MEGGiTT

DATA SHEET

vibro-meter®

VM600^{Mk2} MPC4^{Mk2} + IOC4^{Mk2} machinery protection and condition monitoring module

MPC4^{Mk2} IOC4^{Mk2}

CE

KEY FEATURES AND BENEFITS

- VibroSight® compatible hardware from the vibro-meter® product line
- VM600^{Mk2} (second generation) machinery protection and condition monitoring module
- 4 dynamic channels and 2 auxiliary channels configurable as either tachometer inputs or DC inputs
- VM600^{Mk2} system safety-line to drive all system relays to a safe state
- Diagnostics (built-in self-test (BIST)) provides continuous feedback on the health of the module
- Individually configurable inputs (with sensor power supply outputs), channel filters, processing and outputs – with simultaneous data acquisition (fixed frequency or order tracking)
- High-resolution spectra (FFT) for condition monitoring: up to 6400 lines every 100 ms
- Up to 10 processed outputs per channel
- Multiple alarms per processed output with configurable limits, hysteresis and time delay

KEY BENEFITS AND FEATURES *(continued)*

- AND, OR and majority voting logic functions for the combination of alarm and status information
- Discrete outputs: 4 user-configurable relays for use by alarms and 1 status relay
- Analog outputs: 4 outputs configurable as either 4 to 20 mA or 0 to 10 V
- Conforms to API 670
- Direct system Ethernet communications
- Compatible with VM600^{Mk2} system racks (ABE04x) and slimline racks (ABE056)

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KEY BENEFITS AND FEATURES *(continued)*

- Live insertion and removal of modules (hot-swappable) with automatic reconfiguration
- Software configurable
- Front-panel status indicators (LEDs)

APPLICATIONS

- VM600^{Mk2} machinery protection (MPS) and/or condition monitoring (CMS)
- Vibration and/or combustion monitoring
- API 670 applications

DESCRIPTION

Introduction

The VM600^{Mk2} MPC4^{Mk2} + IOC4^{Mk2} machinery protection and condition monitoring module is designed for operation with the second generation of VM600^{Mk2} rack-based machinery protection system (MPS), from Meggitt's vibro-meter® product line. The VM600^{Mk2} MPC4^{Mk2} + IOC4^{Mk2} module consists of processing and input/output (interface) modules that provide 4 dynamic and 2 auxiliary channels of machinery protection and optional condition monitoring in VM600^{Mk2} systems.

VM600^{Mk2} rack-based monitoring systems

The vibro-meter® VM600^{Mk2} rack-based monitoring system is the evolution of Meggitt's solution for the protection and monitoring of rotating machinery used in the power generation and oil & gas industries. VM600^{Mk2} solutions are recommended when a centralised monitoring system with a medium to large number of measurement points (channels) is required. It is typically used for the monitoring and/or protection of larger machinery such as gas, steam and hydro turbines, and generators, smaller machines such as compressors, fans, motors, pumps and propellers, as well as balance-of-plant (BOP) equipment.

A VM600^{Mk2} system consists of a 19" rack, a rack power supply and one or more monitoring modules. Optionally, relay modules and rack controller and communications interface modules can also be included.

Two types of rack are available: a VM600^{Mk2} system rack (ABE04x, 6U) that can house up to twelve monitoring modules, and a VM600^{Mk2} slimline rack (ABE056, 1U) that can house one monitoring module. The racks are typically mounted in standard 19" rack cabinets or enclosures installed in an equipment room.

Different VM600^{Mk2} monitoring modules are available for machinery protection, condition monitoring and/or combustion monitoring applications. For example, the MPC4^{Mk2} + IOC4^{Mk2} module supports both machinery protection and condition monitoring, the XMV16 + XIO16T module supports extended condition monitoring for vibration and the XMC16 + XIO16T module supports extended condition monitoring for combustion.

Note: For the MPC4^{Mk2} + IOC4^{Mk2} machinery protection and condition monitoring module, the machinery protection functionality is available by default, while the condition monitoring functionality is optional and depends on the purchased VibroSight® software license.

The RLC16^{Mk2} relay module is an optional module used to provide additional relays when the four user-configurable relays per MPC4^{Mk2} + IOC4^{Mk2} module are not sufficient for an application.

The CPUM^{Mk2} + IOCN^{Mk2} rack controller and communications interface module is an optional module used to provide additional VM600^{Mk2} system functionality such as fieldbus communications; module data aggregation, processing and sharing; rack and/or fieldbus communications redundancy; front-panel alarm reset (AR); MPS rack (CPUx) security; system event and measurement event logging.

VM600^{Mk2} rack-based monitoring systems complement the VibroSmart® distributed monitoring systems that are also available from Meggitt's vibro-meter® product line, and are compatible with the same VibroSight® machinery monitoring software suite.

DESCRIPTION (*continued*)

MPC4^{Mk2} + IOC4^{Mk2} module and VM600^{Mk2} racks

A MPC4^{Mk2} + IOC4^{Mk2} machinery protection and condition monitoring module is used as part of a VM600^{Mk2} rack-based monitoring system. The MPC4^{Mk2} + IOC4^{Mk2} module can be used in a VM600^{Mk2} system rack (ABE04x) or slimline rack (ABE056).

The MPC4^{Mk2} module is always used with an associated IOC4^{Mk2} module as a pair/set of modules. Both the MPC4^{Mk2} and the IOC4^{Mk2} are single-width modules that occupy a single VM600^{Mk2} rack slot (module position). The MPC4^{Mk2} is installed in the front of a VM600^{Mk2} rack and the associated IOC4^{Mk2} is installed in the rear of the rack, in the slot directly behind the MPC4^{Mk2}. Each module connects directly to the rack's backplane using two connectors.

Note: The MPC4^{Mk2} + IOC4^{Mk2} module is compatible with all VM600^{Mk2} racks (ABE04x system racks and ABE056 slimline racks) and later VM600 racks.

System communications

In a VM600^{Mk2} system (one or more MPC4^{Mk2} + IOC4^{Mk2} modules and any associated RLC16^{Mk2} modules or CPUM^{Mk2} + IOCN^{Mk2} module), the main communications interface is the LAN (Ethernet) connector on the front panel of each MPC4^{Mk2} module, which is used for used for communication with the VibroSight® software running on an external computer.

In a VM600^{Mk2} rack (ABE4x), the VME bus can be used to share information between modules in the rack. For example, an MPC4^{Mk2} + IOC4^{Mk2} module can provide information such as measurement, alarm and/or status data to a CPUM^{Mk2} + IOCN^{Mk2} module which can then share the information via one of its industry standard fieldbuses.

In a VM600^{Mk2} system (one or more MPC4^{Mk2} + IOC4^{Mk2} modules and any associated RLC16^{Mk2} modules or CPUM^{Mk2} + IOCN^{Mk2} module), the RLC16^{Mk2} modules are controlled and operated by a MPC4^{Mk2}, as determined by the configuration. The VM600^{Mk2} rack's Open collector (OC) bus and Raw bus are used to exchange control and status information between the MPC4^{Mk2} + IOC4^{Mk2} and RLC16^{Mk2} modules.

Relays

The MPC4^{Mk2} + IOC4^{Mk2} module includes five relays. The four user-configurable relays (RL1 to RL4) can be used by a VM600^{Mk2} system to remotely indicate system alarm and/or status information. While, a status (common circuit-fault relay (FAULT)) is used to indicate a problem with the MPC4^{Mk2} + IOC4^{Mk2} module, as detected by the module's internal diagnostics (BIST).

