

Manual

Software RLAS-GD-TE-Scope V1.0

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

for Laser Reflection Sensors R-LAS-GD...-TE



R-LAS-GD1-TE



R-LAS-GD2-TE



R-LAS-GD3-TE



R-LAS-GD4-TE

This manual describes the installation process of the software for the laser reflection sensors R-LAS-GD...-TE. 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 R-LAS-GD...-TE 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 laser reflection sensor through the serial RS232 interface.

1 Installation of the software

Hardware requirements for successful installation of the RLAS-GD-TE-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

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

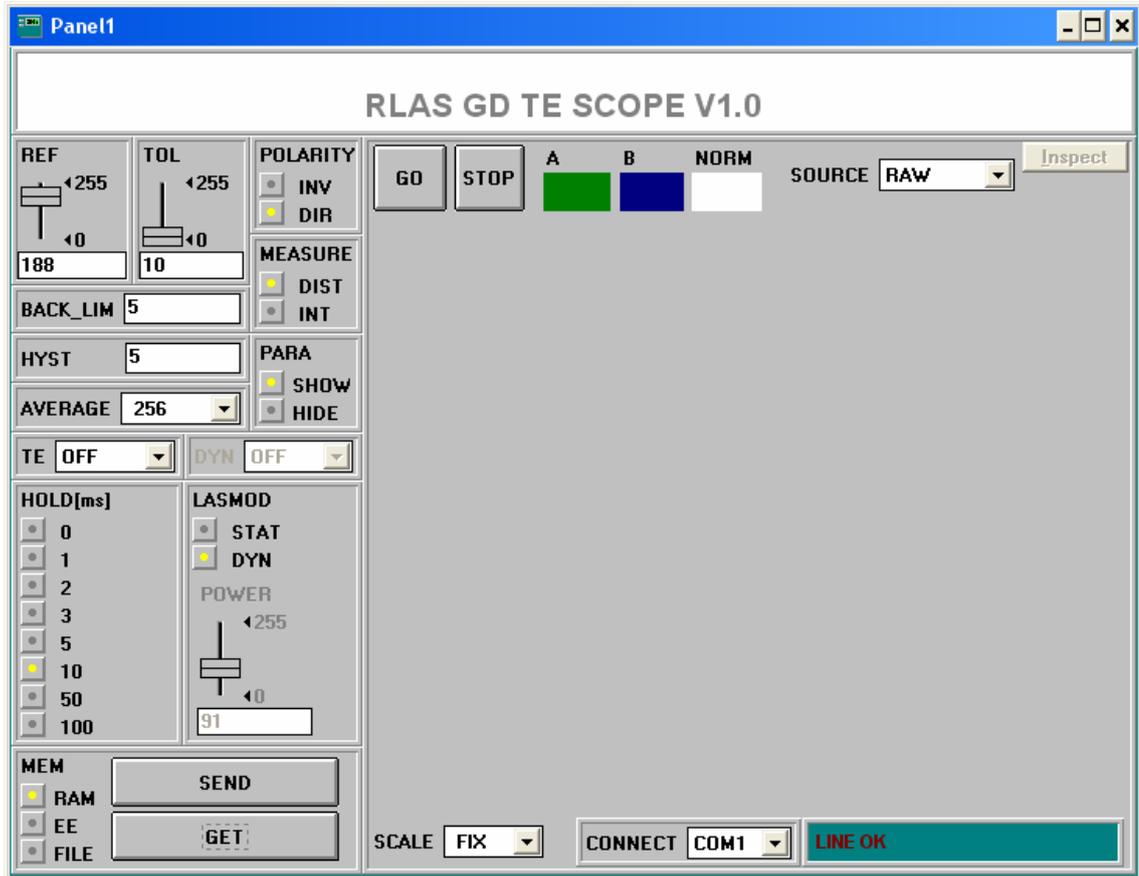
Please install the software as described below:

1. The software can be installed directly from the installation CD-ROM. To install the software, start the SETUP program in the INSTALL 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.

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VGA™ is a trademark of the International Business Machines Corp.

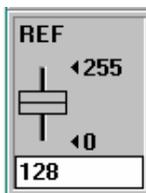
2 Operation of the software

When the 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 laser reflection sensors.



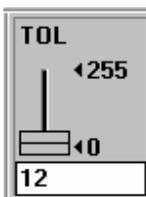
In order to avoid data transfer problems through the serial interface it is recommendable to change to the STOP mode (press the STOP button) before activating function keys and sliders.

