

Pyxis®

nanoFLOW™

Sample Water Flow Control Module

with FS-100 Ultrasonic Flow Meter + Regulating Valve



Pyxis Lab® Inc.

1729 Majestic Dr. (Suite 5)

Lafayette, CO 80026

www.pyxis-lab.com

START-UP GUIDE

Catalog

1. Product Description	3
1.1 Features	3
2. Specifications	4
3. Unpackaging The Nano-Flow	4
4. Replacement / Optional Accessories	5
5. Dimensions	6
6. Electrical Connection	7
7. FS-100 Operation	8
7.1 Key Function	8
7.2 Main Screen	8
7.3 Trend Chart	9
7.4 Alarm Settings	9
7.5 Set the Operating Mode for the FS-100	10
7.6 Communication Settings	10
7.7 Calibration	11
7.7.1 Two-Point Calibration	11
7.8 Regulating Valve Output - 4-20mA Span	12
7.9 Flow Measurement Output - 4-20mA Span	12
7.10 Display Screen Orientation Settings	13
7.10 Device Information	13
8. Communication using Modbus RTU	14
9. Order Details	14

1. Product Description

The Pyxis Nano-Flow Control Module is a stand-alone water flow measurement and control solution designed for use in critical cooling and process-water sample flow applications. This unique platform provides precise flow measurement and regulation and may be installed upstream of inline sensors in water systems that are subject to pressure and flow variation challenges. The Nano-Flow module is offered in a convenient and easy to integrate micro-panel mounted format for rapid installation, setup and maintenance. The micro-panel design is equipped with the Pyxis FS-100 ultrasonic flowmeter with display, which directly controls a pre-mounted regulating valve through a simple to program user interface.

The new 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, and controlled water flow based on user setpoint within the sensor itself.

The flow control module also incorporates an electric box for panel power supply, internal regulating valve control and FS-100 output flow signal wiring with both 4-20mA and RS-485 Modbus for connection to any OEM controller, PLC or DCS.

1.1 Features

- Panel Mounted for Simple Installation and Startup
- Ultrasonic Flow Meter with Local Display capable of 0 – 3,000 mL/minute measurement
- Pre-wired regulating valve controlled via user programmed ultrasonic flow meter setpoint
- Dual Flow Meter Signal Outputs: isolated 4–20 mA and RS-485 Modbus
- Real - time flow rate trend chart
- Built-in temperature sensor automatically compensates the effect of temperature on flow-rate
- Monitor and display instantaneous flow rate and accumulated volume
- Large color LED indicator for operational state indication



Nano-Flow Control Module (P/N 21329)

2. Specifications

Item	Nano-Flow Control Module
P/N	21329
Supported Fluid	Liquids (water)
Supported Fluid Temperature	4°C ~ 49°C (40°F ~120°F)
Wet End Material of Construction	Regulating Valve: CPVC + PTEE + Fluorine rubber FS-100: UPVC + PPS Plastic + GF Polymer + Epoxy+ Fluorine rubber
Sample Inlet Pressure	7.25 – 100 psi (0.01 – 0.690 MPa)
Sample Inlet /Outlet	1/2 - inch NPT
Flow Path Inner Diameter	5mm
FS-100 Rated Flow Range	0 – 3,000 mL/min
FS-100 Resolution	1mL/min
FS-100 Maximum Error	± 1% of the value
FS-100 Display	1.44" Color 128 x128 Resolution
FS-100 Analog Output ⁽¹⁾	1# 4-20mA for flow rate 2# 4-20mA for regulating valve (<i>internally connected</i>)
FS-100 Digital Output	RS-485
Regulating Valve Control Methodology	4-20mA from FS-100
Panel Power Supply	24V DC, 6W
Panel Operation Temperature	32 – 122 °F (-0 – 50 °C)
Panel Storage Temperature	-4 – 158 °F (-20 – 70 °C)
Panel Dimension (H x W x D)	300mm H x 180 mm W x 108mm D
Panel Approximate Weight	~ 1.8 kg
Humidity	5 – 95% No Condensation
Protection	IP-65 Panel-Display / IP-67 Regulating valve
Regulation	CE / RoHS

NOTE (1) The flow control module supports only one 4-20mA (flow rate) output for connection to another device. A second 4-20mA output is internally connected and used to control the regulating valve. (2) Specifications are subject to change without notice. Contact service@pyxis-lab.com for any questions.

