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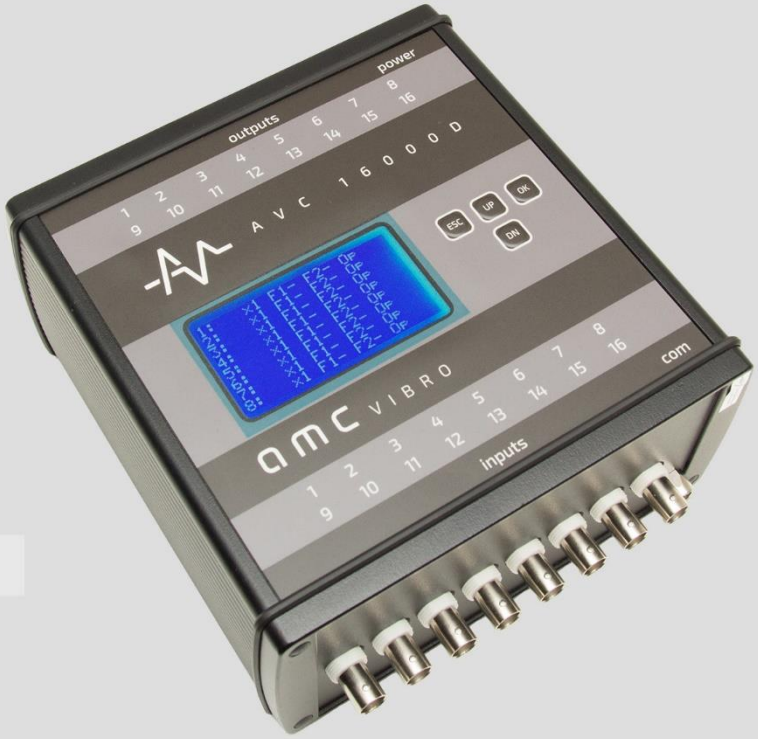

AV CONDITIONER 16000D

8 OR 16 CHANNEL CONDITIONER

USER MANUAL

2018

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1. Introduction

AV CONDITIONER 16000D (AVC 16000D) device was designed to generate and acquisite resilient waves which may be used to research of the states of any object. The operation is based on generation of lambda wave packages and reception of the reflected response signal that contains information about the structure of plates and allows detecting any kind of damages. Whole process is carried out by piezoelectric elements that is the most important part of the device. Received, response signal, after the digitization, is transferred to the PC through USB, where data can be analyzed and displayed in Matlab environment.

AVC 16000D can be part of measuring array system consisting of up to 3 synchronized sensors, that guarantees higher precision and accuracy. The correct operation of this system required a special software that provides the synchronization of the measurement start. Lack of the appropriate synchronization may be a source of errors and noise.

2. Technical data

Parameters	
Power supply	230AVC, 50/60 Hz,
Communication interface	USB
Software environment	LabVIEW
Dimensions	Rack 19”, 2 U
Number of receive channels	7 or 8
Number of transmit channels	0 or 1
Output voltage	1V – 100V
Frequency of lambda wave	10 – 500 kHz
Number of periods in package	1 – 16
Lambda wave modulation	hamming, triangular, rectangular window
Delay between two subsequent packages	0,1 – 1000 us
Maximum amplifier output voltage	200 Vpp
Regulation of receiver amplifier gain	100%, 50%, 20%, 10%, 5%, 2%, 1%
Maximum sampling frequency	2MHz
Measure time	5 – 1000 ms

3. Installation

The dimensions of AVC 16000D device are adopted to fit 19" rail of the standard Rack with height of 2U.

Electrical connections to AVC 16000D consist of 8 measuring channels ports: 8 input or 7 input and 1 output, and USB socket. All of them are located on the front panel. The rear panel has the power supply port and the synchronization port. Additionally, on the front panel there are diodes indicating the state of the device and the fan intake located on the rear panel.

Installing AVC 16000D inside an industry Rack cabinet, it is necessary to provide access to both panels: front (for easy plug-in and plug-out of piezoelements and connection of USB cable) and rear (for connection of power supply and freely airflow).

3.1. Mechanical description

» **Front panel**

Description of the front panel:

- **Monitor** – output of the preamplifier, connector: BNC,
- **Piezo** – piezo plug-in port, connector: SMA,
- **Active** – state of the measurement, diode indicates which channel is selected to acquisition,
- **Output** – output of the high-voltage amplifier, connector: SMA,
- **USB socket.**

» **Rear panel**

Description of the rear panel:

- Connection of the external trigger, connector: BNC,
- Port for synchronization signal,
- Power switch,
- Power supply connector with 1A time-lag fuse under the socket,
- Grounded connector, 4mm banana socket,
- Fan intake.

