

Ultra-Low ΔP 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 ΔP
- 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
- 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
- Primary standard calibration, NIST-traceable certification
- Digital communications protocols supported
- Modbus
- Profibus DP
- Foundation Fieldbus
- Device Net (pending)
- Add Compod™ for enhanced Modbus networking capability, including relays, totalization, inputs and display



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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 ΔP of 4.5 psid (310 mBard), much better than typical ΔP 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 ΔP 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 (ΔP) 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) under calibration 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, Nm³/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 ₂)	370
Carbon Monoxide (CO)	500
Methane (CH ₄)	360
Helium (He)	727
Hydrogen (H ₂)	500
Oxygen (O ₂)	500
Nitrogen (N ₂)	500
Nitrous Oxide (N ₂ 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 Differential Pressure Requirement	
Flow Rate (slpm)	3/8 comp fittings
10 sccm	.5 (34)
1	.5 (34)
10	.5 (34)
20	.75 (57)
30	.75 (57)
40	.75 (57)
50	.75 (57)
100	1.0 (68)
150	1.0 (68)
200	1.0 (68)
250	1.5 (102)
300	2.0 (136)
350	3.0 (204)
400	4.0 (272)
450	4.5 (295)
500	4.5 (295)

Leak Integrity

5×10^{-9} 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

Command Signal

Analog (choice of one):

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

Wetted Material

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

DIGITAL COMMUNICATION

RS-232 standard, RS-485 optional
Profibus DP
Modbus
Foundation Fieldbus
DeviceNet (pending)

OPTIONAL COMPOD

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

Available with optional LCD display

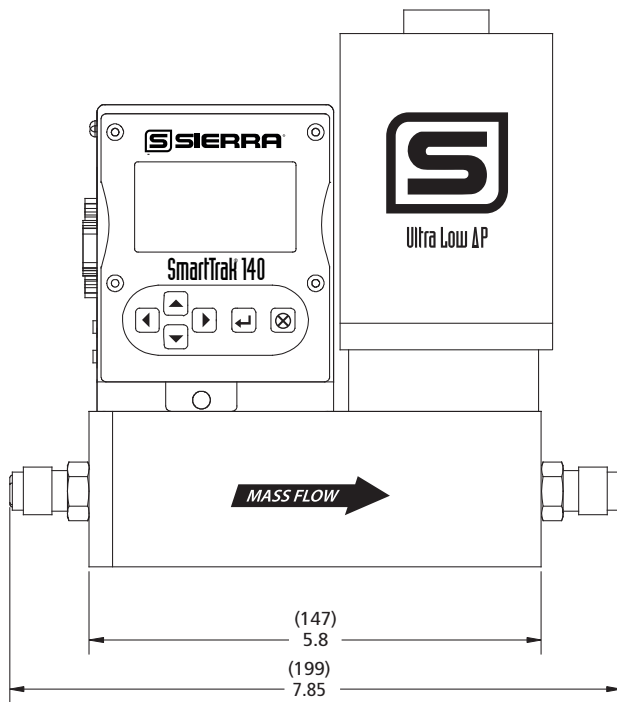
Internal gas flow totalizer with adjustable pulse output

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

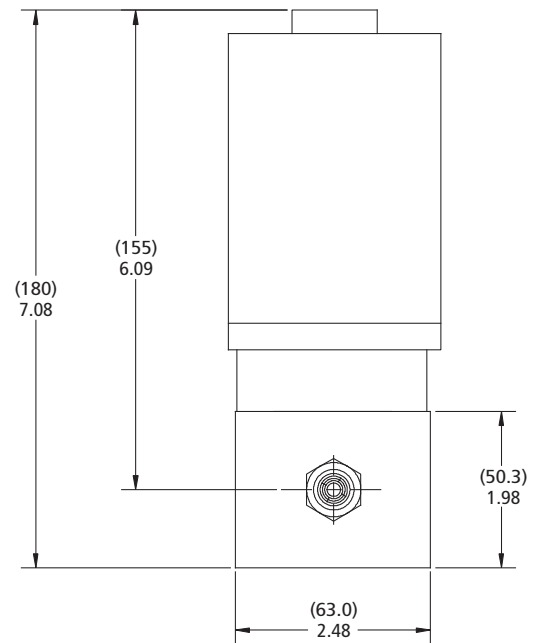
PHYSICAL DIMENSIONS (CONTINUED)

