



**NT[®] HIGH-TEMPERATURE
FLOWMETER MODEL 4401**

*Simultaneous flow and pressure outputs
for high-temperature applications*



high-temperature flow measurement

Overview

Now more than ever there is a need to measure high-temperature chemicals to ensure the integrity of your processes. Entegris' NT® Electronic Flowmeter, model 4401, combines the latest sensing technology and high-purity materials for greater control of high-temperature chemicals. By separating the flow path from the sensing technology in the 4401 model, Entegris has found an effective way to reliably measure high-temperature chemicals.

Constructed for Compatibility

Model 4401 is designed for use in ultrapure, high-temperature applications and is compatible with highly corrosive chemicals. This instrument features PTFE and PFA for all wetted parts. With the FEP-jacketed pigtail available as the standard electrical connection, the flowmeter is resistant to harsh chemical environments and external spraydowns.

Sensing Technology

Using nonmetallic pressure sensing technology, the instrument utilizes differential pressure to provide accurate, reliable flow and pressure measurement. These measurements are highly tolerant of bubbles within the flow path. All products are factory calibrated and 100% verified, require no field calibration and are simple to install. Standard electronic outputs enable easy integration with PLCs, control systems and electronic displays.

Differential Pressure Measurement

Entegris' patented technology for differential pressure flow measurement incorporates pressure sensors that have the same response time as the proven 4400 model. The pressure sensor is separated from the flow by six inch impulse tubes that can handle up to 180°C (356°F) for more reliable

performance. Longer lengths are also available to better position the sensor module further away from the harsh chemical flow. The orifice in the flow stream creates a differential pressure proportional to the fluid flow rate. If there is no flow, the differential pressure is zero. As the flow rate increases, the differential pressure increases.

$$\text{Flow} \propto \sqrt{\text{Inlet pressure} - \text{Outlet pressure}}$$

The flowmeter electronically provides a linear flow signal (4–20 mA output signal) corresponding to the calibrated flow rate. The flowmeter also provides a pressure signal (4–20 mA output signal) corresponding to the pressure measured at the outlet sensor of the flowmeter.

Features and Benefits

- No moving parts to generate particles
- Nonmetallic sensing technology for reliable measurement
- Pressure output included – eliminates need for additional instruments
- 1% full scale accuracy for critical measurements
- Easy installation in any orientation

Applications

Measuring flow and line pressure allows the user to obtain valuable and critical diagnostic information which is used for monitoring or controlling process applications, such as:

- Single wafer wet etch and clean equipment
- Batch style wet etch and clean equipment
- Precision blending and metering
- System diagnostics

Specifications

Materials:	Wetted parts	Sensor module body: PTFE
		Orifice module body: PFA
		Sensor interface: PFA (CTFE available)*
		Impulse tubes: PFA
		Primary seal: Kalrez® 6375 UP
	Nonwetted parts	Polypropylene, polyethylene, PVDF and PVC or FEP-jacketed cable (in addition to materials listed above)
Process temperature:	10°–180°C (50°–356°F)*	
Process connection options:	FlareLock® II flared tube, Super 300 Type Pillar®* – 1/4," 3/8," 1/2," 3/4," 1"	
Bleed port connection:	Flaretek® flared tube, Super 300 Type Pillar – 1/4"	
Impulse tube connection:	FlareLock II flared tube, Super 300 Type Pillar – 1/4"	
Electrical input:	24 VDC (12–28 VDC input voltage)	
Electrical output:	Two 4–20 mA electronically isolated outputs, one for flow and one for outlet	
Pressure:	Operating pressure	0–414 kPa (0–60 PSIG)
	Pressure drop	21 kPa (3 PSIG) at nominal flow (nominal flow = 80% of full scale flow)
	Overpressure limit	690 kPa (100 PSIG) @ 23°C (72°F)
Flow measurement accuracy:	from greater than 20–100% of full scale	±1.0% full scale
	10–20% of full scale	±2.5% full scale
Accuracy stated as % of full scale using deionized water at 23°C (70°F) and includes the combined effects of linearity hysteresis and repeatability		
Repeatability:	from greater than 20–100% of full scale	2% full scale
	10–20% of full scale	5% full scale
Pressure measurement accuracy:	±1% of full scale (includes combined effects of linearity, hysteresis and repeatability)	
Electrical enclosure:	NEMA 5/IP54	
Weight:	1.50 kg (3.3 lb) approximate	
Approvals:	CE	

