



HEIDENHAIN

Wind Turbine Monitoring and Control

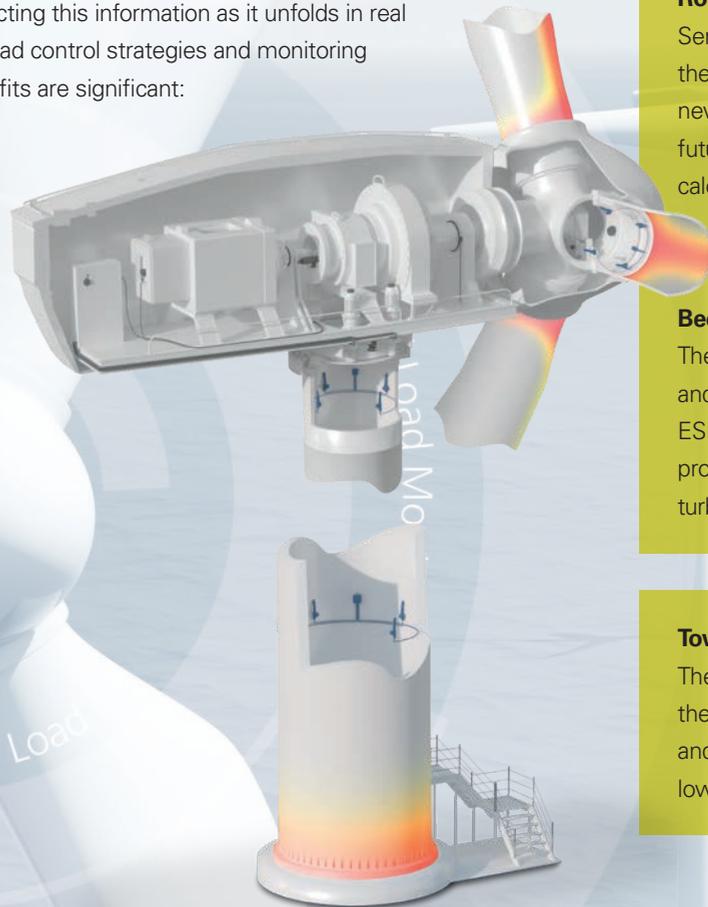
Optimal performance for wind turbines

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Wind turbine monitoring and control from HEIDENHAIN

In order to maximize the efficiency and service life of a wind turbine, the control system needs reliable, real-time data about vibrations and structural loads acting on the tower, bed plate and rotor blades. Collecting this information as it unfolds in real time makes it possible to integrate active load control strategies and monitoring functions into the control system. The benefits are significant:

- Longer service life
- Less maintenance
- Higher energy yields
- Lower structural component costs



Rotor blades

Sensors installed inside the rotor blades can measure individual loads precisely where they occur. This measurement data can be used for detailed status monitoring and for new control systems that deliver greater yield and efficiency. Valuable information for future designs can be gleaned by comparing the measured data with the theoretical calculated data.

