## Ultrasonic Flow Meter Optimized For Thermal Energy/BTU

## FEATURES

- One meter for a wide range of pipe sizes from 2 to 236 inches (50 to 6000 mm)
- Clamp-on or insertion transducers
- Measures bi-directional flow
- Optional clamp-on or insertion PT 100 temperature inputs for thermal energy/BTU measurement
- Optional current input modules for pressure, temperature, or density
- Accuracy +/- 0.5% of reading from 0.16 to 40 ft/s (0.05 to 12 m/s)
- Repeatability +/- 0.1% of full scale
- Clamp-on transducers operating temperature range: 14°F to 176°F (-10°C to 80°C)
- Clamp-on high-temperature transducers operating temperature range: 14°F to 302°F (-10°C to 150°C)
- 1.5 in (38.1 mm) insertion DIA transducers; operating temperature range: -40°F to 176°F (-40°C to 80°C)
- Keypad with 16 tactile keys with 14 dual-function plus six quick set up keys with audible feedback
- Internal memory datalogger; Flow totalizer
- Memkey: automatically detects sensor type; calculates optimal mounting
- Optional Modbus RTU RS-485 output: Sierra Protocol over RS-232, and USB standard, BACnet
- CE approved
- NIST traceable calibration certificate
- Sierra will commission the meter upon request
- Boiler MACT certified
- Rental programs available
- Complete Smart Interface Portal (SIP) for meter setup
- Ships next day online



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## DESCRIPTION

the InnovaSonic<sup>®</sup> 207i transit-time ultrasonic flow meter is Sierra's flagship clamp-on transittime ultrasonic flow meter for liquid flows. An excellent choice for general industry liquid flows, the 207i is optimized for thermal energy/BTU measurements throughout your facility, giving you the critical flow energy data to manage your energy costs downward.

The 207i is part of the iSeries family of flow meters featuring Sierra's proprietary Raptor II operating system also used in our Thermal Mass and Vortex flow meters. A critical element of any thermal energy/BTU measurement is the amount of heat transferred between the hot and cold flow legs. Raptor II uses Sierra's fluid properties database to provide real time density compensation. By accurately measuring fluid flow, taking into account all fluid properties, and making a precise  $\Delta T$  measurement, thermal energy/BTU is calculated with high accuracy.

With a robust stainless steel enclosure, the 207i features a large backlit display and dual-function keypad with audible feedback. Extra effort was put in to help make installation as easy as possible. Clamp-on sensors mean no pipe cutting or expensive plumbing to install. A step by step process using the local display interface guides you through the set-up process. There is even a visual sensor spacing tool on the display—slightly move the sensors together or apart so the indicator line is between the "goal posts" to assure signal strength is ideal.

For thermal energy/BTU metering you can trust, the InnovaMass 207i provides the flow energy measurements to make smart energy measurement decisions.

#### PERFORMANCE SPECIFICATIONS

#### Fluids

All acoustically conductive fluids with <10% solids or bubbles

#### **Quantities Measured**

Volumetric flow totalized mass flow heat energy Totalized flow density speed heat capacity Enthalpy Ambient temperature Inlet and outlet temperature via PT100 or current inputs Pressure (optional) Reynold's number

**Pipe Size** 2 to 236 inches (50 to 6000 mm)

Accuracy Accuracy +/- 0.5% of reading from 0.16 to 40 ft/s (0.05 to 12 m/s)

**Repeatability** +/- 0.1% of full scale

**Resolution** 0.01 ft/s (0.00025 m/s)

Response time 150 ms measuring cycle

#### **OPERATING SPECIFICATIONS**

#### Flow Velocity Range

Bi-directional flows: 0.16 to 40 ft/s (0.05 to 12 m/s) Note: 0.16 ft/s (0.05 m/s) is the default low flow cut-off

#### Temperature

Ambient electronics: -4°F to 140°F (-20°C to 60°C) Clamp-on transducer: 14°F to 176°F (-10°C to 80°C) High temperature clamp-on transducer 14°F to 302°F (-10°C to 150°C) Insertion transducer: -40°F to 176°F (-40°C to 80°C) Note: Insertion pressure limited to 300 psig (20 barg)

Relative Humidity

Up to 99% RH, (non-condensing)

**Power Supply** AC powered 100-240 VAC, 50-60 hz, 0.5 Amps or 9-36 VDC, 0.5 Amps

#### Analog Output

Analog: active or passive 0-20 mA current loop Accuracy: +/- 0.1% of reading Active loop Rext <750 Ohm Passive loop V<24 VDC, Rext <1 kOhm Note: For 1 to 5 VDC output, add 250 Ohm resistor to 4 to 20 mA loop.

