

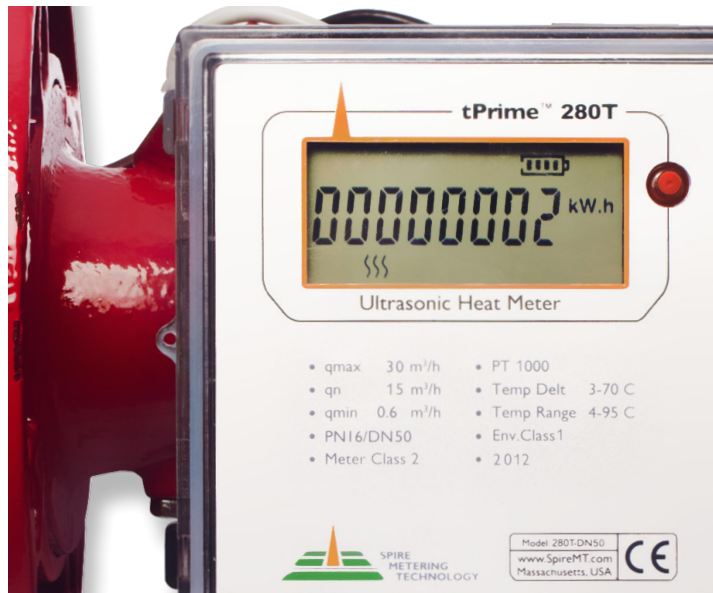


tPrime™ Series 280T

ULTRASONIC HEAT METER

Applications

- Residential submetering
- Commercial buildings
- District heating / cooling
- HVAC
- Green energy management
- AMR and Billing



Features

- Wear-free. Maintenance-free
- Non-reflector sensor design for robust performance in both clear water and dirty water
- Multipath technology for increased accuracy
- Excellent long-term stability. Accuracy does not degrade over time
- Exceed OIML R75 class 2. Billing grade
- IP68 water-proof
- Low pressure drop
- For both heating and cooling circuits
- Free positioning
- Automatically switch to MBus power when available to save battery
- Ready for AMR with Pulse / M-Bus / Modbus / BACnet interface
- Wireless available
- Low cost over the long run
- SpireCapture AMR/AMI and Billing solutions



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tPrime™ Series 280T

ULTRASONIC HEAT METER



The tPrime™ series ultrasonic heat meter, often called BTU meter, offers the most advanced heating/cooling energy measurement by using state-of-the-art ultrasonic flow measurement technology. It does not have any moving parts that can wear or tear, thus, literally requires no maintenance.

With its maximum 95°C operating temperature (130°C version is also available upon request) and nominal pressure of 1.6MPa, the technical specifications of the tPrime series meet the standards for residential and commercial utility metering. The wide dynamic range allows for a load of up to double the rating, thereby ensuring high operation security. The large display can be set to display the

heat consumption, temperature, flow total, working time, flow rate and more. The meter also has a remote readout which could be configured as pulse, M-Bus, RS485/Modbus, BACnet or wireless.

Spire Metering's ultrasonic BTU meter stands out among the competition due to its unique reflector-free sensor design and multipath technology. It is able to work reliably even when the water is dirty, which could be the case in the HVAC circuit after years' operation. Both commercial and residential installations can profit from the advantages of the wear-free heating/cooling energy measurement, namely, precision, operation security and long service life.





tPrime™ Series 280T

ULTRASONIC HEAT METER

Operating Principle

The tPrime™ series BTU meter is consisted of an ultrasonic flow sensor, a pair of PT1000 temperature sensors and an integrator. The microprocessor-based integrator controls the ultrasonic sensor to transmit and receive ultrasound in an orderly fashion so as to conduct precise flow measurement. It also has electronics dedicated to the PT1000 sensor to measure the temperature in the supply pipe as well as the return pipe. The integrator calculates the heat energy based on the flow-rate and the temperature difference between the supply and the return.

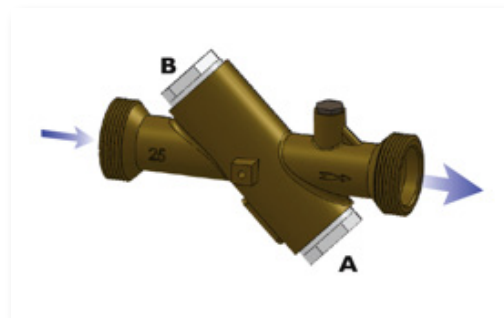
The figure on the right illustrates how the ultrasonic flow sensor works. Two ultrasonic transducers (A and B) are mounted on a spool-piece face-to-face, one is on the upstream and the other on the downstream. The integrator operates by alternately transmitting and receiving a burst of sound energy between the two transducers and measuring the transit-time it takes for sound to travel between the two transducers. The difference in the transit-time measured corresponds directly to the velocity of the liquid in the pipe.

