EN

VIBmonitor

USER MANUAL

EC SYSTEMS

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1. Introduction

In order to ensure prompt and proper installation and commissioning of the system described in this manual, user absolutely must to read and comply with the recommendations contained therein.

1.1 Copyright

This manual, including drawings contained in it, are protected by copyright law. Copying, distributing and changing in whole or in part requires written permission EC Systems sp. z o.o.

Due to the continuous development of VIBmonitor devices, EC Systems sp. z o.o. reserves the right to modify this manual.

1.2 Configuration and handling

Installation, commissioning and operation should be entrusted to a person skilled in matters of electronics, industrial automation and measuring technology, or specially trained for this purpose. The manufacturer is not liable for any damage to the VIBmonitor equipment in part or in whole, as well as other related equipment as a result of improper use, non-use instructions described in this manual or maintenance and operation by unauthorized persons.

1.3 Symbols

NOTE!
Information marked with this sign are of particular importance to the safety of the system

1.4 Safety issues

NOTE!
Before performing the installation, module replacement, setup or wiring, switch off the system power supply.

1.5 Important recommendations

When replacing modules, the bus and signal connectors must be protected from dirt and contacts deformed.

If not all of the slots in the base plate are filled, the unused bus connector must be left free. It is unacceptable to short-circuit the terminals or attaching any devices to unused connectors in the base plate. The design of the system enables operating with as many modules as currently positioned correctly on the base plate.

System components are not resistant to aggressive cleaning agents, aerosols, alcohols and solvents. If necessary, dust can be removed with a dry brush, and larger dirt with a damp cloth.

Housings of base plate and individual modules are not resistant to environmental conditions such as moisture and dust. If installation in such an environment is necessary, the system must be equipped with appropriate housing, in the form of cabinets for automation components with an appropriate degree of protection IP.

The VM-BP6006 base plate, VM-PCS100 processing module and VM-S101 server module do not contain any internal regulatory or configuration elements, so it is prohibited to open the housing of these modules.

1.6 Electrostatic discharge

NOTE!

VIBmonitor system's components are equipped with electronic components that may be damaged by electrostatic discharge, in particular by the connector. While performing any tasks such as handling, mounting, packaging, etc. use the ESD protection.

2. VIBmonitor system

The following section presents basic information about the purpose of the VIBmonitor system. The basic version of the system (Entry Level – EL) is described in details. Chapter II.3 presents VIBmonitor system's optional extensions.

2.1 Purpose of the system

VIBmonitor is a modular, multi-channel and stand-alone system running with the machine. System through conditioning, acquisition of high-quality signals and process parameters and their continuous analysis, monitors and protects the condition of machines. With the verification of real-time data, automatic detection of a machine's state and an advanced diagnostic analysis, system successfully detects anomalies in the early stage of development and significantly reduces the number of false alarms.

Extension of the system is possible by adding or replacing hardware functional cards. VIBmonitor EL is a base version of the system, which includes: processing card, server card, and vibro card.

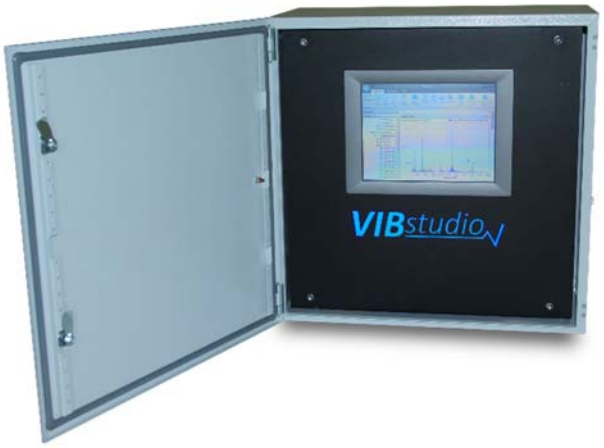
2.2 VIBmonitor EL's structure

The VIBmonitor EL (basic version) is composed of the following parts:

- Base Plate VM-BP6006,
- Processing card VM-PCS100,
- Server card VM-S101,
- Vibro card VM-V4001,

In addition, the system comes with a software tool:

- VIB monitor manager.



VIBmonitor EL system is designed for installation in boxes with IP65 standard. If the VIBmonitor system is supplied with LCD panel, box is provided with glass door (IP65) which enables the display of the data presented by the VIBmonitor manager software.

The main advantages of the VIBmonitor EL system include:

- Advanced diagnostic analysis
- Parallel processing of analog and digital signals
- The modular design
- Signaling LED panels
- Recording of historical data
- Measurement resolution of 24bit, 100kHz sampling
- Cooperation with SCADA systems

- Control of external systems
- Access from anywhere in the world (Ethernet)
- Support for Modbus and OPC

The VIBmonitor EL can be extended by functional cards and peripherals that are presented in Chapters: II.3 and II.4. The modular design of the VIBmonitor system allows any hardware configuration, which enables the creation of a system that meets the exact requirements. The following chapters present the various elements of the VIBmonitor EL system.
VIBmonitor system is part of monitoring and diagnostic platform: VIBstudio.

2.2.1 Base board

The base plate VM-BP6006 allows to connect one processing card (VM-PCS100), one server card (VM-S101) and up to six functional cards.

