



Series ISDP Intrinsically Safe Differential Pressure Transmitter

Specifications - Installation and Operating Instructions



Intrinsic Safety Approval Classification

The ISDP is FM Approved for use in Hazardous (Classified) Locations, according to the requirements of FM 3600:2018, FM 3610:2018, FM 3810:2018, ANSI/ISA 60079-0:2009, ANSI/ISA 60079-11:2009, and ANSI/ISA 61010-1:2004.

Hazardous (Classified) Location Intrinsically Safe for:

Class I Div. 1 Groups A, B, C, D

Class II Div. 1 Groups E, F, G

Class III Div. 1

Class I Zone 0 AEx ia IIC T4 FM19US0208

Ex ia IIC T4 FM19CA0107

Ta = 0°C to 72°C, Type 4X Enclosure

Install in accordance with Control Drawing 19-443480-50.

Entity Parameters

Ui = 28 VDC

Ii = 93 mA

Ci = 22 nF

Li = 400 µH

Pi = 651 mW



WARNING

Use with approved safety barriers only, using entity evaluation.



WARNING

Use only certified Associated Apparatus.

Conditions of safe use

The earth terminal on the housing must be wired to a local earth ground in the hazardous area.

Enclosure parts are constructed of aluminum. The enclosure must be protected from mechanical friction and impact with iron/steel to prevent ignition-capable sparks.

SPECIFICATIONS

Service: Air and non-corrosive gases.

Wetted Materials: Ranges 5 in w.c. and greater: glass, PVC, silicon, alumina ceramic, epoxy, RTV, gold, aluminum, stainless steel and nickel; Ranges 1 in w.c. and lower: stainless steel, silicone, gold and ceramic.

Housing Materials: Aluminum, glass.

Accuracy: $\pm 0.5\%$ at 77°F (25°C) including hysteresis and repeatability (after 1 hour warm-up).

Stability: $< \pm 1\%$ per year.

Pressure Limits: Ranges ≤ 2.5 in w.c. = 2 psi; 5 to 50 in w.c. = 5 psi; 100 in w.c. = 9 psi.

Temperature Limits: 32 to 161.6°F (0 to 72°C).

Compensated Temperature Limits: 32 to 140°F (0 to 60°C).

Thermal Effects: 0.020%/°F (0.036/°C) from 77°F (25°C).

Power Requirements: 10-35 VDC.

Output Signal: 4-20 mA.

Zero & Span Adjustments: Accessible via menus.

Response Time: 250 ms (dampening set to 1).

Display: 4 digit LCD 0.6" height.

Electrical Connections: M12 4 pin connector.

Process Connections: 1/8 female NPT.

Enclosure Rating: Type 4X (IP66).

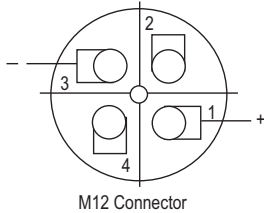
Mounting Orientation: Mount unit in vertical plane. Size: 4.73" x 4.73" x 3.43" (120 mm x 120 mm x 87.1 mm).

Weight: 2 lb 10 oz (1.19 kg).

Agency Approvals: CE, FM (See Intrinsic Safety Approval Classification).

Electrical Connections

Use Model A-231 shielded cable with 4 pin female M12 connection. See Figure 1.



A-231 M12 Cable Colors
PIN 1 is Brown (positive)
PIN 3 is Blue (negative)

Figure 1

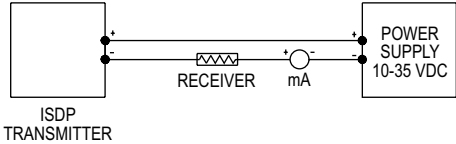


Figure 2

2-Wire Operation - An external power supply delivering 10-35 VDC with minimum current capability of 40 mA (per transmitter) must be used to power the control loop. See Figure 2 for connection of the power supply, transmitter, and receiver. The range of the appropriate receiver load resistance (R_L) for the DC power supply voltage available is expressed by the formula and graph in Figure 3.

