

COMPACT MOLECULAR-ELECTRONIC SEISMIC SENSORS

Molecular-electronic seismic accelerometers and velocimeters are designed for measuring seismic vibrations of the ground surface, buildings and engineering structures in one or three directions and give the analog output signal proportional to the acceleration or velocity of the input seismic signal.

The instruments' sensing elements are self-centering and thus don't require any external mass centering or mass position controls. Sensing elements of all compact sensors but the MTSS-1003 stay fully functional in any orientation with respect to the vertical axis whereas the MTSS-1003 stays functional within installation tilts of up to 15°.

The main features and advantages of the molecular-electronic sensors are:

- high conversion gain – *very low signals can be recorded directly without any pre-amplification*;
- low noise level;
- wide dynamic and frequency ranges;
- very rugged, no springs to be broken;
- no parasitic mechanical resonances;
- no maintenance, mass locking and centering required;
- operation at any tilts*;
- low power consumption;
- waterproof compact case**.

For complete technical parameters of the compact seismic sensors refer to the dedicated datasheets or search on Company's web site at www.r-sensors.ru.

The R-sensors' compact accelerometers family includes the following sensors:

MTSS-1043A is a 3-component high-sensitivity accelerometer designed for measurements of strong motion seismic, industrial vibration monitoring and analysis. The assembly of three identical sensors furnished with electrodynamic force feedback ensures precision, high stability and low noise. This model features ±0.8g input signal range and self-noise level of 70 ng/ $\sqrt{\text{Hz}}$ at 10 Hz.

*- except for MTSS-1003

**- except for MTSS-2003 and MTSS-2043A which have IP 54 protection class

MTSS-1041A is a 1-component version of **MTSS-1043A**. The sensor is small in size, mounted in plastic case, equipped with a screw tail pin for ground installation. It also can be used in a group of three sensors installed orthogonally by means of specially-designed mounting.

MTSS-1033A is a 3-component compact high-performance accelerometer designed for stronger motion measurements, vibration monitoring and analysis. It also can be used as a component of a seismic alarm system. The three identical super compact sensors furnished with strong electrodynamic force feedback ensure second to none input range, precision and high stability. This model features ± 3 g input signal range and self-noise level of 130 ng/ $\sqrt{\text{Hz}}$ at 10 Hz.

MTSS-1031A is a 1-component version of **MTSS-1033A**. Small in size, mounted in plastic case, equipped with a screw tail pin for ground installation. It also can be used in a group of three sensors installed orthogonally with use of specially-designed mounting.

The R-sensors' compact velocimeters family includes the following sensors:

MTSS-2003 is a 3-component high-sensitivity velocimeter designed for measurements of strong motion seismic, industrial vibration monitoring and analysis. This model uses the same layout, sensing cells and electronic circuitry as those of **MTSS-1043A**. The sensors share same electrical parameters but for the output function.

MTSS-1003 is a 3-component low-power compact velocimeter designed for measurements of strong seismic, industrial vibration monitoring and analysis. Able to work within 15° tilt relative to vertical axis.

MTSS-1001 is a 1-component version of **MTSS-2003**. Small in size, mounted in plastic case, equipped with a screw tail pin for ground installation. It also can be used in a group of three sensors installed orthogonally with use of specially-designed mounting.

MTSS-1011 is a 1-component ultra-compact high frequency velocimeter based on the **MTSS1033A**'s strong motion sensing elements. Small in size, mounted in aluminum case, equipped with a screw tail pin for ground installation. This sensors features 50mm/sec input motion clip level @ 100 Hz.

MTSS-1021 is a battery-powered version of **MTSS-1001** compatible with common passive geophones. Small in size, mounted in plastic case, equipped with a screw tail pin for ground installation.

MTSS-1043A

LOW-NOISE SEISMIC ACCELEROMETER



The MTSS-1043A accelerometer combines small size, light weight and high sensitivity over wide frequency band. The electrodynamic feedback provides a high accuracy level and stability of the parameters of the sensor.

The wide dynamic range, lowest distortion, high temperature stability and competitive price make it cost-effective solution for various applications such as high energy earthquake measurements, active seismic, high-rise building or structure monitoring.

