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# AV MONITOR 1002DX

CONDITION MONITORING SYSTEM  
WITH RELAY OUTPUTS

## USER MANUAL

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# 1. Introduction

Each module of the *AVM 1002DX* family is dedicated to another type of application:

- a. **AV MONITOR 1002DS** (*AVM 1002DS*) is a universal module for reciprocating compressors which calculates acceleration RMS or 0-Peak analyses for 24 sections of the machine’s rotation
- b. **AV MONITOR 1002DT** (*AVM 1002DT*) is a module dedicated to ICP® accelerometers with additional temperature output

The features of *AVM 1002DX* family modules are as follow:

feature	AVM 1002DS	AVM 1002DT
ICP® (IEPE) standard accelerometer input	✓	x
temperature input	x	✓
4..20 mA output proportional to signal estimate	✓	✓
vibration velocity or acceleration measurement	✓	x
calculation of RMS or 0-PEAK values	✓	✓
configurable warning and alarm relay outputs, with the delay of the output	✓	✓
build-in connector for AC voltage signal from the vibration sensor (10 V <sub>pp</sub> )	✓	x
DIN rail mounting	✓	✓
vibration sensor failure signaling	✓	x
RMS or 0-Peak analyses for 24 sections of the machine’s rotation	✓	x

The *AVM 1002DX* modules are perfect solution for automated protection systems of rotating machines with constant and variable rotational speed. The device can be integrated with the controller via the 4..20 mA current output. The 10 V<sub>pp</sub> AC voltage output allows to control the vibration level using a portable vibration analyzer. In addition, the relay outputs can be used as safety features. If alarm level is exceeded, *AVM 1002DX* module can turn off the unit before critical damage occurs.

## 2. Front panel description



» **Measurement chain diagnostics for IEPE**

**sensor:** Red LEDs (inactive for DT version):

- *open* - open circuit or sensor failure
- *short* - short circuit or sensor failure

» **Indicator of the selected**

**estimate:** Green LEDs:

- *RMS* – RMS value of vibration signal
- *PEAK* – maximum value of vibration signal (0-Peak)

» **Indicator of the selected measured**

**value:** Green LEDs:

- *acc* – acceleration
- *vel* – velocity

» **Alarm outputs indicators:**

**Red LED:**

- *ALARM* – the alarm threshold exceeded, alarm output ON

**Yellow LED:**

- *WARNING* – the warning threshold exceeded, warning ON

» **Proper work indicator:**

**Green OK LED:**

- diode pulsing with frequency of 1 Hz indicates the correct operation of the device
- rapid pulsing of diode means entering the device setup menu

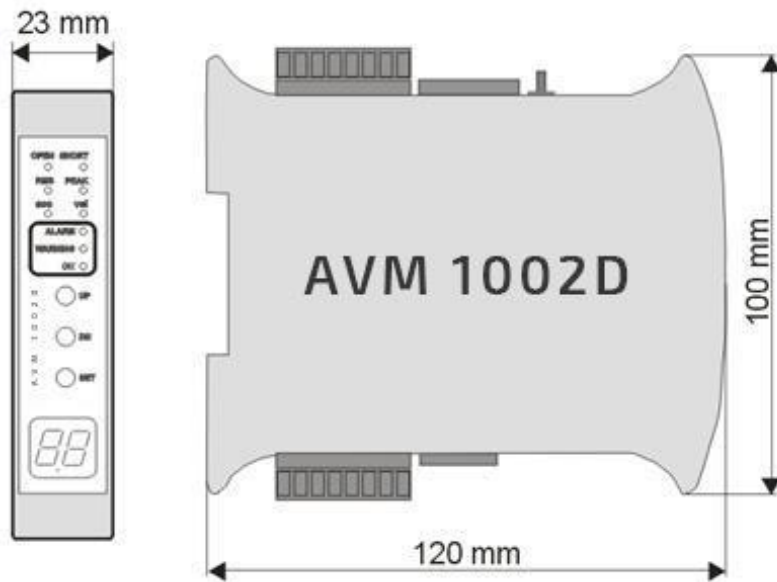
» **Keyboard:**

- *UP* – up
- *DN* - down
- *SET* - set

» **Measured value:**

- double-digit LED display

### 3. Module dimensions



### 4. Mounting

AVM 1002DX modules are designed for mounting on 35 mm DIN rail in an upright position.

