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: ±0.5% at 77°F (25°C) including hysteresis and repeatability (after 1 hour warm-up).
Stability: < ±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).

DWYER INSTRUMENTS, INC.
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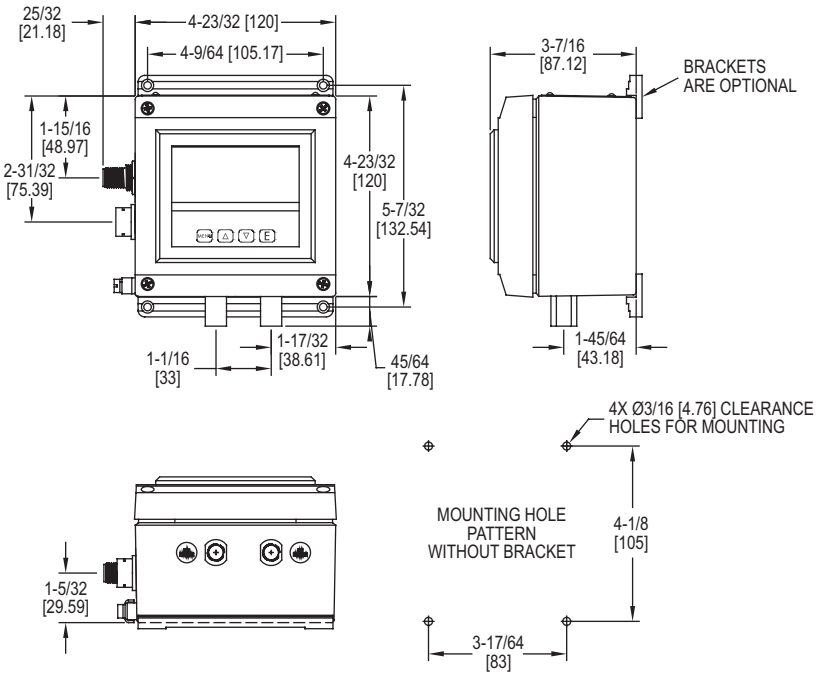
MODEL CHART	
Model	**Range**
ISDP-002	0 to 0.25 in w.c.
ISDP-004	0 to 1 in w.c.
ISDP-005	0 to 2.5 in w.c.
ISDP-006	0 to 5 in w.c.
ISDP-007	0 to 10 in w.c.
IDSP-008	0 to 25 in w.c.
ISDP-009	0 to 50 in w.c.
ISDP-010	0 to 100 in w.c.
ISDP-011	-0.1 to +0.1 in w.c.
ISDP-012	-0.25 to +0.25 in w.c.
ISDP-013	-0.5 to +0.5 in w.c.
ISDP-014	-1.0 to +1.0 in w.c.
ISDP-015	-2.5 to +2.5 in w.c.
ISDP-016	-5.0 to +5.0 in w.c.
ISDP-017	-10 to +10 in w.c.
ISDP-018	0-500 Pa

INSTALLATION

Mount the instrument in a location that will not be subject to excessive temperature, shock or vibration.

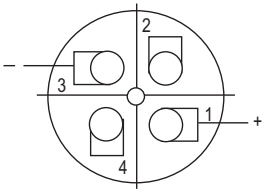


Pressure Connections

Use 1/8″ male NPT fittings. When tightening fittings, grasp the brass fitting on the ISDP with a 1/2″ wrench to prevent the fitting on the ISDP from turning.

Electrical Connections

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



M12 Connector

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

Figure 1

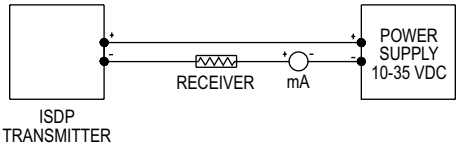


Figure 2

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 (RL) for the DC power supply voltage available is expressed by the formula and graph in Figure 3.

