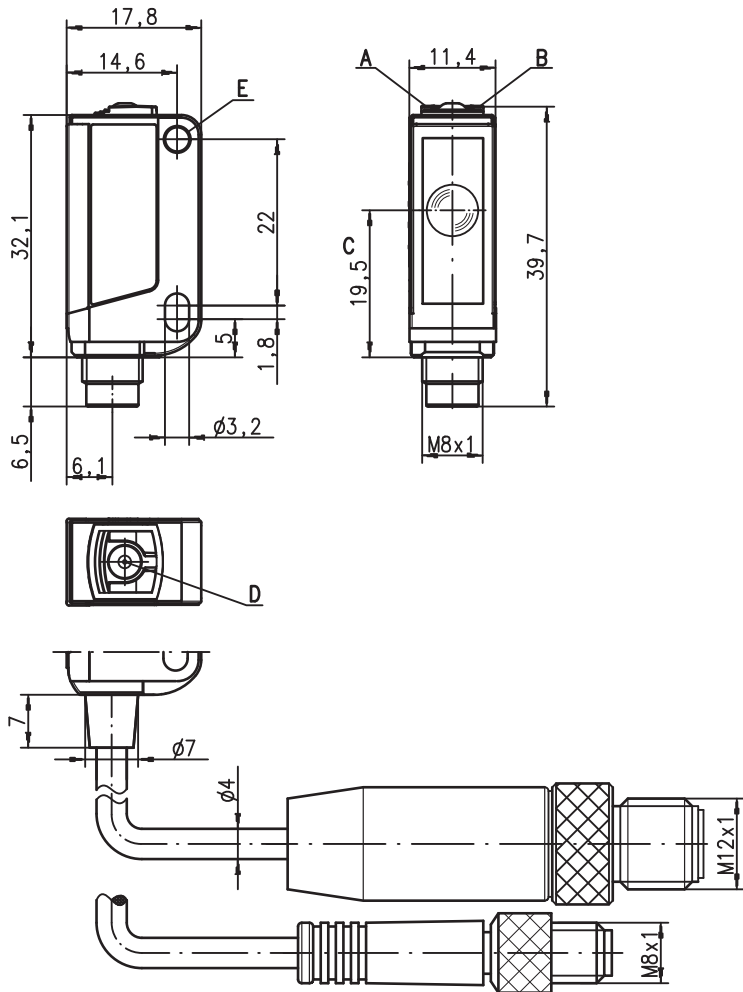**PRK 3B**  **Retro-reflective photoelectric sensors with polarization filter**

en 10-2011/04  50105364



| | | |
|---|---|---|
| I ↔ | 1 kHz | T<sub>I</sub> **0 … 5m** |
| 10 - 30 V DC | A²LS (HF) | SPS PLC |

- Polarized retro-reflective photoelectric sensor, autocollimation optics with visible red light
- For precise positioning of objects and reflector markers
- Small and compact construction with robust plastic housing, protection class IP 67 for industrial application
- A²LS- Active Ambient Light Suppression
- Push-pull output with light/dark switching via teach-in button
- High switching frequency for detection of fast events
- Easy adjustment via lockable teach button or teach input

CE  ISO 9001  c(UL)us LISTED  ECOLAB

IEC 60947...  IEC 60947...  III  IP 67
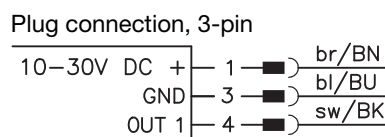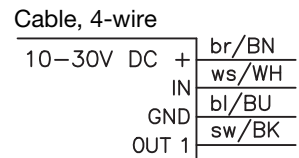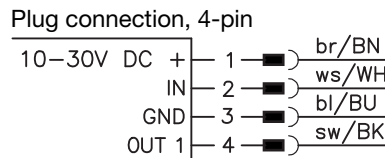
## Accessories:

**(available separately)**

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

We reserve the right to make changes • DS_PRK3B_Standard_EL_en.fm

## Dimensioned drawing



**A** Green indicator diode
**B** Yellow indicator diode
**C** Optical axis
**D** Teach button
**E** Attachment sleeve

## Electrical connection



Plug connection, 4-pin

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

Cable, 4-wire

| 10−30V DC + | | br/BN |
|---|---|---|
| IN | | ws/WH |
| GND | | bl/BU |
| OUT 1 | | sw/BK |