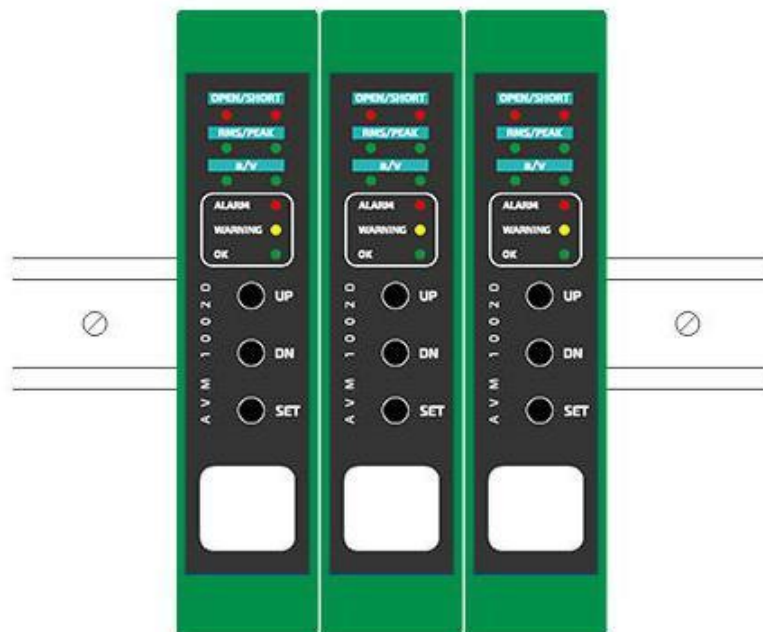


Figure 4-1 // Example of 3 AVM 1002DX modules mounted on DIN rail

## 5. Electrical connectors

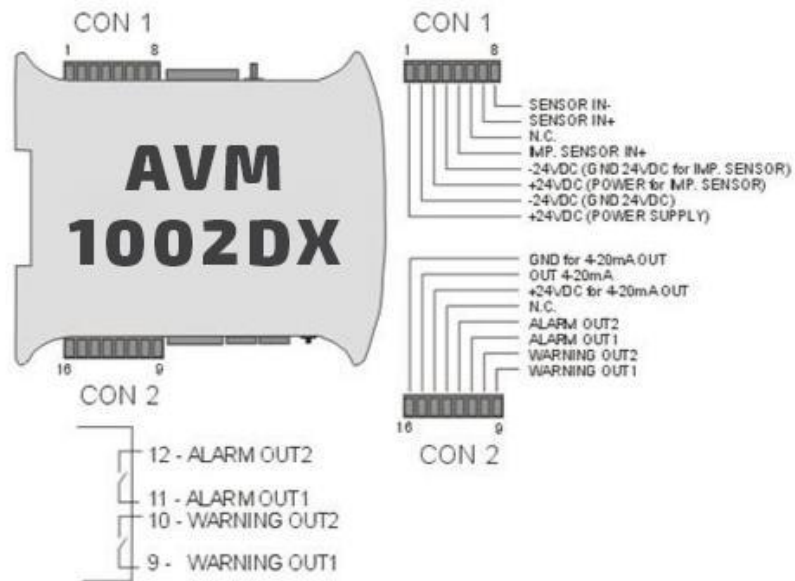


Figure 5-1// Connectors description

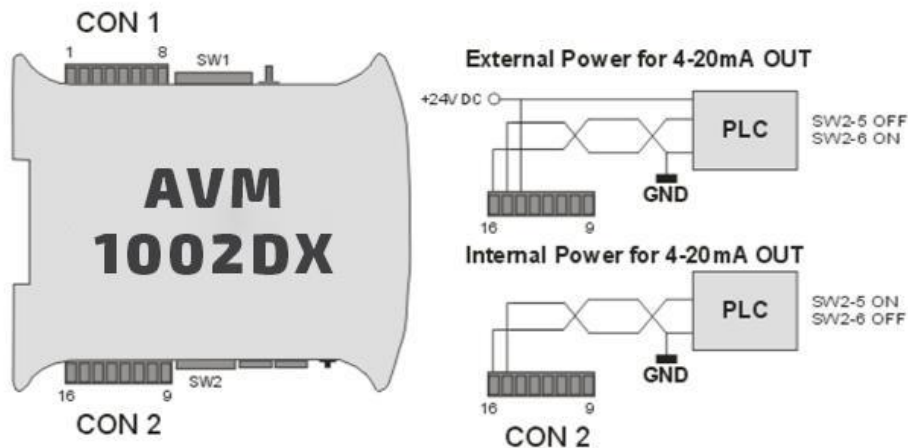


Figure 5-2 // 4..20 mA current loop connection

## 6. Starting up

After connecting the power, the *AVM 1002DX* module enters into testing procedure. Subsequently all display's segments and LEDs will flash for a short period of time. If everything is operating properly, then green *OK* LED is pulsing with a frequency of approximately 1 Hz. Once the testing procedure is over, the device is ready to operate. If an error of a sensor circuit is detected, then corresponding LED will lit.

## 7. Configuration of AVM 1002DX

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The front panel of the *AVM 1002DX* module contains three buttons, labelled subsequently *UP*, *DN* and *SET*. These buttons are used to edit the module functions.

### 7.1 Entering the menu

During normal operation of the *AVM 1002DX* module, pressing *UP* or *DN* button will cause entering into the device menu, which is indicated by rapid blinking of the *OK* LED. While in edit mode, buttons *UP/DN* scroll the menu items:

- A* – alarm,
- U* – warning,
- d* – thresholds activation delay,
- L* – latching of alarm threshold or warning threshold violation,
- CA* – alarm activation in case of the sensor circuit failure,
- CU* – warning activation in case of the sensor circuit failure,
- SC* – correction of values indicated by the module,
- Er* – turning display off on sensor failure,
- AU* – selection of vibration signal estimate,

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**ATTENTION! In some types of AVM 1002DX modules some of the above functions are not active.**

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### 7.2 Setting up of the alarm threshold 'A'

The *AVM 1002DX* has the ability to activate the built-in relay, when the signal from the vibration sensor exceeds the threshold value.