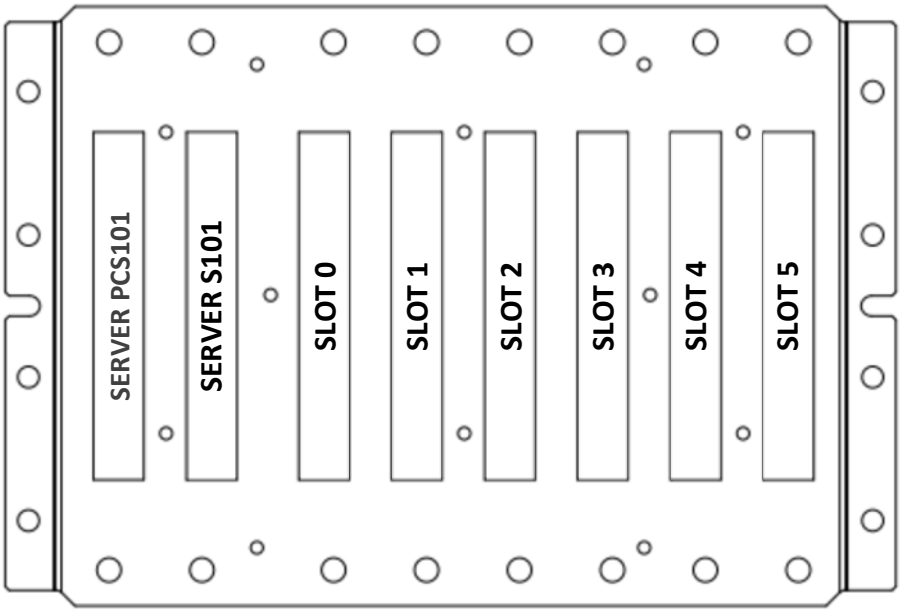


Figure 2-1 » Placement of the connectors on the base plate

Figure 2-2 » Placement of the functional cards on the base plate

VIBmonitor system can be installed on a mouting panel or on a DIN rail TS-35. Mounting on a panel is reduced to attaching the base plate by screws or bolts to the mounting panel. The method of assembling is shown in **Błąd! Nie można odnaleźć źródła odwołania.**.

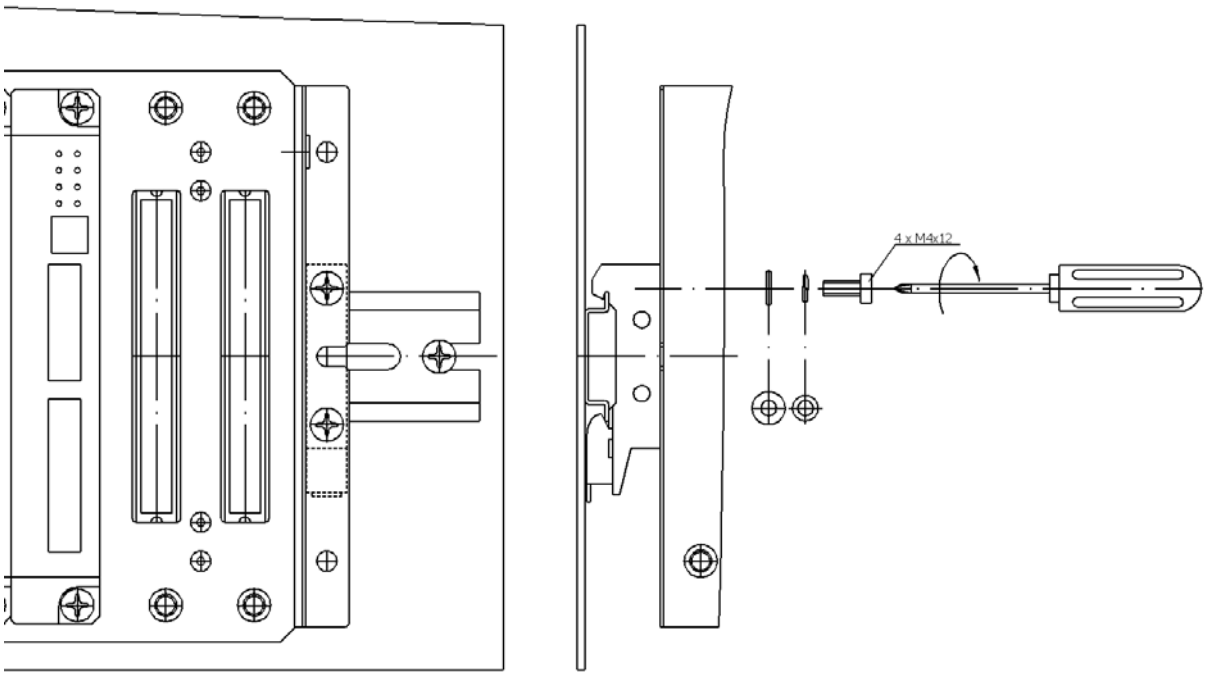


Figure 2-3 » A method of mounting on a TS-35 rail

All modules are equipped with convenient separable screw connectors. Connection of signals can be done by using wires or cables, bare or ended with gas-tight cable ends.

In order to ensure interference immunity only shielded cables should be applied to the transmission of vibration signals. Extensive sided contact needs to be Ensured between shield of the cable and the

PE potential, only near the VIBmonitor unit . The base plate must be properly grounded in order to protect the system from the impact of interference.

