editions are found on the manufacturer's website.

Safety Information

Please read this entire manual before unpacking, setting up or operating this equipment. Pay attention to all danger, warning and caution statements. Failure to do so could result in serious injury to the operator or damage to the equipment.

To make sure that the protection provided by this equipment is not impaired, do not use or install this equipment in any manner other than that specified in this manual.

Use of Hazard Information

 **DANGER**
Indicates a potentially or imminently hazardous situation which, if not avoided, will result in death or serious injury.

 **WARNING**
Indicates a potentially or imminently hazardous situation which, if not avoided, could result in death or serious injury.

 **CAUTION**
Indicates a potentially hazardous situation that may result in minor or moderate injury.

NOTICE
Indicates a situation which, if not avoided, may cause damage to the instrument. Information that requires special emphasis.

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Precautionary Labels

Read all labels and tags attached to the instrument. Physical injury or damage to the instrument could occur if not observed.

	This symbol, if noted on the instrument, refers to the instruction manual for operation and/or safety information.
	This symbol, when noted on a product enclosure or barrier, indicates that a risk of electrical shock and/or electrocution exists.
	Delicate internal electronic components can be damaged by static electricity, resulting in degraded performance or eventual failure.
	Electrical equipment marked with this symbol may not be disposed of in European public disposal systems after 12 August of 2005. In conformity with European local and national regulations (EU Directive 2002/98/EC), European electrical equipment users must now return old or end-of-life equipment to the Producer for disposal at no charge to the user.

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Contents

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Specifications

ITEM	MA-CIP-2 with ST-730
Range	0-100NTU
Reproducibility	±0.5NTU or ±2%FS
Resolution	±0.1NTU
Display	7-inch TFT LCD, 800 x 480 resolution, four-wire resistive touch screen, anti-UV coating
Data Storage	Built-in 4GB memory, up to 1 million data/event record, CSV upload via USB disk drive
Power	100 - 240V AC 50/60Hz, 3 Amp fuse; 200 W
Communication	1x 4-20mA / Modbus RTU / Modbus TCP
4G Communication	Global 4G communication modem, supporting data upload to cloud servers (optional)
Operating Temperature	5 – 45 ℃
Operating Sample Water Pressure	<30 psig
Storage Temperature	Instrument: -20 - +55 ℃; sensor: 0 - +50 ℃
Protection Class	IP65
Relative Humidity	20 % - 90 %
Product Weight	20 kg
Product Size	H800 x D600 x W400 mm
Recirculation Pump	1.3 GPM maximum flow <60psi
Dosing Pump	SEKO China Model #AML200NPE0800

*As Pyxis technology is continuously updated, this technical parameter may change at any time without notice

MA-CIP-2 PANEL SPARE PART NAME & DESCRIPTION	PYXIS P/N
ST-730 *(0-100 NTU Turbidity Sensor Replacement Only)*	53201
UC-100S *(Replacement Display/Data Logging Terminal w/PLC)*	43047
OIW Panel Inlet/Outlet Isolation Valve *Normally Open Motorized / 24 VDC / 5W / IP67*	44024
OIW Panel Circulation Isolation Valve *Normally Closed Motorized / 24 VDC / 5W / IP67*	44025
OIW Panel Recirculation Pump *1.3GPM@60psi / 24 VDC / 40W / IP44*	52607
SEKO Chemical Metering Pump Replacement Model #AML200NPE0800	21748
MA-CIP-2 Panel Complete *(Sensor Purchased Separately)*	MA-CIP-2

2. System Overview

The Turbidity/CIP system consists of the following major components:

1. PLC and touch screen for controlling electric valves and pumps, data logging and data display.
2. A Pyxis ST-730 inline turbidity sensor (0-100NTU).
3. Three electric ball valves for isolating the flow for automatic cleaning operation.
4. SEKO Dosing pump (30psi max) for dosing the cleaning solution to the system.
5. Recirculation pump for recirculating the cleaning solution when the cleaning loop is isolated during the cleaning operation.
6. Two manual PVC ball valves that can be used to throttle the flow.

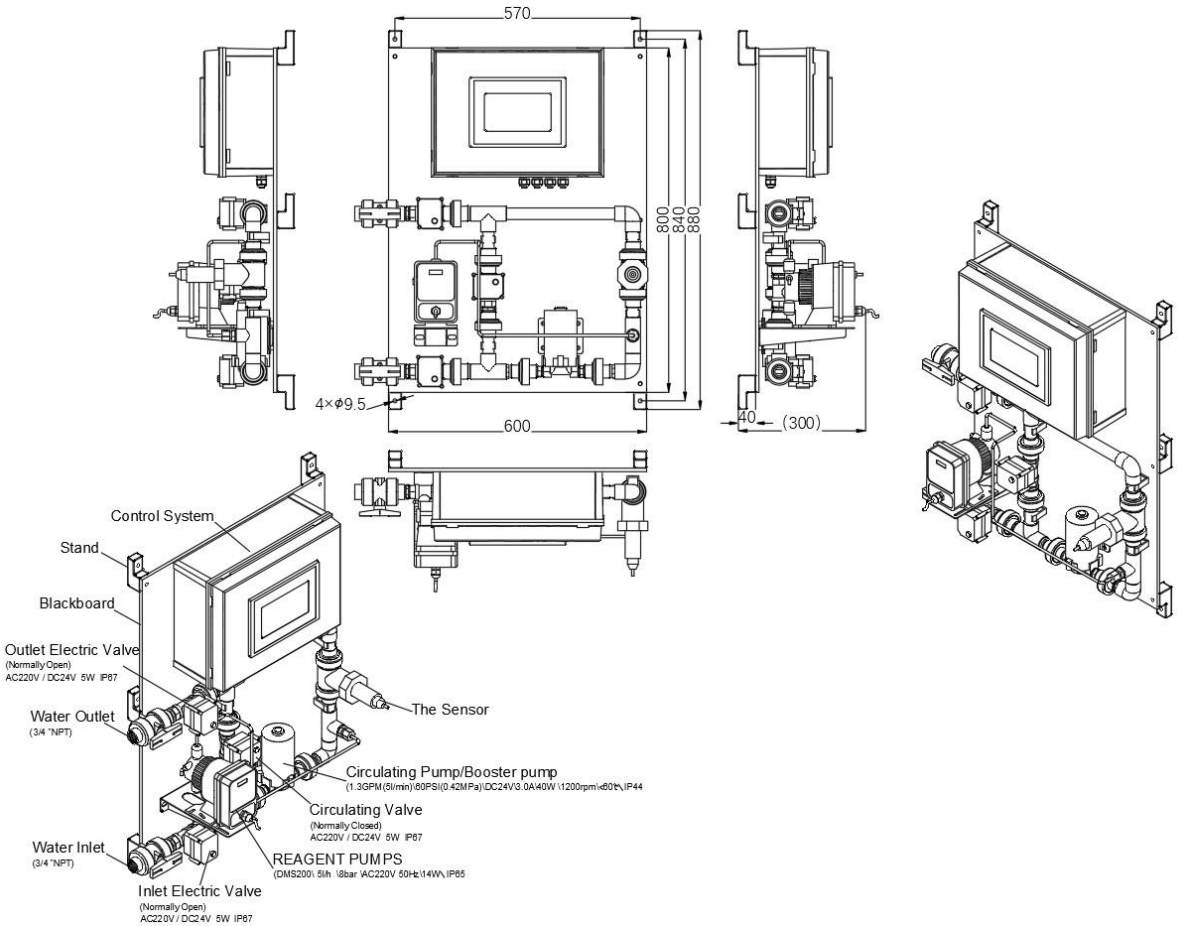

Figure. 1 System Layout

3. Installation and Connection

3.1. Mounting and Sample Installation

Mount the unit to a wall or a mounting frame. Secure the four mounting brackets. Leave 2 feet space on either side for operation access.

Connect the sample water to the ¾ inch sample input ball valve. Make sure the sample pressure is less than 30 PSI. Connect the sample output to a drain line or return the sample to the process. If the sample is discharged to a drain, please adjust the sample outlet ball valve to slightly pressurize the system to prevent siphoning the cleaning chemical. Use the two PVC ball valves to throttle the flow to within 2 GPM.

