

Paine™ 320-12-0010 Series Pressure Transmitter

Digital, High Precision, +175 °C, Pressure and Temperature



The 320-12-0010 Series is our high precision, digital transmitter offering output of both pressure and temperature measurements at a full scale accuracy of $\pm 0.05\%$, and designed to operate to +347 °F (+175 °C).

Utilizing the latest in micro-computer based technology providing precise digital measurements in a simple and easy to use communications interface, the 320-12-0010 Series has the added benefit of a small external package size combined with the ability to operate in corrosive environments. The 320-12-0010 Series is the perfect solution for designers looking for digital measurement in extreme environments.

Solutions

- High temperature and high pressure
- Digital measurement accuracy
- Harsh/extreme environment ready
- Excellent long term stability

Potential applications

- Downhole tools (MWD, LWD, Wireline, and more)
- Offshore energy exploration
- Artificial lift and subsea risers
- Subsea hydraulic controls

Features

- **Accuracy:** 0.05%*
- **Repeatability:** ±0.05%
- **Pressure range:** 0–5,000 to 0–30,000 PSIA (345 to 2069 BAR)
- **Operating temperature:** -40 °F to +347 °F (-40 °C to +175 °C)
- **Digital output:** RS-485.
- **Temperature output:** °F or °C.
- **Temperature measurement:** -40 °F to +347 °F (-40 °C to +175 °C)
- **Temperature resolution:** 12 Bits minimum. Better than 0.09 °F (0.05 °C)

Specifications

Calibration: Calibration certificates are supplied with each unit and available on-line.

Performance

Accuracy: *±0.05% of the Full Scale (F.S.) over the calibrated temperature range. Accuracy is relative to primary standard at time of calibration and includes resolution, hysteresis, non-repeatability and thermal effects.

Repeatability: ±0.05% F.S. over the calibration temperature range.

Pressure output in PSI: Fully compensated for the effects of temperature and non-linearity.

Pressure resolution: 16 Bits minimum (see [Table 1 on page 3](#)).

Temperature output: °F or °C.

Temperature measurement: -40 °F to +347 °F (-40 °C to +175 °C).

Temperature resolution: 12 Bits minimum. Better than 0.09 °F (0.05 °C).

Environmental

Operating temperature range: -40 °F to +347 °F (-40 °C to +175 °C).

Calibrated temperature range: 75 °F to +347 °F (23.9 °C to +175 °C).

Pressure media: Fluids and gases compatible with NO7718, solution annealed and aged to a maximum hardness of 40 HRC.

Proof pressure: See [Table 1 on page 3](#).

Burst pressure: See [Table 1 on page 3](#).

Contents

Specifications	2	Dimensional drawings	5
Qualification summary	4		

Mechanical

Pressure range: Contact factory for additional pressure ranges.

Table 1. Pressure Table

Standard part number	Pressure range PSIA (BAR)	Proof pressure PSIA (BAR)	Burst pressure PSIA (BAR)	Pressure resolution (better than)	Seal part number
320-12-0010-10K0	0–10,000 (689)	15,000 (1034)	20,000 (1378)	0.16 PSI	247-99-250-01
320-12-0010-20K0	0–20,000 (1723)	25,000 (1723)	30,000 (2068)	0.31 PSI	247-99-250-01
320-12-0010-30K0	0–30,000 (2068)	37,500 (2586)	50,000 (3443)	0.46 PSI	247-99-250-02

Pressure fitting: Per MS33656-E3 except bore diameter.

Installation information: Mount using annealed alloy 600 replaceable seal. Thermal coefficient of the mounting expansion should not exceed 8.3×10^{-6} in/in °F for operation above 100 °C.

Recommended installation torque: 125 to 150 in-lb (14 to 17 N-m).

Mounting: Transmitter must be mechanically restrained for use in high shock and/or vibration applications.

Electrical

Digital output: RS-485. Refer to document 200.107 for more information.

Input voltage: 5.0 VDC \pm 0.25 VDC.

Input current: 25 mA maximum.

Insulation resistance: All pins except pin 5 together simultaneously to case, 100 M Ω minimum at 50 VDC and 75 °F \pm 5 °F (23.9 °C to \pm 2.8 °C).

Over voltage protection: Do not exceed 5.25 VDC.

Reverse polarity: “POWER IN” is protected from the application of reverse polarity.

Electrical connection: Mates with Glenair P/N: 801-007-16Z16-7SA. Connector sold separately.

Sleep pin functionality: Transmitter is fully functional when sleep pin is held to logic low (GROUND). When sleep pin is left floating the sensor will be in standby mode.

User guide and programming: Document 200.107 provided with each unit.

Electrostatic discharge (ESD): This transmitter is susceptible to ESD, per ANSI/ESD STM5.1 Human Body Model (HBM) Class 3A and must be protected.

Qualification summary

Halt testing

HALT (Highly Accelerated Life Testing, a “margin discovery process”) was used in the design process for this product. In order to ruggedize the product for extreme downhole environments, the root cause of any failure was determined and the problems corrected until the fundamental limit of the technology was reached. This process yields the widest possible margin between product capabilities and the environment in which it will operate, thus increasing the product’s reliability, reducing field failure and/or downtime, and realizing long-term savings. Throughout all testing, units operated within manufacturer’s specifications.

