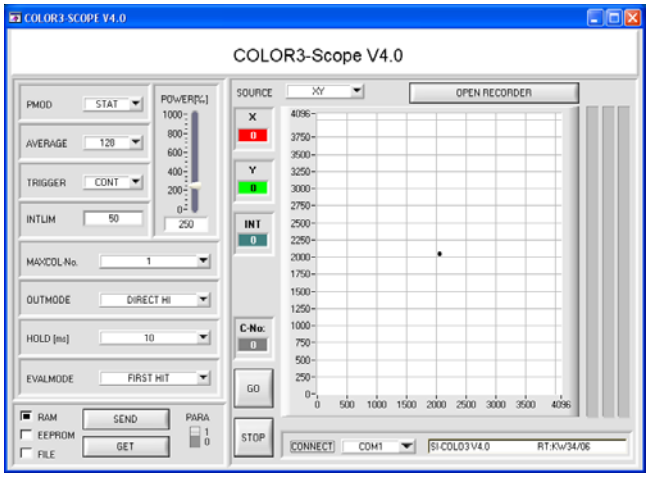
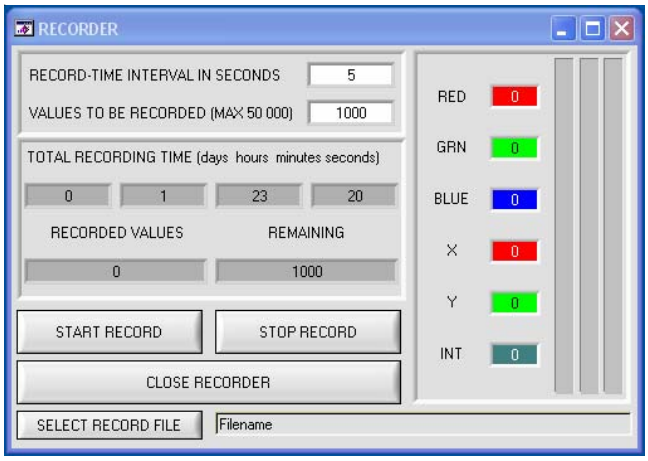
SI-COLO3 Series Color Sensors

New COLOR3-Scope V4.0 software

The Windows® software for the parameterization and visualization of the color sensor data of the SI-COLO3 series has been thoroughly revised. For example, the new **COLOR3-Scope V4.0** software now features a RECORDER button that saves the R,G,B raw data and the X, Y, and INT values in a file. The file, the number of scans, and the scan frequency can be set by the operator with the Windows® software.
With the Excel® software the data can then be viewed in numerical and graphical form. Furthermore, the minimal-distance-mode has been extended with the MINIMAL DIST 2 mode, which makes it possible to include the intensity (in STAT mode) or the transmission power (in DYN mode). This guarantees that colors that lie extremely close to each other (e.g. various shades of gray) can also be perfectly and reliably differentiated.



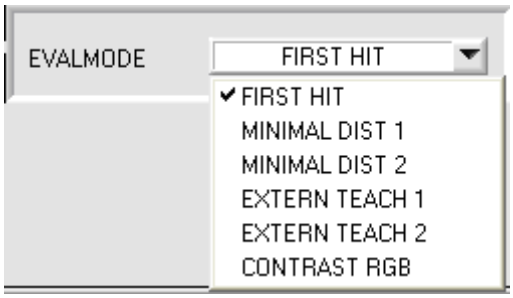
Windows® software COLOR3-Scope for parameterization of SI-COLO3 sensor



„Data recorder" function of COLOR3-Scope software

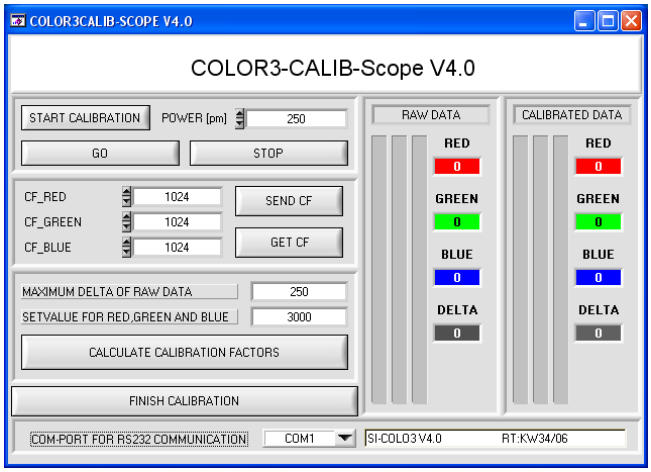
Funktion des Datenrekorders (RECORDER):
The COLOR3-Scope software features a data recorder that makes it possible to save a certain number of RED/GREEN/BLUE/X/Y/INT frames.
The recorded file is saved to the hard disk of your PC and can then be evaluated with a spreadsheet program.The file that is created has seven columns and as many lines as data frames were recorded.

