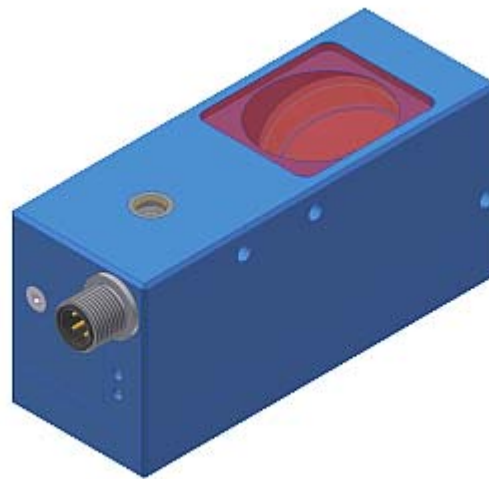


Manual

Software R-LAS-LT-Scope (LT-Scope) V1.1

(PC software for Microsoft® Windows® 7, 8, 10)

**for Laser Reflection Sensor
R-LAS-LT-110-HD2**



This manual describes the installation process of the software for the laser reflection sensors of type R-LAS-LT-110-HD2. As a support for commissioning of the laser reflection sensor it also explains the functional elements of the graphical Windows user interface.

The laser reflection sensors of series R-LAS-LT operate according to the principle of triangulation. Measurement of objects is performed irrespective of the surface quality, colour, and background. Standardised evaluation and automatic power correction ensure a very wide dynamic range.

Through the RS232 interface parameters and measured values can be exchanged between PC and laser reflection sensor. All the parameters can be stored in the non-volatile EEPROM of the R-LAS-LT sensor through the serial RS232 interface.

Installation of the R-LAS-LT-Scope (LT-Scope) software

The following requirements must be fulfilled for successful installation of the R-LAS-LT-Scope (LT-Scope) software:

- Microsoft® Windows® XP, VISTA, 7
- IBM PC AT or compatible
- VGA graphics
- Microsoft-compatible mouse
- CD-ROM drive
- Serial RS232 interface at the PC or USB slot
- Cable **cab-las5/PC** for the RS232 interface or **cab-5/USB** for USB slot

The R-LAS-LT-Scope (LT-Scope) software can only be installed under Windows. Windows must therefore be started first if it is not yet running.

Please install the software as described below:

1. The software can be installed directly from the installation CD-ROM. To install the software, start the SETUP program in the SOFTWARE folder of the CD-ROM.
2. The installation program displays a dialog and suggests to install the software in the C:\"FILENAME" directory on the hard disk. You may accept this suggestion with OK or [ENTER], or you may change the path as desired. Installation is then performed automatically.
3. During the installation process a new program group for the software is created in the Windows Program Manager. In the program group an icon for starting the software is created automatically. When installation is successfully completed the installation program displays "Setup OK".
4. After successful installation the software can be started with a left mouse button double-click on the icon.

