



vibro-meter

MEGGITT

# vibro-meter solutions portfolio

Advanced condition monitoring  
& machinery protection  
for hydropower plants

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# Advanced machinery protection and condition monitoring for hydropower plants.

Learn more about Meggitt and our proud tradition of innovation and excellence.

<https://meggittsensing.com/energy/>

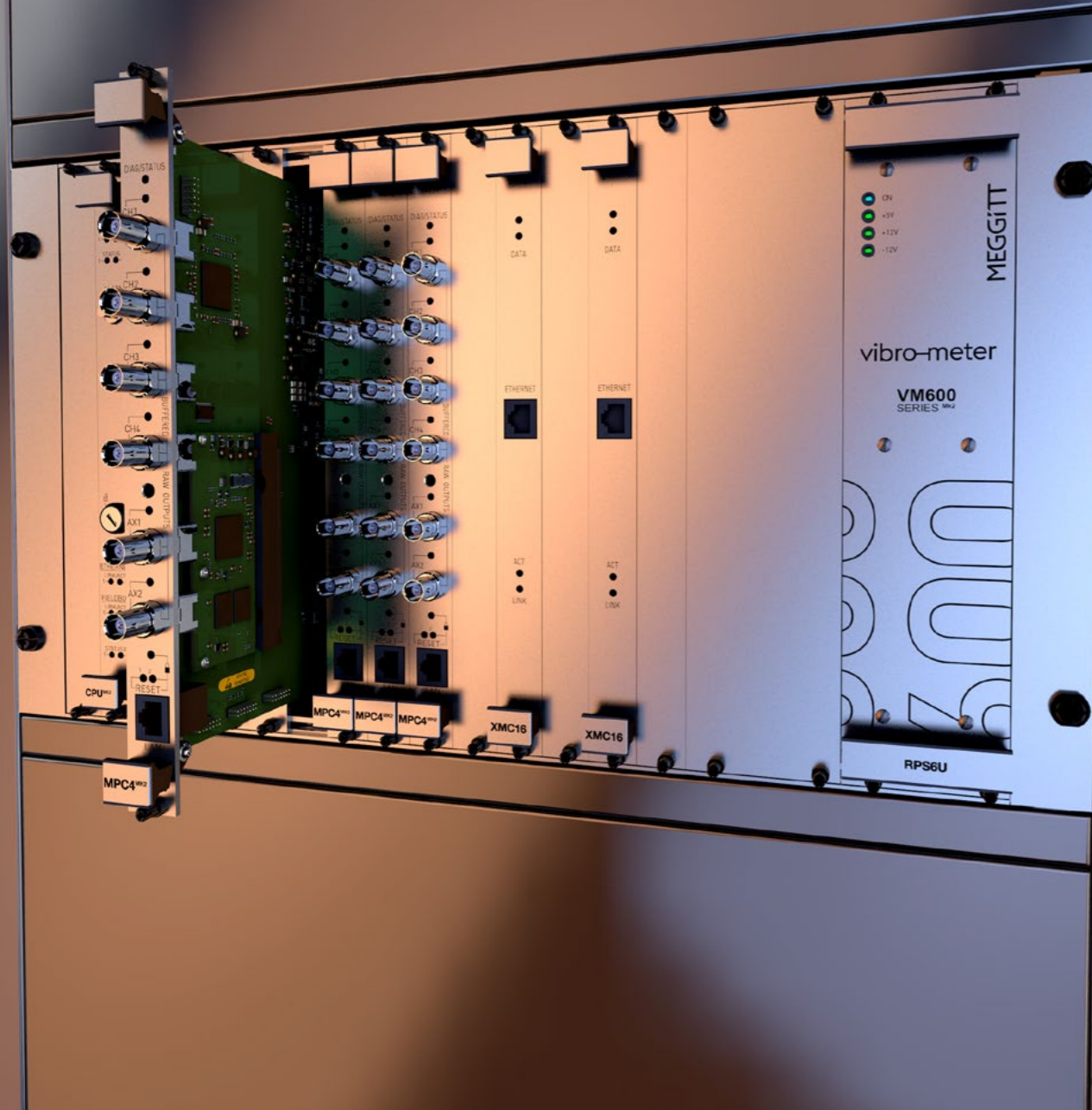


## Your preferred partner for innovative and high-quality monitoring solutions

The Meggitt facility in Fribourg, Switzerland, designs and manufactures complete condition monitoring, vibration monitoring, and measurement solutions for the energy and aerospace industries.

Since its foundation in 1952 as Vibro-Meter, our products and expertise have enabled superior solutions for the sensing and monitoring of vibration, pressure, air gap and other essential parameters in critical plants and equipment. Today, our solutions are trusted by major OEMs globally and have become standard-fit components on machinery used in Power Generation, Oil & Gas and other industrial applications.

Introduction



**"With the VM600<sup>Mk2</sup>, we've taken great care to ensure that new customers receive the most powerful technology in a field-proven architecture."**

### Shaping the future with our DNA

With an installed base of more than 8,000 systems globally, our VM600 machinery monitoring system made waves in the industry when it was introduced, more than 20 years ago.

As we now proudly introduce the VM600<sup>Mk2</sup>, we've made sure to revitalize a classic architecture and revisit the platform brand and design.

VM600<sup>Mk2</sup> is the translation of vibro-meter's legacy, precision and strengths - values that are at the core of our DNA.

## A new era

**When we introduced the VM600 platform in 2000, we "broke the mold" by moving away from application-specific modules.**

The industry paradigm at that time was generally one module for accelerometers, another for velocity sensors, another for proximity sensors, another for thrust, still another for case expansion, yet another for speed, etc. There were even different modules for RMS versus peak measurements. In fact, at that time, competing platforms had as many as 120 different module combinations when the monitor card plus I/O card was considered. It made for a substantial spare parts burden as well as substantial training on so many different permutations.

Although the situation was getting moderately better under newer platforms, we were the first company to introduce a truly "universal" module capable of addressing all measurements except temperature in a single piece of hardware. It even had self-contained relays and two "auxiliary" channels that could be used for speed / phase reference sensors. It was truly a self-contained, 4-channel machinery protection system on a single card. The rack chassis needed to do little more than supply power and act as a mechanical holder for multiple modules. We called it the MPC4 (Machine Protection Card - 4 channel), but in reality it could accommodate 6 channels (4 universal channels + 2 speed channels). If we had to rename it today, in fact, we would probably call it the MPC4+2.

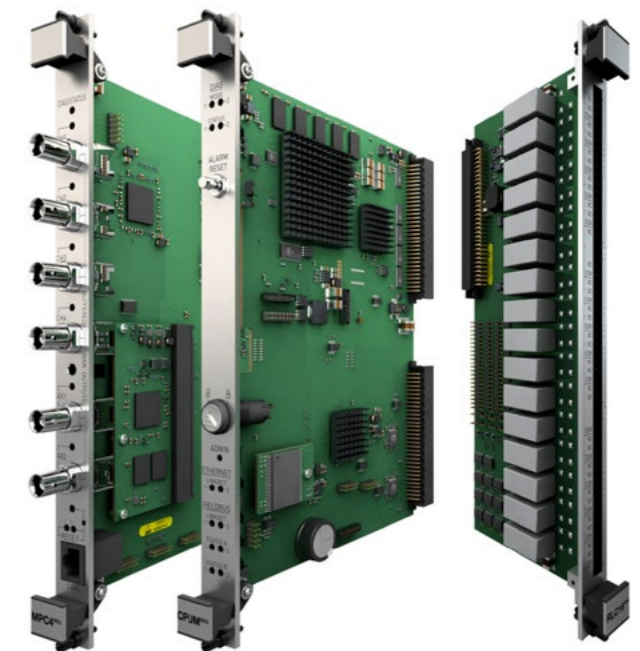
The "one card does it all" approach turned out to be groundbreaking. They say that imitation is the sincerest form of flattery, and

**"we take it as a very high compliment that many other companies have now followed our lead with their own versions of universal modules"**

but few quite so universal as ours even though they have had more than 20 years to catch up.

As we set out to develop a 2nd generation platform, we knew this universal module concept had to remain part of what made the original VM600 so successful. It was time to be innovative once again - but in a different way. Where in the late 1990s we "broke the mold" in our design by moving to a completely different approach of "one card does it all", this time we needed to be innovative by delivering improved functionality without heavily inconveniencing our customers.

As we looked at the existing architecture, we realized that an entirely new system wasn't necessary - merely new cards. Cards that could use the same backplane, same chassis, and same power supplies. Cards that would combine the machinery protection functions more tightly with the condition monitoring functions, yet



Our 2nd generation VM600 platform introduces (L to R) the MPC4<sup>Mk2</sup>, CPUM<sup>Mk2</sup>, and RLC16<sup>Mk2</sup> modules along with companion I/O cards.

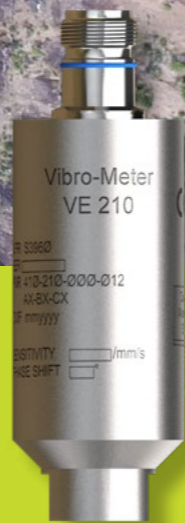
without creating vulnerabilities. Cards that would meet stringent IEC 62443 requirements along with SIL-2 certification for those customers that need vibration-related measurements as part of a safety instrumented system. Cards that provided more flexibility with its on-board relays. And cards that could use modern, ethernet communications.

With the VM600<sup>Mk2</sup>, we've taken great care to ensure that new customers receive the most powerful technology in a field-proven architecture. But we've also made sure that no customer is left behind as the only path to improved performance and improved value. The VM600<sup>Mk2</sup> gives you the opportunity to refresh aging modules that may have reached the end of their useful lifecycle with new modules offering better functionality and performance, yet all while retaining the same chassis and wiring.

