“Great service, fast shipping, knowledgeable staff, and a wide variety of components.”

FLOW

MADE IN USA

Products manufactured in the United States

NEW

Products that are new to the catalog

FT2 Series pg. 244

M-2000 Series pg. 262

DE, DB Series pg. 277

Kele®

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MODEL/SERIES — PAGE

Indicates New Products

NEMA ENCLOSURE TYPES*	
ENCLOSURE RATING	**NEMA** National Electrical Manufacturers Association (NEMA Standard 250) and Electrical and Electronic Manufacturer Association of Canada (EEMAC)
Type 1	Enclosure intended for indoor use primarily to provide a degree of protection against contact with the enclosed equipment or locations where unusual service conditions do not exist
Type 2	Enclosure intended for indoor use primarily to provide a degree of protection against limited amounts of falling water and dirt
Type 3	Enclosure intended for outdoor use primarily to provide a degree of protection against windblown dust, rain, and sleet; undamaged by the formation of ice
Type 3R	Enclosure intended for outdoor use primarily to provide a degree of protection against falling rain and sleet; undamaged by the formation of ice
Type 3S	Enclosure intended for indoor/outdoor use primarily to provide a degree of protection against falling dirt, rain, sleet, snow, windblown dust, and in which the external mechanisms remain operable when ice laden
Type 4	Enclosure intended for indoor/outdoor use primarily to provide a degree of protection against windblown dust and rain, splashing water, and hose-directed water; undamaged by the formation of ice
Type 4X	Enclosure intended for indoor/outdoor use primarily to provide a degree of protection against corrosion, windblown dust and rain, splashing water, and hose-directed water; undamaged by the formation of ice
Type 6	Enclosure intended for indoor/outdoor use where occasional submersion is encountered in limited depth; undamaged by the formation of ice
Type 12	Enclosure intended for indoor use primarily to provide a degree of protection against dust, falling dirt, and dripping noncorrosive liquids
Type 13	Enclosure intended for indoor use primarily to provide a degree of protection against dust, spraying of water, oil, and noncorrosive coolant

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* See page 423 for enclosure types for hazardous locations.

ENCLOSURES

ENCLOSURE SELECTION CHART

NEMA/IP RATINGS

Example Rating

If 1st IP number is	and the 2nd IP number is	then the IP rating is
2	**3**	**IP 2 3**
Protection against solid objects	Protection against liquids	Enclosure protection against penetration of solid objects greater than 12 mm and against spraying water

FIRST NUMERAL		SECOND NUMERAL	
IP	**Test**	**IP**	**Test**
0	No protection	**0**	No protection
1	Protection against solid objects over 50 mm (i.e., accidental touch by hands)	**1**	Protection against vertically falling drops of water (i.e., condensation)
2	Protection against solid objects over 12 mm (i.e., fingers)	**2**	Protection against direct sprays of water up to 15 degrees from vertical
3	Protection against solid objects over 2.5 mm (i.e., tools and wires)	**3**	Protection against sprays up to 60 degrees from vertical
4	Protections against solid objects over 1 mm	**4**	Protection against water sprayed from all directions (limited ingress permitted)
5	Protection against dust (limited ingress, no harm-ful deposit)	**5**	Protection against low pressure jets of water from all directions (limited ingress permitted)
6	Total protection against dust	**6**	Protection against strong jets of water
		7	Protection against the effects of immersion between 15 cm and 1m
		8	Protection against long periods of immersion under pressure

CROSS-REFERENCE (approximate) NEMA, UL, CSA vs IEC Enclosure Type

(cannot be used to convert IEC classifications to NEMA Type numbers)

ENCLOSURE RATING	IP20	IP22	IP55	IP64	IP65	IP66	IP67
Type 1	●						
Type 3				●			
Type 3R		●					
Type 3S				●			
Type 4						●	
Type 4X						●	
Type 6							●
Type 12			●				
Type 13					●		

IEC 60529 has no equivalents to NEMA Enclosure Types 7, 8, 9, 10, or 11.

● Indicates compliance

Enclosure Type Rating vs IP Rating

Electrical enclosures are rated by type (NEMA 250/UL 50) and/or (IEC 60529) based on the degree of protection provided.

Type ratings and IP ratings have only the following in common:

1. A degree of protection for persons from hazardous components inside the enclosure
2. A degree of protection for equipment inside the enclosure from ingress of solid foreign objects, including dust
3. A degree of protection for equipment inside the enclosure from ingress of water

NEMA 250 and UL 50 type rating documentation defines additional requirements that type-rated enclosures must meet. These include the following:

- Mechanical impact on enclosure walls
- Gasket aging and oil resistance
- Corrosion resistance
- Door and cover requirements
- Sheet metal gauge construction requirements

Note: Electrical enclosures that carry an IP rating only have not been designed to the additional type-rating requirements; therefore, a type-rating cannot be assigned to an enclosure that has been only IP rated. Electrical enclosures manufactured by Hoffman are tested for both Type rating and IP rating and carry both Type and IP ratings.

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DESCRIPTION

The **KMS Series** airflow measuring stations utilize multiple averaging sensors for static pressure measurements and a bullet-nose probe for total pressure. The sensors are distributed across the flow stream to conform to the industry standard rules for equal-area averaging (the standard pitot traverse). The standard unit includes a 16-gauge galvanized casing with flanged duct connection, 3/8" hexagon-celled aluminum flow straightening vanes, and internal copper sensors constructed to ASTM B88. Instrument connections are 1/2" FNPT. Other configurations are available on request.

APPLICATION

When utilized with a differential pressure transmitter, the **KMS Series** provides an accurate, repeatable airflow signal for building automation and HVAC applications. Air velocity may be determined by the formula: Velocity (fpm) = $4004\sqrt{\Delta P}$, where ΔP is differential pressure in "W.C. Then, flow rate may be determined by the formula: CFM = AV, where A is the effective area of the flow measuring station in square feet, and V is the velocity obtained above. The proper range for a differential pressure transmitter to use with the **KMS Series** airflow measuring station may be determined by the formula: $\Delta P = (\text{Max Velocity}/4004)^2$.

KMS Front and Back

SPECIFICATIONS

Connections	1/2" FNPT HI/LO pressure pickups, factory-mounted on the long side dimension when station is rectangular
Accuracy	±2% within design flow range
Minimum Velocity	1000 fpm (305 mpm)
Maximum Velocity	6000 fpm (1830 mpm)
Mounting	Duct flanges standard
Media Compatibility	Clean HVAC duct air
Media Temperature Range	400°F (204°C) maximum
Maximum Pressure	6" W.C. maximum duct static
Pressure Drop	<0.13" W.C. @ 2000 fpm

Materials Of Construction	Casing: 16-gauge galvanized sheet steel; pickup sensors: rigid copper (hard drawn to ANSI H23.1 and ASTM B88 standards); internal fittings: copper (ANSI B-16.22); straightening vanes: 3/8" aluminum hexagon cell
Dimensions	Casing depth 12" (30.5 cm); H x W dimensions made-to-order
Warranty	1 year

ORDERING INFORMATION

MODEL	DESCRIPTION
KMS	Airflow measuring station
	SHAPE
	811 Round with flanges
	911 Rectangular with flanges
	DIMENSIONS
	W x H Diameter or width x height (inches)

KMS – **911** – **48 x 24**

Example: **KMS-911-48 x 24** Rectangular airflow station with 16-gauge galvanized casing, 3/8" straightening vanes, and copper probes 48" wide x 24" high

Note: Standard location for flow connections is on the "long" dimensions side of a rectangular station. Stations can be rotated. If connections must be located on the "short" side, specify it on the order; a cost adder applies.

ACCESSORIES

KMS-PAK-B	1/2" FNPT to 1/4" OD tubing barb fitting

FAN INLET AIRFLOW MEASURING PROBE

KIP SERIES

DESCRIPTION

The **KIP Series** Fan Inlet Airflow Measuring Probe provides a reliable and economical means to measure airflow at fan inlets. Similar to airflow stations, the probe measures velocity pressure with multiple averaging pickups for total and static pressure. Rugged, lightweight, and easy to install, it is used with industry-standard differential pressure transmitters, gauges, or manometers. **KIP Series** probes install easily at the fan inlet and do not require straight duct runs. They are particularly applicable for jobs where fitting a flow measuring station is difficult or impossible.

For fan inlet depth > 3.5"

For fan inlet depth 0.5" to 3.5"

RoHS

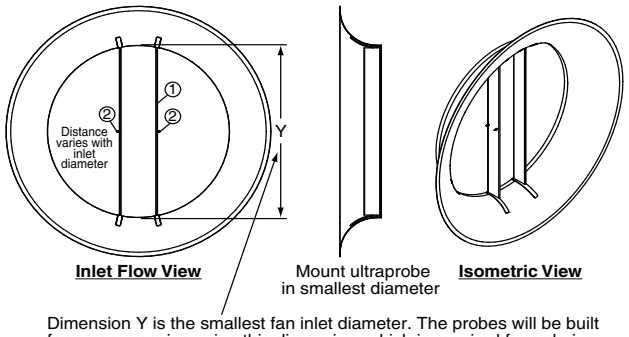
FEATURES

- ***Easy and quick to install***
- ***Accurate and repeatable***
- ***Economical***
- ***Lightweight and rugged***
- ***No straight duct runs required***
- ***High velocity, high differential***
- ***Standard airflow calculations***

SPECIFICATIONS

Connections	3/16" barbs for 1/4" OD poly tubing
Accuracy	±2% within design flow range
Minimum Velocity	400 fpm (122 mpm)
Maximum Velocity	12,000 fpm (3658 mpm)
Mounting	Drill/screw on fan inlet
Media Compatibility	Clean HVAC duct air
Media Temperature Range	400°F (204°C) maximum
Materials Of Construction	Aluminum with anodized finish
Dimensions	Made-to-order
Warranty	1 year

FIGURE 1. FAN INLET



Dimension Y is the smallest fan inlet diameter. The probes will be built for proper spacing using this dimension, which is required for ordering.

APPLICATION

The fan inlet diameter (dimension Y) shown in Figure 1, must be correctly determined and specified. Each set of probes is made to order and cannot be returned for credit if the dimensions are incorrectly specified.

If the fan inlet depth is 3.5" (8.9 cm) or greater, order the KIP-Y-3.5. Each KIP Series probe will have both static (low) and total (high) pressure pickup barbs. "Tee" the high-pressure pickups together and the low pickups together. If the fan inlet depth is less than 3.5" (8.9 cm), order the KIP-Y-.5. One KIP Series probe will have a single static (low) pressure pickup barb, and the other probe will have a single total (high) pressure pickup barb.

Determining the differential (velocity) pressure for a KIP Series probe is the same as for a pitot tube or flow measuring station (see KMS Series catalog page for formulas).

ORDERING INFORMATION

Model	Description
KIP-Y-.5	Probe set for fan inlet depth 0.5" to 3.5" (specify Y; = inlet diameter range 6" to 96" (15 to 244 cm)
KIP-Y-3.5	Probe set for fan inlet depth > 3.5" (specify Y; = inlet diameter range 6" to 96" (15 to 244 cm)

Note: One KIP includes a pair of pickup probes for measuring airflow at a fan inlet. For dual inlet fans, two KIPs must be ordered.

RELATED PRODUCTS		PAGE
CX, RX, XLdp Series	Ashcroft differential pressure transmitters	**883**
M264 Series	Setra differential pressure transmitter	**873**
T-101	1/4" OD black poly tubing, 1 coil, 250 ft (76 m)	**759**

DESCRIPTION

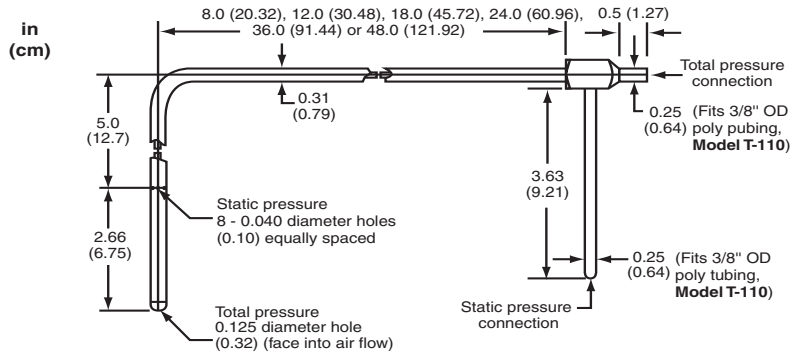
160 Series stainless steel pitot tubes are designed for use with differential pressure transmitters, manometers, or air velocity gauges to measure air flow in ducts. See Measuring Air Flow in the Technical Reference Section for complete application information. The **160 Series** is designed per ASME and meets AMCA and ASHRAE standards. Insertion depth is stamped on the side of the pitot tubes, and the static pressure port is parallel to the sensing tube to allow easy alignment with air flow. A Model A-158 split flange mounting kit allows for simple, leak-free mounting of the **160 Series**.

160-12 tube and A-158 mounting flange

FEATURES

- ***304 stainless steel construction***
- ***ASME design***
- ***Accurate even with up to 15° misalignment***
- ***Insertion depth markings stamped on tube***
- ***Air velocity calculator, flow charts, and instructions included***
- ***1/4" connections for 3/8" OD tubing***
- ***Handy A-158 split flange for duct mounting***
- ***One year warranty***

DIMENSIONS



Note: See *Measuring Airflow* in the Technical Reference section for application of **160 Series** pilot tubes for flow measurement.

ORDERING INFORMATION

MODEL	DESCRIPTION
160	Stainless steel pitot tube
	LENGTH
XX	Length (inches) - 8, 12, 18, 24, 36, 48

160 – 18 ***Example:*** **160-18** Pitot tube with 18" insertion length

RELATED PRODUCTS		PAGE
CX, RX, XLdp Series	Ashcroft differential pressure transmitters	**883**
M264 Series	Setra differential pressure transmitter	**873**
T-110	3/8" OD black poly tubing, 1 coil, 250 ft (76 m)	**759**

ACCESSORIES	
A-158	160 Series pitot tube mounting flange (required for duct mount)

DIFFERENTIAL PRESSURE AIR VELOCITY SENSORS

FXP SERIES

DESCRIPTION

The **FXP Series** probe is a differential air pressure sensor designed to measure air velocities in HVAC ductwork. It uses multiple sensing points to measure total and static pressures and incorporates a unique design to amplify the differential pressure by appoximately 2.5 times for accurate measurement of air velocities down to 200 fpm. It is easy to install and cost effective.

FEATURES

- ***Multiple sensing points for greater accuracy***
- ***Easy installation***
- ***Chamfered sensing points for consistent readings***
- ***2% accuracy***
- ***2.5X signal amplification***
- ***Accepts 1/4" OD tubing***

FXP -10

INSTALLATION

Check that the FXP probe size corresponds with the duct or terminal where it is installed.
The FXP probe is mounted in the duct by drilling a 1" diameter hole.
Check that the air flow direction in the duct corresponds with the arrow on the FXP probe.
For round ducts, install the FXP probe diagonally in the duct for best results. This equalizes both horizontal and vertical irregular air approach.

SIZING THE PRESSURE TRANSMITTER

- CFM- Cubic feet per minute (customer furnished)
- A- Area square feet (customer furnished)
- V- Velocity feet per minute (customer furnished)
- ΔP- Differential pressure in WC"
- Use formula B to calculate the ΔP for transmitter

$$V(FPM) = \frac{CFM}{A}$$

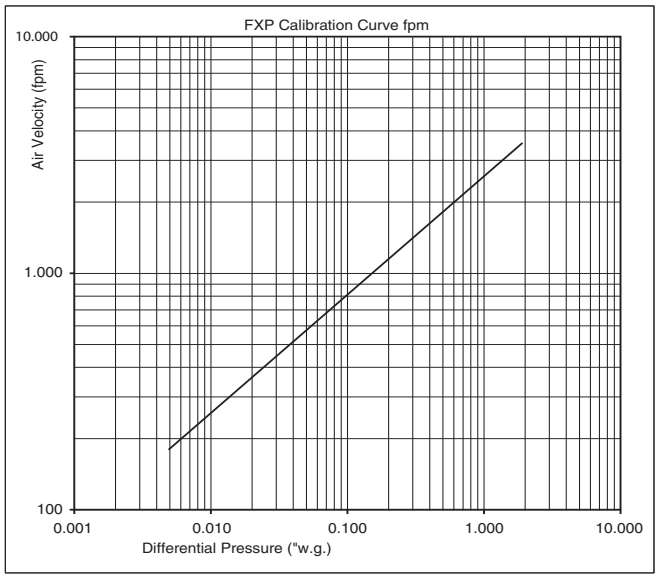
Formula A

$$\Delta P = \left[\frac{V}{Kv}\right]^2$$

Formula B

FXP Calibration Chart					
Size	Kv	Size	Kv	Size	Kv
4"	2225	7"	2450	12"	2500
5"	2325	8"	2480	14"	2525
6"	2400	10"	2440	16"	2550
18" and up		2550			

PERFORMANCE CHART



ORDERING INFORMATION

MODEL	DESCRIPTION	
FXP	FXP air velocity sensor	
	WIDTH	
	XX	Duct width (up to 48")

RELATED PRODUCTS

T-101	1/4" OD black poly tubing, 1 coil, 250 ft (76 m)
M264 Series	Setra differential pressure transmitter
CX, RX, XLdp Series	Ashcroft differential pressure transmitters

AMPLIFLOW AIR VELOCITY SENSOR
AMP SERIES

DESCRIPTION

The **AMP Series** Ampliflow air velocity sensor is designed to measure air flow velocity in HVAC duct systems. The design of the **AMP Series** allows it to amplify the velocity pressure by a factor of three, which, in turn, allows low air flow velocities to be accurately measured. Sensing holes along the length of the tube yield an average velocity pressure reading for greater accuracy. The simple design of the **AMP Series** allows quick, easy installation in new or existing ductwork.

AMP-18

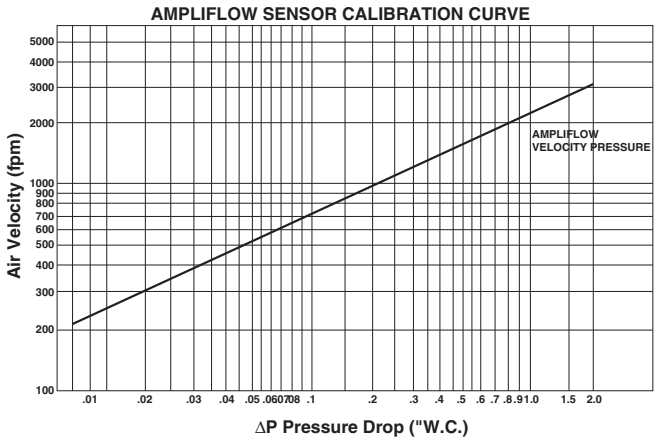
FEATURES

- ***Multipoint readings for average velocity pressure***
- ***Simple installation***
- ***Rugged, extruded aluminum construction***
- ***Double taps allow field check connections***
- ***Three-to-one ratio pressure signals***
- ***Adaptable to round, square, or oval ducts***
- ***1/4" nipples for 3/8" OD tubing***
- ***One-year warranty***

INSTALLATION

Mount the **AMP Series** at least three (10 is ideal) duct diameters downstream of coils, dampers, or elbows, and through the width of the duct for best results. Cut a hole 0.75"H x 0.88"W (1.9 x 2.3 cm) in the duct. Drill holes in the opposite side of the duct to allow the field pressure taps to protrude through the duct. Remove the rubber caps from the field pressure taps and insert the **AMP Series** into the duct so that the field pressure taps protrude. Attach the **AMP Series** to the duct with sheet metal screws and replace the rubber caps on the field pressure taps.

PERFORMANCE



$$\text{Velocity (fpm)} = 2213\sqrt{\Delta P}$$
$$\text{Velocity (mps)} = 11.242\sqrt{\Delta P}$$

ORDERING INFORMATION

MODEL	DESCRIPTION
AMP	Ampliflow air velocity sensor
	WIDTH
	XX Duct width (up to 30")*

Note: The ampliflow will be constructed so that the field pressure taps in the end of the sensing tube protrude through the duct.

* Lengths 30" to 96" available by special order.
Provide field-constructed support for sensors >30".

Nailor Ind. U.S. Patent No. 4,735,100

RELATED PRODUCTS		PAGE
CX, RX, XLdp Series	Ashcroft differential pressure transmitters	**883**
M264 Series	Setra differential pressure transmitter	**873**
T-110	3/8" OD black poly tubing, 1 coil, 250 ft (76 m)	**759**

DIFFERENTIAL PRESSURE FLOW SENSOR

DPFS SERIES

NEW!

Kele

RoHS

DESCRIPTION

The **DPFS Series** Differential Pressure Flow Sensor is the most economical way to sense airflow velocity in VAV ducts, and other small size branch ducts in HVAC systems. The **DPFS Series** is available in 4 different lengths for flow sensing in duct sizes from 4" to 18" (10 to 46 cm) and can reliably sense velocities above 1000 FPM (feet/minute) or 305 MPM (meters/minute).

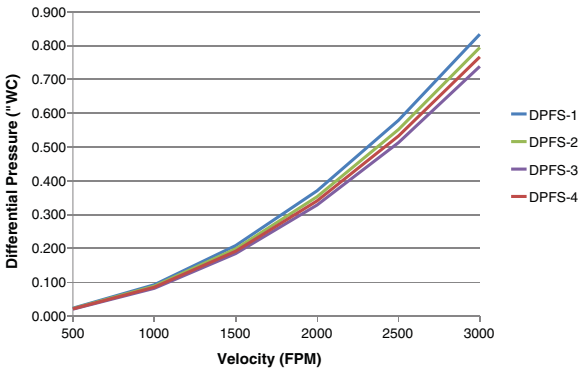
INSTALLATION

Select the appropriate **DPFS model** to fit the duct size; the flow sensor length needs to be at least half the duct width in order to get a good reading of the velocity pressure. The **DPFS-1** is for 4" to 6" ducts; the **DPFS-2** is for 6" to 8" ducts; the DPFS-3 is for 8" to 10" ducts and the **DPFS-4** is for 10" to 18" ducts. Mounting the **DPFS Series** sensor requires a 7/8" (2.2 cm) hole in the duct, through which the probe insert.

The **DPFS** requires 10 straight duct diameters upstream and 10 downstream for accurate readings. The sensor must be mounted with the flow direction arrow accurately pointing in the direction of the airflow. To ensure reliable performance, the sensor pickup openings must be kept free of dirt and dust accumulation.

Using 1/4" OD poly tubing, connect the **DPFS** "H" port to a differential pressure gauge or transmitter "High" input port, and the "L" port to the gauge or transmitter's "Low" input port

FLOW PERFORMANCE



DPFS-1	Velocity = 3285(√ΔP)
DPFS-2	Velocity = 3365(√ΔP)
DPFS-2	Velocity = 3490(√ΔP)
DPFS-2	Velocity = 3425(√ΔP)

Notes: 1. Test data based on round duct sizes 6" (DPFS-1), 8" (DPFS-2), 10" (DPFS-3) and 12" (DPFS-4)
2. Flow coefficients were derived by averaging data for each sensor size.

SPECIFICATIONS

Connections	3/16" (0.48 cm) OD connections for 1/4" (0.64 cm) OD poly tubing
Operating Temperature	40° to 120°F (4° to 49°C)
Mounting Flange	4" x 2" flange with integral foam gasket and two 3/16" holes spaced 3.3" (8.4 cm) center-to-center
Materials of Construction	ABS
Dimensions	
DPFS-1	4.0"W x 2.1"H x 3.6"L (10.2 x 5.3 x 9.1 cm)
DPFS-2	4.0"W x 2.1"H x 6.0"L (10.2 x 5.3 x 15.2 cm)
DPFS-3	4.0"W x 2.1"H x 8.3"L (10.2 x 5.3 x 21.1 cm)
DPFS-4	4.0"W x 2.1"H x 10.6"L (10.2 x 5.3 x 26.9 cm)
Weight	
DPFS-1	0.64 oz (18.1 g)
DPFS-2	0.96 oz (27.2 g)
DPFS-3	1.1 oz (31.8 g)
DPFS-4	1.3 oz (36.3 g)
Warranty	2 years

ORDERING INFORMATION

MODEL	DESCRIPTION
DPFS-1	Differential pressure flow sensor, 3.0" insertion, for 4" to 6" ducts
DPFS-2	Differential pressure flow sensor, 5.2" insertion, for 6" to 8" ducts
DPFS-3	Differential pressure flow sensor, 7.5" insertion, for 8" to 10" ducts
DPFS-4	Differential pressure flow sensor, 9.7" insertion, for 10" to 18" ducts

Cost-saving 10-packs are available; order model with "...-10PAK" suffix.

RELATED PRODUCTS		PAGE
CX, RX, XLdp Series	Ashcroft differential pressure transmitters	**883**
M264 Series	Setra differential pressure transmitter	**873**
T-101	1/4" OD black poly tubing, 1 coil, 250 ft (76 m)	**759**

DIFFERENTIAL PRESSURE FLOW SENSORS
SSS-1000 SERIES

DESCRIPTION

The **SSS-1000 Series** airflow sensors sense differential (velocity) pressure of VAV units and other locations in main or branch ducts. Four different lengths allow selection of the sensor to yield accurate readings on terminal box inlet diameters from 4" to 20" (10.2 to 51.8 cm).

