

NT™ Pressure Transducer Models 4100, 4210

User Guide



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Safety Alert Symbol



WARNING!

Indicates a hazardous situation which, if not avoided, could result in serious injury or death.

Introduction

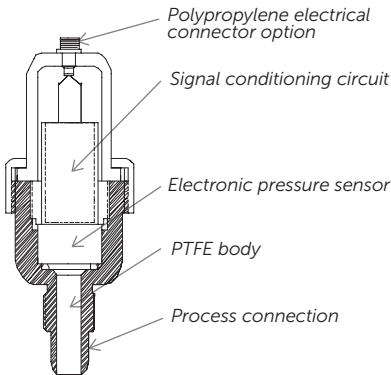
This manual is for use with the following standard NT Pressure Transducer 4000 Series Models 4100 and 4210. These instruments have been designed for use in high purity applications in the semiconductor industry.

These products feature no moving parts and no filled cavities, which reduces the possibility of a contaminated process. The wetted parts of these nonmetallic transducers are constructed with PTFE, PFA or other similar high purity inert materials.

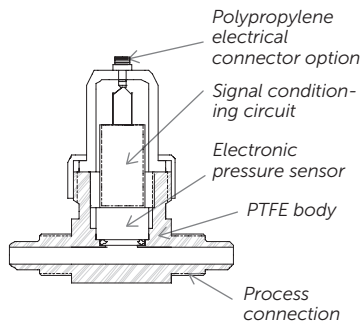


WARNING! Attempting to install or operate standard NT 4000 Series Pressure Transducers without reviewing the instructions contained in this manual could result in personal injury or equipment damage.


Cut-away Example: NT Single-port Pressure Transducer




Cut-away Example: NT Flow-through Pressure Transducer



Installation

 **WARNING!** The pressure transducer has been factory sealed. Do not attempt to remove the cover of the pressure transducer. Any attempt at removal of the pressure transducer cover will void the warranty and damage the unit.

 **WARNING!** Do not tighten the nuts that protect the process connections during shipment. Do not tighten the nuts unless the proper tubing has been installed. Tightening these nuts may result in damage to the pressure transducer process connections.

MECHANICAL INSTALLATION

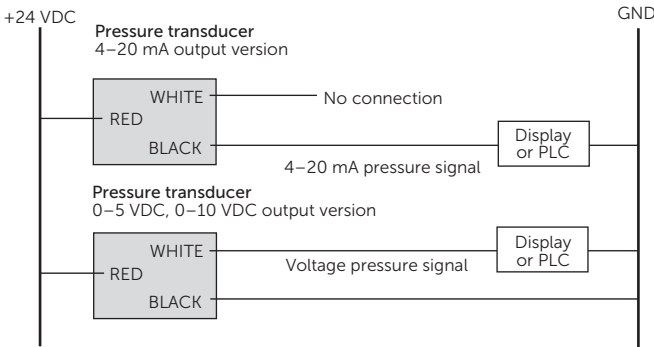
NOTE: For detailed Flaretek® and PrimeLock® tube fitting assembly instructions, visit www.entegris.com.

NOTE: For detailed Super 300 Type Pillar® tube fitting assembly instructions, contact Nippon Pillar Packaging Company, Ltd.

ELECTRICAL INSTALLATION

The pressure transducer provides an analog (0–5 VDC, 0–10 VDC or 4–20 mA) electrical output proportional to the pressure measured.

NOTE: The white wire is not required for the 4–20 mA output configuration, please refer to the wiring diagrams below.



Electrical connector information

WIRE	4–20 MA OUTPUT VERSION	VOLTAGE OUTPUT VERSION
Red VDC+	24 VDC (12–30 VDC)	24 VDC (12–30 VDC)
Black VDC–	Ground	Ground
White	Not used	0–5 VDC signal or 0–10 VDC signal

POWER SUPPLY REQUIREMENTS

The pressure transducer requires a 12–30 volt DC power supply with less than 2% ripple at 100 or 120 Hz. The required power supply voltage varies with the load resistance (R_{Load}), please refer to the formulas on page 5. The power supply 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 pressure transducer measurements when the inductive device is powered up or powered down.

