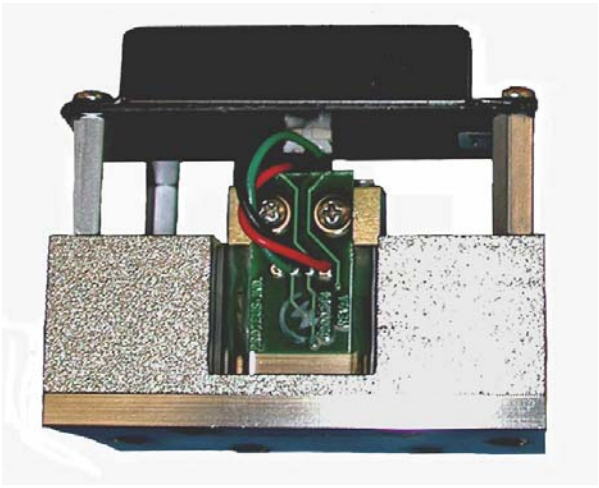
Proteus Industries Inc.

HT & XHT Series Flow Meters for High Temperature Process monitoring



- Fluid temperatures to 150°C and beyond
- Material compatibility with all advanced Heat Transfer fluids.
- Pulse and analog output versions
- Optional temperature sensors
- Analog versions can be calibrated for best accuracy at your target process temperature

Since creating our first flow meters for use with Galden®, Fluorinert™ and other fluorinated heat transfer fluids in 1996, Proteus has shipped thousands of units providing reliable and precise flow measurement for ever-increasing process temperatures.

- **Flow Capacity**
  The flow capacity of the products is stated for water which has a kinematic viscosity of 1 cSt at 25°°C. The actual flow capacity of each device will vary with the kinematic viscosity of the heat transfer fluid at its targeted operating temperature, and the power of your pump. For a fixed pump power, maximum flow is reduced as viscosity increases. ***Our knowledge base allows us to reliably predict flow capacity and to correctly size the flow meter to its targeted process temperature.***
- **Calibration**
  The response of a flow meter can be calibrated to account for viscosity effects. “K-factors” are available to allow your controller to properly convert the pulse output of the HT6000 and XHT6000 meters to provide a more accurate measure of actual fluid flow at your target process temperature.

  HT800 and XHT800 flow meters can be calibrated to provide a voltage directly proportional to flow at the target process temperature.

  FluidVision® 4000 Series instruments can measure and display flow, temperature and pressure from a single sensor module. Analog outputs and trip points for each parameter are user-selectable.
- **Containment**
  Silicone O-ring seals are provided at all interfaces. Straight thread SAE fittings with O-ring seals are used to connect with your chosen tubing.

- **High temperature Hall Effect sensor**
  The 150°C junction temperature of the Hall Effect sensor establishes the higher temperature limit of the flow meter. The HE sensor is thermally separated from the fluid. The highest achievable temperature is determined by how well the HE sensor is cooled.
  XHT versions allow a fluid temperature of 170°C to be achieved when the Hall Effect detector is convectively cooled by ambient air at 40°C. Higher liquid temperatures are accessible with assisted cooling and at lower ambient air temperatures.

- **Electronics thermally isolated for High Temperature operation**
  Electronic components beyond the HE sensor are rated for operation to 85°C. To provide proper cooling, the electronics module of HT800 Series units are mounted on ¾" (or longer) standoffs and must be located in a cooling air stream. Even with the flow meter encapsulated in insulation foam, convective cooling of the electronics unit ensures proper operating conditions for fluid temperatures to 135°C.
  FluidVision 4000 Series electronics are housed in a separate module that is thermally isolated from the sensor module.

- **Pulse and analog outputs available**
  The HT6000 Series devices provide a square wave output with a frequency or around 240 Hz for the maximum flow rate of the meter. The amplitude of this signal can be from 5 to 24 V, as determined by your control system.
  The HT800 Series devices provide an output of 5VDC for the maximum flow rate of the meter. The electronics can be calibrated to provide an output that is corrected to for the viscosity of your heat transfer fluid at your targeted process temperature.
  FluidVision 4000 Series instruments can measure and display flow, temperature and pressure, and allow user selection of analog output, and trip points for each measured parameter.

Flow Ranges & Connections

	Flow Range @ 1 cSt	
Connection	GPM	LPM
9/16 – 18 SAE	0. 1 – 1.4	0.4 – 4.5
	0. 2 – 2.5	0.75 – 9.5
	0.3 – 4.5	1.1 – 17
3/4 – 16 SAE	0.8 – 10	3 – 38
1 1/16 -12 SAE	1.2 – 16	4.5 – 60
1 5/16-12 SAE	4 – 40	15 - 150
Contact Tech@proteusind.com for part numbers.		

