

# Time Delta S

## Fixed Transit-Time Flow Meter System

### Key Features

- **Dynamic flow correction**
- **Simple configuration**
- **Digital outputs**
- **Enhanced anti-bubble measurement technology (ABM)**
- **Rugged and reliable**
- **Maintenance free**

The Time Delta S is a fixed ultrasonic flow meter based on the transit-time measurement method for measuring flow rates of relatively clean homogeneous liquids utilizing clamp-on sensors. Thanks to microprocessor-based electronics, the flow meter can be easily configured from the front keyboard to particular applications. The Time Delta S is ideally suited for liquid flow measurement for pipe diameters from 0.50 to 235 inches. Systems are composed of a converter and sensor set. Applications include flow measurement of any fluid through which an ultrasonic signal may be transmitted, including those of unknown sound velocities. The flow meter is a compact and lightweight instrument incorporating the latest electronics and high speed digital signal processing technologies (32 bit MPU), resulting in high performance and easy operation.

### Features

- **Dynamic flow correction** – system develops characteristic profiles to correct for optimal flow rates across the velocity range
- **Simple configuration** – complete setup from front keyboard and menu driven software interface
- **Digital outputs** – 2 outputs may be configured for totalizer pulse, flow switch, range limiting, overflow, memory alarm, and abnormal signal condition
- **Enhanced anti-bubble measurement technology (ABM)** – removes the effect of entrapped and suspended flow bubbles
- **Rugged and reliable** – NEMA-6 (IP67) enclosure makes Time Delta S well suited to most industrial environments
- **Maintenance free** – no moving parts provides long-term reliable operation
- **High accuracy** –  $\pm 0.5\%$  to  $\pm 1.0\%$  of velocity typical on calibrated system

### Performance Specifications for the Converter

#### Fluid Conditions

**Measured fluid** Homogeneous liquids (water, sea water, hydrocarbons or fluid of unknown sound velocity) capable of ultrasonic wave propagation

**Fluid turbidity** 10000 deg. (mg/l) or less

**State of flow** Axis-symmetric flow in pipe totally filled with fluid

**Fluid temperature** Standard Temperature Sensor: -40 to 212°F (-40 to 100°C). High-Temperature Sensor: -40 to 390°F (-40 to 200°C)

**Velocity range** 0.06 to 105 ft/sec (0.018 to 32 m/sec) bi-directional flow

#### Piping Conditions

**Pipe material** Carbon steel, stainless steel, cast iron, copper, pvc, aluminum, ductile iron, asbestos, frp, peek, pvd, acrylic and other. If other is selected, pipe materials

with a sonic velocity range of 3280 to 12136 ft/sec (1000 to 3700 m/sec) can be selected via the keypad (sonic velocity information for several pipe materials is included in the Operator Manual)

**Pipe size** Small pipe range detector: 0.50 to 4.0 in. (13 to 100mm), 0.75 to 16 in (19 to 400mm). Universal pipe range detector: 2.0 to 72 in. (50 to 1828mm). Large pipe range detector: 8.0 to 235 in. (200 to 6000mm)

**Lining material** Tar, epoxy, mortar, rubber, Teflon, Pyrex glass, other, or none. If other is selected, liner materials with a sonic velocity range of 3280 to 12136 ft/sec (1000 to 3700 m/sec) can be selected via the keypad. (Sonic velocity information for several liner materials is included in the Operator Manual.)

**Fluid type** Water, sea water or other. If other is selected, a sonic velocity range of 1640 to 8200 ft/sec (500 to 2500 m/sec) can be selected via the keypad. (Sonic velocity information for several fluids is included in the Operator Manual.)

### Measurement Accuracy

**Accuracy**  $\pm 0.5\%$  of velocity for velocities  $> 1.0$  ft/sec. typical on calibrated system;  $\pm 1.5\%$  to  $\pm 2.0\%$  of velocity for velocities  $< 1.0$  ft/sec. typical on calibrated system. (Calibrated system conditions include a minimum of 10 inner pipe diameters of upstream straight pipe run and a minimum of 5 inner pipe diameters of downstream pipe run. Longer runs may be necessary due to pipe configurations.)

