Pyxis®

OXIPANEL IK-765P-DCL Dechlorination Analyzer

Fresh or Sea Water Analyzer for measurement of Residual Chlorine, Sulfite and pH

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USER MANUAL

Related Statements

The manufacturer shall not be liable for direct, indirect, special, incidental or consequential damages resulting from any deficiency or omission in this manual. The manufacturer reserves the right to make changes to this manual and the products described in it at any time without notice or liability. Revised versions can be found on the manufacturer's website.

Safety Information

Please read this manual completely before unpacking, installing and operating this equipment. In particular, pay attention to all dangers, warnings and precautions, otherwise, it may cause serious personal injury to the operator or damage to the equipment.

Use of Danger Information

Danger
Indicates a potentially or urgent dangerous situation that, if not avoided, will cause death or serious injury.

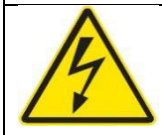
Warning
Indicates a potentially or very dangerous situation that, if not avoided, may cause serious personal injury or death.

Warning
Indicates a potentially dangerous situation that may cause a certain degree of personal injury.

Attention
Indicates conditions that if not avoided, will cause damage to the instrument. This is information that needs special emphasis.

Warning Label

Please read all labels and marks attached to the instrument. Failure to follow the instructions on these safety labels may result in personal injury or damage to the instrument.

	If this symbol appears in the instrument, it means refer to the operation and/or safety information in the instruction manual.
	If there is this mark on the instrument housing or insulator, it means there is a risk of electric shock or death from electric shock.
	Static electricity can damage the delicate internal electronic components, resulting in reduced performance or eventual failure of the instrument.
	Electrical equipment marked with this symbol cannot be disposed of through the European public waste system after August 12, 2005. In order to comply with European regional and national regulations (EU Directive 2002 / 98 / EC), European electrical equipment users must now return abandoned or expired equipment to the manufacturer for disposal without any cost.

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1. Specifications

Item	IK-765P-DCL
P/N	49514
Sensor Name	ST-765P-DCL
Sensor Body Material	CPVC
Residual Chlorine Range	0.001 – 5.000 mg/L
Chlorine Form	User Selected Free or Total [1]
Sulfite Range	0.001-100.00 mg/L Sulfite (auto-range)
Precision	± 0.01 mg/L or 1% of the value w/pH compensation up to 9.0+
pH Range	0.00 - 14.00
pH Precision	±0.01 pH
Sample Operating Temperature	4 °C – 49 °C (40 – 120 °F)
Sample Inlet Pressure	7.25 – 60 psi (0.05 – 0.4MPa)
Sensor Response Time	T95≤60s – Oxidizer / T95≤5s - pH
Measurement Interval	Continuous Measurement with FS-100 Ultrasonic Flow Meter
Installation	ST-001 (CPVC) Flow Cell
Minimum Flow Rate	200 mL/minute
Maximum Flow Rate	800 mL/minute
Sample Inlet	½-inch NPT
Sample Outlet	½-inch NPT
Panel Power Supply	96-260VAC / 50-60 Hz; 60 W
Panel Storage Temperature	-4 – 158 °F (-20 – 70 °C)
Panel Operating Temperature	32 – 122 °F (-0 – 50 °C)
UC-80 Display	4.3-inch LCD Color 480 x 272 Pixel Resolution / Resistive Touch
UC-80 Input	RS-485 Modbus – RTU
UC-80 Output	3x 4-20 mA / RS-485 Modbus-RTU / Modbus-TCP
UC-80 Data Storage	Built-In 1GB of Ram for Storing up to 1-Million Data/Event Records
UC-80 USB	1 x USB host, for data downloading and screen upgrade
UC-80 Relative Humidity	20% - 90% (No Condensation)
UC-80 Altitude	<6,561 feet (<2,000 Meter)
UC-80 Relay	2x 24V DC Relays (Passive Output or Active Output – User Selected)
Dimension (H x W x D)	600H x 300W x 334D mm
Approximate Weight	~ 10 kg
Plumbing Wet Material	CPVC
Rating	IP-65 Panel-Display / IP-67 Sensor
Selectivity	Non-Selective / cross sensitive to other oxidizing species
Compliance	EPA 334.0 / ISO 7393
Regulation	CE Marked / RoHS / UKCA
Typical Electrode Service Life	2 years
Electrode Warranty	6 Months
Sensor Body Warranty	13 Months
Pyxis NB-IOT Gateway	Included & Activated on Request with Enrollment – Contact Pyxis Lab

NOTE *(1) The Total Chlorine measured is as Virtual Total Chlorine and does not incorporate Potassium Iodide injection for "True" Total Chlorine EPA compliance. Pyxis Lab is consistently updating technologies and specifications may change without notice.*

2. **Product Description**

The Pyxis IK-765P-DCL inline residual Chlorine and Sulfite panel is a multi-parameter inline water analyzer specifically designed as a 'Turn-Key' monitoring solutions for clean water applications that require constant validation of chorine removal prior to membrane or other critical to quality system applications. This proprietary technology offers highly accurate and simultaneous measurement, display, and data-logging of Chlorine (user selected as Free or Total Chlorine), Sulfite residual, pH, Temperature, and sample flow rate utilizing proprietary Pyxis Lab smart sensor technology, coupled with a Pyxis UC-80 touch screen display and data logging terminal. The IK-765P-DCL is offered in CPVC construction enabling its use in both Fresh Water and Sea Water monitoring applications. This analyzer design is a convenient and easy to integrate panel mounted solution for rapid installation and simple maintenance.

The IK-765P-DCL analyzer panel design is equipped with the propriety Pyxis ST-765 Series smart sensor configured to simultaneously measure oxidizer as Free or Total Chlorine and Sulfite concentration while also measuring pH and temperature of the sample water for refined compensation. Additionally, the analyzer is equipped with the Pyxis FS-100 ultrasonic flow sensor for real time, precise sample flow measurement and regulation.

This Pyxis ST-765 Series sensor design is membrane-free and based on unique principles and incorporates Pyxis' advanced technology in the field of bare-gold electrochemical detection. The ST-765P-DCL (CPVC) sensor include on this analyzer measures the oxidant level, sulfite level and pH simultaneously while performing temperature and pH compensation for the measurement of oxidant based on conditions present in the application of use. This technology can provide significant value in a variety of water and process applications helping to extend equipment life and performance while improving regulatory compliance.

Typical Applications

- Pre-Ion Exchange Chlorine Removal (Demin, Softening, Mixed Bed)
- Pre-Filter Chlorine Removal (UF, NF)
- Pre-Membrane Chlorine Removal (Reverse Osmosis)
- Chlorine Removal in Clean Process Water Applications

Turn-Key Installation

The IK-765P-DCL analyzer requires a small installation footprint, with simple maintenance and is specifically designed for use in clean water and process applications. Each panel is also provided with ST-001 (CPVC) Inline Flow Tee Assembly and inlet gate valve for flow adjustment and the Pyxis FS-100 ultrasonic flow meter for precise sample flow measurement. The UC-80 display/data logging terminal is prewired to the FS-100 and ST-765P-FCL sensor in RS-485 Modbus format with fully integrated sensor data logging, diagnostics, and calibration interface. This unique platform results in a constant and highly accurate oxidizer measurement consistent with DPD wet chemistry methodology as well as simultaneous Sulfite residual to provide the most rapid visibility and response to dichlorination control verification, eliminating extreme costs associated with RO equipment downtime and membrane damage.

3. Features

- Pyxis ST-765P-DCL (CPVC Free or Total Residual Chlorine + Sulfite + pH + Temperature) is a multi-parameter composite sensor used for the measurement Free or Total Residual Chlorine, Sulfite, pH, and Temperature in compliance with USEPA 334.0 and ISO-7393 guidelines. This sensors advanced PCB offers built-in temperature and pH parameter compensation (up to pH 9.0+) algorithms eliminating the need for a supplemental pH sensor and controller. Unique Bare-Gold electrode technology for residual oxidizer and Sulfite measurement eliminates burn-in time, membranes and electrode solution replenishment commonly associated with conventional Chlorine sensors. The ST-765 Series has a uniquely designed flat bubble pH electrode design for reduced fouling potential. Reduce your maintenance and cost versus colorimetric chlorine measurement or conventional electrochemical sensors by utilizing Pyxis replaceable Dual Gold Electrode Head (EH-765-01) for this sensor allowing for years of reliable service. The ST-765SS Series may be calibrated in-situ when clean via DPD Free/Total Chlorine or Sulfite wet chemistry test measurement of active sample.
- The inline Pyxis sensor is installed using the uniquely designed ST-001 (CPVC) inline tee assembly providing a compact design and bottom-up flow ensuring constant sensor flooding. The water sample inlet line contains an integrated gate valve and FS-100 ultrasonic flow sensor capable of precisely measuring flow within 1mL/min of precision, allowing the users to finely adjust and record the sample flow rate to the recommended flow range of 200–800mL/minute. The recommended maximum inlet pressure of IK-765P-DCL analyzer is 60psi and discharge should be directed to drain. The sensor is connected to the UC-80 display/data logger via RS-485 Modbus (RTU) allowing for integrated sensor calibration interface and diagnostics within the display touch screen.
- The Pyxis FS-100 is a state-of-the-art ultrasonic flowmeter that operates on the principle of transit time difference with a measurement range of 0 – 3,000 mL/min and resolution of 1mL. The sensors advanced PCB design offers built-in temperature compensation to eliminate the effect of temperature with instantaneous, accumulated.
- Convenient and simple to install back-panel for rapid and easy installation. Truly a plumb and power to go platform with intense factory setup, testing and sensor calibration prior to shipment.
- UC-80 Touch screen display/data logger interface with sensor calibration integrated. Display/data logger offers 3x 4-20mA outputs, RS-485, Modbus TCP and 2x-24VDC Relays. Pyxis NB-IOT card is preinstalled and may be activated upon user enrollment for wireless data to cloud transmission.

4. Part Numbers & Ordering Details

Please find a table below outlining ordering details and part numbers for the IK-765P-DCL Series of analyzers and replacement-spart parts.

