

Good Vibrations

VM22 / 23 / 24 / 25 Hand-Held Vibration Meters

This series of single-channel pocket sized vibration meters covers many types of vibration measurement and condition monitoring at rotating machinery. All models are characterized by bright graphical OLED displays, intuitive operation and USB interfaces with PC software. The instruments come with a special low power IEPE sensor which ensures long battery life.

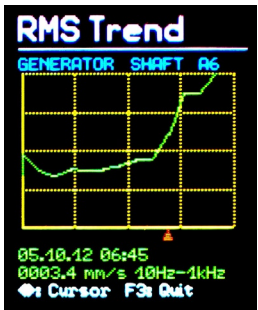
An interesting feature for route measurements is the electronic detection of measuring points using Metra's innovative VMID pads which include a unique ID. The reading contact is integrated into the sensor base. In addition to vibration some instruments offer FFT, RPM and temperature measurement.



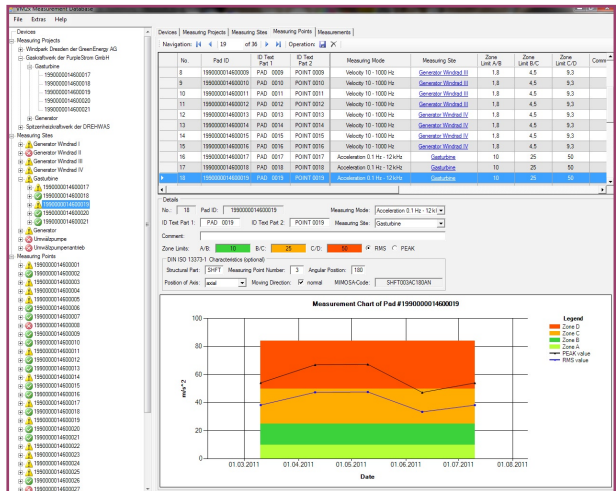
Technical Data	VM22	VM23	VM24	VM25
Vibration acceleration	-	-	0.1 to 240 m/s ² 0.2 Hz to 10 kHz 3 Hz to 1 kHz 1 kHz to 10 kHz	0.1 to 240 m/s ² 0.2 Hz to 10 kHz 3 Hz to 1 kHz 1 kHz to 10 kHz
Vibration velocity	0.1 to 1000 mm/s 10 to 1000 Hz	0.1 to 1000 mm/s 2 to 100 Hz 10 to 1000 Hz	0.1 to 1000 mm/s 2 to 1000 Hz 10 to 1000 Hz	0.1 to 1000 mm/s 2 to 1000 Hz 10 to 1000 Hz
Vibration displacement	-	0.01 to 60 mm 2 to 60 Hz 3 to 200 Hz	0.01 to 60 mm 5 to 200 Hz	0.01 to 60 mm 5 to 200 Hz
Rotary speed	-	-	-	1 to 9999 rpm (optical)
Temperature	-	-	-	-40 to 125 °C (infrared)
True RMS measurement	yes	yes	yes	yes
Peak measurement	-	yes (peak-peak)	yes	yes
Crest factor measurement	-	-	-	yes
Main frequency	-	yes	-	-
Frequency analysis (FFT)	-	512 lines (for main frequ.)	-	125 lines
Bearing coefficient K(t)	-	-	-	yes
Headphone output	-	-	-	yes
Measurement memory	for 16,000 measurements; USB interface			

The VMID function in combination with the large memory offers a simple way of trending even with large numbers of measurements. The trend graph is displayed on the instrument screen.

A convenient tool for managing, trending and archiving measured data is the optionally available PC software *VM2x Measurement Database*.



VM2x trend display and PC software VM2x-MDB



VM31 Human Vibration Analyzer

The VM31 was developed primarily for hand-arm and whole-body human vibration measurement. It complies with ISO 8041, ISO 2631 and ISO 5349. The versatile instrument is also capable of ship vibration measurement to ISO 6954.

