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extreme environments

VibroSmart® DMS vibration monitoring module

VSV300

FEATURES

- From the Vibro-Meter® product line and compatible with the VibroSight® software
- 2 individually configurable dynamic input channels with up to 19 kHz bandwidth
- 1 auxiliary input channel, including tachometer
- Synchronous sampling of input channels
- Up to 20 configurable processed outputs per module
- Spectrum analyzer (FFT) up to 1600 lines every 1 s
- 5 configurable operating ranges (severity states) including 4 alarms per processed output, with hysteresis and time delay
- AND, OR and majority voting logic functions for the combination of alarm and status information for a module
- Targeted for use in a SIL 1 environment (certification pending)
- Redundant communications and redundant power supply inputs to improve availability
- Analog outputs: 2 local outputs configurable as either 4-20 mA or ±5 V
- Discrete outputs: 2 local SPDT relays
- Real-time Ethernet communications
- Live insertion and removal of modules (hot-swappable) with automatic reconfiguration
- Fully software configurable
- Robust terminal base suitable for DIN rail or rack mounting

VSV300
vibration monitoring module
(mounted on a VSB300 terminal base)

(Some certifications pending)

DESCRIPTION

Introduction

The VibroSmart® distributed monitoring system (DMS) is a system of modular and scalable products designed for condition monitoring and machinery protection applications for power generation turbines, oil and gas applications and auxiliary balance-of-plant equipment.

VibroSmart DMS modules can be mounted directly on machinery, eliminating the need for costly cabling, because it is designed and certified to work in extremes, such as harsh industrial environments characterized by potentially explosive atmospheres (ATEX Zone 2), high temperatures (70°C) and high mechanical stress. VibroSmart complements the VM600 series of rack-based solutions from Meggitt Sensing Systems' Vibro-Meter® product line and is compatible with the same VibroSight® software.

The VibroSmart VSV300 vibration monitoring module has two independent dynamic vibration channels and one auxiliary channel, that can be configured as either a tachometer or a DC input channel. This measurement module is capable of stand-alone vibration monitoring or can be integrated with other VibroSmart DMS modules to create more comprehensive measurement blocks.

VibroSmart DMS

A Meggitt Sensing Systems VibroSmart DMS is a network of small and economical modules (providing measurement, communications or other functions) that are connected together in measurement blocks in order to provide the functionality normally offered by rack-based machinery monitoring systems.
A VibroSmart DMS consists of one or more measurement blocks, each containing up to 16 VibroSmart modules, a power supply and an optional host computer running the VibroSight software.

A measurement block is a logical grouping of VibroSmart modules that allows data such as tachometer, trigger and alarm information to be shared, for example, in order to monitor the same machine. Measurement blocks are configured using the VibroSight software.

Note: A VibroSmart DMS is limited to a maximum of 8 measurement blocks without VibroSmart VSN010 real-time Ethernet switches but if each measurement block contains a VSN010, then a higher number of measurement blocks can be achieved, limited only by overall system performance (network traffic, VibroSight computer configuration and so on).

A VibroSmart DMS module consists of an electronics module (providing configurable machinery monitoring functions) that clips into a VibroSmart terminal base, which mounts on a DIN rail. A range of plug-in signal conditioners and plug-in communications interfaces that interface directly with VibroSmart modules will be available to provide an integrated solution for interfacing to sensors and fieldbuses.

VibroSmart terminal bases incorporate buses and connectors to provide all of the I/O connections required to interface to a VibroSmart module. Terminal bases also include non-volatile memory to store the configuration of the attached VibroSmart module, which allows modules to be hot-swapped. Modules and terminal bases use mechanical key-coding for a system that is simple to operate and use.

Different VibroSmart modules, terminal bases, plug-in signal conditioners and plug-in communications interfaces can be combined to offer unique combinations of functionality, versatility and safety assurance. In this way, a monitoring system can be built to meet the exact needs of an application resulting in a more cost-effective and reliable solution.

VSV300 vibration monitoring module

The VSV300 vibration monitoring module performs the data acquisition and all of the signal processing (filtering, analog-to-digital conversion, time and frequency domain processing, and resampling) required to produce processed outputs and extracted data for physical output and data presentation in VibroSight and VibroSight Scope. This includes spectral band extractions, advanced FFT analysis, trending and limit checks (alarm and sensor OK), and run-up / run-down acquisition. For applications requiring less advanced signal processing, refer to the VSV310 vibration monitoring module.

In addition, the VSV300 module has 4 basic and 2 advanced logic functions that can be used to combine local alarm and status information in order to drive one of the VSV300 relays. This local information and the logic function outputs can also be used as inputs to the basic logic functions of a VSI010 communications interface module in the same measurement block.

Like all VibroSmart DMS modules, the VSV300 is fully software configurable using the VibroSight software. Using VibroSight Configurator, a module can be programmed to capture data continuously at scheduled intervals or on the detection of an alarm

DESCRIPTION *(continued)*

condition. In addition, spectral resolution, frequency bandwidth, windowing function and averaging are all fully configurable. Using VibroSight Vision, a catalogue of static and dynamic plots (including bar charts, trend plots, waveforms, spectra and orbit plots) is available to optimise the visualisation and analysis of measurement data from a VSV300.

Communications

All VibroSmart DMS modules and devices communicate using a system bus (SBUS), based on Ethernet technology, that supports data transfer rates of 100 Mbps at distances up to 100 m. The SBUS ensures the transfer of both non-real-time (standard) and real-time (time critical) information between VibroSmart modules, and supports communication with the host computer running the VibroSight software. The SBUS also communicates with the network time server that is required when a VibroSmart DMS uses the VibroSight software for data logging.

