# 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 converter 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
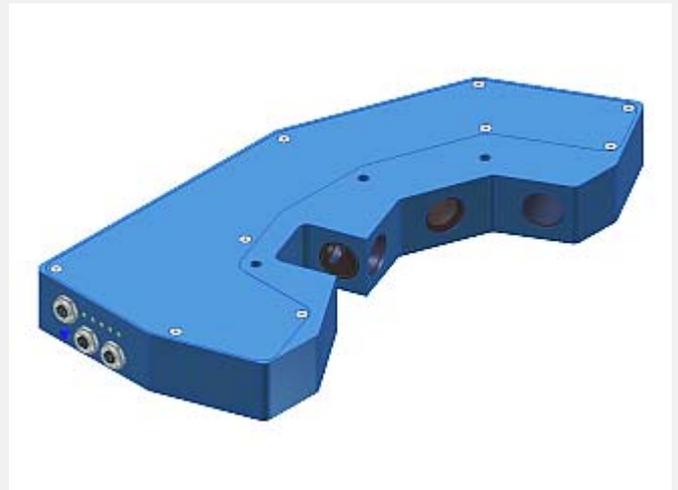
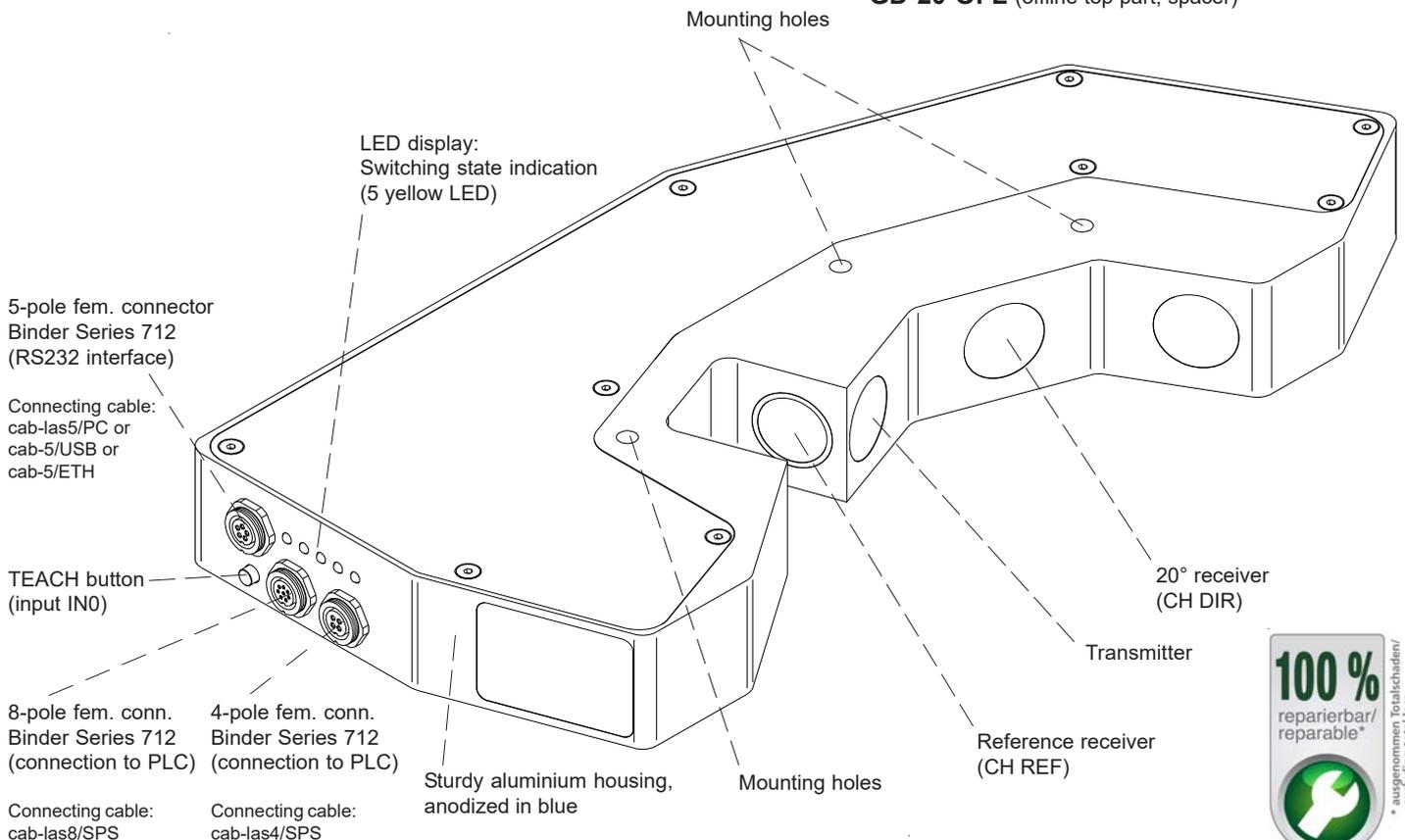

