

# InVue<sup>®</sup> Electronic Flowmeter, Model NT4400


## User Guide



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## Safety Alert Symbol

 <b>WARNING!</b>	<b>INDICATES a hazardous situation which, if not avoided, could result in serious injury or death.</b>
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## Introduction

This User Guide is for use with the InVue® Electronic Flowmeter, NT4400 manufactured with the configurations noted in this manual.

The InVue Electronic Flowmeter, NT4400 (U.S. Patent Nos: 5,869,766; 6,612,175; 7,152,478; 7,866,337; 7,447,600) is designed for use in high-purity applications in the semiconductor industry and is compatible with highly corrosive processes. The instrument measures flow rate without using moving parts or fill-fluids, reducing the possibility

of a contaminated process. The wetted parts of the nonmetallic flowmeter are constructed of PTFE, CTFE, PFA, or similar materials.

The InVue Electronic Flowmeter, NT4400 calculates fluid flow from the differential pressure measured by two sensors separated by a venturi style integral orifice. The unit provides two electrical output signals, each 4 – 20 mA, one for flow rate and another for pressure measurement. The pressure measurement is taken from the outlet of the flowmeter.

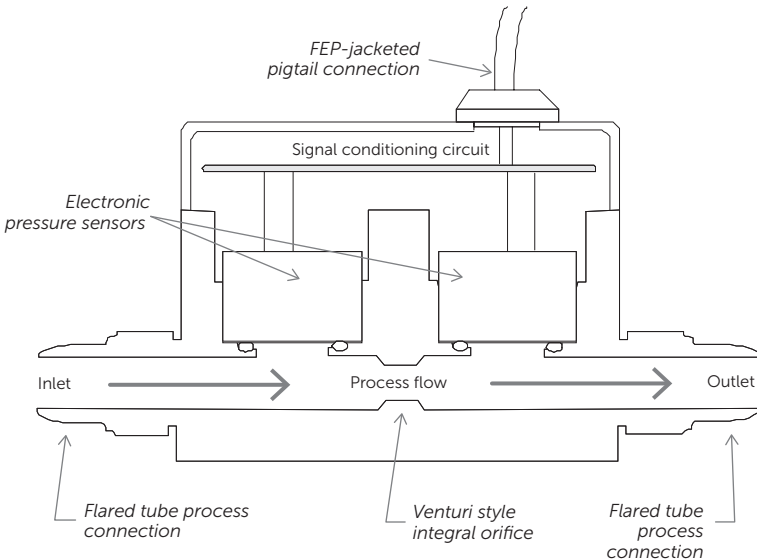


Figure 1. InVue Electronic Flowmeter, NT4400 cutaway view.

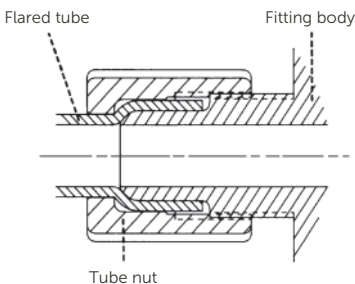
# Installation

**NOTE:** The InVue Electronic Flowmeter, NT4400 has been factory sealed. Do not attempt to remove the cover of the flowmeter. Any attempt at removal of the flowmeter cover will void the warranty.

**⚠ WARNING!** Do not tighten the nuts that protect the tube connections during shipment. Do not tighten the nuts unless the proper tubing has been installed. Tightening these nuts may result in damage to the flowmeter flared tube connections.

## MECHANICAL INSTALLATION

The InVue Electronic Flowmeter, NT4400 must be used with the proper tubing size and fittings. The unit is available with Flaretek® flared tube connections of various sizes, as a standard. PrimeLock® and Super 300 type Pillar® tube connections are available upon request.



**NOTE:** For detailed tube flaring instructions, see “Flaretek tube fitting flare and assembly procedures” on our [website](#).

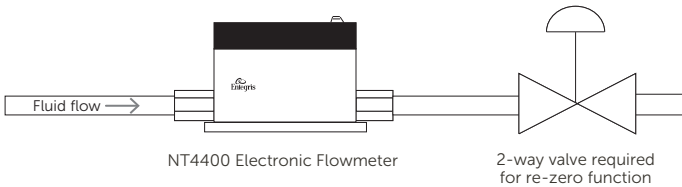
**NOTE:** For detailed PrimeLock tube fitting assembly instructions, visit our [website](#).

For detailed Super 300 Type Pillar tube fitting assembly instructions, contact Nippon Pillar Packing Company, Ltd.

Care should be taken when installing the InVue Electronic Flowmeter, NT4400 to avoid leaks. Do not use excessive torque or subject the flowmeter to high heat during installation. The flowmeter and base bracket assembly must be mounted to a solid surface to ensure stability. Verify the flowmeter and the signal cable are free from mechanical stress from the surrounding equipment.

**NOTE:** When connecting the flowmeter to the process tubing, verify the direction of flow corresponds to the inlet and outlet of the flowmeter (the process fluid must enter at the inlet and exit at the outlet). A flowmeter installed backwards will output an erroneous flow and pressure signal.

**WARNING!** Flaretek fittings are specifically designed, tested and characterized to work together with specific Flaretek fitting components manufactured by Entegris. Customer assumes the risk of connection integrity if Flaretek fittings, body, and/or nut components are attached to components manufactured by third parties.



