iWorx by Taco Electronic Solutions

Installation Guide

502-026

VFTS/VTS Series Sensors with BTUPS Regulated Power Supply

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BTUPS POWER SUPPLY

The BTUPS Power supply is a precision regulated 5 VDC power supply for use with VFTS Flow Sensors and VTS Temperature Sensors.

VFTS/VTS SERIES SENSORS

Overview

The VFTS Series of combined flow and temperature sensors (two-in-one) is based on the principle of vortex shedding behind a bluff body. The VFTS/VTS Sensors are fully compatible with wet, aggressive media. The VFTS/VTS Sensors utilize MEMS sensing technology in combination with a novel packaging concept using corrosion-resistant coating on the MEMS sensor element. This makes the VFTS/VTS Sensors very robust and ideal for supplying accurate liquid temperature sensing in BTU measurement applications. VFTS Sensors are available for flow ranges of 0.25-5, 0.5-10, 1.25-26, 2.6-52, and 5.2-105 GPM.

Application

Flow and temperature measurement for use with the iWorx® BTU3 controller.

Features

- Flow ranges: 0.25-5, 0.5-10, 1.25-26, 2.6-52, and 5.2-105 GPM
- VFTS - Flow and temperature sensor in one package (two-in-one sensor)
- VTS - temperature sensor only
- Based on vortex shedding (no moving parts)
- Voltage output (ratiometric)
- Compact and robust design
- Fast temperature response (direct media contact)
- Compatible with wet, aggressive media

REPRESENTATIONS AND WARRANTIES

This Document is subject to change from time to time at the sole discretion of Taco Electronic Solutions, Inc. All updates to the Document are available at www.taco-hvac.com. When installing this product, it is the reader's responsibility to ensure that the latest version of the Document is being used.

iWorx® products shall only be used for the applications identified in the product specifications and for no other purposes. For example, iWorx® products are not intended for use to support fire suppression systems, life support systems, critical care applications, commercial aviation, nuclear facilities or any other applications where product failure could lead to injury to person, loss of life, or catastrophic property damage and should not be used for such purposes.

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APPLICABLE DOCUMENTATION

Part Number	Audience	Purpose
iWorx® BTU3 Application Guide, Document No. 505-014	– Application Engineers – Wholesalers – Contractors	Provides specific application information about the BTU series, including sequence of operation and configuration information.
iWorx® LCI2 Application Guide, Document No. 505-002	– Application Engineers – Installers – Service Personnel – Start-up Technicians – End user	Provides instructions for setting up and using the iWorx® Local Control Interface.
iWorx® VFTS / VTS Sensors with BTUPS Regulated Power Supply, Document No. 502-026 (this document)	– Application Engineers – Installers – Service Personnel – Start-up Technicians	Provides specific installation and usage information for the sensor series that are most often used with the BTU series controllers.
http://iWorxWizard.taco-hvac.com	– Application Engineers – Wholesalers – Contractors	An on-line configuration and submittal package generator based on user input. Automatically generates bill of materials, sequence of operations, flow diagrams, wiring diagrams, points and specifications.
Additional Documentation	*LonWorks FTT-10A Free Topology Transceiver User's Guide,* published by Echelon Corporation. It provides specifications and user instructions for the FTT-10A Free Topology Transceiver.	

INSTALLATION GUIDE

Precautions

General

This symbol is intended to alert the user to the presence of important installation and maintenance (servicing) instructions in the literature accompanying the equipment.

WARNING: Electrical shock hazard. Disconnect **ALL** power sources when installing or servicing this equipment to prevent electrical shock or equipment damage.

Make all wiring connections in accordance with these instructions and in accordance with pertinent national and local electrical codes. Use only copper conductors.

Static Electricity

Static charges produce voltages that can damage this equipment. Follow these static electricity precautions when handling this equipment.

