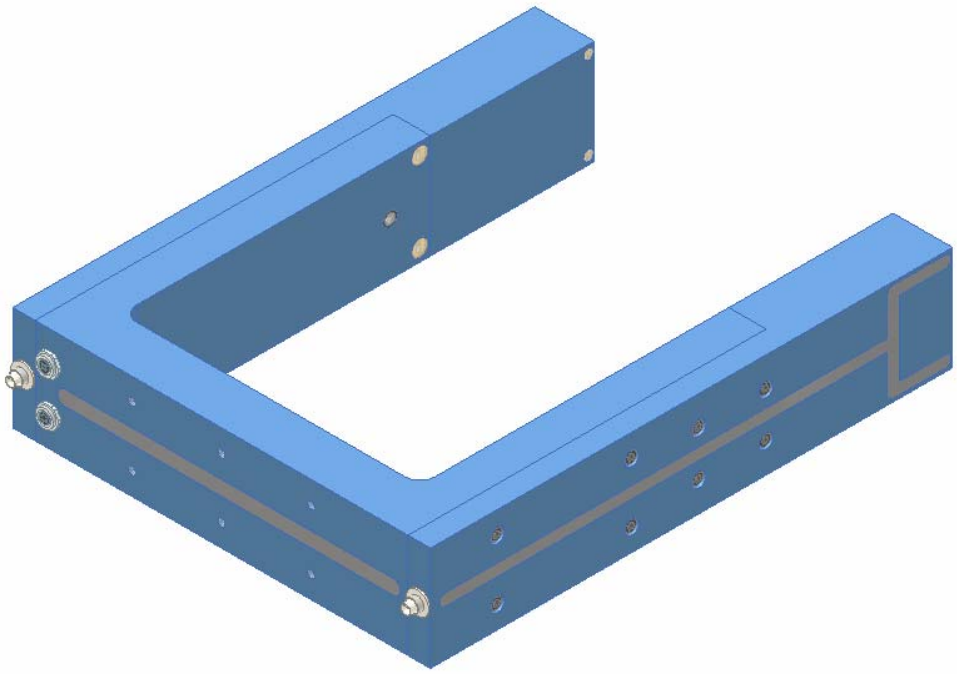
Technical Description

A-LAS-CON1-TRG *Control Unit*

A-LAS-F70-200/200(2x6)-2x *Fork Sensor*



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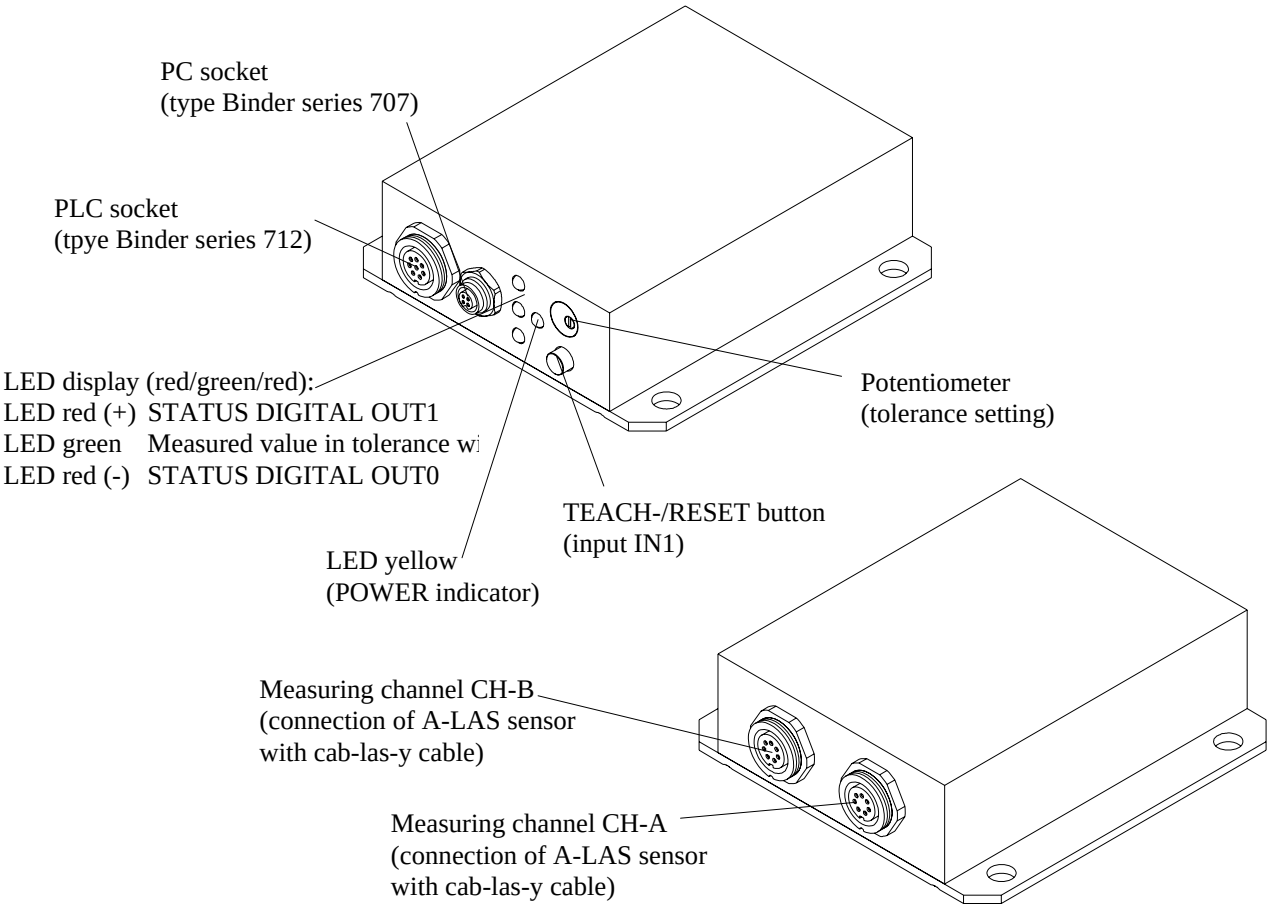
1 Functional principle: A-LAS-CON1-TRG control unit

1.1 Technical description:

A-LAS-CON1-TRG is a control unit that is designed for the connection of sensors of the A-LAS series.
Up to two analog sensors can be connected by way of two 7-pole sockets. A cab-las-y connecting cable is required for the connection of every sensor. The control unit serves for the 100% inspection of objects by means of tolerance-band monitoring. A high-speed 2-channel 12-bit analog/digital-converter allows simultaneous reading of the analog values at both measuring channels. The control unit is able to adjust the laser power separately for every measuring channel.
The microcontroller of the A-LAS-CON1-TRG 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 (the potentiometer is not available in A-LAS-CON1-TRG-version) for tolerance setting. The button can be activated or deactivated with the software. 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-TRG. The A-LAS-CON1-TRG control unit has two digital outputs (OUT0, OUT1) 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 via PLC. The control unit furthermore provides a high-speed analog output (0 ... 10V) with 12-bit digital/analog resolution.