VibroSmart modules can either be located side-by-side (adjacent to each other) or separate from one another. This flexibility allows the logic functionality of the DMS to be physically distributed, for example, depending on the size of and access to the machine being monitored.

VibroSmart modules that are located side-by-side can communicate directly (no Ethernet cabling required) using the sidebus connectors on the terminal base that support both SBUS and redundant power supply distribution. VibroSmart modules that are mounted separate from one another can communicate over standard and redundant Ethernet networks of shielded Cat 5 cable using the Ethernet connectors on the terminal base. However, using these Ethernet connectors does require that the power supply is distributed separately.

Discrete signal interface (DSI) inputs and tachometer signals can be connected directly to individual modules (locally). Alternatively, to eliminate external wiring, these signals can be connected to a single VibroSmart module and shared among modules in the same measurement block using the SBUS.

Safety

The VibroSmart DMS is designed to meet the requirements of the IEC 61508 standard on functional safety and is targeted for use in a SIL 1 environment.

Software

The VibroSight software platform, from Meggitt Sensing Systems, supports the configuration of the VibroSmart modules and the subsequent presentation, storage and further processing of live data and historical data for analysis.

VibroSight Scope is a reduced functionality software client with a simplified user interface that allows the presentation of the extracted data and status information being streamed live from VibroSmart modules.

Applications information

The VSV300 vibration monitoring module is ideal for monitoring, protecting, analysing and diagnosing critical assets such as gas turbines, steam turbines and other rotating machines. It can be used as a stand-alone module or as part of a more comprehensive monitoring system using the VibroSight software.

The VSV300 uses the same terminal base as the less powerful VSV310 module, which allows a VSV310 to be replaced by a VSV300 in a VibroSmart DMS (or vice versa). This quick upgrade requires only configuration changes in VibroSight in order to take advantage of the more powerful features available in the VSV300.

For specific applications, contact your nearest Meggitt Sensing Systems representative.

SPECIFICATIONS

Supported sensors

Currently available	: Compatible with a range of sensors and signal conditioners using 2-wire current transmission and 3-wire voltage transmission
Under development	: VibroSmart plug-in signal conditioners that interface directly with VibroSmart modules will be available to provide a range of signal conditioning options, including: the VSC100 charge amplifier, the VSC110 driver for proximity probes and the VSZ100 zener barrier

SPECIFICATIONS *(continued)*

Dynamic input channels

Number of independent channels	: 2
Voltage ranges	: −20 to 0 V_{DC}, 0 to +20 V_{DC}, ±10 V_{AC} (maximum of 20 $V_{PEAK-TO-PEAK}$)
Current ranges	: 0 to +25 mA DC, ±8 mA AC
Input impedance	
• *Voltage*	: ≥100 kΩ, between the differential (high and low) inputs
• *Current*	: 202 Ω ±3 Ω, between the differential (high and low) inputs
Accuracy	
• *Amplitude*	: ≤1% of input FSD (measurement bandwidth from 10 Hz to 1 kHz)
• *Phase*	: ≤1° (measurement bandwidth from 10 Hz to 1 kHz)
Measurement range	
• *Voltage (AC+DC)*	: ±3 V_{PEAK} or ±30 V_{PEAK}
• *Current*	: 15 mA or 150 mA
Frequency bandwidth (−0.1 dB)	: 0.1 Hz to 19 kHz
• *Analog high-pass filter*	: An optional (software configurable) analog high-pass filter can be added to the AC path to increase the high-pass cut-off frequency (−3 dB) to 0.1, 1.0 or 3.0 Hz. This filter can also be disabled to allow DC-coupling of the input.
Signal to noise ration (SNR)	: ≥80 dB (measurement bandwidth from 10 Hz to 2 kHz)
Common-mode voltage (CMV) range	: ±5 V
Common-mode rejection ratio (CMRR)	: >60 dB (at 50/60 Hz)
Crosstalk attenuation	: Typically 60 dB

Auxiliary input channel – used as a tachometer input

Triggering method	: Crossing of thresholds on rising or falling edge of signal (software configurable)
Triggering thresholds	
• Rising edge	: ⅔ of peak-peak value
• Falling edge	: ⅓ of peak-peak value
Voltage range	: 0.8 to 250 $V_{PEAK-TO-PEAK}$. **≤80 $V_{PEAK-TO-PEAK}$ if used in an ATEX Zone 2**.
Tacho range (on input)	: 0.017 Hz to 427 kHz
Speed / frequency measurement range (after division by “number of teeth”)	: 1 to 100000 RPM / 0.017 Hz to 1.667 kHz
Minimum input voltage for reliable detection	
• *Square-wave input signal*	: 0.8 $V_{PEAK-TO-PEAK}$ (0.017 Hz to 10 kHz) 2.0 $V_{PEAK-TO-PEAK}$ (10 kHz to 427 kHz)
• *Sinusoidal input signal*	: 20.0 $V_{PEAK-TO-PEAK}$ (0.017 Hz to 0.1 Hz) 10.0 $V_{PEAK-TO-PEAK}$ (0.1 Hz to 1.0 Hz) 2.0 $V_{PEAK-TO-PEAK}$ (1.0 Hz to 20.0 Hz) 0.8 $V_{PEAK-TO-PEAK}$ (20.0 Hz to 10.0 kHz) 2.0 $V_{PEAK-TO-PEAK}$ (10.0 kHz to 426.4 kHz)

