

# **A-LAS-CON1-Scope V2.2x**

*Manual*

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## **Functional principle of the A-LAS-CON1 control unit:**

### **Technical description:**

A-LAS-CON1 is a control unit that is designed for the connection of sensors of the A-LAS series.

An analog sensor of the A-LAS series can be connected to one each of the two 7-pin sockets. A cab-las-y connecting cable is required for connecting the L-LAS sensors. The control unit allows a 100% inspection of objects by means of tolerance-band monitoring. A high-speed 2-channel 12-bit analog/digital-converter allows reading and processing of the analog values from the A-LAS sensor at a speed of maximally 60 kHz. With the control unit the laser power can be variably adjusted for the measuring channel.

The microcontroller of the A-LAS-CON1 control unit can be parameterised through the serial RS232 interface by means of a Windows PC software. Various evaluation and trigger modes can be set. The housing of the control unit features a TEACH/RESET button and a potentiometer for tolerance setting. Both the button and the potentiometer can be activated or deactivated with the software. The switching states are visualised by means of 4 LEDs (1x green, 1x yellow and 2x red) that are integrated in the housing of the A-LAS-CON1. The A-LAS-CON1 control unit has three digital outputs (OUT0, OUT1, and OUT2) whose output polarity can be set with the software. By way of two digital inputs (IN0, IN1) the external trigger function and the TEACH/RESET functionality can be set with a PLC. The control unit furthermore provides an analog signal through a high-speed analog output (0 .. 10V) with 12-bit digital/analog resolution.

## **Installation of the A-LAS-CON1-Scope software**

### **System requirements**

System requirements for the installation of the A-LAS-CON1-Scope software:

- 1 GHz Pentium-compatible processor or better
- Windows 2000 or Windows XP operating system with Service Pack 2
- SVGA graphics card with at least 800x600 pixel resolution and 256 colours
- CD-ROM or DVD-ROM drive
- Minimum 800 MB of free harddisk space
- Free serial RS232 interface

### **Installation**

Start the installation from the software CD by double-clicking on the executable file: "Setup.exe"

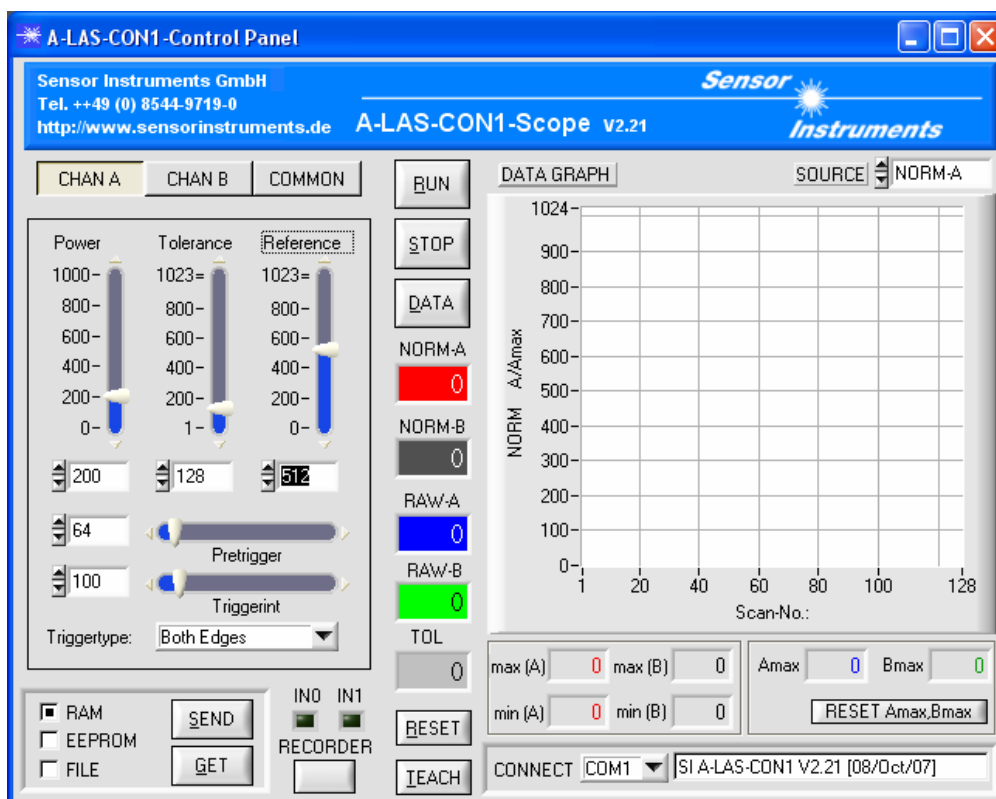
## Operation of the A-LAS-CON1-Scope PC software

### Description

The A-LAS-CON1-Scope software is used for parameterising the A-LAS-CON1 control unit for sensors of the A-LAS series. The measured values provided by the sensor can be visualised with the PC software, which means that the software among others can be used for adjustment purposes and for setting suitable tolerance limits for the inspection of the measuring object.

Data exchange between the PC user interface and the sensor system is effected through a standard RS232 interface. For this purpose the sensor is connected to the PC with the serial interface cable cab-las-4/PC. When parameterisation is finished, the setting values can be permanently saved in an EEPROM memory of the A-LAS-CON1 control unit. The sensor system then continues to operate in "STAND-ALONE" mode without a PC.

When the A-LAS-CON1-Scope software is started, the following Windows® user interface will be displayed:

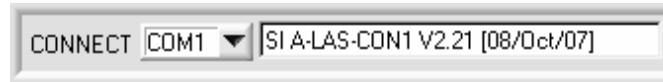


**Picture 1: A-LAS-CON1-Scope V2.2x start window**

The following chapter provides a detailed description of the individual control elements:

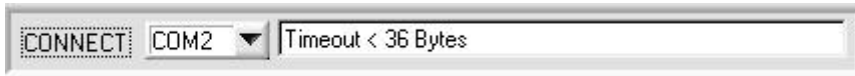
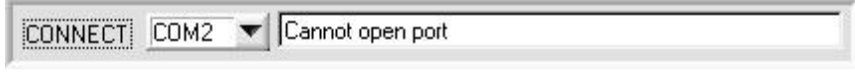
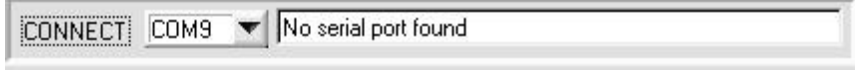
## Control elements

### 1 Communication


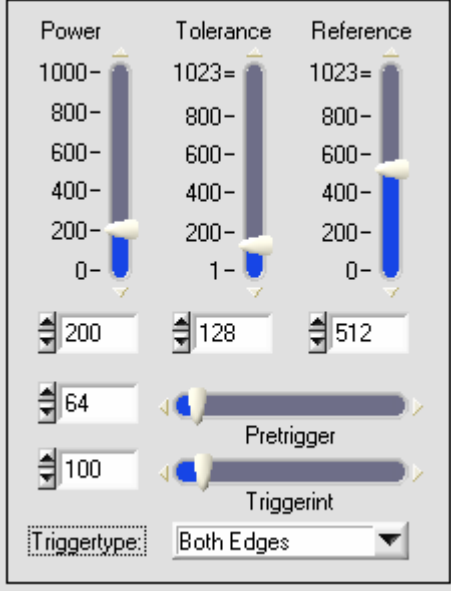
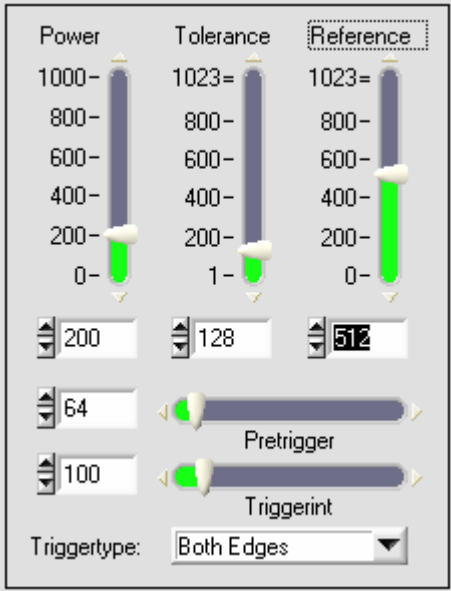


**Picture 2: Connect-box and status line**

In the "connect-box" the serial RS232 interface to which the sensor is connected can be selected from a drop-down field. The status line provides information about current actions and about their success or failure. When the software is started it tries to establish a connection to the A-LAS-CON1 control unit through the standard (COM1) interface. When the connection is established successfully, the current firmware version is displayed in the status line.