Configuration	Triaxial accelerometer, orthogonal axes
Sensitivity	6 V/g or customized
Maximum input signal	± 0.8 g
Frequency bandwidth	0.1 – 120 Hz or customized
Maximum output swing	± 7.5 V, single-ended
Output impedance	500 Ohms
Self-noise	70 ng/ $\sqrt{\text{Hz}}$, at 10 Hz
Dynamic range	126 dB
Cross-axis sensitivity	-60 dB
Non-linearity at 1 Hz	0.1%
Temperature range	-40°C - +55°C (-40°F - 131°F)
Supply voltage	10.5 - 16Vdc, single supply or $\pm 9.5 \dots \pm 15$ Vdc dual supply (option)
Supply current	35mA @ 12 Vdc single supply or ± 12 mA @ ± 12 Vdc dual supply
Installation tilt	ANY
Cable type	Geophysical 1.5 meter (4.92 ft) 8 wires, open-ended or customized length and type
Housing material	Aluminum
Case accessories*	Mounting base, leveling feet
Weight (without accessories)	0.9 kg (1.98 lbs)
Dimensions	120 x 120 x 60mm (4.724" x 4.724" x 2.362")

*- Accessories are sold separately.

MTSS-1033A

STRONG MOTION SEISMIC ACCELEROMETER



The MTSS-1033A accelerometer combines very small size, wide dynamic range and high sensitivity over wide frequency band. The electrodynamic feedback provides high accuracy level and parameters stability of the sensor.

The wide dynamic range, lowest distortion, high temperature stability and competitive price make it ideal and cost-effective solution for various applications such as structure monitoring, seismic control of high-rise buildings, strong industrial vibration analysis.

Configuration	Triaxial accelerometer, orthogonal axes
Sensitivity	2.4 V/g or customized
Maximum input signal	$\pm 3 \text{ g}$
Frequency bandwidth	0.1 – 120 Hz or customized
Maximum output swing	$\pm 7.5\text{V}$, single-ended
Output impedance	500 Ohms
Dynamic range	130 dB
Self-noise	130 ng/ $\sqrt{\text{Hz}}$, at 10 Hz
Cross-axis sensitivity	-60 dB
Non-linearity at 1 Hz	0.1%
Temperature range	-40°C - +60°C (-40°F - 140°F)
Supply voltage	10.5 - 16Vdc, single supply or $\pm 9.5 .. \pm 15$ Vdc dual supply (option)
Supply current	35mA @ 12 Vdc single supply or $\pm 15\text{mA} @ \pm 12$ Vdc dual supply
Installation tilt	ANY
Cable type	UTP Cat 5E 1.5 meter (4.92 ft) 8 wires, open-ended or customized length and type
Housing material	Plastic
Case accessories*	Mounting base, three feet
Weight (without accessories)	0.25 kg (0.55 lbs)
Dimensions	80 x 80 x 55mm (3.15" x 3.15" x 2.17")

*- Accessories are sold separately.

MTSS-1031A/1041A

SEISMIC ACCELEROMETERS



MTSS-1041A and MTSS-1031A are one-component versions of the correspondent three axis accelerometers. The sensors can be produced with differential or single-ended output. While small in size and light, these sensors feature high level of accuracy and stability of parameters.

The wide dynamic range, lowest distortion, high temperature stability and competitive price make it ideal and cost-effective solution for various applications such as earthquake measurements or structure monitoring.

Configuration	Uniaxial accelerometer
Sensitivity 1041A/1031A	6 V/g / 2.4 V/g single-ended 12 V/g / 4.8 V/g differential
Maximum input signal 1041A/1031A	$\pm 0.8 \text{ g} / \pm 3 \text{ g}$
Frequency bandwidth	0.1 – 120 Hz or customized
Maximum output swing	$\pm 7.5\text{V}$, single-ended $\pm 15\text{V}$, differential
Output impedance	500 / 1000 Ohms
Dynamic range 1041A/1031A	126 dB / 130 dB
Self-noise 1041A/1031A	70 ng/$\sqrt{\text{Hz}}$ / 130 ng/$\sqrt{\text{Hz}}$, at 10 Hz
Non-linearity at 1 Hz	0.1%
Temperature range 1041A/1031A	-40°C - +55°C (-40°F - 131°F) / -40°C - +60°C (-40°F - 140°F)
Supply voltage	10.5 - 16Vdc, single supply or $\pm 9.5 .. \pm 15$ Vdc dual supply (option)
Supply current	17mA @ 12 Vdc single supply or $\pm 6\text{mA}$ @ ± 12 Vdc dual supply
Installation tilt	ANY
Cable type	UTP Cat 5E 1.5 meter (4.92 ft) open-ended or customized length
Housing material	Plastic case, aluminum bottom
Case accessories	Screw tail pin, Orthogonal mounting base*
Weight (without accessories)	0.25 kg (0,55 lbs) / 0.21 kg (0,46 lbs)
Dimensions (diameter x height)	48 x 105 mm (1.89" x 4.134")