Technical Data	
Inputs	4 low power IEPE + TEDS
Human vibration weightings	Wb, Wc, Wd, Wh, Wj, Wk, Wm
Acceleration (10 / 100 mV/g transducer)	0.01 - 1000 / 0.001 - 110 m/s ² 0.1 - 1500 Hz 1 - 1000 Hz
Velocity (10 / 100 mV/g transducer)	0.1 - 1000 / 0.01 - 100 mm/s 1 - 100 Hz 2 - 1000 Hz 10 - 1000 Hz
Displacement (10 / 100 mV/g transducer)	1 - 2500 / 0.1 - 250 µm 5 - 250 Hz
Display modes	Interval RMS (long integration) Running RMS (1 s) Vector sum Maximum RMS (MTVV) Vibration dose (4th power RMS)
Frequency analysis	125 lines for X/Y/Z; peak
Data memory	10,000 measurements; 100 log files of 32,000 measurements each; 1000 FFTs; USB interface
Batteries	3 AAA cells; 10 to 14 h



VM31-HAWB Hand-arm and whole-body human vibration kit

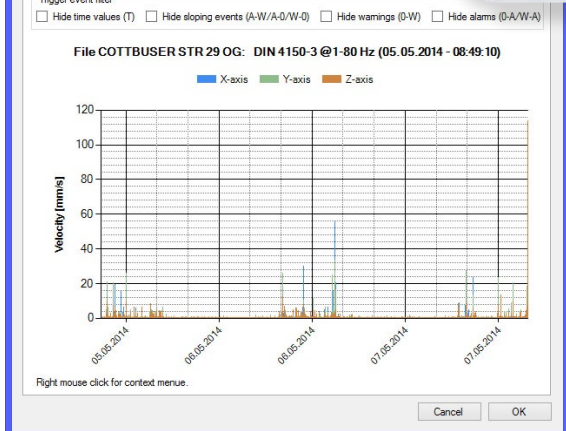
Also available:
VM31-HA Hand-arm kit
VM31-WB Whole-body kit
VM31-M Machine vibration kit

VM40C Triaxial Building Vibration Monitor

The VM40C is a stand alone structural vibration monitoring system to DIN 4150-3, BS 7385, SN 640312a and other standards. It includes a high sensitivity triaxial accelerometer and a rechargeable battery.

It monitors and logs the vibration values and the main frequency. PC software for data inspection and report generation is provided. By connecting a cellular phone modem the VM40 can send SMS messages upon alarm events.

Technical Data	
Measuring ranges Acceleration Velocity	Peak value (ppv) of 0.1 to 15 m/s ² 0.1 to 30 mm/s
Frequency ranges (-3 dB)	0.8 to 100 Hz 0.8 to 395 Hz 5 to 150 Hz
Alarm notification	Warning / alarm LEDs Relay output SMS alerts (option)
Memory	100,000 measurements of X/Y/Z, main frequency, date and time; USB interface



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Please visit our web site www.MMF.de for further information material like data sheets, instruction manuals and trial software.



Trusted Quality Since 1959

In the late 1950s Metra started manufacturing piezoelectric accelerometers and vibration meters. Making both sensors and instruments in our house ensures high quality and design flexibility.

Metra's vibration meters are supplied with a traceable calibration certificate. DKD calibration can be offered on demand.



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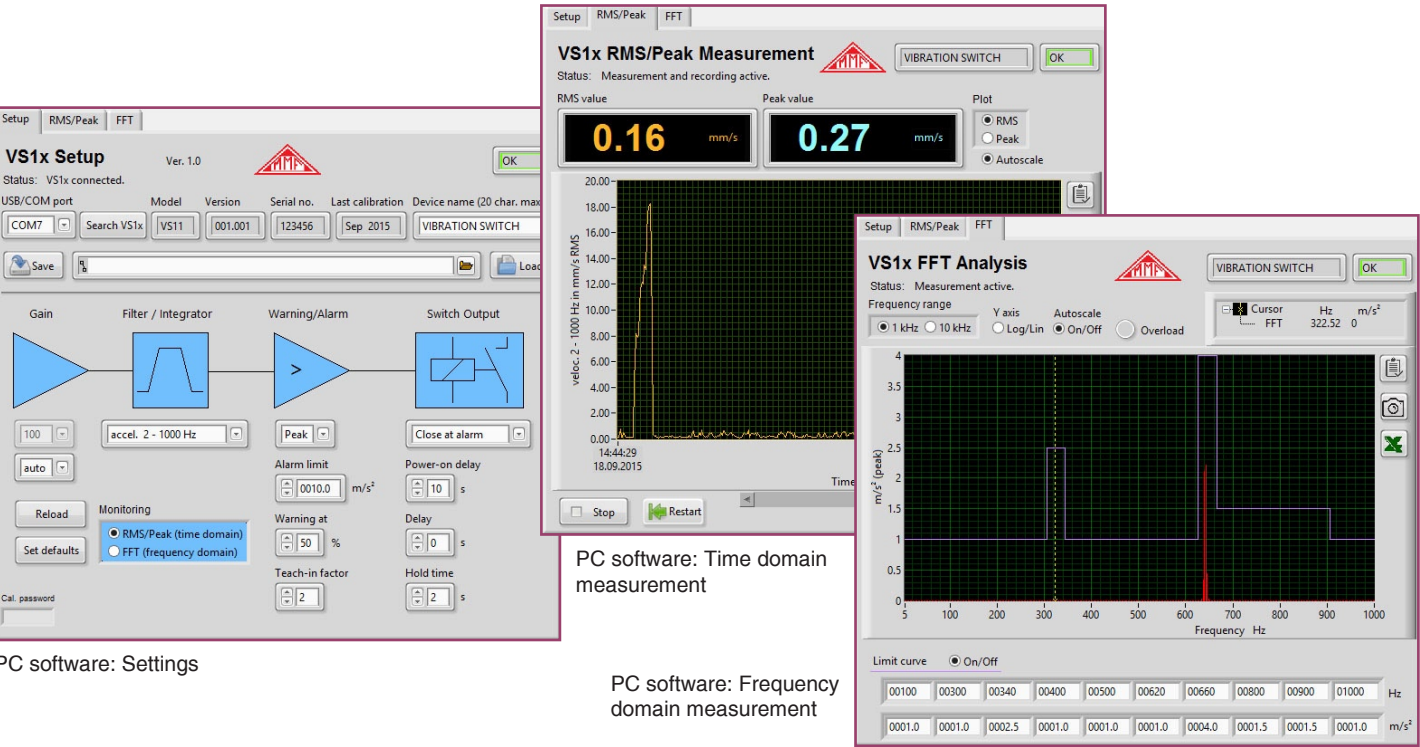
VS10/11/12 Vibration Switches / Monitors

