General

Contrast scanners are integral components of many automated production processes today, for example, in the packaging and printing industries. They are used to detect all kinds of contrasts, e.g., print marks on films or packaging materials. Of course, they can be used in all situations where contrasts have to be detected quickly and accurately. The difference in brightness between mark and background is decisive for reliable detection of contrasts.

The contrast scanners from SICK operate according to the reflectance principle and even detect weak gray value differences on matt, shiny and transparent surfaces. A large selection of equipment types is available with various procedures for detecting contrasts and with different user interfaces for multifaceted requirements.

Applications

Almost all goods and products can be counted, sorted and controlled when they have contrast marks. Typical examples included:

- Controlling packaging processes
- Printing, folding, cutting continuous formats and putting them into envelopes
- Positioning EDP forms
- Horizontal cutting control
- Positioning labels
- Positioning cans and tubes
- Checking counters
- Checking expiry dates
- Detecting codes

Selection/Overview

KT10-2: For flexible applications in the packaging and printing industries. High speeds with greatest precision and automatic drift correction

KT8CAN: CAN bus, unlimited communication through integration into the machine control

The KT5 series offers a large number of options individually suited to your application, ranging from different scanning distances, light spot positions and Teach-in to the elegant display version. 3-colour technology (RGB diode) enables resolution of all contrasts.

KT5*display:* Quality display for assessing detection reliability

KT5W...6: RGB diode with static 2-point Teach-in

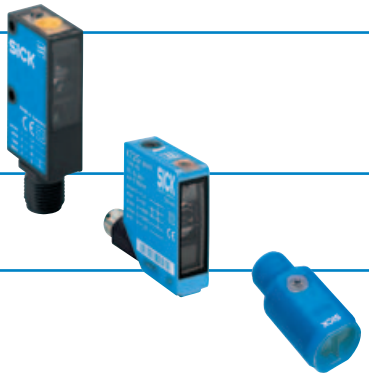
KT5W...3: RGB diode with dynamic Teach-in for learning the mark “on the fly”

KT5RG...6: The sensor for standard applications

KT5G...1: Contrast scanner with potentiometer adjustment and optional analogue output

KT5L-Laser: For precise detection of smallest objects at long scanning distances

KT5 fibre-optic cables: Used for harsh environmental conditions and where space is limited



KT3W: Small build – great contrast detection

KT3L laser: The problem solver – safely detecting smallest marks and objects

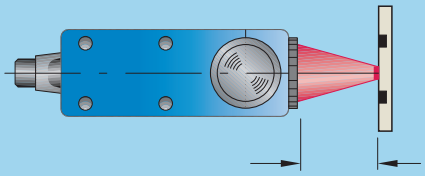
KT2: Fast and easy adjustment, robust metal housing

KT1M: Cylindrical contrast scanner, for simple applications

Definition

Scanning distance

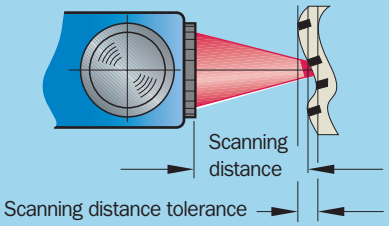
Distance between lens front edge and material to be scanned.



▲ **Scanning distance**

Scanning distance tolerance

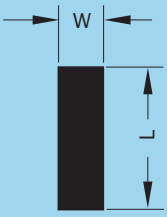
Operating range for the scanning distance in which a change of distance does not result in faulty switching. The size of the operating range depends on the size of the contrast to be resolved.



▲ **Scanning distance tolerance**

Light spot dimensions

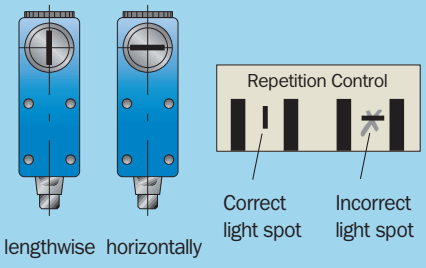
Size of light spot at scanning distance. The light spot size is decisive for switching accuracy and for reliability of reading the printed image.



▲ **Light spot dimensions**

Light spot position

The light spot position vertical or horizontal to the short side of the equipment determines the insertion position. The best switching behavior is achieved when the light spot hits the mark lengthwise.

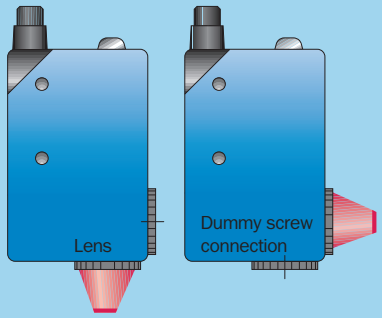


▲ **Light spot position**

Definition

Light emission side*

You can select the light emission side.
The lens can be replaced by a dummy screw connection.

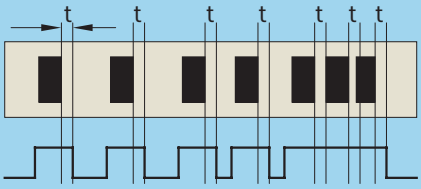


▲ Light emission

*Not with KT 2/KT 3

Release delay

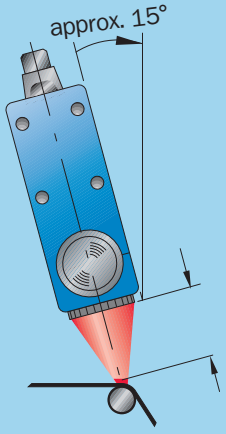
The release delay enables increasing the impulse time of the switching signal. The diagram below shows the mode of operation.



▲ Release delay (PNP, dark-switching)

Shiny surfaces

Increased switching reliability can be achieved on shiny surfaces by an angle of approx. 15° from a vertical line. The shiny components of the reflected light are mirrored away, and the KT only detects diffuse light scattered back.



▲ Mirroring away shiny effects

Mounting

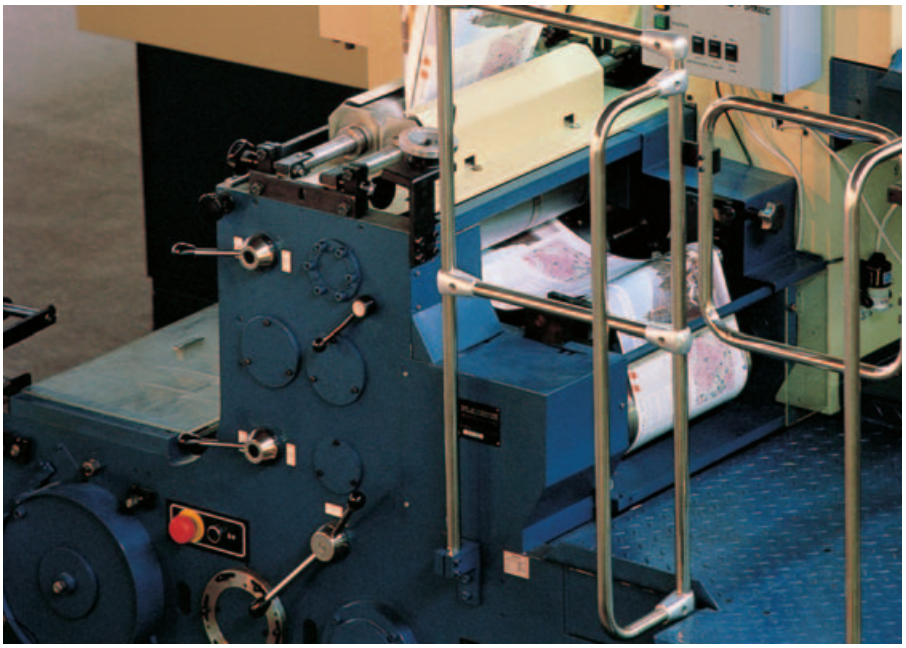
Mounting site

The contrast scanner is mounted at a spot at which the material to be scanned has the least lateral and vertical movements. Compensation is made for lateral movements by correspondingly long marks. The possible contrast resolution decreases with increasing vertical movements.

Attachment

Attachment must permit a reproducible, adjustable scanning distance in accordance with the purpose, i.e., flexible mounting with an adjustment option.

Strong vibrations, which influence the scanning distance, must be excluded.



KT 10-2: for high-speed applications

Very high speeds, poor contrasts and reflective materials put high demands on a sensor. When you need precise positioning, the KT 10-2 is the right choice.

Simple operation is a focus in the 2nd generation of the KT 10. During the teach-in procedure, the sensor selects the emission colour, which fits the existing contrast best. If print marks are to be detected on shiny foils, the sensor is automatically set for them. Thanks to the automatic drift correction, the KT 10-2 adjusts its switching threshold during operation. Consequently, changing environmental conditions cannot influence the performance of the sensor.

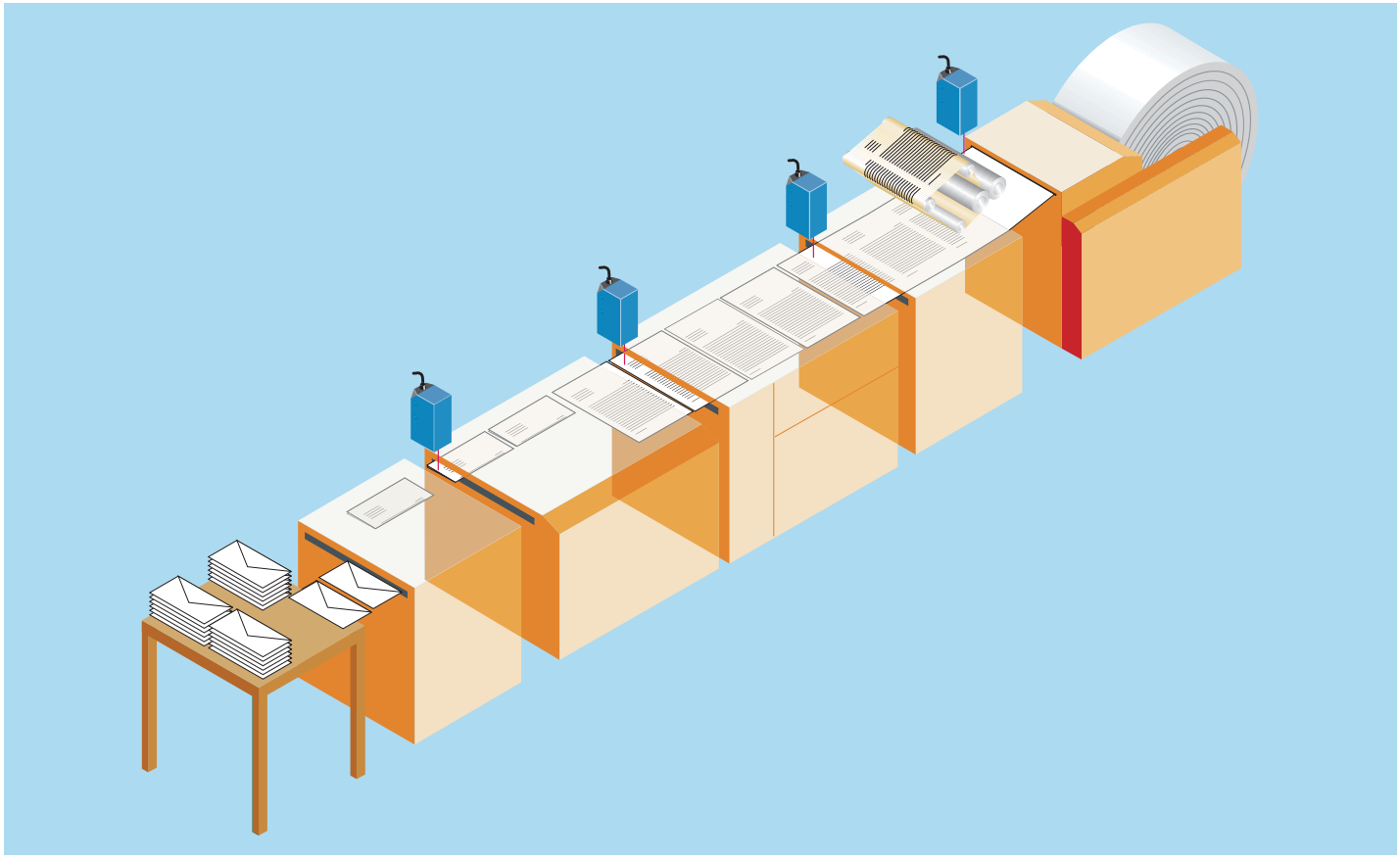
The optional light exits provide flexibility for many installation situations. The robust metal housing ensures long service life.

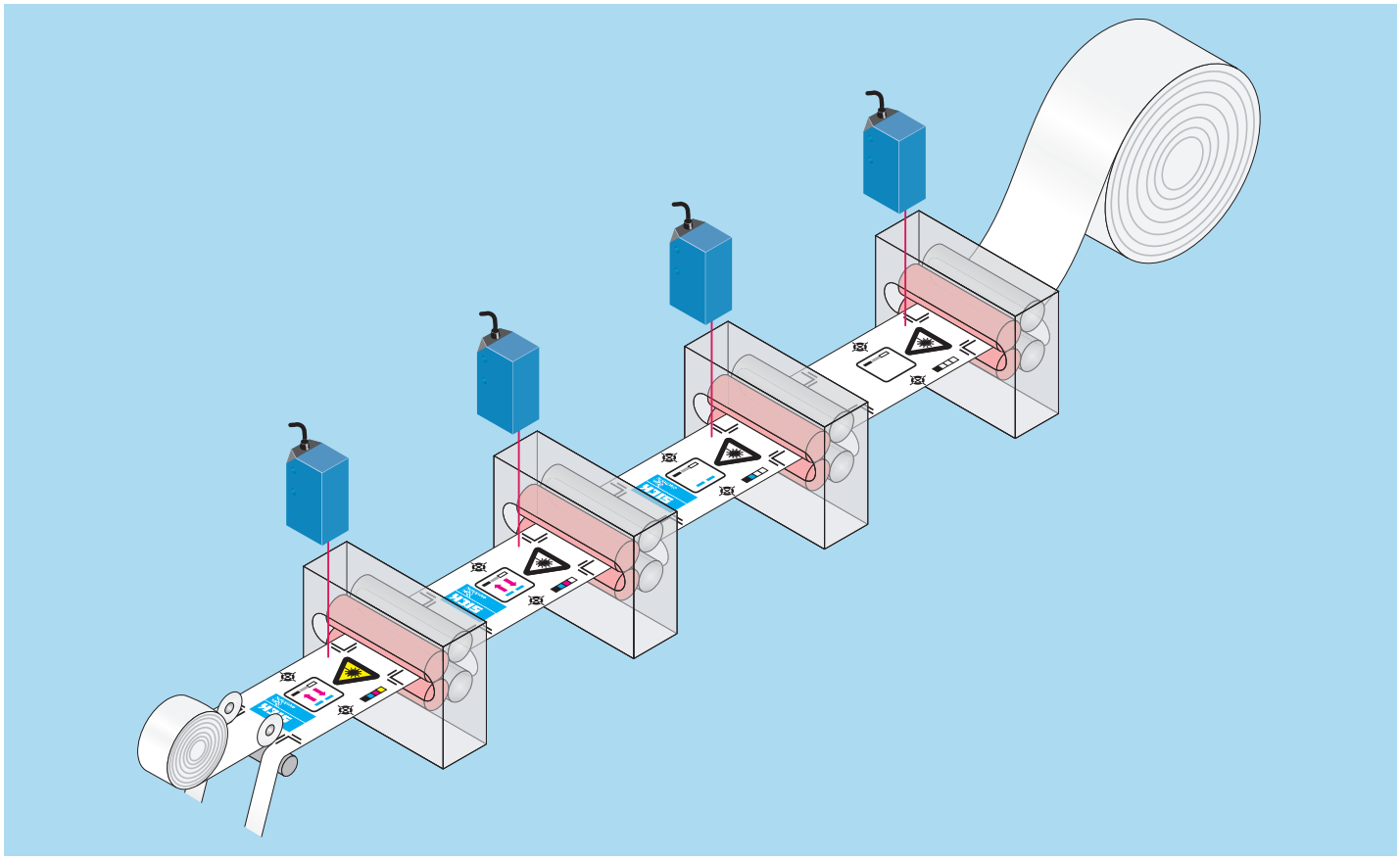
The very short and constant response time of 20 µs is the basis for high speed applications. The precise light spot provide high reproducibility and a high geometric resolution. Consequently, accurate positioning is ensured.

The reliability of detection is displayed on the bar display. If the print quality during production deteriorates, this also can be visualised by the KT 10-2.

In addition, up to five sensor parameters for different contrasts can be stored in the sensor and retrieved when required.

▼ Controlling cutting, folding and inserting into envelopes





▲ Synchronization of a printing process

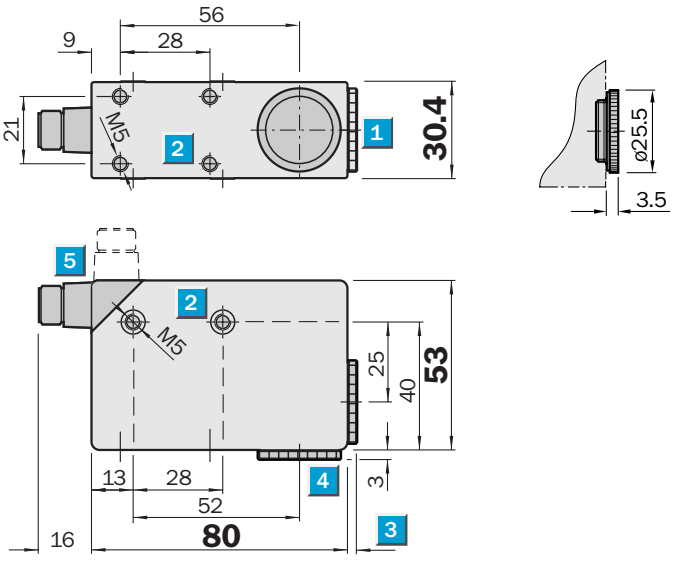
Precise detection of printing, folding and reference marks as well as high processing speed is a matter of course for the contrast scanner, as is the great reproducibility required in printing machines, high performance copiers and in continuous form systems for printing, cutting, folding and inserting letters into envelopes. Of course, the contrast scanner can also be used for other applications, i.e. packaging, which place great demands on contrast detection and speed.

