



Generator Service

Fiber Optic End Winding Vibration Monitoring

for Turbo Generators

The high electromagnetic flux and currents created inside a generator can lead to end-turn basket vibration on some units. Generator stator end winding vibrations (EWV) can loosen the winding, weaken insulation and ultimately crack conductors. Siemens pioneered Fiber Optic Vibration Monitor (FOVM) technology to directly measure end winding vibration during operation in the early 1980s, and now offers the Fiber Optic Vibration Monitor Model 4, the latest and most advanced monitor of its kind.

Features

The Fiber Optic Vibration Monitor Model 4 uses an all-optical sensing technique resistant to electromagnetic interferences. The system now monitors all of its sensors simultaneously in order to determine the vibrational modal shapes. The amplitude of vibration is measured at locations dictated by the end winding design. The system can be configured with up to 8 sensors per generator end.

The improved vibration sensors are comprised of all dielectric materials with a broad vibration frequency range of up to 1000 Hz and an operational temperature range up to 150 °C (according to new IEC standards). The user interface is designed to provide easier access to all vibration and spectral data. Standard analog outputs

provide integration to the plant data acquisition system. Additionally, the Fiber Optic Vibration Monitor Model 4 can be integrated with the customer's network through its onboard Ethernet connection.

The FOVM-4 can be retrofitted for all generator models and operated as a standalone system or integrated into the GenAdvisor™ online monitoring platform. The online monitoring platform offers a common system for integrating the most useful generator monitors such as end winding vibration, partial discharge and interturn short circuits in the rotor.

FOVM-4 offers the following analysis capabilities:

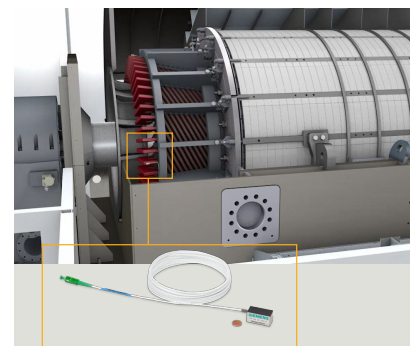
- Continuous online monitoring of end winding vibration.
- Measurement and visualization of vibration frequencies up to 500 Hz.
- Detection of very small vibration amplitudes.
- Improved evolution for determining trending of mode shapes to detect changes of the end winding mechanical structure for some generator types.
- Vibration values that can be displayed and correlated to operational parameters (e.g. active/reactive power and exciter current) to assist in troubleshooting.

- Service offerings available for diagnosis and recommendation for action.
- Ability to connect to the Power Diagnostics Center© for remote monitoring.

Scope of supply

Hardware for the standard FOVM-4 new installation includes:

- Monitor chassis
- Fiber optic sensor installation kit (12 sensors standard, 16 sensor maximum)
- Two fiber optic link cable bundles
- Two fiber optic pressure seals (for hydrogen-cooled generators)
- Two optical multiplexers



The Fiber Optic Vibration Monitor sensor - the heart of the system

Installation services are available upon request. Sensor and cable installation require a generator shutdown and can typically be installed during a rotor-in inspection. Installation of the acquisition unit typically does not require generator shutdown.

Your benefits

The Siemens Fiber Optic Vibration Monitor can be one of the most important investments to help improve your unit availability. This system can offer you the following benefits:

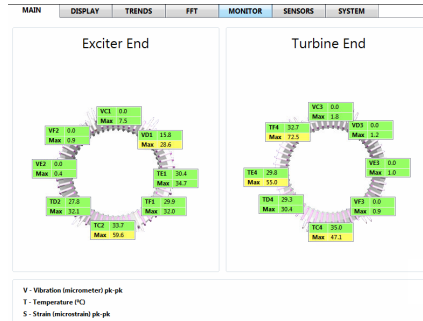
- Online, early detection of many generator stator end winding issues.
- Help to avoid costly outages related to vibrations in generators before massive winding damage occurs.
- More timely identification of maintenance need, for example due to changes in operating regimes.
- More accurate damage assessment and action.
- Improved evolution trending of mode shapes that gives information on structure mechanical changes for some generator types.
- Designed to provide immediate feedback when unit operating changes are initiated to reduce high end-turn basket vibration, thus providing a means of maintaining a unit online.
- The system can pay for itself by helping to prevent one outage or by reducing an outage by just one day.
- Optional incorporation into a monitoring platform to combine with other Siemens online monitors, and enable Siemens enhanced diagnostic service options powered by Sinalytics.

References

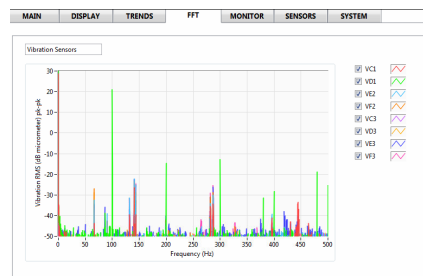
The Fiber Optic Vibration Monitor is capable of monitoring generators manufactured by virtually all OEMs. In the past three decades, over 250 Fiber Optic Vibration Monitors have been installed, and are in operation worldwide from air-cooled generators to large hydrogen-cooled nuclear units. The FOVM-4 is the latest and most advanced in this family and represents a unique system in the generator marketplace.



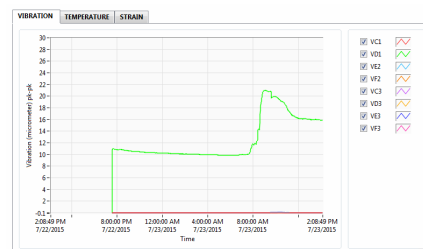
19" Fiber Optic Vibration Monitor Model 4- Acquisition unit with touch screen



"MAIN" tab of the Fiber Optic Vibration Monitor Model 4. The physical location of each sensor on the end winding is displayed.



Fast Fourier Transformation "FFT" Tab of the Fiber Optic Vibration Monitor Model 4 displaying spectral data of the vibration signal.



"TRENDS" Tab of the Fiber Optic Vibration Monitor Model 4 displaying the amplitude of the vibration signal over time.

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