



SENSING  360

LumiSens GearUp

Planetary Gear Condition Monitoring system

The Sensing360 Lumisens GearUp



Gearbox OEM

End-of-line test catches assembly errors. It measures per-planet load distribution or produce K_{γ}

GearUp gives you a Diagnostic Passport per unit; evidence that settles warranty disputes with data, with lower cost than 2% of the average warranty claim.



Turbine OEM

CMS detects surface damage 2-6 weeks before failure. GearUp detects the root cause, load sharing inequality, 3 to 9 months earlier.

It integrates as reseller, white-label or API into your existing digital platform, with no gearbox design changes.



Wind farm operator / IPP

Most of your gearbox costs trace back to a mechanism nobody is measuring: unequal load distribution among the planets.

GearUp measures it, lets you derate instead of shutting down, and buys you months to plan a EUR 50K repair instead of a EUR 500K replacement.



Asset manager

Gearbox risk is currently priced on assumptions. GearUp replaces those assumptions with measured fatigue life per turbine.

This feeds directly into Value (+8-12%), Investment (+1.5-2.5%), and LCOE (-2-5%) models.



Insurance & Lenders

Every planetary failure claim comes down to one question: manufacturing defect, operator error, or normal fatigue?

GearUp answers it with data. Claims arrive with full diagnostic history instead of contested liability.

Why Choose the Sensing360 Solution?

Direct ring gear installation: Optical sensors bonded directly to the stationary ring gear. No rotating telemetry, no slip rings, no maintenance items, Two hours by your own assembly.

Measurement at the source: Strain on the ring gear is the direct mechanical signal of each planet's mesh force. Actual load, per planet, per revolution catching all dynamic events.

Leading indicator, not lagging: Detects load sharing inequality 3-9 months before vibration registers any surface damage. You act on the cause while components are still intact.

Standards-referenced output: "Life" computed per IEC 61400-4 and ANSI/AGMA 6006 using patented extension of Weibull reliability theory. An auditable, standards-based fatigue life.

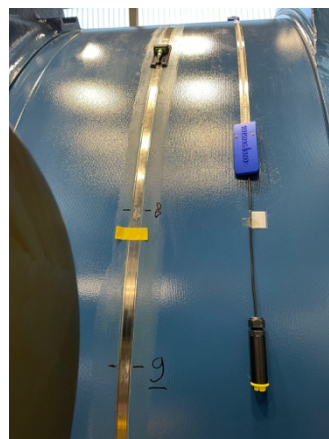
Smart derate instead of shutdown: "Life" exceeds threshold, reduce output to ~80% and bring the overloaded planet back within design limits. You plan the repair on your terms.

Retrofit in two hours: Installs during any scheduled maintenance visit. No crane, no specialist, no turbine design changes. Roll-out batched across your existing maintenance schedule.

Full lifecycle coverage: From factory quality gate to warranty defense to operational monitoring to life extension certification. One sensor system across the entire asset life.

How does it work?

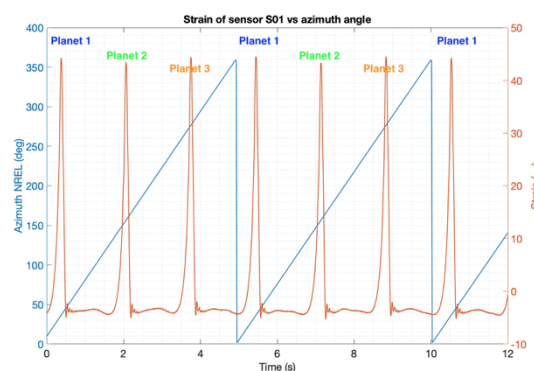
We instrument passive, EMI immune and robust optical sensors directly on the stationary ring gear



Measuring the exact strains caused by the meshing of the planet teeth, exact mechanical deformation caused by the real operating conditions.

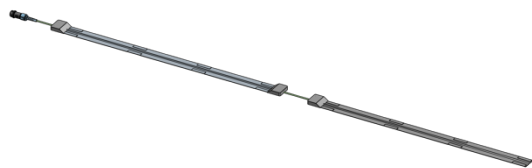


Translating the strains to: main shaft torque, rotation speed and the load sharing between planets plus vibration data (FFT, Order tracking).



Proven and integrated with gearbox OEMs, at NLR and retrofitted turbines.

