

### Vibration Monitor

*VibroSmart*®

#### FEATURES

- ▶ Single-channel microprocessor-based monitor for mV/g accelerometer (constant current supply)
- ▶ Designed for reliable operation in severe industrial environments (IP 65 enclosure)
- ▶ 5-digit display and 5 LED indicators
- ▶ Built-in HP and LP filters with 24 dB/oct slope, integrator and rectifier
- ▶ Field programmable functions or via RS link
  - 3 sensor sensitivity ranges in mV/g
  - 6 measuring ranges in mm/s or inch/s
  - 8 individual HP and LP cut-off frequencies
  - 2 level detectors : "ALARM" and "TRIP" levels
  - 1 analog output available as option
  - 1 digital RS output available as option (ISO 1745 and ModBus protocols)
- ▶ Self-check circuit ("OK System") with relay output
- ▶ BNC output for analysis
- ▶ Various AC/DC power supply options
- ▶ Conforms to CE, ISO 10 816, NF E90.300 & VDI 2056 standards and recommendations



## DESCRIPTION

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The *VibroSmart* VMU 100 is a fully programmable vibration monitor. It is designed for auxiliary rotating machines such as pumps, fans, small hydro turbines, etc. It is housed in a rugged IP 65 enclosure which protects the electronic circuitry from the severe environments often found in the petro-chemical and power generation industries or in other industrial facilities.

It is a single channel monitor which fulfils any display, monitoring and alarm requirements. This microprocessor based monitor with 5-digit display, 5 LED indicators and front panel setup buttons offers a perfect combination of functions in a very small package.

The input processing module can match all accelerometers using a constant current power supply, such as Vibro-Meter's CE 680 series. This configuration allows long distances between the accelerometer and the monitor (up to 500 meters).

The *VibroSmart* VMU 100 monitors, the vibration signal and displays the RMS or peak value of the vibration velocity in mm/s or inch/s.

All configurable parameters are stored in a non-volatile memory and can be programmed with the front panel setup buttons or via an RS link. When an alarm level is exceeded, the corresponding LED will show the alarm status.

An optional analog output module converts the displayed value into a current or voltage based DC signal (4-20 mA or 0-10 V).

In addition, an optional RS-232 or RS-485 digital data link module allows the operator to request measured values (via ModBus/RTU or ISO 1745) and change all the configurable parameters from a remote computer.

A built-in self-check circuit ("OK System") with front panel LED indicator and a relay output provides continuous monitoring of open or short-circuited transducer line, dynamic overload/overflow, or lost power supply.

The front panel BNC output enables connection to a data collector or spectrum analyser.

## SPECIFICATIONS

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### BASIC EQUIPMENT

Micro-processor mother board including display, processing, power supply, vibration input module, A/D converter and 3-relay output module. Optionally, this basic equipment can accept an analog output module and/or an RS digital output module.

### HARDWARE

#### Mother Board

Microprocessor type : H8325, 8-bit at 20 MHz, with 32 kB RAM  
Non-volatile static RAM : EEPROM, 10 000 store cycles, 100 years data retention

#### Processing, Display and Analog Module

Display : 5 red alphanumeric characters, 14 segments, 14 mm  
Full scale (FSD) :  $\pm 9999$  with decimal point user programmable  
Accuracy : 0.5% of FSD  
Temperature stability : 50 ppm/ $^{\circ}$ C  
Front panel buttons : 4 set up buttons  
Front panel indicators : Green LED "OK System"  
• "ALARM" = LD1 Yellow LED, first level  
• "TRIP" = LD2 Red LED, second level

#### A/D Converter

Type : Dual slope integrating

## SPECIFICATIONS (Continued)

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Conversion rate	: 16 conversions per second
Resolution	: $\pm 15$ bit
Accuracy	: 0.05% of reading

### Power Supply

AC voltage	: 115/230 V $\pm 15\%$ , 50/60 Hz
DC voltage	: 20 to 30 V $\pm 5\%$
Consumption	: 10 W max. with all options and all relays ON

