HANSEN TECHNOLOGIES

Bulletin P131
February 2025

Specifications, Applications, Service Instructions & Parts

SENTINEL™ SYSTEM ACTIVITY MONITOR

INTRODUCTION

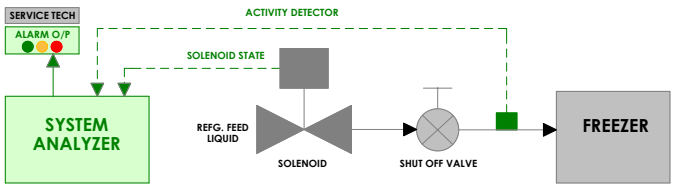
The Sentinel System Activity Monitor is a device which can confirm and compare desired state vs. actual state of refrigerant flow in an industrial refrigeration system. It can improve energy efficiency by promptly identifying valves that are not functioning properly, such as hot gas supply valves that remain partially open/bleed-by during normal refrigeration mode. It can also enhance safety by confirming liquid feed valves are closed completely before initiating hot gas defrost steps. In essence, Sentinel provides true condition feedback, not simply valve position feedback.

Sentinel consists of a specialty activity detector located downstream of a valve or series of valves being monitored to determine the presence of liquid or gas flow. It is paired with a solenoid state detector/indicator to determine and indicate when flow is desired. These environmentally rugged, non-intrusive detectors do not require any pressure piping penetration or changes to existing solenoid electrical wiring. This makes installation on most manufacturer's valves extremely easy and straight forward. The advanced signals created by the detectors are interpreted by the patented algorithms located in the Analyzer. Status is communicated visually via a bright LED indicator for local status and remotely via Modbus or analog/digital output when connected to a plant PLC or cloud-based monitoring solution. The Analyzer also has Bluetooth connectivity for wireless setup and access to status details with alarm history.

APPLICATIONS

The most common application is to monitor liquid feed and hot gas supply valves for proper function on liquid overfeed and direct expansion evaporators. Sentinel is also suitable for monitoring liquid make-up valves to flooded evaporator surge drums, pump recirculators and chillers. Furthermore, Sentinel can be used to functionally test & document any valves critical for safety which might be required to isolate vessels, mains/branches during emergency shut-downs or leaks to atmosphere (such as King valves).

A fully integrated Sentinel system can provide differentiated dashboards for technicians, refrigeration/ plant managers and leadership roles in corporate Engineering, Compliance, Health & Safety



PRINCIPLES OF OPERATION

1. The Analyzer assembly receives input from the Coil Detector and Activity Detector and uses patented algorithms to determine if Activity (flow/no-flow) and Coil (energized/de-energized) are in matching states. The Analyzer then indicates status via several output methods. See Levels of Monitoring section.

2. The Activity Detector assembly is mounted on the pipe at the outlet of a solenoid valve to detect when there is flow through the pipe. The Activity Detector electronics convert the activity signal which is transmitted to the Analyzer. A self-test circuit periodically checks the function of the detector to prevent a false-negative condition.

3. The Coil Detector assembly is mounted to a solenoid coil to detect when the coil is energized and de-energized. The Coil Detector electronics convert the coil signal which is transmitted to the Analyzer. A self-test circuit periodically checks the function of the detector to prevent a false-negative condition. In addition, the detector assembly has an integrated visual indicator via two LEDs thereby replacing the function of traditional beacon lights.

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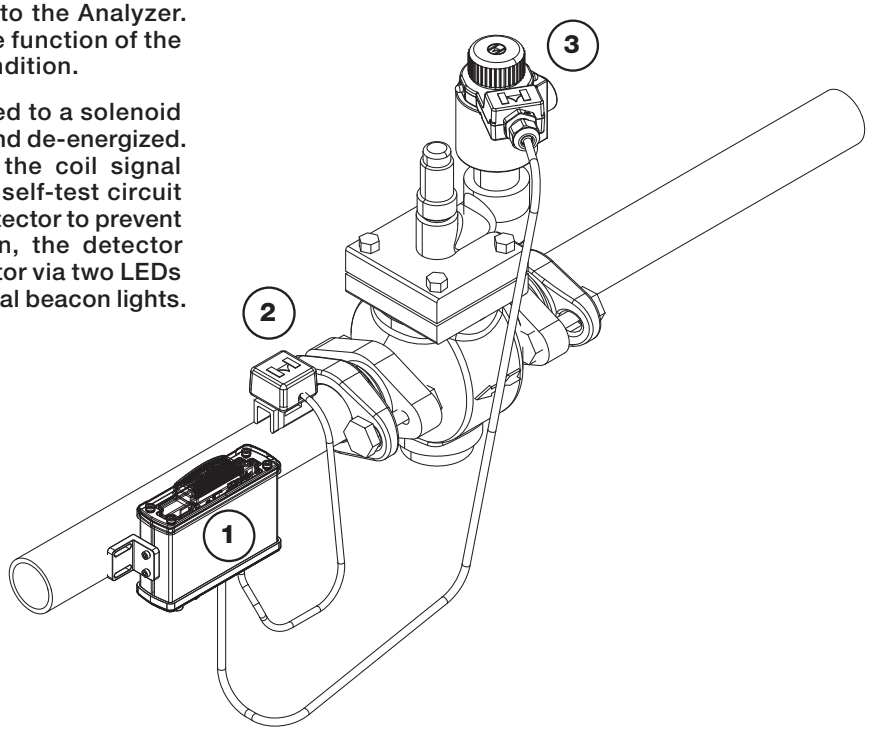
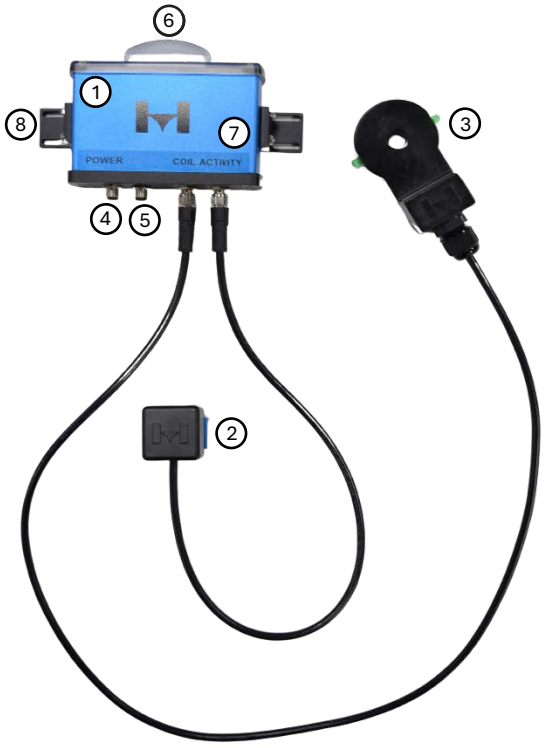


Figure 1. Assembly of a Sentinel system on a valve.



#	Component Description
1	Analyzer
2	Activity Detector
3	Coil Detector
4	Power and Modbus RTU Connector
5	Analog/Digital Signal Connector
6	LED Indicator
7	Bluetooth Module Location
8	Mounting Brackets (x2)

Figure 2. Sentinel and its key components.

ELECTRICAL REQUIREMENTS

- Device Voltage: 24VDC (+10% - 20%)
- Current Draw: 154mA
- Output Signal Types
    - o 4-20mA, Default
    - o 0-10V
    - o RS-485 MODBUS RTU
    - o NPN/PNP
        - ▪ Output 1 only: Status
        - ▪ Output 1 & 2: Status & Alarm
- Wiring Requirements (See System Diagrams)
- Compatible with both AC and DC solenoid coils
- Cabling: Belden 16AWG+22AWG TS or equivalent is suitable for power, modbus and analog/digital communication. Cable can be individually specified for each connection type. Consult an electrician to ensure compliance with all local and national electrical codes and suitability for each connection type. Cable should be shielded, communication wire pair must be twisted.

