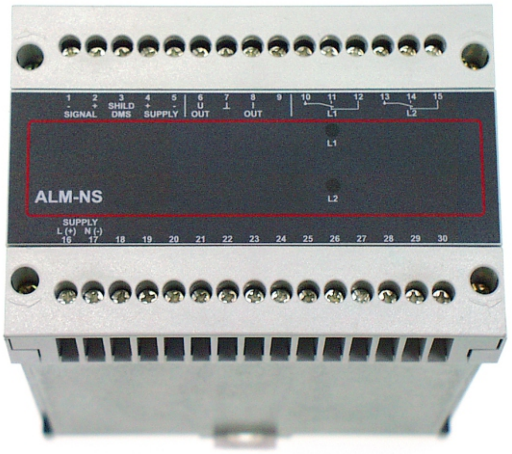
Operating Manual



ALM-NS

Content

1 General

1.1 Information

- These operation instructions contain important information on handling the strain gauge transmitter Working safely requires that all safety instructions and work instructions are observed.
- Skilled personnel must have carefully read and understood the operating instructions prior to beginning any work.
- The operating instructions are part of the product and must be kept in the immediate vicinity of the ALM-NS and readily accessible to skilled personnel at any time.
- Observe the relevant local accident prevention regulations and general safety regulations for the ALM-NS range of use.
- If the serial number gets illegible (e. g. by mechanical damage), the retraceability of the device is not possible any more.
- The transmitter strain gauges described in this operating manual are carefully designed and manufactured using state-of-the-art technology. Every component undergoes strict quality inspection in all stages of manufacture.
- The manufacturer‘s liability is void in the case of any damage caused by using the product contrary to its intended use, non-compliance with these operating instructions, unauthorised modifications to the ALM-NS or assignment of insufficiently qualified skilled personnel.

1.2 Signs, Abbreviations

Warning!
A non-compliance can cause injuries to persons and/or the demolition of the device.
There can be a danger to life.

Attention!
A non-compliance can cause a faulty operation of the device or lead to property damage.

Information!
A non-compliance can have influence on the operation of the device or cause unintentional reactions of the device.

Danger!
Should the safety instructions not be observed, there is a risk of serious or fatal injury caused by electrical power.

2 Transport, Packaging, Storage

2.1 Transport

Check the device for any damage that may have been caused during transportation. Report obvious damage at once.

2.2 Packaging

Do not remove packaging until just before mounting. Keep the packaging as it will provide optimum protection during transport (e. g. change in installation site, returning).

2.3 Storage

For longer term storage avoid the following influences:

- Direct sunlight or proximity to hot objects
- Mechanical vibration, mechanical shock (rough deployment)
- Soot, vapour, dust and corrosive gases

If possible store the device in its original package or an equivalent one

3 Safety Instructions

Before installation, commissioning and operation select the appropriate strain gauge transmitter in terms of function and equipment.

More important safety instructions can be found in the individual chapters.

3.1 Intended Use of the Product

The device has been designed and built solely for the intended use described here and may only be used accordingly.

The technical specifications contained in these operating instructions must be observed. Improper handling or operation of the device outside of its technical specifications requires the device to be taken out of service immediately and an inspection by the manufacturer.

When the device is transported from a cold into a warm environment, the formation of condensation may cause the device to malfunction. Before putting it back into operation, wait for the device temperature and the room temperature to equalise.

The manufacturer shall not be liable for claims of any type based on operation contrary to the intended use.

3.2 Personnel Qualification

Risk of injury if qualification is insufficient

Improper handling can result in considerable injury and damage to equipment.

- The activities described in these operating instructions may only be carried out by skilled personnel who have the qualifications described below.

-Keep unqualified personnel away from hazardous areas.

For installation and start-up of the ALM-NS the personnel has to be familiar with the relevant regulations and directives of the country and must have the required qualification. They must have knowledge on measurement and control technology, have to be acquainted with electric circuits, are capable of carrying out the work described and can independently recognise potential hazards. Depending on the operational conditions they need to have the corresponding knowledge, e. g. of corrosive media.

3.3 Special Hazards

In addition to all standard regulations, please also follow the appropriate existing codes or regulations.

If you do not observe the appropriate regulation, serious injuries and/or damage can occur!