3. Unpackaging The Nano-Flow

The Nano-Flow Control Module package includes the following items:

- **Nano-Flow Control Module (P/N: 21329)**
- Includes one pre-mounted/prewired regulating valve
- Includes electric Box
- Includes one FS-100 ultrasonic flowmeter (P/N: 54200)
- Includes one CE-FE-4.9 Flying Lead Cable with Female 7-Pin Adapter – 1.5m/4.9 feet (P/N: 50762)
- Includes one MA-AC-7US 110VAC-24VDC Cable w/Plug & Female 7-Pin Adapter – 1.5m/4.9 feet (P/N: 26398)

4. Replacement / Optional Accessories

The following optional and replacement accessories are also available from Pyxis Lab.

Item Name/Description	P/N
FS-100 ultrasonic flowmeter Replacement	54200
Nano-Flow Motorized Valve Replacement	21972
Nano-Flow Electric Control Box Replacement	22123
CE-FE-4.9 Explosion Proof Flying Lead Cable with Female 7-Pin Adapter 1.5m (4.9ft)	50762
MA-AC-7US Power outlet adapter cable with USA/Type A plug 110VAC-24VDC	26398
MA-AC-7EU Power outlet adapter cable with EU/DIN plug 230VAC-24VDC	28787

5. Dimensions

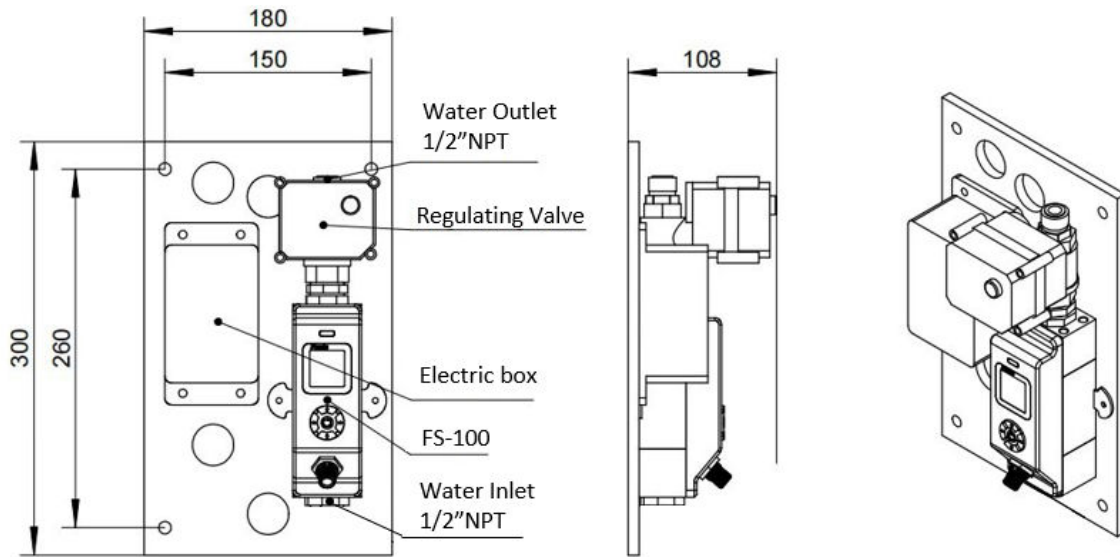


Figure 1 - Panel Dimensions(mm)