ENVIRONMENTAL REQUIREMENTS

Devices and Connectors are IP67 and NEMA 4 rated
Ambient Operating Temperature: -40° F (- 40° C) to +122° F (+50° C),
Operation Humidity: 10 to 100% RH (condensing)

LEVELS OF MONITORING

Local- via onboard LED indicator and/or Bluetooth App
Facility- via PLC or computer
Remote- Cloud based (contact technical support for more information) or PLC

A. Monitoring to Advise/Alarm (Local, Facility, or Remote)
Bring specific functional deviation to the attention of operator/technician to investigate/repair; such as leaking hot gas valve

B. Monitoring to Respond/Control (Facility, or Remote)
Compare valve state vs. activity/flow state to ensure that they are in sync with process and actively prevent unsafe condition from occurring while at same time alerting technicians to investigate/repair; such as a liquid valve stuck open as coil enters defrost hot gas stage.

C. Monitor to Understand (Remote)
Track and analyze operational behavior of individual valves (life-cycle, determination of performance) and evaporators for differences in performance or operational characteristics (for example: diminished flow due to strainer debris).

- Cloud sitewide monitoring
- Cloud multisite monitoring
- Customized dashboards for key personnel

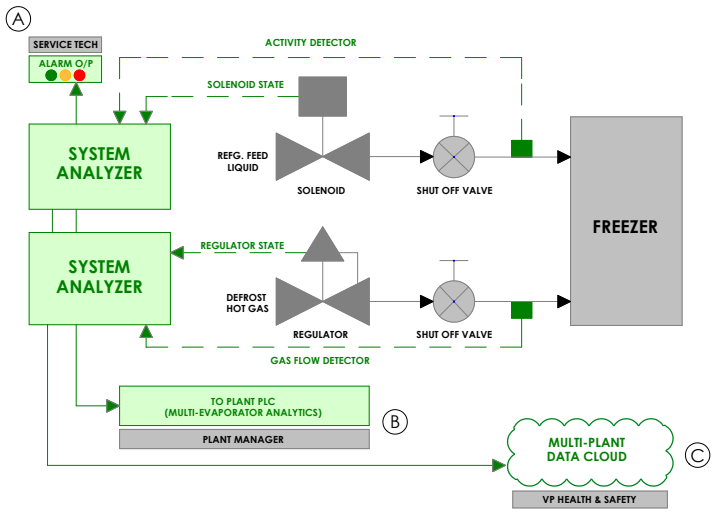
INSTALLATION PREPARATION

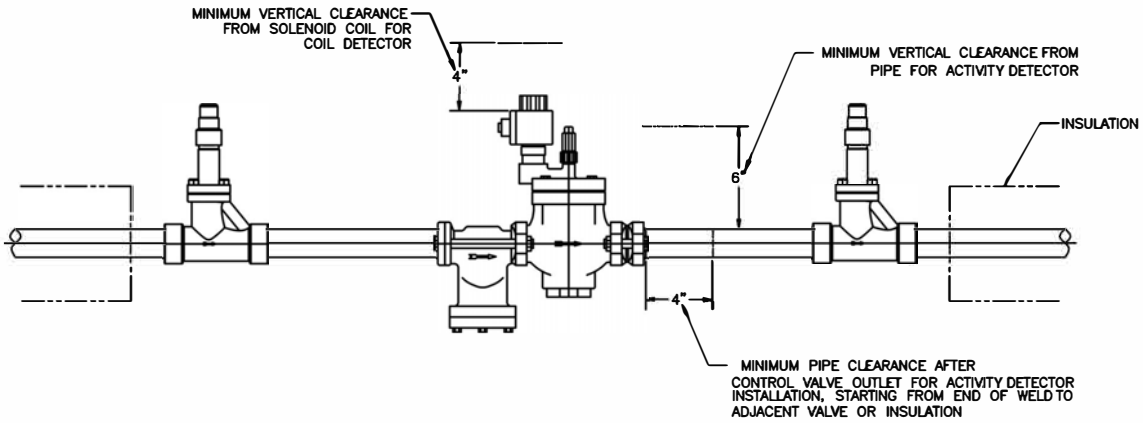
Identify the location of the device installation ensuring the following conditions are met (refer to Figure 3 and Figure 4):
For Coil Detector (Hansen Coils):
- Vertical clearance from top of solenoid coil: 4" minimum

Parker Coils - See Alternate Coils Figure 14 & 15
Danfoss Coils - See Alternate Coils Figure 16

For Activity Detector:
- Insulation clearance from outlet of control valve: 4" minimum
- Pipe section is clear of ice. safely remove the ice/frost from pipe surface.

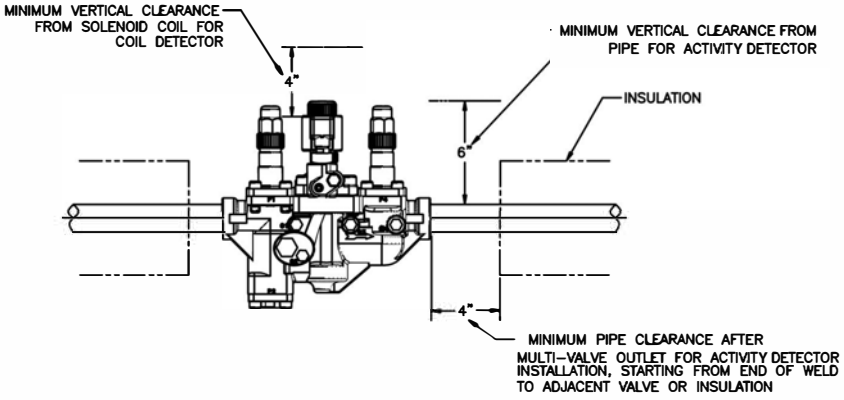
For Analyzer:
- May be strapped to pipe insulation, pipe, or side of valve within 18" of activity detector and 36" from coil detector.





CONVENTIONAL VALVE CONFIGURATION

Figure 3



MULTI– VALVE CONFIGURATION

Figure 4

INSTALLATION INSTRUCTIONS

Warning: Never connect or disconnect the coil detector or activity detector, while the Sentinel is powered ON. Damage to the detectors may result.

Figure 5. Installation of the analyzer on a pipe.

Installing the Coil Detector

1.Remove the coil knob (and beacon if present) from the top of the solenoid coil (Figure 6).

Align the coil detector (Figure 7) then install the provided coil knob (Figure 8).

NOTE: For defrost systems that use a “soft” gas defrost, the Sentinel coil detector must be installed on the “soft” gas solenoid which must remain energized during the “hot” gas defrost stage. For your reference, the Hansen HS4D Two-Step solenoid valve, the “soft” gas solenoid is located on the inlet side of the valve. For your reference, the Hansen MVP-1SD Multi-Valve Platform with 2-step solenoid option, the “soft” gas solenoid is located on the right side of the valve when looking downstream (opposite the outlet equalization tubing) See Figure 9

Figure 6

Figure 7

Figure 8

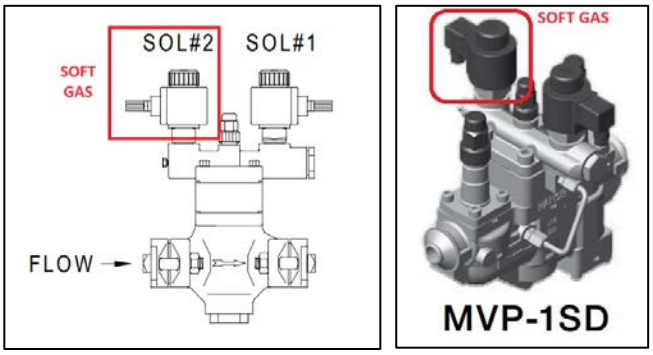


Figure 9 (Hansen HS4D and MVP-1SD)

Installing the Activity Detector

1.Select the appropriately sized clamp for the pipe size

2.Feed clamp through slot in activity detector bracket (Figure 10) and around the pipe on the clean pipe section approximately 1” from the outlet of the control valve (Figure 11). The activity detector can be installed in any orientation. Tighten the drive screw with a 5/16” hex drive or flat head screwdriver until the clamp is secure and bracket is rigid against pipe and can’t be rotated by hand (Figure 12).

