

# STX2100

## Differential Pressure (Flow) Transmitter

### Models FKC...5

The STX2100 differential pressure (flow) transmitter accurately measures differential pressure, liquid level, gauge pressure or flow rate and transmits a proportional 4 to 20mA signal. The transmitter utilizes a unique micromachined capacitance silicon sensor with state-of-the-art microprocessor technology to provide exceptional performance and functionality.

### Features

- High accuracy up to  $\pm 0.04\%$
- Minimum environmental influence
- HART® bilingual communications protocol
- Application flexibility
- Programmable output Linearization Function
- Burnout current flexibility (Under Scale: 3.2 to 4.0mA, Over Scale: 20.0 to 22.5mA)
- Dry calibration without reference pressure



# STX2100 Specifications

## Functional Specifications

### Type: FKC...5

Smart, 4 to 20mA DC + Hart® digital signal

### Service

Liquid, gas, or vapour

### Pressure Ranges

- Static Pressures to 160 bar
- Span from 1 mbar to 30 bar

### Over Range Limit

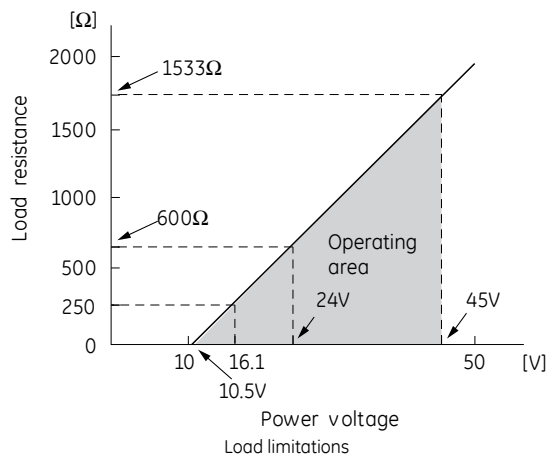
To maximum static pressure limit

### Output Signal

4 to 20mA DC (linear or square root) with digital signal superimposed on the 4 to 20mA signal

### Power Supply

- Transmitter operates on 10.5V to 45V DC at transmitter terminals.
- 10.5V to 32V DC for the units with optional arrester.



### Hazardous locations:

Authority (Digit 10=)	Intrinsic safety
ATEX (K)	Ex II 1 G Ex ia IIC T5 (-40°C ≤ Ta ≤ +50 °C) Ex ia IIC T4 (-40°C ≤ Ta ≤ +70 °C) IP66/67 Entity Parameters: Ui ≤ 28 Vdc, Ii ≤ 94.3 mA, Pi ≤ 0.66 W Ci = 36 nF/26 nF for models with/without Arrester Li = 0.7 mH/0.6 mH for models with/without Analog Indicator

Authority (Digit 10=)	Type n Nonincendive
ATEX (P)	Ex II 3 G Ex nA II T5 (-40°C ≤ Ta ≤ +70 °C) IP66/67 Electrical ratings Model without arrester: Ui ≤ 45 Vdc, 4-20 mA loop powered, Pi ≤ 1.0125 W Model with arrester: Ui ≤ 32 Vdc, 4-20 mA loop powered, Pi ≤ 1.0125 W Optional Analog indicator is not available for type "n"

Authority (Digit 10=)	Flameproof
ATEX (X)	Ex II 2 GD Ex d IIC T6 (-40°C ≤ Ta ≤ +65 °C) Ex d IIC T5 (-40°C ≤ Ta ≤ +85 °C) Ex tD A21 IP66/67 T 85°C Ex tD A21 IP66/67 T 100°C Electrical ratings Model without arrester: Ui ≤ 45 Vdc, 4-20 mA loop powered, Pi ≤ 1.0125 W Model with arrester: Ui ≤ 32 Vdc, 4-20 mA loop powered, Pi ≤ 1.0125 W

### Zero/Span Adjustment

Zero and span are adjustable externally from the adjustment screw (span adjustment is not available with 9th digit code "L, P, M, Q, S, N").

### Damping

The time constant is adjustable between 0 to 32 seconds.

