

NS25/E2 APPLICATION NOTES



General Information

The NS-25/E2 inclinometer is designed for OEM applications. It is a newly developed sensor, manufactured in modern micro system technology. Basically, the sensor consists of a measuring cell, manufactured in thin-film technique which is mounted on a PCB board containing electronic components. The circuit is designed to be very flexible, so that it can be adapted to different systems. The sensor can be adapted to various types of supply voltages by a number of solder straps. The provided interface is a voltage output signal.

Circuit Description

The inclinometer is working with a new circuit concept. We measure the conductivity over two pairs of electrodes based on the ground of the sensor cell. By tilting the sensor we change the liquid level over the electrodes, which causes a change in conductivity. Since we are using a difference measurement method, the temperature coefficient will be reduced.

The electronic unit consists of the following functional blocks: frequency generator, reference voltage generator, signal conditioning, voltage supply, and auxiliary voltage generation. In the standard type NS-25/E2, a frequency generator generates the a.c. frequency, which then connects the reference voltage synchronously to the sensor element. Then the uncoupled signal is rectified and divided into X- and Y-signal synchronized by the frequency. Thereafter the signal is available at the output.

HL-Planartechnik GmbH

Hauert 13, 44 227 Dortmund, Tel.: +49 (0) 231/97400, Fax.: +49 (0) 231/974020

Internet: <http://www.hlplanar.com> E-Mail: service@hlplanar.de

Modifications of NS-25/E2

The NS-25/E2 inclinometer was designed in such a way that, the sensor is adaptable to different applications by simple modifications of the PCB and solder strap options. The differences between the various types of inclinometers are based primarily on the voltage supply and the changing reference potential of the output voltage (ratiometrically around GND or U/2).

The following table gives a summary of the available types of inclinometers:

Type	Supply Voltage	Type of Voltage Supply	Output Voltage X-IY-Output
1	+10 VDC	unipolar, fixed	$\pm 2,5$ V around 5 V
3	+5 VDC	unipolar, fixed	± 2 V around 2,5 V
4	+7...+24 VDC	unipolar, variable	± 2 V around 2,5 V
7	+7...+24 VDC	unipolar~ variable	$\pm 2,5$ V around GND

Options: It is possible to choose whether there are potentiometers for zero and sensitivity. These facilitate easy adaptation to the mounting location and variation of the output voltage of the two analog outputs.

For temperature compensation and long-term stability reasons the electronic system of the NS-25/E2 does not contain any linearization of characteristics!

Tuning

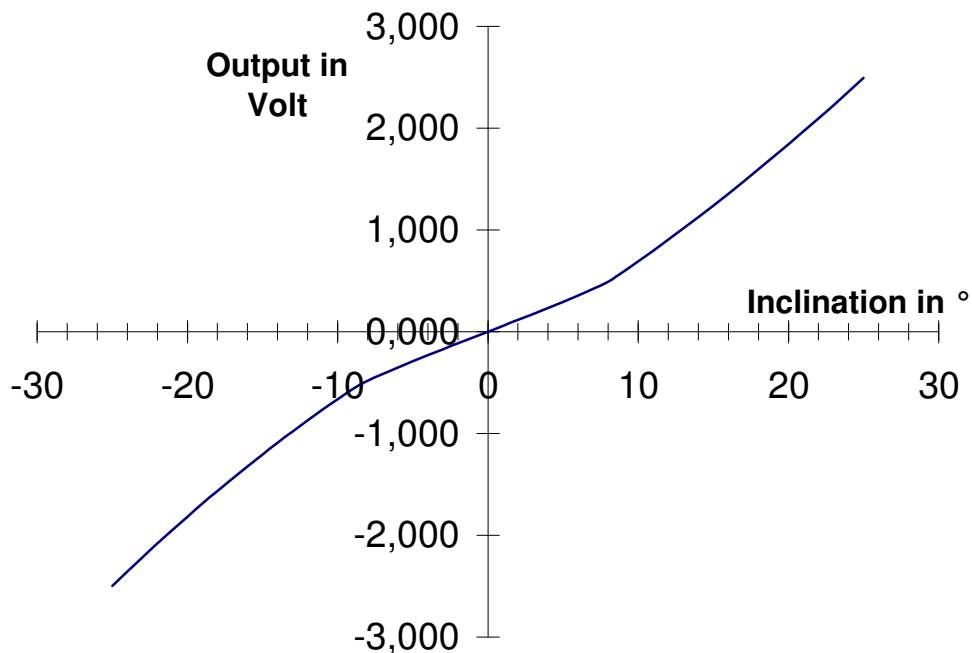
The standard type is equipped with three potentiometers. This enables the user to adjust the sensitivity ($\pm 20\%$) for both measuring axes at the same time and zero point ($\pm 5^{\circ}$) for each axis separately. For applications where vibrations can appear the sensor is also available without the potentiometers. Then the sensitivity is preset and zero deviates about $\pm 2\%$ from absolute zero.

The outputs

The analog outputs should not be connected with resistance loads less than 1 kOhm. They are only partially short-circuit proof. Short circuits with positive supply voltage should be avoided.

Specifications

Measuring range:	$\pm 25^\circ$
Measuring axes:	Two (x/y) orthogonal orientated
Output:	Depends on type (see table)
Resolution:	$2 \cdot 10^{-3}^\circ$
Precision:	0.6% [FS]
Banking sensitivity:	< 1.5% [FS]
Temperature stability	
Zero point:	$2 \cdot 10^{-3} / K$
Sensitivity:	$5 \cdot 10^{-3} / K$
Supply voltage:	Depends on type (see table)
Current consumption:	7--30 mA (depends on type, see table)
Contact:	Pin strip and soldering pads
Operating temperature:	-25 °C ... +70 °C
Storage temperature:	-40 °C ... +85 °C
Dimensions:	50mm x 50mm x 12mm
Weight:	Approx. 20g

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