Figure 10

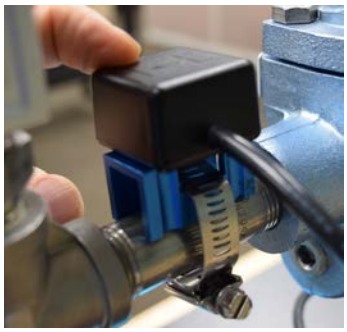


Figure 11

Mounting the Analyzer

1.Identify the mounting location of the analyzer. It can be mounted to the pipe, pipe insulation or other secure position within reach of the detector cables. Analyzer should be mounted in a location where the LED indicator is easily visible to operators and technicians.

2. Use the two provided stainless steel zip ties and mounting brackets on the sides to mount the analyzer. (Figure 13).

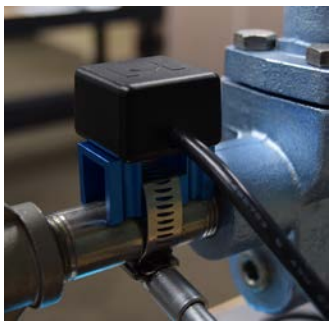


Figure 12

Figure 13

ALTERNATE COIL TYPES

Parker Refrigeration Specialties

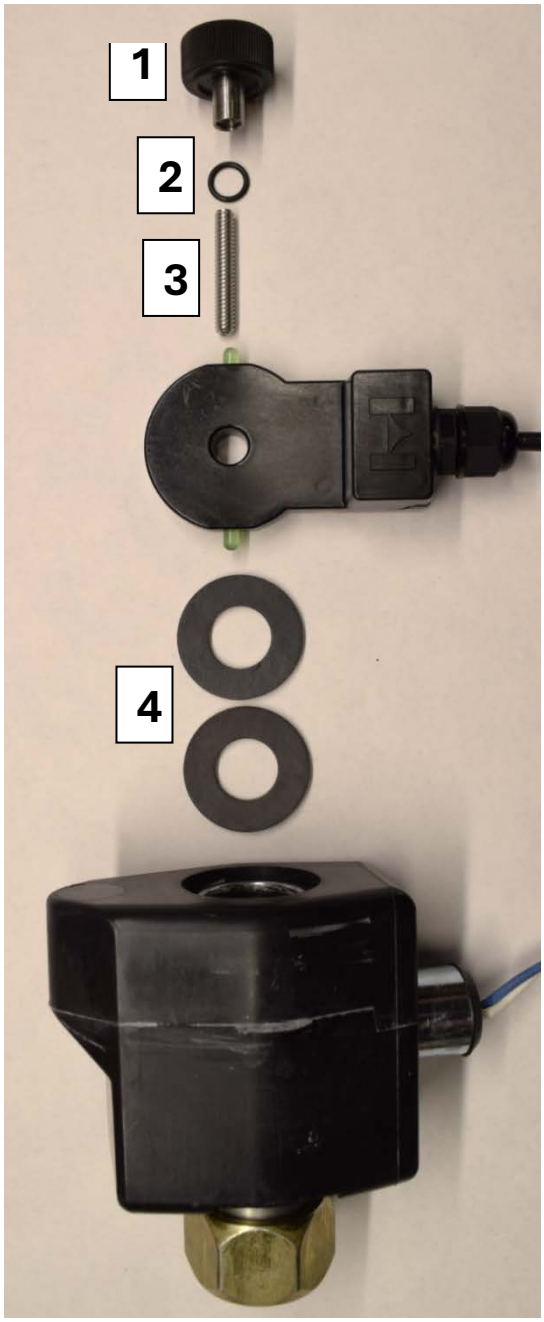


Figure 14

Installation instructions

1. Remove the Parker pilot light knob
2. Place the two rubber washers 4 on the top of the solenoid coil
3. Place the coil detector on the top of the rubber washers 4
4. Screw on the ¼-20 stud 3
5. Insert the O-ring 2 onto the pilot light knob 1
6. Screw on (hand tight) the pilot light knob 1 on the top of the coil detector

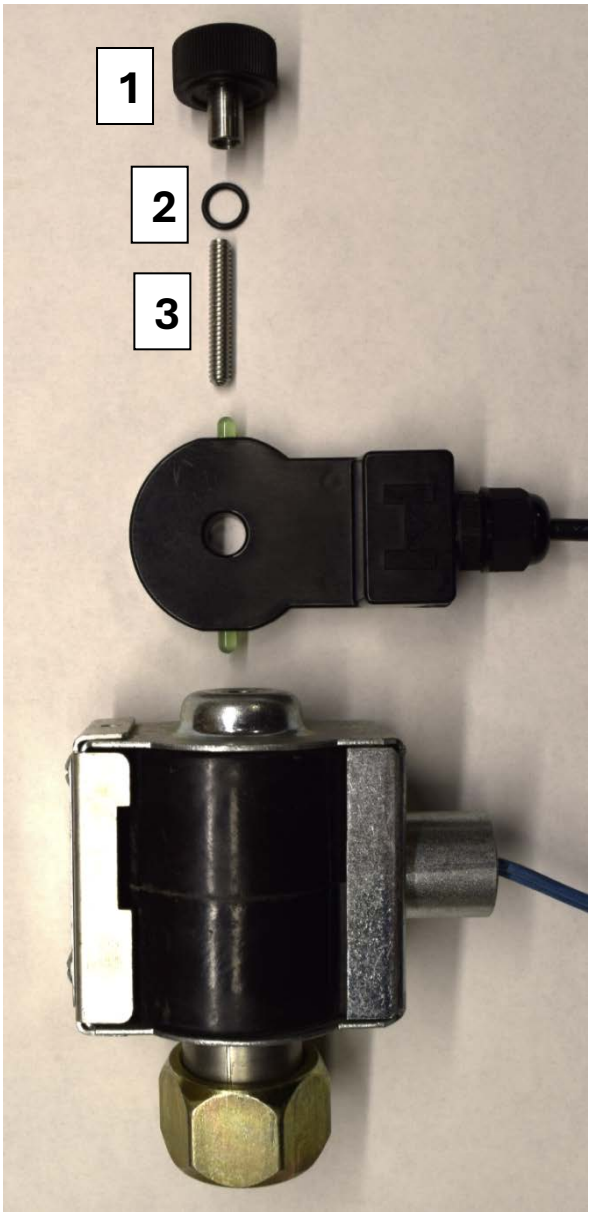


Figure 15

Installation instructions

1. Remove the Parker pilot light knob
2. Place the two rubber washers 4 on the top of the solenoid coil
3. Place the coil detector on the top of the rubber washers 4
4. Screw on the ¼-20 stud 3
5. Insert the O-ring 2 onto the pilot light knob 1
6. Screw on (hand tight) the pilot light knob 1 on the top of the coil detector

