

# The Ultimate Flow Meter For Low Flow Measurement

- Straight-through design
- No Moving Parts
- Wide Rangeability
- High Precision
- Chemical Compatibility
- Maintenance-Free
- Lowest pressure drop

*“The Leader in Precision Thermal Flow Metering”*



INTEK, INC.

***RHEOTHERM***<sup>®</sup>  
*FLOW INSTRUMENTS*

## Low Flow Sensors

### Overview

The Rheotherm low flow meter precisely measures a wide variety of liquids and gases. Using a patented thermal method and the unique TU sensor design, the meter is capable of accurately measuring liquid flows as low as 10 cc per day and gas flows of 20 sccm.

Rheotherm meters combine state of the art precision sensors and a maintenance-free design to provide a practical solution to flow measurement. With this versatile design and wide range of options, these meters handle even the hardest-to-meter flow applications, under the toughest conditions. The TU sensor is one of a series of Rheotherm precision flow sensors from INTEK, INC., *the leader in precision thermal flow metering since 1978.*



### Simple Sensor Design

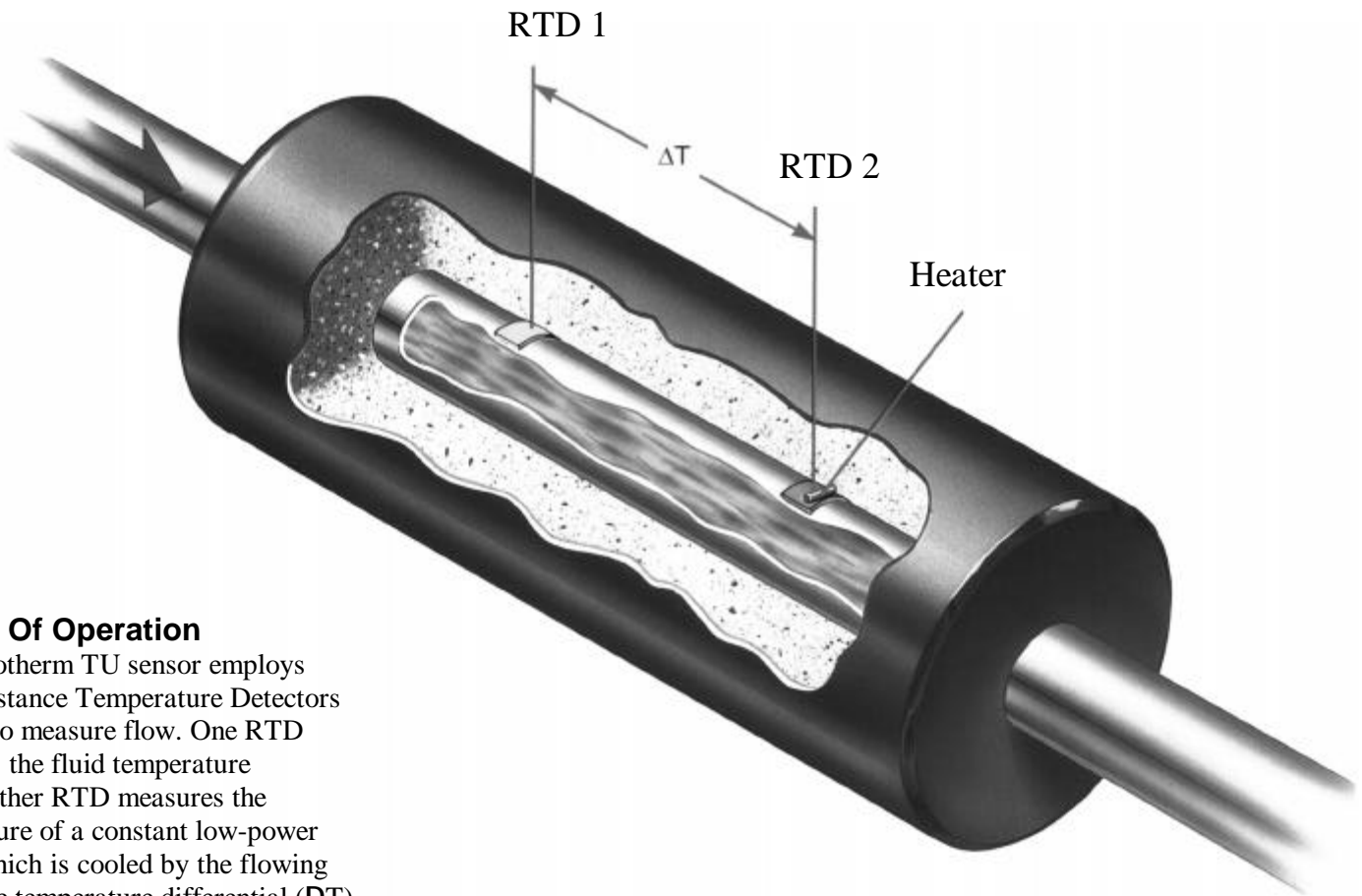
- The TU sensor has a straight-through, unobstructed flow tube for minimal pressure drop. No other technology has a cleaner, straighter flow path.
- With no moving parts, the sensor is maintenance-free. It cannot be damaged by over-ranging.
- Whether adapted for the precision laboratory, harsh plant environment or the operating extremes of space flight, TU sensors have a reliable, time-tested design appropriate to the application.