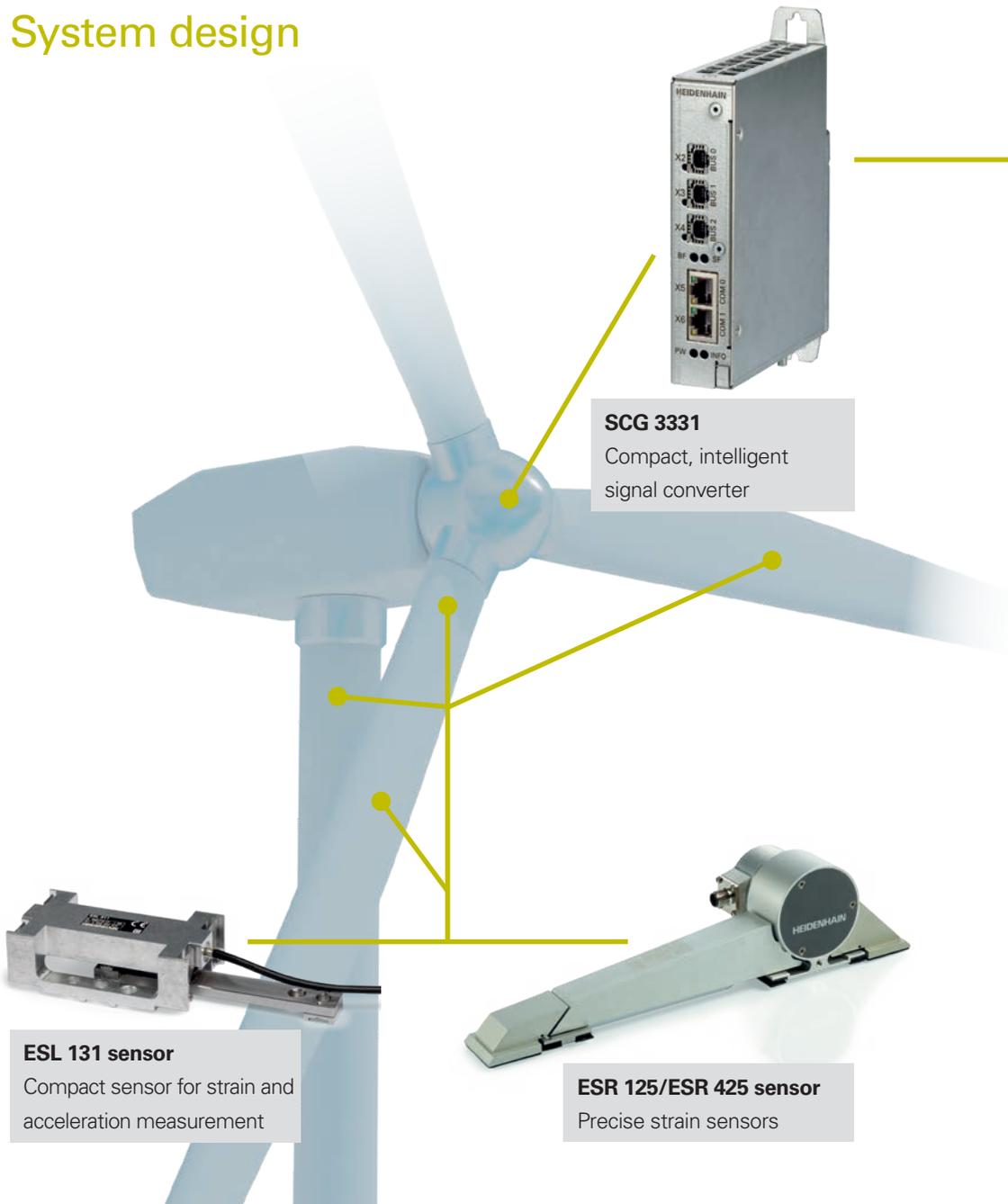
Bed plate

The bed plate supports the main mechanical components (the generator and gearbox) and joins the rotor to the tower. As such, it is subject to numerous complex loads. The ESR and ESL sensors can measure the relative motion between components and provide information about wear and fatigue. This enables adaptive control of the wind turbine for load optimization, which minimizes costly breakdowns.

Tower

The trend towards ever-larger rotor diameters and hub heights means higher loads on the tower and foundation. This generally raises the design and logistics requirements, and thus the overall cost. An optimized, sensor-based control system can significantly lower these loads, thereby downsizing parts and the cost of material.

