


# Welcome

## Energía Eólica

Antonio Gordillo IMA 25 Agosto 2021

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Webinars

# Agenda

Introducción  Wind Park Mexico

- Energía Eólica
- Equipos en Aerogeneradores
  - Productos communes utilizados
  - LMS
  - Rotor Blade Intelligence
  - ICE Detection




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GAMESA CFE Wind Park Mexico La Venta 92 WT 78 MW

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Dzilam Wind Farm, Mexico Envision & Vive Energía Yucatán 2020 28WT 70 MW

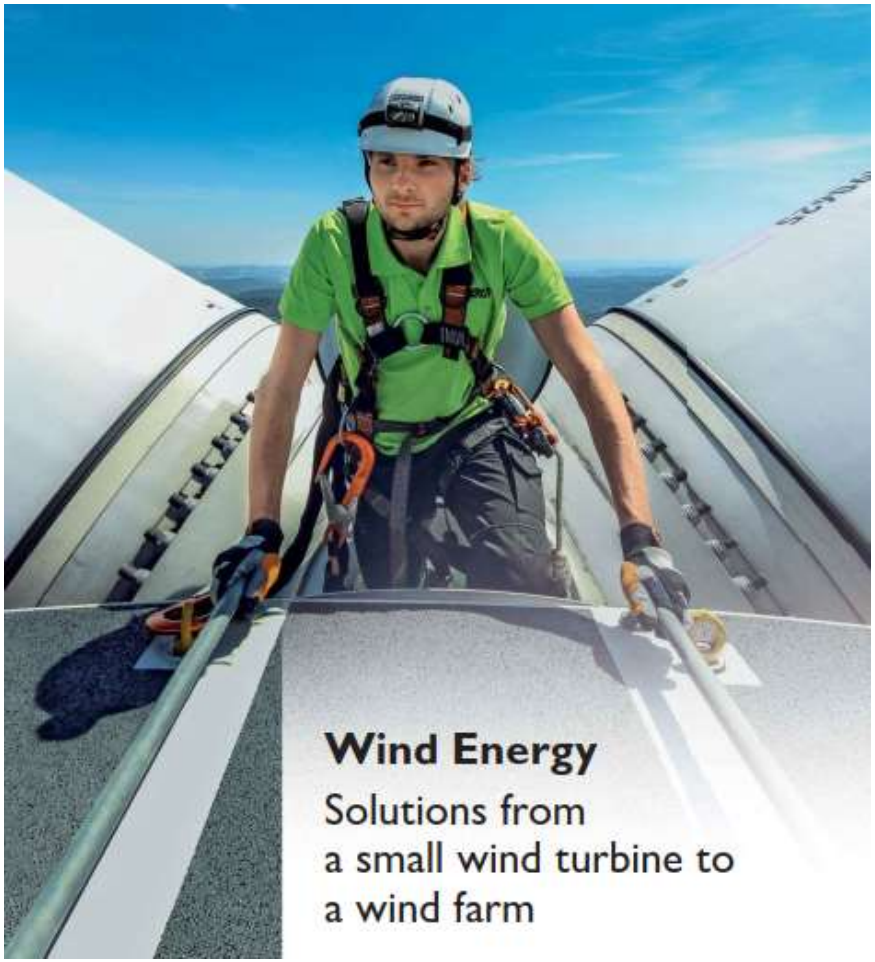
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Webinar IMA Noviembre 2020






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# Wind Solutions



### Wind turbine

From the base of the tower to the rotor blade, the most stringent requirements are placed on the electronic and automation components used in a wind turbine generator (WTG).

Phoenix Contact offers consistent solutions for the reliable automation of all turbines, whether in the tropics or in the polar regions.



### Wind farms

The systems that control and monitor a wind farm must perform to a high level. For automation this means: high data volumes, redundant system configuration, secure network technology and software, as well as detailed monitoring.



### Offshore wind farm

Offshore WTGs do not just have to be equipped to deal with variations in temperature, their electrical equipment must also be resistant to salt spray. Unplanned maintenance must also be avoided at all costs.



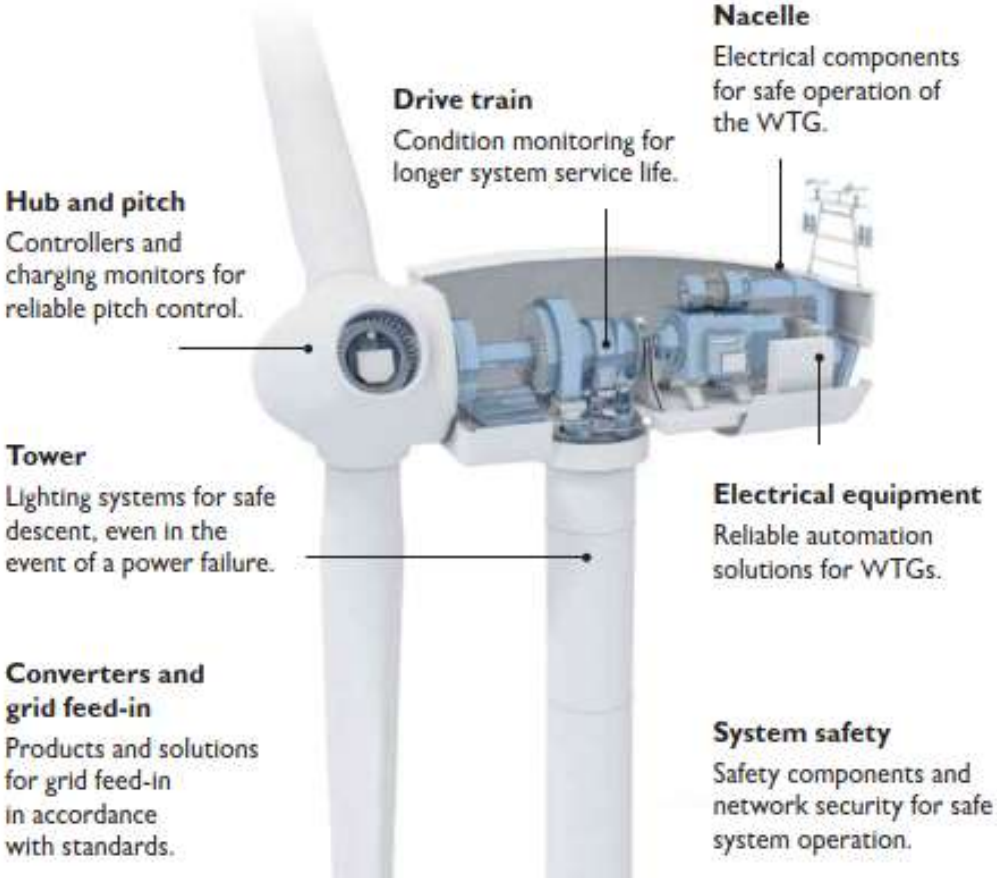
### Small wind turbine

When it comes to the automation of small wind turbines (SWTs), Phoenix Contact offers cost-effective comprehensive solutions that allow you to equip your application quickly and reliably.