- Work in a static free area.
- Touch a known, securely grounded object to discharge any charge you may have accumulated.
- Use a wrist strap when handling printed circuit boards. The strap must be secured to earth ground.

Location

Avoid locations where corrosive fumes, excessive moisture, vibration or explosive vapors are present.

Avoid electrical noise interference. Do not install near large contactors, electrical machinery, or welding equipment.

This equipment is suitable for indoor use only. Preferably, or as required by National Electrical Code, the unit is intended to be installed within an electrical control enclosure. Operate where ambient temperatures do not exceed 140 °F (60 °C) or fall below 32 °F (0 °C) and relative humidity does not exceed 90%, non-condensing.

Mount out of direct sunlight and away from sources of heat and cold other than the media you wish to measure.

BEFORE INSTALLING

About this Document

The instructions in this document are for the BTUPS power supply and VFTS / VTS Series Sensors.

Inspecting the Equipment

Inspect the shipping carton for damage. If damaged, notify the carrier immediately. Inspect the equipment for damage. Return damaged equipment to the supplier.

What is Not Included with this Equipment

- A power source for the equipment electronics and peripheral devices.
- Tools necessary to install, troubleshoot and service the equipment.
- The screws or DIN rail needed to mount the device.
- Cabling, cabling raceway, and fittings necessary to connect this equipment to the power source and peripheral devices.

Equipment Location

Abide by all warnings regarding equipment location provided earlier in this document.

Optimally, the equipment should be installed within a secure enclosure.

If the equipment is to be installed outdoors, it must be contained within a protective enclosure. The enclosure must maintain internal temperature and humidity within the ranges specified for this equipment.

This equipment must be installed within installed within 20 feet of the iWorx BTU3 Controller.

Selecting a Power Source

This equipment requires a UL recognized Class 2 external power source (not supplied) to operate. The power supply requires a voltage of 24 Volts AC.

To calculate power source current requirements, add the power consumption of all sensors and power supplies.

The loads must have EMF protection. This protection can be integral to the load, or installed in the 24 VAC wiring across the load's coil.

BTUPS INSTALLATION

Warning: Electrical shock hazard. To prevent electrical shock or equipment damage, disconnect **ALL** power sources to controllers before installing or servicing this equipment or modifying any wiring.

Mounting the Device

1. Select a mounting location. Enclosure mounting is recommended.
2. Hold the device on the panel you wish to mount it on. With a marker or pencil mark the mounting locations on the panel.
3. Using a small drill bit pre-drill the mounting holes.
4. Using two #6 pan head screws, mount the device to the panel.
5. Wire the device (See Wiring Diagram).

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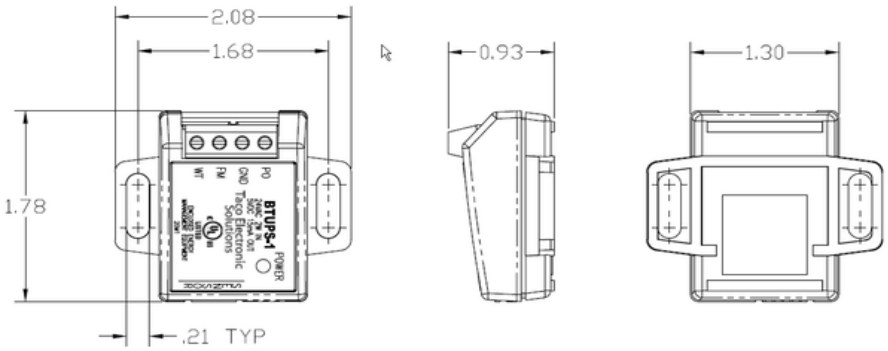
Figure 1: Mounting Dimensions



Grounding the Device

The ground terminal (GND/COM) must be securely connected to a conductive pipe as close as possible to the sensor head. Failure to properly ground this equipment will result in improper operation. Improper grounding may also produce inaccurate sensor data.