### Precision Performance

- Rheotherm flow meters are precisely calibrated at INTEK's calibration laboratory.
- The measurement method ensures unparalleled accuracy at both the high and low ends of the calibrated flow range.
- INTEK's extensive research in fluid heat transfer has yielded an unmatched ability to perform signal corrections for different liquid and gas calibrations.

### Versatility in Application

- The TU sensor has an inherent wide dynamic range. Coupled with advanced analog and digital electronics, turndown requirements of 10:1, 100:1 or greater can be readily met.
- The standard 316 stainless steel wetted tube is compatible with most liquids and gases. For more aggressive fluids, other alloys and metals are easily substituted.
- The sensor design allows for chemical or steam sterilization in place.
- Electropolished tubes can be specified for high purity applications.
- When used with INTEK's intrinsically safe barrier, TU sensors are approved for use in all Class I, Division 1 hazardous locations.



### Theory Of Operation

The Rheotherm TU sensor employs two Resistance Temperature Detectors (RTDs) to measure flow. One RTD measures the fluid temperature and the other RTD measures the temperature of a constant low-power heater which is cooled by the flowing fluid. The temperature differential ( $\Delta T$ ) between the heated and unheated RTD provides the primary flow signal.

At higher flow rates, the cooling effect on the heated RTD is greater, so the temperature differential decreases. This differential signal is approximately a logarithmic function of the flow rate. Since the cooling effect is a function of the mass flow rate, pressure compensation for gases is not required. The primary signal is temperature compensated, conditioned, and optionally linearized by electronics to provide the desired output signals.

This patented measurement method is used to produce the most precise thermal flow meter available. The TU sensor is unique among all flow instruments as the ultimate in low flow measurement.

*All sensing components are mounted on the outside of the flow tube. This configuration results in an unobstructed flow path and no moving parts, for reliable, long-term operation.*

### Liquids

Homogeneous liquids are repeatably measured using TU sensors. The sensor cannot be damaged by over-ranging or by solids in the stream. It is ideal for continuous additive or catalyst injection at a low rate. Some examples are: adhesives, alcohols, colorants, defoamers, fermentation feeds, hydrocarbons, liquified gases, lubricants, odorants, perfumes, solvents, sterilizing fluids, and water/waste treatment chemicals.

