

SMART WIND FARM VIBRATION MONITOR

The self-contained and intelligent ONEPROD KITE system is intended for continuous multi-channel monitoring of wind turbines. Embedding ONEPROD's 30+ years of experience in condition monitoring, KITE allows for early fault detection, including on the gearbox and on the low speed parts. Its extensive processing power makes it possible to monitor the wind turbines with high accuracy despite the variable operating conditions.

ONEPROD KITE offers 12 data acquisition channels for connection of various accelerometers, tachometer and other process information. Its unique cabinet-free design and communication capabilities make of KITE a perfect fit for a reliable monitoring of wind turbines.



Condition Monitoring System for Wind Turbines

Analog Inputs	Number of analog channels	12 synchronous channels
	Type of analog inputs	All sensors needed for an efficient monitoring of a wind turbine can be connected to the KITE (Accelerometers, Tachometers, Current clamp, Thermocouple...). Each channel can be configured individually to adapt to any type of input: IEPE AC, IEPE DC, 4-20 mA, voltage input (AC+DC, DC), impulse counter
Variable operating condition	Management of variable operating conditions	Up to 10 operating conditions can be defined per turbine for a tailored monitoring: High power, low power, broad condition, tracking of yaw movements, tracking of structure movements...
	Operating parameters	Up to 6 parameters managed: rotation speed, wind speed, power, pitch... Operating parameters can be collected from the PLC or measured with a sensor connected to the KITE.
	Scan rate of the operating condition	Real-time: operating parameters are scanned every 100ms to update the operating status of the turbine and automatically adapt the monitoring strategy.
	Continuous monitoring	The turbine is continuously monitored: Parameters are continuously processed and compared to alarm levels, depending on the active operating condition of the wind turbine.
	ONEPROD methodology	KITE ensures the record of data that can be easily compared over the time despite the variable operating condition. To only capture highly qualified data, the operating condition status is automatically validated according to: logical combination between the operating parameters, Condition stability check during the whole measurement, operating parameter stability check (%), condition trigger delay (s).
	Automatic data storage	Monitoring data are automatically transferred for analysis based on different criteria: <ul style="list-style-type: none"> Periodically, on operating condition occurrence, on alarm occurrence, on manual request Scalar values can be stored at a higher periodicity than raw signals (customizable)
	Alarms	KITE provides all tools needed to prevent from false alarms: <ul style="list-style-type: none"> Management of alarm thresholds per operating condition up to 4 alarm levels per indicator (pAL, AL, DG and error) Advanced management of alarm thresholds: Hysteresis management, customizable delay for alarm validation
Low speed parts	Shock Finder™ Algorithm	KITE enables automatic early fault detection with ONEPROD Shock Finder™ : 6 to 10months typical on the low speed shaft of the gearbox before the maintenance action has to be carried out.
Certifications for the Wind industry	Germanischer Lloyd CMS	ONEPROD KITE is GL certified as part of the ONEPROD Wind System solution. Certificate n° TC-GL-005A-2015

Designed for the wind industry

Physical	Protection	KITE is IP51 (waterproof, dustproof) and can be installed without additional enclosure for a long term operation
	Cooling system	Thermally-driven with electro-galvanic steel casing (No fan).
	Operating temperature	from -20 to +60°C
	Storage temperature	from -20 to +70°C
	Altitude	Up to 4000 m
	Embedded storage solution	Flash memory (No spinning HDD): up to 100 full wind measurements sets (incl. FFT and Time waveform)
	Dimensions	371 x 175 x 133 mm (14.6 x 6.89 x 5.23 in) – Package : 410 x 260 x 205 mm (16.1 x 10.2 x 8 in)
	Weight	5,2 kg (11 lbs)
	Mounting	DIN TS 35 rail
	Compliances	CE, RoHS, 2014/35/UE Low voltage directive and 2014/30/UE EMC directive (General requirements : EN61236-1 part B; Immunity assessment: EN61000-5-2:2009, EN 61000-4-3:2006 + A1 :2008 + A2 :2010, EN61000-4-4:2012, EN61000-4-5 :2014, EN61000-4-6 :2014, EN61000-4-8 :2010, EN61000-4-11 :2004, EN61000-4-9 :2001, EN61000-4-10 :2001 ; Emission assessment : EN55011 :2009 + EN55011 :2009/A1 :2010)
Power supply	Voltage	24 VDC (MAX: 28 VDC, MIN: 18 VDC)
	Current	1,5 A (MAX <4A)