VFTS/VTS INSTALLATION

It is recommended that wiring for these units not be run in the same conduit as line voltage wiring or with wiring used to supply highly inductive loads such as motors, generators, and coils.

Installing the Device

The device must be installed in the water pipe where the flow and/or temperature will be measured. The device must be installed with the flow arrow properly aligned with the direction of flow. The diagrams below provide device dimensions for the various models.

Piping Configuration

Proper piping configuration is critical for correct and accurate operation of the sensor. Please observe this section carefully and completely.

- The VFTS should be installed with the arrow on the housing pointing in the direction of flow.
- Before entering the VFTS, piping should be free of bends, pumps or obstructions for a length of at least 15 times the diameter of the pipe.
- After exiting the VFTS, piping should should be free of bends, pumps or obstructions for a length of at least 5 times the diameter of the pipe.
- The VFTS can be installed in any orientation, so long as the sensor remains completely immersed. The presence of air in the pipe or the sensor housing will result in inaccurate readings.
- DO NOT install NPT connections using pipe dope or thread sealant. Use 3 to 4 layers of Teflon tape to seal each joint.

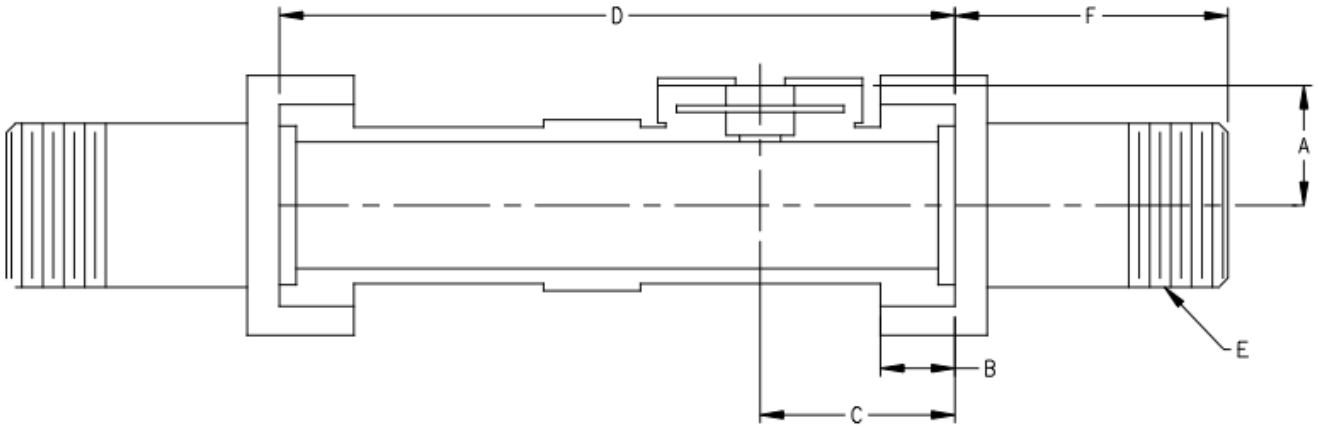
Process Connections

The following process connections are used:

- VFTS5: 1/2” NPT (male) clip lock x 1/2” NPT (male) clip lock
- VFTS10: 3/4” NPT (male) clip lock x 3/4” NPT (male) clip lock
- VFTS26: 3/4” NPT (male) union x 3/4” NPT (male) union

