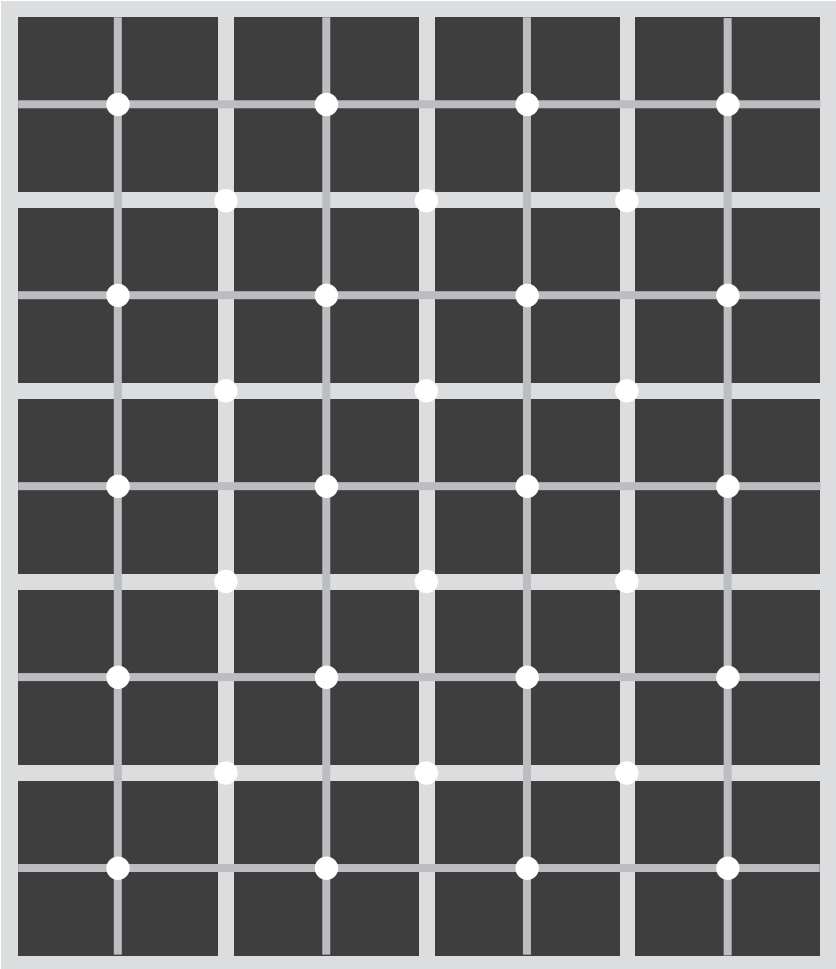
PRODUCT CATALOG 2011/2012

Registration Sensors

Contrast sensors, color sensors, luminescence sensors,
fork sensors, array sensors

SICK
Sensor Intelligence.

Registration sensors: You can't trick them!



SICK **registration sensors** are ideal for reliable detection and differentiation of contrasts, colors, fluorescent materials, and light absorption in automation technology.

Unlike the human eye, they can't be tricked by challenging materials – like the optical illusion above. They detect only what is actually there.

Contrast sensors

Detect contrasts with manual setting of switching thresholds

Color sensors

Identify, inspect and sort colors

Luminescence sensors

Detect luminescent markings that are invisible to the human eye

Fork sensors

Sender and receiver in the same housing for unerring object detection

Array sensors

Precisely detect edges and diameters

Experience

SICK is a technological and market leader in sensor technology. With headquarters in Waldkirch, Germany and more than 5,000 employees in almost 50 subsidiaries, numerous representatives and holdings, SICK has a solution for your application no matter where you are in the world.

Innovation

SICK achieves product innovation by means of consistent development. It has five development sites in Germany and a total of seven other sites all over the world. SICK turns customers' needs into automation solutions that increase efficiency and reduce costs.

Independence

SICK is large enough to be independent – but still flexible enough to react quickly. As a result, we can concentrate on the development of products the market needs without interference.

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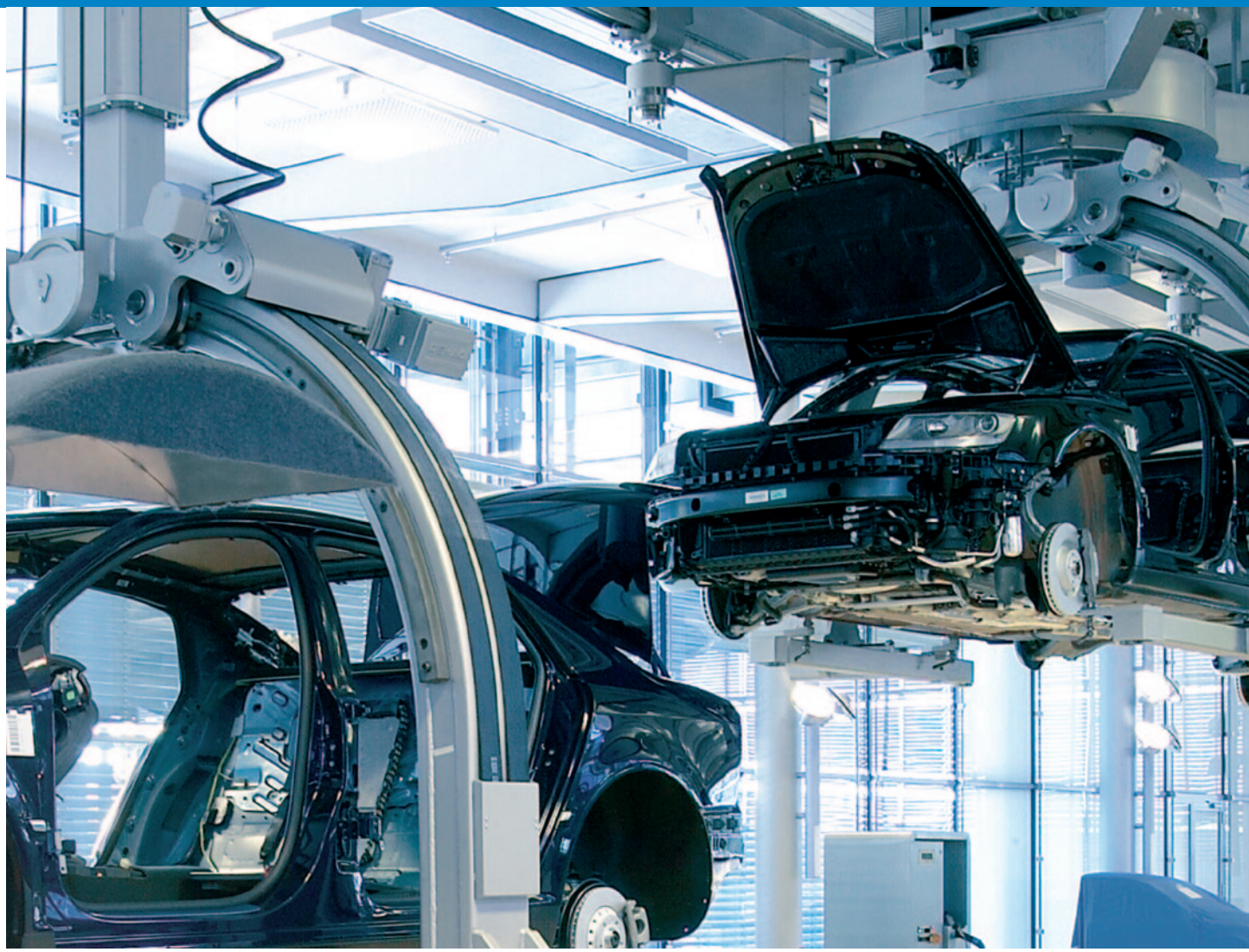
What you get from working with SICK

We help to increase your efficiency

As a leading manufacturer of automation solutions for industrial applications, we are familiar with the processes in our customers' organizations – and we are particularly familiar with their requirements for increased efficiency.



The focus and how you benefit from it

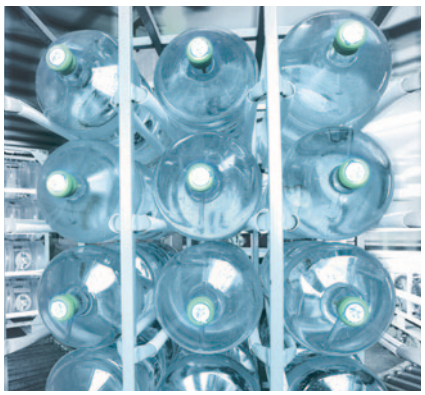
We provide safety

SICK concentrates strictly on the development and production of sensors for factory, logistics and process automation. The result is innovative, powerful products and systems that provide our customers the highest level of safety and increased quality.

A

Openness

**The secret behind our success:
All sensors in principle work in any automation scenario.
This level of openness provides our customers with maximum freedom and creates the best possible safety solution.**

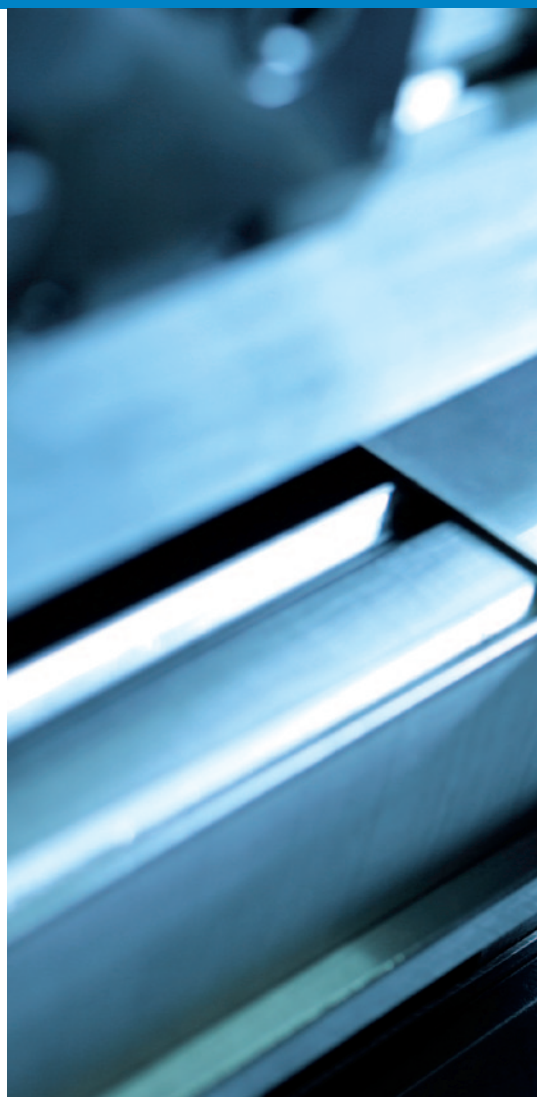


Factory automation

- Electro-sensitive detection, counting, classification and positioning of objects
- Detection of shape, position and surface differences
- Protection against accidents and protection of people with sensors, safety software and safety services

Logistics automation

- Automatic identification using bar code and RFID readers for sorting and destination control in industrial material flow
- Detection of volume, position and outline of objects and surroundings using laser measurement systems



Customers' markets and how we view them

We are familiar with your processes

Sensors from SICK are ideal for all automation in industry, regardless of the type of production processes used or which products are manufactured. For this reason in particular: as a development partner for industry, it is crucial for our success that we are fully familiar with the production steps in every market.

Versatility

With its specialized market expertise, SICK is your partner in the following markets:

- Automotive
- Robotics
- Pharma & Cosmetics
- Consumer goods
- Food
- Beverage
- Machine tools
- Electronics & Solar
- Wood
- Print & Paper
- Textile
- Courier Express Parcel, Postal & Cargo
- Warehouse & Distribution
- Mobile vehicles
- Ports
- Traffic
- Airports
- Building automation

Automotive industry

Our holistic view of optimization potential makes automated processes safer, faster and more transparent. The result is increased plant availability, while at the same time providing safety for workers and machines.

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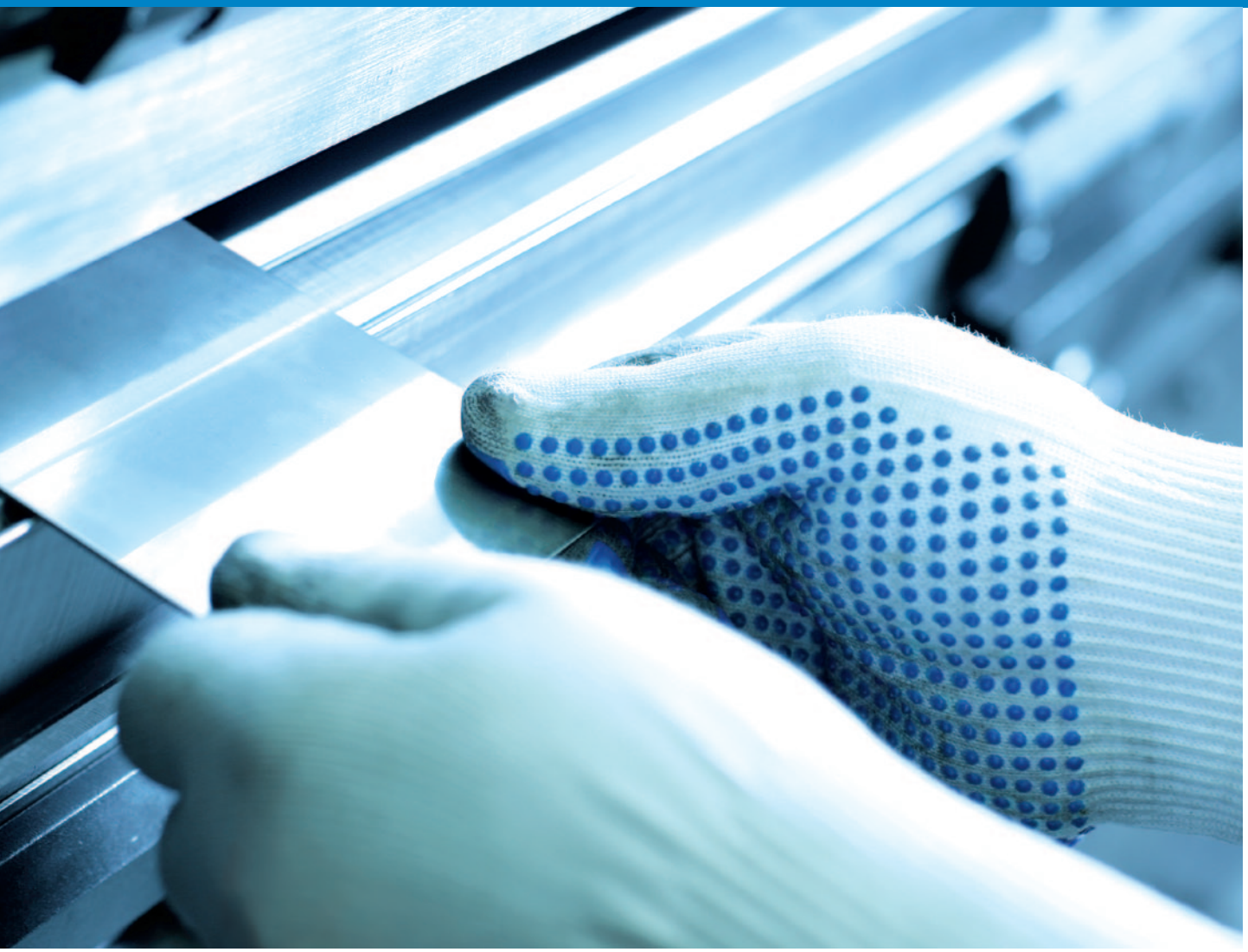


Food & beverage

With comprehensive knowledge, SICK understands every detail in automated production and handling. Perfectly matched sensors ensure plant safety and meet stringent hygienic requirements.

Logistics

In an increasingly global economy, the demands on logistics processes are growing steadily. With tailor-made solutions and products for control, identification, monitoring and measuring, SICK ensures customers have an efficient logistics chain.

Seeing details, understanding the big picture

A

SICK is a worldwide leading manufacturer of intelligent sensors and sensor solutions for all areas of factory, logistics and process automation. The company's comprehensive product portfolio is always oriented to delivering customer benefits. Years of practical experience and thousands upon thousands of application solutions go into creating precisely those products that will support your effort to design processes more efficiently and economically. SICK sensors take on tasks like measuring, detecting, safeguarding, identifying and positioning, for example. And they do the job in all areas of industrial production and logistics.

SICK sensors are almost everywhere: they detect production differences and quality deviations, and optimize workflows in all automated production processes. As part of accident prevention and personal protection, they safeguard access to robot stations and automatic conveyor sections, and they ensure the efficient flow of material in automatic identification systems.

Let's talk about the best solution to your automation tasks.

For more products see www.mysick.com

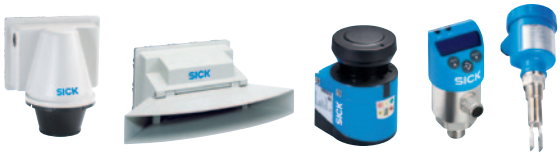
Industrial sensors

- Photoelectric sensors
- Inductive proximity sensors
- Capacitive proximity sensors
- Magnetic proximity sensors
- Magnetic cylinder sensors

Identification solutions

- Bar code scanners
- Camera-based code readers
- Hand-held scanners
- RFID

Measuring and detection solutions



- Laser measurement technology
- Level sensors
- Pressure sensors

System solutions

- Volume measurement systems
- Code reading systems
- Hybrid systems and further system solutions

Registration sensors

- Contrast sensors
- Color sensors
- Luminescence sensors
- Fork sensors
- Array sensors

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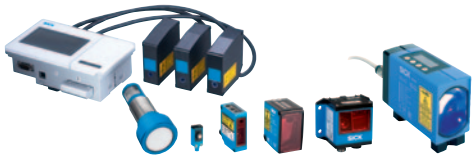
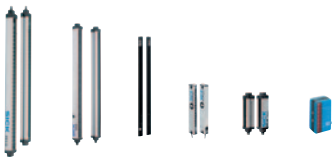
Distance sensors



- Short range distance sensors (displacement)
- Mid range distance sensors
- Long range distance sensors
- Linear measurement sensors
- Ultrasonic sensors
- Optical data transmission
- Position finders

Automation light grids



- High end automation light grids
- Standard automation light grids
- Smart light grids

Vision

- Vision sensors
- Smart cameras
- 3D cameras
- Vision illuminations

Opto-electronic protective devices

- Safety laser scanners
- Safety camera systems
- Safety light curtains
- Multiple light beam safety devices
- Single-beam photoelectric safety switches
- Mirror and device columns
- Upgrade kits

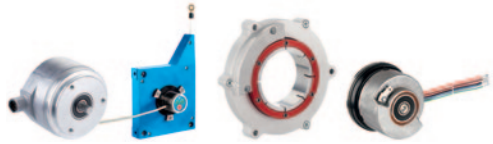
Safety switches

- Electro-mechanical safety switches
- Non-contact safety switches
- Safety command devices

sens:Control – safe control solutions

- Safety relays
- Safety controllers
- Network solutions

Encoders



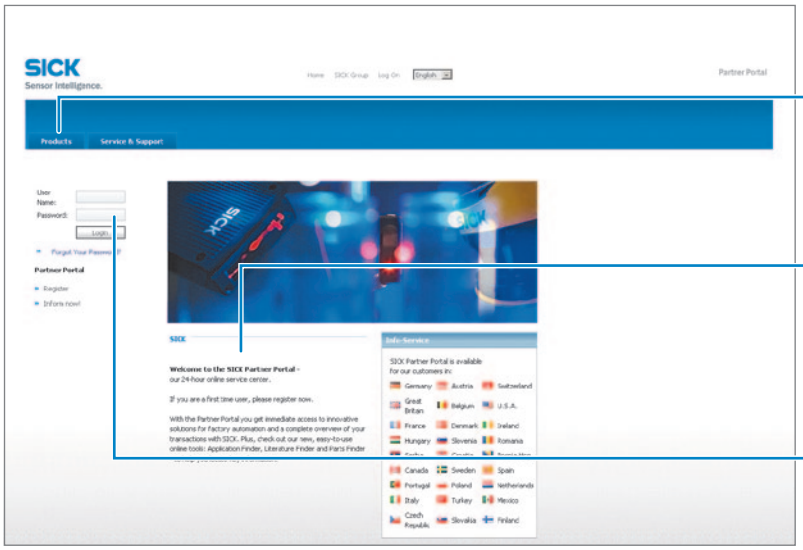
- Motor feedback systems
- Positioning encoders

www.mysick.com –
Your sensor e-business Partner Portal.

An online portal is essential when efficient and fast processing of every detail is required!

You will find comprehensive e-commerce tools and information for your sensor planning at www.mysick.com: complete order administration – from a product availability check, through offers and order conditions, to order placement and status. The SICK Partner Portal supports your workflow with the individual provision of user rights. Moreover, simple online access to application examples and technical data, drawings and graphics will effectively accelerate your product selection.

Plan your product solution online – at SICK's Partner Portal.



User-friendly: you will find everything you need for solution planning under the menu items Products, Information and My Processes.

24-hour availability: regardless of where you are in the world or when you want to know something, everything is available within a click at www.mysick.com.

Secure: your data is password-protected and only visible to you. With individual user administration you define who may access what data and carry out which actions!

Product Finder

www.mysick.com/Products
The Product Finder lets you search for the suitable device for your application using your specification – from a large number of products in all areas of factory and logistics automation.

Applications Finder

www.mysick.com/Applications
You can select an application description for your particular task, market or product group with the Applications Finder.

Literature Finder

www.mysick.com/Literature
You can access all publications in the Literature Finder, e.g. operating instructions, technical information, customer magazines and other literature about SICK products.

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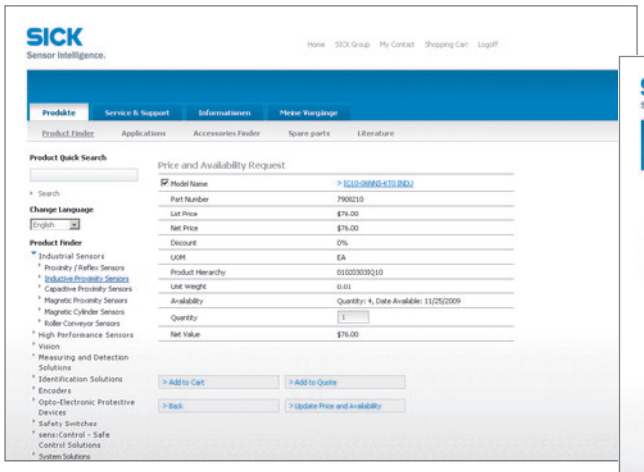
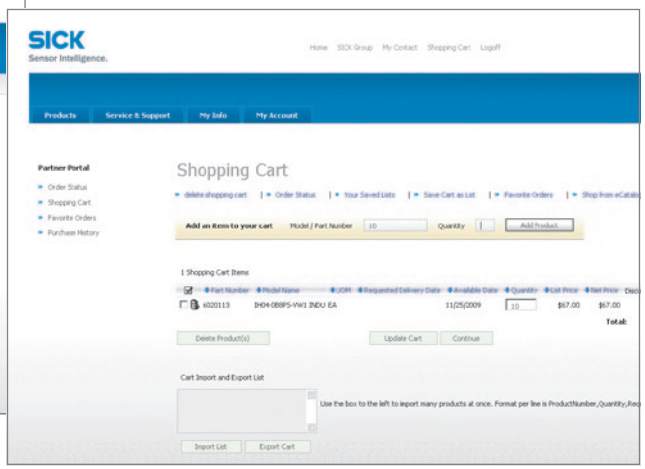
THE ADVANTAGES OF USING IN SICK'S PARTNER PORTAL

- Work more efficiently online
- User administration supports your workflow
- Product availability is immediately displayed
- All processes are sped up, saving you time. For example, price inquiries, quotes, orders
- Find products, applications, circuits and accessories even quicker
- Products and additional information are linked, ensuring comprehensive search results
- All processes available at a glance: product searches, quotes, order status, etc.
- Exclusive downloadable content: technical data, drawings, graphics, etc.

Order online now!

Partner Portal
www.mysick.com



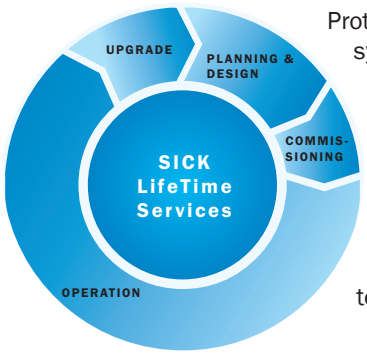


Request price and availability:
Find the price and delivery date of the desired products easily and quickly.

Request for a quote:
You can enter a reference number for a quote. The quote is available online. Each quote is confirmed via e-mail.

Online orders:
You can carry out the order process in just a few steps.

SICK LifeTime Services – a good decision for every phase of a machine‘s life



Protective devices, identification systems and measuring systems report information relevant to the system control and protect man and machine. When optimally integrated and maintained, these components and systems offer great potential for safe processes, consistent product quality and protecting people and the environment.

The complete concept from SICK

From the first meeting and for many years to come, SICK LifeTime Services offer the right level of service to meet customers’ needs. Place your trust in SICK from the beginning. Our practical experience and extensive knowledge of the industry make us highly-qualified partners. SICK service contracts are designed to be convenient. They include guaranteed hotline availability for quick help in solving the problem yourself as well as guaranteed reaction times for on-site call-outs – for all types of production, anywhere in the world.

Machine and system services

Service contracts for SICK LifeTime Services*):

- Inspection contracts for assessing the current system status with recommendations for optimization
- Maintenance contracts for carrying out preventative measures and optimizations
- Service contracts as tailor-made service packages, from reaction time agreements to support availability

*) Not all services are available in all countries. Check with your SICK Sales Representative for the services in your area.

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Consulting & Design
For the ideal fusion of product, application and industry expertise to form the perfect solution.

Product & System Support
For rapid reaction and reliable support for inquiries about integration and the function of SICK systems and sensors. Experienced specialists deal with your problems professionally and provide practical solutions.

Verification & Optimization
For optimum use and smooth operation of SICK systems and sensors. Use SICK's experience for optimum system efficiency.

Upgrade & Retrofits
For integration of powerful and innovative SICK systems and sensors into existing systems to maintain or increase efficiency.

Training & Education
For well-trained staff and optimum use of SICK systems and sensors. SICK seminars and user training courses increase the confidence of design engineers and supervisors.

B

SICK – The pioneer in contrast sensors for more than 60 years

Contrast sensors are primarily used in packaging/printing machines for the detection of printed or control marks. SICK's line of KT contrast sensors detects even the smallest contrasts at the highest speeds, such as print marks on foils or packaging. They detect minute grayscale variations between the mark and the background on matte, shiny or transparent surfaces. A variety of device types with different contrast resolution methods and teach-in versions are available to meet wide-ranging requirements.

Your benefits

- Able to process all packaging materials (yellow mark/white background), resulting in high machine throughput
- Reliable operation, even with jittering webs and high-gloss materials
- High positioning accuracy improves packaging quality
- Simple teach-in and highly visible light spot ensure easy setup
- Simple to integrate into machines due to compact design
- Interchangeable lenses for maximum mounting flexibility
- A range of sensing distances, light spot directions and a 90° rotatable plug enables optimal integration
- Application-specific teach-in processes provide maximum flexibility

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B

Contrast sensors

They put registration marks into a proper light

SICK contrast sensors detect minimum contrast levels at maximum speeds, for example print marks on foil or packaging. Based on the reflection principle, they detect small differences in grayscale values between the mark and the background on matte, glossy or transparent surfaces.

B

The best of the best – our top products

KT3

Small & compact

- Universal use due to 3-color LED technology
- Simple teach-in for setting transmission color, switch point and brightness
- Very small housing

Especially suitable for

- Poor contrast
- Space restrictions

KT5-2 Display

Robust & flexible

- Bar graph display for visualizing the contrast performance
- Variability via different detection distances and light spots
- Tough, multi-functional housing

Especially suitable for

- Packaging industry
- Highly variable contrast conditions

KT10-2

Fast & precise

- Precise detection at high production speeds
- Permanent display of recording quality

Especially suitable for

- Print and paper industry needs

KT3L Laser
KT8L Laser

Powerful & accurate

- Laser technology
- Long detection distance and highly precise small light spot

Especially suitable for

- Tiny marks, such as bar codes
- Distances up to 600 mm

Nearly all packaged products have visible print marks that provide invaluable assistance to the production process. SICK contrast sensors employ a range of technologies to ensure all contrast marks are identified.

Teach-in

After the mark has been detected, the sensor teach-in is a simple process. Depending on the field of application, the teach-in can be triggered in various ways.

Dynamic teach-in
- Teach-in during operation
- No interruption of material flow
- Can also be triggered via external control wire

Static 2-point teach-in
- Extremely simple teach-in when machine is stopped

Manual adjustment via potentiometer
- Very precise adjustment when machine is stopped

The different teach-in options assist the operator in carrying out contrast sensor teach-in and adjusting the contrast sensors under harsh installation conditions.

3-color LED technology

Maximum detection reliability

- During the teach-in process, the sensor sends three different light sources (red, green and blue) to the object that will be detected, and then selects the transmission light that will achieve the highest contrast value
- This enables the contrast sensor to detect all color combinations, even low-contrast combinations such as yellow on white, thus ensuring universal applicability

Black marks on high-gloss targets

Colored marks on patterned backgrounds

White LED technology

Neutral white transmission light is suited for:

- detecting very small marks
- reading colored mark codes
- reliably detecting printing on the background between marks (e.g., tubes)

Small black marks on white backgrounds

Light marks on dark backgrounds

OMR marks on paper

Colored pharmaceutical bar codes

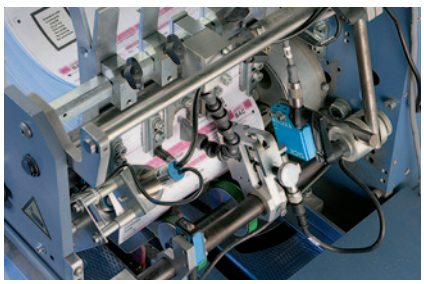
Unlimited possibilities – efficient control, sorting, positioning and counting

▲ **Print mark controlling**
SICK contrast sensors detect print marks to precisely control packaging processes on horizontal and vertical forming, filling and sealing machines in labeling and filling plants. SICK contrast sensors detect these marks reliably and precisely.

▼ **Controlling packaging processes**
SICK contrast sensors adapt effortlessly to the variable environmental conditions of automated processing in horizontal and vertical packaging machines.

▼ **Positioning cans and tubes**
SICK contrast sensors reliably detect print marks on glossy and transparent tubes – for optimal packaging quality.

▼ **Continuous format printing, folding, cutting and insertion**
SICK contrast sensors precisely detect printing and folding marks. This ensures reliable control of individual modules in the insertion machine and synchronization of the entire system.



▼ Positioning labels

On filling lines, SICK contrast sensors control exact targeted positioning of bottle labels. The sensors are optimized to maximum detection performance without stopping the machine.

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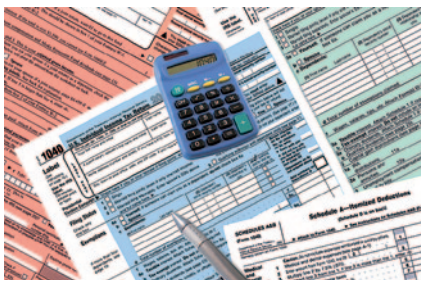
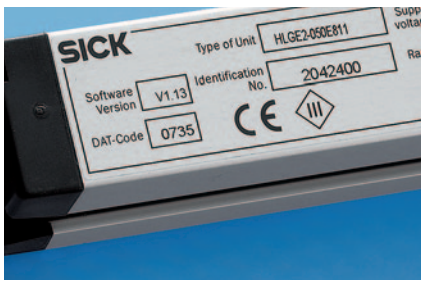
▼ Positioning EDP forms

SICK contrast sensors control exact alignment of forms and ensure their precise machine reading and writing.



▼ Overprinting control

With high-precision contrast detection, automatic brightness adjustment, fast switching frequency and individual assembly options, SICK contrast sensors ensure the quality of your products.



▼ Code identification

SICK contrast sensors quickly and reliably detect OMR print marks used to identify documents. Even the smallest differences in grayscale values are reliably detected.

Product family overview

B

	KT1M	KT2	
			
	Simple – small – outstanding	Contrast detection in tough metal housing	
Technical data overview			
Dimensions (L x W x H)	36.8 mm x M18x1 x 15 mm	41.5 mm x 15 mm x 49 mm	
Sensing distance	23.5 mm	13.5 mm	
Light source	LED white	LED red LED green	
Light spot size	Ø 2 mm	Ø 2 mm	
Switching frequency	400 Hz	10 kHz	
Response time	1.25 ms	50 µs	
Adjustment	Manual adjustment, potentiometer	Manual adjustment, potentiometer	
Connection type	Connector M12, 3-pin	Connector M12, 5-pin	
At a glance			
	• For detecting simple contrast differences, such as black marks on light backgrounds • Small round housing with mounting accessories • NPN and PNP models • Light or dark switching functions • Adjustment via potentiometer	• Small light spot • Tough and compact metal housing • Red or green emitted LED light versions • Adjustment via potentiometer • Light or dark switching can be selected via control cable • Switching frequency of 10 kHz • Two switching outputs (NPN and PNP) in one device	
Detailed information	→ B-12	→ B-18	

B

	KT3	KT3L Laser
		
	Compact and powerful contrast detection	Long sensing distance – precise detection
	22 mm x 12 mm x 40 mm	22 mm x 12 mm x 40 mm
	12.5 mm	40 mm
	LED red, green, blue LED green LED white	Laser diode red light
	1.5 mm x 3.5 mm 1.5 mm x 6.5 mm	1 mm x 2 mm
	10 kHz	1.5 kHz
	50 µs	400 µs
	Static 2-point teach-in Dynamic teach-in (min/max)	Static 2-point teach-in
	Connector M12, 4-pin	Connector M12, 4-pin
	• Very small housing • 3-color RGB technology or white LED • Simple teach-in (when machine is stopped or during operation) • Integrated switching threshold adjustment for high-gloss objects • Reliable operation for jittering materials • Switching frequency of 10 kHz	• Very small housing • Precise, small laser spot • Sensing distance up to 60 mm • Simple 2-point teach-in • Switching frequency of 1.5 kHz • Reliable operation for jittering materials
	➜ B-24	➜ B-30

Product family overview

B

	 KT5-2 Potentiometer	 KT5-2 Teach-in	
	Contrast sensors with potentiometer setting	Contrast sensors with easy teach-in	
Technical data overview			
Dimensions (L x W x H)	80 mm x 30.4 mm x 53 mm	80 mm x 30.4 mm x 53 mm	
Sensing distance	10 mm / 20 mm / 40 mm	10 mm / 20 mm / 40 mm	
Light source	LED green LED white	LED red, green, blue LED red, green	
Light spot size	1.2 mm x 4.2 mm 1.5 mm x 5.5 mm 1.1 mm x 4.2 mm	1.2 mm x 4.2 mm 1.5 mm x 5.5 mm 1.1 mm x 4.2 mm	
Switching frequency	10 kHz	10 kHz	
Response time	50 µs	50 µs	
Adjustment	Manual adjustment, potentiometer	Static 2-point teach-in Dynamic teach-in	
Connection type	Connector M12, 4-pin	Connector M12, 4-pin Connector M12, 5-pin	
At a glance			
	• Tough, metal housing • Manual switching threshold adjustment with optical adjustment indicator • Green or white LED technology • Models with analog output • Switching frequency of 10 kHz • Various sensing distances and light spot directions • M12 plug can be rotated 90°	• Tough, metal housing • Various teach-in methods via control panel or control cable • Maximum detection reliability due to 3-color RGB LED technology • Switching frequency of 10 kHz • Various sensing distances and light spot directions • M12 plug can be rotated 90°	
Detailed information	→ B-36	→ B-44	

B

	KT5-2 Display	KTL5-2 Fiber-optic
		
	Contrast sensors with intelligent bar graph display	Contrast sensors with fiber-optic cables
	80 mm x 30.4 mm x 53 mm	80 mm x 30.4 mm x 53 mm
	10 mm / 20 mm / 40 mm	In relation to the fiber-optic cable
	LED red, green, blue	LED red, green, blue LED green
	1.2 mm x 4.2 mm 1.5 mm x 5.5 mm 1.1 mm x 4.2 mm	In relation to the fiber-optic cable
	10 kHz	10 kHz
	50 µs	50 µs
	Static 2-point teach-in with manual fine adjustment	Manual adjustment, potentiometer Dynamic teach-in Static 2-point teach-in
	Connector M12, 5-pin	Connector M12, 4-pin Connector M12, 5-pin
	• Intuitive 10-segment bar graph display indicates detection status • Static 2-point teach-in of mark and background via the control cable • Maximum detection reliability due to 3-color RGB LED technology • Switching frequency of 10 kHz • Automatic gloss adjustment for highly reflective materials • A range of sensing distances and light spots for numerous applications • M12 plug can be rotated 90°	• Various heat-resistant fiber-optic cable models are available • Various teach-in methods, including potentiometer • Analog output • Switching frequency of 10 kHz
	→ B-54	→ B-60

Product family overview

B

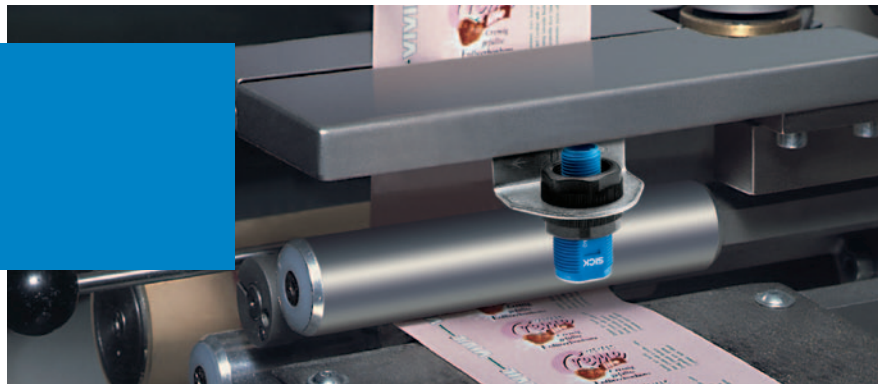
	KT6-2	KT8 CAN
		
	High-performance in a tough metal housing for intelligent contrast detection	Contrast and communication without limits
Technical data overview		
Dimensions (L x W x H)	80 mm x 30.4 mm x 53 mm	80 mm x 30.4 mm x 53 mm
Sensing distance	10 mm	10 mm / 20 mm
Light source	LED red, green, blue	LED red, green, blue
Light spot size	1.5 mm x 6.5 mm	0.8 mm x 4 mm 1.5 mm x 5.5 mm
Switching frequency	5 kHz	22.5 kHz
Response time	100 µs	22 µs
Adjustment	Static 2-point teach-in	Static 2-point teach-in Dynamic teach-in (min/max)
Connection type	Connector M12, 4-pin	Connector M12, 8-pin
At a glance		
	• 3-color RGB LED technology • 2-point teach-in (mark and background) • Tough, metal housing • Automatic gloss adjustment for highly reflective materials • 10 mm sensing distance • Light exits at end or side, based on model • Common mounting footprint	• The CAN interface helps set parameters, process documentation and adaptation • Automatic drift correction • Fast response time • Precise light spot • 3-color RGB LED technology • Two interchangeable light exits
Detailed information	➜ B-68	➜ B-74

B

	 **KT8L Laser**	 **KT10-2**
	Precise, flexible, quick	The industry choice for precise, high-speed mark detection
	80 mm x 30.4 mm x 53 mm	80 mm x 30.4 mm x 53 mm
	150 mm	10 mm
	Laser diode red light	LED red, green, blue
	Ø 0.3 mm Ø 3 mm	0.8 mm x 4 mm
	17 kHz	25 kHz
	30 µs	20 µs
	Static 2-point teach-in Dynamic teach-in (min/max)	Static 2-point teach-in Dynamic teach-in (min/max)
	Connector M12, 5-pin	Connector M12, 5-pin
	• Wide range of operating distances between 30 mm to 800 mm • Small, precise laser light spot (Class II) • Fast switching frequency of 17 kHz • Analog output • Simple teach-in • Detection reliability displayed in the bar graph display	• Very low jitter (< 10 µs) • Precise light spot • Maximum detection reliability due to 3-color RGB LED technology • Two interchangeable light exits • Five storage banks for settings • Automatic drift correction • Fast switching frequency of 25 kHz • Easy-to-read bar graph display
	→ B-80	→ B-86

B

Simple – small – outstanding



Product description

The KT1M contrast sensor is ideal for detecting a wide range of simple contrast combinations, such as black marks on a light background. It can easily be integrated into machines due to its round design and mounting accessories. The sensor features a very precise, highly visible white light spot.

At a glance

- For detecting simple contrast differences, such as black marks on light backgrounds
- Small round housing with mounting accessories
- NPN and PNP models
- Light or dark switching options
- Adjustment via potentiometer

Your benefits

- Cost-effective, application-specific sensor performance
- Quick and simple to integrate into machine designs
- LED indicator shows current operation status

Additional information

8013816/2011-05-30
Subject to change without notice

Detailed technical data

Features

Dimensions (L x W x H)	36.8 mm x M18x1 x 15 mm
Sensing distance	23.5 mm
Sensing distance tolerance	± 1.5 mm
Light source [1) 2)]	LED white
Light spot size	Ø 2 mm
Adjustment	Manual adjustment, potentiometer

[1)] Average service life of 100,000 h at T_A = +25 °C .
[2)] Wave length: 450 nm ... 650 nm.

B

Mechanics/electronics

Supply voltage V_S [1)]	DC 10 V ... 30 V
Ripple [2)]	≤ 5 V_{PP}
Power consumption [3)]	< 20 mA
Switching frequency [4)]	400 Hz
Response time [5)]	1.25 ms
Switching output voltage	PNP: HIGH = V_S – ≤ 3 V / LOW = approx. 0 V NPN: HIGH = approx. V_S / LOW = 3 V
Output current $I_{max.}$	100 mA
Connection type	Connector M12, 3-pin
Protection class [6)]	II
Circuit protection	V_S connections reverse-polarity protected Interference suppression Outputs overcurrent and short-circuit protected
Enclosure rating	IP 67
Weight	Approx. 7 g
Housing material	ABS (plastic), Optics: PMMA

[1)] Limit values. Operation in short-circuit protected network max. 8 A.
[2)] May not exceed or fall short of V_S tolerances.
[3)] Without load.
[4)] With light/dark ratio 1:1.
[5)] Signal transit time with resistive load.
[6)] Reference voltage 50 V DC.

Ambient data

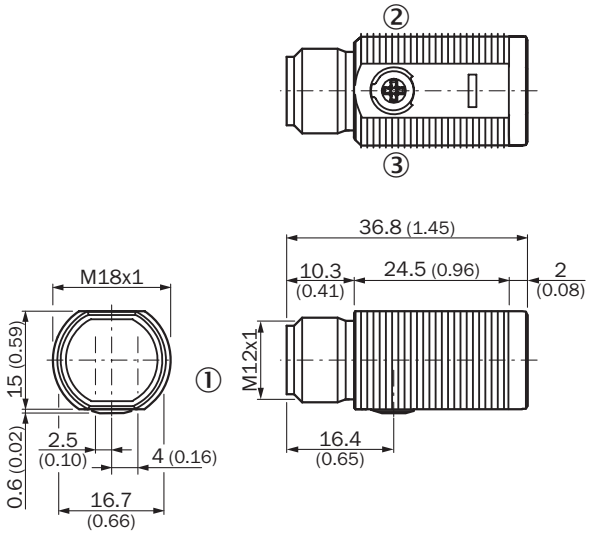
Ambient temperature	Operation: –10 °C ... +55 °C Storage: –25 °C ... +70 °C
Shock load	According to IEC 60068

Ordering information

Switching output	Switching function	Model name	Part no.
PNP	Light switching	KT1M-P1	1027306
	Dark switching	KT1M-P2	1027307
NPN	Light switching	KT1M-N1	1027304
	Dark switching	KT1M-N2	1027305

B

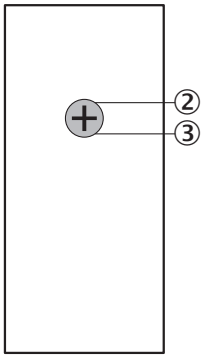
Dimensional drawing



All dimensions in mm (inch)

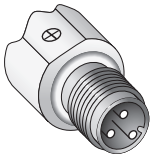
① Connector M12
② Sensitivity adjustment 270°
③ LED indicator yellow

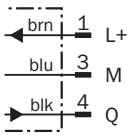
Adjustments



Connection type and diagram

Connector
M12, 3-pin





Recommended accessories

Plug connectors and cables

Connector M12, 3-pin

Connector type	Enclosure rating	Flying leads	Sheath material	Cable length	Model name	Part no.
Female connector	IP 68	Straight	PUR	2 m	DOL-1203-G02MC	6039075
				5 m	DOL-1203-G05MC	6039076
				10 m	DOL-1203-G10MC	6039077
		Angled	PUR	2 m	DOL-1203-W02MC	6039078
				5 m	DOL-1203-W05MC	6039079
				10 m	DOL-1203-W10MC	6036752

Connector M12, 4-pin

Connector type	Enclosure rating	Flying leads	Sheath material	Cable length	Model name	Part no.
Female connector	IP 67	Straight	PVC	2 m	DOL-1204-G02M	6009382
				5 m	DOL-1204-G05M	6009866
				10 m	DOL-1204-G10M	6010543
				15 m	DOL-1204-G15M	6010753
		Angled	PVC	2 m	DOL-1204-W02M	6009383
				5 m	DOL-1204-W05M	6009867
				10 m	DOL-1204-W10M	6010541
		Straight	–	–	DOS-1204-G	6007302
		Angled	–	–	DOS-1204-W	6007303

Mounting brackets/plates

Mounting system type	Material	Model name	Part no.
Mounting ring	Plastic (PA12)	BEF-WN-MH15-1	4039533 [1]
Nuts M18	Plastic (PA12)	Mutter-M18-MH15	4040270 [1]
Mounting bracket	Steel, zinc coated	BEF-WG-M18	5321870
		BEF-WN-M18	5308446

[1] Supplied with KT1M.

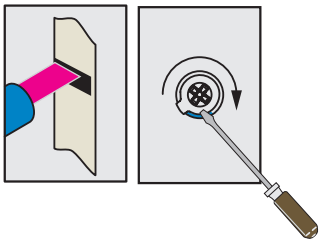
For additional accessories including dimensional drawings, please see page G-1

B

Setting the switching threshold via potentiometer

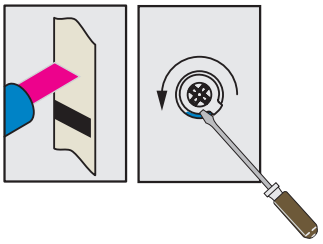
Dark switching (light/dark switching depends on the type of device)

1. Position mark



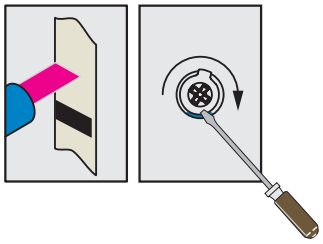
Start at 0° (left stop) (light sender off) and turn until the LED flashes or until you've reached a max. 270° (right stop).

2. Position background



Turn back until the display goes out.

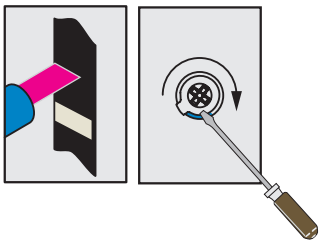
3. Set switching threshold



Turn between point 1 and 2 to ensure that the switching threshold is optimally set.

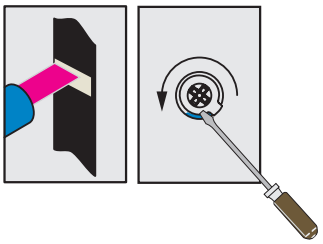
Light switching (light/dark switching depends on the type of device)

1. Position background



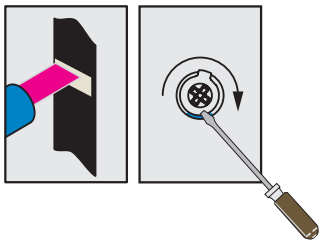
Start at 0° (left stop) (light sender off) and turn until the LED flashes or until you've reached a max. 270° (right stop).

2. Position mark



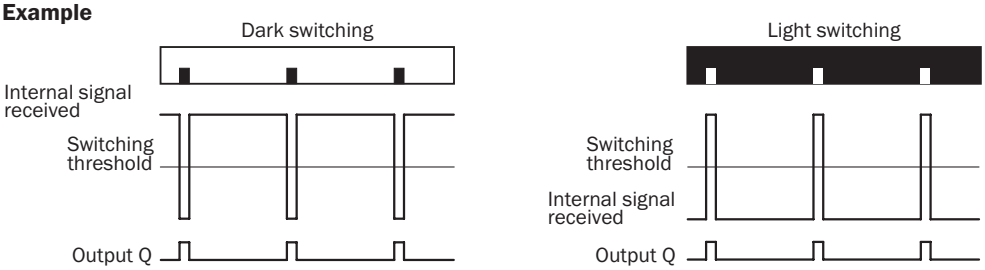
Turn back until the display goes out.

3. Set switching threshold



Turn between point 1 and 2 to ensure that the switching threshold is optimally set.

Example



Switching characteristics

The switching threshold is set in the center between the background and the mark.

Selection

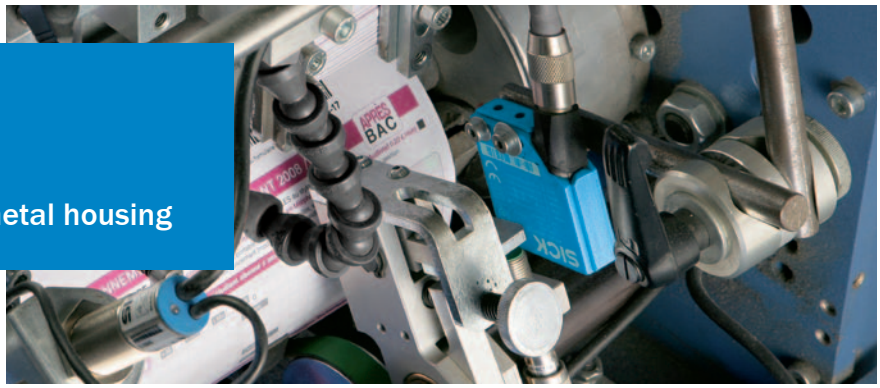
	Dark switching	Dark mark on a light background
Target	**Output**	**LED display**
Light	OFF	ON or flashing
Dark	ON	OFF

	Light switching	Light mark on a dark background
Target	**Output**	**LED display**
Light	ON	ON or flashing
Dark	OFF	OFF

B

B

Contrast detection in tough, metal housing



Product description

The KT2 contrast sensor can be used in various industries where print marks control operating processes. The sturdy and compact metal housing is a cost-effective solution for applications in harsh environments. The primary application is contrast detection through colored print marks. Depending on the grayscale variation, sensors with either a red or green LED can be selected. Manual switching threshold adjustment ensures good functionality and high detection reliability. Using the control cable, adjusting the sensor from dark to light marks and back again is quick and uncomplicated. In addition to a 5-pin M12 standard plug, the KT2 contrast sensor features a dovetail mounting option and additional fixing holes for simple and flexible electrical and mechanical integration into various surroundings.

At a glance

- Small light spot
- Tough and compact metal housing
- Red or green emitted LED light versions
- Adjustment via potentiometer
- Light or dark switching can be selected via control cable
- Switching frequency of 10 kHz
- Two switching outputs (NPN and PNP) in one device

Your benefits

- Reliable detection of even the smallest print marks, ensuring high machine throughput
- Long service life due to tough metal housing
- The compact housing can be integrated quickly and simply into the existing machine design
- Maximum positioning accuracy ensures high production quality

Additional information

8013816/2011-05-30
Subject to change without notice

Detailed technical data

Features

Dimensions (L x W x H)	41.5 mm x 15 mm x 49 mm
Sensing distance	13.5 mm
Sensing distance tolerance	± 2 mm
Light spot size	Ø 2 mm
Adjustment	Manual adjustment, potentiometer
Switching function	Light/dark switching

B

Mechanics/electronics

Supply voltage V_S [1]	DC 10 V ... 30 V
Ripple [2]	≤ 5 V_{PP}
Power consumption [3]	< 80 mA
Switching frequency [4]	10 kHz
Response time [5]	50 µs
Switching output voltage	PNP: HIGH = V_S – ≤ 3 V / LOW = approx. 0 V NPN: HIGH = approx. V_S / LOW ≤ 1.5 V
Switching output	PNP, NPN
Output current $I_{max.}$	100 mA
Input, light/dark (L/D)	PNP: Light: U = 0 V Dark: U = 10 V ... < U_V NPN: Light: U = U_V Dark: U = 0 V
Connection type	Connector M12, 5-pin
Protection class [6]	II
Circuit protection	V_S connections reverse-polarity protected Output Q short-circuit protected Interference suppression
Enclosure rating	IP 67
Weight	Approx. 120 g
Housing material	Die-cast zinc

[1] Limit values. Operation in short-circuit protected network max. 8 A.

[2] May not exceed or fall short of V_S tolerances.

[3] Without load.

[4] With light/dark ratio 1:1.

[5] Signal transit time with resistive load.

[6] Reference voltage 50 V DC.

Ambient data

Ambient temperature	Operation: –10 °C ... +55 °C Storage: –20 °C ... +75 °C
Shock load	According to IEC 60068

Ordering information

Light source [1]	Time delay	Model name	Part no.
LED green [2]	–	KT2G-2B3711	1016112
LED red [3]	–	KT2R-2B3711	1016115
	20 ms	KT2R-2B3721	1016114

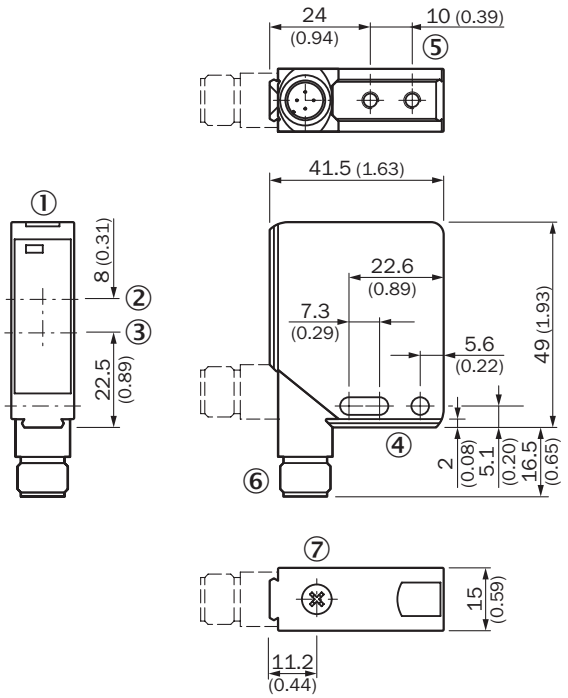
[1] Average service life of 100,000 h at T_A = +25 °C .

[2] Wave length: 525 nm.

[3] Wave length: 660 nm.

B

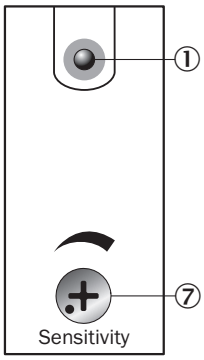
Dimensional drawing



All dimensions in mm (inch)

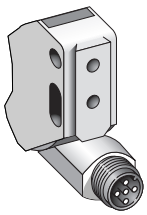
① LED signal strength indicator
② Center of receiver optical axis
③ Center of emitter optical axis
④ Mounting hole ø 4.2 mm
⑤ Screw thread M4
⑥ Connector M12 (rotatable up to 90°)
⑦ Sensitivity adjustment

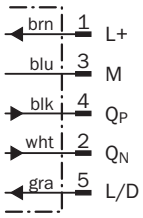
Adjustments



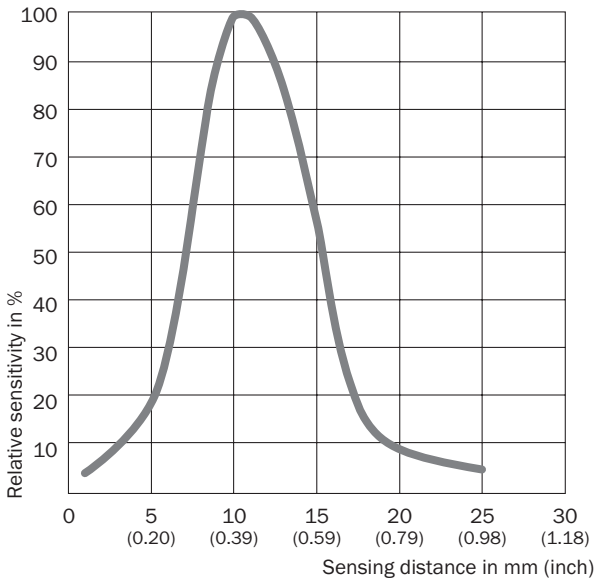
Connection type and diagram

Connector
M12, 5-pin





Sensing distance



B

Recommended accessories

Plug connectors and cables

Connector M12, 5-pin

Connector type	Enclosure rating	Flying leads	Sheath material	Cable length	Model name	Part no.
Female connector	IP 67	Straight	PVC	2 m	DOL-1205-G02M	6008899
				5 m	DOL-1205-G05M	6009868
				10 m	DOL-1205-G10M	6010544
		Angled	PVC	2 m	DOL-1205-W02M	6008900
				5 m	DOL-1205-W05M	6009869
				10 m	DOL-1205-W10M	6010542
		Straight	–	–	DOS-1205-G	6009719
		Angled	–	–	DOS-1205-W	6009720

Mounting brackets/plates

Mounting system type	Material	Model name	Part no.
Mounting bracket	Stainless steel (1.4301)	BEF-WG-W12	2013942
		BEF-WK-W12	2012938

Terminal and alignment brackets

Mounting system type	Description	Material	Model name	Part no.
Clamps	Clamp for dovetail mounting	Steel, zinc coated	BEF-KH-W12	2013285 [1]
Universal bar clamps	Plate D for universal bar clamp	Steel, zinc coated	BEF-KHS-D01	2022461
	Plate K for universal bar clamp	Steel, zinc coated	BEF-KHS-K01	2022718
	Universal bar clamp	Die-cast zinc	BEF-KHS-KH1	2022726
	Mounting rod straight	Steel, zinc coated	BEF-MS12G-A	4056054
			BEF-MS12G-B	4056055
	Mounting rod L-shaped	Steel, zinc coated	BEF-MS12L-A	4056052
			BEF-MS12L-B	4056053

[1] Supplied with KT2.