Plug connection, 3-pin

| 10−30V DC + | 1 | br/BN |
|---|---|---|
| GND | 3 | bl/BU |
| OUT 1 | 4 | sw/BK |

## Specifications

### Optical data
| | |
|---|---|
| Typ. op. range limit (TK(S) 100x100) [1] | 0 … 5m |
| Operating range [2] | see tables |
| Light source [3] | LED (modulated light) |
| Wavelength | 620nm (visible red light, polarized) |

### Timing
| | |
|---|---|
| Switching frequency | 1,000Hz |
| Response time | 0.5ms |
| Delay before start-up | ≤ 300ms |

### Electrical data
| | |
|---|---|
| Operating voltage $U_B$ [4] | 10 … 30VDC (incl. residual ripple) |
| Residual ripple | ≤ 15% of $U_B$ |
| Open-circuit current | ≤ 18mA |
| Switching output [5]          …/6.22 | 1 push-pull switching output |
| | pin 4: PNP light switching, NPN dark switching |
| | pin 2: teach input |
| …/6D.22 | 1 push-pull switching output |
| | pin 4: PNP dark switching, NPN light switching |
| | pin 2: teach input |
| …/6.22…-S8.3 | 1 push-pull switching output |
| | pin 4: PNP light switching, NPN dark switching |
| …/4D.22 | 1 PNP switching output, dark switching, |
| | pin 2: teach input |
| Function characteristics | light/dark reversible |
| Signal voltage high/low | ≥ ($U_B$-2V)/≤ 2V |
| Output current | max. 100mA |
| Operating range | setting via teach-in |

### Indicators
| | |
|---|---|
| Green LED | ready |
| Yellow LED | light path free |
| Yellow LED, flashing | light path free, no performance reserve [6] |

### Mechanical data
| | |
|---|---|
| Housing [7] | plastic (PC-ABS); 1 attachment sleeve, nickel-plated steel |
| Optics cover | plastic (PMMA) |
| Weight | with connector: 10g |
| | with 200mm cable and connector: 20g |
| | with 2m cable: 50g |
| Connection type | 2m cable (cross section 4x0.20mm²), |
| | connector M8 metal, |
| | 0.2m cable with connector M8 or M12 |

### Environmental data
| | |
|---|---|
| Ambient temp. (operation/storage) | -30°C … +55°C/-30°C … +70°C |
| Protective circuit [8] | 2, 3 |
| VDE safety class | III |
| Protection class | IP 67 |
| Light source | free group (in accordance with EN 62471) |
| Standards applied | IEC 60947-5-2 |
| Certifications | UL 508 [4] |

## Options
**Teach-in input/activation input**
| | |
|---|---|
| Transmitter active/not active | ≥ 8V/≤ 2V |
| Activation/disable delay | ≤ 1ms |
| Input resistance | 30kΩ |

1) Typ. operating range limit: max. attainable range without performance reserve
2) Operating range: recommended range with performance reserve
3) Average life expectancy 100,000h at an ambient temperature of 25°C
4) For UL applications: for use in class 2 circuits according to NEC only
5) The push-pull switching outputs must not be connected in parallel
6) Display "no performance reserve" as yellow flashing LED is only available in standard teach setting
7) Patent Pending Publ. No. US 7,476,848 B2
8) 2=polarity reversal protection, 3=short-circuit protection for all transistor outputs

## Remarks

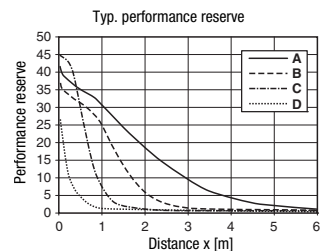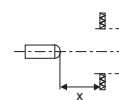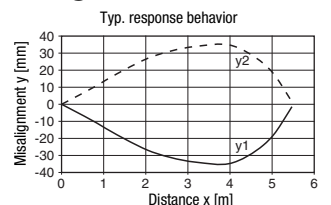| Adapter plate: | BT 3.2 (part no. 50103844) for alternate mounting on 25.4mm hole spacing (Omron E3Z, Sick W100…) |
|---|---|
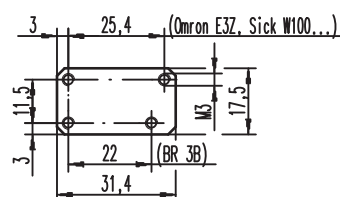
## Tables

