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.

**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

**Size (HxWxD):** 2.9 x 11.3 x 7.5 in (74 x 287 x 191 mm)

**Weight:** 2.0 lb (0.9 kg)

**Materials of Construction:** High-impact polystyrene, stainless steel

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

**Temperature Range:** -40 to 140 °F (-40 to 60 °C) operating & storage

**Power Required:** 12 VDC nominal (7.0 to 16.6 VDC), 100 mA typical, 1 mA standby

**Power Source:** Typically, an 2191 Battery Module, containing 2 alkaline or 2 rechargeable lead-acid batteries. (Other power options are available; ask for details.)

**Typical Battery Life:** Using 15-minute data storage interval Energizer® Model 529 alkaline–15 months

**Rechargeable Lead-acid–2.5 months**

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

**Built-in Conversions**

**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 Conversions:** Most common weirs and flumes; Manning Formula; Data Points (up to 50 level-flow points); 2-term polynomial equation

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

**Data Handling and Communications**

**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, temperature

**Storage Mode:** Rollover; 5 bytes per reading

**Storage Interval:** 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

**Data Retrieval:** 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

**Software:** Flowlink for setup, data retrieval, editing, analysis, and reporting

**Multi-module Networking:** Up to four 2100 Series Flow Modules, stacked and/or remotely connected. Max distance between modules 3300 ft (1000 m)

**Serial Communication Speed:** 38,400 bps

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### 2150 Area Velocity Sensor

**Size (HxWxD):** 0.75 x 1.3 x 6.0 in (19 x 33 x 152 mm)

**Cable (L x Dia):** 33 ft x 0.37 in (10 m x 9 mm) standard.

**Weight:** 2.2 lbs (1 kg) (including cable)

**Materials of Construction:** Sensor–Epoxy, chlorinated polyvinyl chloride (CPVC), stainless steel

**Cable–Polyvinyl chloride (PVC), chlorinated polyvinyl chloride (CPVC)**

**Operating Temperature:** 32 ° to 140 °F (0 ° to 60 °C)

**Level Measurement:**

**Method:** Submerged pressure transducer mounted in the flow stream

**Transducer Type:** Differential linear integrated circuit pressure transducer

**Range (standard):** 0.033 to 10 ft (0.010 to 3.05 m); (optional) up to 30 ft (9.15 m)

**Maximum Allowable Level:** 34 ft (10.5 m)

**Accuracy:** ±0.01 ft from 0.033 to 10 ft, (±0.003 m from 0.01 to 3.05 m.)

**Long-Term Stability:** ±0.023 ft/yr (±0.007 m/yr)

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

**Velocity Measurement:**

**Method:** Doppler ultrasonic, frequency 500 kHz

**Typical Minimum Depth:** 0.08 ft (25 mm)

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

**Accuracy (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)

**Temperature Measurement:** Accuracy ±3.6 °F (±2 °C)

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### 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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