

# Ultra-Low $\Delta P$ High Performance Mass Flow Control

## FEATURES

- Control up to 500 slpm (nlpm) with 4.5 psid (310 mBard)
- High accuracy (+/- 1.0 % of full scale)
- Highly repeatable (+/- 0.2% of full scale)
- True linear performance (+/- 1.0% of full scale in 10 standard gases)
- 10 different gases using Dial-A-Gas® Technology
- Precision digital PID valve control; no manual adjustment or tuning required
- Control valve with large flow coefficient (Cv) for precise control at low  $\Delta P$
- Patented, inherently linear Laminar Flow Element (LFE)
- Advanced platinum sensor technology
- All 316 stainless steel construction
- Unique Pilot Module (mounted or hand-held) lets you view and change critical control functions including:
  - Gas type
  - Setpoint value
  - Zero value
  - Span value
  - Engineering units
  - Output signals
  - Full scale adjust
- Avoid recalibration by re-zeroing and re-spanning in the field
- Choose from multiple analog or digital signals including: RS-232, RS-485, 4-20 mA, 0-5, 1-5, 0-10 VDC
- Optional Compod™ adds MODBUS RTU multi-drop capability
- Primary standard calibration, NIST-traceable certification

# SmartTrak 140



## DESCRIPTIONS

When you need precise mass flow control of expensive process gases, where minimal pressure drop is a key consideration for cost savings and efficiency, the SmartTrak® 140 controls up to 500 slpm with an ultra-low  $\Delta P$  of 4.5 psid (310 mBard), much better than typical  $\Delta P$  values of 25 psid (1700 mBard) for equivalent mass flow controllers on the market. Precision digital PID valve control means no manual adjustment or tuning.

The SmartTrak 140 mass flow controller is a hybrid of two innovative Sierra technologies: our award winning SmartTrak® 100 Series with its industry leading SmartTrak Laminar Flow Element (LFE), sensor and digital electronics is combined with our SideTrak® 840 low  $\Delta P$  valve featuring large flow coefficient (Cv). By combining these two technologies, the SmartTrak 140 boasts the smallest pressure drop in the industry and includes all the features of Sierra's flagship SmartTrak 100 Series. Dial-A-Gas® Technology allows users to set zero, span, and full scale for 10 different gases independently in the field. A hand-held or instrument-mounted user display/interface called the Pilot Module makes field-adjustments and re-configuration easy.

Precision gas mass flow control at higher flow rates, typically greater than 300 slpm (nlpm), relies on a large pressure differential ( $\Delta P$ ) across the control valve, especially with the small flow bodies and control valves commonly used in capillary-type thermal mass flow controllers. In all cases, especially with expensive high purity gases used in the semiconductor industry, maintaining initial pressurization of the gas is critical until it is eventually put to work in the tool. This is where the reduction of functional efficiency and resulting financial losses can occur. The SmartTrak 140 was specifically designed to improve efficiency in these types of applications.

So, when you need premium high performance mass flow control, but require the absolute lowest possible pressure drop, think SmartTrak 140.



## PERFORMANCE SPECIFICATIONS

### Accuracy

Standard: +/- 1.0 % of full scale (including linearity) at operating conditions

### Dial-A-Gas

+/- 1.0 % of full scale in all 10 standard gases (see chart below)

### Repeatability

+/- 0.2% of full scale

### Temperature Coefficient

+/- 0.025% of full scale per °F ( $\pm$  0.05% of full scale per °C) or better

### Pressure Coefficient

+/- 0.01% of full scale per psi ( $\pm$  0.15% of full scale per bar) or better

### Response Time

600 millisecond time constant; 4 seconds (typical) to within +/- 2.0% of final value

## OPERATING SPECIFICATIONS

### Mass Flow Rates

0 to 500 slpm

### Control Range

2 to 100% of full scale flow; automatic shut-off at 1.9%

Flow ranges specified are for an equivalent flow of nitrogen at 760 mm Hg and 21°C (70°F); other ranges in other units are available (e.g., nlpm, scfh, Nm<sup>3</sup>/h, Kg/h)

### Gases

Measures and controls all clean gases including corrosives and toxics; specify when ordering.

The following ten gases make up the Dial-A-Gas feature of every SmartTrak instrument; up to nine alternate gases may be substituted.