SSS-1000 Series

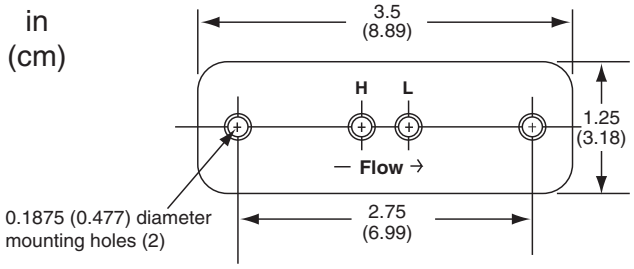
KMC CONTROLS

RoHS

SPECIFICATIONS

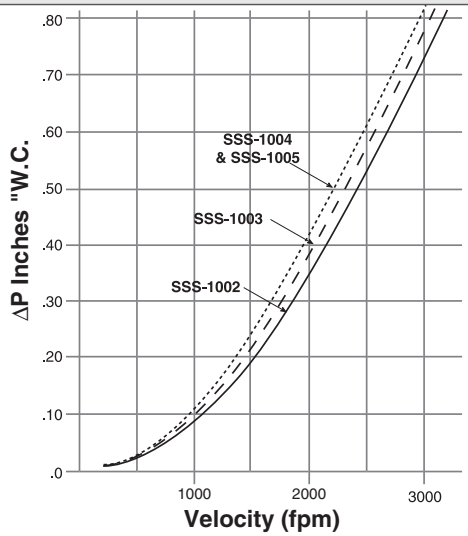
Connections	1/4" (6.4 mm) OD connections, fit 3/8" (9.5 mm) OD polyethylene tubing
Operating Temperature	40°C to 120°F (4° to 49°C)
Mounting	Integral flange with foam gasket
Length	
SSS-1002	3.16" (8.0 cm) insertion
SSS-1003	5.41" (13.7 cm) insertion
SSS-1004	7.66" (19.4 cm) insertion
SSS-1005	9.91" (25.2 cm) insertion
Storage Temperature	-40° to 140°F (-40° to 60°C)
Weight	
SSS-1002	.64 oz (18 g)
SSS-1003	.80 oz (23 g)
SSS-1004	.96 oz (27 g)
SSS-1005	1.1 oz (32 g)
Warranty	2 years

DIMENSIONS



Note: See specifications for insertion dimensions

PERFORMANCE



SSS-1002 Velocity = 3450 $\sqrt{\Delta P}$
SSS-1003 Velocity = 3300 $\sqrt{\Delta P}$
SSS-1004 Velocity = 3200 $\sqrt{\Delta P}$
SSS-1005 Velocity = 3200 $\sqrt{\Delta P}$

INSTALLATION

The **SSS-1000 Series** sensor requires a 7/8" (2.22 cm) diameter cutout for the insertion portion and two pilot holes for sheet metal screws or rivets to hold the flange against the ductwork.
Sensors should be installed as level as possible to ensure accurate velocity pressure readings.
The **SSS-1000 Series** sensor requires 10 duct diameters upstream and 10 duct diameters downstream of straight duct. The proper size is half the duct diameter or larger.

ORDERING INFORMATION

Model	Description
SSS-1002	Differential pressure flow sensor, 3.16" insertion
SSS-1003	Differential pressure flow sensor, 5.41" insertion
SSS-1004	Differential pressure flow sensor, 7.66" insertion
SSS-1005	Differential pressure flow sensor, 9.91" insertion

ACCESSORIES		PAGE
B-265	Barb coupling, 3/8" OD tubing to 1/4" OD tubing	**726**

RELATED PRODUCTS		PAGE
CX, RX, XLdp Series	Ashcroft differential pressure transmitters	**883**
M264 Series	Setra differential pressure transmitter	**873**
T-110	3/8" OD black poly tubing, 1 coil, 250 ft (76 m)	**759**

AIR VELOCITY TRANSMITTERS

EE65 AND EE66 SERIES

DESCRIPTION

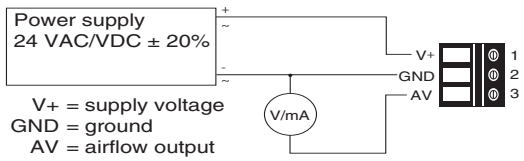
The **EE65 and EE66 Series** airflow velocity transmitters are ideal for accurate ventilation control applications. They incorporate innovative hot film anemometer technology which guarantees good accuracy at low airflow velocity and is superior to conventional anemometers with hot wire sensors or NTC bead thermistors. The hot film sensor is also less sensitive to dust and dirt, for high reliability and low maintenance costs. The **EE65** and **EE66** series are available with current or voltage output, with the measuring range and the response time jumper selectable in the field.
The **EE66** is specifically designed for very low airflow velocities and is accurate down to approximately 30 fpm (0.15 m/s).

FEATURES

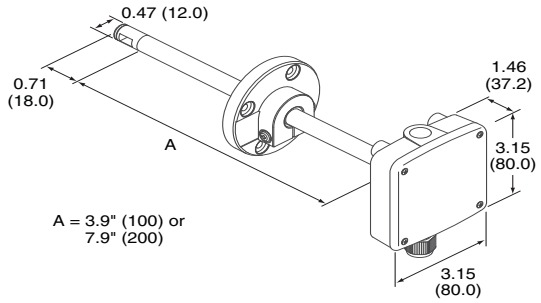
- ***Adjustable insertion length for precise measurement***
- ***Jumper selectable ranges and outputs for application flexibility***
- ***Jumper selectable time constant for signal stability***
- ***Dust and splash-proof NEMA 4 (IP65) enclosure allows installation in potentially wet areas***
- ***Very low flow velocity EE66 model for clean rooms and other low velocity applications***

EE65-01-VB5

WIRING



DIMENSIONS



SPECIFICATIONS

Supply Voltage	24 VAC ±20%, 50/60 Hz, 24 VDC ±20%
Supply Current	150 mA @ 24 VAC, 90 mA @ 24 VDC
Output Signal	0-10 VDC or 4-20 mA; jumper selectable
Loads	0-10 VDC output, 10kΩ minimum resistance; 4-20 mA output, 450Ω maximum resistance
Wiring	Terminal strip with 1/2" NPT conduit connector or M16x1.5 cable gland for 0.18" to 0.39" (0.45 to 10.0 cm) cable diameter
Accuracy	
EE65	±40 fpm (0.2 m/s), plus 3% of measured value, at 68°F (20°C) and 45% RH
EE66	±7.9 fpm (0.04 m/s), plus 2% of measured value, at 68°F (20°C) and 45% RH
Response Time	0.2 or 4 seconds, jumper selectable
Operating Temperature	14° to 122°F (10° to 50°C), sensing tip can go down to -13°F (-25°C)
Velocity Range	
EE65	0-2000 fpm (0-10 m/s), 0-3000 fpm (0-15 m/s) or 0-4000 fpm (0-20 m/s)
EE66	0-200 fpm (0-1.0 m/s), 0-300 fpm (0-1.5 m/s) or 0-400 fpm (0-2.0 m/s)
Enclosure Rating	NEMA 4 (IP 65)
Dimensions	
-VB3	3.2"H x 3.2"W x 5.4" (8.0 x 8.0 x 13.7 cm)
-VB5	3.2"H x 3.2"W x 9.3" (8.0 x 8.0 x 23.7 cm)
Weight	
-VB3	.25 lb (0.11 kg)
-VB5	.30 lb (0.14 kg)
Approvals	CE
Warranty	1 year

ORDERING INFORMATION

MODEL	DESCRIPTION
EE65-01-VB3	Air velocity transmitter, probe length 3.9" (100 mm)
EE65-01-VB5	Air velocity transmitter, probe length 7.9" (200 mm)
EE66-01-VB3	Low flow transmitter, probe length 3.9" (100 mm)
EE66-01-VB5	Low flow transmitter, probe length 7.9" (200 mm)

RELATED PRODUCTS		PAGE
691-K0A	Control transformer, 120:24 VAC, 40 VA, Class 2	**819**
DCP-1.5-W	Power supply, 24 VAC IN to 24 VDC OUT	**837**

AIR VELOCITY TRANSMITTER
AVS-200

DESCRIPTION

The **AVS-200** is an electronic air velocity transmitter for use in HVAC systems, laboratories, and industrial applications. It features three DIP switch-selectable velocity ranges and two analog outputs (one voltage, one current). The **AVS-200** also has a selectable time constant (the time it takes to register 63.2% of a velocity change) of 3 or 10 seconds. The sensing probe has an adjustable insertion length of up to 8" (20.3 cm) and a 4.5' (1.4 m) cable.

AVS-200

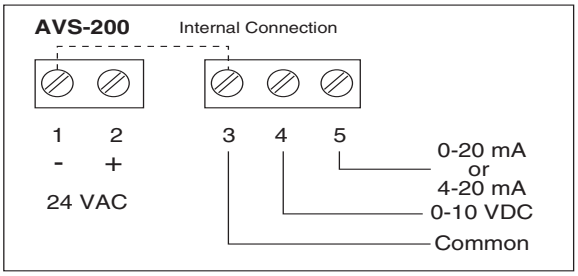
FEATURES

- ***Three DIP switch-selectable velocity ranges***
- ***Two analog outputs***
- ***Selectable time constant***
- ***Dust- and splash-proof (IP44) enclosure***

SPECIFICATIONS

Supply Voltage	24 VAC ±10%, 50/60 Hz
Supply VA	5 VA
Output Signal	0-10 VDC, 0/4-20 mA
Loads	0-10 VDC output: 1kΩ minimum resistance; 4-20 mA output: 600Ω maximum resistance
Wiring	4.5' (1.4 m) cable from transmitter to probe; screw terminals inside transmitter housing
Accuracy	±5% of measured value plus 0.5% of measuring range
Repeatability	0.5% of measuring range
Temperature Effect	Maximum 0.1%/°C (0.2%/°F)
Time Constant	63.2% for 3 or 10 seconds
Operating Temperature	Electronics 32° to 122°F (0° to 50°C); sensing tip -4°F to 140°F (-20° to 60°C)
Velocity Range	0-1000 fpm (0.5.1 m/s), 0-2000 fpm (10.2 m/s), or 0-3000 fpm (0-15.3 m/s); DIP switch selectable
Probe Length Range	Adjustable 1" to 8" (2.5 to 20.3 cm)
Enclosure Rating	IP44
Weight	1.8 lb (0.8 kg)
RoHS Statement	Yes
Warranty	1 year

WIRING



Note: Any device sharing a transformer with the AVS-200 must have a common power negative "-" and signal negative "-" terminal, and polarity must be observed. Otherwise, a separate transformer must be used.

INSTALLATION

The sensing probe must be installed through a 5/8" (16 mm) hole in the duct with the arrow on the mounting flange pointing in the direction of the airflow. The tab on the mounting flange should be aligned with the line on the probe to ensure proper airflow measurement. The insertion length is adjustable. Loosen the set screw, and move the probe to the selected position. The scale on the probe shows the insertion length. Always install the sensing probe downstream of filters and coils. Avoid placement directly in the outside air stream. For best accuracy, locate the sensing probe a minimum of 10 duct diameters (or widths) upstream of any obstruction and a minimum of 10 duct diameters downstream.

ORDERING INFORMATION

MODEL	DESCRIPTION
AVS-200	Air velocity transmitter

	RELATED PRODUCTS	PAGE
691-K0A	Control transformer, 120:24 VAC, 40 VA, Class 2	**819**

THERMAL MASS FLOW METER
FT2 SERIES

DESCRIPTION

The Fox **FT2 Series** Thermal Mass Flow Meters are perfect for measuring flow of natural gas, compressed air, propane, oxygen, and most common gases. The flow meters measure both flow rate and temperature with isolated 4-20 mA outputs for both variables. In addition, a separate pulse output can be used for logging total gas flow. The FT2 mass flow meters measure gas flow velocity as low as 50 sfpm (standard feet/minute) and as high as 50,000 sfpm, without the need for temperature or pressure compensation.

Each flow meter is calibrated at the factory using the same gas as per the application. As a result, the FT2 more than meets EPA accuracy requirements for monitoring both boiler intake gas -- and combustion emissions.

Standard models include a 2 x 16 character backlit display for viewing flow rate, flow total, elapsed time, process gas temperature and alarms, and an integral keypad for setting parameters such as signal spans, pulse frequency scaling, pipe area, zero cutoff, filtering, diagnostics and alarms.

The **FT2 Series** are available in two configurations, inline or insertion. The inline models (male NPT) include built-in flow conditioners which reduce the need for long straight runs of upstream and downstream pipe. The most common inline sizes are 1/2" to 2" and other inline sizes are available. The insertion models install in a 3/4" coupling (field provided) and are available in insertion lengths to fit pipes from 1-1/2" to 72". Both inline and insertion styles come standard with stainless steel wetted parts, an integral NEMA 4X enclosure rated for Class I, Div. 2, Groups B,C,D hazardous areas, and a NIST calibration certificate.

NEW!

MADE IN USA

CE

APPLICATION

Natural gas, air, ammonia, biogas, butane, chlorine, compressed air, carbon monoxide, carbon dioxide, ethane, ethylene, helium, hydrogen, methane, nitrogen, oxygen, propane, and more

FEATURES

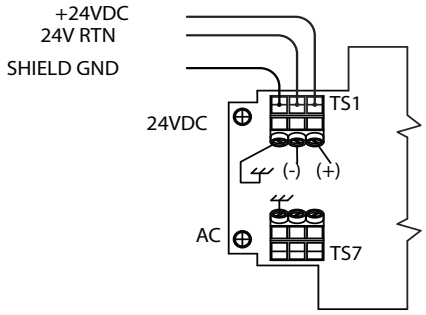
- ***Measures gas flow rate in SCFM, SCFH, NM3M, NM3H, KG/M, KG/H, and more, for complete choice in units***
- ***Two 4-20 mA analog outputs, for both flow rate and temperature***
- ***RS422/RS485-Modbus, Profibus-DP, DeviceNet and Ethernet models available for network communication***
- ***Insertion or inline mounting styles for installation choices***
- ***All welded 316SS sensor construction and no moving parts for durability and long life***
- ***Field programmable for flexibility in configuration***
- ***Standard NEMA 4X enclosure designed for Class I, Division 2, Groups B, C, and D***
- ***NIST traceable calibration standard to assure accuracy***

SPECIFICATIONS

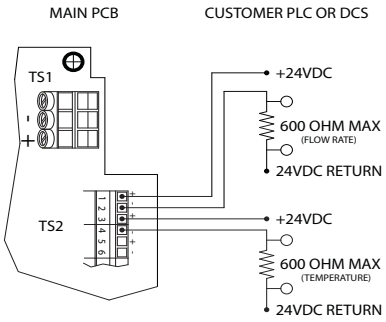
Supply Voltage	24 VDC, ±10%, 85-250 VAC 50/60 Hz
Supply Watts	20 W (VDC powered models)
Supply Current	0.75A (VAC powered models)
Output Signal	2 isolated 4-20 mA outputs (one for flow and one for temperature); 1 isolated pulse output 0-100Hz, 10V p/p for flow (can be used for alarming)
Wiring	Two 3/4" NPT conduit connections on sides of housing
Wiring Terminations	Screw terminals
Communication Interface	RS232 for connection to computer, models available with RS422/RS485-Modbus, Profibus-DP, DeviceNet and Ethernet Modbus TCP
Accuracy	Flow, ±1% of reading; Temperature ±1.8°F (±1.0°C)
Repeatability	±0.2% of full scale
Mounting	1/2" MNPT pipe section to 2" MNPT pipe section (standard inline), 3/4" MNPT coupling, 6" length probe for 1-1/2" to 6" pipes (standard insertion, other lengths available)
Operating Temperature	32° to 140°F (0° to 60°C)
Media Compatibility	Standard configuration for natural gas; other gases such as air, biogas, butane, carbon monoxide, carbon dioxide, nitrogen, methane, oxygen, propane, etc. optional.
Media Temperature Range	-40° to 250°F (-40° to 121°C)
Maximum Pressure Rating	300 psig (21 bar)
Materials of Construction	316 stainless steel sensor and flow body
Enclosure Rating	NEMA 4X, designed for Class I, Division 2, Groups B, C & D hazardous areas
Weight	8.0 lb (3.6 kg) to 10.0 lb (4.5 kg) inline models, 6.0 lb (2.7 kg) 6" insertion model
Approvals	CE
Warranty	1 year

WIRING

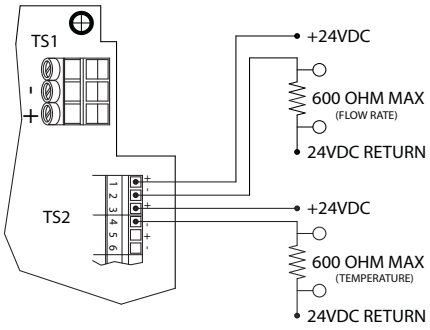
CONNECTIONS FOR EXTERNAL 24VDC POWER SUPPLY



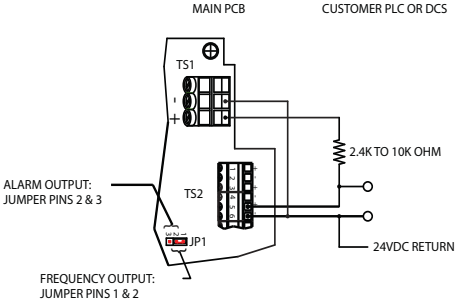
4 TO 20mA ISOLATED CONNECTIONS (RECOMMENDED)



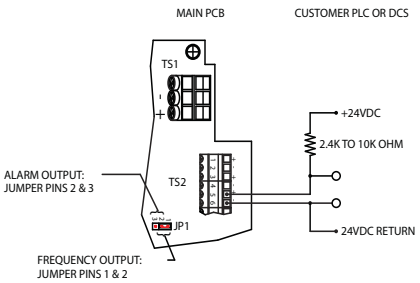
4 TO 20mA ISOLATED CONNECTIONS (RECOMMENDED)



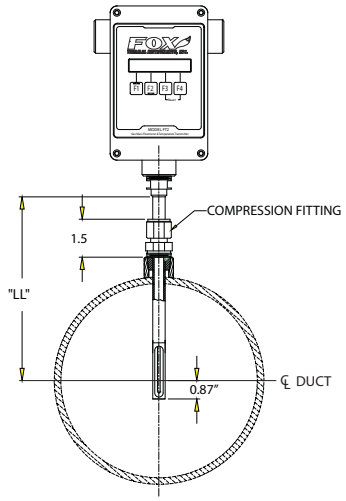
PULSE OUTPUT CONNECTIONS, NON-ISOLATED



PULSE OUTPUT CONNECTIONS, ISOLATED (RECOMMENED)

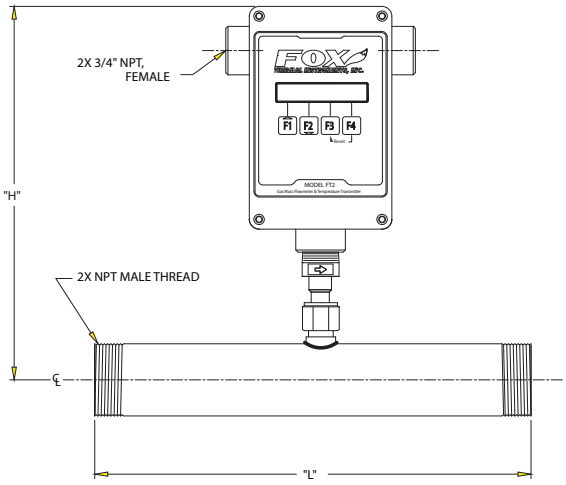


DIMENSIONS



NOTE: DIMENSIONS IN PARENTHESIS ARE IN CENTIMETERS.

PROBE SIZE	DIMENSION LL ±.1"
4-inch	4.0 (10.2)
6-inch	6.0 (15.2)
9-inch	9.0 (22.9)
12-inch	12.0 (30.5)
15-inch	15.0 (38.1)
18-inch	18.0 (45.7)
24-inch	24.0 (61.0)
30-inch	30.0 (76.2)
36-inch	36.0 (91.4)



NOTE: DIMENSIONS IN PARENTHESIS ARE IN CENTIMETERS.

BODY SIZE	DIMENSION "L"	DIMENSION "H"
1/4-inch	5.80 (14.7)	12.5 (31.8)
1/2-inch	12.0 (30.5)	12.5 (31.8)
3/4-inch	12.0 (30.5)	12.5 (31.8)
1-inch	15.0 (38.1)	12.5 (31.8)
1 1/2-inch	12.0 (30.5)	12.5 (31.8)
2-inch	12.0 (30.5)	12.5 (31.8)
2 1/2-inch	18.0 (45.7)	12.6 (32.0)
3-inch	18.0 (45.7)	12.6 (32.0)
4-inch	18.0 (45.7)	13.1 (33.3)

THERMAL MASS FLOW METER
FT2 SERIES

ORDERING INFORMATION

MODEL	DESCRIPTION
FT2	Gas Mass Flowmeter
	PROBE/BODY
	05P 1/2" MNPT Inline, flow range 0-48 scfm
	075P 3/4" MNPT Inline, flow range 0-120 scfm
	10P 1" MNPT Inline, flow range 0-192 scfm
	125P 1 1/4" MNPT Inline, flow range 0-320 scfm
	15P 1 1/2" MNPT Inline, flow range 0-450 scfm
	20P 2" MNPT Inline, flow range 0-750 scfm
	06IE Insertion, 6" probe, flow range (see table)
	SENSOR MATERIAL
	SS 316 Stainless steel sensor and flowbody
	SJ Hasteloy C-276 sensor, 316SS flowbody
	SENSOR TYPE
	ST Standard, -40-250°F (-40-121°C)
	HS High temperature 32-400°F (0-204°C)
	ENCLOSURE/POWER
	E1 Local NEMA 4X, 24 VDC Power
	E2 Local NEMA 4X, 85-250 VAC Power
	DISPLAY/KEYPAD
	DD Display and keypad
	BUS OPTIONS
	B0 No communication bus
	MB Modbus
	BD DeviceNet
	BP ProfiBus-DP
	BE Ethernet Modbus TCP
	CALIBRATION
	G1 Air, N2; max flow less than 1200 SCFM (2040 NM3H)
	G2 Air, N2; max flow greater than 1200 SCFM (2040 NM3H)
	G3 Ar, CO2, H2, CH4, Natural Gas, O2; max flow less than 1000 SCFM (1700 NM3H)
	G4 Ar, CO2, H2, CH4, Natural Gas, O2; max flow greater than 1000 SCFM (1700 NM3H)
	G5 CO, He, Ammonia, Propane, Digester gas; max flow less than 700 SCFM (1190 NM3H)
	G6 CO, He, Ammonia, Propane, Digester gas; max flow greater than 700 SCFM (1190 NM3H)

Example: FT2-05P-SS-ST-E1-DD-B0-G3; 1/2" NPT inline, 316SS, standard temp., 24 VDC power, display/keypad, no communication, for natural gas <1000 SCFM.

NOTE: An FT2 Series Application Data form must be filled out and sent in with the purchase order. Details regarding application and media parameters are required for factory calibration. The form is located at www.kele.com under Flow/FT2 Series/Related Products.

ACCESSORIES

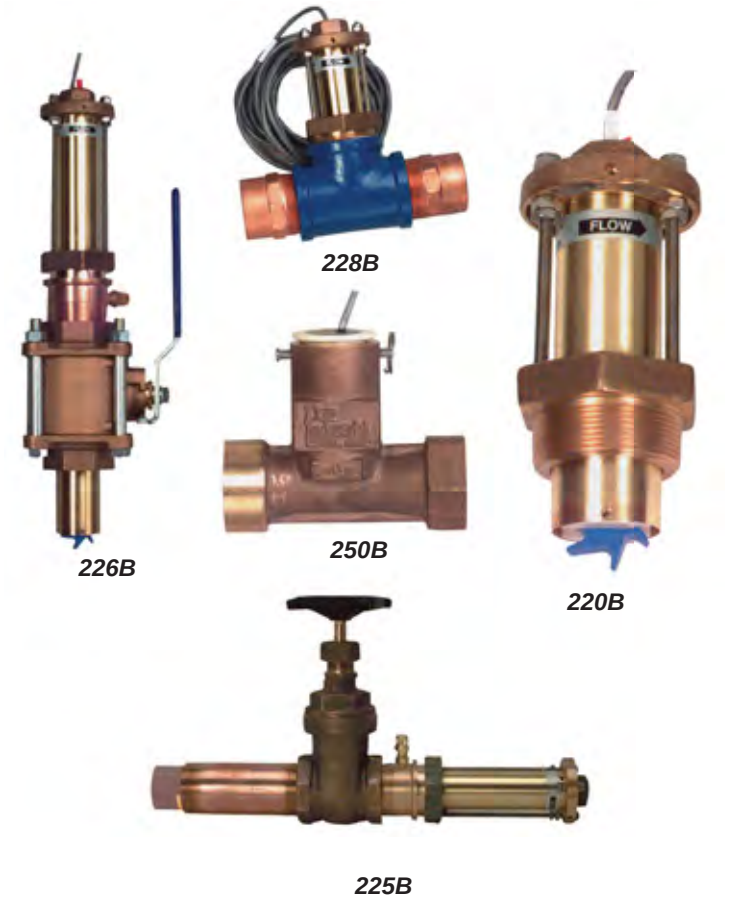
101685	RS232 Transition board for PC connection
102299	90° elbow mounting kit, makes housing upright in vertical pipe installations
102878	Teflon ferrule kit, for ease in removal of the insertion models

NEW!