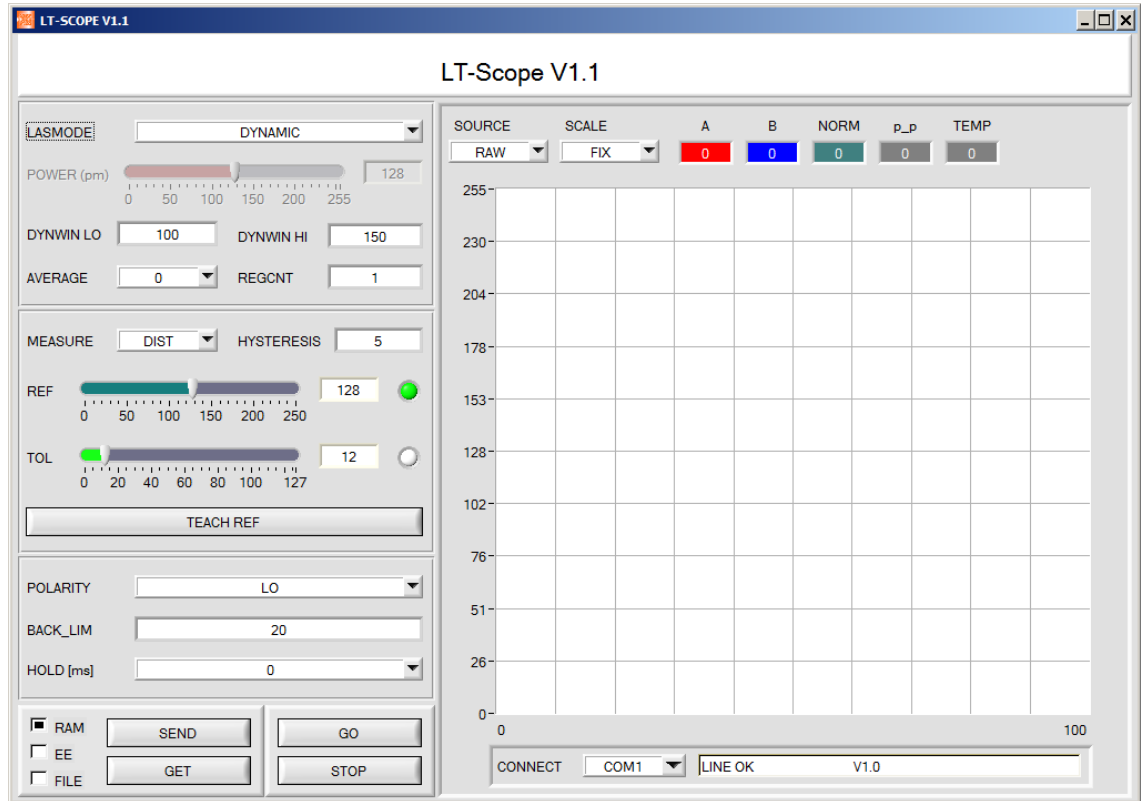
Windows™ is a registered trademark of Microsoft Corp.

VGA™ is a trademark of International Business Machines Corp.

Operation of the R-LAS-LT-Scope (LT-Scope) Software


When the R-LAS-LT-Scope (LT-Scope) software is started it displays the following window on the Windows user interface:

Please read this chapter first before you start to adjust and parameterise the R-LAS-LT sensors.



In order to avoid data transfer problems through the serial interface it is recommendable to change to the STOP mode (press the STOP button) before activating function keys and sliders.

Pressing the right mouse button on an individual element will call up a short help text.

Please note:	The stable function of the interface is a basic prerequisite for measured value transfer from the PC to the sensor.
	Due to the limited data transfer rate through the serial RS232 interface only slow changes of the raw signals at the sensor front end can be observed in the graphic output window of the PC.
ATTENTION !	For maintaining maximum switching frequency at the sensor data communication with the PC must be stopped (press the STOP button).



The software starts with the standard configuration COM1 and the respective communication status.

The software provides the following status messages:

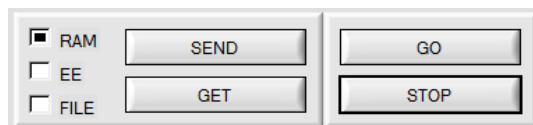
TRY: The PC tries to establish a connection with the sensor through the respective selected interface

LINE OK: The connection between PC and sensor could be established successfully.

TIMEOUT: A connection between PC and sensor could not be established, or the connection is faulty. In this case it should first be checked whether the sensor is supplied with voltage, and whether the RS232 interface cable is correctly connected.

If the interface assignment at the PC is not known, a selection can be made from COM and COM9 by clicking on the selection field [↓] in the CONNECT group.

NOT AVAILABLE: The selected interface is not available at the PC.



SEND [F9]:

When the **SEND** button is clicked (or shortcut key button F9 is pressed), all the currently set parameters are transferred between PC and sensor. The target of the respective parameter transfer is determined by the selected button (**RAM**, **EEPROM**, or **FILE**).

GET [F10]:

The currently set values can be interrogated from the sensor by clicking on the **GET** button (or with shortcut key button F10). The source of data exchange is determined by the selected button (**RAM**, **EEPROM**, or **FILE**).

RAM:

The **RAM** is a **volatile** memory in the sensor's micro-controller, i.e. when the power at the sensor is turned off, these parameters will be lost again.

The sensor always operates with the parameters in its RAM.

If the **RAM** option is selected, a click on **SEND** writes the current parameters to the sensor's **RAM** memory, and a click on **GET** reads the parameters from the sensor's **RAM** memory.