Order Information	P/N
IK-765P-DCL *(Residual Chlorine + Sulfite + Temperature Water Analyzer for Fresh & Sea Water)*	49514

Optional / Replacement Accessories Information	P/N
ST-765P-DCL *(CPVC Residual Chlorine + Sulfite + pH -Sensor Only)*	59907
EH-765-01 *(Replacement Electrode Head for ST-765P-DCL)*	27918
ST-001 *(Replacement ST-001 CPVC Flow Cell for IK-765P-DCL)*	50704
FS-100 *(Replacement Ultrasonic Flowmeter with Display 0-3000mL/Minute)*	54200
UC-80 Display + Data Logging Terminal *(Replacement)*	14003
Pyxis pH Combo Calibration Pack *(pH 4-7-10 Calibration Solution 3-Pack - 500mL ea.)*	57007
Pyxis Zero Oxidizer Calibration Standard *(0ppm Oxidizer Solution – 500mL)*	21022
Pyxis Sulfite Dropper Kit *(Sulfite Dropper Titration Kit for Sulfite Calibration)*	TK35290-Z
Pyxis Probe Cleaning Kit *(Probe Cleaning Solution, Brush, Q-tips & Jar – 500mL)*	SER-01
SP-200 OxiPocket™ *(Pocket All-Oxidizing Disinfectants Colorimeter & Fluorometer)*	50802

5. Analyzer Dimension and Mounting

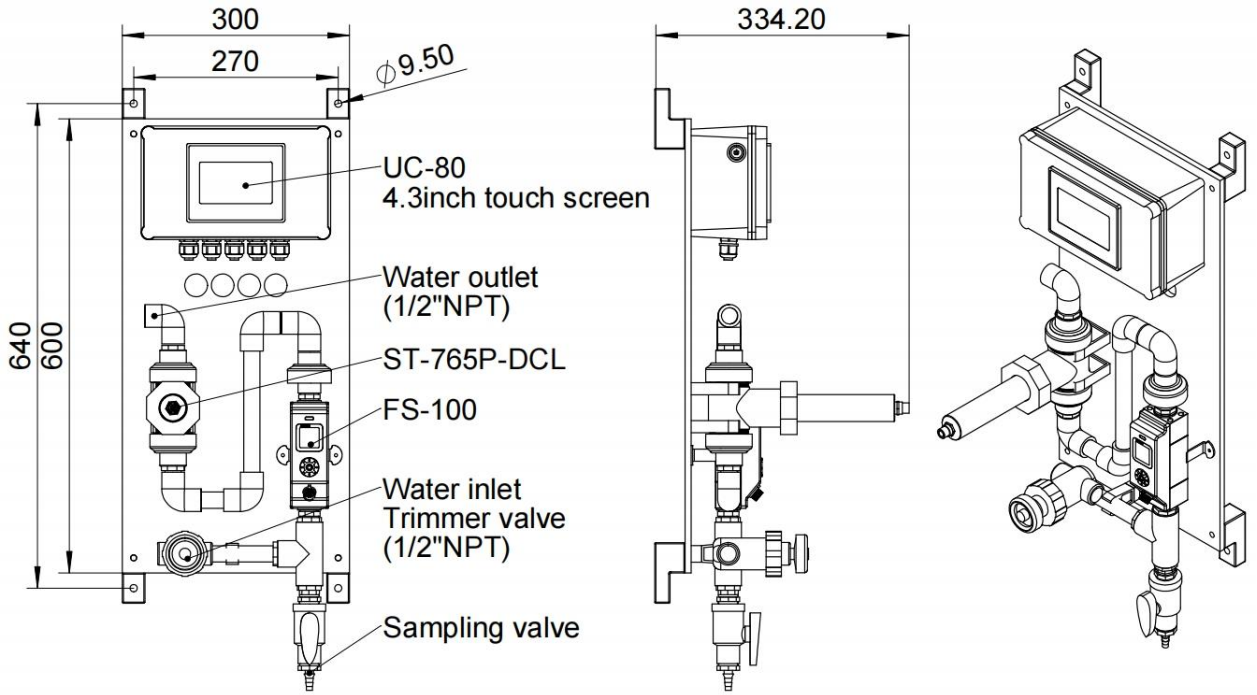


Figure. 1 - IK-765P-DCL

6. Analyzer Installation

6.1. Installation Requirements

Power Supply: 96-260VAC / 50-60 Hz; 60 W

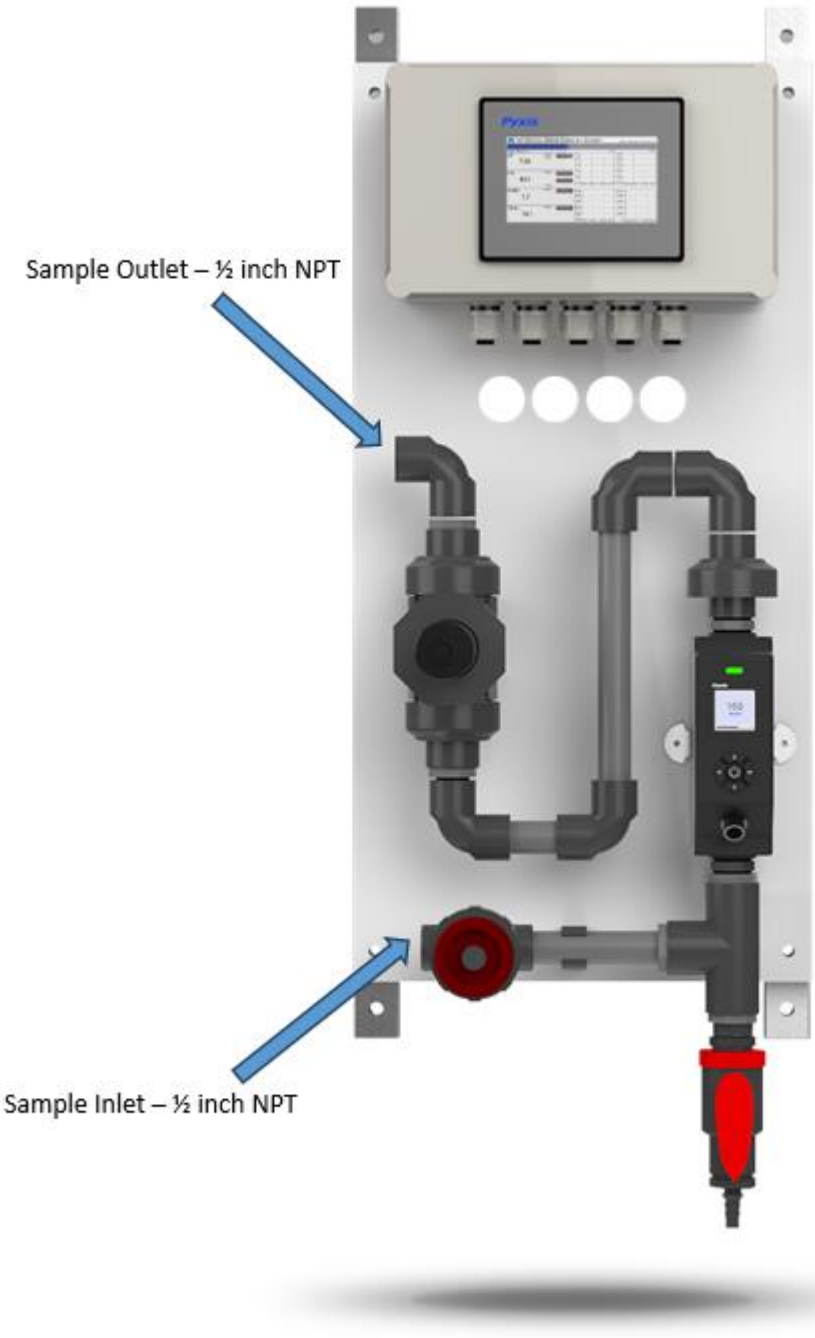
Inlet Water Supply: The inlet water pressure should be from 7.25 – 60 psi (0.05-0.413MPa)

Outlet Water Line: This line should be returned to atmospheric sump or lower pressure recirculation line of the analyzed system water network.

Wall Mount Space: Please leave at least 0.5m of installation space around the equipment for later maintenance.

Wall Mount Weight: Approximately 10kg. Please use appropriate mounting hardware.

6.2. Sample Water Connection



6.3. UC-80 Display Wiring Diagram

The IK-765P-DCL has universal AC power supply equipment allowing users simply to plug the power supply into a 100~240V AC 50/60Hz power outlet for normal operation.

The two relay outputs are defaulted to " Passive Output ", which can be switched to " Active Output " by toggling the button on the board, as shown below in the orange box. When in **ACTIVE** mode, the relay is 24VDC powered. When in **PASSIVE** mode, the relay is a dry contact.

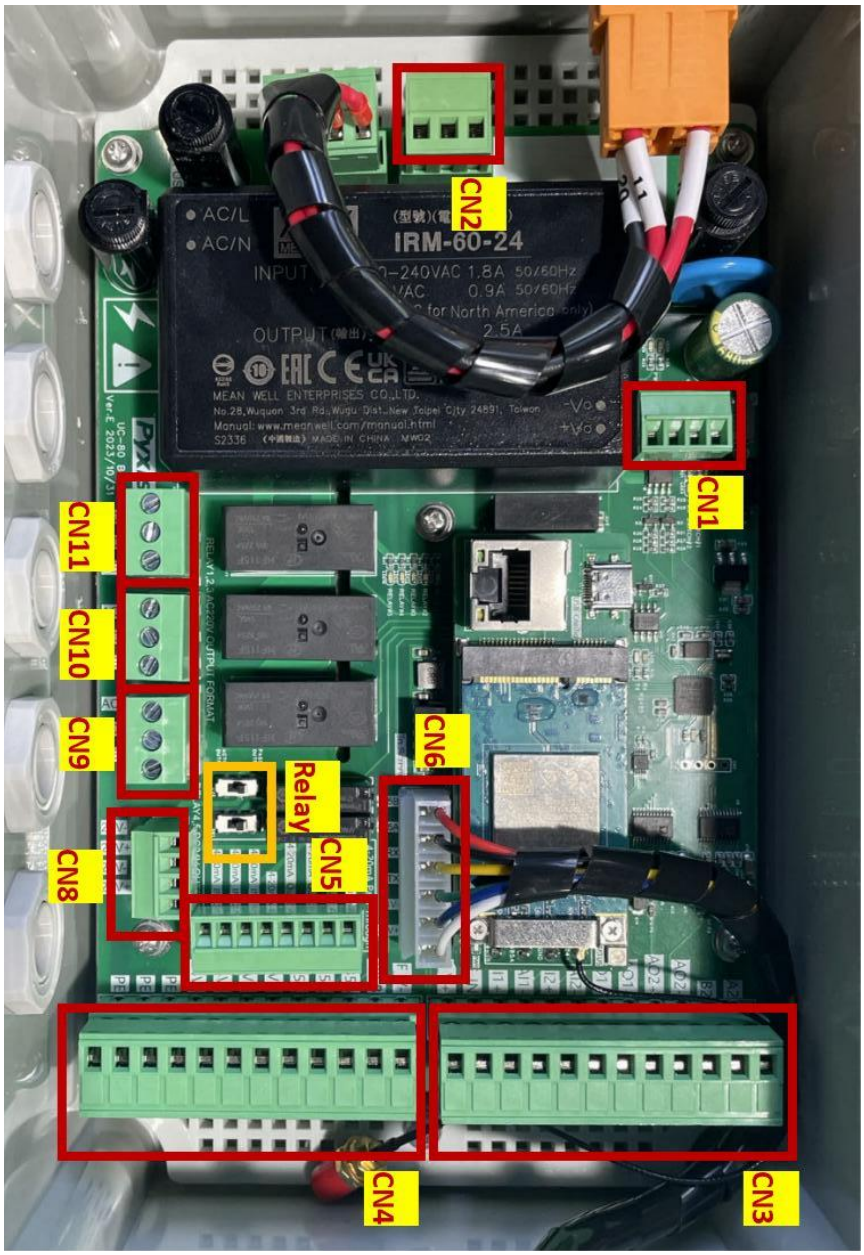


Figure. 2 – Terminal Board of the UC-80 Display

The Pyxis Factory connects all pigtail output cables to the controller internally .The pigtail connection allows for rapid wiring and ease of installation. Please refer to the following diagram for the definition of each terminal.

	Terminal Number	Definition
CN2	N	AC110~220V 50/60Hz : N
	L	AC110~220V 50/60Hz : L
	PE	PE

	Terminal Number	Definition
CN3	A2	DCS:485A(For on-site use)
	B2	DCS:485B(For on-site use)
	AO2-	4-20mA- DCS:pH
	AO2+	4-20mA+ DCS:pH(For on-site use)
	AO1-	/
	AO1+	/
	AI2-	/
	AI2+	/
	AI1-	/
	AI1+	/
	F_IN	/
	F_V+	/

	Terminal Number	Definition
CN4	F_V-	/
	485B	B(Sensor)
	485B	B(Flow)
	485A	A(Sensor)
	485A	A(Flow)
	24V+	24V+(Sensor)
	24V+	24V+(Flow)
	24V-	24V-(Sensor)
	24V-	24V-(For on-site use) /24V-(Flow)
	PE	PE(Sensor)
	PE	PE(Flow)
	PE	/

	Terminal Number	Definition
CN5	4-20mA-	4-20mA- DCS:(FCL/Sulfite)
	4-20mA Out#1	4-20mA+ DCS:(FCL)(For on-site use)
	4-20mA Out#2	4-20mA+ DCS:(Sulfite)(For on-site use)
	4-20mA Out#3	/
	4-20mA-	4-20mA-(Sensor)
	4-20mA IN#1	4-20mA+(Sensor$_{(FCL)}$)
	4-20mA IN#2	4-20mA+(Sensor$_{(Sulfite)}$)
	4-20mA IN#3	/

	Terminal Number	Definition
CN8	24V-	Relay-(For on-site use)
	24V+#1	Relay+(For on-site use)
	24V-	Relay-(Reserved for customer)
	24V+#2	Relay+(Reserved for customer)

Figure. 3 - Terminal Wiring Diagram

WARNING - The process of electrical connection to contact the 96-260VAC single-phase power supply, should be operated by personnel with an electrician's license. Failure to operate according to the electrical code of practice may result in electric shock injury or even death.