Auxiliary input channel – used as a DC input

Measurement range	
• *Voltage (DC)*	: 0 to +20 V
• *Current*	: 0 to +100 mA
Frequency bandwidth (−3 dB)	: DC to 10 Hz
Signal to noise ration (SNR)	: ≥72 dB

SPECIFICATIONS *(continued)*

Sensor OK check

Range	: −20 to +20 VDC
Operating principle	
• *Powered sensors*	: DC voltage monitoring (open-circuit and short-circuit line check)
• *Unpowered sensors*	: Open-circuit line check only

Digital signal processing

A/D converter	: 24 bit
Dynamic range	: ≥80 dB (from 10 Hz to 2 kHz)
Frequency bandwidth	: 0 Hz to 19 kHz
Accuracy	
• *Amplitude*	: ≤1% of input FSD
• *Phase*	: ≤1.5° (measurement bandwidth from 10 Hz to 1 kHz)
Digital filtering	
• *High-pass filter cut-off frequency*	: 0.25 Hz to 10 kHz (main path)
• *High-pass filter roll-off*	: −20 to −60 dB per octave
• *Low-pass filter cut-off frequency*	: 1 Hz to 19 kHz (main path)
• *Low-pass filter roll-off*	: −20 to −60 dB per octave
Number of waveform data points	: 256 to 4096 points (at 1 s update rate)
Number of FFT lines (resolution)	: 100 to 1600 lines (at 1 s update rate)
FFT window	: Rectangular, Hamming, Hanning, Flat Top, Kaiser Alpha 1, Kaiser Alpha 5, Kaiser Alpha 10, Kaiser Alpha 20, Kaiser Alpha 25
Extracted data	: Up to 20 processed outputs per module, depending on the processing block: band extraction (band RMS, band peak, nX harmonics, NOT 1X, sub-harmonics), true peak-to-peak, triggered peak-to-peak, RMS, average and more.
Update rate	: 1 s max. with VibroSight
Integration	: Dual integration over 0.25 Hz to 19 kHz bandwidth
Slow-roll compensation (under development)	: First 4 harmonics
Order tracking	: Highly-accurate digital resampling

Single-channel processing blocks

Only one processing block can be assigned to an input channel at any one time.
The number of processed outputs (data extractions) available depends on the processing block.

Asynchronous absolute bearing vibration (AAB)

• *Main path with band-pass filter*	: Up to 3 outputs: one after the band-pass filter, one after the first integrator and one after the second integrator. Note: ISO 2954 compatible values can automatically be configured for the band-pass filter, if required.
• *Secondary path with low-pass filter*	: Spectrum (configurable averaging and integration) and up to 5 outputs. Waveform and up to 3 outputs.

Relative shaft vibration (RS)

• *Main path with separate AC and DC paths*	: AC path with band-pass filter and up to 4 outputs. DC path with 1 output corresponding to the actual position of the shaft or target.
• *Secondary path*	: Spectrum (configurable averaging) and up to 8 outputs. Waveform.

SPECIFICATIONS *(continued)*

Narrow-band tracking (NB)

- *With averaging and narrow band-pass filter* : Spectrum (configurable averaging and integration) and up to 11 outputs. Waveform.
  Note: Narrow-band tracking (NB) requires a tachometer input in order to track rotational speed.

Tacho processing

- *With configurable "number of teeth" and "tacho ratio"* : 1 output corresponding to the rotation speed of the shaft or target.
  Note: The tachometer input can be either the tachometer input of the module (local) or the tachometer input of a module in the same measurement block as the module (remote).

Position processing (PS)

- *DC path with offset (initial gap)* : DC path with 1 output corresponding to the actual position of the shaft or target.
  Notes: Position processing (PS) and relative shaft vibration processing (RS) use the same signal processing functions to generate a position output (DC). Position processing (PS) can be used with an auxiliary input channel configured as a DC input channel and with the dynamic Input channels.

Broad-band pulsation (BBP)

- *Main path with band-pass filter and notch filter* : Up to 2 outputs.
  Note: The notch filter can be configured as either 50 or 60 Hz to eliminate mains (power-line) frequency interference.
- *Secondary path with low-pass filter* : Spectrum (configurable band rejection and averaging) and up to 5 outputs.
  Waveform and up to 3 outputs.

Eccentricity processing (EC) – under development

- With low-pass filter : Up to 2 outputs: continuous eccentricity (true peak-to-peak) and triggered eccentricity (peak-to-peak/rev) when a tachometer input is available.
  Note: the triggered eccentricity output requires that a tachometer input (1/rev) is available.

Quasi-static DC processing – under development

- *DC path with offset (initial value)* : DC path with 1 output corresponding to the measured physical quantity, such as a slowly varying process parameter.

Dual-channel processing blocks

S_{max}

- *Requires two relative shaft vibration (RS) processing blocks as inputs* : 1 output corresponding to $S_{max}(t) = \sqrt{}(X(t)^2 + Y(t)^2)$ (vibration peak-to-peak displacement).
  Note: ISO 7919-1 method C is used to calculate S_{max}.

X-Ymax discriminator

- *Requires two relative shaft vibration (RS) processing blocks as inputs* : 1 output (true peak) corresponding to the higher of the two input signals.
  Note: ISO 7919-1 method B is used to calculate X-Ymax discriminator.