A protection from electrostatic discharge (ESD) is required.
The proper use of grounded work surfaces and personal wrist straps is required when working with exposed circuitry (PCB, printed circuit boards), in order to prevent static discharge from damaging sensitive electronic components.

There is a danger of death caused by electric current.
Upon contact with live parts, there is a direct danger of death.

Electrical instruments may only be installed and connected by skilled electrical personnel.

Operation using a defective power supply unit (e.g. short circuit from the mains voltage to the voltage output) can result in life-threatening voltages at the device.

The use of this device in safety or emergency stop facilities is only allowed if the corresponding regulations are complied with!

4 Start-Up, Operation

4.1 Function

The strain gauge transmitter ALM-NS has connections for one strain gauge full bridge. Up to four full bridges can be connected in total. The sensor signal from the application gets transformed by the measurement amplifier into a standardized electrical signal. The transmitter charges the strain gauge bridge with stabilized voltage. The output-signal of the bridge changes proportional to the load and can continue processing.

i If more than one strain gauge full bridge is supposed to be connected at the same time, we recommend using a digital summator. The summing amplifier DSV and the sixfold strain gauge summing-up box DSV-6N are best suited for this task.

4.2 Before Mounting

i
- Check if the ALM-NS was delivered in complete assembly.
- Inspect the ALM-NS for possible damage during transportation. Should there be any obvious damage, inform the transport company and supplier immediately.
- Keep the packaging, as it offers optimal protection during transportation.
- Make sure to protect the connecting contacts from damage.

4.3 Product Label (Example)

MÜLLER Art.Nr.: 600-00XXX CE

INDUSTRIE - ELEKTRONIK GMBH
www.mueller-ie.com
Made in Germany
SN.: 1029.06/16-2.-000

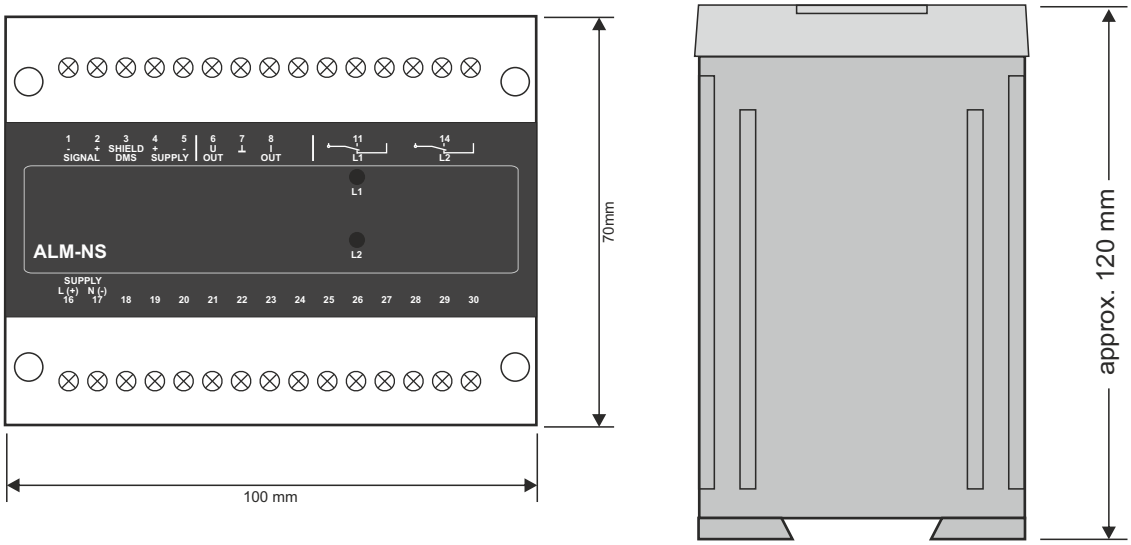
Sensor input:	strain gauge 19(-), 20(+)	Current output:	4...20mA 15(-), 13(+)
Sensor supply:	10VDC 16(-), 17(+)	Voltage output:	0...10V 15(-), 14(+)
Sensitivity:	2.000mV/V	Limit switch 1:	6(COM), 5(NC), 7(NO)
Power supply:	24VDC 1(+/L), 2(√N)	Limit switch 2:	9(COM), 8(NC), 10(NO)
Sensor:	LLxxxxx	Next calibration:	41 / 19