NOTE: Be sure to ground the shield of the cable to local ground.

WARNINGS AND SAFETY

- ⚠ **WARNING!** For use in Class I Division 2 Hazardous Environments, models with disconnecting cable options must be wired in accordance with the control drawing 01-1033562 on page 18.
- ⚠ **WARNING!** For use in Class I Zone 2 Hazardous Environments, models with disconnecting cable options must be wired in accordance with the control drawing 01-1033562 on page 18.
- ⚠ **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.
- ⚠ **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 and/or Zone 2.
- ⚠ **WARNING!** Potential electrostatic charging hazard. For Hazardous Environment use, Entegris recommends using the pressure transducer in conjunction with ESD tubing, such as FluoroLine® Electrostatic Dissipative (ESD) Tubing.

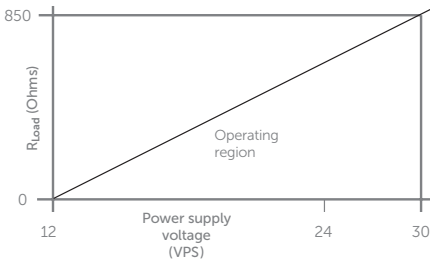


Figure 1. Power required for a 4–20 mA loop.

Load Resistance: Current Output (4–20 mA Configuration)

If a load resistor, R_{Load} , is used in series with the current output, the value of R_{Load} is dependent on the supply voltage and the meter resistance and is calculated from the following formula:

$$R_{Load} = \frac{V_{PS} - 12 \text{ V}}{20 \text{ mA}} - R_{meter}$$

where:

R_{Load} = maximum load resistance (ohms)

V_{PS} = power supply voltage (volts)

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

Load Resistance: Voltage Output (0–5, 0–10 VDC)

The output impedance is 1 kOhm. The input impedance should be ≥ 1 megohm for $\pm 0.1\%$ load impedance error.

Unit Operation

OPERATING ENVIRONMENT


The pressure transducer is to be mounted in a well vented and controlled environment. Refer to the *Reference* section on page 10 for additional specifications.

PROCESS CONNECTION

To avoid possible pressure leaks, make sure all process connections have been performed in accordance with the *Mechanical Installation* guidelines on page 3.

PRESSURE TRANSDUCER COVER ASSEMBLY


NT Pressure Transducer covers are factory sealed and should not be tampered with or opened. Opening the cover shall void the product warranty.

 **WARNING! Any attempt to remove or tamper with the transducer cover will void the warranty and damage the unit.**

PRESSURE AND TEMPERATURE REQUIREMENTS

The minimum pressure required is atmospheric pressure. The pressure transducer may be damaged if subjected to vacuum pressure (pressure that is less than atmospheric pressure).

The pressure transducer is rated for use with fluids at process temperatures between 10–65°C (50–149°F) under normal operating conditions.

 **WARNING! NT Pressure Transducers, Models 4100 and 4210 may be damaged if the sensor is subjected to any level of vacuum pressure (pressure less than atmospheric pressure).**

PRESSURE LIMITS

TRANSDUCER RANGE	MAXIMUM OVER PRESSURE LIMIT @ 23°C (73°F)	MAXIMUM OVER PRESSURE LIMIT @ 65°C (149°F)
0–30 psig	690 kPa (100 psig)	690 kPa (100 psig)
0–60 psig	1034 kPa (150 psig)	690 kPa (100 psig)
0–100 psig	1034 kPa (150 psig)	690 kPa (100 psig)
0–150 psig	1310 kPa (190 psig)	N/A

Maximum over pressure can be limited by the fitting. Consult the fitting specification for maximum over pressure limits.