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



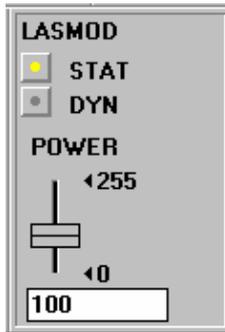
REF setting:

With this slider, or with the edit box, the reference value (setpoint value, corresponds with the standardised distance value) for the respective application can be set with a mouse click. It must be taken into consideration that the adjustable reference value range is limited upwards and downwards by the selected tolerance band.



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 output REFOUT at the 4-pole M8 connector is set according to POLARITY (see below).



LASMOD setting:

In this function group the laser operating mode and the laser power at the laser reflection 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.



Externat input TEACH EXTERN (TE):

The current object can be taught to the sensor through the external TEACH EXT input. The internally calculated norm value is taken as a reference. The

value for TOL is not changed.

TE:

For being able to perform external sensor teaching, this function must be activated with the TE input field. TE=ON.

DYN:

DYN=ON provides the additional function that the sensor, before it uses the calculated NORM value as REF, performs dynamic laser power correction and then continues to operated statically with the determined POWER value. When DYN=ON, the LASMOD and POWER function fields have no effect.

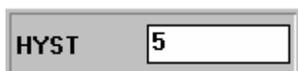
DYN=OFF means that with an external teach signal the calculated NORM value is directly taken as REF. The effect of the LASMOD and POWER function fields is as mentioned above.

When the external teach function is activated, the respective product can be taught by way of a HIGH signal (+24V) at the TEACH EXT input.



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 output is 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. The switching hysteresis increases the signal stability at the digital outputs of the laser reflection sensor.



POLARITY :

Determines the polarity change of the digital output when the tolerance limits are exceeded. INV = low-active; DIR = 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 laser reflection sensor.

DIST:

The laser reflection 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 LASMOD option field should be set to DYN.

INT:

The laser reflection 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 laser reflection sensor from the object surface.

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



HOLD :

The sensors of the laser reflection sensor 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. By activating the respective HOLD selection button a pulse lengthening at the digital output of the laser reflection sensor of up to 200 ms can be set.



PARA (parameter display):
A click on the PARA software switch either displays the parameters BACKLIM, HYST and AVERAGE, or REGCNT, DYN_WIN_HI and DYN-WIN_LOW. The three last parameters also are referred to as automatic control block.



Time constant :

When laser power corrected is activated (LASMOD=DYN), according to the entered value (1 ... 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!



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

The automatic control algorithm (LASMOD=DYN) 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!



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 $(signal1+signal2)/2$ is less than the lower setpoint limit!



MEM:

This function key group serves for parameter exchange between PC and laser reflection sensor through the serial RS232 interface.

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

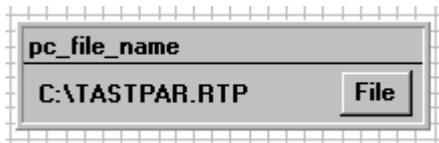
GET: The currently set values can be interrogated from the laser reflection sensor by clicking on the GET button. The source of data exchange is determined by the selected button (RAM, EE, or FILE).

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

EE: The current parameters are written into the non-volatile memory of the EEPROM in the laser reflection sensor, or they are read from the EEPROM, **i.e. the parameters in the internal EEPROM are stored when the voltage at the laser reflection 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.



The following chapters describe how the software can be used as an aid for setting the laser reflection 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 laser reflection sensor.

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 laser reflection sensor through the respective selected interface.
- LINE OK: The connection between PC and aser reflection sensor could be established successfully.
- TIMEOUT: A connection between PC and aser reflection sensor could not be established, or the connection is faulty.
In this case it should first be checked whether the laser reflection sensor is supplied with voltage, and whether the RS232 interface cable (CON3/PC, part 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 Software as an aid for sensor adjustment

Prior to the use of the software as an aid (graphical display of sensor signals) the laser reflection sensor must be manually adjusted to the respective reference distance as accurately as possible.

Fine adjustment of the laser reflection sensor is considerably facilitated by the graphical display of the two receiver signals. For this purpose RAW must have been selected in the SOURCE selection field.