| Reflectors | | | Operating range |
|---|---|---|---|
| 1 | TK(S) | 100x100 | 0 … 4.0m |
| 2 | TK | 40x60 | 0 … 2.6m |
| 3 | TK | 20x40 | 0 … 1.3m |
| 4 | Tape 4 | 50x50 | 0 … 0.7m |

| | | | | | | |
|---|---|---|---|---|---|---|
| 1 | 0 | | | | 4 | 5 |
| 2 | 0 | | 2,6 | 3,2 | | |
| 3 | 0 | | 1,3 | 1,5 | | |
| 4 | 0 | 0,7 | 1,0 | | | |

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

TK … = adhesive
TKS … = screw type

## Diagrams

Typ. response behavior

Typ. performance reserve

**A** TK 100x100
**B** TKS 40x60
**C** TKS 20x40
**D** Tape 4: 50x50

## Remarks

Mounting system:

| ① | = BT 3 (part no. 50060511) |
|---|---|
| ②+③ | = BT 3.1 [1] (part no. 50105585) |
| ①+②+③ | = BT 3B (part no. 50105546) |

1) Packaging unit: PU = 10 pcs.

## PRK 3B — Retro-reflective photoelectric sensors with polarization filter

# Order guide

| Selection table | | | PRK 3B/6.22 Part No. 50104699 | PRK 3B/6.22-S8 Part No. 50104700 | PRK 3B/6.22, 200-S8 Part No. 50104701 | PRK 3B/6.22, 200-S12 Part No. 50105762 | PRK 3B/6D.22-S8 Part No. 50106418 | PRK 3B/6.2-S8.3 Part No. 50109385 | PRK 3B/6.2,200-S8.3 Part No. 50114099 | PRK 3B/6D.22.03, 200-S12 Part No. 50109488 | PRK 3B/4D.22, 200-S8 Part No. 50110775 | PRK 3B/4D.22Z, 200-S8 Part No. 50108373 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Equipment ↓** | | Order code → | | | | | | | | | | |
| Output 1 (OUT 1) | push-pull switching output, configurable | light switching ○ | ●[1] | ●[1] | ●[1] | ●[1] | ● | ●[1] | ●[1] | ● | | |
| | | dark switching ● | ● | ● | ● | ● | ●[1] | ● | ● | ●[1] | | |
| | PNP transistor output | light switching ○ | | | | | | | | | | |
| | | dark switching ● | | | | | | | | | ●[1] | ●[1] |
| | start-up delay (special function) | | | | | | | | | | | ●[2] |
| Input (IN) | teach input | | ● | ● | ● | ● | ● | | | ● | ● | ● |
| | activation input | | | | | | | | | | | |
| Connection | cable 2,000mm | 4-wire | ● | | | | | | | | | |
| | M8 connector, metal | 3-pin | | | | | | ● | | | | |
| | M8 connector, metal | 4-pin | | ● | | | ● | | | | | |
| | 200mm cable with M8 connector | 3-pin | | | | | | | ● | | | |
| | 200mm cable with M8 connector | 4-pin | | | ● | | | | | | ● | ● |
| | 200mm cable with M12 connector | 4-pin | | | | ● | | | | ●[3] | | |
| Configuration | teach-in via button (lockable) and teach input | | ● | ● | ● | ● | ● | | | ● | ● | ● |
| | teach-in via button | | | | | | | ● | ● | | | |

1) Presetting, light/dark switching, adjustable
2) Start-up delay (special function)
 The sensor output does not switch until an object has interrupted the light beam for at least 4 seconds. The output switches off without a time delay.
3) Connector without Ultra-Lock™ fast locking

● **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.

