

# 2150

## Area Velocity Flow Module

The 2150 Flow Module uses continuous wave Doppler technology to measure mean velocity. The sensor transmits a continuous ultrasonic wave, then measures the frequency shift of returned echoes reflected by air bubbles or particles in the flow.

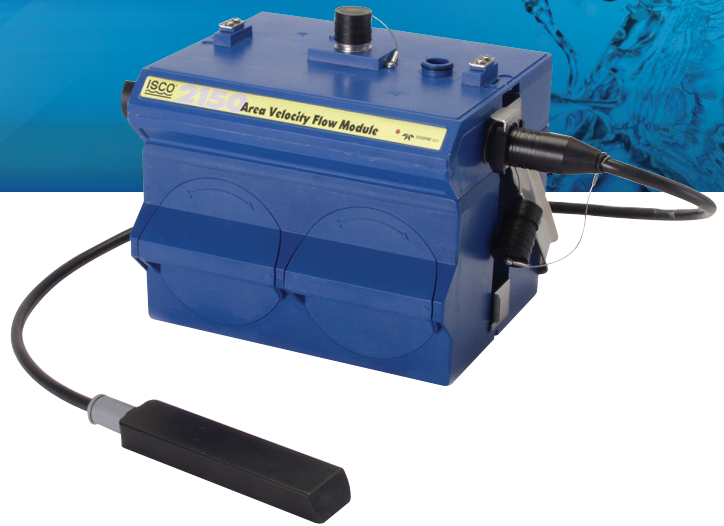
*Continuous wave Doppler flow meter is ideal for portable flow surveys and permanent installations.*

The 2150's "smart" area velocity probe is built on digital electronics, so the analog level is digitized in the sensor itself to overcome electromagnetic interference. The probe is also factory-calibrated for 10-foot (3 meter) span at different temperatures. This built-in calibration eliminates drift in the level signal, providing long-term level stability that reduces recalibration frequency and completely eliminates span recalibration.

In field use, the 2150 is typically powered either by two alkaline, or Teledyne ISCO Rechargeable Lead-acid batteries, within a 2191 Battery Module. Highly efficient power management extends battery life up to 15 months at 15-minute data storage intervals. Other power options (including solar) are available.



*Modules may be stacked to customize a system for any site.*



### Applications:

- Portable and permanent-site AV flow monitoring for inflow and infiltration, capacity assessment, sewer overflow, and other sewer studies
- Measuring shallow flows in small pipes. Our low-profile area velocity sensor minimizes flow stream obstruction and senses velocity in flows down to 1 inch (25 mm) in depth

### Standard Features

- Rugged, submersible enclosure meets NEMA 4X, 6P (IP68) environmental specs
- Chemically resistant epoxy-encapsulated sensor withstands abuse, resists oil and grease fouling, and eliminates the need for frequent cleaning
- Replaceable high-capacity internal desiccant cartridge and hydrophobic filter protect sensor reference from water entry and internal moisture
- Pressure transducer vent system automatically compensates for atmospheric pressure changes to maintain accuracy
- The quick-connect sensor can be easily removed and interchanged in the field without requiring recalibration
- Up to four 2100 Series flow modules can be networked by stacking and/or extension cables

## 2150 Flow Module

<b>Size (HxWxD):</b>	2.9 x 11.3 x 7.5 in (74 x 287 x 191 mm)
<b>Weight:</b>	2.0 lb (0.9 kg)
<b>Materials of Construction:</b>	High-impact polystyrene, stainless steel
<b>Enclosure:</b>	NEMA 4X, 6P (IP68) (self-certified)
<b>Temperature Range:</b>	-40 to 140 °F (-40 to 60 °C) operating & storage
<b>Power Required:</b>	12 VDC nominal (7.0 to 16.6 VDC), 100 mA typical, 1 mA standby
<b>Power Source:</b>	Typically, an 2191 Battery Module, containing 2 alkaline or 2 rechargeable lead-acid batteries. (Other power options are available; ask for details.)
<b>Typical Battery Life:</b>	Using 15-minute data storage interval Energizer® Model 529 alkaline—15 months Rechargeable lead-acid—2.5 months
<b>Program Memory:</b>	Non-volatile programmable flash; can be updated using PC without opening enclosure; retains user program after updating

