Manual
Software RLS-GD-Scope V4.3

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

for gloss detection sensors of RLS-GD series

This manual describes the installation of the PC software for the RLS-GD gloss detection sensor. As a support for commissioning of the gloss sensor this manual explains the functional elements of the Windows® user interface.

The RLS-GD sensor can be "taught" up to 31 gloss degrees or normalized vectors. Evaluation always is performed with 12 bits. With the help of a modulated white-light LED a white light spot is projected onto the surface to be inspected.

Part of the light directly reflected by the object to be measured is directed onto a photodiode by means of an optical receiver unit (optical receiver unit is arranged to the vertical plane at the same angle as the optical transmitter unit). Furthermore, diffuse reflection is determined by way of one additional optical unit.

Gloss detection either operates continuously or is started by an external SPC trigger signal. The gloss degree or the detected normalized vector is output at the 5 digital outputs OUT0 to OUT4, or it can be sent analog either to the voltage output 0…+10V or to the current output 4…20mA. At the same time the detected gloss degree is visualised by means of 5 LEDs at the housing of the RLS-GD.

With the TEACH button at the sensor housing the sensor can be taught the currently detected gloss degree or the normalized vector. For this purpose the corresponding evaluation mode must be set with the software. The TEACH button is connected in parallel to the input IN0 (green wire of cable cab-las8/SPS).

Through the RS232 interface parameters and measured values can be exchanged between the PC and the RLS-GD sensor. All the parameters for gloss grade detection and normalized vector detection can be stored in the non-volatile EEPROM of the RLS-GD sensor. When parameterization is finished the gloss sensor continues to operate with the current parameters in "stand alone" mode without a PC.

In order to perform gloss degree detection the sensor must be calibrated. For this purpose a black glass inlay is required which by definition has a gloss degree of 100. Calibration is then performed with the help of the PC software. It is also possible to perform calibration to other systems. This calibration can be activated or deactivated with the PC software.

The sensor is factory-temperature-compensated. It is stable over a temperature range from 10 degrees to 60 degrees centigrade.

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1 Operation of the RLS-GD-Scope software

Hardware requirements for successful installation of the RLS-GD-Scope software:

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

The RLS-GD-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 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.

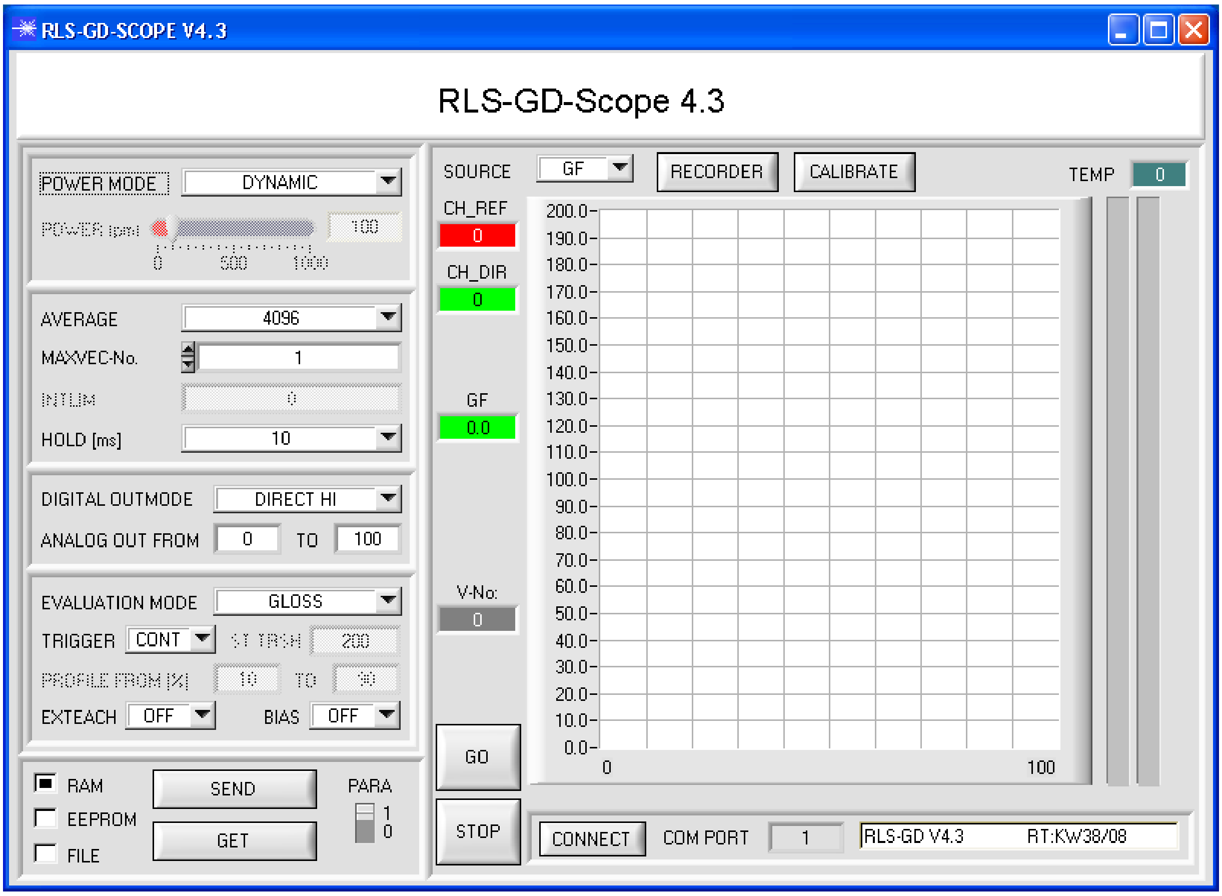
2 Operation of the RLS-GD-Scope software

2.1 Functions of the individual control elements

Please read this chapter first before you start to adjust and parameterise the RLS-GD sensor.

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

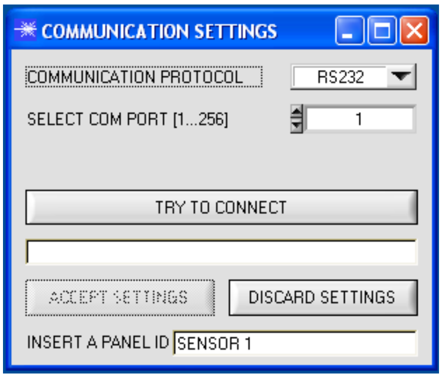
When the RLS-GD-Scope software is started, the following window appears on the Windows interface:

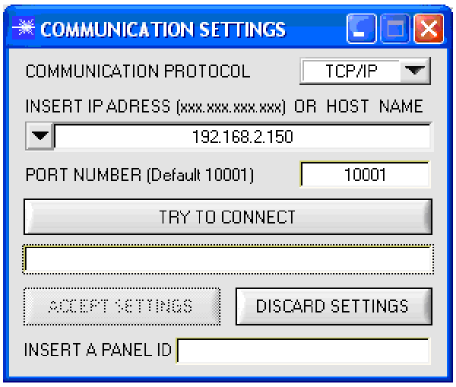


2.1.1 Explanation of general function groups and display elements

The RLS-GD-Scope software starts with the standard configuration COM1 and the respective communication status.

CONNECT:
Pressing the CONNECT button opens a window for selecting and configuring the interface. The currently set connection type is displayed beside the CONNECT button.



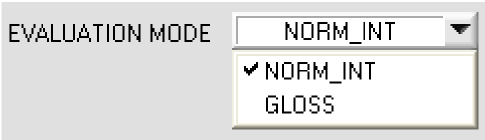


CONNECT:
The COMMUNICATION PROTOCOL function field is used for selecting either an RS232 or a TCP/IP protocol.
If RS232 is selected, a port from 1 to 256 can be selected with SELECT COM PORT, depending on which port the sensor is connected to.
If the sensor should communicate through a local area network, an RS232 to Ethernet adaptor will be needed. This adapter makes it possible to establish a connection to the sensor with the TCP/IP protocol.
The network adaptors that are available from us are based on the Lantronix XPort module. For parameterising these adapters (assigning of an IP address, setting of the Baud rate of 19200) please download the "DeviceInstaller" software that is provided free of charge by Lantronix at http://www.lantronix.com/. DeviceInstaller is based on Microsoft's ".NET" framework. Detailed operating instructions for the "DeviceInstaller" software also are available from Lantronix.
In order to establish a connection to the adaptor, its IP address or HOST name must be entered in the field INSERT IP ADRESS (xxx.xxx.xxx.xxx) OR HOST NAME. The DROP DOWN menu (down arrow) shows the last 10 IP addresses that were used. An address from this list can be directly selected by clicking on the respective item. The DROP DOWN list is saved and is thus always available when the software is closed.
The PORT NUMBER for the XPort-based network adaptors is 10001. This port number must not be changed.
When you press the TRY TO CONNECT button, the software tries to establish a connection with the set parameters. The communication status is shown in the display field. If the sensor answers with its FIRMWARE ID, the set connection type can be accepted by pressing ACCEPT SETTINGS. You will then be returned to the main panel. If you get a CONNECTION FAILURE message, the software could not establish a connection to the sensor. In this case please check if the interface cable is correctly connected, if the sensor is supplied with power, and if the set parameters are correct.
Pressing DISCARD SETTINGS exits the COMMUNICATION SETTINGS panel with the parameters that were set before the panel was started. The software can be started several times, i.e. writing can be done simultaneously in parallel to several sensors, with every sensor having its own software window. In the INSERT A PANEL ID edit-box a software panel can be assigned to a certain sensor for identification.
This ID is shown in the large gloss factor panel and in the recorder.
If a connection has been accepted by pressing ACCEPT SETTINGS, the software starts automatically with these settings when called the next time.

ATTENTION !

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 (19200 bit/s) only slow changes of the raw signals at the sensor front end can be observed in the graphic output window of the PC.
For maintaining maximum switching frequency at the sensor data communication with the PC must be stopped (press the STOP button).

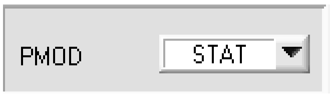
ATTENTION!
A change of the transmitter power only becomes effective at the RLS-GD sensor after actuation of the SEND button in the MEM function field!



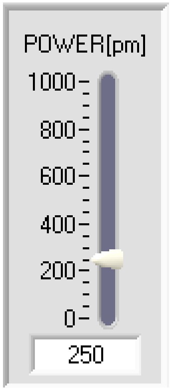
EVALUATION MODE:
The gloss sensor can be operated with two different evaluation modes.

NORM_INT:
Only the channels CH_DIR (direct reflection) and CH_DIF (diffuse reflection) are used for evaluation.
From the two values of CH_DIR and CH_DIF a NORM signal and an INTENSITY are calculated and evaluated (see below).

GLOSS:
The channels CH_REF (reference channel) and CH_DIR are used for evaluation. Before this evaluation mode can be used, however, the sensor must be calibrated (see below).
After successful calibration the sensor determines the gloss degree of the respective surface and outputs this in digital and analog form.



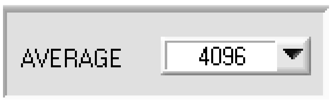
PMOD:
In this function field the operating mode of automatic power correction at the transmitter unit can be set.



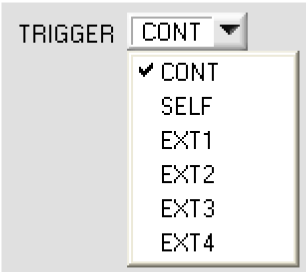
STAT:
The LED transmitter power is constantly kept at the value set with the POWER slider. This operation mode is the recommended if EVALUATION MODE = NORM_INT is selected.

DYN:
The LED transmitter power is dynamically controlled in accordance with the amount of radiation that is diffusely reflected from the object. By using the intensities measured at the receivers the automatic control circuit attempts to adjust the transmitter power in such a way that the dynamic range is not exceeded. This operation mode is the recommended if EVALUATION MODE = GLOSS is selected.

POWER:
In this function field the intensity of the transmitter LED can be adjusted by using the slider or by entering a value in the edit box. A value of 1000‰ means full intensity at the transmitter LED, a value of 0 stands for the lowest transmitter intensity adjustment! With dynamic transmitter power the POWER slider is not active, because the sensor automatically regulates the LED power.



AVERAGE:
This function field is used for adjusting the number of scanning values (measurement values) over which the raw signals measured at the receivers are averaged. A higher AVERAGE default value reduces noise of the raw signals at the receiver unit and there will be a decrease of the maximal available switching frequency of the RLS-GD sensor.



TRIGGER:

This function field serves for setting the trigger mode at the RLS-GD sensor.

CONT:

Continuous gloss value detection (no trigger event required).

SELF:

As long as the CH_DIR channel is higher than ST TRSH (Self Trigger Threshold), measurement values are recorded in an internal buffer. Once CH_DIR is lower than ST TRSH again, a mean value is determined from the number of recorded measurement values, and this mean value is then output. Please not here that the first 10 percent and the last 10 percent of the recorded values are discarded. Otherwise this mode exactly corresponds with the functionality of EXT3, the only difference is the type of triggering. SELF means internal self-triggering, and EXT3 means external triggering through the physical IN0 input.