EEPROM:

The **EEPROM** is a **non-volatile** memory in the sensor's micro-controller. When the power at the sensor is turned off the parameters in the **EEPROM** will not be lost. When power is turned on again, the parameters are loaded from the **EEPROM** to the **RAM** memory. Figuratively speaking the **EEPROM** thus is a level lower than the **RAM**. Data exchange between **PC** and **EEPROM** automatically is performed through the **RAM** memory, which means that parameters that are written to the **EEPROM** automatically are also written to the **RAM**, and data that are read from the **EEPROM** automatically are also read to the **RAM**.

If the **EEPROM** option is selected, a click on **SEND** writes the current parameters to the sensor's non-volatile **EEPROM** memory, and a click on **GET** reads the parameters from the sensor's **EEPROM**.

The **RAM** memory should always be used for parameterising the sensor. When suitable parameters have been found for the respective application, these parameters must be written to the sensor's **EEPROM** so that after restarting the sensor these parameters can be loaded from the **EEPROM** into the **RAM** memory.

FILE:

After pressing **SEND**, the current parameters can be written to a selectable file on the hard disk. With **GET** parameters can be read from such a file. When the **SEND** or **GET** button is pressed, a dialog box opens for selecting the desired file.

TIP! Once suitable parameters have been found for a certain application, these should always be saved in a file on the PC.

GO [F11]:

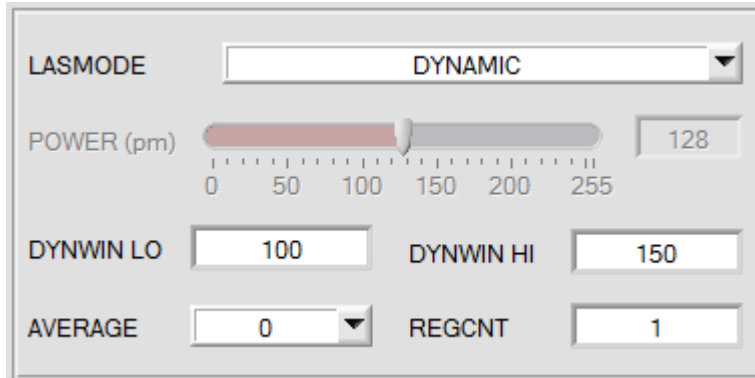
A click on this button starts data transfer from the sensor to the PC through the serial RS232 interface.

STOP [F12]:

A click on this button stops data transfer from the sensor to the PC through the serial RS232 interface.

The functions of the individual control elements will be explained on the following pages:

Note: Changing the parameter function groups will only take effect after pressing the SEND key in the MEM function field on the sensor!



LASMODE:

In this function group the laser operating mode and the laser power at the R-LAS-LT-110-HD2 sensor can be adjusted.

STAT: With this selection button the laser power is constantly kept at the value that is set at the slider.

DYN: The laser power is automatically and dynamically adjusted by means of the amount of radiation reflected from the object. In this operating mode the POWER slider is ineffective..

POWER:

With this slider the laser power is adjusted to a fixed value between 0 and 255 in STAT mode. Any change only becomes effective after the SEND button is pressed!

DYNWIN LO:

Lower limit of the setpoint range (minimum permissible intensity):

DYN_WIN_LO is the lower setpoint limit, i.e. the laser power will be increased, if the measured intensity ($\text{signal}_1 + \text{signal}_2$)/2 is less than the lower setpoint limit!

DYNWIN HI:

Upper limit of the setpoint range (maximum permissible intensity):

The automatic control algorithm (DYNAMIC-mode) tries to keep the laser power (intensity) measured by the laser sensor within a setpoint range. The range limits of the setpoint value can be set by using the software.

DYN_WIN_HI is the upper setpoint limit, i.e. the laser power will be reduced, if the measured intensity lies above the upper setpoint limit!

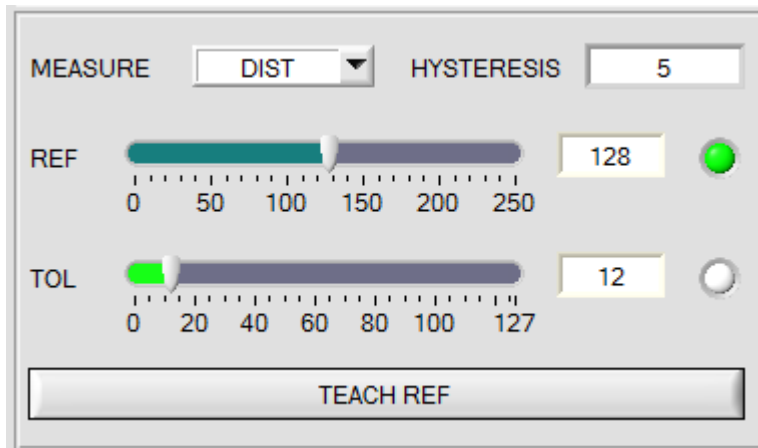
REGCNT:

Time constant with activated automatic laser power control (DYNAMIC-mode):

According to the entered value ($n = 1 \dots 255$) the laser power will be automatically corrected at every x-th scan (measured value scan), i.e. $n = 1$ means a low control time constant, $n = 255$ means a high control time constant!

