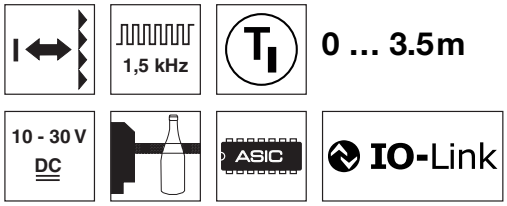
PRK3CT Retro-reflective photoelectric sensors with polarization filter



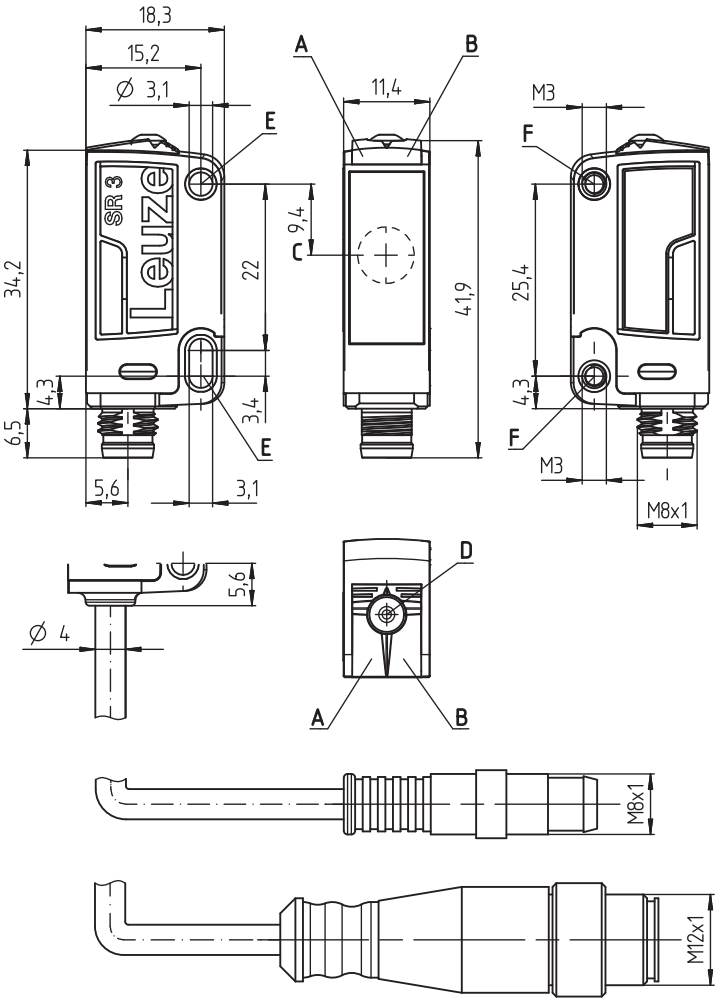
- Polarized retro-reflective photoelectric sensor with autocollimation optics and visible red light
- Particularly suited for highly transparent bottles (PET and glass)
- Small and compact construction with robust plastic housing, degrees of protection IP 67 and IP 69K, tested in accordance with Ecolab for industrial application
- Short response time and low jitter for the detection of fast events
- ***NEW***: Automatic contamination compensation (tracking function) for longer intervals between cleanings
- ***NEW***: Variant with a second switching output in place of the teach input
- ***NEW***: Housing variant with two integrated M3 metal threaded sleeves
- ***NEW***: Housing variant with integrated slotted-hole mounting sleeve made of metal

Accessories:

(available separately)

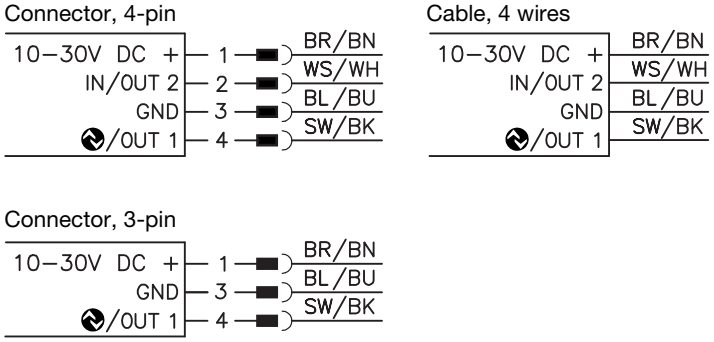
- Mounting systems (BT …)
- Cables with M8 or M12 connector (K-D …)
- Reflectors / reflective tapes
- IO-Link master set
  SET MD12-US2-IL1.1 + accessories - diagnostics set (part no. 50121098)