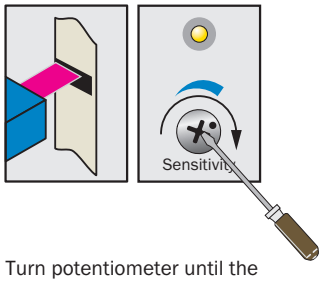
For additional accessories including dimensional drawings, please see page G-1

B

Setting the switching threshold via potentiometer

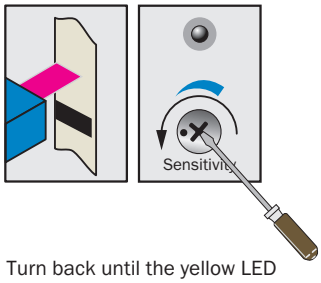
Select switching function (light/dark) using control cable.

1. Position mark



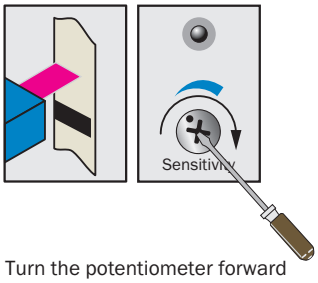
Turn potentiometer until the yellow LED illuminates:
To the right at the dark mark.
To the left at the light mark.

2. Position background



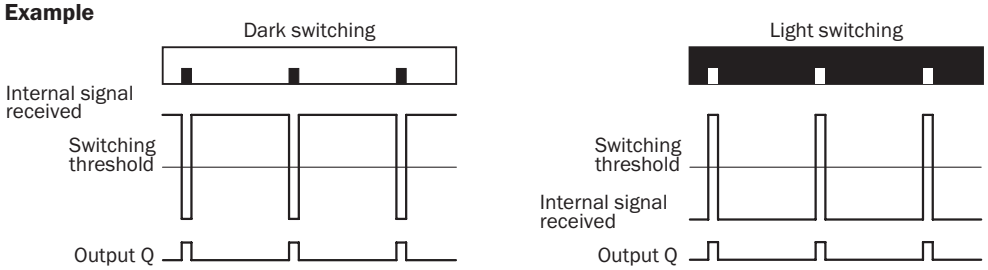
Turn back until the yellow LED goes out.

3. Set switching threshold



Turn the potentiometer forward by half, to ensure that the switching threshold is optimally set.

Example



Switching characteristics

The switching threshold is set in the center between the background and the mark.

B

Compact and powerful contrast detection

B

Product description

The KT3 contrast sensor may be small in size, but it provides big results when it comes to detecting contrasts. Due to 3-color LED technology which detects all contrast combinations, the sensor is ideal for use in packaging and document handling machines. Teach-in can be triggered automatically during operation via the external control signal. The sensor selects all necessary settings automatically, depending on the variation between the mark and the background. These features, along with the highly visible light spot, enable extremely simple commissioning. And, since there is no need to stop the machine, setup time is reduced. High-gloss materials are detected reliably due to automatic adjustment. In addition, the KT3 features 10 kHz technology and a fast 50 µs response time, which leads to high repeat accuracy and excellent results.

At a glance

- Very small housing
- 3-color RGB technology or white LED
- Simple teach-in (when machine is stopped or during operation)
- Integrated switching threshold adjustment for high-gloss objects
- Reliable operation for jittering materials
- Switching frequency of 10 kHz

Your benefits

- Compact design fits in applications with limited space
- 3-color RGB technology enables universal operation with an extremely wide range of weak contrast combinations
- White LED model detects several different marks
- Simple teach-in to optimally set transmission color, switching point and surface shine
- Very good contrast resolution for detecting print marks, even where the variation between the mark and the background is minimal
- Automatic adaptation for high-gloss objects ensures high throughput
- Reliable operation for jittering materials
- Accurate positioning in rapid production processes

Additional information

8013816/2011-05-30
Subject to change without notice

Detailed technical data

Features

Dimensions (L x W x H)	22 mm x 12 mm x 40 mm
Sensing distance	12.5 mm
Sensing distance tolerance	± 2 mm

Mechanics/electronics

Supply voltage V_S [1]	DC 12 V ... 24 V
Ripple [2]	≤ 5 V_{PP}
Power consumption [3]	< 35 mA
Switching frequency [4]	10 kHz
Response time [5]	50 µs
Switching output voltage	PNP: HIGH = V_S– ≤ 2 V / LOW approx. 0 V NPN: HIGH = approx. V_S / LOW ≤ 2 V
Output current $I_{max.}$	100 mA
Input, teach-in (ET)	PNP: Teach: U = 10 V ... < U_V Run: U < 2 V NPN: Teach: U < 2 V Run: U = 10 V ... < U_V
Retention time (ET)	25 ms, non-volatile memory
Connection type	Connector M12, 4-pin
Protection class [6]	II
Circuit protection	V_S connections reverse-polarity protected Output Q short-circuit protected Interference suppression
Enclosure rating	IP 67
Weight	Approx. 11 g
Housing material	ABS (plastic)

[1] Extreme values: 12 V (–10 %) ... 24 V (+20 %).
Operation in short-circuit protected network max. 8 A.
[2] May not exceed or fall short of V_S tolerances.
[3] Without load.
[4] With light/dark ratio 1:1.
[5] Signal transit time with resistive load.
[6] Reference voltage 50 V DC.

Ambient data

Ambient temperature	Operation: –10 °C ... +55 °C Storage: –20 °C ... +75 °C
Shock load	According to IEC 60068

Specific data

Light source [1]	Model name	Ordering information
LED white [2]	KT3M	B-26
LED red, green, blue [3]	KT3W	B-26
LED green [4]	KT3G	B-26

[1] Average service life of 100,000 h at T_A = +25 °C .
[2] Wave length: 400 nm ... 700 nm.
[3] Wave length: 470 nm, 525 nm, 640 nm.
[4] Wave length: 520 nm.

Ordering information

KT3M

- **Light source:** LED white

Light spot size	Light spot direction [1]	Adjustment	Time delay	Switching output	Model name	Part no.
1.5 mm x 3.5 mm	Vertical	Static 2-point teach-in	–	PNP	KT3M-P1116	1044235
				NPN	KT3M-N1116	1044593

[1] In relation to long side of housing.

B

KT3W

- **Light source:** LED red, green, blue

Light spot size	Light spot direction [1]	Adjustment	Time delay	Switching output	Model name	Part no.
1.5 mm x 6.5 mm	Vertical	Dynamic teach-in (min/max)	–	PNP	KT3W-P1115	1025326
				NPN	KT3W-N1115	1025325
		Static 2-point teach-in	–	PNP	KT3W-P1116	1019338
				NPN	KT3W-N1116	1019337
			20 ms	PNP	KT3W-P1126	1022933

[1] In relation to long side of housing.

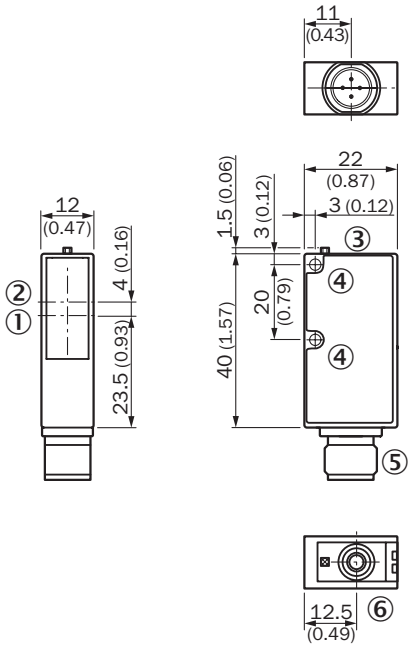
KT3G

- **Light source:** LED green

Light spot size	Light spot direction [1]	Adjustment	Time delay	Switching output	Model name	Part no.
1.5 mm x 3.5 mm	Vertical	Static 2-point teach-in	–	PNP	KT3G-P1116	1019446
				NPN	KT3G-N1116	1019445

[1] In relation to long side of housing.

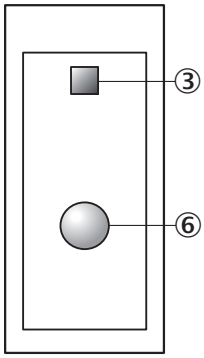
Dimensional drawing



All dimensions in mm (inch)

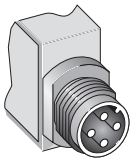
① Axis of the sender optics
② Axis of the receiver optics
③ LED signal strength indicator
④ Mounting hole, Ø 3 mm
⑤ Connector M12
⑥ Teach-in button

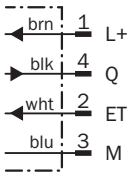
Adjustments



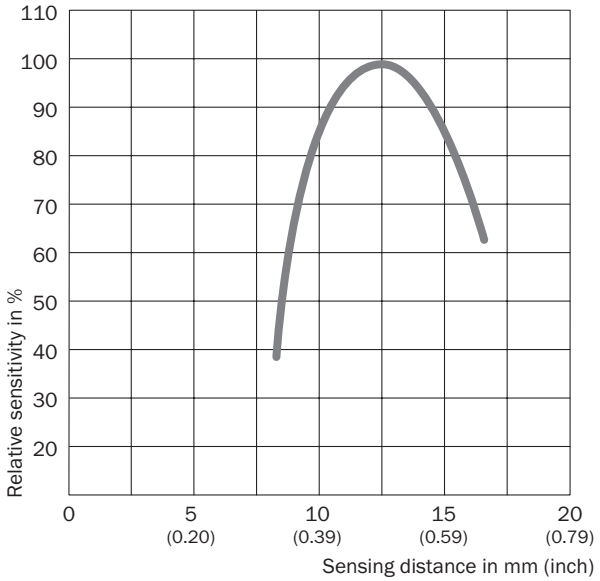
Connection type and diagram

Connector
M12, 4-pin





Sensing distance



Recommended accessories

Plug connectors and cables

Connector M12, 4-pin

Connector type	Enclosure rating	Flying leads	Sheath material	Cable length	Model name	Part no.
Female connector	IP 67	Straight	PVC	2 m	DOL-1204-G02M	6009382
				5 m	DOL-1204-G05M	6009866
				10 m	DOL-1204-G10M	6010543
				15 m	DOL-1204-G15M	6010753
		Angled	PVC	2 m	DOL-1204-W02M	6009383
				5 m	DOL-1204-W05M	6009867
				10 m	DOL-1204-W10M	6010541
		Straight	–	–	DOS-1204-G	6007302
		Angled	–	–	DOS-1204-W	6007303

Mounting brackets/plates

Mounting system type	Material	Model name	Part no.
Mounting bracket	Steel, zinc coated	BEF-WN-W9-2	2022855

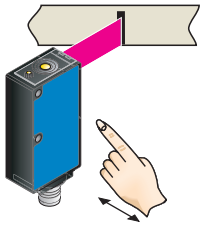
Terminal and alignment brackets

Mounting system type	Description	Material	Model name	Part no.
Universal bar clamps	Universal bar clamp	Die-cast zinc	BEF-KHS-KH1	2022726
	Plate L for universal bar clamp	Steel, zinc coated	BEF-KHS-L01	2023057
	Mounting rod straight	Steel, zinc coated	BEF-MS12G-A	4056054
			BEF-MS12G-B	4056055
	Mounting rod L-shaped	Steel, zinc coated	BEF-MS12L-A	4056052
			BEF-MS12L-B	4056053

For additional accessories including dimensional drawings, please see page G-1

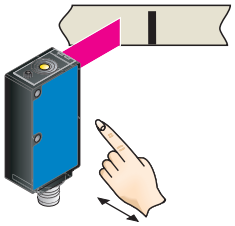
Setting the switching threshold via teach-in (static 2-point teach-in)

1. Position mark



Press and hold teach-in button > 1 s.
Yellow LED flashes slowly.

2. Position background

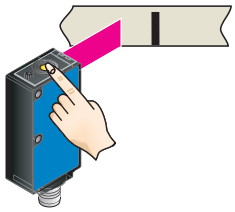


Press and hold teach-in button > 1 s.
Yellow LED goes out.

B

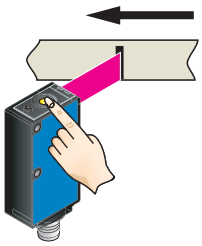
Setting the switching threshold via teach-in (dynamic)

1. Position background

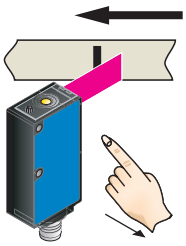


Press the teach-in button and keep it pressed.

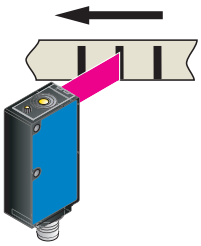
2. Move at least one mark using the light spot



Keep the teach-in button pressed.

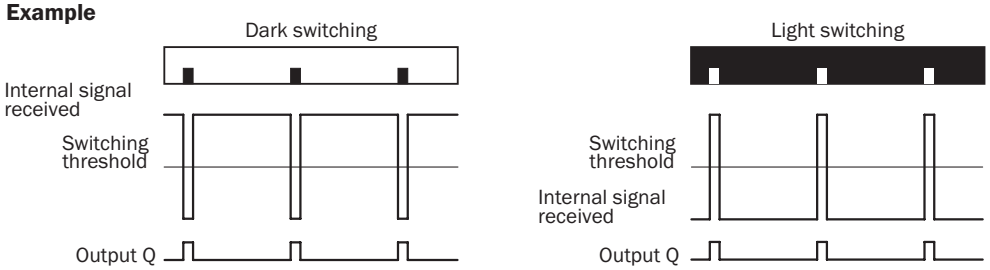


Release the teach-in button.



Yellow LED will illuminate, when emitted light is on the mark.

Example



Switching characteristics

The optimum emitted light is selected automatically.
Light/dark setting is defined using teach-in sequence.
The switching threshold is set in the center between the background and the mark.
Teach-in can also be performed using an external control signal.

B

Long sensing distance – precise detection

CDRH

Additional information

Product description

The KT3L Laser contrast sensor is ideally suited for detecting small contrast marks (1 x 1 mm²). The small, precise laser spot can detect objects at any distance, making the KT3L suitable for a wide range of contrast detection applications that require long sensing distances. The sensor, which is ideal for distances from 20 mm to 60 mm, functions reliably even if the distance between the sensor and the object fluctuates during operation. The compact housing allows it to be installed in the tightest spaces. Plus, simple 2-point teach-in where the operator teaches the mark and the background enables quick setup.

At a glance

- Very small housing
- Precise, small laser spot
- Sensing distance up to 60 mm
- Simple 2-point teach-in
- Switching frequency of 1.5 kHz
- Reliable operation for jittering materials

Your benefits

- Compact design fits in applications with limited space
- Small, precise light spot detects the smallest contrast marks, e.g., 1 x 1 mm², using Class II laser technology
- Long sensing distances up to 60 mm enable flexible installation
- The sensor's long depth-of-field ensures that it can be used at various sensing distances
- Automatic adaptation for high-gloss objects ensures high throughput
- Reliable operation for jittering materials

Detailed technical data

Features

Dimensions (L x W x H)	22 mm x 12 mm x 40 mm
Sensing distance	40 mm
Sensing distance tolerance	± 20 mm
Light source [1) 2)]	Laser diode red light
Operating distance	20 mm ... 60 mm

[1)] Average service life of 50,000 h at T_A = +25 °C.
[2)] Wave length: 655 nm.

B

Mechanics/electronics

Supply voltage V_S [1)]	DC 10 V ... 30 V
Ripple [2)]	≤ 5 V_{PP}
Power consumption [3)]	< 35 mA
Switching frequency [4)]	1.5 kHz
Response time [5)]	400 µs
Switching output voltage	NPN: HIGH = approx. V_S / LOW ≤ 2 V PNP: HIGH = V_S – ≤ 2 V / LOW approx. 0 V
Output current $I_{max.}$	100 mA
Input, teach-in (ET)	PNP: Teach U > 8 V Run: U < 2 V NPN: Teach: U < 2 V Run: U = U_V
Retention time (ET)	25 ms, non-volatile memory
Connection type	Connector M12, 4-pin
Protection class [6)]	II
Circuit protection	V_S connections reverse-polarity protected Output Q short-circuit protected Interference suppression
Enclosure rating	IP 67
Weight	Approx. 11 g
Housing material	ABS (plastic)

[1)] Limit values. Operation in short-circuit protected network max. 8 A.
[2)] May not exceed or fall short of V_S tolerances.
[3)] Without load.
[4)] With light/dark ratio 1:1.
[5)] Signal transit time with resistive load.
[6)] Reference voltage 50 V DC.

Ambient data

Ambient temperature	Operation: –10 °C ... +45 °C Storage: –20 °C ... +75 °C
Shock load	According to IEC 60068

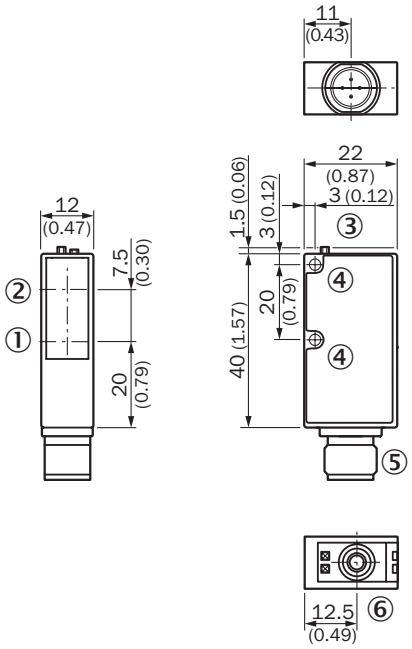
Ordering information

Light spot size	Light spot direction [1)]	Adjustment	Switching output	Model name	Part no.
1 mm x 2 mm	Vertical	Static 2-point teach-in	NPN	KT3L-N3216	1026245
			PNP	KT3L-P3216	1026244

[1)] In relation to long side of housing.

B

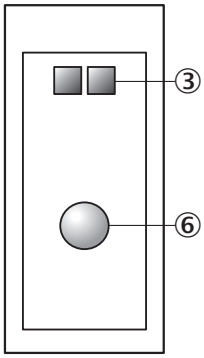
Dimensional drawing



All dimensions in mm (inch)

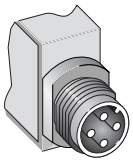
① Axis of the sender optics
② Axis of the receiver optics
③ LED signal strength indicator
④ Mounting hole, Ø 3 mm
⑤ Connector M12
⑥ Teach-in button

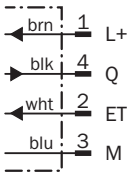
Adjustments



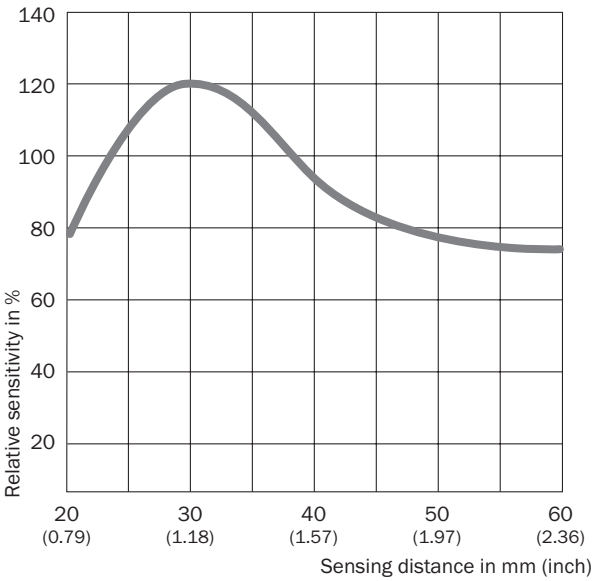
Connection type and diagram

Connector
M12, 4-pin





Sensing distance



Recommended accessories

Plug connectors and cables

Connector M12, 4-pin

Connector type	Enclosure rating	Flying leads	Sheath material	Cable length	Model name	Part no.
Female connector	IP 67	Straight	PVC	2 m	DOL-1204-G02M	6009382
				5 m	DOL-1204-G05M	6009866
				10 m	DOL-1204-G10M	6010543
				15 m	DOL-1204-G15M	6010753
		Angled	PVC	2 m	DOL-1204-W02M	6009383
				5 m	DOL-1204-W05M	6009867
				10 m	DOL-1204-W10M	6010541
		Straight	–	–	DOS-1204-G	6007302
		Angled	–	–	DOS-1204-W	6007303

Mounting brackets/plates

Mounting system type	Material	Model name	Part no.
Mounting bracket	Steel, zinc coated	BEF-WN-W9-2	2022855

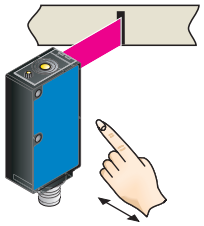
Terminal and alignment brackets

Mounting system type	Description	Material	Model name	Part no.
Universal bar clamps	Universal bar clamp	Die-cast zinc	BEF-KHS-KH1	2022726
	Plate L for universal bar clamp	Steel, zinc coated	BEF-KHS-L01	2023057
	Mounting rod straight	Steel, zinc coated	BEF-MS12G-A	4056054
			BEF-MS12G-B	4056055
	Mounting rod L-shaped	Steel, zinc coated	BEF-MS12L-A	4056052
			BEF-MS12L-B	4056053

For additional accessories including dimensional drawings, please see page G-1

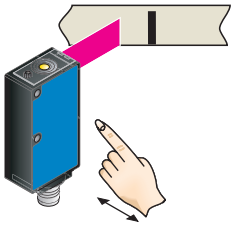
Setting the switching threshold via teach-in (static 2-point teach-in)

1. Position mark



Press and hold teach-in button > 1 s.
Yellow LED flashes slowly.

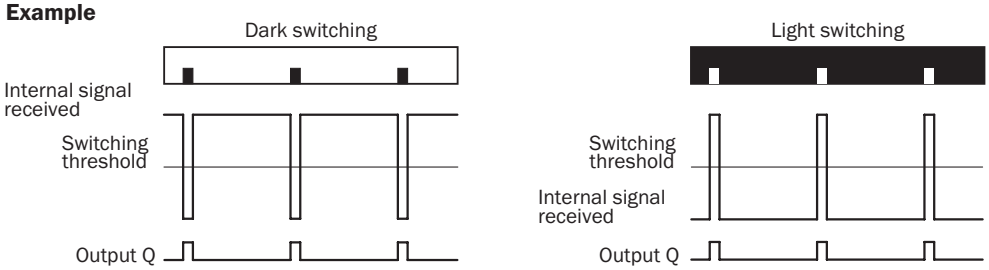
2. Position background



Press and hold teach-in button > 1 s.
Yellow LED goes out.

B

Example



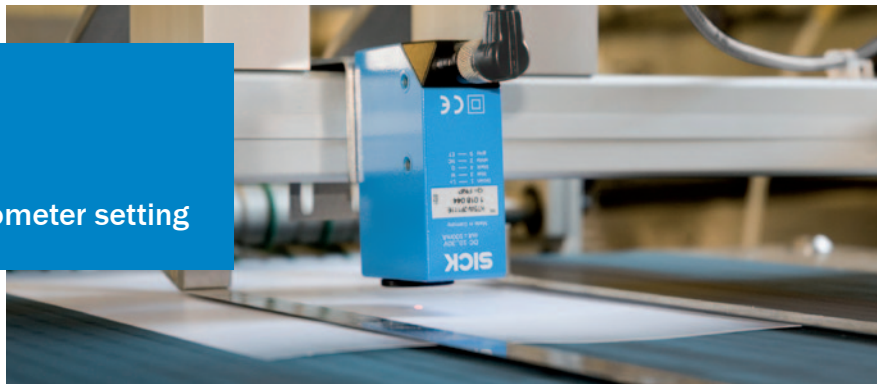
Switching characteristics

The optimum emitted light is selected automatically.
Light/dark setting is defined using teach-in sequence.
The switching threshold is set in the center between the background and the mark.
Teach-in can also be performed using an external control signal.

B

B

Contrast sensors with potentiometer setting



Product description

The KT5 contrast sensor quickly and reliably detects print marks on various foils, cardboard packaging and wrapping materials, which is critical in industrial packaging technology. Unlike other contrast sensor models, the KT5 is able to provide excellent grayscale differentiation due to its white or green lighting technology and a 10 kHz switching frequency. The switching threshold is set manually via a potentiometer – aided by the function indicator, which serves as an adjustment indicator. The selectable light spot geometry and various sensing distances of 10 mm, 20 mm and 40 mm make individual selection possible. Plus, an optional delay that extends the pulse duration optimizes detection reliability, while a 90° rotatable connection plug simplifies mounting. The extensive range of mounting accessories and a selectable light emission on the top or front of the housing simplifies integration.

At a glance

- Tough, metal housing
- Manual switching threshold adjustment with optical adjustment indicator
- Green or white LED technology
- Models with analog output
- Switching frequency of 10 kHz
- Various sensing distances and light spot directions
- M12 plug can be rotated 90°

Your benefits

- All standard print marks and contrasts are detected
- Reliable operation, even with jittering webs and high-gloss materials
- High positioning accuracy improves packaging quality
- Various sensing distances, light spot directions and light emissions make individual configuration and simple integration into the production process possible

Additional information

8013816/2011-05-30
Subject to change without notice

Detailed technical data

Features

Dimensions (L x W x H)	80 mm x 30.4 mm x 53 mm
Light emission	Long and short side of housing, exchangeable
Adjustment	Manual adjustment, potentiometer
Switching function	Light/dark switching

Mechanics/electronics

Supply voltage V_S [1]	DC 10 V ... 30 V
Ripple [2]	≤ 5 V_{PP}
Power consumption [3]	< 80 mA
Switching frequency [4]	10 kHz
Response time [5]	50 µs
Switching output voltage	PNP: HIGH = V_S – ≤ 2 V / LOW approx. 0 V NPN: HIGH = approx. V_S / LOW ≤ 2 V
Output current $I_{max.}$	100 mA
Connection type	Connector M12, 4-pin
Protection class [6]	II
Circuit protection	V_S connections reverse-polarity protected Output Q short-circuit protected Interference suppression
Enclosure rating	IP 67
Weight	Approx. 400 g
Housing material	Die-cast zinc

[1] Limit values.
[2] May not exceed or fall short of V_S tolerances.
[3] Without load.
[4] With light/dark ratio 1:1.
[5] Signal transit time with resistive load.
[6] Reference voltage 50 V DC.

Ambient data

Ambient temperature	Operation: –10 °C ... +55 °C Storage: –25 °C ... +75 °C
Shock load	According to IEC 60068

Specific data

Light source [1]	Analog output Q_A	Time delay	Model name	Ordering information
LED green [2]	0.3 mA ... 10 mA	-	KT5G-2xxx51	B-38
	-	-	KT5G-2xxx11	B-38
	-	20 ms	KT5G-2xxx21	B-39
LED white [3]	0.3 mA ... 10 mA	-	KT5M-2xxx51	B-39
	-	-	KT5M-2xxx11	B-39

[1] Average service life of 100,000 h at T_A = +25 °C .
[2] Wave length: 520 nm.
[3] Wave length: 450 nm ... 650 nm.

Ordering information

KT5G-2xxx51

- **Light source:** LED green
- **Analog output Q_A:** 0.3 mA ... 10 mA
- **Time delay:** -

Sensing distance [1]	Sensing distance tolerance	Light spot size	Light spot direction [2]	Switching output	Model name	Part no.
10 mm	± 3 mm	1.2 mm x 4.2 mm	Vertical	PNP	KT5G-2P1151	1016195
				NPN	KT5G-2N1151	1016385
			Horizontal	PNP	KT5G-2P2151	1017809
20 mm	± 3 mm	1.5 mm x 5.5 mm	Vertical	PNP	KT5G-2P1251	1016196
				NPN	KT5G-2N1251	1022582
40 mm	± 3 mm	1.1 mm x 4.2 mm	Vertical	PNP	KT5G-2P1351	1016197
				NPN	KT5G-2N1351	1016728
			Horizontal	PNP	KT5G-2P2351	1018067
				NPN	KT5G-2N2351	1018068

[1] From front edge of lens.

[2] In relation to long side of housing.

KT5G-2xxx11

- **Light source:** LED green
- **Analog output Q_A:** -
- **Time delay:** -

Sensing distance [1]	Sensing distance tolerance	Light spot size	Light spot direction [2]	Switching output	Model name	Part no.
10 mm	± 3 mm	1.2 mm x 4.2 mm	Vertical	PNP	KT5G-2P1111	1015993
				NPN	KT5G-2N1111	1015981
			Horizontal	PNP	KT5G-2P2111	1016008
				NPN	KT5G-2N2111	1015990
20 mm	± 3 mm	1.5 mm x 5.5 mm	Vertical	PNP	KT5G-2P1211	1015999
				NPN	KT5G-2N1211	1015985
			Horizontal	PNP	KT5G-2P2211	1016010
				NPN	KT5G-2N2211	1015991
40 mm	± 3 mm	1.1 mm x 4.2 mm	Vertical	PNP	KT5G-2P1311	1016003
				NPN	KT5G-2N1311	1015988
			Horizontal	PNP	KT5G-2P2311	1016012
				NPN	KT5G-2N2311	1015992

[1] From front edge of lens.

[2] In relation to long side of housing.

KT5G-2xxx21

- **Light source:** LED green
- **Analog output Q_A: -**
- **Time delay:** 20 ms

Sensing distance [1]	Sensing distance tolerance	Light spot size	Light spot direction [2]	Switching output	Model name	Part no.
10 mm	± 3 mm	1.2 mm x 4.2 mm	Vertical	PNP	KT5G-2P1121	1015997
				NPN	KT5G-2N1121	1015983
			Horizontal	PNP	KT5G-2P2121	1016009
20 mm	± 3 mm	1.5 mm x 5.5 mm	Vertical	PNP	KT5G-2P1221	1016001
			Horizontal	PNP	KT5G-2P2221	1016011
40 mm	± 3 mm	1.1 mm x 4.2 mm	Vertical	PNP	KT5G-2P1321	1016005
			Horizontal	PNP	KT5G-2P2321	1016013

[1] From front edge of lens.

[2] In relation to long side of housing.

KT5M-2xxx51

- **Light source:** LED white
- **Analog output Q_A:** 0.3 mA ... 10 mA
- **Time delay: -**

Sensing distance [1]	Sensing distance tolerance	Light spot size	Light spot direction [2]	Switching output	Model name	Part no.
10 mm	± 3 mm	1.2 mm x 4.2 mm	Vertical	PNP	KT5M-2P1151	1044400

[1] From front edge of lens.

[2] In relation to long side of housing.

KT5M-2xxx11

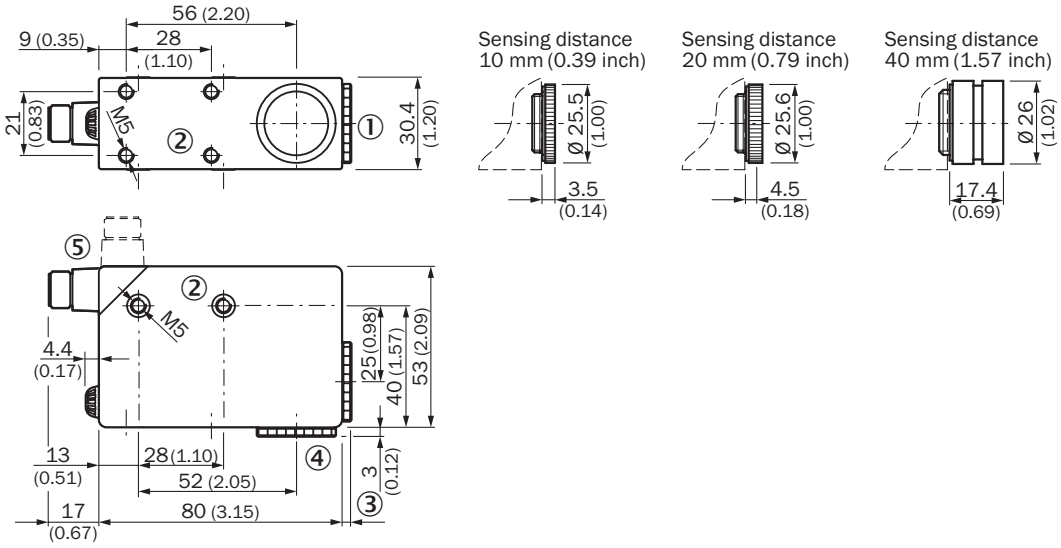
- **Light source:** LED white
- **Analog output Q_A: -**
- **Time delay: -**

Sensing distance [1]	Sensing distance tolerance	Light spot size	Light spot direction [2]	Switching output	Model name	Part no.
10 mm	± 3 mm	1.2 mm x 4.2 mm	Vertical	NPN	KT5M-2N1111	1048489

[1] From front edge of lens.

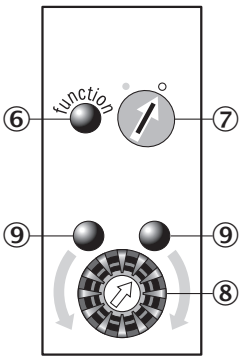
[2] In relation to long side of housing.

Dimensional drawing



All dimensions in mm (inch)

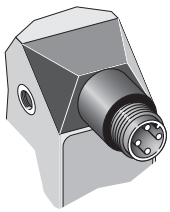
Adjustments

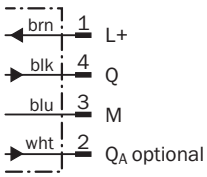


① Lens (light transmission), can be exchanged for pos. 4
② M5 threaded mounting hole, 5.5 mm deep
③ See dimensional drawing for lens
④ Blind screw can be replaced by pos. 1
⑤ Connector M12 (rotatable up to 90°)
⑥ Function signal indicator (yellow)
⑦ Pre-selection switch (light/dark switching)
⑧ Switching threshold adjustment
⑨ Adjustment indicators (green)

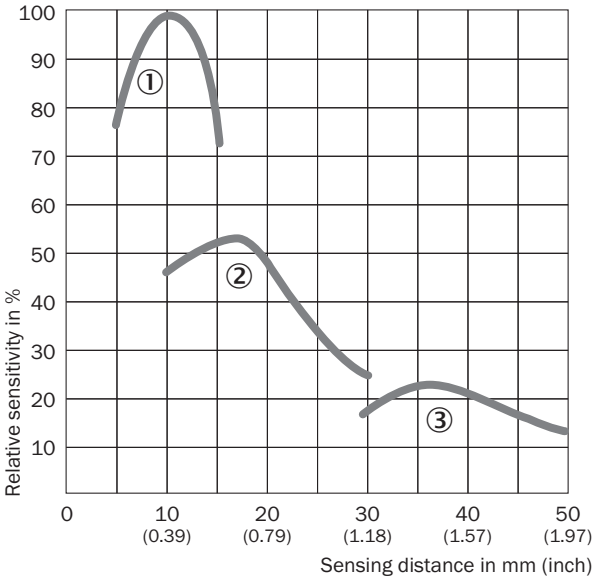
Connection type and diagram

Connector
M12, 4-pin





Sensing distance



① Sensing distance 10 mm
② Sensing distance 20 mm
③ Sensing distance 40 mm

B

Recommended accessories

Plug connectors and cables

Connector M12, 4-pin

Connector type	Enclosure rating	Flying leads	Sheath material	Cable length	Model name	Part no.
Female connector	IP 67	Straight	PVC	2 m	DOL-1204-G02M	6009382
				5 m	DOL-1204-G05M	6009866
				10 m	DOL-1204-G10M	6010543
				15 m	DOL-1204-G15M	6010753
		Angled	PVC	2 m	DOL-1204-W02M	6009383
				5 m	DOL-1204-W05M	6009867
				10 m	DOL-1204-W10M	6010541
		Straight	–	–	DOS-1204-G	6007302
		Angled	–	–	DOS-1204-W	6007303

Terminal and alignment brackets

Mounting system type	Description	Material	Model name	Part no.
Universal bar clamps	Plate G for universal bar clamp	Steel, zinc coated	BEF-KHS-G01	2022464
	Plate K for universal bar clamp	Steel, zinc coated	BEF-KHS-K01	2022718
	Universal bar clamp	Die-cast zinc	BEF-KHS-KH1	2022726
	Mounting rod straight	Steel, zinc coated	BEF-MS12G-A	4056054
			BEF-MS12G-B	4056055
	Mounting rod L-shaped	Steel, zinc coated	BEF-MS12L-A	4056052
			BEF-MS12L-B	4056053

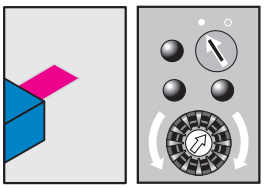
Lenses (only replacement 1:1)

Sensing distance	Model name	Part no.
10 mm	OBJ-211	1004936
20 mm	OBJ-212	1011506
40 mm	OBJ-210	2010945

For additional accessories including dimensional drawings, please see page G-1

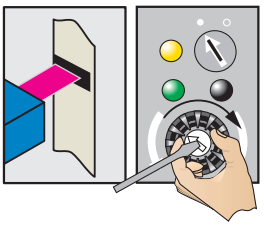
Setting the switching threshold via potentiometer

1. Select switching function (light/dark)



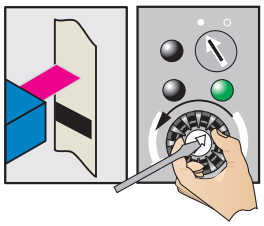
Turn the rotary switch to the desired position.
○ = light switching
● = dark switching

2. Position mark

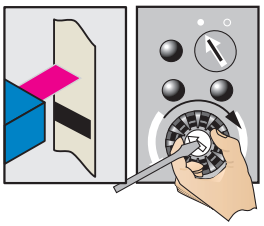


Turn potentiometer in the direction shown (green LED illuminates) until the yellow LED status changes and the green LED opposite illuminates.

3. Position background



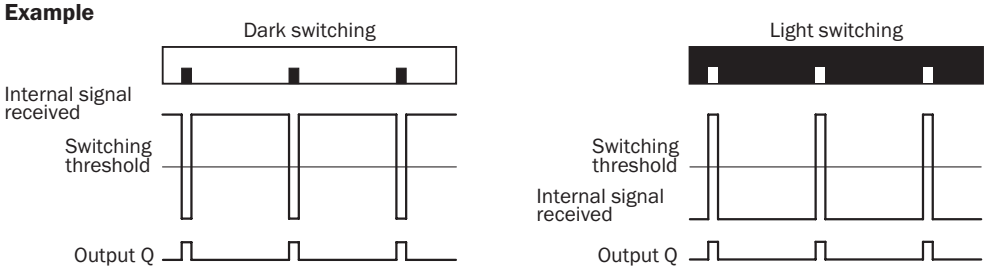
Gradually turn back the potentiometer (count the number of turns) until the yellow LED changes status again and illuminates.



Turn the potentiometer forward again by half the number of turns to ensure that the switching threshold is optimally set.

B

Example



Switching characteristics

The switching threshold is set in the center between the background and the mark.

Contrast sensors with easy teach-in

B

Product description

KT5-2 contrast sensors are ideal for high-precision contrast detection, such as for detecting marks on high-gloss materials. Due to the 3-color LED technology, the sensors activate the best possible emitted light source for each contrast. In addition, the sensors feature application-specific teach-in processes. The sensor defines all necessary parameters automatically – either via the teach-in button on the device or via an external control cable. The sensor then determines the ideal switching threshold from the two gray values detected. High-precision contrast detection; automatic adaptation for high-gloss objects; sensing distances of 10 mm, 20 mm and 40 mm; a switching frequency of 10 kHz; and individual alignment and mounting options make the device suitable for a wide range of tasks. Lastly, the 90° rotatable M12 plug provides simple mounting.

At a glance

- Tough, metal housing
- Various teach-in methods via control panel or control cable
- Maximum detection reliability due to 3-color RGB LED technology
- Switching frequency of 10 kHz
- Various sensing distances and light spot directions
- M12 plug can be rotated 90°

Your benefits

- All print marks and color combinations are reliably detected, ensuring high machine throughput
- Reliable operation, even with jittering webs and high-gloss materials
- High positioning accuracy improves packaging quality
- Various sensing distances, light spot directions and light emissions make individual configuration and simple integration into the production process possible

Additional information

8013816/2011-05-30
Subject to change without notice

Detailed technical data

Features

Dimensions (L x W x H)	80 mm x 30.4 mm x 53 mm
Light emission	Long and short side of housing, exchangeable

Mechanics/electronics

Supply voltage V_S [1]	DC 10 V ... 30 V
Ripple [2]	≤ 5 V_{PP}
Power consumption [3]	< 80 mA
Switching frequency [4]	10 kHz
Response time [5]	50 µs
Switching output voltage	PNP: HIGH = V_S – ≤ 2 V / LOW approx. 0 V NPN: HIGH = approx. V_S / LOW ≤ 2 V
Output current $I_{max.}$	100 mA
Input, teach-in (ET)	PNP: Teach: U = 10 V ... < U_V Run: U < 2 V NPN: Teach: U < 2 V Run: U = 10 V ... < U_V
Input, light/dark (L/D)	PNP: Light: U = 0 V Dark: U > 10 V ... < U_V NPN: Light: U = U_V Dark: U = 0 V
Retention time (ET)	25 ms, non-volatile memory
Protection class [6]	II III (KT5RG)
Circuit protection	V_S connections reverse-polarity protected Output Q short-circuit protected Interference suppression
Enclosure rating	IP 67
Weight	Approx. 400 g
Housing material	Die-cast zinc

[1] Limit values. Operation in short-circuit protected network max. 8 A.
[2] May not exceed or fall short of V_S tolerances.
[3] Without load.
[4] With light/dark ratio 1:1.
[5] Signal transit time with resistive load.
[6] Reference voltage 50 V DC.

Ambient data

Ambient temperature	Operation: –10 °C ... +55 °C Storage: –25 °C ... +75 °C
Shock load	According to IEC 60068

B

Specific data

Light source [1]	Connection type	Adjustment	Model name	Ordering information
LED red, green, blue [2]	Connector M12, 5-pin	Static 2-point teach-in	KT5W-xxx6	B-46
		Dynamic teach-in	KT5W-xxx3	B-46
LED red, green [3]	Connector M12, 4-pin	Static 2-point teach-in	KT5RG-xxx6	B-47

[1] Average service life of 100,000 h at T_A = +25 °C .

[2] Wave length: 470 nm, 525 nm, 640 nm.

[3] Wave length: 525 nm, 640 nm.

B

Ordering information

KT5W-xxx6

- **Light source:** LED red, green, blue
- **Connection type:** Connector M12, 5-pin
- **Adjustment:** Static 2-point teach-in

Sensing distance [1]	Sensing distance tolerance	Light spot size	Light spot direction [2]	Time delay	Switching output	Model name	Part no.
10 mm	± 3 mm	1.2 mm x 4.2 mm	Vertical	20 ms	PNP	KT5W-2P1126	1018587
				–	PNP	KT5W-2P1116	1018044
					NPN	KT5W-2N1116	1018045
			Horizontal	–	PNP	KT5W-2P2116	1022312
20 mm	± 3 mm	1.5 mm x 5.5 mm	Vertical	–	PNP	KT5W-2P1216	1018586
					NPN	KT5W-2N1216	1019022
			Horizontal	–	PNP	KT5W-2P2216	1019020
40 mm	± 3 mm	1.1 mm x 4.2 mm	Vertical	–	PNP	KT5W-2P1316	1018961
					NPN	KT5W-2N1316	1022687

[1] From front edge of lens.

[2] In relation to long side of housing.

KT5W-xxx3

- **Light source:** LED red, green, blue
- **Connection type:** Connector M12, 5-pin
- **Adjustment:** Dynamic teach-in

Sensing distance [1]	Sensing distance tolerance	Light spot size	Light spot direction [2]	Time delay	Switching output	Model name	Part no.
10 mm	± 3 mm	1.2 mm x 4.2 mm	Vertical	20 ms	PNP	KT5W-2P1123	1017810
				–	PNP	KT5W-2P1113	1016629
					NPN	KT5W-2N1113	1016630
			Horizontal	–	PNP	KT5W-2P2113	1018043
					NPN	KT5W-2N2113	1018042
20 mm	± 3 mm	1.5 mm x 5.5 mm	Vertical	–	PNP	KT5W-2P1213	1016715
					NPN	KT5W-2N1213	1016716
40 mm	± 3 mm	1.1 mm x 4.2 mm	Vertical	20 ms	PNP	KT5W-2P1323	1018808
			Horizontal	20 ms	PNP	KT5W-2P2323	1022165

[1] From front edge of lens.

[2] In relation to long side of housing.

KT5RG-xxx6

- **Light source:** LED red, green
- **Connection type:** Connector M12, 4-pin
- **Adjustment:** Static 2-point teach-in

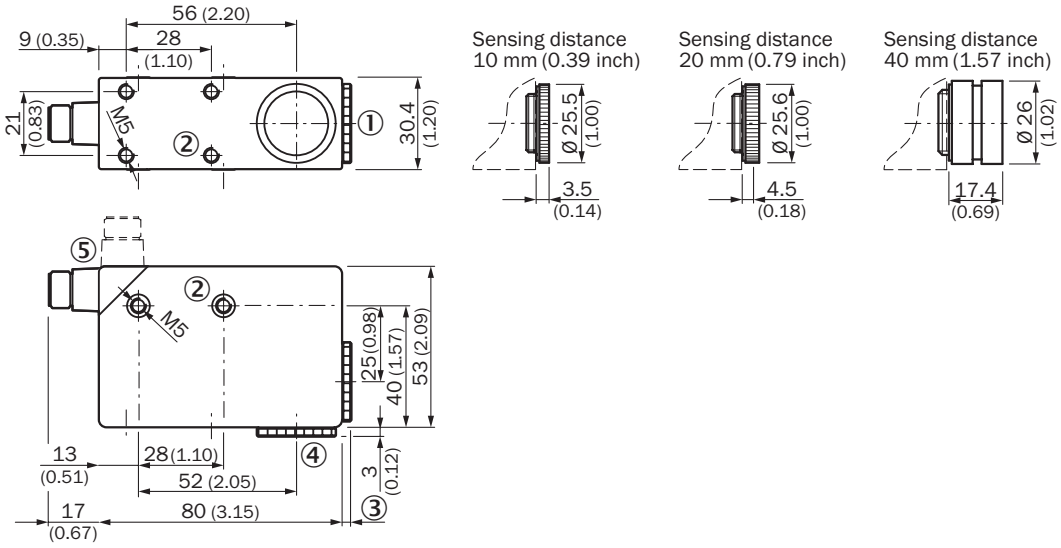
Sensing distance [1]	Sensing distance tolerance	Light spot size	Light spot direction [2]	Time delay	Switching output	Model name	Part no.
10 mm	± 3 mm	1.2 mm x 4.2 mm	Vertical	20 ms	PNP	KT5RG-2P1126	1027396
				–	PNP	KT5RG-2P1116	1027393
					NPN	KT5RG-2N1116	1027394

[1] From front edge of lens.

[2] In relation to long side of housing.

B

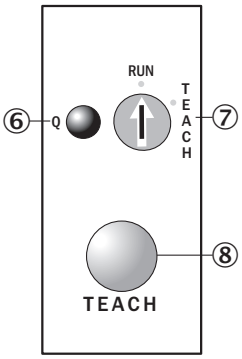
Dimensional drawing



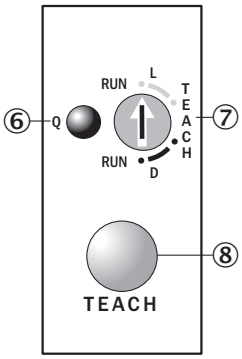
All dimensions in mm (inch)

Adjustments

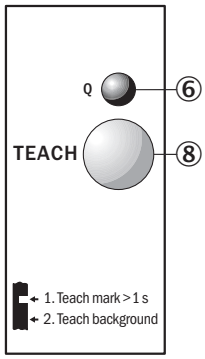
KT5-2 Teach-in
KT5W-xxx6



KT5-2 Teach-in
KT5W-xxx3



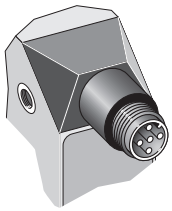
KT5-2 Teach-in
KT5RG-xxx6



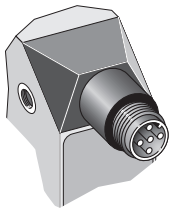
① Lens (light transmission), can be exchanged for pos. 4
② M5 threaded mounting hole, 5.5 mm deep
③ See dimensional drawing for lens
④ Blind screw can be replaced by pos. 1
⑤ Connector M12 (rotatable up to 90°)
⑥ Function signal indicator (yellow)
⑦ Pre-selection switch
⑧ Teach-in button

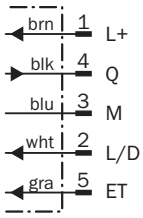
Connection type and diagram

KT5W-xxx6
Connector
M12, 5-pin

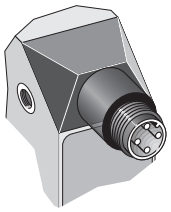


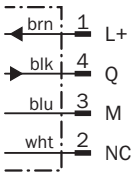
KT5W-xxx3
Connector
M12, 5-pin





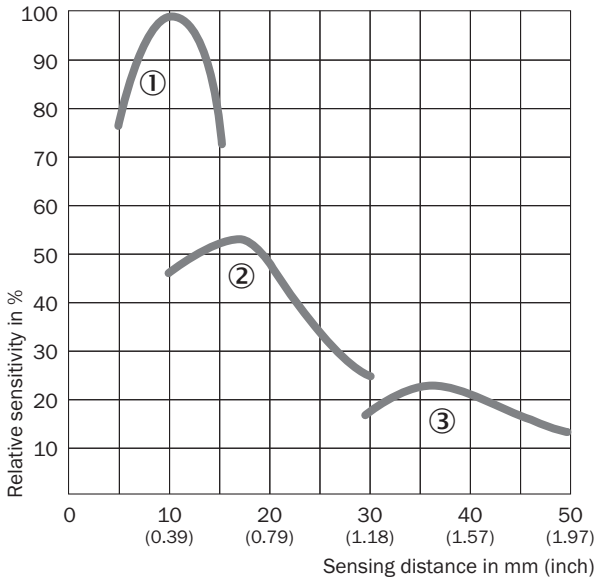
KT5RG-xxx6
Connector
M12, 4-pin





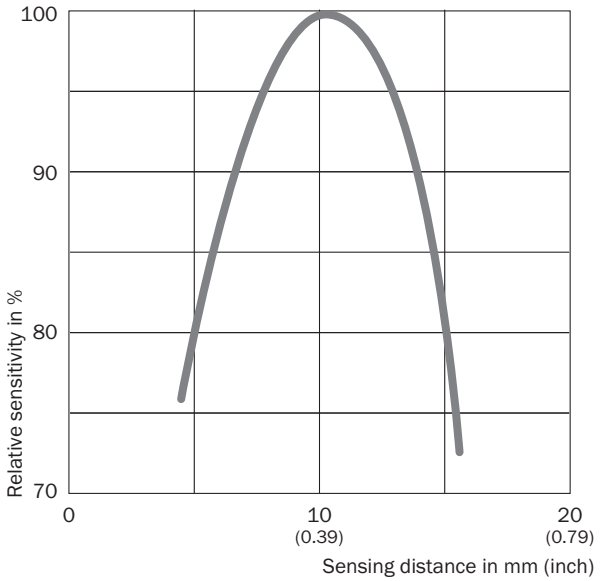
Sensing distance

KT5-2 Teach-in
KT5W



① Sensing distance 10 mm
② Sensing distance 20 mm
③ Sensing distance 40 mm

KT5-2 Teach-in
KT5RG



Recommended accessories

Plug connectors and cables

Connector M12, 4-pin

Connector type	Enclosure rating	Flying leads	Sheath material	Cable length	Type	Part no.
Female connector	IP 67	Straight	PVC	2 m	DOL-1204-G02M	6009382
				5 m	DOL-1204-G05M	6009866
				10 m	DOL-1204-G10M	6010543
				15 m	DOL-1204-G15M	6010753
		Angled	PVC	2 m	DOL-1204-W02M	6009383
				5 m	DOL-1204-W05M	6009867
				10 m	DOL-1204-W10M	6010541
		Straight			DOS-1204-G	6007302
		Angled			DOS-1204-W	6007303

Connector M12, 5-pin

Connector type	Enclosure rating	Flying leads	Sheath material	Cable length	Model name	Part no.
Female connector	IP 67	Straight	PVC	2 m	DOL-1205-G02M	6008899
				5 m	DOL-1205-G05M	6009868
				10 m	DOL-1205-G10M	6010544
		Angled	PVC	2 m	DOL-1205-W02M	6008900
				5 m	DOL-1205-W05M	6009869
				10 m	DOL-1205-W10M	6010542
		Straight	–	–	DOS-1205-G	6009719
		Angled	–	–	DOS-1205-W	6009720

Terminal and alignment brackets

Mounting system type	Description	Material	Model name	Part no.
Universal bar clamps	Plate G for universal bar clamp	Steel, zinc coated	BEF-KHS-G01	2022464
	Plate K for universal bar clamp	Steel, zinc coated	BEF-KHS-K01	2022718
	Universal bar clamp	Die-cast zinc	BEF-KHS-KH1	2022726
	Mounting rod straight	Steel, zinc coated	BEF-MS12G-A	4056054
			BEF-MS12G-B	4056055
	Mounting rod L-shaped	Steel, zinc coated	BEF-MS12L-A	4056052
			BEF-MS12L-B	4056053

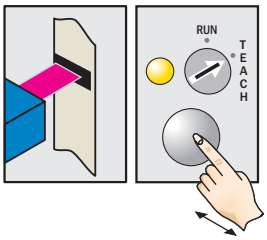
Lenses (only replacement 1:1)

Sensing distance	Model name	Part no.
10 mm	OBJ-211	1004936
20 mm	OBJ-212	1011506
40 mm	OBJ-210	2010945

For additional accessories including dimensional drawings, please see page G-1

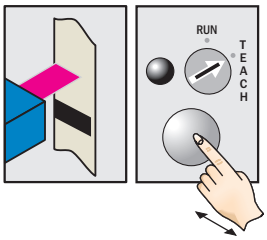
Setting the switching threshold via teach-in (static 2-point teach-in)

1. Position mark



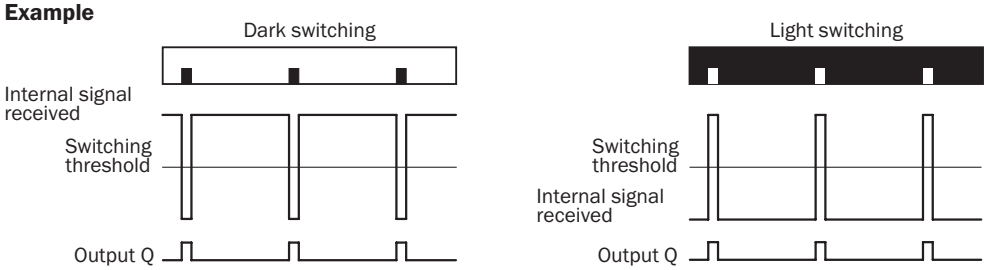
Turn rotary switch to “Teach” position. Press and hold teach-in button > 1 s.
Red emitted light and yellow LED flash.

2. Position background



Press and hold teach-in button > 1 s.
Yellow LED goes out.

Example



Switching characteristics

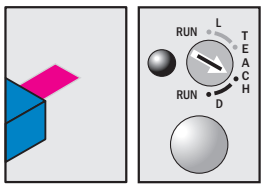
The optimum emitted light is selected automatically.
Light/dark setting is defined using teach-in sequence.
The switching threshold is set in the center between the background and the mark.
Teach-in can also be performed using an external control signal.

