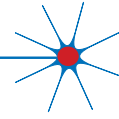


A Non-Contact Flow Meter for Open Channel Flow Monitoring

[56.7]

LaserFlow™



MONITOREA

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AREA VELOCITY
SENSOR ASSEMBLY
(OPTIONAL)

HANDLE

FORCE



TELEDYNE ISCO
Everywhere you look™

LaserFlow is built on a strong history of water and wastewater monitoring innovations

With the breakthrough technology of LaserFlow, the first and only non-contact device to penetrate the water to record velocity, Teledyne Isco has revolutionized the water and wastewater monitoring industry. More than 40 years ago, founder Dr. Allington recognized the need for open channel flow measurement at the time the Clean Water Act of 1972 and the National Pollution Discharge Elimination System (NPDES) were introduced in the United States. This was the beginning of a successful advancement of innovations resulting in a number of patents and products leading to the LaserFlow's development.

Early Innovations

The 1970s and 1980s included many firsts: introducing the first Isco flow meter, the first automatic wastewater sampler, and first bubbler flow meter on the market. Innovations launched in the 1990s included the first flow meter to print reports for permit compliance, a sampler with non-contact liquid detection and sample volume control, first stackable module flow system, and Flowlink data management software. In the 2000s, the stackable modular flow system was expanded with greater flow measurement and remote communication technologies. By the mid-2000s, the first smart and expandable compliance meter with multiple measurement technologies and interface was launched. In the 2010s, LaserFlow, the first and only non-contact flow meter that measures true velocity of water below the surface was launched. In a few short years, it has redefined the industry standard by excelling in a wide range of applications with precise velocity and level measurement. The evolution of successful products is a testament to Teledyne Isco's attentiveness to customers' needs.

Industry Leader

Teledyne Isco has been a leading manufacturer and supplier of durable, reliable in-plant and field instruments for monitoring water quality and pollution. These products include refrigerated and portable automatic wastewater samplers, open channel flow meters with acoustic Doppler area velocity, ultrasonic, bubbler, and submerged probe measurement technologies and Flowlink® software for comprehensive flow data handling and analysis.

Water and Wastewater Monitoring Expert

Teledyne Isco combines a dedicated workforce with a progressive, vertically integrated ISO 9001 manufacturing operation. The dedicated facility combines research, engineering, sales, service, and manufacturing including plastic molding, machine shop and assembly operations.

Following Dr. Allington's lead and the ongoing dialogue with users, Teledyne Isco continues to build upon a rich history of pioneering products leading up to the release of the LaserFlow non-contact velocity sensor. It is this ongoing tradition of innovation that allows Teledyne Isco to meet your water and wastewater monitoring needs now and well into the future.

Widest application range.

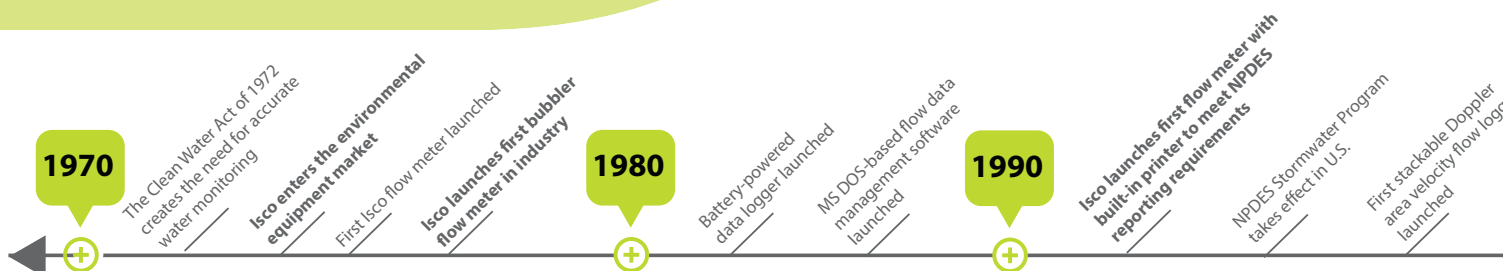
With the widest level and velocity range, the Laserflow is suitable for most open channels.

Minimal cost of ownership.

The construction of the LaserFlow offers lasting durability, while the above water installation limits the need for routine cleaning, maintenance and site visits, saving time, money, and resources.

Effortless data collection.

With Teledyne Isco's remote communication options and Flowlink Global software you can monitor any data, anywhere, anytime, on any device.



Easy installation and maintenance.

The Teledyne Isco hardware makes installation easy. Removal and redeployment is simple from street level. Mounted above the water, the LaserFlow can eliminate confined space entry for maintenance.

Ease of calibration.

Velocity measurement at single or multiple points below the surface eliminates the need for manual profiling. Ultrasonic signal strength validates level measurement while the Doppler power information of the return signal ensures an accurate velocity reading and allows the user insight into changing pipe hydraulics over time.

Accurate measurement regardless of flow conditions.

From bidirectional flow, varying flow speeds and liquid levels, including submerged conditions, the LaserFlow continues to perform accurately by automatically adjusting to these changing conditions.



LaserFlow™

Non-Contact Velocity Sensor

2000

Stackable concept expanded to additional ultrasonic flow measurement and communications
Pulse doppler flow meters introduced

Server-based flow data management software launched

Flowlink (Web user interface) launched

2010

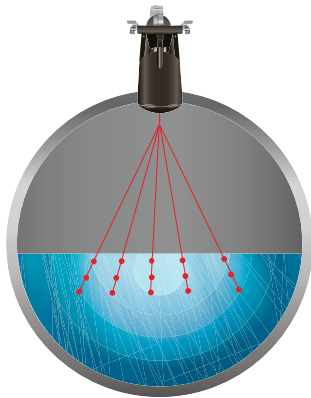
Smart, expandable permanent Signature flow meter with interface options launched

Teledyne Isco launches LaserFlow, first non-contact AI sensor using laser technology in industry

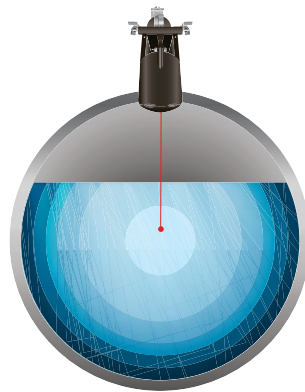
Web UI updated Flowlink for multiple operating systems, web browsers and mobile devices

Teledyne Isco Environmental Products Milestones

Why choose LaserFlow?