Dial-A-Gas Flow Rates	
Gas	Max Flow Rate (slpm/nlpm)
Air	500
Argon (Ar)	725
Carbon Dioxide (CO <sub>2</sub> )	370
Carbon Monoxide (CO)	500
Methane (CH <sub>4</sub> )	360
Helium (He)	727
Hydrogen (H <sub>2</sub> )	500
Oxygen (O <sub>2</sub> )	500
Nitrogen (N <sub>2</sub> )	500
Nitrous Oxide (N <sub>2</sub> O)	355

## OPERATING SPECIFICATIONS (continued)

### Gas and Ambient Temperature

32 to 122°F (0 to 50°C)

### Gas Pressure

500 psig (34 barg) maximum

### Pressure Drop

Minimum Pressure Drop ( $\Delta P$ )		
Flow Rate (slpm/nlpm)	$\Delta P$ (psid)	$\Delta P$ (mBard)
100	7.0	483
150	6.0	414
200	5.5	379
250 to 500	4.5	310

### Leak Integrity

5 X 10<sup>-9</sup> atm cc/sec of helium or better

### Power Requirements

(ripple should not exceed 100 mV peak-to-peak)

24 VDC +/-10%, (800 mA, regulated)

### Output Signal

Analog:

Linear 0/4–20 mA, 500 ohms maximum loop resistance and one of the following (user selectable):

Linear 0–5 VDC, 1000 ohms minimum load resistance

Linear 0-10 VDC, 1000 ohms minimum load resistance

Linear 1-5 VDC, 1000 ohms minimum load resistance

Digital:

RS-232 standard, RS-485 optional

Pilot Module Display optional

### Command Signal

Analog (choice of one):

Linear 4–20 mA, 0–5 VDC, 0-10 VDC, 1-5 VDC

Digital:

RS-232 standard, RS-485 optional

Pilot Module Display optional

### Wetted Material

316 stainless steel or equivalent; 416 stainless steel; Viton or Neoprene "O" rings and Viton, Neoprene or Kalrez valve seat

## OPTIONAL COMPOD

RS-485 communication with MODBUS RTU protocol allows digital multi-drop networks

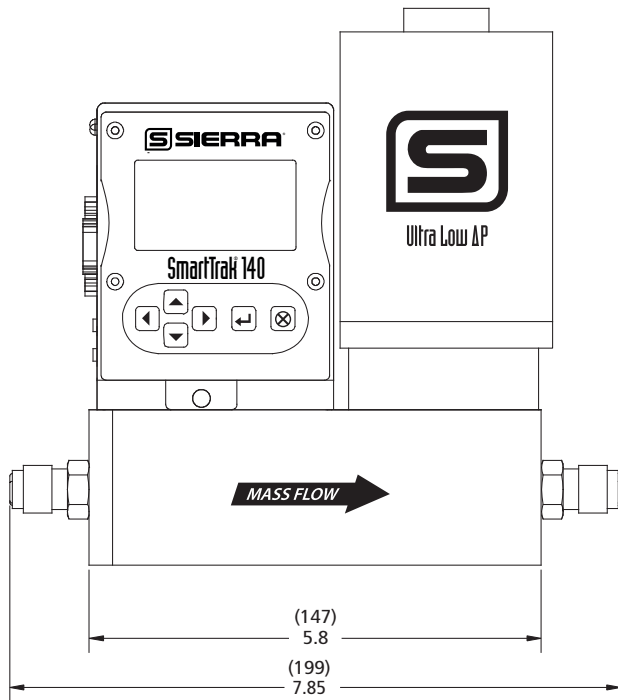
Available with optional LCD display

Internal gas flow totalizer with adjustable pulse output

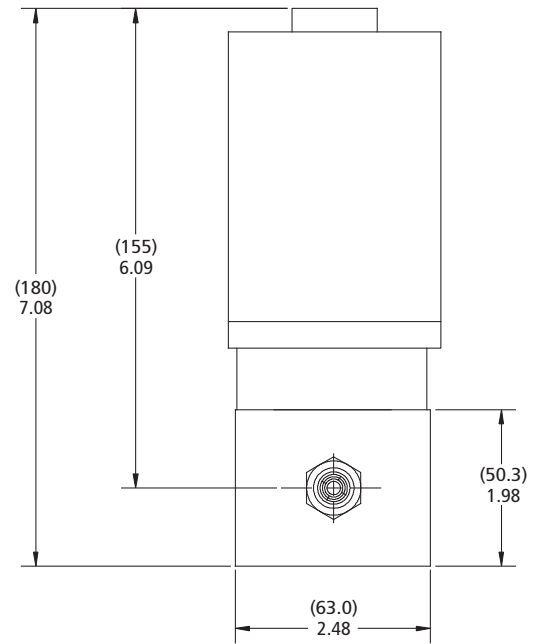
Two digital outputs and one analog input can be configured by user with MODBUS or included software for a wide variety of process controls

All dimensions are in inches with (mm) in brackets. Certified drawings are available on request. NOTE: Fittings are 1/2-inch compression.

