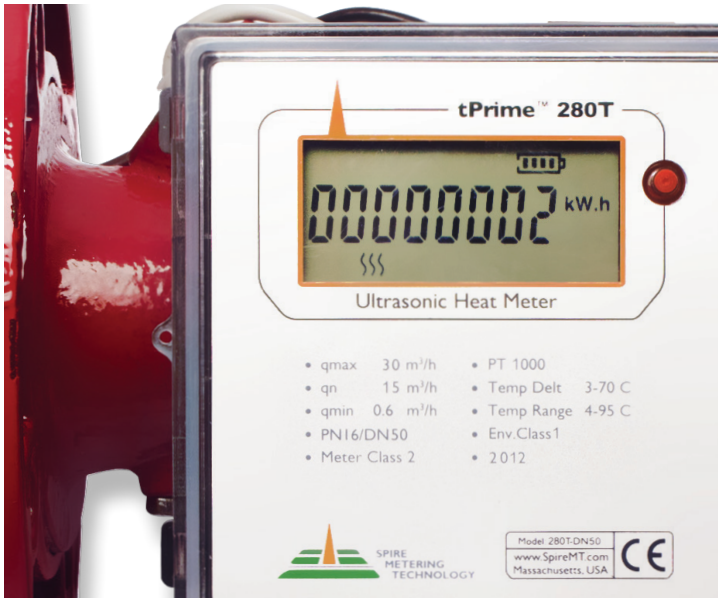
MEASURE **TODAY.** ENSURE **TOMORROW.**

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
- Unique 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 rated for the sensor, IP67 for the integrator
- Low pressure drop
- For both heating and cooling circuits
- Free positioning
- Ready for AMR with M-Bus / Modbus / BACnet interface
- Low cost over the long run
- SpireCapture AMR/AMI and Billing solutions

DS-280T-170721_Rev.6

SPIRE METERING TECHNOLOGY

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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 up to 2.5MPa, 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 M-Bus, RS485/Modbus, BACnet and more.

The BTU calculation is according to EN1434 heat meter standard. The formulas have been carefully implemented in the microprocessor so to reduce the computational error to the minimal.

Spire Metering's ultrasonic BTU meter stands out among the competition due to its unique sensor design and multipath technology. It is able to work reliably even when the water is dirty. 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.

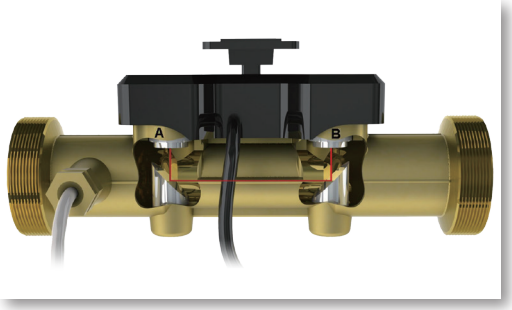
Operating Principle

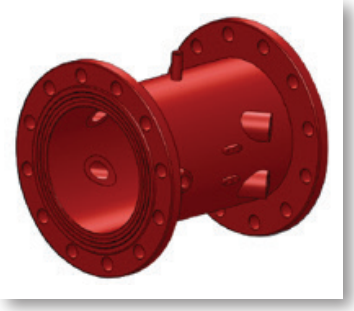
The tPrime™ series BTU meter is consisted of an ultrasonic flow sensor, a pair of PT1000 temperature sensors and an integrator. The microprocessor-based integrator controls the ultrasonic sensor to transmit and receive ultrasound in an orderly fashion so as to conduct precise flow measurement. It also 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 flowrate and the temperature difference between the supply and the return.

The figure below illustrates how the ultrasonic flow sensor works. Two ultrasonic transducers (A and B) are mounted on a spool-piece, one is on the upstream and the other on the downstream. Two reflectors are used to direct the sound from one sensor to another. 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.