The VS1x offers a functionality which is not found in common vibration switches. They feature RMS and peak monitoring with selectable frequency ranges. Additionally the models VS11 and VS12 allow monitoring in frequency domain. The measured FFT spectrum is divided into 10 user-defined frequency bands with individual amplitude limits which enables selective monitoring.

The alarm condition is indicated by green and red LEDs. The instruments include a precise shear type piezoelectric accelerometer. All settings are made via a USB interface. In combination with a free PC software tool they can also be used as digital sensors measuring RMS, peak and spectrum.



Technical Data	VS10	VS11	VS12
Measuring range	acceleration 0.1 to 1000 m/s²; velocity (frequency dependent)		
High pass frequencies	acceleration: 0.1 / 2 / 5 / 10 / 20 / 50 / 100 / 200 / 500 / 1000 Hz; velocity: 2 / 5 / 10 / 20 / 50 Hz		
Low pass frequencies	acceleration: 0.1 / 0.2 / 0.5 / 1 / 2 / 5 / 10 kHz; velocity: 1 kHz		
RMS / peak monitoring	yes	yes	yes
FFT monitoring	-	2 to 1000 or 20 to 10,000 Hz; 360 lines; 10 alarm intervals	
Warning alarm LEDs	green / red	green / red	-
USB connector	internal; Micro USB	internal; Micro USB	external; <i>Binder</i> 711; 8 pin
Switch output	PhotoMOS relay; 60 V / 0.5 A; n.c./n.o.; via terminal blocks	PhotoMOS relay; 60 V / 0.5 A; n.c./n.o.; via terminal blocks	PhotoMOS relay; 60 V / 0.5 A; n.c./n.o.; via <i>Binder</i> 711 socket
Alarm delay / hold time	0 to 99 s / 0 to 9 s		
Power supply	5 to 30 V DC; <100 mA	5 to 30 V DC; <100 mA	USB voltage (5 V DC)
Mounting	stud M8 x 8	stud M8 x 8	stud M8 x 8
Protection grade	IP67	IP67	IP67
Dimensions (ØxH)	50 mm x 52 mm	50 mm x 52 mm	50 mm x 36 mm
Weight	160 g	160 g	125 g



PC software: Settings

PC software: Time domain measurement

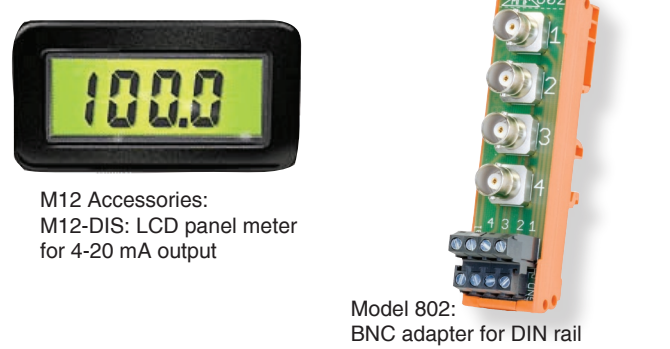
PC software: Frequency domain measurement

M12 Vibration Monitor

The M12 is a universal vibration monitoring and signal conversion instrument suitable for all types of IEPE sensors. It delivers almost all types of time domain vibration signals needed in the industry. There is an AC output of the filtered / integrated or unfiltered sensor signal, DC voltage outputs and a current loop output of the RMS and peak values and a relay output.