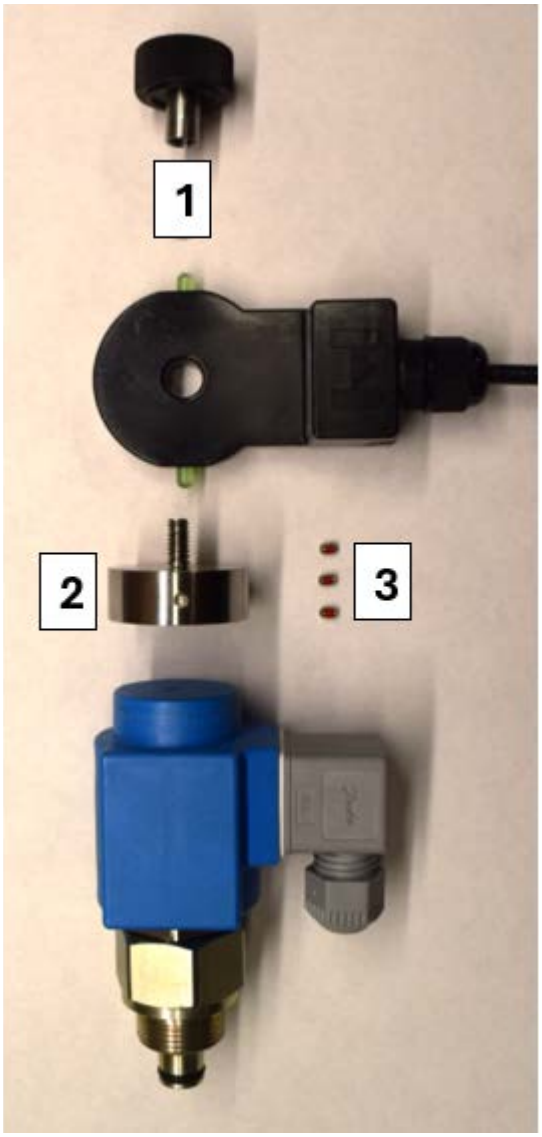


Figure 16

Installation instructions

1. Place adaptor 2 on the top of the solenoid coil
2. Screw on securely the set screws 3 to the adaptor 2
3. Place the coil detector on top of the Adaptor 2
4. Screw on (hand tight) the pilot light knob 1 on the top of the coil detector

Final Connections and Powering the Analyzer

1. With the power OFF ensure both the activity detector and coil detector cable connectors have the keyway aligned, then hand-tighten the M8 connector nut. Leave cap in place for “SIGNAL” connector, if not used.

NOTE: Make sure the keyways of the connectors are aligned before pushing the cables in.

Warning: Never connect or disconnect the coil detector or activity detector, while the Sentinel is powered ON. Damage to the detectors may result.

2. With the power OFF, align and connect power cable to the analyzer in the “Power” position, then hand-tighten the M8 connector nut.

CABLE PINOUT DIAGRAM

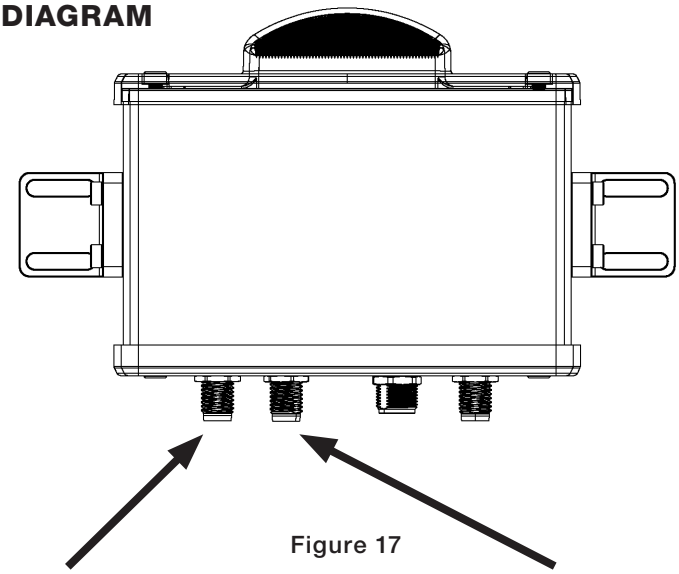
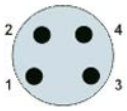


Figure 17

POWER/MODBUS RTU CONNECTOR

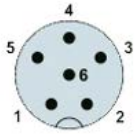
ANALOG AND DIGITAL OUTPUT CONNECTOR

Brown	1	+24V DC
White	2	RS485 B
Blue	3	RS485 A
Black	4	Ground



Pin, 4-pos.

Brown	1	Ground
White	2	PNP/NPN OUT
Blue	3	PNP/NPN Alarm
Black	4	4-20mA OUT
Grey	5	4-20mA Supply
Pink	6	0-10V OUT



Pin, 6-pos.

WIRING CONFIGURATIONS

OPTION 1: RS-485 MODBUS RTU

Communication: minimum 24 AWG shielded Twisted Pair for A+/B- signals
Characteristic Impedance of 120 ohms
Device Power, Minimum 20 AWG for +24VDC/ Ground Power
(Belden1492A is recommended or equivalent).

Shielded wire is required if not run in grounded metal conduit. Shielded wire is recommended for all applications. Shield shall be grounded only at the feed end of the bus.

Main bus run shall be no longer than 300 meters (1,000 feet). Stubs out to devices from the main bus shall be no longer than two meters (6 feet).

Bus shall be terminated with a 120 ohm resistor at each end. Bus termination resistor is integrated on the Sentinel devices and can be enabled via the Bluetooth application or Modbus interface.