DESCRIPTION

200 Series flow sensors feature a six-bladed impeller with a proprietary nonmagnetic sensing mechanism. The design provides higher and more constant torque than four-bladed impeller designs and is less prone to be fouled by waterborne debris. The forward curve-shape, coupled with the absence of magnetic drag, provides improved operation and repeatability at lower flow rates. This is especially true where the impeller is exposed to metallic or rust particles found in steel or iron pipes. As the liquid flow turns the impeller, a low impedance signal is transmitted with a frequency proportional to the flow rate. This signal can travel up to 2,000' (610m) between the sensor and the transmitter without the need for amplification. All sensors are supplied with 20' (6.10m) of Belden type 9320 (two-conductor shielded) cable. Standard construction of the **200 Series** sensors consists of EPDM O-rings, tungsten carbide shaft, nylon impeller, and UHMWPE bearings.

A complete line of flow transmitters is available for use with these flow sensors. The **200 Series** can be used for potable water and the following pages contain details on each model.



226B *228B* *250B* *220B* *225B*

SELECTION CHART

MODEL	DESCRIPTION	PIPE SIZE in (cm)
220B	Brass, insertion type	2-1/2 (6.35) and up
220SS	Stainless steel, insertion type	2-1/2 (6.35) and up
225B	Brass, retractable with gate valve	2-1/2 (6.35) and up
226B	Brass, retractable with ball valve	2-1/2 (6.35) and up
226SS	Stainless steel, retractable with ball valve	2-1/2 (6.35) and up
228C-2	Brass sensor in a 2" (5.08 cm) cast iron tee	2 (5.08)
228B-2	Brass sensor in a 2" (5.08 cm) brass tee	2 (5.08)
228SS-2	Stainless steel sensor in a 2" (5.08 cm) stainless steel tee	2 (5.08)
250B	Removable sensor in a cast bronze tee	1/2 (1.27) , 3/4 (1.91), 1 (2.54), 1-1/4 (3.18), 1-1/2 (3.81)
228PV	Removable sensor in a PVC tee	1-1/2 to 4 (3.81 to 10.16) PVC
4000 Series	PVC	1/2 (1.27), 3/4 (1.91), 1 (2.54) PVC

BRASS & STAINLESS STEEL FLOW SENSORS

220B, 220SS

DESCRIPTION

The **220B** (brass) and **220SS** (stainless steel) flow sensors mount in a 2" NPT pipe saddle or Thredolet® and are used in general flow measuring applications in metallic or PVC pipes from 2-1/2" to 40" (6.4 to 101 cm) size. Positioning nuts on the three threaded retaining rods allow the sensor to be accurately positioned to a standard insertion depth of 1-1/2" into the pipe. When this insertion depth is maintained, and there are at least 10 upstream and 5 downstream diameters of straight uninterrupted flow, an accuracy of ±1% of actual flow rate can be obtained between flow velocities of 0.5 to 30 ft/sec. The standard 200 Series flow sensor are rated for water temperatures to 221 °F. For higher temperature requirements, see the **SDI Series**.

220B

SPECIFICATIONS

Connections	2" MNPT (mount in Thredolet® or tee)
Wiring	20' (6.1 m) Belden 9320 two-conductor shielded cable
Accuracy	±1% of full scale
Repeatability	±0.3% of full scale
Linearity	±0.2% of full scale
Rangeability	60:1
Velocity Range	0.5 to 30 fps (.15 to 9.0 mps)
Media Compatibility	Hot water, chilled water, water/glycol, potable water (verify application is compatible with flow sensor materials of construction, check material compatibility resources prior to ordering)
Media Temperature Range	Maximum 221°F (105°C)
Maximum Pressure	400 psig (2758 kPa) @ 100°F (37.8°C) media temperature

Materials Of Construction	
220B	Standard construction is Admiralty brass UNS C44300 sleeve, glass-reinforced nylon impeller, Pennlon® UHMWPE bearings, tungsten carbide shaft, glass reinforced PPS housing, and ethylene propylene EPDM o-rings (other materials available special order).
220SS	Standard construction is 300 series stainless steel sleeve, glass-reinforced nylon impeller, Pennlon® UHMWPE bearings, tungsten carbide shaft, glass reinforced PPS housing, and ethylene propylene EPDM o-rings (other materials available special order).
Dimensions	7.1"H x 3" diameter (18.1 x 7.6 cm)
Weight	4.1 lb (1.9 kg)
Approvals	CE
Warranty	1 year

ORDERING INFORMATION

MODEL	DESCRIPTION
220B	Brass flow sensor
220SS	Stainless steel flow sensor

	RELATED PRODUCTS	PAGE
310-00	Programmable analog flow transmitter	**255**
UFT-1A	Universal flow transmitter, pulse and calibrated 4-20 mA output	**256**

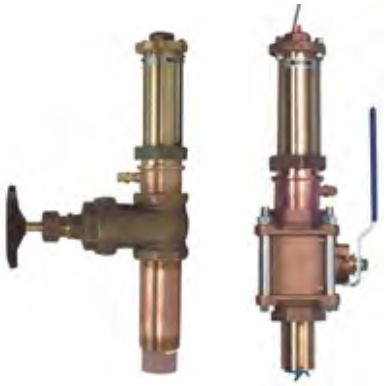
	ACCESSORIES
230-FRK	Repair kit for 200 Series flow sensors (includes impeller, shaft, bearing, and O-ring)
2X2.5-3THD	2" Thredolet® for 2-1/2" and 3" pipes
2X4-6THD	2" Thredolet® for 4", 5" and 6" pipes
2X8-36THD	2" Thredolet® for 8" to 36" pipes

HOT TAP FLOW SENSORS
225B, 226B, 226SS SERIES

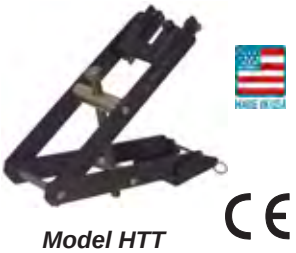
DESCRIPTION

The **225B, 226B, 226SS Series** hot tap flow sensors feature an elongated sensor, special mounting adapter, pipe nipple, and isolation valve, to allow the nonmagnetic impeller sensor to be installed into a pressurized pipe while the pipe is in service. This is accomplished by first attaching a 2" saddle or Thredolet® onto the pipe and screwing the nipple and isolation valve into the saddle or fitting. A hole is then drilled through the pipe using a commercial tapping machine. When complete, the tapping apparatus is removed, the isolation valve is closed, and the sensor is installed. The 225B, 226B, 226SS Series can be used for pipe sizes 2-1/2" to 40" (6.4 to 101 cm).

The hot tap flow sensor is also recommended for any application where it would be difficult to shut down or drain the pipeline to remove the sensor for service. The overall length of the sensor tube is 18" (46 cm); however, a clearance height of 36" (91 cm) should be allowed for the fully extended length of the insertion tool.



Model 225B *Model 226B*



Model HTT

SPECIFICATIONS

Connections	2" MNPT
Wiring	20' (6.1 m) two-conductor 20 AWG U.L. Type PTLC shielded cable
Accuracy	±1% of full scale
Repeatability	±0.3% of full scale
Linearity	±0.2% of full scale
Rangeability	60:1
Velocity Range	0.5 to 30 fps (.15 to 9.0 mps)
Media Compatibility	Hot water, chilled water, water/glycol, potable water (verify application is compatible with flow sensor materials of construction, check material compatibility resources prior to ordering)
Media Temperature Range	Maximum 221°F (105°C)
Maximum Pressure	
225B	300 psig (2069 kPa) @ 100°F (37.8°C) media temperature
226B, 226SS	400 psig (2758 kPa) @ 100°F (37.8°C) media temperature

Materials Of Construction	
225B, 226B	Standard construction is Admiralty brass UNS C44300 sleeve, glass-reinforced nylon impeller, Pennlon® UHMWPE bearings, tungsten carbide shaft, glass reinforced PPS housing, and ethylene propylene EPDM o-rings (other materials available special order).
226SS	Standard construction is 300 series stainless steel sleeve, glass-reinforced nylon impeller, Pennlon® UHMWPE bearings, tungsten carbide shaft, glass reinforced PPS housing, and ethylene propylene EPDM o-rings (other materials available special order).
Dimensions	18"H x 3" diameter (46 x 7.6 cm) plus valve handle
Weight	
225B	17.5 lb (7.9 kg)
226B, 226SS	13.0 lb (5.9 kg)
HTT	12.0 lb (5.4 kg)
Approvals	CE
Warranty	1 year

ORDERING INFORMATION

MODEL	DESCRIPTION
225B	Brass hot tap flow sensor with gate-type isolation valve
226B	Brass hot tap flow sensor with ball-type isolation valve
226SS	Stainless steel hot tap flow sensor with ball-type isolation valve

ACCESSORIES

230-FRK	Repair kit for 200 Series flow sensors (includes impeller, shaft, bearing, and O-ring)
2X2.5-3THD	2" Thredolet® for 2-1/2" and 3" pipes
2X4-6THD	2" Thredolet® for 4", 5" and 6" pipes
2X8-36THD	2" Thredolet® for 8" to 36" pipes
813144-1211	Replacement sleeve assembly for 225B, 226B flow sensors
HTT	Hot tap tool
81873	Replacement gate valve for 225B, 2"

RELATED PRODUCTS

		PAGE
310-00	Programmable analog flow transmitter	**255**
UFT-1A	Universal flow transmitter, pulse and calibrated 4-20 mA output	**256**

FLOW SENSOR WITH INTEGRAL FLOW TRANSMITTER

SDI SERIES

DESCRIPTION

The **SDI Series** flow sensor has an integral transmitter and is available in either brass or stainless steel. Hot tap stainless steel models include isolation valve and mounting hardware which enables flowmeter installation and removal while the piping system is pressurized; system shutdown is unnecessary. Hot tap stainless steel models are also available for bidirectional flow measurement. The impeller is rugged and non-fouling and requires no custom calibration. The **SDI Series** is available with a frequency output, analog output, and scaled-pulse output and the display is optional. Stainless steel models are available with a PEEK (polyetheretherketone) tip for high (up to 300 °F) fluid temperatures.

SDI Series

MADE IN USA

FEATURES

- ***Direct insertion or hot tap installation***
- ***Fits pipe sizes 1.5" to 36"+ (3.8 to 91+ cm)***
- ***Mounts in 1" NPT tap, weld-on or pipe saddle***
- ***Low pressure drop***
- ***Optional 8 character 3/8" (0.95 cm) LCD***
- ***NEMA 4X enclosure standard***
- ***Bidirectional models available***
- ***Field programmable with optional software***

SPECIFICATIONS

Supply Voltage	8-35 VDC
Supply Current	25 mA
Maximum Output Impedance	750Ω @ 24 VDC
Output Signal	Models with standard frequency pulse, two-wire 4-20 mA, scaled pulse, or bi-directional (hot-tap models only)
Wiring Terminations	Screw terminals
Conduit Connection	1/2" FNPT
Configuration	A-SDI Programming software kit, includes 20' cable
Accuracy	± 1% of flow rate
Repeatability	± 0.5%
Display	One line, eight character 3/8" (.95 cm) LCD, annunciators for rate, total, input, output
Operating Temperature	14° to 150°F (20° to 65°C)
Velocity Range	0.3 to 20 fps (.09 to 6.1 mps)
Installation	Install in straight pipe section with a minimum distance of 10 pipe diameters upstream and 5 pipe diameters downstream to any bend, obstruction or transition
Mounting	1" MNPT, mount in Thredolet® or pipe saddle
Media Temperature Range	Maximum 300°F (149°C) for PEEK tip; 180°F (82°C) for PPS tip
Maximum Pressure	1000 psig (6895 kPa) for stainless steel, 600 psig (4137 kPa) for brass
Pressure Drop	0.5 psid (3.5 kPa), or less, at 10 fps velocity
Materials Of Construction	Polypropylene enclosure with Viton® sealed dacrylic cover, probe and sensor materials vary by model number (see ORDERING INFORMATION)
Enclosure Rating	NEMA 4X
Warranty	1 year

ORDERING INFORMATION

MODEL	DESCRIPTION
SDI	Flow sensor with integral transmitter
	MATERIAL
0D1N	Stainless steel insertion with PPS tip for 1.5" to 10" pipes
0D2N	Stainless steel insertion with PPS tip for 12"" to 36" pipes
0D3N	Stainless steel insertion with PPS tip for 36"+ pipes
1D1N	Brass insertion with PPS tip for 1.5" to 10" pipes
1D2N	Brass insertion with PPS tip for 12" to 36" pipes
1D3N	Brass insertion with PPS tip for 36"+ pipes
2D1N	Stainless steel insertion with PEEK tip for 1.5" to 10" pipes
2D2N	Stainless steel insertion with PEEK tip for 12" to 36" pipes
2D3N	Stainless steel insertion with PEEK tip for 36"+ pipes
0H1N	Stainless steel hot tap with PPS tip for 1.5" to 10" pipes
0H2N	Stainless steel hot tap with PPS tip for 12" to 36" pipes
0H3N	Stainless steel hot tap with PPS tip for 36"+ pipes
2H1N	Stainless steel hot tap with PEEK tip for 1.5" to 10" pipes
2H2N	Stainless steel hot tap with PEEK tip for 12" to 36" pipes
2H3N	Stainless steel hot tap with PEEK tip for 36"+ pipes
	OUTPUT
0	Standard frequency pulse
1	4-20 mA
2	Scaled pulse
5	Bidirectional, 4-20 mA + direction (hot tap, PPS tip only)
6	Bidirectional, scaled pulse (hot tap, PPS tip only)
	DISPLAY
0	No display
1	LCD option (not available with output option 0)
	CONSTRUCTION
0200	Viton O-ring, Carbide shaft, stainless steel impeller, Torlon bearing (std)
1200	EPDM O-ring, Carbide shaft, stainless steel impeller, Torlon bearing

SDI | 2D1N | 1 | 1 | 0200

Example: SDI2D1N11200 Flow sensor with integral transmitter, stainless steel insertion with PEEK tip, 4-20 mA output, display, standard constructio

ACCESSORIES

8132030	Replacement ball valve for hot tap install
A-1027	Hot tap adapter nipple, required for hot tap
A-SDI	Programming kit for SDI, includes 20' cable

TEE-MOUNTED FLOW SENSORS
228B, 228C, 228SS

DESCRIPTION

The **228B** is a brass flow sensor mounted in a 2" bronze tee with 2" copper solder couplings included, the **228C** is a brass flow sensor mounted in a 2" cast iron tee, and the **228SS** is a stainless steel flow sensor mounted in a 2" stainless steel tee.

228B-2

SPECIFICATIONS

Connection Type	
228B	2" solder
228C, 228SS	2" FNPT
Wiring	20' (6.1 m) 2-conductor 20 AWG shielded UL type PTLC wire, rated to 221°F (105°C). May be extended to 2000' maximum with similar cable
Accuracy	±1% of full scale
Repeatability	±0.3% of full scale
Linearity	±0.2% of full scale
Velocity Range	0.5 to 30 fps (.15 to 9.0 mps)
Media Compatibility	Hot water, chilled water, water/glycol, potable water (verify application is compatible with flow sensor materials of construction, check material compatibility resources prior to ordering)
Media Temperature Range	Maximum 221°F (105°C)
Maximum Pressure	
228B	200 psig (1379 kPa) @ 100°F (37.8°C) media temperature
228C	175 psig (1207 kPa) @ 100°F (37.8°C) media temperature
228SS	400 psig (2758 kPa) @ 100°F (37.8°C) media temperature

Materials Of Construction	
228B	Standard construction is cast bronze tee (Class 125 per ASME B16.15), copper couplings, admiralty brass UNS C44300 sleeve, glass-reinforced nylon impeller, Pennlon® UHMWPE bearings, tungsten carbide shaft, glass reinforced PPS housing, and ethylene propylene EPDM o-rings (other materials available special order).
228C	Standard construction is cast iron tee (class 125 per ASME B16.4), admiralty brass UNS C44300 sleeve, glass-reinforced nylon impeller, Pennlon® UHMWPE bearings, tungsten carbide shaft, glass reinforced PPS housing, and ethylene propylene EPDM o-rings (other materials available special order).
228SS	Standard construction is 316 stainless steel tee, 300 series SS sleeve, glass-reinforced nylon impeller, Pennlon® UHMWPE bearings, tungsten carbide shaft, glass reinforced PPS housing, and ethylene propylene EPDM o-rings (other materials available special order).
Dimensions	8.4"H x 7.9"W x 3.0"D (21.3 x 20.0 x 7.6 cm)
Weight	
228B	8.8 (4.0 kg)
228C	7.2 lb (3.3 kg)
228SS	12.0 lb (5.4 kg)
Approvals	CE
Warranty	1 year

ORDERING INFORMATION

MODEL	DESCRIPTION
228B-2	Brass flow sensor mounted in a 2" (5.08 cm) bronze tee (copper solder couplings included)
228C-2	Brass flow sensor mounted in a 2" (5.08 cm) cast iron pipe tee
228SS-2	Stainless steel flow sensor mounted in a 2" (5.08 cm) stainless steel pipe tee

ACCESSORIES

230-FRK	Repair kit for 200 Series flow sensors (includes impeller, shaft, bearing, and O-ring)
813124-1211	Replacement sleeve assembly for 220B, 228B, 228BC flow sensors

RELATED PRODUCTS		PAGE
310-00	Programmable analog flow transmitter	**255**
UFT-1A	Universal flow transmitter, pulse and calibrated 4-20 mA output	**256**

TEE MOUNTED FLOW SENSOR

250B

DESCRIPTION

The **250B Series** Flow Sensors consist of a removable flow sensor mounted in a cast bronze housing. They are available for 1/2" to 1-1/2" (1.3 to 3.8 cm) pipe sizes.

250B-0.5

SPECIFICATIONS

Connection Type	1/2" FNPT to 1-1/2" FNPT
Wiring	20' (6.1 m) 2-conductor 20 AWG shielded UL type PTLC wire, rated to 221°F (105°C). May be extended to 2000' maximum with similar cable
Accuracy	±1% of full scale
Repeatability	±0.7% of full scale
Linearity	±0.7% of full scale
Rangeability	60:1
Velocity Range	0.3 to 15 fps (.09 to 4.5 mps)
Media Compatibility	Hot water, chilled water, water/glycol, potable water (verify application is compatible with flow sensor materials of construction, check material compatibility resources prior to ordering)
Media Temperature Range	Maximum 221°F (105°C)
Maximum Pressure	400 psig (2758 kPa) @ 100°F (37.8°C) media temperature
Materials Of Construction	Cast bronze UNS C83600 tee, glass-reinforced nylon impeller, Pennlon® UHMWPE bearings, tungsten carbide shaft, glass reinforced PPS housing, and ethylene propylene EPDM o-rings

Dimensions	
250B-0.5, -0.75	4.6"H x 4.0"W x 1.6"D (11.7 x 10.2 x 4.1 cm)
250B-1	4.8"H x 5.5"W x 2.1"D (12.2 x 14.0 x 5.3 cm)
250B-1.25	5.0"H x 6.1"W x 2.4"D (12.7 x 15.5 x 6.1 cm)
250B-1.5	5.2"H x 6.5"W x 2.6"D (13.2 x 16.5 x 6.6 cm)
Weight	
250B-0.5	4.6 lb (2.1 kg)
250B-0.75	4.8 lb (2.2 kg)
250B-1	6.2 lb (2.8 kg)
250B-1.25	6.5 lb (2.9 kg)
250B-1.5	7.6 lb (3.4 kg)
Approvals	CE
Warranty	1 year

ORDERING INFORMATION

MODEL	DESCRIPTION
250B-0.5	Brass flow sensor mounted in a 1/2" (1.3 cm) NPT bronze pipe tee
250B-0.75	Brass flow sensor mounted in a 3/4" (1.9 cm) NPT bronze pipe tee
250B-1	Brass flow sensor mounted in a 1" (2.5 cm) NPT bronze pipe tee
250B-1.25	Brass flow sensor mounted in a 1-1/4" (3.2 cm) NPT bronze pipe tee
250B-1.5	Brass flow sensor mounted in a 1-1/2" (3.8 cm) NPT bronze pipe tee

RELATED PRODUCTS		PAGE
310-00	Programmable analog flow transmitter	**255**
813107-1211	Replacement sensor assembly for 250B, includes 20' cable	
UFT-1A	Universal flow transmitter, pulse and calibrated 4-20 mA output	**256**

DESCRIPTION

228PV flow sensors are designed to measure water flow in PVC pipes. These sensors consist of a removable, nonmagnetic sensor in a schedule 80 PVC tee with solvent-weld socket end connections. They are available in 1-1/2" to 4" (3.8 to 10.2 cm) sizes.

228PV

SPECIFICATIONS

Connection Type	Schedule 80 PVC
Wiring	20' (6.1 m), 20 AWG two-conductor shielded UL type PTLC cable, rated to 221°F (105°C), may be extended to 2000' maximum with similar cable
Accuracy	±1% of full scale
Repeatability	±0.3% of full scale
Linearity	±0.2% of full scale
Pulse Rate	3.2 to 200 Hz, 5 ms ±25% width, 9-20 VDC power @ 2 mA maximum; 5V CMOS and LSTTL compatible
Velocity Range	0.5 to 30 fps (0.15 to 9 mps)
Media Compatibility	Hot water, chilled water (verify application is compatible with flow sensor materials of construction, check material compatibility resources prior to ordering)
Media Temperature Range	Maximum 140°F (60°C)
Maximum Pressure	100 psig (689 kPa) @ 77°F (25°C) media temperature, decreasing to 40 psig (276 kPa) @ 140°F (60°C)
Materials Of Construction	PVC per ASTM D-2462 and D-2467 virgin unplasticized PVC resin, approved for potable water, PPS housing, EPDM o-ring, tungsten shaft, nylon impeller, Pennlon bearings
Dimensions	
228PV1505	5.2"H x 5.0"W x 2.4"D (13.1 x 12.7 x 6.0 cm)
228PV2005	5.6"H x 5.6"W x 2.9"D (14.3 x 14.3 x 7.3 cm)
228PV3005	6.8"H x 6.5"W x 4.2"D (17.3 x 16.5 x 10.7 cm)
228PV4005	6.8"H x 7.4"W x 5.4"D (17.3 x 18.7 x 13.7 cm)
Weight	
228PV1505	1.0 lb (.45 kg)
228PV2005	1.0 lb (.45 kg)
228PV3005	1.5 lb (.68 kg)
228PV4005	2.5 lb (1.1 kg)
Approvals	CE
Warranty	1 year

ORDERING INFORMATION

MODEL	DESCRIPTION
228PV1505-1211	Flow sensor in 1-1/2" PVC tee, pulse output
228PV2005-1211	Flow sensor in 2" PVC tee, pulse output
228PV3005-1211	Flow sensor in 3" PVC tee, pulse output
228PV4005-1211	Flow sensor in 4" PVC tee, pulse output

	RELATED PRODUCTS	PAGE
UFT-1A	Universal flow transmitter, pulse and calibrated 4-20 mA output	**256**

PVC INLINE FLOW SENSORS
4000 SERIES

DESCRIPTION

4000 Series flow sensors are designed to measure flow in small PVC pipes. They include a nonmagnetic flow sensor with schedule 80 PVC tail pieces (plain end pipe). They are available in 1/2" (1.3 cm), 3/4" (1.9 cm), and 1" (2.5 cm) sizes. Low flow models (410xxx and 411xxx), and models with an optional integral 4-20 mA loop-powered transmitter (4xx210) are available.

