

## PRODUCT SPECIFICATION

### Mechanalysis Stator End Winding Monitor – Fibre Optic Sensing

The objective of Stator End Winding (SEW) monitoring of generators or even large strategic motors is to assess the condition of the windings over time. Overhung windings are subjected to mechanical vibrations and those caused by the electrical twisting effect of the conductors (Maxwell's Rule). Over time the conductor's securing resin frets away providing increased space for progressive movement of the winding's bindings and insulation to then soften. This also causes work hardening of the copper conductors and consequent brittle fractures and machinery failure. Apart from assessing the efficacy of the end winding securing material, when windings are secured during planned maintenance, the SEW system will indicate the tightening improvements made.

The model MIL8800 series has two modules suitable for Stator End Winding monitoring. The traditional, based on charge type accelerometers uses the module M88200 but the new generation of SEW applies fibre optic FBG sensors with module M88285. The patented VibroFibre™ fibre optic sensor is different from older optical systems that employ a vibrating mirror target. The VibroFibre™ uses Fibre Bragg Grating technology; the encapsulated cantilever mounted fibre is etched by laser to create micro mirrors that provides reflective targets for the laser based system. The VibroFibre™ detects absolute displacement, is totally inert and hence intrinsically safe. Constantly self calibrating, the fibre optic system overcomes the past difficulties such as noisy signals inherent with accelerometers, electromagnetic interference and double integration signal processing.



VibroFibre™ Sensor Mounted on End Winding



X-ray Image of VibroFibre™ FBG Sensor

The Mechanalysis model MIL8800 high integrity multi-channel machinery protection monitor system is microprocessor based and programmable. Supplied in a standard 19" Rack, it is panel mounted for general vibration measurement, turbine supervisory instrumentation as well as Stator End Winding. The MIL8800 series is a family of monitors designed to meet API670 specification Edn 4 for power generation, petrochemical, oil and gas and other industries requiring protection of its strategic rotating machinery.



Derived from earlier generations of monitors, based on the proven IRD architecture, and with state of the art signal processing, the MIL8800 gives outstanding Customer Value. It is a low risk solution from 'The Vibration People' of India who understand industry's needs. All MIL8800 modules come with a two year warranty as standard but since this monitor system is not reliant on customised outsourced components, obsolescence is minimised thus guaranteed support is likely for at least 20 years.



## PRODUCT SPECIFICATION

The MIL8800 Vibration Monitoring System (VMS) and Turbine Supervisory Instrumentation (TSI) are supplied in the standard 19" Main Rack Frame for panel mounting. A total of 14 vibration channels are available. Each module is an independent monitor with its individual power supply. In the unlikely event of failure of one module, only two channels of measurement will be affected. This eliminates the need for a redundant power supply unit and avoids common mode failure.

All modules are fully programmable from the front panel keypad for: range, sensitivity, units of measurement, Warning (Alarm) and Trip levels, related time delays, baud rate, parity, FS/NFS condition etc. A press of the NEXT key on the front keypad enables Operators to view the Alarm and Trip levels, sensor bias/gap voltage and the speed of the machine being monitored, when a tachometer is connected.

Each module comes with both Digital and Bar Graph displays to optimise Operational ease of use. By viewing all channels in a rack is often more intuitive of a machine's condition than a 'busy' computer screen display. Standard features such as analyser outputs, Warning (Alarm), Trip indication and machine start-up condition are easily visible on the front panel. The bar graph is configured as a percentage of set Warning (Alarm) or Trip levels thus making it easy for Operators to view signal levels in relation to alarm or trip settings. During system power-on and also in case of transducer failure (TX Fail condition), the 4-20mA DC output is held below the 4mA level for DCS system to detect an unhealthy situation. Warning (Alarm) and Trip relays are deactivated thus preventing uncalled for spurious alarms.

### AVAILABLE MIL8800 MODULES FOR STATOR END WINDING MONITORING

The MIL8800 has a comprehensive range of Vibration and Turbine Supervisory modules, details of these are available on [www.mechanalysisindia.com](http://www.mechanalysisindia.com). There are two options for monitoring vibration on stator end winding as well as temperature monitoring using ThermoFibre™ fibre optic sensors for winding temperature which is a prime indicator of winding status. These are associated with the QPS Photonics HPS data logger that self calibrates before each vibration or temperature measurement is made.

It should be noted that whether water or gas (hydrogen) cooled, the systems offered are suitable for either application with cables and connectors fit for purpose. There is no requirement for IS barriers and the system is inherently safe.

Part Number	Function	Chls	Display	Sensors	Measured Units
M88285	Absolute Vibration (Stator End Winding) 'D output'	2	Digital & Bargraph	VibroFibre™ * FBG Fibre Optics	microns Pk-Pk mm/s Pk, mm/s RMS,
M88955	Temperature	2/4	Digital & Bargraph	ThermoFibre™ * FBG Fibre Optics	Deg C or Deg F
M88200	Absolute Vibration (Case) ('g' input – 'g' or 'v' output 'v' input – 'v' or 'D output')	2	Digital & Bargraph	ICP Accelerometer (Accl or Vel output)	g Pk, g RMS, m/s/s Pk, m/s/s RMS, mm/s Pk, mm/s RMS, i/s Pk, i/s RMS, microns Pk-Pk

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\* A notable feature of the fibre optic system is that installation on a generator takes less than one day for both new and retrofit installations by simply gluing the sensors at the measurement points. The sensors have a projected life of 25 years.

### SYSTEM OPTIONS:

The Mechanalysis-On-Line machinery protection system offers a variety of customised solutions.