EXT1:

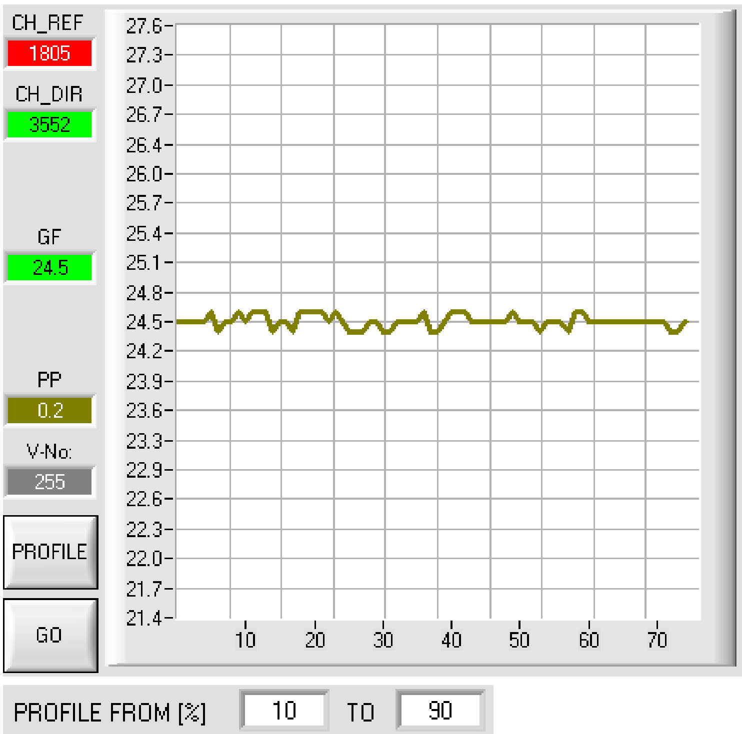
Evaluation is started through the external trigger input (IN0 pin3 green of cable cab-las8/SPS) or through clicking the TEACH button. A trigger event is recognized as long as +24V is present at the IN0 input (HIGH active).
While IN0 is high (+24V), the detected states (vectors) are output, too.
After the trigger input goes to LOW again, the state (V-No.:) that was last detected will be held at the outputs.

EXT2:

Same behaviour as in EXT1 mode, with the difference that an error state (V-No.: = 255) will be output after the trigger input goes to LOW again.

EXT3:

As long as input IN0 is high (+24V), measured values are recorded in an internal buffer. When the input has dropped again, an average is formed from the number of the recorded measured values and is then output. Please note here that the first 10 percent and the last 10 percent of the recorded values are discarded.

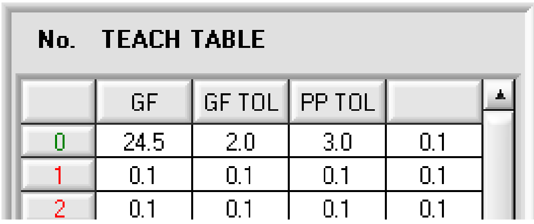


Pressing the PROFILE button shows the internally recorded buffer that is used for evaluation on the graphic display. The display furthermore shows PP [pm], the peak-to-peak value.
A double-click with the left mouse button performs automatic scaling of the X and Y axes. A single click with the left mouse button cancels this scaling again.

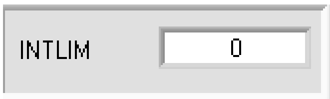
PROFILE FROM defines the range in which the recorded buffer is evaluated.

EXT4:

The transmission LED is active and evaluation is running as long as input IN0 is high (+24V) or as long as the button at the housing is pressed. When IN0 drops again or the button is released, the last recognised state remains present and the transmission LED goes off.
This trigger mode was introduced to reduce the strain on the transmission LED. If the transmission LED is a UV LED it is recommended to operate with this mode.

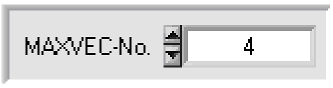


In evaluation mode NORM_INT, the peak-to-peak value is only visualised.
In evaluation mode GLOSS, PP is used for evaluation. If the current PP value is higher than PP TOL, an error will be output.
Reason: A wide scattering in a profile might be averaged in such a way that the gloss factor fits although the product varies too much.

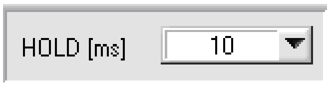


INTLIM:
This edit box is used for setting an intensity limit. Gloss evaluation is stopped, if the current intensity INT=(CH_L+CH_C_+CH_R)/3 arriving at the receiver unit falls below this limit, and ERROR STATE (V-No.: =255) is output.

INFO:
The INTLIM functionality only is available in EVALUATION MODE NORM_INT.
This function field has no effect when the EVALUATION MODE GLOSS is used.



MAXVEC-No.:
This function field serves for setting the number of gloss degrees or normalized vectors to be checked.
In the BINARY modus the maximum number of gloss degrees to be checked is 31. In the DIRECT HI or DIRECT LO modus the maximum number of gloss degrees to be checked is 5 (No. 0,1,2,3,4). The numerical value set here determines the currently possible scanning rate of the sensor. The less the vectors to be checked, the faster the operation of the RLS-GD sensor.
The numerical value set here refers to the number of rows (starting with row 0) in the → TEACH TABLE.



HOLD:
The RLS-GD sensor operates with minimum scanning times in the magnitude of less than 150µs. This is why most of the PLC that are connected to the digital outputs OUT0 … OUT4 have difficulties with the safe detection of the resulting short switching state changes. For the digital outputs of the RLS-GD sensor pulse lengthening of up to 100 ms can be set by selecting the corresponding HOLD value.

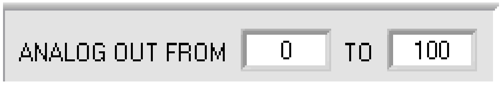
DIGITAL OUTMODE:
This group of buttons offers the method of how to control the 5 digital outputs.

BINARY:
If in this row-by-row comparison the current gloss grades or normalized vectors correspond with the teach-in parameters entered in the TEACH TABLE, this gloss degree or normalized vector in the TEACH TABLE is displayed as a vector number (V-No.) and is sent to the digital outputs (OUT0 ... OUT4) as a **bit pattern**.
The maximum number of gloss degrees or normalized vectors to be taught is 31.

DIRECT:
In this mode the maximum number of gloss degrees or normalized vectors to be taught is 5.
If in this row-by-row comparison the current parameters correspond with the teach-in parameters entered in the TEACH TABLE, this gloss degree or normalized vector in the TEACH TABLE Is displayed as a vector number (V-No.) and is sent **direct** to the digital outputs (OUT0 ... OUT04).I

DIRECT HI:
If **DIRECT HI** is activated and if a line vector (V-no.: 0…4) is detected in the TEACH TABLE, the special digital output (OUT0 … OUT4) is set to HI. If no line vector was detected, the digital outputs are in LO status (no LED is lighting).

DIRECT LO:
If **DIRECT LO** is activated and if a line vector (V-no.: 0…4) is detected in the TEACH TABLE, the special digital output (OUT0 … OUT4) is set to LO, while the other ones are set to HI. If no line vector was detected, the digital outputs are in HI status (all LEDs are lighting).



ANALOG OUT FROM:

These function groups are used for selecting the output mode of the analog outputs.

The gloss sensor features a 4 to 20mA current output and a 0 to 10V voltage output.
Depending on the model the gloss sensor can measure a gloss rate of up to 2000 GU (Gloss Units).
The calculated NORM can have values between 0 and 1000.
Depending on the EVALUATION MODE, either the gloss rate or the norm value will be output in analog form.
The above function field is used to inform the sensor about the sector of the total measuring range that should be output (zoom function).

Example 1: ANALOG OUT FROM 0 TO 100 :

Gloss factor in GU (Gloss Unit)	Voltage output	Current output
25	2,5 V	8mA
75	7,5V	16mA

Example 2: ANALOG OUT FROM 0 TO 50 :

Gloss factor in GU (Gloss Unit)	Voltage output	Current output
25	5 V	12mA
75	10V (außerhalb)	20mA (außerhalb)

Example 3: ANALOG OUT FROM 50 TO 100 :

Gloss factor in GU (Gloss Unit)	Voltage output	Current output
25	0 V (außerhalb)	4mA (außerhalb)
75	5V	12mA

Example 4: ANALOG OUT FROM 0 TO 2000 :

Gloss factor in GU (Gloss Unit)	Voltage output	Current output
250	1,25 V	4mA
750	3,75V	8mA

EXTERN TEACH:

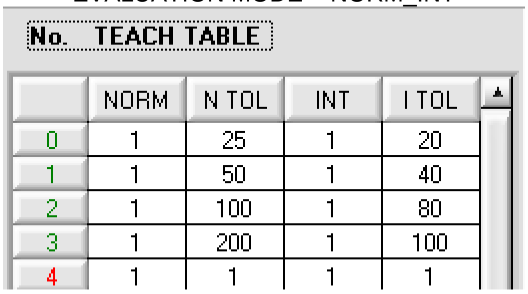
When EXTERN TEACH is activated, the currently present gloss degree or normalized vector (depending on EVALMODE) can be written to the TEACH TABLE by way of the external IN0 input or the TEACH button. The currently present line vector is automatically taken over, starting with line 0, in as many lines as is set in MAXVEC-No..

The advantage is that the user does not have to start the parameterisation software for this purpose.

Please note that when this evaluation mode is selected, the tolerances must at the beginning be stored once to the EEPROM.

Furthermore, the MAXVEC-No. also must be set first, and must also be stored in the EEPROM.

EVALUATION MODE = NORM_INT



EVALUATION MODE = GLOSS

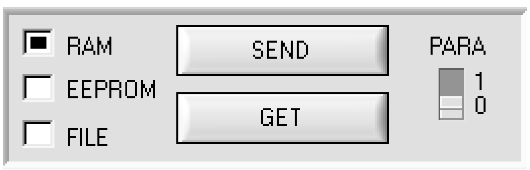
ATTENTION!
When the EXTERN TEACH mode is activated, external triggering with EXT1, EXT2, EXT3, and EXT4 is not possible, because the sensor only has one input.

The TRIGGER function field will no longer be active.

BIAS:

In evaluation mode GLOSS, the gloss factor value can be influenced by means of BIAS.

The sensors can be calibrated to other systems. This function is activated with BIAS = ON.
For details see below under BUTTON CALIBRATE.



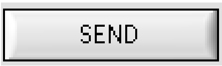
RAM, EEPROM, FILE :

This group of buttons controls parameter exchange between PC and sensor through the serial RS232 interface.

PARA:

With this switch the display of the TEACH TABLE at the PC screen can be switched on and off.

1: Display of function fields for entering and selecting general monitoring parameters.
0: Display of the TEACH TABLE for entering the individual parameters for the teach-in vectors.



[F9]

SEND:

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).

[F10]

GET:

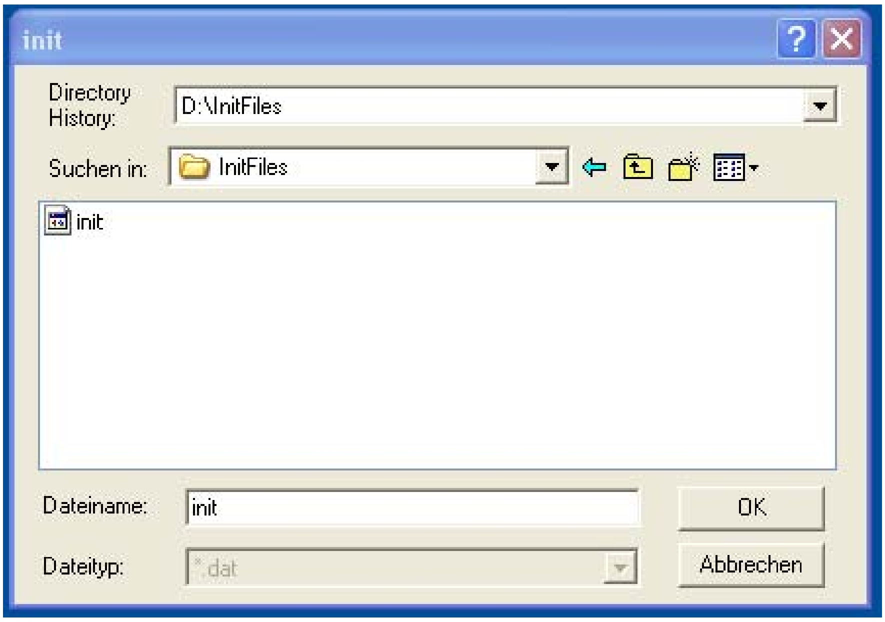
The currently set values can be interrogated from the sensor by clicking on the GET button (or with shortcut key button F10). The source of data exchange is determined by the selected button (RAM, EEPROM, or FILE).

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

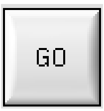
EEPROM: The current parameters are written into the non-volatile memory of the EEPROM in the sensor, or they are read from the EEPROM, **i.e. the parameters in the internal EEPROM are stored when the voltage at the sensor is switched off.**

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.



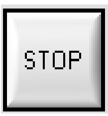
If another output file should be accessed, the file button must first be activated with the mouse pointer. Another dialog field then opens, in which an existing output file can be selected, or in which a file name for a new output file can be entered.



[F11]

GO:

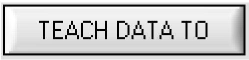
A click on this button (or pressing shortcut key button F11) starts data transfer from the RLS-GD sensor to the PC through the serial RS232 interface.
The currently measured data are shown in the corresponding display elements on the PC user interface.