The flowmeter must be installed with a two-way valve installed downstream from the flowmeter. The valve is required to perform the flowmeter re-zero function. Please refer to *Maintenance* on page 17 for more information concerning the re-zero function.

## OPERATING ENVIRONMENT

The InVue Electronic Flowmeter, NT4400 is to be mounted in an indoor, climate controlled environment. Refer to Reference on page 18 for specifications.

## MOUNTING ORIENTATION

The InVue Electronic Flowmeter, NT4400 may be mounted in any orientation. The flowmeter does not require straight lengths of tubing at the inlet or the outlet connection. For best performance, mount the flowmeter at relative elevation lower than the point-of-dispense to maintain positive pressure at all times.

**NOTE:** To perform within specification, a minimum of 7 kPa (1.0 psig) of pressure must be present on the outlet side of the flowmeter.



## ELECTRICAL INSTALLATION

### Power Supply Requirements

The power supply for the InVue Electronic Flowmeter, NT4400 must provide clean power and must be used only to power similar measurement-type devices. The power supply must not be used to power inductive loads such as motors, relays, or solenoids. These devices may produce transients that may affect the flowmeter measurements when such an inductive device is powered-up or powered down.

In addition to providing clean power, return lines must not be run within the same conduit or cable. Heavy current demands from motors, charging capacitors or other inductive loads may cause a voltage change within the instrumentation signal line, causing erroneous output readings from the flowmeter.

### Input Power

The InVue Electronic Flowmeter, NT4400 requires a nominal 24 VDC (12 – 28 VDC input voltage) to operate. Table A on page 7 describes the unit input power requirements.

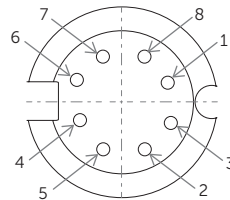
### Output Signals

The InVue Electronic Flowmeter, NT4400 provides two optically isolated analog 4 – 20 mA output signals, one signal for flow and one signal for pressure. Each analog output signal uses a standard two-wire system that requires a 24 VDC (12 – 28 VDC) power supply with less than 2% ripple at 100 or 120 Hz.

The required power supply voltage ( $V_{PS}$ ) for the output signal(s) varies with the maximum load resistance,  $R_{Load}$  (see Figure 4 on page 9). Flowmeter output signals are described in Table A.

Input and output signals to the InVue Electronic Flowmeter, NT4400 are supplied through an 8-wire FEP-jacketed pigtail or an optional 8-wire removable PVC-jacketed electrical connector (D-Series connector), located on the top of the flowmeter.

#### 8-wire Connector (D-series Connector)



## Electrical Connections

The InVue Electronic Flowmeter, NT4400 is provided with a 12' 8-wire FEP-jacketed pigtail or an optional 6' or 12', 8-wire removable PVC-jacketed electrical connector (D-Series connector). Figure 2 and Figure 3 on page 8 show the wiring diagrams for both the pigtail and pin connector configurations.

**⚠ WARNING! Do not remove or replace while circuit is live unless the area is known to be free of ignitable concentrations of flammable substances.**

**⚠ WARNING! Do not replace components unless power has been disconnected or the area is known to be free of ignitable concentrations of flammable gases or vapors.**

**⚠ WARNING! Explosion hazard. Do not connect while the circuit is live or unless the area is known to be free of ignitable concentrations.**

**⚠ WARNING! Substitution of components may impair suitability for division 2.**

**NOTE: For use in Class I Division 2 Hazardous Environments, models with disconnecting cable options must be wired in accordance with the control drawing 01-1033563 on page 22.**

Table A. Electrical connector information

SIGNAL	CONNECTOR TYPE AND WIRE COLOR		COMMENTS
	8-WIRE PIGTAIL OR D-SERIES CONNECTOR	7-WIRE CONNECTOR	
Ground	Black (pin 1)	Black (pin 1)	Input power
+24 VDC	Red (pin 2)	Red (pin 2)	Input power
4–20 mA (-)	Brown (pin 3)	White w/yellow stripe (pin 3)	Pressure output signal
4–20 mA (+)	Yellow (pin 4)	White w/green stripe (pin 4)	Pressure output signal
4–20 mA (+)	Orange (pin 5)	White w/red stripe (pin 5)	Flow output signal
4–20 mA (-)	Blue (pin 6)	White w/black stripe (pin 6)	Flow output signal
Level input (ref. to pin 1)	Violet (pin 7)	Green (pin 7)	Flow re-zero: Apply 24 VDC (12 – 28 VDC) level input for a minimum of 3 seconds to re-zero flow; Please refer to <i>Maintenance</i> on page 17
Factory use	White (pin 8)	—	Factory use only
Shield	—	—	Earth ground or chassis ground



