



Single Axis Tilt Measuring System



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■ 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 unauthorized persons.
- In 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 a 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 66.

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 is intended for side wall mounting. The range of the angle to measure can be set by an internal dip-switch. The measured values are put out digitally via a RS232 interface. With version ...-420-... these values can also be read out via standard 4 ... 20 mA analogue output.

The measuring system is contained a robust aluminum die cast enclosure which is perfectly suited for rough industrial environment.

■ 4 Terminal Assignment

The electrical connection (Unitronic FD CP plus 3x2x0,25mm²) has been made via EMC cable glands and soldered inside. The length varies, depending on the version. The shield of the cable is connected to the housing.

Clamp	Description	Color
1	Supply voltage	white
2	GND Supply voltage	brown
3	RS232-interface (9600 Baud, 8N1)	pink
4	External control signal for tare / zero*	grey
5	GND Analogue output	green
6	Analogue output 4...20 mA	yellow
EMC-Cable-gland	Shield	Cable shield/blank

*In order to tare the read-out, put 24V on pin 4. It is to be secured against unintentional operation.

■ 4.1 Supply Voltage

The supply voltage can be 22 ... 26 VDC. An external Fuse of $I_{\text{extern}}=200\text{mA}$ is necessary.

■ 4.2 Measuring value output RS-232

The measured values are put out constantly via the RS-232-interface (9600 Baud, 8N1) with a sampling rate of approx. 2 per second and may be displayed and recorded with a terminal-application like HyperTerminal for Windows® for example.

■ 4.2.1 Measuring value output 4 ... 20 mA

In case of version ...-420-... the tilt angle can be read out via the analogue output of 4 ... 20 mA. For scaling please refer to page "Device-Configuration". Max. impedance is 500 Ohms.

Scaling (example -see next page):

-10°	...	0	...	+10°
4	...	12	...	20 mA

■ 5 Starting up

The range to measure can be selected with a dip-switch (S-01/1...3).

The dip-switch S-01/4 allows to change the polarity of measured values.

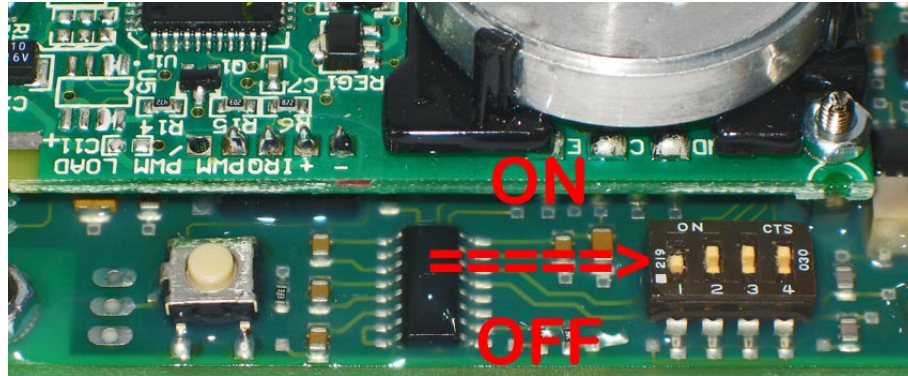


Fig. 1a: Scaling of the measuring range by DIP-switch S-01; shown range: $\pm 45^\circ$ inclination

S-01-1	S-01-2	S-01-3	S-01-4	range /	polarity of analogue output
OFF	OFF	OFF	X	$\pm 10^\circ$	
OFF	OFF	ON	X	$\pm 20^\circ$	
OFF	ON	OFF	X	$\pm 30^\circ$	
OFF	ON	ON	X	$\pm 45^\circ$	
ON	OFF	OFF	X	$\pm 60^\circ$	
ON	OFF	ON	X	$\pm 90^\circ$	
ON	ON	OFF	X	$\pm 120^\circ$	
ON	ON	ON	X	$\pm 180^\circ$	
X	X	X	ON		- range ... + range = 4 mA ... 20 mA
X	X	X	OFF		- range ... + range = 20 mA ... 4 mA

X = not involved

Notice: In order to prevent moisture from intruding, it is recommended that after final setup, the dip-switch gets sealed with some silicone (not too thin though) or adhesive strip.

After mounting the measuring system, a zero-point-adjustment should be carried out. In order to do so, the object to measure, together with the mounted measuring system, must be levelled horizontally.