Dimensioned drawing



A Green indicator diode
B Yellow indicator diode
C Optical axis
D Teach button
E Mounting sleeve (standard)
F Threaded sleeve (PRK3C**.B**…)

Electrical connection



en 01-2016/07 50130059

Technical data

Optical data

Typ. operating range limit (TK(S) 100 x 100) [1]	0 … 3.5m
Operating range [2]	see tables
Light source [3]	LED (modulated light)
Wavelength	635nm (visible red light, polarized)

Sensor operating modes

IO-Link	COM2 (38.1kBaud, Frame 2.5, Vers. 1.1, min. cycle time 2.3 ms)
SIO	is supported
Configuration	direct configuration/system commands; no data storage

Timing

Switching frequency	1,500Hz
Response time	0.33ms [4]
Response jitter	110µs
Readiness delay	≤ 300ms

Electrical data

Operating voltage U_B [5]	10 … 30VDC (incl. residual ripple)
Residual ripple	≤ 15% of U_B
Open-circuit current	≤ 15mA
Switching output	see part number code on page 3
Function	light/dark switching, adjustable
Signal voltage high/low	≥ (U_B-2V)/≤ 2V
Output current	max. 100mA [6]
Operating range	setting via teach-in

Indicators

Green LED	ready
Yellow LED	light path free
Yellow LED, flashing	light path free, no function reserve

Mechanical data

Housing	plastic (high-strength PC-ABS); 2x diecast zinc mounting sleeves or 2x M3 brass threaded sleeves
Optics cover	plastic (PMMA)
Weight	with connector: 10g with 200mm cable and connector: 20g with 2m cable: 50g
Connection type	cable 2m o 5m (cross section 4x0.20mm²), connector M8, metal, cable 0.2m with connector M8 or M12

Environmental data

Ambient temp. (operation/storage)	-40°C … +60°C [7]/-40°C … +70°C
Protective circuit [8]	2, 3
VDE safety class	III
Degree of protection	IP 67 and IP 69K
Light source	exempt group (in acc. with EN 62471)
Standards applied	IEC 60947-5-2
Certifications	UL 508, CSA C22.2 No.14-13 [5] [9]

Additional functions

Teach-in input/activation input

Transmitter active/not active	≥ 0.65 * U_B/≤ 0.35 * U_B
Activation/disable delay	≤ 1ms
Input resistance	20kΩ

1) Typ. operating range limit: max. attainable range without function reserve
2) Operating range: recommended range with function reserve
3) Average life expectancy 100,000h at an ambient temperature of 25°C
4) For short decay times, an ohmic load of approx. 5kOhm is recommended
5) For UL applications: use is permitted exclusively in Class 2 circuits according to NEC
6) Sum of the output currents for both outputs, 50mA for ambient temperatures > 40°C
7) Permissible operating temperature range during IO-Link operation: -10°C to +40°C
8) 2=polarity reversal protection, 3=short circuit protection for all transistor outputs
9) These proximity switches shall be used with UL Listed Cable assemblies rated 30V, 0.5A min, in the field installation, or equivalent (categories: CYJV/CYJV7 or PVVA/PVVA7)

Tables

Reflectors			Operating range
1	TK(S)	100x100	0 … 3.0m
2	TKS	40x60.1	0 … 2.0m
3	MTKS	50x50.1	0 … 1.3m
4	REF 6-A-	50x50	0 … 1.2m
5	TKS	20x40.1	0 … 1.0m

