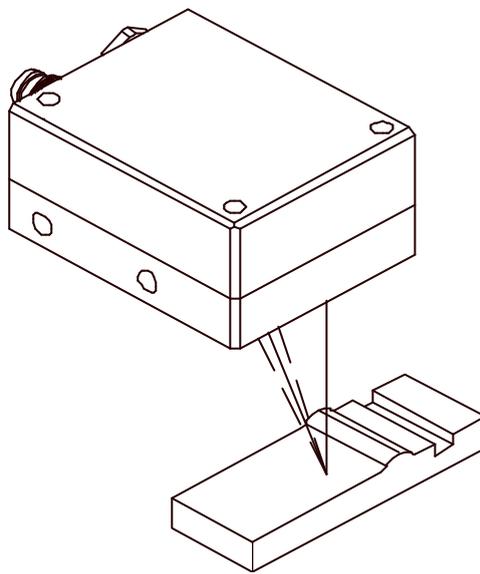


Manual

Software RT-Scope V2.2

(PC-Software for Microsoft® Windows® XP, Me, 2000, 98, NT® 4.0, 95)

for laser reflex sensors of R-LAS-LT series



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

The laser light 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 sensor. All the parameters can be stored in the non-volatile EEPROM of the R-LAS-LT sensor through the serial RS232 interface.

1 Installation of the RT-Scope software

Hardware requirements for successful installation of the RT-SCOPE software.

- IBM PC AT or compatible
- VGA graphics
- Microsoft® Windows® XP, Me, 2000, 98, NT® 4.0 or 95
- Serial RS232 interface at the PC
- Microsoft-compatible mouse
- Cable for the RS232 interface (cab-las5/PC)
- CD-ROM drive
- 5 MByte of free hard disk space

Please install the RT-Scope software as described below:

The RT-Scope software can only be installed under Windows. Windows must therefore be started first, if it is not yet running.

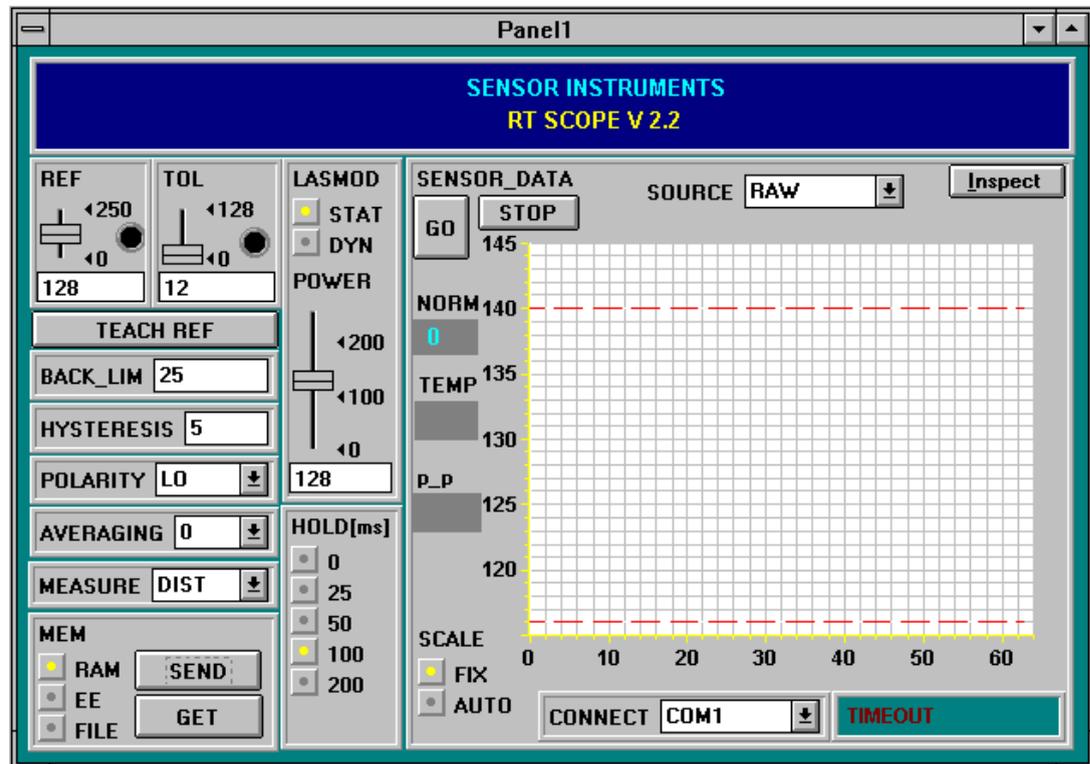
It is recommendable to make a backup copy of the original floppy disk before starting the installation