B

B

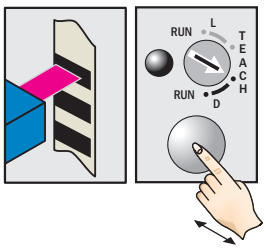
Setting the switching threshold via teach-in (dynamic)

1. Select switching function (light/dark)



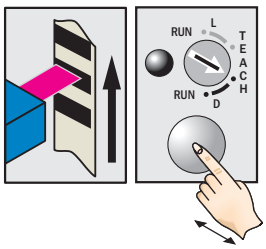
Turn rotary switch to desired teach position:
D = dark switching
L = light switching

2. Position mark or background

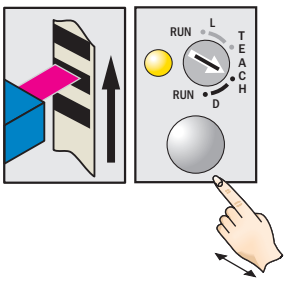


Press the teach-in button and keep it pressed.

3. Move at least one repeat length using the light spot

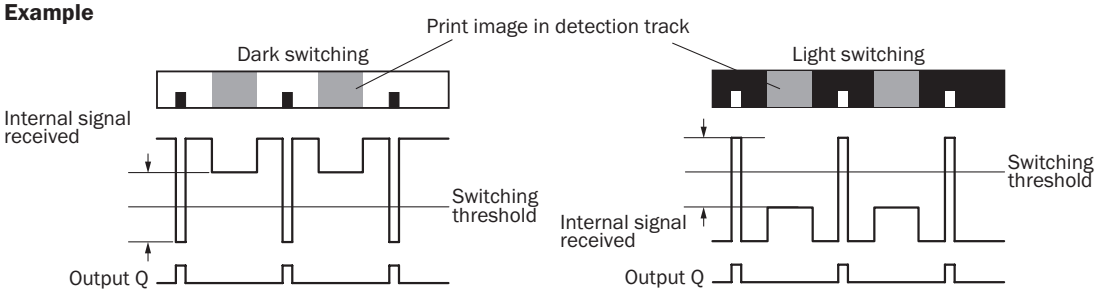


Keep the teach-in button pressed.



Release the teach-in button. Yellow LED will illuminate, when emitted light is on the mark.

Example



Switching characteristics

The optimum emitted light is selected automatically.
The switching threshold is set in the center between the lowest and the second-lowest reflectivity.
Teach-in can also be performed using an external control signal.
Light/dark setting can also be configured using an external control signal.
Observe the minimum speed (25 mm/s ... 300 mm/s).

B

Contrast sensors with intelligent bar graph display

Product description

Contrast sensors are used primarily for reading printed or control marks and stamps. The KT5-2 Display contrast sensor sets standards in performance and ease of use. The sensor's integrated bar graph display and unique threshold adjustments enable users to easily inspect and adjust parameters in the field. In addition, the operator is able to detect the current signal level, read the taught-in switching threshold, and manually adjust the switching threshold using the "+"/"–" button. If the quality of the print mark changes, for instance, the sensor can be easily readjusted "in process." The optimal emitted light color is selected automatically due to 3-color LED technology. The gray values of the mark and the background are taught-in during the 2-point teach-in process. The sensor, which is able to determine the optimal switching threshold automatically, has a switching frequency of 10 kHz – ensuring efficient machine production processes. A variety of sensing distances and individual alignment and mounting options make the device suitable for a wide range of tasks.

At a glance

- Intuitive 10-segment bar graph display indicates detection status
- Static 2-point teach-in of mark and background via the control cable
- Maximum detection reliability due to 3-color RGB LED technology
- Switching frequency of 10 kHz
- Automatic gloss adjustment for highly reflective materials
- A range of sensing distances and light spots for numerous applications
- M12 plug can be rotated 90°

Your benefits

- All print marks and color combinations are detected, ensuring high throughput
- Reliable operation, even with high-gloss materials
- Detects difficult marks, such as jittering and shiny materials
- High positioning accuracy improves packaging quality
- Application-specific teach-in processes reduce setup times
- Various sensing distances, light spot directions and light emissions make individual configuration and simple integration into the production system possible

Additional information

8013816/2011-05-30
Subject to change without notice

Detailed technical data

Features

Dimensions (L x W x H)	80 mm x 30.4 mm x 53 mm
Light source [1) 2)]	LED red, green, blue
Light emission	Long and short side of housing, exchangeable
Adjustment	Static 2-point teach-in with manual fine adjustment

[1)] Average service life of 100,000 h at T_A = +25 °C .

[2)] Wave length: 470 nm, 525 nm, 640 nm.

Mechanics/electronics

Supply voltage V_S [1)]	DC 10 V ... 30 V
Ripple [2)]	≤ 5 V_{PP}
Power consumption [3)]	< 130 mA
Switching frequency [4)]	10 kHz
Response time [5)]	50 µs
Switching output voltage	PNP: HIGH = V_S – ≤ 2 V / LOW approx. 0 V NPN: HIGH = approx. V_S / LOW ≤ 2 V
Output current $I_{max.}$ [6)]	100 mA
Input, teach-in (ET)	PNP: Teach: U = 10 V ... < U_V Run: U < 2 V NPN: Teach: U < 2 V Run: U = 10 V ... < U_V
Retention time (ET)	25 ms, non-volatile memory
Connection type	Connector M12, 5-pin
Protection class [7)]	II
Circuit protection	V_S connections reverse-polarity protected Output Q short-circuit protected Interference suppression
Enclosure rating	IP 67
Weight	Approx. 400 g
Housing material	Die-cast zinc

[1)] Limit values. Operation in short-circuit protected network max. 8 A.

[2)] May not exceed or fall short of V_S tolerances.

[3)] Without load.

[4)] With light/dark ratio 1:1.

[5)] Signal transit time with resistive load.

[6)] Short-circuit protected.

[7)] Reference voltage 50 V DC.

Ambient data

Ambient temperature	Operation: –10 °C ... +55 °C Storage: –25 °C ... +75 °C
Shock load	According to IEC 60068

B

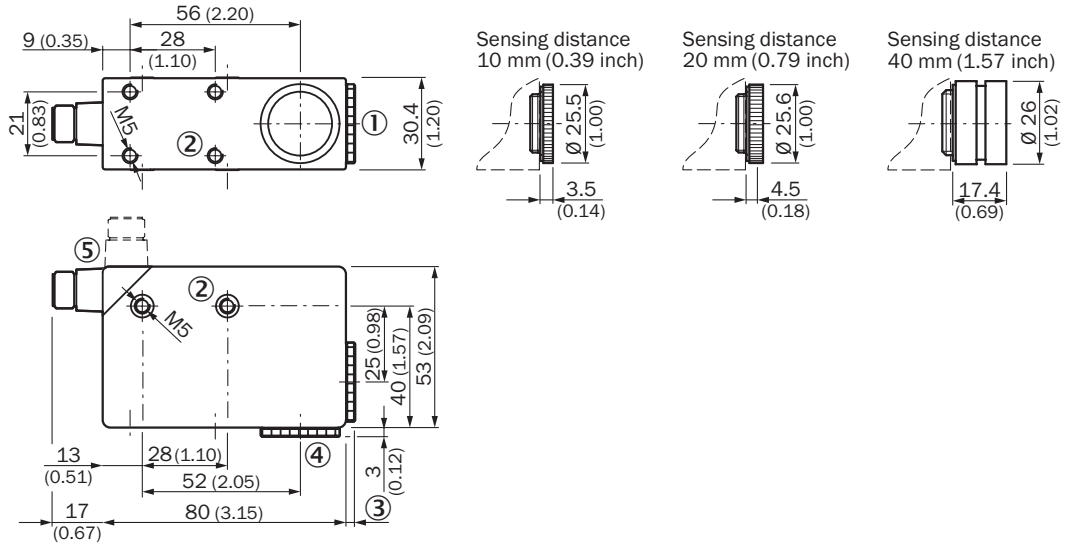
Ordering information

Sensing distance [1]	Sensing distance tolerance	Light spot size	Light spot direction [2]	Time delay	Switching output	Model name	Part no.
10 mm	± 3 mm	1.2 mm x 4.2 mm	Vertical	20 ms	PNP	KT5W-2P1126D	1026579
					NPN	KT5W-2N1126D	1026582
				–	PNP	KT5W-2P1116D	1026538
					NPN	KT5W-2N1116D	1026540
			Horizontal	–	PNP	KT5W-2P2116D	1026584
					NPN	KT5W-2N2116D	1026583
20 mm	± 3 mm	1.5 mm x 5.5 mm	Vertical	–	PNP	KT5W-2P1216D	1026577
					NPN	KT5W-2N1216D	1026580
40 mm	± 3 mm	1.1 mm x 4.2 mm	Vertical	–	PNP	KT5W-2P1316D	1026578
					NPN	KT5W-2N1316D	1026581

[1] From front edge of lens.

[2] In relation to long side of housing.

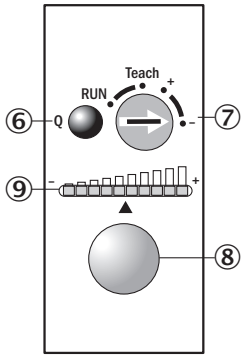
Dimensional drawing



All dimensions in mm (inch)

① Lens (light transmission), can be exchanged for pos. 4
② M5 threaded mounting hole, 5.5 mm deep
③ See dimensional drawing for lens
④ Blind screw can be replaced by pos. 1
⑤ Connector M12 (rotatable up to 90°)

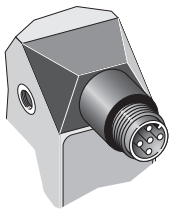
Adjustments

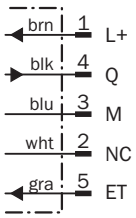


⑥ Function signal indicator (yellow)
⑦ Pre-selection switch
⑧ Teach-in button
⑨ Bar graph (green)

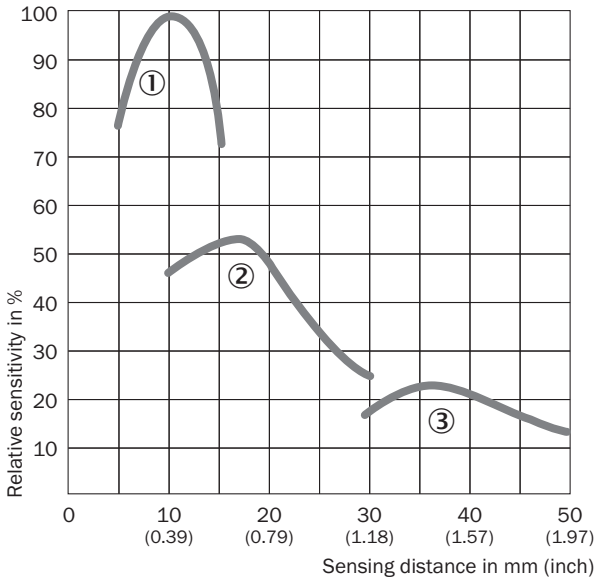
Connection type and diagram

Connector
M12, 5-pin





Sensing distance



① Sensing distance 10 mm
② Sensing distance 20 mm
③ Sensing distance 40 mm

B

Recommended accessories

Plug connectors and cables

Connector M12, 5-pin

Connector type	Enclosure rating	Flying leads	Sheath material	Cable length	Model name	Part no.
Female connector	IP 67	Straight	PVC	2 m	DOL-1205-G02M	6008899
				5 m	DOL-1205-G05M	6009868
				10 m	DOL-1205-G10M	6010544
		Angled	PVC	2 m	DOL-1205-W02M	6008900
				5 m	DOL-1205-W05M	6009869
				10 m	DOL-1205-W10M	6010542
		Straight	–	–	DOS-1205-G	6009719
		Angled	–	–	DOS-1205-W	6009720

Terminal and alignment brackets

Mounting system type	Description	Material	Model name	Part no.
Universal bar clamps	Plate G for universal bar clamp	Steel, zinc coated	BEF-KHS-G01	2022464
	Plate K for universal bar clamp	Steel, zinc coated	BEF-KHS-K01	2022718
	Universal bar clamp	Die-cast zinc	BEF-KHS-KH1	2022726
	Mounting rod straight	Steel, zinc coated	BEF-MS12G-A	4056054
			BEF-MS12G-B	4056055
	Mounting rod L-shaped	Steel, zinc coated	BEF-MS12L-A	4056052
			BEF-MS12L-B	4056053

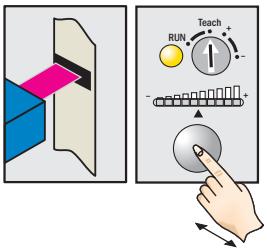
Lenses (only replacement 1:1)

Sensing distance	Model name	Part no.
10 mm	OBJ-211	1004936
20 mm	OBJ-212	1011506
40 mm	OBJ-210	2010945

For additional accessories including dimensional drawings, please see page G-1

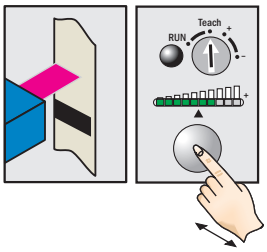
Setting the switching threshold via teach-in (static 2-point teach-in)

1. Position mark

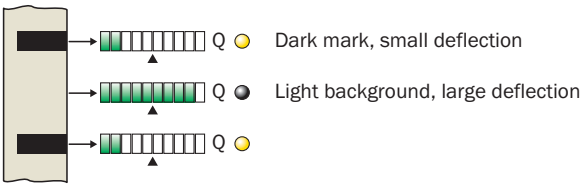


Turn rotary switch to “Teach” position. Press and hold teach-in button > 1 s.
Red emitted light and yellow LED flash.

2. Position background



Press and hold teach-in button > 1 s.
Yellow LED goes out.
Optimum emitted light is selected.

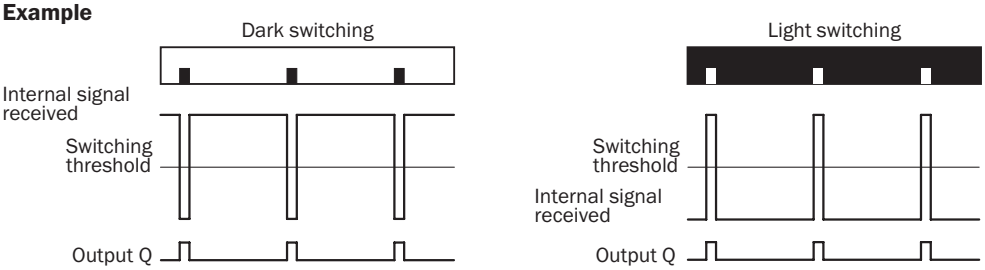


Fine adjustment possible using the “+”/“–” buttons.

Note

The bar display visualizes the detection reliability during teach-in. The more LEDs that illuminate, the better the teach-in:
1 LED illuminates = operation not reliable – contrast difference too low
≤ 4 LEDs illuminate = operation OK – sufficient contrast difference
> 4 LEDs illuminate = reliable operation – high contrast difference

Example



Switching characteristics

The optimum emitted light is selected automatically.
Light/dark setting is defined using teach-in sequence.
The switching threshold is set in the center between the background and the mark.
Teach-in can also be performed using an external control signal.

B

Contrast sensors with fiber-optic cables

Product description

When steam, heat or dust are present, the KTL5-2 family of contrast sensors with fiber-optic cables offers the ideal solution. Various straight or angled fiber-optics can be easily mounted on the sensor. Due to the 3-color RGB LED technology, the sensors are able to activate the best possible emitted light source for each contrast. In addition, the sensors feature application-specific teach-in processes. The sensor defines all necessary parameters automatically – either via the teach-in button on the device or via an external control cable. The sensor then determines the ideal switching threshold from the two gray values detected. High-precision contrast detection, automatic adaptation for high-gloss objects, a 10 kHz switching frequency, analog output, and individual alignment and mounting options make the device suitable for a wide range of tasks.

At a glance

- Various heat-resistant fiber-optic cable models are available
- Various teach-in methods, including potentiometer
- Analog output
- Switching frequency of 10 kHz

Your benefits

- Reliable contrast detection
- Flexible integration into machines due to minimal space requirements and various fiber-optic cable versions
- Durable, glass fiber-optic cables
- Reliable operation in adverse environmental conditions, such as extreme temperatures and moisture
- Resistant to aggressive cleaning agents
- Compact design fits in applications with limited space

Additional information

8013816/2011-05-30
Subject to change without notice

Detailed technical data

Features

Dimensions (L x W x H)	80 mm x 30.4 mm x 53 mm
Sensing distance	Dependent on the fiber-optic cable
Light spot size	Dependent on the fiber-optic cable
Switching function	Light/dark switching

Mechanics/electronics

Supply voltage V_S [1]	DC 10 V ... 30 V
Ripple [2]	≤ 5 V_{PP}
Power consumption [3]	< 80 mA
Switching frequency [4]	10 kHz
Response time [5]	50 µs
Switching output voltage	PNP: HIGH = V_S – ≤ 2 V / LOW approx. 0 V NPN: HIGH = approx. V_S / LOW ≤ 2 V
Output current $I_{max.}$	100 mA
Input, teach-in (ET)	PNP: Teach: U = 10 V ... < U_V Run: U < 2 V NPN: Teach: U < 2 V Run: U = 10 V ... < U_V
Input, light/dark (L/D)	PNP: light: U = 0 V Dark: U > 10 V ... < U_V NPN: light: U = U_V Dark: U = 0 V
Retention time (ET)	25 ms, non-volatile memory
Protection class [6]	II
Circuit protection	V_S connections reverse-polarity protected Output Q short-circuit protected Interference suppression
Enclosure rating	IP 67
Weight	Approx. 400 g
Housing material	Die-cast zinc

[1] Limit values. Operation in short-circuit protected network max. 8 A.
[2] May not exceed or fall short of V_S tolerances.
[3] Without load.
[4] With light/dark ratio 1:1.
[5] Signal transit time with resistive load.
[6] Reference voltage 50 V DC.

Ambient data

Ambient temperature	Operation: –10 °C ... +55 °C Storage: –25 °C ... +75 °C
Shock load	According to IEC 60068

Ordering information

Light source [1]	Connection type	Adjustment	Time delay	Switching output	Analog output Q_A	Model name	Part no. [2]
LED green [3]	Connector M12, 4-pin	Manual adjustment, potentiometer	–	PNP	–	KTL5G-2P11	1016294
					0.3 mA ... 10 mA	KTL5G-2P51	1016950
				NPN	–	KTL5G-2N11	1016295
					0.3 mA ... 10 mA	KTL5G-2N51	1016951
LED red, green, blue [4]	Connector M12, 5-pin	Dynamic teach-in	20 ms	PNP	–	KTL5W-2P23	1019551
			–	PNP	–	KTL5W-2P13	1027562
				NPN	–	KTL5W-2N13	1019661
		Static 2-point teach-in	–	PNP	–	KTL5W-2P16	1026006
				NPN	–	KTL5W-2N16	1025995

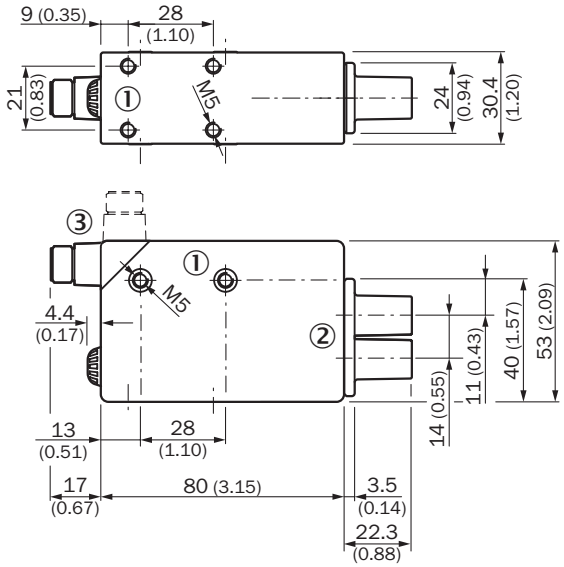
[1] Average service life of 100,000 h at T_A = +25 °C.

[2] Fiber-optic adapter supplied with the sensor.

[3] Wave length: 520 nm.

[4] Wave length: 470 nm, 525 nm, 640 nm.

Dimensional drawing

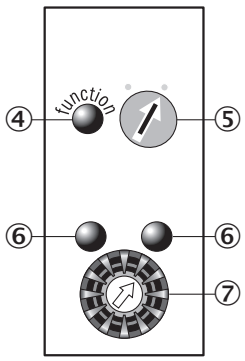


All dimensions in mm (inch)

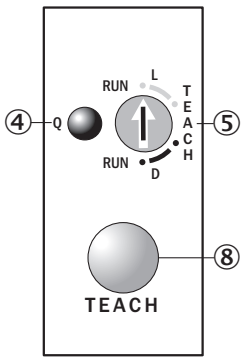
① M5 threaded mounting hole, 5.5 mm deep
② Fiber-optic adapter (M12 x 1 internal thread)
③ Connector M12 (rotatable up to 90°)

Adjustments

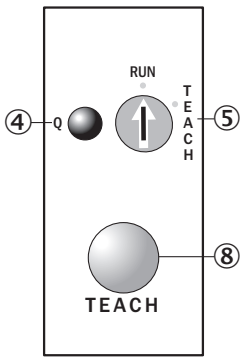
KTL5-2 Fiber-optic
KTL5G-xxx1



KTL5-2 Fiber-optic
KTL5W-xxx3



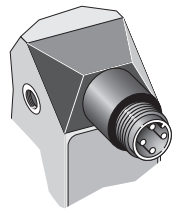
KTL5-2 Fiber-optic
KTL5W-xxx6

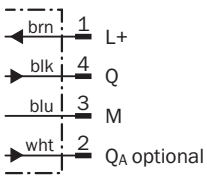


④ Function signal indicator (yellow)
⑤ Pre-selection switch
⑥ Adjustment indicators (green)
⑦ Switching threshold adjustment
⑧ Teach-in button

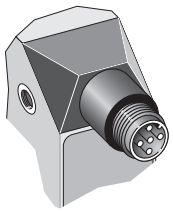
Connection type and diagram

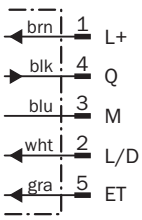
KTL5G-xxx1
Connector
M12, 4-pin



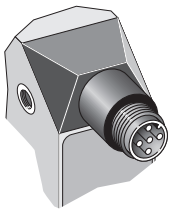


KTL5W-xxx3
Connector
M12, 5-pin





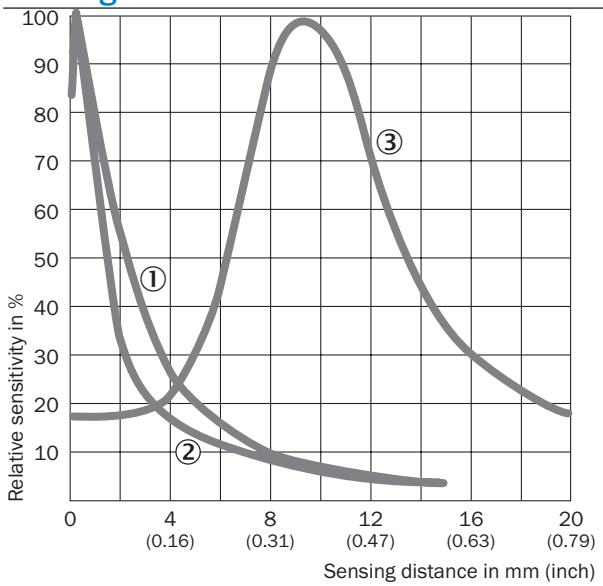
KTL5W-xxx6
Connector
M12, 5-pin



B

B

Sensing distance



① Fiber-optic cable LBST32900
② Fiber-optic cable LBSR32900
③ Fiber-optic cable OCSL

Recommended accessories

Plug connectors and cables

Connector M12, 4-pin

Connector type	Enclosure rating	Flying leads	Sheath material	Cable length	Model name	Part no.
Female connector	IP 67	Straight	PVC	2 m	DOL-1204-G02M	6009382
				5 m	DOL-1204-G05M	6009866
				10 m	DOL-1204-G10M	6010543
				15 m	DOL-1204-G15M	6010753
		Angled	PVC	2 m	DOL-1204-W02M	6009383
				5 m	DOL-1204-W05M	6009867
				10 m	DOL-1204-W10M	6010541
		Straight	–	–	DOS-1204-G	6007302
		Angled	–	–	DOS-1204-W	6007303

Connector M12, 5-pin

Connector type	Enclosure rating	Flying leads	Sheath material	Cable length	Model name	Part no.
Female connector	IP 67	Straight	PVC	2 m	DOL-1205-G02M	6008899
				5 m	DOL-1205-G05M	6009868
				10 m	DOL-1205-G10M	6010544
		Angled	PVC	2 m	DOL-1205-W02M	6008900
				5 m	DOL-1205-W05M	6009869
				10 m	DOL-1205-W10M	6010542
		Straight	–	–	DOS-1205-G	6009719
		Angled	–	–	DOS-1205-W	6009720

Terminal and alignment brackets

Mounting system type	Description	Material	Model name	Part no.
Universal bar clamps	Plate G for universal bar clamp	Steel, zinc coated	BEF-KHS-G01	2022464
	Plate K for universal bar clamp	Steel, zinc coated	BEF-KHS-K01	2022718
	Universal bar clamp	Die-cast zinc	BEF-KHS-KH1	2022726
	Mounting rod straight	Steel, zinc coated	BEF-MS12G-A	4056054
			BEF-MS12G-B	4056055
	Mounting rod L-shaped	Steel, zinc coated	BEF-MS12L-A	4056052
			BEF-MS12L-B	4056053

B

Fiber-optic cables

Core material	Length, fiber-optic cable	Min. bend radius, fiber-optic cable	System	Max. sensing distance	Model name [1]	Part no.
Fiber glass	900 mm	19 mm	Proximity system	9 mm [2]	LBSA32900	7020040
					LBSAA23900	7020103
					LBSAT32900	7020036
					LBSF32900	7020038
					LBSM12900	7020054
					LBSP16900	7020044
					LBSR16900	7020050
					LBSR32900	7020042
					LBSR40900	7020052
					LBST32900	7020046
					LBSTA32900	7020048
				20 mm	OCSL	1016296
			Through-beam system	20 mm	LISA32900	7020039
					LISAA23900	7020102
					LISAT32900	7020035
					LISF32900	7020037
					LISM12900	7020053
					LISP16900	7020043
					LISR16900	7020049
					LISR32900	7020041
					LISR40900	7020051
					LIST32900	7020045
					LISTA32900	7020047

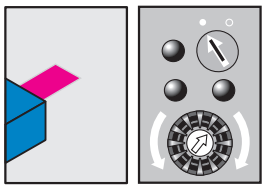
[1] For screwing.
[2] Material to be scanned with 90 % reflectance (DIN5033), Size of material to be scanned = light spot diameter (acceptance angle approx. 60°).

For additional accessories including dimensional drawings, please see page G-1

B

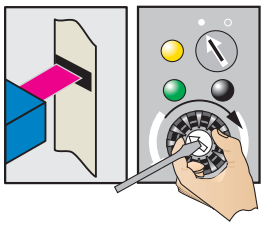
Setting the switching threshold via potentiometer

1. Select switching function (light/dark)



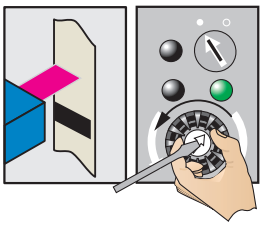
Turn the rotary switch to the desired position:
○ = light switching
● = dark switching

2. Position mark

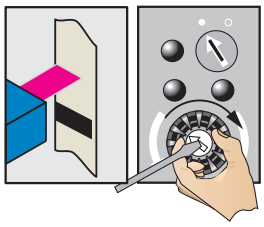


Turn potentiometer in the direction shown (green LED illuminates) until the yellow LED status changes and the green LED opposite illuminates.

3. Position background



Gradually turn back the potentiometer (count the number of turns) until the yellow LED changes status again and illuminates.

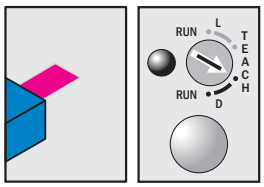


Turn the potentiometer forward again by half the number of turns to ensure that the switching threshold is optimally set.

Switching characteristics
The optimum emitted light is selected automatically.
The switching threshold is set in the center between the background and the mark.

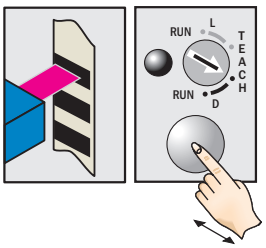
Setting the switching threshold via teach-in (dynamic)

1. Select switching function (light/dark)



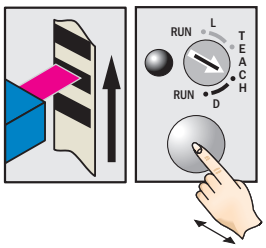
Turn the rotary switch to the desired teach position:
D = dark switching
L = light switching

2. Position mark or background

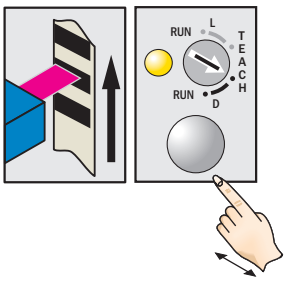


Press the teach-in button and keep it pressed.

3. Move at least one repeat length using the light spot

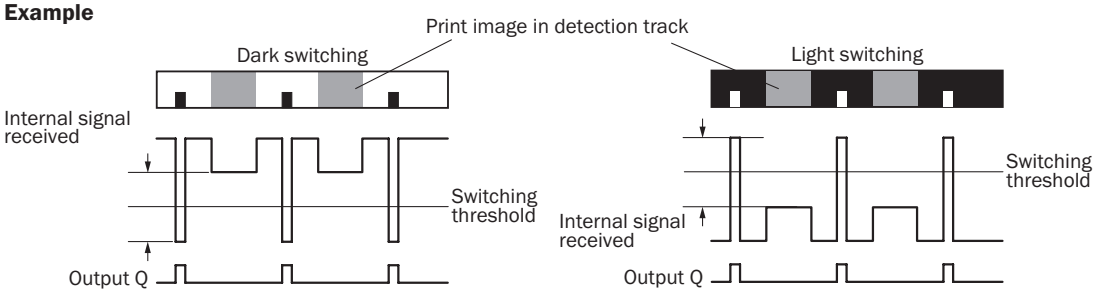


Keep the teach-in button pressed.



Release the teach-in button. Yellow LED will illuminate, when emitted light is on the mark.

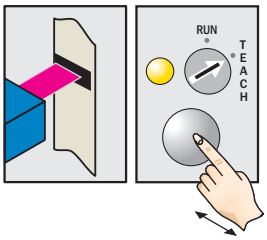
Example



Switching characteristics
The optimum emitted light is selected automatically.
The switching threshold is set in the center between the lowest and the second-lowest reflectivity.
Teach-in can also be performed using an external control signal.
Light/dark setting can also be configured using an external control signal.
Observe the minimum speed (25 mm/s ... 300 mm/s).

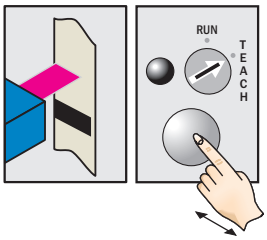
Setting the switching threshold via teach-in (static 2-point teach-in)

1. Position mark



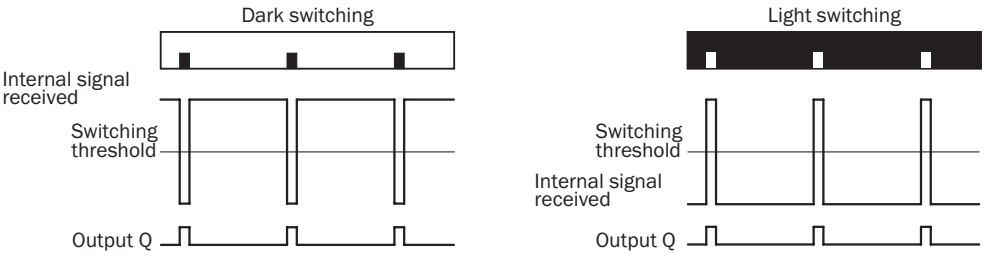
Turn rotary switch to “Teach” position. Press and hold teach-in button > 1 s.
Red emitted light and yellow LED flash.

2. Position background



Press and hold teach-in button > 1 s.
Yellow LED goes out.

Example (for both settings)



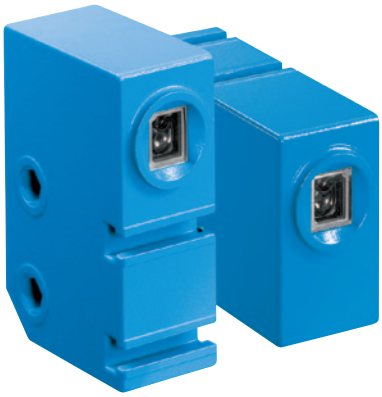
Switching characteristics

The optimum emitted light is selected automatically.
Light/dark setting is defined using teach-in sequence.
The switching threshold is set in the center between the background and the mark.
Teach-in can also be performed using an external control signal.

B

B

High-performance in a tough metal housing for intelligent contrast detection



Product description

The KT6W-2 is a high-performance, cost-competitive contrast sensor with easy setup. The 3-color RGB LED technology allows even the smallest marks and contrasts to be reliably detected. High-gloss reflective marks are also detected due to the sensor's automatic gloss adjustment feature. A tough, metal housing ensures a long service life and high quality. The teach-in process is simple and easy all key parameters, such as transmission color and light/dark switching are detected automatically by the sensor. The KT6W-2 is available with the light emission located on the side of the device or on the end of the device. In addition to sturdy fixing holes, the KT6W-2 features two additional t-slots for even more mounting flexibility.

At a glance

- 3-color RGB LED technology
- 2-point teach-in (mark and background)
- Tough, metal housing
- Automatic gloss adjustment for highly reflective materials
- 10 mm sensing distance
- Light exits at end or side, based on model
- Common mounting footprint

Your benefits

- 3-color RGB LED for all registration mark applications – one sensor fits all
- Tough, metal housing for long service life
- Reliable operation, even with high-gloss reflective and jittering materials
- Easy setup – detect all marks with one sensor

Additional information

8013816/2011-05-30
Subject to change without notice

Detailed technical data

Features

Dimensions (L x W x H)	80 mm x 30.4 mm x 53 mm
Sensing distance	10 mm
Sensing distance tolerance	± 3 mm
Light source [1) 2)]	LED red, green, blue
Light spot size	1.5 mm x 6.5 mm
Light spot direction [3)]	Vertical
Adjustment	Static 2-point teach-in

[1)] Average service life of 100,000 h at T_A = +25 °C .
[2)] Wave length: 470 nm, 525 nm, 640 nm.
[3)] In relation to long side of housing.

Mechanics/electronics

Supply voltage V_S [1)]	DC 10 V ... 30 V
Ripple [2)]	≤ 5 V_{PP}
Power consumption [3)]	< 40 mA
Switching frequency [4)]	5 kHz
Response time	100 µs
Switching output voltage	PNP: HIGH = V_S– ≤ 2 V / LOW approx. 0 V NPN: HIGH = approx. V_S / LOW ≤ 2 V
Output current $I_{max.}$	100 mA
Retention time (ET)	25 ms, non-volatile memory
Connection type	Connector M12, 4-pin
Protection class [5)]	II
Circuit protection	V_S connections reverse-polarity protected Output Q short-circuit protected Interference suppression
Enclosure rating	IP 67
Weight	Approx. 400 g
Housing material	Die-cast zinc

[1)] Limit values. Operation in short-circuit protected network max. 8 A.
[2)] May not exceed or fall short of V_S tolerances.
[3)] Without load.
[4)] With light/dark ratio 1:1.
[5)] Reference voltage 50 V DC.

Ambient data

Ambient temperature	Operation: –10 °C ... +55 °C Storage: –25 °C ... +75 °C
Shock load	According to IEC 60068

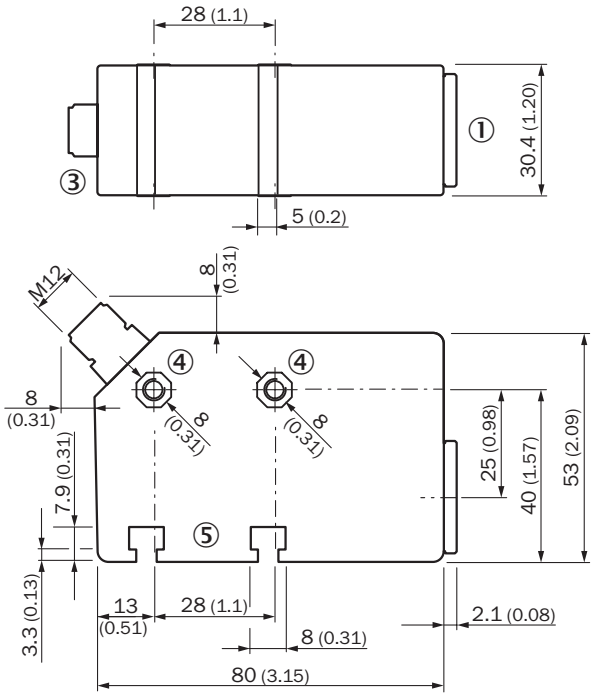
Ordering information

Light emission	Switching output	Model name	Part no.
Short side of housing	PNP	KT6W-2P5116	1046013
	NPN	KT6W-2N5116	1046010
Long side of housing	PNP	KT6W-2P6116	1046014
	NPN	KT6W-2N6116	1046012

B

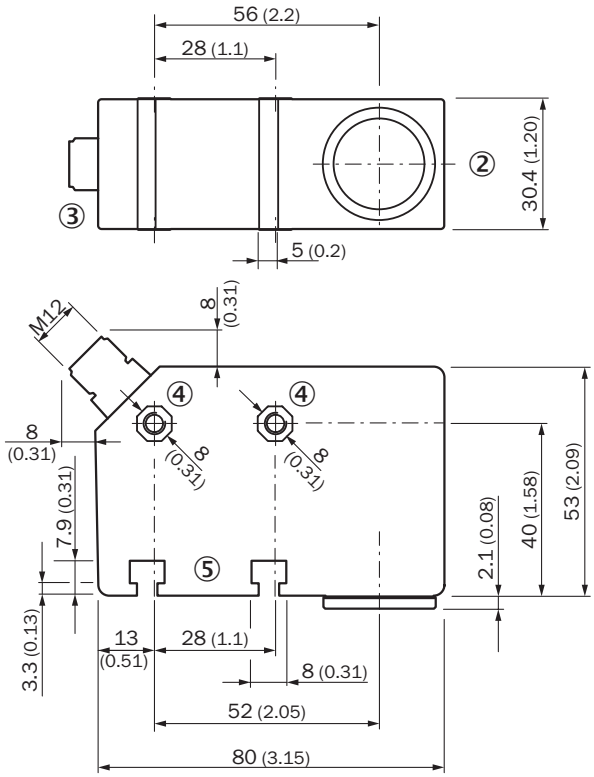
Dimensional drawing

KT6-2
KT6W-2x5xxx



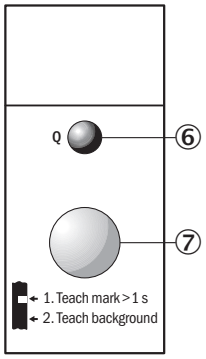
All dimensions in mm (inch)

KT6-2
KT6W-2x6xxx



All dimensions in mm (inch)

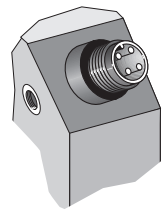
Adjustments

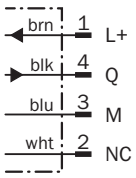


① Lens (light transmission), edge side
② Lens (light transmission), length side
③ Connector M12
④ SW8 mounting hole for M5 nut
⑤ SW8 T-slot for M5 nut
⑥ Function signal indicator
⑦ Teach-in button

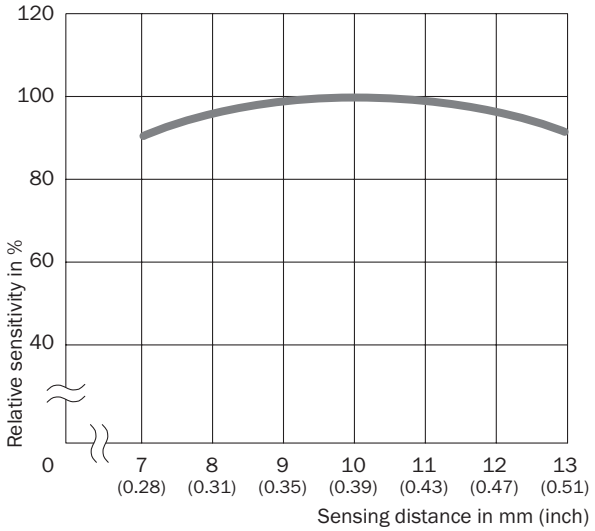
Connection type and diagram

Connector
M12, 4-pin





Sensing distance



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Recommended accessories

Plug connectors and cables

Connector M12, 4-pin

Connector type	Enclosure rating	Flying leads	Sheath material	Cable length	Model name	Part no.
Female connector	IP 67	Straight	PVC	2 m	DOL-1204-G02M	6009382
				5 m	DOL-1204-G05M	6009866
				10 m	DOL-1204-G10M	6010543
				15 m	DOL-1204-G15M	6010753
		Angled	PVC	2 m	DOL-1204-W02M	6009383
				5 m	DOL-1204-W05M	6009867
				10 m	DOL-1204-W10M	6010541
		Straight	–	–	DOS-1204-G	6007302
		Angled	–	–	DOS-1204-W	6007303

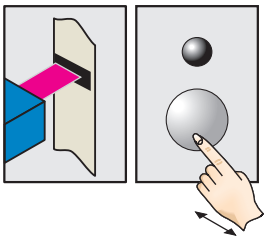
Terminal and alignment brackets

Mounting system type	Description	Material	Model name	Part no.
Universal bar clamps	Plate K for universal bar clamp	Steel, zinc coated	BEF-KHS-K01	2022718
	Universal bar clamp	Die-cast zinc	BEF-KHS-KH1	2022726
	Mounting rod straight	Steel, zinc coated	BEF-MS12G-A	4056054
			BEF-MS12G-B	4056055
	Mounting rod L-shaped	Steel, zinc coated	BEF-MS12L-A	4056052
			BEF-MS12L-B	4056053

For additional accessories including dimensional drawings, please see page G-1

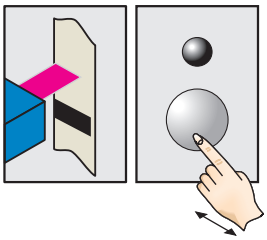
Setting the switching threshold via teach-in (static 2-point teach-in)

1. Position mark



Press and hold teach-in button > 1 s.
Red emitted light flashes.

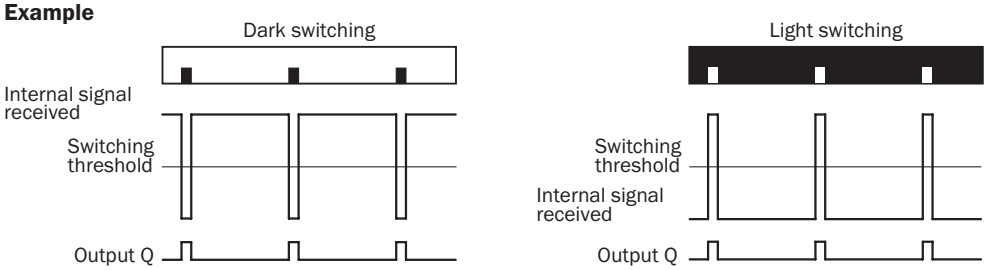
2. Position background



Press and hold teach-in button > 1 s.
Yellow LED will illuminate, when emitted light is on the mark.

B

Example



Switching characteristics
The optimum emitted light is selected automatically.
Light/dark setting is defined using teach-in sequence.
The switching threshold is set in the center between the background and the mark.

B

Contrast and communication without limits

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Product description

The KT8 CAN contrast sensor communicates via CAN. The CAN interface makes adjusting the sensor and integrating additional functions into a machine easier. The CAN interface allows any number of parameter sets can be stored in the machine controller. In addition, important process data, like contamination or current switching thresholds can be queried via the CAN interface, reducing setup times and enabling timely prevention methods. An automatic switching threshold adjusts for high-gloss reflective materials.
The KT8 CAN also features 3-color RGB LED technology, automatic drift correction and fast response times.

At a glance

- The CAN interface helps set parameters, process documentation and adaptation
- Automatic drift correction
- Fast response time
- Precise light spot
- 3-color RGB LED technology
- Two interchangeable light exits

Your benefits

- Easy integration into machine designs due to standard CAN protocol
- Access to the sensor via the control system saves the machine operator time and effort during configuration
- Individual, application-specific configuration and settings
- Automatic drift correction ensures high production reliability with faded print marks and other difficult-to-detect marks
- Reliable operation, even with high-gloss reflective surfaces
- Long-lasting, tough metal housing

Additional information

Detailed technical data

Features

Dimensions (L x W x H)	80 mm x 30.4 mm x 53 mm
Light source [1] [2]	LED red, green, blue
Light emission	Long and short side of housing, exchangeable
Light spot direction [3]	Vertical
Adjustment	Static 2-point teach-in Dynamic teach-in (min/max)
Function	Automatic drift correction Deactivation delay, 10 ms / 20 ms / 40 ms Adjustable, CAN interface

[1] Average service life of 100,000 h at T_A = +25 °C .

[2] Wave length: 470 nm, 525 nm, 640 nm.

[3] In relation to long side of housing.

Mechanics/electronics

Supply voltage V_S [1]	DC 10 V ... 30 V
Ripple [2]	≤ 5 V_{PP}
Power consumption [3]	< 120 mA
Switching frequency [4]	22.5 kHz
Response time [5]	22 µs
Jitter	< 11 µs
Switching output voltage	PNP: HIGH = V_S– ≤ 2 V / LOW approx. 0 V NPN: HIGH = approx. V_S / LOW ≤ 2 V
Output current $I_{max.}$	100 mA
Input, teach-in (ET)	PNP: Teach: U = 10 V ... < U_V Run: U < 2 V NPN: Teach: U < 2 V Run: U = 10 V ... < U_V
Retention time (ET)	25 ms, non-volatile memory
Connection type	Connector M12, 8-pin
Protection class [6]	II
Circuit protection	V_S connections reverse-polarity protected Output Q short-circuit protected Interference suppression
Enclosure rating	IP 67
Weight	Approx. 400 g
Housing material	Die-cast zinc

[1] Limit values. Operation in short-circuit protected network max. 8 A.

[2] May not exceed or fall short of V_S tolerances.

[3] Without load.

[4] With light/dark ratio 1:1.

[5] Signal transit time with resistive load.

[6] Reference voltage 32 V DC.

Ambient data

Ambient temperature	Operation: –10 °C ... +55 °C Storage: –10 °C ... +75 °C
Shock load	According to IEC 60068

B

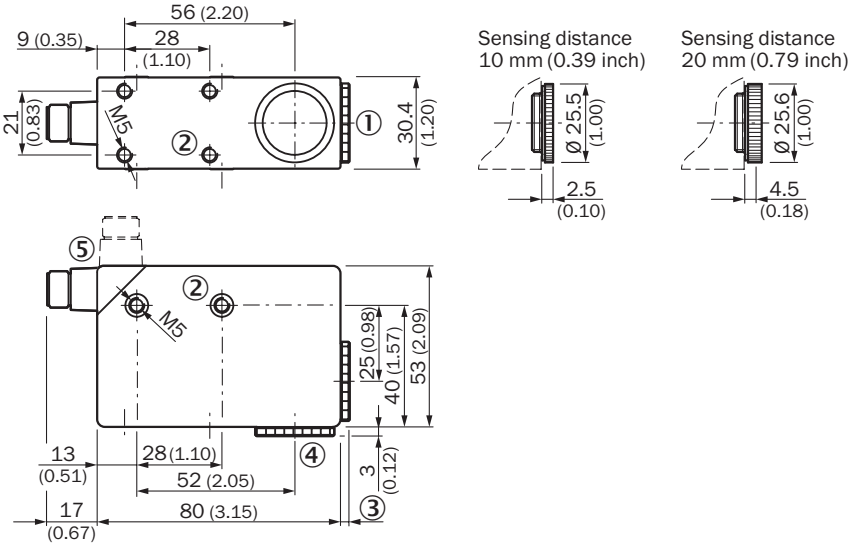
Ordering information

Sensing distance [1]	Sensing distance tolerance	Light spot size	Switching output	Model name	Part no.
10 mm	± 3 mm	0.8 mm x 4 mm	PNP	KT8W-P111C	1027919
			NPN	KT8W-N111C	1028223
20 mm	± 3 mm	1.5 mm x 5.5 mm	PNP	KT8W-P121C	1043689

[1] From front edge of lens.

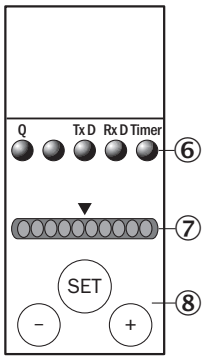
B

Dimensional drawing



All dimensions in mm (inch)

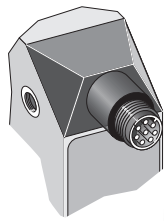
Adjustments

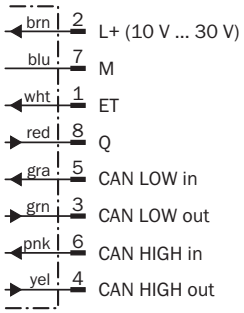


① Lens (light transmission), can be exchanged for pos. 4
② M5 threaded mounting hole, 5.5 mm deep
③ See dimensional drawing for lens
④ Blind screw can be replaced by pos. 1
⑤ Connector M12 (rotatable up to 90°)
⑥ Function signal indicators (yellow)
⑦ Bar graph (green)
⑧ Teach-in button/“+” and “–” button

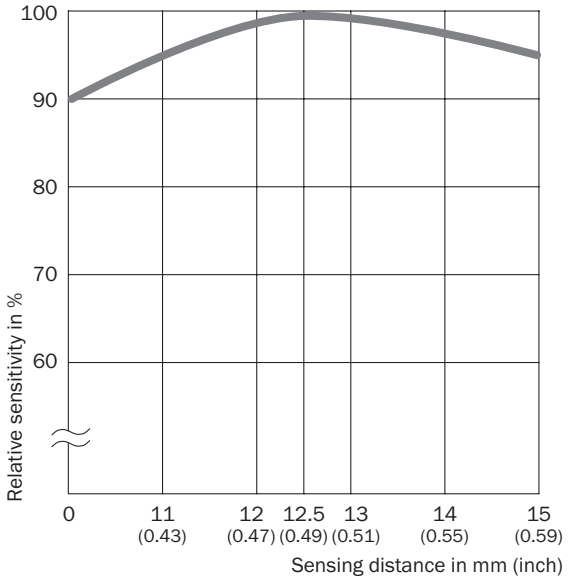
Connection type and diagram

Connector
M12, 8-pin





Sensing distance



B

Recommended accessories

Plug connectors and cables

Connector M12, 8-pin

Connector type	Enclosure rating	Flying leads	Sheath material	Cable length	Model name [1]	Part no.
Female connector	IP 67	Angled	PUR	2 m	DOL-1208-W02MAS01	6029224

[1] Shielded.

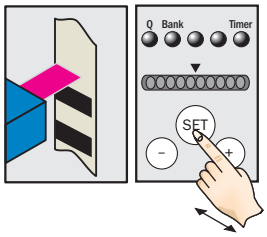
Terminal and alignment brackets

Mounting system type	Description	Material	Model name	Part no.
Universal bar clamps	Plate G for universal bar clamp	Steel, zinc coated	BEF-KHS-G01	2022464
	Plate K for universal bar clamp	Steel, zinc coated	BEF-KHS-K01	2022718
	Universal bar clamp	Die-cast zinc	BEF-KHS-KH1	2022726
	Mounting rod straight	Steel, zinc coated	BEF-MS12G-A	4056054
			BEF-MS12G-B	4056055
	Mounting rod L-shaped	Steel, zinc coated	BEF-MS12L-A	4056052
			BEF-MS12L-B	4056053

For additional accessories including dimensional drawings, please see page G-1

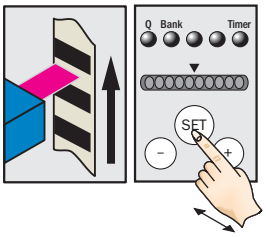
Setting the switching threshold via teach-in (dynamic, factory setting)

1. Position background

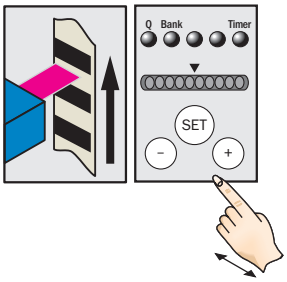


Press and hold SET button.
Emitted light turns white.

2. Move at least one repeat length using the light spot



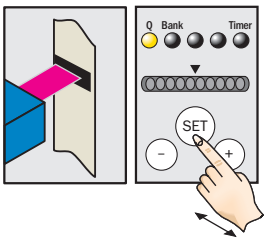
Hold down SET button.



Release SET button.

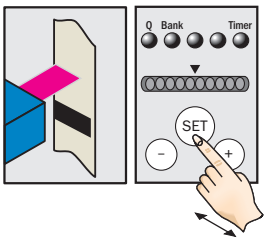
Setting the switching threshold via teach-in (static 2-point teach-in)

1. Position mark



Press and hold SET button > 1 s.
Yellow LED flashes.

2. Position background

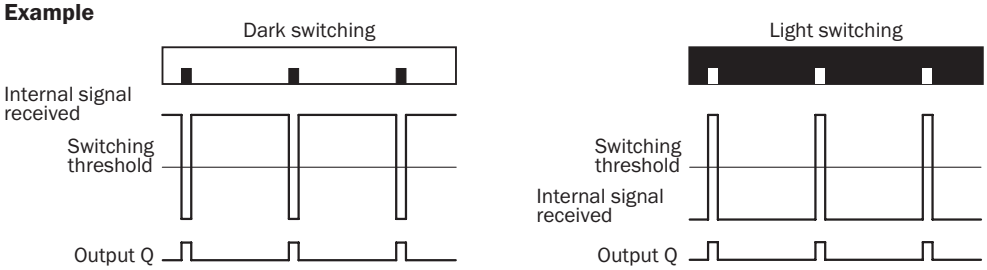


Press and hold SET button > 1 s.
Yellow LED goes out.

Note

The bar display visualizes the detection reliability during teach-in. The more LEDs that illuminate, the better the teach-in:
1 LED illuminates = operation not reliable – contrast difference too low
≤ 4 LEDs illuminate = operation OK – sufficient contrast difference
> 4 LEDs illuminate = reliable operation – high contrast difference

Example



Switching characteristics

Standard setting via control panel or CAN,
Device configuration only possible via CAN, cf. operating instructions.

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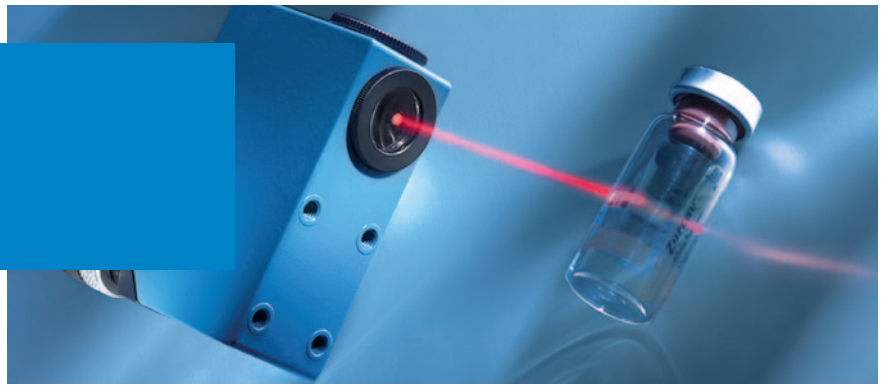
B

Precise, flexible, quick



Product description

The KT8L Laser contrast sensor offers precise detection of the smallest marks and objects due to a long depth of field. With a sensing distance of up to 800 mm, the KT8L Laser provides more flexibility than sensors with shorter sensing distances. Two light spot sizes are available: one with a light spot < 0.3 mm for detecting small marks/targets and another light spot approx. 3 mm for detecting slightly larger objects and marks. In addition, a bar graph display showing detection reliability simplifies the teach-in process. And, since both dynamic and static teach-in are selectable, the user can adapt the sensor to suit individual requirements.