2 Installation of the A-LAS-CON1-Scope-trg software

Hardware requirements for successful installation of the A-LAS-CON1-Scope-trg software:

- 100 MHz Pentium-compatible processor or better.
- CD-ROM or DVD-ROM drive
- Approx. 8 MByte of free hard disk space
- SVGA graphics card with at least 800x600 pixel resolution and 256 colours or higher.
- Windows 2000 or Windows XP operating system
- Free serial RS232 interface or USB port with USB-RS/232 adaptor at the PC

Please install the A-LAS-CON1-Scope-trg software as described below.

1. 

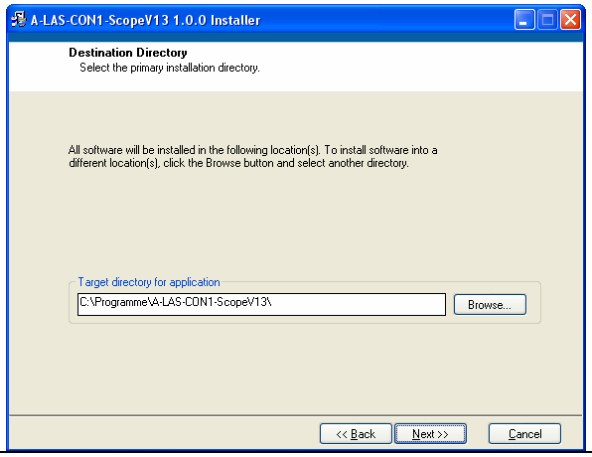
Insert the installation CD-ROM in your CD-ROM drive. In our example we suppose that this is drive "D".

2. 

Start the Windows Explorer and in the directory tree of your CD-ROM drive go to the installation directory D:\Install\ .
Then start the installation program by double-clicking on the SETUP.EXE symbol.

As an alternative, software installation can also be started by clicking on **START-Run...** and then entering "D:\Install.CON1Scope14\setup.exe", which must be confirmed by pressing the **OK** button.

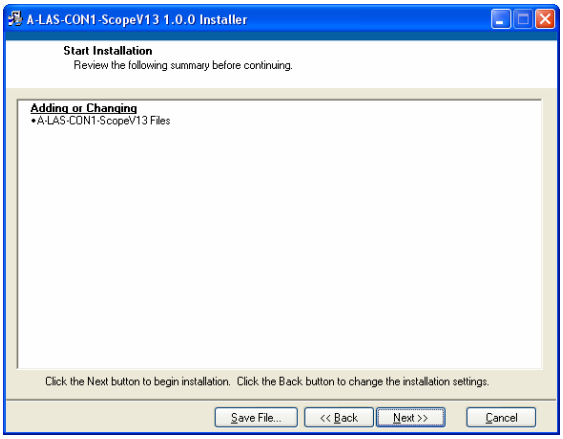
The installation program then displays a dialog-box for A-LAS-CON1-Scope-trg V1.3 installation.
This dialog-box shows some general information about installation.

3. 

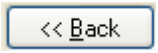
When you click on the Next> button, a new dialog field will appear and suggest an installation path.
You may accept the suggested path with Next>, or you may change the installation path by clicking on the Browse button

Click on Next> to start the installation, or on Cancel to cancel the installation.

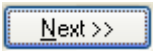
4.



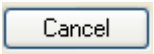
Another A-LAS-CON1-Scope-trg Setup dialog field will be displayed.



Click on the Back button to change the installation path again.

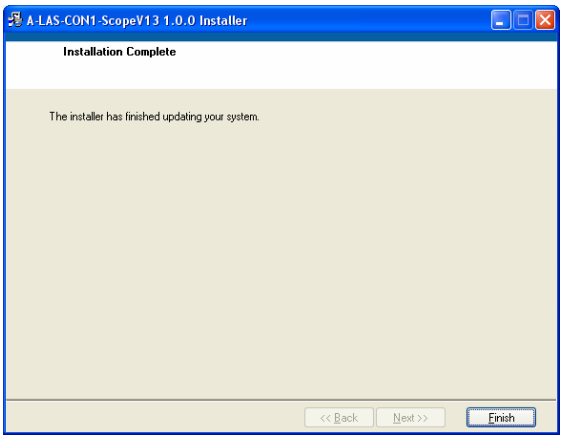


Click on Next>> to start the installation
or



click on Cancel to cancel the installation.

5.



When installation is completed, a dialog box informs you about successful installation.
During the installation process a new program group for the A-LAS-CON1-Scope-trg software is created in the Windows Program Manager. This program group contains the symbol for starting the software.

Click on the Finish button to finish the installation.

The A-LAS-CON1-Scope-trg software can now be started by double-clicking on the program symbol.

Deinstallation of the A-LAS-CON1-Scope-trg software:

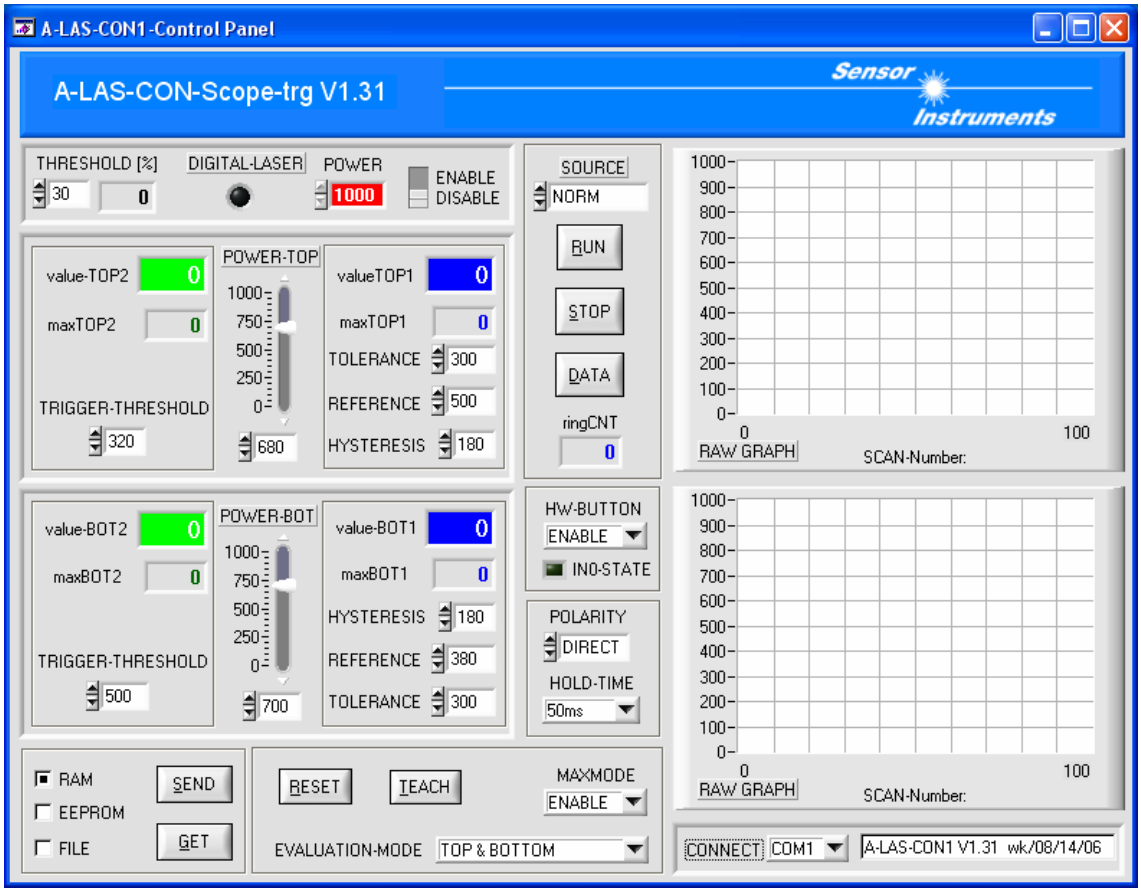
Please use the Windows deinstallation tool to remove the software.
The Windows deinstallation program can be found under Start / Settings / Control Panel / Software.

