



APPLICATION GUIDE

METALSCAN FOR VESTAS WIND TURBINES

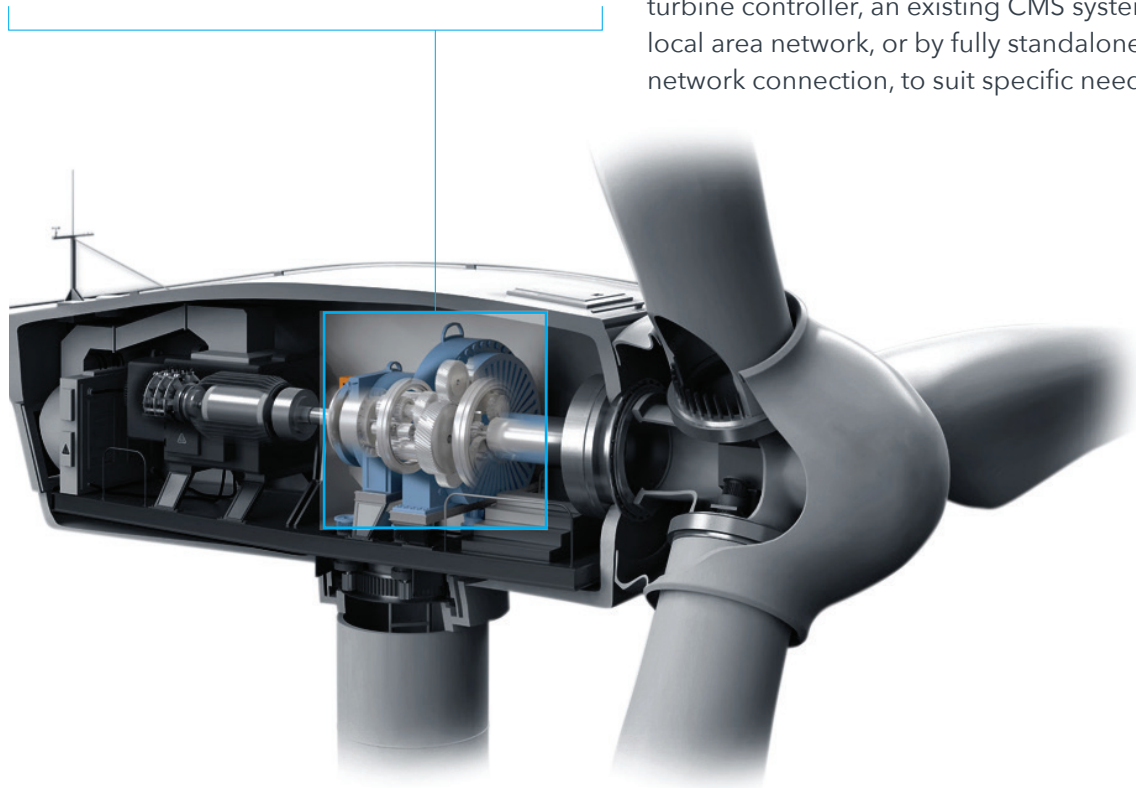
Reduce operating costs of wind energy production with critical component intelligence. MetalSCAN technology empowers wind turbine operators to effectively manage gearbox health issues using oil debris monitoring.

Designed for several Vestas Turbine Platforms, like the V66 1.65MW, NM82/V82 1.65MW, V80/V90/V100/V110 1.8-2MW, and the V90 3MW, the MetalSCAN oil debris monitoring system consists of a single sensor installed into the gearbox oil lubricating system before the filter.

MetalSCAN is a full-flow, non-obstructive, online debris detection system designed to detect the onset of surface fatigue of bearings and gears. It is used as a condition monitoring device to determine the condition of the gearbox. The gearbox is thereby continuously monitored, allowing the operator to track the progressive deterioration of any damaged bearings or gears in real time.

The sensor is installed in the lubrication oil lines, before the oil filter, with standard flanges and fittings adapted to the turbine configuration.