Scanning distance 12.5 mm
Lens (10 mm)

Contrast scanner

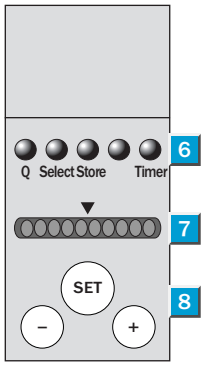
- 20 µs response time (jitter < 10 µs) for fast applications
- Precise light spot for high repeatability
- RGB emission LED (automatic selection)
- 2 light exits (changeable)
- 5 bank memory
- Automatic drift correction

Dimensional drawing



Adjustments possible

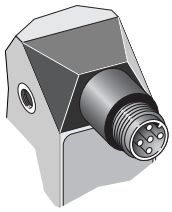
All types



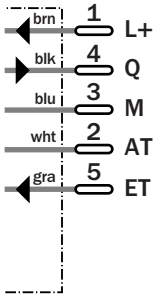
1 Lens (light transmission)
2 M5 mounting holes, 5.5 mm deep
3 See dimensional drawing of lens
4 Blind screw can be replaced by lens
5 5-pin, M12 x 1 plug (rotatable trough 90°)
6 Function signal indicators (yellow)
7 Bar display
8 Teach-in button/„+“ and „–“ button

Connection types

All types



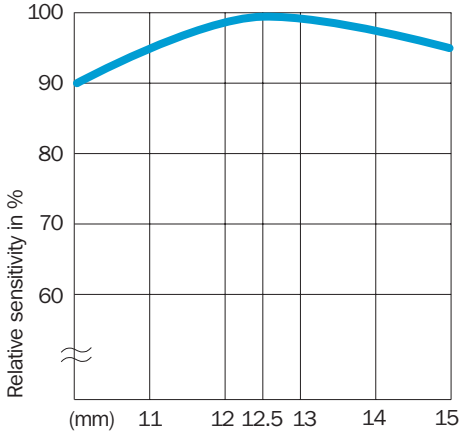
5-pin, M12



Technical data	KT10W-2-	P1115	N1115	P2115	N2115
Scanning distance	from front edge of lens 10 ± 3 mm	■	■	■	■
	from front edge of housing 12.5 ± 3 mm	■	■	■	■
Light source [1]	LED; red, green, blue	■	■	■	■
Wave length (nm)	640, 525, 470	■	■	■	■
Light spot dimensions	4 x 0.8 mm (at 10 mm)	■	■	■	■
Light spot position	Longitudinal	■	■		
	Transverse			■	■
Supply voltage V_S	10 ... 30 V DC [2]	■	■	■	■
Residual ripple [3]	< 5 V	■	■	■	■
Current consumption [4]	< 80 mA	■	■	■	■
Switching outputs	PNP: HIGH = V_S – < 2 V / LOW = 0 V	■		■	
	NPN: HIGH = V_S / LOW = < 2 V		■		■
Output current I_A max.	< 100 mA	■	■	■	■
Output logic	Light/dark via teach-in procedure (default)	■	■	■	■
(Adjustable)	Light switching; dark switching	■	■	■	■
Switching frequency max. [5]	25000/s	■	■	■	■
Response time [6]	20 µs	■	■	■	■
Jitter	< 10 µs	■	■	■	■
Teach-in input ET	PNP: Teach > 10 V ... < V_S	■		■	
ET > 2 ms	Run 0 V or unswitched	■		■	
	NPN: Teach 0 V		■		■
	Run V_S or unswitched		■		■
Teach-in procedure	Dynamic teach-in (default)	■	■	■	■
(Adjustable)	2-point-teach-in	■	■	■	■
Timer deactivation delay	None (default)	■	■	■	■
(Adjustable)	20 ms	■	■	■	■
Blanking input AT		■	■	■	■
Blanked	PNP: AT > 10 V	■		■	
Free running	AT > 2 V or unswitched	■		■	
Blanked	NPN: AT < 2 V		■		■
Free running	AT > 10 V or unswitched		■		■
Retention time	25 ms non-volatile memory	■	■	■	■
Connection type	M12 plug, 5-pin	■	■	■	■
VDE protection class [7]	⧈	■	■	■	■
Circuit protection [8]	A, B, C, D	■	■	■	■
Enclosure rating	IP 67	■	■	■	■
Ambient temperature T_A	Operation –10 ... +55 °C	■	■	■	■
	Storage –25 ... +75 °C	■	■	■	■
Shock load	To IEC 68	■	■	■	■
Weight	Approx. 400 g	■	■	■	■
Housing material	Cast-zinc	■	■	■	■

[1] Average service life 100,000 h at T_A = +25 °C
[2] Limit values
[3] May not exceed or fall short of V_S tolerances
[4] Without load
[5] Signal transit time with resistive load
[6] With light/dark ratio 1:1 and deactivated automatic drift correction
[7] Reference voltage 50 V DC
[8] A = V_S connections reverse-polarity protected
B = Outputs Q and Q short-circuit protected
C = Interference pulse suppression
D = Outputs overcurrent and short-circuit protected

Scanning distance



Order information

Type	Order no.
KT10W-2P1115	1 028 232
KT10W-2N1115	1 028 233
KT10W-2P2115	1 029 070
KT10W-2N2115	1 029 071

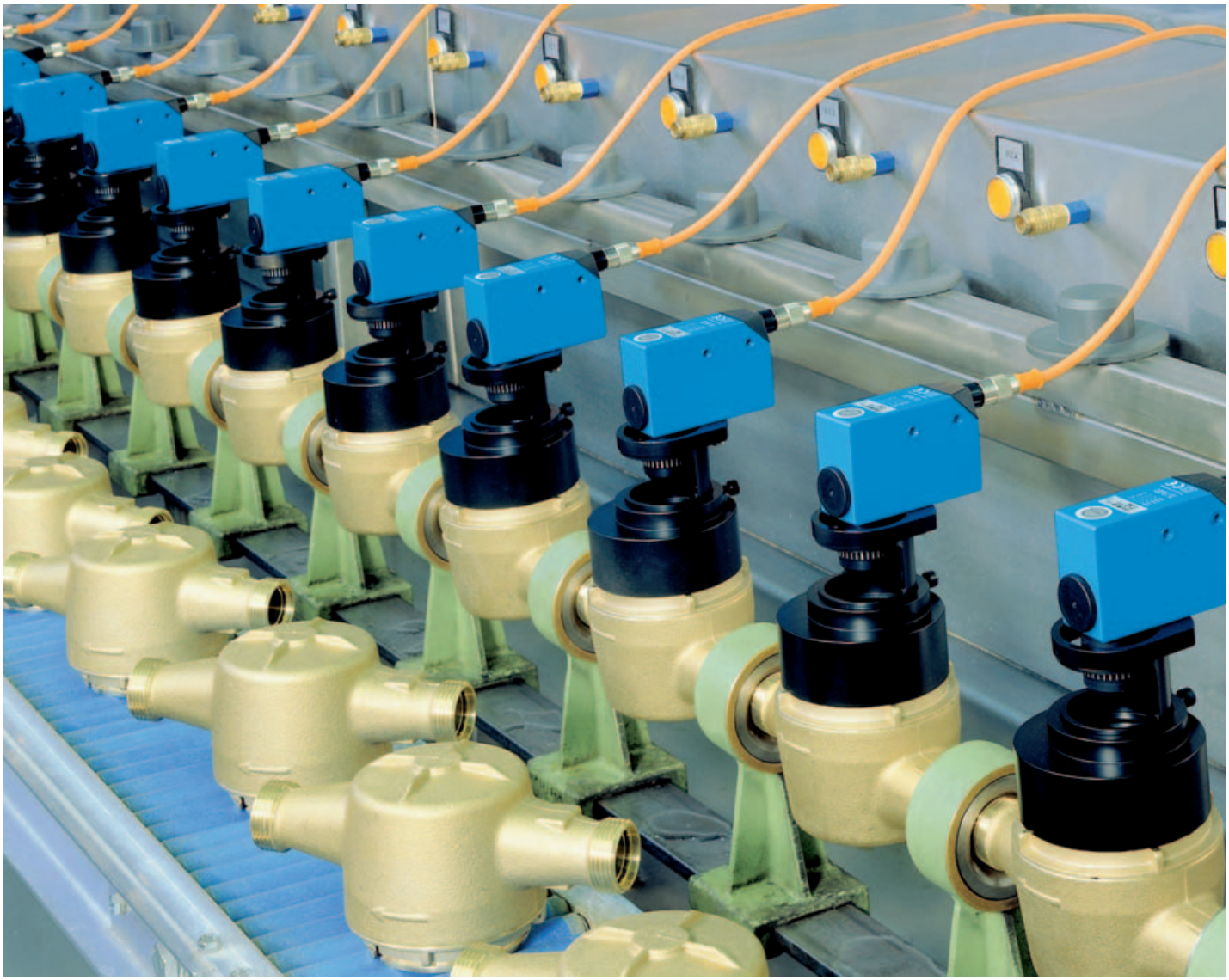
KT8 CAN: communication without limits

The KT8 CAN is distinguished by its ability to communicate. This makes it possible for users to adapt the sensor specifically to their requirements and integrate additional functions conveniently into their machines.

Almost any number of parameter records, i.e. taught-in sensor settings (e.g. for different packaging or printed materials), can be stored via the CAN interface. If required, these parameters are transmitted to the sensor. At the same time, this procedure simplifies the validation process in accordance with “CFR21 part 11” (e.g. in the pharmaceutical industry). The sensor setting is stored as a reproducible parameter record directly in the automation system of the machine. Therefore, there is no longer need to maintain the settings in written form. In addition, important process data such as contamination level or the current switching threshold can also be accessed via modem or internet.

The advantage: Setup times are reduced, critical sensor settings are detected at an early stage and preventative measures become possible. As a result, malfunctions can be corrected quickly and efficiently in emergencies.

Three colour LED, gloss adjustment, automatic drift correction and short response time round off this product.



▲ KT contrast scanner in water meter manufacture

Easy parameter management through integration into CAN network

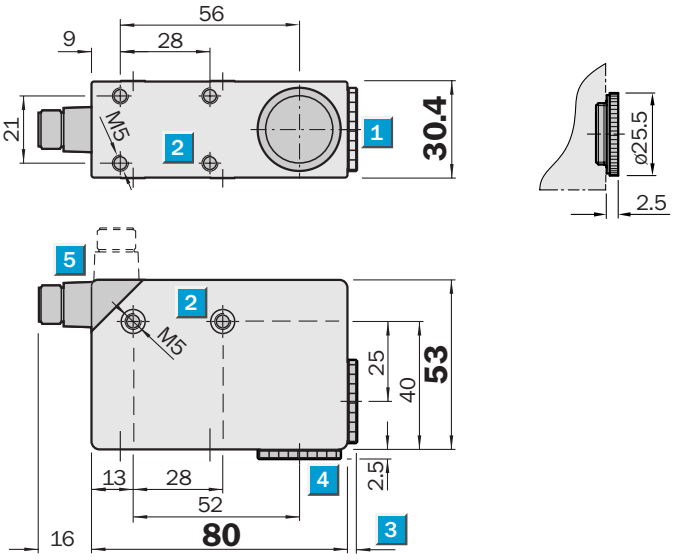
Scanning distance 10 mm (housing 10 mm)

Contrast scanner

- CAN-interface
  - – Parameter administration
  - – Process documentation
  - – Process adaption
- Automatic drift correction
- Short response time
- Precise light spot
- Red, green, blue emission LED
- 2 light exits (changeable)

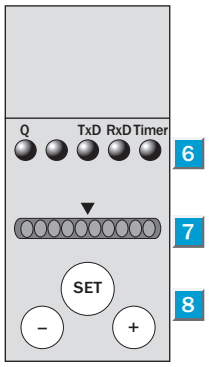
Dimensional drawing

All types



Adjustments possible

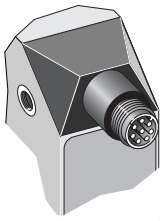
All types



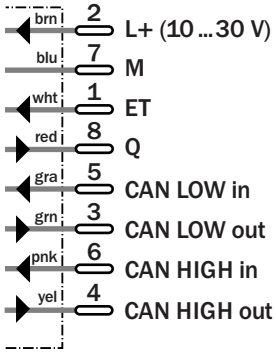
1 Lens (light transmission), can be exchanged for pos. 3
2 M5 mounting holes, 5.5 mm deep
3 See dimensional drawing of lens
4 Blind screw can be replaced by lens 1
5 8-pin, M12 x 1 plug (rotatable through 90°)
6 Functional signal indicators (yellow)
7 Bar display (green)
8 Teach-in button/"+" and "–" button

Connection type

All types



8-pin, M12 x 1

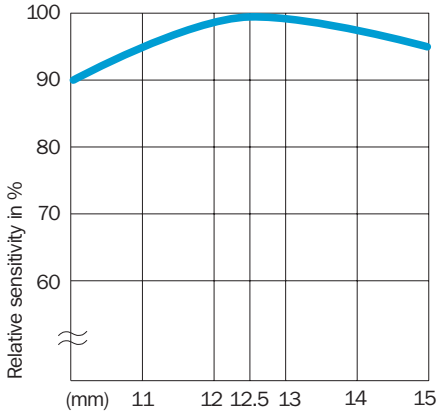


Technical data	KT8W-	P111C	N111C
Scanning distance	10 ± 3 mm		
from front edge of lens			
Scanning distance	12.5 ± 3 mm		
from front edge of housing			
Light source [1]; light type	LED; red, green, blue		
Wave length (nm)	640, 525, 470		
Light spot dimensions	0.8 x 4 mm²		
Light spot position	Longitudinal		
Supply voltage V_S	10 ... 30 V DC [2]		
Residual ripple [3]	< 5 V		
Current consumption [4]	< 120 mA		
Switching outputs	PNP: HIGH = V_S – < 2 V / LOW = 0 V		
	NPN: HIGH = V_S / LOW = < 2 V		
Output current I_A max.	< 100 mA		
Output logic	Light/dark via Teach-in (default)		
Adjustable	Light switching		
	Dark switching		
Switching frequency max.[6]	22500/s		
Response time [5]	22 µs		
Teach-in input ET	PNP: Teach > 10 V ... < V_S		
	Run 0 V or unswitched		
	NPN: Teach 0 V		
	Run V_S or unswitched		
Teach-in procedure	Dynamic-teach-in (default)		
(Adjustable)	2-point-teach-in		
Timer deactivation delay	None (default)		
	10 ms/20 ms/40 ms		
Interface	CAN (with CANopen features)		
Drift correction	manual		
	automatic (default)		
Connection type	M12 plug, 8-pin		
VDE protection class [8]	⧈		
Circuit protection [9]	A, B, C		
Enclosure rating	IP 67		
Ambient temperature T_A	Operation –10 ... +55 °C		
	Storage –25 ... +75 °C		
Shock load	To IEC 68		
Weight	Approx. 400 g		
Housing material	Cast zinc		

1) Average service life 100,000 h at T_A = + 25 °C
2) Limit values
3) May not exceed or fall short of V_S tolerances
4) Without load
5) With resistive load
6) With light/dark ratio 1:1
7) Do not bend below 0 °C
8) Reference voltage 50 V DC
9) A = V_S connections reverse-polarity protected
B = Output short-circuit protected
C = Interference pulse suppression

Note: detailed interface description see www.sick.com

Scanning distance



Order information

Type	Order no.
KT8W-P111C	1 027 919
KT8W-N111C	1 028 223

KT 5: Contrast scanner with intelligent display

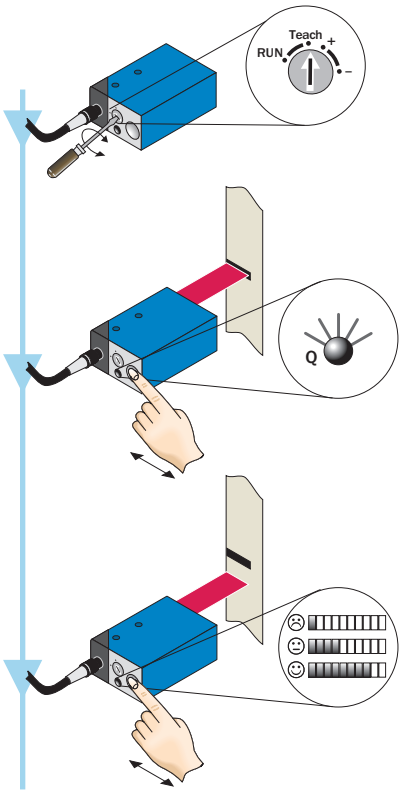
Contrast scanners are used mainly for reading print and registration marks. Here the KT 5 sets new standards in performance and friendlyness. The light bar display provides information about the security of detection. In addition, the user can see the current signal strength and switching threshold. Also, if required the switching threshold may be adjusted manually using the +/– keys. For example, if printing quality changes, the sensor can be adjusted simply “in process”.

Thanks to the three-colour-LED-technology, the optimum emission colour is automatically selected depending on the existing contrast. Futhermore, the precise 2-point-Teach-in procedure is provided, where the gray values of the mark and the background are taught-in. The sensor sets the optimum switching threshold automatically.

A high degree of repeatability is ensured due to the homogenous light spot and the automatic gloss adaptation for shiny materials. The switching frequency of 10,000/s enables an economic operation of the machine. A wide range of sensors with different scanning distances and individual alignment and attachment options cover a wide range of different applications.

Teach-in

Teach-in: setting switching threshold



- After the first Teach-in procedure, the red transmitter light and the status indicator blink and signal that a second Teach-in procedure must be triggered.

- The LED status indicator switches off after the second teach process.
- **Detection reliability:**

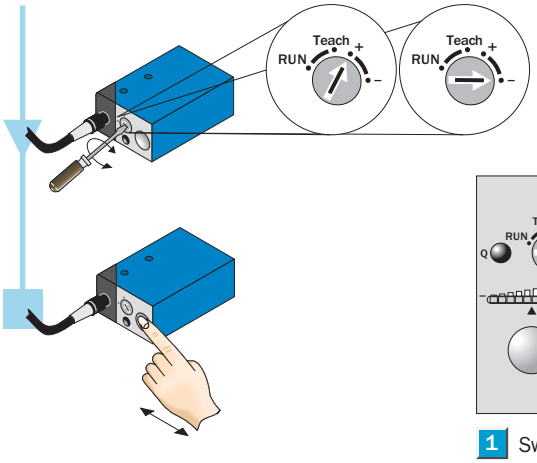
  1 LED on: No reliable operation – minimum contrast difference
  ≤ 4 LEDs on: Capable operation – sufficient contrast difference
  > 4 LEDs on: Reliable operation – high contrast difference

Status

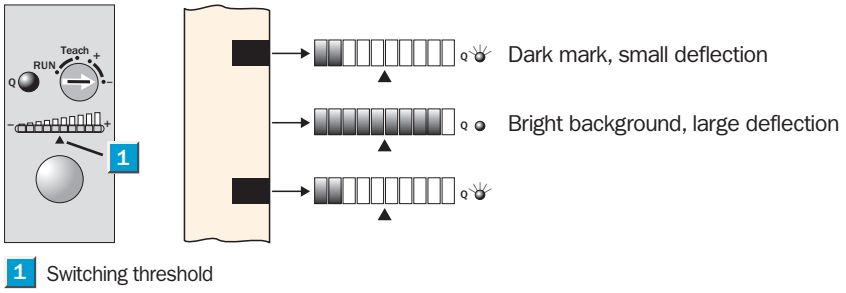
- **Detection reliability:** The bar display signals the quality of the taught-in contrast. The more LEDs light, the more reliable is the detection of the mark.

Manual precise setting

Teach-in: setting switching threshold



- Adjustment of the switching threshold via position +/– and pressing of keys.



1 Switching threshold

Status

- **Switching threshold adjustment:** The bar display visualizes the current level of the material to be scanned, which is on hand.
- The switching threshold is in the middle of the bar display.
- As soon as the switching threshold is exceeded or fallen short of, the switching output changes its state.
- The switching threshold is correspondingly raised or lowered a half LED segment per pressing of the keys.