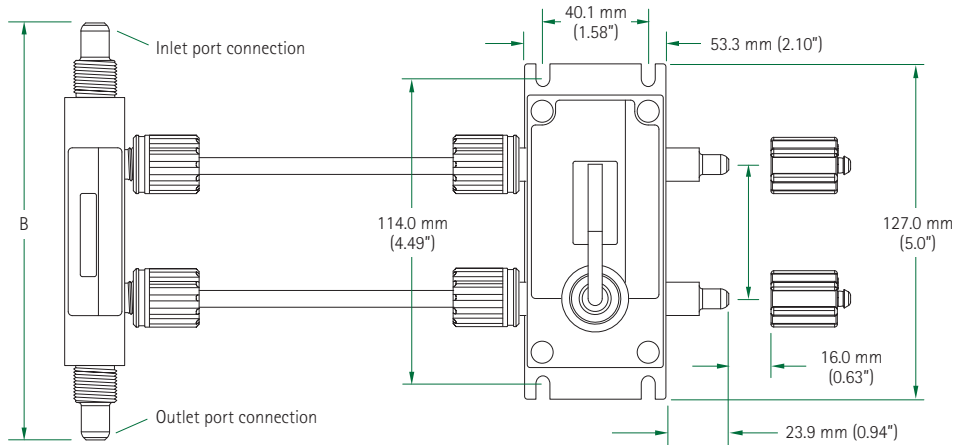
Note: Preliminary specifications and features subject to change.

*Consult the factory for specific application support and expanded capabilities.

