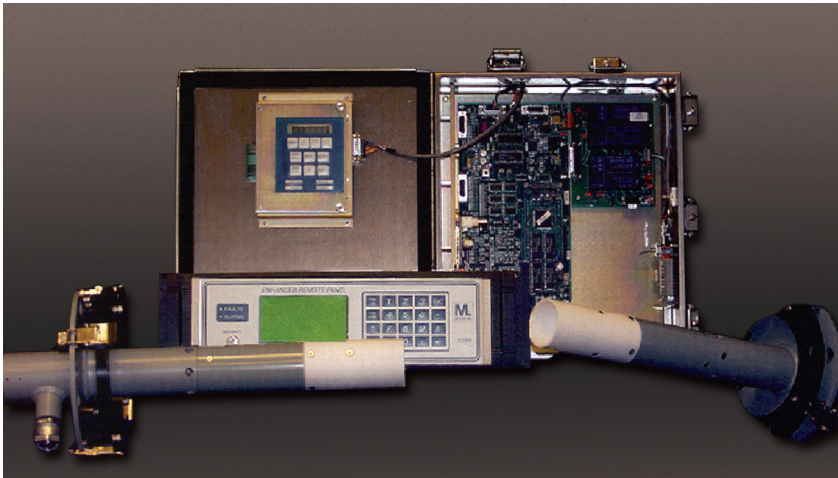


Ultraflow 150

Ultrasonic Gas & Temperature Monitor



The EPA's stringent 7.5% RATA requirement and flow-to-load ratio checks establishes the need for accurate and repeatable flow measurement. Teledyne's Ultraflow 150 achieves this consistent accuracy.

- Ultra low drift operation
- Full system integrity calibration checks
- Low mounting angle rejects pitch flow effects
- Non-intrusive, non-contacting technique
- Flow measurement independent of flue gas composition, pressure and temperature
- Measurement technique rejects cyclonic flow

Ultraflow 150's signal processing and innovative modularity offers customers incomparable performance, accuracy, flexibility, and a maintenance free solution.

Innovative, non-contacting technique reduces maintenance

The Ultraflow 150 is a patented advance in continuous flow measurement systems for small and large stacks and ducts. Transducers are non-intrusively mounted in Teflon housing and are protected from flue gas and particulate with continuous purge air. This non-contacting method mitigates maintenance and ensures long-term operation unlike intrusive pilots thermal systems, optical scintillation, and reflective ultrasonic technology.

Velocity measurement independent of temperature, pressure, and density of flue gas

The system measures the transit times (t_1 and t_2) of the tone bursts between the pair of transducers with a 50 nanosecond transit time resolution. The equation for determining velocity is:

$$Fv = [L / (2\cos\theta)] [(t_2 - t_1) / t_2t_1]$$

When L is the path length and X is the angle between the line-of-sight of the transducers and the nominal flow direction. The flue gas composition has no influence on the calculation of velocity, and therefore knowing only the geometry and transit times are sufficient.

Line average response is exceptionally accurate; long-term drift -1%

The Ultraflow 150 integrates the infinitesimal velocity vectors along the transducer as well as temperature. A normal sampling cycle consists of many measurements in each direction over a time period that can be as short as 5 seconds.

A barometric transducer options is available to correct back to SCFM. Resolution is better than ± 0.3 ft / sec. Long term drift is $\pm 1\%$ over the life of the instrument. A barometric pressure transducer option is available to correct back to SCFM.

Built for Reliability and Performance

Dynamic calibration checks verify all system components

Ultraflow 150 meets all 40 CFR Part 75 requirements, NOx budget rules, and new RATA standards. Calibration checks are conducted once per day or on command to fully test the signal transmission, reception, processing display, and output, i.e., a full system integrity test not available via competing technologies.

The flow characterization curve is also tested under this protocol. No adjustments are ever made to the zero and span since the monitor is drift free. Calibrations can be initiated manually, automatically, by a digital input, or via the front panel command.

Digital signal processing provides greater accuracy, quicker response time, and excellent resolution

Ultraflow 150 utilizes a Field Programmable Gate Array (FPGA) to determine the time of flight based on a proprietary peak finding algorithm. Our peak finding algorithm enables response times of down to 5 seconds, making the instrument ideal for hazardous combustors and process applications.

Easy to use Enhanced Remote Panel

The remote display features easy-to-use menu structures that makes configuration of the flow monitor simple and easy without a laptop. I/O includes four analog outputs, eight digital inputs, eight contact outputs, RS-232, 422, 485 or LosWorks communication. A large LCD display makes viewing easy throughout a control room.

