

**Description:**

The NVM-01 is a low noise amplifier module, for sensitive DC/AC measurement and data acquisition systems. It is ideal as an input for accurate voltage measuring systems down to nV range and for measuring of low noise and of low impedances sources.

**Key features:**

- **Ultra-low noise & offset fluctuation amplifier, allowing very high resolution measurements (spectral density of noise down to  $1 \text{ nT}/\sqrt{\text{Hz}}$ )**
- **Very high linearity**

**Typical applications:**

- Vibrating wire magnetometry
- Rotating coil magnetometry
- Thermocouple thermometry
- Application in laboratories and in production lines

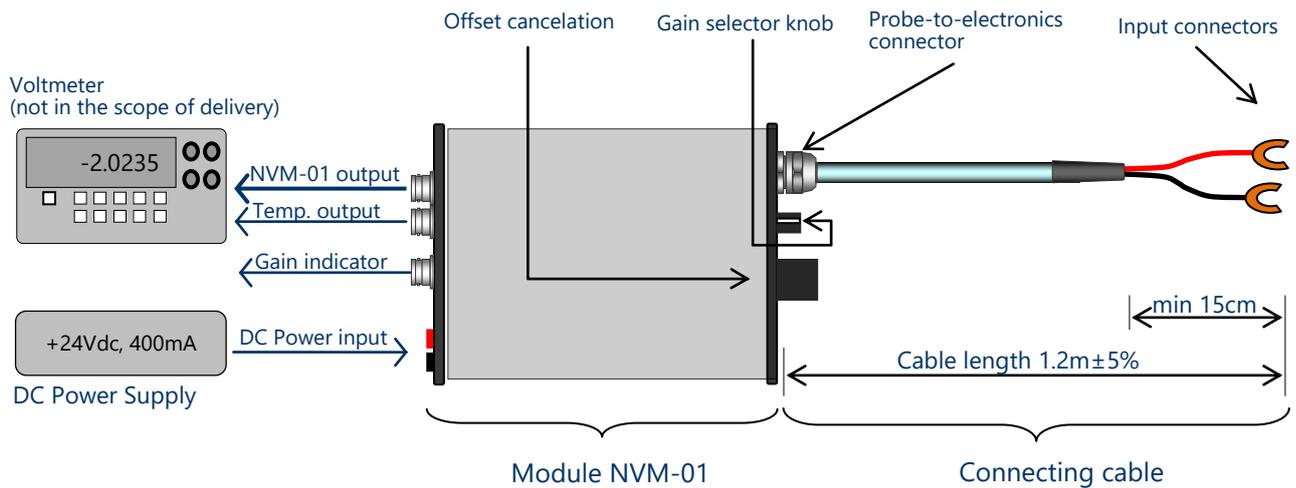


Figure 1: Typical measurement setup with a SENIS NVM-01

Cable wire color	Description
Red	Input positive voltage, V+
Black	Input negative voltage, V-

Table 1: Input cable wiring





Figure 2: Photograph of the NVM-01, Front side.

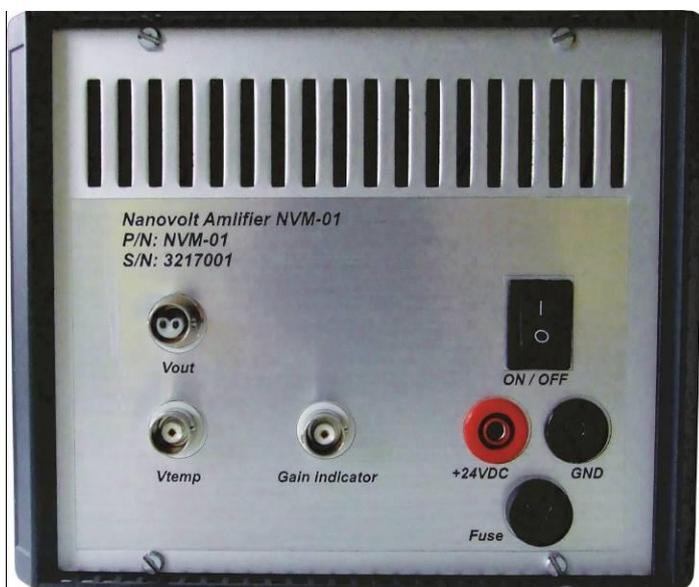


Figure 3: Photograph of the rear side of NVM-01.