[F12]

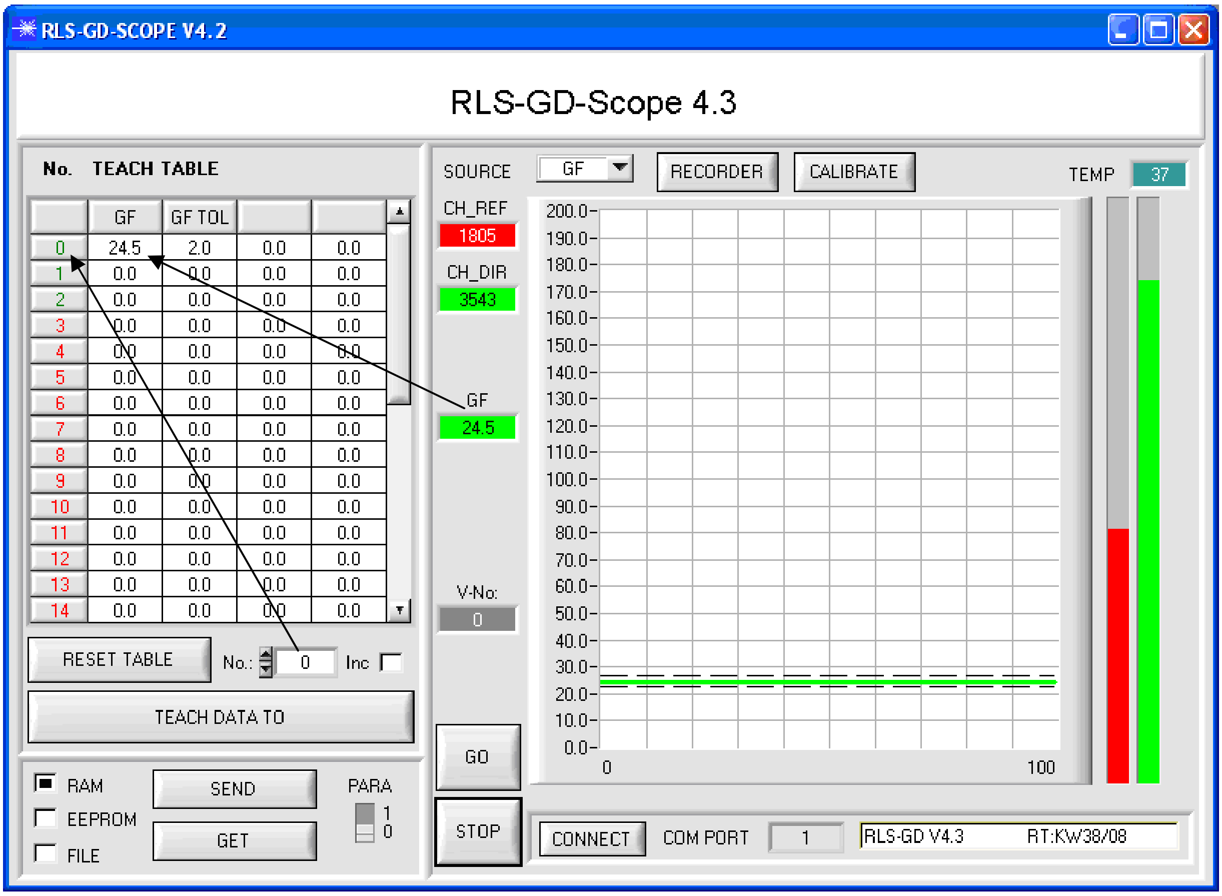
STOP:

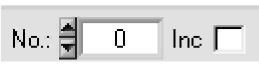
A click on this button (or pressing shortcut key button F12) stops data transfer from the RLS-GD sensor to the PC through the serial RS232 interface.



TEACH DATA TO:

A click on this button starts an automatic teach-in process. The current measured values are defined as teach-in values. The teach-in values are assigned to the teach-in gloss value selected in the **No.:** function field. The graph visualizes the current gloss factor. A tolerance window is applied around the taught gloss factor. In the graph this tolerance window is displayed as a black dashed line.
According to No.: the respective tolerance will be displayed.





No.:

The line into which the current teach vector should be stored is selected with No.:

Inc:

When Inc is activated, and the TEACH DATA TO button is pressed, the No.: input field is automatically incremented (increased) by 1, i.e. the next line in the TEACH TABLE is selected.

RESET TABLE:

A click on this button resets the TEACH TABLE (RESET value = 1).

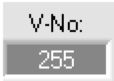
These displays indicate the data that are currently measured at the receiver.
CH_REF = Reference channel
CH_DIR = Direct reflection
CH_DIF = Diffuse reflection

On the right side of the graph the data are additionally visualised in the form of bars.

The NORM and INT displays show the norm and intensity values that are calculated from the measurement data.

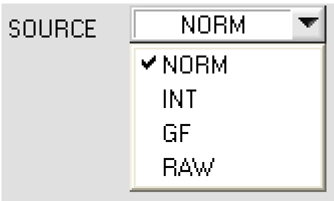
This display shows the calculated gloss factor.
The gloss factor is shown in percent.
A double-click on this display calls up a large display.

This display shows the current temperature that is measured in the sensor housing (!!! not in °C).



V-No.:
This numerical value output field displays the currently detected vector number in accordance with the entry in the TEACH TABLE. The currently detected vector number is sent to the digital outputs OUT0 … OUT4 as a corresponding bit pattern. If value 255 is displayed, no value has been detected that corresponds to the values taught to the Teach Table.
A double-click on this display calls up a large display.

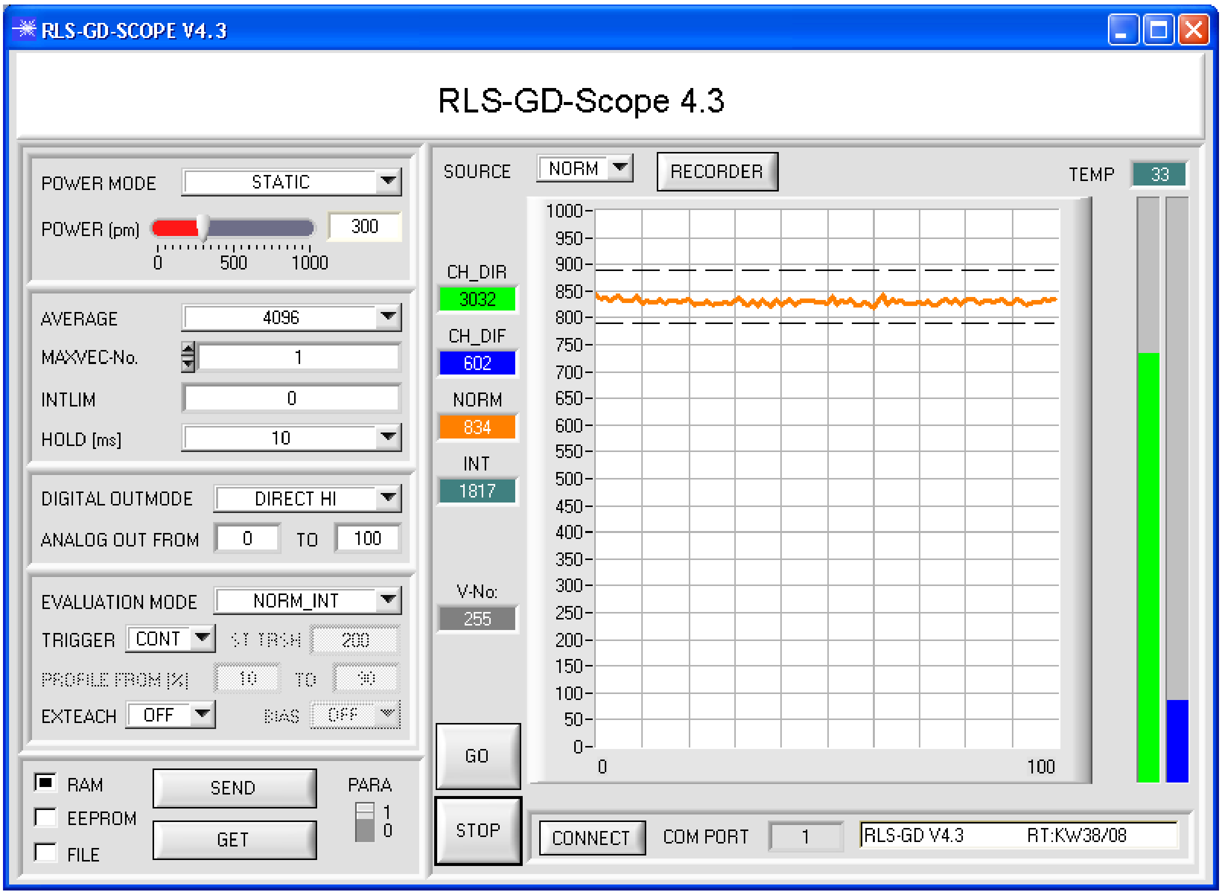
Please note:	**The above-mentioned 5 output fields are only updated when data transfer between PC and RLS-GD sensor is active (GO button pressed).**



SOURCE:
A click on the arrow button opens a selection field for the selection of a display mode in the graphic display window.

NORM	The current NORM is displayed in the graph (range of values 0 … 1000).
INT	The current intensity is displayed in the graph (range of values 0 … 4096).
GF	The current gloss factor is displayed (range of values 0 … 2000).
RAW	The current raw signals are displayed.

2.1.2 EVALUATION MODE NORM_INT

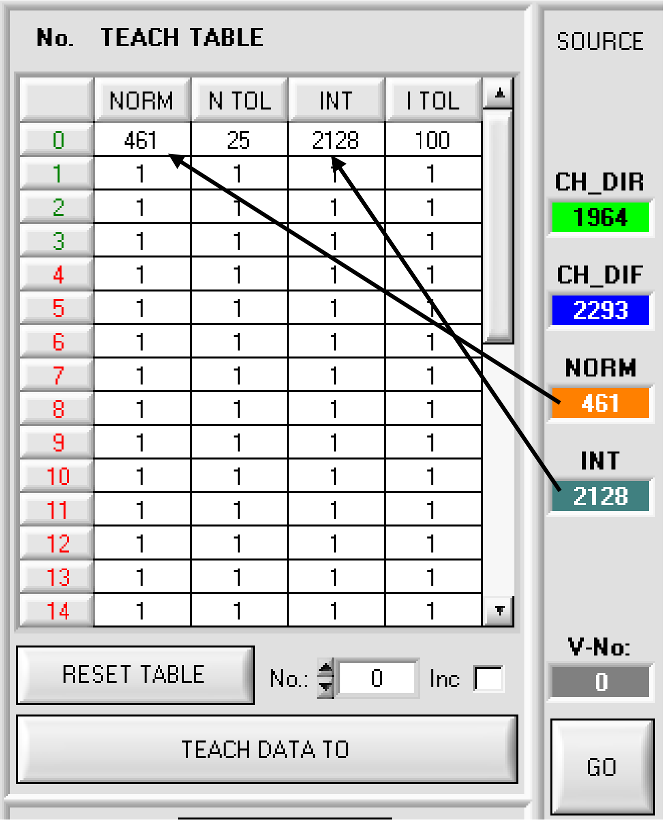


In EVALUATION MODE NORM_INT only the two channels CH_DIR (direct reflection) and CH_DIF (diffuse reflection) are used for evaluation. From the channels CH_DIR and CH_DIF a NORM signal and an intensity are formed according to the formulas below:

$$NORM = \frac{CH\_DIR}{CH\_DIR + CH\_DIF} * 1000 \qquad INT = \frac{CH\_DIR + CH\_DIF}{2}$$

The current values for CH_DIR, CH_DIF, NORM and INT are shown in displays on the PC user interface.
CH_DIR and CH_DIF in addition are visualised in the form of bars at the right side of the graph.
SOURCE is used to select the signal that should be visualised in the graph.

For teaching, the PARA switch must be set to 0.
When PARA has been switched over, the setting parameters will disappear and the TEACH TABLE will be displayed.
The sensor can be taught a total of 31 TEACH vectors.

