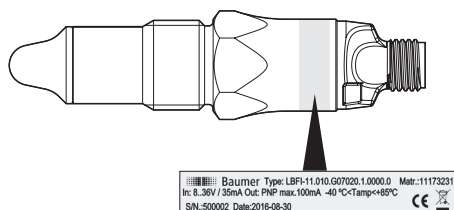













## Type plate / Typenschild



Type	■ Type of sensor
Matr.	■ Material number
In	■ Input voltage and power consumption
Out	■ PNP, NPN, digital, customer-specific ■ Maximum external load
Tamb	■ Ambient temperature
S/N	■ Serial number
Date	■ Date of manufacture
	■ Do not dispose of in household waste
	■ Conformity with EU directives
	■ Permissions, customer-specific

Version	■ Sensortyp
Matr.	■ Materialnummer
In	■ Eingangsspannung und Stromverbrauch
Out	■ PNP, NPN, digital, kundenspezifisch ■ Maximale externe Last
Tamb	■ Umgebungstemperatur
S/N	■ Seriennummer
Date	■ Herstellungsdatum
	■ Nicht im Hausmüll entsorgen
	■ Konformität mit EU-Richtlinien
	■ Zulassungen, kundenspezifisch

Version	■ Type de capteur
Matr.	■ Réf. mat.
In	■ Tension d'entrée et consommation électrique
Out	■ PNP, NPN, digital, spécifique au client ■ Charge externe maximale
Tamb	■ Température ambiante
S/N	■ Numéro de série
Date	■ Date de fabrication
	■ Ne pas jeter avec les ordures ménagères
	■ Conformité avec les directives européennes
	■ Autorisations, selon le client

## Table of contents

1. Safety .....	3	8. Configuration .....	10
2. Construction and function .....	3	9. Troubleshooting .....	12
3. Symbols in warning signs .....	4	10. Cleaning, maintenance and repair .....	12
4. Transport and storage .....	4	11. Disposal .....	12
5. Assembly .....	4	12. Accessories .....	12
6. Electrical connection .....	7	13. Technical data .....	12
7. Electrical connection in explosion hazard areas .....	8	14. Configuration overview .....	13

## 1. Safety

### Intended use

The sensor must be used solely for the level detection of liquids and solids with a dielectric constant of at least 1.5.

The sensor must only be used for media against which the housing material and sensor tip are resistant.

### Staff qualification

Only use staff who are trained for the activities described. This applies in particular to assembly, installation, configuration and troubleshooting. Make sure that the staff have read and understood these instructions.

### Technical condition

Only use sensor in perfect technical condition.

Only use Baumer accessories.

Baumer will accept no liability for other manufacturers' accessories.

### Risk of burns from hot media

During operation the sensor housing may warm up to over 50 °C. When working with hot media provide protection against burns.

## 2. Construction and function

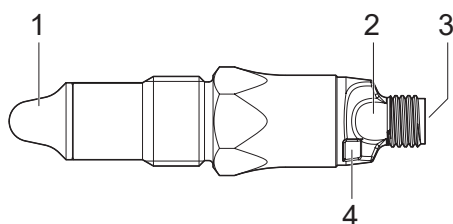


Fig. 1. Construction

- 1 Sensor tip
- 2 LED
- 3 Connection with M12 plug
- 4 qTeach detector

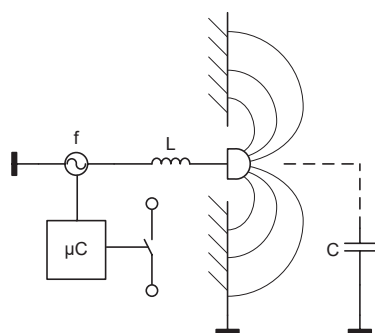



Fig. 2. Function

An electrode integrated into the sensor tip forms a capacitor with the environment. The medium determines the capacity value depending on its dielectric constant (DC values). A resonant circuit occurs together with a coil in the sensor electronics. Depending on the resonance frequency measured and the programmable trigger threshold, the switch signal is activated.