Automatic Meter Reading

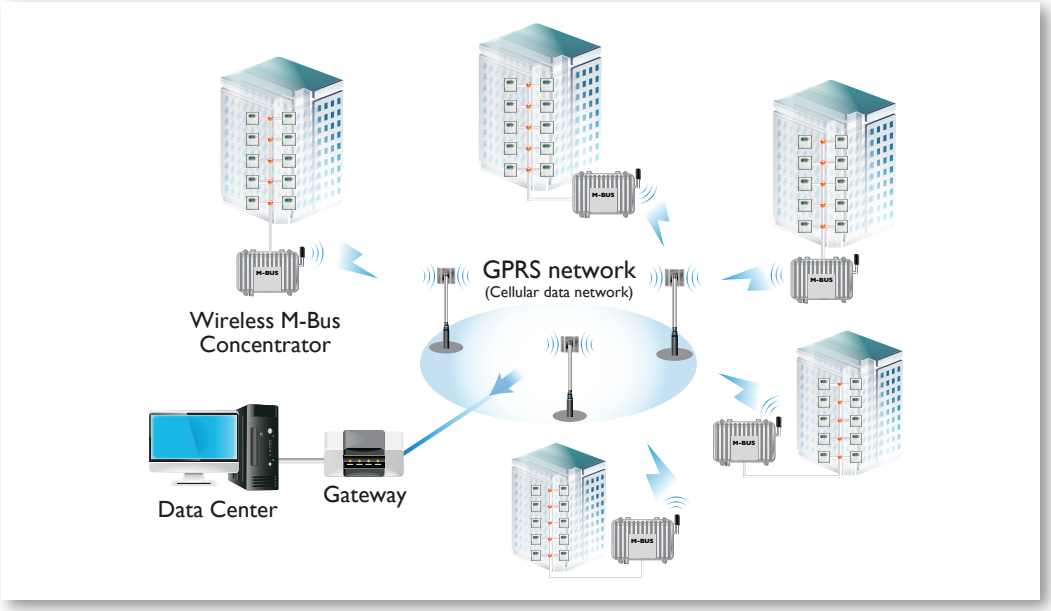
The tPrime™ series BTU meter offers a variety of interface options, such as M-Bus, RS485 with Modbus, BACnet, as well as wireless. It is very flexible to be integrated into an AMR/AMI system.

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.

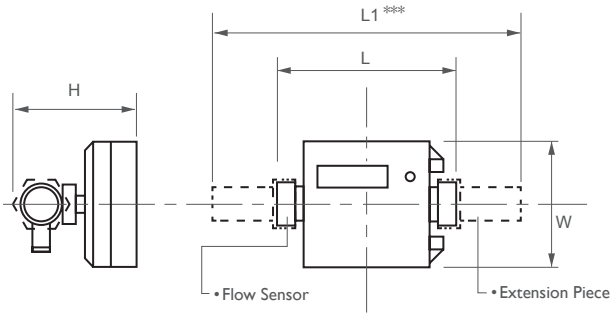
For information on AMR/AMI parts, such as concentrators, repeaters, protocol convertors, data collection devices and etc., **please contact solutions@spiremt.com**