RAW mode:

The two raw signals A and B 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 sensor 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 sensor to the PC

STOP button:

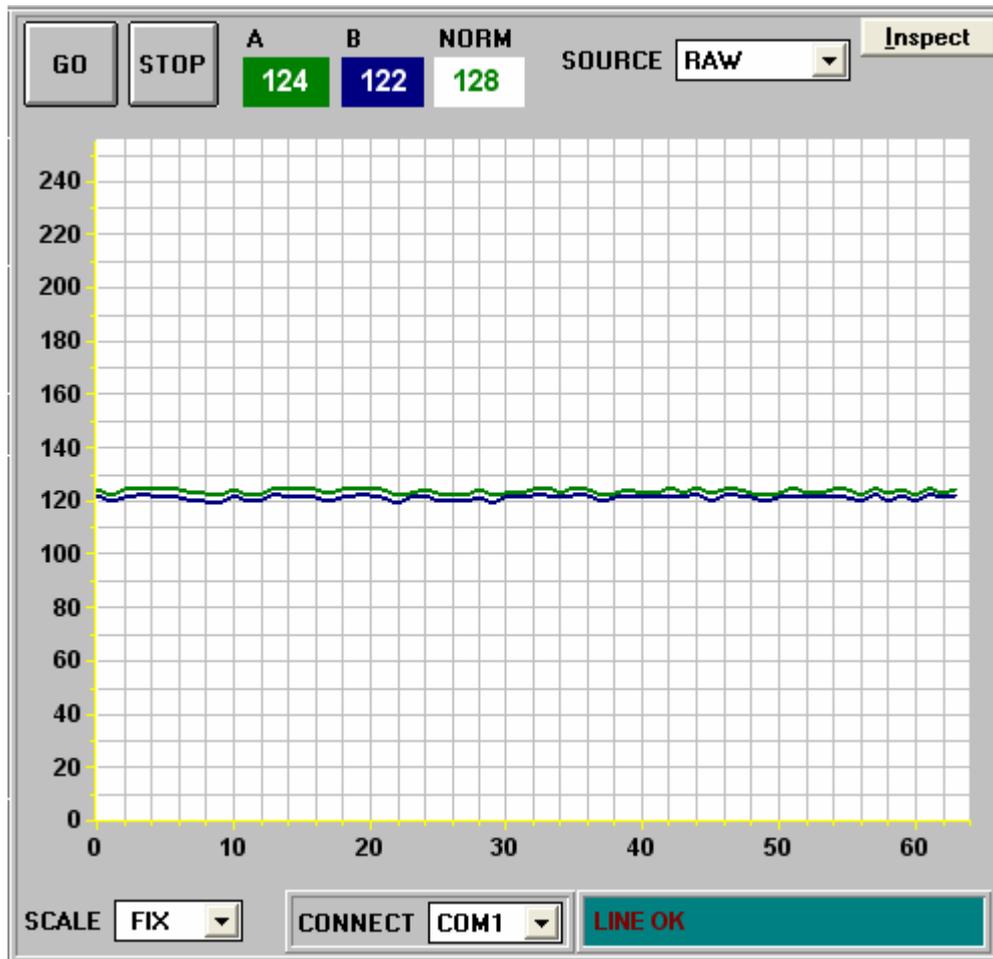
Stops measured value transfer to the PC.

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 laser reflection 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.



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)



Inspect 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.

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.

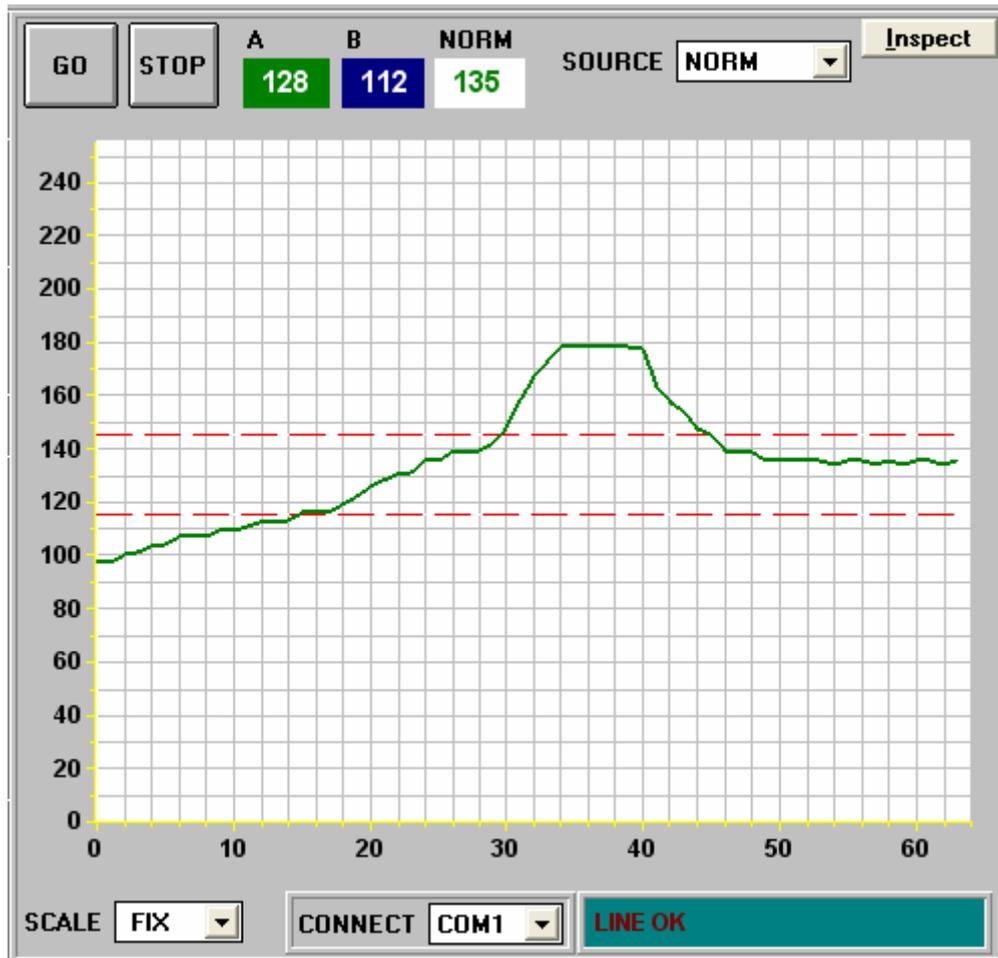
2.2 Software as an aid for threshold setting