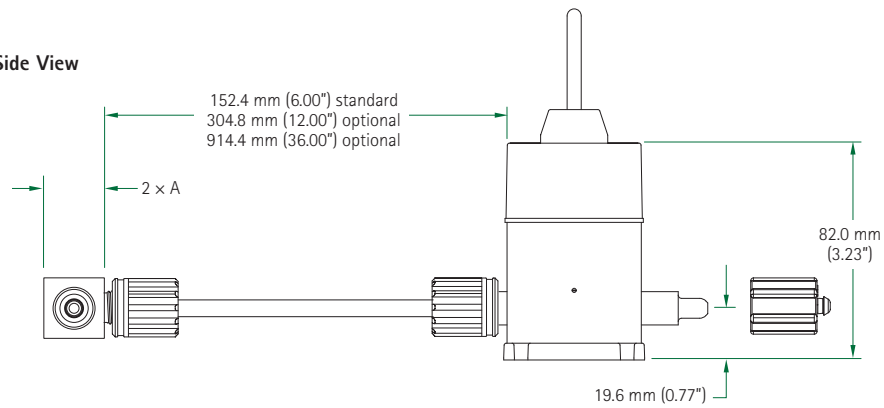
Dimensions

FlareLock II

Top View



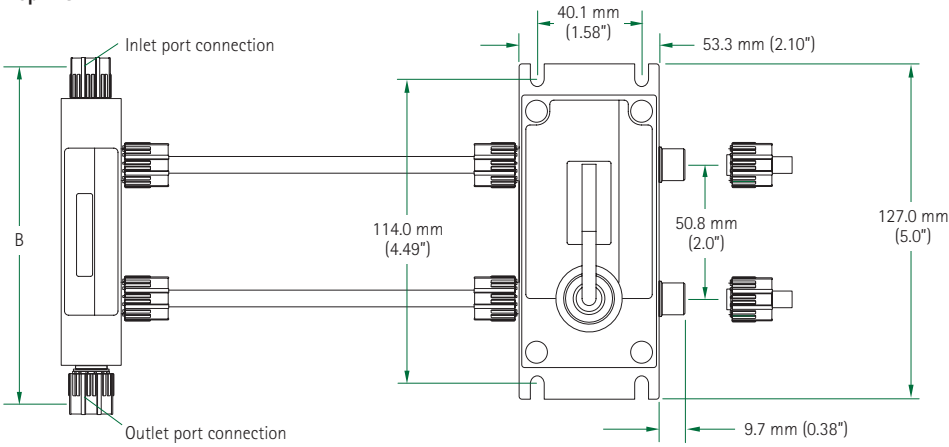
Side View



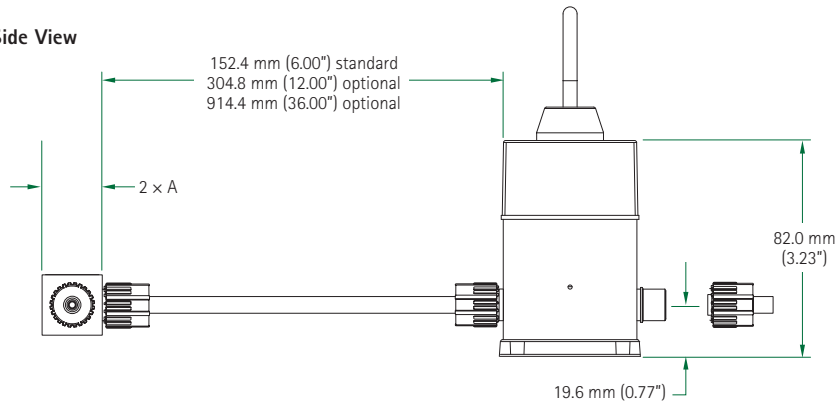
Inlet/Outlet Port Connection	Dimensions	
	A	B
R02	22.9 mm (0.90")	151.9 mm (5.98")
R03	22.9 mm (0.90")	158.0 mm (6.22")
R04	30.5 mm (1.20")	162.0 mm (6.38")
R06	38.6 mm (1.52")	165.6 mm (6.52")
R08	48.3 mm (1.90")	180.3 mm (7.10")

Super 300 Type Pillar

Top View



Side View

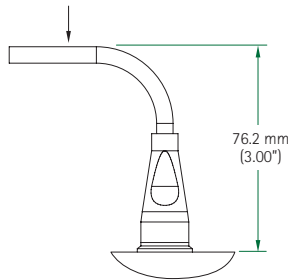


Inlet/Outlet Port Connection	Dimensions	
	A	B
W02	22.9 mm (0.90")	122.9 mm (4.84")
W03	22.9 mm (0.90")	130.8 mm (5.15")
W04	30.5 mm (1.20")	136.7 mm (5.38")
W06	41.6 mm (1.64")	144.5 mm (5.69")
W08	59.4 mm (2.34")	155.7 mm (6.13")

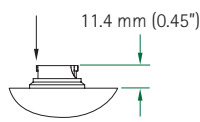
Connections

Side View

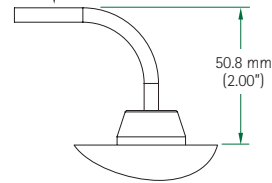
8-conductor connector/cable (DXX)
(cable length up to 30 feet)



Connector only
(DXX)



8-conductor FEP-jacketed cable
pigtail connection (BXX)
(cable length up to 30 feet)



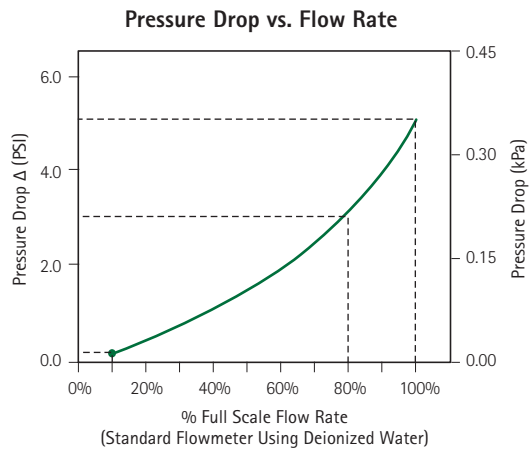
Flow Range

The NT Electronic Flowmeter is available in the following fitting sizes and flow range combinations.

Fitting Size	Flow Range												
	T0 0-50 mL/min	T1 0-125 mL/min	T2 0-250 mL/min	T3 0-500 mL/min	T4 0-1250 mL/min	T5 0-2.5 L/min	T6 0-5 L/min	T7 0-10 L/min	T8 0-20 L/min	T9 0-40 L/min	T10 0-60 L/min	T11 0-90 L/min	T12 0-120 L/min
1/4"	Yes	Yes	Yes	Yes	Yes	—	—	—	—	—	—	—	—
3/8"	Yes	Yes	Yes	Yes	Yes	Yes	Yes	—	—	—	—	—	—
1/2"	—	—	Yes	Yes	Yes	Yes	Yes	Yes	Yes	—	—	—	—
3/4"	—	—	—	—	—	—	—	Yes	Yes	Yes	Yes	—	—
1"	—	—	—	—	—	—	—	—	Yes	Yes	Yes	Yes	Yes

Please consult the factory for custom fitting size and flow range combinations.