 <p style="text-align: center;"><b>Picture 3: Sensor not found</b></p>	<p>The sensor could not be found. Please check if the correct COM port was selected, and select the port again.</p>
 <p style="text-align: center;"><b>Picture 4: COM port is assigned</b></p>	<p>The COM port could not be selected because it is already assigned. Please connect the sensor to another port.</p>
 <p style="text-align: center;"><b>Picture 5: COM port does not exist or is not available</b></p>	<p>The selected COM port does not exist or is not available.</p>

## 2 Parameterisation (overview)

 <p><b>Picture 6: Parameter group selection</b></p>	<p>These buttons are used for selecting the parameter group.</p> <ul style="list-style-type: none"> <li>● CHAN A: Parameters of the sensor at channel A</li> <li>● CHAN B: Parameters of the sensor at channel B</li> <li>● COMMON: General parameters, valid for channel A and channel B</li> </ul>
 <p><b>Picture 7: Parameters of channel A</b></p>	<p>These input fields are used for configuring the parameters for the sensor that is connected at channel A.</p> <p>The individual parameters are:</p> <ul style="list-style-type: none"> <li>● Power: Laser power</li> <li>● Reference: Reference intensity</li> <li>● Tolerance: Tolerance with respect to reference intensity</li> <li>● Triggerint: Trigger threshold intensity</li> <li>● Triggertype: Trigger condition</li> <li>● Pretrigger: Measurement window positioning</li> </ul>
 <p><b>Picture 8: Parameters of channel B</b></p>	<p>These input fields are used for configuring the parameters for the sensor that is connected at channel B.</p> <p>The individual parameters are:</p> <ul style="list-style-type: none"> <li>● Power: Laser power</li> <li>● Reference: Reference intensity</li> <li>● Tolerance: Tolerance with respect to reference intensity</li> <li>● Triggerint: Trigger threshold intensity</li> <li>● Triggertype: Trigger condition</li> <li>● Pretrigger: Measurement window positioning</li> </ul>

Average:	Polarity:
1	DIRECT
Hardware-Mode:	
Disable ALL	
Trigger-Mode:	
CONTINUOUS	
Evaluation-Mode:	
NORM: A/Amax	
Analog-Output-Mode:	
OFF	
Digital-Output-Mode:	
TOL: 0-> (-), 1-> (+), 2-> OK	
Hold Time:	STAT
Hysteresis:	5

**Picture 9: Common parameters**

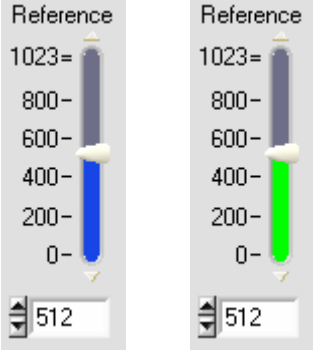
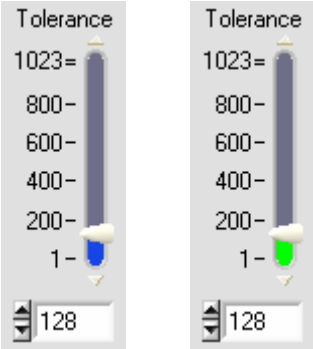
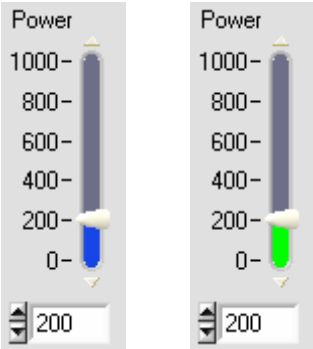
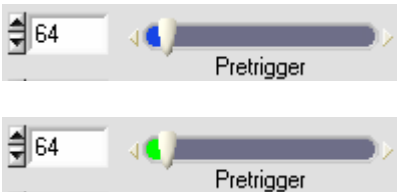
These input fields are used for configuring the common parameters for both connected sensors.


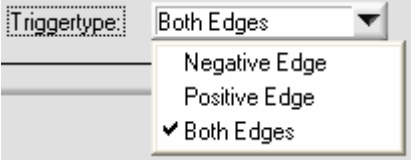
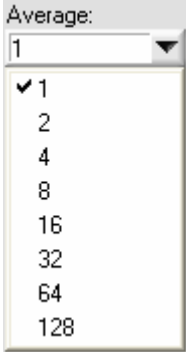

The individual parameters are:

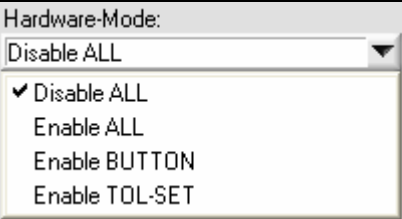
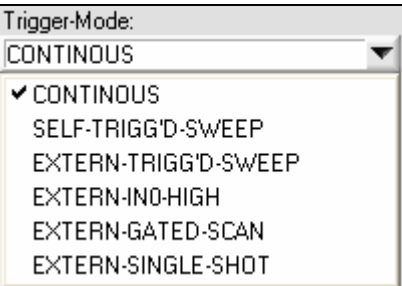
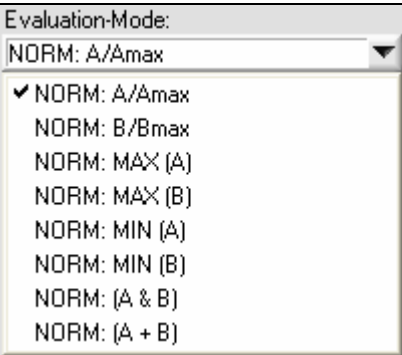
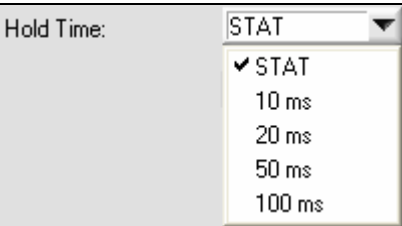
- Average: Rate of averaging
- Polarity: Polarity of the digital output drivers
- Hardware-Mode: Configuration of the button / potentiometer at the housing of the A-LAS-CON1
- Trigger-Mode: Setting of the measuring principle
- Evaluation-Mode: Setting of the evaluation mode
- Analog-Output-Mode: Setting of the analog output
- Digital-Output-Mode: Setting of the digital outputs
- Hold Time: Setting of the error output hold time
- Hysteresis: Setting of the threshold value for the change of the potentiometer tolerance value

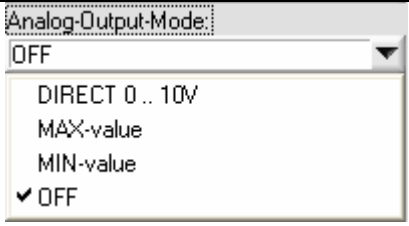
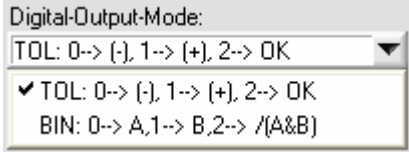
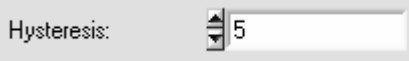



