

# Manual

## RLS-GD-CALIB-Scope V1.0 Software

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

**for calibrating the gloss sensors RLS-GD-60**

The gloss sensors of type RLS-GD-60 can be calibrated by means of separate software RLS-GD-CALIB-Scope.

The balance can be done on the NEUTRAL field [Neutral 3.5 [1.05]] CC23 of the ColorChecker™ table.

(Standard software for RLS-GD-60 sensors → please cf. manual RLS-GD-Scope V1.0)

# 1 Installation of the RLS-GD-CALIB-Scope Software

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

- IBM PC AT or compatible
- VGA graphics
- Microsoft® Windows® XP, 2000, NT® 4.0, Me, 98 or 95
- 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-CALIB-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. The CD-ROM contains a folder named INSTALL. This INSTALL folder contains a SETUP program. Please start this SETUP program to install the software.
2. The installation program displays a dialog box 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.
3. During the installation process a new program group for the software will be created in the Windows Program Manager. In the corresponding program group an icon for starting the software will also be created automatically. When installation is successfully completed the installation program displays a "Setup OK" dialog box .
4. After successful installation the software can be started by double-clicking on the icon with the left mouse button.

Windows® is a registered trademark of Microsoft Corp.

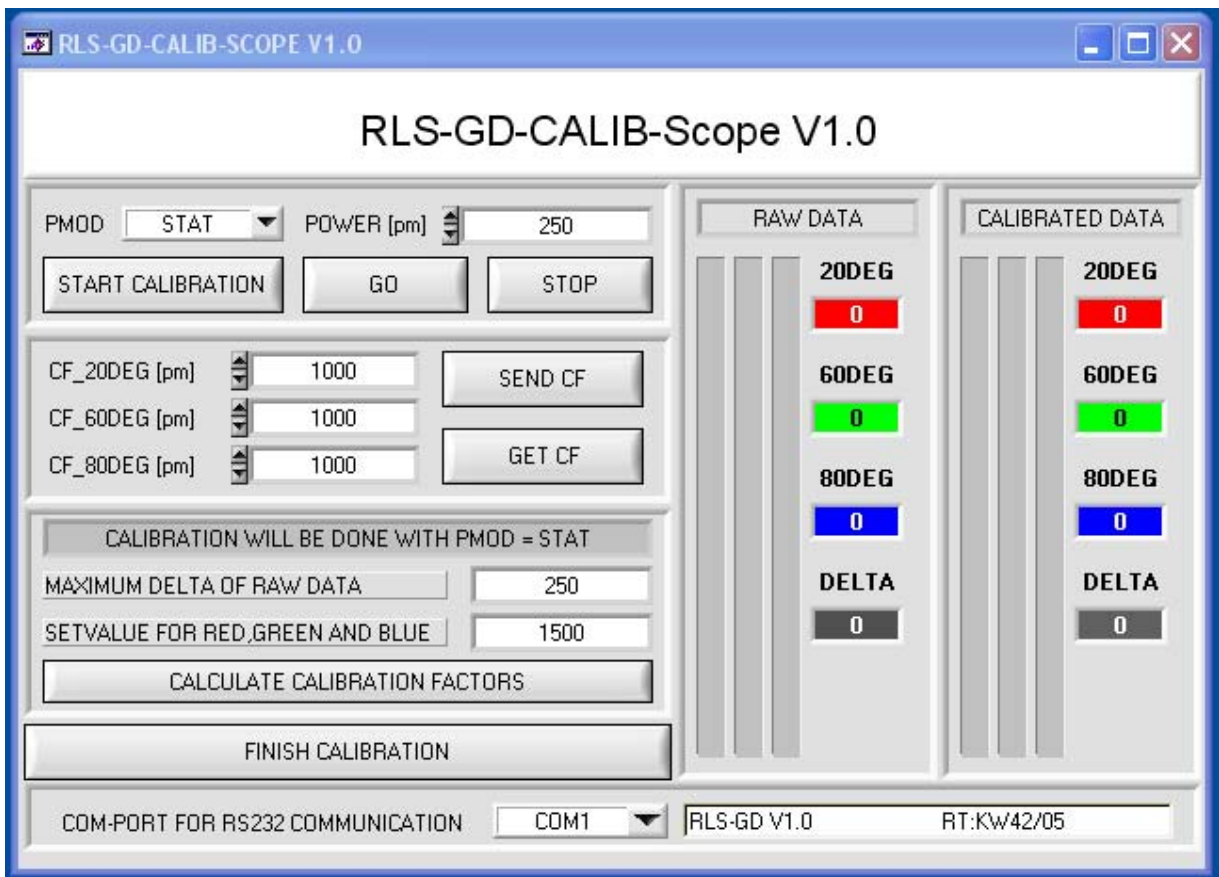
VGA™ is a trademark of International Business Machines Corp.