Multiple point velocity measurement



Single point large pipe



Single point small pipe

Acquire precise readings

Laserflow, the only non-contact velocity sensor that reads below the surface, provides maximum precision by taking velocity measurements at single or multiple points, producing the most accurate mean velocity reading. Multipoint measurement minimizes the effects of turbulence in the water by performing a horizontal scan at different depths. This advancement eliminates the need for time consuming manual profiling prior to installation.

Durable construction

Like all Teledyne Isco products, the LaserFlow is durably constructed for lasting performance. Due to the non-contact nature of the LaserFlow, interaction with flow is not common in normal conditions. However, in surcharged flow conditions, the LaserFlow's rugged construction and submersible enclosure with IP68 ingress protection will keep the electronics protected. The angled body of the LaserFlow allows condensation to easily run off, not interfering with level measurement. Composed mainly of ABS and SST, the LaserFlow is chemical, heat, and corrosion resistant.

Bidirectional flow measurement

The LaserFlow can measure bidirectional flow caused by tidal influence, heavy rain, or a higher level in the merging line downstream.

Eliminate measurement issues in wet environment with optical clarity system

Eliminate measurement difficulties in moisture-rich conditions. Performance is never interrupted, even in less than ideal conditions, with the LaserFlow's advanced optical clarity system. This automatic feature detects the slightest amount of condensation on the window of the sensor, then activates the optical clarity system to clear the window insuring velocity measurement is never compromised.



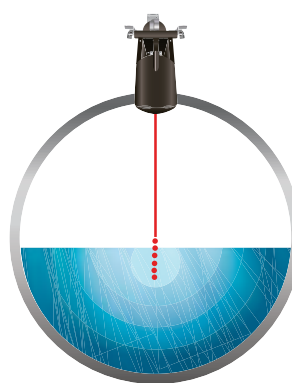
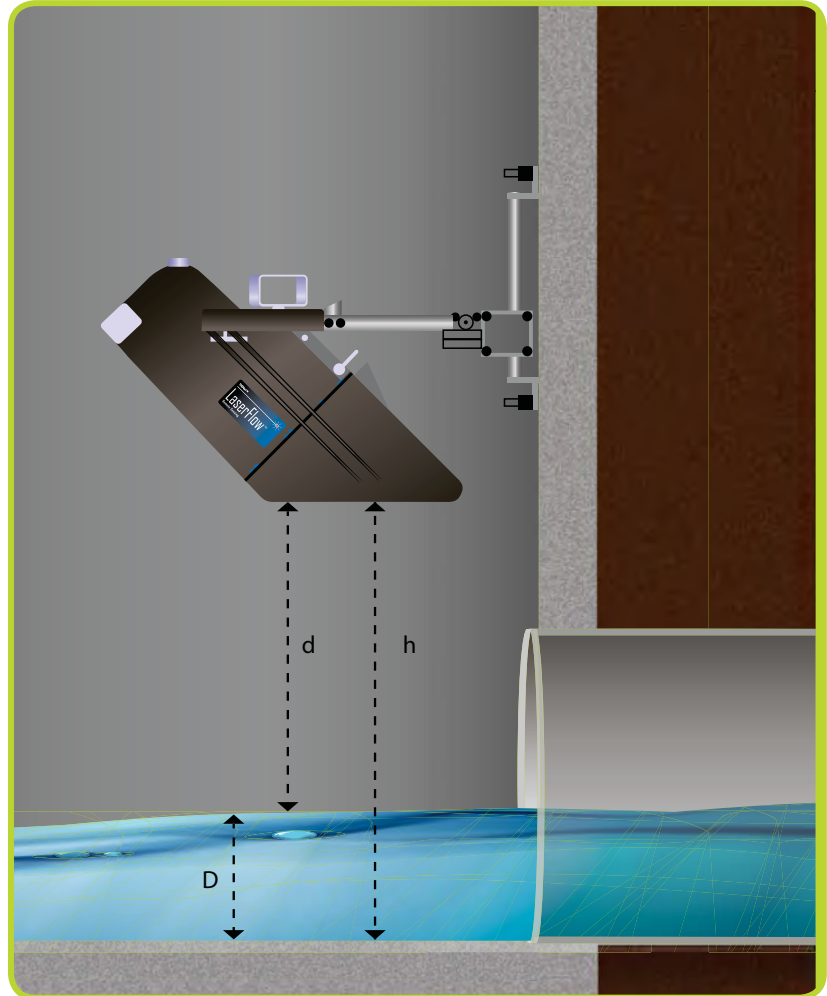
Ease of installation

The LaserFlow has error-free calibration, so you can be sure of a precise installation. The distance (d) information from the sensor to water level verifies level calibration, while x -axis and y -axis installation information corrects for marginal error and ensures the LaserFlow is installed correctly. Ultrasonic level signal strength and Doppler power gives continuous assurance of proper installation.

Self-learning algorithms & advanced features

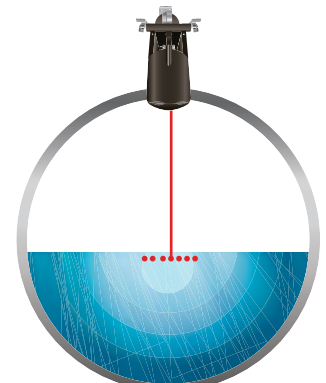
The LaserFlow sensor is engineered to do the work so you don't have to. The adaptive focus option enables the LaserFlow sensor to perform a vertical scan above and below the standard focus point, then adjust the focus to the point with the best signal strength. Optimal signal strength reduces measurement error and produces clear results, regardless of the application. This is ideal when there is a change in elevation (less than 3") between the incoming pipe and the manhole invert or there is a standing wave or debris at the level measuring point.

In applications when the flow profile is possibly affected by incoming flow from the side of the pipe or a bend in the pipe, the peak detect option provides good results. Peak detect scans five points across the user-defined row to locate the peak velocity at a single depth. In turn, a true velocity measurement point is identified in changing flow conditions.



Adaptive Focus

Vertical scan for maximum Doppler power 3 inches above and below face point.



Peak Detection

Scans across user defined row to find the peak detection.

Select the right configuration option.

From industrial applications to municipal manhole installations, the LaserFlow offers versatile configuration options, giving you the flexibility to monitor flow in numerous open channel applications.