6.3.1. UC-80 Display Pre-Wired Output Cable

The UC-80 display and data logging terminal of the IK-765P-DCL series comes equipped with two prewired 8-pin pigtail cable with adapters. The input cable offers a male adapter for direct connection to the ST-765P Series sensor input. This cable is to be terminated to the sensor only.

The output pigtail offers a female adapter. This pigtail cable is designed to be connected to the loose flying lead cable with male adapter and open wires that is provided with the panel. This 8-pin output enables 3x 4-20mA signal passthrough, 1x RS-485 and 1x Relay (Default is Passive Output, can be changed to Active Output 24Watt) output to pass onto another device. The loose flying lead cable can be rapidly connected directly to the equipment in the field. Wire labeling and color code can be found in the table in the lower left corner of Figure 4 seen below, or rewired to the equipment according to the wiring diagram shown in Figure 3.

NOTE:the 24V power ground and the 4-20 mA-return in the controller are internally connected.So, the gray line of the 8-pin pigtail is connected at 24V-, which is actually 4-20mA-.

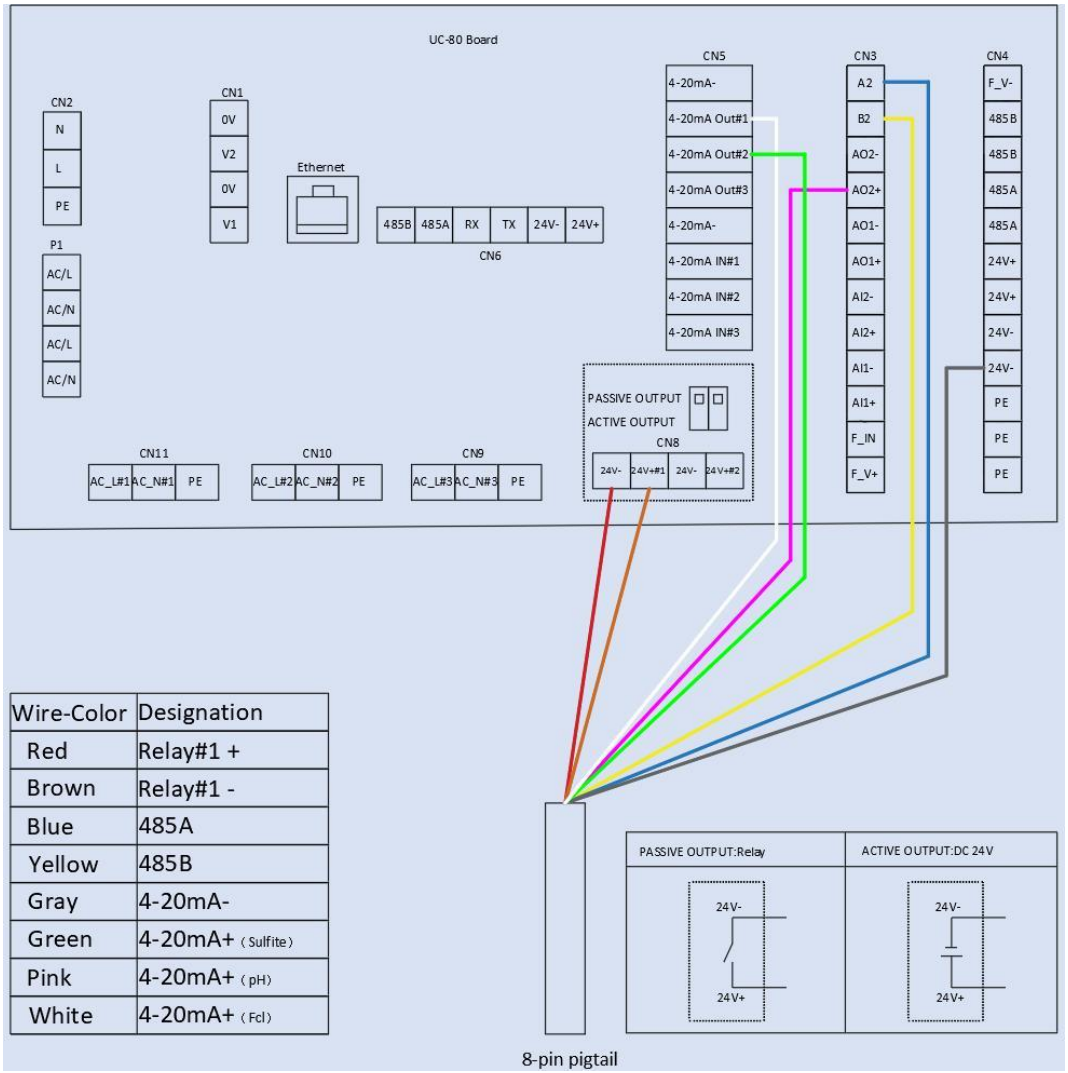


Figure. 4 - Pre-Landed Output Flying Lead Cable Wiring Diagram

7. UC-80 Display Touch Screen Operation

7.1. Main Screen

After the system is powered on an initial screen allows the user to log into the system.

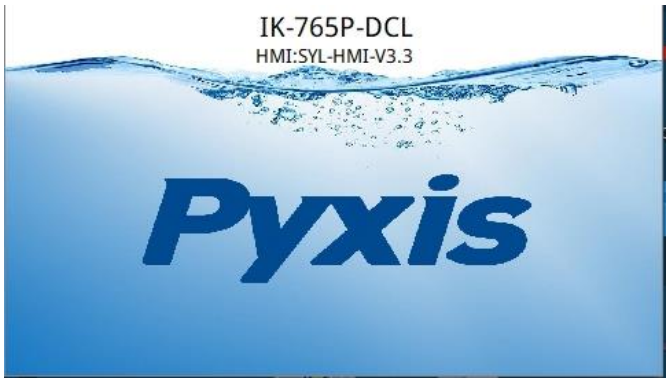


Figure. 5 - Main Screen

7.2. User Login & Password

After powering on the system, log in with the user name and password to be able to change system settings. Click the **"User Login"** button, select the user "**pyxis**", enter the password: "**888888**" in the user password field. A new user can be added via "User Management" in interface of the menu.

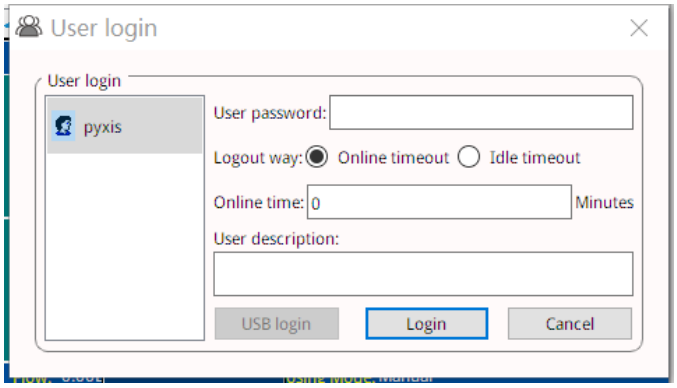


Figure. 6 - User Login Screen

If you do not need a password, or want to change the user, you can enter the system and manage in the **"User Management"** screen of the menu

7.3. Real-Time Monitoring

Click the **"Enter System"** button on the main interface to enter the real-time monitoring screen of the system. The data detected by the Pyxis sensors will be displayed in real-time.See a functional overview of each section of this screen highlighted below.

Figure. 7 - Real-time Monitoring Screen

7.4. Switching between Free Chlorine & Total Chlorine Measurement

IK-765P-DCL can support the measurement of FCL (Free Chlorine) and TCL (Total Chlorine), and can be switched by clicking the button on the main interface.

Figure. 8 - Switch Button

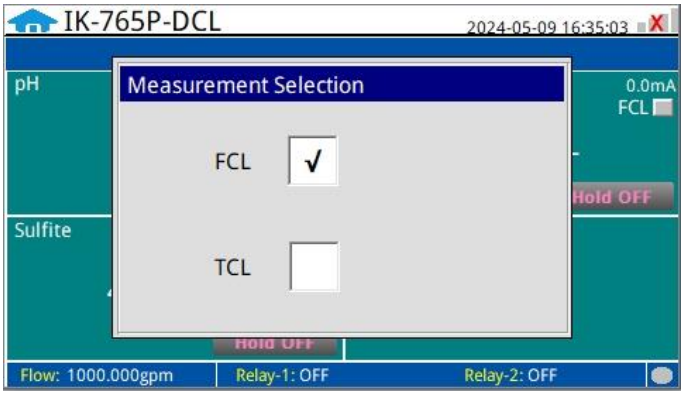


Figure. 9 – Measurement Selection

Select the parameters you want in the pop-up window.

***IMPORTANT NOTE*:** *After switching, a two-point (Zero & Slope) calibration of FCL/TCL is required, please refer to 7.9.2 "Two Point Oxidizer Calibration"*

7.5. Explanation and use of the HOLD Feature

The IK-765P-DCL has an integrated HOLD feature for all Modbus TCP output parameters from the sensor that would be connected to an onsite DCS network. The purpose for this feature is to allow the user to enter a signal value HOLD on the designated parameter during periods of sensor maintenance or removal. This feature prevents network system alarms from operational shutdown during sensor maintenance or replacement. Click the "**Hold OFF**" button on the main interface to enter the HOLD setting interface.

Figure. 10- Main Interface

In the pop-up box, enter the parameter value and click "Confirm" to open the "**Hold ON**" function. The main interface will display the entered value for 15 minutes, after which it will resume displaying the real-time value read by the sensor. ***IMPORANT NOTE*** *Both FCL/TCL and Sulfite will "HOLD ON" together. Please note that you need to set the parameters at the same time*

When the "Hold ON" function is activated by the user, the sensor may be maintained, calibrated or removed and the Modbus TCP output will continue to retain the user entered value for a default period of 15 minutes (or user defined period), ensuring network alarm and process will not be interrupted due to the sudden disappearance of the 'normal' value. The 'actual' live sensor reading along with the user entered hold value reading will both be displayed during this period. Clicking "Cancel" will turn off this function, the main interface will immediately display the real-time value read by the sensor, and the main interface button will be displayed as "**Hold OFF**".

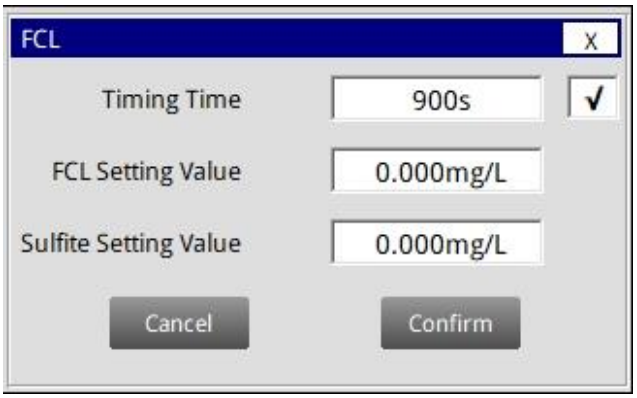


Figure. 11 - Hold Feature

Figure. 12 - Hold ON Interface.

