

transit time

# ultrasonic flowmeter

## Model Sono-Trak™ General Specification

### Features

- ▶ High accuracy
- ▶ Simple, non-invasive clamp-on installation
- ▶ No moving parts
- ▶ No pressure drop
- ▶ Bidirectional measurement
- ▶ Low maintenance
- ▶ Submersible sensors
- ▶ Automatic Reynolds Number compensation
- ▶ Flexible, "buffet-style" module I/O design
- ▶ BTU measurement capability
- ▶ Data logging capability
- ▶ Large, easy-to-read LCD backlit display
- ▶ EZ-Logic™ menu-driven user interface
- ▶ Built-in infrared capability for optional Windows® software
- ▶ Time domain expansion technology used to increase resolution



The EMCO Sono-Trak is a non-invasive, transit-time ultrasonic flowmeter, which uses two transducers operating as both transmitters and receivers. The transducers are mounted on the outside of the process pipe, with one transducer upstream and one downstream.

Each transducer generates a high frequency ultrasonic signal, which is transmitted through the pipe wall and into the fluid. With both transducers operating simultaneously, the fluid velocity determines the difference in transit time of the upstream and downstream signals. Advanced digital processing is used to accurately calculate the average flow rate.



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## Performance Specifications

### Accuracy

± 0.5% of Rate (Factory tested)  
Factory test reference conditions: Water at 70 °F at flow velocities > 1 ft/s in a 6" stainless steel pipe.

± 1–2% of Rate (Typical field installations)  
Field performance is dependant on the accuracy of the pipe internal diameter and wall thickness measurements, as well as straight run conditions.

### Repeatability

± 0.1% of rate

### Response Time

0.3 to 30 seconds

## Physical Specifications

### Materials

Wetted Parts .....None  
Transducer Housing  
250 °F .....Delrin®/Ultem®/Stainless steel;  
NEMA 6 (IP68)  
400 °F .....Torlon®/Vespe®/Stainless steel;  
NEMA 6 (IP68)  
Electronics Housing .....Reinforced polycarbonate with  
stainless steel hardware.  
NEMA 4X (IP65)  
Sensor Cables.....Polyurethane armored coaxial  
Clamps.....Stainless steel

### Cable Length

Standard .....25 ft (7.6 m)  
Options.....50 ft (15.2 m)  
.....75 ft (22.8 m)  
Custom.....76 ft - 1000 ft (23.1 m - 304.8 m)

### Maximum Transducer Cable Length

1000 ft (304.8 m)

### Cable Connection

Standard .....Standard submersible

### Mounting

Transducer .....External, adjustable clamp  
Electronics.....Remote wall

### European CE Mark (Pending)

Light industrial: emissions and immunity  
Low Voltage Directive  
*EN50081-1 EMC*  
*EN50082-1 EMI*

### CSA Approval (Pending)

Class I Div II Groups A,B,C,D  
Class II and Class III Groups E,F

### FM Approval (Pending)

Class I Div II Groups A,B,C,D  
Class II and Class III Groups E,F

## Operating Specifications

### Applied Pipeline Sizes

2 to 100 in. (50 to 2540 mm)

### Measurable Fluids

Most common liquids from waste water to petrochemical products.

### Measurable Flow Velocities

-40 to 40 ft/s (-12 to 12 m/s)

### Process Temperature Limit

Standard .....-40 to 250 °F (-40 to 121 °C)  
High Temp Option.....-40 to 400 °F (-40 to 205 °C)

### Ambient Temperature Limit

-40 to 140 °F (-40 to 60 °C)

### Ambient Humidity Limit

Up to 95% RH, non-condensing

### Process Pressure Limit

Not applicable

### Power Requirements

Field configurable for AC or DC operation:  
12-24 VDC  
115 VAC, 50/60 Hz ( $\pm 10\%$ )  
230 VAC, 50/60 Hz ( $\pm 10\%$ )

### Power Consumption

Less than 5 watts

### Standard Interface

LCD backlit display with 8-character large numeric and 8-character small alphanumeric. Four button menu-driven EZ-Logic interface for programming.

### Flow Units

User-selectable from gallons, liters, cubic feet, MMgals, cubic meters, oil barrels, liquid barrels, feet, meters, pounds and kilograms.

### Time Units

User-selectable from seconds, minutes, hours, and days.

### Energy Units (BTU Module)

User-selectable from BTU, tons, calories and watts.

