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Instruction Manual
Vibration Detector VS4

1. Purpose

The Vibration Detector VS4 is intended for monitoring vibration velocity (often called vibration severity) at rotating machinery to ISO 10816 as part of predictive maintenance. A special feature of Model VS4 is its stand-alone design with internal batteries. It makes cable connections unnecessary. The only installation work to be done is attaching the VS4 to the machine and adjusting the threshold value. Three flashing LEDs indicate the monitoring status. The status can be read at a glance during an inspection route which should be carried out in regular intervals. Thus the VS4 is perfectly suited for applications with tight budget and for personnel with little experience in the field of vibration monitoring.
Two selectable gain ranges, two high pass frequencies and its protection grade IP65 make the VS4 ideal for many applications including, for example, the monitoring of:

- Compressors
- Pumps
- Blower fans
- Generators

Monitoring vibration velocity in regular intervals can help to detect wear in time and thereby prevent the machine from total breakdown and major repair cost. Possible causes of such wear can be, for instance, too much bearing clearance, loose or bent parts or dirt on fan blades.

2. Function

By means of the built-in piezoelectric accelerometer, the VS4 monitors vibrations perpendicular to the lid of its case. It measures both positive and negative excitation. The piezoelectric sensing element and the construction of its case make the VS4 very sturdy.
Figure 1 shows the main components of the circuit.

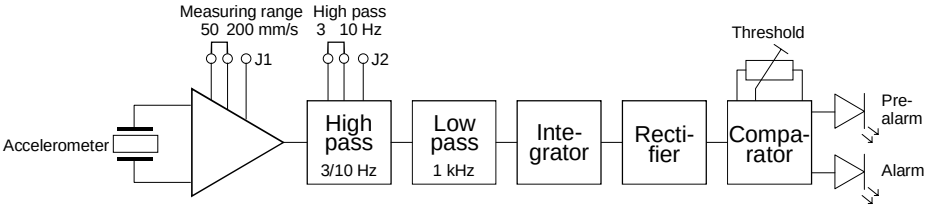

Figure 1: Block diagram

According to the standard ISO 10816 the signal passes a 10 Hz high pass filter and a 1 kHz low pass filter. For slow running machines the high pass can also be switched to 3 Hz. The output signal of the built-in accelerometer passes an integrator in order to obtain vibration velocity. Vibration velocity is advantageous as monitoring quantity since it is a measure of the energy content of vibrations. Two measuring ranges of 50 and 200 mm/s will cover most applications.
The alarm threshold is adjusted by a potentiometer. At 70 % of the adjusted level the yellow pre-alarm LED starts to flash. If the adjusted threshold is exceeded the red alarm LED starts flashing instead. The green power LED indicates sufficient battery voltage. The flashing frequency of the LEDs is about 0.5 Hz ensuring lowest power consumption. The VS4 is powered from two “AA” sized batteries. With one set of heavy-duty Alkaline batteries the unit can be operated for more than one year.

3. Mounting and Adjustments

The adjustment points and the mounting hole become visible after screwing off the lid. Figure 2 shows a view into the opened case.

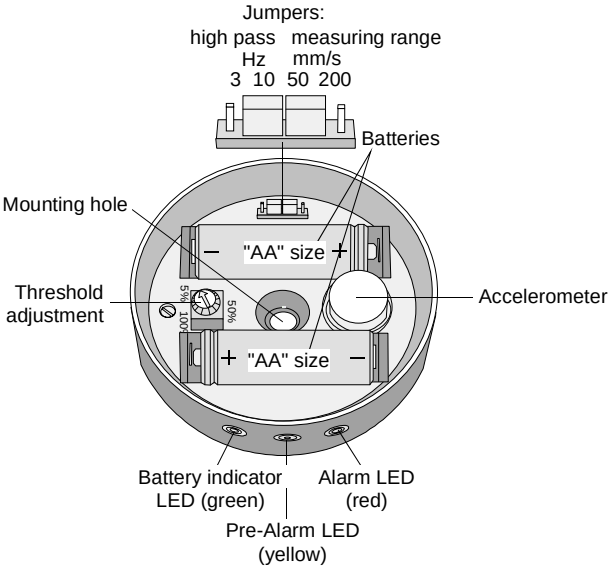

Figure 2: View into the open case

3.1. Mounting

Typical attachment points for the VS4 at a machine are stiff components like cast iron cases, bearing housings or foundations. Flexible components like thin sheet metal or plastic parts are unsuited. The VS4 can be mounted in vertical or horizontal direction, preferably by means of the supplied M8 screw. Before tightening the screw, the LEDs should be aligned to allow good visibility. At daylight the LEDs are visible from a distance of at least 5 m. To guarantee adequate sealing to IP65, the supplied "O" ring (size 7 x 2) must be put under the screw head. Please check also that the "O" ring sealing of the lid (size 77 x 3) is in good condition. Both seals should be replaced when they become cracked. After attaching the VS4 and making the adjustments according to chapter 3.2 the lid can be screwed on. Tighten it firmly so that the labelling faces towards the corresponding LEDs.