### Relay Output Module

“OK System” relay	: Relay NE, 1 NO contact
“ALARM” relay (LD1)	: Relay 1 NO and 1 NC contacts The NE or NDE relay status is programmable
“TRIP” relay (LD2)	: Relay 1 NO and 1 NC contacts The NE or NDE relay status is programmable
Relay type	: Fujitsu JS-12K.12V, 1 pole, 8 A

## SOFTWARE

### Calibration Mode

Sensor sensitivity	: 9.5 to 105 mV/g, 3 ranges with 0.1 mV/g step resolution: 1) 9.5 to 19.9 mV/g 2) 20 to 49.9 mV/g 3) 50 to 105 mV/g
Full scale measuring range (FSD)	: 10, 20, 50, 100, 200 or 500 mm/s RMS or peak <b>or</b> 0.5, 1, 2, 5, 10 or 20 inch/s RMS or peak
Filter cut-off frequencies	
• <i>Low pass (LP)</i>	: From 40 Hz to 10 kHz 40, 100, 200, 500 Hz, 1, 2.5, 5, 10 kHz
• <i>High pass (HP)</i>	: From 1 Hz to 200 Hz 1, 2, 5, 10, 20, 40, 100, 200 Hz

### Level Detectors

Alarm level	: User programmable, from 0 to 9999
Hysteresis	: Fixed at 5% of FSD
Time delay	: User programmable, from 1 to 99 seconds
Latch function	: User programmable, “Latch” or “Unlatch”
Output state	: Driver normally ON, relay NE or normally OFF, relay NDE

### Input Characteristics

Input signal	: From 9.5 to 105 mV/g (CE 680 transducer or equivalent)
Circuit layout	: AC coupling, asymmetrical
Transducer supply	: 2 mA, 24 V <sub>DC</sub>

### Transfer Characteristics

Dynamic range	: 100 g peak
Filters	: Active HP and LP filters, 4-pole Tchebychev, 24 dB/octave skirt slope, 0.1 dB ripple
Cut-off frequencies	: At -3 dB (see above values)
Linearity error	: < 1%
Rectifier circuit	: True Root Mean Square (RMS) value rectifier

**SPECIFICATIONS** *(Continued)*

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**OUTPUT CHARACTERISTICS**

**Raw Signal BNC Output**

Type : Acceleration, unfiltered  
Sensitivity : According to the input signal range

Input in mV/g	Gain
9.5 to 19.9	1
20 to 49.9	0.5
50 to 105	0.2

Dynamic range : 2 V peak  
Output impedance : 500 ohms

**Raw Signal on Terminal**

Type : Acceleration, filtered  
Sensitivity : Same as on BNC output (see above values)  
Dynamic range : 2 V peak  
Output impedance : 500 ohms

**OK System**

Function : Continuous monitoring for open transducer line, short-circuited line, dynamic overload/overflow, or lost power supply.  
"OK" LED (green) : Light ON = normal state  
"OK" relay : Light OFF = indicates fault

**OPTIONS**

(See Ordering Information)

**Analog Output Module**

DC voltage output : 0 to 10 V for FSD  
impedance > 500 ohms  
or  
DC current output : 4 to 20 mA for FSD  
impedance < 800 ohms  
Resolution : 12 bits  
Accuracy : 0.1% ( $\pm 1$  bit)  
Time response : 60 ms

**RS Digital Output Module**

Type : RS 232 C or RS 485  
Baud rate in bps : Selectable from 1200 to 19 200  
Bus interface : 3 wires for RS 232 C  
2 wires for RS 485  
Address (RS-485) : Programmable from 00 to 99  
Bus structure : Slave which replies to commands  
Protocol : ISO 1745, "start-stop" 7-bit code ModBus/RTU™  
Network configuration : Up to 31 modules  
Mode : Asynchronous serial transmission, half-duplex