Another new feature is a second external-teach-mode (EXTERN TEACH 2). With this mode the color sensor during the teach process first automatically adjusts the correct transmission light power (POWER), then stores the X and Y values (taught), and "freezes" the power. This allows fully-automatic teaching (without any action of the operator).



EVALMODE:
In this function filed the evaluation mode at the color sensor can be set.

FIRST HIT:	The current color value (X,Y) lies within the tolerance circle of a taught color.
MINIMAL DIST 1 or MINIMAL DIST 2:	The current color value is assigned to the teach-in color that lies next to this color value (X,Y) in the triangle.
EXTERN TEACH 1 or EXTERN TEACH 2:	Teaching procedure is started by setting the input to 0V for instance via PLC, or push button). the integrated yellow LED indicated the successful teaching procedure.
CONTRAST RGB:	Intensity check of a selected primary color (red, green, or blue) with a maximum switching frequency of 37,5 kHz.



Windows® software COLOR3-CALIB Scope for calibration of SI-COLO3 sensor

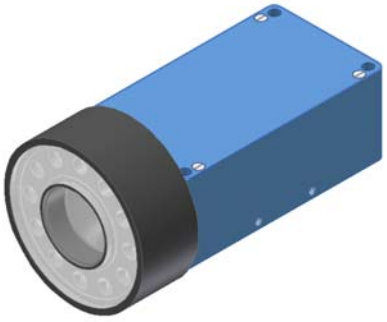
Calibration of SI-COLO3 color sensors with software COLOR3-CALIB-Scope:
The sensors of SI-COLO3 series starting from V3.0 can be calibrated by means of the separate COLOR3-CALIB-Scope software.
Color balancing can be performed on any white target. As an alternative, a ColorCheckerTM is available, which has 24 different color areas according to CIE standard. Calibration can be done on any of the white areas.

SI-COLO4 Series Color Sensors

SI-COLO4 Series launched

After the SI-COLO3 now the SI-COLO4! Up to 31 colors can be taught now, and the electronic unit has been considerably improved with respect to temperature drift (hardware and software temperature compensation). Furthermore, our product range in addition to the proven RGB color detectors of the SI-COLO3 series now also includes a so-called true-color color detector ("picking up colors like the human eye") which for some applications offers advantages compared to the conventional chip. So we now differentiate between RGB types (SI-COLO4-...) and TRUE-COLOR RGB types (SI-COLO4-...-TC). In our applications so far, however, we have learned from experience that in most applications the conventional type (SI-COLO4-...) provides the better color separation.

The **COLOR4-Scope V4.0** software now also allows individual editing of the color marks in the COLOR TEACH TABLE. We also have introduced a new RGB evaluation mode which checks whether the R, G, B values are within a predefined tolerance ΔRGB. This RGB mode also allows the teaching of up to 31 colors. Compared to the SI-COLO3 series we have also introduced new housing types, e.g. the **SI-COLO4-80-DIL** and the **SI-COLO4-80-FCL**, both with a reference distance of 80 mm and a wide operating range.
With the **SI-COLO4-200-DIL** and the **SI-COLO4-200-FCL**, sensors for large operating distances also are available now.

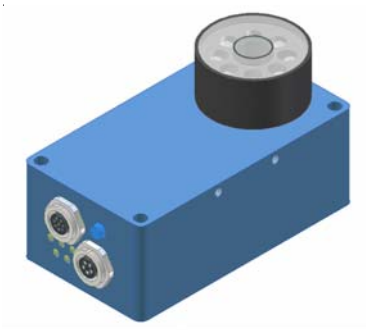


SI-COLO4-80-DIL

SI-COLO4-200-DIL

SI-COLO4-30/90-DIL: Successful baptism of fire

The **SI-COLO4-30/90-DIL** is successfully used at a German car component manufacturer, where it checks high-gloss color sleeves that are very similar in their color. The 10 different types are reliably and perfectly detected by the color sensor



SI-COLO4-30/90-DIL

LWL Series Optical Fibers

New accessory for the SI-COLO..-LWL types: Optical-fiber attachment KL-4

Especially with small objects the use of the new optical-fiber attachment **KL-4** can considerably improve the process reliability. At a distance of 10 mm (focus) the light spot diameter is approx. 0.6 mm and is therefore excellently suited for the color detection of thin cables, flexible leads, wires, pins, and contacts. The reflected-light type **R-S-A1.1-(1.0)-1200-67°** is used as an optical-fiber cable here

R-S-A1.1-(1.5)1200-67°

KL4

RLS-GD Series Gloss Detection Sensors

Bright prospects: ONLINE gloss measurement with RLS-GD-15

Hand-held systems for measuring the gloss degree of surfaces have been in common use for decades. What all such systems have in common is that they use filament lamps or halogen lamps as a light source, and that the measuring system must be placed on the surface to be measured, i.e. they employ a contacting measuring principle and therefore are not suitable for performing online measurements.