Notes

- Light-/dark-switching not required: equipment switches for the material to be scanned, which was under the light spot at the first Teach-in procedure (mark or background).
- The material speed must be zero during Teach-in (machine is idle).
- The Teach-in button can be locked against unintentional activation with “Run”.
- A Teach-in procedure can be triggered when the switch setting is not defined.
- The optimum transmission light was selected automatically.
- Teach-in is also possible via control wire.

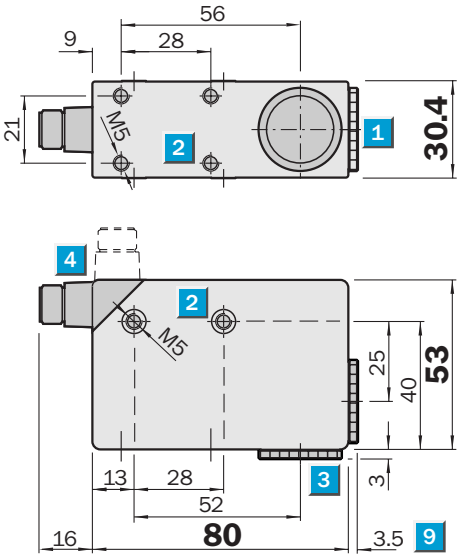
Scanning distance 10/20/40 mm

Contrast scanners

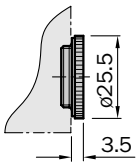
- 10-segment bar display
- Static 2-point Teach-in to mark and background via control cable or control panel on unit
- Detection reliability display
- Subsequent manual adjustment of the switching threshold
- Switching frequency 10,000/s
- Automatic gloss adaptation

Dimensional drawing

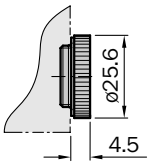
All types



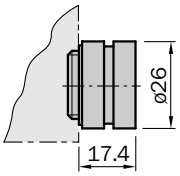
KT 5W-2P 1116D
KT 5W-2P 1126D
KT 5W-2P 2116D
KT 5W-2N 1116D
KT 5W-2N 1126D
KT 5W-2N 2116D



KT 5W-2P 1216D
KT 5W-2N 1216D

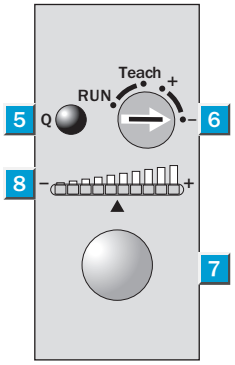


KT 5W-2P 1316D
KT 5W-2N 1316D



Adjustments possible

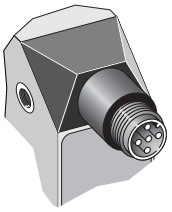
All types



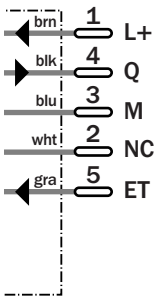
1 Lens (light transmission), can be replaced by item 3
2 M5 mounting holes, 5.5 mm deep
3 Blind screw, can be replaced by item 1
4 5-pin, M12 x 1 plug (rotatable through 90°)
5 Function signal indicator (yellow)
6 Pre-selection switch
7 Teach-in button
8 Bar display
9 See dimensional drawings of the lens

Connection type

All types



5-pin, M12 x 1



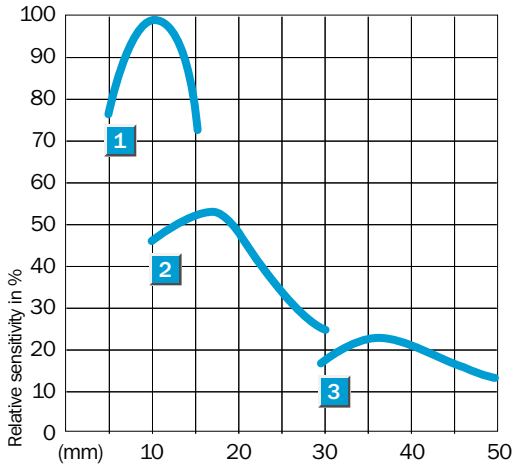
See chapter Accessories

Cables and connectors
Mounting systems
Lens

Technical data	KT 5W-2	P1116D	P1216D	P1316D	P1126D	P2116D	N1116D	N1216D	N1316D	N1126D	N2116D
Scanning distance	10 ± 3 mm	■			■	■	■			■	■
from front edge of lens	20 ± 3 mm		■					■			
	40 ± 3 mm			■					■		
Light spot dimensions	1.2 x 4.2 mm	■			■	■	■			■	■
	1.5 x 5.5 mm		■					■			
	1.1 x 4.2 mm			■					■		
Light source[1]; light type;	LED; red, blue, green;	■	■	■	■	■	■	■	■	■	■
Supply voltage V_S	10... 30 V DC[2]	■	■	■	■	■	■	■	■	■	■
Residual ripple[3]	< 5 V_{PP}	■	■	■	■	■	■	■	■	■	■
Current consumption[4]	< 130 mA	■	■	■	■	■	■	■	■	■	■
Switching outputs	PNP: HIGH = V_S – < 2 V/LOW = 0 V	■	■	■	■	■					
	NPN: HIGH = V_S /LOW = < 2 V						■	■	■	■	■
Output current I_A max.	100 mA short-circuit protected	■	■	■	■	■	■	■	■	■	■
Response time[5]	50 µs	■	■	■	■	■	■	■	■	■	■
Switching frequency[6]	To 10 000/s	■	■	■	■	■	■	■	■	■	■
Time delay	20 ms				■					■	
Light spot position	Longitudinal	■	■	■	■		■	■	■	■	
	Transverse					■					■
Teach-in input ET	PNP: Teach > 10 V...< V_S	■	■	■	■	■					
	Run 0 V or unswitched	■	■	■	■	■					
	NPN: Teach 0 V						■	■	■	■	■
	Run V_S or unswitched						■	■	■	■	■
Retention time	25 ms non-volatile memory	■	■	■	■	■	■	■	■	■	■
Connection type	Plug 5-pin, M12	■	■	■	■	■	■	■	■	■	■
VDE protection class[7]	⧈	■	■	■	■	■	■	■	■	■	■
Enclosure rating	IP 67	■	■	■	■	■	■	■	■	■	■
Circuit protection[8]	A, B, C	■	■	■	■	■	■	■	■	■	■
Ambient temperature T_A	Operation –10 ... +55 °C	■	■	■	■	■	■	■	■	■	■
	Storage –25 ... +75 °C	■	■	■	■	■	■	■	■	■	■
Shock load	To IEC 68	■	■	■	■	■	■	■	■	■	■
Weight	Approx. 400 g	■	■	■	■	■	■	■	■	■	■
Housing	Coated metal	■	■	■	■	■	■	■	■	■	■

1) Average service life 100,000 h at T_A = +25 °C
2) Limit values
3) May not exceed or fall short of V_S tolerances
4) Without load
5) Signal transit time with resistive load
6) With light/dark ratio 1:1
7) Reference voltage 50 V DC
8) A = V_S connections reverse-polarity protected
B = Outputs short-circuit protected
C = Interference pulse suppression

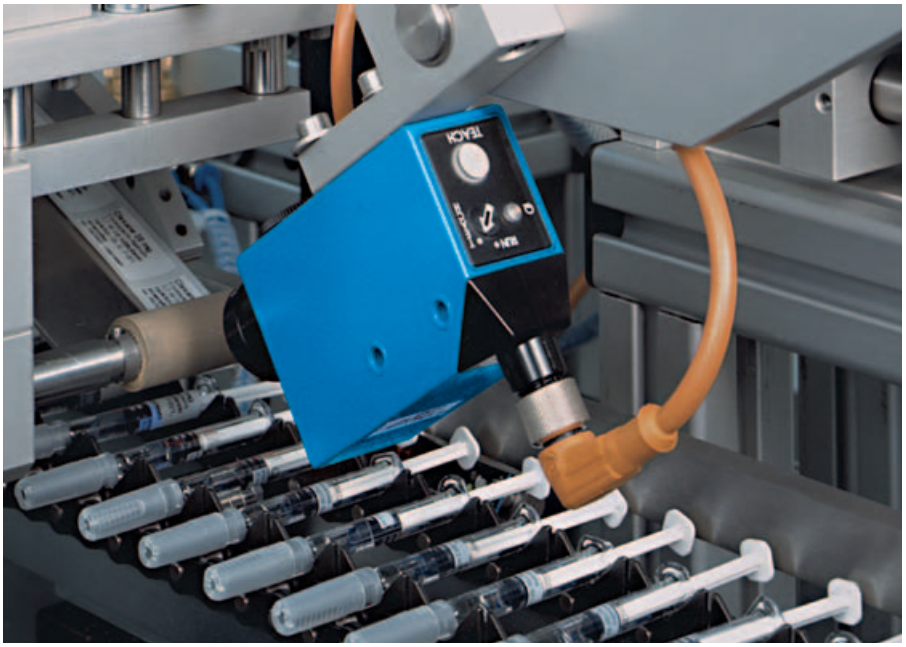
Scanning distance



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

Order information

Preferred type	Order no.
KT 5W-2P 1116D	1 026 538
KT 5W-2P 1216D	1 026 577
KT 5W-2P 1316D	1 026 578
KT 5W-2P 1126D	1 026 579
KT 5W-2P 2116D	1 026 584
KT 5W-2N 1116D	1 026 540
KT 5W-2N 1216D	1 026 580
KT 5W-2N 1316D	1 026 581
KT 5W-2N 1126D	1 026 582
KT 5W-2N 2116D	1 026 583



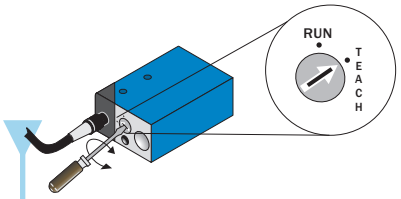
Contrast scanner with static Teach-in on mark and background

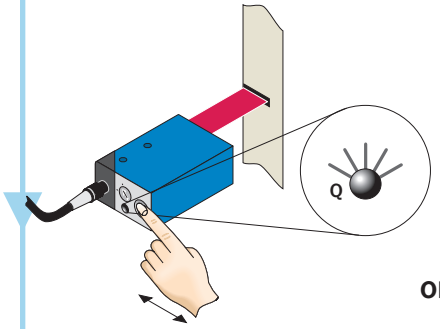
When especially high precision is required for contrast detection, e.g., in detecting marks on highly polished materials, the time (or – more precisely – the millisecond) is ripe for the KT 5W-2P/N___6 contrast scanner.

Thanks to its three-color LED, the equipment can activate the optimum transmitter light source for every contrast. Additionally, it has an especially accurate, static Teach-in procedure. The gray values of the mark to be detected are taught-in separately here either via the Teach-in button on the equipment or an external control wire. The scanner sets the ideal switching threshold from the two determined gray values.

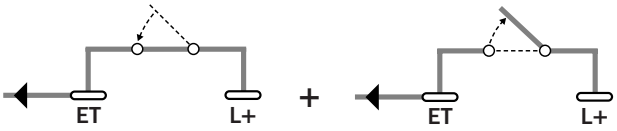
The high precision of the contrast detection, automatic shine adjustment with material to be scanned with high reflectance, scanning distances of 10 mm, 20 mm and 40 mm, switching sequence of 10 kHz and individual alignment and attachment options cover numerous tasks in which it is a questions of “brilliant” detection results.

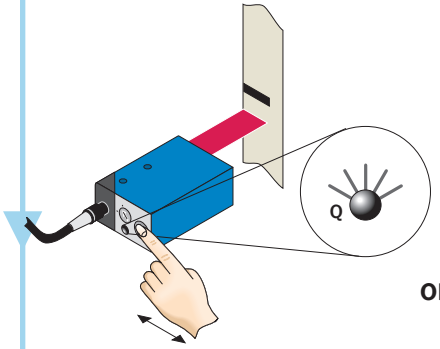
Teach-in: setting switching threshold



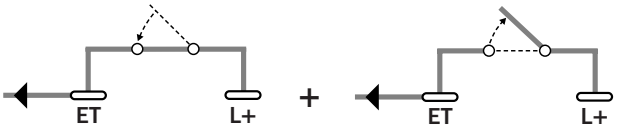


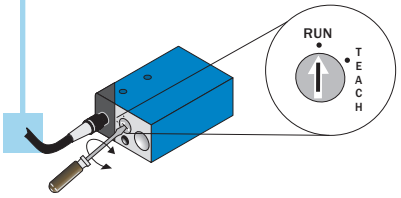
or





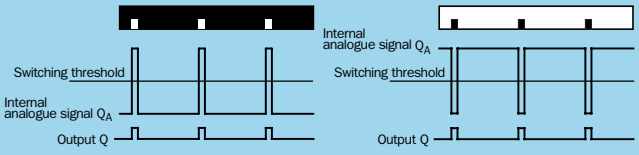
or





Status

- After the first Teach-in procedure, the red transmitter light and the status indicator blink and signal that a second Teach-in procedure must be triggered.
- The optimum transmission light was selected automatically.



Notes

- Light-/dark-switching not required: equipment switches for the material to be scanned, which was under the light spot at the first Teach-in procedure (mark or background).
- The material speed must be zero during Teach-in (machine is idle).
- The Teach-in button can be locked against unintentional activation with “Run”. A Teach-in procedure can be triggered when the switch setting is not defined.

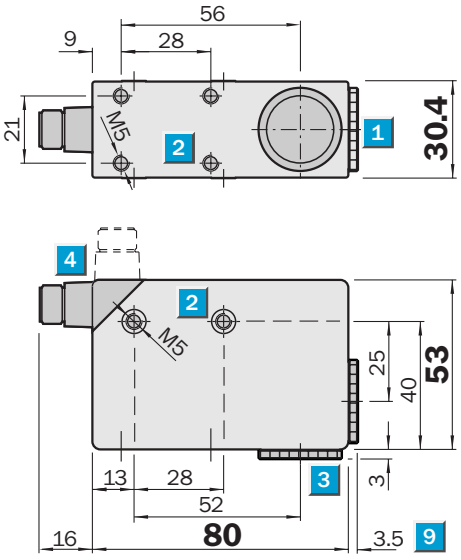
Scanning distance 10/20/40 mm

Contrast scanners

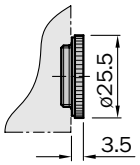
- Static Teach-in to mark and background via control cable or control panel on unit
- Automatic switching threshold adjustment for detection of extremely shiny objects
- Switching frequency 10 000/s
- Light source red, green, blue

Dimensional drawing

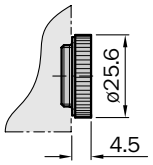
All types



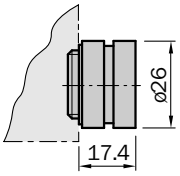
KT 5W-2P 1116
KT 5W-2P 1126



KT 5W-2P 1216
KT 5W-2N 1216

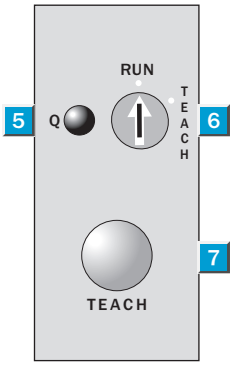


KT 5W-2P 1316
KT 5W-2N 1316



Adjustments possible

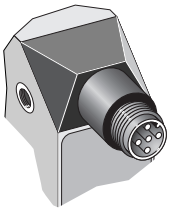
All types



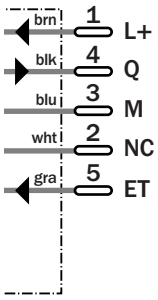
1 Lens (light transmission), can be replaced by item 3
2 M5 mounting holes, 5.5 mm deep
3 Blind screw, can be replaced by item 1
4 5-pin, M12 x 1 plug (rotatable through 90°)
5 Function signal indicator (yellow)
6 Pre-selection switch
7 Teach-in button

Connection type

All types



5-pin, M12 x 1



See chapter Accessories

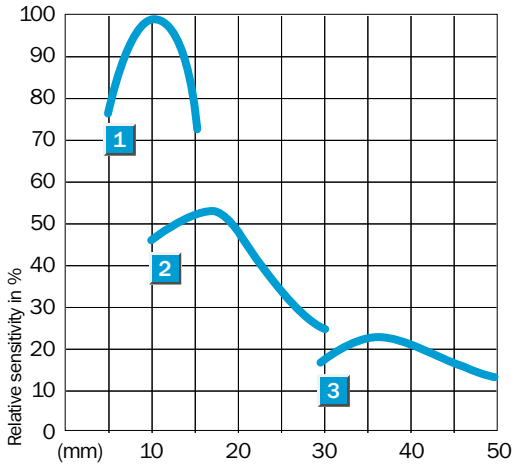
Cables and connectors
Mounting systems
Lens

Technical data	KT 5W-2	P1116	P1126	P1216	P1316	N1116	N1216	N1316
Scanning distance	10 ± 3 mm	■	■			■		
from front edge of lens	20 ± 3 mm			■			■	
	40 ± 3 mm				■			■
Light spot dimensions	1.2 x 4.2 mm	■	■			■		
	1.5 x 5.5 mm			■			■	
	1.1 x 4.2 mm				■			■
Light source[1]; light type;	LED; red, blue, green;	■	■	■	■	■	■	■
Wavelength (nm)	640, 525, 470	■	■	■	■	■	■	■
Supply voltage V_S	10... 30 V DC[2]	■	■	■	■	■	■	■
Residual ripple[3]	< 5 V_{PP}	■	■	■	■	■	■	■
Current consumption[4]	< 80 mA	■	■	■	■	■	■	■
Switching outputs	PNP: HIGH = V_S – < 2 V / LOW = 0 V	■	■	■	■			
	NPN: HIGH = V_S / LOW = < 2 V					■	■	■
Output current I_A max.	100 mA short-circuit protected	■	■	■	■	■	■	■
Response time[5]; switching frequency	50 µs; 10000/s	■	■	■	■	■	■	■
Time delay	No timing element	■		■	■	■	■	■
	Deactivation delay, ... 20 ms		■					
Teach-in input ET	PNP: Teach > 10 V...< V_S	■	■	■	■			
	Run 0 V or unswitched	■	■	■	■			
	NPN: Teach 0 V					■	■	■
	Run V_S or unswitched					■	■	■
Retention time	25 ms non-volatile memory	■	■	■	■	■	■	■
Connection type	Plug 5-pin, M12	■	■	■	■	■	■	■
VDE protection class[6]	⧈	■	■	■	■	■	■	■
Enclosure rating	IP 67	■	■	■	■	■	■	■
Circuit protection[7]	A, B, C	■	■	■	■	■	■	■
Ambient temperature T_A	Operation –10 ... +55 °C	■	■	■	■	■	■	■
	Storage –25 ... +75 °C	■	■	■	■	■	■	■
Shock load	To IEC 68	■	■	■	■	■	■	■
Weight	Approx. 400 g	■	■	■	■	■	■	■
Housing	Cast zinc	■	■	■	■	■	■	■

