

# Isco 2151 Intrinsically Safe Area Velocity Flow System

The 2151 AV Flow System is the intrinsically safe version (CSA approved for Class I, Div. 1, Groups C & D environments) of Isco's 2150 Area Velocity Flow Meter.

To ensure proper application, the 2151 has unique connectors that are compatible only with other intrinsically safe 2100 Series components.

## *Principles of operation*

Our Area Velocity flow modules use continuous-wave Doppler technology to measure mean velocity. The sensor transmits an ultrasonic pulse, then measures the frequency shift of pulses reflected by air bubbles and particles in the flow.

A differential pressure transducer in the sensor measures liquid depth to determine flow area. Flow rate is then calculated by multiplying the area of the flow stream by its average velocity.

The 2151 is powered by two alkaline batteries. Highly efficient power management provides battery life up to 8 months in a typical setup.

## *Applications*

- ▶ Open channel flow measurement in hazardous locations (ATEX Category 1G).
- ▶ Level measurement in potentially explosive areas, such as manholes, digesters and storage tanks
- ▶ Portable and permanent-site AV flow monitoring for inflow and infiltration, sewer overflow, and other sewer studies.



## *Standard Features*

- ▶ Rugged, submersible enclosure meets NEMA 4X, 6P and IP68 requirements.
- ▶ Sealed AV sensor resists fouling by oil and grease, eliminating the need for frequent cleanings. Chemically resistant epoxy shell withstands harsh elements.
- ▶ Quick-connect area velocity sensor can be easily removed and interchanged in the field without needing recalibration.
- ▶ High-capacity internal desiccant cartridge keeps the vent free of moisture during normal operation. Replaceable hydrophobic filter protects against water intrusion during submersion.

## *Software Features*

- ▶ Stores battery voltage information to let you know when to change batteries.
- ▶ Easy to upgrade. New operating software can be downloaded into non-volatile "flash" memory without affecting stored program and data.
- ▶ Rollover memory with variable rate data storage lets you change the data storage interval when programmed conditions occur.
- ▶ 38.4k baud communication provides speedy setup and data retrieval.
- ▶ A 25-foot barrier cable provides safe, in-the-field connection to a laptop computer with 9-pin sub-D serial port.

# Specifications

## 2151 Intrinsically Safe Flow System

<b>Size (H x W x D)</b>	8.4 x 11.3 x 7.6 in. (21.3 x 28.7 x 19.3 cm) including battery compartment.
<b>Weight:</b>	8.2 lbs. (2.4 kg)
<b>Material:</b>	High-impact molded polystyrene
<b>Enclosure:</b>	NEMA 4X, 6P IP68 (self-certified)
<b>Power:</b>	7-12 VDC (Note: Eveready brand 6V Energizer 529 or EN529 alkaline batteries must be used).
<b>Approvals:</b>	CSA Certified for Class I, Div. 1 Group C & D Temperature Code: T3C at 60° C, ambient. CAN/CSA Standard C22.2 No. 157-92 UL Standard No. 913, Aug. 8, 2002
<b>Typical battery life:</b>	8 months (15 minute data interval, using two Eveready Energizer 529 alkaline batteries).
<b>Program Memory:</b>	Non-volatile, programmable flash; can be updated using PC without opening enclosure; retains user program after updating
<b>Flow Conversions:</b>	Up to 2 independent level-to-area conversions and/or level-to-flow rate conversions

### Level-to-Area Conversions

<b>Channel Shapes:</b>	Round, U-shaped, rectangular, trapezoidal, elliptical, with silt correction
<b>Data Points:</b>	Up to 50 level-area points

