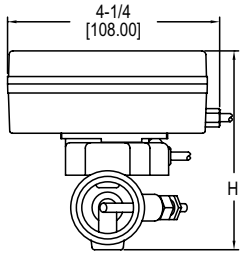
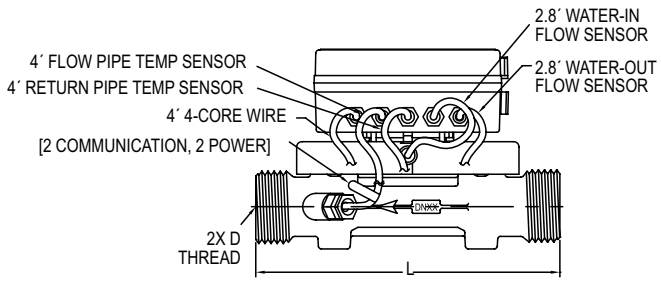
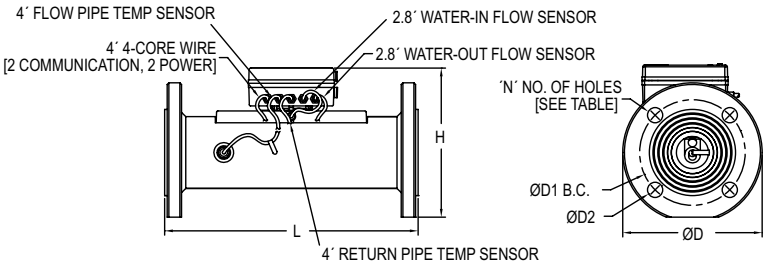
Series TUF Ultrasonic Energy Meter

Specifications - Installation and Operating Instructions







Model	Dimensions in [mm]			Flow Rate GPM [LPM]			Weight lb [kg]
	L	D	H	Max Flow (Qs)	Nominal Flow Range (Qp)	Min Flow (Qi)	
TUF-150-XX	4-21/64 [110.00]	G3/4B	3-31/32 [101.00]	13 [50]	6.6 [25]	0.1 [0.5]	3.1 [1.4]
TUF-200-XX	5-1/8 [130.00]	G1B	3-31/32 [101.00]	22 [83]	11 [42]	0.2 [0.8]	3.1 [1.4]
TUF-250-XX	6-19/64 [160.00]	G11/4B	4-11/64 [106.00]	31 [117]	15 [58]	0.3 [1.2]	4.1 [1.8]
TUF-320-XX	7-3/32 [180.00]	G11/2B	4-29/64 [113.00]	53 [200]	26 [100]	0.5 [2]	5.2 [2.3]
TUF-400-XX	7-7/8 [200.00]	G2B	4-49/64 [121.00]	88 [333]	44 [167]	0.9 [3.3]	6.6 [3.0]

Model	Dimensions in [mm]						Flow Rate GPM [LPM]			Weight lb [kg]
	L	ØD	H	ØD1	ØD2	N	Max Flow (Qs)	Nominal Flow Range (Qp)	Min Flow (Qi)	
TUF-500-XX	7-7/8 [200]	6-1/2 [165.00]	9-27/32 [250]	4-59/64 [125.00]	45/64 [18.00]	4	132 [500]	66 [250]	0.7 [2.5]	30.8 [14]
TUF-650-XX	7-7/8 [200]	7-9/32 [185.00]	10-7/16 [265]	5-45/64 [145.00]	45/64 [18.00]	4	220 [833]	110 [417]	1.1 [4.2]	30.2 [13.7]
TUF-800-XX	8-55/64 [225]	7-7/8 [200.00]	11-1/32 [280]	6-19/64 [160.00]	45/64 [18.00]	8	352 [1333]	176 [667]	1.8 [6.7]	37.5 [17]
TUF-1000-XX	9-27/32 [250]	8-21/32 [220.00]	12-13/64 [310]	7-3/32 [180.00]	45/64 [18.00]	8	528 [2000]	264 [1000]	2.6 [10]	41.8 [19]
TUF-1250-XX	9-27/32 [250]	9-27/32 [250.00]	12-63/64 [330]	8-17/64 [210.00]	45/64 [18.00]	8	881 [3333]	440 [1667]	4.4 [17]	57.3 [26]