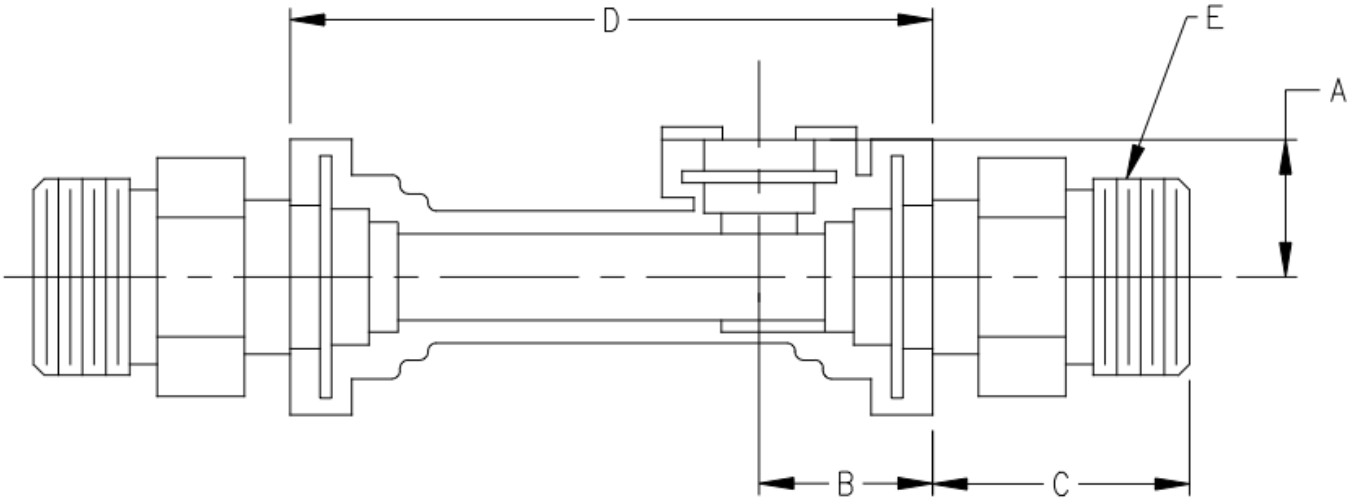
- VFTS52: 1” NPT (male) union x 1” NPT (male) union
- VFTS104: 1 1/4" NPT (male) union X 1 1/4" NPT (male) union
- VTS: Special 1/2 NPT Stainless Steel Pipe Nipple with clip lock

Figure 2: Dimensions - Large Models



PART NO	A	B	C	D	E	F
VFTS26-1	.83 [21]	.47 [12]	1.44 [36.5]	5.08 [129]	2X 3/4 NPT	2.20[55.88]
VFTS52-1	.96 [24.5]	.60 [15]	1.56 [39.5]	5.41 [137.5]	2X 1 NPT	
VFTS104-1	1.11 (28)	.62 (15.7)	2.34 (59.5)	7.10 (180)	2X 1 1/4 NPT	

Figure 3: Dimensions - Small Models



PART NO	A	B	C	D	E
VFTS5-1	.75 [19]	.95 [24]	1.40[35.56]	3.50 [88.88]	2X 1/2 NPT
VFTS10-1		1.0 [25.2]			2X 3/4 NPT

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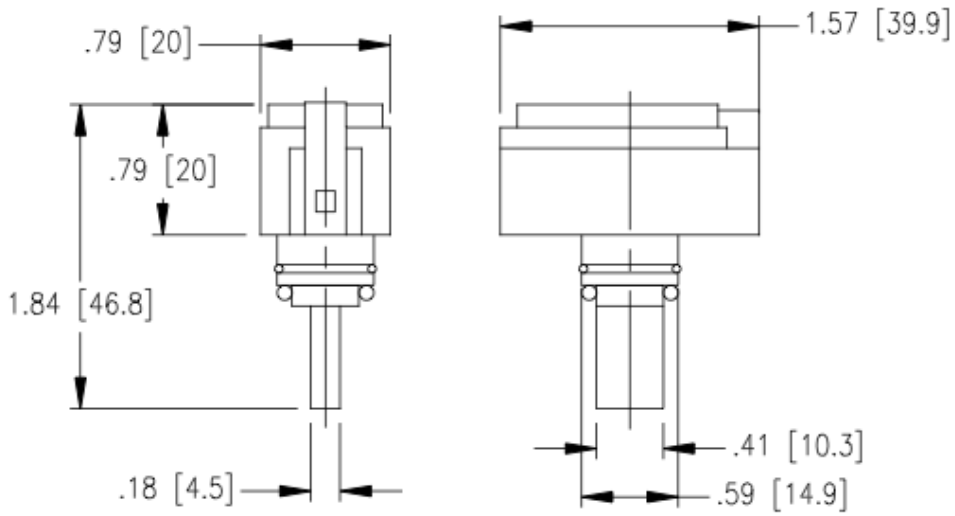
Figure 4: Dimensions - Sensor