The cleaning chemical is not provided in this package. Install a cleaning chemical container and secure dosing pump suction tubing to the chemical container. Cleaning material is application dependent and must be identified and secured by the user.

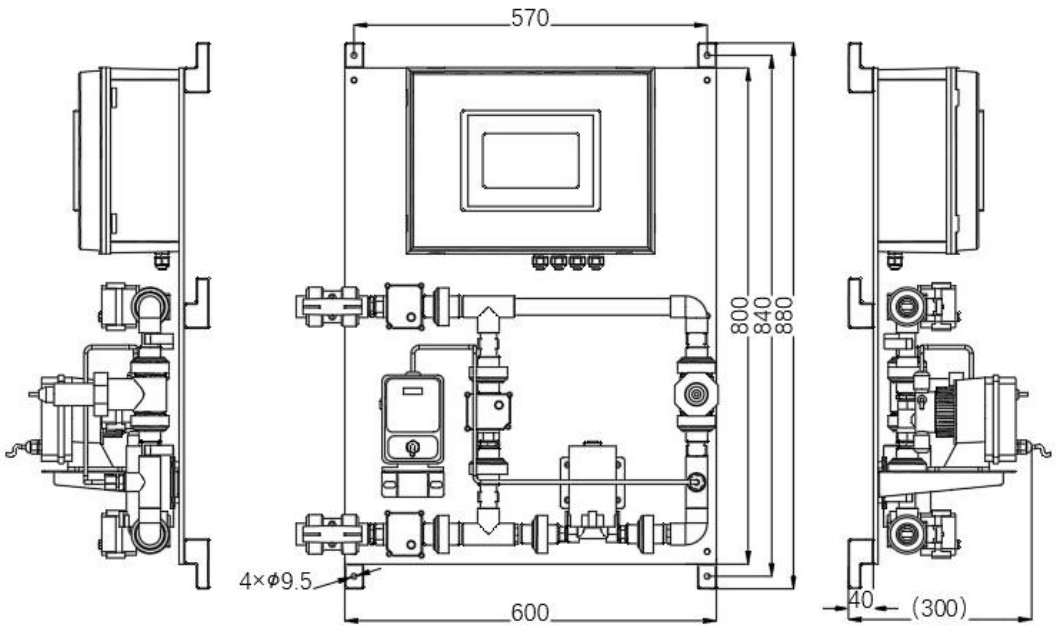

Figure. 2 Dimensions

3.2. Electrical Connection & Wiring

Connect the power cord included in the package to the power socket on the left side of the PLC enclosure. Plug the power cord to a 110 – 240 VAC outlet.

Failure to follow the electrical operation specifications may cause electric shock injury or even death.

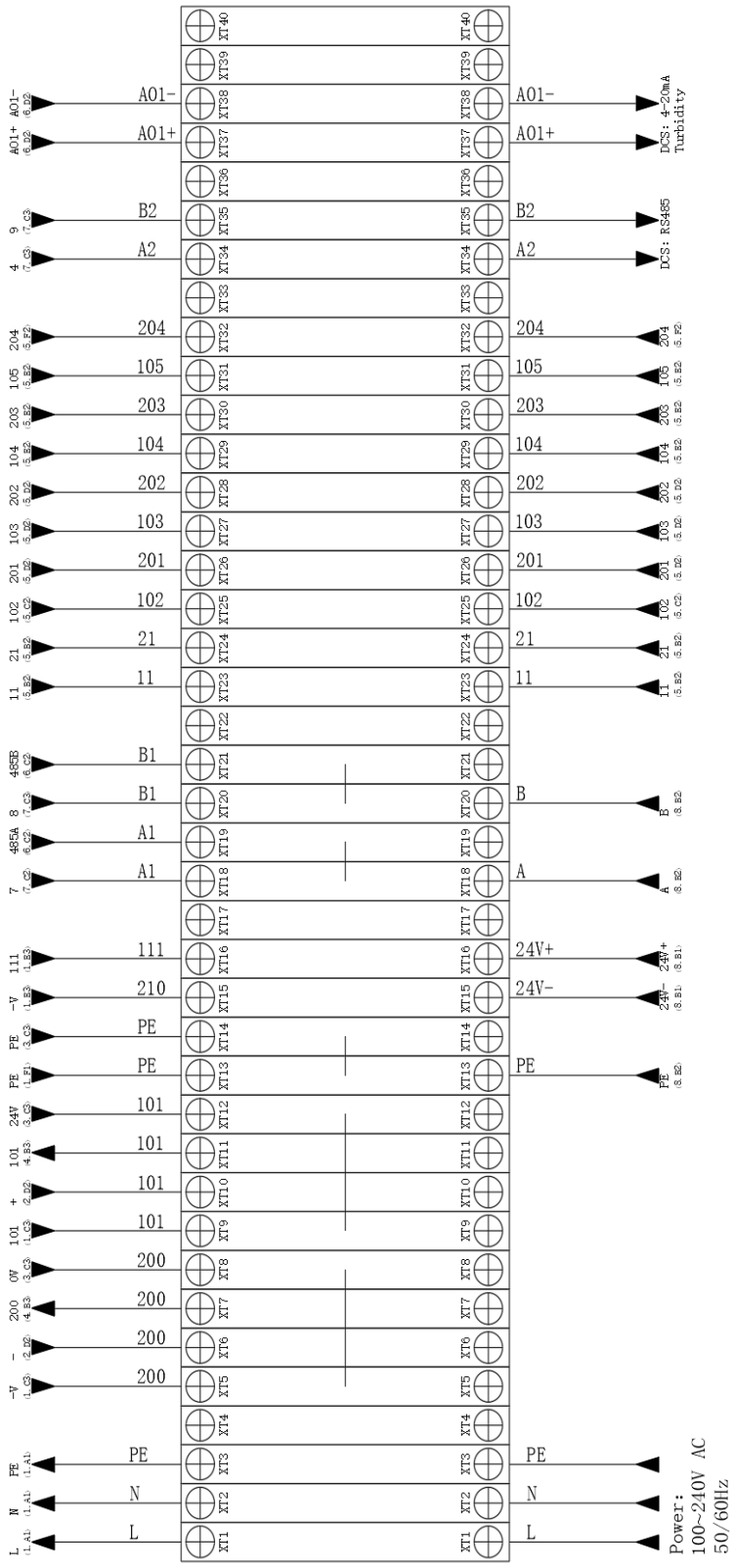

Figure. 3 Terminal wiring diagram

4. Touch Screen Operation

4.1. Initial Screen

After the system is powered on, the initial screen is shown.

Figure. 4 Initial screen

4.2. Real-Time Monitoring

Figure 5 shows the main screen, displaying measured turbidity and CIP valves and pump status.

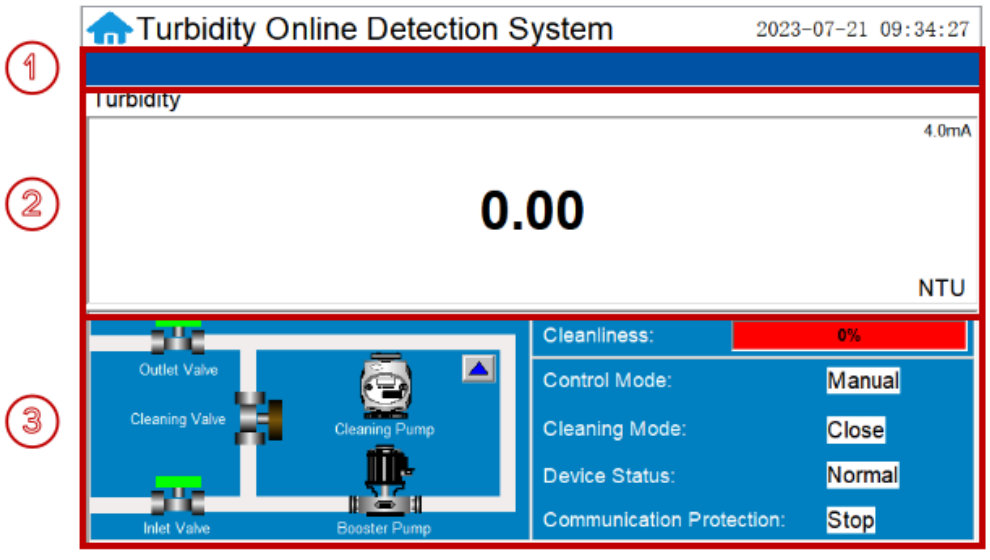

Figure. 5 Main screen

No.	Features
1	The top blue area scrolls the alarm information in real time.
2	Display the value of each sensor in real time
3	In the bottom area of the screen, the status of the recirculating pump and electric valves and the control status of the cleaning system are shown

Control Mode shows whether the system is in manual or automatic mode.