1) Average service life 100,000 h at T_A = + 25 °C
2) Limit values
3) May not exceed or fall short of V_S tolerances
4) Without load
5) Signal transit time with resistive load
6) Reference voltage 50 V DC
7) A = V_S connections reverse-polarity protected
B = Outputs short-circuit protected
C = Interference pulse suppression

Scanning distance

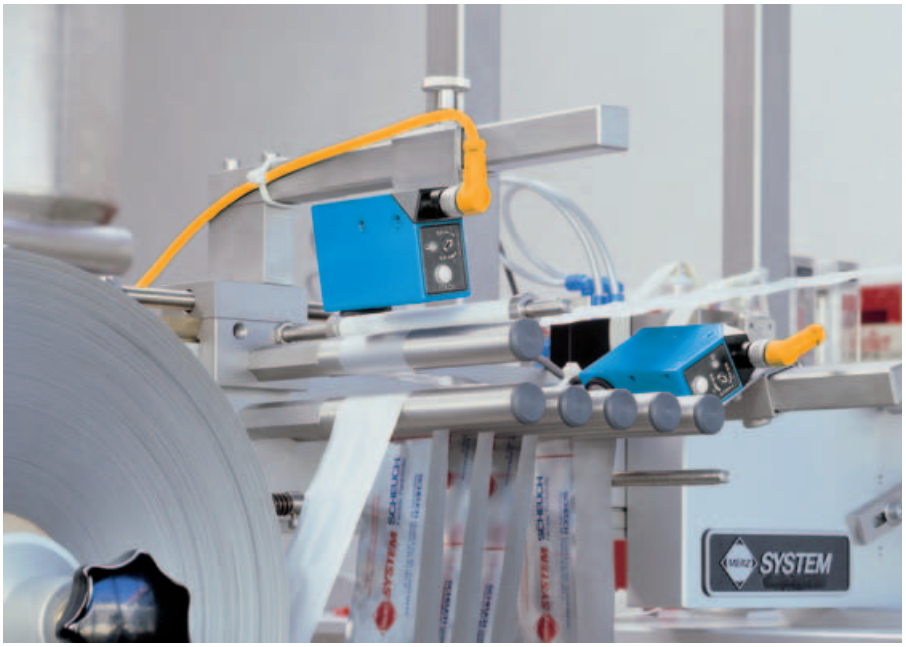
1	Scanning distance 10 mm
2	Scanning distance 20 mm
3	Scanning distance 40 mm



Order information

Preferred type *)	Order no.
KT 5W-2P 1116	1 018 044
KT 5W-2P 1126	1 018 587
KT 5W-2P 1216	1 018 586
KT 5W-2P 1316	1 018 961
KT 5W-2N 1116	1 018 045
KT 5W-2N 1216	1 019 022
KT 5W-2N 1316	1 022 678

*) Further types on request



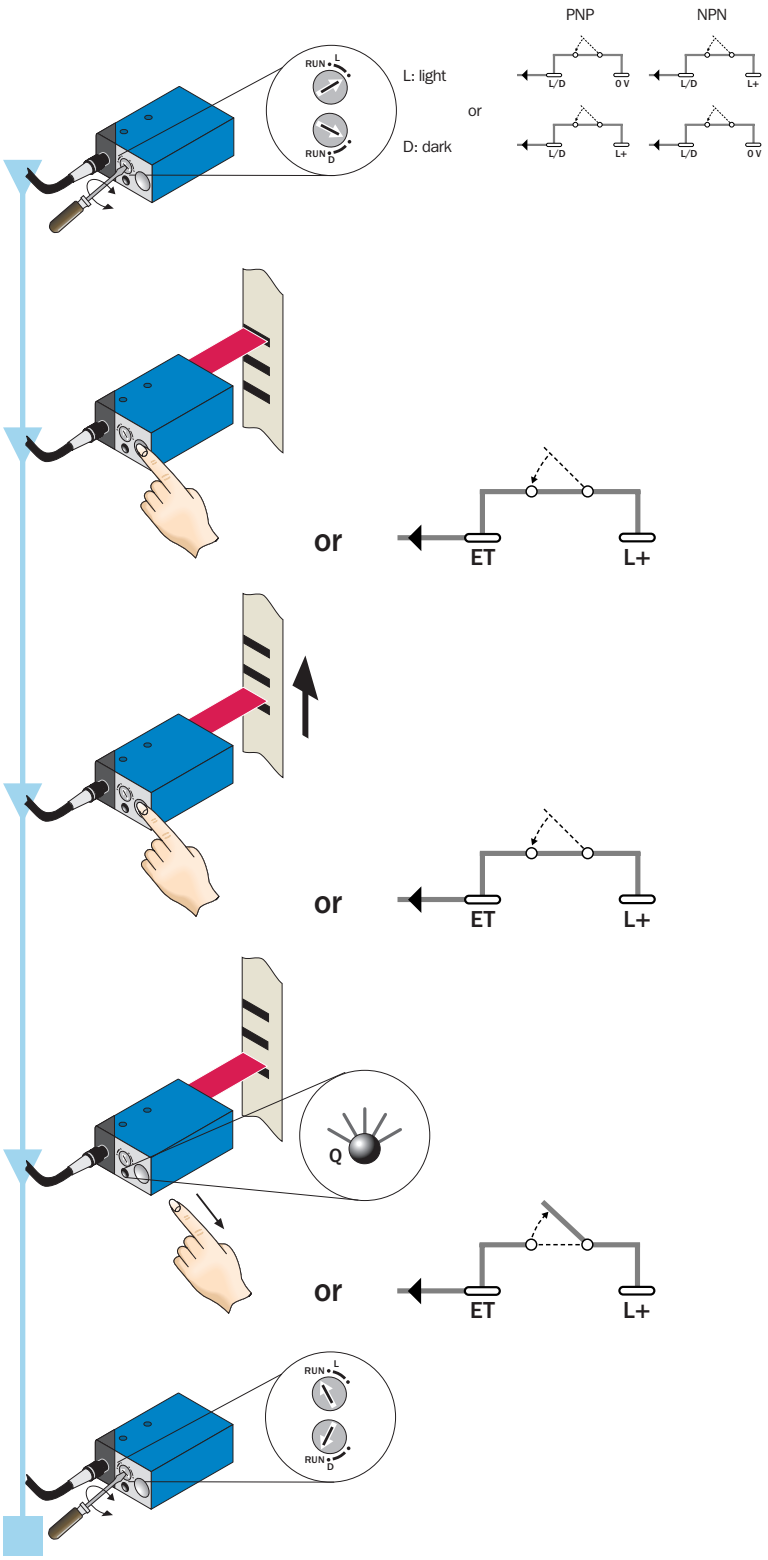
Contrast scanner with dynamic Teach-in

The KT 5G-2P/N___3 provides a high degree of user-friendly operation and detection reliability. This is the result of the dynamic Teach-in procedure in connection with the automatic light transmitter selection.

You can set the optimum switching threshold without stopping the machine, either using the push button on the equipment or an external impulse via the control wire. The equipment selects the light source between the red, blue and green transmission LED automatically, which achieves the respectively best contrast and consequently the highest possible detection reliability.

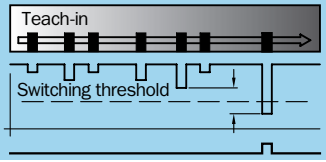
Especially in applications with a high throughput performance, e.g. packaging machines and fill lines, these features contribute to economical system operation because they are interruption-free. The same applies to highly flexible production processes where it is necessary to adapt contrast scanners fast and inexpensively.

Teach-in: setting switching threshold



Status

- The switching threshold is set automatically in the middle between the reception signals from the background and mark.
- The optimum transmission light was selected automatically.



Notes

- At least one repetition length must pass through the light spot with the material to be scanned.
- The material speed during Teach-in procedures is min. 25 mm/s and max. 300 mm/s.
- The Teach-in button can be locked against unintentional activation with “Run”.
  A Teach-in procedure can be triggered when the switch setting is not defined.

Scanning distance 10/20 mm

Contrast scanners

- Dynamic Teach-in
- Automatic light transmission selector, red, blue and green
- Teach-in: button on unit or via control cable
- L/D adjustable on unit or via control cable
- Switching frequency 10 000/s

CE UL

See chapter Accessories

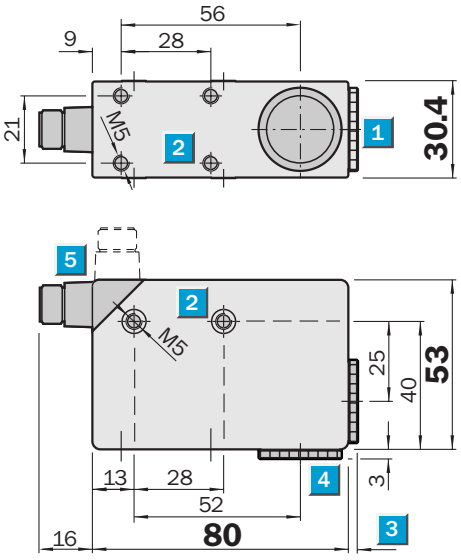
Cables and connectors

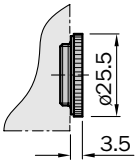
Mounting systems

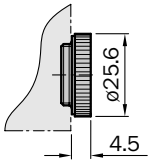
Lens

Dimensional drawing

KT 5W-2P1113	KT 5W-2P1213
KT 5W-2N1113	KT 5W-2N1213
KT 5W-2P1123	

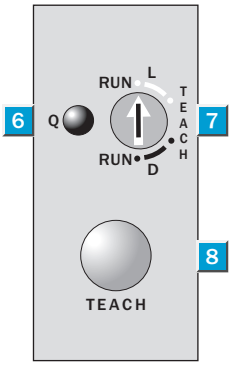






Adjustments possible

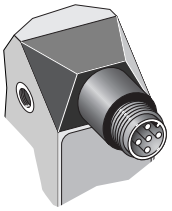
All types



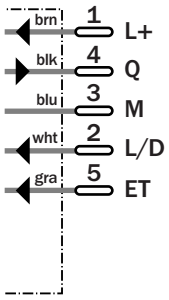
1	Lens (light transmission), can be replaced by item 4
2	M5 mounting holes, 5.5 mm deep
3	See dimensional drawing of lens
4	Blind screw, can be replaced by item 1
5	5-pin, M12 x 1 plug (rotatable through 90°)
6	Function signal indicator (yellow)
7	L/D pre-selection switch
8	Teach-in button

Connection type

All types



5-pin, M12 x 1

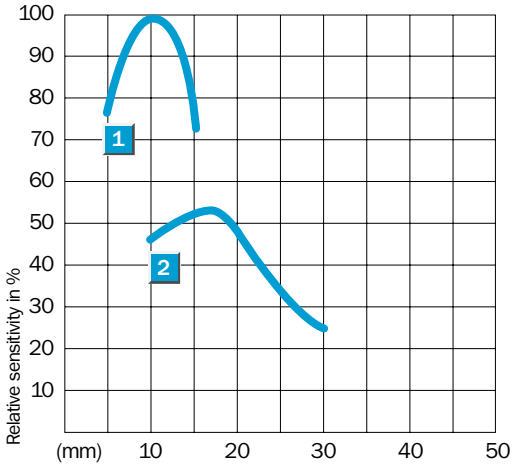


Technical data	KT 5W-2	P1113	P1123	P1213	N1113	N1213
Scanning distance	10 ± 3 mm	■	■		■	
from front edge of lens	20 ± 3 mm			■		■
Light spot dimensions	1.2 x 4.2 mm	■	■		■	
	1.5 x 5.5 mm			■		■
Light source[1]; light type;	LED; red, blue, green;	■	■	■	■	■
Wavelength (nm)	640, 525, 470	■	■	■	■	■
Supply voltage V_S	10... 30 V DC[2]	■	■	■	■	■
Residual ripple[3]	< 5 V_{PP}	■	■	■	■	■
Current consumption[4]	< 80 mA	■	■	■	■	■
Switching outputs	PNP: HIGH = V_S – < 2 V/LOW = 0 V	■	■	■		
	NPN: HIGH = V_S /LOW = < 2 V				■	■
Output current I_A max.	100 mA short-circuit protected	■	■	■	■	■
Switching frequency	To 10000/s	■	■	■	■	■
Response time[5]; switching frequency[6]	50 µs; 10000/s	■	■	■	■	■
Time delay	No timing element	■		■	■	■
	Deactivation delay, ... 20 ms		■			
Teach-in input ET	PNP: Teach > 10 V...< V_S	■	■	■		
	Run 0 V or unswitched	■	■	■		
	NPN: Teach 0 V				■	■
	Run V_S or unswitched				■	■
Retention time	25 ms non-volatile memory	■	■	■	■	■
L/D input, light-/dark-switching	PNP: dark = > 10 V...< V_S	■	■	■		
	light = 0 V or unswitched	■	■	■		
	NPN: dark = 0 V				■	■
	light = V_S or unswitched				■	■
Connection type	Plug M12, 5-pin	■	■	■	■	■
VDE protection class[7]	⧈	■	■	■	■	■
Enclosure rating	IP 67	■	■	■	■	■
Circuit protection[8]	A, B, C	■	■	■	■	■
Ambient temperature T_A	Operation –10 ... +55 °C	■	■	■	■	■
	Storage –25 ... +75 °C	■	■	■	■	■
Shock load	To IEC 68	■	■	■	■	■
Weight	Approx. 400 g	■	■	■	■	■
Housing	Cast zinc	■	■	■	■	■

1) Average service life 100,000 h at T_A = + 25 °C
2) Limit values
3) May not exceed or fall short of V_S tolerances
4) Without load
5) Signal transit time with resistive load
6) With light/dark ratio 1:1
7) Reference voltage 50 V DC
8) A = V_S connections reverse-polarity protected
B = Outputs short-circuit protected
C = Interference pulse suppression

Scanning distance

1	Scanning distance with lens 211	10 mm
2	Scanning distance with lens 212	20 mm



Order information

Preferred type *)	Order no.
KT 5W-2P1113	1 016 629
KT 5W-2P1123	1 017 810
KT 5W-2P1213	1 016 715
KT 5W-2N1113	1 016 630
KT 5W-2N1213	1 016 716

*) Further types on request

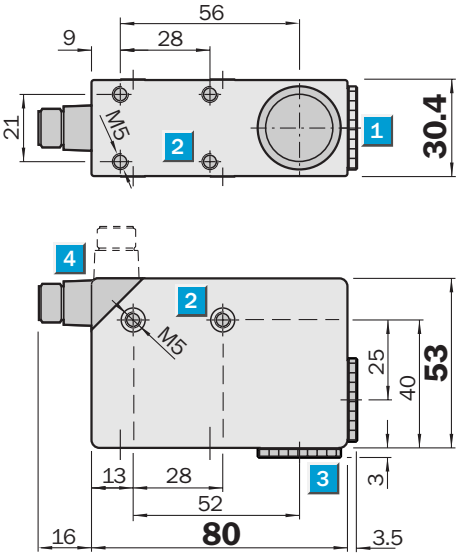
Scanning distance 10 mm

Contrast scanners

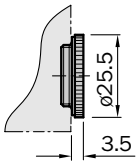
- Statistic Teach-in on mark and background via Teach-in button on unit
- Rotatable M12, 4-pin connector
- Automatic switching threshold adjustment for detection of extremely shiny objects
- Switching frequency 10,000/s
- Two light emission sides
- Automatic light source selection red or green

Dimensional drawing

All types

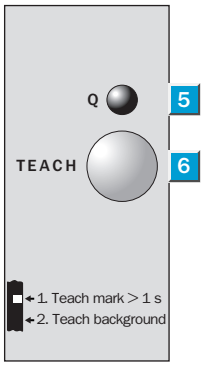


KT5RG-2P1116
KT5RG-2P1126
KT5RG-2N1116



Adjustments possible

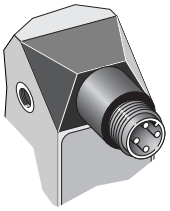
All types



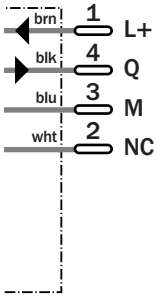
1 Lens (light transmission), can be replaced by item 3
2 M5 mounting holes, 5.5 mm deep
3 Blind srew, can be replaced by item 1
4 4-pin, M12 x 1 plug (rotatable through 90°)
5 Function signal indicator (yellow)
6 Teach-in button

Connection type

All types



4-pin, M12 x 1



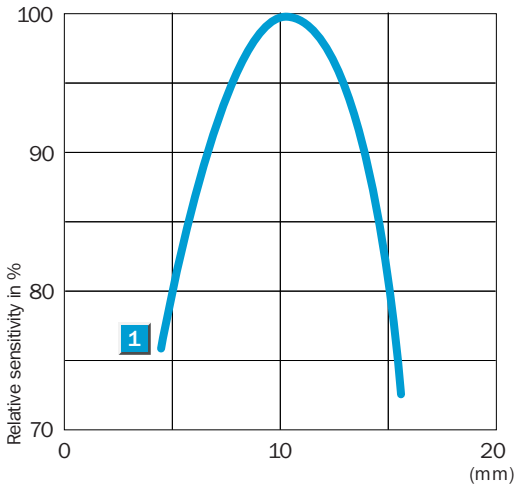
See chapter Accessories

Cables and connectors
Mounting systems
Lens

Technical data	KT 5 RG-2	P 1116	P 1126	N 1116
Scanning distance	10 ± 3 mm	■	■	■
from front edge of lens				
Light spot dimensions	1.2 x 4.2 mm²	■	■	■
Light source [1]; light type;	LED; red, green;	■	■	■
wavelenght (nm)	525, 640	■	■	■
Supply voltage V_S	10 ... 30 V DC[2]	■	■	■
Residual ripple [3]	< 5 V_{PP}	■	■	■
Current consumption [4]	< 80 mA	■	■	■
Switching outputs	PNP: HIGH = V_S – < 2 V / LOW = 0 V	■	■	
	NPN: HIGH = V_S / LOW = < 2 V			■
Output current I_A max.	100 mA short-circuit protected	■	■	■
Response time [5]; switching frequency	50 µs; 10,000/s	■	■	■
Time delay	No timing element	■		■
	Deactivation delay, ... 20 ms		■	
Threshold setting	Static 2-point Teach-in	■	■	■
Retention time	25 ms non-volatile memory	■	■	■
Connection type	Plug 4-pin, M12	■	■	■
VDE protection class	⧫	■	■	■
Enclosure rating	IP 67	■	■	■
Circuit protection [6]	A, B, C	■	■	■
Ambient temperature T_A	Operating –10 ... +55 °C	■	■	■
	Storage –25 ... +75 °C	■	■	■
Shock load	To IEC 68	■	■	■
Weight	Approx. 400 g	■	■	■
Housing	Cast zinc	■	■	■

[1] Average service life 100,000 h at T_A = + 25 °C
[2] Limit values
[3] May not exceed or fall short of V_S tolerances
[4] Without load
[5] Signal transit time with resistive load
[6] A = V_S connections reverse-polarity protected
B = Outputs short-circuit protected
C = Interference pulse suppression

Scanning distance



1 Scanning distance 10 mm

Static 2-point Teach-in

Static Teach-in via Teach-in button on unit

1. Place mark in light spot.
2. Press the Teach-in button on the device for longer than 1 s.
3. Place the light spot on the background, and trigger the second Teach-in procedure.

