ZPU™-5000 ZOOM® PROCESSING UNIT

Multi-Channel Processing Instrumentation & Monitoring/Protection Unit

APPLICATION

Complete on-line monitoring, real time analysis, protection, alarm management and trending of large rotating machines such as:

- Turbogenerators
- Hydrogenerators
- Large electric motors

DESCRIPTION

The ZOOM Processing Unit (ZPU-5000) simultaneously monitors multiple parameters on large rotating machines. It performs various types of measurements in automatic and test modes, processes data, checks alarm conditions and transmits data to the ZOOM Controller for a quick and efficient data interpretation of machine condition through the ZOOM software.

The ZPU-5000 can synchronize acquisition of all parameters with the passing of each rotor pole of a salient pole machine. It tracks up to 16 high speed inputs (a mix of displacement, vibration, etc.) from standstill to over-speed conditions of the machine under study. Interconnecting additional ZPUs extends monitoring range and capabilities.

MAIN FEATURES

- Up to 16 high speed inputs
  - Accepts: 4-20mA, +/- 5V, +/-10V, -2/-18V and ICP® transmission mode
  - Sampling rate: 10k samples/sec (per channel)
- Up to 64 analog outputs
  - 32 processed raw outputs (two per analog input), voltage and current
  - 32 trending outputs (two per analog input), voltage and current
- Continuous and independent alarm monitoring of all inputs with four configurable alarm thresholds per input (drivers for external relays included). In addition:
  - System OK (driver for external relay)
  - Channels OK (driver for external relay)
- Performs synchronized measurements of connected parameters from standstill to runaway speed in automatic and test modes (Signature, Pole, Sampling, Trending and Alarm measurements)
- Vacuum Fluorescent Display (VFD) for visual interpretation
- 3U Height 19 inches rack-mount enclosure
- A 1Gbps Ethernet port, one RS-485/422 serial port, and two USB ports

GENERAL SPECIFICATIONS

The design of the ZPU-5000 acquisition unit relies on a highly integrated processor board combined with plug-in modules. For optimal flexibility and performance, the main acquisition functions of the ZPU-5000 are thus taken in charge by dedicated modules:

- Control (one module per acquisition unit)
- Communication (one module per acquisition unit)
- Analog inputs/outputs (up to 8 dual-channel modules per acquisition unit)

Control Module

This plug-in module supervises control and synchronization signals for ZPU-5000. Related inputs and outputs include:

Inputs

- Two inputs for synchronization 1/rev. signal for bi-directional units
- Rotation direction signal (bi-directional units)
- Acquisition trigger signal (used for trigger acquisition with an external signal)
- Alarm inhibition (used for turning off surveillance and relay activation)

Outputs

- One output for processed synchronization 1/rev. Signal
- One output driving the “System OK” relay
- One output driving the “Channels OK” relay

Communication Module

This module enables communications with various instruments:

- One 1Gbps Ethernet port for communication with ZOOM Controller
- One RS-422/RS-485 serial port for communication with digital measuring chains TWS™, or communication with SCADA using Modbus RTU
- One USB port for connection of a portable storage device to copy configuration or log files

Analog I/O Modules

Analog I/O modules receive and process signals from various sensors and conditioners. Each dual-channel module can receive either current, voltage, or ICP signals from different sources, to which a digital processing is applied.

Each channel also supports 4 analog outputs and 4 open-collector output drivers to control external alarm relays. Each channel is individually programmable, with limitations according to module type:

Real time processing - Processed raw output

- Simple integration (for accelerometers and velocimeters)
- Double integration (for accelerometers)
- No processing (all type of sensors)

Trending output

- No processing
- Air Gap Value
- Peak to peak, Peak, or RMS value
- Minimum, maximum and average values
- Vectorial value (S) from raw values (X-Y)*
- Maximum vectorial value (Smax) from raw values (X-Y)*
- Angle value (Ø) of Smax*

