



Single Axis Tilt Measuring System



Content

■ 1 General Information.....	3
■ 1.1 Safety Instructions.....	3
■ 1.2 Qualified Personnel.....	3
■ 1.3 Intended Use.....	3
■ 2 Instructions for use of the measuring amplifier.....	4
■ 3 Technical Description.....	5
■ 4 Terminal Assignment.....	5
■ 4.1 Supply Voltage.....	5
■ 4.1.1 Load Impedance.....	5
■ 5 Starting up.....	6
■ 5.0.1 Description of measuring axis.....	6
■ 5.1 Calibration of the tilt measuring system.....	7
■ 5.1.1 Adjusting the zero-point.....	7
■ 5.1.2 Adjustment / calibration of the amplifier.....	7
■ 6 Maintenance.....	8
■ 7 Old appliances disposal.....	8
■ Appendix.....	9
■ Datasheet.....	9
■ Order Designation.....	9
■ Housing Dimensions.....	10
■ EMC-Mounting.....	11

■ 1 General Information

To ensure reliable and safe operation, the measuring amplifier must be operated in compliance with the specifications according to this technical description only. These regulations must also be observed if accessories, which have been ordered from Althen Mess- & Sensortechnik GmbH together with the measuring amplifier, are being used.

Notice: Every person who is in charge for the start-up or service of this measuring amplifier must have read this technical manual and must have understood the safety instructions in particular.

■ 1.1 Safety Instructions

When using the amplifier, the legal- and safety regulations for each case of application must be observed. To avoid risks for the system or the operator the following points are to be considered.

- If any visual damage or malfunctions are noticed, the measuring system must be switched off and marked appropriately.
- Disconnect the supply voltage before opening the device.
- The complete measuring unit must be protected against contact and influence of unauthorised persons.
- In the case of a safety-relevant application, where a potential malfunction could cause damage to property or persons, it is imperative that an additional, independent monitor is provided.
- In combination with sensors, the maximum loads / pressures etc. must never be exceeded.

If you have reasons to assume that safe operation is no longer possible, immediately take the device out of operation and secure it against unintentional operation.

■ 1.2 Qualified Personnel

This measuring system must be operated by qualified personnel and in compliance with the relevant technical specifications only. Qualified personnel include such persons who are conversant with the setting up, mounting and starting up of the measuring system and who have qualifications that are appropriate for the tasks they're about to perform.

■ 1.3 Intended Use

Amplifiers from Althen Mess- & Sensortechnik GmbH serve to measure the intended measurand and the evaluation thereof in combination with one or more sensors. Any other use over and above that is regarded as non-intended use.

■ 2 Instructions for use of the measuring amplifier

Notice: The parameterizations, further information concerning the scaling as well as the customized analogue output can be found on the additional page "Device-Configuration".

Since this amplifier is a highly sensitive measurement technology product, it must be used for its intended use as well as the described operating conditions only. Initial start-up and changes in setup and settings must be done by qualified personnel only. To prevent interventions / modifications made by unauthorized personnel, suitable measures must be taken. Both function and calibration must be checked regularly.

The amplifier must be operated with a separate power source used for measurement devices only. Shielded cables, preferably twisted in pairs should be used only. The EMC-installation instructions must be complied with.

The amplifier is contained in an aluminum housing which is equipped with an EMC- cover gasket as well as EMC-cable glands. After initial start-up the lid is to be closed properly. This ensures IP-level 65.

The housing is to be mounted on a grounded object / surface.

The tilt measuring system must be connected to clean earth-potential. Please refer to the EMC-Mounting-Instructions in order to connect the sensor-shields correctly. To avoid possible potential equalization currents over the shield of the cable to the following evaluation unit, this shield should be connected over a suitable capacitor (10 nF / 200 V).

Overall the shield connections must be done properly to EMC-standards (as short as possible with large wire cross-section) and connected to a central point (star grounding). In order to not increase the disturbance sensitivity of the amplifier, all cables should be kept as short as possible and should not be extended. Possible cable-bound disturbances (i.e. noise) must be blocked very near the cable ends (evaluation unit) by suitable measures.

If it is to be expected that the amplifier is, as example, cleaned with a high-pressure cleaner/ steam jet an additional protection shall be provided.

Notice: Changes of the measuring system of any kind demand for the explicit approval of Althen Mess- & Sensortechnik GmbH. Changes of any kind done without that approval exclude all possible warranty and/or liability of Althen Mess- & Sensortechnik GmbH.

Please note that the tilt measuring system responds not to inclination changes only, but as well to vibrations and to acceleration forces. If necessary and been ordered, a low pass filter can be installed.

