



## TEI-19D

Media Isolated High Accuracy Digital Output Pressure Sensor

### SPECIFICATIONS

- 316L SS
- Pressure/temperature read-out
- Digital I<sup>2</sup>C Output
- ASIC calibrated
- Low-power consumption
- 19mm Diaphragm Diameter

### Features

- Thread Mount
- Up to -40°C to +85°C Operating Range
- Up to ±0.2%R Pressure Accuracy
- Solid State Reliability
- Low Pressure

### Applications

- Industrial Ultrasonic Natural Gas Flow Meter
- OEM Equipment

The TEI-19D module includes an Ultra Stable piezo resistive silicon pressure sensor and an ultra-low power 24bits  $\Delta\Sigma$  ADC with internal factory calibrated coefficients. It provides a precise digital pressure and temperature value and different operation modes that allow the user to optimize for conversion speed and current consumption. A high-resolution temperature output allows the implementation of a pressure/temperature function without any additional sensor.

The communication protocol is standard I2C interface, and this module can be interfaced to virtually any microcontroller.

Each module was calibrated in factory. it has been compensated offset, span of the measure pressure and temperature signal.

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## Specifications

Unless otherwise specified, Supply VOLTAGE: 3VDC; Ambient Temperature: 25°C

PARAMETERS		MIN	TYP	MAX	UNITS	NOTES
PRESSURE RESOLVING		-	-	24	BIT	
TEMPERATURE RESOLVING		-	-	16	BIT	
INPUT VOLTAGE RANGE		2.5	3	3.6	VDC	1
PRESSURE ACCURACY AT 25°C±5°C	≥20%Pmax	-0.2	-	0.2	%R	2
	<20%Pmax	-0.2	-	0.2	%SPAN	
PRESSURE ACCURACY AT -20°C TO 65°C	≥20%Pmax	-0.4	-	0.4	%R	
	<20%Pmax	-0.4	-	0.4	%SPAN	
LONG TERM STABILITY		-	0.2	-	%SPAN/yr	
COMPENSATED TEMPERATURE RANGE		-20	-	65	°C	
TEMPERATURE ACCURACY		-2	-	2	°C	
POWER CONSUMPTION AT WORK MODE		-	-	2	mA	
POWER CONSUMPTION AT IDLE MODE		-	-	10	uA	
SCK FREQUENCY		-	60	100	kHz	
INSULATION RESISTANCE (50 VDC)		50M	-	-	OHM	
EMC CRITERIAL		CLASS A, IEC 61000-4-2 TO 4-6			-	6
OPERATING TEMPERATURE		-40	-	80	°C	
STORAGE TEMPERATURE		-40	-	80	°C	
PRESSURE CYCLE (0-FS)		1M	-	-	CYCLES	
PRESSURE OVERLOAD		-	-	3X	RATED	4
PRESSURE BURST		-	-	4X	RATED	5
PACKAGE PROTECTION		IP65			-	
INTERFACE TYPE		I2C			-	
MEDIA, PRESSURE PORT		LIQUIDS AND GASES COMPATIBLE WITH 316/316L STAINLESS STEEL, AND VITON O-RING				