The KT 5 RG-2 selects transmission light from among red or green automatically.

Confirmation:
After the first Teach-in procedure, the red transmitter light blinks, and the status indicator blinks slowly and signals that a second Teach-in procedure must be triggered.

LED and status indicator blink rapidly = contrast insufficient.
LED and status indicator do not blink = Teach-in procedure completed.

Order information

Preferred type *)	Order no.
KT5RG-2P1116	1 027 393
KT5RG-2P1126	1 027 396
KT5RG-2N1116	1 027 394

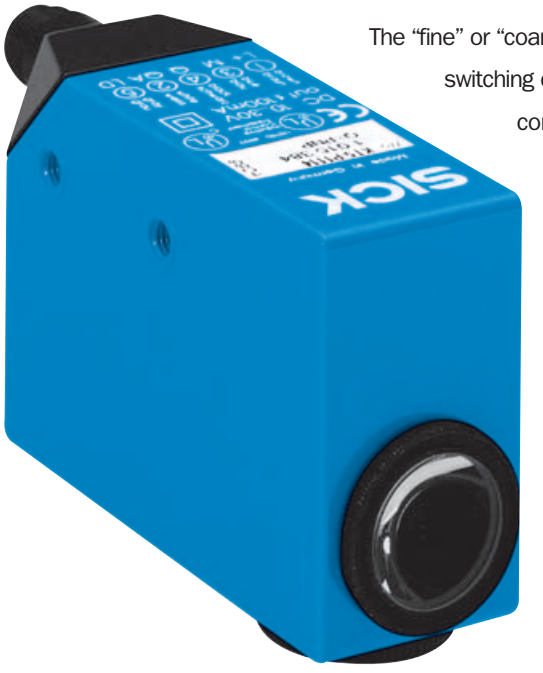
*) Further types on request

Contrast scanner with dynamic contrast detection

Contrast scanners with green light LED can distinguish up to 30 gray value levels. Color deviations due to printing can result in different gray values within a processing procedure.

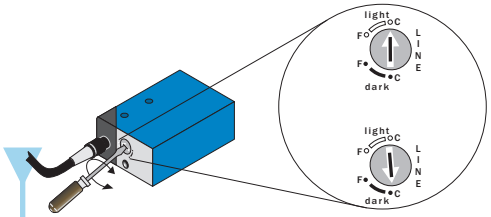
In this model, the switching threshold is set dynamically according to the existing contrast. This means that a switching signal is activated at each contrast that the KT 5 detects.

Manual adjustment or a Teach-in procedure is not required with dynamic contrast detection. Of course, this equipment also has intensive green light for resolving at least 30 gray levels.



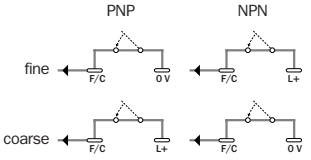
The “fine” or “coarse” contrast to be resolved and light-/dark-switching can be selected using the switch on the control panel or via the control wire.

Teach-in: setting switching threshold



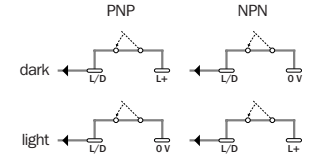
light (light-switching):
fine (insufficient contrast)
or coarse (large contrast)

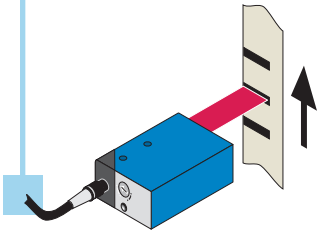
or



dark (dark-switching):
fine (insufficient contrast)
or coarse (large contrast)

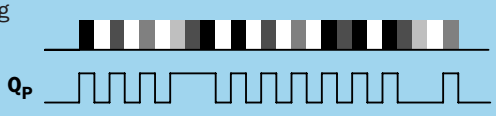
or





Status

- The example shows the mode of operation in the “coarse” setting with dark-switching.



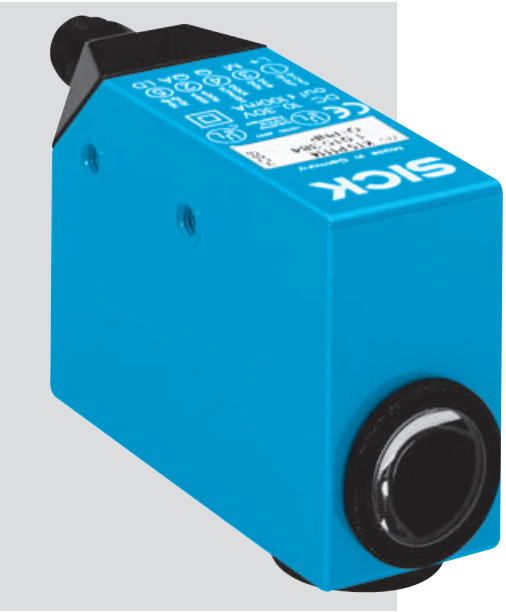
Notes

- The control panel is locked when the switch is set to LINE.
  Then the F/C and /L/D settings are only accepted via the control wire.

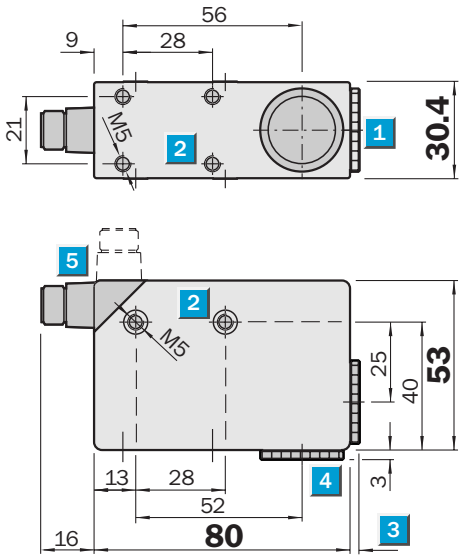
Scanning distance 10/20/40 mm

Contrast scanners

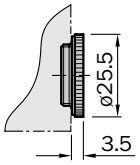
- Green light
- Dynamic contrast determination
- Fine/coarse adjustment
- Light/dark finely adjustable
- Switching frequency 10 000/s



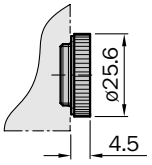
Dimensional drawing



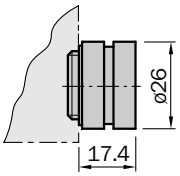
KT 5G-2P 1114
KT 5G-2N 1114
KT 5G-2P 2114



KT 5G-2P 1214
KT 5G-2N 1214

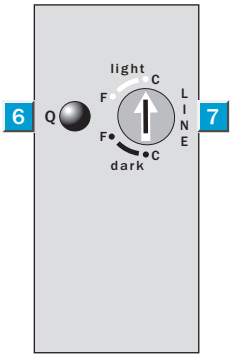


KT 5G-2P 1314
KT 5G-2N 1314



Adjustments possible

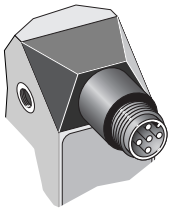
All types



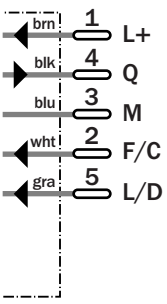
1 Lens (light transmission), can be replaced by item 4
2 M5 mounting holes, 5.5 mm deep
3 See dimensional drawing of lens
4 Blind screw, can be replaced by item 1
5 5-pin, M12 x 1 plug (rotatable through 90°)
6 Function signal indicator (yellow)
7 Fine/coarse selection

Connection type

All types



5-pin, M12



See chapter Accessories

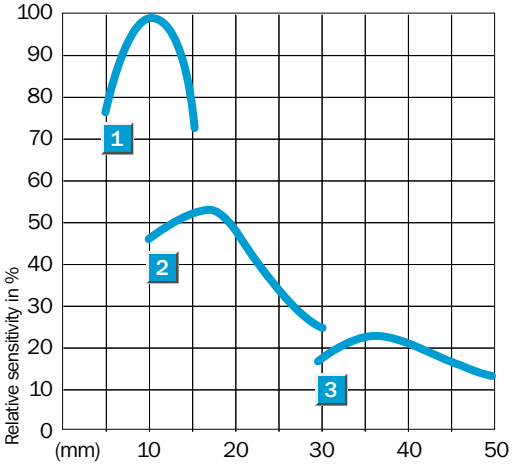
Cables and connectors
Mounting systems
Lens

Technical data	KT 5G-2	P1114	P1214	P1314	P2114	N1114	N1214	N1314
Scanning distance	10 ± 3 mm	■			■	■		
from front edge of lens	20 ± 3 mm		■				■	
	40 ± 3 mm			■				■
Light spot dimensions	1.2 x 4.2 mm	■			■	■		
	1.5 x 5.5 mm		■				■	
	1.1 x 4.2 mm			■				■
Light spot position	Longitudinal	■	■	■		■	■	■
	Transverse				■			
Light source[1]; light type;	LED; green light;	■	■	■	■	■	■	■
Wavelength (nm)	520	■	■	■	■	■	■	■
Supply voltage V_S	10 ... 30 V DC[2]	■	■	■	■	■	■	■
Residual ripple[3]	< 5 V_{PP}	■	■	■	■	■	■	■
Current consumption[4]	< 80 mA	■	■	■	■	■	■	■
Switching outputs	PNP: HIGH = V_S – < 2 V/LOW = 0 V	■	■	■	■			
	NPN: HIGH = V_S /LOW = < 2 V					■	■	■
Output current I_A max.	100 mA short-circuit protected	■	■	■	■	■	■	■
Response time[5]; switching frequency[6]	50 µs; 10 000/s	■	■	■	■	■	■	■
Time delay	No timing element	■	■	■	■	■	■	■
Fine/coarse input F/C	PNP: fine 0 V or unswitched	■	■	■	■			
	coarse > 10 V ... < V_S	■	■	■	■			
	NPN: fine V_S or unswitched					■	■	■
	coarse 0 V					■	■	■
L/D input, light-/dark-switching	PNP: dark = > 10 V ... < V_S	■	■	■	■			
	light = 0 V or unswitched	■	■	■	■			
	NPN: dark = 0 V					■	■	■
	light = V_S or unswitched					■	■	■
Connection type	Plug M12, 5-pin	■	■	■	■	■	■	■
VDE protection class[7]	⧈	■	■	■	■	■	■	■
Enclosure rating	IP 67	■	■	■	■	■	■	■
Circuit protection[8]	A, B, C	■	■	■	■	■	■	■
Ambient temperature T_A	Operation –10 ... +55 °C	■	■	■	■	■	■	■
	Storage –25 ... +75 °C	■	■	■	■	■	■	■
Shock load	To IEC 68	■	■	■	■	■	■	■
Weight	Approx. 400 g	■	■	■	■	■	■	■
Housing	Cast zinc	■	■	■	■	■	■	■

1) Average service life 100,000 h at T_A = + 25 °C
2) Limit values
3) May not exceed or fall short of V_S tolerances
4) Without load
5) Signal transit time with resistive load
6) With light/dark ratio 1:1
7) Do not bend below 0 °C
8) Reference voltage 50 V DC
9) A = V_S connections reverse-polarity protected
B = Outputs short-circuit protected
C = Interference pulse suppression

Scanning distance

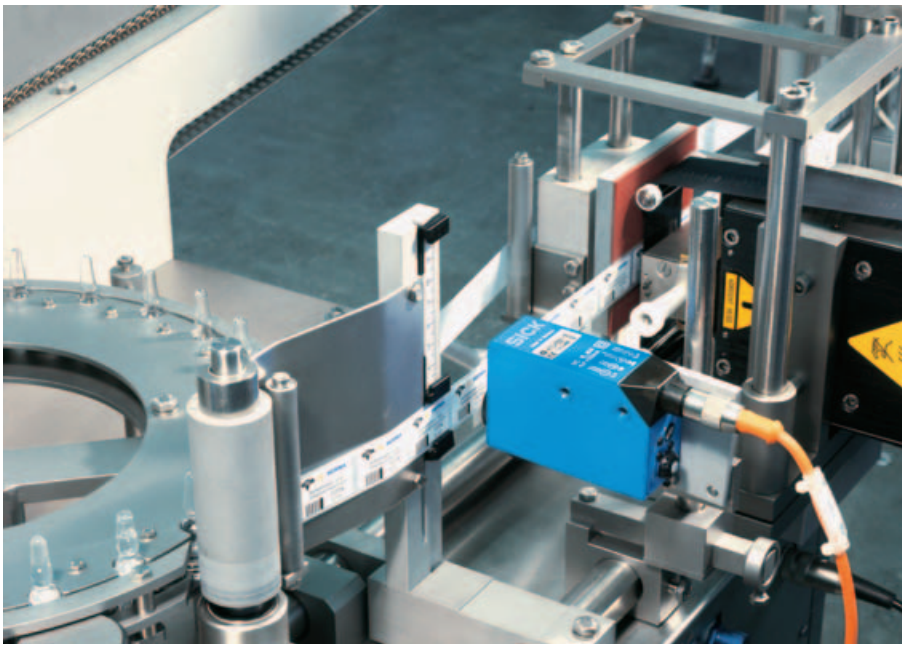
1	Scanning distance 10 mm
2	Scanning distance 20 mm
3	Scanning distance 40 mm



Order information

Preferred type *)	Order no.
KT 5G-2P1114	1 016 999
KT 5G-2P1214	1 017 870
KT 5G-2P1314	1 018 988
KT 5G-2P2114	1 018 309
KT 5G-2N1114	1 017 000
KT 5G-2N1214	1 017 871
KT 5G-2N1314	1 023 121

*) Further types on request



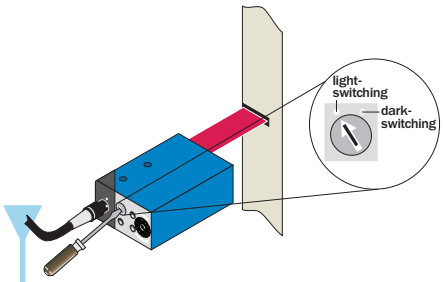
Contrast scanner with manual switching threshold adjustment

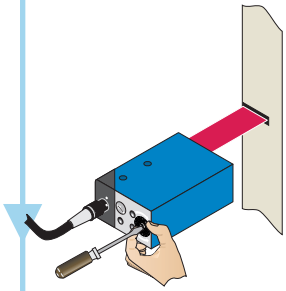
Industrial packaging processes are automated for the most part. Sensors are required for this, which can detect print marks on different films, cardboard packaging and wrapping materials quickly and reliably.

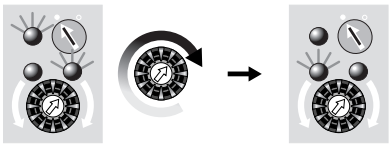
The KT 5G-2P/N_ _ _1 can resolve over 30 different contrast levels. This is the basic model of the KT 5 series. The gray value differentiation, switching sequence of 10 kHz and scanning ranges of optionally 10, 20 and 40 mm cover a wide range of applications in contrast detection. The switching threshold is adjusted manually with support from the status indicator as an adjustment aid. An optional release delay, which increases the impulse duration, optimizes detection reliability.

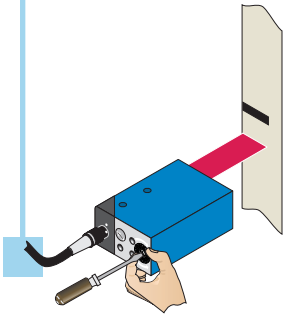
Easy to install too – through the 4-pin M12 plug connection, the comprehensive range of mounting accessories and the selectable light exit at the top or front of the housing.

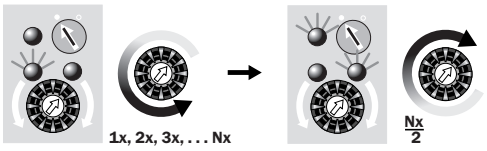
Setting switching threshold





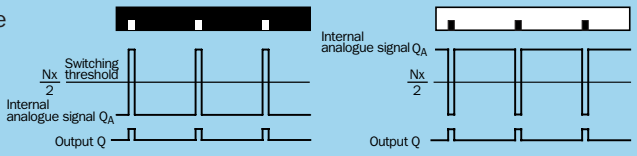






Status

- The switching threshold is set manually in the middle between the background and the mark.



Notes

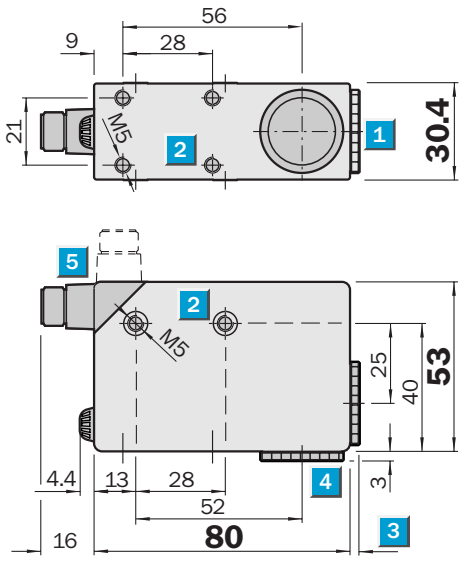
- The material speed must be zero (machine is idle).
- Turn the threshold adjustment knob until the status indicator just lights.
- Switching threshold setting at bright-switching analogue.