POWER SUPPLY VOLTAGE - VDC (2-WIRE CONNECTION)

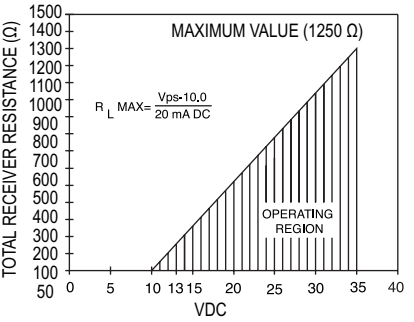
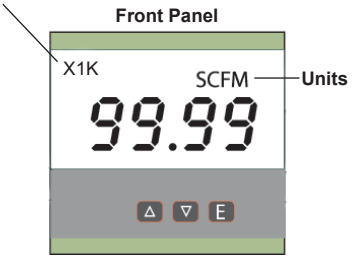


Figure 3

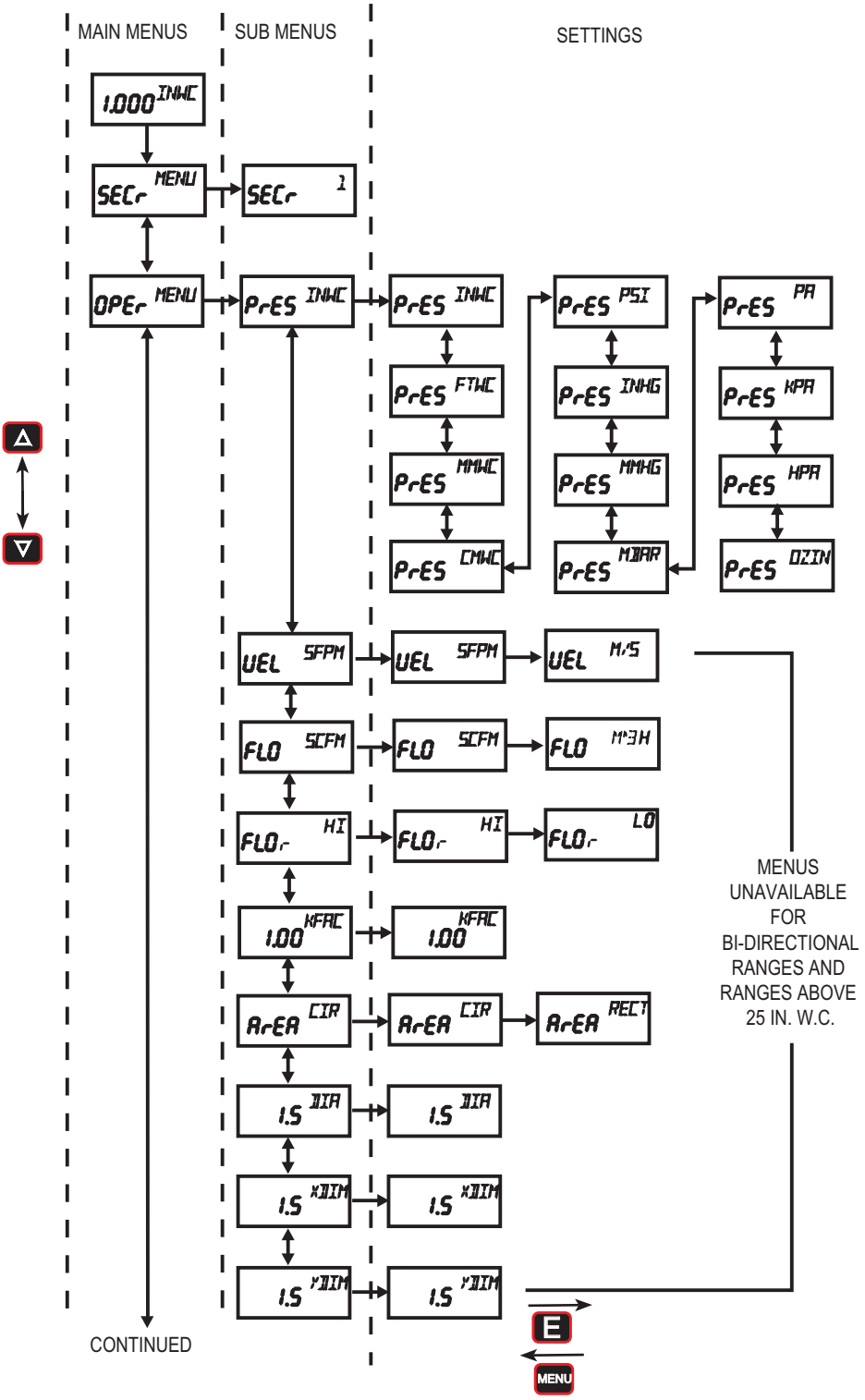
OPERATION

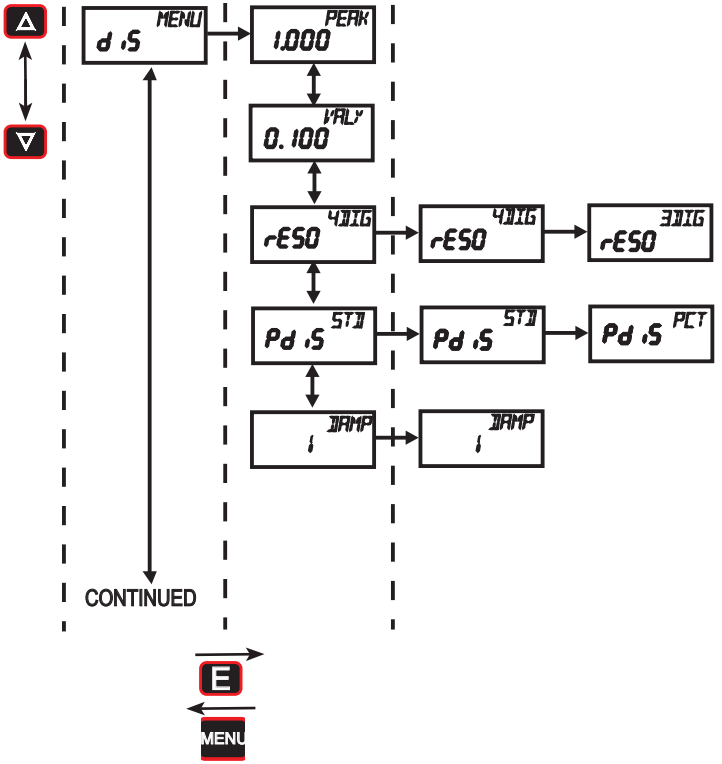
Multiplier descriptor visible with some velocity and flow ranges

