Isco Product Data

2150EX Intrinsically Safe Area Velocity Flow System

The 2150EX is an intrinsically safe Area Velocity Flow Meter which has been approved by Baseefa and CSA for use in potentially explosive atmospheres.

The AV 2150EX smart Area Velocity probe is built on digital electronics, so the analog level is digitized in the sensor itself. The probe is also factory-calibrated for temperature and 3-meter span. This built-in calibration data eliminates temperature drift in the level signal, providing long-term level stability that reduces recalibration frequency and completely eliminates span recalibration.

Superior Probe Design

- All-digital electronics
- Built-in microprocessor eliminates EMI interference
- No temperature drift
- No span calibration required
- Long-term level stability
- Field interchangeable

Power Options

- Battery Module 2196EX with built-in lead-acid rechargeable batteries (for Zone 1 or Class I Division 1 applications only).
- 2194EX Network Interface Module

Applications

- Open channel flow measurement in hazardous locations
- Portable and permanent-site AV flow monitoring for inflow and infiltration, sewer overflow, and other sewer studies.
- Measuring shallow flows in small pipes. The low-profile Area Velocity sensor minimizes flow stream obstruction and senses velocity in flows down to 25 mm in depth.
- Level measurement in potentially explosive areas such as manholes, digesters, and storage tanks.

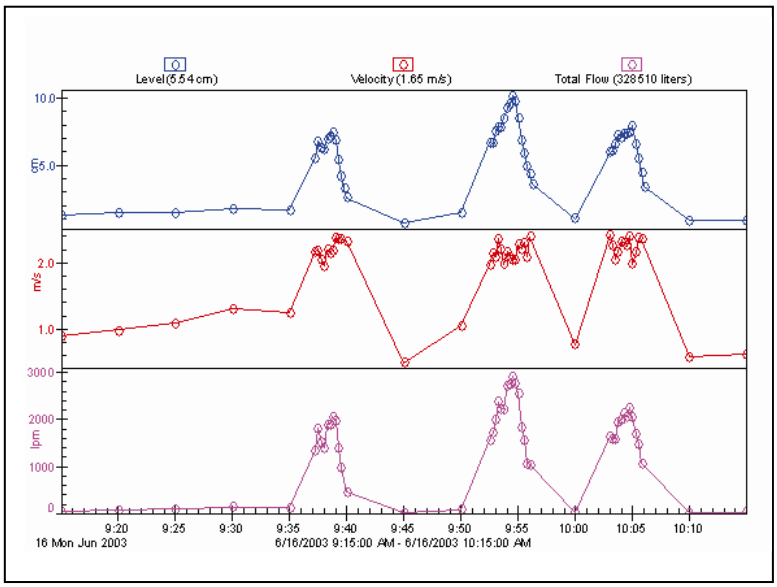
Standard Features

- Rugged, submersible enclosure meets IP68 (NEMA 4X, 6P) environmental protection.
- Chemically resistant epoxy-encapsulated sensor withstands abuse, resists oil and grease fouling, and eliminates frequent cleaning.
- Replaceable high-capacity internal desiccant cartridge and hydrophobic filter protect sensor reference from moisture and water entry.
- Pressure transducer vent system automatically compensates for atmospheric pressure changes to maintain accuracy.
- RS232EX Isolator Cable provides safe, in-the-field connection to a laptop computer.
- The quick-connect sensor can be easily removed and interchanged in the field without needing recalibration.

The 2150EX is approved to the ATEX Directive 94/9/EC by Baseefa, and to Class I, Division 1 by CSA for use in manholes and other hazardous locations. A second flow module can be stacked to provide redundant or multi-stream measurement.