### Standard Input/Output

Infrared serial interface allows access to all configuration and data recording features. (Requires optional IR serial adapter accessory for PC and optional Windows® 95/98/NT compatible software.)

### Optional Input/Output Modules

A maximum of two outputs can be selected.

All input/output modules are optically isolated up to 2,500 volts against ground loops and electrical surges.

### 4-20 mA Output

Field configurable as a 2-wire active or passive transmitter, 800  $\Omega$  maximum resistance.

### Frequency Output

Open collector, field configurable for 0-1,000 Hz or 0-10,000 Hz output, 20 mA maximum (50% duty cycle).

### Dual Relay Output

Two SPDT form C contacts independently controlled; 175 V, 1/4 A switch, 1 A carry current, 0.2  $\Omega$  resistance. Used for batching, high/low flow alarms, empty pipe detection, and error indication.

### RS485 Communication

Used to network up to 100 units together in a master/slave configuration using built-in software and communications protocol. Supports 57.6 KB communications, up to 1000 feet.

### RS232 Communication

Used to monitor flow information. Supports up to 57.6 KB communications. (19.2 KB @ 50 feet).

### Dual RTD

Accepts two 1000  $\Omega$  RTD inputs for BTU measurement. (Does not include RTD's).

### Data Logger

Nonvolatile storage of 100,000 time/date stamped data points, selectable from 1-1,000 seconds. Internal clock/calendar with battery. "Hot-swappable" module can be changed during normal operation. Connects to PC serial port for data retrieval.

# Installation Considerations

## Straight Run Requirements

Typical 10 diameters upstream and 5 diameters downstream. Accurate results can be achieved with straight run of 5 diameters upstream and 3 diameters downstream. Upstream valves and other piping configurations may require more straight run. Consult your EMCO representative or the factory about your specific application.

## Transducer Mounting

**Vertical** .....The recommended flow direction in a vertical pipe is upwards.

**Horizontal**.....Transducer should be mounted on a horizontal pipe in the areas shown.

## Zero Point Adjustment

For best accuracy, a zero point setting must be made with a full pipe at no flow during initial start-up.

## Air/Gas Entrapment

Excess gas entrapment can scatter or reflect the sound wave, causing inaccurate measurement. Allowable air/gas entrapment is 2%.

## Pipe Material

The property of the pipe material can affect the performance of the meter.

Good Results	Caution Needed	Do Not Use On
most metallic plastic	cast iron lined pipes	cement pipes with internal deposits or severe corrosion

## Sonic Wave Forms

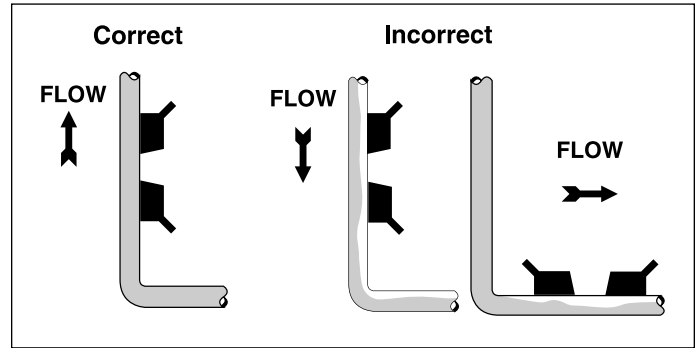
To obtain the best possible signal strength, the following mounting options are recommended:

- 2" to 2.5" (DN50 to DN65) "W"
- 3" to 12" (DN80 to DN300) "V"
- 14" to 100" (DN350 to DN2500)....."Z"