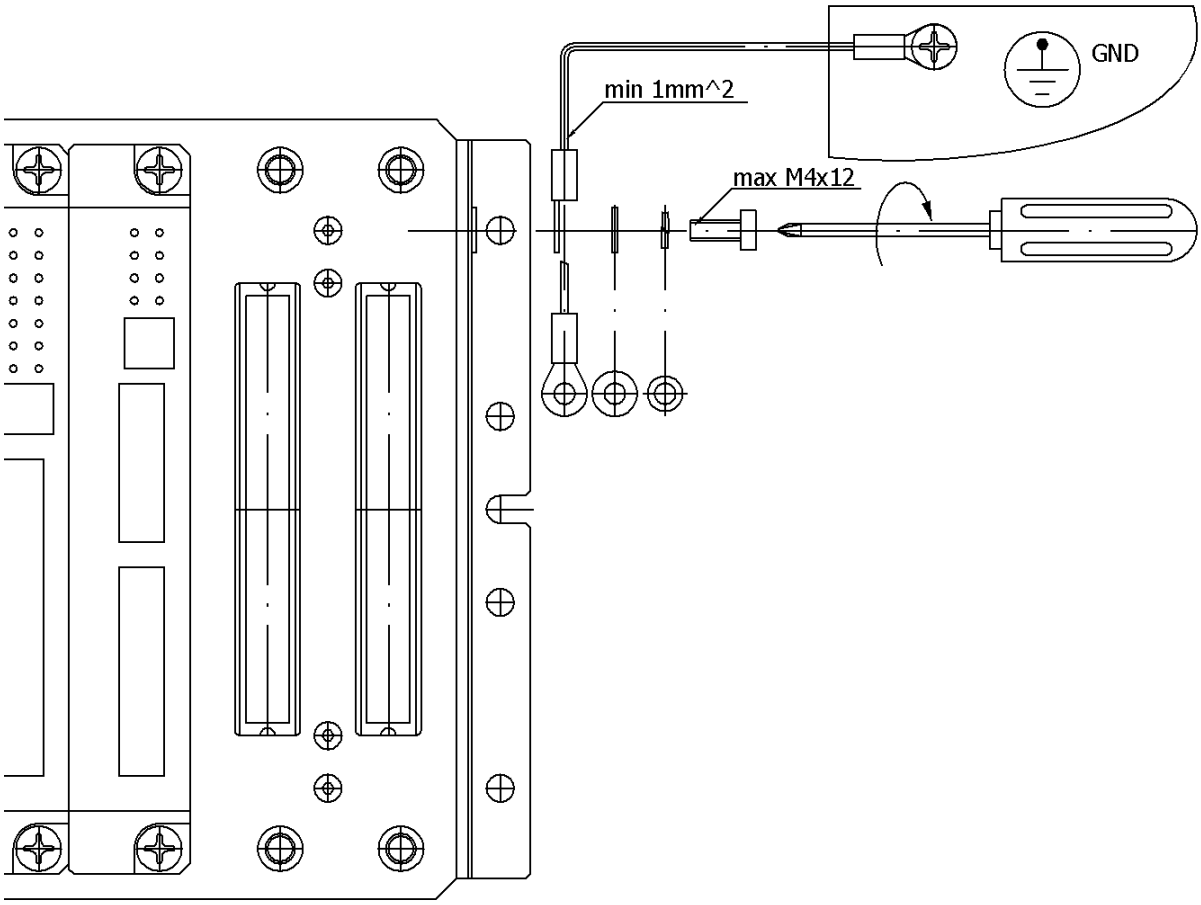


Figure 2-4 » VIBmonitor system ground

Before applying power, check for correct connections.

2.2.2 VM-PCS100 – processing module

2.2.2.1 Description

VM-PCS100 module is an industrial PC configured to management of VIBmonitor system. Allows data acquisition to the internal or external drive connected to the USB port. VM-PCS100 module also allows remote access to the measurement server VM-S101 from anywhere via the Internet. VM-PCS100 module consists of two Ethernet sockets and two USB ports which may be used to connect a keyboard, mouse or external drive.

2.2.2.2 Front panel view

Figure 2-5 » View of the front panel of the VM-PCS100 module

Individual elements of the front panel of the VM-PCS100 module are presented below:

- Power connector:
  - GND
  - PE - must be connected to PE
  - + 24V - Power
- USB
- ETH - Internet connection switch, one of the connectors must be connected to the VM-S101 server card, second connector directly to the host PC.
- LEDs:
  - ST1-ST8 - Status LEDs

2.2.2.3 Configuration

Configuration of the server card can be performed by connecting it to a PC via Ethernet. The default configuration of the server module VM-PCS100 is as follows:

IP Address……: 192.168.8.240
Subnet Mask……: 255.255.255.0
Default Gateway……..: 192.168.8.1

2.2.2.4 Communication

To the single PC may be connected multiple VIBmonitor systems. The way of correct connection is shown below.

