

# Masterflex® MasterSense™ Sensor Integration Addendum

For use with Drive Models Nos.



**07526-10, 07526-12, 07526-20, 07526-22**



**07576-10, 07576-12, 07576-40**



**077421-00, 077421-02**



**077112-10**



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## Applicability

Sensor integration is available for MasterSense drive/pump systems that are updated with the latest software version.

MasterSense pumps can be updated with the latest software version via an OTA (over the air) update by connecting a pump to the internet and updating through the pump “Information” screen accessible on the drive touchscreen. (Please refer to the drive model instruction manual, or contact technical support for details.)



**WARNING. COMPONENTS ARE UNDER PRESSURE, CONSULT MANUAL BEFORE OPERATING PUMP. USE APPROPRIATE MEASURES TO PROTECT OPERATORS, BYSTANDERS, AND EQUIPMENT—FAILURE TO DO SO MAY RESULT IN PERSONAL INJURY OR DEATH.**



**WARNING. PRODUCT USE LIMITATIONS: THE SENSORS AND DRIVES ARE NOT INTENDED FOR USE IN ANY MEDICAL APPLICATION.**

## Background

Pressure is a critical parameter for many peristaltic pump applications including filtration, bulk transfer, and particulate laden or viscous fluid transfers.

The Masterflex MasterSense touchscreen interface (see below) allows for simple integration of a pressure sensor into the flow process for monitoring flow with high- and low-pressure alarms. Monitoring pressure and setting pressure alarms for flow processes can assist in preventing process failures such as over-pressurization, leaks, or filter rupture.

On the Menu touchscreen the “Add Sensor” (see below) feature allows the addition of a single-pressure sensor into a pump workflow downstream from the pump. Once configured, a visual indication of the current sensor pressure will display on the pump touchscreen interface. In addition, there are optional displayed process alarms for high- and low-pressure values.

Enabling a high-pressure to trigger a Pump Shut-Off alarm allows a pump to be stopped once a setpoint is achieved, this assists in preventing over-pressurizing a filter, detecting a closed clamp, or kink in an outlet line. A low-pressure alarm can help with an indication of a leak, an empty feed container, or rupture in the membrane which would cause the pressure to drop below an expected level.

### NOTE:

TYPICAL PRESSURE SENSOR INSTALLATION REQUIRES A PRESSURE SENSOR TO BE INSTALLED BETWEEN A PUMP DISCHARGE END AND BEFORE FLOW RESTRICTION/FILTER.



# Section 1: Hardware Requirements

An operator needs to choose at least one of three setup options.

## Option 1: Masterflex MasterSense MP1 for a PendoTECH™ sensor.

Choose an MP1 pressure signal transmitter to use with a PendoTECH pressure sensor; MP1 pressure range is 0-60 psi.

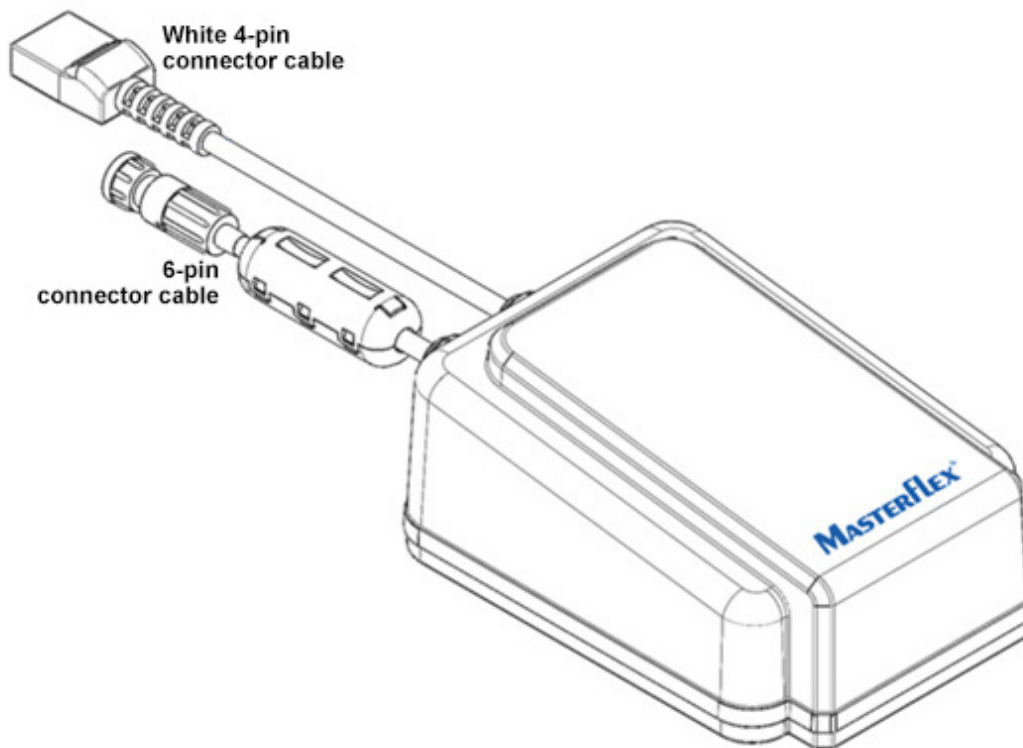
- Connect the 6-pin connector from the MP1 to the AUX port on the back of the drive.
- Connect the white 4-pin connector cable to the PendoTECH sensor.

### NOTE:

SEE SECTION 3.1 (PAGE 14) FOR MORE CONNECTIONS DETAILS.

SEE SECTION 4.1 (PAGE 19) FOR HARDWARE ACCESSORIES DETAILS.

SEE MP1 MANUAL FOR ADDITIONAL CONFIGURATION DETAILS.