With the **RLS-GD-15**, which employs pulsed white-light LEDs, a sensor is now available that is able to determine the gloss of surfaces in a non-contacting manner. This online measuring system operates with a distance of 15 mm from the surface to be examined, and as with hand-held systems a parallel light beam (Ø of the light beam approx. 20 mm) impinges on the surface at an angle of 30° (60° from the vertical line).

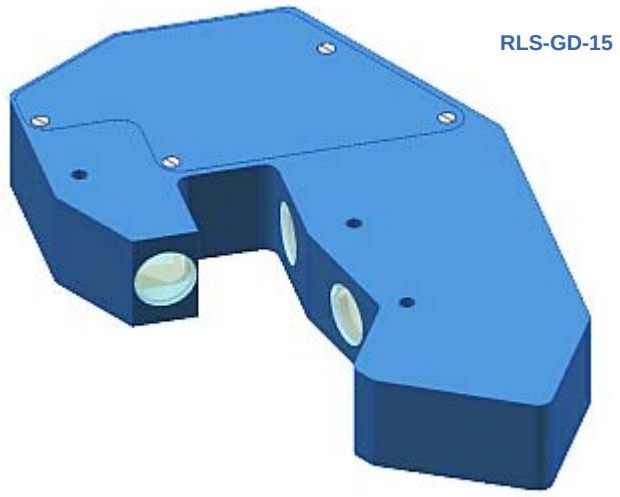
Two different evaluation modes are available:

With the **standardized method** (standard) the direct reflection (impinging at 30°) is compared with a diffuse reflection (75°). The standardized value (DIRECT/DIRECT+DIFFUSE))*1000 provides information about the gloss behavior. There are five digital outputs that can output a maximum of 31 states.
Furthermore a signal that is proportional to the standard value is output through the analog outputs (voltage output 0...10V and current output 4...20mA).
With the help of the zoom function, any area of at least 10% of the total area can be zoomed and expanded to 0...10V or 4...20mA.

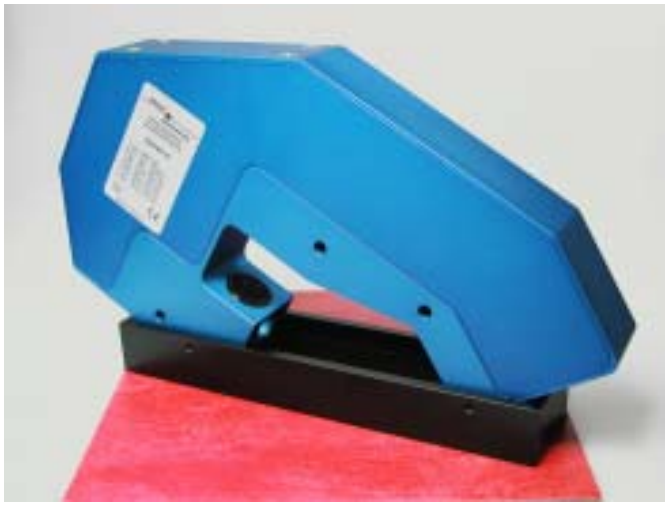
What is of special importance for the user of hand-held systems, however, is the so-called **glossy mode**:
In this mode the direct reflection is compared with a reference. For this the sensor system is calibrated to a calibration surface (black glass) that is equal to a gloss degree of 100%. At the same time the reference value is picked up and stored during calibration. For the reference line a part of the transmitted light beam is optically decoupled and projected onto a reference detector. During the actual measurement, this reference value that was frozen in the calibration process is then permanently used, which allows an absolute measurement of the gloss degree.
This mode also allows the teaching of up to 31 gloss values or tolerances, and a digital serial signal (via RS232) that informs about the gloss degree (0...100%) also is available here.

Furthermore, the two analog outputs (voltage output 0...10V and current output 4...20mA) also provide a signal that is proportional to the gloss degree, and with the zoom function the gloss degree also can be expanded up to a factor of 10.