** Calculated from two channels of the same module*

ELECTRICAL SPECIFICATIONS

Analog I/O modules

• High speed input channels	Up to 16 (2 channels per module, on up to 8 modules)
• High speed input types	Sensor dependant (see **Table 1**)
• Analog outputs (4 per channel)	
Processed raw current	4 to 20 mA (500 Ω max. load)
Processed raw voltage	0 to 10 V (10 kΩ min. load)
Trending current	4 to 20 mA (500 Ω max. load)
Trending voltage	0 to 10 V (10 kΩ min. load)
• Relay driver outputs (4 per channel - HI, HIHI, LO, LOLO)	Bipolar FET (±30 V / 25 mA max., isolated ground)

Control module

• Inputs	
Synchro 1 IN	Signal from 1/rev. sensor - Rotation input closed
Synchro 2 IN (default input)	Signal from 1/rev. sensor - Rotation input open
Input type	Default: 24V Pull-up, for dry contact or electronic switch Mining: 0 to 24 V signal from proximity probe
Trigger level	Adjustable through ZOOM software, falling or rising edge
Pulse duration	10 usec. minimum
Complementary inputs (provided by client)	Rotation, External trigger and Alarm inhibit
Input type	24V Pull-up, for dry contact or electronic switch, triggers on a falling edge
Trigger level	3.8 V (±250 mV hysteresis)
• Outputs	
System OK and Channels OK relay driver	NPN Open-Collector (35 V / 15 mA max.)
Synchro Out	0 - 5 V

Communication module

• Ethernet port	
Protocol	TCP/IP
Speed	Up to 1000 Mbps
• RS-485 / 422 Port	
Electrical specifications	4-wire, full duplex or 2-wire, half duplex
Speed	up to 115 200 bps
• USB Port	Type A, female, USB 1.1, 2.0 compatible

Power Requirements

• Input voltage	100 - 240 Vac (50-60 Hz), 105 - 250 Vdc
• Power consumption	65 W max.
• Protection	One fuse, 250 V, 3.15 A, slow-blow
• Voltage source protection	Additional upstream electrical protection required [1]

Environmental

• Operating temperature range	0 to 50°C [32 to 122°F]
• Supplementary protection	Installed inside an industrial enclosure or cabinet [2]

Physical Characteristics

• Form factor	3U, 19" rack-mount [3]
• Weight	12 kg [26.5 lb]

Note 1: To prolong the lifespan of the equipment, supplemental surge protection and high-frequency filtering are required for installations in harsh or electrically noisy industrial environments (included with any VSM Instrumentation cabinet).

