

# Control Flow From Outside a Pipe

## Flow Switch with Non-Contacting Sensor

### ***Doppler Flow Switch***

#### ***Model DFS 5.1***

##### ***Controls Flow with:***

*No pressure drop  
No sensor fouling  
No maintenance*



#### ***Clamp-on Flow Sensor Installs without cutting the pipe***

##### ***Installs in Minutes No moving parts***

Mount the DFS 5.1 ultrasonic sensor on the outside of metal or plastic pipes. The sensor continuously injects high frequency sound through the pipe wall and into the moving fluid where acoustic pulses are reflected back to the sensor from particles or bubbles in the fluid.

##### ***Ideal for "difficult" liquids No contact, No maintenance***

Flow rates of most liquids can be accurately controlled including acids, caustics, lubrication fluids, chemicals, abrasives, waste water and sludge. There are no moving parts and no sensor maintenance is required.

##### ***Easy Calibration***

The compact, water tight electronics enclosure includes adjustable controls with separate ON and OFF relay set-points and time delay. A LED bargraph for flow rate and set points plus relay status are included.

Installation can be made while the flow system is in full operation. No contact is made with the moving fluid and no holes are drilled in the pipe. There is no fouling or scale build-up on the sensor.





# Non-Contacting Flow Control

## Pump protection ... High or Low flow control

## Overfill alarm ... Bargraph flow rate indication

### **Each DFS 5.1 Flow Switch Includes:**

- **Adjustable ON and OFF relay setpoints**
- **Adjustable time delay**
- **Flow rate bargraph**
- **Relay LED**

### **Install in these Applications:**

- ✓ **Sewage**
- ✓ **Viscous liquids**
- ✓ **Acids**
- ✓ **Slurries**
- ✓ **Solvents**
- ✓ **Treated wastewater**
- ✓ **Sludge**
- ✓ **Pulp stock**
- ✓ **Food products**
- ✓ **Oils**
- ✓ **Paint**
- ✓ **Chemicals**
- ✓ **Aerated Water**
- ✓ **Cooling Water**

### **No pipe cutting, No pressure drop, No sensor fouling, No maintenance!**

It takes just a few minutes to install and calibrate a DFS 5.1 Flow Switch. The DFS 5.1 controls flow of most liquids in closed pipes. The ultrasonic sensor mounts on the outside of any pipe from 1/2" to 180" (12.5 mm to 4.5 m) I.D.

### **Easy to Calibrate**

The DFS 5.1 control relay can be set to turn ON and OFF at any flow rate between 0.25 and 10 ft/sec (0.075 to 3 m/sec). Insert two links for separate ON/OFF set points or just one link for a Hi or Lo flow alarm. Set relay actuation time delay from 0 to 80 seconds.



### **Ideal for Pump Protection**

Avoid expensive pump repairs and downtime. The DFS 5.1 strap-on Sensor can be installed in minutes without shutting down flow or cutting pipe. Use the adjustable relay time delay to eliminate relay "chatter" and reduce pump wear.

### **Reliable and Repeatable**

Repeatability is  $\pm 0.1\%$  of full scale (0.1 ft/sec or 0.003 m/sec). There are no moving parts and no maintenance is required.

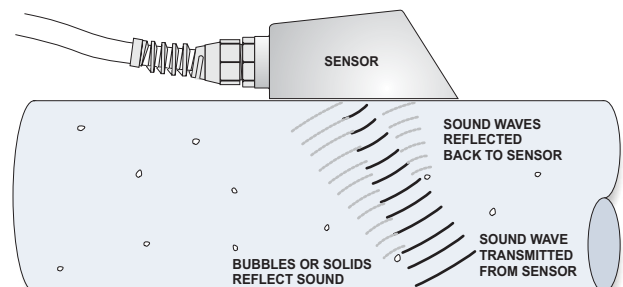
The clamp-on ultrasonic sensor cannot be damaged or fouled by contact with the liquid it measures. Sealed in a stainless steel housing, the DFS 5.1 sensor withstands moisture or accidental submersion in water up to 10 psi (69 Kpa).

### **Self-tunes to Extended Sensor Cable**

Up to 500 ft (150 m) extra sensor coaxial cable can be added. Extended cable and junction box can be ordered from Greyline. The cable can be cut or extended as required during installation. The flow switch automatically tunes to the cable length. No circuit adjustment or calibration is required.

### **Designed for "difficult" liquids**

The DFS 5.1 Doppler Flow Switch is recommended for flow control of liquids containing gas bubbles or solids: chemicals, slurries, sewage, sludge, viscous liquids, wastewater, caustics and abrasives. The ultrasonic sensor injects high frequency sound through the pipe wall into the flowing liquid. Acoustic pulses are continuously reflected back to the sensor and the DFS 5.1 measures a frequency shift to calculate flow velocity.