1. The software can be installed directly from the installation CD-ROM. To install the software, start the SETUP program in the INSTALL folder of the CD-ROM.
2. The installation program displays a dialog and suggests to install the RT-Scope software in the C:\RTV22 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 RT-SCOPE software is created in the Windows Program Manager. In the RT-SCOPE 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 RT-SCOPE icon.

Windows™ is a trademark of the Microsoft Corp.
MS-DOS® is a registered trademark of the Microsoft Corp.
VGA™ is a trademark of the International Business Machines Corp.

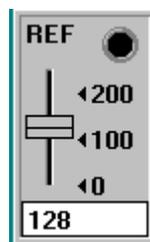
2 Operation of the RT-Scope Software

When the *RT-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.



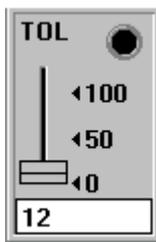
In order to avoid data transfer problems through the serial interface it is recommendable to change to the STOP mode (press the STOP button) before activating function keys and sliders.

The functions of the individual *RT-Scope* control elements will be explained on the following pages:



REF setting:

With this slider, or with the edit box, the reference value (setpoint value, corresponds with the standardised distance value, e.g. 45 mm in case of type LT-45) 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 (pin 4 of the 4-pole M8 plug).



TOL setting:

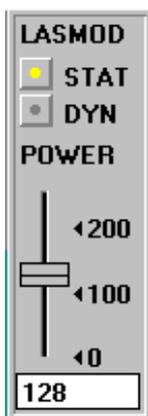
With this slider, or with the edit box, a tolerance band can be applied around the respective reference value (setpoint value, standardised distance value). If the current measured value from the sensor exceeds the set tolerance thresholds in up or down direction, the TOL-"LED" lights up in red. Such exceeding of the set tolerance limits also becomes effective at output pin2 of the 4-pole 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 (the new reference value is automatically sent from the PC to the *R-LAS-LT* sensor).

With the following 6 control elements a change only becomes effective at the *R-LAS-LT* sensor after activation of the SEND button !



LASMOD setting:

In this function group the laser operating mode and the laser power at the *R-LAS-LT* 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.

ATTENTION!

The value 0 means full intensity, and the value 255 stands for the lowest intensity !



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.





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 *RT-SCOPE* program.



POLARITY:

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



AVERAGING:

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* sensor.

DIST:

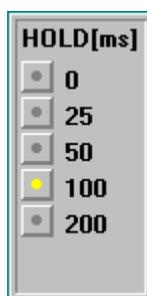
The *R-LAS-LT* sensor works for distance measuring according to the triangulation principle. In DIST mode standardisation of the two input signals (raw values A, B) is performed according to the following algorithm: $STANDARD=128+(A-B)/(A+B)$.

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



HOLD :

The sensors of the *R-LAS-LT* series operate with minimum scan times in the range of 150µs. 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. TOLOUT 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.



MEM:

This function key group serves for parameter exchange between PC and *R-LAS-LT* sensor through the serial RS232 interface.

SEND: When the SEND button is clicked, all the currently set parameters are transferred between PC and *R-LAS-LT* sensor or sent to an output file. The target of the respective parameter transfer is determined by the selected button (RAM, EE, or FILE).

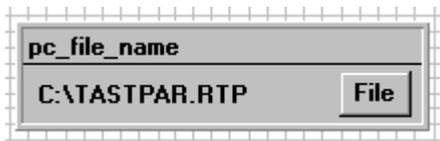
GET: The currently set values can be interrogated from the *R-LAS-LT* sensor by clicking on the GET button. The source of data exchange is determined by the selected button (RAM, EE, or FILE).