In this brochure you will learn more about vibro-meter's new solution

# Sensing technology for power generation.

Comprehensive solution to monitor hydropower equipment's health, from an extensive range of sensors, to the machinery protection system and the condition monitoring software.

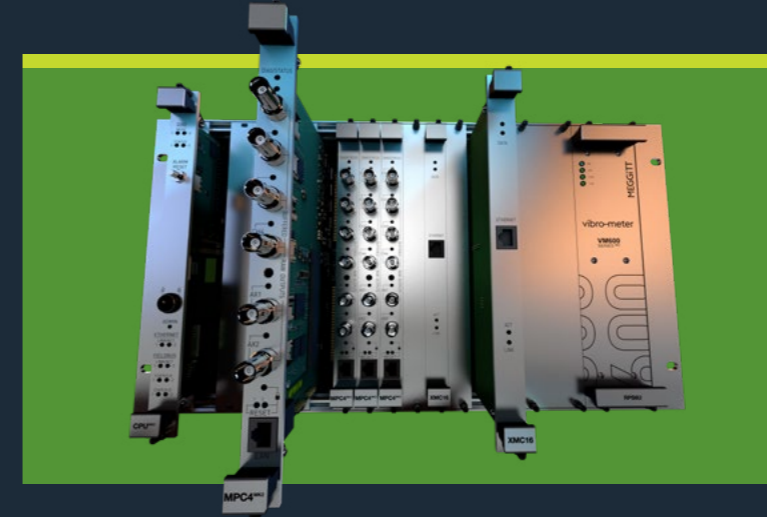


## Sensors & signal conditioners

vibro-meter's comprehensive range of sensors to monitor hydropower equipment are fully functional down to very low frequencies, in wet and corrosive environment and in the presence of electromagnetic and radio frequency interference.

## From sensors to answers

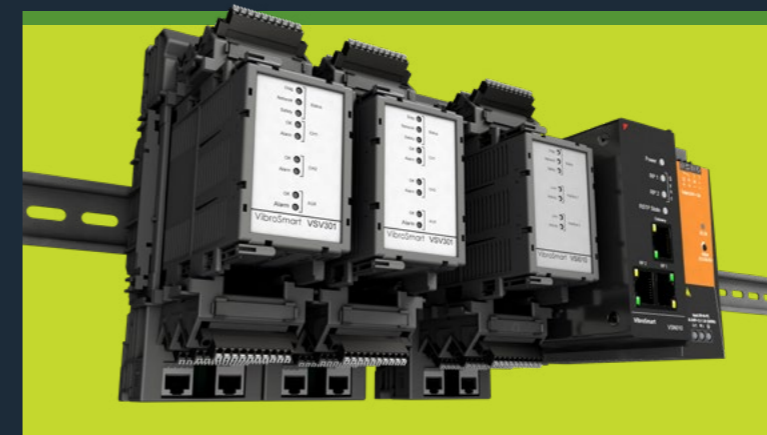
With one common data visualization, event management and diagnostic platform, plant operators can choose the system that suits their requirements.



## VM600<sup>Mk2</sup>

Centralized and modular machinery protection, condition monitoring for vibration and air gap applications from medium to high channel counts.

Typically used for large hydro turbines, VM600<sup>Mk2</sup> highly configurable system does not require application-specific cards. A single signal input card for receiving protection and condition monitoring data on vibration, position, air gap and phase reference measurements.



## VibroSmart

Highly flexible distributed protection and condition monitoring system for turbines, pumps and smaller critical assets requiring low-channel counts. Modules can be mounted directly on machinery, eliminating the need for costly cabling.

Modules communicate in real time with each other and with VibroSight software, via Ethernet and fieldbus.



## VibroSight

A common software platform for the configuration, operation and management of VM600<sup>Mk2</sup> and VibroSmart systems.

Fast and powerful, user-friendly software with an extensive plot catalogue for online and offline data visualisation and analysis.

# Solution portfolio

## Plant-wide ecosystems integration



### Local or remote monitoring center

Capability to safely transfer acquired data in quasi real-time through a data diode to a remote monitoring center for data analysis and archiving.

SECURE REMOTE CONNECTION

### VibroSight

With one common data visualization, event management and diagnostic platform, plant operators can choose the system or combination of systems that suit the requirements of a given plant.



### Plant Control System

Capability to communicate with third party systems like a PLC or external relays via industry standard protocols like Modbus, Profibus or IEC61850 GOOSE.



FIELDBUS

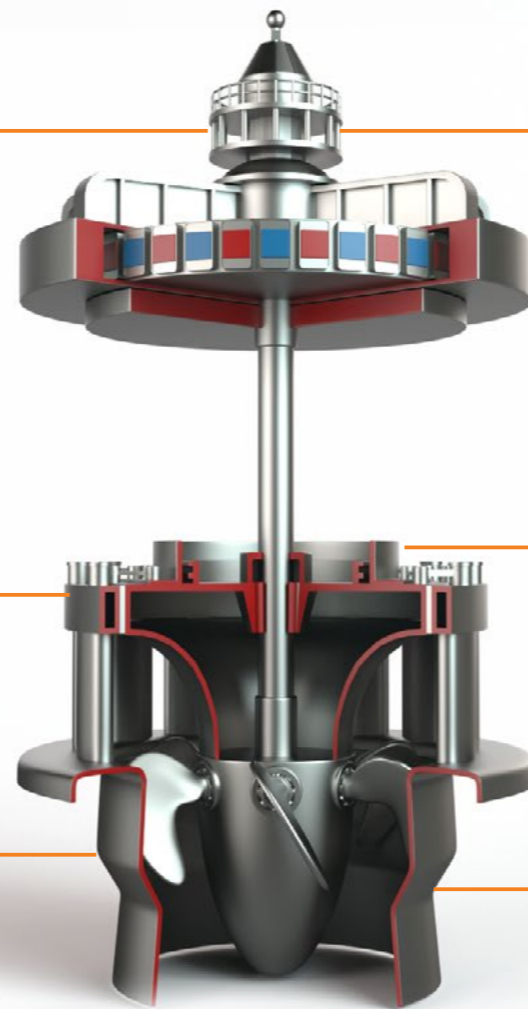
ETHERNET



### VM600Mk2

Centralized and modular architecture with a higher channel density that addresses complex installations. Dynamic inputs from proximity probes, accelerometers, velocity, air gap sensors are fed into standard 19-inch, 6U racks installed in a cabinet.

ANALOG SENSOR SIGNALS

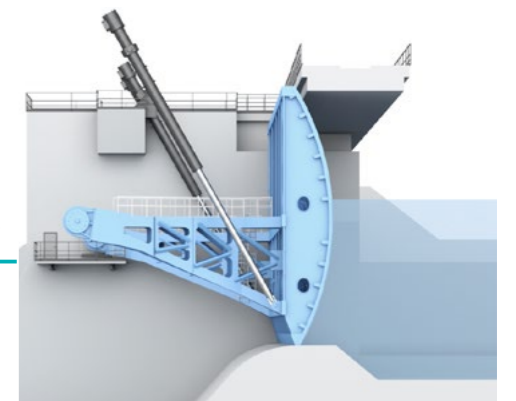


### VibroSmart

A distributed architecture with a lower channel density. Inputs from all sensors are wired to modules typically installed in an industrial housing, closer to or on the machinery being monitored. As a result, sensor cabling is effectively replaced by Ethernet cabling, thereby reducing installation costs.

### Balance of plant monitoring

- Spillway gates vibration
- Synchronous condenser vibration
- Pump vibration
- Penstock pressure fluctuation



# Expert article

## Uniquely Flexible Hydro Monitoring Solutions.

Whether a distributed or centralized architecture is right for you, the choice is yours with the VibroSmart and VM600<sup>Mk2</sup> platforms from vibro-meter

### A needless battle

The debate over centralized versus distributed instrumentation architectures has been ongoing for more than 40 years, predating many of those reading this. Nor will it end any time soon.

This is unfortunate because it is needless. Rather than viewing these architectures as one versus the other it is helpful to view them as one plus the other. Both have their place. Both make sense when the application particulars dictate one approach in one situation and the other approach in another situation.

For many manufacturers, however, their distributed offerings entail very different functionality and channel types than their centralized architectures, forcing

customers to choose based not on the best architectural fit but the best feature set.

We have a refreshingly different perspective: give our customers a similar set of features and channels in each platform and let them choose based on the architecture that fits the application best – not the feature set. Nowhere is this more evident than in our hydro monitoring capabilities.

For applications that can best be addressed by a distributed architecture, we're pleased to offer our VibroSmart platform. And for applications that can best be addressed by a centralized architecture, we're pleased to offer our VM600<sup>Mk2</sup> platform.

**“The total installed cost of wiring typically runs about €16 per meter per point and is often the single most costly part of a monitoring project.”**

### Distributed or Centralized?

If you have never actually installed a monitoring system (or had to pay for it), it is easy to think that the preference for one of the two architectures might boil down simply to subjective factors. But in reality, it primarily boils down to something quite objective: installation costs.

Consider this important fact: the total installed cost of wiring typically runs about €16 per meter per point and is often the single most costly part of a monitoring project. To make this more tangible, let's consider two scenarios. The first is three machines with 8 monitored points each, located 250m from a control room but for which wiring already exists and with an existing monitoring system that is obsolete and ready for replacement. The second scenario assumes the same three machines but will use a distributed system. This is depicted in Figure 1.