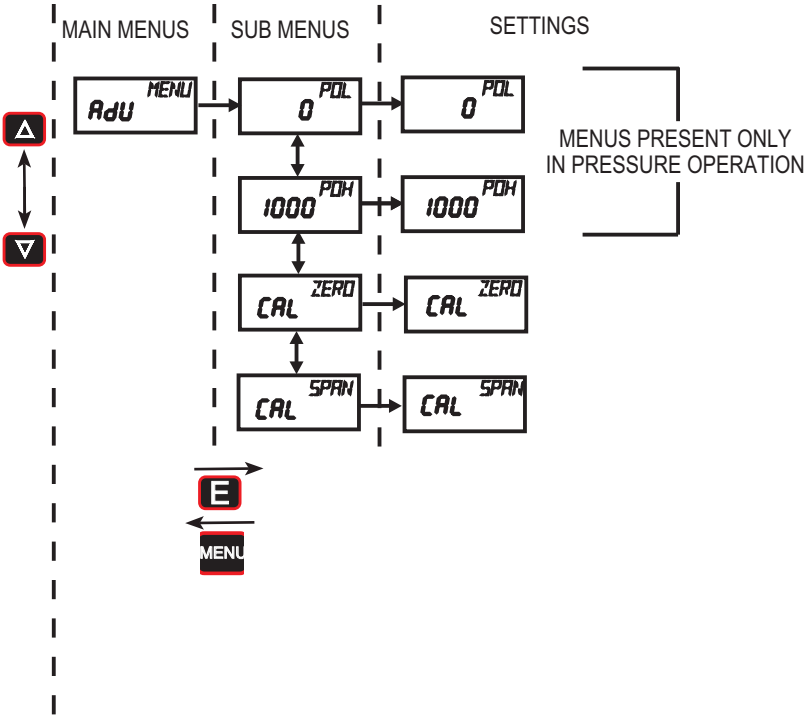


KEY FUNCTIONS			
	HOME POSITION FUNCTION	**MAIN MENU FUNCTION**	**SUB MENU FUNCTION**
MENU **MENU**	Allows access to the menus	Return to home position	Return to previous menu
△ **UP ARROW**		Sequences through menus	Increments a value
▽ **DOWN ARROW**		Sequences through menus	Decrements a value
E **ENTER**	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 INWC
SECr MENU
SECr 1
OPEr MENU
PrES INWC
PrES INWC
PrES FTWC
PrES MMWC
PrES CMWC
PrES PSI
PrES INHG
PrES MMHG
PrES MBAR
PrES PA
PrES KPA
PrES HPA
PrES OZIN
UEL SFPM
UEL SFPM
UEL M/S
FLO SCFM
FLO SCFM
FLO M^3H
FLOr HI
FLOr HI
FLOr LO
1.00 KFAC
1.00 KFAC
ArEA CIR
ArEA CIR
ArEA RECT
1.5 DIA
1.5 DIA
1.5 XDIM
1.5 XDIM
1.5 YDIM
1.5 YDIM
MENUS UNAVAILABLE FOR BI-DIRECTIONAL RANGES AND RANGES ABOVE 25 IN. W.C.
CONTINUED
E
MENU


MENU
d .S
PEAK
1.000
VALY
0.100
rES0
rES0
rES0
Pd .S
Pd .S
Pd .S
IRAMP
IRAMP
CONTINUED
E
MENU


MAIN MENUS
SUB MENUS
SETTINGS
AdU
MENU
0
POL
0
POL
1000
POH
1000
POH
CAL
ZERO
CAL
ZERO
CAL
SPAN
CAL
SPAN
MENUS PRESENT ONLY
IN PRESSURE OPERATION
E
MENU

Main Menu Selections (Upper Right Display Reads MENU)

SECr 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.

AdJ Advanced functions - Modify advanced function parameters, transmitter output scaling, and calibration.

MAIN MENUS and SUB MENUS

SECr **(Security) MAIN MENU**

SECr 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.

UNITS VISIBLE, SO UNIT IS PRESENTLY SET TO MEASURE PRESSURE

UNITS NOT VISIBLE

UNITS NOT VISIBLE

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: OVFL(over flow) or UnFL(under flow) will appear when the ranges have been exceeded above or below full scale by 2%.

Table 1: Pressure range vs. available units

UEL **(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**

LO - 99.99 x 1K flow range
HI - 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 **=** LO **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 **=** HI **maximum duct size (English)**

RANGE IN WC	M³/Hr RANGE	MAX. DUCT SIZE M²
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 **=** LO **maximum duct size (metric)**

RANGE IN WC	M³/Hr RANGE	MAX. DUCT SIZE M²
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 **=** HI **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 = LO and 0.1 foot resolution for FLOr = HI, or entered in millimeters with 1 millimeter resolution.

ArEA - Area, select DIR 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

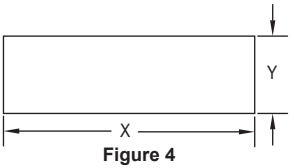


Figure 4

dS **(Display) MAIN MENU**

PEAK - Peak value
VALy - Valley value
ZERO - Zero
rESO - Resolution
PdS - Process display
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.

AdJ **(Advanced) MAIN MENU**
POL - Process output low
POH - Process output high
ZERO - Zero calibration
SPAN - Span calibration

POL **and** POH **(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 POL to the desired display reading for 4 mA output, and set POH to the desired display reading for 20 mA output. POH must be higher than POL. POL may be adjusted 2% BELOW minimum scale up to POH. POH may be adjusted from POL 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.

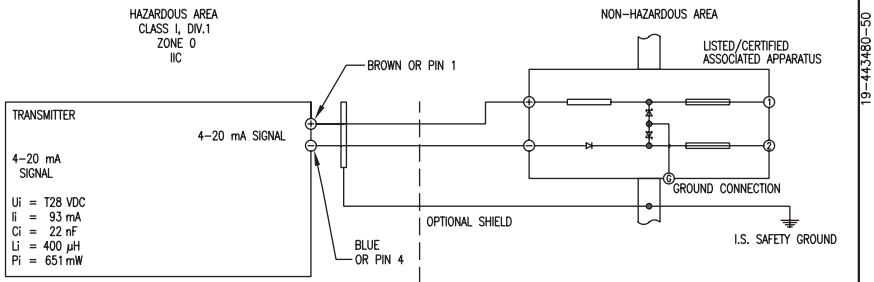
With the display reading ZERO, press the ENTER key. The upper display will blink. Press ENTER again to complete the zeroing of the instrument or press the MENU key to cancel.