3 Operation of the A-LAS-CON1-Scope-trg software

The A-LAS-CON1-Scope-trg software is used for parameterising the A-LAS-CON1-TRG control unit of the A-LAS series. The measured values provided by the sensor can be visualised with the PC software, which means that the software 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 must be 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-TRG control unit. The sensor system then continues to operate in "STAND-ALONE" mode without PC.

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

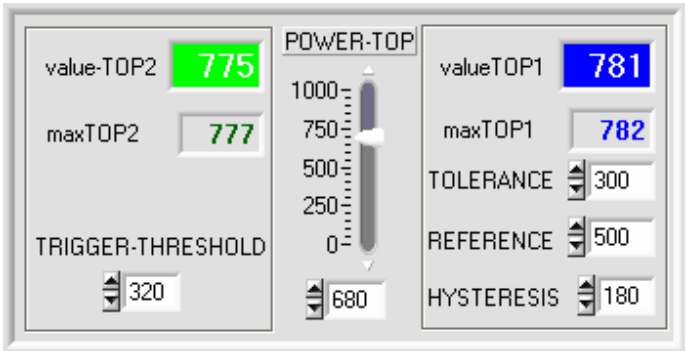


The A-LAS-CON1-Scope-trg Control Panel provides a great variety of functions:

- Visualisation of measurement data in numeric and graphic output fields.
- Setting of the laser power for the laser transmitter.
- Setting of the polarity of the digital switching outputs OUT0 and OUT1.
- Selection of a suitable evaluation mode.
- Presetting of setpoint value and tolerance band.
- Saving of parameters to the RAM, EEPROM memory of the control unit, or in a configuration file on the hard disk of the PC.

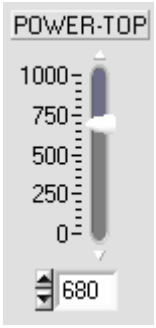
The individual control elements of the *A-LAS-CON1-Scope-trg* software will be explained in the following chapter.

3.1 Control elements of the A-LAS-CON1-Scope-trg software:



Settings for TOP sensors:
In this function fields different settings and parameters for the two TOP sensor-channels (TOP1 and TOP2) can be preset by using the slider or by entering a numerical values in the corresponding input fields.

Attention !
The settings at the A-LAS sensor control unit are only updated after the SEND button is pressed.



POWER-TOP:
In this function field the laser power at the A-LAS transmitter can be adjusted for both measuring channels (TOP1 and TOP2) by using the slider or by entering a numerical value in the corresponding input field.

Attention !
The laser power at the transmitter unit of the A-LAS sensor is only updated when the SEND button is pressed.

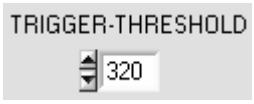
value-TOP2, value-TOP1:
If SOURCE RAW is selected and the RUN-BUTTON is pressed, the two numerical display fields show the current raw data of measuring channels TOP2 (left) and TOP1 (right) as 10-bit ADC values..

value-TOP2, value-TOP1:
If SOURCE NORM is selected and the RUN-BUTTON is pressed, the two numerical display fields show the normalised measured values.
The normalising equations are:

$$valueTOP2 = 1000 * \frac{RAW\_TOP2}{\max TOP2}$$

$$valueTOP1 = 1000 * \frac{RAW\_TOP1}{\max TOP1}$$

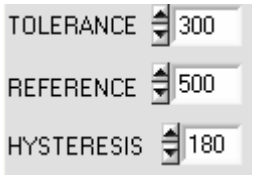
maxTOP2, maxTOP1:
These numerical display fields show the current maximum value at measuring channel TOP2 and TOP1. The current maximum value is updated with a non-return pointer. If the laser power is changed with the POWER slider, the current maximum values must be updated by clicking on the RESET button.

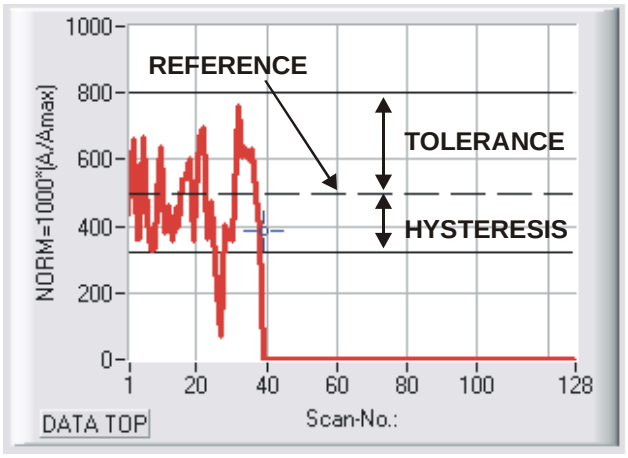


TRIGGER-THRESHOLD:

These function field is used for entering the trigger threshold at the trigger-channel TOP2 of the A-LAS control unit. The trigger threshold can be set by moving the slider or by entering a numerical value in the edit box.
The raw data at measuring channels TOP1 and TOP2 are referenced to the respective current maximum value (maxTOP1, maxTOP2). If the light measuring section is not covered, referencing yields NORM values (valTOP1 and valTOP2) of 1000 units.

The trigger threshold is absolutely referenced to the referenced valTOP2 norm value:
The trigger sensor is the left sensor channel at the top of the fork-sensor (TOP2).





TOLERANCE:

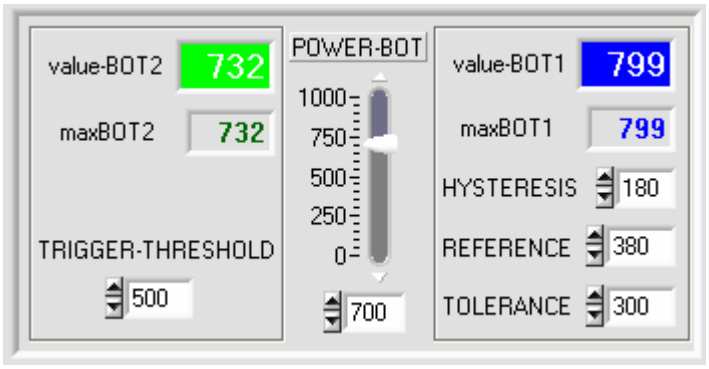
With this edit-box a tolerance band can be applied to the currently set reference value (setpoint value of the light measuring section that is covered by the measuring object). When the set tolerance limit is exceeded, this becomes effective as a change of switching state at digital output OUT0 (gray/pin5) at the 8-pole PLC socket.