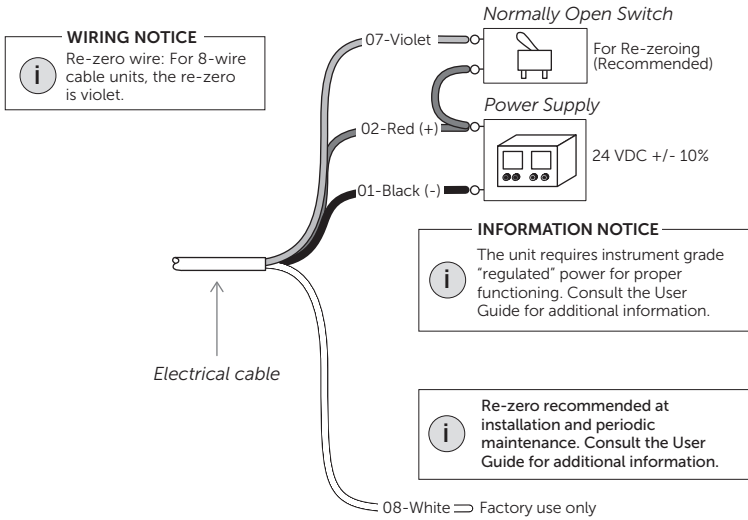


Figure 2. Connect power and re-zero wires.

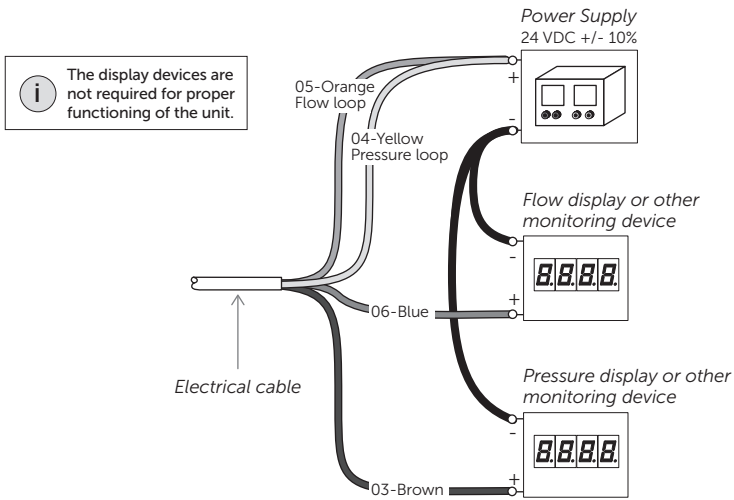


Figure 3. Connect flow and pressure signal wires.

## Load Resistance

If a load resistor,  $R_{Load}$ , is used in series with the current output (flow and pressure outputs), the value of  $R_{Load}$  is dependent on the supply voltage and the meter resistance and is calculated from the following formula.

$$R_{Load} = \frac{(V_{PS} - 12)}{0.02} - R_{meter}$$

where:

$R_{Load}$  = maximum load resistance

$V_{PS}$  = power supply voltage

$R_{meter}$  = meter resistance  
(theoretically = 0)

If  $R_{Load}$  is calculated using a voltage drop across the meter ( $V_m$ ), the following equation is used:

$$R_{Load} = 50 * (V_{PS} - 12 - V_m)$$

Figure 4 below shows the power required for a 4–20 mA loop.

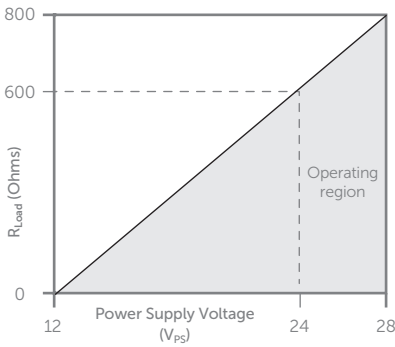


Figure 4. Power required for a 4–12 mA loop.

# Unit Operation

## INVUE ELECTRONIC FLOWMETER, NT4400 COVER

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The InVue Electronic Flowmeter, NT4400 cover is factory sealed and should not be tampered with.


**NOTE:** Any attempt to remove or tamper with the flowmeter cover will void the warranty.

## OPERATING PRESSURE REQUIREMENTS

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The flowmeter calculates fluid flow from the difference in pressure (measured by two sensors) across a venturi style orifice. For the flowmeter to perform within specification, a minimum of 7 kPa (1.0 psig) must be present at the outlet of the flowmeter. Maximum pressure is 414 kPa (60 psig).

 **WARNING!** The InVue Electronic Flowmeter, NT4400 may be damaged if the flowmeter is subjected to any level of vacuum pressure (less than atmospheric pressure).

 **WARNING!** The InVue Electronic Flowmeter, NT4400 over-pressure limit decreases significantly for temperatures above 65°C (149°F).

## Flow Accuracy

The accuracy of the analog flow output is  $\pm 1\%$  of full scale, or  $\pm 2.5\%$  of full scale. The flowmeter accuracy includes the effects of linearity, hysteresis and repeatability, measured using deionized water at room temperature.

