

PPT03M Miniature Pressure Transducer

Configurable OEM pressure sensing for space-constrained designs



FEATURES

- Miniature form factor — 0.65" diameter body
- Outputs: 0.5–4.5V, 0–5V, 4–20mA, I²C (0x28), SPI
- Pressure ranges from 150 PSI to 5,000 PSI
- Gauge, Sealed Gauge & Absolute references
- Accuracy from ±0.15% to ±1.00% FS (TEB)
- Operating temperature options -10 °C to +125 °C
- Six standard mechanical connections — NPT, UNF, BSPP
- SS316L housing, IP65, 26AWG flying leads

DESCRIPTION

The PPT03M is a miniature pressure transducer platform for engineers who need accurate pressure measurement where space is the primary constraint. At just 0.65" in diameter, it fits compact embedded systems, tight manifold geometries, and size-critical instrumentation that larger transducers cannot accommodate.

Despite the small footprint, the PPT03M supports analog, current, and digital outputs across ranges from 150 PSI to 5,000 PSI. The SS316L housing and IP65 rating suit both clean and demanding media, and every parameter is specified at order time through a structured part number.

APPLICATIONS

- Embedded instrumentation
- Handheld & portable devices
- Robotics platforms
- Medical & laboratory equipment
- HVAC systems
- Motorsport & aerospace support equipment
- Hydraulic & pneumatic systems

MAXIMUM ENVIRONMENTAL RATINGS

Operating Temperature	-10 to 125 °C	Proof Pressure	1.25× full scale
Pressure Range	150 to 5,000 PSI	Burst Pressure	1.5× full scale
Ingress Protection	IP65	Housing / Wetted Material	SS316L

Electrical & performance specifications

PARAMETER	MIN	TYP	MAX	UNITS
Supply Voltage (main)	2.7	5.0	5.5	VDC
Supply Voltage (4–20mA)	9	–	36	VDC
Output – code 0	0.5	–	4.5	V
Output – code 1	0	–	5	V
Output – code 2	4	–	20	mA
Output – code 3 / 4	–	I ² C (0x28) / SPI	–	–
Accuracy (TEB)	–0.15	–	+1.00	%FS
Temperature Error	–1.5	–	+1.5	°C
Operating Temperature	–10	–	125	°C
Pressure Range	150	–	5,000	PSI
Proof Pressure	–	1.25× FS	–	–
Burst Pressure	–	1.5× FS	–	–
Environmental Rating	–	IP65	–	–
Electrical Connection	–	26AWG flying leads	–	–
Housing Material	–	SS316L	–	–
O-Ring (UNF / BSPP ports)	–	Buna-N, 70 Duro	–	–

Accuracy, operating temperature, and pressure range are set by the ordered option codes – see Ordering Information. Total Error Band (TEB) includes non-linearity, hysteresis, repeatability, and thermal effects over the compensated range.

WIRING

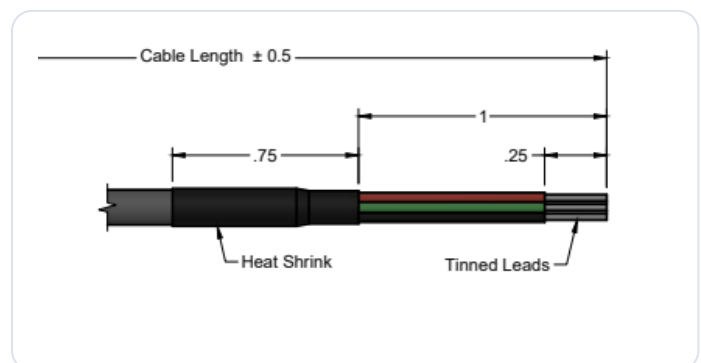
Electrical connections

WIRE	0.5–4.5V / 0–5V	4–20mA	I ² C / SPI
Red	V+	+	VDD
Black	GND	–	GND
White	Vout	–	SDA / MISO
Yellow	–	–	SCL / SCLK
Green	–	–	INT / SS

Notes: 1) Analog outputs use the 3-wire pinout. 2) 4–20mA is 2-wire loop-powered. 3) Digital parts use the 5-wire pinout. 4) Leads are 26AWG tinned, with heat-shrink strain relief at both ends.

FIG. 1

Lead assignment



Cable end – heat-shrink strain relief and 26AWG tinned leads. Colours per the table at left.

