



Series TDS

Flow Switch

Owner's Manual



Dwyer Instruments, Inc.
102 Indiana Hwy. 212
(P.O. Box 373)
Michigan City, IN 46360 (46361) USA
www.Dwyer-Inst.com

Offered in liquid and gas sensor types, the general purpose flow switch provides reliable low or no-flow detection of relatively clean, non-coating media with one 1A relay output. Liquid examples include water and acetic acid. Available in Polypropylene-Ryton® or PVDF, the short flow sensor is used in pipe or ducting from ½” to 1-1/2”, and the long flow sensor is used in 2” and up. The flow switch set point may be adjusted from 0.04 to 3 fps in liquids or 1 to 90 fps in gases as a low-flow alarm. The flow sensor is best applied in applications with relatively constant temperatures.

New Features

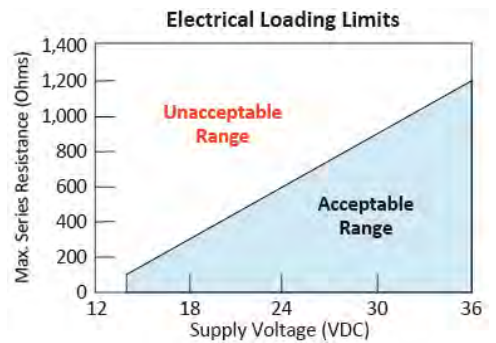
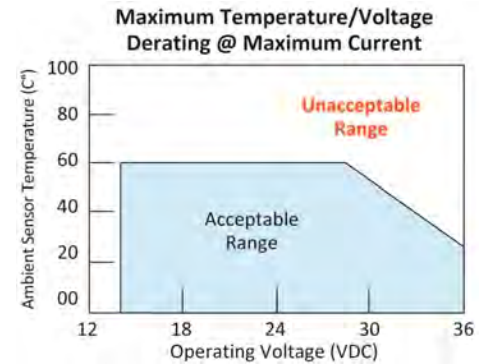
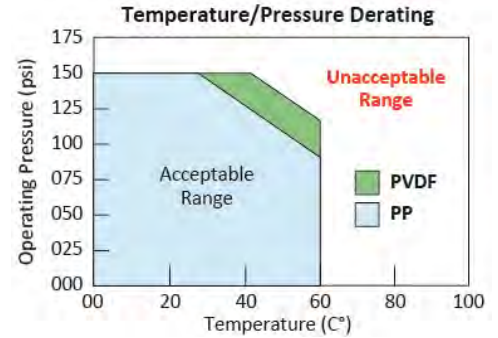
- Rugged Polypropylene-Ryton® or PVDF sensor for corrosive liquids and gasses.
- Adjustable set point with LED for flow or no-flow status indication.
- 60VA relay selectable NO or NC via power supply wiring polarity
- Solid State sensor is not damaged by over-ranging flow velocities.

⚠ Make a Fail-Safe System: Design a fail-safe system that accommodates the possibility of switch and/or power failure. Dwyer Instruments recommends the use of redundant backup systems and alarms in addition to the primary system. Adding a redundant alarm switch to the system is a cost effective means to prevent costly run-dry issues.

