Ultra-High Pressure Capillary Digital Gas Mass Flow Meters & Controllers

FEATURES

- Ideal for pilot plants, hydrogenation reactors, and autoclave processes
- Measure and control gas mass flow rates over an inlet pressure range of 35 to 345 barg
- Ranges from 100 mln/min to 20 ln/min (N_2 equivalent)
- High accuracy +/- 1.0% of full scale; repeatability +/- 0.2% of full scale
- Wide differential pressure range from 0.345 bar to 345 bar
- Innovative new ValFlex™ control valve design for precision control over a wide range of pressures and flow rates
- Leak-by of as little as 4 mln/min at 345 bar, depending on orifice size
- Inert, carbon-reinforced polyamide valve seat increases valve durability and precision
- Special high pressure rated seals minimize gas permeability
- Add Vogtlin's Compod™ expansion module to run small-scale pilot plants or control high pressure reactors and autoclave processes without the expense of DCS or PLC systems.
- Proprietary high pressure calibration facility, directly traceable to NIST
- 24 VDC input power reduces installation cost and complexity
- Unique Pilot Module (mounted or hand-held) lets you view and change critical control functions
- Choose from multiple analog or digital signals
- Supports Modbus and Profibus DP
- CE approved
- All functions are also available from your pc or workstation via the free SmartTrak100 software

SmartTrak 100HP

DESCRIPTION

Precision flow measurement and control at very high gas pressures is among the most challenging applications in the flow industry. Leaks, gas behavioral changes, and unpredictable valve control can all lead to reduced performance.

Designed to overcome these challenges, the 100HP combines the high performance of the SmartTrak® with a wider, more robust flow body, all-welded sensor seals, an innovative new valve design called ValFlex™, and a state-of-the-art high pressure calibration facility. The result is an instrument with increased application flexibility and accuracy in high pressure gas flow control applications.

To increase valve performance and accuracy under high pressures, 's proprietary ValFlex™ valve seat technology uses a flexible, high-impact, carbon-reinforced polyamide valve seat material to assure smooth interaction with the valve orifice. The result is precision control over a wide range of flows from 100 mln/min to 20 ln/min with an industry leading leak-by as little as 4 mln/min at 345 bar, dependant on the orifice used.

Because traditional valve seat elastomers like Viton®, Neoprene and Kalrez swell and deform under high pressures, the 100HP uses harder, denser seals to minimize gas permeability.

To ensure the 100HP delivers precise, high pressure measurement and control, each unit is calibrated on our proprietary NIST traceable high-pressure calibration facility using a gas booster, high-pressure accumulator tanks, and mirrored precision pressure gauges, yielding highly accurate inlet and outlet pressures to match the customer's application perfectly.

An instrument designed with purpose, the 100HP is a versatile solution for the most challenging high-pressure gas mass flow applications.

PERFORMANCE SPECIFICATIONS

Accuracy
± 1.0% of full scale including linearity under calibration conditions

Repeatability
± 0.2% of full scale

Temperature Coefficient
± 0.05% of full scale per °C

Pressure Coefficient
± 0.15% of full scale per bar, or better

Response Time
5 seconds (typical) to within ± 2% of final value

OPERATION SPECIFICATIONS

Mass Flow Rates
C100L High Pressure Full Scale: 100 mln/min to 20 ln/min

Flow ranges specified are for an equivalent flow of nitrogen at 1013.25 mbar a and 0°C; other ranges in other units are available (e.g., nlpm, scfh, nm^3/h, kg/h)

For measuring and controlling a wide range of flow rates, please consider the SmartTrak 100 series.
For measuring or controlling flows below 5 mln/min, please consider the MicroTrak™ 101.
For controlling flows in industrial (IP67) applications, please consider the MaxTrak® 180.

Control Range
5–100% of full scale flow; automatic shut-off at 4.9%.

Gases
All clean gases including corrosives and toxics; specify when ordering.

Maximum Gas Flow Rates	
Gas	Max Flow Rate (ln/min)
Air	20
Argon (Ar)	27.96
Carbon Dioxide (CO$_2$)	14.74
Carbon Monoxide (CO)	20
Methane (CH$_4$)	15
Helium (He)	27.96
Hydrogen (H$_2$)	20
Nitrogen (N$_2$)	20
Nitrous Oxide (N$_2$O)	14.32

Gas and Ambient Temperature
0°C to 50°C

Warranty
1 year

PHYSICAL SPECIFICATIONS

Gas Inlet Pressure
35 to 345 barg; See the SmartTrak 100 series for pressures up to 35 barg.

Rated Burst Pressure
517 barg

Pressure Drop Across a Meter

Typical Pressure Drop for Nitrogen Mass Flow Meters Pressure Differential in mbar	
Flow Rate (slpm)	¼-inch Fittings
0.1	25
0.5	25
1	25
10	35
20	50

Note: Tested at 21°C, outlet at ambient pressure

Differential Pressure Requirement for Controllers

Minimum Differential Pressure Requirement for Mass Flow Controllers Pressure Differential in mbar	
Flow Rate (slpm)	¼-inch Fittings
0.1	360
1	550
10	2200
20	4400

Note: Tested at 21°C, outlet at ambient pressure

Leak Integrity
5 X 10-9 mbar l/sec of helium or better

Maximum Differential Pressure (ΔP)
345 bar to atmosphere

VALVE DESIGN

Proprietary ValFlex™ Valve Design
Assures valve seat/orifice compliance for smooth control. Inert, carbon-reinforced Polyamide material (compatible with most gases) increases valve durability and precision.

