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BARTON 763A

Gauge pressure transmitter

APPLICATIONS

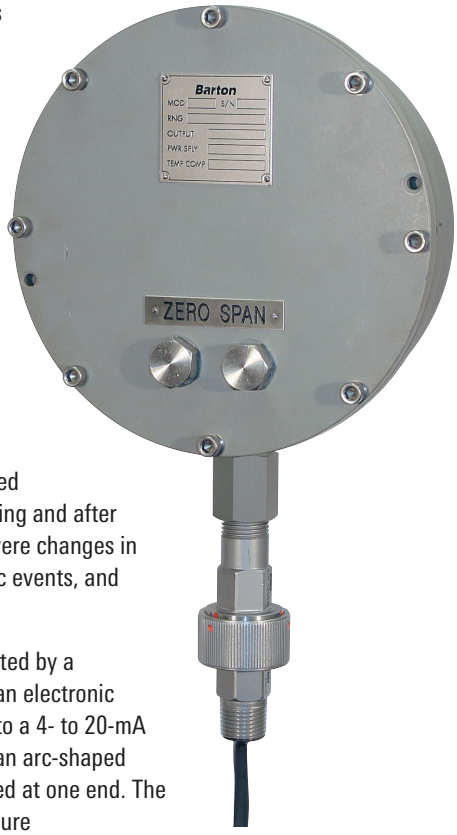
Safety-related applications in nuclear power generating stations

- Steam flow
- Coolant flow
- Feedwater flow
- Steam generator level
- Pressurizer level
- Torus level
- Scram discharge level
- Containment pressure

ADVANTAGES

- Qualified for Class 1E in containment service in accordance with IEEE-323-1974/ 344-1975 and NUREG 0588
- Excellent performance and reliability
- Pressure range: 0–300 to 0–3,000 psi [0–20.7 to 0–206.8 bar]
- Factory calibration for any increments within the given ranges
- 0.5% accuracy of factory-calibrated span
- Radiation-resistant electronics
- Continuous operation in adverse environments
- Ruggedized housing

The BARTON 763A* gauge pressure transmitter uses a C-type Bourdon tube transducer and provides a 4- to 20-mA or 10- to 50-mA output signal for transmission to remote receiving, control, or readout devices. It is ideal for a variety of safety related applications in nuclear power generating stations including pressurizer pressure and steam generator pressure. The transmitter is recommended for applications that normally operate above 75% of factory-calibrated span or for applications requiring zero suppression.



BARTON 763A gauge pressure transmitter.

The instrument is designed to operate beyond its normal operating environmental specifications for a limited time under the adverse conditions encountered within the containment of a nuclear power plant during and after an incident. These adverse environments include severe changes in ambient pressure, temperature and humidity, seismic events, and radiation exposure.

The BARTON 763A transmitter is mechanically actuated by a C-type Bourdon tube transducer and equipped with an electronic circuit for sensing gauge pressure and converting it to a 4- to 20-mA or 10- to 50-mA output. The C-type Bourdon tube is an arc-shaped metal tube that is elliptical in cross-section and sealed at one end. The opposite end, which is open, is attached to the pressure source. Pressure applied inside the tube affects its shape and actuates the sensing element.

A regulated DC power supply is required to operate the transmitting loop. The electronic components of the BARTON 763A transmitter are housed inside a rugged, pressure-sealed enclosure to prevent steam penetration. An EGS® quick-disconnect connector assures the integrity of the electrical connections, and specially designed radiation resistant electronic components minimize degradation associated with exposure to nuclear radiation. A standard enclosure cover enables easy access to the zero-span adjustment controls.

Basis of operation

A wire is welded to the free end of the Bourdon tube and to a strain gauge beam. Pressure applied to the Bourdon tube tends to straighten the tube, which proportionally bends the strain gauge beam. Motion of the free end of the beam applies tension to one strain gauge, increasing its resistance, and compression to the other, decreasing its resistance. The two gauges form a bridge circuit, and the bridge output signal is conditioned and converted to a 4- to 20-mA or 10- to 50-mA output signal by the transmitter electronics. The output signal is transmitted over a two-wire transmission line to remote receiving devices.

Storage

Storage per ANSI N45.2.2-1978 Level B at 70 degF [21 degC] ±20 degF [±12.2 degC] in a factory-sealed package for 2.5 years maximum should not affect installed service life.

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Quality assurance

BARTON 763A transmitters are manufactured in accordance with 10 CFR 50 Appendix B and ANSI N45.2. For safety-related applications, specific procedures exist for

- configuration control of pressure boundary components
- chemical and physical certifications on pressure boundary components
- configuration control of electronic components
- configuration control of manufacturing processes
- pneumatic testing of pressure boundaries to 150% of the factory-calibrated upper-range value.