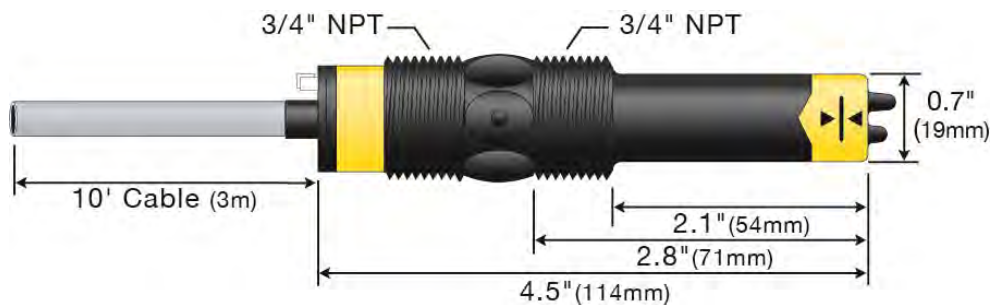
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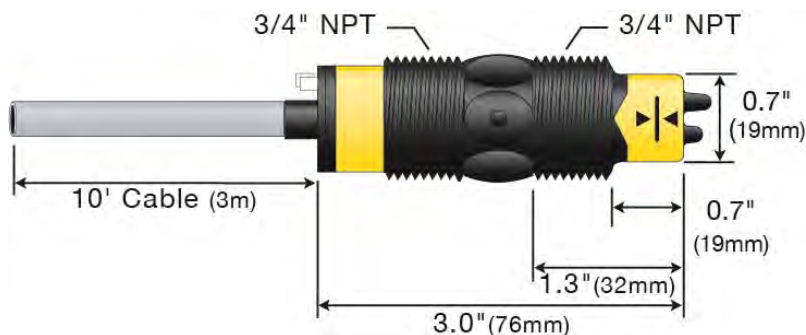
Set point range: .04 to 3 fps / (.012 to .91 mps)
 Factory set point: .2 fps (.06 mps)
 Repeatability: ±.5% of set point @ fixed temp.
 Response time: 1-10 seconds
 Set point adjust.: Potentiometer
 LED indication: Flow Status
 Viscosity range: 1-200 centipoise
 Supply Voltage: 14-36 VDC
 Consumption: 70 mA maximum
 Contact type: (1) SPST relay
 Contact rating: 60 VA, 1A max
 Contact output: Selectable NO/NC
 Process temp.: F: 32° to 140° / C: 0° to 60°
 Electronics temp. F: -40° to 140° / C: -40° to 60°
 Pressure: 150 psi (10 bar) @ 25°C., derated @ 1.667 psi (.113 bar) per °C. Above 25° C.
 Sensor rating: NEMA 4X (IP65)
 Sensor Material: TDS1_2: PP-Ryton®
 TDS2_2:PVDF
 Cable jacket mat.: TDS1_2: PP
 TDS2_2: FEP
 Cable type: 4-conductor, #22 AWG (shielded)
 Cable length: Standard: 10' (3m)
 Process mount: 3/4" NPT
 Classification: General purpose
 CE compliance: EN 61326 EMC / EN 61010-1 safety



Long Sensor



Short Sensor



- ⚠ About This Manual:** PLEASE READ THE ENTIRE MANUAL PRIOR TO INSTALLING OR USING THIS PRODUCT. This manual includes information on all models of the Dwyer Instruments Thermal Dispersion Flow Switch: TDS Series. Please refer to the part number located on the switch label to verify the exact model which you have purchased.
- ⚠ User's Responsibility for safety:** Dwyer Instruments manufactures a wide range of flow switches and technologies, while each of these sensors is designed to operate in a wide variety of applications; it is the user's responsibility to select a sensor model that is appropriate for the application, install it properly, perform tests of the installed system, and maintain all components. The failure to do so could result in property damage or serious injury.
- ⚠ Proper Installation and Handling:** Because this is an eclectically operated device, only properly trained staff should install and/or repair this product. Use a proper sealant with all installations. Never over tighten the sensor within the fitting, beyond a maximum of 80 inch-pounds torque. Always check for leaks prior to system start-up.
- ⚠ Material Compatibility:** The TDS series sensors are available in two different wetted materials. Models TDS1_2 are made of Polypropylene (PP) with Ryton® tips. Models TDS 2_2 are made of Polyvinylidene Fluoride (PVDF). Make sure that the model you have selected is compatible with the application liquid. To determine the chemical compatibility between the sensor and its application liquids, refer to an industry reference such as the Compass Corrosion Guide (available from Compass Publications).
- ⚠ Wiring and Electrical:** The supply voltage used to power the sensor should never exceed a maximum of 36 volts DC. Electrical wiring of the sensor should be performed in accordance with all applicable national, state, and local codes.
- ⚠ Flammable, Explosive and Hazardous Applications: DO NOT USE THE TDS SERIES GENERAL PURPOSE FLOW SWITCHES IN HAZAROUS LOCATIONS.**

⚠ Warning ⚠

- ⚠** *The rating for the relay is 120 VAC / 60 VDC @ 1A. For CE rated applications, the relay rating is 60 VAC / 60 VDC @ 1Amp.*
- ⚠** *Dwyer Instrument's Thermal Dispersion flow switches are not recommendable for use with electrically charged application liquids. For most reliable operation, the liquid being measured may need to be electrically grounded.*
- ⚠** *The sensing tip of the sensor must always be submersed in the liquid and never exposed to air.*
- ⚠** *The liquid temperature must remain constant and not change throughout the process.*

Configurations:

Part Number	Length	Material (body)	Material (cable)
TDS112	Short (3")	PP-Ryton®	Polypropylene
TDS122	Long (4.5")	PP-Ryton®	Polypropylene
TDS212	Short (3")	PVDF	FEP
TDS222	Long (4.5")	PVDF	FEP

Technology: The thermal dispersion flow switches measure liquid temperature to determine changes in flow velocity. As fluid flows across the sensing tips, the temperature is reduced proportionately as a function of the flow rate. When a temperature or velocity shift reaches the user defined set point, the switch changes state indicating the appropriate flow condition (flow or no-flow).