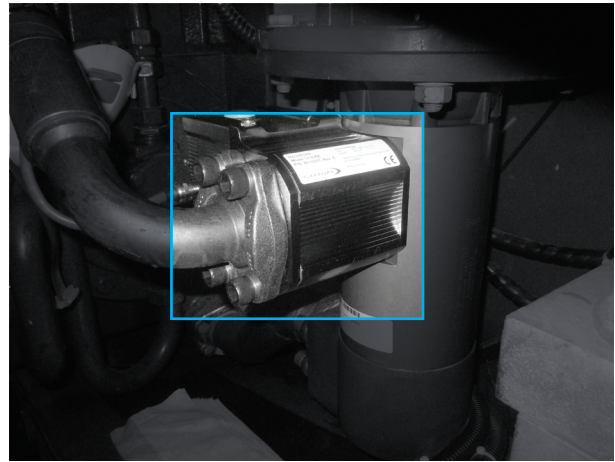
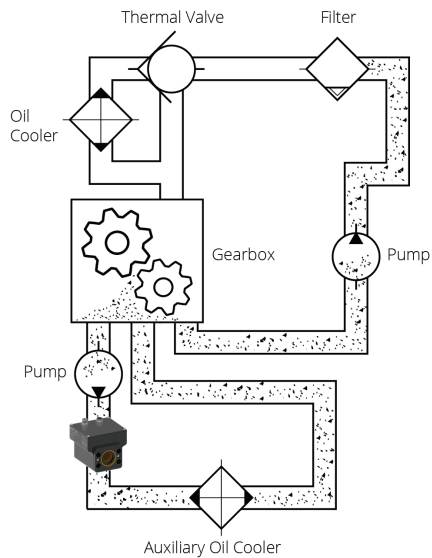
Several convenient data communication options are available, including direct connection to the turbine controller, an existing CMS system, or the local area network, or by fully standalone cellular network connection, to suit specific needs.



Physical Installation

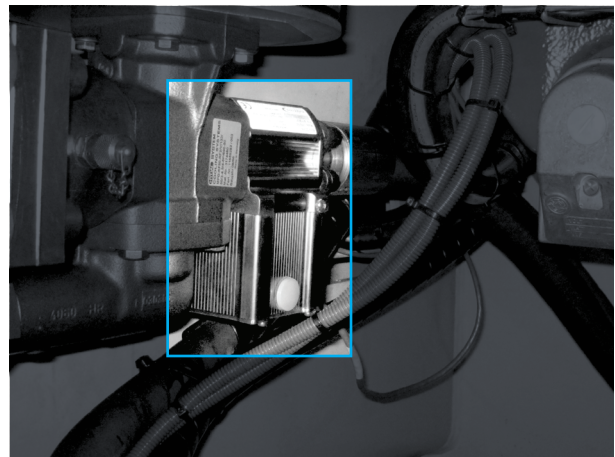
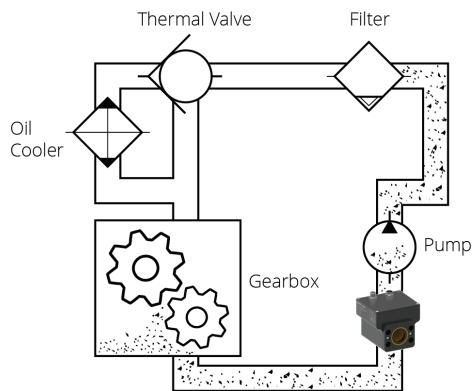
Installation on Vestas V66 Wind Turbine

To install the sensor, the existing four bolts connecting the cooler supply hose at the electric pump are removed, the hose is pulled back, the sensor is placed in line and four new elongated bolts are installed to secure the hose and sensor to the pump.



Installation on NEG-Micon NM82/V82 1.65MW Wind Turbine

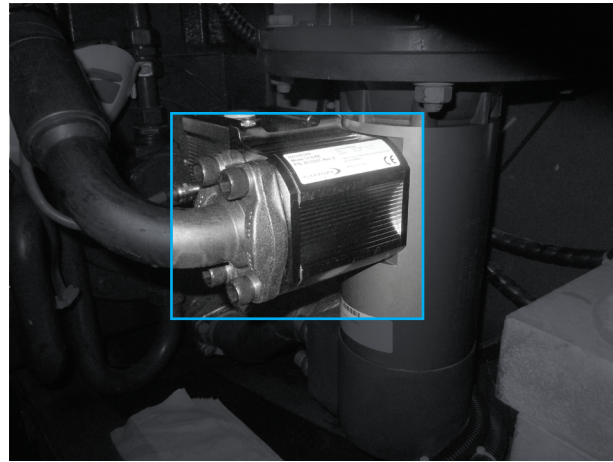
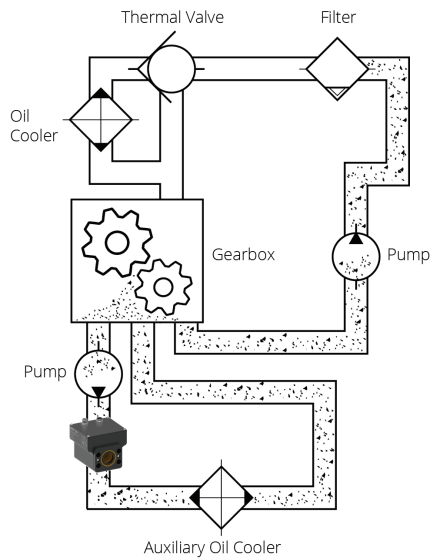
To install the sensor, the existing four bolts connecting the pump supply hose are removed, the hose is pulled back, the sensor is placed in line and four new elongated bolts are installed to secure the hose and sensor to the pump inlet port.