## 2 Operation of the RLS-GD-CALIB-Scope Software

Please read this chapter first before you start to calibrate the RLS-GD gloss sensor.

**Info:** Clicking on an individual element with the right mouse button displays a short help on the respective element.

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



Basically there are two methods for calibrating the color sensors: PMOD = STAT, and PMOD = DYN.

If you decide to use PMOD = STAT, you must set the transmission power of the white-light LED yourself. If you perform calibration in the PMOD = DYN mode, the transmission power of the LED adjusts itself automatically so that the sensor is operated in the dynamic range.

If, for example, you have several sensors which you expect to behave in the same way, the proper mode is PMOD = STAT. You can then preset the same POWER value for all the sensors, and set a setpoint value for the intensity of the three bars. The disadvantage of this calibration method is that calibration may not be possible for individual sensors because the calibration factor would be too high. The calibration factor is a value that is applied to the actual raw signal in order to perform matching to other sensors. Too high or too low calibration factors would considerably falsify the signal.

If you decide to use PMOD = DYN, the average of the three raw signals will be determined. The calibration factors are then formed on the basis of this average.

## 2.1 Calculation example for determining the calibration factors:

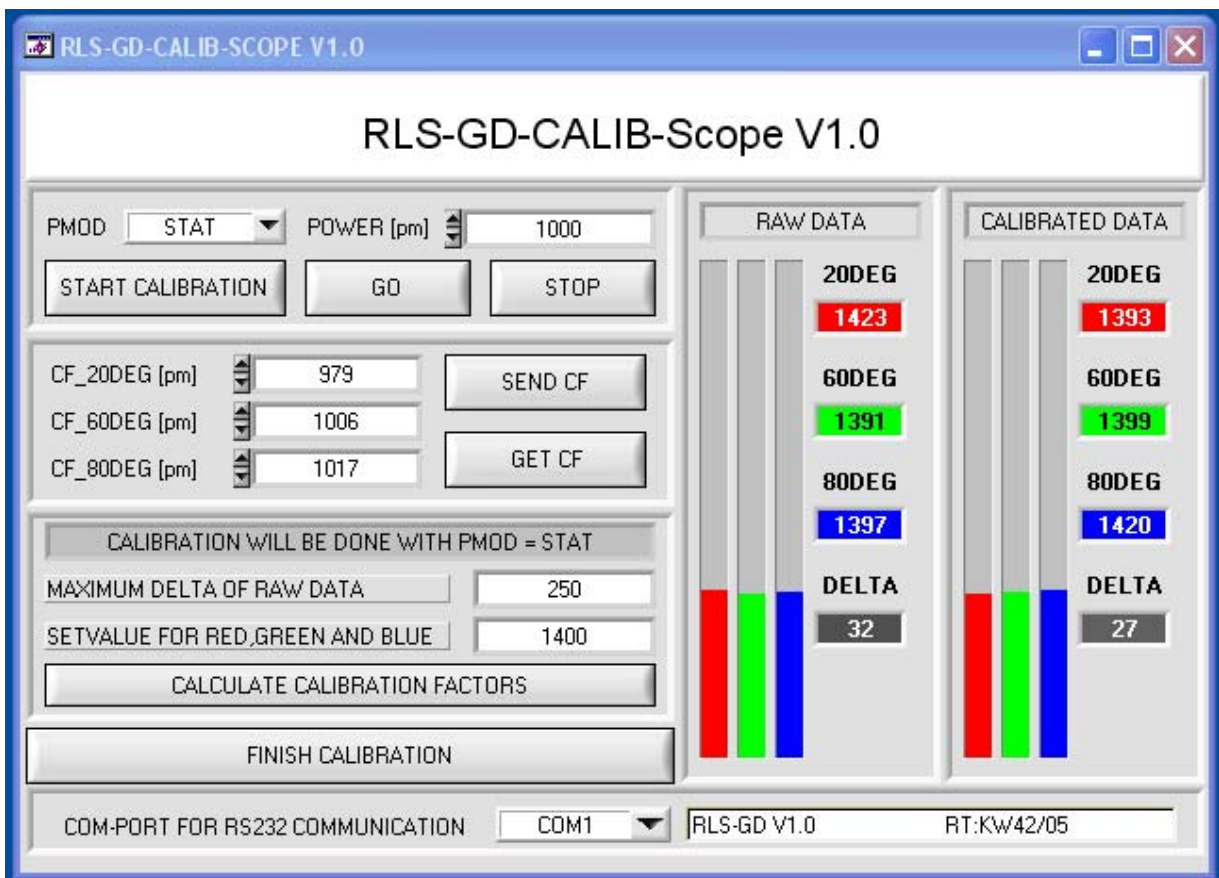
In the example in the picture below, PMOD = STAT has been selected, i.e. a suitable POWER value at which the three bars of the raw signals are in the dynamic range has been set. Each of the three bars is at approx. 3000 digits. It is thus appropriate to set a setpoint value of 3000 (see SETVALUE) for the three bars. When calibration is now started by pressing CALCULATE CALIBRATION FACTORS, the software automatically calculates the calibration factors for channel 20DEG, channel 60DEG, and channel 80DEG. The calibration factors are calculated as integers in per mil (pm).

