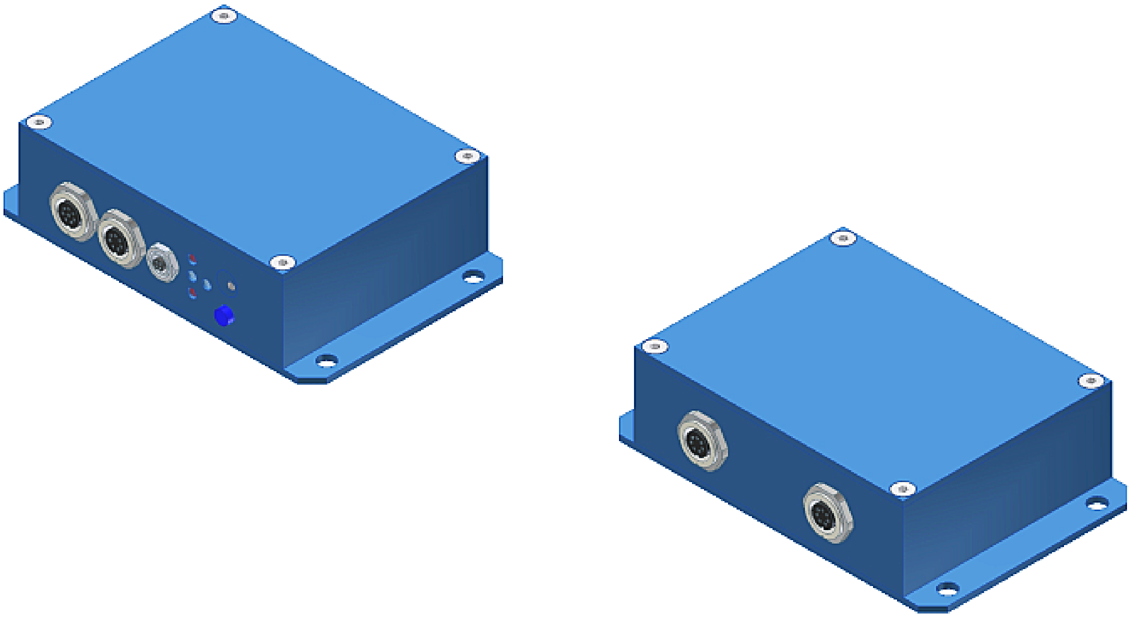
Manual

Software A-LAS-CON1-Scope V3.0x

(PC software for Microsoft® Windows® Vista, XP, 2000, NT® 4.0, Me, 98)

for electronic control unit A-LAS-CON1



Contents

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 a resolution of at least 800x600 pixels and 256 colors
- CD-ROM or DVD-ROM drive
- Minimum of 800 MB of free hard disk space

Installation

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

A-LAS-CON1 function principle

Short description

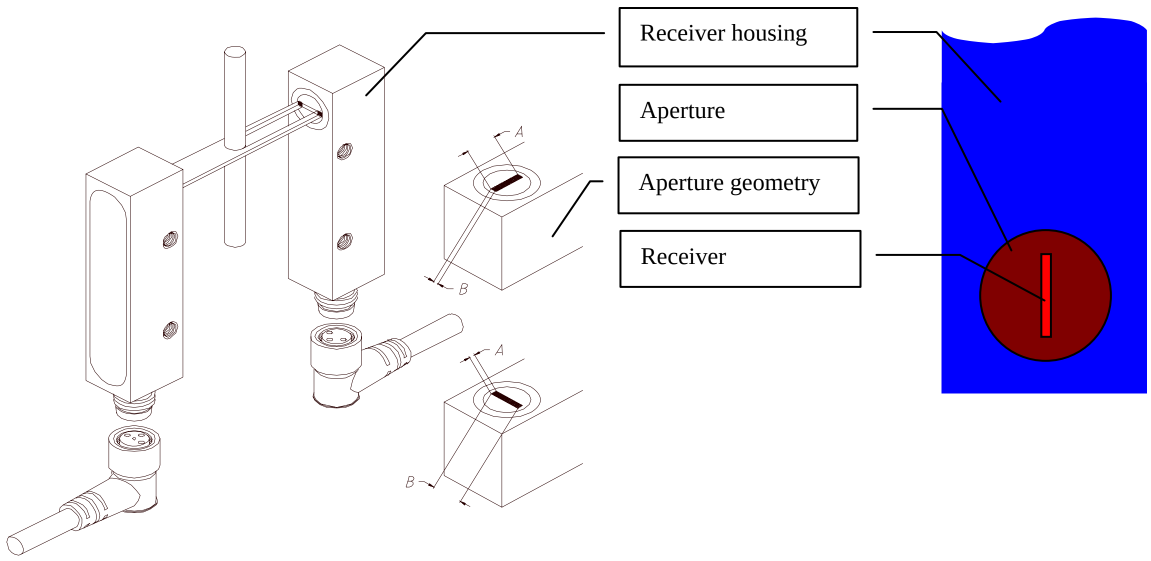
"A-LAS-CON1" is a microcontroller-based control unit for the evaluation of the signals from up to two analog laser sensors of type "A-LAS". (The control unit of type "A-LAS-CON1-FIO" contains the transmitter and receiver electronics and features two optical fibre connections.)

The A-LAS-CON1 control unit has two 7-pole female connectors that each allow the connection of an A-LAS sensor by way of a suitable connecting cable (cab-las-y or cab-las-y-male). The analog output signals of the two sensors are read and digitised by the control unit at a rate of up to 25000 times per second. The digital values are then internally processed and evaluated according to user-defined settings. The two sensors (referred to as "channels") are interpreted independently of each other. An additional virtual channel allows the forming of mathematic combinations of the two real channels. The signals are evaluated by way of a tolerance band that is separately defined for each channel and can be freely set within the measuring range. For configuration purposes the A-LAS-CON1 control unit features an RS232 interface through which the settings of the control unit can be accessed with the "A-LAS-CON1-Scope" PC software. A separate data line allows the connection of an expansion module or of another A-LAS-CON1 control unit.

Through an 8-pole female connector the A-LAS-CON1 control units is supplied with a supply voltage of nominal 24V. The states of the individual channels can be output via three short-circuit-proof, freely configurable digital outputs (OUT0, OUT1, OUT2). At the housing of the A-LAS-CON1 the output state is visualised by way of 4 LEDs. Two digital inputs provide a trigger function for controlling measurement value scanning and/or a teach function for setting new tolerance band values. Through a high-speed analog output (0…+10V or 4…20mA) the measurement values can be output as analog values. A TEACH/RESET button at the housing of the A-LAS-CON1 control unit allows access to one of the two digital inputs (IN0, IN1). A potentiometer for configuring the tolerance bands also is provided.

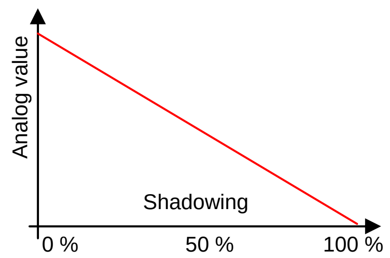
Detailed description: From analog sensor to digital value

A sensor of type A-LAS-90 is used as an example here for demonstrating the function of the A-LAS sensor.

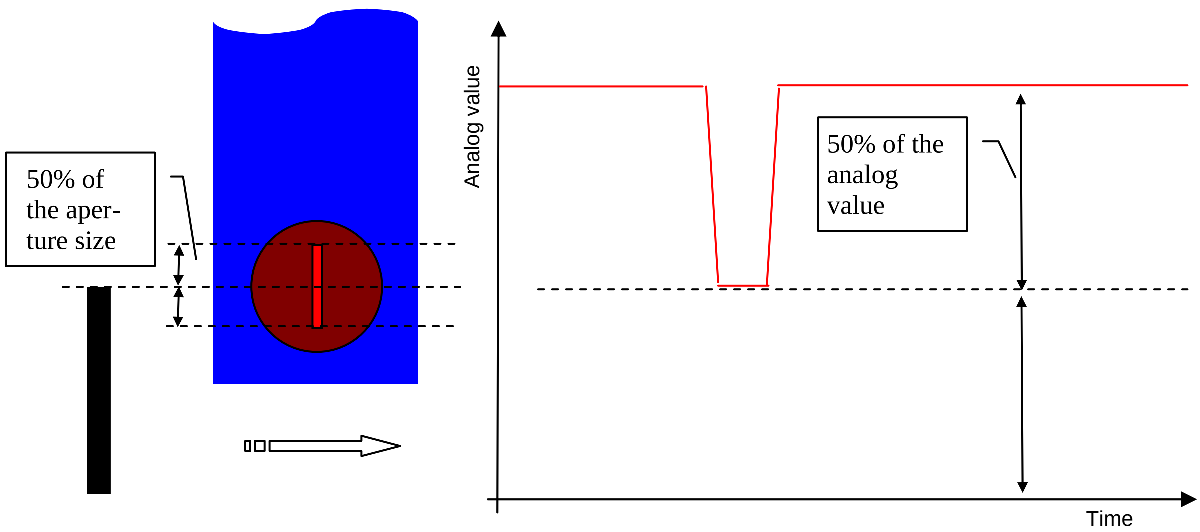


In principle, however, the function description applies to all the A-LAS sensors.

The A-LAS sensor consists of two parts – a transmitter and a receiver. With high-precision optics the transmitter generates a parallel laser light beam ("light curtain") that typically is limited by a rectangular aperture. High-quality optical components guarantee a homogeneous distribution of the light intensity in the full aperture range. The receiver also features a suitable rectangular aperture and is equipped with a system of filters for suppressing extraneous light. The light intensity arriving through the receiver's aperture is integrated and converted into a proportional voltage that can be picked up at the electrical connections of the sensor.

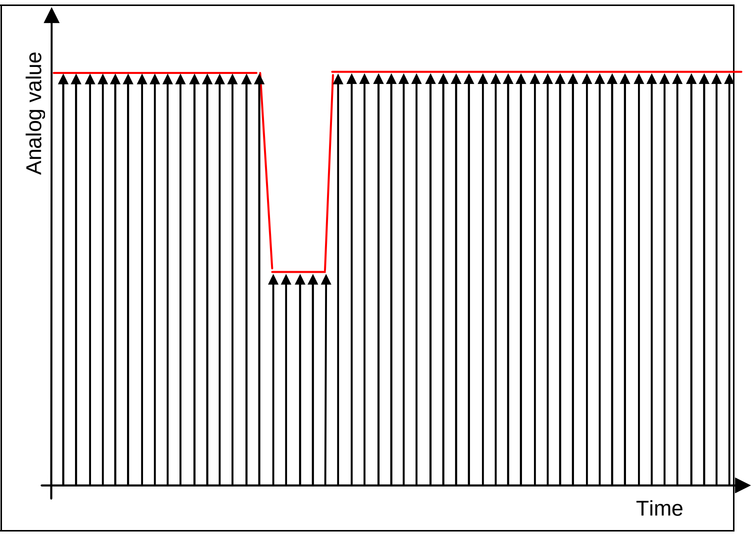


When the laser beam is covered by an object in its beam path, the voltage at the analog output changes proportionally to the degree of shadowing.



The analog value (0 ... 5V) that is generated by the A-LAS sensor is scanned by the A-LAS-CON1 control unit in fixed time intervals (up to 25000 scans per second), and is then converted into a 12-bit digital value by an analog/digital converter. This digital representation of the sensor's analog value hereinafter is referred to as the "RAW VALUE". The RAW VALUE is calculated according to the following transfer function:

$$\text{RAW VALUE} = \frac{\text{Analog value}}{5V} * 4095$$

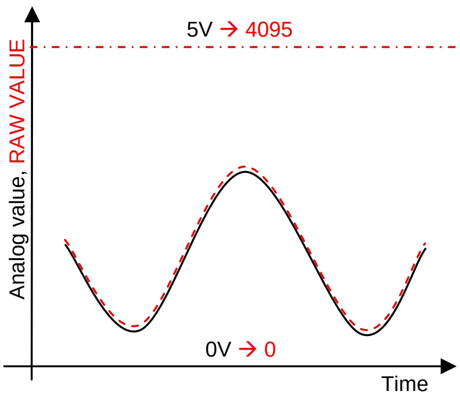


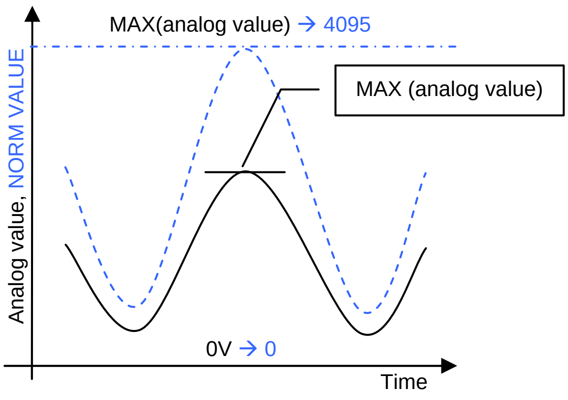
The RAW VALUE depends on various factors. It is influenced by the laser power of the transmitter, by possible dirtying of the transmitter and/or receiver (which both results in a reduced intensity of the laser beam), and finally by the shadowing caused by an object.

