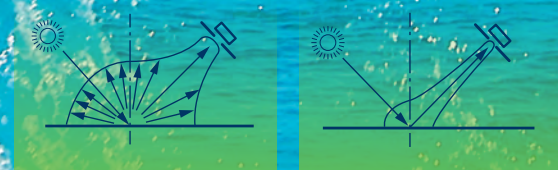
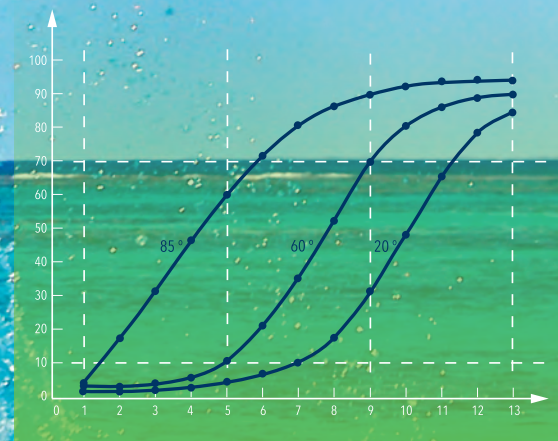
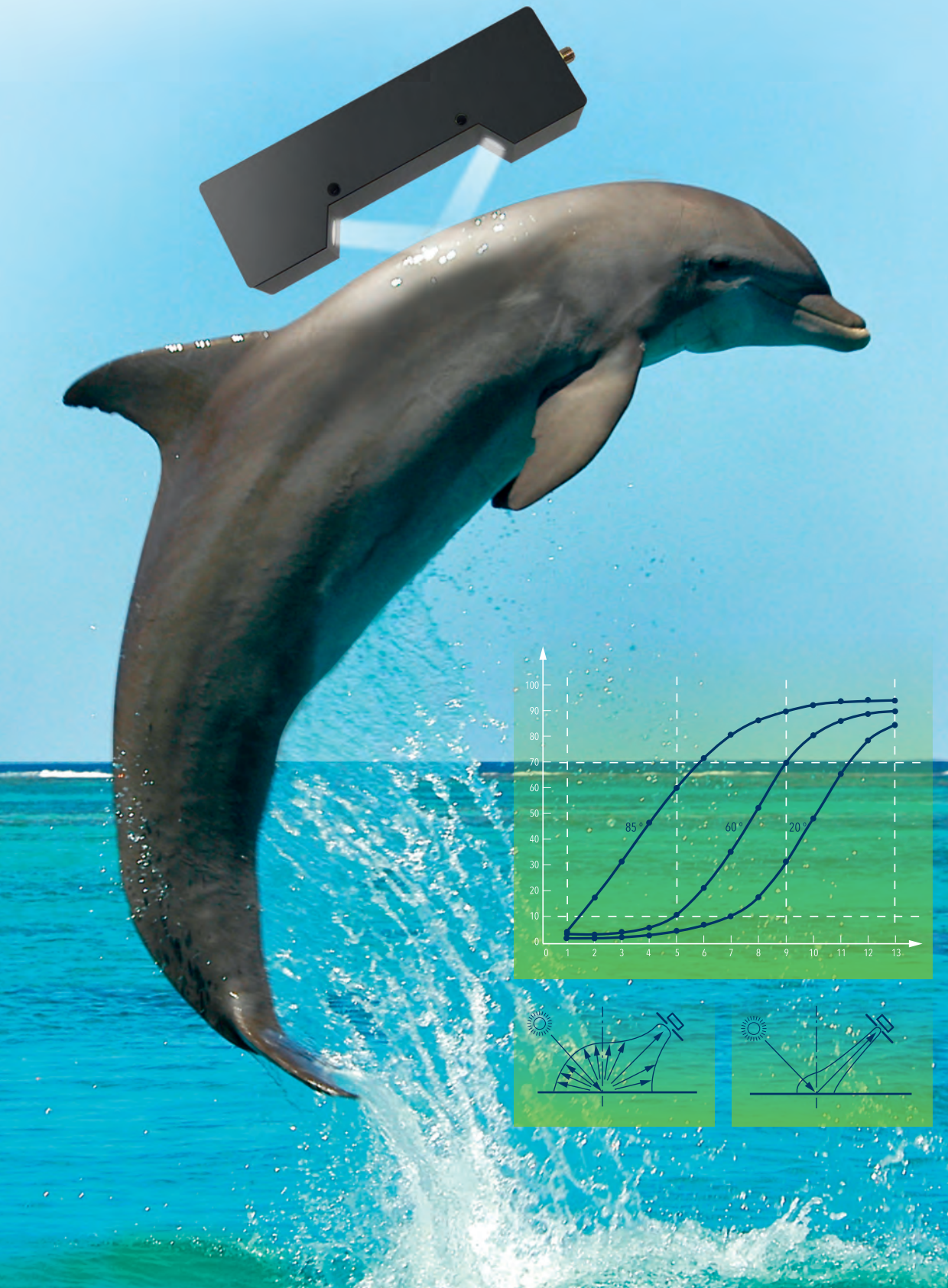


Splendid View.

Non-Contact Inline Gloss Measurement from Various Angles.

Surface inspection and counting

GLOSS Series Gloss Detection Sensors



GLOSS Series

► GLOSS-15-60°

- Insensitive to outside light due to clocked white light
- 60° gloss measurement
- Working distance 15 mm ± 10%
- Internal reference (thus optimum light power adjustment to the respective object surface)
- Teaching of up to 7 gloss degrees
- Parameterisable under Windows®
- RS232 interface (USB or Ethernet adapter is available)
- 3 switching outputs (npn-/pnp-able, 100 mA, short circuit proof)
- Transmitter power adjustable or controllable (STAT or DYN)
- Averaging can be activated (over up to approx. 32000 values)
- Scratch-resistance glass cover of optics
- Compact and sturdy aluminum housing
- Calibration function (black glass) by means of calibration unit (optional)
- 1 analog output (0...+10V or 4...20mA, selectable) proportional to gloss degree 0...100 respectively zoomed up to the tenfold with zoom mode
- Digital input IN1 to trigger the analog output value
- Digital input IN0 to trigger the Scope function
- Offline unit as well as blast-air top available (optional)



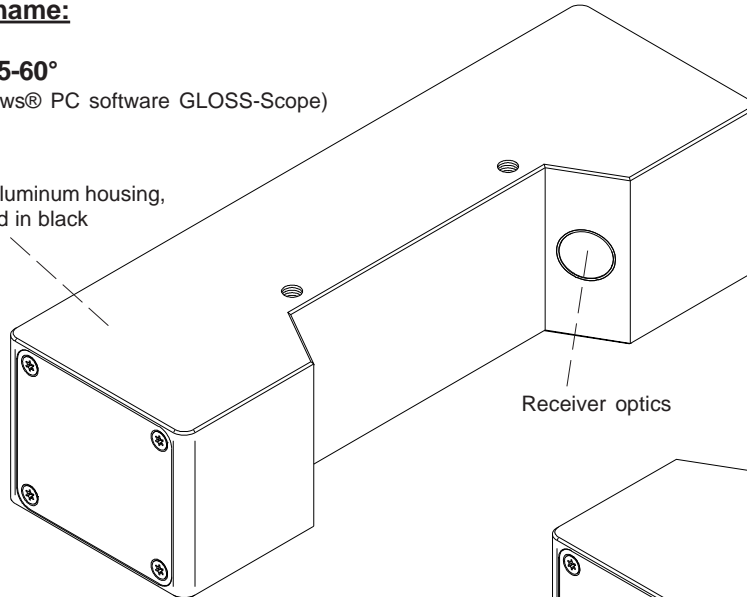
Design

Product name:

GLOSS-15-60°

(incl. Windows® PC software GLOSS-Scope)

Sturdy aluminum housing,
anodized in black



Receiver optics

4-pole fem. conn.
Binder Series 707
(RS232 interface)

Connecting cable:
cab-las4/PC or
cab-4/USB or
cab-4/ETH

8-pole fem. conn.
Binder Series 712
(connection to PLC)

Connecting cable:
cab-las8/SPS

Mounting
possibilities
(threaded M5)

Accessories: (p. 7-9)

GLOSS-15-60°-CAL (Calibration unit)

GLOSS-15-60°-OFL (Offline unit)

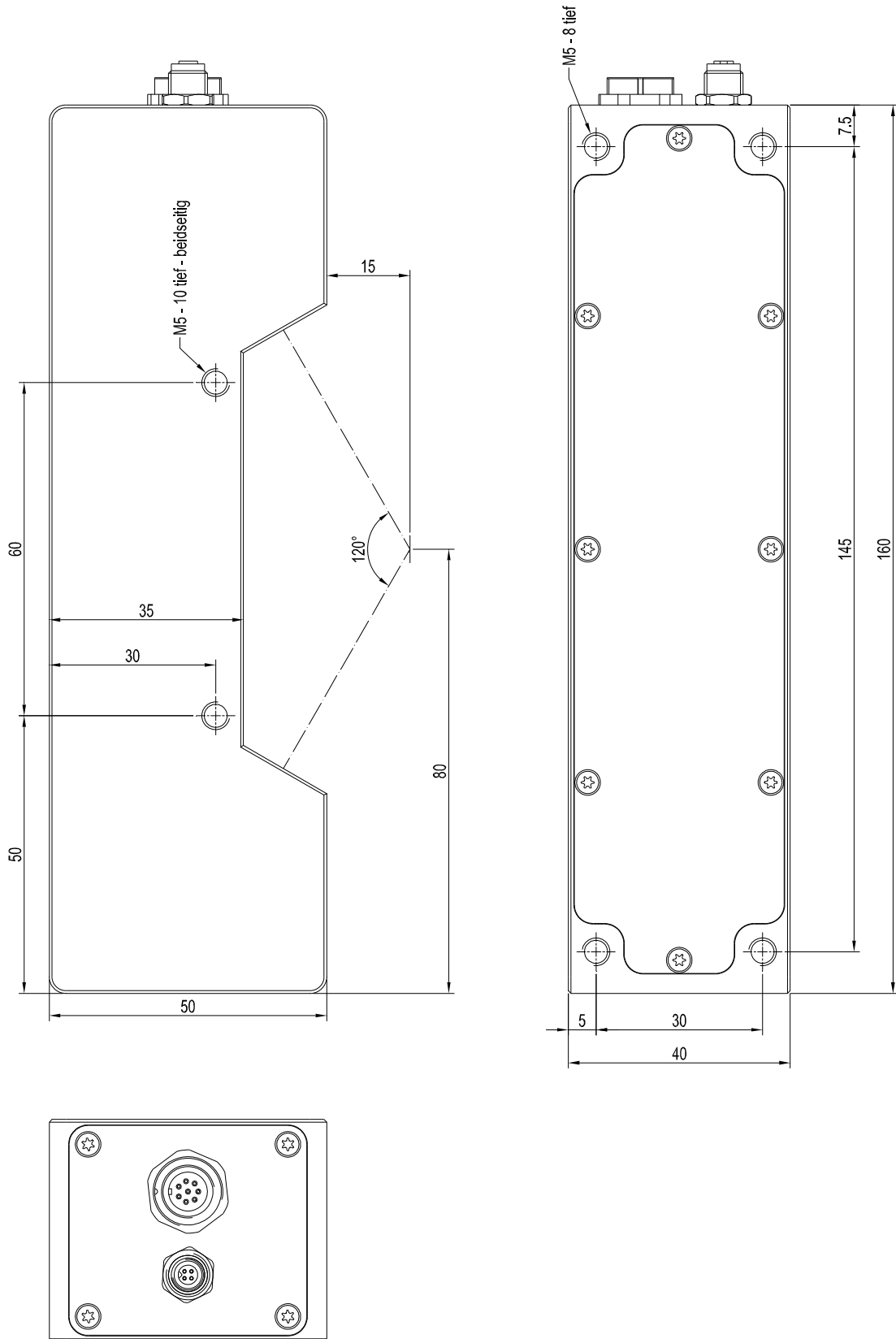
ABL-GLOSS-15-60° (Blast-air top)



Technical Data

Type	GLOSS-15-60°
Light source	White light LED (modulated or direct light, can be adjusted under Windows®)
Working distance	typ. 15 mm ± 10%
Light spot size	at a working distance of 15 mm: typ. 10 mm x 20 mm (elliptical)
Optical filter	day light filter (KG2)
Voltage supply	+24VDC (± 10%), protected against polarity reversal, overload protected
Enclosure rating	IP54
Ambient light	up to 5000 Lux
Current consumption	typ. 100 mA
Interface	RS232, parameterisable under Windows®
EMC test acc. to	DIN EN 60947-5-2
Type of connector	connection to PLC: 8-pole female connector Binder Series 712 connection to PC: 4-pole female connector Binder Series 707
Connecting cables	to PLC: cab-las8/SPS or cab-las8/SPS-w and cab-las4/SPS to PC/RS232 interface: cab-las5/PC or cab-las5/PC-w to PC/USB interface: cab-4/USB or cab-4/USB-w to PC/Ethernet interface: cab-4/ETH
Operating temperature range	-20°C ... +55°C
Storage temperature range	-20°C ... +85°C
Housing material	aluminum, anodized in black
Housing dimensions	LxWxH approx. 160 mm x 50 mm x 40 mm
Max. switching current	100 mA, short-circuit proof
Switching frequency	max. 60 kHz
Input DIGITAL (2x)	digital input IN0: to trigger the Scope function digital input IN1: to trigger the analog output value
Output DIGITAL (3x)	OUT0 ... OUT2: Qinv or Q, (adjustable via PC): Qinv: npn bright-switching (nnp n.c.) / pnp dark-switching (pnp n.o.) Q: pnp bright-switching (pnp n.c.) / npn dark-switching (nnp n.o.)
Output ANALOG (1x)	voltage output 0V...+10V or current output 4mA...20mA (can be switched under Windows®)
Tolerance range for digital outputs	parameterisable under Windows®
Transmitted light power	adjustable under Windows®
Averaging	over 32000 values (adjustable under Windows®)

Dimensions



All dimensions in mm

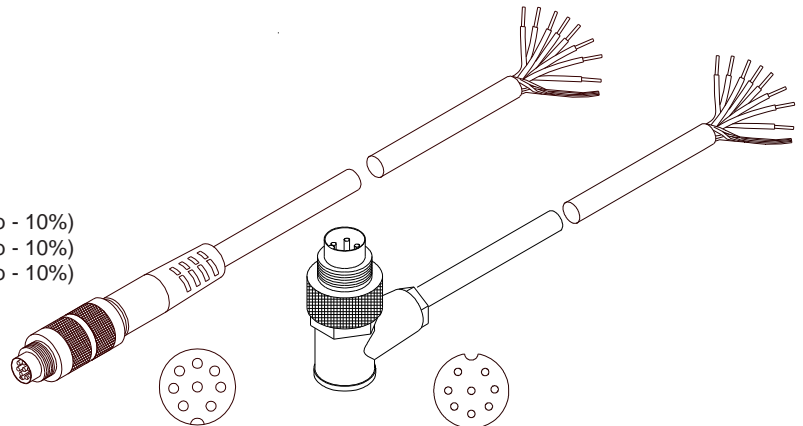
Connector Assignment

Connection to PLC:

8-pole fem. connector Binder Series 712

Pin:	Color:	Assignment:
1	white	GND (0V)
2	brown	+24VDC ($\pm 10\%$)
3	green	IN0 (digital 0: 0 ... 1V, digital 1: +Ub - 10%)
4	yellow	IN1 (digital 0: 0 ... 1V, digital 1: +Ub - 10%)
5	grey	OUT0 (digital 0: Type 0 ... 1V, digital 1: Type +Ub - 10%)
6	pink	OUT1 (digital 0: Type 0 ... 1V, digital 1: Type +Ub - 10%)
7	blue	OUT2 (digital 0: Type 0 ... 1V, digital 1: Type +Ub - 10%)
8	red	ANALOG (0...+10V or 4 ... 20mA)

Connecting cable:
 cab-las8/SPS-(length)
 cab-las8/SPS-w-(length) (angle type, 90°)
 (standard length 2m)



cab-las8/SPS-...
 (max. length 25m,
 outer jacket: PUR)

cab-las8/SPS-w-...
 (max. length 25m,
 outer jacket: PUR)

Connection to PC:

4-pol. fem. connector Binder Series 707

Pin:	Assignment:
1	+24VDC (+Ub, OUT)
2	GND (0V)
3	RxD
4	TxD

Connection via RS232 interface at the PC:

Connecting cable:
 cab-las4/PC-(length)
 cab-las4/PC-w-(length) (angle type 90°)
 (standard length 2m)

alternative:

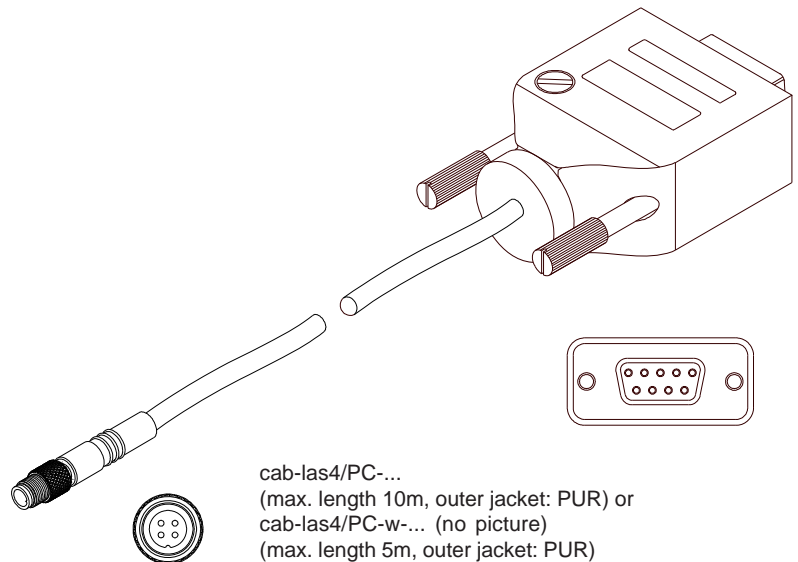
Connection via USB interface at the PC:

Connecting cable (incl. driver software):
 cab-4/USB-(length)
 cab-4/USB-w-(length) (angle type 90°)
 (standard length 2m)

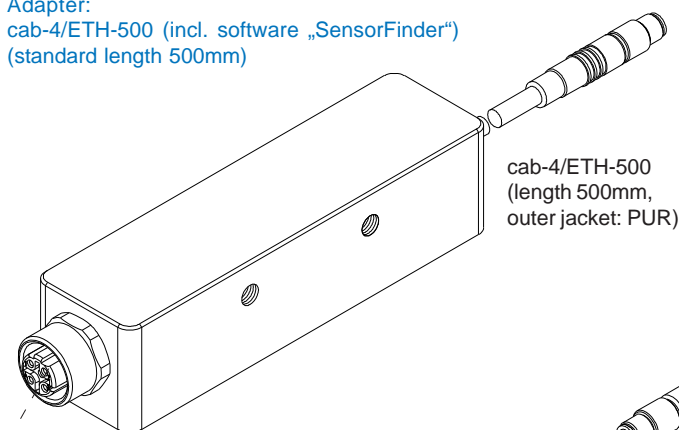
alternative:

Connection to local network via Ethernet bus:

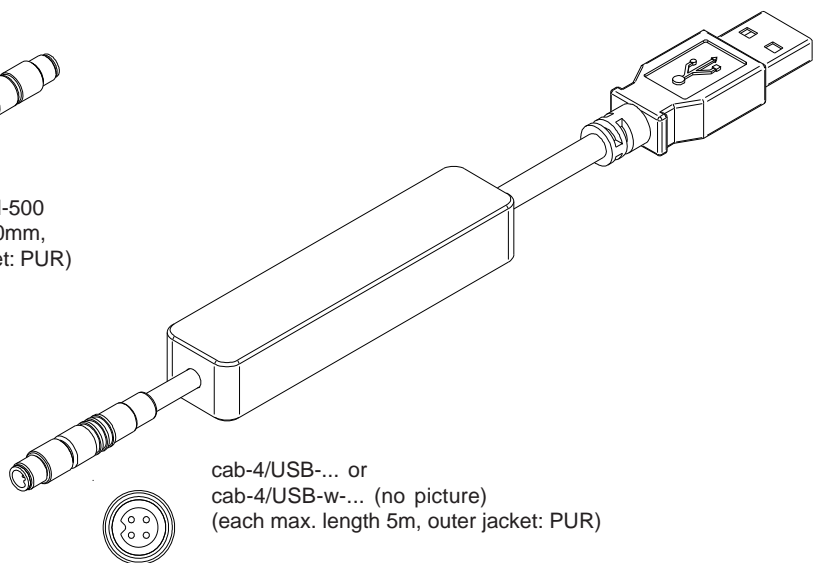
Adapter:
 cab-4/ETH-500 (incl. software „SensorFinder“)
 (standard length 500mm)



cab-las4/PC-...
 (max. length 10m, outer jacket: PUR) or
 cab-las4/PC-w-... (no picture)
 (max. length 5m, outer jacket: PUR)



cab-4/ETH-500
 (length 500mm,
 outer jacket: PUR)



cab-4/USB-... or
 cab-4/USB-w-... (no picture)
 (each max. length 5m, outer jacket: PUR)

4-pole M12 fem. connector (D-coded) for
 connection of an external CAT5 cable, e.g.
 cab-eth/M12D-RJ45-flx-(length)
 (available in length 2m, 5m, 10m, or 20m)



Measuring Angles

For the gloss detection sensors of GLOSS Series different standard measuring angles are available:

- 20° for high-glossy surfaces (gloss degree >70 GU)
- 45° TAPPI standard (paper industry) for glossy surfaces
- 60° TAPPI standard (paper industry) for matt surfaces
- 75° for moderate glossy surfaces (gloss degree >10 GU and <70 GU)
- 85° for matt surfaces (gloss degree <10 GU)

[GU = Gloss Unit]



Measuring Principle

Measuring principle of the gloss detection sensor GLOSS-...:

A white-light LED projects a white light spot onto the surface to be inspected. A part of the light that is directly reflected from the measuring object is directed onto a receiver by the receiver optics (the receiver optics is arranged at the same angle from the vertical as the transmitter optics). Furthermore, diffuse reflection is determined by means of an additional optics. Signal acquisition is performed with 12 bit.

The GLOSS sensor optionally can be "taught" up to 7 gloss levels or norm vectors. The gloss level or the detected norm vector is provided at the digital outputs. In addition the gloss level also is provided in analog form from 0 to 10V or from 4mA to 20mA.

A digital input allows external "teaching" of the sensor. An additional input allows the "freezing" of the analog output signal upon a positive input edge.

The GLOSS sensor allows highly flexible signal acquisition. The sensor, for example, can be operated in alternating-light mode (AC mode), which means the sensor is not influenced by external light, or in constant-light mode (DC mode), which provides outstanding high-speed sensor operation. An OFF function deactivates the sensor's integrated light source. With the stepless adjustment of the integrated light source, the selectable gain of the receiver signal, and an INTEGRAL function the sensor can be adjusted to almost any surface.

The sensor must be calibrated for gloss level detection. For this purpose a reference surface is required which by definition has a gloss level of 100GU (Gloss Units). Calibration then is performed with the PC software. The sensor also can be calibrated to foreign systems, which can be optionally activated in the PC software.

Parameters and measurement values can be exchanged between PC and sensor either through RS232 or Ethernet (using an Ethernet adaptor). Through the interface all the parameters can be stored in the non-volatile EEPROM of the sensor.

The PC software facilitates the parameterisation, diagnostics, and adjustment of the sensor system (oscilloscope function). The software furthermore provides a data recorder function that automatically records data and stores them on the hard disk of the PC.

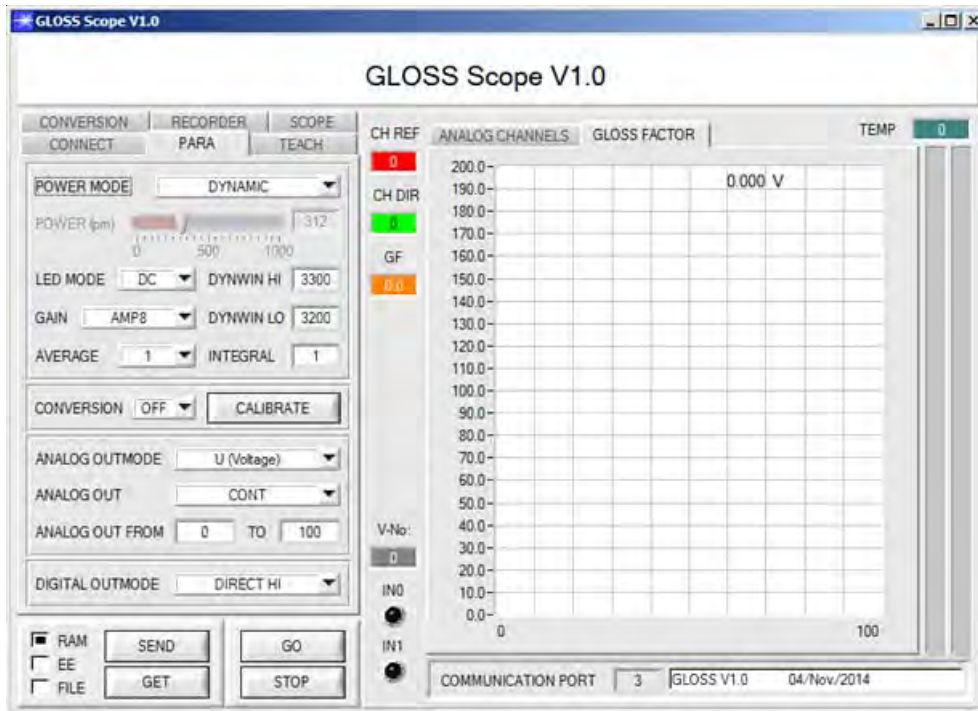
GLOSS sensors are temperature-compensated over a range of 0°C to 80°C.

Possible firmware updates can be easily performed through the RS232 interface, even with the sensor system in installed condition.

When parameterisation is finished, the color sensor continues to operate with the current parameters in STAND-ALONE mode without a PC.

Parameterization

Windows® interface:



The gloss sensor is parameterized under Windows® with the GLOSS-Scope software. The Windows® user interface facilitates the teach-in process at the sensor and supports the operator in the task of adjustment and commissioning of the sensor.

The software provides various display elements and a graphic window for the visualisation of all the data that are important for parameterisation.

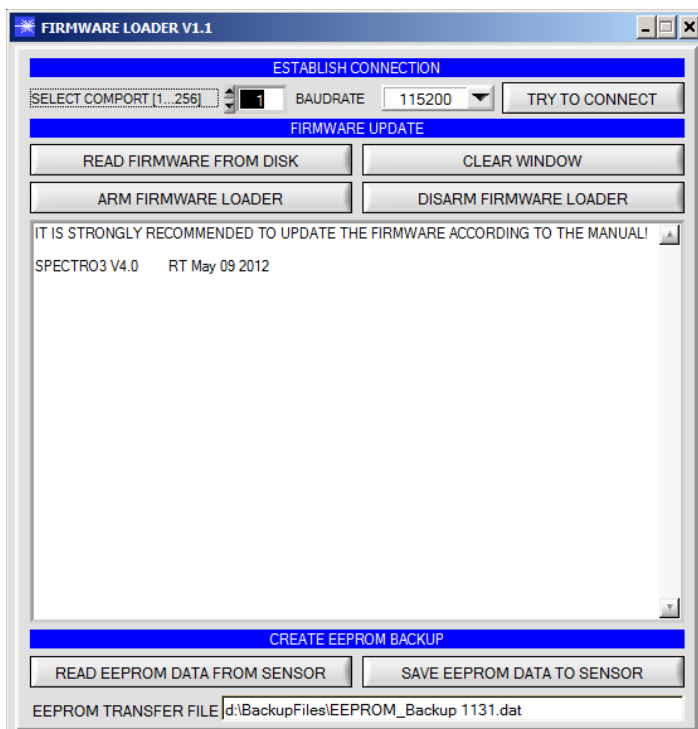
In the CONVERSION tab a certain conversion value can be assigned to the gloss factor GF signal.

The GLOSS-Scope software features a data recorder (RECORDER tab).

The SCOPE tab visualizes an oscilloscope.

Firmware Update

Firmware update by means of the software „FirmwareLoader“:

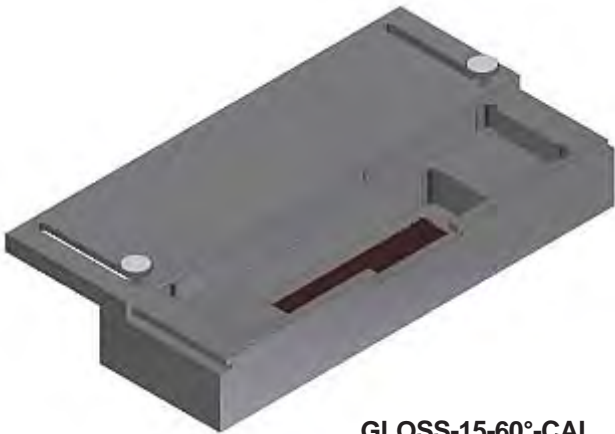


The software „Firmware Loader“ allows the user to perform an automatic firmware update. The update will be carried out through the RS232 interface.

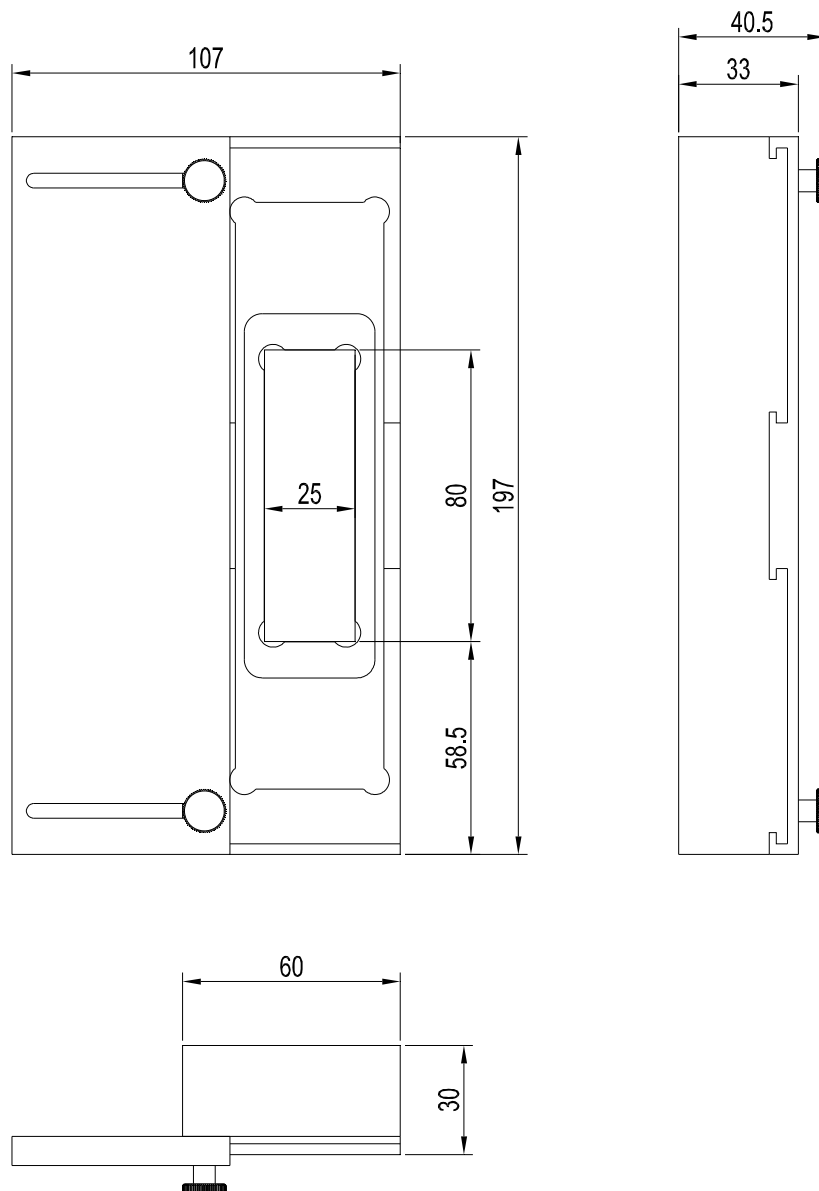
An initialisation file (xxx.ini) and a firmware file (xxx.elf.S) are required for performing a firmware update. These files can be obtained from your supplier. In some cases an additional firmware file for the program memory (xxx.elf.p.S) is also needed, and this file will be automatically provided together with the other two files.