Design

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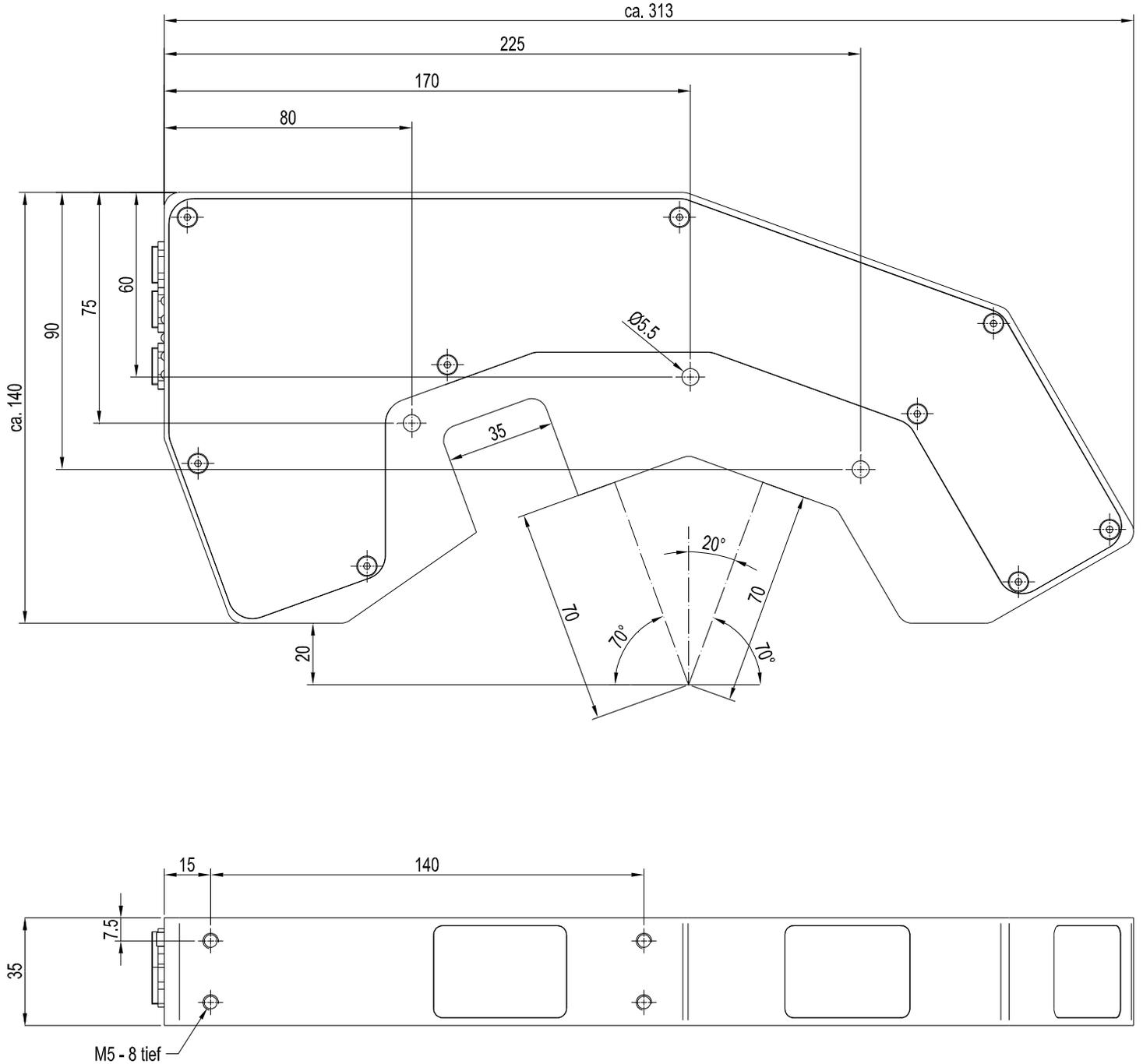**GD-20-OFL** (offline top part, spacer)