To avoid such dependency on laser power and dirtying, the RAW VALUE can be normalised. This means that absolute scaling of the analog value is replaced by relative scaling. The value referred to as NORM VALUE is calculated according to the following formula:

$$\text{NORM VALUE} = \frac{\text{Analog value}}{\text{MAX (analog value)}} * 4095$$

This NORM VALUE is independent of laser power and dirtying, it only is linearly dependent on the shadowing of the laser beam. As a prerequisite for the correct function of normalisation, however, the maximum analog value must be determined anew in regular intervals.



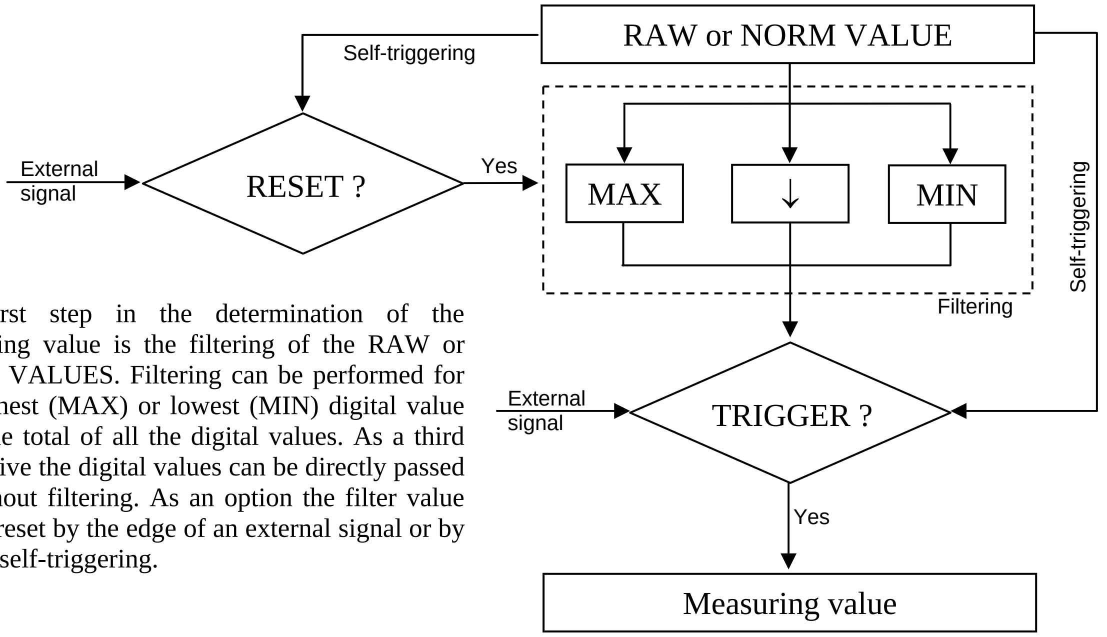


Summary:

- A-LAS sensors generate an analog voltage value that depends on the shadowing of the laser beam arriving at the A-LAS receiver.
- The A-LAS-CON1 control unit in fixed time intervals converts this analog value into a digital value.
- The digital value either is absolutely scaled (RAW VALUE) or relatively scaled (NORM VALUE).
- The normalisation process requires that the A-LAS sensor becomes "free" in regular intervals.

Detailed description: From digital value to measuring value

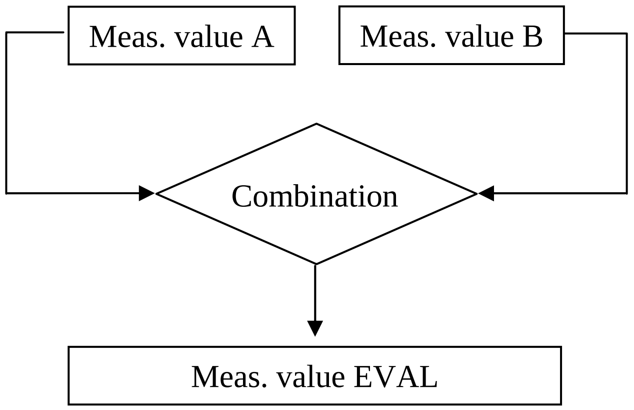
The measuring value contains the information that the user needs. It results from the function of one or several RAW or NORM VALUES. The measuring value furthermore can depend on a certain moment or period of time.



The first step in the determination of the measuring value is the filtering of the RAW or NORM VALUES. Filtering can be performed for the highest (MAX) or lowest (MIN) digital value from the total of all the digital values. As a third alternative the digital values can be directly passed on without filtering. As an option the filter value can be reset by the edge of an external signal or by way of self-triggering.

After filtering, the presence of a trigger event is determined. The different trigger events can be divided into three groups: With *continuous* evaluation, each individual new digital value is interpreted. With *status-controlled* evaluation, measuring values are determined as long as the status is present. With *edge-controlled* evaluation a measuring value is determined in the cycle following the edge. With *edge- and status-controlled* evaluation the edges or states may be generated via an external signal (through digital inputs) by the channel itself or by the alternative channel.

The measuring value of the third (virtual) channel always results from the measuring values of the two real channels. The measuring value of the third channel that is formed from the combination of the two real channels only is updated when a new measuring value is present each at channel A and channel B.



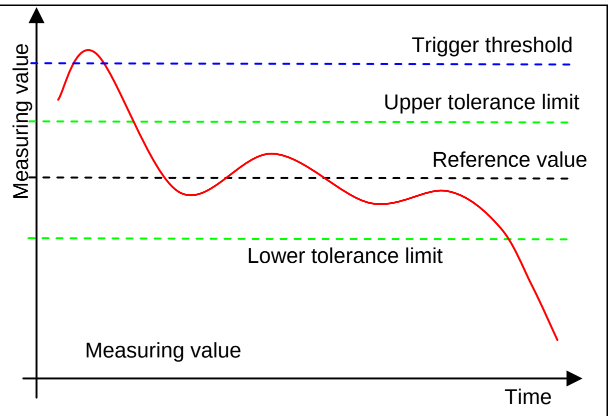
Summary:

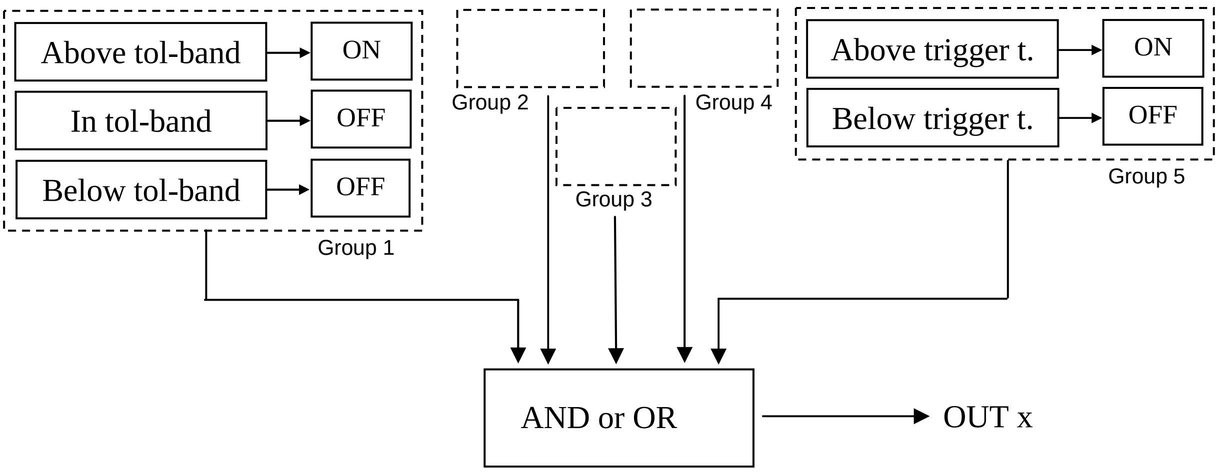
- The RAW or NORM VALUES first are filtered (MAX, MIN, or DIRECT) and are output when the trigger condition is fulfilled.
- Trigger conditions: Continuous, status-controlled, or edge-controlled.
- Trigger sources: External, digital input signals, the measuring channel, the alternative channel.
- The third ("EVAL") channel results from the mathematic combination of channel A and channel B.

Detailed description: From measuring value to digital/analog output

Each of the three channels A, B, and EVAL has its own tolerance band that is applied around a reference value. An upper tolerance value defines the width of the tolerance band from the reference value to the upper tolerance limit. Correspondingly, a lower tolerance value defines the width of the tolerance band from the reference value to the lower tolerance limit. Reference value, upper and lower tolerance limit may have any values within the measuring range.

Irrespective of this, channel A and channel B each have their own trigger threshold that can be used to create trigger events by self-triggering.
This results in a total of five groups that each may assume one of several different states.
At any moment the measuring value of channel A may lie above, in, or below the tolerance band (group 1, three states).
The same applies to channel B (group 2, three states) and channel EVAL (group 3, three states).
At the same time channel A may lie above or below its respective trigger threshold (group 4, two states).
The same applies to channel B (group 5, two states).
Each individual state can be assigned a digital value – "ON" or "OFF".





At any moment there thus are five digital values, which are linked by way of a logic AND or OR combination. (AND: Only if all five are "ON", then "ON", otherwise "OFF"; OR: Only if all five are "OFF", then "OFF", otherwise "ON"). The result finally is sent to one of the three digital outputs as a 0V ("OFF") or 24V ("ON") level. Each of the three outputs can be configured this way.

The analog output can provide one of the three measuring values (channel A, B, or EVAL), or one of the two RAW VALUES (RAW VALUE A or RAW VALUE B) as an analog 0 – 10V voltage.

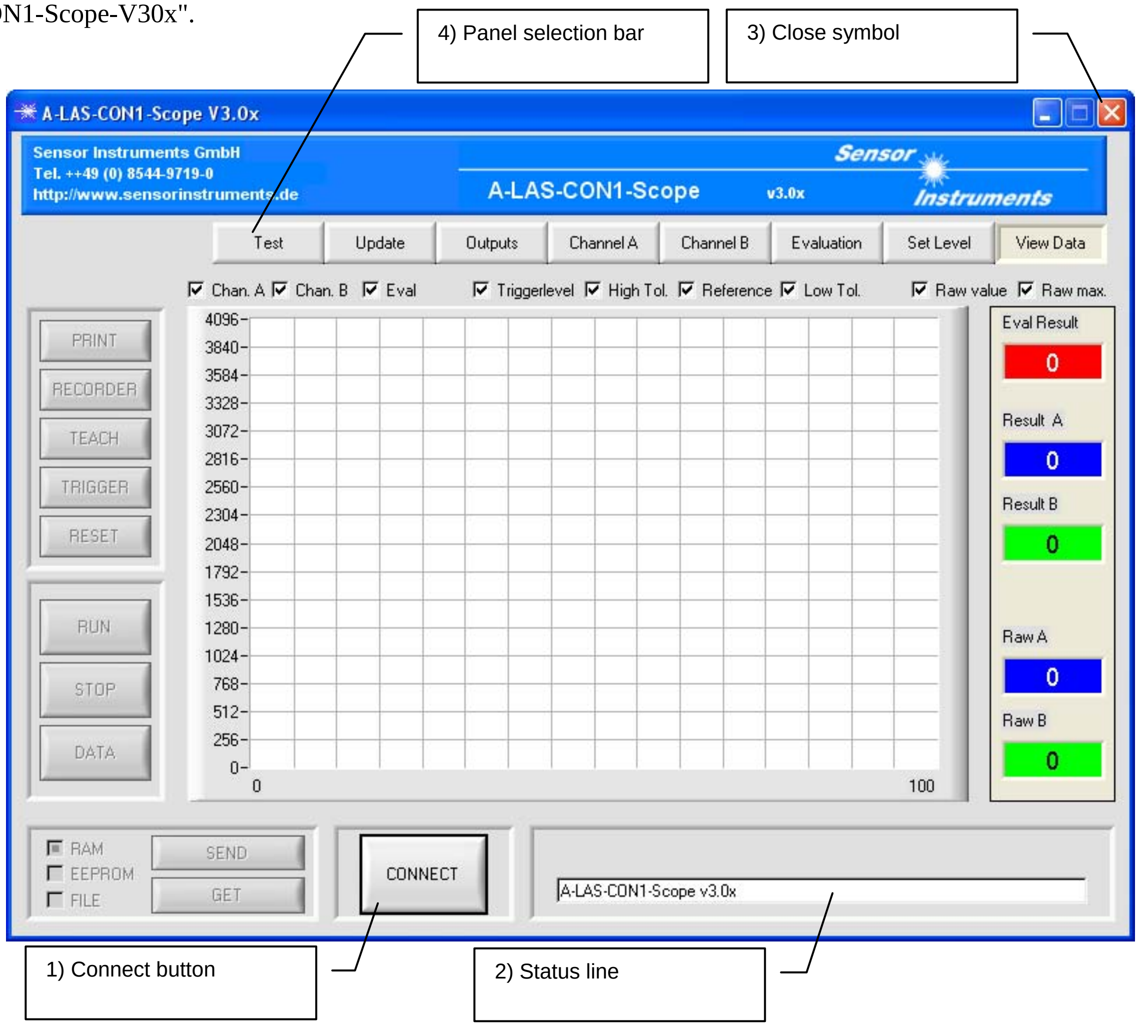
Summary:

- Each of the three channels has its own tolerance band, channel A and B have a trigger threshold.
- Each of the three digital outputs can output every state of any channel or the combination of the states of several channels as a digital value.
- The analog output provides one of the three measuring values or one of two RAW VALUES as an analog voltage.