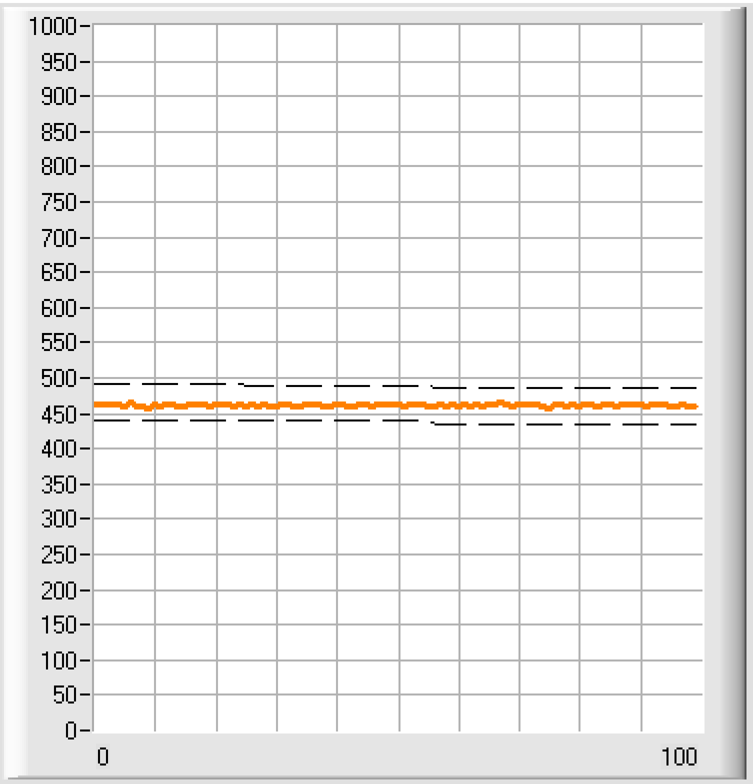


	NORM	N TOL	INT	I TOL
0	461	25	2128	100
1	1	1	1	1
2	1	1	1	1
3	1	1	1	1
4	1	1	1	1
5	1	1	1	1
6	1	1	1	1
7	1	1	1	1
8	1	1	1	1
9	1	1	1	1
10	1	1	1	1
11	1	1	1	1
12	1	1	1	1
13	1	1	1	1
14	1	1	1	1

When the GO button is pressed, the NORM and INT data that are currently calculated in the sensor are shown on the PC user interface.
When the TEACH DATA TO button is pressed, the data for NORM and INT are written to the line in the TEACH TABLE that is selected under No.:.

N TOL is used for setting a plus/minus tolerance for the taught NORM signal. The value of 25 can be changed by the user. For this purpose the corresponding cell in the TEACH TABLE must be selected either with a double-click or with function key F2.
The higher the value of N TOL, the more insensitive the sensor will be.
I TOL is used for setting a plus/minus tolerance for the taught intensity.

Once a vector has been taught, the information is transferred to the sensor by pressing the SEND button.
When the SEND button is pressed, the sensor stops data polling.
In order to check whether the sensor has adopted the teach vector, the GO button must be pressed again.
The currently detected line is displayed under V-No:.

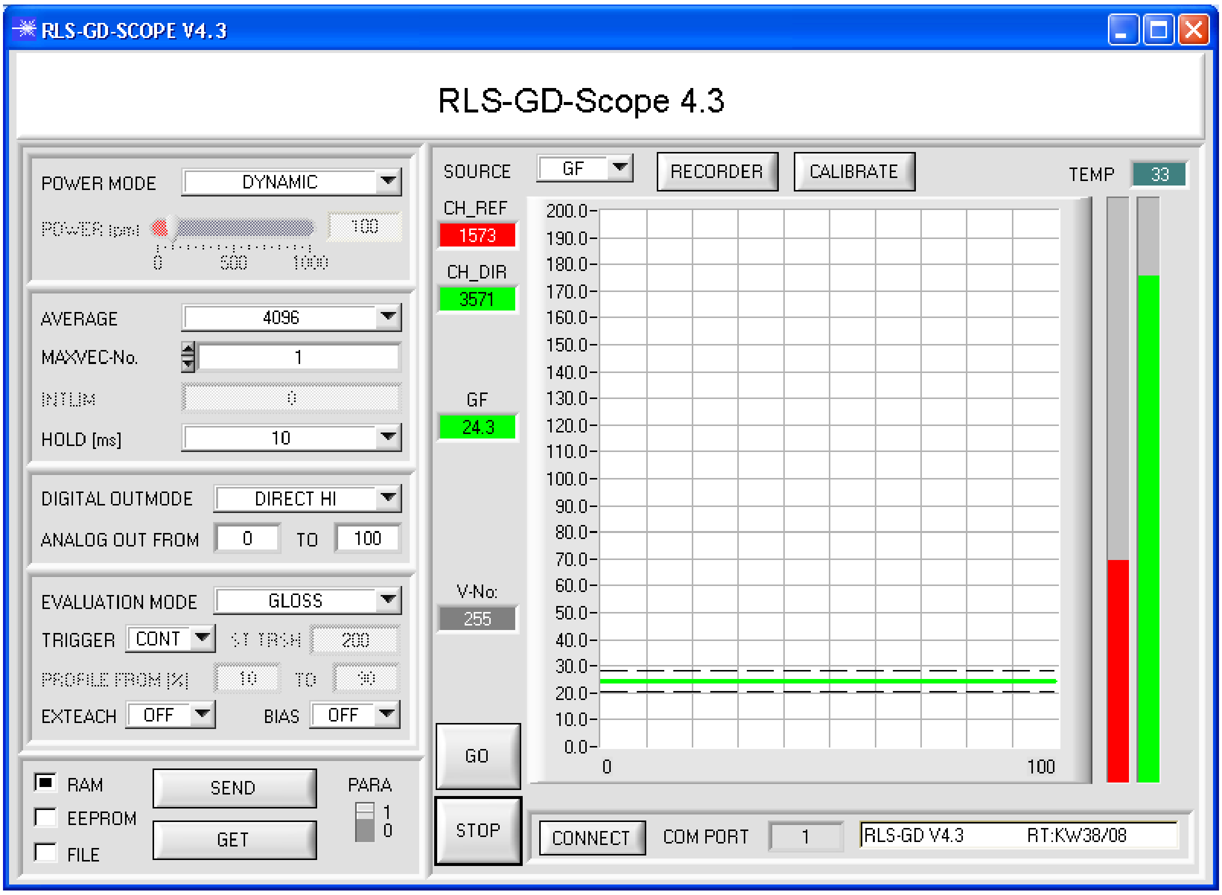


SOURCE is used for selecting which signal (NORM or INT) should be shown in the graphic display. In addition to the signal, the tolerance window that was selected under No.: is also displayed.

Please note!
The value range for the NORM signal is 0 … 1000.
The value range for the INT signal is 0 … 4096.

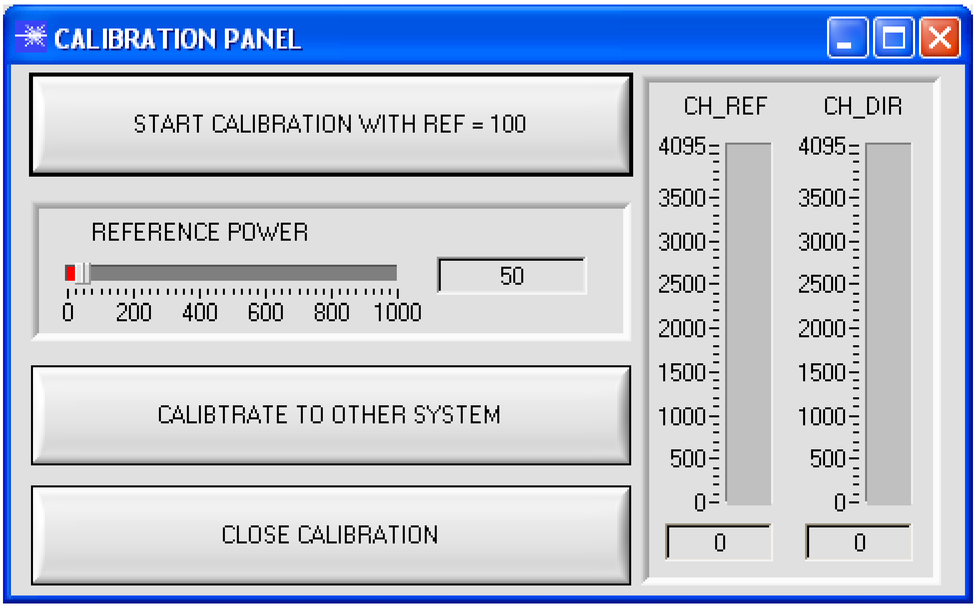
When PMOD = DYN is selected, the sensor tries to regulate the white-light LED such that a certain intensity arrives at the sensor.
It does therefore not make any sense to evaluate the intensity here, because the intensity is pre-set.
It rather makes sense here to evaluate the intensity with which the white-light LED is controlled.
I.e. in PMOD = DYN the displayed INT is the intensity of the white-light LED, and the value range for INT in this case is 0 … 1000.

2.1.3 EVALUATION MODE GLOSS



In EVALUATION MODE GLOSS only the two channels CH_REF (reference channel) and CH_DIR (direct reflection) are used for evaluation. The gloss factor is calculated from the channels CH_REF and CH_DIR, and is shown in the graphic display and in the numerical display.
A double-click on the numerical display GF opens a large numerical display.
Double-clicking in the graph starts automatic scaling. This automatic scaling is switched off again with a single mouse-click on the Y-axis.

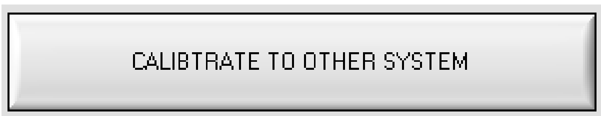
The sensor must be calibrated first before it can be operated in evaluation mode GLOSS.
Sensor calibration should be performed from time to time, because dirt may accumulate on the optical unit. A reference surface which by definition has a gloss factor of 100 is required for calibration.
The sensor must be placed in the holder with the reference surface.
The calibration mode can then be started by pressing CALIBRATE.



When you press START CALIBRATION, you will be asked to place the reference calibration surface with a gloss factor of 100 in front to the sensor.
Click on YES when you have placed the reference surface.
A suitable POWER will then be set at which channel CH_DIR is in the upper third of its dynamic range.
If a suitable POWER value could be found, the software informs you that calibration is now possible and that the corresponding calibration factors have been stored in the sensor's EEPROM memory.

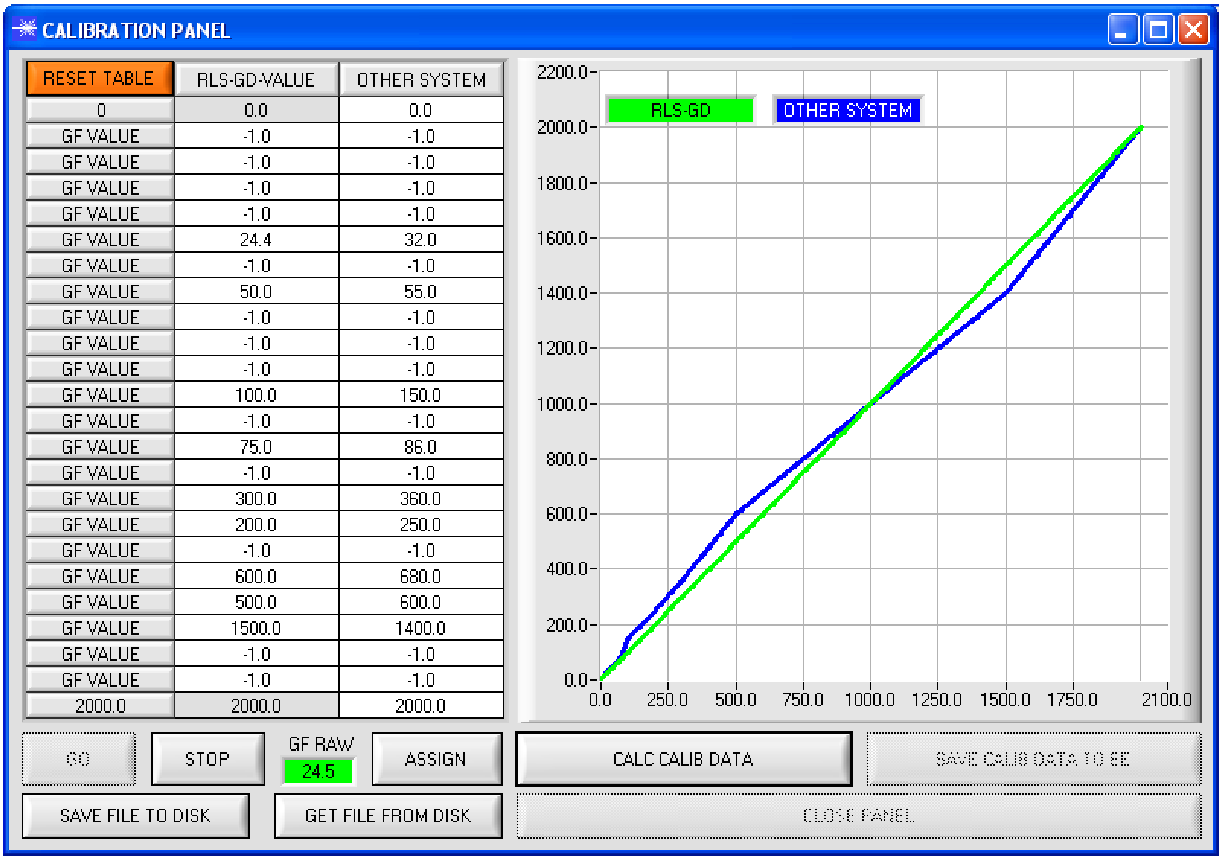
The resulting values of CH_REF and CH_DIR are kept and, upon successful calibration, are stored in the EEPROM of the sensor, i.e. it is NOT necessary to perform calibration every time the sensor is restarted.

Please note!
If there should be an error message during calibration, this may have the following causes: The reference surfaces do not have the correct distance to the sensor, or the reference surfaces are dirty. It may also be that the optical unit of the sensor is dirty, or that the PC connection is interrupted.