The relays in a VM600^{Mk2} system (one or more MPC4^{Mk2} + IOC4^{Mk2} modules and any associated RLC16^{Mk2} modules), are driven by control circuitry that supports a VM600^{Mk2} system safety-line, that is, a system-wide control signal that automatically drives all system relays (IOC4^{Mk2} and RLC16^{Mk2}) and analog outputs (IOC4^{Mk2}) to a safe state should a problem be detected. In this way, IOC4^{Mk2} and RLC16^{Mk2} relays configured as normally energised (NE) can always be de-energised in the event of a problem with one of the components of the relay coil control signal.

Note: This supports the "de-energise to trip principle" required in safety-related applications.

Software

The VibroSight® software supports the configuration and operation of VM600^{Mk2} modules, including the storage, display and/or further processing of MPC4^{Mk2} data for analysis. For example, measurements (dynamic or static) can be logged to a VibroSight Server data repository and/or displayed in the VibroSight Vision software.

More specifically, MPC4^{Mk2} + IOC4^{Mk2} modules are software configured using the VibroSight® software. To prioritise machinery protection functionality and help meet stringent cybersecurity and API 670 requirements, the MPC4^{Mk2} + IOC4^{Mk2} module segregates machinery protection (MPS) and condition monitoring (CMS) functionality by running separate module firmware using separate configurations from different VibroSight configuration software:

- VibroSight Protect supports the configuration and operation of machinery protection system (MPS) functionality for a VM600^{Mk2} system (that is, for MPC4^{Mk2} + IOC4^{Mk2}, RLC16^{Mk2} and CPUM^{Mk2} + IOCN^{Mk2} modules).

DESCRIPTION (*continued*)

• VibroSight Capture supports the configuration and operation of condition monitoring system (CMS) functionality for a VM600^{Mk2} system (that is, for MPC4^{Mk2} + IOC4^{Mk2} modules).

Other VibroSight software modules support operations such as data display and analysis (VibroSight Vision), data logging and post-processing (VibroSight Server) system maintenance (VibroSight System Manager), etc.

The VibroSight Vision plot catalogue includes static plots such as Bar chart, Spider, Table, Trend, Bode, Polar, Correlation and Shaft Centerline, and dynamic plots such as Waveform, Long Waveform, Polar Waveform, Orbit, Corbit, Spectrum and Full Spectrum, Waterfall/Cascade, and Full Waterfall/Cascade.

More generally for extended condition monitoring system (CMS) applications, the VibroSight software supports the configuration and operation of XMx16 + XIO16T modules for condition monitoring and/or combustion monitoring, including the processing and presentation of measurement data for analysis. VibroSight is also used to configure and manage CPUM^{Mk2} + IOCN^{Mk2} modules.

Refer to the *VibroSight® machinery monitoring system software data sheet* for further information.

VibroSight® / VM600^{Mk2} MPC4^{Mk2} condition monitoring licensing

In VibroSight® / VM600^{Mk2} MPC4^{Mk2} systems, the MPC4^{Mk2} + IOC4^{Mk2} module can provide machinery protection system (MPS) functionality and/or condition monitoring system (CMS) functionality, depending on the requirements of the application.

For the VM600^{Mk2} MPC4^{Mk2} + IOC4^{Mk2} machinery protection and condition monitoring module, machinery protection functionality is available by default for all versions of the module, while condition monitoring functionality is optional. Accordingly, MPC4^{Mk2} condition monitoring can be used by either (1) ordering a version of the module with condition monitoring enabled or (2) ordering and uploading a condition monitoring license to a version of the module without condition monitoring enabled (using VibroSight System Manager).

Note: MPC4^{Mk2} condition monitoring also requires a VibroSight® software edition / license that supports condition monitoring.

For example, a VibroSight / VM600^{Mk2} MPC4^{Mk2} system consisting of MPC4^{Mk2} + IOC4^{Mk2} modules can initially be installed and used as a MPS only. Then, CMS functionality can be quickly and easily added at any time by upgrading the licenses for the MPC4^{Mk2} + IOC4^{Mk2} module(s) and for VibroSight software, as required.

Applications information

As part of a VibroSight® / VM600^{Mk2} system, MPC4^{Mk2} + IOC4^{Mk2} machinery protection and condition monitoring modules are ideal for the protection and/or condition monitoring of critical assets such as gas, steam or hydro turbines and other high-value rotating machines in a wide range of industrial applications.

For further information, contact your local Meggitt representative.

SPECIFICATIONS

Supported sensors

Currently available : Compatible with a wide range of sensors and measurement chains with current (2-wire) or voltage (3-wire) outputs, including the following sensors from the Meggitt vibro-meter® product line:
- CAxxx vibration sensors (piezoelectric accelerometers)
- CExxx and PVxxx vibration sensors (piezoelectric accelerometers and velocity sensors)
- CVxxx and VExxx vibration sensors (velocity sensors)
- CPxxx dynamic pressure sensors (piezoelectric pressure sensors)
- TQxxx proximity sensors
- LSxxx air-gap sensors.

Dynamic inputs

Number of channels : 4 (independent channels)

Voltage inputs
- DC measurement range : 0 to +20 V_{DC} or 0 to −20 V_{DC}.
  Note: 10 Hz DC filter (see **DC filtering on page 5**).
- AC measurement range : ±20 $V_{PEAK-PEAK}$
- AC + DC measurement range : ±24 $V_{PEAK-PEAK}$

Common-mode voltage range : −50 to +50 V_{DC}

Common-mode rejection ratio (CMRR) : >55 dB, up to 60 Hz.
>60 dB, from 45 to 65 Hz.

Current inputs
- DC measurement range : 0 to 35 mA
- AC measurement range : ±30 $mA_{PEAK-PEAK}$
- AC + DC measurement range : ±50 $mA_{PEAK-PEAK}$

Frequency bandwidth : DC to 20 kHz

Input impedance
- Voltage : ≥100 kΩ, between the differential (high and low) inputs
- Current : 200 Ω ±0.2%

Accuracy
- Amplitude : ±1% of full scale
- Phase : ±1° from 10 Hz to 2 kHz.
  ±15° from 2 to 20 kHz.

Dynamic input range : ≥80 dB, from 3 Hz to 20 kHz

DC filtering

DC filter
- Cutoff frequency (−3 dB) : 10 Hz ±3.5 Hz
- Roll-off : −40 dB/decade (second order)

Note: The DC filter is used to extract the DC part of a dynamic input when it is configured as a DC input.

High-pass filtering

High-pass filter
- Cutoff frequency (−3 dB) : 0.1, 1 or 3 Hz (or bypassed)
- Roll-off : −20 dB/decade (first order)
- Phase error : <1° at 100 times the cutoff frequency (10, 100 or 300 Hz)

Note: The high-pass filter is used to configure a dynamic input for an AC only input signal with one of 3 different cutoff frequencies. This filter can be disabled in order to allow the DC-coupling of the input signal (AC + DC).

SPECIFICATIONS *(continued)*

Auxiliary inputs

Number of channels	: 2 (independent channels) configurable as either tachometer inputs or DC inputs
Common-mode voltage range	: −50 to +50 V_{DC}
Common-mode rejection ratio (CMRR)	: >50 dB, up to 60 Hz. >55 dB, from 45 to 65 Hz.
Tachometer input	
• Triggering method	: Crossing of threshold on rising edge or falling edge of signal
• Triggering threshold	: 2/3 of peak-peak value ±10% for rising edge. 1/3 of peak-peak value ±10% for falling edge.
• Tachometer pulse acquisition/ detection (on input)	: Up to 51.2 kHz.
• Speed / frequency measurement range	: 1 to 100000 RPM / 0.01667 to 1666.67 Hz. Note: Configurable tacho divider of 1 to 255 (pulses per revolution).
• Voltage range	: 0.6 to 50 $V_{PEAK-PEAK}$ from 2 Hz to 10 kHz. 2 to 50 $V_{PEAK-PEAK}$ from 10 kHz to 50 kHz.
Auxiliary input	
• Current range input	: ±50 $mA_{PEAK-PEAK}$ (AC + DC measurement range)
• Voltage range input	: ±50 $V_{PEAK-PEAK}$
DC input	
• Voltage measurement range	: 0 to +20 V_{DC} or 0 to −20 V_{DC}. Note: 10 Hz DC filter (see **DC filtering on page 6**).
• Current measurement range	: ±50 $mA_{PEAK-PEAK}$ (AC + DC input)
Input impedance	
• Voltage	: ≥100 kΩ, between the differential (high and low) inputs
• Current	: 200 Ω ±0.2%
Dynamic input range	: ≥72 dB

DC filtering

DC filter	
• Cutoff frequency (−3 dB)	: 10 Hz ±3.5 Hz
• Roll-off	: −40 dB/decade (second order)

Note: The DC filter is used to extract the DC part of an auxiliary input when it is configured as a DC input.