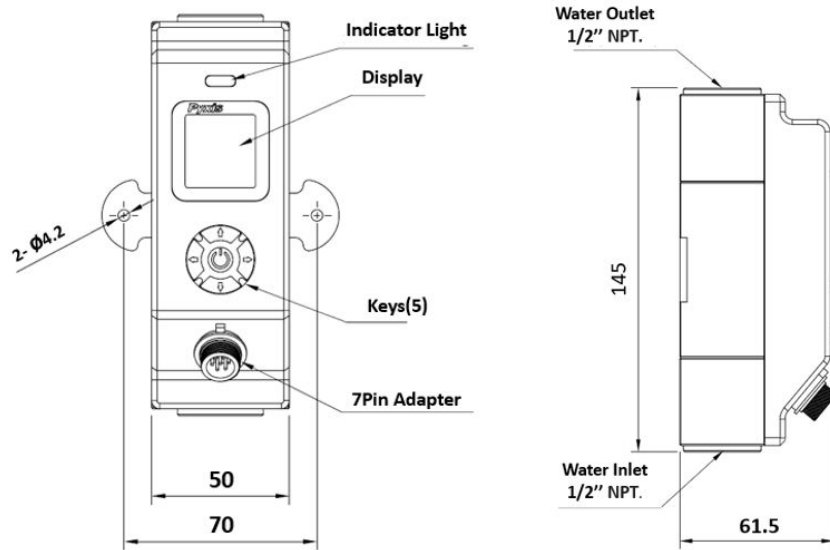
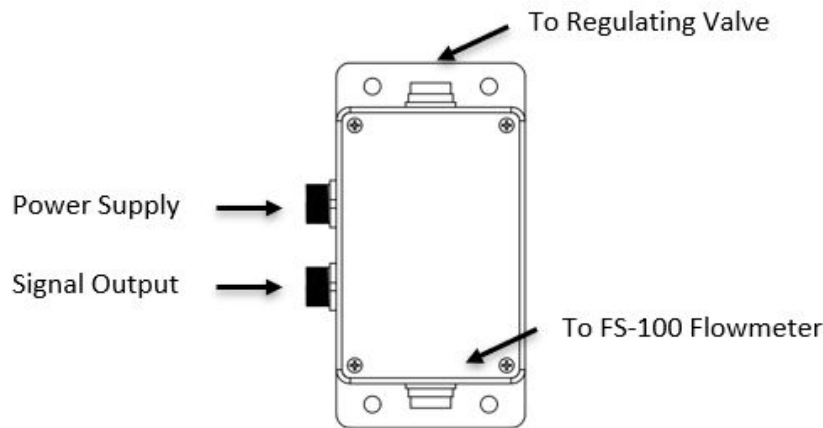


Figure 2 - FS-100 Dimensions(mm)

6. Electrical Connection

The flow control module contains an electrical box for panel power supply (top left adapter), internal regulating valve control (top center adapter) and FS-100 output flow signal wiring (bottom left adapter). The electrical box provides 1x 4-20mA output signal and 1x RS-485 signal of the FS-100 flowmeter to be PASSED-THROUGH to another receiving device. Users should connect with the 7-Pin Explosion-proof Female Adapter / Flying Lead Cable (1) that is provided with each Nano-Flow Control Module and refer to the wiring table below for proper wiring of flow signal and 24VDC power (if desired) to receiving device. ***NOTE*** Each Nano-Flow comes with one **MA-AC-7US** (110VAC to 24VDC) power supply cable with USA-Plug Type A for direct power from outlet, eliminating the need to power via 24VDC flying lead wires in bottom adapter. For EU power supply cable Pyxis offers **MA-AC-7EU** (220VAC to 24VDC) power supply cable with EU-DIN plug as an optional accessory. Please refer to Section 4.0 for order details.



Power Supply from An Outlet (TOP LEFT 7-PIN ADAPTER)

Power Cable Provided	Description
MA-AC-7US (P/N 26398)	110VAC-24VDC Type A Plug / 7Pin Female

NOTE Only use MA-AC-7US if you are not powering via 24VDC flying lead wires from bottom adapter.

Signal Output and Power Supply via 24VDC Flying Lead (BOTTOM LEFT 7-PIN ADAPTER)

Wire Color	Designation
Red	24VDC+ (6watts)
Black	24VDC- & 4-20mA – (Common Ground)
White	4-20 mA+ for Flow
Green	Not Used
Blue	RS-485 A
Yellow	RS-485 B
Silver	Earth Ground

NOTE the CC-FE-4.9 Flying Lead Wire Offers 24VDC Power if user doesn't desire to use MA-AC-7US outlet power cable.