**Linearity** 0.1% of scale

**Repeatability** 0.5% or better

### Physical Specifications for the Converter

**Ambient temperature** -10 to 140°F (-23.0 to 60.0°C)

**Ambient humidity** less than 90% RH

**Enclosure** Copper aluminum alloy, coated with epoxy paint (blue/gray color)



**Environmental rating** NEMA-6 (IP67)  
**Dimensions** 8.65H x 9.05W x 3.75D in.  
 (220 x 230 x 95 mm)  
**Weight** 9.9 lbs. (4.5kg)

**Functional Specifications for the Converter**

**Power supply** 100 to 240V AC  $\pm$ 10%, 50/60 Hz. Optional 20 to 30V DC  
**Power consumption** Approx. 20 VA  
**LCD display** 2 line, 16 character per line, 4.0W x 1.0H in. (102 x 25mm), high resolution Back-Lit LCD  
**Keypad** 20 keys, tactile feedback  
**Power failure backup** System data stored in non-volatile memory  
**Response time** 0.5 sec. or less  
**Analog output signal** 4 to 20mA DC (isolated), max. load resistance 1K Output can be configured to hold last value, force high, force low or force zero during fault condition, keypad selectable  
**Transmit output voltage** X1, X2, X4 and X8 transmit voltage, keypad selectable

**Alarm output signals** Two open-collector digital transistor outputs (max., 30V DC, 200mA)  
**Analog output check** Analog output values of -20% to +120% can be forced onto the analog loop via keypad for testing purposes  
**Alarm output function** Open collector digital alarm outputs independently configurable from keypad for the following. Not Used: No output. Signal Error: ON at abnormal measurement. Flow SW high: ON when flow rate exceeds high limit. Flow SW low: ON when flow rate falls below low limit. F: Total alarm: ON when flow total exceeds forward integral switch. R: Total alarm: ON when flow total exceeds reverse integral switch. F: Total overflow: ON when forward integral value overflows. R: Total overflow: ON when reverse integral value overflows. R: Flow direction: ON when reverse flow direction is detected. F: Total Pulse: Forward flow integral pulse. R: Total Pulse: Reverse flow integral pulse (*Note: maximum totalizer*

*pulse = 5 pulses/sec. Minimum totalizer pulse = 1 pulse/day. Totalizer pulse width 50 msec or 100 msec, keypad selectable)*  
**Communications Option** RS-232 port standard  
**Display language** English or Japanese (Katakana)

**Measurement Display Screen**

**System units** English or Metric, keypad selectable  
**LCD display** Configurable from keypad to display flow rate and one of the following: forward totalizer value, reverse totalizer value, totalizer difference value, forward totalizer pulse count, reverse totalizer pulse count, flow velocity (ft/sec or m/sec) and output range %  
**Display** Display of forward or reverse totalized flow, keypad selectable—maximum 9 digits, with rollover cycle counter  
**Totalizer** English System Units: gal, Kgal, ft3, Kft3, Mft3, Mbbl, Kbbbl, acre-ft (gal = U.S. gallons). Metric System Units: ml, l, m3, Km3, Mm3, Mbbl, bbl, Kbbbl

*We attempt to provide you with complete information in this catalog. Because of the specific nature of ultrasonic technology, we strongly recommend you contact us regarding application and availability before placing your order.*

**Ordering Information**

Included in standard delivery: converter, manual

FLVS12	Time Delta S fixed transit-time flow meter converter, AC power input	\$ 2,650
FLVS42	Time Delta S fixed transit-time flow meter converter, DC power input	3,250

**Accessories**

Each detector kit includes: Detector unit, 16 ft. signal cable, mounting straps, 3.5 oz tube of sonic coupling compound