POWER SUPPLY VOLTAGE - VDC
(2-WIRE CONNECTION)

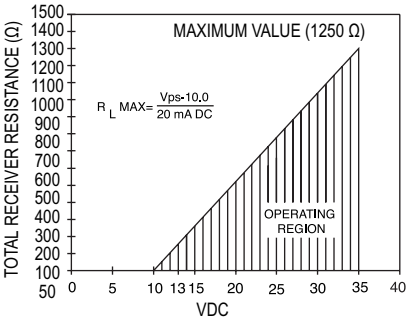
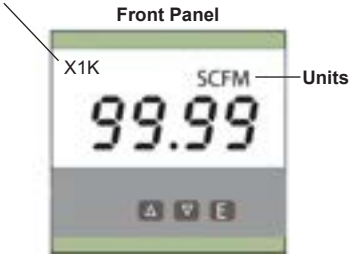


Figure 3

OPERATION

Multiplier descriptor visible with some velocity and flow ranges



KEY FUNCTIONS			
	HOME POSITION FUNCTION	MAIN MENU FUNCTION	SUB MENU FUNCTION
 MENU	Allows access to the menus	Return to home position	Return to previous menu
 UP ARROW		Sequences through menus	Increments a value
 DOWN ARROW		Sequences through menus	Decrements a value
 ENTER	Displays full scale range of unit	Enter into SUB MENU	Changes a value or setting. Press ENTER and display will blink. Adjust with UP or DOWN arrows. Press ENTER to store. Display will stop blinking. Peak/Valley SUB MENU resets display to present value.

