

Isco 2151P Intrinsically Safe Area Velocity Flow System

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

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.

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

A CSA-approved 12V DC intrinsically safe power supply is mandatory. Power is fed to the 2151P through an attached cable from the safe area.

Remote flow monitoring is possible through the use of Isco's 2103 Modem Module or 2108 Analog Output Module.

Applications

- ▶ Open channel flow measurement in Hazardous Locations (Class I, Div. 1, Groups C & D).
- ▶ Level measurement in potentially explosive areas, such as manholes, digesters and storage tanks.
- ▶ Permanent AV flow monitoring.



*Dual-module
version available*

Standard Features

- ▶ Rugged, submersible enclosure meets NEMA 4X, 6P and IP68 requirements.
- ▶ Sealed AV sensor resists fouling by oil and grease — no need for frequent cleanings. Chemically resistant epoxy shell withstands harsh elements.
- ▶ Pressure transducer vent system automatically adjusts for atmospheric pressure changes to maintain accuracy.
- ▶ Quick-connect area velocity sensor can be easily removed and interchanged in the field without needing recalibration.
- ▶ High-capacity internal desiccant cartridge keeps vent free of moisture during normal operation. Replaceable hydrophobic filter protects against water intrusion during submersion.
- ▶ An RS 232 Communicator Cable, with built-in barrier, provides safe, in-the-field connection to a laptop computer.

Software Features

- Secure data storage. All data are continuously stored in “flash” memory to protect against loss in case of power failure.
- Easy to upgrade. New operating software can be downloaded into non-volatile "flash" memory, without affecting stored program and data.
- Records and stores input voltage data for future reference.
- 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.

Options and Accessories

Network Barrier Cable

Connects with other 2100 Series modules (such as; modem, wireless, analog output, and Field Wizard) that are located outside the hazardous area.

Network Isolator

As above, but designed for DIN rail mounting.

Intrinsically Safe Power Supply

Converts 110V AC or 220V AC power to 12V DC ($\pm 5\%$) intrinsically safe power for the 2151P.

Quick-disconnect Box

Allows convenient 2151P installation and removal where there is a great distance between the safe and hazardous areas.

Network Cable

Bulk cable that may be ordered in custom lengths. For use with the Quick-disconnect Box, to cover long distances between safe and hazardous areas.