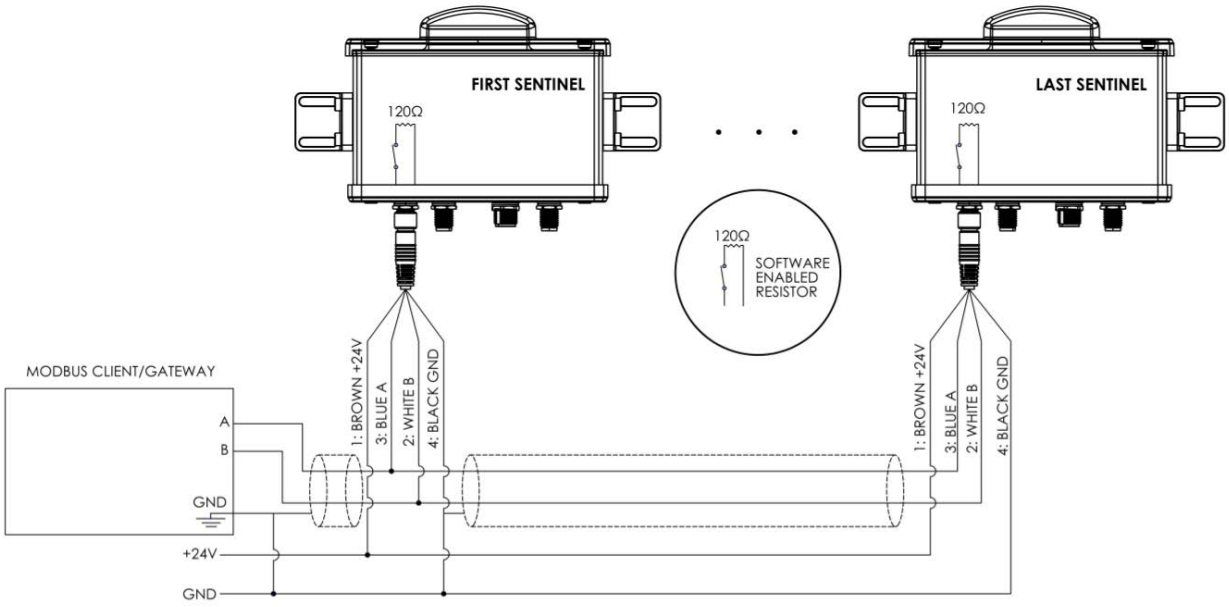


Figure 18 - Option 1

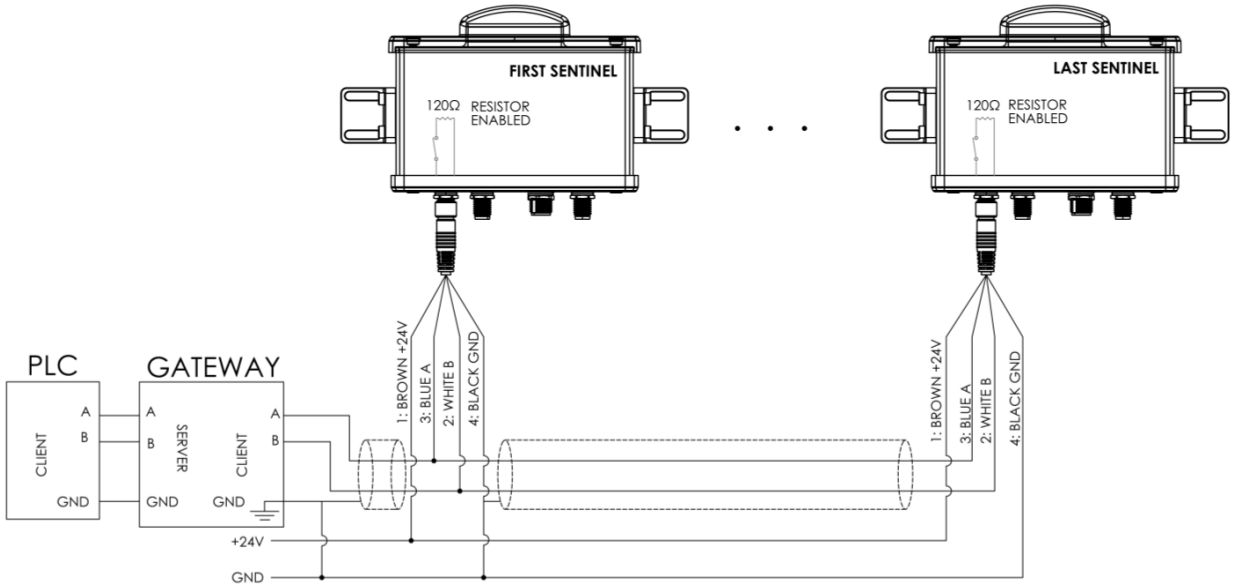


Figure 19 - Option 1

Option 2: PNP/NPN OUT/Alarm Signal Wiring

Minimum 24AWG wire. Each Sentinel unit requires its own PNP/NPN input at PLC

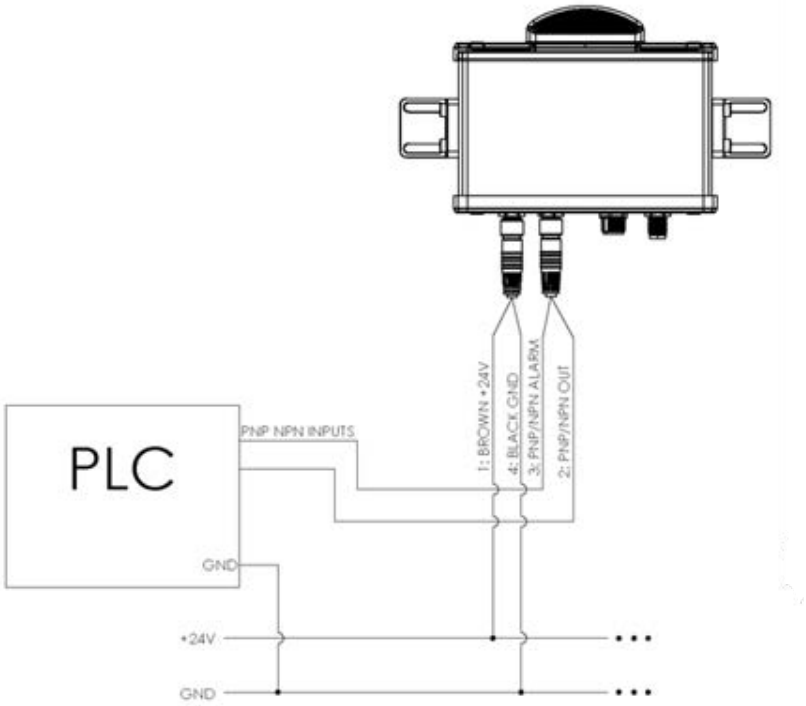


Figure 20 - Option 2

OPTION 3: 4-20 mA SIGNAL WIRING

Minimum 24AWG twisted pair wire preferably shielded with the shield grounded at the PLC end of the connection. Each Sentinel unit requires its own 4-20 mA input at PLC.

Note: Sentinel is not a loop powered device. A separate power supply is required to power 4-20 mA signal.

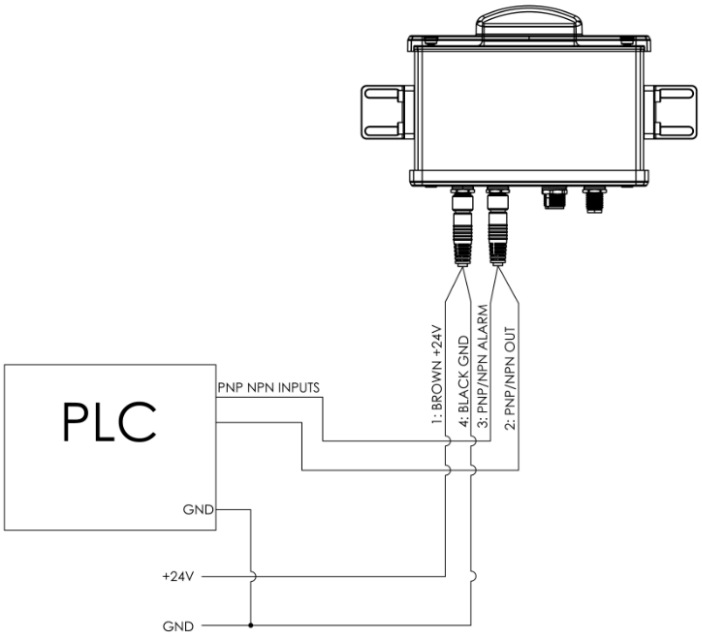


Figure 21 - Option 3

OPTION 4: 0-10V SIGNAL WIRING

Minimum 24AWG twisted pair wire preferably shielded with the shield grounded at the PLC end of the connection. Each Sentinel unit requires its own 0-10 V input at PLC/controller.

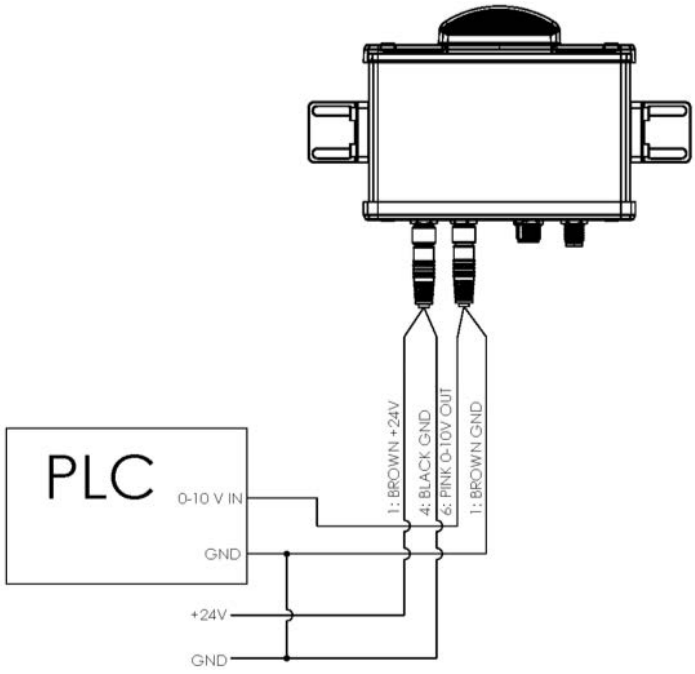


Figure 22 - Option 4

DEVICE SETUP

1. Power ON the device.

2. Configure the device in Bluetooth (Output configuration) or MODBUS RTU. See Bluetooth Device Setup Section.

3. Once configured, verify the calibration magenta LED is flashing and the Bluetooth app calibration is Running

Analog or Digital Signal Output (1 wire)