Calibration Unit



GLOSS-15-60°-CAL
(Calibration unit, optional)



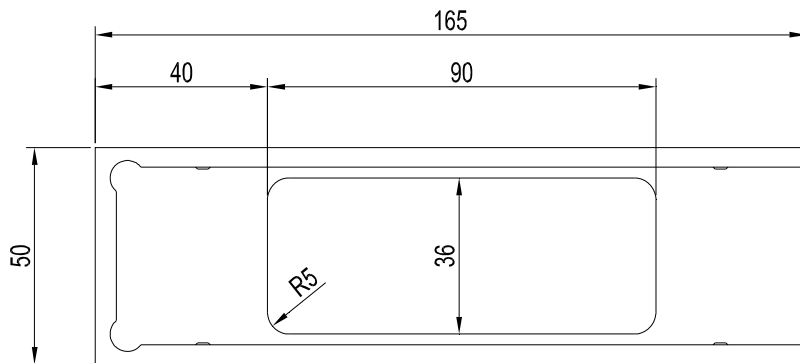
All dimensions in mm



Offline Unit



GLOSS-15-60°-OFL
(Offline unit / spacer, optional)



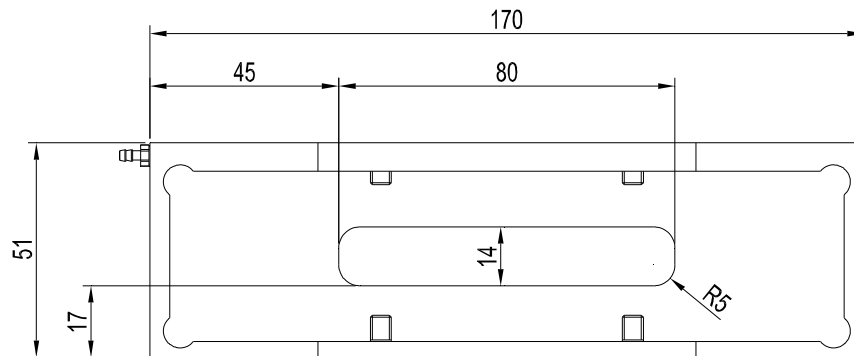
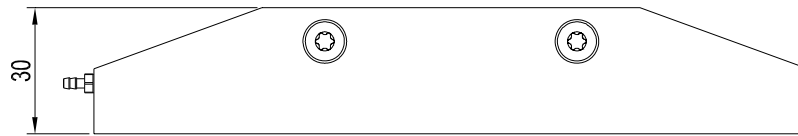
All dimensions in mm



Blast-air Top



ABL-GLOSS-15-60°
(Blast-air top, optional)



All dimensions in mm

RLS Series

▶ RLS-GD-150

- Insensitive to outside light due to clocked white-light
- 1 receiver (0°) and reference
- Storing of up to 31 measured values (switching thresholds)
- Tolerance can be set for each measured value
- Working distance typ. 150 mm ± 20%
- Parameterisable under Windows®
- RS232 interface (USB- or Ethernet adapter is available)
- Switching state indication by means of yellow LEDs (5x)
- Transmitter power adjustable (STAT or DYN)
- Averaging can be activated (over up to 32000 values)
- 5 switching outputs (npn-/pnp-able, 100 mA, short-circuit proof)
- 2 analog outputs (0...+10V and 4...20mA, proportional to measured value 0%...100% or via zoom function up to 10-fold zoom)
- Scratch-resistance glass cover of optics, sturdy aluminum housing

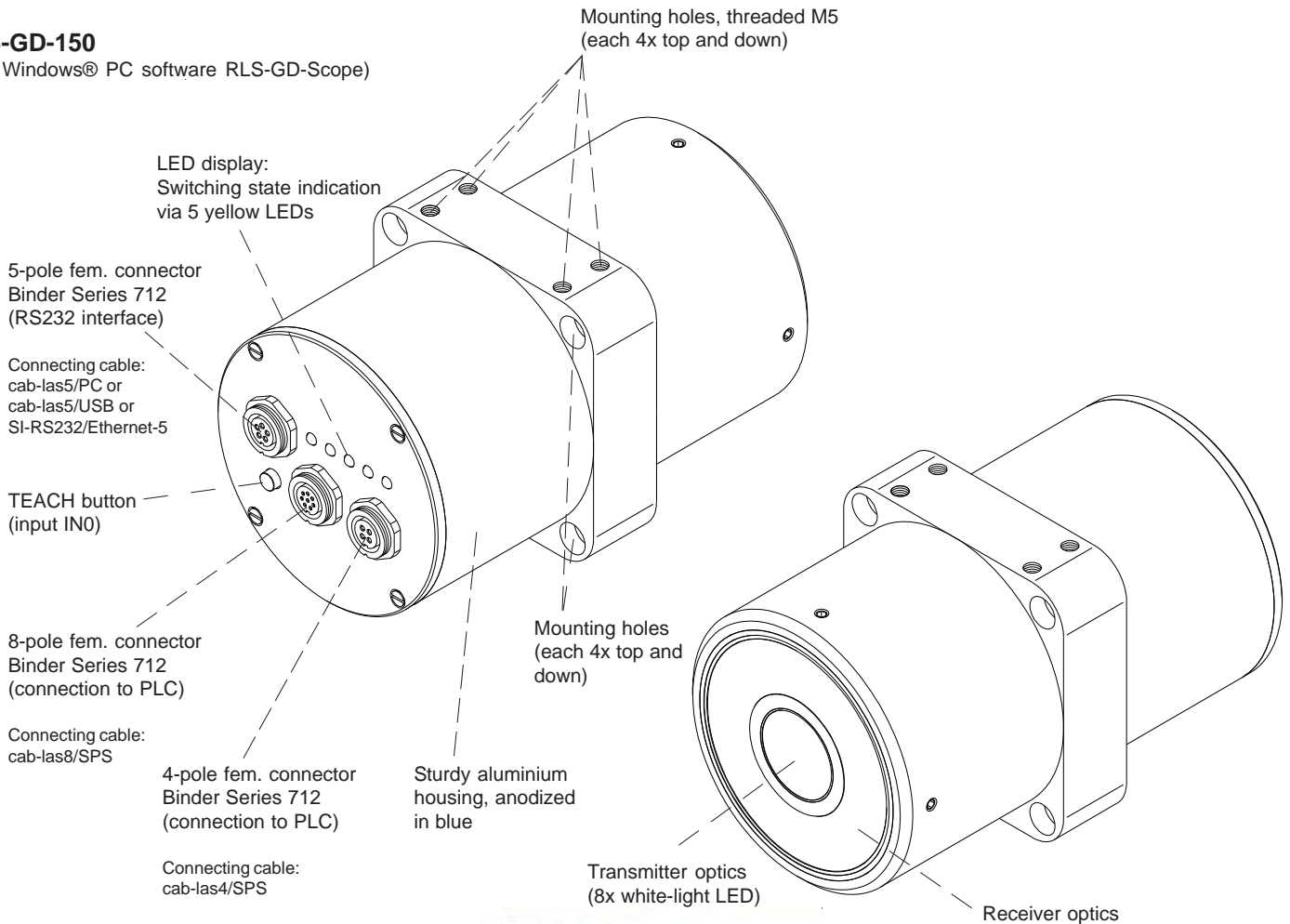


Design

Product name:

RLS-GD-150

(incl. Windows® PC software RLS-GD-Scope)

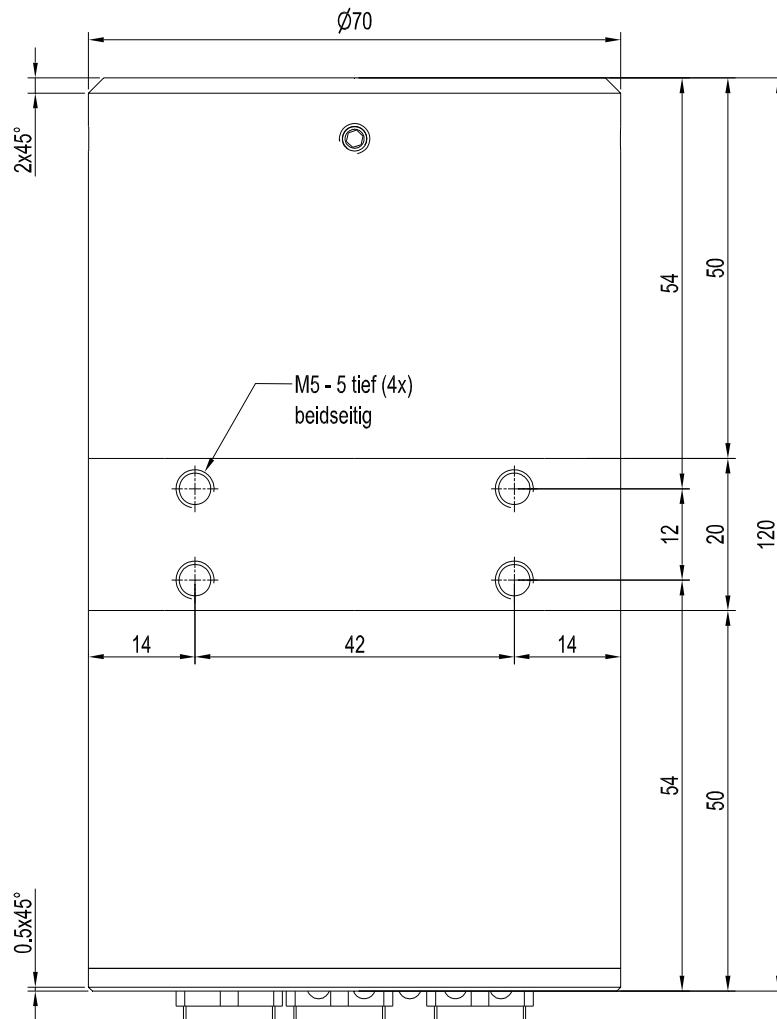
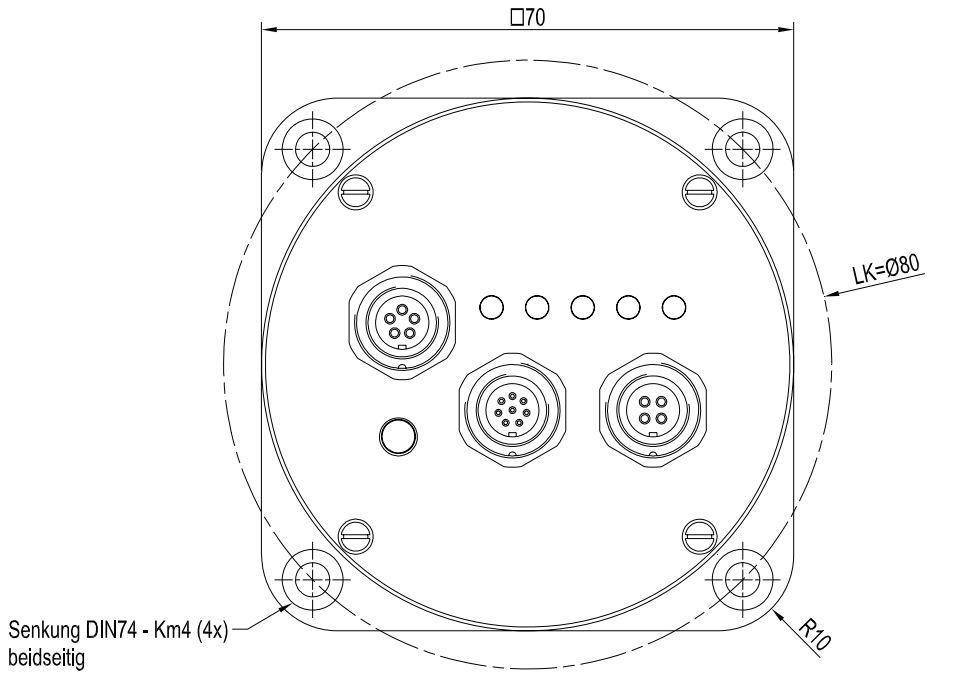




Technical Data

Model	RLS-GD-150
Light source	8x white-light LED, modulated 30 kHz
Working distance	typ. 150 mm ± 20%
Light spot size	at a distance of 150 mm: typ. Ø 100 mm
Optical filter	2x polarisation filter (transmitter and receiver), day light filter (KG2)
Voltage supply	+24VDC (± 10%), protected against polarity reversal, overload protected
Alternating light operation	100 kHz
Ambient light	up to 5000 Lux
Enclosure rating	IP54
Current consumption	typ. 110 mA
Interface	RS232, parameterisable under Windows®
EMC test acc. to	DIN EN 60947-5-2
Type of connector	Connection to PLC: 8-pole circular fem. connector Binder Series 712 Connection to PLC: 4-pole circular fem. connector Binder Series 712 Connection to PC: 5-pole circular fem. connector Binder Series 712
Connecting cables	to PLC: cab-las8/SPS or cab-las8/SPS-w and cab-las4/SPS to PC/RS232 interface: cab-las5/PC or cab-las5/PC-w to PC/USB interface: cab-las5/USB or cab-las5/USB-w to PC/Ethernet interface: SI-RS232/Ethernet-5
Operating temperature range	-20°C ... +55°C
Storage temperature range	-20°C ... +85°C
Housing material	Aluminium, anodized in blue
Housing dimensions	LxØ: approx. 120 mm x Ø 70 (Ø 80) mm
Max. switching current	100 mA, short-circuit proof
Switching frequency	max. 5 kHz (depends on averaging)
Output DIGITAL (5x)	OUT0 ... OUT4: Qinv or Q, can be adjusted via PC: Qinv: npn bright-switching (npn normally closed) / pnp- dark-switching (Schließer) Q: pnp-hellschaltend (Öffner) / npn-dunkelschaltend (Schließer)
Output ANALOG (2x)	1x voltage output 0...+10V 1x current output 4...20mA
Input IN0	by means of teach button at the sensor housing
Sensitivity (switching threshold)	parameterisable under Windows® (selection of threshold or tolerance window)
Pulse lengthening	0 ms ... 100 ms
Transmitter light power	adjustable under Windows®
Averaging	up to 32000 (adjustable under Windows®)
Switching state indication	by means of 5 yellow LEDs

Dimensions



All dimensions in mm

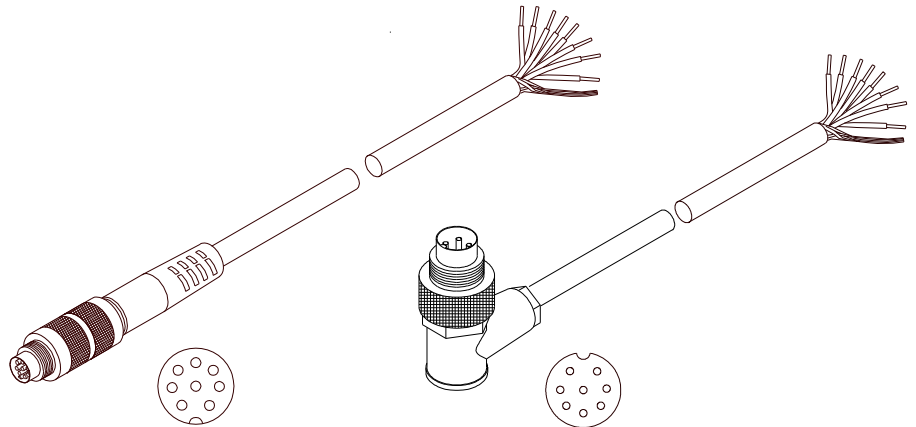


Connector Assignment

**Connection to PLC:
8-pole fem. connector Binder Series 712**

Pin:	Color:	Assignment:
1	white	GND (0V)
2	brown	+24VDC (±10%)
3	green	IN0
4	yellow	OUT0
5	grey	OUT1
6	pink	OUT2
7	blue	OUT3
8	red	OUT4

Connecting cable:
cab-las8/SPS-(length)
cab-las8/SPS-w-(length) (angle type, 90°)
(standard length 2m)

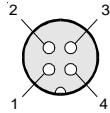


cab-las8/SPS-...
(max. length 25m, outer jacket: PUR)

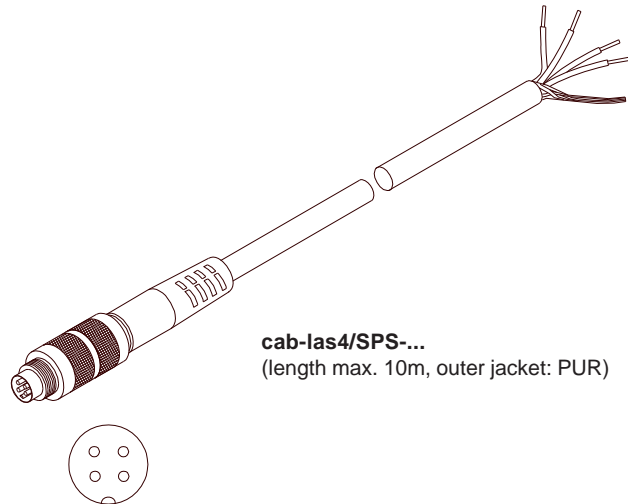
cab-las8/SPS-w-...
(max. length 25m, outer jacket: PUR)

**Additional connection to PLC:
4-pole fem. connector Binder Series 712**

Pin:	Color:	Assignment:
1	white	GND (0V)
2	brown	not connected
3	black	Analog output voltage (0...+10V)
4	blue	Analog output current (4...20mA)



Connecting cable:
cab-las4/SPS-(length)
(Standard length 2m)



cab-las4/SPS-...
(length max. 10m, outer jacket: PUR)

Connector Assignment

**Connection to PC:
5-pole fem. connector Binder Series 712**

Pin:	Assignment:
1	GND (0V)
2	TxD
3	RxD
4	+24VDC (+Ub, OUT)
5	not connected

Connection via RS232 interface at the PC:

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

alternative:

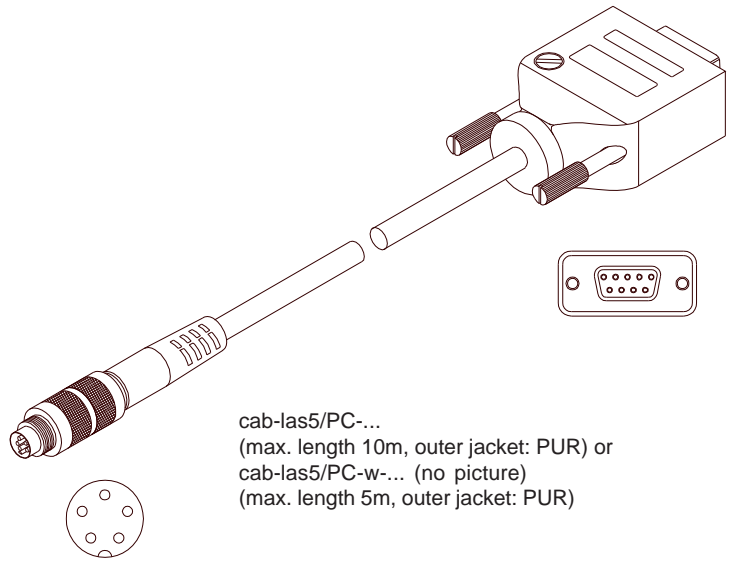
Connection via USB interface at the PC:

Connecting cable (incl. driver software):
 cab-las5/USB-(length)
 cab-las5/USB-w-(length) (angle type 90°)
 (standard length 2m)

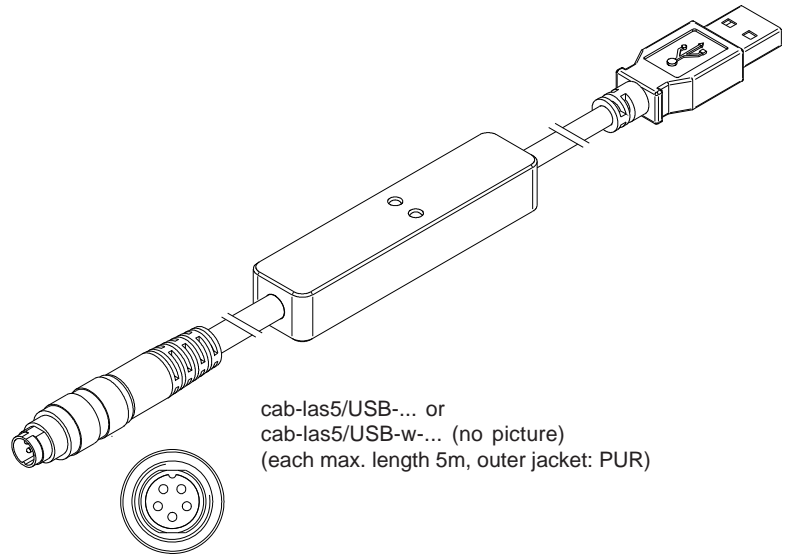
alternative:

Connection to local network via Ethernet bus:

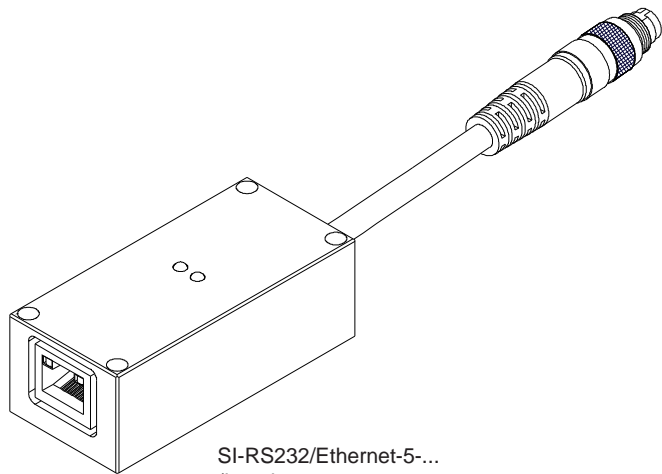
Adapter (based on Lantronix XPortModul):
 SI-RS232/Ethernet-5-(length)
 (standard length 2m)



cab-las5/PC-...
 (max. length 10m, outer jacket: PUR) or
 cab-las5/PC-w-... (no picture)
 (max. length 5m, outer jacket: PUR)



cab-las5/USB-... or
 cab-las5/USB-w-... (no picture)
 (each max. length 5m, outer jacket: PUR)



SI-RS232/Ethernet-5-...
 (length 0,5m, 1m, or 2m,
 outer jacket: PUR)



LED Display

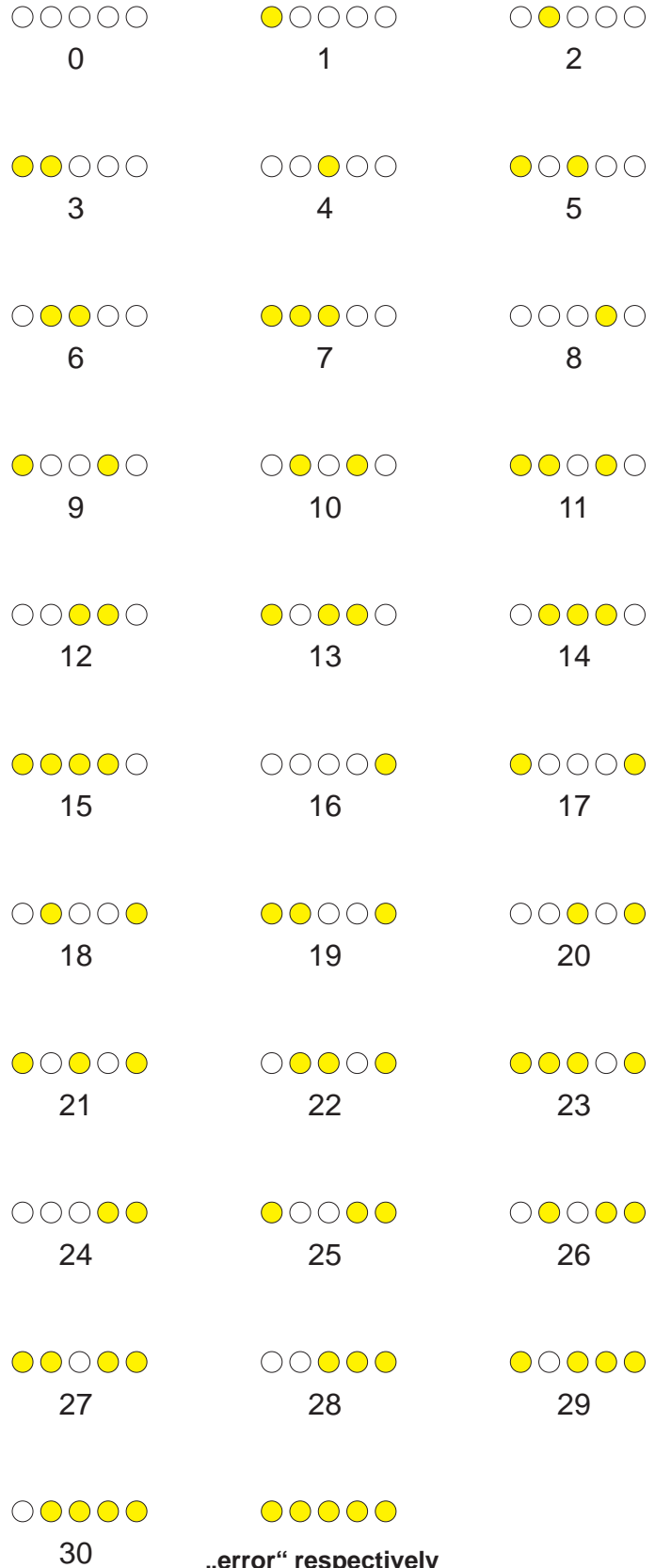
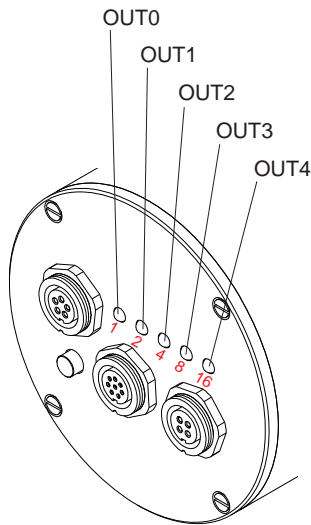
LED display:

The gloss grade is visualized by means of 5 yellow LEDs at the housing of the gloss sensor.

In the BINARY mode 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-150 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).

In the DIRECT mode the maximum number of gloss grades to be taught is 5. These 5 gloss grades can be directly output at the 5 digital outputs. The respective detected gloss grade is displayed by means of the 5 yellow LEDs at the gloss sensor housing.

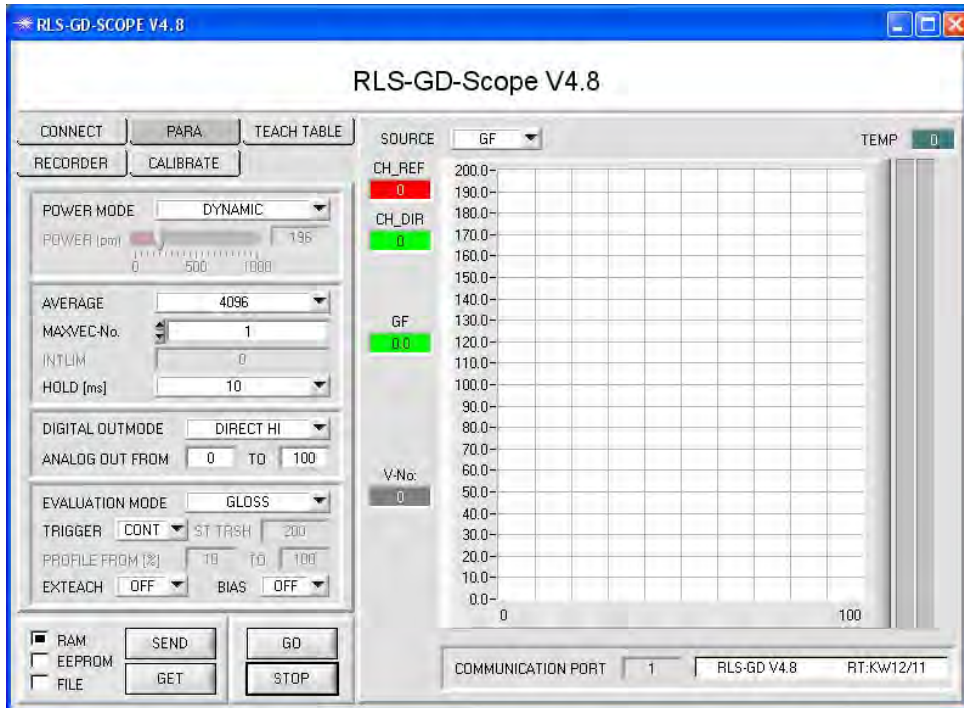




Parameterization

Windows® user interface:

The RLS-GD gloss sensor is parameterized under Windows® with the RLS-GD-Scope software. The Windows® user interface facilitates the teach-in process at the sensor and supports the operator in the task of adjustment and commissioning of the sensor.

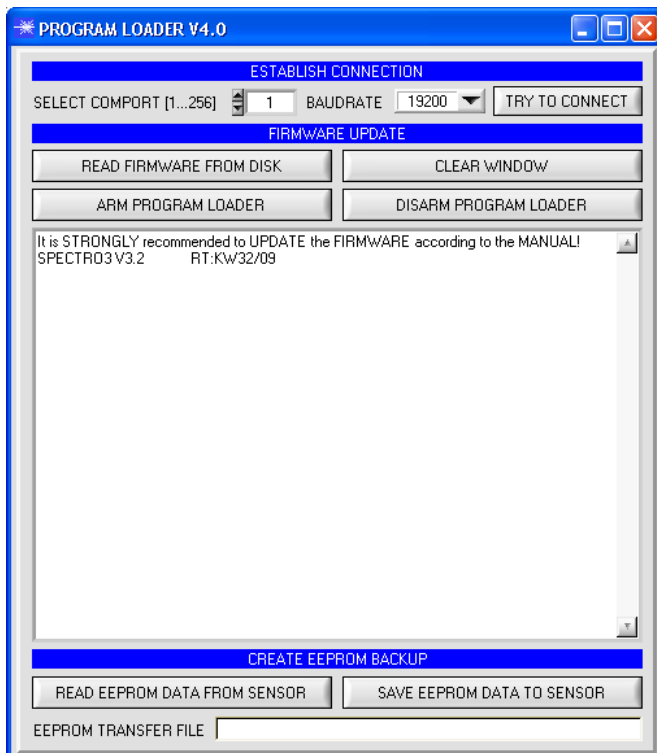


The RS232 interface (PARA) is used for setting parameters such as:

- MAXVEC-No.:
Number of gloss degrees (normalized vectors) to be checked
- POWER MODE:
Light power of the white-light LED
- EVALUATION MODE:
The RLS-GD sensor can be operated with two different evaluation modes (NORM_INT or GLOSS)
- AVERAGE:
Averaging over a maximum of 32768 values
- TRIGGER:
Continuous or external or self trigger
- DIGITAL OUTMODE:
Triggering of the digital outputs
- INTLIM:
Minimum intensity required for gloss evaluation
- HOLD:
Pulse lengthening up to 100ms max.

Under Windows® representation of the gloss value on a PC in numeric form and in a color chart, and representation of RGB values in a time chart. In addition the current RGB values are displayed as a bar chart.

Firmware Update by means of the software Program Loader:



The software „Program Loader“ allows the user to perform an automatic firmware update. The update will be carried out through the RS232 interface.

An initialisation file (xxx.ini) and a firmware file (xxx.elf.S) are required for performing a firmware update. These files can be obtained from your supplier. In some cases an additional firmware file for the program memory (xxx.elf.p.S) is also needed, and this file will be automatically provided together with the other two files.

A plausibility check is performed after the initialisation file has been loaded with the Program Loader. If the initialisation file was changed or damaged, it will not be possible to perform a firmware update.

When the plausibility check is successfully completed, the instructions contained in the initialisation file will be carried out step by step.

The complete memory contents of the micro-controller in the sensor will be deleted in a firmware update. This means that both the program in the program memory and the data in the data memory will be lost.

The new firmware automatically writes the correct data to the program memory again.

However, the parameter settings, temperature curves, linearization curves, etc. that are stored in the data memory (EEPROM) will be deleted.

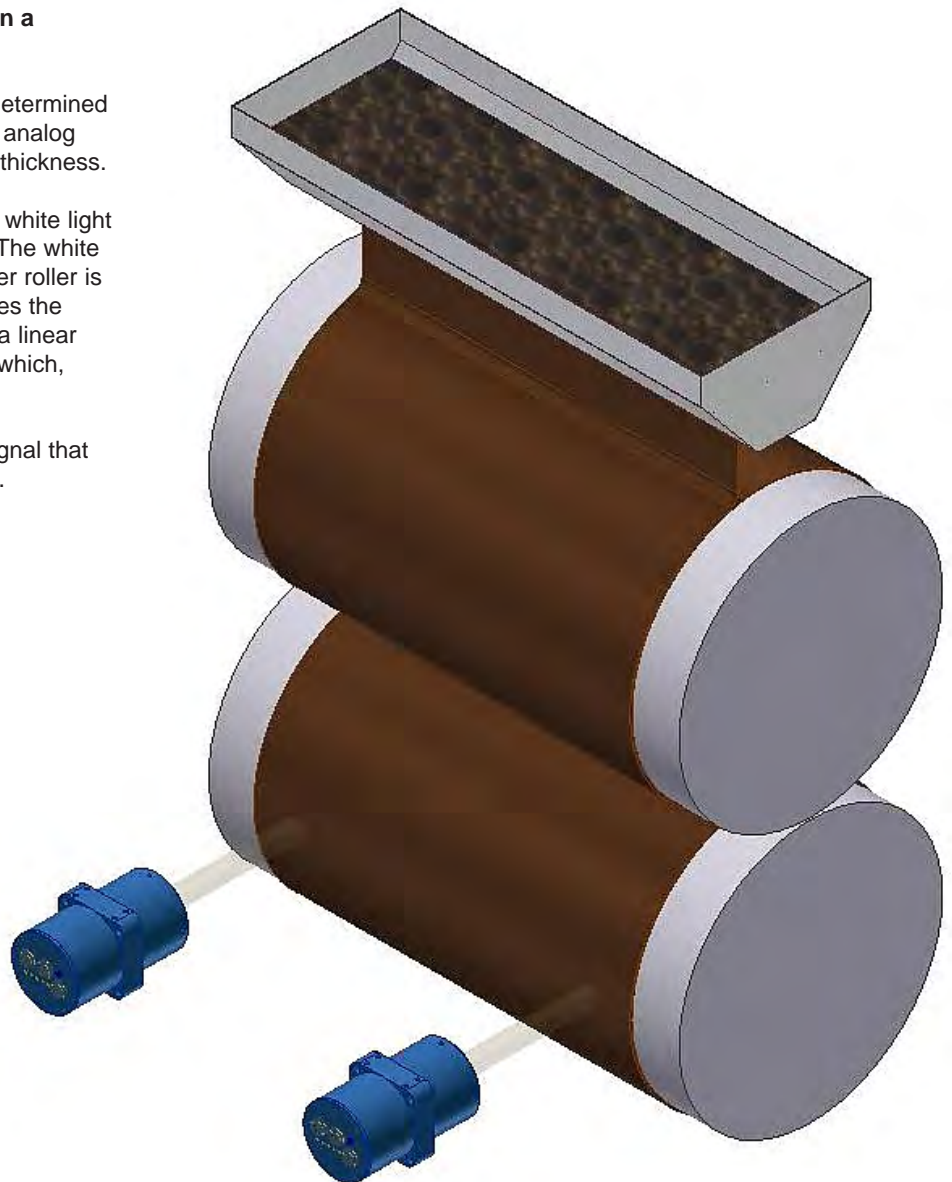
With the Program Loader V4.0 software the data will be saved in the EEPROM, and can be written back again after successful firmware update. For this purpose the software creates an EEPROM backup file.

**Application Example****Monitoring the chocolate layer thickness on a calender roller**

The chocolate coating of a calender roller is determined with an RLS-GD-150. At the sensor output an analog signal provides information about the coating thickness.

From a distance of approx. 150 mm polarised white light is vertically directed onto the calender roller. The white light that is diffusely reflected from the calender roller is detected by way of a receiver ring that encircles the white light source. The receiver also features a linear polarisation filter, the polarisation direction of which, however, is rotated by 90° with respect to the transmitter's polarisation filter.