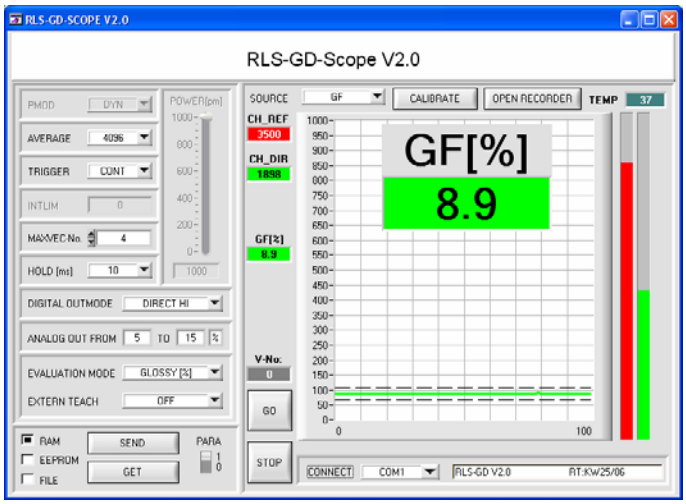
The fields of application of the gloss sensor include the wood industry (laminate floor coverings), foil production (linoleum floor covering, foamed foils for the interior, foils for the furniture industry) and paper production (adhesive application on a paper roll). In the field of medicine the sensor also is used to check the adhesive application on electrode strips (plastic strips).



RLS-GD-15



RLS-GD-15 with calibration attachment GD-15-CAL. An offline attachment (GD-15-OFL) for determining the optimal mounting distance from the measuring object also is available as an accessory.



Windows® software RLS-GD-Scope for parameterization of RLS-GD-15 sensor

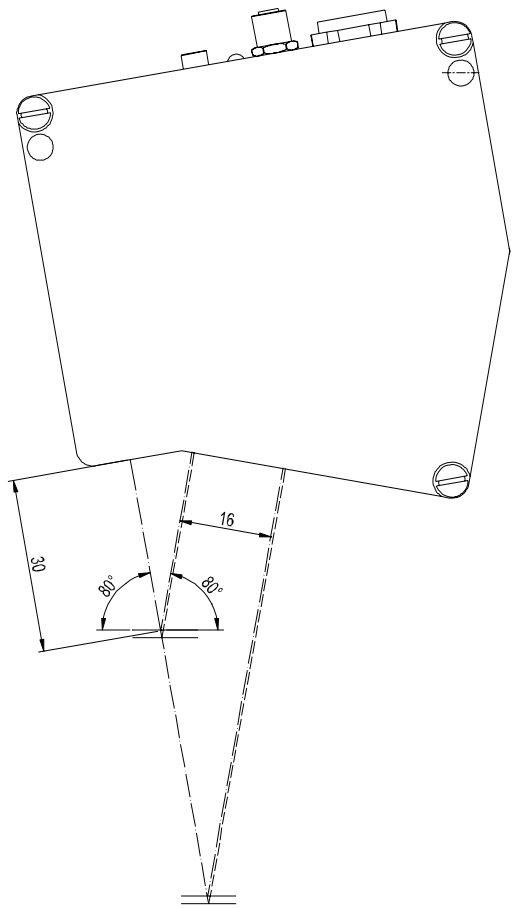
L-LAS Series Laser Line Sensors

Detecting both sides of a glass pane at a glance with the L-LAS-GTM-256/16

In glass processing it is of special importance - especially in case of surfaces that are coated on one side - to know on which side of the glass the additional layer has been applied. The additional layer(s) may have quite different tasks: The layer may be highly water-repellent (lotus effect), or it may reduce reflections (anti-reflection layer) or increase reflection (mirror-coated glass).