# DFS 5.1 Specifications

## General

### Greyline DFS 5.1 Doppler Flow Switch

Shipping Weight: 8 lbs (3.6kg)

Enclosure: watertight, dust tight NEMA4X (IP 67) polycarbonate with a clear shatter-proof face

Power Input: 100-240VAC 50-60Hz ( $\pm 10\%$ ), 2 Watts

Control Relay: 5 ampere DPDT

Set Points: ON/OFF adjustment from 0.25 to 10 ft/sec (0.075 to 3 m/sec)

Sensor: single-head ultrasonic with 20 ft (6m) shielded cable

Pipe Size: Any pipe ID from  $\frac{1}{2}$ " to 180" (12.5 mm to 4.5 m)

Sensor Operating Temperature:  $-40^{\circ}$  to  $300^{\circ}\text{F}$  ( $-40^{\circ}$  to  $150^{\circ}\text{C}$ )

Electronics Operating Temperature:  $-10^{\circ}$  to  $140^{\circ}\text{F}$  ( $-23^{\circ}$  to  $60^{\circ}\text{C}$ )

Accuracy:  $\pm 2\%$ , requires solids or bubbles minimum size of 100 microns, minimum concentration 75 ppm. Repeatability:  $\pm 0.1\%$

## Standard Features

Set-point: field-adjustable with separate ON/OFF set-points or select Hi flow alarm or Lo flow alarm mode

Indication: flow rate LED bargraph, relay status LED

Time Delay: adjustable 0 to 80 seconds

Electrical Surge Protection: AC power input and sensor

Sensor mounting bracket, clamp and coupling compound included

## Options

Sensor Cable: up to 500 ft (150 m) shielded coaxial pair with cable Junction Box

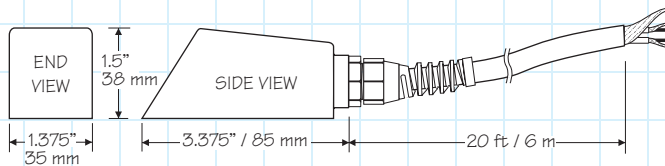
Sensor mounting clamp: stainless steel, adjustable

Power input: 12-24 VDC ( $\pm 10\%$ ), 3W Max

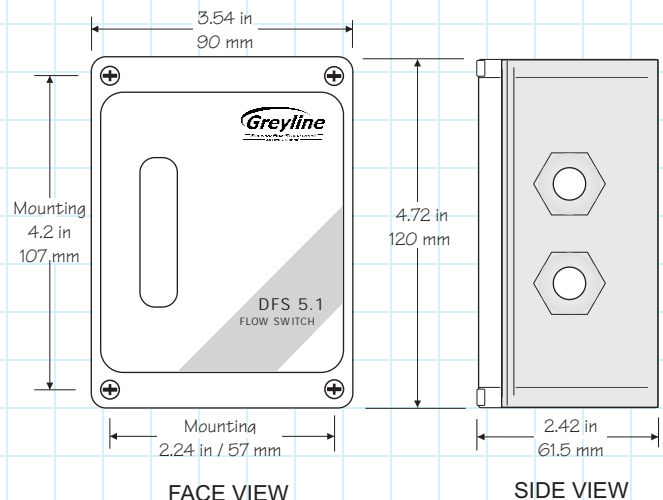
## Applications

- Recommended for liquids containing suspended solids or bubbles minimum size of 100 microns, minimum concentration 75 ppm
- Sensor mounts on Vertical or Horizontal pipes.
- Sensor Mounting Location:
  - 6-10 pipe diameters from elbows, tees (turbulence increasing devices)
  - >30 pipe diameters from pumps, controlling valves and pipe discharge
- Pipe Materials: steel, stainless steel, cast iron, PVC, fiberglass, any contiguous pipe material that conducts sound, including lined pipes with liner bonded to pipe wall. Avoid pipes with loose insertion liners and pipe materials which contain air pockets (concrete, wood etc.)

## Dimensions



SE4 ULTRASONIC  
DOPPLER SENSOR



ENCLOSURE



# Easy-to-install, Automatic Flow Control

## Recommended for Pump Protection and Flow Alarms



DFS 5.1 Doppler  
Sensor with  
Pipe Clamp

### ***Greyline DFS 5.1 Doppler Flow Switch***

The DFS 5.1 flow sensor installs without cutting the pipe. It takes just a few minutes to mount on the outside of any pipe. The switch/electronics enclosure can be mounted 20 ft (6 m) away from the sensor (optional up to 500 ft / 152 m) to simplify wiring to pumps, alarms, valves or other equipment.

Switch adjustments and electrical connections are fast and easy. The DFS 5.1 relay time delay is adjustable from 0 to 80 seconds to prevent nuisance alarms and relay "chatter" in turbulent flow. Includes switch selectable "normal" and "failsafe" operating modes.

### ***Choose the DFS 5.1 Flow Switch for:***

- ☒ No contact with the measured liquid
- ☒ No obstruction to flow - No pressure drop
- ☒ Sensor mounts easily on the outside of the pipe
- ☒ Can be installed while pipe line is in use
- ☒ Insensitive to pressure, specific gravity and conductivity
- ☒ Does not require pipe metering sections
- ☒ Does not require consideration of material compatibility with the liquid

### ***Repeatable, Reliable Flow Control***

Use the DFS 5.1 for pump protection, valve control and flow/no-flow alarms. It is ideal for "difficult" liquids like wastewater, slurries, abrasives and chemicals, or any liquid which contains gas bubbles or solids. The standard Sensor mounts on any pipe 1/2" (12.5 mm) diameter or larger.

### ***How to Order***

Contact a Greyline sales representative in your area or phone one of our sales engineers. Describe your requirements and receive our prompt quotation.

### ***Applications Support***

Take advantage of Greyline's applications experience. Phone toll free 1-888-473-9546 for advice and information on applications, installation or service for Greyline instruments.

### ***No Risk Appraisal***

The Greyline DFS 5.1 Doppler Flow Switch must meet your requirements. Discuss your application with a Greyline representative to arrange a 30-day trial.

### ***The Greyline Guarantee***

Quality of Materials and Workmanship - Each instrument manufactured by Greyline is warranted against defects in materials and workmanship for a period of one year from date of purchase. Refer to our limited warranty included with each product.



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RELIABLE MEASUREMENT AND CONTROL