Unique Multi-path Technology

For large size meters, it is not easy to install the flow sensor perfectly in line with the pipe line. A small misalignment could cause flow profile distortion inside the flow sensor; thus, causing significant measurement errors. Spire Metering developed a unique multi-path technology to solve this problem. Two/four pairs of ultrasonic transducers are mounted on the flow sensor body to interrogate the flow from two/four different paths (refer to figure on the right.) A flow calculation algorithm based on fluid dynamics theory is then used to derive an average flow reading with improved accuracy.

Non-reflector Design

Intended for small pipe sizes, Spire Metering has designed a straight-through flow sensor containing a flow guide that extends the sound path, allowing for more precise measurement. This reflector-less design is revolutionary as it provides enough sound path to ensure overall accuracy enhancement. This is significant because over time, heating and cooling circuits become dirty and begin to affect typical reflector designs. This fundamental change eliminates impending failures and allows the meter to continue to capture measurements regardless of liquid quality.





tPrime™ Series 280T ULTRASONIC HEAT METER

Automatic Meter Reading

The tPrime™ series BTU meter offers a variety of interface options, such as M-Bus, RS485 with Modbus, BACnet, Pulse, as well as wireless (GSM, GPRS and RF). It is very flexible to be integrated into an AMR/AMI system.

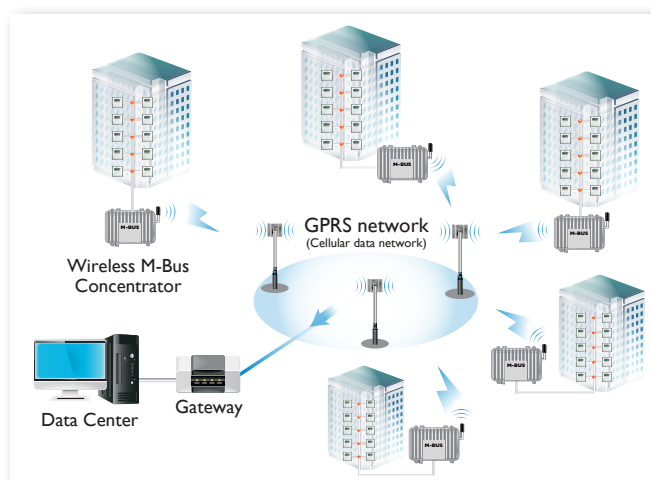
Spire Metering also offers a complete range of AMR/AMI solutions as well as an integrated billing system. Its SpireCapture system is a cutting edge fixed automatic meter reading system which integrates both wired and wireless AMR/AMI technologies. It provides a unified platform for meter reading and data management through M-Bus networks, RF wireless networks, GSM networks, GPRS networks as well as TCP/IP networks. In addition, it works seamlessly with Spire Metering's billing software to make data exchange easy, fast and reliable.

SpireCapture is an advanced, highly robust meter reading solution that delivers comprehensive usage information as well as timely, high-resolution meter reading. This data enables gas, water, heat and electric utilities to

eliminate on-site visits and estimated reads, reduce theft and loss, implement time-of-use billing, and profit from all of the financial and operational benefits of fixed-network AMI/AMR.

A typical M-Bus based AMR system is illustrated in the below figure. It is consisted of a number of M-Bus utility meters, several M-Bus concentrators, a GSM/GPRS wireless modem for each concentrator, and a data center. The Concentrator communicates with the data center through a GSM/GPRS network. The data center first issues a meter reading command and sends it to the wireless network. The modem receives the command and forwards it to the M-Bus concentrator. Then, the concentrator either replies to the command with requested data or passes the command to its sub meters transparently.