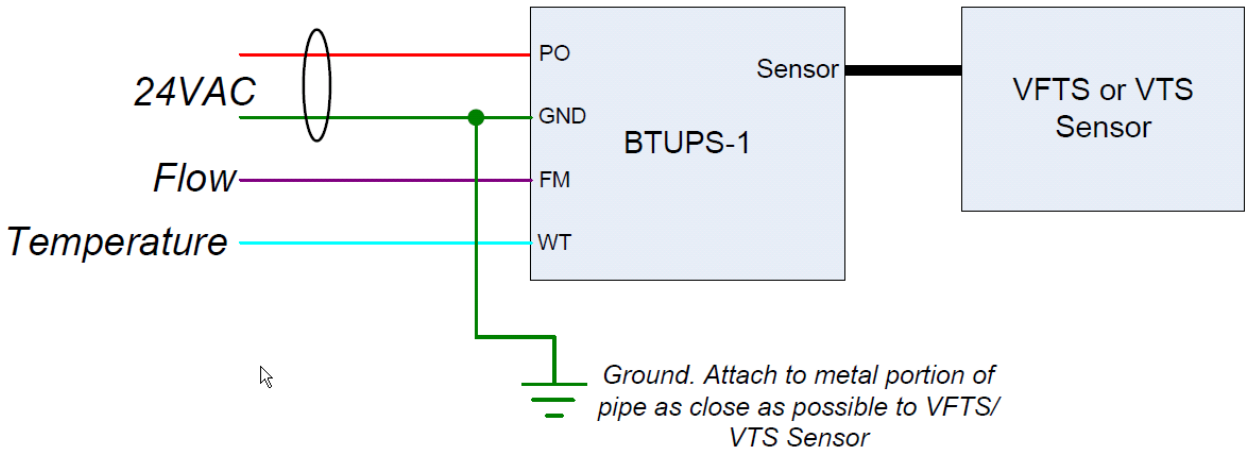
WIRING INFORMATION

WARNING: Electrical shock hazard. To prevent electrical shock or equipment damage, disconnect ALL power sources to controllers before installing or servicing this equipment or modifying any wiring.

Wiring includes a connection between an iWorx® controller and an iWorx® Sensor. Wiring requires at least 18 gauge (0.205 mm^2), shielded twisted- pair wire.

NOTE: Shielded cable is required. Wiring can be in the same conduit with UI, AO, and DI wiring. If the cable is installed in areas of high RIF/EMI, the cable must be in conduit.

Figure 5: Typical VFTS Sensor Wiring



SPECIFICATIONS - BTUPS

Electrical

Power Supply

- 24 VAC (20VAC to 28VAC), requires Class 2 supply
- 1W maximum power consumption

Outputs

- 5 VDC
- 50 mA maximum current output

Mechanical

Housing

- Dimensions: 2.23” (56.6 mm) high x 2.08” (52.8 mm) wide x 1.38” (35.1 mm) deep
- ABS

Weight

- Power Supply Weight: 0.70 pounds (0.32 kilograms)

Environmental

- Temperature: 32 °F to 140 °F (0 °C to 60 °C)
- Humidity: 0 to 90%, non-condensing

Agency Listings - Power Supply

- UL Listed for US and Canada, Energy Management Equipment

SPECIFICATIONS - VFTS/VTS

Sensor

Flow Sensor (VFTS only)