Formula:

$$CF_{20DEG} = (SETVALUE / RAW DATA 20DEG) * 1000 = (1400 / 1423) * 1000 = 979$$

$$CF_{60DEG} = (SETVALUE / RAW DATA 60DEG) * 1000 = (1400 / 1391) * 1000 = 1006$$

$$CF_{80DEG} = (SETVALUE / RAW DATA 80DEG) * 1000 = (1400 / 1397) * 1000 = 1017$$



When the calibration factors have been calculated by the software on the user interface, they are automatically saved to the non-volatile EEPROM memory of the sensor. Calibration is then finished, and work with the RLS-GD-Scope software can be continued.

When the sensor detects a raw signal, it applies the calibration factor saved in the EEPROM to this raw signal according to the following formula:

$$CALIBRATED 20DEG = (RAW DATA 20DEG * CF_{20DEG}) / 1000 = (1423 * 979) / 1000 = 1393$$

$$CALIBRATED 60DEG = (RAW DATA 60DEG * CF_{60DEG}) / 1000 = (1391 * 1006) / 1000 = 1399$$

$$CALIBRATED 80DEG = (RAW DATA 80DEG * CF_{80DEG}) / 1000 = (1397 * 1017) / 1000 = 1420$$

This means that only the calibrated data for the channels 20DEG, 60DEG, and 80DEG are displayed in the RLS-GD-Scope software. Evaluation by the micro-controller also is exclusively done with the calibrated data.

## 2.2 Calibration with PMOD = STAT

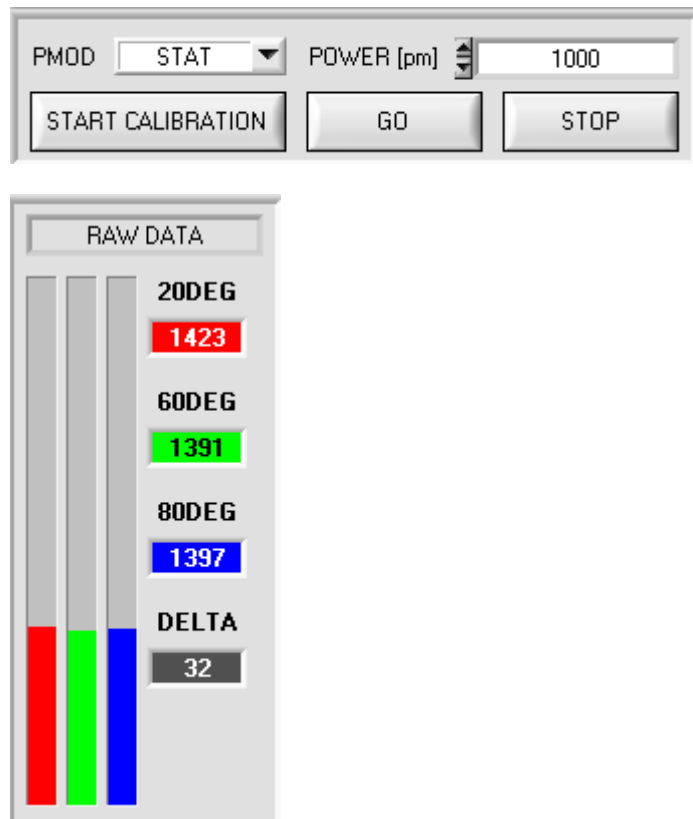
This chapter describes the individual steps for calibrating the RLS-GD-60 gloss sensor with PMOD = STAT:

**INFO:** The individual pop-up windows are intended as a help to guide you through the calibration process.

**ATTENTION:** It is a prerequisite for successful calibration that the sensor front-end is calibrated to a grey surface (Neutral 3.5 CC23).