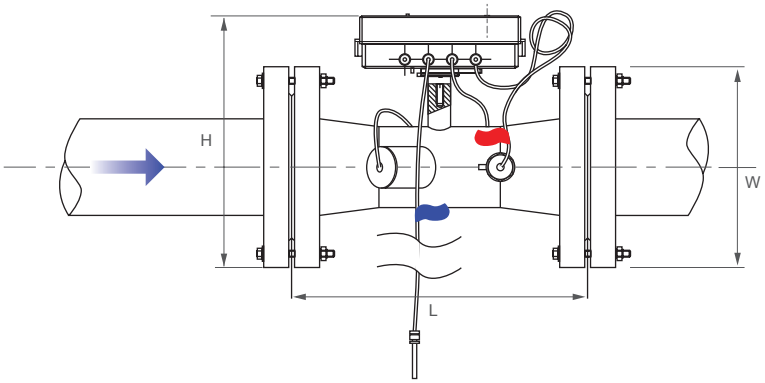


tPrime™ Series 280T
ULTRASONIC HEAT METER

Specifications ****

Size		Flowrate						Dimension (mm)			Weight* (kg)	Pipe Joint** (BSP / DIN)	
		qn		qmin		qmax							
mm	inch	m^3/h	gpm	m^3/h	gpm	m^3/h	gpm	L	W	H		Flow Sensor	Ext. Piece
15	½	1.5	6.6	0.03	0.1	3.0	13.2	110	120	86	1.4	G3/4B	G1/2B
20	¾	2.5	11	0.05	0.2	5.0	22	130	120	86	1.4	G1B	G3/4B
25	1	3.5	15.4	0.07	0.3	7.0	30.8	160	128	89	1.8	G1 1/4B	G1B
32	1 ¼	6.0	26.4	0.12	0.5	12.0	52.8	180	130	96	2.4	G1 1/2B	G1 1/4B
40	1 ½	10	44	0.2	0.9	20	88	200	134	98	3.0	G2B	G1 1/2B
50	2	15	66	0.6	2.6	30	132	200	165	190	8.7	Flange – Nut 4-M16	
65	2 ½	25	110	1.0	4.4	50	220	200	185	204	9.9	Flange – Nut 4-M16	
80	3	40	176	1.6	7	80	352	225	200	220	11.8	Flange – Nut 8-M16	
100	4	60	264	2.4	10	120	528	250	220	240	15.2	Flange – Nut 8-M16	
125	5	100	440	4.0	17	200	880	250	250	235	21.1	Flange – Nut 8-M16	
150	6	150	660	6.0	26	300	1320	300	285	270	28.3	Flange – Nut 8-M20	
200	8	250	1100	10.0	44	500	2200	350	340	320	39.5	Flange – Nut 12-M20	
250	10	400	1760	16.0	70	800	3520	450	405	405	85.0	Flange – Nut 12-M24	
300	12	600	2640	24.0	106	1200	5280	500	460	460	117.0	Flange – Nut 12-M24	
350	14	800	3520	32.0	141	1600	7040	500	520	520	128.0	Flange – Nut 16-M24	
400	16	1000	4400	40.0	211	2000	8800	500	580	580	150.0	Flange – Nut 16-M27	
450	18	1000	4400	40.0	264	2000	8800	500	640	640	188.0	Flange – Nut 20-M27	
500	20	2000	8800	80.0	352	4000	17600	500	715	715	225.0	Flange – Nut 20-M30	
600	24	2000	8800	80.0	352	4000	17600	800	840	840	415.0	Flange – Nut 20-M33	





Notes:

** Weight may differ depending on accessories.*

*** Pipe joint could be NPT / ANSI flange upon request. Standard pressure rating PN16 or ANSI 150#.*

**** L1 equals L plus 94mm for DN15, 102mm for DN20, 121mm for DN25, 137mm for DN32 and 128mm for DN40.*

***** For the flange data in above table are for standard pressure rating PN16. For higher pressure rating, please contact support@spiremt.com for more information.*

Electrical Data	
Power Supply:	Battery, 3.6V, Lithium
Replacement Interval:	5 years at t_{BAT} <30°C
Power Consumption:	<0.2W
Standby Current:	<10uA
Backup Power Supply:	Internal SuperCap
Communication Interface:	M-Bus (default). Optional: RS485 with MODBUS support, optical isolated; BACnet, Radio
CE approval:	EN61326-1:2006