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Wind Turbines

# Overview

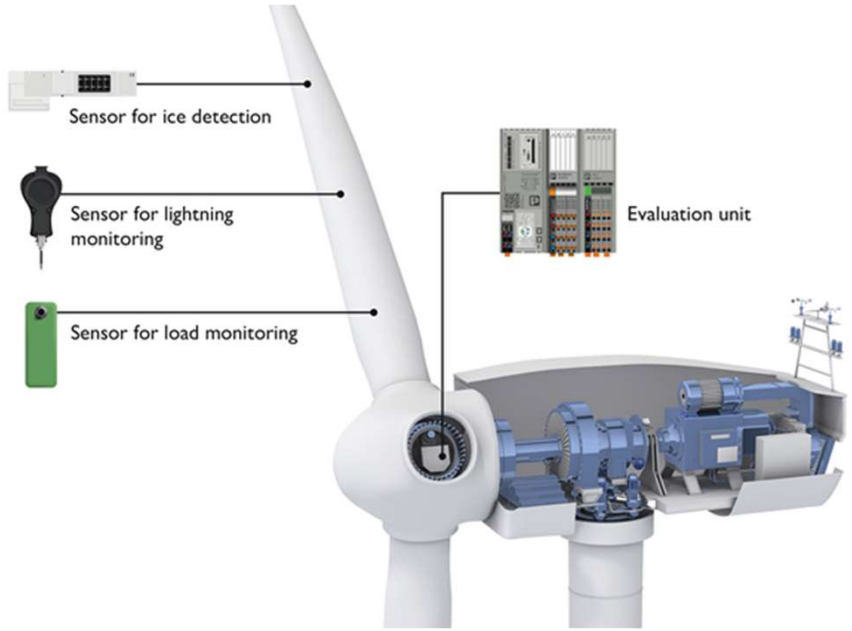



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Product applications solutions

# Wind Solutions

- Electrical Equipment
- Tower Lighting
- Rotor Blade Tension Monitoring
- Lightning Monitoring System
- Hub and pitch nacelle
- Safety
- ICE detection
- Grid Monitoring Protection Controller
- Converts and grid feed in




Wind Energy

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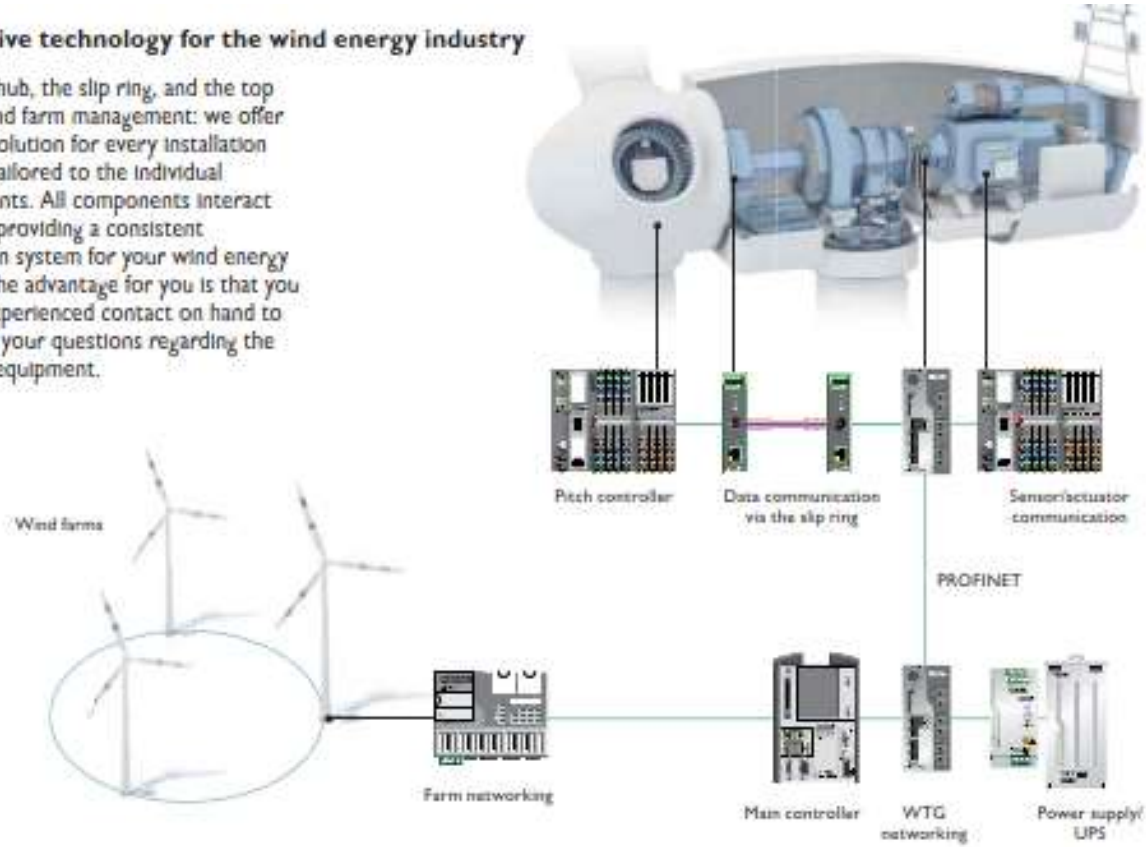
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# Electrical Equipment




## Impressive technology for the wind energy industry

From the hub, the slip ring, and the top box to wind farm management: we offer the ideal solution for every installation location, tailored to the individual requirements. All components interact perfectly, providing a consistent automation system for your wind energy project. The advantage for you is that you have an experienced contact on hand to answer all your questions regarding the electrical equipment.