Absolute shaft vibration (AS) – under development

- *Requires one asynchronous absolute bearing vibration (AAB) processing block and one relative shaft vibration (RS) processing block as inputs* : 1 output corresponding to either:
  AS = AAB + RS with sensors at the same location, or
  AS = AAB − RS with sensors diametrically opposed.
  Spectrum and up to 5 outputs.
  Waveform (configurable averaging).

SPECIFICATIONS *(continued)*

Alarm processing

Alarms	:	Four configurable alarm ranges (Danger+, Alert+, Alert−, Danger−) with configurable hysteresis and time delay
Adaptive monitoring	:	Trip multiplier uses the DSI TM control input to multiply the configured alarm limits by a configurable factor. Adaptive monitoring uses a control parameter (such as speed or position) to multiply the configured alarm limits by coefficients configured for different ranges of the control parameter.

Alarm combination

Logic functions	:	AND, OR and majority voting logic, with optional inversion of individual inputs
Configurable functions	:	Inversion of individual inputs
Basic logic functions		
• *Number*	:	4
• *Configurable inputs*	:	From the sensor OK checks, and the measurement alarms (Danger+, Alert+, Alert−, Danger−) and associated data quality indicators (status bits) of the module
Advanced logic functions		
• *Number*	:	2
• *Configurable inputs*	:	From the basic logic function outputs of the module

Discrete signal interface (DSI) inputs

Control signal		
• *Alarm bypass (AB)*	:	A closed contact between the DSI_AB and DSI_RET inputs inhibits the local relay outputs
• *Alarm reset (AR)*	:	A closed contact between the DSI_AR and DSI_RET inputs resets the alarms latched by the module
• *Trip multiply (TM)*	:	A closed contact between the DSI_TM and DSI_RET inputs multiplies the alarm levels by a scale factor (software configurable), to enable trip multiplier-based adaptive monitoring
• *Spare*	:	Reserved for future use
Operating principle	:	Detection of an open circuit or a closed circuit on the input. These control signals can be connected directly to individual modules (locally) or connected to a single module (the DSI Master) and shared among modules in the same measurement block using the SBUS (remotely).

Buffered outputs – dynamic channel

Type	:	Buffered raw analog output
Number	:	2, available on J2 of the terminal base (see Connectors on page 11)
Frequency bandwidth	:	0 Hz to 19 kHz
Accuracy		
• *Amplitude*	:	≤1% (measurement bandwidth from 0 Hz to 19 kHz)
• *Phase*	:	≤1° (measurement bandwidth from 10 Hz to 10 kHz). ≤2° (measurement bandwidth from 10 kHz to 19 kHz).
Transfer ratios		
• *Voltage*	:	1 V/0.1 V (10:1 with no phase inversion)
• *Current*	:	0.5 V/mA (with no phase inversion)

SPECIFICATIONS *(continued)*

Admissible load on output
- *Resistance* : ≥50 kΩ
- *Capacitance* : Able to drive up to 5 m of cable with a typical capacitance of 100 pF

Note: Where required, a VSA301 buffered output amplifier can be used to amplify the buffered raw analog outputs, provide front-panel BNC connectors and allow the transmission of the signal over distances up to 500 m.

Buffered output – auxiliary channel

Type : Processed tachometer output.
When the auxiliary channel is configured as a tachometer input, the buffered output for the auxiliary channel is a processed tachometer output and when it is configured as DC input, there is no buffered output. The processed tachometer output is generated only when the tachometer is connected directly (locally) to the module.

Number : 1, available on J2 of the terminal base (see Connectors on page 11)

Voltage : 0 to 5 V TTL-compatible signal (with no phase inversion)

Admissible load on output
- *Resistance* : ≥50 kΩ
- *Capacitance* : Able to drive up to 5 m of cable with a typical capacitance of 100 pF

Note: Where required, a VSA301 buffered output amplifier can be used to allow the transmission of the processed tachometer output over distances up to 500 m.

Analog outputs

Number of local outputs : 2 single-ended

Configurable as either
- *4-20 mA (DC)* : Used to output a static signal (extracted data)
- *±5 V_{PEAK} (AC)* : Used to output processed versions of a single dynamic channel signal or an arithmetic combination of both dynamic channel signals (simple addition or subtraction)

Admissible load on output (DC) : ≤360 Ω

Admissible load on output (AC) : ≥50 kΩ

Frequency bandwidth (AC) : 0 Hz to 10 kHz

Amplitude accuracy (AC) : 1% typ. (measurement bandwidth from 10 Hz to 2 kHz)

Number of additional (remote) 4-20 mA outputs : Up to 6, using VSR0x0 relay modules (under development)

Discrete outputs

Local relays
- *Number* : 2
- *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 the logic function outputs of the module

Number of additional (remote) relays : Up to 12, using VSR0x0 relay modules (under development)

SPECIFICATIONS *(continued)*

Relay characteristics

Manufacturer	: Panasonic
Type and contact arrangement	: Single-pole double-throw (SPDT), with all contacts available on J3 of the terminal base (see Connectors on page 11)
Nominal switching capacity (resistive load)	: 0.5 A 125 V AC / 2 A 30 V DC
Maximum switching power (resistive load)	: 60 W (62.5 VA)
Maximum switching voltage	: 125 V_{AC} / 220 V_{DC}. **≤80 V_{DC} if used in an ATEX Zone 2**.
Maximum switching current	: 1 A_{AC} / 2 A_{DC}
Operate / release time	: 4 ms (max.) / 4 ms (max.)
Breakdown voltages	
• *Between open contacts*	: 250 V_{AC} (353 V_{PEAK})
• *Between contact and coil*	: 250 V_{AC} (353 V_{PEAK})
Mechanical / electrical life	: 10^8 operations (min.) / 10^5 operations (min.)