AVERAGE:

Determines the number of measuring points over which the sensor signal is averaged (noise suppression).



MEASURE:

Selects the operating mode of the R-LAS-LT-110-HD2 sensor.

DIST:

The R-LAS-LT sensor works for distance measuring according to the triangulation principle. In DIST mode standardization of the two input signals (raw values A, B) is performed according to the following algorithm: $STANDARD=128+(A-B)/(A+B)$.

In this operating mode the LASMOD option field should be set to DYN.

INTENSITY:

The R-LAS-LT sensor responds to intensity fluctuations at the receiver unit. The mean value of the input signals (raw values A, B) is formed: $I=(A+B)/2$. A typical application example for this is contrast measurement through the radiation that is reflected back to the R-LAS-LT sensor from the object surface.

In this operating mode the LASMOD option field should be set to STAT.

REF:

With this slider, or with the edit box, the reference value (setpoint value, corresponds with the standardized distance value, e.g. 500 mm in case of type LT-500) for the respective application can be set with a mouse click. A REF-"LED" indicates whether the current measured value lies above (yellow) or below (green) the set REFERENCE (change of switching state at digital output REFOUT). It must be taken into consideration that the adjustable reference value range is limited upwards and downwards by the selected tolerance band. It must also be taken into consideration that the HYSTERESIS setting (see below) has no effect on the REF-"LED", HYSTERESIS only is effective at digital output REFOUT (pin4 of the 4-pin M8 plug).

TOL:

With this slider, or with the edit box, a tolerance band can be applied around the respective reference value (setpoint value, standardised distance value). If the current measured value from the sensor exceeds the set tolerance thresholds in up or down direction, the TOL-"LED" lights up in red. Such exceeding of the set tolerance limits also becomes effective at output pin2 of the 4-pin M8 plug (TOLOUT) as a change of switching state.

It must also be taken into consideration that the HYSTERESIS setting (see below) has no effect on the TOL-"LED", HYSTERESIS only becomes effective at digital output TOLOUT.

TEACH REF:

When this button is pressed the currently measured STANDARD signal value is set as a new reference in STANDARD mode.

HYSTERESIS:

The hysteresis setting value applies a switching threshold around the upper and lower tolerance threshold and around the currently set reference value. The switching hysteresis acts on the two digital outputs TOLOUT and REFOUT. The switching hysteresis increases the signal stability at the digital outputs of the R-LAS-LT sensor. It must be taken into consideration that the hysteresis setting has no effect on the REF-"LED" and TOL-"LED" display in the R-LAS-LT-Scope (LT-Scope) program

POLARITY	<input type="text" value="LO"/>
BACK_LIM	<input type="text" value="20"/>
HOLD [ms]	<input type="text" value="0"/>

POLARITY :

Determines the polarity change of the digital output when the tolerance limits are exceeded.
LO = low-active; HIGH = high-active

BACK_LIM :

In this edit box a threshold for the minimum background intensity (background limit) can be pre-set. As a rule the operating range of the laser sensor lies above this threshold. The mean value $(A+B)/2$ is formed from the raw signals A and B measured at the differential diode (receiver). If this mean value falls below the set BACK_LIM threshold, the current STANDARD value is replaced with the value 255. The digital outputs are no longer actuated. In case of very low signal levels (mostly caused by the background) "biasing" to an infinitely large distance (corresponds with STANDARD value = 255) is performed through the STANDARD value instead of the unsafe distance information.

HOLD :

The sensors of the R-LAS-LT series operate with minimum scan times in the range of 150 μ s. For this reason most of the SPCs that are connected at the sensor outputs have difficulties with the safe detection of the resulting short changes of switching states (e.g. TOLONUT signal). By activating the respective HOLD selection button a pulse lengthening at the digital output of the R-LAS-LT sensor of up to 200 ms can be set.

