

3-Component Quartz Force Rings and Links 260 & 261 Series



Highlights

- Measure 3-Orthogonal Forces Simultaneously
- Stainless Steel Construction
- Hermetically Sealed
- Choice of ICP® or Charge Versions

Three-component quartz force ring sensors are capable of simultaneously measuring dynamic force in three orthogonal directions (X, Y, and Z). They contain three sets of quartz plates that are stacked in a preloaded arrangement. Each set responds to the vector component of an applied force acting along its sensitive axis. 3-component ring force sensors must be statically pre-loaded for optimum performance. Pre-loading provides the sensing elements with the compressive loading required to allow the proper transmission of shear forces. Versions are available with ranges up to 10k lb (45 kN) in the z-axis (perpendicular to the top surface), and up to 4000 lb (18 kN) in the x-and y (shear) axes. Both ICP® and charge output styles are available.

Three-component force links eliminate the preload requirement of 3-component quartz force ring sensors, and offers a convenient, 4-screw hole mounting plate on each side end the sensor. Quartz 3-component force links are constructed by installing a 3-component force ring sensor, under pre-load, between two mounting plates.

An elastic, beryllium-copper stud holds this stainless steel assembly together. The use of this elastic stud permits the applied force to be sensed by the crystals with a minimal amount of shunted force. The stud also provides the necessary normal force, and thus friction required to transmit shear forces in the x- and y-axes. Since 3-component force links are factory pre-loaded, they may be used directly for measurements of compression and tension in the z-axis, a positive and negative forces in the x- and y-axes. Versions are available with ranges up to 10k lb (45 kN) in the z-axis (perpendicular to the top surface), and up to 4000 lb (18 kN) in the x- and y-axes. Both ICP® and charge output styles are available. ICP® designs utilize built-in microelectronic circuitry that provides a low-impedance voltage output via a multipin connector. This arrangement offers system simplicity by requiring only a single multi-conductor sensor cable. The low-impedance voltage signal makes this sensor ideal for use in harsh industrial environments.

Charge output 3-component force sensors operate with in-line charge converters or conventional laboratory-style charge amplifiers. The use of laboratory-style charge amplifiers permits each channel to be independently ranged by the user to maximize signal-to-noise ratio. Charge output styles are recommended for higher temperature applications and can also be used for quasi-static measurements with long discharge time constant charge amplifiers.

Hochwertige Messtechnik und Beratung aus einer Hand

 **PCB SYNOTECH** GmbH

PCB Synotech GmbH
Porschestr. 20 – 30 ■ 41836 Hückelhoven
Tel.: +49 (0) 24 33/44 44 40 – 0
E-Mail: info@synotech.de ■ www.synotech.de

3-Component Quartz Force Rings

Applications

- Force Limited Vibration Testing
- Engine Mount Analysis
- Cutting Tool Forces
- Biomechanics
- Force Dynamometer
- Modal analysis