Art.Nr.: Part number

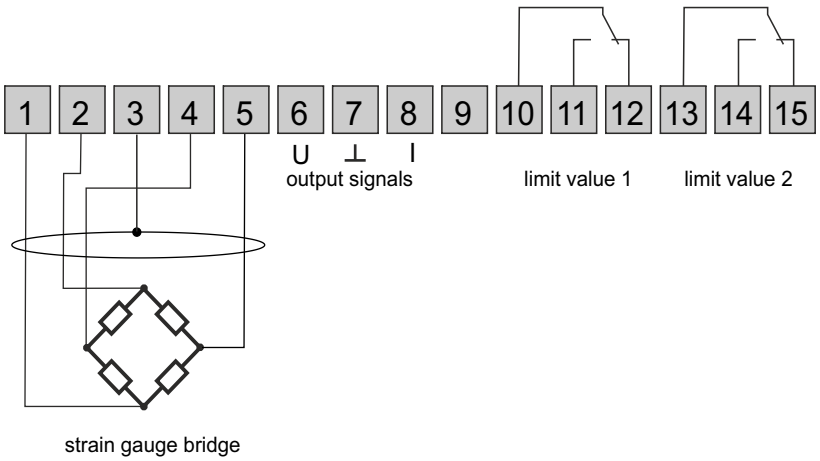
SN : Serial number

4.4 Mounting

i
- Check the delivery immediately for completeness and obvious faults.
- If parts are missing or if there are faults, contact the transport company and supplier immediately.



4.5 Electrical Connection



4.6 Electrical Start-Up

Fasten the wiring terminals tight onto the cable. The supply voltage has to be identical to the specifications on the product label.

Only operate the device when mounted.

Follow the indicated temperature restrictions for the use of the device before and during operation.

Ensure the protective conductor connection inside the corresponding equipment rack is connected **live** with the protective conductor.

4.7 Supply Voltage

Danger

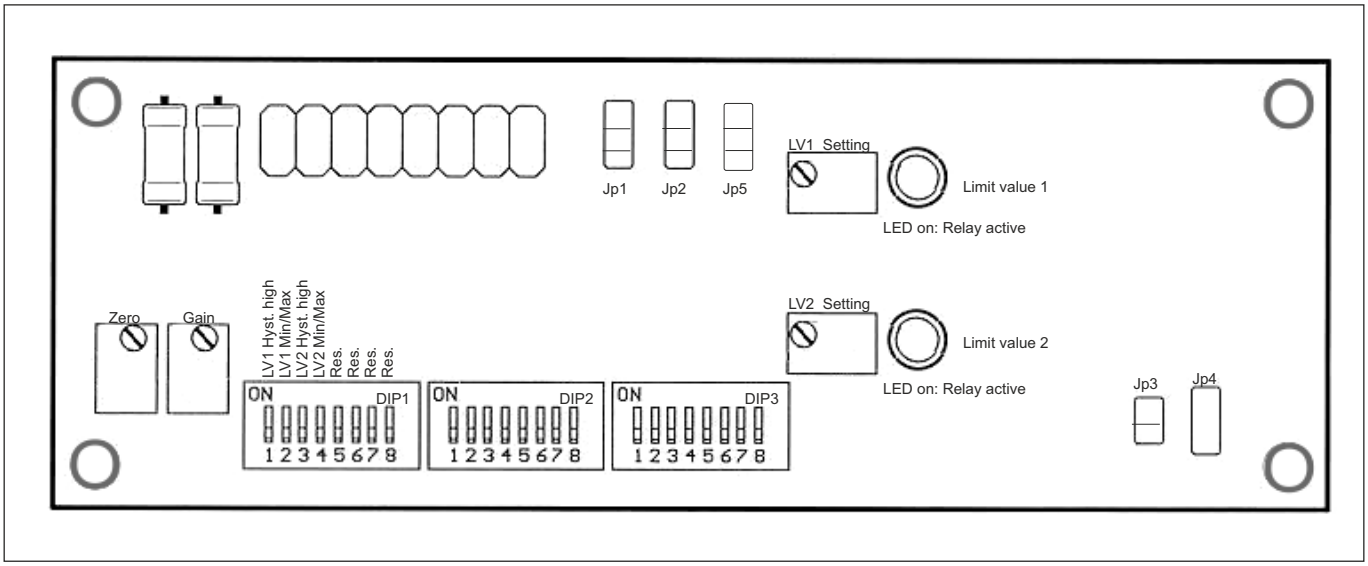
Danger by electrical shock! Conduct electrical installation only in dead voltage condition.