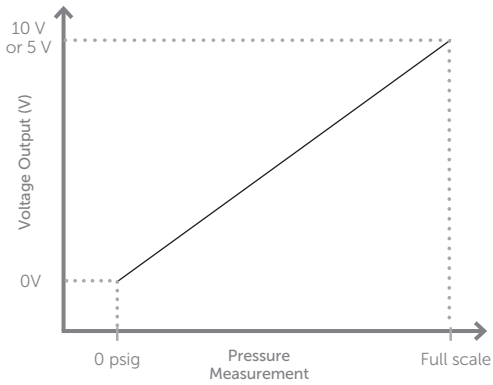
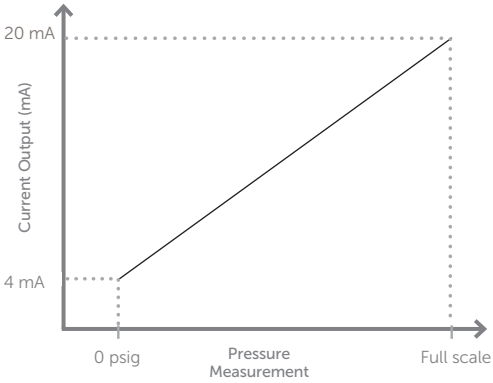
⚠ WARNING! The pressure limits for standard NT Pressure Transducers (4000 Series) decrease significantly for temperatures above 65°C (149°F). Exceeding these limits may result in personal injury or equipment damage.

PRESSURE REFERENCE ACCURACY

The accuracy of the pressure transducer output is $\pm 1\%$ of full scale. This accuracy includes the effects of linearity, hysteresis and repeatability, measured at room temperature. Accuracy specifications for non-standard product configurations might vary.

LINEAR OUTPUT SIGNAL

The output signal of the pressure transducer is a linear function proportional to the applied pressure.



Troubleshooting

Troubleshooting the NT Pressure Transducers may be accomplished by measuring the output signal of the pressure transducer with a battery powered current/voltage meter. The meter may be placed in series with the pressure transducer to measure the current output or it may be used to directly measure the voltage output.

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

Reference

The following lists the specifications for the NT Pressure Transducer product line. Please consult the factory for product specifications manufactured for nonstandard applications.

NOTE: Specifications are subject to change without notice.

Physical Specifications:

Materials	Wetted parts	Body	PTFE
		Sensor interface	CTFE or PFA
		O-ring	Kalrez®
	Nonwetted parts	Polypropylene, polyethylene, Viton®, PVDF (in addition to materials listed above)	
Connection type	Flaretek tube fitting, Super 300 Type Pillar tube fitting, NPT (PrimeLock available upon request.)		

Electrical Specifications:

Input voltage	24 VDC (12–30 VDC)
Input current	20 mA maximum
Pressure signal output ranges	4–20 mA, 0–5 VDC, 0–10 VDC
Electrical connection	6', 12', 30' FEP-jacketed pigtail or polypropylene 3-pin connector
Electrical enclosure	IP54

Performance Specifications

Reference accuracy	±1% of full scale (includes linearity, hysteresis and repeatability) at 23°C (73°F)
Process temperature	10–65°C (50–149°F)

Certifications

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 Entegris' Web site at: www.entegris.com

HAZARDOUS LOCATIONS AND EXPLOSIVE ATMOSPHERES

North America — Class I Division 2

Entegris has tested our standard products to the UL 61010-1, UL 12.12.01 standards for use in Class I, Division 2 Gas Groups A-D, T6 10°C ≤Ta ≤65°C (maximum 90°C T_{process}) hazardous environments.

Europe — Zone 2

Entegris has tested our standard products to the EN 60079-0, EN 60079-11 standards for use in Zone 2 Gas Group IIC, T5 10°C ≤Ta ≤65°C (maximum 90°C T_{process}) hazardous environments, in accordance with EU Directive 2014/34/EU.

International — Zone 2

Entegris has tested our standard products to the IEC 60079-0, IEC 60079-11 standards for use in Zone 2 Gas Group IIC, T5 10°C ≤Ta ≤65°C (maximum 90°C T_{process}) hazardous environments.

Korean Certificate Safety (KCs)

Entegris has tested our standard products in accordance with Article 34 of the Occupational Safety & Health Act.

The results of this testing are on file at Entegris and are available upon request.