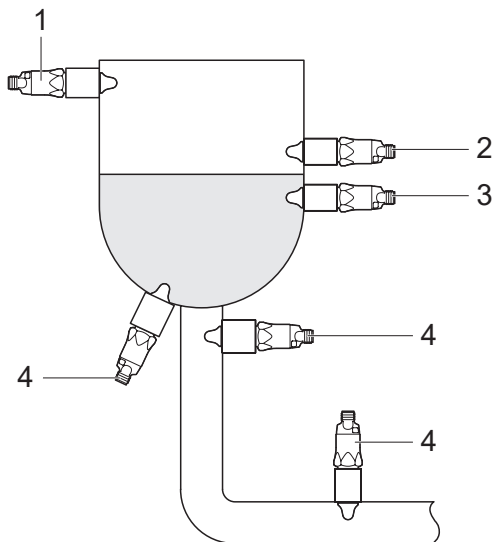
### 3. Symbols in warning signs

Symbol	Warning term	Explanation
	<b>DANGER</b>	In situations which cause death or serious injuries.
	<b>WARNING</b>	In situations which can cause death or serious injuries.
	<b>CAUTION</b>	In situations which can cause light or medium injuries.
	<b>ATTENTION</b>	For material damage

### 4. Transport and storage

- ▶ Check packaging and sensor for damage.
- ▶ In the event of damage: Do not use sensor.
- ▶ Store sensor where it will be secure against shock.
- Storage temperature: -40 ... +85 °C
- Relative humidity: < 98 %

### 5. Assembly



- 1 Overfill protection
- 2 Limit level, max.
- 3 Limit level, min.
- 4 Run-dry protection

The sensor can be mounted on any point in the vessel.

A sensor mounted at the top of the vessel (1) ensures against overfilling. Sensors attached further down detect a maximum (2) or minimum (3) limit level. A sensor attached at the bottom or on the outfeed pipe (4) can protect a connected pump against dry running.

If the sensor is mounted in a pipe, it is recommended to use window trigger as the trigger function. The adaptive trigger can have limited functionality if it is mounted in a pipe.

Fig. 3. Mounting options

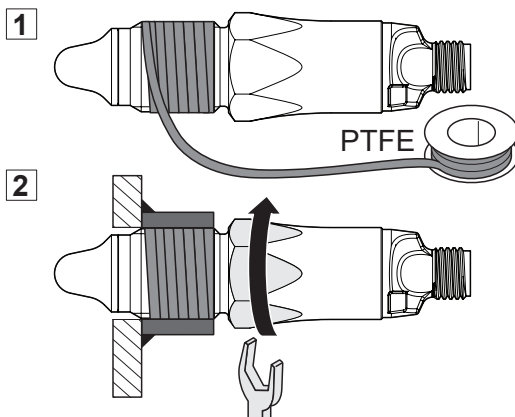
## 5.1 LBFI mounting



### **DANGER**

#### **Risk of injury from hazardous medium**

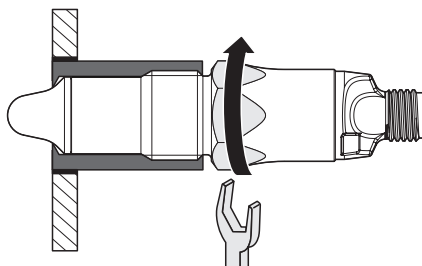
- ▶ Wear protective equipment for hazardous media (e.g. acids, alkaline solutions).
- ▶ Empty vessel and pipelines before mounting.



#### **LBFI with the following process connections:**

- G 1/2 A ISO 228-1 (BCID G07)
- 1/2-14 NPT (BCID N02)

- ✓ Vessel and pipelines are free of media.
- ▶ Seal thread on sensor with Teflon tape (PTFE).
- ▶ Screw in sensor.  
G 1/2 A tightening torque: 30 Nm max.  
NPT tightening torque: 20 Nm max.