Technical Data	M12
Input	IEPE; 3.5 to 4.5 mA / 24 V
Acceleration ranges	10 / 50 / 250 m/s² 1 to 50,000 Hz
Velocity ranges	10 / 50 / 250 mm/s 3 to 1000 Hz
Displacement ranges	100 / 500 / 2500 µm 3 to 200 Hz
Available high pass modules (FB3-....Hz)	2 / 3 / 5 / 10 / 30 / 50 / 100 / 300 / 500 / 1000 Hz
Available low pass modules (FB2-....kHz)	0.1 / 0.3 / 0.5 / 1 / 3 / 5 / 10 / 30 kHz
Relay output	change over; 40 V AC / 2 A
Alarm delay	0 to 25 s (front panel)
Alarm hold time	2 / 10 s (DIP switch)
Current loop output	4 to 20 mA, optic. isolated
Voltage outputs	RMS and peak; 0 to +10 V
LED indicators	10 LED bar graph for level; overload; sensor; alarm
Power supply	12 to 28 V DC
Dimensions (WxHxD)	22 x 76 x 111 mm³

High pass and low pass filters are plug-in modules which can be changed by the user. Single and double integrators are selectable by DIP switches. The module is designed for DIN rail mounting. Connections are made by screw terminals. At the front is an LED bar graph indicating the magnitude.



Selected Standards for Machine Vibration

Vibration monitoring as part of a predictive maintenance plan allows for the prediction of machine breakdown and will thereby save maintenance cost.

The ISO 10816 family of standards deals with unbalance. Typical reasons for unbalance are loose parts, bent components or worn out bearings.

ISO 10816-1 specifies the RMS of vibration velocity (severity) from 10 to 1000 Hz as an indicator of unbalance. It shows permissible values for different machine types with different sizes, foundations and speeds.

ISO 10816-3 indicates vibration velocity limit values for large machines up to 50 MW.

ISO 10816-6 deals with reciprocating machinery. Their vibration is typically measured in three directions between 2 and 1000 Hz as RMS values of acceleration, velocity and displacement. This standard also gives reference values for different machine conditions.

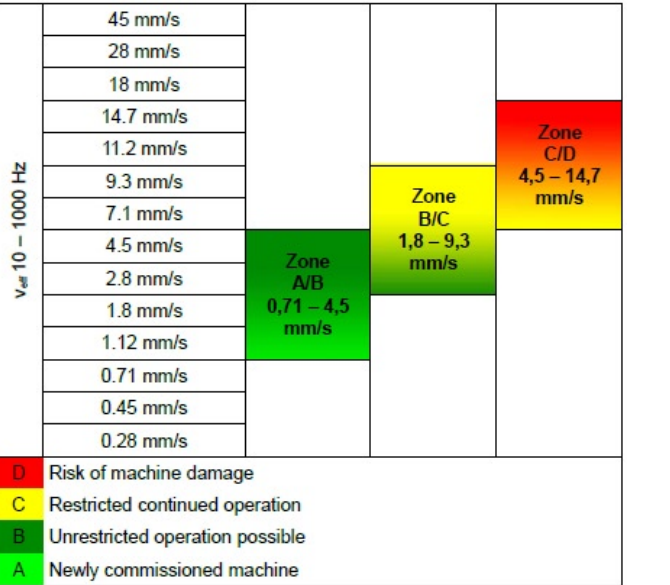
ISO 10816-7 classifies vibration velocity limits for rotodynamic pumps.

Apart from these given limit values predictive maintenance experts often use their own methods and limits.

Roller bearing condition monitoring is a far more complex matter than unbalance. Only very few standards have been published. A good overview can be found in guideline **VDI 3832**.

For bearing evaluation usually acceleration in the frequency range above 1 kHz and up to at least 10 kHz is measured. A powerful but demanding method are frequency analysis (FFT) and envelope curve formation.

There are also more simple methods based on characteristic variables like RMS and peak values, crest factor, kurtosis factor or K(t) value.