		Conforms to UL Std 12.12.01, UL Std 61010-1 Class I, Div 2 Groups A-D, T6 10°C ≤Ta ≤65°C, IP54 Input: 24 VDC, 20 mA Max.		19-KA4BO-0549X		IECEx ETL 19.0009X Ex ic IIC T5 Gc

		Conforms to UL Std 12.12.01, UL Std 61010-1 Class I, Div 2, Groups A-D, T6 10°C ≤Ta ≤65°C, IP54 Input: 30 VDC, 120 mA Max.		19-KA4BO-0549X		IECEx ETL 19.0009X Ex ic IIC T5 Gc

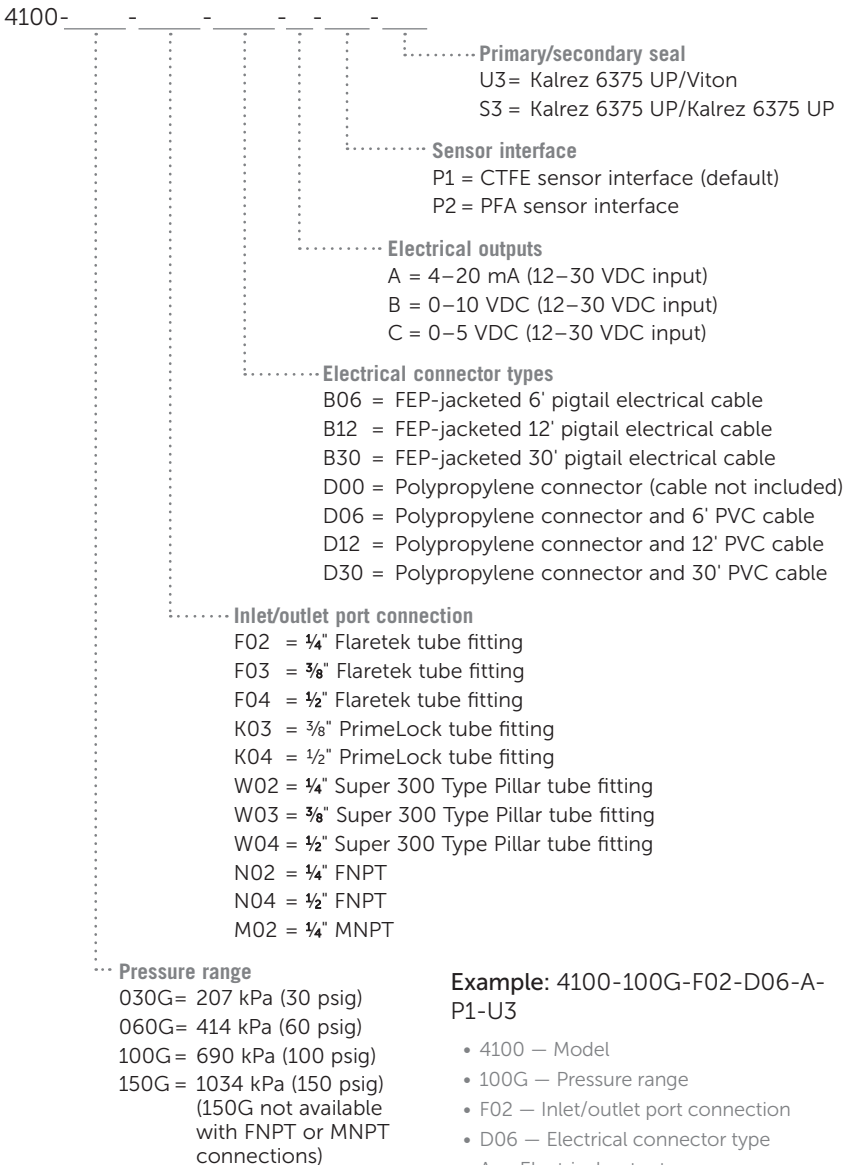
		Conforms to UL Std 12.12.01, UL Std 61010-1 Class I, Div 2, Groups A-D, T6 10°C ≤Ta ≤65°C, IP54 Input: 24 VDC, 20 mA Max.		19-KA4BO-0550X		IECEx ETL 19.0009X Ex ic IIC T5 Gc

