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THREE-COMPONENT MOLECULAR-ELECTRONIC LOW-NOISE BROADBAND SEISMOMETER CME-4311

TECHNICAL PASSPORT AND USER MANUAL

Model	CME-4311
Serial number	_____
Bandwidth	0.0167 Hz (60 sec) – 50 Hz
Sensitivity	2000 V/(m/sec)

Manufacture date:	“ ” 2023	_____
		Signature
Delivery date:	“ ” 20__	_____
		Signature

1. Introduction

Three-component molecular-electronic low-noise broadband seismometer CME-4311 is designed for registration of ground motion in three orthogonal directions.

The device can equally be used as to stationary seismic stations and for research in the field conditions. Seismometer CME-4311 has an analog output (voltage output signal is proportional to the velocity of external signal) and the operation requires connection to an analog-to-digital recorder (not supplied in the delivery set).

The seismometer contains an electronic board and three high-sensitive molecular-electronic sensors (a.k.a. transducers) - one vertical and two horizontal, which are located along three orthogonal directions, all mounted on a common base and placed in a protective outer casing.

Being exposed to an external mechanical force due to the seismic motion of the ground, the working fluid inside the transducers (a concentrated electrolyte solution) is moved between the electrodes of the sensing cells, bringing to or drawing away from them ions of the dissolved substance. Convective flow of charged ions causes an electrical response at the electrodes. The electrical response is amplified and converted by the electronic unit into an electrical output voltage proportional to the velocity of external action (ground motion).

The seismometer is not explosive, toxic and is not a source of environmental pollution.

2. Installation and Connection

The delivery set contains the following:

- molecular-electronic low-noise broadband seismometer;
- cable with connector DH-20-J12PE-03-001;
- dust protective cap for connector on the housing of the seismometer (mounted on connector);
- 2 pointers (mounted in the bottom of the housing of the seismometer);
- leveling legs – 3 sets (mounted at the bottom of the seismometer housing);
- technical passport and operation manual.

The device does not require configuration and any preliminary preparation.

The device does not require mass-centering and therefore does not have any mass position sensor outputs or mass centering inputs. The seismometer does not require tilt alignment and is fully functional at tilt angles up to 15°.

Power supply: unipolar DC source with 12 or 24 V DC nominal voltage and permissible range from 10.5 to 30 V DC. Current consumption is 27 mA. During a short settling period after power-up the current consumption may increase up to 60 mA. It is desirable to use either a stabilized power source or battery. The device is protected from reverse power supply polarity.

To make measurements, the seismometer is placed on a firm horizontal surface pointing the arrow on the top of the housing of the seismometer to the North. Then pointers on the bottom of the housing of the seismometer will point to the North and South.

The horizontal position of the seismometer is provided by the bubble level on the upper cover of the housing and the leveling legs.

Connect the cable to the analog-to-digital recorder and to a power source of the seismometer. The pinout of the cable connector and wires assignment are listed in Annex 1.

Connect the cable to the seismometer.

Turn on the power.

3. Operation

If the seismometer is unpacked, installed and connected as instructed above, the seismometer will be operational within 10-45 min. Within first 24-72 hours, depending on the ambient conditions, the noise level will be little higher and sparse spikes may occur in output signal. This is normal for settling.

The seismometer is protected from changes in temperature and atmospheric pressure. A styrofoam box could be used as an additional protection. Operating temperature is from –12 to +55°C.

In accordance with the International Protection Marking the protection degree for this device is IP 54 – partial protection from dust (does not penetrate in a quantity which may prevent the device operation), protection against splashing water from any direction.

ATTENTION! The device should not be immersed in water or installed in flooded water places without additional protection.

4. Calibration

The seismometer is calibrated and adjusted (with a typical precision of ± 1 dB) to provide a velocity-flat response over the pass band with the -3 dB slopes at the edges of the frequency range.

5. Transportation and Storage

The seismometer is sufficiently rugged and virtually impervious to damage during transportation and therefore is not equipped with arresters and other special devices for carrying, packing, unpacking and transportation. Nevertheless, it is recommended to avoid abrupt impacts to exclude possible negative influence to the seismometer. It is recommended to use the packaging supplied with the device or any standard packing materials to prevent damage to the connector on the housing cover or scratching of the case. The storage temperature range is from –15 to +70 °C. Permissible short-term (1-2 hours) increase or decrease of the temperature outside the specified range.

IMPORTANT! It is not recommended to turn the device upside down or keep in lateral position. The transportation in these positions can result in longer settling period with higher noise level.

6. Warranty and Service

The warranty period of the device is 18 months. Within this period the device which proves defective should be returned to the manufacturer for free repair or replacement.