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# Tower Lighting

QDP



PLD T



SAI







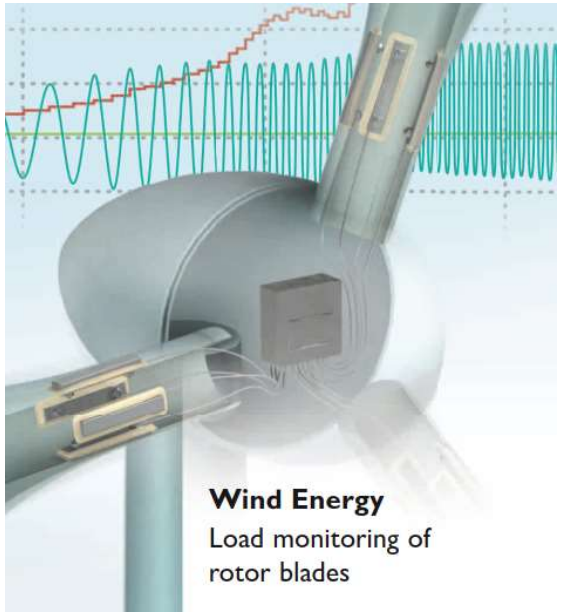


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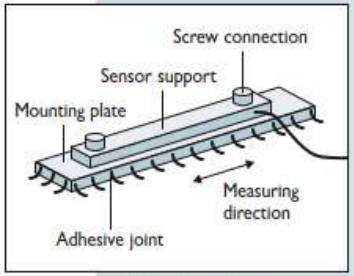

Blade Intelligence System
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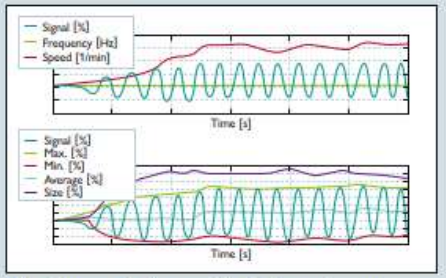
# Rotor Blade Tension Monitoring



**Wind Energy**
Load monitoring of rotor blades




*Vibration-resistant sensors measure the expansion*




*The data analysis provides information about the blade condition*

The rotor blades are subject to large dynamic forces which can lead to structural damages over the service life of the blades. Damages can be recognized early by continuously monitoring loads and vibrations. These data allow a perfect load-based regulation of the wind power plant, thereby reducing the stress on the blades to a minimum.

**Your advantages at a glance:**

- Proactive rotor blade monitoring
- Early detection of damages
- Optimized load control
- Reliable operation under harsh ambient conditions
- Open system for optimum integration
- Remote service capability, easy integration in remote service infrastructures
- Recording of load spectrum
- 4 digital outputs, e.g. as alarm output for threshold violations
- Providing all measured data for analysis purposes

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# Blade Intelligent System








## Blade Intelligence System

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# LMS Lightning Monitoring System




*The Lightning Monitoring System LM-S from Phoenix Contact captures lightning strikes and analyzes the peak current, specific energy and charge of lightning surge currents. It consists of sensors for the down conductors of a lightning protection system and the analyzer. The calculated data are easily accessible via the integrated web interface at any time from any place. This data provides lightning strike information of the facility and enable preventive maintenance. Based on data from the LM-S system, measures can be taken quickly to avoid consequential damage and downtime. If the effect is classified as noncritical, unnecessary maintenance or service work can be avoided. In structures that are not significantly affected, but have lightning-related sites, LM-S can be used for lightning research.*

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Application Lightning Monitoring System 2012

# LMS around the world

***Phoenix Contact wins HERMES AWARD 2012 with LM-S***

*This award is an international award for outstanding innovative development performance. The award ceremony took place on 22 April 2012 as part of the opening celebration of Hannover Messe.*

HERMES
AWARD
2012

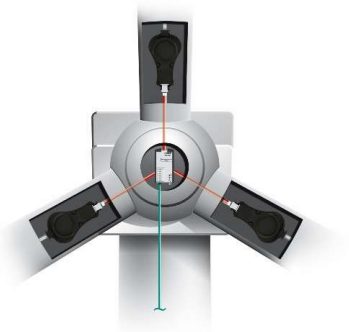



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# LMS





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# LMS





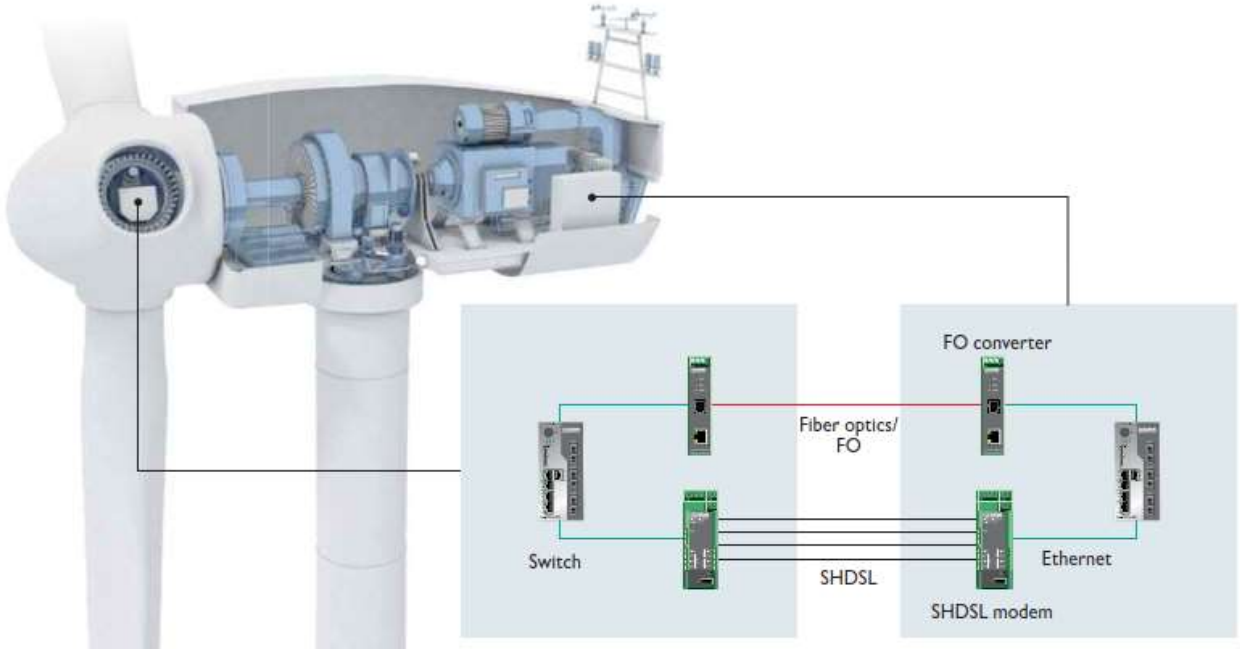

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# Hub and pitch

## High-availability technology for pitch control

Ensure maximum availability for controlling the pitch servomotors by using uninterruptible power supplies from Phoenix Contact. We have worked together with our partners in the wind industry to develop charge controllers for accumulators or capacitors which operate reliably even under the harsh conditions in the hub. This ensures that the rotor blades can operate in emergency mode even in the event of fluctuations or interruptions in the power supply.