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.

NOTES:
1. SELECTED ASSOCIATED APPARATUS MUST BE THIRD PARTY LISTED AS PROVIDING INTRINSICALLY SAFE CIRCUITS FOR THE APPLICATION, AND NOT EXCEED THE ENTITY PARAMETERS LISTED IN THIS DRAWING.
2. ASSOCIATED APPARATUS OUTPUT CURRENT MUST BE LIMITED BY A RESISTOR SUCH THAT THE OUTPUT VOLTAGE-CURRENT PLOT IS A STRAIGHT LINE DRAWN BETWEEN OPEN-CIRCUIT VOLTAGE AND SHORT-CIRCUIT CURRENT.
3. CAPACITANCE AND INDUCTANCE OF THE FIELD WIRING FROM THE INTRINSICALLY SAFE TRANSMITTER TO THE ASSOCIATED APPARATUS SHALL BE CALCULATED AND MUST BE INCLUDED IN THE SYSTEM CALCULATIONS AS SHOWN IN THIS DRAWING.
4. TRANSMITTERS MUST BE INSTALLED TO THE MANUFACTURER'S CONTROL DRAWING AND ARTICLE 504 OF THE NATIONAL ELECTRICAL CODE (ANSI/NFPA 70) FOR INSTALLATION IN THE UNITED STATES OR SECTION 18 OF THE CANADIAN ELECTRICAL CODE (CSA C22.1) FOR INSTALLATION IN CANADA OR OTHER LOCAL INSTALLATION CODES, AS APPLICABLE.
5. THE ASSOCIATED APPARATUS MANUFACTURER'S INSTALLATION INSTRUCTIONS MUST BE FOLLOWED WHEN INSTALLING THE EQUIPMENT.
6. NO REVISIONS TO THIS DRAWING WITHOUT PRIOR AUTHORIZATION BY FM APPROVALS.
7. EQUIPMENT CONNECTED TO THE ASSOCIATED APPARATUS MUST NOT USE OR GENERATE MORE THAN 250 VRMS OR VDC.
8. WARNING – ENCLOSURE PARTS ARE CONSTRUCTED OF ALUMINUM. ENCLOSURE MUST BE PROTECTED FROM MECHANICAL FRICTION AND IMPACT WITH IRON/STEEL TO PREVENT IGNITION CAPABLE SPARKS.



19-443480-50

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

ASSOCIATED APPARATUS
Vo ≤ 28 VDC
Io ≤ 93 mA
Po ≤ 651 mW
Co ≥ 22 nF + C_{cable}
Lo ≥ 400 µH + L_{cable}

STANDARDS:

FM 3600:2018	ANSI/ISA 60079-0:2009
FM 3610:2018	ANSI/ISA 60079-11:2009
FM 3810:2018	ANSI/ISA 61010-1:2004

CATALOG NUMBERS
ISDP-aaa
└ THREE NUMERIC CHARACTERS 001 THRU 018 SENSOR RANGE

ZONE AND DIVISION ENTITY PARAMETERS ARE SHOWN AS: DIVISION (ZONE)

(CD) = CRITICAL DIMENSION
STANDARD TOLERANCES UNLESS NOTED:
ALL DECIMAL DIMENSIONS ± .005
ALL ANGLES ± 1°

NO.	CHANGES	BY/DATE
5	REVISED THE NOTES AND LAYOUT PER ECR-045741	DPR 01-06-20

DATE 01-02-08
DWN BY KAS
CHKD CAR
APPD LRR
NAME ISDP I.S. CONTROL DRAWING
ACAD2002
MATERIAL
FINISH

DWYER INSTRUMENTS, INC.
MICHIGAN CITY, INDIANA 46360 U.S.A.
FR. NO. 19-443480-50

3

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