Description of the A-LAS-CON1-Scope V3.0x software

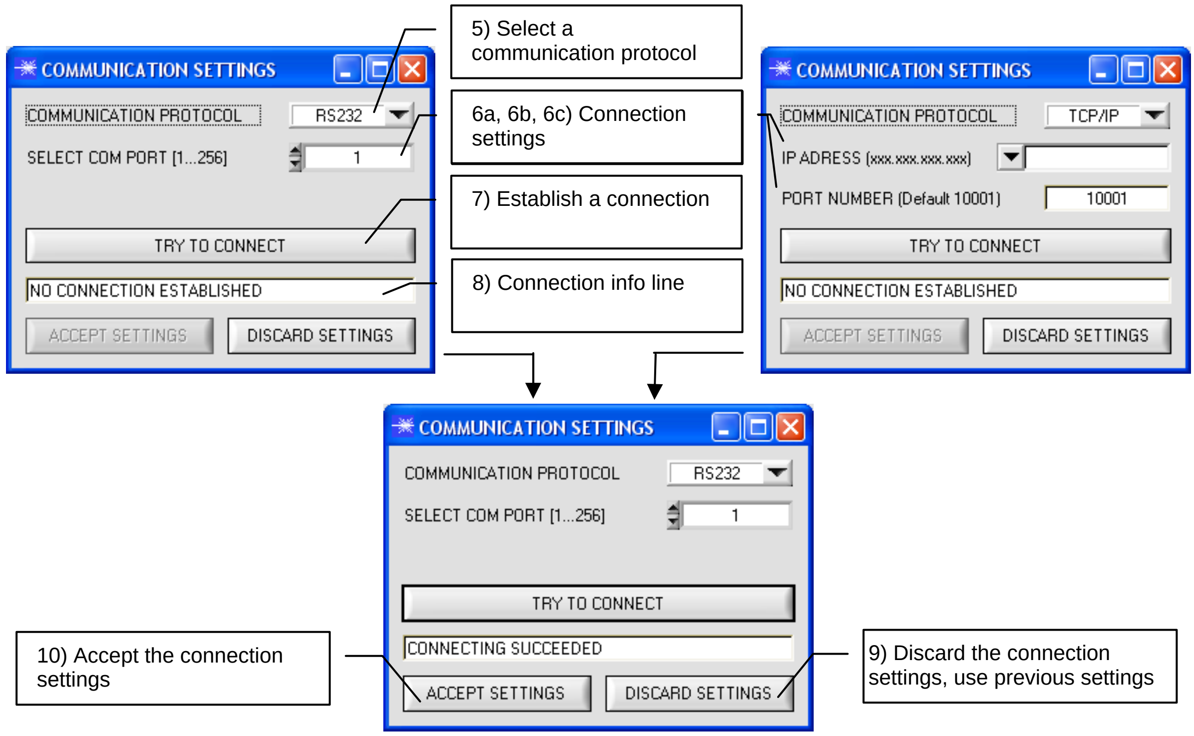
Connecting, status line, and panel selection

Start the software by using the start-menu link under "START/Programs/A-LAS-CON1-Scope-V30x/A-LAS-CON1-Scope-V30x".

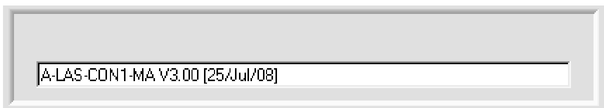


When the A-LAS-CON1 control unit that should be configured is properly supplied with power and has been connected to the PC for data transfer – either by way of a serial RS232 cable (e.g. type cab-las4/PC), a serial-to-USB converter (e.g. type cab-las4/USB) that simulates a virtual COM port at the PC, or through the network using a serial-to-Ethernet adaptor (e.g. type SI-RS232/Ethernet-4-1000) – a connection with the control unit can be established by starting the connection dialog with the "CONNECT" button (→ 1).

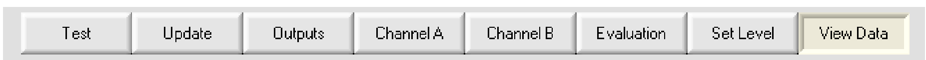
The communication settings window offers a choice from two communication protocols – depending on the type of data connection you use. The "RS232" option must be used for an USB or RS232 connection, the "TCP/IP" option for a network connection (→ 5). The port number of the desired COM port for "RS232" communication, and the IP address of the network adaptor and its port number can be entered in additional input fields (→ 6a, 6b, 6c). When all the required information has been correctly entered, click on the "TRY TO CONNECT" button (→ 7) to try to establish a connection. When the control unit is successfully recognised, a corresponding message will be displayed in the connection info line (→ 8).



The connection settings may then be accepted (→ 10) or discarded, i.e. the previous settings will be used again (→ 9).



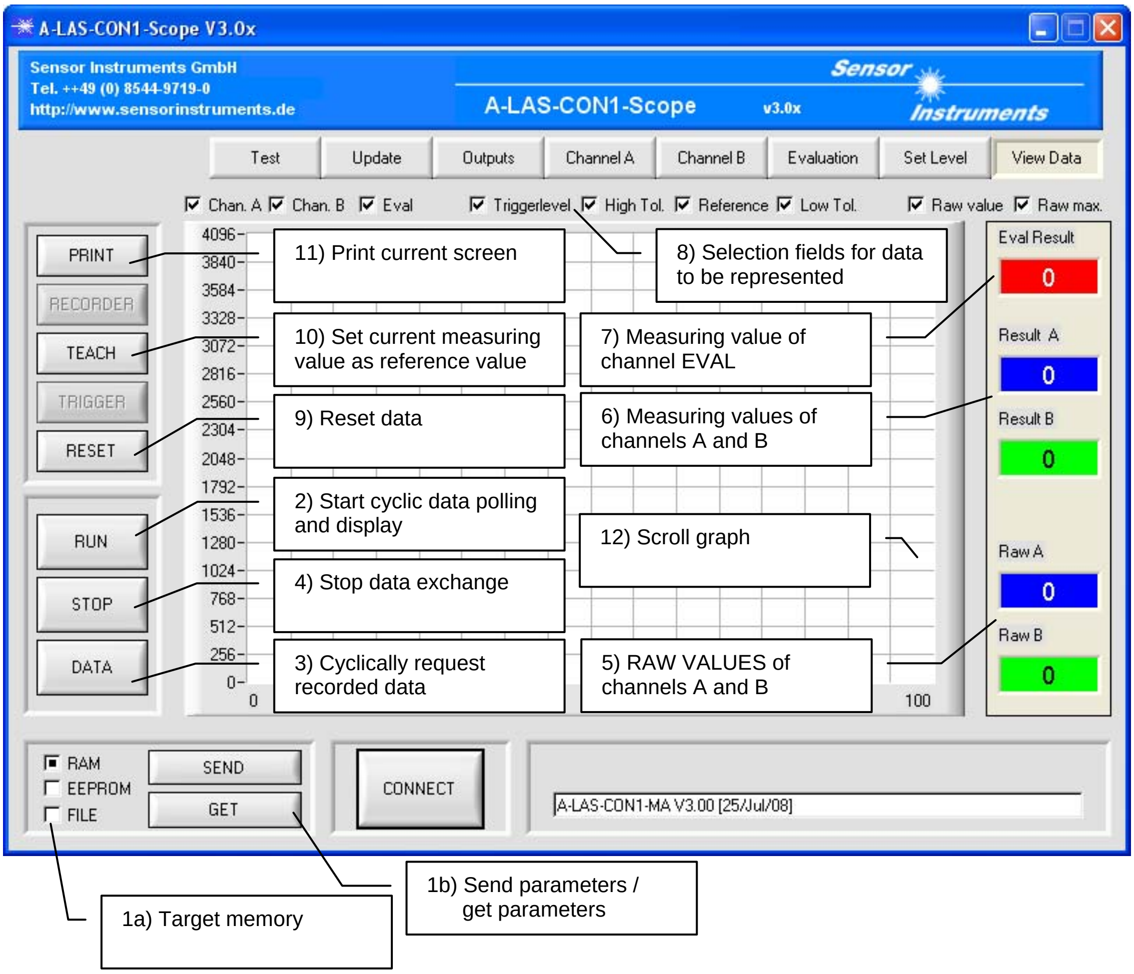
When connection has been established, the status line (→ 2) shows the version string of the control unit. This status line displays the exact firmware version that is used at the control unit. If you should have any service enquiries, please state this information together with the exact (engraved) designation and serial number of the control unit.



Use the panel selection bar at the top of the software's main window to switch between various views and panels of the software (→ 4).

A mouse-click on the "X" at the top right corner of the main window closes the program (→ 3).

Send, receive, and display data

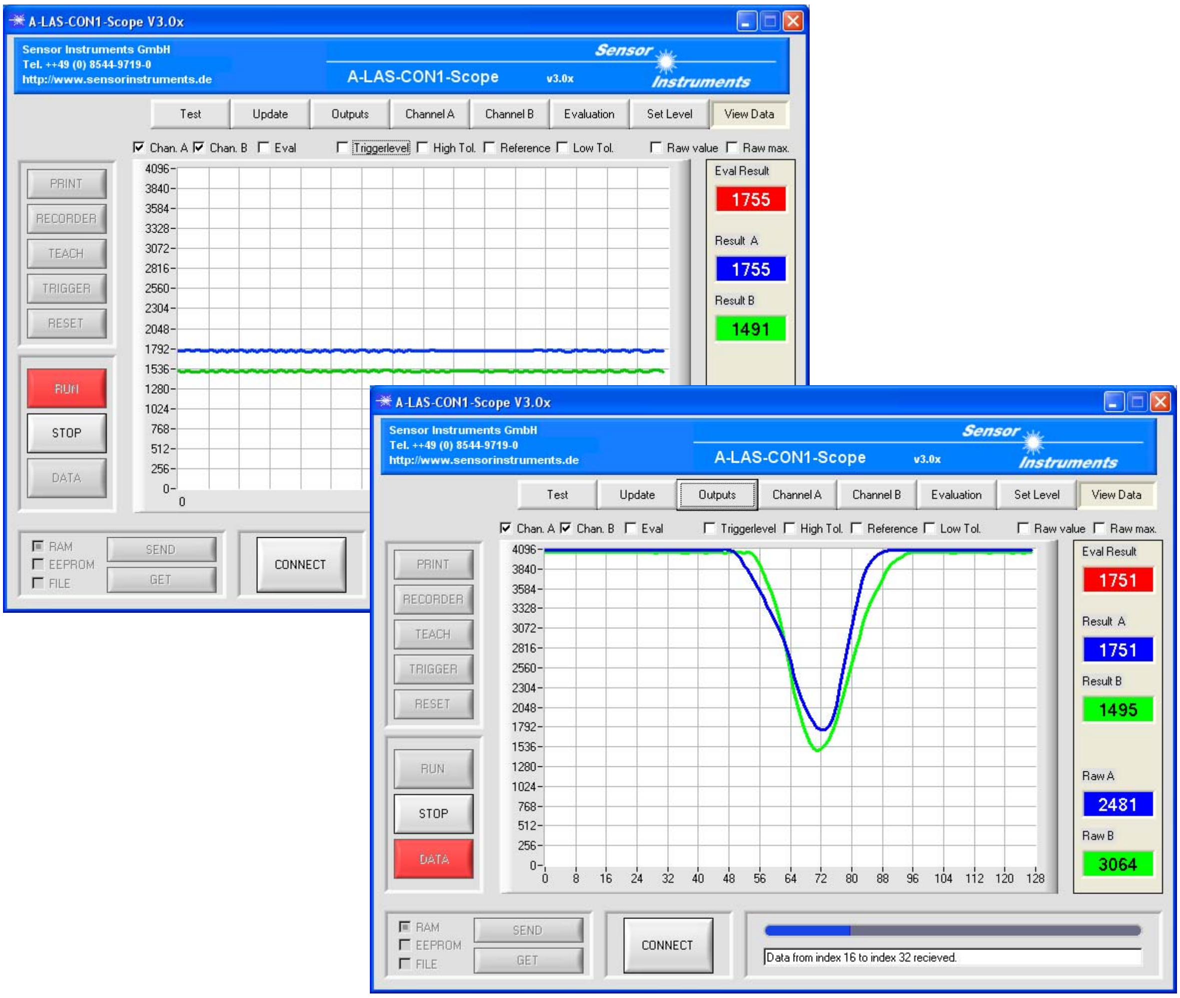


The parameters of the control unit (which are described in detail in the next chapter) always are sent to the A-LAS-CON1 or received by the A-LAS-CON1 as a complete parameter set. Two buttons are available for this purpose (→ 1b): "SEND" (sends parameters from the PC to the A-LAS-CON1), and "GET" (calls parameters from the A-LAS-CON1 and enters these parameters in the input fields of the PC user interface). The target memory can be selected from three options (→ 1a): "RAM" selects the volatile memory of the A-LAS-CON1 as source or target. All the parameters stored in this memory will be lost when the control unit is turned off. "EEPROM" selects the non-volatile memory of the control unit as source or target, i.e. the parameters stored in this memory will still be available when the control unit is turned off and then on again. However, this non-volatile memory only can perform a limited number of read and write cycles. "FILE" selects the local hard disk of the PC as source or target and thus allows the local storing and managing of various parameter sets.