Accuracy / MPE (Maximum Permissible Error)	
MPE according to OIML R75 / EN1434, the whole system error is the combination of the following:	
Calculator (Integrator):	Ec = ± (0.5 + $\Delta\Theta_{min}$ /$\Delta\Theta$)
Temperature Sensor:	Et = ± (0.5 + 3$\Delta\Theta_{min}$ /$\Delta\Theta$)
Flow Sensor:	Ef = ± (2 + 0.02 qn /q)
Here $\Delta\Theta$ is the temperature difference between the flow and return of the heat exchange circuit. q is the flow rate and qp is the nominal flow rate.	
NOTE: *The actual error of 280T meters is much smaller than the above MPE.*	

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

Temperature Measurement	
Sensor Type:	Pt1000, 2-wire. Pt500 available upon request
Measurement Range:	0 -150°C (32-302°F)
Difference Range:	ΔΘ: 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 / EN1434)
Environmental Class:	B
Electromagnetic Class:	E1
Environmental Temp:	0-55°C (32-131°F)
Enclosure Protection:	IP68 water-proof rated for the sensor, IP67 for the integrator
Integrator Detachable:	Yes
Pressure:	PN16 (PN25 available upon request)
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 the square on the flow: $\Delta p = k \times q2$
Here Δp is pressure loss, q is volume flow rate and k is the coefficient.
All meters have Δp less than 0.25bar at qp.

Order Specifications

For International Market (Metric Unit System)

280T - DN □□□ - □ - □ - □ - □

Size	ID		ID
DN15	015	DN125	125
DN20	020	DN150	150
DN25	025	DN200	200
DN32	032	DN250	250
DN40	040	DN300	300
DN50	050	DN350	350
DN65	065	DN400	400
DN80	080	DN450	450
DN100	100	DN500	500

Output Interface	ID
M-Bus (Default)	1
RS485/Modbus	2
BACnet/MSTP	3
Other, please specify	4

Pipe Joint	ID
BSP	A
NPT	B
DIN Flange	C
ANSI Flange (RF150#)	D
Other, please specify	E

Temperature	ID
Standard Temperature (Default)	A
High Temperature	B

Pressure	ID
1.6MPa (232 psig)	1
2.5MPa (362 psig)	2

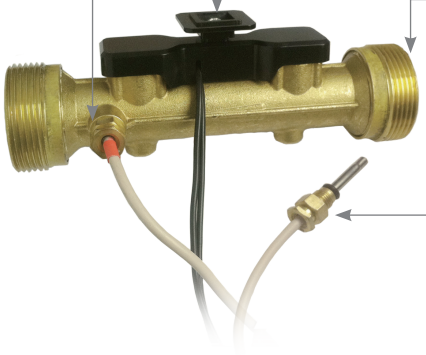
Example

280T-DN025-1-A-A-1 stands for the 280T tPrime™ series BTU meter for pipe DN25mm with M-Bus interface, BSP pipe joint (a pair of extension pieces and a T-connector thermowell are included). Standard pressure and temperature rating.

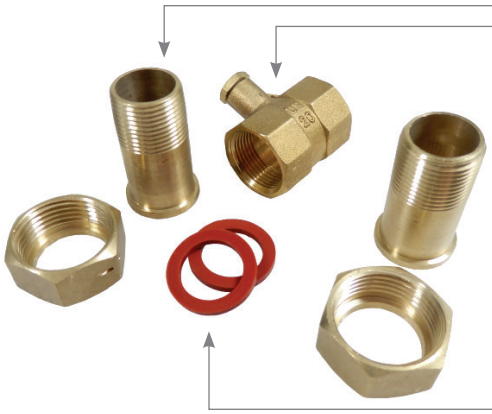
280T-DN100-1-C-A-1 stands for the 280T tprime series BTU meter for pipe DN100mm with M-Bus interface, DIN flange pipe joint, standard pressure and temperature rating.

