

## MEMS Capacitive Accelerometer

### ASC OS-225MF-PG

Biaxial

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 2900 Hz

Stainless-Steel Housing (IP68)

**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 2.9 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 OS-225MF-PG 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 robust, reliable stainless-steel housing with protection class IP68 and an integrated cable with configurable length and connectors.

The hermetically sealed housing of the accelerometers is ideal for very harsh environmental conditions, e.g. bogie stability tests and monitoring applications in rail transport or condition monitoring of vehicles and their components in the construction sector.

#### Features

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

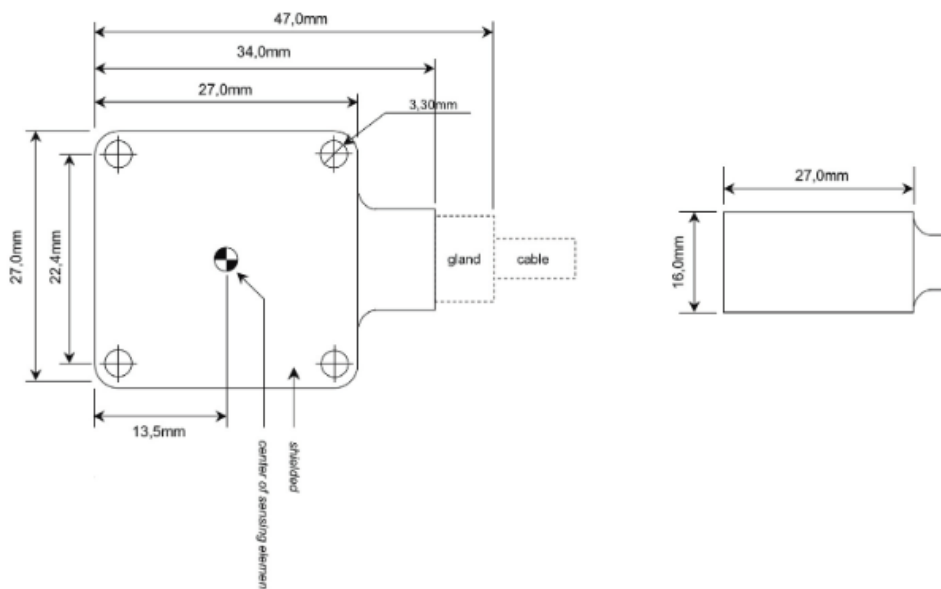
#### Options

- Customized Cable Length
- Customized Connector
- TEDS Module
- V4A Stainless-Steel Housing

#### Applications

- Railway Engineering
- Condition Monitoring
- Structural Health Monitoring

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
Specified Frequency Response Range (±5 %)	Hz	0 to 700	0 to 1150	0 to 2000	0 to 2300	0 to 2700	0 to 2900	0 to 2500
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 specified frequency range ±5 %)	µV	250	310	410	440	475	490	460
Resistive Load	kΩ	1000						
Isolation		Case Isolated						

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	Standard Cable: -40 to +100 Optional with seawater resistant Cable K1: -15 to +70 Optional with waterproof Cable K2: -40 to +100						
Storage Temperature Range	°C	-55 to +125						
Shock Limit (0.1 ms, half-sine)	g	6000						
Protection Class		IP68 (test conditions: hydrostatic head 3 m, duration 30 min, DUT powered) Please note: the housing is hermetically sealed and therefore not repairable.						

Physical

Sensing Element	MEMS Capacitive							
Case Material	Standard: Stainless-Steel V2A (material number 1.4301) Optional: Stainless-Steel V4A (seawater resistant, material number 1.4404)							
Connector at Cable End	Optional							
Mounting	Adhesive   Screw Holes							
Weight (without cable)	gram	68						
Cable (standard)	30 gram per meter   AWG 30   Polyurethane (PUR)   Diameter 4.5 mm							
Cable K3 (seawater resistant)	22 gram per meter   AWG 30   Polyurethane (PUR)   Diameter 3.75 mm   waterproof, sea water resistance up to +60°C and 1 bar pressure							
Cable K4 (waterproof)	29 gram per meter   AWG 30   Polyurethane (PUR)   Diameter 3.75 mm   waterproof							

**Sensor Calibration**

**Factory Calibration (supplied with the sensor)**

Part Number		#16722	#16754	#16756	#16758	#16760	#16762	#16764
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	1150	2000	2300	2700	2900	2500
Input Amplitude	m/s <sup>2</sup>	5	5	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		#16738	#16766	#16768	#16770	#16772	#16774	#16776
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	1900	3200	4000	4500	5000	7000
Input Amplitude	m/s <sup>2</sup>	5	5	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.

