MEMS Capacitive Accelerometer

ASC 5421MF | ASC 5425MF

Triaxial
MEMS Capacitive
Measurement Range: ±2 to ±200 g
Noise Density: 10 to 680 µg/√Hz
Frequency Range (±5 %): DC to 1500 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 ±200 g and within a frequency response range of up to 1.5 kHz (±5 %) or 7 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 5421MF and ASC 5425MF are based on proven MEMS technology and capacitive operating principle. The integrated electronic circuitry enables a differential analog voltage output (±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 (±3 dB) and an extremely robust design with shock resistance up to 6,000 g.

The sensor ASC 5421MF features a lightweight aluminum housing and the sensor ASC 5425MF 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 accelerations over a wide frequency response range in three degrees of freedom, e.g. for test bench applications, vehicle and road monitoring as well as resonance and flutter tests in aviation.

Features

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

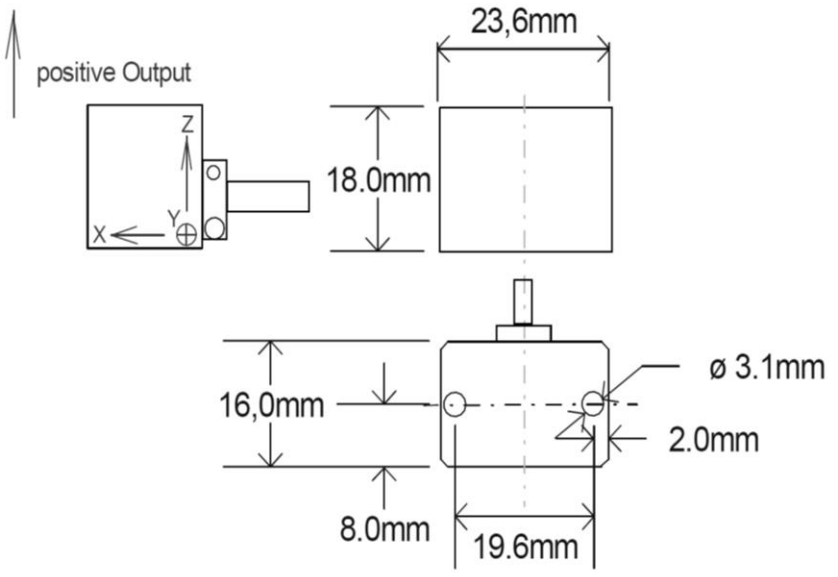
Options

- Customized Cable Length
- Customized Connector
- TEDS Module

Applications

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

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



ASC 5421MF | ASC 5425MF

MEMS Capacitive Accelerometer

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	<15						
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	-40 to +125						
Storage Temperature Range	°C	-40 to +125						
Shock Limit (0.1 ms, half-sine)	g	6000						
Protection Class		IP65						

Physical

Sensing Element		MEMS Capacitive
Case Material		ASC 5421MF: Anodized Aluminum ASC 5425MF: Stainless-Steel
Connector at Cable End		Optional
Mounting		Adhesive | Screw Holes
Weight (without cable)	gram	ASC 5421MF: 20 ASC 5425MF: 40
Cable		30 gram per meter | AWG 30 | Polyurethane (PUR) | Diameter 4.5 mm

Sensor Calibration

Factory Calibration (supplied with the sensor)

Part Number		#14550	#18475	#14552	#14553	#14556	#14556	#14556
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^2	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		#14558	#18479	#14560	#14561	#14564	#14564	#14564
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^2	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^2.
- 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 +5 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 +5 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 +5 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 shielding is provided as a tinned-copper braiding which is also internally connected to the sensor housing				

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

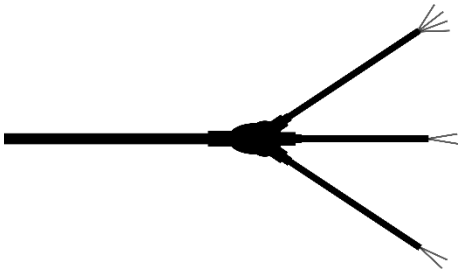
Pin		Color Code		Description
1	Supply +	Red	Power:	supply voltage +5 to +40 VDC
2	Supply -	Black	Power:	GND
3	Signal +	Green/Violet	X-Axis:	positive, analog output voltage signal for differential mode
4	Signal -	White/Violet	X-Axis:	negative, analog output voltage signal for differential mode
5	Signal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

Cable Configuration

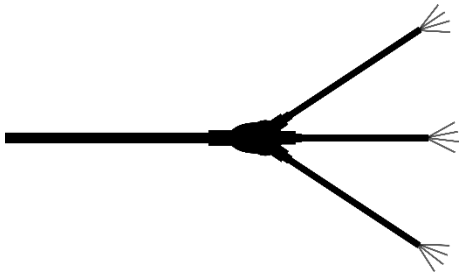
8 Wire System - 8L
Common power supply for all axes, no cable switch

12 Wire System - 12L
Separate power supply for all axes, no cable switch

8 Wire System - 8L3
Common power supply for all axes, including 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	21MF (Aluminum)		002		6	A		8L
	25MF (Stainless-Steel)		005					8L3
			010					12L
			030					12L3
			050					
			100					
			200					

Example:

ASC 5421MF-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
- 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 adaptions 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.

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