Environmental

Operating	
• *Temperature*	: −25 to +70 °C (−13 to +158 °F)
• *Humidity*	: 0 to 90% non-condensing
Storage	
• *Temperature*	: −40 to +85 °C (−40 to +185 °F)
• *Humidity*	: 0 to 95% non-condensing
Protection rating	: IP22 according to IEC 60529. It is also possible to deploy VibroSmart DMS modules and devices within an industrial housing in order to attain a rating of IP56. Contact Meggitt Sensing Systems for more information.

Explosive atmospheres

Available in Ex approved versions for use in hazardous locations

Type of protection Ex nA: non sparking apparatus		
Europe	EC type examination certificate	**Pending** LCIE 13 ATEX 1041 X II 3 G Ex nA IIC T6 to T4 Gc
International	IECEx certificate of conformity	**Pending** IECEx LCIE 13.0058X Ex nA IIC T6 to T4 Gc
North America	cCSAus certificate of compliance	**Pending** ... Class I, Division 2, Groups A, B, C, D Ex nA T6

⚠ **For specific parameters of the mode of protection concerned and special conditions for safe use, please refer to the appropriate “EC type examination certificate”. These certificates are available from Meggitt SA on demand.**

SPECIFICATIONS *(continued)*

Approvals

Conformity	: CE marking
Electrical safety	: EN 61131 part 2
Electromagnetic compatibility	: EN 61000 part 6-2 EN 61000 part 6-4 EN 61326 part 3-1

Approvals (pending)

Hazardous area	: Ex (see Explosive atmospheres on page 9)
Safety integrity level (according to IEC 61508)	: SIL 1
Other	: DNV (maritime), GOST and TÜV Rheinland

SBUS communications

Type	: Real-time Ethernet
Network interface	: 100BASE-TX
Data transfer rate	: Up to 100 Mbps
Distance between devices	: Up to 100 m at 100 Mbps (100BASE-T compliant)
Network topologies	: Linear and ring (daisy-chained)
Number of modules per VibroSmart DMS	: Up to 128 (without VibroSmart VSN010 real-time Ethernet switches)
Signals shared across a measurement block	
• *Real-time*	: Tachometric time-stamp, trigger and alarm messages
• *Non-real-time*	: Remote DSI inputs. Measurement data (processed outputs and extracted data).

Note: SBUS is the system bus, based on real-time Ethernet, used by a VibroSmart DMS for all communications.
The SBUS supports inter-module communication between VibroSmart modules such as the transfer of non-real-time information and real-time information such as tachometric time-stamps, triggers and alarms.
The SBUS supports extra-module communications such as the exchange of commands, configuration information and measurement data between VibroSmart modules and a host computer running the VibroSight software, and communication between VibroSmart modules and a network time server.

Configuration

VibroSmart modules	: Fully software configurable over Ethernet, using a host computer running the VibroSight software
Terminal bases	: A DIP switch on the terminal base selects either the sidebus connector (J1x) or the Ethernet connector (Ethx) as the active SBUS port for each side of the terminal base. Only two physical ports can be active at any one time, that is, either J11 or Eth1 (right side) and either J10 or Eth2 (left side).

Time synchronisation

Local synchronisation between VibroSmart devices (inter-module)

• *Protocol*	: Precision time protocol (PTP)
• *Accuracy*	: <1 µs between VibroSmart modules in the same measurement block
• *Required*	: Yes (mandatory). For each measurement block, one module automatically acts as the PTP master for the other (slave) modules in the measurement block.

SPECIFICATIONS *(continued)*

Global synchronisation between VibroSmart and other systems (extra-module)

- *Protocol* : Network time protocol (NTP)
- *Accuracy* : <10 ms between VibroSmart modules and an NTP server
- *Required* : No (optional).
  For a system, an NTP server can be manually configured as a common time reference in order to synchronise VibroSmart devices and a host computer and/or third-party systems, such as a DCS or PLC.

Power supply (input)

Voltage	: +24 V_{DC} nominal (+16 to +32 V_{DC} input range)
Power consumption	: <6.5 W Note: This power consumption figure does not include the Power supplies to sensors (outputs).
Redundancy	: Two separate inputs for connection to different external power supplies

Power supplies to sensors (outputs)

Number of independent sensor power supplies	: 3
Constant voltage	: +24V_{DC} ±3% (+25mA max.) −24V_{DC} ±3% (−25mA max.)
Constant current	: +6 mA ±1%

Note: These power supplies are not included in the Power supply (input)'s power consumption figure.
If enabled, the consumption of this Power supplies to sensors (outputs) should be calculated separately and added to the Power supply (input) to obtain the module's total power consumption.

LED indicators

Status	: Diag – indicates the status of the module, such as normal operation, configuration status or internal hardware or firmware failures. Network – indicates Ethernet link activity and network time server synchronisation. Safety – indicates the status of the module's safety function and any active adaptive monitoring functions (AB or TM).
CH 1, CH 2 and AUX	: OK – indicates the status (sensor OK check) of the input signal for each channel. Alarm – indicates the status of each channel, such as normal operation or an alarm (Danger+, Alert+, Alert−, Danger−).