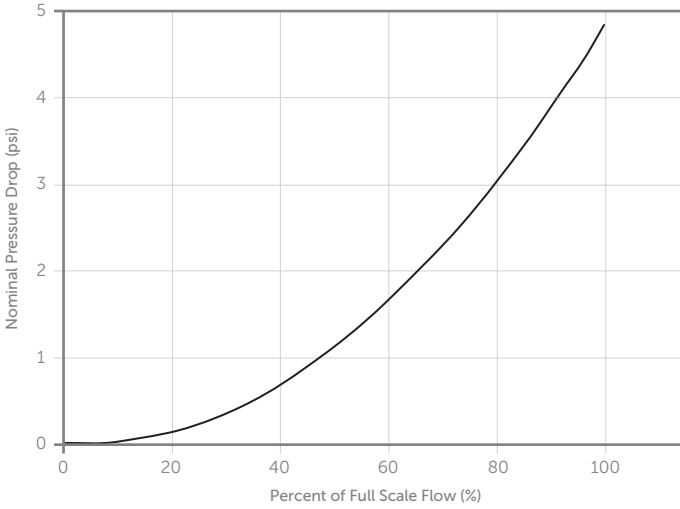
## Pressure Accuracy

The accuracy of the analog pressure output is  $\pm 1\%$  of full scale. These calculations include the effects of linearity, hysteresis and repeatability, measured at 23°C (73°F).

## Pressure Drop Chart

The following pressure drop chart details the pressure drop developed using deionized water at 23°C (73°F).

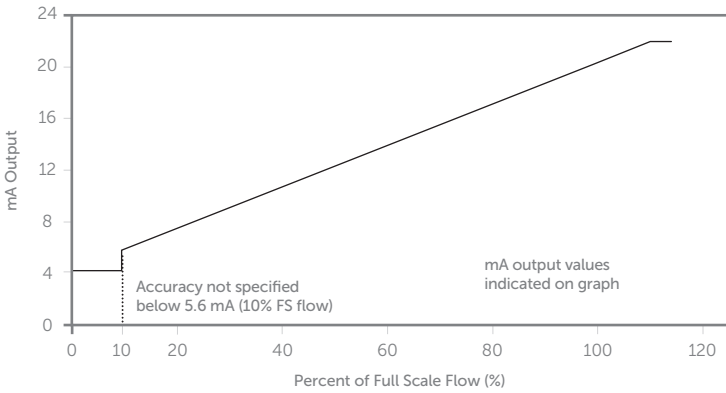
### Pressure Drop vs. Percent Full Scale Flow – T Flow Ranges



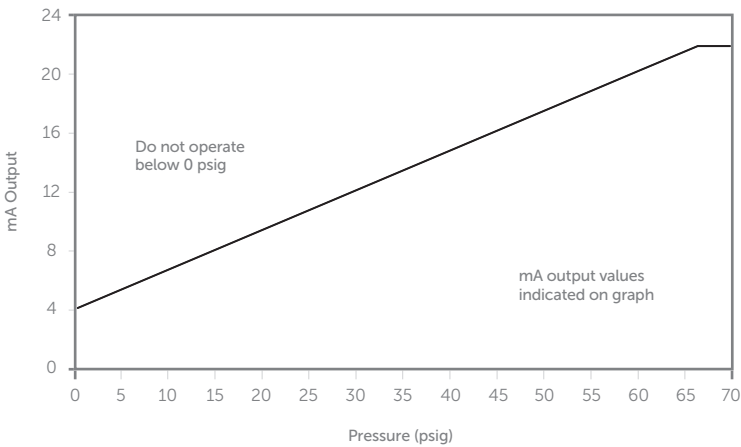
The following diagrams illustrate the expected current outputs for the flow and pressure measurement signals from the flowmeter. Outputs below 4 mA or above 20 mA signify low or high alarm conditions.

**NOTE: Specifications are subject to change without notice.**

**mA Output vs. Full Scale Flow – T Flow Ranges**



**mA Output vs. Pressure**



### Determining the Flowmeter $C_v$

The  $C_v$  of the flowmeter using de-ionized water at 23°C (73°F) is listed on the right.

$C_v$  flow factor is the number of gallons of water that pass through the orifice in one minute at a pressure drop of 7 kPa (1.0 psid).

### CE Compliance

Entegris products have been tested to various test standards required by the EMC 2014/30/EU directive. The results of this testing are on file at Entegris and are available upon request.

Please contact the factory for the latest information. The most current specifications may be found on our [website](#).

### Hazardous Locations

The InVue Electronic Flowmeter, NT4400 conforms to UL 61010-1 and ANSI®/ISA® 12.12.01 standards for use in Class I, Division 2 Group A – D, T6 10°C ≤ Ta ≤ 65°C, hazardous environments.

FLOW RANGE	$C_v$
T0	0.006
T1	0.015
T2	0.031
T3	0.061
T4	0.15
T5	0.31
T6	0.61
T7	1.2
T8	2.4
T9	4.9
T10	7.3
T11	11.0
T12	14.6

# Diagnostics

Troubleshooting the InVue Electronic Flowmeter, NT4400 may be accomplished by measuring the current (4–20 mA) output signal of the flowmeter with a battery powered current/voltage meter. The meter may be placed in series with a flowmeter output to measure the current output

or it may be used to directly measure the voltage from a load resistor.

Using the battery powered current/voltmeter is an effective method to determine whether the Entegris device or the on-site data acquisition system is not functioning properly.