Package, media & installation

Package

An all stainless (SS316L) cylindrical body, 0.65" in diameter and roughly 1.07" tall above the port, with 26AWG tinned flying leads exiting through heat-shrink strain relief. The installed footprint stays minimal, so the sensor routes cleanly through dense assemblies without adding bulk.

Pressure port

Six standard process connections: 1/4" NPT, 1/8" NPT, 7/16-20 UNF-2A, 9/16-18 UNF-3A AN, 1/4" BSPP, and 3/8-24 UNF-1A. Custom threads are available (option 7) – consult the factory.

Wetted parts

Wetted components are stainless steel SS316L. UNF and BSPP ports include a Buna-N, 70 Duro O-ring; NPT ports seal on the thread. Alternative elastomers are available for aggressive media.

Stability

A MEMS piezoresistive sensing element, media-isolated inside the stainless housing. Material selection minimises mechanical stress on the element, improving long-term stability across temperature and pressure cycling. Each unit is factory calibrated and temperature compensated.

Media

Compatible with oil, air, gas, water, and industrial fluids. Verify compatibility with specific or aggressive media against the wetted materials below before specifying.

Pressure ranges

Standard ranges run from 150 PSI to 5,000 PSI in gauge, sealed gauge, and absolute references. Custom pressure ranges are available for OEM programs.

Ø0.65"

Body diameter

±0.15%

Best accuracy FS (TEB)

5,000

Max range PSI

5

Output options

INSTALLATION

Handling & mounting guidance

Torque the transducer on its hex flats only — never by the body or the leads. Do not apply sealant or tape over the pressure orifice.

Support the cable near the exit so the strain relief carries no sustained load, and keep the bend radius above ten cable diameters.

Avoid pressure spikes above the proof rating; add a snubber on pulsating hydraulic circuits to protect the element and preserve calibration.

For absolute and sealed-gauge parts the reference is sealed at manufacture; no vent path is required or permitted.

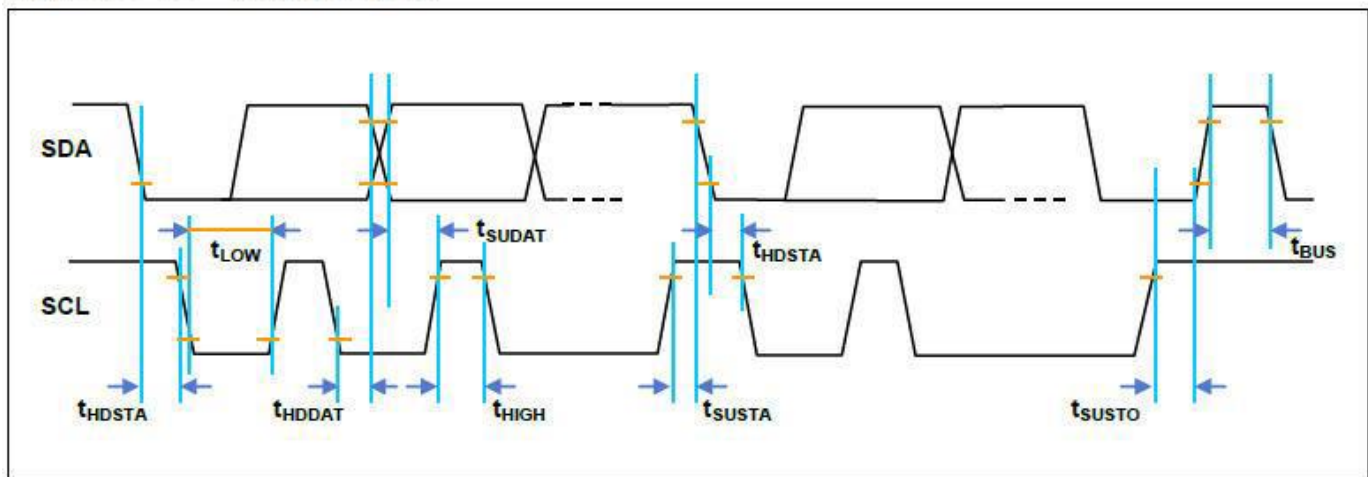
I²C & SPI communication

Output codes 3 and 4 replace the analog signal with a digital interface: addressable I²C at 0x28, or read-only SPI. An internal DSP corrects the converted bridge signal and computes the temperature value for digital output. Two normal-operation modes are available — Update Rate Mode (continuous conversion at a selectable rate) and Sleep Mode (low power) — both over I²C or SPI, selected at the factory with SPI as the default. The on-board EEPROM holds calibration coefficients and configuration bits and is **locked at the factory**.