3.2. Adjustments

The measuring range of the VS4 can be selected between 50 and 200 mm/s vibration velocity by means of a jumper (see Figure 2). The alarm threshold is adjusted by a potentiometer knob. The scale marking 0 - 50 - 100 % refers to the selected measuring range. The minimum threshold is at 5 % of the measuring range.

To determine an appropriate alarm threshold for your machine, the recommendations of the standard ISO 10816 may be useful (Figure 3). It defines four machine groups depending on their power and corresponding vibration velocity values for different levels of "machine health" between "good" and "unacceptable". These recommendations can only provide a rough orientation, however. During practical operation you will find better alarm limits for the machine possibly.

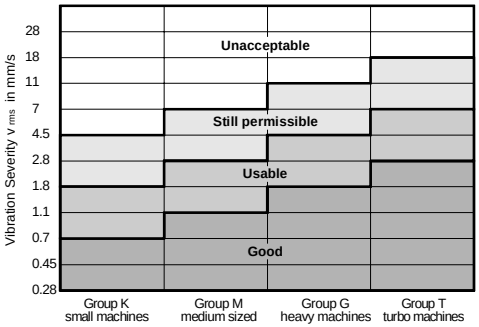

Figure 3:Assessment classes of vibration severity

Machines may be classified as belonging to the following groups (compare Figure 3):

Group K: Components of motors or machines which are rigidly coupled to the entire machine, like electric motors up to 15 kW.

Group M: Electric motors from 15 kW up to 75 kW without special foundations, rigidly mounted motors or machines up to 300 kW with special bed-plates.

Group G: Big driving engines and other machines with rotating masses on rigid and heavy foundations which are relatively stiff in the direction of the measured vibration

Group T: Big driving engines and other machines with rotating masses on foundations which are relatively flexible in the direction of the measured vibration, like turbo generator blocks and gas turbines above 10 MW.

Reciprocating engines, like combustion engines and compressors may require to monitor frequencies below 10 Hz. In this case the high pass filter of Model VS4 can be switched to 3 Hz by a jumper. The jumper positions are shown in Figure 2.

3.3. Power Supply

The VS4 contains two “AA” sized batteries. Provided that heavy duty alkaline batteries with a capacity of > 2200 mAh are used, the VS4 can be continuously operated over one year with one pair of batteries. We recommend the battery type „Procell MN1500“ made by Duracell. As long as the green “Power” LED flashes, the battery voltage is sufficient, i.e. above 1 VDC. Both batteries should be equally charged for proper function. When inserting the batteries, please make sure that their polarity corresponds to the marking on the battery holders.

4. Technical Data

Measuring ranges:	Vibration velocity 50 / 200 mm/s (RMS)
Frequency range:	3 / 10 .. 1000 Hz (-3 dB limits)
Adjustable alarm threshold:	5 .. 100 % of selected range
Accuracy of alarm threshold scale:	± 10 % of maximum value
Pre-alarm:	at 70 % of adjusted threshold
Transverse sensitivity:	< 10 % of main direction
Destruction limit:	1000 g / 10 000 m/s²
Power supply:	2 “AA” sized batteries
Battery life:	> 1 year with alkaline cells > 2200 mAh, T = 21 °C
Battery indicator:	green LED, above 1 V cell voltage
Protection grade:	IP65
Operating temperature range :	-20 .. 55 °C (limited by batteries)
Mounting:	M8 screw (supplied accessory)
Weight:	340 g including batteries
Dimensions:	∅ 88 mm; height 44 mm

Limited Warranty

Metra warrants for a period of

24 months

that its products will be free from defects in material or workmanship
and shall conform to the specifications current at the time of shipment.

The warranty period starts with the date of invoice.

The customer must provide the dated bill of sale as evidence.

The warranty period ends after 24 months. Repairs do not extend the warranty period.

This limited warranty covers only defects which arise as a result
of normal use according to the instruction manual.

Metra's responsibility under this warranty does not apply to any improper or inadequate maintenance or modification and operation outside the product's specifications.

Shipment to Metra will be paid by the customer.

The repaired or replaced product will be sent back at Metra's expense.

CE

Declaration of Conformity

Product: Vibration Detector

Model: VS4

It is hereby certified that the above mentioned product

complies with the demands pursuant to the following standards:

- EN 50081-1
- EN 50082-1

Responsible for this declaration is the producer

Metra Mess- und Frequenztechnik

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Declared by Manfred Weber

Radebeul, 22nd of September, 2003

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