To save the inclination angle as zero-reference:

- a) the button shown below is to be pressed or
- b) a short 24 Volt signal is to be put to clamp 4

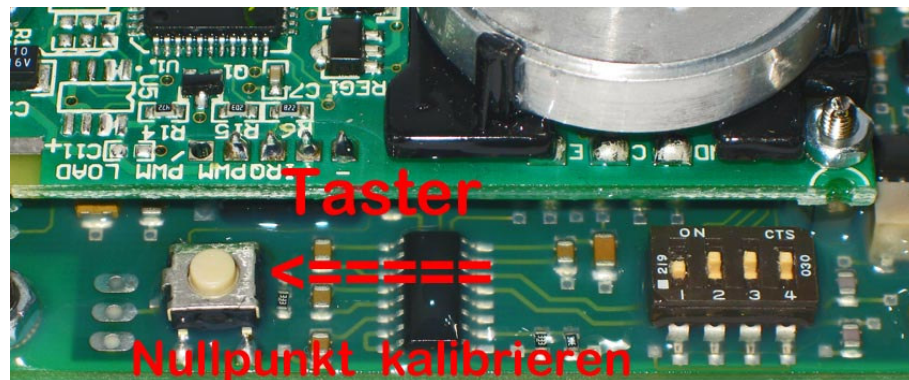


Fig 1b: Button for tare

There are 3 internal LED's:

LED	Color	Action	Description
1	yellow	flashes	measured values are present and are being outputted.
2	red	flashes	chosen range has been exceeded.
2	red	lights up for approx. 1 sec	system is being zeroed / tared (after putting 24 Volts to clamp 4 / pushing the button).
3	green	on	Indicates internal supply voltage.

Notice: 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.