For information on AMR/AMI parts, such as concentrators, repeaters, protocol convertors, data collection devices and etc., **please contact solutions@spiremt.com**



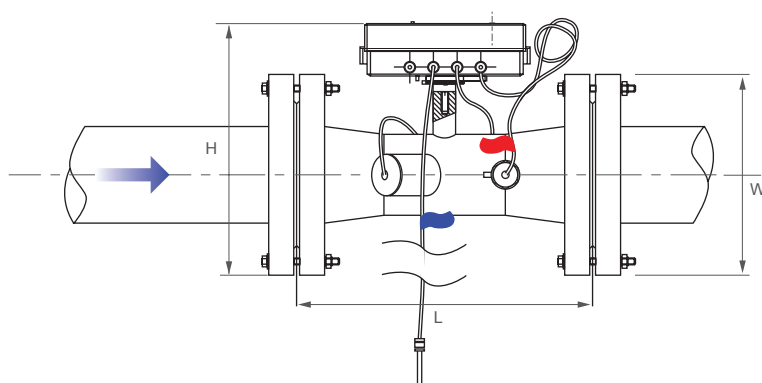
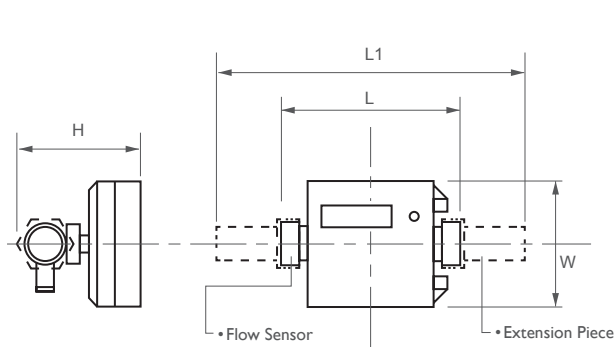


tPrime™ Series 280T

ULTRASONIC HEAT METER

Specifications

Size		Flowrate						Dimension (mm)			Weight* (kg)	Pipe Joint** (BSP / DIN)	
		qn		qmin		qmax							
mm	inch	m³/h	gpm	m³/h	gpm	m³/h	gpm	L	W	H		Flow Sensor	Ext. Piece
15	1/2	1.5	6.6	0.03	0.1	3.0	13.2	110	120	86	0.7	G3/4B	G1/2B
20	3/4	2.5	11	0.05	0.2	5.0	22	130	120	86	0.8	G1B	G3/4B
25	1	3.5	15.4	0.07	0.3	7.0	30.8	160	128	89	0.9	G1 1/4B	G1B
32	1¼	6.0	26.4	0.12	0.5	12.0	52.8	180	130	96	1.3	G1 1/2B	G1 1/4B
40	1½	10	44	0.2	0.9	20	88	200	134	98	1.8	G2B	G1 1/2B
50	2	15	66	0.6	2.6	30	132	200	165	190	5.6	Flange – Nut 4-M16	
65	2½	25	110	1.0	4.4	50	220	200	185	204	6.6	Flange – Nut 4-M16	
80	3	40	176	1.6	7	80	352	225	192	220	9.0	Flange – Nut 8-M16	
100	4	60	264	2.4	10	120	528	250	220	240	11.6	Flange – Nut 8-M16	
125	5	100	440	4.0	17	200	880	250	230	235	16.2	Flange – Nut 8-M16	
150	6	150	660	6.0	26	300	1320	300	265	270	16	Flange – Nut 8-M20	
200	8	250	1100	10.0	44	500	2200	350	350	320	22	Flange – Nut 12-M20	
250	10	400	1760	16.0	70	800	3520	450	405	405	60	Flange – Nut 12-M24	
300	12	600	2640	25.0	110	1200	5280	500	460	460	80	Flange – Nut 12-M24	
350	14	800	3520	30.0	132	1600	7040	500	520	520	105	Flange – Nut 16-M24	
400	16	1200	5280	48.0	211	2400	10560	500	580	580	123	Flange – Nut 16-M27	
450	18	1500	6600	60.0	264	3000	13200	500	640	640	157	Flange – Nut 20-M27	
500	20	2000	8800	80.0	352	4000	17600	500	715	715	208	Flange – Nut 20-M30	



Notes:

- Weight may differ depending on accessories.
- Pipe joint could be NPT / ANSI flange upon request. For DN50~DN100, the flange is removable.



tPrime™ Series 280T

ULTRASONIC HEAT METER

Electrical Data

Power Supply: Battery, 3.6V, Lithium
Replacement Interval: 10 years at $t_{BAT} < 30^{\circ}\text{C}$
Network Power Supply: Automatically switch to M-Bus or RS485 power if available to save battery
Power Consumption: $< 0.2\text{W}$
Standby Current: $< 10\mu\text{A}$
Backup Power Supply: Internal SuperCap
Communication Interface: M-Bus (default). Optional: RS485 with MODBUS support, optical isolated; Pulse, optical isolated, BACnet, Radio, GSM
CE approval: EN61326-1:2006

Accuracy / MPE (Maximum Permissible Error)

MPE according to OIML R75, the whole system error is the combination of the following:

Calculator (Integrator): $E_c = \pm (0.5 + 2 / \Delta\Theta)$

Temperature Sensor: $E_t = \pm (0.5 + 4 / \Delta\Theta)$

Flow Sensor: $E_f = \pm (2 + 0.02 q_n / q)$

Here $\Delta\Theta$ is the temperature difference between the flow and return of the heat exchange circuit. q is the flow rate and q_n is the nominal flow rate.