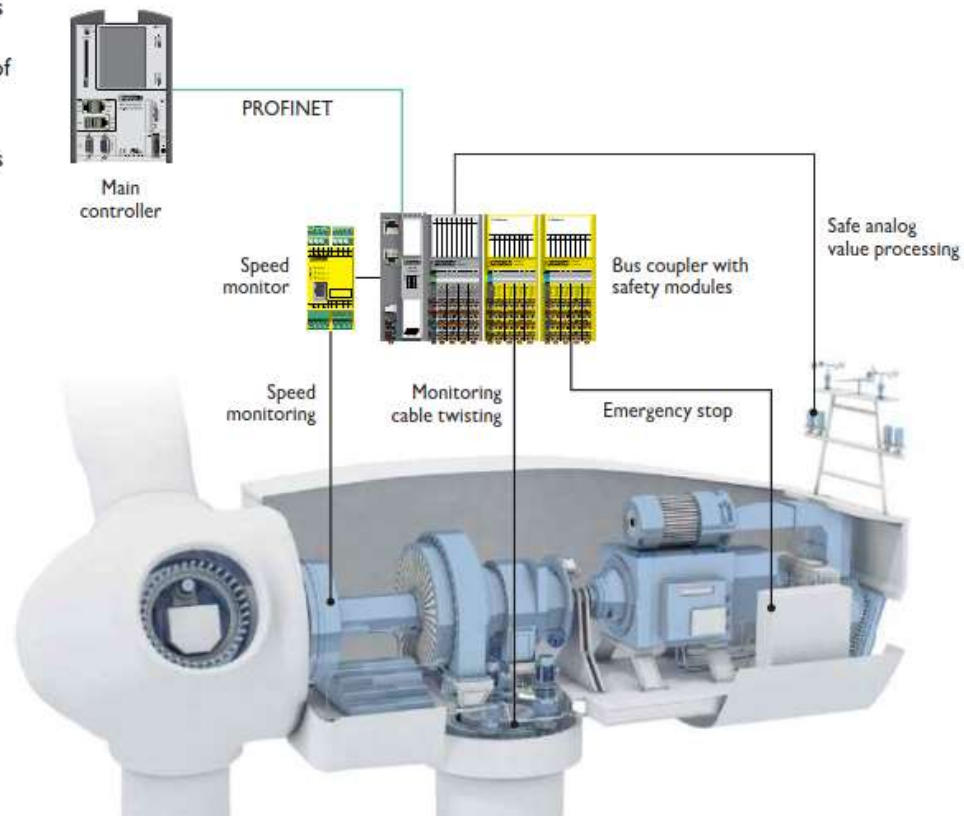

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# Safety

## Safe monitoring of the WTG

Safe monitoring of a wide range of signals is a challenge when controlling WTGs. Thanks to the comprehensive portfolio of safety products from Phoenix Contact, you can also implement the high requirements set by machinery directives for wind energy.



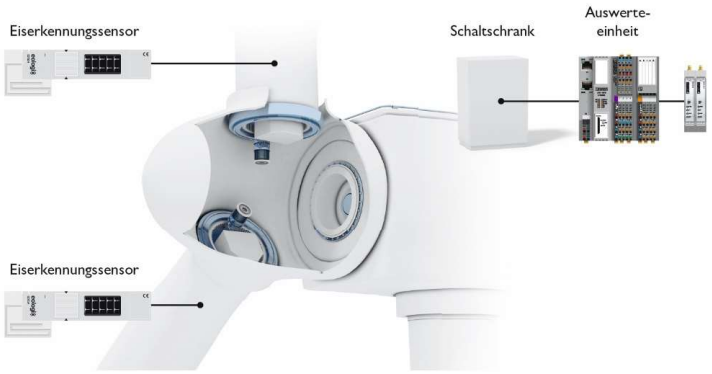

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# ICE Detection











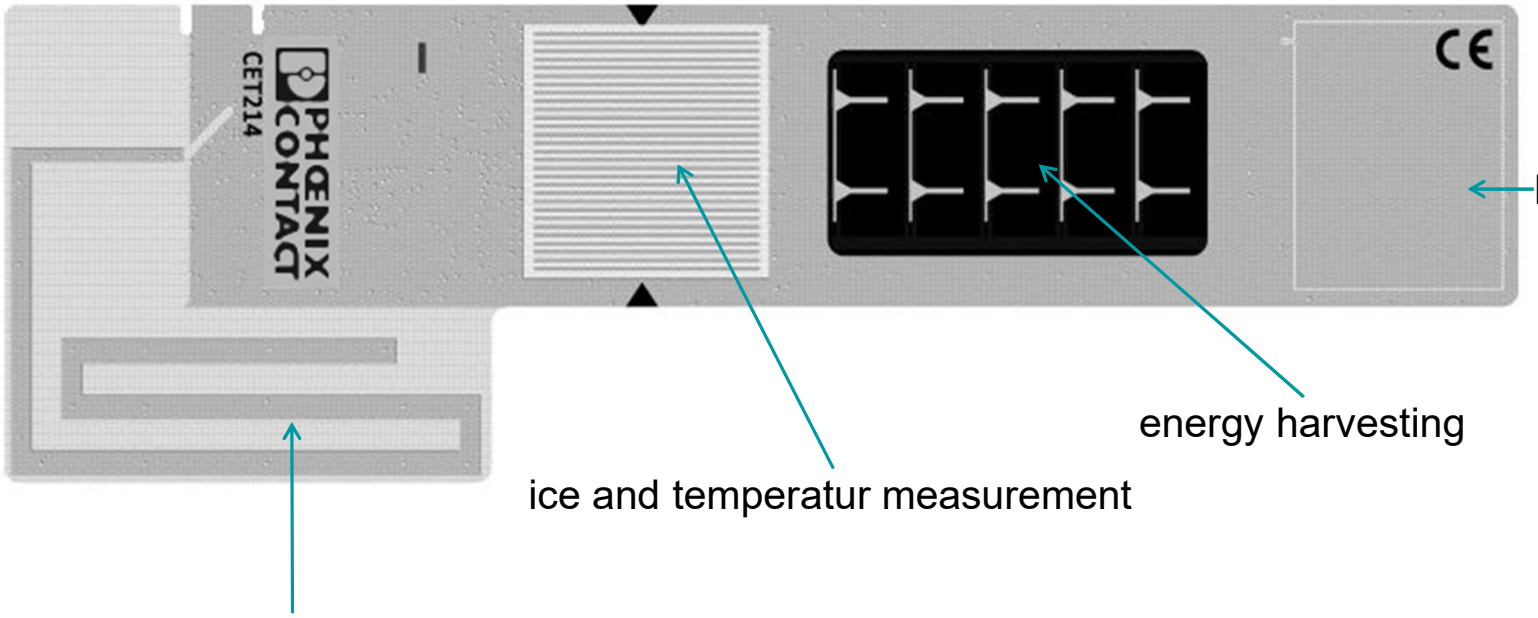
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# Blade based ice detection system