At a glance

- Wide range of operating distances between 30 mm and 800 mm
- Small and precise laser light spot (Class II)
- Fast switching frequency of 17 kHz
- Analog output
- Simple teach-in
- Detection reliability displayed in the bar graph display

Your benefits

- Wide range of applications with sensing distances up to 800 mm
- Precise detection of the smallest marks and objects, e.g., 1 x 1 mm²
- Adjusts itself to specific applications, opening up a wide range of uses
- Reliable operation, even with unsteady objects

Additional information

Detailed technical data

Features

Dimensions (L x W x H)	80 mm x 30.4 mm x 53 mm
Light source [1) 2)]	Laser diode red light
Light emission	Long side of housing
Light spot direction	Round
Adjustment	Static 2-point teach-in, dynamic teach-in (min/max)
Switching function	Automatic drift correction
Time delay	20 ms, adjustable

[1)] Average service life of 50,000 h at T_A = +25 °C.

[2)] Wave length: 655 nm.

Mechanics/electronics

Supply voltage V_S [1)]	DC 10 V ... 30 V
Ripple [2)]	≤ 5 V_{PP}
Power consumption [3)]	< 80 mA
Switching frequency [4)]	17 kHz
Response time [5)]	30 µs
Jitter	< 15 µs
Switching output voltage	NPN: HIGH = approx. V_S / LOW ≤ 2 V PNP: HIGH = V_S – ≤ 2 V / LOW approx. 0 V
Analog output Q_A	0.3 mA ... 10 mA
Output current $I_{max.}$	100 mA
Input, teach-in (ET)	PNP: Teach: U = 10 V ... < U_V Run: U < 2 V NPN: Teach: U < 2 V Run: U = 10 V ... < U_V
Retention time (ET)	25 ms, non-volatile memory
Connection type	Connector M12, 5-pin
Protection class [6)]	II
Circuit protection	V_S connections reverse-polarity protected Output Q short-circuit protected Interference suppression
Enclosure rating	IP 67
Weight	Approx. 400 g
Housing material	Die-cast zinc

[1)] Limit values. Operation in short-circuit protected network max. 8 A.

[2)] May not exceed or fall short of V_S tolerances.

[3)] Without load.

[4)] With light/dark ratio 1:1.

[5)] Signal transit time with resistive load.

[6)] Reference voltage 50 V DC.

Ambient data

Ambient temperature	Operation: –10 °C ... +45 °C Storage: –10 °C ... +75 °C
Shock load	According to IEC 60068

B

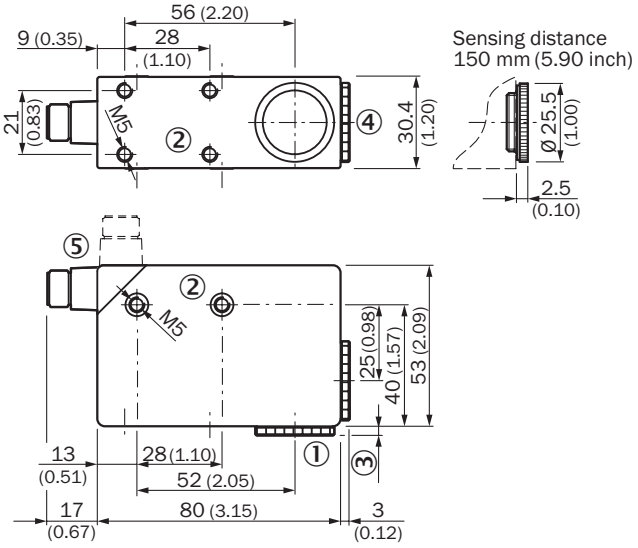
Ordering information

Sensing distance [1]	Operating distance [2]	Light spot size [3]	Switching output	Model name	Part no.
150 mm	30 mm ... 800 mm	Ø 0.3 mm	NPN	KT8L-N3656	1041263
			PNP	KT8L-P3656	1041262
	30 mm ... 600 mm	Ø 3 mm	NPN	KT8L-N3756	1041352
			PNP	KT8L-P3756	1041351

[1] From front edge of lens.
[2] With respect to black-white contrast 6 % / 90 %.
[3] At focal point = sensing distance 150 mm.

B

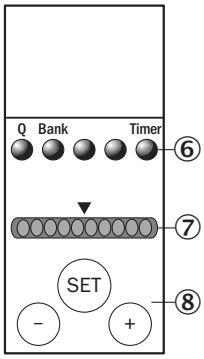
Dimensional drawing



All dimensions in mm (inch)

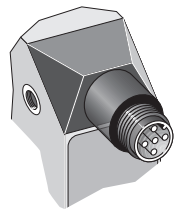
① Lens (light transmission), cannot be exchanged for pos. 4
② M5 threaded mounting hole, 5.5 mm deep
③ See dimensional drawing of lens
④ Blind screw cannot be replaced by pos. 1
⑤ Connector M12 (rotatable up to 90°)
⑥ Function signal indicators (yellow)
⑦ Bar graph (green)
⑧ Teach-in button/“+” and “–” button

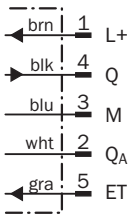
Adjustments



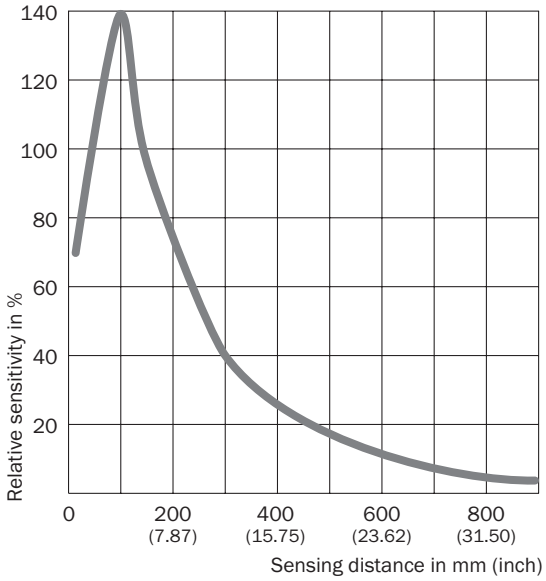
Connection type and diagram

Connector
M12, 5-pin





Sensing distance



B

Recommended accessories

Plug connectors and cables

Connector M12, 5-pin

Connector type	Enclosure rating	Flying leads	Sheath material	Cable length	Model name	Part no.
Female connector	IP 67	Straight	PVC	2 m	DOL-1205-G02M	6008899
				5 m	DOL-1205-G05M	6009868
				10 m	DOL-1205-G10M	6010544
		Angled	PVC	2 m	DOL-1205-W02M	6008900
				5 m	DOL-1205-W05M	6009869
				10 m	DOL-1205-W10M	6010542
		Straight	–	–	DOS-1205-G	6009719
		Angled	–	–	DOS-1205-W	6009720

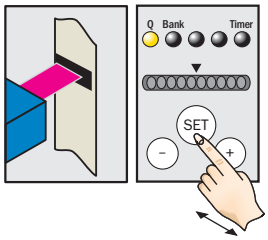
Terminal and alignment brackets

Mounting system type	Description	Material	Model name	Part no.
Universal bar clamps	Plate G for universal bar clamp	Steel, zinc coated	BEF-KHS-G01	2022464
	Plate K for universal bar clamp	Steel, zinc coated	BEF-KHS-K01	2022718
	Universal bar clamp	Die-cast zinc	BEF-KHS-KH1	2022726
	Mounting rod straight	Steel, zinc coated	BEF-MS12G-A	4056054
			BEF-MS12G-B	4056055
	Mounting rod L-shaped	Steel, zinc coated	BEF-MS12L-A	4056052
			BEF-MS12L-B	4056053

For additional accessories including dimensional drawings, please see page G-1

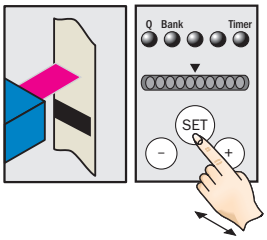
Setting the switching threshold via teach-in (static 2-point teach-in, factory setting)

1. Position mark



Press and hold SET button > 1 s.
Yellow LED flashes.

2. Position background

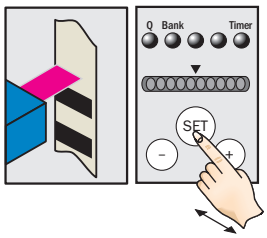


Press and hold SET button > 1 s.
Yellow LED goes out.

B

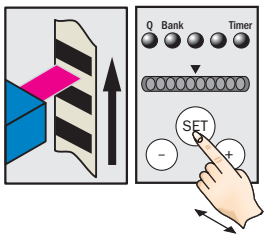
Setting the switching threshold via teach-in (dynamic)

1. Position background

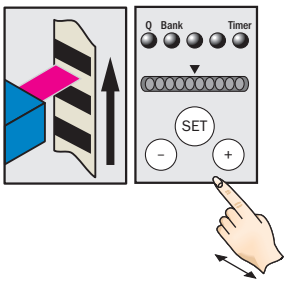


Press and hold SET button.
Emitted light turns white.

2. Move at least one repeat length using the light spot



Hold down SET button.

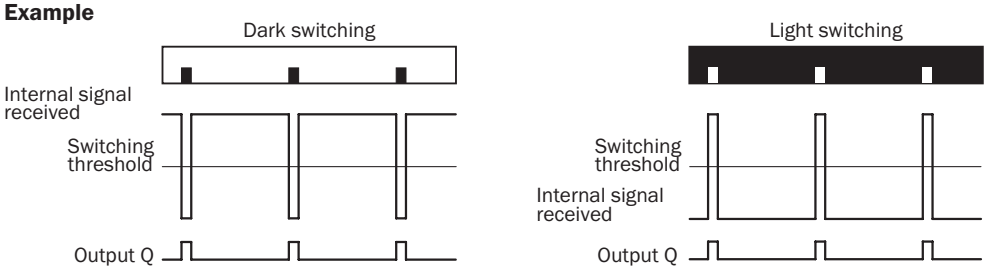


Release SET button.

Note

The bar display visualizes the detection reliability during teach-in. The more LEDs that illuminate, the better the teach-in:
1 LED illuminates = operation not reliable – contrast difference too low
≤ 4 LEDs illuminate = operation OK – sufficient contrast difference
> 4 LEDs illuminate = reliable operation – high contrast difference

Example

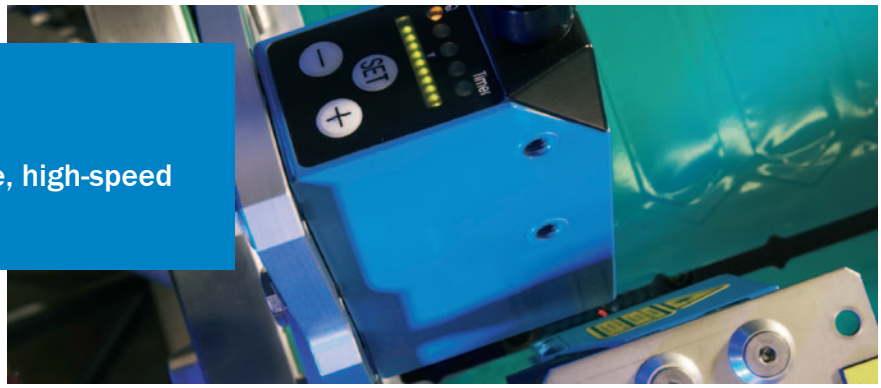


Switching characteristics

Light/dark setting is defined using teach-in sequence or menu, cf. operating instructions.
The switching threshold is set in the center between the background and the mark.
Teach-in and the light/dark setting can also be configured using an external control signal.

B

The industry choice for precise, high-speed mark detection



B

Product description

The KT10-2 contrast sensor is ideal for high-speed applications with poor contrasts and reflective materials. This second generation KT10 contrast sensor is defined by its ease of use. Even during the teach-in phase, the sensor selects the transmission color that best matches the existing contrast. And, if marks need to be detected on glossy foils the sensor automatically adjusts according to the application. In addition, the sensor compensates for dirt build-up on lenses using automatic drift correction. The KT10-2 offers an exceptionally fast switching frequency, an easy-to-read bar graph display and two light exits. The bar graph display provides visible confirmation of the teach-in and can be used to monitor the sensor's status during operation. And, the sensor's two interchangeable light exits enable the KT10-2 to be mounted in more places.

At a glance

- Very low jitter (< 10 µs)
- Precise light spot
- Maximum detection reliability due to 3-color RGB LED technology
- Two interchangeable light exits
- Five storage banks for settings
- Automatic drift correction
- Fast switching frequency of 25 kHz
- Easy-to-read bar graph display

Your benefits

- Precise detection of print marks enables optimal results for packaging and printing applications
- All contrast marks, even pale yellow on white paper, can be reliably detected due to RGB LED technology
- Automatic drift correction helps detect difficult-to-see marks, such as faded print marks, enabling higher production reliability
- Reliable operation, even with high-gloss reflective surfaces, increases throughput
- Simple teach-in via an external signal can be performed while the material is moving, enabling shorter setup time
- Long-lasting, tough metal housing

Additional information

8013816/2011-05-30
Subject to change without notice

Detailed technical data

Features

Dimensions (L x W x H)	80 mm x 30.4 mm x 53 mm
Light source [1) 2)]	LED red, green, blue
Light emission	Long and short side of housing, exchangeable
Adjustment	Static 2-point teach-in Dynamic teach-in (min/max)
Function	Automatic drift correction
Time delay	20 ms, adjustable

[1)] Average service life of 100,000 h at T_A = +25 °C .

[2)] Wave length: 470 nm, 525 nm, 640 nm.

B

Mechanics/electronics

Supply voltage V_S [1)]	DC 10 V ... 30 V
Ripple [2)]	≤ 5 V_{PP}
Power consumption [3)]	< 120 mA
Switching frequency [4)]	25 kHz
Response time [5)]	20 µs
Jitter	< 10 µs
Switching output voltage	NPN: HIGH = approx. V_S / LOW ≤ 2 V PNP: HIGH = V_S– ≤ 2 V / LOW approx. 0 V
Output current $I_{max.}$	100 mA
Input, teach-in (ET)	PNP: Teach: U = 10 V ... < U_V Run: U < 2 V NPN: Teach: U < 2 V Run: U = 10 V ... < U_V
Input, blanking input (AT) [6)]	PNP: Blanked: U > 10 V ... < U_V Free-running: U < 2 V NPN: Blanked: U < 2 V Free-running: U > 10 V ... < U_V
Retention time (ET)	25 ms, non-volatile memory
Connection type	Connector M12, 5-pin
Protection class [7)]	II
Circuit protection	V_S connections reverse-polarity protected Output Q short-circuit protected Interference suppression Outputs overcurrent and short-circuit protected
Enclosure rating	IP 67
Weight	Approx. 400 g
Housing material	Die-cast zinc

[1)] Limit values. Operation in short-circuit protected network max. 8 A.

[2)] May not exceed or fall short of V_S tolerances.

[3)] Without load.

[4)] With light/dark ratio 1:1.

[5)] Signal transit time with resistive load.

[6)] AT > 200 µs.

[7)] Reference voltage 50 V DC.

Ambient data

Ambient temperature	Operation: –10 °C ... +55 °C Storage: –10 °C ... +75 °C
Shock load	According to IEC 60068

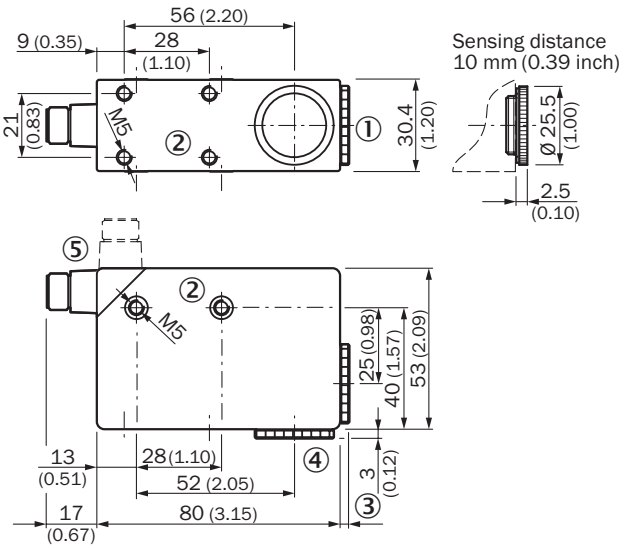
Ordering information

Sensing distance [1]	Sensing distance tolerance	Light spot size	Light spot direction [2]	Switching output	Model name	Part no.
10 mm	± 3 mm	0.8 mm x 4 mm	Vertical	NPN	KT10W-2N1115	1028233
				PNP	KT10W-2P1115	1028232
			Horizontal	NPN	KT10W-2N2115	1029071
				PNP	KT10W-2P2115	1029070

[1] From front edge of lens.

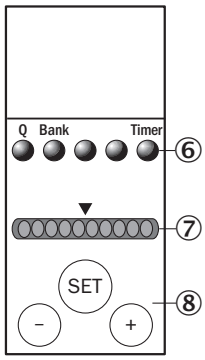
[2] In relation to long side of housing.

Dimensional drawing



All dimensions in mm (inch)

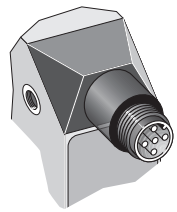
Adjustments

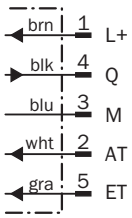


① Lens (light transmission)
② M5 threaded mounting hole, 5.5 mm deep
③ See dimensional drawing of lens
④ Blind screw can be replaced by pos. 1
⑤ Connector M12 (rotatable up to 90°)
⑥ Function signal indicators (yellow)
⑦ Bar graph (green)
⑧ Teach-in button / “+” and “–” button

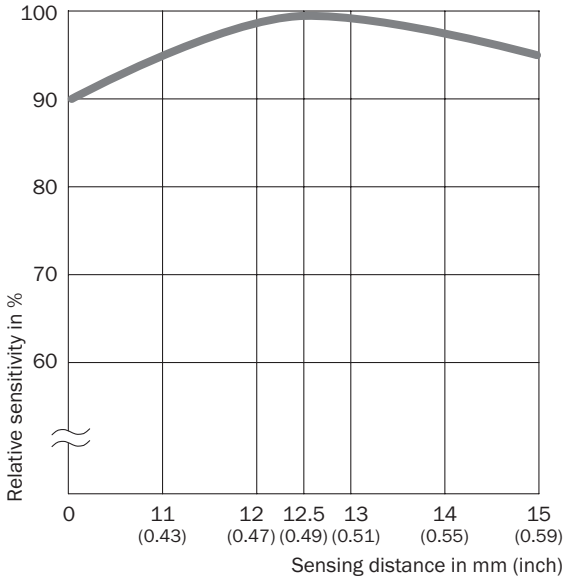
Connection type and diagram

Connector
M12, 5-pin





Sensing distance



B

Recommended accessories

Plug connectors and cables

Connector M12, 5-pin

Connector type	Enclosure rating	Flying leads	Sheath material	Cable length	Model name	Part no.
Female connector	IP 67	Straight	PVC	2 m	DOL-1205-G02M	6008899
				5 m	DOL-1205-G05M	6009868
				10 m	DOL-1205-G10M	6010544
		Angled	PVC	2 m	DOL-1205-W02M	6008900
				5 m	DOL-1205-W05M	6009869
				10 m	DOL-1205-W10M	6010542
		Straight	–	–	DOS-1205-G	6009719
		Angled	–	–	DOS-1205-W	6009720

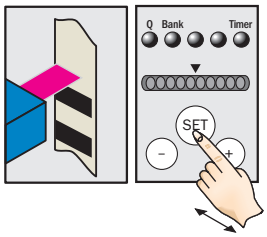
Terminal and alignment brackets

Mounting system type	Description	Material	Model name	Part no.
Universal bar clamps	Plate G for universal bar clamp	Steel, zinc coated	BEF-KHS-G01	2022464
	Plate K for universal bar clamp	Steel, zinc coated	BEF-KHS-K01	2022718
	Universal bar clamp	Die-cast zinc	BEF-KHS-KH1	2022726
	Mounting rod straight	Steel, zinc coated	BEF-MS12G-A	4056054
			BEF-MS12G-B	4056055
	Mounting rod L-shaped	Steel, zinc coated	BEF-MS12L-A	4056052
			BEF-MS12L-B	4056053

For additional accessories including dimensional drawings, please see page G-1

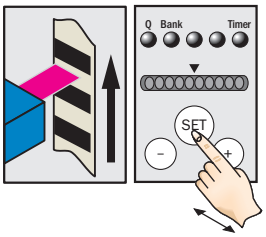
Setting the switching threshold via teach-in (dynamic, factory setting)

1. Position background

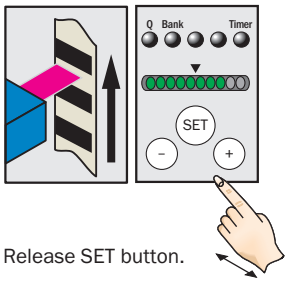


Press and hold SET button.
Emitted light turns white.

2. Move at least one repeat length using the light spot



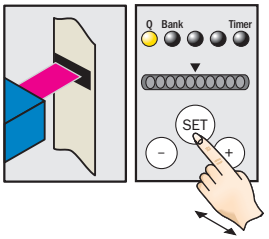
Hold down SET button.



Release SET button.

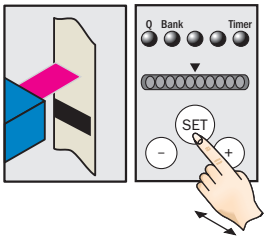
Setting the switching threshold via teach-in (static 2-point teach-in)

1. Position mark



Press and hold SET button > 1 s.
Red emitted light and yellow LED flash.

2. Position background

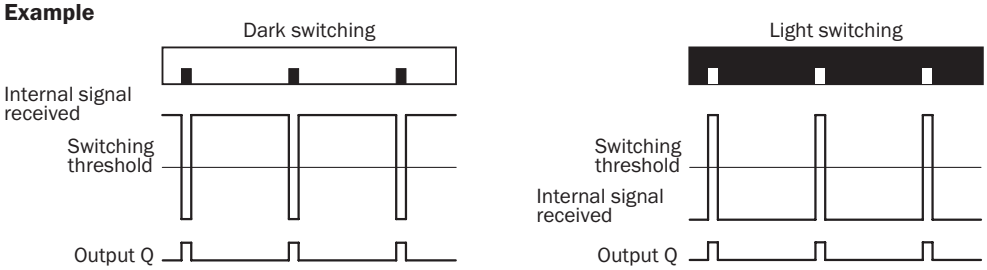


Press and hold SET button > 1 s.
Yellow LED goes out.
Optimum emitted light is selected.

Note

The bar display visualizes the detection reliability during teach-in. The more LEDs that illuminate, the better the teach-in:
1 LED illuminates = operation not reliable – lowest contrast difference
≤ 4 LEDs illuminate = operation OK – sufficient contrast difference
> 4 LEDs illuminate = reliable operation – high contrast difference

Example



Switching characteristics

Light/dark setting is defined using teach-in sequence.
The switching threshold is set in the center between the background and the mark.
Teach-in and the light/dark setting can also be configured using an external control signal.

B

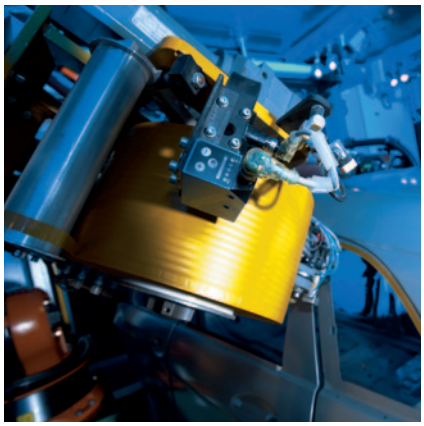
C

Focus on color

Color sensors detect the color of a surface. The sensors cast light (red, green, and blue LEDs) on the objects to be tested, calculate the chromaticity coordinates from the reflected radiation and compare them with previously stored reference colors. If the color values are within the set tolerance range, a switching output is activated.

Your benefits

- Identify and store up to four colors. No need to reprogram the sensor for changeovers, reducing downtime.
- High resolution colors can be matched exactly for better process reliability
- Simple, intuitive operation saves time
- Broad spectrum of color tolerances enables more flexible use



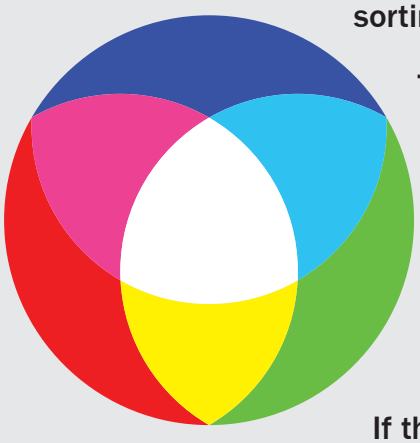
8013816/2011-05-30
Subject to change without notice

C

Color sensors

It‘s all about color!

If color is the most critical factor for precise detection, checking and sorting, then SICK color sensors are the right choice.



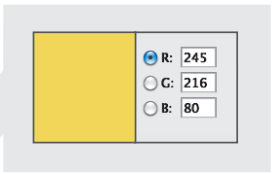
The color sensors utilize single-color LEDs (●●● = RGB) to blend together to match all color hues.

This light is transmitted to the object to be tested. The sensors calculate the color coordinates from the reflected beam and compare these with the previously color reference values.

If the color values are within the tolerance range, a switching output is activated. Intelligent evaluation in the sensor enables reliable operation.

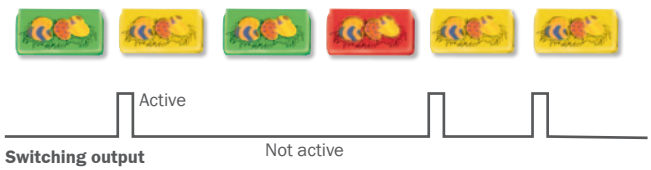
C

Teach-in

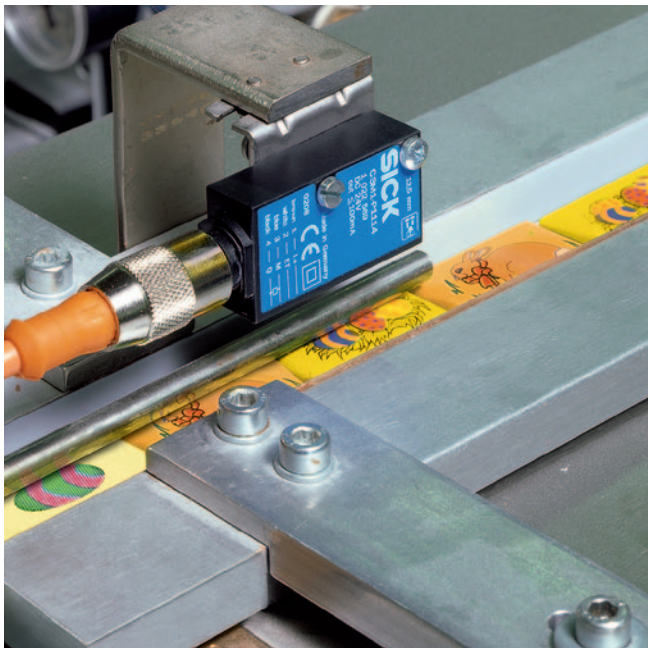


During the teach-in process, reference colors are simply stored in the system.

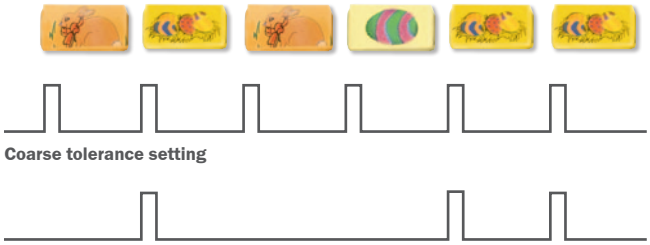
If the color sensor detects the stored value, it automatically switches the output to active.



Tolerance



With color sensors, the tolerance for color detection can be easily adjusted from coarse to fine to suit your application.



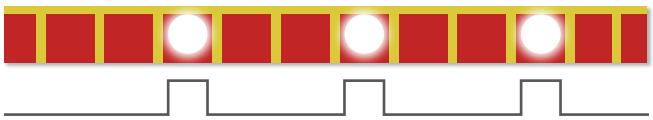
Coarse tolerance setting

Fine tolerance setting

C

Light spot

The size of the color sensor's light spot depends on the sensing distance.

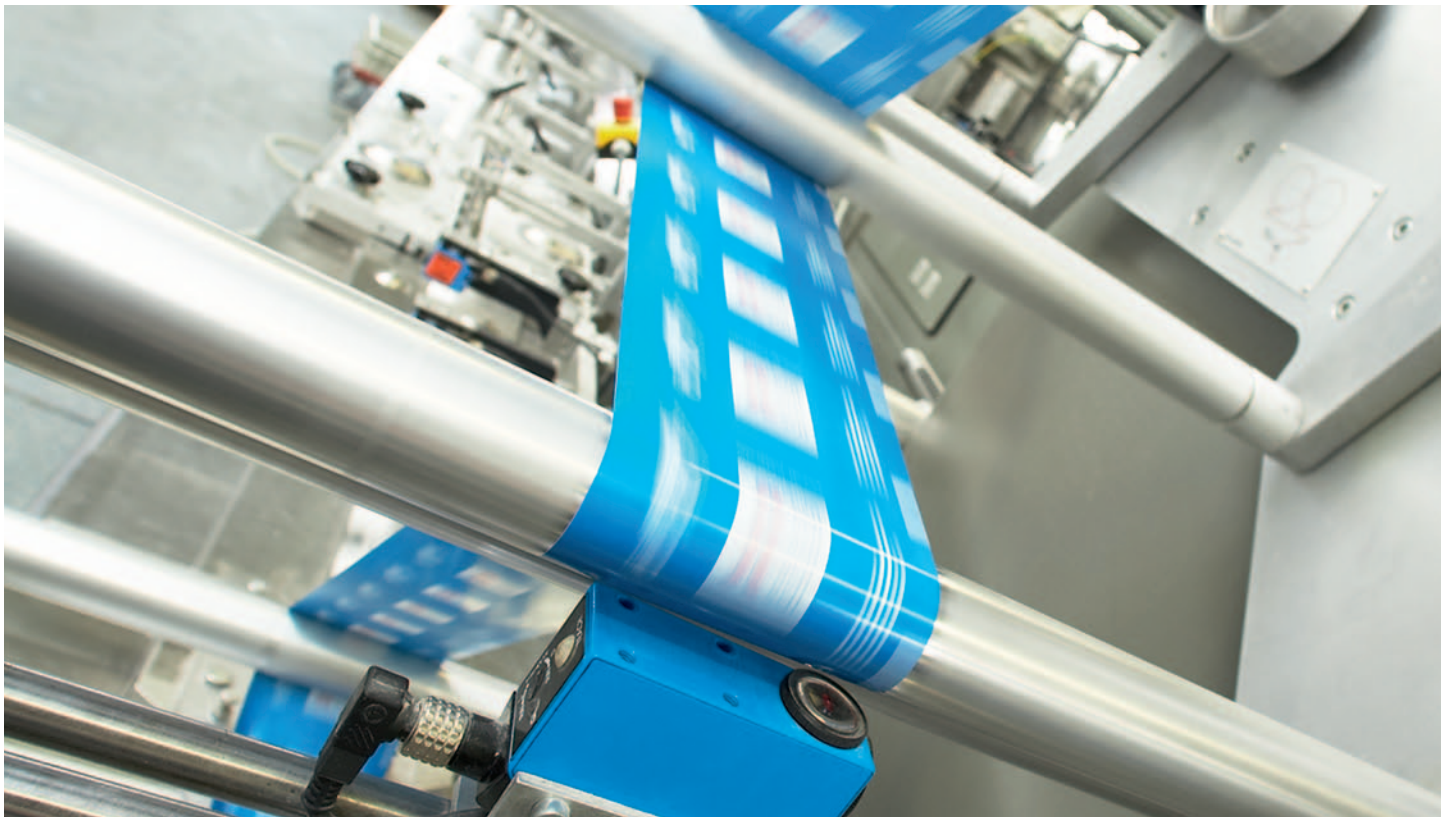


Large light spot: Unaffected by surface shadow or dirt which has penetrated the surface. Ideal for process checks, e.g., whether the correct label roll is inserted in the system.

Small light spot: For exact positioning and precise switching, such as for registration control.

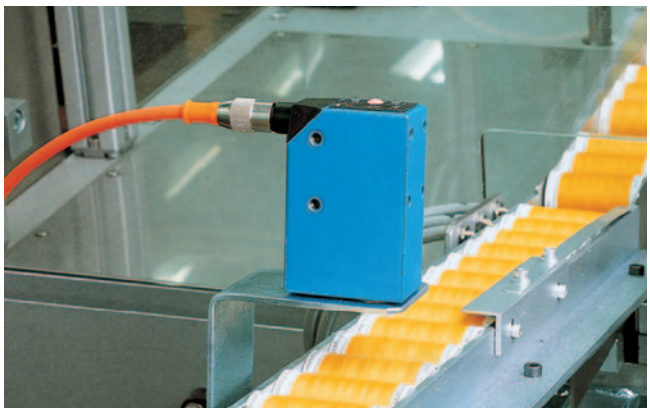
C

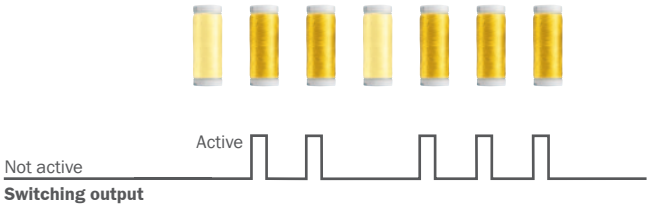
Color target detection



Process check

Color verification on sewing thread spindles



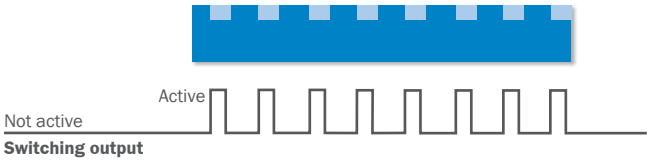


In the textile industry, incorrect colors often creep in during production. In order to filter these out, the desired color is taught into the sensor and the tolerance is set to precise. This sorts out and discards any undesired color variables. The bar graph display on the device makes it easy for the user to set the sensor and visualizes the color matching while the process is running.

Recommended product	CS8-1 (see page C-14)
Sensing distance	**Large**
Tolerance setting	**Precise**
Light spot size	**Large**
Colors to be detected	**1**

Controlling the cycle on a packaging machine

For “aesthetic” reasons, the manufacturer does not want print marks or the associated reading lines on the back of the packaging. The color sensor controls the packaging process based solely on a color hue in the print image. The simple teach-in function means this color only needs to be learned once. With the small, precise light spot, the CS scans the sheet and switches whenever it detects the taught color. This makes it possible to avoid print marks errors.

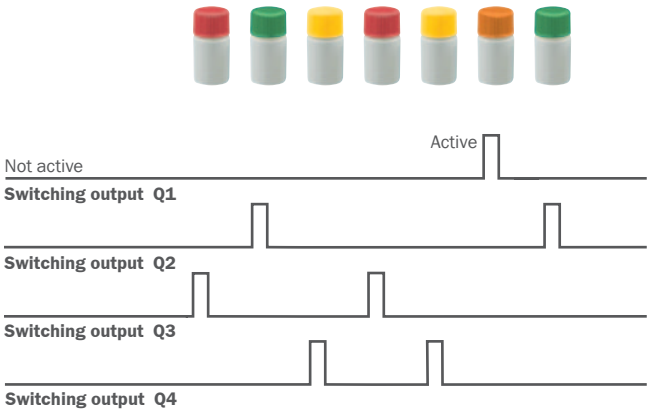


Recommended products	CSM (see page C-8) CS8-1 (see page C-14)
Sensing distance	**Small**
Tolerance setting	**Medium**
Light spot size	**Small**
Colors to be detected	**1**

C

Sorting

Sorting tubes for tablets



A pharmaceutical manufacturer fills tubes with tablets of various active ingredients. The lids of the tubes are of different colors. Before being completed and packed together, the tablet tubes must be grouped according to color. The system runs with a relatively high throughput. The CS8-4 provides the option of storing up to four colors at once using the teach-in function. Once each channel is assigned a color, sorting can begin.

Recommended product	CS8-4 (see page C-14)
Sensing distance	**Large**
Tolerance setting	**Coarse**
Light spot size	**Large**
Colors to be detected	**4**

C

Product family overview

	 **CSM1**	 **CS8**
	Compact color detection	High-performance color sensing
Technical data overview		
Sensing distance	12.5 mm	12.5 mm 60 mm
Light spot size	1.5 mm x 6.5 mm	2 mm x 4 mm 13 mm x 13 mm
Switching frequency	1.5 kHz	1 color up to 6 kHz 4 colors up to 3.5 kHz
Response time	500 µs	1 color up to 85 µs 4 colors up to 145 µs
Switching output	NPN PNP	NPN PNP
Output (channel)	1 color	1 color 4 colors
Adjustment	Static 1-point teach-in	Static 1-point teach-in
Connection type	Connector M12, 4-pin	Connector M12, 5-pin Connector M12, 8-pin
At a glance		
	• One color can be saved • 12.5 mm sensing distance • Switching frequency 1.5 kHz • Color tolerance (precise, medium, coarse) can be set • Static object teach-in via control cable or control panel • Small housing	• One (CS8-1) or four (CS8-4) colors can be saved • 12.5 mm or 60 mm sensing distance • Fast response time up to 85 µs • High resolution color • Bar graph display shows the correlation of the colors • Extremely precise light spot and high resolution • Metal housing with two light exits (inter-changeable)
Detailed information	➜ C-8	➜ C-14

C

Compact color detection

Product description

The compact CSM is ideal for all applications where space is limited. It identifies, sorts or checks objects according to color. Teach-in of the color tolerance (precise, medium, and coarse) is easy. The CSM is characterized by its user-friendly operation and has a switching frequency of 1.5 kHz.

At a glance

- One color can be saved
- 12.5 mm sensing distance
- Switching frequency 1.5 kHz
- Color tolerance (precise, medium, coarse) can be set
- Static object teach-in via control cable or control panel
- Small housing

Your benefits

- Easy integration into existing machines – even in places where space is limited
- Fast and easy setup saves time and costs
- Broad spectrum of color tolerances enables more flexible use

Additional information

8013816/2011-05-30
Subject to change without notice

Detailed technical data

Features

Dimensions (L x W x H)	22 mm x 12 mm x 40 mm
Light source [1) 2)]	LED red, green, blue
Adjustment	Static 1-point teach-in

[1)] Average service life 100,000 h at T_a = +25 °C.

[2)] Wave length: 470 nm, 525 nm, 640 nm.

Mechanics/electronics

Supply voltage V_S [1)]	DC 12 V ... 24 V
Ripple [2)]	< 5 V_{PP}
Power consumption [3)]	< 35 mA
Switching frequency [4)]	1.5 kHz
Response time [5)]	500 µs
Switching output voltage	NPN: HIGH = approx. V_S / LOW ≤ 2 V PNP: HIGH = V_S – ≤ 2 V / LOW approx. 0 V
Output current $I_{max.}$	< 100 mA
Input, teach-in (ET)	PNP: Teach: U = 10 V ... < U_V Run: U < 2 V NPN: Teach: U < 2 V Run: U = 10 V ... < U_V
Connection type	Connector M12, 4-pin
Protection class [6)]	II
Circuit protection	V_S connections reverse-polarity protected Output Q short-circuit protected Interference suppression
Enclosure rating	IP 67
Weight	Approx. 11 g
Housing material	ABS

[1)] Limit values: DC 12 V (–10 %) ... DC 24 (+20 %).
Operation in short-circuit protected network max. 8 A.

[2)] May not exceed or fall short of V_S tolerances.

[3)] Without load.

[4)] With light/dark ratio 1:1.

[5)] Signal transit time with resistive load.

[6)] Reference voltage 50 V DC.

Ambient data

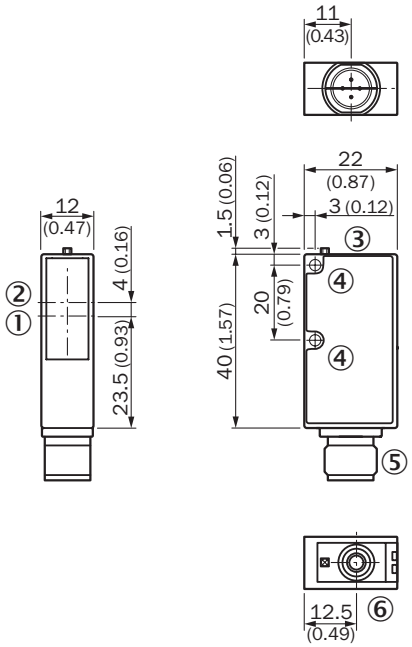
Ambient temperature	Operation: –10 °C ... +55 °C Storage: –20 °C ... +75 °C
Shock load	According to IEC 60068

Ordering information

Sensing distance [1)]	Sensing distance tolerance	Light spot size	Light spot direction	Output (channel)	Switching output	Model name	Part no.
12.5 mm	± 2 mm	1.5 mm x 6.5 mm	Longitudinal	1 color	NPN	CSM1-N1114	1018514
					PNP	CSM1-P1114	1022569

[1)] From front edge of lens.

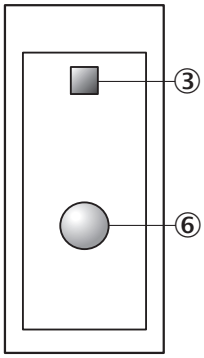
Dimensional drawing



All dimensions in mm (inch)

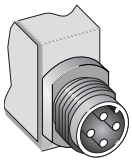
① Axis of the sender optics
② Axis of the receiver optics
③ LED signal strength indicator
④ Mounting hole, Ø 3 mm
⑤ Connector M12
⑥ Teach-in button

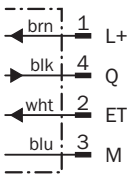
Adjustments



Connection type and diagram

Connector
M12, 4-pin





Recommended accessories

Plug connectors and cables

Connector M12, 4-pin

Connector type	Enclosure rating	Flying leads	Sheath material	Cable length	Model name	Part no.
Female connector	IP 67	Straight	PVC	2 m	DOL-1204-G02M	6009382
				5 m	DOL-1204-G05M	6009866
				10 m	DOL-1204-G10M	6010543
				15 m	DOL-1204-G15M	6010753
		Angled	PVC	2 m	DOL-1204-W02M	6009383
				5 m	DOL-1204-W05M	6009867
				10 m	DOL-1204-W10M	6010541
		Straight	–	–	DOS-1204-G	6007302
		Angled	–	–	DOS-1204-W	6007303

Mounting brackets/plates

Mounting system type	Material	Model name	Part no.
Mounting bracket	Steel, zinc coated	BEF-WN-W9-2	2022855

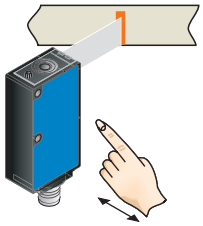
Terminal and alignment brackets

Mounting system type	Description	Material	Model name	Part no.
Universal bar clamps	Universal bar clamp	Die-cast zinc	BEF-KHS-KH1	2022726
	Plate L for universal bar clamp	Steel, zinc coated	BEF-KHS-L01	2023057
	Mounting rod straight	Steel, zinc coated	BEF-MS12G-A	4056054
			BEF-MS12G-B	4056055
	Mounting rod L-shaped	Steel, zinc coated	BEF-MS12L-A	4056052
			BEF-MS12L-B	4056053

For additional accessories including dimensional drawings, please see page G-1

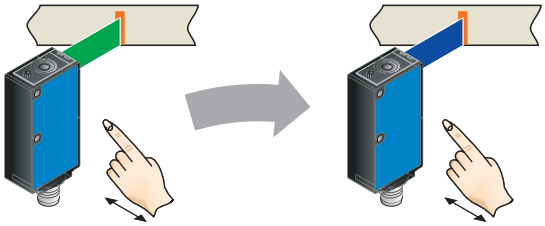
Setting the switching threshold via teach-in

1. Trigger teach-in



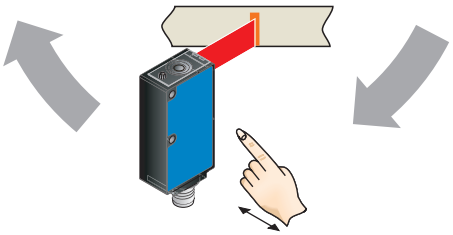
Position object in light field.
Press teach-in button > 1 s.

2. Select color tolerance



Press teach-in button > 1 s
when transmitted light is green
= tolerance medium (standard setting).

Press teach-in button > 1 s
when transmitted light is blue
= tolerance precise.



Press teach-in button > 1 s
when transmitted light is red
= tolerance coarse.

C

C

High-performance color sensing

C

Product description

The ability to teach up to four colors can lead to faster changeovers and shorter downtime. The CS8 series offers high switching speeds – as fast as 6 kHz (85 µs) – enabling higher throughput. And, the sensor maintains the extreme precision of the lightspot; this sharp, well-defined spot provides tighter process control and more consistent object detection. A bar graph display enables easy setup and provides information about the color quality and detection reliability.

At a glance

- One (CS8-1) or four (CS8-4) colors can be saved
- 12.5 mm or 60 mm sensing distance
- Fast response time up to 85 µs
- High resolution color
- Bar graph display shows the correlation of the colors
- Extremely precise light spot and high resolution
- Metal housing with two light exits (interchangeable)

Your benefits

- Identify and store up to four colors. No need to reprogram the sensor for changeovers, reducing downtime.
- High resolution colors can be matched exactly for better process reliability
- Maintains the extreme precision of the light spot, enabling a consistent object detection
- A bar graph display provides information about the color quality and detection reliability, ensuring simple process monitoring
- Broad spectrum of color tolerances enables more flexible use
- Fast response times at high speeds for reliable detection
- Detection reliability is not affected by varying temperatures

Additional information

8013816/2011-05-30
Subject to change without notice

Detailed technical data

Features

Dimensions (L x W x H)	53 mm x 30.4 mm x 80 mm
Light source [1) 2)]	LED red, green, blue
Adjustment	Static 1-point teach-in

[1)] Average service life 100,000 h at T_a = +25 °C.

[2)] Wave length: 470 nm, 525 nm, 640 nm.

Mechanics/electronics

Supply voltage V_S [1)]	DC 10 V ... 30 V
Ripple [2)]	< 5 V_{PP}
Power consumption [3)]	< 120 mA
Switching output voltage	NPN: HIGH = approx. V_S / LOW ≤ 2 V PNP: HIGH = V_S – ≤ 2 V / LOW approx. 0 V
Output current $I_{max.}$ [4)]	< 100 mA
Input, teach-in (ET)	PNP: Teach: U = 10 V ... < U_V Run: U < 2 V NPN: Teach: U < 2 V Run: U = 10 V ... < U_V
Input, blanking input (AT) [5)]	PNP: Blanked: U > 10 V ... < U_V Free-running: U < 2 V NPN: Blanked: U < 2 V Free-running: U > 10 V ... < U_V
Retention time (ET)	25 ms, non-volatile memory
Time delay	Deactivation delay 20 ms, shiftable
Protection class [6)]	II
Circuit protection	V_S connections reverse-polarity protected Output Q short-circuit protected Interference suppression
Enclosure rating	IP 67
Weight	Approx. 400 g
Housing material	Die-cast zinc

[1)] Limit values. Operation in short-circuit protected network max. 8 A.

[2)] May not exceed or fall short of V_S tolerances.

[3)] Without load.

[4)] Consumption count Q1 ... Q4.

[5)] AT > 200 µs.

[6)] Reference voltage 32 V DC.

Ambient data

Ambient temperature	Operation: –10 °C ... +55 °C Storage: –20 °C ... +75 °C
Shock load	According to IEC 60068

C

Specific data

Output (channel)	Switching frequency [1]	Response time [2]	Connection type	Model name	Ordering information
1 color	1 kHz, 3 kHz, 6 kHz, adjustable	500 µs, 160 µs, 85 µs	Connector M12, 5-pin	CS81	C-16
4 colors	0.5 kHz, 1 kHz, 3.5 kHz, adjustable	1,000 µs, 500 µs, 145 µs	Connector M12, 8-pin	CS84	C-16

[1] With light/dark ratio 1:1.

[2] Signal transit time with resistive load.

Ordering information

CS81

- **Output (channel):** 1 color
- **Switching frequency:** 1 kHz, 3 kHz, 6 kHz, adjustable
- **Response time:** 500 µs, 160 µs, 85 µs
- **Connection type:** Connector M12, 5-pin

C

Sensing distance [1]	Sensing distance tolerance	Light spot size	Light spot direction	Switching output	Model name	Part no.
12.5 mm	± 3 mm	2 mm x 4 mm	Longitudinal	NPN	CS81-N1112	1028228
				PNP	CS81-P1112	1028224
60 mm	± 9 mm	13 mm x 13 mm	–	NPN	CS81-N3612	1028229
				PNP	CS81-P3612	1028225

[1] From front edge of lens.

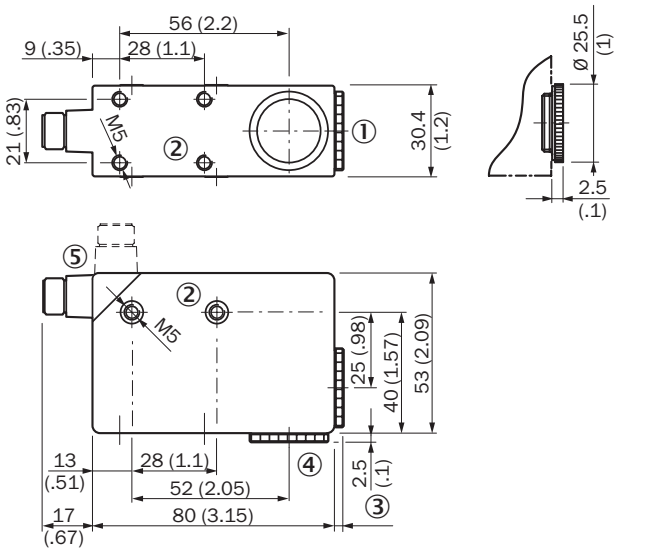
CS84

- **Output (channel):** 4 colors
- **Switching frequency:** 0.5 kHz, 1 kHz, 3.5 kHz, adjustable
- **Response time:** 1,000 µs, 500 µs, 145 µs
- **Connection type:** Connector M12, 8-pin

Sensing distance [1]	Sensing distance tolerance	Light spot size	Light spot direction	Switching output	Model name	Part no.
12.5 mm	± 3 mm	2 mm x 4 mm	Longitudinal	NPN	CS84-N1112	1028230
				PNP	CS84-P1112	1028226
60 mm	± 9 mm	13 mm x 13 mm	–	NPN	CS84-N3612	1028231
				PNP	CS84-P3612	1028227

[1] From front edge of lens.

Dimensional drawing

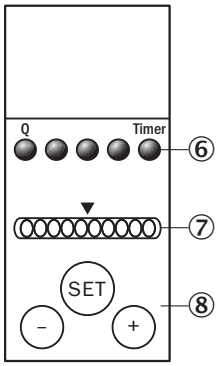


All dimensions in mm (inch)

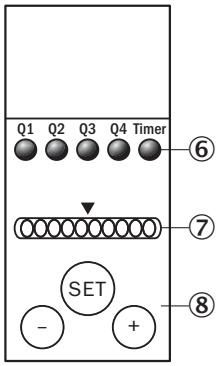
① Lens (light transmission)
② M5 threaded mounting hole, 5.5 mm deep
③ See dimensional drawing for lens
④ Blind screw can be replaced by lens
⑤ Connector M12 (rotatable up to 90°)
⑥ Function signal indicators (yellow)
⑦ Bar graph (green), Power-on left LED
⑧ Teach-in button/"+" and "–" button

Adjustments

CS8-1

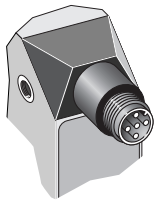


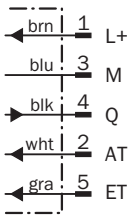
CS8-4



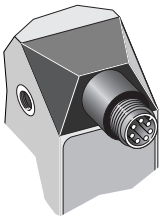
Connection type and diagram

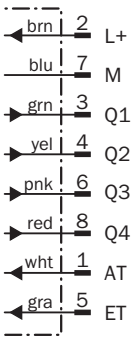
CS81
Connector
M12, 5-pin





CS84
Connector
M12, 8-pin





C

Recommended accessories

Plug connectors and cables

Connector M12, 5-pin

Connector type	Enclosure rating	Flying leads	Sheath material	Cable length	Model name	Part no.
Female connector	IP 67	Straight	PVC	2 m	DOL-1205-G02M	6008899
				5 m	DOL-1205-G05M	6009868
				10 m	DOL-1205-G10M	6010544
		Angled	PVC	2 m	DOL-1205-W02M	6008900
				5 m	DOL-1205-W05M	6009869
				10 m	DOL-1205-W10M	6010542
		Straight	–	–	DOS-1205-G	6009719
		Angled	–	–	DOS-1205-W	6009720

Connector M12, 8-pin

C

Connector type	Enclosure rating	Flying leads	Sheath material	Cable length	Model name	Part no.
Female connector	IP 67	Straight	PVC	2 m	DOL-1208-G02MA	6020633
				5 m	DOL-1208-G05MA	6020993
		Angled	PVC	2 m	DOL-1208-W02MA	6020992
				5 m	DOL-1208-W05MA	6021033
		Straight	–	–	DOS-1208-G	6028422
					DOS-1208-GA	6028369

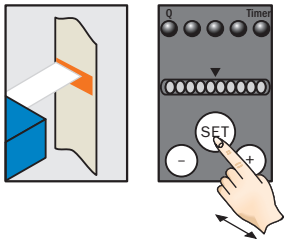
Terminal and alignment brackets

Mounting system type	Description	Material	Model name	Part no.
Universal bar clamps	Plate G for universal bar clamp	Steel, zinc coated	BEF-KHS-G01	2022464
	Plate K for universal bar clamp	Steel, zinc coated	BEF-KHS-K01	2022718
	Universal bar clamp	Die-cast zinc	BEF-KHS-KH1	2022726
	Mounting rod straight	Steel, zinc coated	BEF-MS12G-A	4056054
			BEF-MS12G-B	4056055
	Mounting rod L-shaped	Steel, zinc coated	BEF-MS12L-A	4056052
			BEF-MS12L-B	4056053

For additional accessories including dimensional drawings, please see page G-1

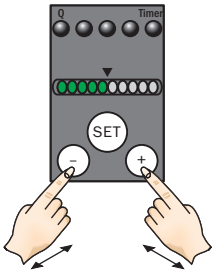
CS8-1 – Setting the switching threshold via teach-in

1. Trigger teach-in



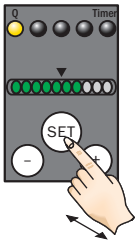
Position object in light field.
Press SET button > 1 s.

2. Select color tolerance



If necessary adapt tolerance with
“+” button (more precise) or
“–” button (more coarse).

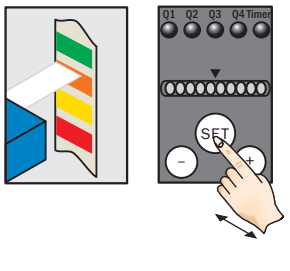
3. Confirm teach-in



Press SET button > 1 s.
Color correspondence is
visualized via bar graph display.

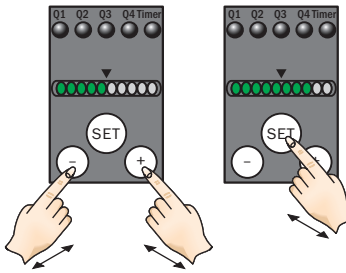
CS8-4 – Setting the switching threshold via teach-in

1. Trigger teach-in



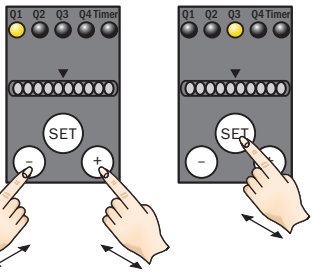
Position object in light field.
Press SET button > 1 s.

2. Select color tolerance



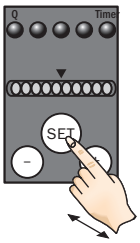
If requested adapt tolerance with
“+” button (more precise) or
“–” button (more coarse).
Press SET button > 1 s.

3. Allocate channel to color



Allocate channel for color with
“+” button (Q1 to Q4) or
“–” button (Q4 to Q1).
Press SET button > 1 s.

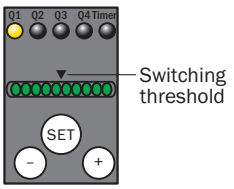
4. Confirm teach-in



Press SET button > 1 s.
Color correspondence is
visualized via bar graph
display.

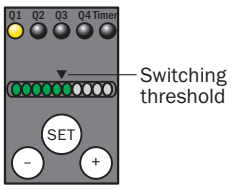
CS8 – Display of the color correspondence

1. Full correspondence



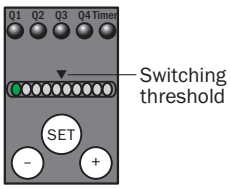
Color detected
= Q active.

2. Correspondence



Color just detected
= Q active.