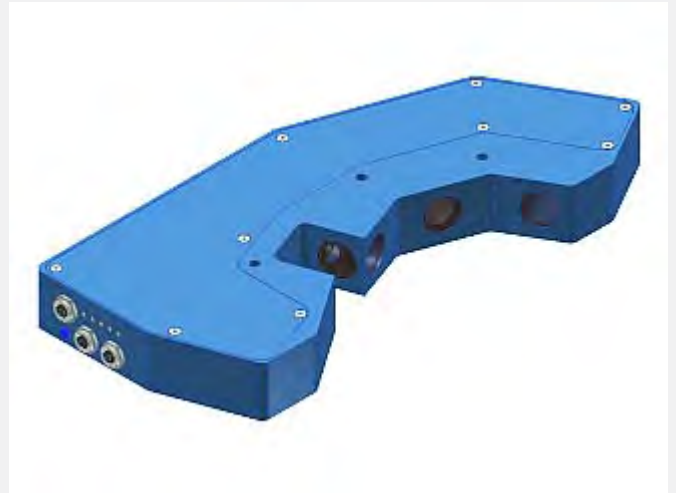
The analog output of the sensor provides a signal that is proportional to the received quantity of light.



RLS Series

▶ RLS-GD-20/20°-UV Detection of Glass Coating

- Insensitive to outside light due to clocked UV illumination
- Receiver (20°) and reference
- Storing of up to 31 gloss degrees (gloss values)
- Tolerance adjustable for each gloss degree
- Working distance typ. 20 mm ± 10%
- Parameterisable under Windows®, calibration function
- RS232 interface (USB or Ethernet adapter is available)
- 5 switching outputs (npn-/pnp-able, 100 mA, short-circuit proof)
- Switching state indication by means of yellow LED (5x)
- Transmitter power adjustable (STAT or DYN)
- Averaging can be activated (over up to approx. 32000 values)
- Scratch-resistance glass cover of optics, sturdy aluminum housing
- Various evaluation algorithms (normalized or calibrated onto optical glass or mirror = 100%)
- Analog output (0...+10V or 4...20mA, proportional to the gloss degree 0...100 or via zoom function up to 10-fold zoom)
- Special trigger mode (EXT4) for extension of working life of UV-LED



Design

Product name:

RLS-GD-20/20°-UV

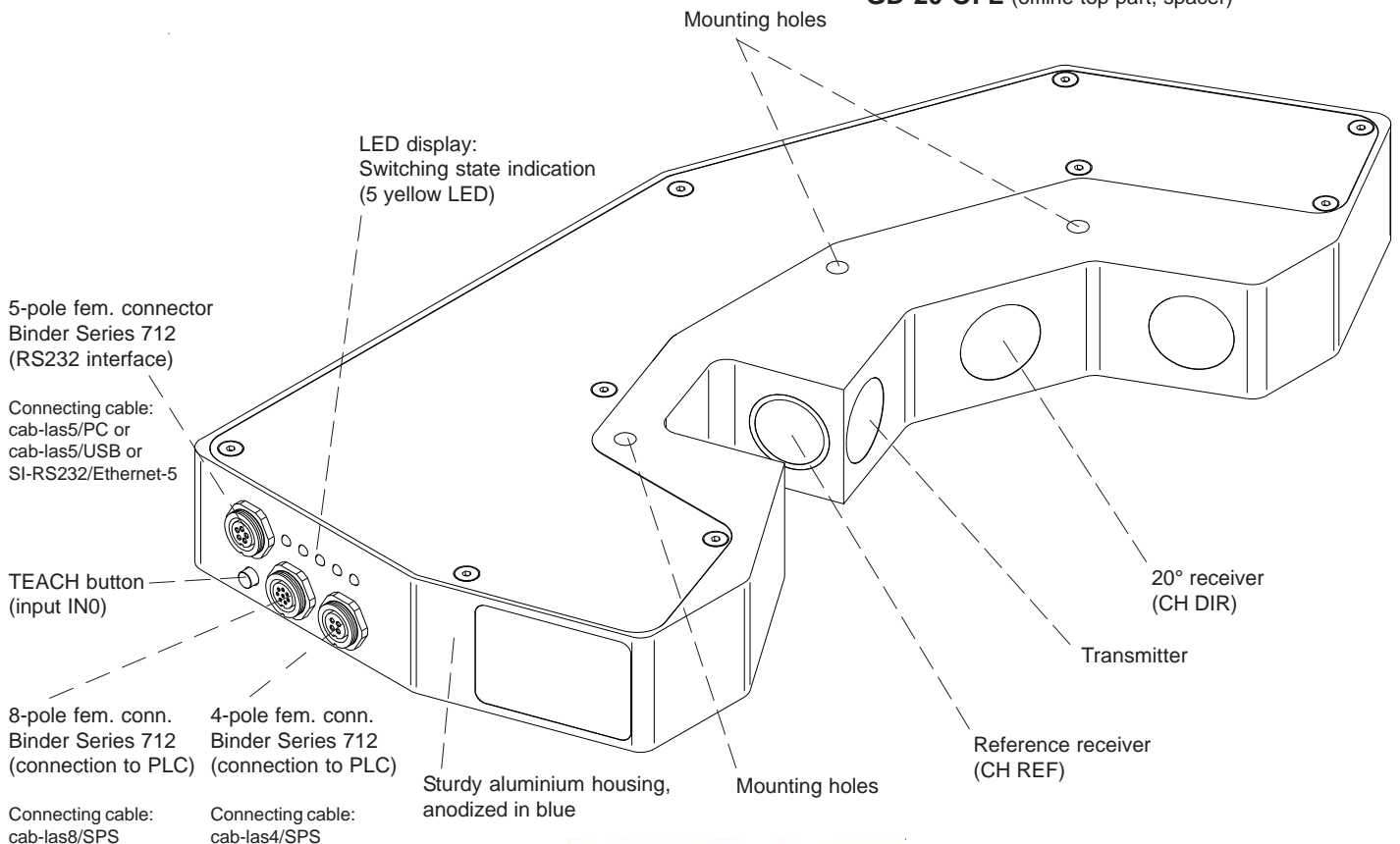
(incl. Windows® PC software RLS-GD-Scope)

Accessories: (cf. page 9)

GD-20-CAL-UV (calibration top-part with glass)

GD-20-CAL-UV-MIRR (calibration top-part with mirror)

GD-20-OFL (offline top part, spacer)



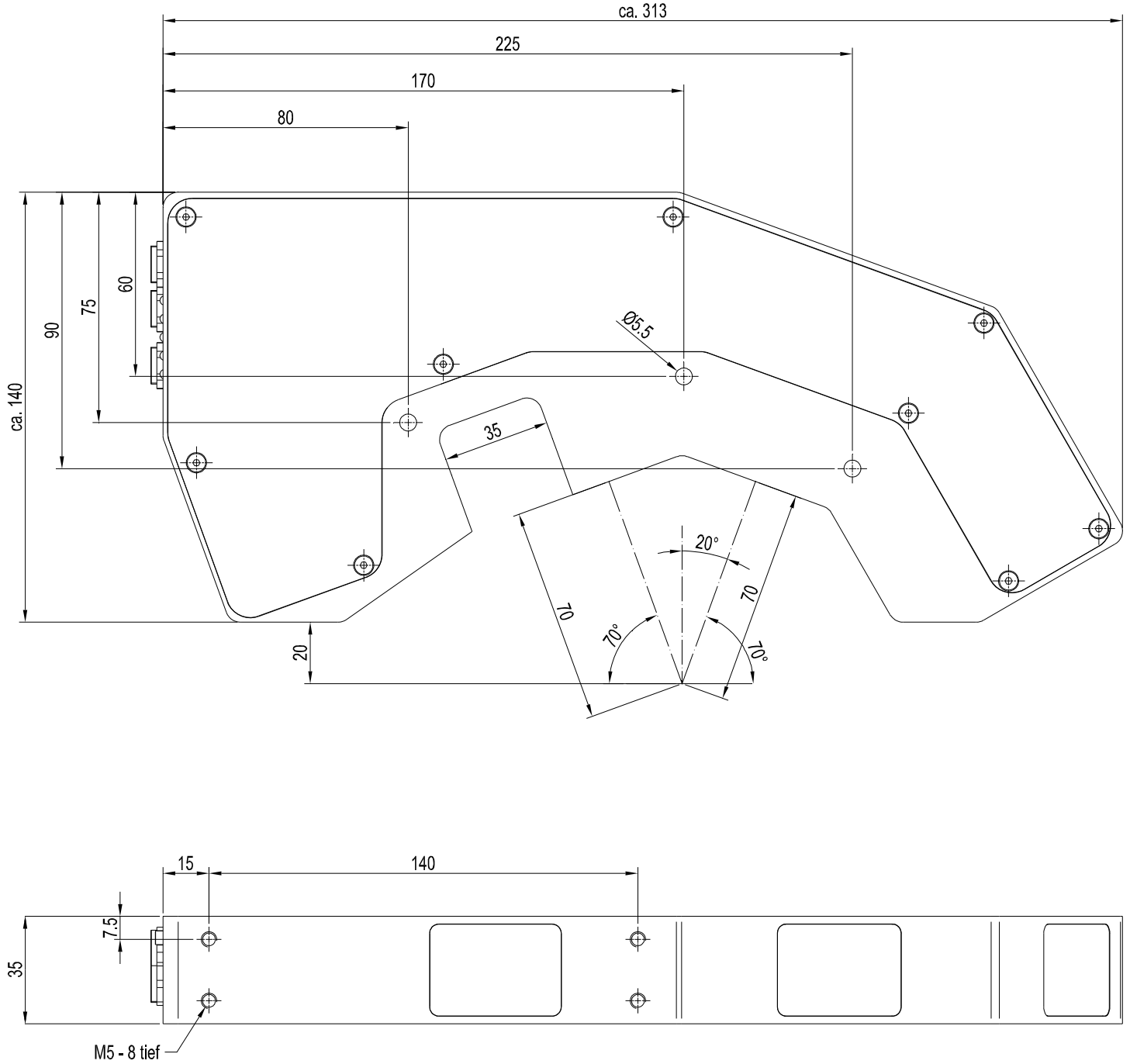


Technical Data

Model	RLS-GD-20/20°-UV
Light source	1x UV LED (280 nm), AC-operation (100 kHz)
Working distance	typ. 20 mm ± 10%
Light spot size	in a distance of 20 mm: typ. Ø 10 mm
Optical filters	UV filter UG11
Voltage supply	+24VDC (± 10%), protected against polarity reversal, overload protected
Pulsating light operation	100 kHz
Ambient light	up to 5000 Lux
Enclosure rating	IP54
Current consumption	typ. 110 mA
Interface	RS232, parameterisable under Windows®
EMC test acc. to	DIN EN 60947-5-2
Type of connector	connection to PLC: 8-pole female connector Binder Series 712 connection to PLC: 4-pole female connector Binder Series 712 connection to PC: 5-pole female connector Binder Series 712
Connecting cables	to PLC: cab-las8/SPS or cab-las8/SPS-w and cab-las4/SPS to PC/RS232 interface: cab-las5/PC or cab-las5/PC-w to PC/USB interface: cab-las5/USB or cab-las5/USB-w to PC/Ethernet interface: SI-RS232/Ethernet-5
Operating temperature range	-20°C ... +55°C
Storage temperature range	-20°C ... +85°C
Housing material	aluminium, anodized in blue
Housing dimensions	LxWxH approx. 313 mm x 140 mm x 35 mm
Max. switching current	100 mA, short-circuit proof
Switching frequency	max. 5 kHz (depends on averaging)
Output DIGITAL (5x)	OUT0 ... OUT4: Qinv or Q, adjustable via PC: Qinv: npn bright-switching (npn n.c.) / pnp dark-switching (pnp n.o.) Q: pnp bright-switching (pnp n.c.) / npn dark-switching (npn n.o.)
Output ANALOG (2x)	1x voltage output (0 ... +10V) 1x current output (4 ... 20mA)
Input IN0	via teach push button at the housing
Sensitivity (switching threshold)	parameterisable under Windows® (selection: threshold or tolerance window)
Pulse lengthening	0 ms ... 100 ms
Transmitted light power	adjustable under Windows®
Averaging	over 32000 values (adjustable under Windows®)
Switching state indication	by means of 5 yellow LED



Dimensions



All dimensions in mm

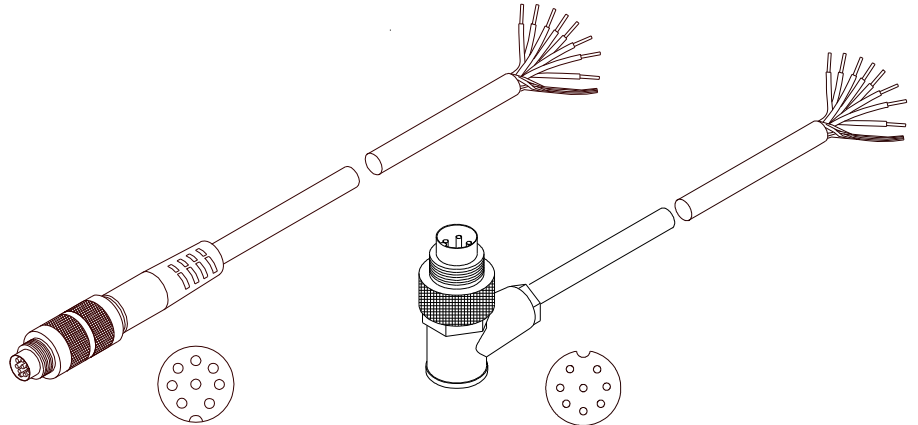


Connector Assignment

**Connection to PLC:
8-pole fem. connector Binder Series 712**

Pin:	Color:	Assignment:
1	white	GND (0V)
2	brown	+24VDC (±10%)
3	green	IN0
4	yellow	OUT0
5	grey	OUT1
6	pink	OUT2
7	blue	OUT3
8	red	OUT4

Connecting cable:
cab-las8/SPS-(length)
cab-las8/SPS-w-(length) (angle type, 90°)
(standard length 2m)

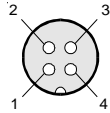


cab-las8/SPS-...
(max. length 25m, outer jacket: PUR)

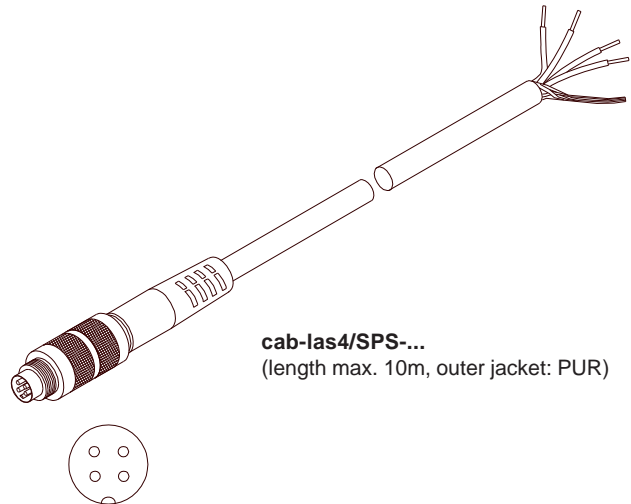
cab-las8/SPS-w-...
(max. length 25m, outer jacket: PUR)

**Additional connection to PLC:
4-pole fem. connector Binder Series 712**

Pin:	Color:	Assignment:
1	white	GND (0V)
2	brown	not connected
3	black	Analog output voltage (0...+10V)
4	blue	Analog output current (4...20mA)



Connecting cable:
cab-las4/SPS-(length)
(Standard length 2m)



cab-las4/SPS-...
(length max. 10m, outer jacket: PUR)

Connector Assignment

**Connection to PC:
5-pole fem. connector Binder Series 712**

Pin:	Assignment:
1	GND (0V)
2	TxD
3	RxD
4	+24VDC (+Ub, OUT)
5	not connected

Connection via RS232 interface at the PC:

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

alternative:

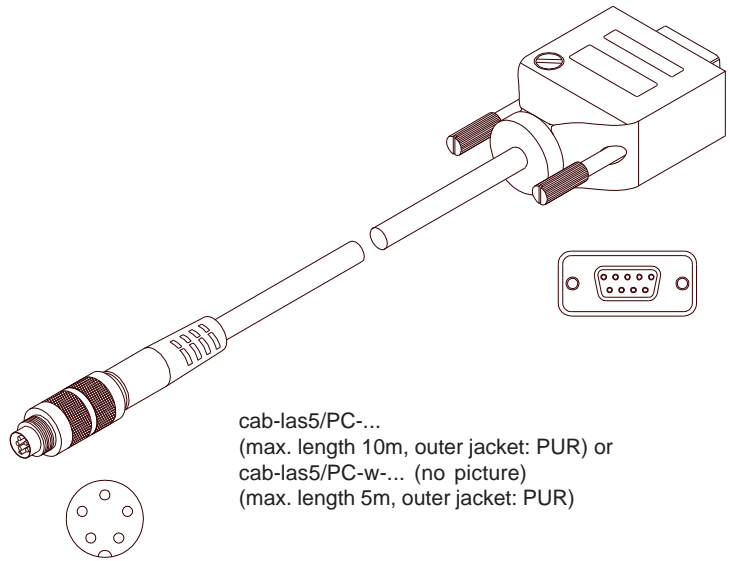
Connection via USB interface at the PC:

Connecting cable (incl. driver software):
 cab-las5/USB-(length)
 cab-las5/USB-w-(length) (angle type 90°)
 (standard length 2m)

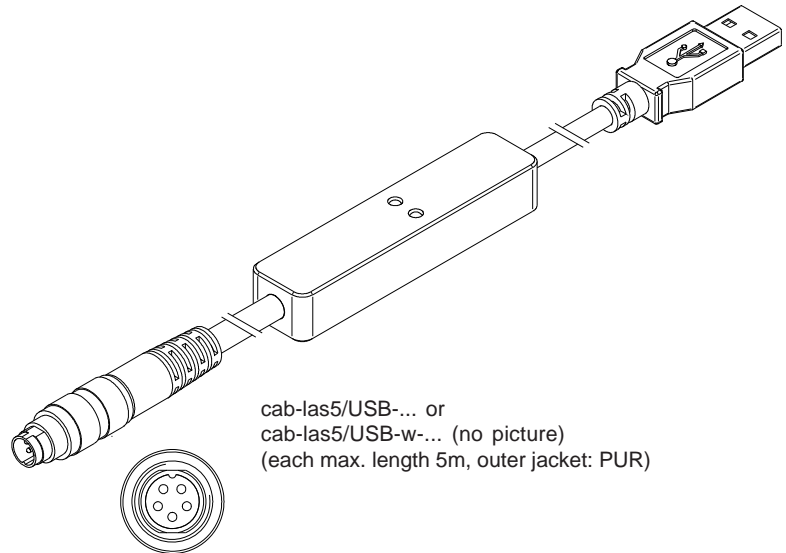
alternative:

Connection to local network via Ethernet bus:

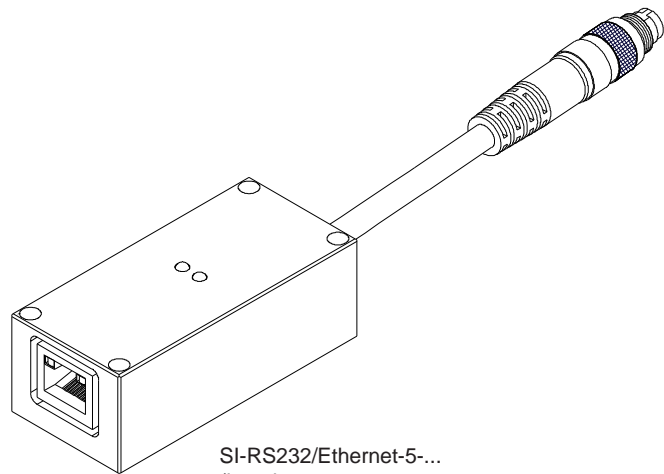
Adapter (based on Lantronix XPortModul):
 SI-RS232/Ethernet-5-(length)
 (standard length 2m)



cab-las5/PC-...
 (max. length 10m, outer jacket: PUR) or
 cab-las5/PC-w-... (no picture)
 (max. length 5m, outer jacket: PUR)



cab-las5/USB-... or
 cab-las5/USB-w-... (no picture)
 (each max. length 5m, outer jacket: PUR)



SI-RS232/Ethernet-5-...
 (length 0,5m, 1m, or 2m,
 outer jacket: PUR)

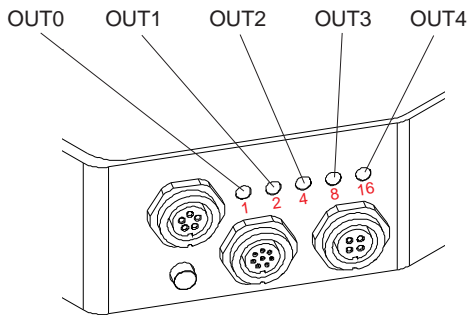
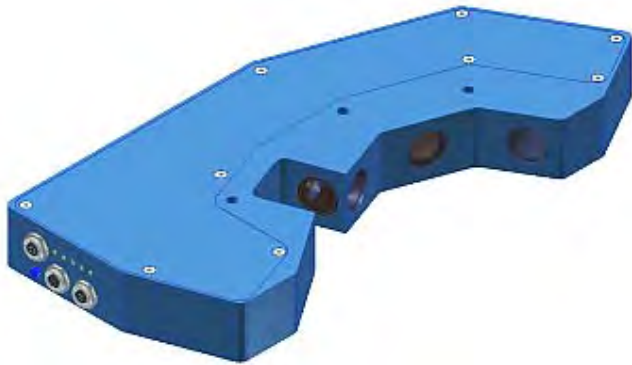


LED Display

LED display:

The gloss grade is visualized by means of 5 yellow LEDs at the housing of the gloss sensor. At the same time the gloss grade indicated at the LED display is output as 5-bit binary information at the digital outputs OUT0 ... OUT4 of the 8-pole PLC connector.

In the DIRECT mode the maximum number of gloss grades to be taught is 5. These 5 gloss grades can be directly output at the 5 digital outputs. The respective detected gloss grade is displayed by means of the 5 yellow LEDs at the gloss sensor housing.



○ ○ ○ ○ ○ 0	● ○ ○ ○ ○ 1	○ ● ○ ○ ○ 2
● ● ○ ○ ○ 3	○ ○ ● ○ ○ 4	● ○ ● ○ ○ 5
○ ● ● ○ ○ 6	● ● ● ○ ○ 7	○ ○ ○ ● ○ 8
● ○ ○ ● ○ 9	○ ● ○ ● ○ 10	● ● ○ ● ○ 11
○ ○ ● ● ○ 12	● ○ ● ● ○ 13	○ ● ● ● ○ 14
● ● ● ● ○ 15	○ ○ ○ ○ ● 16	● ○ ○ ○ ● 17
○ ● ○ ○ ● 18	● ● ○ ○ ● 19	○ ○ ● ○ ● 20
● ○ ○ ○ ● 21	○ ● ● ○ ● 22	● ● ● ○ ● 23
○ ○ ○ ● ● 24	● ○ ○ ● ● 25	○ ● ○ ● ● 26
● ● ○ ○ ● 27	○ ○ ● ● ● 28	● ○ ● ● ● 29
○ ● ● ● ● 30	● ● ● ● ●	

„error“ respectively „not detected“



Measuring Principle

Measuring principle of the RLS-GD-20/20°-UV:

The RLS-GD-20/20°-UV 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 UV-LED a white light spot (\varnothing approx. 10 mm) is projected onto the surface to be inspected by way of an optical transmitter unit at an angle of 20° to the vertical plane.

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 also arranged at an angle of 20° to the vertical plane). For this receiver calibration can be performed on black glass (under 20°, corresponds to 100). For this purpose a reference line is applied during calibration to store a reference value which then serves as a comparison value during measurement.

Gloss detection either operates continuously or is started by an external PLC trigger signal. The gloss degree respectively 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-20/20°-UV.

TEACH button:

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).

Evaluation algorithm EXTERN TEACH:

With this function field the gloss sensor can be taught by means of a LOW-signal at pin 3 (for instance via push button, or PLC). During this procedure the object to be taught has to be in the visibility range of the gloss sensor. The yellow LEDs indicate a successful teaching procedure.

RS232 interface:

Through the RS232 interface parameters and measured values can be exchanged between the PC and the RLS-GD-20/20°-UV sensor. All the parameters for gloss degree detection respectively normalized vector detection can be stored in the non-volatile EEPROM of the RLS-GD-20/20°-UV sensor. When parameterisation is finished the gloss sensor continues to operate with the current parameters in "stand alone" mode without a PC.

Calibration:

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.

Temperature compensation:

The sensor is factory-temperature-compensated. It is stable over a temperature range from 10 degrees to 60 degrees centigrade. The current temperature inside the housing is visualised by the PC user interface.



Visualization

Visualization of the gloss degree:

Under Windows® representation of the gloss degree on a PC in numeric form and in a gloss chart, and representation of the 20° value in a time chart. In addition the current 20° value is displayed as a bar chart.

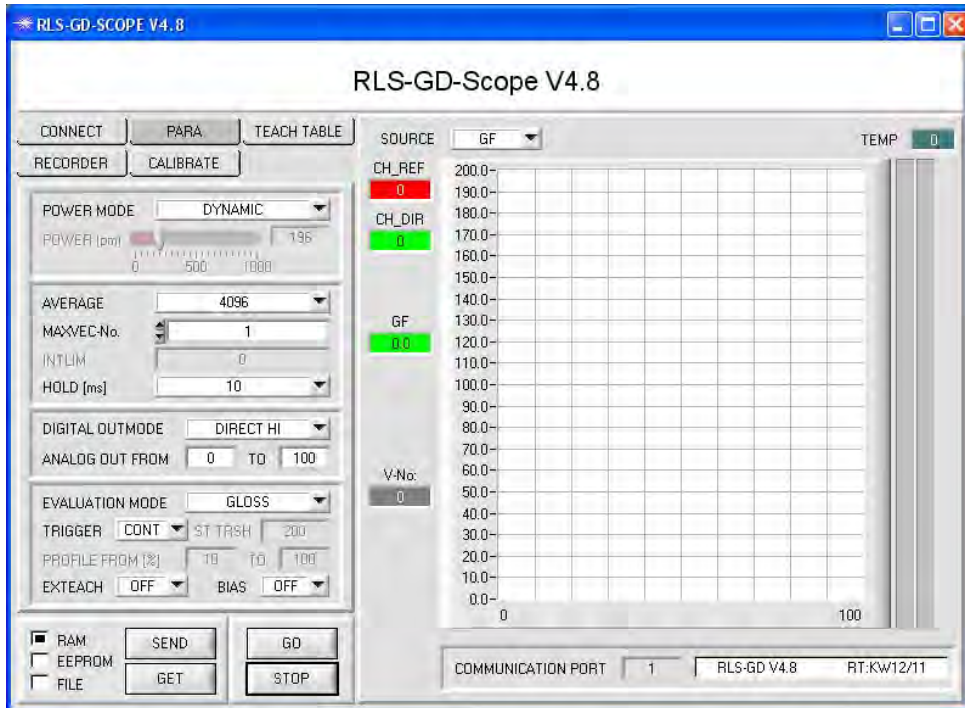
The following evaluation algorithms can also be selected:

- Target lies within the tolerance window of a taught gloss grade.
- EXTERN TEACH: With this function field the gloss sensor can be taught by means of a LOW-signal at pin 3 (for instance via push button, or PLC). During this procedure the object to be taught has to be in the visibility range of the gloss sensor. The yellow LEDs indicate a successful teaching procedure.

Parameterization

Windows® user interface:

The RLS-GD gloss sensor is parameterized under Windows® with the RLS-GD-Scope software. The Windows® user interface facilitates the teach-in process at the sensor and supports the operator in the task of adjustment and commissioning of the sensor.

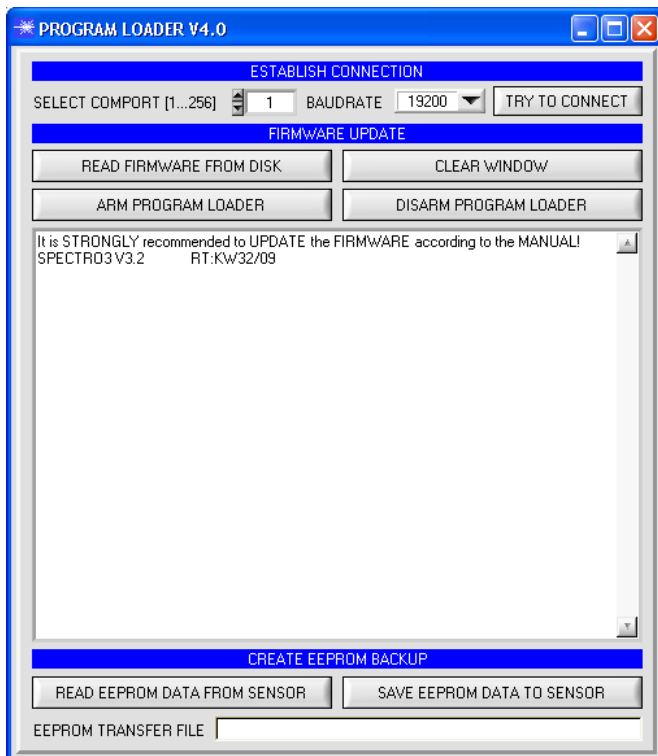


The RS232 interface (PARA) is used for setting parameters such as:

- MAXVEC-No.:
Number of gloss degrees (normalized vectors) to be checked
- POWER MODE:
In this function field the operating mode of automatic power correction at the transmitter unit can be set
- EVALUATION MODE:
The RLS-GD-20/20°-UV sensor is operated with evaluation mode GLOSS
- AVERAGE:
Averaging over a maximum of 32768 values
- TRIGGER:
Continuous or external or self trigger
- DIGITALOUTMODE:
Triggering of the digital outputs
- INTLIM:
Minimum intensity required for gloss evaluation
- HOLD:
Pulse lengthening up to 100ms max.

Under Windows® representation of the gloss value on a PC in numeric form and in a color chart, and representation of RGB values in a time chart. In addition the current RGB values are displayed as a bar chart.

Firmware Update by means of the software Program Loader:



The software „Program Loader“ allows the user to perform an automatic firmware update. The update will be carried out through the RS232 interface.

An initialisation file (xxx.ini) and a firmware file (xxx.elf.S) are required for performing a firmware update. These files can be obtained from your supplier. In some cases an additional firmware file for the program memory (xxx.elf.p.S) is also needed, and this file will be automatically provided together with the other two files.

A plausibility check is performed after the initialisation file has been loaded with the Program Loader. If the initialisation file was changed or damaged, it will not be possible to perform a firmware update.

When the plausibility check is successfully completed, the instructions contained in the initialisation file will be carried out step by step.

The complete memory contents of the micro-controller in the sensor will be deleted in a firmware update. This means that both the program in the program memory and the data in the data memory will be lost.

The new firmware automatically writes the correct data to the program memory again.

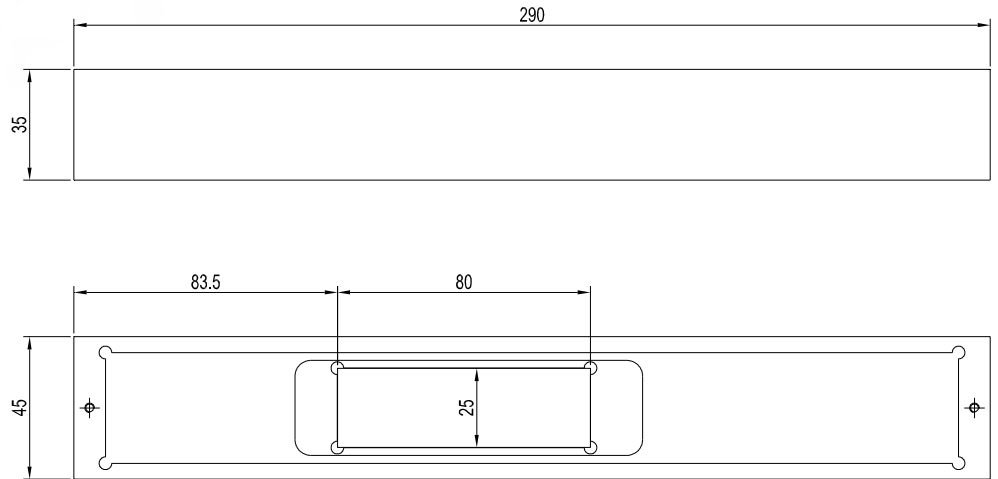
However, the parameter settings, temperature curves, linearization curves, etc. that are stored in the data memory (EEPROM) will be deleted.

With the Program Loader V4.0 software the data will be saved in the EEPROM, and can be written back again after successful firmware update. For this purpose the software creates an EEPROM backup file.