Figure 4: Photograph of the input cable



## Electrical specifications:

Unless otherwise noted, the given specifications apply for all measurement channels at room temperature (23°C) and after a device warm-up time of 60 minutes.

General			
Parameter	Value		Remarks
Input voltage ranges, $V_{LR}$	$\pm 250 \mu\text{V}$ , Gain 1 $\pm 100 \mu\text{V}$ , Gain 2 $\pm 25 \mu\text{V}$ , Gain 3 $\pm 10 \mu\text{V}$ , Gain 4		<i>Differential; Selectable</i>
Input Impedance	1M $\Omega$    6pF		
Source resistance	< 100 $\Omega$		<i>Optimal</i>
Output voltages ( $V_{out}$ )	differential		
Gain (G)	Output filter: LPF, $f_c = 10\text{Hz}$	Output filter: LPF, $f_c = 40\text{Hz}$	<i>Corner frequency of Low Pass output filter can be selected by appropriate jumpers, see appendix A.</i>  <i>Differential output; Selectable</i>
	Gain 4	8,303 E+05	8,340 E+05
	Gain 3	3,295 E+05	3,317 E+05
	Gain 2	8,284 E+04	8,285 E+04
	Gain 1	3,287 E+04	3,287 E+04
Gain indicator	Gain 4	4V $\pm 5\%$	
	Gain 3	3V $\pm 5\%$	
	Gain 2	2V $\pm 5\%$	
	Gain 1	1V $\pm 5\%$	
Tolerance of Gain (@ $V < \pm V_{LR}$ )	<10%		
Nonlinearity (NL) (@ $V < \pm V_{LR}$ )	<1%		
Temperature coefficient of gain	< 0.01%/°C		<i>@ Temperature range 23 °C <math>\pm</math> 5 °C</i>
Long-term instability of gain	< 1% over 10 years		
Output Offset (@ $V_{in} = 0\text{V}$ ) ( $B_{offs}$ )	Can be cancelled		
Temperature coefficient of the input offset voltage	< $\pm 30\text{ nV}/^\circ\text{C}$		
Input Offset fluctuation and drift (0.1 to 10 Hz)	$\leq 4\text{ nV}_{RMS}$		<i>RMS value;</i>
Voltage noise			
Input Noise Spectral Density @ $f > 1\text{ Hz}$	$\leq 1\text{ nV}/\sqrt{\text{Hz}}$		

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Typical frequency response		
Parameter	Value	Remarks
Frequency bandwidth [f <sub>T</sub> ]	10Hz or 40Hz (see Figure 4)	<i>Bessel filter; Corner frequency of Low Pass output filter can be selected by appropriate jumpers, see appendix A.</i>
Settling time, 1%	< 10ms	
Output resistance	< 10 Ohms, short circuit proof	
Temperature output of the electronic box		
Ground-referred voltage	V <sub>T</sub> = 80,4mV/°C, see Figure 5	
Power		
DC power	170mA – 200mA @ 24Vdc	Fused (315mA)
Environmental parameters		
Operating temperature	+15°C to +35°C	
Storage temperature	-20°C to +85°C	

## Mechanical specifications:

Mechanical		
Parameter	Value	Remarks
Differential Signal input connector	Lemo-EVP.1S.304.CLLSV - socket, panel, 4 way (mating Plug, FGG.1S.304)	
Power Input Connector	2 x 4mm Banana Socket	
Temperature connector	BNC connector, panel	
Gain indicator connector	BNC connector, panel	
Voltage output connector	Radial BR2 bulkhead receptacle rear mount (mating plug, BR2 straight plug clamp 2 cores cab 4mm)	
Enclosure	High mechanical strength, electrically shielded aluminium case, dimension: 165 x 315 x 133mm (W x L x H)	
Weight	<2kg	