FIG. 2 · I²C

Timing diagram

Figure 2.6 *I²C™ Timing Diagram*



(See section 3.1 for data transmission details.)

CLOCK SETTING	BIT RATES
4 MHz (factory set)	400 kHz or 100 kHz
1 MHz	100 kHz

PARAMETER	I ² C (CODE 3)	SPI (CODE 4)
Address / select	0x28	SS (chip select)
Direction	Read / write	Read only
Supply	2.7–5.5 VDC	2.7–5.5 VDC
Data lines	SDA, SCL	MISO, SCLK, SS
Interrupt	INT (green)	—

TABLE 2.8 – I²C PARAMETERS

~~0.6 μs min - t_{SCL}~~ ~~0.1 μs min - t_{HDSTA}~~ LOW
0 μs min - t_{HIGH} 0.1 μs min - t_{SUSTA} HDATA
2 μs min - t_{SUDAT} LOW and HIGH widths must equal or exceed the minimum SCL period.

Read & write command reference

The sensor begins A/D conversions 10 ms after power-up — **do not issue any command during start-up**. With a 4 MHz clock and the EEPROM locked, the first corrected data is written to the digital interface within 6 ms of power-on. Operation afterward depends on whether the part was factory-programmed in Update Mode (data taken at a fixed, selectable rate) or Sleep Mode (waits for a master command before measuring).

COMMAND	BUS	MODE	ACTION & RETURNED DATA
Read_MR	I ² C / SPI	Sleep	Wakes the part and runs a full measurement cycle — temperature, auto-zero, bridge — then DSP correction. I ² C: slave address + READ bit, then master issues stop. SPI: drop SS low ≥8 μs and raise; the rise triggers the measurement.
Write_MR	I ² C only	Sleep	Wakes the part and measures the bridge only, correcting with previously measured temperature and auto-zero values. Slave address + WRITE bit (0). A Read_DF is then required to fetch the result.
Read_DF2	I ² C / SPI	Both	Two bytes of bridge data (2 status MSBs). Used when corrected temperature is not required.
Read_DF3	I ² C / SPI	Both	Two bytes of bridge data plus one byte of temperature (8-bit accuracy). Master sends NACK + stop to terminate.
Read_DF4	I ² C / SPI	Both	Four bytes: high/low bridge data plus the full corrected 11-bit temperature T[10:0]. The last 5 bits of the final byte are undetermined and must be masked in the application.
I ² C WRITE	I ² C only	Command	32-bit packet: address + WRITE, command byte, then a 16-bit data field. Command Mode only; supply all zeros when the command needs no data.

STATUS BITS & POLLING

After a valid output is read, the status bits are set to “stale,” so the application can read at any time and be assured the data is no older than the selected update period. Poll no faster than 20% above the update-rate period. In I²C mode the INT/SS pin acts as an interrupt — a rise signals new valid data is ready, removing the need to poll.

DATA VALIDITY AT POWER-ON

Data is invalid from power-on reset until the first measured value is written to the digital register. An I²C Write_MR issued as the first command after power-on returns invalid data even though the status bits report “valid,” because the correction uses uninitialised temperature and auto-zero values.

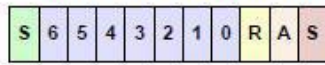
I²C read packet formats

FIG. 3 — I²C READ OPERATIONS

Figure 3.6 I²C™ Measurement Packet Reads

(1) I²C Read_MR – Measurement Request:

Slave starts a measurement and DSP calculation cycle.

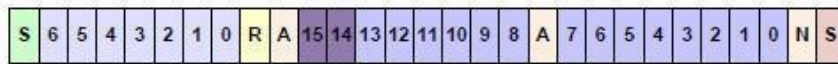


Device Slave
Address [6:0]

Wait for
Slave ACK

(2) I²C Read_DF2 – Data Fetch 2 Bytes:

Slave returns only bridge data to the master in 2 bytes.



Device Slave
Address [6:0]

Wait for
Slave ACK

Bridge Data
[13:8]

Master
ACK

Bridge Data
[7:0]

Master
NACK

(3) I²C Read_DF3 – Data Fetch 3 Bytes:

Slave returns 2 bridge data bytes & temperature high byte (T[10:3]) to master.