MODEL CHART

Model	Process Connection	Corresponding Pipe Fitting	Power	Model	Process Connection	Corresponding Pipe Fitting	Power
TUF-150-XX	G-3/4	1/2″ NPT or BSPT	24 VAC/VDC	**TUF-150-XX-DC**	G-3/4	1/2″ NPT or BSPT	24 VDC
TUF-200-XX	G1	3/4″ NPT or BSPT	24 VAC/VDC	**TUF-200-XX-DC**	G1	3/4″ NPT or BSPT	24 VDC
TUF-250-XX	G1-1/4	1″ NPT or BSPT	24 VAC/VDC	**TUF-250-XX-DC**	G1-1/4	1″ NPT or BSPT	24 VDC
TUF-320-XX	G1-1/2	1-1/4″ NPT or BSPT	24 VAC/VDC	**TUF-320-XX-DC**	G1-1/2	1-1/4″ NPT or BSPT	24 VDC
TUF-400-XX	G2	1-1/2″ NPT or BSPT	24 VAC/VDC	**TUF-400-XX-DC**	G2	1-1/2″ NPT or BSPT	24 VDC
TUF-500-XX	GB9119 flange	2″ DN 50 PN 16 flange	24 VAC/VDC	**TUF-500-XX-DC**	GB9119 flange	2″ DN 50 PN 16 flange	24 VDC
TUF-650-XX	GB9119 flange	2-1/2″ DN 65 flange	24 VAC/VDC	**TUF-650-XX-DC**	GB9119 flange	2-1/2″ DN 65 flange	24 VDC
TUF-800-XX	GB9119 flange	3″ DN 80 flange	24 VAC/VDC	**TUF-800-XX-DC**	GB9119 flange	3″ DN 80 flange	24 VDC
TUF-1000-XX	GB9119 flange	4″ DN 100 flange	24 VAC/VDC	**TUF-1000-XX-DC**	GB9119 flange	4″ DN 100 flange	24 VDC
TUF-1250-XX	GB9119 flange	5″ DN 125 flange	24 VAC/VDC	**TUF-1250-XX-DC**	GB9119 flange	5″ DN 125 flange	24 VDC

The **Series TUF Tennant Ultrasonic BTU Flowmeter** is a MID/EN1434 approved highly accurate and stable energy meter. It utilizes ultrasonic technology to measure heating and cooling energy consumption. The Series TUF incorporates a flowmeter, temperature meter, and a calculator into a single, compact unit. The size and lack of moving parts means the Series TUF requires minimal maintenance. The 8-digit LED display enables easy reading of the meter's recorded values; including temperature, flow-rate, energy consumption, etc. These features make it ideal for installation on chillers, boilers, and individual apartment piping. With the optional couplings it is capable of being used with either NPT or BSPT pipe sizes. It is the perfect meter for tenant billing applications.

FEATURES

- Lower maintenance costs with local parameter display and no moving parts
- Serial communication output allows for easy transfer of data
- Flow and temperature monitor in one unit eliminates the need for multiple units

SPECIFICATIONS

Service: Clean, compatible liquids.
Wetted Materials: Brass and 316L SS.
Range: See chart.
Display: 8-digit LED.
Accuracy: BTU: EN1434/CJ128 Class 2; Flow: ±(2+(0.02 Qp / Q))%; Temperature: 0.18°F (±0.1°C).
Power Requirements: 24 VAC/VDC (model dependent)* or 3.6 V ER26500 lithium metal battery, user supplied and installed, battery acts as back-up if power is lost.
Power Consumption: 1 W.
Temperature Limits: Ambient: 41 to 131°F (5 to 55°C); Process: 36 to 203°F (2 to 95°C).
Humidity Limit: <93%.
Pressure Limits: 232 psi (16 bar) for DN15 to DN40; 362 psi (25 bar) for >DN50.
Pressure Drop: <1.5 psi (10 kPa).
Process Connection: See chart.
Serial Communications: Modbus® RTU or BACnet MSTP (selectable)**.
Enclosure Rating: IP65.
Enclosure Material: Plastic.
Repeatability: Flowmeter: 1%.
Electrical Connections: 3 ft (0.91 m) 4x0.2 mm² cable with terminal block.
Flow Direction: Unidirectional.
Mounting Orientation: Horizontal or vertical.
Weight: See chart.
Agency Approvals: CE.

*Power supply must be floating, not grounded. Model numbers ending in "-DC" are for DC only applications.
**M-BUS available upon request.