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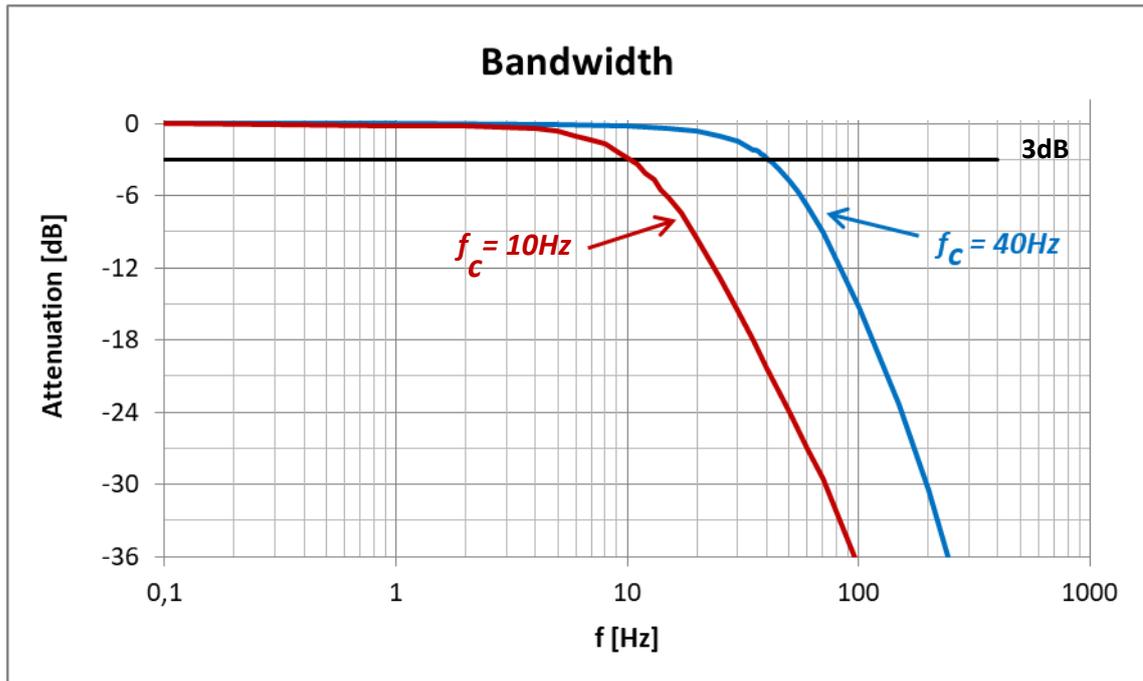