To set the alarm threshold one should perform the following procedure:

1. Press *UP/DN*. Afterwards the *OK* LED will blink rapidly, which indicates entering into the device menu.
2. By pressing *UP/DN* set the letter 'A' on the display.
3. Confirm by pressing the *SET* button.
4. Use the *UP/DN* buttons to select the desired alarm threshold value in the range from 0.0 to 99. Alarm threshold value cannot be lower than the warning threshold value.
5. To confirm the change, press the *SET* button.

If the vibration sensor signal will exceed the alarm threshold value and will remain above it for the time the configured delay, the alarm relay will be activated.

To disable the alarm threshold, instead of the numerical value from the range from 0.0 to 99, set the 'FF' value on the display and confirm by pressing the *SET* button.

### **7.3 Setting up of the warning threshold 'U'**

The second relay installed in the *AVM 1002DX* module is marked WARNING. It informs about excitation of the warning level of the signal.

To set the warning threshold one should perform the following procedure:

1. Press *UP/DN*. Afterwards the *OK* LED will blink rapidly, which indicates entering into the device menu.
2. By pressing *UP/DN* set the letter 'U' on the display.
3. Confirm by pressing the *SET* button.
4. Use the *UP/DN* buttons to select the desired warning threshold value in the range from 0.0 to 99. Warning threshold value cannot be greater than the alarm threshold value.
5. To confirm the change, press the *SET* button.

To disable the warning threshold, instead of the numerical value from the range from 0.0 to 99, set the 'FF' value on the display and confirm by pressing the *SET* button.

### **7.4 Setting up of the threshold activation delay 'd'**

In the *AVM 1002DX* module the user can define how long the alarm threshold or the warning threshold should be exceeded before activating the relay output.