Scanning distance 10/20/40 mm

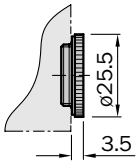
Contrast scanners

- Green light
- Manual switching threshold adjustment
- Adjustment switch
- Optional time delay
- Switching frequency 10 000/s

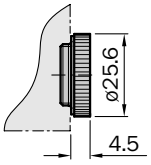
Dimensional drawing



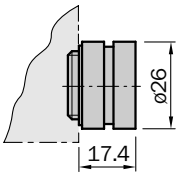
KT 5G-2P 1111
KT 5G-2P 1121
KT 5G-2P 1151



KT 5G-2P 1211
KT 5G-2P 1221

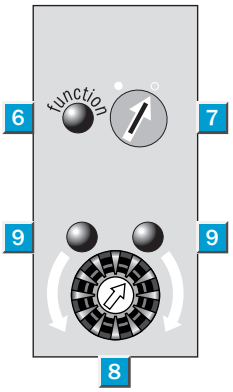


KT 5G-2P 1311
KT 5G-2P 1321



Adjustments possible

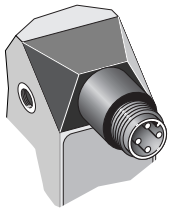
All types



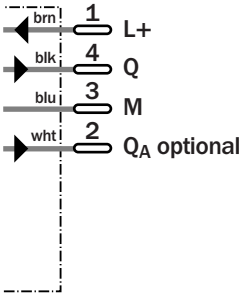
1	Lens (light transmission), can be replaced by item 4
2	M5 mounting holes, 5.5 mm deep
3	See dimensional drawing of lens
4	Blind screw, can be replaced by item 1
5	4-pin, M12 x 1 plug (rotatable through 90°)
6	Function signal indicator (yellow)
7	Operating mode selector switch
○	Light-switching
●	Dark-switching
8	Switching threshold adjustment
9	Adjustment indicators (green)

Connection type

All types



4-pin, M12



See chapter Accessories

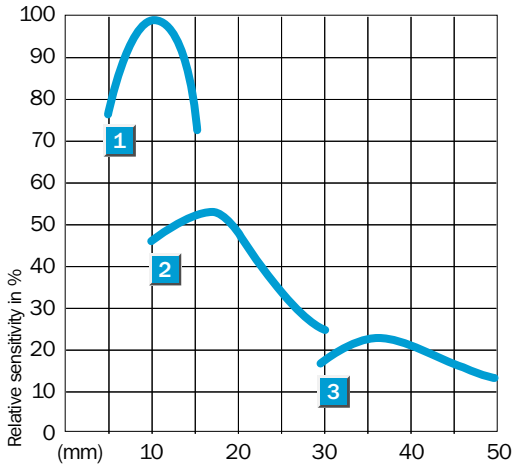
- Cables and connectors
- Mounting systems
- Lens

Technical data	KT 5G-2	P1111	P1121	P1151	P1211	P1221	P1311	P1321	P2111
Scanning distance	10 ± 3 mm	■	■	■					■
from front edge of lens	20 ± 3 mm				■	■			
	40 ± 3 mm						■	■	
Light spot dimension	1.2 x 4.2 mm	■	■	■					■
	1.5 x 5.5 mm				■	■			
	1.1 x 4.2 mm						■	■	
Light spot position	Longitudinal	■	■	■	■	■	■	■	
	Transverse								■
Light source[1]; light type;	LED; green light;	■	■	■	■	■	■	■	■
Wavelength (nm)	520	■	■	■	■	■	■	■	■
Supply voltage V_S	10 ... 30 V DC[2]	■	■	■	■	■	■	■	■
Residual ripple[3]	< 5 V_{PP}	■	■	■	■	■	■	■	■
Current consumption[4]	< 80 mA	■	■	■	■	■	■	■	■
Switching outputs	Light-/dark-switching, selectable	■	■	■	■	■	■	■	■
	PNP: HIGH = V_S – < 2 V/LOW = 0 V	■	■	■	■	■	■	■	■
Output current I_A max.	100 mA	■	■	■	■	■	■	■	■
Response time[5]; switching frequency[6]	50 µs; 10 000/s	■	■	■	■	■	■	■	■
Time delay	No timing element	■		■	■		■		■
	deactivation delay, ... 20 ms		■			■		■	
Analogue output Q_A	0.3 ... 10 mA			■					
Switching threshold	Adjustable (standard type)	■	■	■	■	■	■	■	■
Connection type	Plug 4-pin, M12	■	■	■	■	■	■	■	■
VDE protection class[7]	⧈	■	■	■	■	■	■	■	■
Enclosure rating	IP 67	■	■	■	■	■	■	■	■
Circuit protection[8]	A, B, C	■	■	■	■	■	■	■	■
Ambient temperature T_A	Operation –10 ... +55 °C	■	■	■	■	■	■	■	■
	Storage –25 ... +75 °C	■	■	■	■	■	■	■	■
Shock load	To IEC 68	■	■	■	■	■	■	■	■
Weight	Approx. 400 g	■	■	■	■	■	■	■	■
Housing	Cast zinc	■	■	■	■	■	■	■	■

1) Average service life 100,000 h at T_A = + 25 °C
2) Limit values
3) May not exceed or fall short of V_S tolerances
4) Without load
5) Signal transit time with resistive load
6) With light/dark ratio 1:1
7) Reference voltage 50 V DC
8) A = V_S connections reverse-polarity protected
B = Outputs short-circuit protected
C = Interference pulse suppression

Scanning distance

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



Order information

Preferred type *)	Order no.
KT 5G-2P 1111	1 015 993
KT 5G-2P 1121	1 015 997
KT 5G-2P 1151	1 016 195
KT 5G-2P 1211	1 015 999
KT 5G-2P 1221	1 016 001
KT 5G-2P 1311	1 016 003
KT 5G-2P 1321	1 016 005
KT 5G-2P 2111	1 016 008

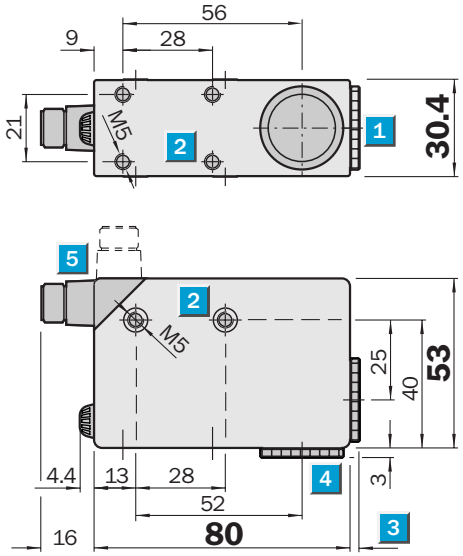
*) Further types on request

Scanning distance 10/20/40 mm

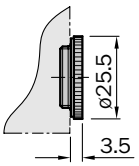
Contrast scanners

- Green light
- Manual switching threshold adjustment
- Adjustment switch
- Optional time delay
- Switching frequency 10 000/s

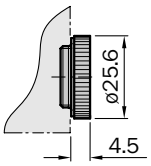
Dimensional drawing



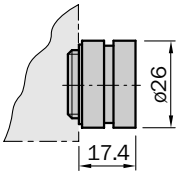
KT 5G-2N 1111
KT 5G-2N 1151



KT 5G-2N 1211

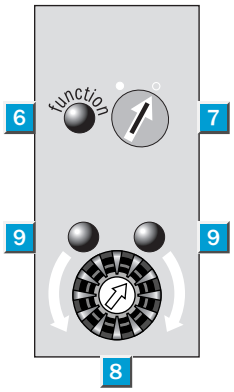


KT 5G-2N 1311



Adjustments possible

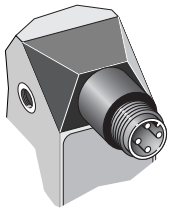
All types



1	Lens (light transmission), can be replaced by item 4
2	M5 mounting holes, 5.5 mm deep
3	See dimensional drawing of lens
4	Blind screw, can be replaced by item 1
5	4-pin, M12 x 1 plug (rotatable through 90°)
6	Function signal indicator (yellow)
7	Operating mode selector switch
○	Light-switching
●	Dark-switching
8	Switching threshold adjustment
9	Adjustment indicators (green)

Connection type

All types



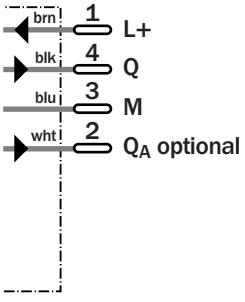
See chapter Accessories

Cables and connectors

Mounting systems

Lens

4-pin, M12

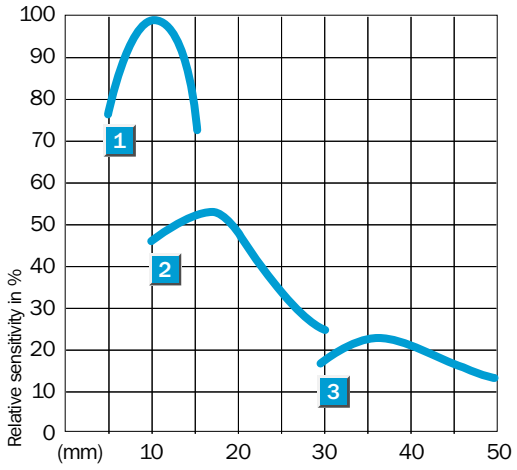


Technical data	KT 5G-2	N1111	N1151	N1211	N1311
Scanning distance	10 ± 3 mm	■	■		
from front edge of lens	20 ± 3 mm			■	
	40 ± 3 mm				■
Light spot dimension	1.2 x 4.2 mm	■	■		
	1.5 x 5.5 mm			■	
	1.1 x 4.2 mm				■
Light spot position	Longitudinal	■	■	■	■
Light source[1]; light type;	LED; green light;	■	■	■	■
Wavelength (nm)	520	■	■	■	■
Supply voltage V_S	10 ... 30 V DC[2]	■	■	■	■
Residual ripple[3]	< 5 V_{PP}	■	■	■	■
Current consumption[4]	< 80 mA	■	■	■	■
Switching outputs	Light-/dark-switching, selectable	■	■	■	■
	NPN: HIGH = V_S /LOW = < 2 V	■	■	■	■
Output current I_A max.	100 mA	■	■	■	■
Response time[5]; switching frequency[6]	50 µs; 10 000/s	■	■	■	■
Time delay	No timing element	■	■	■	■
Analogue output Q_A	0.3 ... 10 mA		■		
Switching threshold	adjustable (standard type)	■	■	■	■
Connection type	Plug 4-pin, M12	■	■	■	■
VDE protection class[7]	⧈	■	■	■	■
Enclosure rating	IP 67	■	■	■	■
Circuit protection[8]	A, B, C	■	■	■	■
Ambient temperature T_A	Operation –10 ... +55 °C	■	■	■	■
	Storage –25 ... +75 °C	■	■	■	■
Shock load	To IEC 68	■	■	■	■
Weight	Approx. 400 g	■	■	■	■
Housing	Cast zinc	■	■	■	■

1) Average service life 100,000 h at T_A = + 25 °C
2) Limit values
3) May not exceed or fall short of V_S tolerances
4) Without load
5) Signal transit time with resistive load
6) With light/dark ratio 1:1
7) Reference voltage 50 V DC
8) A = V_S connections reverse-polarity protected
B = Outputs short-circuit protected
C = Interference pulse suppression

Scanning distance

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



Order information

Preferred type *)	Order no.
KT 5G-2N 1111	1 015 981
KT 5G-2N 1151	1 016 385
KT 5G-2N 1211	1 015 985
KT 5G-2N 1311	1 015 988

*) Further types on request

Scanning distance 150 mm

Contrast scanners

- Laser class 2
- Adjustment switch
- Long scanning distance
- Accurate recording of very small marks
- Switching frequency 10 000/s

Laser class 2

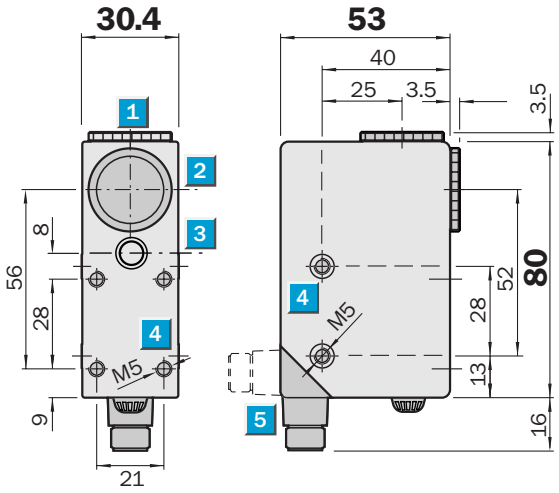
See chapter Accessories

Cables and connectors

Mounting systems

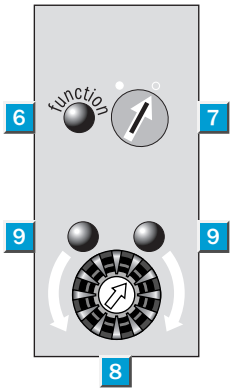
Dimensional drawing

All types



Adjustments possible

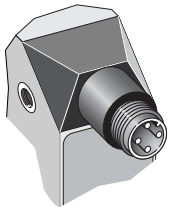
All types



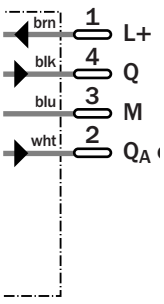
1	Blind screw
2	Receiver
3	Sender
4	M5 mounting holes, 5.5 mm deep
5	4-pin, M12 x 1 plug
6	Function signal indicator (red)
7	Operating mode selector switch
○	Light-switching
●	Dark-switching
8	Switching threshold adjustment
9	Adjustment indicators (green)

Connection type

All types



4-pin, M12



Technical data	KT 5L-	P3611	N3611								
Scanning distance	150 mm										
from front edge of lens											
Light spot	> 0.3 mm at 150 mm										
Light source[1]; light type;	Laser diode; red light;										
Wavelength (nm)	650										
Supply voltage V_S	10 ... 30 V DC[2]										
Residual ripple[3]	< 5 V_{PP}										
Current consumption[4]	< 80 mA										
Switching outputs	Light-/dark-switching, selectable										
	PNP: HIGH = V_S – < 2 V/LOW = 0 V										
	NPN: HIGH = V_S /LOW = < 2 V										
Output current I_A max.	100 mA short-circuit protected										
Response time[5]; switching frequency[6]	50 µs; 10 000/s										
Analogue output Q_A	0.3 ... 10 mA										
Connection type	Plug M12, 4-pin										
VDE protection class[8]	⧈										
Laser class[9]	2 (IEC 825/VDE 0837)										
Enclosure rating	IP 67										
Ambient temperature T_A	Operation –10 ... +40 °C										
	Storage –25 ... +75 °C										
Shock load	To IEC 68										
Weight	Approx. 400 g										
Housing	Cast zinc										

1) Average service life 100,000 h at T_A = + 25 °C
2) Limit values
3) May not exceed or fall short of V_S tolerances
4) Without load
5) Signal transit time with resistive load
6) With light/dark ratio 1:1
7) Reference voltage 50 V DC
8) A = V_S connections reverse-polarity protected
B = Outputs short-circuit protected
C = Interference pulse suppression

Order information	
Preferred type *)	**Order no.**
KT 5L-P 3611	1 011 536
KT 5L-N 3611	1 013 266

*) Further types on request

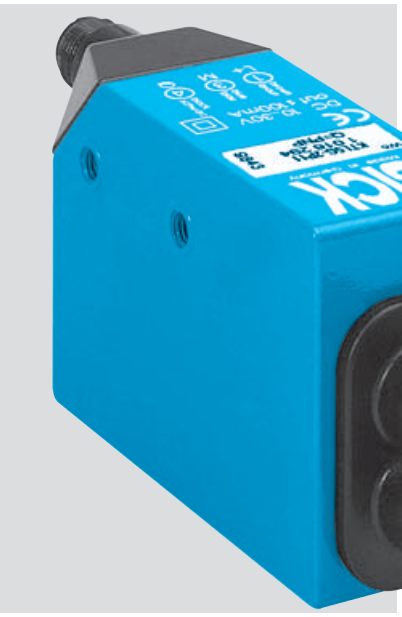
Scanning distance up to 15 mm

Proximity mode

Scanning range up to 60 mm

Through-beam mode

- Green light
- Switching threshold adjustable *or* static Teach-in to mark and background via control cable or control panel on unit *or* dynamic Teach-in
- Insensitive to ambient light



See chapter Accessories

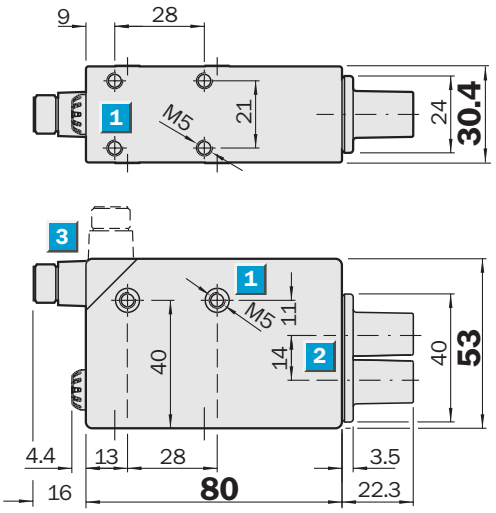
Cables and connectors

Mounting systems

Fibre-optic cable

Dimensional drawing

All types



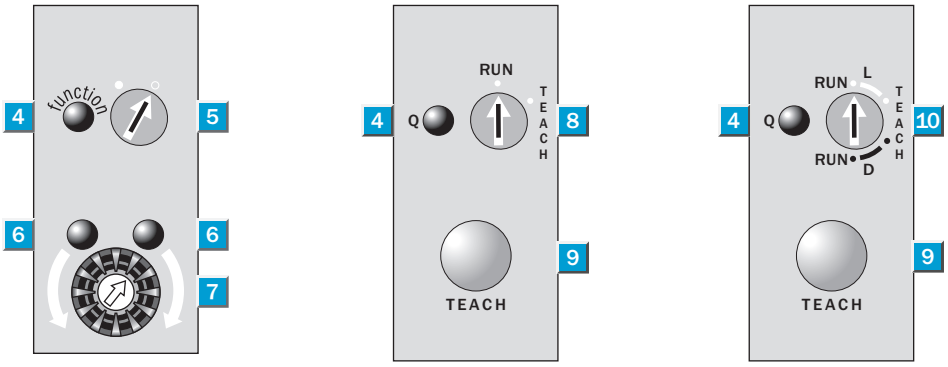
1 M5 mounting holes, 5.5 mm deep
2 Fibre-optic adapter (M12 x 1 internal thread)
3 4-pin, M12 x 1 plug (rotatable through 90°)
4 Function signal indicator (yellow)
5 Operating mode selector switch
○ Light-switching
● Dark-switching
6 Switching threshold adjustment
7 Adjustment indicators (green)
8 Pre-selection switch
9 Teach-in button
10 L/D pre-selection switch

Adjustments possible

KTL 5G-2P11
KTL 5G-2N11
KTL 5G-2P51
KTL 5G-2N51

KTL 5W-2P16

KTL 5W-2P23
KTL 5W-2N13

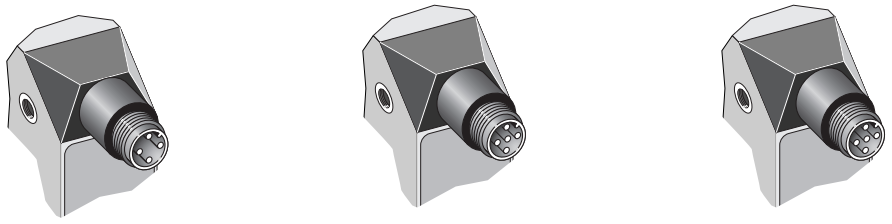


Connection type

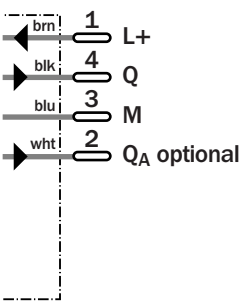
KTL 5G-2P11
KTL 5G-2N11
KTL 5G-2P51
KTL 5G-2N51