Default 4-20mA Signal Pass-Through From FS-100 Flowmeter		
Unit of Measure	4mA Value	20mA Value
Flow Rate (mL/min)	0 mL/min	3000 mL/min

7. FS-100 Operation

7.1 Key Function

⏏ Enter Key

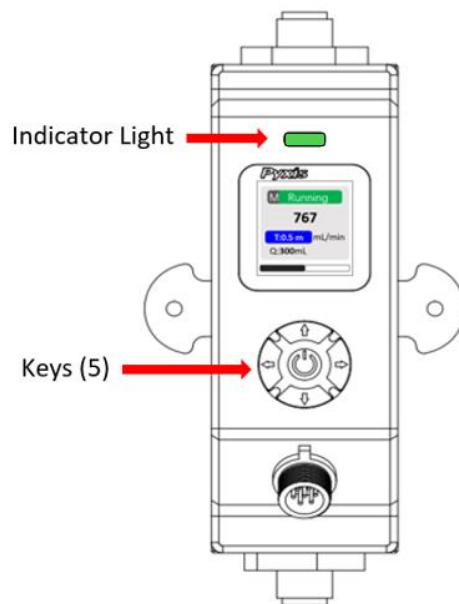
- Main screen → Setting Menu.
- Confirms and saves the input values.

◀▶ Left / Right Key

- Main screen → Trend Chart.
- Move the cursor to the left or right.
- Turn pages on the screen.

▲▼ Up / Down Key

- To increase or decrease a displayed number value.
- Jump up and down in the operating menu.



LED Status Indicator

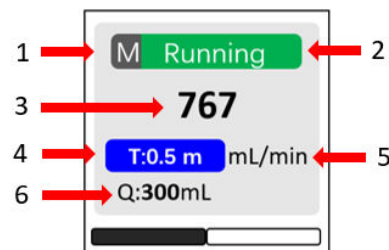
The status LED is used for a quick visualization of the flowmeter status.

LED Behavior	Status
Green	Normal Running
Red	Alarm Information

7.2 Main Screen

Main Screen Description

NO.	Description
1	Flow Detection Mode ⁽¹⁾
2	Working Status (same color as LED status indicator)
3	Flow Rate Value
4	Timer ⁽²⁾ (unit: auto range)
5	Unit of measured flow value
6	Accumulated Flow Value (unit: auto range)



(1) **R** = Average Flow Rate Mode / **M** = Instantaneous Flow Rate Mode / **C** = Flow Rate Control Mode

**NOTE* For C-Mode please refer to Section 7.5 for programming details.*

(2) The **Timer** feature is enabled when the FS-100 is powered on. It can be set by pressing the ▼ key.

- **Pause or Restart the Timer:** Press ▼ key momentarily and release.
- **Reset the Timer:** Press and hold ▼ key for about two seconds.

(3) Calculation of the accumulated flow and **Timer** work synchronously, i.e., when the **Timer** is pause, pause display value; when the timer is resume, normally display the value; when the **Timer** is reset, clear the value.

7.3 Trend Chart

From the main screen, Press ◀ or ▶ to the trend chart display. Flow values will be displayed as a line graph to show the real-time trend. Press ◀ or ▶ to return to the main screen.

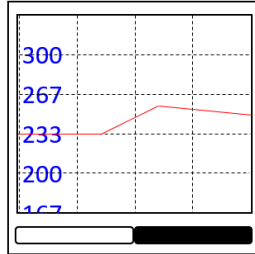


Figure 3

7.4 Alarm Settings

Press ◀ or ▶ in the setting menu and select [Alarm]. From Alarm settings screen, press ▲ or ▼ to adjust the displayed number, then press ◀ to move the cursor to “Yes”. ***NOTE*** To enable the alarm function, the Detection Time(s) must ≥ 1 second.

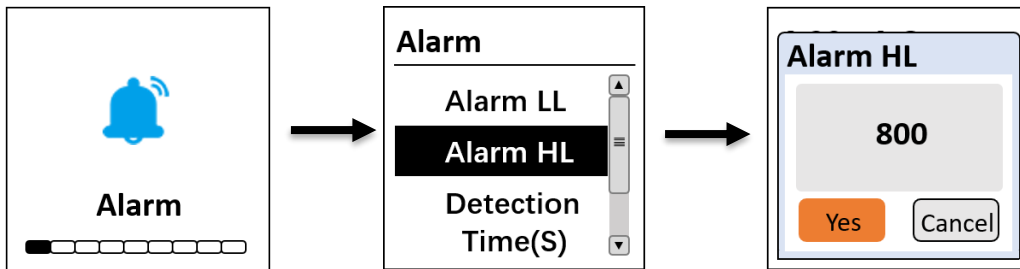


Figure 4

The Upper Alarm (Alarm HL) and Lower Alarm (Alarm LL) limit are constantly compared with flow rate value. Once the flow rate value exceeds the alarm upper limit or falls below the lower alarm limit, and the duration time is longer than the detection time, the main screen and LED indicator will display a red alarm status as shown in Figure 5.