● **Special function: start-up delay, only for PRK 3B/4D.22Z, 200-S8**
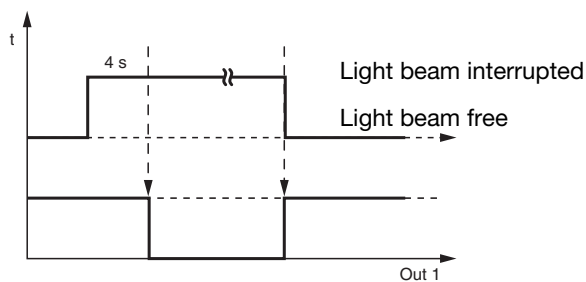


# Sensor adjustment (teach) via teach button

● **The sensor is factory-adjusted for maximum operating range.**
 Recommendation: teach only if the desired objects are not reliably detected.
● **Prior to teaching:**
 **Clear the light path to the reflector!**
 The device setting is stored in a fail-safe way. A reconfiguration following voltage interruption or switch-off is thus not required.
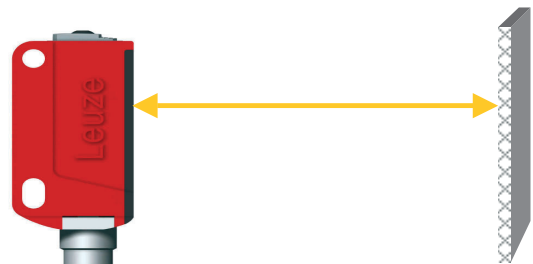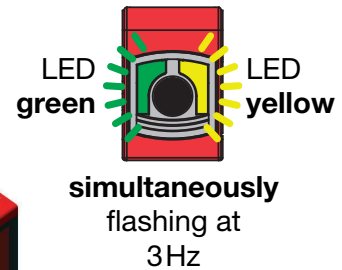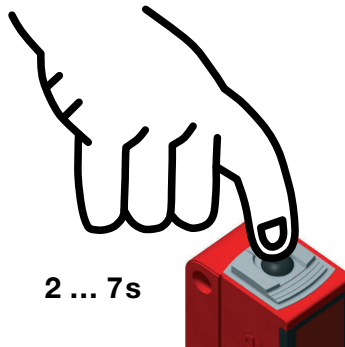
### *Standard teaching for average sensor sensitivity*

- **Press teach button until both LEDs flash <u>simultaneously</u>.**
- **Release teach button.**
- **Ready.**

  After the standard teaching, the sensor switches when half of the light beam is covered by the object.

**2 … 7 s**

LED **green**    LED **yellow**

**simultaneously** flashing at 3 Hz

### *Teaching for increased sensor sensitivity*

- **Press teach button until both LEDs flash <u>alternatingly</u>.**
- **Release teach button.**
- **Ready.**

  After the teaching for increased sensor sensitivity, the sensor switches when about 18 % of the light beam are covered by the object.

**7 … 12s**

LED **green**    LED **yellow**

**alternatingly** flashing at 3 Hz
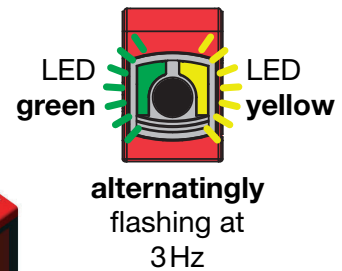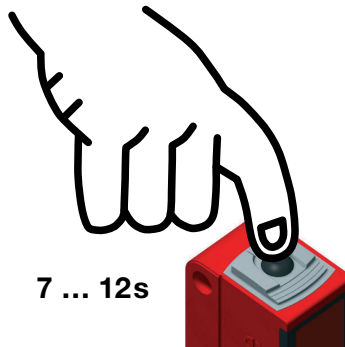
### *Teaching for maximum operating range (factory setting at delivery)*

- **Prior to teaching:
  <u>Cover</u> the light path to the reflector!**
- **Procedure as for standard teaching.**