Property damage by electrostatic charge!
Follow safety precautions corresponding DIN EN 61340-51/-3 to prevent electrostatic charge!

Work on the electronics may only be carried out by qualified personnel.

4.8 Operation

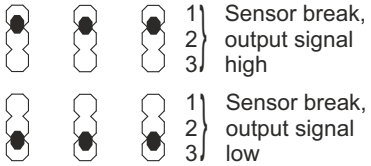
4.8.1 Overview Pin Assignment



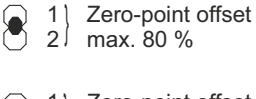
4.8.2 Solderbridge-Jumper and DIP Switch Assignment

Jumper Assignment

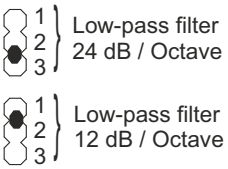
JP1 JP2 JP5



JP3



JP4



DIP Switch Assignment

DIP1 Limit value switching characteristics
DIP2 Selection output signal and input sensitivity
DIP3 Filter adjustment

! - Tables for the switching characteristics of the DIP switches can be found on page 10

- On request, the solder bridges on JP1, JP2 and JP4 can be left free. This switches off the function for sensor break detection.

4.8 Operation (Continued)

4.8.3 Configuration

- The assignment for jumpers and trimmers can be found on page 7

- Tables for the switching characteristics of the DIP switches can be found on page 10

1. Before Configuration
Please apply supply voltage before configuration.

2. Limit Value Switching Characteristics
Use switching block **DIP1** to adjust the switching characteristics of the limit values.

3. Selection Output Signal
Select the corresponding output signal via switching block **DIP2**.
Use DIP switches 1 and 2 of block DIP2.

4. Setting Input Sensitivity
Use switching block DIP2 to adjust input sensitivity in mV/V.
Use DIP switches 3-8 of block DIP2.

5. Setting Filter
Use switching block **DIP3** to adjust the filter.
Additionally, jumper **JP4** can be used to set a low-pass filter.

6. Setting Zero Point
Apply an input signal which matches your zero point.
Create the signal either via a connected calibrator or via applying
a corresponding physical value by a connected sensor.
Use the trimmer **Zero Point** to set the output signal to the value you want to equal your zero point.

If a solder bridge is on jumper JP3, then a maximum zero-point offset of 80% is set. Otherwise, if the jumper is free, a maximum zero-point offset of 40% is set.

7. Setting Accuracy Rating
Apply an input signal which matches your accuracy rating.
Create the signal either via a connected calibrator or via applying
a corresponding physical value by a connected sensor.
Use the trimmer **Gain** to set the output signal to the value you want to equal your accuracy rating.

8. Calibration
Apply the zero signal to the input again and check the output signal.
For a exact calibration it can be necessary to repeat the steps 6 and 7 multiple times
and alternately.
If both settings are exact, you can continue to step 9.

4.8 Operation (Continued)

4.8.3 Configuration (Continued)

9. Switch Point Setting

Apply an input signal which matches the value you want the limit value to switch at.
Use switching block DIP1 to set hysteresis to a minimum.
Use the potentiometers **LV1** or **LV2** to search for switch point **Limit Value 1** or **Limit Value 2**. You will have found the switch point if the condition of the corresponding LED changes. Now adjust the trimmer potentiometer LV1 or LV2 until switching occurs exactly at the applied value.

Alternatively: If no signal can be applied, you can read out the currently set limit values as voltage at the Limit Value Measurement Points **LP1** and **LP2**.
Now adjust the trimmer potentiometers LV1 or LV2 until the voltage measured from the measurement points equals your voltage values. The new limit values are now set.
Check relay behavior at a later time with an applied signal.

The ALM-NS is now configured.

Configuration Example:

The ALM-NS is supposed to switch at 20% and 80% in a range of 0...100 kg. The measurement range of 0…100 kg equals a voltage range of 0…10 V. It is assumed jumper JP3 is connected.