Connectors

J1, bottom rear	: 10-contact terminal strip connector. Redundant power supply inputs and local DSI inputs.
J2, bottom centre	: 10-contact terminal strip connector. Buffered version of raw input signals and analogue outputs configured for a processed output or extracted data.
J3, bottom front	: 10-contact terminal strip connector. Local relay contacts (COM, NC and NO).
J4, top front	: 10-contact terminal strip connector. Auxiliary input channel. Note: A VibroSmart plug-in signal conditioner or other external signal conditioner may be required.

SPECIFICATIONS *(continued)*

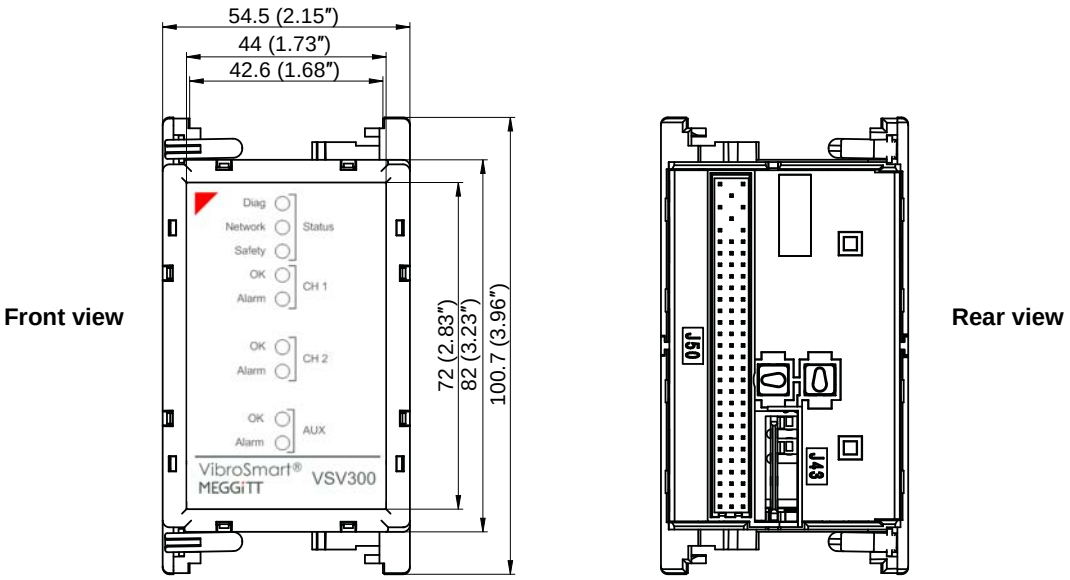
J5, top centre	:	10-contact terminal strip connector. Dynamic input channel 2. Note: A VibroSmart plug-in signal conditioner or other external signal conditioner may be required.
J6, top rear	:	10-contact terminal strip connector. Dynamic input channel 1. Note: A VibroSmart plug-in signal conditioner or other external signal conditioner may be required.
J10, right side J11, left side	:	Proprietary connectors. Sidebus connectors for SBUS communications (extra-module and inter-module) and the distribution of power to modules (redundant physical paths).
Eth1, bottom right Eth2, bottom left	:	8P8C (RJ45) connectors, female. Ethernet connectors for SBUS communications (extra-module and inter-module).

Physical

Module mounting	:	The VSV300 module clips into the VSB300 terminal base, which mounts on a TH 35-7.5 DIN rail.
Connection to other modules	:	Sidebus connectors J10 and J11 allow direct connections between modules that are located side-by-side. Ethernet connectors Eth1 and Eth2 allow connections between modules mounted further apart, using shielded Cat 5 Ethernet cable.
Connection to a host computer	:	Ethernet connectors Eth1 and Eth2 allow connections to a host computer or network, using shielded Cat 5 Ethernet cable.
Connection to a sensor (front-end)	:	Connector J4 is dedicated to the auxiliary input channel, while connectors J5 and J6 are dedicated to the dynamic input channels.
Connection to a power supply	:	VibroSmart modules that are located side-by-side can distribute the power supply via the sidebus connectors J10 and J11 when at least one module is connected to the external +24 V_{DC} supply. VibroSmart modules that are mounted separate from one another require that each module is connected to the external +24 V_{DC} supply via its J1 connector.
Dimensions		
• *VSV300 module*	:	See Mechanical drawings
• *VSB300 terminal base*	:	See Mechanical drawings
Weight		
• *VSV300 module*	:	300 g (0.66 lb) approx.
• *VSB300 terminal base*	:	550 g (1.21 lb) approx.