Calculator (Integrator)

Display: LCD, 8 digits
Resolution: 999.99999 - 999999.99 - 99999999
Energy Unit: KWh – MWh – GJ
Communication Protocol: M-Bus (default). Optional: MODBUS



tPrime™ Series 280T

ULTRASONIC HEAT METER

Temperature Measurement

Sensor Type: Pt1000, 2-wire
Measurement Range: 0 -150°C (32-302°F)
Difference Range: $\Delta\Theta$: 3K-70K
Permissible Temperature: Θ : 2-60°C (35-140°F) for long term and up to 95°C (203°F) for short term
High-temperature version up to 130°C (266°F) (upon request)

Mechanical Data

Metrological Class: 2 (according to OIML R75)
Environmental Class: B
Electromagnetic Class: EI
Environmental Temp: 0-55°C (32-131°F)
Enclosure Protection: IP68
Integrator Detachable: Yes
Pressure: PN16
Flow Sensor Cable: 1.2m (up to 10m, upon request)
Temperature Sensor Cable: 1.2m (up to 10m, upon request)

Pressure Loss

The pressure loss of a flow sensor is proportional to $\Delta p = k \times q^2$ the square on the flow:
Here Δp is pressure loss, q is volume flow rate and k is the coefficient.
All meters have Δp less than 0.25bar at q_p .



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Order Specifications

280T - DN - - - -

Size

DN15 (1/2 ")	015	DN125 (5 ")	125
DN20 (3/4 ")	020	DN150 (6 ")	150
DN25 (1 ")	025	DN200 (8 ")	200
DN32 (1 1/4 ")	032	DN250 (10 ")	250
DN40 (1 1/2 ")	040	DN300 (12 ")	300
DN50 (2 ")	050	DN350 (14 ")	350
DN65 (2 1/2 ")	065	DN400 (16 ")	400
DN80 (3 ")	080	DN450 (18 ")	450
DN100 (4 ")	100	DN500 (20 ")	500

Output Interface

Pulse	0
M-Bus	1
RS485/Modbus	2
BACnet	3
GSM wireless	4
RF wireless	5
Others	6

Pipe Joint

BSP	A
NPT	B
DIN Flange	C
ANSI Flange	D

Accessory

None	0
with extension piece (for size ≤ DN40)	1
with extension piece and T-connector / thermal well (for size ≤ DN40)	2

Temperature

Standard Temperature	A
High Temperature	B

Example

280T-DN025-1-A-2-A stands for the 280T tPrime™ series BTU meter for pipe DN25mm with M-Bus interface, BSP pipe joint, extension pieces and T-connector (thermal well.) Standard temperature rating.



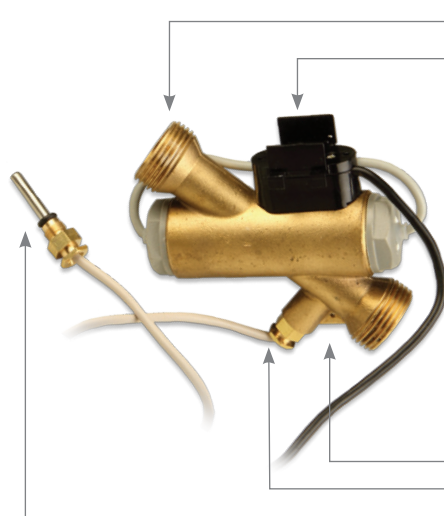
tPrime™ Series 280T

ULTRASONIC HEAT METER

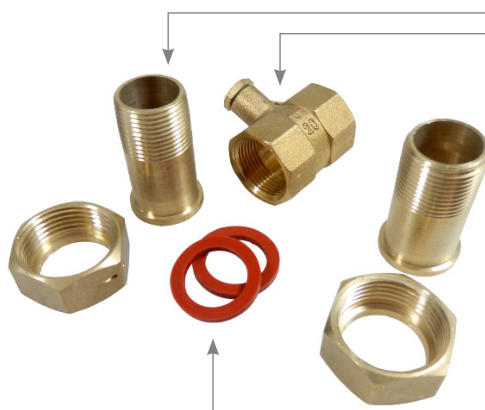
Small size BTU meter (DN15-DN40)