Heavy duty components are easy to install

The Ultraflow 150 has simplified placement requirements using customer-installed 3 1/2" I.D., schedule 40 pipe as mounting ports. (For other pipe sizes, please consult the factory.) Teledyne provides all system components. Materials of construction for the Transducer Interface Enclosure and j-boxes are stainless steel. Transducer assemblies are aluminum protected by acid resistant epoxy paint.

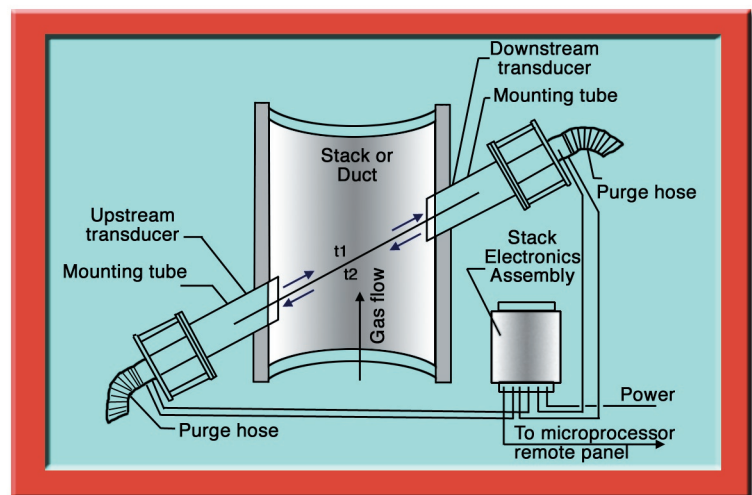
"X" Pattern configuration eliminates a second platform

In the most demanding application situations with the Model 150, an "X" pattern may be required. The instrument has the capability of measuring flow through either a single or dual set of transducers. A dual set is referred to as an "X" pattern, and eliminates any adverse effects due to applications that exhibit a low pitch flow. This enables nearly 100% availability and may institute redundancy.

Transducer Interface Enclosure (TIE)

Electrical signals corresponding to acoustic transmit and receive signals are conveyed via cables between the transducers and the TIE. The TIE houses preamp / driver boards that amplify receive signals and transmit pulses. A signal processing board containing an FPGA controls timing, data collection, filtering, boxcar integration, and other functions.

A microprocessor board evaluates the boxcar data and determines time of flight, flow velocity, volume, speed of sound, temperature, and signal-to-noise ratio. All these data values may be viewed via the Enhanced Remote Panel or the optional Local User Interface (LUI).



Purge Air System

The transducer assemblies are normally kept dry and clean by purge air. Depending on the application, the optimal installation may consist of dual blowers (a separate purge blower for each side of the stack), a single blower configuration with flow splitter to reliably send equal amounts of purge air to each side of the stack, or no blowers at all where a reliable negative-draft process is present.

A no blower system has an in-line filter to clean up the ambient air. When blowers are used, the normal purge system consists of blowers, hoses, air filters, mounting plates, and a protective weather cover. Teledyne will recommend the optimum configuration for each application.

Transducer Assemblies

Each of the two transducers alternately act as transmitter and receiver. The purge nozzles are constructed of acid resistant Teflon with stainless steel or Hastelloy hardware for easy cleaning and long service life. Each transducer assembly is made of lightweight aluminum stock and can be easily extracted from its mounting port by disengaging four latches. The Ultraflow 150 can handle up to four transducer assemblies. This enables the assemblies to be installed at very shallow angles which eliminates the necessity for an additional access platform. This "X" pattern also increases availability and accuracy.

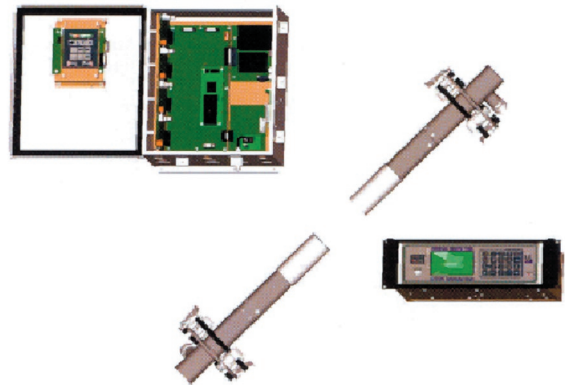
Enhanced Remote Panel

The Ultraflow 150 uses a large, back-lit, LCD graphics display with English language, menu driven screens. This provides ready access to all information needed for full use of the system. In addition, the user can graph up to the most recent 100 values of a selected parameter, such as:

- Volumetric flow and temperature
- Calibration values

The keypad is a rugged, 20-button ensemble inlaid under a hard-coated, scratch and chemical resistant Lexan coating, and can be used to:

- Display volumetric flow, velocity, and temperature
- Identify the Cause of Alarm or Malfunction
- Configure the analog outputs
- Edit parameters such as path length
- Set alarm values for high or low volumetric flow or temperature, and out of cal measurements
- View new signal-to-noise diagnostics
- Load linearization curves for correlation to Method 2
- View flow data pre and post linearization



Standard with the Enhanced Remote Panel is a security keylock for protection of important calibration parameters. System elements communicate over a single, twisted pair (FFT) using LosWorks communication protocol. Bright LED indicator lights are used to indicate faults and alarms. The four optically-isolated analog outputs, normally packaged within the Enhanced Remove Panel, can also be offered in a separate housing for convenient installation.