» **Location of connectors**

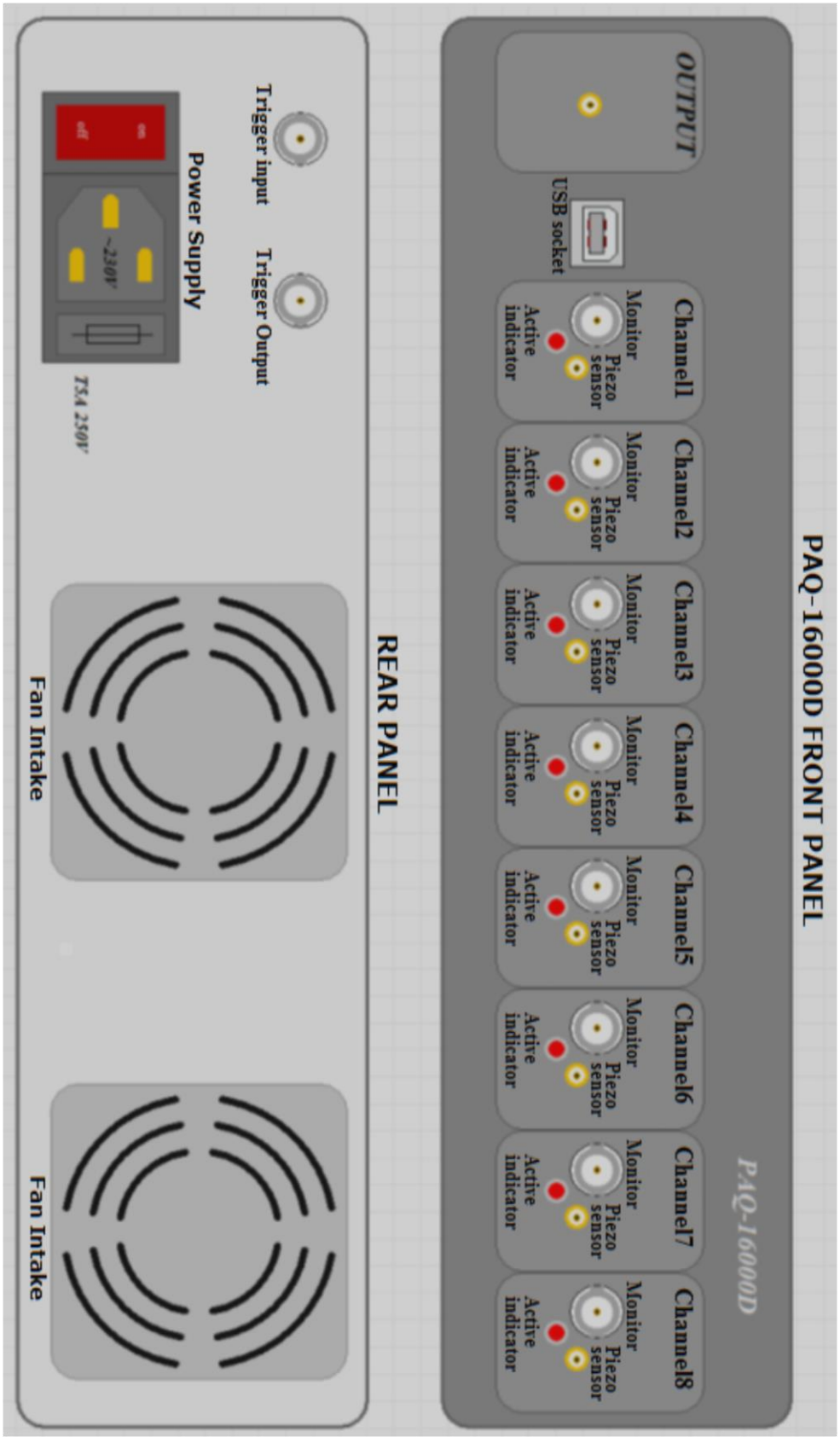

Figure 3.1 Front panel and rear panel

3.2. Electrical description

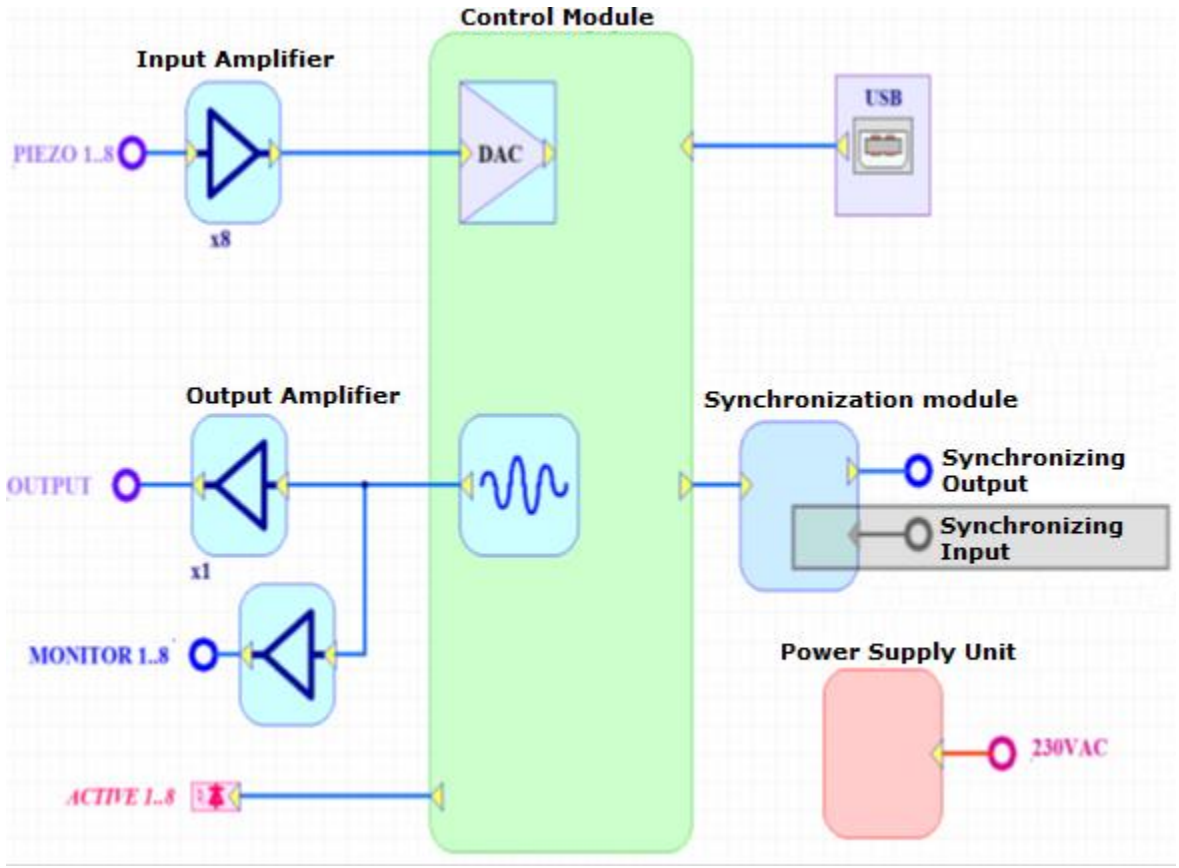

Figure 3.2 AVC 16000D Block diagram

AVC 16000D device has a modular structure and consists of the following key components: input/output amplifiers, power supply unit, control module and synchronization module that provides additional trigger signal.

Communication between AVC 16000D and the PC is held by USB interface and a dedicated application for