Dynamic Pressure Sensors for High Frequency Measurements

Extremely fast, micro-second response with wide amplitude & frequency range

Highlights

- Ultra-high frequency > 500 kHz
- Fast rise time < 1 µsec
- Peak pressure and total impulse

Applications

- Shock tubes and closed bombs
- Time-of-arrival measurements
- Explosion, blast, and shock wave

Model 113B / 102B
High Frequency Pressure Sensors

Series CA102B
Ablative coating option 'CA' available for flash protection

Series 113B and 102B high frequency dynamic pressure sensors are structured with naturally piezoelectric, stable quartz sensing elements that are well-suited to measure rapidly-changing pressure over wide amplitude and frequency ranges. They feature micro-second response times and high resonant frequency. Solid-state construction, acceleration compensation, hermetically-sealed housings, and laser-welded flush diaphragms provide undistorted high frequency response and durability in adverse environmental conditions. ICP® technology provides a high signal-to-noise ratio and high-level voltage output, capable of driving long cables to a safe zone for data acquisition. Charge output sensors are also available for applications requiring continuous high operating temperatures. Piezoelectric sensors are more stable, robust, and use less costly signal conditioning than comparable piezoresistive types for dynamic pressure measurements.

Typical applications include pulsations, hydraulic and pneumatic pressure fluctuations (e.g. compressors), fluid-borne noise detection, cavitation, high intensity acoustics, closed bomb combustion studies, explosive component performance (e.g detonators, explosive bolts) and airbag testing. A popular application includes measurement of free field, enclosed, and directed (shock tube) air blast resulting from explosions or muzzle blast. Air blast over pressure and reflected pressure measurements can be measured to determine peak pressure, and total impulse of the structural loading imparted on any unit under test (e.g., building, ground transport vehicle, surface or underwater vehicle).

Series 113B and 102B pressure sensors are available with ranges to 15 kpsi (103 MPa) and sensitivities to 100 mV/psi (14.5 mV/kPa). Each sensor is supplied with NIST-traceable, A2LA accredited dynamic calibration to ISO17025. They are 100% in-process tested for resonant frequency, rise time, and acceleration compensation before shipment to the customer.

As with all PCB® instrumentation, these sensors are complemented with toll-free applications assistance, 24-hour customer service, and is backed by a no-risk policy that guarantees satisfaction or your money refunded.