4000 Series

SPECIFICATIONS

Analog Output	2-wire, 4-20 mA (4xx210 models)
Pulse Rate	3.2 to 200 Hz, 5 ms ±25% width, 9-20 VDC power @ 2 mA maximum; 5V CMOS and LSTTL compatible (4xx200 models)
Wiring	
Pulse models	20' (6.1 m), 20 AWG three-conductor shielded cable
4-20 mA models	3' (.91 m), 20 AWG two-conductor shielded cable
Accuracy	±1% of full scale
Repeatability	±0.5% of full scale
Connection Type	PVC plain end pipe
Velocity Range	
400..., 401..., 402...	1.0 to 20 fps (.33 to 6.0 mps)
410..., 411...	0.25 to 8.0 fps (.075 to 2.4 mps)
Media Compatibility	Water, pure water (verify application is compatible with flow sensor materials of construction, check material compatibility resources prior to ordering)
Media Temperature Range	Maximum 140°F (60°C)
Maximum Pressure	350 psig (2413 kPa) @ 73°F (22.8°C) media temperature
Materials of Construction	PVC fittings, PPS housing, Viton o-ring, zirconia ceramic shaft, Tefzel impeller, UHMWPE bearings
Dimensions	
400..., 410...	3.4"H x 8.8"W x 3.5"D (9.1 x 22.2 x 8.9 cm)
401..., 411...	3.4"H x 10.8"W x 3.5"D (9.1 x 26.8 x 8.9 cm)
402...	3.4"H x 13.0"W x 3.5"D (9.1 x 33.1 x 8.9 cm)
Weight	
400..., 410...	.75 lb (.34 kg)
401..., 411...	.85 lb (.38 kg)
402...	.95 lb (.43 kg)
Approvals	CE
Warranty	1 year

ORDERING INFORMATION

MODEL	DESCRIPTION
400200-0021	Inline flow sensor with 1/2" PVC tail pieces, pulse output
400210-0021	Inline flow sensor with 1/2" PVC tail pieces, integral 4-20 mA
410200-0021	Inline low flow sensor with 1/2" PVC tail pieces, pulse output
410210-0021	Inline low flow sensor with 1/2" PVC tail pieces, integral 4-20 mA
401200-0021	Inline flow sensor with 3/4" PVC tail pieces, pulse output
401210-0021	Inline flow sensor with 3/4" PVC tail pieces, integral 4-20 mA
411210-0021	Inline low flow sensor with 3/4" PVC tail pieces, pulse output
411210-0021	Inline low flow sensor with 3/4" PVC tail pieces, integral 4-20 mA
402200-0021	Inline flow sensor with 1" PVC tail pieces
402210-0021	Inline flow sensor with 1" PVC tail pieces, integral 4-20 mA

RELATED PRODUCTS		PAGE
A-4000-20	Programming kit	
UFT-1	Universal flow transmitter, pulse output only	**256**

PROGRAMMABLE ANALOG FLOW TRANSMITTER
310 SERIES

DESCRIPTION

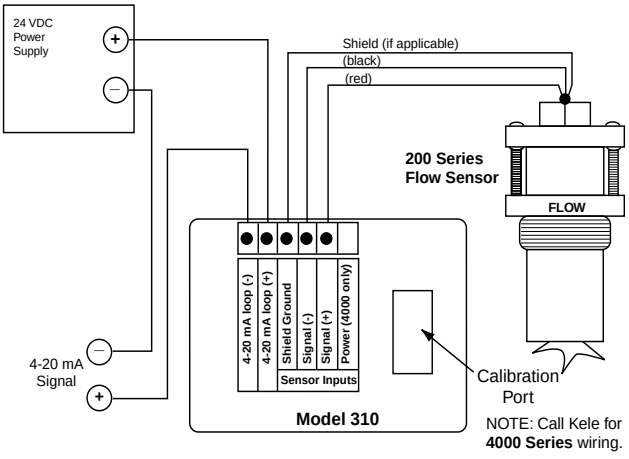
The **310 Series** programmable analog flow transmitter is a loop-powered device that converts the signal from a 200 or 4000 Series flow sensor into a linear 4-20 mA signal. An integral, adjustable electronic filter dampens the analog output for smooth, stable operation. The microprocessor-based **310 Series** can be ordered pre-configured, or it can be field-configured with a compute. An A301-20 Programming Kit will configure all **310 Series** transmitters.

FEATURES

- ***4-20 mA loop powered***
- ***Compact size***
- ***Computer programmable***
- ***Electronic signal dampening***

310-00

WIRING



SPECIFICATIONS

Supply Voltage	Loop powered, 9-35 VDC
Input Signal	0.4 to 10 kHz, unscaled raw pulses from Data Industrial flow sensor, or sine wave
Output Signal	4-20 mA, 2-wire
Maximum Output Impedance	750Ω @ 24 VDC
Configuration	A301-20 programming kit (order separately) cable connects to DIC communication port and DB9 COM port on a computer. Transmitter must be loop-powered for programming (9-24 VDC will work)
Accuracy	±0.04% of reading over entire span
Response Time	Varies with filter, typically 1 second 10% to 90% step response
Operating Temperature	-20° to 158°F (-29° to 70°C)
Mounting	
310-00	Surface mount, transmitter only
310-01	Surface mount, in NEMA 4X enclosure
310-02	Surface mount, in metal enclosure
310-03	Surface mount, in plastic enclosure
310-04	DIN rail mount, with clips
Dimensions	**310-00, -04** 1.8"H x 3.7"W x 1.5"D (4.4 x 9.3 x 3.8 cm) **310-01, -02, -03** 2.8"H x 4.5"W x 2.0"D (7.1 x 11.3 x 5.1 cm)
Warranty	1 year

ORDERING INFORMATION

MODEL	DESCRIPTION
310	Programmable analog flow transmitter
	MOUNTING
00	Transmitter only
01	Transmitter in NEMA 4X enclosure
02	Transmitter in metal enclosure
03	Transmitter in plastic enclosure
04	Transmitter with DIN rail mount
	OPTIONS
XR	Pre-configured option

310 – 00 – XR ***Example:*** **310-00-XR** Preconfigured programmable analog flow transmitter for field mounting

For preconfigured flow sensors, specify pipe size, schedule, and maximum flow rate at time of order.

	RELATED PRODUCTS	PAGE
A301-20	Flow/BTU transmitter programming kit, includes cable	
200 Series	Data Industrial impeller type flow sensors with pulse output	**247**

UNIVERSAL FLOW TRANSMITTER

UFT-1 SERIES

DESCRIPTION

The **UFT-1 Series** universal flow transmitter is a solid-state, digital signal converter designed to operate with Data Industrial 200 Series flow sensors. Both analog (4-20 mA) and pulse outputs are available. The **UFT-1** may be mounted in an optional NEMA 4X enclosure or with digital display of gpm or totalized flow (in a non-watertight enclosure).

UFT-1

UFT-1E-1

FEATURES

- ***Analog and pulse outputs***
- ***Optional watertight (NEMA 4X) enclosure***
- ***Optional displays for flow rate and totalization***
- ***Excitation voltage for flow sensors***
- ***LED indication of pulse activity***

OPERATION

INSTALLATION AND CALIBRATION

The **UFT-1** transmitter can be mounted in any position. NEMA 4X enclosed models have a watertight seal; when a display option is selected, however, the enclosure becomes non-watertight. Field calibration is not required with the **UFT-1** and flow conversion must be accomplished at the monitoring computer. The information below is provided for making the conversion calculations.

FLOW RATE

Flow (gpm) = ((mA measured - 4 mA) x Maximum gpm)/16 mA. Maximum gpm is the flow rate at 20 mA output on the transmitter and must be specified at the time the **UFT-1** is ordered for proper calibration.

TOTALIZED FLOW

Totalized gallons = (Flow factor) x (Output divider) x (Total pulses) For totalized m3, multiply the above by 0.00379.
Output divider = 10 or 100 depending on jumper-selection. Flow factors per pulse are shown in Table 1.

APPLICATION

ANALOG OUTPUT (RATE)

The **UFT-1** analog transmitter converts a Data Industrial digital flow signal into a precalibrated 4-20 mA signal. It must be calibrated for each Data Industrial flow sensor installation. The pipe type, size, and maximum flow rate must be specified at the time of order if 4-20 mA output is to be used.

PULSE OUTPUT (TOTALIZATION)

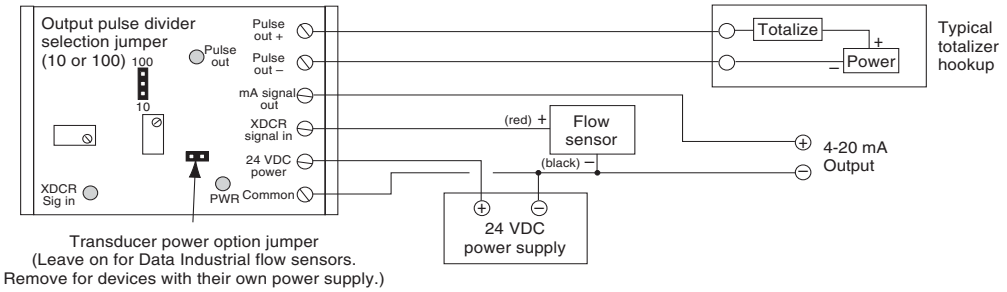
The **UFT-1** pulse output divides the Data Industrial digital flow signal by a jumper-selectable 10 or 100 to provide a more usable digital pulse. The pulse output is normally used where flow totalization is required. A simple conversion formula (using the flow factors for Data Industrial Flow Sensors on the next page) can convert the digital pulses to totalized gallons.
The pulse output is an optoisolated transistor switch that can be wired to source or sink pulses to totalizer equipment.

NOTE: The **UFT-1 Series** is not intended for field setup or field calibration.

SPECIFICATIONS

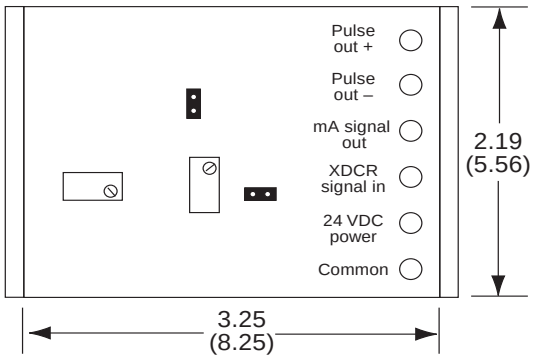
Supply Voltage	24 VDC
Input Signal	15 to150 Hz FS, dry or electric contact
Maximum Output Impedance	750Ω @ 24 VDC
Output Signal	
UFT-1	Solid state switch;
UFT-1A	4-20 mA
Pulse Output	40 VDC @ 200 mA
Configuration	Factory configure only; provide pipe size/ schedule and maximum flow rate at time of order
Accuracy	± 0.5%
Response Time	5 seconds from 10% to 90%
Operating Temperature	32° to 140°F (0° to 60°C)
Operating Humidity	5% to 90% RH non-condensing
Mounting	
UFT-1, -1A	Snap track
UFT-1E, -1AE	Surface mount, enclosed
Warranty	18 months

WIRING



DIMENSIONS

in
(cm)



FLOW FACTORS FOR DATA INDUSTRIAL FLOW SENSORS

MODEL	PIPE SIZE in (cm)	FLOW FACTOR	GALLONS/PULSE	
			JUMPER IN 10 POSITION	JUMPER IN 100 POSITION
228PV-1.5	1-1/2 (3.81)	0.03118	0.3118	3.118
228PV-2	2 (5.08)	0.04611	0.4611	4.611
228B-2	2 (5.08)	0.04579	0.4579	4.579
228C-2	2 (5.08)	0.04731	0.4731	4.731
250B-0.5	1/2 (1.27)	0.005646	0.05646	0.5646
250B-0.75	3/4 (1.91)	0.007514	0.07514	0.7514
250B-1	1 (2.54)	0.007015	0.07015	0.7015
250B-1.25	1-1/4 (3.18)	0.01280	0.1280	1.280
250B-1.5	1-1/2 (3.81)	0.01780	0.1780	1.780
220B-2.5	2-1/2 (6.35)	0.03800	0.3800	3.800
220B	3 (7.62)	0.07280	0.7280	7.280
220B	4 (10.16)	0.1396	1.396	13.96
220B	5 (12.7)	0.2457	2.457	24.57
220B	6 (15.24)	0.3611	3.611	36.11
220B	8 (20.32)	0.6710	6.710	67.10
220B	10 (25.40)	1.080	10.80	108.0
220B	12 (30.48)	1.630	16.30	163.0
220B	14 (35.56)	1.944	19.44	194.4
220B	16 (40.64)	2.502	25.02	250.2
220B	18 (45.72)	3.158	31.58	315.8

Notes
1. Flow factors for a **Model 225** and **226** are the same as **Model 220.**
* 2. Flow factor for **Model 228S** is the same as **228C.**
3. **PV Series** is sized for schedule 80 PVC pipe.
All other series are sized for schedule 40 black iron pipe.

ORDERING INFORMATION

MODEL	DESCRIPTION
UFT-1	Universal flow transmitter pulse output only
UFT-1A	Universal flow transmitter with pulse and calibrated 4-20 mA output*
UFT-1E	Universal flow transmitter pulse output in NEMA 4X enclosure
UFT-1AE	Universal flow transmitter with pulse and calibrated 4-20 mA output* in NEMA 4X enclosure
	DISPLAY OPTION (enclosed models only, enclosure changes to non-watertight)
1	Flow totalization only
2	Flow rate only
3	Flow totalization and flow rate**

UFT-1 – **1**

Example: **UFT-1A-E-2** Basic transmitter with calibrated 4-20 mA flow rate output (4 mA = no flow; 20 mA = max flow), enclosed with LCD flow rate indication

* Pipe size, schedule, and maximum flow rate must be specified at time of order.

** When a UFT-1AE3 is ordered the UFT-1A will be in one enclosure and the totalizer and rate display will be in a separate enclosure.

RELATED PRODUCTS		PAGE
200 Series	Data Industrial impeller type flow sensors with pulse output	**247**
DCP-1.5-W	Power supply, 24 VAC IN to 24 VDC OUT	**837**

FLOW MONITOR
3000 SERIES

DESCRIPTION

The Badger Meter **3000 Series** flow monitor is an economical, full-featured, compact unit designed for flow measurement applications. Outputs include one mechanical relay and one solid state pulse output, both featuring unit/pulse and set-point control independently based on flow or total readings. An analog 4-20 mA or 0-20 mA output is provided and USB, RS-485 Modbus, and BACnet/MSTP provide high-level communication.

A two-line by 16-character, 3/8" high backlit LCD display is configured by the user to display flow rate and flow total. Custom units can be created during field setup. The flow sensor input features flexible scaling options and signal type selections that permit the use of most Data Industrial flow sensors, or other frequency (sine/pulse) or linear devices.

3000-0-0

FEATURES

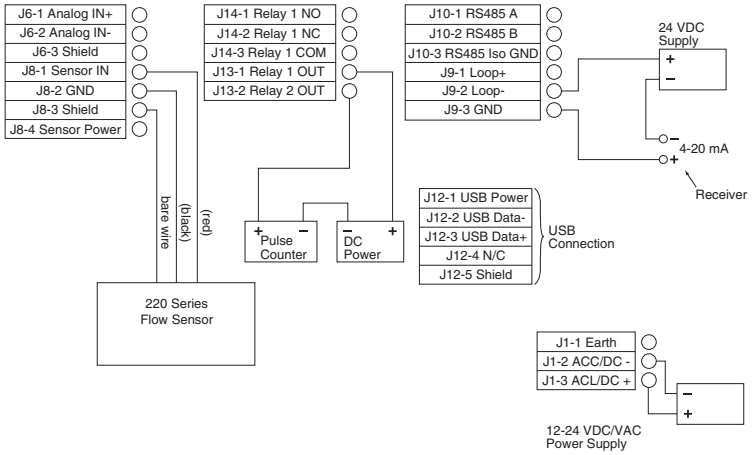
- ***One mechanical relay and one solid state relay output***
- ***Optional 0/4-20 mA output***
- ***USB, RS-485, Modbus, and BACnet/MSTP all in one unit***
- ***Menu-driven programming or Windows based programming***
- ***NEMA 4X rated***
- ***Two-line x 16-character display***
- ***Password-restricted access***
- ***Non-volatile memory***

SPECIFICATIONS

Supply Voltage	12-24 VAC/VDC
Input	Data Industrial flow sensor or other frequency (sine/pulse) device
Maximum Output Impedance	1 kΩ maximum load @ 24 VDC (sinking); 600Ω maximum load (sourcing)
Output	Solid state pulse output rated at 1A @ 30 VAC or 35 VDC; closed 0.5Ω @ 1A; open >10 MΩ
Relay Output	Relay and pulse output are fully functional as either totalizing or setpoint outputs
Relay Output Rating	5A @ 120 VAC or 30 VDC resistive; 1A @ 120 VAC or 30 VDC inductive
Analog Output	4-20 mA, 0-20 mA range, isolated (sinking or sourcing); loop powered (sinking) output 30 VDC @ 0 mA maximum, 3 VDC @ 20 mA minimum; self powered (sourcing) output with 600Ω maximum load
Pulse Rate	1 pulse per 1.0000000 to 99999999 units; any predefined or custom unit can be used for flow totalizing; contact time 1 to 9999 milliseconds
Setpoints	Flow rate alarm setpoint available
Communication Interface	USB 2.0A to mini-B 5-pin cable required, provides access to all programming and operation features
Communication Protocol	RS485 supports Modbus and BACnet/MSTP
Display	Backlit LCD, 16 characters/line, 0.31"H (0.79 cm), two lines
Engineering Units	Flow in GPM, gal/sec, gal/hr, Mgal/day, LPS, LPM, ft3/sec, ft3/min, ft3/hr, m3/sec, m3/min, m3/hr, acre-ft/sec, acre-ft/min, acre-ft/hr, bbl/sec, bbl/min, bbl/hr; Total in Mgal, liters, ft3, m3 acre-ft, bbl; or field-programmed custom
Operating Temperature	-4° to 158°F (-20° to 70°C)
Enclosure Rating	NEMA 4X
Dimensions	
Panel mount	3.8"H x 3.8"W x 3.2"D (9.6 x 9.6 x 6.3 cm)
Wall mount	4.7"H x 4.7"W x 3.6"D (12.0 x 12.0 x 9.2 cm)
Weight	
Panel mount	0.8 lb (0.34 kg)
Wall mount	1.2 lb (0.54 kg)
Approvals	CE, UL
Warranty	1 year

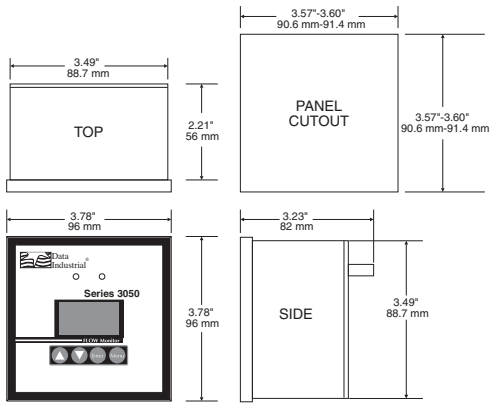
WIRING

Badger 3000 Flow Monitor

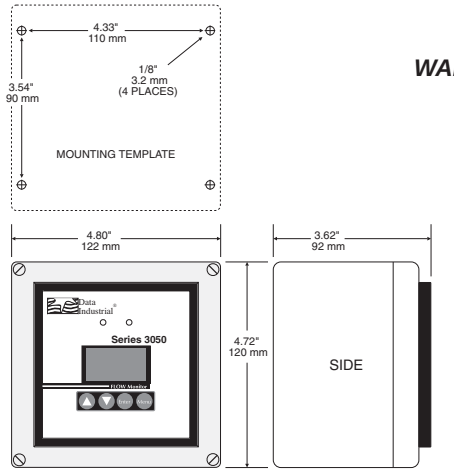


DIMENSIONS

PANEL MOUNT



WALL MOUNT



ORDERING INFORMATION

MODEL	DESCRIPTION
3050	BTU monitor with display
	ANALOG OUTPUTS
	0 No analog output
	1 Analog output, RS485 (BACnet/Modbus), and USB
	MOUNTING
	0 Panel mount
	1 Wall mount

RELATED PRODUCTS		PAGE
200 Series	Data Industrial impeller type flow sensors with pulse output	**247**

ULTRASONIC FLOWMETER
DTFXL SERIES

DESCRIPTION

The **DTFXL Series** ultrasonic flow meter measures water flow in a wide variety of pipe sizes and pipe materials, using clamp-on sensors that attach to the outside of the pipe. This non-invasive, non-contact flow meter provides instantaneous flow rate and accumulated flow and provides a 4-20 mA output as well as pulse outputs. The **DTFXL Series** flow meter is easy to install, has a large bidirectional flow range, and comes with or without a display. Configuration, monitoring, and calibration of the **DTXFL** is accomplished with an easy-to-use software package via a cable connection from a PC to the flow meter.
For systems using water/glycol solutions, the higher-powered DB Series ultrasonic flow meter is recommended.

FEATURES

- ***Transit-time technology in an economical package***
- ***Can handle some suspended solids and gas pockets***
- ***Bidirectional flow range for changeover systems***
- ***Multiple totalizers for forward, reverse, net***
- ***Models with or without display***
- ***Selectable standard or metric engineering units***
- ***Non-invasive, no system down time to install***
- ***4-20 mA output plus choice of pulse outputs***
- ***Optional armored cable***
- ***High temperature transducers available***

DYNASONICS
DIVISION OF RACINE FEDERATED INC.

DTFXL4-AN1-NN

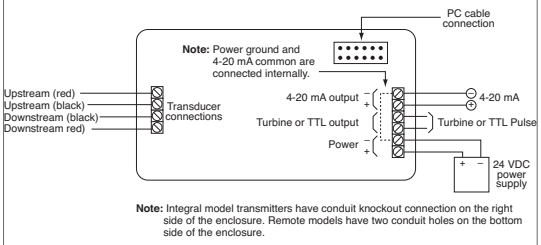
APPLICATION

The **DTFXL Series** is available in 3 basic transmitter/transducer arrangements for installation and application flexibility.
Models with integral transducers are available for pipe sizes 1/2" to 2"; the transmitter is attached to the transducers which clamp on to the pipe for a local mount arrangement.
Models with remote small pipe (1/2" to 2") clamp-on transducers require the transmitter to be wall- or panel-mounted away from the pipe.
Models with remote large pipe (2-1/2" to 100") strap-on transducers also require the transmitter to be wall or panel-mounted away from the pipe.
Transmitters are available with or without display.

SPECIFICATIONS

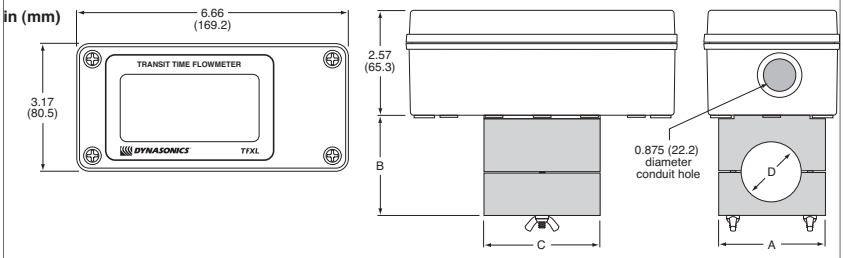
Supply Voltage	11 to 30 VDC
Frequency	0-1000 Hz for Turbine output (non-ground referenced AC and 100 mV pp minimum), switch selectable; 5 VDC pp ground-referenced square wave for TTL output
Supply Current	0.25 A
Maximum Output Impedance	900Ω maximum for 4-20 mA output; source power can share common with power supply
Outputs	4-20 mA and Turbine or TTL
Conduit Opening	1/2" conduit knockout (7/8" hole, 2.2 cm)
Cable Length	Remote transducer models available with 20' (6.1m), 50' (15m), or 100' (30m) cables
Accuracy	± 1.0% of reading above 1 fps (0.3 mps) velocity, ± 0.01% of reading below 1 fps (0.3 mps)
Response Time	0.3 to 30 seconds, adjustable
Display	Two-line x eight-character LCD
Operating Temperature	-40° to 185°F (-40° to 85°C); remote DTTS/DTTN transducers have upper limit of 250°F (121°C) and high temperature DTTH transducers have upper limit of 400°F (200°C)
Velocity Range	0.1 to 40 fps (feet/second), 0.03 to 12.4 mps (meters/second), bi-directional
Pipe Size Range	1/2" to 100" (1.2 to 254 cm)
Media Compatibility	Most clean liquids or liquids with some suspended solids or aeration, not recommended for glycol solutions, not for steam; for water/glycol systems the DE Series is recommended
Enclosure Rating	NEMA 4X as long as a liquid-tight connector is used
Approvals	ANSI/ISA 582.01; CSA C22.2 No. 213, E79-15-95
Warranty	1 year

WIRING



Note: Integral model transmitters have conduit knockout connection on the right side of the enclosure. Remote models have two conduit holes on the bottom side of the enclosure.

DIMENSIONS- INTEGRAL MODELS



Dimensions A, B, C and D vary by pipe size, the D dimension being slightly larger than the outside diameter of the pipe.

ORDERING INFORMATION

MODEL	DESCRIPTION
DTFXL1	Transmitter without display
DTFXL2	Transmitter with display
DTFXL3	Transmitter without display, UL enclosure
DTFXL4	Transmitter with display, UL enclosure
PIPE SIZE	
A	1/2" ANSI carbon steel
B	3/4" ANSI carbon steel
C	1" ANSI carbon steel
D	1 1/4" ANSI carbon steel
E	1 1/2" ANSI carbon steel
F	2" ANSI carbon steel
G	1/2" copper
H	3/4" copper
I	1" copper
J	1 1/4" copper
K	1 1/2" copper
L	2" copper
M	1/2" tubing (plastic)
N	3/4" tubing (plastic)
P	1" tubing (plastic)
Q	1 1/4" tubing (plastic)
R	1 1/2" tubing (plastic)
S	2" tubing
X	For DTTN, DTTH, DTTL transducers
Y	For DTTS, DTTC transducers
CONNECTOR OPTIONS	
N	1/2" conduit knockout
OUTPUT SIGNALS	
1-NN	4-20 mA and pulse

Remote transducers for small pipes (with "X" pipe size)	
MODEL	**DESCRIPTION**
DTTS	Remote transducers for 1/2" to 2" pipes
DTTC	High Temperature transducer for 1/2" to 2" pipes
PIPE SIZE	
D	1/2"
F	3/4"
G	1"
H	1 1/4"
J	1 1/2"
L	2"
PIPE TYPE	
P	ANSI carbon steel
C	Copper
T	Tubing
CABLE LENGTH	
020	20 feet (6.1 m)
050	50 feet (15 m)
100	100 feet (30 m)
CABLE ARMOR OPTION	
N	No armor
A	Flexible armor
CABLE ARMOR LENGTH	
000	No armor
020	20 feet (6.1 m)
050	50 feet (15 m)
100	100 feet (30 m)

Remote transducers for large pipes (with "X" pipe size)	
MODEL	**DESCRIPTION**
DTTN	Standard transducer for 2 1/2" to 20" pipes
DTTH	High temperature transducer for 2 1/2" to 100" pipes
DTTL	High large transducer for 24" to 100" pipes
CABLE LENGTH	
020	20 feet (6.1 m)
050	50 feet (15 m)
100	100 feet (30 m)
CABLE ARMOR OPTION	
N	No armor
A	Flexible armor
CABLE ARMOR LENGTH	
000	No armor
020	20 feet (6.1 m)
050	50 feet (15 m)
100	100 feet (30 m)
OPTIONS	
N	Normal area rating

NOTE: Add -C suffix to transmitter model number for factory-configured transmitter and fill out the application data sheet located on Kele's website. The UltraLink software is required to reset the DTFXL totalizer and to field configure, monitor, and diagnose the DTFXL. The PC cable is required to connect a PC to the DTFXL and the software is available on CD or free from www.dynasonics.com.

