PCB PIEZOTRONICS
AN AMPHENOL COMPANY

SERIES **260 & 261**

3-COMPONENT DYNAMIC FORCE SENSORS

- Standard ranges available up to 10,000 lbf in the Z axis and 4000 lbf in the X and Y axis
- Hermetically Sealed Stainless Steel Construction
- ICP® and Charge Output Versions
- Electrically Isolated

TYPICAL APPLICATIONS

- Automotive Chassis and Other Vehicle Dynamic Measurements
- Monitor Cutting Tool Forces and Detect Tool Wear
- Provide Feedback for Force Limited Vibration Testing
- Measure Input Forces for Modal Analysis and Structural Testing
- Assess and Study Biomechanic Ability, Chart Therapy Progress
- Monitor Machine and Engine Mounts for Imbalance or Looseness
- Measure Impact Forces During Drop Testing and Crash Testing

CONDUCT SIMULTANEOUS FORCE MEASUREMENTS IN THREE ORTHOGONAL DIRECTIONS

Triaxial, ground isolated, dynamic force sensors are offered in both ICP® and charge output configurations for dynamic and quasi-static force measurement applications. Each utilizes an array of precision-aligned, quartz sensing crystals. Measurements along the z-axis are proportional to applied compression, tension and impact forces. Measurements along the x and y axes are proportional to shear forces that are imposed upon preloaded crystals by the test fixture.

ICP® models contain built-in microelectronic signal conditioning circuitry to provide clean, low-impedance output signals that can be transmitted over low cost cables and in adverse, industrial environments. Multi-pin connectors facilitate a single point hookup with common, multi-conductor cable. Charge output styles achieve higher temperature operation, and are suitable for applications requiring flexible setup and maximum signal-to-noise.

Versions are available with ranges up to 10,000 lb (45 kN) in the z-axis (perpendicular to top surface) and to 4000 lb (18 kN) in the x- and y-axes. Both ICP® and charge output styles are available. The 260 series is supplied with both an imperial and metric bolt. The 261 series is available with either imperial or metric mounting holes. The 260B and 261B series feature electrical isolation.

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

3-COMPONENT ICP® AND CHARGE OUTPUT QUARTZ FORCE RING STYLES

Model 260B01 | Model 260B02 | Model 260B03 | Model 260B11 | Model 260B12 | Model 260B13

TRIAXIAL, GROUND ISOLATED, QUARTZ FORCE SENSORS							
		ICP®			Charge		
Model Number		**260B01**	**260B02**	**260B03**	**260B11**	**260B12**	**260B13**
Performance							
Compression or Tension Range (z-axis)	lb (N)	1000 (4450)	1000 (4450)	10k (45k)	1000 (4450)	1000 (4450)	10k (45k)
Shear Range (x-, y-axis)	lb (N)	500 (2220)	1000 (4450)	4000 (18k)	500 (2220)	1000 (4450)	4000 (18k)
Maximum Compression or Tension (z-axis)	lb (N)	1320 (5870)	1320 (5870)	11k (49k)	1320 (5870)	1320 (5870)	11k (49k)
Maximum Shear (x-, y-axis)	lb (N)	660 (2940)	1100 (4890)	4400 (20k)	660 (2940)	1100 (4890)	4400 (20k)
Sensitivity (± 20%) (z-axis)	–	2.5 mV/lb 0.56 mV/N	2.5 mV/lb 0.56 mV/N	0.25 mV/lb 0.06 mV/N	15 pC/lb 3.4 pC/N		
Sensitivity (± 20%) (x-, y-axis)	–	10 mV/lb 2.25 mV/N	5 mV/lb 1.12 mV/N	1.25 mV/lb 0.28 mV/N	32 pC/lb 7.2 pC/N		
Resolution (broadband) (z-axis) (x-, y-axis)	lb (N) rms	0.006 (0.027) 0.002 (0.009)	0.005 (0.022) 0.003 (0.013)	0.05 (0.22) 0.01 (0.045)	see note [2]		
Amplitude Linearity	% FS	≤1					
Cross-Talk Fx ÷ Fy Fx, Fy ÷ Fz	%	±3 ±5					
Low Frequency Response (-5%) (z-axis) (x-, y-axis)	Hz Hz	0.01 0.001			see note [2]		
Environmental Specifications							
Temperature Range	°F °C	-65 to +250 -54 to +121			-100 to +350 -73 to +177		
Electrical Specifications							
Discharge Time Constant [1] (z-axis) (x-, y-axis)	seconds	≥50 ≥500			see note [2]		
Output Impedance	ohm	≤100			N/A		
Output Bias Voltage	+VDC	8 to 14			N/A		
Voltage Excitation	+VDC	20 to 30			N/A		
Constant Current Excitation	mA	2 to 20			N/A		
Capacitance (all axes)	pF	N/A			18	30	70
Insulation Resistance	ohm	N/A			$>10^{12}$		
Electrical Isolation	ohm	$\geq 10^{8}$					
Polarity (in direction of markings)		positive			negative		
Physical Specifications							
Recommended Pre-Load [3]	lb (N)	5000 (22k)	10k (44.5k)	40k (178k)	5000 (22k)	10k (44.5k)	40k (178k)
Connector	type	4-pin Jack			(3) 10-32 Jack		
Stiffness (z-axis) (x-, y-axis)	lb/µin (kN/µm)	10 (1.75) 2.5 (0.440)	19 (3.3) 6 (1.0)	39 (7) 11 (2)	10 (1.75) 2.5 (0.440)	19 (3.3) 6 (1.0)	39 (7) 11 (2)
Sealing	type	hermetic weld					
Material	type	17-4 stainless steel					
Maximum Moment (z-axis)	ft-lb (N-m)	16 (21.7)	58 (78.6)	375 (508.4)	16 (21.7)	58 (78.6)	375 (508.4)
Maximum Moment (x-, y-axis)	ft-lb (N-m)	37 (50.2)	96 (130.2)	940 (1274.5)	37 (50.2)	96 (130.2)	940 (1274.5)
Weight	oz (gm)	0.94 (27)	1.59 (45)	9.6 (271)	0.87 (24.6)	1.5 (42.5)	9.9 (280)
Supplied Accessories							
Mounting Stud (beryllium-copper)	model	081A70 | M081A70	081A74 | M081A74	081A71 | M081A71	081A70 | M081A70	081A74 | M081A74	081A71 | M081A71
Mounting Stud Thread	size	5/16-24 | M8x1.25	1/2-20 | M12x1.25	7/8-14 | M24x3	5/16-24 | M8x1.25	1/2-20 | M12x1.25	7/8-14 | M24x3
Anti-Friction Washer	model	082B02	082M12	082B06	082B02	082M12	082B06
Pilot Bushing	model	083A10	083A13	083A11	083A10	083A13	083A11
Optional Models							
Reverse Shear Polarity	model	–			260B31	260B32	260B33