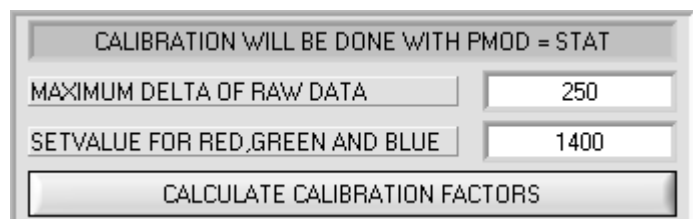
### Step 1:

Select PMOD = STAT in the function field. Press START CALIBRATION. The software automatically establishes a connection to the sensor and starts to record raw data from the sensor front-end. These raw data are visualized under RAW DATA. Set the value for POWER [pm] such that all three bars are in the dynamic range, i.e. each of the three bars should lie between 2500 and 3000 digits. Data exchange can be started and stopped with the GO und STOP buttons.



### Step 2:

When you have set a suitable POWER value, determine a SETVALUE FOR RED, GREEN, AND BLUE. The software now calculates the calibration factors in such a way that this SETVALUE is reached for the raw data (see calculation example on page 4).



### Step 3:

Set a MAXIMUM DELTA OF RAW DATA (the software suggests 250). Calibration is only permitted, if the current DELTA of the RAW DATA is smaller than the MAXIMUM DELTA OF RAW DATA. DELTA is the maximum of 20DEG, 60DEG, and 80DEG, minus the minimum of 20DEG, 60DEG, and 80DEG. This is necessary in order to ensure that the sensor functions properly and calibration is performed on a white surface.



**Step 4:**

Start calibration by pressing **CALCULATE CALIBRATION FACTORS**.  
 The button starts to flash in RED, and at the same time 100 raw data are recorded through the interface, of which the respective average of 20DEG, 60DEG, and 80DEG is formed.  
 The individual calibration factors are formed from these average values and from the SETVALUES FOR RED, GREEN, and BLUE, and they are then entered in the corresponding edit-boxes.  
 The calibration software automatically saves the calculated calibration factors to the EEPROM of the sensor.  
 Then the software changes to the GO mode and displays the RAW DATA and the CALIBRATED DATA.  
 Please note that the DELTA of the CALIBRATED DATA is considerably lower than the DELTA of the RAW DATA, and that the values for 20DEG, 60DEG, and 80DEG in the CALIBRATED DATA approximately are equal to the value of SETVALUE.

You may also change the calibration factors CF\_20DEG, CF\_60DEG, CF\_80DEG manually by entering new values in the corresponding input fields. Please note that these factors are saved to the EEPROM by pressing SEND CF. GET CF reads the calibration factors that are currently saved in the EEPROM.

If pressing CALCULATE CALIBRATION FACTORS should not be successful, please follow the information provided in the pop-up windows.

CALCULATE CALIBRATION FACTORS

CALCULATE CALIBRATION FACTORS

CF_20DEG [pm]	979	SEND CF
CF_60DEG [pm]	1006	GET CF
CF_80DEG [pm]	1017	

RAW DATA

	20DEG	
	1423	
	60DEG	
	1391	
	80DEG	
	1397	
	DELTA	
	32	

CALIBRATED DATA

	20DEG	
	1393	
	60DEG	
	1399	
	80DEG	
	1420	
	DELTA	
	27	

Calibration only is completed successfully, if the following pop-up window is displayed:

**CALIBRATION PASSED!**
✕

Calibration successful!  
 Calibration factors will be sent to the EEPROM of the sensor.  
 GO mode will be activated.  
 Press FINISH CALIBRATION to leave calibration scope.

OK

**Step 5:**

Finish the calibration process by pressing **FINISH CALIBRATION**.  
 The calibration factors set under CF\_20DEG, CF\_60DEG, and CF\_80DEG, and a standard parameter set, will be sent to the sensor.

FINISH CALIBRATION

## 2.3 Calibration with PMOD = DYN

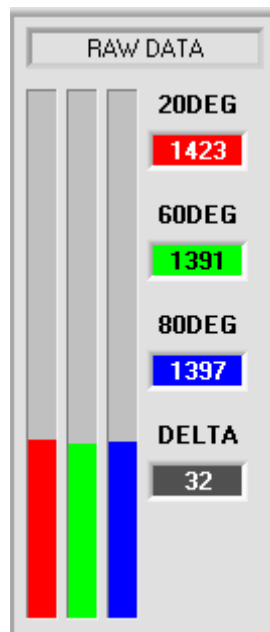
This chapter describes the individual steps for calibrating the RLS-GD-60 gloss sensor with PMOD = DYN:

**INFO:** The individual pop-up windows are intended as a help to guide you through the calibration process.

**ATTENTION:** It is a prerequisite for successful calibration that the sensor front-end is calibrated to a grey surface (Neutral 3.5 CC23).