RAM: The current parameters are written into the RAM memory of the *R-LAS-LT*, or they are read from the RAM, **i.e. these parameters are lost when the voltage at the *R-LAS-LT* sensor is switched off.**

EE: The current parameters are written into the non-volatile memory of the EEPROM in the *R-LAS-LT* sensor, or they are read from the EEPROM, **i.e. the parameters in the internal EEPROM are stored when the voltage at the *R-LAS-LT* sensor is switched off.**

FILE: A click on this button opens an info field with the file name of the current parameter file.

PLEASE NOTE: The current parameters are only stored in the current output file, or retrieved from the current output file, when the SEND or GET button is activated with a mouse click.



pc_file_name:

This info field displays the currently selected file name of the output file with the corresponding directory path.

If another output file should be accessed, the file button must first be activated with the mouse pointer. Then another dialog field will open, where an existing output file can be selected, or where a file name for a new output file can be entered.



(dialog field: open)

(file name:)
(directories:)

(OK)
(Cancel)

(file format:)
(drives:)



The following chapters describe how the *RT-SCOPE* software can be used as an aid for setting the *R-LAS-LT* sensors in practice.

The stable function of the RS232 interface (LINE OK status message) is a prerequisite for measured value transfer from the PC to the *R-LAS-LT* sensor.

The *RT-SCOPE* 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 *R-LAS-LT* sensor through the respective selected interface.

LINE OK: The connection between PC and *R-LAS-LT* sensor could be established successfully.

TIMEOUT: A connection between PC and *R-LAS-LT* sensor could not be established, or the connection is faulty.

In this case it should first be checked whether the *R-LAS-LT* sensor is supplied with voltage, and whether the RS232 interface cable (CON3/PC art. no.: 80 80 33) is correctly connected.

If the interface assignment at the PC is not known, a selection can be made from COM1, COM2, COM3, and COM4 by clicking on the selection field [↓] in the CONNECT group.

TIMEOUT error conditions may occur, if the functional elements are activated simultaneously with activated GO mode (measured value transfer).

Therefore the STOP button should be pressed before parameters are entered by the operator!

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

The following chapters are based on the assumption that the connection between PC and sensor could be established successfully (LINE OK status message).

2.1 RT-SCOPE as an aid for sensor adjustment

Prior to the use of the software aids (graphical display of sensor signals) the *R-LAS-LT* sensor must be manually adjusted to the respective reference distance as accurately as possible (e.g. 45 mm with type LT-45).

Fine adjustment of the *R-LAS-LT* sensors is considerably facilitated by the graphical display of the two receiver signals (from the differential diode in the sensor). For this purpose RAW must have been selected in the SOURCE selection field.



RAW-Modus:

The two raw signals A and B from the differential diode are displayed in the measured value window.



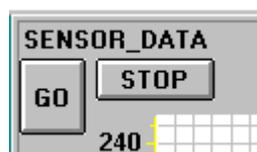
Then the laser operating mode should be set to DYN. In addition DIST must be set in the MEASURE selection field.



Attention!

These settings must be activated at the *R-LAS-LT* by clicking on the SEND button.

Activation of measured value transfer is started by pressing the GO button.



GO button: Starts graphical display - -Transfer of measured values from the *R-LAS-LT* sensor to the PC