Model	Flow Measuring Range	Resolution
VFTS5	0.25 to 5 gpm (1 to 20 l/min)	0.026 gpm (0.1 l/min.)
VFTS10	0.5 to 10 gpm (2 to 40 l/min)	0.052 gpm (0.2 l/min)
VFTS26	1.25 to 26 gpm (5 to 100 l/min)	0.132 gom (0.5 l/min)
VFTS52	2.6 to 52 gpm (10 to 200 l/min)	0.264 gpm (1.0 l/min)
VFTS104	5.2 to 105 gpm (20 to 400 l/min)	0.528 gpm (2.0 l/min)

- Accuracy (±1σ), 0 to 100 °C: ±1.5 % FS
- Response time (63.2 %): < 1 s

Temperature Sensor

- Measuring Range: 32 to 212 °F (0 to 100 °C)
- Accuracy (±1σ), 25 to 80 °C: ±1 °C
- Accuracy (±1σ), 0 to 100 °C: ±2 °C
- Response time (63.2 % at 50 % FS flow): < 1 s
- Resolution: 0.9 °F (0.5 °C)

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Electrical

- Power supply: 5 V DC (provided by BTUPS). Grounding of the sensor supply is required (PELV)
- Power limitation: 150 VA
- Current limitation: 8 A
- Output signals: Ratiometric
- Flow signal: 0.5 - 3.5 V (Zero at 0.35 V)
- Temperature signal: 0.5 - 3.5 V
- Power consumption: < 50 mW
- Load impedance: > 10 kΩ

General

Media and Environment

- Media types: The sensor is compatible with liquids (kinematic viscosity 2.0 mm^2/s maximum)
- Media temperature (operation): 32 to 212 °F (0 to 100 °C)
- Media temperature (peak): -13 to 257 °F (-25 to 120 °C), non-freezing
- Ambient air temp. (operation): -13 to 140 °F (-25 to 60 °C)
- Ambient air temp. (peak): -67 to 194 °F (-55 to 90 °C)
- Humidity: 0 - 95 % (relative), non-condensing
- System burst pressure: 232 psi (16 bar)

Sensor Materials

- Sensing element: Silicon-based MEMS sensor
- Seal (sensor to housing): EPDM rubber
- Housing and Flow Pipe: Engineering Plastics
- Wetted materials: Corrosion-resistant EPDM and Engineering Plastics

Environmental Standards

- Enclosure class: IP44 (Non overmolded IP20)
- Temperature cycling: IEC 68-2-14
- Vibration (non-destructive): 20 - 2000 Hz, 10G, 4h
- Electromagnetic compatibility: EN 61326-1

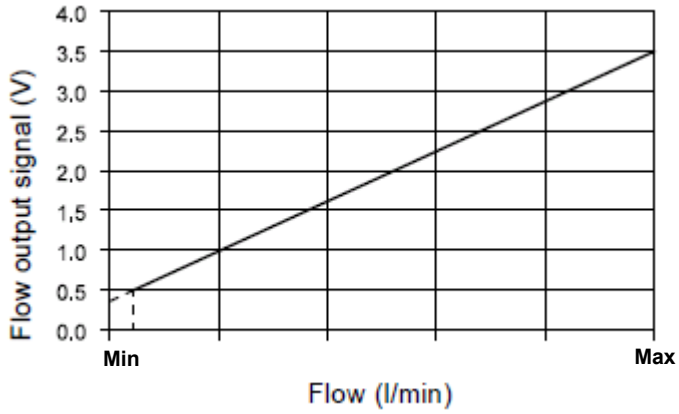
Weight

Model	Weight (Sensor Only)	Weight (Shipping)
VFTS5	0.6 lb [0.27 kg]	1.6 lb [0.73 kg]
VFT10	0.6 lb [0.27 kg]	1.6 lb [0.73 kg]
VFTS26	0.9 lb [0.41 kg]	1.9 lb [0.86 kg]
VFTS52	1.3 lb [0.59 kg]	2.3 lb [1.04 kg]
VFTS104	2.1 lb [0.95 kg]	3.1 lb [1.41 kg]
VTS	0.2 lb [0.09 kg]	0.3 lb [0.14 kg]