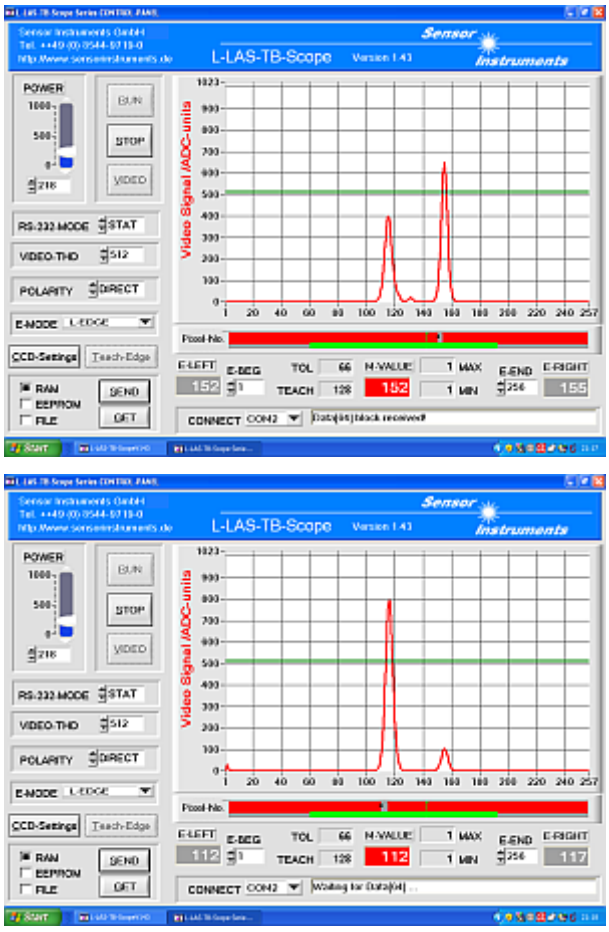
The **L-LAS-GTM-256/16** sensor uses the reflection principle. Collimated (parallel) laser light (light spot dimensions 3 mm x 0.5 mm) is directed onto the glass surface at a certain angle (selectable by the user and depending on the distance between sensor and glass surface) and is partly reflected by the 1st surface, but the largest part of the laser light penetrates the glass pane and is then partly reflected at the back side of the glass (2nd surface). Compared to the 1st reflection there will be a parallel offset of the two laser beams due to the glass thickness.

Both laser beams impinge on a line detector that is integrated in the laser sensor. The line video signal is evaluated by an integrated controller. The ratio of the reflected light can then be determined from the amplitude of the peak in the video signal.



Arrangement of the laser beams in the L-LAS-GTM-256/15

A standardized comparison of the two peaks (Peak1/(Peak1+Peak2) * 1000) or an amplitude evaluation of the two peaks (Peak1 ± ΔPeak, Peak2 ± ΔPeak) are available as evaluation modes. An analog signal (0...+10V) and a switching signal are provided at the sensor output.



Windows® software L-LAS-TB-Scope for parameterization of L-LAS-TB line sensors

This sensor typically is used in engineering applications:

- Stacking of glass panes (detection of the correct position)
- Production of insulating glass (detection of the correct position)
- After coating (quality inspection)

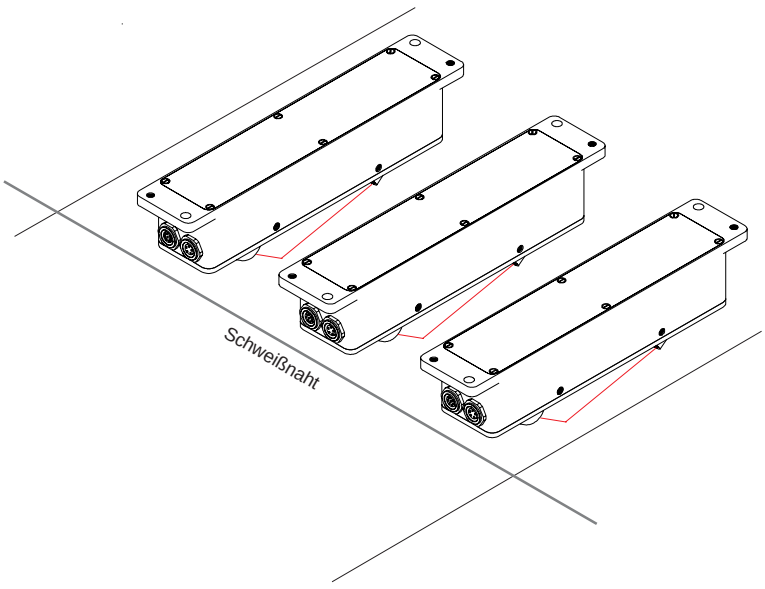
or for retrofitting at the glass manufacturers.

LCC Series Laser Edge Detectors

LCC-40 sensor detects the welding seam

In sheet metal processing the material is unwound from so-called coils and is then, for example, transported to an eccentric press (punching process).
At some place in the coil there is a welding seam that must be detected in time prior to the punching process, because on the one hand the punching die may be damaged by such a welding seam, and on the other hand such welding seams may lead to defective parts being produced.
Since the sheet metal also may contain shrink holes or small holes, a distinction must be made between these permissible small defects and a welding seam. This is done by using three **LCC-40** edge detectors, at least two of which must simultaneously detect an edge in order to make sure that no switching process is triggered as a result of a small defect.