3. No correspondence



Color not detected
= Q inactive.

Special settings

“Evaluation mode,” “Tolerance change during operation,” “Show quality,” “Time stage,” and “Output logic” can be set via a special menu (cf. appropriate operating instructions for the device).

(–) **and** (+)
> 1 s = enter/exit

(–) **or** (+)
< 1 s = navigate

(SET)
> 1 s = select/confirm

C

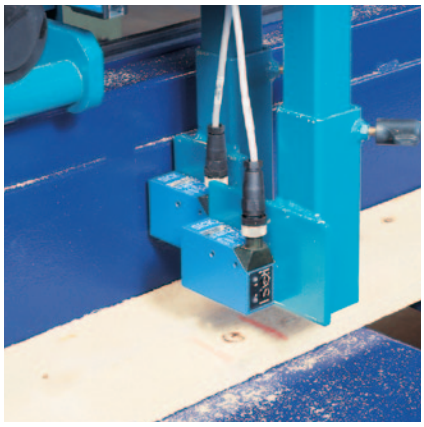
D

The bright idea for fluorescent material

Luminescence sensors detect visible and non-visible marks that illuminate when using ultraviolet (UV) light. Fluorescent material and marks are reliably detected independently of their pattern, colors or surface conditions on any material. Luminescence sensors emit UV light with a wave length of approximately 375 nm. Fluorescent substances convert the UV light into long-wave visible light, which is then received and evaluated by the luminescence sensor.

Your benefits

- 90 % of the applications can be solved using the default factory setting. A simple setup permits the adjustment to specific tasks.
- Set up in minutes, saving time and money
- The right solution for everybody – there is a wide range of models, depending on applications
- Filters ensure that background luminescence is reliably suppressed, enabling greater process reliability



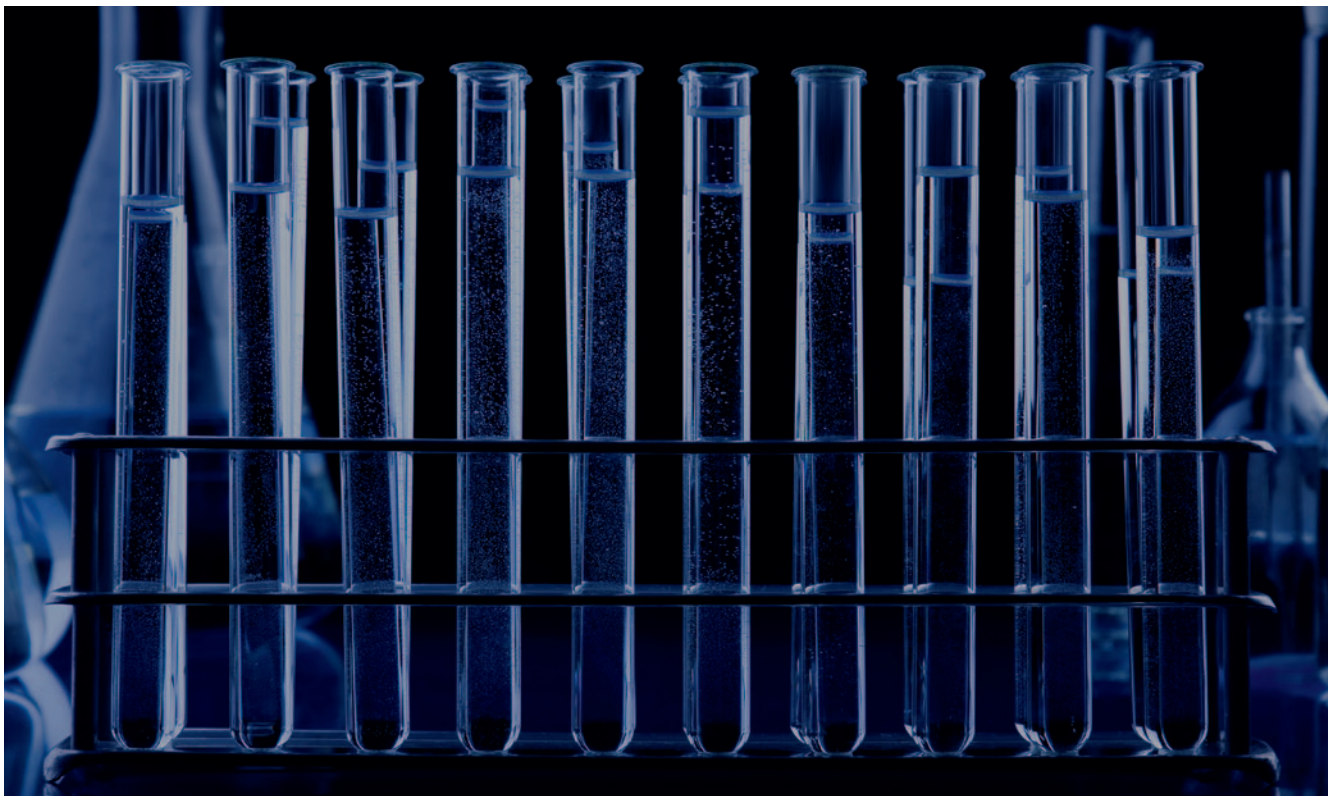
8013816/2011-05-30
Subject to change without notice

D

Luminescence sensors

See the invisible

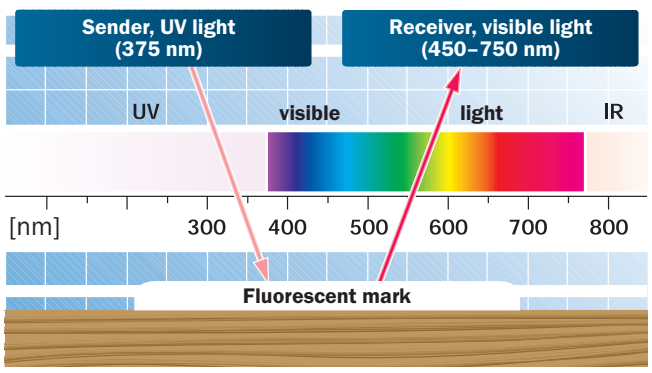
Luminescence sensors detect marks that are only visible under UV light. This is due to fluorescent substances contained in the mark, which convert the UV light into visible light. The reflected light beam is received by the luminescence sensor and evaluated.



D

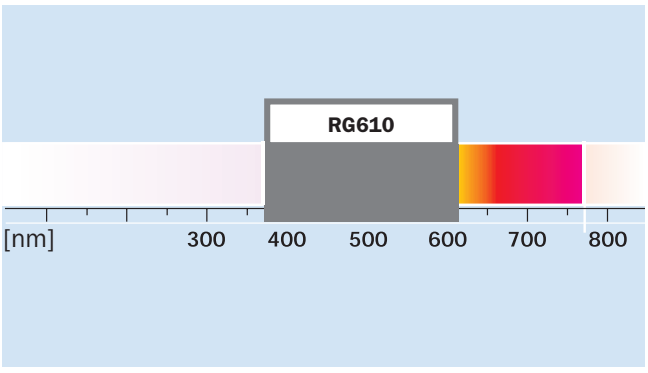
Operating principle

Luminescence sensors emit modulated UV light with a wave length of 375 nm. Fluorescent substances are excited by this, and send back light with a long wave length in the visible spectrum (approx. 420 to 750 nm). This light is detected and evaluated by the luminescence sensor.



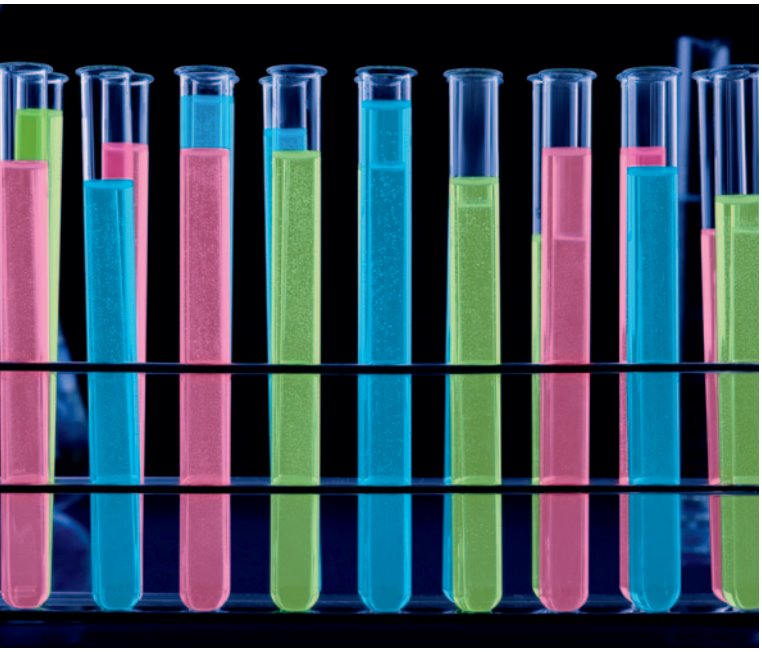
Function of the filters

The example shows use of a RG610 filter. Wave length ranges below 610 nm (purple, blue, green) are suppressed and only visible light > 610 nm (red) reaches the receiver. This means disruptive background luminescences that light up green or blue can be reliably suppressed, such as a red mark on white paper.



Luminophores

The illumination effect of the fluorescent substances is attributable to mixed luminophores – small particles that convert the UV light into visible light in different wave length ranges and different intensities. Luminophores can be added to almost all substances. This includes chalk or wax crayon, plastics, ink, oil, grease, labels and felt-tip pen marks.



Luminescence calibration chart

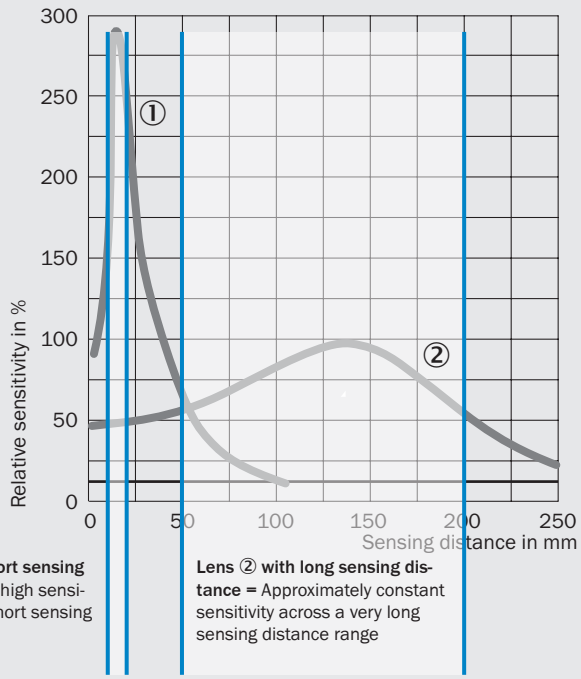
The luminescence calibration chart (available from SICK) is used as the reference for the switching properties of the luminescence sensors. The luminescence calibration chart can be used for checking the readability under different signal intensities, in order to achieve a reliable application in different areas of application. This chart is a relative measurement between the values and the test material with the help of the analog output. In LUT8 and LUT9, the bar graph display shows the luminescence intensity – left 30 %, right 200 % in relation to the reference, depending on the sensing distance.

30 % signal strength in relation to the reference

200 % signal strength in relation to the reference

D

Reading out the sensitivity curve

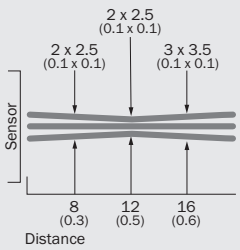


Lens ① with short sensing distance = Very high sensitivity across a short sensing distance range

Lens ② with long sensing distance = Approximately constant sensitivity across a very long sensing distance range

Effects of the light spot size

Sensing distance 12 mm

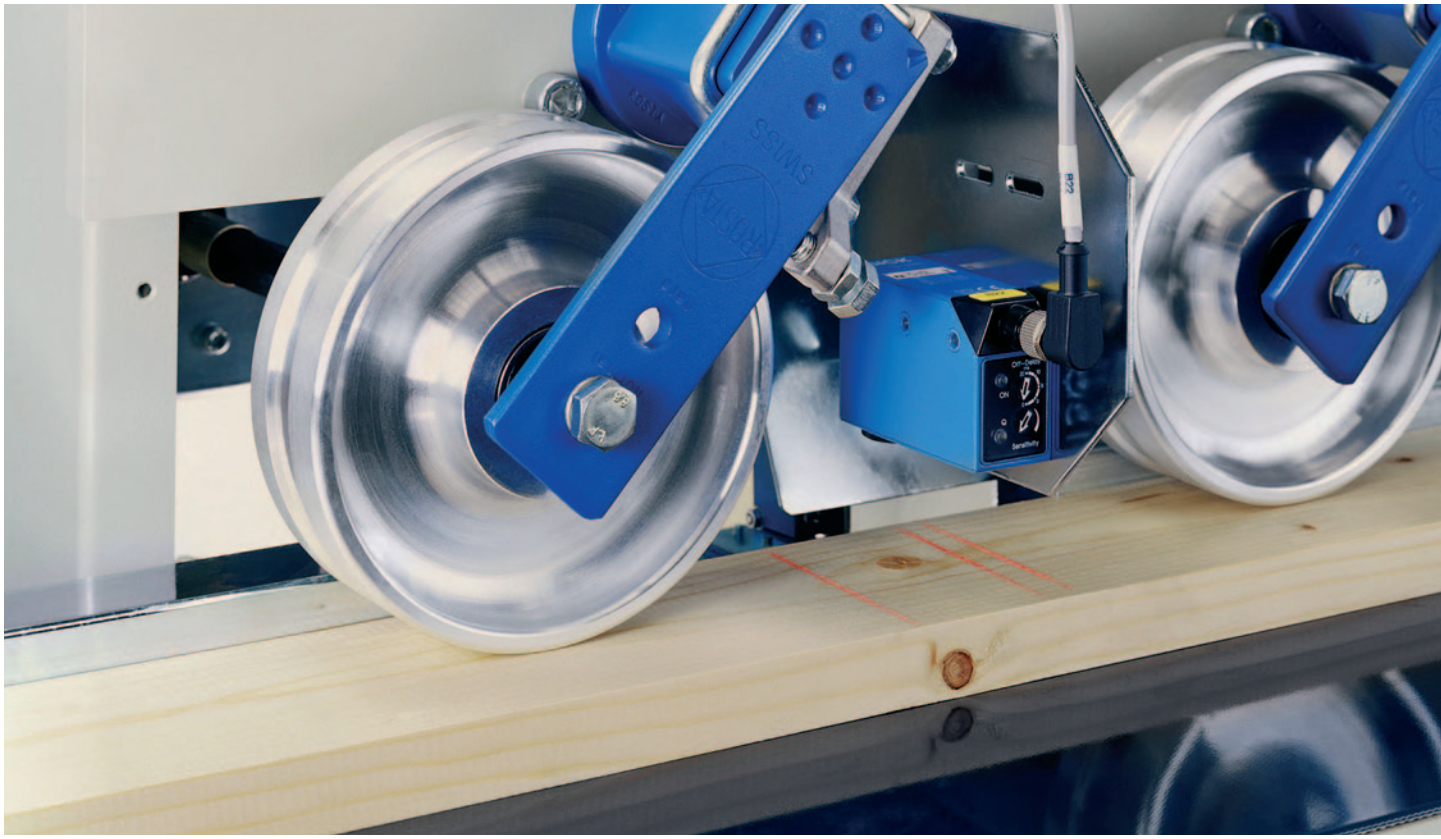


All dimensions in mm (inch)

Luminescence sensors have a differently sized light spot depending on the sensing distance (range).

Long sensing distance, large light spot
For flexible use if the markings can occur at different points on the object.
Short sensing distance, small light spot
For accurate positioning and precise switching.

Wood-processing industry



Knotholes and other “flaws” in wooden boards are marked in order for them to be removed by sawing. The luminescence sensor picks up fluorescent chalk or ink on a very wide range of wood materials. The ability to have a long distance between the sensor and object means that marks can be reliably detected on different wood thicknesses without mechanical adjustment of the sensors. The sturdy metal housings are ideal for use under harsh industrial conditions.

Pharmaceutical industry

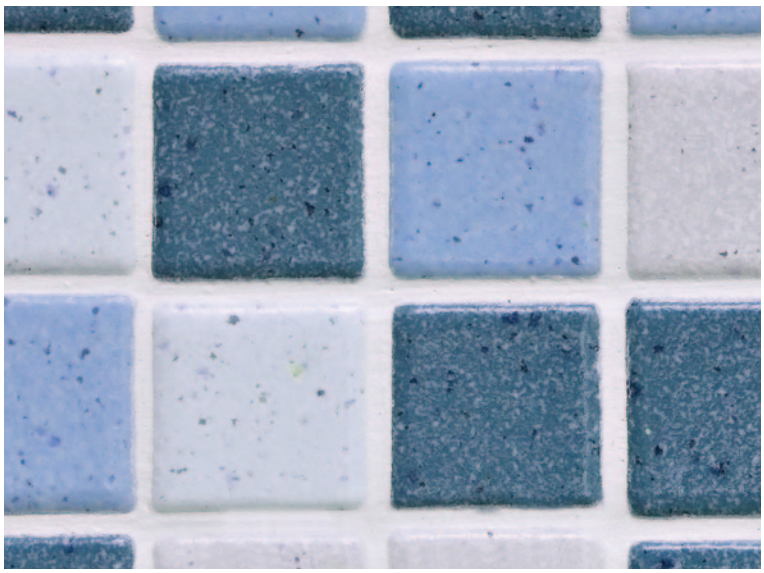
Whether the instruction insert is in the package or the labels affixed to the vials – luminescence sensors permit a very high standard of process reliability. High switching frequency and reliability are essential – and these are precisely the qualities offered by luminescence sensors.

Food & Beverage

On luxury goods in particular, it is an advantage for the control marks not to impair the high-quality design of labels. In this case, the alignment of labels and stoppers can be checked using invisible, luminescent markings that only show up under UV light. Luminescence sensors from SICK are the right solutions for an industry in which label orientation and positioning are important.

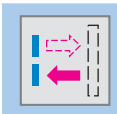
D

Ceramics industry

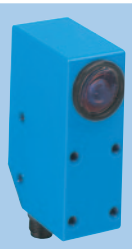


There are various qualities of ceramic tiles in the ceramics industry. The tiles are allocated to different quality levels in order for them to be matched with their particular application. The tiles are marked in different ways in order for the sorting to be controlled quickly and easily, and these markings are reliably detected by the luminescence sensors.

Product family overview

				
		LUT1	**LUT2-2**	
		Compact sensor for long sensing distances	High performance in a miniature format	
Technical data overview				
Sensing distance		50 mm / 80 mm / 150 mm	12.5 mm	
Light source		UV-LED/Blue LED	UV-LED	
Light emission		Long side	Long side	
Switching frequency		600 Hz / 6 kHz	500 Hz, 2 kHz	
Response time		850 µs / 85 µs	1 ms, 250 µs	
Analog output QA		0.5 mA ... 10 mA	–	
Adjustment		Manual (“+”/”–” button)	Static 2-point teach-in	
Connection type		Connector M12, 5-pin	Connector M12, 4-pin	
At a glance				
		• Infinite switching threshold adjustment using touch-sensitive keypad • Long sensing distances up to 150 mm • Transmitter LED UV (375 nm) or blue (470 nm) • Fast switching speed 600 Hz or 6 kHz	• Small plastic housing • High system sensitivity • Static teach-in on mark and/or background via control panel or control cable • Fast switching speed 500 Hz and 2 kHz	
Detailed information		→ D-8	→ D-16	

D

			IO-Link 
	LUT3-6	**LUT8**	**LUT9**
	The solution for standard applications	For universal use with easy adjustment	The new standard for high-performance luminescence sensors
	10 mm / 20 mm / 50 mm	10 mm / 20 mm / 50 mm / 90 mm	10 mm / 20 mm / 50 mm / 90 mm / 150 mm
	UV-LED	UV-LED	UV-LED/Blue LED
	Long side	Long side	Long side Long and short side, exchangeable
	1.5 kHz	2.5 kHz	500 Hz, 2.5 kHz, 6.5 kHz
	350 µs	200 µs	1 ms, 200 µs, 75 µs
	–	0 mA ... 13 mA	0 mA ... 13 mA
	Manual (potentiometer)	Manual (rotary switch)	Static 2-point teach-in with manual fine adjustment IO-Link
	Connector M12, 4-pin	Connector M12, 5-pin	Connector M12, 5-pin (standard) Connector M12, 4-pin (IO-Link)
	• Tough metal housing • Sensing distance: 10, 20 or 50 mm • Sensing distances selectable through interchangeable lenses • Transmitter LED UV (375 nm)	• Tough metal housing • Simple sensitivity adjustment in 8 stages • Bar graph display provides information about the luminescence intensity • Sensing distances selectable through interchangeable lenses • Additional optical filters suppress background luminescence • Fiber-optic cable connection (with 20 mm lens) • Switching and analog output	• Simple teach-in • Operating range up to 250 mm • Version with IO-Link • Bar graph display provides information about the luminescence intensity • High speed (6.5 kHz), standard (2.5 kHz), high resolution (500 Hz) models • Additional optical filters suppress background luminescence • Fiber-optic cable connection (with 20 mm lens) • Switching and analog output
	→ D-22	→ D-28	→ D-34

D

Compact sensor for long sensing distances

D

Product description

LUT1 series luminescence sensors feature easy to adjust sensitivity. The switching threshold can be adjusted via a plus/minus button, greatly simplifying setup for applications that require changeover. Even at very high speeds, luminescent marks are reliably detected. The visible blue emitted light from the LUT1B version is well-suited for red luminescent marks.

At a glance

- Infinite switching threshold adjustment using touch-sensitive keypad
- Long sensing distances up to 150 mm
- Transmitter LED UV (375 nm) or blue (470 nm)
- Fast switching speed 600 Hz or 6 kHz

Your benefits

- Robust metal housing is reliable and ideal for tough environment conditions
- High detection reliability ensures the process: Blue transmitter LED excites red luminophores especially well. The UV LED is well-suited for blue, green or yellow marks.
- Visible light spot of the LUT1B version makes accurate alignment easy

Additional information

8013816/2011-05-30
Subject to change without notice

Detailed technical data

Features

Light emission	Long side
Adjustment	Manual (“+”/”–” button)
Switching function	Light switching

Mechanics/electronics

Supply voltage V_S [1]	DC 10 V ... 30 V
Ripple [2]	< 5 V_{PP}
Power consumption [3]	< 40 mA
Switching output voltage	PNP: HIGH = V_S – ≤ 2 V / LOW approx. 0 V NPN: HIGH = approx. V_S / LOW ≤ 2 V
Analog output Q_A [5]	0.5 mA ... 10 mA
Output current $I_{max.}$	200 mA
Connection type	Connector M12, 5-pin
Protection class [6]	III
Circuit protection	V_S connections reverse-polarity protected Output Q short-circuit protected Interference suppression
Enclosure rating	IP 67
Weight	Approx. 240 g
Housing material	Die-cast zinc

[1] Limit values: operation in short-circuit protected network max. 8 A.

[2] May not exceed or fall short of V_S tolerances.

[3] Without load.

[5] Only LUT1B-12205.

[6] Reference voltage 50 V DC.

Ambient data

Ambient temperature	Operation: –20 °C ... +60 °C Storage: –40 °C ... +70 °C
Shock load	According to IEC 60068

Specific data

Dimensions (L x W x H)	Sensing distance [1]	Operating range	Light spot size	Model name	Ordering information
47.5 mm x 23 mm x 70 mm	50 mm	15 mm ... 60 mm	5 mm x 5 mm	LUT1B-xxx2x	D-10
	80 mm	60 mm ... 100 mm	20 mm x 50 mm	LUT1B-xxx0x	D-10
60 mm x 23 mm x 70 mm	150 mm	60 mm ... 160 mm	6 mm x 14 mm	LUT1B-xxx3x	D-10
			12 mm x 12 mm	LUT1U-xxx3x	D-11

[1] From front edge of lens.

D

Ordering information

LUT1B-xxx2x

- **Dimensions (L x W x H):** 47.5 mm x 23 mm x 70 mm
- **Sensing distance:** 50 mm
- **Operating range:** 15 mm ... 60 mm
- **Light spot size:** 5 mm x 5 mm

Light source [1) 2)]	Receiving range	Receiving filters	Switching frequency [3)]	Response time [4)]	Switching output	Model name	Part no.
Blue LED	590 nm ... 750 nm	OG 590	600 Hz	850 µs	PNP/ control output	LUT1B-41225	1024125
			6 kHz	85 µs	PNP	LUT1B-11325	1024127
					PNP/NPN	LUT1B-31325	1027593

1) Average service life 100,000 h at T_a = +25 °C.
2) Wave length: 470 nm.
3) With light/dark ratio 1:1.
4) Signal transit time with resistive load.

LUT1B-xxx0x

- **Dimensions (L x W x H):** 47.5 mm x 23 mm x 70 mm
- **Sensing distance:** 80 mm
- **Operating range:** 60 mm ... 100 mm
- **Light spot size:** 20 mm x 50 mm

Light source [1) 2)]	Receiving range	Receiving filters	Switching frequency [3)]	Response time [4)]	Switching output	Model name	Part no.
Blue LED	590 nm ... 750 nm	OG 590	600 Hz	850 µs	PNP	LUT1B-12205	1027497

1) Average service life 100,000 h at T_a = +25 °C.
2) Wave length: 470 nm.
3) With light/dark ratio 1:1.
4) Signal transit time with resistive load.

LUT1B-xxx3x

- **Dimensions (L x W x H):** 60 mm x 23 mm x 70 mm
- **Sensing distance:** 150 mm
- **Operating range:** 60 mm ... 160 mm
- **Light spot size:** 6 mm x 14 mm

Light source [1) 2)]	Receiving range	Receiving filters	Switching frequency [3)]	Response time [4)]	Switching output	Model name	Part no.
Blue LED	590 nm ... 750 nm	OG 590	600 Hz	850 µs	PNP/ control output	LUT1B-41235	1024126

1) Average service life 100,000 h at T_a = +25 °C.
2) Wave length: 470 nm.
3) With light/dark ratio 1:1.
4) Signal transit time with resistive load.

LUT1U-xxx3x

- **Dimensions (L x W x H):** 60 mm x 23 mm x 70 mm
- **Sensing distance:** 150 mm
- **Operating range:** 60 mm ... 160 mm
- **Light spot size:** 12 mm x 12 mm

Light source [1) 2)]	Receiving range	Receiving filters	Switching frequency [3)]	Response time [4)]	Switching output	Model name	Part no.
UV-LED	450 nm ... 750 nm	KV 418 (standard)	6 kHz	85 µs	PNP	LUT1U-11331	1024128

[1)] Average service life 100,000 h at T_a = +25 °C.

[2)] Wave length: 375 nm.

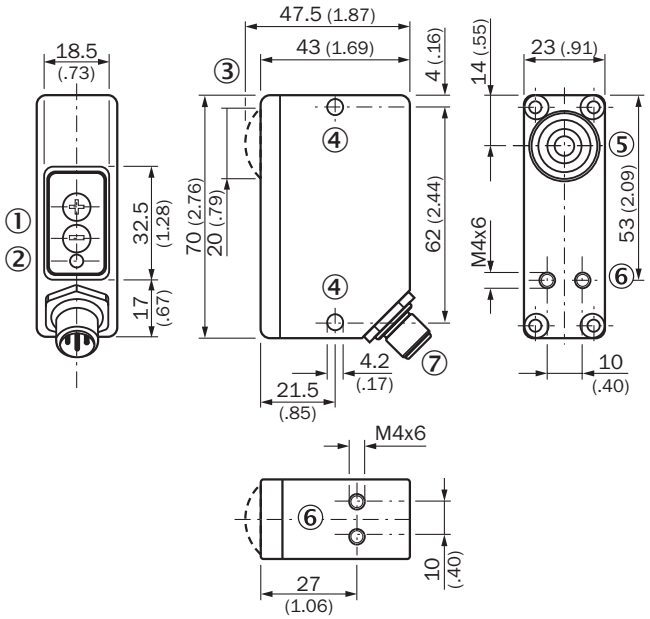
[3)] With light/dark ratio 1:1.

[4)] Signal transit time with resistive load.

D

Dimensional drawings

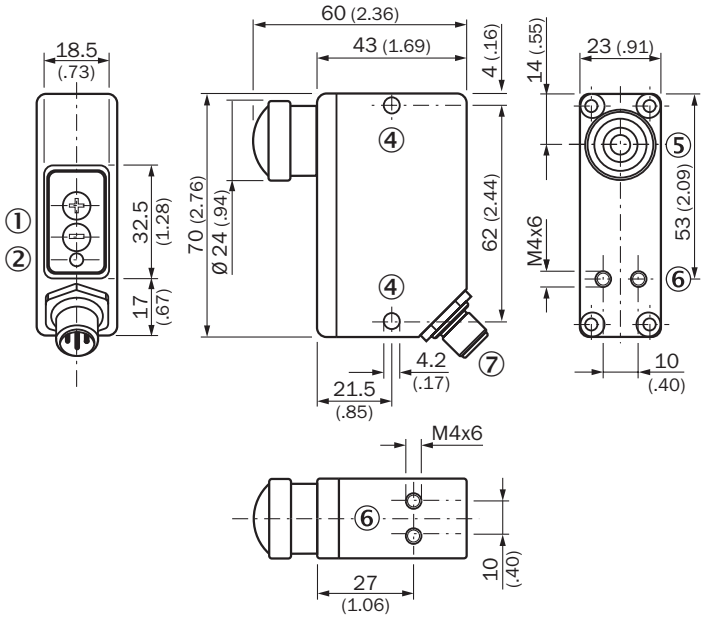
LUT1B-xxx2x
LUT1B-xxx0x



All dimensions in mm (inch)

D

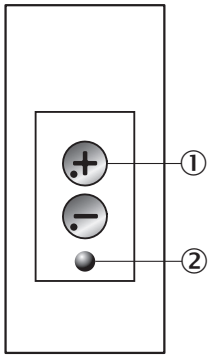
LUT1x-xxx3x



All dimensions in mm (inch)

① Control elements
② LED signal strength indicator
③ Lens planar to surface for LUT1B-12205
④ Mounting hole
⑤ Optical axis
⑥ Threaded mounting hole
⑦ Connector M12

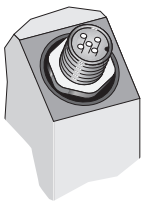
Adjustments

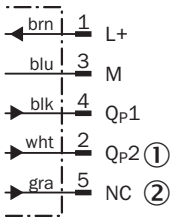


① Control elements
② LED signal strength indicator

Connection type and diagram

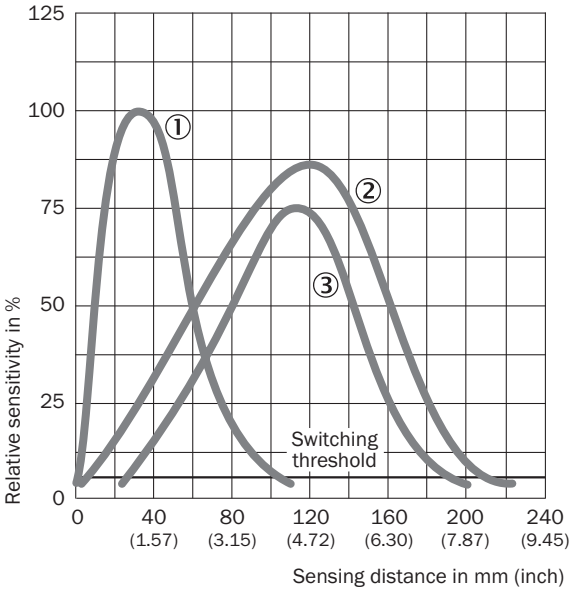
Connector
M12, 5-pin





① QP2 or control output
② NC or analog output

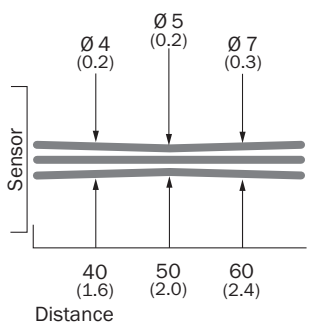
Sensing distance



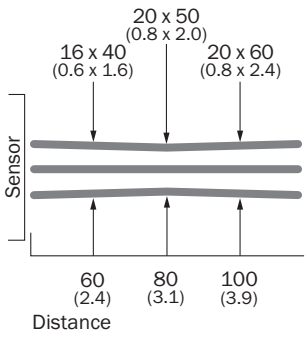
① LUT1B sensing distance 50 mm; scan material: acryl orange
② LUT1B sensing distance 150 mm; scan material: acryl orange
③ LUT1U sensing distance 150 mm; scan material: SICK Luminescence reference 100 %

Light spot size

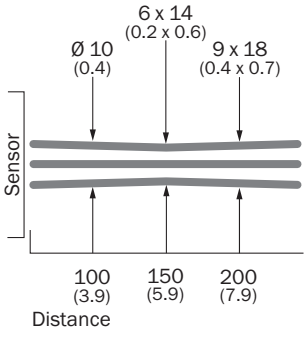
Sensing distance 50 mm



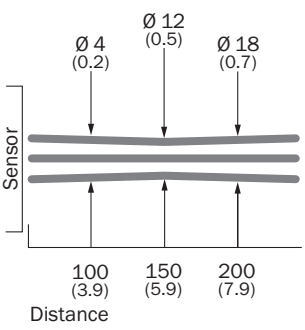
Sensing distance 80 mm



Sensing distance 150 mm



Sensing distance 150 mm



All dimensions in mm (inch)

Recommended accessories

Plug connectors and cables

Connector M12, 5-pin

Connector type	Enclosure rating	Flying leads	Sheath material	Cable length	Model name	Part no.
Female connector	IP 67	Straight	PVC	2 m	DOL-1205-G02M	6008899
				5 m	DOL-1205-G05M	6009868
				10 m	DOL-1205-G10M	6010544
		Angled	PVC	2 m	DOL-1205-W02M	6008900
				5 m	DOL-1205-W05M	6009869
				10 m	DOL-1205-W10M	6010542
		Straight	–	–	DOS-1205-G	6009719
		Angled	–	–	DOS-1205-W	6009720

Others

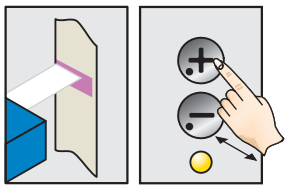
Description	Model name	Part no.
Crayon, red fluorescence	LUM-FT	1004460
Writing chalk, red fluorescence	LUM-KLK	1002959
–	Luminescence reference German/English	8008840

For additional accessories including dimensional drawings, please see page G-1

D

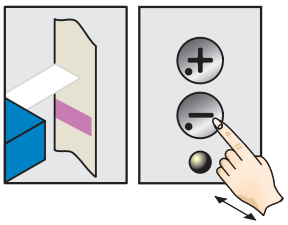
Setting the switching threshold via “+”/“–” buttons

1. Position mark



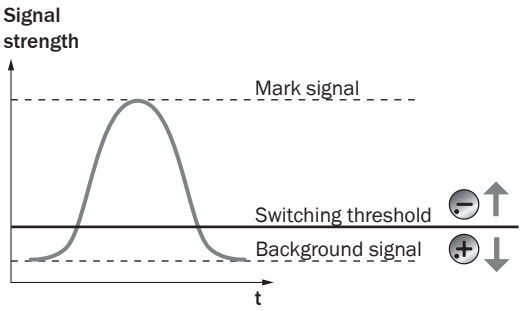
Press “+” button and hold until yellow LED illuminates.

2. Position background



If yellow LED illuminates, press “–” button and hold until yellow LED just goes out.

Sensitivity setting



Note

Adjustments are intendend for luminescence background suppression.

D

High performance in a miniature format

Product description

The second generation LUT2-2 is ideal for applications where fluorescent marks need to be reliably detected in confined spaces. Even when the level of luminescence is low, the LUT2-2 detects fluorescent marks using its enhanced system sensitivity. This mini-luminescence sensor can easily be adjusted using a simple teach-in procedure. Thanks to a switching frequency of up to 2 kHz, the LUT2-2 is also suitable for high-speed machine production capacities.

At a glance

- Small plastic housing
- High system sensitivity
- Static teach-in on mark and/or background via control panel or control cable
- Fast switching speed 500 Hz and 2 kHz

Your benefits

- Compact size enables easy integration into any machine
- Fast and easy setup saves time and money
- Increased reliability and precision enable fast response time

Additional information

8013816/2011-05-30
Subject to change without notice

Detailed technical data

Features

Dimensions (L x W x H)	22 mm x 12 mm x 40 mm
Light source [1) 2)]	UV-LED
Light emission	Long side
Light spot direction	Vertical
Receiving filters	KV 418 (standard)
Adjustment	Static 2-point teach-in
Switching function [3)]	Light/dark switching

[1)] Average service life 100,000 h at T_a = +25 °C.

[2)] Wave length: 370 nm.

[3)] L/D switching via teach-in.

Mechanics/electronics

Supply voltage V_S [1)]	DC 12 V ... 24 V
Ripple [2)]	≤ 5 V_{PP}
Power consumption [3)]	≤ 30 mA
Switching frequency [4)]	500 Hz, 2 kHz, depending on the mark intensity
Response time [5)]	1 ms, 250 µs
Switching output voltage	PNP: HIGH = V_S– ≤ 2 V / LOW approx. 0 V NPN: HIGH = approx. V_S / LOW ≤ 2 V
Output current $I_{max.}$	≤ 100 mA
Input, teach-in (ET)	PNP: Teach: U = 10 V ... < U_V Run: U < 2 V NPN: Teach: U < 2 V Run: U = 10 V ... < U_V
Connection type	Connector M12, 4-pin
Protection class [6)]	II
Circuit protection	V_S connections reverse-polarity protected Output Q short-circuit protected Interference suppression
Enclosure rating	IP 67
Weight	Approx. 11 g
Housing material	ABS

[1)] Limit values DC 12 V (–10 %) ... DC 24 V (+20 %).
Operation in short-circuit protected network max. 8 A.

[2)] May not exceed or fall short of V_S tolerances.

[3)] Without load.

[4)] With light/dark ratio 1:1.

[5)] Signal transit time with resistive load.

[6)] Reference voltage 50 V DC.

Ambient data

Ambient temperature	Operation: –10 °C ... +55 °C Storage: –25 °C ... +75 °C
Shock load	According to IEC 60068

D

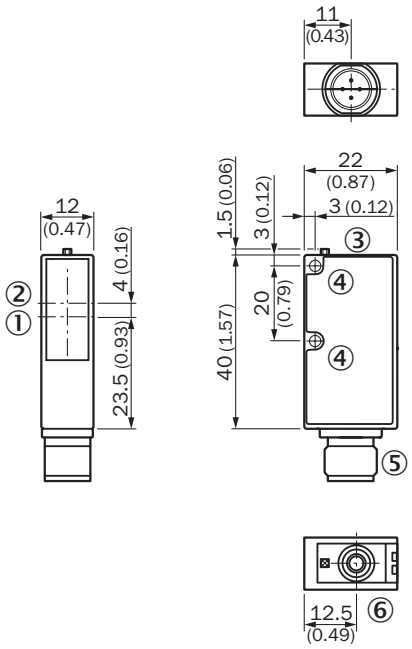
Ordering information

Sensing distance [1]	Operating range	Light spot size [2]	Receiving range	Switching output	Model name	Part no.
12.5 mm	8 mm ... 20 mm	2 mm x 2.5 mm	450 nm ... 750 nm	PNP	LUT2-2P1116	1048505
				NPN	LUT2-2N1116	1048506

[1] From front edge of lens.

[2] At sensing distance.

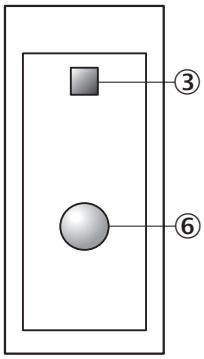
Dimensional drawing



All dimensions in mm (inch)

① Axis of the sender optics
② Axis of the receiver optics
③ LED signal strength indicator
④ Mounting hole, Ø 3 mm
⑤ Connector M12
⑥ Teach-in button

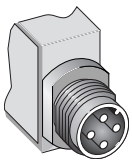
Adjustments

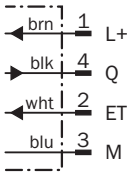


D

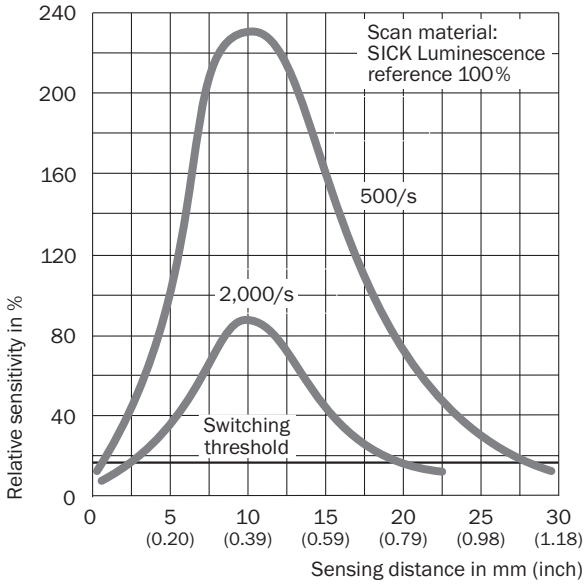
Connection type and diagram

Connector
M12, 4-pin



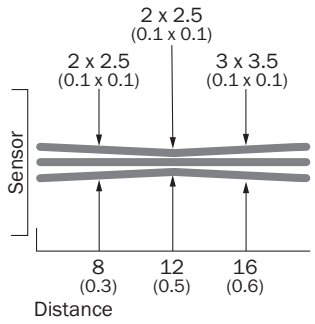


Sensing distance



Light spot size

Sensing distance 12 mm



All dimensions in mm (inch)

D

Recommended accessories

Plug connectors and cables

Connector M12, 4-pin

Connector type	Enclosure rating	Flying leads	Sheath material	Cable length	Model name	Part no.
Female connector	IP 67	Straight	PVC	2 m	DOL-1204-G02M	6009382
				5 m	DOL-1204-G05M	6009866
				10 m	DOL-1204-G10M	6010543
				15 m	DOL-1204-G15M	6010753
		Angled	PVC	2 m	DOL-1204-W02M	6009383
				5 m	DOL-1204-W05M	6009867
				10 m	DOL-1204-W10M	6010541
		Straight	–	–	DOS-1204-G	6007302
		Angled	–	–	DOS-1204-W	6007303

Mounting brackets/plates

Mounting system type	Material	Model name	Part no.
Mounting bracket	Steel, zinc coated	BEF-WN-W9-2	2022855

Terminal and alignment brackets

Mounting system type	Description	Material	Model name	Part no.
Universal bar clamps	Universal bar clamp	Die-cast zinc	BEF-KHS-KH1	2022726
	Plate L for universal bar clamp	Steel, zinc coated	BEF-KHS-L01	2023057
	Mounting rod straight	Steel, zinc coated	BEF-MS12G-A	4056054
			BEF-MS12G-B	4056055
	Mounting rod L-shaped	Steel, zinc coated	BEF-MS12L-A	4056052
			BEF-MS12L-B	4056053

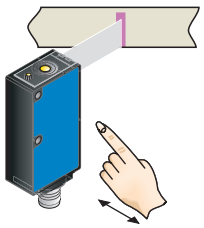
Others

Description	Model name	Part no.
Crayon, red fluorescence	LUM-FT	1004460
Writing chalk, red fluorescence	LUM-KLK	1002959
–	Luminescence reference German/English	8008840

For additional accessories including dimensional drawings, please see page G-1

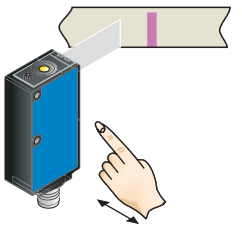
Setting the switching threshold via static 2-point teach-in

1. Position mark



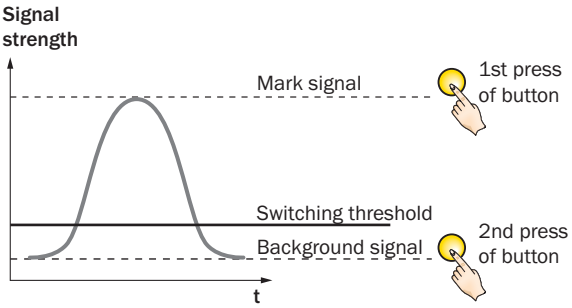
Press and hold teach-in button > 1 s. Yellow LED flashes slowly.

2. Position background



Press and hold teach-in button > 1 s. Yellow LED goes out.

Sensitivity setting



Note

Adjustments are intendend for luminescence background suppression.

D

The solution for standard applications

D

Product description

Whether ensuring that the package insert is in the packaging or the labels are on the vial – the LUT3-6 luminescence sensor permits reliable monitoring.

For optimum adjustment to the fluorescent mark, the sensitivity of the LUT3-6 luminescence sensor is set with an infinite potentiometer.

At a glance

- Tough metal housing
- Sensing distance: 10, 20 or 50 mm
- Sensing distances selectable through interchangeable lenses
- Transmitter LED UV (375 nm)

Your benefits

- Sensitivity of the sensor can be infinitely adjusted using a potentiometer, saves time and reduces costs
- Filters ensure that background luminescence is reliably suppressed, ensuring greater process reliability
- Interchangeable lenses for different sensing distances provide flexibility

Additional information

8013816/2011-05-30
Subject to change without notice

Detailed technical data

Features

Dimensions (L x W x H)	80 mm x 30.4 mm x 53 mm
Light source [1) 2)]	UV-LED
Light emission	Long side
Light spot direction	Vertical
Receiving filters	KV 418 (standard)
Receiving range	450 nm ... 750 nm
Adjustment	Manual (potentiometer)
Switching function	Light switching

[1)] Average service life 100,000 h at T_a = +25 °C.

[2)] Wave length: 375 nm.

Mechanics/electronics

Supply voltage V_S [1)]	DC 12 V ... 30 V
Ripple [2)]	< 2 V_{PP}
Power consumption [3)]	< 60 mA
Switching frequency [4)]	1.5 kHz
Response time [5)]	350 µs
Switching output voltage	PNP: HIGH = V_S – ≤ 3 V / LOW = apporox. 0 V NPN: HIGH = approx. V_S / LOW ≤ 2 V
Switching output	PNP/NPN
Output current $I_{max.}$	100 mA
Connection type	Connector M12, 4-pin
Protection class [6)]	II
Circuit protection	V_S connections reverse-polarity protected Output Q short-circuit protected Interference suppression
Enclosure rating	IP 67
Weight	Approx. 400 g
Housing material	Die-cast zinc

[1)] Limit values: operation in short-circuit protected network max. 8 A.

[2)] May not exceed or fall short of V_S tolerances.

[3)] Without load.

[4)] With light/dark ratio 1:1.

[5)] Signal transit time with resistive load.

[6)] Reference voltage 50 V DC.

Ambient data

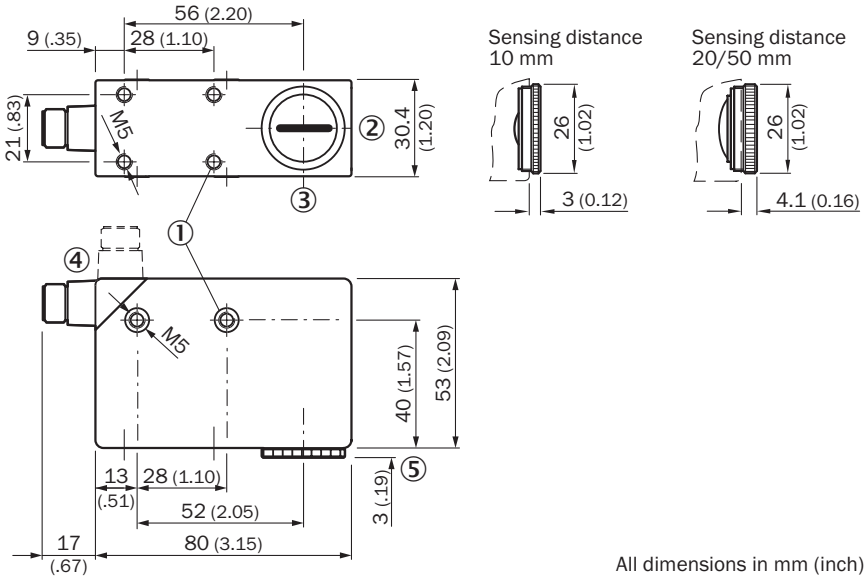
Ambient temperature	Operation: –10 °C ... +55 °C Storage: –25 °C ... +75 °C
Shock load	According to IEC 60068

Ordering information

Sensing distance [1)]	Operating range	Light spot size	Model name	Part no.
10 mm	0 mm ... 15 mm	2 mm x 6 mm	LUT3-610	1015396
20 mm	10 mm ... 35 mm	3 mm x 9 mm	LUT3-620	1015397
50 mm	30 mm ... 60 mm	5 mm x 15 mm	LUT3-650	1015398

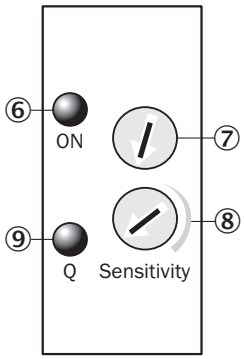
[1)] From front edge of lens.

Dimensional drawing



All dimensions in mm (inch)

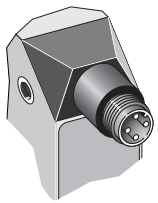
Adjustments

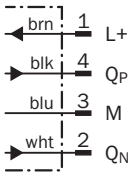


① M5 threaded mounting hole, 5.5 mm deep
② Light spot direction
③ Center of optical axis
④ Connector M12 (rotatable up to 90°)
⑤ See dimensional drawing for lens
⑥ Function signal indicator (green)
⑦ Not used
⑧ Sensitivity adjustment
⑨ Function signal indicator (yellow), switching output

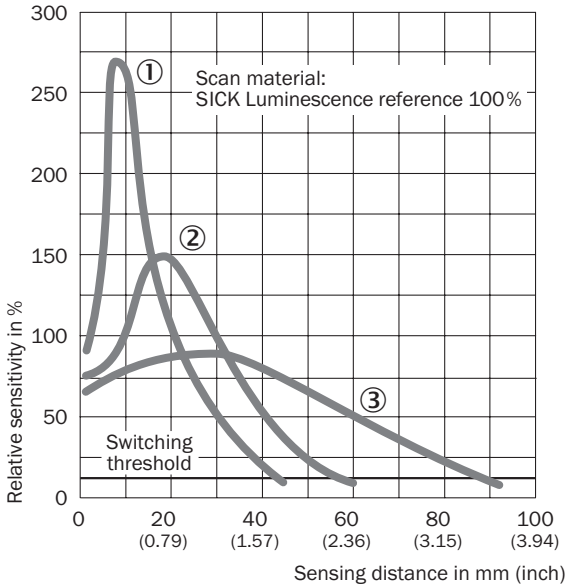
Connection type and diagram

Connector
M12, 4-pin





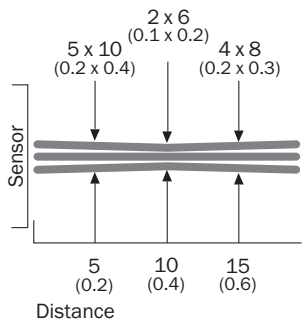
Sensing distance



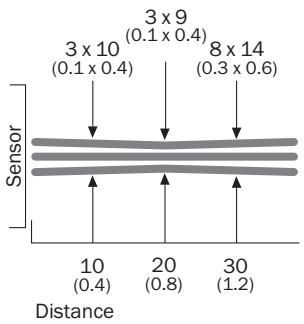
① Sensing distance 10 mm
② Sensing distance 20 mm
③ Sensing distance 50 mm

Light spot size

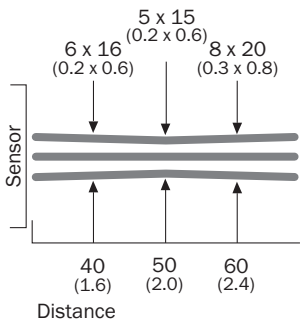
Sensing distance 10 mm



Sensing distance 20 mm



Sensing distance 50 mm



All dimensions in mm (inch)

D

Recommended accessories

Plug connectors and cables

Connector M12, 4-pin

Connector type	Enclosure rating	Flying leads	Sheath material	Cable length	Model name	Part no.
Female connector	IP 67	Straight	PVC	2 m	DOL-1204-G02M	6009382
				5 m	DOL-1204-G05M	6009866
				10 m	DOL-1204-G10M	6010543
				15 m	DOL-1204-G15M	6010753
		Angled	PVC	2 m	DOL-1204-W02M	6009383
				5 m	DOL-1204-W05M	6009867
				10 m	DOL-1204-W10M	6010541
		Straight	–	–	DOS-1204-G	6007302
		Angled	–	–	DOS-1204-W	6007303

Terminal and alignment brackets

Mounting system type	Description	Material	Model name	Part no.
Universal bar clamps	Plate G for universal bar clamp	Steel, zinc coated	BEF-KHS-G01	2022464
	Plate K for universal bar clamp	Steel, zinc coated	BEF-KHS-K01	2022718
	Universal bar clamp	Die-cast zinc	BEF-KHS-KH1	2022726
	Mounting rod straight	Steel, zinc coated	BEF-MS12G-A	4056054
			BEF-MS12G-B	4056055
	Mounting rod L-shaped	Steel, zinc coated	BEF-MS12L-A	4056052
			BEF-MS12L-B	4056053

Lenses (also for exchange)

Sensing distance	Model name	Part no.
10 mm	OBJ-LUT3-10	2016348
20 mm	OBJ-LUT3-20	2016349
50 mm	OBJ-LUT3-50	2016350

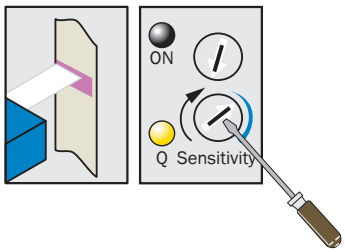
Others

Description	Model name	Part no.
Crayon, red fluorescence	LUM-FT	1004460
Writing chalk, red fluorescence	LUM-KLK	1002959
–	Luminescence reference German/English	8008840

For additional accessories including dimensional drawings, please see page G-1

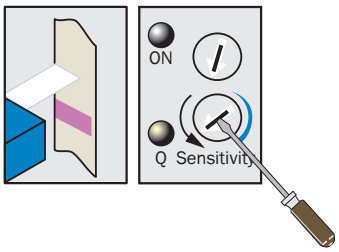
Setting the switching threshold via potentiometer

1. Position mark



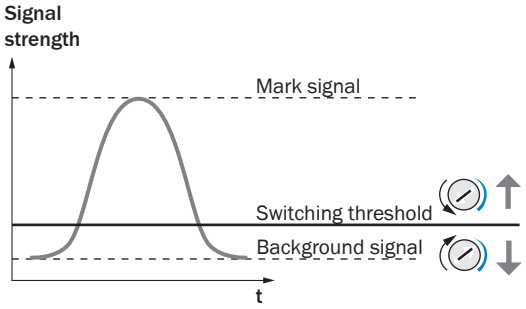
Turn “Sensitivity” rotary switch clockwise until yellow LED illuminates.

2. Position background



If yellow LED illuminates, turn “Sensitivity” rotary switch counter-clockwise until the yellow LED just goes out.

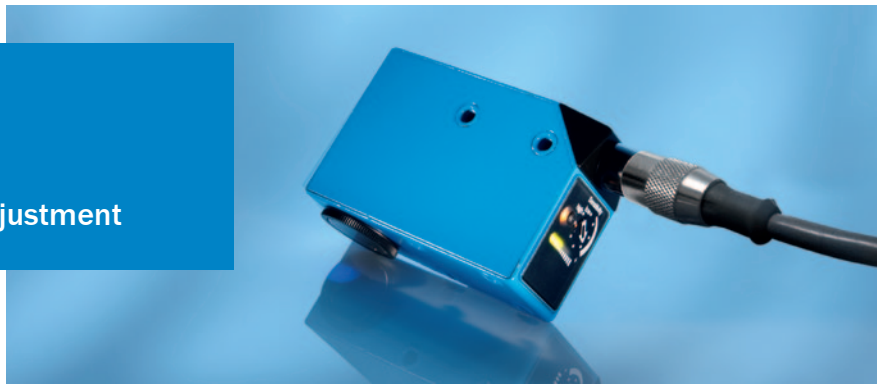
Sensitivity setting



Note
Adjustments are intendend for luminescence background suppression.

D

For universal use with easy adjustment



D

Product description

The strength of the LUT8 is its straightforward operating concept. The sensitivity of the LUT8, and the switching reliability, can easily be adapted to the mark to be detected with the help of the 8-position rotary switch. An additional advantage is the bar graph display which visualizes the luminescence intensity of the mark and that of the background.