CALIBRATE TO OTHER SYSTEM:
After successful calibration with a reference of 100, the sensor can be calibrated to another system. This is necessary, for example, if several systems of the same type should be exactly matched to each other, or the RLS-GD should be matched to another system.
Calibration is activated with the parameter BIAS = ON.
For performing calibration to another system, press the CALIBRATE TO OTHER SYSTEM button.

The following panel will be displayed:



Plug the RLS-GD sensor into the offline holder.
Start the gloss rate display for the RLS-GD with GO and STOP.
For calibration to another system you need various reference surfaces with various gloss rates. The rows for 0 and 2000 must be filled in. As a rule a value of 0 is entered in row 0 for both systems, and a value of 2000 in row 2000 for both systems. Deactivate unused rows with -1.
Press GO and measure a reference surface at a certain position with the RLS-GD sensor. The value that is displayed under GF RAW can be directly transferred to any cell under RLS GD VALUE. Simply select a cell with a left mouse-click and then press ASSIGN. You may of course also enter the value manually by double-clicking on the respective cell.
Then use the other system to measure at the same position, and enter this value in the same row, but under the OTHER SYSTEM column. When you have measured several supporting points, press CALC CALIB DATA. The characteristic lines of the two systems are then visualised in the graph (green = RLS GD, blue = other system).

Pressing the SAVE CALIB DATA TO EE button saves the best-fit-line in the EEPROM of the sensor.
With SAVE FILE TO DISK the calibration table can be saved as a file on the harddisk.
SAVE FILE TO DISK allows you to load a previously saved file.
RESET TABLE sets all the cells except cell 0 and 2000 to -1 (deactivated)
Press CLOSE PANEL to exit the calibration function.

INFO: Press STOP first, before you transfer the data to the EEPROM.

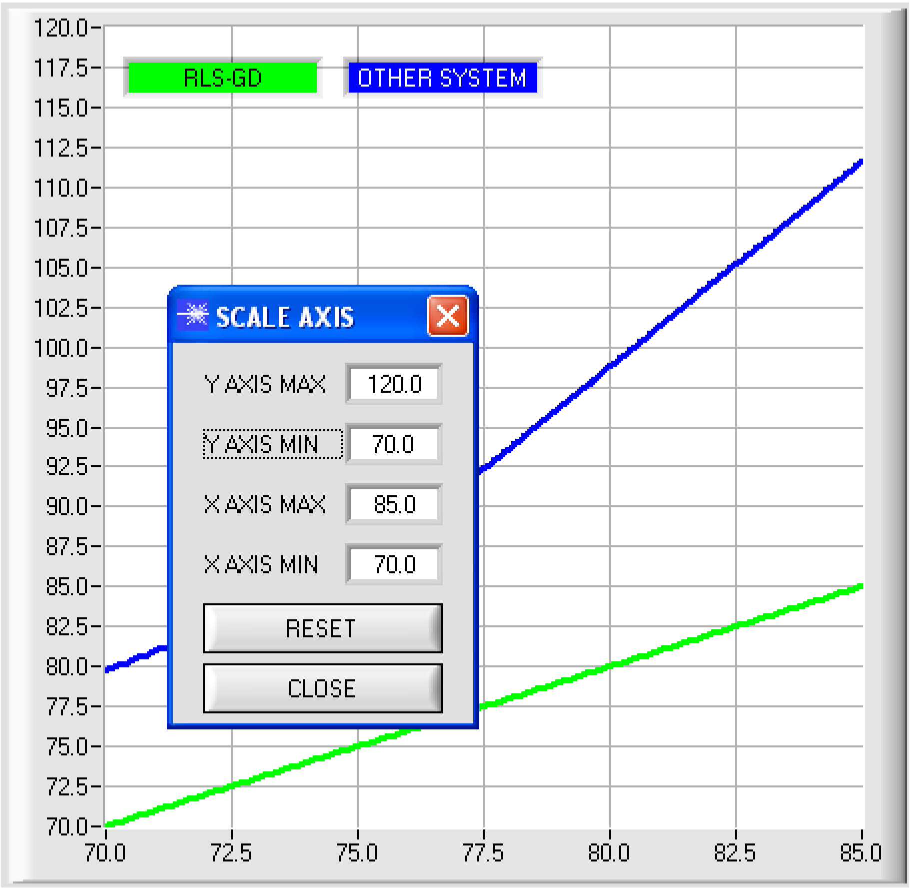
The rows in the table may be filled as desired, i.e. no special order has to be observed. The program sorts automatically. You only have to make sure that the same reference surfaces are entered in the same rows.

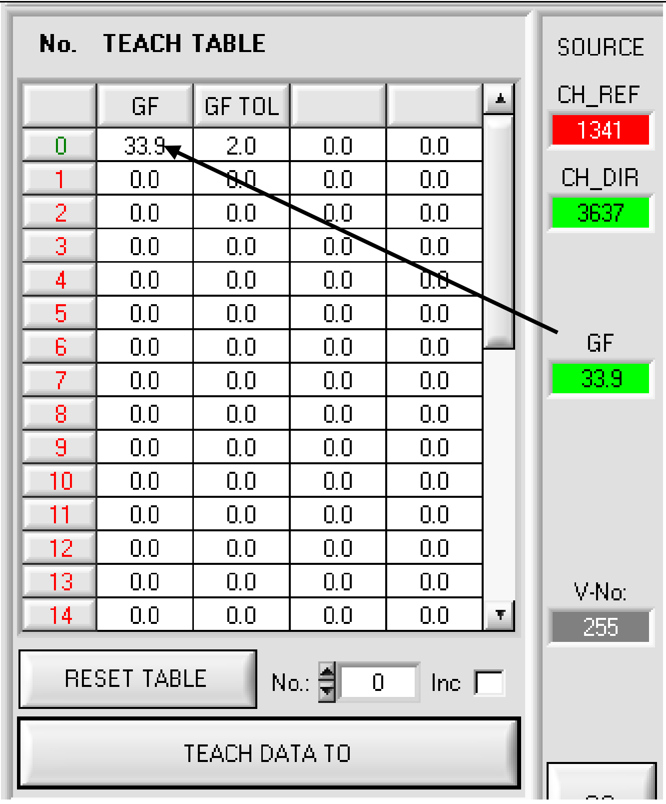
A double-click on the graph opens a panel for scaling of the axes.

With the software parameter BIAS calibration to another system can be activated with ON or deactivated with OFF.

BIAS = OFF
If the sensor detects a RAW GF of 80 this factor will be output directly.

BIAS = ON
If the sensor detects a RAW GF of 80 this factor will not be output but the value 98,5 instead.

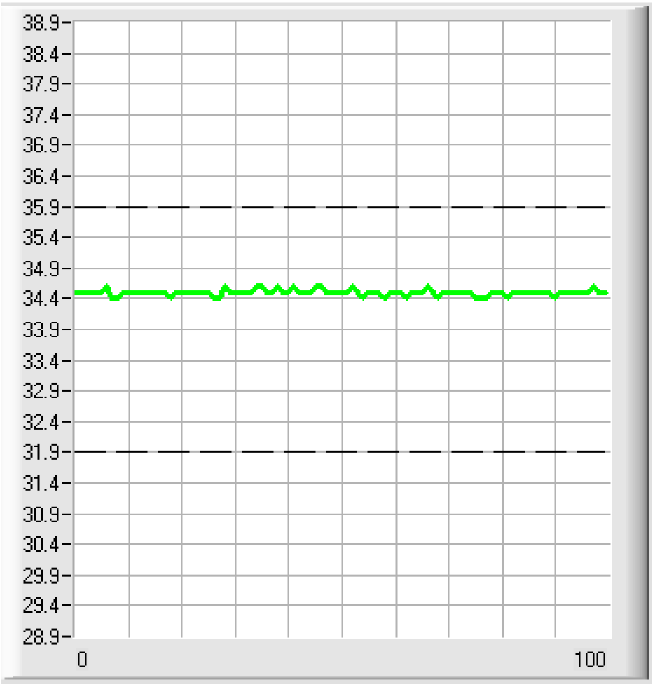




When the GO button is pressed, the value of the gloss factor that is currently calculated in the sensor is shown on the PC user interface.
When the TEACH DATA TO button is pressed, the gloss factor is written to the line in the TEACH TABLE that is selected under No:.
The sensor can be taught a maximum of 31 gloss factors.

GF TOL is used for setting a plus/minus tolerance for the taught gloss factor. The value of 20 can be changed by the user. For this purpose the corresponding cell in the TEACH TABLE must be selected either with a double-click or with function key F2. The higher the value of GF TOL, the more insensitive the sensor will be.

Once a gloss factor has been taught, the information is transferred to the sensor by pressing the SEND button.
When the SEND button is pressed, the sensor stops data polling.
In order to check whether the sensor has adopted the teach vector, the GO button must be pressed again.
The currently detected line is displayed under V-No.:



Under SOURCE the gloss factor can be selected for being displayed in the graphic display. In addition to the signal, the tolerance window that was selected under No.: is also displayed.

Please note!
The value range for the gloss factor is 0 to 2000.
Double-clicking the left mouse button in the graph starts automatic scaling. This automatic scaling is switched off again with a single mouse-click on the Y-axis.

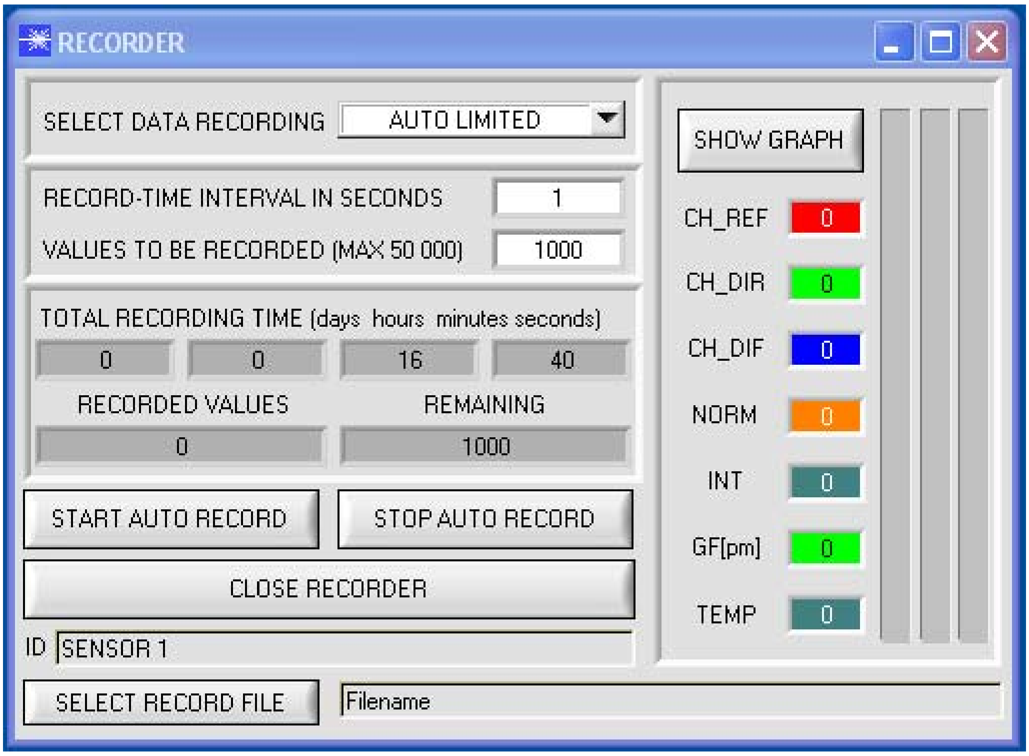
2.1.4 Function of the data recorder (RECORDER)

The RLS-GD-Scope software features a data recorder that makes it possible to save a certain number of data frames. The recorded file is saved to the hard disk of the PC and can then be evaluated with a spreadsheet program.

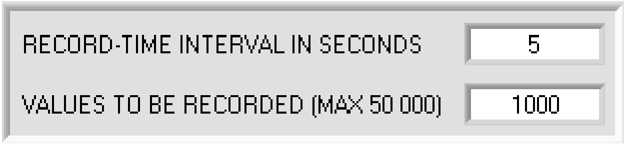
The created file has eight columns and as many rows as data frames were recorded. A row is structured as follows:
Date and time, CH_REF, CH_DIR, CH_DIF, NORM, INT, GF[pm], PP[pm], TEMP.

The following steps describe how data frames are recorded with the recorder:
Please note!:
The recording function depends on the selected EVALUATION MODE. In various EVALUATION MODES certain data are not needed and are therefore set to a value of 0, i.e. the value 0 will be recorded for these data.

Step 1:
Press the RECORDER button. The following window will be displayed:



Step 2:
If you want to automatically record several data frames, please select AUTO LIMITED under SELECT DATA RECORDING.
Enter a time interval for recording (in this example: 5, i.e. a new value is called from the sensor every five seconds). Then enter the maximum number of values you wish to record in the second input field.

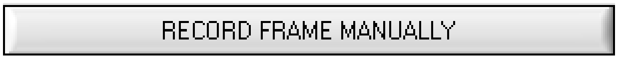


Please note:
Recording can also be stopped earlier, the data recorded so far will not be lost.

These fields indicate how long recording will take (in days, hours, minutes, and seconds) if all data are recorded.

Step 3:
By pressing the button SELECT RECORD FILE a file can be selected in which the data frame will be stored.
If you select an already existing file name, you will be asked whether you want to overwrite the existing file or not.