**2 … 7 s**

LED **green**    LED **yellow**

**simultaneously** flashing at 3 Hz
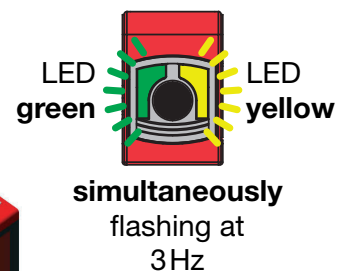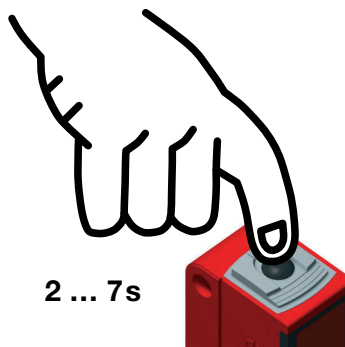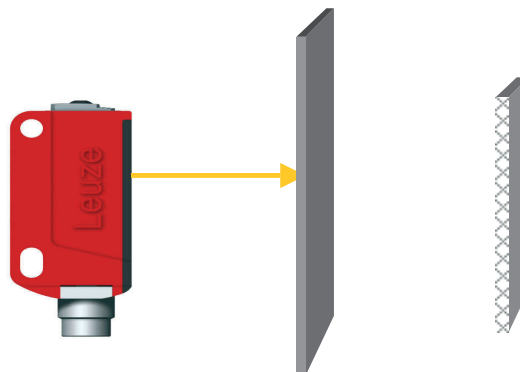
**PRK 3B**        **Retro-reflective photoelectric sensors with polarization filter**

## *Adjusting the switching behavior of the switching output – light/dark switching*

- Press teach button until the green LED flashes.
  The yellow LED displays the current setting of
  the switching output:
  ON             = output switches on light
  OFF           = output switches on dark
- Continue to press the teach button in order to
  change the switching behavior.
- Release teach button.
- Ready.

LED **yellow**

**ON =
light switching**

LED
**green**
flashes at
3 Hz

**OFF =
dark switching**

**> 12s**
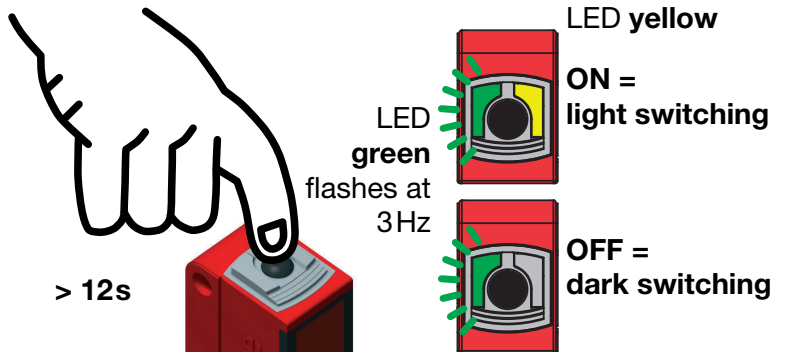
## Locking the teach button via the teach input

A **static high signal** (≥ 4ms) at the teach
input locks the teach button on the device 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.
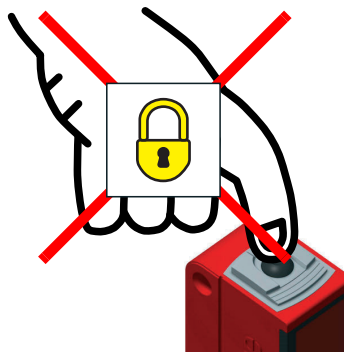
## Sensor adjustment (teach) via teach input

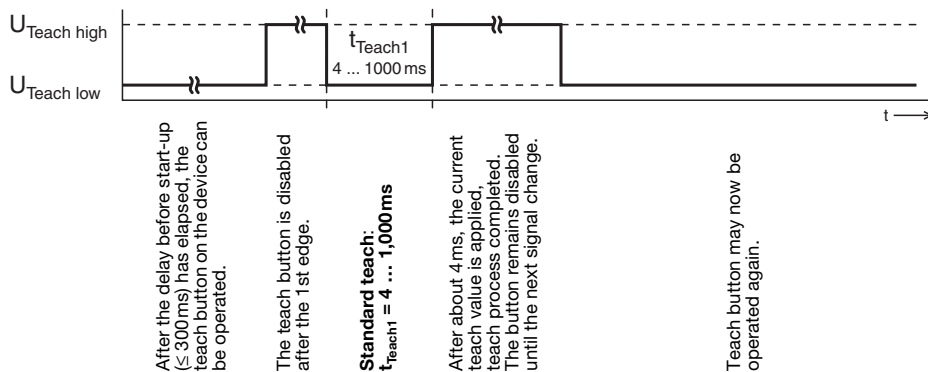**The following description applies to PNP switching logic!**