### 3 Parameterisation (details)

 <p>Reference 1023= 800- 600- 400- 200- 0- 512</p>	<p>This input field serves for entering and displaying the current reference value for measuring channel A / measuring channel B. The current measured value is compared with the reference value, and according to the evaluation mode and the result of comparison, the digital and analog outputs will be set. The value range is from 0 to 1023. Pressing the "GET" button updates the display with the current sensor values. Pressing the "SEND" button sends this parameter together with all the others to the A-LAS-CON1 controller.</p>
 <p>Tolerance 1023= 800- 600- 400- 200- 1- 128</p>	<p>This input field serves for entering and displaying the current tolerance value for measuring channel A / measuring channel B. The tolerance value determines the width of the tolerance band. The upper limit of the tolerance band is equal to the reference value plus the tolerance value, and the lower limit of the tolerance band is equal to the reference value minus the tolerance value. Current measured values lying within the tolerance band are considered to be OK (see: "Digital-Output-Mode"). The value range is 1 to 1023. Pressing the "GET" button updates the display with the current sensor values. Pressing the "SEND" button sends this parameter together with all the others to the A-LAS-CON1 controller.</p>
 <p>Power 1000- 800- 600- 400- 200- 0- 200</p>	<p>This input field is used for setting the laser power for the sensors at channel A / channel B. A higher laser power leads to a higher signal intensity at the receiver and thus to a higher resolution. At the same time a higher laser power also means higher power consumption and may, among others, lead to receiver overriding. When setting the laser power, care should be taken that the analog raw value (see: "RAW-A" and "RAW-B") with a free sensor and without covering of the receiver is 50 to 80 percent of the maximum value. The value range is 0 to 1000. Pressing the "GET" button updates the display with the current sensor values. Pressing the "SEND" button sends this parameter together with all the others to the A-LAS-CON1 controller.</p>
 <p>64 Pretrigger 64 Pretrigger</p>	<p>This input field is used for setting the measurement window (only applicable with trigger modes "SELF-TRIGG'D-SWEEP" and "EXTERN-TRIGG'D-SWEEP"! ). It determines the number of measurement points between the trigger moment and the end of the measurement window. The value range is 1 to 1023. Pressing the "GET" button updates the display with the current sensor values. Pressing the "SEND" button sends this parameter together with all the others to the A-LAS-CON1 controller.</p>

 <p><b>Picture 14: Trigger threshold value</b></p>	<p>This input field is used for setting the trigger threshold value (only applicable with trigger mode "SELF-TRIGG'D-SWEEP!"). It determines the value that the current measured value must overshoot or undershoot to cause a trigger event. The value range is 1 to 1023. Pressing the "GET" button updates the display with the current sensor values. Pressing the "SEND" button sends this parameter together with all the others to the A-LAS-CON1 controller.</p>
 <p><b>Picture 15: Trigger type</b></p>	<p>This input field serves for setting the trigger type (only applicable with trigger mode "SELF-TRIGG'D-SWEEP!"). It determines which trigger event starts measured value recording.</p> <p>Settings:</p> <ul style="list-style-type: none"> <li>● Negative Edge: Trigger threshold undershooting will start measured value recording.</li> <li>● Positive Edge: Trigger threshold overshooting will start measured value recording.</li> <li>● Both Edges: Both trigger threshold undershooting and overshooting will start measured value recording.</li> </ul> <p>Pressing the "GET" button updates the display with the current sensor values. Pressing the "SEND" button sends this parameter together with all the others to the A-LAS-CON1 controller.</p>
 <p><b>Picture 16: Averaging</b></p>	<p>This input field is used for setting the type of averaging (not applicable with trigger modes "EXTERN-GATED-SCAN" and "EXTERN-SINGLE-SHOT!"). It determines how many values are averaged for a measured value.</p> <p>Settings:</p> <ul style="list-style-type: none"> <li>● 1 (no averaging)</li> <li>● 2</li> <li>● 4</li> <li>● 8</li> <li>● 16</li> <li>● 32</li> <li>● 64</li> <li>● 128</li> </ul> <p>Pressing the "GET" button updates the display with the current sensor values. Pressing the "SEND" button sends this parameter together with all the others to the A-LAS-CON1 controller.</p> <p>See: Trigger modes "EXTERN-TRIGG'D-SWEEP" and "SELF-TRIGG'D-SWEEP".</p>
 <p><b>Picture 17: Polarity of the digital output signals</b></p>	<p>This input field is used for setting the polarity of the output drivers for the digital switching outputs.</p> <p>Settings:</p> <ul style="list-style-type: none"> <li>● DIRECT: Logical 0 is equivalent to GND level, logical 1 is equivalent to VCC level</li> <li>● INVERS: Logical 0 is equivalent to VCC level, logical 1 is equivalent to GND level</li> </ul> <p>Pressing the "GET" button updates the display with the current sensor values. Pressing the "SEND" button sends this parameter together with all the others to the A-LAS-CON1 controller.</p>


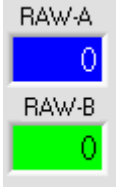
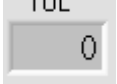
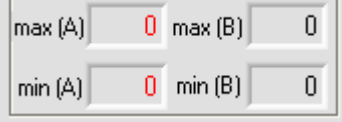
 <p><b>Picture 18: Hardware mode setting</b></p>	<p>This input field is used for setting the hardware mode. In this field the TEACH/RESET button and the tolerance potentiometer at the housing front side of the A-LAS-CON1 control unit can be activated/deactivated.</p> <p>Setting options:</p> <ul style="list-style-type: none"> <li>● Disable ALL: Button/potentiometer deactivated.</li> <li>● Enable ALL: Button/potentiometer activated</li> <li>● Enable BUTTON: Button activated, potentiometer deactivated</li> <li>● Enable TOL-SET: Button deactivated, potentiometer activated</li> </ul> <p>Pressing the "GET" button updates the display with the current sensor values. Pressing the "SEND" button sends this parameter together with all the others to the A-LAS-CON1 controller.</p>
 <p><b>Picture 19: Trigger mode</b></p>	<p>This input field is used for setting the trigger mode. It defines the type and moment of measured value recording.</p> <p>Setting options:</p> <ul style="list-style-type: none"> <li>● CONTINUOUS</li> <li>● SELF-TRIGG'D-SWEEP</li> <li>● EXTERN-TRIGG'D-SWEEP</li> <li>● EXTERN-IN0-HIGH</li> <li>● EXTERN-GATED-SCAN</li> <li>● EXTERN-SINGLE-SHOT</li> </ul> <p>Pressing the "GET" button updates the display with the current sensor values. Pressing the "SEND" button sends this parameter together with all the others to the A-LAS-CON1 controller. For further information please refer to the chapter on "Measuring modes".</p>
 <p><b>Picture 20: Evaluation mode</b></p>	<p>This input field serves for setting the evaluation mode for the acquired sensor values. It defines how the measured value is determined by the control unit.</p> <p>Setting options:</p> <ul style="list-style-type: none"> <li>● NORM: A/Amax:</li> <li>● NORM: B/Bmax:</li> <li>● NORM: MAX (A):</li> <li>● NORM: MAX (B):</li> <li>● NORM: MIN (A):</li> <li>● NORM: MIN (B):</li> <li>● NORM: (A &amp; B)</li> <li>● NORM: (A + B)</li> </ul> <p>Pressing the "GET" button updates the display with the current sensor values. Pressing the "SEND" button sends this parameter together with all the others to the A-LAS-CON1 controller. For further information please refer to the chapter on "Measuring modes".</p>
 <p><b>Picture 21: Output hold time</b></p>	<p>This input field is used for setting the output hold time for the digital switching outputs. Pressing the "GET" button updates the display with the current sensor values.</p> <p>Setting values:</p> <ul style="list-style-type: none"> <li>● STAT: The levels of the error outputs are kept until there is a change of switching state.</li> <li>● 10ms/20ms/50ms/100ms: The levels of the error outputs are kept for the set time, and are then updated according to the switching state.</li> </ul>

