



*"Setting The Standard For Supplier Excellence"*

## **Microwave Solids Flow Monitors Models SFD-2 & SFI**



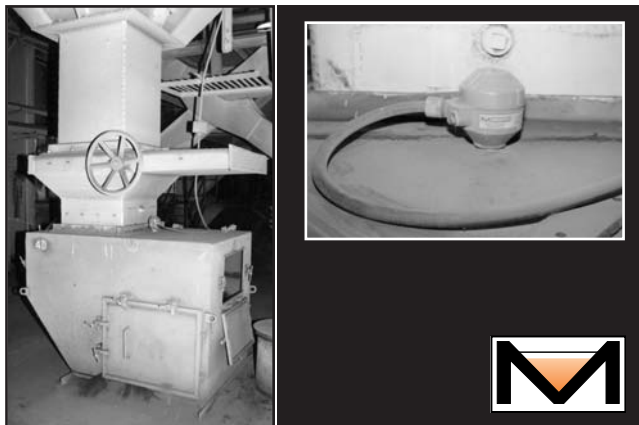
- ▼ **Best Value In Solids Flow Detection**
- ▼ **Superior Application Versatility**
- ▼ **Excellent Sensitivity**
- ▼ **Indicate Flow/No-Flow In Chutes,  
Feeders and Pipelines**
- ▼ **On/Off Flow Detector (SFD-2)**
- ▼ **Analog Output Indicator (SFI)**
- ▼ **Hazardous Location Approval**





- ▼ **Senses Light And Heavy Materials, Small And Large Particles**
- ▼ **Non-Contact Sensor Detects Flow Through Most Non-Metallic Surfaces**
- ▼ **Non-Intrusive Flush Mounting – No Probe Protruding Into Material Flow**
- ▼ **SFD-2 Provides Relay Outputs and Convenient Remote Electronics**
- ▼ **SFI Solids Flow Indicator Provides Variable Analog Signal**
- ▼ **Sensors Include CSA Class II, Division I Approval for Hazardous Locations**

Monitor's line of microwave solids flow monitors are high quality, industrial grade instruments capable of providing a signal indicating the flow/no-flow condition of solids and powders in gravity chutes, feeders and pneumatic pipelines. The Model SFD-2 Solids Flow Detector provides relay outputs that can be setup to indicate changes in the target flow stream (on/off). The Model SFI Solids Flow Indicator provides an analog output which varies with changing conditions of the material flow stream. These non-contact monitors contain no moving parts or probes that can wear out or break off in the material flow, thus ensuring process integrity.



An installed SFD-2 in a coal-fired power plant provides an alarm output when there is an interruption in coal supply.

The SFD-2 and SFI use low power microwaves to sense motion within the chute or pipeline being monitored. Microwaves are virtually unaffected by ambient noise and light, heat, humidity, pressure, vacuum, high or low temperatures or dust. This provides maximum effectiveness in typical industrial application environments. These advantages over sonic or mechanical flow monitors make microwave technology the best choice for solids flow monitoring.

#### PRINCIPLE OF OPERATION

Both the SFD-2 and SFI utilize a microwave transceiver (combination transmitter/receiver) enclosed within a watertight, dust-ignition proof powder coated aluminum housing with a screw-on/off cover. A process seal (Teflon® or Ryton®) acts as a transparent window through which the microwave energy is transmitted and the reflected return signal is received. The transceiver module generates and transmits a microwave signal into the area where material flow is to be monitored. The reflected microwave signal shifts in accordance with the Doppler Effect phenomena. The Doppler-shifted energy is analyzed to determine the appropriate output from the unit.

The SFD-2 has a split-architecture design consisting of the transceiver and a separate power supply/conditioning circuit board. The relays are incorporated on the power supply/conditioning circuit board, which is optionally available with a fiberglass enclosure and indicating lights. With the SFD-2, the Doppler-shifted energy signal from the transceiver is carried back to the power supply/conditioning circuit board through the user-supplied signal and power supply cable. At the power supply/conditioning circuit board the signal intensity is indicated with an LED and converted into a relay output based upon the sensitivity adjustment. The power supply/conditioning circuit board provides the power to drive the transceiver and contains the controls for setting sensitivity, hold-off time delay, hold-on time delay and fail-safe selection.