Small size BTU meter (DN15-DN40)

- Integrator
- Interface Cable
- Flow Sensor Cable

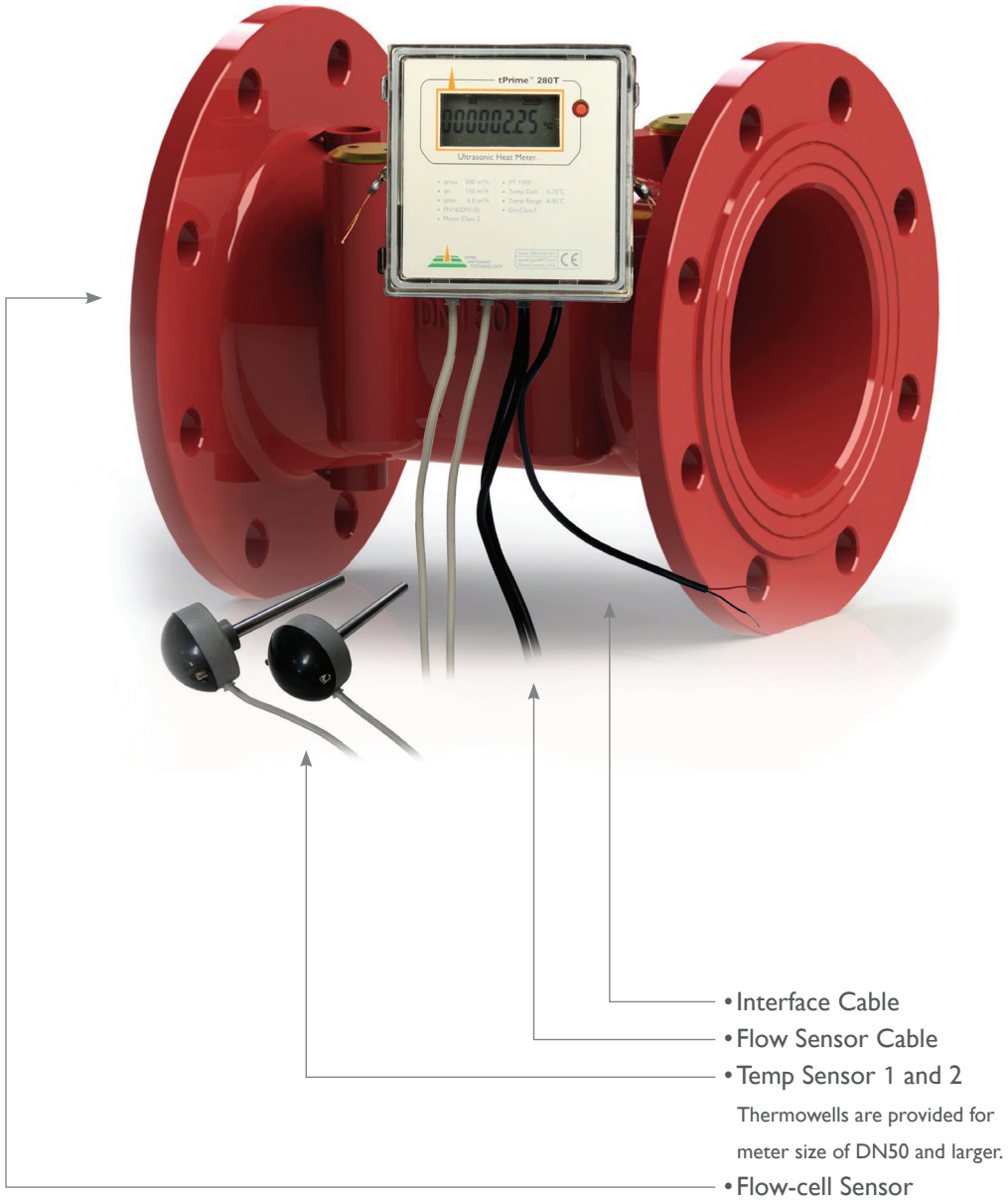


- Temperature Sensor 1 (already installed)
- Integrator Holder
- Flow Sensor
- Temperature Sensor 2



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

Large Size BTU Meter (DN50 and Larger)



Memo

Memo

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.