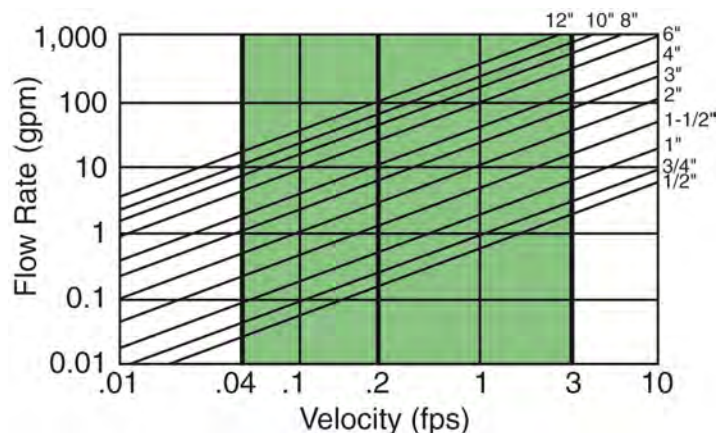
Dwyer Instrument's sophisticated electronics convert the temperature shift into a signal which indicates whether a flow or no-flow condition occurs. Depending on how the sensor is wired, this signal may be wired for normally open or normally closed circuits.

Dwyer Instrument's Thermal Dispersion flow switches have no moving parts to clog or foul, making them suitable for a variety of applications, including non-coating and non-scaling liquids. The TDS series directly measure mass flow and can operate over board range of liquids from 0.4 to 1.2 specific gravity and 1 to 200 cp.

Initializing Sequence for TDS series: Powering up the TDS series is different in liquid and air. When the flow switch is powered up while submersed, the TDS series will immediately indicate flow before switching to its correct state. When the flow switch is powered up in air, the TDS series will immediately indicate no-flow before indicating its correct state. A time delay may be used to eliminate the initialization sequence. Dwyer Instrument's thermal dispersion relay controllers feature a 0 to 60 second time delay for your convenience.

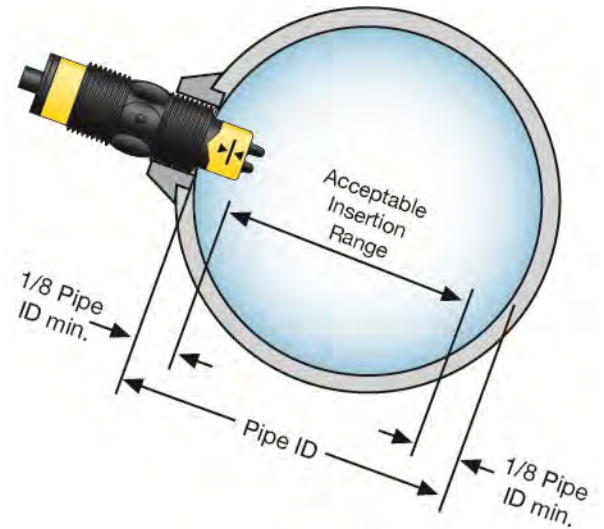
Set Points: The TDS series flow switch set point is factory calibrated to 0.2 fps. To convert feet/sec to GPM, please refer to the chart below.