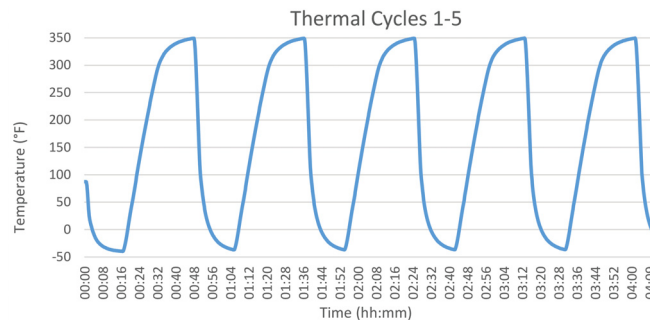
Life testing

3,000 hours: Proven to operate within specification 3,000 hours at 355 °F (179 °C) and 212 thermal cycles at 100 °F to +350 °F (37 °C to +176 °C).

Thermal testing

100 cycles: -40 °F to +356 °F (-40 °C to +180 °C).

Figure 1. Cycles of Temperature Transitioning between the Cold and Hot Extremes

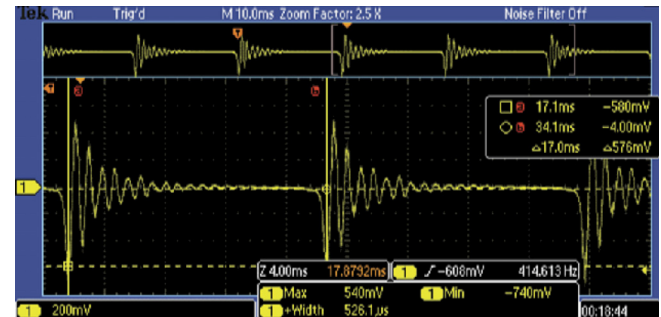


Demonstrated repeatable digital output during thermal cycling, continuing to operate within specification.

Shock

25,000 shocks: Proven to operate within specification after 25,000 shocks per axis at 500 g with 1 ms Full Width Half Max (FWHM).

Figure 2. Shock Profile

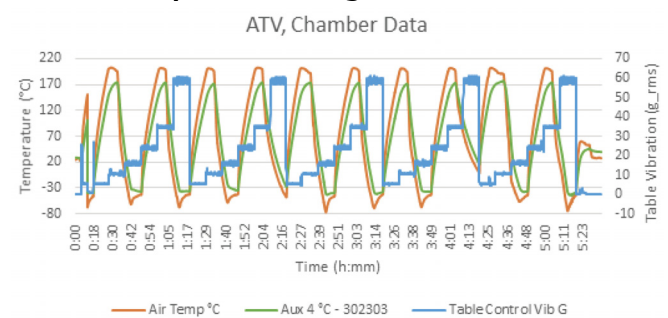


The 320-12-0010 Series is designed to survive the violent shocks encountered during drilling, exploration, and other applications.

Thermal vibration

Subjected to repetitive vibration g levels exceeding 50 grms⁽¹⁾ and temperatures exceeding 175 °C (347 °F).

Figure 3. Levels of Vibration Introduced during Repeated Cycles of Temperature and Rates of Temperature Changes

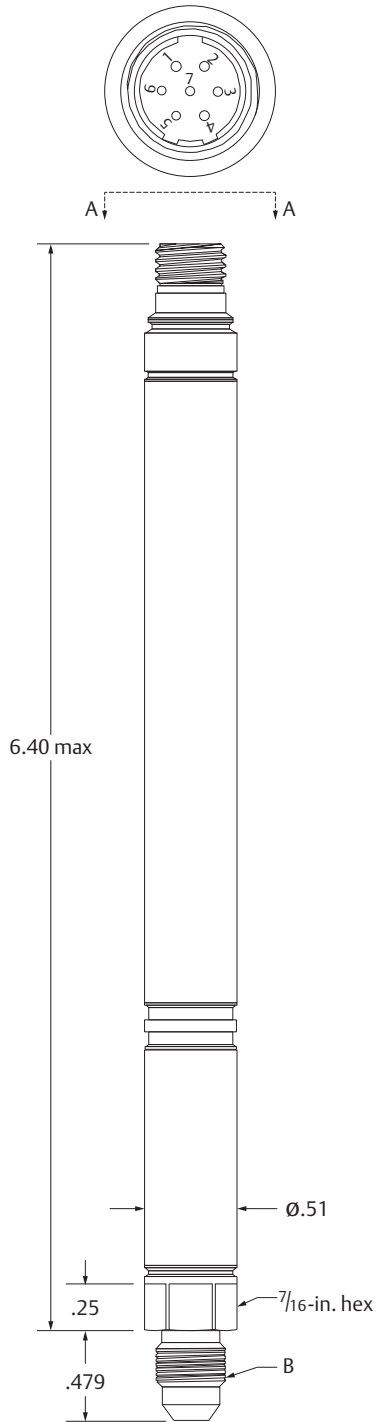


1. Grms is used to define the overall energy or acceleration level of vibration. Grms (root-mean-square) is calculated by taking the square root of the area under the Probability Density Function (PSD) curve.

Dimensional drawings

Figure 4. 320-12-0010 Series


View A-A
Scale 3:1



Connections	
PIN	Function
1	Power in
2	RS-485 "B"
3	RS-485 "A"
4	Power return/Communication return
5	Case ground
6	Sleep
7	Not used


B. Fitting end per MS33656-E3 except before diameter
Dimensions are inches.


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