LabVIEW environment. Due to the number of test samples during measurement it is not possible to transfer all the data directly to the PC. Because of this, after completing the whole procedure data are sent to the PC via USB and saved in a format described in the software user manual.

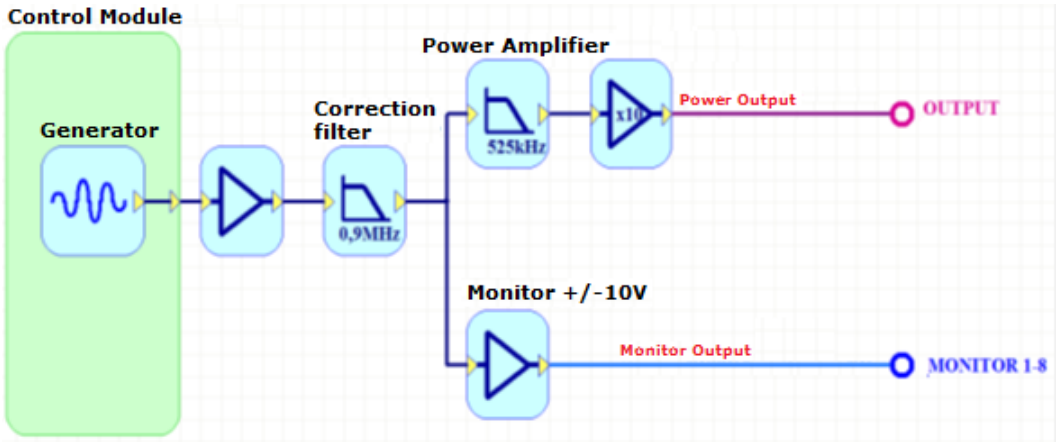

Figure 3.3 Block diagram of the transmit path

One of the main feature of the AVC 16000D device is the possibility to regulate most parameters including: frequency, amplitude and envelope of generated signal.