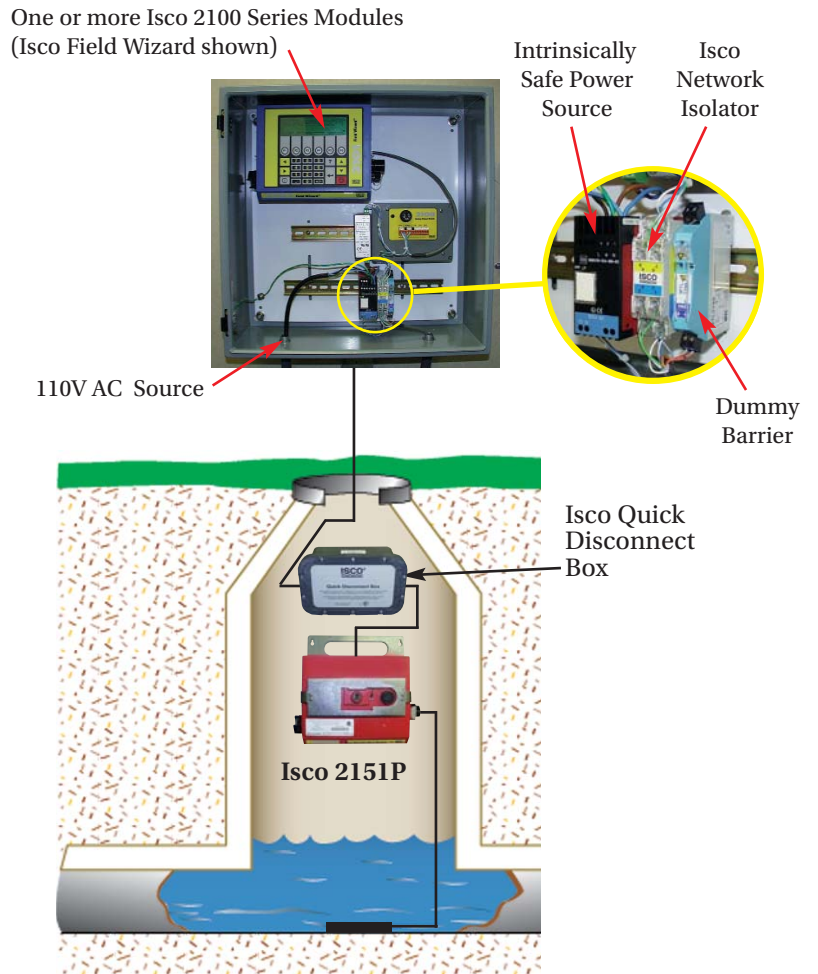
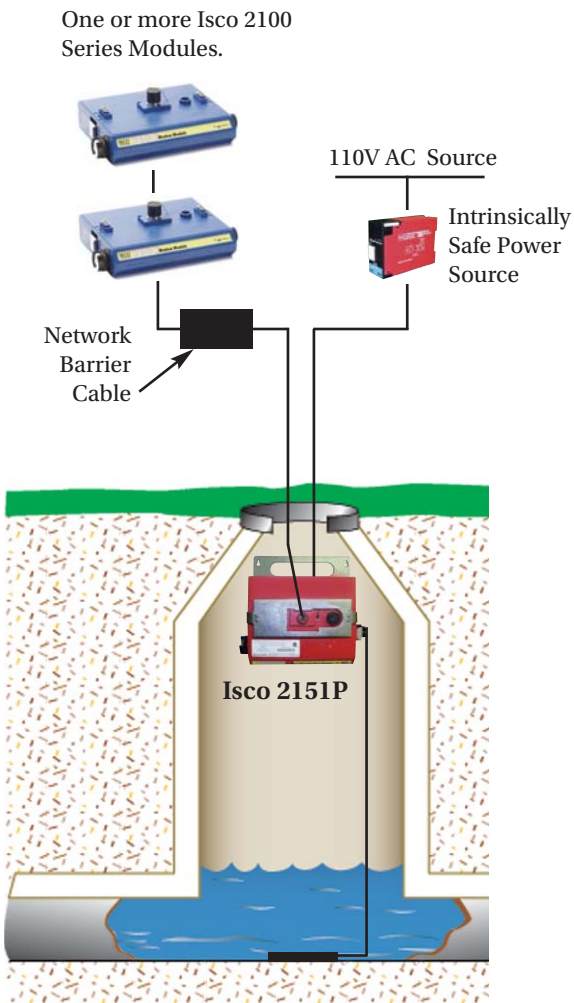
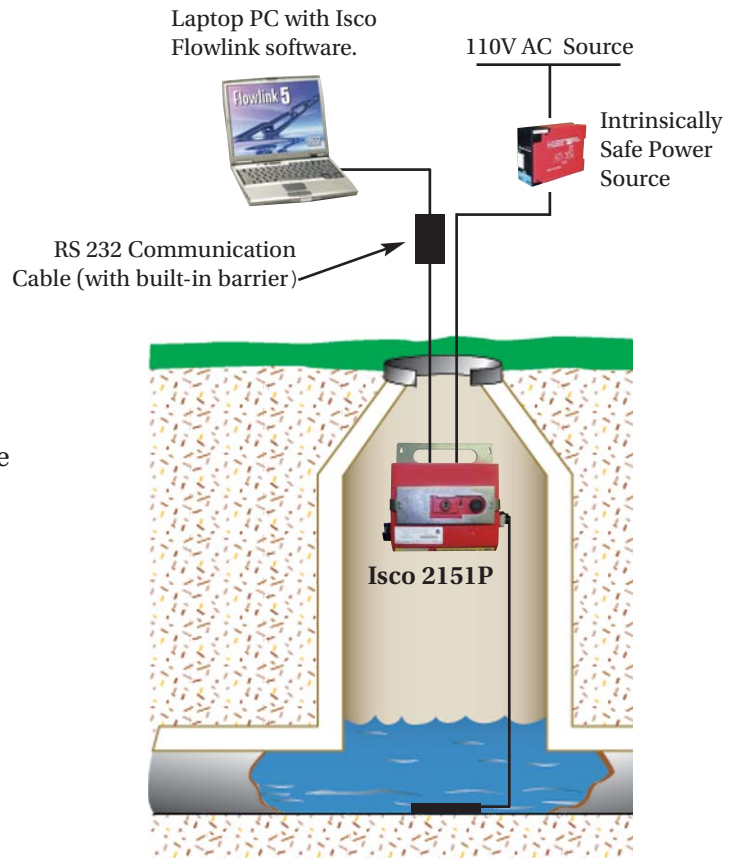
Dual Modules

Provides redundancy for level, velocity, and electronics.

Example System Configurations

These illustrations show just a few system possibilities for use of the 2151P AV module where hazardous conditions exist.

NOTE: Items pictured above the manhole rim are assumed to be located in a safe zone.