#### **LBFI with the following process connections:**

- G 1/2 A ISO 228-1 (BCID G07) with industrial weld-in sleeve for universal use, Ø 30 x 26 (ZPW1-711, ZPW1-721)
- G 1/2 A hygienic (BCID A03) with weld-in sleeve or adapter from Baumer

For these process connections, do not seal with Teflon tape (PTFE) or elastomer.

- ✓ Vessel and pipelines are free of media.
- ✓ Adapter or weld-in sleeve are mounted free of dead space.
- ▶ Screw in sensor.  
Tightening torque: 15 ... 20 Nm

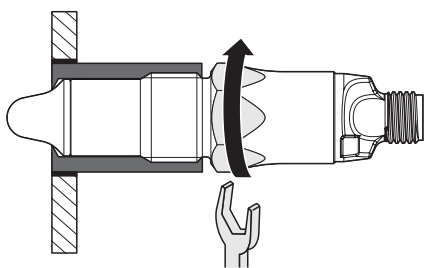
## 5.2 LBFH mounting



### WARNING

#### Danger to health from contaminated medium

- ▶ Only use weld-in sleeves or adapters from Baumer.
- ▶ Do not seal process connections with Teflon tape (PTFE) or elastomer.
- ▶ Welding work must only be carried out by welders trained in the area of hygiene.

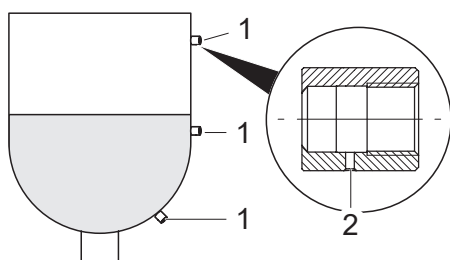


#### LBFH with the following process connection:

- G 1/2 A hygienic, BCID A03

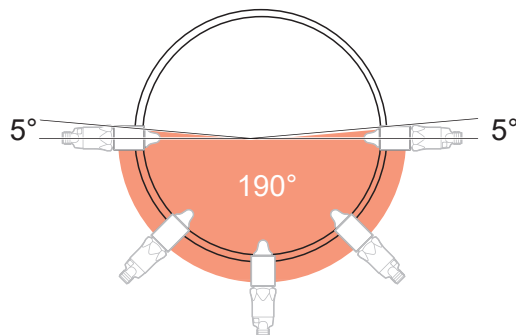
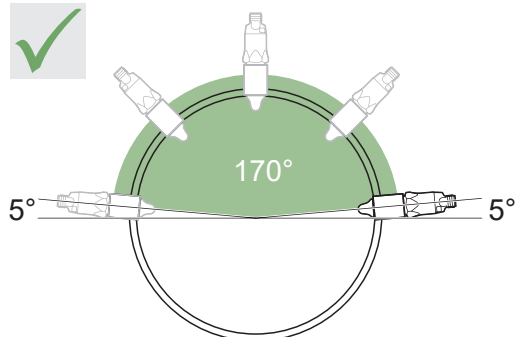
- ✓ Weld-in sleeve or adapter are hygienically mounted and are internally flush.
- ✓ Weld seams are smoothed out to  $Ra < 0.8 \mu m$ .
- ✓ Leakage hole points downwards.
- ▶ Screw in sensor.  
Tightening torque: 15 ... 20 Nm

#### Example of mounting with weld-in sleeve ZPW3-321



- 1 ZPW3-321
- 2 Leakage hole

#### Example of mounting with weld-in sleeve ZPW3-326 or ZPW3-327



## 5.3 Approvals



The EHEDG certificate is only valid in connection with the appropriate installation parts. These are marked with the "EHEDG Certified" logo.



The 3-A Sanitary Standard requirements are only met with the appropriate installation parts. These are marked with the 3-A logo.



Approved for explosion hazard areas when installed as specified.