## Diagnostics Guide

SYMPTOM	POSSIBLE CAUSES	SUGGESTIONS
1. Current output reads 4 mA or less when fluid flow is present.	The flowmeter is installed backwards.	Install the flowmeter so the direction of flow is from inlet towards outlet (direction of the arrow).
	The flowmeter was accidentally re-zeroed while flow was present.	Make sure the flow is stopped, and that there is a minimum of 7 kPa (1.0 psig) static line pressure present, then re-zero the flowmeter. See page 17. Use the included pressure output to verify the re-zero pressure.
	Insufficient line pressure.	The line pressure (i.e., back-pressure must be 7 kPa (1.0 psig). If the back-pressure is being supplied by a column of liquid, the column height must be greater than 28 inches of water (7 kPa [1.0 psig]). Some liquids may require greater height due to lower density. Use the included pressure output to verify the re-zero pressure.
	The actual flow is lower than the specified flow range for the flowmeter.	A flowmeter configured to a different flow range is required. For example, if the flowmeter is a T7 unit, any flow less than 1.0 L/min will read 4 mA. Please contact Entegris for additional product information.
	Improper wiring.	Verify main power connection (Red and Black wires).

## Diagnostics Guide (continued)

SYMPTOM	POSSIBLE CAUSES	SUGGESTIONS
2. Output reads above 4 mA when there is zero flow.	The flowmeter needs to be re-zeroed.	Perform the re-zeroing procedure. Make sure the flow is stopped, and that there is a minimum of 7 kPa (1.0 psig) static line pressure present, then re-zero the flowmeter. See page 17. Use the included pressure output to verify the re-zero pressure.
3. Current output does not change with changing flow.	The pressure output is being monitored instead of the flow output.	Check the wiring to ensure the flow output is wired correctly.
	Improper wiring.	Verify main power connection (Red and Black wires).
	Insufficient line pressure.	The line pressure (i.e., back-pressure must be 7 kPa (1.0 psig). If the back-pressure is being supplied by a column of liquid, the column height must be greater than 28 inches of water (7 kPa [1.0 psig]). Some liquids may require greater height due to lower density. Use the included pressure output to verify the re-zero pressure.
	The flowmeter was accidentally re-zeroed while flow was present.	Make sure the flow is stopped, and that there is a minimum of 7 kPa (1.0 psig) static line pressure present, then re-zero the flowmeter. See page 17. Use the included pressure output to verify the re-zero pressure.
4. Current output is extremely high (>25 mA).	The 4–20 mA loop signal is shorted to the power (+24 V) of the flowmeter.	Examine all electrical connections. Please note, if wires are stripped back too far before insertion in a terminal block, they may cross and short together.



## Diagnostics Guide (continued)

SYMPTOM	POSSIBLE CAUSES	SUGGESTIONS
5. Output is extremely noisy (spiking above and below 20 and 4 mA).	The actual fluid flow conditions are noisy.	Flow turbulence may be caused by "noisy" pumps used in a system. Examples of noisy pumps are diaphragm pumps without pulsation dampeners and peristaltic pumps operating at low flow rates. Please contact Entegris for additional information.
	The supply power (+24 V) is noisy.	If the power supply is shared with other systems, components such as solenoids, DC motors, valves, etc., the flowmeter may be receiving "dirty" power. The noise spikes on the power supply will cause the flowmeter output to be noisy.
6. Flow inaccuracy at low operating flow rates.	The flowmeter needs to be re-zeroed.	Perform the re-zeroing procedure. Make sure the flow is stopped, and that there is a minimum of 7 kPa (1.0 psig) static line pressure present, then re-zero the flowmeter. See page 17. Use the included pressure output to verify the re-zero pressure.
	Insufficient back-pressure (7 kPa [1.0 psig]).	Check pressure output valve. If below 7 kPa (1.0 psig) at all operational flow rates (including zero flow), move flowmeter or increase back-pressure. Use the included pressure output to verify the pressure.
	The flowmeter is mounted above dispense point.	Move flowmeter below dispense point.

# Maintenance

## NORMAL OPERATION

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During normal operation, the InVue Electronic Flowmeter, NT4400 requires no maintenance, other than a periodic re-zero of the flowmeter.

## FLOWMETER RE-ZERO FUNCTION

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The calibration of the flowmeter can be re-zeroed, meaning that the analog output that corresponds to zero flow may be reset.

**⚠ WARNING! When executing the re-zero function, there must be 7 to 414 kPa (1 to 60 psig) of static pressure. Best results when re-zero is performed at the operating pressure.**

**NOTE: The following procedure must be followed precisely to ensure proper flowmeter re-zero.**

1. The flowmeter re-zero function requires the same power supply of 24 VDC (12 – 28 VDC) as is used to power the unit.
2. Stop the process fluid flow and verify that the flowmeter is experiencing **absolutely no flow** (typically requires a fully closed process valve located on the **outlet** side of the flowmeter).
3. Using the pressure output signal of the flowmeter, verify that there is **at least 7 kPa (1.0 psig) [414 kPa (60 psig) maximum]** of **stable** static line pressure.
4. Apply 24 VDC (12 – 28 VDC) to the violet wire for a minimum of three seconds. This voltage supply must use the same ground as the power supply for the flowmeter.

In most applications, the re-zero procedure may be automated using switches, a PLC or other logic controller devices.

In order to obtain best performance, the re-zero function should be performed, if possible, every day of service when operating at ambient temperature conditions. The re-zero function should be performed more often if operating at higher temperature. It is also recommended to perform a re-zero after start-up and after fluid temperature changes of greater than 5°C (9°F). Best performance will be achieved by re-zeroing between each dispense cycle.

