△ **Leuze electronic**

KRTW 55   White light contrast scanner

en 04-2012/11   50112062-01

13mm

10 - 30 V
DC

🔷 **IO-**Link

- White light transmitter
- Various teach variants
- Short response time
- Switching threshold adjustment via EasyTune
- Level adaptation for glossy objects
- 316L stainless steel housing in WASH-DOWN-Design
- Enclosed optics design prevents bacterial carry-overs
- ECOLAB and Clean*Proof+* tested
- Paperless device identification
- Scratch resistant and non-diffusive plastic front cover
- Keyboard lockout
- Remote teach via cable
- Pulse stretching 20ms

CE   c(UL)us LISTED   ECOLAB Clean*Proof+*

IEC 60947...   IEC 60947...   IP 69K IP 67   WASH DOWN

Accessories:
(available separately)

- Mounting systems (BT 3…)
- Cable with M8 or M12 connector (K-D …)

We reserve the right to make changes • DS_KRTW55_en_50112062-01.fm

Dimensioned drawing

- **A** Green indicator diode
- **B** Yellow indicator diode
- **C** Light spot orientation horizontal
- **D** Light spot orientation vertical
- **E** Transmitter
- **F** Receiver
- **G** Optical axis
- **H** Teach button

Electrical connection

Connector, 4-pin

10−30V DC +	1	br/BN
IN	2	ws/WH
GND	3	bl/BU
OUT 1	4	sw/BK

Specifications

Optical data
Scanning range [1]	13 mm ± 2 mm
Light spot dimensions	1.5 mm x 4 mm (at a distance of 13 mm)
Light spot orientation	vertical or horizontal (see dimensioned drawing)
Light source [2]	white LED (optimized through YellowBoost)
Wavelength	430 … 700 nm

Sensor operating modes
IO-Link	COM2 (38.4 kBaud)
SIO	standard push-pull
Dual Core	no

Timing of the sensor
Internal switching frequency	10 kHz
Internal response time	50 µs
Response jitter, internal	20 µs
Repeatability [3]	0.02 mm
Delay before start-up	≤ 300 ms
Conveyor speed during teach	≤ 0.1 m/s for a mark width of 1 mm
Teach process	static 1-point, static 2-point or dynamic 2-point
Teach delay	≤ 10 ms

Timing of the outputs
Response time	pin 4	IO-Link COM2: acc. to IO-Link specification (typically 2.5 ms)
		SIO: 50 µs

Electrical data
Operating voltage U_B [4]	with SIO	10 … 30 VDC (incl. residual ripple)
	with COM2	18 … 30 VDC (incl. residual ripple)
Residual ripple		≤ 15 % of U_B
Output/function	…/2…	pin 4: GND if mark detected
	…/4…	pin 4: U_B if mark detected
	…/6…	pin 4: IO-Link SIO mode, U_B if mark detected
	…/6…	pin 4: IO-Link COM2 mode, see configuration file IODD
Signal voltage high/low		≥ (U_B-2V)/≤ 2V
Output current		max. 100 mA
Open-circuit current		≤ 20 mA

Indicators
Green LED in continuous light	ready
Green and yellow LED flashing at 3 Hz	teach event active
Green and yellow LED flashing at 8 Hz	teaching error
Green LED off and yellow LED flashing at 8 Hz	sensor error
Yellow LED in continuous light	mark detected (dependent on the teach sequence)
Transmitter LED, white flashing at 8 Hz	teaching error

Mechanical data
Housing	AISI 316L stainless steel, DIN X2CrNiMo17132, W.No1.4404
Housing design	WASH-DOWN-Design
Housing roughness [5]	Ra ≤ 2.5
Connector	AISI 316L stainless steel, DIN X2CrNiMo17132, W.No1.4404
Optics cover	coated plastic (PMMA), scratch resistant and non-diffusive
Operation	plastic (TPV-PE), non-diffusive
Weight	with M8 connector: 40 g
	with 200 mm cable and M12 connector: 60 g
	with 5000 mm cable: 110 g
Connection type	M8 connector, 4-pin,
	0.2 m cable with M12 connector, 4-pin
	5 m cable, 4 x 0.20 mm²

Environmental data
Ambient temp. (operation/storage) [6]	-30 °C … +70 °C/-30 °C … +70 °C
Protective circuit [7]	2, 3
VDE safety class [8]	III
Protection class [9]	IP 67, IP 69K
Environmentally tested acc. to	ECOLAB, Clean*Proof*+
LED class	1 (in accordance with EN 60825-1)
Standards applied	IEC 60947-5-2
Certifications	UL 508 [4]
Chemical resistance	tested in accordance with ECOLAB and Clean*Proof*+ (see Remarks)