The A-LAS-CON1-Scope PC software displays the current recorded data of the control unit in numeric and graphic form. For this purpose the software in cyclic intervals (approx. 2 – 3 times per second) requests values from the A-LAS-CON1 and displays these values in a scroll graph (→ 12) and as numerical values (→ 5, 6, 7). Because of the great number of different data, individual graphs can be activated or deactivated for display in the scroll graph (→ 8). For starting cyclic data polling the software can be set to RUN mode by clicking on the "RUN" button (→ 2).

As an option the A-LAS-CON1 also can record the trigger events of the channels. For this purpose the recorded RAW or NORM VALUES are buffered in the control unit. With the "DATA" button these recorded data can be cyclically requested and displayed. The DATA or RUN mode can be stopped by clicking on the "STOP" button (→ 4).

INFO: The display of data by the PC software is independent of the recording and evaluation of the data by the A-LAS-CON1 control unit. Evaluation at the A-LAS-CON1 control unit continues even when the RUN or DATA mode of the PC software is stopped.



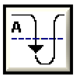
A click on the "RESET" button (→ 9) resets the current data at the A-LAS-CON1 control unit. This affects both the filters (resetting of the MAX / MIN values) and the average and buffer memories.

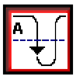
A click on the "TEACH" button (→ 10) sets the current measuring value as the new reference value. The selection as to whether a teach individually refers to channel A, channel B, channel EVAL, or to two or all channels simultaneously, is defined by the "TEACH TARGET" parameter.

The "PRINT" button (→ 11) allows the printing of the currently visible window.

General information on the parameters for channel A and B

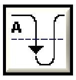
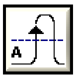
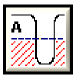
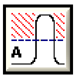
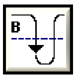
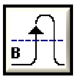
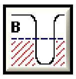
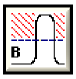
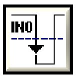
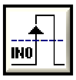
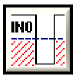
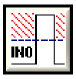
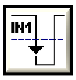
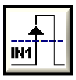
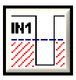
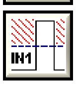
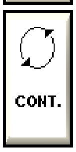
- Option field: An option field is an individual button with a status of either "ON" or "OFF". An individual option field mostly is a part of a group that as a whole describes a parameter.

OFF 

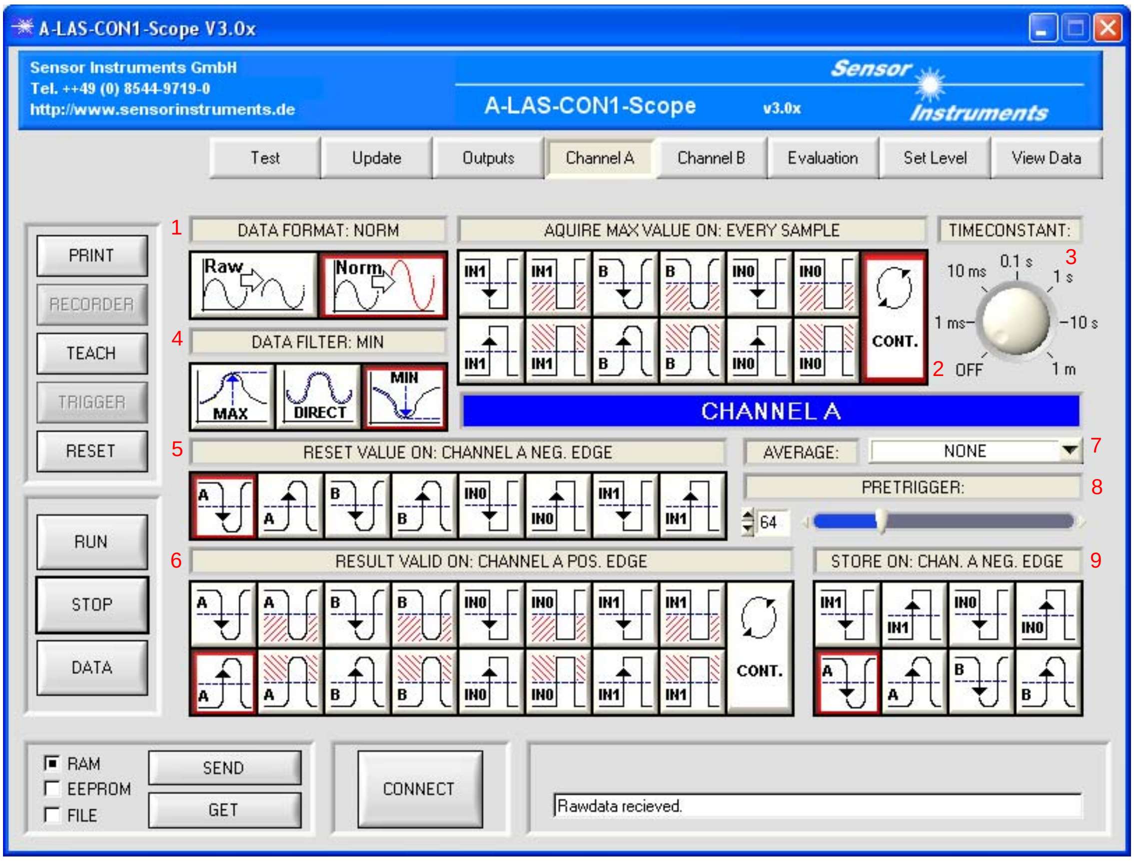


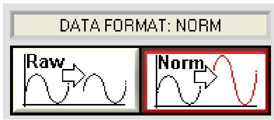
ON

- The individual option fields each are identified by a pictogram. These pictograms have the following meaning:

	Edge: Digital value of channel A falls below the trigger threshold of channel A
	Edge: Digital value of channel A exceeds trigger threshold of channel A
	Status: Digital value of channel A below the trigger threshold of channel A
	Status: Digital value of channel A above the trigger threshold of channel A
	Edge: Digital value of channel B falls below the trigger threshold of channel B
	Edge: Digital value of channel B exceeds trigger threshold of channel B
	Status: Digital value of channel B below the trigger threshold of channel B
	Status: Digital value of channel B above the trigger threshold of channel B
	Edge: Digital input IN0 changes from "ON" status to "OFF" status
	Edge: Digital input IN0 changes from "OFF" status to "ON" status
	Status: Digital input IN0 is off
	Status: Digital input IN0 is on
	Edge: Digital input IN1 changes from "ON" status to "OFF" status
	Edge: Digital input IN1 changes from "OFF" status to "ON" status
	Status: Digital input IN1 is off
	Status: Digital input IN1 is on
	Continuous: Without condition or event

Parameters of channel A

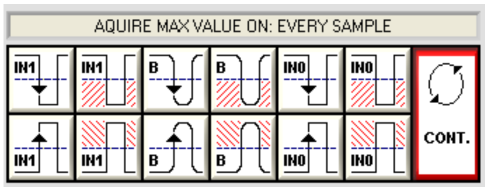




DATA FORMAT (1):
Selection of the analog/digital conversion format. Possible options:

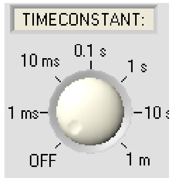
- RAW: Evaluation without normalising in absolute scaling
- NORM: Evaluation with normalising in relative scaling

If NORM is selected as the data format, the two opposite option fields are available.



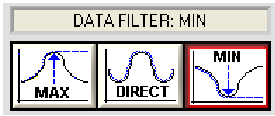
MAX MODE (2):
The moment of maximum analog value acquisition.
The maximum analog value is required for calculating the NORM VALUES (cf. "from analog sensor to digital value").
The acquisition of the maximum analog value can be performed continuously, edge-controlled, or status-controlled. The previous maximum analog value each time is compared with the new analog value. If the new analog value is higher than the previous value, the previous value will be replaced by the new one.

TIMECONSTANT (3):
Time constant. The maximum analog value can be decimated in fixed time intervals. Together with the mechanism of maximum value acquisition this guarantees that dirtying is automatically compensated. With this parameter the time constant can be adapted to the application conditions

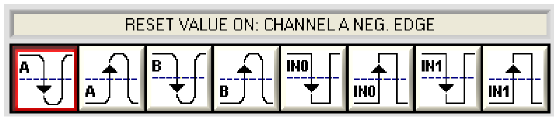


DATA FILTER (4):
Selection of filter parameters. Options:
- MAX: The maximum digital value is determined
- MIN: The minimum digital value is determined
- DIRECT: The digital value is passed on without changes

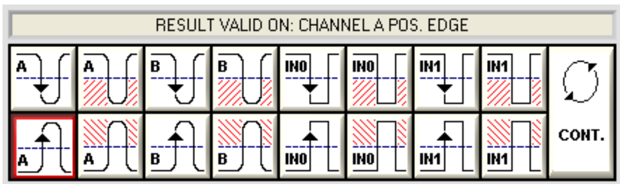
Depending on the selection of the filter parameter (with MAX, MIN) the following option field is available:



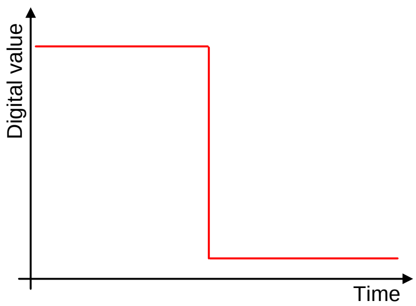
RESET MODE (5):
Defines whether/when the filtered digital value (with MAX or MIN setting) should be reset. It is possible to select one event, several events, or none of the events here. If several events are selected, the value is reset at each of the selected events.



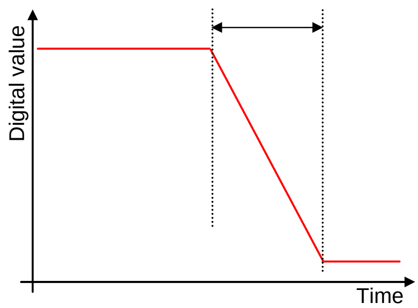
TRIGGER MODE (6):
Defines the moment or period of time at which a measuring value is generated. It is possible to select one or several events or states (with limitations, if a selection does not make sense).