KTL 5W-2P16

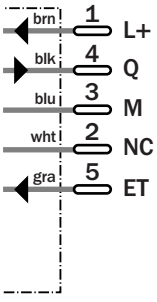
KTL 5W-2P23
KTL 5W-2N13



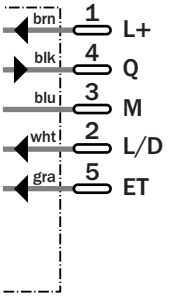
4-pin, M12



5-pin, M12x1



5-pin, M12x1

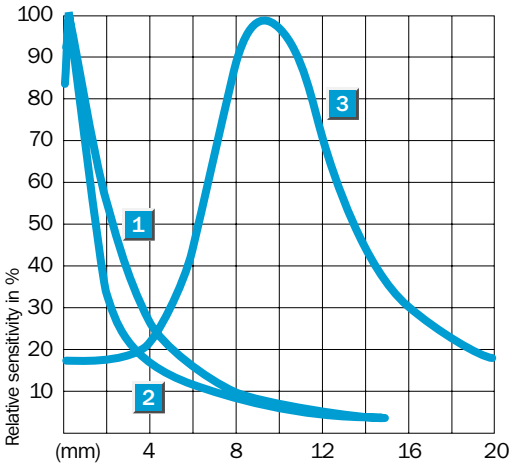


Technical data	KTL 5	G-2P11	G-2P51	G-2N11	G-2N51		W-2P16	W-2P23	W-2N13		
Scanning distance/scanning range	15 mm/60 mm	■	■	■	■		■	■	■		
Light source[1]; light type;	LED; green;	■	■	■	■						
Wavelength (nm)	520	■	■	■	■						
Light source[1]; light type;	LED; red, green, blue;						■	■	■		
Wavelength (nm)	640, 525, 470						■	■	■		
Supply voltage V_S	10... 30 V DC[2]	■	■	■	■		■	■	■		
Residual ripple[3]	< 5 V_{PP}	■	■	■	■		■	■	■		
Current consumption[4]	< 30 mA at DC 24 V	■	■	■	■		■	■	■		
Switching outputs	Light-/dark-switching, selectable	■	■	■	■		■	■	■		
	PNP: HIGH = V_S – < 2 V/LOW = 0 V	■	■				■	■			
	NPN: HIGH = V_S /LOW = < 2 V			■	■				■		
Output current I_A max.	100 mA short-circuit protected	■	■	■	■		■	■	■		
Response time[5]; switching frequency[6]	50 µs; 10 000/s	■	■	■	■		■	■	■		
Time delay	No timing element	■	■	■	■		■		■		
	Deactivation delay, ... 20 ms							■			
Analogue output Q_A	0.3 ... 10 mA		■		■						
Connection type	Plug M12, 4-pin	■	■	■	■		■	■	■		
VDE protection class[8]	⧈	■	■	■	■		■	■	■		
Enclosure rating	IP 67	■	■	■	■		■	■	■		
Ambient temperature T_A	Operation –10 ... +55 °C	■	■	■	■		■	■	■		
	Storage –25 ... +75 °C	■	■	■	■		■	■	■		
Shock load	To IEC 68	■	■	■	■		■	■	■		
Weight	Approx. 400 g	■	■	■	■		■	■	■		
Housing	Cast zinc	■	■	■	■		■	■	■		
Switching threshold adjustment/	Manual switching threshold setting[9]	■	■	■	■						
Teach-in											
	Dynamic Teach-in[10]							■	■		
	Static Teach-in[11]						■				

1) Average service life 100,000 h at T_A = + 25 °C
2) Limit values
3) May not exceed or fall short of V_S tolerances
4) Without load
5) Signal transit time with resistive load
6) With light/dark ratio 1:1
7) Reference voltage 50 V DC
8) A = V_S connections reverse-polarity protected
B = Outputs short-circuit protected
C = Interference pulse suppression
9) See page 1107
10) See page 1097
11) See page 1093

Scanning distance

1	Fibre-optic cable LBST 32900
2	Fibre-optic cable LBSR 32900
3	Fibre-optic cable OCSL



Order information

Preferred type *)	Order no.
KTL 5G-2 P 11	1 016 294
KTL 5G-2 P 51	1 016 950
KTL 5G-2 N 11	1 016 295
KTL 5G-2 N 51	1 016 951
KTL 5W-2 P 16	1 026 006
KTL 5W-2 P 23	1 019 551
KTL 5W-2 N 13	1 019 661

*) Further types on request

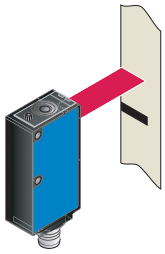
Dynamic, convenient, excellent: Contrast Scanners with dynamic Teach-in

The new KT 3 contrast scanner is small in price and design, but big in detecting contrasts in standard applications. With scanning ranges to 12.5 mm and switching sequences up to 10,000/s, the mark sensor is predestined for use in packaging machines, for example.

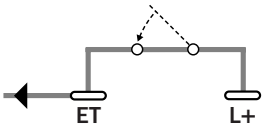
Features such as integrated tuning of switching thresholds for high-gloss objects and dynamic Teach-in make the KT 3 easy to both commission and use. Depending on the existing contrast, the KT 3 selects the optimum transmission colour (red, green or blue). And thanks to the miniature design, the KT 3 is especially well suited for cramped quarters.

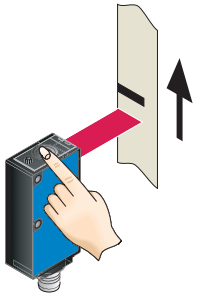
Contrasts do not need expensive technology, but instead simply the KT 3.

Teach-in: setting switching threshold

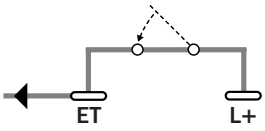


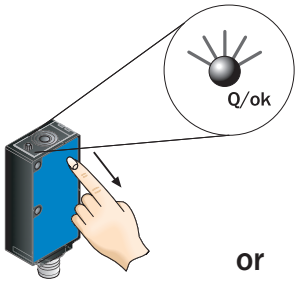
or



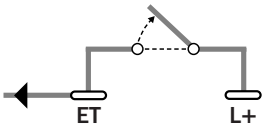


or



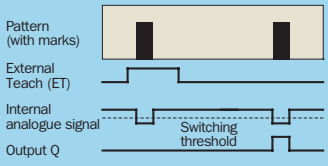


or



Notes

- The switching threshold is in the middle between the reception signals from the background and mark and is stored permanently.
- The optimum transmission light was selected automatically.



Status

- The material speed during the Teach-in procedure must be slower than 10 m/minute when there are smaller marks.
- Only teach-in one mark if possible.
- If the Teach-in procedure was unsuccessful, the output switches at approx. 3.5/s and the yellow LED display blinks. The reception signal was too weak, too strong (possibly due to shiny reflectance) or the contrast difference was too slight.

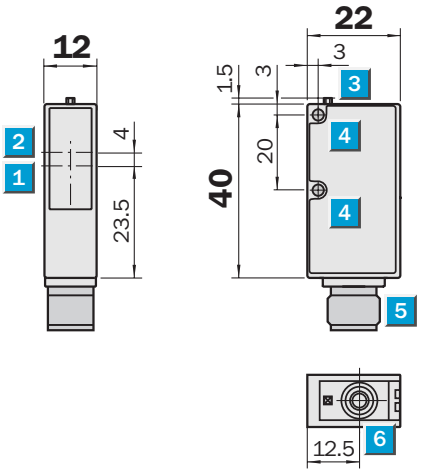
Scanning distance 12.5 mm

Contrast scanners

- Light source green or red, green, blue
- Integrated switching threshold adjustment for detection of extremely shiny objects
- Dynamic Teach-in via control panel or control wire while machine is running
- Switching frequency 10,000/s

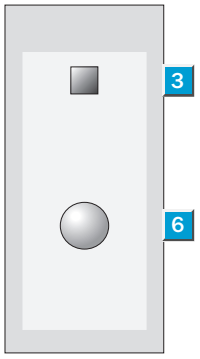
Dimensional drawing

All types



Adjustments possible

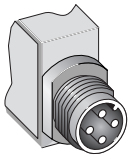
All types



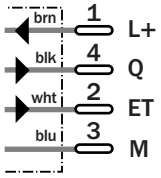
1 Axis of the sender optics
2 Axis of the receiver optics
3 LED signal strength indicator
4 Mounting hole
5 Plug M12, 4-pin
6 Teach-in button

Connection type

All types



4-pin, M12



See chapter Accessories

Cables and connectors

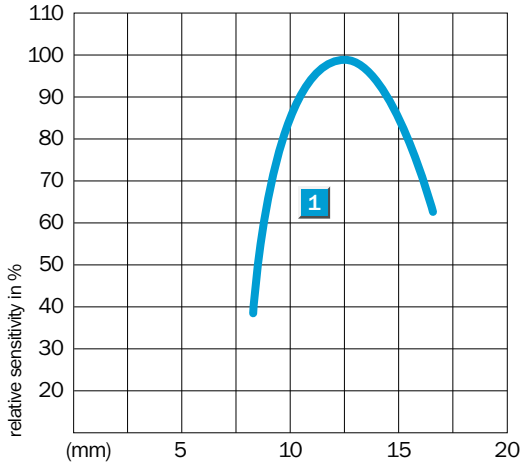
Mounting systems

Technical data	KT 3	W-P 1115	W-N 1115
Scanning distance	12.5 mm	■	■
from front edge of lens			
Scanning distance tolerance	± 2 mm	■	■
Light spot dimensions	1.5 x 6.5 mm	■	■
	1.5 x 3.5 mm		
Light source[1]; light type;	LED; red, green, blue;	■	■
Wavelength (nm)	640, 525, 470	■	■
Supply voltage V_S	24 V DC ± 20%	■	■
Residual ripple[2]	< 5 V_{PP}	■	■
Current consumption[3]	< 35 mA	■	■
Switching outputs	NPN: HIGH = V_S / LOW = < 2 V		■
	PNP: HIGH = V_S - < 2 V/ LOW = approx.	■	
Output current I_A max.	100 mA	■	■
Response time[4]	50 µs	■	■
Switching frequency[5]	To 10000/s	■	■
Time delay optional	20 ms	■	■
Teach-in input ET	PNP: Teach > 10 V...< V_S	■	
	NPN: Teach 0 V		■
Connection type	Plug 4-pin, M12	■	■
VDE protection class[6]	⧈	■	■
Enclosure rating	IP 67	■	■
Circuit protection[7]	A, B, C	■	■
Ambient temperature T_A	Operation –10 ... +55 °C	■	■
	Storage –20 ... +75 °C	■	■
Shock load	To IEC 68	■	■
Weight	Approx. 80 g	■	■
Housing	ABS	■	■
Switching threshold adjustment/	Dynamic Teach-in	■	■
Teach-in			

1) Average service life 100,000 h at T_A = + 25 °C
2) May not exceed or fall short of V_S tolerances
3) Without load
4) Signal transit time with resistive load
5) With light/dark ratio 1:1
6) Reference voltage 50 V DC
7) A = V_S connections reverse-polarity protected
B = Outputs short-circuit protected
C = Interference pulse suppression

Scanning distance

1 Scanning distance 12.5 mm



Order information

Preferred type *)	Order no.
KT 3W-P 1115	1 025 326
KT 3W-N 1115	1 025 325

*) Further types on request

KT 3G-P/N__6
KT 3W-P/N__6
KT 3L-P/N__6

Contrast Scanners

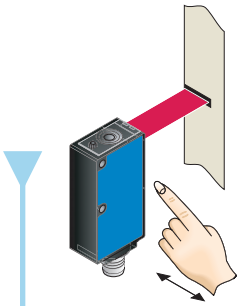
Ready, steady, go: Contrast Scanners with static Teach-in on mark and background

The proven static 2-point Teach-in is also available in the KT 3. You only need to teach on the mark and the background, and away you go. The sensor selects the optimum transmission colour (for KT 3 W) and matches the switching threshold according to the difference between mark and background. High-gloss foils are no problem, thanks to automatic gloss adjustment. The 10 kHz technology completes the superb functionality of this little wonder.

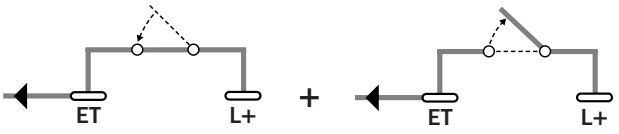
The laser version of the KT 3 is available for detecting small marks at great scanning distances. It features a small light spot, irrespective of changes in scanning distance. This leads to high repeat accuracy.

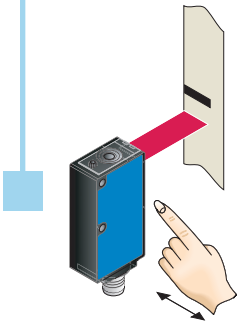
Thanks to its high switching frequency, the KT 3 laser ensures economical operation of your machine.

Teach-in: setting switching threshold

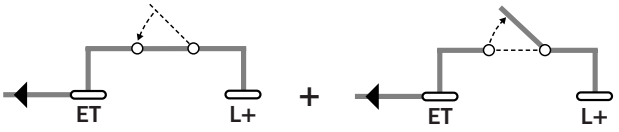


or



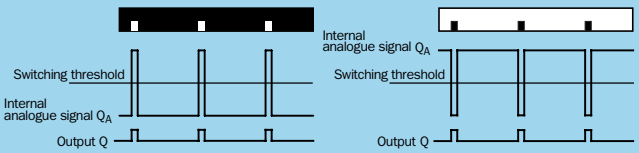


or



Status

- After the first stage of the Teach-in (longer than 1 s), the emitted light and the status indicator flash slowly which indicates that the second stage of Teach-in must be initiated.
- LED and signal strength indicator not flashing = Teach-in successfully completed.
- LED and signal strength indicator flashing rapidly = Teach-in unsuccessful.
- The optimum transmission light was selected automatically.



Notes

- Light-/dark-switching not required: equipment switches for the material to be scanned, which was under the light spot at the first Teach-in procedure (mark or background).
- The material speed must be zero during Teach-in (machine is idle).

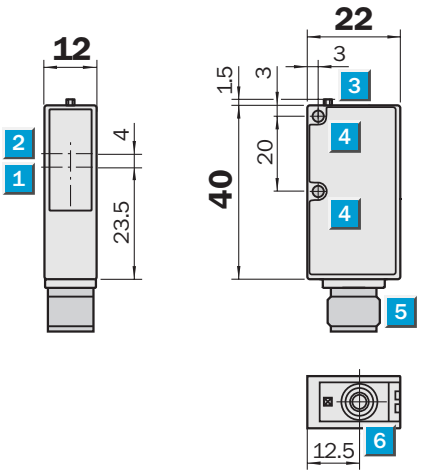
Scanning distance 12.5 mm

Contrast scanners

- Light source green or red, green, blue
- Integrated switching threshold adjustment for detection of extremely shiny objects
- Static 2-point Teach-in to mark and background via control cable or control panel on unit
- Switching frequency 10,000/s

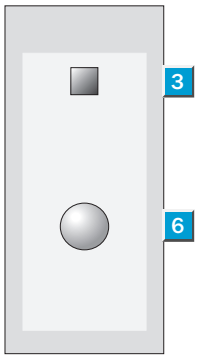
Dimensional drawing

All types



Adjustments possible

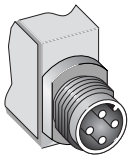
All types



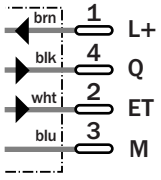
1 Axis of the sender optics
2 Axis of the receiver optics
3 LED signal strength indicator
4 Mounting hole
5 Plug M12, 4-pin
6 Teach-in button

Connection type

All types



4-pin, M12



See chapter Accessories

Cables and connectors

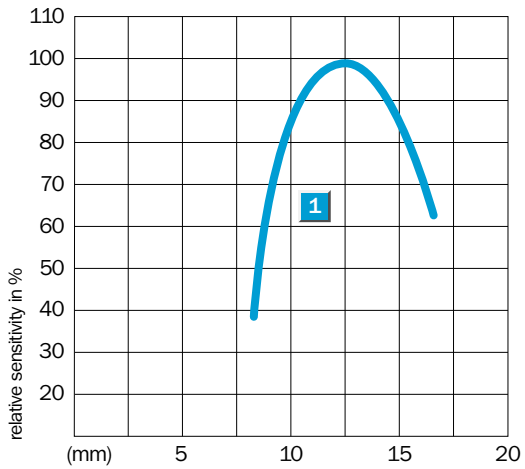
Mounting systems

Technical data	KT 3	G-P 1116	G-N 1116		W-P 1116	W-P 1126	W-N 1116				
Scanning distance	12.5 mm, ± 2 mm	■	■		■	■	■				
from front edge of lens											
Light spot dimensions	1.5 x 6.5 mm				■	■	■				
	1.5 x 3.5 mm	■	■								
Light source[1]; light type;	LED; red, green, blue;				■	■	■				
Wavelength (nm)	640, 525, 470				■	■	■				
Light source[1]; light type;	green;	■	■								
Wavelength (nm)	520	■	■								
Supply voltage V_S	24 V DC ± 20 %	■	■		■	■	■				
Residual ripple[2]	< 5 V_{PP}	■	■		■	■	■				
Current consumption[3]	< 35 mA	■	■		■	■	■				
Switching outputs	NPN: HIGH = V_S / LOW = < 2 V		■				■				
	PNP: HIGH = V_S - < 2 V/	■			■	■					
	LOW = approx. 0 V										
Output current I_A max.	100 mA	■	■		■	■	■				
Response time[4]	50 µs	■	■		■	■	■				
Switching frequency[5]	To 10 000/s	■	■		■	■	■				
Time delay	No timing element	■	■		■		■				
	Deactivation delay, ... 20 ms					■					
Teach-in input ET	PNP: Teach > 10 V ... < V_S	■			■	■					
	NPN: Teach 0 V		■				■				
Connection type	Plug 4-pin, M12	■	■		■	■	■				
VDE protection class[6]	⧈	■	■		■	■	■				
Enclosure rating	IP 67	■	■		■	■	■				
Circuit protection[7]	A, B, C	■	■		■	■	■				
Ambient temperature T_A	Operation –10 ... +55 °C	■	■		■	■	■				
	Storage –20 ... +75 °C	■	■		■	■	■				
Shock load	To IEC 68	■	■		■	■	■				
Weight	Approx. 80 g	■	■		■	■	■				
Housing	ABS (plastic)	■	■		■	■	■				
Switching threshold adjustment/	Static Teach-in	■	■		■	■	■				
Teach-in											

1) Average service life 100,000 h at T_A = + 25 °C
2) May not exceed or fall short of V_S tolerances
3) Without load
4) Signal transit time with resistive load
5) With light/dark ratio 1:1
6) Reference voltage 50 V DC
7) A = V_S connections reverse-polarity protected
B = Outputs short-circuit protected
C = Interference pulse suppression

Scanning distance

1 Scanning distance 12.5 mm



Order information

Preferred type *)	Order no.
KT 3G-P 1116	1 019 446
KT 3G-N 1116	1 019 445
KT 3W-P 1116	1 019 338
KT 3W-P 1126	1 022 933
KT 3W-N 1116	1 019 337