		Conforms to UL Std 12.12.01, UL Std 61010-1 Class I, Div 2, Groups A-D, T6 10°C ≤Ta ≤65°C, IP54 Input: 30 VDC, 120 mA Max.		19-KA4BO-0550X		IECEx ETL 19.0009X Ex ic IIC T5 Gc

Ordering Information

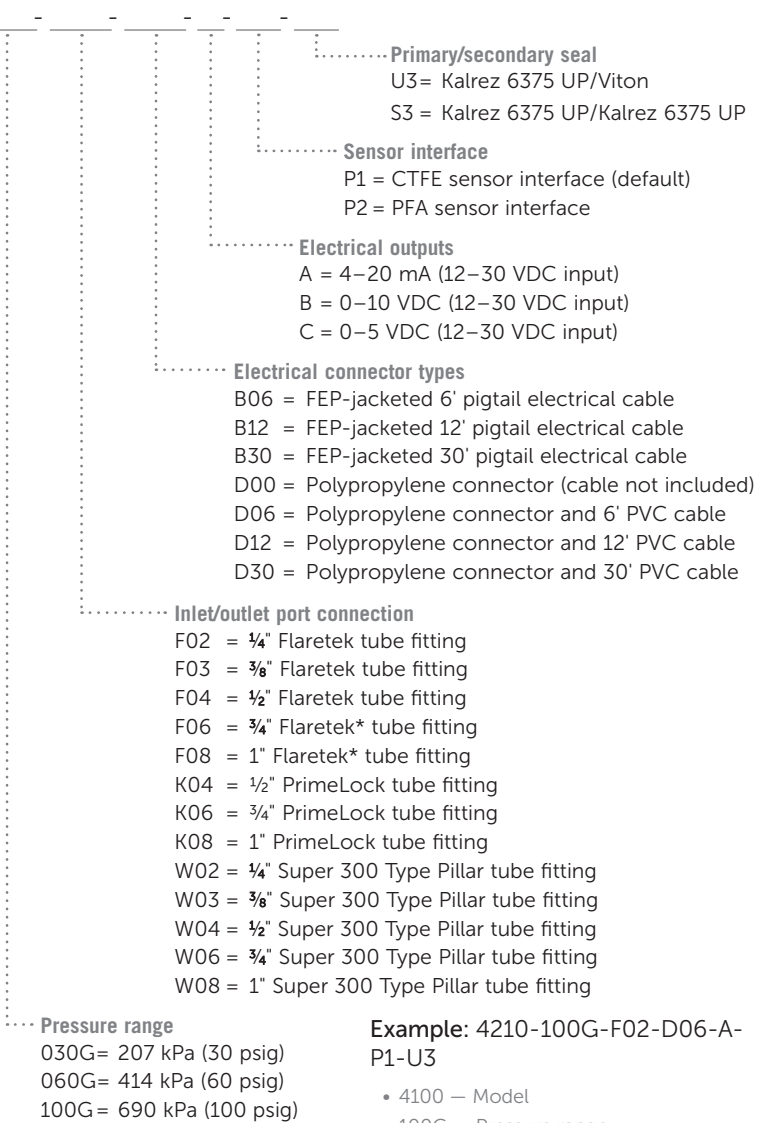
Refer to the following for the desired configuration.

Model 4100 Single-port Pressure Transducer: part number



Model 4210 Single-port Pressure Transducer: part number

4210-



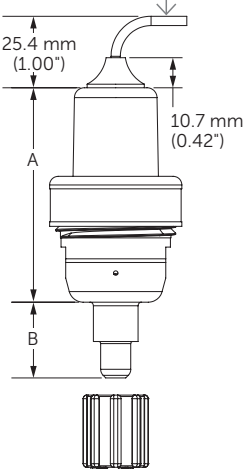
*For detailed pressure limit information on Flaretek tube fitting connections, refer to the Maximum Pressure Capabilities chart in the Flaretek fittings product section on Entegris' website at <http://www.entegrisfluidhandling.com>.