# Section 1: Hardware Requirements (Cont')

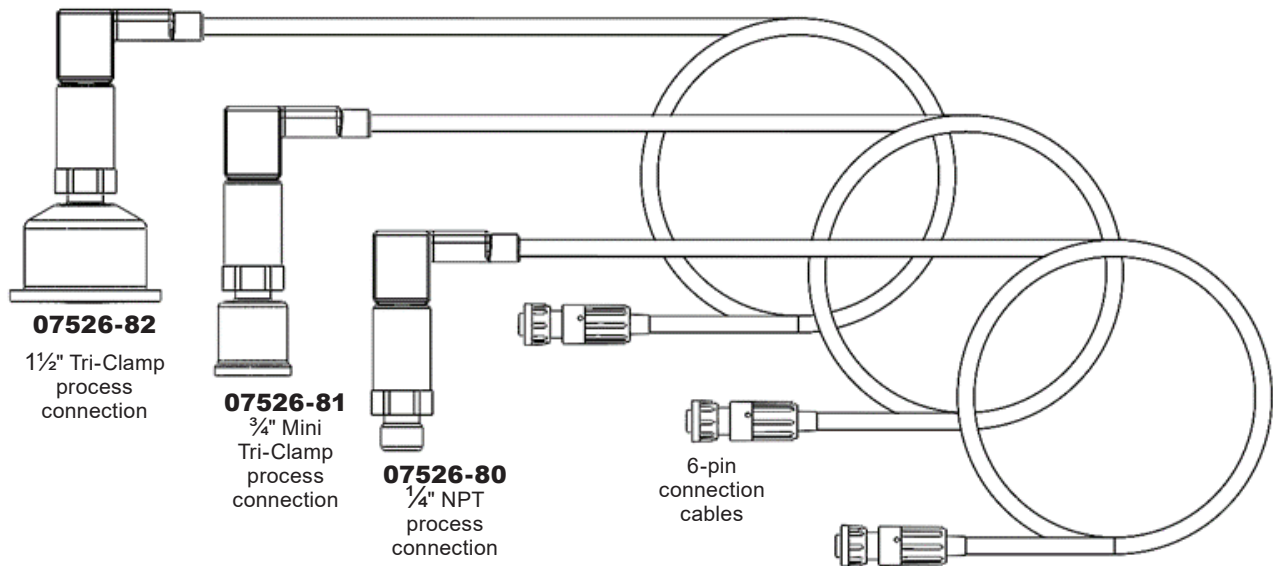
## Option 2: Masterflex MasterSense MP30.

**NOTE:**

SEE SECTION 4.1 (PAGE 20) FOR CONNECTIONS DETAILS.

SEE MP30 MANUAL FOR ADDITIONAL DETAILS.

Choose an appropriate sized transducer and 6' connection cable.



## Option 3: Universal Adapter Cable.

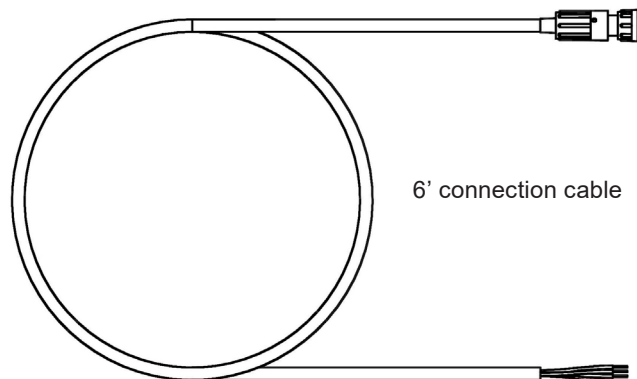
Choose a Universal adapter cable (see below) which is compatible with any pressure sensor that can produce an 0–5V, 0–10V, 0–20mA or 4–20mA analog output.

**NOTE:**

SEE SELECTION 2.5 (PAGE 8) FOR PRESSURE RANGE SETUP REQUIREMENTS DETAILS.

SEE SECTION 3 (PAGE 14) FOR HARDWARE SETUP DETAILS.

SEE SECTION 4.1 (PAGE 19-20) FOR FOR HARDWARE ACCESSORIES DETAILS.



## Section 2: Operator Interface

Once an option is selected and is correctly configured, move to software operation.

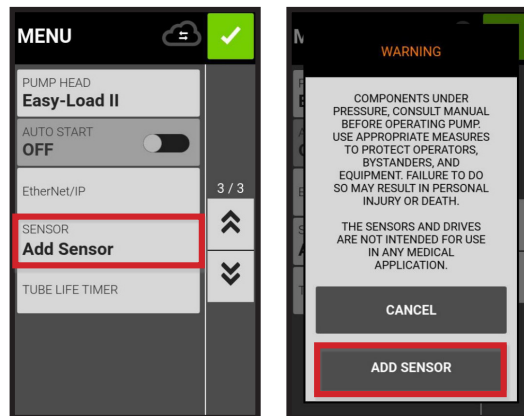
### 1) Theory of workflow operation.



### 2) Add Sensor.

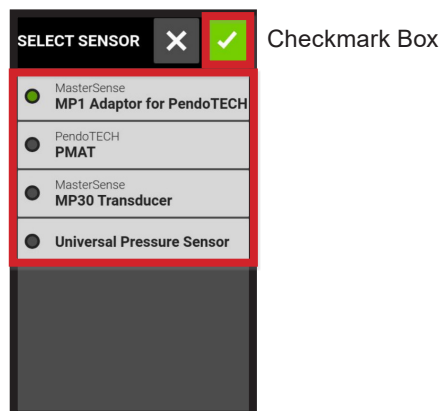
Once the hardware is correctly setup, do the following to add a sensor.

- With the touchscreen “Menu” screen displayed, tap the “Add Sensor” button (see below).
- A “Warning” screen displays.
- Tap the “Warning” screen “Add Sensor” button to continue.