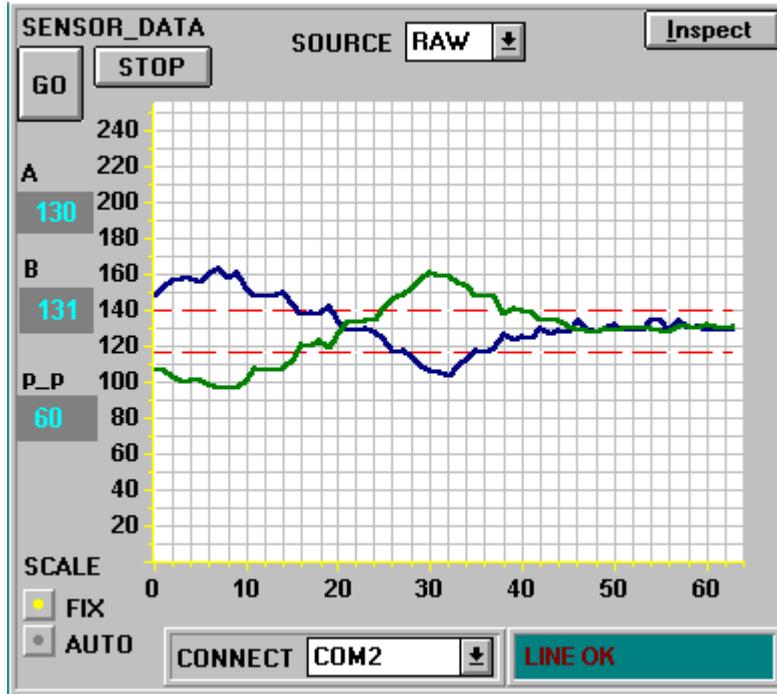
STOP button: Stops measured value transfer to the PC.

Now the two raw signals A and B from the sensor should appear in the graphical display window in "scroll-mode". If this is not so (signals at the top or bottom stop), the current measured values can be taken from the fields A and B on the left side of the display window.

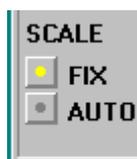
The aim of fine adjustment in RAW mode is to match the two raw signals A and B from the *R-LAS-LT* sensor as closely as possible under permanent observation of the graphical measured value display.

For this purpose the position of the sensor relative to the measuring object is carefully changed mechanically under observation of the raw signals.

The following picture shows a typical fine adjustment process in the graphical display window.



Fields A and B in the above picture show the current measured values of the sensor's differential diode. Field p_p displays the maximum deviation of raw signals A and B within the display window.



SCALE setting:

These selection buttons are used for setting the scaling type of the y-axis.

- FIX: Fixed scaling of the y-axis (0...255)
- AUTO: Automatic adaption of y-axis scaling to the current measured values (zoom function).



Inspekt button:

This button fixes the current screen of the display window. A dialog box then opens and offers different possibilities for further processing of the display window under Windows. The individual function elements of the inspect button are excellently suited for documentation purposes.

Print: Prints the current display window.



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- Copy Page:** Copies the current display window to the Windows clipboard, from where it can be inserted and further processed in various Windows programs (documentation in the word processor, graphics software, spreadsheet, ...).
- Zoom:** For zooming in or zooming out the display window.

2.2 RT-SCOPE as an aid for threshold setting

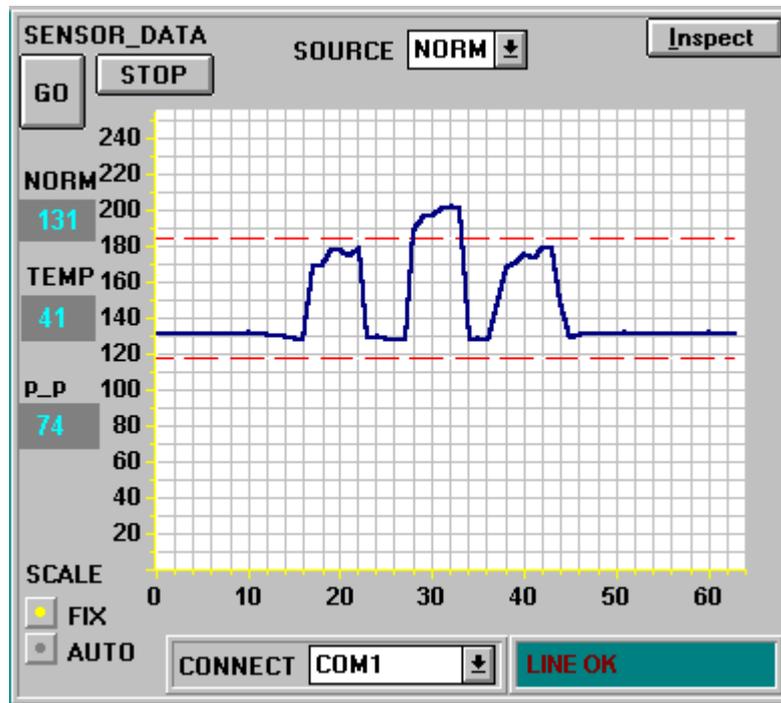
Adaptation of the parameters to the respective application is performed in the STANDARD measuring mode. For this purpose the STANDARD setting must be selected with a mouse click in the SOURCE selection field.



