

SENSECOM-ACH

Communication unit with tilt monitoring

Purpose

SENSECOM-ACH is indicative tilt meter designed to monitor vertical tilt changes $>1^\circ$ and to immediately ($<10s$) send alarm when threshold is reached between ends of measuring periods (default 30s) and sending daily status messages over SIGFOX IoT network.

The device is optimized for battery operation, with an estimated life of up to 2 messages per day being > 10 years.

Typical applications: Indication of disturbance of mast construction, movements of surface layers of soil, slopes, etc. by measurement of tilt permanent change.

Device description:

SENSECOM-ACH device uses accelerometer to indicate permanent change of device inclination. The device is attached firmly to a pole, mast, rock, or any similar structure which is fixed enough to minimize significant own vibrations (caused by wind, mechanical machines, etc.) or shifts caused by temperature changes.

After an installation, **SENSECOM-ACH** performs initial measurements as a reference inclination (by accelerometer values in each axis) when activated and sends the initial message. The electronics of the device are in sleep mode most of the time with minimal power consumption. Accelerometer monitors and saves values each 1s. By default, the device is activated for evaluation each 30s, device evaluates average of last 30 measured values and decides on alarm initiation. If accelerometer reaches preset threshold against reference (last initial or accelerometer alarm message values), the device immediately sends alarm to SIGFOX B/E and resets reference values. Device reference values can be reinitiated also after On remote request by downlink.

Last evaluated values are also sent in regular (daily by default) status message:

- X,Y,Z accelerometer values representing inclination in each axis separately
- Inner temperature (if enabled, ACHT model)
- Inner relative humidity (if enabled, ACHT model)

Data processing

In the SIGFOX cloud, measured values are typically available for processing within 10 seconds (max 15s). Data can be obtained using a call-back mechanism (push method), REST-API, or download to a CSV file (manually).

Device security

Due to the accelerometer, the device is able to indicate tampering (significant $>45^\circ$ tilt changes). In case of violation, it

sends immediately the alarm message the same way as the tilt permanent change.

The device also sends 1x / day system Keep-Alive message with information about battery voltage and processor temperature.

Missing Keep-Alive

detects device disconnection or failure. There is also optional a temperature and humidity sensor inside the device which can indicate environmental change inner the device if the sensors are enabled (ACHT model).

Message transmission has assured integrity through the AES-128 algorithm (message spoofing avoidance).

Message types

Types of transmitted messages from **SENSECOM-ACH** to (from) the cloud:

- **Status message** - periodical message containing measured values from the sensors.
- **Alarm message** - a message generated when tilt change threshold (default 1° in any of axis) or manipulation threshold (default 45°) is exceeded, or significant temperature or humidity change thresholds are exceeded (model ACHT).
- **Keep-Alive message** – 24h system periodical message sent by the device.
- **Downlink acknowledge message** - System response to received downlink.
- **Configuration message** - comes after successful receipt and processing of downlink.
- **Downlink message** - message received by the device from SIGFOX back-end as a part of sending the first message after each Keep-Alive message. It is used for eventual adjustment of the device.

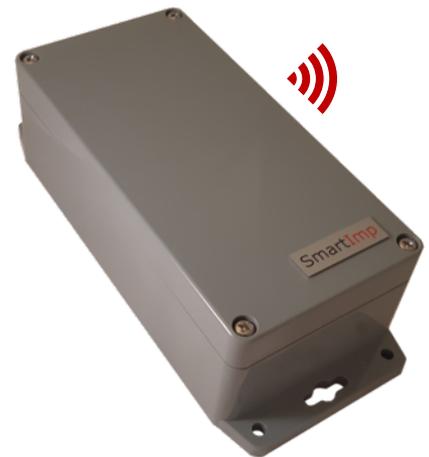
Remote setup and FW upgrade

Period of value messages, inner sensors sensitivity or their de/activation can be set remotely once a day (via downlink). Contact the manufacturer for remote adjustment if needed. In places with poor coverage of the SIGFOX network, the device may not be able to receive a downlink message even though the uplink message has been received regularly by the network. Remote FW upgrade is not possible.

Device casing:

The device is designed to be attached to a pole, mast, rock, or any similar structure.

The device is in a plastic case (ABS) with dimensions 160x80x60mm (h-w-d), the case can be attached in all 4 corners. The housing is IP65 (or IP67-68 using silicone). The device includes internal antenna (PCB based).



Technical parameters

Parameter	Value
Tilt measurement type	Accelerometric
The main measurement parameter	Relative tilt change between measurement evaluations over 3-axis (separately) 1°-default , 2°, 5°, 10° (remotely adjustable)
Accuracy of main parameter	1°
Frequency of measurement	1 per second
Frequency and way of evaluation	Every 30s average and extremal values are calculated
Calibration (initiation)	Initial, Automatic at permanent tilt change (signaled by alarm message), or On remote request
Secondary parameters	Device inner Temperature and Humidity (if enabled) - ACHT model
Transmission network	SIGFOX (ISM band 868MHz)
Uplink message types	Initial and periodical status (with measured values) Alarm Configuration change Keep-Alive 24h Downlink acknowledgement
Period of status messages	10min, 30min, 1h, 2h, 4h, 12h, 24h-default (remotely adjustable)
Accessibility of data	SIGFOX back-end (12 Bytes payload messages): Call-back (push) REST-API Email CSV download
Antenna	Internal PCB antenna for ISM band (868MHz)
Power supply	Lithium battery (non-rechargeable) 3,6V, replaceable, size C, type SAFT LS 26500 (7,7Ah)
Expected battery life without battery replacement	>10 years with 2 messages a day (Status+KeepAlive)
Housing protection	IP65 (IP67-68 with silicon)
Weight	200g
Operational temperature	-25°to +65°C
Case dimensions	160x80x60 mm (dimensions without brackets)
SIGFOX Certificate number	P_00B4_FE9C_01

Device casing

Case: material ABS, IP65 (IP67-68 with silicon), dimensions without brackets: 160x80x60 mm