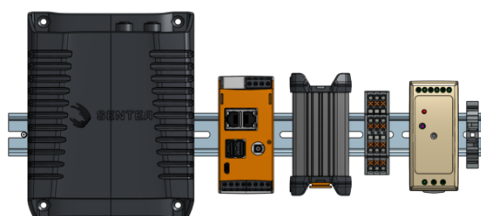




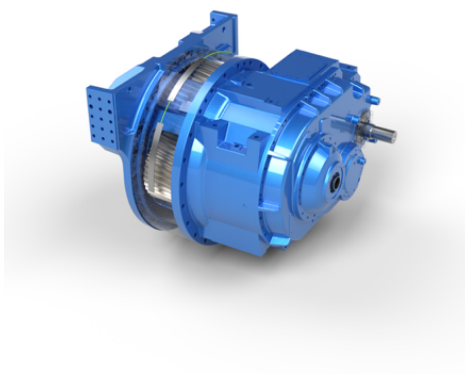
Fiber Optic Sensor Strip



Stand-alone Solution



Top-box Solution



LumiSens GearUp

The GearUp system includes a fibre optic sensor strip and a data processing module.

The GearUp Fiber Optical Sensor Strip is directly mounted to the ring gear of the first stage of the gearbox. Due to the use of fibre optic technology, the sensor is robust to environmental influences.

The GearUp Data Processing Unit provides a local data feed of torque, rpm and load sharing. Additionally, frequency data is periodically captured for the purpose of condition monitoring.

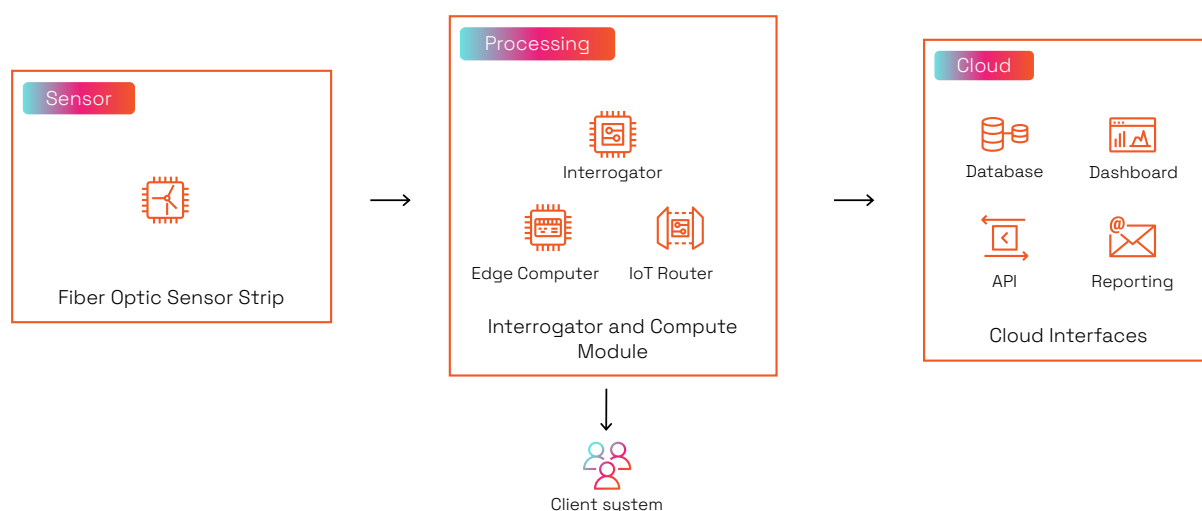
The GearUp Data Processing Unit is available as a cabinet mounted stand-alone solution with 230 V power supply or a top-box solution, requiring a 24 V DC supply.

Features

- Exact operation monitoring
- Outputs: Torque, load sharing, speed
- CoMo: Frequency spectra, Order analysis
- Fiber optic sensor strip
- Local data feed
- Robust to environmental influences
- Remote connectivity
- Stand-alone or top-box solution

Optional cloud connectivity provides:

- Cloud portal
- Dashboard
- API
- Reporting
- Predictive maintenance package
- Reliability based maintenance package



Common features

Optical sensor strip	
Number of FBGs	7
Connector	LC/APC
Mounting options	Adhesive or spot-welding
Material	Stainless Steel
Dimensions	1488 mm x 40 mm x 3.4 mm
Local data interface	
Protocol	ModBus TCP
Sampling interval	100 Hz
Output parameters	Torque, RPM and load sharing
Interrogator	
Max sampling rate	24 kHz
Channels	4
Data processing unit	
Type	RevPi Connect 5
Connectivity	
Antenna type	SMA connector