Options
Input pin 2
Function characteristics	keyboard lockout / line teach / pulse stretching
Input active/not active	≥ 8V/≤ 2V or not connected

Output pin 4
|		
Line teach active	for SIO	2 Hz at the switching output
	for COM2	see configuration file IODD
Error after line teach	for SIO	2 Hz at the switching output
	for COM2	see configuration file IODD

1) Scanning range: recommended range with performance reserve
2) Average life expectancy 100,000h at an ambient temperature of 25°C
3) At conveyor speed 1 m/s
4) For UL applications: for use in class 2 circuits according to NEC only
5) Typical value for the stainless steel housing
6) Operating temperatures of +70°C permissible only briefly (≤ 15min)
7) 2=polarity reversal protection, 3=short circuit protection for all transistor outputs
8) Rating voltage 50V
9) IP 69K only in combination with M12 connector

Tables

Diagrams

Remarks

- **Approved purpose**:
  This product may only be used by qualified personnel and must only be used for the approved purpose. This sensor is not a safety sensor and is not to be used for the protection of persons..

- With glossy objects, the sensor is to be fastened at an inclination of approx. 10° relative to the object surface.
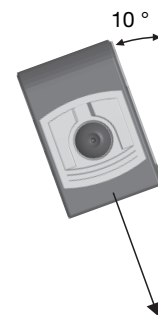
- For applications in wet environment, the customer must protect the M8-connection against humidity.

Order guide

Selection table		KRTW 55/6.1121-S8 Part no. 50111641	KRTW 55/4.1121-S8 Part no. 50111642	KRTW 55/4.1121,200-S12 Part no. 50110602	KRTW 55/2.1121-S8 Part no. 50110601	KRTW 55/2.1121,200-S12 Part no. 50110603	KRTW 55/4.1121,5000 Part no. 50114075
Equipment ↓	Order code →						
Transmitter color	white light	●	●	●	●	●	●
	RGB (red, green, blue)						
	laser-generated red light						
Light spot orientation	vertical	●	●	●	●	●	●
	horizontal						
	round						
Output (OUT 1)	PNP transistor output		●	●			●
	NPN transistor output				●	●	
	push-pull switching output	●					
	IO-Link COM2	●					
Input (IN)	teach input	●	●	●	●	●	●
Connection	M8 connector, metal — 4-pin	●	●		●		
	200 mm cable with M12 connector — 4-pin			●		●	
	cable 5000 mm, 4-wire						●
Teach process	static 1-point						
	static 2-point	●	●	●	●	●	●
	dynamic 2-point						
Response time / Switching frequency	50 µs / 10 kHz	●	●	●	●	●	●
	83 µs / 6 kHz						
	125 µs / 4 kHz						
Configuration	switching threshold adjustment with EasyTune via teach button	●	●	●	●	●	●
	remote teach, keyboard lockout and pulse stretching via pin 2	●	●	●	●	●	●
	teach level 1, teach-level 2 and pulse stretching via teach button	●	●	●	●	●	●

IO-Link process data

The sensor transmits 2 bytes to the master.

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0	Assignment	Default settings
Data bit																	
																Switching output	0 = no mark, 1 = mark detected
																Not assigned	Free
																Sensor operation	0 = off, 1 = on
																Switching threshold LSB	Value range 0 … 31 (0 … 100 % in approx. 3 % steps)
																Switching threshold	
																Switching threshold	0 % = min. switching threshold
																Switching threshold	100 % = max. switching threshold
																Switching threshold MSB	
																Active transmitter LSB	00 = red, 01 = green or white,
																Active transmitter MSB	10 = blue, 11 = all colors on (teach-in active)
																Not assigned	Free
																Measurement value LSB	Value range 0 … 31 (0 … 100 % in approx. 3 % steps)
																Measurement value	
																Measurement value	0 % = min. signal level
																Measurement value	100 % = max. signal level
																Measurement value MSB	

Additional information on the IO-Link service data is available on request.

Static 2-point teach

Suitable for manual positioning of the marks (availability dependent on sensor type).

Switching threshold in center:

| Position the background. | Press teach button for 2 … 7 s and release.

2 … 7s

Value for background is accepted. | LEDs flash simultaneously.

Simultaneous flashing | Position the mark. | Briefly press teach button.

Value for mark is accepted. | Sensor in RUN mode. Yellow LED illuminates.