*- The item is sold separately.



Three MTSS-1041A/MTSS-1031A sensors installed on a mounting base.

MTSS-2003

LOW-NOISE GEOPHONE



The compact MTSS-2003 velocity sensor combines low-noise, small weight and high gain. The electrodynamic feedback results in very flat response over wide frequency range, high dynamic range and high time and temperature stability of the instrument parameters.

The wide dynamic range, high temperature stability and competitive price make it ideal and cost-effective solution for various applications such as earthquake measurements, structure monitoring, and object state control.

This model uses the same layout, sensing cells and electronic circuitry as those of **MTSS-1043A**. The output function of a device is formed by a feedback configuration.

Configuration	Triaxial velocimeter, orthogonal axes
Sensitivity	250 V·sec/m or customized
Maximum input signal	$\pm 30 \text{ mm/sec}$
Frequency bandwidth	1 – 300 Hz or customized
Maximum output swing	$\pm 7.5\text{V}$, single-ended
Output impedance	500 Ohms
Integral noise in the pass band	100 nm/sec
Dynamic range	110 dB
Cross-axis sensitivity	-60 dB
Non-linearity at the edge of the dynamic range	less than 1%
Temperature range	-40°C - +55°C (-40°F - 131°F)
Supply voltage	10.5 - 16Vdc, single supply or $\pm 9.5 \dots \pm 15$ Vdc dual supply (option)
Supply current	35mA @ 12 Vdc single supply or $\pm 15\text{mA} @ \pm 12$ Vdc dual supply
Installation tilt	ANY
Cable type	Geophysical 1.5 meter (4.92 ft) 8 wires, open-ended or customized length and type
Housing material	Aluminum
Case accessories*	Mounting base, leveling feet
Weight (without accessories)	0.9 kg (1.98 lbs)
Dimensions	120 x 120 x 60mm (4.724" x 4.724" x 2.362")

*- Accessories are sold separately.

MTSS-1003

LOW-POWER GEOPHONE



The MTSS-1003 is a low-power three component sensor featuring the low-noise molecular-electronic sensing element.

The wide dynamic range, high temperature stability and competitive price make it ideal and cost-effective solution for various applications such as earthquake measurements, structure monitoring, and object state control.

The MTSS-1003 has 3 installation legs included; for installation with screws on flat surfaces the sensors can be supplied with the eyes setting fixture.

Configuration	Triaxial velocimeter, orthogonal axes
Sensitivity	250 V·sec/m or customized
Maximum input signal	± 30 mm/sec
Frequency bandwidth	1 – 300 Hz or customized
Maximum output swing	±7.5V, single-ended
Output impedance	500 Ohms
Integral noise in the pass band	100 nm/sec
Dynamic range	110 dB
Cross-axis sensitivity	-60 dB
Non-linearity at the edge of the dynamic range	less than 1%
Temperature range	-40°C - +55°C (-40°F - 131°F)
Supply voltage	10.5 - 16Vdc, single supply
Supply current	15mA @ 12 Vdc single supply
Installation tilt	± 15°
Cable type	UTP Cat 5E 1.5 meter (4.92 ft) 4 wires, open-ended or customized length and type
Housing material	Aluminum
Case accessories	3 feet
Weight (without accessories)	0.8 kg (1.76 lbs)
Dimensions (diameter * height)	70 x 93 mm (2.76" x 3.66")

MTSS-1001

GEOPHONE



One-component version of the MTSS-2003 velocimeter. While small in size and light, these sensors features high level of accuracy and stability of parameters.