### SPECIFICATIONS (CONTINUED)

#### PHYSICAL CHARACTERISTICS

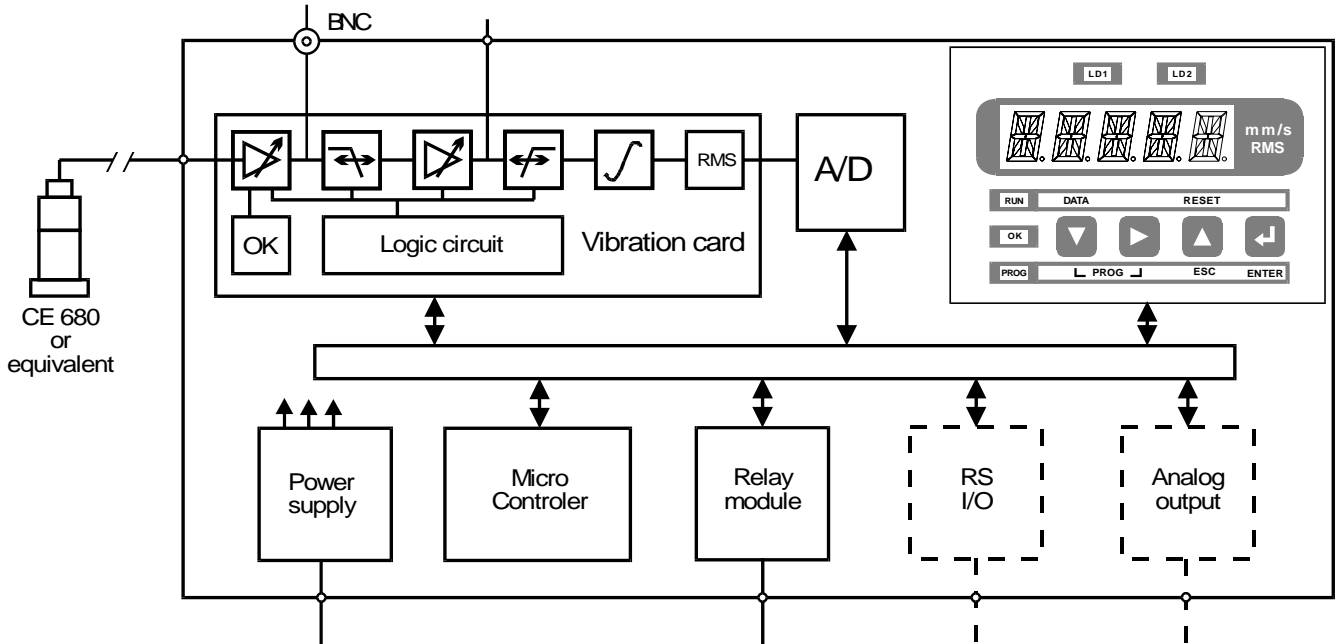
Design standard	:	Complies with all essential specifications of CE, ISO10 816, NF E90.300 and VDI 2056 recommendations
Mechanical	:	Aluminium enclosure, IP 65 protection, 4 PG 11 input/output stuffing glands, 4 mounting holes for M6 screws
Electrical connections	:	Removable terminals (for 1.5 mm <sup>2</sup> wire)
Dimensions		
• Height	:	226 mm
• Width	:	150 mm
• Depth	:	70 mm
Weight	:	~ 1.5 kg