#### **Digital Output**

Pulse output: 0 to 9999 Hz, OCT (min. and max. frequency adjustable) Relay output: SPST, max. 1 Hz, (1A @ 125 VAC or 2A @ 30 VDC)

#### **Digital communications**

Modbus RTU protocol RS-485, RS-232 and USB proprietary Sierra Protocol, BACnet

#### Inputs

Upstream and downstream ultrasonic transducers Standard frequency is 1 Mhz. Two PT 100 RTD inputs (optional) Two wire or four wire supported Range: -4.0 °F to 302°F (-20°C to 150°C) Resolution: 0.018°F (0.01°K) Accuracy: +/- 0.01% of reading +/- 0.05°F (0.03°K) Optional configurable current inputs for temperature, pressure, and density

#### SOFTWARE

#### Software

Smart Interface Portal (SIP) Allows access to all meter functions via USB or RS-232

#### Diagnostics

Speed of sound (SOS) Transit time ΔT Signal strength Quality Noise TOM/TOS

#### Datalogging

Internal datalogging Note: Each record is less than 100 bytes depending on whether flow or flow and energy are logged

#### PHYSICAL SPECIFICATIONS

Transmitter Wall-mounted NEMA 4X (IP65), stainless steel

#### Transducers

Clamp-on transducers: encapsulated design IP68 Standard cable length: 30 ft (9 m) Maximum cable length: 300 ft (90 m) Memkey for automatic detection of sensor characteristics

Insertion Transducers IP68 Transducer Mounting Methods

Pipe strap Chain Pipe clamps

Keypad 16 tactile keys with 14 dual-function keys, audible feedback

**Display** 160 x 240 graphic LCD backlit display

#### Weights

Transmitters: approximately 4.7 lb (2.2 kg) Transducer: approximately 2 lb (0.9 kg)

#### 207i Transmitter Wall Mount with Transducers



#### **OPTIONAL RTDS: CLAMP-ON OR INSERTION**

Sierra offers clamp-on and insertion RTDs to make the precise  $\Delta T$  measurement so thermal energy can be calculated with a high degree of accuracy (See page 7 and 8 for dimensional drawings).

#### **PERFORMANCE SPECIFICATIONS**

Accuracy RTD: ±0.12% at 0°C Complete NIST-traceable calibration certificate

#### **OPERATING SPECIFICATIONS**

**Temperature** Measurements up to 450°F (232°C)

Type PT100 RTD; 4-Wire; 100 ohm,  $\alpha = 0.00385$  (standard)

**Stability** RTD: 0.2°C after 10,000 hours at maximum temperature (1 year, 51 days, 16 hours continuous)

**Response Time** RTD: <5 seconds Typical to reach a 63.2% temperature change

Humidity Excellent moisture resistance for condensing environments

#### Calibration

NIST traceable test data indicating actual vs. standard temperature is supplied with each RTD

#### PHYSICAL SPECIFICATIONS

## Enclosure

316 stainless enclosure with piano hinge door. Five  $\frac{3}{4}$ -inch conduit holes pre-drilled across the bottom. NEMA 4X / IP66 rated

RTD Rating NEMA 4X, IP66 PT100 platinum RTD 4-wire

Electrical Connections 6-position terminal block

Thermowell Standard-duty threaded, stepped well Threaded, ½-inch NPT 2-inch thermowell insertion length, no lagging extension

Sensor sheath material: stainless steel 316NUN nipple union nipple

Lead Wire Materials Teflon insulated, hermetically sealed

Wire Size 20 gauge wire

**Pull Force** Wires will withstand at least 20 lb of pull force before separating from sensor head

## **207i OPTIMAL INSTALLATION LOCATIONS**

#### **Optimal Transducer Installation Examples**



#### Transducer Installation For Pump Storage Tanks



## TRANSDUCER SPACING REQUIREMENTS



#### Z Mount



#### Transmitter Wall Mount with Transducers and RTDs



#### **207i TRANSMITTER DIMENSIONS**

Front View 207i Transmitter Wall Mount



Side View 207i Transmitter Wall Mount



Bottom View 207i Transmitter Wall Mount



Example Thermal Energy / BTU Setup



#### **CLAMP-ON TRANSDUCER DIMENSIONS**

**Clamp-on Transducers** 

#### 207i Clamp-on Transducers



Note: Transducer hazardous area classification: Ex d II BT4

### **INSERTION TRANSDUCER DIMENSIONS**



Dimensional Specification - Standards Insertion Transducers			
No.	Parts No. Parts		Parts
1	Cable	7	Locking Nut
2	End Connector	8	Locating Sleeve
3	O-Ring	9	Joint Nut
4	Alignment Handle	10	Ball Valve
5	Locking Sleeve	11	Pedestal
6	Locking Collar	12	Sensor