## Reference

The following section lists the specifications for the InVue Electronic Flowmeter, NT4400.

### Physical specifications

PART		MATERIALS OF CONSTRUCTION
Wetted parts	Body	PTFE
	Sensor interface	CTFE or PFA (consult factory for specific material)
	O-rings	Perfrez® PXC Ultra
Nonwetted parts		Polypropylene, Polyethylene, Viton®, and PVDF
Connection type		Flaretek tube fitting, standard. PrimeLock, and Super 300 Type Pillar are available upon request.

### Electrical specifications

Nominal input voltage	24 VDC
Input voltage range	12 – 28 VDC
Input current	50 mA (max.) (+20 mA +20 mA for each output signal)
Signal output range for flow and pressure	4 – 20 mA (Externally powered with 24 VDC. Output varies proportionately with flow or pressure measured)
Maximum load resistance	0 $\Omega$ at 12 VDC
	800 $\Omega$ at 28 VDC
Maximum output current	22 mA for flow signal, 22 mA for pressure signal
Electrical connection	12', 8-wire FEP-jacketed pigtail or polypropylene removable connector with 6' or 12' PVC-jacketed cable.
Electrical enclosure	IP54

#### Certifications



ETL listed for conformance to UL 61010-1 and ANSI/ISA 12.12.01 standards for use in Class I, Division 2 Group A–D, T6 10°C ≤Ta ≤65°C, hazardous environments.

## Performance specifications

<b>Process temperature</b>		10° to 65°C (50° to 149°F)
<b>Ambient temperature</b>		10° to 65°C (50° to 149°F)
<b>Storage temperature</b>		-15° to 40°C (20° to 149°F)
<b>Minimum operating pressure (at the outlet)</b>		7 kPa (1.0 psig)
<b>Maximum operating pressure</b>		414 kPa (60 psig)
<b>Pressure drop</b>		21 kPa (3 psid) at 80% flow (10:1 turn down) 21 kPa (3 psid) at 40% flow (20:1 turn down)
<b>Response time</b>		50 msec update rate
<b>Flow accuracy</b>	10:1 turndown (T flow ranges)	20 – 100% of range $\pm 1.0\%$ of full scale 10 – 20% of range $\pm 2.5\%$ of full scale*
	20:1 turndown (E flow ranges) (legacy)	10 – 100% of range $\pm 1.0\%$ of full scale 5 – 10% of range $\pm 2.5\%$ of full scale Accuracy stated as full scale using deionized water at 23°C (73°F) and includes the combined effects of linearity, hysteresis and repeatability.*
<b>Flow repeatability</b>	10:1 turndown (T flow ranges)	20 – 100% of range $\pm 0.5\%$ of full scale 10 – 20% of range $\pm 1.0\%$ of full scale
	20:1 turndown (E flow ranges) (legacy)	10 – 100% of range $\pm 0.5\%$ of full scale 5 – 10% of range $\pm 1.0\%$ of full scale
<b>Pressure measurement range</b>		0 – 414 kPa (0–60 psig)
<b>Over-pressure limit</b>		690 kPa (100 psig)
<b>Pressure accuracy</b>		$\pm 1.0\%$ of full scale, includes the combined effects of linearity, hysteresis and repeatability.
<b>Pressure repeatability</b>		$\pm 1.0\%$ of full scale

\*Note: A performance loss up to 10% FS accuracy error may occur when the unit is exposed to radiated radio frequency fields of 10 V/m in the frequency range of 730–970 MHz range or conducted radio frequency of 3V in the 10–15 MHz range.

## Ordering Information

The part number represents the configuration. For example, part number 4400-T7-F04-B06-A-P7-U3 represents the following configuration:

- InVue Electronic Flowmeter, Model NT4400
- Flow range of 0–10 L/min
- ½" Flaretek tube fitting

- FEP-jacketed 6' pigtail electrical cable
- 4 – 20 mA electrical output
- CTFE sensor interface
- Kalrez Perfrez PXC Ultra/Viton primary/secondary seal

The flowmeter is available in the following fitting size and flow range combinations.

### FLOW RANGE

Fitting size (Flaretek connection)	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
¼"	Yes	Yes	Yes	Yes	Yes	–	–	–	–	–	–	–	–
⅜"	Yes	Yes	Yes	Yes	Yes	Yes	Yes	–	–	–	–	–	–
½"	–	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	–	–	–	–
¾"	–	–	–	–	–	–	Yes	Yes	Yes	Yes	Yes	–	–
1"	–	–	–	–	–	–	–	Yes	Yes	Yes	Yes	Yes	Yes

*For PrimeLock and Pillar connection options, please contact Entegris.  
Please consult the factory for custom fitting size and flow range combinations.*

# Ordering Information (continued)

InVue Electronic Flowmeter, Model 4400: part number

4400 - - - - A - -

... **Primary/secondary seal**

U3 = Perfrez PXC Ultra/Viton

S3 = Perfrez PXC Ultra/Perfrez PXC Ultra

..... **Sensor interface†**

P7 = CTFE sensor interface

(for acids, bases and oxidant, typically)

P8 = PFA sensor interface

(for solvents and temperatures  
>40°C (>104°F), typically)

..... **Electrical outputs**

A = 4–20 mA (12–28 VDC input)