If we had to install the wiring in scenario #1 from scratch using today's prices, the cost would be about €96,000. Fortunately, the wire is already in place and can be reused. In this case, we might simply choose a solution that can be mostly easily mounted in place of the outgoing system – also in a 19" EAI rack-mounted form factor – and the VM600<sup>Mk2</sup> with its centralized architecture would be a good fit.

In scenario #2, selection of a centralized architecture has a very different outcome. As in scenario #1, the wiring costs would be about €96,000 if the wiring for each and every sensor went to a system located in the control room.

However, by use of a distributed monitoring system we now have an option that allows us to keep individual sensor wiring for each system to no more than 10m (assuming we mount the distributed systems at each hydro unit) and then to run redundant network cables back to the control room where a human-machine interface (HMI) will be located. In this instance, we now have two cables that run 280m (250 + 15 + 15) and 24 cables that run 10m each. Total wiring cost using a distributed architecture becomes €12,800. Or in other words, a savings of 87%! This is substantial and underscores why a customer would have a compelling reason in some applications to choose a distributed versus centralized architecture.

It is recognized that each distributed monitoring system must generally be mounted in its own simple junction box, but this will rarely eclipse the savings enabled by shorter wiring runs and becomes more acute for longer runs.

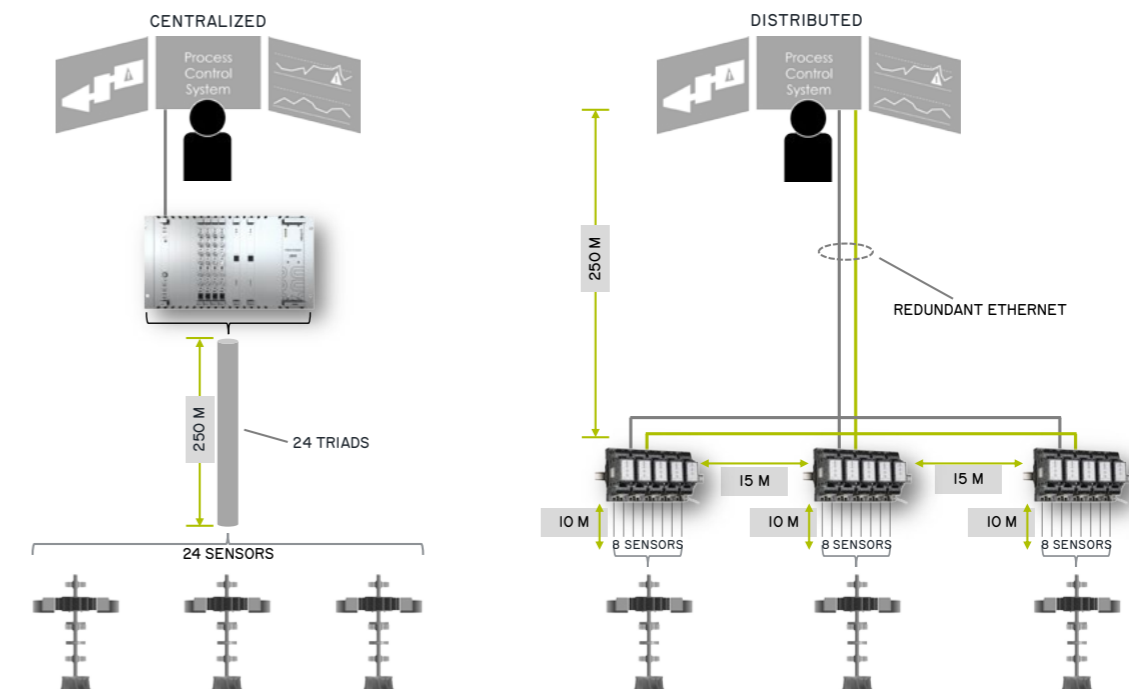


Figure 1: Centralized versus distributed architectures can result in dramatically different field wiring costs for some applications. In this instance, the wiring costs for a centralized approach are 87% more than those for a distributed approach.

**Taking a distributed architecture further**

Above, we showed how a distributed architecture could dramatically reduce wiring costs in a scenario with three machines. This can also hold true for a single machine where the VibroSmart system is distributed around the machine to keep wiring runs very short. The VibroSmart architecture incorporates a virtual backplane that can be created both by plugging modules side-by-side using special connectors on the terminal bases, and/or by running Ethernet cables between the modules. This is called the "sidebus" (or S-bus) in the VibroSmart system and allows adjacent modules to be connected side-to-side using the special S-bus connectors and non-adjacent modules to be connected via conventional Ethernet cabling.

This granularity of distribution can be especially advantageous in applications such as hydro where vertical machines may span multiple floors of the power hall and a small junction box with one or more VibroSmart modules can be mounted very close to each cluster of desired sensors. As shown in Figure 2, this can be a very small junction box to accommodate just one or two VibroSmart modules; the power can be supplied remotely, meaning the junction box does not even need to hold individual power supplies. A single Ethernet cable can be run between each junction box to create this virtual backplane (S-bus) and a single twisted pair can carry the required 24Vdc power needed for each junction box.

**Channel Types**

As shown in Figure 3, Hydro machines have a number of special measurements such as air gap, magnetic flux, partial discharge, and cavitation – most entailing special sensors and corresponding special signal conditioning. They also have a number of conventional measurements such as temperatures, flows, thrust position, phase, casing vibration, and shaft radial vibration; however, there are special signal conditioning requirements for vibration on hydro units that are not characteristic of other machines.

One of these characteristics is a requirement for very low frequencies. Smaller units such as those incorporating Pelton wheels will often turn at several hundred rpm. While considered quite fast for hydro units, this would normally correspond to a very slow machine in and of itself – much slower than most motors, pumps, compressors, blowers, and gas and steam turbines. Even so, larger units using Francis and Kaplan type designs typically turn even slower and speeds of only 50-60 rpm are common. This means the sensors and monitors must have a frequency response down to 1 Hz just to capture rotational speed, let alone sub-harmonic frequencies for which fractional frequencies down to 0.1 Hz would be required.

Another characteristic behavior of hydro units is so-called "rough load zone" (RLZ) that corresponds to turbulent flow conditions when bringing a unit online

and adjusting flow via the wicket gates. It is typically detected from the vibration signature by removing the 1X component from the overall broadband signal, resulting in a measurement known as NOT 1X. Operators required rapid feedback from a monitoring system when a machine is in RLZ because it can inflict significant damage if left in the condition for too long.

Some hydro units are part of pumped storage schemes whereby power is generated during periods of peak demand by allowing it to flow out of a reservoir, spinning the turbine and connected generator normally. However, during periods of low demand, this water is pumped back up into the reservoir by running the generator as a motor and the turbine as a pump. This allows the hydro plant to act as a "battery" by charging and discharging. Charging the battery occurs by pumping, storing the power as potential energy by virtue of elevation of the water in the reservoir. The battery can then be discharged when required by allowing the water to flow back through the turbine, spinning the generator and producing power. This cycle usually continues daily to charge during off times and discharge during peak demand times. Such plants require special monitoring schemes that can detect when the machine is running in generating mode versus pump mode because the alarm setpoints will be different. This is so-called "state-based" monitoring that recognizes the operating state the machine and adjusts the setpoints accordingly.

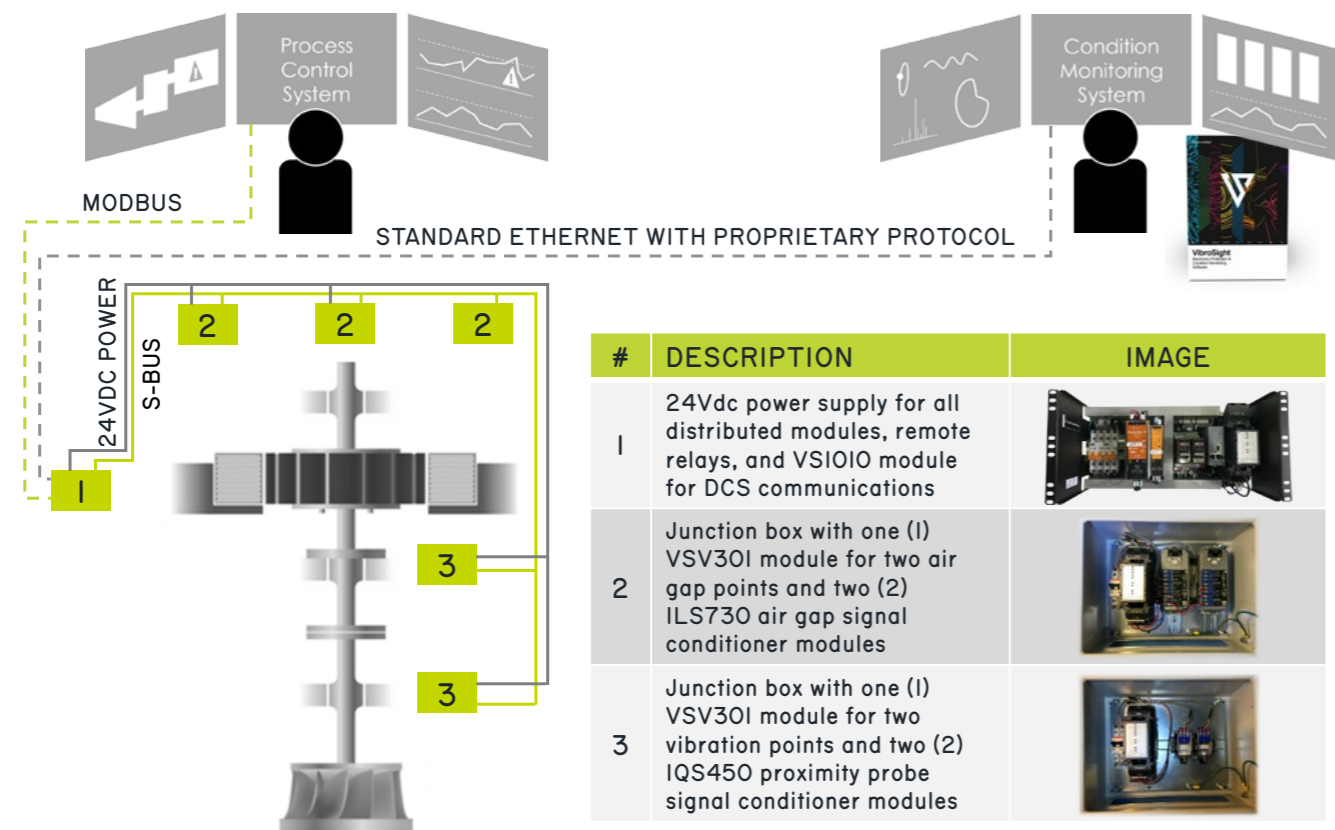


Figure 2: The configuration shown here was provided for a hydro customer in eastern Canada, allowing consolidation of two separate systems (one for air gap and one for vibration) into the integrated environment provided by the VibroSmart platform. Modules were distributed around the machine to minimize wiring runs and keep installation costs correspondingly low.