Possibility 1:

2 V are applied as signal for limit value 1. Use the trimmer potentiometer LV1 to search the point at which Limit Value Relay 1 switches. If the searched point is found, the corresponding LED will change conditions. The limit value 1 is now set.

Subsequently, repeat the same process for limit value 2, this time applying a signal voltage of 8 V.
If then a connected load cell with a measurement range of 0...100 kg at a voltage range of 0...10 V measures weights at 20 kg or higher, limit value 1 will switch. If the measured weight reaches a value of 80 kg or higher, limit value 2 will switch.

Possibility 2:

Applying of a signal is impossible.
Connect a measuring device to the LV measuring points LP1 or LP2. The values read out from the measuring points equal the current settings for the limit values. In this example, you will measure a voltage of 5 V at LP1 and a voltage of 10 V at LP2.

Now set the corresponding trimmer potentiometers LV1 or LV2, until the measurement device at LP1 shows a voltage of 2 V and at LP2 a voltage of 8 V[1]. The limit values are now set to 20% and 80%.

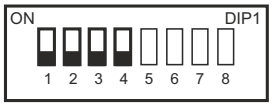
If you now connect a load cell with a measuring range of 0...100 kg at 0...10 V, you will get the switching characteristics of Possibility 1.

1) The relays won't switch during this. The setting of the limit values should be checked at a later date by applying a signal.

4.8 Operation (Continued)

4.8.4 Tables DIP Switch Switching Characteristics

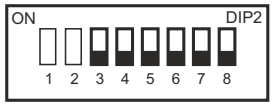
DIP1

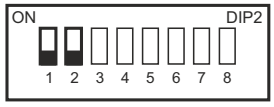


Switches 5-8 of DIP-Block 1 have no function.

Characteristics \ DIP-Switch (Block 1)	1	2	3	4
GW1 = Max / GW2 = Max		OFF		OFF
GW1 = Min / GW2 = Max		ON		OFF
GW1 = Min / GW2 = Min		ON		ON
GW1 = Max / GW2 = Min		OFF		ON
GW1 = Hyst 1% / GW2 = Hyst 1%	OFF		OFF	
GW1 = Hyst 10% / GW2 = Hyst 1%	ON		OFF	
GW1 = Hyst 10% / GW2 = Hyst 10%	ON		ON	
GW1 = Hyst 1% / GW2 = Hyst 10%	OFF		ON	

DIP2





Output \ DIP Switch (Block 2)	1	2
2...12 V, 4...24 mA	ON	OFF
2...10 V, 4...20 mA	ON	ON
0...10 V, 0...20 mA	OFF	OFF

mV/V \ DIP Switch (Block 2)	3	4	5	6	7	8
0,1	ON	OFF	OFF	OFF	OFF	OFF
0,25	OFF	ON	OFF	OFF	OFF	OFF
0,5	OFF	OFF	ON	ON	ON	ON
0,75	OFF	OFF	ON	OFF	OFF	ON
1,0	OFF	OFF	ON	OFF	OFF	OFF
1,5	OFF	OFF	OFF	ON	ON	OFF
2,0	OFF	OFF	OFF	OFF	ON	ON
2,5	OFF	OFF	OFF	ON	OFF	OFF
3,0	OFF	OFF	OFF	OFF	ON	OFF
4,0	OFF	OFF	OFF	OFF	OFF	ON

DIP3

fg / Hz \ DIP Switch (Block 3)	1	2	3	4	5	6	7	8
1	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF
10	ON	OFF	ON	OFF	ON	OFF	ON	OFF
100	ON	ON	ON	ON	ON	ON	ON	OFF