Mode Of Operation	Analog Output (1-Wire)			Digital Output (1-wire)
General Operation	4-20mA (AN2)	0-10V (AN1)	0-5V	NPN/PNP (signal)
Coil OFF / Flow OFF	4mA	5V	2.5V	0
Coil ON / Flow ON	20mA	10V	5V	1
Calibration Mode	2.5mA	4V	2V	N/A
Device Fault	0.5mA	2.5V	1V	N/A

Analog Signal Output + Digital Alarm Output (2 Wire)

Mode Of Operation	Analog Output + Digital Alarm (2-Wire)			
General Operation	4-20mA (AN2)	0-10V (AN1)	0-5V (AN1)	NPN/PNP (alarm)
Coil OFF / Flow OFF	4mA	5V	2.5V	0
Coil ON / Flow ON	20mA	10V	5V	0
Alarm				
Coil OFF / Flow ON	N/A	N/A	N/A	1
Coil ON / Flow OFF	N/A	N/A	N/A	1
Calibration Mode	2.5mA	4V	2V	N/A
Device Fault	0.5mA	2.5V	1V	N/A

Analog Signal Output + Digital Alarm Output (3 Wire)

Mode Of Operation	Analog Output+Strength of Signal + Digital Alarm (3-Wire)			
General Operation	4-20mA (AN2)	0-10V (AN1)	0-5V (AN1)	NPN/PNP (alarm)
Coil OFF / Flow OFF	4mA	5V	2.5V	0
Coil ON / Flow ON	20mA	10V	5V	0
Strength of Signal				
Proportional Output	0-10V (AN1)	4-20mA (AN2)	4-20mA (AN2)	N/A
Alarm				
Coil OFF / Flow ON	N/A	N/A	N/A	1
Coil ON / Flow OFF	N/A	N/A	N/A	1
Calibration Mode	2.5mA	4V	2V	N/A
Device Fault	0.5mA	2.5V	1V	N/A

Digital Signal Output + Digital Alarm Output (2 Wire)

Mode Of Operation	Digital Output + Alarm (2 bit)	
General Operation	NPN1 (signal)	NPN2 (alarm)
Coil OFF / Flow OFF	0	0
Coil ON / Flow ON	1	0
Coil ON / Flow OFF	1	1
Coil OFF / Flow ON	0	1

MOBUS REGISTER TABLES

FIRMWARE REVISION 0.3.2

Address	Description	Data Type	Additional Info
Input (RO 16 bit)			
30001	Flow State	uint16	0: Flow Off 1: Flow On
30002	Coil State	uint16	0: Coil Off 1: Coil On
30003	High Alarm State	uint16	0: No active High Alarm 1: Active High Alarm
30004	Low Alarm State	uint16	0: No Active Low Alarm 1: Active Low Alarm
30005	Superbin Power Level MSB	float32	Sum of all current superbin power levels. Used for determining flow
30006	Superbin Power Level LSB		Sum of all current superbin power levels. Used for determining flow
30016	Operational Mode	uint16	Current state/mode of the algorithm the device is in 0: Coil Detector Learn-in 1: Activity Detector Energize 2: Activity Detector De-Energize 3: Secondary Learn In 4: General Operation 5: Primary Learn-in Failed 6: Secondary Learn-in Failed 7: Valve Polarity Mismatch 8: Activity Detector Recalculation 1 9: Activity Detector Recalculation 2
30018	Secondary Learn-In Accuracy Percent	uint16	Accuracy in Percent of Secondary Learn In thresholds
30068	Learn-In Mode On Threshold MSB	float32	Threshold that superbin power level must be above for flow to be detected as 'On'
30069	Learn-In Mode On Threshold LSB		Threshold that superbin power level must be above for flow to be detected as 'On'
30070	Learn-In Mode Off Threshold MSB	float32	Threshold that superbin power level must be below for flow to be detected as 'Off'
30071	Learn-In Mode Off Threshold LSB		Threshold that superbin power level must be below for flow to be detected as 'Off'
30073	Alarm History Log 1(Most Recent)	uint16	(Solenoid Coil, Mechanical _ leaking or no flow) 0: No Alarm 1: High Alarm 2: Low Alarm

MODBUS DATA INTERFACE.

Serial Parameters: 19200 Baud rate, 8-N-1

Default Device Address: 254 (Hex: 0xFE)

BLUETOOTH DEVICE SETUP

1 Connect to the device via Bluetooth App using a magnet as shown in figure 23.

Ensure the analyzer is flashing blue. A device's default name is "Device 1," select this device in the app as shown in figure 24

Figure 23

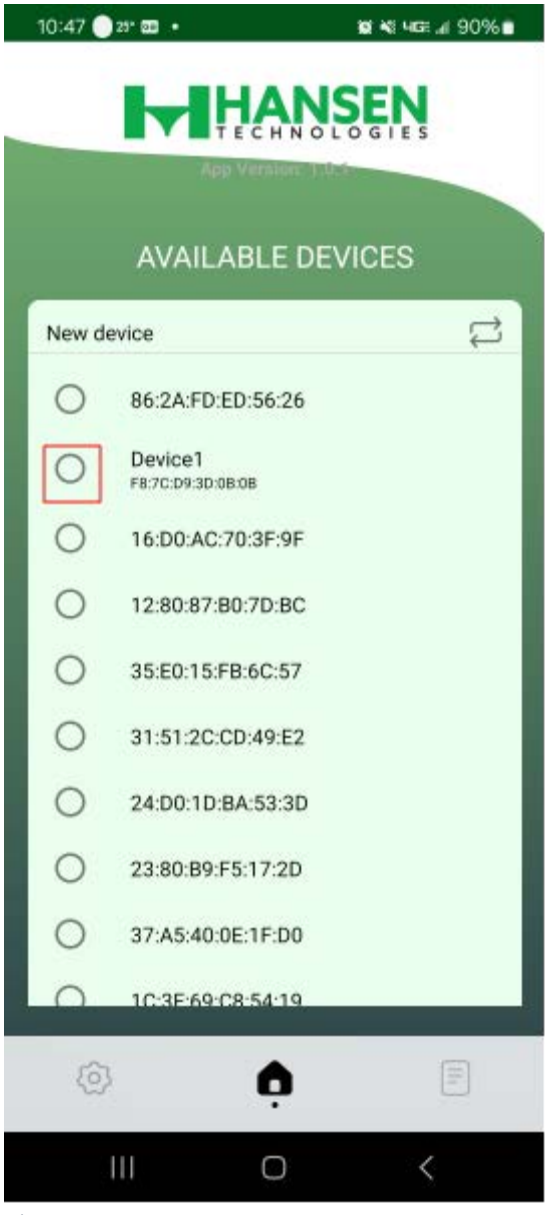


Figure 24

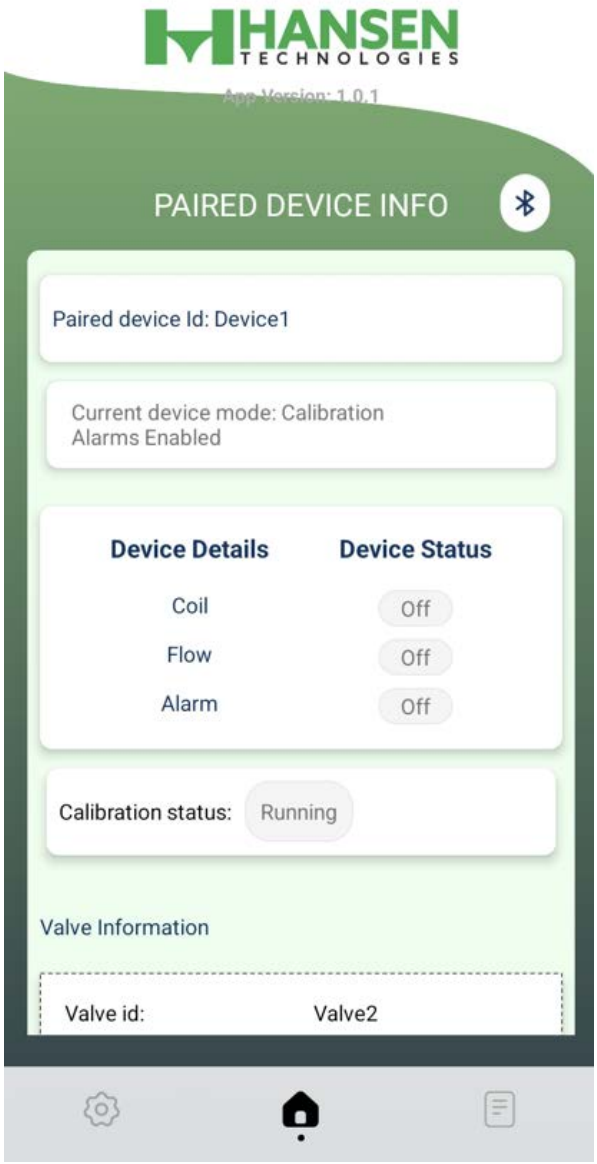


Figure 25

2. Once paired, the analyzer LED should begin flashing magenta and you will be re-directed to the home page, as shown in figure 25.