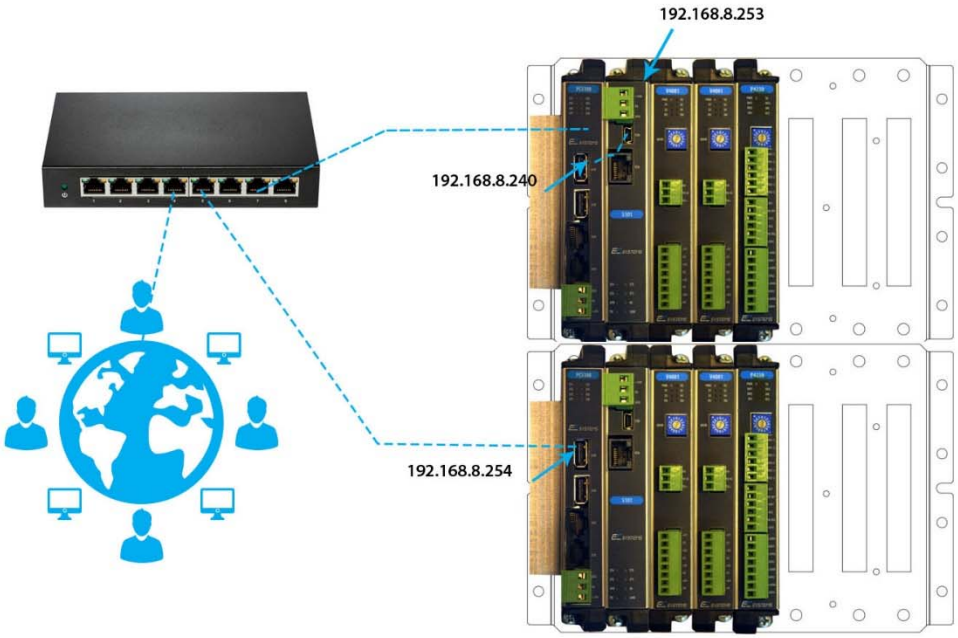


Figure 2-6 » Example of network configuration

2.2.2.5 Powering

VM-PCS100 module requires powering of 24 V DC with at least 12 W power.

NOTE!

PE conductor must be connected to the input of the EP.

2.2.2.6 Technical data

	Type of a module	VM-PCS100 – processing module
Technical Data	Processor	Intel® Atom™ Z530; 1,6 GHz
	Memory	512 MB – 1 GB DDR2
	System's drive	512 MB – 4 GB SSD
	Data disk	2 – 8 GB SATA II 3.0G
	External communication interface	Ethernet 10/100 Mb USB 2.0
	Internal communication interface	Ethernet 10/100 Mb, SATA II
	Power connector	Eurostyle terminal 5.08 mm^2
	System's bus interface	ZDIN-CM-96
	Communication connector	RJ45 connector, USB A connector
Operation Parameters	Power supply	24 VDC

	Power consumption	Max. 12 W
	Temperature range	-20..+60°C
	Humidity	<95% RH
	Protection	IP30
	Dimensions	96x147x40 (WIDTH. HIGH. DEPTH., IN MM)
Mounting	Mounting	Screws (in set) to the vm-bp6006 base plate

2.2.3 VM-S101 – server module

2.2.3.1 Description

VM-S101 module allows remote access to the VIBmonitor system, its modules, their configuration and reading the collected data from anywhere using the Internet. VM-S101 module must be configured via Ethernet before using the system. After powering, a server is seen by two seconds at 192.168.8.253, at this time one can give it a new network address. After assigning of the network address, the server is reachable at this address; if within 15 seconds it does not receive any command from the PC, the default network address will be restored and the cycle will repeat until the server receives a command to execute.

The module also has an internal power supply, to supply other system modules VIBmonitor.

2.2.3.2 Front panel view

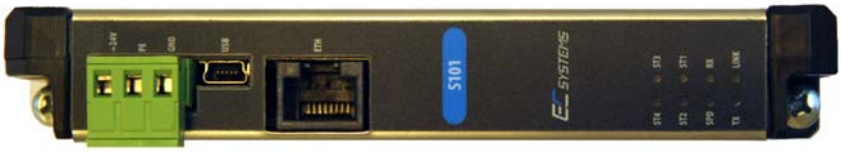


Figure 2-7 » View of the front panel of the VM-S101 module

Individual elements of the front panel of the module VM-S101 are presented below:

- Power connector:
  - GND,
  - PE - must be connected to PE,
  - + 24V - power,
- USB - used only for the initial configuration,
- ETH - Internet connection, connect to an external switch, directly to a PC or to a processing module VM-PCS100,
- LEDs
  - LINK - Link Ethernet
  - TX - Data transmission,
  - RX - receive data,

› SPD - speed transmission,
› ST1 - ST4 module status LEDs.

2.2.3.3 Powering

VM-S101 module requires powering of 24VDC ± 1%. Server card also enables powering of the extension cards; therefore it is important to calculate the total power consumption of the system when the selecting of the power supply.

2.2.3.4 Technical data

	Module type	VM-S101 – server module
Technical data	No. of supported modules	6
	Processor	FPGA
	Memory	32 MB SDRAM
	External communication interface	Ethernet 10/100 Mb USB 1.0
	Internal communication interface	RS485, SPI
	Power connector	Eurostyle terminal 5.08 mm2
	System's bus interface	ZDIN-CM-94
	Communication connector	RJ45, mini USB
Operational Parameters	Power supply	24 VDC
	Power consumption	max. 4 W
	Temperature range	-20..+60°C
	Humidity	<95% RH
	Protection	IP30
	Dimensions	96x147x23 (WIDTH. HIGH. DEPTH., IN MM)
Mounting	Mounting	Screws (in set) to the vm-bp6006 base plate

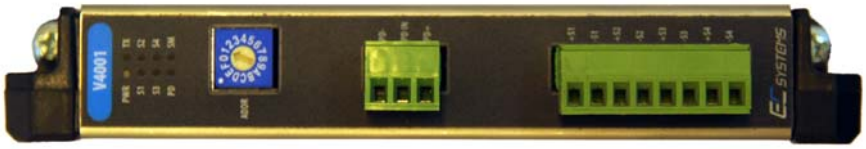
2.2.4 VM-V4001 – vibro card

2.2.4.1 Description

VM-V4001 module contains 4 input channels, enabling:

- conditioning of IEPE type signals,
- the ability to amplify the signal (20 dB),
- phase marker input.