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INSTALLATION INSTRUCTIONS

1. Install the meter as shown in either Figure 1 or Figure 2.
2. Mount the temperature sensor with the blue tag on the corresponding return pipe on application. The sensor with the red tag has already been installed in the meter.
3. Flush the system in the proper direction until:
   - No impurities remain in the filter and pipe.
   - No water leaks when pressure is added to the system.
   - The humidity inside the enclosure containing the meter does not exceed 93%.
4. After flushing for a period of time; close the ball valves on either side of the meter and flush the impurities out of all filters.

*3.6 V ER26500 battery may be purchased separately to power display only.

INSTALLATION REQUIREMENTS

NOTICE If the following requirements are not followed, then large air particles and impurities in the pipe could influence the meter's measuring accuracy.

1. Ensure that there is a 10 diameter straight run of pipe upstream and a 5 diameter straight run of pipe downstream form the meter.
2. See the installation positions in Figure 3, in which A and B are the proper installation positions, while C and D are the improper positions.
3. If the meter is installed on the horizontal pipe, it must be oriented at least 45° from horizontal (see Figure 4). If the meter's face is horizontal, then debris accumulation can increase inaccuracies (see Figure 5 for correct and incorrect orientations). There is no special requirement when installing on the vertical pipe work.
4. Handle display with care. LCD display may damage with force.

Note: the meter can be installed on the return pipe or the supply pipe according to user's needs, but it should be selected in advance.

INSTALLATION NOTES

NOTICE If not specified at time of order, refer to appendix III to change from supply to return programming.
Change from supply to return, and vice-versa, is only possible using digital communication protocols.

NOTICE Do not directly weld the meter on to the pipe; the extreme heat will damage the BTU meter's internal elements.

⚠ CAUTION Do not install the meter near a high temperature heat source such as during electro gas welding. Doing so after installing an optional battery could cause the battery to explode and cause injury to people and damage the meter.

1. Avoid tugging on the temperature probe's cables.
2. Ensure the water is flowing in the direction indicated by the arrow on the meter's body.
3. If several meters are installed on the same vertical pipe work, each meter should be separated from the others to avoid pipe leakage or fallen debris that could affect the other meters' operation.