■ 3 Technical Description

This single axis, industrial tilt measuring system, which consists of one non-contact sensor and an electronic customized for said sensor, serves to measure accurate tilt angles in x-axis and it is intended for side wall mounting. Depending on the version the tilt angle can be between ± 3 up to $\pm 60^\circ$, or between $0 \dots 10^\circ$ to $0 \dots 90^\circ$.

A standard analogue output of $4 \dots 20$ mA is available for further evaluation.

The measuring system is contained a robust aluminium die cast enclosure which is perfectly suited for rough industrial environment. Additionally, the measuring system has been encapsulated to meet IP68 specifications and be better protected against vibrations.

■ 4 Terminal Assignment

The electrical connection has been made via EMC cable glands and soldered inside. The shield of the cable is connected to the housing.

Clamp	Description	Color
1	18 ... 28 VDC	red
2	Signal	black

■ 4.1 Supply Voltage

The supply voltage can be $18 \dots 28$ VDC.

It is to be noted, that the voltage determines the max load impedance. For instance: a voltage of 24 VDC allows a max. load impedance of 500 Ohms.

■ 4.1.1 Load Impedance

The maximum load impedance depends on the supply voltage and is:

$$[18 \text{ VDC} = 200 \text{ Ohm}]$$

$$24 \text{ VDC} = 500 \text{ Ohm}$$

$$[28 \text{ VDC} = 700 \text{ Ohm}]$$

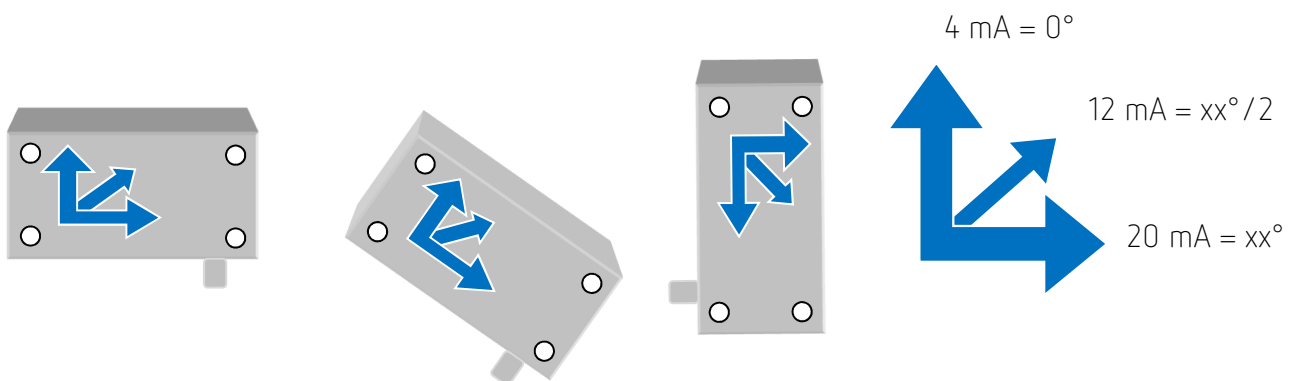
■ 5 Starting up

Before mounting, all transport protection has to be removed and disposed of properly.

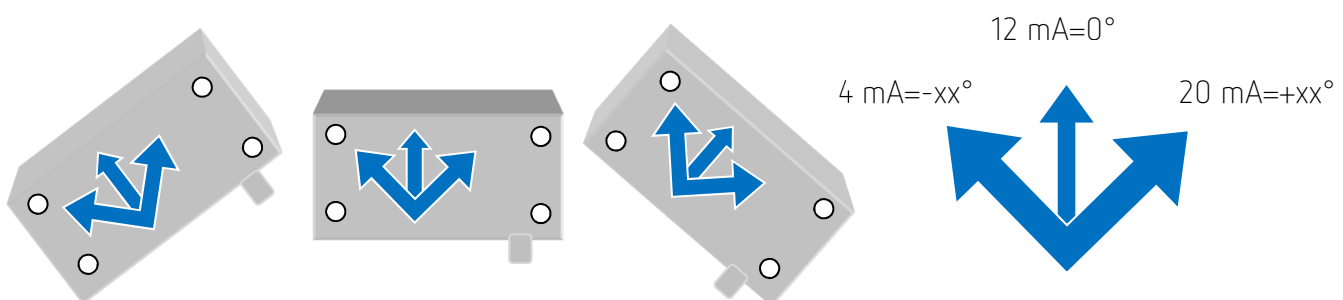
The measuring object is to be leveled horizontally (e.g. using the PRO3600 protractor from ALTHEN).

- The sensor is to be mounted to a vertical surface at the object to measure.
- After taking of the lid the mounting holes are visible.
- The tilt measuring system is to be connected according to the terminal assignment. The EMC-mounting instructions are to be complied with.
- System is to be powered up.
- Allow the measuring system approx. 15 minutes to warm up.
- After levelling the system out 12 mA are to be adjusted.
- If the range of adjustment should not be sufficient the mounting must be changed.
- Both function and calibration are to be checked.
- In order to ensure protection class IP68, the lid must be closed properly after initial start-up.