Industry best, leak-by of as little as 4 mln/min at 345 bar, depending on the orifice used.

PHYSICAL SPECIFICATIONS

Dimensions
Height: 137.2 mm
Length: 154 mm*
Width: 37.3 mm
*with ¼-inch compression fittings

Weight
1.9 kg

Wetted Material
316SS (1.4404) stainless steel or equivalent; 416 stainless steel
90A Viton® seals and Polyamide valve seat (MFC only)

Approvals
CE approved

POWER REQUIREMENTS

Input Power
(ripple should not exceed 100 mV peak-to-peak)
For meter: 15-24 VDC ±10% (230 mA, regulated)
For controller: 24 VDC ±10% (500 mA, regulated)

ANALOG AND DIGITAL OUTPUTS

Analog Output Signal
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 0-20 mA, 4-20 mA, 0-5 VDC, 0-10 VDC, 1-5 VDC

Digital Communication
RS-232 standard, RS-485 optional
Pilot Module Display optional

Digital Communication Protocols
Profibus DP
Modbus

OPTIONAL COMPOD

Vögtlin's Compod™
The Compod adds modbus communication, totalizor, Analog i/o, alarms and pulse output to the SmartTrak.

## SOFTWARE

Free user software to allow for full configuration and readout of the instrument.

HIGH PRESSURE CALIBRATION

High Pressure Calibration Facility
Each unit is calibrated on our proprietary NIST traceable high pressure calibration facility using laboratory grade nitrogen gas. The facility consists of a gas booster, high-pressure accumulator tanks, a burst test outlet manifold, and a calibration outlet manifold.
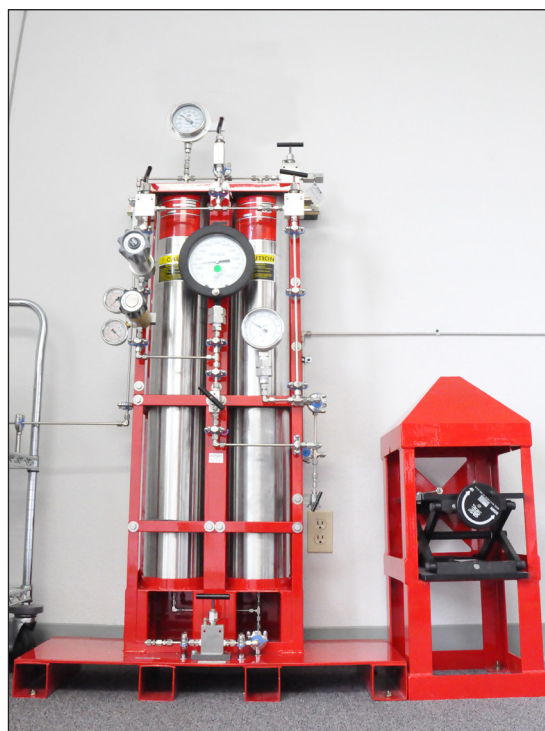
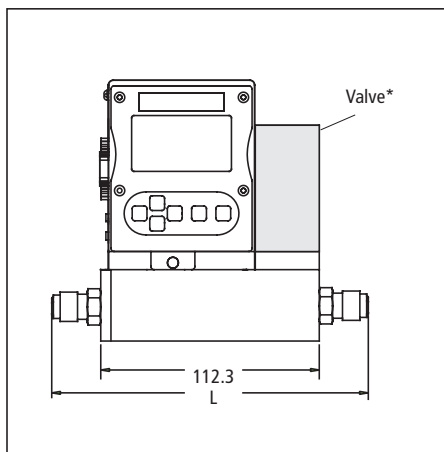**High-Pressure Accumulator Tank and Burst Test Manifold**

The facility features the highest quality regulators to minimize the droop effect, providing flat pressure profiles across a large flow range. The burst test outlet manifold is rated to and able to produce pressures at or above the 100HP rated burst pressure of 517 barg.