RELATED PRODUCTS		PAGE
D002-2007-001	Additional 36" stainless straps for DTTN/H transducers (two straps included standard with remote transducers)	
D005-0803-104	UltraLink software CD	
D005-2116-004	USB to DB-9 Serial Communications Cable	
D010-0204-001	PC to transmitter cable	
D010-2102-010	Mounting track assembly for DTTN/DTTH transducers, for <10" pipes	
DCP-1.5-W	Power supply, 24 VAC IN to 24 VDC OUT	**837**
DCPA-1.2	Power supply, 120 VAC IN to 24 VAC/24 VDC OUT	**836**

FLOW

MAGNETIC FLOW METER
M-2000 SERIES

DESCRIPTION

The **M-2000 Series** Magnetic Flow Meter from Badger Meter is the result of years of research and field use in electromagnetic flow meters. The M-2000 can measure almost any liquid, slurry or paste that has minimum electrical conductivity. These meters are perfect for flow measurement in commercial HVAC water systems, wastewater, reclaimed water, irrigation and industrial applications because they can handle suspended solids, have no pressure drop and no moving parts, and their accuracy is not affected by temperature, pressure, viscosity, density or flow profile. They are NSF listed for use in potable water. The ANSI 150 RF flanged pipe spool makes them easy to install and they are available with the NEMA 4X (IP66) integral amplifier (transmitter and display housing) mounted atop the flow detector housing, or with the amplifier remotely mounted. For the remote mount configuration, a 30 ft. cable is standard (other lengths available) and the detector housing comes with either a NEMA 4X or NEMA 6P (submersible) junction box. Each meter is factory calibrated and tested and a certificate is included.

NEW!

FEATURES

- ***High accuracy of +/- 0.25% and flow range of 300:1 for reliable measurement***
- ***Unaffected by most solids contained in the fluid for application flexibility***
- ***Pulsed DC magnetic field for zero point stability***
- ***Corrosion resistant liners provide long life***
- ***Grounding rings included for non-conductive piping***
- ***Bidirectional flow sensing and totalization for reversing system application***
- ***Empty pipe detection feature generates error message when pipe is not full***
- ***NEMA 4X (IP66) enclosure for installation in exposed areas***
- ***Large backlit 4-line, 20 character LCD display for local indication and programming even in low light conditions***
- ***Modbus RTU via RS232 communications for network systems***

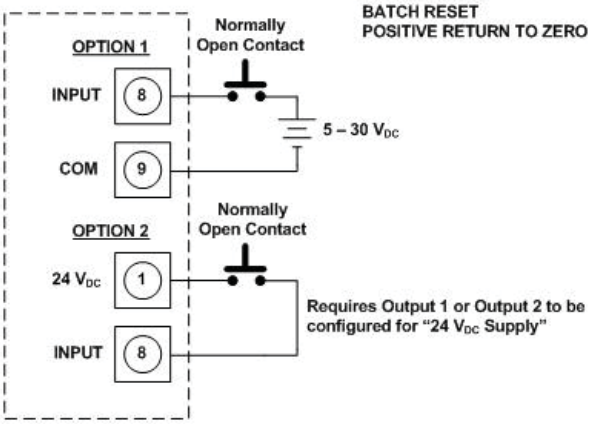
SPECIFICATIONS

Supply Voltage	8-26 VAC (45-65 Hz)
Supply Watts	15 W
Digital Inputs	Maximum 30 VDC, programmable as positive zero return, external totalizer reset, or preset batch start
Maximum Output Impedance	800 ohms @ 24 VDC
Outputs	
Analog output:	0-20 mA, 4-20 mA, 0-10 mA, or 2-10 mA
Digital outputs:	Four configurable, 24 VDC sourcing outputs (maximum of two) 50 mA each or 100 mA total, sinking open collector outputs (maximum of four) 100 mA each or 30 VDC total, AC solid state relay (maximum of two) 48 VAC 500 mA maximum
Pulse outputs:	Scalable up to 10 kHz, passive open collector up to 10 kHz active switched 24 VDC, up to two outputs (forward and reverse flow), pulse width programmable from 1 to 1,000 ms or 50% duty cycle
Frequency output:	Scaleable up to 10 kHz open collector, up to 1 kHz solid state relay
Alarm	High/low flow alarm, error alarm, empty pipe alarm outputs
Wiring Terminations	1/2" NPT conduit connection and 3 cord grips on amplifier housing; 30 ft. standard length cable for remote mount configurations (other lengths available)
Communication	RS232 - Modbus RTU or remote display
Accuracy	±0.25% of flow rate for velocities greater than 1.64 fps (0.5 mps; ±0.004% for lower velocities
Repeatability	±0.1%
Display	Backlit, 4 line, 20 character LCD and 3-button progamming keys
Engineering Units	Ounces, pounds, liters, US gallons, imperial gallons, barrels, hectoliters, megagallons, cubic meters, cubic feet, acre feet
Pipe Size Range	1" to 24" standard (1/4", 1/2" and 28" to 54" also available), ANSI 150 RF flanges standard
Flow Range	Unidirectional or bidirectional with two separate totalizers (programmable)
Velocity Range	0.10 to 39.4 fps (0.03 to 12 mps)
Operating Temperature	-4° to 140°F (-20° to 60°C)
Operating Humidity	Up to 90% non-condensing
Media Compatibility	Many fluid applications including hot or chilled water, glycol solutions; minimum conductivity 5.0 µΩ/cm
Media Temperature Range	178°F (80°C) with rubber liner; 212°F (100°C) with PTFE liner and local mount amp; 311°F (155°C) with PTFE liner and remote mount amp
Maximum Pressure	285 psig at ambient temperature, refer to ANSI B16.5 standard for 150 lb RF flanges for temperature/pressure spec
Materials Of Construction	Meter housing and flanges: carbon steel Liner: Rubber Electrodes: Alloy C Pipe spool: 316 SS Grounding rings: stainless steel Amplifier housing: cast aluminum with powder-coat paint
Enclosure Rating	NEMA 4X (IP66) amplifier housing; NEMA 4X or NEMA 6P detector housing junction box for remote mount configuration
Approvals	NSF Listed, CE
Warranty	1 year

NEW!

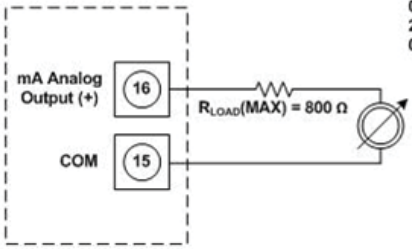
WIRING

DIGITAL INPUT



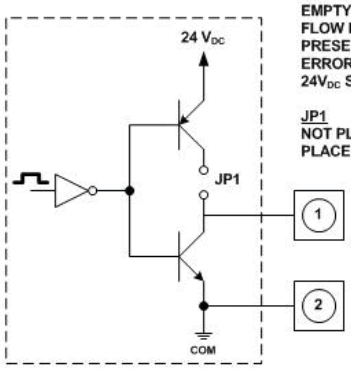
PROGRAMMABLE FUNCTIONS
REMOTE RESET
BATCH RESET
POSITIVE RETURN TO ZERO

ANALOG OUTPUT



PROGRAMMABLE RANGE
4-20 mA
0-20 mA
2-10 mA
0-10 mA

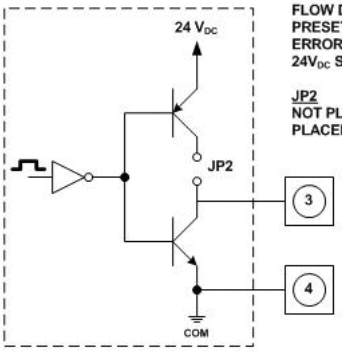
OUTPUT #1



PROGRAMMABLE FUNCTIONS
FORWARD PULSE
REVERSE PULSE
AMR PULSE
FLOW SET POINT
EMPTY PIPE ALARM
FLOW DIRECTION
PRESET OUTPUT
ERROR ALARM
24V_{DC} SUPPLY

JP1
NOT PLACED : PASSIVE OPERATION
PLACED: ACTIVE OPERATION

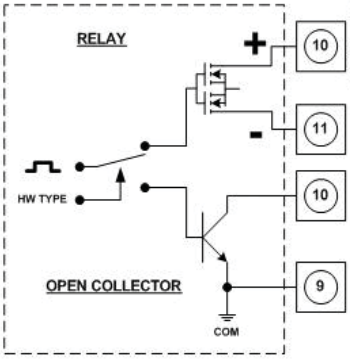
OUTPUT #2



PROGRAMMABLE FUNCTIONS
FORWARD PULSE
REVERSE PULSE
FLOW SET POINT
EMPTY PIPE ALARM
FLOW DIRECTION
PRESET OUTPUT
ERROR ALARM
24V_{DC} SUPPLY

JP2
NOT PLACED : PASSIVE OPERATION
PLACED: ACTIVE OPERATION

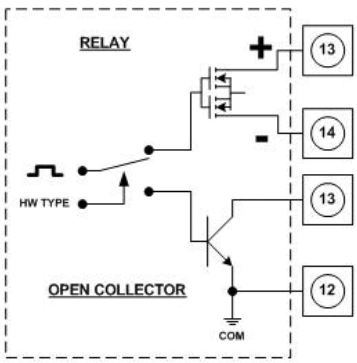
OUTPUT #3



PROGRAMMABLE FUNCTIONS
FREQUENCY OUTPUT
FLOW SET POINT
EMPTY PIPE ALARM
FLOW DIRECTION
PRESET OUTPUT
ERROR ALARM

PROGRAMMABLE CIRCUIT
SOLID STATE RELAY
OPEN COLLECTOR

OUTPUT #4



PROGRAMMABLE FUNCTIONS
FLOW SET POINT
EMPTY PIPE ALARM
FLOW DIRECTION
PRESET OUTPUT
ERROR ALARM

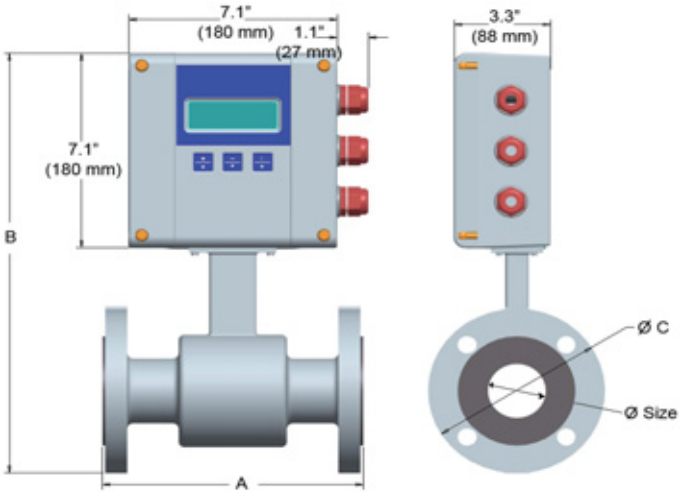
PROGRAMMABLE CIRCUIT
SOLID STATE RELAY
OPEN COLLECTOR

FLOW

MAGNETIC FLOWMETER
M-2000 SERIES

DIMENSIONS

Note: Dimension D in table below is overall height (similar to dimension B) to the top of junction box, for assemblies with remote amplifier configuration.



DIMENSIONS AND FLOW RANGES

Size	A	B	C	D	Weight	Flow Range
1" (DN25)	8.9" (22.5 cm)	14.4" (36.6 cm)	4.3" (10.8 cm)	11.7" (29.8 cm)	18 lb (8.0 kg)	0.3 to 93 gpm (1.2 to 350 lpm)
1-1/4" (DN32)	8.9" (22.5 cm)	15.2" (38.6 cm)	4.6" (11.7 cm)	12.5" (31.8 cm)	20 lb (9.0 kg)	0.5 to 150 gpm (2.0 to 575 lpm)
1-1/2" (DN40)	8.9" (22.5 cm)	15.4" (39.0 cm)	5.0" (12.7 cm)	12.7" (32.2 cm)	21 lb (9.5 kg)	0.8 to 239 gpm (3 to 900 lpm)
2" (DN50)	8.9" (22.5 cm)	15.9" (40.3 cm)	6.0" (15.2 cm)	13.2" (33.5 cm)	26 lb (11.5 kg)	1 to 373 gpm (4.7 to 1400 lpm)
2-1/2" (DN65)	11.0" (28.0 cm)	17.1" (43.4 cm)	7.0" (17.8 cm)	14.4" (36.6 cm)	52 lb (23.5 kg)	2 to 631 gpm (8 to 2400 lpm)
3" (DN80)	11.0" (28.0 cm)	17.3" (44.0 cm)	7.5" (19.1 cm)	14.7" (37.2 cm)	54 lb (24.5 kg)	3 to 956 gpm (12 to 3600 lpm)
4" (DN100)	11.0" (28.0 cm)	18.4" (46.6 cm)	9.0" (22.9 cm)	15.7" (39.8 cm)	56 lb (25.5 kg)	5 to 1493 gpm (19 to 5600 lpm)
5" (DN125)	15.8" (40.0 cm)	19.6" (49.8 cm)	10.0" (25.4 cm)	16.9" (43.0 cm)	58 lb (26.0 kg)	8 to 2334 gpm (30 to 8800 lpm)
6" (DN150)	15.8" (40.0 cm)	20.6" (52.4 cm)	11.0" (27.9 cm)	17.9" (45.6 cm)	60 lb (27.0 kg)	11 to 3361 gpm (40 to 12,700 lpm)
8" (DN200)	15.8" (40.0 cm)	22.5" (57.2 cm)	13.5" (34.3 cm)	20.4" (51.8 cm)	86 lb (39.0 kg)	20 to 5975 gpm (75 to 22,600 lpm)
10" (DN250)	19.7" (50.0 cm)	26.8" (68.1 cm)	16.0" (40.6 cm)	24.1" (61.3 cm)	178 lb (81 kg)	30 to 9336 gpm (120 to 35,300 lpm)
12" (DN300)	19.7" (50.0 cm)	28.9" (73.4 cm)	19.0" (48.3 cm)	26.2" (66.6 cm)	207 lb (94 kg)	45 to 13,444 gpm (170 to 50,800 lpm)
14" (DN350)	19.7" (50.0 cm)	30.8" (78.2 cm)	21.0" (53.3 cm)	28.2" (71.6 cm)	258 lb (117 kg)	60 to 18,299 gpm (230 to 69,200 lpm)
16" (DN400)	23.6" (59.0 cm)	33.7" (85.6 cm)	23.5" (59.7 cm)	31.0" (78.8 cm)	306 lb (139 kg)	80 to 23,901 gpm (300 to 90,400 lpm)
18" (DN450)	23.6" (59.0 cm)	35.0" (89.0 cm)	25.0" (63.5 cm)	32.4" (82.2 cm)	400 lb (181 kg)	100 to 30,250 gpm (380 to 114,000 lpm)
20" (DN500)	23.6" (59.0 cm)	38.2" (96.9 cm)	27.5" (69.9 cm)	35.5" (90.1 cm)	493 lb (224 kg)	125 to 37,346 gpm (470 to 140,000 lpm)
22" (DN550)	23.6" (59.0 cm)	39.6" (100 cm)	29.5" (74.9 cm)	36.9" (93.7 cm)	523 lb (237 kg)	150 to 45,188 gpm (570 to 170,000 lpm)
24" (DN600)	23.6" (59.0 cm)	42.2" (107 cm)	32.0" (81.3 cm)	39.5" (100 cm)	552 lb (251 kg)	180 to 53,778 gpm (680 to 200,000 lpm)

APPLICATION AND INSTALLATION

The M-2000 provides two amplifier mounting options, integral or remote. The amplifier housing is NEMA 4X rated and can be located outdoors; observe the operating temperature range of -4° to 140°F (-20° to 60°C). If located outdoors, provide a roof or shield over the amplifier to protect the LCD display from direct sunlight. If the amplifier is to be remote mounted, standard available cable lengths are 15', 30', 50' and 100' (up to 500' optional).

Magnetic flowmeters can operate accurately in any pipeline orientation and can measure flow in both directions. A "Forward Flow" direction arrow is printed on the detector label. They also perform best when placed in a vertical pipe with the liquid flowing upward; this assures a full pipe at all times and minimizes sediment deposits on the liner and electrodes. If mounting in a horizontal pipe, mount the detector such that the electrodes are on the sides of the pipe, not the top and bottom, also to minimize deposits and build-up on the electrodes. Avoid locations where a partially-filled piping situation can occur; the meter will display an "Empty Pipe Detection" message and will stop measuring flow until the pipe is full.

Sufficient straight-pipe runs are required for optimum accuracy and performance. A minimum of 3 diameters upstream and 2 diameters downstream are required (more is better).

Grounding is critical for magnetic flow meters; they must be electrically connected to the liquid media. If using non-conductive piping, the grounding rings (included) must be properly installed. See the M-2000 manual for details.

ORDERING INFORMATION

MODEL	DESCRIPTION		
M2K-	Magnetic flowmeter		
	SIZE CODE	PIPE SIZE	
	010	1"	
	013	1-1/4"	
	015	1-1/2"	
	020	2"	
	025	2-1/2"	
	030	3"	
	040	4"	
	050	5"	
	060	6"	
	080	8"	
	100	10"	
	120	12"	
	140	14"	
	160	16"	
	180	18"	
	200	20"	
	220	22"	
	240	24"	
		LINER CODE	LINER MATERIAL
		R-	Rubber
		T-	PTFE
			AMPLIFIER OPTIONS
			LC — Local mount amplifier, NEMA 4X (IP66) housing
			RM-N4X — Remote mount amp, 30 ft. cable, NEMA 4X junction box on detector tube
			RM-N6P — Remote mount amp, 30 ft. cable, NEMA 6P junction box on detector tube

M2K- | 040 | R- | LC

Example: ***M2K-040R-LC*** 4" magnetic flowmeter with rubber liner, local mount amplifier

FIXED AND RETRACTABLE INSERTION VORTEX FLOW METERS

2200, 3100 SERIES

DESCRIPTION

The **2200 Series** fixed insertion and **3100 Series** retractable vortex flow meters are used to measure the flow rate of water or water/glycol mixtures in 2" to 20" pipes. Each flow meter is factory calibrated and scaled to provide precise output signals. No complex field adjustments or confusing measurement routines are required to install the flow meters. Simple design, easy installation, reliable performance, and low cost make these flow meters an excellent choice for commercial HVAC applications.

2200 Series with optional display and Thredolet® mount

FEATURES

- ***No moving parts***
- ***Easy to install***
- ***Reliable and robust design***
- ***Wide flow range - 15:1 turndown ratio***
- ***Microprocessor based piezo resistive sensor technology***
- ***Optional integral display***

FIGURE 1. VORTICES CREATED BY A BLUFF BODY

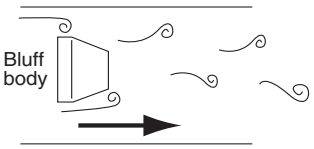
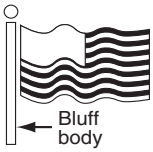


FIGURE 2. EXAMPLES OF VORTEX EFFECT



OPERATION

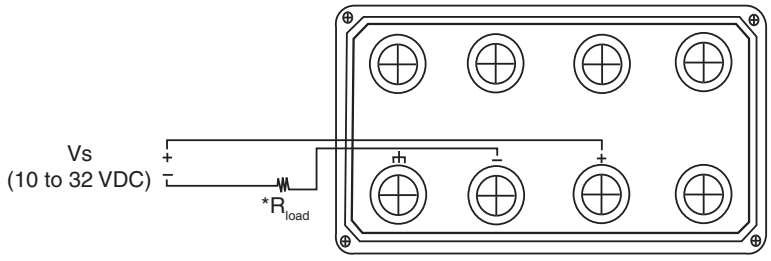
As flow passes a bluff body in the flow stream, vortices are alternately formed on either side of the bluff body (Figure 1). According to well-proven physical laws, the frequency at which vortices are alternately formed is directly proportional to the average flow velocity. The vortices create low- and high-pressure zones behind the bluff body. A vortex flow meter has a sensing element that detects these low- and high-pressure zones and the frequency at which they are created to measure flow.

The fluttering of a flag (Figure 2) is one example of how vortices are created. The flag pole acts as a bluff body to the blowing wind as the flag waves from the force of the vortices alternately created.

SPECIFICATIONS

Supply Voltage	10-32 VDC
Maximum Output Impedance	R(load) = 50 (Vs-10)
Output Signal	4-20 mA loop-powered standard (pulse output available special order)
Connections	2200: 1-1/2" MNPT 3100: 2" MNPT
Wiring Terminations	Screw terminals inside housing
Conduit Connection	3/4" FNPT
Configuration	For factory pre-configuration, specify pipe size, pipe material/schedule and maximum flow rate. Separately available Hydro-Flow Field-Pro software is available for field configuration
Accuracy	± 1% of full scale (combined linearity and repeatability)
Display	Optional, LCD alternates between showing 4-digit flow rate and 8-digit total flow
Engineering Units	English, gallons; metric, cubic meters (other units available upon request or can be configured using Hydro-Flow Field-Pro software)
Operating Temperature	-20° to 140°F (-29° to 60°C)
Velocity Range	1 fps (0.3 mps) minimum, 15 fps (4.5 mps) maximum
Pipe Size Range	2200: 2" to 20" (5 to 50 cm) 3100: 3" to 20" (8 to 50 cm)
Installation	Install in straight pipe section with a minimum distance of 10 pipe diameters upstream and 5 pipe diameters downstream to any bend, obstruction or transition
Mounting	Thredolet®, or piping tee (2200 Series only)
Media Compatibility	Water, water/glycol mixtures, condensate
Media Temperature Range	32° to 160°F (0° to 71°C)
Maximum Pressure	400 psig (2759 kPa) for Thredolet® mount, 150 psig (1035 kPa) for piping tee mount
Materials Of Construction	Reinforced polycarbonate enclosure, Ultem® plastic vortex shedder, 316 SS shedder bar, stainless steel stem, EPDM o-rings, brass compression fitting, aluminum/nickel-plated retractor (3300 Series only)
Enclosure Rating	NEMA 6
Warranty	2 years

WIRING



4-20 mA wiring
* R_{load} maximum = 50 (Vs - 10)

FLOW RANGES

	Pipe size in (mm)	2" (50)	3" (80)	4" (100)	6" (150)	8" (200)	10" (250)	12" (300)	14" (350)	16" (400)	18" (450)	20" (500)
2200 Series	Minimum flow gpm (m^3/h)	10.6 (2.4)	23.4 (5.4)	40 (9.2)	100 (23)	167 (38)	267 (61)	368 (83)	418 (95)	568 (129)	734 (167)	934 (212)
	Maximum flow gpm (m^3/h)	160 (36.3)	350 (79.5)	600 (136)	1500 (341)	2500 (557)	4000 (909)	5500 (1249)	6250 (1420)	8500 (1931)	11000 (2498)	14000 (3180)
3100 Series	Minimum flow gpm (m^3/h)	N/A	26.6 (6.0)	40 (9.0)	100 (23)	167 (38)	267 (61)	366 (83)	417 (95)	567 (129)	733 (167)	933 (212)
	Maximum flow gpm (m^3/h)	N/A	400 (90.8)	600 (136)	1500 (341)	2500 (557)	4000 (909)	5500 (1249)	6250 (1420)	8500 (1931)	11000 (2498)	14000 (3180)

ORDERING INFORMATION

MODEL	DESCRIPTION
2200	Fixed insertion vortex flow meter
3100	Retractable insertion vortex flow meter

PIPE SIZE	DESCRIPTION
02	2" pipe (fixed insertion only)
03	3" pipe
04	4" pipe
06	6" pipe
08	8" pipe
10	10" pipe
12	12" pipe
14	14" pipe
16	16" pipe
18	18" pipe
20	20" pipe

MOUNTING	DESCRIPTION
1	Thredolet®
4	Tee (2" size only)

OUTPUT, DISPLAY OPTIONS	DESCRIPTION
2-1-1	4-20 mA output, no display
2-2-1	4-20 mA output, display, English units

2200 **06** **1** **2-1-1**

Example: **2200-06-1-2-1-1** Fixed insertion flow meter, 6" pipe, Thredolet® mount, 4-20 mA, no display

Notes: Other options and configurations available. Separately ordered configuration software also available for field configuration. Consult Kele with calibration information when ordering (pipe size, fluid temperature and pressure, max flow rate).