	Description	Pipe diameter range	Temperature range	
FLD22	Small diameter sensor (2 MHz)	0.50 to 4.0 in	-40 to 212°F	\$ 1,150
FLW12	Small diameter sensor (2 MHz)	0.75 to 16.0 in	-40 to 212°F	1,150
FLW41	Universal sensor (1 MHz)	2.0 to 72.0 in	-40 to 212°F	750
FLW50	Large diameter sensor (0.5 MHz)	8.0 to 235.0 in	-40 to 212°F	2,500
FLD32	High-temperature sensor (2 MHz)	2.0 to 16.0 in	-40 to 390°F	3,500
TKUSTTNIST	Calibration, NIST traceable (5 pt.)			450
TKUSTTPTG	FS-200 Ultrasonic thickness gauge			1,200
TKUSTTSG	Sonic coupling compound			15
TKUSTTSGN	Sonic coupling compound, silicone-free			35
TKUSTTPCSR	Pipe tape measure			30
TKUSTTPLSS	Line isolator/conditioner			359.95
TKUSTTRG58	Signal cable, 50 ohm (16 ft min)			2.50/ft.

*Information subject to change without notice. Prices in USD.*

# Time Delta S

## Specifications (continued)

**Flow rate** English System Units: gal/sec, gal/min, gal/hr, gal/day, ft<sup>3</sup>/sec, ft<sup>3</sup>/min, ft<sup>3</sup>/hr, Mft<sup>3</sup>/day, bbl/sec, bbl/min, bbl/hr, and Mbbbl/day (Note: gal refers to U.S. gallons; bottom line of LCD display configurable from keypad). Metric System Units: l/sec, l/min, l/hr, Ml/day, m<sup>3</sup>/sec, m<sup>3</sup>/min, m<sup>3</sup>/hr, Mm<sup>3</sup>/day, bbl/sec, bbl/min, bbl/hr, and Mbbbl/day (Note: gal refers to U.S. gallons; bottom line of LCD display configurable from keypad)

**Display** Maximum 8-digit display of flow velocity and rate with flow direction, keypad selectable (Note: bottom line of LCD display configurable from keypad)

**Decimal point position** Instantaneous flow rate is keypad selectable for the following: 00000000, 0000000.0, 000000.00, 00000.000, 0000.0000, 000.00000, 00.000000 and 0.0000000 (Note: bottom

line of LCD display configurable from keypad)

**Test mode** Simulated flow values can be entered directly from the keypad for bench testing alarms, flow switches, totalizers, and the analog output

**Damping** 0 to 99 sec. (time constant), keypad selectable

**Low flow cutoff** 0 to 16.0 ft/sec (0 to 5.0 m/sec), keypad selectable

**Zero setting** Zero Point Adjust: used when the flow can be stopped; zero point is manually set. Zero Point Clear: used when flow cannot be stopped; automatically sets zero point, keypad selectable

**Analog output cal** 4 mA and 20 mA (zero and span), keypad selectable

**Analog output check** Analog output values of -20% to +120% can be forced onto the analog loop via keypad for testing purposes

## Detector Models FLW and FLD

**Mounting method** V or Z method mounted to outside of pipe by means of steel bands, nylon belts or steel wire

**Straight pipe length** Upstream side—10d or more; downstream side—5d or more (d = inside pipe diameter)

**Signal cable** RG-58 or RG-58A/U, 50 ohm coaxial cable

**Cable length** Standard length 16 ft., maximum length 1000 ft. (300m)

**Connection** Converter: Internal screw. Detector Models FLW: internal terminal screw, strain-relieved, water-proofed. Detector Models FLD: BNC connector (female)

**Pipe diameter range** FLD22 (Small diam. pipe range): 0.50 to 4.0 in. (13 to 100mm). FLW12 (Small diam. pipe range): .75 to 16 in. (19 to 400mm). FLW41 (Universal pipe range): 2.0 to 72 in. (50 to 1828mm). FLW50 (Large diameter pipe range): 8.0 to 235 in. (200 to 6000mm). FLD32 (High-Temperature detector): 2.0 to 16 in. (50 to 400mm)