Device Slave
Address [6:0]

Wait for
Slave ACK

Bridge Data
[13:8]

Master
ACK

Bridge Data
[7:0]

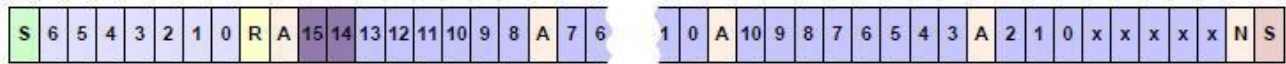
Master
ACK

Temperature
Data [10:3]

Master
NACK

(4) I²C Read_DF4 – Data Fetch 4 Bytes:

Slave returns 2 bridge data bytes & 2 temperature bytes (T[10:3]) and (T[2:0]xxxxx) to master.



Device Slave
Address [6:0]

Wait for
Slave ACK

Bridge Data
[13:8]

Master
ACK

Bridge Data
[7:0]

Master
ACK

Temperature
Data [10:3]

Master
ACK

Temperature
Data [2:0]

Master
NACK

- S** Start Condition
- 5** Device Slave Address (example: Bit 5)
- 2** Data Bit (example: Bit 2)
- R** Read/Write Bit (example: Read=1)
- A** Acknowledge (ACK)
- N** No Acknowledge (NACK)
- S** Stop Condition
- Status Bit**

PROTOCOL DIFFERENCES VS. STANDARD I²C

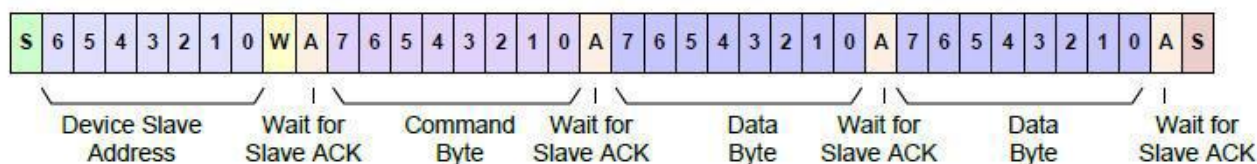
1) A start-stop condition with no CLK transitions in between causes a communication error on the next transfer; send an additional start condition to restore it. 2) A restart condition — a falling SDA edge during transmission while CLK is still high — has the same effect. 3) A falling SDA edge is not allowed between the start condition and the first rising SCL edge; with an address whose first bit is 0, hold SDA low through the first bit.

I²C write packet formats

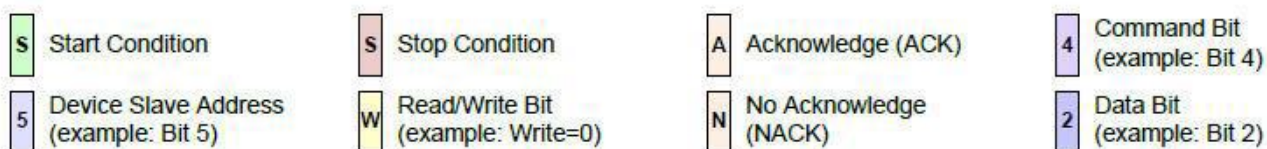
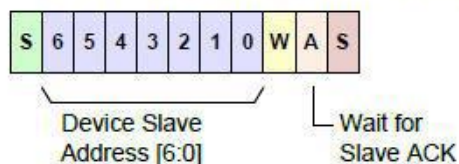
FIG. 4 — I²C WRITE OPERATIONS

Figure 3.9 I²C™ Measurement Packet Writes

(1) I²C Write, Command Byte, and 2 Data Bytes.



(2) I²C Write_MR – Measurement Request:
Slave starts a bridge only measurement and DSP calculation cycle.



CLOCK GENERATOR / POWER-ON RESET

An internal 4 MHz temperature-compensated oscillator provides the time base for all operations, feeding a 4:1 post-scalar. Factory default is the 4 MHz core clock; 1 MHz can be factory-selected for better resolution where fast response is not required. Factory update rate is Update_Rate 00 (0.5 ms), adjustable by request — slower rates reduce power consumption.

SPI DATA PACKET

The full output packet is 4 bytes: high bridge byte, low bridge byte, then 11 bits of corrected temperature T[10:0] — the T[10:3] byte followed by the {T[2:0], xxxx} byte. The last 5 bits are undetermined and must be masked. Terminate after byte 2 for bridge value only, or after byte 3 for 8-bit temperature resolution.