Software Features

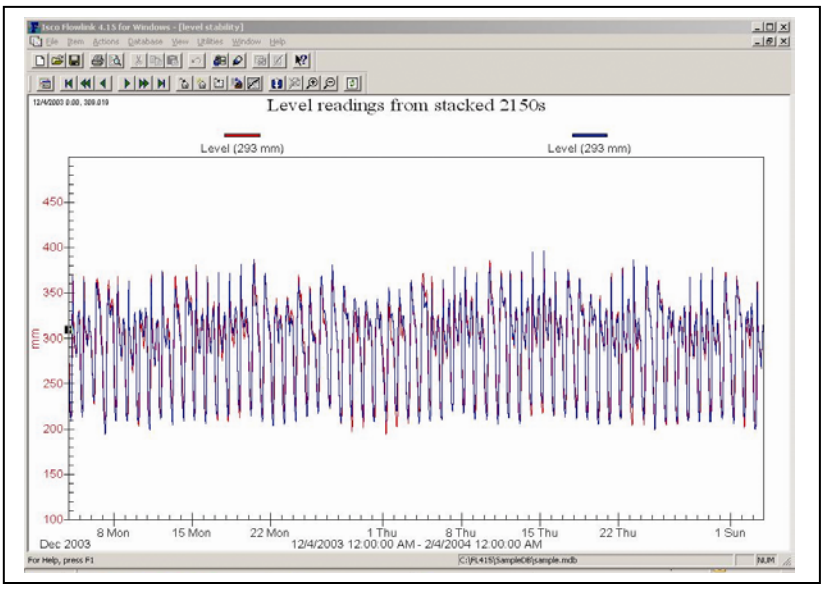
- Secure data storage. All data are continuously stored in "flash" memory to protect against loss in case of power failure
- Easy to upgrade. New operating software can be downloaded into non-volatile "flash" memory, without affecting stored program and data, and without removing the 2150EX from the hazardous area.
- Records and stores input voltage and temperature data for future reference.
- Variable rate data storage lets you change the data storage interval when programmed conditions occur. This feature assures maximum information about an exceptional event – such as an overflow – while conserving power and data capacity during normal conditions.
- 38.4k baud communication provides speedy setup and data retrieval.



Variable rate data storage

The 2150EX flow module has the ability to automatically switch data storage rates based on varying conditions.

In the example at left, the 5-minute data storage rate automatically changed to 30 seconds when the flow rose above a programmed level.



Level stability

Frequent multipoint level recalibration is an onerous requirement with other Area Velocity flow meters. Isco's exclusive smart sensor design in the Area Velocity probe yields exceptionally low drift in the level signal.

The 2150EX's factory-calibrated 3-meter span total eliminates the need for cumbersome span recalibration in the field.

In the example at left, two area velocity probes were installed at the same site. The level readings from both sensors track closely without any drift over an 8-week period.

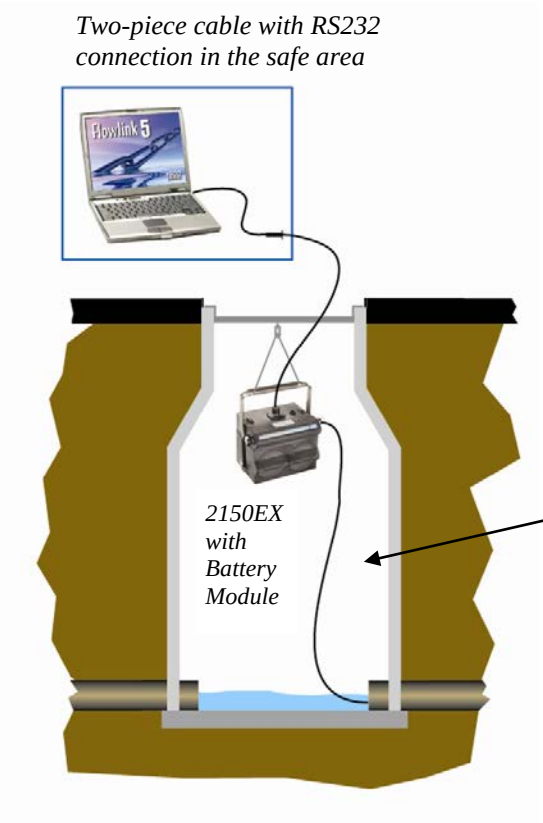
Portable installation

For temporary installations, the 2150EX with battery module is suspended in a manhole or other hazardous area. The EX network cable is routed to the safe area, where it can be connected via a second cable to a laptop computer running Isco Flowlink® software. This allows data retrieval and setup without removing the flow meter from the manhole.