Switching threshold set in the center. |

Switching threshold near the mark:

| Position the background. | Press teach button for 7 … 12 s and release.

7 … 12s

Value for background is accepted. | LEDs flash alternatingly.

Alternating flashing | Position the mark. | Briefly press teach button.

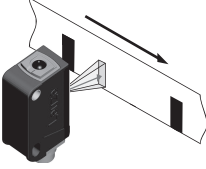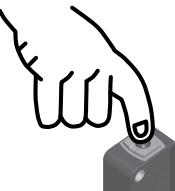Value for mark is accepted. | Sensor in RUN mode. Yellow LED illuminates.
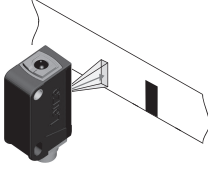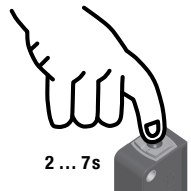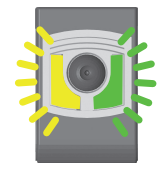
Switching threshold is set near the mark. |

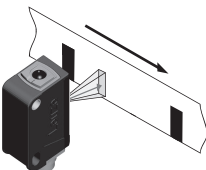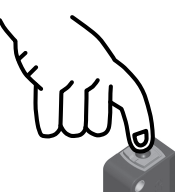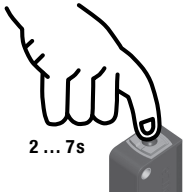| KRTW 55	White light contrast scanner
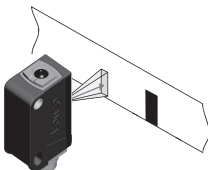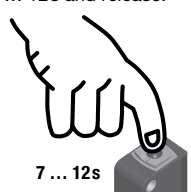
Dynamic 2-point teach

Suitable for marks moved during automated machine processes (availability dependent on sensor type).

Switching threshold in center

Position the background.	Press teach button for 2 … 7s and release.	LEDs flash simultaneously.	Allow marks to pass through dynamically.	Briefly press teach button.	Sensor in RUN mode. Yellow LED is off.
	2 … 7s				
	Measurement window opens.	**Simultaneous flashing**		Measurement window closes.	Switching threshold set in the center.

Switching threshold near the mark

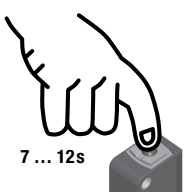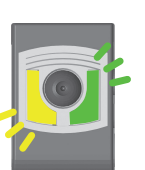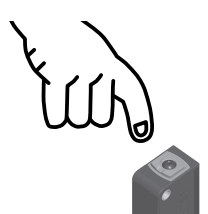| Position the background.	Press teach button for 7 … 12s and release.	LEDs flash alternatingly.	Allow marks to pass through dynamically.	Briefly press teach button.	Sensor in RUN mode. Yellow LED is off.
	7 … 12s				
	Measurement window opens.	**Alternating flashing**		Measurement window closes.	Switching threshold is set near the mark.

Static 1-point teach

Suitable for detecting all marks outside of the reference value (availability dependent on sensor type).
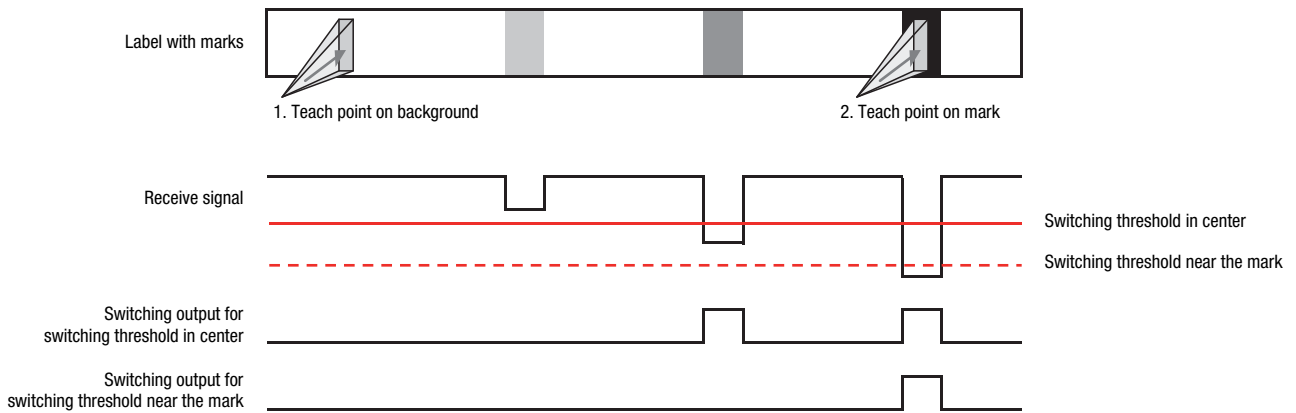
Standard sensitivity