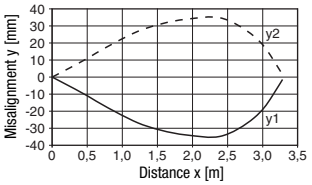
1	0			3	3.6
2	0		2.0	2.4	
3	0		1.3	1.6	
4	0		1.2	1.4	
5	0	1.0	1.2		

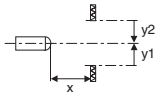
Operating range [m]
Typ. operating range limit [m]

TK … = adhesive
TKS … = screw type

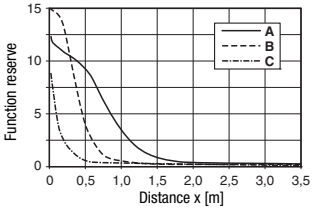
Diagrams

Typ. response behavior





Typ. function reserve



A TKS 40x60
B TKS 20x40
C Tape 4: 50x50

Notes

Observe intended use!

- This product is not a safety sensor and is not intended as personnel protection.
- The product may only be put into operation by competent persons.
- Only use the product in accordance with its intended use.

- The light spot may not exceed the reflector.
- Preferably use MTK(S) or tape 6.
- For foil 6, the sensor's side edge must be aligned parallel to the side edge of the reflective tape.

PRK3CT Retro-reflective photoelectric sensors with polarization filter

Part number code

PRK3C___.BTT3/4P-200-M12

Operating principle

PRK	Retro-reflective photoelectric sensors with polarization filter

Construction/version

3C	SR3C series

Light type

N/A	Red light

Radiation source

N/A	LED

Equipment

N/A	Standard
B	Housing model with two M3 threaded sleeves (brass)
T	Autocollimation principle (single lens) for highly transparent bottles without tracking
TT	Autocollimation principle (single lens) for highly transparent bottles with tracking

Operating range adjustment

N/A	Operating range not adjustable
3	Teach-in via button
6	Auto-teach

Switching output/function IN/OUT 1: Pin 4 or black conductor

2	NPN transistor output, light switching
N	NPN transistor output, dark switching
4	PNP transistor output, light switching
P	PNP transistor output, dark switching
L	IO-Link
X	Not connected (n. c.)
8	Activation input (activation with high signal)

Switching output/function IN/OUT 2: Pin 2 or white conductor

2	NPN transistor output, light switching
N	NPN transistor output, dark switching
4	PNP transistor output, light switching
P	PNP transistor output, dark switching
W	Warning output
X	Not connected (n. c.)
8	Activation input (activation with high signal)
9	Deactivation input (activation with high signal)
T	Teach-in via cable

Electrical connection

N/A	Cable, PVC, standard length 2000 mm, 4-wire
M8	M8 connector, 4-pin (plug)
M8.3	M8 connector, 3-pin (plug)
200-M8	Cable, PVC, length 200 mm with M8 connector, 4-pin, axial (plug)
200-M8.3	Cable, PVC, length 200 mm with M8 connector, 3-pin, axial (plug)
200-M12	Cable, PVC, length 200 mm with M12 connector, 4-pin, axial (plug)

Order guide

The sensors listed here are preferred types; current information at *www.leuze.com*

Sensors with through-holes

Order code	Part no.
PRK3C.T3/4T-M8	50133644
PRK3C.T3/4T	50133645
PRK3C.T3/4T-200-M12	50133646
PRK3C.T3/4T-200-M8	50133647
PRK3C.T3/LP-M8	50133648
PRK3C.T3/LP	50133649
PRK3C.T3/LP-200-M12	50133650
PRK3C.T3/LP-200-M8	50133651
PRK3C.T3/4P-M8	50133652
PRK3C.T3/4P	50133653
PRK3C.T3/4P-200-M12	50133654
PRK3C.T3/4P-200-M8	50133655
PRK3C.TT3/4T-M8	50129407
PRK3C.TT3/4T	50129408
PRK3C.TT3/4T-200-M12	50129409
PRK3C.TT3/4T-200-M8	50129410
PRK3C.TT3/LP-M8	50133668
PRK3C.TT3/LP	50133669
PRK3C.TT3/LP-200-M12	50133670
PRK3C.TT3/LP-200-M8	50133671
PRK3C.TT3/4P-M8	50133672
PRK3C.TT3/4P	50133673
PRK3C.TT3/4P-200-M12	50133674
PRK3C.TT3/4P-200-M8	50133675