Cleaning Mode shows one of three cleaning modes: No Cleaning= "Close"; Timer Control = "Cycle"; Cleanliness Setpoint Control = "Threshold".

Device Status shows one of operation status: Normal, the system is in the measurement mode; Cleaning, the system cleaning is in progress; Protection, the system is being locked after failing to reach automatic cleanliness setpoint.

Communication Protection shows whether the system data logging is being stopped during the cleaning operation and a quiet period right after the cleaning operation. **Stop** means that the system is not in the communication protection and data logging is currently being enabled.

4.3. Menu Bar

Click the "  " button in the upper left corner of the screen to enter the system menu interface, where the user can select the desired operation interface.

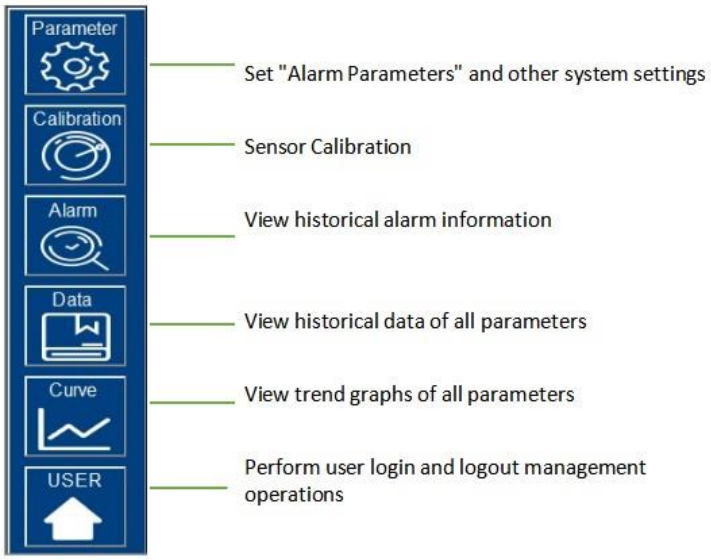

Figure. 6 Menu

4.4. User Login

The user must log in with the username and password to be able to change the system parameters. Without login, the user can only view the readings on the main interface. Click the "User Login" button, a user login window will be prompted, Select the user "**pyxis**", enter the password: "**888888**" in the user password field. New users can be set up in User Management.

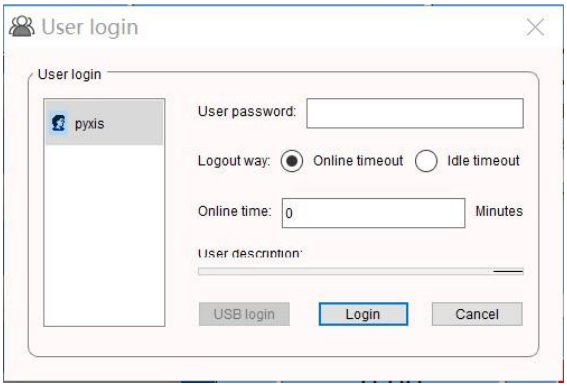

Figure. 7 User Login

4.5. Parameter Setting

Click the "Parameter" button in the menu bar, Select submenu items: **Alarm Parameters**, **Control Parameters** and so on.

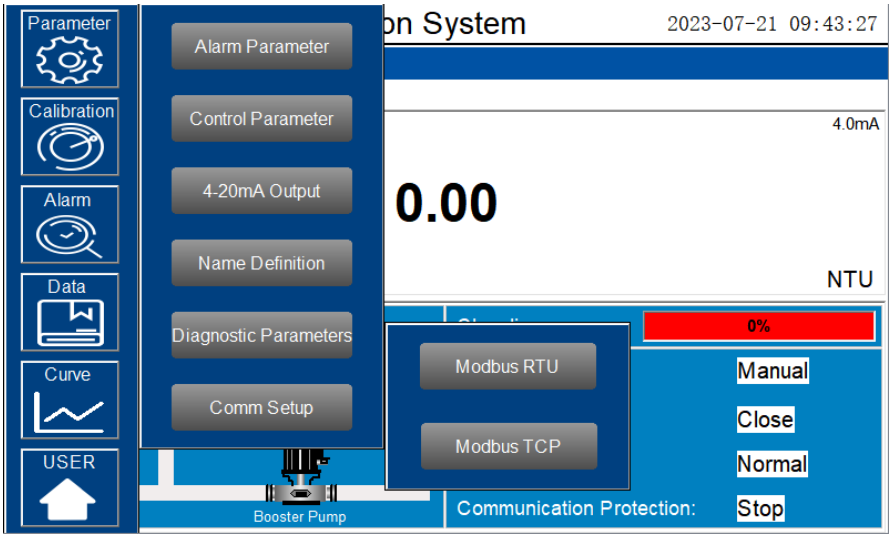

Figure. 8 Parameter Settings

4.5.1. Alarm Parameter Setting

When the online user has the right to operate, upper and lower alarm limits can be set. Click "Alarm Parameter " to enter the interface of alarm parameter setting. Here you can set the alarm upper limit and lower limit of each sensor. When the measured value is lower than the set lower limit, “XX lower limit” alarm will be displayed on the real-time monitoring screen. When the measured value is greater than the set upper limit value, the "XX upper limit” will be displayed. Users can also select to turn on or off the alarm display function in the upper right of the corresponding parameter list.

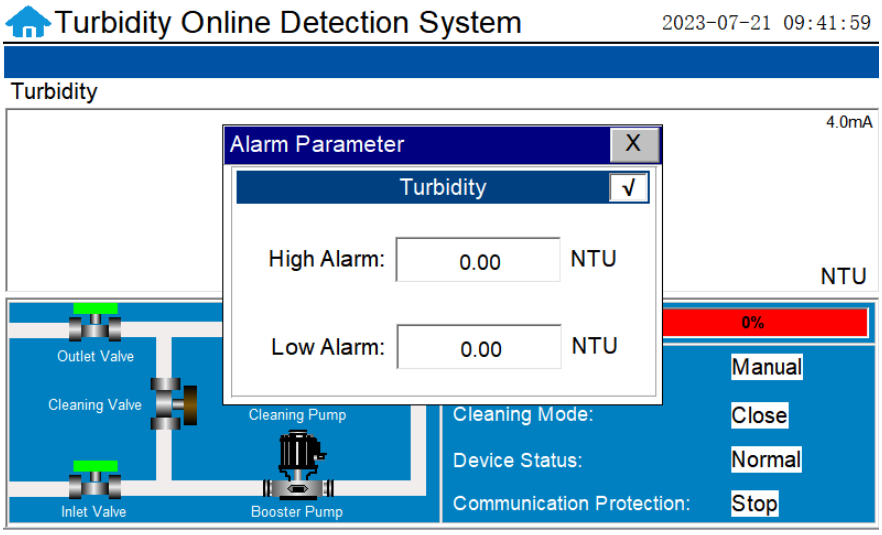

Figure. 9 Alarm Parameter Setting

4.5.2. Control Parameter

Click **Control Parameter** to choose the Hand Automatic status desired.