CALCULATION FORMULAS

Pressure: $Y = 130.07 \cdot X + 1638$ (offset ± 125 counts) Temperature: $Y = 10.3 \cdot X + 511$ (25 °C = 768 counts) $Y =$ integer value (counts) $\cdot X =$ pressure (%FS) or temperature (°C)

Confirm the transfer-function coefficients for your configured build with the factory before writing production firmware.

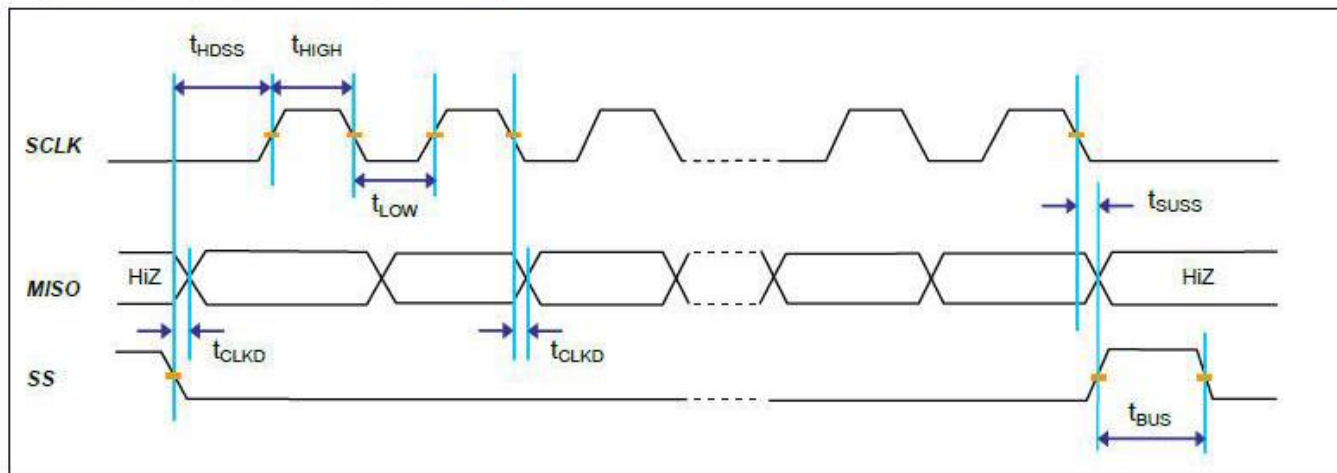
Half-duplex read interface & timing

SPI is read-only (half duplex) and cannot be used in the calibration Command Mode, which requires receiving commands. Speeds up to 800 kHz are supported in 4 MHz mode, 200 kHz in 1 MHz mode. MISO change is programmable for falling or rising edge; falling edge is the factory default. Data changes after the falling edge of SCLK – the master should sample MISO on the rise.

FIG. 5

SPI bus data output timing

Figure 2.7 SPI Bus Data Output Timing



(See section 3.1 for data transmission details.)

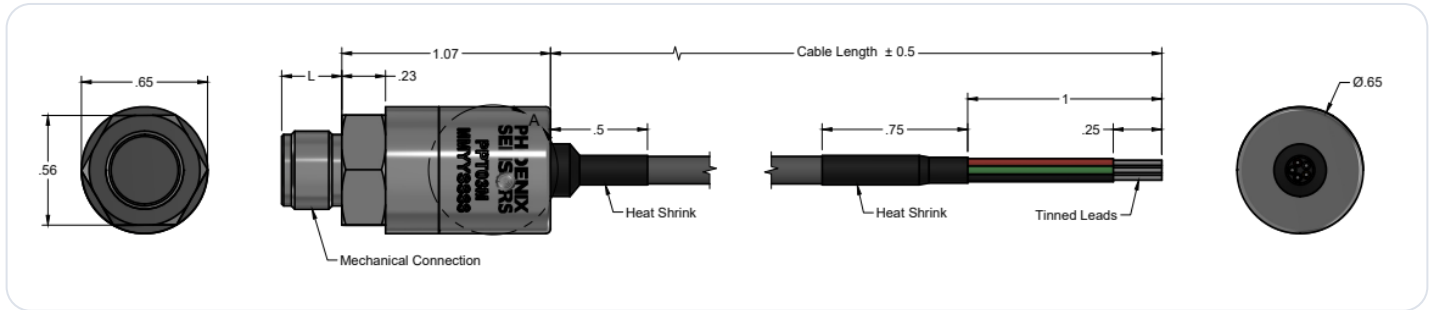
TABLE 2.9

SPI parameters

PARAMETER	SYMBOL	MIN	MAX	UNITS
SCLK frequency (4 MHz clock)	f_{SCL}	50	800	kHz
SCLK frequency (1 MHz clock)	f_{SCL}	50	200	kHz
SS drop to first clock edge	t_{HDSS}	2.5	—	μs
Minimum SCLK low width	t_{LOW}	0.6	—	μs
Minimum SCLK high width	t_{HIGH}	0.6	—	μs
Clock edge to data transition	t_{CLKD}	0	0.1	μs
Rise of SS vs. last clock edge	t_{SUSS}	0.1	—	μs
Bus free time, rise to fall of SS	t_{BUS}	2	—	μs