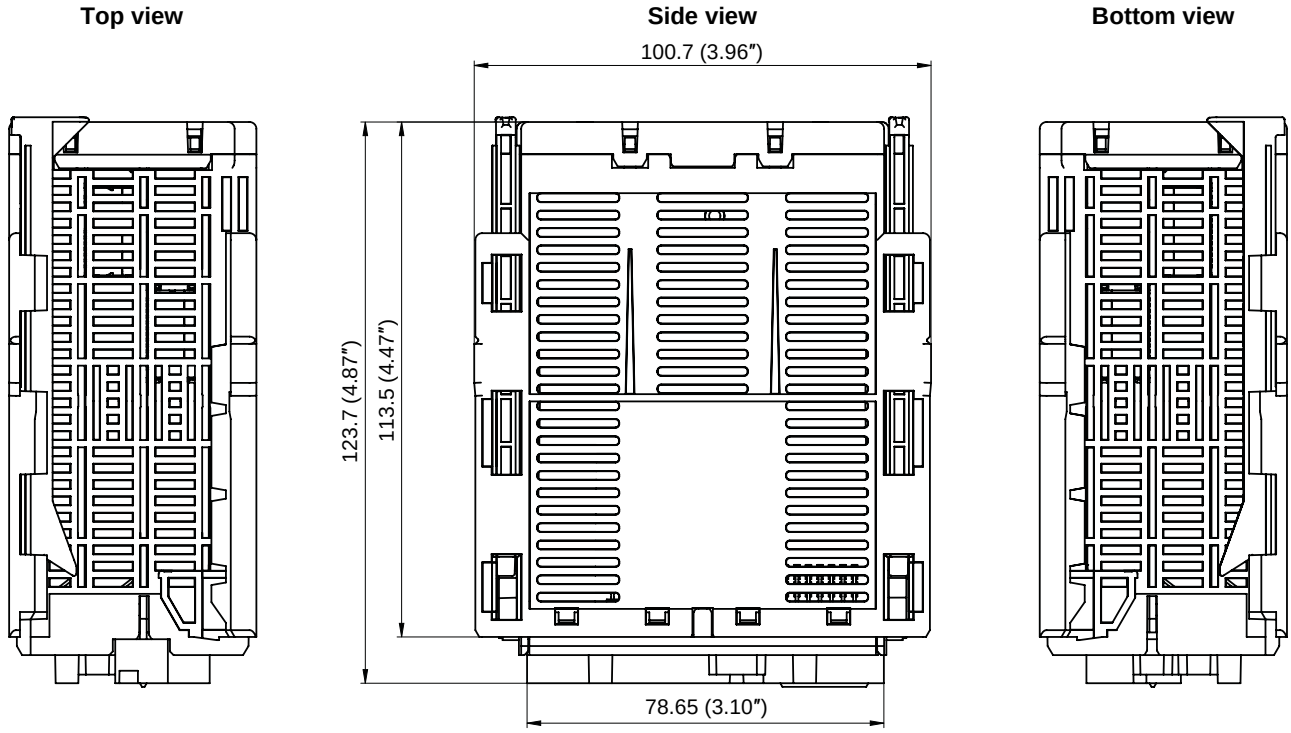
MECHANICAL DRAWINGS

VSV300 module – front view



Note: All dimensions are in mm (in) unless otherwise stated.

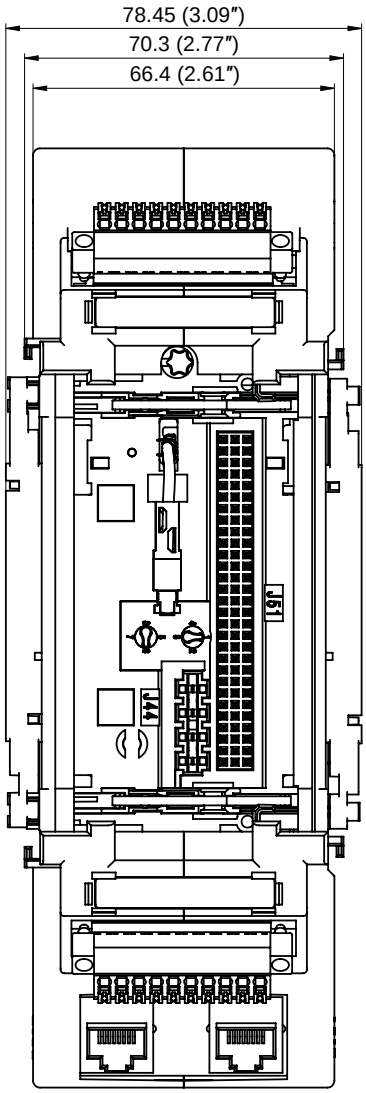
VSV300 module – other views



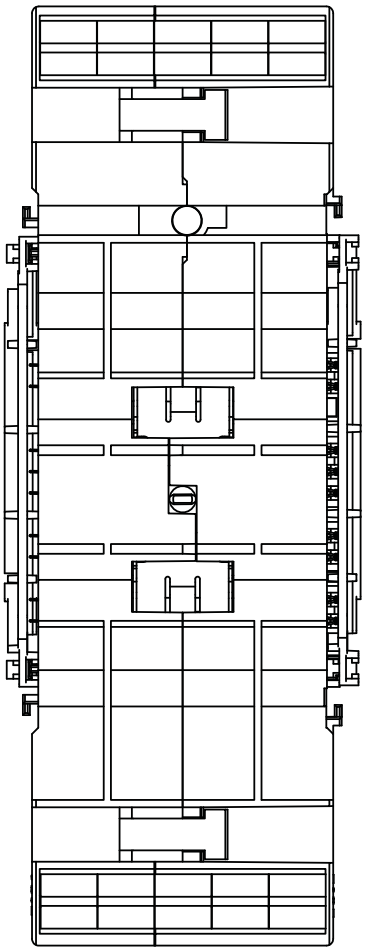
Note: All dimensions are in mm (in) unless otherwise stated.