This warranty shall remain valid provided there are no signs of opening and/or external damage to the housing resulting from abnormal use of the device.

After this period the regular repairing charges will apply.

7. Manufacturer

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8. Technical characteristics of CME-4311

Type of sensing element	Molecular-electronic transducer
Number of sensing elements	3
Configuration	Three orthogonal sensitivity axes - Vertical, North, East
Sensitivity	2000 V/(m/sec)
Type of output signal	Analog, differential
Maximum input signal	± 5 mm/sec
Maximum output signal	± 10 V
Bandwidth	0.0167 Hz (60 sec) – 50 Hz
Power supply voltage	12/24 V DC nominal (10.5 V – 30 V permissible)
Current consumption	27 mA
Output impedance	1000 Ohm
Dynamic range	122 dB
Non-linearity @ 1 Hz	0.5%
Self-noise @ 1 Hz	2.8 nm/sec (5.6 μV)
Self-noise	See below – Fig. 1
Maximum inclination during installation	± 15º
Temperature range	–12ºC .. +55ºC
Housing material	Aluminium
Housing dimensions – diameter / height / height with handle	180 mm / 140 mm / 180 mm
Weight	4.7 ± 0.1 kg
Connector type on the housing to connect the cable	DH-20-C12SX-03-401 plug (12 pins)
Connector type on the cable for connection to the seismometer	DH-20-J12PE-03-001 socket (12 pins). Cable length – 1.5 m

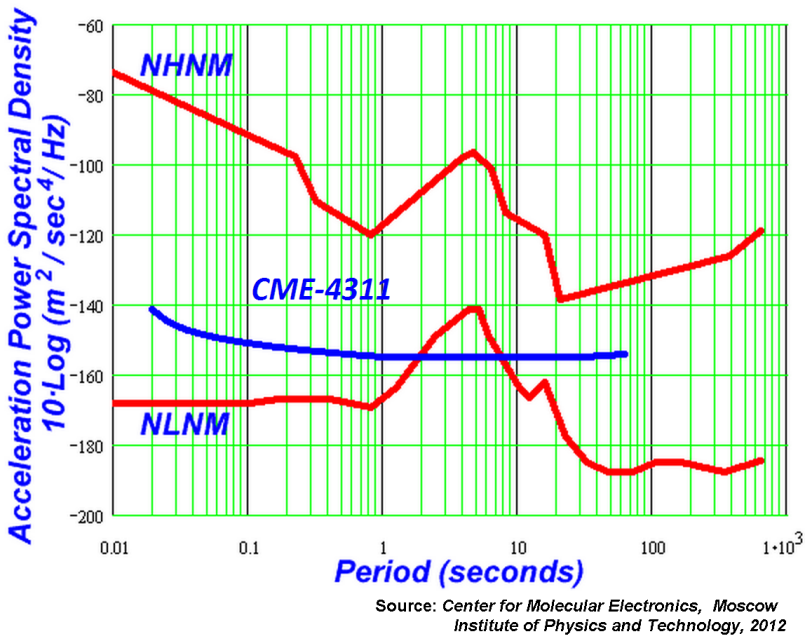

Fig. 1. The self-noise of CME-4311

ANNEX 1.

PINOUT OF THE CONNECTOR AND WIRES ASSIGNMENT OF THE SEISMOMETER CABLE

Fig. 2. Appearance of the seismometer cable.

Connector type: DH-20-J12PE-03-001 socket

Pin number	Pin assignment (wire assignment)	Seismometer cable wire color
1	No connect (Не используется)	Pink (Розовый)
2	Signal GND (Сигнальная земля)*	Brown (Коричневый) + Braiding (Оплетка)
3	East- / Восток- (Channel Y- / Канал Y-)	Violet (Фиолетовый)
4	East+ / Восток+ (Channel Y+ / Канал Y+)	Green (Зелёный)
5	Nord- / Север- (Channel X- / Канал X-)	Grey (Серый)
6	Nord+ / Север+ (Channel X+ / Канал X+)	White (Белый)
7	Vertical- / Вертикаль- (Channel Z- / Канал Z-)	Black (Чёрный)
8	Vertical+ / Вертикаль+ (Channel Z+ / Канал Z+)	Yellow (Жёлтый)
9	Power «-» (Power GND) / Питание «-» (Земля питания)*	Blue (Синий)
10	Power «+» (Питание «+»)	Red (Красный)
11	No connect (Не используется)	---
12	No connect (Не используется)	---

* Wires “Power GND” and “Signal GND” have connection inside the seismometer.