STANDARD mode:

The standardised signal created from the raw signals (differential diode) A and B is displayed in the measured value window.

The picture below shows a typical signal shape of three measuring objects (two of which are "accepts") in the display window. The tolerance threshold was set such that it is violated by a "reject". In case of the second measuring object ("reject") the upper tolerance threshold was exceeded - this leads to an activation of the digital output TOLOUT at the *R-LAS-LT* sensor.



The STANDARD field shows the value that is standardised by the software, which is formed from the two signals A and B from the differential diode.

The TEMP field displays an uncalibrated numerical value, which represents a measure of the temperature in the sensor housing.

The p_p field indicates the maximum change (peak to peak) of the STANDARD signal in the display window.

When suitable parameters for the respective application have been found by observing the STANDARD signal shapes, the parameters must be written to the non-volatile EEPROM memory of the *R-LAS-LT* sensor by clicking on the SEND button.

Attention ! The selection button in the MEM control field must be set to EE !!

When the parameters have been entered and the sensor has been adjusted with the help of the graphical representation provided by the *RT-SCOPE* software, the PC is no longer required for the actual measuring task (application).

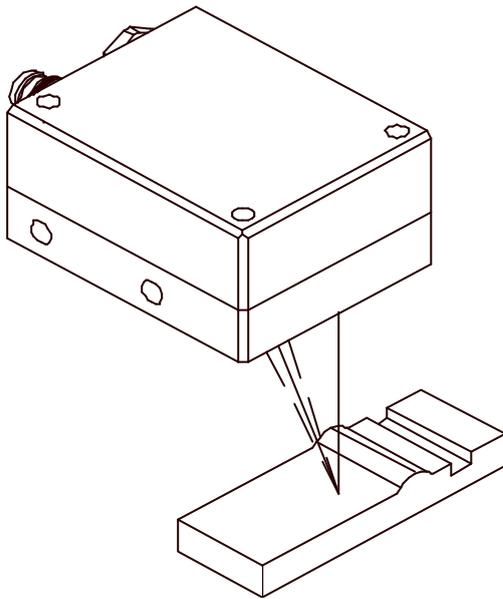


The PC and the RS232 interface cable can then be disconnected from the *R-LAS-LT* sensor. The *R-LAS-LT* sensor then performs the measuring task in STAND-ALONE operation in accordance with the parameters stored in the EEPROM.

2.3 Application example - distance measurement

The picture below shows an application example where the *R-LAS-LT* sensor is used for distance measuring.

The measuring object should be checked for its contours. For this purpose it is transported through the light spot of the sensor unit. With the help of the signal shapes measured by the sensor it is possible to check whether the tolerance thresholds pre-set by the operator are exceeded.



The following procedure is recommended for distance measurement with the *R-LAS-LT* sensor:

1. Perform mechanical adjustment of the sensor to the respective reference distance (e.g. 45 mm distance to the measuring object in case of type *LT45*).
2. Connect the PC with the *R-LAS-LT* sensor using the RS232 interface cable, and provide voltage supply for the *R-LAS-LT* sensor.
3. Start the *RT-SCOPE* Windows software and perform sensor fine adjustment in RAW mode by observing the two sensor signals (LASMOD to DYN, MEASURE to DIST + SEND!).
4. Set STANDARD in the SOURCE selection field, and set LASMOD to DYN. DIST must be selected in the MEASURE selection field.
5. Activate the selected options by pressing the SEND button.
6. Start measured value pickup by pressing the GO button.