Sensor/measurement chain OK check

Number of levels	: Up to 16 configurable threshold levels (16 DC regions)
OK level range	
• Voltage inputs	: ±20 V_{DC}
• Current inputs	: 0 to 23 mA
Operating principle	
• SIL safety sensors	: Line-fault detection of conditions such as a problem with the sensor and/or cabling, problem with the signal conditioner, and/or other problem with the measurement chain or power supply. Note: Requires a SIL safety sensor/measurement chain that provides a suitable diagnostic signal (DC bias level), for example, measurement chains using IPC707 or IQS900 signal conditioners.
• Standard sensors	: Powered sensors – line-fault detection of conditions such as open-circuit or short-circuit. Unpowered sensors – line-fault detection of conditions such as open-circuit.

SPECIFICATIONS *(continued)*

Digital signal processing

Analogue to digital converter (ADC)	: 24 bit
Dynamic range	: ≥80 dB
Frequency bandwidth	: 0 Hz to 20 kHz
Accuracy	
• Amplitude	: ≤1% of input full scale
• Phase	: ≤1.5°
Digital filtering	
• Notch filter	: 50 or 60 Hz
• ISO 2954 filter	: 10 Hz to 1 kHz (−3 dB), −24 dB/octave
• Band-pass filter	: <0.1 dB ripple in pass band, >55 dB attenuation in stop band, 0.1 or 3 dB attenuation at cutoff, −24 to −60 dB/octave slope
• High-pass filter	: 0.25 to 400 Hz
• Low-pass filter	: 10 Hz to 20 kHz
Data acquisition	: Fixed frequency or order tracking
Fixed frequency	: Frequency span: 0.25 Hz to 20 kHz. Note: The low-pass filter (LPF) cutoff frequency to high-pass filter (HPF) cutoff frequency ratio must be less than 400 when the HPF cutoff frequency is less than 3 Hz. See also Digital filtering above.
Order tracking	: Digital resampling. Tracking range: 300 to 6000 RPM (default). Frequency span: DC to 3.125, 6.25, 12.5, 25, 50 or 100 orders. Waveform averaging: 1 (default). Note: Order tracking requires a reference speed (auxiliary input configured as a tacho/speed channel).
Measurement resolution	: 2048, 4096, 8192 or 16384 point waveform / 800, 1600, 3200 or 6400 line spectrum
FFT window types	: Blackman, Blackman-Harris, Flat top, Hamming, Hanning, Kaiser α=1, Kaiser α=5, Kaiser α=10, Rectangular or Tukey α=0.5. Note: Hanning is the default window type.
FFT resolution	: 800, 1600, 3200 or 6400 spectral lines
Data sampling rate	: 2.56 × frequency bandwidth
Extracted data (measurements)	: Up to 10 processed outputs per channel/processing function. See **Processing functions on page 10**.
Extracted data types	: Time domain measurements: Scalar. Frequency domain measurements: Scalar, Vector and Phasor.
Fixed-frequency measurements	: Time domain or Frequency domain measurements. Time domain measurements: Overall (Scalar). Frequency domain measurements: Single frequency – nX (Amplitude + Phase (Vector)), Band – Band start to Band stop (Amplitude (Scalar)), Highest peak – Band start to Band stop (Amplitude + Phase + Frequency (Phasor)).
Order-tracking measurements	: Frequency domain measurements only. Frequency domain measurements: Single frequency – nX (Amplitude + Phase (Vector)), Band – Band start to Band stop (Amplitude (Scalar)), Highest peak – Band start to Band stop (Amplitude + Phase + Frequency (Phasor)).
Integration count	: 0, 1 or 2 (Acceleration to Velocity or Displacement), as required

SPECIFICATIONS *(continued)*

Measurement types	: Time domain measurements: True RMS, True Peak, True Peak-peak, True Average. Frequency domain measurements: Amplitude + Phase (Vector). Note: True RMS and True average measurements have a configurable Response time (400 ms default). True Peak and True Peak-peak measurements have a configurable Decay time (4700 ms default).
Qualifiers (rectifiers)	: Time domain measurements: True RMS, True Peak, True Peak-peak, True Average, Scaled Peak, Scaled Peak-peak or Scaled Average. Frequency domain measurements: RMS, Peak, Peak-peak or Average.
Update rate – internal (MPC4^{Mk2} module)	: 20 ms min. for time domain processing. 100 ms min. for frequency domain processing. Note: MPC4^{Mk2} + IOC4^{Mk2} and RLC16^{Mk2} relays are also updated every 20 ms.
Update rate – external (VibroSight Capture condition monitoring data update rate)	: Configurable as 100 ms, 200 ms, 500 ms, 1 s, 2 s or 5 s. Note: 1 s is the default VibroSight Capture condition monitoring update rate.
Update rate – external (VibroSight Capture condition monitoring data logging rule rate)	: Configurable between 100 ms and 99 days
Update rate – external (VibroSight Vision live data display interval)	: Configurable as 100 ms, 200 ms, 500 ms, 1 s, 2 s, 5 s, 10 s, 20 s, 50 s, …

SPECIFICATIONS *(continued)*

Machinery protection system (MPS) functionality / processing

Measurement resolution (fixed)	: 2048 point waveforms / 800 line spectra

Notes
The lower-resolution waveforms and spectra available from MPC4^{Mk2} + IOC4^{Mk2} modules configured for and running machinery protection only are intended to support the configuration, verification and troubleshooting of sensor / measurement chains.
VibroSight Vision uses a direct connection to a module in order to display these plots.

Firmware	: Machinery protection firmware (640-025-vvv-ppp) running on the module (MPC4^{Mk2})
Configuration	: Machinery protection configuration stored on the module (IOC4^{Mk2})
MPS functionality / licensing	: Machinery protection (MPS) functionality is available by default

Condition monitoring system (CMS) functionality / processing

Measurement resolution (user-configurable)	: 4096, 8192 or 16384 point waveforms / 1600, 3200 or 6400 line spectra
Waveform frequency span	: 0 or 0.25 to 156.25, 312.5, 625, 1250, 2500, 5000, 10000 or 20000 Hz
Spectra resolution	: 1600 line spectra: 0.1, 0.2, 0.39, 0.78, 1.56, 3.13, 6.25 or 12.5 Hz. 3200 line spectra: 0.05, 0.1, 0.2, 0.39, 0.78, 1.56, 3.13 or 6.25 Hz. 6400 line spectra: 0.02, 0.05, 0.1, 0.2, 0.39, 0.78, 1.56 or 3.13 Hz.
Spectra averaging	: Yes: 1 to 100 / RMS, Peak hold or Mean
Measurement averaging	: Yes: 1 to 100

Notes
The higher-resolution waveforms and spectra (and other plot types) available from MPC4^{Mk2} + IOC4^{Mk2} modules configured for and running condition monitoring are intended to support the display and analysis of dynamic measurement data for the purposes of condition monitoring.
VibroSight Vision typically uses a connection to a VibroSight Server in order to display such live and/or historical waveforms and spectra (and all other plot types).