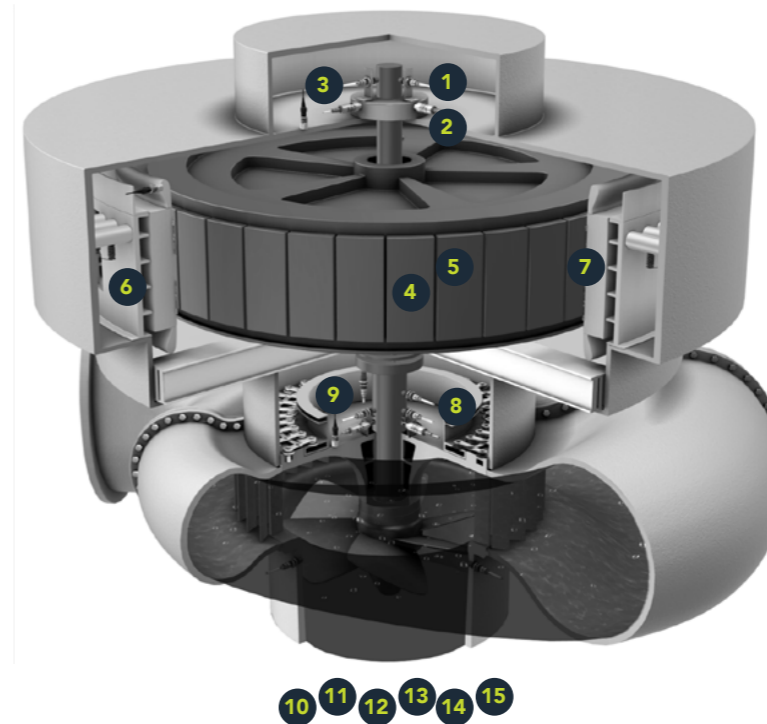


Figure 3: Hydro turbine-generator machines have a number of conventional as well as specialized measurement requirements. Even on conventional measurements, such as radial vibration, requirements are different than on other machine types such as the need to address very low frequencies (down to 0.1 Hz) and the ability to provide signal conditioning such as NOT 1X that can detect the presence of rough load zone.

**"One Card Does It All"**

One of the substantial advantages of the vibro-meter approach is that these hydro measurements – and many others for other machine types – can be made in both the VM600<sup>Mk2</sup> and the VibroSmart platforms. This ensures that you can choose your platform based on what architecture works best for your application – not because the necessary functionality is available in one platform but not the other. This is enabled by vibro-meter's "one card does it all" approach to signal processing. When we designed the original VM600 back in the late 1990s and launched it to the market in 2000, we made a ground-breaking decision to create a truly universal monitoring card that could make any vibration, position, or speed measurement – and indeed any dynamic or quasi-static measurement – in a single module. This was known as the MPC4 (Machine Protection Card – 4-channel) and it revolutionized the industry. That same approach was used in the design of the VibroSmart platform where a single module type (VSV301) could be used universally for any conventional dynamic or static machinery measurement – whether vibration, air gap, cavitation, magnetic flux, etc. This is done by allowing the user to fully customize the transducer type and the measurement particulars.

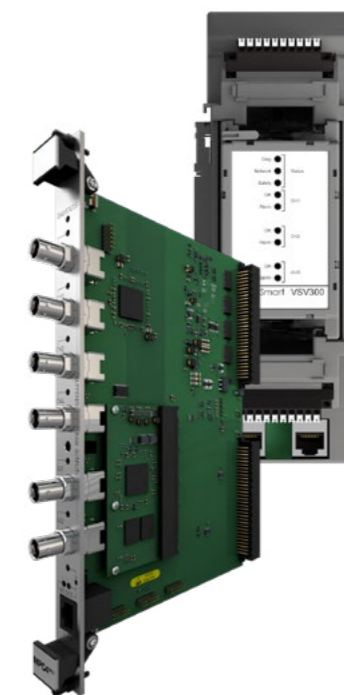


Figure 4: The universal "one card does it all" approach of the MPC4 in the VM600 platform was used as the basis for the VibroSmart platform as well. The VSV301 module is a universal module that provides all measurements with two universal dynamic channels and one speed/auxiliary channel.

- 1 Shaft Vibration (Relative)
- 2 Bearing Vibration (Seismic)
- 3 Casing Vibration
- 4 Partial Discharge
- 5 Magnetic Flux
- 6 Stator Expansion
- 7 Air Gap
- 8 Speed / Phase
- 9 Thrust Position
- 10 Temperatures
- 11 Pressure
- 12 Level
- 13 Wicket Gate Position
- 14 Cavitation
- 15 Foundation vibration

**Simplicity**

A defining characteristic of vibro-meter's monitoring architectures is simplicity. This is evident not only in the "one card does it all" universal approach to channel types, but also in the relatively small number of other modules required.

For the VM600 platform, there are only five other modules: temperature, power, CPUM (communications), RLC16 (additional relays), and XMV16 (condition monitoring).

In the VibroSmart platform, it is even simpler and consists of a single additional module type: the VSI010. This module supports both serial and Ethernet-based communications with automation and control platforms using protocols such as Modbus, Profibus, and GOOSE. This allows compatibility with older machinery control and process control environments using serial communications as well as newer environments with Ethernet-based communications infrastructures. The module also supports full network redundancy to ensure that communications are never interrupted.

Accessories are available such as network switches and BNC patch panels.



**“A defining characteristic of vibro-meter’s monitoring architectures is simplicity. This is evident not only in the “one card does it all” universal approach to channel types, but also in the relatively small number of other modules required.”**

Figure 5: The simplicity of the VibroSmart system is evident in a system that requires only two module types: one for communications and one for universal signal processing applications (shown here) including the suite of measurements used for hydro machinery.

**Software Considerations**

The agnostic approach taken by vibro-meter in its hardware platforms also extends to the software connectivity. Both platforms are fully supported in our VibroSight suite supporting configuration, condition monitoring, decision support, data import/export, and more. This ensures that a single software environment can unify all of the monitoring hardware you use across your operations, allowing you to mix and match hardware based on the particulars of your operations, machine locations, and new versus retrofit installations.

VibroSight also contains the specialized plot types used on hydro machines such as air gap and magnetic flux. This ensures a comprehensive solution for hydro machinery that incorporates all measurement types – not just conventional vibration and position.

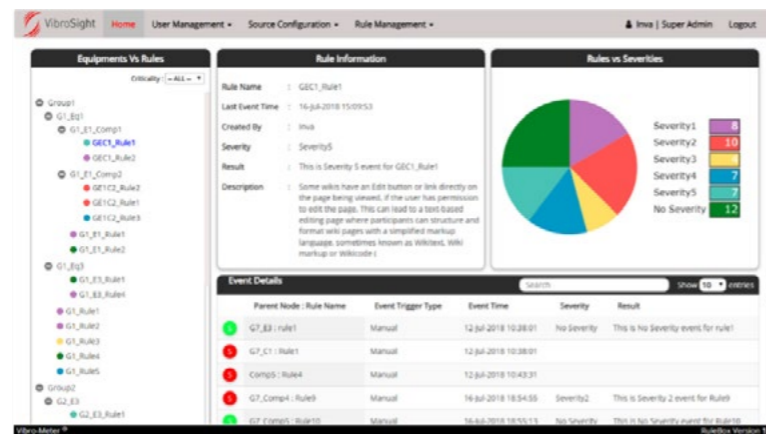


Figure 6: The VibroSmart and VM600 platforms are fully supported by VibroSight software including the diagnostic rule box “decision support” capabilities (top) and the specialized plot types such as air gap (bottom) unique to hydro machines.

**Comprehensive Solutions**

Our ability to address the hydropower market extends beyond just the flexibility of both centralized and distributed monitoring systems, and corresponding software with our VibroSight suite. We also offer the specialized sensors that are routinely employed on hydro turbines and generators, along with conventional acceleration and proximity sensors. You can learn more about both the VibroSmart and VM600<sup>Mk2</sup> platforms in our online product catalog or by contacting your nearest vibro-meter sales and service professional. You can also visit our application page to see all vibro-meter offerings for the hydropower sector.

