

g ASC QF-1211
MEMS Capacitive Accelerometer



SPECIFICATIONS

- Uniaxial
- MEMS Capacitive
- Measurement Range: ± 3 and ± 5 g
- Noise Density: $< 1.2 \mu\text{g}/\sqrt{\text{Hz}}$
- Frequency Range (± 3 dB): DC to 700 Hz
- Aluminum
- Made in Germany

MEMS CAPACITIVE ACCELEROMETER

The key components in capacitive accelerometers are high-quality micro-electromechanical 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 a bandwidth of up to 700 Hz (± 3 dB) and amplitudes up to ± 5 g. Other advantages of capacitive accelerometers are their outstanding temperature stability, excellent response behavior and achievable resolution.

DESCRIPTION

Accelerometers of ASC QF-series 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 sensors of the ASC QF series feature an ultra-low noise level and achieve a resolution of less than $1 \mu\text{g}$. They therefore fulfill the requirements of motion class B of seismic measurements.

The sensors ASC QF-1211 feature a lightweight aluminum housing with protection class IP67 and an integrated cable as well as configurable length and connectors. The accelerometers are available in uniaxial configuration.

The flat and compact design enables quick and easy mounting which is a basic requirement for reference measurements in numerous applications. Due to the excellent vibration and shock resistance the sensors are also ideally suited for drilling tools like MWD (measurement while drilling) systems.



FEATURES

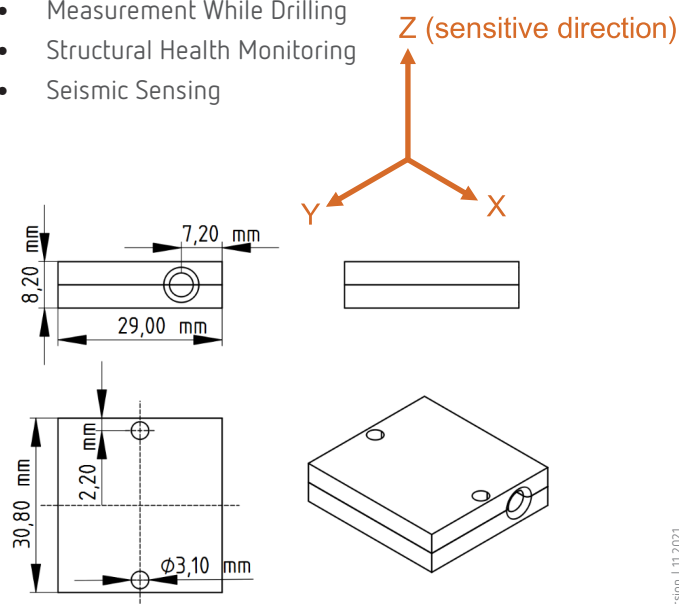
- Ultra-low Noise Differential Voltage Output
- DC Response, Gas-damped
- High Shock Resistance
- Excellent Bias and Scale Factor Stability
- Built-in Self-Test Option
- Temperature Output

OPTIONS

- Customized Cable Length
- Customized Connector
- TEDS Module

APPLICATIONS

- Noise Measurements
- Reference Measurements
- Measurement While Drilling
- Structural Health Monitoring
- Seismic Sensing





TYPICAL SPECIFICATIONS

Dynamic

Measurement Range	g	±3	±5
Scale Factor (sensitivity)	mV/g	900	540
Noise Density	µg/√Hz	0.7	1.2
Frequency Response Range (±3 dB)	Hz	0 to 550	0 to 700
Amplitude Non -Linearity	% FSO	<0.3 (typ) <1 (max)	
Transverse Sensitivity	%	<1	

Electrical

Power Supply Voltage	V	5 to 40	
Operating Current Consumption	mA	27 ±5	
Offset (bias)	mV	±10	
Broadband Noise (over frequency range 0.1 to 100 Hz)	µV	<10	
Isolation		Case isolated	

Self -Test Option

Duty Cycle	%	50	
Emulated Output Amplitude	g	0.25	0.5
Expected Frequency	Hz	19 ±5	

Temperature Sensor

Output Voltage at 20 °C	V	1.22 ±0.01	
Scale Factor	mV/K	-4.35 ±0.05	

Environmental

Temperature Coefficient of Scale Factor	ppm/K	120 (typ) 20 to 220 (max)	
Temperature Coefficient of the Offset	mg/K	0.3 (max)	0.5 (max)
Operating Temperature Range	°C	-40 to +85	
Storage Temperature Range	°C	-40 to +100	
Shock Limit (0.15 ms, single shocks)	g	1500	
Protection Class		IP67	