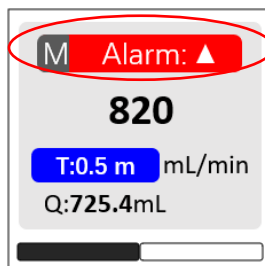


Figure 5

7.5 Set the Operating Mode for the FS-100

Press ◀ or ▶ in the setting menu and select **[Pattern]**. The following operating modes are available:

- **Flow Rate** = Display the average flow rate
- **Flow Meter** = Display the instantaneous flow rate
- **Flow Control** = Set a desired constant flow rate

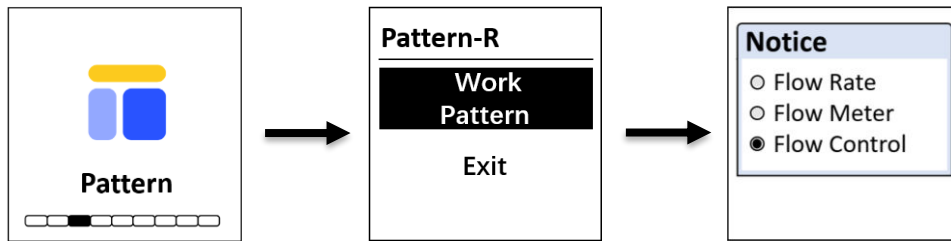


Figure 6

If the user selects **Flow Control** mode, a preset flow rate must be entered (Figure 7). The FS-100 will control the regulating valve according to the preset flow rate.

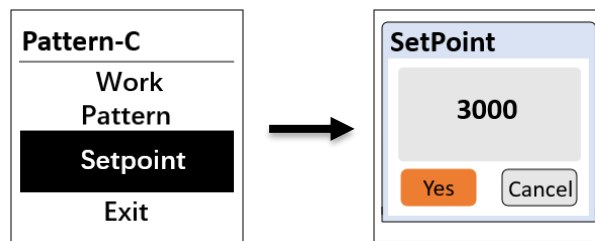


Figure 7

NOTE If the actual flow rate does not reach the preset flow rate, and duration time is longer than two minutes, the main screen and LED indicator will display red alarm status **Flow Control Err**

7.6 Communication Settings

Press ◀ or ▶ in the setting menu and select **[Com]** to modify communication parameters (Figure 8).

The following communication settings are available:

- **Modbus Address** (Range: 1~247)
- **Baud Rate** (Options: 9600 / 38400 / 57600 / 115200)
- **Parity** (Options: None / Odd / Even)

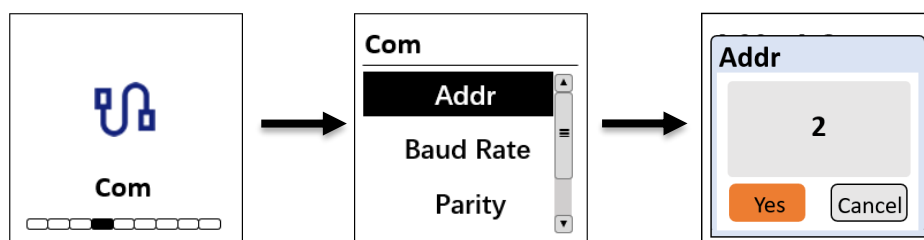


Figure 8

7.7 Calibration

During flow meter ZERO & SLOPE calibration, the FS-100 must be set to instantaneous flow mode. ***NOTE*** Please refer to Section 7.5 to set the operating mode for FS-100).

7.7.1 Two-Point Calibration

Zero Calibration: This function is used to correct the instantaneous flow rate to “ZERO”. ***NOTE*** To perform zero calibration the pipe must be filled with fluid and the fluid should not be moving.

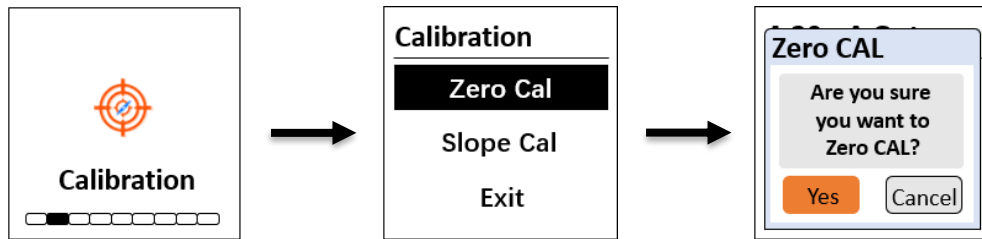


Figure 9.