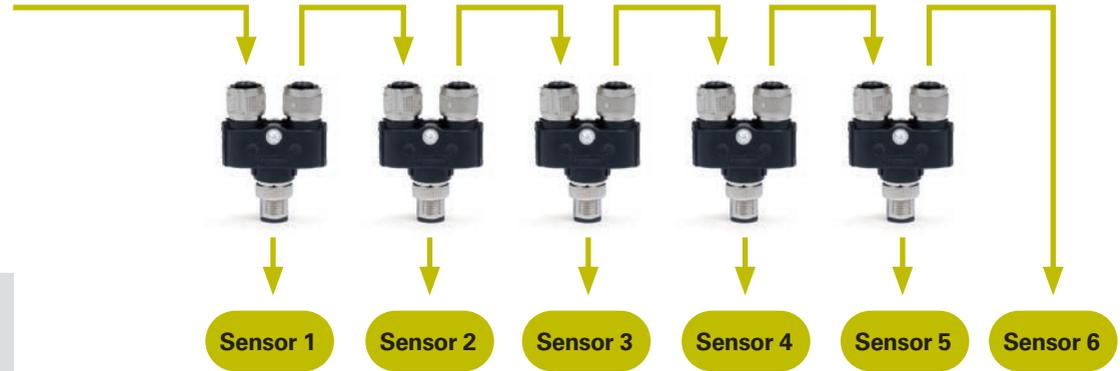
System design



SCG 3331
Compact, intelligent
signal converter

ESL 131 sensor
Compact sensor for strain and
acceleration measurement

ESR 125/ESR 425 sensor
Precise strain sensors



Designed for installation in towers, bed plates and rotor blades

Up to three EnDat strands can be connected to the SCG 3331 in bus mode, and up to six sensors can be used on each strand. Therefore, up to 18 sensors can be connected to an SCG 3331 under full capacity.

EnDat 3 in bus mode connects these sensors in daisy chain mode. The maximum cable length is 100 meters.

Passive Y splitters allow EnDat 3 to be set up in bus mode for a single-cable solution.

Greater protection and performance for your wind turbines

Optimal performance

Highly synchronous scanning and sensor-data transmission

- Reduced structural loads thanks to precise adaptive response to surrounding conditions

SCG 3331 connectivity for up to 18 sensors

- Extensive functionality

Digital node for ID label and diagnostics

- Continuous system monitoring



Flexible system solution

Integrated 3-axis acceleration sensor (optional)

- Implementation of cutting-edge control and monitoring functions

Up to six sensors per strand (including non-HEIDENHAIN sensors)

- Flexible extensibility for future designs

Maximum cable length: 100 m

- Versatile sensor installation, even in the middle of the blade



Practical design

Long-term sensing stability with high resolution and a wide measuring range

- Efficient and well-designed system

High level of mechanical and electrical protection for the sensors, electronics and connecting technology

- Protection from harsh ambient conditions, especially inside rotor blades

Maintenance-free components

- Long-term operation without additional maintenance



Simple mounting design

Single-cable solution for multiple sensors (daisy chain)

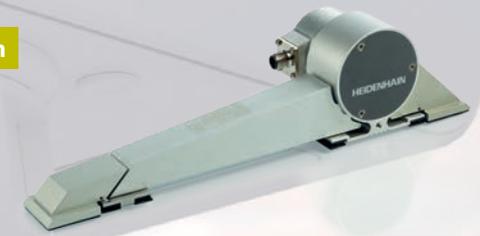
- Easy installation and simple cabling, especially between the rotor blade and tower

Straightforward sensor assembly

- Low-cost installation and setup

Compact sensor and electronics design

- Low space requirement



Products

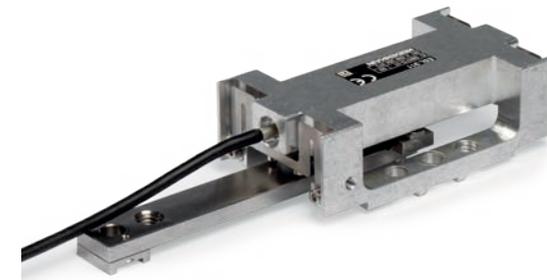
Sensors

Specifications	ESR 125 2D	ESR 425 2D	ESL 131 2D	ESL 131 5D
Measurement data				
Strain resolution	0.025 μe		0.25 μe	
Strain measuring range	$\pm 5000 \mu\text{e}$			
Resolution per axis for acceleration	n/a		0.09 mg	
Measuring range per axis for acceleration	n/a		$\pm 4 \text{ g}$ resp. $\pm 8 \text{ g}$	
Interface				
Sensor interface	EnDat 3			
Additional information	Sensor diagnostics and access to the OEM memory			
Operating temperature	-40 °C to 100 °C		-40 °C to 80 °C	-40 °C to 75 °C
Protection EN 60529	IP66		IP65	
Mass	0.65 kg		< 0.5 kg	

