R·sensors

# VOLNA-5M Shake Table
# Technical passport

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|---|---|
| Model | Volna-5M |
| Serial number | 000000 |

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|---|---|---|
| Date of Manufacture: | _____ | _____ |
| | | signature |
| Delivery date: | _____ | _____ |
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# 1. Introduction

The Volna-5M shake table is designed to swing seismic instruments such as seismic sensors, seismic accelerometers, seismometers in vertical and horizontal directions to measure their amplitude-frequency and phase-frequency characteristics.

The comprising units of the shake table allows setting the frequency of vibrations, adjusting and measuring the amplitude of the created sinusoidal vibrations and the amplitude of the output signal of the seismic instrument which is being studied.

The shake table consists of the following units:

**The Mechanical table** (fig. 1 in Appendix 1) provides swinging motion of the movable platform with a seismic instrument located on it in horizontal or vertical directions relative to the fixed structure as well as measurement of the platform motion;

**The Sinusoidal signal generator** (fig. 2 in Appendix 1) generates a control sinusoidal signal of the required frequency and amplitude which goes to the Control Unit;

**The Control unit** (fig. 3 in Appendix 1) receives the control signal from the Generator, provides its power amplification to supply the Mechanical table drive, receives output signals of the motion sensor (that is part of the Mechanical table) and of the seismic instrument which is being studied;

**The Digital module** (fig. 4 in Appendix 1) provides digital recording of output signals of the motion sensor and the seismic instrument being studied and can also be used as a digital generator of the input control signal.

The shake table is not explosive, toxic or a source of environmental pollution.

# 2. Delivery set

***The delivery set includes:***

- The Mechanical table in a protective case;
- The UTG932E Sinusoidal signal generator with accessories (a power cable with the AC/DC adapter, a cable for connecting the Control unit with two BNC connectors, a cable for connecting an additional device with one BNC connector);
- The Control unit;
- The E-154 Digital module (the ADC external module) with accessories (a digital cable with USB-A и USB-B connectors);
- A 220 V power cable (network) for the Control unit (the cable length is 1.8 meters);
- A cable of the DB-15M connector (plug) and GX20M-7A connector (socket) to connect the Mechanical table to the Control unit (the cable length is 1.6 meters);
- The GX12-4A connector cable (socket) to connect the Digital module to the Control unit (the cable length is 0.75 meter);
- Leveling feet for the Mechanical table – 8 pcs;
- Tension spring (110x20x2 mm) (spare) – 2 pcs;
- Steel ribbons (28x13x0.1 mm) (spare) for the movable platform of the Mechanical table – 1 set (8 pcs);
- The Digital module software disk;
- Technical passport.

***The following may be additionally supplied:***

- User Manual.

## 3. Design and operating principles

The Mechanical table consists of a fixed structure and a movable platform which are assembled from parts made of steel and aluminum alloys.

The movable platform has the shape of a cube, on one of its faces are installed seismic instruments being studied, and it is suspended on steel ribbons measuring 28x13x0.1 mm according to the method of maximum prevention of rotational vibrations of the platform.

The fixed structure consists of two parts. The outer part is a base installed on a laboratory table. The inner part is located inside the movable platform and connected with the outer part by means of special plates passing through the holes in the movable platform. Springs which the movable part of the platform is suspended on are fixed on the inner part of fixed structure.

Horizontal swings of the platform occur according to the scheme of a pendulum suspended on steel ribbons in the field of gravity. Swings in the vertical direction occur on the special power adjustable springs which compensate for the weight of the installed seismic instrument and the movable platform. The tension of the springs is adjusted using a special screw.

To switch from the horizontal mode to the vertical mode, the shake table housing is rotated by 90°, and the power springs are set to an undeformed condition using a special lever.

## 4. Operating conditions

An operating temperature of the shake table is 0°C to +40°C after heating the units for 10 minutes. Humidity in the room where the shake table is used shall not exceed 80 %.

## 5. Transportation and storage

All units of the shake table are transported and stored in packaging that protects them from mechanical damage, dust and moisture.