Wetted Materials

Rotor	PPS
O-ring	Silicone Rubber
Rotor Shaft	316 Stainless Steel

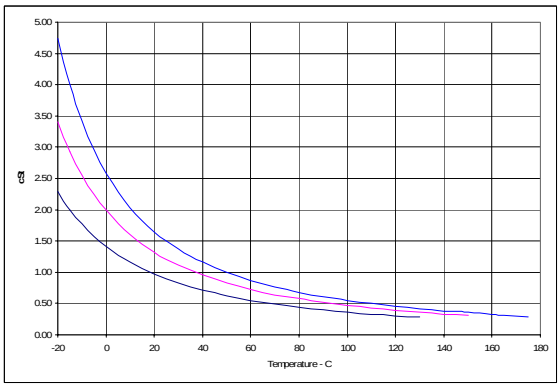
Alternate materials are available to improve chemical compatibility,

Performance Specifications

	HT6000	HT800	**HT4000**	XHT6000	XHT800	**XHT4000**
Temperature Range	5 ~ 135°C			5 ~ 170°C		
Output	16 ~ 240 Hz	0 – 5 VDC	0-5, 0-10 VDC 4 – 20 mA	16 ~ 240 Hz	0 – 5 VDC	0-5, 0-10 VDC 4 – 20 mA
Viscosity Range	0.6 to 35 cSt – ***actual flow range is determined by viscosity***					
Operating Pressure	To 250 psi , 1720 kPa					
Pressure Drop	Determined by fluid viscosity at the selected operating temperature					
Accuracy	Determined by calibration method. Single point viscosity matched calibration.					
Linearity	± 1% from 100 to 10% of range at constant temperature.					
Air Temperature	5 °C to 40°C – non condensing					

Viscosity and Temperature

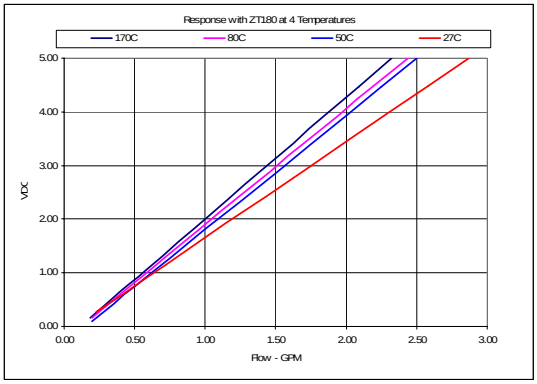
The kinematic viscosity of heat transfer fluids increase as temperature decreases. Proteus flow sensors are capable of operating across the full useable range of popular low-temperature fluids.



Viscosity vs. Temperature for ZT-130, ZT-150 and ZT-180

Calibration compensates for viscosity effects

Fluids with kinematic viscosities of < 1cSt provide less resistance to the rotor, allowing a higher rotational frequency to be reached.
This lowers the upper flow limit of the meter. Fluids with kinematic viscosities >1cSt provide more resistance to the rotor, requiring more power to be used to move the fluid and causing the flow range of the meter to increase.



The inherent linearity of the Proteus flow sensor is preserved. With knowledge of these temperature effects it is a simple matter to calibrate the sensor for its targeted temperature and heat transfer fluid.

LT Series Flow Meters for Low Temperature Process monitoring

LT800 Series flowmeter – still functioning in a block of ice

- Fluid temperatures from -60 to 85°C
- Material compatibility with all advanced Heat Transfer fluids.
- Pulse and analog output versions
- Optional temperature sensors
- Analog versions can be calibrated for best accuracy at your target process temperature

Since creating our first flow meters for use with Galden®, Fluorinert™ and other fluorinated heat transfer fluids in 1996, Proteus has shipped thousands of units providing reliable and precise flow measurement for process temperatures down to -60°C.

- **Flow Capacity**
  The flow capacity of the flow meters is stated for water which has a kinematic viscosity of 1cSt at 25°C. The actual flow capacity of each device will vary with the kinematic viscosity of the heat transfer fluid at its targeted operating temperature, and the power of your pump. For a fixed pump power, maximum flow is reduced as viscosity increases. ***Our knowledge base allows us to reliably predict flow capacity and to correctly size the flow meter to its targeted process temperature.***
- **Calibration**
  The response of a flow meter can be calibrated to account for viscosity effects. "K-factors" are available to allow your controller to properly convert the pulse output of LT6000 meters to provide a more accurate measure of actual fluid flow at your target process temperature.

  LT800 flow meters can be calibrated to provide a voltage directly proportional to flow at the target process temperature.

  FluidVision® 4000 Series instruments can measure and display flow, temperature and pressure from a single sensor module. Analog outputs and trip points for each parameter are user-selectable.
- **Waterproof electronics**
  Water from condensation and melted ice cannot penetrate the water-proofed seals of the electronics housings.
- **Containment**
  Silicone O-ring seals are provided at all interfaces. Straight thread SAE fittings with O-ring seals are used to connect with your chosen tubing.
- **Usable to a fluid temperature of 85°C**
  The upper temperature limit of the LT Series flow meters is established by the temperature rating of the electronics.