Notes: [1] The Discharge Time Constant (DTC) determines low frequency response according to the relationship f-5%=3/(2π(DTC)). Sensors accurately follow transient events lasting a few percent of the DTC. For square wave events, the DTC should be 100 times the event duration. For ramp shape events, the DTC should be 50 times the event duration and for a half sine pulse the DTC should be 25 times the pulse duration. To ensure measurement system compatibility, use DC coupled or Long Time Constant signal conditioners for long duration transient measurements. [2] Resolution, System Discharge Time Constant and Low Frequency range are dependent upon sensor cable and signal conditioning used. [3] Recommended pre-load is required to meet published specification and calibration.

3-COMPONENT ICP® AND CHARGE OUTPUT FORCE LINK STYLES


Model 261B01


Model 261B11


Model 261B02


Model 261B12


Model 261B03


Model 261B13

TRIAXIAL, GROUND ISOLATED, QUARTZ FORCE LINKS							
		ICP®			Charge		
Model Number		**261B01**	**261B02**	**261B03**	**261B11**	**261B12**	**261B13**
Performance							
Compression or Tension Range (z-axis)	lb (N)	1000 (4450)	1000 (4450)	10k (45k)	1000 (4450)	1000 (4450)	10k (45k)
Shear Range (x-, y-axis)	lb (N)	500 (2220)	1000 (4450)	4000 (18k)	500 (2220)	1000 (4450)	4000 (18k)
Maximum Compression or Tension (z-axis)	lb (N)	1320 (5870)	1320 (5870)	11k (49k)	1320 (5870)	1320 (5870)	11k (49k)
Maximum Shear (x-, y-axis)	lb (N)	660 (2940)	1000 (4890)	4400 (20k)	660 (2940)	1100 (4890)	4400 (18k)
Sensitivity (± 20%) (z-axis)	–	2.5 mV/lb 0.56 mV/N	2.5 mV/lb 0.56 mV/N	0.25 mV/lb 0.06 mV/N	15 pC/lb 3.4 pC/N		
Sensitivity (± 20%) (x-, y-axis)	–	10 mV/lb 2.25 mV/N	5 mV/lb 1.1 mV/N	1.25 mV/lb 0.28 mV/N	32 pC/lb 7.2 pC/N		
Resolution (broadband) (z-axis) (x-, y-axis)	lb (N) rms	0.006 (0.027) 0.002 (0.009)	0.005 (0.022) 0.003 (0.013)	0.05 (0.222) 0.01 (0.040)	see note [2]		
Amplitude Linearity	% FS	≤1					
Cross-Talk Fx ÷ Fy Fx, Fy ÷ Fz	% %	±3 ±5					
Low Frequency Response (-5%) (z-axis) (x-, y-axis)	Hz Hz	0.01 0.001			see note [2]		
Environmental Specifications							
Temperature Range	°F °C	-65 to +250 -54 to +121			-100 to +350 -73 to +177		
Electrical Specifications							
Discharge Time Constant [1] (z-axis) (x-, y-axis)	seconds	≥50 ≥500			see note [2]		
Output Impedance	ohm	≤100			N/A		
Output Bias Voltage	+VDC	8 to 14			N/A		
Voltage Excitation	+VDC	20 to 30			N/A		
Constant Current Excitation	mA	2 to 20			N/A		
Capacitance (all axes)	pF	N/A			18	30	70
Electrical Isolation	ohm	≥10^8			≥10^8		
Polarity (in direction of markings)	–	positive			negative		
Physical Specifications							
Connector	type	4-pin Jack			(3) 10-32 Jack		