LCC-40 in the process of welding seam detection



Schematic arrangement of three LCC-40 sensors for welding seam detection

SI-COLO3 Series Color Sensors

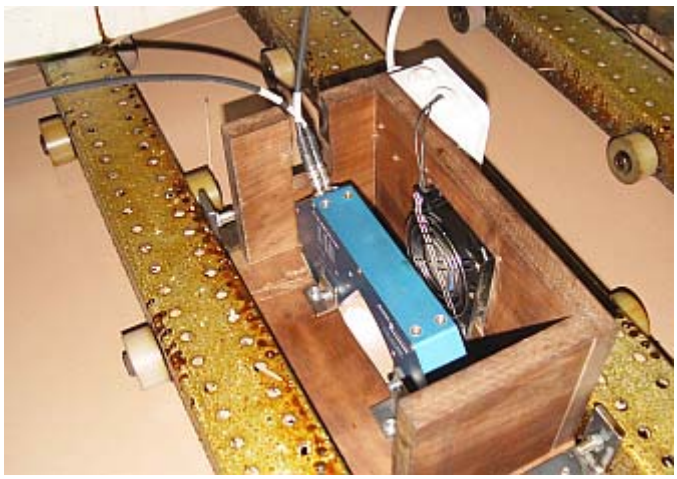
Debut in the field of hygiene with the SI-COLO3-30-DIL

In the production of tampons of different sizes it happens again and again in the packing process that the so-called pull-back string (bright-blue) does not fully rest on the back side of the tampon, but was partly pulled into the interior of the tampon. Checking of the tampon is only possible through a transparent plastic foil, because at the possible time of checking the tampon already has been foil-sealed.
By using special direct reflected light suppression, the **SI-COLO3-30-DIL** provides excellent results even through the transparent foil. The best results were achieved with the Minimal Distance Mode. For this, teaching was performed with a half-covered tampon (half white, half bright-blue) as a so-called limit part, and a white tampon. Because of start/stop operation, the EXT trigger mode was chosen here.

RLS-GD Series Gloss Sensors

Gloss sensor RLS-GD-60-HP successfully used in laminate flooring production

An Austrian manufacturer of laminate flooring already successfully employs four gloss sensors of type **RLS-GD-60-HP**. The 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** for quality inspection of the decor, where a distinction should be made between decor and sub-decor.



RLS-GD-60-HP with mounting facility, in the process of monitoring the back side of laminate flooring

RLS-GD Series Gloss Sensors

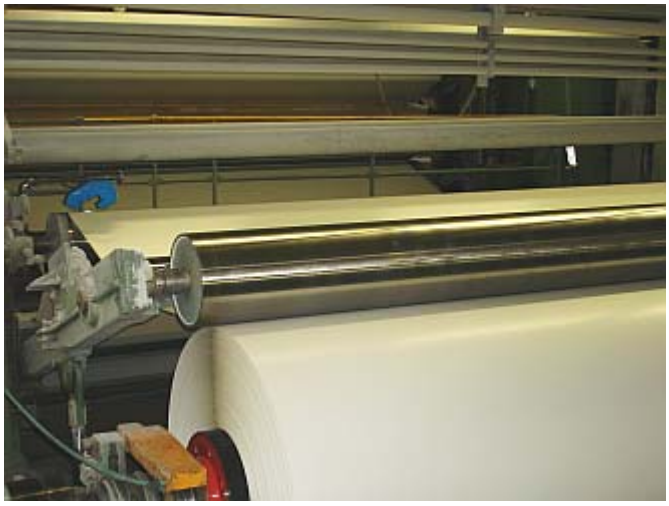
Online gloss measurement in the paper industry with the RLS-GD-15

In paper production the gloss degree of continuous paper (roll paper for the printing industry) presently is checked only by way of sampling with hand-held systems at the start and end of a roll. This type of offline measurement, however, cannot provide any information about the condition of the paper surface during production.