### Zero Elevation/Suppression

-100% to +100% of URL

### Normal/Reverse Action

Selectable

### Indication

Analog indicator or 5-digit LCD meter, as specified.

### Burnout Direction

If self-diagnostic detects transmitter failure, the analog signal will be driven to either "Output Hold", "Output Overscale" or "Output Underscale" modes.

"Output Hold":

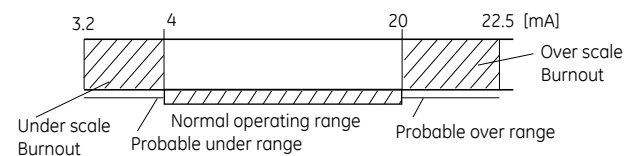
Output signal is held as the value just before failure happens.

"Output Overscale":

Adjustable within the range 20.0mA to 22.5mA

"Output Underscale":

Adjustable within the range 3.2mA to 4.0mA



Output limits conforming to NAMUR NE43 by order.

### Loop-check output

Transmitter can be configured to provide a constant signal between 3.2mA and 22.5mA.

## Temperature Limit

Ambient: -40 to +85°C

(-20 to +80°C for LCD indicator)

(-40 to +60°C for arrester option)

(-10 to +60°C for fluorinated oil filled transmitters)

Ambient and process temperature restrictions apply to versions approved for use in hazardous locations.

Process: -40 to +120°C for silicone fill sensor

-20 to +80°C for fluorinated oil fill sensor

Storage: -40 to +90°C

## Humidity Limit

0 to 100% RH

## Local Configurator with LCD display (Option)

Local configurator with 3 push button and LCD display.

## Programmable Output linearization Function

Output signal can be characterized with "14 points linear approximation function".

## Performance Specifications for Linear Output

Reference conditions, silicone oil fill, 316L SS isolating diaphragms, 4 to 20mA analog output in linear mode.

## Accuracy Rating

(including linearity, hysteresis, and repeatability)

### Max span above 320 mbar model:

For spans greater than 1/10 of URL:

$\pm 0.065\%$  of span or  $\pm 0.04\%$  of span (optional)

For spans below 1/10 of URL:

$\pm \left( 0.015 + 0.05 \frac{0.1 \times \text{URL}}{\text{Span}} \right) \%$  of span

### Max span 10 mbar, 60 mbar model:

For spans greater than 1/10 of URL:

$\pm 0.1\%$  of span

For spans below 1/10 of URL:

$\pm \left( 0.05 + 0.05 \frac{0.1 \times \text{URL}}{\text{Span}} \right) \%$  of span

## Stability

$\pm 0.1\%$  of upper range limit (URL) for 10 years for 6th digit code 3, 5, 6, 8.

## Temperature Effect

Effects per 28°C change between the limits of -40°C and +85°C

Range code (6th digit in Code symbols)	Zero shift	Total effect
"1"/10mbar "2"/60mbar	$\pm \left( 0.125 + 0.1 \frac{\text{URL}}{\text{Span}} \right) \%$	$\pm \left( 0.15 + 0.1 \frac{\text{URL}}{\text{Span}} \right) \%$
"3"/320mbar "5"/1300mbar "6"/5000mbar "8"/30000mbar	$\pm \left( 0.075 + 0.0125 \frac{\text{URL}}{\text{Span}} \right) \%$	$\pm \left( 0.095 + 0.0125 \frac{\text{URL}}{\text{Span}} \right) \%$

Double the effects for material code (7th digit in codes symbols) "H", "M", "T", "B", "L" and "U"

### Static pressure effect

Static pressure code (5th digit in Code symbols)	Zero shift (% of URL)
"1"/10mbar sensor "2"/60mbar sensor	$\pm 0.2\%$ / 2bar $\pm 0.2\%$ / 32bar
"2" "3" "4"	$\pm 0.035\%$ / 69 bar

Double the effects for material code (7th digit in codes symbols) "H", "M", "T", "B", "L" and "U"