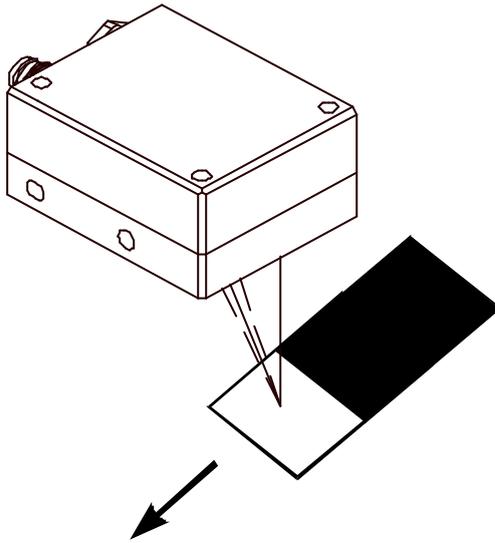


7. Pull the measuring object through the light spot of the sensor. Possible monitoring parameters (tolerance, reference values, averaging) can be found with the help of the STANDARD signal shape.

8. Store the set parameter values by pressing the SEND button.

2.4 Application example - contrast measurement

The picture below shows an application example where the *R-LAS-LT* sensor is used for contrast measurement. The measuring object should be checked for its contrast transition. For this purpose it is transported through the light spot of the sensor unit. At the receiver unit the *R-LAS-LT* sensor responds to intensity fluctuations of the radiation that is diffusely reflected from the measuring object.



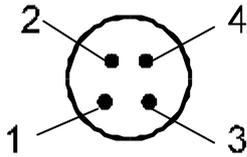
The following procedure is recommended for contrast measurement with the *R-LAS-LT* sensor:

1. Perform mechanical adjustment of the sensor to the respective reference distance (e.g. 45 mm distance to the measuring object in case of type *LT45*).
2. Connect the PC with the *R-LAS-LT* sensor using the RS232 interface cable, and provide voltage supply for the *R-LAS-LT* sensor.
3. Start the *RT-SCOPE* Windows software and perform sensor fine adjustment in RAW mode by observing the two sensor signals (first set LASM0D to DYN, MEASURE to DIST + SEND!), for this purpose move the measuring object with the reference surface (e.g. white) into the laser spot.
4. Contrast measurement:
Select STANDARD in the SOURCE selection field.
Set LASM0D to STAT.
Select INTENSITY in the MEASURE selection field.
5. Activate the selected options by pressing the SEND button.
Start measured value pickup by pressing the GO button.



6. Move the measuring object (reference surface, e.g. white) into the laser spot.
With the LASER-POWER slider the laser intensity can be adjusted such that the STANDARD signal does not lie near the upper or lower limit of the graphical display window of the *RT-SCOPE* software.
Activate the set parameters by pressing the SEND button!
Pull the contrast transition of the measuring object past the laser spot, observing the STANDARD signal.
The aim of parameterisation is to detect as high a signal jump as possible (STANDARD) at the contrast change.
For this purpose, apart from LASER-POWER adaptation, an increase of the STANDARD signal stroke may also be achieved by slightly changing the reference distance.

Appendix



4-pole M8 plug *R-LAS* - SPC (*LT type*)

R-LAS-LT type: Pin assignment 4-pole M8 plug *R-LAS* - PLC

PIN	COLOUR	SIGNAL
1	brn	+U _b (+12VDC ... +30VDC)
2	wht	TOLOUT
3	blu	GND
4	blk	REFOUT

R-LAS-LT-...-ANA type: Pin assignment 4-pole M8 plug *R-LAS* - PLC:

PIN	COLOUR	SIGNAL
1	brn	+U _b (+12VDC ... +30VDC)
2	wht	ANA (0 ... 10V)
3	blu	GND
4	blk	REF 100mA

R-LAS-LT-...-ANA-5V type: Pin assignment 4-pole M8 plug *R-LAS* - PLC:

PIN	COLOUR	SIGNAL
1	brn	+U _b (+12VDC ... +30VDC)
2	wht	ANA (0 ... 5V)
3	blu	GND
4	blk	REF 100mA

Pin assignment 5-pole socket RS232

PIN	SIGNAL
1	GND
2	TxD
3	RxD



4	n.c.
5	n.c.