3-Component Quartz Force Rings

Model Number	260A01	260A02	260A03	260A11	260A12	260A13
Measurement Range (z axis)	1000 lb 4.45 kN	1000 lb 4.45 kN	10k lb 44.48 kN	1000 lb 4.45 kN	1000 lb 4.45 kN	10k lb 44.48 kN
Measurement Range (x or y axis)	500 lb 2.22 kN	1000 lb 4.45 kN	4000 lb 17.79 kN	500 lb 2.22 kN	1000 lb 4.45 kN	4000 lb 17.7 kN
Sensitivity (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 3.37 pC/N	32 pC/lb 7.19 pC/N	15 pC/lb 3.37 pC/N
Sensitivity (x or 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 7.19 pC/N	15 pC/lb 3.37 pC/N	32 pC/lb 7.19 pC/N
Maximum Force (z axis)	1320 lb 5.87 kN	1320 lb 5.87 kN	11 klb 48.93 kN	1320 lb 5.87 kN	1320 lb 5.87 kN	11 klb 48.93 kN
Maximum Force (x or y axis)	660 lb 2.94 kN	1000 lb 4.45 kN	4400 lb 19.57 kN	660 lb 2.94 kN	1000 lb 4.45 kN	4400 lb 19.57 kN
Maximum Moment (z axis)	14 ft-lb 18.98 N-m	40 ft-lb 54.23 N-m	240 ft-lb 325.4 N-m	14 ft-lb 18.98 N-m	40 ft-lb 54.23 N-m	240 ft-lb 325.4 N-m
Maximum Moment (x or y axis)	13 ft-lb 17.63 N-m	70 ft-lb 94.91 N-m	325 ft-lb 440.7 N-m	13 ft-lb 17.63 N-m	70 ft-lb 94.91 N-m	325 ft-lb 440.7 N-m
Broadband Resolution (z axis)	0.006 lb-rms 0.027 N-rms	0.006 lb-rms 0.027 N-rms	0.05 lb-rms 0.222 N-rms	[1]	[1]	[1]
Broadband Resolution (x or y axis)	0.002 lb-rms 0.0089 N-rms	0.006 lb-rms 0.027 N-rms	0.01 lb-rms 0.04 N-rms	[1]	[1]	[1]
Upper Frequency Limit	90 kHz	90 kHz	39 kHz	90 kHz	90 kHz	39 kHz
Low Frequency Response (-5%) (z axis)	0.01 Hz	0.01 Hz	0.01 Hz	[2]	[2]	[2]
Low Frequency Response (-5%) (x or y axis)	0.001 Hz	0.001 Hz	0.001 Hz	[2]	[2]	[2]
Discharge Time Constant (z axis)	≥ 50 sec	≥ 50 sec	≥ 50 sec	—	—	—
Discharge Time Constant (x or y axis)	≥ 500 sec	≥ 500 sec	≥ 500 sec	—	—	—
Non-Linearity	≤ 1% FS	≤ 1% FS	≤ 1% FS	≤ 1% FS	≤ 1% FS	≤ 1% FS
Temperature Range	-65 to +250 °F -54 to +121 °C	-65 to +250 °F -54 to +121 °C	-65 to +250 °F -54 to +121 °C	-100 to +350 °F -73 to +177 °C	-100 to +350 °F -73 to +177 °C	-100 to +350 °F -73 to +177 °C
Stiffness (z axis)	10 lb/μin 1.75 kN/μm	19 lb/μin 3.3 kN/μm	40 lb/μin 7 kN/μm	10 lb/μin 1.75 kN/μm	19 lb/μin 3.3 kN/μm	40 lb/μin 7 kN/μm
Stiffness (x or y axis)	4 lb/μin 0.7 kN/μm	6 lb/μin 1 kN/μm	15 lb/μin 2.6 kN/μm	4 lb/μin 0.7 kN/μm	6 lb/μin 1 kN/μm	15 lb/μin 2.6 kN/μm
Housing Material	Stainless Steel	Stainless Steel	Stainless Steel	Stainless Steel	Stainless Steel	Stainless Steel
Sealing	Hermetic	Hermetic	Hermetic	Hermetic	Hermetic	Hermetic
Electrical Connector(s)	1/4-28 4-Pin Jack	1/4-28 4-Pin Jack	1/4-28 4-Pin Jack	10-32 Coaxial Jacks	10-32 Coaxial Jacks	10-32 Coaxial Jacks
Size (Length x Width x Height)	1.075 x 0.95 x 0.39 27.3 x 24.1 x 9.9	1.35 x 1.25 x 0.39 34.3 x 31.8 x 9.9	2.25 x 2.25 x 0.79 57.1 x 57.1 x 20.07	0.95 x 0.95 x 0.39 24.1 x 24.1 x 9.9	1.25 x 1.25 x 0.39 31.8 x 31.8 x 9.9	2.25 x 2.25 x 0.79 57.1 x 57.1 x 20.07
Weight	26 gm	45 gm	271 gm	25 gm	43 gm	280 gm
Supplied Accessories						
Mounting Stud	081A70	081A74	081A71	081A70	081A74	081A71
Anti-Friction Washer	082B02	082M12	082B06	082B02	082M12	082B06
Pilot Bushing	083A10	083A13	083A11	083A10	083A13	083A11
Additional Versions						
Metric Mounting Thread	M260A01	M260A02	M260A03	M260A11	M260A12	M260A13
Additional Accessories						
Mating Cable Connector	AY	AY	AY	EB	EB	EB
Recommended Cable	010	010	010	003 CE	003 CE	003 CE

Notes

[1] Resolution is dependent upon cable length and signal conditioner [2] Low frequency is dependent upon system discharge time constant

Hochwertige Messtechnik und Beratung aus einer Hand



PCB Synotech GmbH
 Porschestra. 20 – 30 ▪ 41836 Hückelhoven
 Tel.: +49 (0) 24 33/44 44 40 – 0
 E-Mail: info@synotech.de ▪ www.synotech.de

3-Component Quartz Force Links







Highlights

- Easy flange mounting
- Fixed preloaded assembly
- Measures 3 orthogonal (Fx, Fy, Fz)
- ICP® & charge models
- English & metric models

Applications

- Impact Testing
- Biomechanics
- Force Plates
- Force-limited Vibration
- Vehicle Dynamics
- Cutting Tool Force Monitoring