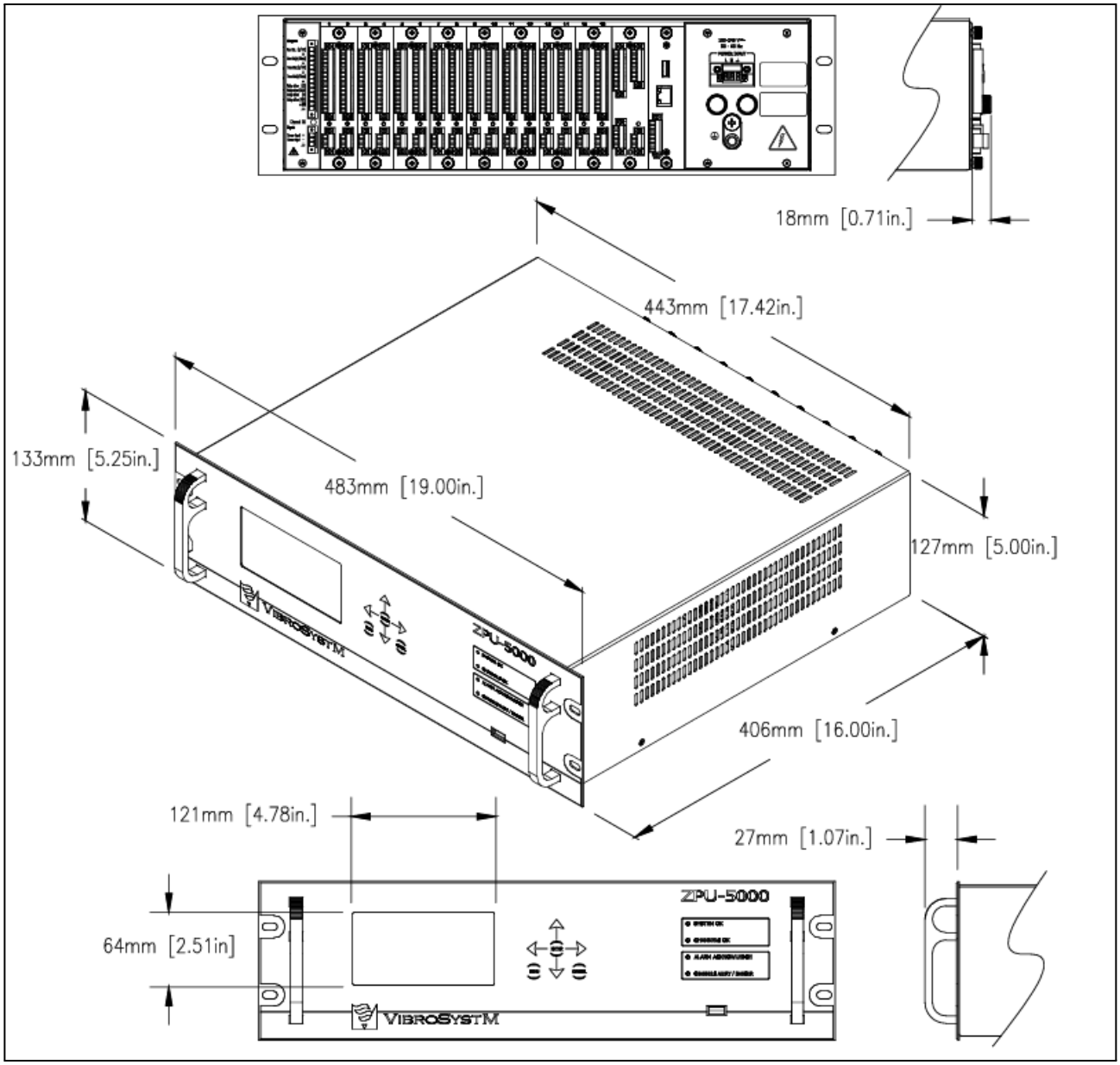
Note 2: The equipment must be installed inside an IP54 cabinet to protect it from water and dust penetration (refer to VSM Instrumentation cabinet).

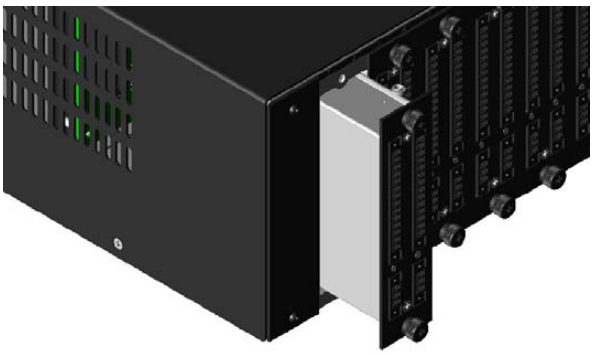
Note 3: For structural integrity, the ZPU-5000 must not be installed solely with the front panel screws. Mandatory lateral supports are required for this equipment.