Signal generated in the control module is amplified by the power amplifier and filtered by the 0,9Mhz correction low-pass filter. Then signal is distributed to two paths: output (piezoelectric element) and monitor. The output signal is fed to the 525kHz low-pass filter and then to the power amplifier with the gain of 10. Maximum amplitude of the output signal is 100V.

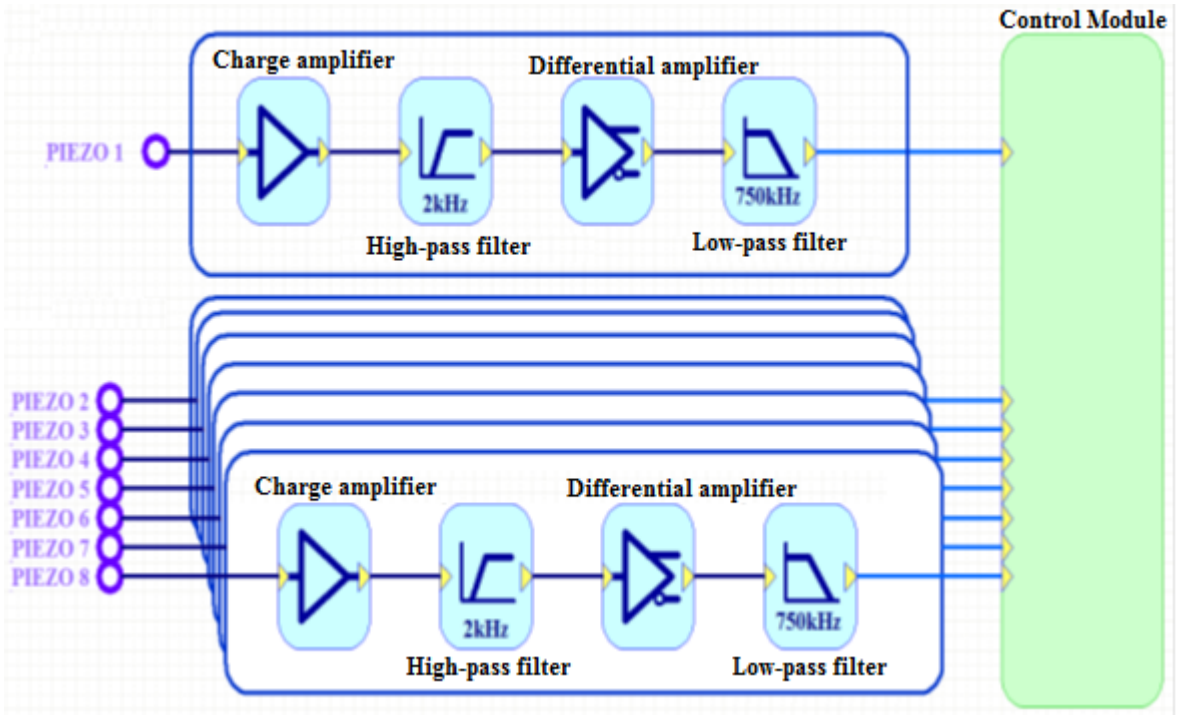

Figure 3.4 Block diagram of the receive path

Maximum analog-to-digital sample rate is 2Mbps with 25bit resolution. The AD converter has the built-in anti-aliasing filter and allows choosing appropriate measuring range (span). Each measuring channel has bandwidth of 10 to 500kHz. Synchronization and trigger unit allows AVC 16000D to operate

synchronously with other sensors with optional external trigger on the falling edge. The maximal amplitude of external trigger is limited to 10V.