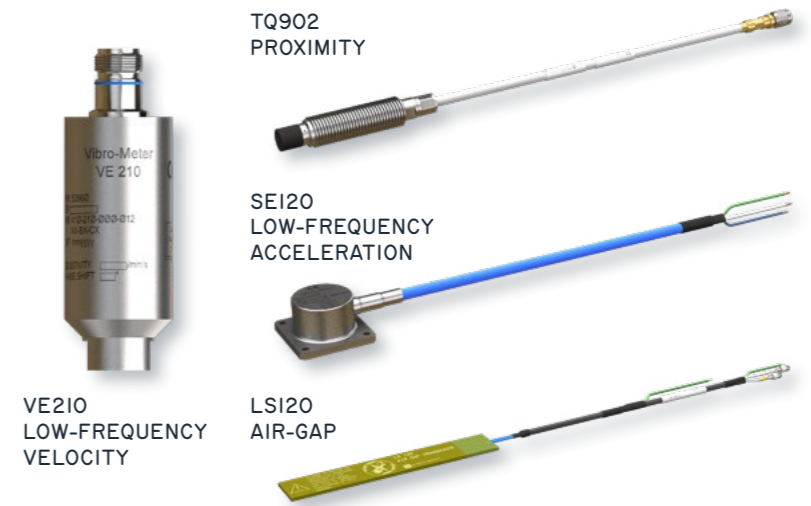


Figure 7: In addition to monitoring systems, vibro-meter provides a complete complement of sensors for the aggressive environments, low frequencies, and specialized measurements encountered on machinery in the hydroelectric industry.

**Endnotes**

The XMV16 modules are 16-channel devices and required only when condition monitoring is required and machinery protective functions are not needed. When machinery protection is required, the MPC4<sup>Mk2</sup> modules are used and provide integrated protection and condition monitoring, eliminating the need for a separate module such as the XMV.



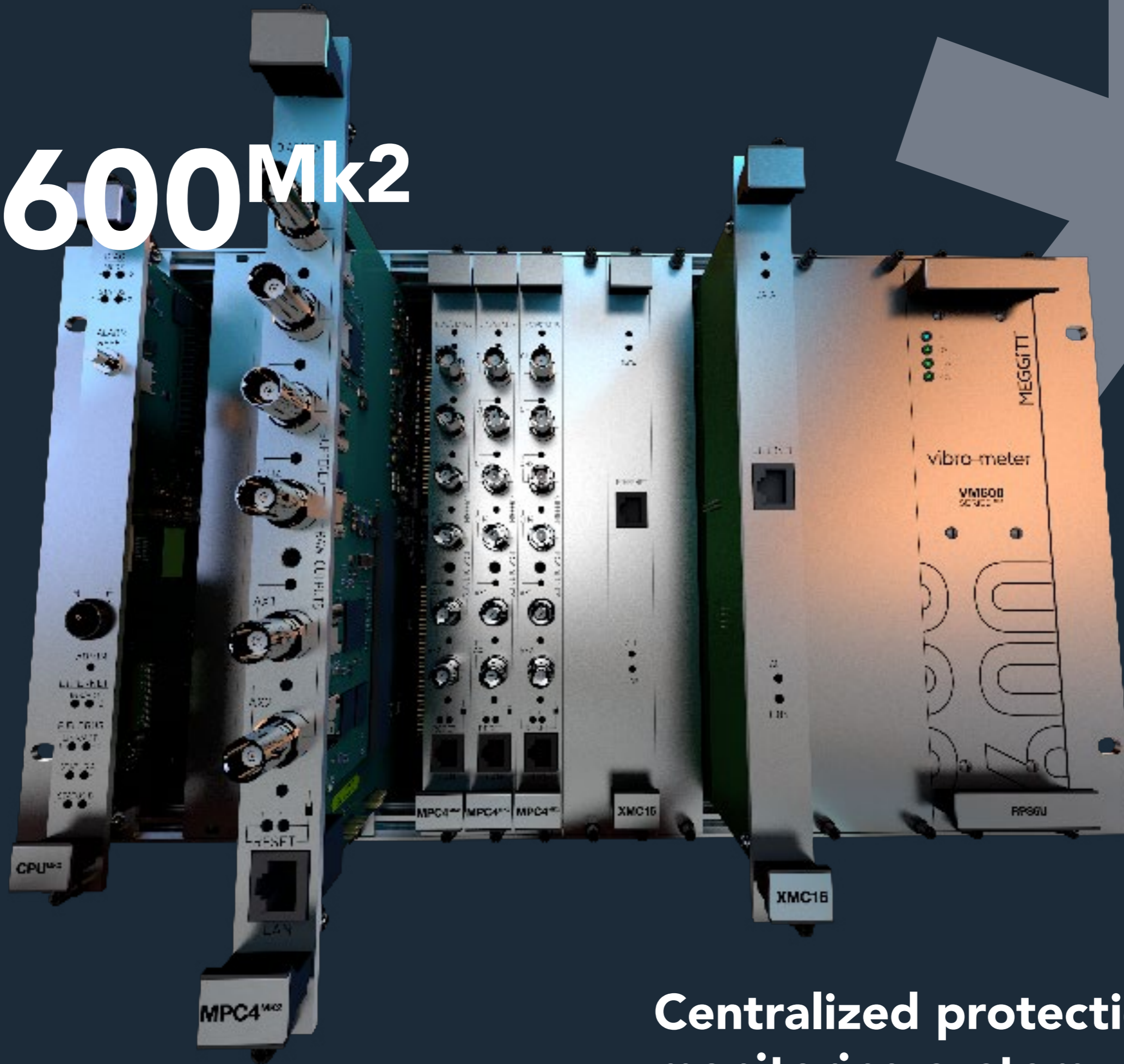
**More than just turbine-generators...**

The VibroSmart platform can be used to monitor other hydro assets such as pumps, spillway gates, control gates, wicket gates, penstock vanes, motors, and more. It can also be used for measurements other than vibration, speed, and position such as load, temperature, power, strain, dynamic pressure, and quasi-static pressure. The universal nature of the VSV301 modules allow them to be easily adaptable to virtually any type of dynamic or quasi-static signal.

Expert article



# VM600Mk2



Centralized protection & monitoring system

# Features

VM600<sup>Mk2</sup>

**Ideal for complex hydro installations requiring centralized monitoring with high channel density.**



### Accessible

Designed to centrally process a wide range of dynamic inputs from proximity probes, accelerometers, velocity sensors and air-gap sensors. The distance between the sensors and the monitoring system can extend to 1,000 meters (3,000 feet).



### Staying power

Monitoring cards are hot-swappable so that you can keep your protection system running virtually continuously should a card fail.

Importantly, replaced modules are automatically reconfigured with the system configuration in order to minimize downtime. The requirement for spare modules is kept to a minimum.



### Extended life cycle

By upgrading installed measurement chains and VM600 racks with the latest<sup>Mk2</sup> modules allows first generation users to considerably lower their total cost of ownership.

Further, replacing MPC4 with MPC4<sup>Mk2</sup> module allows condition monitoring to easily be added to existing machinery protection only systems.



### Increased safety and security

Locked operational mode for improved safety and security. That is, physical access to a VM600 rack is required in order to change the machinery protection system (MPS) configuration.

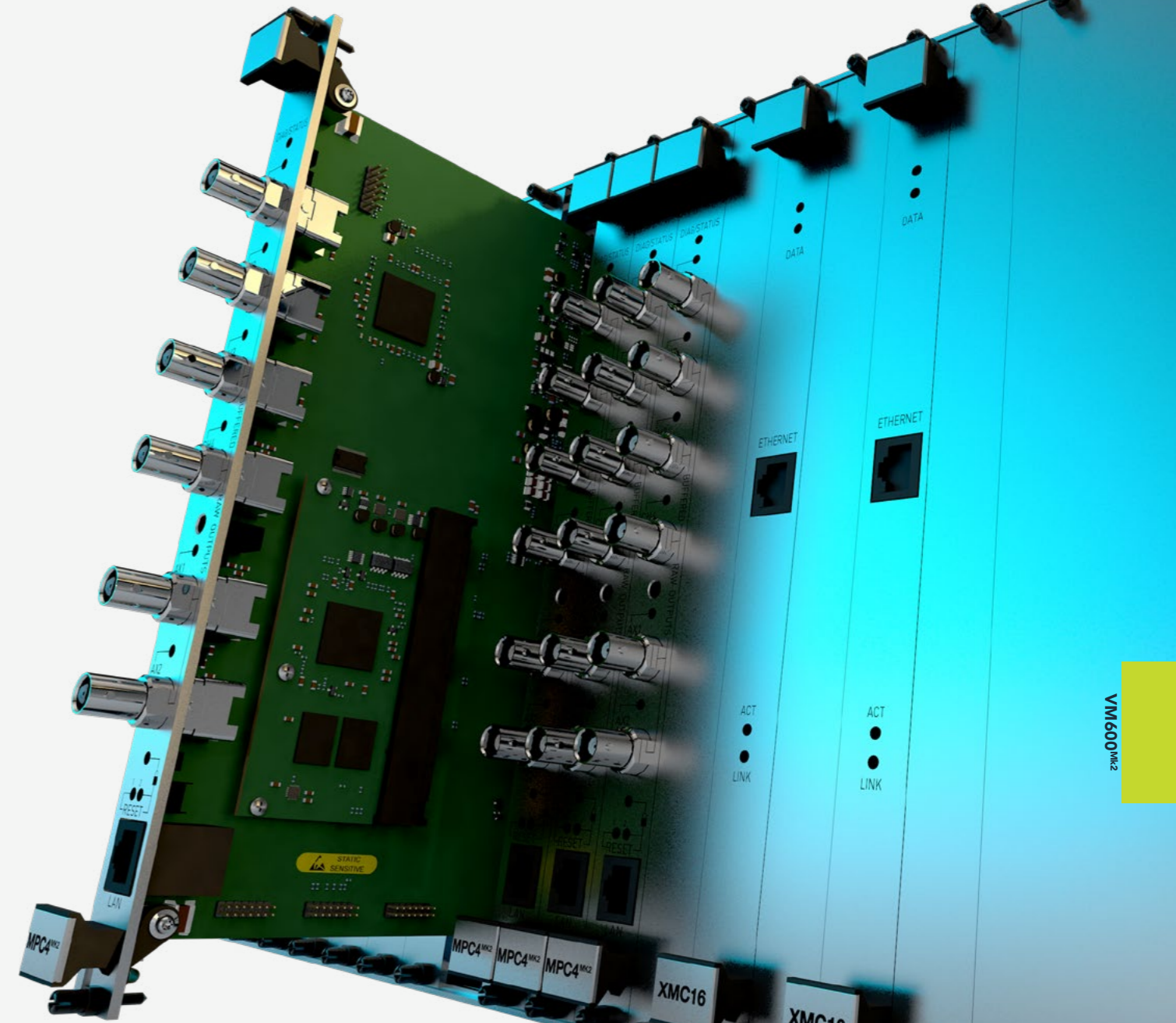
System-wide control signal that automatically drives all system relays and analog outputs to a safe state should the MPC4<sup>Mk2</sup> module's diagnostics (BITE) detect a problem.