■ 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

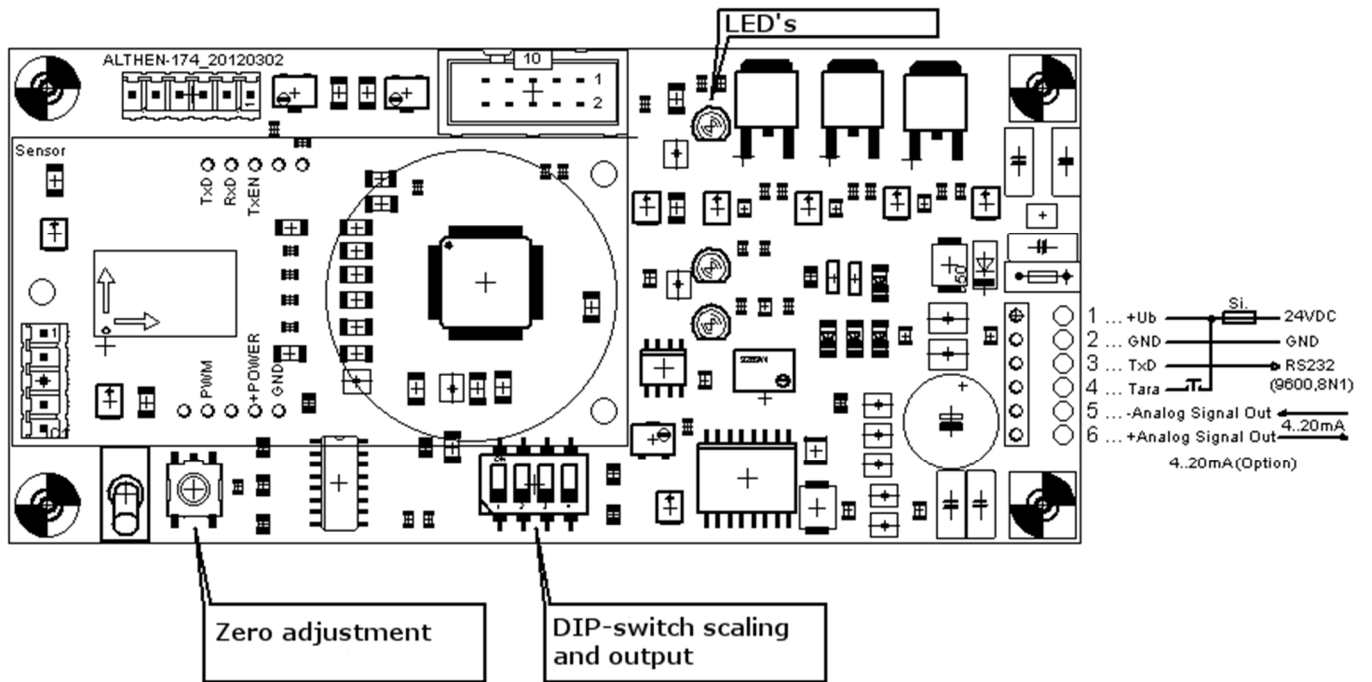
■ Datasheet

Number of measuring axis:	1	
Supply voltage:	22...26 VDC	Elektronik gegen Verpolung geschützt
Power consumption:	ca. 3 W	
Data Interface/Analogue Output:	Serial RS232 (9600 Baud, 8N1) 4 ... 20 mA max. 500 Ohm	
Measuring Frequency (-3dB):	0,4 Hz	
Selectable Ranges	Range selectable via internal dip-switch ±10°, ±20°, ±30°, ±45°, ±60°, ±90°, ±120°, ±180° inclination	
Accuracy:	±0,2°	@ 23°C
Repeatability:	±0,1°	
Hysteresis:	±0,1°	
Thermal drift:	±0,015°/°C	
Electrical connections:	Standard: 3 m Cable (up to 10 m if requested) Cable- type: Unitronic FD CP plus 3x2x0,25mm ²	
Housing:	EMC-aluminum die-cast	
Protection class:	IP66	
Dimensions (W x H x D):	150x65x36 mm (w/o cable gland)	
Weight:	ca. 630 g incl. 3 m Cable, Electronics not encapsulated ca. 1150 g incl. 10 m Cable, Electronics not encapsulated	
Storage temperature range:	-20°C ... +60°C	
Operating temperature range:	-20°C ... +60°C	

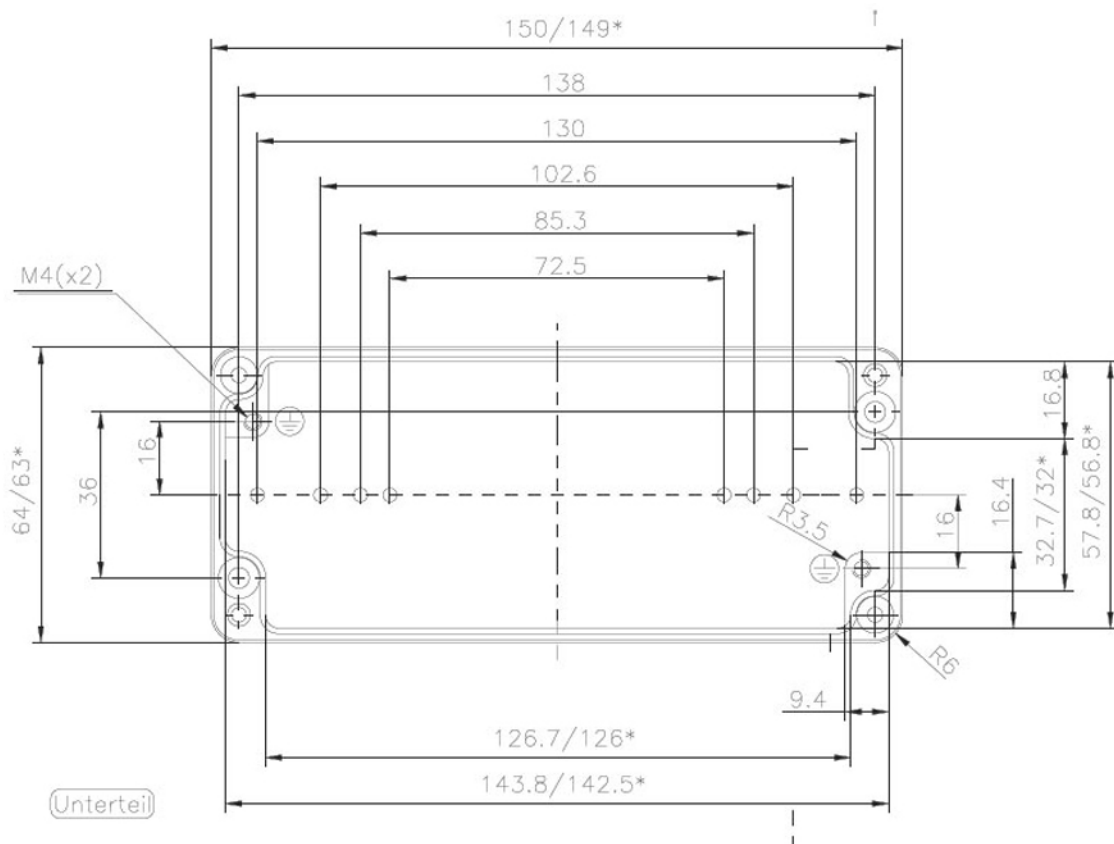
■ Order Designation

NM1-ISU-IP-3L-24...	1-axis industrial inclination measurement system, Supply voltage 22...26 VDC, 3-wire-technology	
...-RS232-...	Measurement value output via RS232-data interface (9600 Baud, 8N1)	
...-420-...	Measurement value output via RS232-data interface, with additional analogue output 4...20 mA	
...-x-...	Cable length in m	
...V-	Electronics and sensor encapsulated for protection	

■ Component diagram



■ Housing dimensions



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