Dynamic Pressure Sensors for High Frequency


Model Number	113B28	113B27	113B21	113B26	113B24	113B22	113B23	113B03
Measurement Range (+/- 5 Volt Output)	50 psi 345 kPa	100 psi 690 kPa	200 psi 1380kPa	500 psi 3450 kPa	1 kpsi 6895 kPa	5 kpsi 34,475 kPa	10 kpsi 68,950 kPa	15 kpsi 103,420 kPa
Useful Overrange (+/- 10 Volt Output)	100 psi [1] 690 kPa [1]	200 psi [1] 1380 kPa [1]	400 psi [1] 2758 kPa [1]	1 kpsi [1] 6895 kPa [1]	2 kpsi [1] 13,790 kPa [1]	10 kpsi [1] 68,950 kPa [1]	—	—
Sensitivity	100 mV/psi 14.5 mV/kPa	50 mV/psi 7.25 mV/kPa	25 mV/psi 3.6 mV/kPa	10 mV/psi 1.45 mV/kPa	5 mV/psi 0.725 mV/kPa	1 mV/psi 0.145 mV/psi	0.5 mV/psi 0.073 mV/kPa	0.44 pC/psi 0.064 pC/kPa
Maximum Pressure	1 kpsi 6895 kPa	1 kpsi 6895 kPa	1 kpsi 6895 kPa	10 kpsi 68,950 kPa	10 kpsi 68,950 kPa	15 kpsi 103,420 kPa	15 kpsi 103,420 kPa	15 kpsi 103,420 kPa
Resolution	0.5 mpsi 0.0034 kPa	1 mpsi 0.007 kPa	1 mspi 0.007 kPa	2 mpsi 0.014 kPa	20 mpsi 0.138 kPa	20 mpsi 0.138 kPa	40 mpsi 0.28 kPa	10 mpsi [3] 0.07 kPa [3]
Resonant Frequency	≥ 500k Hz	≥ 500k Hz	≥ 500k Hz	≥ 500k Hz	≥ 500k Hz	≥ 500k Hz	≥ 500k Hz	≥ 500k Hz
Rise Time (Reflected)	≤ 1 µsec	≤ 1 µsec	≤ 1 µsec	≤ 1 µsec	≤ 1 µsec	≤ 1 µsec	≤ 1 µsec	≤ 1 µsec
Low Frequency Response (-5 %)	0.5 Hz	0.5 Hz	0.5 Hz	0.01 Hz	0.005 Hz	0.001 Hz	0.0005 Hz	—
Non-linearity	≤ 1 % [2]	≤ 1 % [2]	≤ 1 % [2]	≤ 1 % [2]	≤ 1 % [2]	≤ 1 % [2]	≤ 1 % [2]	≤ 1 % [2]
Acceleration Sensitivity	≤ 0.002 psi/g ≤ 0.0014 kPa/(m/s²)	≤ 0.002 psi/g ≤ 0.0014 kPa/(m/s²)	≤ 0.002 psi/g ≤ 0.0014 kPa/(m/s²)	≤ 0.002 psi/g ≤ 0.0014 kPa/(m/s²)	≤ 0.002 psi/g ≤ 0.0014 kPa/(m/s²)	≤ 0.002 psi/g ≤ 0.0014 kPa/(m/s²)	≤ 0.002 psi/g ≤ 0.0014 kPa/(m/s²)	≤ 0.002 psi/g ≤ 0.0014 kPa/(m/s²)
Temperature Range	-100 to +275 °F -73 to +135 °C	-100 to +275 °F -73 to +135 °C	-100 to +275 °F -73 to +135 °C	-100 to +275 °F -73 to +135 °C	-100 to +275 °F -73 to +135 °C	-100 to +275 °F -73 to +135 °C	-100 to +275 °F -73 to +135 °C	-400 to +400 °F -240 to +204 °C
Discharge Time Constant (at room temp)	≥ 1 sec	≥ 1 sec	≥ 1 sec	≥ 50 sec	≥ 100 sec	≥ 500 sec	≥ 1000 sec	—
Electrical Connector	10-32 jack	10-32 jack	10-32 jack	10-32 jack	10-32 jack	10-32 jack	10-32 jack	10-32 jack
Housing Material	17-4 Stainless	17-4 Stainless	17-4 Stainless	17-4 Stainless	17-4 Stainless	17-4 Stainless	17-4 Stainless	17-4 Stainless
Diaphragm Material	Invar	Invar	Invar	Invar	Invar	Invar	Invar	Invar
Sealing	Welded Hermetic	Welded Hermetic	Welded Hermetic	Welded Hermetic	Welded Hermetic	Welded Hermetic	Welded Hermetic	Welded Hermetic
Additional Versions								
All Invar Material	113B38	113B37	113B31	113B36	113B34	113B32	113B33	—
Stainless Steel Diaphragm	S113B28	S113B27	S113B21	S113B26	S113B24	S113B22	S113B23	—

Series 113B

Series 113B
Dynamic Pressure Sensors for High Frequency

Supplied Accessories

Seal Rings: (3) 065A02 brass, 0.015 in. thick, (1) 065A05 stainless steel, 0.240 in. thick.

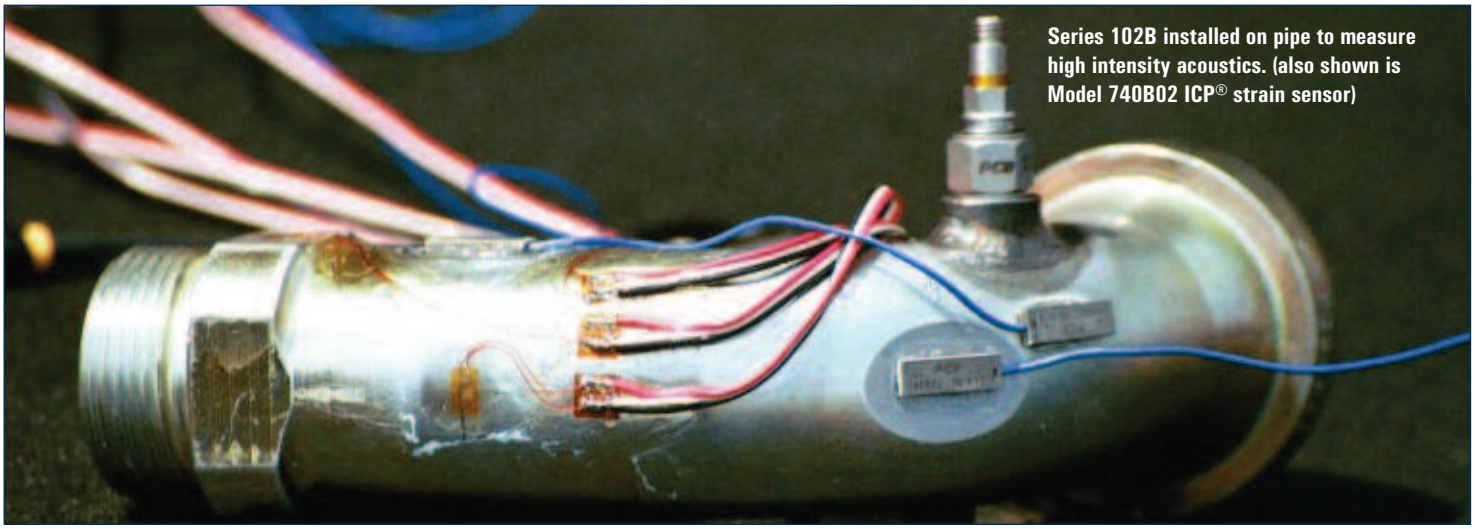
Clamp Nuts: (1) 060A03 English 5/16-24 thread, (1) 060A05 metric M7 thread