Position the reference value.	Press teach button for 2 … 7s.	LEDs flash simultaneously.	Release teach button.	Sensor in RUN mode. Yellow LED is off.
	2 … 7s	**Simultaneous flashing**	Value is accepted.	Standard sensitivity is set.

High sensitivity

Position the reference value.	Press teach button for 7 … 12s.	LEDs flash alternatingly.	Release teach button.	Sensor in RUN mode. Yellow LED is off.
	7 … 12s	**Alternating flashing**	Value is accepted.	High sensitivity is set.

Switching threshold diagrams

Static 2-point teach

Label with marks

1. Teach point on background   2. Teach point on mark

Receive signal

Switching threshold in center

Switching threshold near the mark

Switching output for
switching threshold in center

Switching output for
switching threshold near the mark

Dynamic 2-point teach

Label with marks

Open measurement window   Close measurement window

Receive signal

Switching threshold in center

Switching threshold near the mark

Switching output for
switching threshold in center

Switching output for
switching threshold near the mark

Static 1-point teach

Label with marks

Teach reference value

Receive signal

Standard
sensitivity

High
sensitivity

Switching output for
standard sensitivity

Switching output for
high sensitivity

Pulse stretching option

Switching pulse stretching on or off:

Press the teach button longer than 12s.	Only the green LED flashes.	Release teach button.	Change is displayed and accepted automatically after 2s. Sensor in RUN mode.

> 12s

after 2s

After 2s the yellow LED is back to normal operation, displaying the state of the switching output.

After releasing the teach button, the yellow LED displays the new pulse stretching status for 2s:
yellow LED on: pulse stretching ON
yellow LED off: pulse stretching OFF

## "EasyTune" option - fine tuning of the switching threshold

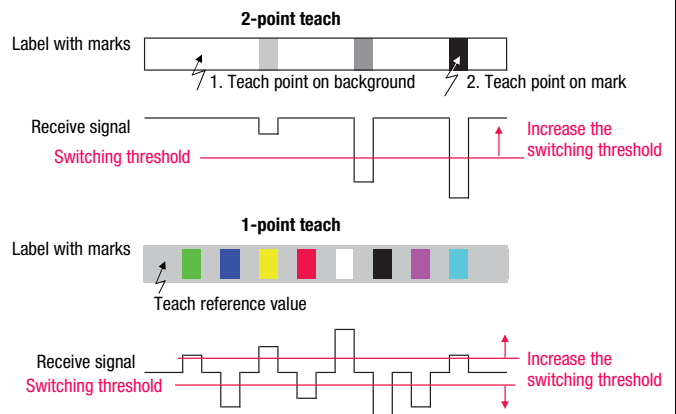Following power-on and completed teach event: Green LED illuminates continuously (ready)
Yellow LED on/off continuously (mark detected/not detected)

Increasing the switching threshold:

Long press of the button = large force expenditure = increase switching threshold

Each press of the button with a duration between 200ms and 2s increments the switching threshold.
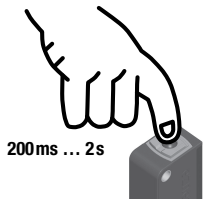
200ms … 2s

Green LED flashes **briefly once**

A press of the button is acknowledged by a single, brief **flash of the green LED** – the new switching threshold is now valid.

2-point teach

Label with marks

1. Teach point on background   2. Teach point on mark

Receive signal

Switching threshold

Increase the switching threshold

1-point teach

Label with marks

Teach reference value

Receive signal

Switching threshold

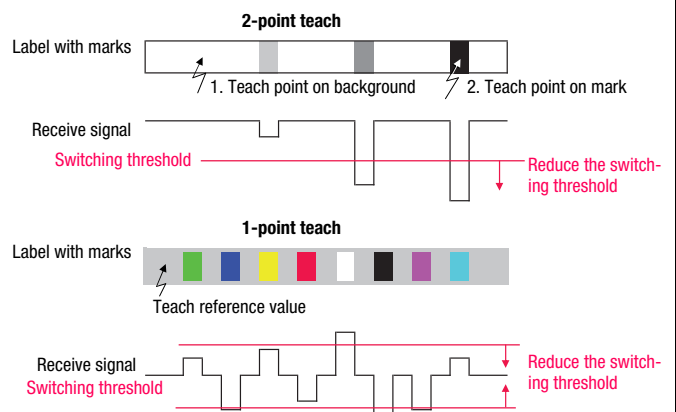Increase the switching threshold

Reducing the switching threshold:

Short press of the button = small force expenditure = reduce switching threshold

Each press of the button with a duration between 2ms and 200ms decrements the switching threshold.
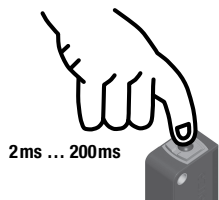
2ms … 200ms

Green LED flashes **briefly once**

A press of the button is acknowledged by a single, brief **flash of the green LED** – the new switching threshold is now valid.

2-point teach

Label with marks

1. Teach point on background   2. Teach point on mark

Receive signal

Switching threshold

Reduce the switching threshold

1-point teach

Label with marks

Teach reference value

Receive signal

Switching threshold

Reduce the switching threshold

If the upper or lower end of the adjustment range is reached, the green and yellow LEDs flash at a considerably higher frequency of 8Hz for the duration of one second.
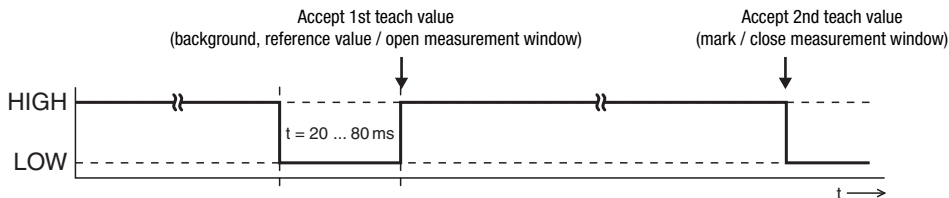
Sensor adjustments via the input IN (Pin 2)

The following description applies to PNP switching logic!
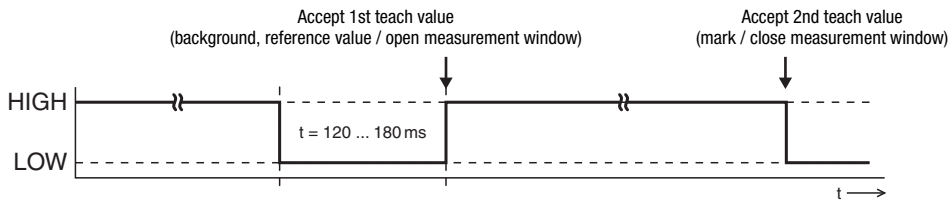
Signal level LOW $\leq$ 2V

Signal level HIGH $\geq$ (U_B-2V)
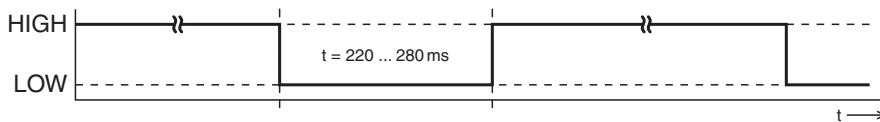
With the NPN models, the signal levels are inverted!

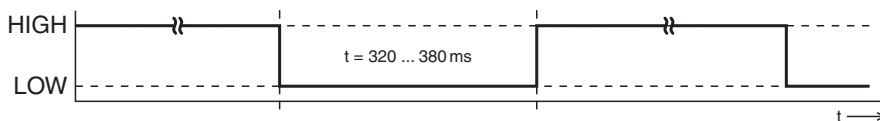### Switching threshold in center / standard sensitivity

Accept 1st teach value
(background, reference value / open measurement window)

Accept 2nd teach value
(mark / close measurement window)

t = 20 ... 80 ms

Switching threshold near the mark / high sensitivity

Accept 1st teach value
(background, reference value / open measurement window)

Accept 2nd teach value
(mark / close measurement window)

t = 120 ... 180 ms

Pulse stretching ON

t = 220 ... 280 ms

Pulse stretching OFF

t = 320 ... 380 ms

Locking the teach button via the input IN (Pin 2)

A **static HIGH signal** ($\geq$ 20ms) at the teach input locks the teach button on the sensor if required, such that no manual operation is possible (e.g., protection from erroneous operation or manipulation).

If the teach input is not connected or if there is a static low signal, the button is unlocked and can be operated freely.