At a glance

- Tough metal housing
- Simple sensitivity adjustment in 8 stages
- Bar graph display provides information about the luminescence intensity
- Sensing distances selectable through interchangeable lenses
- Additional optical filters suppress background luminescence
- Fiber-optic cable connection (with 20 mm lens)
- Switching and analog output

Your benefits

- An 8-step rotary switch easily adjusts to accurately determine the switching output position for different materials
- Bar graph display provides continual process control through easy visualization of the luminescence intensity
- Filters ensure that background luminescence is reliably suppressed, ensuring greater process reliability
- Interchangeable lenses for different sensing distances provide flexibility

Additional information

8013816/2011-05-30
Subject to change without notice

Detailed technical data

Features

Dimensions (L x W x H)	80 mm x 30.4 mm x 53 mm
Light source [1) 2)]	UV-LED
Light emission	Long side
Light spot direction	Vertical
Adjustment	Manual (rotary switch)
Switching function	Light switching

[1)] Average service life 100,000 h at T_a = +25 °C.

[2)] Wave length: 375 nm.

Mechanics/electronics

Supply voltage V_S [1)]	DC 12 V ... 30 V
Ripple [2)]	< 5 V_{PP}
Power consumption [3)]	< 100 mA
Switching frequency [4)]	2.5 kHz
Response time [5)]	200 µs
Switching output voltage	PNP: HIGH = V_S – ≤ 3 V / LOW = apporox. 0 V NPN: HIGH = approx. V_S / LOW ≤ 2 V
Switching output	PNP/NPN
Analog output Q_A	0 mA ... 13 mA
Output current $I_{max.}$	100 mA
Connection type	Connector M12, 5-pin
Protection class [6)]	II
Circuit protection	V_S connections reverse-polarity protected Output Q short-circuit protected Interference suppression
Enclosure rating	IP 67
Weight	Approx. 400 g
Housing material	Die-cast zinc

[1)] Limit values: operation in short-circuit protected network max. 8 A.

[2)] May not exceed or fall short of V_S tolerances.

[3)] Without load.

[4)] With light/dark ratio 1:1.

[5)] Signal transit time with resistive load.

[6)] Reference voltage 50 V DC.

Ambient data

Ambient temperature	Operation: –10 °C ... +55 °C Storage: –25 °C ... +75 °C
Shock load	According to IEC 60068

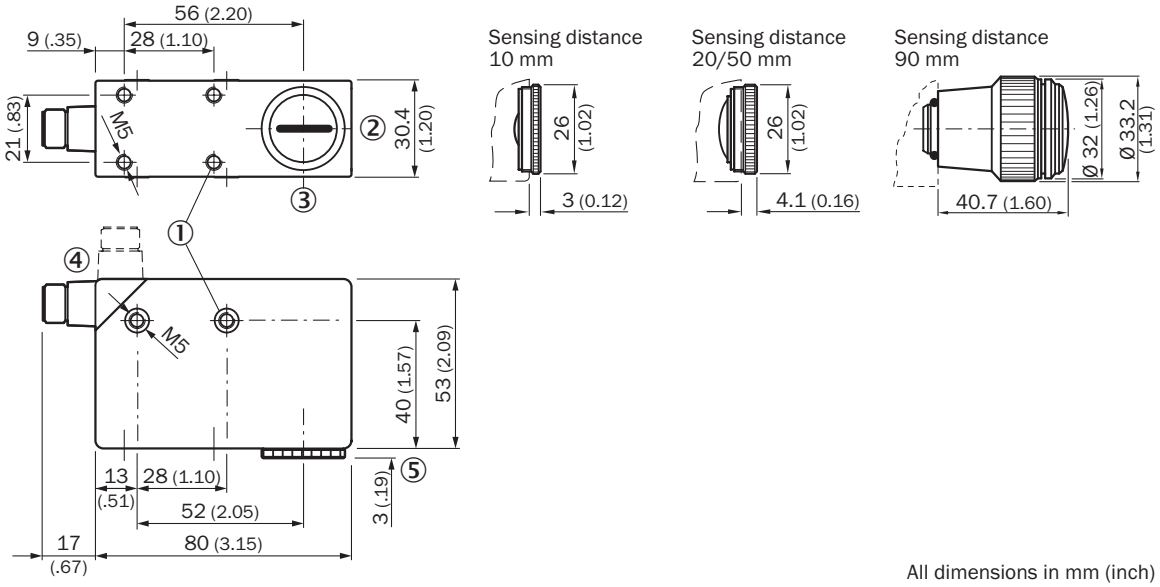
D

Ordering information

Sensing distance [1]	Operating range	Light spot size	Receiving filters	Receiving range	Model name	Part no.
10 mm	0 mm ... 20 mm	2 mm x 6 mm	KV 418 (standard)	450 nm ... 750 nm	LUT8U-11101	1046711
20 mm	10 mm ... 40 mm	3 mm x 9 mm	KV 418 (standard)	450 nm ... 750 nm	LUT8U-11201	1047042
50 mm	20 mm ... 70 mm	Ø 6 mm	KV 418 (standard)	450 nm ... 750 nm	LUT8U-11701	1047048
		5 mm x 15 mm	KV 418 (standard)	450 nm ... 750 nm	LUT8U-11301	1047043
			OG 570	570 nm ... 750 nm	LUT8U-11311	1047045
			RG 610	610 nm ... 750 nm	LUT8U-11321	1047046
			RG 665	670 nm ... 750 nm	LUT8U-11331	1047047
90 mm	30 mm ... 110 mm	12 mm x 12 mm	KV 418 (standard)	450 nm ... 750 nm	LUT8U-11401	1047044

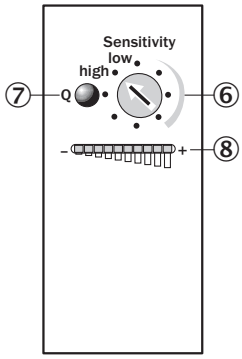
[1] From front edge of lens.

Dimensional drawing



All dimensions in mm (inch)

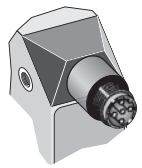
Adjustments

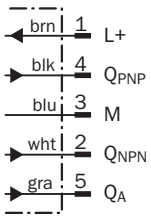


① M5 threaded mounting hole, 5.5 mm deep
② Light spot direction
③ Center of optical axis
④ Connector M12 (rotatable up to 90°)
⑤ See dimensional drawing for lens
⑥ Rotary selection switch
⑦ Function signal indicator (yellow), switching output
⑧ Bar graph (green), Power on left LED

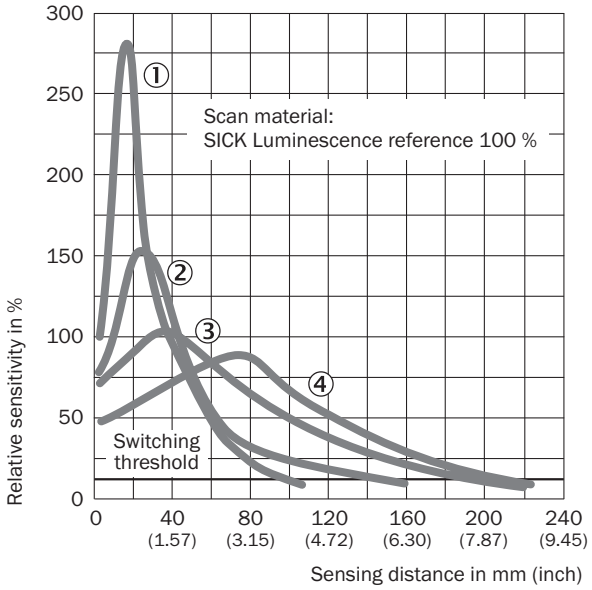
Connection type and diagram

Connector
M12, 5-pin





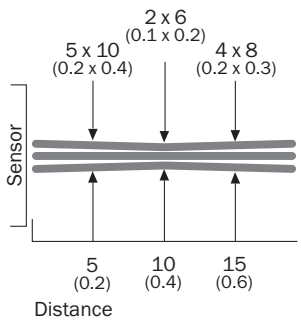
Sensing distance



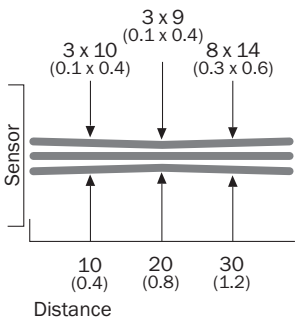
① Sensing distance 10 mm
② Sensing distance 20 mm
③ Sensing distance 50 mm
④ Sensing distance 90 mm

Light spot size

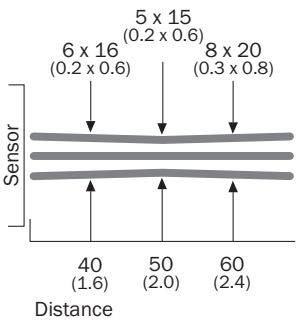
Sensing distance 10 mm



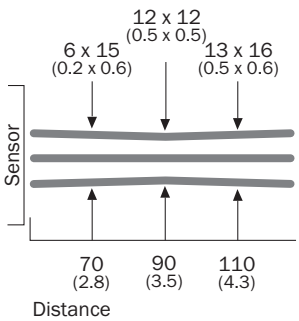
Sensing distance 20 mm



Sensing distance 50 mm



Sensing distance 90 mm



All dimensions in mm (inch)

D

Recommended accessories

Plug connectors and cables

Connector M12, 5-pin

Connector type	Enclosure rating	Flying leads	Sheath material	Cable length	Model name	Part no.
Female connector	IP 67	Straight	PVC	2 m	DOL-1205-G02M	6008899
				5 m	DOL-1205-G05M	6009868
				10 m	DOL-1205-G10M	6010544
		Angled	PVC	2 m	DOL-1205-W02M	6008900
				5 m	DOL-1205-W05M	6009869
				10 m	DOL-1205-W10M	6010542
		Straight	–	–	DOS-1205-G	6009719
		Angled	–	–	DOS-1205-W	6009720

Terminal and alignment brackets

Mounting system type	Description	Material	Model name	Part no.
Universal bar clamps	Plate G for universal bar clamp	Steel, zinc coated	BEF-KHS-G01	2022464
	Plate K for universal bar clamp	Steel, zinc coated	BEF-KHS-K01	2022718
	Universal bar clamp	Die-cast zinc	BEF-KHS-KH1	2022726
	Mounting rod straight	Steel, zinc coated	BEF-MS12G-A	4056054
			BEF-MS12G-B	4056055
	Mounting rod L-shaped	Steel, zinc coated	BEF-MS12L-A	4056052
			BEF-MS12L-B	4056053

Lenses (also for exchange)

Sensing distance	Model name	Part no.
10 mm	OBJ-LUT3-10	2016348
20 mm	OBJ-LUT3-20	2016349
50 mm	OBJ-LUT3-50	2016350

Fiber-optic cables

Description	Length, fiber-optic cable	Min. bend radius, fiber-optic cable	Model name [1]	Part no.
Liquid fiber-optic	1,000 mm	40 mm	LLUV8-1000	2017099
	500 mm	40 mm	LLUV8-500	2017098

[1] Only to mount with 20 mm lens.

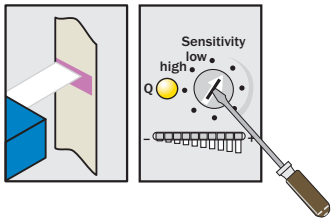
Others

Description	Model name	Part no.
Crayon, red fluorescence	LUM-FT	1004460
Writing chalk, red fluorescence	LUM-KLK	1002959
–	Luminescence reference German/English	8008840

For additional accessories including dimensional drawings, please see page G-1

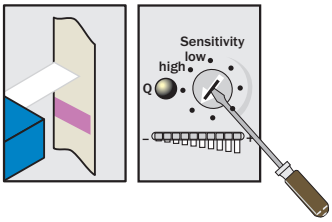
Setting the switching threshold via rotary switch (8 stages)

1. Position mark



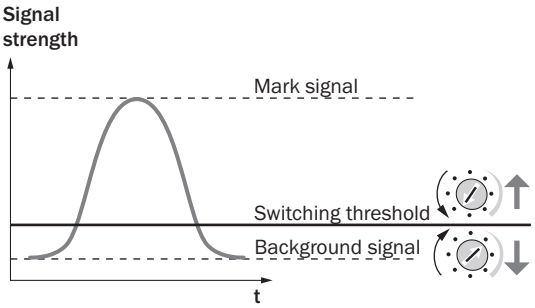
Turn “Sensitivity” rotary switch clockwise until yellow LED illuminates.

2. Position background



If yellow LED illuminates, turn “Sensitivity” rotary switch counter-clockwise until the yellow LED just goes out.

Sensitivity setting



Note

The bar graph display shows the luminescence intensity (regardless of switching threshold setting). Adjustments are intendend for luminescence background suppression.

D

The new standard for high-performance luminescence sensors

D

Additional information

Product description

The LUT9 luminescence sensor offers a long sensing distance and remote monitoring capabilities via IO-Link.

With a sensing distance of up to 250 mm, the LUT9 sets a new standard for luminescence sensors. Due to the long distances possible between the sensor and the object, marks on lumber with varying thicknesses, for example, can be reliably detected without mechanical adjustment of the sensors. In addition, the teach function and manual fine adjustment allow for maximum process reliability. The LUT9 version with IO-Link can actively be integrated into the machine control logic, configured/monitored from the controller, and used for process data collection. Especially helpful is a bar graph display on the device indicating the luminescence intensity.

At a glance

- Simple teach-in
- Operating range up to 250 mm
- Version with IO-Link for remote monitoring
- Bar graph display provides information about the luminescence intensity
- High speed (6.5 kHz), standard (2.5 kHz), high resolution (500 Hz) models
- Additional optical filters suppress background luminescence
- Fiber-optic cable connection (with 20 mm lens)
- Switching and analog output

Your benefits

- Simple sensitivity adjustment via teach-in for optimum adaptation to the application
- Long sensing distance tolerance leads to less mechanical height adjustments of the sensor on the machine
- Using IO-Link, the sensor can be configured and monitored by the central control system, enabling simple, cost-effective diagnostics and data collection
- Bar graph display provides continual process control through easy visualization of the luminescence intensity
- Filters ensure that background luminescence is reliably suppressed, ensuring greater process reliability
- Interchangeable lenses for different sensing distances and the second light exit provide flexibility
- High detection reliability ensures the process and reduces downtime
- Select speed or high resolution, making it ideal for any application.

8013816/2011-05-30
Subject to change without notice

Detailed technical data

Features

Dimensions (L x W x H)	80 mm x 30.4 mm x 53 mm
Light spot direction	Vertical
Adjustment	Static 2-point teach-in with manual fine adjustment IO-Link (optional)
Switching function [1]	Light switching

[1] L/D switching via teach-in or IO-Link.

Mechanics/electronics

Supply voltage V_S [1]	DC 10 V ... 30 V
Ripple [2]	< 5 V_{PP}
Power consumption [3]	< 100 mA
Switching frequency [4]	500 Hz, 2.5 kHz, 6.5 kHz, adjustable
Response time [5]	1 ms, 200 µs, 75 µs
Switching output voltage	PNP: HIGH = V_S – ≤ 2 V / LOW approx. 0 V NPN: HIGH = approx. V_S / LOW ≤ 2 V
Analog output Q_A	0 mA ... 13 mA
Output current $I_{max.}$	100 mA
Time delay	0 ms, 10 ms, 20 ms, adjustable
Connection type	Connector M12, 5-pin (standard) Connector M12, 4-pin (IO-Link)
Protection class [6]	II
Circuit protection	V_S connections reverse-polarity protected Output Q short-circuit protected Interference suppression
Enclosure rating	IP 67
Weight	Approx. 400 g
Housing material	Die-cast zinc

[1] Limit values: operation in short-circuit protected network max. 8 A.
[2] May not exceed or fall short of V_S tolerances.
[3] Without load.
[4] With light/dark ratio 1:1, no time delay.
[5] Signal transit time with resistive load.
[6] Reference voltage 50 V DC.

Ambient data

Ambient temperature	Operation: –10 °C ... +55 °C Storage: –25 °C ... +75 °C
Shock load	According to IEC 60068

Specific data

Sensing distance [1]	Operating range	Light spot size	Model name	Ordering information
10 mm	0 mm ... 20 mm	2 mm x 6 mm	LUT9x-xx1xx	D-36
20 mm	10 mm ... 40 mm	3 mm x 9 mm	LUT9x-xx2xx	D-36
50 mm	20 mm ... 70 mm	5 mm x 15 mm	LUT9x-xx3xx	D-36
90 mm	30 mm ... 110 mm	12 mm x 12 mm	LUT9x-xx4xx	D-36
150 mm	50 mm ... 250 mm	5 mm x 12 mm	LUT9x-xx6xx	D-37

[1] From front edge of lens.

D

Ordering information

LUT9x-xx1xx

- **Sensing distance:** 10 mm
- **Operating range:** 0 mm ... 20 mm
- **Light spot size:** 2 mm x 6 mm

Light source [1) 2)]	Light emission	Receiving range	Receiving filters	Switching output	Model name	Part no.
UV-LED	Long side	450 nm ... 750 nm	KV 418 (standard)	PNP/NPN	LUT9U-11106	1047049

[1)] Average service life 100,000 h at T_a = +25 °C.
[2)] Wave length: 375 nm.

LUT9x-xx2xx

- **Sensing distance:** 20 mm
- **Operating range:** 10 mm ... 40 mm
- **Light spot size:** 3 mm x 9 mm

Light source [1) 2)]	Light emission	Receiving range	Receiving filters	Switching output	Model name	Part no.
UV-LED	Long side	450 nm ... 750 nm	KV 418 (standard)	PNP/NPN	LUT9U-11206	1047050
	Long and short side, exchangeable	450 nm ... 750 nm	KV 418 (standard)	PNP/NPN	LUT9U-12206	1046749
	Long side	450 nm ... 750 nm	KV 418 (standard)	PNP, IO-Link	LUT9U-P120L	1046188
				NPN, IO-Link	LUT9U-N120L	1046189

[1)] Average service life 100,000 h at T_a = +25 °C.
[2)] Wave length: 375 nm.

D

LUT9x-xx3xx

- **Sensing distance:** 50 mm
- **Operating range:** 20 mm ... 70 mm
- **Light spot size:** 5 mm x 15 mm

Light source [1) 2)]	Light emission	Receiving range	Receiving filters	Switching output	Model name	Part no.
UV-LED	Long side	450 nm ... 750 nm	KV 418 (standard)	PNP/NPN	LUT9U-11306	1046712
		570 nm ... 750 nm	OG 570	PNP/NPN	LUT9U-11316	1047052
		610 nm ... 750 nm	RG 610	PNP/NPN	LUT9U-11326	1047053
		670 nm ... 750 nm	RG 665	PNP/NPN	LUT9U-11336	1047054
	Long and short side, exchangeable	450 nm ... 750 nm	KV 418 (standard)	PNP/NPN	LUT9U-12306	1047055
	Long side	450 nm ... 750 nm	KV 418 (standard)	PNP, IO-Link	LUT9U-P130L	1045606
				NPN, IO-Link	LUT9U-N130L	1046190

[1)] Average service life 100,000 h at T_a = +25 °C.
[2)] Wave length: 375 nm.

LUT9x-xx4xx

- **Sensing distance:** 90 mm
- **Operating range:** 30 mm ... 110 mm
- **Light spot size:** 12 mm x 12 mm

Light source [1) 2)]	Light emission	Receiving range	Receiving filters	Switching output	Model name	Part no.
UV-LED	Long side	450 nm ... 750 nm	KV 418 (standard)	PNP/NPN	LUT9U-11406	1047051

[1)] Average service life 100,000 h at T_a = +25 °C.
[2)] Wave length: 375 nm.

LUT9x-xx6xx

- **Sensing distance:** 150 mm
- **Operating range:** 50 mm ... 250 mm
- **Light spot size:** 5 mm x 12 mm

Light source [1] [2] [3]	Light emission	Receiving range	Receiving filters	Switching output	Model name	Part no.
UV-LED [2]	Long side	450 nm ... 750 nm	KV 418 (standard)	PNP/NPN	LUT9U-11606	1047414
Blue LED [2]	Long side	610 nm ... 750 nm	RG 610	PNP/NPN	LUT9B-11626	1047056

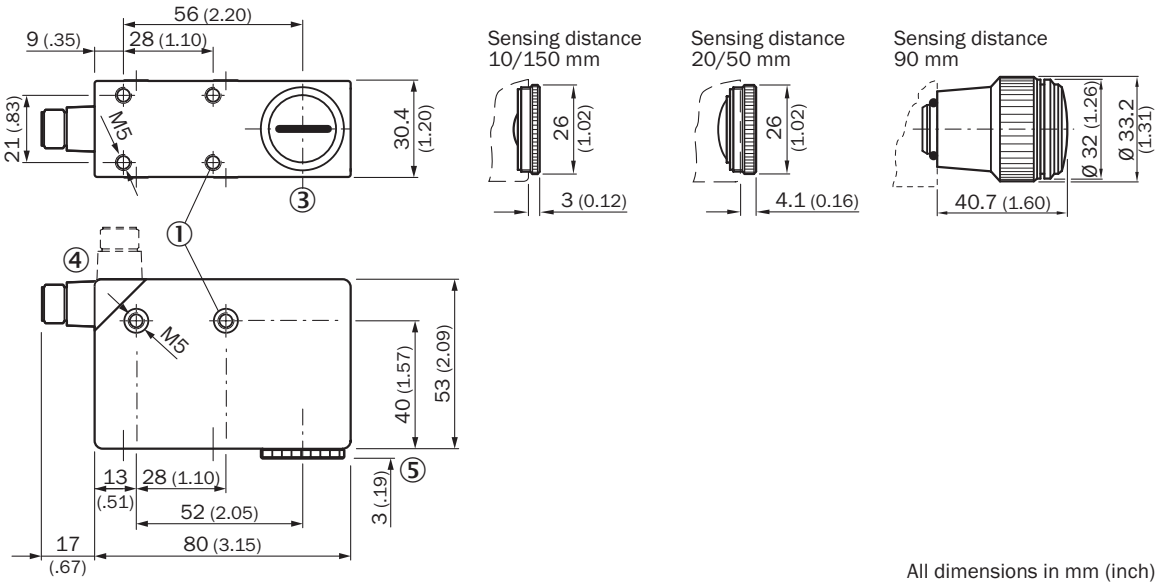
[1] Average service life 100,000 h at T_a = +25 °C.

[2] Wave length: 375 nm.

[3] Wave length: 470 nm.

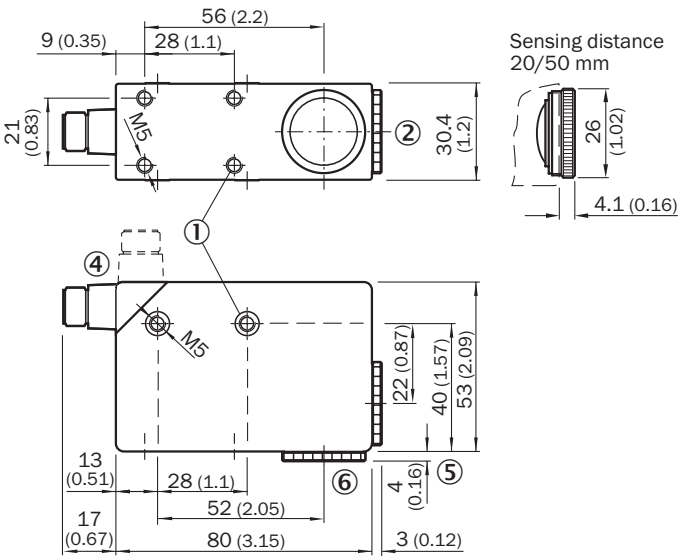
Dimensional drawings

LUT9x-x1xxx



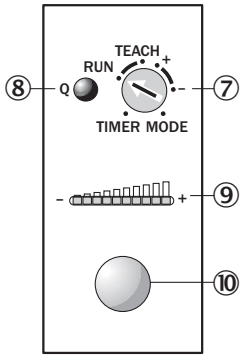
All dimensions in mm (inch)

LUT9x-x2xxx



All dimensions in mm (inch)

Adjustments



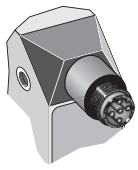
① M5 threaded mounting hole, 5.5 mm deep
② Lens (light transmission), can be replaced by blind screw
③ Center of optical axis
④ Connector M12 (rotatable up to 90°)
⑤ See dimensional drawing for lens
⑥ Blind screw can be replaced by lens
⑦ Rotary selection switch
⑧ Function signal indicator (yellow), switching output
⑨ Bar graph (green), Power on left LED
⑩ Teach-in button

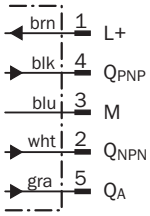
Connection type and diagram

D

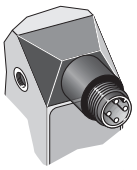
LUT9x-1

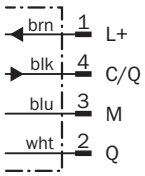
Connector
M12, 5-pin (standard)



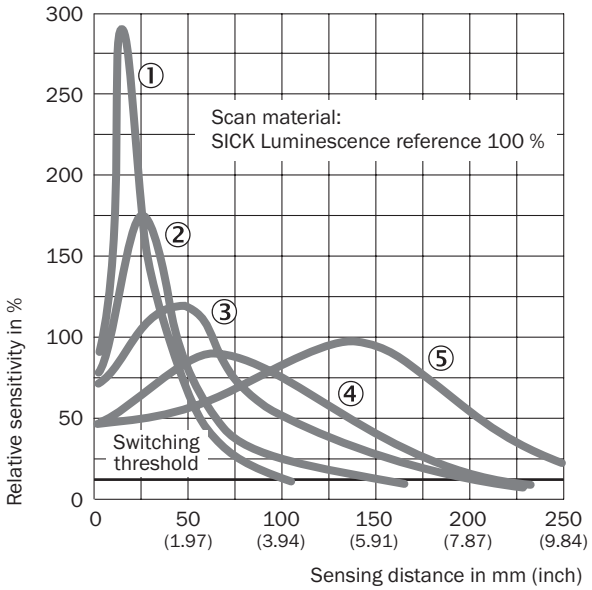


LUT9x-P
LUT9x-N
Connector
M12, 4-pin (IO-Link)





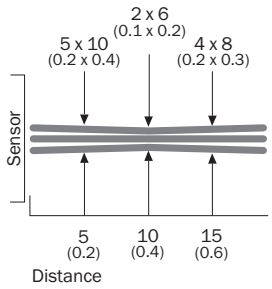
Sensing distance



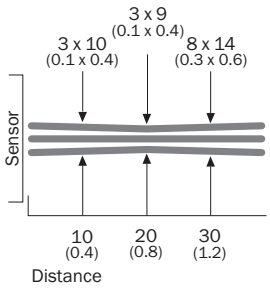
① Sensing distance 10 mm
② Sensing distance 20 mm
③ Sensing distance 50 mm
④ Sensing distance 90 mm
⑤ Sensing distance 150 mm

Light spot size

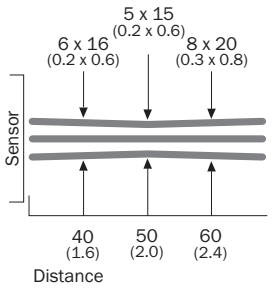
Sensing distance 10 mm



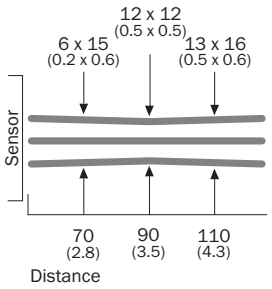
Sensing distance 20 mm



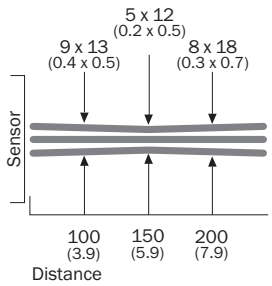
Sensing distance 50 mm



Sensing distance 90 mm



Sensing distance 150 mm



All dimensions in mm (inch)

D

Recommended accessories

Plug connectors and cables

Connector M12, 4-pin

Connector type	Enclosure rating	Flying leads	Sheath material	Cable length	Model name	Part no.
Female connector	IP 67	Straight	PVC	2 m	DOL-1204-G02M	6009382
				5 m	DOL-1204-G05M	6009866
				10 m	DOL-1204-G10M	6010543
				15 m	DOL-1204-G15M	6010753
		Angled	PVC	2 m	DOL-1204-W02M	6009383
				5 m	DOL-1204-W05M	6009867
				10 m	DOL-1204-W10M	6010541
		Straight	–	–	DOS-1204-G	6007302
		Angled	–	–	DOS-1204-W	6007303

Connector M12, 5-pin

Connector type	Enclosure rating	Flying leads	Sheath material	Cable length	Model name	Part no.
Female connector	IP 67	Straight	PVC	2 m	DOL-1205-G02M	6008899
				5 m	DOL-1205-G05M	6009868
				10 m	DOL-1205-G10M	6010544
		Angled	PVC	2 m	DOL-1205-W02M	6008900
				5 m	DOL-1205-W05M	6009869
				10 m	DOL-1205-W10M	6010542
		Straight	–	–	DOS-1205-G	6009719
		Angled	–	–	DOS-1205-W	6009720

Terminal and alignment brackets

Mounting system type	Description	Material	Model name	Part no.
Universal bar clamps	Plate G for universal bar clamp	Steel, zinc coated	BEF-KHS-G01	2022464
	Plate K for universal bar clamp	Steel, zinc coated	BEF-KHS-K01	2022718
	Universal bar clamp	Die-cast zinc	BEF-KHS-KH1	2022726
	Mounting rod straight	Steel, zinc coated	BEF-MS12G-A	4056054
			BEF-MS12G-B	4056055
	Mounting rod L-shaped	Steel, zinc coated	BEF-MS12L-A	4056052
			BEF-MS12L-B	4056053

Lenses (also for exchange)

Sensing distance	Model name	Part no.
10 mm	OBJ-LUT3-10	2016348
20 mm	OBJ-LUT3-20	2016349
50 mm	OBJ-LUT3-50	2016350

Fiber-optic cables

Description	Length, fiber-optic cable	Min. bend radius, fiber-optic cable	Model name [1]	Part no.
Liquid fiber-optic	1,000 mm	40 mm	LLUV8-1000	2017099
	500 mm	40 mm	LLUV8-500	2017098

[1] Only to mount with 20 mm lens.

D

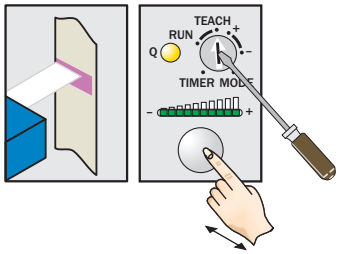
Others

Description	Model name	Part no.
Crayon, red fluorescence	LUM-FT	1004460
Writing chalk, red fluorescence	LUM-KLK	1002959
–	Luminescence reference German/English	8008840

For additional accessories including dimensional drawings, please see page G-1

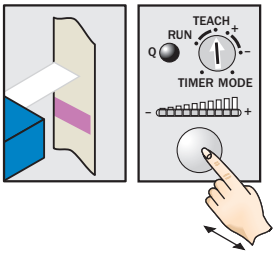
Setting the switching threshold via static 2-point teach-in

1. Position mark



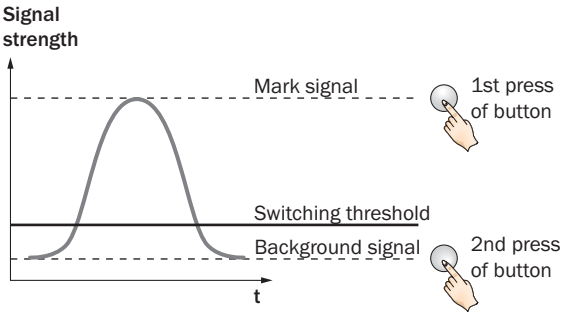
Turn rotary switch to “TEACH” position and press and hold teach-in button > 1 s.
Yellow LED flashes slowly.

2. Position background



Press and hold teach-in button again > 1 s. Yellow LED goes out.

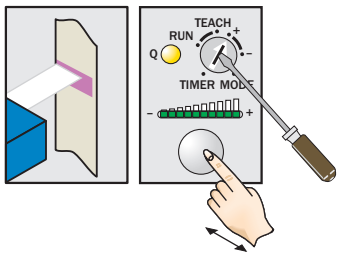
Sensitivity setting



Note
The bar graph display shows detection reliability. The more LEDs that illuminate, the better the teach-in.

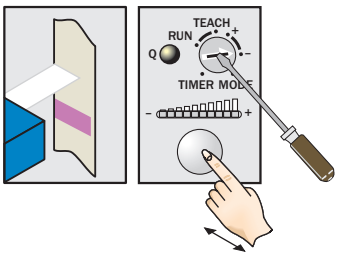
Setting the switching threshold via “+”/“–” buttons

1. Position mark



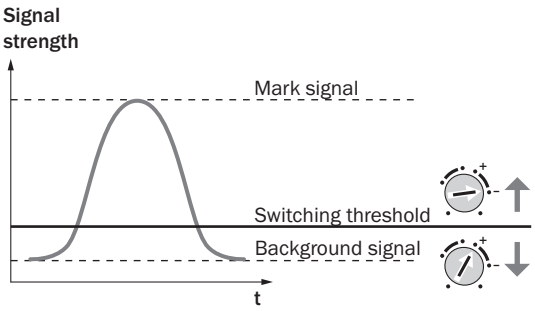
Turn rotary switch to “+” position and press and hold teach-in button until yellow light goes out (more green LEDs illuminate on the bar display).

2. Position background



If yellow LED illuminates, turn rotary switch to “–” position and press and hold teach-in button until yellow light just goes out (green LEDs go out on the bar display).

Sensitivity setting



Note for all settings
Once configuration is complete, turn the rotary switch to the “RUN” position. The bar display then shows the luminescence intensity (regardless of switching threshold setting).
Adjustments are intendend for luminescence background suppression.

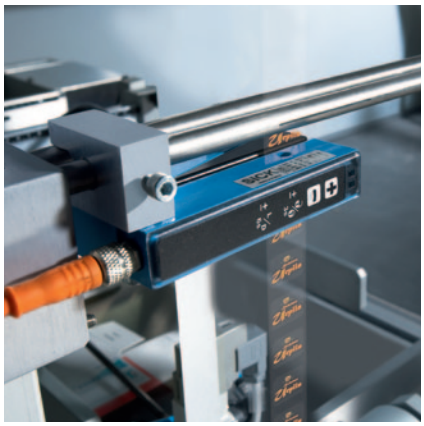
D

SICK fork sensors: more models, more functionality

Fork sensors, which operate using a through-beam design, combine the sender and receiver in a single housing. As a result, alignment is no longer time-consuming. Even very slight differences in light attenuation are detected due to highly focused light emission and high detection accuracy. Easy installation, high immunity to ambient light, and a wide range of fork widths are some of the many advantages that SICK fork sensors offer. Applications include detecting labels or parts on conveyors.

Your benefits

- An integrated housing that combines the sender and receiver keeps installation time to a minimum
- A wide variety of fork widths, depths and different detection technologies (IR LED, red LED, laser and ultrasonic) meet any need
- A highly visible light spot in the laser and red light versions make these sensors easy to adjust
- High switching frequencies ensure reliable performance
- High immunity to ambient light provides reliable detection
- Aluminum housing meets requirements for use in general industrial conditions



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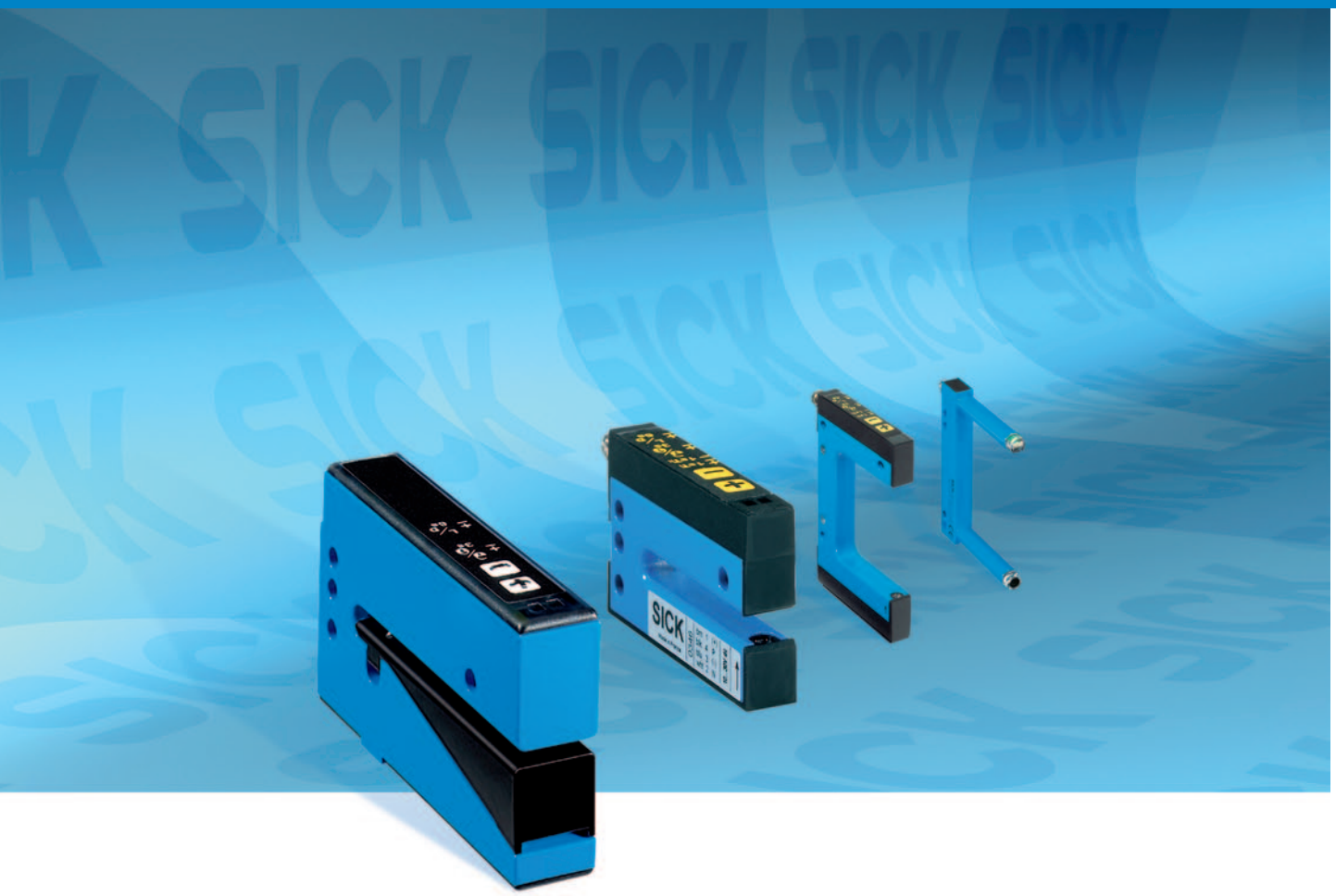


Fork sensors

E

Instantly correct

SICK fork sensors operate using the through-beam design. Time-consuming alignment is not necessary since the sender and receiver are combined in the same housing. SICK fork sensors have two principles of operation.

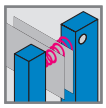
Optical fork sensors

Optical fork sensors detect objects via the interruption of the light beam. Even small differences in light absorption can be reliably detected.

Fields of application

- Label recognition
- Counting and positioning objects
- Process control

Ultrasonic fork sensors



Ultrasonic fork sensors reliably evaluate and detect the material properties (e.g., thickness, adhesion) of an object, rather than its translucency. Thicker materials absorb the sensor's ultrasound better than thin materials. Transparent labels can be detected even on clear backer material.

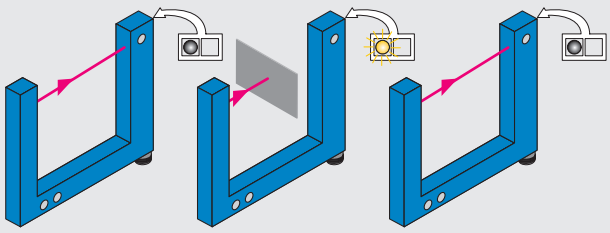
Fields of application

- Label recognition
- Double sheet detection
- Adhesive surface detection

Switching function

Switching output Q = dark switching

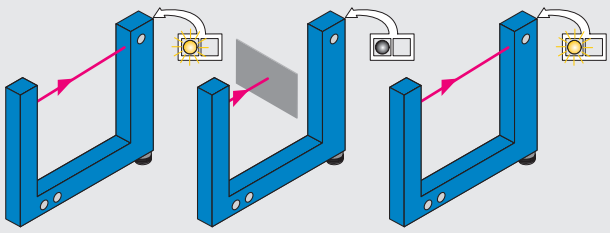
- The switching output is active when the beam path is interrupted, i.e., when there is an object in the beam path



In label recognition, this status corresponds to:
Switching output active on the label.

Switching output $\bar{Q}$ = light switching

- The switching output is active when there is no object in the beam path



In label recognition, this status corresponds to:
Switching output active in a label gap.

Label or double sheet detection

Transparent, shiny, and metallic labels; white, opaque and colored material; thin foils, foil on foil, paper on paper – modern labeling machines are confronted with a variety of materials and surface conditions. SICK fork sensors always offer the right solution. Optical fork sensors can be used for the reliable detection of opaque labels. Ultrasonic fork sensors reliably detect even on clear backer material.

Checking presence of objects on conveyor belts

To control various logistical processes, it is necessary to reliably detect certain objects on the conveyor belts. As soon as an object passes the fork sensor, the object is detected. Due to different transmission sources and sizes, SICK's wide range of fork sensors are able to meet nearly any application requirement. In accordance with the design, the sender and receiver are located in the same housing. And, since no complex, time-consuming alignment is needed, mounting and commissioning are quick and easy.

Product family overview

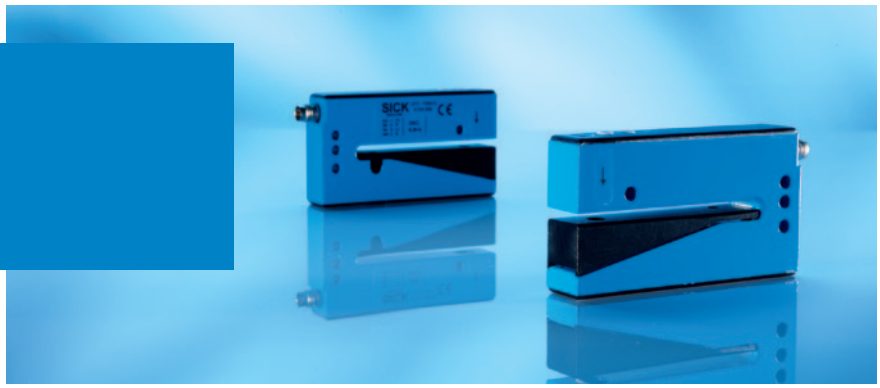
	 **UF3**	 **WF*next***	
	The clear choice for detecting transparent labels	WF*next* - it's next for high-speed applications	
Technical data overview			
Fork width	3 mm	2 mm / 5 mm / 15 mm / 30 mm / 50 mm / 80 mm / 120 mm	
Fork depth	69 mm	42 mm / 59 mm / 95 mm	
Minimum detectable object (MDO)	Gap between labels: 2 mm Size of labels: 2 mm	0.2 mm	
Light source	–	LED, infrared	
Switching frequency	1,200 Hz	10 kHz	
Response time	300 µs	100 µs	
Switching function	Light/dark switching, selectable via button	Light/dark switching, selectable via button	
Connection type	Connector M8, 4-pin	Connector M8, 4-pin	
At a glance			
	• Detection of transparent, opaque or printed labels • Unaffected by metallic foils and labels • Fast response time of 300 µs • Small, industry-standard housing • Rugged, IP 65 aluminum housing	• Infrared light source • Simple and accurate adjustment via teach-in or manually via "+"/"–" buttons • Fast response time (max. 100 µs) • PNP and NPN switching output • Light/dark switching function • 21 different models with different fork widths and depths • Rugged, IP 65 aluminum housing	
Detailed information	➜ E-6	➜ E-12	

E

	WFL	WFM
		
	Get precise detection of small targets with WFL fork sensors	WFM fork sensors – connect and get started
	2 mm / 5 mm / 15 mm / 30 mm / 50 mm / 80 mm / 120 mm	30 mm / 50 mm / 80 mm / 120 mm / 180 mm
	42 mm / 59 mm / 95 mm	40 mm / 60 mm / 124 mm
	0.05 mm	0.8 mm / 1 mm
	Laser, Class 1, 670 nm	LED, red
	10 kHz	4 kHz
	100 µs	125 µs
	Light/dark switching, selectable via button	Dark switching Light switching
	Connector M8, 4-pin	Connector M8, 3-pin Cable 2 m, 3-pin
	• Very precise laser beam (Class 1 laser) • Simple and accurate adjustment via teach-in • Fast response time (max. 100 µs) • Minimum detectable object size of 0.05 mm • PNP and NPN switching output • Light/dark switching function • 21 different models with different fork widths and depths • Rugged, IP 65 aluminum housing	• Highly visible red emitted light • No setup, out-of-the-box operation • 360° signal strength indicator • 5 fork sizes: maximum depth 120 mm maximum width 180 mm • Rugged, IP 67 aluminum housing
	➜ E-20	➜ E-28

E

The clear choice for detecting transparent labels



Product description

The UF3 ultrasonic sensor reliably detects labels and materials, regardless of printed design, transparency or surface characteristics. Unlike optical sensors, the UF3 relies on damping – a process where the thickness of a material determines the degree to which the sensor absorbs sound waves. A high level of positioning accuracy and stable response times make the fork sensor suitable for nearly any environment. Due to its small, compact metal housing, the UF can be used in harsh conditions and where space is limited. As a result, the UF3 can distinguish between labels located just 2 mm apart from one another on an adhesive tape. Applications include detecting transparent labels on transparent substrates, detecting labels with different printed designs or differentiating between single- and two-ply materials.

At a glance

- Detection of transparent, opaque or printed labels
- Unaffected by metallic foils and labels
- Fast response time of 300 µs
- Small, industry-standard housing
- Rugged, IP 65 aluminum housing

Your benefits

- Reliable label detection, regardless if labels are transparent, opaque or have a printed design, ensuring greater flexibility with one sensor
- Fast response times enable precise detection – even at high web speeds
- Compact housing ensures space-saving installation
- The aluminum housing meets all requirements for use in harsh industrial conditions
- Ultrasonic technology prevents false detection, which may be caused by ambient light or shiny surfaces

Additional information

E

8013816/2011-05-30
Subject to change without notice

Detailed technical data

Features

Functional principle	Ultrasonic detection principle
MDO [1) 2)]	Gap between labels: 2 mm Size of labels: 2 mm
Label detection	✔
Adjustment	Manual ("+"/"–" button)
Switching function	Light/dark switching, selectable via button

[1)] Minimum detectable object.

[2)] Depends on the label thickness.

Mechanics/electronics

Supply voltage V_S [1)]	DC 10 V ... 30 V
Ripple [2)]	< 1 V
Power consumption [3)]	40 mA
Capacative load	200 nF
Switching frequency [4)]	1,200 Hz
Response time [5)]	300 µs
Switching output voltage	PNP: HIGH = V_S– ≤ 2 V / LOW approx. 0 V NPN: HIGH = approx. V_S / LOW ≤ 2 V
Output current $I_{max.}$ [6)]	100 mA
Initialization time	100 ms
Protection class [7)]	III
Circuit protection	Output Q short-circuit protected Interference suppression
Enclosure rating	IP 65
Weight	Approx. 95 g
Housing material	Aluminum

[1)] Limit values, reverse-polarity protected. Operation in short-circuit protected network max. 8 A.

[2)] May not exceed or fall short of V_S tolerances.

[3)] Without load.

[4)] With light/dark ratio 1:1, typical, dependent on material and speed.

[5)] Signal transit time with resistive load.

[6)] Output current minimal 0.03 mA.

[7)] Reference voltage 50 V DC.

Ambient data

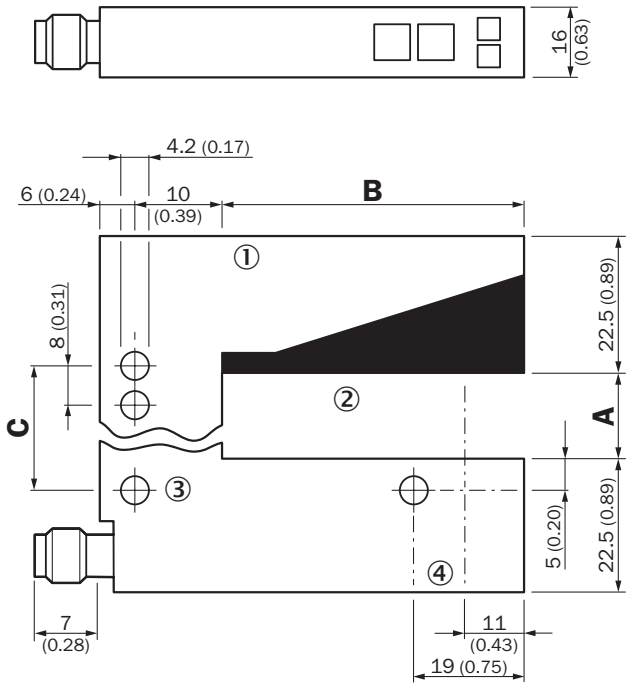
Ambient temperature [1)]	Operation: +5 °C ... +30 °C Storage: –30 °C ... +70 °C
Air movement	Max. 5 m/s wind speed
Shock load	According to IEC 60068

[1)] Do not bend below 0 °C.

Ordering information

Fork width	Fork depth	Switching output	Connection type	Model name	Part no.
3 mm	69 mm	PNP/NPN	Connector M8, 4-pin	UF3-70B410	6034888

Dimensional drawing

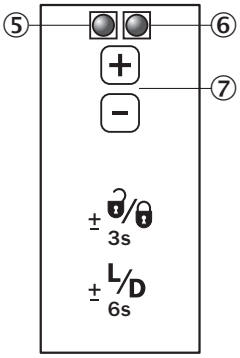


Dimensions in mm (inch)

	A Fork width	B Fork depth	C
UF3	3 (0.12)	69 (2.72)	14 (0.55)

All dimensions in mm (inch)

Adjustments

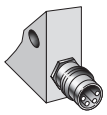


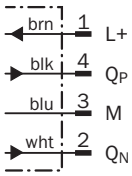
① Screw for removing the cover for cleaning purposes
② Fork opening: fork width 3 mm, forks depth 69 mm
③ Mounting hole, Ø 4.2 mm
④ Detection axis
⑤ Function signal indicator (yellow), switching output
⑥ Function indicator (red)
⑦ "+"-/"–" buttons and function button

E

Connection type and diagram

Connector
M8, 4-pin





Recommended accessories

Plug connectors and cables

Connector M8, 4-pin

Connector type	Enclosure rating	Flying leads	Sheath material	Cable length	Model name	Part no.
Female connector	IP 67	Straight	PVC	2 m	DOL-0804-G02M	6009870
				5 m	DOL-0804-G05M	6009872
				10 m	DOL-0804-G10M	6010754
		Angled	PVC	2 m	DOL-0804-W02M	6009871
				5 m	DOL-0804-W05M	6009873
				10 m	DOL-0804-W10M	6010755
		Straight	–	–	DOS-0804-G	6009974
		Angled	–	–	DOS-0804-W	6009975

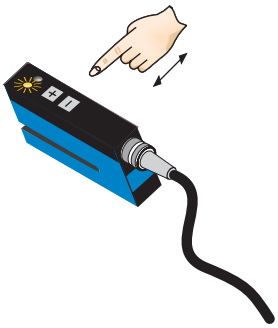
For additional accessories including dimensional drawings, please see page G-1

E

Setting the switching threshold via “+”/“–” buttons

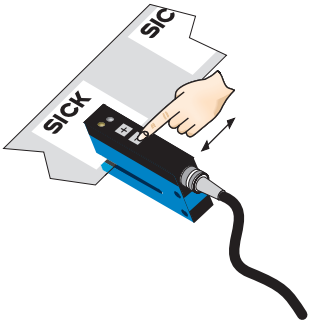
As an example “$\overline{Q}$ ≙ light switching” = switching signal on label gap.

1. No object in the active area of the fork sensor



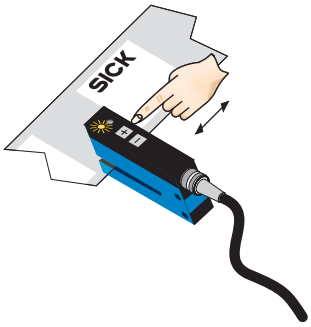
Yellow LED illuminates.
If the yellow LED does not illuminate, press both the “+” and “–” buttons together and hold for 6 seconds (see **notes** ± L/D 6s).

2. Position label in the active area of the fork sensor



Press the “–” button and hold until yellow LED goes out.

3. Position substrate in the active area of the fork sensor



Yellow LED illuminates.
If the yellow LED does not illuminate, press the “+” button to increase sensitivity.

Notes

+ / – Once teach-in process is complete, the switching threshold can be adjusted at any time using the “+” or “–” button. To make minor adjustments, press the “+” or “–” button once. To configure settings quickly, keep the “+” or “–” button pressed for longer.

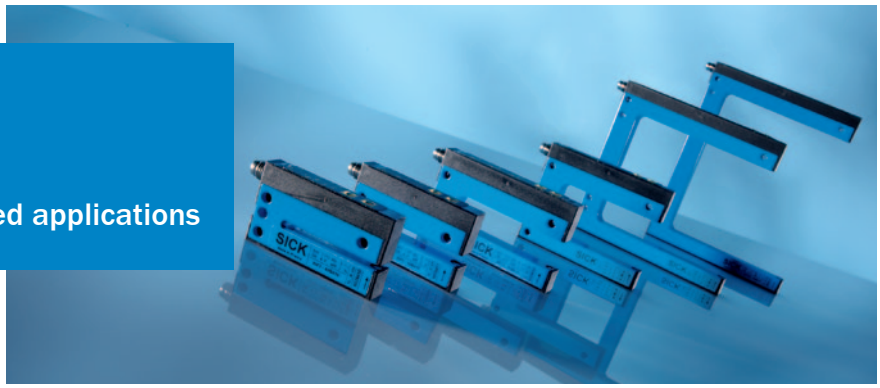
± 3s Press both the “+” and “–” buttons together (3 seconds) to lock the device and prevent unintentional actuation.

± L/D 6s Press both the “+” and “–” buttons together (6 seconds) to define the switching function (light/dark switching). Standard setting: Q = light switching.

E

E

WF*next* - it's next for high-speed applications



Product description

The WF*next* line is ideal for high-speed, accurate label detection. It includes more than 40 fork sensors with a large selection of fork widths and depths to fit any application, such as detecting labels, holes or double sheets. Since the sender and receiver are in one housing, adjustment is not necessary. This easy-to-use sensor line includes fork widths between 2 mm and 120 mm with fork depths of 40 mm, 60 mm and 95 mm. Its fast response time and fine resolution make it possible to detect small and flat objects moving at high speeds. On multiple installations, WF*next* sensors can be installed adjacent to one another with no cross talk.

At a glance

- Infrared light source
- Simple and accurate adjustment via teach-in or manually via "+"/"–" buttons
- Fast response time (max. 100 µs)
- PNP and NPN switching output
- Light/dark switching function
- 21 different models with different fork widths and depths
- Rugged, IP 65 aluminum housing

Your benefits

- Fast response time and fine resolution ensure reliable detection even at high speeds
- Infrared light source provides excellent ambient light immunity
- User friendly setting via teach-in or "+"/"–" button
- A wide range of different fork sizes enables flexible installation
- The aluminum housing meets all requirements for use in harsh industrial conditions

Additional information

8013816/2011-05-30
Subject to change without notice

Detailed technical data

Features

Functional principle	Optical detection principle
Label detection	✔
Light source	LED, infrared
Switching function	Light/dark switching, selectable via button

Mechanics/electronics

Supply voltage V_S [1]	DC 10 V ... 30 V
Ripple [2]	< 10 %
Power consumption [3]	40 mA
Switching frequency [4]	10 kHz
Response time [5]	100 µs
Stability of response time	± 20 µs
Switching output voltage	PNP: HIGH = V_S – ≤ 2 V / LOW approx. 0 V NPN: HIGH = approx. V_S / LOW ≤ 2 V
Output current $I_{max.}$	100 mA
Initialization time	100 ms
Connection type	Connector M8, 4-pin
Ambient light safety	Sunlight: 10,000 lx
Protection class [6]	III
Circuit protection	V_S connections reverse-polarity protected Output Q short-circuit protected Interference suppression
Enclosure rating	IP 65
Weight [7]	Approx. 36 g ... 160 g
Housing material	Aluminum

[1] Limit values, reverse-polarity protected. Operation in short-circuit protected network max. 8 A.
[2] May not exceed or fall short of V_S tolerances.
[3] Without load.
[4] With light/dark ratio 1:1.
[5] Signal transit time with resistive load.
[6] Reference voltage 50 V DC.
[7] Depending on fork width.

Ambient data

Ambient temperature [1]	Operation: –20 °C ... +60 °C Storage: –30 °C ... +80 °C
Shock load	According to IEC 60068

[1] Do not bend below 0 °C.