Output Signals

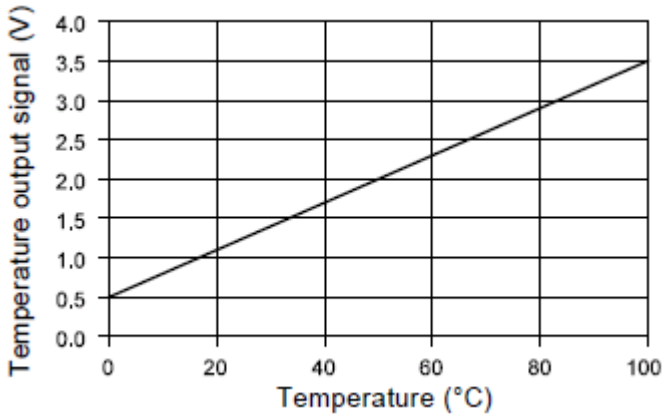
Flow (VFTS model)

Figure 6: Flow Response



Temperature

Figure 7: Temperature Response



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TROUBLESHOOTING TIPS

This section describes common problems and how to resolve them.

Problem	Solution
The temperature reading is out of range, at minimum, or maximum.	-Is the input shorted or open? -Is the VFTS/VTS connected to the BTUPS? -Does the BTUPS have 24VAC power?
The Flow Sensor is not reading values.	-Is the cable plugged in? -Are the wires connected to the proper input? -Is the VFTS connected to the BTUPS? -Is the BTUPS's common connected to Earth Ground? -Is all air bled from the piping?
The Flow Sensor is registering a flow even when there can be no flow in the system.	The flow meter is improperly grounded. Ensure that there is a direct connection from Earth Ground to the GND connection of the BTUPS.
Erratic readings	Bad wire connection or condensation on board.

Getting Help

Components within an iWorx® controller, sensor, or power supply cannot be field repaired. If there is a problem with a unit, follow the steps below before contacting your local TES representative or TES technical service.

1. Make sure controllers, sensors, and power supplies are connected and communicating to desired devices.
2. Record precise hardware setup indicating the following:

   Version numbers of application software.

   Device and/or firmware version number.

   A complete description of difficulties encountered.

Notes:

LIMITED WARRANTY STATEMENT

Taco Electronic Solutions, Inc. (TES) will repair or replace without charge (at the company's option) any product or part which is proven defective under normal use within one (1) year from the date of start-up or one (1) year and six (6) months from date of shipment (whichever occurs first).

In order to obtain service under this warranty, it is the responsibility of the purchaser to promptly notify the local TES stocking distributor or TES in writing and promptly deliver the subject product or part, delivery prepaid, to the stocking distributor. For assistance on warranty returns, the purchaser may either contact the local TES stocking distributor or TES. If the subject product or part contains no defect as covered in this warranty, the purchaser will be billed for parts and labor charges in effect at time of factory examination and repair.

Any TES product or part not installed or operated in conformity with TES instructions or which has been subject to accident, disaster, neglect, misuse, misapplication, inadequate operating environment, repair, attempted repair, modification or alteration, or other abuse, will not be covered by this warranty.

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If in doubt as to whether a particular product is suitable for use with a TES product or part, or for any application restrictions, consult the applicable TES instruction sheets or in the U.S. contact TES at 401-942-8000 and in Canada contact Taco (Canada) Limited at 905-564-9422.

TES reserves the right to provide replacement products and parts which are substantially similar in design and functionally equivalent to the defective product or part. TES reserves the right to make changes in details of design, construction, or arrangement of materials of its products without notification.

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