Firmware	: Condition monitoring firmware (640-033-vvv-ppp) running on the module (MPC4^{Mk2})
Configuration	: Machinery protection configuration stored on the associated VibroSight Server
CMS functionality / licensing	: Condition monitoring (CMS) functionality is optional and can be used by either: (1) ordering a version of the MPC4^{Mk2} module with condition monitoring enabled *or* (2) ordering and uploading a MPC4^{Mk2} CMS license to a version of the MPC4^{Mk2} module without condition monitoring enabled. See **Ordering information on page 23** for further information.

Notes
For condition monitoring, the waveforms / spectra resolution and update rates are user-configurable, so the VibroSight Protect software automatically checks the configured processing load and will issue a warning if resolutions and/or update rates must be reduced.
For example, a MPC4^{Mk2} + IOC4^{Mk2} module can typically provide a maximum of two to four 6400 line spectra at 100 ms, depending on the required filter coefficients.

SPECIFICATIONS *(continued)*

Processing functions

The following configurable signal processing blocks and measurements are supported by the MPC4^{Mk2} + IOC4^{Mk2} module:

Single-channel processing

Bearing absolute vibration:

- Dynamic channels only (accelerometer or velocity sensors)
- Fixed-frequency or order-tracking data acquisition
- Band-pass or ISO 2954 filtering
- Up to 10 measurements for fixed-frequency data acquisition: up to 6 time-domain measurements (2 direct and 2 per integration level) and up to 4 frequency-domain measurements
- Up to 6 measurements for order-tracking data acquisition: up to 2 time-domain measurements (2 direct) and up to 4 frequency-domain measurements
- Waveform and spectrum.

Combustion dynamics:

- Dynamic channels only (pressure sensors)
- Fixed-frequency data acquisition
- Band-pass and notch (50 or 60 Hz) filtering
- Up to 6 measurements for fixed-frequency or order-tracking data acquisition: up to 2 time-domain measurements and up to 4 frequency-domain measurements
- Waveform and spectrum.

Shaft relative vibration:

- Dynamic channels only (proximity sensors)
- Fixed-frequency or order-tracking data acquisition
- Band-pass filtering
- Up to 6 measurements for fixed-frequency or order-tracking data acquisition: up to 2 time-domain measurements and up to 4 frequency-domain measurements (AC displacement)
- 1 quasi-static measurement (DC gap)
- Waveform and spectrum.

Note: Shaft relative vibration processing outputs include both dynamic (AC) and quasi-static (DC) components.

Shaft eccentricity:

- Dynamic channels only (proximity sensors)
- 1 quasi-static measurement (eccentricity).

Air gap:

- Dynamic channels only (air-gap sensors)
- Fixed-frequency data acquisition
- 1 air gap measurement (min. gap)
- Rotor shape and rotor signature waveforms with associated measurements (min. gap, max. gap, avg. gap, rotor eccentricity, rotor circularity and rotor ellipticity).

Custom dynamic:

- Dynamic channels only (other/custom sensors)
- Fixed-frequency or order-tracking data acquisition
- Band-pass or ISO 2954 filtering
- Up to 10 measurements for fixed-frequency or order-tracking data acquisition: up to 4 time-domain measurements and up to 6 frequency-domain measurements
- 1 quasi-static measurement (DC)
- Waveform and spectrum.

Note: Custom dynamic processing outputs include both dynamic (AC) and quasi-static (DC) components.

SPECIFICATIONS *(continued)*

Position:
- Dynamic or auxiliary channels (proximity sensors)
- 1 quasi-static measurement (DC gap).

Note: Position processing is equivalent to Shaft relative vibration processing's quasi-static (DC) component.

Shaft axial position – collar:
- Dynamic or auxiliary channels (proximity sensors)
- 1 quasi-static measurement (axial position).

Shaft axial position – shaft end:
- Dynamic or auxiliary channels (proximity sensors)
- 1 quasi-static measurement (axial position).

Rotor position – collar:
- Dynamic or auxiliary channels (proximity sensors)
- 1 quasi-static measurement (position).

Differential expansion – collar:
- Dynamic or auxiliary channels (proximity sensors)
- 1 quasi-static measurement (differential expansion).

Differential expansion – pendulum:
- Dynamic or auxiliary channels (proximity sensors)
- 1 quasi-static measurement (differential expansion).

Rotor expansion – collar:
- Dynamic or auxiliary channels (proximity sensors)
- 1 quasi-static measurement (expansion).

Quasi-static pressure:
- Dynamic or auxiliary channels (pressure sensors)
- 1 quasi-static measurement (position).

Quasi-static temperature:
- Dynamic or auxiliary channels (temperature sensors)
- 1 quasi-static measurement (position).

Housing expansion:
- Dynamic or auxiliary channels (LVDT type sensors)
- 1 quasi-static measurement (expansion).

Custom quasi-static:
- Dynamic or auxiliary channels (other/custom sensors)
- 1 quasi-static measurement (DC).

Speed:
- Auxiliary channels only (tachometers)
- 1 speed measurement.

Notes
In general, the MPC4^{Mk2} + IOC4^{Mk2} module supports one processing block per input channel (dynamic or auxiliary).
A maximum of 6 single-channel processing blocks can be configured per MPC4^{Mk2} + IOC4^{Mk2} module.
A maximum of 3 dual-channel processing blocks can be configured per MPC4^{Mk2} + IOC4^{Mk2} module (two for dynamic channels and one for auxiliary channels).
There are 2 to 10 processed outputs (data extractions) per processing function, depending on the function.

SPECIFICATIONS *(continued)*

Dual-channel processing

X-Y bearing absolute vibration:

- Dynamic channels only (accelerometer or velocity sensors)
- Fixed-frequency data acquisition
- Band-pass or ISO 2954 filtering
- 1 time-domain measurement (Vmax)
- Orbits – 1 unfiltered overall orbit (OVR orbit) and up to 6 filtered orbits (1X, 2X, etc.)
- Full spectrum – with up to 6 frequency-domain measurements (1X, 2X, Not 1X, etc.).

Note: Vmax can be calculated using the real maximum displacement value directly from the orbit (that is, the largest radius from the unfiltered orbit), which is a peak measurement.
Alternatively, Vmax can be calculated using an X-Y max discriminator that uses the maximum value of the peak-to-peak displacement values measured in two orthogonal directions of the unfiltered orbit, which is a peak-peak measurement.

X-Y shaft relative vibration:

- Dynamic channels only (proximity sensors)
- Fixed-frequency data acquisition
- Band-pass filtering
- 1 time-domain measurement (Smax)
- Orbits – 1 unfiltered overall orbit (OVR orbit) and up to 6 filtered orbits (1X, 2X, etc.)
- Shaft centerline
- Full spectrum – with up to 6 frequency-domain measurements (1X, 2X, Not 1X, etc.).

Note: Smax can be calculated using the real maximum displacement value directly from the orbit (that is, the largest radius from the unfiltered orbit), which is a peak measurement (ISO 7919-1 Method C).
Alternatively, Vmax can be calculated using an X-Y max discriminator that uses the maximum value of the peak-to-peak displacement values measured in two orthogonal directions of the unfiltered orbit, which is a peak-peak measurement (ISO 7919-1 Method B).

Shaft absolute vibration:

- Dynamic channels only (proximity sensor and accelerometer or velocity sensor)
- Fixed-frequency data acquisition
- Band-pass filtering
- 1 time-domain measurement (Overall)
- Absolute spectrum – with up to 6 frequency-domain measurements (1X, 2X, Not 1X, etc.).