Mounting holes

LED display:
Switching state indication
(5 yellow LED)

5-pole fem. connector
Binder Series 712
(RS232 interface)

Connecting cable:
cab-las5/PC or
cab-5/USB or
cab-5/ETH

TEACH button
(input IN0)

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

Connecting cable:
cab-las8/SPS

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

Connecting cable:
cab-las4/SPS

Sturdy aluminium housing,
anodized in blue

Mounting holes

20° receiver
(CH DIR)

Transmitter

Reference receiver
(CH REF)

100 %
reparierbar/
reparable*
* ausgenommen Totalschaden/
excluding total loss

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
Optcal filters	UV filter UG11
Resolution	0.1 GU (Gloss Unit)
Reproducibility	± 0.1 GU (Gloss Unit), in case of an averaging of 512
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　　CE
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-5/USB or cab-5/USB-w to PC/Ethernet interface: cab-5/ETH-500
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 DIGITAL (1x)	IN0 (Pin 3), digital (0V/+24V) or 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

ca. 313

225

170

80

90

75

60

ca. 140

Ø5.5

35

20°

70

70°

70°

70°

70

20

15

140

7.5

35

M5 - 8 tief

All dimensions in mm

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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°)
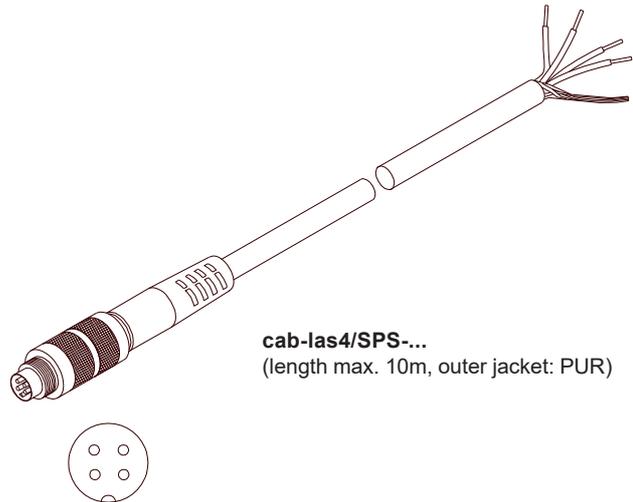(standard length 2m)
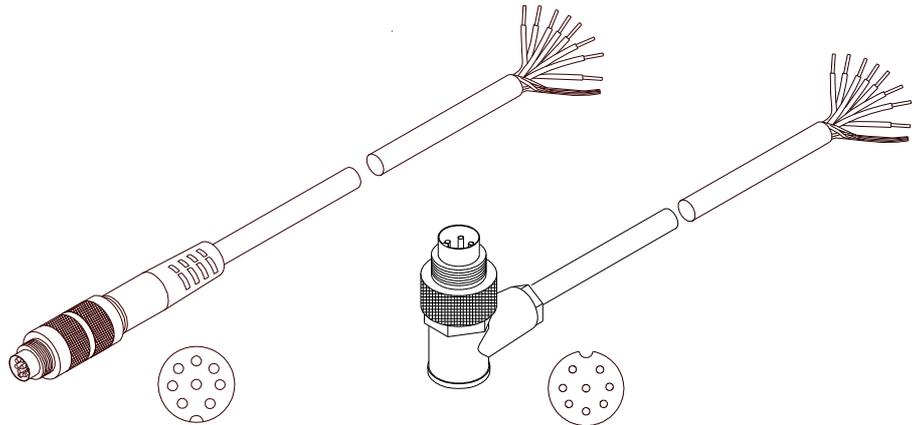
cab-las8/SPS-...
(max. length 25m, outer jacket: PUR)