### 3) Select Sensor Type.

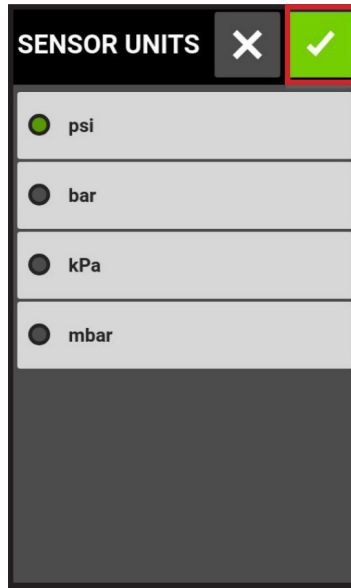
- The “Select Sensor” screen automatically displays (see below).
- Tap a sensor type.
- Tap the **green** checkmark box to move to the “Select Units” screen (see next).



## Section 2: Operator Interface(Cont')

### 4) Select Units.

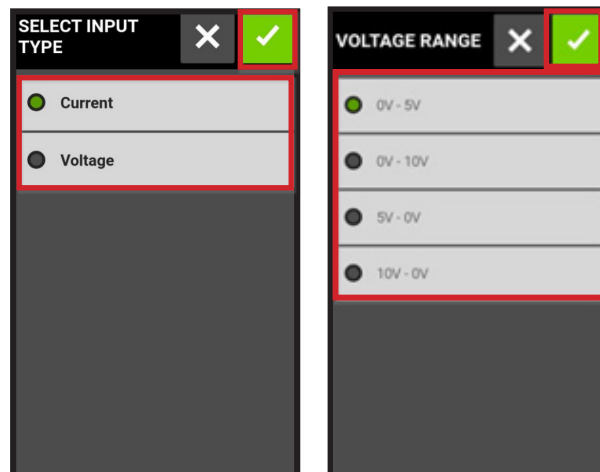
- The “Select Units” screen displays.
- Tap a preferred pressure unit (see below).
- Tap the **green** checkmark box to move to the “Select Input Type” screen (next).



### 5) Select Input Type.

**NOTE:** INPUT TYPE AND PRESSURE RANGE ARE **ONLY** FOR AN UNIVERSAL ADAPTER OPTION.

- The “Select Input Type” screen displays.
- Tap either “Current” or “Voltage” (see below).
- Tap the **green** checkmark box.
- The “Voltage Range” or “Current Range” screen displays.
- Tap a voltage or current range.
- Tap the selected **green** checkmark box to move to the “Pressure Range” screen (next).

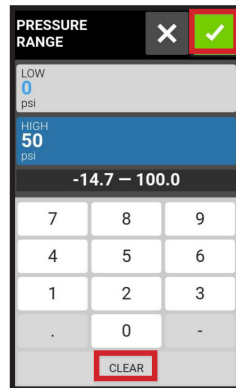


## Section 2: Operator Interface (Cont')

### 5) Select Pressure Range.

**NOTE:** INPUT TYPE AND PRESSURE RANGE ARE **ONLY** FOR UNIVERSAL ADAPTER OPTION.

- The “Pressure Range” screen displays (see below).
- Enter a desired pressure (electrical) range with the touchscreen keypad.
- Tap to move between “Low” and “High” input fields.
- Tap “Clear” to change values.
- Tap the **green** checkmark box to move to the “Zero Sensor” screen (next).



Current Input Examples	
Example Sensor Output	Example Expected Pressure
4mA	0 psi
20mA	30 psi

Voltage Input Examples	
Example Sensor Output	Example Expected Pressure
0V	0 psi
5V	30 psi

**NOTE:**

PRESSURE RANGE LIMITS ARE BETWEEN -14.7 AND 100.0 psi.

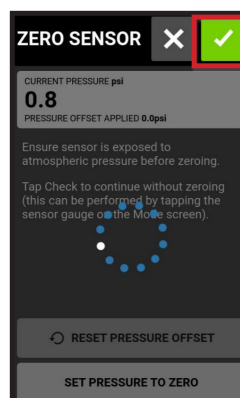
REFER TO THE CURRENT INPUT AND VOLTAGE INPUT EXAMPLE TABLES (ABOVE) FOR THE EQUIVALENCIES BETWEEN EITHER mA OR V ALONG WITH PSI FOR SETUP.

### 6) Zero Sensor.

The Zero Sensor screen displays readouts of current pressure and current pressure offset applied. With this touchscreen the option to reset pressure offset and pressure-to-zero are provided.

To reset a pressure, do the following:

- Tap the “Reset Pressure Offset” button (see below) to clear a pressure offset applied field
- Tap the “Set Pressure to Zero” button (pressure offset is applied as pressure values are stored in the pressure offset applied field).
- Tap the “Set Pressure to Zero” button to reduce a current pressure field to 0.0. (If a residual pressure reading is present before tapping the Set Pressure to Zero button, that residual pressure value will be stored in the pressure offset applied field.)
- Tap the **green** checkmark box to move to the “Alarm Thresholds” screen (next).





## Section 2: Operator Interface (Cont')

### 7) Alarm Thresholds.

Configure sensor alarms, warnings, and delays by dragging the On/Off “High Limit” and “Low Limit” switches on the Alarm Thresholds touchscreens (see below).