To set the delay one should perform the following procedure:

1. Press *UP/DN*. Afterwards the *OK* LED will blink rapidly, which indicates entering into the device menu.
2. By pressing *UP/DN* set the letter 'd' on the display.
3. Confirm by pressing the *SET* button.
4. Use the *UP/DN* buttons to select the desired delay time in the range from 0 to 16 s.
5. To confirm the change, press the *SET* button.

### **7.5 Setting up the latch of alarm or warning threshold violation 'L'**

*AVM 1002DX* has the ability to store the information about the violation of the warning or the alarm threshold. When the violation occurs, after the delay 'd', proper relay is activated until the user erases the violation information by pressing the *SET* button.

To set up the latch one should perform the following procedure:

1. Press *UP/DN*. Afterwards the *OK* LED will blink rapidly, which indicates entering into the device menu.
2. By pressing *UP/DN* set the letter 'L' on the display.
3. Confirm by pressing the *SET* button.
4. Use the *UP/DN* buttons to select the *ON* option.
5. To confirm the change, press the *SET* button.



To turn off the latch one should perform the following procedure:

1. Press *UP/DN*. Afterwards the *OK* LED will blink rapidly, which indicates entering into the device menu.
2. By pressing *UP/DN* set the letter '*L*' on the display.
3. Confirm by pressing the *SET* button.
4. Use the *UP/DN* buttons to select the '*oF*' option.
5. To confirm the change, press the *SET* button.

## **7.6 Signaling of the sensor failure 'CA', 'CU'**

For full control of the measurement chain *AVM 1002DX* can activate alarm/warning outputs when the measurement chain or vibration sensor is damaged.

Sensor failure alarm can be attributed to the triggering alarm or warning relay. Triggering of the relay occurs after 5 seconds of open/short sensor failure.

To set up the sensor failure signaling on the alarm output one should perform the following procedure:

1. Press *UP/DN*. Afterwards the *OK* LED will blink rapidly, which indicates entering into the device menu.
2. By pressing *UP/DN* set the '*CA*' on the display.
3. Confirm by pressing the *SET* button.
4. Use the *UP/DN* buttons to select the *ON* option.
5. To confirm the change, press the *SET* button.

To set up the sensor failure signaling on the warning output one should perform the following procedure:

1. Press *UP/DN*. Afterwards the *OK* LED will blink rapidly, which indicates entering into
2. the device menu.
3. By pressing *UP/DN* set the '*CU*' on the display.
4. Confirm by pressing the *SET* button.
5. Use the *UP/DN* buttons to select the *ON* option.
6. To confirm the change, press the *SET* button.

To turn off the sensor failure signaling '*CA*'/'*CU*' one should perform the following procedure:

1. Press *UP/DN*. Afterwards the *OK* LED will blink rapidly, which indicates entering into the device menu.
2. By pressing *UP/DN* set the '*CA*'/'*CU*' on the display.
3. Confirm by pressing the *SET* button.
4. Use the *UP/DN* buttons to select the '*oF*' option.
5. To confirm the change, press the *SET* button.

## 7.7 Setting up the correction of values indicated by the module 'SC'

The *AVM 1002DX* module is designed to work with ICP® (IEPE) accelerometers with sensitivity of 100 mV/g, however it is possible to set up set correction of values indicated by the module to adjust the module to a sensor with sensitivity slightly different than 100 mV/g. The 'SC' parameter indicates how much the presented values are being increased or decreased.

To set correction of values indicated by the module one should perform the following procedure:

1. Press *UP/DN*. Afterwards the *OK* LED will blink rapidly, which indicates entering into the device menu.
2. By pressing *UP/DN* set the 'SC' on the display.
3. Confirm by pressing the *SET* button.
4. Use the *UP/DN* buttons to select the desired correction value within the -50 up to +50 range. Negative values are indicated by glowing decimal point on the right display.
5. To confirm the change, press the *SET* button.

## 7.8 Turning display off on sensor failure 'Er'

The *AVM 1002DX* module enables to mask the incorrect measurement values in the case of sensor circuit failure. Activating this feature results in display of the "--" symbol in the case of open or short circuit.

