



ADL M20

art. _____

Vibrometer with temperature measurement function

**OPERATION MANUAL
combined with a PASSPORT**

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INTRODUCTION

The operation manual combined with the passport is intended to acquaint users with the description and operation, intended use, completeness, maintenance and repair, storage, transportation, disposal, certificate of acceptance, and manufacturer's warranty on the vibrometer with temperature measurement function ADL M20, then the device, or vibrometer.

We recommend that technical personnel approved to work with the vibrometer have special training in the field of vibration control and diagnostics of machines in accordance with ISO 10816-1: 2007.

1. DESCRIPTION AND WORK


1.1 Purpose of the product

ADL M20 - is a portable diagnostic device that allows you to perform rapid diagnostics of vibration and thermal state of various industrial equipment.

According to ISO 10816-1: 2007 the device allows to carry out measurements and control of vibration on root-mean-square value of vibration velocity, vibration acceleration peak, and vibration displacement. A separate advantage is the ability to determine the thermal state of the object of control.

The main areas of application of the device are operational control of the mechanical and thermal condition of the equipment during operation, repairs, and maintenance. Diagnosis of bearings, gears, turbines, generators, fans, pumps, electric motors, various rotors, structures in general, and their individual elements.

The advantages of using this device are:

- versatility - measurement of vibration and temperature parameters;
- compactness;
- ease of use - measurement of vibration and temperature is carried out at the touch of a button;
- speed of measurements;
- fast change of measurement parameter;
- wireless transmission of measurement data via Wi-Fi;
- the ability to link through software (software) to control points for QR tags; 
- the bright screen allows to carry out measurements in the conditions of low illumination;
- Ability to quickly charge the battery from a standard USB charger.

1.2 Technical specifications

Technical characteristics are presented in table 1.

Table 1

Parameter	Value
RMS value of vibration velocity	0,01 - 200 mm/s
Peak value of vibration acceleration	0,1 - 200 m/s ²
The scope of vibration displacement	1 - 2000 μm
Relative error	± 5 %
Operating frequency range	10 – 1000 Hz
Temperature measurement range	from -20 to +200 °C
Accuracy of temperature measurement	0,5 °C
Display type and size	OLED, 0.96"/128×64 mm
Li-Pol battery	3.7 V, 600 mAh
Connector	micro-USB or USB-C
Compatibility	Android, iOS
Wireless communication module Bluetooth Low Energy (BLE)	Up to 10 m
Continuous operation time	8 hours
Environmental conditions: - temperature - relative humidity	0 - 55 °C <85 %
Degree of protection	IP54
Overall dimensions (W × D × H)	170 × 36 × 20 mm
Weight	100 g