..... **Electrical connector type**

B12 = FEP-jacketed 12' pigtail electrical cable

D00 = Polypropylene connector (cable not included)

D12 = Polypropylene connector and 12' PVC cable

..... **Inlet/outlet connection\***

F02 = 1/4" Flaretek tube fitting

F03 = 3/8" Flaretek tube fitting

F04 = 1/2" Flaretek tube fitting

F06 = 3/4" Flaretek tube fitting

F08 = 1" Flaretek tube fitting

*Note: For PrimeLock and Pillar connection options, please contact Entegris.*

..... **Flow range\***

T0 = 0–50 mL/min

T7 = 0–10 L/min

T1 = 0–125 mL/min

T8 = 0–20 L/min

T2 = 0–250 mL/min

T9 = 0–40 L/min

T3 = 0–500 mL/min

T10 = 0–60 L/min

T4 = 0–1250 mL/min

T11 = 0–90 L/min

T5 = 0–2.5 L/min

T12 = 0–120 L/min

T6 = 0–5 L/min

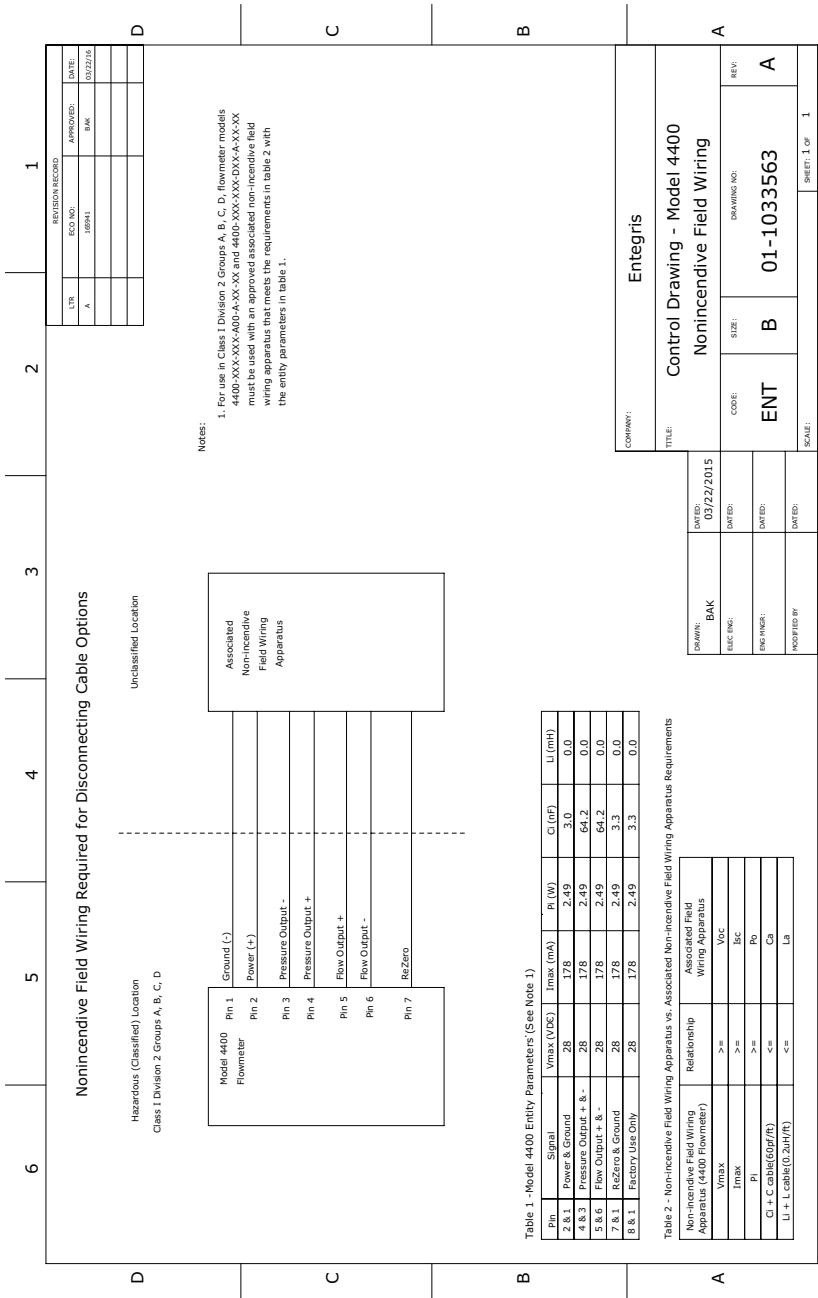
*†Selection is dependent on application and chemical media. Please contact Entegris for best selection.*

*\*Please refer to previous page for fitting size and flow range combinations available.*

*Product specified with a flared connection is packaged with two PVDF nuts.*

*For alternative nut material or custom configurations and specifications, please contact the factory.*