Approved by Underwriter Laboratories (UL) for use in the USA and Canada as an industrial control device.



WHG certified for leakage and overflow protection. All documentation must be available at the place of use and can be found on the product page on [www.baumer.com](http://www.baumer.com)

For more information about approvals and certification, please see the product page on [www.baumer.com](http://www.baumer.com).

## 6. Electrical connection

- ✓ A voltage supply of 8 V to 36 V DC is provided.
- ▶ Switch off supply voltage.
- ▶ Connect sensor in accordance with the pin assignment.

### Terminal assignment



Output type	Equivalent circuit with IO-Link	Function	M12, 4 pin
<b>PNP</b>		+ Vs	1
		SW1	4
		SW2	2
		GND (0 V)	3
<b>NPN</b>		+ Vs	1
		SW1	4
		SW2	2
		GND (0 V)	3
<b>Digital (push-pull)</b>		+ Vs	1
		SW1	4
		SW2	2
		GND (0 V)	3

## 7. Electrical connection in explosion hazard areas

Depending on the variant, the LBFH/I is approved for most explosion hazard areas.



### DANGER

#### Risk of fatal accident due to a wrongly connected sensor

- ▶ In explosive gas atmospheres of zone 0 or 1, use Baumer isolation barriers or Zener barriers.
- ▶ In explosive dust atmospheres, use insulated cable to IP67.
- ▶ Allow only persons trained in explosion protection to perform the installation.
- ▶ Never use FlexProgrammer or IO-Link Master configuration tools in explosion hazard areas.

### 7.1 Explosive gas atmospheres zone 0 and 1

The LBFH/I can be used in explosion hazard areas of zone 0 or zone 1. Sensors can use Baumer isolation barriers which are easy to install or use Zener barriers.

Approval for LBFx.xx.xxx.xxxxxx.x.4xxx.x: ATEX II 1G Ex ia IIC T4 Ga  
and ATEX II 1D Ex ta IIIC T100 °C Da (TÜV 17 ATEX 188894 X)

#### LBFx.xx.xxx.xxxxxx.x.4xxx.x and additional dust atmospheres:

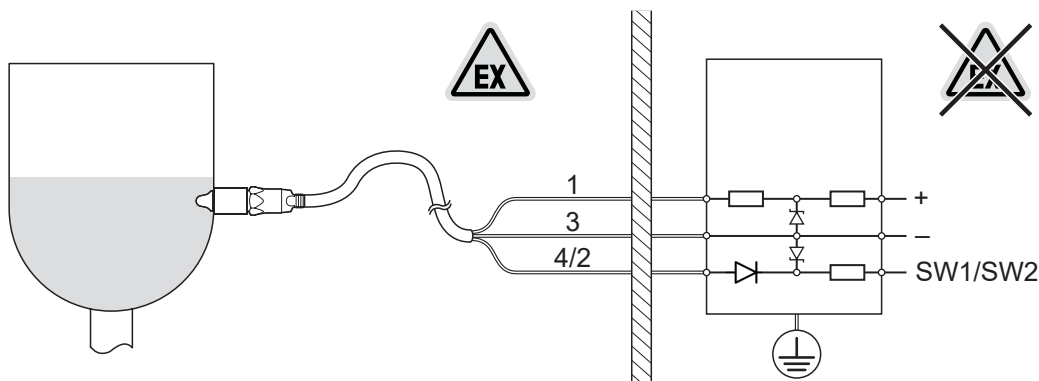
- ▶ Use insulated cable to IP67.
- ▶ Secure cables with external strain relief at a distance 5 centimeters from the sensor.

#### All LBFH/I in zone 0 and zone 1

- ▶ Use PROFSI3-B25100-ALG-LS isolation barriers for the connection.  
– or –  
Use Zener barriers.
- ▶ Comply with the following temperatures, connection values and circuit diagram.