Various displays and a graphic window are available for the visualization of all important data for the parameterization. The meaning of the individual displays and the graph is explained below.



A:
Shows the raw signal from receiver A.

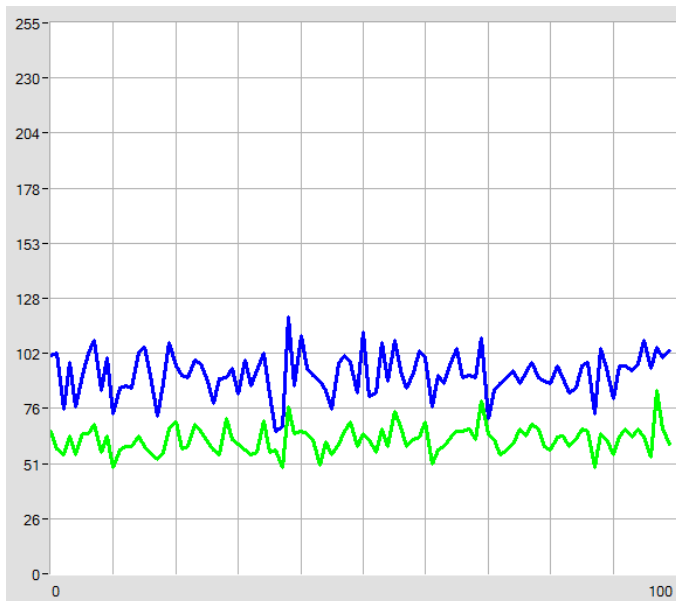
B:
Shows the raw signal from receiver B.

NORM:
Shows the normalized signal formed by the raw signals (differential diode) A and B.

p_p:
Indicates the peak-to-peak value of the norm value shown in the graph MEASURE.

TEMP:
Temporary signal $TEMP=(A+B)/2$

SOURCE **SCALE**

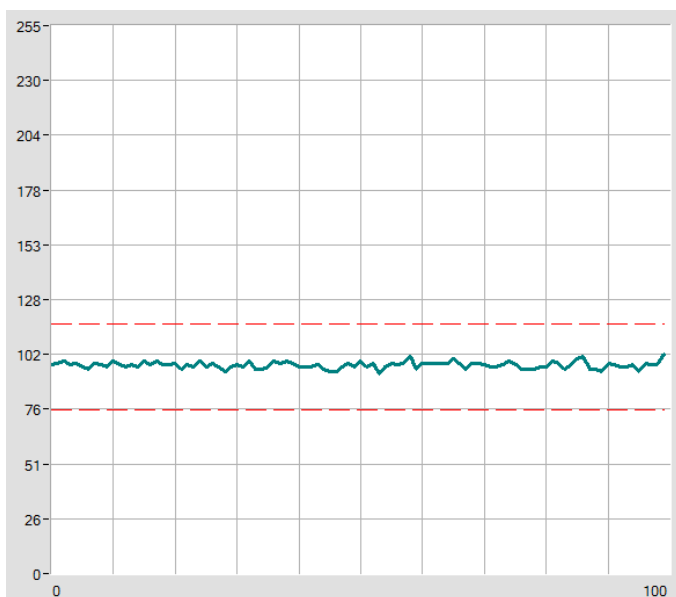


SOURCE:

With the help of **SOURCE** you can choose which signals are displayed in the graph.

RAW:

Shows the raw signals from receiver A and B.



MEASURE:

Displays the NORM signal with the tolerance window set.

SCALE:

With SCALE you can start or stop an auto-zoom.

Connector Assignment

Assignment 4-pole M12 connector R-LAS-LT-110-HD2 <-> PLC:

PIN	COLOR	SIGNAL
1	brn	+U _b (+24VDC ± 10%)
2	wht	+24V: LASER ON 0V or not connected: LASER OFF
3	blu	GND (0V)
4	blk	REFOUT (100 mA)

Connecting cable:
cab-M12/4-g-(length)
(standard length 2m, also available in 5m)

Assignment 5-pole fem. connector R-LAS-LT-110-HD2 <-> RS232:

PIN	SIGNAL
1	GND (0V)
2	TxD
3	RxD
4	Not connected
5	Not connected

Connection via RS232 interface at the PC:

Connecting cable:
cab-las5/PC-(length)
cab-las5/PC-w-(length) (angle type 90°)
(standard length 2m)