■ 5.0.1 Description of measuring axis



Versions 0 ... xx° (Note: figure shows version 0...90°)



Versions 0 ... $\pm xx^\circ$ (Note: figure shows version 0... $\pm 45^\circ$)

■ 5.1 Calibration of the tilt measuring system

Notice: The measuring system is factory pre-calibrated. Under normal circumstances, an adjustment is not necessary.

After mounting the system, caused by deviations of mounting, a slight correction of the zero-point is often necessary. The calibration of the span / full-scale is to be checked.

■ 5.1.1 Adjusting the zero-point

- - Connect an amperemeter
- - The measuring object is to be leveled out.
- - Adjust the zero point with the potentiometer „N“ to

12,00 mA (version ± xx°) or

4,00 mA (version 0 ... xx°).

Notice: The zero-point adjustment range is approx. 10 %. If this might not be sufficient, the measuring object is to be re-leveled.

■ 5.1.2 Adjustment / calibration of the amplifier

Before shipping, the measuring system has been pre-adjusted. Using the potentiometer “V” should not be necessary.

Anyway, if a re-adjustment is necessary, it is done as follows:

- Level the measuring system with the help of e.g. precision spirit level.
- Now adjust the zero-point.
- Now tilt the measuring system about 80 ... 100% of its maximum range.
- Now use the gain /end value potentiometer (“V”) to set the analogue output to the desired value.

For scaling of the analogue output applies:

$$\text{Analogue output} = 12 \text{ mA} + \frac{\text{Defined angle}}{\text{Full range}} \times 8 \text{ mA}$$

■ 6 Maintenance

The flawless function and calibration of the whole measuring system is to be checked regularly. This inspection is also necessary after every repair or change of any component of the measurement system.

■ 7 Old appliances disposal



According to european and german law, it is prohibited to dispose of old electronic devices into household waste, but must be collected and disposed of separately.

Amplifiers and measurement units manufactured and sold by Althen Mess- & Sensortechnik GmbH serve B2B purposes only. Therefore, those old appliances must not be given to the communal disposer, but must be given back to the seller or disposed of properly. If you need any further information, please contact your local authorities.

These measures serve to protect the environment and allow recycling and recovery of valuable materials. Furthermore, do electronic devices contain substances that may cause damage to the environment if burned or dumped with normal household waste.

■ Appendix

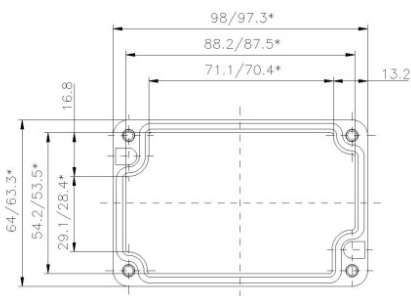
■ Datasheet

Number of measuring axis:	1	
Supply voltage:	18...28 VDC	Protected against voltage reversal
Power consumption:	ca. 3 W	
Analogue output	4 ... 20 mA (2-wire)	Max. impedance depending on voltage
Frequency (-3dB):	0,5 Hz	
Preferred measuring ranges	±3°, ±5°, ±10°, ±15, ± 20, ±30, ±45° 0...10°, 0...30°, 0...45°, 0...60°, 0...90°	Other ranges on request
Accuracy at 23°C:	to ±10° tilt ±10° bis ± 30° to 60°	±0,1 ° ±0,2° ±0,25°
Electrical connections:	3 m cable 2x0,25mm ² (AWG20), other lengths on request	
Enclosure:	EMC-aluminum die-cast	
Protection class:	IP68	
Dimensions (W x H x D):	98x38x63 mm (w/o cable gland)	
Weight:	ca. 550g (incl. 3m cable)	
Storage temperature range:	-35°C...+75°C	
Operating temperature range:	-20°C...+60°C	