In the course of transportation, the Mechanical table is placed in a protective case.

While being transported, the movable platform of the table is installed on the fixed part with arresting screws: two attracting and four supporting ones. When installing, first unscrew the supporting screws by one to two turns, then the attractive screws by five to six turns. When arresting, first tighten the attracting screws until stop, then tighten the supporting screws are until a light stop (you must not squeeze, otherwise you may spoil the ribbon suspensions).

If transported by the car, the Mechanical table shall be installed closer to the middle of the car and protected against sharp impacts.

Storage temperature is 0°C to +50°C.

## 6. Warranty and service

The warranty period of the shake table is 18 months. During this period, replacement or repair of the defective units shall be made at the expense of the manufacturer.

The warranty repair is carried out if the warranty seals are preserved as well as there are no evidence of opening and external damage to the case which could be a result of misuse of the instrument.

After the warranty expires, maintenance and repair are charged on the price-list.

## 7. Volna-5M Specifications

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| ***7.1. Mechanical table*** | |
| Frequency range | 0.1 – 100 Hz |
| Maximum motion amplitude | ± 2 mm |
| Motion amplitude operation range | ± 1.5 mm |
| Maximum output signal of motion sensor | ± 2 V |
| Motion sensor conversion factor | 1 V/mm |
| Load weight at vertical swings without using additional springs | 3.5 – 10.5 kg |
| Load weight at horizontal swings | 3.5 – 30 kg |
| Dimensions – length / width / height | 28.5 sm / 27.5 sm / 28.5 sm |
| Weight | 12.6 ± 0.5 kg |
| Weight with a protective case | 14.8 ± 0.5 kg |
| ***7.2. UTG932E Sinusoidal signal generator*** | |
| Signal generation method | DDS - direct digital synthesis method |
| Number of channels | 2 |
| Maximum frequency generated | 30 MHz |
| ADC sampling rate | 200 MHz |
| Vertical resolution | 14 bit |
| Permissible amplitude of generator output voltage (not more than 5 minutes) | ± 10 V |
| Supply voltage | 220 V / 50 Hz (through AC/DC adapter) |
| Power consumption | < 10 W |
| Dimensions – length / width / height | 9 sm / 17.2 sm / 6.8 sm |
| Weight | 0.4 kg |

| ***7.3. Control unit*** | |
|---|---|
| Frequency range | 0.1 – 100 Hz |
| Maximum input signal | ±12 V |
| Maximum output signal | ±12 V |
| Supply voltage | 220 V / 50 Hz |
| Power consumption | < 5 W |
| Case connector types | <u>Front panel:</u><br>BNC connector (socket) to connect generator;<br>BNC connector (socket) to connect additional device.<br><u>Back panel:</u><br>220 V / 50 Hz (plug) power cable connector;<br>GX20M-7B (plug) connector to connect Mechanical table;<br>GX12-4F (plug) connector to connect Digital module. |
| Dimensions (without handle) – length / width / height | 22 sm / 26 sm / 10.5 sm |
| Weight | 1.7 ± 0.1 kg |

| ***7.4. E-154 Digital module (ADC external module)*** | |
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| ADC number of channels | 8 |
| ADC resolution | 12 bit |
| Noise-free resolution | 11.8 bit (120 kHz, measuring range ±5 V) |
| Input resistance in single-channel mode | Over 20 MOhm |
| Input signal measurement subranges | ±5 V; ±1.6 V; ±0.5 V; ±0.16 V |
| Maximum conversion frequency | 120 kHz |
| Digital-to-Analog Converter number of channels | 1 |
| Digital-to-Analog Converter resolution | 8 bit |
| Maximum output signal | ±5 V |
| Output resistance | 18 Ohm |
| Output current | ±10 mA |
| Supply voltage | 5 V through USB |
| Power consumption | to 130 mA |

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| Dimensions – length / width / height | 7 sm / 9,2 sm / 4 sm |
| Weight | 0.1 kg |