5 Fault Detection/Fault Current

5.1 Function Test

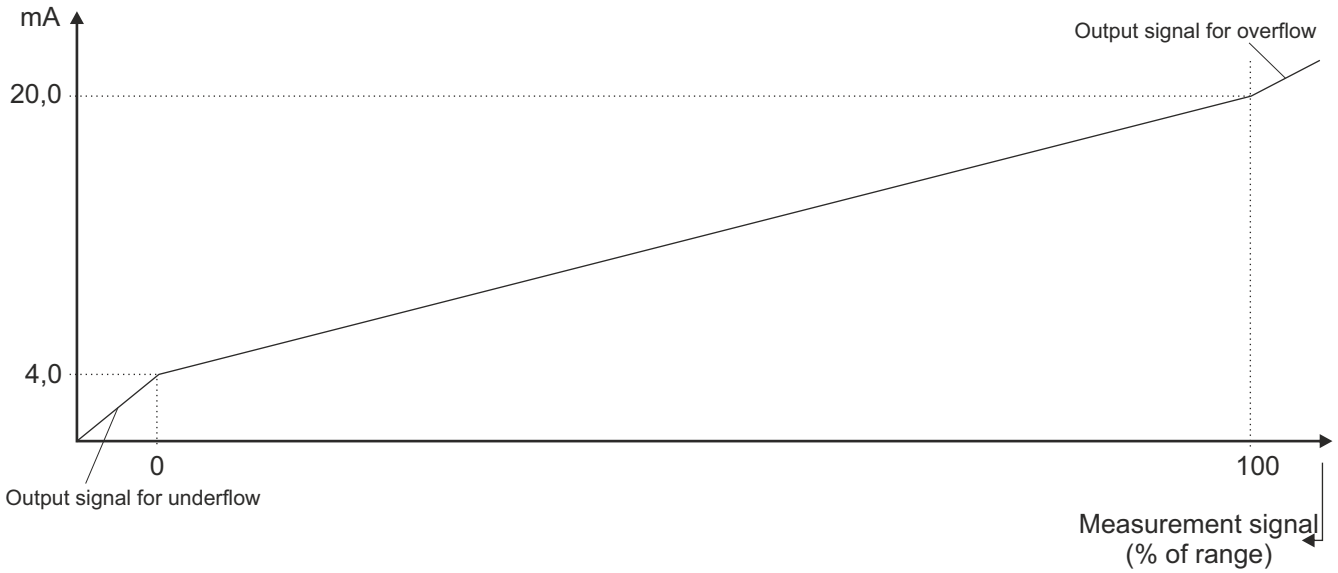
The output signal must be proportional to the force. If this is not the case, it may be an indication of an incorrect installation position or incorrect setting. In this case, refer to *Fault Recovery* (page 12).

5.2 Fault Detection / Fault Current

The device has a function to detect sensor break and short circuit. When the solder bridges of jumpers JP!, JP2 and JP5 are set, the output signal reaction to errors can be determined. The output signal can go into overflow or underflow. (see page 7 for more details on jumper assignment)

In case of error, if the ALM-NS is configured for overflow, the output signal will send a fault current or a fault voltage which will exceed the designed maximum. For example, a device with a current range of 4...20 mA will send a fault current of higher than 20 mA.

In case of error, if the ALM-NS is configured for underflow, the output signal will send a fault current or a fault voltage which will exceed the designed minimum. For example, a device with a current range of 4...20 mA will send a fault current smaller then 4 mA. (see Technical Data, page 14 for more possible output ranges)



Current output and measurement signal for output range 4...20 mA

Fault detection only works optimally if at maximum one strain gauge full bridge is connected to the ALM-NS. If more than one device is connected at the same time, a sensor break will only be detected if all connected full bridges develop faults simultaneously.

Warning

- Only the manufacturer should conduct repairs.

- Do not use any pointed or hard objects for cleaning to prevent damage to the electrical contacts.
- Verify in advance if the right voltage supply and the right type of wiring has been chosen.

Failure	Possible Cause	Procedure
No output signal	Cable break No/incorrect voltage supply	Check connectors and cable Adjust voltage supply as per operating manual
No/false output signal	Wiring error	Follow terminal assignment (see product label / operating manual)
Output signal unchcanged after change in load or force	Strain gauge transducer is defective	Replace strain gauge transducer
Output signal doesn‘t correspond to expectations	Wrong device configuration	Adjust configuration
Output signal doesn‘t correspond to expectations	Strain gauge transducer is unsuitable or defect	Select correct strain gauge transducer or replace defective device
Device exceeds minimum or maximum output signal	Device is in error condition	See chapter 5.2
Signal span erratic / imprecise	EMC interference sources in the vicinity, e. g. inverter drive Working temperature too high / too low	Shield the device, shield cables, remove interference sources Ensure permissible temperatures as per operating manual

Note: An additional charge is possible in case of unjustified reclamation.

Check unit after every setting change to ensure correct operation. If the fault presists, send the device in for repair or replace the unit.

In case of service: Clean dismounted devices before returning. See also chapter 7 for more details.