Performance Data



FLOW FACTOR

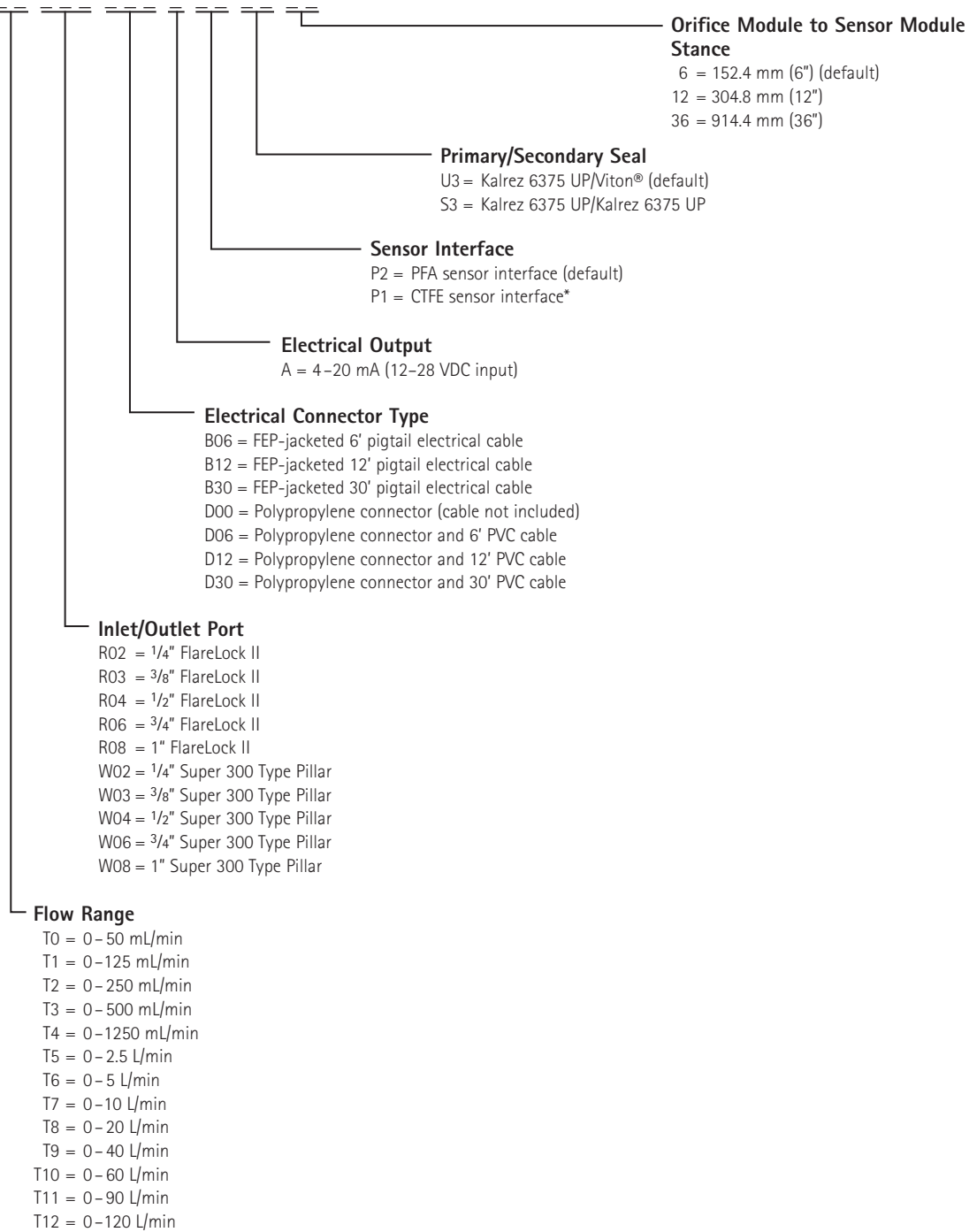
Flow Range	C _v	K _v
T0	0.006	0.086
T1	0.015	0.214
T2	0.031	0.443
T3	0.061	0.871
T4	0.15	2.14
T5	0.31	4.43
T6	0.61	8.71
T7	1.2	17.1
T8	2.4	34.3
T9	4.9	70.0
T10	7.3	104.2
T11	11.0	157.1
T12	14.6	208.5

Ordering Information

NT High-temperature Flowmeter, Model 4401

Part Number

4401



*Consult the factory for specific application support and expanded capabilities.

For More Information

Please call your Regional Customer Service Center today to learn what Entegris can do for you. Visit www.entegris.com and select the “Customer Service” link for the center nearest you.

Terms and Conditions of Sale

All purchases are subject to Entegris’ “Terms and Conditions of Sale.” To view and print this information, visit Entegris’ website at www.entegris.com and select the Legal Notices link from the footer found on the home page.

Entegris® NT®, Flaretek® and FlareLock® are registered trademarks of Entegris, Inc.
Viton® and Kalrez® are registered trademarks of DuPont Dow Elastomers, L.L.C.
Pillar® is a registered trademark of Nippon Pillar Packaging Company, Ltd.

ENTEGRIS, INC.

Corporate Headquarters | 129 Concord Road | Billerica, MA 01821 USA
Customer Service Tel. +1 952-556-4181 | In North America 800-394-4083 | Customer Service Fax +1 952-556-8022
www.entegris.com