The calibration outlet manifold features mirrored precision pressure gauges, yielding highly accurate inlet and outlet pressures to match each application.
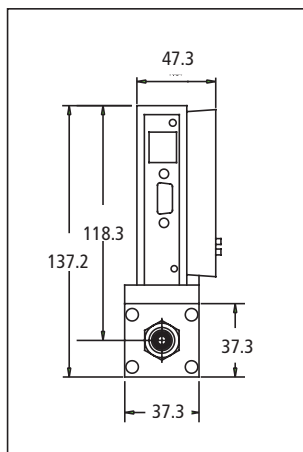
PHYSICAL DIMENSIONS

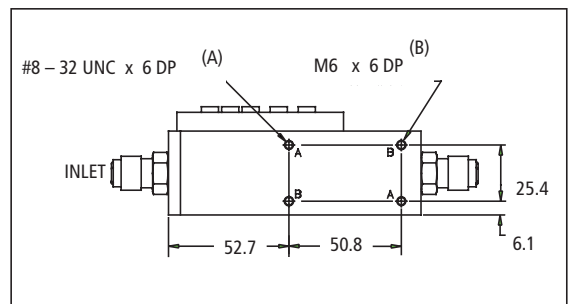| DIMENSION L	
Fittings	Length with fittings in mm
¼ compression	154
¼ VCO	143
¼ VCR	151
6 mm compression	156

M100HP-L & C100HP-L Front view

M100HP-L & C100HP-L Inlet view

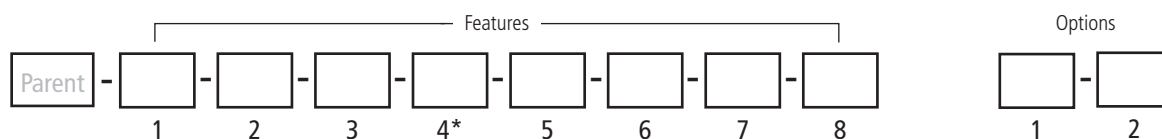**M100HP-L & C100HP-L Bottom view**

*Valve on C100HP-L controller only; not present on M100HP-L meter

All dimensions are in mm. Certified drawings are available on request.

Gauge for High-Pressure Accumulator Tank Used During Calibration

ORDERING THE SMARTTRAK 100 HIGH PRESSURE

Features — Options

| Parent | - | 1 | - | 2 | - | 3 | - | 4* | - | 5 | - | 6 | - | 7 | - | 8 | | 1 | - | 2 |

Instructions: To order a 100HP-L, please fill in each number block by selecting the codes from the corresponding features below. *MFC only

Parent Number	
C100HP-L	High pressure mass flow controller, digital high performance with pressure 35 to 345 barg; flow 100 mln/min to 20 ln/min. Standard configuration includes: flow body and sensor constructed of 316 stainless steel, electromagnetic valve, digital electronics mounted on flow body, 90A Viton® "O"-rings and polyamide valve seats. Linear analog and RS-232 output signals; miniature 15-pin D electrical connector; requires 24 VDC 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 0/4-20 mA source. Note: No Dial-A-Gas available.
M100HP-L	High pressure mass flow meter pressure 35 to 345 barg; flow 100 mln/min to 20 ln/min. Standard configuration includes: flow body and sensor constructed of 316 stainless steel, digital electronics mounted on flow body, 90A Viton® "O"-rings. Linear analog and RS-232 output signals; miniature 15 pin D electrical connector; requires 15-24 VDC Note: No Dial-A-Gas available.

Feature 1: 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 3 meter CAT 5 cable. Optional cables up to 15 meters may be used. May be used with digicomms but not simultaneously
CMNR	Compod with RS-485 Modbus communication mounted on the enclosure
CMDD	Compod with RS-485 Modbus communication and display mounted on the enclosure

Note: Only one option may be selected for Feature 1.

Feature 2: Inlet/Outlet Fittings	
2	1/4-inch compression (standard).
5	1/4-inch VCO
8	1/4-inch VCR
10	6 mm compression

Feature 3: Flow Body Elastomers (required for MFM and MFC)	
OV1	90A Viton® elastomers
OV1-F	Viton® (For phosphine only)

Feature 4: Valve Seat (required MFC only)	
VX1	ValFlex™ inert, carbon-reinforced Polyamide

Feature 5: Input Power	
PV1M	15-24 VDC for meters (optional)
PV2	24 VDC for all instruments (standard)

Feature 6: Output Signal	
V1	0-5 VDC and 0/4-20 mA linear output signals
V2	1-5 VDC and 0/4-20 mA linear output signals
V3	0-10 VDC and 0/4-20 mA linear output signals

Note: Alternate among V1, V2, V3 with Pilot Module display/interface or SmartTrak Software

Feature 7: External Setpoint Signals (MFC only)			
S0	Pilot Module/RS-232 (standard for Pilot Module/digital operation)	S3	0-10 VDC, linear
S1	0-5 VDC, linear, standard for analog operation	S4	4-20 mA, linear
S2	1-5 VDC, linear	S5	0-20 mA, linear

Feature 8: Electrical Connection			
C0	15-pin mating connector with no cable	C10	3 m 100-Analog Cable. 15 conductor cable with D-connector on one end, fly leads on the other.
C1	300 mm 100-Analog Cable. 15 conductor cable with D-connector on one end, fly leads on the other.	C25	8 m 100-Analog Cable. 15 conductor cable with D-connector on one end, fly leads on the other.
C3	1 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 16 meters. Fixed price any length.

Option 1: Profibus	
DP	Profibus DP (NR Only)

Option 2: Certificates	
MC	Material certificates--US Mill certs on all wetted flow body parts
CC	Certificate of Conformance

Note: Pilot Module not available with digital communications

High-Pressure Mass Flow Controller – Actual Size