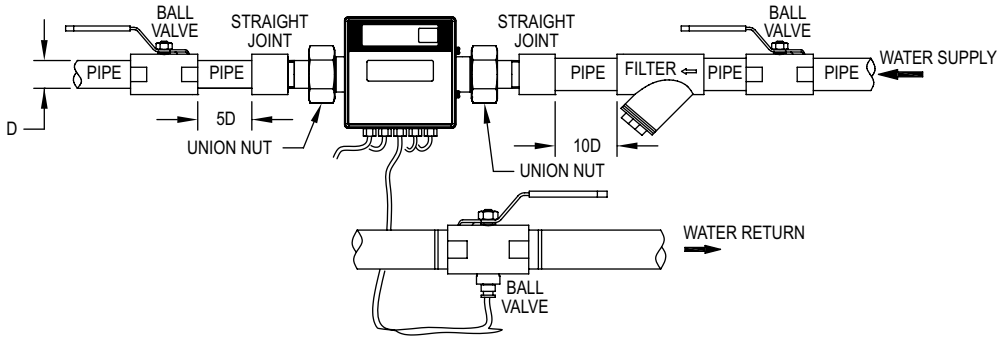


Figure 1: Installation diagram for TUF-150 to TUF-400

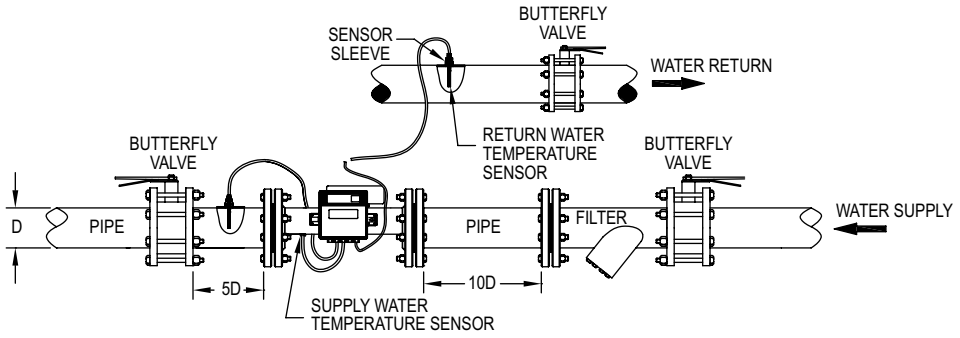


Figure 2: Installation diagram for TUF-500 to TUF-2000

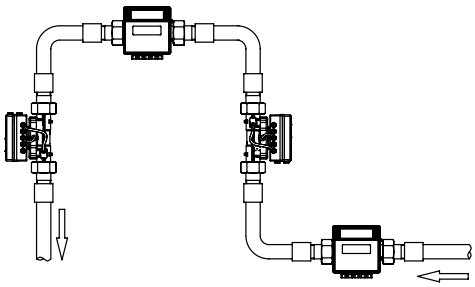


Figure 3: Installation positions

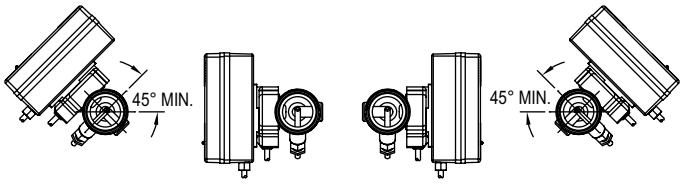
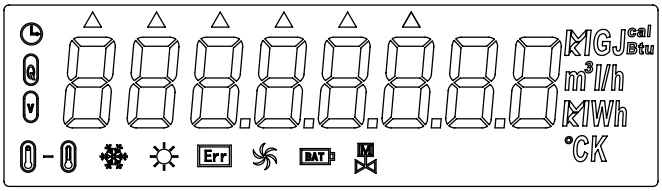


Figure 4: Mounting rotation

1. If meter is not in use during freezing conditions, drain all water from the connecting pipe. Low temperatures will cause the water to freeze in the pipe and damage the meter.
2. This device is intended to be used with clean water. While dirty water will not damage the meter, it will cause errors in the reading.
3. A filter should be mounted near the meter and cleaned regularly.
4. If the heat exchanging system is operating normally, but the instantaneous flow-rate of the heat meter reduces significantly, then there is too much dirt in the filter. This will narrow the pipe and reduce the flow. Cleaning the filter will fix the problem.
5. To protect the meter and avoid damage from harsh conditions, it is recommended that the meter be encased in an enclosure.
6. Primary Address: first 2 digits of Manufacturer ID
7. Secondary Address: later 8 digits of Manufacturer ID
8. Company Code: BAS (08 33)
   - Version: 54



DISPLAY

1. Switching Between Information
   Holding down the button for > 1s will switch the sections from curren information ▲, to monthly information ▲▲, and then to other information ▲▲▲. Once in the desired section, pressing the key will switch the information shown for the given section.
2. Display Units
   Energy is displayed in kW•h, power is displayed in kW, flow volume is displayed as m^3, and flow-rate is displayed in m^3/h.
3. Display Details
   a. "Monthly Reading Date" is displayed as "Pd= XX", in which XX is the end date of the current month's energy summation. The factory default value is 31, meaning that the monthly recording period ends at midnight on the 31st day of the month. At this time the current month's cumulated energy will be stored and the system will begin to record the next month's energy.

   b. The meter can store and display the recordings from the past 18 months.

   c. The units for "Sum of Working Time" (hours) is displayed as h.

   d. "Software and Protocol Editions" are displayed as "UEr.X.X X.X". The first X.X is the software edition code and the second X.X is the communication protocol edition code.

   e. "Leaving-factory serial number" is the meter's identification number, which is the same as the one in the external label. This serial number is a unique number set by the factory; it is also the secondary address in M-BUS system.