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)

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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:
USB converter (incl. driver software):
cab-5/USB-(length)
cab-5/USB-w-(length) (angle type 90°)
(standard length 2m)

Connection to local network via Ethernet bus:
Ethernet converter (incl. software „SensorFinder"):
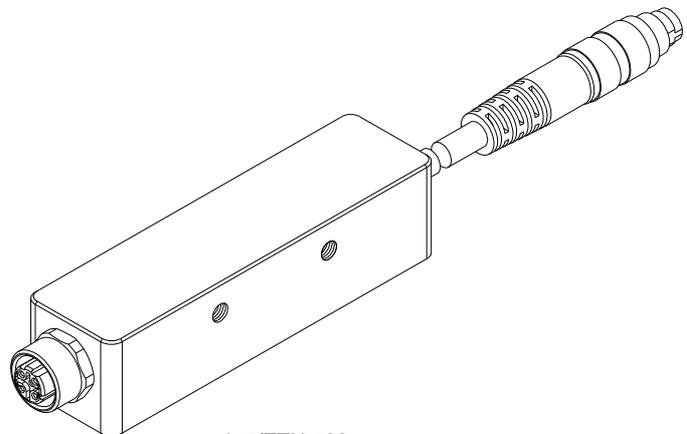cab-5/ETH-500
(standard length 0.5m)

Optional: External CAT5 cable, e.g.
cab-eth/M12D-RJ45-flx-(length)
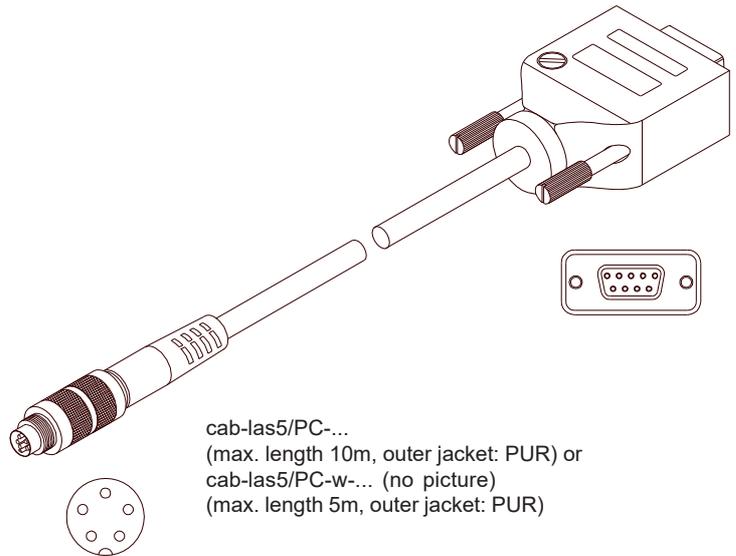
cab-las5/PC-...
(max. length 10m, outer jacket: PUR) or
cab-las5/PC-w-... (no picture)
(max. length 5m, outer jacket: PUR)
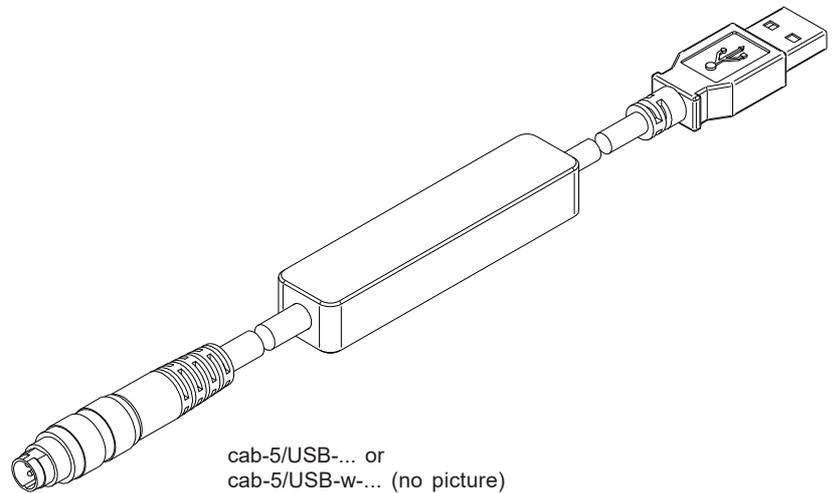
cab-5/USB-... or
cab-5/USB-w-... (no picture)
(each max. length 5m, outer jacket: PUR)

