

g ASC 5411LN | ASC 5415LN
MEMS Capacitive Accelerometer



SPECIFICATIONS

- Triaxial
- MEMS Capacitive
- Measurement Range: ± 2 to ± 400 g
- Noise Density: 7 to 400 $\mu\text{g}/\sqrt{\text{Hz}}$
- Frequency Range ($\pm 5\%$): DC to 2000 Hz
- Aluminum or Stainless-Steel Housing
- Made in Germany

MEMS CAPACITIVE ACCELEROMETER

The key components in capacitive accelerometers are high-quality micro-electro-mechanical systems (MEMS) that feature excellent long-term stability and reliability. This technology enables the measurement of static (DC) and constant accelerations, which can be used to calculate the velocity and displacement of moving objects. Depending on the design of the spring-mass-damping system, however, it is also possible to detect dynamic (AC) accelerations with amplitudes up to ± 400 g and within a frequency response range of up to 2 kHz ($\pm 5\%$) or 4.2 kHz (± 3 dB). Other advantages of capacitive accelerometers are their outstanding temperature stability, excellent response behavior and achievable resolution.

DESCRIPTION

The accelerometers of type ASC 5411LN and ASC 5415LN are based on proven MEMS technology and capacitive operating principle. The integrated electronic circuitry enables a differential analog voltage output (± 4 V FSO) and flexible power supply voltage from 6 to 40 VDC. The LN (Low Noise) accelerometers from ASC provide an outstanding noise performance from 7 to 400 $\mu\text{g}/\sqrt{\text{Hz}}$ which is essential for demanding measurements of smallest frequencies and amplitudes.

The sensor ASC 5411LN features a lightweight aluminum housing and the sensor ASC 5415LN provides a robust stainless-steel housing, both with protection class IP65 and an integrated cable with configurable length and connectors.

The triaxial accelerometers enable the detection of smallest acceleration amplitudes in three degrees of freedom, for example for measuring aerodynamic and mass-related imbalances in wind turbines or for evaluation ride comfort in passenger ships.



FEATURES

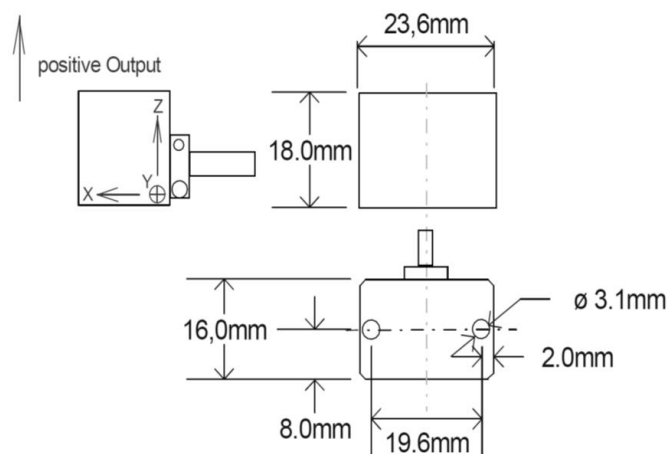
- Very Low Noise Differential Voltage Output
- DC Response, Gas damped
- High Shock Resistance
- Excellent Offset and Scale Factor Stability

OPTIONS

- Customized Cable Length
- Customized Connector
- TEDS Module

APPLICATIONS

- NVH and Operational Stability
- Driving and Ride Comfort Tests
- Vehicle and Running Dynamics





TYPICAL SPECIFICATIONS

Dynamic

| | | | | | | | | | |
|---|--------|--------------------------|----------|-----------|-----------|-----------|-----------|-----------|-----------|
| Measurement Range | g | ±2 | ±5 | ±10 | ±25 | ±50 | ±100 | ±200 | ±400 |
| Scale Factor (sensitivity) | mV/g | 2000 | 800 | 400 | 160 | 80 | 40 | 20 | 10 |
| Noise Density | µg/√Hz | 7 | 12 | 18 | 25 | 50 | 100 | 200 | 400 |
| Specified Frequency Response Range (±5 %) | Hz | 0 to 250 | 0 to 400 | 0 to 700 | 0 to 1300 | 0 to 1600 | 0 to 1700 | 0 to 1900 | 0 to 2000 |
| Frequency Response Range (±3 dB) | Hz | 0 to 525 | 0 to 800 | 0 to 1100 | 0 to 1750 | 0 to 2100 | 0 to 3000 | 0 to 3600 | 0 to 4200 |
| Amplitude Non-Linearity | % FSO | <0.15 (typ) <0.5 (max) | | | | | | | |
| Transverse Sensitivity | % | <2 (typ) <3 (max) | | | | | | | |