#### ENVIRONMENTAL

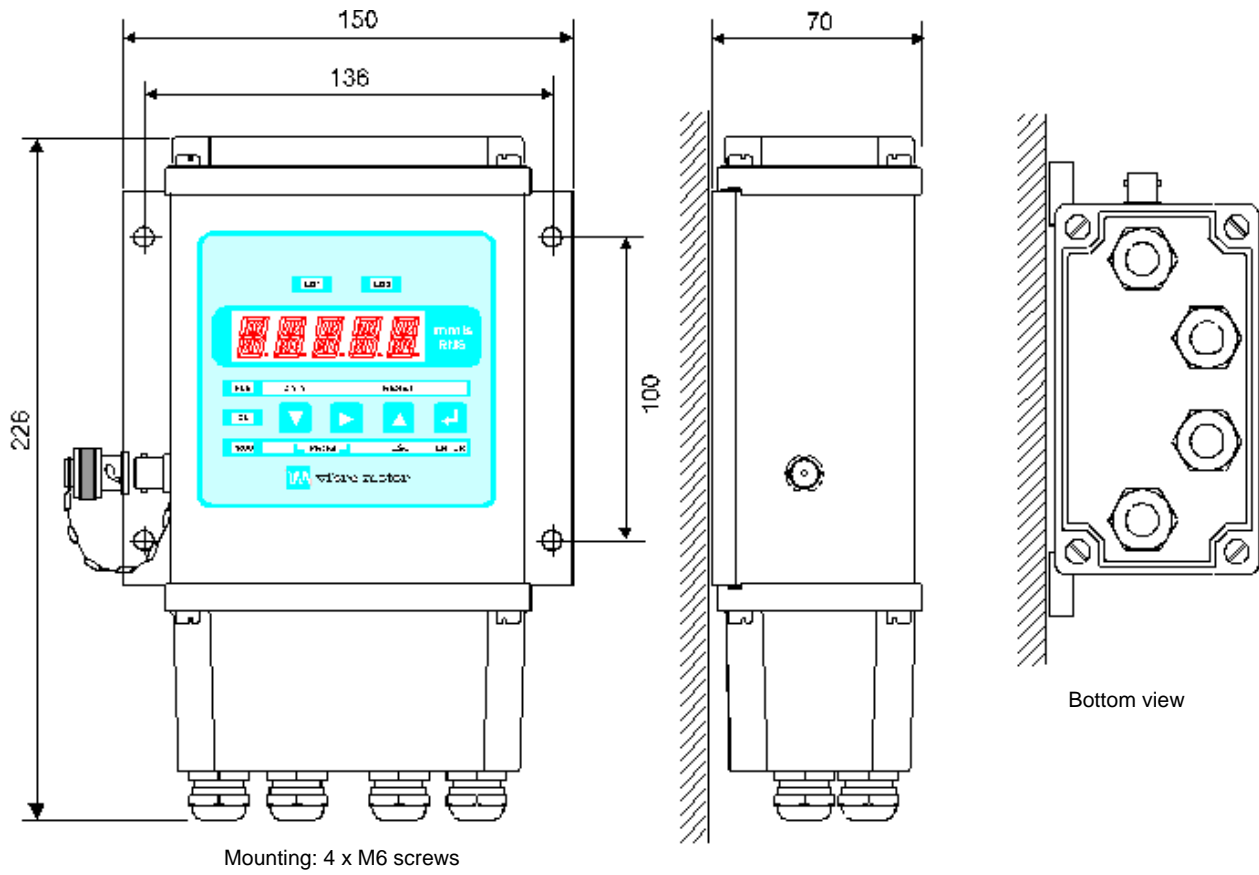
(According to IEC 68.2 recommendations)

Operating temperature	:	0°C to +60°C
Storage temperature	:	-25°C to +85°C
Humidity	:	Max. 95% non-condensing
Vibration	:	10 to 55 Hz, 0.35 mm peak, 6 hours in each direction
Shock	:	15 g peak, 11 ms, half sine pulse

#### BLOCK DIAGRAM



DESIGN AND DIMENSIONS



## ORDERING INFORMATION

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To order please specify :

Type	Designation	Ordering Number
VMU 100	Vibration Monitor	204-100-000-011 / X1 / X2 / X3 / X4 / X5 Programmable parameters (if X4 = 1): PP1 / PP2 / ... / PP23

**IMPORTANT :** The parameters X1, X2, X3, X4 and X5 must be defined when ordering. PP1 to PP23 concern programmable parameters which can be defined in the field by programming the *VibroSmart*. If they are defined when ordering, the set-up will be done in the factory prior to delivery.

## CONFIGURATION PARAMETERS

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X1 (1)	Power Supply
1	115 V <sub>AC</sub>
2*	230 V <sub>AC</sub>
5	20-30 V <sub>DC</sub>

X2	Analog Output Card
0*	None
1	0 - 10 V or 4 - 20 mA

X3	RS Output Card
0*	None
1	RS 232
2	RS 485

X4	Factory setup of programmable parameters
0*	No
1	Yes

X5 (2)	Programmation Rights
1*	Total
2	Limited
3	Blocked

\* = Default setting

### Notes :

- (1) The power supply can be changed from 115 V<sub>AC</sub> to 230 V<sub>AC</sub> by adjusting a jumper on the base card of the *VibroSmart*.
- (2) The programmation rights can also be changed by adjusting a jumper on the base card of the *VibroSmart*.

