

MEMS Capacitive Accelerometer

ASC ECO CS-x311

Uniaxial, Biaxial, Triaxial

MEMS Capacitive

Measurement Range: ± 2 to ± 40 g

Frequency Range ($\pm 5\%$): DC to 630 Hz

Scale Factor: 0.2 mA/g to 4 mA/g

Aluminum Housing

Made in Germany



MEMS Capacitive Accelerometer

The key components in capacitive accelerometers are high-quality micro-electro-mechanical systems (MEMS). 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 ± 40 g and within a frequency response range of up to 630 Hz ($\pm 5\%$) or 2.4 kHz (± 3 dB).

Description

The accelerometers of type ASC ECO CS-x311 are based on proven MEMS technology and capacitive operating principle. The integrated electronic circuitry enables a single-ended analog current output of 4-20 mA and flexible power supply voltage from 8 to 25 VDC. The models of the ASC ECO CS series feature broadband noise of $< 4.5 \mu\text{A}$ and are used in applications that are requiring extremely long cables (> 100 m) or very high EMC immunity. They featuring a wide frequency response range from 0 Hz to 2.4 kHz (± 3 dB) and an extremely robust design with shock resistance up to 10,000 g.

The sensors feature a lightweight, reliable aluminum housing with protection class IP67 and an integrated cable with configurable length and connectors. The accelerometers are available in uniaxial, biaxial and triaxial configuration.

Due to their loss-free signal transmission, even in the case of very long cables, the sensors of the ASC ECO CS series are also used in civil engineering applications, such as infrastructure monitoring in rail transport or structural analysis of bridges.

Features

- Low Noise Current Output
- Loss-free Signal Transmission
- Very High EMC Immunity
- DC Response, Gas damped
- Very High Shock Resistance

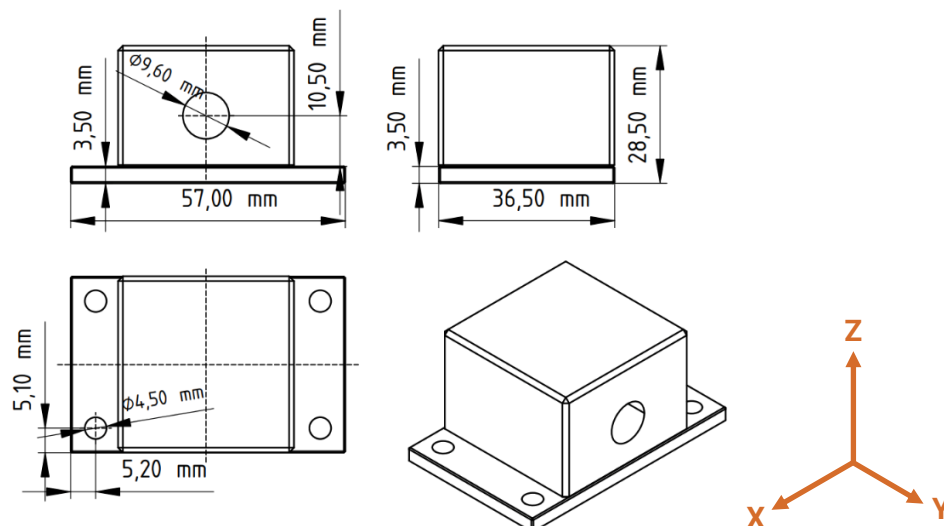
Options

- Customized Cable Length
- Customized Connector
- Stainless Steel Housing
- Selectable Axes Configuration

Applications

- Civil Engineering
- Renewable Energy and Industrial Applications
- Condition Monitoring

More applications in several markets are figured out on our web page www.asc-sensors.de



Typical Specification

Dynamic

Measurement Range	g	±2	±4	±8	±10	±20	±40
Scale Factor (sensitivity)	mA/g	4	2	1	0.8	0.4	0.2
Noise Density	µg/√Hz	35	40	50	120	130	145
Frequency Response Range (±5 %)	Hz	DC to 630					
Frequency Response Range (±3 dB)	Hz	DC to 1500			DC to 2400		
Amplitude Non-Linearity	%	0.1	0.4	1.1	0.1	0.5	1.3
Transverse Sensitivity	%	<1 (typ)					

Electrical

Power Supply Voltage	V	8 to 25					
Operating Current Consumption	mA	<65					
Offset (bias)	mA	12					
Broadband Noise (over typical frequency range ±5 %)	µA	4.5	2.5	1.6	3.0	1.6	0.9
Isolation	Integrated electronic circuitry is isolated from the sensor housing Sensor housing and cable shielding are internally connected						

Environmental

Temperature Coefficient of the Scale Factor (typ)	ppm/K	±100					
Temperature Coefficient of the Offset	mg/K	±0.1 (typ) ±0.15 (max)			±0.2 (typ) ±0.75 (max)		
Operating Temperature Range	°C	-20 to +80					
Storage Temperature Range	°C	-20 to +80					
Shock Limit	g	5000 (0.5 ms, unpowered)			10000 (0.1 ms, unpowered and powered)		
Protection Class	IP67						

Physical

Sensing Element	MEMS Capacitive						
Case Material	Anodized Aluminum						
Connector at Cable End	Optional						
Mounting	Adhesive Screw Holes						
Weight (without cable)	gram	75					
Cable	35 gram per meter 9 x 0.14 mm ² Polyurethane (PUR) Diameter 4.95 mm						

ASC ECO CS-x311

MEMS Capacitive Accelerometer

Sensor Calibration

Factory Calibration (supplied with the sensor)