# Control Drawing



# Appendix

## LEGACY PRODUCT INFORMATION

### 7-wire Connector (A-series Connector, Legacy)

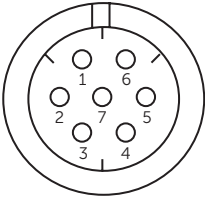
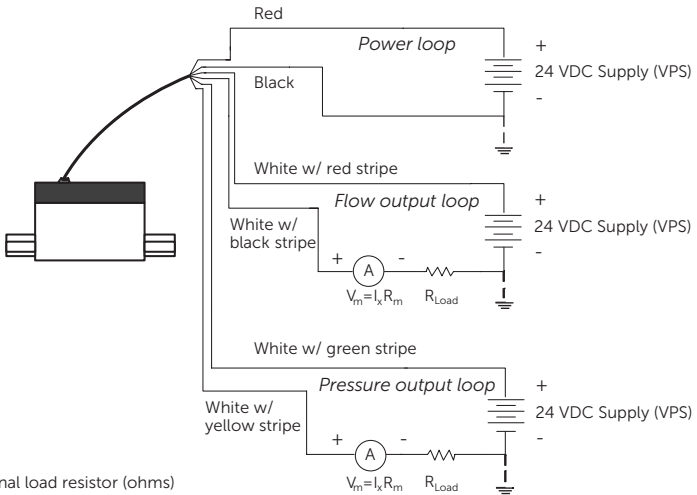


Figure 1L. Electrical connector (Code-A00).



$R_{Load}$  = Optional load resistor (ohms)  
 $V_m$  = Maximum voltage drop across meter at 20 mA  
 $R_m$  = Internal resistance of meter (ohms)

Figure 2L. Wiring diagram for the 7-wire/7-pin removable connector (A-series connector, legacy).



## Legacy Flow Range Codes

FLOW RANGE		C <sub>v</sub>
<b>M0</b>	<b>E0</b>	0.006
<b>M1</b>	<b>E1</b>	0.015
<b>M2</b>	<b>E2</b>	0.031
<b>M3</b>	<b>E3</b>	0.061
<b>M4</b>	<b>E4</b>	0.15
<b>01</b>	<b>E5</b>	0.31
<b>02</b>	<b>E6</b>	0.61
<b>03</b>	<b>E7</b>	1.2
<b>04</b>	<b>E8</b>	2.4
<b>05</b>	<b>E9</b>	4.9
—	<b>E10</b>	7.3
—	—	11.0
—	—	14.6

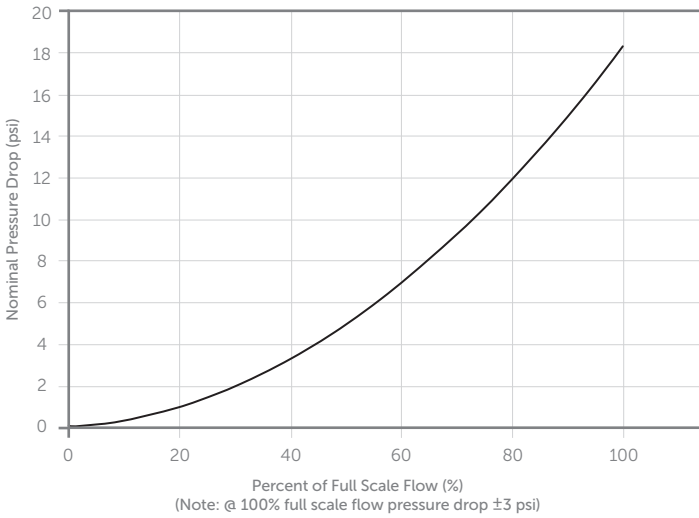
CODE	FLOW RANGE (5:1 TURNDOWN)
<b>M0</b>	10 – 50 mL/min
<b>M1</b>	25 – 125 mL/min
<b>M2</b>	50 – 250 mL/min
<b>M3</b>	100 – 500 mL/min
<b>M4</b>	250 – 1250 mL/min
<b>01</b>	0.5 – 2.5 L/min
<b>02</b>	1 – 5 L/min
<b>03</b>	2 – 10 L/min
<b>04</b>	4 – 20 L/min
<b>05</b>	8 – 40 L/min

CODE	FLOW RANGE (20:1 TURNDOWN)
<b>E0</b>	0 – 100 mL/min
<b>E1</b>	0 – 250 mL/min
<b>E2</b>	0 – 500 mL/min
<b>E3</b>	0 – 1000 mL/min
<b>E4</b>	0 – 2.5 L/min
<b>E5</b>	0 – 5 L/min
<b>E6</b>	0 – 10 L/min
<b>E7</b>	0 – 20 L/min
<b>E8</b>	0 – 40 L/min
<b>E9</b>	0 – 80 L/min
<b>E10</b>	0 – 120 L/min

## Legacy Pressure Drop Chart

### Pressure Drop vs. Percent Full Scale Flow – E Flow Ranges



## Legacy Model String Codes

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<b>Code</b>	<b>Electrical Connector Type</b>
A00	Polypropylene connector (7-wire, legacy version)

<b>Code</b>	<b>Sensor Interface</b>
P1	CTFE sensor interface
P2	PFA sensor interface

<b>Code</b>	<b>Primary/Secondary Seal</b>
U1	Perfrez 4079/Viton
U2	Perfrez 1050/Viton
S1	Perfrez 4079/Perfrez 4079
S2	Perfrez 1050/Perfrez 1050

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**WARNING! All products returned to Entegris must be accompanied by a list of all chemicals that have been in contact with the unit and the corresponding Material Safety Data Sheet (MSDS) for each chemical. Returned products will not be accepted without an MSDS.**

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