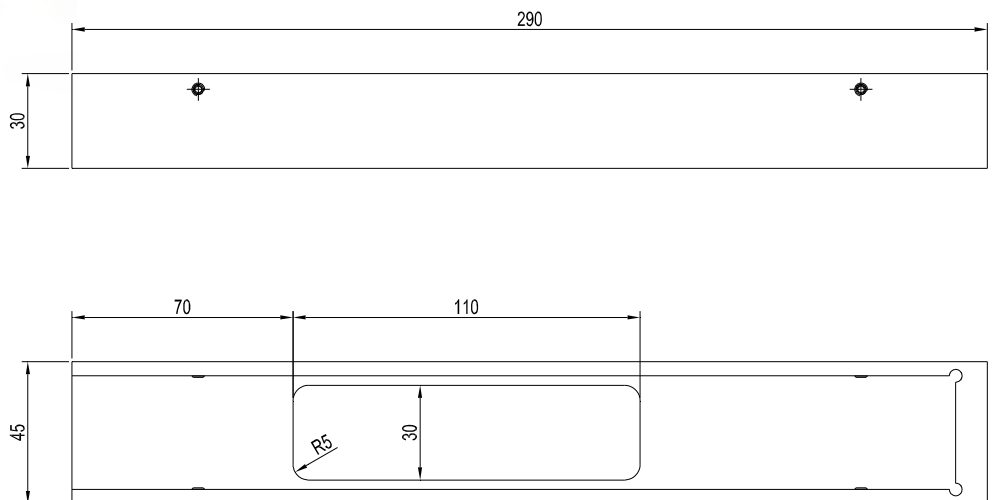
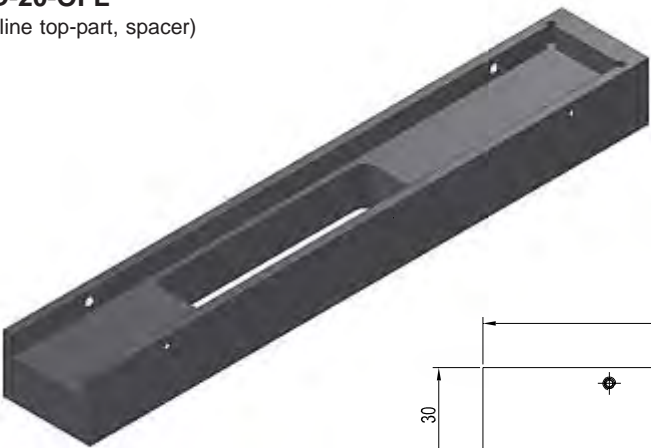


Accessories

GD-20-CAL-UV
GD-20-CAL-UV-MIRR
 (Calibration top-part)



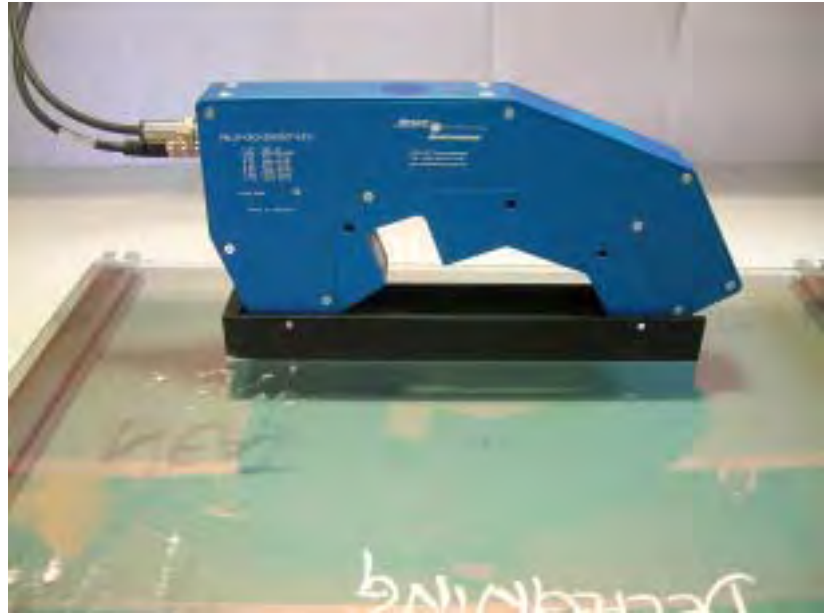
GD-20-OFL
 (offline top-part, spacer)



All dimensions in mm

**Application Example****Detection of nano coat on glass panes**

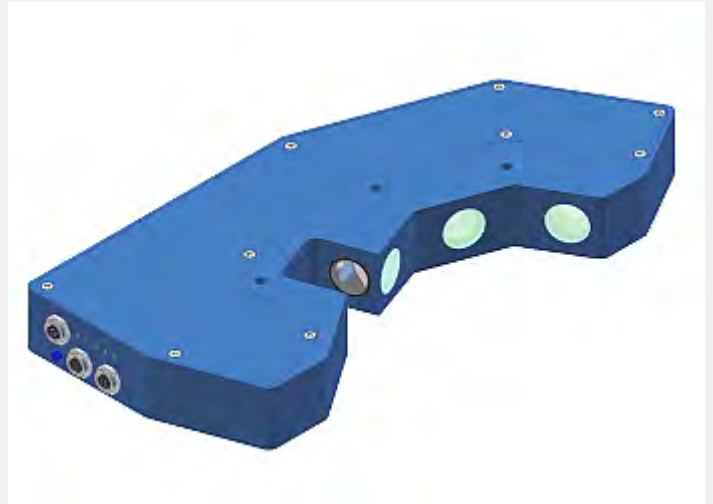
On one side of clear and different tinted glass panes a nano coat is applied. The RLS-GD-20/20°-UV gloss sensor can detect on which side of the pane the coating was applied. The sensor is mounted at a distance of 20 mm to the glass pane. The glass side that shows a high gloss grade is the coated side.



RLS Series

▶ RLS-GD-20/20° Gloss Detection

- Insensitive to outside light due to clocked white light
- 2 receivers (20°, 60°) and reference
- Storing of up to 31 gloss degrees
- Tolerance adjustable for each gloss degree
- Working distance typ. 15 mm ± 10%
- Parameterisable under Windows®
- RS232 interface (USB or Ethernet adapter is available)
- 5 switching outputs (npn-/pnp-able, 100 mA, short circuit proof)
- Switching state indication via 5 yellow LEDs
- Transmitter power adjustable or controllable (STAT or DYN)
- Averaging can be activated (over up to approx. 32000 values)
- Scratch-resistance glass cover of optics, sturdy aluminum housing
- Calibration function (Wood's glass)
- Various evaluation algorithms (standardized or calibrated onto Wood's glass = 100%)
- Analog output (voltage 0...+10V and current 4...20mA, proportional to the gloss degree 0%...100% respectively zoomed up to the tenfold) via zoom function



Design

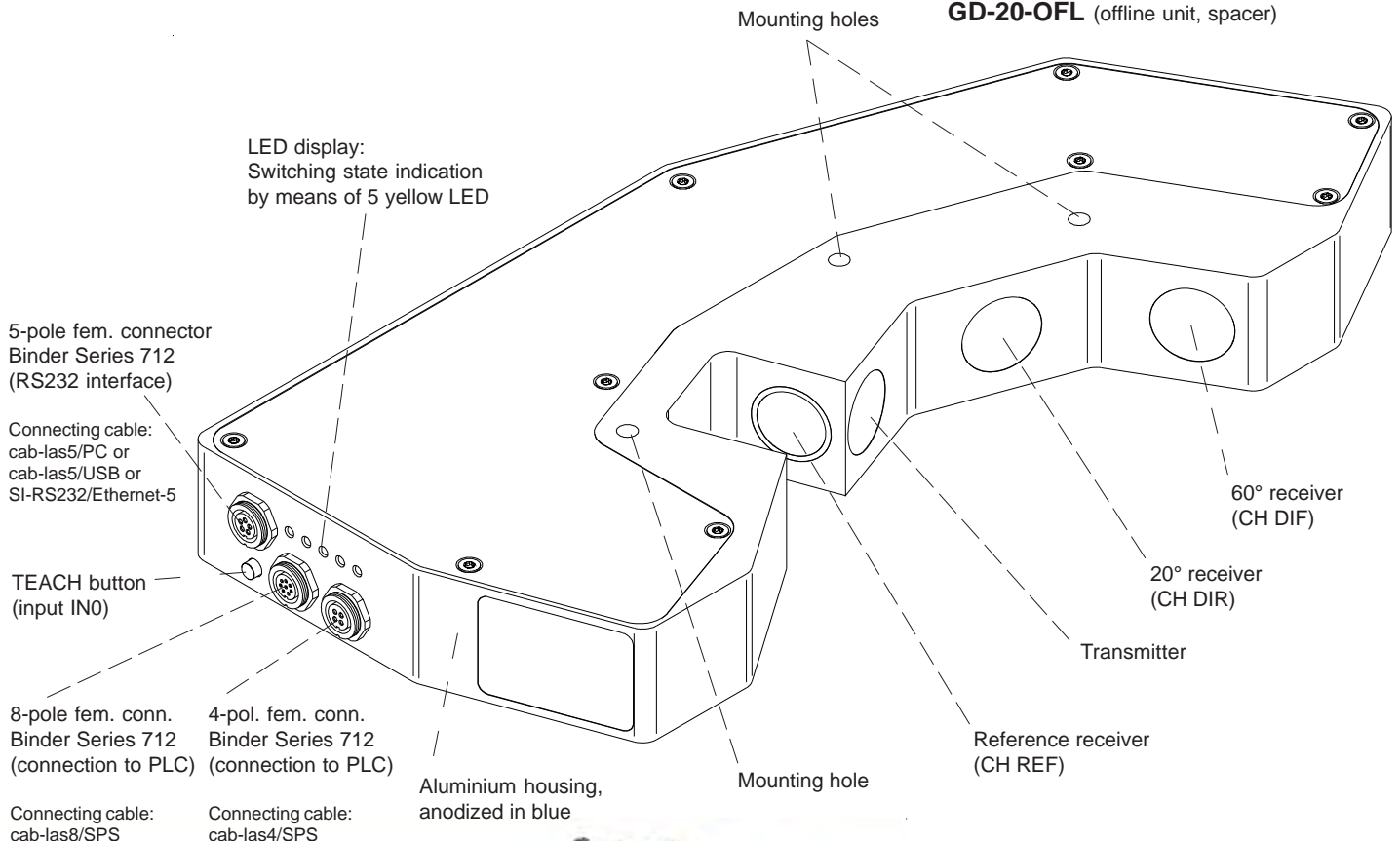
Product name:

RLS-GD-20/20°

(incl. Windows® PC software RLS-GD-Scope)

Accessories: (cf. page 9-10)

- ABL-RLS-GD-20** (blast air add-on unit)
- GD-20-CAL** (calibration add-on unit)
- GD-20-CAL-UV-MIRR** (calibration add-on unit)
- GD-20-OFL** (offline unit, spacer)



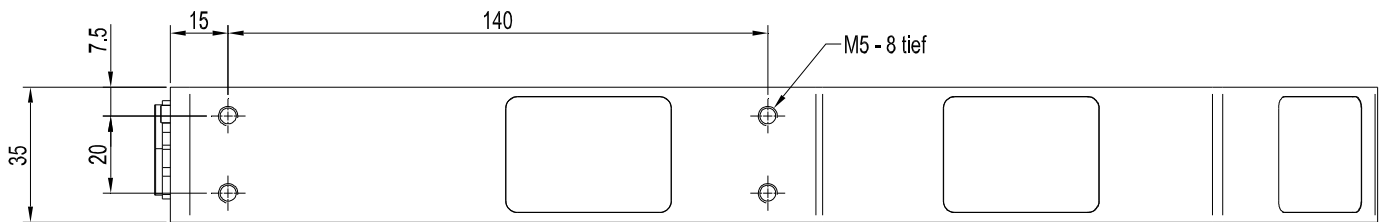
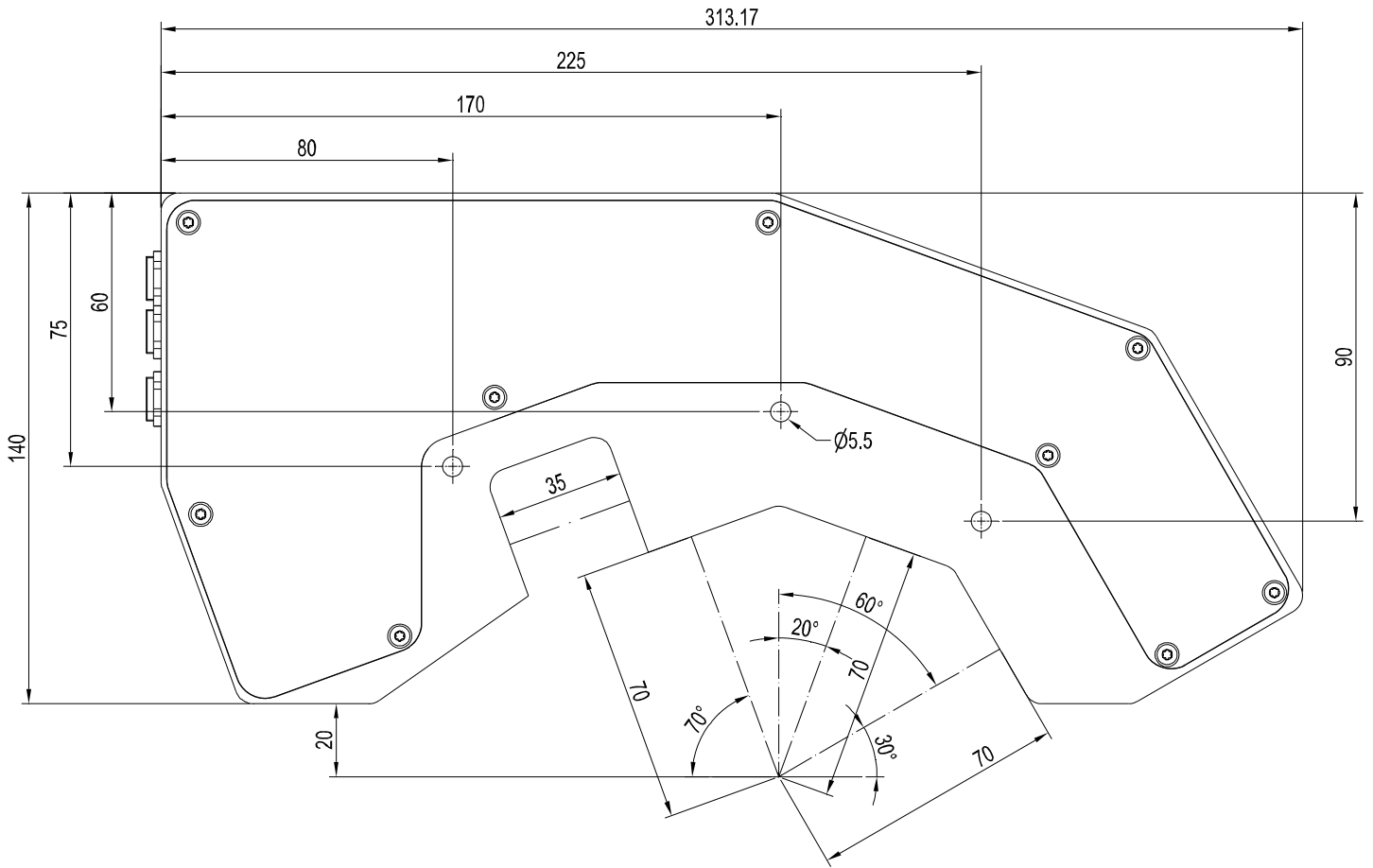


Technical Data

Model	RLS-GD-20/20°
Light source	1x white light LED, AC-operation (100 kHz)
Working distance	typ. 20 mm ± 10%
Light spot size	in a distance of 20 mm: typ. 16 mm x 18 mm (elliptical)
Optical filters	day light filter (KG2), UV block filter
Voltage supply	+24VDC (± 10%), protected against polarity reversal, overload protected
Pulsating light operation	100 kHz
Ambient light	up to 5000 Lux
Enclosure rating	IP54
Current consumption	typ. 110 mA
Interface	RS232, parameterisable under Windows®
EMC test acc. to	DIN EN 60947-5-2
Type of connector	connection to PLC: 8-pole female connector Binder Series 712 connection to PLC: 4-pole female connector Binder Series 712 connection to PC: 5-pole female connector Binder Series 712
Connecting cables	to PLC: cab-las8/SPS or cab-las8/SPS-w and cab-las4/SPS to PC/RS232 interface: cab-las5/PC or cab-las5/PC-w to PC/USB interface: cab-las5/USB or cab-las5/USB-w to PC/Ethernet interface: SI-RS232/Ethernet-5
Operating temperature range	-20°C ... +55°C
Storage temperature range	-20°C ... +85°C
Housing material	aluminium, anodized in blue
Housing dimensions	LxWxH approx. 313 mm x 140 mm x 35 mm
Max. switching current	100 mA, short-circuit proof
Switching frequency	max. 5 kHz (depends on averaging)
Output DIGITAL (5x)	OUT0 ... OUT4: Qinv or Q, adjustable via PC: Qinv: npn bright-switching (npn n.c.) / pnp dark-switching (pnp n.o.) Q: pnp bright-switching (pnp n.c.) / npn dark-switching (npn n.o.)
Output ANALOG (2x)	1x voltage output (0 ... +10V) 1x current output (4 ... 20mA)
Input IN0	via teach push button at the housing
Sensitivity (switching threshold)	parameterisable under Windows® (selection: threshold or tolerance window)
Pulse lengthening	0 ms ... 100 ms
Transmitted light power	adjustable under Windows®
Averaging	over 32000 values (adjustable under Windows®)
Switching state indication	by means of 5 yellow LED



Dimensions



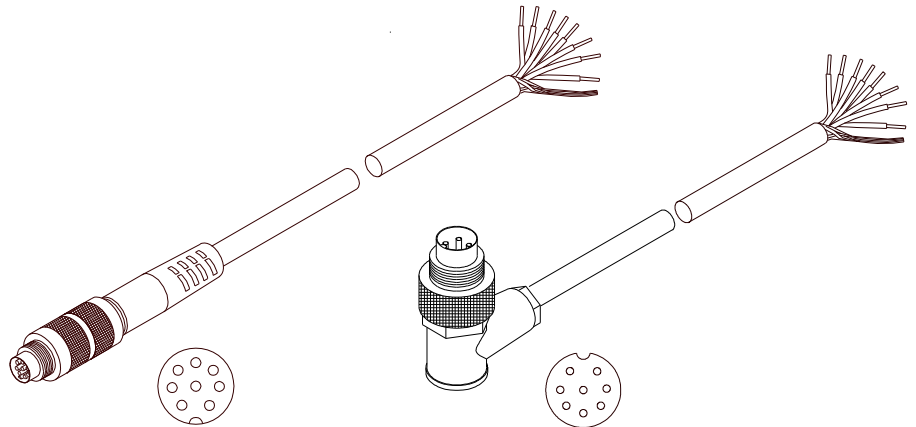
All dimensions in mm

Connector Assignment

**Connection to PLC:
8-pole fem. connector Binder Series 712**

Pin:	Color:	Assignment:
1	white	GND (0V)
2	brown	+24VDC (±10%)
3	green	IN0
4	yellow	OUT0
5	grey	OUT1
6	pink	OUT2
7	blue	OUT3
8	red	OUT4

Connecting cable:
cab-las8/SPS-(length)
cab-las8/SPS-w-(length) (angle type, 90°)
(standard length 2m)

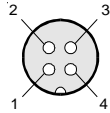


cab-las8/SPS-...
(max. length 25m, outer jacket: PUR)

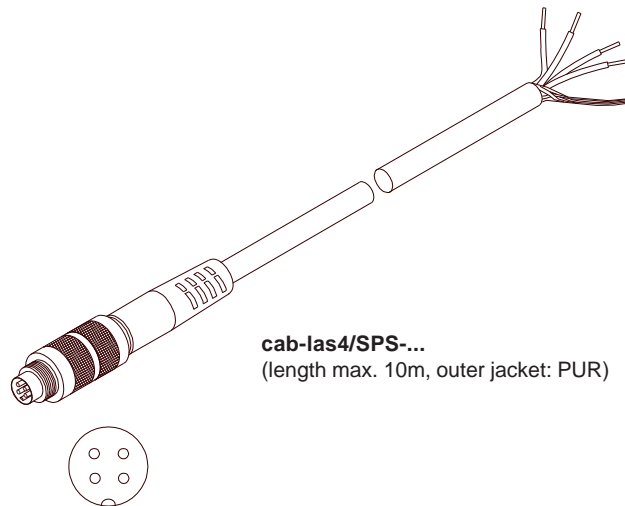
cab-las8/SPS-w-...
(max. length 25m, outer jacket: PUR)

**Additional connection to PLC:
4-pole fem. connector Binder Series 712**

Pin:	Color:	Assignment:
1	white	GND (0V)
2	brown	not connected
3	black	Analog output voltage (0...+10V)
4	blue	Analog output current (4...20mA)



Connecting cable:
cab-las4/SPS-(length)
(Standard length 2m)



cab-las4/SPS-...
(length max. 10m, outer jacket: PUR)

Connector Assignment

**Connection to PC:
5-pole fem. connector Binder Series 712**

Pin:	Assignment:
1	GND (0V)
2	TxD
3	RxD
4	+24VDC (+Ub, OUT)
5	not connected

Connection via RS232 interface at the PC:

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

alternative:

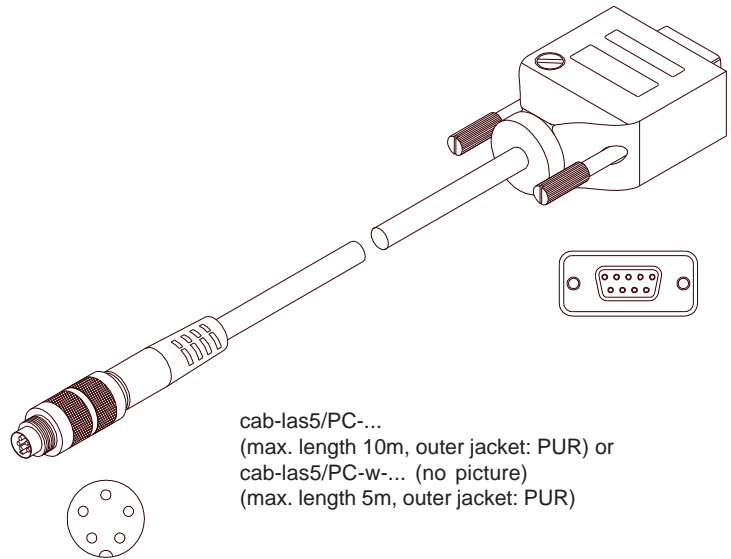
Connection via USB interface at the PC:

Connecting cable (incl. driver software):
 cab-las5/USB-(length)
 cab-las5/USB-w-(length) (angle type 90°)
 (standard length 2m)

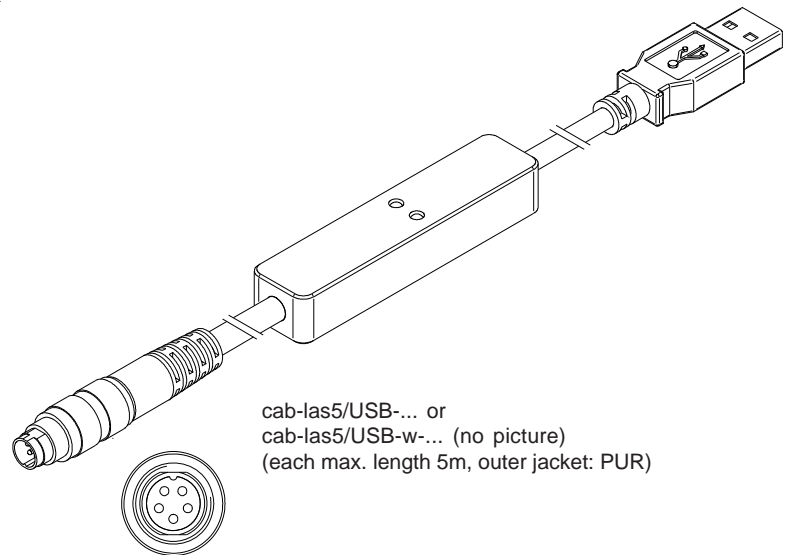
alternative:

Connection to local network via Ethernet bus:

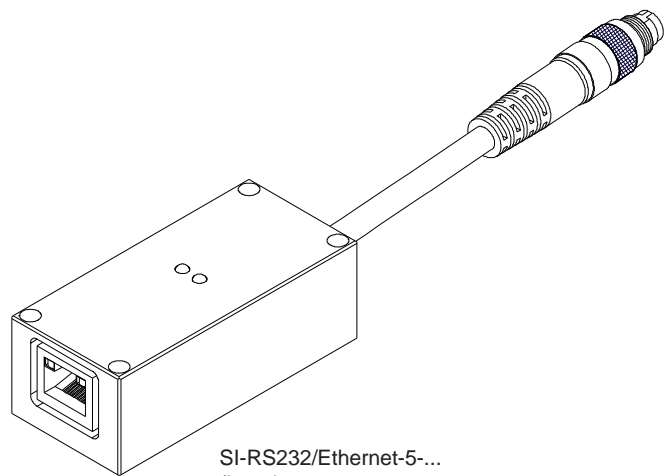
Adapter (based on Lantronix XPortModul):
 SI-RS232/Ethernet-5-(length)
 (standard length 2m)



cab-las5/PC-...
 (max. length 10m, outer jacket: PUR) or
 cab-las5/PC-w-... (no picture)
 (max. length 5m, outer jacket: PUR)



cab-las5/USB-... or
 cab-las5/USB-w-... (no picture)
 (each max. length 5m, outer jacket: PUR)



SI-RS232/Ethernet-5-...
 (length 0,5m, 1m, or 2m,
 outer jacket: PUR)



Measuring Angles

Different standard measuring angles for RLS-GD Series available:

RLS-GD 20/20°	measures with an angle of 20°:	for high-glossy surfaces
RLS-GD 15/60°	measures with an angle of 60°:	for semi-glossy surfaces ("all-rounder")
RLS-GD 12/75°	measures with an angle of 75°:	for low-glossy to high-glossy surfaces (standard in paper industry)
RLS-GD 5/85°	measures with an angle of 85°:	for low-glossy surfaces



Measuring Principle

Measuring principle of the gloss detection sensor RLS-GD-20/20°:

The RLS-GD-20/20° sensor can be "taught" up to 31 gloss degrees or normalized vector. Evaluation always is performed with 12 bits. With the help of a modulated white-light LED a white light spot (Ø approx. 15 mm) is projected onto the surface to be inspected by way of an optical transmitter unit at an angle of 20° to the vertical plane.

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 also arranged at an angle of 20° to the vertical plane). Furthermore, diffuse reflection is determined by way of one additional optical unit. The gloss degree is then determined from the 2 receiver signals (20°, 60°).

As an alternative calibration can be performed on black glass (under 20°, corresponds to 100). For this purpose a reference line is applied during calibration to store a reference value which then serves as a comparison value during measurement.

Gloss detection either operates continuously or is started by an external PLC trigger signal. The gloss degree respectively 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-20/20°.

TEACH button:

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).

Evaluation algorithm EXTERN TEACH:

With this function field the gloss sensor can be taught by means of a LOW-signal at pin 3 (for instance via push button, or PLC). During this procedure the object to be taught has to be in the visibility range of the gloss sensor. The yellow LEDs indicate a successful teaching procedure.

RS232 interface:

Through the RS232 interface parameters and measured values can be exchanged between the PC and the RLS-GD-20/20° sensor. All the parameters for gloss degree detection respectively normalized vector detection can be stored in the non-volatile EEPROM of the RLS-GD-20/20° sensor. When parameterization is finished the gloss sensor continues to operate with the current parameters in "stand alone" mode without a PC.

Calibration:

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.

Temperature compensation:

The sensor is factory-temperature-compensated. It is stable over a temperature range from 10 degrees to 60 degrees centigrade. The current temperature inside the housing is visualised by the PC user interface.



Visualization

Visualization of the gloss degrees:

Under Windows® representation of the gloss degree on a PC in numeric form and in a gloss chart, and representation of the 20°/60° values in a time chart. In addition the current 20°/60° values are displayed as a bar chart.

The following evaluation algorithms can also be selected:

- Target lies within the tolerance window of a taught gloss grade.
- EXTERN TEACH: With this function field the gloss sensor can be taught by means of a LOW-signal at pin 3 (for instance via push button, or PLC). During this procedure the object to be taught has to be in the visibility range of the gloss sensor. The yellow LEDs indicate a successful teaching procedure.



LED Display

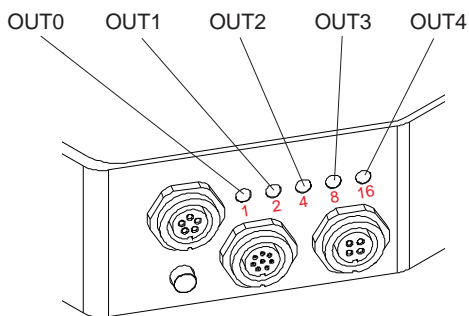
LED display:

The gloss grade is visualized by means of 5 yellow LEDs at the housing of the gloss sensor.

In the BINARY mode the gloss grade indicated at the LED display is output as 5-bit binary information at the digital outputs OUT0 ... OUT4 of the 8-pole PLC connector.

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).

In the DIRECT mode the maximum number of gloss grades to be taught is 5. These 5 gloss grades can be directly output at the 5 digital outputs.

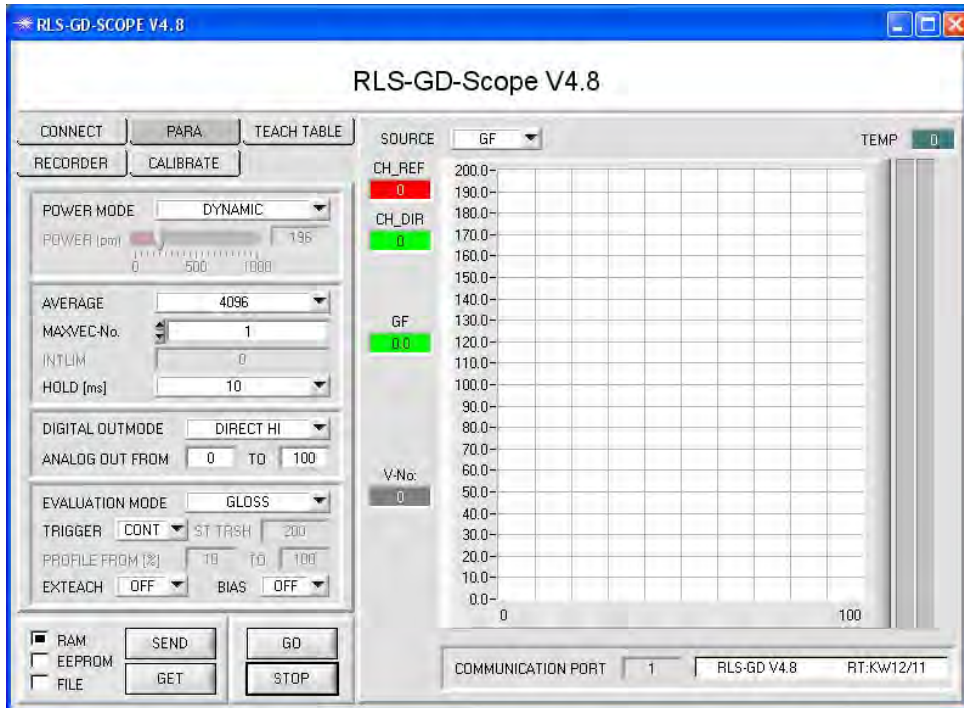


○ ○ ○ ○ ○ 0	● ○ ○ ○ ○ 1	○ ● ○ ○ ○ 2
● ● ○ ○ ○ 3	○ ○ ● ○ ○ 4	● ○ ● ○ ○ 5
○ ● ● ○ ○ 6	● ● ● ○ ○ 7	○ ○ ○ ● ○ 8
● ○ ○ ● ○ 9	○ ● ○ ● ○ 10	● ● ○ ● ○ 11
○ ○ ● ● ○ 12	● ○ ● ● ○ 13	○ ● ● ● ○ 14
● ● ● ● ○ 15	○ ○ ○ ○ ● 16	● ○ ○ ○ ● 17
○ ● ○ ○ ● 18	● ● ○ ○ ● 19	○ ○ ● ○ ● 20
● ○ ○ ○ ● 21	○ ● ● ○ ● 22	● ● ● ○ ● 23
○ ○ ○ ● ● 24	● ○ ○ ● ● 25	○ ● ○ ● ● 26
● ● ○ ○ ● 27	○ ○ ● ● ● 28	● ○ ● ● ● 29
○ ● ● ● ● 30	● ● ● ● ● „error“ respectively „not detected“	

Parameterization

Windows® user interface:

The RLS-GD gloss sensor is parameterized under Windows® with the RLS-GD-Scope software. The Windows® user interface facilitates the teach-in process at the sensor and supports the operator in the task of adjustment and commissioning of the sensor.

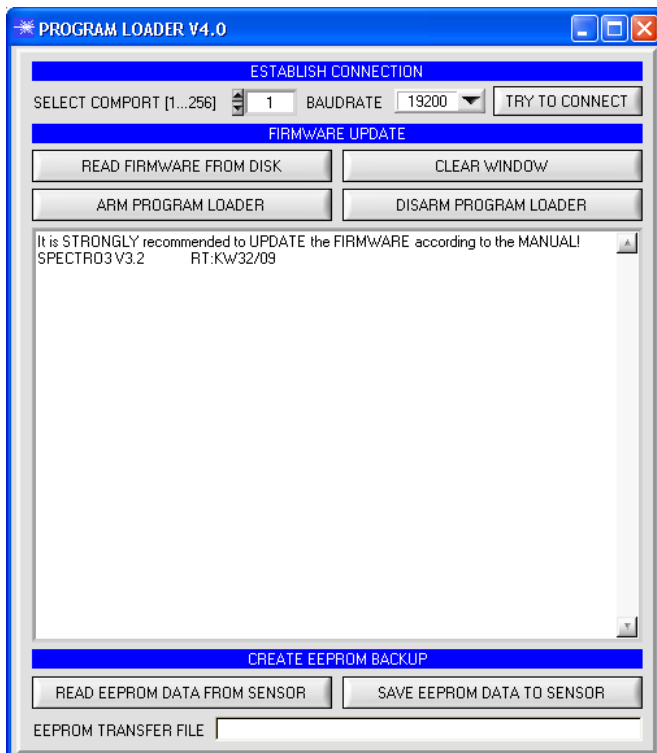


The RS232 interface (PARA) is used for setting parameters such as:

- MAXVEC-No.:
Number of gloss degrees (normalized vectors) to be checked
- POWER MODE:
In this function field the operating mode of automatic power correction at the transmitter unit can be set
- EVALUATION MODE:
The RLS-GD sensor can be operated with two different evaluation modes (NORM_INT or GLOSS)
- AVERAGE:
Averaging over a maximum of 32768 values
- TRIGGER:
Continuous or external or self trigger
- DIGITAL OUTMODE:
Triggering of the digital outputs
- INTLIM:
Minimum intensity required for gloss evaluation
- HOLD:
Pulse lengthening up to 100ms max.

Under Windows® representation of the gloss value on a PC in numeric form and in a color chart, and representation of RGB values in a time chart. In addition the current RGB values are displayed as a bar chart.

Firmware Update by means of the software Program Loader:



The software „Program Loader“ allows the user to perform an automatic firmware update. The update will be carried out through the RS232 interface.

An initialisation file (xxx.ini) and a firmware file (xxx.elf.S) are required for performing a firmware update. These files can be obtained from your supplier. In some cases an additional firmware file for the program memory (xxx.elf.p.S) is also needed, and this file will be automatically provided together with the other two files.