Slope Calibration: This function is used to calibrate the accumulated flow value. Determine the accumulated flow value of the sample water over a period of time by using the electronic balance. The user can customize the sampling time to their preference.

1. Turn off the water valve and place the water outlet line in a beaker.
2. From the main screen, reset the Accumulated Flow Value (Q) to 0.00mL by pressing and holding the ▼ key for about two seconds.
3. Quick Press the ▼ key to restart the calculation of the accumulated flow value. Turn on the water valve and fill the beaker with water.
4. Navigate to Slope Calibration screen and enter the measured value of the shot amount as noted by the electronic balance (as grams). ***NOTE*** 1-mL of water weighs 1-gram.

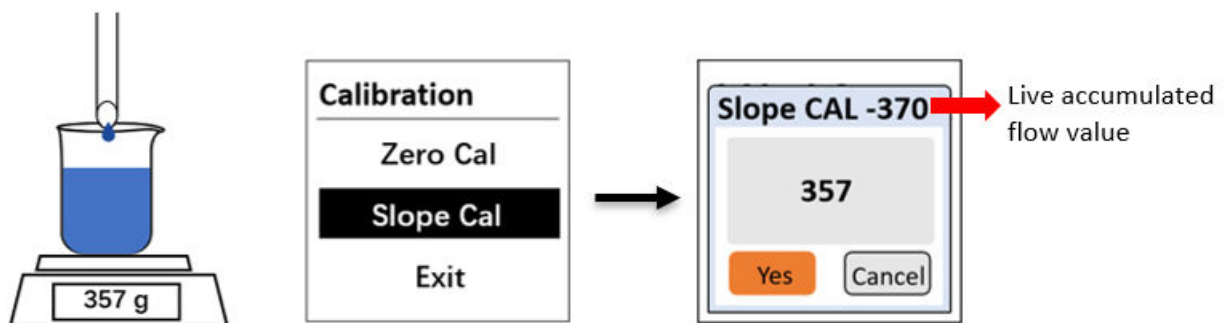


Figure 10.

5. If the calibration was successful, the interface will return a message “calibration succeed”.

7.8 Regulating Valve Output - 4-20mA Span

The FS-100 series flow meter controls the valve position of the regulating ball valve by outputting the 4-20 mA signal. After the user assigns a desired flow set point in **Flow Control (C)** mode, the FS-100 series will automatically calculate the error between the actual flow rate and the setpoint flow rate and adjust the appropriate 4-20mA output value through the preprogrammed PID algorithm to regulate the valve. This advanced capability and feature provides turn-key and real-time application use resulting in the sample flow rate infinitely close to the user programmed setpoint value. See process diagram below.

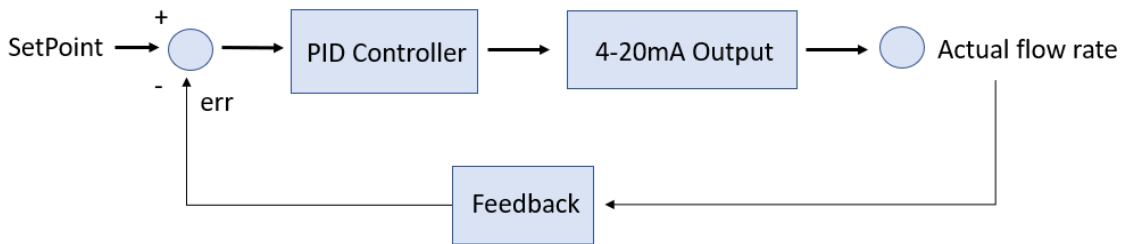


Figure 11

7.9 Flow Measurement Output - 4-20mA Span

Press ◀ or ▶ in the setting menu and select **[4-20mA Out]** to change the 4-20mA output corresponding to the flow rate. See Figure 12 for details. ***NOTE*** The default 4–20mA output of the FS-100 flowmeter is scaled as: 4mA = 0 mL/min, 20 mA = 3000 mL/min.

