

## MEMS Capacitive Accelerometer

### ASC 4221MF

Uniaxial  
 MEMS Capacitive  
 Measurement Range:  $\pm 2$  to  $\pm 200$  g  
 Noise Density: 10 to 680  $\mu\text{g}/\sqrt{\text{Hz}}$   
 Frequency Range ( $\pm 5\%$ ): DC to 1500 Hz  
 Aluminum 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  $\pm 200$  g and within a frequency response range of up to 1.5 kHz ( $\pm 5\%$ ) or 7 kHz ( $\pm 3$  dB). Other advantages of capacitive accelerometers are their outstanding temperature stability, excellent response behavior and achievable resolution.

#### Description

The accelerometers of type ASC 4221MF are based on proven MEMS technology and capacitive operating principle. The integrated electronic circuitry enables a differential analog voltage output ( $\pm 2.7$  V FSO) and flexible power supply voltage from 5 to 40 VDC. The MF (Medium Frequency) accelerometers from ASC provide a wide frequency response range from 0 Hz to 7 kHz ( $\pm 3$  dB) and an extremely robust design with shock resistance up to 6,000 g.

The sensors feature a lightweight, reliable aluminum housing with protection class IP67 and an integrated cable with configurable length and connectors.

The uniaxial ASC 4221MF have an ultra-compact design and weigh only 3 grams. This makes them ideal for measuring applications in hard-to-access installations, such as testing the operational stability of automotive components.

#### Features

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

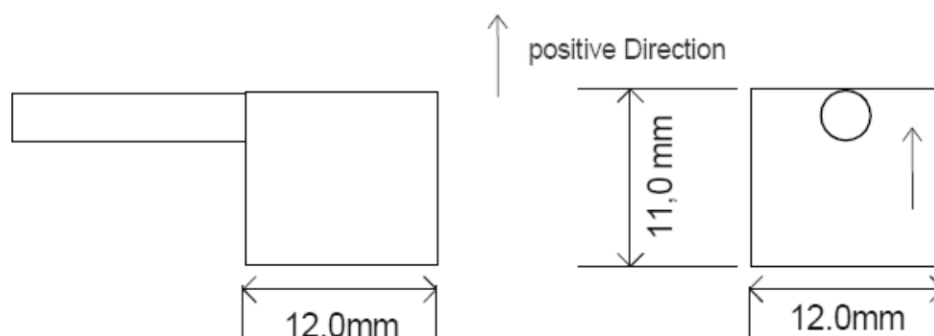
#### Options

- Customized Cable Length
- Customized Connector
- TEDS Module

#### Applications

- Operational Stability Tests
- Structural Analyses
- Flutter Tests

More applications in several markets are figured out on our web page [www.asc-sensors.de](http://www.asc-sensors.de)



Typical Specification

Dynamic

Measurement Range	g	±2	±5	±10	±30	±50	±100	±200
Scale Factor (sensitivity)	mV/g	1350	540	270	90	54	27	13.5
Noise Density	µg/√Hz	10	20	35	100	170	340	680
Min. Frequency Response Range (±5 %)	Hz	0 to 100	0 to 700	0 to 1000	0 to 1500	0 to 1500	0 to 1500	0 to 1500
Max. Frequency Response Range (±3 dB)	Hz	0 to 1150	0 to 1900	0 to 3200	0 to 4000	0 to 4500	0 to 5000	0 to 7000
Amplitude Non-Linearity	% FSO	<0.1 (typ)   <0.3 (max)						
Transverse Sensitivity	%	<1						

Electrical

Power Supply Voltage	V	5 to 40						
Operating Current Consumption	mA	<10						
Offset (bias)	mV	±10						
Broadband Noise (over frequency range ±5 %)	µV	250	310	410	440	475	490	460
Resistive Load	kΩ	1000						
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	ppm/K	120 (typ)   20 to 220 (max)						
Temperature Coefficient of the Offset (max)	mg/K	±0.2	±0.5	±1	±3	±5	±10	±20
Operating Temperature Range	°C	-20 to +125						
Storage Temperature Range	°C	-20 to +125						
Shock Limit (0.1 ms, half-sine)	g	6000						
Protection Class	IP67							

Physical

Sensing Element	MEMS Capacitive							
Case Material	Anodized Aluminum							
Connector at Cable End	Optional							
Mounting	Adhesive							
Weight (without cable)	gram	3						
Cable	13 gram per meter   AWG 30   Polyurethane (PUR)   Diameter 3.1 mm							

Sensor Calibration

Factory Calibration (supplied with the sensor)

Part Number		#14549	#18473	#14551	#14554	#14555	#14555	#14555
Measurement Range (sensor)	g	±2	±5	±10	±30	±50	±100	±200
Applied Frequency (min)	Hz	1	10	10	10	10	10	10
Applied Frequency (max)	Hz	100	700	1400	1600	1800	1800	1800
Input Amplitude	m/s <sup>2</sup>	5	15	50	100	200	200	200
Reference Frequency for Determination of Scale Factor	Hz	16	80	80	80	80	80	80

Calibration according DIN ISO 17025 (order separately)

Part Number		#14557	#18478	#14559	#14562	#14563	#14563	#14563
Measurement Range (sensor)	g	±2	±5	±10	±30	±50	±100	±200
Applied Frequency (min)	Hz	0.5	10	10	10	10	10	10
Applied Frequency (max)	Hz	150	1200	2000	2300	2500	2500	2500
Input Amplitude	m/s <sup>2</sup>	5	15	50	100	200	200	200
Reference Frequency for Determination of Scale Factor	Hz	16	80	80	80	80	80	80

Remarks:

- The conversion factor 1 g corresponds to 9.80665 m/s<sup>2</sup>.
- 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 (4 Wire System)

	Pin	Color Code	Description
1	Supply +	Red	Power supply voltage +5 to +40 VDC
2	Supply -	Black	Power GND
3	Signal +	Green	Positive, analog output voltage signal for differential mode
4	Signal -	White	Negative, analog output voltage signal for differential mode

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

### Ordering Information

Series	Model	- Range [g]	- Cable Length [m]	Connector & Pinout
ASC 42	21MF	002	6	A
		005		
		010		
		030		
		050		
		100		
		200		

*Example:*

**ASC 4221MF-002-6A**

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.

## MEMS Capacitive Accelerometer

### 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**.

Made in Germany



analyzing



monitoring



testing



measuring