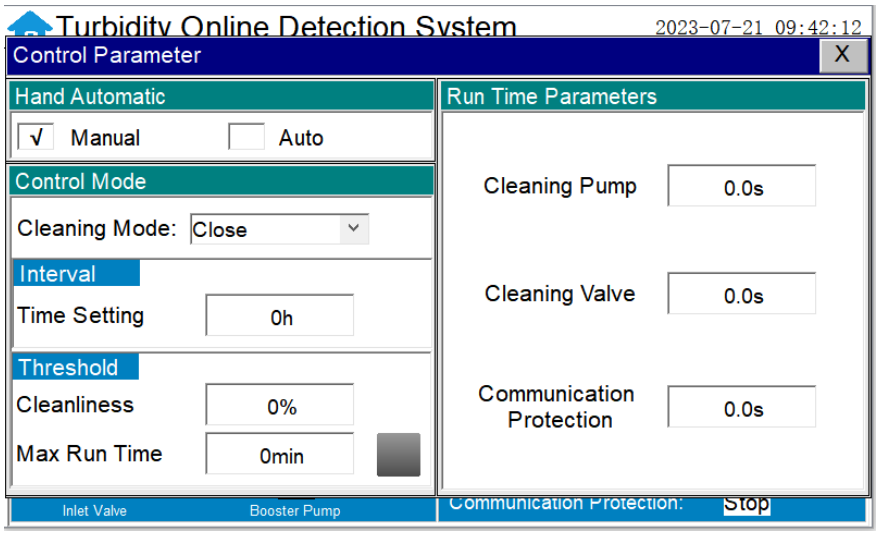

Figure. 10 Control Parameters

In Auto mode, the pumps and valves are automatically turned on and off according to the cleaning setup. In Manual mode, individual pumps and valves can be turned on and off manually by clicking on the triangle next to the piping diagram in the main screen (as shown in Figure 11).

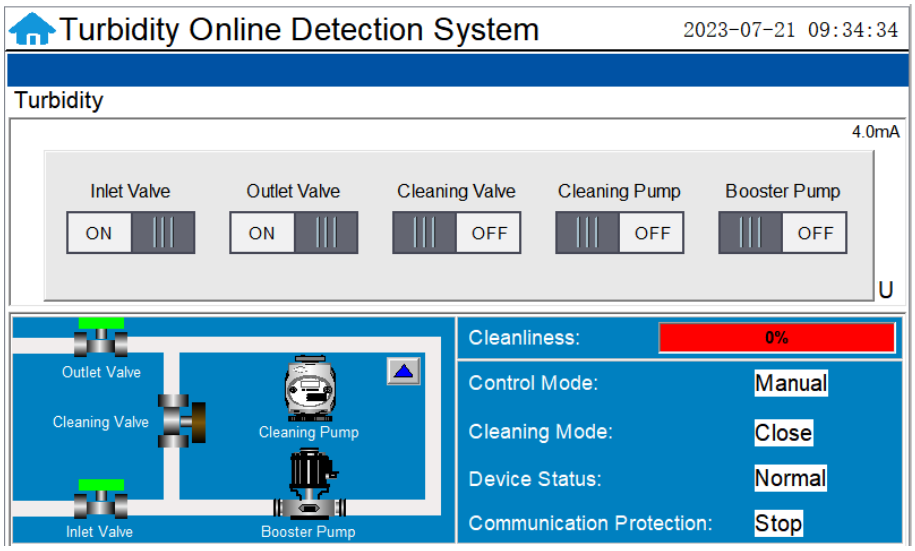

Figure. 11 Manual control valves

The following describes the parameters for setting the control mode interface.

Control Mode: The user can select a cleaning control mode among three control modes, 1) periodic timer cleaning control, 2) cleanliness setpoint control, or 3) no cleaning.

Cleaning Pump is the duration in seconds that the dosing pump injects the cleaning chemicals into the system.

Cleaning Valve is the duration in seconds that the recirculation pump operates after the cleaning chemicals have been injected.

Communication Protection is the time in seconds before data logging is resumed after the cleaning operation. During the recirculation pump operation period, the data logging is disabled.

Timer Control is commonly used as the method of cleaning before the system dynamics are understood. As system dynamics and sensor cleanliness are learned, users can alter method of cleaning control.

Time Setting is the cleaning time interval in hours.

Setpoint Control In setpoint control, the Threshold Cleanliness Value will trigger the cleaning action. The percentage of cleanliness is measured by the amount of light attenuation through the measurement cell by the ST-730 probe. The probe cannot differentiate light attenuation caused by deposition on the optical surface or by absorption by the bulk water color. The cleanliness value will not be 100% for water samples with color and turbidity when the probe's optical windows are clean.

If the initial cleanliness value as example is 80% measured when the system is clean, the user can empirically set up the threshold setpoint at 40%. Please note that Pyxis sensor automatically compensates for the light attenuation in converting measured raw signal to the concentration. The sensor will tolerate the deposition build up until 80% excitation light is being blocked the deposition on the optical path and/or by the bulk sample water color and turbidity.

Security Time is the duration that the recirculation pump will continue to operate after the normal period of recirculation pump operation and the cleanliness value measured has not reached to the setpoint. When this happens, the automagical cleanliness setpoint cleaning will stop and the user must resume the automatic cleaning operation by selecting cleanliness setpoint cleaning against.

4.5.3. 4-20mA Output

Click "4-20mA Output " to enter the 4-20mA output parameter setting interface. The 4mA and 20mA output values should correspond with the lower and upper limits of the sensor range. ***NOTE*** *The closer the value is set to the measurement value the more accurate the data. It is recommended to set according to the range of the sensor.*

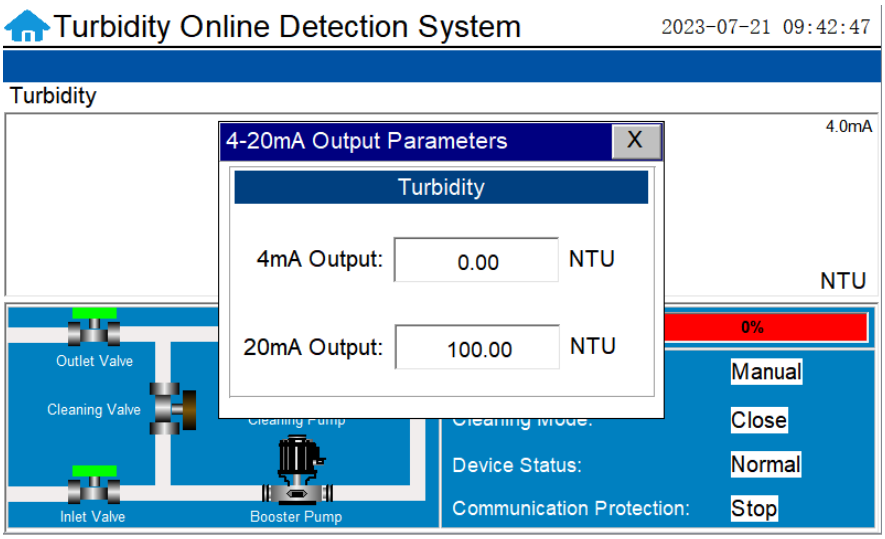

Figure. 12 4-20mA Output

4.5.4. Name Definition

Click the orange dialog box to customize the sensor name.

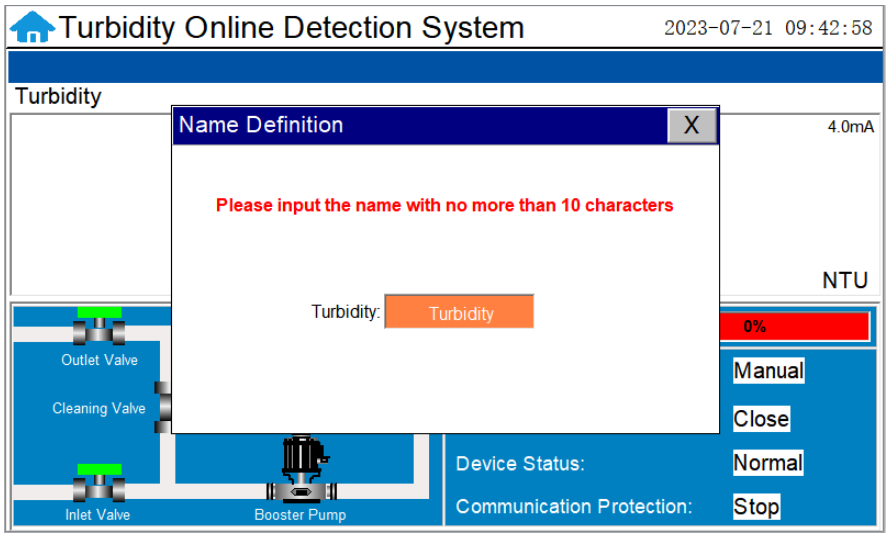

Figure. 13 Name Definition

4.5.5. Diagnostic Parameters

Click “Diagnostic Parameters” to enter the system diagnosis page. In the diagnosis page, the raw data measured by the probe is displayed. To help troubleshoot possible issues with the probe, please save an image of this data when the probe is placed in a clean water (tap water or deionized water), in a known calibration standard, and in the sample that the probe is intended for.