Installation Drawings

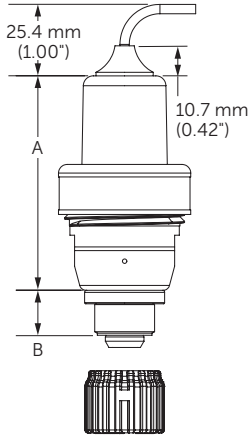
4100 Single-port Pressure Transducer

Flaretek Connection

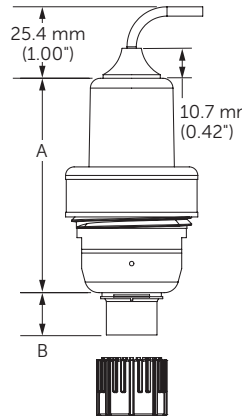
3 conductor pigtail connection (BXX)(cable length up to 30 feet)



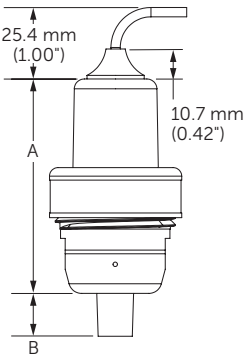
PrimeLock Connection



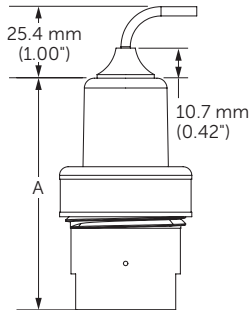
Super 300 Type Pillar Connection



Male Pipe Thread Connection



Female Pipe Thread Connection

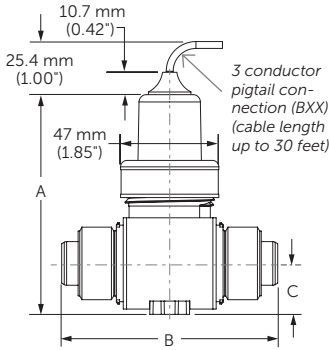


INLET/OUTLET PORT CONNECTION	A	B
¼" Flaretek tube fitting	76.2 mm (3.00")	25.2 mm (0.99")
¾" Flaretek tube fitting	76.2 mm (3.00")	26.9 mm (1.06")
½" Flaretek tube fitting	76.2 mm (3.00")	29.0 mm (1.14")
¾" PrimeLock tube fitting	76.2 mm (3.00")	20.3mm (0.80")
½" PrimeLock tube fitting	76.2 mm (3.00")	22.6mm (0.89")
¼" FNPT	82.3 mm (3.24")	–
½" FNPT	88.9 mm (3.50")	–
¼" MNPT	76.2 mm (3.00")	15.0 mm (0.59")
¼" Super 300 Type Pillar tube fitting	76.2 mm (3.00")	11.0 mm (0.43")
¾" Super 300 Type Pillar tube fitting	76.2 mm (3.00")	15.0 mm (0.59")
½" Super 300 Type Pillar tube fitting	76.2 mm (3.00")	17.5 mm (0.69")

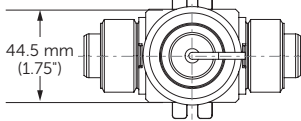
4210 Flow-through Pressure Transducer

Flaretek Connection

Side View

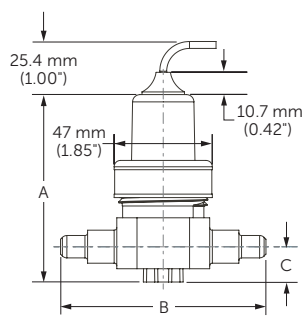


Top View

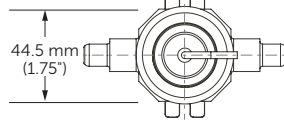


PrimeLock Connection

Side View

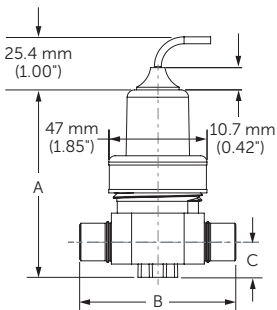


Top View

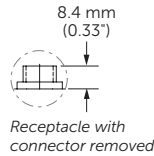
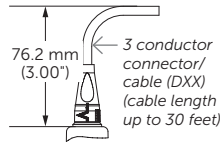
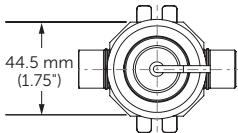