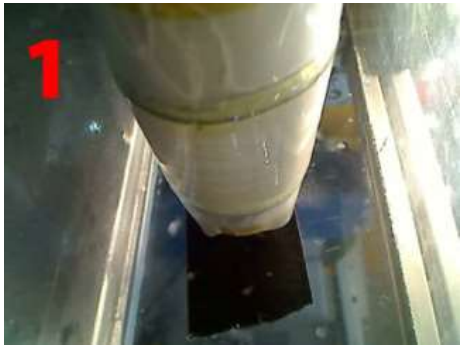
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# Technology




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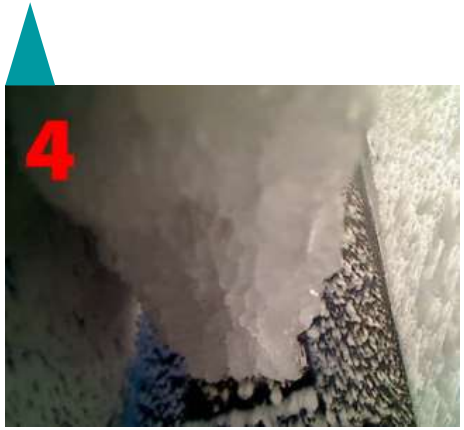
# Icing Wind Tunnel Test















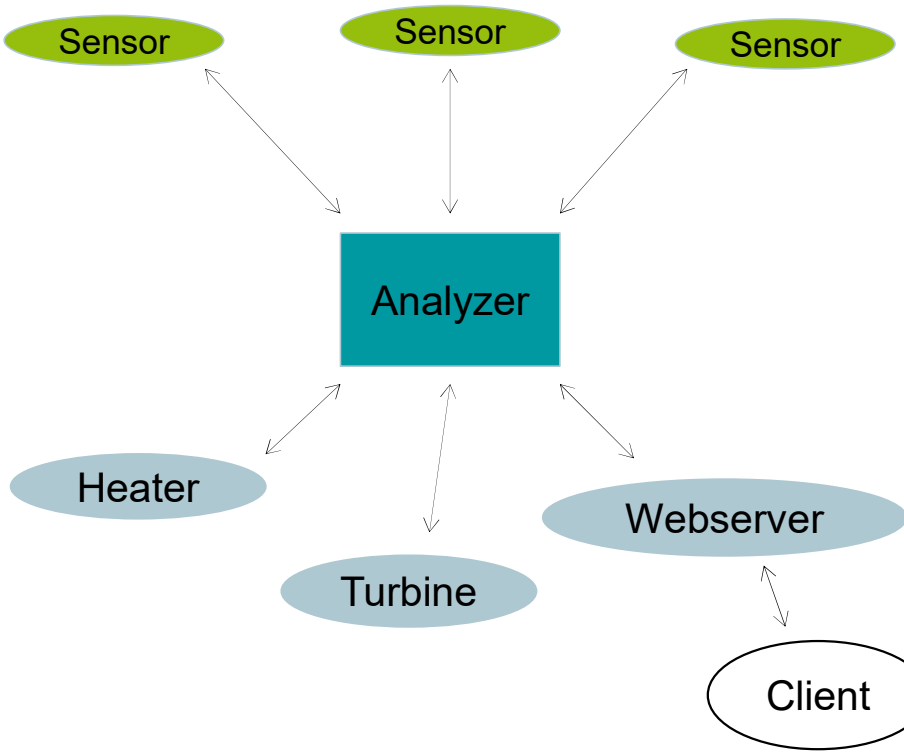

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# System Set Up

## Sensors








## Base station







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# Simplified stand alone system

- No initializing process at turbine start up

  → Simplified initializing

- No turbine controller information needed

  → Simplified integration

- Independent from blade characteristics and resonance frequency

  → Simplified installation



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# Sensor Configuration

**Ice detection for wind turbines:**

The Systems identifies ice on the rotor and stops the turbine

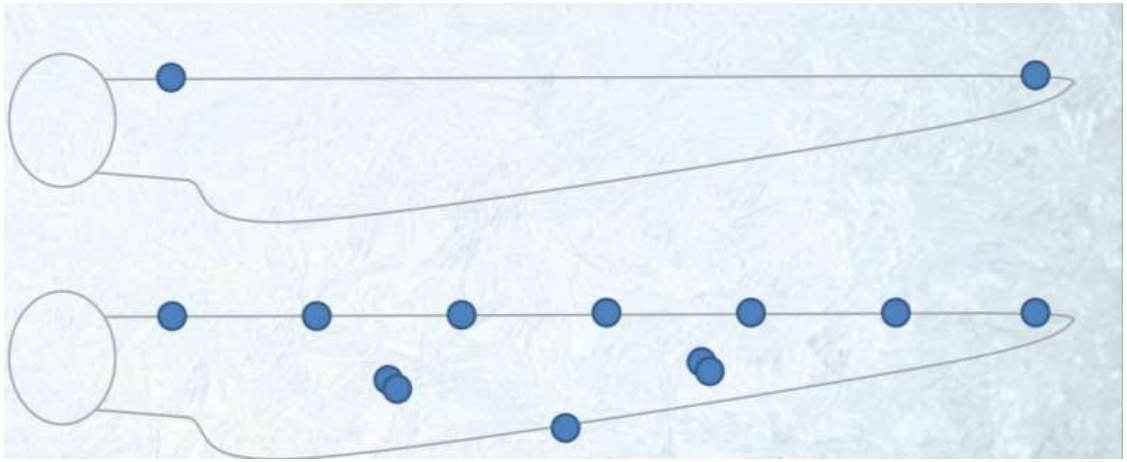
→ 6 Sensors per turbine

**Automatic restart:**

The Systems identifies ice on the rotor and stops the turbine after de-icing the turbine can start automatically