Characteristics				
Installation	Gluing	Magnetic	Adhesive bonding, screw fastening	Adhesive bonding, screw fastening
Place of operation	Sheet	Tower, bed plate	Blades, tower, bed plate	Blades, tower, bed plate
Time window	Permanent	Limited period	Permanent	Permanent
Measurement type	Strain, temperature (internal)	Strain, temperature (internal, external for surfaces)	Strain, temperature (internal)	Strain, temperature (internal), 3-axis acceleration



ESR 125 2D/ESR 425 2D



ESL 131 2D/ESL 131 5D

Intelligent downstream electronics

Specifications	SCG 3331
Electrical data	
Supply voltage	24 V DC \pm 15%
Fieldbus interface	2 x PROFINET IO RT
Sensor connections	3 x EnDat 3 strands, with up to 6 x sensors per EnDat 3 strand
Synchronization of the sensors in the EnDat 3 strand	< 2 μ s
Synchronization of the EnDat 3 strands	< 2 μ s
Scanning frequency	> 1 kHz

Accessories

Connection technology	M12 connecting cable
	Y splitter



SCG 3331

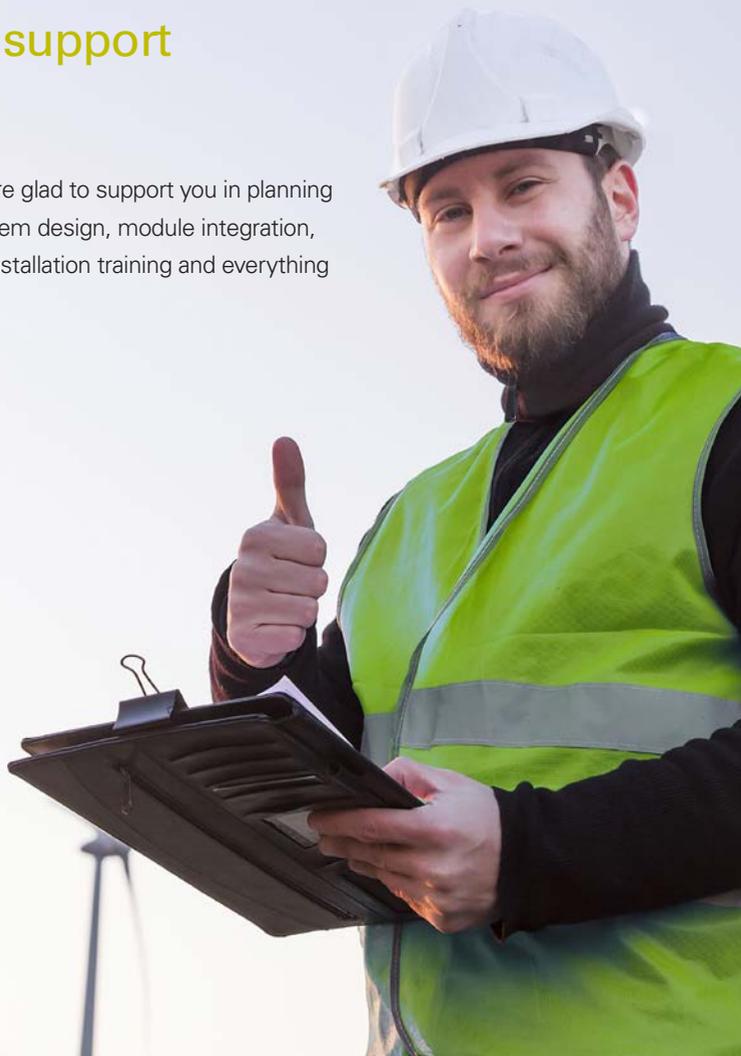


Y splitter

M12 connecting cable

Services and support

Our application specialists are glad to support you in planning and implementation for system design, module integration, sensor integration, on-site installation training and everything in between.



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Further information



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