2.2.4.2 Module view



Rysunek 2-8 » View of the front panel of the VM-V4001 module

Individual elements of the front panel of the VM-V4001 module are presented below:

- LEDs:
  - PWR - indicates the presence of power
  - TX - module <-> server transmission,
  - S1 to S4 - the status of the analog inputs:
    - LED blinking - no sensor (OPEN)
    - LED continuous light - short-channel (SHORT)
    - LED is not lit - the sensor is connected,
  - PD - phase marker,
- ADDR – enables setting address, depending on the number of the slot where the card has been installed,
- Phase marker connector:
  - PD-phase marker (GND)
  - PDIN - phase marker input,
  - PD + - power output of the phase marker (+24V),
- Analog Input connector:
  - + S1 + S4 - hot wire of vibration sensor,
  - S1 to S4 for - cold wire of vibration sensor.

2.2.4.3 Configuration

VM-V4001 module has an phase marker input, which can be configured as NPN or PNP. Configuration is done by the manufacturer. The user is obliged to specify the module operating type: NPN or PNP.

Note!

One need to set the correct address for each module depending on the slot number position in the base plate. Slots must be occupied in turn starting with the slot 0 . The VM-V4001 cards should be placed closest to server card. Optional cards should be placed after VM-4001 cards.

2.2.4.4 The parameters of the measuring path

Name of the parameter	Value
Gain	x1, x2, x5, x10
Sensor power supply	4mA, 20VDC
FGP filter cutoff frequency	0.16Hz
FDP filter cutoff frequency	12kHz

2.2.4.5 How to connect IEPE sensors

The module consists of 4 input channels, designed for use with IEPE type vibration sensors. During installation, pay the particular attention to the power plug polarity. To connect the sensor with VM-V4001 card twisted pair cable should be used in the shield. The shield should be tucked into the PE potentials at one point. Example of connecting the sensor to the module is shown in the figure below.

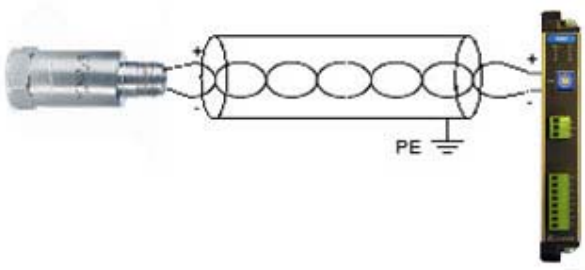
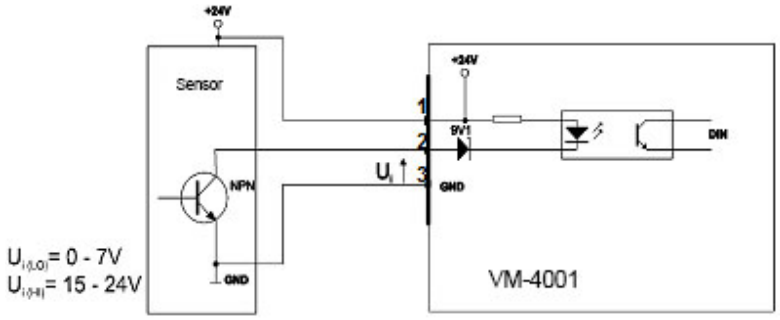


Figure 2-9 » How to connect the IEPE sensor

2.2.4.6 Phase marker input

Phase marker's input is connected with 4 vibration input channels. It can be configured as NPN or PNP (active high or low). The connection schemes for both NPN and PNP configurations are shown in the following figures.



Rysunek 2-10 » Configuration NPN

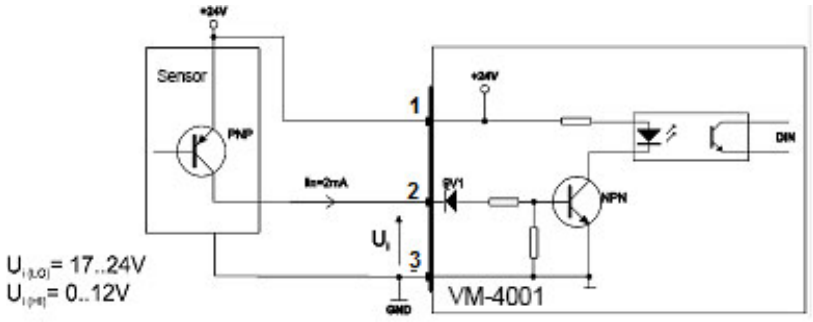


Figure 2-11» Configuration PNP

NOTE!
Shorted power supply outputs of phase marker (pin 1 and pin 3) may cause permanent damage to the module and the system.