3. Select the gear icon in the lower left corner of the screen as shown in figure 26

Figure 26

4. Go to “Output Configuration” and ensure all outputs are turned “Off” if communicating via RS-485. If not select appropriate settings for your configuration. As shown in figure 27

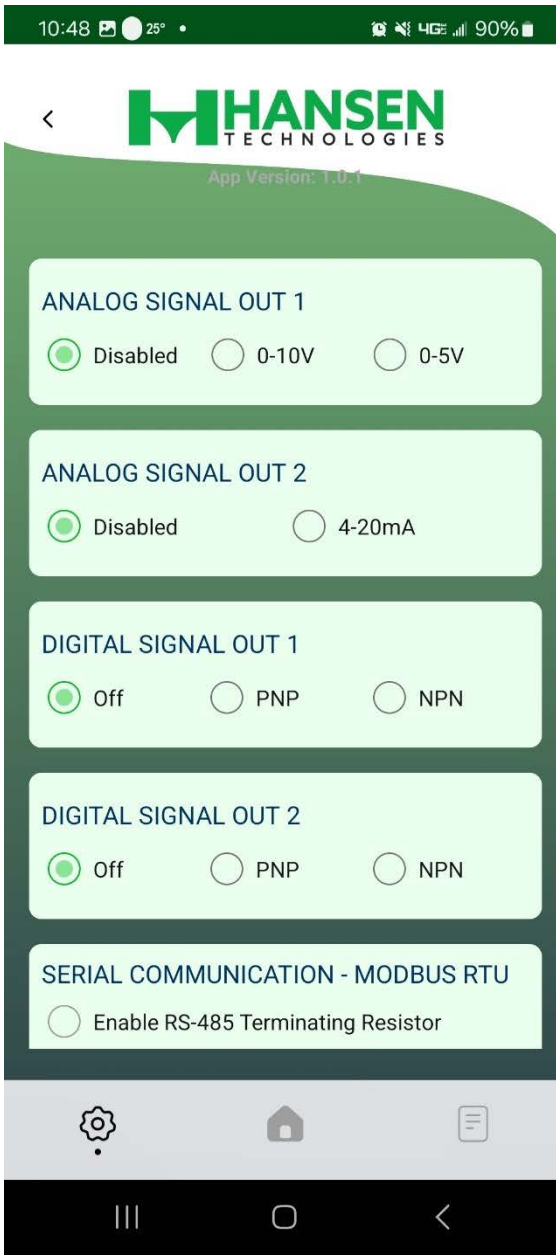


Figure 27

5. Set the slave address to the number you have selected for this device; it will default to 254. “Enable Terminating Resistor” must be turned ON for the final unit in an RS-485 string. After these steps, press “Next”. As shown in figure 28

Figure 28

6. Select “Solenoid Valve” and then press “Apply” to save all the settings as shown in figure 29.

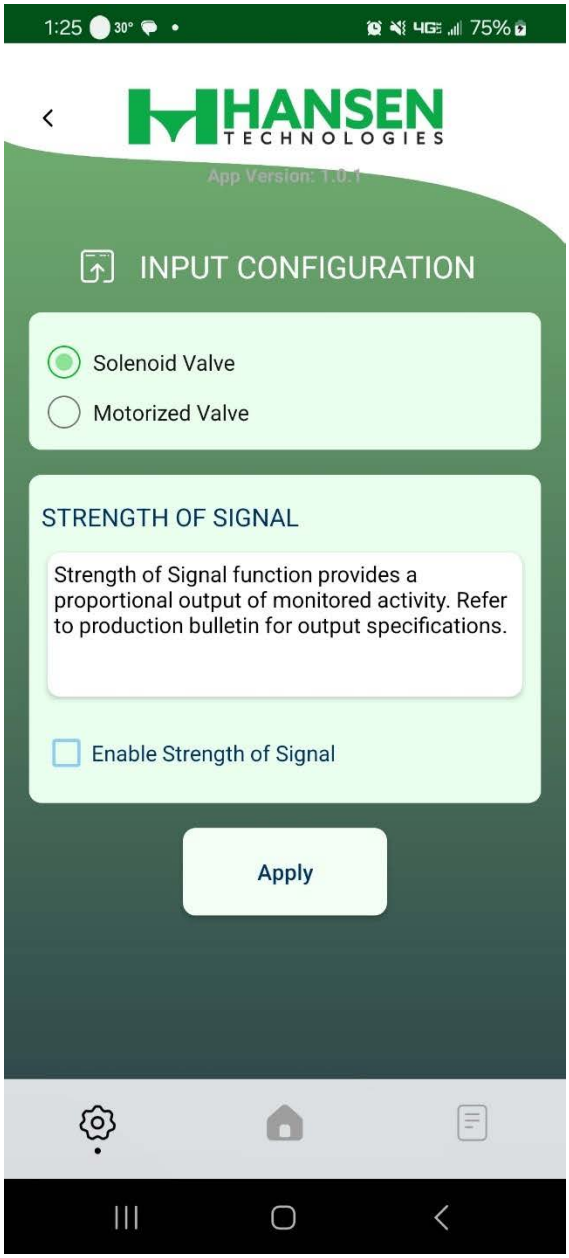


Figure 29

7. Navigate to “Device Customization” to change the names on the analyzer. This will make it easier to find analyzers in your PLC or cloud portal as shown in figure X.

a. Device ID

b. Valve ID

c. Evaporator ID

d. Site ID

With this naming convention, it is easier to determine the name of the analyzer, the type of valve it is sensing, what evaporator (and hence, which refrigeration room) the valve is part of, and which site this is supporting (See figure 30).