For these applications you can use one of three Teledyne Isco flow meters with the LaserFlow:

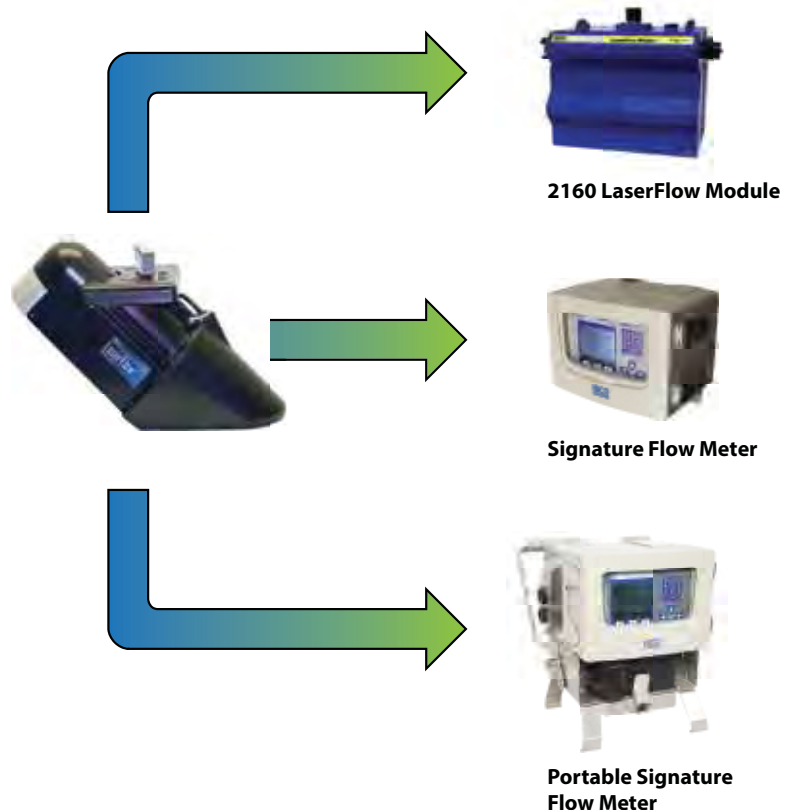
- 2160 LaserFlow Module
- Signature® Flow Meter
- Signature Portable Flow Meter

2160 LaserFlow Module

Battery powered logger to collect historical data

- IP 68 enclosure is ideal for installations in manhole and sites with potential to surcharge
- The modular design allows the ability to stack other modules such as additional measurement technology module for redundant measurement, interface module to log parameters from other instruments, and cell/wireless modules for remote communication
- Power efficient electronics offers long battery life for sites that are remote and not frequently visited

The non-contact LaserFlow sensor with 2160 module is widely used



in waste water collection system to avoid risky, time consuming and expensive confined space entries required for the routine maintenance, deployment and removal of the sensors.

Standard waste water collection system applications:

- Capacity assessment and system mapping
- Sanitary sewer flow monitoring
- Inflow and Infiltration (I&I) studies
- Combined Sewer Overflow (CSO)
- Other Sanitary Sewer Evaluation Studies (SSES)

Signature Flow Meter

AC powered flow meter for permanent sites

- The flexible platform allows multiple measurement technologies and sampler interfaces with single flow meter
- Multiple Inputs such as pH, Rain Gauge, SDI 12, Analog, MODBUS, and Contacts provide a common logging and recording platform for different instruments and parameters
- Recorded parameters can be interfaced with central control system via output/interface such as Analog, MODBUS, Ethernet and/or cell communication
- The unalterable daily, weekly and/or monthly reports from meter provide information such as average and total of during the report period as well as time and value
- USB interface allows you to quickly update the firmware, and download the data and reports
- IP66 enclosure is ideal for outdoor applications

The non-contact measurement of the LaserFlow sensor and the above features of the Signature Flow meter combine to provide ideal solutions for applications such as billing and discharge compliance. The Area Velocity measurement allows the use to avoid expensive construction associated with primary devices (flume/weir). For the sites with existing primary devices it provides accurate reading during normal flow conditions and the ability to operate in abnormal condition such as during flume submergence. The non-contact measurement avoids regular cleaning in application with lot of debris such as waste water treatment plant influent water.



Signature Portable Flow Meter

Flow meter for battery or solar powered remote sites

The Signature portable flow meter offers all features of the Signature flow meter, as well as following features:

- A convenient handle for easy transport
- Connector for quick connection with multiple measurement technologies, pH, Rain Gauge, Sampler, and battery power
- Multiple interfaces to provide a common recording platform for different parameters/instruments
- Cell phone communication which allows remote access to all recorded data and alarms. It avoids the need for multiple cell phones with each instrument and save communication cost
- Power saving mode which provides long battery life for remote sites and reduced number of site visits



With the standard SDI 12 or MODBUS input, multi-parameter sondes can be interfaced with Signature portable flow meter to record data such as pH, Temperature, Conductivity, Dissolved Oxygen, Turbidity, etc. from surface water site. The sampler can be triggered based on flow or any of the recorded parameter.

Standard portable applications:

- **Storm water flow measurement**
- **River and creek monitoring**
- **Irrigation channel flow measurement**
- **Outfall monitoring**

Standard permanent site applications:

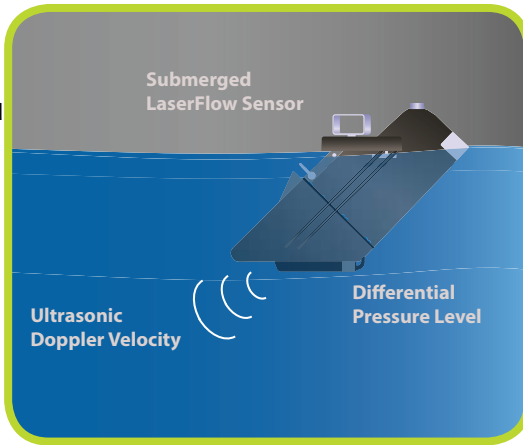
- **Waste Water Treatment Plant (WWTP) influent, effluent and in-plant**
- **Industrial discharge**
- **Drinking water plant inlet and outlet**
- **Aqueduct measurement**

Advanced options for advanced needs.

Continuous measurements in submerged conditions

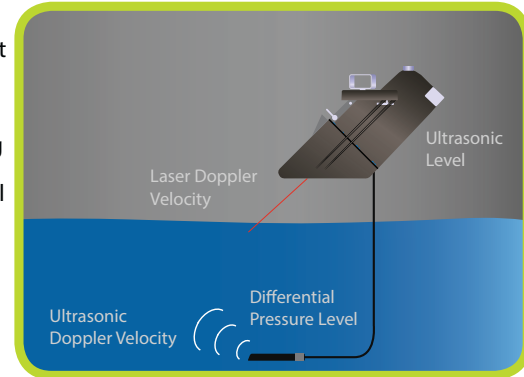
During submerged conditions, when water reaches the LaserFlow, the optional bottom-mounted 350 AV sensor seamlessly takes over the flow rate measurement. The surcharge sensor measures velocity using continuous wave Doppler area velocity (AV) technology and level by differential pressure sensor.