REFERENCE:

This function field serves for entering the reference value for the measuring channel TOP1 (right top receiver of the A-LAS-fork sensor). The reference value is equal to the teach-in value (setpoint value) of the covering caused by the measuring object (bottle) at the respective measuring channel TOP1.
Maximum value referencing results in a value range of 0 .. 1000 units. The numerical value that is preset here is proportional to the respective covering at measuring channel TOP1.

HYSTERESIS:

This function field serves for entering an additional tolerance band below the reference value. The hysteresis value applies an additional switching threshold to the currently set tolerance band. This switching hysteresis affects digital output OUT0.

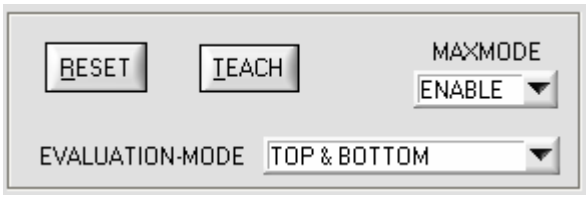


Settings for BOTTOM sensors:

In this function fields different settings and parameters for the two BOTTOM sensor-channels (BOT1 and BOT2) can be preset by using the slider or by entering a numerical values in the corresponding input fields.

Attention !
The settings at the A-LAS sensor control unit are only updated after the SEND button is pressed.

The function of the control elements for the two bottom-sensors BOT1 (right) and BOT2 (left) of the A-LAS-fork work similar to the top-sensor function fields:



This function field is used for activating automatic maximum value adaptation of the two measuring channels.

ENABLE: Automatic maximum value adaptation activated.
OFF: Automatic maximum value adaptation deactivated.

Maximum value adaptation compensates measured-value distortion that occurs at the optical transmitter/receiver units due to dirtying. When maximum value adaptation is activated, the last detected maximum value is decreased step by step with a fixed time interval of approx. 10s, if the current measured value is smaller than the last detected maximum value.

Attention!
Automatic maximum value adaptation may only be activated when the light measuring section becomes completely free again after the passage of the measuring objects.

A click on the RESET button resets the current maximum values and the ring-buffer for the measurement values.

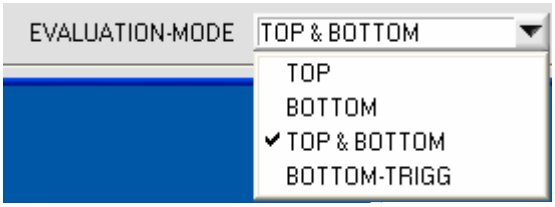
As an alternative to the software RESET button, it is also possible to press the red pushbutton at the housing of the A-LAS-CON1-TRG control unit for a short time (<750 ms).

The RESET function also can be initiated by applying a short (<750ms) HIGH level to the digital input IN0 (pin3/green).

A click on the TEACH button uses the last measured values of channel TOP1 and BOT1 as the reference (setpoint-value).

As an alternative to the software TEACH button, it is also possible to press the red pushbutton at the housing of the A-LAS-CON1-TRG control unit for a time (>1500 ms).

The TEACH function also can be initiated by applying a HIGH level (t >1500ms) to the digital input IN0 (pin3/green). The green LED on the housing of the A-LAS-CON1-TRG is toggling 3x.



EVALUATION-MODE:
This drop-down function field is used for setting the evaluation mode at the A-LAS-CON1-TRG control unit.

TOP: Evaluation of the analog value val_TOP1 at measuring channel TOP1 (right top receiver element of the fork sensor) that is referenced to the current maximum value maxTOP1.

The evaluation is done at the moment when the trigger condition is valid at the trigger-sensor TOP2.

$$valueTOP1 = 1000 * \frac{RAW\_TOP1}{\max TOP1}$$

BOTTOM: Evaluation of the analog value val_BOT1 at measuring channel BOT1 (right bottom receiver element of the fork-sensor) that is referenced to the current maximum value maxBOT1.

The evaluation is done at the moment when the trigger condition is valid at the trigger-sensor BOT2.

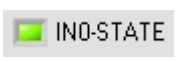
$$valueBOT1 = 1000 * \frac{RAW\_BOT1}{\max BOT1}$$

TOP & BOTTOM: Both the TOP and BOTTOM evaluation is done.

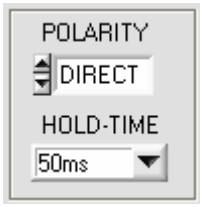
For the top channel TOP1 (right) the trigger sensor is TOP2 (left-receiver-element) and for the bottom channel BOT1 the BOT2 receiver element is used as the trigger sensor. This evaluation mode works with two individual trigger-thresholds both for the top-channel and for the bottom-channel.

BOTTOM-TRIGG: Evaluation is done if the trigger-condition of the trigger sensor BOT2 (left) of the A-LAS-fork is valid. At this moment both the TOP1 and BOT1 measurement channels are evaluated simultaneously. This evaluation mode works only with one trigger-threshold (TRIGGER-bottom).

HW-BUTTON:
This drop-down function field can be used for individually activating or deactivating the TEACH/RESET button at the housing of the A-LAS-CON1-TRG.
The T1 button has two functions:
(I) Button is pressed for a short time (<750ms) RESET max values
(II) Button is pressed for a longer time (>1.5s) TEACH function



IN0-STATE:
This display element visualizes the state of the digital input IN0 (Pin3, green) of the A-LAS-CON1-TRG control unit.
GREEN: IN0 = +24VDC
OFF: IN0 = 0V (open)



POLARITY:
This function field determines the polarity change of digital outputs OUT0 and OUT1 when a tolerance threshold is exceeded.
DIRECT:
In case of an error, OUT0, OUT1 = +24VDC (high-active), red LED on.
INVERSE:
In case of an error, OUT0, OUT1 = 0V (low-active), red LED off.

HOLD-TIME:
The A-LAS-CON1-TRG control unit operates with minimum scan times in the range of 100µs. For this reason most of the PLCs that are connected to the digital error outputs OUT0 and OUT1 have difficulties with the safe detection of the resulting short changes of switching states.
By selecting the respective element in the drop-down list a pulse lengthening at the digital outputs of the A-LAS-CON1-TRG control unit can be set.
Minimum output hold time = 10ms
Maximum output hold time = STAT (status at the digital output remains constant until the next trigger event).

DIGITAL-LASER:
This function group serves for the settings of the digital laser sensor D-LAS at the top of the A-LAS laser fork sensor. The D-LAS sensor is used for the detection of paper-labels at the bottle-neck.

