PRK3CL	Laser retro-reflective photoel. sensors with polariz. filter for bottles

0…500mm

3 kHz

10 - 30 V DC

IO-Link

- ● Polarized laser 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
- ● *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

CE   c UL us LISTED   CDRH   ECOLAB

IEC 60947...   IEC 60947...   III   IP 69K IP 67

Accessories:

(available separately)
- ● Mounting systems (BT …)
- ● Cables with M8 or M12 connector (KD …)
- ● Reflectors
- ● Reflective tapes
- ● IO-Link master set
  SET MD12-US2-IL1.1 + accessories - diagnostics set (part no. 50121098)

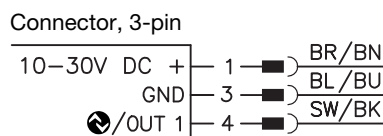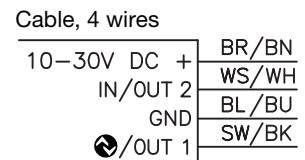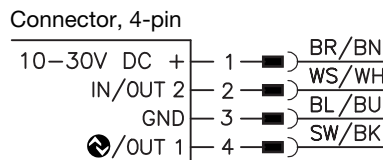## Dimensioned drawing

- **A** Green indicator diode
- **B** Yellow indicator diode
- **C** Optical axis
- **D** Teach button
- **E** Mounting sleeve (standard)
- **F** Threaded sleeve (PRK3CL1.**B**…)

Electrical connection

Connector, 4-pin

10–30V DC +	1	BR/BN
IN/OUT 2	2	WS/WH
GND	3	BL/BU
⚛/OUT 1	4	SW/BK

Cable, 4 wires

10–30V DC +	BR/BN
IN/OUT 2	WS/WH
GND	BL/BU
⚛/OUT 1	SW/BK

Connector, 3-pin

10–30V DC +	1	BR/BN
GND	3	BL/BU
⚛/OUT 1	4	SW/BK

Technical data

Optical data

Typ. operating range limit (tape 6) [1]	0 … 500 mm
Operating range [2]	see tables
Light beam diameter	approx. 1 mm, consistent
Squint angle	typ. ± 2°
Light source [3]	laser (pulsed)
Laser class	1 acc. to IEC 60825-1:2007
Wavelength	655 nm (visible red light, polarized)
Max. output power	≤ 1.7 mW
Pulse duration	≤ 5.3 µs

Sensor operating modes

IO-Link	COM2 (38.1 kBaud, 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	3,000 Hz
Response time	0.17 ms [4]
Readiness delay	≤ 300 ms

Electrical data

Operating voltage U_B [5]	10 … 30 VDC (incl. residual ripple)
Residual ripple	≤ 15 % of U_B
Open-circuit current	≤ 15 mA
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. 100 mA [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: 10 g; with 200 mm cable and connector: 20 g; with 2 m cable: 50 g
Connection type	cable 2 m (cross section 4x0.20 mm²), connector M8, metal, cable 0.2 m with connector M8 or M12

Environmental data

Ambient temp. (operation/storage)	-40 °C … +55 °C [7]/-40 °C … +70 °C
Protective circuit [8]	2, 3
VDE safety class	III
Degree of protection	IP 67 and IP 69K
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	≤ 1 ms
Input resistance	20 kΩ

1) Typ. operating range limit: max. attainable range without function reserve
2) Operating range: recommended range with function reserve
3) Average life expectancy 50,000 h at an ambient temperature of 25 °C
4) For short decay times, an ohmic load of approx. 5 kOhm 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, 50 mA 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 [3]
1	TK	series 53	0 … 0.4 m
2	REF 6-S-	20x40	0 … 0.4 m
3	REF 6-A-	25x25	0 … 0.4 m

1	0	0.4	0.5
2	0	0.4	0.5
2	0	0.4	0.5

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

- For REF 6-A-25x25, the sensor's side edge must be aligned parallel to the side edge of the reflective tape

- The devices may only be operated with the reflectors listed in the table.

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.