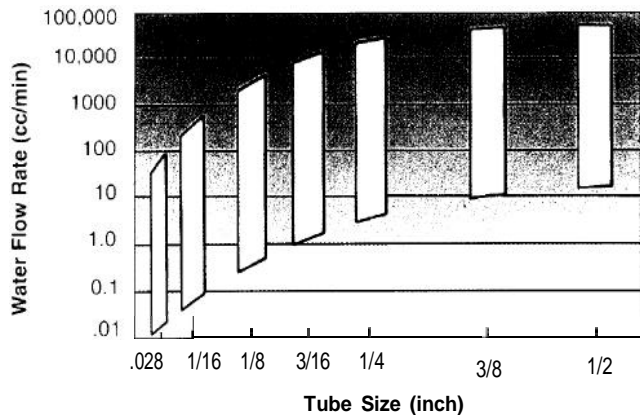
### Gases

Mass flow and volume flow of air or other process gas can be measured. Pressure or temperature correction is not required. The sensor is not plugged or damaged by liquid carryover. Electropolished and cleaned flow tubes are available to maintain gas purity. Intrinsically safe and explosion-proof options are available for hazardous gases.

Basic Models – The basic model defines the electronics to be used with the TU sensor. For a complete model and feature selection code number, See Model Selection Guide.

<b>Model 111 D:</b>	Standard linear flow meter calibrated for 10:1 turndown
<b>Model 112:</b>	Linear unit for wide turndown applications (up to 100:1)
<b>Model 100:</b>	Continuous analog output signal, proportional to logarithm of flow rate (non-linear). A low-cost option which is useful for repeatable feedback control or computer linearization.
<b>Model 100FS:</b>	Flow switch with signal or optional dual switch relays. Relays are SPDT, rated for 10 A at 120 Vac. Hysteresis is as low as 4% of set point.

	Standard	Options
Turndown ratio:	10:1	up to 100:1
Process connection:	tube stubs	flanges, NPT, VCR, sanitary
Wetted surface:	316 SS	other metals and alloys
output:	0/10 Vdc	4/20 mA, pulse, 1 or 2 SPDT relays
Display:	None	flow rate, total flow, fluid temperature
Input power:	120 Vac, 60 Hz, ½ A	220 Vac, 50/60 Hz; 24 - 28 Vac, 60 Hz; dc power
Enclosure:	NEMA 4 (weatherproof)	NEMA 7 (explosion-proof) NEMA 4X (corrosion resistant) NEMA 1 (laboratory or panel mount)



*Rheotherm TU sensors measure flow over seven orders of magnitude*

## Technology Leader

*Within the Rheotherm product line, other sensors are available for large-line gas and liquid flow monitoring or switching. For assistance in any flow application, call your local representative or an INTEK application engineer.*

**“The Leader In Precision Thermal Flow Metering”**



**INTEK, INC.**

751 Intek Way  
Westerville, Ohio 43082-9057  
Tel: 614-895-0301  
Fax: 614-895-0319

## Specifications

### Applications:

Liquid, gas, and uniform slurry

### Line Size:

1/16 in. OD and larger

### Calibration Units:

Volume, mass, or velocity

### Output Resolution:

Model 111D & 112 - 0.02% FS

Model 100 - continuous

### Flow Rate Ranges:

Liquids - 10 cc/day to 10 GPM

Gases - 6 fps (std velocity) to 1100 fps

### Temperature Limits:

(Specify requirements)

Sensor - Standard, 0°F to 140°F

Optional, -40°F to 500°F

Electronics - 0°F to 120°F

### Fluid Temperature (Sensor)

### Stability:

±3% of reading over ±30°F for most fluids

### Pressure Limits:

Per flow tube and fitting working pressure limit

### Pressure Drop:

Per sensor tube ID

### Response Time:

1 second

### Time Constant:

Typical 4 to 6 seconds (63% of change)

### Repeatability:

±0.5% of reading

### Calibration Accuracy:

±1% of reading

### Intrinsically Safe Barrier:

FM approved barrier for Class I, Div. 1, Group ABCD sensor locations