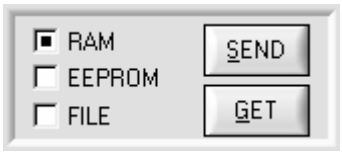
The D-LAS laser sensor measures the time of coverage when a bottle moves through the laser spot. If a label is present at the bottle-neck, this time compared to the full trigger time (100%) is bigger than the coverage-time, if no label is at the bottle-neck.

THRESHOLD [%]:
This edit-field is used to set a limit for the coverage time [%] which is used to detect the presence of a label at the bottle-neck.

Actual coverage-value (measured at the last trigger-event).

POWER:
In this function field the laser power at the D-LAS transmitter can be adjusted.

This binary switch enables or disables the evaluation of the D-LAS label-check.



PARAMETER TRANSFER:

This group of function buttons is used for transferring parameters between the PC and the A-LAS-CON1-TRG control unit through the serial RS-232 interface.

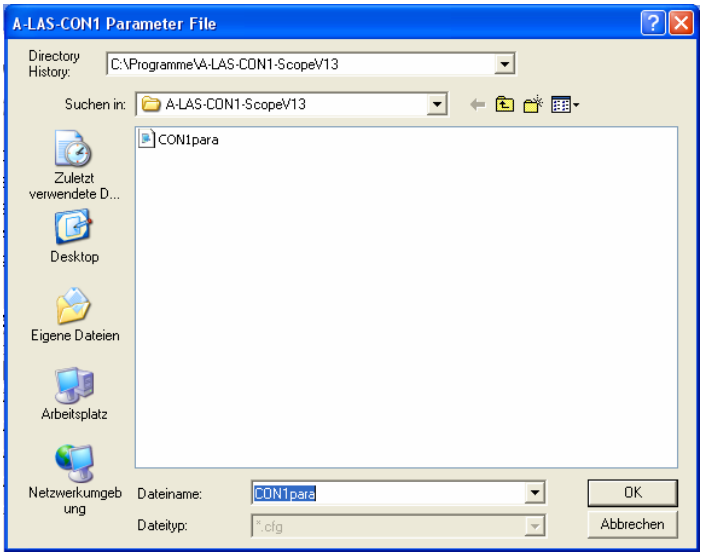
SEND:
When the SEND button is clicked, the parameters currently set on the user interface are transferred to the A-LAS-CON1-TRG control unit. The target of data transfer is determined by the selected radio-button (RAM, EEPROM, or FILE).

GET:
When the GET button is clicked, the setting parameters are transferred from the A-LAS-CON1-TRG control unit to the PC and are updated on the user interface. The source of data transfer again is determined by the selected radio-button.

RAM:
The currently set parameters are written to the volatile RAM memory of the A-LAS-CON1-TRG control unit, or they are read from the RAM and transferred to the PC. Please note: The parameters set in the RAM will be lost when the power supply at the A-LAS-CON1-TRG control unit is turned off.

EEPROM:
The currently set parameters are written to the non-volatile EEPROM memory of the A-LAS-CON1-TRG control unit, or they are read from the EEPROM and transferred to the PC. Parameters that are saved in the EEPROM will not be lost when the power supply is turned off.
If parameters are read from the EEPROM of the A-LAS-CON1-TRG control unit, these must be written to the RAM of the A-LAS-CON1-TRG by selecting the RAM button and then clicking on SEND. The A-LAS-CON1-TRG control unit then continues to operate with the set RAM parameters.

FILE:
When the FILE radio-button is selected, a click on the SEND/GET button opens a new file dialog window at the user interface. The current parameters can be written to a freely selectable file on the hard disk of the PC, or parameters can be read from such a file.



FILE dialog window:

The standard output file for the parameter values has the file name „CON1para.cfg“.

The output file can be opened with the Windows Editor program.

3.2 Serial RS232 data transfer:

RS232 COMMUNICATION:

- Standard RS232 serial interface without hardware-handshake.
- 3-line-connection: GND, TXD, RXD.
- Speed: 19200 baud, 8 data-bits, no parity-bit, 1 stop-bit in binary mode, MSB first.

Attention !

The stable function of the RS232 interface (status message after program start) is a basic prerequisite for data transfer between the PC and the A-LAS-CON1-TRG control unit. Due to the limited data transfer rate of the serial RS232 interface (19200 bit/s) only slow changes of the analog values at the A-LAS sensors can be observed in the graphic display at the PC. In order to guarantee the maximum switching frequency of the A-LAS-CON1-TRG control unit it is therefore necessary to terminate the data exchange during the normal monitoring process in production (press the STOP button).

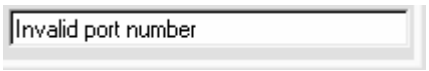
CONNECT:

When the software is started, it attempts to establish a connection to the A-LAS-CON1-TRG control unit through the standard COM1 interface. If connection could be established successfully, the current firmware version is displayed in the status line.

The serial connection between the PC and the A-LAS-CON1-TRG control unit could not be established, or the connection is faulty.

In this case it should first be checked whether the A-LAS-CON1-TRG control unit is supplied with voltage, and whether the serial interface cable is correctly connected to PC and A-LAS-CON1-TRG control unit.

If the number of the serial interface that is assigned at the PC should not be known, interfaces COM1 to COM9 can be selected by using the CONNECT drop-down list.

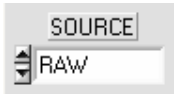


If there is an “Invalid port number” status message, the selected interface, e.g. COM2, is not available at your PC.

If there is a “Cannot open port ” status message, the selected interface, e.g. COM2, may already be used by another device.

3.3 A-LAS-CON1-Scope-trg software as an aid for sensor adjustment:

RUN:
After a click on the RUN button, the fine adjustment between A-LAS transmitter and receiver can be observed in the graphic display window RAW-GRAPH. For this purpose the graphic output source (SOURCE) must first be set to RAW in the SOURCE drop-down list field. After a click on the RUN button, the raw data of the respective measuring channel pass through the graphic display window from right to left in "scroll-mode". Measuring channel CHA is shown as a blue curve, and CHB as a green curve.