General Specifications

Performance	
Available spans	0–300 to 0–3,000 psi [0–20.7 to 0–206.8 bar]
Output	4–20 or 10–50 mA
Reference accuracy†	±0.5% of factory-calibrated span, including effects of conformance (non-linearity), deadband, hysteresis, and repeatability
Adjustability	±5% field adjustability of factory-calibrated span without affecting normal or incident condition performance. Span is field adjustable from 20% to 100% of factory-calibrated span. Zero is field adjustable for up to 30% suppression. Zero or span adjustments beyond ±5% affect normal and incident condition performance. Calibration is by the end-point method with zero and full-scale outputs held to ±0.05% of true.
Sensitivity†	±0.01% of factory-calibrated span
Power requirements	4–20 mA:15 VDC plus 2 VDC per 100-ohm load to 53-VDC maximum
	10–50 mA: 15 VDC plus 5 VDC per 100-ohm load to 53-VDC maximum
Load range	4–20 mA: 50 ohm per volt above 15 VDC
	10–50 mA: 20 ohm per volt above 15 VDC
Load effect†	4–20 mA: < ±0.05% of factory-calibrated span per 100-ohm change
	10–50 mA: < ±0.1% of factory-calibrated span per 100-ohm change
Power supply effect†	4–20 mA: < ±0.025% of factory-calibrated span per 1-V change
	10–50 mA: < ±0.05% of factory-calibrated span per 1-V change
Noise†	< 0.25% peak to peak of factory-calibrated span
Thermal effect†	< ±1.0% of factory-calibrated span per 100-degF [38 degC] change from 40 to 150 degF [4 to 66 degC]
	< ±1.5% of factory-calibrated span per 100-degF change from 150 to 320 degF [66 to 160 degC]
Radiation†	±10.0% error for exposures to 200-Mrad [2,000-kGy] total ionizing dose (TID) gamma ray
	±5.0% error for exposures to 50-Mrad [500-kGy] TID gamma ray
Seismic	
During event†	< ±5.0% error (0–300 to 0–3,600 psi [0–20.7 to 0–248.2 bar] gauge pressure spans)
After event†	< 1.5% error (0–300 to 0–500 psi [0–20.7 to 0–34.5 bar] gauge pressure spans)
	< ±0.5% error (0–500 to 0–3,600 psi [0–34.5 to 0–248.2 bar] gauge pressure spans)
Loss-of-coolant accident (LOCA) performance†	< ±5.0% error during the first 5 min of LOCA 420 degF [216 degC]
	< ±10.0% error thereafter to the conclusion of the LOCA test as performed per Document No. 9A-CR3-763-6. The LOCA errors include the cumulative effects of thermal, mechanical, radiation, and seismic aging as performed per Document No. 9A-CR3-763-6.
Long-term drift†	Cumulative ±1.0% of factory-calibrated span per year
Time response	< 180 ms to reach 50% for 10% to 90% step function
Maximum overpressure	150% of factory calibrated upper-range value without damage
Process connection	½-in NPT (female)
Electrical interface	Two-wire (16 American wire gauge) pigtail (20-ft long)
Weight	11 lbm

† Turndown has a directly proportional effect on the indicated specifications.

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Materials of Construction[†]	
Process port	316 stainless steel
Sensing element	Bourdon tube, Haynes® 25 alloy
O-rings	Ethylene propylene terpolymer
Mounting bracket	Carbon steel
Electronics housing	Carbon steel
Finish	Amerlock® gray epoxy paint
Labels and tags	Stainless steel

[†] Materials constituting the pressure boundary are traceable to the raw material heat number through physical marking (if possible) and through material certification.

Class 1E qualification

The BARTON 763A gauge pressure transmitter is qualified for Class 1E in-containment service per IEEE 323-1974/344-1975 and NUREG 0588. The service conditions associated with these qualifications include the following:

Qualified Service Life	
Accelerated aging for 1,830 h at 257 degF [125 degC]	100 years at normal conditions of 104 degF [40 degC]
	60 years at normal conditions of 113 degF [45 degC]
	40 years at normal conditions of 122 degF [50 degC]
	26 years at normal conditions of 131 degF [55 degC]
	11 years at normal conditions of 140 degF [60 degC]
Radiation exposure	200-Mrad [2,000-kGy] TID gamma ray
Design-basis-event (DBE) environment	Two 10-s temperature ramps to 486-degF [252-degC] maximum
	24-h duration chemical spray exposure
	15-d total exposure to saturated steam at 250-degF [121-degC] minimum
Long-term severe environment	85 d at 200 degF [93 degC] and 95% relative humidity
Seismic qualifications	Operating basis earthquake (OBE) at 9.0 g_n (series of 5)
	Safe shutdown earthquake (SSE) at 12.5 g_n
	5% critical damping
	No resonance in frequencies below 75 Hz
Mechanical aging	500,000 pressure cycles during accelerated aging
	Electrically cycled to induce stress during accelerated aging
	Vibration cycling using 0.2-g_n sweeps over the 1- to 100-Hz range at 1.0 octave/min