Electrical

| | | | | | | | | | |
|---|----|---------------|-----|-----|-----|-----|-----|-----|-----|
| Power Supply Voltage | V | 6 to 40 | | | | | | | |
| Operating Current Consumption | mA | <20 | | | | | | | |
| Offset (bias) | mV | ±80 | ±80 | ±40 | ±40 | ±40 | ±40 | ±40 | ±40 |
| Broadband Noise (over specified frequency range ±5 %) | µV | 225 | 195 | 190 | 145 | 160 | 165 | 175 | 180 |
| Output Impedance | Ω | 90 | | | | | | | |
| Isolation | | Case isolated | | | | | | | |

Environmental

| | | | | | | | | | |
|---|-------|-------------|------|------|------|------|------|------|------|
| Temperature Coefficient of the Scale Factor (max) | ppm/K | ±200 | | | | | | | |
| Temperature Coefficient of the Offset (max) | mg/K | ±0.8 | ±2 | ±4 | ±10 | ±20 | ±40 | ±80 | ±160 |
| Operating Temperature Range | °C | -40 to +100 | | | | | | | |
| Storage Temperature Range | °C | -40 to +100 | | | | | | | |
| Shock Limit (max peak) | g | 2000 | 2000 | 5000 | 5000 | 5000 | 5000 | 5000 | 5000 |
| Protection Class | | IP65 | | | | | | | |

Physical

| | | | | | | | | | |
|------------------------|------|---|--|--|--|--|--|--|--|
| Sensing Element | | MEMS Capacitive | | | | | | | |
| Case Material | | ASC 5411LN: Anodized Aluminum ASC 5415LN: Stainless - Steel | | | | | | | |
| Connector at Cable End | | Optional | | | | | | | |
| Mounting | | Adhesive Screw Holes | | | | | | | |
| Weight (without cable) | gram | ASC 5411LN: 20 ASC 5415LN: 40 | | | | | | | |
| Cable | | 19 gram per meter AWG 30 Polyurethane (PUR) Diameter 4.5 mm | | | | | | | |



SENSOR CALIBRATION

Factory Calibration (supplied with the sensor)

| Part Number | | | | | | | | | | |
|---|------------------|-----|-----|-----|------|------|------|------|------|--|
| Measurement Range (sensor) | g | ±2 | ±5 | ±10 | ±25 | ±50 | ±100 | ±200 | ±400 | |
| Applied Frequency (min) | Hz | 1 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | |
| Applied Frequency (max) | Hz | 100 | 400 | 700 | 1300 | 1600 | 1700 | 1900 | 2000 | |
| Input Amplitude | m/s ² | 5 | 5 | 50 | 100 | 200 | 200 | 200 | 200 | |
| Reference Frequency for Determination of Scale Factor | Hz | 16 | 80 | 80 | 80 | 80 | 80 | 80 | 80 | |

Calibration according DIN ISO 17025 (order separately)

| Part Number | | | | | | | | | | |
|---|------------------|-----|-----|------|------|------|------|------|------|--|
| Measurement Range (sensor) | g | ±2 | ±5 | ±10 | ±25 | ±50 | ±100 | ±200 | ±400 | |
| Applied Frequency (min) | Hz | 0.5 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | |
| Applied Frequency (max) | Hz | 150 | 800 | 1100 | 1750 | 2100 | 3000 | 3600 | 4200 | |
| Input Amplitude | m/s ² | 5 | 5 | 50 | 100 | 200 | 200 | 200 | 200 | |
| Reference Frequency for Determination of Scale Factor | Hz | 16 | 80 | 80 | 80 | 80 | 80 | 80 | 80 | |

Remarks :

- The conversion factor 1 g corresponds to 9.80665 m/s².
- If any other calibration procedure is required, don't hesitate to contact us. Our services include both factory calibration and calibration in accordance with DAkkS guidelines.
- Furthermore, sensors have to be calibrated regularly to ensure accurate and precise results. On request we will be glad to remind you of the next scheduled calibration of your sensors.

Cable Code / Pin Configuration (12 Wire System) including separate Power Supply for all Axes

| Pin | Color Code | Description |
|-----|------------|--|
| 1 | Supply + | Red/Violet X- Axis: power supply voltage + 6 to +40 VDC |
| 2 | Supply - | Black/Violet X- Axis: power GND |
| 3 | Signal + | Green/Violet X- Axis: positive, analog output voltage signal for differential mode |
| 4 | Signal - | White/Violet X- Axis: negative, analog output voltage signal for differential mode |
| 5 | Supply + | Red/Grey Y- Axis: power supply voltage + 6 to +40 VDC |
| 6 | Supply - | Black/Grey Y- Axis: power GND |
| 7 | Signal + | Green/Grey Y- Axis: positive, analog output voltage signal for differential mode |
| 8 | Signal - | White/Grey Y- Axis: negative, analog output voltage signal for differential mode |
| 9 | Supply + | Red Z- Axis: power supply voltage + 6 to +40 VDC |
| 10 | Supply - | Black Z- Axis: power GND |
| 11 | Signal + | Green Z- Axis: positive, analog output voltage signal for differential mode |
| 12 | Signal - | White Z- Axis: negative, analog output voltage signal for differential mode |