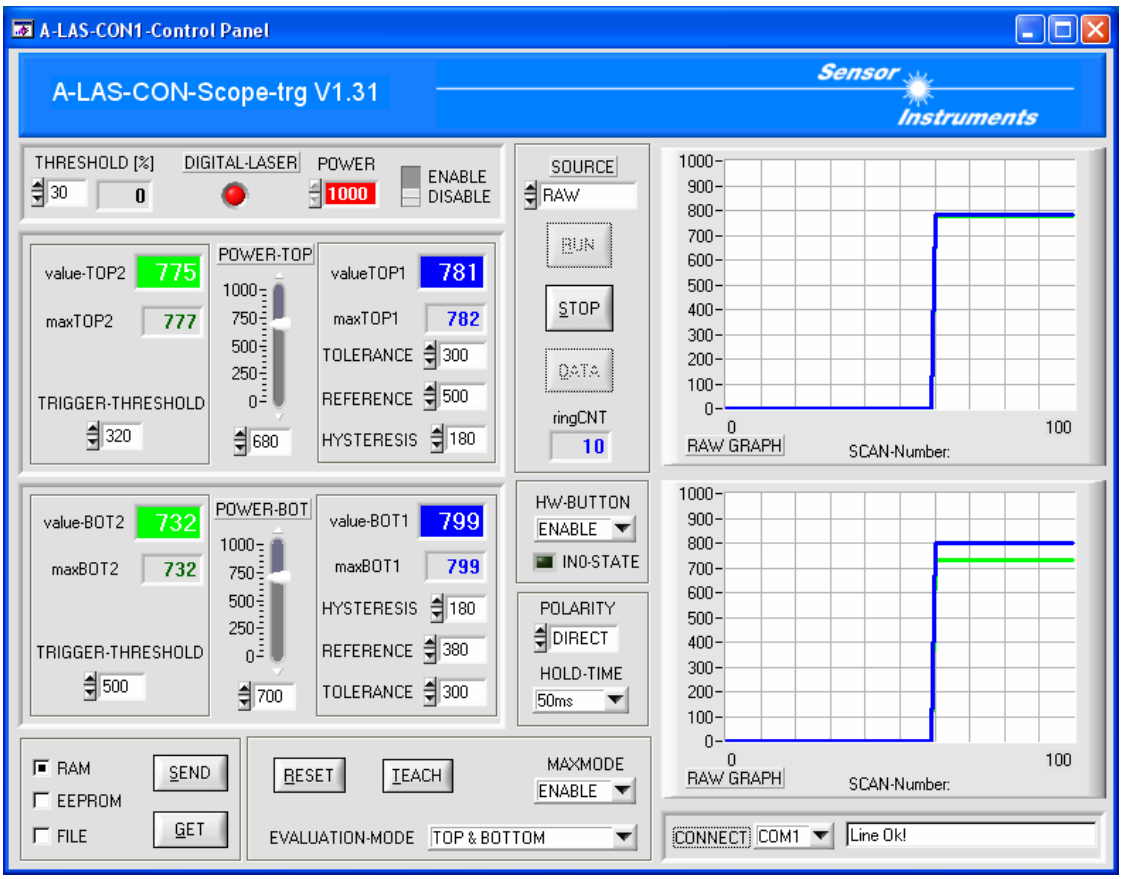


STOP:
A mouse-click on the STOP button stops the data transfer between the A-LAS-CON1-TRG and the PC.

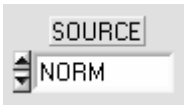
The RAW-GRAPH displays the analog values of the A-LAS analog sensors that are connected to measuring channels TOP1, TOP2 and BOT1, BOT2 in a separate RAW-GRAPH window.

The y-axis is limited to a numerical value of 1000, because the A-LAS-CON1-TRG evaluates the measured values with 10-bit accuracy.
To make use of the dynamic range, the raw values should lie between 500-800 ADC units when the sensor is not covered. For this purpose the laser power can be adapted with the corresponding POWER slider, if necessary.

After the RUN button is pressed, many numerical output fields and visualisation elements are updated:

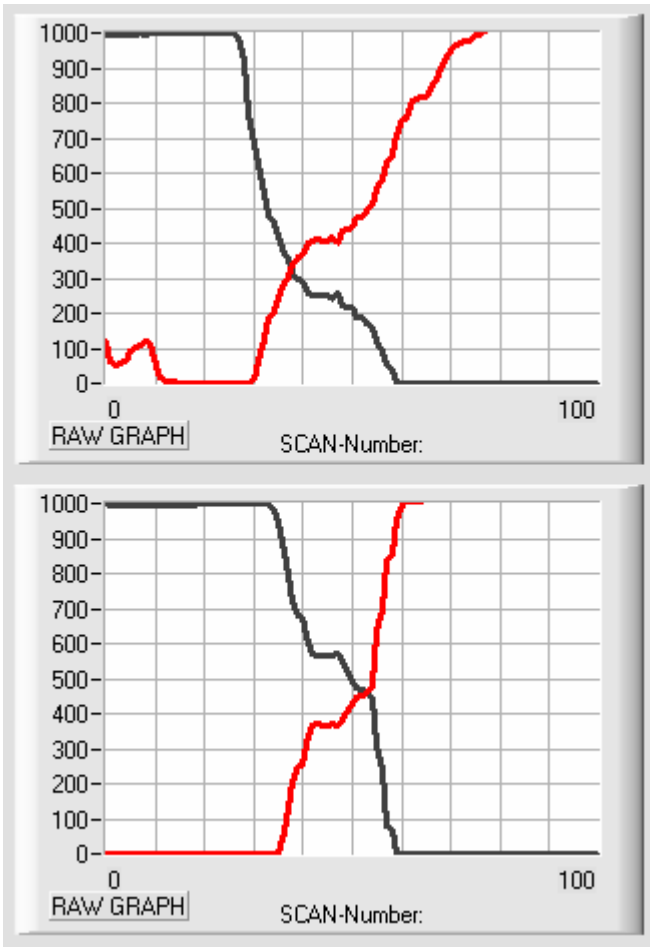


NORM / RUN:
The RUN button must be pressed to activate the "scroll mode".



When NORM is selected in the SOURCE drop-down list element, the normalised measured values for the analog laser channels are shown in the graphic display window.

The NORM-graph windows can be used to adjust the optimal height of the bottles relative to the position of the top and bottom sensor elements at the A-LAS fork. If both the red curve (right sensor) and the black curve (left sensor) are crossing each other the bottle is placed at the center of the rectangular transmitter aperture.

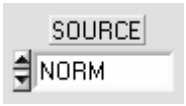


If the light measuring sections are not covered, referencing (normalising) to the respective current maximum value results in the
NORM value =1000 (see left).

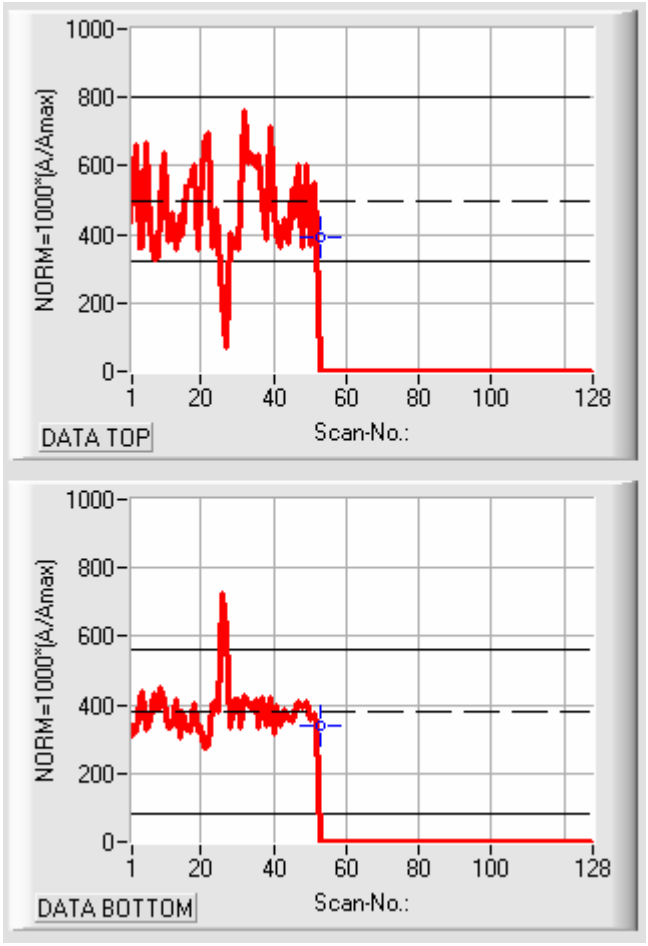
The graphical output windows for both the laser sensors are displayed one above the other.