MENU MAP

MAIN MENUS

SUB MENUS

SETTINGS



1,000 INHC

SEC_r MENU

SEC_r 1

OPe_r MENU

PrES INHC

PrES INHC

PrES PSI

PrES PR

PrES FTMC

PrES INHG

PrES HPA

PrES MMHC

PrES MMHG

PrES HPA

PrES CMHC

PrES MJAR

PrES OZIN

UEL SCFM

UEL SCFM

UEL M/S

FLO SCFM

FLO SCFM

FLO MPH

FLO_r HI

FLO_r HI

FLO_r LO

1.00 HFAC

1.00 HFAC

ArER CIP

ArER CIP

ArER RECT

1.5 IIR

1.5 IIR

1.5 XIIM

1.5 XIIM

1.5 XIIM

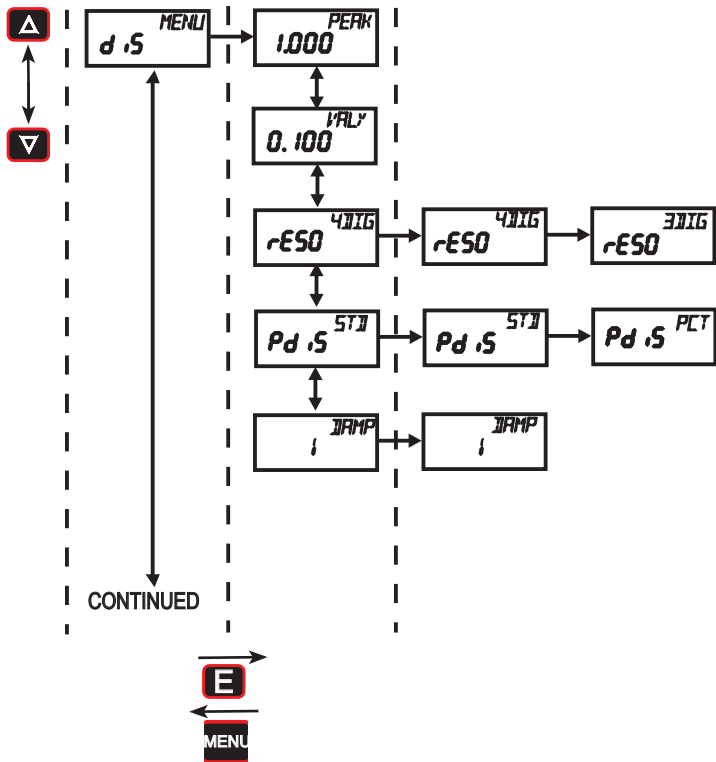
1.5 XIIM

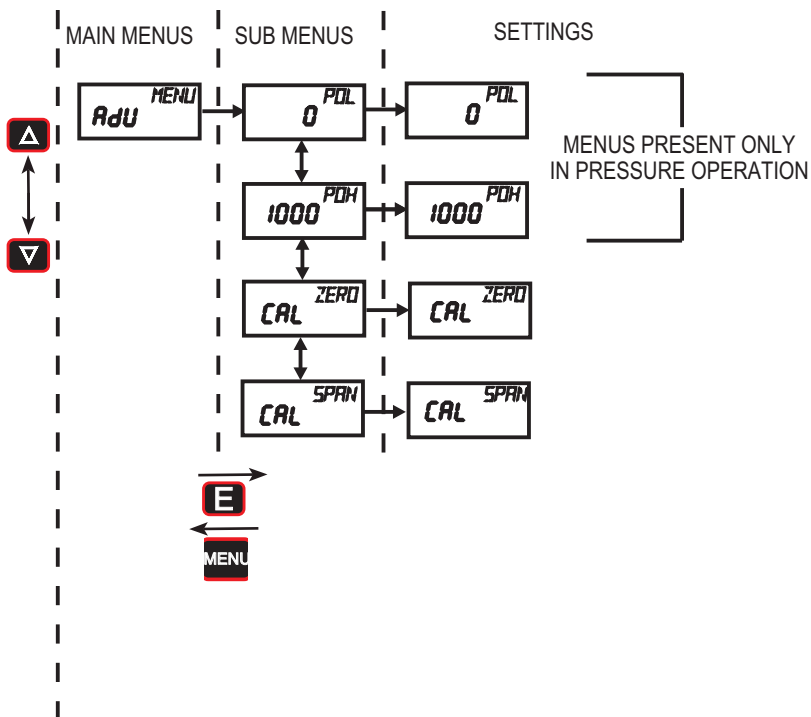
MENUS
UNAVAILABLE
FOR
BI-DIRECTIONAL
RANGES ABOVE
25 IN. W.C.

CONTINUED

E

MENU





Main Menu Selections (Upper Right Display Reads MENU)

- SEC** - Security - Lock out access to menus and settings.
- OPER** - Operation - Selection of Pressure, Velocity or Flow and corresponding engineering units.
- DIS** - Display - Monitor and adjust display related settings: Peak, Valley, display resolution, % output and dampening.
- ADV** - Advanced functions - Modify advanced function parameters, transmitter output scaling, and calibration.

MAIN MENUS and SUB MENUS

SEC (Security) MAIN MENU

SEC is the only SUB MENU in the security MENU. When the security SUB MENU is selected, the present security level is displayed in the upper right hand display. To change the security level, adjust the number displayed to the number shown in the following table for the desired security level.

Security Level Displayed	Access	Password Value to Enter
1	All menus access	10
2	All settings locked	70

NOTICE

The password values shown in the table cannot be altered, so retain a copy of these pages for future reference.

OPER (Operation) MAIN MENU

The OPER MENU selects the measurement type of the instrument.
The SUB MENUS are:

- PRES - Pressure

XDIM - X Dimension

VEL - Velocity

YDIM - Y Dimension

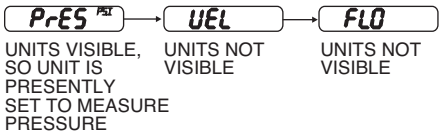
FLO - Flow

KFAC - K Factor

AREA - Area

DIA - Diameter

If the instrument is set for Velocity, the OPER MENU will have an additional KFAC SUB MENU. If the instrument is set for Flow, the OPER MENU will have additional KFAC and AREA SUB MENUS. These will be discussed under Velocity and Flow. When scrolling through the OPER SUB MENUS, the measurement type the unit is currently set for will show the units in the upper right display. The other measurement types will have a blank upper right display.



PrES (Pressure) SUB MENU

For pressure measurement, the following units are available:

- INWC - Inches of water column
- FTWC - Feet of water column
- MMWC - Millimeters of water column
- CMWC - Centimeters of water column
- PSI - Pounds per square inch
- INHG - Inches of mercury
- MMHG - Millimeters of mercury
- MBAR - Millibar
- PA - Pascal
- KPA - Kilopascals
- HPA - Hectopascals
- OZIN - Ounce inches

INWC	FTWC	MMWC	CMWC	PSI	INHG	MMHG	MBAR	PA	KPA	HPA	OZIN
.1000		2.540	.2540			.1868	.2491	24.91		.2491	
.2500		6.350	.6350			.4671	.6227	62.27		.6227	.1445
.5000		12.70	1.270			.9342	1.245	124.5	.1245	1.245	.2890
1.000		25.40	2.540			1.868	2.491	249.1	.2491	2.491	.5780
2.007	.1674	50.99	5.099	.0725	.1477	.3750	5.000	500.0	.500	5.000	1.160
2.500	.2083	63.50	6.350		.1839	4.671	6.227	622.7	.6227	6.227	1.445
5.000	.4167	127.0	12.70	.1806	.3678	9.342	12.45	1245	1.245	12.45	2.890
10.00	.8333	254.0	25.40	.3613	.7356	18.68	24.91	2491	2.491	24.91	5.780
25.00	2.083	635.0	63.50	.9032	1.839	46.71	62.27	6227	6.227	62.27	14.45
50.00	4.167	1270	127.0	1.806	3.678	93.42	124.5		12.45	124.5	28.90
100.0	8.333	2540	254.0	3.613	7.356	186.8	249.1		24.91	249.1	57.80
Note: O/F (over flow) or U/F (under flow) will appear when the ranges have been exceeded above or below full scale by 2%.											