**Flow Rate vs. Velocity
(gpm vs. fps)**

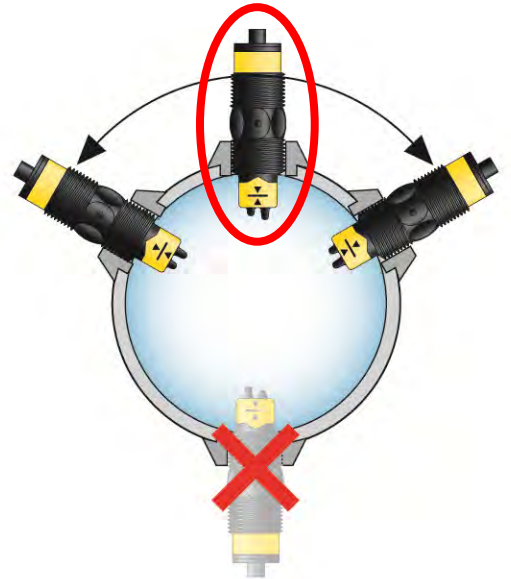


The TDS series flow switch must always be in contact with the liquid being measured. The flow switches feature a 3/4" NPT threads which will allow it to be used with various types of fittings. Be sure to check the insertion depth of the flow switch in the fitting after it is installed. See the diagram to the right for the recommended insertion depth.

- The two tips of the sensor are to be perpendicular to the flow (as seen to the right). Never mount the tips with one in front of the other.



When using any type of fitting, the orientation as well as the insertion depth of the flow switch in the pipe is critical. See the diagram to the right for the recommended orientation. Best location for installation will be along the top of the pipe.



⚠ Warning ⚠

- ⚠ The flow switch tips have a thin plastic wall which may be damaged if dropped or installed improperly.
- ⚠ The TDS series flow switch is designed for use in liquid. For best results, avoid installing the TDS series where bubbles are present or where the tips of the switch may be out of the liquid.
- ⚠ The two temperature probes (tips) must always be perpendicular to the flow (see the flow at the same time).

Supply Voltage: The supply voltage to the TDS series flow switch should never exceed a maximum output of 36 VDC. Use controllers or power supplied, with a minimum output of 14 VDC or maximum output of 36 VDC.

Required Cable Length: Determine the length of the cable required between the TDS series flow switch and its point of termination. Allow enough slack to ensure the easy installation, removal and/or maintenance of the sensor. The cable length may be extended up to a maximum of 1000 ft, using a well-insulated, 14 to 20 gauge shield four conductor cable.

Wire Stripping: Using a 10 gauge wire stripper, carefully remove the outer layer of insulation from the last 1-1/4" of the sensor's cable. Unwrap and discard the exposed foil shield from around the signal wires, leaving the drain wire attached if desired. With a 20 gauge wire stripper, remove the last 1/4" of the colored insulation from the signal wires.

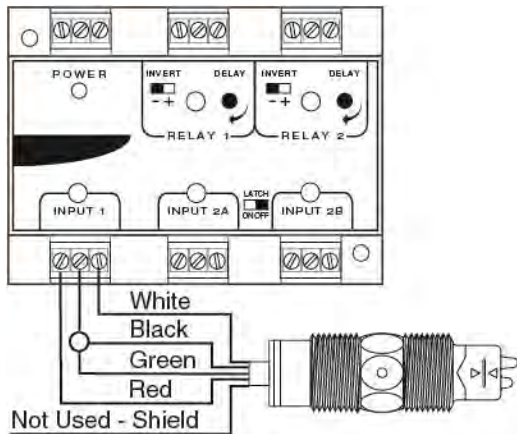
Signal Output (Relay Switching):

Allows the sensor to switch a small load on or off directly, using an internal 1A relay [120 VDC/VDC or (CE: 60 VDC/VDC)]. The NO/NC status is set by the polarity of the voltage feeding the red and black wires. The green wire is the common for the relay and the white wire is the NO or NC, depending on the polarity of red and black.

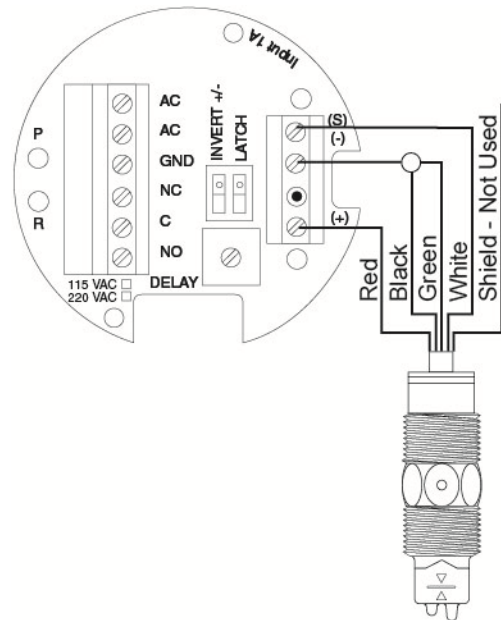


Wiring to a Dwyer Instruments Controller:

TDC Series Controller



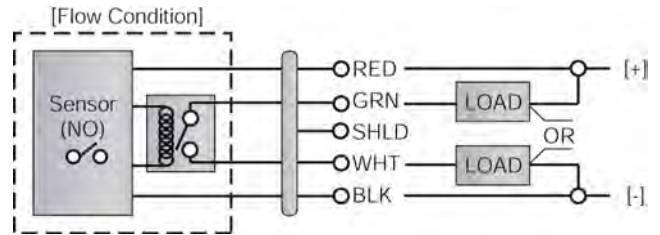
TSP Series Controller



Wiring the Relay Output: The TDS series relay output can be wired as a dry contact to a VDC or VAC power source. The TDS series does require 14-36 VDC power to operate the sensor and switch the relay. All installations below identify a dry switch state as the normal position of the relay.

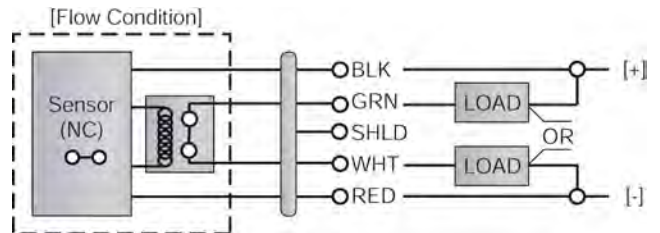
Switching a Normally Open DC Load (Open during Flow, Closed during No-Flow):

The Red wire connects to Positive (+) of the power supply and the Black wire connects to Negative (-). The LOAD can be attached to either the Green or White wires. Complete the circuit by connecting the Green to (+) VDC power or White to (-) VDC power (see illustration to the right).



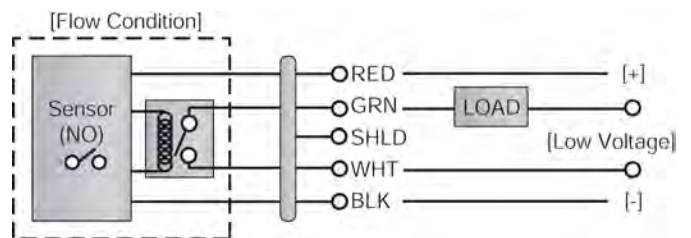
Switching a Normally Closed DC Load (Closed during Flow, Open during No-Flow):

The Black wire connects to positive (+) of the power supply and the Red wire connects to Negative (-). The Load can be attached to either the Green or White wires. Complete the circuit by connecting the Green to (+) VDC power or White to (-) VDC power (see illustration to the right).



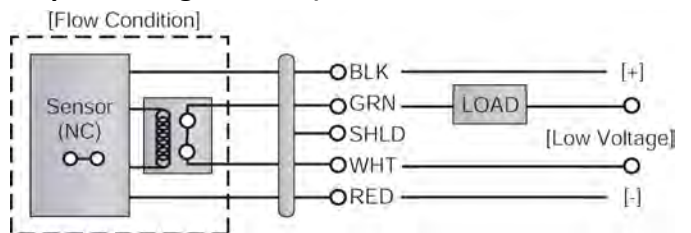
Switching a Normally Open AC Load (Open during Flow, Closed during No-Flow):

The Red wire connects to Positive (+) of the DC power supply and the Black wire connects to Negative (-). The LOAD can be attached to the Green wire and the Hot of the VAC power. Connect the white to the Neutral of the VAC power (see illustration to the right). Low voltage VAC is less than 36 VAC.



Switching a Normally Closed AC Load (Closed during Flow, Open during No-Flow):

The Black wire connects to Positive (+) of the DC power supply and the Red wire connects to Negative (-). The LOAD can be attached to the Green wire and the Hot of the VAC power. Connect the White to the Neutral of the VAC power (see illustration to the right). Low voltage VAC is less than 36 VAC.



For all Sensor Wiring diagrams above:

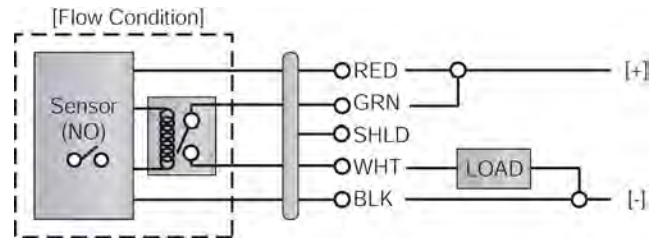
Sensor Power: Red and Black Wires (36 VDC Max.)