### Level-to-Flow Rate Conversions

<b>Weirs:</b>	V-notch, rectangular, Cipolletti, Isco Flow Metering Inserts, Thel-Mar
<b>Flumes:</b>	Parshall, Palmer-Bowlus, Leopold-Lagco, trapezoidal, H, HS, HL
<b>Manning Formula:</b>	Round, U-shaped, rectangular, trapezoidal
<b>Data Points:</b>	Up to 50 level-flow rate points
<b>Equation:</b>	2-term polynomial
<b>Flow Calculations:</b>	Up to 2 independent, net, positive or negative, based on either flow rate conversion
<b>Data Storage:</b>	Non-volatile flash; retains stored data during program updates. Capacity 395,000 bytes (up to 79,000 readings, equal to over 270 days of level and velocity readings at 15-minute intervals, plus total flow and input voltage readings at 24 hour intervals)
<b>Data Types:</b>	Level, velocity, flow rate 1, flow rate 2, total flow 1, total flow 2, input voltage
<b>Storage Mode:</b>	Rollover with variable rate data storage based on level, velocity, flow rate 1, flow rate 2, total flow 1, total flow 2, or input voltage
<b>Storage Interval:</b>	15 or 30 seconds; 1, 5, 15, or 30 minutes; or 1, 2, 4, 12, or 24 hours. 5 Bytes per reading.
<b>Setup/Data Retrieval:</b>	Serial connection to PC with Isco Flowlink Software.
<b>Baud Rate:</b>	38,400
<b>Temperature range:</b>	0° to 140°F (-18° to 60°C) Operating Temperature; -40° to 140°F (-40° to 60°C) Storage Temperature

## Area Velocity Sensor

<b>Size (H x W x L):</b>	0.75 x 1.31 x 6.0 in (1.9 x 3.3 x 15.2 cm)
<b>Cable Length:</b>	25 ft (7.6 m)
<b>Cable Diameter:</b>	0.37 in (0.9 cm)
<b>Weight :</b>	2.1 lbs (0.95 kg) including cable
<b>Materials:</b>	Sensor - Epoxy, chlorinated polyvinyl chloride (CPVC), stainless steel; Cable - Polyvinyl chloride (PVC), chlorinated polyvinyl chloride (CPVC).
<b>Operating Temperature:</b>	32° to 140°F (0° to 60°C)
<b>Compensated Range:</b>	32° to 122°F (0° to 50°C)

### Level Measurement

<b>Method:</b>	Submerged pressure transducer mounted in the flow stream.
<b>Transducer Type:</b>	Differential linear integrated circuit pressure transducer
<b>Range:</b>	0.033 to 10 ft (0.010 to 3.05 m)
<b>Max Allowable Level:</b>	34 ft (10.5 m)
<b>Accuracy [1]:</b>	0.033 to 10 ft (0.010 to 3.05 m) ±0.008 ft (±0.003 m)
<b>Long-term Stability:</b>	0.007 m/yr
<b>Compensated Range:</b>	32° to 122° F (0° to 50° C)

### Velocity Measurement

<b>Method:</b>	Doppler ultrasonic, Frequency 500 kHz, Transmission Angle 20° from horizontal
<b>Minimum Depth:</b>	0.08 ft (25 mm) typical
<b>Range:</b>	-5 to +20 ft/s (-1.5 to +6.1 m/s)
<b>Accuracy [2]:</b>	-5 to +5 ft/s (-1.5 to +1.5 m/s) ±0.1 ft./s (±0.03 m/s)

### Temperature Measurement

<b>Accuracy:</b>	±3.6°F (±2°C)
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[1] Maximum non-linearity, hysteresis, and temperature error from actual liquid level.  
[2] In water with a uniform velocity profile and a speed of sound of 4850 ft/s (1480 m/s), for indicated velocity range.

## Ordering Information

Isco 2151 AV Flow System .....	68-2000-008
Eveready Energizer 529 6V alkaline battery (two required) .....	340-2006-02
Flowlink Software .....	68-2540-200
RS 232 Communication Cable w/ built-in barrier .....	60-2004-153



**Teledyne Isco, Inc.**  
4700 Superior St.  
Lincoln, NE 68504 USA  
Phone: (402) 464-0231  
USA & Canada: (800) 228-4373  
Fax: (402) 465-3022  
e-mail: iscoinfo@teledyne.com  
Website: www.isco.com