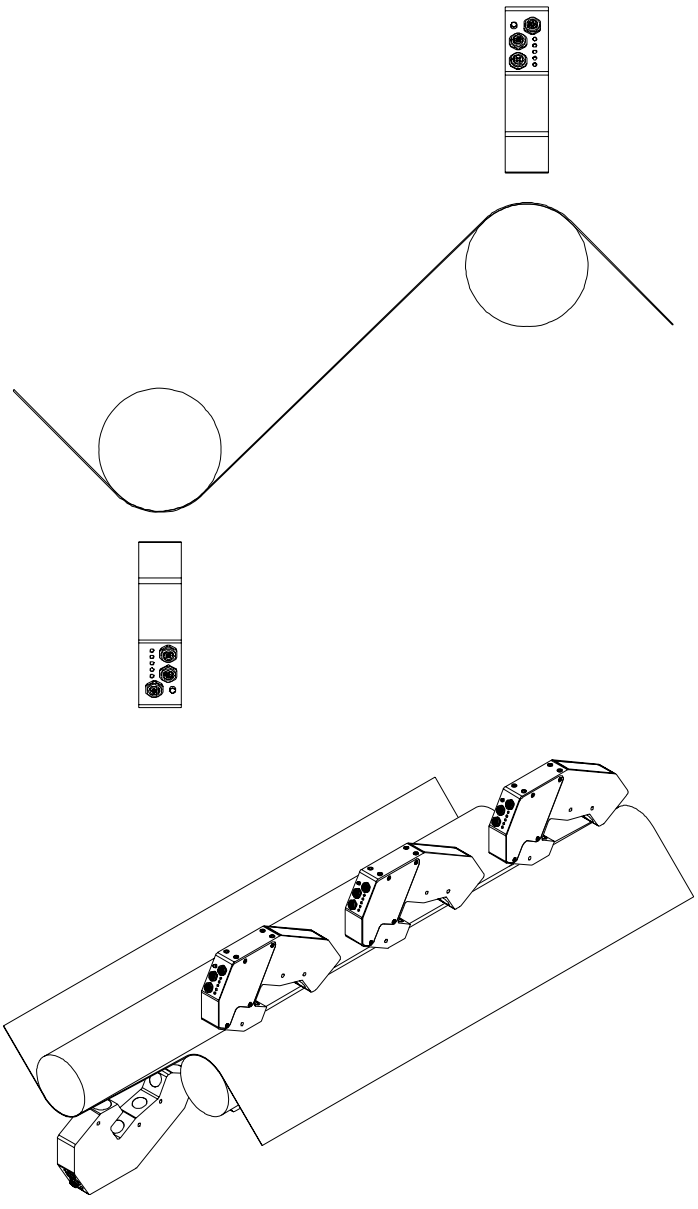
The gloss degree is a highly important factor in the printing process. If the gloss degree is too high (paper compressed too much), the printing color cannot dry in time and may become smudged. If on the other hand the gloss degree is too low, the printing color will run on the paper. The gloss degree can be influenced with the calander, which is an arrangement of rollers that are each mounted in pairs and can take up a paper web. When the distance between the rollers is reduced (gap reduction), the pressure on the paper web is increased, which also results in a higher gloss degree. When the gap is increased, the gloss degree is correspondingly reduced.

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** 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-GD-15 monitoring the gloss degree of a paper web



RLS-GD-15 operating in paper production

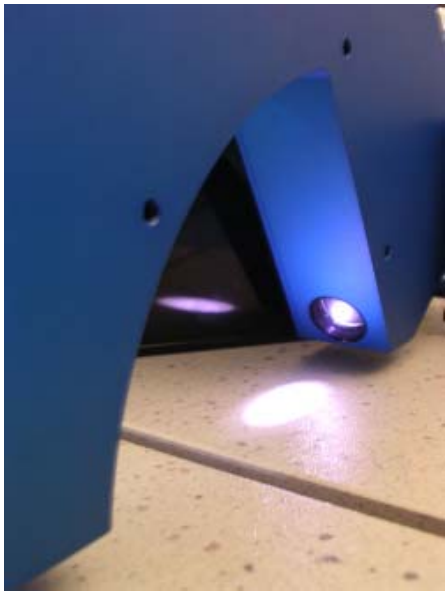


Schematic arrangement of six RLS-GD-15 gloss sensors in a system for paper web monitoring

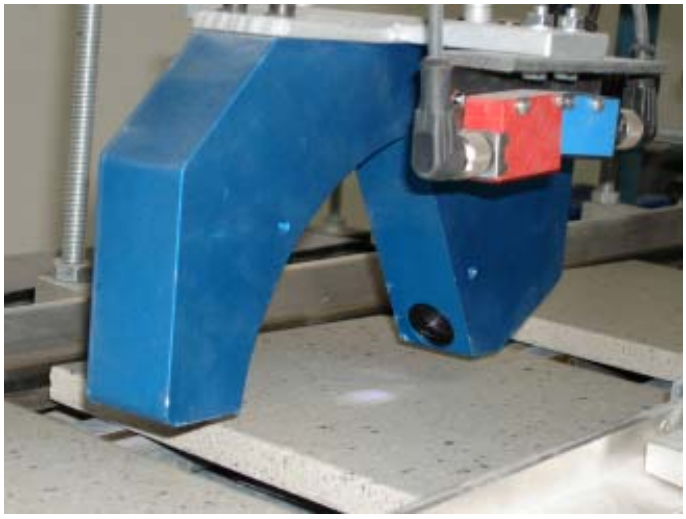
RLS-GD Series Gloss Sensors

Gloss measurement of ceramic floors with the RLS-GD-15

100% inspection during production becomes ever more important also in this branch of industry.
In the final inspection of finished buildings of a supermarket chain, for example, there recently was a complaint about the quality of the ceramic floors. The reason for this complaint was the irregular appearance, because individual ceramic tiles showed differences in the reflection of daylight. The manufacturer of these ceramic tiles then decided to integrate an online gloss inspection in the production process. In this system, a reflected-light sensor supplies a trigger signal to the SPC. At the trigger moment, the SPC evaluates the analog signal of the **RLS-GD-15** gloss sensor through the analog input, and shows the trend of the gloss value with a trend display. The system furthermore checks whether the gloss value is within the permitted range.