7.6. Activating the 4G DTU Gateway/Module

Each analyzer comes with a 4G DTU module with global SIM card to push sensor data to the Pyxis Cloud server. By default, the 4G DTU module is disabled. Please contact Pyxis Lab for pricing details and to activate the 4G DTU by emailing service@pyxis-lab.com When the 4G DTU module is enabled, real-time sensor readings and historical data trends are available in the uPyxisPlus mobile app and the Pyxis Cloud web application. The 4G signal strength is displayed in the upper-right corner of the UC-80 display screen.

When contacting Pyxis Lab, please provide the PN and SN of the Pyxis device, which can be viewed in the label on the bottom left of the device, for example, "PN-49514 and SN-240001" in the image below. A sequential combination of these numbers will also serve as the 4G number of the device. (ie. 49514240001) After activation Pyxis Lab will provide user ID and Password details to allow for immediate cloud data access sufficient for 1-year.

Figure. 13 - Device Label

7.7. Menu Bar

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

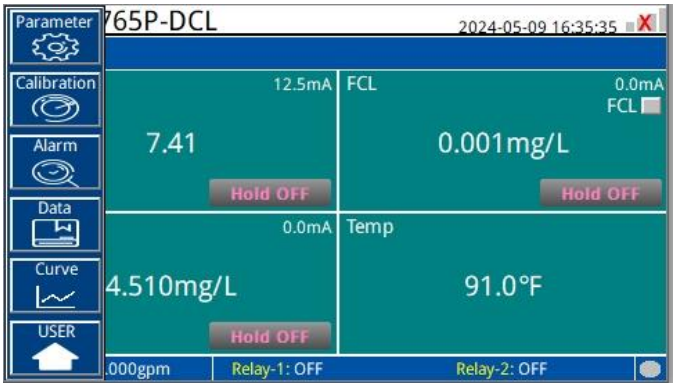


Figure. 14 - Menu Bar

7.8. Configurable Parameters

Click the **"Parameter"** button in the menu bar. Here you can select a list of options to include enter **Control Interface** / **Settings Inferface** / **User Defined Settings** / **Diagnostic Data** / **4-20mA Output Setup** and **Comm Setup**.

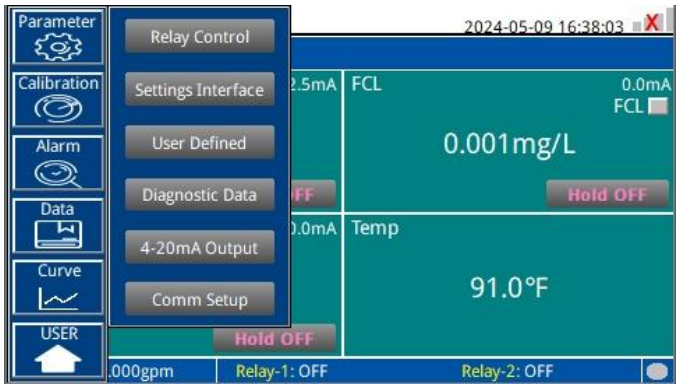


Figure. 15 - Parameter Settings Menu

7.8.1. Relay Output Control

The IK-765P-DCL has two (2) 24VDC relay outputs.

The two relay outputs are defaulted to " Passive Output ", which can be switched to " Active Output " by toggling the button on the board, as shown below in the orange box. When in ACTIVE mode, the relay is 24VDC powered. When in PASSIVE mode, the relay is a dry contact.

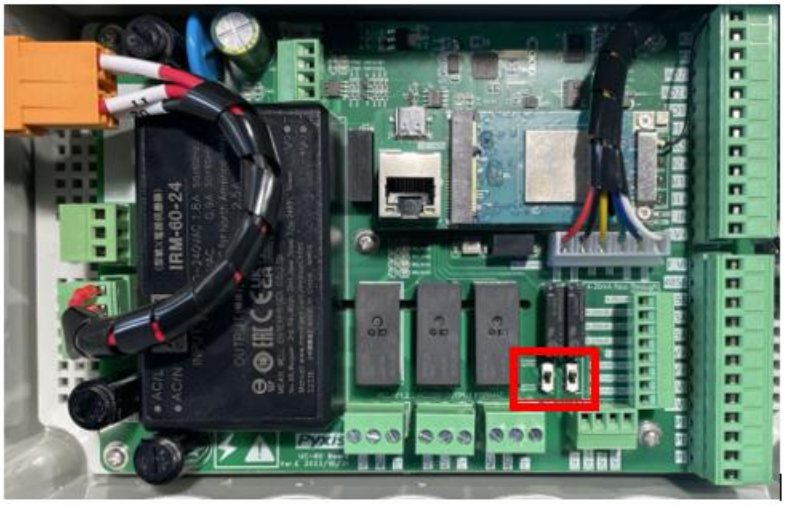


Figure. 16 – Relay Active/Passive Toggle Switch on UC-80 Terminal Board

Both Relay outputs have 4 modes of operation including **Disable / Manual / Periodicity** and **Sensor Value**

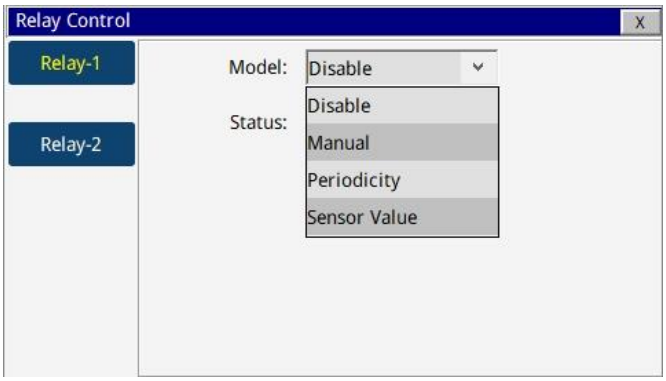


Figure. 17 – Relay Output Control

When the mode selection is set to **Disable**, there will be no relay output available.

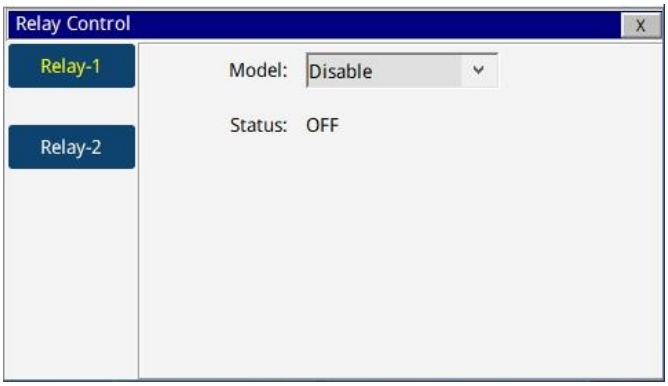


Figure. 18 – Disable

When the mode is selected as **Manual**, users can manually turn on the Output by clicking the **"Turn On"** button in the lower right corner and turn it off by clicking the **"Turn On"** button again.

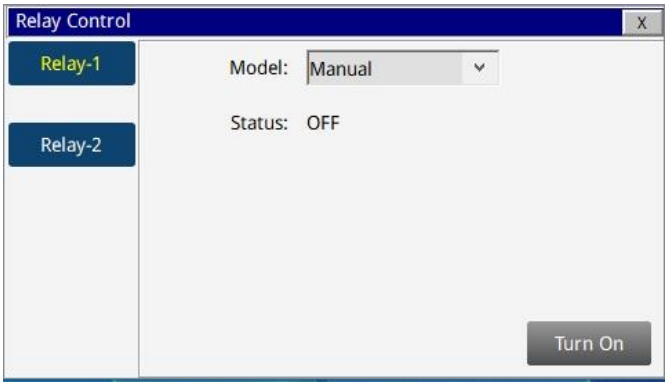


Figure. 19 – Manual

When the mode selection is **Periodicity**, it will periodically output according to the user programmed Interval Time and Running Time

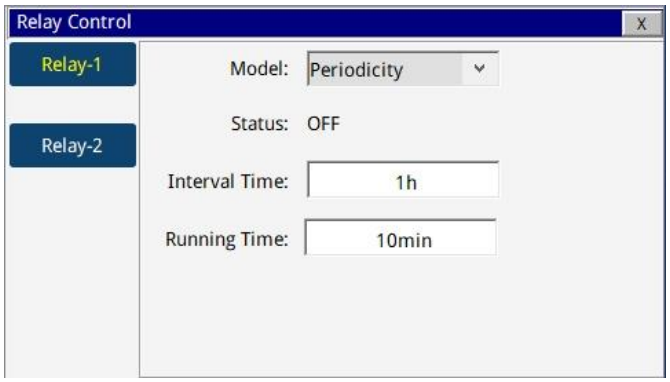


Figure. 20 – Periodicity

When the mode selection is **Sensor Value**, users can select which parameters they desire to control. See examples below.

Example 1: Open (ON) Value = 0.2
Close (OFF) Value = 0.5
Measured Value≤0.2 will Open the Relay
Measured Value≥0.5 will Close the Relay

Example 2: Open (ON) Value = 0.5
Close (OFF) Value = 0.2
Measured Value≤0.2 will Close the Relay
Measured Value≥0.5 will Open the Relay

Users can utilize the **Protection Time** to prevent over activation of the relay if the responding parameter does not come within desired range within a specified time. After relay opening, when the measured value continues to exceed the set shutdown value beyond the protection time, the relay will automatically shut down the output. This feature allows for overfeed prevention.

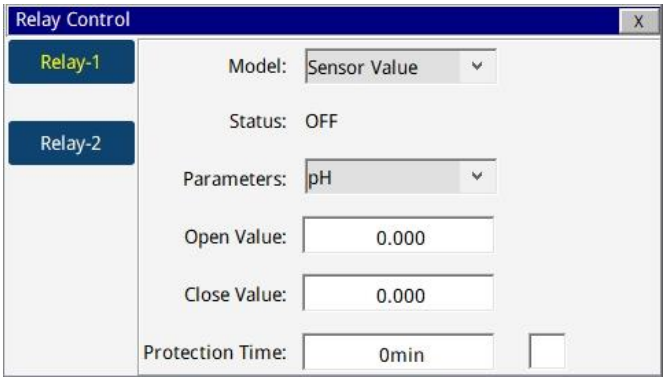


Figure. 21 –Sensor Value

7.8.2. Settings Interface

Clicking on **"Settings Interface"** tab opens a sub-menu for **Alarm Parameters** and **Senser Parameters**.

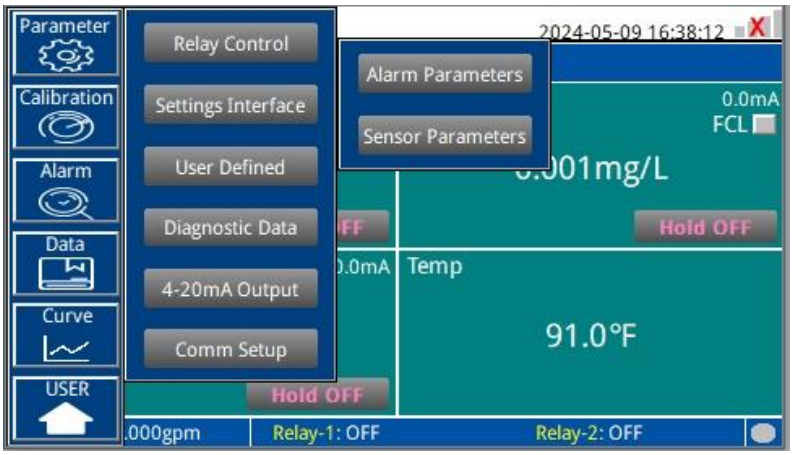


Figure. 22 –Setting Interface

Alarm Parameters Setting

Users can set the upper and lower alarm limits. Click **"Alarm Parameters"** to enter the alarm parameter settings. When the measured sensor value is lower than the set lower limit (the XX lower limit alarm) or when the measured value is higher than the set upper limit (the XX upper limit alarm), the corresponding sensor alarm will be displayed on the real-time monitoring screen. The user can also choose to turn the alarm display on or off at the top right of the corresponding parameter list.