#### ATEX II 1G Ex ia IIC T4 Ga

Highest values for selection of barriers	Ui: 30 V DC Ii: 100 mA Pi: 0,75 W
Internal capacitance	Ci: 63 nF
Internal inductance	Li: 617 µH
Temperature class	T1...T4: –40 < Tamb < 85 °C
Protection class for cable accessories	IP67



#### Function M12-A 4-pin

+ Vs	1
GND (0V)	3
SW1/SW2	4/2



### DANGER

#### Risk of fatal accident due to failing communication with the sensor

IO-Link communication is not possible when a barrier is installed.

- ▶ Do not use IO-Link communication together with a barrier.





## DANGER

### Risk of fatal accident if installation requirements are ignored

Correct gas and dust protection can only be achieved by meeting their installation requirements.

- ▶ Make sure that all requirements are met and that sensor and installation have a valid approval for their specific explosive atmosphere.
- ▶ In an explosive gas atmosphere, always use the sensor with a barrier.

## 7.2 Explosive dust atmospheres zones 20, 21 and 22

The LBFH/I can be used in explosion hazard areas of zone 20, 21 and 22.

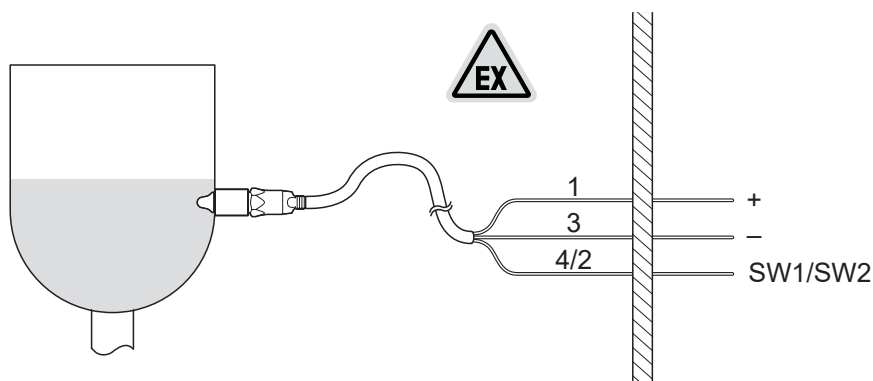
Approval for LBFx.xx.xxx.xxxxxx.x.4xxx.x: ATEX II 1D Ex ta IIIC T100 °C Da (TÜV 17 ATEX 188894 X)

### LBFx.xx.xxx.xxxxxx.x.4xxx.x:

- ▶ Use insulated cable to IP67.
- ▶ Secure cables with external strain relief at a distance 5 centimeters from the sensor.
- ▶ Comply with the following temperatures, connection values and circuit diagram.

### ATEX II 1D Ex ta IIIC T100 °C Da

Voltage supply range	30 V DC max.
Temperature class	T100°C: –40 < Tamb < 85 °C
Surface temperature	100 °C max.
Protection class for cable accessories	IP67



Function	M12-A 4 pin
+ Vs	1
GND (0V)	3
SW1/SW2	4/2

## 7.3 Explosive gas atmospheres zone 2

The LBFH/I can be used in explosion hazard areas of zone 2.

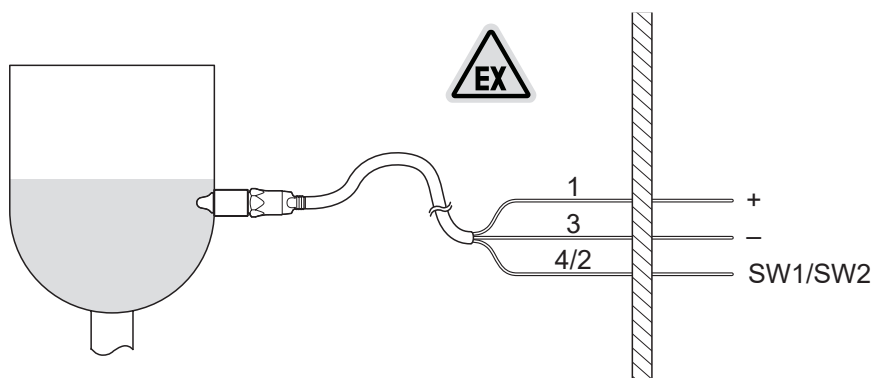
Approval for LBFx.xx.xxx.xxxxxx.x.3xxx.x: ATEX II 3G Ex nA IIC T4 Gc (TÜV 17 ATEX 188895 X)

