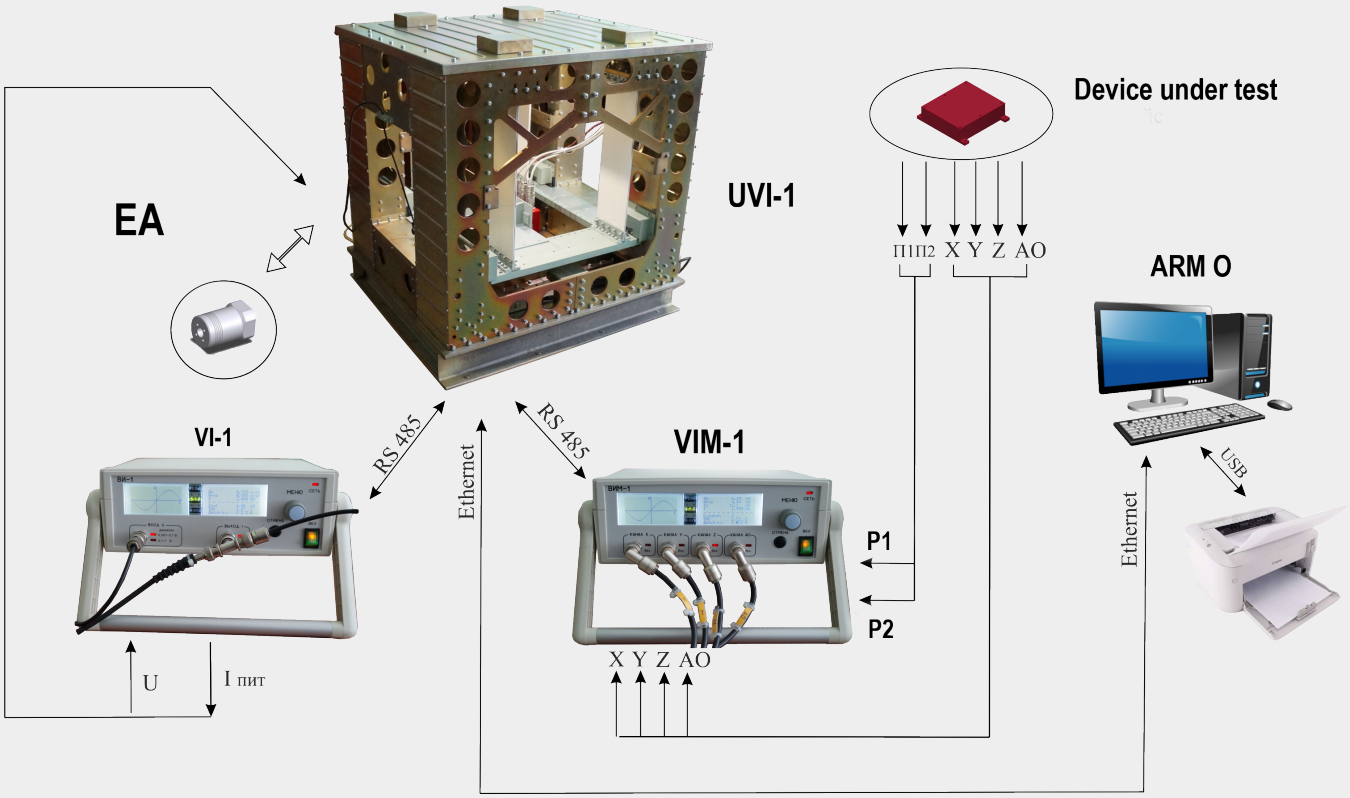
VIBRATION MEASUREMENT SYSTEM

Vibration Measurement System (VIS-1) is designed for the calibration (testing) of seismic protection system sensors in nuclear power plants. VIS-1 can also calibrate other acceleration sensitive devices and various types of vibration transducers, as well as assess the behavior of seismically sensitive sensors. VIS-1, as well as the entire VIS-1 system, is certified metrological equipment and has a Metrological Qualification Certificate. VIS-1 is designed in accordance with Technical Specification UYAISH.411732.001 TS supplemented with UYAISH.411732.001 TS.1.

OVERVIEW DIAGRAM FOR THE CALIBRATION (TESTING) OF THE DEVICES UNDER TEST USING VIS-1



VIS-1 INCLUDES:

- **Vibration Testing Machine (UVI-1),** is used to create vibrations of the device under test;
- **Reference Accelerometer (EA)** is used to convert mechanical vibrations into electrical signal with a given transformation accuracy;
- **Vibration Meter (VI-1)** is used for collecting and processing signals from the vibrations of the EA, as well for the EA power supply;
- **Multi-channel Vibration Meter (VIM-1)** is used for receiving and processing vibration signals from the device under test in analog form (as a source voltage or current) as well as in discrete form (threshold values;
- **Operator workstation (ARM O)** includes a personal computer and a laser printer.