A plausibility check is performed after the initialisation file has been loaded with the Program Loader. If the initialisation file was changed or damaged, it will not be possible to perform a firmware update.

When the plausibility check is successfully completed, the instructions contained in the initialisation file will be carried out step by step.

The complete memory contents of the micro-controller in the sensor will be deleted in a firmware update. This means that both the program in the program memory and the data in the data memory will be lost.

The new firmware automatically writes the correct data to the program memory again.

However, the parameter settings, temperature curves, linearization curves, etc. that are stored in the data memory (EEPROM) will be deleted.

With the Program Loader V4.0 software the data will be saved in the EEPROM, and can be written back again after successful firmware update. For this purpose the software creates an EEPROM backup file.



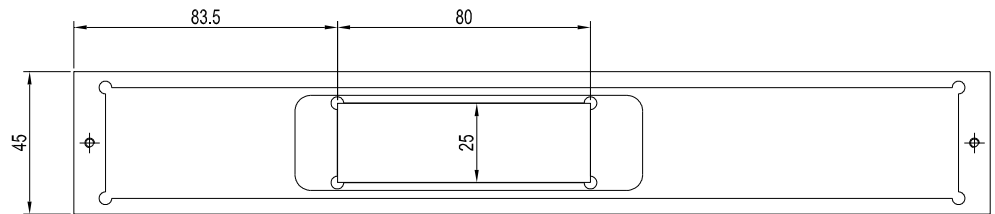
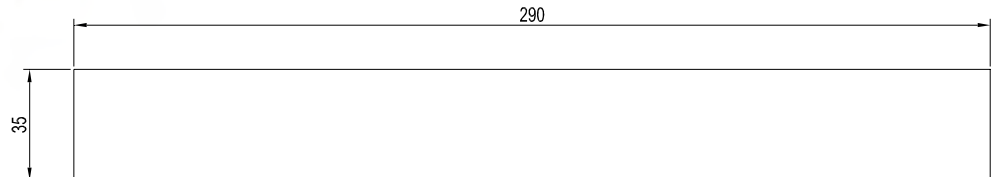
Accessories

GD-20-CAL

(calibration add-on top)

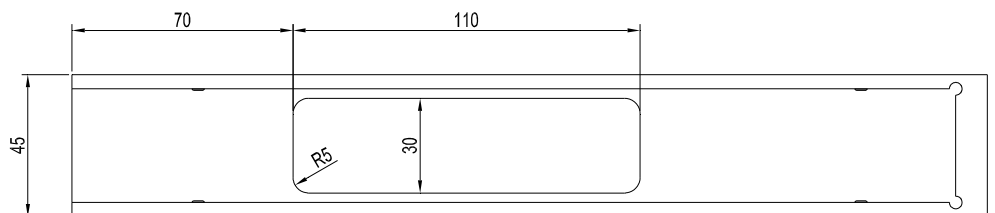
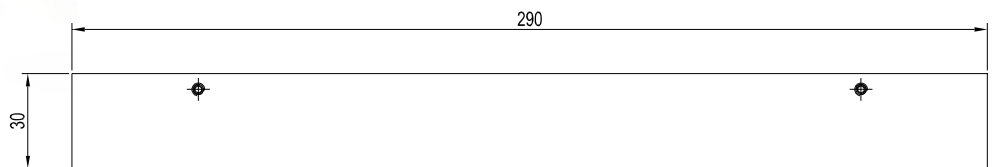
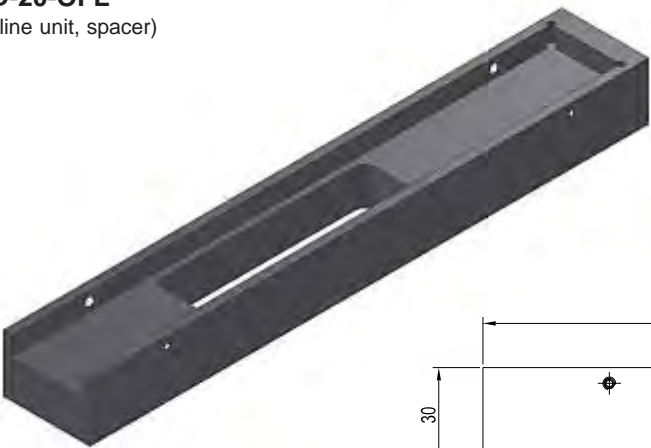
GD-20-CAL-UV-MIRR

(calibration add-on top,
for glossy metal surfaces)



GD-20-OFL

(offline unit, spacer)



All dimensions in mm

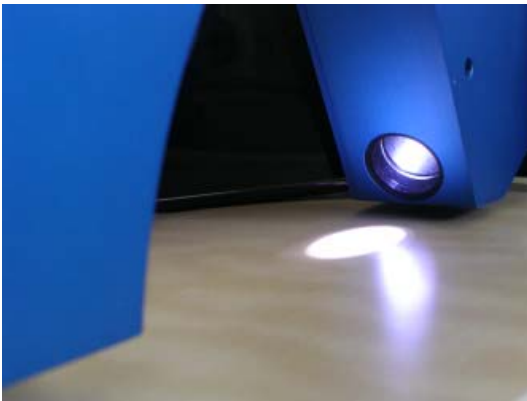


Application Examples

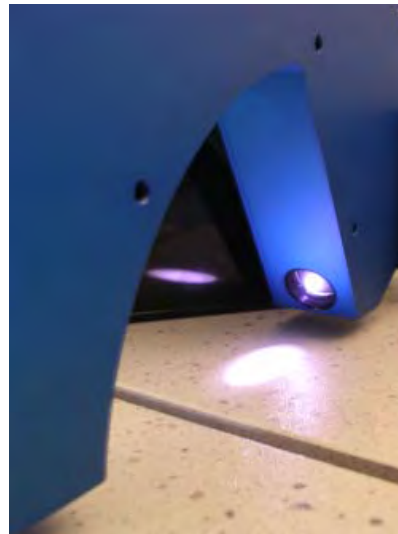
Online measurement of the gloss degree

In the production of plastic sheets (design sheets, wall coverings, floor coverings, table coatings, foam sheets, and coated carrier materials for the furniture industry, automobile industry, fashion industry, or construction industry) and ceramic parts (ceramic tiles and plates for wall and floor) 100% quality inspection of the optically visible surface has become an ever more frequent requirement.

For this purpose the RLS-GD sensor features non-contacting detection of the gloss degree. The simultaneous measurement of the object from two different directions (direct reflection and diffuse reflection) allows intensity-independent evaluation. The sensor can be taught to a certain surface, and up to 31 tolerance windows can be applied around the taught value. Measurement output is performed digitally by way of five outputs.



Gloss degree determination of sheets for the furniture industry



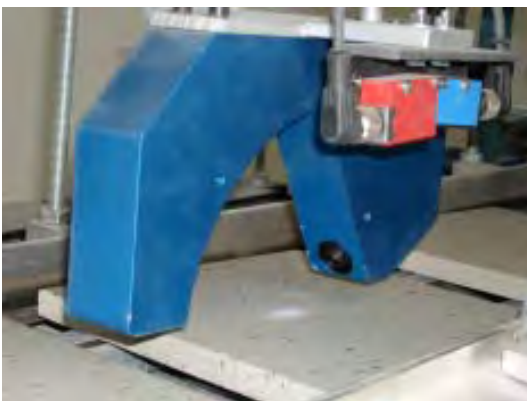
Online gloss measurement at ceramic parts



Monitoring of the gloss value of imitation leather



Examination of leather surfaces with respect to their gloss behavior



Gloss degree monitoring at plates of stone



Application Examples

Checking the presence of sub-decor during laminate flooring production

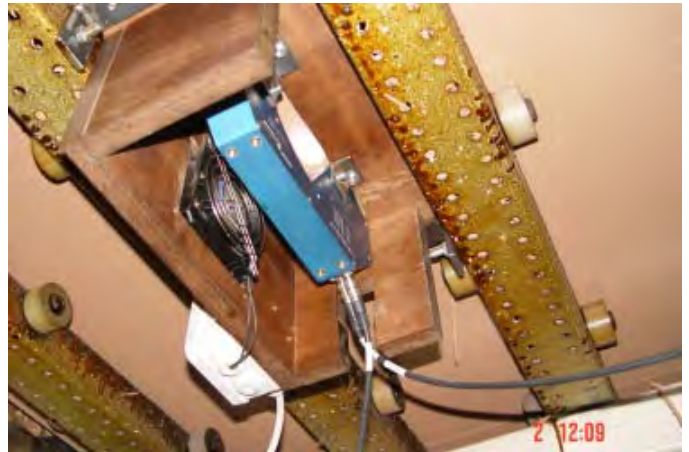
It may happen in the production of laminate flooring that the sub-decor is not applied. Such missing sub-decor should be detected as early as possible in the production process, which is why surface checking should be performed directly after the laminating unit. Because of the great variety of different products and surface decors, image processing systems and color sensors turned out to be unsuitable for this application.

The RLS-GD-15/60° gloss sensor, however, can perfectly distinguish between sub-decor present / not present. The application uses the analog output (4mA ... 20mA), which behaves proportionally to the gloss grade of the surface. A missing sub-decor leads to a sudden change of the analog signal, i.e. of the gloss grade. It is furthermore possible to perform teaching to the respective sub-decor, the gloss grade is then indicated in 31 stages (from good to bad) by way of switching outputs, and can thus easily be interrogated by a PLC. When a certain stage is exceeded, an alarm signal can be triggered or, in case of small deviations (trend), the operator can be informed in time.



Online gloss measurement at laminate flooring (monitoring of counteracting paper)

These sensors are used to check whether the resistant hard-paper layer is applied correctly. For this inspection use is made of the different gloss degrees of the hard-paper layer and the uncoated back side of the laminate flooring. This wood processing company presently is considering the use of the RLS-GD-15/60° for quality inspection of the decor, where a distinction should be made between decor and sub-decor.



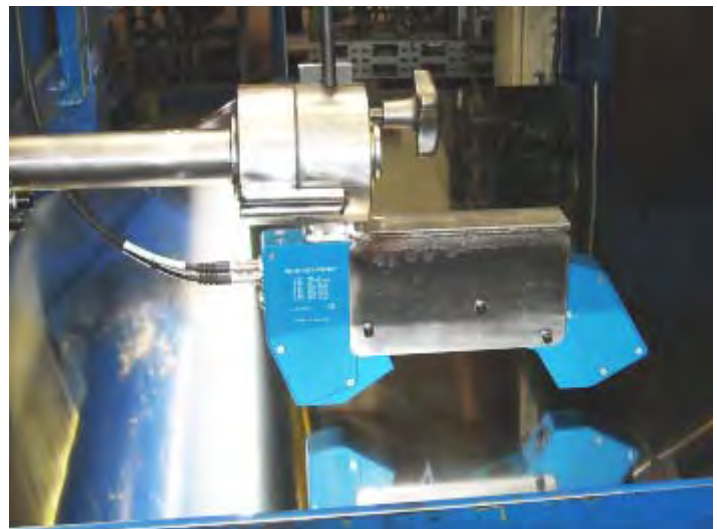
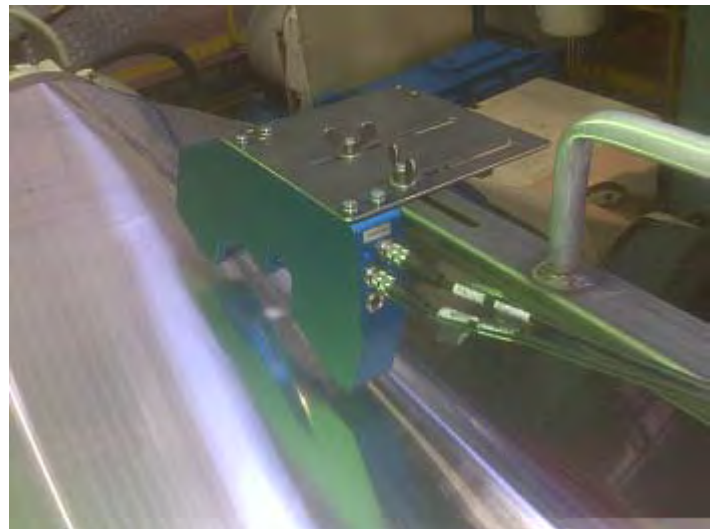
Online gloss measurement during PVC-flooring production in transverse motion operation

In the production of plastic floor coverings the gloss degree decisively depends on the material temperature in the extruder. Environmental influences such as air humidity and ambient temperature also are of importance with respect to the gloss degree. "Until now, measurements were only performed at the start and end of production. With the RLS-GD-15/60° online measuring system the gloss degree can now be determined during the whole production process." It is furthermore planned to use the analog signal (4...20mA, proportional to the gloss degree) for automatically controlling the temperature of the extruder and thus the gloss degree.



**Application Examples****Gloss measurement of aluminium strip material**

In the production of aluminium strip material the gloss rate provides information about the quality of the product. This parameter furthermore informs the machine operator how to set his machine in case of a deviation from the ideal value. Until now the gloss rate was determined by way of random sampling with laboratory equipment, the RLS-GD-20/20° inline gloss measuring system and the RLS-GD-MONITORING monitoring software provides information about both the current gloss rate and the current trend of the gloss value. 'Order number', 'date', 'time', 'operator name', and 'customer' data also are stored.



RLS Series

▶ RLS-GD-15/60° Gloss Detection

- Insensitive to outside light due to clocked white light
- 2 receivers (15°, 60°) and reference
- Storing of up to 31 gloss degrees
- Tolerance adjustable for each gloss degree
- Working distance typ. 15 mm ± 10%
- Parameterisable under Windows®
- RS232 interface (USB or Ethernet adapter is available)
- 5 switching outputs (npn-/pnp-able, 100 mA, short circuit proof)
- Switching state indication via 5 yellow LEDs
- Transmitter power adjustable or controllable (STAT or DYN)
- Averaging can be activated (over up to approx. 32000 values)
- Scratch-resistance glass cover of optics, sturdy aluminum housing
- Calibration function (Wood's glass)
- Various evaluation algorithms (standardized or calibrated onto Wood's glass = 100%)
- Analog output (voltage 0...+10V and current 4...20mA, proportional to the gloss degree 0%...100% respectively zoomed up to the tenfold) via zoom function



Design

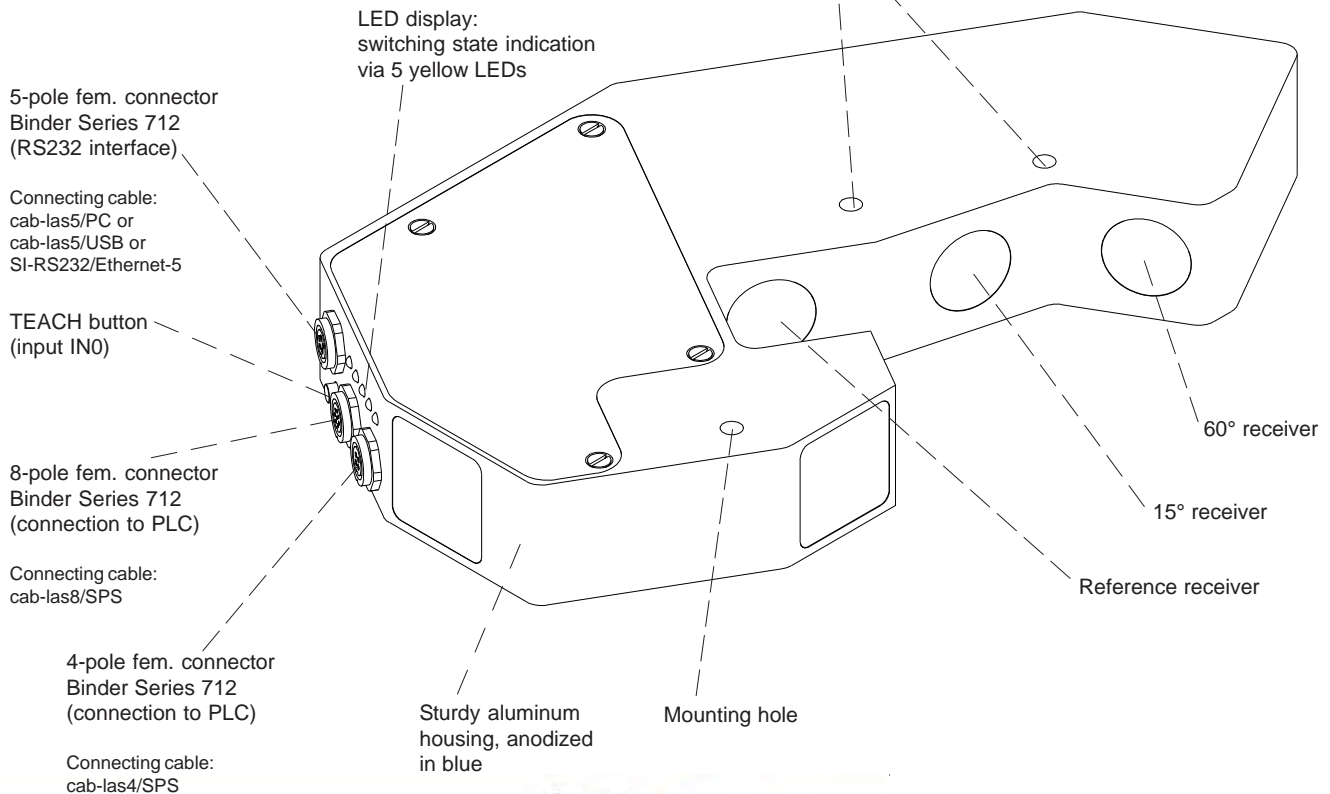
Product name:

RLS-GD-15/60°

(incl. Windows® PC software RLS-GD-Scope)

Accessories: (cf. page 9-12)

- GD-15-CAL (calibration top-part)
- ABL-GD-15-CAL2 (calibration top-part)
- GD-15-OFL (offline top-part / spacer)
- ABL-GD-15-OFL (offline top-part / spacer)
- ABL-RLS-GD-15 (blow-air top-part)
- ABL-RLS-GD-15-TRIG (blow-air top-part)



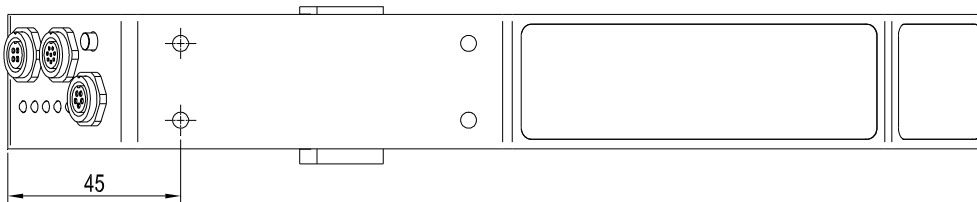
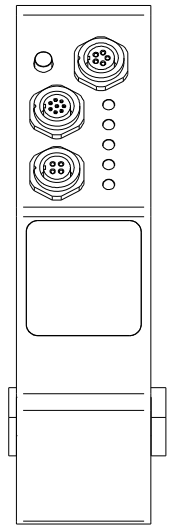
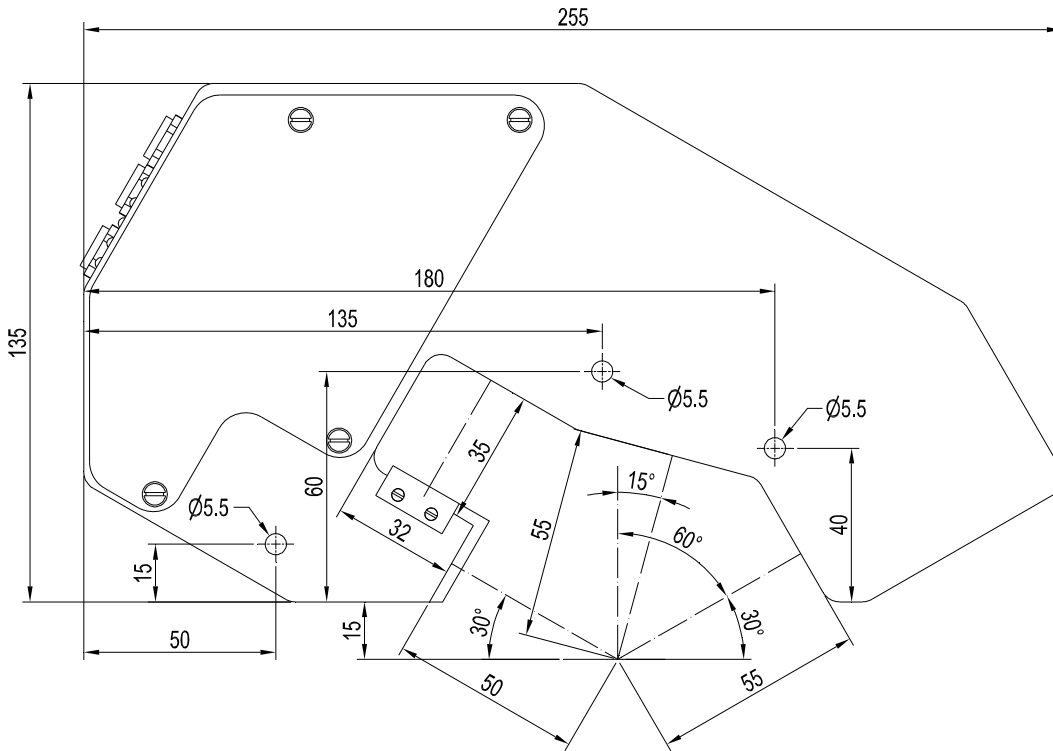
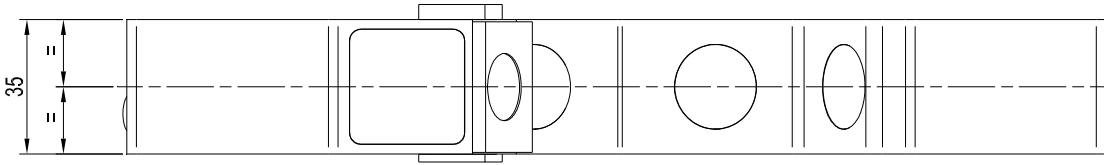


Technical Data

Model	RLS-GD-15/60°
Light source	1x white light LED, AC-operation (100 kHz)
Working distance	typ. 15 mm ± 10%
Light spot size	in a distance of 15 mm: typ. 16 mm x 35 mm (elliptical)
Optical filters	day light filter (KG2), UV block filter
Voltage supply	+24VDC (± 10%), protected against polarity reversal, overload protected
Pulsating light operation	100 kHz
Ambient light	up to 5000 Lux
Enclosure rating	IP54
Current consumption	typ. 110 mA
Interface	RS232, parameterisable under Windows®
EMC test acc. to	DIN EN 60947-5-2
Type of connector	connection to PLC: 8-pole female connector Binder Series 712 connection to PLC: 4-pole female connector Binder Series 712 connection to PC: 5-pole female connector Binder Series 712
Connecting cables	to PLC: cab-las8/SPS or cab-las8/SPS-w and cab-las4/SPS to PC/RS232 interface: cab-las5/PC or cab-las5/PC-w to PC/USB interface: cab-las5/USB or cab-las5/USB-w to PC/Ethernet interface: SI-RS232/Ethernet-5
Operating temperature range	-20°C ... +55°C
Storage temperature range	-20°C ... +85°C
Housing material	aluminum, anodized in blue
Housing dimensions	LxWxH approx. 255 mm x 135 mm x 35 mm
Max. switching current	100 mA, short-circuit proof
Switching frequency	max. 5 kHz (depends on averaging)
Output DIGITAL (5x)	OUT0 ... OUT4: Qinv or Q, (adjustable via PC): Qinv: npn bright-switching (npn n.c.) / pnp dark-switching (pnp n.o.) Q: pnp bright-switching (pnp n.c.) / npn dark-switching (npn n.o.)
Output ANALOG (2x)	1x voltage output (0...+10V) 1x current output (4...20mA)
Input IN0	via teach push button at the housing
Sensitivity (switching threshold)	parameterisable under Windows® (selection: threshold or tolerance window)
Pulse lengthening	0 ms ... 100 ms
Transmitted light power	adjustable under Windows®
Averaging	over 32000 values (adjustable under Windows®)
Switching state indication	by means of 5 yellow LEDs



Dimensions



All dimensions in mm

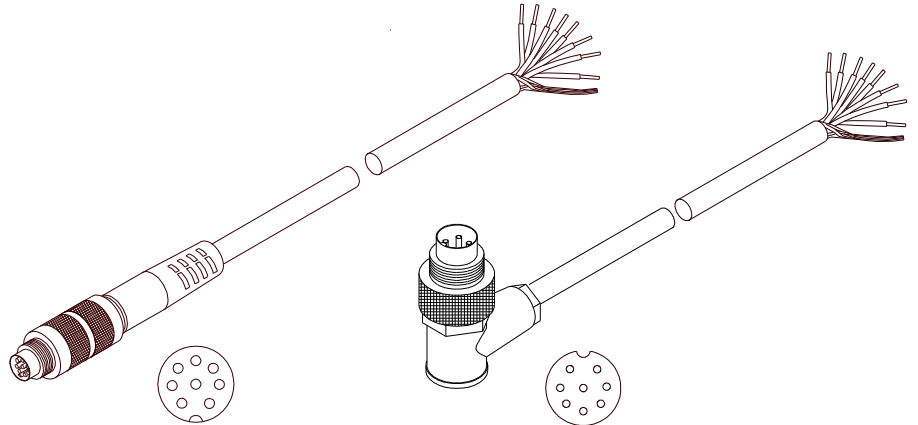


Connector Assignment

**Connection to PLC:
8-pole fem. connector Binder Series 712**

Pin:	Color:	Assignment:
1	white	GND (0V)
2	brown	+24VDC (±10%)
3	green	IN0
4	yellow	OUT0
5	grey	OUT1
6	pink	OUT2
7	blue	OUT3
8	red	OUT4

Connecting cable:
cab-las8/SPS-(length)
cab-las8/SPS-w-(length) (angle type, 90°)
(standard length 2m)

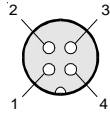


cab-las8/SPS-...
(max. length 25m, outer jacket: PUR)

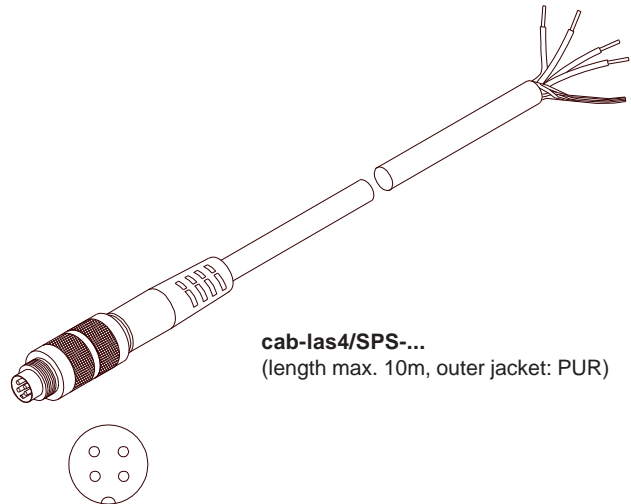
cab-las8/SPS-w-...
(max. length 25m, outer jacket: PUR)

**Additional connection to PLC:
4-pole fem. connector Binder Series 712**

Pin:	Color:	Assignment:
1	white	GND (0V)
2	brown	not connected
3	black	Analog output voltage (0...+10V)
4	blue	Analog output current (4...20mA)



Connecting cable:
cab-las4/SPS-(length)
(Standard length 2m)



cab-las4/SPS-...
(length max. 10m, outer jacket: PUR)

Connector Assignment

**Connection to PC:
5-pole fem. connector Binder Series 712**

Pin:	Assignment:
1	GND (0V)
2	TxD
3	RxD
4	+24VDC (+Ub, OUT)
5	not connected

Connection via RS232 interface at the PC:

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

alternative:

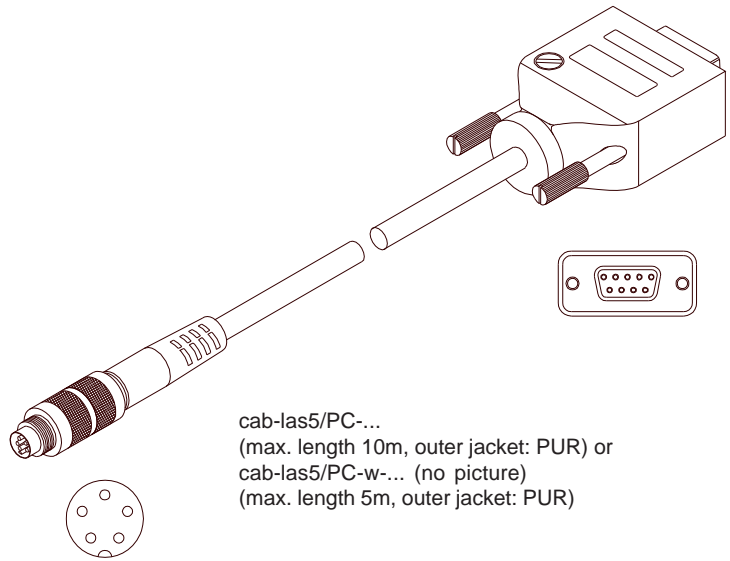
Connection via USB interface at the PC:

Connecting cable (incl. driver software):
 cab-las5/USB-(length)
 cab-las5/USB-w-(length) (angle type 90°)
 (standard length 2m)

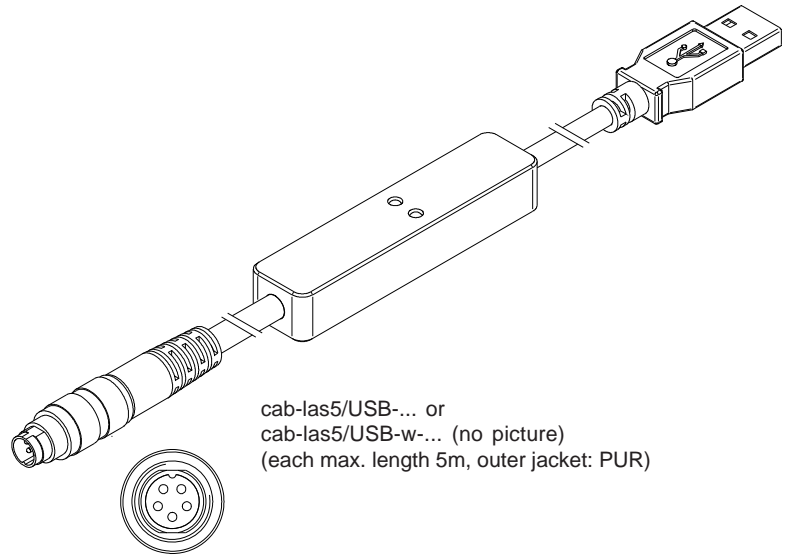
alternative:

Connection to local network via Ethernet bus:

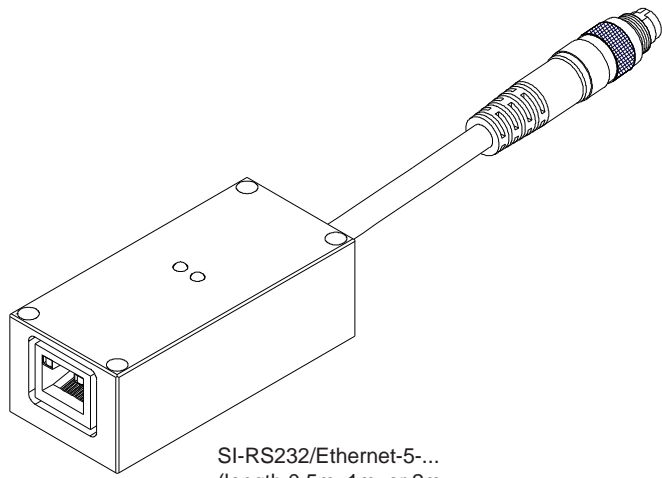
Adapter (based on Lantronix XPortModul):
 SI-RS232/Ethernet-5-(length)
 (standard length 2m)



cab-las5/PC-...
 (max. length 10m, outer jacket: PUR) or
 cab-las5/PC-w-... (no picture)
 (max. length 5m, outer jacket: PUR)



cab-las5/USB-... or
 cab-las5/USB-w-... (no picture)
 (each max. length 5m, outer jacket: PUR)



SI-RS232/Ethernet-5-...
 (length 0,5m, 1m, or 2m,
 outer jacket: PUR)



Measuring Angles

Different standard measuring angles for RLS-GD Series available:

RLS-GD 20/20°	measures with an angle of 20°:	for high-glossy surfaces
RLS-GD 15/60°	measures with an angle of 60°:	for semi-glossy surfaces ("all-rounder")
RLS-GD 12/75°	measures with an angle of 75°:	for low-glossy to high-glossy surfaces (standard in paper industry)
RLS-GD 5/85°	measures with an angle of 85°:	for low-glossy surfaces



Measuring Principle

Measuring principle of the gloss detection sensor RLS-GD-15/60°:

The RLS-GD-15/60° sensor can be "taught" up to 31 gloss degrees or normalized vector. Evaluation always is performed with 12 bits. With the help of a modulated white-light LED a white light spot (Ø approx. 15 mm) is projected onto the surface to be inspected by way of an optical transmitter unit at an angle of 60° to the vertical plane.

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 also arranged at an angle of 60° to the vertical plane). Furthermore, diffuse reflection is determined by way of one additional optical unit. The gloss degree is then determined from the 2 receiver signals (15°, 60°).

As an alternative calibration can be performed on black glass (under 60°, corresponds to 100%). For this purpose a reference line is applied during calibration to store a reference value which then serves as a comparison value during measurement.

Gloss detection either operates continuously or is started by an external SPC trigger signal. The gloss degree respectively 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-15/60°.

TEACH button:

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).

Evaluation algorithm EXTERN TEACH:

With this function field the gloss sensor can be taught by means of a LOW-signal at pin 3 (for instance via push button, or PLC). During this procedure the object to be taught has to be in the visibility range of the gloss sensor. The yellow LEDs indicate a successful teaching procedure.

RS232 interface:

Through the RS232 interface parameters and measured values can be exchanged between the PC and the RLS-GD-15/60° sensor. All the parameters for gloss degree detection respectively normalized vector detection can be stored in the non-volatile EEPROM of the RLS-GD-15/60° sensor. When parameterization is finished the gloss sensor continues to operate with the current parameters in "stand alone" mode without a PC.