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

The picture below shows a typical signal shape.



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

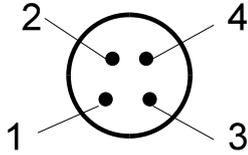
When suitable parameters for the respective application have been found by observing the STANDARD signal shapes, the parameters must be written to the non-volatile EEPROM memory of the laser reflection sensor by clicking on the SEND button.

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 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 sensor. The sensor then performs the measuring task in STAND-ALONE operation in accordance with the parameters stored in the EEPROM.

3 Connector assignment



4-pole M8-connector R-LAS – PLC

Connector assignment 4-pole M8-connector (R-LAS-GD...-TE to PLC):

Pin	Color	Signal
1	Brown	+U _b (+12VDC ... +30VDC)
2	White	TEACH EXT
3	Blue	GND (0V)
4	Black	REFOUT

Connector assignment 5-pole female connector Binder Series 712 (R-LAS-GD...-TE to PC/RS232)

Pin	Signal
1	GND (0V)
2	TxD
3	RxD
4	n.c.
5	n.c.

4 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**

5 RS232 communication protocol

RS232 communication protocol PC ↔ R-LAS-GD-TE-Scope V1.0

- Standard RS232 serial interface without hardware-handshake
- 3-wire connection: GND, TX0, RX0 (no-modem method)
- Speed: 4800 baud, 8-bits data, no parity-bit, 1 stop-bit

The PC has to send a data frame of 17 bytes to the R-LAS-GD...-TE hardware.

All bytes must be transmitted in binary format.

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

Method:

The R-LAS-GD...-TE hardware 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, after this, the real setting parameters (15 bytes) are read in.

After reading in the completely data frame, the R-LAS-GD...-TE hardware 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 REFERENZ	Reference value [0 .. 255]
4	Parameter TOL	Tolerance width [0 .. 255]
5	Parameter POLARITY	Polarity digital output [0=INV,1=DIR]
6	Parameter HOLD[ms]	Output hold time (0,1,2,3,5,10,50,100) coded to [0,,,,,7]
7	Parameter LASMOD	Laser operation mode (STAT, DYN) coded to [0,1]
8	Parameter POWER	Laser power [0 .. 255] – Attention: inverse operation!
9	Parameter HYSTERESIS	Hysteresis band [0 .. 255]
10	Parameter AVERAGE	Signal averaging (1,2,4,8,...,32768) coded to [0,1,2,3,4,...,15]
11	Parameter MEASURE	Measuring operation mode (distance, intensity) [0,1]
12	Parameter BACK_LIM	Auswerteschwelle Hintergrundausblendung [0 .. 255]
13	Parameter REGCNT	Anzahl Hauptschleifendurchläufe, nach denen im Modus LASMOD = dyn. die Laserleistung nachgeregelt werden soll.
14	Parameter DYN_WIN_LO	Untere Grenze ab der dyn. Lasernachregelung erfolgt.
15	Parameter DYN_WIN_HI	Obere Grenze bis zu der dyn. Lasernachregelung erfolgt.
16	Parameter TE	Enable Extern Teach (OFF=0, ON=1)
17	Parameter DYN	Dynamisch Einregelung bei Extern Teach (OFF=0, ON=1)

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, NORM)	3 byte binary
6	Free	
7	send line ok = 0xAA to PC	1 byte binary

KW 05/07