**Bi-directional Flow** 

#### **Standard Insertion Transducer**



#### Display For Thermal Energy / BTU Readout



## **CLAMP-ON RTD DIMENSIONS**

## Clamp-on PT 100 RTD



Clamp-on PT 100 RTD

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Clamp-on PT 100 RTD Side View

Clamp-on PT 100 RTD Bottom View



## **RTDI INSERTION DIMENSIONS**

## Insertion RTD

Clamp-on PT 100 RTD Installation Example

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## **ORDERING THE 207i**



Instructions: To order the 207i, please fill in each number block by selecting the codes from the corresponding features below.

Parent Nur	Parent Number		
207i	InnovaSonic <sup>®</sup> Ultrasonic Flow Meter		
Feature 1:	Power		
P2	DC powered, 9-36 VDC at 0.5 Amps		
Р3	AC powered, 100-240 VAC, 50-60 Hz, .5 Amps		

Feature 2:	Transducer
S	Clamp-on transducer, operating temperature: 14°F to 176°F (-10°C to 80°C) IP 68; transducer hazard area classification Ex d II BT4
н	High-temperature clamp-on transducer, operating temperature: 14°F to 302°F (-10°C to 150°C)
W	Insertion transducer, operating temperature: -40°F to 176°F (-40°C to 80°C). 1.5 inch (38.1 mm) DIA insertion transducer. Suitable for pipes 2 to 236 inches (50 to 6000 mm); IP 68; Note: Insertion pressure limited to 300 psig (20 barg). Insertion transducers include ball valves 1.5-inch(38.1 mm); carbon steel installation seat for ball valve (brass), mounting kit (includes 4 screws and four plastic bushings) and seal kits (consult factory for other materials). Pending.

Feature 3: Transducer Cable	
30	30 ft. (9m) standard cable length
X (in feet)	Special length up to 300 ft. (90 m). Note: 5 week lead time for cables over 30 feet.

Note: Note: 207i has six (6) expansion slots. These slots may be used as required for options below:

Option 1: PT100 Inputs		Opt	Option 2: 4-20mA Inputs	
PT100()	Accepts input from PT100 RTD; specify quantity (typically 2) in parenthesis	AI(	)	Accepts analog current; inputs from any device (typically temp, pressure, or density); specify quantity in parenthesis
Option 3: I	Nodbus RS-485 Output	Opt	tion 4: B	ACnet Output
Modbus	Modbus RTU, RS-485 output	BAC	Cnet	BACnet output; gateway outputs BACNet protocol
Option 5: Strain Reliefs (cable glands)		Acc	essories	:: PT100 Inputs

option 5. 5	option 5. Strain Kellers (cable gianus)	
STRAIN	5 x 3/4 inch sheilded strain reliefs (cable galnds) not required for 3/4-inch conduit	
	·	

Accessories: 4-20 mA Inputs	
207i-Al	Accepts analog current; inputs from any device (typically temp, pressure, or density)

Accessories:	BACnet	Output
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**207i-BACnet** BACnet output; gateway outputs BACNet protocol

Accessories (Mounting)		
205-2011	Coupling compound (100 g)	
<b>205-2010</b> Pipe straps 43 inches (1092 mm)		

Accessories: PT100 Inputs	
Accessories: PT100 Inputs	Accepts input from PT100 RTD
Accessories: Modb	us RS-485 Output

Accessories: Moabus KS-485 Output		
207i-Modbus	Modbus RTU RS-485 output	

Accessories: Strain Reliefs (cable glands)	
207i-STRAIN	5 x 3/4 inch sheilded strain reliefs (cable galnds) not required for 3/4-inch conduit

207i-RTDC ( )	2x clamp on PT 100 RTD, 4- wire. NEMA 4X enclosure. Maximum operating temperature: 450°F (232°C). Insert cable length in parenthesis.
207i-RTDI ( )	2x Insertion PT 100 RTD, 4- wire. NEMA 4X enclosure. Maximum operating temperature: 450°F (232°C) Insert cable length in parenthesis.

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