

# GAM900/GAM900S

Acceleration precisely measured and safely monitored



# The benefits at a glance: Less sensors – more safety

## Minimum size, maximum performance

### Extremely reliable and robust

- IP 67 protection thanks to encapsulated electronics
- Temperature range  $-40 \dots +85 \text{ }^{\circ}\text{C}$

### Precise detection of acceleration

- Even at low frequencies of less than 0.5 Hz
- Compensation of temperature drift and installation errors

### Fast and simple

- Mechanical integration due to compact design
- Electric integration with Analog and CANopen interface
- Safety chain integration due to limit monitoring with relay output

Simplified implementation of Machinery Directive due to SIL2/PLd certificate



## Precise acceleration for maximum control

Acceleration sensors GAM900 and GAM900S provide the control system with precise acceleration information via CANopen or Analog interface. This way, vibrations can be reduced prior to reaching critically high amplitudes. The selected capacitive MEMS sensors operate with highest precision, especially at small amplitudes, where measuring errors due to cross-axis-sensitivity can be neglected. Therefore, GAM900 and GAM900S are ideally suited for precise acquisition of vibrations e.g. at wind towers.

## Configurable filters improve precision and eliminate distortions

Vibration caused measuring distortions can not be excluded, even if acceleration sensors are attached to solid, load-bearing machine parts. GAM900 and GAM900S utilize low-pass or band-pass filters of up to 8th order to efficiently suppress parasitic frequencies, as generated for example by yaw brakes in wind turbines. Offset errors caused by installation errors or temperature drift are efficiently compensated while significantly enhancing accuracy.

## Less components, simple integration

The PLd-certified acceleration sensor GAM900S is a 2 in 1 product. It replaces conventional sensors for monitoring of vibration and shock:

- Acceleration sensors for detection of two-dimensional tower vibration and
- mechanical limit switches with relay contact as part of the safety chain.

At the same time, it reduces cable routing effort down to a minimum. Convenient connection to any conventional control system is possible by Analog or CANopen interface. Easy integration into the safety chain is enabled by redundant relay contacts.

## Certified components simplify implementation of the Machinery Directive

Based on limit monitoring with SIL2/PLd certificate, the acceleration sensor GAM900S simplifies the safety assessment of the installation and hence the implementation of the Machinery Directive 2006/42/EG.

GAM900S is the ideal sensor when it comes to the implementation of the safety function "protection against excessive shocks and tower vibrations". Due to the integrated limit monitoring including signal processing, there is no necessity for control-specific implementation of safety rated embedded software or application software.

## One product, many benefits



Less components, easy integration



Precise acceleration, maximum control



Easy implementation of the Machinery Directive





## GAM900 – maximum flexibility

Permanent vibration monitoring is required in many fields of application:

- Anti-sway control at gantry cranes
- Side-sway monitoring at working platforms
- Vibration monitoring at giant machines and installations
- Swing detection at bucket excavators in the mining industry
- Nacelle torsion monitoring at wind turbines

In such applications, GAM900 offers numerous possibilities for configuration for example:

- Free filtering (low-pass, band-pass)
- Adjustable relay switching thresholds
- Definition of the measuring direction

Configuration is a mere child's play.

The PC software GAM900 Configurator enables convenient configuration and diagnostics within few minutes. Predefined configuration files allow for easy and quick parameterization of several sensors.







## GAM900S – maximum safety

Vibrations are an everyday occurrence at machines and installations. Acceleration sensor GAM900S detects both vibration and shock to provide the machine control with the information via CANopen or Analog output. The safety relay output can be integrated in any safety system and will be activated as soon as the defined default limit is exceeded.

Four factory-configured frequency bands with different filters enable perfect tuning to the requirements of the individual type of installation.

In wind turbines, the acceleration sensor GAM900S is predestined for implementation of the safety function "protection against excessive shocks and tower vibrations". Permanent monitoring prevents damage or even destruction of the installation.

For corrosive environments of the C5M category, the housing design made of glass-fiber reinforced plastic is ideal and ensures safe longterm operation in offshore installations.