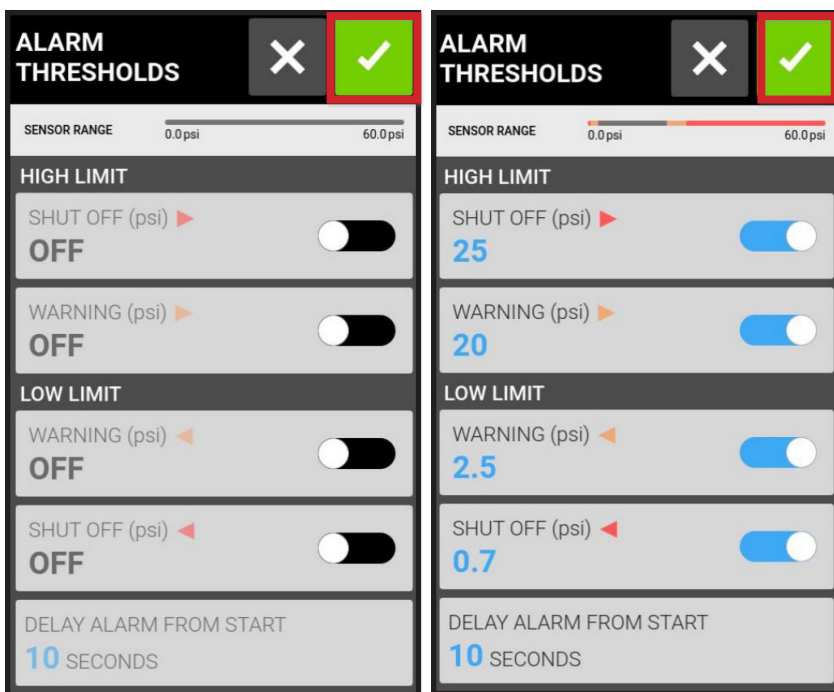
To set an alarm, do the following:

- **On the Alarm Thresholds screen tap an alarm type.** (Warning alarms and Pump Shut-Off alarms are available for both high- and low-pressure setpoints and can be run simultaneously.)
- **Tap the green checkmark box to move to the “Set Up Complete” screen (next).**

#### NOTES:

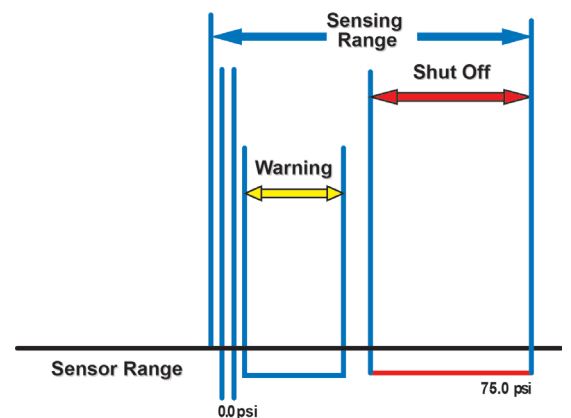
- 1) PUMP SHUT-OFF AND WARNING ALARMS CAN BE RUN SIMULTANEOUSLY, BUT THE WARNING VALUES WILL ALWAYS NEED TO BE EQUAL TO OR WITHIN THE “PUMP SHUT-OFF” VALUES.
- 2) LOW-LIMIT ALARMS ARE PRESET TO A 10 SECOND DELAY FROM START AS A PUMP IS MOST COMMONLY AT AMBIENT PRESSURE DURING INITIAL START FOR MANY WORKFLOWS. THIS 10-SECOND DELAY CAN BE CHANGED TO ANOTHER DURATION BY AN OPERATOR—CHOOSE A RANGE FROM 0 SECONDS TO A MAXIMUM OF 300 SECONDS. IF AN OPERATOR SELECTS A MINIMUM OF 0 SECONDS, THE SYSTEM MAY STOP AND WARN IMMEDIATELY.
- 3) ALARM STATES WILL TRIGGER THE DRIVE GENERAL ANALOG I/O CONNECTION ALARM OUTPUT (EITHER 25-PIN OR 31-PIN DEPENDING ON MODEL).
- 4) GENERAL ALARM ONLY TRIGGERS WHEN THE PUMP HAS BEEN RUNNING AND THE ALARMS ON/OFF SLIDER POSITION IS SET TO ITS SLIDER ON-POSITION (SEE BELOW). AN ALARM CONTINUES UNTIL MESSAGES ARE CLEARED. THIS FEATURE ALLOWS A PLC SYSTEM OR OTHER EXTERNAL DEVICES TO “SEE” THAT AN ALARM HAS BEEN TRIGGERED.
- 5) AFTER CONFIGURATION, THE PUMPS WILL PROMPT AN OPERATOR WITH THE SENSOR SETTINGS FOR CONFIRMATION. THE PROCESS CAN BE RESTARTED BY REMOVING A SENSOR—HOWEVER, THAT CONFIGURATION WILL NOT BE SAVED.

#### EXAMPLES OF ALARM THRESHOLD SETTINGS



SENSOR RANGE BAR

ON SLIDER POSITION

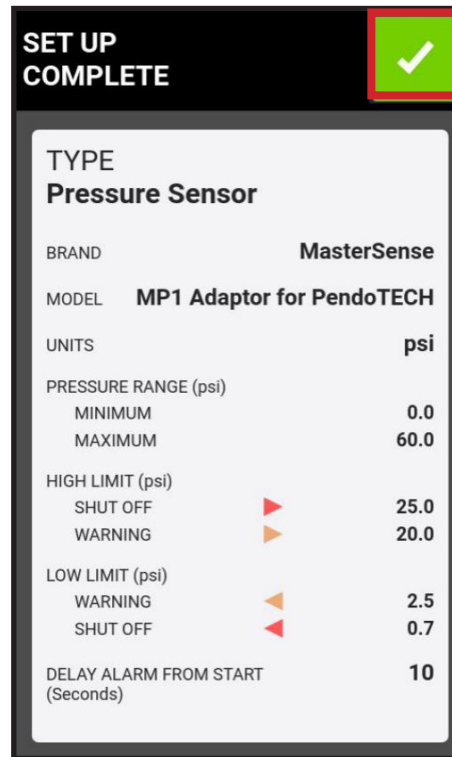


## Section 2: Operator Interface (Cont')

### 8) Alarm Summary.

The “Set Up Complete” screen automatically displays signaling the set up process is completed.