 <p><b>Picture 22: Settings for the analog output</b></p>	<p>This input field is used for configuring the analog output. It defines the type and source of the analog signal.</p> <p>Setting options:</p> <ul style="list-style-type: none"> <li>● DIRECT 0..10V: The current measured value (!) is output as a voltage value of 0 to 10 V.</li> <li>● MAX-value: The maximum measured value determined since the last RESET is output as a voltage of 0 to 10 V.</li> <li>● MIN-value: The minimum measured value determined since the last RESET is output as a voltage of 0 to 10 V.</li> <li>● OFF: The analog output is deactivated and is not updated in case of a status change.</li> </ul> <p>Pressing the "GET" button updates the display with the current sensor values. Pressing the "SEND" button sends this parameter together with all the others to the A-LAS-CON1 controller.</p>
 <p><b>Picture 23: Settings for the digital outputs</b></p>	<p>This input field serves for configuring the digital outputs. It defines the logical assignment of the output signals to the digital outputs.</p> <p>Setting options:</p> <ul style="list-style-type: none"> <li>● TOL: 0→ (-), 1→ (+), 2→ OK In case of undershooting of the tolerance band OUT0 becomes logical high, in case of overshooting of the tolerance band OUT1 becomes logical high, in case of measured values within the tolerance band OUT2 becomes logical high.</li> <li>● BIN: 0→ A, 1→ B, 2→ /(A&amp;B) In case of tolerance overshooting at channel A OUT0 becomes logical high, in case of tolerance overshooting at channel B OUT1 becomes logical high, in case of both channels within the tolerance OUT2 becomes logical high.</li> </ul> <p>Pressing the "GET" button updates the display with the current sensor values. Pressing the "SEND" button sends this parameter together with all the others to the A-LAS-CON1 controller.</p>
 <p><b>Picture 24: Hysteresis value of the potentiometer tolerance</b></p>	<p>This input field is used for setting the hysteresis value for manual tolerance band setting (ATTENTION: This only applies to the tolerance value that is set with the potentiometer at the housing front side of the A-LAS-CON1 control unit). It determines the resolution of the tolerance value and thus its stability. A high resolution of the tolerance value allows a fine tolerance setting. Due to potentiometer value noise, however, it also leads to increased noise of the tolerance value. A coarser resolution setting leads to a more stable tolerance value which, however, cannot be so finely adjusted. The value range is 5 to 100. Pressing the "GET" button updates the display with the current sensor values. Pressing the "SEND" button sends this parameter together with all the others to the A-LAS-CON1 controller.</p>

	<p>This is the button group for the sending and getting of sensor parameters. Pressing the "SEND" button sends the current parameter record as it is set in the individual input fields to the respective target. Pressing the "GET" button updates the individual input fields with the data from the respective target.</p> <p>Targets:</p> <ul style="list-style-type: none"> <li>● RAM: Data are written to / loaded from the volatile memory of the A-LAS-CON1 control unit.</li> <li>● EEPROM: Data are written to / loaded from the non-volatile memory of the A-LAS-CON1 control unit.</li> <li>● FILE: Data are written to / loaded from the local harddisk of the PC.</li> </ul>
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**Picture 25: Data exchange with the sensor**

## 4 Visualisation

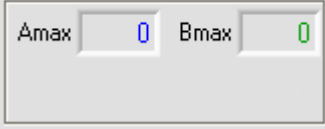

	<p>Display of the current measured value of measuring channel A/B. The values are updated via the PC software by pressing the "RUN" button. The value range is 0 to 1023.</p>
	<p>Display of the current raw value of measuring channel A/B. The values are updated via the PC software by pressing the "RUN" button. The value range is 0 to 4095.</p>
	<p>Display of the current tolerance value that is read from the potentiometer at the housing front side of the A-LAS-CON1 control unit. The value is updated via the PC software by pressing the "RUN" button.</p>
	<p>Display of the maximum and minimum measured values determined since the last RESET, normalised to a value range of 0 to 1024. The values are updated via the PC software by pressing the "RUN" button.</p>

**Picture 26: Measured value display**

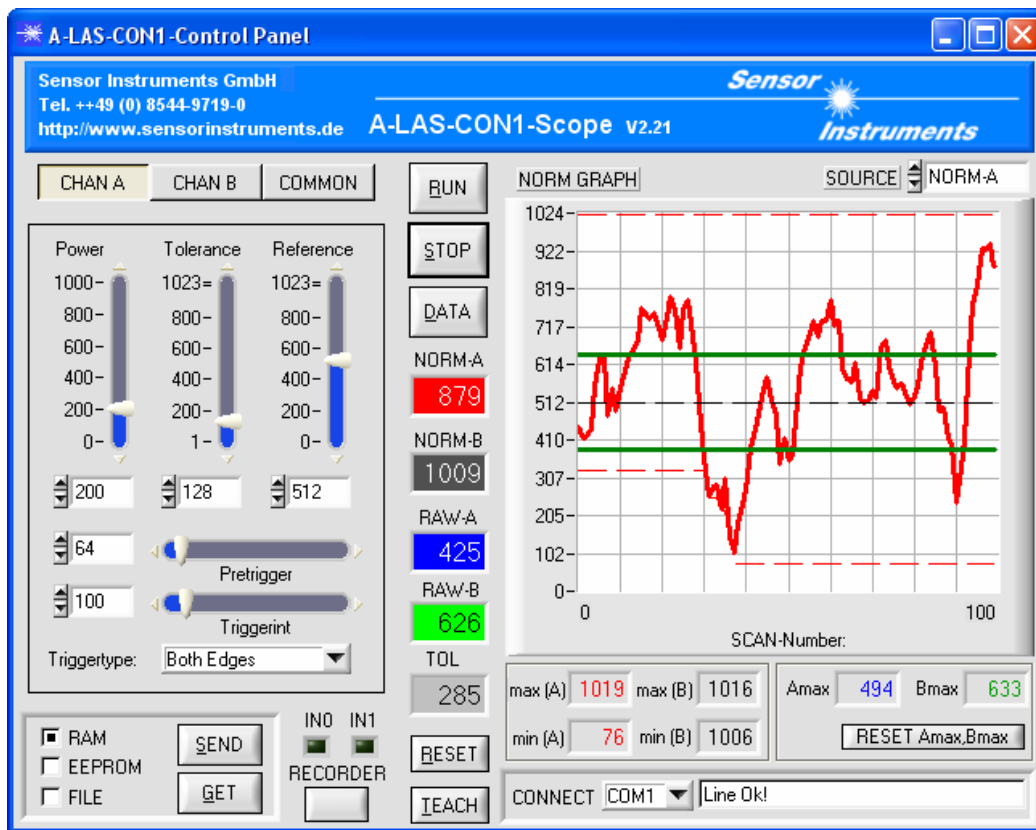
**Picture 27: Raw value display**

**Picture 28: Potentiometer tolerance setting**

**Picture 29: Maximum/minimum measured values**

 <p><b>Picture 30: Highest raw values</b></p>	<p>Display of the normalising basis, i.e. the highest analog value found since the last power-up of the control unit.</p>
 <p><b>Picture 31: Status display of the digital inputs</b></p>	<p>Display of the logical status of digital inputs IN0 and IN1. The display is updated via the PC software by pressing the "RUN" button.</p>