During surcharged conditions, the AV sensor measures precise flow over a large area, and is not limited to the area around the sensor.



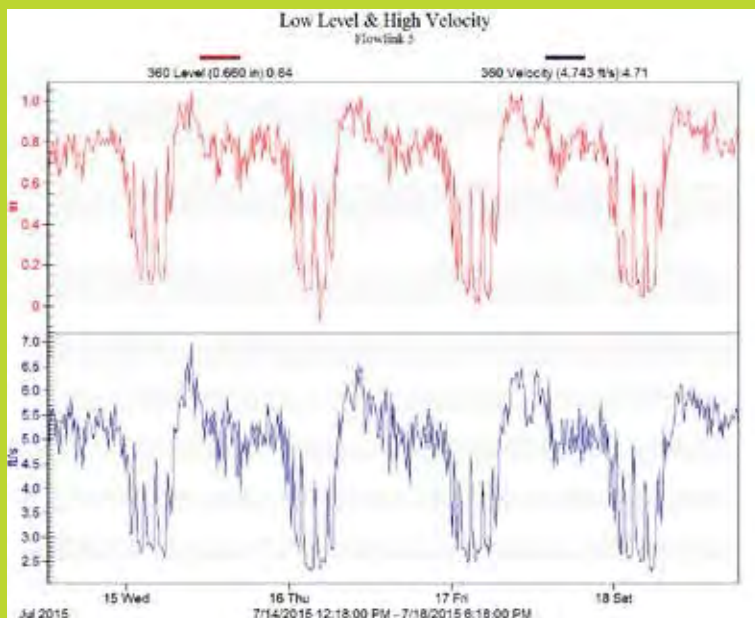
Redundant measurement for critical sites

When redundant flow measurement is required for critical monitoring sites, an additional sensor can be added to the LaserFlow sensor or flow meter.



The addition of the TIENet 310 Ultrasonic provides redundant level measurement, whereas the addition of the TIENet 350 Area Velocity sensor provides redundant level, velocity and flow measurement. No additional power source is required for these additional sensors. With this flexibility, redundant measurements with different measurement technologies can be easily performed at the same location.

Unique applications. No problem.



Low Level, High Velocity.

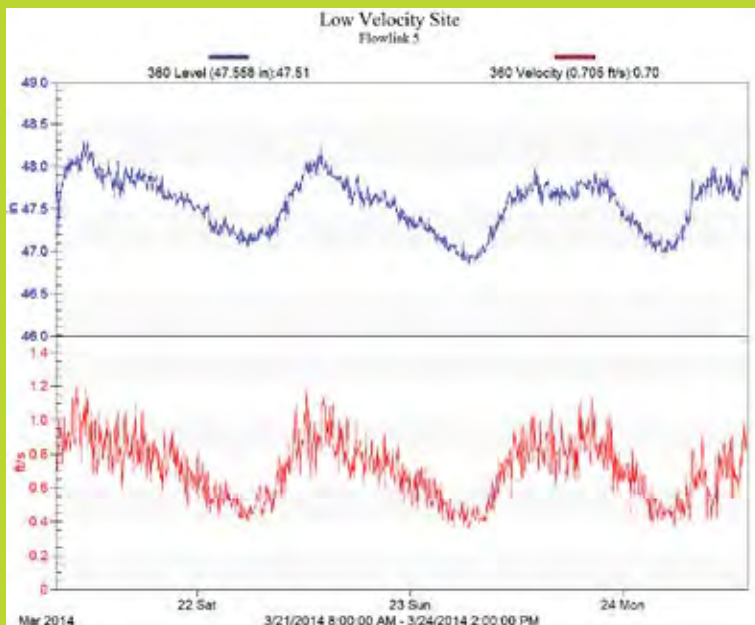
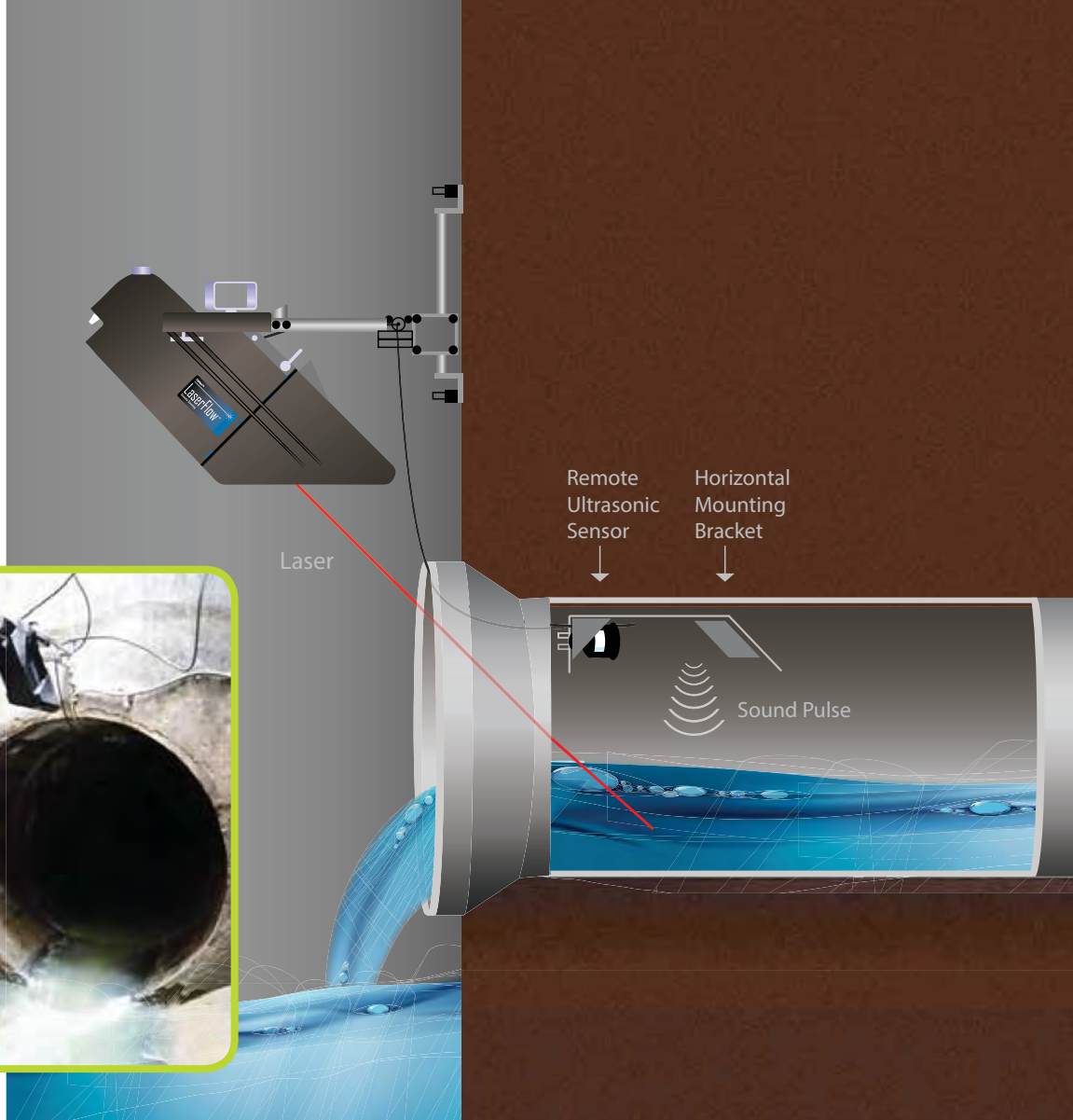
LaserFlow has the ability to read high velocities in low levels. This is a very challenging application that only LaserFlow can meet, measuring velocities as rapid as 15 feet per second in levels as shallow as 0.5 inches.