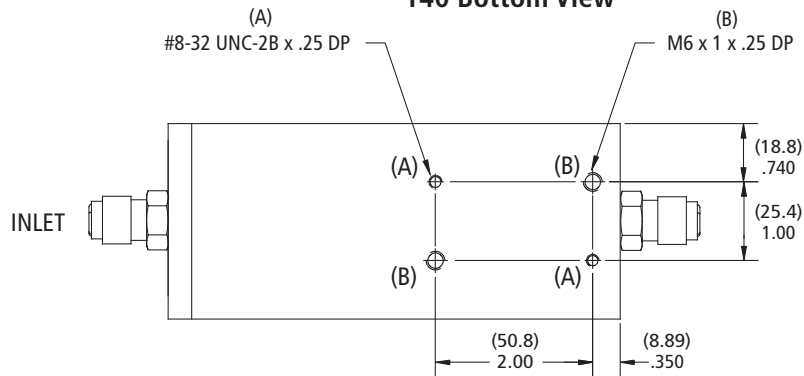
140 Front View



140 Inlet View



140 Bottom View





<p><b>PARENT NUMBER</b>  <b>C140M</b> Mass Flow Controller                  (up to 500 slpm, ΔP of 4.5 psid; 310 mBard)</p>									
<p><b>PILOT MODULE DISPLAY/INTERFACE</b>  <b>NR</b> No display/interface  <b>DD</b> Pilot Module display/interface  <b>RD</b> Remote display Pilot Module display/interface  <b>CMNR</b> Compod™ with RS-485 MODBUS communication no display  <b>CMDD</b> Compod™ with RS-485 MODBUS communication and display  <b>CMNRRelays</b> CMNR with 2 analog relays  <b>CMDDRelays</b> CMDD with 2 analog relays</p>									
<p><b>INLET/OUTLET FITTINGS</b>  <b>3</b> 3/8-inch compression (maximum 300 slpm)  <b>4</b> 1/2-inch compression  <b>6</b> 1/2-inch VCO  <b>11</b> 10 mm compression  <b>12</b> 12 mm compression  <b>13</b> 1/4-inch FNPT adapter bushing (maximum 400 slpm)  <b>14</b> 3/8-inch FNPT (maximum 300 slpm)  <b>15</b> 1/2-inch FNPT</p>									
<p><b>ELASTOMERS</b>  <b>OV1</b> Viton®  <b>ON1</b> Neoprene®</p>									
<p><b>VALVE SEAT</b>  <b>SV1</b> Viton® or equivalent  <b>SN1</b> Neoprene®  <b>SK2</b> Kalrez®</p>									
<p><b>INPUT POWER</b>  <b>PV2</b> 24 VDC</p>									
<p><b>OUTPUT SIGNAL</b>  <b>V1</b> 0-5 VDC and 4-20 mA linear output signals  <b>V2</b> 1-5 VDC and 4-20 mA linear output signals  <b>V3</b> 0-10 VDC and 4-20 mA linear output signals</p>									
<p><b>EXTERNAL SETPOINT SIGNAL</b>  <b>S0</b> Pilot Module/RS-232 (standard for digital operation)  <b>S1</b> 0-5 VDC, linear  <b>S2</b> 1-5 VDC, linear  <b>S3</b> 0-10 VDC, linear  <b>S4</b> 4-20 mA, linear  <b>S5</b> 0-20 mA, linear</p>									
<p><b>ELECTRICAL CONNECTION</b>  <b>C10</b> 10-foot (3 m) communication cable  <b>C0</b> 15-pin mating connector with no cable  <b>C1</b> 6-inch (150mm) cable  <b>C3</b> 3-foot (1m) cable  <b>C25</b> 25-foot (8 m) communication cable  <b>C( )</b> Custom length communication cable. Specify cable length in feet in parenthesis. Maximum length 50 feet (16 meters). Same price any length.</p>									

FOR ACCESSORIES AND ADDITIONAL CABLES PLEASE CONTACT YOUR LOCAL SIERRA DISTRIBUTOR