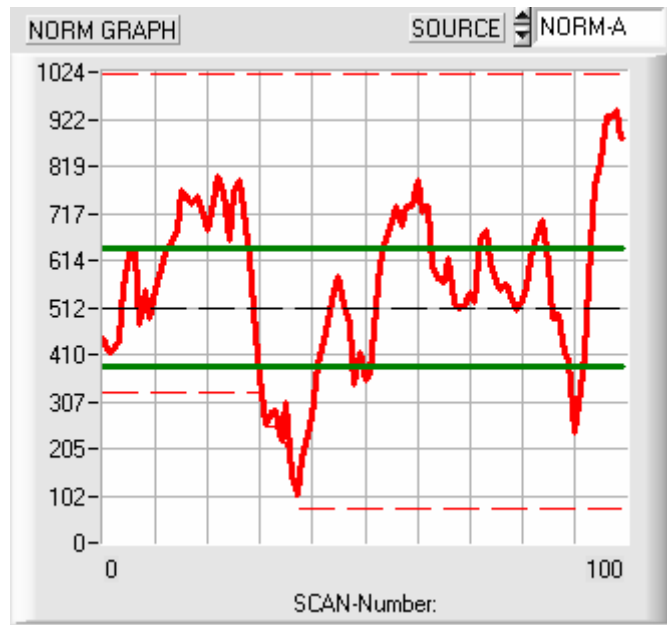
## 5 Graphic display



**Picture 32: Graphic display of the normalised measured value as a function of time.**

This display is available if one of the entries NORM-A, NORM-B, MAX (A), MAX (B), MIN (A), or MIN (B) is selected in the "SOURCE" menu. When the "RUN" button is pressed, the graph is constantly updated in "RUN" mode. The display shows the following data:

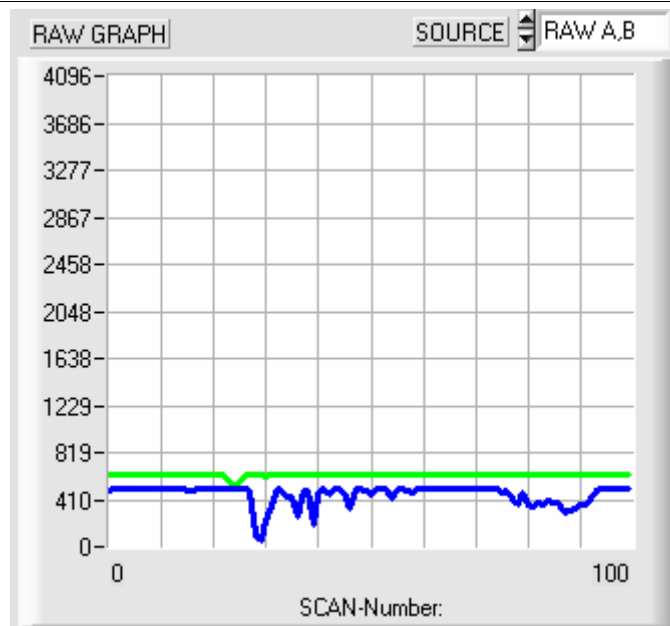
1. Black dashed line: Reference value.
2. Red dashed line: Maximum and minimum measured value since the last RESET.
3. Green continuous line: Tolerance band, defined by its upper and lower limit.
4. Red/gray continuous line: Measured value.



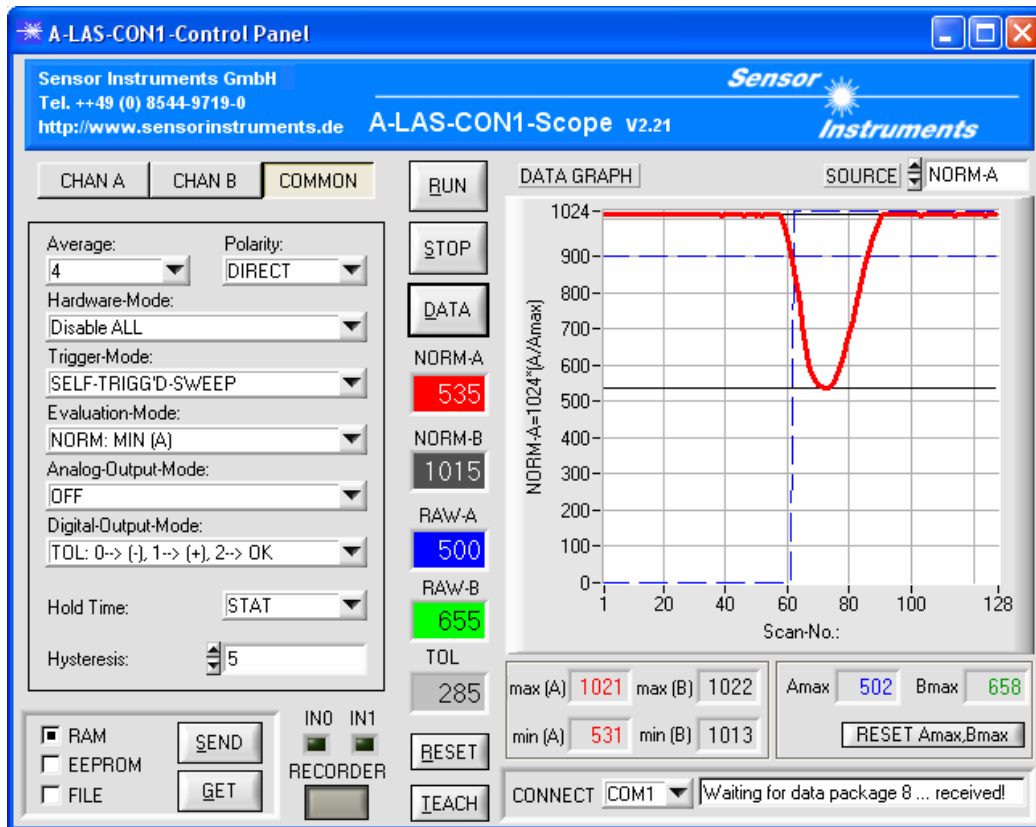
**Picture 33: Norm graph**

This display is available if RAW A,B is selected in the "SOURCE" menu. When the "RUN" button is pressed, the graph is constantly updated in "RUN" mode. The display shows the following data:

1. Blue continuous line: Raw value of channel A
2. Green continuous line: Raw value of channel B



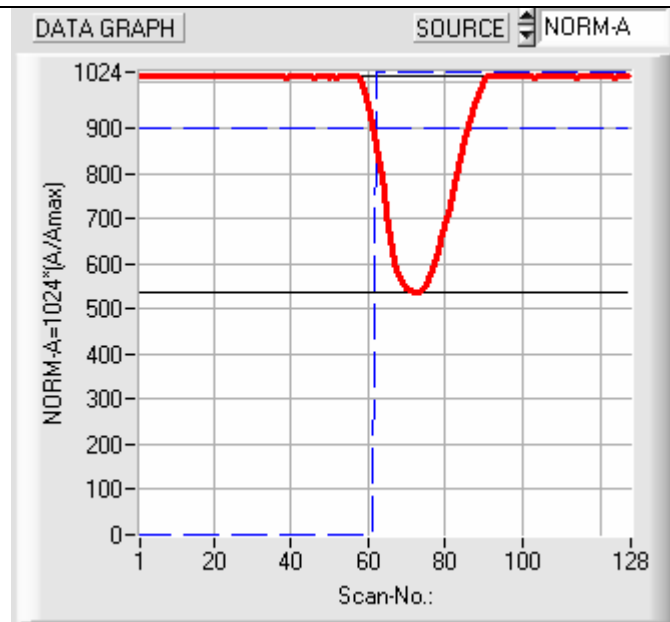
**Picture 34: Raw value graph**



**Picture 35: Display of the recorded curve of the A-LAS-CON1 control unit**


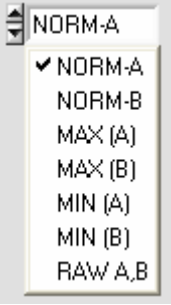
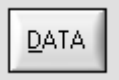
This display shows the data that are read from the volatile memory of the A-LAS-CON1 control unit. When the "DATA" button is pressed, the memory area is automatically read and displayed (if available). The display shows the following data:

1. Blue dashed line: Trigger threshold and trigger moment
2. Black continuous line: Minimum and maximum value of the curve
3. Red/gray continuous line: Recording of the 128 measured values