Calibration:

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.

Temperature compensation:

The sensor is factory-temperature-compensated. It is stable over a temperature range from 10 degrees to 60 degrees centigrade. The current temperature inside the housing is visualised by the PC user interface.



Visualization

Visualization of the gloss degrees:

Under Windows® representation of the gloss degree on a PC in numeric form and in a gloss chart, and representation of the 15°/60° values in a time chart. In addition the current 15°/60° values are displayed as a bar chart.

The following evaluation algorithms can also be selected:

- Target lies within the tolerance window of a taught gloss grade.
- EXTERN TEACH: With this function field the gloss sensor can be taught by means of a LOW-signal at pin 3 (for instance via push button, or PLC). During this procedure the object to be taught has to be in the visibility range of the gloss sensor. The yellow LEDs indicate a successful teaching procedure.

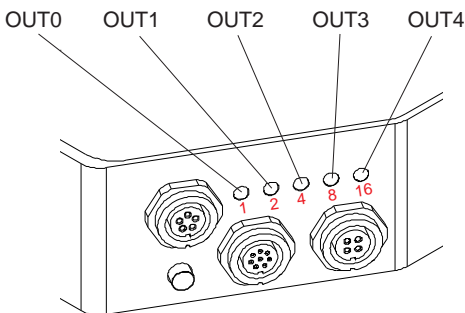


LED Display

LED display:

The gloss grade is visualized by means of 5 yellow LEDs at the housing of the gloss sensor. At the same time the gloss grade indicated at the LED display is output as 5-bit binary information at the digital outputs OUT0 ... OUT4 of the 8-pole PLC connector.

In the DIRECT mode the maximum number of gloss grades to be taught is 5. These 5 gloss grades can be directly output at the 5 digital outputs. The respective detected gloss grade is displayed by means of the 5 yellow LEDs at the gloss sensor housing.



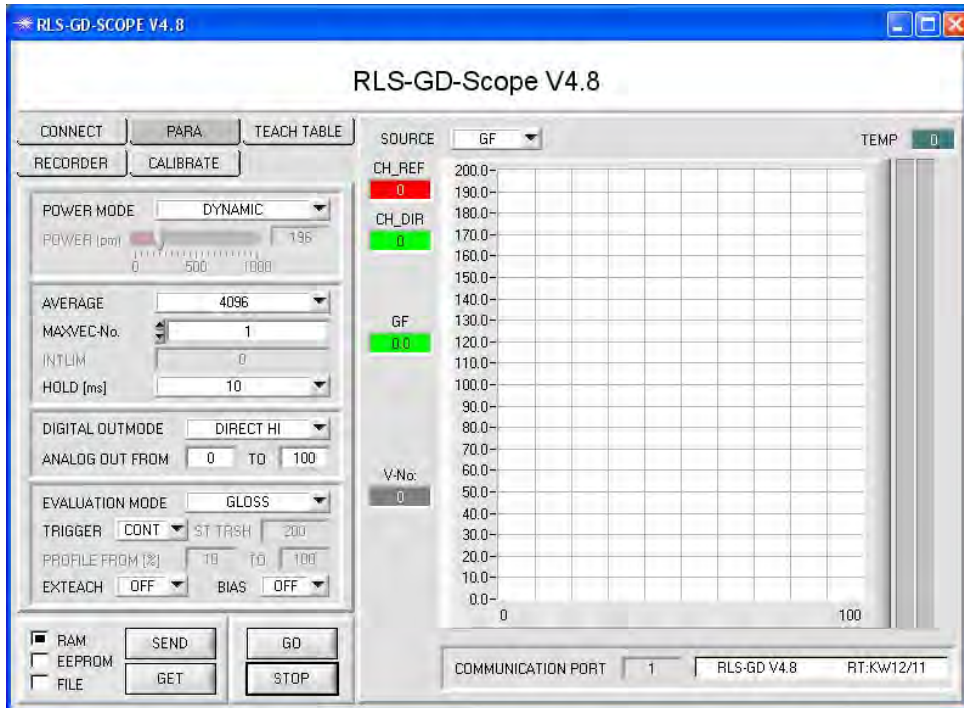
○ ○ ○ ○ ○ 0	● ○ ○ ○ ○ 1	○ ● ○ ○ ○ 2
● ● ○ ○ ○ 3	○ ○ ● ○ ○ 4	● ○ ● ○ ○ 5
○ ● ● ○ ○ 6	● ● ● ○ ○ 7	○ ○ ○ ● ○ 8
● ○ ○ ● ○ 9	○ ● ○ ● ○ 10	● ● ○ ● ○ 11
○ ○ ● ● ○ 12	● ○ ● ● ○ 13	○ ● ● ● ○ 14
● ● ● ● ○ 15	○ ○ ○ ○ ● 16	● ○ ○ ○ ● 17
○ ● ○ ○ ● 18	● ● ○ ○ ● 19	○ ○ ● ○ ● 20
● ○ ○ ○ ● 21	○ ● ● ○ ● 22	● ● ● ○ ● 23
○ ○ ○ ● ● 24	● ○ ○ ● ● 25	○ ● ○ ● ● 26
● ● ○ ○ ● 27	○ ○ ● ● ● 28	● ○ ● ● ● 29
○ ● ● ● ● 30	● ● ● ● ●	

„error“ respectively „not detected“

Parameterization

Windows® user interface:

The RLS-GD gloss sensor is parameterized under Windows® with the RLS-GD-Scope software. The Windows® user interface facilitates the teach-in process at the sensor and supports the operator in the task of adjustment and commissioning of the sensor.

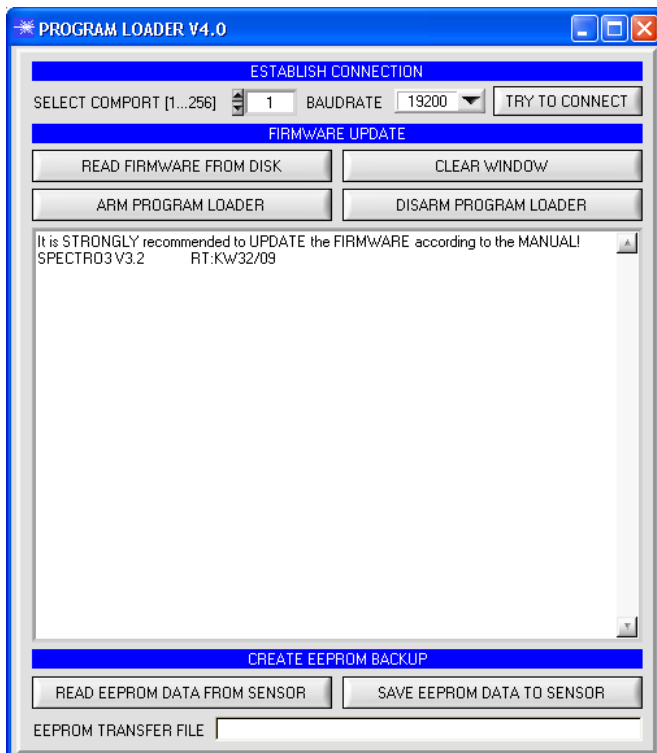


The RS232 interface (PARA) is used for setting parameters such as:

- MAXVEC-No.:
Number of gloss degrees (normalized vectors) to be checked
- POWER MODE:
In this function field the operating mode of automatic power correction at the transmitter unit can be set
- EVALUATION MODE:
The RLS-GD sensor can be operated with two different evaluation modes (NORM_INT or GLOSS)
- AVERAGE:
Averaging over a maximum of 32768 values
- TRIGGER:
Continuous or external or self trigger
- DIGITAL OUTMODE:
Triggering of the digital outputs
- INTLIM:
Minimum intensity required for gloss evaluation
- HOLD:
Pulse lengthening up to 100ms max.

Under Windows® representation of the gloss value on a PC in numeric form and in a color chart, and representation of RGB values in a time chart. In addition the current RGB values are displayed as a bar chart.

Firmware Update by means of the software Program Loader:



The software „Program Loader“ allows the user to perform an automatic firmware update. The update will be carried out through the RS232 interface.

An initialisation file (xxx.ini) and a firmware file (xxx.elf.S) are required for performing a firmware update. These files can be obtained from your supplier. In some cases an additional firmware file for the program memory (xxx.elf.p.S) is also needed, and this file will be automatically provided together with the other two files.

A plausibility check is performed after the initialisation file has been loaded with the Program Loader. If the initialisation file was changed or damaged, it will not be possible to perform a firmware update.

When the plausibility check is successfully completed, the instructions contained in the initialisation file will be carried out step by step.

The complete memory contents of the micro-controller in the sensor will be deleted in a firmware update. This means that both the program in the program memory and the data in the data memory will be lost.

The new firmware automatically writes the correct data to the program memory again.

However, the parameter settings, temperature curves, linearization curves, etc. that are stored in the data memory (EEPROM) will be deleted.

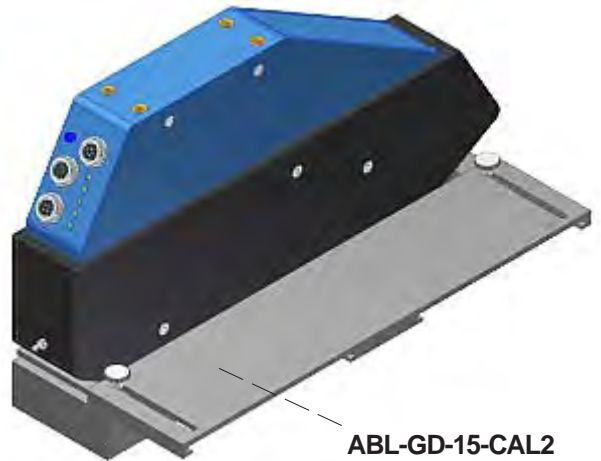
With the Program Loader V4.0 software the data will be saved in the EEPROM, and can be written back again after successful firmware update. For this purpose the software creates an EEPROM backup file.



Calibration Top-parts

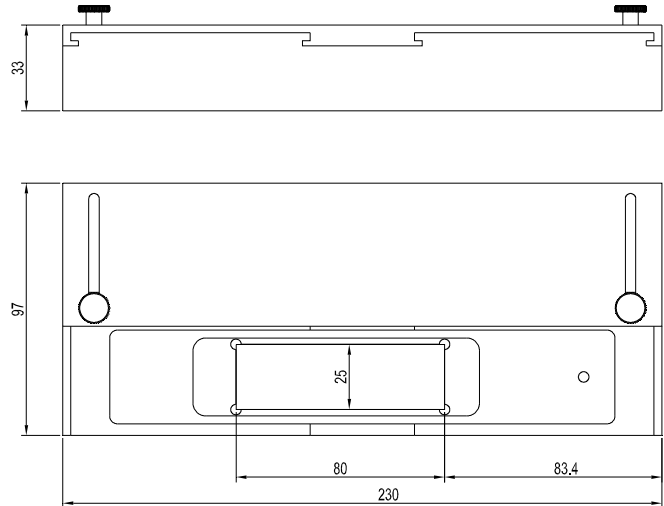
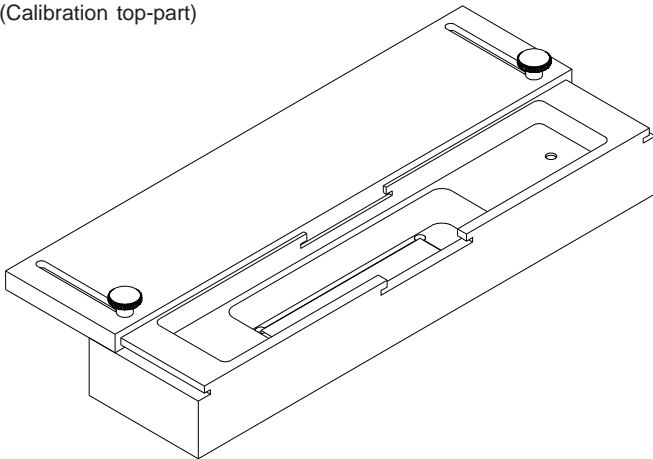


GD-15-CAL

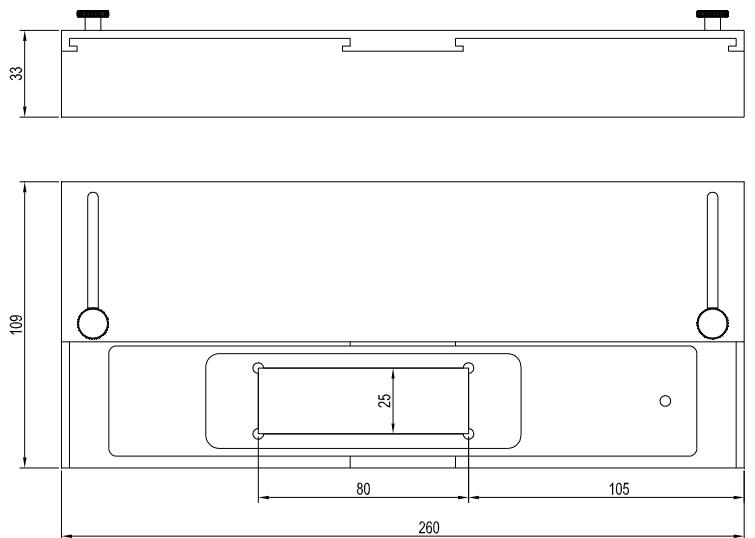
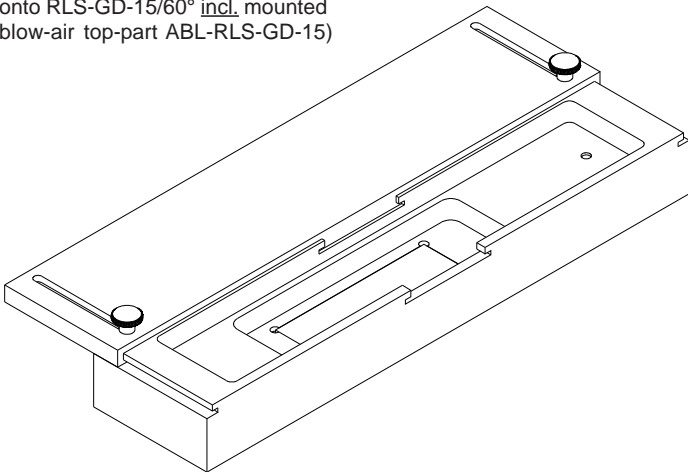


ABL-GD-15-CAL2

GD-15-CAL
(Calibration top-part)



ABL-GD-15-CAL2
(Calibration top-part for mounting onto RLS-GD-15/60° incl. mounted blow-air top-part ABL-RLS-GD-15)



All dimensions in mm



Offline Top-parts

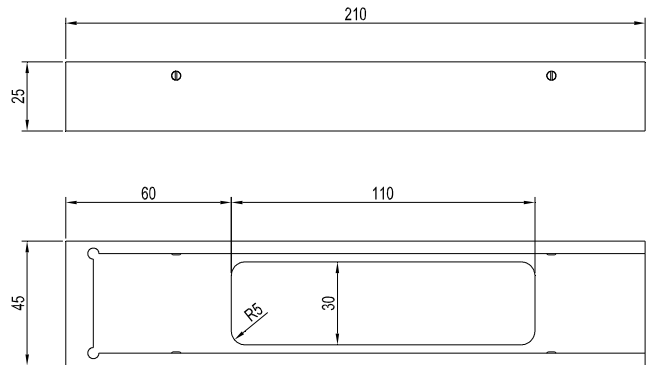
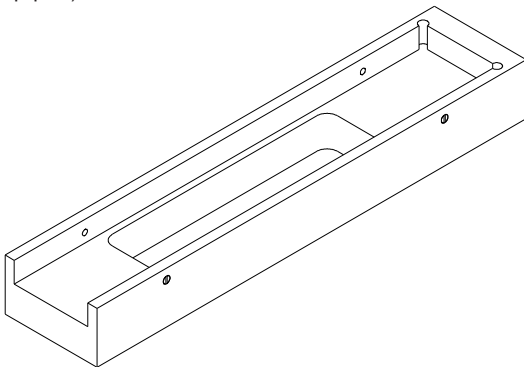


GD-15-OFL

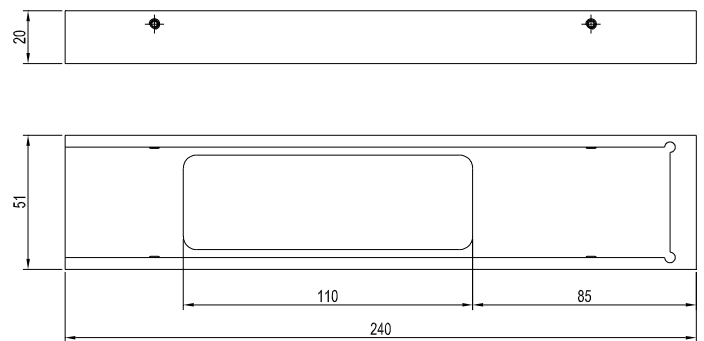
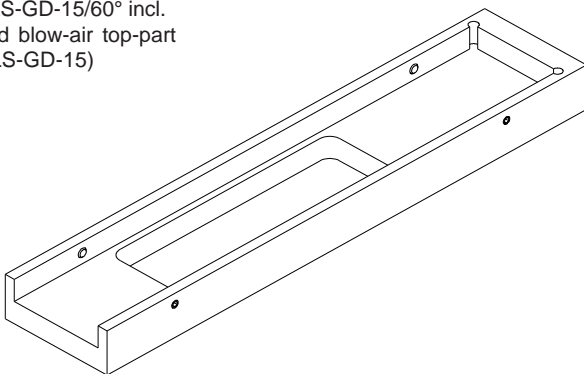


ABL-GD-15-OFL

GD-15-OFL
(Offline top-part)



ABL-GD-15-OFL
(Offline top-part for mounting
onto RLS-GD-15/60° incl.
mounted blow-air top-part
ABL-RLS-GD-15)



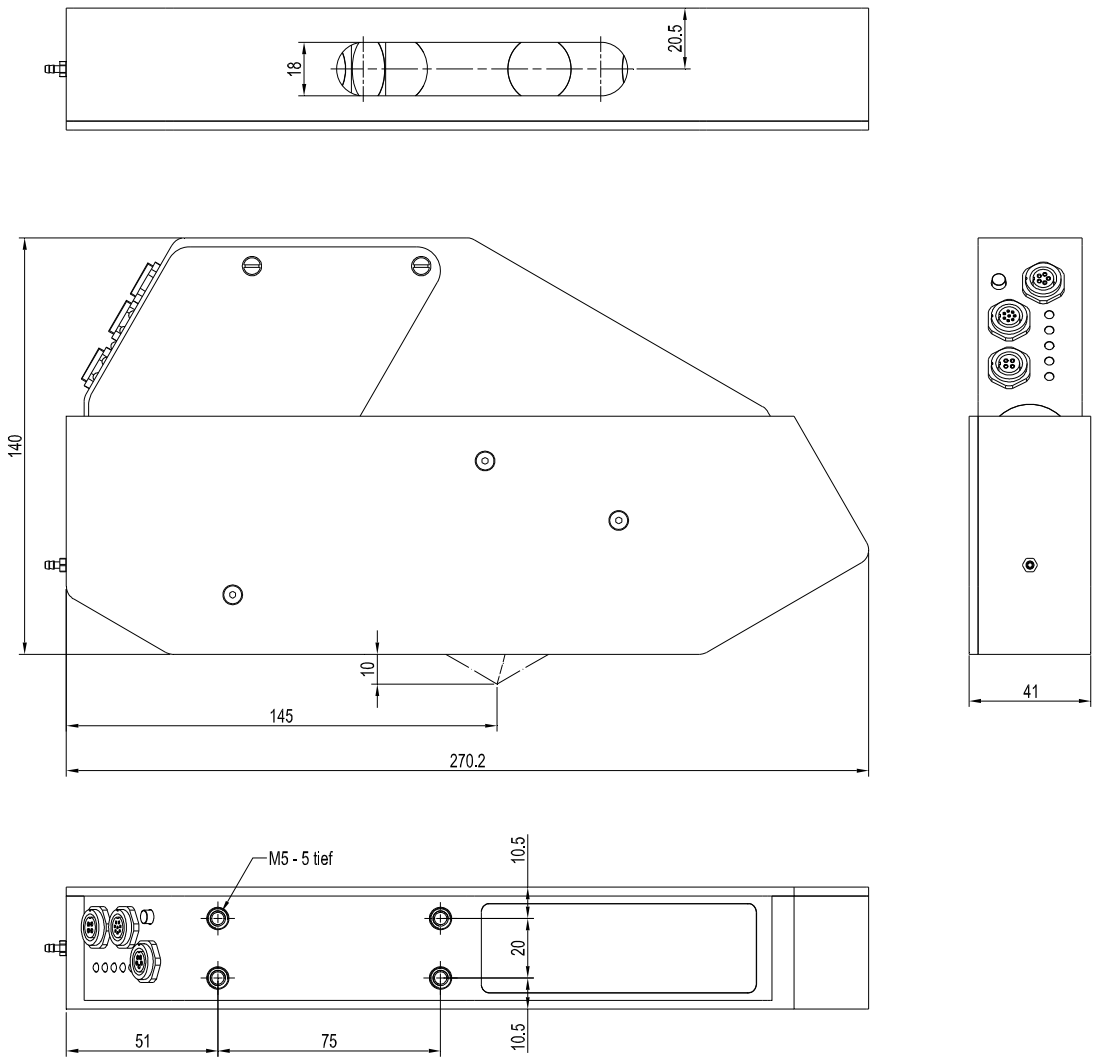
All dimensions in mm



Blow-air Top-part

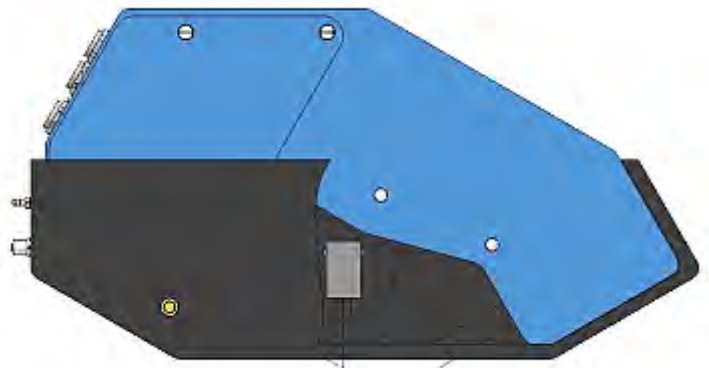


ABL-RLS-GD-15
(blow-air top-part)



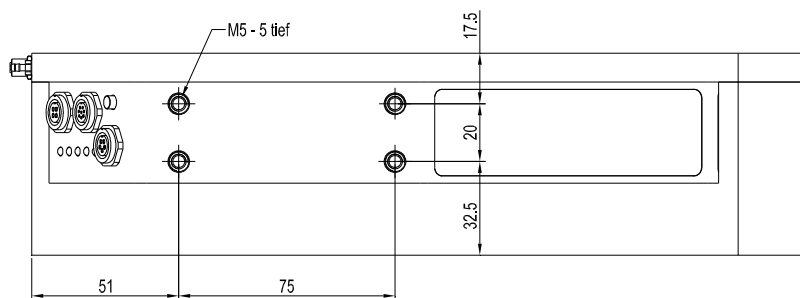
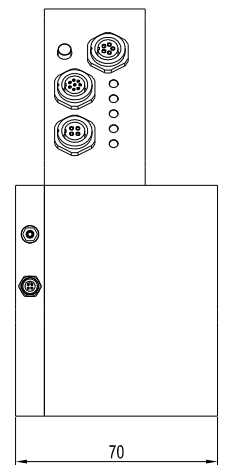
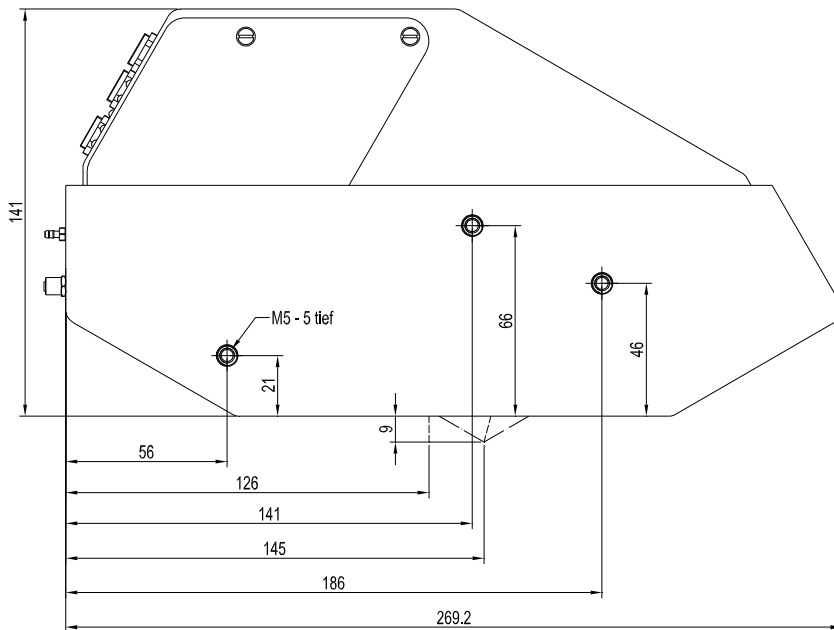
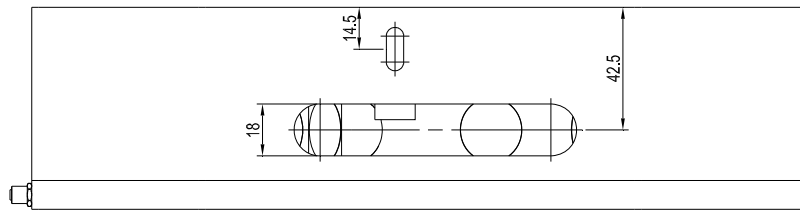
All dimensions in mm

Blow-air Top-part



ABL-RLS-GD-15-TRIG

(blow-air top-part for mounting onto RLS-GD-15/60° including trigger sensor C-LAS-LT-35)



All dimensions in mm

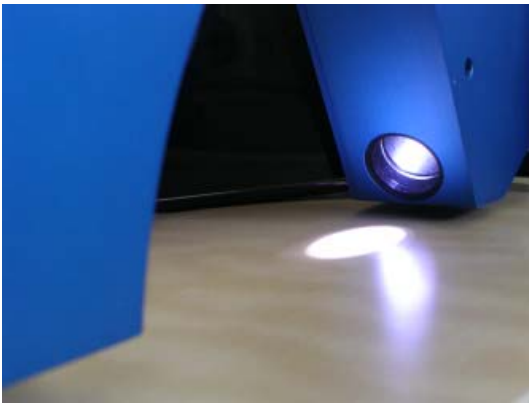


Application Examples

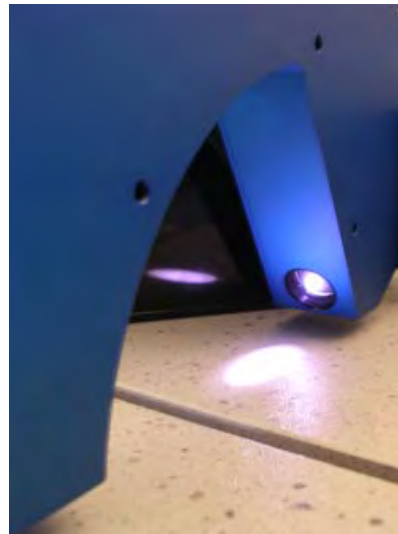
Online measurement of the gloss degree

In the production of plastic sheets (design sheets, wall coverings, floor coverings, table coatings, foam sheets, and coated carrier materials for the furniture industry, automobile industry, fashion industry, or construction industry) and ceramic parts (ceramic tiles and plates for wall and floor) 100% quality inspection of the optically visible surface has become an ever more frequent requirement.

For this purpose the RLS-GD sensor features non-contacting detection of the gloss degree. The simultaneous measurement of the object from two different directions (direct reflection and diffuse reflection) allows intensity-independent evaluation. The sensor can be taught to a certain surface, and up to 31 tolerance windows can be applied around the taught value. Measurement output is performed digitally by way of five outputs.



Gloss degree determination of sheets for the furniture industry



Online gloss measurement at ceramic parts



Monitoring of the gloss value of imitation leather



Examination of leather surfaces with respect to their gloss behavior



Gloss degree monitoring at plates of stone



Application Examples

Checking the presence of sub-decor during laminate flooring production

It may happen in the production of laminate flooring that the sub-decor is not applied. Such missing sub-decor should be detected as early as possible in the production process, which is why surface checking should be performed directly after the laminating unit. Because of the great variety of different products and surface decors, image processing systems and color sensors turned out to be unsuitable for this application.

The RLS-GD-15/60° gloss sensor, however, can perfectly distinguish between sub-decor present / not present. The application uses the analog output (4mA ... 20mA), which behaves proportionally to the gloss grade of the surface. A missing sub-decor leads to a sudden change of the analog signal, i.e. of the gloss grade. It is furthermore possible to perform teaching to the respective sub-decor, the gloss grade is then indicated in 31 stages (from good to bad) by way of switching outputs, and can thus easily be interrogated by a PLC. When a certain stage is exceeded, an alarm signal can be triggered or, in case of small deviations (trend), the operator can be informed in time.



Online gloss measurement at laminate flooring (monitoring of counteracting paper)

These sensors are used to check whether the resistant hard-paper layer is applied correctly. For this inspection use is made of the different gloss degrees of the hard-paper layer and the uncoated back side of the laminate flooring. This wood processing company presently is considering the use of the RLS-GD-15/60° for quality inspection of the decor, where a distinction should be made between decor and sub-decor.



Application Examples

Online gloss measurement during PVC-flooring production in transverse motion operation

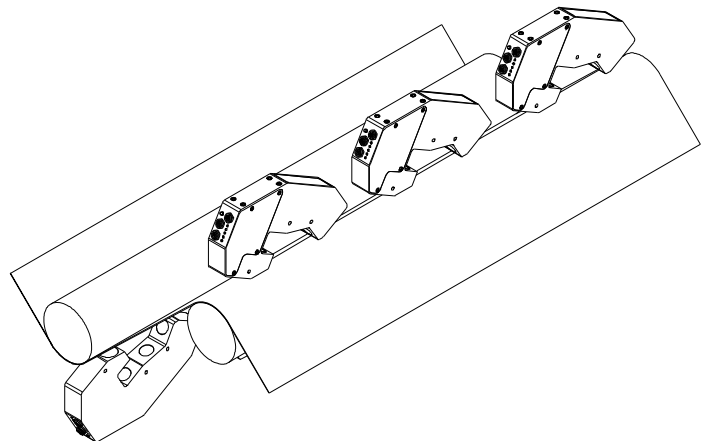
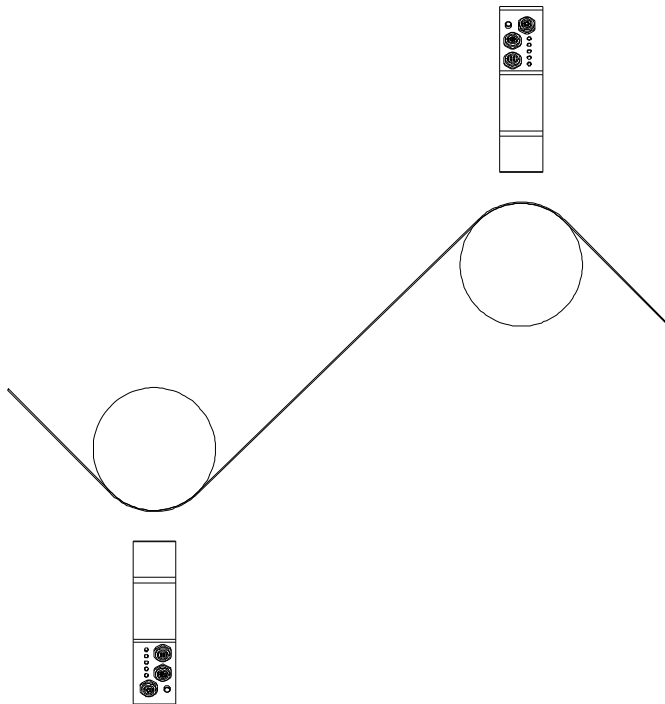
In the production of plastic floor coverings the gloss degree decisively depends on the material temperature in the extruder. Environmental influences such as air humidity and ambient temperature also are of importance with respect to the gloss degree. Until now, measurements were only performed at the start and end of production. With the RLS-GD-15/60° online measuring system the gloss degree can now be determined during the whole production process. It is furthermore planned to use the analog signal (4...20mA, proportional to the gloss degree) for automatically controlling the temperature of the extruder and thus the gloss degree.



Gloss measurement in the paper industry

Since the gloss degree should be measured on both sides of the paper web, and the paper web should not bend during measurement, but should run flatly, the position for the RLS-GD-15/60° gloss sensors was chosen at two deflection rollers.

In order to also obtain information about the gloss degree characteristics in crosswise direction of the paper web, three gloss sensors are mounted on each side (close to the left edge - center - close to the right edge). This means that there are six sensors for one system.