7 Maintenance, Dismounting, Return, Cleaning, Disposal

7.1 Maintenance

- The ALM-NS are maintenance-free.
- Only the manufacturer should conduct repairs.

7.2 Dismounting

Create dead voltage condition on device. Disconnect electrical connections. Use chapter 4.4 in reversed order.

7.3 Return

Warning

Before returning the device, follow the instructions in chapter 7.4.

To return a device, use the original packaging or something comparable.

To protect against damage, use anti-static foil, insulating material or identification as sensitive measurement equipment.

7.4 Cleaning

Clean the device regularly to prevent dust formation on device. The electrical contacts must be kept clean and dry!

Property damage!
Abrasive agents or aggressive solvents can damage the contacts.

- Power down the device and create dead voltage condition before cleaning.
- Use only a soft, wet piece of cleaning cloth for cleaning.

7.5 Disposal

Dispose device components and packaging materials as per the respective waste treatment and disposal regulations of the region or country to which the ALM-NS is supplied.

Collect electrical and electronic parts separately. Separate metals and plastics. Dispose of printed circuit board assemblies professionally.

8 Technical Data

Input		
Strain gauge:	Full bridges:	up to 4 parallel, 350 Ω (sum signal) overall >80 Ω
	Sensitivity:	0,1 / 0,25 / 0,75 / 1 / 1,5 / 2 / 2,5 / 3 / 4 mV/V
Fine adjustment:	Continuously over:	±20%
Zero point:	Offset:	±40% / ±80% (range selectable with solder bridge)
Filter:	Active low-pass:	20 dB/Octave, 5 Hz
Output		
Current and voltage:	2...10 V and 4...20 mA 0...10 V and 0...20 mA (adjustable with DIP switches)	
Load resistance:	>600 Ω	
Load:	<500 Ω	
Bridge supply:	4...14 VDC (continuously adjustable with potentiometer)	
	Bridge resistance:	>80 Ω
Sensor break:	Output signal upscale / Output signal downscale (adjustable with solder bridge) (works only with 1 strain gauge sensor)	
Limit Value Switch		
Relays:	2 pcs, with 1 floating contact each	
Contact:	250 VAC 5 A	
Limit value:	Adjustable to:	0...100% (of range)
Adjustment:	Connection of strain gauge not necessary	
Switching characteristics:	Falling below limit value / exceeding limit value (adjustable with DIP switches)	
Accuracy:	<0,1% of terminal value	
Hysteresis:	1% / 10% (adjustable with DIP switches)	
Supply		
Voltage:	24 V AC/DC / 42 VAC / 115 VAC / 230 VAC / 24 VDC galvanically isolated	
Power consumption:	5...8 VA (depending on model)	
Accuracy		
Linearity:	<0,02% of terminal value	
Temperature coefficient:	<50 ppm / K	
Environmental Conditions		
Operating temperature:	-10...+60°C	
Storage temperature:	-20...+70°C	

8 Technical Data (Continued)

Mechanics

Casing:	Material:	polycarbonate GF	
	Dimensions:	100 x 73 x 118 mm	
	Color:	Bottom part:	black
		Front:	gray
	Connection:	Wiring terminals:	terminal screws up to 4 mm²
	Mounting:	on top hat rail	
	Protection:	Casing:	IP40
		Terminals:	IP20
Weight:	approx. 600 g		

Setting

Sensitivity Input:	DIP switches (see input)
Type of output signal:	DIP switches (see output)
Zero point offset:	solder bridge (40% / 80%)
Low-pass filter:	solder bridge (12 / 24 dB / octave)
Limit frequency:	DIP switches (1 / 10 / 100 Hz)
Limit values:	adjustment with potentiometer (0...100%)
Switching behavior:	DIP switch (minimum / maximum)
Switching hysteresis:	DIP switch (1% / 10%)
Behavior on sensor break:	3 solder bridges (upscale / downscale)
Sensor supply:	potentiometer (4...14 V)

Factory Setting

Behavior on sensor break: Upscale
Low-pass filter: 12 dB / Octave
Behavior limit value switch 1: Minimum
Hysteresis limit value switch 1: 1%
Zero-point offset: By 40% of measurement range
Limit frequency: 1 Hz
Behavior limit value switch 2: Maximum
Hysteresis limit value switch 2: 1%

9 Dimensions (in mm)