Physical Installation

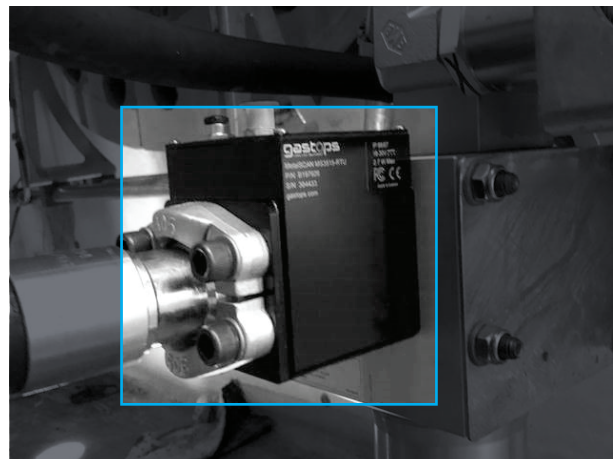
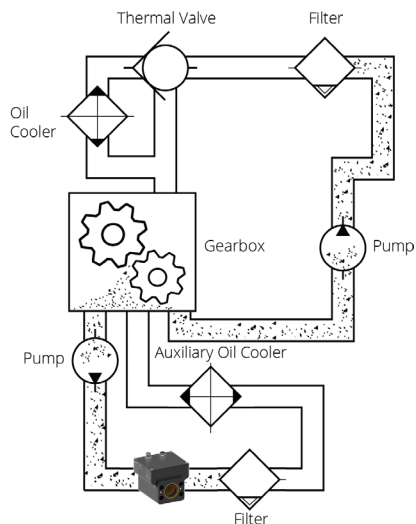
Installation on Vestas V80/V90/V100/V100 1.8-2MW MK1-3 Wind Turbine

To install the sensor, the existing four bolts connecting the cooler supply hose at the pump are removed, the hose is pulled back, the sensor is placed in line and four new elongated bolts are installed to secure the hose and sensor to the pump.



Installation on Vestas V80/V90/V100/V110 1.8-2MW MK4-8 Wind Turbine

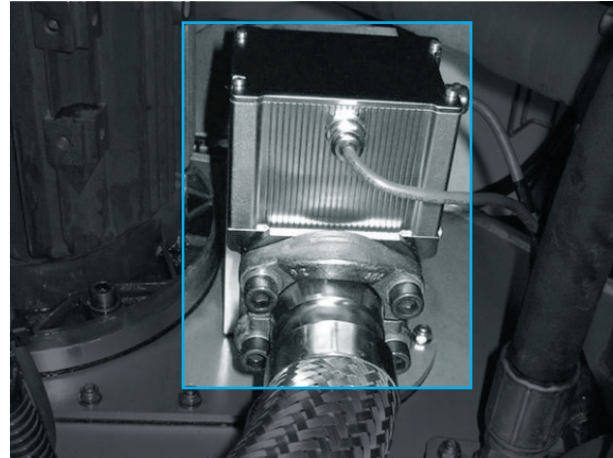
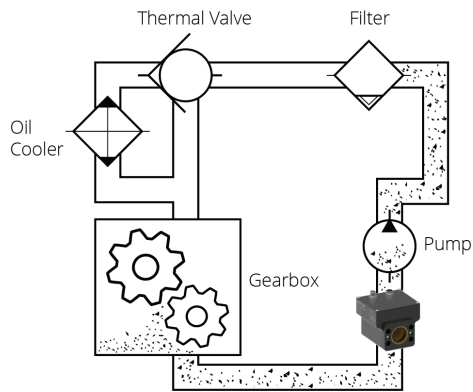
To install the sensor, the existing four bolts connecting the cooler supply hose at the filter manifold are removed, the hose is pulled back, the sensor is placed in line and four new elongated bolts are installed to secure the hose and sensor to the in-line filter.



Physical Installation

Installation on Vestas V90-3MW Wind Turbine

To install the sensor, the existing hydraulic hose after the pump is removed, the sensor is placed in line and four new elongated bolts are installed to secure the new hose and sensor in place.



The sensor can then be wired from its standard M12 connector to the turbine controller input channels already provisioned for MetalSCAN, to an Ethernet network connection, or to an optional module for cellular connection. Simply follow the step-by-step installation instructions included with the MetalSCAN package.



Option 1
Direct Integration



Controller

OR



Monitoring System

Option 2
Gastops Integration



> MetalSCAN Monitor

> MetalSCAN Remote

The entire installation of the MetalSCAN system on a Vestas Turbine is easily completed in less than 2 hours. Training requirements are minimal and offered at no cost. Training often takes place remotely ahead of any personnel being on site for the commissioning.