Shaft axial position – shaft end:

- Dynamic or auxiliary channels (proximity sensors)
- 1 quasi-static measurement (axial position).

Note: Dual-channel Shaft axial position – shaft end processing is similar to it's single-channel equivalent except that two sensors with voting logic (2oo2 or 1oo2) are used.

Differential expansion – dual taper:

- Dynamic or auxiliary channels (proximity sensors)
- 1 quasi-static measurement (differential expansion).

Differential expansion – single taper:

- Dynamic or auxiliary channels (proximity sensors)
- 1 quasi-static measurement (differential expansion).

Differential expansion – collar:

- Dynamic or auxiliary channels (proximity sensors)
- 1 quasi-static measurement (differential expansion).

Mathematical function:

- Dynamic or auxiliary channels (any sensors)
- 1 mathematically calculated measurement (Sum, Subtraction, RMS Sum, RMS Subtraction, Min or Max).

SPECIFICATIONS *(continued)*

Differential housing expansion:
- Dynamic or auxiliary channels (LVDT type sensors)
- 1 quasi-static measurement (differential expansion (mathematical subtraction)).

Notes
In general, dual-channel processing requires that both channels are configured for fixed-frequency data acquisition and use the same filter (frequency span) settings, such as cutoff frequencies, attenuation and slope.
However, the Mathematical function processing does allow different processing functions to be combined.

Alarm processing

Alarms	: Alarm with configurable limits (severity levels), hysteresis and time delay per processed output (data extraction)
Time delay	: Up to 60 s in steps of 100 ms
Hysteresis	: Up to 20% of the alarm level (physical quantity)
Severity levels	
• Machinery protection applications	: Out of range+, Danger+, Alert+, Normal, Alert−, Danger−, Out of range−
• Basic condition monitoring applications	: Out of range+, Danger+, Alert+, Information+, Normal, Information−, Alert−, Danger−, Out of range−
Adaptive monitoring	: Adaptive monitoring uses a control parameter provided by an auxiliary channel (typically speed) to multiply the configured alarm limits by multiple coefficients configured for different ranges of the control parameter. Trip multiplier uses the DSI TM control signal to multiply the configured alarm limits by a single configurable coefficient. See **Discrete signal interface (DSI) inputs on page 14**.

Alarm combination

Logic functions	: AND, OR and majority voting logic (1oo2, 2oo2 and 2oo3), with optional inversion of individual inputs
Level 1 (basic) logic functions	
• Number	: 32
• Number of inputs per logic function	: 32
• Configurable inputs	: Sensor OK checks, measurement alarms (such as Danger+, Alert+, Alert− and Danger−) and/or associated data quality indicators (status bits)
Level 2 (advanced) logic functions	
• Number	: 32
• Number of inputs per logic function	: 32
• Configurable inputs	: Outputs from level 1 (basic) logic functions. Note: Level 1 (basic) and level 2 (advanced) logic functions can be combined to generate more complex logic function.
Alarm update rate (internal)	: 100 ms max. Note: This is the time required for the MPC4^{Mk2} + IOC4^{Mk2} module to detect and initiate an alarm, including output relay (RL1 to RL4) activation.

SPECIFICATIONS *(continued)*

Discrete signal interface (DSI) inputs

Control signal

- Alarm bypass (AB) : A closed contact between the DSI AB and RET inputs inhibits the activation of alarms and relays on the MPC4^{Mk2} + IOC4^{Mk2} module. Note: The common circuit-fault relay (FAULT) is activated when Alarm bypass (AB) is enabled.
- Alarm reset (AR) : A closed contact between the DSI AR and RET inputs resets (clears) the alarms and relays latched by the MPC4^{Mk2} + IOC4^{Mk2} module. Note: The Alarm reset (AR) input is edge-sensitive and a high-to-low transition is required to activate the reset. The Alarm reset (AR) input should not be held low and must transition low-to-high before another reset (high-to-low) can activate the reset.
- Trip multiply (TM) : A closed contact between the DSI TM and RET inputs multiplies the configured alarm levels for the MPC4^{Mk2} + IOC4^{Mk2} module by a scale factor (software configurable)

Operating principle : Detection of an open circuit or a closed circuit on the input

Buffered outputs – dynamic channels

Number : 4

Type : Buffered outputs (buffered "raw" analog signal).
Buffered analog signals corresponding to dynamic channel input channels (CH1 to CH4) are available on BNC connectors on the MPC4^{Mk2} module (front of rack) and on the J2 screw-terminal connector on the IOC4^{Mk2} module (rear of rack).
See **Connectors on page 21**.

Frequency bandwidth : DC to 60 kHz

Output impedance : <5 Ω

Accuracy

- Amplitude : ±0.1 dB up to 20 kHz.
  ±3 dB from 20 to 60 kHz.
- Phase : <1° from 10 Hz to 2 kHz.
  <15° from 2 to 20 kHz.

Transfer ratios

- Voltage input : 1 V/V
- Current input : 0.2 V/mA

Admissible load on output

- Resistance : ≥50 kΩ
- Capacitance : Able to drive up to 3 m of cable with a typical capacitance of 100 pF/m
- Impedance : >50 kΩ with a load capacitance <5 nF

SPECIFICATIONS *(continued)*

Buffered outputs – auxiliary channels

Number	: 2
Type	: Buffered outputs (buffered "raw" analog signal or TTL-level signal). Buffered analog signals corresponding to auxiliary input channels (AX1 and AX2) are available on BNC connectors on the MPC4^{Mk2} module (front of rack) and on the J2 connector on the IOC4^{Mk2} module (rear of rack). See **Connectors on page 21**. Note: When an auxiliary input is configured as a tachometer input, a buffered TTL-level signal corresponding to the auxiliary input channel (AX1 or AX2) is available on the J2 connector on the IOC4^{Mk2} module (rear of rack). When an auxiliary input is configured as a DC input, no digital TTL-level signal is available.
Frequency bandwidth	: DC to 60 kHz
Output impedance	
• Buffered TTL-level signal (tachometer input)	: <300 Ω
• Buffered "raw" analog signal (DC input)	: <5 Ω
Signal levels	: 0 to 5 V TTL-compatible signal (non-inverting)
Admissible load on output	
• Resistance	: >50 kΩ
• Capacitance	: Able to drive up to 3 m of cable with a typical capacitance of 100 pF/m
• Impedance	: >50 kΩ with a load capacitance <5 nF

Analog outputs

Number of local outputs	: 4 single-ended outputs. Used to output quasi-static measurement signals (DC). Individually configurable as either current or voltage output signals.
Current outputs	
• Range	: 4 to 20 mA (nominal). Two modes of operation are supported, as follows: • Mode 1, measured value with quality checks – the analog output is driven in the 4 to 20 mA signal range during normal operation, and the analog output is driven to 2 mA to indicate a problem. • Mode 2, measured value without quality checks – the analog output is driven in the 2 to 23 mA signal range. Note: Current outputs are 0 mA ± 0.5 mA when disabled.
• Resolution	: 10 µA
• Accuracy	: ≤1% of full scale
• Admissible load on output	: ≤360 Ω. Note: Compliance voltage is 10 V min.
Voltage outputs	
• Range	: 0 to 10 V. Note: Voltage outputs are 0 V ±10 mV when disabled.
• Resolution	: 2.5 mV
• Accuracy	: ≤1% of full scale
• Admissible load on output	: ≥50 kΩ with a load capacitance <5 nF
Update rate / frequency bandwidth	: 100 ms / 10 Hz max.
Short-circuit protection	: Yes