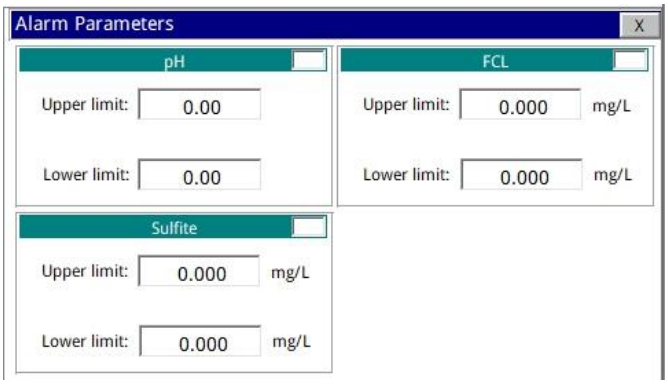


Figure. 23 - Alarm Parameter Setting

Sensor Parameters - Smoothing Factor Description & Adjustment

In **"Sensor Parameters"** within the "**Settings Interface"** field of the **"Parameter"** menu, users can set the smoothing coefficient for the sensor. Usually the oxidant concentration (e.g., free chlorine) is a very small signal, which is easily subject to external interference. The ST-765P-DCL Series sensors adopt a continuous smoothing and averaging algorithm to filter out these minor interferences. A suitable smoothing factor setting can allows users to obtain a high-quality measurement and suitable dynamic response based on the application needs. The smoothing factor setting regulates the speed of sensors response.

The higher the smoothing factor value, the faster the sensor response and the lower the interference and noise suppression enabling a more rapid response to any changes of the real value. The lower the smoothing factor value, the slower the sensor response and the better the interference and noise suppression, but the slower the response to the real value change.

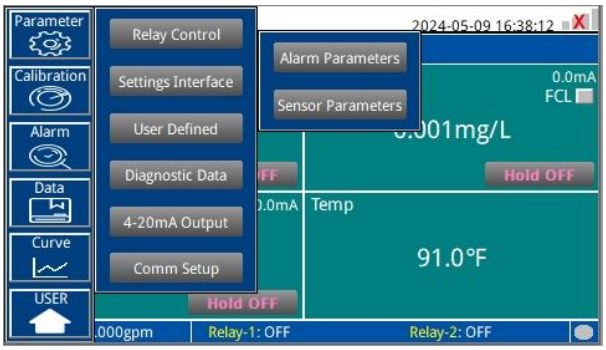


Figure. 24 - Settings & Sensor Parameters Interface

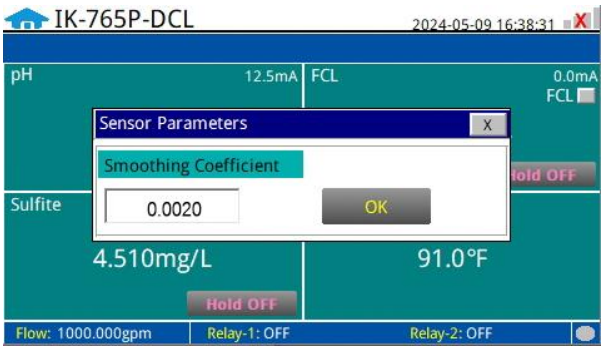


Figure. 25 - Smoothing Coefficient

See the next page for Smoothing Factor settings chart.

Pyxis Lab uses the term "T90" when the measured value of the sensor reaches 90% of the true value to describe the speed of the sensor response in seconds. The default smoothing factor of ST-765P-DCL Series sensor is **0.002 (T90≈4 minutes)**. The available setting range of the smoothing factor is 0.001 to 0.9. The following table outlines the comparison between the smoothing factor and T90 for the ST-765P-DCL Series sensor and should be used if considering an adjustment to the smoothing factor settings.

Smoothing Factor	T90 (Seconds)
0.1	5.5
0.09	6
0.08	7
0.07	8
0.06	9.25
0.05	11.25
0.04	14
0.03	19
0.02	28.5
0.01	57.25
0.009	63.75
0.008	71.75
0.007	82
0.006	97.5
0.005	114.75
0.004	143.5
0.003	191.5
0.002	287.5

$$T_{90} \approx 0.538 * Smooth\_factor^{-1.013}$$

NOTE *The smoothing coefficient is not available when the sensor is in calibration mode.*

7.8.3. User Defined Settings

The **“User Defined”** setting function allows users to assign a customized name, unit of measure and analyzer type used to any of the ST-765P-DCL Series sensor channel inputs displayed on the IK-765P-DCL.

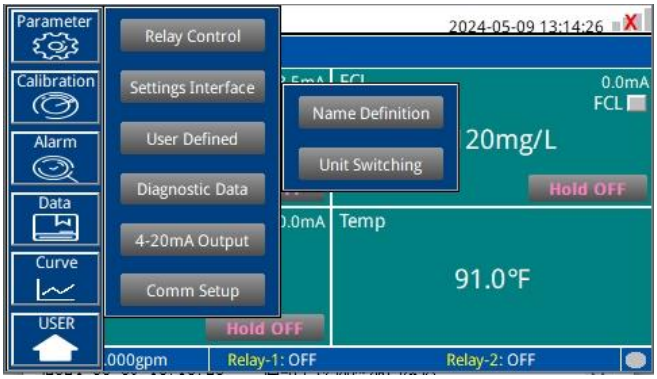


Figure. 26 – User Defined Settings

Parameter Name Definition

Click the orange dialog box to customize the sensor name.

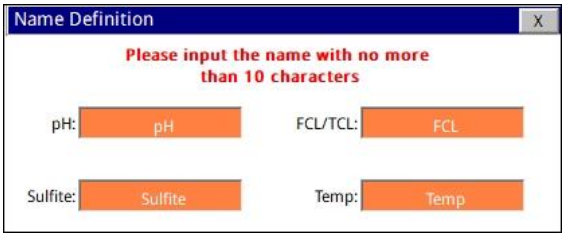


Figure. 27 - Name Definition

Unit of Measure Switching

Users can change the unit of temperature and flow rate in **"Unit Switching"**.

Figure. 28 - Unit Switching

7.8.4. Diagnostic Parameters for Troubleshooting Support

Click **"Diagnosis Parameters"** to enter the diagnosis page. In the diagnosis page, the raw data measured by the probe is displayed. To help troubleshooting possible issues with the probe, please take an image of this data when the probe is placed in a clean water (tap water or deionized water), in a standard, and in the sample that the probe is intended for. These images may be sent to service@pyxis-lab.com for troubleshooting support.

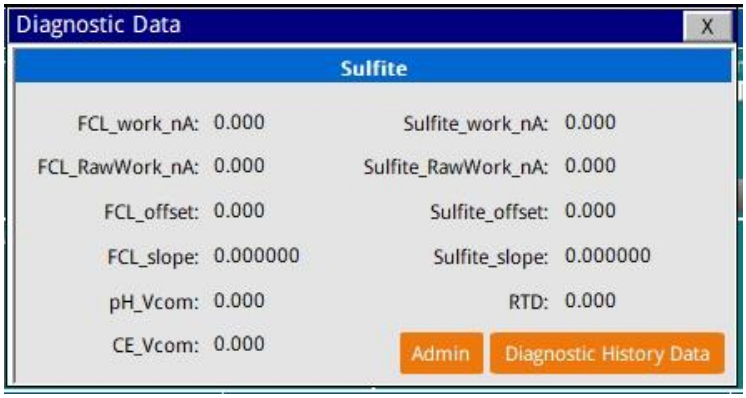


Figure. 29 - Diagnostic Parameters

Click on **"Diagnostic History Data"** in the lower right corner to access to view previous diagnostic parameters. Data can also be exported and made available for support from the Pyxis Lab Service Department.

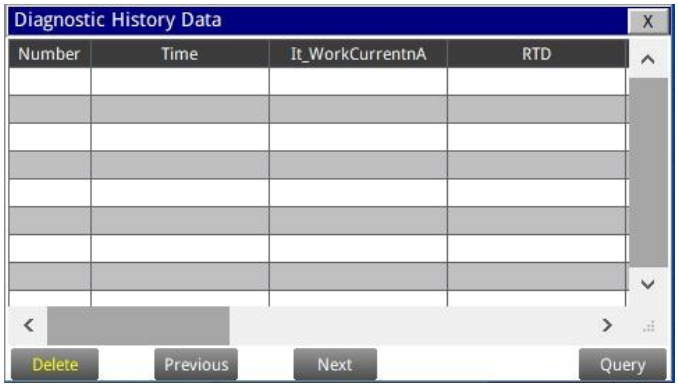


Figure. 30 - Diagnostic History Data

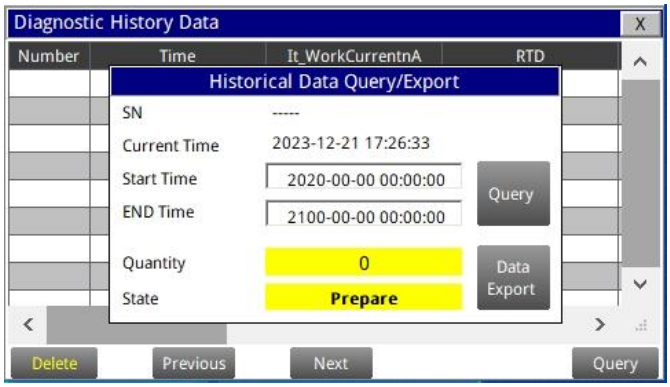


Figure. 31 - Diagnostic History Data Query

7.8.5. 4-20mA Output Parameter Settings & Adjustment

Click **"4-20mA Output"** to enter the 4-20mA output parameter setting interface. The 4mA and 20mA output values should correspond to the default lower and upper limits of the sensor range. These values may be adjusted by the user as desired. ***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. 32 - 4-20mA Output Setting

7.8.6. UC-80 Modbus Communication Settings

If the site desires to connect the UC-80 outputs to a DCS (Distributed Control System) for the purposes of information and process control, users can connect the master station device to the UC-80 through the HMI (Human Machine Interface) terminal and read the data according to the parameter register table provided in Section 8.1 of this manual)

Modbus RTU (RS-485) and **Modbus TCP** and **Ethernet Address** settings are preset but may be altered by the user as desired.

Figure. 33 - Modbus RTU

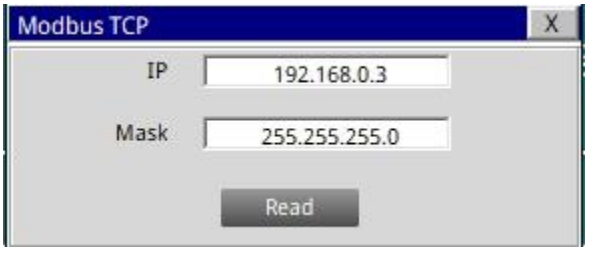


Figure. 34 - Modbus TCP

7.9. Sensor Calibration

Click on the **"Calibration"** button in the menu bar and select the sensor function desired for calibration.