RLS Series

▶ RLS-GD-12/75° Gloss Detection

- Insensitive to outside light due to clocked white light
- 2 receivers (15°, 75°) and reference
- Storing of up to 31 gloss degrees
- Tolerance adjustable for each gloss degree
- Working distance typ. 15 mm ± 10%
- Parameterisable under Windows®
- RS232 interface (USB or Ethernet adapter is available)
- 5 switching outputs (npn/pnp-able, 100 mA, short circuit proof)
- Switching state indication via 5 yellow LEDs
- Transmitter power adjustable or controllable (STAT or DYN)
- Averaging can be activated (over up to approx. 32000 values)
- Scratch-resistance glass cover of optics, sturdy aluminum housing
- Calibration function (Wood's glass)
- Various evaluation algorithms (standardized or calibrated onto Wood's glass = 100%)
- Analog output (voltage 0...+10V and current 4...20mA, proportional to the gloss degree 0%...100% respectively zoomed up to the tenfold) via zoom function

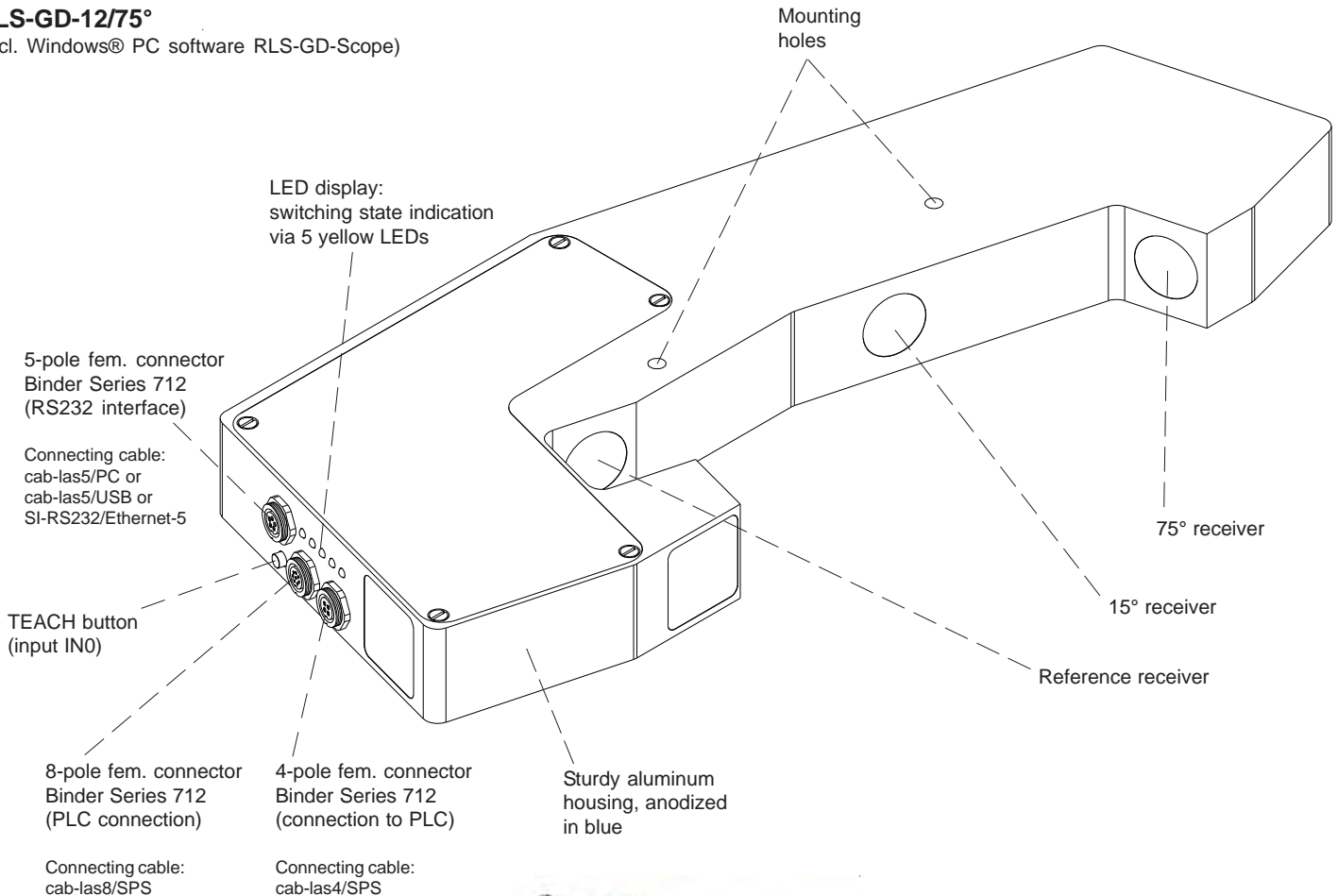


Design

Product name:

RLS-GD-12/75°

(incl. Windows® PC software RLS-GD-Scope)

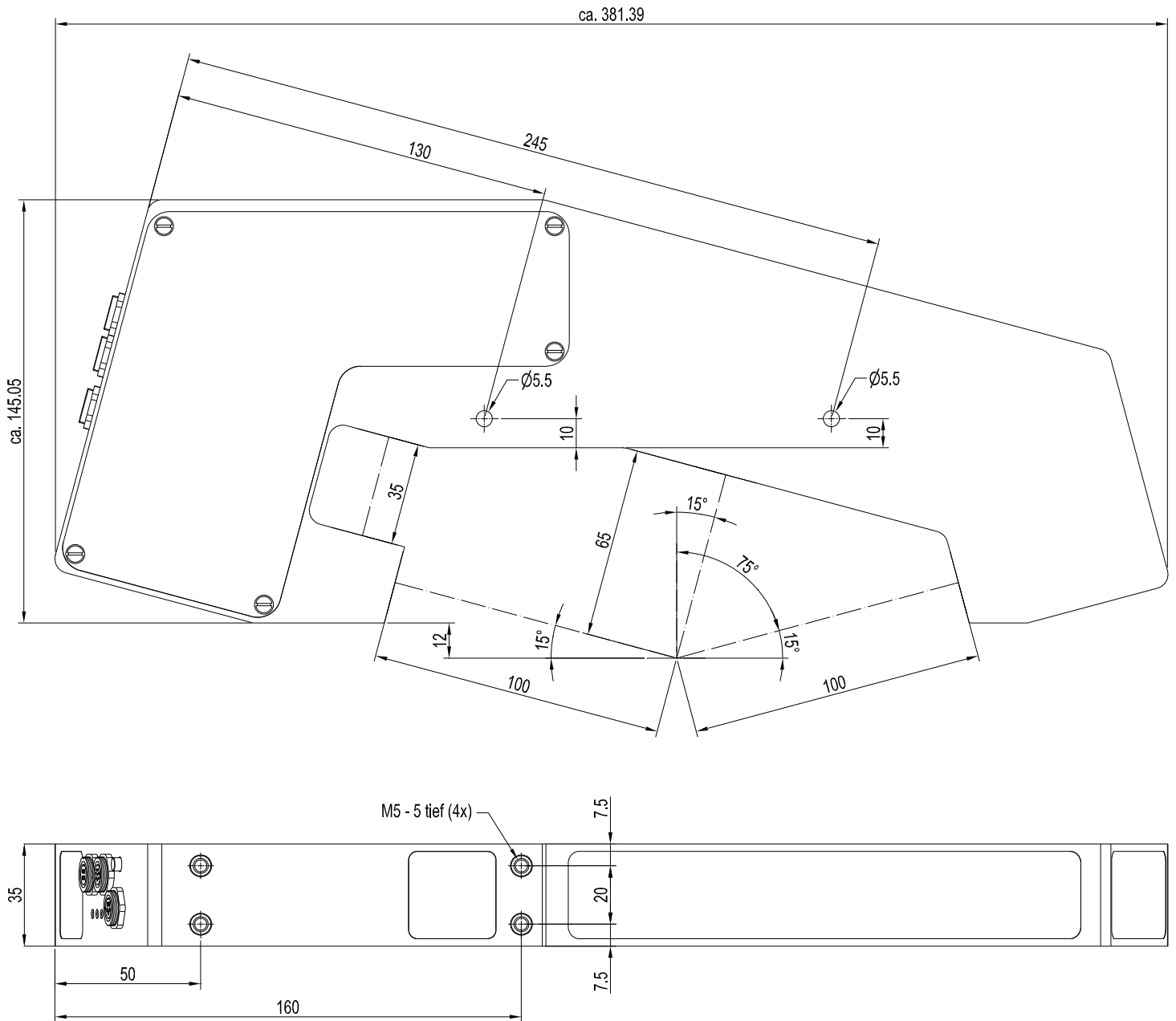




Technical Data

Model	RLS-GD-12/75°
Light source	1x white light LED, AC-operation (100 kHz)
Working distance	typ. 12 mm ± 10%
Light spot size	in a distance of 12 mm: typ. 16 mm x 65 mm (elliptical)
Optical filters	day light filter (KG2), UV block filter
Voltage supply	+24VDC (± 10%), protected against polarity reversal, overload protected
Pulsating light operation	100 kHz
Ambient light	up to 5000 Lux
Enclosure rating	IP54
Current consumption	typ. 110 mA
Interface	RS232, parameterisable under Windows®
EMC test acc. to	DIN EN 60947-5-2
Type of connector	connection to PLC: 8-pole female connector Binder Series 712 connection to PLC: 4-pole female connector Binder Series 712 connection to PC: 5-pole female connector Binder Series 712
Connecting cables	to PLC: cab-las8/SPS or cab-las8/SPS-w and cab-las4/SPS to PC/RS232 interface: cab-las5/PC or cab-las5/PC-w to PC/USB interface: cab-las5/USB or cab-las5/USB-w to PC/Ethernet interface: SI-RS232/Ethernet-5
Operating temperature range	-20°C ... +55°C
Storage temperature range	-20°C ... +85°C
Housing material	aluminum, anodized in blue
Housing dimensions	LxWxH approx. 382 mm x 145 mm x 35 mm
Max. switching current	100 mA, short-circuit proof
Switching frequency	max. 5 kHz (depends on averaging)
Output DIGITAL (5x)	OUT0 ... OUT4: Qinv or Q, (adjustable via PC): Qinv: npn bright-switching (npn n.c.) / pnp dark-switching (pnp n.o.) Q: pnp bright-switching (pnp n.c.) / npn dark-switching (npn n.o.)
Output ANALOG (2x)	1x voltage output (0...+10V) 1x current output (4...20mA)
Input IN0	via teach push button at the housing
Sensitivity (switching threshold)	parameterisable under Windows® (selection: threshold or tolerance window)
Pulse lengthening	0 ms ... 100 ms
Transmitted light power	adjustable under Windows®
Averaging	over 32000 values (adjustable under Windows®)
Switching state indication	by means of 5 yellow LEDs

Dimensions



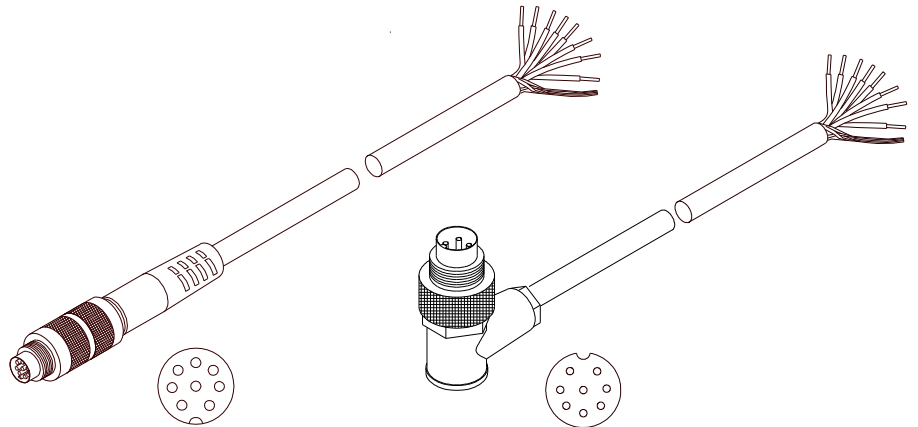
All dimensions in mm

Connector Assignment

**Connection to PLC:
8-pole fem. connector Binder Series 712**

Pin:	Color:	Assignment:
1	white	GND (0V)
2	brown	+24VDC (±10%)
3	green	IN0
4	yellow	OUT0
5	grey	OUT1
6	pink	OUT2
7	blue	OUT3
8	red	OUT4

Connecting cable:
cab-las8/SPS-(length)
cab-las8/SPS-w-(length) (angle type, 90°)
(standard length 2m)

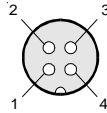


cab-las8/SPS-...
(max. length 25m, outer jacket: PUR)

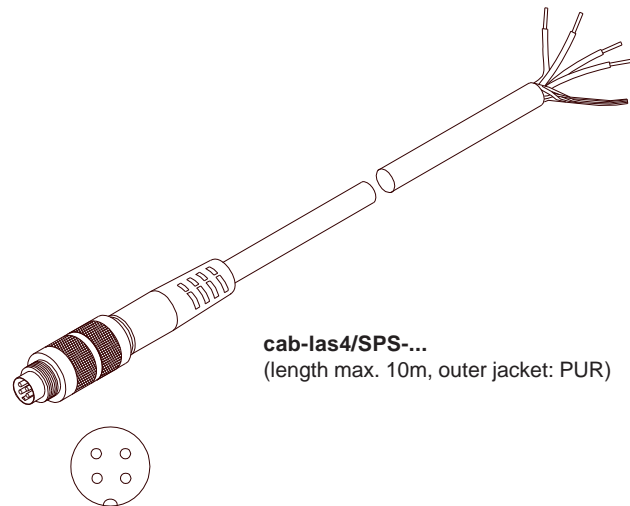
cab-las8/SPS-w-...
(max. length 25m, outer jacket: PUR)

**Additional connection to PLC:
4-pole fem. connector Binder Series 712**

Pin:	Color:	Assignment:
1	white	GND (0V)
2	brown	not connected
3	black	Analog output voltage (0...+10V)
4	blue	Analog output current (4...20mA)



Connecting cable:
cab-las4/SPS-(length)
(Standard length 2m)



cab-las4/SPS-...
(length max. 10m, outer jacket: PUR)

Connector Assignment

**Connection to PC:
5-pole fem. connector Binder Series 712**

Pin:	Assignment:
1	GND (0V)
2	TxD
3	RxD
4	+24VDC (+Ub, OUT)
5	not connected

Connection via RS232 interface at the PC:

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

alternative:

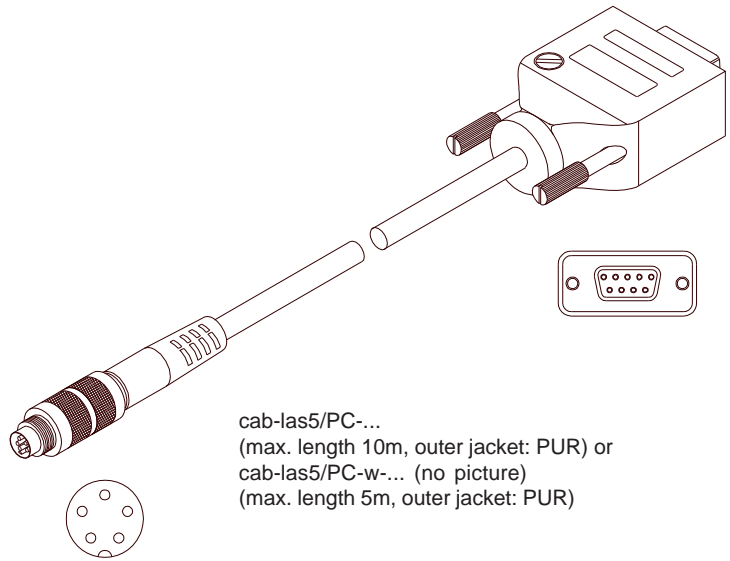
Connection via USB interface at the PC:

Connecting cable (incl. driver software):
 cab-las5/USB-(length)
 cab-las5/USB-w-(length) (angle type 90°)
 (standard length 2m)

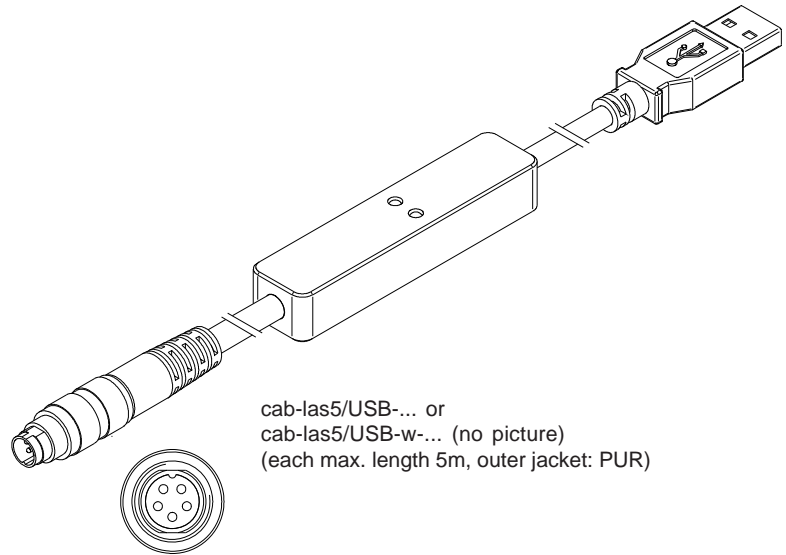
alternative:

Connection to local network via Ethernet bus:

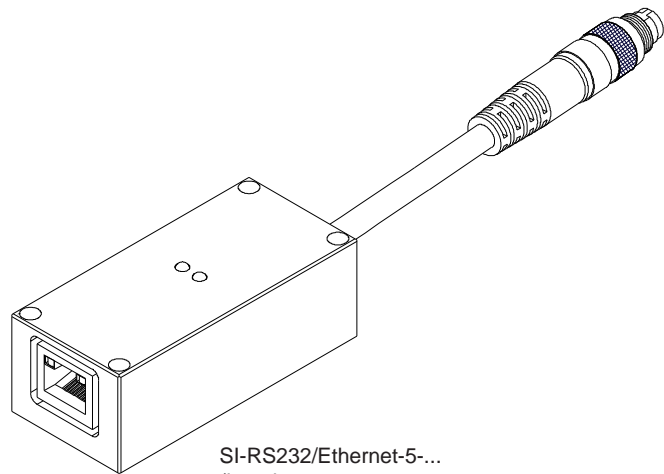
Adapter (based on Lantronix XPortModul):
 SI-RS232/Ethernet-5-(length)
 (standard length 2m)



cab-las5/PC-...
 (max. length 10m, outer jacket: PUR) or
 cab-las5/PC-w-... (no picture)
 (max. length 5m, outer jacket: PUR)



cab-las5/USB-... or
 cab-las5/USB-w-... (no picture)
 (each max. length 5m, outer jacket: PUR)



SI-RS232/Ethernet-5-...
 (length 0,5m, 1m, or 2m,
 outer jacket: PUR)



Measuring Angles

Different standard measuring angles for RLS-GD Series available:

RLS-GD 20/20°	measures with an angle of 20°:	for high-glossy surfaces
RLS-GD 15/60°	measures with an angle of 60°:	for semi-glossy surfaces ("all-rounder")
RLS-GD 12/75°	measures with an angle of 75°:	for low-glossy to high-glossy surfaces (standard in paper industry)
RLS-GD 5/85°	measures with an angle of 85°:	for low-glossy surfaces



Measuring Principle

Measuring principle of the gloss detection sensor RLS-GD-12/75°:

The RLS-GD-12/75° sensor can be "taught" up to 31 gloss degrees or normalized vector. Evaluation always is performed with 12 bits. With the help of a modulated white-light LED a white light spot (\varnothing approx. 15 mm) is projected onto the surface to be inspected by way of an optical transmitter unit at an angle of 75° to the vertical plane.

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 also arranged at an angle of 75° to the vertical plane). Furthermore, diffuse reflection is determined by way of one additional optical unit. The gloss degree is then determined from the 2 receiver signals (15°, 75°).

As an alternative calibration can be performed on black glass (under 75°, corresponds to 100%). For this purpose a reference line is applied during calibration to store a reference value which then serves as a comparison value during measurement.

Gloss detection either operates continuously or is started by an external PLC trigger signal. The gloss degree respectively 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-12/75°.

TEACH button:

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).

Evaluation algorithm EXTERN TEACH:

With this function field the gloss sensor can be taught by means of a LOW-signal at pin 3 (for instance via push button, or PLC). During this procedure the object to be taught has to be in the visibility range of the gloss sensor. The yellow LEDs indicate a successful teaching procedure.

RS232 interface:

Through the RS232 interface parameters and measured values can be exchanged between the PC and the RLS-GD-12/75° sensor. All the parameters for gloss degree detection respectively normalized vector detection can be stored in the non-volatile EEPROM of the RLS-GD-12/75° sensor. When parameterization is finished the gloss sensor continues to operate with the current parameters in "stand alone" mode without a PC.

Calibration:

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.

Temperature compensation:

The sensor is factory-temperature-compensated. It is stable over a temperature range from 10 degrees to 60 degrees centigrade. The current temperature inside the housing is visualised by the PC user interface.



Visualization

Visualization of the gloss degrees:

Under Windows® representation of the gloss degree on a PC in numeric form and in a gloss chart, and representation of the 15°/75° values in a time chart. In addition the current 15°/75° values are displayed as a bar chart.

The following evaluation algorithms can also be selected:

- Target lies within the tolerance window of a taught gloss grade.
- EXTERN TEACH: With this function field the gloss sensor can be taught by means of a LOW-signal at pin 3 (for instance via push button, or PLC). During this procedure the object to be taught has to be in the visibility range of the gloss sensor. The yellow LEDs indicate a successful teaching procedure.



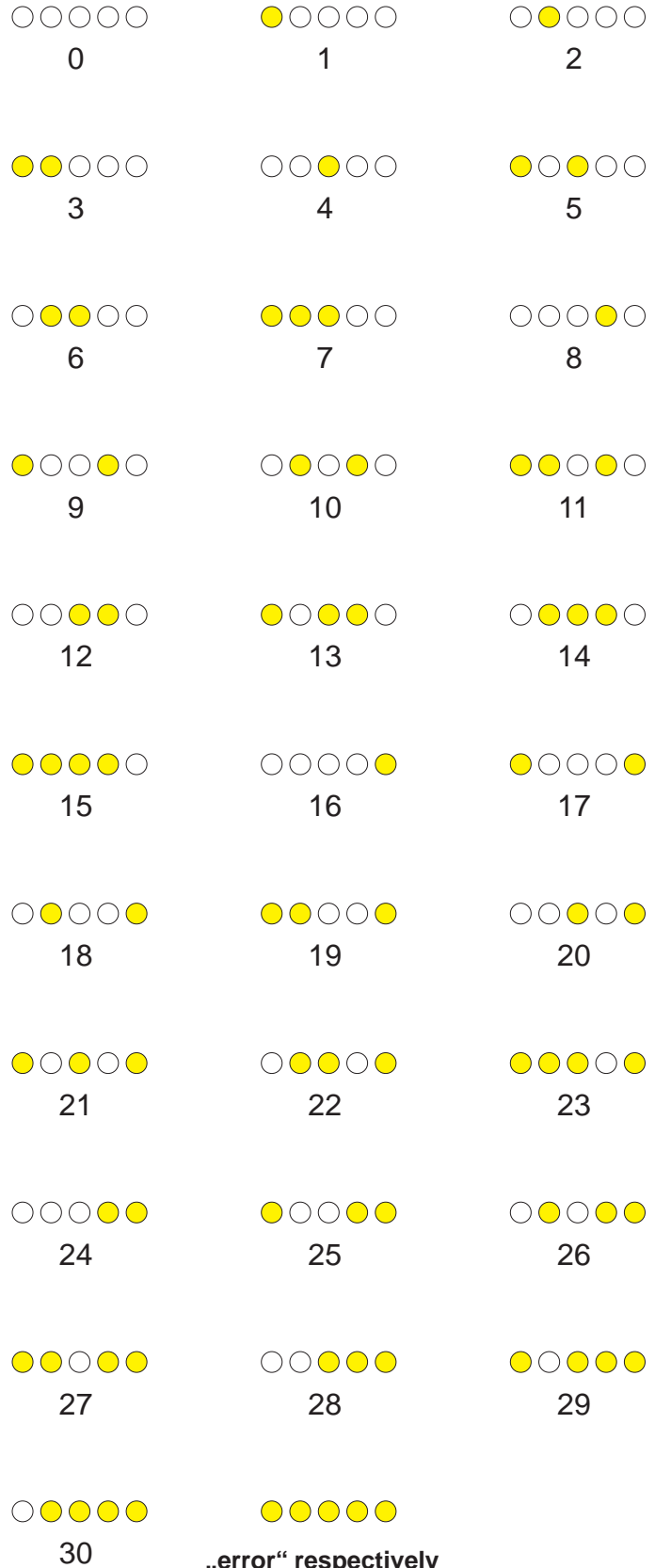
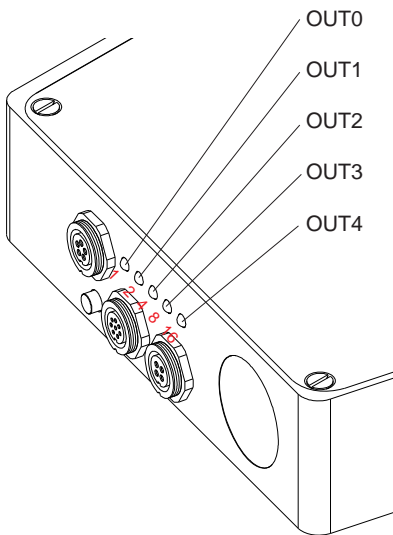
LED Display

LED display:

The gloss grade is visualized by means of 5 yellow LEDs at the housing of the gloss 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 PLC connector.

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).

In the DIRECT mode (OUT DIRECT HI or OUT DIRECT LO) the maximum numbers of line vectors to be taught is 5.

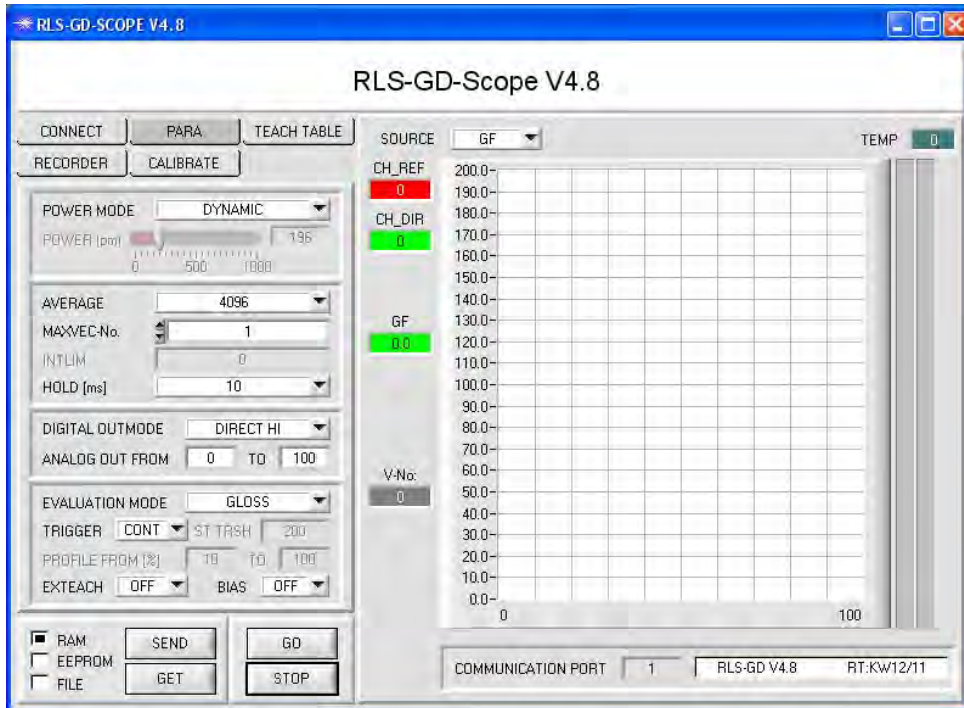


„error“ respectively „not detected“

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Windows® user interface:

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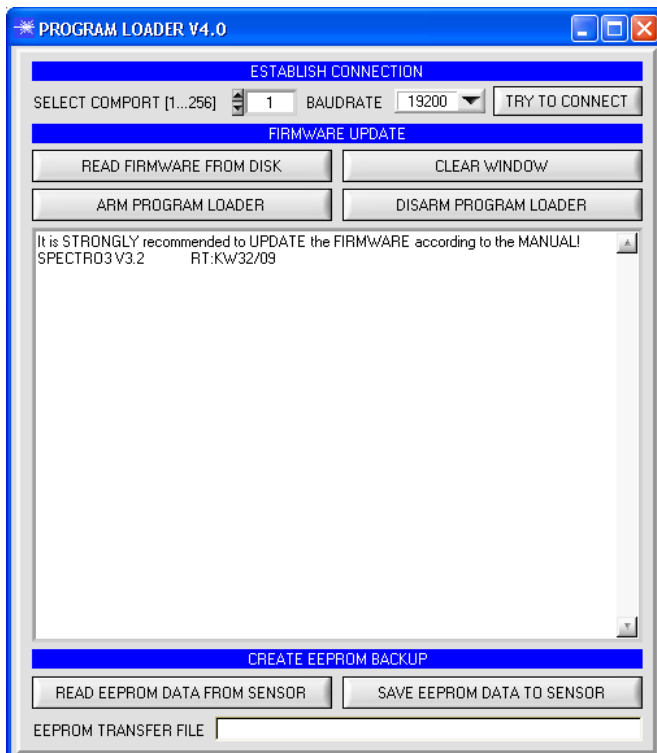


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- MAXVEC-No.:
Number of gloss degrees (normalized vectors) to be checked
- POWER MODE:
In this function field the operating mode of automatic power correction at the transmitter unit can be set
- EVALUATION MODE:
The RLS-GD sensor can be operated with two different evaluation modes (NORM_INT or GLOSS)
- AVERAGE:
Averaging over a maximum of 32768 values
- TRIGGER:
Continuous or external or self trigger
- DIGITAL OUTMODE:
Triggering of the digital outputs
- INTLIM:
Minimum intensity required for gloss evaluation
- HOLD:
Pulse lengthening up to 100ms max.

Under Windows® representation of the gloss value on a PC in numeric form and in a color chart, and representation of RGB values in a time chart. In addition the current RGB values are displayed as a bar chart.

Firmware Update by means of the software Program Loader:



The software „Program Loader“ allows the user to perform an automatic firmware update. The update will be carried out through the RS232 interface.

An initialisation file (xxx.ini) and a firmware file (xxx.elf.S) are required for performing a firmware update. These files can be obtained from your supplier. In some cases an additional firmware file for the program memory (xxx.elf.p.S) is also needed, and this file will be automatically provided together with the other two files.

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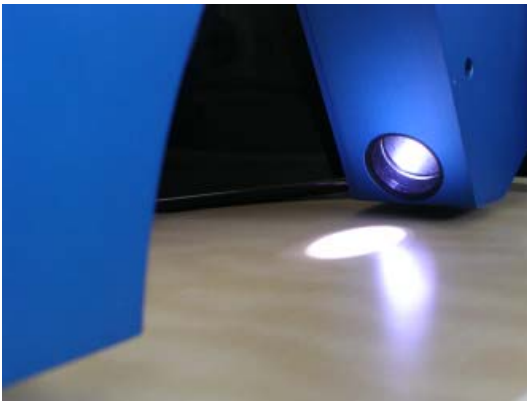


Application Examples

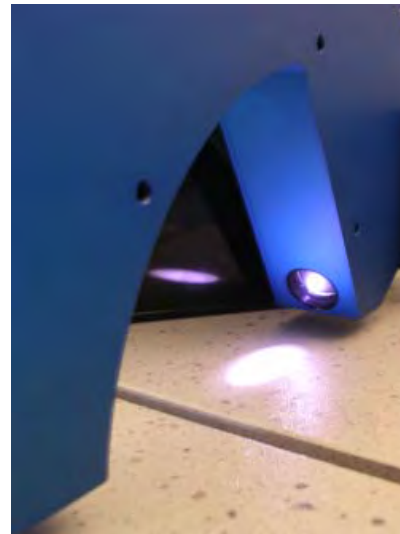
Online measurement of the gloss degree

In the production of plastic sheets (design sheets, wall coverings, floor coverings, table coatings, foam sheets, and coated carrier materials for the furniture industry, automobile industry, fashion industry, or construction industry) and ceramic parts (ceramic tiles and plates for wall and floor) 100% quality inspection of the optically visible surface has become an ever more frequent requirement.

For this purpose the RLS-GD sensor features non-contacting detection of the gloss degree. The simultaneous measurement of the object from two different directions (direct reflection and diffuse reflection) allows intensity-independent evaluation. The sensor can be taught to a certain surface, and up to 31 tolerance windows can be applied around the taught value. Measurement output is performed digitally by way of five outputs.



Gloss degree determination of sheets for the furniture industry



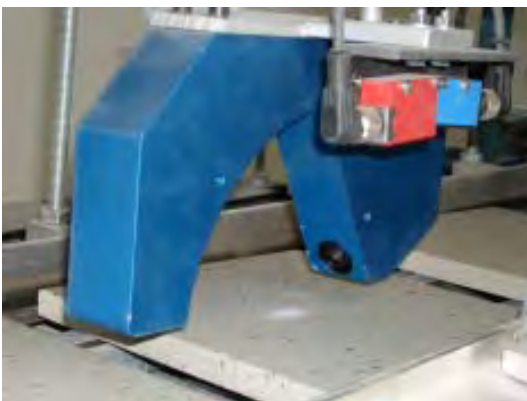
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Monitoring of the gloss value of imitation leather



Examination of leather surfaces with respect to their gloss behavior



Gloss degree monitoring at plates of stone



Application Examples

Checking the presence of sub-decor during laminate flooring production

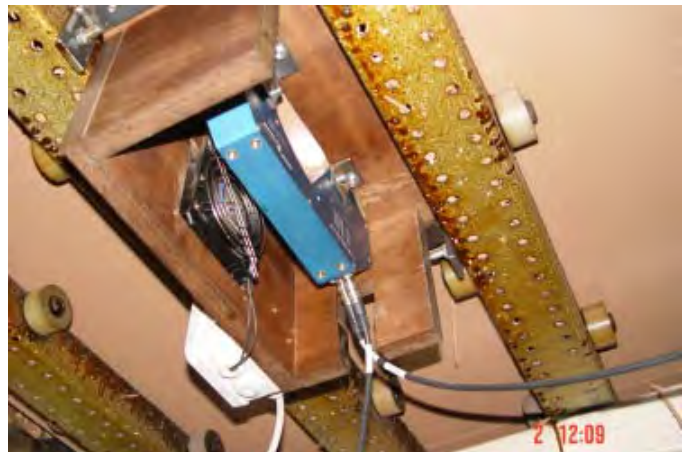
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The RLS-GD-15/60° gloss sensor, however, can perfectly distinguish between sub-decor present / not present. The application uses the analog output (4mA ... 20mA), which behaves proportionally to the gloss grade of the surface. A missing sub-decor leads to a sudden change of the analog signal, i.e. of the gloss grade. It is furthermore possible to perform teaching to the respective sub-decor, the gloss grade is then indicated in 31 stages (from good to bad) by way of switching outputs, and can thus easily be interrogated by a PLC. When a certain stage is exceeded, an alarm signal can be triggered or, in case of small deviations (trend), the operator can be informed in time.