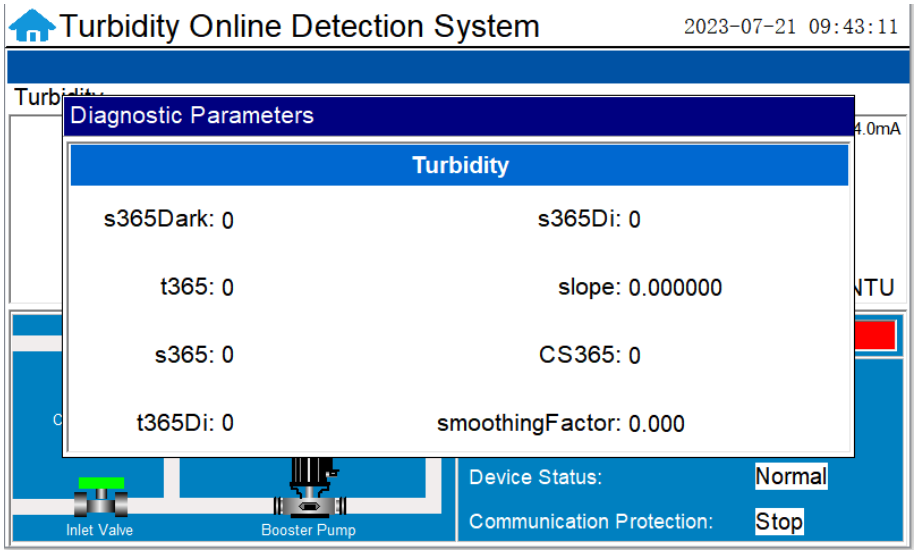

Figure. 14 Diagnostic Parameters

4.5.6. Modbus Communication Settings

If the site needs to use DCS to read device information, just connect the master station device to the controller through the terminal (see the attached electrical diagram for the terminal) and read the data according to the parameter register table (see address table).

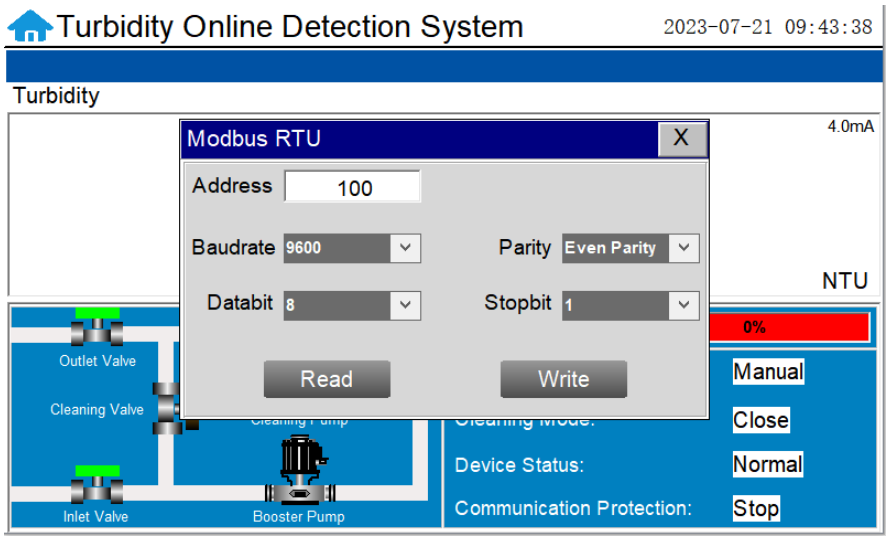

Figure. 15 Modbus RTU

It is also possible to connect based on the Ethernet address via Modbus TCP. The RJ45 port is located on the rear of the HMI display inside the UC-100 box itself.

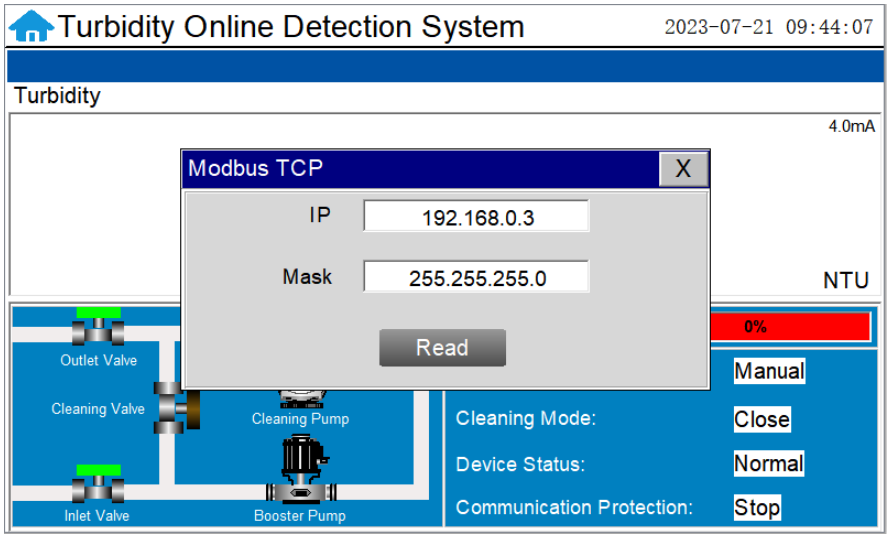

Figure. 16 Modbus TCP

4.6. Turbidity Calibration

Click the **Calibration** button in the menu bar to launch the calibration interface. ***IMPORTANT NOTE -*** *The sensor needs to be protected from light when performing calibration.*

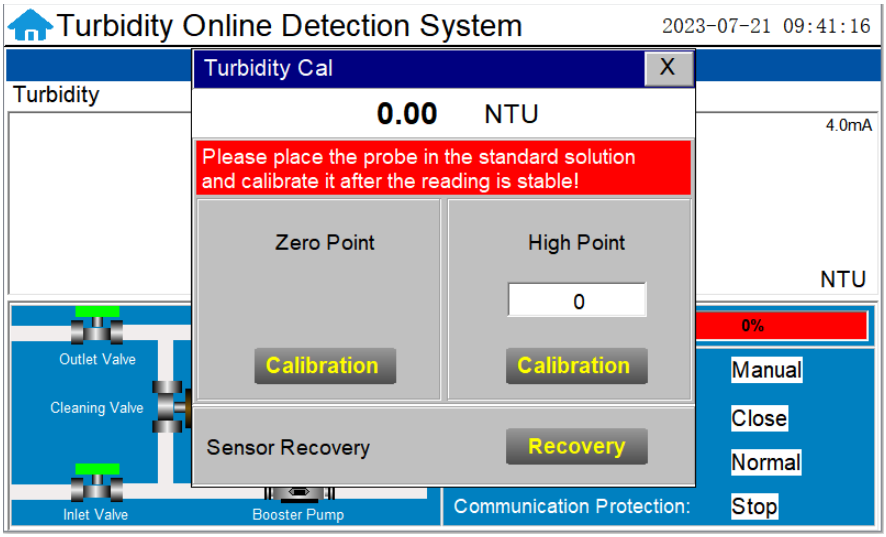

Figure. 17 Turbidity Calibration

One Point Calibration

Close the water inlet valve, drain all the water in the pipeline, take out the sensor, and rinse it with deionized water or tap water 3 times. Then fill a beaker with Pyxis 100NTU Turbidity Calibration Standard Solution (P/N 57010) and enter the value of the standard solution in the "High point" screen and click the "Calibration" under "High point" to start the high calibration. After the calibration success pop-up box pops up, the calibration is successful. ***NOTE*** *If deposits are present on the inside of the optical channel you may consider soaking the sensor in Pyxis Probe Cleaning Solution Kit (P/N SER-01) for 30 minutes, then brushing with the provided pipe cleaner brush of the kit.*

Two Point Calibration

Close the water inlet valve, drain all the water in the pipeline, take out the sensor and rinse it with deionized water or tap water 2-3 times. Then fill the beaker with deionized water and click "Calibration "under the "Zero Point" to start the zero calibration. Be sure to cover the beaker with a towel to protect from ambient light.