SPECIFICATIONS *(continued)*

Discrete outputs

Relays

- Number : 5.
  4 × output relays (RL1 to RL4) – suitable for alarm and/or status outputs.
  1 × common circuit-fault relay (FAULT) – for fault indication.
  See **Relay characteristics on page 18**.
- Configurable functions : Normally energized (NE) or normally de-energized (NDE). Latched or unlatched.
- Configurable inputs : From the sensor OK checks, the measurement alarms (Danger+, Alert+, Alert−, Danger−) and/or the logic functions of the MPC4^{Mk2} module

Communication interfaces

External (Ethernet)

- Number : 1.
  Available on LAN connector of the MPC4^{Mk2} module.
  See **Connectors on page 21**.
- Network interface : 10/100BASE-TX
- Data transfer rate : Up to 100 Mbps
- Maximum distances : System Ethernet communications can support distances up to 100 m at 100 Mbps, depending on Ethernet cabling.
  For distances greater than the specified maximum, the Ethernet interface operates at reduced data transfer rates.
- Protocols : TCP/IP (proprietary protocols) for communication with a computer running software such as VibroSight®

Internal (VME)

- Bus interface : A24/D16 slave mode

Note: In a VM600^{Mk2} rack (ABE4x), the VME bus can be used to share information between modules in the rack. For example, MPC4^{Mk2} + IOC4^{Mk2} modules can provide information such as measurement, alarm and status data to a CPUM^{Mk2} + IOCN^{Mk2} rack controller module which can then share the information via one of its industry standard fieldbuses. While in the opposite direction, a CPUM^{Mk2} + IOCN^{Mk2} rack controller module can issue alarm bypass (AB), alarm reset (AR) and trip multiply (TM) commands to MPC4^{Mk2} + IOC4^{Mk2} modules in the rack (when modules are Unlocked (maintenance operating mode)).

VM600^{Mk2} module compatibility : The MPC4^{Mk2} + IOC4^{Mk2} module is compatible with RLC16^{Mk2} modules as part of a VM600^{Mk2} system.
The MPC4^{Mk2} + IOC4^{Mk2} module includes benefits and features such as improved measurement capability, VM600^{Mk2} system safety-line functionality and module diagnostics (BIST) that are not supported by the VM600^{Mk1} MPC4/IOC4T card pair.
Note: In a VM600^{Mk2} system, the MPC4^{Mk2} module automatically configures its relays as normally energized (NE) or normally de-energized (NDE), as per the configuration created using VibroSight Protect, whereas the VM600^{Mk1} RLC16 relay card uses jumpers on the card to manually configure the relays as NE or NDE.

SPECIFICATIONS *(continued)*

System communications

External : System communication interface (Ethernet) for communication with VibroSight® software running on an external computer

Internal – VM600^{Mk2} VME : VME bus interface for communication with controlling/processing modules via rack backplane. For example, with a CPUM^{Mk2} + IOCN^{Mk2} rack controller module.

Internal – VM600^{Mk2} rack buses : Open collector (OC) bus and/or Raw bus to share and monitor RLC16^{Mk2} module relays, and distribute the system-wide safety-line control signal.
Raw bus to monitor/share the RLC16^{Mk2} module's status.

Note: Generally, in a VM600^{Mk2} rack (ABE4x), the Raw bus is used to share dynamic input signals between processing modules, the Tacho bus is used to share tachometer (speed) input signals between processing modules, and the Open collector (OC) bus is used by processing modules to drive relay modules, all in the same rack. For example, the Raw bus and the Tacho bus are commonly used to share sensor signals (vibration and speed respectively) between different machinery protection modules and/or condition monitoring modules.

Specifically for a VM600^{Mk2} system in a VM600^{Mk2} rack (ABE4x), the Open collector (OC) bus and/or Raw bus can be used to connect up to 32 outputs from a MPC4^{Mk2} + IOC4^{Mk2} machinery protection and condition monitoring module to RLC16^{Mk2} relay modules in the same rack, if additional relays are required.

External communication links/connections

- Connection to a computer/network : The system communication interface (LAN connector on MPC4^{Mk2} module) can be used for connections/communications between the MPC4^{Mk2} module and a computer/network, using standard Ethernet cabling. See **Connectors on page 21**.
- VibroSight® software : Used for the configuration of a VM600^{Mk2} system (one or more MPC4^{Mk2} + IOC4^{Mk2} modules and any associated RLC16^{Mk2} modules)

Configuration

MPC4^{Mk2} + IOC4^{Mk2} module : Software configurable via/over Ethernet, using a computer running the VibroSight® software.

VibroSight Protect is used for the configuration and operation of machinery protection system (MPS) functionality for VM600^{Mk2} systems (MPC4^{Mk2} + IOC4^{Mk2}, RLC16^{Mk2}, CPUM^{Mk2} + IOCN^{Mk2}).
VibroSight Capture is used for the configuration and operation of condition monitoring system (CMS) functionality for VM600^{Mk2} systems (MPC4^{Mk2} + IOC4^{Mk2}).
Refer to the *VibroSight® machinery monitoring system software data sheet* for further information.

The IOC4^{Mk2} includes non-volatile memory that stores a copy of the configuration for the MPC4^{Mk2} + IOC4^{Mk2} module, such that if the MPC4^{Mk2} is replaced (hot-swapped), it is automatically reconfigured using the configuration from the IOC4^{Mk2}.
Jumpers on the IOC4^{Mk2} module are manually configured to select the VM600^{Mk2} rack's Open collector (OC) bus and/or Raw bus lines that control and monitor the module's relays, and distribute the system-wide VM600^{Mk2} system safety-line control signal. The jumper information is generated by the VibroSight® software.

SPECIFICATIONS *(continued)*

Relay characteristics

Number : 4 × user-configurable relays (RL1 to RL4).
1 × common circuit-fault relay (FAULT).
Note: The common circuit-fault relay (FAULT) is also known as the status relay.

Type : Single-pole double-throw (SPDT) / 1 Form C, epoxy-sealed or equivalent

Contact arrangement : 1 × COM, 1 × NC and 1 × NO contact per relay (RL1 to RL4 and FAULT).
Additional fused contact (1 × COM FUSED) for common circuit-fault relay (FAULT) only.
See **Relay fuse on page 19** and **Connectors on page 21**.

Rated load

- VDE : 8 A at 250 V_{AC} resistive, 100k cycles
- UL : 10 A at 250 V_{AC} resistive, 30k cycles.
  10 A at 30 V_{DC} resistive, 30k cycles.

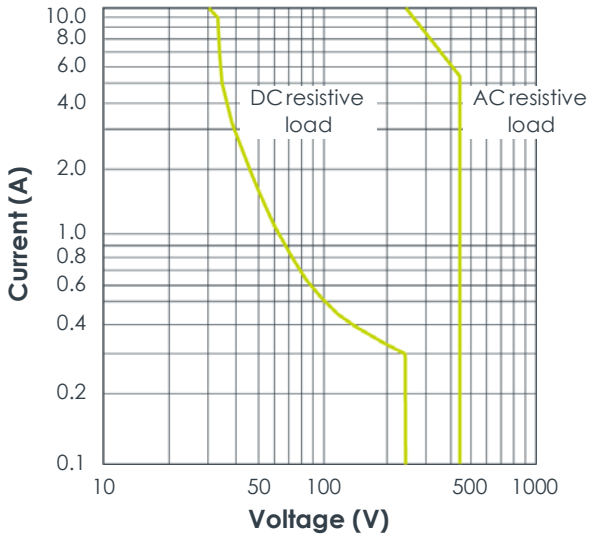
Maximum switching power : 2500 VA / 300 W.
Note: If the switching voltage is >30 V_{DC}, then special precautions must be taken. Contact Meggitt SA for more information.

Maximum switching voltage : 240 V_{AC} / 125 V_{DC}

Maximum switching current : 10 A

Safety approved contact rating : 10 A at 240 V_{AC}.
10 A at 30 V_{DC}.