3-Component Quartz Force Links

						
Model Number	261A01	261A02	261A03	261A11	261A12	261A13
Measurement Range (z axis)	1000 lb 4.45 kN	1000 lb 4.45 kN	10k lb 44.48 kN	1000 lb 4.45 kN	1000 lb 4.45 kN	10k lb 44.48 kN
Measurement Range (x or y axis)	500 lb 2.22 kN	1000 lb 4.45 kN	4000 lb 17.79 kN	500 lb 2.22 kN	1000 lb 4.45 kN	4000 lb 17.7 kN
Sensitivity (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 3.37 pC/N	32 pC/lb 7.19 pC/N	15 pC/lb 3.37 pC/N
Sensitivity (x or 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 7.19 pC/N	15 pC/lb 3.37 pC/N	32 pC/lb 7.19 pC/N
Maximum Force (z axis)	1320 lb 5.87 kN	1320 lb 5.87 kN	11k lb 48.93 kN	1320 lb 5.87 kN	1320 lb 5.87 kN	11k lb 48.93 kN
Maximum Force (x or y axis)	660 lb 2.94 kN	1000 lb 4.45 kN	4400 lb 19.57 kN	660 lb 2.94 kN	1000 lb 4.45 kN	4400 lb 19.57 kN
Maximum Moment (z axis)	14 ft-lb 18.98 N-m	40 ft-lb 54.23 N-m	240 ft-lb 325.4 N-m	14 ft-lb 18.98 N-m	40 ft-lb 54.23 N-m	240 ft-lb 325.4 N-m
Maximum Moment (x or y axis)	13 ft-lb 17.63 N-m	70 ft-lb 94.91 N-m	325 ft-lb 440.7 N-m	13 ft-lb 17.63 N-m	70 ft-lb 94.91 N-m	325 ft-lb 440.7 N-m
Broadband Resolution (z axis)	0.006 lb-rms 0.027 N-rms	0.006 lb-rms 0.027 N-rms	0.05 lb-rms 0.222 N-rms	[1]	[1]	[1]
Broadband Resolution (x or y axis)	0.002 lb-rms 0.0089 N-rms	0.006 lb-rms 0.027 N-rms	0.01 lb-rms 0.04 N-rms	[1]	[1]	[1]
Upper Frequency Limit	10 kHz	10 kHz	10 kHz	10 kHz	10 kHz	10 kHz
Low Frequency Response (-5%) (z axis)	0.01 Hz	0.01 Hz	0.01 Hz	[2]	[2]	[2]
Low Frequency Response (-5%) (x or y axis)	0.001 Hz	0.001 Hz	0.001 Hz	[2]	[2]	[2]
Discharge Time Constant (z axis)	≥ 50 sec	≥ 50 sec	≥ 50 sec	N/A	N/A	N/A
Discharge Time Constant (x or y axis)	≥ 500 sec	≥ 500 sec	≥ 500 sec	N/A	N/A	N/A
Non-Linearity	≤ 1% FS	≤ 1% FS	≤ 1% FS	≤ 1% FS	≤ 1% FS	≤ 1% FS
Temperature Range	-65 to +250 °F -54 to +121 °C	-65 to +250 °F -54 to +121 °C	-65 to +250 °F -54 to +121 °C	-100 to +350 °F -73 to +177 °C	-100 to +350 °F -73 to +177 °C	-100 to +350 °F -73 to +177 °C
Stiffness (z axis)	10 lb/μin 1.75 kN/μm	19 lb/μin 3.3 kN/μm	40 lb/μin 7 kN/μm	10 lb/μin 1.75 kN/μm	19 lb/μin 3.3 kN/μm	40 lb/μin 7 kN/μm
Stiffness (x or y axis)	4 lb/μin 0.7 kN/μm	6 lb/μin 1 kN/μm	15 lb/μin 2.6 kN/μm	4 lb/μin 0.7 kN/μm	6 lb/μin 1 kN/μm	15 lb/μin 2.6 kN/μm
Housing Material	Stainless Steel	Stainless Steel	Stainless Steel	Stainless Steel	Stainless Steel	Stainless Steel
Sealing	Hermetic	Hermetic	Hermetic	Hermetic	Hermetic	Hermetic
Electrical Connector(s)	1/4-28 4-Pin Jack	1/4-28 4-Pin Jack	1/4-28 4-Pin Jack	10-32 Coaxial Jacks	10-32 Coaxial Jacks	10-32 Coaxial Jacks
Size (Length x Width x Height)	1.65 x 1.65 x 1.65 in 42 x 42 x 42 mm	2.16 x 2.16 x 2.35 in 55 x 55 x 60 mm	3.15 x 3.15 x 3.54 in 80 x 80 x 90 mm	1.65 x 1.65 x 1.65 in 42 x 42 x 42 mm	2.16 x 2.16 x 2.35 in 55 x 55 x 59.60 mm	3.15 x 3.15 x 3.54 in 80 x 80 x 90 mm
Weight	386 gm	975 gm	2994 gm	386 gm	975 gm	2994 gm
Mounting	1/4-28 Thread	5/16-24 Thread	3/8-24 Thread	1/4-28 Thread	5/16-24 Thread	3/8-24 Thread
Additional Versions						
Metric Mounting Threads	M261A01	M261A02	M261A03	M261A11	M261A12	M261A13
Additional Accessories						
Mating Cable Connectors	AY	AY	AY	EB	EB	EB
Recommended Cables	010	010	010	003 CE	003 CE	003 CE
Notes						
[1] Resolution is dependent upon cable length and signal conditioner [2] Low frequency is dependent upon system discharge time constant						

Hochwertige Messtechnik und Beratung aus einer Hand



PCB Synotech GmbH
 Porschestra. 20 – 30 ▪ 41836 Hückelhoven
 Tel.: +49 (0) 24 33/44 44 40 – 0
 E-Mail: info@synotech.de ▪ www.synotech.de