#### Safety standards

- SIL 2 in accordance with IEC 61508
- API 670 5th edition machinery protection compliant
- Cybersecure in accordance with IEC 62443 (formerly ISA 99).

#### International compliance

- Europe: EU declaration of conformity (CE certificate).
- North America: cCSAus.



# MPC4<sup>Mk2</sup>

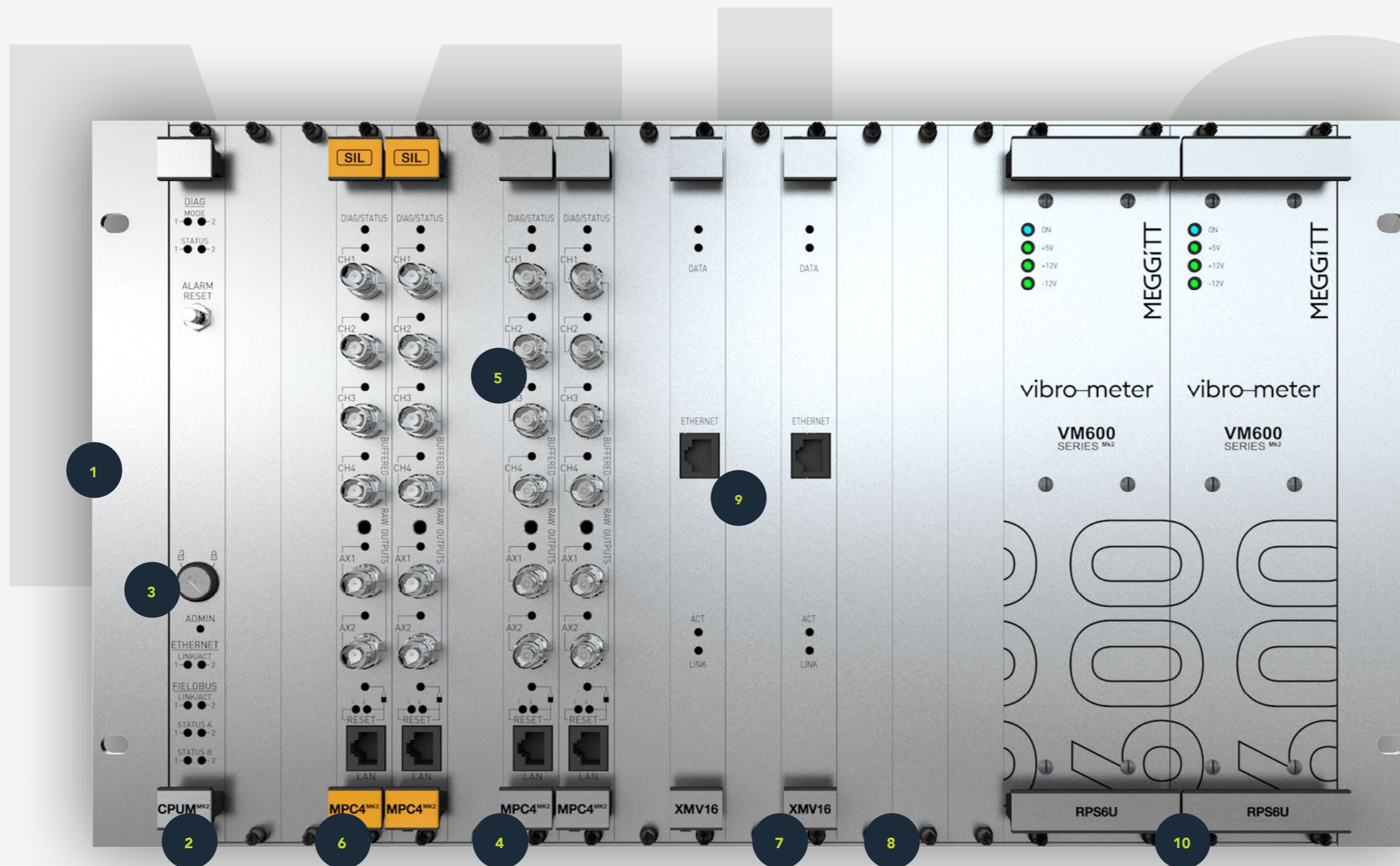
### Smart architecture

Machinery protection, condition monitoring functionalities are delivered from **one** module to support condition-based maintenance strategies and help reduce operating costs. In addition, the **new MPC4<sup>Mk2</sup>** module provides **integrated condition monitoring** functionality identical to that of a separate XMC16 module, and **completely segregates** the protective functions from the condition monitoring functions.

Like its predecessor, the **same sensors** can be **shared between protective and condition monitoring** functions via the rack's backplane.

VM600<sup>Mk2</sup>

## Architecture

VM600<sup>Mk2</sup>

1 19" EIA chassis, 6U tall, 300mm deep, 21 slots (numbered 0-20).  
Note: also available a 19" EIA chassis, 1U tall, 311mm deep, 1 slot.

2 CPUM<sup>Mk2</sup> Communications and rack control module; supports redundant media with communications with plant control and automation platforms including PLCs, DCSs, turbine controllers, local displays, and more; supported protocols include Modbus TCP, Modbus RTU\*, Profibus DP, and Profinet\*. Cybersecure design to meet IEC 62443.

3 Keylock provides an extra measure of physical security in addition to password-protected access to configuration changes.

4 MPC4<sup>Mk2</sup> Universal vibration monitoring module provides 4 channels of dynamic signal inputs and 2 channels of speed/phase or DC inputs; provides integrated protection and condition monitoring while delivering cybersecure performance to meet IEC 62443; up to 12 modules (72 channels) per rack.

5 The MPC4<sup>Mk2</sup> is capable of specialized measurements such as generator air gap on hydroelectric units.

6 SIL 2 version of MPC4<sup>Mk2</sup> modules. Five on-board relays allow alarm and module fault (OK) status annunciation, suitable for auto-shutdown applications meeting SIL 2.

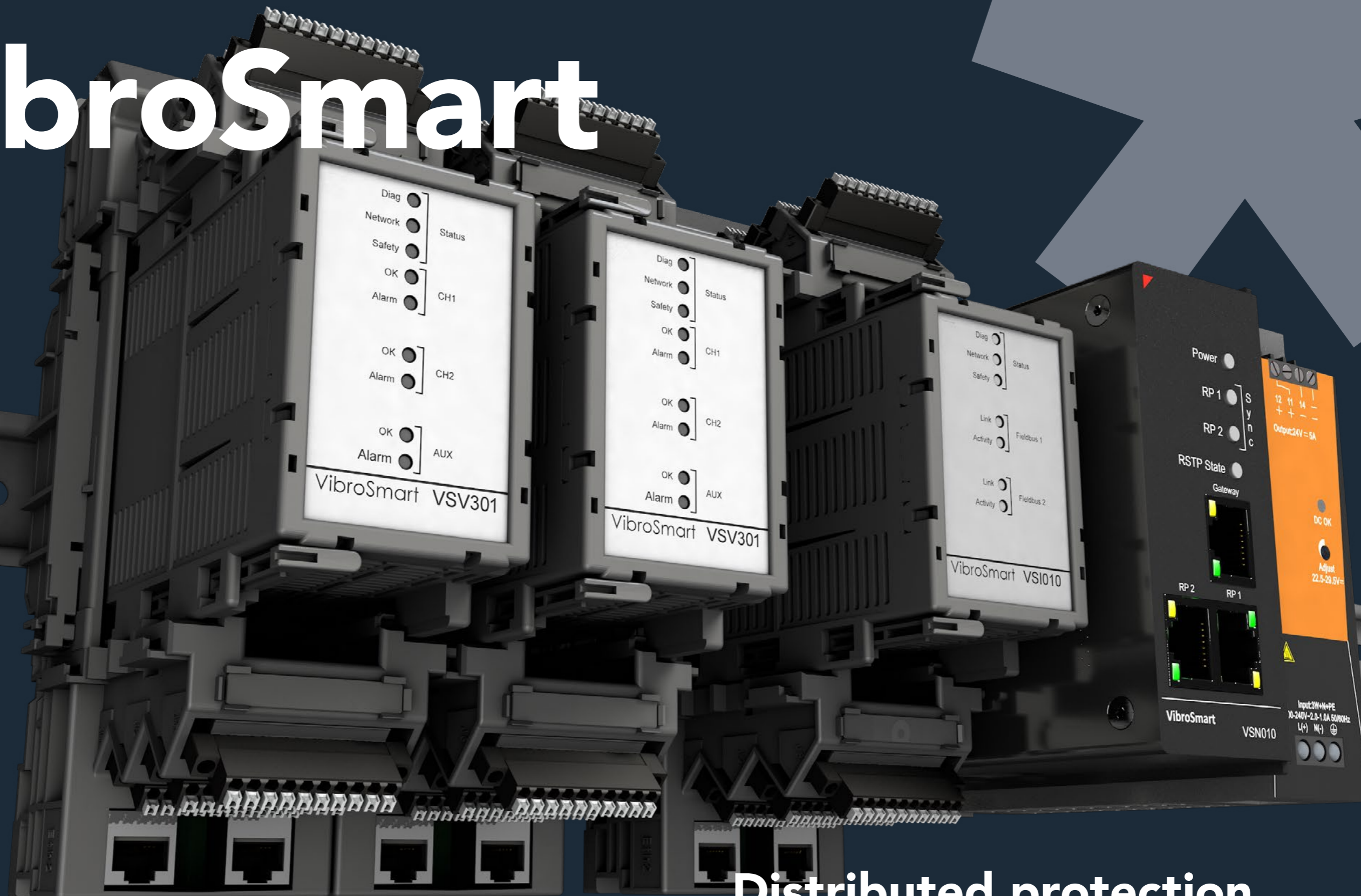
7 XMV16 module can be used for condition monitoring-only applications where protection is not required; allows 16 channels of high-performance condition monitoring in a single rack slot. Ideal for balance-of-plant assets, small hydro units where protection is not required, or for adding condition monitoring to existing third-party protection systems.