Transmission of the acceleration information via Analog or CANopen interface

Control System

Limit verification by redundant safety relays

Safety System

# GAM900S – safety with certificate

## Safety rated embedded software and 2-channel hardware with EC type examination

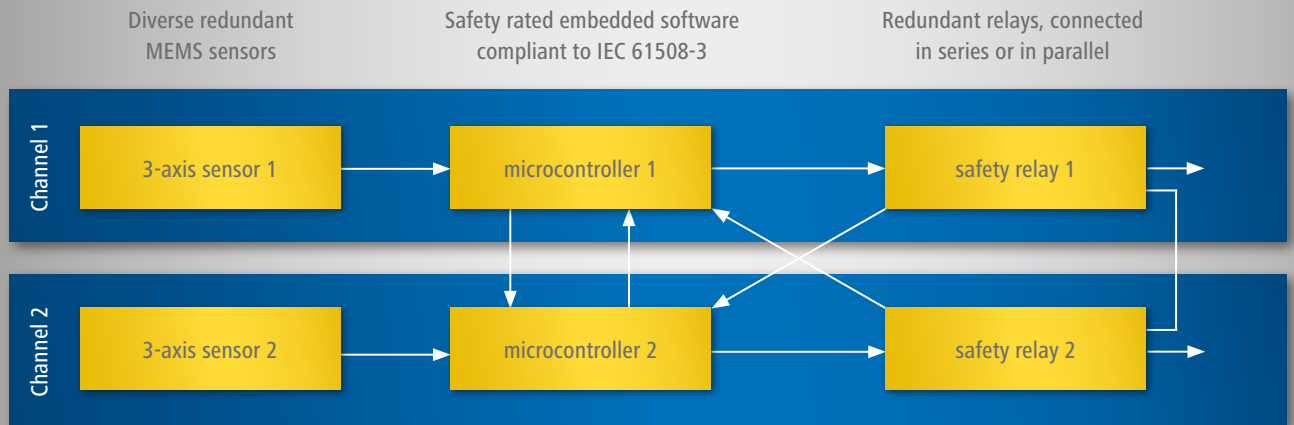
Simplify the implementation of the Machinery Directive – GAM900S as “logic unit for safety functions”.

According to Machinery Directive annex IV, logic units for safety functions must comply with increased requirements of the conformity assessment procedure, since in the event of failure their functionality might entail substantial hazards. Compliance to the requirements must be made either by full quality assurance according to annex X or by EC type-examination by a notified body according to annex IX of the Machinery Directive (see safety-relevant information and work sheet No. 300 050, “Logic units for functional safety”, BGIA manual lfg 1/10, II/2010).

The EC type-examination of the acceleration sensor GAM900S by the notified body TÜV Rheinland certifies the compliance with the increased requirements of the conformity assessment procedure according to the Machinery Directive. Further SIL2/PLd certified encoders complete the Baumer portfolio and simplify safety certification of the installation.



Certified  
Functional Safety



## Safe detection by diverse redundant sensors

GAM900S incorporates two precise MEMS sensors to reliably detect shock and vibration as prevailing for example at wind towers:

- Diverse redundant sensors to ensure systematic suitability and mandatory identification of common-cause failures.\*
- Components from different manufacturers are used, with different designs and different methods of signal processing.

## Safe processing by certified software compliant to IEC 61508-3

From specification to validation, the GAM900S safety rated embedded software (SRESW) is compliant with the requirements of the safety standard IEC 61508-3:

- Extensive testings and detailed documentation of the safety-relevant software.
- Guaranteed independence of safety and standard software e.g. used for CANopen communication.
- Certified by TÜV Rheinland: Full compliance to safety integrity levels SIL2/PLd.

## Safe monitoring by redundant relays

GAM900S utilizes two relays with readback contact:

- 2-channel addressing of relay and status cross-checked by the SRESW.
- Activation of the test input will identify any undetected error affecting the two relays, resulting for example from welded contacts.
- Depending on customer requirements, the relay contacts are either internally connected in series or available at two separate connectors.

\*See IFA position paper "Using standard components or safety components to implement safety functions of machinery", May 2011

# Product overview



	GAM900S	GAM900
Sensing principle	2× MEMS capacitive, diverse redundant, 3-axis	1× MEMS capacitive, 3-axis
Band width	0...30 Hz	
Interfaces	Analog (4 ... 20 mA or 0 ... 10 V) and CANopen	
Relay output	Max. 4×, thereof 1× safe, internally redundant, SIL2/PLd compliant	Max. 2 ×
Dimensions W × H × L	55 × 30 × 90 mm	
Material	Glass-fiber reinforced plastic (offshore-capable) or aluminum	
Voltage supply	10 ... 30 VDC	
Connection	1× or 2× M12 connector, 12-pin	
Measuring range	±2 g	
Resolution	<4 mg	
Operating temperature	−40 ... +85 °C	
Protection	IP 67	
Certificates	SIL2/PLd compliant to IEC 61508/ISO 13849-1 UL approval / E63076	UL approval / E63076
Optional	Customer-specific filter and relay configuration	Band width up to 150 Hz

Learn more about our acceleration sensors at:  
[www.baumer.com/gam](http://www.baumer.com/gam)



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