Vibration severity zone limits to ISO 10816-1

M14 Vibration Monitor

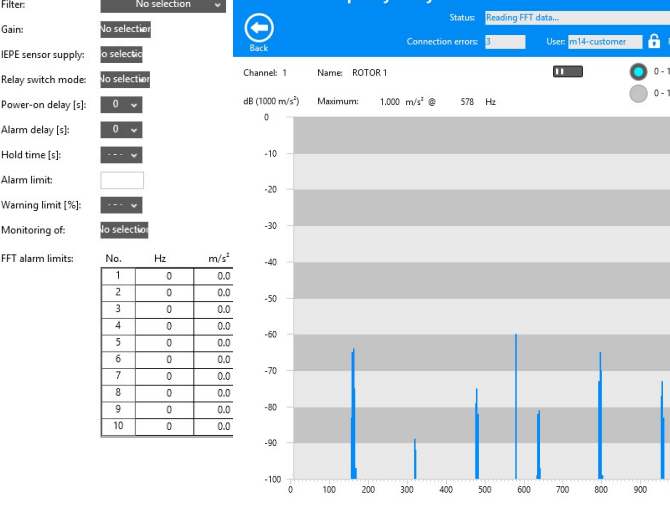
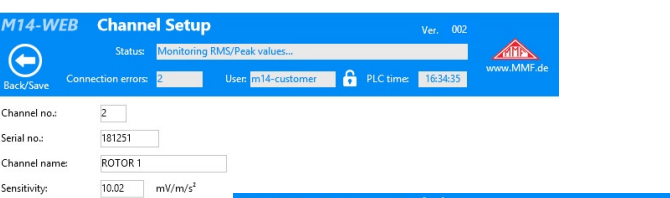
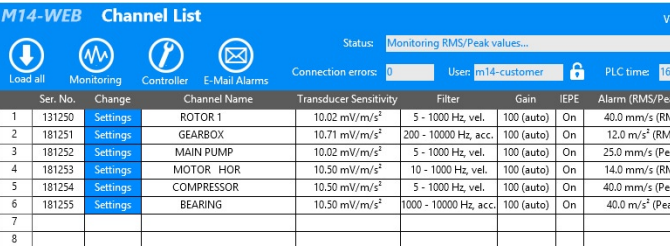
The M14 is suitable for various applications in machine condition monitoring, process control or quality testing. It monitors in time and frequency domain. In time domain monitoring of acceleration and velocity with programmable high pass and low pass frequencies is available. In frequency domain the user can set 10 frequency bands with individual amplitude limits. Two relay outputs for warning and alarm are provided. There is an AC output and a current loop output.

The M14 is fully programmable via a front side USB socket and an RS-485 bus on its rear side. All settings are made via these interfaces. RMS / peak values and FFT spectra can also be transmitted.

The M14 is designed as a narrow DIN rail module with an interconnection bus for power supply and RS-485 thereby saving cabling work. On the front panel there is an LED bar graph showing the current amplitude. A teach-in button is provided to set the alarm limit automatically based on the measured vibration and a selectable factor.

M14 Web Based Monitoring

The M14 can be used as a stand-alone monitoring device providing relay switch signals and a current loop output. Its bus-programmable design also makes it suited for remote monitoring via local networks or the internet. Metra offers for this purpose the ready-to use monitoring solution M14-WEB using a WAGO PLC Model PFC200. The PLC communicates with the M14 units via the RS-485 bus. Each module is addressed by its serial number. Up to 32 modules can be connected to M14-WEB. The PLC hosts web pages for setup, RMS or peak monitoring, trending and FFT. This enables remote monitoring via an internet browser.



Technical Data	M14
Input	IEPE; 3.5 to 4.5 mA / 24 V
Acceleration ranges (with 100 mV/g sensor)	10 / 100 / 1000 m/s² 0.1 to 10,000 Hz
Velocity ranges (with 100 mV/g sensor)	10 / 100 / 1000 mm/s 2 to 1000 Hz
High pass frequencies	5 / 10 / 20 / 50 / 100 / 200 / 500 / 1000 Hz
Low pass frequencies	0.1 / 0.2 / 0.5 / 1 / 2 / 5 / 10 kHz
FFT	500 lines; 5-1400 Hz, 20 Hz-11 kHz
Relay output	2x PhotoMOS relay; 60 V / 0.5 A
Alarm delay	0 to 99 s
Alarm hold time	1 to 9 s
Current loop output	4 to 20 mA, optic. isolated
LED indicators	10 LED bicolor bargraph for level; overload; sensor
Dimensions (WxHxD)	13 x 107 x 116 mm³
Power supply	8 to 28 V DC