PRK3CL   Laser retro-reflective photoel. sensors with polariz. filter for bottles

Part number code

PRK3C L1 . 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
L1   Laser class 1

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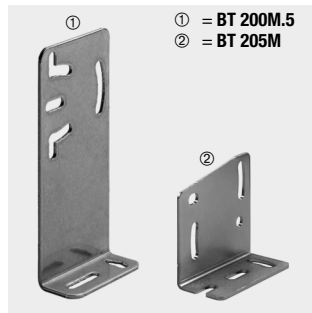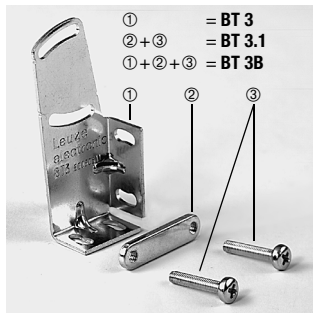200-M12   Cable, PVC, length 200mm with M12 connector, 4-pin, axial (plug)

Order guide

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

Sensors with through-holes	
Order code	**Part no.**
PRK3CL1.TT3/4T-M8	50133714
PRK3CL1.TT3/4T	50133715
PRK3CL1.TT3/4T-200-M12	50133716
PRK3CL1.TT3/4T-200-M8	50133717
PRK3CL1.TT3/LP-M8	50133718
PRK3CL1.TT3/LP	50133719
PRK3CL1.TT3/LP-200-M12	50133720
PRK3CL1.TT3/LP-200-M8	50133721
PRK3CL1.TT3/4P-M8	50133722
PRK3CL1.TT3/4P	50133723
PRK3CL1.TT3/4P-200-M12	50133724
PRK3CL1.TT3/4P-200-M8	50133725
PRK3CL1.T3/4T-M8	50133688
PRK3CL1.T3/4T	50133690
PRK3CL1.T3/4T-200-M12	50133691
PRK3CL1.T3/4T-200-M8	50133692
PRK3CL1.T3/LP-M8	50133693
PRK3CL1.T3/LP	50133694
PRK3CL1.T3/LP-200-M12	50133695
PRK3CL1.T3/LP-200-M8	50133696
PRK3CL1.T3/4P-M8	50133697
PRK3CL1.T3/4-M8.3	50133698
PRK3CL1.T3/4P	50133699
PRK3CL1.T3/4P-200-M12	50133700
PRK3CL1.T3/4P-200-M8	50133701

Sensors with threaded sleeves	
Order code	**Part no.**
PRK3CL1.BTT3/4T-M8	50133726
PRK3CL1.BTT3/4T	50133727
PRK3CL1.BTT3/4T-200-M12	50133728
PRK3CL1.BTT3/4T-200-M8	50133729
PRK3CL1.BTT3/LP-M8	50133730
PRK3CL1.BTT3/LP	50133731
PRK3CL1.BTT3/LP-200-M12	50133732
PRK3CL1.BTT3/LP-200-M8	50133733
PRK3CL1.BTT3/4P-M8	50133734
PRK3CL1.BTT3/4P	50133735
PRK3CL1.BTT3/4P-200-M12	50133736
PRK3CL1.BTT3/4P-200-M8	50133737
PRK3CL1.BT3/4T-M8	50133702
PRK3CL1.BT3/4T	50133703
PRK3CL1.BT3/4T-200-M12	50133704
PRK3CL1.BT3/4T-200-M8	50133705
PRK3CL1.BT3/LP-M8	50133706
PRK3CL1.BT3/LP	50133707
PRK3CL1.BT3/LP-200-M12	50133708
PRK3CL1.BT3/LP-200-M8	50133709
PRK3CL1.BT3/4P-M8	50133710
PRK3CL1.BT3/4P	50133711
PRK3CL1.BT3/4P-200-M12	50133712
PRK3CL1.BT3/4P-200-M8	50133713

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

① = BT 3
②+③ = BT 3.1
①+②+③ = BT 3B

① = BT 200M.5
② = BT 205M

BTU 200M…

Laser safety notices -? laser class 1

⚠ **ATTENTION, LASER RADIATION – LASER CLASS 1**

The device satisfies the requirements of IEC 60825-1:2007 (EN 60825-1:2007) safety regulations for a product of **laser class 1** as well as the U.S. 21 CFR 1040.10 regulations with deviations corresponding to "Laser Notice No. 50" from June 24, 2007.
↳ Observe the applicable statutory and local laser protection regulations.
↳ The device must not be tampered with and must not be changed in any way.
There are no user-serviceable parts inside the device.
Repairs must only be performed by Leuze electronic GmbH + Co. KG.