Step 1:

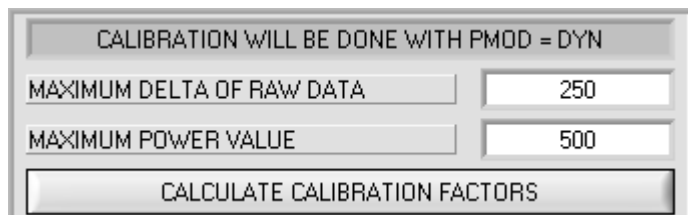
Select PMOD = DYN in the function field.  
 Press START CALIBRATION.  
 The software automatically establishes a connection to the sensor and starts to record raw data from the sensor front-end. These raw data are visualized under RAW DATA.  
 Based on the reflection from the surface, the transmission power is automatically adjusted such that the sensor operates in the dynamic range.  
 The POWER that is necessary for this is displayed under POWER.  
 Data exchange can be started and stopped with the GO und STOP buttons.



Step 2:

After the sensor has adjusted itself to the surface, determine a MAXIMUM POWER VALUE. The sensor automatically controls its POWER in order to operate in the dynamic range. This value is displayed under POWER.  
 For performing a calibration, this POWER value must not be higher than the MAXIMUM POWER VALUE.

Reason: In case of a black surface the sensor would operate with excessive power.  
 This input parameter was introduced in order to guarantee that the sensor is calibrated to a white surface.



Step 3:

Set a MAXIMUM DELTA OF RAW DATA (the software suggests 250).  
 Calibration is only permitted, if the current DELTA of the RAW DATA is smaller than the MAXIMUM DELTA OF RAW DATA.  
 DELTA is the maximum of 20DEG, 60DEG, and 80DEG, minus the minimum of 20DEG, 60DEG, and 80DEG. This is necessary in order to ensure that the sensor functions properly and calibration is performed on a white surface.



**Step 4:**

Start calibration by pressing **CALCULATE CALIBRATION FACTORS**. The button starts to flash in RED, and at the same time 100 raw data are recorded through the interface, of which the respective average of RED, GREEN, and BLUE is formed.

The software automatically calculates the SETVALUE to which calibration should be performed:

$$\text{SETVALUE} = (20\text{DEG} + 60\text{DEG} + 80\text{DEG})/3.$$

The individual calibration factors are calculated from the average values for 20DEG, 60DEG, and 80DEG, and from the calculated SETVALUE, and they are then entered in the corresponding edit-boxes.

The calibration software automatically saves the calculated calibration factors to the EEPROM of the sensor.

Then the software changes to the GO mode and displays the RAW DATA and the CALIBRATED DATA.

Please note that the DELTA of the CALIBRATED DATA is considerably lower than the DELTA of the RAW DATA, and that the values for RED, GREEN, and BLUE in the CALIBRATED DATA approximately are equal to the value of SETVALUE.

You may also change the calibration factors CF\_20DEG, CF\_60DEG, CF\_80DEG manually by entering new values in the corresponding input fields. Please note that these factors are saved to the EEPROM by pressing SEND CF. GET CF reads the calibration factors that are currently saved in the EEPROM.

If pressing **CALCULATE CALIBRATION FACTORS** should not be successful, please follow the information provided in the pop-up windows.

Calibration only is completed successfully, if the following pop-up window is displayed:

The interface includes a 'CALCULATE CALIBRATION FACTORS' button (shown flashing red), a panel with three input fields for CF\_20DEG [pm] (979), CF\_60DEG [pm] (1006), and CF\_80DEG [pm] (1017), and 'SEND CF' and 'GET CF' buttons. Below are two data displays: 'RAW DATA' and 'CALIBRATED DATA'. Each display shows three vertical bars (red, green, blue) and a 'DELTA' value. The RAW DATA shows values 1423, 1391, 1397, and DELTA 32. The CALIBRATED DATA shows values 1393, 1399, 1420, and DELTA 27.

The pop-up window has a blue title bar with 'CALIBRATION PASSED!' and a close button. The main text reads: 'Calibration successful! Calibration factors will be sent to the EEPROM of the sensor. GO mode will be activated. Press FINISH CALIBRATION to leave calibration scope.' An 'OK' button is centered at the bottom.

**Step 5:**

Finish the calibration process by pressing **FINISH CALIBRATION**.

The calibration factors set under CF\_20DEG, CF\_60DEG, and CF\_80DEG, and a standard parameter set, will be sent to the sensor.

A single button labeled 'FINISH CALIBRATION'.