Combined low and high widths must equal or exceed the minimum SCLK period.

Outline drawing — inches



MECHANICAL CONNECTION	CODE	PORT LENGTH L
1/4" NPT	1	.49
1/8" NPT	2	.38
7/16-20 UNF-2A	3	.36
9/16-18 UNF-3A AN	4	.80
1/4" BSPP	5	.51
3/8-24 UNF-1A	6	.31
Custom thread	7	consult factory

FEATURE	DETAIL
Body diameter	Ø.65
Hex flats	.56 across flats
Body height above port	1.07
Housing / wetted	SS316L
Leads	26AWG, tinned

NOTES

- 1) Dimensions and tolerances in inches: X ±0.5 · X.X ±0.15 · X.XX ±0.010 · X.XXX ±0.005.
- 2) Cable length per order code, ±0.5".
- 3) Heat shrink at both cable ends for strain relief.
- 4) Laser marking: logo, part number, month/year and serial number.
- 5) O-ring supplied with 7/16-20 UNF, 1/4 BSPP and 3/8-24 UNF ports.

REPRESENTATIVE CONFIGURATIONS

Shipping PPT03M builds

PART NUMBER	OUTPUT	RANGE	TYPE	CONNECTION	ACCURACY	TEMP
PPT03M-0-1KS243-3FT	0.5-4.5V	1,000 PSI	Sealed gauge	1/8-27 NPT	±0.50% FS	-40 to 125 °C
PPT03M-3-5KS45-FB	I ² C (0x28)	5,000 PSI	Sealed gauge	3/8-24 UNF-1A	±0.25% FS	-40 to 125 °C
PPT03M-0-4KA73-IFT-AP	0.5-4.5V	4,000 PSIA	Absolute	5/16-24 UNF-3A (custom)	±0.25% FS	-30 to 65 °C
PPT03M-0-3KS251-5FT	0.5-4.5V	3,000 PSI	Sealed gauge	1/8-27 NPT	±1.00% FS	-10 to 60 °C

Existing builds shown for reference – the -AP variants add a SAE AS4395-02 port, shielded PTFE cable, 200 Grms vibration rating, and E595 low-outgassing materials. Any combination of the option codes on page 10 can be built; custom threads, ranges, and cable constructions are quoted on request.

Part-number configuration



Model	Output	Range (PSI)	Type	Mechanical connection	Accuracy (TEB)	Operating temp	Cable
PPT03M	0 = 0.5–4.5V 1 = 0–5V 2 = 4–20mA 3 = I ² C (0x28) 4 = SPI	150 = 150 ... standard increments ... 5K = 5,000 (consult factory for full list)	G = Gauge S = Sealed gauge A = Absolute	1 = 1/4 NPT 2 = 1/8 NPT 3 = 7/16-20 UNF-2A 4 = 9/16-18 UNF-3A AN 5 = 1/4 BSPP 6 = 3/8-24 UNF-1A 7 = Custom	1 = ±0.15% 2 = ±0.20% 3 = ±0.25% 4 = ±0.50% 5 = ±1.00%	1 = -10-60°C 2 = -20-85°C 3 = -40-125°C	1 = 1FT ... through ... 10 = 10FT custom lengths on request

EXAMPLE PART NUMBERS

PPT03M-0-3KS251-5FT → 0.5–4.5V · 3,000 PSI sealed gauge · 1/8 NPT · ±1.00% FS · -10 to 60 °C · 5 ft cable

PPT03M-3-1KA633-1FT → I²C (0x28) · 1,000 PSI absolute · 3/8-24 UNF-1A · ±0.25% FS · -40 to 125 °C · 1 ft cable

Configure your PPT03M

Custom pressure ranges, thread configurations, and cable constructions available for OEM volumes. Talk to an engineer to spec your part.

[REQUEST A QUOTE](#)

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