Permanent installation

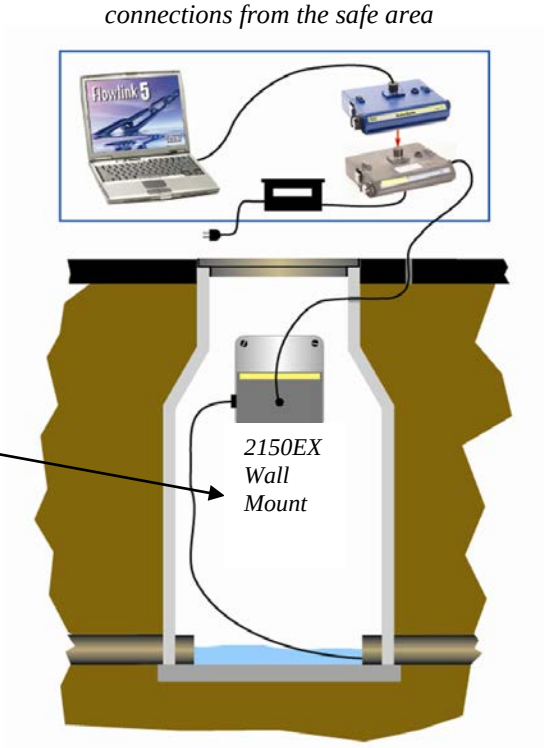
In a typical long-term application, the 2150EX is powered by the 2194EX network interface module located in the safe area. Connecting cable is typically routed through conduit, and the 2194EX is supplied with 12 to 24 Volts DC from a Teledyne Isco power pack or other suitable source. The 2194EX also provides the data connection to a PC running Flowlink® software, or to another 2100 Series module such as the 2101 Field Wizard.

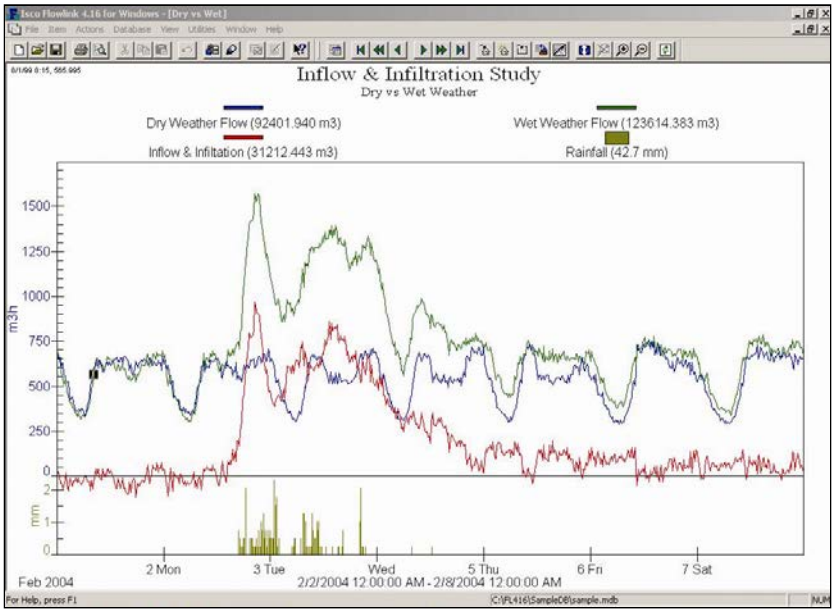
Two-piece cable with RS232 connection in the safe area



Hazardous Area

2194EX provides power and data connections from the safe area





Flowlink® data analysis

Isco Flowlink® software is a powerful tool for analyzing flow and water quality data. This screen shows a comparison of dry and wet weather flows, plus rainfall, typical of an Inflow & Infiltration study.