**Operating temperature range** FLD22, FLW12, FLW41, FLW50: -40 to 212°F (-40 to 100°C). FLD32 (High-Temperature): -40 to 390°F (-40 to 200°C)

**Ambient temperature range** All detector models: -4.0 to 140 °F (-20 to 60°C)

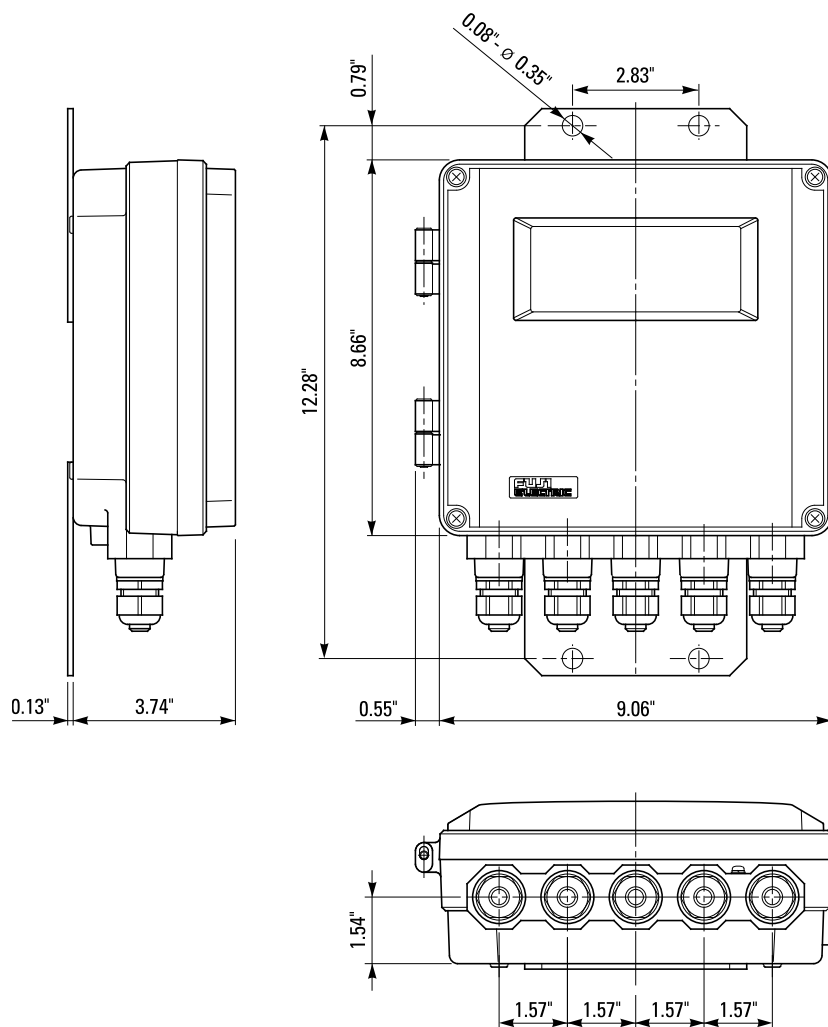
**Ambient humidity** All detector models: less than 100% RH