Graphical output for the TOP sensor channels:
Red curve: TOP1 (right sensor / measure-sensor)
Black curve: TOP2 (left sensor / trigger-sensor)

Graphical output for the BOTTOM sensor channels:
Red curve: BOT1 (right sensor / measure-sensor)
Black curve: BOT2 (left sensor / trigger-sensor)



DATA:
If the DATA button is pressed, a ring-buffer of the last 128 measured objects is displayed in two graphical output windows.
The red curves in both data-graphs are representing the measured values of the top – und bottom measurement sensors (TOP1 and BOT1) when the trigger condition is valid.



The last measured NORM-value are marked with a blue cross-cursor.

The index of the last measured NORM-value is displayed at the ringCNT output field.

In the left example the last measured value are for the top sensor TOP1 = 392

and for the

bottom sensor BOT1= 341

If the measured value lies outside the tolerance band the error output OUT0 (pin5/grey) changes its state (hold-time).

A click on the RESET button resets the current maximum values and clears the ring-buffer for the measurement values.

As an alternative to the software RESET button, it is also possible to press the red pushbutton at the housing of the A-LAS-CON1-TRG control unit for a short time (<750 ms).

The RESET function also can be initiated by applying a short (<750ms) HIGH level to the digital input IN0 (pin3/green).

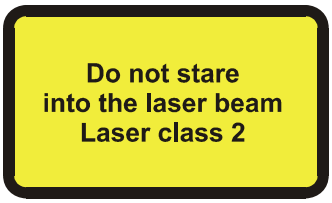
4 Appendix

4.1 Technical data:

Designation	**A-LAS-CON1-TRG**
Power supply	+12VDC ... +32VDC
Current consumption	typ. 200 mA
Min. detectable object	< 10 µm (depending on the aperture of the A-LAS sensor)
Resolution	0.1% (100% = aperture size of the A-LAS sensor)
Operating temperature range	-20°C ... +55°C
Storage temperature range	-20°C ... +85°C
Type of protection	IP54
Digital inputs (IN0, IN1)	Input voltage +Ub/0V, with protective circuit
Digital outputs (OUT0, OUT1)	pnp-brigh-switching/npn-dark-switching or pnp-dark-switching/npn-bright-switching, adjustable under Windows®, 100 mA, short-circuit-proof
Bandwidth of analog signal	15 kHz (-3dB)
Laser power correction	adjustable under Windows® at a PC
Housing material	Aluminium, anodised in blue
Housing dimensions	LxWxH approx. 80 mm x 80 mm x 25 mm (without flange female connectors)
Connectors	8-pole circular female connector type Binder series 712 (PLC/Power) 4-pole circular female connector type Binder series 707 (PC/RS232) 8-pole circular female connector type Binder series 712 (A-LAS sensors bottom) 7-pole circular female connector type Binder series 712 (A-LAS sensors top)
Teach button	Teach button at the housing for teaching in the setpoint value
LED indicators	LED red (+) : Status tolerance output OUT1 LED green : Power indicator / visualisation of the teach process LED red (-) : Status tolerance output OUT0
EMC test acc. to	IEC - 801 ...
Scanning frequency	max. 100 Hz
Max. switching current	100 mA, short-circuit-proof
Interface	RS232, parameterisable 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 CH1: cab-las-y / special version TRG/Coca-Cola To A-LAS sensor CH2: cab-las-y/ special version TRG/Coca-Cola

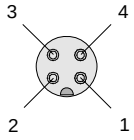
LASER WARNINGS

Solid-state laser, λ=670 nm, 1mW max. optical power,
laser class 2 acc. to EN 60825-1
Therefore no additional protective measures are required for the use of these laser transmitters.



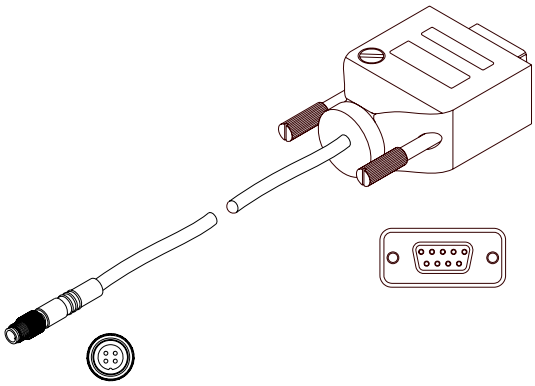
4.2 Connector assignment

RS232 connection to PC:
4-pole M5 socket type Binder 707

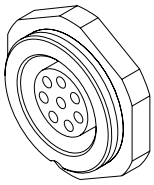


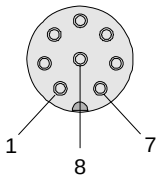
Pin:	Assignment:
1	0V (GND)
2	0V (GND)
3	RxD
4	TxD

Connecting cable:
cab-las4/PC (length 2m, cable sheath: PUR)



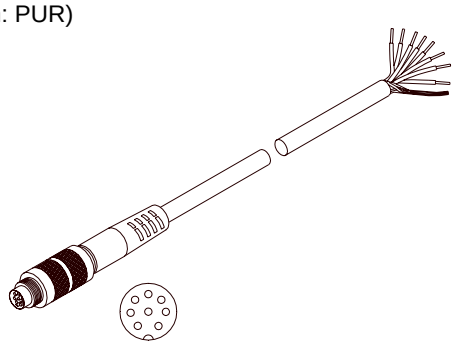
Interface to PLC/power supply:
8-pole socket type Binder 712



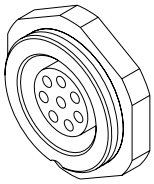


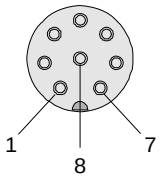
Pin:	Color:	Assignment:
1	white	0V (GND)
2	brown	+12VDC … +32VDC
3	green	IN0 (TEACH/RESET)
4	yellow	not connected
5	grey	OUT0 (analog-sensor-output)
6	pink	OUT1 (digital-sensor-output)
7	blue	0V (GND)
8	red	not connected

Connecting cable:
cab-las8/SPS (length 2m, cable sheath: PUR)



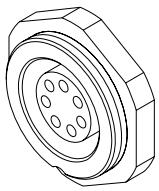
Interface A-LAS-CON1-TRG-TRG to fork sensor A-LAS-F70-200/200-(2x6)-2x (TOP sensors, D-LAS sensor)
8-pole socket type Binder 712