### Overrange effect

Static pressure code (5th digit in Code symbols)	Zero shift (% of URL)
"1"/10mbar sensor "2"/60mbar sensor	$\pm 0.3\%$ / 2bar $\pm 0.1\%$ / 32bar
"2" "3" "3"	$\pm 0.1\%$ / 100bar $\pm 0.1\%$ / 160bar FK35,36,38 $\pm 0.15\%$ / 160bar FK33

Double the effects for material code (7th digit in codes symbols) "H", "M", "T", "B", "L" and "U"

## Supply Voltage Effect

Less than 0.005% of calibrated span per 1V

## Update Rate

60 msec

## Response Time

(at 63.2% of output signal)

Range code (6th digit in code symbols)	Time constant (at 23°C)	Dead time
"1"	0.33 s	0.12 s
"2"	0.3 s	
"3"	0.12 s	
"5" through "8"	0.08 s	
Response time = time constant + dead time		

## Mounting Position Effect

Zero shift, less than 1.2 mbar for a 10° tilt in any plane.

No effect on span.

This error can be corrected by adjusting Zero.

## Vibration Effect

> ±0,25% of span for spans greater than 1/10 of URL.

Frequency 10 to 150Hz, acceleration 39.2m/sec<sup>2</sup>.

## Dielectric Strength

500V AC, 50/60Hz 1 min., between circuit and earth.

## Insulation Resistance

More than 100MΩ at 500V DC.

## Internal Resistance for External Field Indicator

12Ω max. (connected to test terminal CK+ and CK-)

## Performance Specifications for Square Root Output

Accuracy rating		
Output	Span	
	over 0.1 × URL	below 0.1 × URL
50 to 100%	±0.065 %	±(0.015+0.05 × 0.1 × URL/Span)%
20 to 50%	±0.163 %	±2.5 × (0.015+0.05 × 0.1 × URL/Span)%
10 to 20%	±0.325 %	±5 × (0.015+0.05 × 0.1 × URL/Span)%

Max span 10mbar, 60mbar model	
Output	Accuracy
50 to 100%	±0.1 %
20 to 50%	±0.25%
10 to 20%	±0.5 %

## Temperature Effect

Effects per 28°C change between the limits of -40°C and +85°C

Range code	Shift at 20% output point
"1" and "2"	± (0.375+0.25 $\frac{URL}{Span}$ ) %/28°C
"3" through "9"	± (0.24+0.03125 $\frac{URL}{Span}$ ) %/28°C

## Low Flow Cut-off

Customer configurable for any point between 0 to 20% of output

## Physical Specifications

### Electrical Connections

1/2-14 NPT, Pg13.5 or M20×1.5

### Process Connections

1/4-18 NPT on 54mm centers, as specified.

Meets DIN 19213.

option: 1/2NPT for oval flanges

Process-wetted parts material				
Material code (7th digit in Code symbols)	Process cover	Diaphragm	Wetted sensor body	Vent/drain
V	316L SS(*1)	316L SS	316 SS	316 SS
W	316L SS(*1)	Hastelloy-C	316 SS	316 SS
H	316L SS(*1)	Hastelloy-C	Hastelloy-C lining	316 SS
J	316L SS(*1)	316L SS + Gold coating	316SS	316 SS
M	316L SS(*1)	Monel	Monel lining	316 SS
T	316L SS(*1)	Tantalum	Tantalum lining	316 SS
B	Hastelloy-C lining	Hastelloy-C	Hastelloy-C lining	Hastelloy-C
L	Monel lining	Monel	Monel lining	Monel
U	Tantalum lining	Tantalum	Tantalum lining	Hastelloy-C

Notes: \*(1) ASTM CF8M

Remark:

Sensor gasket: Viton o-ring or PTFE square section gasket. Availability of above material design depends on ranges and static pressure. Refer to "Code symbols".

### Non-Wetted Parts Material

Electronics housing:

Low copper die-cast aluminum alloy finished with polyester coating (standard), or 316 stainless steel, as specified.

Bolts and nuts:

- Cr-Mo alloy (standard) up to 160 bar,
- 316 stainless steel for static pressure up to 100 bar max.
- SS630 or SS660 for static pressure > 100 bar.