AVERAGE (7):
Defines the value of floating averaging. According to the properties of floating averaging, fast changes or noise are suppressed, whereas slow changes are passed on without any change. Erratic changes are delayed

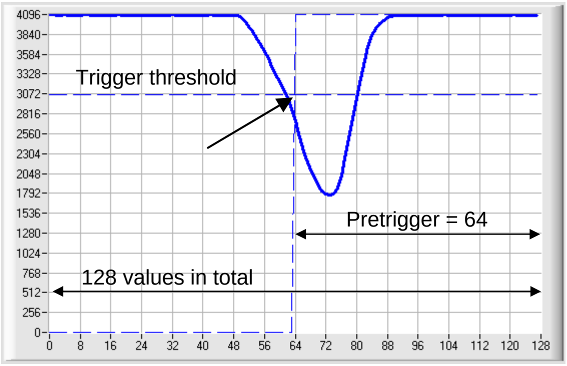


Without floating averaging

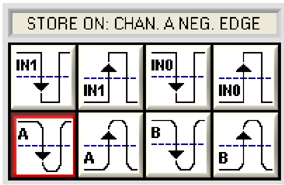


With floating averaging over 64 values

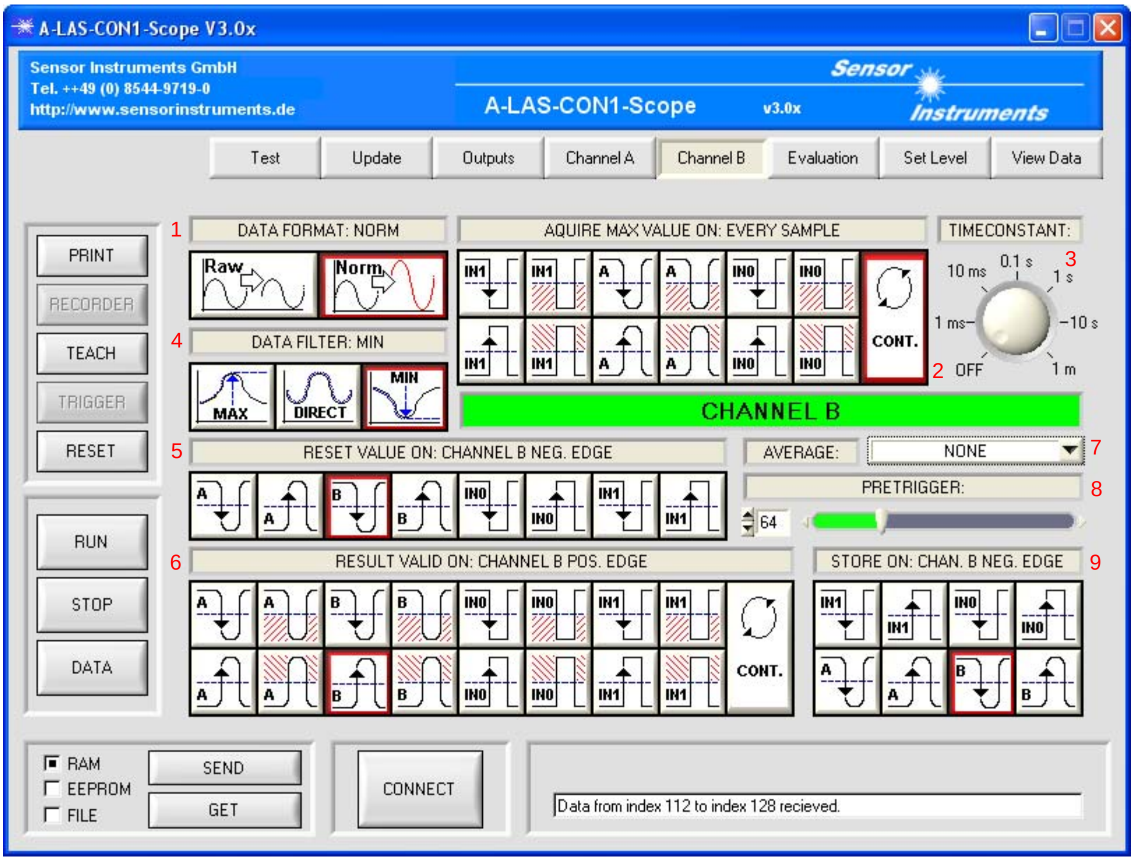
PRETRIGGER (8):
Parameter for configuring the recording of trigger events. Defines the number of digital values that still should be recorded after the trigger event. The total of recorded values is limited to 128. A higher pretrigger value than 128 leads to a shifting of the window.



SNAPSHOT MODE (9):
Defines whether and from which event a "snapshot", i.e. a record of the values of the respective channel, should be made. The buffer that is available for recording has a capacity of 128 values. The recorded values can be called up by the A-LAS-CON1-Scope PC software and can be evaluated for adjustment purposes

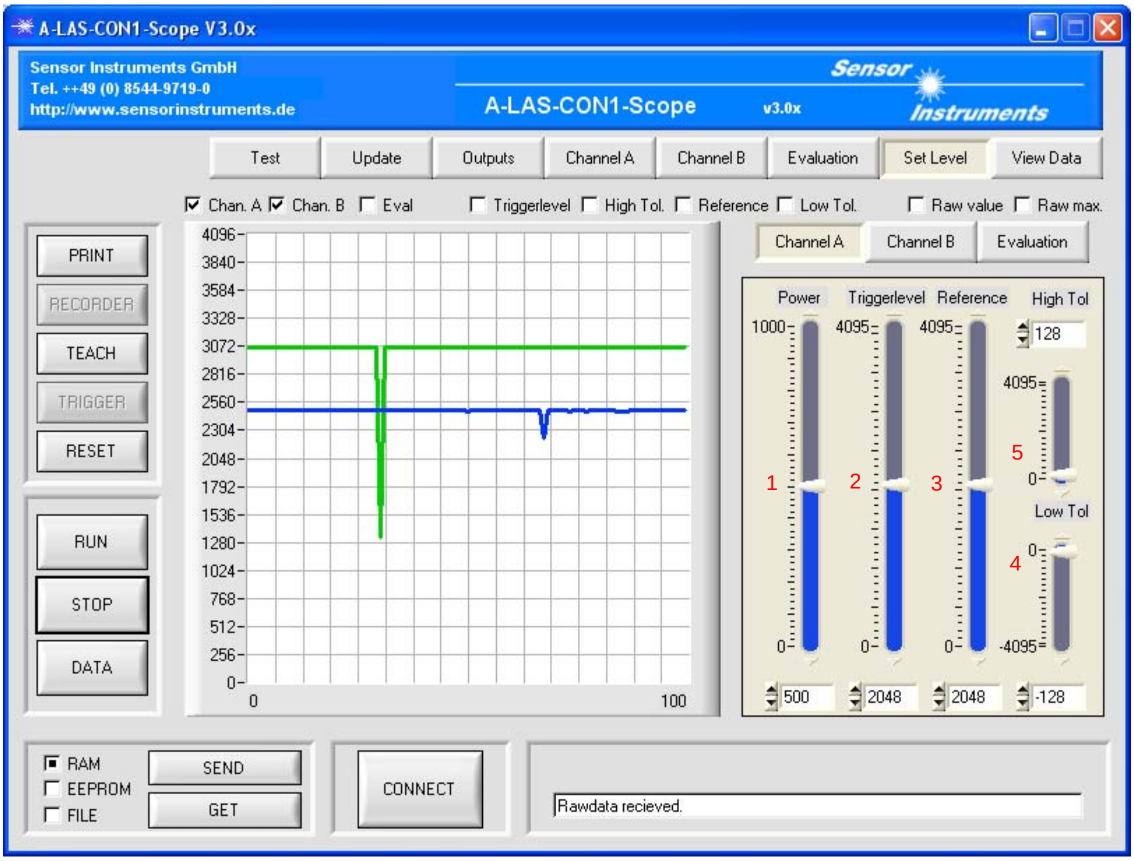


Parameters of channel B

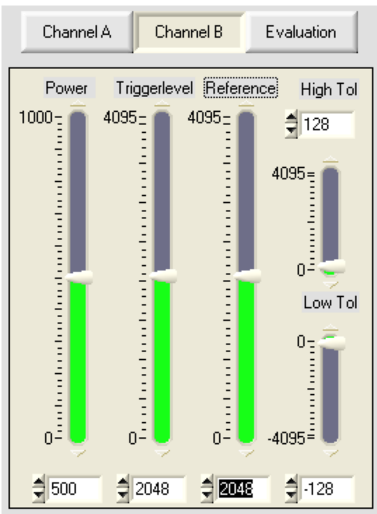


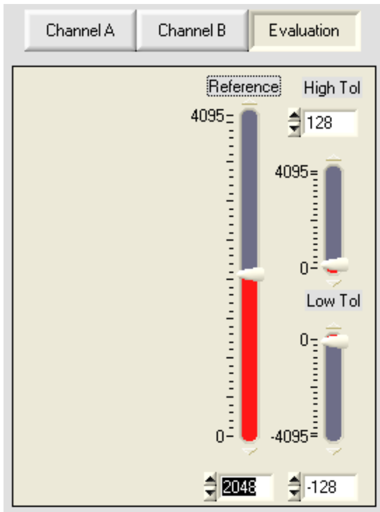
The number, arrangement, and function of the various option and input fields of channel B is identical with those of channel A, with one exception: The MAX MODE parameter (2) of channel B contains other option fields than its equivalent in channel A.

Trigger thresholds, reference values, and tolerances

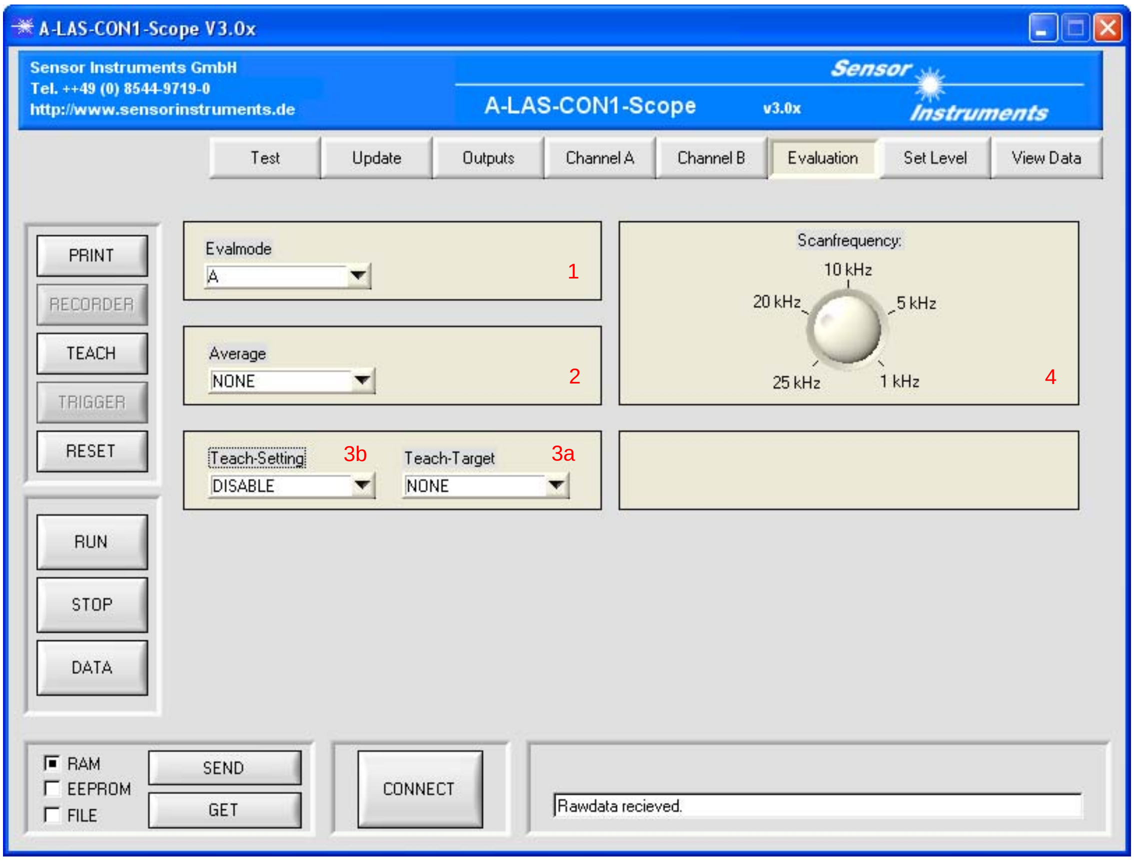


Select "SET LEVEL" in the panel selection bar to set the tolerance, reference, trigger threshold, and laser power parameters. The respective parameters (→ 1,2,3,4,5) can be influenced by moving the respective bar display or by directly entering a numerical value.





Virtual channel, scan frequency, and teach mode



This window contains parameters that refer to the general function of the control unit and to the third channel called EVAL.