Accurate measurement to different elevations

In applications such as a free-falling outfall or drop manhole, the level of the water under the sensor will differ from the level at the velocity measurement point. If the difference in elevation is more than three inches, a Teledyne Isco remote ultrasonic sensor may be installed above the velocity measurement point so that both measurement points reference the same elevation.

To accommodate unique site requirements, various mounting hardware is available for use with the LaserFlow sensor and remote ultrasonic sensor.



Low Velocity, High Level.

Smooth surface flow conditions are no challenge for LaserFlow. The capability to measure below the surface eliminates the need for unevenness in the liquid's surface to receive a return signal.



Hardware Installation

Limit manhole re-entry with sensor retrieval arm

Following initial installation and adjustment of the LaserFlow, using the optional sensor retrieval arm, the sensor can be installed or removed as needed without the need for manhole re-entry. Raising and lowering the LaserFlow can be accomplished by grasping the locking handle and removing the sensor from the permanent mounting mechanism. Availability of installation parameters and verifiable measurements ensure exact installment.

The handle's simple, yet effective locking mechanism holds the sensor securely in place and is easily engaged and released from above the ground.



Accurate outdoor readings with sunshade

The LaserFlow sunshade is an optional accessory to ensure accurate measurement when the Laserflow sensor is installed in an outdoor location in direct sunlight. This prevents sunlight from striking the sensor directly and heating it to a higher temperature than that of the surrounding air.



Mounting hardware to support any application

Unlike other in-situ flow sensors, there is no need to re-enter the pipe to install the LaserFlow. You can choose one of two mounting options, the permanent mount or temporary mount.

Permanent Mount

The LaserFlow permanent mount is an easy-to-install wall-mounted bracket that requires minimal hardware and only two drilled holes. This mounting bracket is composed of stainless steel which resists corrosion and provides added strength.



Temporary Mount

The temporary mounting hardware is a convenient option to monitor locations for small duration flow studies and is suitable for fiberglass enclosures or deteriorating environments when drilling holes is not applicable. The LaserFlow can be placed anywhere on the spreader bar for even greater flexibility. For installations where the temporary mount cannot suspend the sensor directly over the center of the flow, an optional elbow pipe is available to create an offset of six inches from the cargo arm.



Teledyne Isco Flowlink® software packages available for your data collection needs

Flowlink

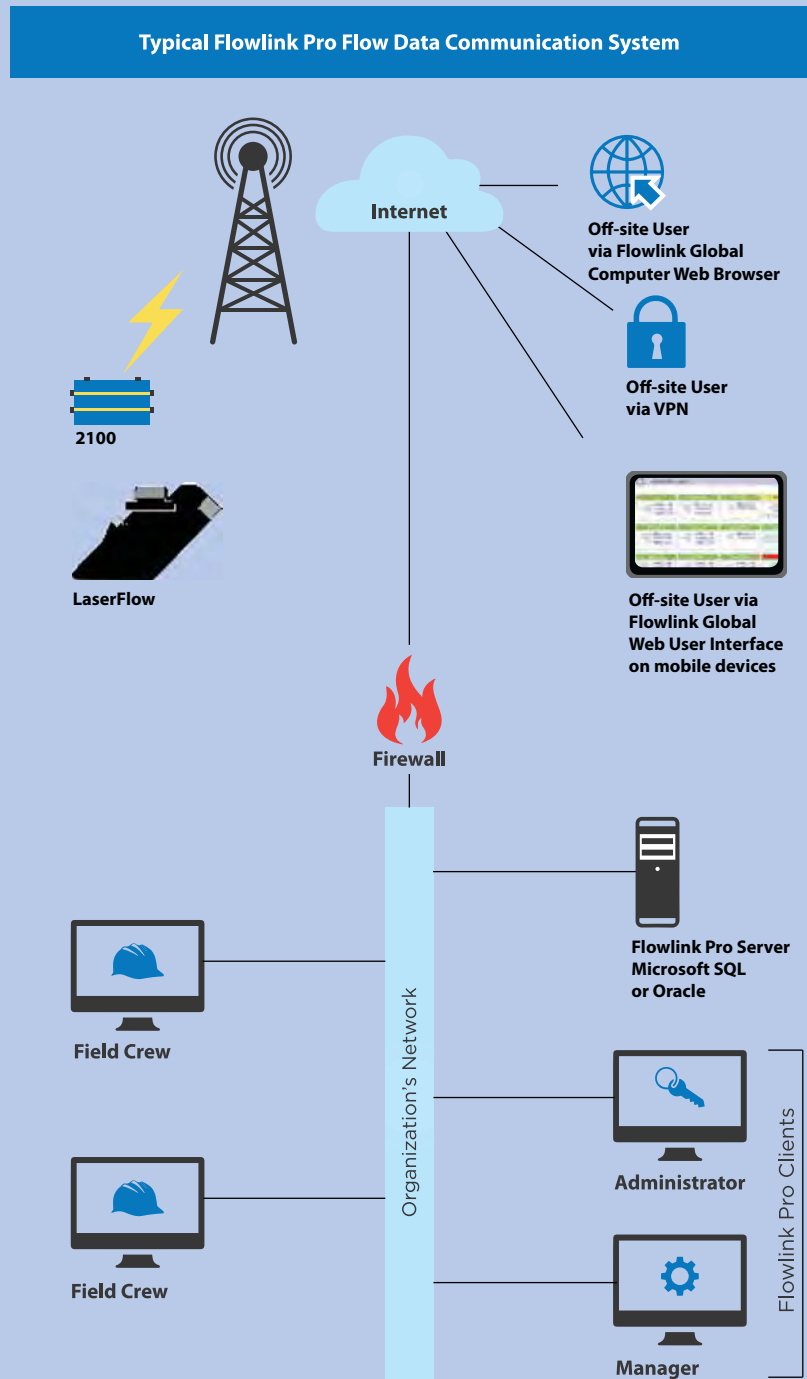
Teledyne Isco's comprehensive Flowlink® software provides the tools to manage all of your flow monitoring data. The software is specifically designed for desktop computers in the office and notebook computers in the field. To collect data, the software communicates via USB connectivity, Ethernet and cellular modem (CDMA or GSM). Once the data is retrieved, the software has built in tools for evaluating site conditions, data analysis and reporting.