Step 4:
Pressing the START AUTO RECORD button starts automatic data recording.

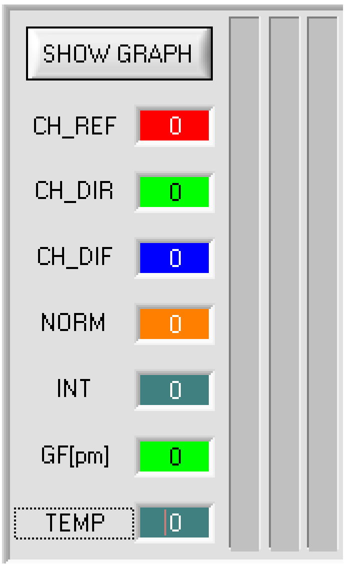


The recorder starts to record data, and the button is red to indicate that recording is active.

The respective data frames are shown in the display windows.

In the two display fields RECORDED VALUES and REMAINING you can check how many data frames have been recorded, and how many frames remain to be recorded.

Pressing the SHOW GRAPH button opens a graphic window that displays the recorded values

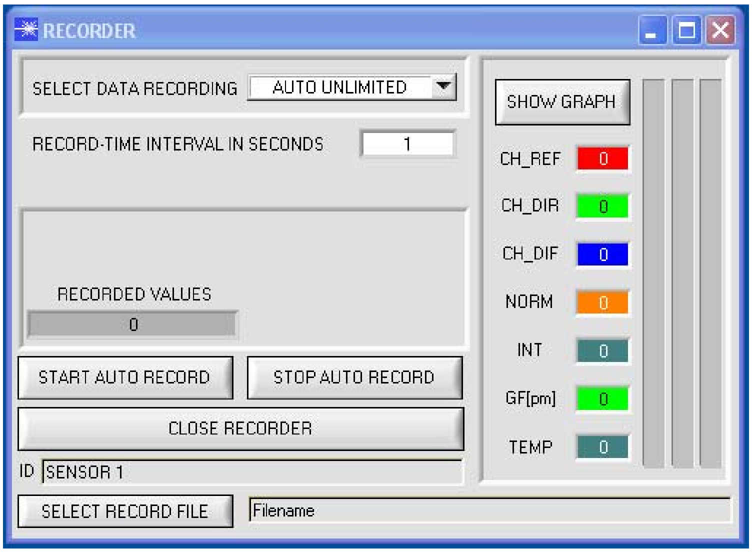


Please note:
During recording the two input fields RECORD-TIME INTERVAL and VALUES TO BE RECORDED are inactive.

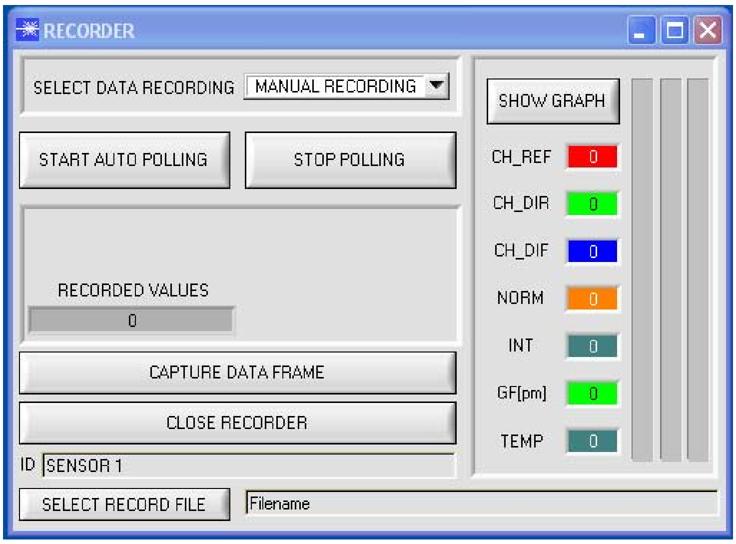
Step 5:
When all the data frames set under VALUES TO BE RECORDED have been recorded, or when the STOP AUTO RECORD button is pressed, a pop-up window will appear which confirms that the file is stored.

Step 6:
Press the CLOSE RECORDER button to close the recorder and return to the main program.

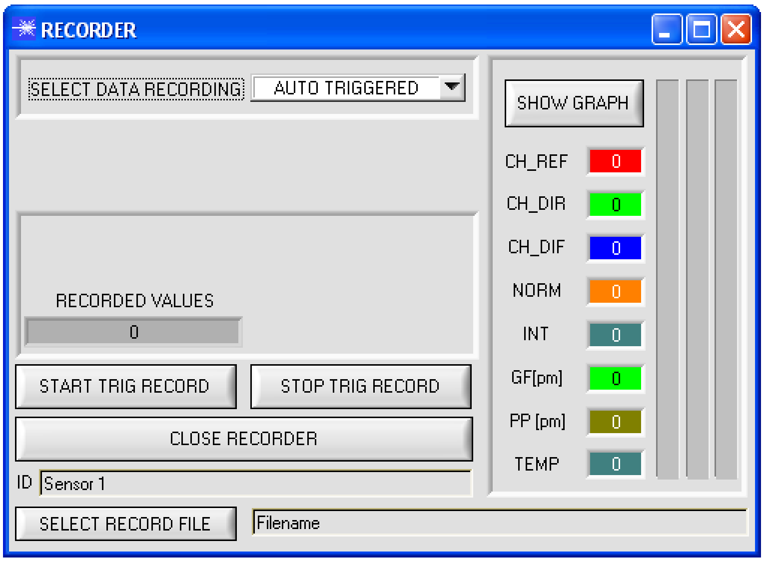
If you want to record an unlimited number of data, please select the AUTO UNLIMITED function under SELECT DATA RECORDING. Select the desired recording interval and press START AUTO RECORD.



If you want to record data "manually", please select the MANUAL RECORDING function under SELECT DATA RECORDING.
You can start reading data from the sensor by pressing the START AUTO POLLING button. These data are visualised in the display window. Pressing the CAPTURE DATA FRAME button saves a data frame in the file that was selected under SELECT RECORD FILE. The RECORDED VALUES field shows the sum of the frames already recorded.

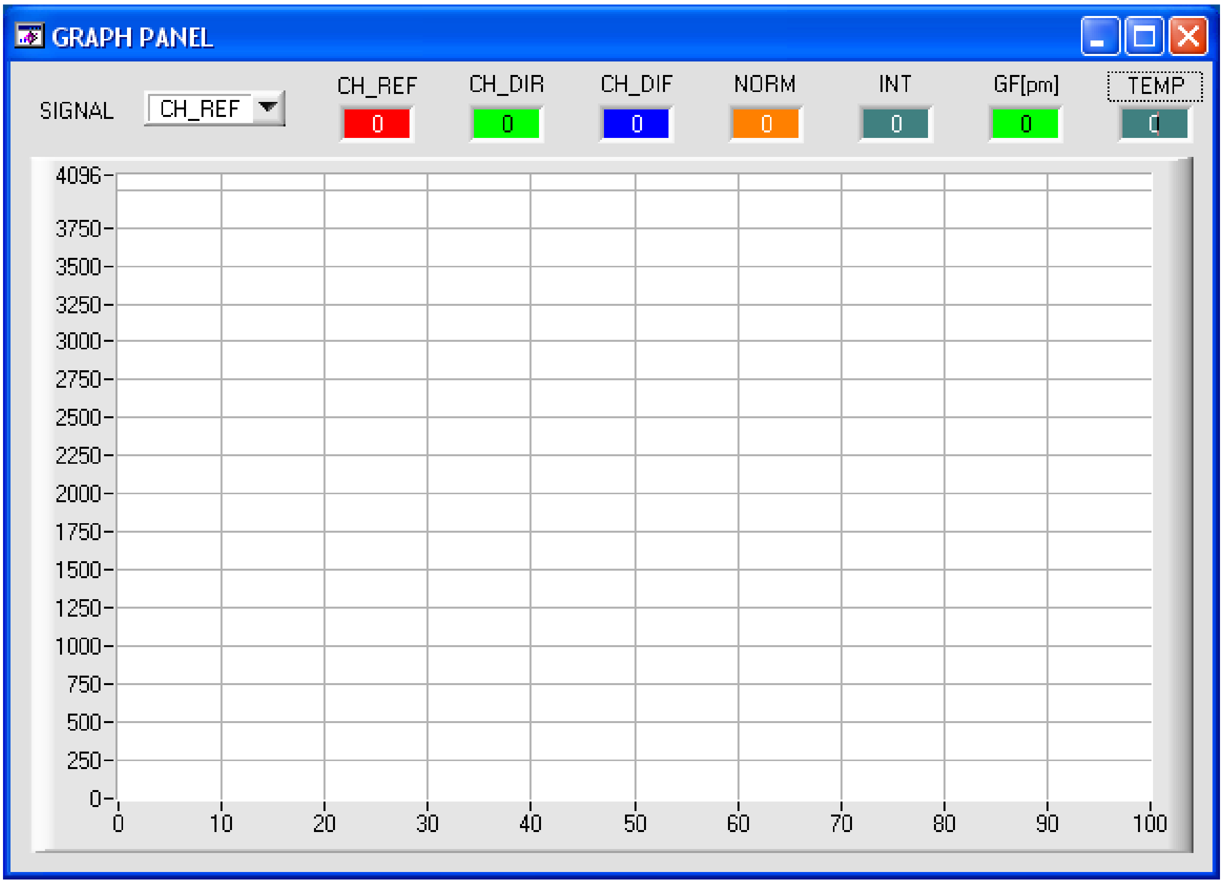


If SELECT DATA RECORDING is set to AUTO TRIGGERED, and TRIGGER = SELF, EXT1, EXT2, EXT3, or EXT4 the sensor will automatically send a data frame after each drop of the trigger when START TRIG RECORD is pressed. This data frame is recorded by the recorder.
Pressing the STOP TRIG RECORD button terminates the automatic sending function of the sensor again.



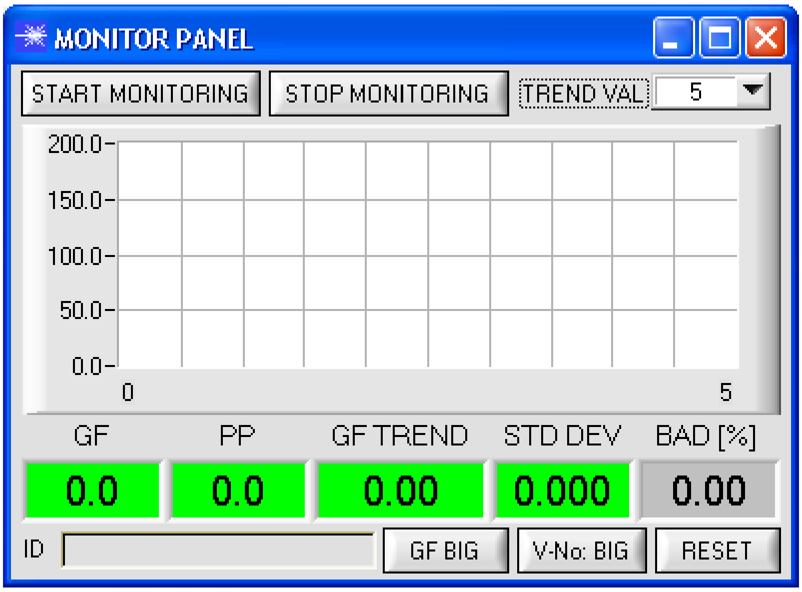
Please note:
When you press START AUTO RECORD, the file that is selected under SELECT RECORD FILE will be deleted. With RECORD FRAME MANUALLY, the file will be created if it does not already exist. If the file already exists, the data are added to the existing file.

When the SHOW GRAPH button is pressed, a panel will be displayed that allows the user to monitor the different signals. The individual signals can be activated from the SIGNAL drop-down menu.



2.1.5 Monitoring function

The monitoring function is only available if EVALUATION MODE = GLOSS is selected and if TRIGGER = SELF, EXT1, EXT2, EXT3, or EXT4. By clicking the MONITOR button the following panel is opened:



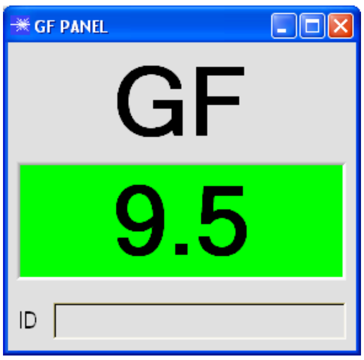
START MONITORING starts gloss factor monitoring. After every trigger event the sensor automatically sends the current gloss factor to the PC. This gloss factor is visualised in the GF display and in the graph. Under TREND VAL you can set how many of the last data frames are shown in the graphic display. The GF TREND display shows the gloss factor mean value that is calculated from the values that are displayed in the graph.

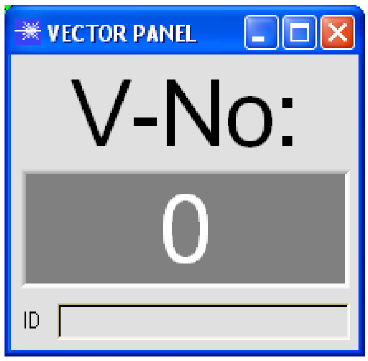
When TRIGGER = SELF or EXT3 is selected, the PP value of the current profile is also transferred and shown in the PP display window. The displayed value STD DEV visualizes the standard deviation from average GF TREND.