To enable the feature one should perform the following procedure:

1. Press *UP/DN*. Afterwards the *OK* LED will blink rapidly, which indicates entering into the device menu.
2. By pressing *UP/DN* set the 'Er' on the display.
3. Confirm by pressing the *SET* button.
4. Use the *UP/DN* buttons to select the *ON* option.
5. To confirm the change, press the *SET* button.

To disable the feature one should perform the following procedure:

1. Press *UP/DN*. Afterwards the *OK* LED will blink rapidly, which indicates entering into the device menu.
2. By pressing *UP/DN* set the 'Er' on the display.
3. Confirm by pressing the *SET* button.
4. Use the *UP/DN* buttons to select the 'oF' option.
5. To confirm the change, press the *SET* button.

## 7.9 Selecting the measured vibration signal estimate 'AU'

The *AVM 1002DX* module enables measuring RMS or 0-PEAK values of vibration acceleration or velocity.

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**ATTENTION! The configuration must be confirmed using SW1 and SW2 configuration switches described in the following chapter.**

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To select desired estimate one should perform the following procedure:

1. Press *UP/DN*. Afterwards the *OK* LED will blink rapidly, which indicates entering into the device menu.
2. By pressing *UP/DN* set the 'AU' on the display.
3. Confirm by pressing the *SET* button.
4. Use the *UP/DN* buttons to select one of the following option:
  - » 'PU' – 0-PEAK value of the velocity signal,
  - » 'rU' – RMS value of the velocity signal,
  - » 'PA' – 0-PEAK value of the acceleration signal,
  - » 'rA' – RMS value of the acceleration signal.
5. To confirm the change, press the *SET* button.

## 7.10 Relay output state configuration 'uA', 'uU'

The *AVM 1002DF* has a special feature to control relay output state (normally open or normally closed). The configuration can be done independently for warning and alarm output.

To configure relay output state one should perform the following procedure:

1. Press *UP/DN*. Afterwards the *OK* LED will blink rapidly, which indicates entering into the device menu.
2. By pressing *UP/DN* set on the display letters 'uU' for the warning relay or 'uA' for the alarm relay.
3. Confirm by pressing the *SET* button.
4. Use the *UP/DN* buttons to select the desired configuration: 'no' or 'nc'.
5. To confirm the change, press the *SET* button.

The table below displays the effects of the possible settings:

selected configuration	relay output state				
	power OFF	startup or module error	no warning or alarm	sensor error (if enabled)	warning or alarm active
no	open	open	open	closed	closed
nc	open	open	closed	open	open

Figure 7-1 The effects of the possible settings



### 7.11 Measurement duration 'C'

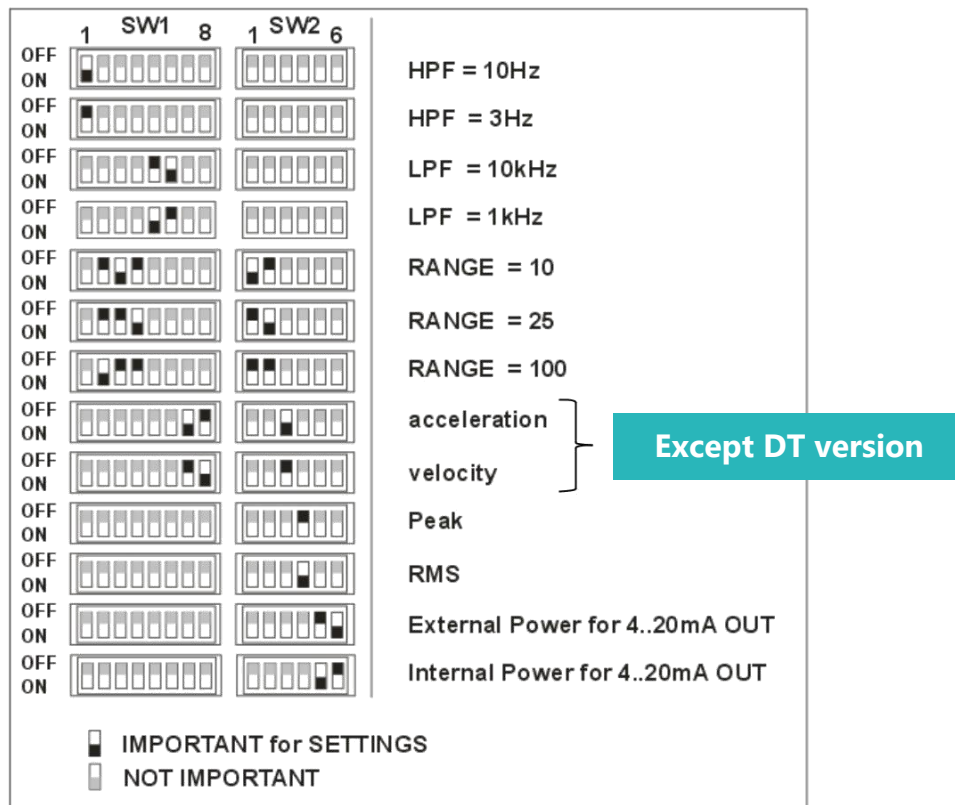
This parameter is responsible for the refresh rate of the LED display and value on 4..20 mA current output. When this parameter is set, the module has to be restarted. It is possible to change the value from 0.1 to 1 s, every 0.1 s.