1.3 Construction and operation

1.3.1 The general view of the device is shown in Figure 1.1.

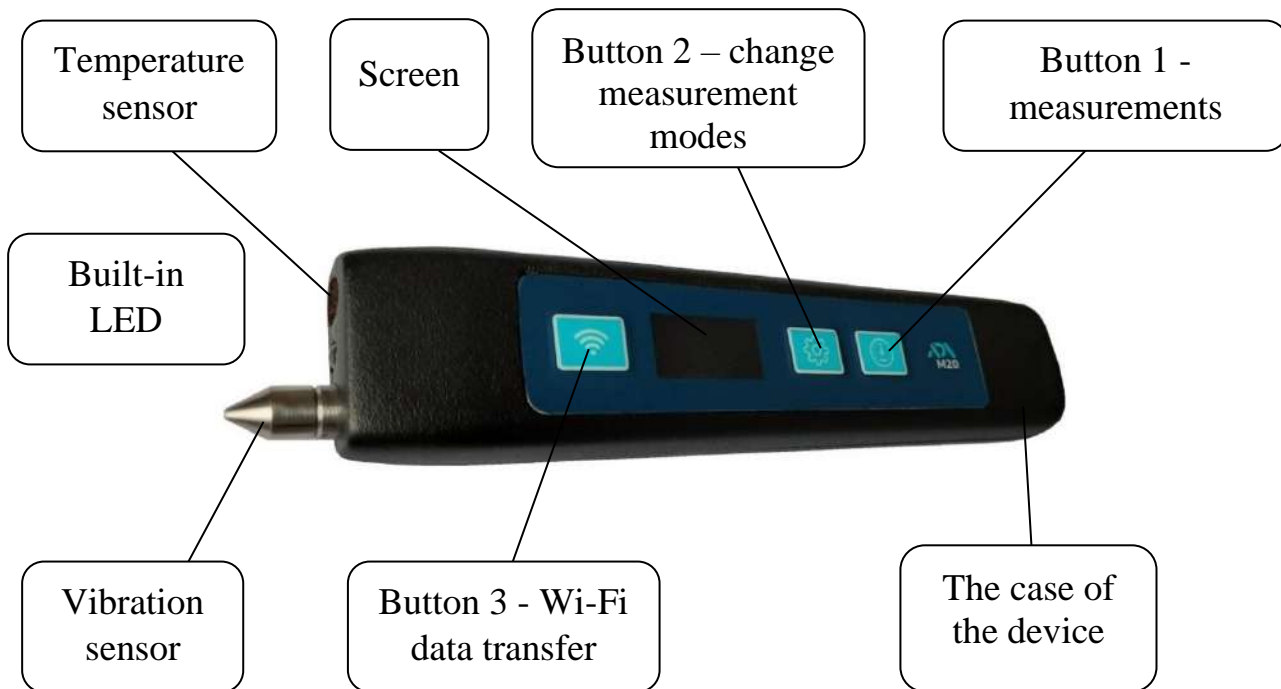





Figure 1.1 - General view of the device

1.3.2 Operation of the device.

Button 1  - a short press of the button turns on the device, holding the button allows you to take measurements.


Button 2  - short press of the button allows you to select the desired measurement parameter: vibration speed, vibration acceleration, range, or temperature. A long press of the button for more than 5 seconds turns on the flashlight, to turn off the flashlight you need to press button 2 again for more than 5 seconds.

Button 3  - You can use this button to turn on wireless data. Measurement data will be transmitted according to 4 parameters: the root-mean-square value of vibration velocity (mm / s), vibration acceleration peak (m / s^2), vibration displacement (μm), and temperature ($^{\circ}C$).

To work with the device, press the vibration sensor to the surface under test and press button 1 (Fig. 1.1). The vibration and thermal condition of the surface under test will appear on the screen of the instrument. Button 2 (Fig. 1.1) you can switch the measurement modes.

Keep the device perpendicular to the surface under test. Start measuring at the touch of a button. Temperature and vibration are measured simultaneously after pressing button 1 (Fig. 1.1).

After the button is released, the display will show the last measurement result, which is displayed for 30 seconds, after which the device will automatically turn off.

When the battery charge indicator  falls below the allowable limit, you need to charge the battery with the supplied cable and power supply.

Importantly:

To attach measurement points to QR tags, you need to use special software and the device is equipped with a Wi-Fi module and a camera to read the tag.

Select a bearing, bearing support, or other structural components that clearly shows vibration and temperature characteristics as the test point.

When measuring vibration - keep the sensor in contact with the surface with the necessary force and strictly perpendicular to the direction of measurement. For the most comprehensive study of the vibration characteristics of the object it is necessary to measure in three mutually orthogonal directions: vertical, transverse, and axial.

To measure the temperature, keep the instrument at a distance of no more than 30 mm from the measuring point.

1.3.3 Setting up wireless communication from readers.

To obtain data from the vibrometer, you need to create a simple TCP-SERVER without authentication and configure it on port 2323.

After the vibrometer as a client connects to the server, the server will receive data if available.

The data on the server will come in the form of a string, the format of which is described below.

```

sprintf (string_tmp, "\ t% 8.4f \ t% 8.4f \ t% 8.4f \ t% 8.4f \ n"
, val.acc // 1. vibration acceleration [m / s2]
, val.vel // 2. vibration velocity [mm / s]
, val.dis // 3. vibration displacement [mkm]
, val.t_o // 4. temperature [C °])

```

* Data is separated by tabs.

```

[x]<ID vibrometer >    0.00    0.00    0.00    0.00
      ↑                [_____] [_____] [_____] [_____]
the number of the
transmitted
measurement since
the start of the
vibrometer

```

After receiving the data string, the server must respond with the string "[ok] \ n", which will inform the vibrometer about the successful delivery of data, after which the vibrometer will send the following data if any.

If there is no response [ok] \ n "from the server - the vibrometer will repeat the transmission of the current line after 500 ms, until it receives a response.

* In order for the vibrometer to find the server, it is necessary to run it in configuration mode and fill in the appropriate fields.