cab-5/ETH-500
(length 0.5m, outer jacket: PUR)
4-pole M12 fem. conn. (D-coded)
for connection of an external
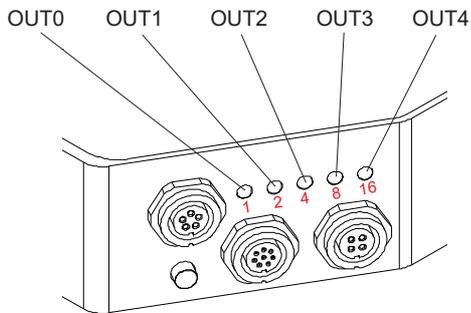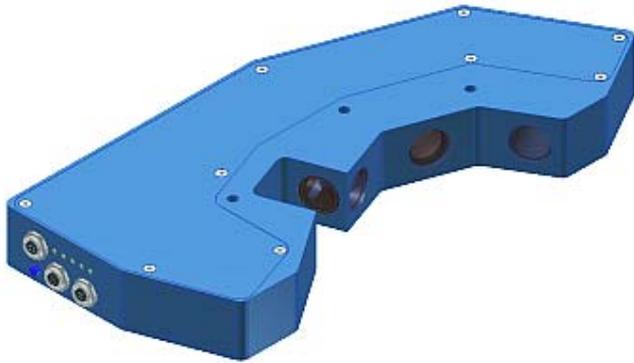CAT5 cable, e.g.
cab-eth/M12D-RJ45-flx-(length)

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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"	

OUT0   OUT1   OUT2   OUT3   OUT4

1   2   4   8   16

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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 (Ø 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 indicatea 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 degres 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.
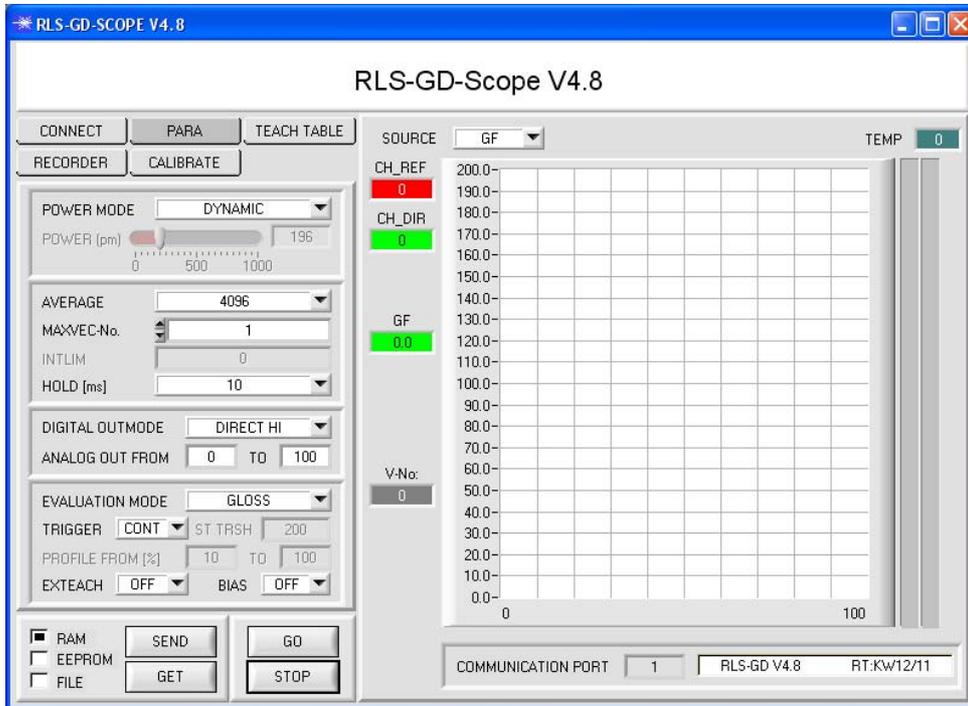