Sensors with threaded sleeves

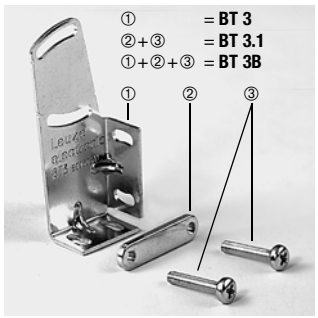
Order code	Part no.
PRK3C.BT3/4T-M8	50133656
PRK3C.BT3/4T	50133657
PRK3C.BT3/4T-200-M12	50133658
PRK3C.BT3/4T-200-M8	50133659
PRK3C.BT3/LP-M8	50133660
PRK3C.BT3/LP	50133661
PRK3C.BT3/LP-200-M12	50133662
PRK3C.BT3/LP-200-M8	50133663
PRK3C.BT3/4P-M8	50133664
PRK3C.BT3/4P	50133665
PRK3C.BT3/4P-200-M12	50133666
PRK3C.BT3/4P-200-M8	50133667
PRK3C.BTT3/4T-M8	50133676
PRK3C.BTT3/4T	50133677
PRK3C.BTT3/4T-200-M12	50133678
PRK3C.BTT3/4T-200-M8	50133679
PRK3C.BTT3/LP-M8	50133680
PRK3C.BTT3/LP	50133681
PRK3C.BTT3/LP-200-M12	50133682
PRK3C.BTT3/LP-200-M8	50133683
PRK3C.BTT3/4P-M8	50133684
PRK3C.BTT3/4P	50133685
PRK3C.BTT3/4P-200-M12	50133686
PRK3C.BTT3/4P-200-M8	50133687

Accessories mounting systems

Order code	Part no.
For sensors with through-holes:	
BT 3	50060511
BT 3.1 1)	50105585
BT 3B	50105546
For sensors with threaded sleeves:	
BT 200M.5	50118542
BT 205M 1)	50124651
BTU 200M-D10	50117256
BTU 200M-D12	50117255
BTU 200M.5-D12	50120426
BTU 200M-D14	50117254

1) Packaging unit: PU = 10 pcs.

Mounting systems



IO-Link interface

Sensors in the PRK3C…/**L**… variant have a dual-channel architecture. The IO-Link interface in accordance with specification 1.1.1 (October 2011) is provided on pin 4 (OUT 1). This allows the devices to be configured quickly and easily and, therefore, cost-effectively. Furthermore, the sensor transmits its process data and makes diagnostic information available through it.

Parallel to the IO-Link communication, the sensor can output the continuous switching signal for object detection on OUT 2. The IO-Link communication does not interrupt this signal.

Note: In Leuze Sensor Studio, the following applies with regard to the designations: **Q1 = OUT 1**, **Q2 = OUT 2**.

IO-Link process data

Output data device

Data bit								Assignment	Meaning
7	6	5	4	3	2	1	0		
								Switching output Q1 (OUT 1)	0 = inactive, 1 = active
								Warning output autoControl	0 = no warning, 1 = warning
								Sensor operation[1)]	0 = off, 1 = on
								Not used	Free
								Not used	Free
								Not used	Free
								Not used	Free
								Not used	Free

1) Sensor operation off when detection is not possible (e.g during the teach event)

Input data device

Data bit								Assignment	Meaning
7	6	5	4	3	2	1	0		
								Deactivation	0 = transmitter active, 1 = transmitter inactive
								Not used	Free
								Not used	Free
								Not used	Free
								Not used	Free
								Not used	Free
								Not used	Free
								Not used	Free

Device-specific IODD

At www.leuze.com in the download area for IO-Link sensors you will find the **IODD zip file** with all data required for the installation.

IO-Link parameter documentation

A complete description of the IO-Link parameters is given in the *.html files. Please double-click one of the two language variants: ***IODD*-de.html** for **German** or ***IODD*-en.html** for **English**.