Notes

[1] For +10 volt output, minimum 24 VDC supply voltage required. Negative 10 volt output may be limited by output bias.

[2] Zero-based, least-squares, straight line method.

[3] Resolution dependent on signal conditioning and cable length used in charge system.



Series 102B installed on pipe to measure high intensity acoustics. (also shown is Model 740B02 ICP® strain sensor)

Ground Isolated, Dynamic Pressure Sensors for High Frequency

Model Number	102B18	102B16	102B15	102B06	102B04	102B	102B03
Measurement Range (+/- 5 Volt Output)	50 psi 345 kPa	100 psi 690 kPa	200 psi 1380 kPa	500 psi 3450 kPa	1 kpsi 6895 kPa	5 kpsi 34,475 kPa	10 kpsi 68,950 kPa
Useful Overrange (+/- 10 Volt Output)	100 psi [1] 690 kPa [1]	200 psi [1] 1380 kPa [1]	400 psi [1] 2758 kPa [1]	1 kpsi [1] 6895 kPa [1]	2 kpsi [1] 13,790 kPa [1]	10 kpsi [1] 68,950 kPa [1]	—
Sensitivity	100 mV/psi 14.5 mV/kPa	50 mV/psi 7.25 mV/kPa	25 mV/psi 3.6 mV/kPa	10 mV/psi 1.45 mV/kPa	5 mV/psi 0.725 mV/kPa	1 mV/psi 0.145 mV/psi	0.5 mV/psi 0.073 mV/kPa
Maximum Pressure	1 kpsi 6895 kPa	1 kpsi 6895 kPa	1 kpsi 6895 kPa	10 kpsi 68,950 kPa	10 kpsi 68,950 kPa	15 kpsi 103,420 kPa	15 kpsi 103,420 kPa
Resolution	0.5 mpsi 0.0034 kPa	1 mpsi 0.007 kPa	1 mspi 0.007 kPa	2 mpsi 0.014 kPa	20 mpsi 0.138 kPa	20 mpsi 0.138 kPa	40 mpsi 0.28 kPa
Resonant Frequency	≥ 500k Hz	≥ 500k Hz	≥ 500k Hz	≥ 500k Hz	≥ 500k Hz	≥ 500k Hz	≥ 500k Hz
Rise Time (Reflected)	≤ 1 µsec	≤ 1 µsec	≤ 1 µsec	≤ 1 µsec	≤ 1 µsec	≤ 1 µsec	≤ 1 µsec
Low Frequency Response (-5 %)	0.5 Hz	0.5 Hz	0.5 Hz	0.01 Hz	0.005 Hz	0.001 Hz	0.0005 Hz
Non-linearity	≤ 1 % [2]	≤ 1 % [2]	≤ 1 % [2]	≤ 1 % [2]	≤ 1 % [2]	≤ 1 % [2]	≤ 1 % [2]
Acceleration Sensitivity	≤ 0.002 psi/g ≤ 0.0014 kPa/(m/s²)	≤ 0.002 psi/g ≤ 0.0014 kPa/(m/s²)	≤ 0.002 psi/g ≤ 0.0014 kPa/(m/s²)	≤ 0.002 psi/g ≤ 0.0014 kPa/(m/s²)	≤ 0.002 psi/g ≤ 0.0014 kPa/(m/s²)	≤ 0.002 psi/g ≤ 0.0014 kPa/(m/s²)	≤ 0.002 psi/g ≤ 0.0014 kPa/(m/s²)
Temperature Range	-100 to +275 °F -73 to +135 °C	-100 to +275 °F -73 to +135 °C	-100 to +275 °F -73 to +135 °C	-100 to +275 °F -73 to +135 °C	-100 to +275 °F -73 to +135 °C	-100 to +275 °F -73 to +135 °C	-100 to +275 °F -73 to +135 °C
Discharge Time Constant (at room temp)	≥ 1 sec	≥ 1 sec	≥ 1 sec	≥ 50 sec	≥ 100 sec	≥ 500 sec	≥ 1000 sec
Electrical Connector	10-32 jack	10-32 jack	10-32 jack	10-32 jack	10-32 jack	10-32 jack	10-32 jack
Housing Material	17-4 Stainless	17-4 Stainless	17-4 Stainless	17-4 Stainless	17-4 Stainless	17-4 Stainless	17-4 Stainless
Diaphragm Material	Invar	Invar	Invar	Invar	Invar	Invar	Invar
Sealing	Welded Hermetic	Welded Hermetic	Welded Hermetic	Welded Hermetic	Welded Hermetic	Welded Hermetic	Welded Hermetic
Additional Versions							
Metric Mounting Thread	M102B18	M102B16	M102B15	M102B06	M102B04	M102B	M102B03