**PROGRAMMABLE PARAMETERS**

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The following parameters can all be changed in the field by programming the *VibroSmart*. If they are defined when ordering, the set-up will be done in the factory prior to delivery.

Programmable parameters: PP1 / PP2 / ... / PP23

PP1	Input Sensitivity
1	10 mV/g
2	25 mV/g
3*	100 mV/g
9	Other

PP2	Unit
1*	mm/s
2	inch/s

PP3	Calibration
1*	RMS
2	Peak

PP4	Full Scale
01	5 mm/s
02	10 mm/s
03*	20 mm/s
04	50 mm/s
05	100 mm/s
06	200 mm/s
07	500 mm/s
51	0.5 inch/s
52	1.0 inch/s
53	2.0 inch/s
54	5.0 inch/s
55	10.0 inch/s
56	20.0 inch/s
57	50.0 inch/s

PP5	Rounding
1*	1
2	2
3	5
4	10

PP6	HP Filter
1	1 Hz
2	2 Hz
3	5 Hz
4*	10 Hz
5	20 Hz
6	40 Hz
7	100 Hz
8	200 Hz

PP7	LP Filter
1	40 Hz
2	100 Hz
3	200 Hz
4	500 Hz
5*	1 kHz
6	2.5 kHz
7	5 kHz
8	10 kHz

\* = Default setting



## PROGRAMMABLE PARAMETERS (Continued)

PP8	LD1 Activity
1*	Yes
2	No

PP9	LD1 Direction
0	Not applicable if PP8 = 02
1*	High
2	Low

PP10	LD1 Normal State
0	Not applicable if PP8 = 02
1*	On
2	Off

PP11	LD1 Latch
0	Not applicable if PP8 = 02
1*	Yes
2	No

PP12	LD1 Level
0	Not applicable if PP8 = 02
9*	Specify value in writing (* 60% of Full Scale)

PP13	LD1 Delay Time
0	Not applicable if PP8 = 02
9*	Specify value in writing (* 1 sec.)

PP20	Analog Output
0	Not applicable
1*	0 - 10 V <sub>DC</sub> (if X2 = 1)
2	4 - 20 mA (if X2 = 1)

PP22	RS Baud Rate
0	Not applicable
1	1200 (if X3 = 1 or 2)
2	2400 (if X3 = 1 or 2)
3	4800 (if X3 = 1 or 2)
4*	9600 (if X3 = 1 or 2)
5	19 200 (if X3 = 1 or 2)

PP14	LD2 Activity
1*	Yes
2	No

PP15	LD2 Direction
0	Not applicable if PP14 = 02
1*	High
2	Low

PP16	LD2 Normal State
0	Not applicable if PP14 = 02
1	On
2*	Off

PP17	LD2 Latch
0	Not applicable if PP14 = 02
1*	Yes
2	No

PP18	LD2 Level
0	Not applicable if PP14 = 02
9*	Specify value in writing (* 80% of Full Scale)

PP19	LD2 Delay Time
0	Not applicable if PP14 = 02
9*	Specify value in writing (* 1 sec.)

PP21	RS Address (0-99)
00	00 (if X3 = 1 or 2)
01*	01 (if X3 = 1 or 2)
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99	99 (if X3 = 1 or 2)

PP23	Protocol
0	Not applicable
1*	ISO 1745 (if X3 = 1 or 2)
2	ModBus/RTU (if X3 = 1 or 2)

\* = Default setting

## ORDERING EXAMPLE

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VMU 100 Vibration Monitor : 204-100-000-011 / 1 / 0 / 2 / 1 / 1  
Programmable parameters : 3 / 1 / 1 / 03 / 4 / 3 / 8 /  
1 / 1 / 1 / 1 / 9 / 9 /  
1 / 1 / 2 / 1 / 9 / 9 /  
1 / 01 / 4 / 1

where PP12 = 12 mm/s (60% of FSD)  
PP13 = 1 second

PP18 = 16 mm/s (80% of FSD)  
PP19 = 1 second

## ACCESSORIES

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CE 680 series accelerometers See data sheet 262-055  
EC 318 cable assembly See data sheet 262-645  
EC 319 cable assembly See data sheet 262-646



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### Sales offices

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

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