Flowlink Pro

Flowlink Pro Software is a server based application that supports automatic transmission of data from field devices. The use of this software package eliminates the need for site-to-site data collection visits that cost time and money. This client server configuration accepts "pushed data" from meters or equipment with cellular modems via the Internet for hands-off data collection. The software package includes the built-in data analysis tools that are included in the standard Flowlink package as well as advanced server-based alarm notifications.

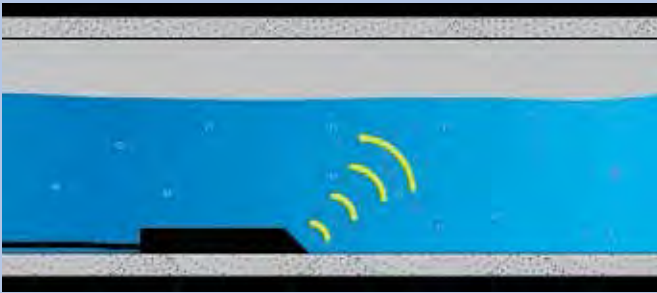
Flowlink Global

Flowlink Global is a Web User Interface (Web UI) that enables multiple users to simultaneously monitor and service sites in your Flowlink Pro database from their desktop computers, laptops, or mobile devices. This web interface supports Windows or iOS operating systems and a variety of web browsers including Internet Explorer, Safari, Google Chrome, Mozilla Firefox and Opera.



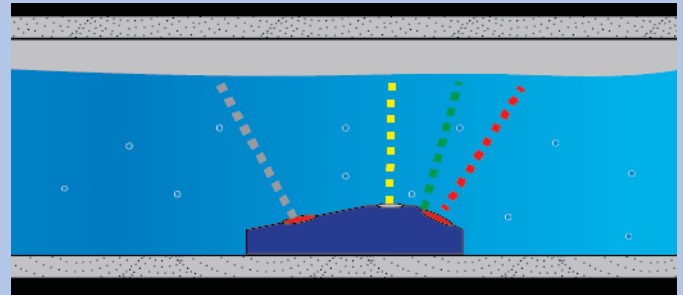
Flow Monitoring Technologies

In addition to LaserFlow, Teledyne Isco provides various flow monitoring technologies.



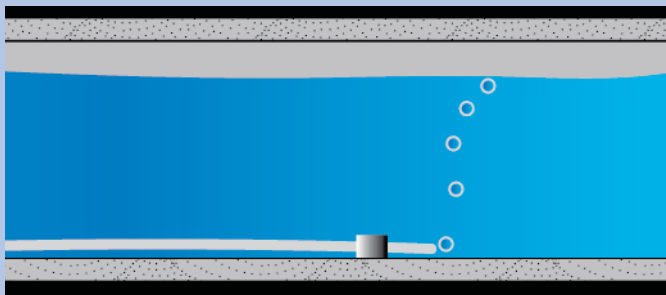
Continuous-wave Doppler

Area Velocity sensors continuously transmit an ultrasonic signal from within the flow stream. Those signals are reflected off bubbles and particles, and return to the sensor where the frequency shift is measured to derive an average velocity. A differential pressure transducer in the sensor measures liquid depth to determine the flow area. Flow rate is then calculated by multiplying the area of the flow stream by its average velocity.



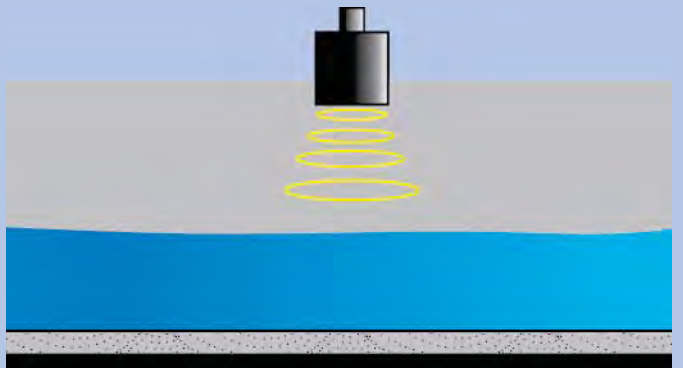
Pulse Doppler Velocity Profiling

Ceramic crystals transmit acoustic signals (sound pulses) into the flow stream. They are echoed back after contacting bubbles or particles. By measuring the difference in frequency between the emitted and returned signals (known as Doppler shift), the velocities of particles in the flow stream can be accurately determined. By “range gating” the returned signals, velocity is measured in multiple, distinct cells, called velocity bins. Detailed velocity data in relation to sensor location is then used to calculate a highly-accurate flow profile.



Bubbler

Especially useful in flow streams affected by harsh weather, debris, or corrosive chemicals, bubbler technology forces compressed air from a submerged tube. The depth of flow is determined by measuring the pressure needed to force the bubbles out of the line. That information is then converted into the flow rate using known parameters.



Non-contact Ultrasonic

With its sensor mounted above the flow stream, transmitted sound pulses are reflected off the liquid surface. The elapsed time between transmitted and returned signals determines liquid level. Flow rate is then calculated using one of the meter’s built-in flow conversions or a user-defined level-to-flow relationship.