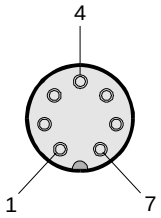




Pin:	Color:	Assignment:
1	white	0V (GND)
2	brown	+5V
3	green	+24VDC
4	yellow	I-SET0 (TOP)
5	grey	I-SET2 (D-LAS)
6	pink	ANA0 (TOP1)
7	blue	ANA1 (TOP2)
8	red	OUTPUT Q (D-LAS)

Interface A-LAS-CON1-TRG-TRG to fork sensor A-LAS-F70-200/200-(2x6)-2x (BOTTOM sensors)
7-pole socket type Binder 712

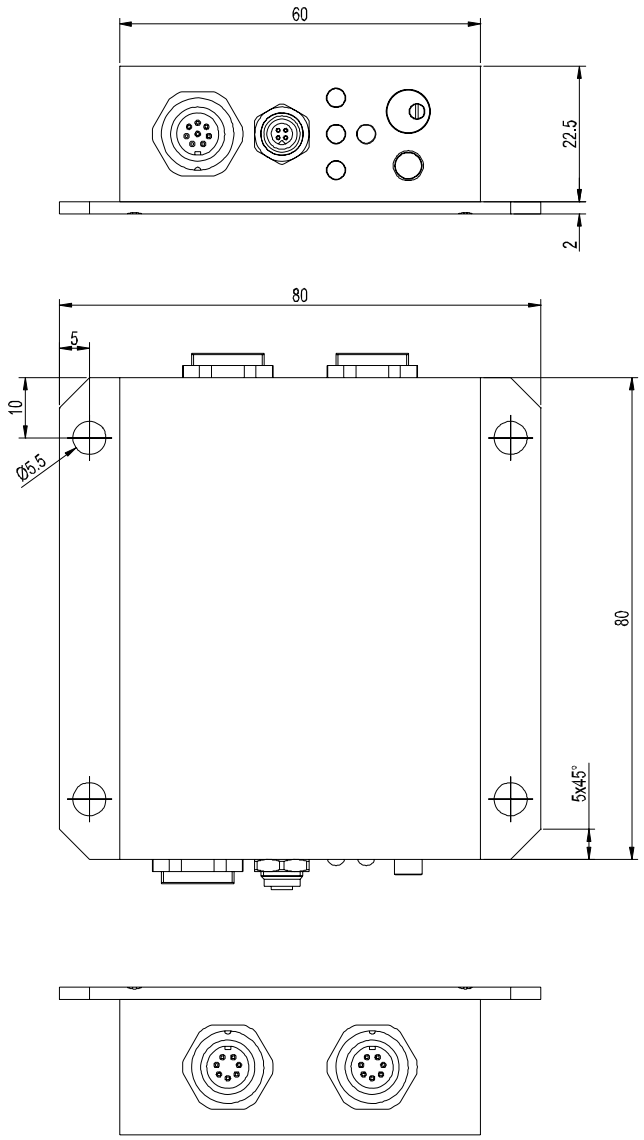




Pin:	Color:	Assignment:
1	white	0V (GND)
2	brown	+5V
3	green	not connected
4	yellow	I-SET1 (BOT)
5	grey	I-SET1 (BOT)
6	pink	ANA1 (BOT1)
7	blue	ANA5 (BOT2)

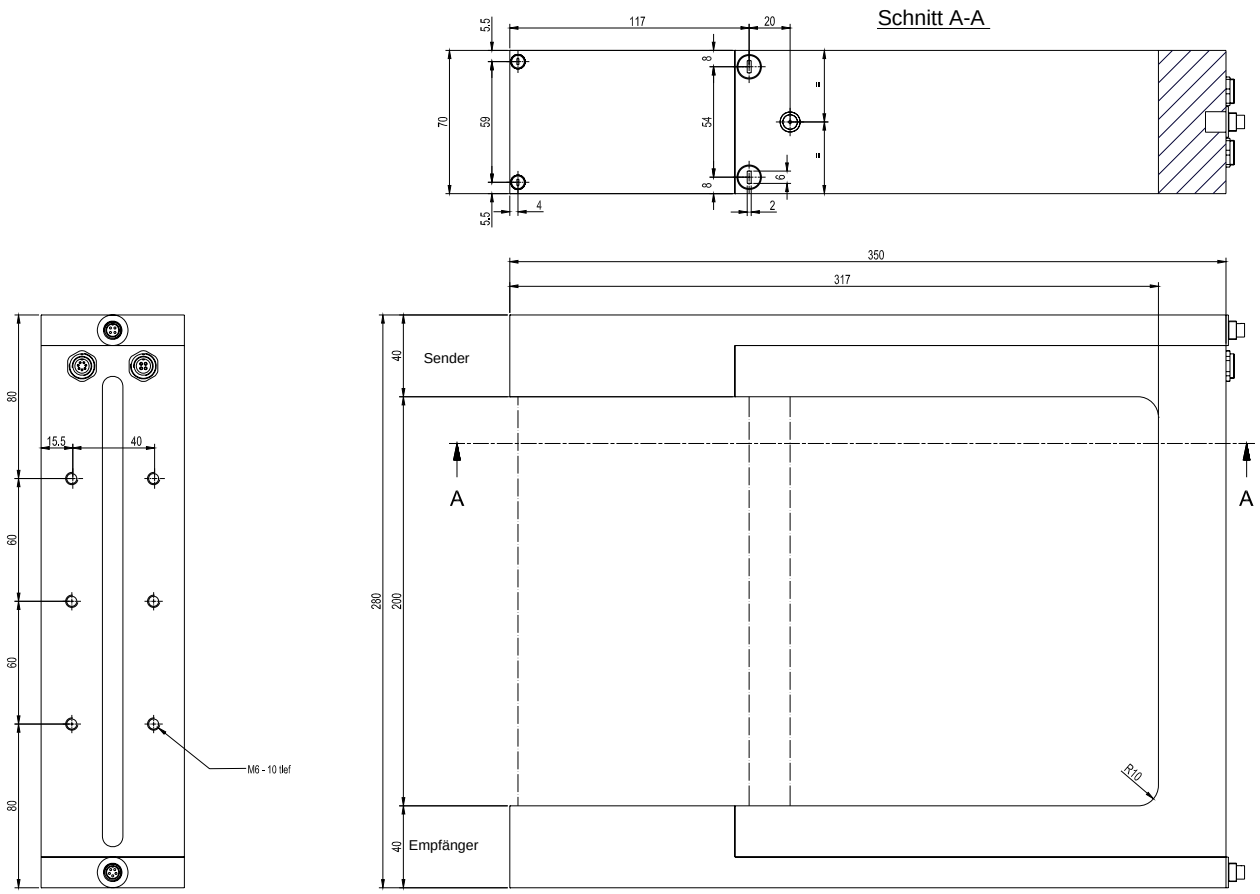
4.3 Housing dimensions

4.3.1 Control unit A-LAS-CON1-TRG



All dimensions in mm

4.3.2 Fork sensor A-LAS-F70-200/200-(2x6)-2x



All dimensions in mm