- Tap the **green** checkmark box to move to the “Mode Continuous” screen (next).

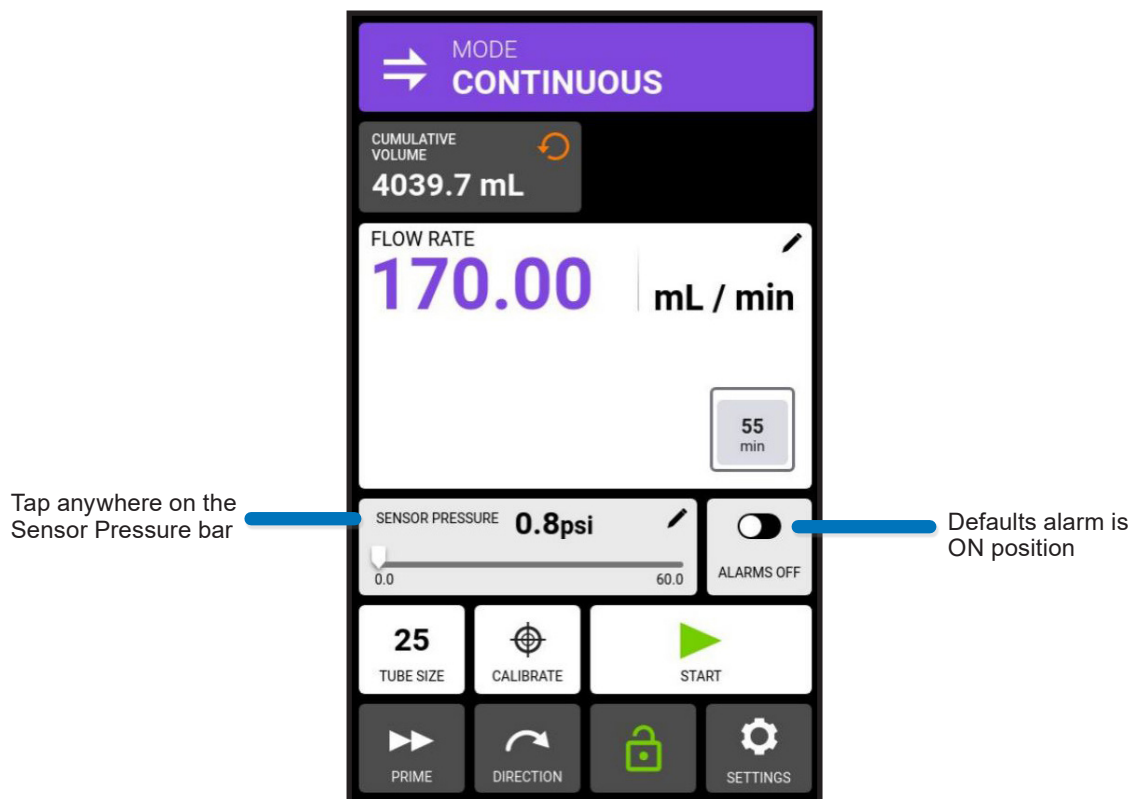


## Section 2: User Interface Operation (Cont')

### 9) Main Screen.

The Mode Continuous (Main) screen displays.

- Tap the "Alarms" switch to toggle on or off positions.
- Tap anywhere on the "Sensor Pressure" bar to move to the "Sensor Settings" screen (next).



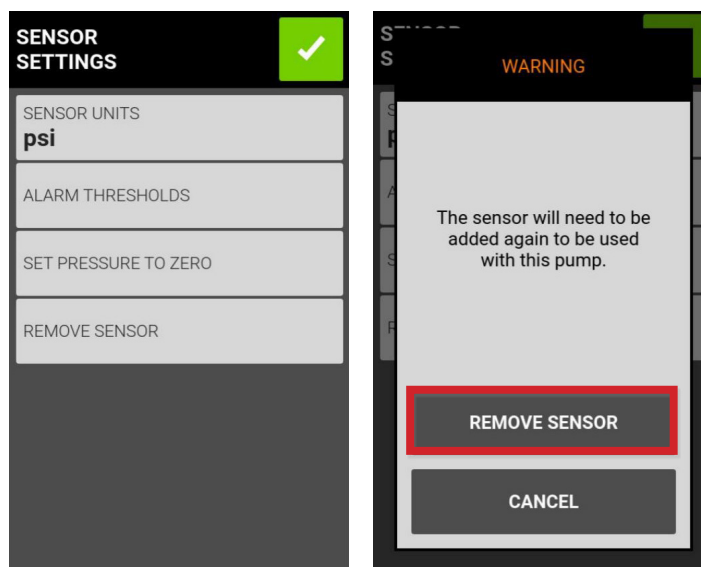
## Section 2: Operator Interface (Cont')

### 10) Remove Sensor Software Configuration Settings if Required.

If required, remove the current sensor settings with the “Sensor Settings” touchscreen menu (see below).

To remove a sensor software configuration, do the following:

- Tap the **green** checkmark box to on the “Sensor Settings” screen to move to the “Warning” touchscreen.
- Tap the “Remove Sensor” button to confirm sensor removal (or previously sensor configuration will remain).