The background of the GF, PP, GF TREND and PP TREND display windows may either be red or green.
GF is green, if GF ± GF TL of vector 0 was recognized in the teach table.
PP is green, if PP is smaller than the value taught in row 0 of the teach table (only if TRIGGER=SELF or EXT3).

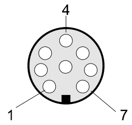
GF TREND is green, if the gloss factor mean value corresponds with vector 0 in the teach table.
The BAD[%] display shows the percentage of values recorded in the graph that do not correspond with the teach vector in row 0.

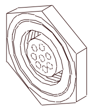
A left double-click on the display GF or a click on the button GF BIG opens a large window that displays the gloss factor.
A click on the button V-No: BIG opens a large window that displays the recognized vector.
A click on the button RESET sets all values to 0.



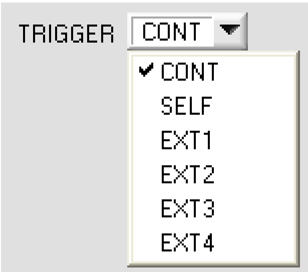


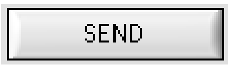
2.1.6 External triggering of the RLS-GD sensor





External triggering is performed through pin no. 3 (grn) at the 8-pole socket of the RLS-GD/PLC connection.

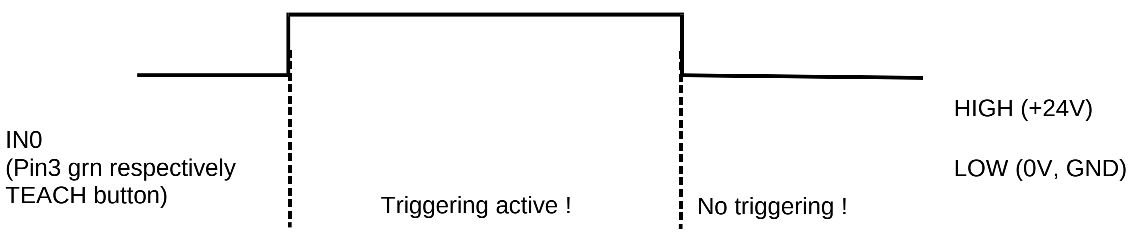




EXTERN:
First the external TRIGGER mode must be set at the sensor. For this purpose option EXT1, EXT2, EXT3, or EXT4 must be selected in the TRIGGER selection field.

PLEASE NOTE:
The new setting is only activated at the RLS-GD sensor after a click on the SEND button!

Please note: **The trigger input (IN0 PIN3 green of cable cab-las8/SPS) is HIGH active, i.e. a trigger event is detected as long as IN0 = HIGH (+24V).**



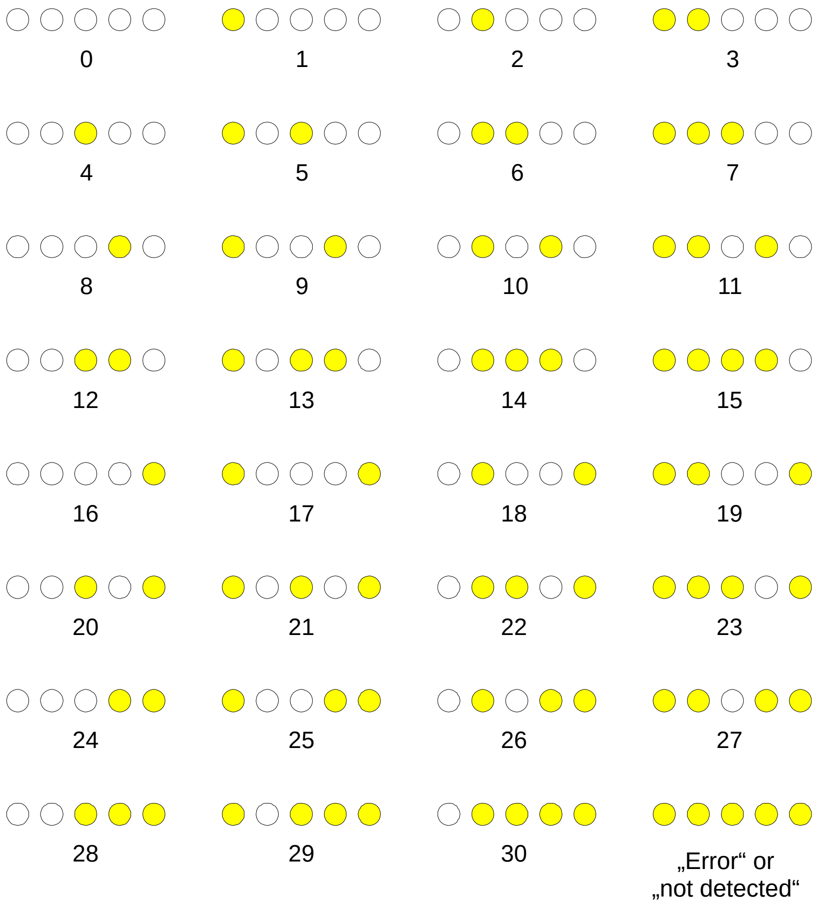
2.1.7 Function of the LED display

LED display:

BINARY

The line vector is visualised by way of 5 yellow LEDs at the housing of the RLS-GD sensor. At the same time in the binary modes (OUT BINARY) the line vector indicated on the LED display is output as 5-bit binary information at the digital outputs OUT0 to OUT4 of the 8-pin RLS-GD/PLC socket.

The RLS-GD sensor is able to process a maximum of 31 line vectors (0 ... 30) in accordance with the corresponding lines in the TEACH TABLE. An “error” or a “not detected” is displayed by the lighting of all LED (OUT0 ... OUT4) digital outputs are set to HIGH-level).

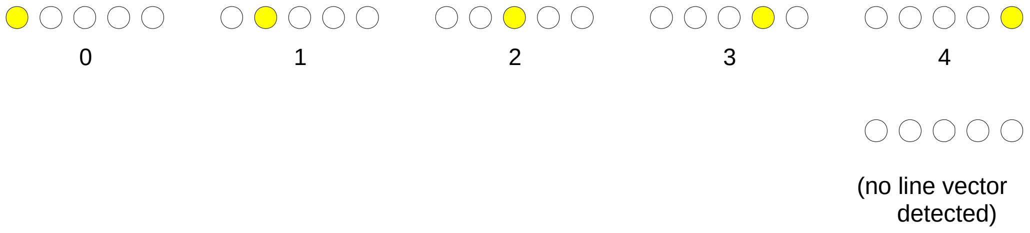


DIRECT

In the DIRECT mode (OUT DIRECT HI or OUT DIRECT LO) the maximum numbers of line vectors to be taught is 5 (no. 0, 1, 2, 3, 4).

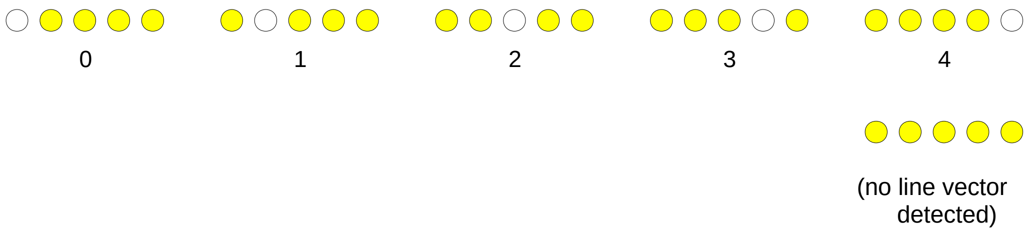
DIRECT HI:

If DIRECT HI is activated, the specially digital output is set to HI while the other 4 are set to LO.
If no line vector was detected, all digital outputs are set to LOW (no LED is lighting).



DIRECT LO:

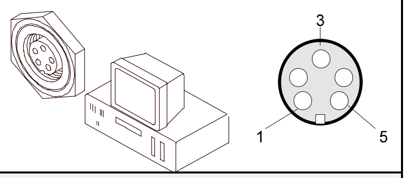
If DIRECT LO is activated, the specially digital output is set to LO, while the other 4 are set to HI.
If no line vector was detected, all digital outputs are set to HIGH (all LED are lighting).



3 Connector assignment of the RLS-GD sensor

Connection of RLS-GD to PC:

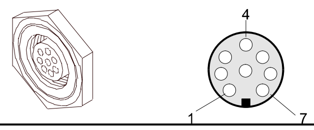
5-pole female connector (type Binder 712)
RLS-GD/PC-RS232



Pin No.:		Assignment:
1		0V (GND)
2		TxD
3		RxD
4		Not connected
5		Not connected

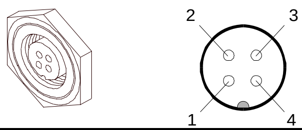
Connection of RLS-GD to PLC:

8-pole female connector (type Binder 712)
RLS-GD/PLC



Pin No.:	Color:	Assignment:
1	white	0V (GND)
2	brown	+24VDC (± 10%)
3	green	IN0
4	yellow	OUT0 (Digital 0: Type 0 … 1V, Digital 1: Type +Ub – 10%)
5	grey	OUT1 (Digital 0: Type 0 … 1V, Digital 1: Type +Ub – 10%)
6	pink	OUT2 (Digital 0: Type 0 … 1V, Digital 1: Type +Ub – 10%)
7	blue	OUT3 (Digital 0: Type 0 … 1V, Digital 1: Type +Ub – 10%)
8	red	OUT4 (Digital 0: Type 0 … 1V, Digital 1: Type +Ub – 10%)

4-pole female connector (type Binder 712)
RLS-GD/PLC



Pin No.:	Color:	Assignment:
1	white	0V (GND)
2	brown	Not connected
3	black	Analog voltage output (0 ... +10V)
4	blue	Analog current output (4 ... 20mA)

4 RS232 communication protocol

RS232 communication protocol PC ⇔ RLS GD Sensor (RLS-GD-Scope V4.3)
- Standard RS232 serial interface without hardware-handshake - 3-wire: GND (0V), TX0, RX0 - Speed: 19200 baud, 8 data-bits, no parity-bit, 1 stop-bit in binary mode, us (unsigned), MSB (most significant byte) first. The control device (PC or PLC) has to send a data frame of 18 words to the RLS-GD hardware. All bytes must be transmitted in binary format (us, MSB). The meaning of the parameters is described in the software manual. Info: 1 word = 2 bytes Method: The hardware is permanently reading (polling) the incoming byte at the RS232 connection. If the incoming word is 0x0055 (synch-word), then the 2. word (order-word) is read in, after this, 16 words (parameters) will be read. After reading in the completely data frame, the RLS-GD hardware executes the order which is coded at the 2. word (order-word).

Format of the data frame:

Word No.	*Format*	Meaning	Comment:
1	Word	sync-word = 0x0055	hex-code 0x0055, binary: 0000 0000 0101 0101, synchronisation word
2	Word	**ORDER NUMBER**	order word
3	Word	POWER	LED intensity (0 ... 1000) Attention intensity in thousendth!
4	Word	PMOD	LED mode STAT, DYN (0, 1)
5	Word	AVERAGE	Signal averaging 1,2,4,8,16,32,64,128,256,512,1024,2048,4096,8192,16384 or 32768
6	Word	EVALUATION MODE	Evaluation mode NORM_INT or GLOSS coded to (0,1)
7	Word	HOLD[ms]	Hold time 0,1,2,3,5,10,50 or 100ms coded to (0,1,2,3,5,10,50 or 100)
8	Word	INTLIM	Lower intensity limit (0 ... 4095)
9	Word	MAXVEC-No.	Number of the vectors (1,2,3,…,31)
10	Word	DIGITAL OUTMODE	Function of the digital output (0=direct/HI, 1=binary, 2=direct/LO)
11	Word	TRIGGER	Trigger mode CONT, SELF, EXT1, EXT2, EXT3, EXT4 coded to (0,1,2,3,4,5)
12	Word	EXTERN TEACH	Extern Teach OFF or ON coded to (0,1)
13	Word	ANAOUT BEGIN	Analog Output Range begin
14	Word	ANAOUT END	Analog Output Range end
15	Word	BIAS	BIAS OF or ON coded to (0,1)
16	Word	ST TRSH	Self Trigger Treshold
17-18	Word	Free	Must be sent as dummy (e.g. 2x value 0)

Value	ORDER NUMBER (parameter byte no. 2)	
0	nop	no operation
1	Save parameter from PC into RAM	Cf. Example 1
2	Save one selectable row of TEACH TABLE into RAM	Cf. Example 2
3	Send parameter from RAM to PC	Cf. Example 3
4	Send one selectable Row of TEACH TABLE from RAM to PC	Cf. Example 4
5	Send data from RAM to PC	Cf. Example 5
6	Save parameter from RAM to EEPROM	Cf. Example 6
7	Send connection OK to PC	Cf. Example 7
8	Load Parameter from EEPROM to RAM	Cf. Example 8
9	Send Profile to PC	Cf. Example 9
20	Send line ok = 0x0055, 0x0014, 0x00AA, 15 Dummies to PC	Cf. Example 20
50	Start or Stop an automatic send of a data frame after trigger	Cf. Example 50

Example 1: DATA FRAME with ORDER NUMBER = 1:

ORDER NUMBER (second word = 1): WRITE parameters from PC into RAM of the RLS-GD!
The completely data frame = 18 words must be sent to the RLS-GD hardware in binary form (sync-word / order-word / 16 parameter words).