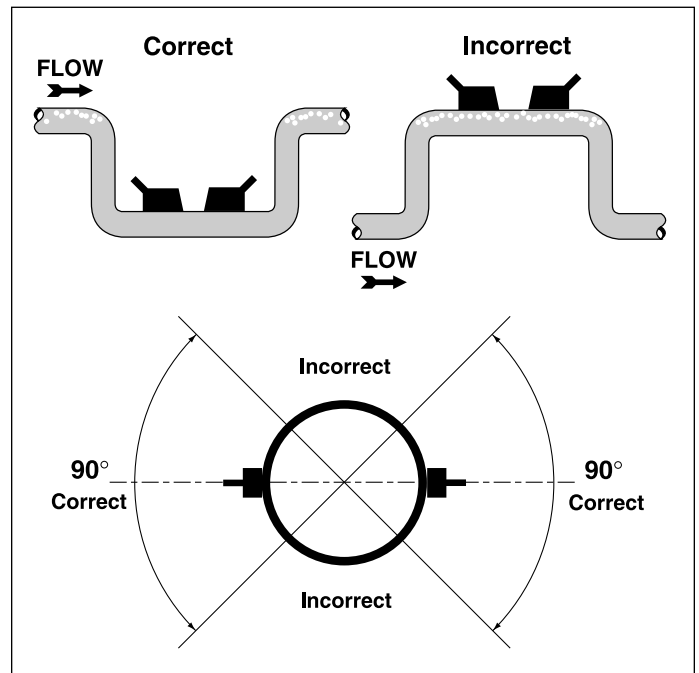
## Transducer Spacing

Transducer spacing is dependent upon pipe size and is calculated automatically during set-up.