INSERTION VORTEX FLOW METER

V-BAR 700

DESCRIPTION

The **V-Bar 700** insertion vortex flow meter can be used to measure the flow rates of most liquids, gases, and steam. The same **V-Bar 700** will fit pipe sizes from 3" to 80" (8 to 200 cm), features no moving parts, adds negligible head loss to the system, and comes with an easily programmable integral local flow rate indicator and totalizer. The microprocessor-based electronics condition the signal and provide a frequency output, a scaled pulse output, or a 4-20 mA output.

OPERATION

Vortex flow meters are devices that measure the frequency of vortices created in the flow stream. Vortices are like tiny eddies produced by an obstruction (called a bluff body) in the flow and are actually areas of low pressure. These vortices travel with the flow downstream until they run out of energy. Inserting a bluff body (Figure 1) into the stream creates these vortices that alternate from side to side. The frequency of these vortices or pressure pulses can be measured and are directly proportional to the average flow rate. A flag waving in the wind is an example of this vortex effect (Figure 2). The flagpole is the bluff body, and the high- and low-pressure areas are seen as high and low ridges in the flag. These ridges alternate as they travel across the flag and cause the flag to appear to be waving.

FEATURES

- ***Measures flow rates of liquids, gases, or steam***
- ***2000 psig (13,790 kPa) pressure rating***
- ***500°F temperature rating***
- ***No moving parts***
- ***Integral transmitter with local display***
- ***Stainless steel construction***

FIGURE 1. VORTICES CREATED BY A BLUFF BODY

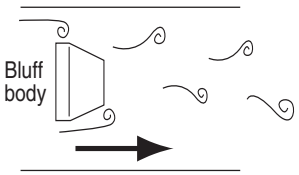
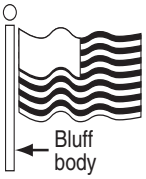


FIGURE 2. EXAMPLES OF VORTEX EFFECT



SPECIFICATIONS

Supply Voltage	Isolated 18-40 VDC
Supply Current	35 mA maximum
Maximum Output Impedance	R(load) = 50 (Vs-18)
Output Signal	4-20 mA two-wire loop-powered, scalable frequency voltage pulse (3-wire 0-3000 Hz square wave, 50% duty cycle, low level = 0-1 V, high level = power supply voltage-load)
Connections	2" MNPT process connection, 1/4" pressure tap
Wiring Terminations	Screw terminals inside housing
Conduit Connection	3/4" FNPT
Configuration	Factory pre-configuration required, see Ordering Information
Accuracy	± 1.0% of flow rate for water applications, ± 1.5% of flow rate for steam and gas
Repeatability	± 0.15% of flow rate
Response Time	Adjustable from 1 to 100 seconds
Display	2-line by 8-character LCD alternately shows flow rate and total flow. Four-button interface enables local programming modifications
Engineering Units	English, gallons; metric, cubic meters (other units available upon request)
Operating Temperature	-20° to 140°F (-29° to 60°C)
Operating Humidity	5 to 100% RH non-condensing
Velocity Range	Liquid flow: 1.5 fps (0.5 mps) minimum, 32 fps (9 mps) maximum
Pipe Size Range	3" to 80" (8 to 200 cm)
Installation	Straight pipe section, minimum 10 pipe diameters upstream, 5 pipe diameters downstream
Mounting	Thredolet®, or piping tee
Media Compatibility	Liquid, gas or steam
Media Temperature Range	-200° to 500°F (-129° to 260°C)
Maximum Pressure	2000 psig (138 bar)
Materials Of Construction	Wetted parts: 316 stainless steel (or cast equivalent); External parts: Aluminum, 316 SS, carbon steel; Electrical enclosure: 383 Aluminum
Enclosure Rating	NEMA 4X
Dimensions	Maximum overall height 32.5" (82.6 cm); insertion 3" minimum to 10" maximum (7.6 to 25.4 cm), recommended service clearance 12" (30.5 cm)
Weight	9 lb (4.1 kg) maximum
Warranty	2 years

ORDERING INFORMATION

Please call Kele for specific application and prices. The following information is required:

1. Pipe size and schedule
2. Type of gas or liquid
3. Operating pressure
4. Maximum flow rate (btu/h, lb/hr, scfm)
5. Temperature
6. Constant or varying pressure

DESCRIPTION

The **KVS** and **KV Series** target flow meters are highly durable and reliable flow meters for steam, liquids, and gases. With no moving parts, they measure flow with a strain gauge bridge circuit (outside the fluid) on a shaft attached to a stainless steel target in the pipe. The signal from the strain gauge circuit is converted to an analog signal by a transmitter mounted in an integral explosionproof housing (standard).

venture MEASUREMENT

Fixed insertion meter with Model 2000 4-20mA transmitter

FEATURES

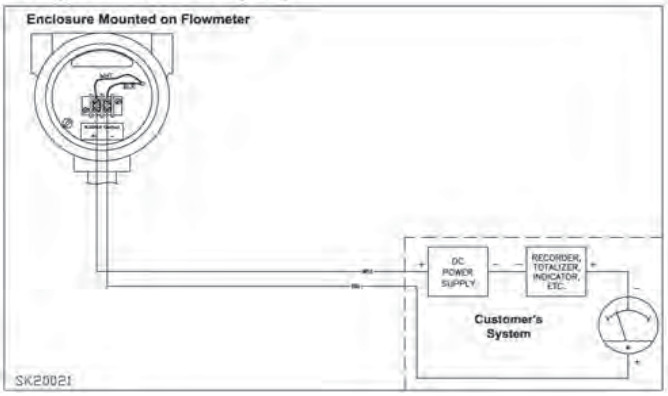
- ***Hermetically sealed, bonded strain gage technology***
- ***No moving parts for long life and high durability***
- ***Integral linear analog transmitter***
- ***NEMA 4X housing standard***

SPECIFICATIONS

Supply Voltage	12-42 VDC
Maximum Output Impedance	RL = (Vsupply - 12) * 43.33
Output Signal	2-wire, 4-20 mA, linear to flow
Wiring Terminations	Screw terminals inside housing
Conduit Connection	3/4" FNPT
Configuration	Factory pre-configuration required to assure application/product match: specify pipe size and material/ schedule, fluid/gas type, operating pressure and temperatures, and minimum/maximum flow rates
Accuracy	± .05% for pipe sizes up to 8", 1% to 2% for pipe sizes over 8"
Repeatability	± 0.15% of flow rate
Response Time	.002 to 0.1 seconds
Display	2-line alphanumeric with bar graph
Operating Temperature	-4° to 170°F (-20° to 75°C)
Flow Range	19.6 gpm (4" pipe) to 98,000 gpm (60" pipe)
Velocity Range	Liquid flow: 1.5 fps (0.5 mps) minimum, 32 fps (9 mps) maximum
Pipe Size Range	4" to 60" (100 to 1500 cm)
Installation	Install in straight pipe section with a minimum distance of 10 pipe diameters upstream and 5 pipe diameters downstream to any bend, obstruction or transition
Mounting	ANSI flanges standard, other options available
Media Compatibility	Liquid, gas or steam
Media Temperature Range	-65° to 425°F (-54° to 218°C), other ranges special order
Maximum Pressure	>1000 psi (69 bar) for primary sensing elements; piping connections per applicable ANSI specs
Materials of Construction	Wetted parts: 304 and 316 stainless steel (or cast equivalent), Teflon® seals; Electronics housing: Polyester coated Aluminum
Enclosure Rating	NEMA 4X
Dimensions	Height 10.8" (27.3 cm) from mounting flange to top of transmitter; insertion length depends on pipe size specified, target locates in center of pipe
Weight	9 lb (4.1 kg) maximum
Warranty	2 years

WIRING

Integral Model 2000 Wiring Diagram



ORDERING INFORMATION

MODEL	DESCRIPTION
KV	Insertion target flow meter, integral transmitter, for water
KVS	Insertion target flow meter, integral transmitter, for steam

LINE SIZE (inches)	DESCRIPTION
4, 5, 6, 8, 10, 12, etc.	Select pipe size (larger insertion and smaller in-line models also available)

MOUNTING	DESCRIPTION
M	2" raised-face flange
P	4" raised-face flange

FLANGE RATING	DESCRIPTION
1	150 # raised-face ANSI
2	300 # raised-face ANSI

BODY, ELEMENT	DESCRIPTION
S1K	303/304 SS Body, 1,000 psi, 425 DF rating

KV — 6 — M — 1 — S1K

Example: **KV-6-M-1-S1K** Insertion target flow meter for water, 6" pipe size, 2" RF 150 # mounting flange, 303/304 SS body, 1,000 psi, 425 DF rating

NOTES: The following information is required. Each flow meter is factory-configured for a specific application.

1) Type of fluid or gas
2) Operation pressure and temperature
3) Maximum flow rate (gpm, lb/hr, scfm, etc.)
4) Transmitter output required (4-20 mA, pulse, mass flow, batch relay control, etc.)
5) Constant or varying pressure

Smaller pipe size inline target flow meters (1/2" - 3") also available. Remote transmitters, retractable type flow meters, and many other options also available. Consult Kele.

ACCESSORIES		PAGE
DCP-1.5-W	Power supply, 24 VAC IN to 24 VDC OUT	837

DESCRIPTION

The Data Industrial **340 Series** is an inexpensive and easy-to-apply BTU transmitter which calculates energy usage based on liquid flow rate from a Data Industrial impeller flow sensor and differential temperature using two 10 kΩ thermistor inputs. The onboard microcontroller and digital circuitry provide precise measurements and produce accurate drift-free outputs. Configuration is accomplished with a Windows® based software programming kit. The **340 Series** is available with a standard pulse output or with onboard communication technology for LonWorks, BACnet, Johnson Controls N2 Metasys, or Modbus networks.

340-00

FEATURES

- ***AC or DC powered for installation flexibility***
- ***Field programmable makes changes easy***
- ***Small footprint saves panes space***
- ***Uses two matched 10 kΩ thermistors***
- ***Used with Data Industrial flow sensors***

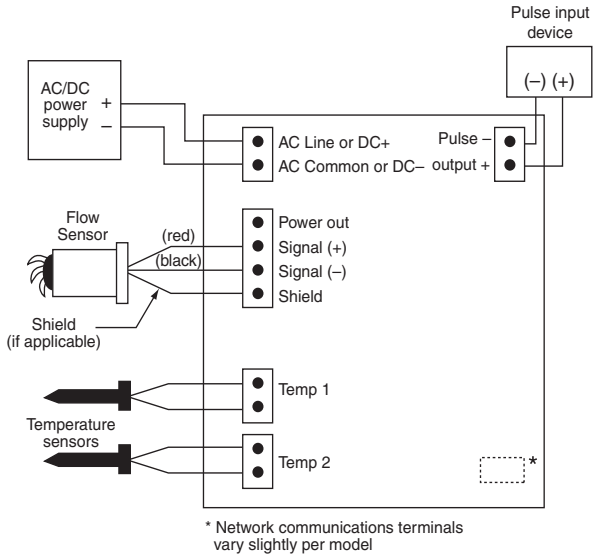
SPECIFICATIONS

Supply Voltage	12-24 VAC ±5% or 12-24 VDC ±10%
Supply Current	60 mA @ 24 VDC
Input Signal	All flow sensors: Excitation voltage 3-wire, 7.9-11.4 VDC, 270Ω source impedance Pulse sensors: Signal amplitude 2.5 VDC threshold, signal limit <35V AC or DC peak, frequency 0-10 kHz, pull-up 8.5 VDC @ 2 kΩ source impedance Sine wave sensors: Signal amplitude 10 mV p-p threshold, signal limit <35V AC or DC peak, frequency 0-10 kHz Temperature sensors: Two matched 10 kΩ @ 25°C, two-wire, type II
Output Signal	
-- Output	Pulse, isolated solid state switch programmed for units of energy or flow
BN Output	BACnet and Modbus communication
NW Output	LonWorks communication
N2 Output	N2 communication
MB Output	Modbus communication
Pulse Output	Voltage range: 0 to ±60V (DC or AC peak); On-state load current: 700 mA maximum; On-state load resistance: 700 mΩ; Off-state leakage: < 1µA @ 60 V peak; Pulse width: adjustable from .05 to 5.0 seconds
User Interface	Computer connection allows visibility of real-time flow rate, flow total, temperature readings, energy rate and energy total
Communication	None (base unit), BACnet and Modbus, LonWorks, Metasys N2, or Modbus
Configuration	Windows® based A301-20 programming kit (order separately) cable connects to DIC communication port and DB9 COM port on a computer for calibration of flow sensor information, units, output scaling; unit must be powered to configure
Mounting	
-00 Enclosure	Surface mount, no enclosure
-02 Enclosure	Surface mount, in metal enclosure
-03 Enclosure	Surface mount, in plastic enclosure
-04 Enclosure	DIN rail mount, with clips
Operating Temperature	-20° to 158°F (-29° to 70°C)
Weight	0.3 lb (0.14 kg)
Warranty	1 year

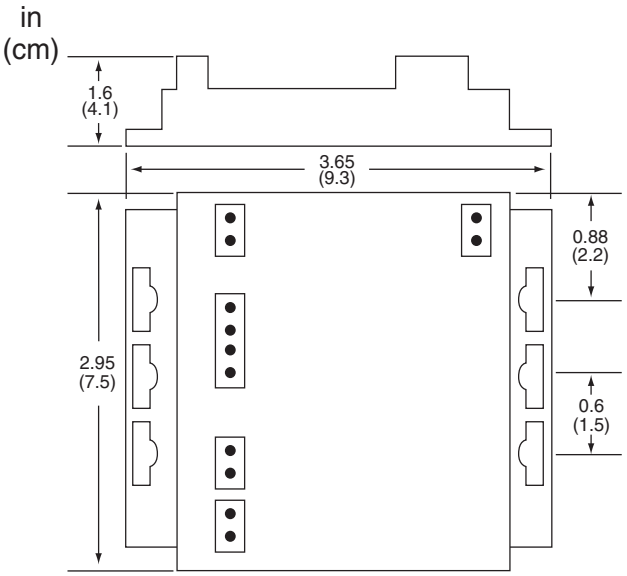
BTU TRANSMITTER

340 SERIES

WIRING



DIMENSIONS



ORDERING INFORMATION

MODEL	DESCRIPTION
340	BTU meter
	OUTPUT
-	Transmitter with standard pulse output
LW	Transmitter for use with LONWorks networks
N2	Transmitter for use with Johnson Metasys networks
BN	Transmitter for use with BACnet and Modbus networks
	ENCLOSURE
00	Transmitter only
02	Transmitter with metal enclosure
03	Transmitter with plastic enclosure
04	Transmitter with DIN rail mounting clips

340 – **–** – **02** ***Example:*** **340 Series** BTU meter with standard pulse output and metal enclosure

RELATED PRODUCTS		PAGE
200 Series	Data Industrial impeller type flow sensors with pulse output	**247**
A301-20	Flow/BTU transmitter programming kit, includes cable	
ST-U24B-XP	Temperature sensors, matched ±0.1°F, brass wells	**1030**
ST-U24S-XP	Temperature sensors, matched ±0.1°F, stainless steel wells	**1030**

ACCESSORIES		PAGE
691-K0A	Control transformer, 120:24 VAC, 40 VA, Class 2	**819**
DCP-1.5-W	Power supply, 24 VAC IN to 24 VDC OUT	**837**

DESCRIPTION

The Badger Meter **3050 Series** BTU monitor is an economical, full-featured, compact unit designed for BTU measurement applications. Outputs include one mechanical relay and one solid state pulse output, both featuring unit/pulse and set-point control independently based on flow or total readings. An analog 4-20 mA or 0-20 mA output is optional and USB, RS-485 Modbus, and BACnet/MSTP provide high-level communication.

A two-line by 16-character, 3/8" high backlit LCD display is configured by the user to display flow rate and flow total plus energy and temperature measurements. Custom units can be created during field setup. The flow sensor input features flexible scaling options and signal type selections that permit the use of most Data Industrial meter sensors, or other frequency (sine/pulse) or linear devices. Matched 10 kΩ thermistors (ordered seperately) provide temperature differential for BTU calculations.

3050-1-0

FEATURES

- ***One mechanical relay and one solid state relay output***
- ***Optional 0/4-20 mA output***
- ***USB, RS-485, Modbus, and BACnet/MSTP all in one unit***
- ***Menu-driven programming or Windows based programming***
- ***NEMA 4X rated enclosure***
- ***Two-line x 16-character display***
- ***Password-restricted access***
- ***Non-volatile memory***
- ***Temperature sensor zeroing***

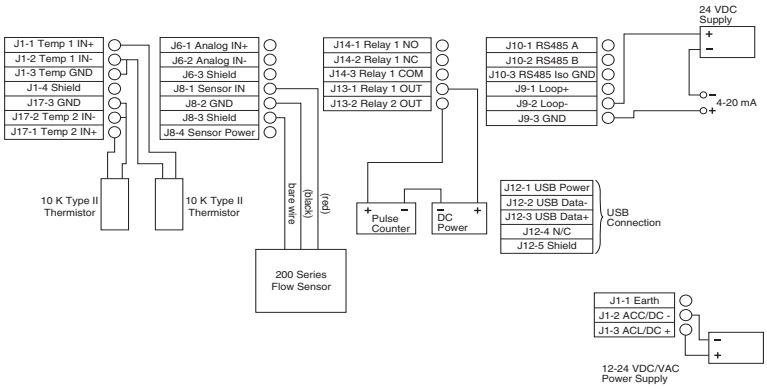
SPECIFICATIONS

Supply Voltage	12-24 VAC/VDC
Input	Data Industrial flow sensor or other frequency (sine/pulse) device
Sensor Input	Two 2-wire 10 kΩ type II thermistors or 100Ω 3-wire platinum RTDs or field-defined custom temperature inputs
Maximum Output Impedance	1 kΩ @ 24 VDC
Output	Solid state pulse output rated at 1A @ 30 VAC or 35 VDC; closed 0.5Ω @ 1A; open >10 MΩ
Relay Output	Relay and pulse output are fully functional as either totalizing or setpoint outputs
Relay Output Rating	5A @ 120 VAC or 30 VDC resistive; 1A @ 120 VAC or 30 VDC inductive
Analog Output	4-20 mA, 0-20 mA (isolated, sinking or sourcing); loop powered (sinking) 30 VDC @ 0 mA maximum, 3 VDC @ 20 mA minimum; self powered (sourcing) 600Ω maximum load
Pulse Rate	1 pulse per 1.0000000 to 99999999 units; any predefined or custom unit can be used for flow or BTU totalizing; contact time 1 to 9999 milliseconds
Setpoints	Setpoint alarm for flow rate, BTU rate, Temp1, Temp2, DeltaT using any predefined or custom unit
Zero Adjustments	Compensation for variances between input sensors by adjusting T2 to match T1
Communication Interface	USB 2.0A to mini-B 5-pin cable required, provides access to all programming and operation features
Communication Protocol	RS485 supports Modbus and BACnet/MSTP
Display	Backlit LCD, 16 characters/line, 0.31"H (0.79 cm), two lines
Engineering Units	Flow and Total in gal, liters, ft3, acre-ft, or bbl; Energy rate kBTU/hr, BTU/min, KW, Tons, J/sec or field-programmed custom; energy total units can be MBTU, kBTU, kWh, MWh, kJ, or field-programmed custom
Operating Temperature	-4° to 158°F (-20° to 70°C)
Enclosure Rating	NEMA 4X
Weight	
Panel mount	0.8 lb (0.34 kg);
Wall mount	1.2 lb (0.54 kg)
Approvals	CE, UL
Warranty	1 year

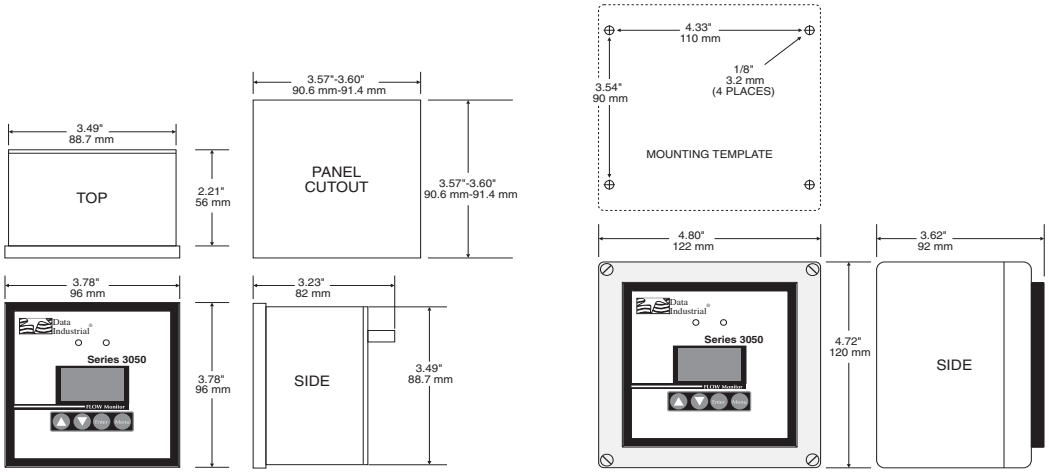
BTU MONITOR
3050 SERIES

WIRING

Badger 3050 BTU Monitor



DIMENSIONS



ORDERING INFORMATION

MODEL	DESCRIPTION	
3050	BTU monitor with display	
	ANALOG OUTPUTS	
	0	No analog output
	1	Analog output, RS485 (BACnet/Modbus), and USB
	MOUNTING	
	0	Panel mount
	1	Wall mount

RELATED PRODUCTS		PAGE
200 Series	Data Industrial impeller type flow sensors with pulse output	**247**
ST-U24B-XP	Temperature sensors, matched ±0.1°F, brass wells	**1030**
ST-U24S-XP	Temperature sensors, matched ±0.1°F, stainless steel wells	**1030**

DESCRIPTION

The **380 Series** BTU meters provide an inexpensive solution to monitoring thermal energy consumption in cold or hot water systems. The integrated flow and temperature sensors along with the internal metering components make installation and commissioning easy. With on-board Modbus and BACnet communication and a compact design that will fit in a wall, the 380 Series is perfect for networking and multi-tenant billing applications.

380CS07

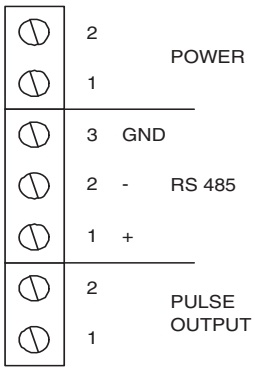
FEATURES

- ***AC or DC power***
- ***Field programmable***
- ***Scaled pulse or RS-485 (Modbus and BACnet) output standard***
- ***Two temperature sensors included***
- ***Compact, fits within a standard 2X4 stud wall***
- ***Compatible with potable water and water/glycol mixtures***

APPLICATION

Strip Malls
Multi-tenant buildings
Office buildings
Thermal storage systems
Sustainable design buildings

WIRING

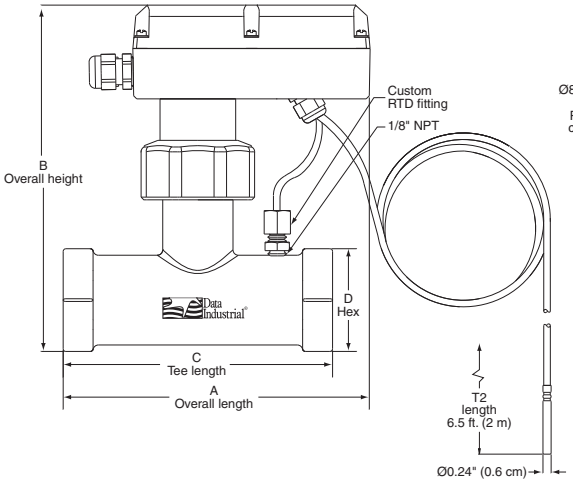


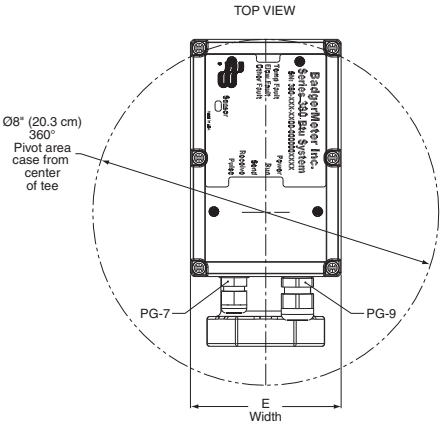
SPECIFICATIONS

Supply Voltage	12-28 VAC or 12-35 VDC
Supply VA	5 VA
Supply Current	200 mA maximum
Sensor Input	0.24" diameter RTD probe, meets IEC751 Class B; 6.5' (2 m) cable for remote sensor, custom fitting for 1/8" NPT pipe tap included
Output	Scaled pulse: 10, 50, 150, 200 or 250 ms
Wiring	Two cable glands, PG6 and PG9
Wiring Terminations	Screw terminals inside enclosure
Communication	Modbus RTU, BACnet
Repeatability	±0.5%
Size	3/4", 1", 1-1/4", 1-1/2", 2"
Connections	FNPT
Velocity Range	1 to 15 fps
Operating Temperature	-4° to 149°F (-20° to 65°C)
Media Temperature Range	
Cold service	-4° to 140°F (-20° to 60°F)
Hot service	39° to 257°F (4° to 125°C)
Materials Of Construction	
	Cast bronze tee, 316 SS impeller, PEEK flow sensor, polyurethane potting material, polycarbonate housing
Enclosure Rating	NEMA 4
Weight	
3/4"	6 lb (2.7 kg)
1"	7 lb (3.2 kg)
1-1/4"	8 lb (3.6 kg)
1-1/2"	9 lb (4.1 kg)
2"	13 lb (5.9.kg)
Warranty	1 year

BTU METER
380 SERIES

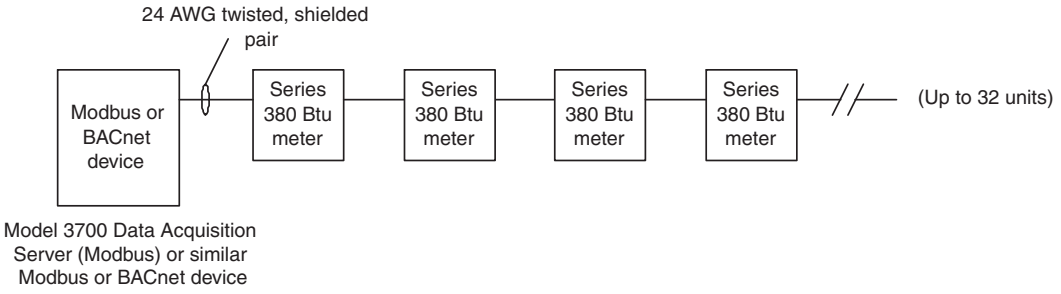
DIMENSIONS





TEE/NPT SIZE	Dimensions in (cm)				
	A	B	C	D	E
2"	7.9 (20.1)	8.5 (21.6)	7.8) (19.8)	3.3 (8.4)	3.5 (8.9)
1.5"	7.3 (18.5)	8.3 (21.1)	6.7 (17.1)	3.8 (9.7)	3.5 (8.9)
1.25"	7.1 (18)	8.1 (20.6)	6.3 (16)	2.4 (6.1)	3.5 (8.9)
1"	6.7 (17.1)	7.9 (20.1)	5.4 (13.7)	2 (5.1)	3.5 (8.9)
3/4"	6.7 (17.1)	7.9 (20.1)	5.4 (13.7)	2 (5.1)	3.5 (8.9)

INSTALLATION



Model 3700 Data Acquisition Server (Modbus) or similar Modbus or BACnet device

ORDERING INFORMATION

MODEL	DESCRIPTION
380CS07	380 BTU System, cold service, 3/4" FNPT
380CS10	380 BTU System, cold service, 1" FNPT
380CS12	380 BTU System, cold service, 1-1/4" FNPT
380CS15	380 BTU System, cold service, 1-1/2" FNPT
380CS20	380 BTU System, cold service, 2" FNPT
380HS07	380 BTU System, hot service, 3/4" FNPT
380HS10	380 BTU System, hot service, 1" FNPT
380HS12	380 BTU System, hot service, 1-1/4" FNPT
380HS15	380 BTU System, hot service, 1-1/2" FNPT
380HS20	380 BTU System, hot service, 2" FNPT

RELATED PRODUCTS

3700	Data acquisition server
A304-1M	Model 380 programming software

ULTRASONIC ENERGY METER, FLOW METER
DE/DB SERIES

DYNASONICS™
DIVISION OF RACINE FEDERATED INC.