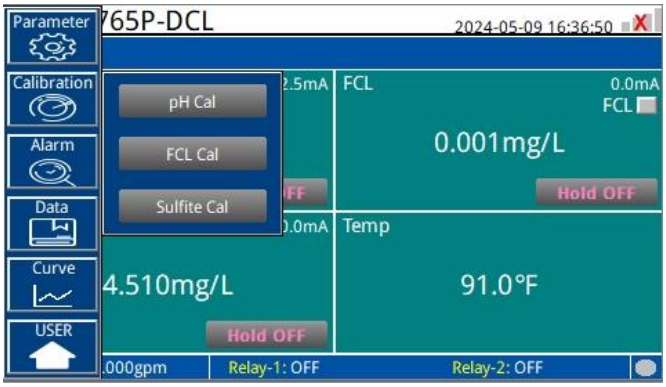


Figure. 35 - Sensor Calibration

7.9.1. pH Calibration

The pH function is thoroughly calibrated at the Pyxis Lab factory prior to shipment. After removing the sensor and checking it with a pH standard buffer solution in a beaker, if the sensor value has shifted, then the user may choose from single-point, two-point or three-point calibration to re-calibrate the pH portion of the ST-765P sensor as desired. Pyxis Combo pH 4-7-10 Calibration Standard Kit (P/N:57007) or similar is suggested.

NOTE *Click the Recovery button in the calibration interface of the sensor to restore the factory calibration settings if a user error is made during calibration and other operations. This will restore the factory settings of the sensor through this function.*

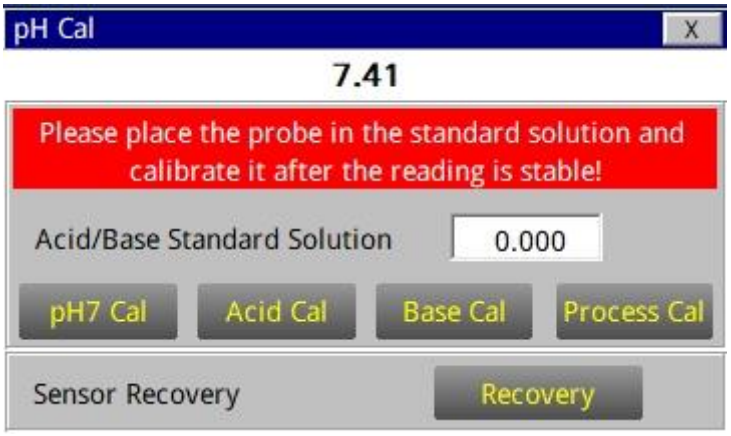


Figure. 36 - pH Calibration

Single Point pH Calibration

Remove the ST-765P-DCL sensor and rinse 3x with DI water ensuring there is no debris or fouling of the sensor electrode head. Submerge the sensor into a beaker with pH=7 buffer solution. Click **"pH7 calibration"**. A dialog box will pop up to confirm whether to perform this operation, click **"OK"** if the calibration operation is confirmed, if the calibration is successful the dialog box will show **"Calibration Success"**.

Figure. 37 - pH Calibration Prompt

A **Process Calibration** can be used if the pH calibration standard is not readily available for high, mid, and low calibration, or if there is a fixed deviation between the actual water sample and the true value after the user has done the calibration test. The pH process calibration is actually a correction (-0.5 to 0.5 pH units) made to the true pH value as measured by the sensor. ***NOTE*** *Anything outside this range will require a formal calibration using pH calibration standard solution.*

Two Point pH Calibration

Remove the ST-765P-DCL sensor and rinse 3x with DI water ensuring there is no debris or fouling of the sensor electrode head. Submerge the sensor into a beaker with pH=7 buffer solution. Click **"pH7 calibration"**. A dialog box will pop up to confirm whether to perform this operation, click **"OK"** if the calibration operation is confirmed, if the calibration is successful the dialog box will show **"Calibration Success"**.

After pH7 is successfully calibrated, you can choose Acid Calibration or Alkali Calibration for the second calibration point. If you choose Acid Calibration, clean beaker 3x with deionized water. Fill the beaker with pH=4 buffer solution. Enter the value 4 in the calibration value dialog box, and click **"Acid Calibration"**, then a dialog box will pop up to confirm whether to perform this operation. Click **"OK"** if the calibration operation is confirmed and the dialog box will show **"Calibration Successful"** if the calibration is successful. Similarly a pH=10 buffer solution can be selected for the second point calibration if desired.

Figure.38 - pH Calibration Value Input

Three Point pH Calibration

Remove the ST-765P-DCL sensor and rinse 3x with DI water ensuring there is no debris or fouling of the sensor electrode head. Submerge the sensor into a beaker with pH=7 buffer solution. Click **"pH7 calibration"**. A dialog box will pop up to confirm whether to perform this operation, click **"OK"** if the calibration operation is confirmed, if the calibration is successful the dialog box will show **"Calibration Success"**.

After pH7 is successfully calibrated, you can choose Acid Calibration or Alkali Calibration for the second calibration point. If you choose Acid Calibration, rinse the beaker 3x with deionized water. Fill the beaker with pH=4 buffer solution. Enter the value 4 in the calibration value dialog box, and click **"Acid Calibration"**, then a dialog box will pop up to confirm whether to perform this operation. Click **"OK"** if the calibration operation is confirmed and the dialog box will show **"Calibration Successful"** if the calibration is successful.

After successful Acid Calibration, select pH=10 for Alkali Calibration. Rinse the beaker 3x with deionized water. Fill the beaker with pH=10 buffer solution. Enter the value 10 in the calibration value dialog box, and click **"Alkali Calibration"**, then a dialog box will pop up to confirm whether to perform this operation. Click **"OK"** if the calibration operation is confirmed and the dialog box will show **"Calibration Successful"** if the calibration is successful. The three-point calibration is completed.

7.9.2. Oxidizer Calibration

The oxidizer measurement module of the ST-765P-DCL sensor is thoroughly calibrated at the Pyxis Lab factory according to the specific oxidant being measured.

To calibrate the sensor, the user can perform a Single-Point or Two-Point calibration according to the requirements of the application. (USEPA-334.0 / ISO-7393 compliant methodology).

Single Point Oxidizer Calibration (In-Situ)

Use a portable or laboratory colorimeter (ie. Pyxis OxiPocket SP-200, SP-208, SP-800 or similar) to test the oxidizer concentration value of the active (flowing) water sample in the IK-765P-DCL flow reservoir. DPD methodology is recommended. Once you have tested and confirmed the oxidizer concentration value in the active (flowing) flow reservoir, enter the test result value of the colorimeter into the calibration screen in the **Process Calibration**. ***IMPORTANT NOTE*** *the label name of oxidizer being measured will be displayed in the upper left corner of this screen based on the model of IK-765P-DCL and ST-765P-DCL sensor format (ie. FCL for Free Chlorine and TCL for Total Chlorine)* Once the measured oxidizer value has been entered, click **"Process Calibration"**. A dialog box will pop up to confirm whether to perform this operation. If the calibration operation is confirmed, click **"OK"**, and if the calibration is successful, the dialog box will show **"Calibration Success"**.

NOTE *Click the Recovery button in the calibration interface of the sensor to restore the factory calibration settings if a user error is made during calibration and other operations. This will restore the factory settings of the sensor through this function.*

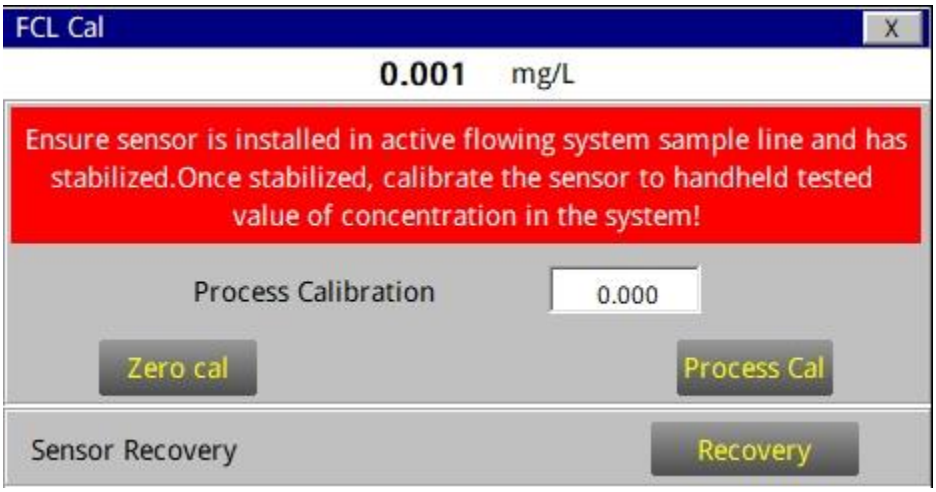


Figure. 39 – Free Chlorine Calibration of ST-765P-FCL

Two Point Oxidizer Calibration

NOTE *Under normal operational use of the ST-765P Series sensor, Pyxis Lab does not suggest a Zero-Point calibration by the user and the preprogrammed factory zero should remain unaltered. Only Slope calibration is recommended as a standard practice. A zero calibration is recommended only after the user alters from FCL to TCL measurement format.*

Zero-Point Calibration Procedure:

If a zero calibration is necessary, close the water inlet valve and remove the ST-765P-DCL sensor and rinse 3x with DI water ensuring there is no debris or fouling of the sensor electrode head. Submerge the sensor into a beaker filled with Pyxis Zero Oxidizer Calibration Solution (P/N:21022) or with 100µS/cm Conductivity Standard Solution. Either will work. Wait for the ST-765P-DCL sensor oxidizer value to stabilize on the touch-screen display. Sensor stabilization should occur within few minutes. Click **"Zero Calibration"** and a dialog box will pop up to confirm whether you desire to perform this operation. Click **"OK"** to confirm the calibration operation. If the calibration is successful, the dialog box will show **"Calibration Success"**. The sensor is now zero-calibrated to the known zero calibration solution.

Slope-Point (Process) Calibration Procedure:

After successful zero calibration, insert the ST-765P-DCL Series sensor back into the Tee and open the sample water supply valve allowing the sensor to read and stabilize after a few minutes of observation while the sensor is exposed to active flow of 200-800mL/min in the Tee. Use a portable or laboratory colorimeter (ie. Pyxis OxiPocket SP-200, SP-208, SP-800 or similar) to test the oxidizer concentration value of the active (flowing) water sample in the IK-765P-DCL flow reservoir. DPD methodology is recommended. Once you have tested and confirmed the oxidizer concentration value in the active (flowing) flow reservoir, enter the test result value of the colorimeter into the calibration screen in the **Process Calibration**. ***IMPORTANT NOTE*** *the label name of oxidizer being measured will be displayed in the upper left corner of this screen based on the model of IK-765P-DCL and ST-765P-DCL sensor format (ie. FCL for Free Chlorine and TCL for Total Chlorine).* Once the measured oxidizer value has been entered, click **" Process Calibration "**. A dialog box will pop up to confirm whether to perform this operation. If the calibration operation is confirmed, click **"OK"**, and if the calibration is successful, the dialog box will show **"Calibration Success"**.

NOTE *Click the Recovery button in the calibration interface of the sensor to restore the factory calibration settings if a user error is made during calibration and other operations. This will restore the factory settings of the sensor through this function.*

7.9.3. Sulfite Calibration

NOTE *Under normal circumstances, the ZERO calibration of the ST-765 series sensor is not recommended or required, Pyxis Lab suggests High calibration only, unless otherwise directed via Pyxis Lab technical support team. Please refer to the High calibration procedure section for details. A zero calibration is recommended only after the user alters from FCL to TCL measurement format.*

Zero-Point Calibration Procedure:

If a zero calibration is necessary, close the water inlet valve and remove the ST-765P-DCL sensor and rinse 3x with DI water ensuring there is no debris or fouling of the sensor electrode head. Submerge the sensor into a beaker filled with Pyxis Zero Oxidizer Calibration Solution (P/N:21022) or with 100µS/cm Conductivity Standard Solution. Either will work. Wait for the ST-765P-DCL sensor oxidizer value to stabilize on the touch-screen display. Sensor stabilization should occur within few minutes. Click **"Zero Calibration"** and a dialog box will pop up to confirm whether you desire to perform this operation. Click **"OK"** to confirm the calibration operation. If the calibration is successful, the dialog box will show **"Calibration Success"**. The sensor is now zero-calibrated to the known zero calibration solution.

