

# Control Flow From Outside a Pipe



## Flow Switch with Non-Contacting Sensor

### *Doppler Flow Switch*

### *Model DFS-II*

**Controls Flow with:**  
No pressure drop  
No sensor fouling  
No maintenance



### **Flow Sensor installs without cutting the pipe**

**Installs in Minutes  
No moving parts**

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

**Easy Calibration**

Mount the DFS-II 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.

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.

The compact, water tight electronics enclosure includes adjustable controls with separate ON and OFF switch set-points, sensitivity and time delay. Indicator lights for signal strength and relay status are included.

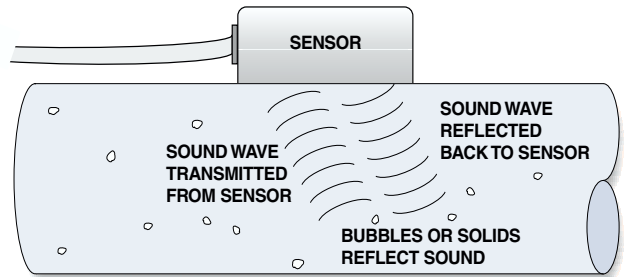
Installation can be made while the flow system is in full operation. No contact is made with the moving fluid and no holes are drilled in the pipe. There is no fouling or scale build-up on the sensor.

# Non-Contacting Flow Control

## Pump protection ... Flow/No flow indication Overfill alarm ... High or Low flow control

### *Ideal for "difficult" liquids*

The DFS-II Doppler Flow Switch is recommended for flow control of liquids containing gas bubbles or solids: chemicals, slurries, 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-II measures a frequency shift to calculate flow velocity.



### *Each DFS-II Includes adjustable:*

- *ON and OFF setpoints*
- *Relay deadband*
- *Time delay*
- *Sensitivity*
- *Failsafe mode*

### *Installed in these Applications:*

- ✓ *Sewage*
- ✓ *Viscous liquids*
- ✓ *Acids*
- ✓ *Slurries*
- ✓ *Solvents*
- ✓ *Treated wastewater*
- ✓ *Sludge*
- ✓ *Pulp stock*
- ✓ *Food products*
- ✓ *Oils*
- ✓ *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-II Flow Switch. The DFS-II controls flow of most liquids in closed pipes. The ultrasonic sensor mounts on the outside of any pipe from 1" to 180" (25 mm to 4.5 m) I.D.

### *Reliable and Repeatable*

The DFS-II control relay can be set to turn ON and OFF at any flow rate between 1 and 10 ft/sec (0.3 to 3 m/sec). Repeatability is  $\pm 0.1\%$  of full scale (0.1 ft/sec or 0.003 m/sec).

Standard features include signal strength indication, 5 ampere DPDT relay contacts, a non-contacting, strap-on Sensor and a remote watertight enclosure.

### *Durable Sensor...*

Sealed in a stainless steel and epoxy housing, the DFS-II ultrasonic sensor withstands accidental submersion up to 10 psi (69 Kpa). It is also available with optional intrinsic safety barriers for Sensor mounting in hazardous rated locations.

### *Ideal for Pump Protection*

Avoid expensive pump repairs and downtime The DFS-II 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.

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

Up to 500 ft (152 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.

### *Special Offer*

Discuss your application with a Greyline sales representative to arrange a trial in your facilities. Test a DFS-II on your application for 30 days and return it for full credit if it does not perform satisfactorily. Contact Greyline Instruments or your local sales representative for more information, a quotation, or a demonstration.

# DFS-II Specifications

## General **Greyline DFS-II 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: 120VAC 50-60Hz, 10 watts  
Control Relay: 5 ampere DPDT  
Set Points: ON/OFF adjustment from 0.25 to 10 ft/sec (0.076 to 3 m/sec)  
Sensor: single-head ultrasonic with 20 ft (6m) shielded cable  
Pipe Size: Any pipe ID from ½" to 180" (12.5 mm to 4.5 m)  
Sensor Operating Temperature: -40° to 200°F (-40° to 93°C)  
Electronics Operating Temperature: -10° to 140°F (-23° to 60°C)  
Accuracy: ±2%, requires solids or bubbles minimum size of 100 microns, minimum concentration 75 ppm. Repeatability: ±0.1%