The SFI Solids Flow Indicator, unlike the SFD-2, consists solely of a transceiver. In this case the transceiver will receive its DC power through the user supplied signal cable and power supply. The three-wire design allows the user to monitor the analog output while providing the supply power to the unit. The Doppler-shifted energy is relative to the magnitude of the flow/no-flow condition that exists, when material velocity is constant, and this is reflected in the varying analog output signal.



## APPLICATIONS

Monitor's Solids Flow Detector and Indicator can be used in a variety of applications to detect flow/no-flow conditions of powders and bulk solid materials. The selection of either SFD-2 Solids Flow Detector or the SFI Solids Flow Indicator is based upon the type of output required (relay or analog).

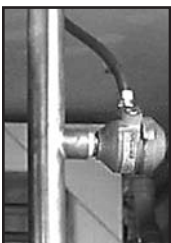
Typical applications include:

- ▼ Detection of a partial or full plug in a conveying line
- ▼ Detecting the bridging of material in a storage vessel upstream
- ▼ Sensing inadequate or a lack of flow due to upstream equipment failure (conveyor, blower, diverter valve, feeder)
- ▼ Verifying flow conditions
- ▼ Turning on/off equipment or processes downstream

## USE OF SFI ANALOG OUTPUT

The Model SFI Solids Flow Indicator can be used to infer the relative amount of flowing material within the target conduit (by monitoring the available analog signal). However, it should be noted that this device provides an output that should be considered, at best, a very rough estimate of the flow of material. The analog signal corresponds to the magnitude of the Doppler-shifted energy created by the flow of material through the microwave energy field.

*Note: Monitor Technologies LLC accepts no responsibility for the accuracy of the analog output signal. This signal can be influenced by several varying factors including, but not limited to, particle size distribution, dielectric constant variation, moisture content variation, dispersion of material flow, variation in velocity of material flow, movement of auxiliary equipment, temperature variations and type of conveying system. Please consult the factory to discuss applications where the accuracy of the analog output is of importance.*



Pictured at the left is a SFI installed in a plant that manufactures ink for desktop printers and copy machines. 100-pound batches of carbon black come out of a feeder and are pneumatically conveyed through a four-inch vertical line. The SFI is used to indicate when a batch of carbon black has cleared the line.

## FEATURES

### TRANSCIEVER (SENSOR)

- ▼ Powder coated Nema 4 cast aluminum construction
- ▼ Approved for Class II hazardous areas
- ▼ Meets applicable FCC regulations
- ▼ Screw-on/off cover
- ▼ Teflon® process seal is standard
- ▼ 15-30VDC/Analog three-wire input/output (SFI only)

### CIRCUIT BOARD (SFD-2 only)

- ▼ Connects to transceiver using an inexpensive, low voltage 3-wire system
- ▼ Convenient control functions for time delay, sensitivity and fail-safe selection
- ▼ Control function changes can be made without accessing the transceiver
- ▼ Yellow and Red LEDs indicate material flow intensity and output activation

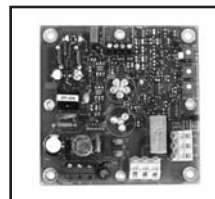
## FEATURES

### RYTON® PROCESS SEAL

Both the SFD-2 and SFI come standard with a Teflon® process seal window through which the transmit/receive signal passes. While this material is compatible with most applications, a Ryton® seal is available for use in applications where the seal is subjected to high pressure or abrasive materials.

### ENCLOSURE FOR CIRCUIT BOARD (SFD-2 only)

The standard SFD-2 does not provide an enclosure for the power supply/conditioning circuit board. This allows the user to install the board wherever is appropriate. A NEMA 4X enclosure is available. When selected, the power supply/conditioning circuit board is supplied installed within a fiberglass enclosure furnished with long-lasting LED indicators flush with the enclosure face.



Left: Power Supply/Conditioning Circuit Board



Right: Optional Enclosure



## ACCESSORIES

### GALVANIZED HALF-COUPLING

Monitor provides a galvanized half-coupling which can be welded to the chute or pipe for mounting the transceiver. Half Coupling: P/N 17-3111

### LOCKNUT

The optional locknut provides flexibility in the depth of the mounting of the transceiver to ensure that the process seal is flush with the inside of the conduit in which the target material flows. Lock Nut: P/N 17-3000-7C

### SADDLE COUPLING

The saddle coupling provides a means of mounting the transceiver without welding a mounting coupling. The saddle coupling, which includes a gasket, is suitable for round chutes 4-10" (102 - 254mm) in diameter and can be easily clamped to the chute or pipeline. Saddle Coupling: P/N 17-3102-1