Online gloss measurement at laminate flooring (monitoring of counteracting paper)

These sensors are used to check whether the resistant hard-paper layer is applied correctly. For this inspection use is made of the different gloss degrees of the hard-paper layer and the uncoated back side of the laminate flooring. This wood processing company presently is considering the use of the RLS-GD-15/60° for quality inspection of the decor, where a distinction should be made between decor and sub-decor.



Online gloss measurement during PVC-flooring production in transverse motion operation

In the production of plastic floor coverings the gloss degree decisively depends on the material temperature in the extruder. Environmental influences such as air humidity and ambient temperature also are of importance with respect to the gloss degree. "Until now, measurements were only performed at the start and end of production. With the RLS-GD-15/60° online measuring system the gloss degree can now be determined during the whole production process." It is furthermore planned to use the analog signal (4...20mA, proportional to the gloss degree) for automatically controlling the temperature of the extruder and thus the gloss degree.



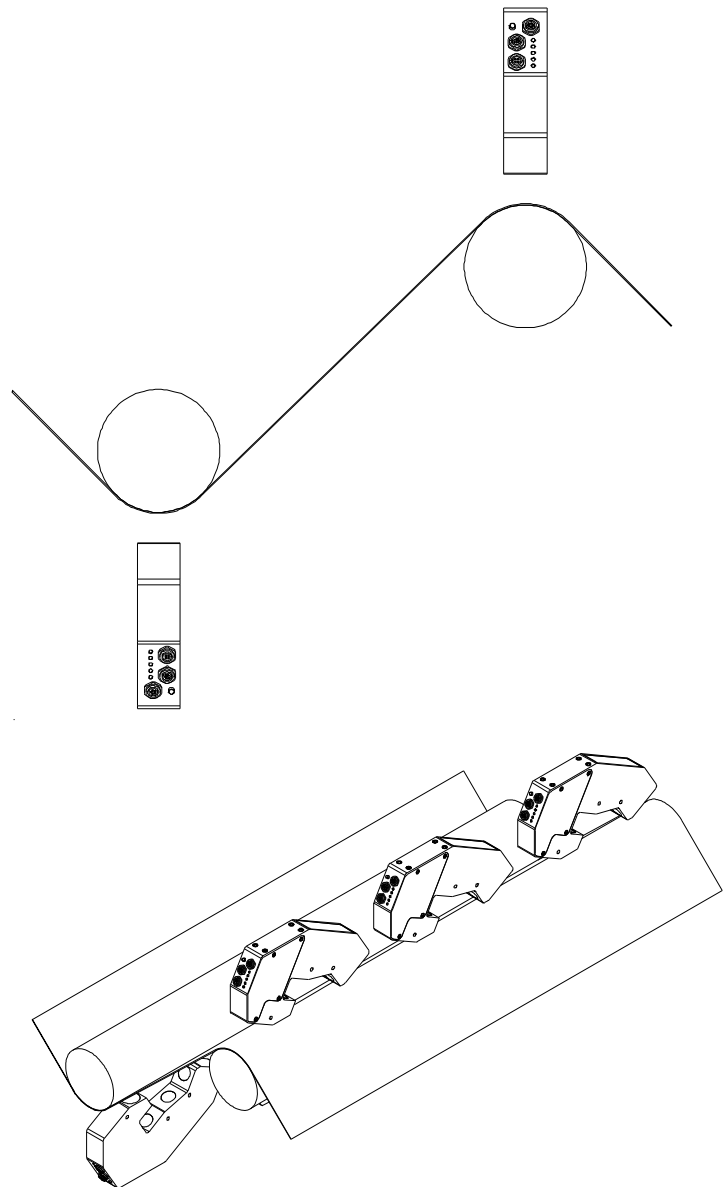


Application Examples

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In order to also obtain information about the gloss degree characteristics in crosswise direction of the paper web, three gloss sensors are mounted on each side (close to the left edge - center - close to the right edge). This means that there are six sensors for one system.



RLS Series

▶ RLS-GD-5/85° Gloss Detection

- Insensitive to outside light due to clocked white light
- 2 receivers (5°, 85°) and reference
- Storing of up to 31 gloss degrees
- Tolerance adjustable for each gloss degree
- Working distance typ. 15 mm ± 10%
- Parameterisable under Windows®
- RS232 interface (USB or Ethernet adapter is available)
- 5 switching outputs (npn-/pnp-able, 100 mA, short circuit proof)
- Switching state indication via 5 yellow LEDs
- Transmitter power adjustable or controllable (STAT or DYN)
- Averaging can be activated (over up to approx. 32000 values)
- Scratch-resistance glass cover of optics, sturdy aluminum housing
- Calibration function (Wood's glass)
- Various evaluation algorithms (standardized or calibrated onto Wood's glass = 100%)
- Analog output (voltage 0...+10V and current 4...20mA, proportional to the gloss degree 0%...100% respectively zoomed up to the tenfold) via zoom function

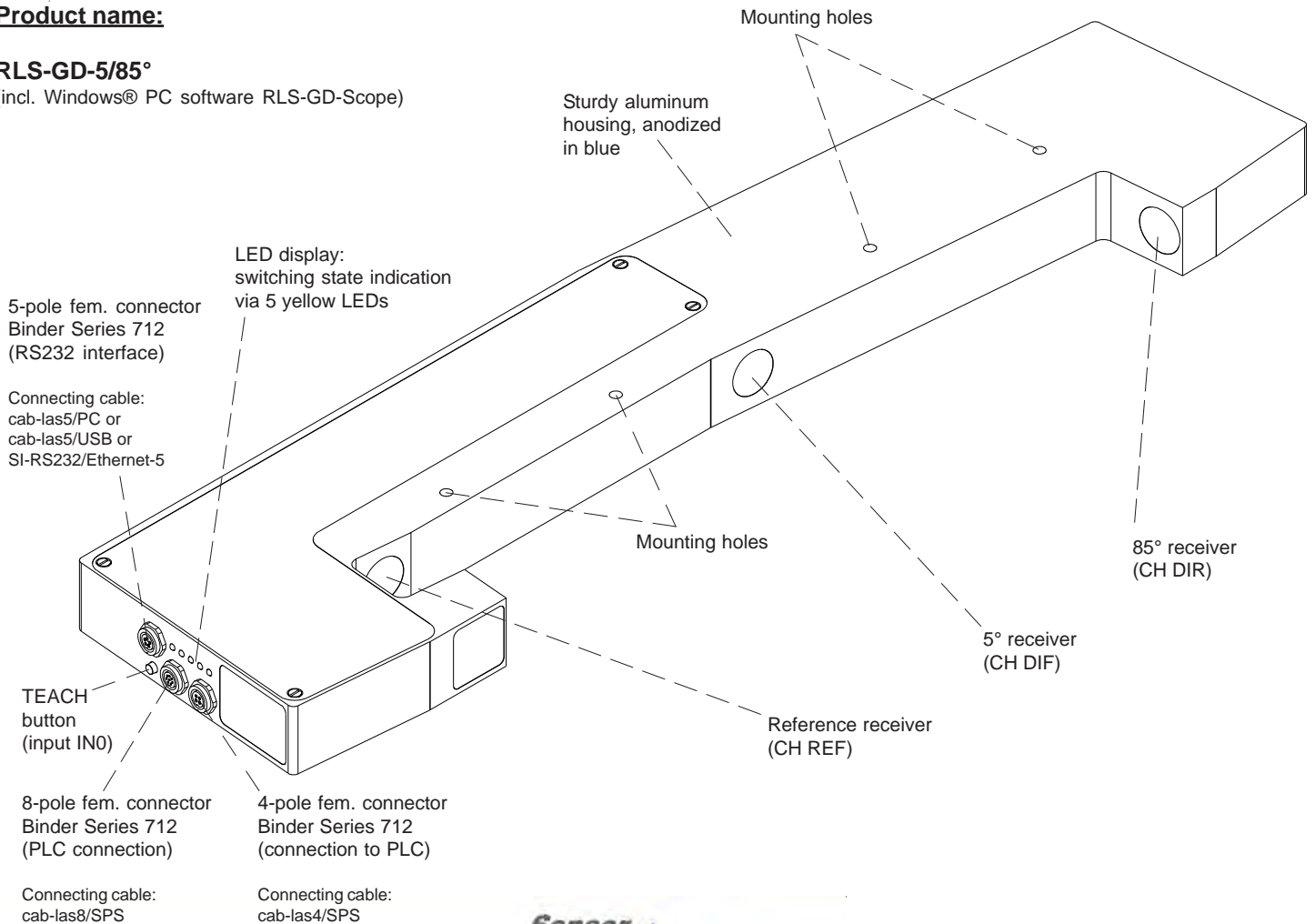


Design

Product name:

RLS-GD-5/85°

(incl. Windows® PC software RLS-GD-Scope)

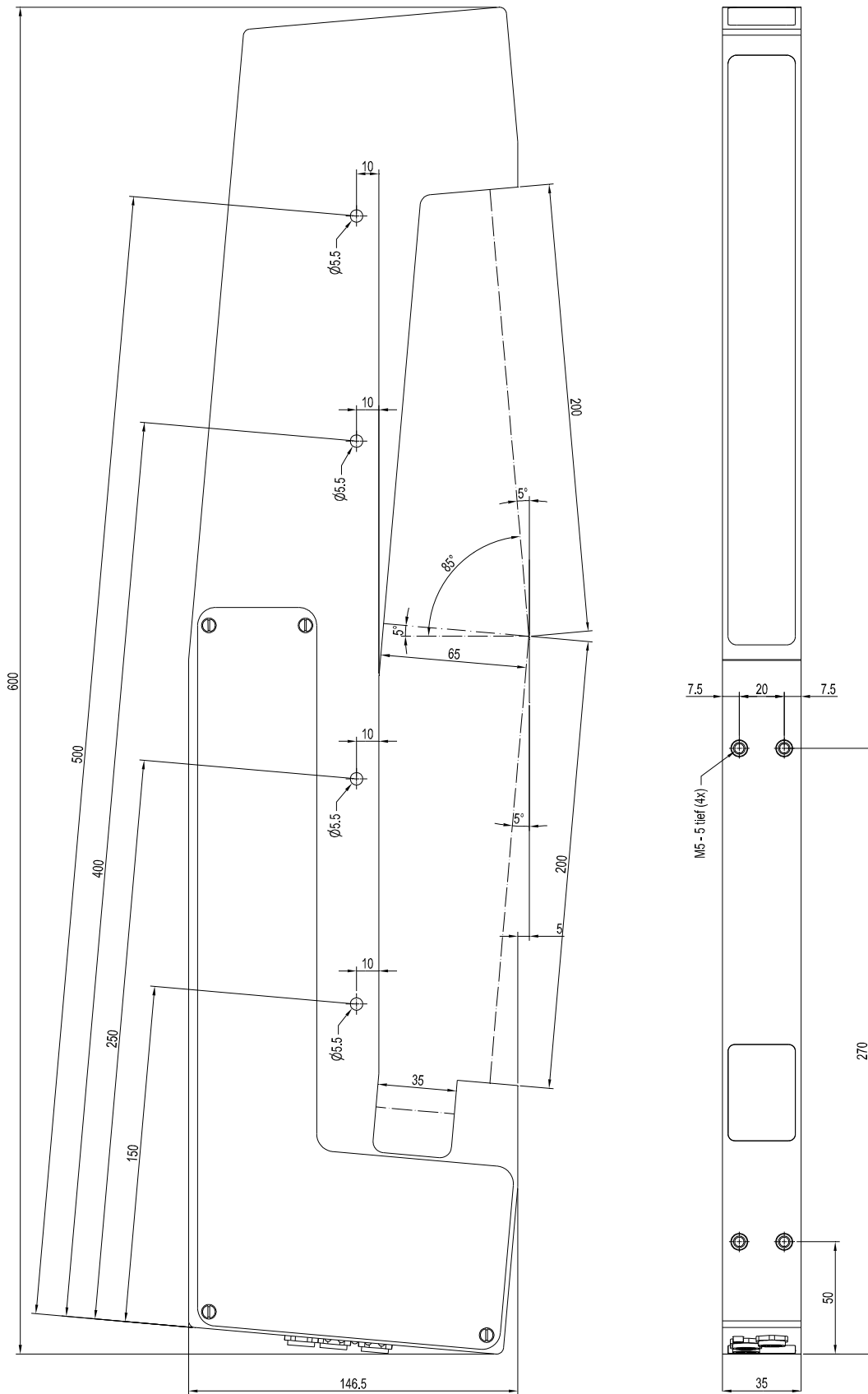




Technical Data

Model	RLS-GD-5/85°
Light source	1x white light LED, AC-operation (100 kHz)
Working distance	typ. 5 mm ± 10%
Light spot size	in a distance of 5 mm: typ. 16 mm x 160 mm (elliptical)
Optical filters	day light filter (KG2), UV block filter
Voltage supply	+24VDC (± 10%), protected against polarity reversal, overload protected
Pulsating light operation	100 kHz
Ambient light	up to 5000 Lux
Enclosure rating	IP54
Current consumption	typ. 110 mA
Interface	RS232, parameterisable under Windows®
EMC test acc. to	DIN EN 60947-5-2
Type of connector	connection to PLC: 8-pole female connector Binder Series 712 connection to PLC: 4-pole female connector Binder Series 712 connection to PC: 5-pole female connector Binder Series 712
Connecting cables	to PLC: cab-las8/SPS or cab-las8/SPS-w and cab-las4/SPS to PC/RS232 interface: cab-las5/PC or cab-las5/PC-w to PC/USB interface: cab-las5/USB or cab-las5/USB-w to PC/Ethernet interface: SI-RS232/Ethernet-5
Operating temperature range	-20°C ... +55°C
Storage temperature range	-20°C ... +85°C
Housing material	aluminum, anodized in blue
Housing dimensions	LxWxH approx. 600 mm x 146,5 mm x 35 mm
Max. switching current	100 mA, short-circuit proof
Switching frequency	max. 5 kHz (depends on averaging)
Output DIGITAL (5x)	OUT0 ... OUT4: Qinv or Q, (adjustable via PC): Qinv: npn bright-switching (nnp n.c.) / pnp dark-switching (pnp n.o.) Q: pnp bright-switching (pnp n.c.) / npn dark-switching (nnp n.o.)
Output ANALOG (2x)	1x voltage output (0...+10V) 1x current output (4...20mA)
Input IN0	via teach push button at the housing
Sensitivity (switching threshold)	parameterisable under Windows® (selection: threshold or tolerance window)
Pulse lengthening	0 ms ... 100 ms
Transmitted light power	adjustable under Windows®
Averaging	over 32000 values (adjustable under Windows®)
Switching state indication	by means of 5 yellow LEDs

Dimensions



All dimensions in mm

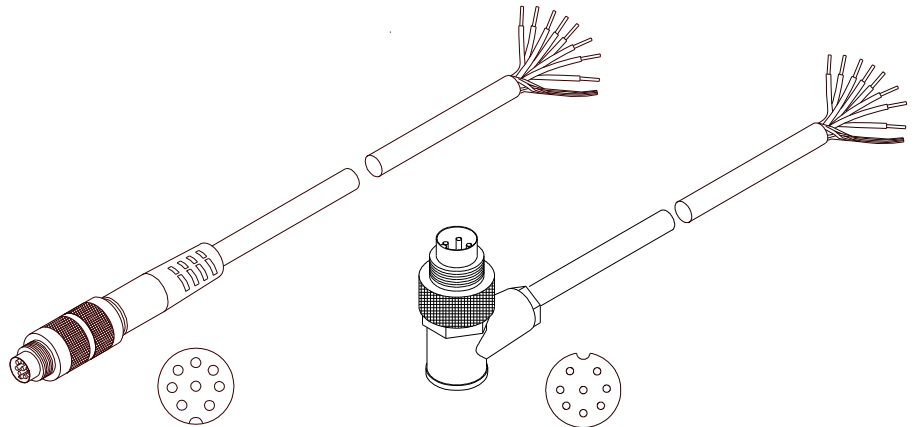


Connector Assignment

**Connection to PLC:
8-pole fem. connector Binder Series 712**

Pin:	Color:	Assignment:
1	white	GND (0V)
2	brown	+24VDC (±10%)
3	green	IN0
4	yellow	OUT0
5	grey	OUT1
6	pink	OUT2
7	blue	OUT3
8	red	OUT4

Connecting cable:
cab-las8/SPS-(length)
cab-las8/SPS-w-(length) (angle type, 90°)
(standard length 2m)

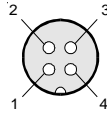


cab-las8/SPS-...
(max. length 25m, outer jacket: PUR)

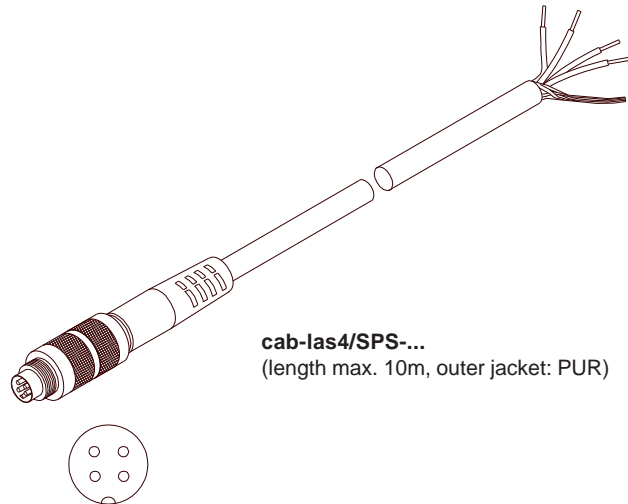
cab-las8/SPS-w-...
(max. length 25m, outer jacket: PUR)

**Additional connection to PLC:
4-pole fem. connector Binder Series 712**

Pin:	Color:	Assignment:
1	white	GND (0V)
2	brown	not connected
3	black	Analog output voltage (0...+10V)
4	blue	Analog output current (4...20mA)



Connecting cable:
cab-las4/SPS-(length)
(Standard length 2m)



cab-las4/SPS-...
(length max. 10m, outer jacket: PUR)

Connector Assignment

**Connection to PC:
5-pole fem. connector Binder Series 712**

Pin:	Assignment:
1	GND (0V)
2	TxD
3	RxD
4	+24VDC (+Ub, OUT)
5	not connected

Connection via RS232 interface at the PC:

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

alternative:

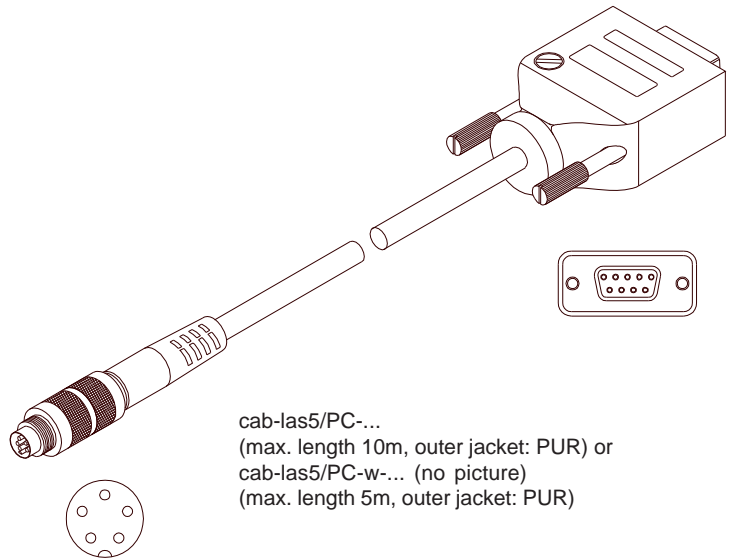
Connection via USB interface at the PC:

Connecting cable (incl. driver software):
 cab-las5/USB-(length)
 cab-las5/USB-w-(length) (angle type 90°)
 (standard length 2m)

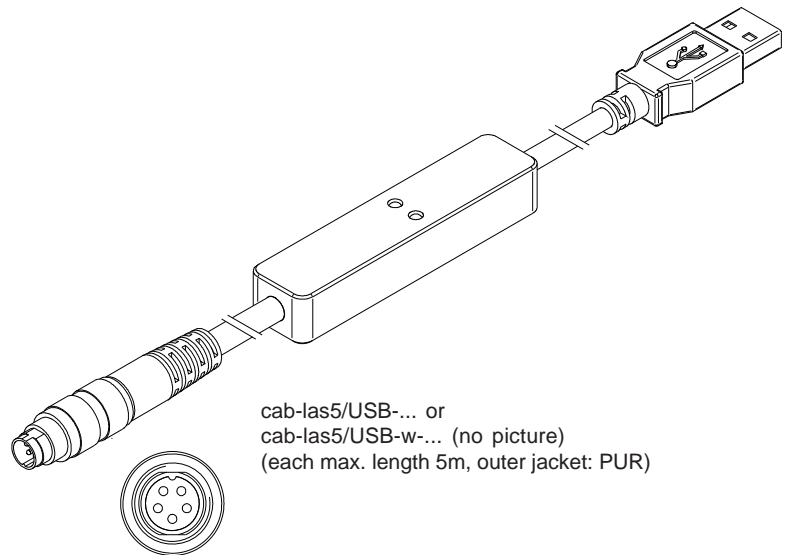
alternative:

Connection to local network via Ethernet bus:

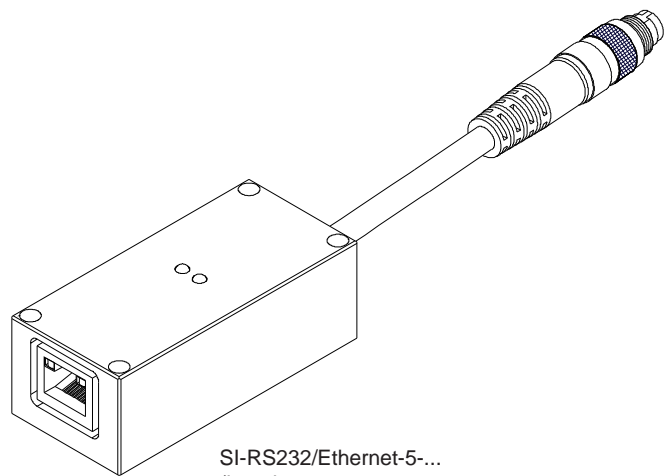
Adapter (based on Lantronix XPortModul):
 SI-RS232/Ethernet-5-(length)
 (standard length 2m)



cab-las5/PC-...
 (max. length 10m, outer jacket: PUR) or
 cab-las5/PC-w-... (no picture)
 (max. length 5m, outer jacket: PUR)



cab-las5/USB-... or
 cab-las5/USB-w-... (no picture)
 (each max. length 5m, outer jacket: PUR)



SI-RS232/Ethernet-5-...
 (length 0,5m, 1m, or 2m,
 outer jacket: PUR)



Measuring Angles

Different standard measuring angles for RLS-GD Series available:

RLS-GD 20/20°	measures with an angle of 20°:	for high-glossy surfaces
RLS-GD 15/60°	measures with an angle of 60°:	for semi-glossy surfaces ("all-rounder")
RLS-GD 12/75°	measures with an angle of 75°:	for low-glossy to high-glossy surfaces (standard in paper industry)
RLS-GD 5/85°	measures with an angle of 85°:	for low-glossy surfaces



Measuring Principle

Measuring principle of the gloss detection sensor RLS-GD-5/85°:

The RLS-GD-5/85° sensor can be "taught" up to 31 gloss degrees or normalized vector. Evaluation always is performed with 12 bits. With the help of a modulated white-light LED a white light spot (\varnothing approx. 25 mm) is projected onto the surface to be inspected by way of an optical transmitter unit at an angle of 85° to the vertical plane.

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 also arranged at an angle of 85° to the vertical plane). Furthermore, diffuse reflection is determined by way of one additional optical unit. The gloss degree is then determined from the 2 receiver signals (5°, 85°).

As an alternative calibration can be performed on black glass (under 85°, corresponds to 100%). For this purpose a reference line is applied during calibration to store a reference value which then serves as a comparison value during measurement.

Gloss detection either operates continuously or is started by an external SPC trigger signal. The gloss degree respectively 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-5/85°.

TEACH button:

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).

Evaluation algorithm EXTERN TEACH:

With this function field the gloss sensor can be taught by means of a LOW-signal at pin 3 (for instance via push button, or PLC). During this procedure the object to be taught has to be in the visibility range of the gloss sensor. The yellow LEDs indicate a successful teaching procedure.

RS232 interface:

Through the RS232 interface parameters and measured values can be exchanged between the PC and the RLS-GD-5/85° sensor. All the parameters for gloss degree detection respectively normalized vector detection can be stored in the non-volatile EEPROM of the RLS-GD-5/85° sensor. When parameterization is finished the gloss sensor continues to operate with the current parameters in "stand alone" mode without a PC.

Calibration:

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.

Temperature compensation:

The sensor is factory-temperature-compensated. It is stable over a temperature range from 10 degrees to 60 degrees centigrade. The current temperature inside the housing is visualised by the PC user interface.



Visualization

Visualization of the gloss degrees:

Under Windows® representation of the gloss degree on a PC in numeric form and in a gloss chart, and representation of the 5°/85° values in a time chart. In addition the current 5°/85° values are displayed as a bar chart.

The following evaluation algorithms can also be selected:

- Target lies within the tolerance window of a taught gloss grade.
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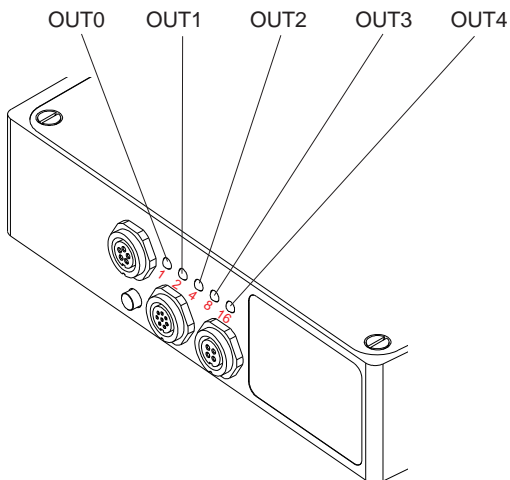


LED Display

LED display:

The gloss grade is visualized by means of 5 yellow LEDs at the housing of the gloss sensor. At the same time the gloss grade indicated at the LED display is output as 5-bit binary information at the digital outputs OUT0 ... OUT4 of the 8-pole PLC connector.

In the DIRECT mode the maximum number of gloss grades to be taught is 5. These 5 gloss grades can be directly output at the 5 digital outputs. The respective detected gloss grade is displayed by means of the 5 yellow LEDs at the gloss sensor housing.



○ ○ ○ ○ ○ 0	● ○ ○ ○ ○ 1	○ ● ○ ○ ○ 2
● ● ○ ○ ○ 3	○ ○ ● ○ ○ 4	● ○ ● ○ ○ 5
○ ● ● ○ ○ 6	● ● ● ○ ○ 7	○ ○ ○ ● ○ 8
● ○ ○ ● ○ 9	○ ● ○ ● ○ 10	● ● ○ ● ○ 11
○ ○ ● ● ○ 12	● ○ ● ● ○ 13	○ ● ● ● ○ 14
● ● ● ● ○ 15	○ ○ ○ ○ ● 16	● ○ ○ ○ ● 17
○ ● ○ ○ ● 18	● ● ○ ○ ● 19	○ ○ ● ○ ● 20
● ○ ● ○ ● 21	○ ● ● ○ ● 22	● ● ● ○ ● 23
○ ○ ○ ● ● 24	● ○ ○ ● ● 25	○ ● ○ ● ● 26
● ● ○ ○ ● 27	○ ○ ● ● ● 28	● ○ ● ● ● 29
○ ● ● ● ● 30	● ● ● ● ●	

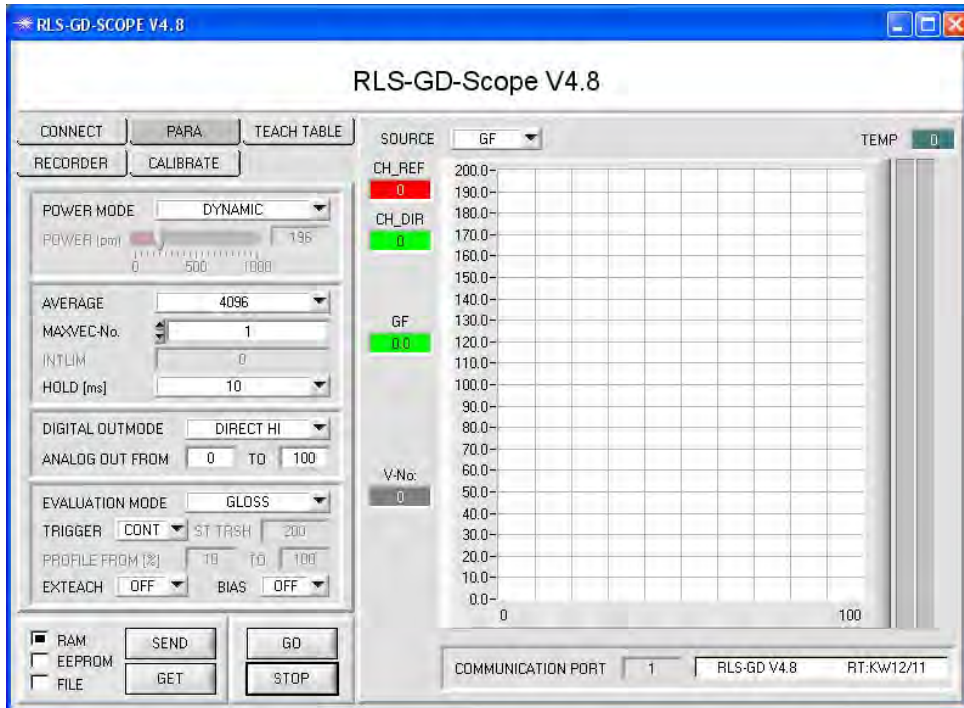
„error“ respectively „not detected“



Parameterization

Windows® user interface:

The RLS-GD gloss sensor is parameterized under Windows® with the RLS-GD-Scope software. The Windows® user interface facilitates the teach-in process at the sensor and supports the operator in the task of adjustment and commissioning of the sensor.

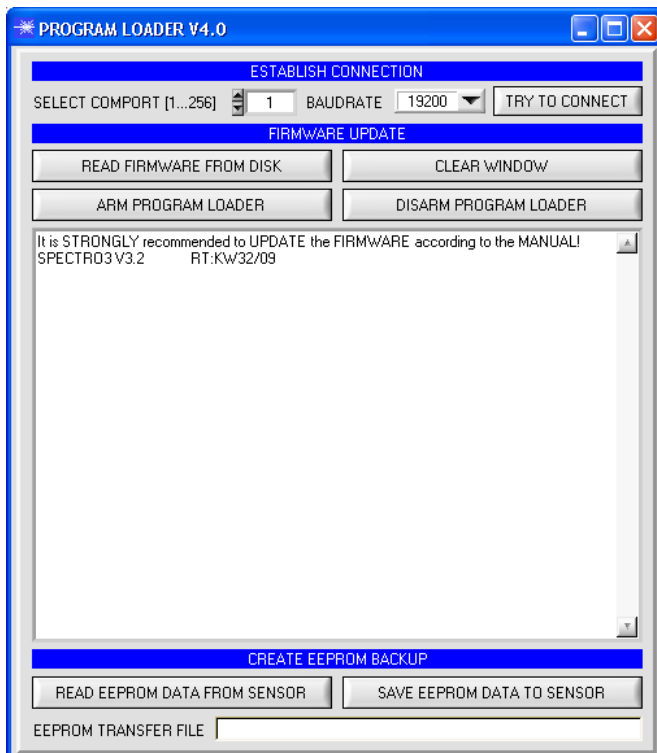


The RS232 interface (PARA) is used for setting parameters such as:

- MAXVEC-No.:
Number of gloss degrees (normalized vectors) to be checked
- POWER MODE:
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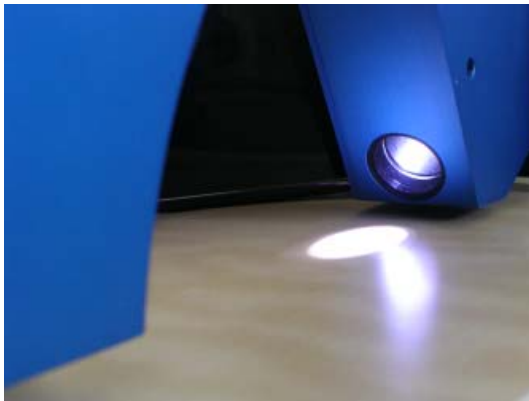


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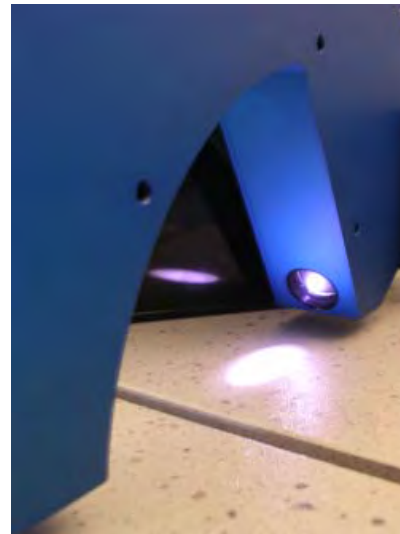
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Monitoring of the gloss value of imitation leather



Examination of leather surfaces with respect to their gloss behavior



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Application Examples

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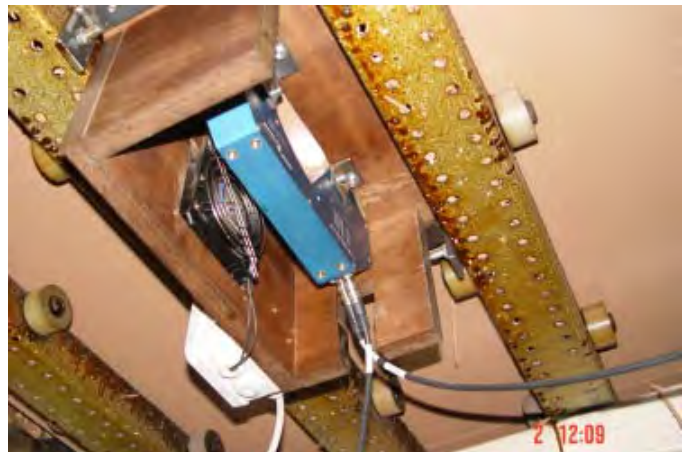
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