- Integrator
- Interface Cable
- Flow Sensor Cable



- Flow-cell Sensor
- Integrator Holder
- Temperature Sensor Mounting Pot
- Temp Sensor 1 (already installed)
- Temp Sensor 2



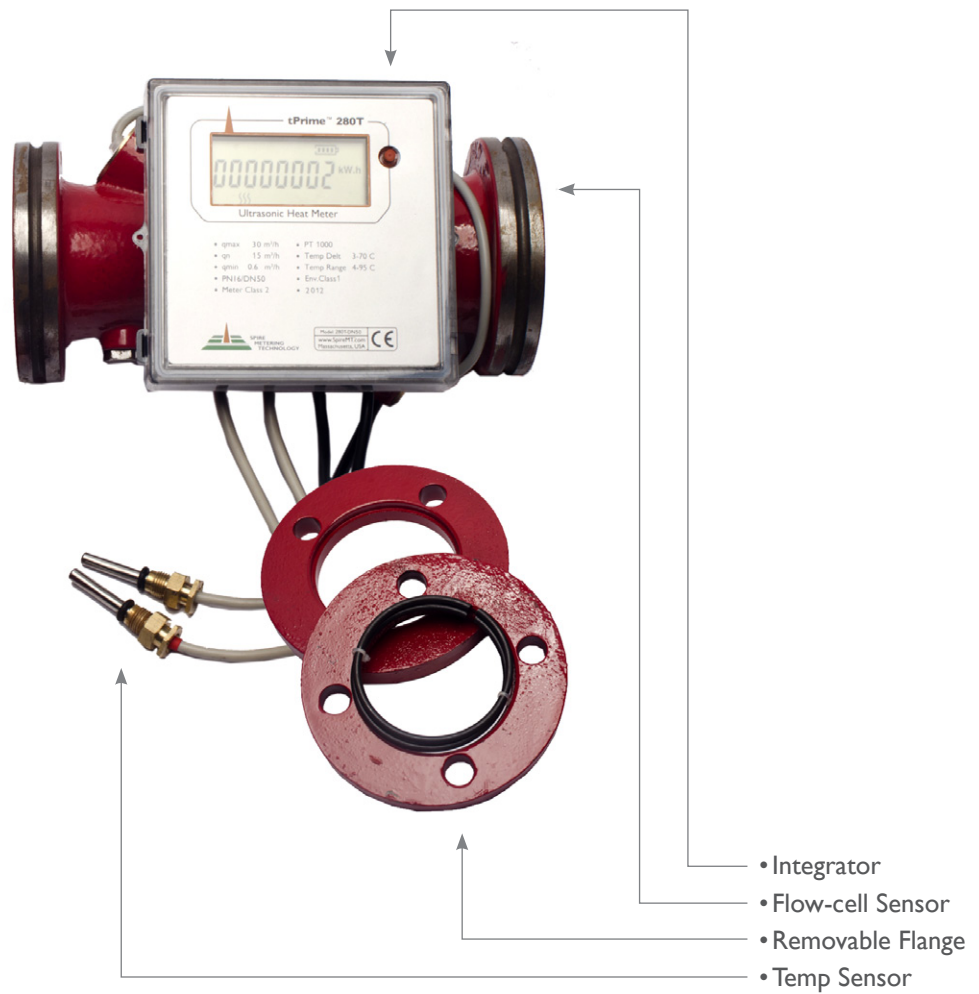
- Extension Piece (optional)
- T-connector / Thermal well (optional)
- Gasket



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Medium Size BTU Meter (DN50-DN100)





tPrime™ Series 280T

ULTRASONIC HEAT METER

Large Size BTU Meter (DN125-DN500)





tPrime™ Series 280T

ULTRASONIC HEAT METER

About Spire Metering Technology

Formerly Shenitech, Spire Metering is a global leader in flow and energy management solutions. Through continuous innovation, we transform complex ultrasonic technology into affordable, reliable solutions for accurate flow and energy measurement. Spire Metering offers water, heat, electricity and gas meters as well as AMR/AMI solutions. To find out how we can help today, please tell us about your application.