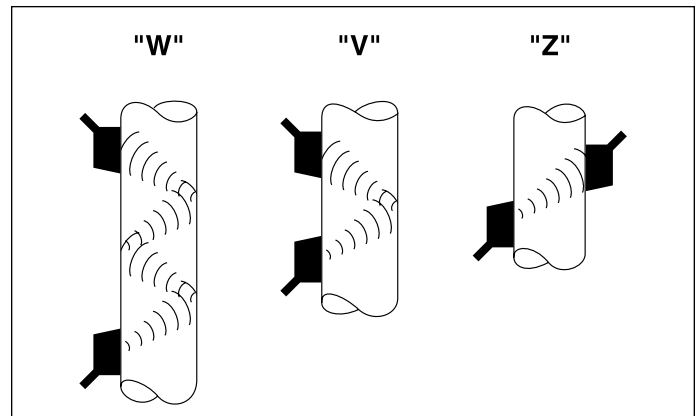
## Vertical Pipe Mounting



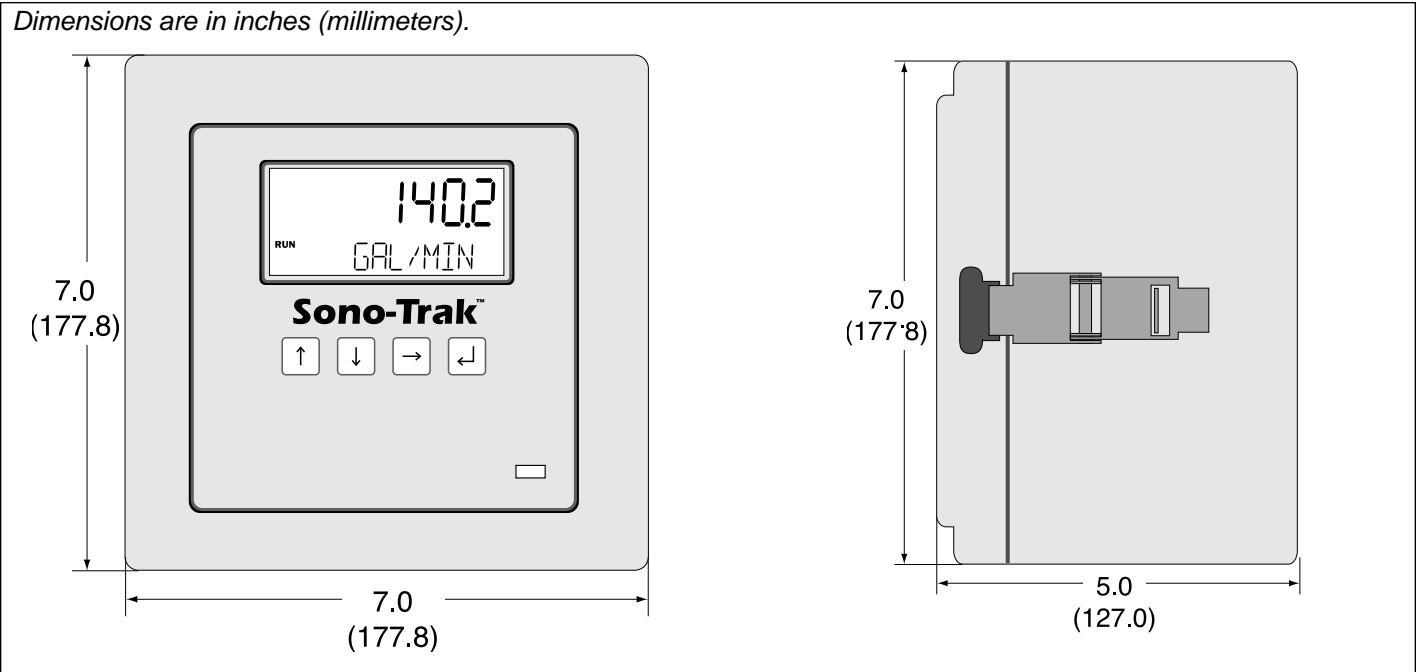
## Horizontal Pipe Mounting



## Sonic Wave Forms

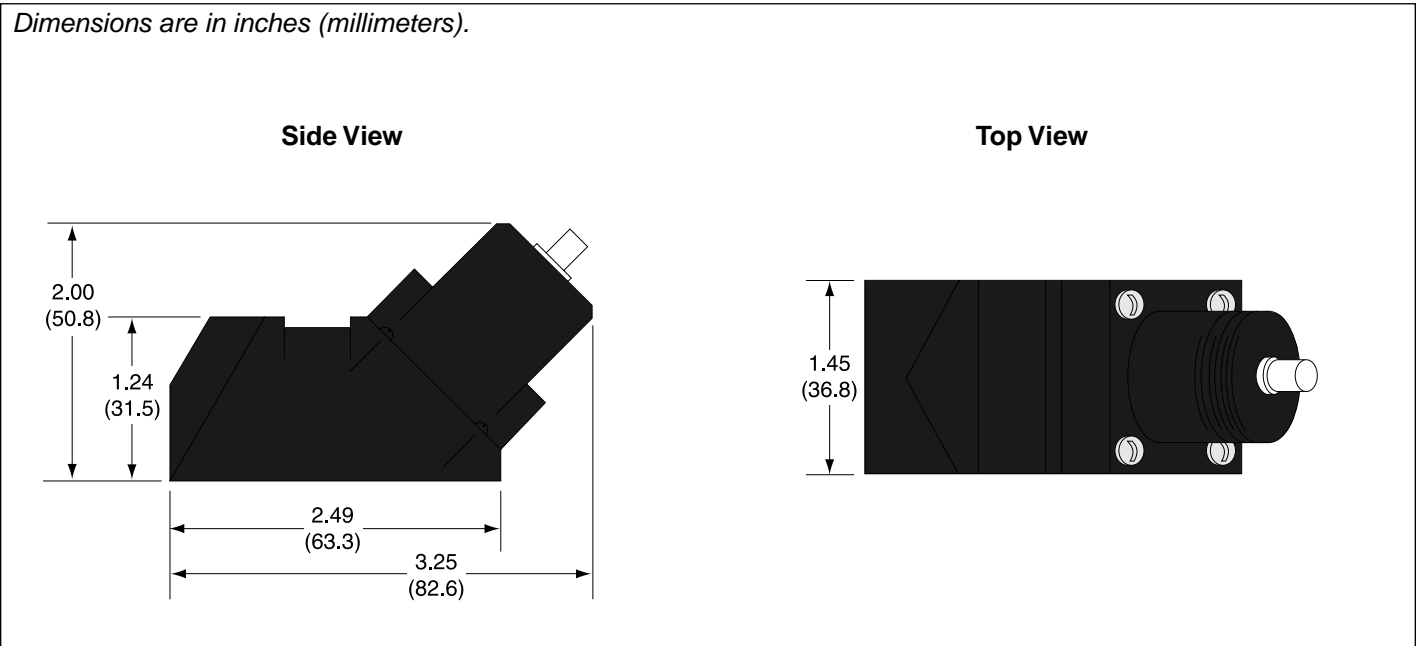


# Electronics Dimensions and Weight



Weight: 4.5 lb (2.0 kg)

# Transducer Dimensions and Weight



Weight: 4.5 lb (2.05 kg) for two transducers with 25 ft (7.6 m) of cable.

