K-Beam® Accelerometer

Capacitive MEMS, Single Axis Accelerometer

Type 8315A... is a high sensitivity, low noise, single axis accelerometer family which measures acceleration and/or low-frequency vibration in the primary sensing axis. The accelerometer features include:

- Measuring ranges: ±2 g, ±10 g, ±30 g, ±50 g, ±100 g, ±200 g
- Frequency response: 0 ... 1 000 Hz (6 %) (except ±2 g)
- Bipolar ±4 V, single ended 2.5 V ±2 V and ±4 V or ±8 V differential accelerometer output options
- Operating temperature −55 ... 125 °C
- Low noise
- Excellent thermal stability
- 25.4x21.6 mm footprint
- Wide supply voltage range, 5 ... 50 VDC
- 6 000 gpk shock rated
- Conforming to CE

Description

Type 8315A... capacitive accelerometer family utilizes a silicon Micro-Electro-Mechanical System (MEMS) variable capacitance sensing element. The sensing element of each axis, consists of a very small inertial mass and a flexure element cantilever positioned between two plates. As the mass deflects under acceleration, the capacitance between these plates changes. AC excitation and synchronous amplitude demodulation circuitry contained in the accelerometer's internal signal conditioner provides an analog output signal proportional to the applied acceleration. This output signal is scaled as a voltage which is proportional to the applied acceleration.

There are 3 housing/electrical interface options (AC, TA, TB) which determine the available output signal formats. The accelerometer is powered by a single regulated supply between 6 and 50 VDC (+5 VDC supply options are available on demand).

The AC option is a hard anodized aluminum housing with an epoxy seal and an integral PVC cable. The maximum temperature range is +85 °C and the available output signal formats are bipolar 0 ±4 V, single ended 2.5 ±2 V and differential 0±4 V or 0±8 V. The sensing element and electronics are contained in this lightweight housing with an environmental seal and integral ground isolation.

The TA and TB options offer a welded titanium housing with either an industry standard 4 pin, ¼-28 connector or integral PTFE jacketed cable. The maximum temperature range is +125 °C and the available output signal formats are bipolar 0 ±4 V (with temperature output), single ended 2.5 ±2 V (with temperature output) and differential 0±4V or 0±8V. Temperature output is provided if external compensation of the output signal is desired. The sensing element and electronics are contained in a lightweight, welded titanium housing for a fully hermetic design with integral ground isolation. For adhesive mounting, the hard anodized plate, at the bottom of the sensor provides ground isolation. For screw mounting, the sensors are supplied with integral isolation inserts in the screw holes to ensure a ground isolated mount in combination with the hard anodized plate on the bottom of the sensor.
Application
Type 8315A... is an instrument grade, single axis accelerometer. As such, Type 8315A... is well suited for a wide variety of R&D and OEM applications requiring precision measurements and packaging designed for demanding application and handling needs.

In particular, the sensor design is optimized for low frequency applications common to Aviation/Aerospace, Automotive, Civil Engineering Structures, Seismic and other R&D studies. In particular, Aviation/Aerospace ground and flight testing often evaluates dynamics and structural vibration to assess performance parameters, reliability and integrity. Automotive laboratory and road testing often evaluates system parameters such as vehicle ride, dynamics and structural analysis to assess performance parameters, reliability and durability. Civil engineering structures such as bridges often are evaluated for structural response to assess the integrity of the bridge to ensure safety. Seismic ground and structural testing is often performed to measure the effect of earthquakes and other natural phenomena. The differential versions are being used for railway comfort or conditional maintenance monitoring applications where halogen free cables are requested as well. Other R&D studies include human motion studies, robotics and platform motion control systems for example.

Mounting
Reliable and accurate measurements require that the mounting surface be clean and flat. The accelerometer can be directly attached to the test structure with the supplied screws for a ground isolated mount or with adhesive. Several optional accessories are offered to mount Type 8315A... Type 8464K01 is an adhesive mounting base with 2, 4-40 threaded holes to mount the sensor with the supplied screws. Type 8464K02 is similar to Type 8464K01 except it has a threaded 10-32 hole to provide a ground isolated stud mount. Type 8464K03 is similar to Type 8464K01 except it provides magnetic mounting for the sensor. Type 8522 is a triaxial mounting cube which is used to provide a biaxial or triaxial solution for Type 8315A family of sensors. The instruction manual for Type 8315A... provides detailed information regarding mounting surface preparation.
## Technical Data