DESCRIPTION

The **DE Series** ultrasonic energy meter and **DB Series** ultrasonic flow meter attach externally to water distribution piping to measure flow rate and (the **DE Series**) supply/return temperature difference to calculate energy consumption. Since they are non-invasive, they add no pressure head loss to the system and can be installed on existing piping systems without shutdown or interruption. Installation is easy and fast, there are no moving parts, and they measure bi-directional flow. The DE energy meter measures energy usage in BTU, MBTU, MMBTU, Tons, kJ, kW, MW and is perfect for retrofit of existing hot water or chilled water hydronic systems. Network communication models include Modbus RTU over RS485, Modbus TCP/IP, and Ethernet communication includes BACNet®/IP, EtherNet/IP® protocols.

The DE and DB meters have a backlit display (available with or without a keypad interface), a USB port for programming, and integral or remote clamp-on flow transducer configurations. The **DE Series** uses strap-on RTD temperature sensors (immersion sensors are also available). The **DE and DB meters** work with pipe sizes 1/2" to 100", are available in 24 VAC, 120 VAC, or 24 VDC power, and have a 4-20 mA analog output for flow rate and a pulse output for totalizing. Free ULTRALINK™ software is used to configure the meters.

APPLICATION

- ***Heating/chilled/condenser water***
- ***Potable water***
- ***Irrigation water***
- ***Rain/reclaimed water***

FEATURES

- ***Backlit display for easy reading in low light***
- ***USB Port for configuration and monitoring***
- ***No fluid contact means no fluid compatibility issues, no pressure drop, and no plant shutdown necessary for installation***
- ***Bi-directional flow measurement for reversing flow systems***
- ***Selectable engineering units for international preferences***
- ***No moving parts to maintain or replace minimizes service costs***
- ***Works with small amounts of suspended solids or aeration***
- ***Totalizer options include forward, reverse and net total for flow measurement flexibility***
- ***Network communication models available for large projects (up to 126 meters per network)***
- ***Keypad models allow access to many parameters***
- ***Free Ultralink™ software for configuration***

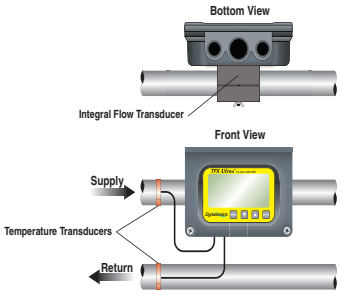
SPECIFICATIONS

Supply Voltage	95-264 VAC, 47-63 Hz 20-28 VAC, 47-63 Hz 10-28 VDC
Frequency	DTTS small transducers: 2 MHz DTTN remote transducers: 1 MHz DTTL large pipe transducers 500 kHz
Supply VA	17 VA maximum @ 95-264 VAC
Supply Watts	5W @ 10-28 VDC
Supply Current	0.35 A @ 20-28 VAC
Maximum Output Impedance	AC powered: 400 Ω maximum DC powered: Maximum loop resistance = (Vsupply-7)/0.02
Outputs	DE: 4-20 mA internal power, can span negative-to-positive flow/energy rates DB: 4-20 mA internal power, can span negative-to-positive flow/energy rates; two 0-1,000 Hz open collector transistors that can be configured for flow rate, alarming or totalizing
Wiring	Transducer cables: RG59 coaxial 75 Ω or Twinaxial 78 Ω, (optional armored conduit), maximum length 990' (300 m) in 10' (3m) increments RTDs (DE meters only): Platinum 385, 1 kΩ, 3-wire PVC jacket cable
Conduit Opening	Two 1/2" FNPT and one 3/4" FNPT
Cable Length	Remote transducer models available with 20' (6.1m), 50' (15m), or 100' (30m) cables
Communication	USB: 2.0 for connection to PC running ULTRALINK™ configuration utility RS485: Modbus RTU command set, ENERGYLINK network monitoring software 10/100 Base-T: RJ45 communication via Modbus TCP/IP, Ethernet/IP and BACnet®/IP
Configuration	PC running free ULTRALINK™ software or via integral display keypad (limited access to parameters)
Accuracy	Flow: ± 1.0% of reading above 1 fps (0.3 mps) velocity, ± 0.01% of reading below 1 fps (0.3 mps) Temperature (DE only): 0.45°F (0.25°C)
Repeatability	0.5% of reading
Sensitivity	Flow: 0.001 fps (.0003 mps) Temperature: 0.05°F (.025°C)
Display	Two-line LCD, LED backlit, top row: 0.7" (1.8 cm) height, 7-segment; bottom row: .35" (0.9 cm) height, 14-segment; flow rate and totalization indication
Engineering Units	DB: flow rate in gallons, cubic feet, million gallons, barrels, acre-feet, lbs., meters, cubic meters, liters, million liters, kg. DE: flow rates above plus BTU, MBTU, MMBTU, Tons, kJ, kW, MW
Pipe Size Range	1/2" to 100" (1.2 to 254 cm)
Velocity Range	0.1 to 40 fps (feet/second), 0.03 to 12.4 mps (meters/second), bi-directional
Operating Temperature	-40° to 185°F (-40° to 85°C); remote DTTS/DTTN transducers have upper limit of 250°F (121°C) and high temperature DTTH have upper limit of 400°F (200°C)
Media Compatibility	Most clean liquids or liquids with some suspended solids or aeration
Materials Of Construction	Enclosure: powder-coated aluminum, polycarbonate, stainless steel, polyurethane, nickel-plated steel mounting brackets Transducers: NEMA 6 (IP67), PVC/CPVC, Ultem®, Nylon cord grip, PVC cable jacket
Enclosure Rating	NEMA 4 (IP65) as long as a liquid-tight connectors are used
Approvals	UL 61010-1, CSA C22.2 No. 61010-1 (24 VDC, 120 VAC only); CE EN61326-1:2006
Warranty	1 year

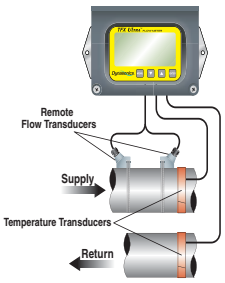
FLOW

ULTRASONIC ENERGY METER, FLOW METER
DE/DB SERIES

INSTALLATION (DE MODEL SHOWN; DB DOES NOT HAVE TEMPERATURE TRANSDUCERS)



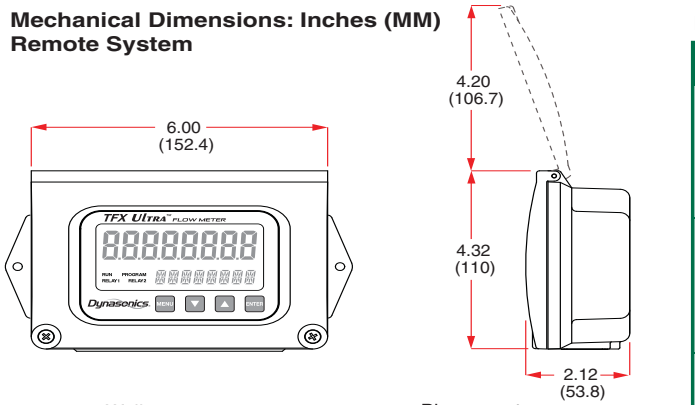
Transmitter with integral transducers

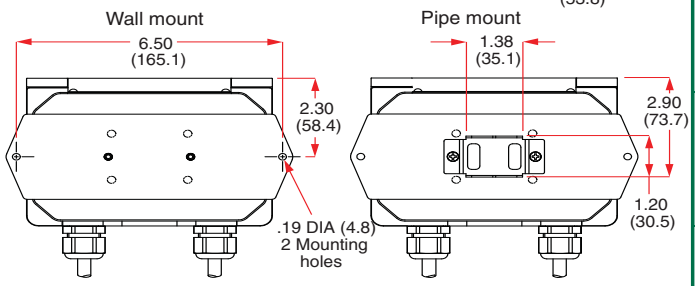


Transmitter with remote transducers

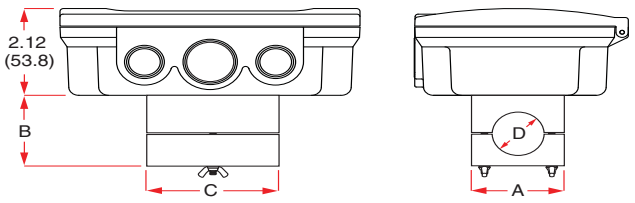
DIMENSIONS AND FLOW RANGES

Mechanical Dimensions: Inches (MM)
Remote System





Integral System

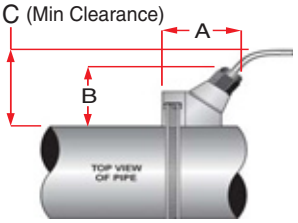


DTTS/DTTN Transducer Dimensions: Inches (MM)

Pipe Size	Pipe Material	A	B	C	D	Measuring Range
½"	ANSI/DN	2.46 (62.5)	2.36 (59.9)	2.66 (67.6)	0.84 (21.3)	2 - 38 GPM 8 - 144 LPM
	Copper	2.46 (62.5)	2.36 (59.9)	3.33 (84.6)	0.63 (15.9)	1.8 - 27 GPM 7 - 102 LPM
	Tubing	2.46 (62.5)	2.28 (57.9)	3.72 (94.5)	0.50 (12.7)	1.5 - 18 GPM 6 - 68 LPM
¾"	ANSI/DN	2.46 (62.5)	2.57 (65.3)	2.66 (67.6)	1.05 (26.7)	2.75 - 66 GPM 10 - 250 LPM
	Copper	2.46 (62.5)	2.50 (63.5)	3.56 (90.4)	0.88 (22.2)	2.5 - 54 GPM 10 - 204 LPM
	Tubing	2.46 (62.5)	2.50 (63.5)	3.56 (90.4)	0.75 (19.0)	2.5 - 45 GPM 10 - 170 LPM
1"	ANSI/DN	2.46 (62.5)	2.92 (74.2)	2.86 (72.6)	1.32 (33.4)	3.5 - 108 GPM 13 - 409 LPM
	Copper	2.46 (62.5)	2.87 (72.9)	3.80 (96.5)	1.13 (28.6)	3.5 - 95 GPM 13 - 360 LPM
	Tubing	2.46 (62.5)	2.75 (69.9)	3.80 (96.5)	1.00 (25.4)	3.5 - 85 GPM 13 - 320 LPM
1-¼"	ANSI/DN	2.80 (71.0)	3.18 (80.8)	3.14 (79.8)	1.66 (42.2)	5 - 186 GPM 19 - 704 LPM
	Copper	2.46 (62.5)	3.00 (76.2)	4.04 (102.6)	1.38 (34.9)	4.5 - 152 GPM 17 - 575 LPM
	Tubing	2.46 (62.5)	3.00 (76.2)	4.04 (102.6)	1.25 (31.8)	4 - 136 GPM 15 - 514 LPM
1-½"	ANSI/DN	3.02 (76.7)	3.42 (86.9)	3.33 (84.6)	1.90 (48.3)	6 - 250 GPM 23 - 946 LPM
	Copper	2.71 (68.8)	2.86 (72.6)	4.28 (108.7)	1.63 (41.3)	5 - 215 GPM 19 - 814 LPM
	Tubing	2.71 (68.8)	3.31 (84.1)	4.28 (108.7)	1.50 (38.1)	5 - 200 GPM 19 - 757 LPM
2"	ANSI/DN	3.70 (94.0)	3.42 (86.9)*	5.50 (139.7)	2.375 (60.3)*	8 - 420 GPM 30 - 1590 LPM
	Copper	3.70 (94.0)	3.38 (85.9)*	5.50 (139.7)	2.125 (54.0)*	8 - 375 GPM 30 - 1419 LPM
	Tubing	3.21 (81.5)	3.85 (98.0)	4.75 (120.7)	2.00 (50.8)	8 - 365 GPM 30 - 1381 LPM

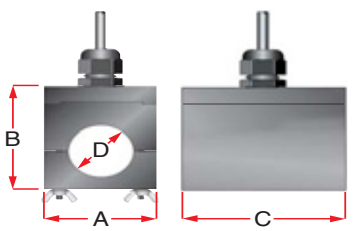
* Varies due to U-bolt configuration

DTTN/DTTH
Pipes larger than 2" (50 mm)

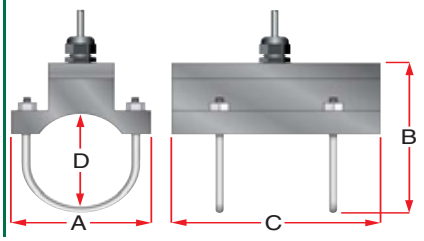


	A	B	C
DTTN	2.95 (74.9)	2.75 (69.8)	3.00 (76.2)
DTTH	2.95 (74.9)	2.75 (69.8)	3.00 (76.2)
DTTL	3.40 (86.4)	2.94 (74.7)	3.20 (81.3)

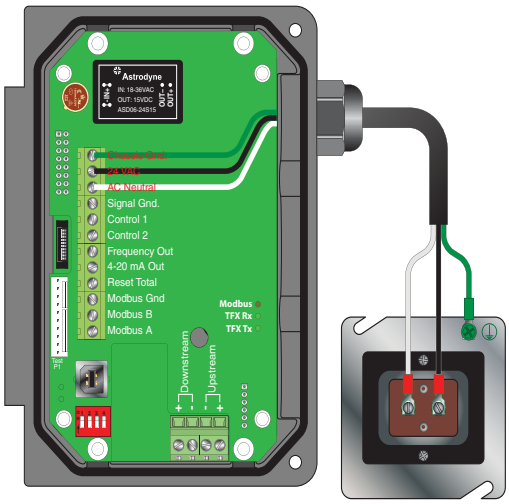
DTTS
Pipes/Tubing ½" to 2" (12 mm to 50 mm)



DTTS U-Bolt Connections
ANSI/DN & Copper 2" (50 mm) Models

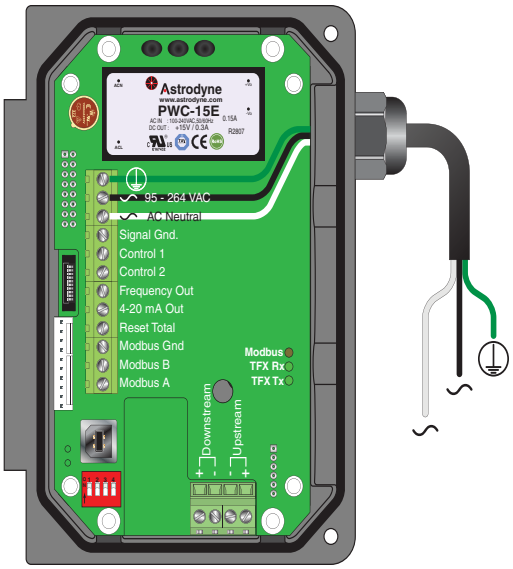


POWER WIRING FOR 24 VAC

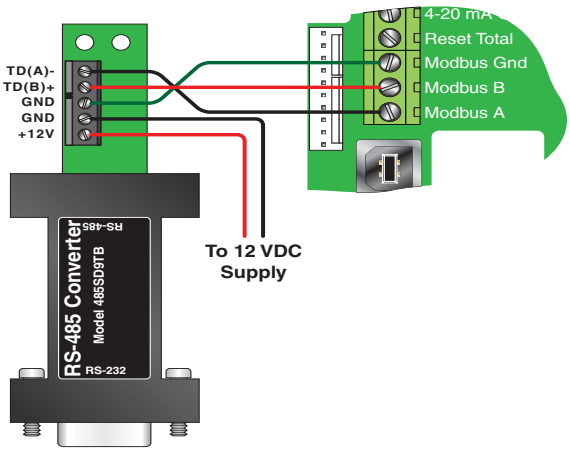


24 VAC
Transformer

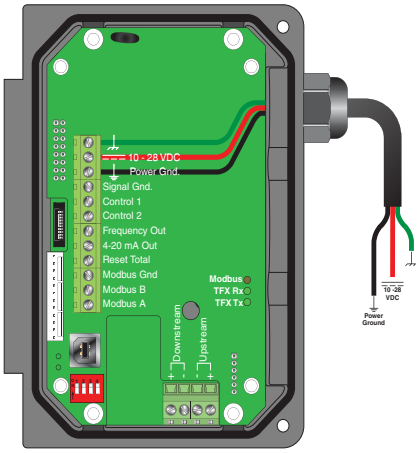
POWER WIRING FOR 120 VAC



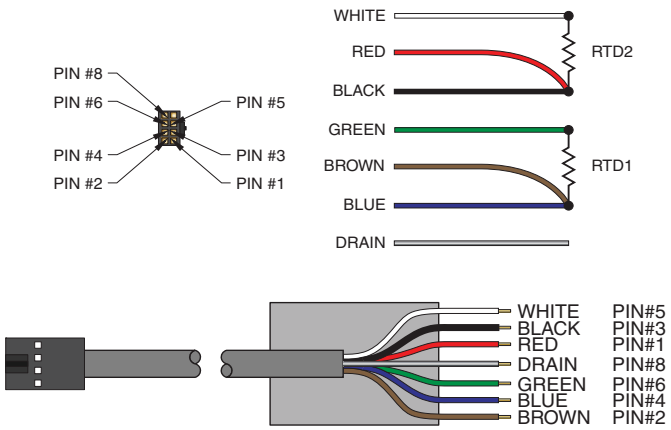
COMMUNICATIONS WIRING (MODEL SPECIFIC)



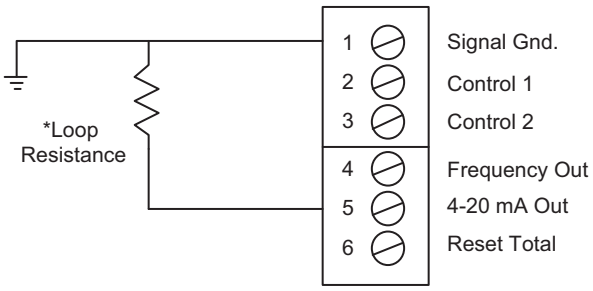
POWER WIRING FOR 24 VDC



TEMPERATURE SENSOR WIRING



4-20 mA OUTPUT WIRING



DE/DB Series

*Loop resistance maximum = 400 ohms for AC powered units or (supply voltage – 7 VDC/0.02 for DC powered units.

FLOW

ULTRASONIC ENERGY METER, FLOW METER
DE/DB SERIES

ORDERING INFORMATION

MODEL	DESCRIPTION
DE	BTU Meter
DB	Flowmeter
PIPE SIZE	
IA	1/2" ANSI pipe
IB	3/4" ANSI pipe
IC	1" ANSI pipe
ID	1 1/4" ANSI pipe
IE	1 1/2" ANSI pipe
IF	2" ANSI pipe
IG	1/2" copper
IH	3/4" copper
II	1" copper
IJ	1 1/4" copper
IK	1 1/2" copper
IL	2" copper
IM	1/2" OD tubing
IN	3/4" OD tubing
IP	1" OD tubing
IQ	1 1/4" OD tubing
IR	1 1/2" OD tubing
IS	2" OD tubing
RZ	Remote Flow Transducers (see DT, DS tables)
TRANSDUCER MATERIAL/TEMPERATURE	
L	PVC: -40 to +185˚F (-40 to +185˚C)
H	CPVC: -40 to +250˚F (-40 to +121˚C)
N	None (select for Remote Transducer Only)
POWER	
A	90-264 VAC
C	20-28 VAC
D	11-28 VDC
KEYPAD	
Y	Keypad
N	No keypad
COMMUNICATIONS	
Y	10/100 Base-T (EtherNet/IP, BACnet/IP, Modbus TCP/IP)
N	No communications
ENERGY TEMPERATURE RANGE (Separately ordered RTD kit required)	
L	+32 to +122˚F (0 to +122˚C)
M	+32 to +212˚F (0 to +100˚C)
N	None (for DB flowmeter)
H	-40 to +350˚F (-40 to +177˚C)
X	-4 to +85˚F (-20 to +30˚C)
APPROVALS	
N	General safety (power supply C only)
OPTIONS	
0	None, plugged ports
1	Cable Gland Kit

Remote transducers for small pipes (with "RZ" pipe size)	
MODEL	DESCRIPTION
DTTS	Remote transducers for 1/2" to 2" pipes
DTTC	High Temperature transducer for 1/2" to 2" pipes
PIPE SIZE	
D	1/2"
F	3/4"
G	1"
H	1 1/4"
J	1 1/2"
L	2"
PIPE TYPE	
P	ANSI carbon steel
C	Copper
T	Tubing
CABLE LENGTH	
020	20 feet (6.1 m)
050	50 feet (15 m)
100	100 feet (30 m)
CABLE ARMOR OPTION	
N	No armor
A	Flexible armor
CABLE ARMOR LENGTH	
000	No armor
020	20 feet (6.1 m)
050	50 feet (15 m)

Remote transducers for large pipes (with "RZ" pipe size)	
MODEL	DESCRIPTION
DTTN	Standard transducer for 2 1/2" to 20" pipes
DTTH	High temperature transducer for 2 1/2" to 100" pipes
DTTL	Large transducer for 24" to 100" pipes
CABLE LENGTH	
020	20 feet (6.1 m)
050	50 feet (15 m)
100	100 feet (30 m)
CABLE ARMOR OPTION	
N	No armor
A	Flexible armor
CABLE ARMOR LENGTH	
000	No armor
020	20 feet (6.1 m)
050	50 feet (15 m)
100	100 feet (30 m)
OPTIONS	
N	Normal area rating

Note: Shaded selections are special order.
Note: DT remote transducers come with 36' straps that fit pipes up to 10". (P/N D002-2007-001)

ACCESSORIES

D010-2102-010	Mounting track assembly for DTTN/DTTH transducers, for <10" pipes
D010-2102-016	Mounting track assembly for DTTN/DTTH transducers, for 10" to 16" pipes
D005-2117-003	USB A/B Cable, 10 ft. (3 m) for DE/DB Series Meters
D005-2117-004	USB A/B Cable, 15 ft. (4.6 m) for DE/DB Series Meters
D010-3000-120	RTD kit for DE Energy Meter, strap-on, 20 ft. cables
D010-3000-121	RTD kit for DE Energy Meter, strap-on, 50 ft. cables
D010-3000-122	RTD kit for DE Energy Meter, strap-on, 100 ft. cables
D002-2007-005	72" stainless steel straps, 1 pair, for DTTN/DTTH, for pipes up to 20"

PADDLE FLOW SWITCH
626600A

DESCRIPTION

The **626600A** Flow Switch from Caleffi is used to prove liquid flow in 1" to 8" pipes containing water, glycol solutions, or other liquids that are compatible with stainless steel, brass, and EPDM. It is designed for use in HVAC systems, heat exchangers, pumping systems, water treatment, and process systems in general.