PRK3CL   Laser retro-reflective photoel. sensors with polariz. filter for bottles

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

7	6	5	4	3	2	1	0	Assignment	Meaning
								Data bit	
								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

7	6	5	4	3	2	1	0	Assignment	Meaning
								Data bit	
								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 PRK3CL…**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 PRK3CL…**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**.

PRK3CL   Laser retro-reflective photoel. sensors with polariz. filter for bottles

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.			

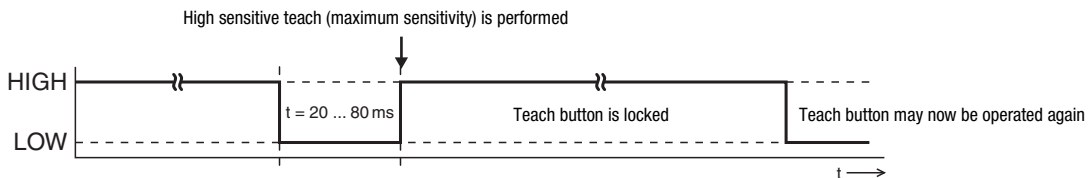## Sensor adjustment (teach) via teach input (pin 2)

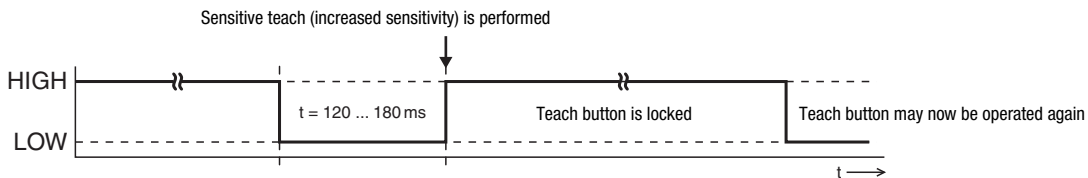**The following description applies to PNP switching logic!**

Signal level LOW ≤ 2V

Signal level HIGH ≥ (U$_B$-2V)

With the NPN models, the signal levels are inverted!

High sensitive teach (maximum sensitivity)

High sensitive teach (maximum sensitivity) is performed

HIGH

t = 20 ... 80 ms | Teach button is locked | Teach button may now be operated again

LOW

t ⟶

Sensitive teach (increased sensitivity)

Sensitive teach (increased sensitivity) is performed

HIGH

t = 120 ... 180 ms | Teach button is locked | Teach button may now be operated again

LOW

t ⟶

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.

HIGH

t = 220 ... 280 ms

LOW

t ⟶
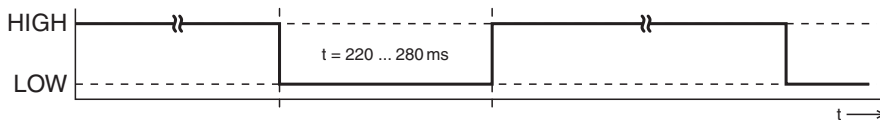
Dark switching logic

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.

HIGH

t = 320 ... 380 ms

LOW

t ⟶
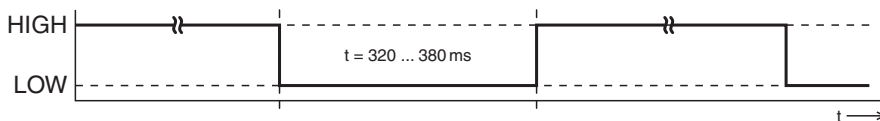
Locking the teach button via the teach input

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.