These include:

- Un-interrupted Power Supply (UPS)
- Intrinsically Safe Barriers
- Additional current Isolators for dual 4-20mA outputs
- RS232 connectivity to SCADA

## PRODUCT SPECIFICATION

### SPECIFICATION OF MODEL MIL8800 MAIN RACK

**Construction:** Designed to meet API670 for on-line machinery protection, the 19" Rack has a rugged construction aluminium extruded channels, plate and ABS press fitted guides to maintain module / connector alignment. Conduit entry holes are at the base to provide easy access for input signal cables. Adequate ventilation ducts are also provided. The use of epoxy-glass circuit boards with gold plated connector contacts; solid-state circuitry and virtually wire-free modular assembly enhances reliability.



**Channels:** The 19" Rack (P/N M88007) houses a maximum of 7 Dual Channel Modules. Rack P/Ns M88002 or M88004 refer to two or four channel options respectively.

<b>Weight &amp; Dimensions</b>	(P/N M88007) :
Main Rack Frame	: 3.7 Kg
Dimensions	: 482mm (W) x 221mm (H) x 377mm (D)
Rack with 7 modules	: 10.0 Kg (single module is 0.9Kg)

### GENERAL SPECIFICATIONS OF MODEL MIL8800 SIGNAL MODULES:

Each signal module has its own specification sheet but the main features are summarised below:

**Programmable:** Measurement units, ranges, warning (alarm), trip levels, sensor sensitivity, band pass filters etc can be set from the password protected front keypad at any time. However, for Customer convenience, specified units and ranges will be factory set at time of order.

**Display:** The front panel has 100 segment Dual Bar Graph and two rows of 16 character Digital displays. Signals are displayed as a percentage of the Full Scale Range of the Bar Graph, as well as the Warning (Alarm) and Trip values, when selected. This user friendly feature enables Operators to view the relationship in terms of percentage (%) between the measured value and the warning or trip settings. Actual signal levels in native units are also shown on the Digital Display along with sensor bias/gap voltage and speed (with a tacho signal) by selection.

### Communications to:

- **DCS** – The system provides industry standard isolated 4-20mA DC signal output per channel for interfacing with Distributed Control System (DCS) as well as RS485/MODBUS connectivity as standard.
- **SCADA** - The RS232 output is available as an option to SCADA systems.
- **Multi-Channel Simultaneous Diagnostics** - *Taking you Further*, BNC connectors are available at the back plane of each module for sending buffered Time Wave Form signals to any on-line multi-channel simultaneous or scanning diagnostics system. This offers turbine diagnostics applying the Dual Redundancy Parallel Processing (DRPP) architecture that offers greater system reliability.
- **Remote Display/DPM** - A 0-5V DC per channel output is provided for local or remote display/Digital Panel Meters or recorders.
- **Analyser Outputs** – Where applicable three BNC connectors, one for each channel and the third for tacho/phase these are located on the front panel for use with a portable dual channel vibration analyser. Shaft phase measurement is available when a Tacho Module is installed. The same vibration BNC signal sockets are repeated at the rear of the rack.

**Independent Warning (Alarm) Relay:** The Warning (Alarm) Relay operates when an alarm occurs in any module. One change-over (SPDT) potential free contact rated at 5A resistive @ 230V AC is provided. Normally de-energized (non fail safe), field changeable to normally energize (fail safe). Reset is manual and is actuated only when the signal level goes below the pre-set alarm level.



## PRODUCT SPECIFICATION

**Independent Trip Relay:** The Trip Relay operates when trip occurs in any module. Two change-over (DPDT) potential free contacts rated at 5A resistive @ 230V AC are provided. Normally de-energized (non fail safe), field changeable to normally energize (fail safe). Reset is manual and is actuated only when the signal level goes below the pre-set trip level.

**Common TX Fail Relay:** The TX Fail Relay operates when any transducer failure (change in bias voltage) is detected; it is displayed by flashing bar graph on the front panel of the module. One change-over (SPDT) potential free contact rated at 5A resistive @ 230V AC is provided. Normally de-energized (non fail safe), field changeable to normally energize (fail safe). Reset is automatic when fault condition returns to normal. Alarm and Trip relays are deactivated and also the 4-20mA DC out put is pulled below 4mA in TX Fail condition.

**Start-up Protection:** Start-up control bus deactivates Alarm and Trip relays and also pulls 4-20mA DC output below 4mA indicating invalid signal to the DCS.

### Power Supply

90 – 270V AC, 50/60Hz, single phase, 10VA per module.  
 SMPS power supply furnishes ± 24 volt power to each monitor modules.

**Calibration:** Each vibration module is calibrated to National Standards via the Mechanalysis state-of-the-art full frequency digital calibration system that has traceable certification and is always valid.

**Wiring:** Barrier terminal strips are provided for all external wiring. Conduit entry holes are available at the bottom of the Main Rack Frame.

**Type Tests:** The following primary Type Tests have been passed and will remain current.

- Dry Heat Cyclic (Temperature Cyclic) IS:9000 P-III & IS:9000 P-V
- Damp Heat Cyclic (Temperature Cyclic) IS:9000 P-III & IS:9000 P-V
- RF Susceptibility (EMI) BS EN 61000
- Radiated Susceptibility (RFI) BS EN 61000
- Bump IEC 68-2, Vibration IEC 68-2, Humidity IEC 68-2

The unit has the European Union CE Mark. Other international certifications will be undertaken as required.

### Environmental

- Storage temp : 18°C to 65°C
- Operating temp : 0°C to 50°C ambient
- Humidity : 95% none condensing
- Type Tests : Comprehensive range, certifications available on request.

**Mechanalysis (India) Ltd continues to be an industry leading provider of Condition management Solutions. With over 30 years experience in machinery vibration and associated technologies, the company designs and manufacture's proven instrumentation suitable for harsh industrial environments.**

The Vibration People of Mechanalysis (India) Ltd can be contacted at any one of the following Branches

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