Flow Monitoring Products from Teledyne Isco

2100 Series Flow Modules

Teledyne Isco's 2100 Series offers flexible, modular design and easy configuration for a wide range of networked open-channel flow monitoring applications, including Inflow and Infiltration studies, cMOM and AMP data collection, and river monitoring. Compact, stackable, IP68 modules snap together to provide the capabilities needed for practically any site and monitoring requirement.



2100 Series Flow System



2150 Area Velocity Flow Module



2110 Area Velocity Flow Module



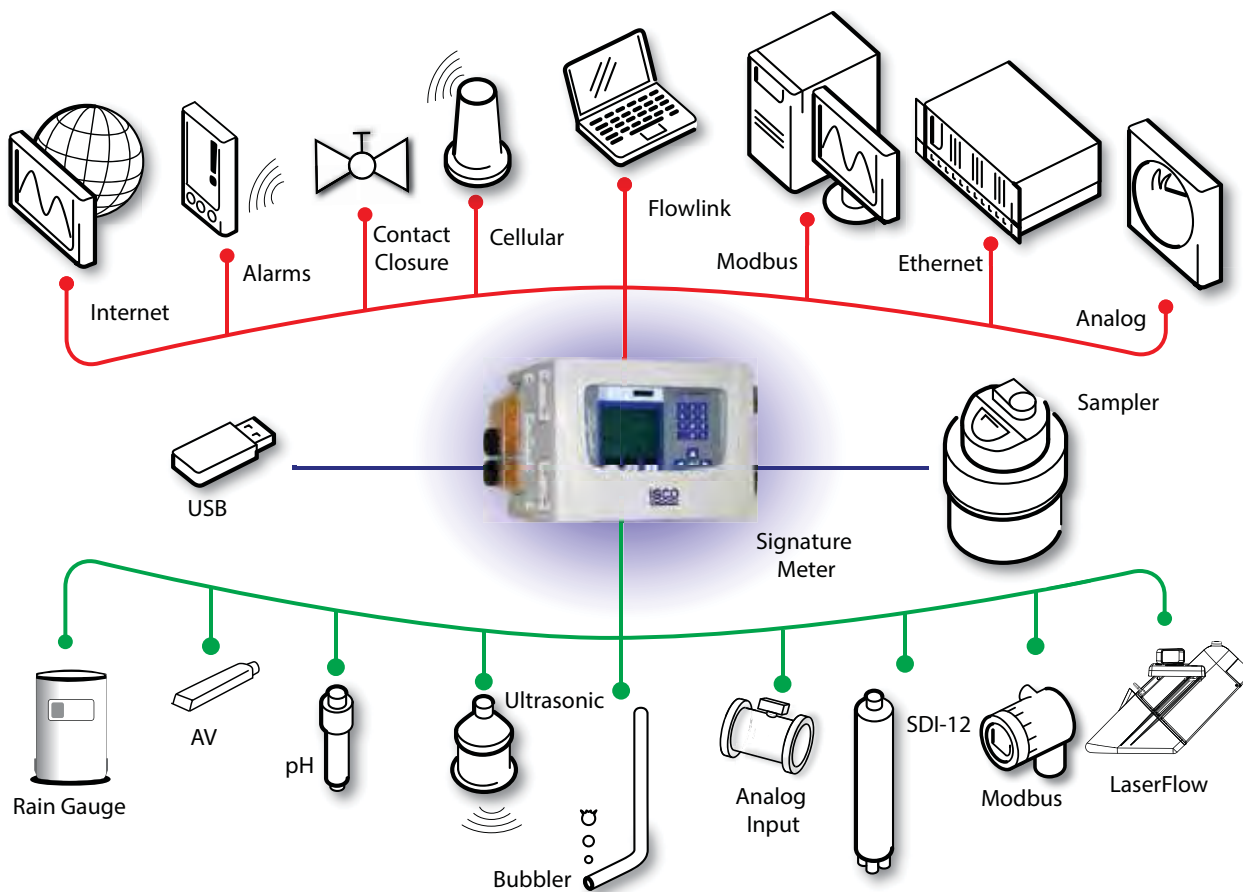
2105 Ci/Gi Interface and
Communication Modules



Signature® Flow Meter

The Signature Flow Meter is designed for open channel flow monitoring applications. It supports flow measurement technologies including ultrasonic, bubbler, submerged ultrasonic area velocity, and non-contacting laser Doppler area velocity. The meter can calculate flow using standard open channel level-to-flow conversions, as well as user defined equations or level to flow data points, depending on the application need.

With multiple smart interface options and multi-parameter logging (such as pH), the Signature Flow Meter provides a common platform for control action, reporting, and communication.





Pulse Doppler Deep Water



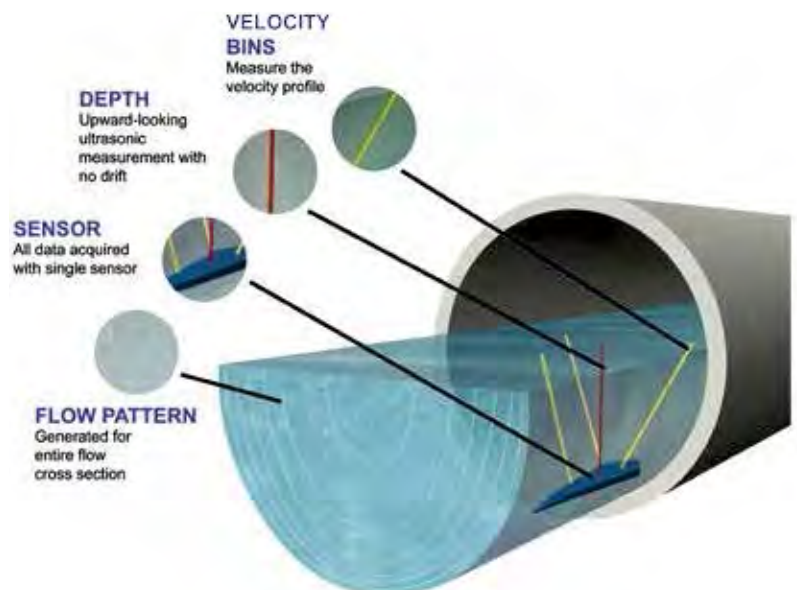
Pulse Doppler Shallow Water

accQpulse Flow Meter

Teledyne Isco's accQpulse Flow Meter brings unparalleled measurement precision and accuracy in various sized pipes and channels with flow depths of 0.25 to 16.5 feet (76 to 5030 mm).