Table 1: Pressure range vs. available units

VEL (Velocity) SUB MENU

For velocity measurement, the following units are available:

- SFPM - Standard feet per minute
- M/S - Meters per second

INPUT RANGE INWC	SFPM RANGE	M/S RANGE
0 - 0.1	0 - 1266	0 - 6.431
0 - 0.25	0 - 2002	0 - 10.17
0 - 0.5	0 - 2832	0 - 14.39
0 - 1	0 - 4004	0 - 20.35
0 - 2.5	0 - 6332	0 - 32.17
0 - 5	0 - 8954	0 - 45.48
0 - 10	0 - 12.66 x IK	0 - 64.33
0 - 25	0 - 20.02 x IK	0 - 101.7

Table 2: Available velocity ranges

Note: Air velocity and flow readings are based upon standard dry air conditions with an ambient temperature of 70°F and a barometric pressure of 29.92 INHG.

FLO (Flow) SUB MENU

For flow measurements the following units are available:

- SCFM - Standard cubic feet per minute
- M³H - Cubic meters per hour

FLO r (Flow Range) SUB MENU

- L0 - 99.99 x 1K flow range
- H - 999.9 x 1K flow range

Tables 3-6 show the flow ranges available, and the maximum duct size that can be set for each input range.

RANGE IN WC	SFPM RANGE	MAX. DUCT SIZE, SQ. FT.
0.1	99.99 x 1K	78.9
0.25	99.99 x 1K	49.9
0.5	99.99 x 1K	35.3
1	99.99 x 1K	24.9
2.5	99.99 x 1K	15.7
5	99.99 x 1K	11.1
10	99.99 x 1K	7.8
25	99.99 x 1K	4.9

Table 3: FLOr = L0 maximum duct size (English)

RANGE IN WC	SFPM RANGE	MAX. DUCT SIZE, SQ. FT.
0.1	999.9 x 1K	789.8
0.25	999.9 x 1K	499.5
0.5	999.9 x 1K	353.1
1	999.9 x 1K	249.7
2.5	999.9 x 1K	157.9
5	999.9 x 1K	111.7
10	999.9 x 1K	78.9
25	999.9 x 1K	49.9

Table 4: FLOr = H maximum duct size (English)

RANGE IN WC	M ³ /Hr RANGE	MAX. DUCT SIZE M ²
0.1	99.99 x 1K	4.32
0.25	99.99 x 1K	2.73
0.5	99.99 x 1K	1.93
1	99.99 x 1K	1.37
2.5	99.99 x 1K	0.86
5	99.99 x 1K	0.61
10	99.99 x 1K	0.43
25	99.99 x 1K	0.27

Table 5: FLOr = L0 maximum duct size (metric)

RANGE IN WC	M ³ /Hr RANGE	MAX. DUCT SIZE M ²
0.1	999.9 x 1K	43.19
0.25	999.9 x 1K	27.31
0.5	999.9 x 1K	19.3
1	999.9 x 1K	13.64
2.5	999.9 x 1K	8.63
5	999.9 x 1K	6.10
10	999.9 x 1K	4.31
25	999.9 x 1K	2.73

Table 6: FLOr = H maximum duct size (metric)

KFAC SUB MENU

KFAC K Factor - becomes accessible if the instrument is set for Velocity or Flow. When the Digihelic® II Controller is used with a Pitot tube, the manufacturer may specify a K Factor. The adjustment range is 0.01 to 2.00. The factory setting is 1.

AREA, DIA, XDIM and YDIM SUB MENUS

These SUB MENUS become accessible if the instrument is set for flow. When measuring flow, the area of the duct must be specified. Tables 3 and 4 show the input range vs maximum flow and duct size. For a rectangular duct the maximum size is specified in square feet or meters (see Figure 4). For a circular duct the maximum size is specified as the diameter. X, Y and circular dimensions are entered in feet with 0.01 foot resolution for FLOr = L0 and 0.1 foot resolution for FLOr = H, or entered in millimeters with 1 millimeter resolution.

AREA - Area, select CIRC for a circular duct or RECT for a rectangular duct. If a circular duct is selected, the DIA SUB MENU will be activated. If a rectangular duct is selected, the XDIM and YDIM SUB MENUS will be activated.