1.3.4 Operation with the device in configuration mode.

1. To turn on the vibrometer in the configuration mode, press button 2 and without releasing it, press button 1 (Fig. 1.1).

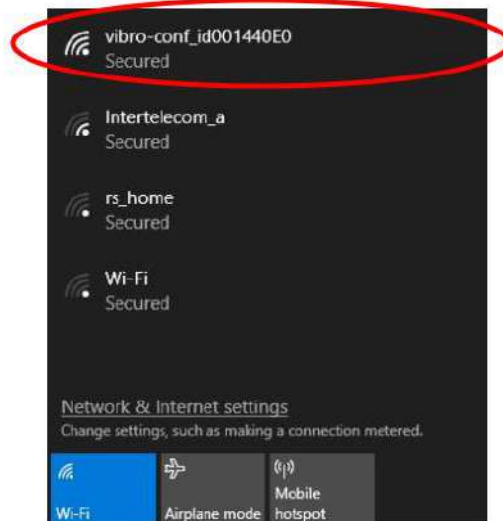


Figure 1.2 - Wi-Fi network "vibro-conf..." created by the device in configuration mode

The message "config" will appear on the screen of the vibrometer, at the same time the vibrometer will create a network "vibro-conf ..." (Fig. 1.2), to which you need to connect a laptop with configuration software.

2. Connect the laptop to the network "vibro-conf ...", password "vibroper" (Fig. 1.3).

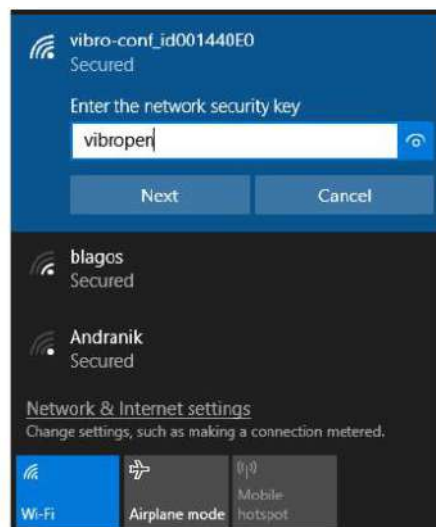


Figure 1.3 - Connection to the network "vibro-conf ...", enter the password

3. Start vibropen_configer.exe, and wait for the connection to the vibrometer (the indicator will light up green).

4. Fill in the fields for the vibrometer configuration (Fig. 1.4):

SSID - The name of the existing network to which the vibrometer will be connected when turned on in the measurement mode.

PASSWORD - password to connect to the network.

HOST - IP address of the server in the network.

To load the configuration into memory, press the "SET" button of the application.

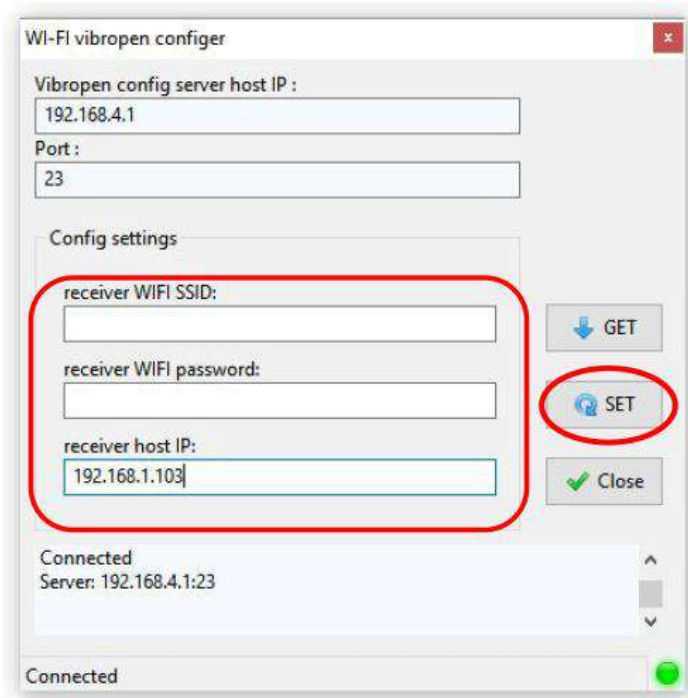




Figure 1.4 - Device configuration using the vibropen_configer.exe application

5. Close the application. Disconnect the laptop from the WI-FI network "vibro-conf ...".

6. Press button 3 on the device to exit the configuration mode. Wait for the vibrometer to turn off.

1.3.5 Operation with the device in measurement mode and data transfer to the server.

1. To switch on the instrument in the measurement mode, press button 1  and wait for the measurement to end (process bar).
2. At the moment of inclusion the vibrometer simultaneously with measurement will be connected to a network and the server according to the parameters loaded in it.
3. Measurement data is sent to the server by pressing button 3  on the vibrometer.