## Section 2: Operator Interface (Cont')

### 11) Sensor Warnings and Alarms.

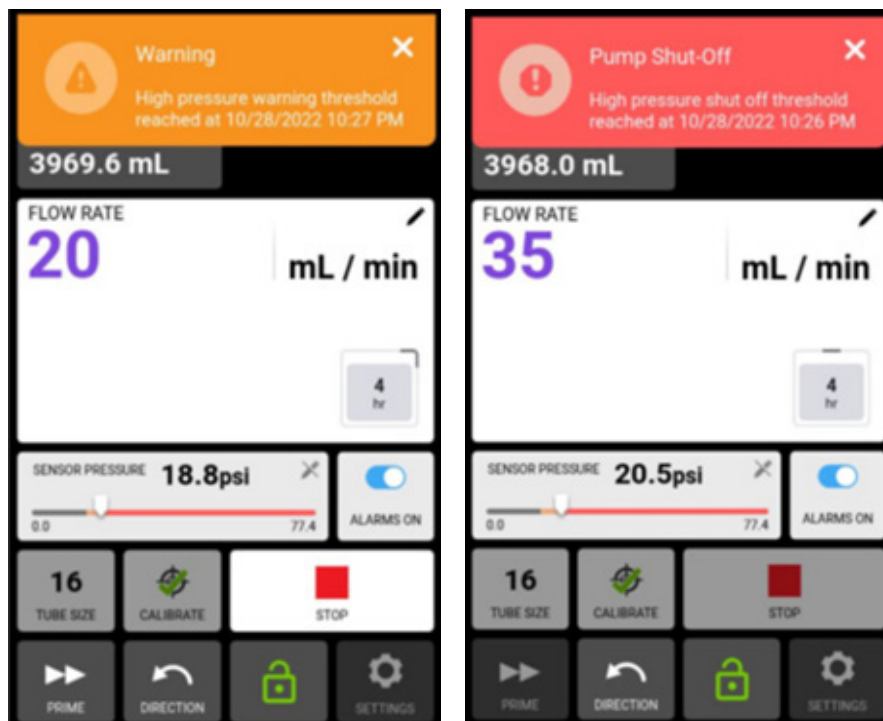
The touchscreen automatically displays either a “Warning” or “Pump Shut-Off” alarm state messages (top) based on the current alarm thresholds and the current pressure in the flow configuration (see below).

To remove an alarm message tap anywhere in the colored area.

#### NOTE:

WARNING LIMIT ALARMS ALERTS will have a yellow pop-up message. The pump will continue to operate; 2 audible beeps will sound every 30 seconds; will continue to alarm until a pop-up message is dismissed by tapping the orange color field (see below).

PUMP SHUT OFF LIMIT ALARM ALERTS will have a red pop-up message. The pump will stop operation once threshold is met; 3 audible beeps every 30 seconds; requires dismissing of message by tapping the red color field to run pump.



# Section 3: Universal Pressure Adapter

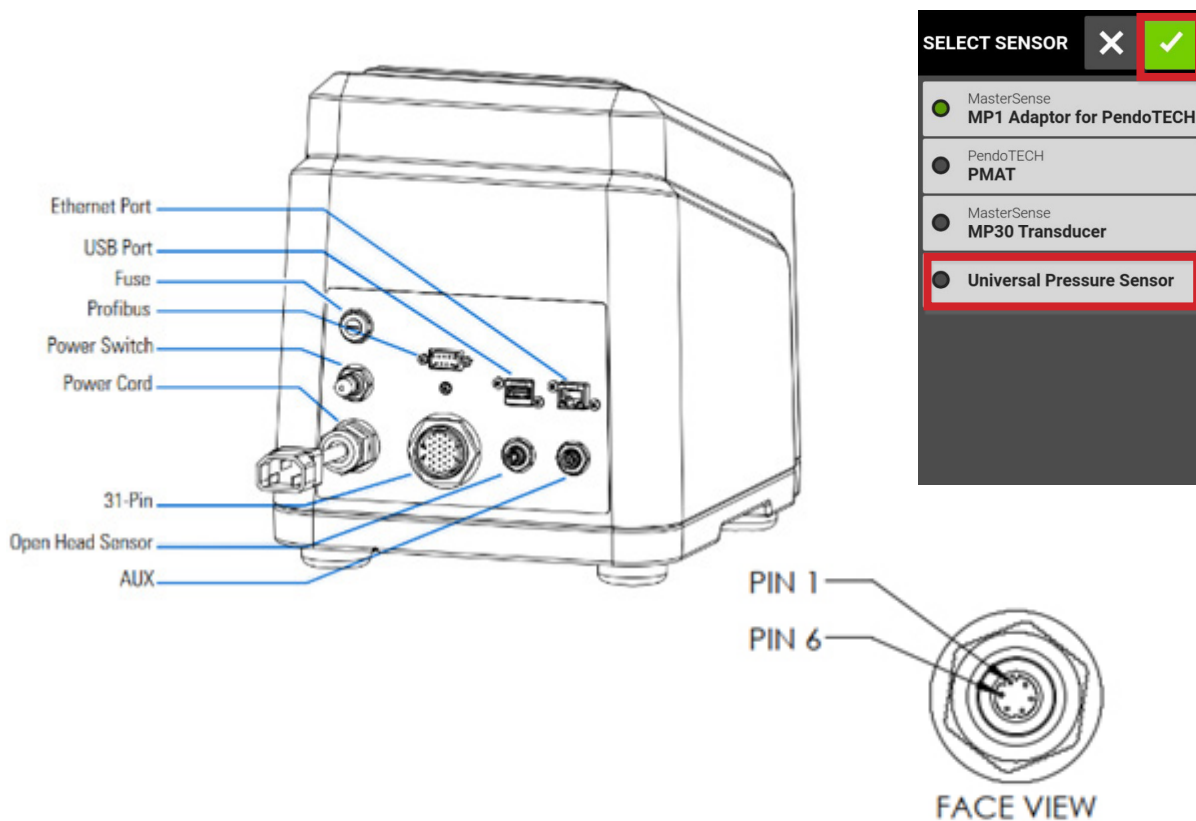
## 3.1 Drive Back Panel and AUX Connector.