Slope-Point (Process) Calibration Procedure:

While the sensor is exposed to active flow of 200-800mL/min in the Tee. Enter the Sulfite concentration has been determined by the titration or dropper method (i.e. Pyxis Sulifte Dropper Kit - P/N TK35290-Z) and ensure that the sensor reading has been stable for at least 10 minutes before calibration, click the **"Process Calibration"** button to start the Process calibration. If the calibration is successful, the dialog box will display **"Calibration Successful"**.

NOTE *Click the Recovery button in the calibration interface of the sensor to restore the factory calibration settings if a user error is made during calibration and other operations. This will restore the factory settings of the sensor through this function.*

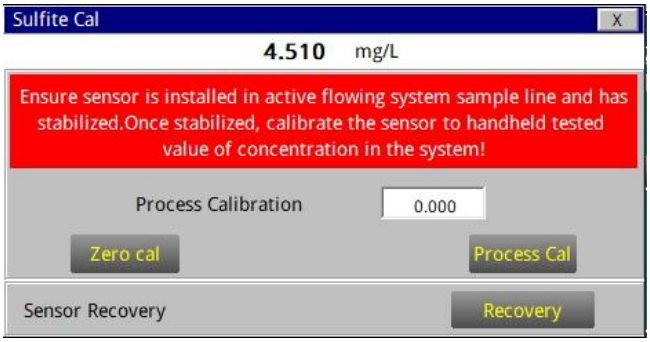


Figure. 40 - Sulfite Calibration

7.10. Alarm View

Click the **"Alarm View"** button on the main screen to enter the alarm view screen.

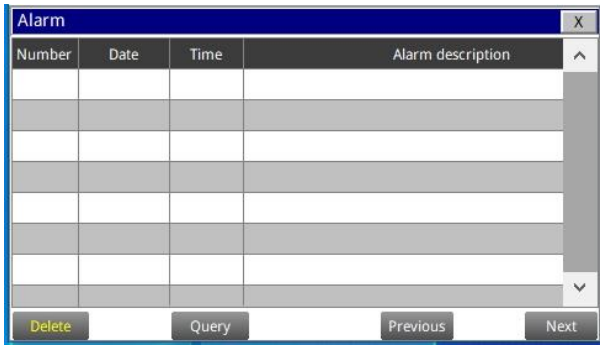


Figure. 41 - Alarm View

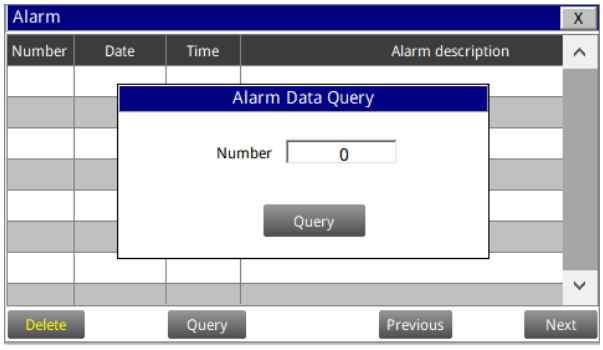


Figure. 42 - Alarm Data Query Screen

In this screen users can browse all logged alarms. Drag the right scroll bar up and down to view the history of alarms. Click **"Previous"** and **"Next"** to advance to the next page. Click **"Query"** then enter the alarm number in the pop-up box to query that alarm. The Delete button in the lower left corner will delete all alarm records. After clicking delete, you must exit the screen and reenter before the historical data within the data report will be cleared.

7.11. Historical Data – Query, View & USB Download

Click on **"Data"** to view historical data and calibration logs.

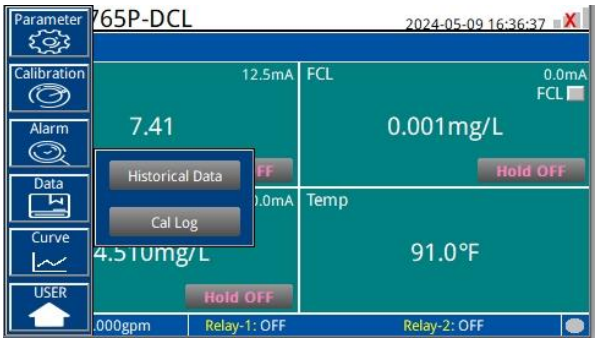


Figure. 43 – Data

Historical Data

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

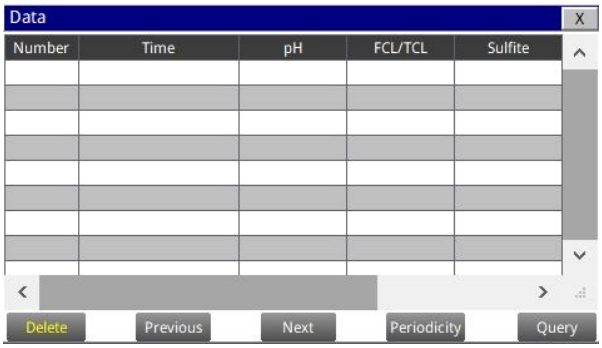


Figure. 44 - Historical Data Screen

In the data report, the user can view the stored data of all parameters. The system records sensor readings every 4 seconds by default but this can be edited by the user if desired. 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 up to 100,000 data entries. New data will overwrite the previously saved data after recording 100,000 data entries. The user can click the **"Periodicity"** button to change the data recording time interval. Click **"Delete"** in the lower left corner. After entering the retention time, click the **"Delete"** button to clear all historical data within the retention time range.

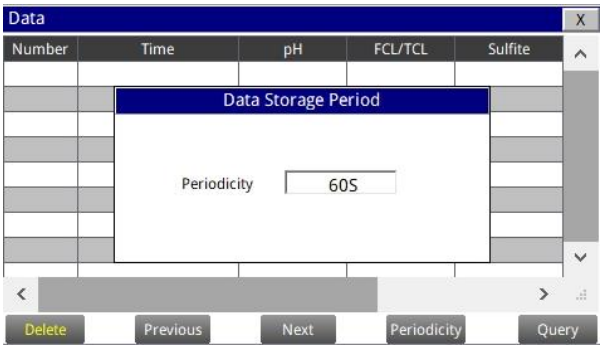


Figure. 45 - Data Storage Cycle Time Setting Figure.

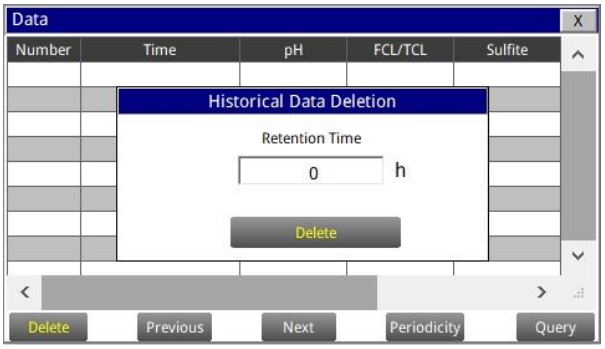


Figure. 46 - History Data Deletion Screen

Click the **"Query"** button 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 must be filled in exactly and completely according to the system time format of Year / Month / Day / Hours / Minutes / Seconds.*

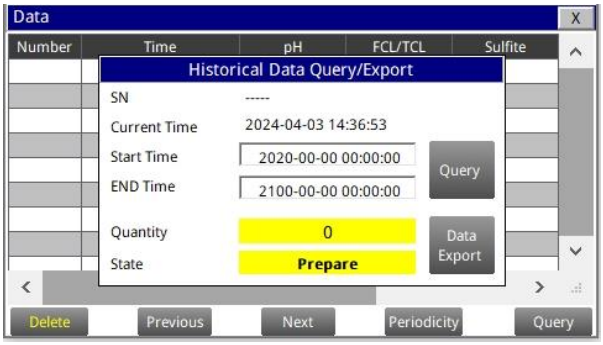


Figure. 47 - Historical Data Query and Export Screen

Insert a USB disk behind the HMI display screen and enter the time range of the data to be exported in the query area. Click on the **"Data Export"** to download the data to the USB disk. The data quantity will be shown as a positive number if data export is successful. If the data export was not successful, please check whether the time format is correct. ***NOTE*** *Please be sure to use an empty (no saved files) FAT32 formatted USB disk with data capacity of 32-64GB.*

When a **Quantity** value appears, refer to the following table to troubleshoot the issue.

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

Calibration Log

The calibration log can be viewed in the calibration log interface, and when the export operation is performed, the diagnostic parameters, historical data, and calibration log will be exported simultaneously.

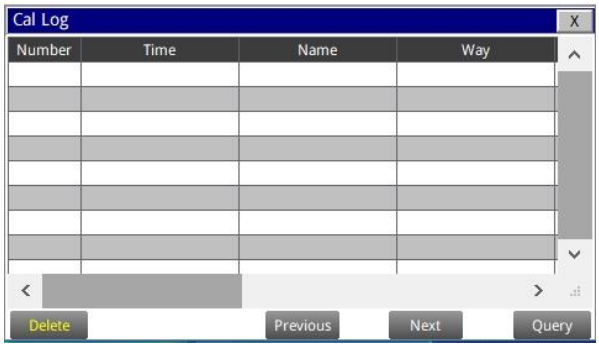


Figure. 48 - Calibration Log

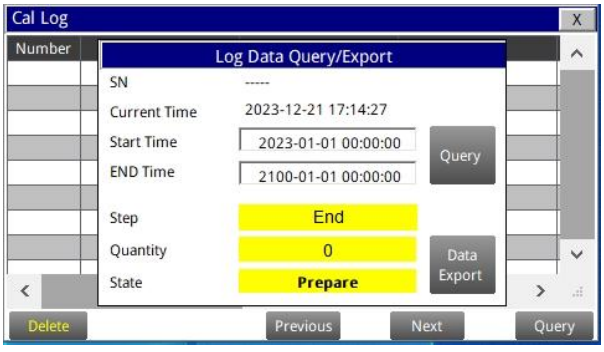


Figure. 49 - Calibration Log Query/Export

7.12. Historical Data Curves

Click the **"Historical Curve"** button in the menu bar to enter the trend curve interface. You can click the buttons below the X-axis to browse and view the values in a different time range. Click on Y-axis Range to change the minimum and maximum Y-axis values for a proper range.