1.4 Marking and sealing

On the rear panel of the case, there is a plate indicating the serial number, year of manufacture, name of the device, and brief instructions on how to assign buttons to the device.

To prevent unauthorized access and attempts at unqualified repairs, the electronic unit of the device is properly sealed.

1.5 Packing

For storage and transportation, the device is placed in a case bag.

2. INTENDED USE

2.1 Operational restrictions

Persons who have studied this operating manual, as well as safety rules when working with control equipment and have been instructed in occupational safety are allowed to work with the device.

2.1.1 At the place of operation.

If acceptance tests are carried out on-site, the rotors must be mounted on standard supports. In this case, it is important that all the main elements of the machine are mounted during the acceptance tests; for the main machine models this requirement is mandatory, and for serial machines, if this is not possible, the evaluation criteria must be adjusted accordingly. The results of comparing the vibration state of the same type of machines installed on different foundations can be compared only if the dynamic characteristics of the foundations are similar.

2.1.2 On the test bench.

It is necessary to create conditions under which the coincidence of the frequencies of the natural oscillations of the test rig with the speed of the machine or from any of its powerful harmonics is excluded. It is generally considered that this requirement is met if the value of the horizontal and vertical vibration of the supporting elements of the foundation near the bearing supports does not exceed 50% of the vibration value of the respective bearing in the same direction. The test rig must also not cause changes in the value of any of its main frequencies of the machine in operation. If the resonances of the support cannot be eliminated, acceptance tests should be performed on a fully assembled machine at the site of operation.

2.2 Preparing the product for use

Before use, carefully inspect the device for external damage. Check the battery charge of the device, the operation of the LED, and check the attachment of the sensor tip.

2.3 Use of the product

Usually, measurements are performed at different points in two or three mutually perpendicular directions, which allows to obtain a set of values of vibration parameters. The level of vibration of the machine means the maximum value of vibration, which is measured at one point or group of points in selected directions, under certain conditions, and steady-state.

2.3.1 The vibration state of many types of machines can be assessed by the vibration level for a single measuring point. However, for some machines this approach is unacceptable and vibration levels should be determined based on independent measurements at a number of points.

2.3.2 Measurement points.

Measurements should be made on bearings, bearing housings, or other structural elements that respond to dynamic forces as much as possible and characterize the overall vibration state of the machine. Typical examples of the location of measuring points are shown in Figures 2.1a-2.1d. (for more details, see ISO 10816-1: 2007).