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

The standard sensitive directions of the biaxial sensor ASC OS-225MF-PG are the X-axis and Y-axis. Upon request all other combinations of sensitive directions are possible (X and Z or Y and Z) while the color code of the corresponding sensitive directions is always the same.

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

## MEMS Capacitive Accelerometer

### Standard Cable Code / Pin Configuration (6 Wire System) including common Power Supply for all Axes

The standard sensitive directions of the biaxial sensor ASC OS-225MF-PG are the X-axis and Y-axis. Upon request all other combinations of sensitive directions are possible (X and Z or Y and Z) while the color code of the corresponding sensitive directions is always the same.

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

### Optional Cable Code / Pin Configuration (6 Wire System)

The standard sensitive directions of the biaxial sensor ASC OS-225MF-PG are the X-axis and Y-axis. Upon request all other combinations of sensitive directions are possible (X and Z or Y and Z) while the color code of the corresponding sensitive directions is always the same.

Pin	Color Code Cable Type K3	Color Code Cable Type K4	Description
1	Supply +	Red	Red Power: supply voltage +5 to +40 VDC
2	Supply -	Brown	Black Power: GND
3	Signal +	White	Green/Violet X-Axis: positive, analog output voltage signal for differential mode
4	Signal -	Grey	White/ Violet X-Axis: negative, analog output voltage signal for differential mode
5	Signal +	Yellow	Green/Grey Y-Axis: positive, analog output voltage signal for differential mode
6	Signal -	Pink	White/Grey Y-Axis: negative, analog output voltage signal for differential mode
7	Signal +	Green	Green Z-Axis: positive, analog output voltage signal for differential mode
8	Signal -	Blue	White Z-Axis: negative, analog output voltage signal for differential mode

### Cable Configuration

#### 6 Wire System - 6L

Common power supply for all axes, no cable switch



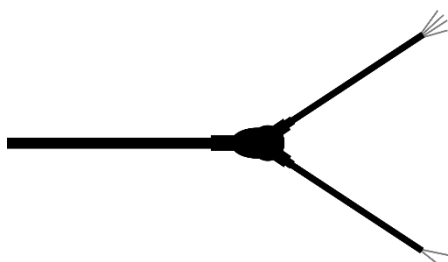
#### 8 Wire System - 8L (standard cable only)

Separate power supply for all axes, no cable switch



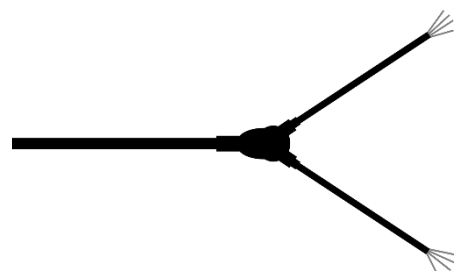
#### 6 Wire System - 6L2

Common power supply for all axes, including cable switch



#### 8 Wire System - 8L2 (standard cable only)

Separate power supply for all axes, including cable switch



### Ordering Information

Series	Model	- Range [g]	- Cable Length [m]	Connector & Pinout	- Cable	- Cable Configuration
ASC OS	-225MF-PG	002	6	A	K3	6L
		005			K4	6L2
		010				8L
		030				8L2
		050				
		100				
		200				

*Example:*

**ASC OS-225MF-PG-002-6A-6L**

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 for all types of cables are possible on request.
- All versions have 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.
- Cable type identifier "K3" and "K4" are not used within the ordering information when standard cable is requested.
- Applications where waterproof accelerometers are required, cable type K3 and cable type K4 are suggested while cable type K4 features a higher operating temperature range (see specifications).
- Applications where seawater resistant accelerometers are required, cable type K3 is mandatory. In this case also the optional stainless-steel housing V4A (material number 1.4404) is recommended.
- The standard sensitive directions of the biaxial sensor ASC OS-225MF-PG are the X-axis and Y-axis. Upon request all other combinations of sensitive directions are possible (X and Z or Y and Z).
- Cable configurations "8L" and "8L2" are only available when the standard cable is used.

### 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 registration number of the certificate is **D-K-18110-01-00**.
- All ASC products are **CE**-compliant.

Made in Germany



analyzing



monitoring



testing



measuring