Acquisition & embedded processing details

Acquisition	Analog inputs	<u>IEPE input:</u> Constant current: 4mA +/-0.5mA, Open loop tension: ~ 23 volts Coupling AC , high pas filter: frequency cutoff 0,1Hz at -3dB, 6db/octave Input impedance > 60 kΩ AC Range measure : +/-8 V _{peak} around DC polarization
		<u>AC-DC input:</u> Coupling DC Input impedance > 60 kΩ AC, > 150kΩ DC Range measure : +/-23,5 V _{peak}
		<u>4-20mA input:</u> Maximal Input tension: 13 volts
General signal processing	A/D Converter	24 bits
	Frequency range	50 Hz; 100 Hz; 200 Hz; 500 Hz; 1 kHz; 2 kHz; 5 kHz; 10 kHz; 20 kHz.
	Number of lines	400; 800; 1,600 or 3,200
	Number of averages	from 1 to 4,096
	Multichannel acquisition type	independent or synchronous
	Type of average	linear, exponential, peak
	Overlap	0%; 50%; 75%
	High-pass filter	None, 2 Hz; 10 Hz; 3 kHz
	Integration	none, 1 or 2
	Zoom factor	none; x2; x4; x8; x16; x32; x64; x128; Maximum resolution: 30 MHz
Monitoring indicators	Windowing	Hanning; Rectangular; Flat-top
	Synchronous analysis	yes / no
	Envelope detection	yes / no
	Standard indicators	Acceleration, velocity, absolute displacement, relative displacement, relative position, bearing defect factor. High pass and low pass filters can be selected depending on the type of indicator.
	Value calculated per indicator (customizable)	RMS value; "equivalent peak" value; "equivalent peak-to-peak" value; "true peak" value; "true peak-to-peak" value
Embedded processing on Time waveforms	Time waveform signal record	1s to 80s on 12 channels. Up to 51.2 kHz sampling (20kHz analysis)
	SFI (Shock Finder™)	Automatic abnormal periodic shock detection: gives a binary result (presence of shocks Y/N) and the number of shocks detected.
	Kurtosis	Classic shock detection indicator. Kurtosis alarming can be smoothed thanks to band-kurtosis indicator available as post processing in NEST software
Embedded processing on FFT	Others	Statistical analysis and filtering are available as post processing in NEST software
	Number max of post-processed parameters	Up to 10 indicators can be defined from a spectrum
	Broadband energy indicators	RMS, equivalent peak or equivalent peak-to-peak level between two fixed frequencies
	Narrow band peak extraction indicators	RMS, equivalent peak or equivalent peak-to-peak level defined over a few spectral lines centered on a fixed or variable frequency the number of lines can be parameterized the center frequency is defined by two coefficients, A and B (integer), and by the following formula: $F_c = A.F_0 + B$ (with F_0 = rotation frequency)

Communication Details

Architecture	Ethernet	10/100 base T ports Auto MDI-X capability (port B); compatible with Wi-Fi, 3G-4G modems.
	Number of Ethernet ports	2 ports. Typical use: 1 for the PLC Modbus TCP, 1 for the office network and communication with NEST software
	Modbus	TCP/IP (Ethernet port)
	Modbus mode	Slave. Can exchange data in both directions (input and output) with one PLC. Master. Can read data (input) on 1 to 3 PLCs.
Inputs	Numerical inputs (Modbus TCP)	Values of operating parameters; Values of indicators (temperature...) can be collected from the PLC. Up to 255 parameters per system.
	Logical inputs	4 opto-isolated logical inputs 0-24VDC, 24VAC peak - Input current: 14mA at 24VDC, Common-mode voltage : 35V max Switching thresholds : 13V (high), 8V (low)
Outputs	Available data on Modbus output	Number of indicators, Values of indicators, Status of indicators, Units of indicators, Values of operating parameters
	Logical output	4 logical isolated outputs, Maximum input voltage 28V DC, rated load 1.3A
	System output	1 integrity relay , 70VDC, 35V RMS, and 46.7V peak AC, maximum current 2A, maximum power cut-60W
	OPC Server (through NEST software)	Publishing of machine alarm status and expert advice; publishing of parameters values and alarm statuses
	E-mail notification	On any alarm status change or aggravating status change only, through NEST software.

Software management

KITE is operated with ONEPROD NEST software. NEST provides all tools for vibration analysis, reporting and fleet supervision.