Fill fluid:

Silicone oil (standard) or fluorinated oil

Mounting bracket:

304 stainless steel

### Environmental Protection

IEC IP67 and NEMA 6/6P

### Mounting

- Without mounting bracket: direct mounting on manifold (optional)
- With optional mounting bracket: for 50mm (2") pipe or direct wall mounting.

### Mass {Weight}

Transmitter approximately 3.1 to 3.6kg without options.

Add; 0.5kg for mounting bracket

4.5kg for stainless steel housing (option)

## Optional Features

### Indicator

- A plug-in analog indicator (2.5% accuracy).
- An optional 5-digit LCD meter with engineering unit is also available.

### Local Configurator with LCD Display

An optional 5 digits LCD meter with 3 push buttons

### Arrester

- A built-in arrester protects the electronics from lightning surges.
- Lightning surge immunity: 4kV (1.2 × 50μs)

### Oxygen Service

Special cleaning procedures are followed throughout the process to maintain all process wetted parts oil free. The fill fluid is fluorinated oil.

### Chlorine Service

The fill fluid is fluorinated oil.

### Degreasing

Process-wetted parts are cleaned, but the fill fluid is standard silicone oil. Not for use on oxygen or chlorine measurement.

### NACE Specification

Metallic materials for all pressure boundary parts comply with NACE MR-01-75. 630/304 or 660/660 stainless steel bolts and nuts comply with NACE.

### Optional Tag Plate

An extra stainless steel tag with customer tag data is wired to the transmitter.

### Vacuum Service

Special silicone oil and filling procedure are applied.

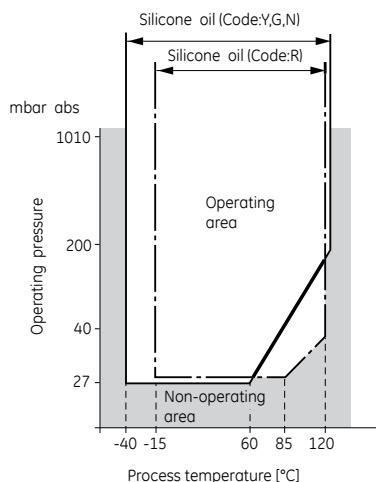


Fig. 1 Relation between process temperature and operating pressure



1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	DESCRIPTION
				5												Indicator & Arrester
																Indicator
																Arrester
																Initial setting
				5	-	A										None
				5	-	B										Analog, 0-100% linear scale
				5	-	C										Analog, 0-100% sq. root scale
				5	-	D										Analog, Custom scale
				5	-	J										Analog, double scale
				5	-	E										None
				5	-	F										Analog, 0-100% linear scale
				5	-	G										Analog, 0-100% sq. root scale
				5	-	H										Analog, Custom scale
				5	-	K										Analog, double scale
				5	-	1										Digital, 0-100%
				5	-	2										Digital, Custom scale
				5	-	3										Digital, 0-100% sq. root scale
				5	-	4										Digital, 0-100%
				5	-	5										Digital, Custom scale
				5	-	6										Digital, 0-100% sq. root scale
																Approvals for hazardous locations
						A										None (Standard)
						X										ATEX - Flameproof enclosures (digit 4 = "M, P, R, T" & "W" only)
						K										ATEX - Intrinsic Safety
						P										ATEX - Type "n" (digit 9 = A, E, 1, 2, 3, 4, 5 & 6 only)
						M										ATEX - Flameproof enclosure & Intrinsic Safety combined approval (digit 4 = "M, P, R, T" & "W" only)
																Side vent/drain & mounting bracket
																Side Vent/drain
																Mounting bracket
						A										None
						C										None
						D										Yes, SS
						F										Yes
																Yes, SS
																SS parts
																SS tag plate
																SS housing
						Y										None
						B										Yes
						C										None
						E										Yes
																Yes
																Special applications & fill fluid
																Treatment
																Fill fluid
						Y										None (std)
						W										Silicone oil
						G										None (std)
						A										Fluorinated oil
						D										Degreasing
						N										Silicone oil
						R										Oxygen service
																Fluorinated oil (only w/digit 7=V)
																Chlorine service
																Fluorinated oil (only w/digit 7=H,T,B,U)
																(*8) NACE
																Silicone oil
																Vacuum service
																Silicone oil
																Process cover gasket
						- A										Viton
						- C										PTFE square section gasket in SS flange (custom design)
						- D										(*6) PTFE square section gasket in PVDF insert
																Bolts/screws material
						A										Carbon steel Cr-Mo (standard) M10
						U										(*3) SS 316/316 (bolt/nuts) M10
						F										SS 630/304 (bolt/nuts) M10
						V										Carbon steel Cr-Mo (standard) M12 for static pressure > 160 bar
						W										(13) SS 660/660 (bolt/nuts) M12 for static pressure > 160 bar
																Special options or design
																(*7) special, no code available