Stand-alone version

Cabinet	
Mounting	Wall mounting
Protection	IP65
Power supply	Multi-voltage power supply 100 V to 240 V / 50 Hz to 60 Hz / 50 W
Dimensions	380 mm x 380 mm x 210 mm
Operating temperature	-25 °C to +55 °C between 5% and 95% humidity (no condensation)

Top-box version

Cabinet	
Mounting	DIN-rail NS 35/ 7,5 ZN
Dimensions	500 mm x 150 mm x 150 mm
Power supply	24 V DC
Operating temperature	-25 °C to +55 °C between 5% and 95% humidity (no condensation)

Edge & Cloud Functionality

Best for:	Core	Quality	Cloud		
			Base	Park	Integrate
	Direct data feed	EoL quality check	Monitoring of few (pilot) turbines	For monitoring of wind farms	For multiple wind farms
Edge parameters					
Torque	✓	✓	✓	✓	✓
Speed	✓	✓	✓	✓	✓
Load Sharing	✓	✓	✓	✓	✓
Frequency spectra	✗	✗	✓	✓	✓
Order analysis	✗	✗	✓	✓	✓
EoL load sharing quality parameters	✗	✓	✗	✗	✗
Core parameters local data feed	✓	✗	✓	✓	✓
Features					
Core parameters dashboard	✗	✓	✓	✓	✓
Reporting	✗	✓	✓	✓	✓
API Access	✗	✗	✗	✓	✓
Self-hosted deployment	✗	✗	✗	✗	✓
Assets	1	1	up to 4	up to 200	unlimited
Platform users	n.a.	n.a.	up to 8	up to 50	unlimited
Retention	✗	✗	2 years	5 years	20 year
Availability	✗	✗	single zone	single/multi zone	n/a
GearUp Predictive Maintenance					
Predictive maintenance dashboard	✗	✗	✓	✓	✓
Gearbox fault detection	✗	✗	✓	✓	✓
Detect non-optimal operating conditions	✗	✗	✓	✓	✓
Realtime alarms	✗	✗	✓	✓	✓
GearUp Reliability Based Maintenance					
Reliability based maintenance dashboard	✗	✗	✓	✓	✓
Mean time to failure per WTG and component	✗	✗	✓	✓	✓
Fatigue life failure monitoring	✗	✗	✓	✓	✓
Operation based maintenance interval	✗	✗	✓	✓	✓
Failure probability	✗	✗	✓	✓	✓

Specifications

Sensor performance

Torque range	Standard	0 kNm - 7 MNm ⁽¹⁾ - higher torque ranges possible
Torque accuracy	Standard	2-3% <i>Full Scale</i> - linearity & repeatability incl. drift & creep
Speed range	Standard	1 - 400 RPM ⁽¹⁾
Speed indication	Standard	0,1% <i>Full Scale</i> ⁽²⁾
Temperature sensing	Option	-10 to +90 °C
Temperature accuracy	Option	± 0,1 °C
Load sharing resolution	Standard	1% [0,01] - planet _{max} /planet _{mean}

Output signal - Core signals

Torque	Standard	100 Hz
Speed	Standard	100 Hz
Load sharing	Standard	1 Hz
Bus interface	Standard	Modbus over IP · Ethernet (TCP/UDP)
Bus interface	Option	Modbus · 4-20 mA · 0-10Vdc
Database & dashboard	Two options	GearUp Condition (CBM) GearUp (RBM)

Operation characteristics

Gearbox size range	Standard	0,5 MW - 7 MW ⁽¹⁾ - higher MW ranges possible
Ring gear diameter	Standard	0,7 - 2,5 m ⁽¹⁾
Temperature range	Standard	-50 to +150 °C
Power	Standard	12V DC external · 24V DC external ⁽³⁾
Hardware	Standard	Sensor strip · Patchcord · Edge Interrogator · Interface
Software · as a service	Option	Database · Dashboard · API · Connectivity · Condition monitoring · Root cause analysis

Physical characteristics

LxWxH	Standard	900 x 35 x 1.5 mm - see drawing
Weight	Standard	0,3 Kg
Modularity	Option	Multiple strips for 360° coverage of circumference

⁽¹⁾ Validated - not limited to ⁽²⁾ Above minimum torque ⁽³⁾ As option