



Bently Nevada* 3500/46M

Multi-Mode Hydro Monitor Module

Multiple machine operating states can now be addressed with a single module

Hydro machinery, such as units that operate in pump-storage applications, exhibit distinctly different vibration characteristics depending upon whether the unit is operating as a motorpump or a turbine-generator. Other units may operate as only turbine-generators, but varying flow, head, and load conditions can likewise yield distinctly different vibration characteristics. To address such machinery, a monitoring system capable of recognizing these distinct operating states is necessary, providing unique alarm setpoints for each characteristic operating mode.

The 3500/46M Hydro Monitor Module is specifically designed to address the unique vibration measurement needs of hydro machinery. Recently enhanced, it now provides users with from one to eight configurable machine states for which independent alarm setpoints and time delays can be programmed, resulting in a fully parametric monitoring strategy that is tailored to the individual operating modes of your hydro assets. This allows the 3500/46M to be more successfully applied to pump-storage applications in addition to conventional generation-only applications.

Benefits

The addition of multi-mode functionality to the existing air gap and radial vibration measurement capabilities in the 3500/46M monitor provides users with improved ability to protect and manage their hydro assets. By defining alarm levels for each relevant operating state, both spurious and missed alarms can be reduced because there is no longer a need to define an “average” machine state for which all alarms apply. Users can manually switch between these operating states, or the unit control system can be interconnected to automatically switch the monitor between states, providing seamlessly coordinated control and monitoring. For example, operating states can be configured for any of the following, alone or in combination:

- Machine speed
- Machine load
- Direction of rotation
- Environmental conditions
- Process variable levels

Improved diagnostics

In addition to tailored parametric alarming strategies that offer better machinery protection capabilities, the multi-mode functionality of the 3500/46M allows improved diagnostics. Users can more easily identify important machinery behavior changes that may be caused by these modes, allowing enhanced abilities to pinpoint cause-effect relationships. Through the ability to isolate not only machine parameter changes, but also the mode under which these changes occur, users have a more comprehensive picture of their machinery assets. They are better able to maximize machinery efficiency, availability and profitability while avoiding costly damage caused by previously undetected mechanical problems.

Applications

The 3500/46M is equipped with signal conditioning capabilities relevant only to hydro units, and as such, is intended only for hydro applications. For hydro units that do not require multi-mode monitoring capabilities, the monitor can be configured without this functionality, operating identically to older-series 3500/46M modules where multi-mode capability was not present. In this manner, the module can be used for new applications and for spare parts requirements in existing applications.



Select features

- Minimum air gap dimension and location
- Measured rotor shape¹
- Calculated stator shape¹
- Rotor/stator concentricity¹
- Individually programmable channels, assignable to any of the following functions:
 - Hydro Radial Vibration
 - Hydro Air Gap
 - Hydro Velocity
 - Multi-mode Hydro Radial Vibration
 - Multi-mode Air Gap
 - Multi-mode Hydro Velocity
 - Multi-mode Thrust
 - Multi-mode Acceleration
 - Stator end winding
 - Hydro acceleration
 - Hydro thrust
 - Multimode hydro dynamic pressure
- Multi-mode switching can be initiated via software commands or via hardwired contact closures.

Comprehensive solutions

The 3500/46M module is part of a comprehensive offering of monitor module types, transducers, diagnostic software, and services designed to address every aspect of condition monitoring and protection for hydro units, encompassing vibration, air gap, partial discharge, and other parameters. For additional information, please contact your local Bently Nevada sales person, or visit our website at [Bently.com](https://www.bently.com).