2.2.4.7 Technical data

	Module type	VM-V4001 – vibro card
Technical Data	Vibration sensors input type	IEPE (24V DC 4.0 mA)
	No. Of channels	4
	Gain	x1, x2, x5, x10
	High pass filter	0.16 Hz, 12 dB/oct.
	Low pass filter	12 kHz, 24 dB/oct.
	Input status	OPEN, SHORT, OK
	Channels auto-calibration	Yes
	Type of a/d converter	delta-sigma
	Sampling frequency	25kHz, 50kHz or 100kHz
	Resolution	24 bit
	Internal communication interface	RS485, SPI
	Sensor input connector	Eurostyle terminal 3.81 mm^2
	Phase marker input connector	Eurostyle terminal 3.81 mm^2
	System's bus interface	ZDIN-CM-64
Operating Data	Power supply	24 VDC, via VM-S101 module
	Power consumption	max. 6 W
	Temperature range	-20..+60°C
	Humidity	<95% RH
	Protection	IP30
	Dimensions	96x147x23 (WIDTH. HIGH. DEPTH., IN MM)
Mounting	Mounting	Screws (in set) to the vm-bp6006 base plate

2.2.5 VIBmonitor manager – software

2.3 Extensions of VIBmonitor system – functional cards

This section provides the information about possible extensions (functional cards) of VIBmonitor system.

2.3.1 VM-V4001 – vibro card

Additional VM-V4001 vibro card contains four vibro inputs:

- Input Type: IEPE (ICP),
- Resolution: 24bit,
- Sampling frequency: 25,50,100kHz,
- Parallel Processing,
- 1x phase marker.

The detailed specification is shown in chapter 2.2.4.

2.3.2 VM-P4230 – process values module

2.3.2.1 Description

The card contains:

- 4x analog input:
  - 0-10 mA or 4-20 mA industrial standard,
  - resolution of 16bit,
  - sampling frequency of 1kHz,
  - parallel processing,
- 2x digital input:
  - 24VDC OC,
- 3x relay output:
  - contact load 24VDC, 100mA NO (NC).

Dodac tutaj kartę AR wg schematu jak wyżej

2.3.2.2 Module view

Figure 2-12 » The front panel of the VM-P4230 module

- LEDs:
  - PWR - indicates the presence of power,
  - TX - module <-> server transmission,
  - DO1 to DO3 - the status of the digital outputs,
  - DI1 to DI2 - the status of digital inputs,
- ADDR - enables setting address, depending on the number of the slot where the card has been installed,
- Digital output connectors to control the relays:
  - DO1-1 to DO3-1 - hot wire,
  - DO1-2 to DO3-2 - neutral wire,
  - relay outputs are characterized by the following parameters:
    - 36V - Maximum voltage between DOx-1 and DOx-2,
    - 120mA - the maximum load current,
    - 16Ω - maximum resistance,
- Dual state digital input connector:
  - -DI1 and -DI2 - cold potential connector,
  - IN-DI1 and DI2-IN - digital signal input,
  - + DI1 and DI2 + - hot potential connector,
  - the parameters:
    - 2 - digital inputs,
    - npn, pnp - Operating mode
    - 24VDC - the maximum voltage between + DIx and -Dix,
- Analog Input connectors:
  - + AIN1 to + AIN4 - positive analog input,
  - -AIN1 to -AIN4 - negative analog input,
  - the parameters of the analog inputs:
    - 4-20mA - current input
    - 0-10 VDC - voltage input.

2.3.2.3 Configuration

Configuration is done by the manufacturer. The user is obliged to specify the module operating type, according to the formula shown below.

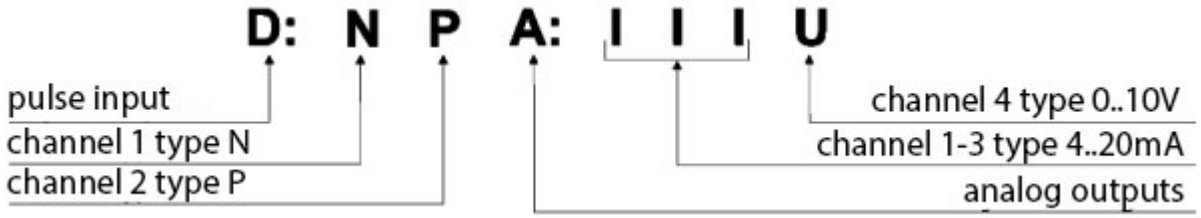
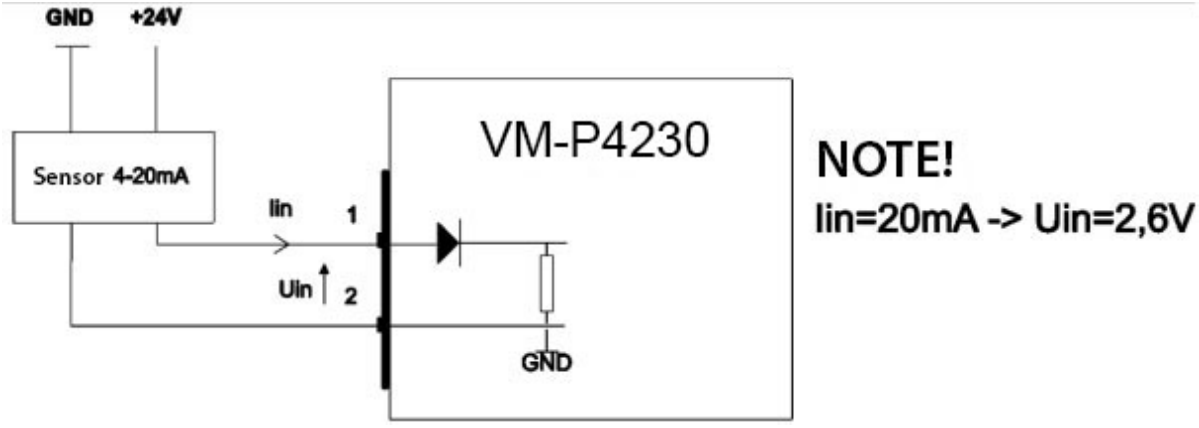


Figure 2-13 » Method of marking module configuration

Module VM-P4200 has digital inputs that can operate as an impulse ones. It can be configured as NPN or PNP, relay outputs and analog inputs that can be configured as current (I) or voltage (U) source/sink(?).