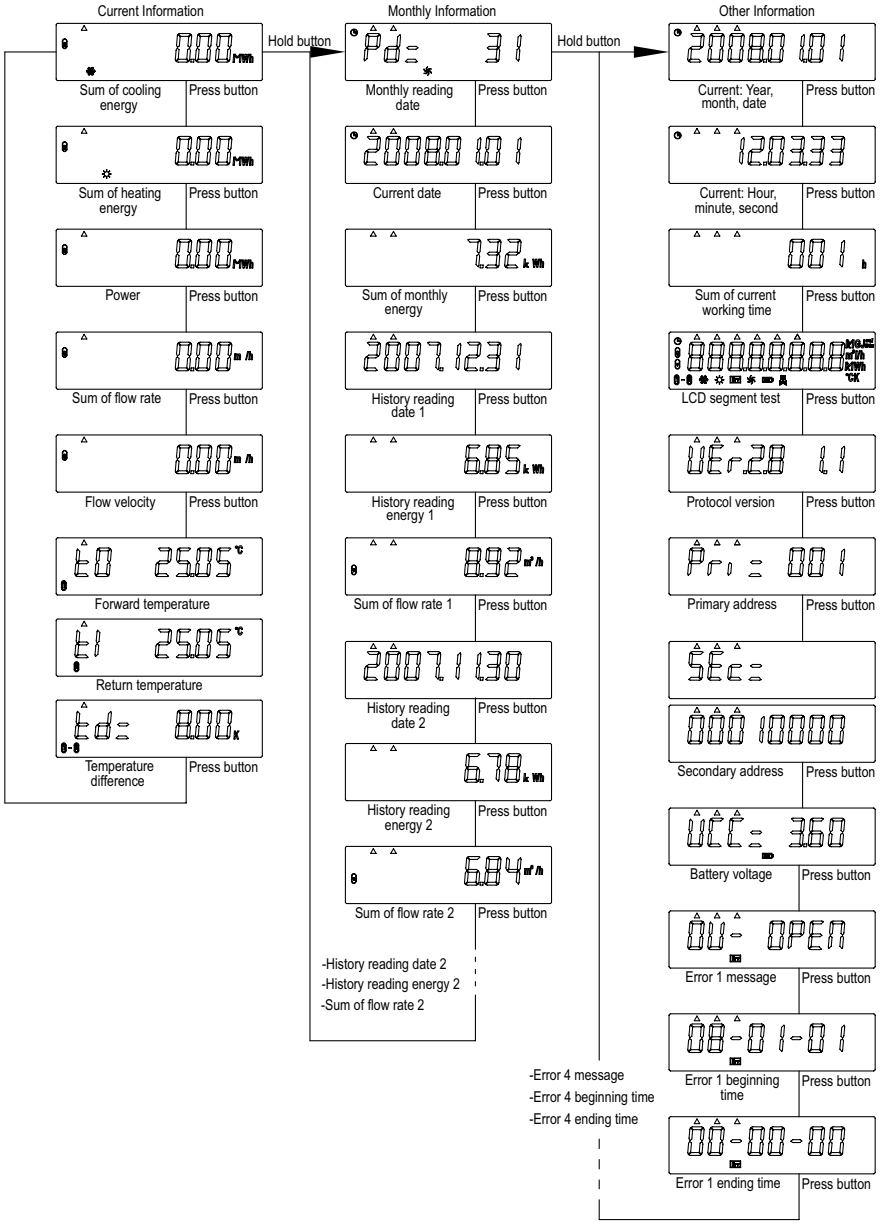
   f. Battery Voltage displays "UCC=X.XX" (the default unit is Volts). When the battery's voltage capacity is lower than 2.9±0.1 V, " BAT " will appear on the display. This symbol will not appear if no battery is installed.

   g. If there are any unresolved errors, the start date will display as normal but the end date will display "00-00-00", and then the error message will be displayed.

4. LCD Display Data:
   - Cooling energy
   - Heat energy
   - Volume
   - Operating time
   - Flow temperature
   - Return temperature
   - Temperature difference
   - Power
   - Volume flow
   - Recorded date
   - Recorded energy
   - Recorded volume

Error Message Table	
Error Messages	**Explanation**
IN—CLOSE	Temperature sensor of water supply is in closed state
IN—OPEN	Temperature sensor of water supply is in open state
OU—CLOSE	Temperature sensor of return water is in closed state
OU—OPEN	Temperature sensor of return water is in open state
FL-OPEN	Flow sensor failure. (Could be caused by air in the meter, the absence of water, or water flowing in the wrong direction)
COD=XXXX	There is an error in malfunction record. "XXXX" is the error code
BAT	Low Battery*

*Battery not included



WARRANTY/RETURN
Refer to “Terms and Conditions of Sale” in our catalog and on our website. Contact customer service to receive a Return Goods Authorization number before shipping the product back for repair. Be sure to include a brief description of the problem plus any additional application notes.

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