**Picture 36: Data graph**

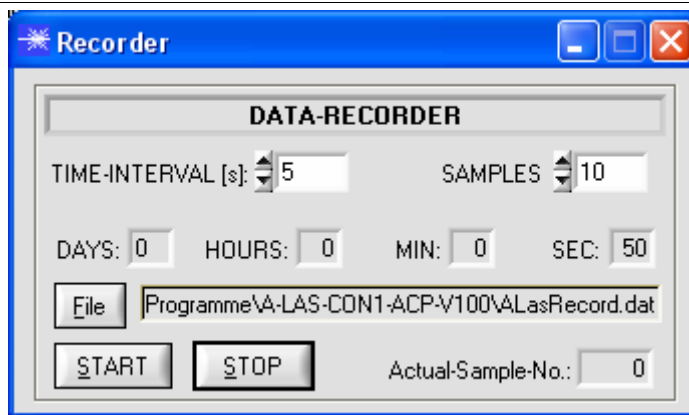


 <p><b>Picture 37: RUN and STOP buttons</b></p>	<p>These are the control buttons for starting and stopping the automatic data exchange with the sensor control unit. In "RUN" mode, data packages with the current measured values are automatically called from the control unit and displayed in short time intervals. The type of display is determined by the "SOURCE" selection menu.</p> <p><b>ATTENTION: Due to the limited data rate of the interface (19200 bits/sec) it is not possible to display every determined measured value.</b></p>
 <p><b>Picture 38: Selection menu</b></p>  <p><b>Picture 39: DATA button</b></p>	<p>This is the "SOURCE" selection menu for selecting the source for the graphic display. Options:</p> <ul style="list-style-type: none"> <li>● NORM-A/NORM-B</li> <li>● MAX (A)/MAX (B)</li> <li>● MIN (A)/MIN (B)</li> <li>● RAW A,B</li> </ul> <p>This is the control button for reading the data memory of the A-LAS-CON1 control unit. The data source is determined by the "SOURCE" selection menu.</p>

## 6 Miscellaneous

	<p>TEACH button. When this button is pressed, the current measured value and the currently selected tolerance value (either set with the input field or via the potentiometer, depending on the hardware mode) will be used as a reference and tolerance value for future measurements.</p>
	<p>RESET button. When this button is pressed, the maximum and minimum measured values that have been determined since the last RESET will be reset and the measured value memories will be cleared.</p>
	<p>Global reset button. When this button is pressed, the normalising basis (i.e. the maximum determined analog raw values) will be reset and determined anew.</p>
	<p>RECORD panel button. Pressing this button starts the RECORD panel that controls the recording of measured values on the local harddisk. (ATTENTION: Due to the continuous communication through the serial interface the system can be noticeably slowed down). See "Measured value recording".</p>

## 7 Measured value recording



Picture 40: Recorder panel for controlling data recording

Recorder panel for controlling data recording.

The interval of data exchange and the number of values to be recorded can be set. This determines the total length of the recording interval. The recording process can be started and stopped with the "START" and "STOP" buttons.

## Measuring modes

### 1 Continuous scan (measuring mode without external trigger signal)

This measuring mode is characterised by the taking of periodic samples from the connected sensors. When the trigger modes "CONTINUOUS" and "SELF-TRIGG'D-SWEEP" are selected, the A-LAS-CON1 control unit operates according to this principle.

#### ***Trigger mode "CONTINUOUS"***

No external trigger events are processed in this trigger mode. Samples of the analog values from the A-LAS sensor are continuously taken, normalised, averaged (if necessary), and evaluated, and the status of the digital/analog outputs is correspondingly set anew. The maximum scan frequency is 40 kHz (i.e. a new analog value is determined every 25  $\mu$ s). Floating averaging is possible here. Even with higher averaging (e.g. over 128 values) this guarantees that the averaged value is updated with every new sample and that the scan frequency is maintained. Depending on the averaging, the scan frequency is as follows:

AVERAGE:	Scantime ( $\mu$ s)/Frequency (Hz)
1	25/40000
2	30/33333
4	30/33333
8	30/33333
16	40/25000
32	40/25000
64	40/25000
128	50/20000

All the evaluation modes are available for this trigger mode. In evaluation modes NORM-A and NORM-B the current measured values are compared with the tolerance band. In evaluation mode NORM (A+B) a sum signal of the two measuring channels is formed and evaluated. In evaluation mode NORM (A&B) the outputs are set according to the logic operation of the check result of both measuring channels. In evaluation modes MAX (A) and MAX (B) as well as MIN (A) and MIN (B) the automatically matched maximum and minimum measured values are evaluated.

#### ***Trigger mode "SELF-TRIGG'D-SWEEP"***

In this trigger mode samples of both measuring channels are continuously taken, normalised, averaged, and intermediately saved with a frequency of 20 kHz. These samples are compared with a user-defined threshold. When a threshold value overshooting is detected, an internal mechanism starts to save 128 values. As an option, these values can first be averaged, which simultaneously means a multiplication of the window width. The averaging function is set with the AVERAGE parameter. (Example: With AVERAGE 1, every sample is directly saved. With a scan frequency of 20 kHz the window width is 128 multiplied by 50  $\mu$ s, which is 6.4 ms. With an averaging of 16, the average values of 16 samples each are stored in steps. The window width thus is 128 multiplied by 16 multiplied by 50  $\mu$ s, which is 102.4 ms.)

The start of value saving can be varied with the "PRETRIGGER" parameter. This parameter determines how many measured values after the trigger event still form a part of the measuring window. (Example: With PRETRIGGER 64, the next 64 values will still form a part of the measuring window. With a constant measuring window size of 128 values, the trigger event thus lies exactly in the middle of the measuring window. The TRIGGERTYPE parameter can be used to exclude certain threshold value overshootings. With TRIGGERTYPE Negative Edge, for example, the system can be set such that only a positive-to-negative transition of the measured value compared to the threshold value is taken as a trigger event.

As soon as the measuring window is completely saved, it will be interpreted according to the evaluation mode. In evaluation mode MAX (A) or MAX (B) the maximum value of the measuring window is determined and compared with the tolerance band. In evaluation mode MIN (A) or MIN (B) the minimum value of the measuring window is determined.

## 2 Trigger-controlled scan (measuring modes with external trigger signal)

This measuring mode is characterised by the fact that samples are only taken when there is an external trigger signal. When the trigger modes "EXTERN-IN0-HIGH", "EXTERN-GATED-SCAN", and "EXTERN-SINGLE-SHOT" are selected, the A-LAS-CON1 control unit operates according to this principle.

### ***Trigger mode "EXTERN-IN0-HIGH"***

This trigger mode is the same as the "CONTINUOUS" trigger mode, with the difference that samples are only taken when there is a logic HIGH level at digital input IN0. When the level is logic LOW, measured value taking is interrupted.

If MAX (A), MIN (A), MAX (B), or MIN (B) is selected as evaluation mode, the matched maximum and minimum measured values are automatically reset in case of a rising edge of trigger input IN0. At the falling edge of trigger input IN0 there thus is the maximum and minimum value of the just finished measuring period for both channels. These maximum and minimum values are saved according to an algorithm which allows the saving of the 128 highest and lowest maximum and minimum values for every channel. This information is available as long as the trigger mode and the evaluation mode are not changed, and can be read by way of the "DATA" button.

### ***Trigger mode "EXTERN-GATED-SCAN"***

This trigger mode is the same as the "EXTERN-IN0-HIGH" trigger mode, with an optimisation concerning the scan frequency. The scan frequency constantly is 60 kHz (one sample every 16.666 µs) without averaging, which is not available in this trigger mode.

### ***Trigger mode "EXTERN-SINGLE-SHOT"***

The rising edge of the IN0 trigger signal starts the taking of a single measured value. This will be evaluated according to the evaluation mode, and the digital/analog outputs will be correspondingly set.



## 3 Hybrid trigger modes

### ***Trigger mode "EXTERN-TRIGG'D-SWEEP"***

This trigger mode is the same as the "SELF-TRIGG'D-SWEEP" trigger mode, with the difference that the trigger event is not generated by a threshold value overshooting, but by an external trigger signal of digital input IN0.