→ Sensor amount depending on blade length

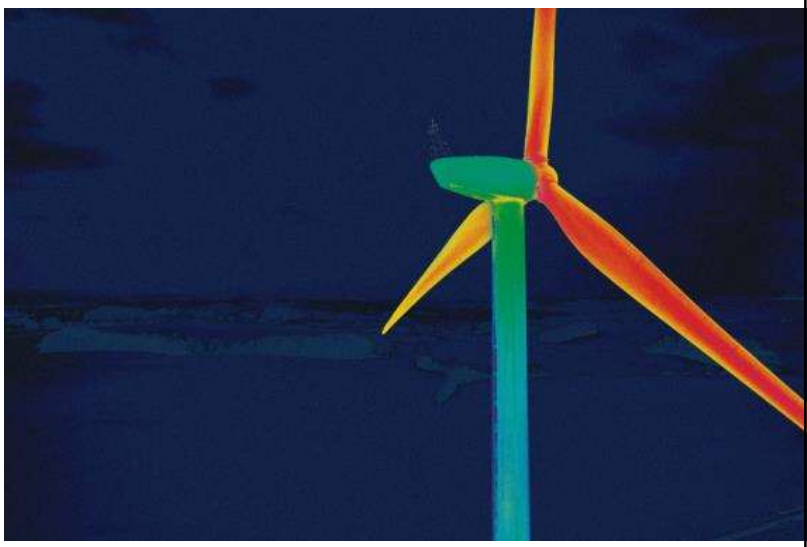
→ e.g. V112: 21 sensors per turbine



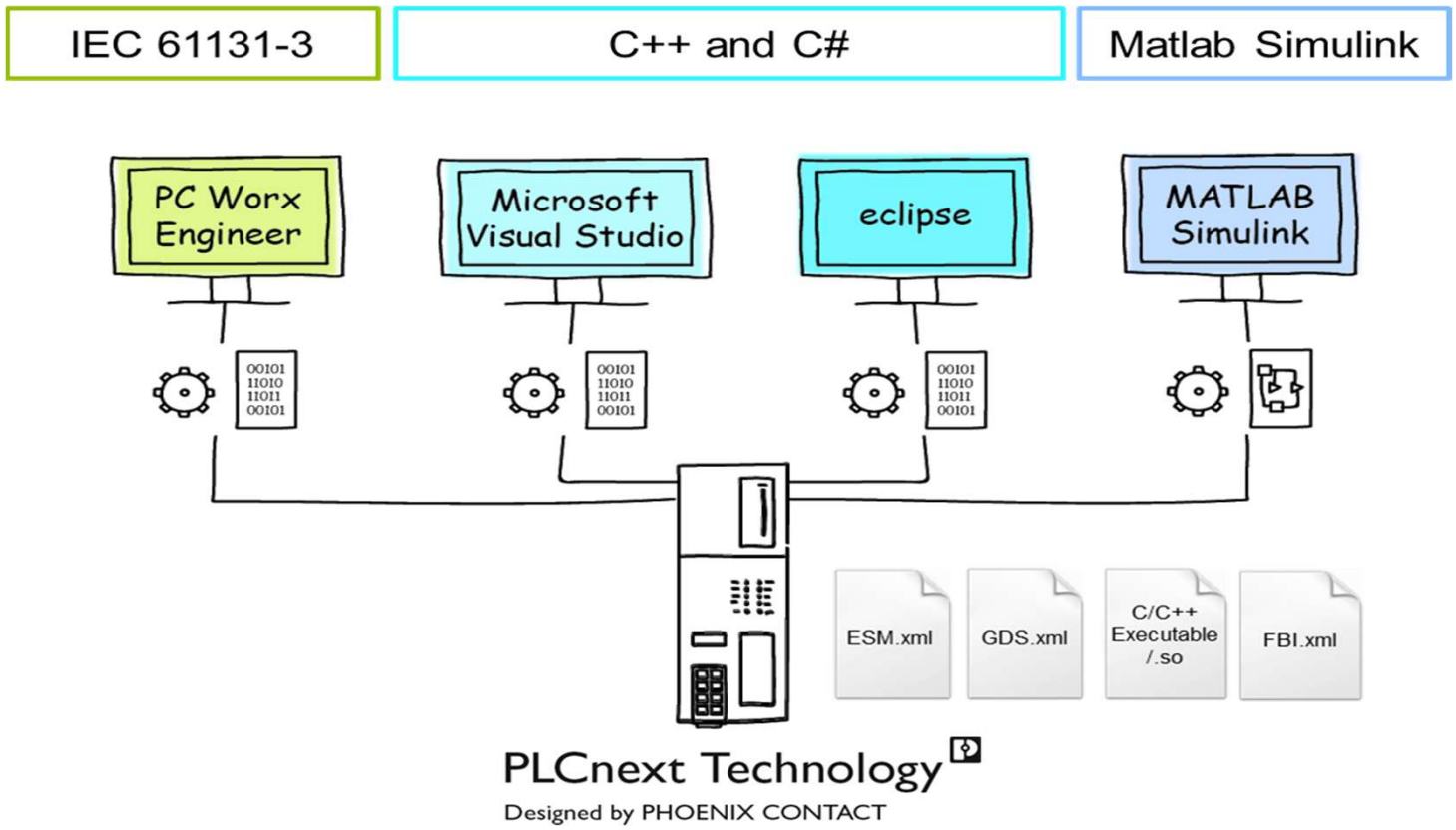
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# Rotorblade heating

- Temperature measurement directly on the blade
- Feedback for the blade heating
- Build up reliable control loop to improve heating system



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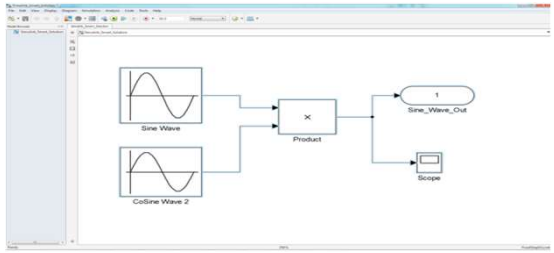





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# Simulation of Rotorblade heating