## Built-in Conversions

<b>Flow Rate Conversions:</b>	Up to 2 independent level-to-area conversions and/or level-to-flow rate conversions
<b>Level-to-Area Conversions:</b>	Channel Shapes—round, U-shaped, rectangular, trapezoidal, elliptical, with silt correction; Data Points—Up to 50 level-area points
<b>Level-to-Flow Conversions:</b>	Most common weirs and flumes; Manning Formula; Data Points (up to 50 level-flow points); 2-term polynomial equation
<b>Total Flow Calculations:</b>	Up to 2 independent, net, positive or negative, based on either flow rate conversion

## Data Handling and Communications

<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, temperature
<b>Storage Mode:</b>	Rollover; 5 bytes per reading
<b>Storage Interval:</b>	15 or 30 seconds; 1, 2, 5, 15, or 30 minutes; or 1, 2, 4, 12, or 24 hours. Storage rate variable based on level, velocity, flow rate, total flow, or input voltage
<b>Data Retrieval:</b>	Serial connection to PC or optional 2101 Field Wizard module; optional modules for spread spectrum radio; land-line or cellular modem; 1xRTT. Modbus and 4-20 mA analog available

<b>Software:</b>	Flowlink for setup, data retrieval, editing, analysis, and reporting
<b>Multi-module Networking:</b>	Up to four 2100 Series Flow Modules, stacked and/or remotely connected. Max distance between modules 3300 ft (1000 m)
<b>Serial Communication Speed:</b>	38,400 bps

## 2150 Area Velocity Sensor

<b>Size (HxWxD):</b>	0.75 x 1.3 x 6.0 in (19 x 33 x 152 mm)
<b>Cable (L x Dia):</b>	33 ft x 0.37 in (10 m x 9 mm) standard. Custom lengths available on request
<b>Weight:</b>	2.2 lbs (1 kg) (including cable)
<b>Materials of Construction:</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>Level Measurement:</b>	<u>Method</u> — Submerged pressure transducer mounted in the flow stream <u>Transducer Type</u> — Differential linear integrated circuit pressure transducer <u>Range (standard)</u> — 0.033 to 10 ft (0.010 to 3.05 m); (optional) up to 30 ft (9.15 m) <u>Maximum Allowable Level</u> — 34 ft (10.5 m) <u>Accuracy</u> — ±0.01 ft from 0.033 to 10 ft, (±0.003 m from 0.01 to 3.05 m) <u>Long-Term Stability</u> — ±0.023 ft/yr (±0.007 m/yr) <u>Compensated Range</u> — -32 ° to 122 °F (0 ° to 50 °C)
<b>Velocity Measurement:</b>	<u>Method</u> — Doppler ultrasonic, frequency 500 kHz <u>Typical Minimum Depth</u> — 0.08 ft (25 mm) <u>Range</u> — -5 to +20 ft/s (-1.5 to +6.1 m/s) <u>Accuracy</u> (in water with uniform velocity profile, speed of sound = 4850 ft/s, for indicated velocity range)— ±0.1 ft/s from -5 to 5 ft/s (±0.03 m/s from -1.5 to +1.5 m/s) ±2% of reading from 5 to 20 ft/s (1.5 to 6.1 m/s)
<b>Temperature Measurement:</b>	Accuracy ±3.6 °F (±2 °C)

## 2150 Ordering Information

Contact your Teledyne ISCO representative for complete ordering details and information on other 2100 Series Modules.

2150 with AV sensor, 2191 Battery Module, and Handle .....	68-2050-002
2150 Module with AV sensor (only) .....	68-2050-001
Flowlink® 5 Software .....	68-2540-200
Energizer® Model 529 Alkaline Lantern Battery (2 required).....	340-2006-02
Rechargeable Lead-acid Battery (2 required) .....	60-2004-041
Charger for Lead-acid Batteries (holds 2 batteries) .....	60-2004-040

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