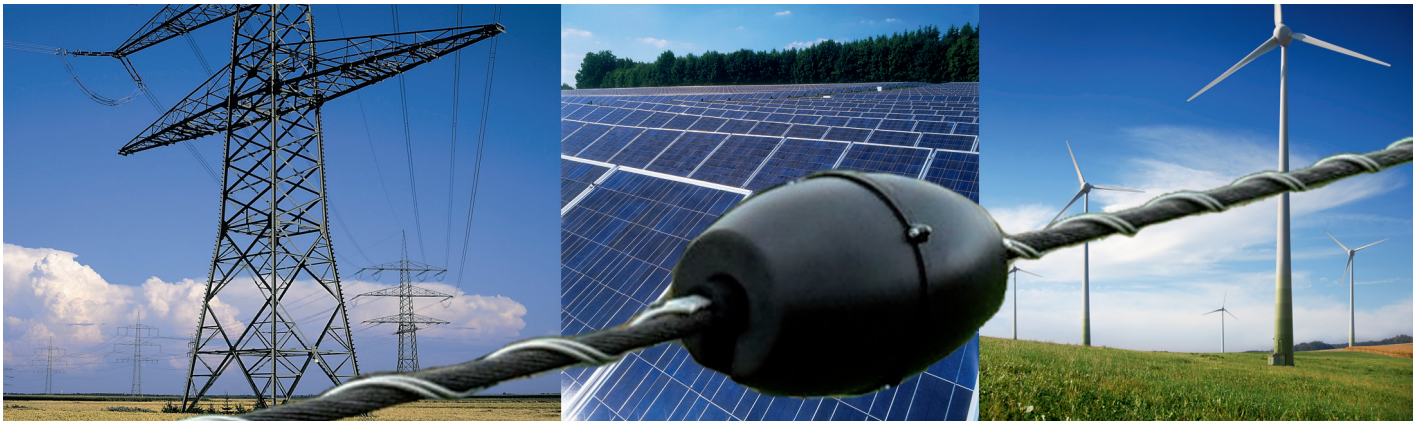
ASTROSE®
AUTONOMOUS SENSOR NETWORK FOR CONDITION MONITORING OF POWER LINES



ASTROSE® Project Partners
Mitteldeutsche Netzgesellschaft Strom mbH
amprion GmbH
ELMOS Semiconductor AG
Microelectronic Packaging Dresden GmbH
K+L Elektrotechnik GmbH
unilab AG
Fraunhofer ENAS
Fraunhofer IZM
Chemnitz University of Technology

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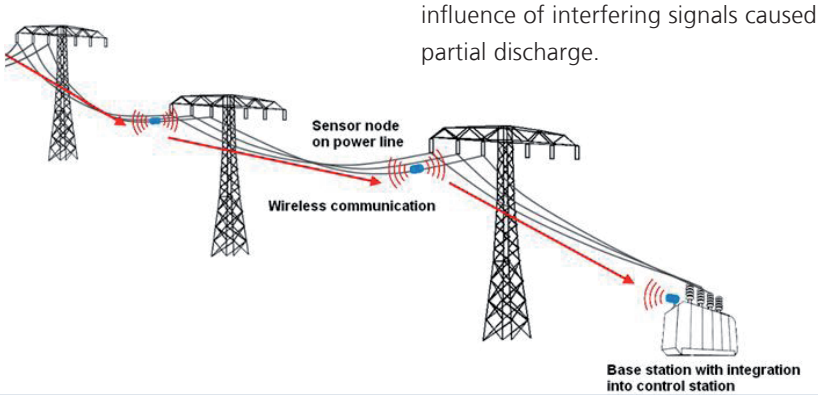
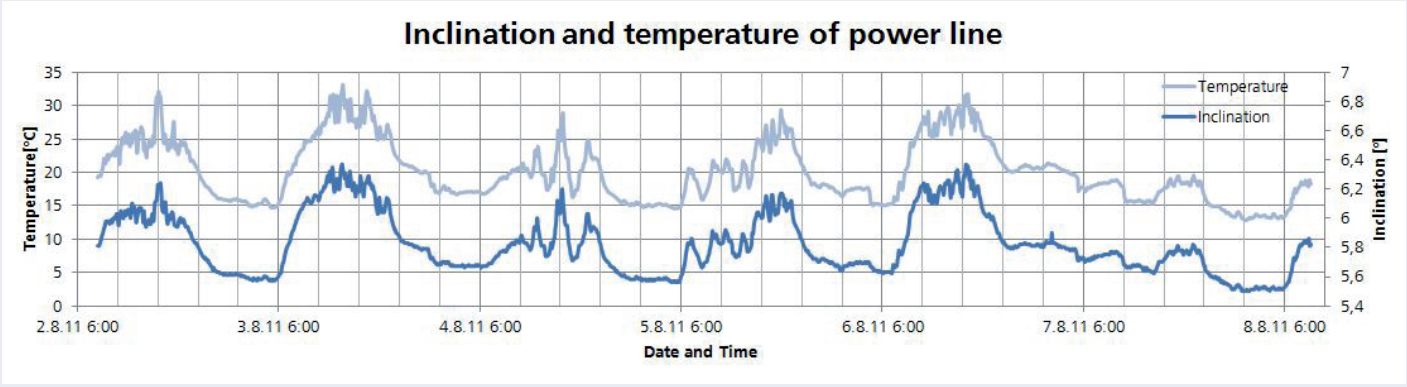
VDI VDE IT

Description

The condition monitoring of power lines aims at the optimization of the capacity utilization of energy transport while guarantee hazard free operation. The ASTROSE® system allows a decentralized monitoring of high-voltage transmission networks (110 kV, 220 kV and 380 kV) using autonomously working sensors. They measure the key parameters determining a cable's maximum throughput – the inclination of the power lines, the temperature, the current flow and the wind movement. An ultra-low power micro controller collects the data from the sensors and controls the radio transceiver for the wireless communication in the 2.4 GHz ISM frequency band.

Every 15 minutes, all data are wirelessly transmitted along the power line to the transformer station. There the data are fed in an internet-based remote maintenance system. Each sensor node is geographically localized and identified by its unique ID. The housing of the sensor node is made of PUR (Polyurethan). It contains the electronics, sensors, antennas and the antenna filter. All components are powered by the current of the electrical fringing field that surrounds the conductor wires. A capacitive MEMS inclination sensor detects both, the sag of the power line and its oscillation caused by wind motion. In order to avoid partial discharges slot antennas are used that distribute the 50 Hz electric field. The antenna filter avoids the influence of interfering signals caused by partial discharge.





ASTROSE® Sensor Node – Specifications

Description	Value	Unit
Casing diameter	100	mm
Casing length	150	mm
Measurement range of the inclination sensor	± 10	°
Resolution of the inclination sensor	0.01	°
Measurement range of the oscillation sensor	± 90	°
Resolution of the oscillation sensor	0.1	°
Measurement range of the current sensor	0 … 4	kA
Resolution of the current sensor	10	A
Short-circuit detection	> 4	kA
Measurement range of the temperature sensor	-25 … 100	°C
Resolution of the temperature sensor	0.1	°C
Temperature sensor accuracy	± 1	°C

Base Station – Specifications

Description	Value	Unit
Dimensions (L x W x H)	130 x 80 x 20	mm³
Operation voltage	9	V
Wireless data coupling via 50 Ohm antenna socket (SMA-compatible outdoor beam antenna included)	1	
Communication interface (RS232, fiber optic)	1	

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