## 8. Measurement parameter configuration

Measurement parameter configuration is set by proper set-up of configuration switches *SW1* and *SW2*. Description of switches *SW1* and *SW2* is presented in the following table and Figure 8-1:

**Functions of configuration switches**

SW 1	SW2
	
<p>S1 – ON, HPF = 10 Hz (OFF = 3 Hz)</p> <p>S2 – range 100</p> <p>S3 – range 10</p> <p>S4 – range 25</p> <p>S5 – DX: LPF = 1 kHz</p> <p>S6 – LPF = 10 kHz</p> <p>S7 – acceleration</p> <p>S8 – velocity</p>	<p>S1 – ON, range 10 (OFF, range 100)</p> <p>S2 – ON, range 25 (OFF, range 100)</p> <p>S3 – ON - acceleration (OFF - velocity)</p> <p>S4 – ON - RMS (OFF - PEAK)</p> <p>S5 – ON, internal power supply +24 V for 4..20 mA</p> <p>S6 – ON, external power supply for 4..20 mA</p>

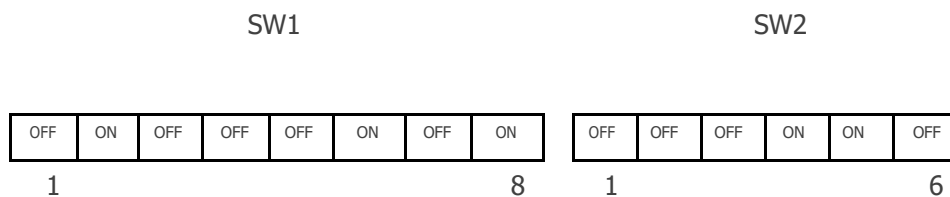


Picture 8-1 // Functions of configuration switches

**Example:**

Monitoring of the RMS of the vibration signal velocity, using 3 Hz high pass filter and 10 kHz low pass filter, for 100 mm/s range and internal power loop.

The following configuration of the switches must be set:

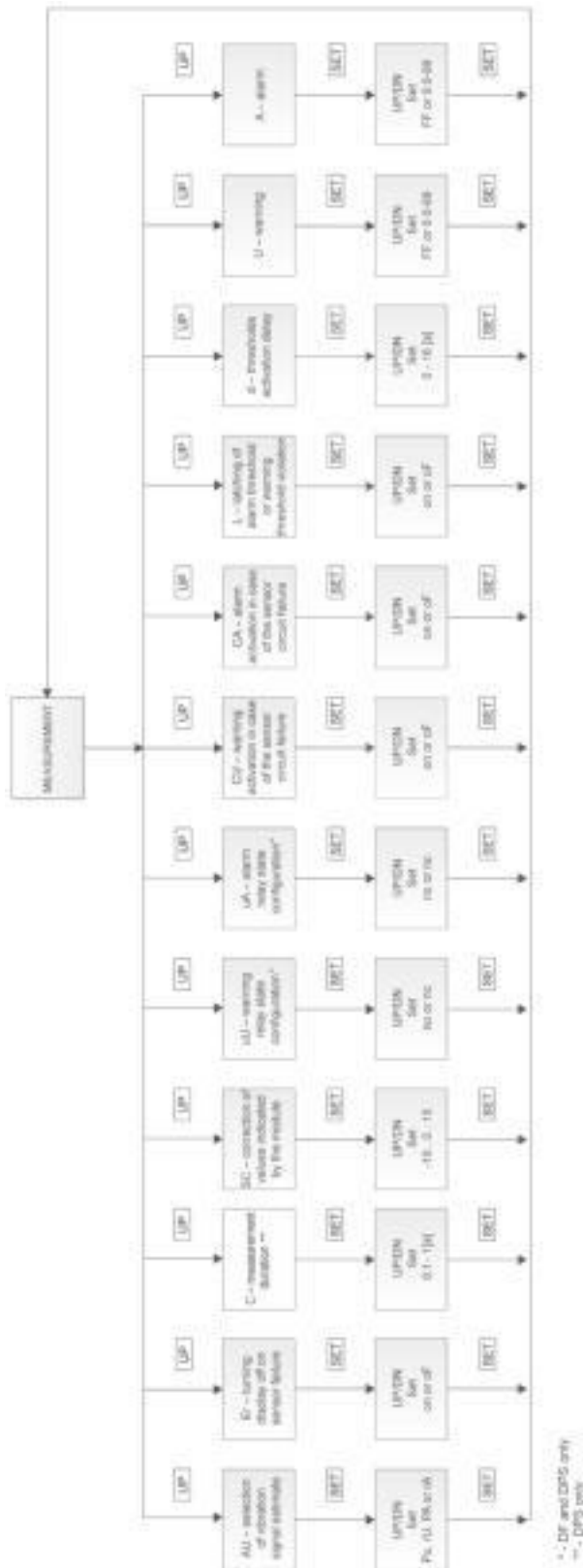


**WARNING!**

The set-up of the switches configuration should be done on a switched off device. If the set-up was done on an operating module, it needs to be restarted in order to activate the new configuration.

## 9. Menu

Graphical representation of menu structure is presented on the following figure.



**ATTENTION! In some types of AVM 1002DX modules some of the above functions are not active.**

## 10. Technical parameters

PARAMETER	VALUE
sensor type	DX: IEPE, 100 mV/g , 8 mA/20 V DT: 10 mV/°C
measured values	DX: vibration velocity, acceleration DT: temperature
types of estimates	RMS, 0-PEAK
power supply	24 VDC (18..36 VDC)
power consumption	<4 W
low-pass filter	DX: 1 and 10 kHz, 24 dB/oct., 4 <sup>th</sup> order DT: no LPF filter
high-pass filter	DX: 3 and 10 Hz, 12 dB/oct., 2 <sup>nd</sup> order DT: no HPF filter
insulation	1 kV DC (2 or 3 kV DC optionally)
current output:	2 or 3 wired 4..20 mA current loop
voltage output	AC, 10V <sub>pp</sub> max
delay	0 - 16s every 1s
alarm level	0 – 99
warning level	0 – 99
relay outputs	24 V/100 mA, NO
operating temperature	-20..+60°C
operating relative humidity	<95% RH
protection class	IP20
dimensions	23 x 100 x 120 (W x H x L)
mounting	35 mm DIN rail

## 10. Recycle

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### 10.1. Hazardous Materials

AVM 2000 devices do not use any hazardous materials outlined by RoHS. These regulations confirm that lead, mercury, cadmium, hexavalent chromium, polybrominated biphenyls, polybrominated diphenyl ether, or other battery related materials are limited to no more than trace amounts.



### 10.2. Recycling Facilities

When decommissioning out of use devices, minimize the impact of the waste created. Refer to local waste removal administration for current information on proper material collection and recycling.