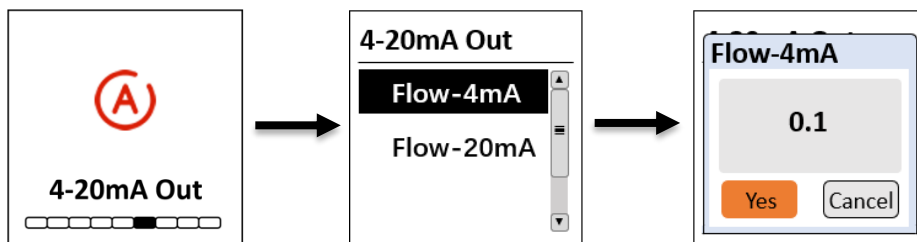


Figure 12

7.10 Display Screen Orientation Settings

Press ◀ or ▶ in the setting menu and select [**Screen**] to select the display orientation of the screen.

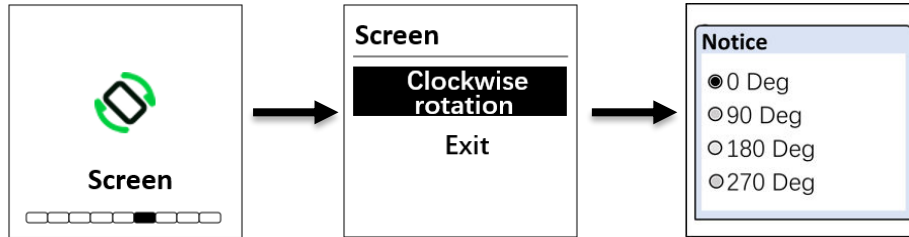


Figure 13

7.10 Device Information

Press ◀ or ▶ in the setting menu and select [**Info**]. This screen contains the device name, serial number, software version, and hardware version (Figure 14)

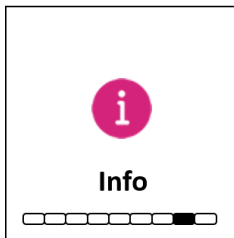


Figure 14 Device Information

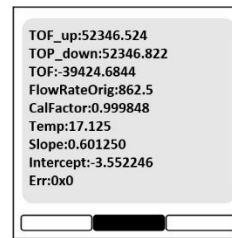
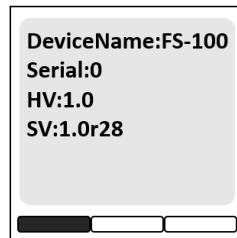


Figure 15 Diagnosis



Figure 16

Press ◀ or ▶ to turn the page. This screen information has no use for normal operation, but instead is used for device troubleshooting. Provide an image of both the **DEVICE INFORMATION** screen and the **DIAGNOSIS** screen when you contact Pyxis (service@pyxis-lab.com) for troubleshooting your device or call +1 (866) 203-8397 ext 2.

8. Communication using Modbus RTU

The FS-100 ultrasonic flowmeter is configured as a Modbus slave device. In addition to flow rate mL/min, many operational parameters, including warning and error messages, are available via Modbus RTU connection. Contact Pyxis Lab Customer Service (service@pyxis-lab.com) for more information.

General Communication Settings

Baud Rate	9600 bps
Data Bit	8-bit
Stop Bit	1-bit
Parity Check	Even
Bus Type	RS-485

Register Address of Communication Parameters (read-only)

Register Address	Type	Byte Order	Register Definition
46002	Float	CDAB	Flow Rate
46004	Float	CDAB	Temperature Value
46022	Float	CDAB	4-20mA for Flow
46018	Unsigned int 16	AB	Error Code

9. Order Details

Order Information

P/N

Nano-Flow Control Module (*Ultrasonic Flow Regulating Module Panel*) 21329

Optional / Replacement Accessories Information

P/N

FS-100 (*Ultrasonic Flow Meter with Display 0-3,000mL/Minute*) 54200

Nano-Flow Motorized Valve (*Replacement*) 21972

Nano-Flow Electric Control Box (*Replacement*) 22123

CE-FE-4.9 (*Flying Lead Cable with Female 7-Pin Adapter 1.5m-4.9ft*) 50762

MA-AC-7US (*Power outlet adapter cable with USA/Type B plug 110VAC-24VDC*) 26398

MA-AC-7EU (*Power outlet adapter cable with EU/DIN plug 230VAC-24VDC*) 28787