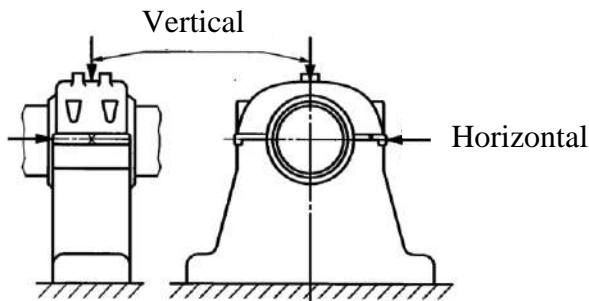


Figure 2.1a - Measurement points on the bearing support

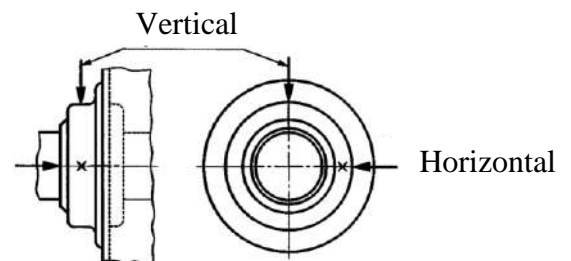


Figure 2.1b - Measurement points on the bearing housing

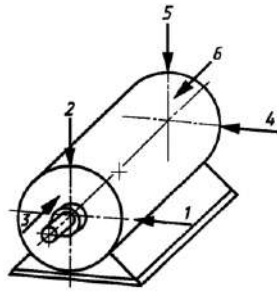


Figure 2.1c - Measurement points on small electric machines

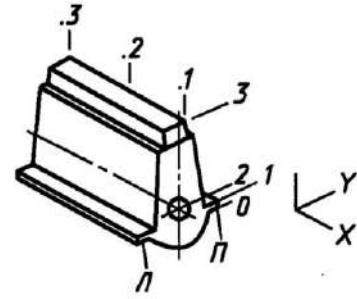


Figure 2.1g - Measurement points on the engine

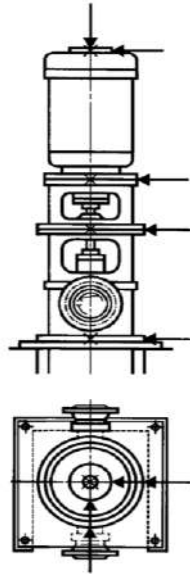


Figure 2.1d - Measurement points on the vertical installed machine

A complete assessment of the vibration state of large units is given by the results of measurements at controlled points in three mutually perpendicular directions, as shown in Figures 2.1a - 2.1d. As a rule, such completeness of measurements is required only for acceptance tests. During operational control, one or two measurements are usually performed in the radial direction (usually horizontal and (or) vertical). In addition, it is also possible to measure axial vibration, usually at the location of the thrust bearing.

The location of measuring points for machines of specific types shall be specified in the relevant standards for machines of these types.

3. PACKING LIST

№	Name	Quantity, pcs.
1	Vibrometer with temperature measurement function	1
2	Charger	1
3	Cable to charger	1
4	Operation manual combined with a passport	1
5	Packaging	1

4. MAINTENANCE AND REPAIR

Checking the technical condition of the device in order to ensure its operability during the entire period of operation is carried out at least once a year in the following sequence:

- 1) Check the completeness of the vibrometer according to item 3 "Packing list";
- 2) Carry out an external inspection of the device, make sure that there is no mechanical damage to the electronic unit, sensor tip, screen;
- 3) Check the efficiency;
- 4) If deficiencies have been identified, they should be addressed to the manufacturer;

Importantly! It is not allowed to open the electronic unit by persons unauthorized by the manufacturer and self-repair the vibrometer.

5. STORAGE

Storage of the device is carried out in a case, in the closed, heated room with air temperature $(25 \pm 15) ^\circ \text{C}$, relative humidity from 45 to 80% and atmospheric pressure from 630 to 800 mm of mercury. Art. The room must be free of mold, acid fumes, reagents, paints and other chemicals. Abrupt changes in temperature and humidity that cause dew should not be allowed in the room.

6. TRANSPORTATION

The device in transport packaging, which ensures its safety, is transported by rail, road, sea, or air transport in compliance with the relevant rules of carriage of goods in force on these modes of transport. In the case of transportation by air, transportation should be carried out in airtight heating compartments.

7. DISPOSAL

After the end of service life, the device does not pose danger to the life and health of people, to the environment, and does not demand special ways of utilization.

The batteries of the device are disposed of in accordance with current regulations for the disposal of these products.

8. ACCEPTANCE CERTIFICATE

Vibrometer with
temperature measurement ADL M20 № _____
function
product description designation serial No

manufactured and adopted in accordance with the mandatory requirements of state (national) standards, current technical documentation, and recognized as approved for operation

Production date: _____

Quality Control Head

stamp _____
personal signature

Vodoriz O.
print full name

9. MANUFACTURER'S WARRANTIES

The manufacturer guarantees the compliance of the device with the operation manual combined with the passport in compliance with the conditions of operation, transportation, storage, intended use, as well as maintenance and repair.

Warranty period - 12 months.

The manufacturer undertakes to repair the appliance during the warranty period until it is replaced as a whole if the appliance fails during this period.

Post-warranty repairs are carried out by the manufacturer.

The warranty does not apply to:

- on mechanical damages and the damages caused by the influence of aggressive environments, high temperatures, hit in the device of liquid, foreign objects;

- for consumables and parts that wear out quickly (batteries, cases, covers, etc.);

- for products that have been repaired during the warranty period by persons not authorized by the Supplier, and for products in violation of the integrity of the Supplier's protective equipment;

- faults that have occurred as a result of non-compliance with the requirements of the operation manual and exceeding the measurement ranges specified in the operation manual;

- for preventive maintenance and replacement of consumables.



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