Specifications

2151P Intrinsically Safe Flow System

Size: (H x W x D)
 Single 3.75 x 9.5 x 11.0 in (9.5 x 24.0 x 28.0 cm)
 Double 6.0 x 9.5 x 11.0 in (15.0 x 24.0 x 28.0 cm)

Weight:
 Single 3.75 lbs (1.7 kg)
 Double 7.5 lbs (3.4 kg)

Case Material: High-impact molded polystyrene

Enclosure Rating: NEMA 4X, 6P IP68 (self-certified)

Power: 12V DC, 100 mA nominal (CSA-approved intrinsically safe)

Approvals: 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, Feb. 21, 1994

Program Memory: Non-volatile, programmable flash; can be updated using PC without opening enclosure; retains user program after updating

Flow Conversions: Up to 2 independent level-to-area conversions and/or level-to-flow rate conversions

Level-to-Area Conversions

Channel Shapes: Round, U-shaped, rectangular, trapezoidal, elliptical, with silt correction

Data Points: Up to 50 level-area points

Level-to-Flow Rate Conversions

Weirs: V-notch, rectangular, Cipolletti, Isco Flow Metering Inserts, Thel-Mar

Flumes: Parshall, Palmer-Bowlus, Leopold-Lagco, trapezoidal, H, HS, HL

Manning Formula: Round, U-shaped, rectangular, trapezoidal

Data Points: Up to 50 level-flow rate points

Equation: 2-term polynomial

Flow Calculations: Up to 2 independent, net, positive or negative, based on either flow rate conversion

Data Storage: 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)

Data Types: Level, velocity, flow rate 1, flow rate 2, total flow 1, total flow 2, input voltage

Storage Mode: 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

Storage Interval: 15 or 30 seconds; 1, 5, 15, or 30 minutes; or 1, 2, 4, 12, or 24 hours. 5 Bytes per reading.

Setup/Data Retrieval: Serial connection to IBM PC or compatible computer using Isco Flowlink Software.

Baud Rate: 38,400

Temperature range: 0° to 140°F (-18° to 60°C) Operating Temperature; -40° to 140°F (-40° to 60°C) storage temperature

Area Velocity Sensor

Size (H x W x L): 0.75 x 1.31 x 6.0 in (1.9 x 3.3 x 15.2 cm)

Cable Length: 25 ft (7.6 m)

Cable Diameter: 0.37 in (0.9 cm)

Weight : 2.1 lbs (0.95 kg) including cable

Materials: Sensor - Epoxy, chlorinated polyvinyl chloride (CPVC), stainless steel; Cable - Polyvinyl chloride (PVC), chlorinated polyvinyl chloride (CPVC).

Operating Temperature: 32° to 160°F (0° to 71°C)

Compensated Range: 32° to 122°F (0° to 50°C)

Level Measurement

Method: Submerged pressure transducer mounted in the flow stream.

Transducer Type: Differential linear integrated circuit pressure transducer

Range: 0.033 to 10 ft (0.010 to 3.05 m)

Max Allowable Level: 20 ft (6.1 m)

Accuracy: Non-linearity and hysteresis at 77°F (25°C) per foot of change from calibration depth, for indicated level range
 0.033 to 5.0 ft (0.03 to 1.52 m): ±0.008 ft/ft (±0.008 m/m)
 Greater than 5.0 ft (1.52 m): ±0.012 ft/ft (±0.012 m/m)

Max Long-Term Drift: 0.033 ft. (0.010 m)

Temp. Coefficient: ±0.0035 ft/°F (±0.0019 m/°C) (Max error within compensated range, per degree of change from calibration temperature.)

Velocity Measurement

Method: Doppler ultrasonic, Frequency 500 kHz, Transmission Angle 20° from horizontal

Minimum Depth: 1 in (25 mm) typical

Range: -5 to +20 ft/s (-1.5 to +6.1 m/s)

Accuracy: In water, uniform velocity, speed of sound = 1480 m/s, for indicated velocity range.
 -5 to +5 ft/s (-1.5 to +1.5 m/s): ±0.1 ft./s (±0.03 m/s)
 5 to 20 ft/s (1.5 to 6.1 m/s): ±2% of reading

Ordering Information

Isco 2151P AV Flow System 68-2000-011

Isco 2151P Dual AV Flow System 68-2000-012

Flowlink Software 60-2540-200

RS 232 Communication Cable (w/ built-in barrier) 60-2004-153

Network Barrier Cable 60-2004-201

Network Isolator (for DIN rail mounting) 60-2004-224

Intrinsically Safe Power Supply 341-0012-01

Quick Disconnect Box 60-2004-228



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