Then, repeat the above steps and flush the sensor 2-3 times with deionized water or tap water. Fill the beaker with Pyxis 100NTU Turbidity Calibration Standard Solution (P/N 57010), enter the value of the standard solution on the "High point" screen, and click the "Calibration" under "High point" to start the high calibration. After the calibration success pop-up box pops up, the calibration is successful. ***NOTE*** *If deposits are present on the inside of the optical channel you may consider soaking the sensor in Pyxis Probe Cleaning Solution Kit (P/N SER-01) for 30 minutes, then brushing with the provided pipe cleaner brush of the kit.*

4.7. Alarm Browsing

Click the **Alarm Browsing** button on the main interface to enter the alarm browsing interface.

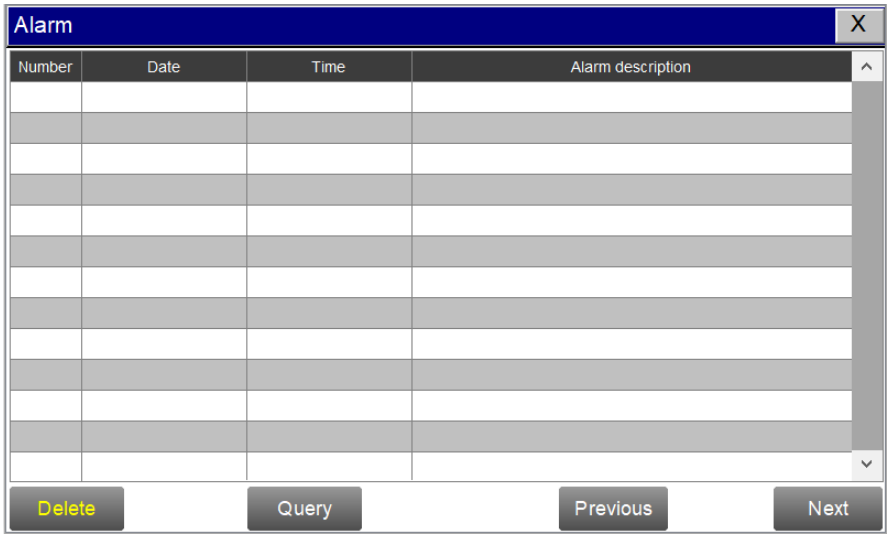

Figure. 18 Alarm Browsing

In this interface, the user can browse all alarm signals. Drag the right scroll bar to slide up and down to view historical alarm records. You can also click "Previous" and "Next" to turn pages quickly.

Click Query, enter the number in the pop-up box and query, you can quickly view the alarm problem of the corresponding number.

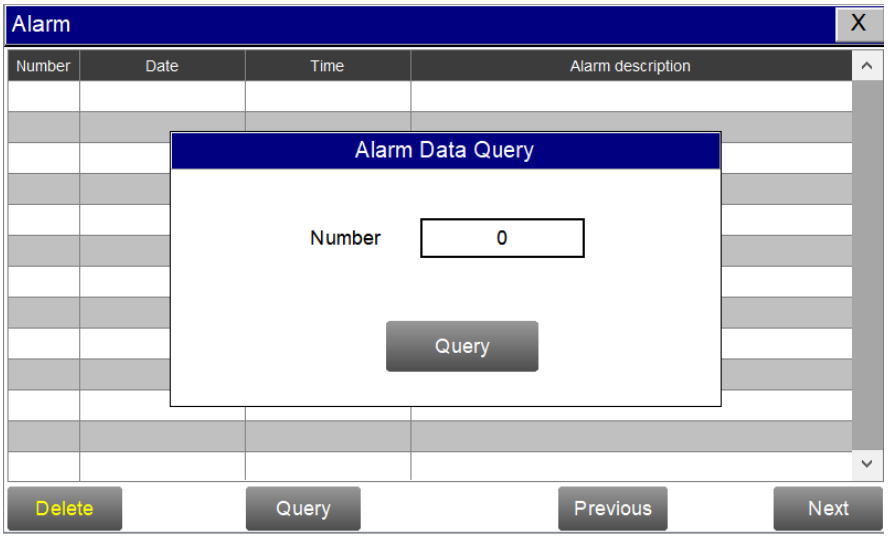

Figure. 19 Alarm data query interface

After clicking the delete button in the lower left corner, all alarm records will be deleted. After clicking delete, you need to exit the current interface and enter again, the historical data in the data report will be cleared.

4.8. Historical Data

Click the **Historical Data** button in the menu bar to enter the data report interface.

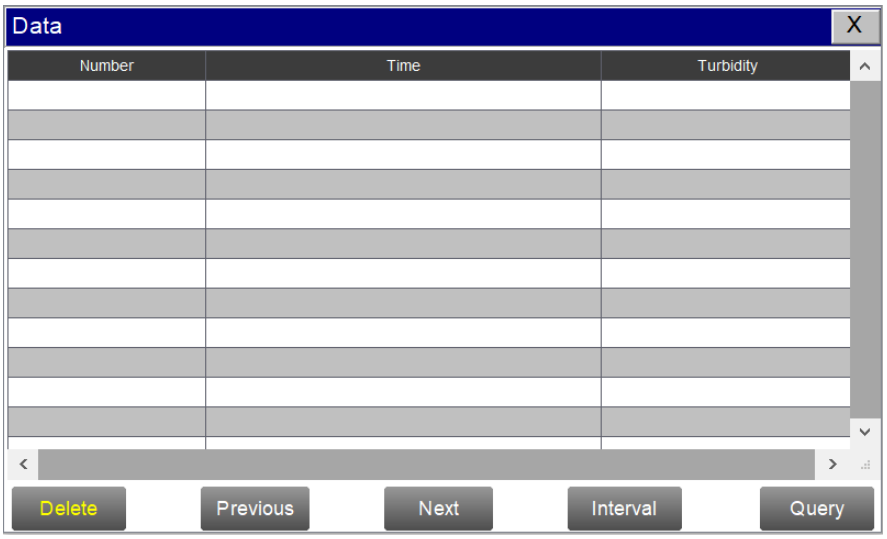

Figure. 20 Historical data

In the data report, the user can view the stored data of all parameters. The system records sensor readings every 4 seconds by default. Drag the scroll bar on the right to slide up or down or click "Previous" and "Next" to view historical data records. The data record can save 100,000 pieces of data. After 100,000 data points saved, new data will overwrite the previous data.

The user can click the ‘Periodicity’ button to change the data saving time interval.

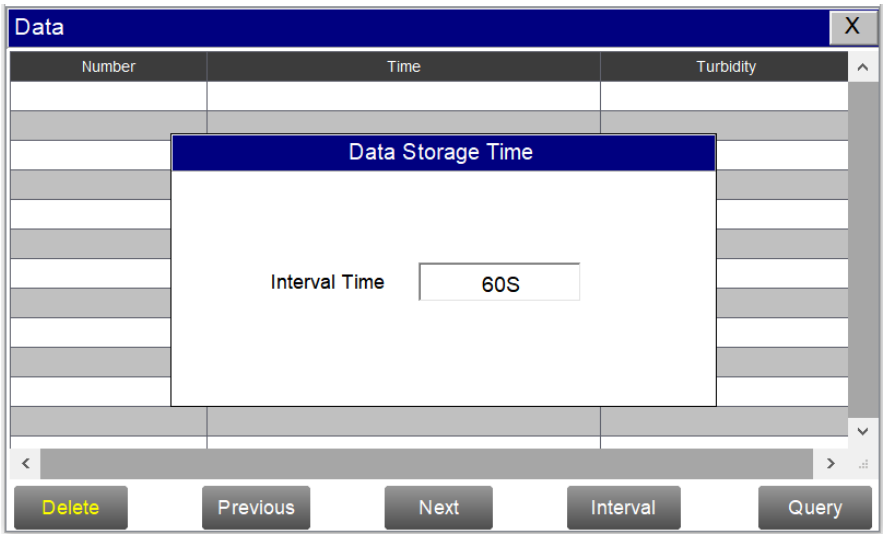

Figure. 21 Data storage retrieving setting

Click Delete in the lower left corner. After entering the retention time, click the Delete button to clear all historical data except for those within the retention time period.