Cable Code / Pin Configuration (8 Wire System) including common Power Supply for all Axes

| Pin | Color Code | Description |
|-----|------------|---|
| 1 | Supply + | Power: supply voltage +6 to +40 VDC |
| 2 | Supply - | Power: GND |
| 3 | Signal + | X- Axis: positive, analog output voltage signal for differential mode |
| 4 | Signal - | X- Axis: negative, analog output voltage signal for differential mode |
| 5 | Signal + | Y- Axis: positive, analog output voltage signal for differential mode |
| 6 | Signal - | Y- Axis: negative, analog output voltage signal for differential mode |
| 7 | Signal + | Z- Axis: positive, analog output voltage signal for differential mode |
| 8 | Signal - | Z- Axis: negative, analog output voltage signal for differential mode |

Cable Configuration

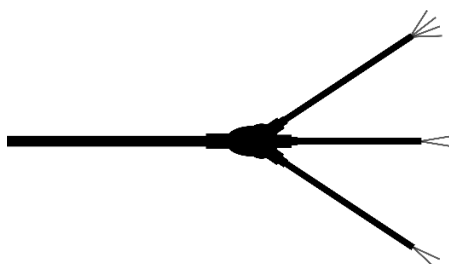
8 Wire System - 8L

Common power supply for all axes, no cable switch



8 Wire System - 8L3

Common power supply for all axes, including cable switch



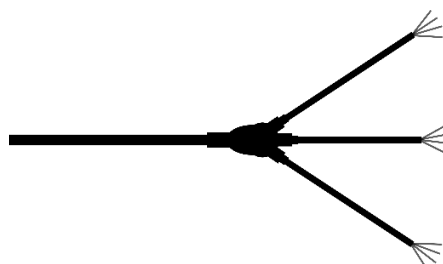
12 Wire System - 12L

Separate power supply for all axes, no cable switch



12 Wire System - 12L3

Separate power supply for all axes, including cable switch



ORDERING INFORMATION

Ordering information are based on standard configurations. The integrated cable features a length of 6 meters and has no connector at the cable end which is identified by "A" in the product match code. However different lengths and the assembling of almost all connector types is possible on request.

| Series | Model | - Range [g] | - Cable Length [m] | Connector & Pinout | - Cable Configuration |
|--------|--------------------------|-------------|--------------------|--------------------|-----------------------|
| ASC 54 | 11LN (Aluminum) | 002 | 6 | A | 8L |
| | 15LN (Stainless - Steel) | 005 | | | 8L3 |
| | | 010 | | | 12L |
| | | 025 | | | 12L3 |
| | | 050 | | | |
| | | 100 | | | |
| | | 200 | | | |
| | | 400 | | | |

Example:

ASC 5411 LN-002-6A-8L

Remark: All customized versions regarding cable length, connector and/or pinout will lead to a corresponding product match code.



■ SAFETY PRECAUTION FOR INSTALLING AND OPERATING

This data sheet is a part of the product. Read the data sheet carefully before using the product and keep it available for future operation. Handling, electrical connections, mounting or any other work performed at the sensor must be carried out by authorized experts only. Appropriate safety precautions must be taken to exclude any risk of personal injury and damage to operating equipment as a result of a sensor malfunction.

Handling

The sensor is packaged in a reliable housing to protect the sensing elements and integrated electronic components from the ambient environment. However, poor handling of the product can lead to damages that may not be visible and cause electrical failure or reliability issues. Handle the component with caution:

- Avoid shocks and impacts on the housing, such as dropping the sensor on hard surface
- Never move the sensor by pulling the cable
- Make sure that the sensor is used within the specified environmental conditions
- Transport and store the sensor in its original or similar packaging
- The sensor should be mounted on a stable flat surface with all screws tightened or other mounting options
- Avoid any deformation during mounting the sensor
- Mounting tolerances may have an influence on the measured result

Electrical

ASC's inertial sensors are working with many established data acquisition systems. However, make sure that a proper DAQ is used, for the corresponding operation principle of the sensor. Furthermore, suitable precautions shall be employed during all phases of shipment, handling and operating:

- Active sensor pins are susceptible to damage due to electrostatic discharge (ESD)
- Make sure that the sensor is used within the specified electrical conditions
- Check all electrical connections prior to initial setup of the sensor
- Completely shield the sensor and connecting cable
- Do not perform any electrical modifications at the sensor
- Do not perform any adaptations on the wiring or connectors while the device under power
- Never plug or unplug the electrical connection while the sensor is under power
- When a certain pin is not used during operation, make sure that the pin is insulated

Quality

- We have a quality management system according to ISO 9001:2015.
- The Deutsche Akkreditierungsstelle GmbH (DAkkS) has awarded to our calibration laboratory the DIN EN ISO/IEC 17025:2018 accreditation for calibrations and has confirmed our competence to perform calibrations in the field of mechanical acceleration measurements. The pictured DAkkS - ILAC logo refers exclusively to the accredited service.
- All ASC products are **CE** - compliant.