During pump set up selections, the Universal Pressure Sensor option should be selected on the “Select Sensor” touchscreen (see below).

**FYI:** the pump can also accept any pressure transmitter or pressure signal that outputs in a 0–20mA to a 4–20mA range, or a 0–5V to 0–10V range.

**CAUTION:** it is a dangerous practice to setup a pump to accept a voltage input signal and provide a current input. Likewise, setting the pump up for a current input signal and providing the pump drive a voltage signal. Both of these settings can cause a pump malfunction and should be avoided.

The 6-pin adapter cable for a universal connector accessory is required for connections to additional process sensors.



**NOTE:**

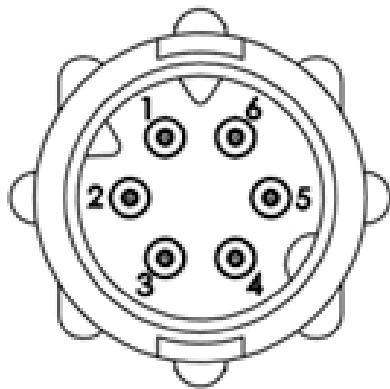
SEE SECTION 3.3 (UPCOMING PAGE 16) FOR 4-20mA LOOP POWER WIRING DETAILS.  
SEE SECTION 3.3 (UPCOMING PAGE 19) 0-5V, 0-10V SENSOR OUTPUT DETAILS.  
SEE SECTION 3.3 (UPCOMING PAGE 18) FOR SENSOR OUTPUT DETAILS.  
SEE SECTION 2.5 (PREVIOUS PAGE 8) FOR SELECTING RANGE DETAILS.

## Section 3: Universal Pressure Adapter (Cont')

### 3.2 AUX Connector Sensor Specifications.

**FYI:** for drives 07526-10, 07526-12, 07526-20, 07526-22; 07576-10, 07576-12, 07576-40, 77421-00, 77421-02, 77112-10.

The back panel of supported drives contain an input 6-pin connector which accepts a external pressure sensor cable. The AUX power pinouts are shown below.



Back Panel View

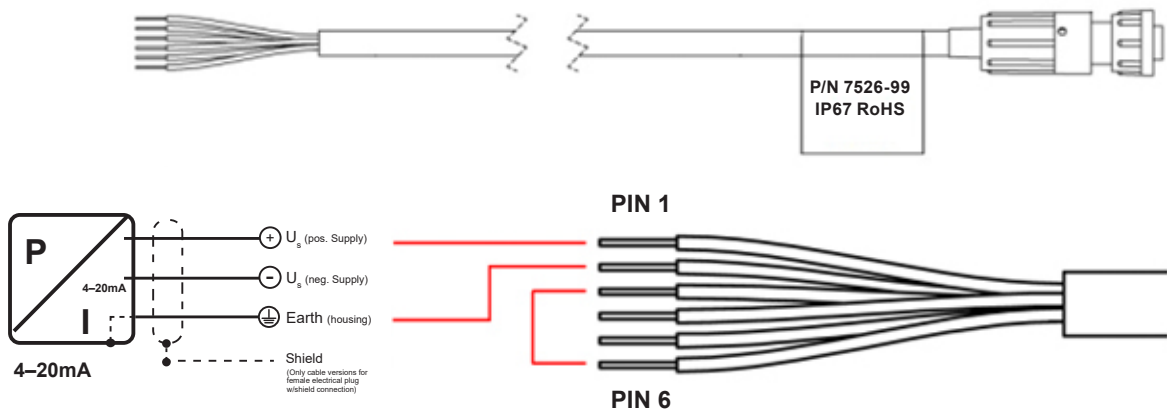
Pinouts	
Pin	Function
1	24 VDC
2	Analog (+)
3	Analog (-)
4	Not Used
5	Not Used
6	Ground

AUX Power	
Power Outlet Supply	+24 VDC, 50mA Max
4-20mA input	249 $\Omega$ typical input impedance 4–20mA/0–20mA (operator selectable); Scalable Pressure -14.7 to 100 psi (-1 to 6.89 bar)
0–5V/0–10V input	10 $\Omega$ typical input impedance 0–5/0–10V (operator selectable); Scalable Pressure -14.7 to 100 psi (-1 to 6.89 bar)
Accuracy	$\pm 1\%$ F.S., 10-bit resolution, 0°C to 70°C 40mA max Common Mode Range: $\pm 50V$ referenced to ground

# Section 3: Universal Pressure Adapter (Cont')

## 3.3 Universal Sensor Typical Wiring Diagram.

Typical 4–20mA Loop Power Wiring Diagram



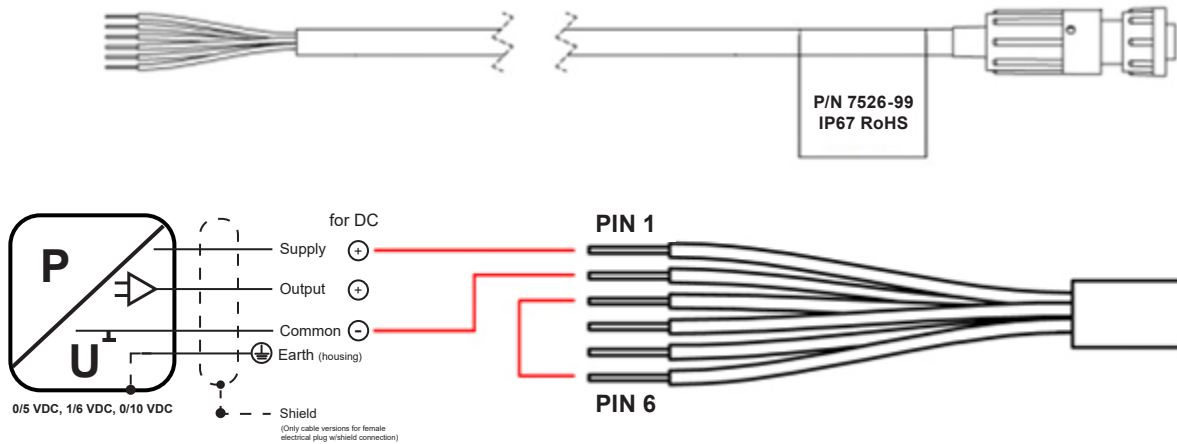
4–20mA Output		
Pin	Function	Color
1	24 VDC	Blue
2	Analog Input (+)	Red
3	Analog Input (-)	Black
4	N/A	Green
5	N/A	White
6	Ground	Yellow