The wide dynamic range, low distortion, high temperature stability and competitive price make it ideal and cost-effective solution for various applications such as earthquake measurements or structure monitoring.

Configuration	Uniaxial velocimeter
Sensitivity	250 V·sec/m or customized
Maximum input signal	± 30 mm/sec
Frequency bandwidth	1 – 300 Hz or customized
Maximum output swing	±7.5V, single-ended
Output impedance	500 Ohms
Integral noise in the pass band	100 nm/sec
Dynamic range	110 dB
Non-linearity at the edge of the dynamic range	less than 1%
Supply voltage	10.5 - 16Vdc, single supply or ±9.5 .. ±15 Vdc dual supply (option)
Supply current	17mA @ 12 Vdc single supply or ±6mA @ ± 12 Vdc dual supply
Installation tilt	ANY
Cable type	UTP Cat 5E 1.5 meter (4.92 ft) 4 wires, open-ended or customized length and type
Housing material	Plastic case, aluminum bottom
Case accessories	Screw tail pin, Orthogonal mounting base*
Weight (without accessories)	0.25 kg (0,55 lbs)
Dimensions (diameter * height)	48 x 105 mm (1.89" x 4.134")

*- The item is sold separately.



Three MTSS-1001 sensors installed on a mounting base.

MTSS-1011

COMPACT STRONG MOTION VELOCIMETER

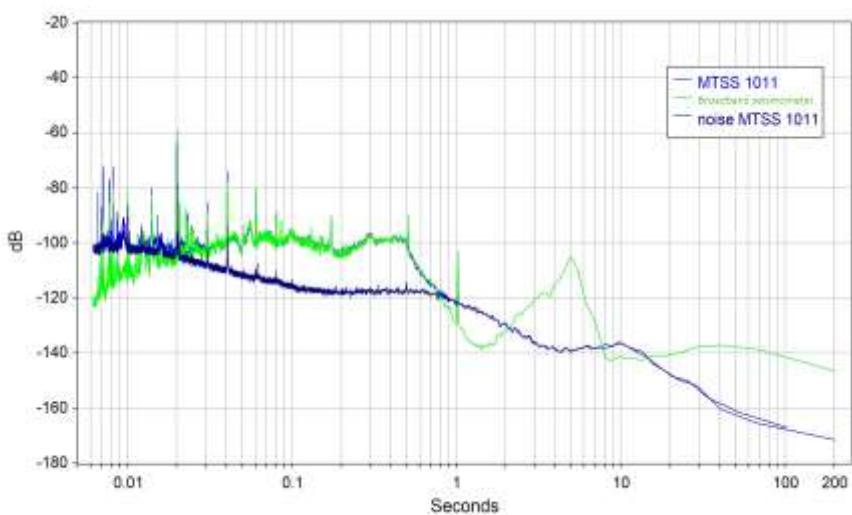


One-component velocimeter made with sensing elements identical to those of MTSS-1033A strong motion accelerometer. While being small in size and light, these sensors feature high level of accuracy and stability of parameters.

The wide dynamic range, low distortion, high temperature stability and competitive price make it ideal and cost-effective solution for various applications like structure monitoring, vibration analysis or earthquake alarm.

Configuration	Uniaxial velocimeter
Sensitivity	95 V·sec/m or customized
Maximum input signal	± 50 mm/sec at 100Hz
Frequency bandwidth	1 – 630 Hz or customized
Maximum output swing	±6.0V, single-ended
Output impedance	500 Ohms
Supply voltage	±9.5 .. ±15 Vdc dual supply
Supply current	±10mA @ ± 12 Vdc dual supply
Installation tilt	ANY
Cable type	UTP Cat 5E 1.5 meter (4.92 ft) 4 wires, open-ended or customized length and type
Housing material	Aluminum
Case accessories	Screw tail pin, Orthogonal mounting base*
Weight (without accessories)	0.27 kg (0.6 lbs)
Dimensions (diameter x height)	45 x 60 mm (1.77" x 2.362")

*- This item is sold separately.



Noise performance of MTSS-1011 comparing with a conventional broadband seismometer