Specific data

Fork width	Model name	Ordering information
2 mm	WF2	E-14
5 mm	WF5	E-14
15 mm	WF15	E-14
30 mm	WF30	E-14
50 mm	WF50	E-15
80 mm	WF80	E-15
120 mm	WF120	E-15

Ordering information

WF2

- **Fork width:** 2 mm

MDO [1]	Switching output	Adjustment	Fork depth	Model name	Part no.
0.2 mm	PNP/NPN	Manual ("+"/"–" button)	42 mm	WF2-40B410	6028428
			59 mm	WF2-60B410	6028436
			95 mm	WF2-95B410	6028443
		Teach-in	42 mm	WF2-40B416	6028450
			59 mm	WF2-60B416	6028457
			95 mm	WF2-95B416	6028464

[1] Minimum detectable object.

WF5

- **Fork width:** 5 mm

MDO [1]	Switching output	Adjustment	Fork depth	Model name	Part no.
0.2 mm	PNP/NPN	Manual ("+"/"–" button)	42 mm	WF5-40B410	6028429
			59 mm	WF5-60B410	6028437
			95 mm	WF5-95B410	6028444
		Teach-in	42 mm	WF5-40B416	6028451
			59 mm	WF5-60B416	6028458
			95 mm	WF5-95B416	6028465

[1] Minimum detectable object.

WF15

- **Fork width:** 15 mm

MDO [1]	Switching output	Adjustment	Fork depth	Model name	Part no.
0.2 mm	PNP/NPN	Manual ("+"/"–" button)	42 mm	WF15-40B410	6028430
			59 mm	WF15-60B410	6028438
			95 mm	WF15-95B410	6028445
		Teach-in	42 mm	WF15-40B416	6028452
			59 mm	WF15-60B416	6028459
			95 mm	WF15-95B416	6028466

[1] Minimum detectable object.

WF30

- **Fork width:** 30 mm

MDO [1]	Switching output	Adjustment	Fork depth	Model name	Part no.
0.2 mm	PNP/NPN	Manual ("+"/"–" button)	42 mm	WF30-40B410	6028431
			59 mm	WF30-60B410	6028439
			95 mm	WF30-95B410	6028446
		Teach-in	42 mm	WF30-40B416	6028453
			59 mm	WF30-60B416	6028460
			95 mm	WF30-95B416	6028467

[1] Minimum detectable object.

WF50

- **Fork width:** 50 mm

MDO [1]	Switching output	Adjustment	Fork depth	Model name	Part no.
0.2 mm	PNP/NPN	Manual ("+"/"–" button)	42 mm	WF50-40B410	6028432
			59 mm	WF50-60B410	6028440
			95 mm	WF50-95B410	6028447
		Teach-in	42 mm	WF50-40B416	6028454
			59 mm	WF50-60B416	6028461
			95 mm	WF50-95B416	6028468

[1] Minimum detectable object.

WF80

- **Fork width:** 80 mm

MDO [1]	Switching output	Adjustment	Fork depth	Model name	Part no.
0.2 mm	PNP/NPN	Manual ("+"/"–" button)	42 mm	WF80-40B410	6028433
			59 mm	WF80-60B410	6028441
			95 mm	WF80-95B410	6028448
		Teach-in	42 mm	WF80-40B416	6028455
			59 mm	WF80-60B416	6028462
			95 mm	WF80-95B416	6028469

[1] Minimum detectable object.

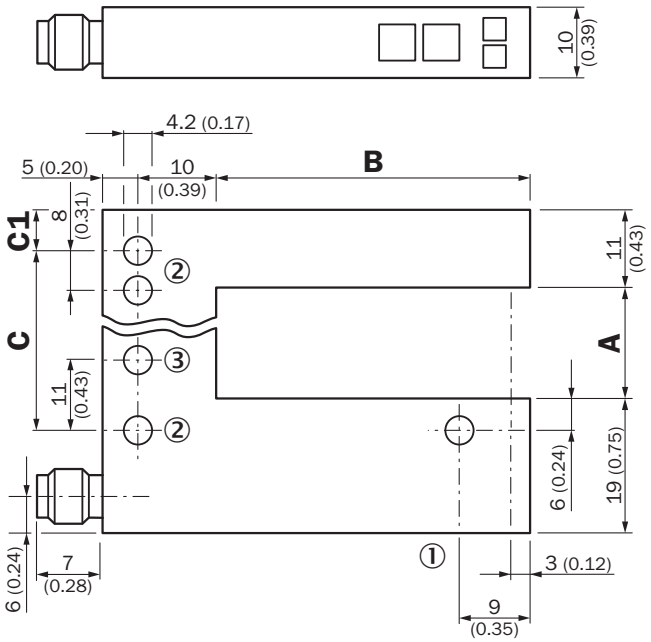
WF120

- **Fork width:** 120 mm

MDO [1]	Switching output	Adjustment	Fork depth	Model name	Part no.
0.2 mm	PNP/NPN	Manual ("+"/"–" button)	42 mm	WF120-40B410	6028435
			59 mm	WF120-60B410	6028442
			95 mm	WF120-95B410	6028449
		Teach-in	42 mm	WF120-40B416	6028456
			59 mm	WF120-60B416	6028463
			95 mm	WF120-95B416	6028470

[1] Minimum detectable object.

Dimensional drawing



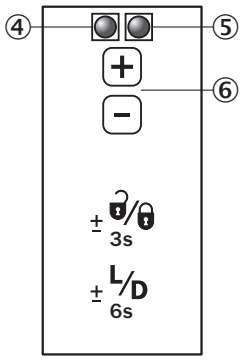
All dimensions in mm (inch)

Dimensions in mm (inch)

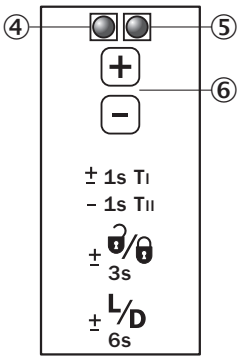
	A Fork width	B Fork depth	C	C1
WF2	2 (0.08)	42/59/95 (1.65/2.32/3.74)	14 (0.55)	5 (0.20)
WF5	5 (0.20)	42/59/95 (1.65/2.32/3.74)	14 (0.55)	6.5 (0.20)
WF15	15 (0.59)	42/59/95 (1.65/2.32/3.74)	27 (1.06)	5 (0.20)
WF30	30 (1.18)	42/59/95 (1.65/2.32/3.74)	42 (1.65)	5 (0.20)
WF50	50 (1.97)	42/59/95 (1.65/2.32/3.74)	51 (2.01)	16 (0.63)
WF80	80 (3.15)	42/59/95 (1.65/2.32/3.74)	81 (3.19)	16 (0.63)
WF120	120 (4.72)	42/59/95 (1.65/2.32/3.74)	121 (4.76)	16 (0.63)

Adjustments

WF*next*
Adjustment: "+"/"–" button



WF*next*
Adjustment: Teach-in

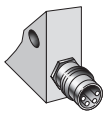


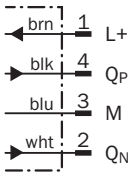
① Optical axis
② Mounting hole, Ø 4.2 mm
③ WF50/80/120 only
④ Function signal indicator (yellow), switching output
⑤ Function indicator (red)
⑥ "+"/"–" buttons and function button

E

Connection type and diagram

Connector
M8, 4-pin





Recommended accessories

Plug connectors and cables

Connector M8, 4-pin

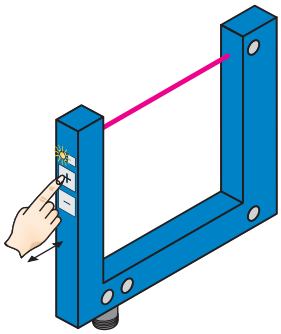
Connector type	Enclosure rating	Flying leads	Sheath material	Cable length	Model name	Part no.
Female connector	IP 67	Straight	PVC	2 m	DOL-0804-G02M	6009870
				5 m	DOL-0804-G05M	6009872
				10 m	DOL-0804-G10M	6010754
		Angled	PVC	2 m	DOL-0804-W02M	6009871
				5 m	DOL-0804-W05M	6009873
				10 m	DOL-0804-W10M	6010755
		Straight	–	–	DOS-0804-G	6009974
		Angled	–	–	DOS-0804-W	6009975

For additional accessories including dimensional drawings, please see page G-1

E

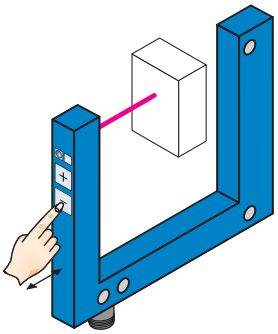
Setting the switching threshold via “+”/“–” buttons (WFxx-B410)

1. No object in the beam path



The yellow function indicator illuminates when the light received is at its optimum level.
If necessary, increase sensitivity using the “+” button.

2. Object in the beam path

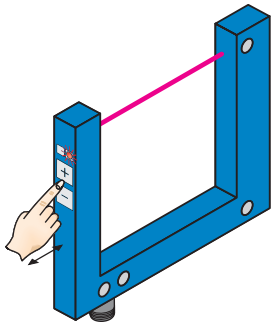


Yellow function indicator goes out.
If necessary, reduce sensitivity using the “–” button.

Setting the switching threshold via teach-in (WFxx-B416)

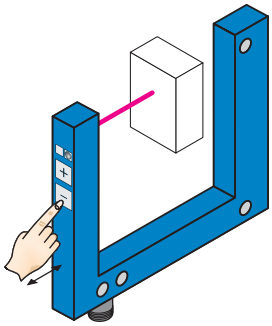
The switching threshold is set automatically. Fine adjustment is possible using the “+”/“–” buttons.

1. No object or substrate in the beam path



Press the “+” and “–” buttons together and hold for 1 second.
The red function indicator flashes slowly.

2. Object or label in the beam path



Press the “–” button for 1 second.
Red function indicator goes out.

E

Notes

Material speed = 0 (machine at a standstill).

Once teach-in process is complete, the switching threshold can be adjusted at any time using the “+” or “–” button. To make minor adjustments, press the “+” or “–” button once.
To configure settings quickly, keep the “+” or “–” button pressed for longer.

Press both the “+” and “–” buttons together (3 seconds) to lock the device and prevent unintentional actuation.

Press both the “+” and “–” buttons together (6 seconds) to define the switching function (light/dark switching). Standard setting: $\overline{Q}$ = light switching.

E

Get precise detection of small targets with WFL fork sensors

Product description

The WFL laser fork sensor family is characterized by fast response times and a highly focused visible laser beam. The sender and receiver, which operate using the through-beam principle, are combined in a single housing. This enables maximum positioning accuracy. Due to extremely fast response times and high resolutions, these sensors are ideal for detecting very small objects, such as needles, and transparent objects. With more than 20 sensors available, this line of fork sensors can be used for a wide variety of applications.

At a glance

- Very precise laser beam (Class 1 laser)
- Simple and accurate adjustment via teach-in
- Fast response time (max. 100 µs)
- Minimum detectable object size of 0.05 mm
- PNP and NPN switching output
- Light/dark switching function
- 21 different models with different fork widths and depths
- Rugged, IP 65 aluminum housing

Your benefits

- A highly precise laser beam ensures consistent measurement accuracy along the entire measuring range and reliable detection of the smallest objects
- A visible laser light spot enables easy alignment and fast adjustment
- Reliable and simple setting via teach-in ensures high process reliability
- A wide range of different fork sizes increases installation flexibility
- The aluminum housing meets all requirements for use in harsh industrial conditions

CDRH

Additional information

E

8013816/2011-05-30
Subject to change without notice

Detailed technical data

Features

Functional principle	Optical detection principle
Light source	Laser, Class 1, 670 nm
Switching function	Light/dark switching, selectable via button

Mechanics/electronics

Supply voltage V_S [1]	DC 10 V ... 30 V
Ripple [2]	< 10 %
Power consumption [3]	40 mA
Switching frequency [4]	10 kHz
Response time [5]	100 µs
Stability of response time	± 20 µs
Switching output voltage	PNP: HIGH = V_S – ≤ 2 V / LOW approx. 0 V NPN: HIGH = approx. V_S / LOW ≤ 2 V
Output current $I_{max.}$	100 mA
Initialization time	100 ms
Connection type	Connector M8, 4-pin
Ambient light safety	Incandescent lamp: 5,000 lx Sunlight: 10,000 lx
Protection class [6]	III
Circuit protection	V_S connections reverse-polarity protected Output Q short-circuit protected Interference suppression
Enclosure rating	IP 65
Weight [7]	Approx. 36 g ... 160 g
Housing material	Aluminum

[1] Limit values, reverse-polarity protected. Operation in short-circuit protected network max. 8 A.
[2] May not exceed or fall short of V_S tolerances.
[3] Without load.
[4] With light/dark ratio 1:1.
[5] Signal transit time with resistive load.
[6] Reference voltage 50 V DC.
[7] Depending on fork width.

Ambient data

Ambient temperature [1]	Operation: –20 °C ... +50 °C Storage: –30 °C ... +80 °C
Shock load	According to IEC 60068

[1] Do not bend below 0 °C.

Specific data

Fork width	Model name	Ordering information
2 mm	WFL2	E-22
5 mm	WFL5	E-22
15 mm	WFL15	E-22
30 mm	WFL30	E-22
50 mm	WFL50	E-22
80 mm	WFL80	E-23
120 mm	WFL120	E-23

Ordering information

WFL2

- **Fork width:** 2 mm

MDO [1]	Switching output	Adjustment	Fork depth	Model name	Part no.
0.05 mm	PNP/NPN	Teach-in	42 mm	WFL2-40B416	6036821
			59 mm	WFL2-60B416	6036828
			95 mm	WFL2-95B416	6036835

[1] Minimum detectable object.

WFL5

- **Fork width:** 5 mm

MDO [1]	Switching output	Adjustment	Fork depth	Model name	Part no.
0.05 mm	PNP/NPN	Teach-in	42 mm	WFL5-40B416	6036822
			59 mm	WFL5-60B416	6036829
			95 mm	WFL5-95B416	6036836

[1] Minimum detectable object.

WFL15

- **Fork width:** 15 mm

MDO [1]	Switching output	Adjustment	Fork depth	Model name	Part no.
0.05 mm	PNP/NPN	Teach-in	42 mm	WFL15-40B416	6036823
			59 mm	WFL15-60B416	6036830
			95 mm	WFL15-95B416	6036837

[1] Minimum detectable object.

WFL30

- **Fork width:** 30 mm

MDO [1]	Switching output	Adjustment	Fork depth	Model name	Part no.
0.05 mm	PNP/NPN	Teach-in	42 mm	WFL30-40B416	6036824
			59 mm	WFL30-60B416	6036831
			95 mm	WFL30-95B416	6036838

[1] Minimum detectable object.

WFL50

- **Fork width:** 50 mm

MDO [1]	Switching output	Adjustment	Fork depth	Model name	Part no.
0.05 mm	PNP/NPN	Teach-in	42 mm	WFL50-40B416	6036825
			59 mm	WFL50-60B416	6036832
			95 mm	WFL50-95B416	6036839

[1] Minimum detectable object.

WFL80

- **Fork width:** 80 mm

MDO [1]	Switching output	Adjustment	Fork depth	Model name	Part no.
0.05 mm	PNP/NPN	Teach-in	42 mm	WFL80-40B416	6036826
			59 mm	WFL80-60B416	6036833
			95 mm	WFL80-95B416	6036840

[1] Minimum detectable object.

WFL120

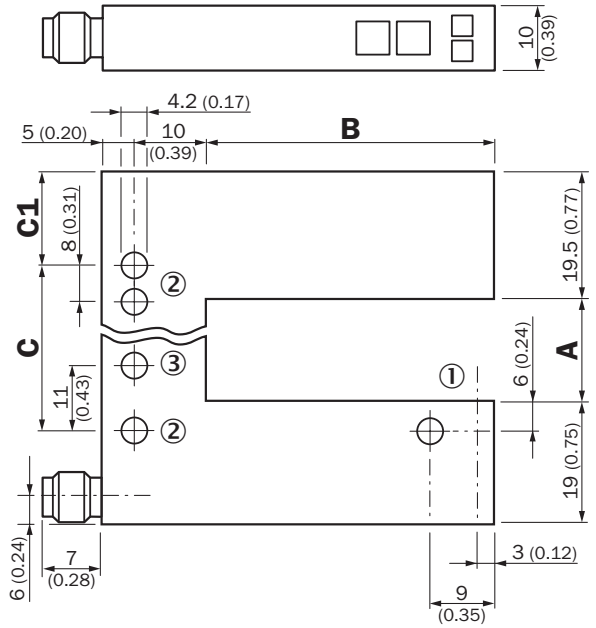
- **Fork width:** 120 mm

MDO [1]	Switching output	Adjustment	Fork depth	Model name	Part no.
0.05 mm	PNP/NPN	Teach-in	42 mm	WFL120-40B416	6036827
			59 mm	WFL120-60B416	6036834
			95 mm	WFL120-95B416	6036841

[1] Minimum detectable object.

E

Dimensional drawing

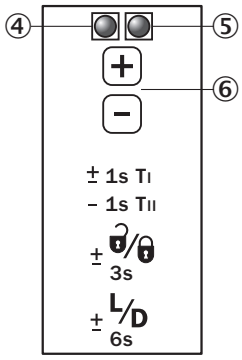


All dimensions in mm (inch)

Dimensions in mm (inch)

	A Fork width	B Fork depth	C	C1
WFL2	2 (0.08)	42/59/95 (1.65/2.32/3.74)	14 (0.55)	13.5 (0.53)
WFL5	5 (0.20)	42/59/95 (1.65/2.32/3.74)	14 (0.55)	15 (0.59)
WFL15	15 (0.59)	42/59/95 (1.65/2.32/3.74)	27 (1.06)	13.5 (0.53)
WFL30	30 (1.18)	42/59/95 (1.65/2.32/3.74)	42 (1.65)	13.5 (0.53)
WFL50	50 (1.97)	42/59/95 (1.65/2.32/3.74)	51 (2.01)	24.5 (0.96)
WFL80	80 (3.15)	42/59/95 (1.65/2.32/3.74)	81 (3.19)	24.5 (0.96)
WFL120	120 (4.72)	42/59/95 (1.65/2.32/3.74)	121 (4.76)	24.5 (0.96)

Adjustments

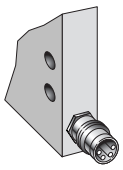


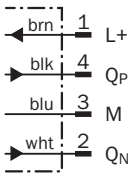
① Optical axis
② Mounting hole, Ø 4.2 mm
③ WFL50/80/120 only
④ Function signal indicator (yellow), switching output
⑤ Function indicator (red)
⑥ "+"/"−" buttons and function button

E

Connection type and diagram

Connector
M8, 4-pin





Recommended accessories

Plug connectors and cables

Connector M8, 4-pin

Connector type	Enclosure rating	Flying leads	Sheath material	Cable length	Model name	Part no.
Female connector	IP 67	Straight	PVC	2 m	DOL-0804-G02M	6009870
				5 m	DOL-0804-G05M	6009872
				10 m	DOL-0804-G10M	6010754
		Angled	PVC	2 m	DOL-0804-W02M	6009871
				5 m	DOL-0804-W05M	6009873
				10 m	DOL-0804-W10M	6010755
		Straight	–	–	DOS-0804-G	6009974
		Angled	–	–	DOS-0804-W	6009975

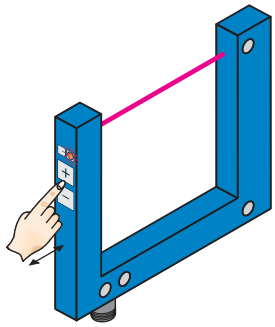
For additional accessories including dimensional drawings, please see page G-1

E

Setting the switching threshold via teach-in (WFxx-B416)

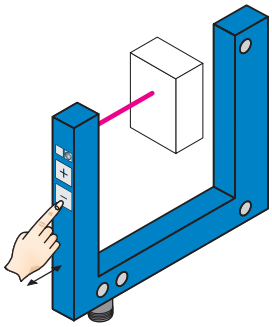
The switching threshold is set automatically. Fine adjustment is possible using the “+”/“–” buttons.

1. No object or substrate in the beam path



Press the “+” and “–” buttons together and hold for 1 second. The red function indicator flashes slowly.

2. Object or label in the beam path



Press the “–” button for 1 second. Red function indicator goes out.

Notes

Material speed = 0 (machine at a standstill).

Once teach-in process is complete, the switching threshold can be adjusted at any time using the “+” or “–” button. To make minor adjustments, press the “+” or “–” button once. To configure settings quickly, keep the “+” or “–” button pressed for longer.

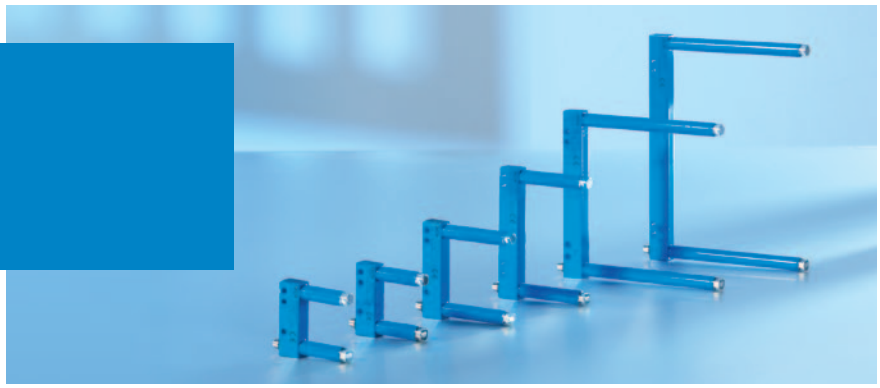
Press both the “+” and “–” buttons together (3 seconds) to lock the device and prevent unintentional actuation.

Press both the “+” and “–” buttons together (6 seconds) to define the switching function (light/dark switching). Standard setting: $\overline{Q}$ = light switching.

E

E

WFM fork sensors – connect and get started



Product description

WFM fork sensors can be integrated quickly due to Plug and Play installation – no time-consuming alignment is necessary. A 360-degree output indicator makes it easy to see the switching status during the operation. Since the sender and receiver of the sensor are integrated within the same aluminum housing, aligning the sensors is not necessary and detection tasks can be prepared and solved even faster. The WFM line includes five different types with fork widths from 30 to 180 mm and fork depths from 40 to 120 mm, providing greater application flexibility. This new generation of SICK fork sensors is suited for a variety of applications, such as detecting parts in production processes or checking presence when filling bottles.

At a glance

- Highly visible red emitted light
- No setup, out-of-the-box operation
- 360° output indicator
- 5 fork sizes:
  maximum depth 120 mm
  maximum width 180 mm
- Rugged, IP 67 aluminum housing

Your benefits

- Fixed housings guarantee a high level of operational safety with simple commissioning
- A visible red light enables easy alignment and fast adjustment
- The 360-degree yellow output indicator makes continual process control possible
- A wide range of different fork sizes increases installation flexibility
- The aluminum housing meets all requirements for use in harsh industrial conditions

Additional information

E

Detailed technical data

Features

Functional principle	Optical detection principle
Light source	LED, red
Adjustment	None

Mechanics/electronics

Supply voltage V_S [1]	DC 10 V ... 30 V
Ripple [2]	< 10 %
Power consumption [3]	< 20 mA
Switching frequency [4]	4 kHz
Response time [5]	125 µs
Stability of response time	± 15 µs
Switching output voltage	PNP: HIGH = V_S – ≤ 1.5 V / LOW = 0 V NPN: HIGH = approx. V_S / LOW ≤ 1.5 V
Output current $I_{max.}$	100 mA
Initialization time	140 ms
Ambient light safety	Sunlight: 10,000 lx
Protection class [6]	III
Circuit protection	V_S connections reverse-polarity protected Output Q short-circuit protected Interference suppression
Enclosure rating	IP 67
Weight [7]	Approx. 80 g ... 190 g
Housing material	Aluminum

[1] Limit values, reverse-polarity protected. Operation in short-circuit protected network max. 8 A.

[2] May not exceed or fall short of V_S tolerances.

[3] Without load.

[4] With light/dark ratio 1:1.

[5] Signal transit time with resistive load.

[6] Reference voltage 50 V DC.

[7] Depending on fork width.

Ambient data

Ambient temperature [1]	Operation: –10 °C ... +60 °C Storage: –40 °C ... +80 °C
Shock load	According to IEC 60068

[1] Do not bend below 0 °C.

Specific data

Fork width	Fork depth	Model name	Ordering information
30 mm	42 mm	WFM30-40	E-30
50 mm	60 mm	WFM50-60	E-30
80 mm	60 mm	WFM80-60	E-30
120 mm	124 mm	WFM120-120	E-30
180 mm	124 mm	WFM180-120	E-31

Ordering information

WFM30-40

- **Fork width:** 30 mm
- **Fork depth:** 42 mm

MDO [1]	Connection type	Switching output	Switching function	Model name	Part no.
0.8 mm	Connector M8, 3-pin	PNP	Dark switching	WFM30-40P321	6037819
			Light switching	WFM30-40P311	6037820
		NPN	Dark switching	WFM30-40N321	6037821
			Light switching	WFM30-40N311	6037822
	Cable 2 m, 3-pin	PNP	Dark switching	WFM30-40P121	6037823

[1] Minimum detectable object.

WFM50-60

- **Fork width:** 50 mm
- **Fork depth:** 60 mm

MDO [1]	Connection type	Switching output	Switching function	Model name	Part no.
0.8 mm	Connector M8, 3-pin	PNP	Dark switching	WFM50-60P321	6037824
			Light switching	WFM50-60P311	6037825
		NPN	Dark switching	WFM50-60N321	6037826
			Light switching	WFM50-60N311	6037827

[1] Minimum detectable object.

WFM80-60

- **Fork width:** 80 mm
- **Fork depth:** 60 mm

MDO [1]	Connection type	Switching output	Switching function	Model name	Part no.
0.8 mm	Connector M8, 3-pin	PNP	Dark switching	WFM80-60P321	6037828
			Light switching	WFM80-60P311	6037829
		NPN	Dark switching	WFM80-60N321	6037830
			Light switching	WFM80-60N311	6037831

[1] Minimum detectable object.

WFM120-120

- **Fork width:** 120 mm
- **Fork depth:** 124 mm

MDO [1]	Connection type	Switching output	Switching function	Model name	Part no.
0.8 mm	Connector M8, 3-pin	PNP	Dark switching	WFM120-120P321	6037832
			Light switching	WFM120-120P311	6037833
		NPN	Dark switching	WFM120-120N321	6037834
			Light switching	WFM120-120N311	6037835

[1] Minimum detectable object.

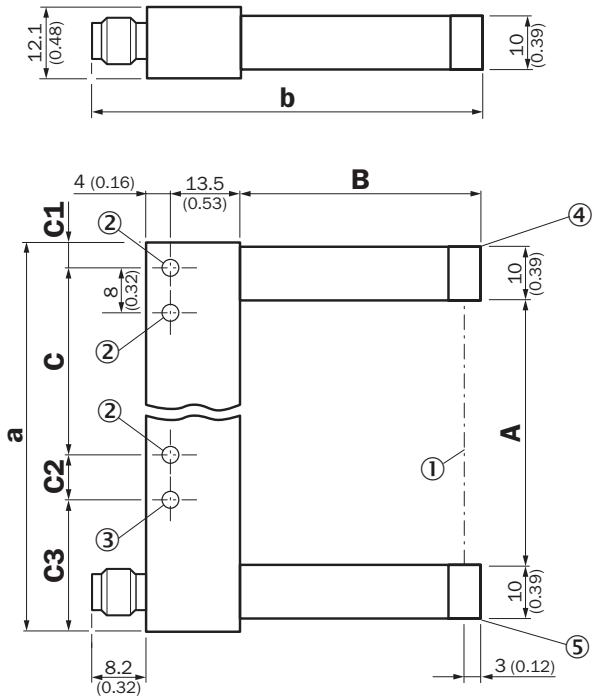
WFM180-120

- **Fork width:** 180 mm
- **Fork depth:** 124 mm

MDO [1]	Connection type	Switching output	Switching function	Model name	Part no.
1 mm	Connector M8, 3-pin	PNP	Dark switching	WFM180-120P321	6037836
			Light switching	WFM180-120P311	6037837
		NPN	Dark switching	WFM180-120N321	6037838
			Light switching	WFM180-120N311	6037839

[1] Minimum detectable object.

Dimensional drawing



All dimensions in mm (inch)

Dimensions in mm (inch)

	A Fork width	B Fork depth	C	C1
WFM30	30 (1.18)	42 (1.65)	30 (1.18)	6.5 (0.26)
WFM50	50 (1.97)	60 (2.36)	40 (1.57)	6.5 (0.26)
WFM80	80 (3.15)	60 (2.36)	70 (2.76)	6.5 (0.26)
WFM120	120 (4.72)	124.3 (4.89)	100 (3.94)	17 (0.67)
WFM180	180 (7.09)	124.3 (4.89)	152 (5.98)	22 (0.87)

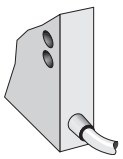
	C2	C3	a	b
WFM30	– (–)	– (–)	54 (2.13)	67.7 (2.67)
WFM50	8 (0.31)	19.5 (0.77)	74 (2.91)	85.7 (3.37)
WFM80	8 (0.31)	19.5 (0.77)	104 (4.09)	85.7 (3.37)
WFM120	10 (0.39)	17 (0.67)	144 (5.67)	150.2 (5.91)
WFM180	8 (0.31)	22 (0.87)	204 (8.03)	150.2 (5.91)

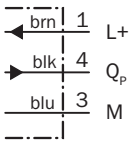
① Optical axis
② Mounting hole, Ø 4.3 mm
③ WFM50/80/120/180
④ Transmitted light (red)
⑤ Function signal indicator (yellow), switching output

E

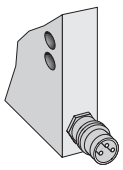
Connection type and diagram

Cable 2 m
3-pin

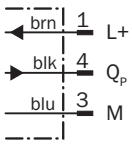




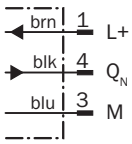
Connector M8
3-pin



WFM PNP



WFM NPN



Recommended accessories

Plug connectors and cables

Connector M8, 3-pin

Connector type	Enclosure rating	Flying leads	Sheath material	Cable length	Model name	Part no.
Female connector	IP 67	Straight	PVC	2 m	DOL-0803-G02M	6010785
				5 m	DOL-0803-G05M	6022009
				10 m	DOL-0803-G10M	6022011
		Angled	PVC	2 m	DOL-0803-W02M	6008489
				5 m	DOL-0803-W05M	6022010
				10 m	DOL-0803-W10M	6022012
		Straight	–	–	DOS-0803-G	7902077
		Angled	–	–	DOS-0803-W	7902078

For additional accessories including dimensional drawings, please see page G-1

E

Ax20 array sensors for edge and diameter detection solutions

Array sensors use closely spaced beams of light to detect even the slightest differences in gray scale between the target and the background within their field-of-view. They are ideal for edge and diameter detection as well as detecting widths and gaps. SICK's array sensors offer industry-leading reproducibility, in addition to compact, rugged metal housings for use in highly restricted or harsh environments.

Your benefits

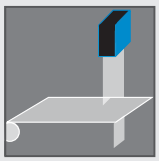
- Cost-effective solution to reliably determine edge position and width measurement
- Easy-to-integrate, compact housing can be mounted over the web so less downtime is required for maintenance
- No reflector is required, reducing maintenance and providing greater product reliability. Reduces downtime. Only array sensors available in diffuse mode, making them ideal for environments where dirt and dust can interfere with other types of solutions that require a reflector.
- High reproducibility of 0.03 mm and industry-leading resolution enable greater accuracy and quality control
- Highly visible white LED light spot ensures fast and accurate alignment, reducing time-consuming fine adjustment
- No teach, program or menu activities make setup virtually hassle free

Array sensors

F

For fast web edge and line detection

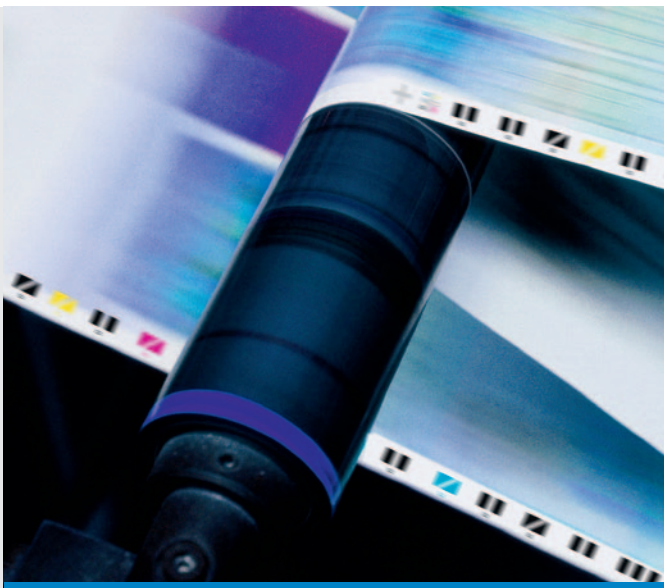
Reliable under pressure



Edge

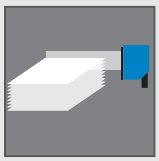
The Ax20 traces the position of the web edge and detects the lateral position of the paper or foil web.

Benefits:
- Sensing system enables flexible installation (no fork design)
- Very high reproducibility
- Clearly visible light spot for precise setting
- Long measurement range eliminates need for fine web adjustments



Web edge detection
The Ax20 “looks” at the web from above and has a long measurement range, making it especially flexible.

When the highest level of precision counts



Edge

The Ax20 monitors stack heights with high reliability, ensuring that, for example, the gripper can pick up the next sheet of paper in an optimal fashion.

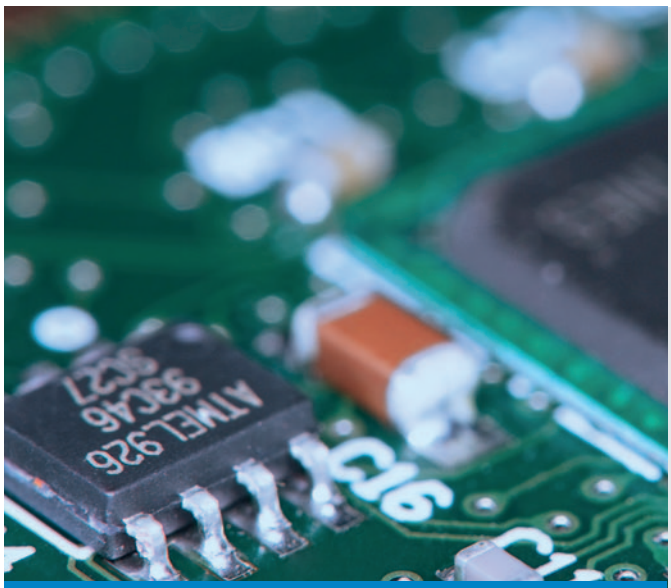
Benefits:
- Small housing – ensures trouble-free integration into any machine
- Precise functioning for a variety of materials
- Long measurement range
- Low sensitivity to ambient light

Stack height monitoring
The Ax20 is installed aimed at the side of the stack and can detect even the smallest stack edges, even when objects are closely positioned.

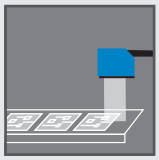
F

Efficient width, diameter and small parts detection

High accuracy positioning



Object positioning
The high-performance Ax20 uses non contact measurement as a longer-lasting alternative to mechanical solutions.



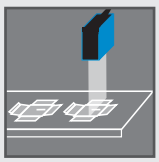
Edge

The Ax20 quickly and precisely recognizes the front edge of an object such as an electronic printed circuit board, which enables reliable positioning and assembling processes even under high transport speeds.

Benefits:
- Precise positioning enabled by highly visible light spot
- Replaces mechanical limit stop with an optical one, eliminating mechanical wear
- Enables a variety of positioning tasks in a cost-effective manner

A high-speed solution

Glue beads detection
The Ax20 ensures reliable detection of glue beads – enabling high cycle rates in the packaging, pharmaceutical and automotive industries.



Diameter

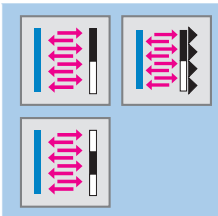
The packaging industry depends on high throughput and fast production speeds – and the Ax20 is up to the task. With its IP 67 protection rating and high immunity to ambient light, the Ax20 ensures quality control when applying glue and adhesive, even under the toughest conditions.

Benefits:
- Reliable detection of glue bead via thickness measurement
- Excellent contrast resolution, (e.g., with transparent adhesive on white cardboard)
- Long sensing distance prevents contamination

F

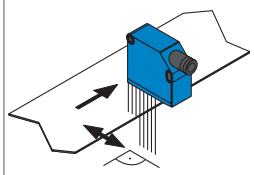
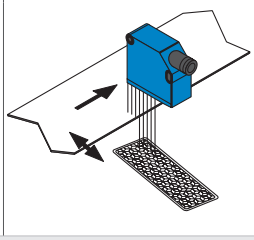
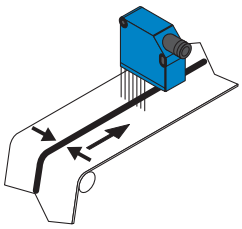
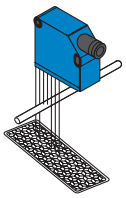
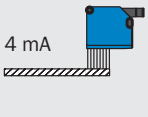
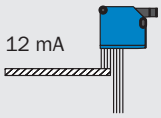
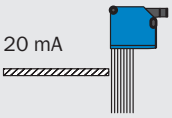
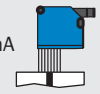
F

Product family overview



Ax20E Edge

Ax20D Diameter

	Ax20E array sensors – edge detection	Ax20D array sensors – diameter detection
Technical data overview		
Functional principle	Proximity and reflector or only reflector	Proximity and reflector
Sensing distance	25 mm / 100 mm	25 mm / 100 mm
Measurement range	20 mm / 30 mm	20 mm / 30 mm
Reproducibility	0.03 mm / 0.05 mm	0.03 mm / 0.05 mm
Minimum detectable object (MDO)	0.8 mm / 1.6 mm	0.8 mm / 1.6 mm
Analog output QA	4 mA ... 20 mA	4 mA ... 20 mA
Switching output	Q (NPN) / Q (PNP)	Q (NPN) / Q (PNP)
At a glance		
	• Detect position of edge of material • Reflector mode version also available • Compact, metal housing • Reproducibility of 0.03 mm • Sensing distance 25 mm or 100 mm • Measurement range up to 30 mm • Analog output 4 mA ... 20 mA	• Detection of diameter and width • Compact, metal housing • Reproducibility of 0.03 mm • Sensing distance 25 mm or 100 mm • Measurement range up to 30 mm • Analog output 4 mA ... 20 mA
Further information		
Functional principle	Proximity  Reflector 	Proximity  Reflector 
Analog output	4 mA  12 mA  20 mA 	4 mA  20 mA 
Fields of application	• Measurement web edge guidance control, e.g., paper webs, foil and transparent materials • Object positioning (end of travel indication) • Line tracking	• Gap detection • Width measurement • Line diameter detection
Detailed information	➜ F-6	➜ F-6

F

Ax20 array sensors for edge and diameter detection solutions

Product description

Array sensors use closely spaced beams of light to detect even the slightest differences in gray scale between the target and the background within their field-of-view. They are ideal for edge and diameter detection as well as detecting widths and gaps. SICK's array sensors offer industry-leading reproducibility, in addition to compact, rugged metal housings for use in highly restricted or harsh environments.

At a glance

- Proximity contrast line sensor in a compact housing
- Application-specific sensor functions
- Detect position of edge of material
- Diameter, width and gap detection of different objects
- Very high reproducibility of 0.03 mm
- Large measurement range: 30 mm
- Visible white LED light spot to enable accurate alignment
- Simple setup, no teach-in necessary

Your benefits

- Cost-effective solution to reliably determine edge position and width measurement
- Easy-to-integrate, compact housing can be mounted over the web so less downtime is required for maintenance
- No reflector is required, reducing maintenance and providing greater product reliability. Reduces downtime. Only array sensors available in diffuse mode, making them ideal for environments where dirt and dust can interfere with other types of solutions that require a reflector.
- High reproducibility of 0.03 mm and industry-leading resolution enable greater accuracy and quality control
- Highly visible white LED light spot ensures fast and accurate alignment, reducing time-consuming fine adjustment
- No teach, program or menu activities make setup virtually hassle free

Additional information

F

8013816/2011-05-30
Subject to change without notice

Detailed technical data

Features

Dimensions (L x W x H)	54.1 mm x 24.3 mm x 59.8 mm
Operating range	20 mm ... 30 mm / 90 mm ... 110 mm
Measurement range	20 mm / 30 mm
Light spot size	30 mm x 5 mm / 50 mm x 10 mm
Light source [1]	LED white
Linearity [2]	± 2 %

[1] Wave length: 400 nm ... 700 nm.
[2] Analog current range (16 mA).

Mechanics/electronics

Supply voltage V_S [1]	DC 24 V ± 20 %
Ripple [2]	≤ 5 V
Power consumption [3]	< 3.1 W
Switching output voltage	NPN: HIGH = approx. V_S / LOW ≤ 2 V PNP: HIGH = V_S– ≤ 2 V / LOW approx. 0 V
Analog output Q_A	4 mA ... 20 mA
Resolution of analog output	12 bit
Output rate of analog output	1 ms
Output current $I_{max.}$	< 100 mA
Initialization time [4]	0.48 s
Connection type	Connector M12, 5-pin
Protection class	III
Circuit protection	V_S connections reverse-polarity protected Output Q short-circuit protected Interference suppression
Enclosure rating	IP 67
Weight	Approx. 135 g
Housing material	Metal

[1] Operation in short-circuit protected network max. 8 A.
[2] May not exceed or fall short of V_S tolerances.
[3] Without load.
[4] Typ. max. 1.6 s.

Ambient data

Ambient temperature	Operation: –10 °C ... +55 °C Storage: –25 °C ... +75 °C
Shock load	According to IEC 60068

F

Specific data

Functional principle	Model name	Ordering information
Edge detection, proximity and reflector	AT20E	F-8
Edge detection, reflector	AL20E	F-8
Diameter detection, proximity and reflector	AT20D	F-8

Ordering information

AT20E

- **Functional principle:** Edge detection, proximity and reflector

Sensing distance	Measurement range	Reproducibility [1]	MDO [2]	Switching output [3]	Model name	Part no.
25 mm	20 mm	0.03 mm	0.8 mm	Q (NPN)	AT20E-NM111	1046458
				Q (PNP)	AT20E-PM111	1044484
100 mm	30 mm	0.05 mm	1.6 mm	Q (NPN)	AT20E-NM331	1046459
				Q (PNP)	AT20E-PM331	1045990

[1] With respect to sensing distance.
[2] Minimum detectable object.
[3] Active when object detected.

AL20E

- **Functional principle:** Edge detection, reflector

Sensing distance	Measurement range	Reproducibility [1]	MDO [2]	Switching output [3]	Model name	Part no.
25 mm	20 mm	0.03 mm	0.8 mm	Q (NPN)	AL20E-NM111	1046460
				Q (PNP)	AL20E-PM111	1046463
100 mm	30 mm	0.05 mm	1.6 mm	Q (NPN)	AL20E-NM331	1046461
				Q (PNP)	AL20E-PM331	1046462

[1] With respect to sensing distance.
[2] Minimum detectable object.
[3] Active when object detected.

AT20D

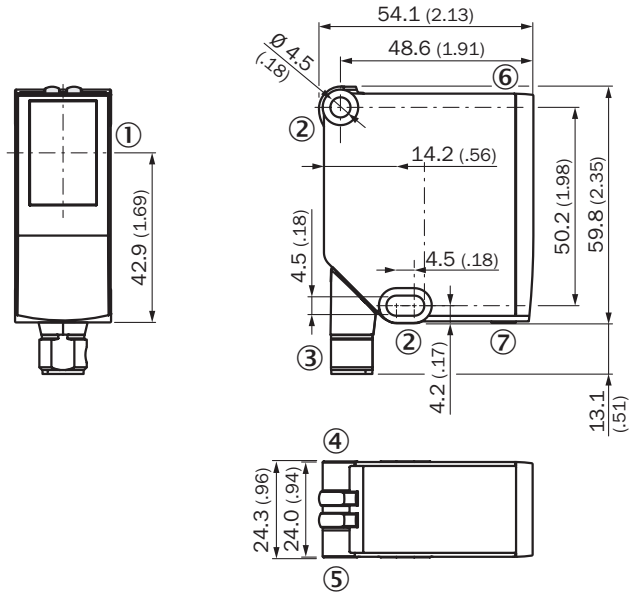
- **Functional principle:** Diameter detection, proximity and reflector

Sensing distance	Measurement range	Reproducibility [1]	MDO [2]	Switching output [3]	Model name	Part no.
25 mm	20 mm	0.03 mm	0.8 mm	Q (NPN)	AT20D-NM111	1046466
				Q (PNP)	AT20D-PM111	1046464
100 mm	30 mm	0.05 mm	1.6 mm	Q (NPN)	AT20D-NM331	1046467
				Q (PNP)	AT20D-PM331	1046465

[1] With respect to sensing distance.
[2] Minimum detectable object.
[3] Active when object detected.

F

Dimensional drawing

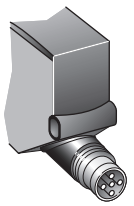


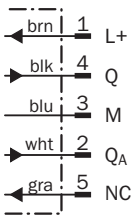
All dimensions in mm (inch)

① Center of optical axis
② Mounting hole, Ø 4.5 mm
③ Connector M12 (rotatable up to 90°)
④ Function signal indicator (green)
⑤ Function signal indicator (yellow), switching output
⑥ Head side
⑦ Connector side

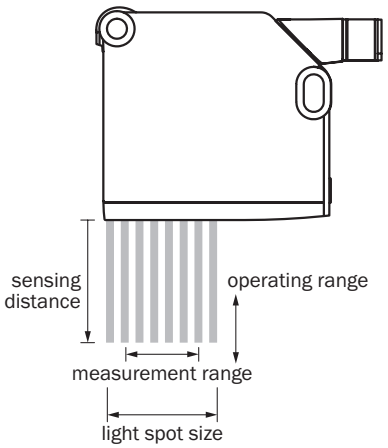
Connection type and diagram

Connector
M12, 5-pin





Explanation of parameters



Sensing distance	Operating range	Measurement range	Light spot size
25 mm	20 mm ... 30 mm	20 mm	30 mm x 5 mm
100 mm	90 mm ... 110 mm	30 mm	50 mm x 10 mm

F

Recommended accessories

Plug connectors and cables

Connector M12, 5-pin

Connector type	Enclosure rating	Flying leads	Sheath material	Cable length	Model name	Part no.
Female connector	IP 67	Straight	PVC	2 m	DOL-1205-G02M	6008899
				5 m	DOL-1205-G05M	6009868
				10 m	DOL-1205-G10M	6010544
		Angled	PVC	2 m	DOL-1205-W02M	6008900
				5 m	DOL-1205-W05M	6009869
				10 m	DOL-1205-W10M	6010542
		Straight	–	–	DOS-1205-G	6009719
		Angled	–	–	DOS-1205-W	6009720

Mounting brackets/plates

Mounting system type	Material	Model name	Part no.
Mounting bracket	Stainless steel (1.4301)	BEF-WN-DT20	4043524

Reflectors

Dimensions (L x W x H)	Model name	Part no.
110 mm x 30 mm x 3 mm	REF-AX001	2049250
95 mm x 30 mm x 0.3 mm	REF-AX002	2049249

For additional accessories including dimensional drawings, please see page G-1

F

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A winning combination: sensors and accessories from SICK

For optimum integration of sensors into your systems, SICK offers a complete range of accessories. This includes everything from connection and mounting systems, to reflectors, lenses, fiber-optic cables and even luminescence chalk.

Reliable signal transmission is paramount for productivity – high-quality connectivity components with long service lives reduce costs. SICK offers perfect connection systems for any application or sector, whether for the material handling, packaging, automotive or food and beverage industries. The extensive range of connectors and distributors lets you easily implement the best cabling solution for every application, even under the harshest and most difficult conditions.

With its sophisticated mounting concept, SICK reponds to a vast array of sensor installation requirements and offers the right solutions for mounting, alignment and protection of industrial SICK sensor systems. Efficient, and functional.

G

Product Finder

www.mysick.com/products

Further accessories can be found online: enter the part no. of the product, and make your selection in “Related content: Accessories”.

8013816/2011-05-30
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Accessories

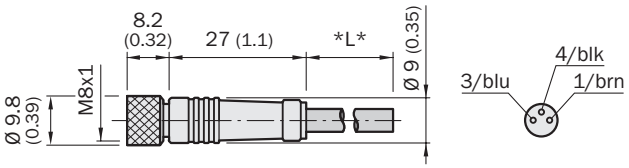
G

Plug connectors and cables

Connector M8, 3-pin

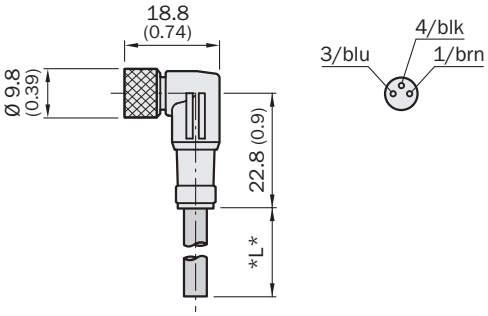
Connector type	Enclosure rating	Flying leads	Sheath material	Cable length	Model name	Part no.
Female connector	IP 67	Straight	PVC	2 m	DOL-0803-G02M	6010785
				5 m	DOL-0803-G05M	6022009
				10 m	DOL-0803-G10M	6022011
		Angled	PVC	2 m	DOL-0803-W02M	6008489
				5 m	DOL-0803-W05M	6022010
				10 m	DOL-0803-W10M	6022012
		Straight			DOS-0803-G	7902077
		Angled			DOS-0803-W	7902078

DOL-0803-G02M
DOL-0803-G05M
DOL-0803-G10M



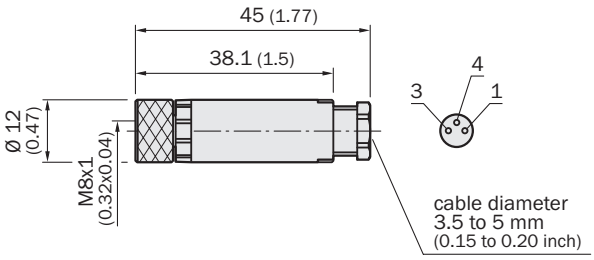
All dimensions in mm (inch)

DOL-0803-W02M
DOL-0803-W05M
DOL-0803-W10M



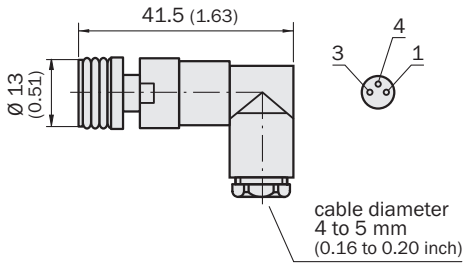
All dimensions in mm (inch)

DOS-0803-G



All dimensions in mm (inch)

DOS-0803-W



All dimensions in mm (inch)

WFM

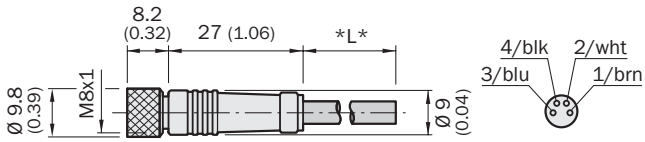
→ E-28

G

Connector M8, 4-pin

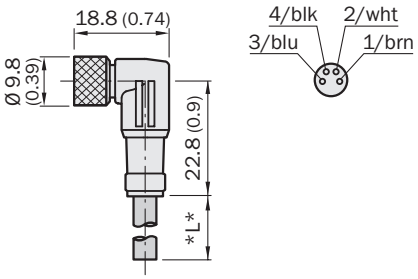
Connector type	Enclosure rating	Flying leads	Sheath material	Cable length	Model name	Part no.
Female connector	IP 67	Straight	PVC	2 m	DOL-0804-G02M	6009870
				5 m	DOL-0804-G05M	6009872
				10 m	DOL-0804-G10M	6010754
		Angled	PVC	2 m	DOL-0804-W02M	6009871
				5 m	DOL-0804-W05M	6009873
				10 m	DOL-0804-W10M	6010755
		Straight			DOS-0804-G	6009974
		Angled			DOS-0804-W	6009975

DOL-0804-G02M
DOL-0804-G05M
DOL-0804-G10M



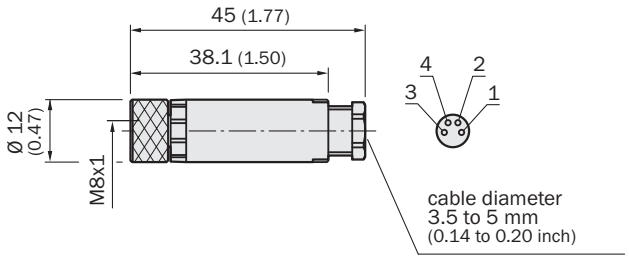
All dimensions in mm (inch)

DOL-0804-W02M
DOL-0804-W05M
DOL-0804-W10M



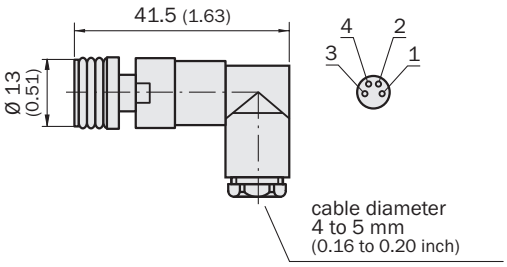
All dimensions in mm (inch)

DOS-0804-G



All dimensions in mm (inch)

DOS-0804-W



All dimensions in mm (inch)

UF3

→ E-6

WF*next*

→ E-12

WFL

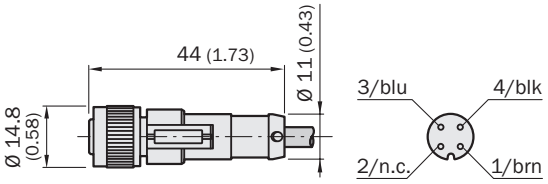
→ E-20

G

Connector M12, 3-pin

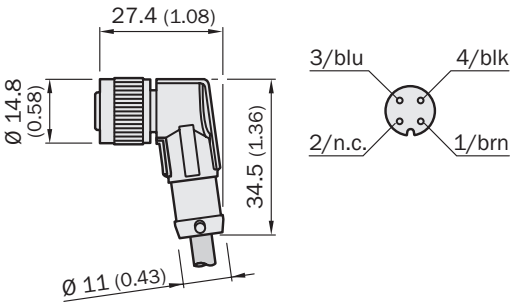
Connector type	Enclosure rating	Flying leads	Sheath material	Cable length	Model name	Part no.
Female connector	IP 68	Straight	PUR	2 m	DOL-1203-G02MC	6039075
				5 m	DOL-1203-G05MC	6039076
				10 m	DOL-1203-G10MC	6039077
		Angled	PUR	2 m	DOL-1203-W02MC	6039078
				5 m	DOL-1203-W05MC	6039079
				10 m	DOL-1203-W10MC	6036752

DOL-1203-G02MC
DOL-1203-G05MC
DOL-1203-G10MC



All dimensions in mm (inch)

DOL-1203-W02MC
DOL-1203-W05MC
DOL-1203-W10MC



All dimensions in mm (inch)

KT1M

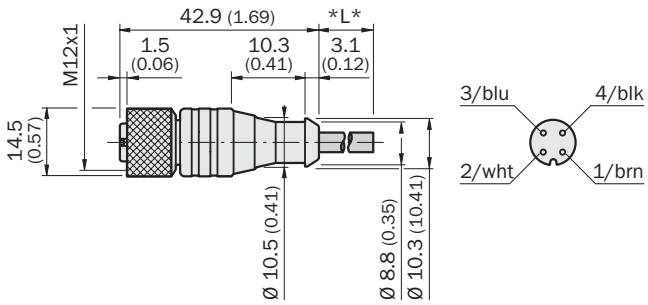
→ B-12

Connector M12, 4-pin

Connector type	Enclosure rating	Flying leads	Sheath material	Cable length	Model name	Part no.
Female connector	IP 67	Straight	PVC	2 m	DOL-1204-G02M	6009382
				5 m	DOL-1204-G05M	6009866
				10 m	DOL-1204-G10M	6010543
				15 m	DOL-1204-G15M	6010753
		Angled	PVC	2 m	DOL-1204-W02M	6009383
				5 m	DOL-1204-W05M	6009867
				10 m	DOL-1204-W10M	6010541
		Straight			DOS-1204-G	6007302
		Angled			DOS-1204-W	6007303