2.3.2.4 Analog input

The 4..20mA input is protected against short circuit and the device is able to detect open-circuit. The figure below is an example of connecting the transmitter to the 4..20mA input.



Rysunek 2-14 » Example of connecting the transmitter to the 4..20mA input

2.3.2.5 Digital input

These inputs are designed to work with voltage in the range of 0..24 V DC. Examples of connection of proximity sensors with NPN output and PNP are located respectively in the figures below.

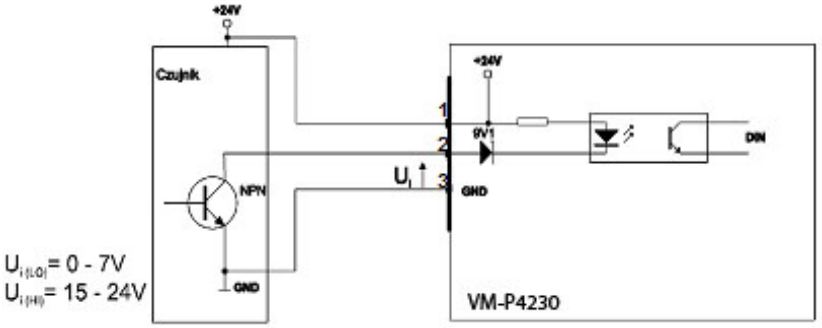


Figure 2-15 » Configuration NPN

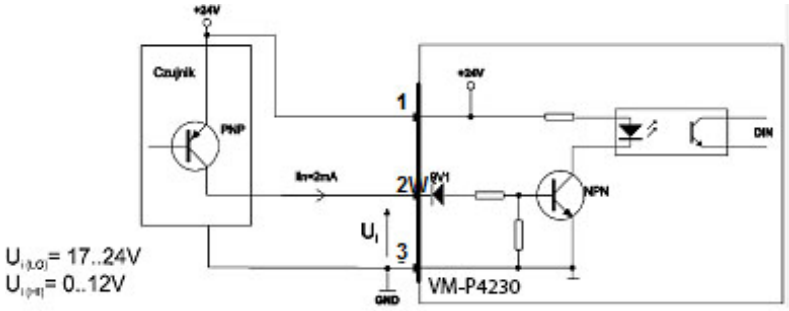


Figure 2-16 » Configuration PNP

NOTE!

Shorted power supply outputs of phase marker (pin 1 and pin 3 or pin 4 and pin 6) may cause permanent damage to the module and the system.

2.3.2.6 Digital output

Module VM-P4230 allows the connection of up to three relays. The relay should be attached as shown below.

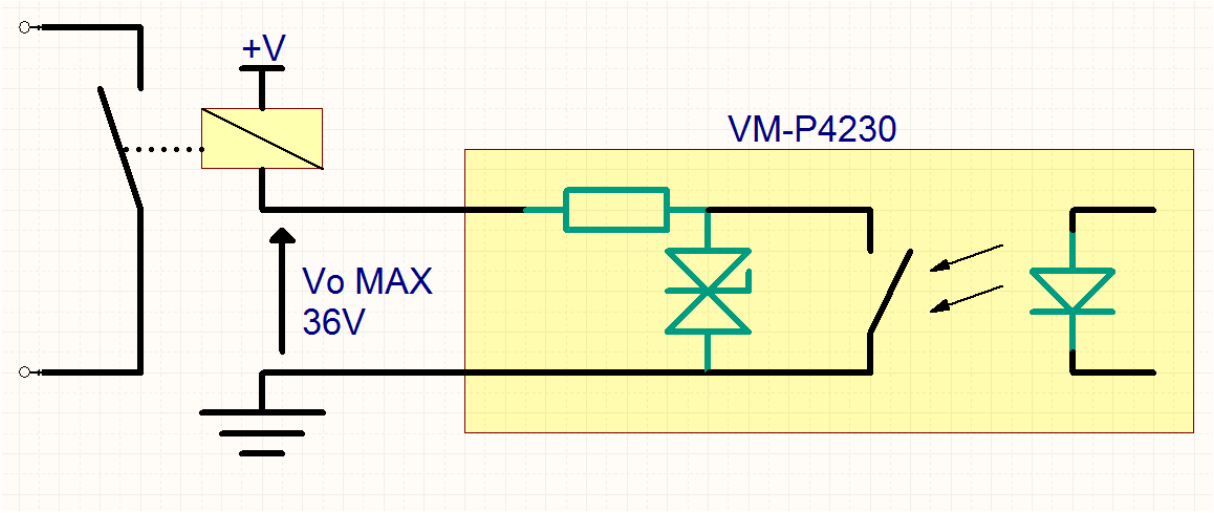


Figure 2-17 » Example connection of digital outputs

2.3.2.7 Technical data

	Module type	VM-P4230 – process values module
Analog inputs	No. of analog input channels	4
	Analog channels types	configurable 0..10V, 4..20mA
	Sampling frequency	1000 Hz
	Resolution	16 bit
	A/D converter	SAR
	Anti-aliasing filter	yes
	Input status	OK, out of range
Digital inputs	No. of digital input channels	2
	Digital channels types	OC 24V DC (configurable NPN, PNP)
Digital outputs	No. of digital output channels	3
	Maximum operating voltage	36VDC
	Maximum load current	120mA
	System's bus interface	ZDIN-CM-64
Operating parameters	Power supply	24 VDC, via VM-S101 module
	Power consumption	max. 2,5W
	Temperature range	-20..+60°C
	Humidity	<95% RH
	Protection	IP30
	Dimensions	96x147x23 (WIDTH. HIGH. DEPTH., IN MM)
	Mounting	Screws (in set) to the vm-bp6006 base plate

2.3.3 VM-AR480 – ANDout card

A card containing:

- 4 x 4-20 mA output,
- 8 x relay output:
  - contact load: 24VDC, 100mA NO / NC.