**Notes\*:**

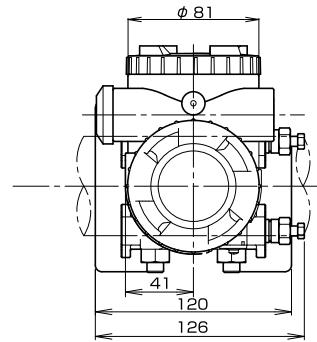
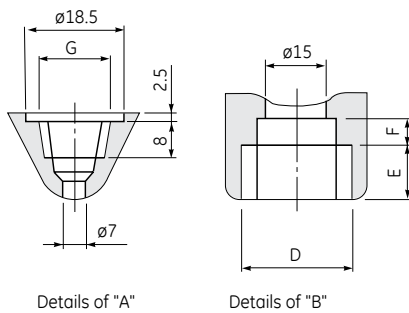
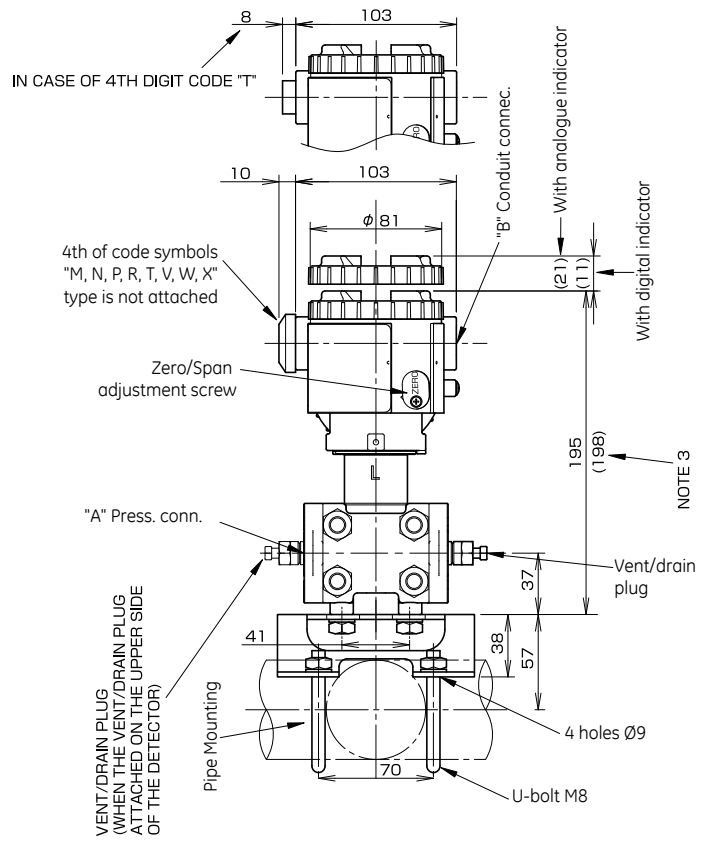
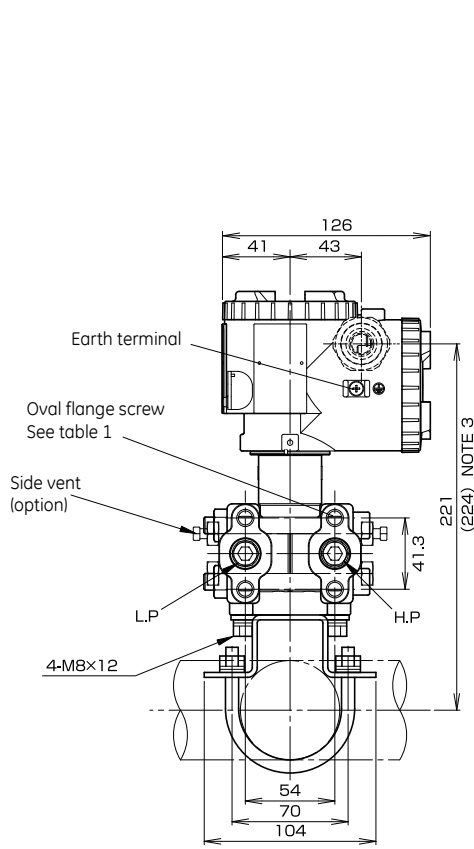
- 1 Not Used
- 2 Turn down of 100 : 1 is possible, but it should be used at a span greater than 1/40 of the maximum span for better performance.
- 3 Max. static pressure 100 bar for SS 316 bolts/nuts; for static pressure > 100 bar, please specify SS 630 or SS 660 bolts
- 4 Gold coating on wetted measuring cell parts for Hydrogen service - Hydroseal version - gold/ceramic coating is available upon request.
- 5 Process cover with lining has only side vent-drain facility
- 6 Process cover with PVDF insert with 1/2-18 NPT side process connection/ no vent drain, other upon request - square section PTFE gasket
- 7 When no code can be found in the current code symbols, place\* in concerned code digit(s) and add\* in 16<sup>th</sup> digit
- 8 Our stainless steel bolts/nuts in SS630 and SS660 are in conformity with the NACE requirements and must be used for NACE service
- 9 Not Used
- 10 Process connection on the bottom side.
- 11 Not Used
- 12 Pressure > 160 bar not used
- 13 SS660 bolts/nuts have to be used for oil & gas applications