Relay Rating: Green and White Wires (60VA, 1A Max.)

Wiring as a P-Channel or N-Channel output: The TDS series can be substituted for either a P-Channel (PNP, Sourcing) output or N-Channel (NPN, sinking) output.

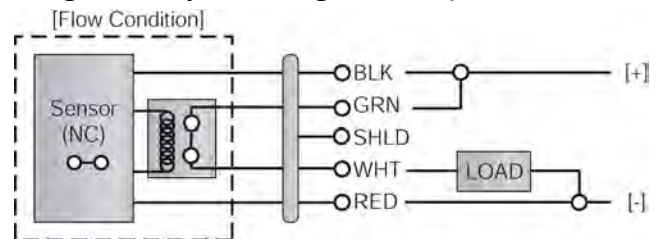
Normally Open DC Load as a P-Channel Output (Open during Flow, Closed during No-Flow):

To wire as a NO P-Channel output follow the directions below. The Red Wire connects to Positive (+) of the power supply and the Black wire connects to Negative (-). The Green wire is jumping to the Red wire while the White wire is connected to the LOAD. Jumper the LOAD back to the Negative (-) to complete the circuit.



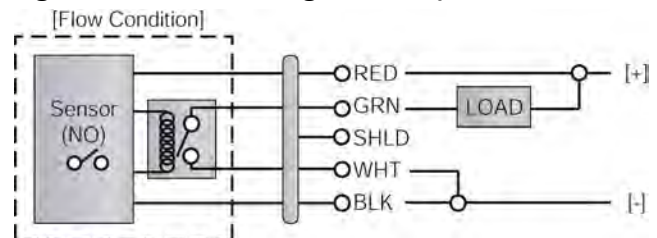
Normally Closed DC Load as a P-Channel Output (Closed during Flow, Open during No-Flow):

To wire as a NC P-Channel output, follow the directions below. The Black wire connects to Positive (+) of the power supply and the Red wire connects to Negative (-). The Green wire is jumping to the Black wire while the White wire is connected to the LOAD. Jumper the LOAD back to the Negative (-) to complete the circuit.



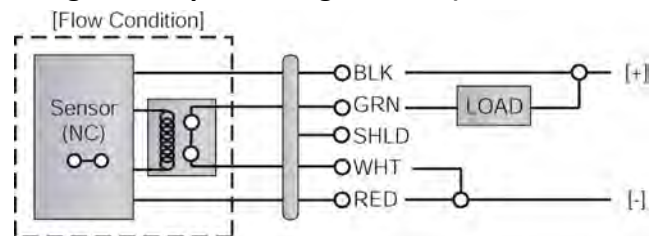
Normally Open DC Load as a N-Channel Output (Open during Flow, Closed during No-Flow):

To wire as a NO N-Channel output, follow the directions below. The Red wire connects to Positive (+) of the power supply and the Black wire connects to Negative (-). The white wire is jumping to the Black wire while the Green wire is connected to the LOAD. Jumper the LOAD back to the Positive (+) to complete the circuit.



Normally Closed DC Load as a N-Channel Output (Closed during Flow, Open during No-Flow):

To wire as a NC N-Channel output, follow the directions below. The Black Wire connects to Positive (+) of the directions below. The Black Wire connects to Negative (-). The white wire is jumping to the Red wire while the White wire is connected to the LOAD. Jumper the LOAD back to Positive (+) to complete the circuit.



For all Sensor Wiring diagrams above:

Sensor Power: Red and Black Wires (36 VDC Max.)

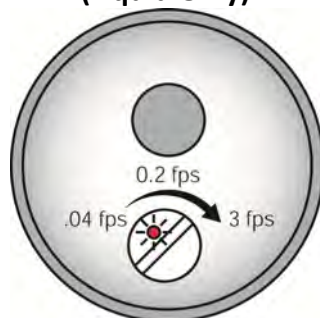
Relay Rating: Green and White Wires (60VA, 1A Max.)

Set Point: If the preset factory calibration is not adequate for your application, follow the calibration steps listed below.

Note: The switch's internal LED will be on when the switch detects no-flow and will off when the switch detects flow, regardless of the polarity of the Red and Black wires. Reversing the Red and Black wires will reverse the polarity of the relay switch, but not the internal LED.