Super 300 Type Pillar Connection

Side View



Top View



Inlet/outlet port connection	A	B	C
¼" Flaretek tube fitting	89.7 mm (3.53")	94.7 mm (3.73")	18.5 mm (0.73")
⅜" Flaretek tube fitting	89.7 mm (3.53")	98.3 mm (3.87")	17.0 mm (0.67")
½" Flaretek tube fitting	96.0 mm (3.78")	102.4 mm (4.03")	21.6 mm (0.85")
¾" Flaretek tube fitting	104.4 mm (4.11")	108.5 mm (4.27")	25.4 mm (1.00")
1" Flaretek tube fitting	112.5 mm (4.43")	120.7 mm (4.75")	30.5 mm (1.20")
½" PrimeLock tube fitting	92.2mm (3.63")	89.7 mm (3.53")	17.5 mm (0.69")
¾" PrimeLock tube fitting	105.2 mm (4.41")	103.4 mm (4.07")	24.4 mm (0.96")
1" PrimeLock tube fitting	113.5 mm (4.47")	112.5 mm (4.43")	28.4 mm (1.12")
¼" Super 300 Type Pillar tube fitting	89.7 mm (3.53")	66.5 mm (2.62")	18.5 mm (0.73")
⅜" Super 300 Type Pillar tube fitting	89.7 mm (3.53")	74.5mm (2.93")	17.0 mm (0.67")
½" Super 300 Type Pillar tube fitting	96.0 mm (3.78")	79.5 mm (3.13")	21.6 mm (0.85")
¾" Super 300 Type Pillar tube fitting	104.4 mm (4.11")	88.4mm (3.48")	25.4 mm (1.00")
1" Super 300 Type Pillar tube fitting	111.8 mm (4.40")	98.6mm (3.88")	29.7 mm (1.17")

Note: No NPT option on Model 4210.

Control Drawing 01-1033562

Nonincendive Field Wiring Required for Disconnecting Cable Options

1
2
3
4
5
6

D
C
B
A

Nonincendive Field Wiring Required for Disconnecting Cable Options

Hazardous (Classified) Location
Class I Division 2 Groups A, B, C, D

Associated
Nonincendive
Field Wiring
Apparatus

Ground (-)
Power (+)

Model 4100 or 4210
Pressure
Transducer
4-20mA Output

Associated
Nonincendive
Field Wiring
Apparatus

Ground (-)
Power (+)
Pressure Output

Model 4100 or 4210
Pressure
Transducer
Voltage Output

Barrier

Unclassified Location

REV	ECO'D BY	APPROV'D BY	DATE
A	LSPH	BM	01/21/15
B		SM	01/24/15

Notes:

- For use in Class Division 2 Groups A, B, C, D, the following pressure transducer models must be used with an approved associated nonincendive field wiring apparatus that meets the requirements in table 3, with the entity parameters in table 1.
- For use in Class Division 2 Groups A, B, C, D, the following pressure transducer models must be used with an approved associated nonincendive field wiring apparatus that meets the requirements in table 3, with the entity parameters in table 2.