Input levels:	Minimum voltage	Maximum voltage
LOW (0)	-	0.8 V
High (1)	2.5 V	-

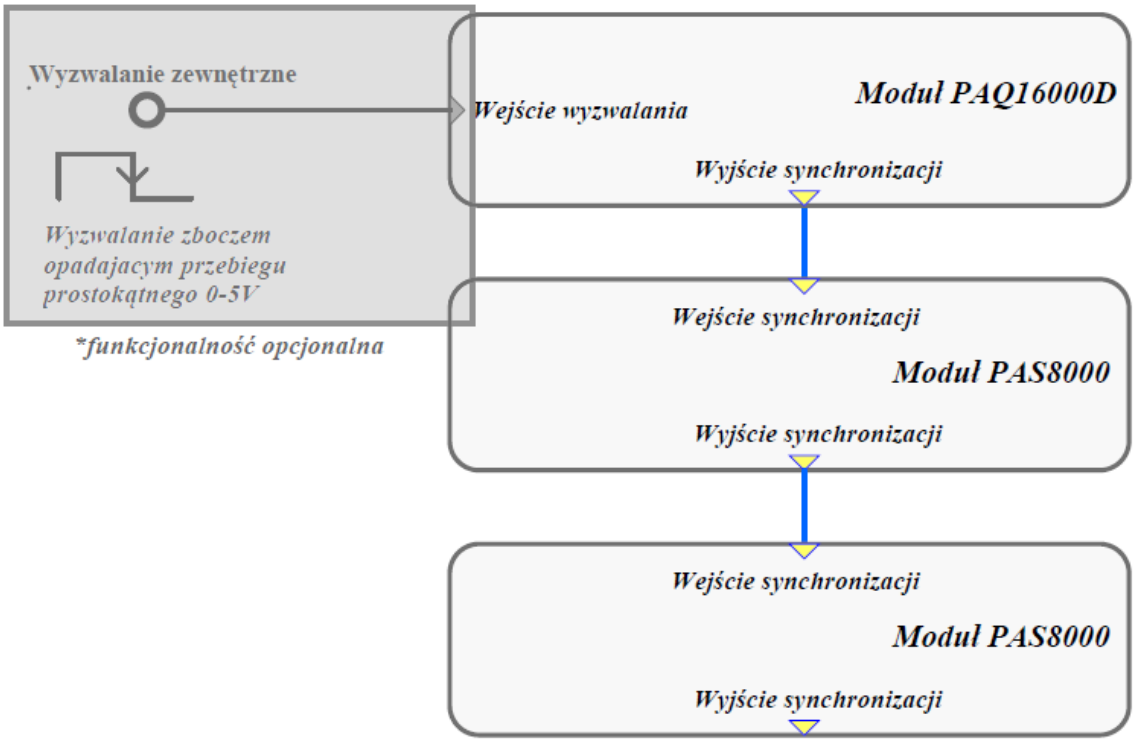

Figure 3.5 Connection schematic of synchronized devices

3.3. Operating and use

The order of steps while using the device AVC 16000D is as following:

» **Connection to the PC**

Data are exchanged between AVC 16000D and the PC through USB. For a proper operation it is recommenced to connect the device prior to starting the PC. For the detailed description of installation please refer to user manuals of the AVC 1600-D and AVC 8000 software.

- Connect the USB cable
- Install all the drivers
- Start the program for using AVC 16000D.

After execution of the above instructions the device is ready for work.

» **Connection of piezoelectric elements**

The measuring set consists of 8 piezoelectric elements (maximum number for one AVC 16000D device) with soldered supplying wiring and the SMA connector. In order to run the experiment, at first all required sensors must be connected to the SMA sockets located on the front panel and piezoelements must be attached to plates using glue or wax. If the investigated plate is conductor, it is necessary to equalize its electrical potential with the AVC 16000D device.

» **Parameters configuration, measurement and data gathering**

Setting and operation of AVC 16000D device are describe in detail in the software documentation for the AVC 16000D and AVC 8000 device.

» **Finalizing the work**

Turning off the AVC 16000D should be performed when the device is in the IDLE state. The power supply is disconnected when the position of switch is changed from "ON" to "OFF". Re-launching of the device may be performed without resetting of the PC.

4. Safety precaution

Please, take head of the following general warnings:

WARNING!

The device is powered by high voltage source. There is the must to check the proper supplying voltage – switch on the rear panel.

WARNING!

The device generates the high-voltage output impulse – please, pay the attention during the operation of the device

WARNING!

Piezoelectric elements must be installed on the isolated and separated area.

During distribution of piezoelements on the metal plates one cannot short circuit the supplying wires of piezoelement with the tested object.

5. Accessories

The AVC 16000D set consists of:

- AVC 16000Q - Device for generation and acquisition of the elastic waves
- Software for AVC 16000D/AVC 8000
- User manual
- Power supply cable
- USB cable

6. Recycle

6.1. Hazardous Materials

AVC 16000D system does 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.

6.2. 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.