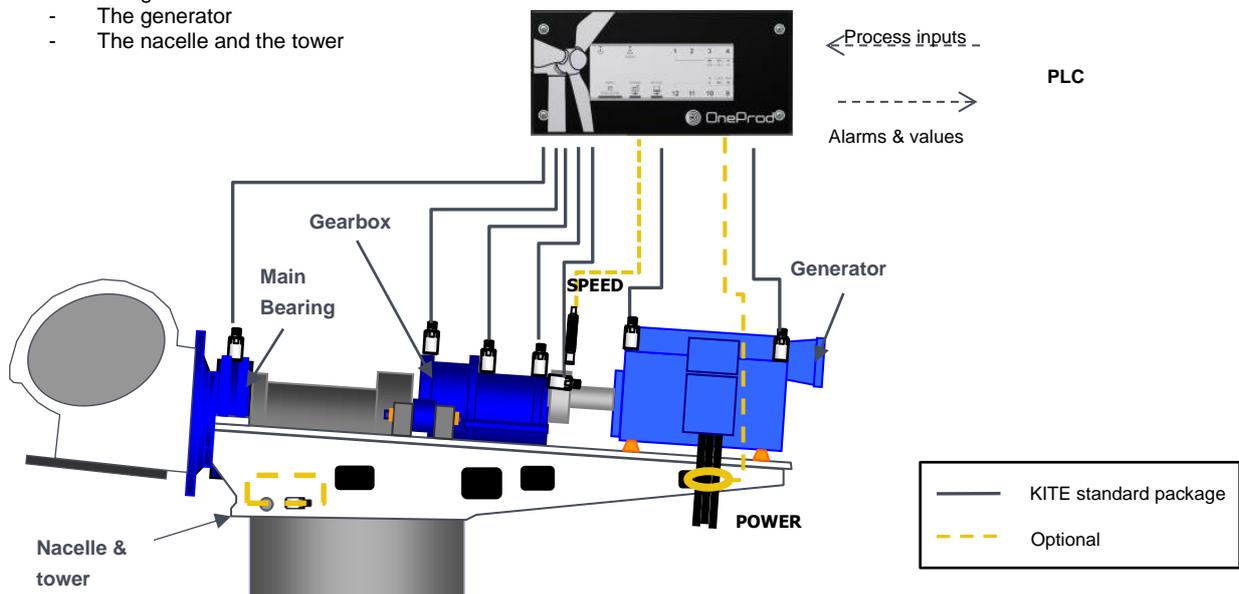
Software Post-processing	On time waveforms	Filters: High Pass, Low Pass, Band Pass, Shock Finder smart filter High Resolution Spectra (400 to 6,400 lines) Automatic parameters: Statistical levels (RMS, peak, peak-peak, mean...), Kurtosis and band-Kurtosis
	On spectra	Automatic parameters: Peak Extraction, Energy Narrow band Level, Energy broadband Level Bearings frequencies, gear frequencies Cepstra (automatic or manual) FFT concatenation (merged spectrum) for productive analysis
	On parameters	Logic combination of parameters
Advanced thresholds	Alarm thresholds levels	4 levels (pre Alarm, Alarm, Danger, Error)
	Standard thresholds types	HIGH level thresholds, LOW level threshold, IN RANGE thresholds, OUT OF RANGE thresholds,
Data mining	Advanced thresholds types	Evolution vs. previous control, Evolution vs. reference date, Statistics, Forecast
	Operating condition	Trends filtered per operating condition for variable operating condition machines
	History	Trends, waterfall Filter on control history from parameter trend.
	Comparison	Superimposition of parameters, spectra, time waves from one or several machines
	Quick access to results	Quick look matrix: the machine condition in one view of all alarm status (2DG)

For more details, please refer to the datasheet of NEST software.

Monitoring recommendations

The recommended pieces of equipment to be monitored by the system are the following. The number of sensors may vary according to the turbine's design:

- The rotor / main bearing set
- The gearbox
- The generator
- The nacelle and the tower



Packaging & accessories

With its IP51 design, KITE can be installed directly in the turbine, without any other enclosure.

KITE Standard package KTE 3001000 contains



*KITE Monitoring system for Wind Turbines
with its documentation and certificates*



*7x 10m cables
IP67 - M12 connector*



*7x Standard accelerometers
ASH426WB with M6 screw*



*7x Stainless steel
M6 cementing studs*



*2x isolated ceramic studs (for
the generator)*

KITE Optional accessories:



*Additional Standard ASH426WB
accelerometer for the monitoring
of the drivetrain
CAC3201000*



*Low Frequency ASH366-500 Accelerometer
for the monitoring of the Nacelle / Tower
CAC3200000*



*Tachometer for rotation speed
measurement - M12 connector
CAC1007000*



*Current clamp for Power measurement
MVX1028000*



*Additional cable for accelerometer & tachometer
IP67 - M12 connector (ref / cable length)*

- 5m: CAB3107000
- 10m: CAB3108000
- 20m: CAB3109000
- 30m: CAB3110000



*24VDC power supply module
(to be installed in the top box)
MVX1024000*



*Galvanic Insulator for connection
of analog input from the PLC
MVX1018000*



*Optocoupler to duplicate
an existing tachometer input
MVX1017000*



*M6 Stainless steel cementing studs
Pack of 10 pieces
ACA3126000*



*Isolated cementing disks
Pack of 10 pieces
ACA3127000*



*Cementing glue
860074*