## Ordering Information

When ordering this instrument, specify:

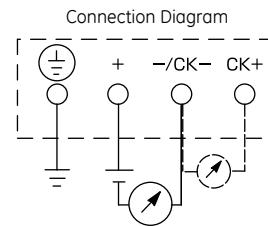
1. CODE SYMBOLS
2. Measuring range
3. Output orientation (burnout direction) when abnormality has occurred in the transmitter.  
Hold / Overscale / Underscale  
Unless otherwise specified, output hold supplied.
4. Choose output mode to be linear or square root. Unless otherwise stated, linear is supplied.
5. Indicator and arrestor options D, H, 2 and 5: specify the required custom scale.
6. Tag No. (up to 20 alphanumeric characters), if required.

# Outline Diagram (Unit: mm) <7th digit code : V, H, M, T>



4th digit of the code symbols	Conduit conn.			Press. conn.	Oval frange screw
	D	E	F	G	
R	M20x1.5	16	5	1/4-14NPT	7/16-20UNF
T	1/2-14NPT	16	5	1/4-14NPT	7/16-20UNF
V	Pg13.5	8	4.5	1/4-14NPT	M10 or M12
W	M20x1.5	16	5	1/4-14NPT	M10 or M12
X	Pg13.5	8	4.5	1/4-14NPT	7/16-20UNF