## Notes

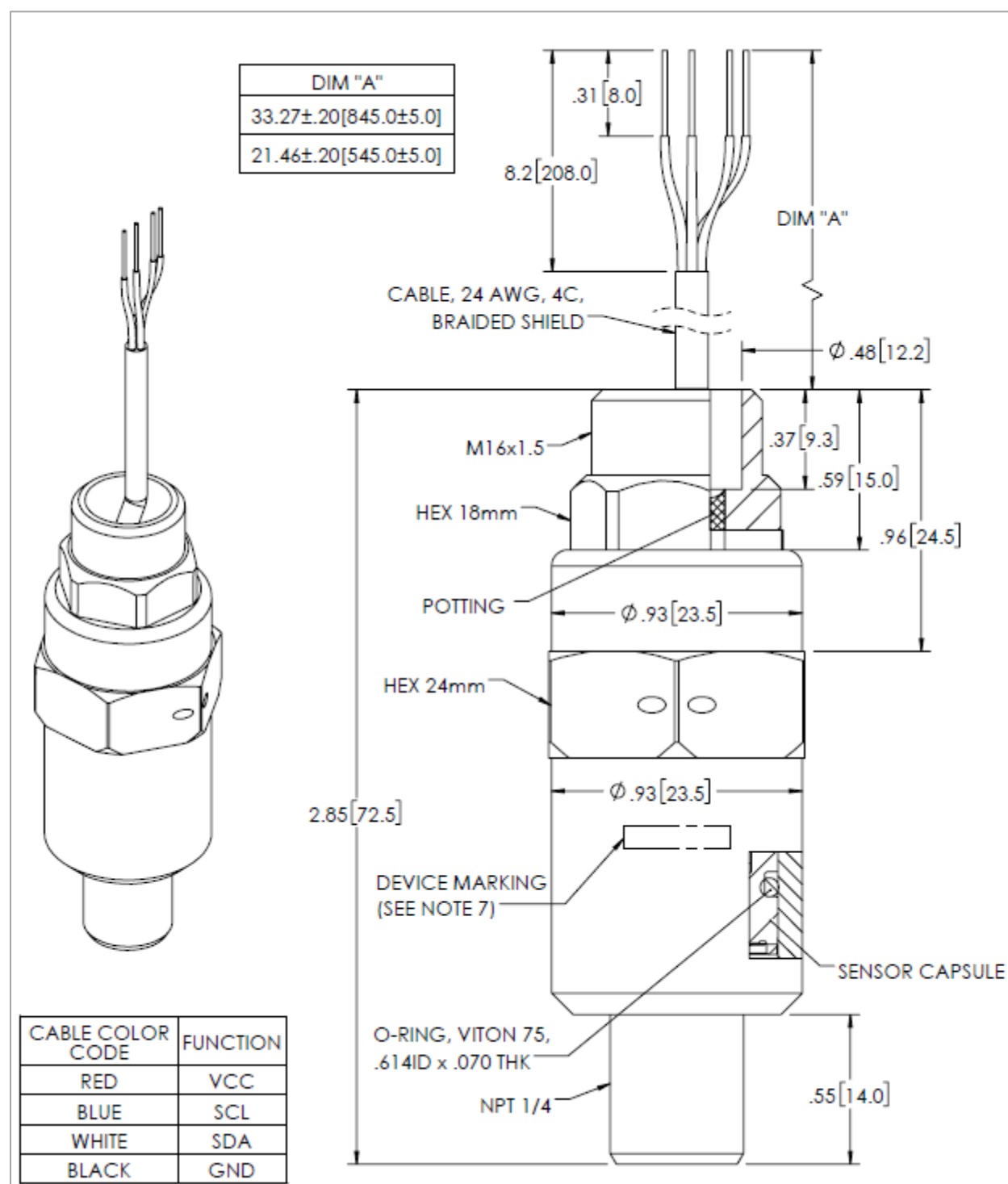
- Output is not Ratiometric to Supply Voltage.
- Accuracy: combined linearity, hysteresis and repeatability.  
 $\%R = (\text{Read Value} - \text{Target Value}) / \text{Target Value} * 100$ ;  $\%S = (\text{Read Value} - \text{Target Value}) / \text{Span Value} * 100$
- Oversampling rate: 4096.
- The maximum pressure that can be applied without changing the transducer's performance or accuracy.
- The maximum pressure that can be applied to a transducer without rupture of either the sensing element or transducer.
- EMC performance criteria:
  - IEC 61000-4-2:2006 ESD: 8 kV air discharge; 6 kV contact discharge; 10 cycles; class A.
  - IEC 61000-4-3:2002 Radiated: E1 (80m-2000mHz), 3V/m, 80%AM 1kHz, Sine; class A.
  - IEC 61000-4-4:2004 Electrical Fast Transient (Burst): ±2 kV on DC 24V port; ±1 kV on signal; class A.
  - IEC 61000-4-6:2006 Conducted RFI: E1(0.15mHz~80mHz), 3V, 80%am, 1kHz, Sine, dwell times 10s; DC 24V port and signal; class A.
  - IEC 61000-4-5:2005 Surge: DC port, L to L +/-1kV; L to PPE +/-2kV; 3 cycles; DC 24V port; class A.
- Device marking:  
Part marked with full part number, lot number, serial number and date code.
- Maximum temperature range for product with cable is -30°C to +65°C
- Shipping requirements:  
Devices are shipped individually packaged in an anti-static plastic bag and box.  
The port thread is protected by a static dissipative cap.



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Digital Output Pressure Sensor

### Dimensions





## Communication protocols

### General:

It defined data output format and calculation method for pressure and temperature. TE has developed transfer PCB based on the communication protocols to complete the output conversion between TEI-19D 24bits product.

Only the Read pressure command will start conversion of pressure and temperature.

The read pressure and temperature command will return the last data but not real time data. The max sample rate is about 10Hz.

### Interface

This is universal I2C communication with 7 bits I2C address (0b 1101 111x), SCK frequency is 100khz.

Action	Addresss	Commands	Addresss	Read Data						
Read Pressure	0xBE	0X6C	0xBF	D1	D2	D3				
Read Temperature	0xBE	0X54	0xBF	D1	D2					
Read SN	0xBE	0X31	0xBF	D1	D2	D3	D4	D5	D6	D7