Figure 4: Gain vs. Frequency

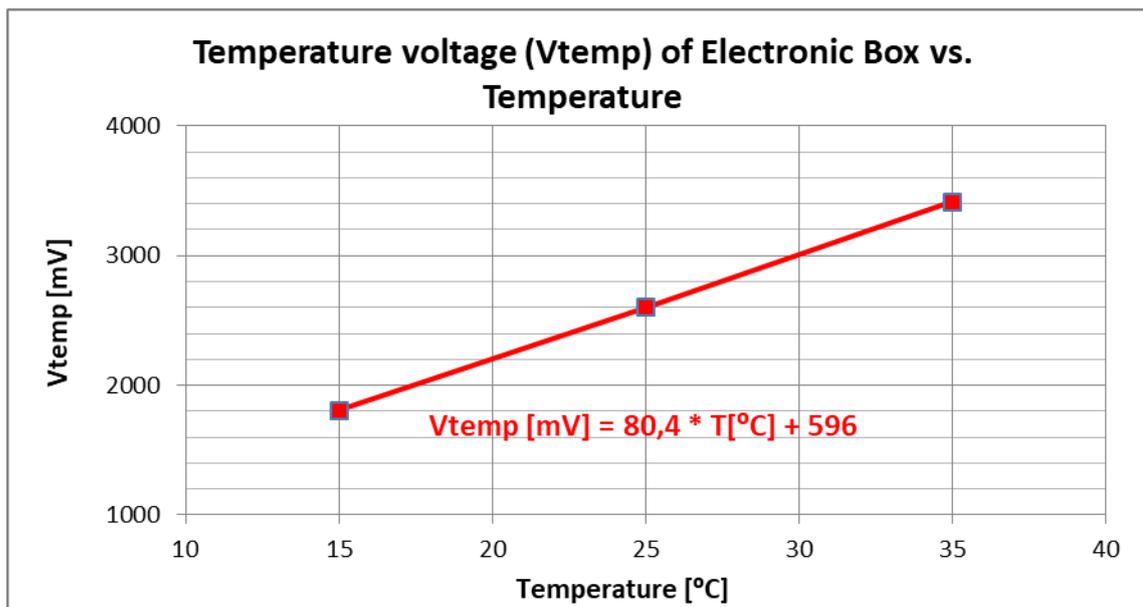


Figure 5: Temperature voltage of the Electronic box vs. Temperature

## Installation manual for the NVM-01:

**Prior to any operation**, please touch a grounded object in order to discharge any static electricity you may have built. This is especially important when the humidity is low, e.g. in the winter in the areas with lot of snow or with severe cold weather.

**Important!!** Thermal emf's are usually in the range of tenths of  $\mu\text{V}/^\circ\text{C}$ . This means that you need to have the NVM-01 thermally as stable as possible. The amplifier should be placed away from drafted areas and away from windows or the direct sunlight.



## Appendix A – Setting corner frequency of the output LP filter

Corner frequency of output Low-pass filter can be set to 10Hz or 40Hz with the two jumpers on the amplifier module of NVM-01.

First, amplifier module must be removed from NVM-01 by unscrewing the 4 screws – see figure A and figure B.



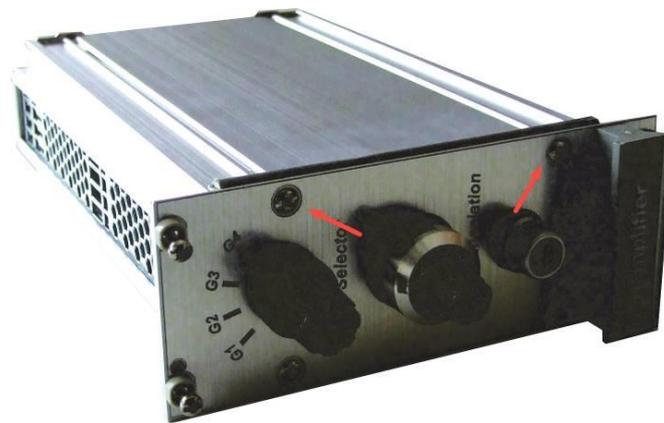
Figure A: Removing "Amplifier" module from electronic box



Figure B: Removing "Amplifier" module from electronic box



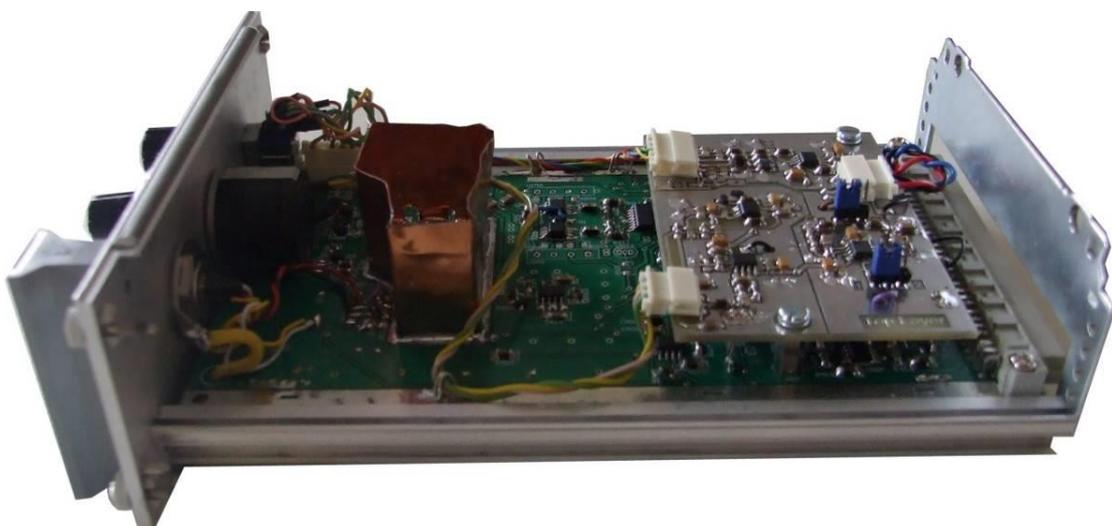
When "Amplifier" module is removed from the electronic box, the amplifier top cover should be removed by unscrewing the 4 screws, two from at the front side of Amplifier module – marked on figure C, and two screws at the back side of the amplifier module – marked on figure D.