Series 102B
Ground Isolated, Dynamic Pressure Sensors for High Frequency

Supplied Accessories

Seal Rings: (3) 065A03 brass 0.030 in. thick.

Notes

[1] For +10 volt output, minimum 24 VDC supply voltage required. Negative 10 volt output may be limited by output bias.

[2] Zero-based, least-squares, straight line method.

Series 102B

Additional Sensors for High Frequency Pressure Measurements

Series 137
- ICP® free-field blast pencil probes
- Ranges from 50 to 5000 psi (344 to 34,475 kPa)
- Rise time <4 µsec
- Resonant frequency >500k Hz

Series 138
- ICP® underwater blast explosion pressure probes
- Ranges from 1000 to 50k psi (6894 to 344,740 kPa)
- Rise time <1.5 µsec
- Resonant frequency >1M Hz

Series 132
- Shock wave time-of-arrival ICP® microsensors
- 50 psi (344 kPa) range
- Rise time <3 µsec
- Resonant frequency >1M Hz
- 0.124" (3.15 mm) diameter diaphragm

Series 134
- Designed for reflected shock wave pressure measurement
- Unique non-resonating design, Tourmaline sensing element
- Pressure ranges from 1000 to 20k psi (6894 to 137,900 kPa)
- Rise time ≤ 0.2 µsec

Mounting Adaptors

061A01 (3/8-24)
061A10 (M10)
062A01 (1/8-NPT)

061A59 (3/8-24 Acetal, Ground Isolated)

064B02 Water Cooled, Flush Mount

Recommended Signal Conditioners for High Frequency Pressure Sensors

Model 482A21
- Single & 4-channel versions
- Unity gain, low-noise, AC and DC powerable
- 1M Hz response

Series 482C & 483C
- AC-powered
- 4- & 8-channel versions
- Variety of gain & filtering configurations
- Can operate with charge output sensors
- 1M Hz response (482C05 and 483C05 models only)

Series 481A
- AC-powered
- 16-channel
- Many configuration options
- Can operate with charge output sensors
- Daisy-link multiple racks for up to 256 channels
- 1M Hz response (481A20 model only)

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AS9100 CERTIFIED ■ ISO 9001 CERTIFIED ■ A2LA ACCREDITED to ISO 17025

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PCB® Piezotronics Test & Measurement Pressure product offering includes piezoelectric, strain gage and thin-film pressure sensors for research & development, test, measurement, monitoring, and control requirements. Piezoelectric sensors measure rapid transients, pulsations, turbulence, noise, spikes, combustion, explosions, cavitation, blast shock waves, and other such pressures. Strain gage and thin-film pressure sensors measure static or slowly changing test and process pressures. Additional Test & Measurement products include sensors for acoustics, force, load, strain, torque, acceleration, shock, vibration, and supporting electronics. PCB® products are backed by our **Total Customer Satisfaction** policy, which guarantees your satisfaction or your money refunded.

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