### LBFx.xx.xxx.xxxxxx.x.3xxx.x:

- ▶ Comply with the following temperatures, connection values and circuit diagram

### ATEX II 3G Ex nA IIC T4 Gc

Voltage supply range	Un: 30 V DC max.
Temperature class	T1...T4: –40 < Tamb < 85 °C



Function	M12-A 4 pin
+ Vs	1
GND (0V)	3
SW1/SW2	4/2

## 8. Configuration

The sensor can be configured either via qTeach, remote teach, FlexProgrammer or IO-Link. If formation of foam or adhesion of media have to be detected, a configuration with the FlexProgrammer will be necessary.

If for both switch outputs different switch points or media have to be configured, a configuration with FlexProgrammer or qTeach is also necessary.

### Configuring with qTeach (Standard version)

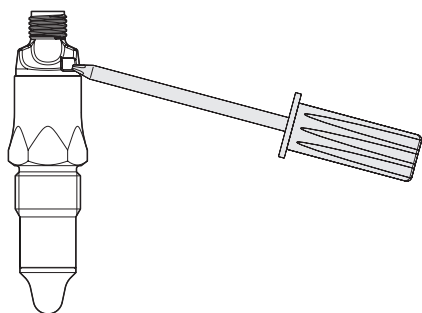
Via qTeach, the switch points SW1 and SW2 can be configured independently. Switch output SW1 is NO (normally opened) and switch output SW2 is NC (normally closed).

Configuration is only possible during the first 5 minutes after connecting the voltage supply. After that, qTeach will be locked.

Note: For a graphical overview of the configuration procedure refer to “14.5 Configuration procedure with qTeach” on page 16.

✓ Sensor is connected.

- ▶ Hold screwdriver or other metal object on the qTeach detector.



The LED is blinking magenta at 1 Hz for 3 seconds. For selecting the switch the LED alternates between yellow and blue in 2 second intervals.

- ▶ When the LED has the color of the desired switch, remove the screwdriver or metal object from the qTeach detector to select the according switch:

SW1: yellow

SW2: blue

The LED is blinking in the selected color at 0.5 Hz.

- ▶ Put the sensor tip into the media and touch the qTeach area.

The LED flashes in the selected color while the teaching process is running.

For selecting the switching window the LED alternates between green, cyan and white in 2 second intervals.

- ▶ Hold screwdriver or other metal object on the qTeach detector.
- ▶ When the LED has the color of the desired switching window, remove the screwdriver or metal object from the qTeach detector to select the according switching window:

Switching window  $\pm 12\%$ , hysteresis 4%: green

Switching window  $\pm 6\%$ , hysteresis 2%: cyan

Switching window  $\pm 3\%$ , hysteresis 1%: white

The configuration is complete and the changes are saved.

If the DC value of the media is too close to air, the most narrow switching window has to be selected. If the LED flashes red (indicating an error) or if the configuration time of 5 minutes has been exceeded, no changes are saved.

- ▶ To restart the configuration disconnect and reconnect the voltage supply.

Configuration via qTeach is enabled in the factory settings and can be disabled by the user.

## Configuration via qTeach (Adaptive version)

Via qTeach, the different trigger types can be set for SW1 and SW2. The switch logic is normally open (NO) for both SW1 and SW2.

For a graphical overview of the configuration procedure, refer to “14.4 qTeach configuration procedure” on page 15.

**Note:** Configuration is only possible during the first 5 minutes after connecting the sensor to the power supply. After that, qTeach is locked.