Functions configurable via IO-Link

PC configuration and visualization is performed comfortably with the USB-IO-Link Master SET US2-IL1.1 (part no. 50121098) and the Leuze Sensor Studio (in the download area of the sensor at *www.leuze.com*).

Function block	Function	Description
Configuration	Logical function of Q2	Q2 can optionally be configured as a **warning output** and, with active high signal, then indicates when the control limit for contamination compensation has been reached (tracking). The reflector must now be cleaned. If the function **Q2 = switching output** is selected, the switching function corresponds to the current setting which was selected via the L/D changeover. If **Q2 = inv. switching output** is selected, the switching behavior of the output is inverted.
	Key Lock	**On** disables the teach button on the sensor.
	Easy Tune	Activates manual fine adjustment of the switching threshold at the sensor. To achieve a better function reserve, it can be advantageous to change the taught switching threshold. Used for this purpose is the **easyTune function**, which is similar in principle to a potentiometer. When activated, the switching threshold can be adapted by pressing the button (short or long button operation) on the sensor. **Short operation of the teach button** (2 ms to 200 ms) **increases the sensitivity** slightly; **long operation of the button** (200 ms to 2 s) **reduces** the sensitivity accordingly. The green LED on the sensor lights up briefly as confirmation each time the button is pressed. If the upper or lower end of the adjustment range is reached, the green and yellow LEDs flash rapidly.
	L/D switching	In the factory setting, outputs Q1 and Q2 are antivalent switching outputs: Light switching: Q1 = light switching, Q2 = dark switching. Dark switching: Q1 = dark switching, Q2 = light switching.
	Tracking (only with PRK3C…**TT**…)	Activates the **tracking function**. The sensor measures the received signal level continuously. System contamination at the reflector and/or sensor reduces the signal and can then be compensated automatically. The control rate depends on the number of gaps in the process. This tracking function increases the interval between cleaning sessions considerably.
	Switching delay	**On** activates the **internal time function**.
	Function selection of the switching delay	Activation of a suitable switching delay is possible. It is not possible to combine switching delays.
	Time base of the switching delay	Possibility of selecting a time base.
	Factor for the time base of the switching delay	To adapt the time base, it is multiplied by the entered factor. Only whole-number factors from 1 to 15 are permitted.

Function block	Function	Description
Commands (The commands with a gray background correspond to the functions which can be performed at the sensor using the teach button or the remote teach function.)	**High sensitive teach** for the detection of a highly transparent object (e.g. filled single bottle, glass pane or film)	Clear the light path before activation.
	Sensitive teach for the detection of a transparent object (e.g. empty single bottle)	Clear the light path before activation.
	Switch on tracking (only with PRK3C…**TT**…)	See configuration.
	Light switching	
	Dark switching	
	Switch the process data display mode to analog value	Activate to display diagrams on the Process tab when using **Leuze Sensor Studio**.

PRK3CT Retro-reflective photoelectric sensors with polarization filter

Sensor adjustment (teach) via teach button

The sensor is factory-adjusted for maximum operating range. After the sensor has been commissioned, it is essential to perform a teach procedure on the reflector with clear light path.

① **High sensitive teach (maximum sensitivity) for the detection of a highly transparent object (e.g. filled single bottle, glass pane or film)**		② **Sensitive teach (increased sensitivity) for the detection of a transparent object (e.g. empty single bottle)**	
Clear the **light path** before teaching!			
1.	**Hold down** the teach button (**2 to 7s**) until the **yellow and green LEDs flash simultaneously**.	**1.**	**Hold down** the teach button (**7 to 12s**) until the **yellow and green LEDs flash alternately**.
2.	**Release** teach button – ready.	**2.**	**Release** teach button – ready.
The sensor switches reliably when a highly transparent object (e.g. filled single bottle, glass pane or film) is transported through the light beam.		The sensor switches reliably when a transparent object (e.g. empty single bottle) is transported through the light beam.	
Device settings are stored fail-safe.			

NOTE

With the "high sensitive teach" setting, the sensor can always detect empty or filled highly transparent bottles reliably. However, the sensor then also reacts sensitively to contamination or moisture condensation.