## Section 3: Universal Pressure Adapter (Cont')

### 3.3.1 Sensor Output Wiring Diagram.

Typical 0–5V, 0–10V Sensor Output Wiring Diagram



0/5 VDC, 0/10 VDC Output		
Pin	Function	Color
1	24 VDC	Blue
2	Analog Input (+)	Red
3	Analog Input (-)	Black
4	N/A	Green
5	N/A	White
6	Ground	Yellow

## Section 4: Hardware Accessories

### 4.1 MasterSense MP1 Adapters for PendoTECH Single-Use Pressure Sensors

**07526-91 MP1 kit pump system includes:**

- MasterSense MP1 Adapter
- PendoTECH Luer pressure sensor
- ¼" and ⅜" barb tee fitting adapters

07526-91: Sensors and Adapters	
Description	Fits Masterflex Pump Tubing Sizes
Luer connection sensor	N/A
¼" barb tee to Luer adapter	L/S® 17, 24 I/P® 26
⅜" barb tee to Luer adapter	L/S 18, 35, 36 I/P 70, 73

**07526-92 MP1 kit includes:**

- MasterSense MP1 Adapter
- PendoTECH ½" barb pressure sensor

07526-92: Adapter	
Description	Fits Masterflex Pump Tubing Sizes
½" barb	I/P 82, 88 B/T® 87

Additional Sensors			
MasterSense MP1 SKU: 07526-90		Required PendoTECH Pressure Sensor	
Barb Size	Masterflex Tube Sizes	PSF	PC
Luer		19406-20	19406-32
⅛"	L/S 16	19406-51	
¼"	L/S 17, 24, I/P 26	19406-27	19406-21
⅜"	L/S 18, 35, 36, I/P 70, 73	19406-25	19406-23
½"	I/P 82, 88, B/T 87	19406-22	19406-28
¾"	B/T 91	19406-24	19406-29
¾" Sanitary		19406-52	
1" Sanitary		19406-54	

## Section 4: Hardware Accessories (Cont')

### 4.1 MasterSense MP30 Series Reusable Pressure Sensors

- 30 psi high-accuracy pressure gauges with direct connection to MasterSense pump systems
- 316 Stainless Steel wetted parts
- Acceptable for CIS/SIP applications

#### Choose model for appropriate process connection

- **07526-80** : ¼" NPT process connection
- **07526-81**: ¾" Mini Tri-Clamp process connection. Fits ¼", ½", and ¾" Tri-Clamp fittings
- **07526-82**: 1½" Tri-Clamp process connection. Fits 1" and 1½" Tri-Clamp connections

<b>Accessories</b>				
<b>0-30 Pressure Gauges</b>				
Sensors include 6' cable and 6-pin connector				
<b>NPT Thread Process Connections</b>		Tee Fitting	Barb Adapters for Tee (PP)	
¼" NPT (±0.25 Accuracy)	<b>07526-80</b>	31320-94 (¼" FNPT Tee)	⅛" 40621-45 ⅜" 412517-47 ¼" 40610-38 ⅝" 40621-51 ⅜" 40610-39 ½" 40610-40	
<b>Sanitary Process Connections</b>		Reusable Tee Fittings	Silicone Gasket	Sanitary Clamp
Mini ¾" Sanitary Tri-Clamp (±1% accuracy)	<b>07526-81</b>	31809-61 (PVDF) 31806-61 (PP) 30700-88 (316L SS)	30548-00	31201-93
1" and 1½" Sanitary Tri-Clamp (±0.5% accuracy)	<b>07526-82</b>	31809-63 (PVDF) 31806-61 (PP) 30700-90 (316L SS)	30548-04	31201-95

**NOTE:** THE UNIVERSAL ADAPTER IS COMPATIBLE WITH ANY DEVICE THAN CAN PRODUCE A 0–5V, 0–10V, 0–20mA, OR 4–20mA ANALOG OUTPUT.

## Section 5: Operating Issues

**Issue**      **Flow pressure is not changing.**

**Solutions**    Sensor was not connected properly, try the following:

- 1) Verify pressure sensor cable is connected properly to the back of the drive—the cable may need to be pushed in firmly after initially attaching it.
- 2) Verify the drive was not started with its pump head open (operating the drive with the pump head open is very dangerous and should be avoided under all circumstances).
- 3) Verify the fluid path direction flow, that the flow is going in the desired direction.
- 4) Verify fluid is properly aligned through the fluid path—induce better flow by pressing and squeezing the tube as the pump motor rotates.
- 5) Verify the pressure sensor is connected on the MP1 or MP30 end. If not, plug the pressure sensor cable from the sensor into the fluid path downstream of the pump.

**Issue**      **Flow pressure reading remains too high when attempting to zero-out pressure.**

**Solution**    1) There may be a pump calibration error for the drive: contact Masterflex customer technical support department for next steps.

**Issue**      **Touchscreen warning displays.**

**Solution**    1) If a touchscreen warning alarm displays and the pump cannot be started, clear touchscreen warning (tapping the “X” upper-right) and restart the pump (pump drive will not run until the alarm condition is cleared).



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