*) Further types on request

Scanning distance
20 ... 60 mm

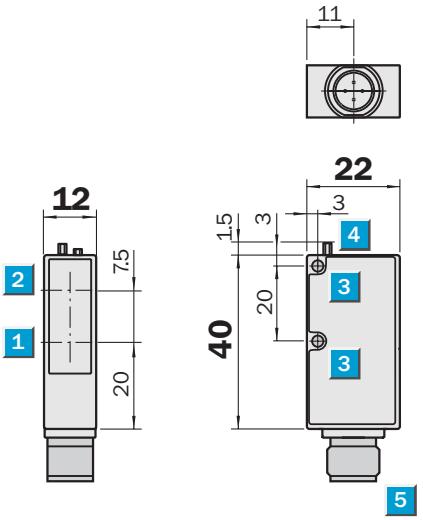
Contrast scanners

- Light source laser
- Automatic switching threshold adjustment for detection of extremely shiny objects
- Static Teach-in to mark and background via control cable and control panel
- Switching frequency 1,500/s
- M12 plug

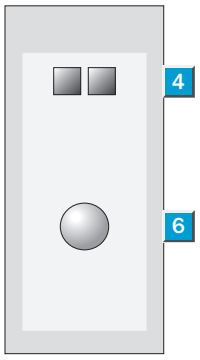
CE CDRH

See chapter Accessories
Cables and connectors
Mounting systems

Dimensional drawing
All types

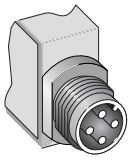


Adjustments possible
All types

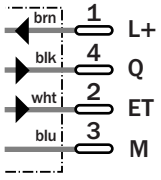


1 Axis of the sender optics
2 Axis of the receiver optics
3 Through hole Ø 3.2 mm
4 Operating signal green; signal strength indicator yellow
5 Plug M12 or M8, 4-pin
6 Teach-in button

Connection type
All types



4-pin, M12

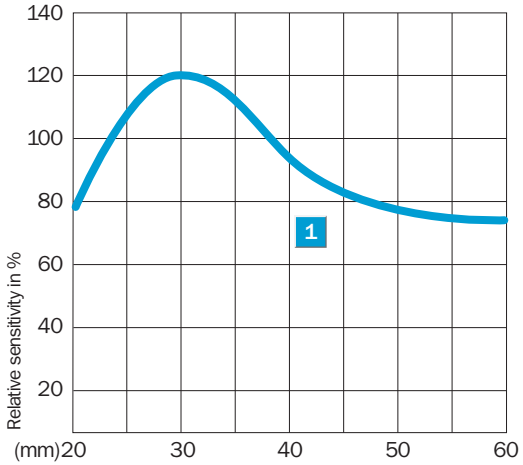


Technical data	KT 3	L-P 3216	L-N 3216
Scanning distance	20 ... 60 mm	■	■
from front edge of lens			
Light spot dimensions	At a nominal distance of 40 mm	■	■
	1 x 2 mm longitudinal		
Light source[1]	Laser class 2	■	■
Wavelength (nm)	655	■	■
Supply voltage V_S	10 ... 30 V DC	■	■
Residual ripple[2]	< 5 V_{PP}	■	■
Current consumption[3]	< 35 mA	■	■
Switching outputs	PNP: HIGH = V_S - < 2 V/	■	
	LOW = approx. 0 V		
	NPN: HIGH = V_S / LOW = < 2 V		■
Output current I_A max.	100 mA	■	■
Response time[4]	400 µs	■	■
Switching frequency[5]	1 500/s	■	■
Time delay, optional	20 ms	■	■
Teach-in input ET	PNP: Teach U < 2 V	■	
	NPN: Teach U > 8 V		■
Connection type	Plug 4-pin, M12	■	■
VDE protection class[6]	⧈	■	■
Enclosure rating	IP 67	■	■
Circuit protection[7]	A, B, C	■	■
Ambient temperature T_A	Operation –10 ... +55 °C	■	■
	Storage –20 ... +75 °C	■	■
Shock load	To IEC 68	■	■
Weight	Approx. 80 g	■	■
Housing	ABS	■	■

1) Average service life 50,000 h at T_A = + 25 °C
2) May not exceed or fall short of V_S tolerances
3) Without load
4) Signal transit time with resistive load
5) With light/dark ratio 1:1
6) Reference voltage 50 V DC
7) A = V_S connections reverse-polarity protected
B = Oututs short-circuit protected
C = Interference pulse suppression

Scanning distance

1 Scanning distance 20 ... 60 mm



Order information

Preferred type *)	Order no.
KT 3L-P 3216	1 026 244
KT 3L-N 3216	1 026 245

*) Further types on request

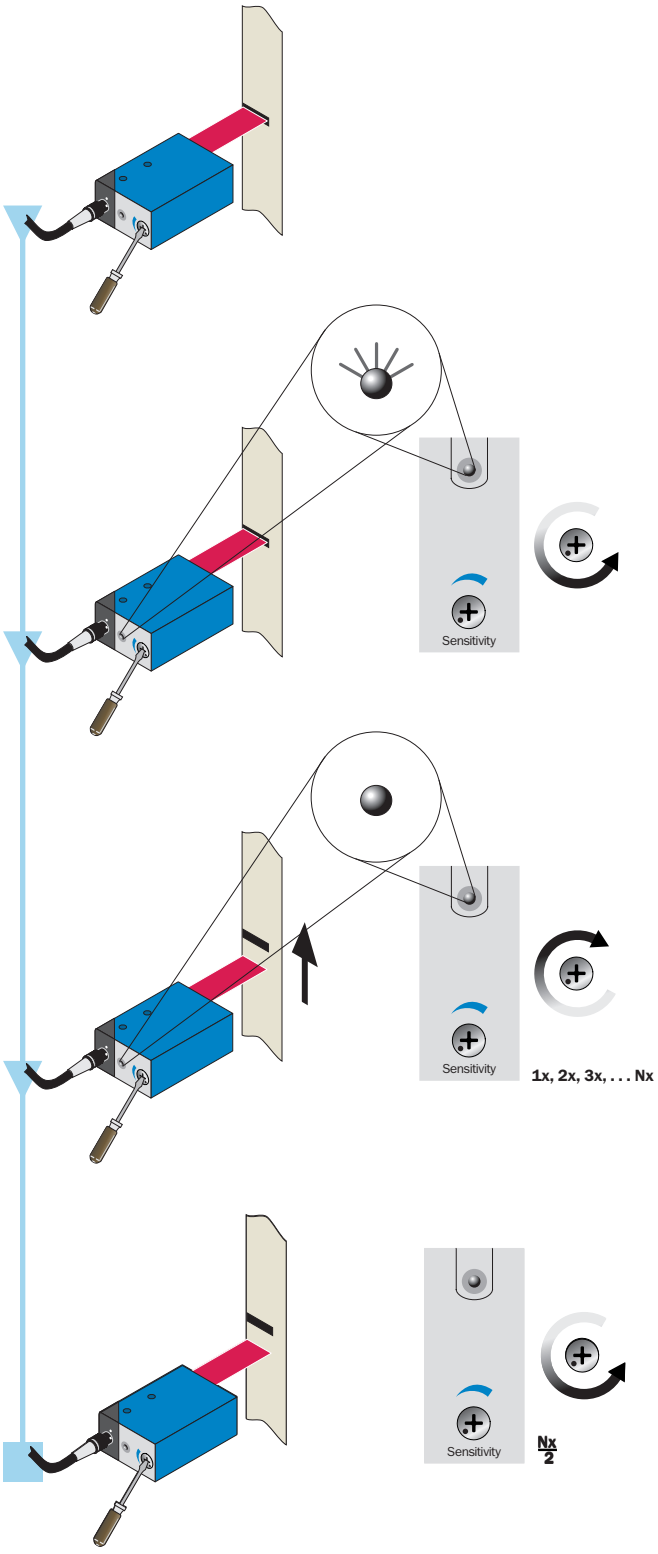
Contrast scanner with a good price/performance ratio

The KT 2 contrast scanner can be used in many industrial sectors in which print marks can control work processes. Dependent on the gray value difference, you can select between sensors with red or green transmission light. The manual switching threshold adjustment provides smooth operation and a high degree of detection reliability. Setting and resetting from dark to light marks and back is easy and simple via control wire.

Contrast scanners of the KT 2 series with compact metal housing are an inexpensive alternative for standard applications with only slight performance requirements for contrast detection due to simple colouring of the print marks.

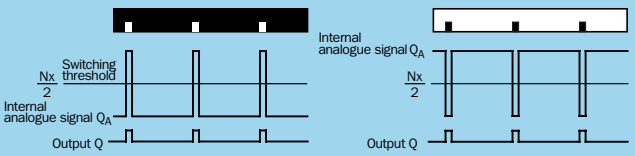
In addition to a 5-pin M12 standard plug, the KT 2 contrast scanner can be attached using a dovetail and additional mounting holes for convenient and flexible electric and mechanic integration in many different environments.

Setting switching threshold



Status

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



Note

- The material speed must be zero during Teach-in (machine is idle).

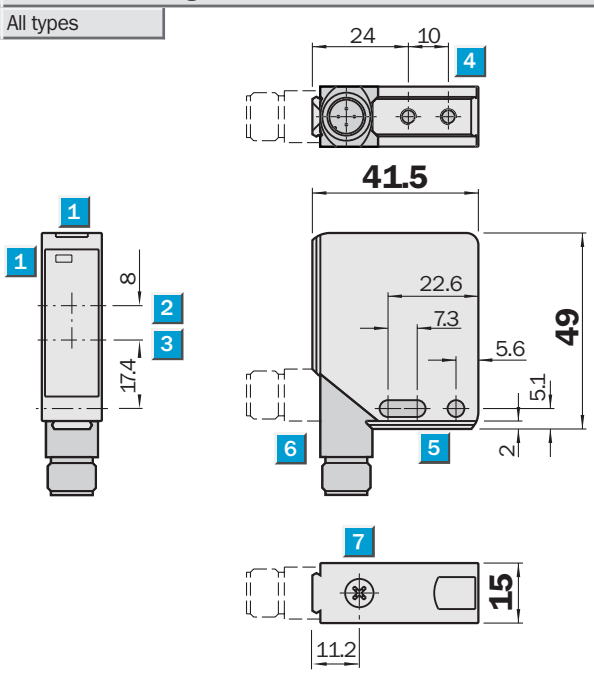
Scanning distance 13.5 mm

Contrast scanners

- Red or green light transmitter
- Sensitivity adjustable
- Light- or dark-switching selectable via control cable
- Switching frequency 10 000/s
- NPN and PNP switching output

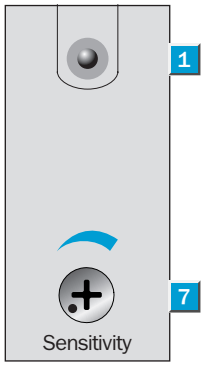
Dimensional drawing

All types



Adjustments possible

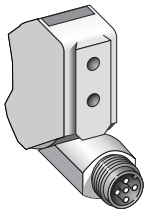
All types



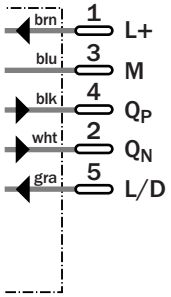
1 LED signal strength indicator
2 Optical axis – receiver
3 Optical axis – sender
4 M4 mounting holes, 4 mm deep
5 Through hole ø 4.2 mm
6 M12 plug (rotatable through 90°)
7 Sensitivity adjustment

Connection type

All types



5-pin, M12



See chapter Accessories

Cables and connectors

Mounting systems

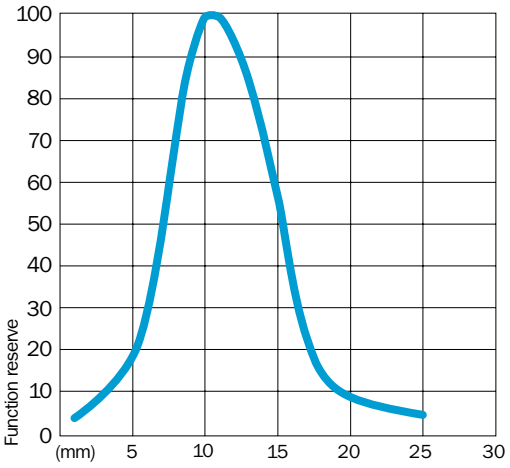
Technical data	KT 2	R-2B 3711	G-2B 3711	R-2B 3721
Scanning distance	13.5 mm	■	■	■
from front edge of lens				
Light spot dimensions	2 mm, round	■	■	■
Light source[1]; light type;	LED; red:	■		■
Wavelength (nm)	660	■		■
Light source[1]; light type;	LED; green;		■	
Wavelength (nm)	525		■	
Supply voltage V_S	10 ... 30 V DC[2]	■	■	■
Residual ripple[3]	< 5 V_{PP}	■	■	■
Current consumption[4]	< 80 mA	■	■	■
Switching outputs	light-/dark-switching	■	■	■
	PNP: HIGH = V_S – < 2.9V/	■	■	■
	LOW = approx. 0 V			
	NPN: HIGH = V_S /LOW = < 1.5 V	■	■	■
Output current I_A max.	100 mA	■	■	■
Response time[5]; switching frequency[6]	≤ 300 µs; 10 kHz	■	■	■
Time delay	Deactivation delay, ... 20 ms			■
L/D input, light-/dark-switching	PNP: dark = > 10 V ... < V_S	■	■	■
	light = 0 V or unswitched	■	■	■
	NPN: dark = 0 V	■	■	■
	light = V_S or unswitched	■	■	■
Connection type	Plug, M12, 5-pin	■	■	■
VDE protection class[7]	⧈	■	■	■
Enclosure rating	IP 67	■	■	■
Circuit protection[8]	A, B, C	■	■	■
Ambient temperature T_A	Operation –10 ... +55 °C	■	■	■
	Storage –25 ... +75 °C	■	■	■
Shock load	To IEC 68	■	■	■
Weight	Approx. 400 g	■	■	■
Housing	Cast zinc	■	■	■

1) Average service life 100,000 h at T_A = + 25 °C
2) Limit values
3) May not exceed or fall short of V_S tolerances
4) Without load
5) Signal transit time with resistive load
6) With light/dark ratio 1:1
7) Reference voltage 50 V DC
8) A = V_S connections reverse-polarity protected
B = Outputs short-circuit protected
C = Interference pulse suppression

Scanning distance

Scanning distance SD, adjustable	13.5 mm

Object shown with 90 % remission (based on standard white acc. to DIN 5033)



Order information

Preferred type *)	Order no.
KT 2R-2B 3711	1 016 112
KT 2G-2B 3711	1 016 115
KT 2R-2B 3721	1 016 114

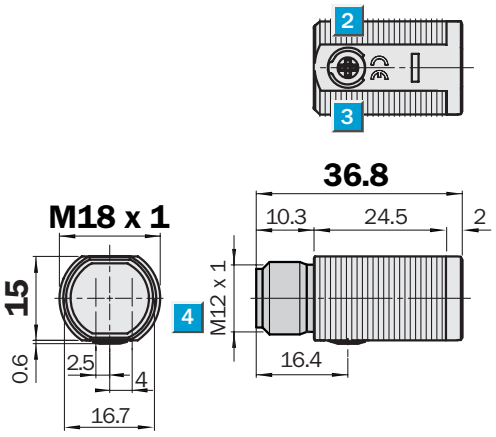
*) Further types on request

Scanning distance 23.5 mm

Contrast scanners

- Light source white: for a wide range of application
- Easy mounting thanks to accessories
- LED indicator: Switching output active and operation reserve
- Light or dark switching

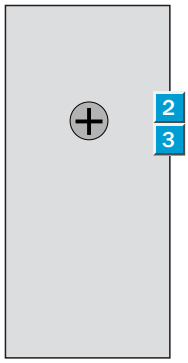
Dimensional drawing



Adjustments possible

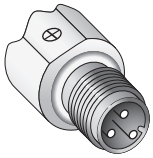
All types

1 M12 plug, 3-pin
2 Sensitivity control 270°
3 Yellow LED indicator

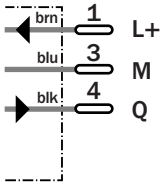


Connection type

KT1M-P1
KT1M-P2
KT1M-N1
KT1M-N2



3-pin, M12



See chapter accessories

Cables and connectors
Mounting systems

Technical data	KT1M-	P1	P2	N1	N2
Scanning distance	23.5 mm	■	■	■	■
Scanning distance tolerance	± 1.5 mm	■	■	■	■
Light spot diameter	Approx. core 2 mm (5 mm)	■	■	■	■
Light source[1]; Light type;	LED; white;	■	■	■	■
wavelenght (nm)	450 ... 650	■	■	■	■
Threshold setting	Potentiometer 270°, manually	■	■	■	■
Light reception indicator	Yellow LED	■	■	■	■
Supply voltage V_S	10 ... 30 V DC [2]	■	■	■	■
Residual ripple [3]	≤ 5 V_{PP}	■	■	■	■
Current consumption [4]	≤ 20 mA	■	■	■	■
Switching outputs	PNP: HIGH = V_S – 2.9 V/LOW = 0 V	■	■		
	NPN: HIGH = V_S/LOW = 2.9 V			■	■
Switching mode	Light-switching	■		■	
	Dark-switching		■		■
Output current I_A max.	≤ 100 mA	■	■	■	■
Response time [5]	1.25 ms	■	■	■	■
Switching frequency [6]	400/s	■	■	■	■
Connecting type	Plug M12, 3-pin	■	■	■	■
VDE protection class [7]	⧈	■	■	■	■
Enclosure rating	IP 67	■	■	■	■
Circuit protection [8]	A, B, C	■	■	■	■
Ambient temperature T_A	Operation –10 °C ... +55 °C	■	■	■	■
	Storage –25 °C ... +70 °C	■	■	■	■
Weight	Approx. 7 g	■	■	■	■
Housing material	Housing: ABS	■	■	■	■
	Optic: PMMA	■	■	■	■

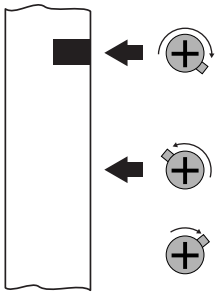
1) Average service life 100,000 h at T_A = + 25 °C
2) Limit values
3) May not exceed or fall short of V_S tolerances
4) Without load
5) Signal transit time with resistive load
6) With light/dark ratio 1:1
7) Reference voltage 50 V DC
8) A = V_S connections reverse-polarity protected
B = Interference pulse suppression
C = Outputs overcurrent and short-circuit protected

Teach-in, dark operation (D.ON)

Truth table

Light remission	Output	LED indicator
Yes (background)	inactive	on or blinks
No (mark)	active	off

Threshold setting



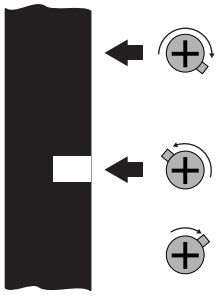
1. Position sensor on mark.
   Start at 0° (light source off) and turn until LED flashes or until 270°.
2. Position sensor on background.
   Turn back until LED off.
3. Turn between point 1 and 2.

Teach-in, light operation (L.ON)

Truth table

Light remission	Output	LED indicator
Yes (mark)	active	on or blinks
No (background)	inactive	off

Threshold setting



1. Position sensor on background.
   Start at 0° (light source off) and turn until LED flashes or until 270°.
2. Position sensor on mark.
   Turn back until LED off.
3. Turn between point 1 and 2.

Order information

Type	Order no.
KT1M-P1	1 027 306
KT1M-P2	1 027 307
KT1M-N1	1 027 304
KT1M-N2	1 027 305