8 RLC16<sup>Mk2</sup> relay expansion module provides 16 additional relays to augment the 5 relays on board each MPC4<sup>Mk2</sup> module.

9 Proprietary ethernet communications provide all dynamic and other rack signals to VibroSight software for archival, analysis, and visualization.

10 Simplex or redundant power supplies deliver all required power for rack modules and connected sensors.

# VibroSmart



**Distributed protection  
& monitoring system**

# Features

## VibroSmart

**Ideal for distributed monitoring of turbines, pumps and smaller critical assets requiring low-channel counts.**



### Machinery protection & condition monitoring

- VibroSmart's easily extended modular construction delivers first-class scalable machinery protection and condition monitoring for rotating plant.
- Comprehensive protection system, including : data acquisition and protection, relays, logical functions and analog outputs.
- Seamless redundancy: VSN010 module provides a redundant communication loop with high-availability



### Modular, scalable

- Patented real-time distributed networking monitors smaller critical assets and balance-of-plant equipment requiring low-channel count clusters.
- System can grow as monitoring or protection needs become more and more important, or new safety requirements become required.
- Simplified logical grouping for distributed applications: measurement blocks can be easily created – independence between different measurement blocks is easy to achieve.



### Low-cost installation and maintenance

- VibroSmart can be mounted directly on machinery , reducing the need for expensive sensor cabling. Modules are designed and certified to work in harsh industrial environments characterized by hazardous areas and high mechanical stress.
- Pre-wiring and pre-configuration of inexpensive terminal bases allows installation work to start earlier, then be populated with modules later on.
- Modules are hot-swappable for ease of maintenance and reduced downtime.



### Flexible & Versatile

- VibroSmart's structure is highly flexible and supports all sensor types to deliver API 670 standard machinery monitoring functions. When combined with VibroSight software, it enables detailed insights into machinery health.

#### Safety standards

- Ex certification - hazardous area safety
- PROFIsafe - for the communication interface module (VSI010 + VSB010)

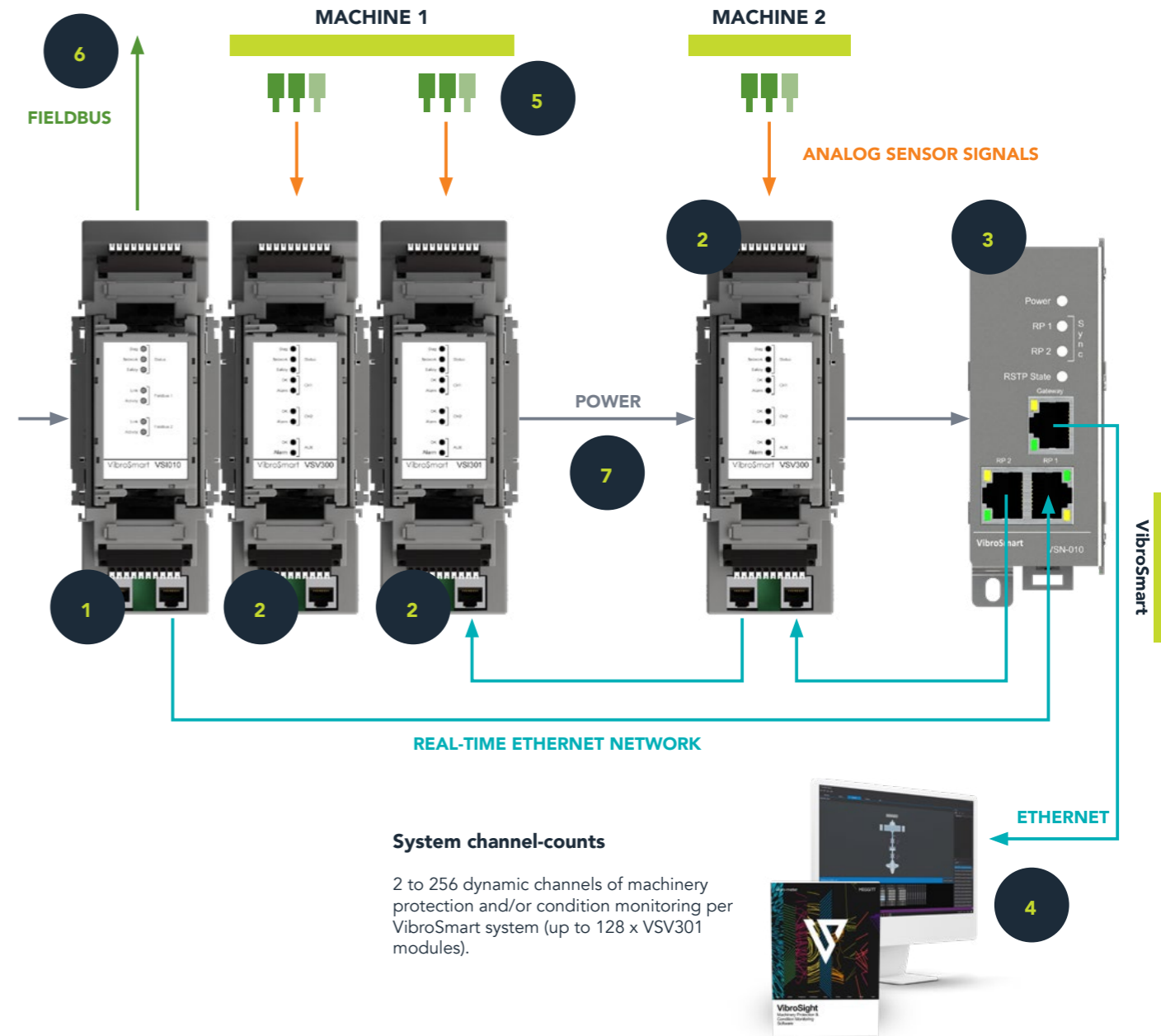
#### International compliance

- EU declaration of conformity
- EAC Russian Federation declaration of conformity
- Profibus, Modbus and IEC61850 GOOSE
- IEC Standard



# Architecture

## VibroSmart



### System channel-counts

2 to 256 dynamic channels of machinery protection and/or condition monitoring per VibroSmart system (up to 128 x VSV301 modules).

- 1 VSI010: Communications interface module and terminal base with 2 fieldbuses.
- 2 VSV301: Monitoring module and terminal base with 2 dynamic channels and 1 auxiliary channel (tachometer or DC input).
- 3 VSN010: Real-time Ethernet switch enables cost-effective redundant networks (HSR ring topology) of VibroSmart modules.
- 4 VibroSight: machinery monitoring system software.
- 5 Sensors: vibro-meter or third-party sensors.
- 6 Fieldbus: Up to 2 serial fieldbus interfaces (Modbus RTU or PROFIBUS DP) or 1 Ethernet fieldbus interface (Modbus TCP). PROFIsafe safety layer to ensure more reliable PROFIBUS communications.
- 7 Power: Modules located side-by-side can communicate directly via their terminal bases that support redundant power supply distribution to improve availability.

# VibroSight



**Advanced machinery  
protection & condition  
monitoring software**

# Features

## VibroSight

**Fast and powerful, user-friendly software that enables the reliability and operational efficiency of industrial machinery.**



### Data visualization and analysis

- Exceptional data handling and visualisation capabilities for the effortlessly fast display and analysis of data.
- Online or offline data presentation and analysis - Setup and storage of user-defined plots as projects
- Complete catalogue of plots with cursor synchronisation to allow all information relevant to a particular event or time period to be easily displayed.



### Integrated data management

- Proprietary, highly-optimised system of VibroSight databases for outstanding performance.
- Fully-integrated support for VibroSight database management simplifies the configuration and operation of database backups, database purges and the management of offline data storage.
- Extremely easy to use data management configuration means that no external data/database management tools are required.