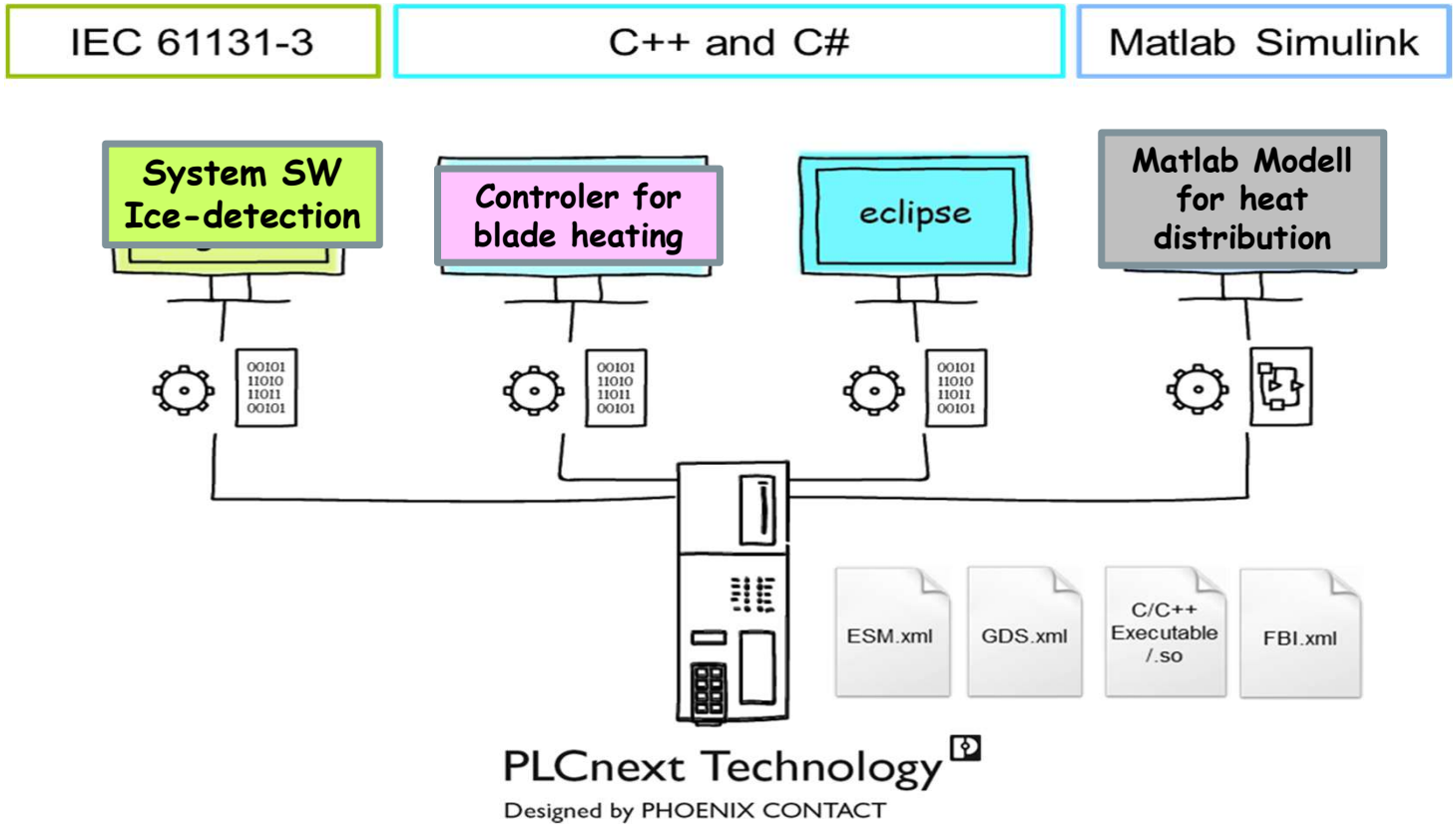



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# Heater integrated

Temperature measurement

Ice-sensors

Heater with integrated
Ice detection PLC





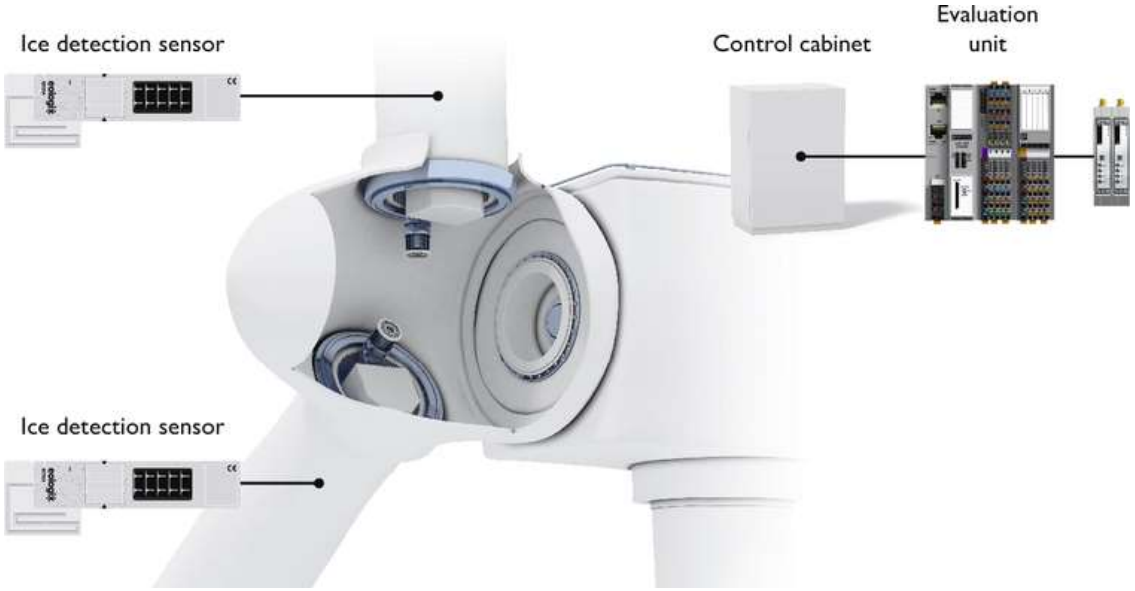
Control room

WTG PLC

Not needed for ice and temperature measurement

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# Heater integrated




Identification of Ice grow on the blade

⇩

Pre Warning by Bus system or Relais

⇩

Start heating system

The system is allowed to be used with restart on heated blades

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# Mounting: Ground/Platform Mount





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# Mounting: Rope access





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# Ice & Temperature Measurement

- surface status is indicated by 4 levels:



**4:** ice > ~ 10 mm



**3:** ice > ~ 1 - 2 mm



**2:** „activity“ (very thin layer < 1 mm or wet)

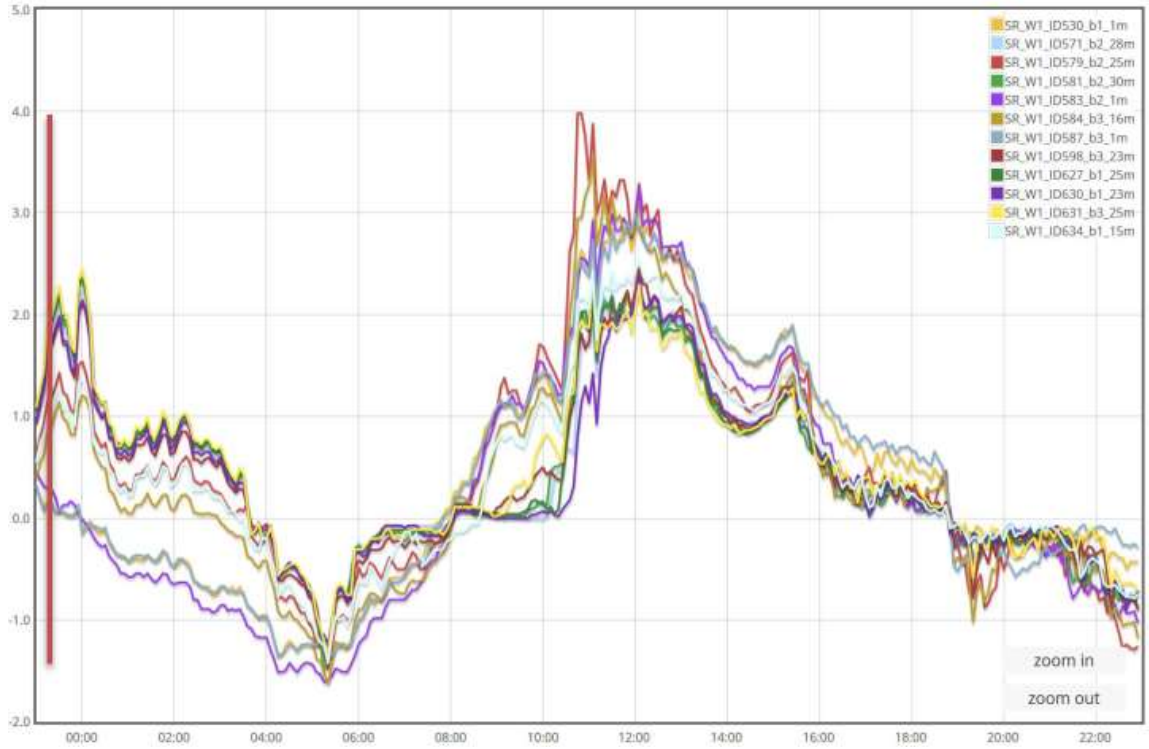
**1:** free surface

- temperature measurement:
  - accuracy: +/- 0.25 °C integrated

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# Real-world data during a day






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# Grid monitoring protection controller

## Intelligent network and system protection for low-voltage networks

To ensure the stability of networks, the low-voltage directive VDE-AR-N 4105 specifies certain protection devices for systems for power generation. To meet the requirements, Phoenix Contact offers a type-approved network and system protection for wind energy whose conformity has been confirmed by an independent testing institute.

The network protection device ensures that the power generation plant is electrically isolated within 200 milliseconds as soon as voltage and frequency of the supply network exit the tolerance range.

| Order No. | Type | Description |
|---|---|---|
| **2403153** | WIL-SC-GMPC-SET1 | Network protection device, 1 energy measurement terminal |
| **2403154** | WIL-SC-GMPC-SET2 | Network protection device, 2 energy measurement terminals |



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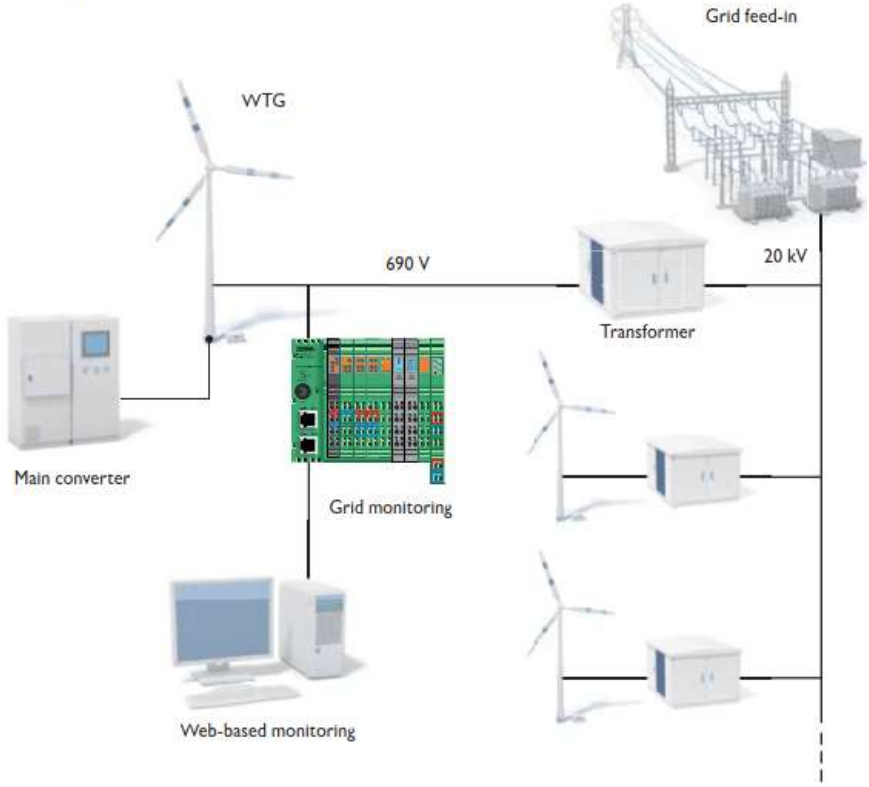
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# Converts and grid feed in

## Standard-compliant energy feed-in at all times

Modern WTGs also have the task of compensating for mains fluctuations and therefore increasing the stability of the network. They must meet the network connection requirements that are based on VDE-AR-N 4105 in Germany, for example. Also, they must integrate mains and plant protection, which acquires the condition values of the network and implements emergency shutdown in accordance with defined procedures, if necessary.

In line with these requirements, the operation of the WTG must be consistently ensured and the main network must be continuously monitored at the same time. Solutions for feed-in management from Phoenix Contact can be used to continuously monitor the power supply network, enabling the plant control system to respond to events in the network.




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Wind

# Some solutions










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**Tecnología en el parque eólico de Palo Alto en EGP, México 43 WT 129 MW**

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