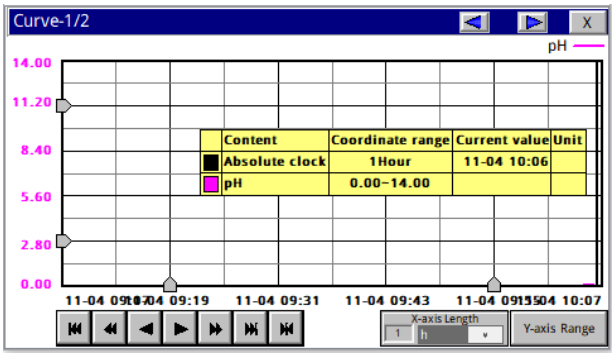


Figure. 50 - History Curve Screen 1-2

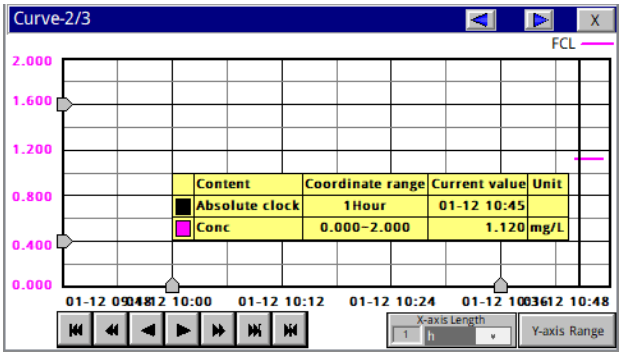


Figure. 51 - History Curve Screen 2-2

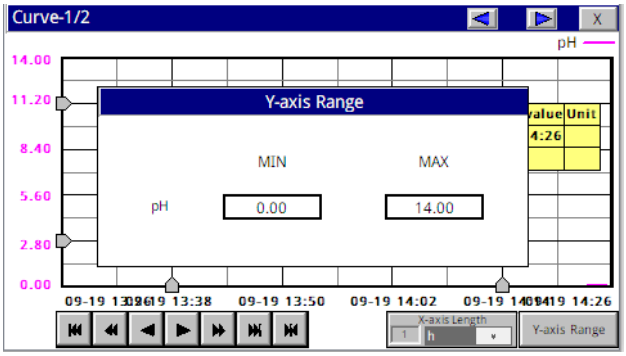


Figure. 52 - Y-axis Range Setting 1-2

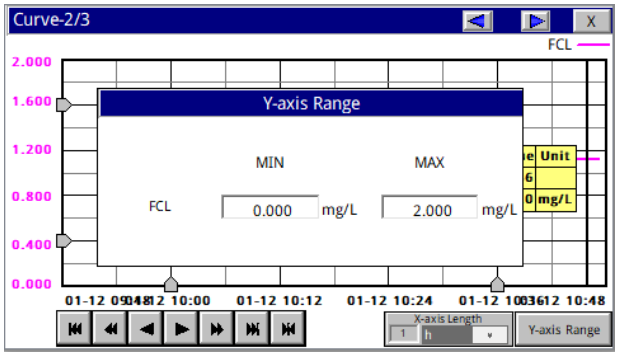


Figure. 53 - Y-axis Range Setting 2-2

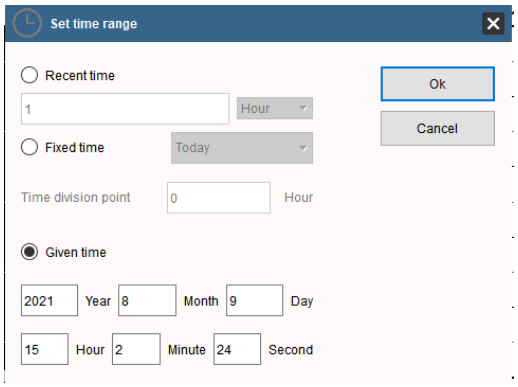


Figure. 54 - Time Setting Screen

Please refer to the button description overview for Historical Curve Function navigation.

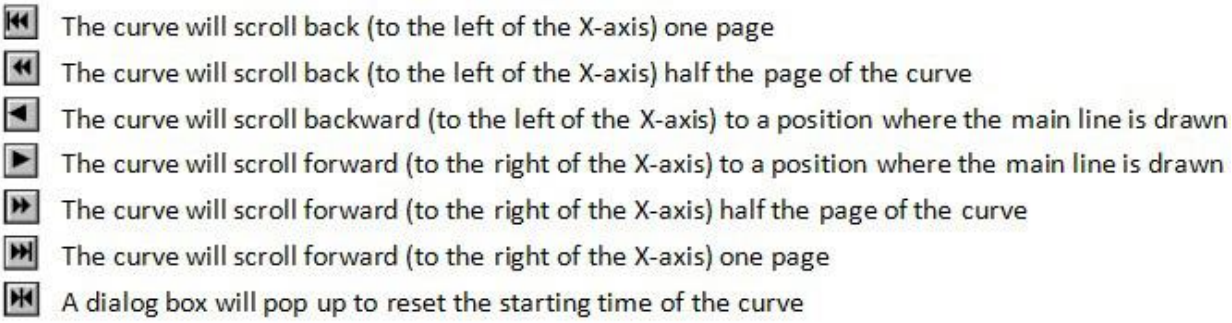


Figure. 55 - Button Function Review

7.13. User Management

Click the **"User"** button on the menu bar and then you can select **"Login"**, **"Logout"** and **"Manage"** operations.

Figure. 56 - User Management

Logout enables the user to log out of the logged-in state and only view the real-time readings, but cannot perform operations such as parameter settings. Click **“Manage”** to enter the user management interface, where you can add users, change passwords and other operations. Users can set their own user name and password and select the user group they belong to. Only users in the administrator group can set parameters such as calibration.

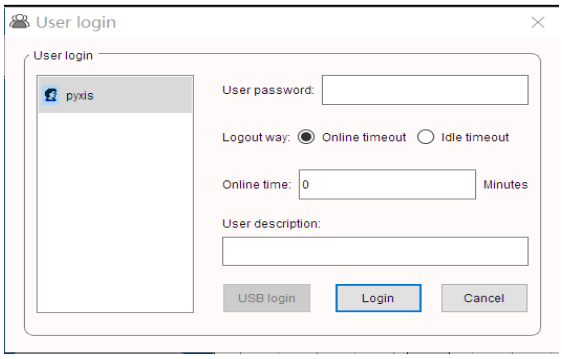


Figure. 57 - Modifying the User Screen

Modify Password: Select the user you want to change, then click **“Modify User”** button, enter the user's own password in the User Password column and Confirm Password column, and click **“Confirm”** to modify successfully.

NOTE *If you do not want to set the password, you can delete the password and save it.*

8. Modbus Register Table & Analyzer Maintenance

8.1. Modbus Correspondence Address

Serial Number	Definition	Address	Format	Mode	Unit	Note
1	pH	1	float	read-only		Data Format ABCD
2	Oxidizer (FCL/TCL)	3	float	read-only	mg/L	
3	Sulfite	5	float	read-only	mg/L	
4	Temp	7	float	read-only	°C/°F	
5	Flow	9	float	read-only	gpm mL/min	
6	FCL lower limit alarm	11	uint	read-only		0: Normal 1: Alarm
7	FCL upper limit alarm	12	uint	read-only		
8	pH lower limit alarm	13	uint	read-only		
9	pH upper limit alarm	14	uint	read-only		
10	Sulfite lower limit alarm	15	uint	read-only		
11	Sulfite upper limit alarm	16	uint	read-only		
12	The communication of the FCL sensor is abnormal	17	uint	read-only		
13	The relay module communication is abnormal	18	uint	read-only		
14	The communication of the traffic collection module is abnormal	19	uint	read-only		
15	Communication between analog modules is abnormal	20	uint	read-only		
Communication Protocol: Standard Modbus-RTU						
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						

Table. 1 - Modbus Correspondence Address

8.2. Analyzer Operation and Preventative Maintenance

After the analyzer is installed by a qualified technician, it can begin to monitor water quality immediately. Upon powerup of the analyzer, the ST-765P-DCL Series sensor will always conduct a 5-minute electrode initialization process to prepare the bare-gold for service. During this time, the sensor will not read an oxidizer value. After this cycle, the sensor will begin reading the live oxidizer value. The IK-765P-DCL is designed to be simple to operate, but still requires some regular maintenance. Actual system maintenance may vary depending on the installation conditions and usage. Please refer to the table below as a general recommended maintenance schedule guideline. Little operator intervention is required during normal operation.

Required Services	Recommended Frequency	Procedure Location
Cleaning Inlet Water Filter Screen	Monthly or Cleaned As Needed	NA
Cleaning of Flow Reservoir & Electrode Head	Monthly or Cleaned As Needed	Section 9.2
pH Calibration	Every 6 Months or As Needed	Section 7.7.1
Oxidizer Calibration	Every 6 Months or As Needed	Section 7.7.2
Sulfite Calibration	Every 6 Months or As Needed	Section 7.7.3
EH-765-01 Electrode Head Replacement	Every 1-2 Years or As Needed	Section 9.1

Table. 2 - Maintenance Intervals

8.3. Instrument Alarms and Descriptions

Please refer to the instrument alarms and descriptions table when troubleshooting the IK-765P-DCL inline inspection system issues an alarm or indicates abnormal measurement data.

Alarms	Description	Symptoms	Solutions/Recommendations
pH / Oxidizer Sensor Communication Abnormalities	pH / Oxidizer Sensor without Communication	No pH and Oxidizer Measurements	Check the connection between the sensor and the circuit board. If the problem persists, contact Pyxis.
pH Upper Limit Alarm	pH above the Alarm Setting	Information Only	Compare with manual measurement readings. Check and clean line valves. Check that water flow is normal. Check that the sensor is clean.
pH Lower Limit Alarm	pH below the Alarm Setting	Information Only	
Oxidizer Upper Limit Alarm	Oxidizer above the Alarm Setting	Information Only	
Oxidizer Lower Limit Alarm	Oxidizer below the Alarm Setting	Information Only	
pH/Oxidizer Calibration Failure Code 2		Calibration Failure	Check whether the water flow is normal, whether the sensor is clean, whether the standard liquid is contaminated
pH/Oxidizer Calibration Failure Code 3	Standard Solution Value out of Range	Calibration Failure	
pH/Oxidizer Calibration Failure Code 5	Wrong Data Type for the Liquid Value	Calibration Failure	

Table. 3 - Common Alarms

9. Sensor Electrode Head Replacement Maintenance

9.1. Replacing pH and Oxidizer Electrode Head

The EH-765-01 electrode head (P/N: 27918) of the ST-765P-DCL Series sensors can be replaced when the original electrode heads have reached the end of their working life. The typical working life of the electrode can be as long as 2-years under normal operating conditions. Please refer to the following steps to replace the electrode head of your sensor.

1. Isolate the sensor by turning off sample flow. Remove and make sure there is no water on the sensor.
2. Hold the sensor main body with one hand and use the other hand to twist the locking ring counterclockwise until the front end of the black electrode is completely unscrewed, as shown in Figure 58-2. ***NOTE* The sensor electrode head should be oriented towards the ground to avoid residual water getting into the sensor.**
3. Thoroughly wipe the electrode head with a dust-free cloth or paper-towel then pull out the electrode head as shown in Figure 58-3.
4. Gently loosen the electrode plug connector and remove the electrode head, as show in Figure 58-4.
5. To install the new electrode head, please use the mounting hook to securely plug in the wiring connector, as shown in Figure 58-5. ***NOTE*** **Before connecting the electrode head, please make sure that the new electrode head gasket is properly installed at the base of the electrode head thread to ensure a watertight seal, as shown in Figure 58-5.**
6. Then reconnect, insert the new electrode head into the main sensor housing and ensure that the two alignment protrusions on the electrode head are aligned with the notches in the sensor body housing, as shown in Figure 58-6. Then twist the lock ring of sensor in a clockwise direction until the threads of the electrode head completely enter the sensor housing as shown in Figure 58-1. ***NOTE* Be sure to return your sensor operation to Flow Interlock Auto Mode (Section 9.6.1)**

Figure. 58 - Replacing EH-765-01 pH and Oxidizer Electrode Head

9.2. Sensor Cleaning with Pyxis Probe Cleaning Kit

In the event of heavy inorganic deposition on the ST-765P-DCL Series electrode head, users may conduct an off line chemical cleaning using the Pyxis Probe Cleaning Kit (P/N: SER-01). Remove the ST-765P-DCL Series sensor from the reservoir and inspect the internal components of the flow reservoir and brush head with a flash light. If necessary flush thoroughly with clean water until adequately clean. Soak the lower half of the ST-765P-DCL Series sensor in 100 mL Pyxis Probe Cleaning Solution for 10-15 minutes. Gently wipe the sensor electrode head with the provided Q-tips. If the surface is not entirely clean, continue to soak the sensor for an additional time until clean. Rinse the sensor with distilled water. Pyxis Lab Probe Cleaning Kit can be purchased at our online Estore/Catalog at https://www.pyxis-lab.com/product/inline-sensor-cleaning-kit/

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