The RS232 interface (PARA) is used for setting parameters such as:
- MAXVEC-No.:
  Number of gloss degrees (normalized vectors) to be checked
- POWER MODE:
  In this function field the operating mode of automatic power correction at the transmitter unit can be set
- EVALUATION MODE:
  The RLS-GD-20/20°-UV sensor is operated with evaluation mode GLOSS
- AVERAGE:
  Averaging over a maximum of 32768 values
- TRIGGER:
  Continuous or external or self trigger
- 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:
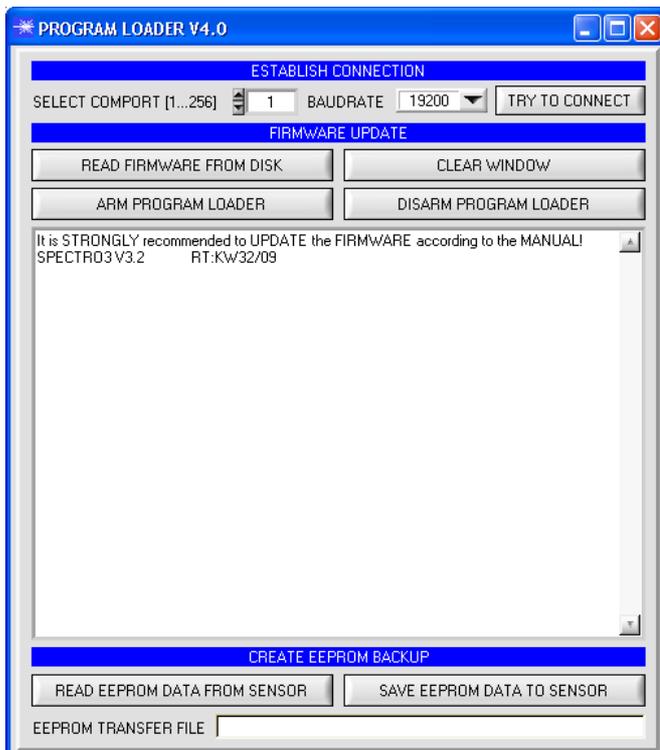
The software „Program Loader" allows the user to perform an automatic firmware update. The update will be carried out through the RS232 interface.

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.