MECHANICAL DRAWINGS *(continued)*

VSB300 terminal base – front and rear views



Front view

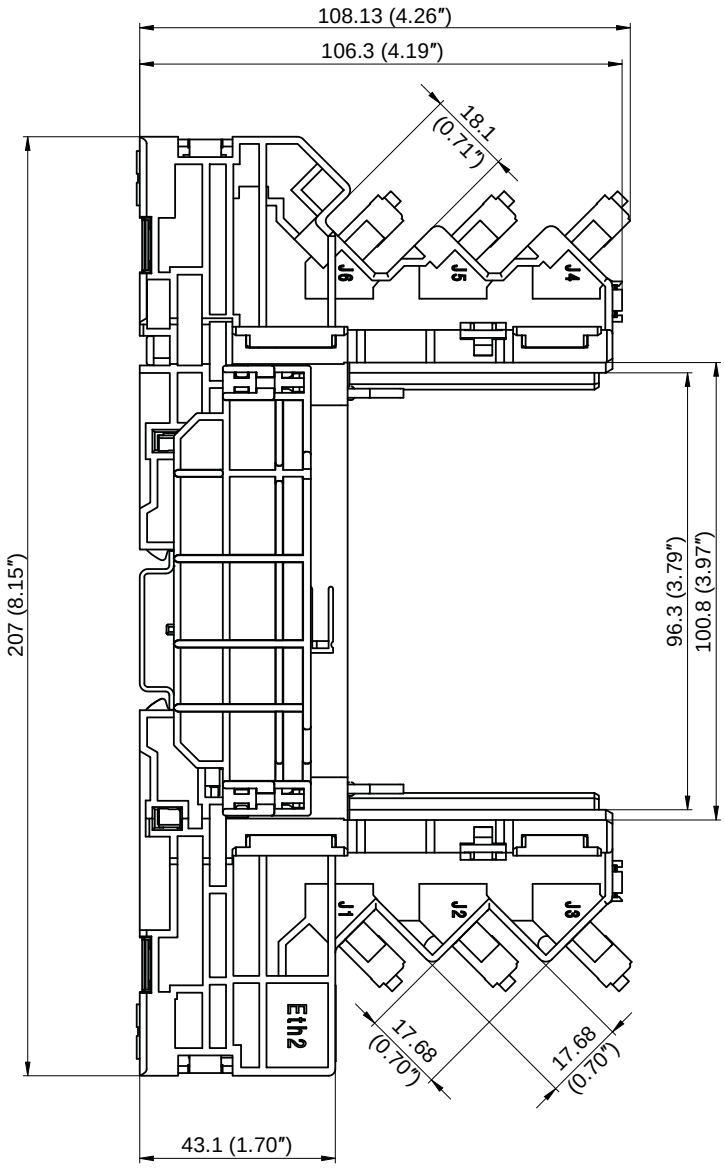


Rear view

Note: All dimensions are in mm (in) unless otherwise stated.

MECHANICAL DRAWINGS *(continued)*

VSB300 terminal base – side view



Note: All dimensions are in mm (in) unless otherwise stated.

ORDERING INFORMATION

To order please specify

Type	Designation	Ordering number
VSV300	VibroSmart vibration monitoring module	600-008
VSB300	Terminal base for VSV3x0 modules	600-009

Notes:
The VSB300 terminal base is supplied with a set of 6x terminal base connectors that are labelled and mechanically key-coded for the VSV3x0 module / VSB300 terminal base. Sets of additional connectors can be ordered as VSK002.

ACCESSORIES

A number of accessories including connectors, plug-in signal conditioners (under development), DIN rails, cables and screws will be available to order.

Type	Designation	Ordering number
VSA001	T30 Torx driver with a length of 150 mm (suitable for the DIN rail adaptor screw in terminal bases)	975.51.54.0030
VSA002	Cable assembly for use with the buffered outputs (J2) of a VSV3x0 module / VSB300, terminated with male BNC connectors for use as flying leads	934-129-000-011
VSA003	Cable assembly for use with the buffered outputs (J2) of a VSV3x0 module / VSB300, terminated with female BNC connectors for use with a patch panel	934-128-000-011
VSK002	Set of 6x terminal base connectors (labelled and mechanically key-coded for VSV3x0 module / VSB300 terminal base)	622-007-200-001

Notes:
The VSA002 is a 2 m cable assembly with a terminal base connector at one end for connection to the VSB300 terminal base (J2) and three male BNC connectors at the other end (one per output signal) for direct connections to test equipment.
The VSA003 is a 2 m cable assembly with a terminal base connector at one end for connection to the VSB300 terminal base (J2) and three female BNC connectors at the other end (one per output signal) for connections to BNC patch panels.

RELATED PRODUCTS

APF 19x	AC-DC converters	: Refer to corresponding data sheets
APF 20x	AC-DC converters with Ex approval	: Refer to corresponding data sheets
VSA301	Buffered output amplifier	: Refer to corresponding data sheet
VSI010	Communications interface module	: Refer to corresponding data sheet
VSN010	Real-time Ethernet switch	: Refer to corresponding data sheet
VSV310	Vibration monitoring module	: Refer to corresponding data sheet

Headquartered in the UK, Meggitt PLC is a global engineering group specializing in extreme environment components and smart sub-systems for aerospace, defence and energy markets.

Meggitt Sensing Systems is the operating division of Meggitt specializing in sensing and monitoring systems, which has operated through its antecedents since 1927 under the names of ECET, Endevco, Ferroperm Piezoceramics, Lodge Ignition, Sensorex, Vibro-Meter and Wilcoxon Research. Today, these operations are integrated under one strategic business unit called Meggitt Sensing Systems, headquartered in Switzerland and providing complete systems, using these renowned brands, from a single supply base.

The Meggitt Sensing Systems facility in Fribourg, Switzerland was formerly known as Vibro-Meter SA, but is now Meggitt SA. This site produces a wide range of vibration and dynamic pressure sensors capable of operation in extreme environments, leading-edge microwave sensors, electronics monitoring systems and innovative software for aerospace and land-based turbo-machinery.

In this publication, a dot (.) is used as the decimal separator and thousands are separated by thin spaces. Example: 12345.67890.

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