Three (3) piezoelectric ceramics in the sensor emit short pulses along narrow acoustic beams pointing in different directions to measure velocity. A fourth piezoelectric ceramic, mounted in the center of the sensor assembly and aimed vertically, is used to measure the depth.







Each acoustic beam measures velocity at multiple points, or "bins", within the water column. The measured velocity data within each bin are very precise – to within 0.01 ft/s. This distribution of accurate velocity measurements is then used to determine the flow pattern over the entire cross-section of flow. Since the flow pattern and measured velocity distribution are dependent on each other, the accQpulse's advanced flow algorithms automatically adapt to changing hydraulic conditions within the pipe. This removes the need for in-situ calibration and ensures accurate flow rate measurement over a host of different measurement environments and hydraulic conditions.



Teledyne Isco Environmental Product Suitability Guide

	2150 Area Velocity Flow Module	2110 Ultrasonic Flow Module	2160 LaserFlow	accQpulse	accQpulse	H-ADFM
						
	Continuous Wave Doppler	Ultrasonic	Flow Meter	Pulse Doppler Shallow Water	Pulse Doppler Deep Water	Pulse Doppler Horizontal Mount
Small Channels and Pipes (<36")	X	X	X	X		
Large Channels and Pipes (>36")	X	X	X		X	
Large Pipes (Low Depth <3")	X		X			
Concrete-lined Open Channels	X	X	X	X	X	X
Primary Devices (Weirs and Flumes)		X				
Full Pipes/Force Mains (>18" dia.)						
Compound Pipes (Surcharge)	X		X	X	X	
Lift Stations						

⁽¹⁾ Nominal levels

	HotTap	Signature Ultrasonic Flow Meter	Signature Bubbler Flow Meter	Signature Area Velocity Flow Meter	Signature LaserFlow	3010 Flow Transmitter
						
	Pulse Doppler Closed Pipe	Ultrasonic	Bubbler	Area Velocity		Ultrasonic
Small Channels and Pipes (<36")		X	X	X	X	
Large Channels and Pipes (>36")		X	X	X	X	
Large Pipes (Low Depth <3")		X	X	X	X	
Concrete-lined Open Channels		X	X	X	X	
Primary Devices (Weirs and Flumes)		X	X	X	X	X
Full Pipes/Force Mains (>18" dia.)	X					
Compound Pipes (Surcharge)				X	X	
Lift Stations	X					

⁽¹⁾ Nominal levels

Teledyne Isco reserves the right to improve products and change specifications at any time.



**Teledyne Isco Open Channel
Flow Measurement Handbook**

7th Edition

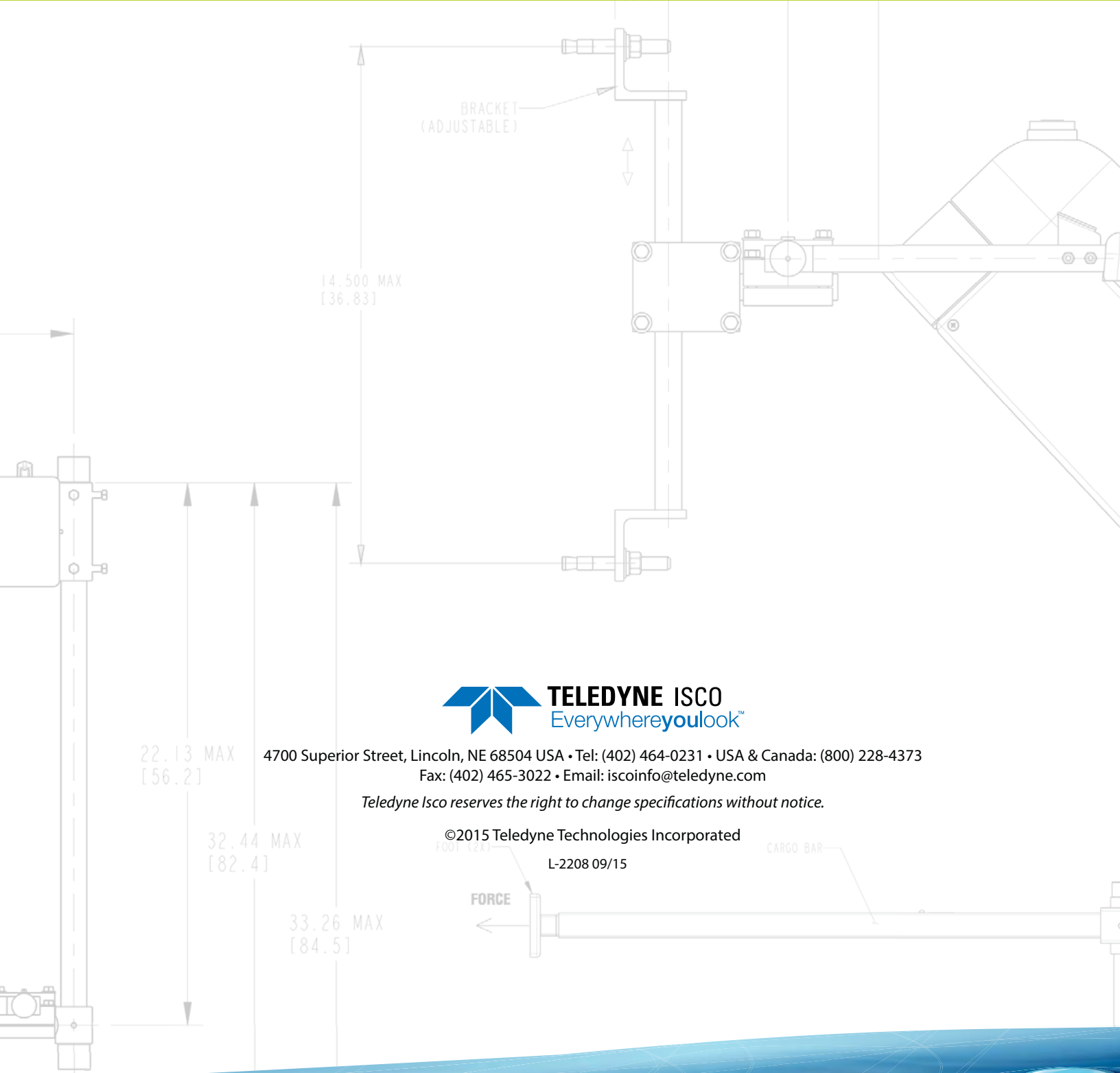


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