Part Number		#12054	#17873	#17874	#14496	#17485	#17143
Number of Sensitive Directions		Uniaxial Biaxial			Triaxial		
Measurement Range (sensor)	g	±2	±4 and ±8	±10 to ±40	±2	±4 and ±8	±10 to ±40
Applied Frequency (min)	Hz	1	10	10	1	10	10
Applied Frequency (max)	Hz	100	630	630	100	630	630
Input Amplitude	m/s ²	5	15	50	5	15	50
Reference Frequency for Determination of Scale Factor	Hz	16	80	80	16	80	80

Calibration according DIN ISO 17025 (order separately)

Part Number		#14512	#17876	#17875	#14513	#17877	#17524
Number of Sensitive Directions		Uniaxial Biaxial			Triaxial		
Measurement Range (sensor)	g	±2	±4 and ±8	±10 to ±40	±2	±4 and ±8	±10 to ±40
Applied Frequency (min)	Hz	0.5	10	10	0.5	10	10
Applied Frequency (max)	Hz	150	1500	2400	150	1500	2400
Input Amplitude	m/s ²	5	15	50	5	15	50
Reference Frequency for Determination of Scale Factor	Hz	16	80	80	80	80	80

Please note: The conversion factor 1 g corresponds to 9.80665 m/s². If any other calibration procedure is required, don't hesitate to contact us.

Cable Configuration

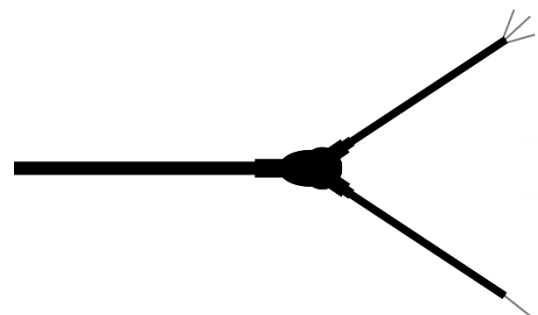
3 Wire System - 3L (Uniaxial)

Common power supply for all axes, no cable switch



4 Wire System - 4L2 (Biaxial)

Common power supply for all axes, including cable switch



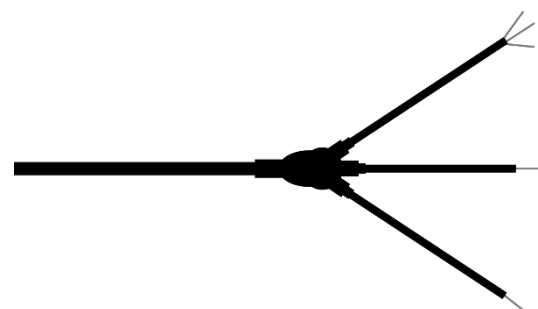
4 Wire System - 4L (Biaxial)

Common power supply for all axes, no cable switch



5 Wire System - 5L3 (Triaxial)

Common power supply for all axes, including cable switch



5 Wire System - 5L (Triaxial)

Common power supply for all axes, no cable switch



Cable Code / Pin Configuration (5 Wire System) including common Power Supply for all Axes

Pin	Color Code	Description
1	Supply +	Red Power: supply voltage +8 to +25 VDC
2	Supply -	Black Power: GND
3	Signal	Violet X-Axis: single-ended, analog output current signal
5	Signal	Yellow Y-Axis: single-ended, analog output current signal
7	Signal	Green Z-Axis: single-ended, analog output current signal

Cable shielding is provided as a tinned-copper braiding which is also internally connected to the sensor housing

The cable code and pin configuration are based on a triaxial sensor. However, referring to the ordering information there are different axes configurations available. That means the standard uniaxial version is not fixed to Z-axis but could be fabricated in Y or X configuration. Furthermore, the biaxial version is not fixed to YX but is also available in ZY or ZX configuration. However, the color code of the integrated cable for the corresponding axis will be always the same for all possible sensor configurations.

Please, contact us for further details and options.

Ordering Information

Series	Sensitive Directions	Model	Housing Material	Range [g]	Axes Config	Cable Length [m]	Connector & Pinout	Cable Configuration
ASC ECO CS	1 (Uniaxial)	31	1 (Aluminum)	002	Z (Uniaxial)	6	A	3L (Uniaxial)
	2 (Biaxial)			004	Y (Uniaxial)			4L (Biaxial)
	3 (Triaxial)			008	X (Uniaxial)			4L2 (Biaxial)
				010	YX (Biaxial)			5L (Triaxial)
				020	ZY (Biaxial)			5L3 (Triaxial)
				040	ZX (Biaxial)			

Example:
ASC ECO CS-1311-002-Z-6A-4L

Ordering information are based on standard configurations. All customized versions regarding connector and/or pinout will lead to a corresponding product match code:

- Standard length of the integrated cable is 6 meters. However, different customized cable lengths are possible on request.
- Standard version has no connector at the cable end which is identified by "A" in the product match code. However, it is possible to assemble almost all connector types during production.
- Furthermore, sensors have to be calibrated regularly to ensure accurate and precise results. Our services include both factory calibration and calibration in accordance with DAkKS guidelines. On request we will be glad to remind you of the next scheduled calibration of your sensors.

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
- When adhesives are used to mount the sensors, please select the corresponding products according to permanent or removable mounting, ambient temperature range as well as quality of the mounting surface
- 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
- An incorrect wiring of the signal or power supply connections will lead to damages of the sensor
- Completely shield the sensor and connecting cable according to your application
- 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 registration number of the certificate is **D-K-18110-01-00**.
- The sensors described in the data sheet are **CE**-compliant as well as **UKCA**-compliant.

Made in Germany



analyzing



monitoring



testing



measuring