Specifications

2150EX Flow Module	
Size (H x W x D):	22.6 x 28.0 x 19.3 cm including battery compartment.
Weight:	3.0 kg (without batteries)
Material:	High-impact ABS
Enclosure:	IP68 (NEMA 4X, 6P, self-certified)
Power required:	7.0 to 9.0VDC, 100 mA typical at 8V DC, 1 mA standby
Batteries:	Lithium or rechargeable lead-acid batteries
Program Memory:	Non-volatile, programmable flash; can be updated using PC without opening enclosure; retains user program after updating
Flow Rate 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
Total Flow Calculations:	Up to 2 independent, net, positive or negative, based on either flow rate conversion
Data Storage Memory:	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, 2, 5, 15, or 30 minutes; or 1, 2, 4, 12, or 24 hours. 5 Bytes per reading.
Data Retrieval:	Serial connection to computer with Flowlink Software.
Baud Rate:	38,400
Temperature range:	-40° to 60°C operating & storage

AV 2150EX Area Velocity Sensor	
Size (H x W x L):	1.9 x 3.3 x 15.2 cm
Cable Length x dia:	10.0 m x 0.9 cm
Weight (including cable):	1.02 kg
Materials:	Sensor - Epoxy, chlorinated polyvinyl chloride (CPVC), stainless steel; Cable - Polyvinyl chloride (PVC), chlorinated polyvinyl chloride (CPVC), stainless steel.
Operating Temperature:	-10° to 60°C
Level Measurement	
Method:	Submerged pressure transducer mounted in the flow stream.
Transducer Type:	Differential linear integrated circuit pressure transducer
Range:	0.010 to 3.05 m
Maximum Allowable Level:	10.5 m
Accuracy – maximum non-linearity, hysteresis, and temperature error from actual liquid level	
0.010 to 3.05 m:	±0.003 m
Long-Term Stability:	±0.007 m/yr
Compensated Range:	0° to 50°C
Velocity Measurement	
Method:	Doppler ultrasonic, Frequency 500 kHz, Transmission Angle 20° from horizontal
Typical Minimum Depth:	25 mm
Range:	-1.5 to +6.1 m/s
Accuracy - in water, uniform velocity, speed of sound = 1480 m/s, for indicated velocity range	
-1.5 to +1.5 m/s:	±0.03 m/s
1.5 to 6.1 m/s:	±2% of reading
Temperature Measurement	
Accuracy:	±2°C

Approvals	
2150EX AV Flow Module AV2150EX AV Flow Sensor RS232EX Isolator Cable NET2EX EX Network Cable (2m) NET8EX EX Network Cable (8m)	Ex II 1G EEx ia IIB T4 (-40°C ≤ Ta ≤ +60°C) Exia CL I , Div. 1, GP C, D T4 @ -40°C to +60°C amb C SP US
2196EX Battery Module	Ex II 2G Ex e ia IIB T4 (-40°C ≤ Ta ≤ +60°C) Exia CL I, Div. 1, GP C, D T4 @ -40°C to +60°C amb C SP US
CA75EX Network Interface Cable (75M) CA150EX Network Interface Cable (150m)	Ex II 1G EEx ia IIB T4 (-40°C ≤ Ta ≤ +60°C)
2194EX Interface Module RS485EX Isolator Cable	Ex (1) G [EEx ia] IIB (-40°C ≤ Ta ≤ +60°C)

2150EX Ordering Information

Contact your Teledyne Isco representative for complete ordering details.

Description	Part Number
2150EX with AV sensor, 2196EX Battery Module, and handle	68-2000-043
2150EX module with AV sensor, without Battery Module	68-2000-021
2196EX Battery Module (for Zone 1-Category 2G only)	68-2004-540
Flowlink software	68-2540-200
2194EX network interface module	60-2004-333

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Teledyne Isco, Inc.

4700 Superior Street
Lincoln NE 68504 USA
Tel: (402) 464-0231
USA and Canada: (800) 228-4373
Fax: (402) 465-3022
E-Mail: iscoinfo@teledyne.com
Internet: www.isco.com