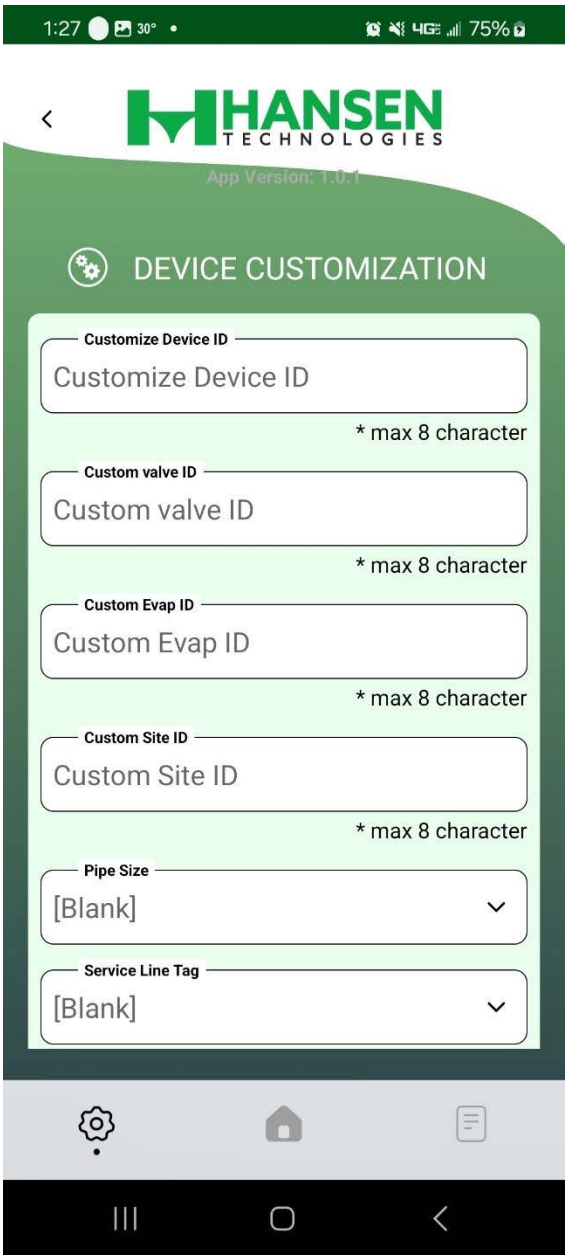


Figure 30

LEARN-IN MODE - CALIBRATION

- If device has not previously been calibrated, learn-in mode will begin automatically after initialization.
- The learn-in algorithm requires a clean signal separation for the on and off flow signal.
- Primary Learn-In (PLI) – During PLI, the initial on and off power level thresholds are determined for the coil detector and activity detector. After PLI is completed, the algorithm runs Secondary Learn-In.
- Secondary Learn-In (SLI) – During SLI, the device begins outputting coil and activity states based on the thresholds determined in PLI. The alarms are disabled during SLI. The SLI algorithm will (over 100 cycles or 21 days) then calculate the optimized power levels as determined by the SLI algorithm, then the device advances to General Operation mode.

LED INDICATOR TABLE

Learn-In Progress	Analyzer Detecting Coil State Change?	LED Description	LED Status Indication	LED Color Example
Setting Up				
Before Primary Learn-In Mode (PLI)	N/A	No Light Seen	No power to the analyzer	No Color
	N/A	Slow Flashing Cyan and Magenta	Standby (firmware update or as soon as power cable is plugged in)	
	N/A	Slow Flashing Amber	Sensor Fault/Wire Connection Issue	
Primary Learn-In				
During PLI	N/A	Slow Flashing Magenta	Primary Learn-In mode running	
After PLI (if PLI failed)	N/A	Slow Flashing Magenta and Red	Primary Learn-In mode failed	
Secondary Learn-In				
During Secondary Learn-In mode (SLI) (if PLI passed, SLI starts running)	Yes	Fast Flashing White	SLI: flow is turning off	
	Yes	Fast Flashing Green	SLI: flow is turning on	
	No	Solid White	SLI: flow is currently off	
	No	Solid Green	SLI: flow is currently on	
	No	Fast Flashing Red	Alarm State (high or low)	
After SLI (if SLI failed)	N/A	Slow Flashing Magenta and Red	Secondary Learn-In mode failed	
General Mode of Operation				
After SLI (SLI passed, General Mode of Operation reached)	Yes	Fast Flashing White	General operation: flow is turning off	
	Yes	Fast Flashing Green	General operation: flow is turning on	
	No	Solid White	General operation: flow is currently off	
	No	Solid Green	General operation: flow is currently on	
	N/A	Fast Flashing Red	Alarm State (high or low)	
Hansen App Controllable Modes and Settings				
Bluetooth Device Pairing	N/A	Fast Flashing Blue	Sentinel is ready to pair via Bluetooth App	
Monitor Mode	Yes	Fast Flashing White	Monitor mode: flow is turning off	
	Yes	Fast Flashing Green	Monitor mode: flow is turning on	
	No	Slow Flashing Cyan and White	Monitor mode: flow is currently off	
	No	Slow Flashing Cyan and Green	Monitor mode: flow is currently on	
	N/A	Fast Flashing Red	Alarm State (high or low)	
Absolute Mode	N/A	Solid White	Absolute mode: flow is currently off	
	N/A	Solid Green	Absolute mode: flow is currently on	

MAINTENANCE

Warning: Never connect or disconnect the coil detector or activity detector, while the Sentinel is powered ON. Damage to the detectors or analyzer may result.

REPLACING THE ACTIVITY DETECTOR

Replacing the Activity Detector

1. Power OFF the Analyzer.
2. Unplug the Activity Detector cable from the Analyzer.
3. Using a 5/16" hex driver or a flat screwdriver remove the worm screw clamp and the Activity Detector from the pipe.
4. Mount the new Detector to the pipe.
5. Plug the Activity Detector cable to the Analyzer.
   Note: Ensure the keyways of the connectors are aligned.
6. Power ON the Analyzer.

REPLACING THE COIL DETECTOR

1. Power OFF the Analyzer.
2. Unplug the Coil Detector cable from the Analyzer.
3. Unscrew the coil knob and remove the Detector from the top of the coil.
4. Mount the new Detector on the coil.
5. Plug the Coil Detector cable to the Analyzer.
   Note: Ensure the keyways of the connectors are aligned.
6. Power ON the Analyzer.

ISSUE	CAUSE	ACTION
Indicator LED does not display	A. No power to control unit or wrong voltage.	A. Remove the power cable from the control unit and check voltage at pins 1 and 4 of the cable.
Slow Blinking Magenta/Red LED	A. Learn-In Mode Failed	A. Cycle the power Off and On and retry Learn-In. A. No activity of the valve. Turn the valve On.
Fast Red LED, Coil LED On	A. Alarm – Coil ON/Flow OFF, Valve stuck closed	A. Operate the manual stem to free the valve. A. Rebuild the valve.
Fast Red LED, Coil LED Off	A. Alarm – Coil OFF/Flow ON, Debris in the valve.	A. Open the valve, clean the seat and reassemble.
MODBUS RTU Communication Issues	A. Terminating resistor not enabled on first/last device on bus. A. Terminating resistor is enabled on devices besides the first/last in the bus. A. Slave ID not set.	A. Enable terminating resistor(s) via Bluetooth App. A. Disable terminating resistor(s) via Bluetooth App. A. Set the Slave ID via Bluetooth App.
Flashing LED (amber)	A. Faulty detector.	A. Power cycle the device. A. Pull error log and determine detector failure. Replace faulty detector.

RESETTING DATA

	Reset Type				
Data Type	Power Cycle	Software Cycle	Calibration Reset	Cycle Count Reset	Factory Reset
Device Customization & Valve Information Note: Modbus/Slave Address will reset. Modbus or Cloud communication will stop until address reset.	0	0	0	0	1
Calibration Data	0	0	1	0	1
Operational Mode Note: Software Cycle will not reset General Operation Mode (fully through learn ins)	0	1	1	0	1
Cycle Counts	0	0	1	1	1
Alarm Counts	0	0	1	1	1
Alarm Log	0	0	0	0	1
Device Run Time	1	1	0	0	1
Commision Date Note: Does not reset, logs original install date	0	0	0	0	0

WARRANTY

Hansen Sentinel Activity Monitor electronics are guaranteed against defective materials or workmanship for 90 days F.O.B. factory. All other components are guaranteed for 1 year F.O.B. factory. No consequential damages or field labor is included.

ORDERING INFORMATION

Description	Cat. No.
Sentinel Activity Monitor System w/sensors & cables	SNTL
OPTIONAL EQUIPMENT & SPARE PARTS	
Sentinel Analyzer Kit*	SNTL-ANLZR*
Sentinel Flow Sensor Kit*	SNTL-FLOW*
Sentinel Coil Sensor Kit*	SNTL-COIL*
Sentinel Power/Com Cable Kit,2M long*	SNTL-PWRC*
Sentinel Signal Cable, 2M long*	SNTL-SIGC
Sentinel Splitter	SNTL-SPLT
Sentinel Coil Adapter Kit	68-1003

NOTE: * Indicates included in Sentinel Activity Monitor System

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