## Standard Features

Set-point: field-adjustable with separate ON/OFF set-points  
Indication: signal strength LED, relay status LED  
Time Delay: adjustable 0 to 60 seconds / Sensitivity: adjustable  
Electrical Surge Protection: AC power input and sensor  
Failsafe Mode: switch selectable  
Sensor Coupling Compound included

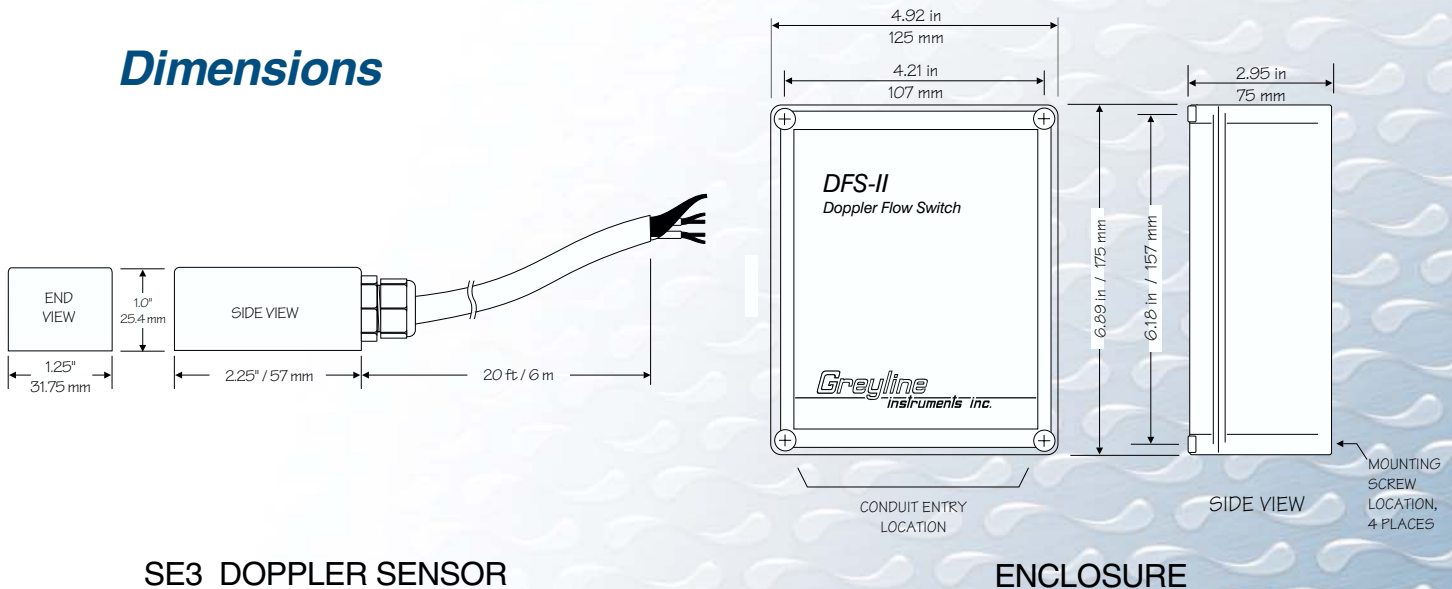
## Options

Intrinsically Safe Sensor for hazardous locations  
Sensor Cable: up to 500 ft (152 m) shielded coaxial pair. Self tunes to extended cable  
Sensor mounting clamp: stainless steel, adjustable  
Power input: 220VAC 50-60HZ, or 24VDC

## 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



# Easy-to-install, Automatic Flow Control

## Recommended for Pump Protection and Flow Alarms

### *DFS-II Doppler Flow Switch*



DFS-II Doppler  
Sensor with  
Pipe Clamp

The DFS-II 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-II relay time delay is adjustable from 0 to 60 seconds to prevent nuisance alarms and relay "chatter" in turbulent flow. Includes switch selectable "normal" and "failsafe" operating modes.

### *Choose the DFS-II 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-II 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" (25 mm) diameter or larger.

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