**Environmental rating** FLW Models: NEMA 6 (IP67). FLD22/FLD32 Models: NEMA3 (IP52)

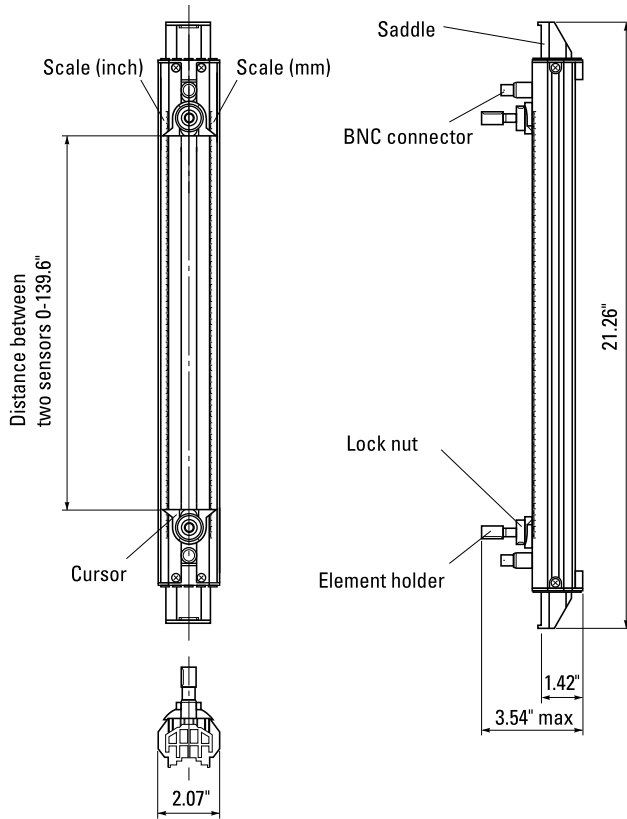
**Material** FLD22: High impact plastic housing, aluminum alloy/high impact plastic mounting bracket. FLD32: Stainless steel housing, aluminum alloy/high impact plastic mounting bracket. FLW12, FLW41, FLW50: Polyurethane/stainless steel cover plate. FLW12, FLW41, FLW50, FLD22: Epoxy resin crystal wedge. FLD32: Stainless steel crystal wedge

**Dimension (WxHxD)/weight** FLD22: 12.50 x 2.08 x 1.40 in./2.2 lbs. (540 x 53 x 36mm/1 kg). FLW12, FLW41 (each transducer): 2.83 x 2.36 x 1.57 in./0.9 lbs. (72 x 60 x 40mm/0.4 kg). FLW50 (each transducer): 4.10 x 3.66 x 2.44 in./3.0 lbs. (104 x 93 x 62mm/1.4 kg). FLD32 (rail assembly including transducers): 20.86 x 2.05 x 1.30 in./3.53 lbs. (530 x 52 x 33mm/1.6 kg)