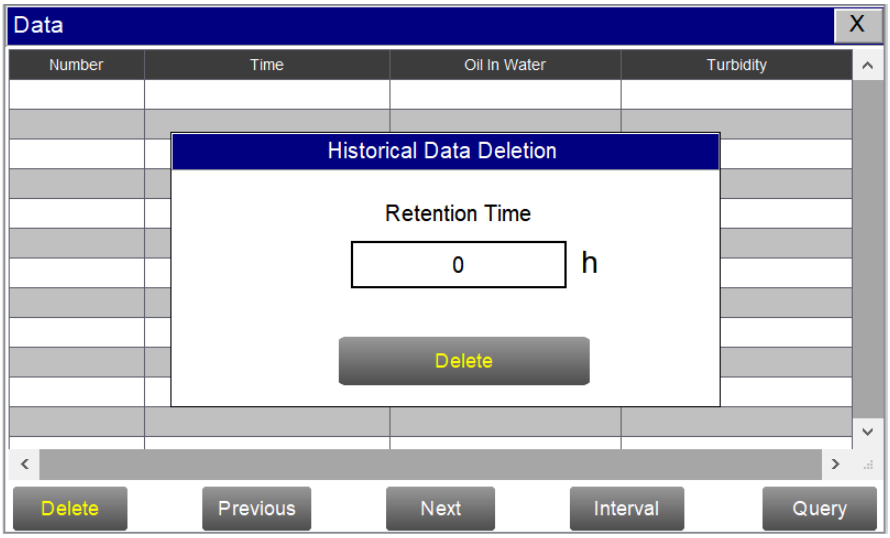

Figure. 22 Deleting historical data

Click the query in the lower right corner, enter the start time and end time, and then click the query button ***NOTE**: The start time and end time need to be filled in completely and exactly according to the system time format. Otherwise, it will not be recognized for the query.*

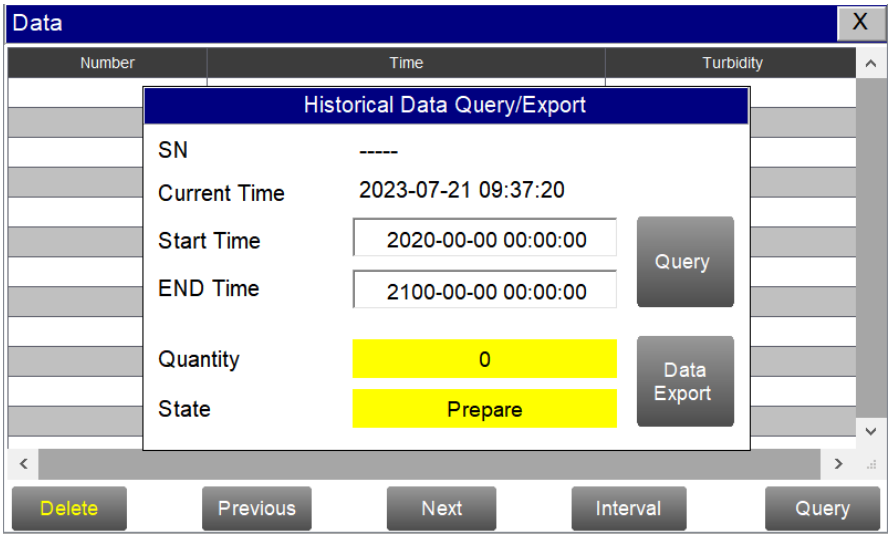

Figure. 23 Historical data query interface

Insert a USB disk behind the HMI screen and enter the time range of the data to be exported in the query area, click on the data export, when the status is displayed as success, and the quantity is positive, the data export in the CSV format is successful. If the quantity is negative, the data was not successfully exported. Please check whether the time format is correct.

When the Quantity notation appears, you can refer to the following table to identify the problem.

Quantity	Description
-1001	Progress or control data object type is incorrect
-1004	Group object name does not exist, or the group object does not have the save property
-1020	The start time of the export is greater than the end time
-1021	USB flash drive is not inserted
-1022	Only one export task is allowed at the same time
-1023	The number of records read is 0
-1024	File operation failed
-1025	Export path is empty
-1026	Export path is not legal
-1027	Incorrect time format
-1028	Unsupported export mode

4.9. Historical Data Curve

Click the **Historical Curve** button in the menu bar to launch the trend curve interface. You can click the button below the time axis to browse and view the values in different time periods. Clicking the Y-axis range will pop up the Y-axis range setup as shown in figure 27. Enter the minimum and maximum values to reset the Y axis range.

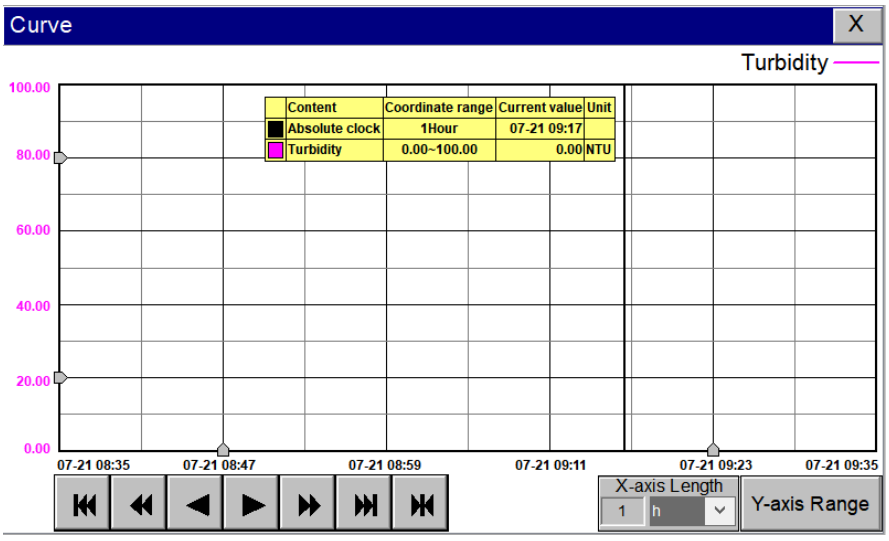

Figure. 24 Trend curve interface

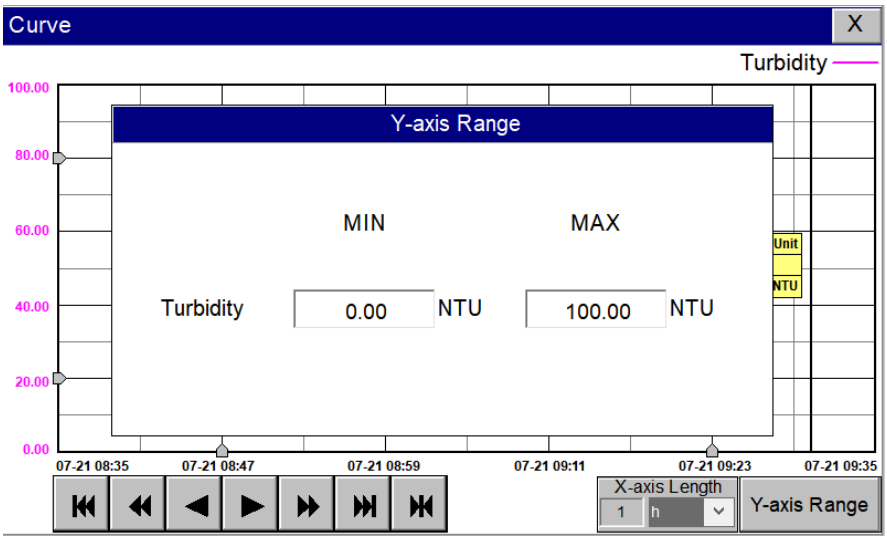

Figure. 25 Y-axis range setting

- The curve will scroll back (to the left of the X-axis) one page
- The curve will scroll back (to the left of the X-axis) half the page of the curve
- The curve will scroll backward (to the left of the X-axis) to a position where the main line is drawn
- The curve will scroll forward (to the right of the X-axis) to a position where the main line is drawn
- The curve will scroll forward (to the right of the X-axis) half the page of the curve
- The curve will scroll forward (to the right of the X-axis) one page
- A dialog box will pop up to reset the starting time of the curve