Design Solutions of Physical Process Analysis Design Bureau

Physical Process Analysis Design Bureau of PC "RPC Radiy" is set up for development of seismic protection systems, calibration equipment and qualification of product data at NPP. The bureau designs and implements the Seismic Sensor that is the source of seismic data for the seismic protection equipment. Other successfully designed and implemented product is the vibration measuring system for periodic calibration of seismic sensors in semi-automatic mode. Besides nuclear products the design bureau has developed the Information Acquisition and Display Unit that is the basic item in any monitoring system design including the Automatic System for Early Diagnostics of Emergencies. Additionally, the design bureau develops the angel precision gages for the wide scope of measurement.

29 Akademika Tamma Str.
25009, Kropyvnytskyi, Ukraine
inter.project@radiy.com I www.radiy.com

v 04.0
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Main Technical Characteristics of UVI-1

Repeatable vibrations frequency band	2..200 Hz ->1..200 Hz
Accelerations peak values range	0.1..10 m/s^2
Max. bench displacement	24 mm
Maximum loading weight	10 kg
Relative accuracy of vibration frequencies	± 0,1 %
Frequency fluctuation, max	± 0,1 %
Fluctuation of acceleration RMS, max	± 0,1 %
Non-linear distortion factor, max	5 %
Cross components peak, max	10 %
Vibration noise level, max	- 40 dB
Bench overall dimensions	400 x 400 mm
Max. consumption	300 W
Overall dimensions, max	850x750x900 mm
Weight, max	290 kg

Main Technical Characteristics of VI-1

Measured signal type	variable
Operating band	1..1000 Hz ->1..2000 Hz
Range of input signal voltage RMS	1..1000 mV
Relative measurement error RMS	±1 % ± 2 EMP
Complementary measurement error RMS	± 0,2 %
Frequency relative measurement error	± 0,1 %
Non-linear distortions measurement range	0..30 %
Distortions measurements reduced error	± 5 %
Range of current output values	0..20 mA
Max consumption	10 W
Overall dimensions, max	280x190x120 mm
Weight, max	2 kg

Main Technical Characteristics of VIM-1

Measured signal type	AC, DC AC with DC components
Analog instrumentation channels quantity	4 channels
Operating band	1..1000 Hz ->1..2000 Hz
Range of input signal voltage RMS	0,01..10 V
Range of input signal current RMS	0,02..20 mA
Relative measurement error RMS	±1 % ±2 EMP
Complementary measurement error RMS	± 0,2 %
Frequency relative measurement error	± 0,1 %
Non-linear distortions measurement range	0..30 %
Distortions measurements reduced error	± 5 %
Quantity of discrete registration channels	4 channels
Max consumption	10 W
Overall dimensions, max	280x190x120 mm
Weight, max	2 kg

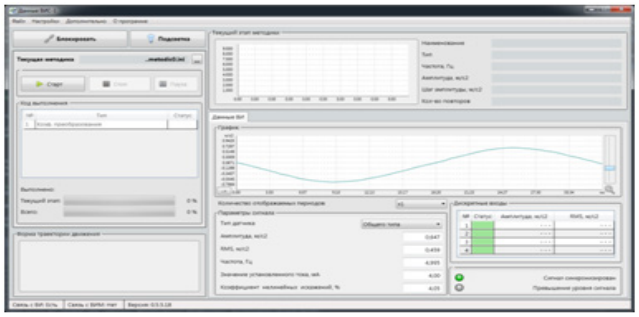
Main Technical Characteristics of EA

Operating band	1..1000 Hz ->1..2000 Hz
Conversion ratio	80..140 mV/ms^{-2}
Conversion relative accuracy	±1,5 %
Conversion complementary error	± 0,1 %
Overall dimensions, max	40x40x50 mm
Weight, max	0,2 kg

KEY FEATURES OF VIS-1:

- expanded lower limit for frequency reproduction and qualitative sinusoidal vibration for platform motion;
- capability to measure non-linear distortions of the reference sensor and device to be calibrated, as well as capability for spectral representation of the received signals;
- capability to measure peak oscillation amplitude of the first harmonic in the signal spectrum;
- capability for fixing the device to be calibrated below the level of vibration platform for testing vertically fixed items;
- capability to handle oversized devices to be calibrated in lateral and transverse oscillation axes;
- weight limit for device to be calibrated increased to 10 kg;
- automated calibration process using preset functions.

Main window of VIS-1 control program



Reports generation

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