Maximum switching capacity curves :



Operate / release time : 7 / 3 ms typ.

Dielectric strength

- Between open contacts : 1000 $V_{AC\ (RMS)}$
- Between contact and coil : 5000 $V_{AC\ (RMS)}$

Insulation resistance : 1000 MΩ min. (at 500 V_{DC}, 50% relative humidity (RH))

Mechanical life : >1 × 10^7 operations

Electrical life : >1 × 10^5 operations (at 8 A, 250 V_{AC})

SPECIFICATIONS *(continued)*

Note: In general, MPC4^{Mk2} + IOC4^{Mk2} module relays are limited to 240 V_{AC} max. in accordance with the EN 61010 electrical safety standard.

⚠ **When used in a VM600^{Mk2} slimline rack (ABE056) with a DC power supply, the relay contacts on a IOC4^{Mk2} module have a maximum switching voltage of 70 V_{DC} / 33 $V_{AC\ (RMS)}$ (46.7 $V_{AC\ (PEAK)}$).**

Relay fuse

Contact	: Fused contact (COM FUSED) for common circuit-fault relay (FAULT) only. See **Relay characteristics on page 18** and **Connectors on page 21**.
Type	: Littelfuse 443 series NANO$^{2®}$ surface-mount fuse (SMD) or equivalent
Characteristic	: Time delay (T) / "Slo-Blo®"
Current rating	: 2 A
Voltage rating	: 250 V_{AC} max.
Interrupting rating (breaking capacity)	: 50 A (at 250 V_{AC})
Case style	: Small rectangular surface-mount fuse (SMD) with square end blocks for insertion into a board-mounted (SMD) metal fuse clip/holder

Environmental

Temperature	
• Operating	: −20 to 65°C (−4 to 149°F)
• Storage	: −40 to 85°C (−40 to 185°F)
Humidity	
• Operating and storage	: 0 to 95% relative humidity (RH), non-condensing
Altitude	: 2000 m (6560 ft) max. Note: Reduced air density affects cooling ability.

Approvals

Conformity	: European Union (EU) declaration of conformity (CE marking)
Electromagnetic compatibility	: EN 61000-6-2:2005. EN 61000-6-4:2007 + A1:2011.
Electrical safety	: EN 61010-1:2010. CAN/CSA-C22.2 No. 61010-1.
Environmental management	: RoHS compliant (2011/65/EU)
Insulation coordination for measuring relays and protection equipment	: Separate circuits according to IEC 60255-27

Note: Some certifications and approvals for the VM600^{Mk2} MPC4^{Mk2} + IOC4^{Mk2} module are pending.

SPECIFICATIONS *(continued)*

Power supply to module (input)

Power source	: VM600^{Mk2} rack power supply
Supply voltages	: +5 V_{DC} and ±12 V_{DC}
Consumption	
• *MPC4*^{Mk2}	: <6 W
• *IOC4*^{Mk2}	: <9 W
Total power consumption (MPC4^{Mk2} + IOC4^{Mk2} module)	: <15 W

Power supplies to sensors (output)

Number	: 6 × independent sensor power supplies. Note: One per input/channel (CH1 to CH4, AX1 and AX2).
Power supply output	
• Constant voltage	: +24 *or* −24 V_{DC} ±3% at up to 35 mA max. Note: Short-circuit protected.
• Constant current	: +6 mA ±1%. Note: Voltage compliance >22 V_{DC}.

Control inputs

MPC4^{Mk2}

• Button 1 (left)	: Used to run the proof test for the MPC4^{Mk2} + IOC4^{Mk2} module
• Button 2 (right)	: Used to lock/unlock the MPC4^{Mk2} + IOC4^{Mk2} module, that is, to switch between the main operating modes of a VM600^{Mk2} system (MPC4^{Mk2} + IOC4^{Mk2} modules and any associated RLC16^{Mk2} modules), as follows: • Locked (secure operating mode) – the VM600^{Mk2} system performs its monitoring and protection functions while ensuring the security of the modules/system and it's configuration. That is, the configuration cannot be changed and maintenance activities cannot be performed. • Unlocked (maintenance operating mode) – the VM600^{Mk2} system performs its monitoring and protection functions without ensuring the security of the modules/system and it's configuration. That is, the configuration can be changed and maintenance activities can be performed. Note: Physical access to a VM600^{Mk2} system (specifically, the MPC4^{Mk2} module) is required in order to change the operating mode and therefore to be able to change the machinery protection (MPS) functionality for a VM600^{Mk2} system.
• Reset	: Simultaneously pushing buttons 1 (left) and 2 (right) is used to reset the MPC4^{Mk2} + IOC4^{Mk2} module and any associated RLC16^{Mk2} modules (VM600^{Mk2} system), resulting in a reboot and power-on self-test (POST)

IOC4^{Mk2}

• DSI signals	: See **Discrete signal interface (DSI) inputs on page 14**

SPECIFICATIONS *(continued)*

Status indicators (LEDs)

MPC4^{Mk2}

- DIAG/STATUS : Multicolour LED used to indicate the status of the MPC4^{Mk2} + IOC4^{Mk2} module, such as normal operation, configuration status or internal hardware or firmware failures
- CH1 to CH4 : Multicolour LEDs used to indicate the status of the dynamic channels (CH1 to CH4)
- AX1 and AX2 : Multicolour LEDs used to indicate the status of the auxiliary channels (AX1 and AX2)
- LOCK : LED used to indicate the main operating mode of the MPC4^{Mk2} + IOC4^{Mk2} module (VM600^{Mk2} system):
  Locked (safety operating mode) or
  Unlocked (maintenance operating mode)
- LAN : LAN connector link and activity LEDs to indicate the status of the system LAN (Ethernet) communications

Connectors

MPC4^{Mk2}

- CH1 to CH4 : BNC connectors (female).
  Buffered "raw" sensor/measurement chain signals for the dynamic channel inputs (CH1 to CH4).
  Note: For the dynamic channels, the buffered "raw" outputs are analog signals.
- AX1 and AX2 : BNC connectors (female).
  Buffered "raw" sensor/measurement chain signals for the auxiliary channel inputs (AX1 and AX2).
  Note: For the auxiliary channels, the buffered "raw" outputs are analog signals. Corresponding digital signals are available on J2.
- LAN : 8P8C (RJ45) modular jack, female.
  System Ethernet for communication between the MPC4^{Mk2} + IOC4^{Mk2} module and a computer running the VibroSight® software.

IOC4^{Mk2}

- J1 : 24-pin S2L connector (male), compatible with 24-pin B2CF plug-in connectors (female) with PUSH IN spring connections and B2L plug-in connectors (female) with tension clamp spring connections.
  Inputs (analog signals) for the dynamic channels (CH1 to CH4) and the auxiliary channels (AX1 and AX2).
- J2 : 36-pin S2L connector (male), compatible with 36-pin B2CF plug-in connectors (female) with PUSH IN spring connections and B2L plug-in connectors (female) with tension clamp spring connections.
  Outputs (buffered "raw" signals) for the dynamic channels (CH1 to CH4) and the auxiliary channels (AX1 and AX2).
  Outputs (digital (pulse train) signals (TTL-level)) for the auxiliary channels (AX1 and AX2).
  Inputs and ground reference (digital signals) for the DSI control signals (AB, AR and TM).
  Outputs (analog signals) for the analog DC outputs.

SPECIFICATIONS *(continued)*

• J3	: 16-pin connector (male), compatible with 16-pin MC/STF plug-in connectors (female) with screw-terminal connections. Outputs (contacts) for the common circuit-fault relay (FAULT) and the user-configurable relays (RL1 to RL4).

Notes

The IOC4^{Mk2} module's connectors are removable to simplify installation and mounting.