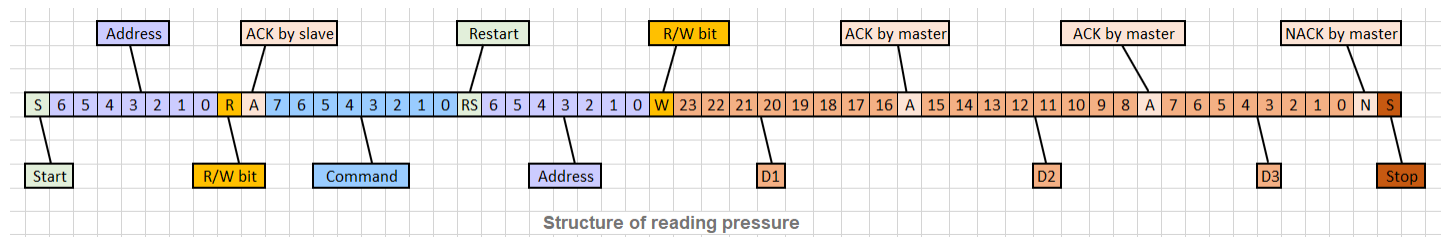
### User Commands

#### Instruction

S: START; P: STOP; RS: RESTART; D: DATA

#### 1. READING PRESSURE

S 0xBE 0X6C RS 0xBF D1 D2 D3 P



PRESSURE VALUE D1, D2, D3 (HEX)

THE LAST BIT OF D3 IS THE FLAG OF SIGN (0: + ;1: -)

CALCULATION FORMULA:  $P = D1 * 256 + D2 + D3 / 256$  (NOTES: NEED TO SHIELD THE LAST BIT OF D3)

FOR EXAMPLE:

A. PRESSURE = 101.32KPA

S 0xBE 0X6C RS 0xBF 0X00 0X65 0X52 P

B. PRESSURE = -101.32KPA

S 0xBE 0X6C RS 0xBF 0X00 0X65 0X53 P

#### 2. READING TEMPERATURE

S 0xBE 0X54 RS 0xBF D1 D2 P

TEMPERATURE VALUE D1, D2(HEX)

CALCULATION FORMULA:



IF  $D1 < 128$  THEN THE TEMPERATURE IS POSITIVE:  $T = D1 + D2/256$

IF  $D1 > 127$  THEN THE TEMPERATURE IS NEGATIVE:  $T = -((255 - D1) + (255 - D2)/256)$

FOR EXAMPLE:

C. TEMPERATURE = 20.0 °C

S 0XBE 0X54 RS 0XBF 0X14 0X00 P

D. TEMPERATURE = -20.0 °C

S 0XBE 0X54 RS 0XBF 0XEC 0X00 P

### 3. READING ID (SERIES NUMBER)

S 0XBE 0X31 RS 0XBF D1 D2 D3 D4 D5 D6 D7 P

ID DEFINITION:

FOR EXAMPLE:

S 0XBE 0X31 RS 0XBF 0X20 0X18 0X03 0X15 0X04 0X14 0X21 P

2018 0315 0414 21

2018: YEAR

0315: MONTH/DATE

0414: SERIAL NUMBER

#### 3.1: PRESSURE RANGE CODE

PRESSURE RANGE AS FOLLOW:

1: 0.2MPa;

2: 0.5MPa;

3: 1.0MPa;

4: 2.0MPa

#### 3.2: ACCURACY CODE

ACCURACY CODE AS FOLLOW:

1:  $\pm 0.2\%R$  (for  $\geq 20\%P_{max}$ ,  $25^{\circ}C \pm 5^{\circ}C$ ),  $\pm 0.2\%F$  (for  $< 20\%P_{max}$ ,  $25^{\circ}C \pm 5^{\circ}C$ );

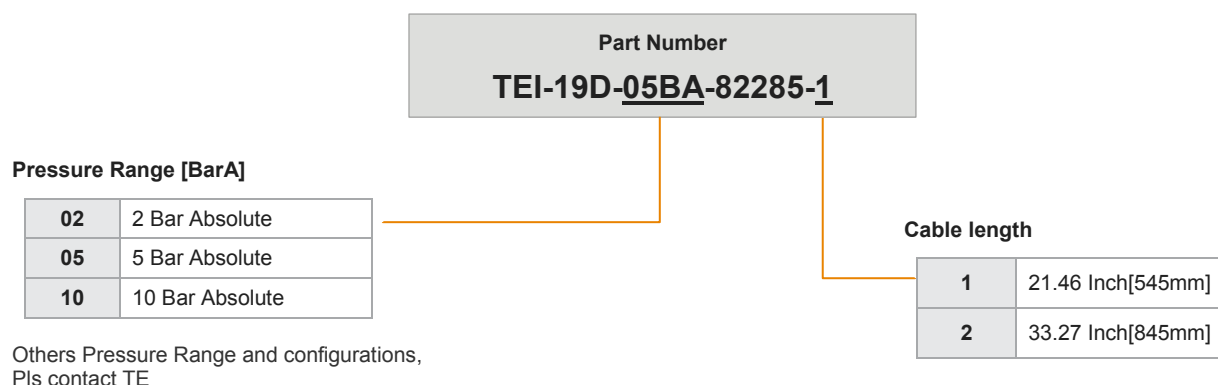
$\pm 0.4\%R$  (for  $\geq 20\%P_{max}$ ,  $-20^{\circ}C$  to  $65^{\circ}C$ ),  $\pm 0.4\%F$  (for  $< 20\%P_{max}$ ,  $-20^{\circ}C$  to  $65^{\circ}C$ )



## TEI-19D

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### Ordering Information



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