The high quality of **Model 626600A** makes it ideal for controlling pumps, burners, compressors, refrigerators, motorized valves, or for activation of signaling units or warning devices.

CALEFFI

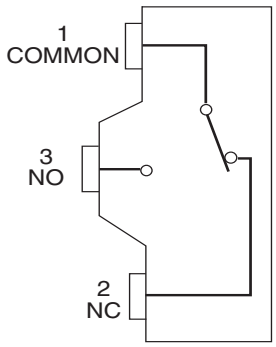
FEATURES

- ***316L stainless steel bellows for durability and long life***
- ***NEMA 5 (IP54) environmental rating for use in humid or dusty environments***
- ***Six stainless steel blades to fit 1" to 8" pipes***
- ***Insulated cover over microswitch contacts for safety***
- ***Large, easily-accessible calibration screw with locking nut to maintain setpoint***

SPECIFICATIONS

Contact Rating	Resistive/Inductive: 15A @ 240 VAC maximum; Lamp load: 3A @ 125 VAC for the N.C. contact, 1.5A @ 125 VAC for the N.O. contact; Motor load: 5A, 1/4 HP @ 125 VAC for the N.C. contact, 2.5A, 1/8 HP @ 125 VAC for the N.O. contact
Pipe Size Range	1" to 8" (2.5 to 20 cm)
Connections	1" MNPT
Operating Temperature	130°F (55°C) maximum ambient
Media Temperature Range	-20°F to 240°F (-30°C to 116°C)
Maximum System Pressure	150 psig (1 bar)
Materials Of Construction	Wetted parts: P-Cu Zn40 Pb2 brass body, 316L stainless steel bellows, EPDM o-ring; Housing cover: Class UL94V-0 self-extinguishing polycarbonate
Weight	1.7 lb (0.8 kg)
Approvals	CE, cULus
Warranty	2 years

WIRING

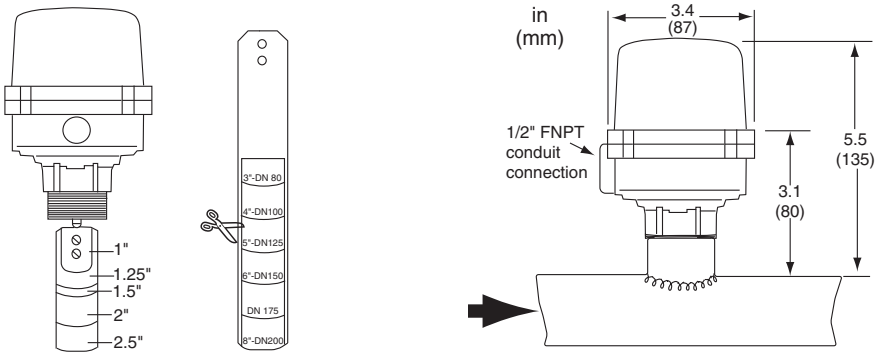


Shown in no-flow, normal position

PADDLE FLOW SWITCH

626600A

DIMENSIONS



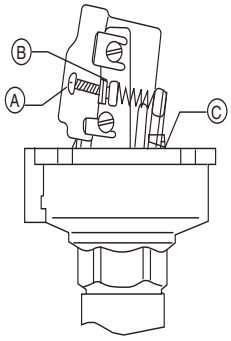
Select the blade marked with the diameter of the pipe in which the switch will be installed. For pipe sizes 1" to 2.5", remove all extra pre-fitted blades. For pipes 3" and above, leave all pre-fitted blades installed and add the long blade and trimming as shown for pipe size. Install the switch in the pipe, observing the flow direction arrows shown on the body casting and housing cover. The distance between the top of the pipe and the upper surface of the brass housing should be 3.1" (80 mm).
The switch can be installed in a horizontal or vertical pipe, but avoid installing the switch below horizontal; dirt and deposits may collect in the switching mechanism and affect operation.

OPERATION

Operating flow rates: gpm (lpm)

Diameter of Pipe	1"	1.25"	1.5"	2"	2.5"	3"	4"	5"	6"	8"
Minimum calibration Operating flow rate with **increasing flow**	5.7 (21.7)	7.5 (28.4)	11.4 (43.4)	13.2 (50.1)	22.0 (83.5)	29.9 (113)	44.0 (167)	61.1 (232)	72.6 (275)	162 (618)
Minimum calibration Operating flow rate with **decreasing flow**	4.0 (15.0)	5.5 (20.9)	8.4 (31.7)	9.7 (36.7)	16.3 (61.8)	22.9 (86, 8)	37.4 (142)	51.5 (197)	63.8 (242)	145 (551)
Maximum calibration Operating flow rate with **increasing flow**	12.3 (46.8)	16.7 (63.5)	26.0 (98.5)	29.5 (112)	51.5 (195)	69.5 (264)	94.6 (359)	136 (518)	189 (718)	334 (1269)
Maximum calibration Operating flow rate with **decreasing flow**	11.9 (45.1)	16.3 (61.8)	25.5 (96.9)	29.0 (110)	50.6 (192)	68.6 (260)	92.4 (351)	127 (484)	158 (601)	308 (1169)

CALIBRATION



If the required operating flow rate differs from that given in the table below, the necessary correction should be carried out as follows: turn the calibration screw (A) in a clockwise direction for the contacts to close at higher flow rate values or in a counterclockwise direction for lower flow rate values. When the adjustment has been made, lock the screw (A) with the locking ring nut (B). **Avoid all contact with the presetting screw (C).** An incorrect setting would seriously impair the operation of the switch.

ORDERING INFORMATION

MODEL	DESCRIPTION
626600A	Paddle flow switch, 1" to 8" pipes, NEMA 5

DESCRIPTION

The **FS1-6** paddle flow switch is designed to prove liquid flow in a wide variety of HVAC and industrial applications. The corrosion-resistant flow switch is mounted in a weather-resistant box for simple wiring connections. The polyphenylene sulfide plastic vane is field trimmable for 1" (2.54 cm) and larger pipes, and it is magnetically coupled to the SPDT switch to prevent liquid from entering the switch housing.

FEATURES

- ***Weather-resistant construction***
- ***Simple installation***
- ***Leak-proof magnetic switch operation***
- ***Field adjustable for 1" (2.54 cm) and larger pipes***
- ***SPDT snap-acting switch***

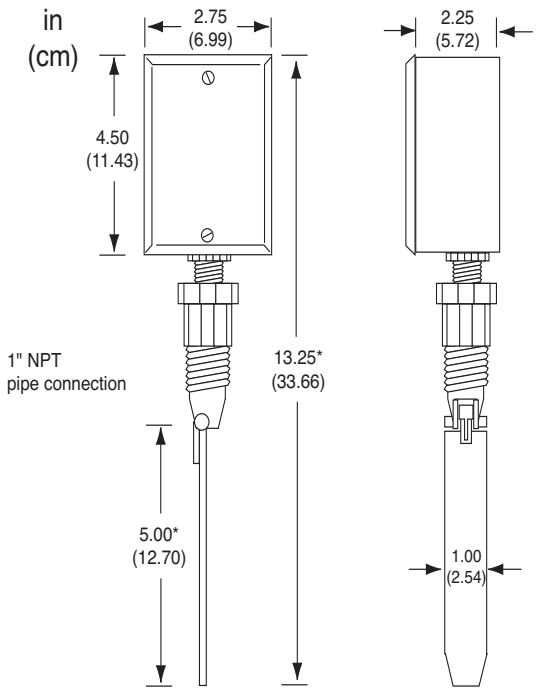
SPECIFICATIONS

Contact Arrangement	SPDT; black wire = common, red wire = normally open (at no flow), blue wire = normally closed (at no flow)
Contact Rating	5A @ 125/250 VAC
Wiring	18" (46 cm) leads, 18 AWG
Pipe Size Range	1" to 12" (2.5 to 30 cm)
Connections	1" MNPT
Media Temperature Range	212°F (100°C) maximum
Maximum System Pressure	150 psig (1 bar)
Materials Of Construction	Wetted parts: Polyphenylene sulfide vane, ceramic 8 magnet, 316 stainless steel spring and pin
Weight	1 lb (.45 kg)
Warranty	1 year

WIRING

Black - Common
Red - Normally open (no flow)
Blue - Normally closed (no flow)

DIMENSIONS



* Dimension with vane full length for 6" and larger pipe installation

FLOW SWITCH

FS1-6

INSTALLATION

1. Carefully unpack switch, making sure to remove any packing from the lower housing. Adjust the actuation or deactuation point by trimming the vane to the length desired. If using a pipe with weld-o-let, cond-o-let, or plastic PVC fittings, use graduations indicated on the vane. If using standard 125 or 250 lb (57 or 113 kg) bronze, iron, or steel fittings, trim the vane 0.125" (0.32 cm) above the marking provided. Because of the great variation in fittings and process connections, it is recommended the unit be checked when installed to ensure proper operation and that there is no interference between the vane and the fittings. For pipes larger than 6" (15.24 cm), leave the vane full length.

2. This flow switch is intended to be used in clean process media where particles, scale, and debris are not present. Buildup of such materials may cause inaccurate signals.

3. The switch must be indexed during installation in the line with the flow arrow on the side of the switch pointing in the direction of the flow. Pipe sealant is required at the 1" NPT thread connection. It is important to not get the sealant in the vane assembly as it may prevent proper operation and cause misleading signals. When installing the unit, be certain not to over-torque the housing. Damage may occur if excessive force is used.

4. Connect the switch wires in accordance with local electrical codes. The FS1-6 is not intended to be a load-carrying conduit connection. Loads may damage the switch and stop operation.

PERFORMANCE

PIPE SIZE	ACTUATION gpm (lpm)	DEACTUATION gpm (lpm)
1	10.7 (40.5)	9.3 (35.2)
1.25	9.5 (36.0)	7.7 (29.1)
1.5	8.1 (30.7)	6.3 (23.9)
2	9.8 (37.1)	8.5 (32.2)
3	12.4 (46.9)	8.9 (33.7)
4	20.2 (76.5)	12.7 (48.1)
6	43.0 (163)	32.8 (124)
8	74.2 (281)	56.6 (214)
10	116.7 (442)	89.0 (337)
12	167.1 (632)	127.4 (482)

ORDERING INFORMATION

MODEL	DESCRIPTION
FS1-6	Weather-resistant flow switch

DESCRIPTION

The **F61 Series** paddle flow switches are used to prove flow on liquid lines using water, ethylene glycol solutions, or other liquids compatible with brass and phosphor bronze parts. The SPDT contact switch is activated by liquid flow through the pipe and the set point is adjustable.
The **F61KD** (NEMA 1 enclosure) and **F61MD** (NEMA 3R enclosure) are inline models for 1/2" NPT and 3/4" NPT pipe. The **F61KB-11** (NEMA 1 enclosure) and **F61MB-1** (NEMA 3R enclosure) are for 1" (2.5 cm) and larger pipes. They are furnished with a stainless steel paddle in three segments for pipes 1" to 3" (2.5 to 7.6 cm) in diameter. Paddle segments may be removed or trimmed as needed. A 6" (15 cm) paddle is also furnished for 4" (10 cm) diameter pipes and larger.

F61KB-11

F61KD-3

SPECIFICATIONS

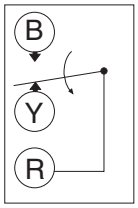
Media Temperature Range	
KB-11, KD-3, KD-4	32°F to 250°F (0°C to 121°C)
MB-1, MD-1, MD-2	-20°F to 250°F (-30°C to 121°C)
Maximum System Pressure	150 psig (1034 kPa)
Materials Of Construction	
KB-11, MB-1, KD-3, KD-4	Brass fittings, phosper bronze bellows, stainless steel paddle
MD-1, MD-2	Brass fittings, stainless steel bellows, stainless steel paddle
Approvals	UL recognized
Warranty	1 year

WIRING

ELECTRICAL RATINGS

MOTOR RATINGS	120V	208V	240V	277V
Horsepower	1	1	1	–
AC full load amps	16	8.8	8	–
AC locked rotor amps	96	52.8	48	–
Noninductive or Resistance load amps	16	16	16	16
Pilot duty – 125 VA 24/277 VAC				

Action on increase of flow



F61 Series

DIMENSIONS

Model	Size	Connections	Dimensions	Weight	Enclosure Rating
F61KD-3	1/2"	FNPT inline	5.0"H x 4.0"W x 2.8"D (12.8 x 10.1 x 7.1 cm)	2.1 lb (.95 kg)	NEMA 1
F61MD-1	1/2"	FNPT inline	5.0"H x 4.0"W x 2.8"D (12.8 x 10.1 x 7.1 cm)	2.2 lb (1.0 kg)	NEMA 3R
F61KD-4	3/4"	FNPT inline	5.0"H x 4.0"W x 2.8"D (12.8 x 10.1 x 7.1 cm)	2.1 lb (.95 kg)	NEMA 1
F61MD-2	3/4"	FNPT inline	5.0"H x 4.0"W x 2.8"D (12.8 x 10.1 x 7.1 cm)	2.2 lb (1.0 kg)	NEMA 3R
F61KB-11	1"	1" MNPT insertion	8.4"H (3" paddle) x 4.0"W x 2.8"D (21.3 x 10.2 x 7.1 cm)	1.7 lb (.77 kg)	NEMA 1
F61MB-1	1"	1" MNPT insertion	8.7"H (3" paddle) x 4.8"W x 2.8"D (22.1 x 12.2 x 7.1 cm)	2.4 lb (1.1 kg)	NEMA 3R

FLOW SWITCH
F61 SERIES

ADJUSTMENTS: TYPICAL FLOW RATES — gpm (m^3/hr)											
	LINE PIPE SIZE (in)		1	1-1/4	1-1/2	2	2-1/2	3	4*	5*	6*	8*
MODEL		Flow increases R to Y closes	4.2 (1.0)	5.8 (1.3)	7.5 (1.7)	13.7 (3.1)	18.0 (4.1)	27.5 (6.2)	65.0 (14.8) 37.0† (8.4)	125.0 (28.4) 57.0† (12.9)	190.0 (43.1) 74.0† (16.8)	375.0 (85.2) 205.0† (46.6)
F61KB-11 F61MB-1	Minimum adjustment	Flow decreases R to B closes	2.50 (0.6)	3.70 (0.8)	5.00 (1.1)	9.50 (2.2)	12.50 (2.8)	19.00 (4.3)	50.0 (11.4) 27.0† (6.1)	101.0 (22.9) 41.0† (9.3)	158.0 (35.9) 54.0† (12.3)	320.0 (72.7) 170.0† (38.6)
	Maximum adjustment	Flow increases R to Y closes	8.80 (2.0)	13.30 (3.0)	19.20 (4.4)	29.00 (6.6)	34.50 (7.8)	53.00 (12.0)	128.0 (29.1) 81.0† (13.4)	245.0 (55.6) 118.0† (26.8)	375.0 (85.2) 144.0† (32.7)	760.0 (172.6) 415.0† (94.2)
		Flow decreases R to B closes	8.50 (1.9)	12.50 (2.8)	18.00 (4.1)	27.00 (6.1)	32.00 (7.3)	50.00 (11.4)	122.0 (27.7) 76.0† (17.3)	235.0 (53.4) 111.0† (25.2)	360.0 (81.8) 135.0† (30.7)	730.0 (165.8) 400.0† (90.8)

*Flow rates for these sizes are calculated.
† These gpm figures are for switch with 6" paddle. For 4" and 5" line pipe the paddle is trimmed.

MODEL	INLET/OUTLET SIZE (Female NPT)	NEMA Enclosure	ADJUSTMENT RANGE – gpm (m^3/hr)	
			R to Y closes flow increase	R to Y opens flow decrease
F61KD-3	1/2" x 1/2"	1	Minimum 0.6 (0.14) Maximum 1.1 (0.25)	Minimum 0.3 (0.07) Maximum 0.9 (0.2)
F61KD-4	3/4" x 3/4"	1		
F61MD-1	1/2" x 1/2"	3R		
F61MD-2	3/4" x 3/4"	3R		

ORDERING INFORMATION

MODEL	DESCRIPTION
F61KD-3	Flow switch inline 1/2" x 1/2" NPT, NEMA 1
F61MD-1	Flow switch inline 1/2" x 1/2" NPT, NEMA 3R
F61KD-4	Flow switch inline 3/4" x 3/4" NPT, NEMA 1
F61MD-2	Flow switch inline 3/4" x 3/4" NPT, NEMA 3R
F61KB-11	Flow switch for pipe 1" diameter and larger, NEMA 1
F61MB-1	Flow switch for pipe 1" diameter and larger, NEMA 3R

DPP, LIM, MCP, PCF AND SKJ MODELS
EDC CONDENSATE PUMPS

DESCRIPTION

Kele offers a variety of **EDC** condensate pumps that are small, quiet running, high performance pumps with capacities for drawing off up to 23 gallons per hour (70 liters per hour) of water from condensation in air conditioning and ventilation systems. Rigorously tested for total efficiency over a long life-span, these devices are in use all over the world.

SKJ

DPP

MCP

PCF

FEATURES

- ***DRAIN PAN PUMP (DPP)***
- ***Designed for low-cost installations***
- ***Compact dimensions***
- ***Completely encapsulated electronics***
- ***Sensor cell is protected by a large surface area grill, designed to keep out particles larger than 1 mm***

- ***LIMPET CONDENSATE DISCHARGE (LIM)***
- ***Designed for modern wall-mounted air conditioners***
- ***Aesthetic design blends into surroundings***
- ***Built-in non-return valves***
- ***Electronic noise control***
- ***Built-in alarm circuit***

- ***MICROPUMP II CONDENSATE REMOVAL (MPP)***
- ***Fits inside the tubing chase of a high wall-mount air conditioner***
- ***Water sensor has no moving parts or mechanical floats***
- ***Transparent filter chamber allows any dirt build-up to be easily seen***
- ***High water alarm***
- ***Completely encapsulated electronics***
- ***Horizontal or vertical mounting***

- ***PACIFIC PUMP CONDENSATE REMOVAL (PCF)***
- ***Single-ended pump unit for small footprint***
- ***Low profile for ease of mounting***
- ***Electronic control with high water alarm***
- ***Thermal protection***
- ***Tiny remote mount reservoir/sensing unit***
- ***Mounts vertically or horizontally***
- ***Fits all wall-mount splits***

- ***WATERWAY SKYJET CONDENSATE REMOVAL (SKJ)***
- ***High discharge lift***
- ***Built-in non-return valves***
- ***Internal dirt filter***
- ***High water alarm***
- ***Electronic noise control for quiet operation***
- ***Cable fitted for power and alarm connections***
- ***Flame-retardant polymer construction***

COMMON SPECIFICATIONS

Media Temperature Range	
DPP	100°F (40°C) maximum
All others	77°F (25°C) maximum
Approvals	
DPP	CE, UL94V-0 flame spread rating
All others	CE
Warranty	2 years
Fuse Size	5A, 3A (PCF)

INDIVIDUAL SPECIFICATIONS

Model	Supply Voltage	Supply Watts	Maximum Capacity	Maximum Discharge Lift
DPP.0062.1	208-240 VAC 50/60 Hz	30W	89 gallons/day (336 liters/day)	19.7' (6 m)
DPP.0062.2	110-120 VAC 50/60 Hz	30W	89 gallons/day (336 liters/day)	19.7' (6 m)
LIM.4000.1	208-240 VAC 50/60 Hz	30W	72 gallons/day (264 liters/day)	49' (15 m)
LIM.4000.2	110-120 VAC 50/60 Hz	30W	72 gallons/day (264 liters/day)	49' (15 m)
MCP.2000.1	208-240 VAC 50/60 Hz	30W	84 gallons/day (312 liters/day)	49' (15 m)
MCP.2000.2	110-120 VAC 50/60 Hz	30W	84 gallons/day (312 liters/day)	49' (15 m)
PCF.3000.4	110-120 VAC 50/60 Hz	30W	60 gallons/day (227 liters/day)	16' (5 m)
PCF.3000.5	208-240 VAC 50/60 Hz	30W	60 gallons/day (227 liters/day)	16' (5 m)
SKJ.0075.2	208-240 VAC 50/60 Hz	50W	444 gallons/day (1680 liters/day)	164' (50 m)
SKJ.0075.3	110-120 VAC 50/60 Hz	50W	444 gallons/day (1680 liters/day)	164' (50 m)

DPP, MCP, PCF, LIM, MSP, AND SKJ MODELS
EDC CONDENSATE PUMPS

DIMENSIONS

Model	Dimensions	Wiring	Enclosure Rating
DPP.0062.1	1.3"H x 1.6"W x 4.7"L (3.2 x 4.0 x 12.0 cm) with .125" (.32 cm) ID discharge tube	60" (1.5 m) cable	IP67, fully submersible
DPP.0062.2	1.3"H x 1.6"W x 4.7"L (3.2 x 4.0 x 12.0 cm) with .125" (.32 cm) ID discharge tube	60" (1.5 m) cable	IP67, fully submersible
LIM.4000.1	2.0"H x 2.0"W x 11.4"L (5.1 x 5.1 x 29.0 cm) with .25" (.6 cm) ID discharge tube	18" (46 cm) 5-conductor cable, alarm contacts rated 5A @ 250 VAC	IP30, not submersible
LIM.4000.2	2.0"H x 2.0"W x 11.4"L (5.1 x 5.1 x 29.0 cm) with .25" (.6 cm) ID discharge tube	18" (46 cm) 5-conductor cable, alarm contacts rated 5A @ 250 VAC	IP30, not submersible
MCP.2000.1	1.4"H x 1.6"W x 7.6"L (3.5 x 4.0 x 19.2 cm) with .25" (.6 cm) ID discharge tube	40" (1 m) 18 AWG 5-conductor cable, alarm relay conductors 5A @ 250 VAC maximum	IP20, not submersible
MCP.2000.2	1.4"H x 1.6"W x 7.6"L (3.5 x 4.0 x 19.2 cm) with .25" (.6 cm) ID discharge tube	40" (1 m) 18 AWG cable, alarm relay conductors 5A @ 250 VAC maximum	IP20, not submersible
PCF.3000.4	1.2"H x 1.8"W x 5.1"L (3.0 x 4.5 x 13.0 cm) with .25" (.32 cm) ID discharge tube	56" (1.4 m) 18 AWG 3-conductor power cable, 56" pump-to-sensor cable, alarm relay screw terminals inside housing	IP20, not submersible
PCF.3000.5	1.2"H x 1.8"W x 5.1"L (3.0 x 4.5 x 13.0 cm) with .25" (.32 cm) ID discharge tube	56" (1.4 m) 18 AWG 3-conductor power cable, 56" pump-to-sensor cable, alarm relay screw terminals inside housing	IP20, not submersible
SKJ.0075.2	6.1"H x 5.7"W x 10.0"L (15.5 x 14.5 x 25.5 cm) with .375" (.95 cm) ID discharge tube	72" (1.8 m) 18 AWG cable; SPST alarm contact output (N.C.), 6A @ 250V maximum	IP20, not submersible
SKJ.0075.3	6.1"H x 5.7"W x 10.0"L (15.5 x 14.5 x 25.5 cm) with .375" (.95 cm) ID discharge tube	72" (1.8 m) 18 AWG cable; SPST alarm contact output (N.C.), 6A @ 250V maximum	IP20, not submersible

ORDERING INFORMATION

MODEL	DESCRIPTION
DPP.0062.1	Drain pan pump, 208-240 VAC, 3.7 gph (14 lph)
DPP.0062.2	Drain pan pump, 110-120 VAC, 3.7 gph (14 lph)
LIM.0071.0	Replacement filter element for LIM.4000 system
LIM.4000.1	Condensate discharge system, 208-240 VAC, 3 gph (11 lph)
LIM.4000.2	Condensate discharge system, 208-240 VAC, 3 gph (11 lph)
MCP.2000.1	Micro-pump II, 208-240 VAC, 3.5 gph (13 lph)
MCP.2000.2	Micro-pump II, 110-120 VAC, 3.5 gph (13 lph)
MSP.2000.1	MSP.2250.2 Waterway Master Pump, 110-120 VAC, 15.8 gph
PCF.0061.0	Acoustic jacket for PCF pump system
PCF.3000.4	Pacific pump system, 110-120 VAC, 2.5 gph (9.5 lph)
PCF.3000.5	Pacific pump system, 208-240 VAC, 2.5 gph (9.5 lph)
SKJ.0075.1	Waterway SkyJet Hi-lift pump, 208-240 VAC, 23 gph

ACCESSORIES

PCF.0061.0	Acoustic jacket for PCF pump system
ACC.0038.0	Inline filter kit for Pacific pumps
ACC.0056.0	Anti-syphon valve kit
DPP.0076.0	Clear PVC tubing, 3/8" OD, 1/4" ID for PCF/LIM pump discharge, 98' (30 m) length coil