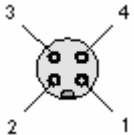
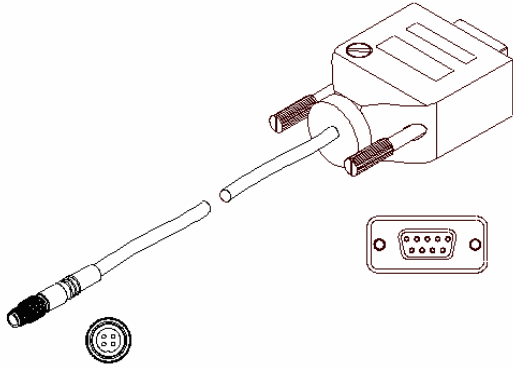
## Appendix

### Technical data


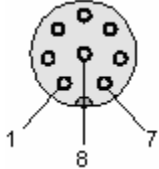
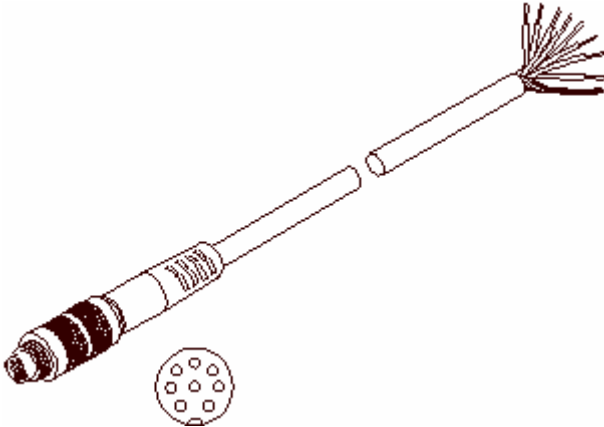
Designation	A-LAS-CON1 V2.2x
Power supply	$U_b = +12V DC \dots +30V DC$
Current consumption	< 250 mA
Operating temperature range	-20°C ... +55°C
Storage temperature range	-20°C ... +85°C
Type of protection	IP54
Digital inputs (IN0, IN1)	Log. 0: GND, Log. 1: + $U_b$ (incl. protective circuit)
Digital outputs (OUT0, OUT1, OUT2)	Digital-outmode DIRECT: Log. 0: GND, Log. 1: + $U_b$ Digital-outmode INVERS: Log. 0: + $U_b$ , Log 0: GND short-circuit-proof, max. 100mA
Analog output	$V_{out} = 0 \dots +10V$
Sensitivity setting	With TOL potentiometer, or with PC under Windows®
Housing material	Aluminium, blue anodized
Housing dimensions	LxWxH approx. 90 mm x 65 mm x 27 mm
Connections	8-pin circular socket type Binder series 712 (SPS/Power) 4-pin circular socket type Binder series 707 (PC/RS232) 7-pin circular socket type Binder series 712 (A-LAS sensor CHA) 7-pin circular socket type Binder series 712 (A-LAS sensor CHB)
Teach button	Teach button at the housing for setpoint teaching
LED indicators	LED red (+): Status of tolerance output OUT1 LED green: Status of tolerance output OUT2 LED red (-): Status of tolerance output OUT0 LED yellow: Visualisation of the teach process
Scan frequency	Max. 60KHz
Interface	RS232, can be parameterised under Windows®
Connecting cables	To PC: cab-las4/PC or cab-las4/PC-w To PLC: cab-las8/SPS or cab-las8/SPS-w To A-LAS sensor CHA: cab-las-y To A-LAS sensor CHB: cab-las-y
<p><b>Solid-state laser, <math>\lambda=670\text{ nm}</math>, 1mW max. optical power,</b>  <b>laser class 2 according to EN 60825-1</b>  Therefore no additional protective measures are required for the use of these laser transmitters.</p>	
	

## Connector assignment

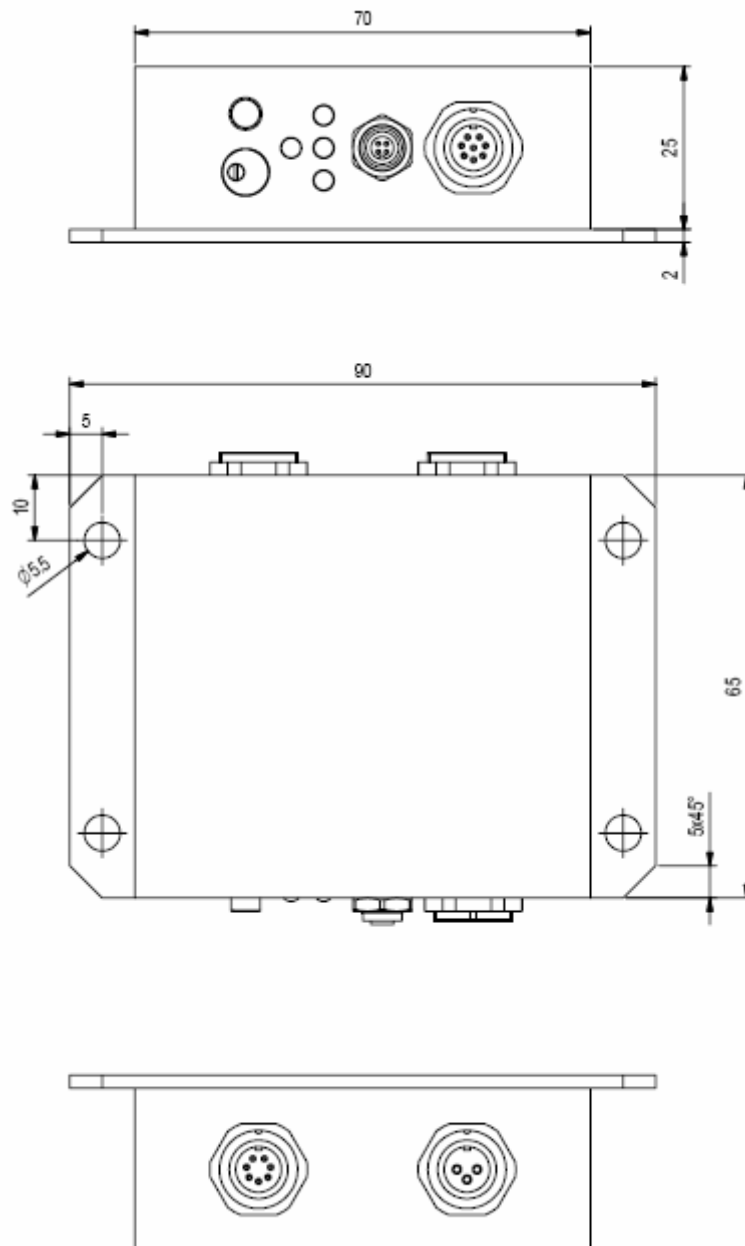
At the housing: 4-pin M5 socket type Binder 707, for connecting cable cab-las4/PC (length 2m, sheathing: PUR)

		<table border="1"> <thead> <tr> <th>Pin:</th> <th>Assignment:</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>-</td> </tr> <tr> <td>2</td> <td>0V (GND)</td> </tr> <tr> <td>3</td> <td>Rx</td> </tr> <tr> <td>4</td> <td>Tx</td> </tr> </tbody> </table>	Pin:	Assignment:	1	-	2	0V (GND)	3	Rx	4	Tx
Pin:	Assignment:											
1	-											
2	0V (GND)											
3	Rx											
4	Tx											
												

At the housing: 8-pin socket type Binder 712, for connecting cable cab-las8/SPS (length 2m, sheathing: PUR)