Condition Monitoring

Once installed, the sensor detects the presence of metallic particles to provide early detection, identify severity, and provide remaining life indication of the bearings and gears located deep within the gearbox.

The sensor detects metal particles above its minimum size threshold and provides particle data, equipment condition and self-diagnostic information directly to the turbine controller, to an existing CMS system, or via an Ethernet or cellular network.

The information collected by the sensor is compared to pre-established machinery condition indicators. These condition indicators are based upon simple criteria which determine whether or not the gearbox is healthy. When damage is detected, condition indicator models help determine how much damage there is and how much longer the equipment can be operated before a potential failure. All analysis is performed locally to the sensor and subsequently transmitted to a host monitoring system.

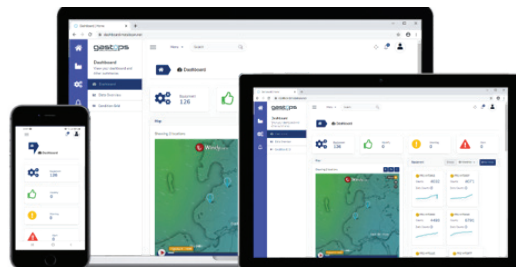
Increased insight and visibility into the health of the gearbox allows for proactive health assessment enabling effective maintenance planning and empowering operators with real-time knowledge of equipment health.



Software and Services

When connected through the local area network, MetalSCAN sensors can be interfaced to MetalSCAN Monitor, a completely client-hosted standalone software platform that enables operators to host, monitor, and analyze the data locally. MetalSCAN Monitor is a user-friendly software that lends itself to operators with all levels of experience and is designed for monitoring all types of wind turbines and fleet sizes. MetalSCAN Monitor allows operators to interface to external data acquisition or monitoring systems and can be connected to the Gastops MetalSCAN Remote Web Portal, enabling a complete Condition Assessment and Analytics Monitoring Service. The MetalSCAN Remote Web Portal provides users with detailed health indicators for each turbine, a customizable watchlist for the entire fleet and fully customizable warning, alarm, and event notifications. Data is posted on the portal in near real-time and allows for customized reporting and cross-comparisons of turbines by type, windfarm or any other key characteristic. Operators can also import or export data and reports in several supported formats or interface to 3rd party systems via a Rest API.

Users can easily subscribe and renew their Gastops Monitoring Service, which includes monitoring by Gastops' analytics team, monthly reporting on key health indicators for each turbine, along with observations and recommendations for the entire fleet.



Ordering Information

MS3500 Sensor and Installation Kit Order Codes

To place an order or request a quote, email us at sales@gastops.com or call **+1 613 744 3530**.

| Turbine - Gearbox Type | Sensor Order Code | Installation Kit Order Code |
|---|-------------------|-----------------------------|
| Vestas-V66 - All Gearboxes | MS3515 | Vestas-V66 |
| Vestas-V82/NM82 - All Gearboxes | MS3515 | Vestas-NM82 |
| Vestas-V80/90 Mk1-3 - All Gearboxes | MS3515 | Vestas-V80/90-A Mk1-3 |
| Vestas-V80/90/100 Mk4-8 - All Gearboxes | MS3515 | Vestas-V80/90/100 Mk4-8 |
| Vestas-V90-3MW - All Gearboxes | Contact Gastops | Contact Gastops |
| Others | Contact Gastops | Contact Gastops |

Accessories

To help you integrate the MetalSCAN MS3500 series sensor into your equipment, we offer accessories such as cordsets and a modem, as well as software and remote services.

| Product | Order Code |
|--|--------------------|
| M12 Power/COM Cordset, Straight backshell, 10m | Cable-3500-A-10-00 |
| M12 Power/COM Cordset, 90 backshell, 10m | Cable-3500-A-10-90 |
| M12 Power/COM Cordset, Straight backshell, 5m | Cable-3500-A-05-00 |
| M12 Power/COM Cordset, 90 backshell, 5m | Cable-3500-A-05-90 |
| M12 Ethernet Cordset, Straight backshell, 10m | Cable-3500-D-10-00 |
| M12 Ethernet Cordset, 90 backshell, 10m | Cable-3500-D-10-90 |
| M12 Ethernet Cordset, Straight backshell, 5m | Cable-3500-D-05-00 |
| M12 Ethernet Cordset, 90 backshell, 5m | Cable-3500-D-05-90 |
| LTE/3G/2G Modem | Contact Gastops |
| MetalSCAN Monitor Software | Software-3000 |
| MetalSCAN Remote Condition Monitoring Service | Monitoring-3001 |
| MetalSCAN Remote Condition Monitoring Service - Cellular | Monitoring-3002 |
| MetalSCAN Remote Data Hosting Service | Monitoring-3003 |



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