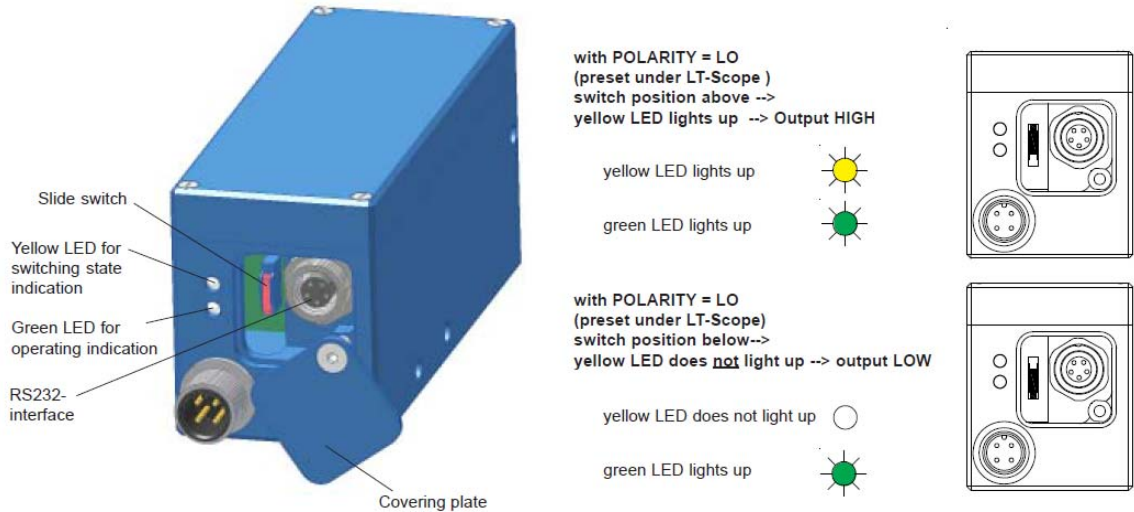
alternative:

Connection via USB interface at the PC:

Connecting cable (incl. driver software):
cab-5/USB-(length)
cab-5/USB-w-(length) (angle type 90°)
(standard length 2m)

Setting


With the R-LAS-LT-110-HD2 parameter input is performed under Windows® by means of software R-LAS-LT-Scope (LT-Scope) through the serial RS232 interface. The access to the RS232 interface is enabled by screwing off the covering plate. Moreover, a slide switch under the covering plate is used for output polarity setting (alteration switch).



Laser Warning

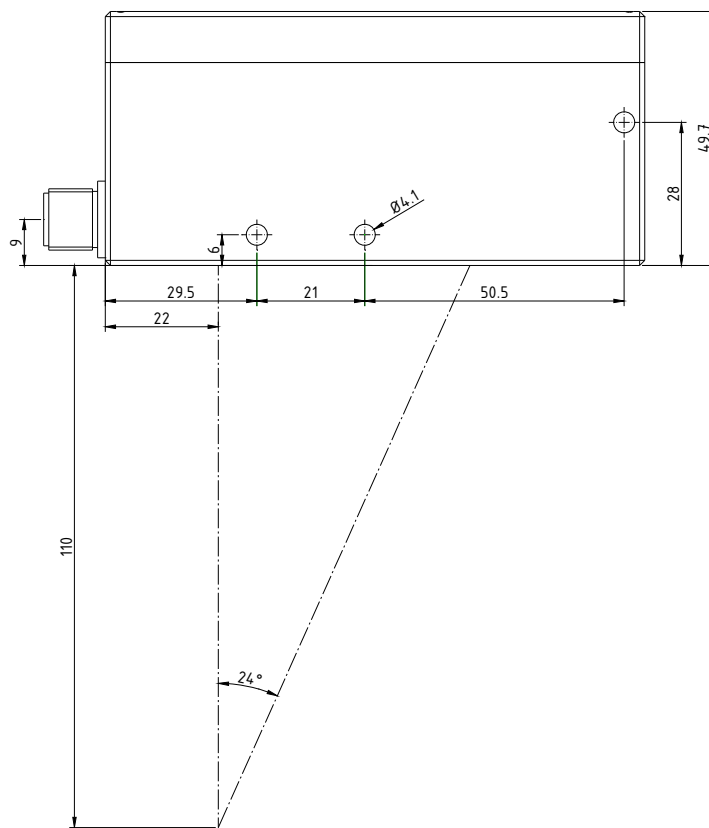
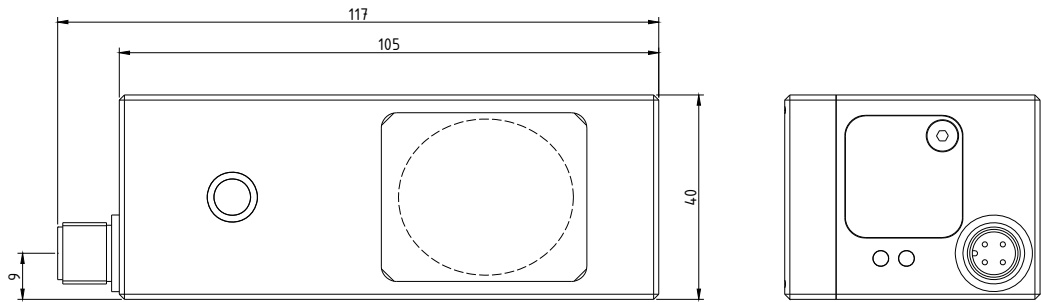
LASER:

Solid-state laser, $\lambda=670$ nm, 1mW max. optical power,
Laser class 2 according to EN 60825-1
Therefore no additional protective measures are required for use of these laser transmitters.



**Do not stare
into the laser beam
Laser class 2**

Dimensions



All dimensions in mm

RS232 Communication Protocol

RS232 communication protocol PC ↔ Laser reflection sensor R-LAS-LT-Scope (LT-Scope) V1.1

- Standard RS232 serial interface without hardware-handshake
- 3-wire connection: GND, RX, TX (Null-Modem-Methode).
- Speed: 4800 Baud, 8 bits data, no parity bit, 1 stop bit

The PC has to send a data frame (17 Bytes) to the electronic control unit *R-LAS-LT-110-HD2* (hardware).

All bytes must be transmitted in binary format.

The meaning of the parameters (bytes) are described below.

Method:

The electronic control unit is permanently reading (polling) the incoming byte at the RS232 connection.

If the incoming byte = 0x55 (synch-byte), then the 2.byte (order-byte) is read in, and after this, the actual setting parameters (15 bytes) are read in. After reading in the completely data frame, the electronic control unit *R-LAS-LT-110-HD2* executes the order which is coded at the 2. byte (order-byte).

Format of the data frame

Byte No.	Meaning:	Comment:
1	sync-byte = 0x55	hex-code, binary: 01010101
2	ORDER NUMBER	
3	Parameter TOL	Tolerance band width [0 .. 127]
4	Parameter POLARITY	Polarity of digital outputs [0,1]
5	Parameter HOLD[ms]	Output hold time (0,25,50,100,200) coded to [0,1,2,3,4]
6	Parameter LASMOD	Laser operating mode (STAT, DYN) coded to [0,1]
7	Parameter POWER	Laser power [0 .. 255] – Attention: inverse operation!
8	Parameter HYSTERESIS	Hysteresis band [0 .. 50]
9	Parameter AVERAGING	Signal averaging (0,4,8,16,32,64) coded to [0,1,2,3,4,5]
10	Parameter MEASURE	Measuring operating mode (distance, intensity) [0,1]
11	Parameter REFERENCE	Reference value [0 .. 250]
12	Parameter BACKLIMIT	Evaluation threshold background suppression [0 .. 250]
13	Parameter REGCNT	Number of main loop passes, after which in the mode LASMOD = dyn. the laser power should be readjusted
14	Parameter DYN_WIN_LO	Lower limit from which the dyn. laser power correction is done
15	Parameter DYN_WIN_HI	Upper limit up to which the dyn. laser power correction is done
16	Parameter free	Free (but must be transmitted, for example, zero)
17	Parameter free	Free (but must be transmitted, for example, zero)

ORDER NUMBER (byte no. 2)

0	nop	no operation
1	save parameter from PC into RAM	volatile - normal operation
2	save parameter from PC into RAM + EEPROM	nonvolatile - limited store cycles
3	send parameter from RAM to PC	15 byte binary
4	send parameter from EEPROM to RAM + to PC	15 byte binary
5	send actual raw data from RAM to PC (AD_A, AD_B)	2 byte binary
6	send NORM and TEMP to PC	2 byte binary
7	send line ok = 0xAA to PC	1 byte binary