Figure. 26 Button Function Review

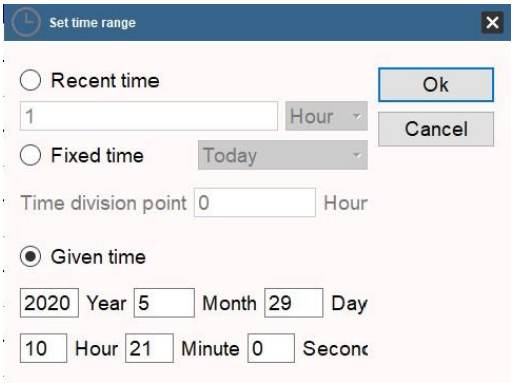

Figure. 27 System Time Setting

4.10. User Management

Click the **User Management** button on the menu bar to Login, Logout, or carry out Administration operations.

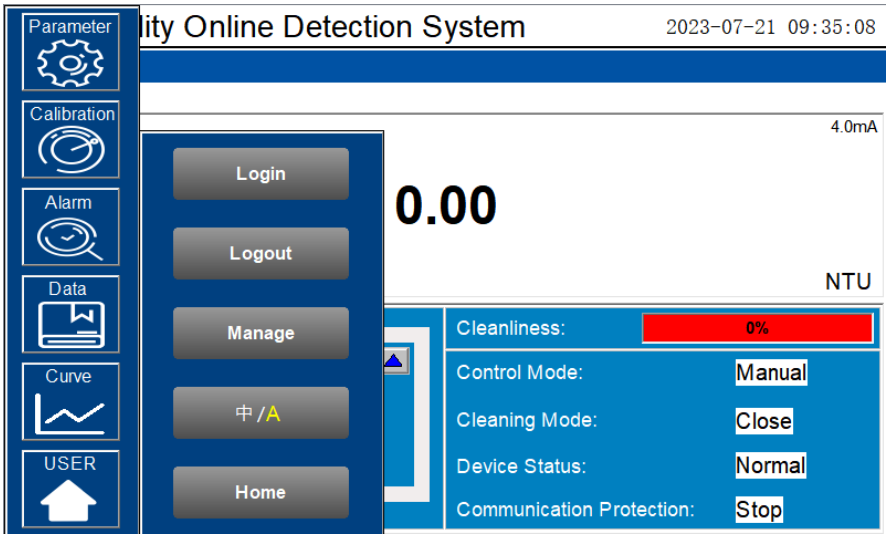

Figure. 28 User management

After Logout, the user can only view the measured values and cannot change any setup parameters.

Click Admin to launch the user management interface, where you can add users, modify passwords, and carry out other operations.

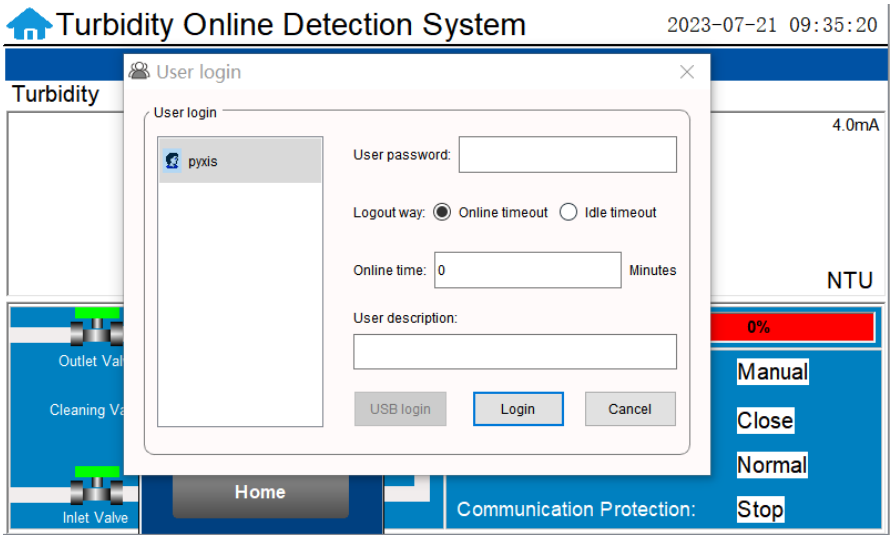

Figure. 29 User Management Interface

Change Password: Select the user to be changed. Then click the Change User button. Enter the user's own password in the User Password column and click Confirm to finish.

4.11. Setting the DATE & TIME

In the main interface, click the time in the upper right corner, the time setting box will pop up, you can change the date and time here.

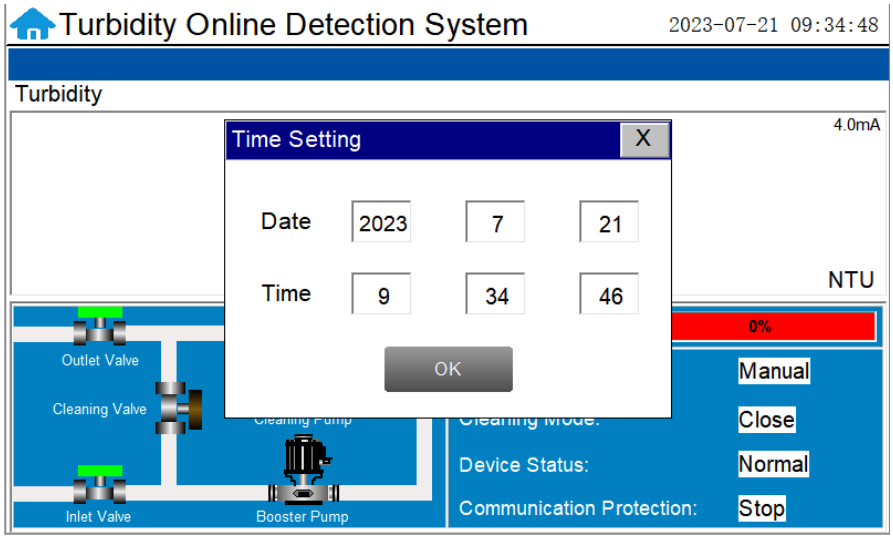

Figure. 30 Time Setting

5. Modbus RTU Register Table

No.	Format	Model	Unit	Note	No.	Format
1	Turbidity	1	float	read-only	NTU	Data format: ABCD
2	Cleanliness	3	uint	read-only	%	
3	Upper Turbidity Alarm	4	uint	read-only		0: Normal 1: Alarm
4	Turbidity lower limit alarm	5	uint	read-only		
5	Turbidity Sensor Communication Abnormal	6	uint	read-only		
6	PLC Communication Abnormal	7	uint	read-only		
7	Analog Module Communication Abnormal	8	uint	read-only		
Communication protocol: Standard Modbus-RTU						Communication parameters and station numbers can be modified via **PARAMETERS**
Communication parameters: Baud rate - 9600, data bit - 8, stop bit - 1, parity bit - Even						
Station number: 100						
Communication protocol: standard Modbus-TCP						
Communication parameters: IP: 192.168.0.3 (can be set); Port: 502						
Station number: 1						
NOTE - Address has been reduced by 1						

6. Contact Us

Pyxis Lab, Inc.
21242 Spell Circle
Tomball, TX USA 77375
1-866-203-8397
www.pyxis-lab.com
service@pyxis-lab.com