<table>
<thead>
<tr>
<th>Type</th>
<th>Unit</th>
<th>8315A2D0</th>
<th>8315A010</th>
<th>8315A030</th>
<th>8315A050</th>
<th>8315A100</th>
<th>8315A200</th>
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</thead>
<tbody>
<tr>
<td>Acceleration range</td>
<td>g</td>
<td>±2</td>
<td>±10</td>
<td>±30</td>
<td>±50</td>
<td>±100</td>
<td>±200</td>
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<tr>
<td>Frequency response, ±5 %</td>
<td>Hz</td>
<td>0 … 250</td>
<td>0 … 100</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Sensitivity, ±5 % (ref 100 Hz), Output Type A, 0 ±4 V FSO output</td>
<td>mV/g</td>
<td>2 000</td>
<td>400</td>
<td>133,3</td>
<td>80</td>
<td>40</td>
<td>20</td>
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<tr>
<td></td>
<td>Output Type B, 2,5 ±2 V FSO output</td>
<td>mV/g</td>
<td>1 000</td>
<td>200</td>
<td>66,6</td>
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<td>Output Type C, 0 ±4 V FSO differential</td>
<td>mV/g</td>
<td>2 000</td>
<td>400</td>
<td>133,3</td>
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<td>40</td>
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<tr>
<td></td>
<td>Output Type D, 0 ±8 V FSO differential</td>
<td>mV/g</td>
<td>4 000</td>
<td>800</td>
<td>266,6</td>
<td>160</td>
<td>80</td>
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<td>Resonant frequency, nom.</td>
<td>kHz</td>
<td>1,3</td>
<td>2</td>
<td>4</td>
<td>5,1</td>
<td>7,2</td>
<td>11</td>
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<tr>
<td>Transverse sensitivity, typ. (max.)</td>
<td>%</td>
<td>1,0</td>
<td>(3,0)</td>
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<tr>
<td>Sensitive axis misalignment, typ. (max.)</td>
<td>mrad</td>
<td>10</td>
<td>(30)</td>
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<td>Amplitude linearity, (max.)</td>
<td>%FSO</td>
<td>±1</td>
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<td></td>
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<td>Phase shift (max.) @ 0 Hz</td>
<td>degrees</td>
<td>0</td>
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<tr>
<td>Phase shift (max.) @ 10 Hz</td>
<td>degrees</td>
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<td></td>
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<tr>
<td>Phase shift (max.) @ 100 Hz</td>
<td>degrees</td>
<td>20</td>
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<tr>
<td>Noise density, 0 … 100 Hz typ. (max)</td>
<td>mgs/√ Hz</td>
<td>0,025</td>
<td>(0,030)</td>
<td>0,125</td>
<td>(0,15)</td>
<td>0,375</td>
<td>(0,45)</td>
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<tr>
<td>Noise 0 … 100 Hz, (typ.)</td>
<td>mgs</td>
<td>0,25</td>
<td>1,25</td>
<td>3,75</td>
<td>6,25</td>
<td>12,5</td>
<td>25</td>
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<tr>
<td>Resolution (threshold), (typ.)</td>
<td>mgs</td>
<td>0,35</td>
<td>1,75</td>
<td>3,85</td>
<td>8,75</td>
<td>17,5</td>
<td>35</td>
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</tbody>
</table>

### Electrical

- 0 g output, output Type (A; B; C; D) mV: 0 ±60 (A); 2 500 ±60 (B); 0 ±60 (C); 0 ±120 (D)
- Capacitive load, (max.) μF: 0,5
- Load resistance (min.) kΩ: 30
- Output impedance, typ. Ω: 300
- Supply current, (nom.) mA: 1,6
- Supply voltage, temperature VDC: 6 … 50 (≤ 100 °C); 6 … 35 (≤ 110 °C); 6 … 20 (≤ 120 °C); 6 … 12,5 (≤ 125 °C)
- Reverse polarity protection: Yes

### Environmental

- Shock, (half sine, 200 μs) g: 6 000
- Random, (20 … 2 000 Hz) g rms: 20
- Storage temperature range °C: –55 … 125 (TA or TB housing); –55 … 85 (AC housing)
- Operating temperature range °C: –55 … 125 (TA or TB housing); –55 … 85 (AC housing)
- Temp. coeff. sensitivity, typ. (max) ppm/°C: ±100 (±300)
- Temp. coeff. sensitivity, typ. (max) %/°C: ±0,01 (±0,030)
- Temp. coeff. of bias, typ. (max) mg/°C: ±0,1 (±0,8) ±0,5 (±4) ±1,5 (±12) ±2,5 (±20) ±5 (±40) ±10 (±80)
- Temperature sensor
  - Output @ 20 °C V: 1,632
  - Sensitivity mV/°C: –11,77
  - Accuracy °C: ±5

### Physical

- Case: Titanium or anodized Aluminum
- Mounting: 4-40/M3
- Sealing: environmental (AC housing); hermetic (TA or TB housing)
- Ground isolation: Yes
- Weight (excluding cable) grams: 15 (TA or TB housing)/12 (AC housing)
- Cable length tolerance m: ±0,1

Operation of sensor with supply voltage exceeding stated values at indicated temperatures will cause permanent damage to sensor.