  Applications requiring process temperatures to 170°C or more can be accommodated by Proteus HT and XHT series flow meters.

- **Pulse and analog outputs available**
  The LT6000 Series devices provide a square wave output with a frequency or around 240 Hz for the maximum flow rate of the meter. The amplitude of this signal can be from 5 to 24 V, as determined by your control system.

  The LT800 Series devices provide an output of 5VDC for the maximum flow rate of the meter. The electronics can be calibrated to provide an output that is corrected to for the viscosity of your heat transfer fluid at your targeted process temperature.

  Fluid Vision 4000 Series instruments can measure and display flow, temperature and pressure, and allow user selection of analog output, and trip points for each measured parameter.

Flow Ranges & Connections

	Flow Range @ 1 cSt	
Connection	GPM	LPM
9/16 – 18 SAE	0. 1 – 1.4	0.4 – 4.5
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Wetted Materials

Rotor	PPS
O-ring	Silicone Rubber
Rotor Shaft	316 Stainless Steel

Alternate materials are available to improve chemical compatibility,

Performance Specifications

	LT6000	LT800	**LT4000**
Temperature Range	-50 ~ 85°C		
Output	16 ~ 240 Hz	0 – 5 VDC	0-5, 0-10 VDC , 4 – 20 mA
Viscosity Range	0.6 to 35 cSt – ***actual flow range is determined by viscosity***		
Operating Pressure	To 250 psi, 1720 kPa		
Pressure Drop	Determined by fluid viscosity at the selected operating temperature		
Accuracy	Determined by calibration method. Single point viscosity matched calibration.		
Linearity	± 1% from 100 to 10% of range at constant temperature.		
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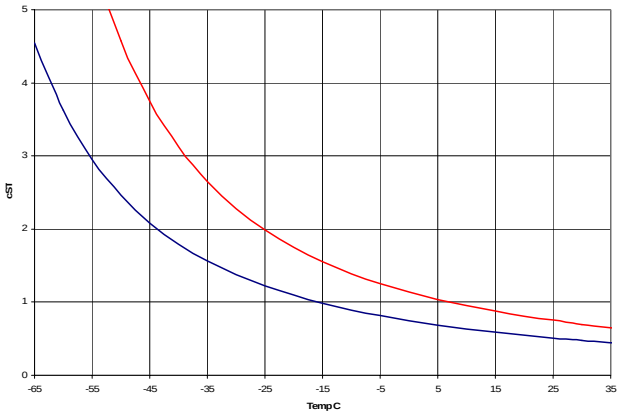
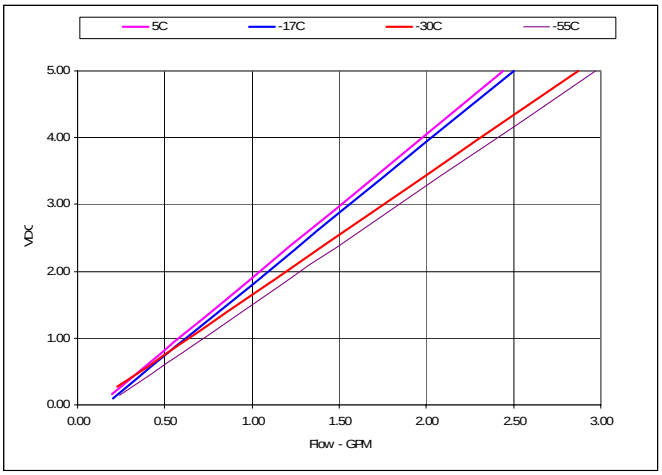


Viscosity vs. temperature for Galden® HT-70 and HT-90

Calibration compensates for viscosity effects

Fluids with kinematic viscosities of < 1cSt provide less resistance to the rotor, allowing a higher rotational frequency to be reached. This lowers the upper flow limit of the meter. Fluids with kinematic viscosities >1cSt provide more resistance to the rotor, requiring more power to be used to move the fluid and causing the flow range of the meter to increase.



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Proteus – Customization Experts

Bring us your specifications and let us create a High Temperature Flow Meter that exactly meets your requirements. Materials can be modified for improved compatibility with your heat transfer fluid. Flow ranges can be matched to large connections. Specialized and certified calibrations with viscosity matched fluids can be created.

Connecting fittings will be properly positioned, your meters will be leak tight, and all electrical connections will have been tested end-to-end.

Our lean manufacturing processes and ISO-9001 certified procedures ensure that your devices will arrive on time, every time, ready for use.

4000 Series unit with remote mounted electronics for high temperature measurements.

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