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

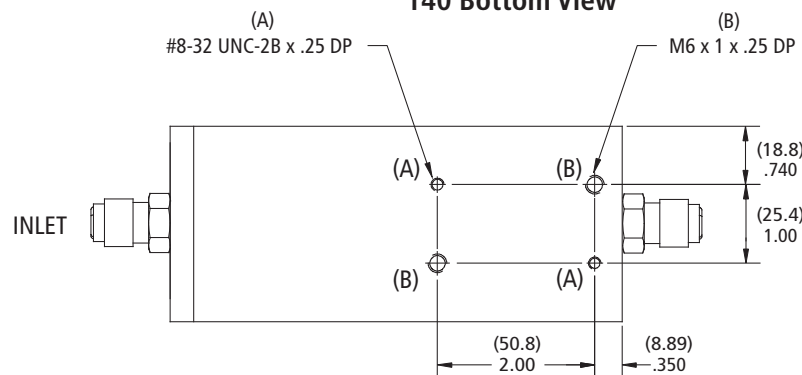
140 Front View

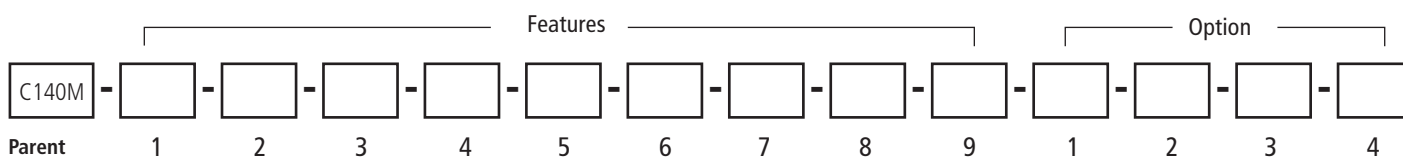


140 Inlet View



140 Bottom View





Instructions: To order a 1040 please fill in each number block by selecting the codes from the corresponding features below and following pages.

Parent Number	
C140M	Mass Flow Controller, Digital High Performance with Multiple Gas Capability (Dial-A-Gas [®]). Pressure to 500 psig (34.5 barg); flow up to 500 slpm with ΔP of 4.5 psid (310 mBard)
	Standard configuration includes: flow body and sensor constructed of 316 stainless steel, SideTrak [®] 840H electromagnetic valve, SmartTrak [®] 100 digital electronics mounted on a medium flow body, Viton [®] "O"-rings and valve seats. Linear analog and RS-232 output signals; Requires 24 VDC input power and a command signal. This signal can come from the Pilot Module Display/Interface, the RS-232 port or any external 0-5, 0-10, 1-5 VDC or 4-20 mA source. SmartTrak software is available.

Feature 2: Pilot Module Display	
NR	No display/interface If Option 2 digital communications are selected, NR must be selected
DD	Pilot Module Display/Interface mounted on the enclosure
RD	Remote display Pilot Module display/interface. Includes 10-foot (3 m) CAT 5 cable. Optional cables up to 50 feet (15.24 m) may be used. May be used with digicomms but not simultaneously.
CMNR	Compod [™] with RS-485 Modbus communication mounted on the enclosure (NR only)
CMDD	Compod [™] with RS-485 Modbus communication and display mounted on the enclosure

Note: For Digital communication options, see Option 2.

Note: Only one option may be selected for Feature 2.

Feature 3: Inlet/Outlet Fittings	
3	3/8-inch compression (maximum 300 slpm)
4	1/2-inch compression
6	1/2-inch VCO
11	10 mm compression
12	12 mm compression
13	1/4-inch FNPT adapter bushing (maximum 400 slpm)
14	3/8-inch FNPT (maximum 300 slpm)
15	1/2-inch FNPT

Feature 4: Body Elastomers	
OV1	Viton [®] (standard)
OV1-F	Viton [®] (For phosphine only)
ON1	Neoprene [®] (not available for C100L-HP)

NOTE: Consult factory for other elastomers.

Feature 5: Valve Seat (MFC)	
SV1	Viton [®]
SN1	Neoprene [®] (or equivalent)
SK2	Kalrez [®] (or equivalent for medium flow bodies)
VX1	ValFlex [™] inert, carbon-reinforced Polyamide required for CO ₂ above 50% concentration or 250 psi

Feature 6: Input Power	
PV2	24 VDC for all instruments (standard)

Feature 7: Output Signal	
V1	0-5 VDC and 4-20 mA linear output signals
V2	1-5 VDC and 4-20 mA linear output signals
V3	0-10 VDC and 4-20 mA linear output signals

NOTE: Alternate among V1, V2, V3 with Pilot Module display/interface or SmartTrak software

Feature 8: External Setpoint Signal	
S0	Pilot Module/RS-232 (standard for Pilot Module/digital operation)
S1	0-5 VDC, linear (standard for analog operation)
S2	1-5 VDC, linear
S3	0-10 VDC, linear
S4	4-20 mA, linear
S5	0-20 mA, linear

Note: Alternate among S0, S1, S2, S3, S4 with Pilot Module display/interface or SmartTrak software

Feature 9: Electrical Connection	
C0	15-pin mating connector with no cable
C1	1-foot (300 mm) 100-Analog cable: 15 conductor cable with D-connector on one end, fly leads on the other.
C3	3-foot (1 m) 100-Analog cable: 15 conductor cable with D-connector on one end, fly leads on the other.
C10	10-foot (3 m) 100-Analog cable: 15 conductor cable with D-connector on one end, fly leads on the other.
C25	25-foot (8 m) 100-Analog cable: 15 conductor cable with D-connector on one end, fly leads on the other.
C ()	100-Analog cable (): Custom length communication cable. Specify cable length in feet in parenthesis. Maximum length 50 feet (16 meters). Fixed price any length

Option 1: Special Cals	
GS	Gas Substitution: One or more gases or mixtures may be substituted for 9 of the standard Dial-A-Gas gases. See application data sheet for specifics.

Option 2: Digital Communications	
MB	See Compod options under Feature 2
DP	Profibus DP (NR Only)
FF	Foundation Fieldbus full device description (DD) (NR only)
DN	DeviceNet (pending)

Note: Pilot Module Not Available with Digital Communications

Option 3: Certificates	
MC	Material certificates--US Mill certs on all wetted flow body parts
CC	Certificate of conformance

Option 4: O2 Cleaning	
O2C	O2 cleaning. Includes certification. Product cleaned for O2 service. Inspected with ultra-violet light and double-bagged prior to shipment.