1. Install the fitting and flow switch as described in the Installation section of this manual. Turn the flow switch and controller power on and adjust the flow rate to the application setting. If the medium to be sensed is likely to be subject to any temperature variation, the flow switch should be set as the highest normal temperature likely to be encountered.
2. Locate the potentiometer knob at the top of the flow switch. The red LED is visible through the potentiometer. The adjustment is a single turn 270° potentiometer. The initial response time of the flow switch after adjustment is 1 to 10 seconds. Adjust the potentiometer in slow increments and wait for the response.
 - a. LED is ON - If the LED is on, slowly adjust the potentiometer counter-clockwise, with a small flat head screwdriver until the LED turn off.
 - b. LED is OFF - If the LED is off, slowly adjust the potentiometer clockwise. with a small flat head screwdriver until the light turns on.
3. Adjust the potentiometer back and forth where the LED is switching, eventually settling for where the LED is OFF (this is the low flow state for the switch).
 - a. If the flow is increased, the LED will remain OFF indicating a flow condition
 - b. If the flow is decrease, the LED will turn ON indicating a no-flow condition.
4. Verify that the new calibration is correct by lowering the system flow rate below the set point and check to see that the red LED turns on. Then increase the flow rate above the set point and verify that the red LED turns off accordingly.

**TDS SERIES Flow Switch
(Liquid Only)**



**Potentiometer
Location**



MAINTENANCE/REPAIR: The TDS Series is not field serviceable and should be returned if repair is needed (field repair should not be attempted and may void warranty).

General: The TDS series flow switch requires no periodic maintenance except to clean off any deposits or scaling from the sensor tip as necessary. It is the responsibility of the user to determine the appropriate maintenance schedule, based on the specific characteristics of the application liquids.

Cleaning Procedure:

- 1. Power:** Make sure that all power to the sensor, controller and/or power supply is completely disconnected.
- 2. Sensor Removal:** *Make sure that the flow is off and the pressure is down prior to removing the TDS series flows switch.* Carefully, remove the sensor from the installation. Replace the sensor with a 3/4" NPT plug to insure that the liquid does not leak out during this procedure. **Do not re-install the TDS series if the threads are damaged.**
- 3. Cleaning the sensor:** Use a soft bristle brush and mild detergent, carefully wash the TDS series flow switch. Do not use harsh abrasives such as steel wool or sandpaper, which might damage the surface sensor. Do not use incompatible solvents which may damage the surface sensor. Do not use incompatible solvents which may damage the sensor's PP/Ryton or PVDF plastic body.
- 4. Sensor Installation:** Follow the appropriate steps of installation as outlined in the installation section of this manual.

Testing the Sensor:

- 1. Immersing the switch:** Place the switch in a cup of water. Make sure the tips are submersed in the water.
- 2. Power:** Turn on power to the switch with Red to (+) and Black to (-). You can reverse the polarity if desired.
- 3. No-Flow/Flow Test:** With the switch setting still in the cup, wait until the Red LED turns ON (no-flow condition).
 - a. Swirl the switch in the cup and wait until the Red LED turn OFF (flow condition).
 - b. Stop swirling the sensor and let it rest in the cup waiting for the Red LED to turn ON again (no-flow condition).
 - c. Repeat the above two steps.
- 4. Relay Test:** Connect a multimeter (set to read Ohms) to the White and Green Wires. Perform the above No-Flow/Flow test with the multimeter connect to observe the actuation of the relay.
 - a. With Red to (+) and Black to (-), the multimeter will read a small resistance during no-flow (closed relay) and OL during a flow condition (open relay).
 - b. Reverse Polarity [Red to (-) and Black to (+)] to see the multimeter read OL during a no-flow state (open relay) and a small resistance during a flow condition (closed relay).

The No-Flow/Flow test determines if the switch is capable of sensing the changes between no-flow and flow. The Relay test determines the ability of the relay to switch between a no-flow and flow condition. This is the basic test to determine functionality of the sensor.

WARRANTY/RETURN

Refer to “Terms and Conditions of Sale” in our catalog or on our website. Contact customer service to receive a Return Goods Authorization number before shipping your product back for repair. Be sure to include a brief description of the problem plus any relevant application notes.

Dwyer Instruments, Inc.
Attn: Repair Department
102 Highway 212
Michigan City, IN 46360