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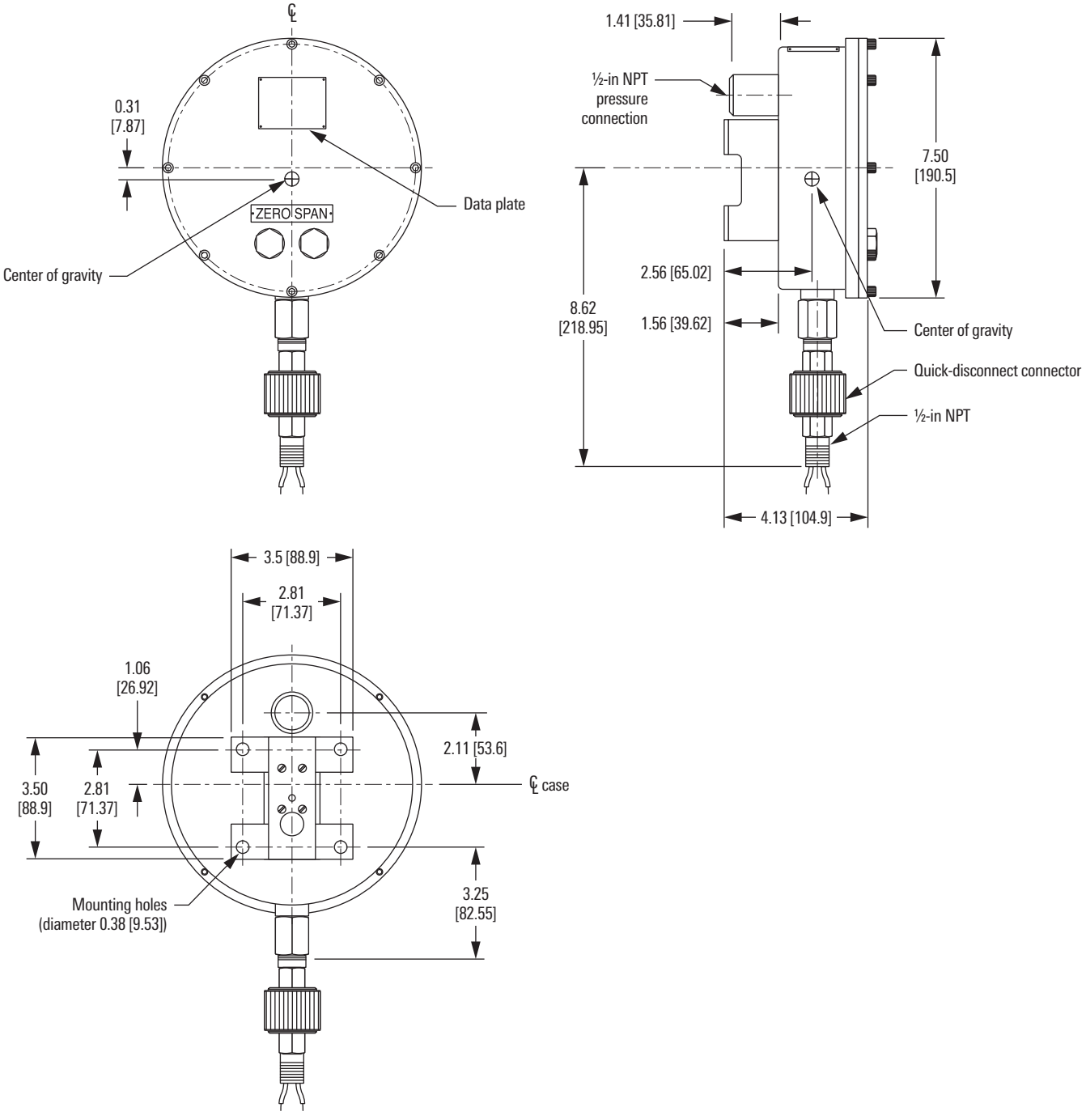

BARTON 763A transmitter dimensions, in [mm].

cameron.slb.com/measurement

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