- EVALMODE (1): This parameter defines the type of combination of the two channels A and B and thus the function of channel EVAL.
  Possible settings:
  - A: Simple representation of channel A. This function is equal to:
  $$EVAL = A$$
  - GRAD A: Gradient of the measuring values of channel A, calculated from the difference of the current and the previous measuring value.
  $$EVAL = \frac{A(t_0) - A(t_{-1})}{2} + 2048$$
  - (A) / (A + B): A measure of the symmetry between the two channels.
  $$EVAL = 4095 * \frac{A}{A+B}$$
  - (A + B): The sum of both channels.
  $$EVAL = \frac{A+B}{2}$$

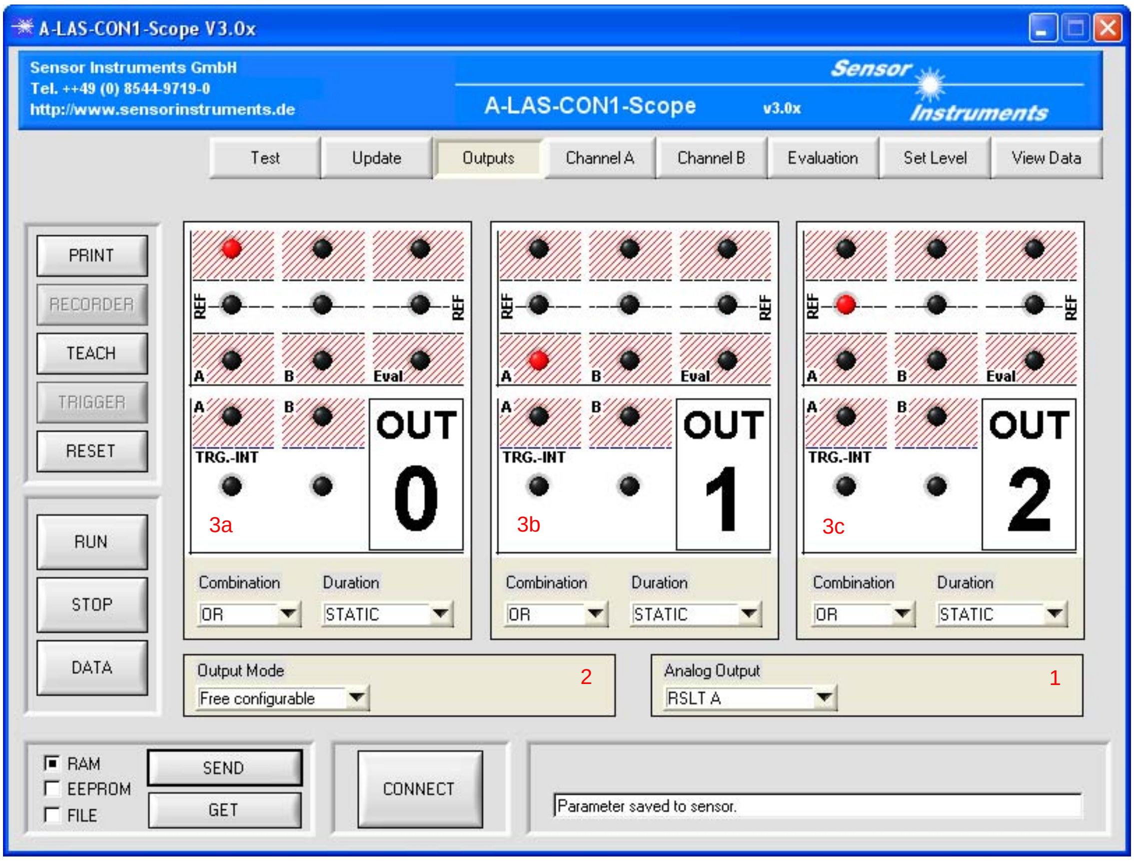
- AVERAGE (2): The measuring values of channel EVAL can be averaged before they are output. Unlike the averaging described above (cf. "Parameters of channel A", 7), averaging here is performed "at a stretch". All the measuring values required for averaging are recorded first before averaging is performed and the measuring value is output. Averaging can be set over up to 32k values.

- TEACH TARGET (3a): Defines for which channel or which combination of channels the current measuring value is set as the new reference value in a teach process.

- TEACH SETTING (3b): Defines whether an electric signal and/or a manual actuation of the button at the housing of the A-LAS-CON1, or exclusively the A-LAS-CON1-Scope may initiate a teach.

- SCANFREQUENCY (4): Defines the fixed scan rate of the analog signals of the connected A-LAS sensors. The maximum scan frequency is 25 kHz, which is equal to a time interval of 40 µs between two samples.

Digital and analog outputs



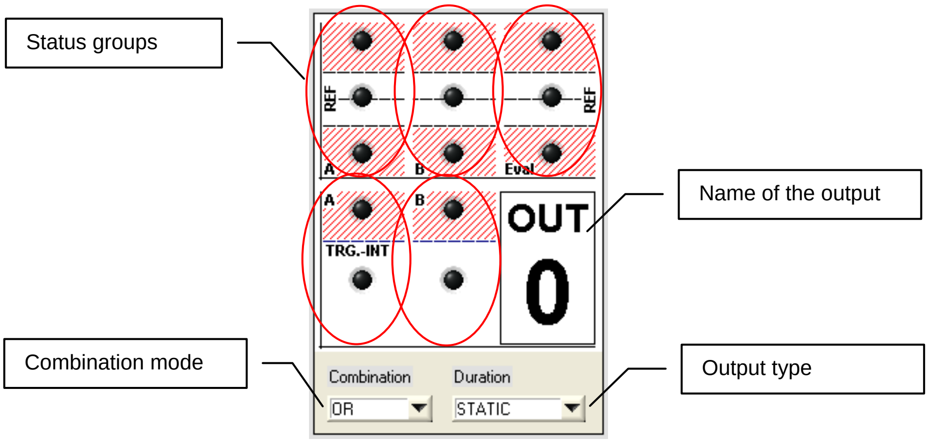
This window is used for configuring the three digital outputs OUT0, OUT1, OUT2, and the analog output.

- ANALOG OUTPUT (1): This parameter defines the output mode of the analog output, which either provides the current RAW VALUES or the processed measuring values.

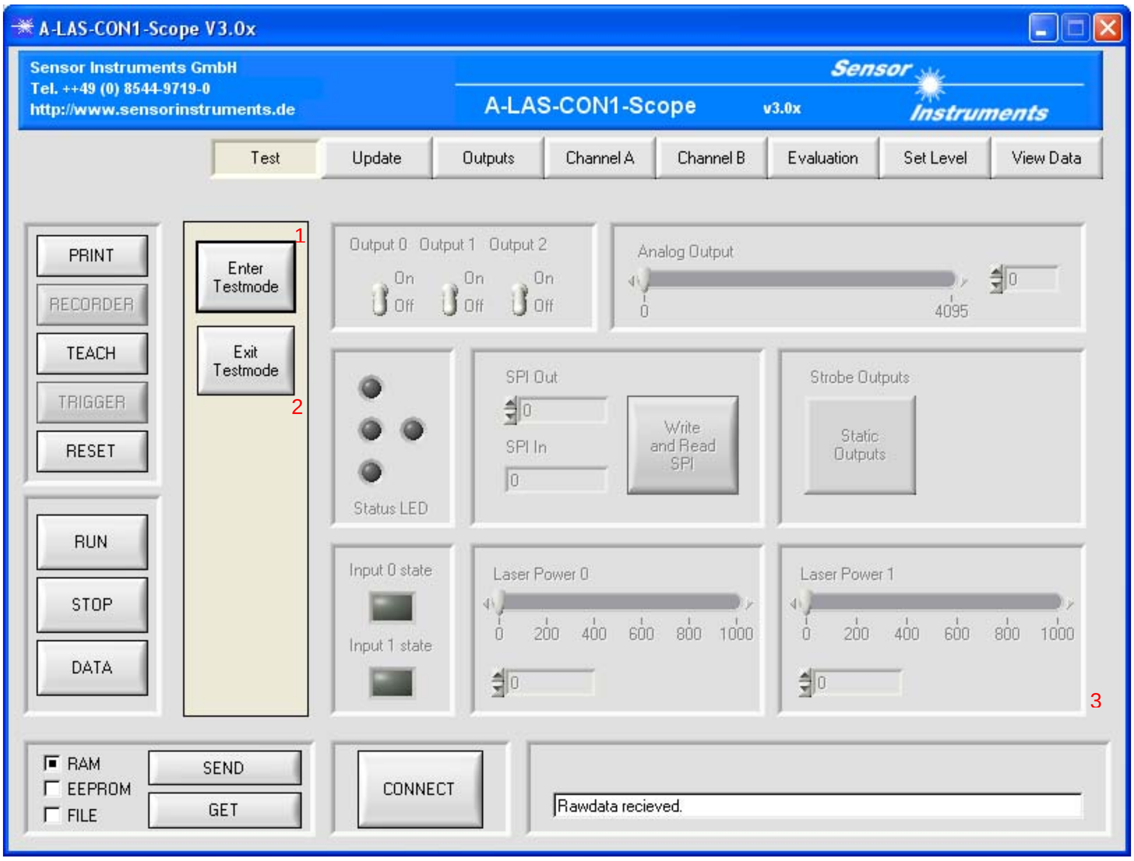
- OUTPUT MODE (2): This parameter does NOT exist in the control unit. Its purpose is to provide more inexperienced users with the possibility of simply setting the outputs to a pre-defined pattern.
  The following selections are possible here:
  - "Preset: Channel A": The three digital outputs and the analog output are configured such that they provide the status of the measuring value of channel A. Tolerance band undershooting is output at OUT0, and overshooting at OUT1. OUT2 is active when the measuring value lies within the tolerance band. The analog output provides the measuring value of channel A as an analog voltage.
  - "Preset: Channel B": ditto, for channel B
  - "Preset: Evaluation": ditto, for channel EVAL
  - "Free configurable": This option allows unlimited access to the settings of all outputs.

- OUTPUT CONFIGURATION (3a, 3b, 3c): This is the input field for setting the digital outputs. For each of the outputs all possible states, grouped by channel, are available as input fields. The digital values that are assigned to the states are visualised as an LED. A click on the LED changes its value.

Under the status groups there are two drop-down fields for determining the type of combination ("COMBINATION") and for setting the output type ("DURATION"). The states either can be combined by way of an AND or OR relation. The available output types are static or pulsed output with variable pulse duration.

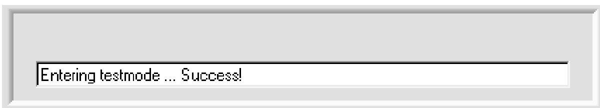


Test mode

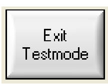


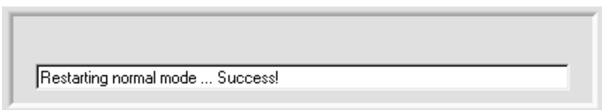
As another feature the A-LAS-CON1-Scope software allows direct access to various hardware components of the A-LAS-CON1 control unit (digital/analog outputs, LED, laser power). This makes it possible to test the proper function of the components or the behaviour of devices that are connected to the control unit (e.g. PLC, relays) without any need of complex simulation set-ups or changes of A-LAS-CON1 parameters.

To allow direct access to hardware components, the A-LAS-CON1 must be set to the so-called test mode (→ 1). This interrupts all the running measurements and sets the A-LAS-CON1 to a wait state. No further measurements will be performed, and no outputs will be activated. When the test mode is successfully entered, the buttons and input fields of the test mode window (→ 3) will be enabled and can then be changed by the user.

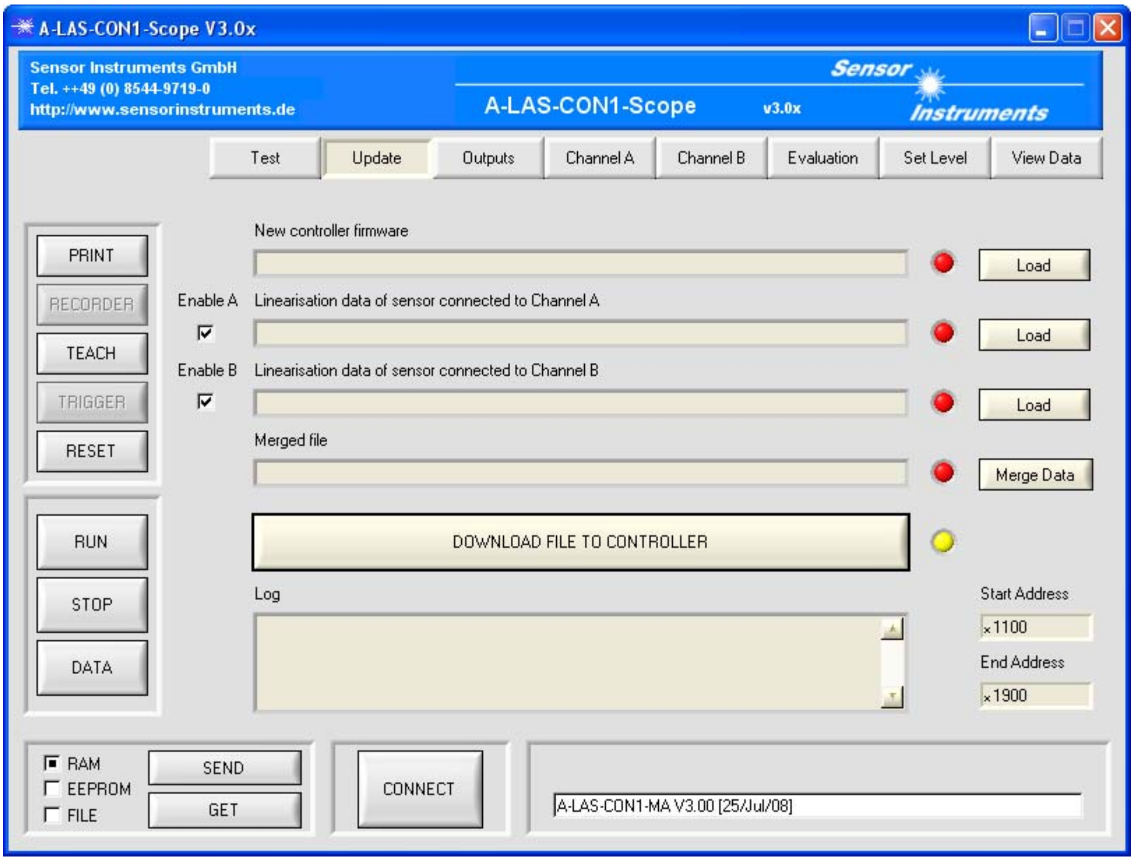


When the tests are finished, the test mode can be exited again (→ 2). The A-LAS-CON1 control unit then starts to perform measurements again with all the parameters that were set before the test.