DATA FRAME PC → RLS GD (18 WORDS)

0x0055	SYNC.-WORD
1	ORDER-WORD
200	POWER
0	PMOD
1024	AVERAGE
0	EVALUATION MODE
10	HOLD[ms]
10	INTLIM
5	MAXVEC-No.
0	DIGITAL OUTMODE
0	TRIGGER
0	EXTER TEACH
0	ANAOUT BEGIN
100	ANAOUT END
0	BIAS
200	ST TRSH
0	DUMMY
0	DUMMY

DATA FRAME RLS GD → PC (18 WORDS)

0x00AA	SYNC.-WORD
1	ORDER-WORD
200	POWER
0	PMOD
1024	AVERAGE
0	EVALUATION MODE
10	HOLD[ms]
10	INTLIM
5	MAXVEC-No.
0	DIGITAL OUTMODE
0	TRIGGER
0	EXTER TEACH
0	ANAOUT BEGIN
100	ANAOUT END
0	BIAS
200	ST TRSH
0	DUMMY
0	DUMMY

Example 2: DATA FRAME with ORDER NUMBER = 2:

ORDER NUMBER (second word = **2**): **WRITE one selectable row (vector) of TEACH TABLE into RAM of the RLS-GD!**

The completely data frame = 18 words must be sent to the RLS-GD hardware in binary form (sync-word / order-word / ROW-NO / 4 parameter words = vector, 11 dummies).

Fill unused words of the TEACH VECTOR by value word=1 in binary form.

DATA FRAME PC → RLS-GD (18 WORDS)

0x0055	SYNC-WORD
2	ORDER-WORD
0	ROW-No. (0…30)
500	NORM respectively GF
20	N TOL respectively GF TOL
500	INT respectively 1 respectively PP
30	I TOL respectively 1
1	DUMMY
1	DUMMY
1	DUMMY
1	DUMMY
1	DUMMY
1	DUMMY
1	DUMMY
1	DUMMY
1	DUMMY
1	DUMMY
1	DUMMY

DATA FRAME RLS-GD → PC (18 WORDS)

0x00AA	SYNC-WORD
2	ORDER-WORD
0	ROW-No. (0…30)
500	NORM respectively GF
20	N TOL respectively GF TOL
500	INT respectively 1 respectively PP
30	I TOL respectively 1
1	DUMMY
1	DUMMY
1	DUMMY
1	DUMMY
1	DUMMY
1	DUMMY
1	DUMMY
1	DUMMY
1	DUMMY
1	DUMMY
1	DUMMY

Example 3: DATA FRAME with ORDER NUMBER = 3:

ORDER NUMBER (second word = 3): READ parameters out of RLS-GD-RAM memory!
The same frame as example 1 must be sent to the RLS-GD hardware except of the order word that must be **3**. The values for the parameters must be sent as Dummies.
The complete DATA FRAME which is responded by the RLS-GD hardware is 18 words.

DATA FRAME PC → RLS-GD (18 WORDS)
DATA FRAME RLS-GD → PC (18 WORDS)

0x00AA	SYNC-WORD
3	ORDER-WORD
200	POWER
0	PMOD
1024	AVERAGE
0	EVALUATION MODE
10	HOLD[ms]
10	INTLIM
5	MAXVEC-No.
0	DIGITAL OUTMODE
0	TRIGGER
0	EXTER TEACH
0	ANAOUT BEGIN
100	ANAOUT END
0	BIAS
200	ST TRSH
0	DUMMY
0	DUMMY

Example 4: DATA FRAME with ORDER NUMBER = 4:

ORDER NUMBER (second word = 4): READ one selectable row (vector) from RAM of the RLS-GD!

The same frame as example 2 must be sent to the RLS-GD hardware except of the order word that must be **4**. The values for the parameters must be sent as Dummies.

The complete DATA FRAME which is responded by the RLS-GD hardware is 18 words.

DATA FRAME PC → RLS-GD (18 WORDS)
DATA FRAME RLS-GD → PC (18 WORDS)

0x00AA	SYNC-WORD
4	ORDER-WORD
0	ROW-No. (0…30)
500	NORM respectively GF
20	N TOL respectively GF TOL
500	INT respectively 1 respectively PP
30	I TOL respectively 1
1	DUMMY
1	DUMMY
1	DUMMY
1	DUMMY
1	DUMMY
1	DUMMY
1	DUMMY
1	DUMMY
1	DUMMY
1	DUMMY
1	DUMMY

Example 5: DATA FRAME with ORDER NUMBER = 5:

ORDER NUMBER (second word = 5): READ RLS-GD RAW DATA
Parameters must be sent for a constant parameter frame as dummies.
At order word **5** they do not affect the RAM or EEPROM.
ORDER NUMBER = 19 is similar. but if TRIGGER = 1 or 2 only triggered values are transmitted.

DATA FRAME PC → RLS-GD (18 WORDS)

0x0055	SYNC-WORD
5	ORDER-WORD
0	DUMMY
0	DUMMY
0	DUMMY
0	DUMMY
0	DUMMY
0	DUMMY
0	DUMMY
0	DUMMY
0	DUMMY
0	DUMMY
0	DUMMY
0	DUMMY
0	DUMMY
0	DUMMY
0	DUMMY
0	DUMMY

DATA FRAME RLS-GD → PC (18 WORDS)

0x00AA
5
CH_REF
CH_DIR
CH_DIF
NORM
INT
GF
V-No:
TEMP
GF RAW
DUMMY
DUMMY
DUMMY
DUMMY
DUMMY
DUMMY
DUMMY

Example 6: DATA FRAME with ORDER NUMBER = 6:

ORDER NUMBER (second word = 6): SAVE parameters from RAM to EEPROM of the RLS-GD!
The complete data frame = 18 words must be sent to the RLS-GD hardware in binary form (sync-word / order-word / 16 parameter words).

DATA FRAME PC → RLS-GD (18 WORDS)

0x0055	SYNC-WORD
6	ORDER-WORD
0	DUMMY
0	DUMMY
0	DUMMY
0	DUMMY
0	DUMMY
0	DUMMY
0	DUMMY
0	DUMMY
0	DUMMY
0	DUMMY
0	DUMMY
0	DUMMY
0	DUMMY
0	DUMMY
0	DUMMY
0	DUMMY

After sending this data frame, the sensor saves all the parameters and teach vectors from its RAM (volatile memory) to its EEPROM (non volatile memory).
ATTENTION: The right parameters and teach vectors must be in the RAM of the sensor. To save the parameters and teach vectors into RAM see **Example1** and **Example2.**

After completing the sensor writes back an echo of the same frame.
DATA FRAME RLS-GD → PC (18 WORDS)

0x00AA	SYNC-WORD
6	ORDER-WORD
0	DUMMY
0	DUMMY
0	DUMMY
0	DUMMY
0	DUMMY
0	DUMMY
0	DUMMY
0	DUMMY
0	DUMMY
0	DUMMY
0	DUMMY
0	DUMMY
0	DUMMY
0	DUMMY
0	DUMMY
0	DUMMY

Example 7: DATA FRAME with ORDER NUMBER = 7:

ORDER NUMBER (second word = 7): SEND CONNECTION OK from the RLS-GD to PC!
Cf. example 1:
Send the same DATA FRAME but with ORDER NUMBER 7 to the sensor.
The sensor will reply with 18 words which tell the version of the sensor.

Example 8:
DATA FRAME with ORDER NUMBER = 8:

ORDER NUMBER (second word = 8): Load parameters from EEPROM to RAM of the RLS-GD!
The complete data frame = 18 words must be sent to the RLS-GD hardware in binary form (sync-word / order-word / 16 parameter words).

DATA FRAME PC → RLS-GD (18 WORDS)

0x0055	SYNC-WORD
8	ORDER-WORD
0	DUMMY
0	DUMMY
0	DUMMY
0	DUMMY
0	DUMMY
0	DUMMY
0	DUMMY
0	DUMMY
0	DUMMY
0	DUMMY
0	DUMMY
0	DUMMY
0	DUMMY
0	DUMMY
0	DUMMY
0	DUMMY

After sending this data frame, the sensor loads all the parameters and teach vectors from it's EEPROM (non volatile memory) to it's RAM (volatile memory).
ATTENTION: The EEPROM parameters must be load first to the RAM to read it from the sensor. To get the parameters and teach vectors from RAM see **Example3** and **Example4.**

After completing the sensor writes back an echo of the same frame.

DATA FRAME RLS-GD → PC (18 WORDS)

0x00AA	SYNC-WORD
8	ORDER-WORD
0	DUMMY
0	DUMMY
0	DUMMY
0	DUMMY
0	DUMMY
0	DUMMY
0	DUMMY
0	DUMMY
0	DUMMY
0	DUMMY
0	DUMMY
0	DUMMY
0	DUMMY
0	DUMMY
0	DUMMY
0	DUMMY

Example 9: DATA FRAME with ORDER NUMBER = 9:

ORDER NUMBER (second word = 9): Send profile buffer to PC. The profile buffer contains 120 values.
Only 16 values can be send in one block. → 8 blocks must be send

The complete data frame = 18 words must be sent to the RLS-GD hardware in binary form (sync-word / order-word / 16 parameter words).

DATA FRAME PC → RLS-GD (18 WORDS)

0x0055	SYNC-WORD
9	ORDER-WORD
0	block number (0….7)
0	DUMMY
0	DUMMY
0	DUMMY
0	DUMMY
0	DUMMY
0	DUMMY
0	DUMMY
0	DUMMY
0	DUMMY
0	DUMMY
0	DUMMY
0	DUMMY
0	DUMMY
0	DUMMY
0	DUMMY

DATA FRAME RLS-GD → PC (18 WORDS)

0x00AA	SYNC-WORD
9	ORDER-WORD
Value in profile Buffer	Value (block*16)+0 in the profile Buffer
Value in profile Buffer	Value (block*16)+1 in the profile Buffer
Value in profile Buffer	Value (block*16)+2 in the profile Buffer
Value in profile Buffer	Value (block*16)+3 in the profile Buffer
Value in profile Buffer	Value (block*16)+4 in the profile Buffer
Value in profile Buffer	Value (block*16)+5 in the profile Buffer
Value in profile Buffer	Value (block*16)+6 in the profile Buffer
Value in profile Buffer	Value (block*16)+7 in the profile Buffer
Value in profile Buffer	Value (block*16)+8 in the profile Buffer
Value in profile Buffer	Value (block*16)+9 in the profile Buffer
Value in profile Buffer	Value (block*16)+10 in the profile Buffer
Value in profile Buffer	Value (block*16)+11 in the profile Buffer
Value in profile Buffer	Value (block*16)+12 in the profile Buffer
Value in profile Buffer	Value (block*16)+13 in the profile Buffer
Value in profile Buffer	Value (block*16)+14 in the profile Buffer
Value in profile Buffer	Value (block*16)+15 in the profile Buffer

If block number = 7
DATA FRAME RLS-GD → PC (18 WORDS)

0x00AA	SYNC-WORD
9	ORDER-WORD
Value in profile Buffer	Value (block*16)+0 in the profile Buffer
Value in profile Buffer	Value (block*16)+1 in the profile Buffer
Value in profile Buffer	Value (block*16)+2 in the profile Buffer
Value in profile Buffer	Value (block*16)+3 in the profile Buffer
Value in profile Buffer	Value (block*16)+4 in the profile Buffer
Value in profile Buffer	Value (block*16)+5 in the profile Buffer
Value in profile Buffer	Value (block*16)+6 in the profile Buffer
Value in profile Buffer	Value (block*16)+7 in the profile Buffer
Maximum	Maximum Value of profile buffer
Minimum	Minimum Value of profile buffer
Amount	Amount of captured values during trigger
0	DUMMY
0	DUMMY
0	DUMMY
0	DUMMY
0	DUMMY

Example 20: DATA FRAME with ORDER NUMBER = 20:

ORDER NUMBER (second word = 20): SEND LINE OK from the RLS-GD to PC!
Cf. example 1:
Send the same DATA FRAME but with ORDER NUMBER 20 to the sensor.
The sensor will reply with the same18 words but with SYNC-WORD=0x00AA which tell that there is a connection.

Example 50: DATA FRAME with ORDER NUMBER = 50:

ORDER NUMBER (second word = 50): Start or Stop an automatic send of a data frame after a trigger.
The complete data frame = 18 words must be sent to the RLS-GD hardware in binary form (sync-word / order-word / 16 parameter words).

DATA FRAME PC → RLS-GD (18 WORDS)

0x0055	SYNC-WORD
50	ORDER-WORD
0	0=autosend off, 1=autosend on
0	DUMMY
0	DUMMY
0	DUMMY
0	DUMMY
0	DUMMY
0	DUMMY
0	DUMMY
0	DUMMY
0	DUMMY
0	DUMMY
0	DUMMY
0	DUMMY
0	DUMMY
0	DUMMY
0	DUMMY

After activation an automatic send (autosend=1) the sensor writes after each trigger a dataframe.
Cf. DATA FRAME RLS-GD → PC (18 WORDS) in Example 5.