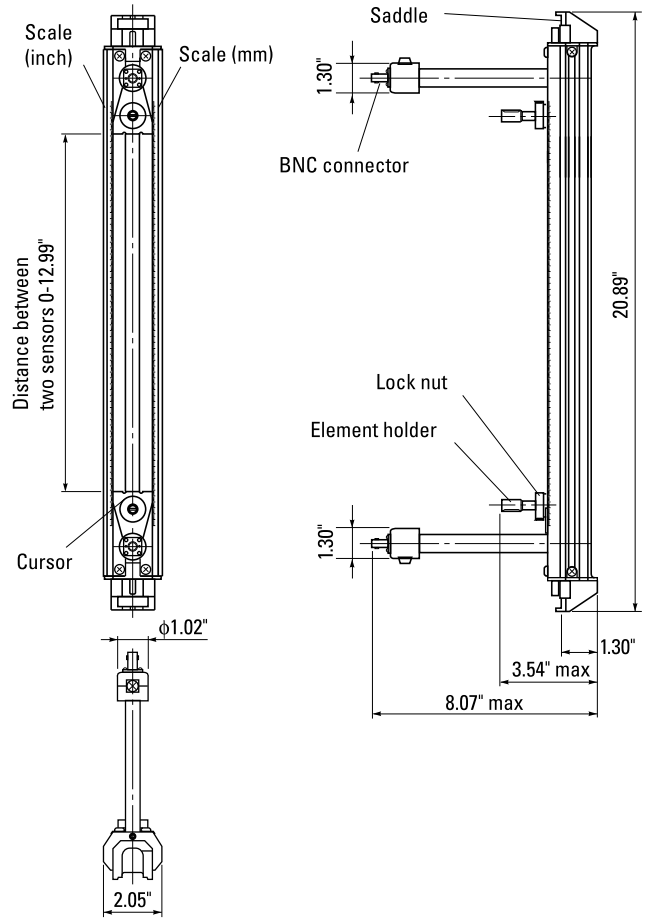
## FLV Converter



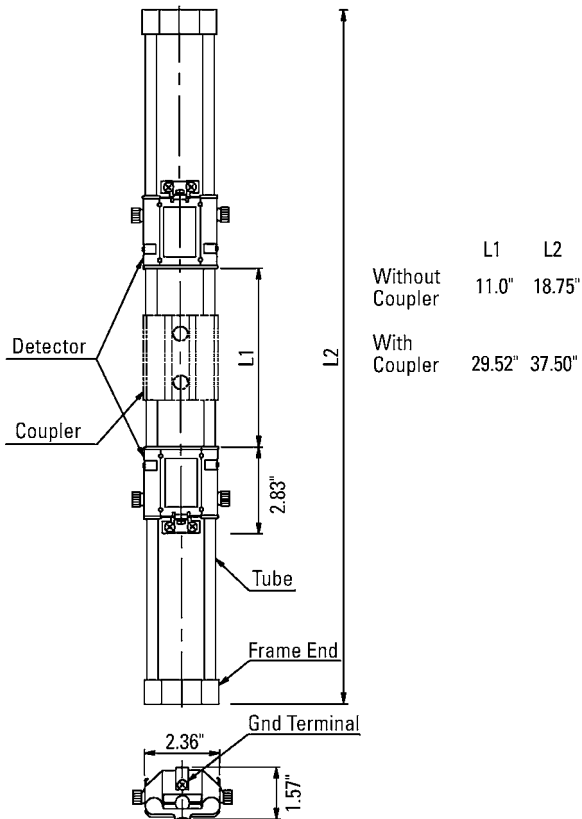
### FLD22 Small Diameter Sensor Set



### FLD32 High-Temperature Sensor Set



### FLW12 Small Diameter Sensor Set

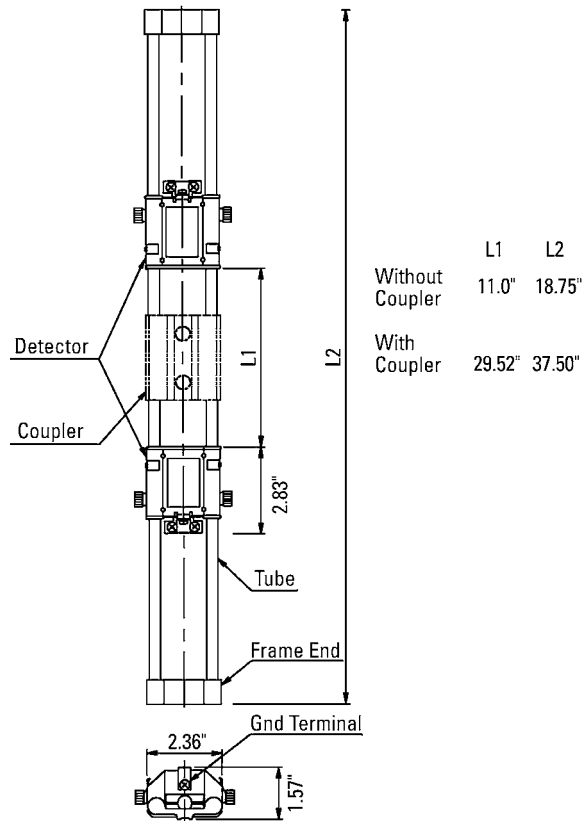


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# Time Delta S

Specifications (continued)

## FLW41 Universal Sensor Set



## FLW50 Large Diameter Sensor Set