2.3.3.1 Technical data

	Type Of Module	VM-AR480 – ANDout Card
Analog Outputs	No. Of Analog Channels	4
	Type Of Analog Channels	4..20ma
	Sampling Frequency	1000 Hz
	Resolution	16 Bit
Digital Outputs	No. Of Digital Channels	8
	Maximum Working Voltage	30 V DC
	Maximum Load Current	100 Ma/2A
Operating Parameters	Power supply	24 V DC
	Power Consumption	45 W
	Temperature Range	-20..+60°c
	Humidity	<95% RH
	Protection	IP30
	Dimensions	96x147x23 (WIDTH. HIGH. DEPTH., IN MM)
	Mounting	Screws (In Set) To The Vm-Bp6006 Base Plate

2.3.3.2 Configuration

Configuration is done by the manufacturer. The user is required to specify the operation type of the module, according to the formula, as shown below.

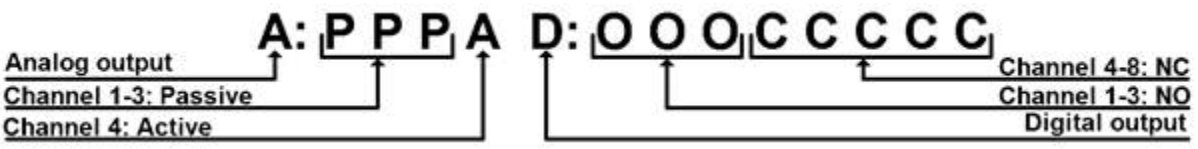


Figure 2-18 » Method of marking the modules configuration

VM-AR480 module is provided with analog outputs that can be active or passive. In the first case, channels are powered by VM-AR480 card, in the second case the power supply must be supplied externally between terminals +24 V and GND of each channel.

If one configure more than one channel as active, outputs "GND" of individual channels are at the same potential, the same is true for the outputs marked "+24 V".

2.3.4 GSM card

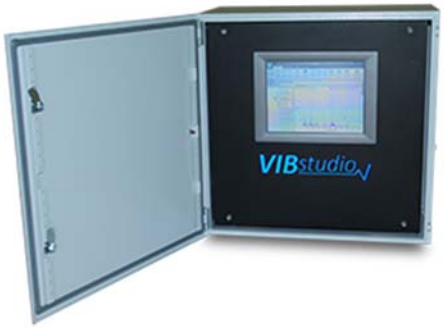
This card allows for remote access to the system using GSM technology. Module is responsible for sending messages by e-mail/mobile phone/android application.

The module allows one to send status notifications(based on the information on the LCD panel) to mobile phone (through an application or e-mail or text).

2.4 Extensions of VIBmonitor system – peripheral devices

This (the following) section provides the information about possible peripheral extensions of VIBmonitor system.

2.4.1 TPC-1271H – LCD panel



TFT LCD LED 12.1' touch panel is compatible with IP65. The panel allows one to display the visualization of vibration estimates presented in the VIBmonitor manager software:

- RMS,
- PP,
- Kurtosis,
- RMS envelope (Envelope RMS).

Additionally, the panel allows one to visualize the settings and exceeding of alert thresholds. It is also possible to configure:

- Level of alarm thresholds (warning, alarm),
- State of relay outputs (with respect to the thresholds).

2.4.1.1 Technical data

Technical parameters are included in the accompanying specification of the module.

2.4.2 VIBair SB

The module enabling connectivity to wireless sensors (VIBair) and their integration with VIBmonitor system.

2.4.3 VIBair – sensor

Wireless vibration sensor is compatible with VIBmonitor by VIBair SB module. The basic specification of the VIBair sensor is as follows:

- 1(2) directions of vibration measurement,
- Frequency: 10kHz,
- Built-in analysis:
  - aRMS,
  - aPEAK,
  - Crest Factor,
  - VRMS,
  - Envelope RMS,
  - FFT,
- Temperature measurement.

2.5 Powering the system

VIBmonitor system requires power supply of 24 V DC. Power supply should be connected only to the processing module and server module. Other parts are powered by internal bus interface. It is necessary to provide noise-free power supply. It is most preferred to use a separate power supply only for the VIBmonitor system. In particular, avoid common circuit with power contactors and relays. Use a miniature circuit breaker 2A characteristic C.

2.6 Mounting of the VIBmonitor system

The choice of a system's installation place is important. Avoid direct neighborhood of devices - generating electromagnetic interference, in particular, inverters, commutator motors, contactors and relays, as well as power cables of medium and high voltage. Prior to installation, check the system for signs of damage and whether it is complete. System after installation looks like in the figure below.

2.7 Use and operation

A properly configured and connected system is designed for continuous, unattended operation. We recommend periodic review of the system once a year by an employee of EC Systems.

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