Table 1 - Analog I/O Modules

Module Type	Description
AGM-420 *(VSM-IM/ZPU-AG)*	Current signal from air gap sensors • Nominal input range: 4 to 20 mA (dc to 1000 Hz) • Input Impedance: 200 ohms
CIM-420 *(VSM-IM/ZPU-4/20MA)*	Current signal from proximity sensors, temperature, magnetic flux… and more • Nominal input range: 4 to 20 mA (dc to 1000 Hz) • Input impedance: 200 ohms
VIM-5/5 *(VSM-IM/ZPU-5/5V)*	Voltage signal from proximity sensors… and more • Nominal input range: -5 to +5V (dc to 1000 Hz) • Input impedance: >10k ohms
VIM-10/10 *(VSM-IM/ZPU-10/10V)*	Voltage signal from proximity or displacement sensors… and more • Nominal input range: -10 to +10V (dc to 1000 Hz) • Input impedance: >10k ohms
VIM-2-18 *(VSM-IM/ZPU-2/-18V)*	Signal from -2 to -18 V displacement or proximity sensor • Nominal input range: -2 to -18 V (dc to 1000 Hz) • Input impedance: >10k ohms
ICPM-1.13-500 *(VSM-IM/ZPU-500MVG)*	ICP signal from piezoelectric accelerometer • Input sensitivity: 500 mV/g (includes constant current source) • Nominal input range: 0 to 1.13 g (peak) 0.7 to 1000 Hz
ICPM-5.65-500 *(VSM-IM/ZPU-500MVG-5)*	ICP signal from piezoelectric accelerometer • Input sensitivity: 500 mV/g (includes constant current source) • Nominal input range: 0 to 5.65 g (peak) 0.7 to 1000 Hz
ICPM-1.13-100 *(VSM-IM/ZPU-100MVG-1)*	ICP signal from piezoelectric accelerometer • Input sensitivity: 100 mV/g (includes constant current source) • Nominal input range: 0 to 1.13 g (peak) 0.7 to 1000 Hz
ICPM-5.65-100 *(VSM-IM/ZPU-100MVG-5)*	ICP signal from piezoelectric accelerometer • Input sensitivity: 100 mV/g (includes constant current source) • Nominal input range: 0 to 5.65 g (peak) 0.7 to 1000 Hz
ICPM-28-3.94 *(VSM-IM/ZPU-VEL)*	ICP signal from piezoelectric velocimeter • Input sensitivity: 3.94 mV/mm/s (includes constant current source) • Nominal input range: 0 to 28 mm/s (peak) 0.7 to 1000 Hz
FIM-40-100 *(VSM-IM/ZPU-FOA)*	Signal from FOA-100 or FOA-200 accelerometer • Input sensitivity: 100 mV/g • Nominal input range: 0 to 40 g (peak) 30 to 1000 Hz
FIM-40-100 (LF) *(VSM-IM/ZPU-FOA-LF)*	Signal from FOA-100 or FOA-200 accelerometer (low frequency, mining applications) • Input sensitivity: 100 mV/g • Nominal input range: 0 to 40 g (peak) 10 to 1000 Hz

DIMENSIONS





View of ZPU-5000 plug-in modules

Display panel showing real-time information

TRANSIT / STORAGE GENERAL CONDITIONS

Specifications valid only in original VibroSystM factory packaging.

- Transit / Short term storage (< 3 months) -20 to 60°C [-4 to 140°F], up to 95% RH, non-condensing
- Long term storage 0 to 35°C [32 to 95°F], up to 75% RH, non-condensing

PRODUCT INFORMATION

Product Number	Description
VSM-ZPU5000 Including: VSM-IM/ZPU-COMM VSM-IM/ZPU-CTRL(/M)	ZPU-5000 Multi-channel processing instrumentation & monitoring/protection unit Communication module Control Module (Option /M only for mining industries)
VSM-IM/ZPU-AG	”2-Ch.” Air Gap Input Module
VSM-IM/ZPU-4/20MA	”2-Ch.” Current Input Module (4 to 20 mA)
VSM-IM/ZPU-5/5V	”2-Ch.” Voltage Input Module (± 5 V)
VSM-IM/ZPU-10/10V	”2-Ch.” Voltage Input Module (± 10 V)
VSM-IM/ZPU-2/-18V	”2-Ch.” Vibration / Proximity Input Module (-2 to -18 V)
VSM-IM/ZPU-500MVG	’2-Ch.” Vibration / Acceleration Input Module (ICP/500 mV/g) (1.13 g)
VSM-IM/ZPU-500MVG-5	”2-Ch.” Vibration / Acceleration Input Module (ICP/500 mV/g) (5.65 g)
VSM-IM/ZPU-100MVG-1	’2-Ch.” Vibration / Acceleration Input Module (ICP/100 mV/g) (1.13 g)
VSM-IM/ZPU-100MVG-5	”2-Ch.” Vibration / Acceleration Input Module (ICP/100 mV/g) (5.65 g)
VSM-IM/ZPU-VEL	”2-Ch.” Vibration / Velocity Input Module (ICP/3.94 mV/mm/s)
VSM-IM/ZPU-FOA	”2-Ch.” Vibration / Acceleration Input Module (FOA)
VSM-IM/ZPU-FOA-LF	”2-Ch.” Vibration / Acceleration Input Module (FOA) low frequency