### Application specific packages

- Base/standard VibroSight package provides full support for vibration analysis, including Rolling-element bearing analysis.
- Optional application specific packages for Hydro air-gap monitoring, External data import and Mathematical processing.



### Data import and export

- VibroSight can import data from external systems using industry standard interfaces such as Modbus and OPC.
- This allows data from third party systems such as other monitoring and/or control systems (such as a DCS or PLC) to be easily centralized in a single database for ease of data management and/or to take advantage of the speed and power of VibroSight for the display and analysis of plant-wide data.
- Equally, VibroSight can export its data using industry standard interfaces in order to share information with third-party systems.

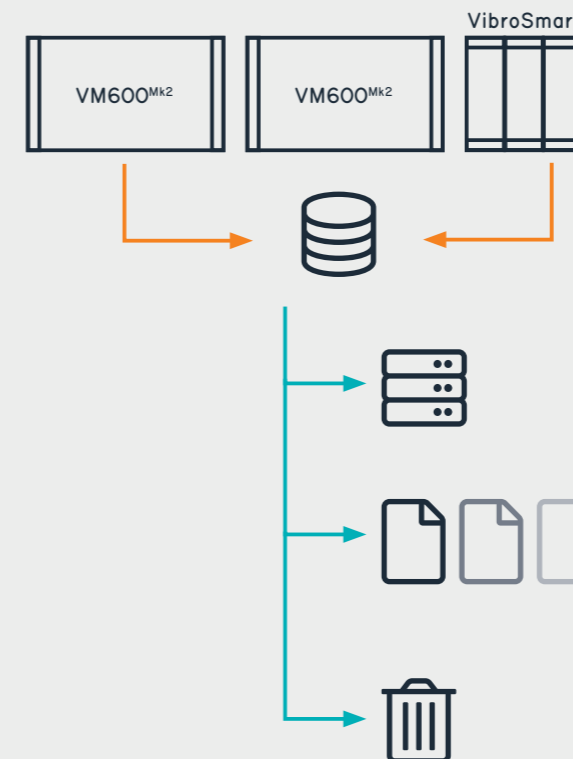
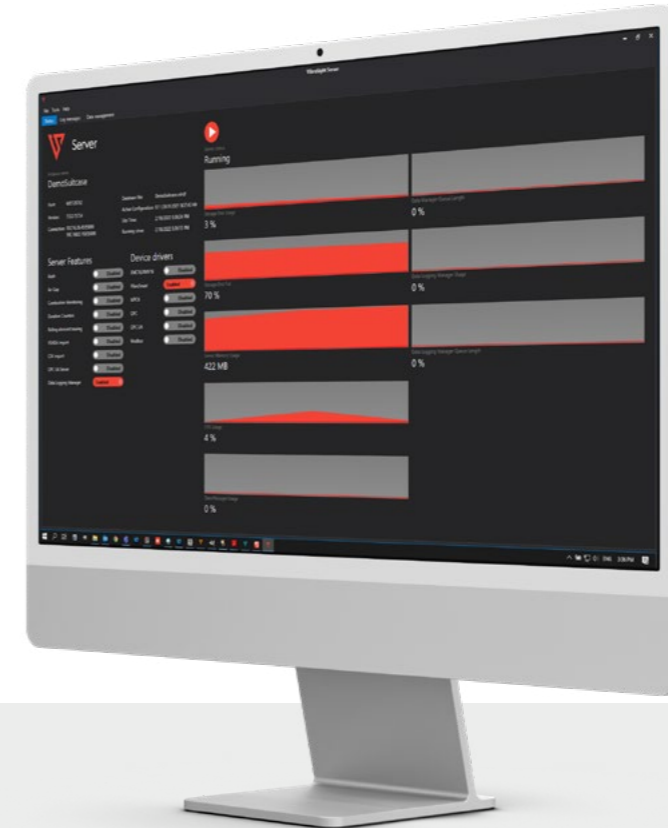
# Architecture

## VibroSight

VibroSight is a suite of user-friendly application software modules for analyzing machinery health. It supports the flexible configuration of channels, processing, outputs, alarms and plant structure, helping to monitor the condition of all critical assets.

**“Operators can assess the overall condition of machines at a glance or use the full suite of visualization and analysis tools and plots to undertake in-depth analyses.”**

With continuous data acquisition offering seamless monitoring of even short events, VibroSight is suitable for the most stringent test-bed applications. However, configurable data-logging rules enable users to ensure they are not overwhelmed by data.



### Monitoring Systems

VibroSight can gather data from vibro-meter VM600 racks, VibroSmart distributed monitoring systems but as well from third party systems via Modbus, OPC or CSV files.

### Database

VibroSight doesn't require the installation and maintenance of a third party database thus simplifying the system management from the IT point of view.

### Backup

VibroSight can automatically create an incremental database backup on a network drive to quickly recover the monitoring system from a computer catastrophic failure.

### Historical data files

The data from the database can be periodically downselected and copied over automatically to historical data files that can be used to create a mirrored database at a different location or for longer term storage.

### Purge

The database size can be maintained under control by automatically deleting the oldest data from the database.

# Applications

## VibroSight

# System configuration

### EventViewer

Monitoring of alarms and system events  
Allows the monitoring of alarms and system events from monitoring systems or stored in VibroSight databases.



### Mimic

Machine operator interface  
Provides an overview of the machinery being monitored using live measurement data.



# Management

### Server

Data logging, management & sharing  
Data logging into the database and provides data access to all VibroSight suite applications and third party software.



### System manager

System maintenance  
Allows system maintenance tasks like module firmware upgrades or configuration of IP addresses and NTP settings.



### Protect

Machinery protection configurator  
For the configuration of machinery protection functionality.



### Capture

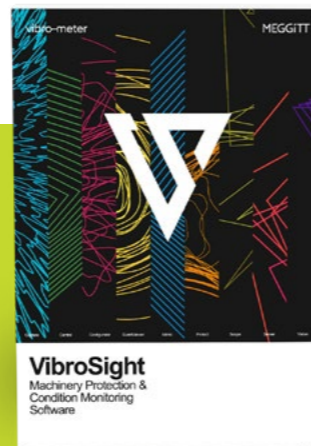
Condition monitoring configurator  
For the configuration of condition monitoring functionality.



# Monitoring

### Vision

Data visualization & analysis  
Features a comprehensive plot catalog to display and analyse live or historical data from monitoring systems or stored in VibroSight databases.



**Adopted by major hydro utilities as their fleet standard for air-gap and vibration monitoring, VibroSight is actively developed and maintained with at least three new software releases per year including new features and improvements.**

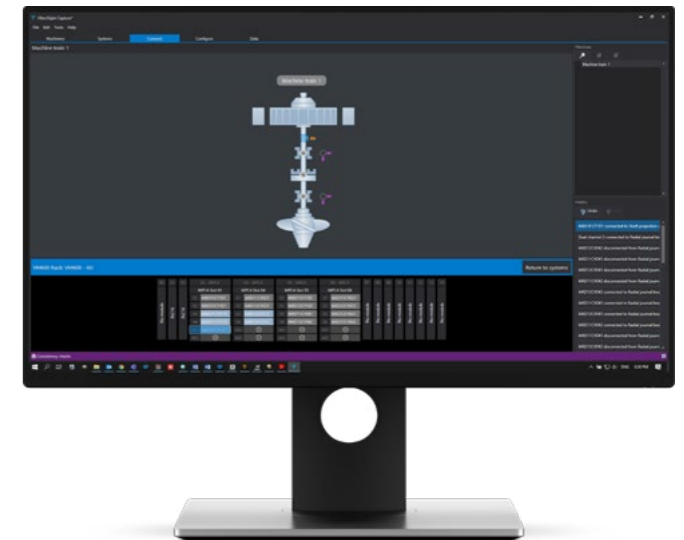
### Protect: machinery protection configurator

VibroSight Protect is a software tool exclusively dedicated to the configuration and commissioning of machinery protection systems. It has been designed to naturally guide the user through the configuration of all the protection chain components (input channels, processing functions, alarms, logical functions and relays) in a very user friendly way to avoid any potential misconfigurations that could end in a miss-strip or a false-trip.



### Capture: condition monitoring configurator

In VibroSight Capture the user can configure the condition monitoring capabilities without being able in any way to impact the machinery protection function either intentionally or by pure mistake. The configuration workflow uses as reference point the modelling and layout of the machine trains under surveillance. The condition monitoring settings include condition monitoring processing functions and software alarms, database logging, database management, data import and export.



### Vision: data visualization & analysis

VibroSight Vision offers easy to use data handling and visualisation capabilities so that it is effortlessly fast for the display and analysis of data. It includes a complete catalogue of plots with cursor synchronisation that allows all of the information relevant to a particular event or time period to be more easily displayed for even quicker analysis. Data from multiple VibroSight databases (\*.vsdha) can be worked with at the same time using simple drag and drop operations in order to more easily compare present and historical data across multiple sites and time periods.





# MEGGITT

## **About us**

Meggitt pioneered high performance sensing and condition monitoring solutions for extreme environments. After working with the world's turbine manufacturers for more than 60 years, Meggitt through vibro-meter portfolio remains master of all aspects of the condition monitoring and machinery protection disciplines.

From high performance sensing, data acquisition and management to the high speed digital networking and the signal processing algorithms that can deliver diagnostics for prescriptive maintenance solutions.

## **Meggitt PLC**

Headquartered in the United Kingdom, Meggitt PLC is an international group operating in North and South America, Europe and Asia. Known for its specialised extreme environment engineering, Meggitt is a world leader in aerospace, energy and defence markets. An 11,000-strong workforce serves customers from around 40 manufacturing facilities and regional offices worldwide.

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