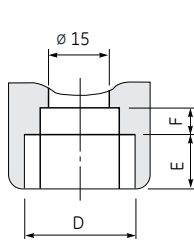
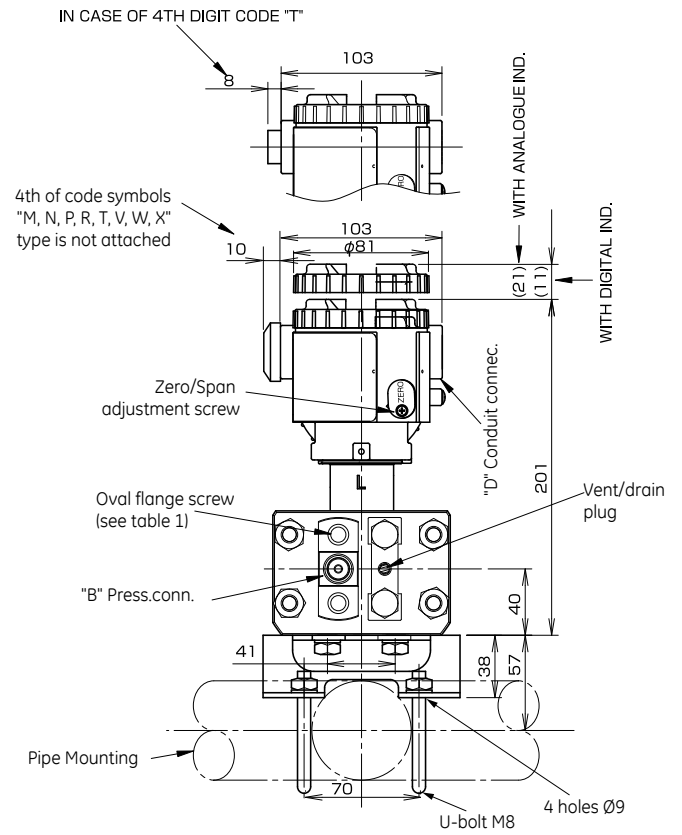
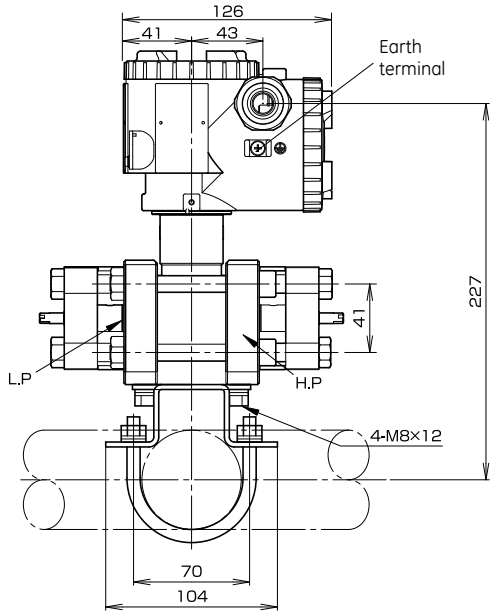
TABLE 1



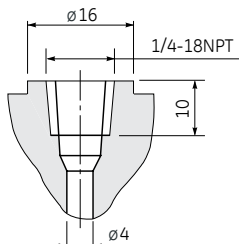
NOTE 1: IN CASE OF 10TH CODE "C", ø11 CABLE IS SUITABLE.  
NOTE 2:

NOTE 3: WHEN THE 5TH DIGIT OF THE CODE SYMBOLS "1,2,4" or THE 7TH DIGIT OF THE CODE SYMBOLS "C,H,M,T"

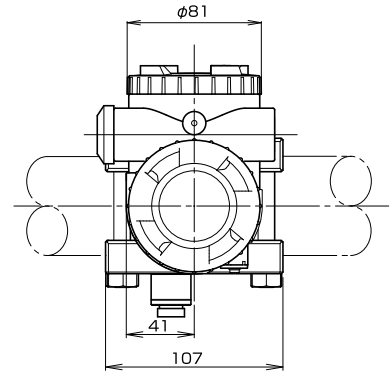




Details of "C"

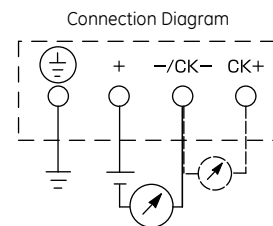


Details of "B"



4th digit of the code symbols	Conduit conn.			Press. conn.	Oval frange screw
	D	E	F	G	
R	M20x1.5	16	5	1/4-14NPT	7/16-20UNF
T	1/2-14NPT	16	5	1/4-14NPT	7/16-20UNF
V	Pg13.5	8	4.5	1/4-14NPT	M10 or M12
W	M20x1.5	16	5	1/4-14NPT	M10 or M12
X	Pg13.5	8	4.5	1/4-14NPT	7/16-20UNF

TABLE 1



NOTE 1: IN CASE OF 10TH CODE "C",  $\phi 11$  CABLE IS SUITABLE.







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