UltraFlow 150 Ultrasonic Gas Flow and Temperature Monitor

Flow measurement:	Range:	0 - 200 ft / second (0 - 66 m / second)
	Resolution:	0.1 ft / second (0.03 m / second)
	Long-term repeatability:	± 0.3 ft / second (± 0.1 m / second)
	Relative accuracy: (vs. EPA Test Method 2)	Site dependent, typically < 5% above 10 / feet / second
	Response time:	As low as 5 seconds (adjustable)
Initial calibration:	Factory calibration based on duct geometry plus flow data. Available for site specific calibration against pilot tube traverses.	
Drift:	± 1% reading over full range of rated ambient temperature and line voltage.	
Media conditions:	Temperature:	-40° to 650° F (- 40° to 343° C) depending on stack size and flow speed, consult factory
	Pressure:	-30 to 20 inches of H2O
	Moisture:	Dry to saturated, including condensed water
	Particulate:	≤ 300 mg / m3
Duct size:	Diameter:	From 3 to 45 feet
Temperature calculations:	Accuracy:	± 3° F (1.7° C) for most reasonably stable combustion applications
	Display resolution:	≤ 1° (C or F)
Power, Environment:	Power:	TIE: 85 - 265 VAC; 47 - 63 Hz, 30 VA max Remote display panel: 85 - 265 VAC, 47 - 63 Hz, single phase, 25 VA max
	Ambient temp limits:	TIE: -40° to 150° F (-40° to 66° C); Remote panel: 32° to 104° F (0 to 40°C)
	Relative humidity:	TIE: 5 to 100% humidity, condensing; Remote panel: 0 to 95% non-condensing
Mounting:	Process connection:	Mounting plates furnished for welding to 3.5 Sch. 40 pipe (supplied by customer) with squeeze rings , seals, and stainless steel hardware provided. For other pipe sizes, consult factory.
TIE:	Enclosure:	NEMA 4X, 304 stainless steel, 16.5" H x 14.5" W x 6" D (41.9 x 36.8 W x 15.2 cm)
	Output:	RS-232C or LosWorks® network protocol
Enhanced remote panel:	Enclosure:	General purpose 19" rack mount; 5.25" H x 16 5/8" W x 7 3/8" D (13.3 x 42.2 W x 18.7 cm), Weight: 10 lbs
	Display type:	Graphics mode liquid crystal with LED backlight
	Display resolution:	240 x 128
	Indicating LEDs:	Fault, Alarm, Power
	User input controls:	20-key keypad, security keyswitch
	Diagnostics:	Numerical and English descriptive diagnostic codes
	Security:	Both security code and key switch
	Alarms and faults:	Cal out of tolerance, malfunction, purge fail
Multi I/O Board Characteristics:	Analog outputs:	Four, isolation: optical and capacitive barriers: channel to channel, channel to circuit common and earth
	Digital inputs:	Eight, modes: Isolated (5 VDC - 24 VDC user supplied) and Non-isolated (dry contact)
	Relay outputs:	Eight, SPST, N.O. (Single Pole Single Throw, Normally Open)
Six Point I/O Board Characteristics:	Analog outputs:	Two, Output type: 4 - 20 mA with live 4 mA zero, or 0 - 20 mA without live zero; maximum load resistance: 900 ohms; isolation type: Optical and capacitive barriers: channel to channel
	Digital inputs:	Two, Modes: Isolated (5 VOC - 24 VOC user supplied) and Non-isolated (dry contact)
	Relay outputs:	2 SPST, N.O. or N.C. (Single Pole Single Throw), Normally Open or Normally Closed (jumper selectable)

TELEDYNE ANALYTICAL INSTRUMENTS

A Teledyne Technologies Company
16830 Chestnut Street
City of Industry, California 91748, USA

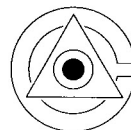
TEL: 626-934-1500 FAX: 626-934-1651
TOLL FREE: 888-789-8168

Visit Our Web Site at:
www.teledyne-ai.com

Warranty: Instrument is warranted for 1 year against defects in material or workmanship

NOTE: Specifications and features will vary with application. The above are established and validated during design, but are not to be construed as test criteria for every product. All specifications and features are subject to change without notice.

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