Stiffness (z-axis) (x-, y-axis)	lb/µin (kN µm)	4.9 (0.860) 1.9 (0.33)	7.2 (1.26) 2.9 (0.51)	15 (2.63) 5.5 (0.96)	4.9 (0.860) 1.9 (0.33)	7.2 (1.26) 2.9 (0.51)	15 (2.63) 5.5 (0.96)
Stiffness (rz-axis) (rx-, ry-axis)	lbf*in/radian (N*m/radian)	3.4E5 (3.8E4) 7.5E5 (8.5E4)	9.4E5 (1.1E5) 2.8E5 (3.2E5)	7.1E6 (8.0E5) 1.7E7 (1.9E6)	3.4E5 (3.8E4) 7.5E5 (8.5E4)	9.4E5 (1.1E5) 2.8E5 (3.2E5)	7.1E6 (8.0E5) 1.7E7 (1.9E6)
Coupled Stiffness (x-ry-, y-rx-axis)	lbf*in/µin (N*m/µm)	1.0 (4.4)	2.5 (11)	7.9 (35)	1.0 (4.4)	2.5 (11)	7.9 (35)
Sealing	type	hermetic weld					
Material	type	17-4 stainless steel					
Maximum Moment (z-axis)	ft-lb (N-m)	16 (21.7)	58 (78.6)	375 (508.4)	16 (21.7)	58 (78.6)	375 (508.4)
Maximum Moment (x-, y-axis)	ft-lb (N-m)	37 (50.2)	96 (130.2)	940 (1274.5)	37 (50.2)	96 (130.2)	940 (1274.5)
Weight	oz (gm)	13.6 (386)	34.4 (975)	108.7 (3080)	13.6 (386)	34.4 (975)	108.7 (3080)
Mounting Holes		1/4-28 UNF-2B	5/16-24 UNF-2B	3/8-24 UNF-2B	1/4-28 UNF-2B	5/16-24 UNF-2B	3/8-24 UNF-2B
Options	**prefix**	**Metric**					
Model Number	M	M261B01	M261B02	M261B03	M261B11	M261B12	M261B13
Mounting Holes		M6x1.0-6H	M8x1.25-6H	M10x1.5-6H	M6x1.0-6H	M8x1.25-6H	M10x1.5-6H

Notes: [1] The Discharge Time Constant (DTC) determines low frequency response according to the relationship f-5%=3/(2π(DTC)). Sensors accurately follow transient events lasting a few percent of the DTC. For square wave events, the DTC should be 100 times the event duration. For ramp shape events, the DTC should be 50 times the event duration and for a half sine pulse the DTC should be 25 times the pulse duration. To ensure measurement system compatibility, use DC coupled or Long Time Constant signal conditioners for long duration transient measurements. [2] Resolution, System Discharge Time Constant and Low Frequency range are dependent upon sensor cable and signal conditioning used.

4-CHANNEL, LINE-POWERED, ICP® SENSOR SIGNAL CONDITIONER

MODEL 482C15

Sensor Input Type: ICP®, Voltage
Voltage Gain: x1, x10, x100
Adjustable ICP® current
Optional input filtering

4-CHANNEL, LINE-POWERED, ICP® & CHARGE SENSOR SIGNAL CONDITIONER

MODEL 482C54

Sensor Input Type: ICP®, Charge
Voltage Gain: x0 to x200 Gain
Frequency Range (-5%): 0.05 to 75000 Hz
DC Power: +9 to +18 VDC

8-CHANNEL, LINE-POWERED, ICP® SENSOR SIGNAL CONDITIONER

MODEL 483C15

Sensor Input Type(s): ICP®, Voltage
Voltage Gain (±1%): x1, x10, x100
Optional input filtering
Power Required: AC Power

8-CHANNEL, LINE-POWERED, ICP® & CHARGE SENSOR SIGNAL CONDITIONER

MODEL 483C30

Sensor Input Type(s): ICP®, Voltage, Charge
Voltage Gain: x0.1 to x200
TEDS Sensor Support: Yes
Power Required: AC Power

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