Table 1 - Entity Parameters for Models 4100, 4210 with 4-20mA Output (See Note 1)

Cable Option Conductor Color	Signals	Vmax (VDC)	Imax (mA)	P1 (W)	C1 (rF)	Li (mH)
A00, DX4 Cable Options Red & Black	Power & Ground	30	120	0.90	2.5	0.0

Table 2 - Entity Parameters for Models 4100, 4210 with Voltage Output (See Note 2)

Cable Option Conductor Color	Signals	Vmax (VDC)	Imax (mA)	P1 (W)	C1 (rF)	Li (mH)
A00, DX4 Cable Options Red & Black	Power & Ground	30	120	0.90	0.48	0.0

Table 3 - Nonincendive Field Wiring Apparatus vs. Associated Nonincendive Field Wiring Apparatus Requirements

Nonincendive Field Wiring Apparatus (Model 4100/4210)	Relationship	Associated Nonincendive Field Wiring Apparatus
Vmax	>=	Voc
Imax	>=	Icc
P1	>=	Po
C1 + C cable (500rF)	<=	Ca
Li + L cable (0.2uH(rF))	<=	Ls

Entegris

Control Drawing - Model 4100/4210
Nonincendive Field Wiring

DRAWN:	S. NELSON	DATE:	01/06/2019
ELECT ENG:	S. NELSON	DATE:	<Checked Date>
ENG INCH:	R. GEROU	DATE:	<QC Date>
MODIFIED BY:	<Released By>	DATE:	<Release Date>

CODE:	ENT	SIZE:	B
DRAWING NO.:	01-1033562		
REV:	B		

DRAWN: 1
SHEET: 1

Appendix

Table 1. Entity parameters for Models NT4100, NT4210 with 4–20 mA output (see note 1.)

Cable option conductor color	A00, DXX cable option	Red and black
Signals	Power and ground	
V_{max}	30 VDC	
I_{max}	120 mA	
P_i	0.9 W	
C_i	25 nF	
L_i	0.0 mH	

Table 2. Entity parameters for Models NT4100, NT4210 with voltage output (see note 2.)

Cable option conductor color	A00, DXX cable option	Red and black
Signals	Power and ground	
V_{max}	30 VDC	
I_{max}	120 mA	
P_i	0.9 W	
C_i	0.48 nF	
L_i	0.0 mH	

Table 3. Nonincendive field wiring apparatus vs. associated nonincendive field wiring apparatus requirements

NONINCENDIVE FIELD WIRING APPARATUS (MODEL NT4100/4200)	RELATIONSHIP	ASSOCIATED NONINCENDIVE FIELD WIRING APPARATUS
V_{max}	≥	V _{oc}
I_{max}	≥	I _{sc}
P_i	≥	P _o
C_i + C cable (60 pf/ft)	≤	C _a
L_i + L cable (0.2 uH/ft)	≤	L _a

NOTES:

1. For use in Class I Division 2 or Zone 2 Groups A, B, C, D, the following pressure transducer models must be used with an approved associated nonincendive field wiring apparatus that meets the requirements in Table 3 with the entity parameters in Table 1.

4100-XXXX-XXX-A00-A-XX-XX
4100-XXXX-XXX-DXX-A-XX-XX
4210-XXXX-XXX-A00-A-XX-XX
4210-XXXX-XXX-DXX-A-XX-XX

2. For use in Class I Division 2 or Zone 2 Groups A, B, C, D, the following pressure transducer models must be used with an approved associated nonincendive field wiring apparatus that meets the requirements in Table 3 with the entity parameters in Table 2.

4100-XXXX-XXX-A00-B-XX-XX
4100-XXXX-XXX-DXX-B-XX-XX
4100-XXXX-XXX-XXX-B-XX-XX-PXX
4100-XXXX-XXX-A00-C-XX-XX
4100-XXXX-XXX-DXX-C-XX-XX
4210-XXXX-XXX-A00-B-XX-XX
4210-XXXX-XXX-DXX-B-XX-XX
4210-XXXX-XXX-XXX-B-XX-XX-TXX
4210-XXXX-XXX-A00-C-XX-XX
4210-XXXX-XXX-DXX-C-XX-XX
4210-XXXX-XXX-XXX-C-XX-XX-TXX

Notes

FOR MORE INFORMATION

Please call your Regional Customer Service Center today to learn what Entegris can do for you. Visit entegris.com and select the [Contact Us](#) link to find the customer service center nearest you.

TERMS AND CONDITIONS OF SALE

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