Update

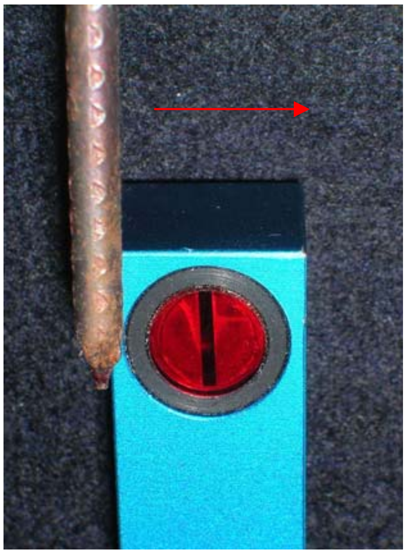


The "UPDATE" panel provides the possibility of re-programming the A-LAS-CON1 control unit in case of a product upgrade. As an option the linearisation data of the sensors that are used can be transferred to the control unit together with the new firmware.

To be completed.

Examples

Example 1: "Nail test"

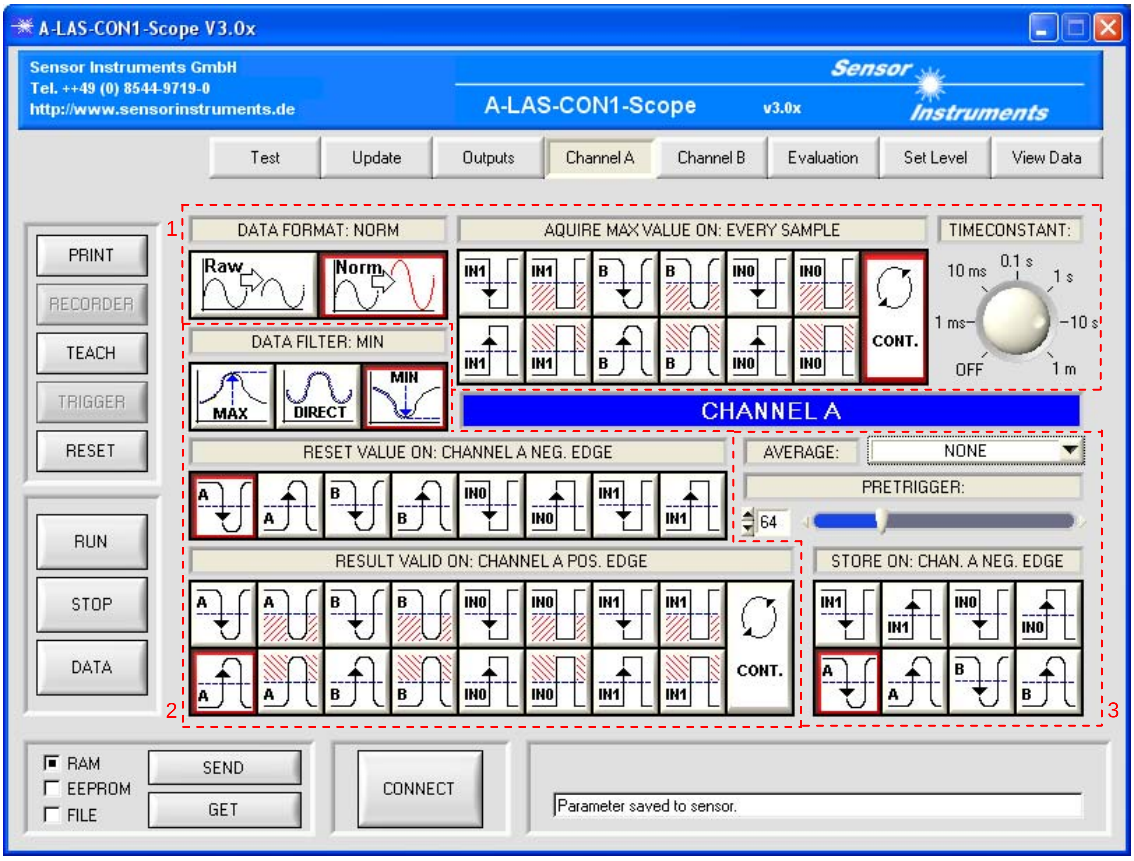


Task: Measurement of the length of nails, and sorting out of nails that are too short or too long.

System solution: The components that are used are an A-LAS-F12 fork-type sensor with an aperture geometry of 6.5 mm x 0.8 mm, and an A-LAS-CON1 control unit in combination with the A-LAS-CON1 V3.0x firmware and the A-LAS-CON1-Scope V30x PC software. The aperture geometry was chosen such that the nail length variation does not exceed the length of the aperture.

Application setup: The nails are guided in series, suspended from a rail. While being transported they pass the laser light curtain of the A-LAS fork-type sensor, the aperture of which is parallel to the nail alignment. Up to 10 nails pass the aperture per second.

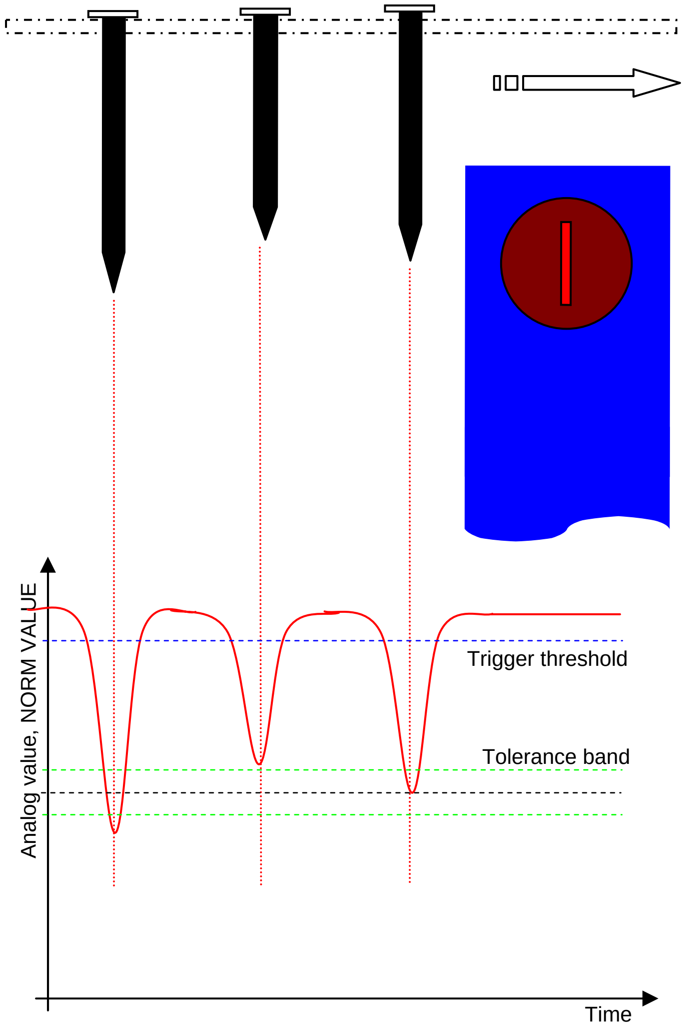
Parameterisation of the A-LAS-CON1 control unit:



Only one A-LAS sensor is used for this application. Since both channels are equal, the sensor can be connected to any one of the two channels. In this example the sensor was connected to channel A, channel B is not used.

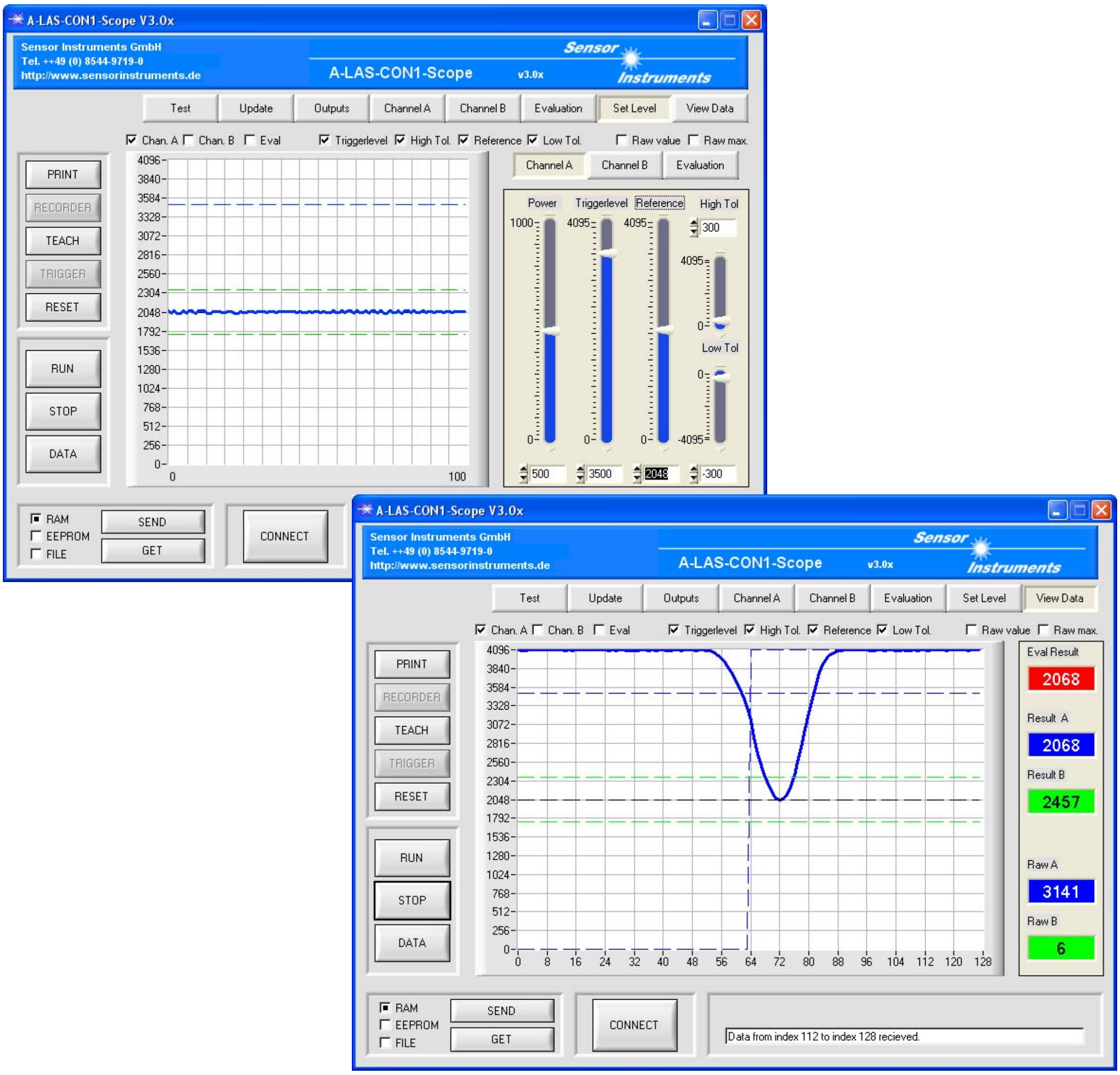
Normalised evaluation can be used because the aperture of the A-LAS sensor is not covered between two nails. Normalised processing also offers advantages (independent of dirtying, independent of laser power) and is therefore chosen for this application. For this purpose the DATA FORMAT parameter is set to "NORM". Maximum value determination should be performed continuously. The maximum value should be reduced every 10 seconds to counteract possible dirtying. (→ 1).