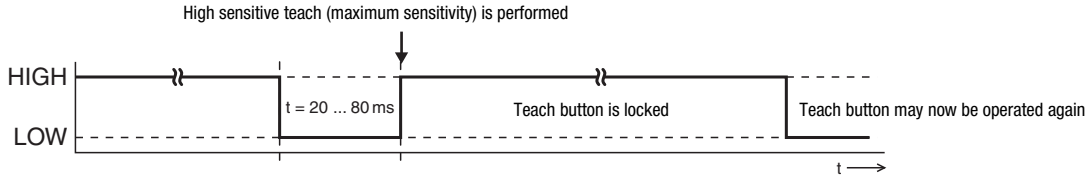
↳ If necessary, check whether the "sensitive teach" setting would provide adequate sensitivity.
The advantage of this setting is the slightly lower sensitivity to contamination and moisture condensation.

③ **Teach at max. operating range (factory setting)**		④ **Set switching behavior (light/dark switching)**	
Obstruct the **light path** before teaching!		When the function is activated, the switching output is always inverted relative to the previously set state (toggle function).	
1.	**Hold down** the teach button (**2 to 7s**) until the **yellow and green LEDs flash simultaneously**.	**1.**	Hold down the teach button **longer than 12s** until only the **green LED flashes**. **LED ON**: Switching output now **light switching** (Output active if light path is free) **LED OFF**: Switching output now **dark switching** (Output active if there is an object in the light path)
2.	**Release** teach button – ready.	**2.**	**Release** teach button – ready.
The sensor now operates with the maximum function reserve/operating range.		**Note**: The yellow LED is not dependent on the switching behavior setting and always indicates light switching in normal operation.	
Device settings are stored fail-safe.			

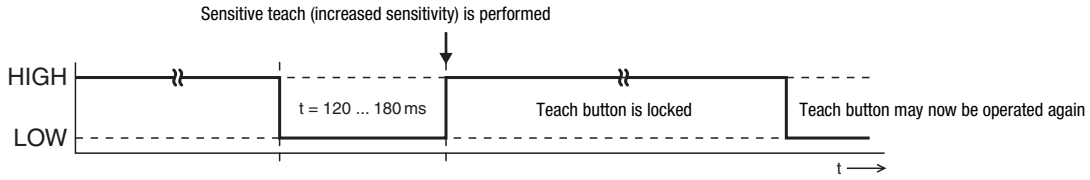
Sensor adjustment (teach) via teach input (pin 2)

The following description applies to PNP switching logic!
Signal level LOW ≤ 2V
Signal level HIGH ≥ (U_B-2V)
With the NPN models, the signal levels are inverted!

High sensitive teach (maximum sensitivity)

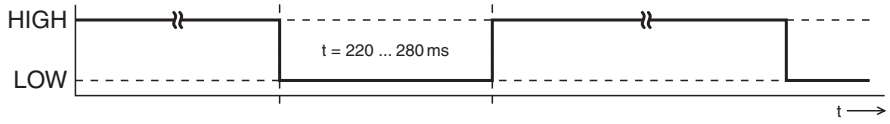


Sensitive teach (increased sensitivity)



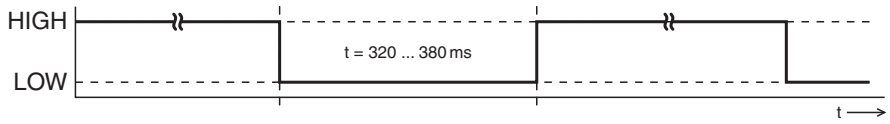
Light switching logic

Switching outputs light switching, this means outputs active when object is detected.
In the case of complementary switching outputs, OUT1 (pin 4) light switching, OUT2 (pin 2) dark switching.



Dark switching logic

Switching outputs dark switching, this means outputs inactive when object is detected.
In the case of complementary switching outputs, OUT1 (pin 4) dark switching, OUT2 (pin 2) light switching.



Locking the teach button via the teach input

A **static high signal** (≥ 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.