Physical

		Adhesive Screw Holes	
Sensing Element		MEMS capacitive	
Case Material		Anodized Aluminum	
Connector at Cable End		Optional	
Mounting		Adhesive Screw Holes	
Weight (without cable)	gram	15	
Cable		30 gram per meter AWG 30 Polyurethane (PUR) Diameter 4.5 mm	



■ SENSOR CALIBRATION

Factory Calibration (supplied with the sensor)

Part number	# 14549		
Measurement Range (sensor)	g	± 3	±5
Applied Frequency (min)	Hz	1	
Applied Frequency (max)	Hz	100	
Input Amplitude	m/s ²	5	
Reference Frequency for Determination of Scale Factor	Hz	16	

Calibration according DIN ISO 17025 (order separately)

Part number	# 14557		
Number of sensitive Directions	Uniaxial		
Measurement Range (sensor)	g	± 3	±5
Applied Frequency (min)	Hz	0.5	
Applied Frequency (max)	Hz	150	
Input Amplitude	m/s ²	5	
Reference Frequency for Determination of Scale Factor	Hz	16	

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 (6 WIRE SYSTEM)

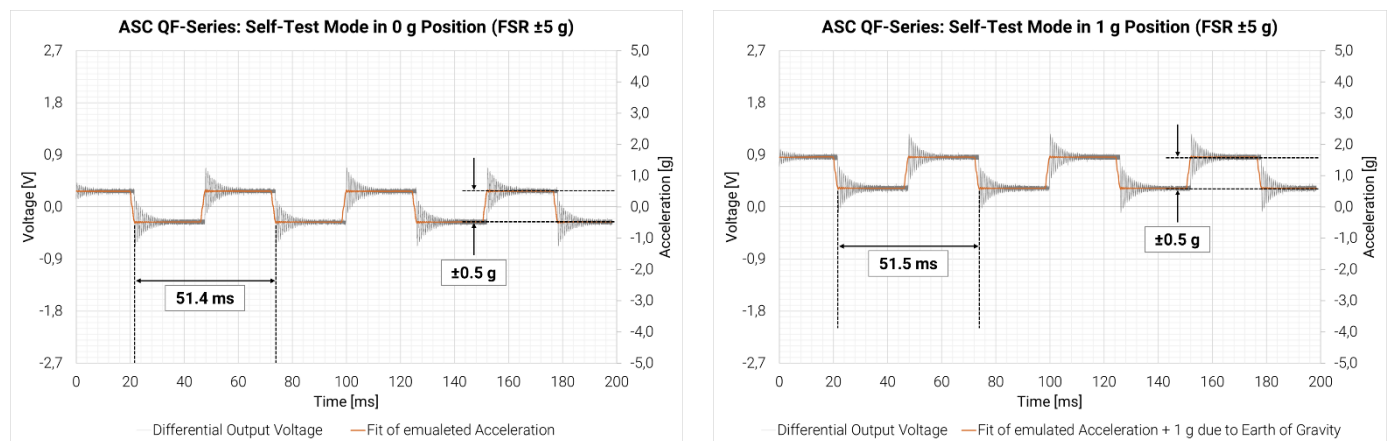
	Pin	Color Code	Description
1	Supply +	Red	Power supply Voltage +5 to +40 VDC
2	Supply -	Black	GND
3	Self-Test	Black/Violet	Self-Test, active high between 2.7 V to 3.3 V for all sensitive directions
4	Signal -	White	Negative, analog output voltage signal for differential mode
5	Signal +	Green	Positive, analog output voltage signal for differential mode
6	Temperature	Red/Violet	Analog output voltage temperature sensor

SELF-TEST OPTION

The accelerometers of ASC QF-series are featuring a built-in self-test option for validation of the functionality of the sensor. This feature is available when pin "Self -Test" is active high between 2.7 V to 3.3 V. When activated, an electrostatic force is applied to the micro-mechanical structure leading to a deflection of the seismic mass that is similar to an input acceleration.

Because it is an alternating electrostatic force the self-test mode generates a square wave signal (duty cycle 50 %, frequency 19 Hz) that is measurable at the analog output voltage signal pins "Signal +" and "Signal -". However, the electrostatic force is always applied additional to any other input acceleration. Therefore, the measured values depend also on the position within the Gravity of Earth while the specified range of the emulated output voltage is similar.

The typical voltage output signal for a sensor of the ASC QF-series with measurement range of ± 5 g is shown in the following graphs.



ORDERING INFORMATION

Series	Model	- Range [g]	- Cable Length [m]	Connector & Pinout
ASC QF	-1211	003	6	A
		005		

Example:

ASC QF-1211-003-6A

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.



■ 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 is 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.