*Figure C:* Removing top cover from "Amplifier" module.



*Figure D:* Removing top cover from "Amplifier" module.



*Figure E:* Amplifier module without top cover.



There are two "blue" jumpers on the additional board.

When both jumpers are at position 1 – see figure F, corner frequency of output LP filter is set to 10Hz.

When both jumpers are at position 2 – see figure G, corner frequency of output LP filter is set to 40Hz.

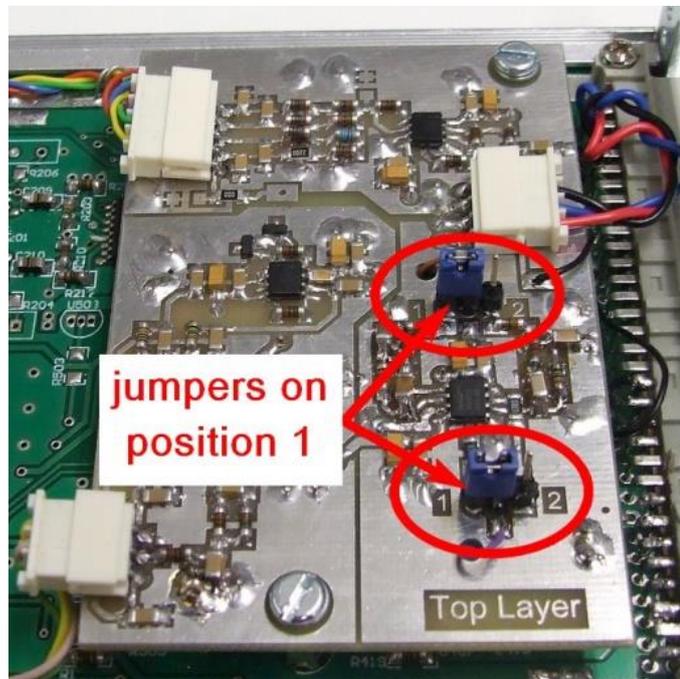


Figure F: Jumper position for setting the corner frequency of output LP filter to 10Hz.

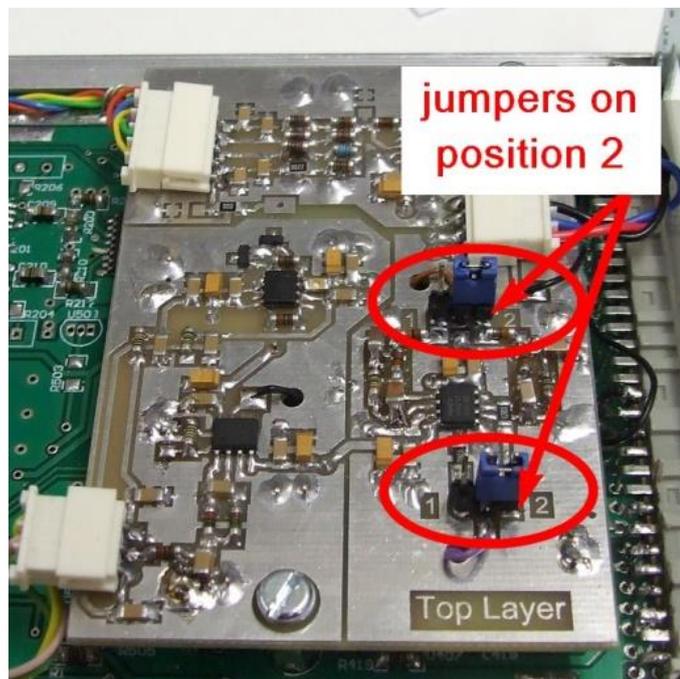


Figure G: Jumper position for setting the corner frequency of output LP filter to 40Hz.

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