- DIA - Diameter, enter the diameter of a duct
- XDIM - Enter the "X" dimension of a duct
- YDIM - Enter the "Y" dimension of a duct

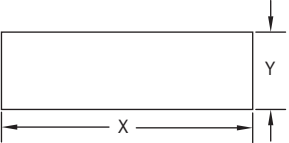


Figure 4

dS (Display) MAIN MENU

- PEAK - Peak value
- RESO - Resolution
- VALy - Valley value
- PdS - Process display
- ZERO - Zero
- DAMP - Dampening level

PEAK (Peak) SUB MENU

The Peak feature stores the highest pressure reading the instrument has measured since the last reset or power up. At power up PEAK is reset to the present pressure reading. To manually reset the PEAK value, press the ENTER key while in the PEAK SUB MENU.

VALy (Valley) SUB MENU

The valley feature stores the lowest pressure reading the instrument has measured since the last reset or power up. At power up VALy is reset to the present pressure reading. To manually reset the VALy value, press the ENTER key while in the VALy SUB MENU.

RESO (Resolution) SUB MENU

The Series ISDP Controller is capable of displaying four digits of resolution. However, at very low pressures the instability of the pressure may cause fluctuations in the least significant digit causing the least significant digit to be of little value. Three digit resolution (3DIG) can only be active when there is at least one digit to the right of a decimal.

3DIG - Set display for 3 digit resolution

4DIG - Set display for 4 digit resolution

PdS (Process Display) SUB MENU

STD - Display reads pressure, velocity, or flow values

PCT - Display reads % of full scale value

When the display is reading percent, PCT is displayed in the upper right of the display. The percent display is only available in pressure operation.

DAMP (Dampening) SUB MENU

Adjust from 1-16

Dampening stabilizes the display from instabilities due to things such as vibration and excessive pressure fluctuations. The dampening setting adjusts the amount of readings that are averaged for each display update. Adjust the dampening value until the display reads a stable value for the application.

PdU (Advanced) MAIN MENU

PdL - Process output low

PdH - Process output high

ZERO - Zero calibration

SPAN - Span calibration

PdL and PdH (Process Output Low and High) SUB MENUS

This feature is used in pressure operation only.

Process output low and high are used to scale the 4-20 mA output. Set PdL to the desired display reading for 4 mA output, and set PdH to the desired display reading for 20 mA output. PdH must be higher than PdL. PdL may be adjusted 2% BELOW minimum scale up to PdH. PdH may be adjusted from PdL to 2% ABOVE maximum scale.

ZERO and SPAN (Calibration of Zero and Span) SUB MENUS

The lower display reads CAL in this mode.

ZERO Calibration

Note: For accurate calibration, do not apply any pressure when performing this function.

With the display reading ZERO, press the ENTER key. The upper display will blink. Press ENTER again to complete the zeroing of the instrument or press the MENU key to cancel.

SPAN Calibration

With the display set to SPAN, apply full scale pressure to the unit. Press the ENTER key. The upper display will blink. Press ENTER again to complete the calibration or press the MENU key to cancel.

MAINTENANCE

Upon final installation of the Series ISDP Intrinsically Safe Differential Pressure Transmitter, no routine maintenance is required. The Series ISDP is not field serviceable and should not be returned if repair is needed (field repair should not be attempted and may void warranty). Be sure to include a brief description of the problem plus any relevant application notes. Contact customer service to receive a return goods authorization number before shipping



Do not dispose of as unsorted domestic or municipal waste. Consult retailer or local authorities for recycling information.



HAZARDOUS (CLASSIFIED) LOCATION INTRINSICALLY SAFE FOR:

ASSOCIATED APPARATUS	
V _o ≤ 28 VDC	
I _o ≤ 93 mA	
P _o ≤ 651 mW	
C _o ≤ 22 nF + C _{load}	
L _o ≤ 400 µH + L _{load}	

CLASS I DIV 1 GROUPS A,B,C,D
CLASS I DIV 1 GROUPS E,F,G
CLASS III DIV 1
CLASS I CLASS I ZONE 0 AEx to IIC T4 FM19US0208
CLASS I CLASS I ZONE 0 AEx to IIC T4 FM19CA0107
(g= 0°C to 77°C
TYPE 4X ENCLOSURE

CATALOG NUMBERS
SDP—ggg

-THREE NUMERIC CHARACTERS 001 THRU 018 SENSOR RANGE

ONE AND DIVISION ENTITY PARAMETERS ARE
GIVEN AS: DIVISION (ZONE)