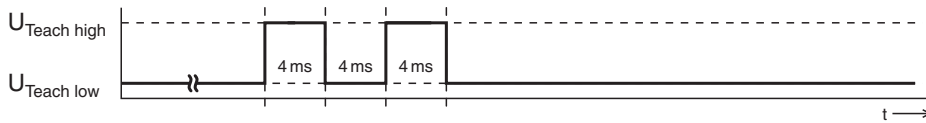$U_{Teach\ low} \leq 2V$

$U_{Teach\ high} \geq (U_B-2V)$

**Prior to teaching: Clear the light path to the reflector!**

The device setting is stored in a fail-safe way. A reconfiguration following voltage interruption or switch-off is thus
not required.

## *Standard teaching for average sensor sensitivity*

$U_{Teach\ high}$

$U_{Teach\ low}$

$t_{Teach1}$
4 ... 1000 ms

$t$ ⟶

After the delay before start-up
(≤ 300ms) has elapsed, the
teach button on the device can
be operated.

The teach button is disabled
after the 1st edge.

**Standard teach:
$t_{Teach1}$ = 4 ... 1,000ms**

After about 4ms, the current
teach value is applied,
teach process completed.
The button remains disabled
until the next signal change.

Teach button may now be
operated again.

## Quick standard teach

U Teach high

U Teach low
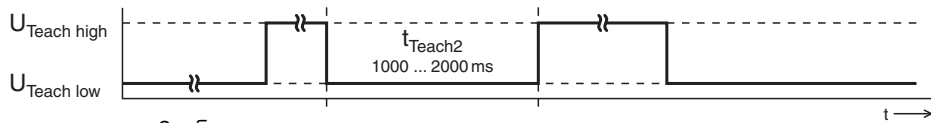
4 ms | 4 ms | 4 ms

t ⟶

SPS
PLC

**shortest teaching duration for standard teaching: approx. 12 ms**

After the standard teaching, the sensor switches when half of the light beam is covered by the object.

## Teaching for increased sensor sensitivity

U Teach high

U Teach low

$t_{Teach2}$
1000 ... 2000 ms

t ⟶

After the delay before start-up (≤ 300 ms) has elapsed, the teach button on the device can be operated.

The teach button is disabled after the 1st edge.

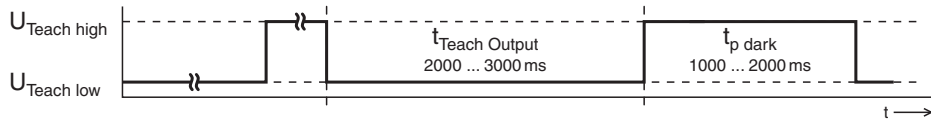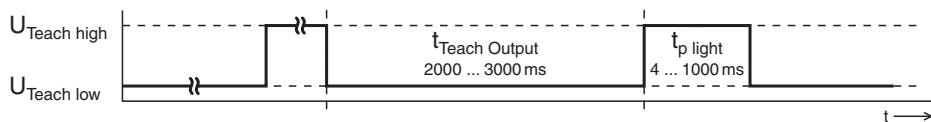**Teach for increased sensor sensitivity:** $t_{Teach2}$ = 1,000 ... 2,000 ms

After about 4 ms, the current teach value is applied, teach process completed. The button remains disabled until the next signal change.

Teach button may now be operated again.

After the teaching for increased sensor sensitivity, the sensor switches when about 18 % of the light beam are covered by the object.

## Adjusting the switching behavior of the switching output – light/dark switching

U Teach high

U Teach low

$t_{Teach Output}$
2000 ... 3000 ms

$t_{p\ light}$
4 ... 1000 ms

t ⟶

U Teach high

U Teach low

$t_{Teach Output}$
2000 ... 3000 ms

$t_{p\ dark}$
1000 ... 2000 ms

t ⟶

After the delay before start-up (≤ 300 ms) has elapsed, the teach button on the device can be operated.

The teach button is disabled after the 1st edge.

**Setting the switching behavior of the switching output:** $t_{Teach Output}$ = 2,000 ... 3,000 ms

**Switching output switches on light:** $t_{p\ light}$ = 4 ... 1,000 ms

**Switching output switches on dark:** $t_{p\ dark}$ = 1,000 ... 2,000 ms

The button remains disabled until the next signal change.