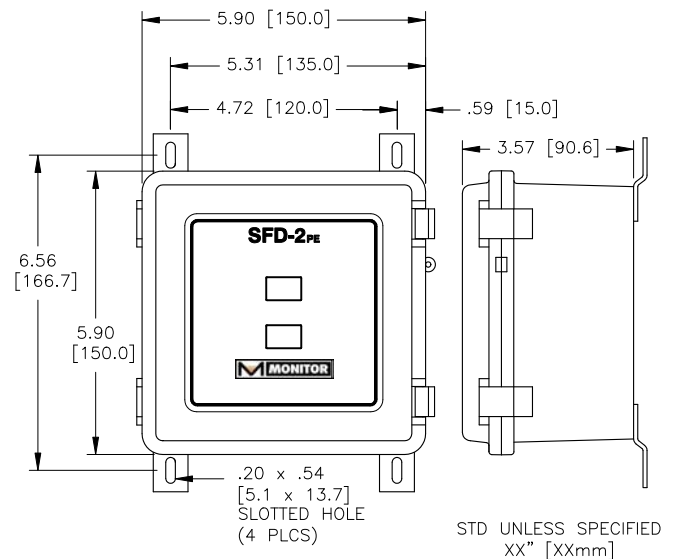
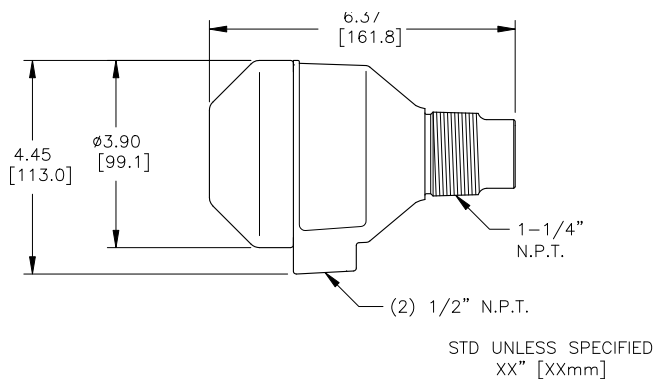
### STAINLESS STEEL ADAPTERS

Four different mounting adapters can be used to provide a stainless steel process contacting surface. The adapter can be of either 1-1/2" NPT or Tri-Clamp® food grade construction.

1-1/2" NPT:	P/N 17-3303-1 (Teflon® seal) P/N 17-3303-3 (Ryton® seal)
Tri-Clamp:	P/N 17-3305-1 (Teflon® seal) P/N 17-3305-3 (Ryton® seal)

## SENSOR MECHANICALS

DIMENSIONS ARE SHOWN IN INCHES WITH MILLIMETER EQUIVALENT IN BRACKETS



## ORDERING INFORMATION

### MODEL SFD-2

17-84 X X-X X

**POWER SUPPLY  
OPTIONS**

- 1 = Power Supply/  
Cond.Board Only
- 2 = Power Supply/  
Cond. Board in  
Fiberglass  
Enclosure with  
Lights

**SEALS**

- 1 = Teflon®
- 2 = Ryton®

**SENSOR APPROVALS**

- 1 = Hazardous Locations (North America)  
(Sensor ONLY)

**OPERATING VOLTAGE**

- 1 = Universal 100-240VAC (±10%)

### MODEL SFI

17-85 X X-X X

**OUTPUT**  
1 = Analog

**SEALS**

- 1 = Teflon®
- 2 = Ryton®

**SENSOR APPROVALS**

- 1 = Hazardous Locations (North America)

**OPERATING VOLTAGE**

- 1 = 24 VDC (15-30 VDC acceptable)

### ACCESSORIES

- |            |  |           |  |
|------------|--|-----------|--|
| 17-3000-7c | Locknut for securing housing in mounting coupling    | 17-3305-1 | Adapter, T304 S.S., Food Grade Tri-Clamp, Teflon® Process Seal |
| 17-3102-1  | Saddle Coupling with Gasket                          |           |  |
| 17-3111    | Half Coupling, Galvanized Steel                      | 17-3305-3 | Adapter, T304 S.S., Food Grade Tri-Clamp, Ryton® Process Seal  |
| 17-3303-1  | Adapter, T304 S.S., 1-1/2" NPT, Teflon® Process Seal |           |  |
| 17-3303-3  | Adapter, T304 S.S., 1-1/2" NPT, Ryton® Process Seal  |           |  |