Contact Kistler for +5 VDC supply voltage versions.
K-Beam® Accelerometer – Capacitive MEMS, Single Axis Accelerometer, Type 8315A...

Included Accessories

Aluminum Housing
- Mounting screw, M3x12 mm long
- Mounting screw, 4-40 UNC-2A x 1/2" long
- Fiber washer
- Mounting wax

Type/Art. No.
431-0492-003
431-0375-005
434-0318-001
8432

Titanium Housing
- Mounting screw, M3x14 mm long
- Mounting screw, 4-40 UNC-2Ax9/16" long
- Mounting wax

Type/Art. No.
431-0492-004
431-0491-002
8432

Optional Accessories
- Adhesive mounting base (off-ground) with two 4-40 female threaded holes on sensor side
- Mounting base (off-ground) with two 4-40 female threaded holes on sensor side, one 10-32 threaded female thru-hole, with 10-32 stud
- Magnetic mounting base
- Triaxial mounting cube, with 10-32 UNF-2Ax1/2" screw and #10 washer, two 4-40 UNC-2A x 7/16" screws with washers
- Baseplate conversion for backward compatibility to Type 8305/8310/8312 mounting pattern with 10-32 stud
- Flexible shielded breakout cable, silicone jacket (mates with Type 8315 with integral connector option) pigtail wires on opposite end (lengths 2, 5, 10 and sp meters)
- Extension cable, 4-pin 1/4-28 neg. to 4-pin 1/4-28 neg. PTFE jacket
- Output cable, 4-pin neg., 1/4-28 neg. to pigtailes PTFE jacket
- Halogen free output cable, 4 pin neg., 1/4-28 neg. to pigtail

Type/Art. No.
8464K01
8464K02
8464K03
8522
8464K04
1534AxxK00
1592A...
1592M1...
1592M2...

Ordering Key

Type 8315A

Measuring Range
<table>
<thead>
<tr>
<th>Type</th>
<th>2D0</th>
<th>010</th>
<th>030</th>
<th>050</th>
<th>100</th>
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<tbody>
<tr>
<td>±2 g</td>
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<td></td>
<td></td>
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<td></td>
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<tr>
<td>±10 g</td>
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<tr>
<td>±30 g</td>
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<td>±50 g</td>
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<td>±100 g</td>
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<tr>
<td>±200 g</td>
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</tbody>
</table>

Output Type
- 0 ±4 V FSO, no temperature output
- 0 ±4 V FSO, with temperature output
- 2.5 ±2 V FSO, no temperature output
- 2.5 ±2 V FSO with temperature output
- 0 ±4 V FSO differential, no temp. output
- 0 ±8 V FSO differential, no temp. output

Housing/Electrical Interface

Anodized aluminum housing with integral cable (max. temperature to 85 °C)
- (output types A0, B0, C0 + D0 only)
- Titanium housing with 4 pin connector (output types AT, BT, C0 and D0 only)
- Titanium housing with integral cable (PTFE) (output types AT, BT, C0 and D0 only)

Electrical Interface

<table>
<thead>
<tr>
<th>A (pin)</th>
<th>B (wire color)</th>
<th>C (wire color)</th>
<th>Type</th>
<th>Type</th>
<th>Type</th>
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</thead>
<tbody>
<tr>
<td>1</td>
<td>red</td>
<td>red</td>
<td>power</td>
<td>power</td>
<td>power</td>
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<td>2</td>
<td>black</td>
<td>black</td>
<td>return</td>
<td>return</td>
<td>return</td>
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<tr>
<td>3</td>
<td>yellow</td>
<td>green</td>
<td>N/C</td>
<td>temp. output –</td>
<td>output –</td>
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<tr>
<td>4</td>
<td>white</td>
<td>white</td>
<td>output +</td>
<td>output +</td>
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</tr>
<tr>
<td></td>
<td>–</td>
<td>–</td>
<td>N/C</td>
<td>N/C</td>
<td>N/C</td>
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<tr>
<td></td>
<td>–</td>
<td>–</td>
<td>blue</td>
<td>N/C</td>
<td>N/C</td>
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<tr>
<td></td>
<td>–</td>
<td>–</td>
<td>shield</td>
<td>case</td>
<td>case</td>
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</table>

Please contact Kistler for +5 VDC supply options

Measure
Connect
Amplify
Output
Analyze

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