		<table border="1"> <thead> <tr> <th>Pin:</th> <th>Color:</th> <th>Assignment:</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>white</td> <td>0V (GND)</td> </tr> <tr> <td>2</td> <td>brown</td> <td>+12V...+30V DC</td> </tr> <tr> <td>3</td> <td>green</td> <td>IN0 (EXT TRIG.)</td> </tr> <tr> <td>4</td> <td>yellow</td> <td>IN1 (TEACH)</td> </tr> <tr> <td>5</td> <td>gray</td> <td>OUT0</td> </tr> <tr> <td>6</td> <td>pink</td> <td>OUT1</td> </tr> <tr> <td>7</td> <td>blue</td> <td>OUT2</td> </tr> <tr> <td>8</td> <td>red</td> <td>ANA (0...+10V)</td> </tr> </tbody> </table>	Pin:	Color:	Assignment:	1	white	0V (GND)	2	brown	+12V...+30V DC	3	green	IN0 (EXT TRIG.)	4	yellow	IN1 (TEACH)	5	gray	OUT0	6	pink	OUT1	7	blue	OUT2	8	red	ANA (0...+10V)
Pin:	Color:	Assignment:																											
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## Housing dimensions



Picture 41: Housing dimensions in mm

## RS232 interface protocol

### 1 Description

- Standard RS232 serial interface, no hardware handshake.
- 3-line-connection: GND, TXD, RXD
- Speed: 19200 baud, 8 data-bits, no parity-bit, 1 stop-bit, binary-mode

The control device (PC or PLC) must be able to send a data frame with a length of 18-words (1 word = 2 byte = 16 bit) to the A-LAS-CON1 control unit. All words must be transferred in binary format. The higher-order byte of each word must be transferred first (MSB-first).

#### METHOD:

The microcontroller of the A-LAS-CON1 control unit permanently reads the input buffer of the RS-232 module (polling). If the word arriving there is 0x0055 (0x55 hexadecimal = 85 decimal), this is interpreted as a synchronisation event: <sync-word>. When the 1st word <sync-word> has been read, the 2nd word will be read. The 2nd word contains the order number: <order-word> .

After the order word <order-word>, the number of the parameter set (0 or 1) must be transferred in the 3rd word = <parameter-set-no>.

After the number of the parameter set (0 or 1), the A-LAS-CON1 reads in 15-parameters = <parameter-word>. When the complete data frame (18-words = 36 bytes) has been read, the A-LAS-CON1 executes the order <order-word> transferred in the 2nd word.

### 2 List of order numbers

The order number contained in the 2nd word of the transferred command <order-word> may have the following values.

VALUE:	Description:	Action:
1	Sends parameters to the volatile memory of the A-LAS-CON1	Sends 18 word from PC to A-LAS-CON1 (RAM), 18 word response echo
2	Reads parameters from the volatile memory of the A-LAS-CON1	Reads 18 word from A-LAS-CON1 (RAM) to the PC, 18 word response with parameters
3	Sends parameters to the non-volatile memory of the A-LAS-CON1	Sends 18 word from PC to A-LAS-CON1 (EEPROM), 18 word response echo
4	Reads parameters from the non-volatile memory of the A-LAS-CON1	Reads 18 word from A-LAS-CON1 (EEPROM) to the PC, 18 word response with parameters
5	Echo-test, tests the communication readiness of the A-LAS-CON1	Sends 18 word from PC to A-LAS-CON1 (RAM), 18 word response echo (start: 0x00AA)
6	Starts a TEACH process and keeps the result in the volatile memory	Sends 18 word from PC to A-LAS-CON1 (RAM), 18 word response echo
7	Reads the software version of the A-LAS-CON1 control unit	Sends 18 word from PC to A-LAS-CON1 (RAM), 36 bytes ASCII string response
8	Reads measured values from the A-LAS-CON1 control unit	Reads 18 word from A-LAS-CON1 (RAM) to the PC, 18 word response with measured values
9	Reads the data memory of the A-LAS-CON1 control unit.	Reads 18 word from A-LAS-CON1 (RAM) to the PC, 18 word response with measured values
10	Resets the local maximum/minimum values of the A-LAS-CON1 control unit.	Sends 18 word from PC to A-LAS-CON1 (RAM), 18 word response echo
11	Resets the normalising basis of the A-LAS-CON1 control unit	Sends 18 word from PC to A-LAS-CON1 (RAM), 18 word response echo



### Parameter layout (commands 1, 2, 3 and 4)

Position		
<b>1</b>	<sync-word> = 0x0055	hex-code 0x0055, binary=0000 0000 0101 0101, dec.=85
<b>2</b>	<order-word>	Command-word (see table below)
<b>3</b>	<parameter-set-no> = 0	Parameter set number = 0
<b>4</b>	parameter POWER	Laser power of the measuring channel (0 ... 1000)
<b>5</b>	parameter REFERENCE	Reference default value (teach value) (1 ... 1023)
<b>6</b>	parameter TOLERANCE	Tolerance default value (1 ... 1023)
<b>7</b>	parameter TRIGGERINT	Trigger threshold of the measuring channel (1 ... 1023)
<b>8</b>	parameter HYSTERESIS	Hysteresis value (in the tolerance window) (5 ... 100)
<b>9</b>	parameter POLARITY	Output polarity for OUT0,OUT1,OUT2 (0=DIRECT, 1=INVERSE)
<b>10</b>	parameter HOLD	Output hold time for OUT0,OUT1,OUT2 (0,10,20,50,100)
<b>11</b>	parameter AVERAGE	Average value (1,2,4,8,16,32,64,128)
<b>12</b>	parameter HWMODE	Hardware mode (0=Disable All, 1=Enable All, 2=Enable Button, 3=Enable Poti)
<b>13</b>	parameter EVALMODE	Evaluation mode: (0=NORM-A, 1=NORM (A&B), 2=NORM (A+B), 3=MAX (A), 4=NORM-B, 5=MAX (B), 6=MIN (A), 7=MIN (B))
<b>14</b>	parameter TRGMODE	Trigger mode: (0=CONTINUOUS, 1=SELF-TRIGG'D-SWEEP, 2=EXTERN- TRIGG'D-SWEEP, 3=EXTERN-IN0-HIGH, 4=EXTERN-GATED- SCAN, 5=EXTERN-SINGLE-SHOT)
<b>15</b>	parameter DIG-MODE	Operating mode of digital outputs (0:TOL, 1:BIN)
<b>16</b>	parameter ANA-MODE	Operating mode of analog output: (0=DIRECT 0..10V, 1=MAXIMA-value, 2=MINIMA-value, 3=OFF)
<b>17</b>	parameter <FREE>	-
<b>18</b>	parameter PRETRIGGER	Pretrigger (1 ... 1023)

### 3 Measured value layout (command 8)

<b>1</b>	<sync-word> = 0x0055	
<b>2</b>	<order-word>	
<b>3</b>	NORM-A	:= Normalised measured value of measuring channel CH-A
<b>4</b>	NORM-B	:= Normalised measured value of measuring channel CH-B
<b>5</b>	RAW-A	:= Raw value of measuring channel CH-A
<b>6</b>	RAW-B	:= Raw value of measuring channel CH-B
<b>7</b>	Amax	:= Current maximum value (RAW value) of CH-A
<b>8</b>	Bmax	:= Current maximum value (RAW value) of CH-B
<b>9</b>	maxval-A	:= Normalised maximum value of CH-A since the last trigger or reset
<b>10</b>	maxval-B	:= Normalised maximum value of CH-B since the last trigger or reset
<b>11</b>	minval-A	:= Normalised minimum value of CH-A since the last trigger or reset
<b>12</b>	minval-B	:= Normalised minimum value of CH-B since the last trigger or reset
<b>13</b>	potival	:= Analog value at the tolerance potentiometer (normalised)
<b>14</b>	buttonval	:= Status of the Teach/Reset button at the housing (pressed = 1)
<b>15</b>	instate	:= Status at digital inputs IN0 and IN1 (IN0 = low byte, IN1 = high byte)
<b>16</b>	n.a.	
<b>17</b>	n.a.	
<b>18</b>	n.a.	