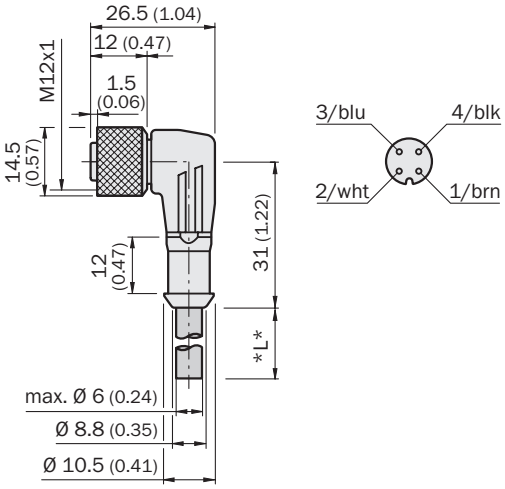
G

DOL-1204-G02M
DOL-1204-G05M
DOL-1204-G10M
DOL-1204-G15M



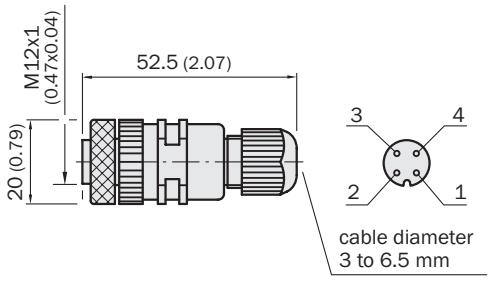
All dimensions in mm (inch)

DOL-1204-W02M
DOL-1204-W05M
DOL-1204-W10M



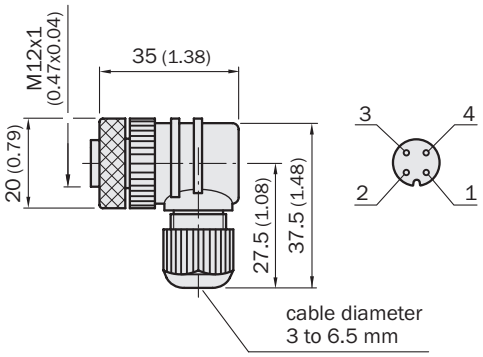
All dimensions in mm (inch)

DOS-1204-G



All dimensions in mm (inch)

DOS-1204-W



All dimensions in mm (inch)

KT1M

➜ B-12

KT3

➜ B-24 ... B-35

KT5-2 Potentiometer

➜ B-36

KT5-2 Teach-in

➜ B-44

KTL5-2 Fiber Optic

➜ B-60

KT6-2

➜ B-68

CSM1

➜ C-8

LUT2-2

➜ D-16

LUT3-6

➜ D-22

LUT9 IO-Link

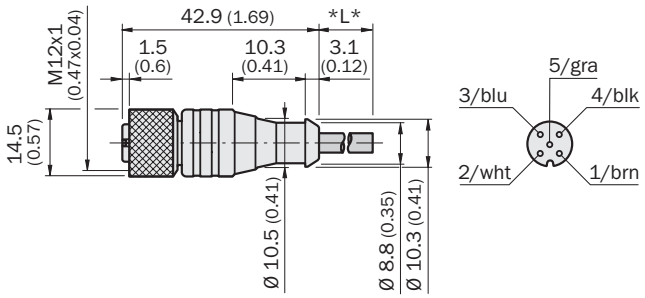
➜ D-34

G

Connector M12, 5-pin

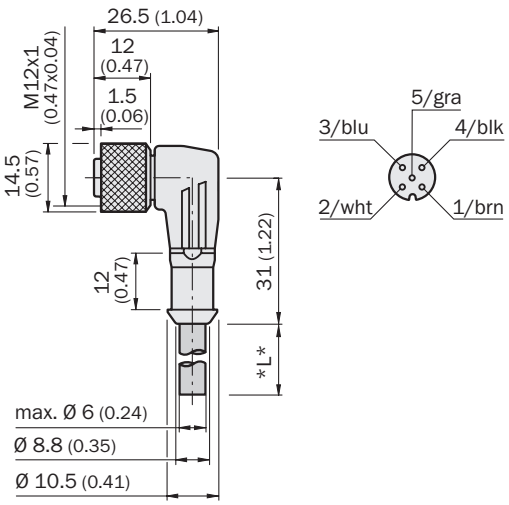
Connector type	Enclosure rating	Flying leads	Sheath material	Cable length	Model name	Part no.
Female connector	IP 67	Straight	PVC	2 m	DOL-1205-G02M	6008899
				5 m	DOL-1205-G05M	6009868
				10 m	DOL-1205-G10M	6010544
		Angled	PVC	2 m	DOL-1205-W02M	6008900
				5 m	DOL-1205-W05M	6009869
				10 m	DOL-1205-W10M	6010542
		Straight			DOS-1205-G	6009719
		Angled			DOS-1205-W	6009720

DOL-1205-G02M
DOL-1205-G05M
DOL-1205-G10M



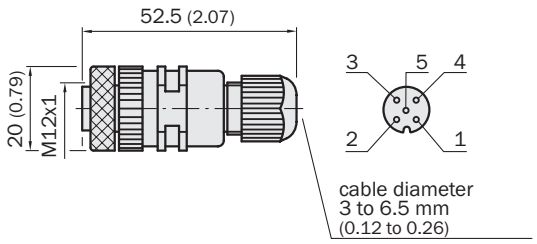
All dimensions in mm (inch)

DOL-1205-W02M
DOL-1205-W05M
DOL-1205-W10M



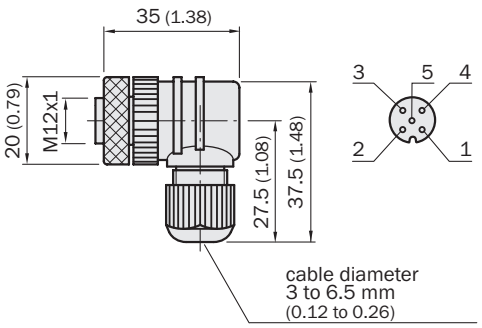
All dimensions in mm (inch)

DOS-1205-G



All dimensions in mm (inch)

DOS-1205-W



All dimensions in mm (inch)

G

KT2

→ B-18

KT5-2 Teach-in

→ B-44

KT5-2 Display

→ B-54

KTL5-2 Fiber Optic

→ B-60

KT8L Laser

→ B-80

KT10-2

→ B-86

CS8

→ C-14

LUT1

→ D-8

LUT8

➜ D-28

LUT9

➜ D-34

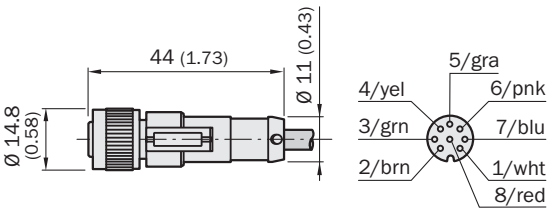
Ax20

➜ F-6

Connector M12, 8-pin

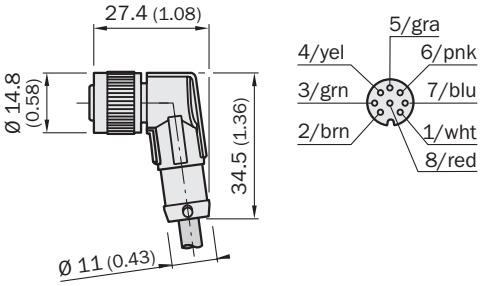
Connector type	Enclosure rating	Flying leads	Sheath material	Cable length	Model name	Part no.
Female connector	IP 67	Straight	PVC	2 m	DOL-1208-G02MA	6020633
				5 m	DOL-1208-G05MA	6020993
		Angled	PVC	2 m	DOL-1208-W02MA	6020992
		Angled	PVC	5 m	DOL-1208-W05MA	6021033
		Straight			DOS-1208-G	6028422
					DOS-1208-GA	6028369

DOL-1208-G02MA
DOL-1208-G05MA



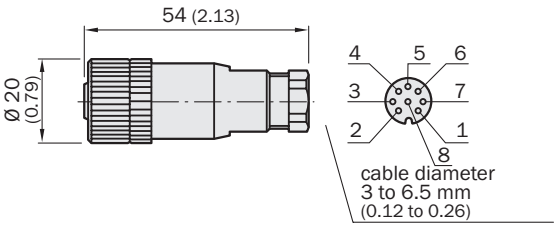
All dimensions in mm (inch)

DOL-1208-W02MA
DOL-1208-W05MA



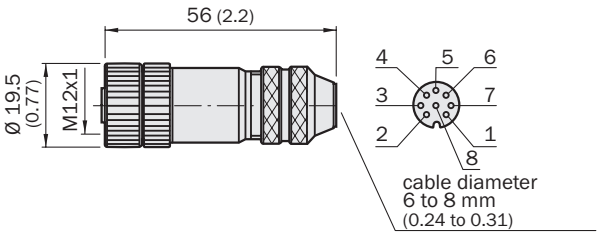
All dimensions in mm (inch)

DOS-1208-G



All dimensions in mm (inch)

DOS-1208-GA



All dimensions in mm (inch)

CS8

➜ C-14

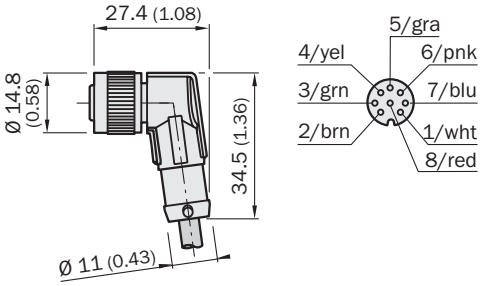
G

Connector M12, 8-pin

Connector type	Enclosure rating	Flying leads	Sheath material	Cable length	Model name [1]	Part no.
Female connector	IP 67	Angled	PUR	2 m	DOL-1208-W02MAS01	6029224

[1] Shielded.

DOL-1208-W02MAS01



All dimensions in mm (inch)

KT8 CAN

➜ B-74

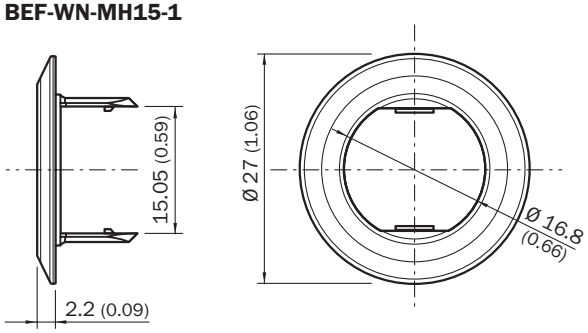
G

Mounting brackets/plates

Mounting system type	Material	Model name	Part no.
Mounting ring	Plastic (PA12)	BEF-WN-MH15-1	4039533 [1]
Nuts M18	Plastic (PA12)	Mutter-M18-MH15	4040270 [1]
Mounting bracket	Steel, zinc coated	BEF-WG-M18	5321870
		BEF-WN-M18	5308446

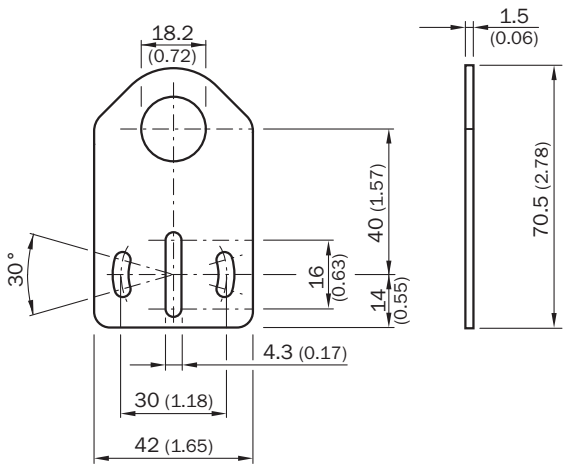
[1] Supplied with KT1M.

BEF-WN-MH15-1



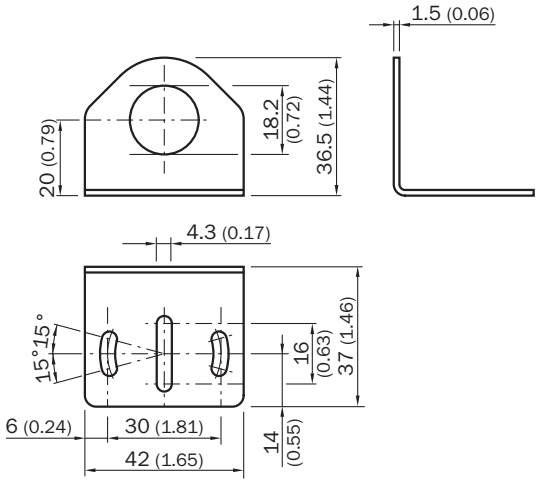
All dimensions in mm (inch)

BEF-WG-M18



All dimensions in mm (inch)

BEF-WN-M18



All dimensions in mm (inch)

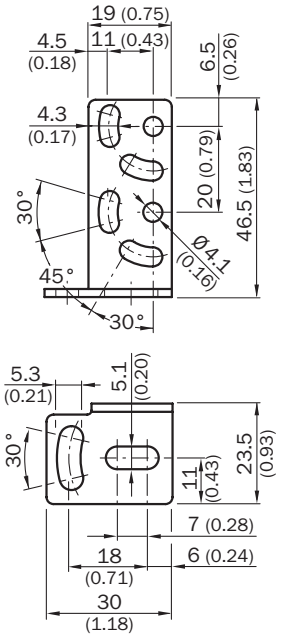
KT1M

➜ B-12

G

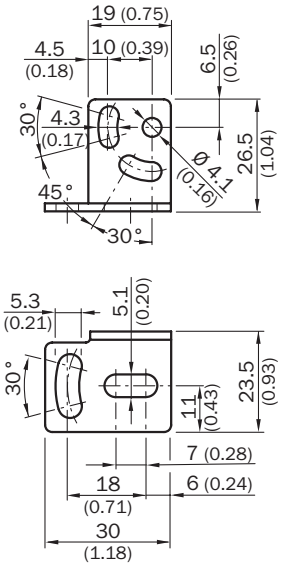
Mounting system type	Material	Model name	Part no.
Mounting bracket	Stainless steel (1.4301)	BEF-WG-W12	2013942
		BEF-WK-W12	2012938

BEF-WG-W12



All dimensions in mm (inch)

BEF-WK-W12



All dimensions in mm (inch)

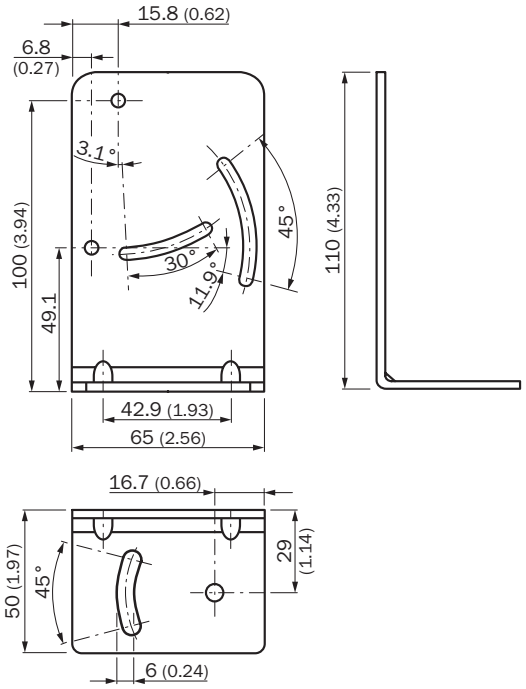
KT2

➜ B-18

G

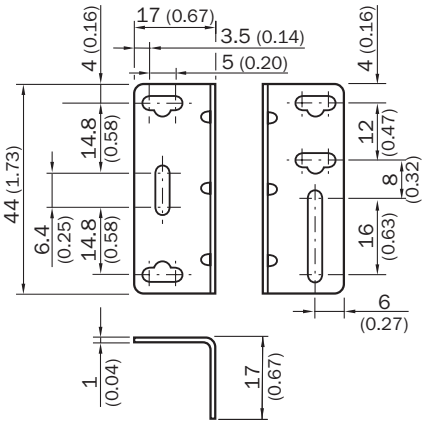
Mounting system type	Material	Model name	Part no.
Mounting bracket	Stainless steel (1.4301)	BEF-WN-DT20	4043524
	Steel, zinc coated	BEF-WN-W9-2	2022855

BEF-WN-DT20



All dimensions in mm (inch)

BEF-WN-W9-2



All dimensions in mm (inch)

Ax20

➜ F-6

KT3

➜ B-24 ... B-35

CSM1

➜ C-8

LUT2-2

➜ D-16

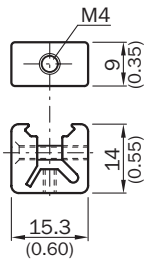
G

Terminal and alignment brackets

Mounting system type	Description	Material	Model name	Part no.
Clamps	Clamp for dovetail mounting	Steel, zinc coated	BEF-KH-W12	2013285 [1]
Universal bar clamps	Plate D for universal bar clamp	Steel, zinc coated	BEF-KHS-D01	2022461
	Plate L for universal bar clamp	Steel, zinc coated	BEF-KHS-L01	2023057

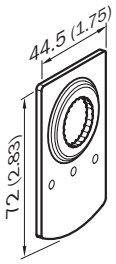
[1] Supplied with KT2.

BEF-KH-W12



All dimensions in mm (inch)

BEF-KHS-D01

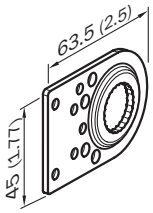


All dimensions in mm (inch)

KT2

➜ B-18

BEF-KHS-L01



All dimensions in mm (inch)

KT3

➜ B-24 ... B-35

CSM1

➜ C-8

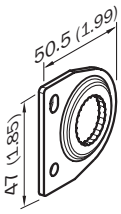
LUT2-2

➜ D-16

G

Mounting system type	Description	Material	Model name	Part no.
Universal bar clamps	Plate G for universal bar clamp	Steel, zinc coated	BEF-KHS-G01	2022464
	Plate K for universal bar clamp	Steel, zinc coated	BEF-KHS-K01	2022718

BEF-KHS-G01



All dimensions in mm (inch)

KT5-2

➜ B-36 ... B-67

KT8

➜ B-74 ... B-85

KT10-2

➜ B-86

CS8

➜ C-14

LUT3-6

➜ D-22

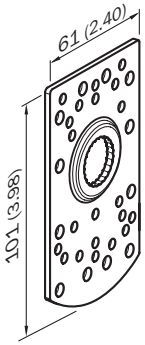
LUT8

➜ D-28

LUT9

➜ D-34

BEF-KHS-K01



All dimensions in mm (inch)

KT2

➜ B-18

KT5-2

➜ B-36 ... B-67

KT6-2

➜ B-68

KT8

➜ B-74 ... B-85

KT10-2

➜ B-86

CS8

➜ C-14

LUT3-6

➜ D-22

LUT8

➜ D-28

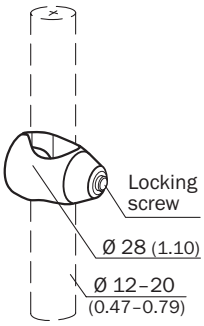
LUT9

➜ D-34

G

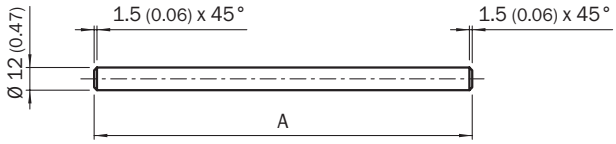
Mounting system type	Description	Material	Model name	Part no.
Universal bar clamp	Universal bar clamp	Die-cast zinc	BEF-KHS-KH1	2022726
	Mounting rod straight	Steel, zinc coated	BEF-MS12G-A	4056054
			BEF-MS12G-B	4056055
	Mounting rod L-shaped	Steel, zinc coated	BEF-MS12L-A	4056052
			BEF-MS12L-B	4056053

BEF-KHS-KH1



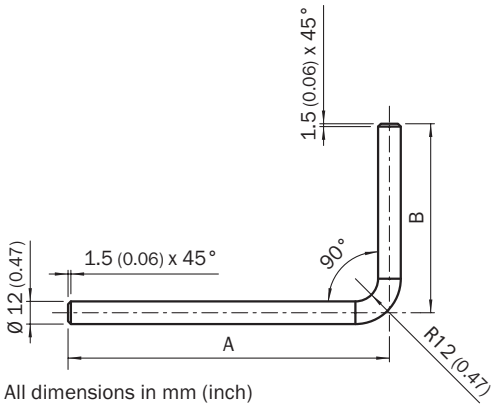
All dimensions in mm (inch)

BEF-MS12G-A (size A = 200 mm)
BEF-MS12G-B (size A = 300 mm)



All dimensions in mm (inch)

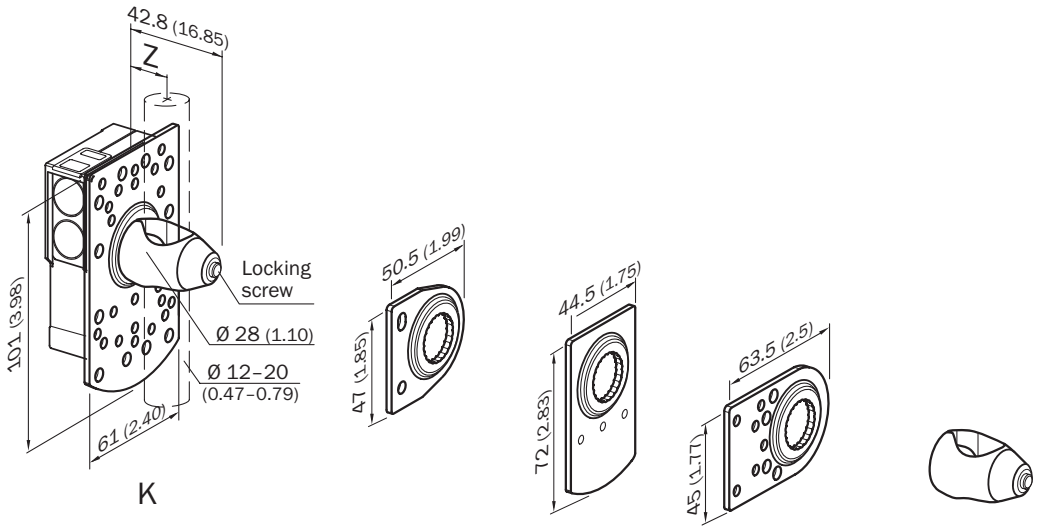
BEF-MS12L-A (size A/B = 150 mm)
BEF-MS12L-B (size A/B = 250 mm)



All dimensions in mm (inch)

G

Principle of function - terminal and alignment brackets

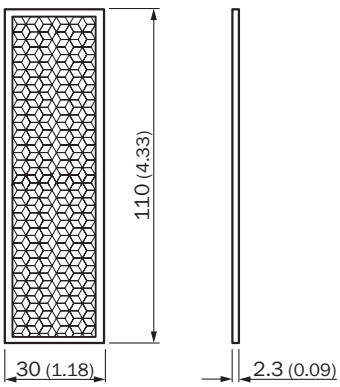


All dimensions in mm (inch)

Reflectors

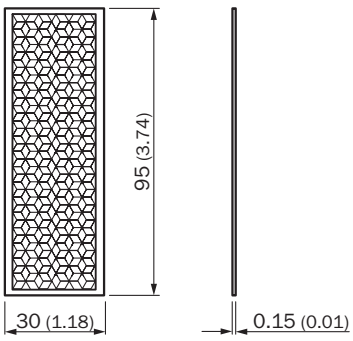
Dimensions (L x W x H)	Model name	Part no.
110 mm x 30 mm x 3 mm	REF-AX001	2049250
95 mm x 30 mm x 0.3 mm	REF-AX002	2049249

REF-AX001



All dimensions in mm (inch)

REF-AX002



All dimensions in mm (inch)

Ax20

→ F-6

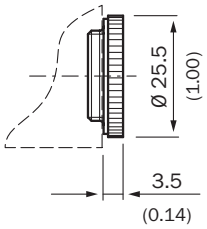
G

Lenses

(only replacement 1:1)

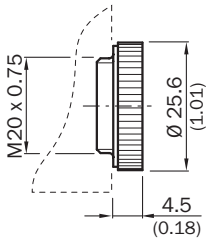
Sensing distance	Model name	Part no.
10 mm	OBJ-211	1004936
20 mm	OBJ-212	1011506
40 mm	OBJ-210	2010945

OBJ-211



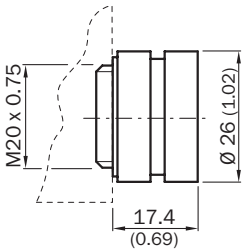
All dimensions in mm (inch)

OBJ-212



All dimensions in mm (inch)

OBJ-210



All dimensions in mm (inch)

KT5-2 Potentiometer

➜ B-36

KT5-2 Teach-in

➜ B-44

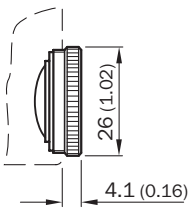
KT5-2 Display

➜ B-54

(also for exchange)

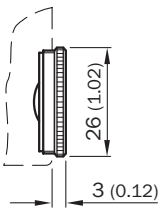
Sensing distance	Model name	Part no.
10 mm	OBJ-LUT3-10	2016348
20 mm	OBJ-LUT3-20	2016349
50 mm	OBJ-LUT3-50	2016350

OBJ-LUT3-10



All dimensions in mm (inch)

OBJ-LUT3-20
OBJ-LUT3-50



All dimensions in mm (inch)

LUT3-6

➜ D-22

LUT8

➜ D-28

LUT9

➜ D-34

G

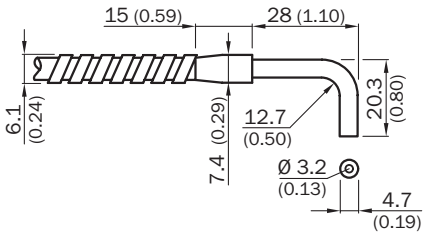
8013816/2011-05-30
Subject to change without notice

Fiber-optic cables

Core material	Length, fiber-optic cable	Min. bend radius, fiber-optic cable	System	Max. sensing distance	Model name [1]	Part no.
Fiber glass	900 mm	19 mm	Proximity system	9 mm [2]	LBSA32900	7020040
					LBSAA23900	7020103
					LBSAT32900	7020036
					LBSF32900	7020038
					LBSM12900	7020054
					LBSP16900	7020044
					LBSR16900	7020050
					LBSR32900	7020042
					LBSR40900	7020052
					LBST32900	7020046
					LBSTA32900	7020048
				20 mm	OCSL	1016296
			Through-beam system	20 mm	LISA32900	7020039
					LISAA23900	7020102
					LISAT32900	7020035
					LISF32900	7020037
					LISM12900	7020053
					LISP16900	7020043
					LISR16900	7020049
					LISR32900	7020041
					LISR40900	7020051
					LIST32900	7020045
					LISTA32900	7020047

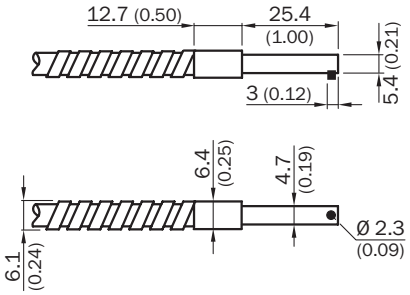
[1] For screwing.
[2] Material to be scanned with 90 % reflectance (DIN5033), Size of material to be scanned = light spot diameter (acceptance angle approx. 60°).

LBSA32900
LISA32900



All dimensions in mm (inch)

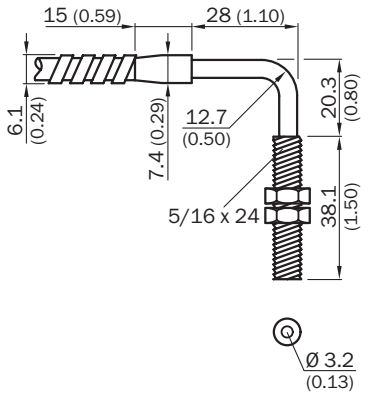
LBSAA23900
LISAA23900



All dimensions in mm (inch)

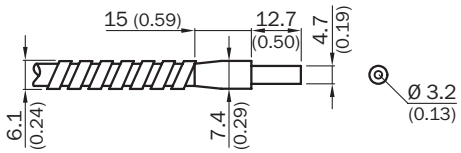
G

LBSAT32900
LISAT32900



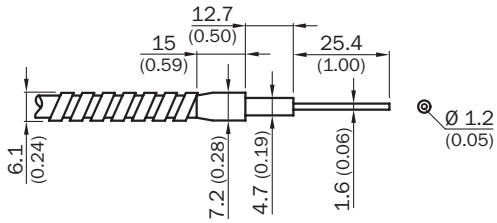
All dimensions in mm (inch)

LBSF32900
LISF32900



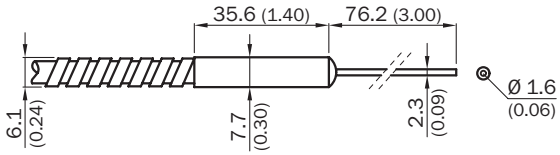
All dimensions in mm (inch)

LBSM12900
LISM12900



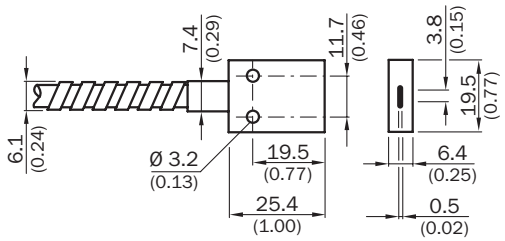
All dimensions in mm (inch)

LBSP16900
LISP16900



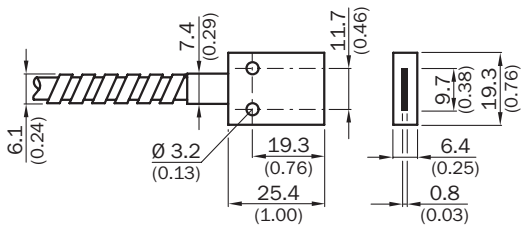
All dimensions in mm (inch)

LBSR16900
LISR16900



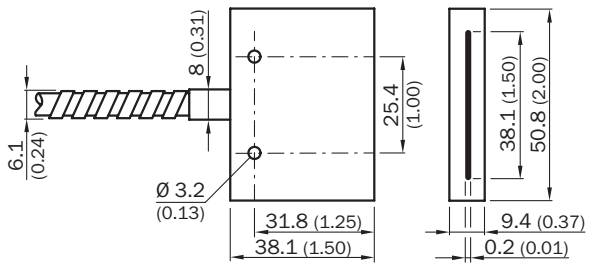
All dimensions in mm (inch)

LBSR32900
LISR32900



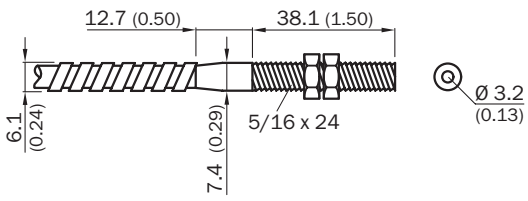
All dimensions in mm (inch)

LBSR40900
LISR40900



All dimensions in mm (inch)

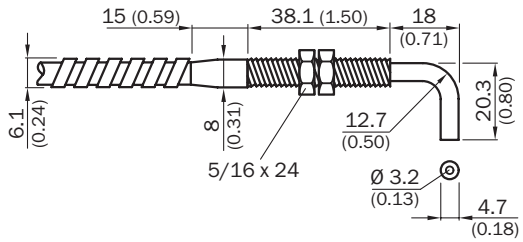
LBST32900
LIST32900



All dimensions in mm (inch)

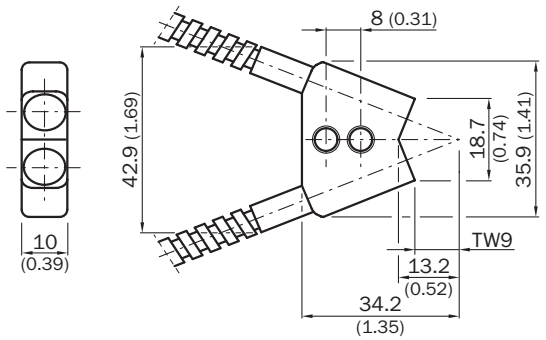
G

LBSTA32900
LISTA32900



All dimensions in mm (inch)

OCSL



All dimensions in mm (inch)

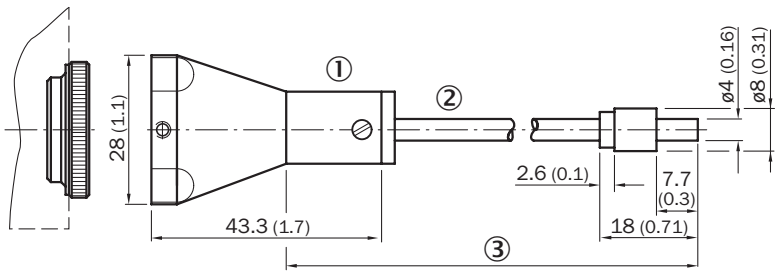
KTL5-2
Fiber Optic

➜ B-60

Description	Length, fiber-optic cable	Min. bend radius, fiber-optic cable	Model name [1]	Part no.
Liquid fiber-optic	1,000 mm	40 mm	LLUV8-1000	2017099
	500 mm	40 mm	LLUV8-500	2017098

[1] Only to mount with 20 mm lens.

LLUV8-1000
LLUV8-500



All dimensions in mm (inch)

① Adapter
② Fiber-optic cable LLVS8, min. bend radius R_{min} = 40 mm
③ Length, fiber-optic cable

LUT8

➜ D-28

LUT9

➜ D-34

G

Others

Description	Model name	Part no.
Crayon, red fluorescence	LUM-FT	1004460
Writing chalk, red fluorescence	LUM-KLK	1002959
–	Luminescence reference German/English	8008840

LUTx

➜ D-8 ... D-41

Glossary

B

Blanking input (AT)

An input that allows the state of a sensor to be frozen when a voltage is applied. The sensor is then “blanked” and the switching output Q is inactive. This is desirable when the sensor should not detect and switch for specific time periods.

Bus system

A system for transferring data between multiple participating devices over a common cable. It allows high data transmission rates and central control of all sensors. It also allows the exchange of additional information such as process data and diagnostic data. *SICK registration sensors* use the IO-Link and CAN bus systems.

▸ see IO-Link on page H-2 and CAN on page H-1

C

Cable

Cables have different properties depending on the sheathing used:

PUR cable

- Oil-resistant
- Resistant to drying and cracking

PVC cable

- Not suitable for constant use in an oily environment
- Not resistant to ozone or UV light

Due to the danger of breakage, cables must not be moved at temperatures below –5 °C.

CAN

Abbreviation for Controller Area Network; an asynchronous serial bus system. It connects multiple devices with identical access rights, such as sensors and actuators. The data is transferred using identifiers for arbitration. The high interference immunity, real-time transfer capability and low cost of the CAN system have established it as a standard in many safety-relevant areas, e.g., in automobile and automation technology.

CANopen®

A communication protocol based on the CAN bus. It extends the CAN bus with a protocol structure. The KT8 CAN protocol is based on the CANopen® protocol.

CDRH

Abbreviation for Center for Devices and Radiological Health, a regulating authority for laser products in the USA. All products marketed in the USA must conform to these regulations.

Conformity

Awareness and satisfaction of the requirements of all product safety directives for the respective market.

For *SICK registration sensors* there are basically two main laws relating to this:

- EMC Directive 89/336/EEC
- Low Voltage Directive 73/23/EEC

As a manufacturer, SICK declares conformity to these directives by affixing the CE marking to the product.

CE

Within the USA, the national regulations of the OSHA (Occupational Safety and Health Act) and the NEC (National Electrical Code) apply. Testing is performed by the UL (Underwriters Laboratories).

The conditions of approval must be complied with when the sensor is used. Devices with individual approval and an approval number from Underwriters Laboratories bear the letter “L” for “Listed.”

UL LISTED

Alternatively, UL offers a combined certification for the USA and Canada.

c UL us LISTED

Connection example

In the sensor connection example, the conductor colors are abbreviated as follows:

- blk = black
- blu = blue
- brn = brown
- gra = gray
- grn = green
- ora = orange
- pnk = pink
- red = red
- trq = turquoise
- vio = violet
- wht = white
- yel = yellow

The following abbreviations are used for the pin assignments:

- AT = blanking input
- ET = external teach input
- F/C = fine/coarse input
- L+ = power supply
- L/D = light-switching/dark-switching input (light on/dark on)
- M = ground
- NC = not connected
- Q/$\overline{Q}$ = switching output (may also be additionally labeled or numbered)
- Q_A = analog output

D

Drift correction

Automatic adjustment of the switching threshold of a sensor during normal operation.

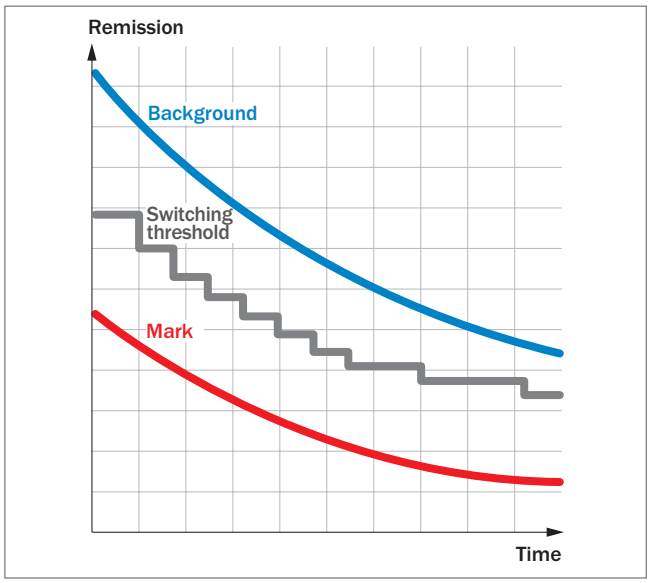


Fig. drift correction

For example, the largest (brightest) measured value over a certain number of switching cycles is searched for. This is then compared with the largest measured value from the teach-in process. If the largest measured value changes, then the switching threshold is adjusted proportionally.

The switching threshold is adjusted step by step as the lens becomes more and more dirty. After cleaning, the switching threshold tracking system adjusts the switching threshold step by step back up to the teach-in value.

E

EMC

"Electromagnetic compatibility" designates a technical device that is not affected by electromagnetic interference.

This is achieved by limiting the sources of interference within the devices and by designing the devices to be resistant to external interference. EMC is regulated by EU guidelines and standards. *SICK sensors* must also conform to especially stringent in-house standards that exceed the minimum legal requirements.

Enclosure rating

Marking indicating the level of protection from foreign objects such as dust or water provided by an enclosure. The designation begins with the letters IP, followed by a code number as an incremental indicator for the level of protection against touching and the intrusion of foreign bodies, followed by a second number indicating the level of protection from water penetration.

▸ see fig. enclosure rating on page H-6

External teach (ET) input

An input that causes the sensor to learn a new switching threshold via an external input signal. This allows the switching threshold to be changed remotely.

F

Function indicator

The state of the switching output of the sensor is indicated by a yellow LED. On some sensors, operational readiness is also signaled by a second LED.

H

Housing material

SICK registration sensors are available with housings in the following materials:

- Aluminum
- Powder-coated die-cast zinc
- Plastic (e.g., ABS)

If the sensor is frequently or constantly exposed to chemicals then it must be subjected to operational testing.

IJ

Insensitivity to ambient light

The ability of a sensor to ignore light interference from other sources such as HF valves, warning lamps or sunlight. The insensitivity to sunlight is defined by the limit value in lux at which an optical sensor is not affected. This is achieved through the use of optical filters, pulsed light and multi-bit analysis.

IO-Link

IO-Link

A communication system used in automation technology developed through the collaboration of leading automation technology manufacturers. This is a point-to-point connection between the control system, sensors and actuators that allows centrally controlled parameter setting and querying of the connected devices.

This communication technology and its features allow machines and systems to be operated much more effectively:

- Reduction of machine downtime and changeover times
- Easy setting of parameters
- Improved process quality through continuous monitoring of process parameters

Jitter

Variation of the switching output over time, caused by the tolerances of electronic components that always exist. This results in variations in the response time of a sensor. The response time can thus vary and may be faster or slower.

▸ see response time on page H-4

L

Laser classifications

Division of lasers and LEDs into device classes, in increasing order of danger to human eyes and skin. The following table shows the classification according to the EN 60825-1 and DIN VDE 0837 standards. The latter is no longer used for new lasers in Germany.

▸ see tab. laser classifications on page H-3

LED classification

IEC 62471: “Safety for lamps and lamp systems,” used for LED devices since 2006.

Light/dark switching

A sensor setting allowing the output logic to be inverted. The designation of light or dark switching relates to the point of view of the receiver element. When set to “light switching” the switching output (Q) is activated as when the receiver element receives more light than the set threshold value. When set to “dark switching,” the switching output (Q) is activated when the receiver element receives less light than the set threshold value.

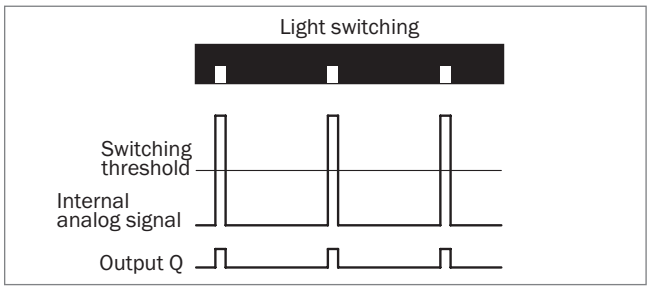


Fig. light switching

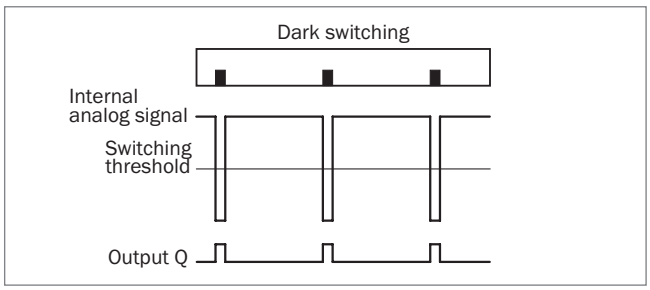


Fig. dark switching

Light spot direction

A sensor exhibits optimum switching behavior when the light spot intrudes parallel to the mark.

Depending on the type of sensor, the light spot is emitted vertically or horizontally to the narrow side from the sensor housing. Some contrast sensors are available with vertical or horizontal emission openings as desired.

Danger class	Class 1	Class 1M	Class 2	Class 2M	Class 3R	Class 3B	Class 4
Description	• Not dangerous, eye-safe	• Eye-safe when not used with optical concentration instruments	• Not dangerous under short-term irradiation, eye-safe due to the blink reflex	• In the visual spectrum under short-term irradiation up to 0.25 s, not dangerous in the same manner as Class 2 • Blink reflex, depending on whether this relates to a divergent or spread beam, may be unsafe when used with optical instruments	• Irradiation is a maximum of five times higher than the values for Class 1 (or Class 2) • The risk is somewhat lower than with Class 3 B	• Dangerous to the eyes and, in special cases, also for the skin	• Very dangerous to the eyes and dangerous for the skin
Safety measures							
Protective housing		Aim for class 1					
Safety locks					Prevent the removal of covers		
Key-operated switch						Authorized personnel	
Control elements					As far as possible away from the beam, use adjustment indicators		
Permanently installed					Limit irradiation (scatter irradiation)		
Laser protective officer					Order in writing		
Laser protective goggles		When observing the direct beam			Always required Adjust the room brightness accordingly		
Access restrictions					Warning notices, limit times		
Instruction		Required					

Tab. laser classifications

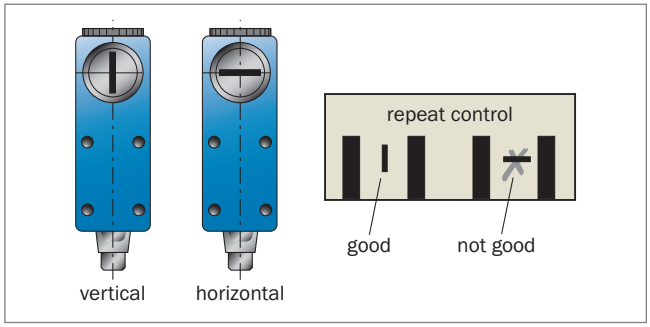


Fig. light spot direction

Luminescence calibration chart

A scale in the form of a printed card marked with a range of luminescence intensities (10 % to 200 %). This allows the readability of the sensors to be checked for varying signal strengths in order to determine the intensity of the luminescent marking required for a particular application so that the objects are correctly scanned. The pigments used in the luminescence markings are permanently stable so that they can be used as long-term reference.

N

No false triggering on power-up

A function that only enables the switching output of a sensor after a self-test has been successfully performed when the sensor is switched on. This ensures a defined start-up state and avoids undesired switching.

O

OFF delay (release delay)

Artificial impulse extension of the switching signal.

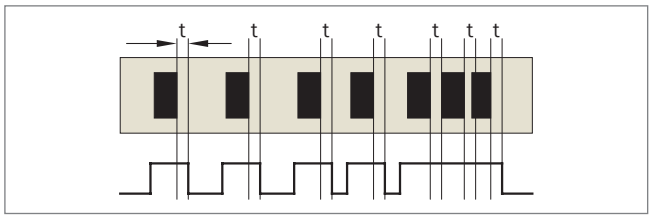


Fig. OFF delay

P

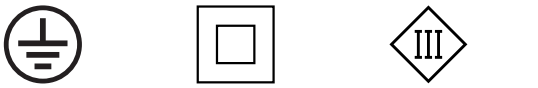
Plug connection

A connection for exchanging electrical and optical signals. *SICK registration sensors* have M8 or M12 round metric plugs with screwed connectors.

Protection class

Electrical devices are divided into different classes based on the safety measures

provided to prevent electric shock. The protection classes are defined in the DIN EN 61140 standard. There are four protection classes ranging from “Basic insulation” (Class 0) to “Safety extra-low voltage, double insulation, safety transformer” (Class 3). *SICK registration sensors* have a protection class of 2 or 3.



Protection class 1 Protection class 2 Protection class 3

R

Repeat accuracy

The difference in measured values for a number of measurements under identical conditions.

Reproducibility

▸ see repeat accuracy on page H-4

Residual ripple

An AC voltage component superimposed on the DC operating voltage. This remains after rectification and smoothing of alternating current. For reliable sensor operation the residual ripple in the power supply must not exceed a specified value (e.g., 5 V_{PP} for *SICK contrast sensors*).

Response time

The time delay between the occurrence of an event (defined threshold value exceeded) and the switching of the sensor (switching). An event is (e.g.,) the entry of a print mark into the light spot of a sensor.

The contrast marks move toward the light spot generated by the sender and typically generate an edge path in the received signal (see illustration) when they pass through the light spot. The positioning accuracy of detection of the edge signal depends on the cycle time t_c.

Depending on the time sequence of the transmitter pulse, the detection of the edge can vary (jitter) by about one period (cycle time).

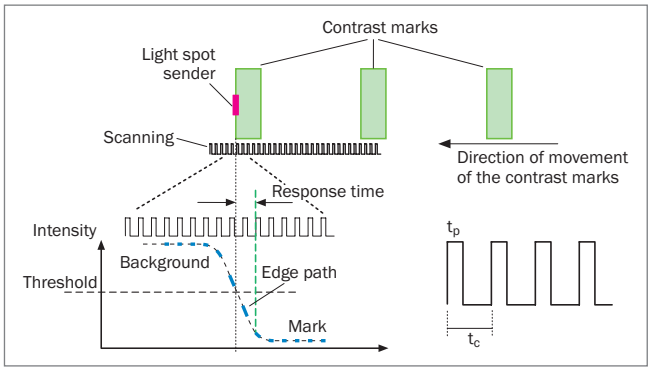


Fig. response time: t_p = sensor switch-on period; t_c = sensor cycle time

S

Sensing distance

Distance between the front edge of the lens (last optical surface of the sensor) and the surface of the object to be detected.

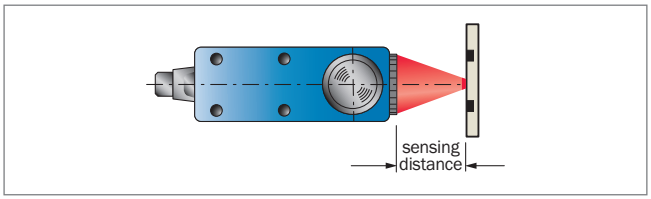


Fig. sensing distance

Sensing distance tolerance

Sensing distance operating range within which the sensor reliably functions. The size of the operating range depends on the clarity of the feature to be detected.

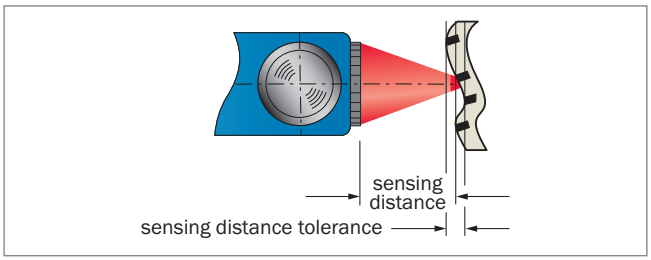


Fig. sensing distance tolerance

Shiny surfaces

Increased reliability of detection on shiny surfaces can be achieved by angling the sensor by about 15° from the vertical. This reflects the shiny component of the reflected light away from the sensor and the sensor then only detects the diffuse reflected light.

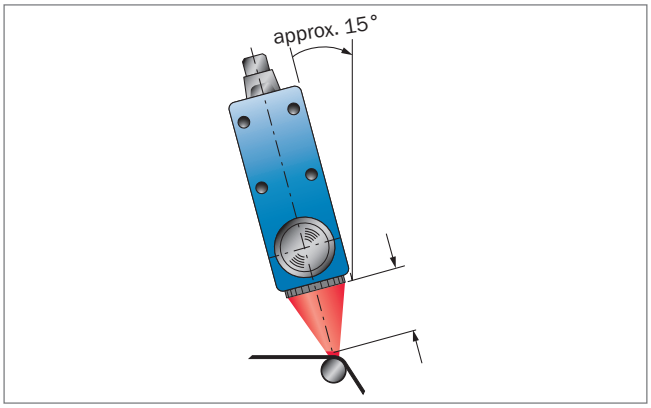


Fig. shiny surfaces

Storage banks

Sensor storage used for storing a number of different configurations (e.g., for different objects to be sensed) that can be accessed during normal operation.

Switching frequency

A frequency value in Hertz [Hz] defining the switching rate that the sensor is capable of.

The higher the switching frequency the more intervals are available for switching within a specific period of time. The response time and jitter are also reduced at higher switching frequencies.

Switching output (Q)

An output (cable) providing a digital indication of the output state of the sensor.

SICK registration sensors are available with NPN and PNP switching types.

T

Teach-in

The process by which the sensor electronics are trained to recognize the features of an object to be detected. To do this, the object is placed in the sensor light path and its characteristic reflectivity is measured by the receiver. The learning process for determining the switching threshold is then started by pressing a button on the device or via an external control cable.

Various different teach-in processes provide easy setup of switching thresholds. This greatly accelerates commissioning and adjustment of the sensor.

▸ see teach-in method on page H-5

Teach-in method

A sensor can be setup via teach-in using a number of difference method:

- Single-point teach-in
- Two-point teach-in
- Dynamic teach-in

The method to be used for each particular type of sensor is explained in detail in the respective chapters and operating instructions.

W

Wave length

SICK registration sensors use wave lengths in the electromagnetic spectrum ranging from 370 nm (UV light, luminescence sensors) through 650 nm (red light, contrast and color sensors) to 1,000 nm (infrared light, fork sensors).

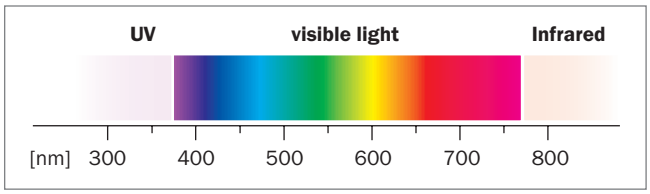


Fig. wave length

Z

Time delay

▸ see response time on page H-4

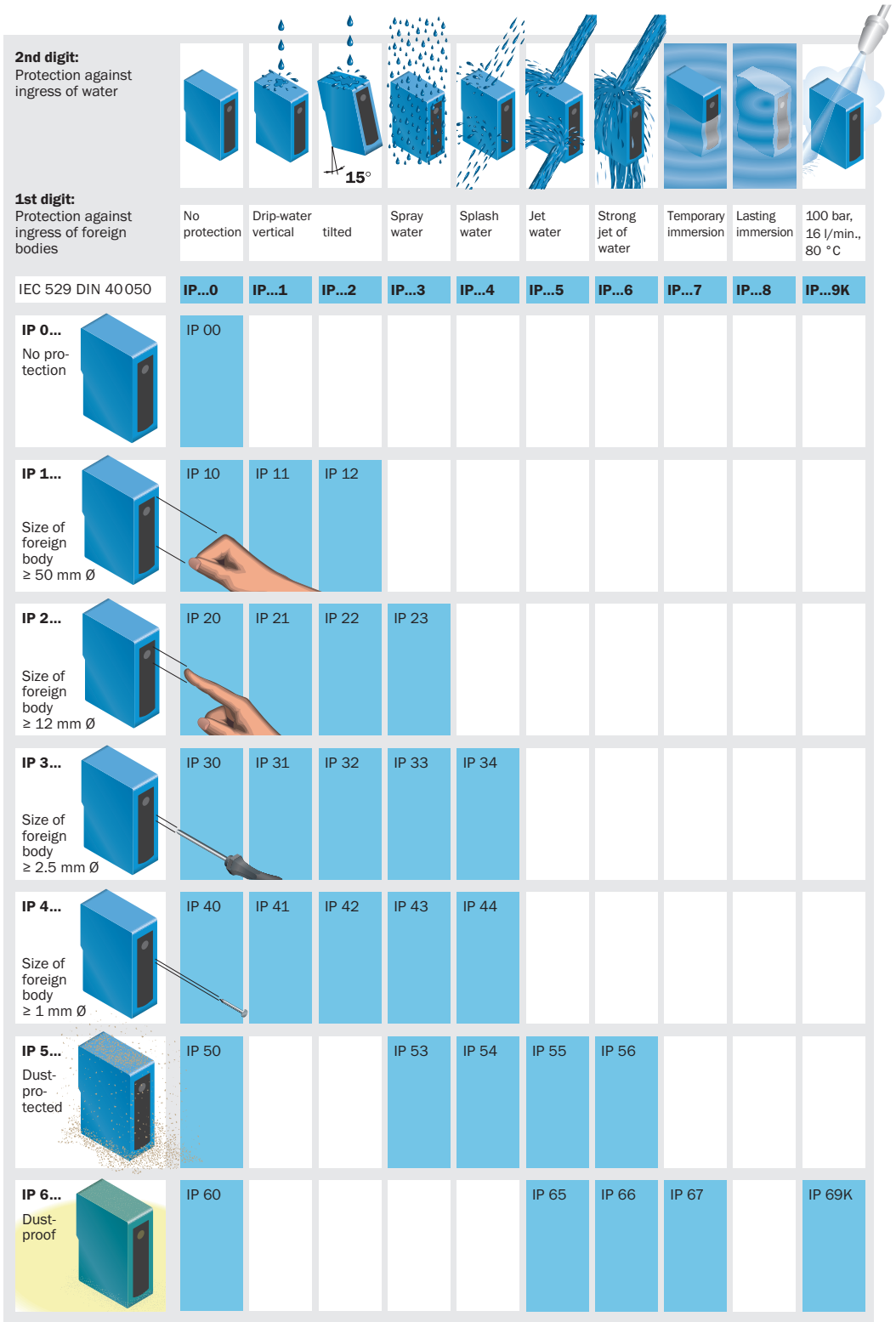


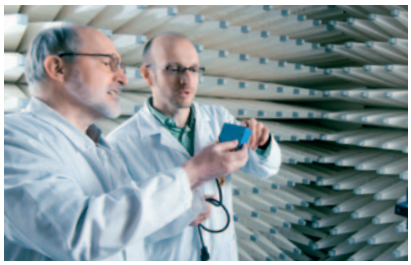
Fig. enclosure rating

Notes

Notes

8013816/2011-05-10 · SF (2011-05) · WB USmod int36a

SICK at a glance



Leading technologies

With a staff of more than 5,000 and over 50 subsidiaries and representations worldwide, SICK is one of the leading and most successful manufacturers of sensor technology. The power of innovation and solution competency have made SICK the global market leader. No matter what the project and industry may be, talking with an expert from SICK will provide you with an ideal basis for your plans – there is no need to settle for anything less than the best.

Unique product range

- Non-contact detecting, counting, classifying and positioning of any type of object
- Accident and operator protection with sensors, safety software and services
- Automatic identification with bar code and RFID readers
- Laser measurement technology for detecting the volume, position and contour of people and objects
- Complete system solutions for analysis and flow measurement of gases and liquids

Comprehensive services

- SICK LifeTime Services – for safety and productivity
- Application centers in Europe, Asia and North America for the development of system solutions under real-world conditions
- E-Business Partner Portal www.mysick.com – price and availability of products, requests for quotation and online orders

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