For the J1 and J2 connectors:
- Clamping range (min. to max.): 0.2 to 1 mm^2 (28 to 18 AWG)
- Tightening torque (min. to max.): 0.15 to 0.2 N•m (0.11 to 0.15 lb-ft).

For the J3 connector:
- Clamping range (min. to max.): 0.14 to 1.5 mm^2 (28 to 16 AWG).
- Tightening torques (min. to max.): 0.2 to 0.25 N•m (0.15 to 0.18 lb-ft) for conductor screws,
  0.2 to 0.3 N•m (0.15 to 0.22 lb-ft) for mounting-flange screws.

The J3 connector provides 1 × COM, 1 × NC and 1 × NO contact per user-configurable relay (RL1 to RL4) and 1 × COM, 1 × COM FUSED, 1 × NC and 1 × NO contact for the common circuit-fault relay (FAULT).

Physical

MPC4^{Mk2}

• Height	: 6U (262 mm, 10.3 in)
• Width	: 20 mm (0.8 in)
• Depth	: 187 mm (7.4 in)
• Weight	: 0.42 kg (0.93 lb) approx.

IOC4^{Mk2}

• Height	: 6U (262 mm, 10.3 in)
• Width	: 20 mm (0.8 in)
• Depth	: 125 mm (4.9 in)
• Weight	: 0.31 kg (0.68 lb) approx.

ORDERING INFORMATION

To order please specify

Type	Designation	Ordering number (PNR)
MPC4^{Mk2}	Different versions of the VM600^{Mk2} MPC4^{Mk2} processing module:	
	– Standard version The MPC4^{Mk2} ordering number PNR 601-041-Ax corresponds to the underlying module version 600-041-vvv-vvv, where "vvv" represents the hardware versions that can be used by a finished product.	601-041-Ax*
IOC4^{Mk2}	Different versions of the VM600^{Mk2} IOC4^{Mk2} input/output module:	
	– Standard version The IOC4^{Mk2} ordering number PNR 600-043 corresponds to the underlying module version 620-024-100-1Hh, where "Hh" represents the hardware versions ("H" increments are for major modifications that can affect product interchangeability, "h" increments are for minor modifications that have no effect on interchangeability).	600-043
MPC4^{Mk2} CMS license	To enable condition monitoring on a MPC4^{Mk2} module	608-002-000-001

Notes

Machinery protection and condition monitoring

The VM600^{Mk2} MPC4^{Mk2} + IOC4^{Mk2} machinery protection and condition monitoring module supports both machinery protection and condition monitoring applications as follows: machinery protection functionality is available by default, while condition monitoring functionality is optional and requires a license.
Accordingly, MPC4^{Mk2} condition monitoring can be used by either (1) ordering a version of the MPC4^{Mk2} module with condition monitoring enabled (that is, pre-licensed) as described in **Option code** below or (2) ordering a MPC4^{Mk2} CMS license for a version of the MPC4^{Mk2} module without condition monitoring enabled.

For any MPC4^{Mk2} + IOC4^{Mk2} module, the available machinery monitoring functionality is determined by the firmware running on the module (there is separate machinery protection firmware and condition monitoring firmware) and whether the module has condition monitoring enabled/licensed.

(For MPC4^{Mk2} modules, VibroSight System Manager is used to check/update the firmware(s) running on a module, check the condition monitoring license status of a module and upload a MPC4^{Mk2} CMS license, as required.)

Note: It is important to note that MPC4^{Mk2} condition monitoring also requires a VibroSight® software edition/license that supports condition monitoring. Refer to the *VibroSight® machinery monitoring system software data sheet* for further information.

For example, a VibroSight® / VM600^{Mk2} system consisting of MPC4^{Mk2} + IOC4^{Mk2} modules can initially be installed and used as a MPS only. Then, CMS functionality can be quickly and easily added at any time by upgrading the licenses for the MPC4^{Mk2} + IOC4^{Mk2} module(s) and for the VibroSight® software, as required.

***Option code**

To order a MPC4^{Mk2} module, the ordering number (PNR 601-041) with option code (Ax) is used to specify the exact type/version of module required:
-A0 specifies a MPC4^{Mk2} module without condition monitoring enabled and without a configuration.
-A1 specifies a MPC4^{Mk2} module without condition monitoring enabled and with a configuration.
-A2 specifies a MPC4^{Mk2} module with condition monitoring enabled and without a configuration.
-A3 specifies a MPC4^{Mk2} module with condition monitoring enabled and with a configuration.

For example, a complete ordering number for a MPC4^{Mk2} module that supports machinery protection only and is not configured is 601-041-A0. Similarly, a complete ordering number for a MPC4^{Mk2} module that supports both machinery protection and condition monitoring and is not configured is 601-041-A2. As these modules are not required to be configured, no additional information is required. Such unconfigured versions of the module are the standard option for replacement modules / spare parts.

For example, a complete ordering number for a MPC4^{Mk2} module that supports machinery protection only and is configured is 601-041-A1. Similarly, a complete ordering number for a MPC4^{Mk2} module that supports both machinery protection and condition monitoring and is configured is 601-041-A3.
For a module that is required to be configured (option code A1 or A3), the following additional information must be provided: IP address, Subnet mask and Default gateway (or DHCP), NTP server address (or Disabled), Slot number (VM600^{Mk2} rack slot number / module position) and details of the VibroSight Protect configuration (MPS only), as required.

(Notes continued on the following page …)

ORDERING INFORMATION *(continued)*

Notes *(continued)*

Condition monitoring licensing

To order a MPC4^{Mk2} CMS license that enables condition monitoring for a MPC4^{Mk2} module that currently supports machinery protection only, the ordering number 608-002-000-001 is used. As a MPC4^{Mk2} CMS license is tied to a module, the following additional information must be provided: Serial number (xxxxxxx) and MAC address.

(For MPC4^{Mk2} modules, VibroSight System Manager is used to access a device information file for the module that provides the required information, subsequently set (upload) the generated license, etc.)

Conformal coating

Versions of the VM600^{Mk2} MPC4^{Mk2} + IOC4^{Mk2} machinery protection and condition monitoring module are available with an optional conformal coating ("varnish") applied to the circuitry of the modules in order to provide additional environmental protection against chemicals, dust, moisture and temperature extremes. Contact Meggitt SA for further information.

RELATED PRODUCTS

ABE04x	VM600^{Mk2}/VM600 system racks	: Refer to corresponding data sheet
ABE056	VM600^{Mk2}/VM600 slimline rack	: Refer to corresponding data sheet
CPUM^{Mk2} + IOCN^{Mk2}	VM600^{Mk2} rack controller and communications interface module	: Refer to corresponding data sheet
RLC16^{Mk2}	VM600^{Mk2} relay module	: Refer to corresponding data sheet
XMx16 + XIO16T	VM600^{Mk2}/VM600 condition monitoring module	: Refer to corresponding data sheet
VibroSight	VibroSight® machinery monitoring system software	: Refer to corresponding data sheet

Meggitt (Meggitt PLC) is a leading international engineering company, headquartered in England, that designs and delivers high-performance components and subsystems for aerospace, defence and selected energy markets. Meggitt comprises four customer-aligned divisions: Airframe Systems, Engine Systems, Energy & Equipment and Services & Support.

The Energy & Equipment division includes the Energy Sensing and Controls product group that specialises in sensing and monitoring solutions for a broad range of energy infrastructure, and control valves for industrial gas turbines, primarily for the Power Generation, Oil & Gas and Services markets. Energy & Equipment is headquartered in Switzerland (Meggitt SA) and incorporates the vibro-meter® product line, which has over 65 years of sensor and systems expertise and is trusted by original equipment manufacturers (OEMs) globally.

Sales offices

Meggitt has offices in more than 30 countries. For a complete list, please visit our website.

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