## Model and Suffix Codes

### SONO-TRAK MODEL STRUCTURE

Category	Description	Suffix Codes
<b>Electronics</b>	2 line backlit display with 4 button keypad <sup>1</sup>	ST-30
<b>I/O Port 1</b>	None 4-20 mA Output Frequency Output Dual Relay Output (Dry Contact) Dual RTD Input (limit 1 per unit) <sup>2</sup> Data Logger (limit 1 per unit) <sup>3</sup> RS 232 Interface <sup>3</sup> RS 485 Interface <sup>3</sup>	-N -A -F -R -BTU -DL -RS2 -RS4
<b>I/O Port 2</b>	None 4-20 mA Output Frequency Output Dual Relay Output (Dry Contact) Dual RTD Input (limit 1 per unit) <sup>2</sup> Data Logger (limit 1 per unit) <sup>2</sup> RS 232 Interface <sup>3</sup> RS 485 Interface <sup>3</sup>	-N -A -F -R -BTU -DL -RS2 -RS4
<b>Process Temperature</b>	-40 to 250° F (-40 to 120° C) -40 to 400° F (-40 to 205° C)	-250 -400
<b>Transducers</b>	Submersible	-1
<b>Cable Length<sup>4</sup></b>	25' (7.6 m) 50' (15.2 m) 75' (22.8 m) 76' - 1000' (23.1 m - 304.8 m) (specify length)	-25 -50 -75 -xx
<b>Pipe Clamp</b>	2 - 12" (50 - 300 mm) 14 - 24" (350 - 600 mm) 26 - 36" (650 - 900 mm) 38 - 100" (950 - 2540 mm) (specify pipe size)	-12 -24 -36 -xx

### Example

**ST-30-A-N-250-1-25-12**

Notes:

1. ST-30 electronics are wall mounted.
2. BTU option does not include RTD's.
3. Includes Windows communication software program.
4. Cable length is for each transducer.

Standard Approvals:

CE  
FM Class I Div II (A, B, C, D)  
CSA Class I Div II (A, B, C, D)

Available December 2000  
Pending  
Pending

## Model and Suffix Codes

### ACCESSORIES

Description	Part Number
Windows communication software for IR Port/RS232/RS485 modules	6001100
Infrared serial communicator for wireless PC interface	1-800-138
Transducer cable conduit adapter $\frac{3}{4}$ " NPT (requires 2 pieces)	340790

### SPARE MODULES/ELECTRONICS

Description	Part Number
4-20 mA Output	011148
Frequency/Pulse Output	011154
Dual Relay Output (Dry Contact)	011155
Dual RTD Input (limit 1 per unit)	011153
Data Logger (limit 1 per unit)	011164
RS 232 Interface	011151
RS 485 Interface	011156
Display Board	011146
Microprocessor Board	011145
Power Supply Board	011147

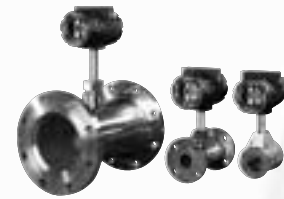
### SPARE PARTS

Description	Part Number
Acoustic coupling grease (3 oz tube)	1-685-162
Pipe clamp for 2 to 12" (50 to 300 mm OD) (Requires 2 clamps)	1-410-635
Pipe clamp for 14 to 24" (350 - 600 mm) (Requires 4 clamps)	1-410-635
Pipe clamp for 26 to 36" (650 - 900 mm) (Requires 2 each)	1-410-642
Mounting feet for electronics	1-630-438
Sono-Trak I/O Manual	140209

## Providing innovative flowmeter products and services for over three decades . . .

Engineering Measurements Company (EMCO) is a long established manufacturer of precision flowmeters for liquid, gas, and steam applications for commerce and industry. Manufactured under an ISO 9001 certified quality system, which includes extensive flow calibration capability, engineering, applications, and service, underpinning a world-wide sales and service organization totally focused on providing the best flowmeters and customer service in the industry.

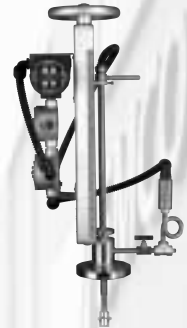
- ▶ Manufacturing is housed in a modern plant located in Longmont, Colorado
- ▶ Modern clean-room, mechanized assembly equipment, and computer based testing ensure the highest quality product
- ▶ Trained professional flow specialists and technicians offer timely customer assistance
- ▶ Factory trained and certified field technicians provide product support services



Vortex PhD™ Inline Vortex



V-Bar™  
Insertion  
Vortex



Turbo-Bar™  
Insertion  
Turbine



MAGFLO® Electromagnetic



PDH Helix



PDP Piston



Sono-Trak™



990197 Rev. D  
Specifications subject to change without notice

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