■ Order Designation

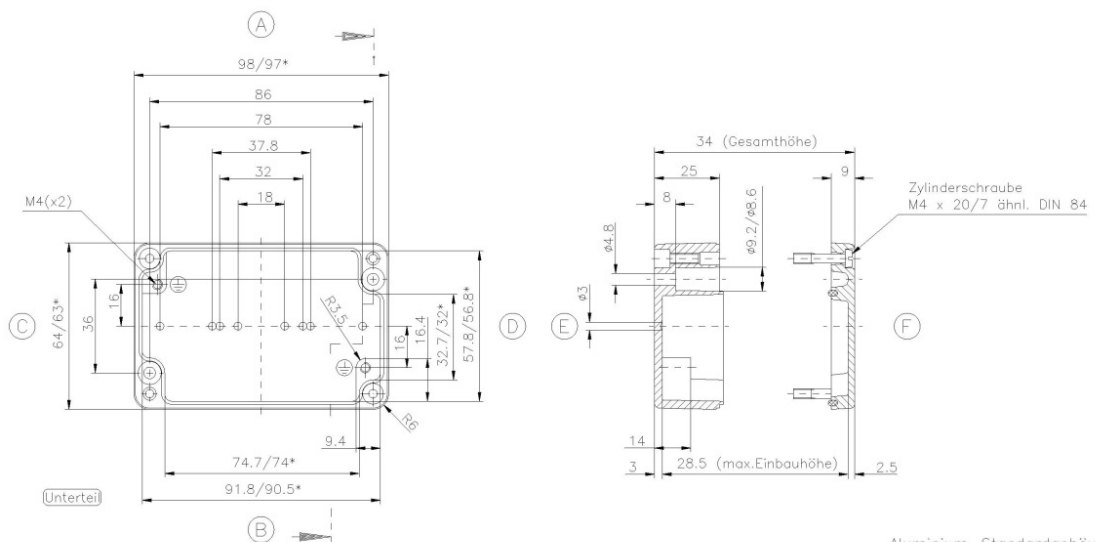
NM1-IP-2L-24-420-...	1-axis measuring system
...-Bxx-...	Bidirectional, xx=inclination measuring range, e.g. B45 = ±45 °
...-Lxx-...	Left-handed, xx= inclination measuring range, e.g. L30 = 0 ... -30°
...-Rxx-...	Right-handed, xx= inclination measuring range, e.g. R30 = 0 ... 30°
...-y m	Cable length (1-120m) customer request

■ Housing Dimensions



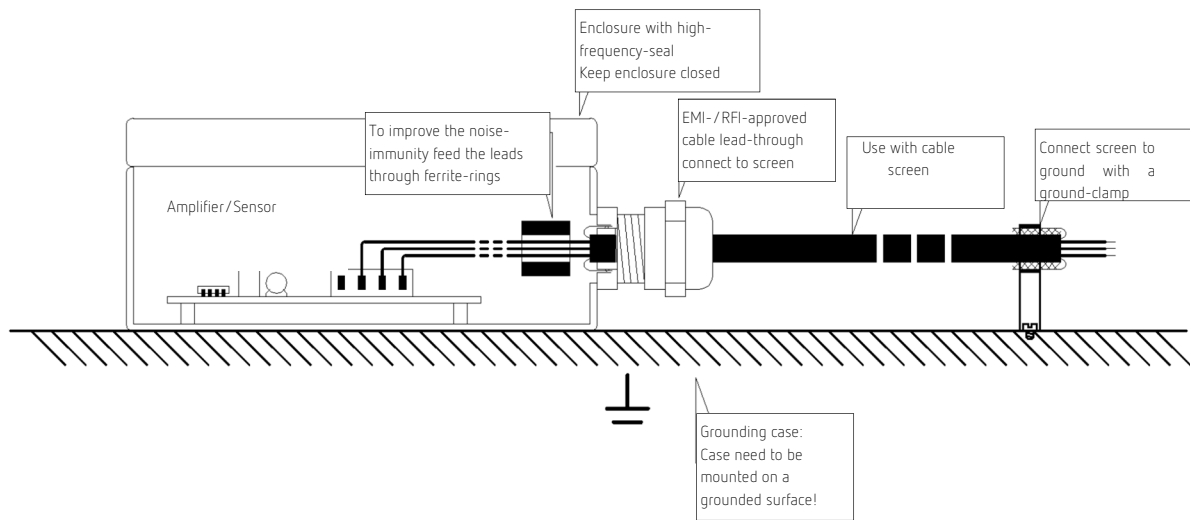
* = Mass durch Formkonizität nach unten verringert.
Freimass – Toleranz nach GTA 13/5 DIN 1688

Deckel



Aluminium-Standardgehäuse
Best.Nr. 01.061003

■ EMC-Mounting



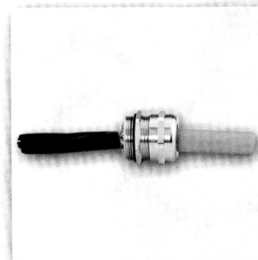
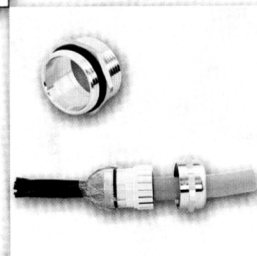
1st Step



- + Skin cable
- + Lay open the braid

2nd Step

- + Lead cable through cap nut
- + Establish cable in clamping
- + put braid over clamping
- + Braid have to overlap the o-ring approx. 2mm



3rd Step



- + Put clamping application in Cable gland
- + Tighten cap nut
- + FINISHED!

Subject to modifications.
All information describe our products in general form.