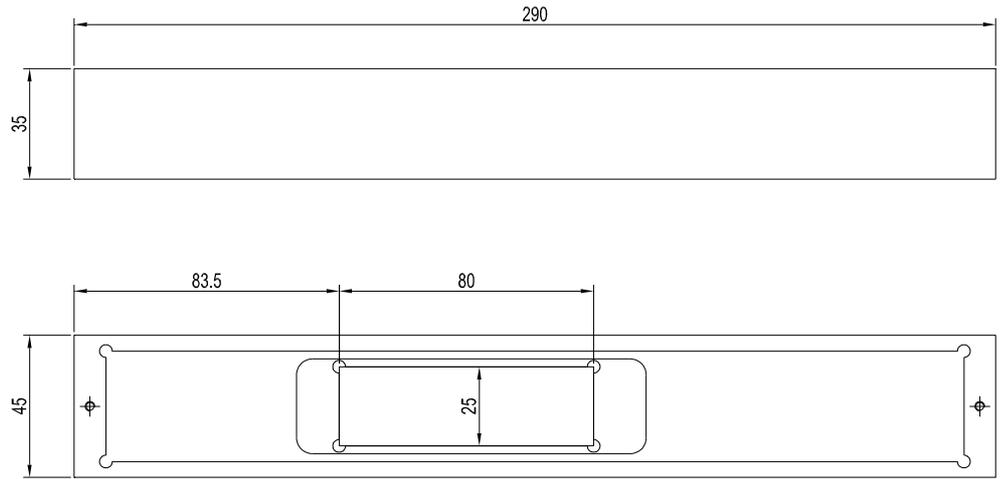The new firmware automatically writes the correct data to the program memory again.

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.
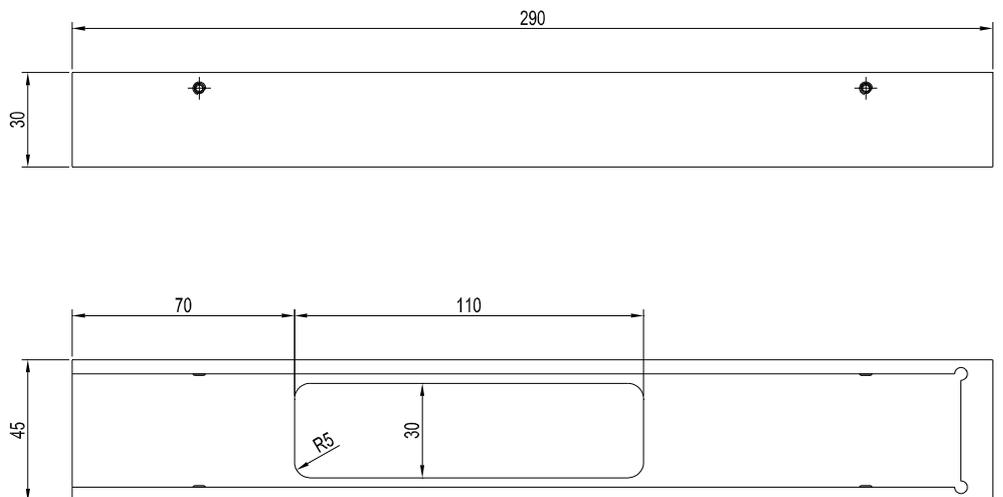For this purpose the software creates an EEPROM backup file.

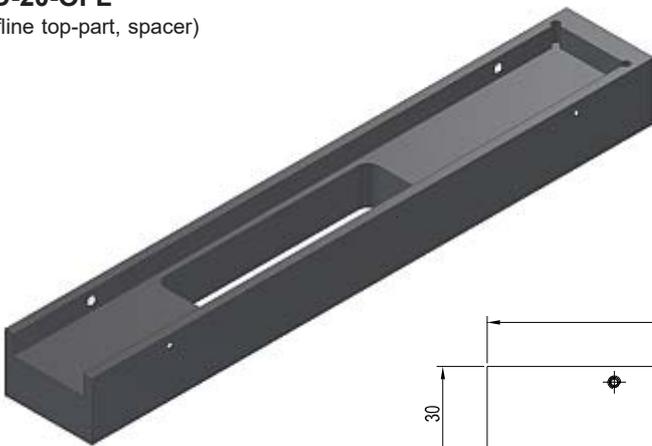*Sensor Instruments GmbH • D-94169 Thurmansbang • Schlinding 11*
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Accessories

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

290

35

83.5

80

45

25

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

290

30

70

110

45

30

R5

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.

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