When a nail passes through the laser beam, shadowing increases up to a maximum, the point of the nail, and then decreases again when the nail leaves the laser beam. The analog voltage of the sensor behaves inversely to this. The target is to derive the point of the nail and thus its length from the degree of shadowing. For this purpose the trigger threshold is set such that it lies just below the value that is present when the aperture is free. When the nail moves into the aperture, the trigger threshold is undershot, and when the nail moves out of the aperture again, the trigger threshold is overshot. The minimum value between these two events should be determined and output.



For this purpose the RESET MODE parameter is set to the positive-to-negative overshooting of the trigger threshold of channel A. At this event the last minimum value should be reset. The TRIGGER MODE parameter is set to the negative-to-positive overshooting of the trigger threshold of channel A. At this moment minimum value determination is finished, and the value that is found corresponds with the largest nail dimension. The value that is found becomes the measuring value and is checked against the set tolerance band. The tolerance limits are set such that the permissible length of the nails represents the range within the tolerance band (→ 2).

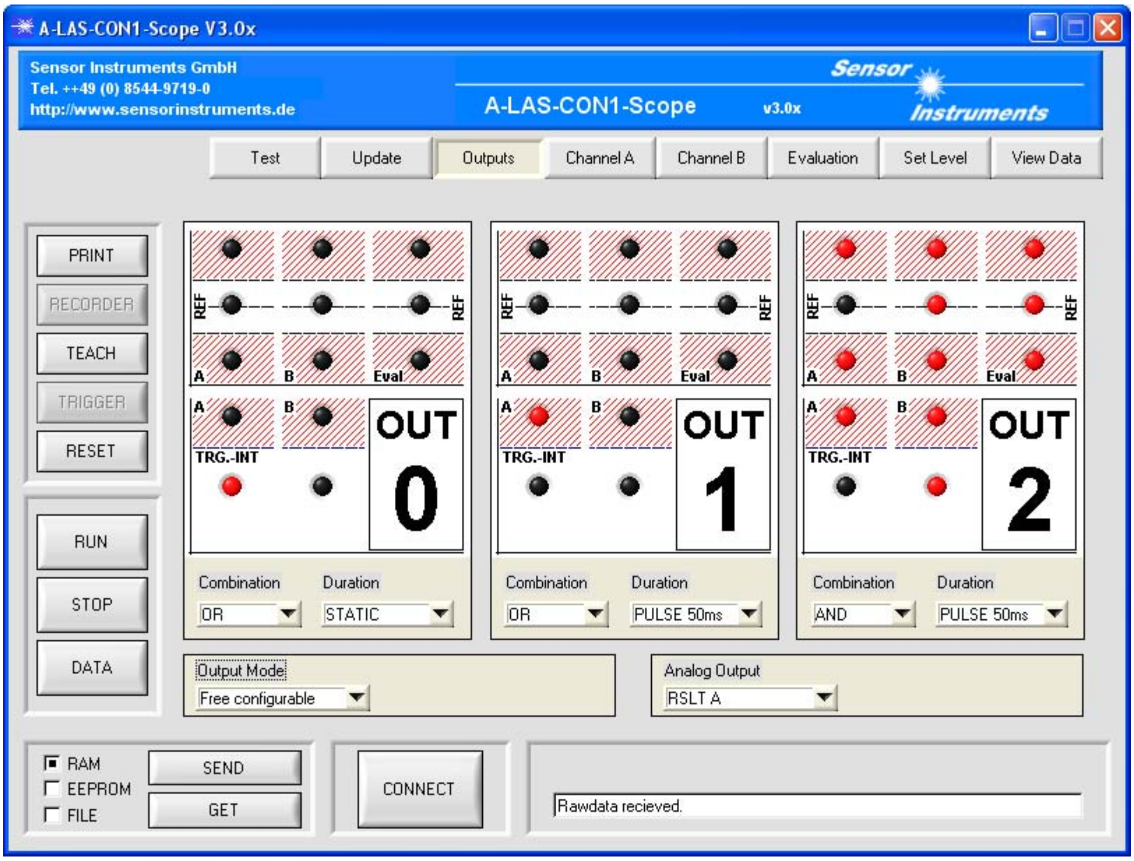
Finally the SNAPSHOT MODE parameter is set such that the entry of the nail into the aperture starts a record of this event. PRETRIGGER is used to define that the event should lie exactly at the center of the recorded window (→ 3).

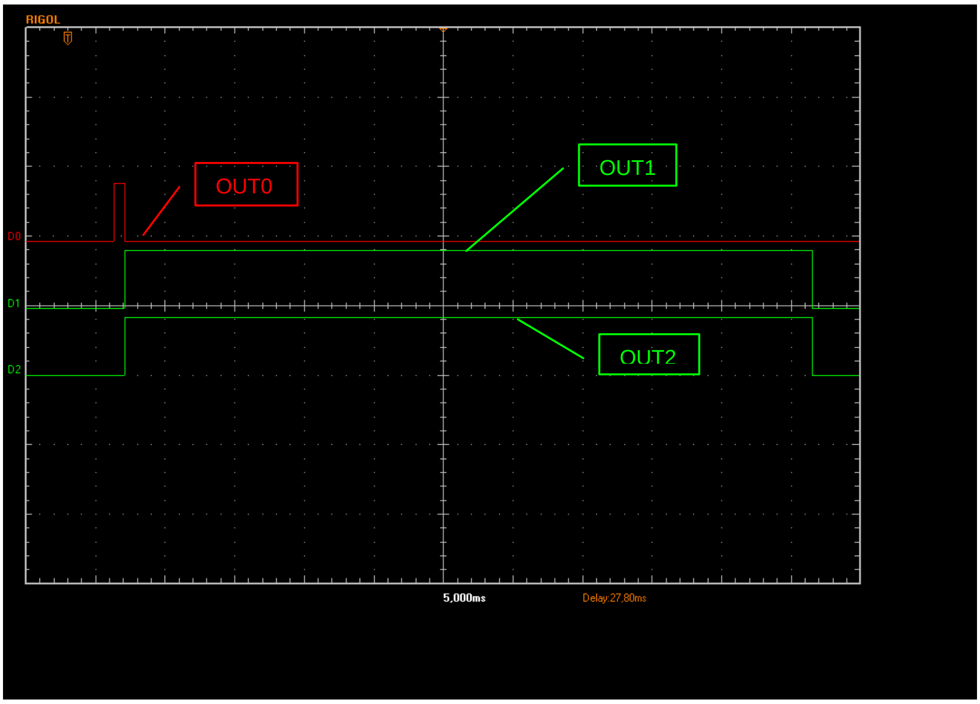


The outputs should provide the following information:

- OUT0 should provide a static information of whether there is an object in the beam path of the laser. The length of this pulse provides information about the speed of the nails, or about the presence of any unwanted object covering the beam path.
- OUT1 should output a pulse of 50 ms duration when a nail has passed the aperture. This, for example, can be used as a signal for a counter that records the passing nails, or – visible at the assigned LED at the front of the A-LAS-CON1 housing – an indicator that informs the user about the proper function of the system.
- OUT2 should output a pulse of 50 ms duration when the measuring result does not meet the requirements (i.e. lies out of the tolerance band). This signal, for example, could be used to control a valve that sorts out the faulty nail.
- The analog output should provide the measuring value as a 0 .. 10V voltage. This voltage for example could be read by a PLC, or could be visualised by way of an analog indicator.

The output settings would look as follows:





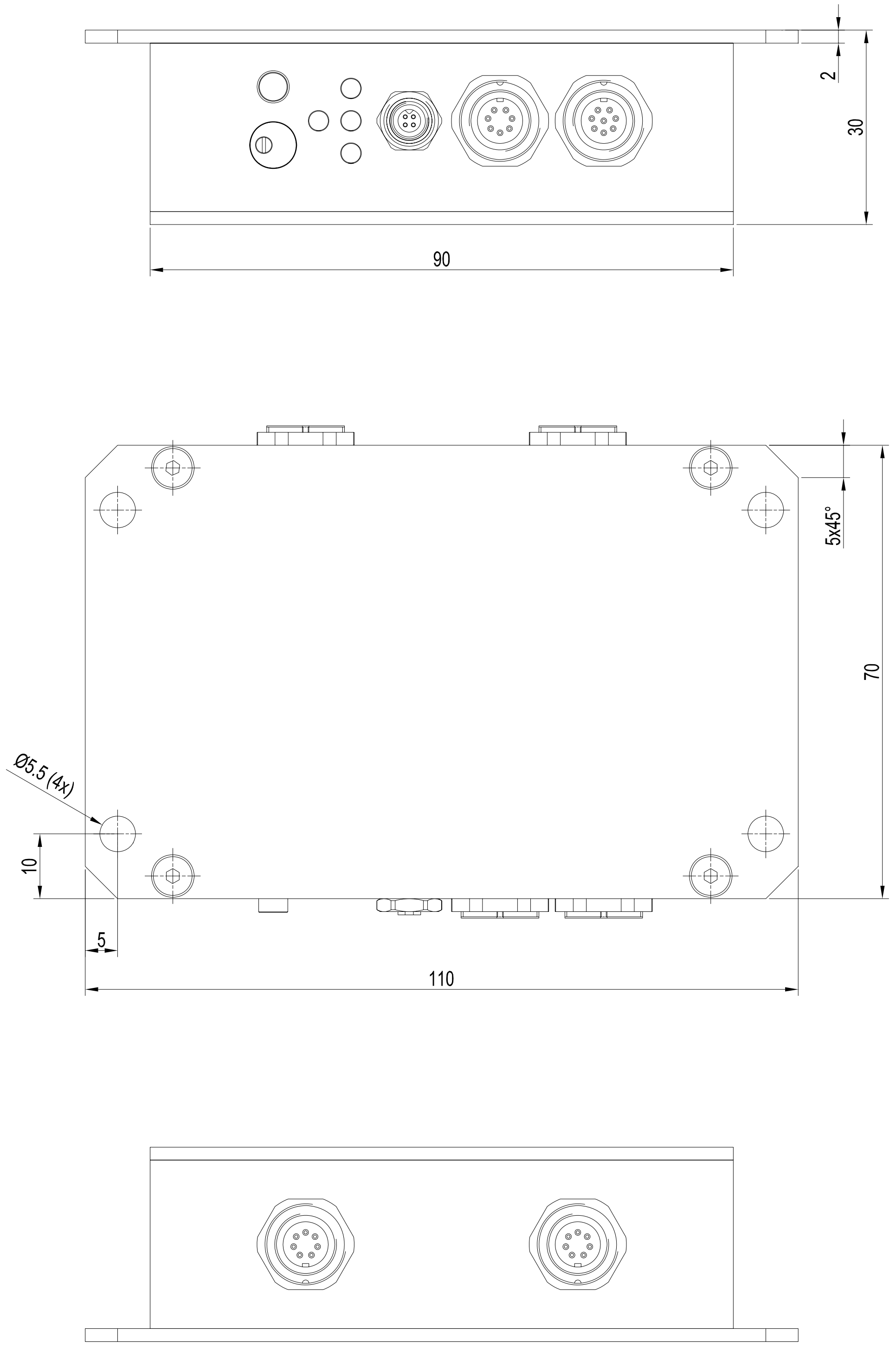
Oscillograph record of the three digital outputs (faulty nail)

Annex

Technical data of the A-LAS-CON1 control unit

Designation	A-LAS-CON1 V3.0
Power supply	U_b = +18 ... +32V DC
Current consumption	< 250mA
Operating temperature range	-20°C ... +55°C
Storage temperature range	-20°C ... +85°C
Protection rating	IP54
Digital inputs (IN0, IN1)	Log. 0: GND, Log. 1: +U_b (incl. protective circuit)
Digital outputs (OUT0, OUT1, OUT2)	Log. 0: GND, Log. 1: +U_b short-circuit-proof, max. 100mA
Analog output	V_{out} = 0 .. 10V
Housing material	Aluminium, anodized in blue
Housing dimensions	L x W x H approx. 110 mm x 70 mm x 28 mm
Connections	8-pole circular female connector type Binder series 712 (SPS/Power) 4-pole circular female connector type Binder series 707 (PC/RS232) 7-pole circular female connector type Binder series 712 (DATA/Slave/Master) 7-pole circular female connector type Binder series 712 (A-LAS sensor CHA) 7-pole circular female connector type Binder series 712 (A-LAS sensor CHB)
Teach button	Teach button at the housing for setpoint value teaching
LED indicators	LED red : Status tolerance output OUT1 LED green/red: Status tolerance output OUT2 LED red: Status tolerance output OUT0 LED yellow/green: multifunctional
Scan frequency	Max. 25 kHz
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 CHA: cab-las-y to A-LAS sensor CHB: cab-las-y

Housing



All dimensions in mm