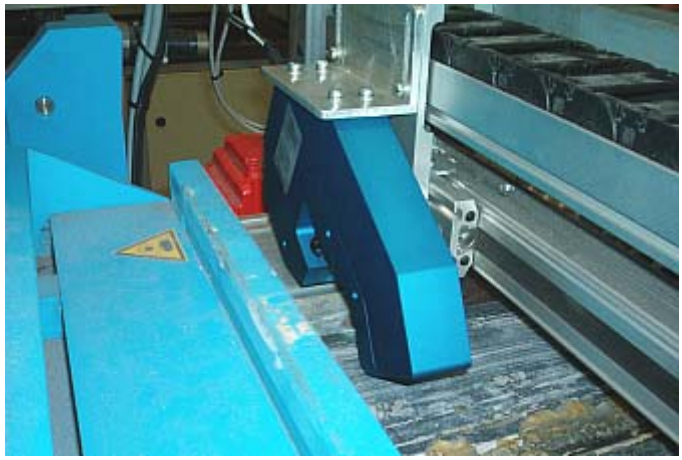
Online gloss measurement at ceramic parts



Gloss degree monitoring in stone slab production

RLS-GD-15 allows online measurement of the gloss degree of plastic floor coverings

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** 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.



Online gloss measurement in PVC floor covering production in traversing operation

Current Developments

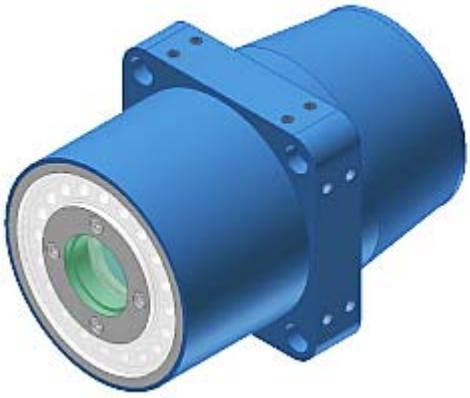
SPECTRO Series
Spectrometers

At present we are developing color measurement sensors that will form the new SPECTRO series and are intended to supplement the SI-COLO series with respect to color measurement, e.g. Lab.

The **SPECTRO-8** (8-range method) has eight different color detectors, with regard to lighting the white-light LEDs will be supplemented by blue-light LEDs, which allows TRUE-COLOR measurement. We expect that the first samples of the **SPECTRO-8** will be available in the first quarter of 2007.

Additional measuring systems such as the **SPECTRO-256** (available in the first quarter of 2007) and the **SPECTRO-16** (available in the second quarter of 2007) are planned to extend this series.

In the fourth quarter of 2007 the above models will be followed by the **SPECTRO-76**, a full online color measuring system with
- 76 color detectors
- White-light / blue-light LED lighting
- Pulsed light, i.e. insensitive to outside light
- High measuring frequency.

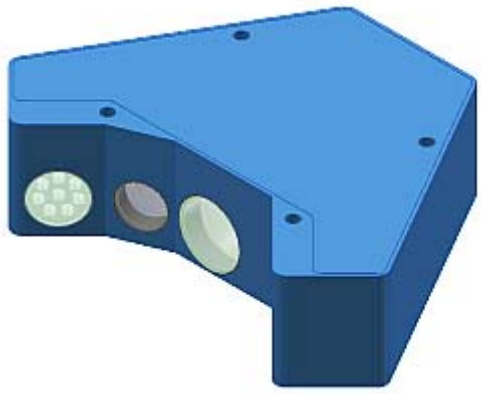


SPECTRO-8

SPECTRO-256

RLS-GDCOL Series
Color-Gloss Sensors

The **RLS-GDCOL-20** control system, a color-gloss sensor, also is planned to be finished in the first quarter of 2007.
The simultaneous inspection of color and gloss allows a reliable detection of materials that are extremely difficult to distinguish, such as e.g. imitation leathers for the automobile industry.



RLS-GD/COL-20