

Main product features

- Detects only direct lightning strikes
- Key measurement parameters:
 - Peak current
 - Rise time
 - Charge
 - Specific energy
 - Full waveform recording
- Robust and durable design for off-shore use
- PoE Power supply and Ethernet communication
- A single box connected with a single Ethernet cable
- Simple installation through magnetic adhesion
- Life time expectancy 20+ years

Illustration



Sensor mounted above wind turbine door



Lightning Sensor & Analyzer including the IP68 rated Ethernet cable connection.

Product family context

Jomitek offers two generations of lightning sensors. These are the Lightning Sensor Classic, and - Advanced.

The Classic sensor features a simple relay functionality, which triggers when a lightning strike current exceeds a given threshold.

The Advanced model feature enhanced analysis, configuration, and reporting functionalities using the IEC 60870-5-104 protocol over Ethernet connection or a web based graphical user interface.

To determine the entry point of a lightning strike, Jomitek also offer simple sensors for turbine blades. When the turbine control combines the information from the blade mounted sensors with the tower mounted Lightning Sensor & Analyzer, a detailed and cost effective assessment of a strike can be obtained.

General description

The 2nd generation Jomitek lightning sensor is designed with a focus on ease of installation and operation.

The system raises an alarm in the form of signalling to the turbine control via Ethernet based protocols, when a lightning current surge is channelled through the structure the system is mounted on.

There is no requirement for built-in battery backup for alarm retention, which eliminates the need for periodic maintenance of the sensor system. External power supply backup is assumed present at the site of installation. Power supply and additional battery backup systems are also offered as a separate Jomitek product; The lightning sensor control box.

Mounting the sensor box is simple. Strong permanent magnets integrated in the box design, ensures securing on magnetically adhesive surfaces. Additional caulking along the rim of the box is recommended.

A single Ethernet cable is the only interface to the box, which supports easy installation of the cabling. The power is supplied via the Ethernet cable as Power over Ethernet (PoE).

For installations requiring backwards compatibility with the 1st generation lightning sensor, a relay output is available, when using the lightning sensor control box.

The internal memory keeps storage of more than 100 strike events.

Technical specification

Power Supply

PoE according to IEEE-802.3af, If relay output is used at Mode B pins: Power Level Class:	Mode A / Mode B Mode A 2 (17-20mA)
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Measurement range

- Minimum peak current trigger level	1kA
- Current range	+/- 250kA
- Current accuracy	10%

Measurement Parameters

Strike timestamp (t)	
Peak current (I)	
Rise Time (dI/dt)	
Charge (ΣIdt)	
Specific energy (ΣI^2dt)	
Polarity (+/-)	

Sampling

- Frequency	1MHz
- Sample time per strike	1000 msec

Memory

- Raw sample memory	2 × 1M samples
- Wav file memory	100+ strikes

Interface

- Ethernet cable	Screened CAT6
- Relay output via lightning sensor control box (use Mode B pins)	Isolated, AC/DC, max 24V

Data transfer protocols

Web interface	
FTP	
IEC 60870-5-104	
Modbus TCP	

Mechanical properties

- Temperature range	-40 to +85°C
- Expected lifetime	20+ years
- Sensor box protection	IP66
- Size (l×w×h)	200 × 120 × 60 mm
- Mounting	Magnetically adhesive
- Weight	1280 g
- Environment class	C5-M
ISO12944	

Installation guidelines will be provided on request.

Standards and test reports

This device fulfils below standards:

EMC directive

- EN 61000-6-4:2011

Low Voltage directive

- EN 61010-1:2010

International Protection Rating (IP Code)

- IP66 (dust tight, powerful water jets)

Laboratory certification has been performed at the Shanghai University laboratory. Test reports are available on request.



Laboratory test setup

Mounting and testing

Contact Jomitek for information on testing options for the Lightning Sensor & Analyzer equipment.

Example of sensor mounting solution below:



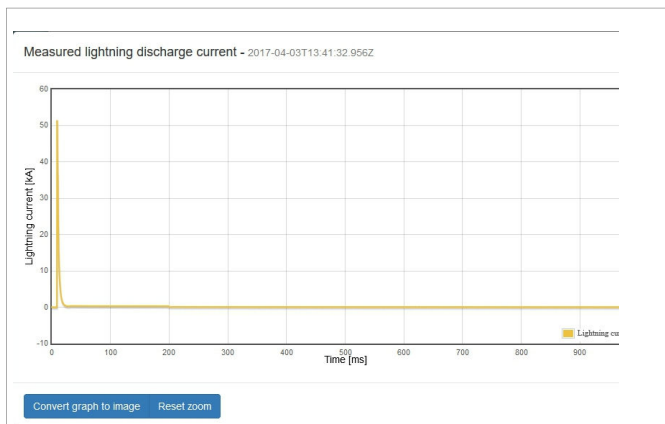
Sensor having extra strong magnets

Theory of operation

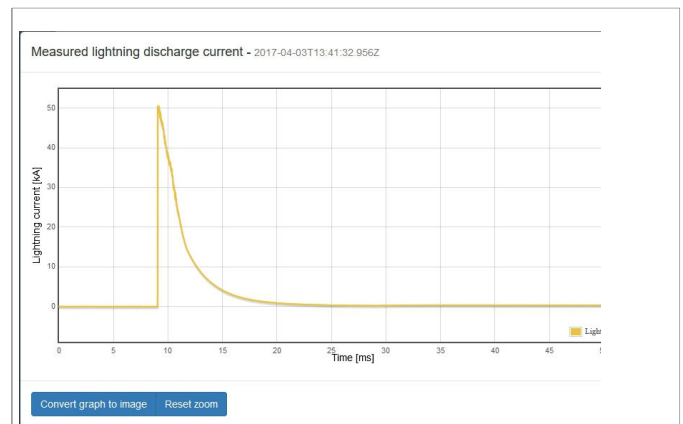
The sensor is continuously sampling the magnetic field near the turbine tower. If the signal raises above the trigger level, the active sample buffer is filled, and the alternate sample buffer is used afterwards. While the active buffer data is being processed and analysed, the alternate buffer is used to record potential new strikes, allowing for a combined 2 second continuous recording capability @ 1MHz.

Whenever a trigger situation has been detected, a digital output relay is activated via the optional lightning sensor control box. The relay will automatically reset after a predefined period or by a specific reset command. After sensor internal data processing, the key measurement parameters and the corresponding time series recording will be available for read out. This typically takes 40 seconds. Readout of the data is possible using a number of protocols. A simple web interface might be used or the FTP protocol, the IEC 60870-5-104 protocol or Modbus TCP.

The wave files (time series recording) generated during a strike can be watched in details on the web interface or can be downloaded via FTP or the web interface as gzipped versions (.wav.gz-files).



1000 msec time series readout



50 msec zoom



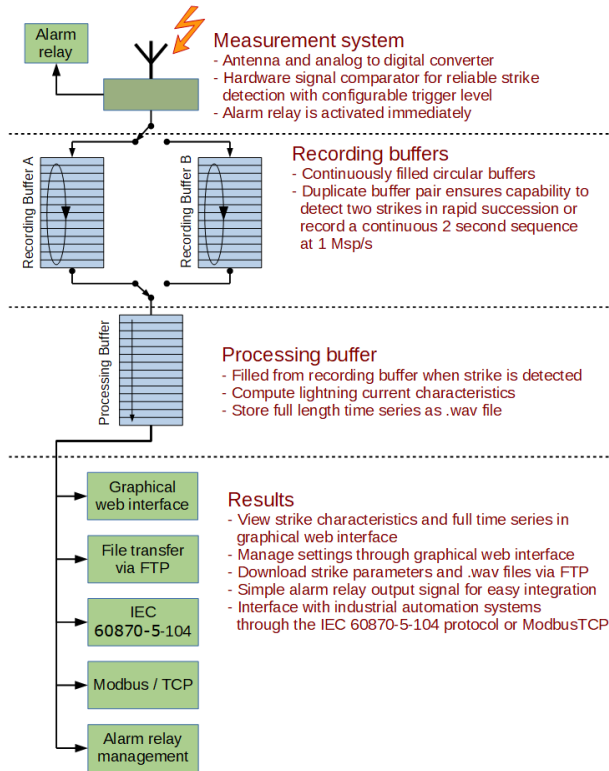
500 usec zoom



100 usec zoom

Theory of operation, continued

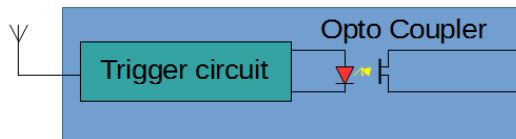
The processing flow, when a lightning strike is detected, is visualized in below figure:



Relay output

Whenever a lightning strike occurs, a digital electronic relay output is triggered. The Ethernet Mode B pins are used.

The output circuit is illustrated in below figure:



The maximum voltage to apply on the output pins is 24V.

The relay output ensures backwards compatibility with the Classic (1st generation) lightning sensor system.

Use of the lightning sensor control box

There are three use cases for the Lightning Sensor & Analyzer which requires adding a second box; the lightning sensor control box. The primary features provided of this box, are

- Interfacing of relay output signal
- Battery backup during power outage
- (Non-standard) PoE injection

Secondary features include

- Multiple power input redundancy
- Manual reset of lightning alarm
- Visual alarm indication via LEDs

Use case 1: Via the lightning sensor box relay interfacing, status LEDs and manual reset buttons, full backwards compatibility with the Jomitek Lightning Sensor Classic is provided.

Use case 2: If an industrial PoE switch/router with battery backup is not available for interfacing of the Lightning Sensor & Analyzer, the control box features an integrated, and easily accessible, Lithium Ion battery which can supply the lightning sensor with the power needed to ensure that a lightning causing a power outage is recorded and stored in non-volatile memory.

Use case 3: If an industrial PoE switch/router is not available the control box is able to inject a non-standard PoE signal, compatible with the lightning sensor, using one of the following sources

- 110/230VAC
- 5-48VDC
- Integrated battery

Ordering information:

Inside the box, 2 jumpers are configuring for relay output on 2 of the 8 Ethernet wires. See the Users manual for details. The box is delivered preconfigured in these 2 versions.

Part number Description

J30000001001 Lightning Sensor & Analyzer, standard

J30000001002 Lightning Sensor & Analyzer, Relay output