## SPECIFICATIONS

### TRANSCIEVER (SENSOR)

<b>Power Requirement:</b>	Provided by power supply/conditioning PCB
<b>SFD-2</b>	15-30VDC, 100mA max.
<b>SFI</b>	
<b>Enclosure:</b>	Die-cast aluminum, beige polyester powder coated
<b>Enclosure Protection:</b>	NEMA 4, IP66
<b>Ambient Operating Temperature:</b>	
<b>SFD-2</b>	-40° to +185° F (-40° to +85° C)
<b>SFI</b>	-13° to +185° F (-25° to +85° C)
<b>Process Temperature:</b>	250° F (121° C) if ambient air temp. below 150° F (65° C)
<b>Process Seals:</b>	TFE Teflon®, Ryton®
<b>Pressure Ratings:</b>	TFE Teflon® (75 psi intermittent) Ryton® (300 psi)
<b>Process Connection:</b>	1 1/4" NPT (1-1/2" w/ SS Adapter)
<b>Conduit Connection:</b>	(2) 1/2" NPT
<b>Detection Range:</b>	0 to 10' free air, env. and target dependent
<b>Sensitivity:</b>	Switch selectable HI/LOW
<b>Minimum Velocity:</b>	2.5 ft/sec (762 mm/sec)
<b>Output:</b>	
<b>SFD-2</b>	None, signal from transceiver is delivered to and processed by power supply/conditioning circuit board
<b>SFI</b>	4-20mA output typical (full span may not be achieved; actual span is application dependent)
<b>Isolation (SFI Only):</b>	750 VPK isolation between sensor ground and user power supply/analog supply
<b>Indicators:</b>	Green LED – power Yellow LED – loop, intensifies with disturbance detected
<b>Emission:</b>	24.125 GHz, FCC & IC certified, energy levels less than 1mW/cm <sup>2</sup> (OSHA limit at 10mW/cm <sup>2</sup> )
<b>Approvals:</b>	CSA <sub>US/C</sub> , Class II Div. 1 & 2 Groups E, F & G CE Mark (Ordinary Locations)

### POWER SUPPLY/CONDITIONING BOARD (SFD-2 ONLY)

<b>Enclosure (if supplied):</b>	PBT/Polycarbonate
<b>Enclosure Protection:</b>	NEMA 4X, IP66
<b>Ambient Operating Temperature:</b>	-40° to 158° F (-40° to 70° C)
<b>Interconnection Distance:</b>	2500ft max (minimum wire size 22 AWG)
<b>Power:</b>	Universal 100-240VAC, ±10%, 50/60HZ
<b>Power Consumption:</b>	5 VA max
<b>Output:</b>	DPDT dry contact, 5A @ 250VAC, 30VDC
<b>External lights (if applicable):</b>	Solid state LED clusters Yellow – material sense Red – output operate
<b>Sensitivity Adjustment:</b>	Single-turn adjust 0 to 100% of sensor range
<b>Time Delay:</b>	Hold-off, single-turn adjustment, 0.25 to 15 sec. Hold-on, single-turn adjustment, 0.25 to 15 sec.
<b>Fail-Safe:</b>	Switch selectable, (Flow/No-Flow)
<b>Indicators:</b>	Green LED - power Yellow LED - sense Red LED - output
<b>Approvals:</b>	CSA <sub>US/C</sub> , ordinary locations, industrial control equipment CE Mark (Ordinary Locations)

Ryton® - Trademark of Phillips Chemical Co.  
Teflon® - Trademark of Dupont Chemical Co.  
Tri-Clamp® - Trademark of Tri-Clover, Inc.



## WARRANTY

Monitor Technologies LLC warrants each SFD-2/SFI it manufactures to be free from defects in material and workmanship under normal use and service within two (2) years from the date of purchase. The purchaser must give notice of any defect to Monitor within the warranty period, return the product intact and prepay transportation charges. The obligation of Monitor Technologies LLC under this warranty is limited to repair or replacement at its factory. This warranty shall not apply to any product which is repaired or altered outside of the Monitor Technologies LLC factory, or which has been subject to misuse, negligence, accident, incorrect wiring by others or improper installation.

Monitor Technologies LLC reserves the right to change the design and/or specifications without prior notice.