### Step 1: Selecting the switch

✓ Sensor is powered up.

- ▶ Hold a screwdriver or other metal object on the qTeach detector.

The LED rapidly blinks magenta. The LED alternates between yellow, cyan and orange in 3 second intervals.

- ▶ When the LED has the color assigned to the desired switch, remove the screwdriver from the qTeach area:
  - Yellow: SW1
  - Cyan: SW2
  - Orange: Factory setting
 The LED slowly blinks in the selected color.

### Step 2: Selecting the trigger type

- ▶ For the switch selected in step 1, select the trigger type by holding the screwdriver on the qTeach area again. When the desired trigger type appears, remove the screwdriver:
  - White: Window trigger
  - Green: Adaptive trigger

If the LED flashes red, an error has occurred and the changes are not saved.

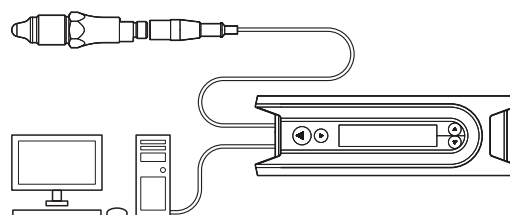
- ▶ To restart the configuration, disconnect and reconnect the sensor to the power supply.

Configuration via qTeach is enabled in the factory settings and can be disabled by the user.

## Configuring with FlexProgrammer and PC

Switch points and damping of both switch outputs can be set as desired with FlexProgrammer.

- ▶ Connect FlexProgrammer to sensor.
- ▶ Connect FlexProgrammer to PC and set parameters (see FlexProgrammer instructions).



## Configuring with IO-Link Master

Switch points, hysteresis, damping, output mode, etc. can be configured via IO-Link with an IO-Link Master.

- ▶ Connect IO-Link Master to sensor
  - ▶ Connect IO-Link to PC and set parameters.
- A detailed description of the parameter and process data for the IODD can be found on [www.baumer.com](http://www.baumer.com) in the products separate download area.

## Configuring via remote teach

Sensors that are built into places hard to access can be configured via remote teach easily and without any other help. The switch points SW1 and SW2 can be configured independently. Switch output SW1 is NO (normally opened) and switch output SW2 is NC (normally closed).

- ✓ The remote teach function has been activated with FlexProgrammer before the integration of the sensor (see FlexProgrammer instructions).
- ▶ Short-circuit switch output SW1 for more than 1 second with GND (0 V).  
The LED flashes magenta.
- ▶ Continue as described in the qTeach procedure.

## 9. Troubleshooting

Fault	Cause	Action
LED does not light up	Sensor not correctly connected	▶ Check plug and power supply.
Red LED indicator light	Short circuit	▶ Remedy short circuit.
	Unsuitable media characteristics	▶ Check signal quality with FlexProgrammer.
LED flashes red	Device error	▶ Dismount and return sensor.

## 10. Cleaning, maintenance and repair

### Cleaning

- ▶ Clean, disinfect or sterilize sensor as needed (CIP/SIP).

### Maintenance

Regular maintenance is not required.

### Repair

Do not repair the sensor yourself.

- ▶ Send damaged sensor to Baumer.

## 11. Disposal



- ▶ Do not dispose of in household waste.
- ▶ Separate materials and dispose of in compliance with nationally applicable regulations.

## 12. Accessories

For adapter and other accessories see [www.baumer.com](http://www.baumer.com).

## 13. Technical data

Environmental conditions		Features	
Operating temperature range	■ -40 ... -85 °C	Repeatability	■ ± 1 mm
Storage temperature range	■ -40 ... -85 °C	Hysteresis	■ ± 1 mm
Ambient humidity	■ < 98 % RH, condensing	Response time	■ 0.04 s
Protection class	■ IP67 ■ IP69K (with appropriate cable)	Damping	■ 0.1 ... 10.0 s (adjustable)
Oscillations (sinusoidal) (EN 60068-2-6)	■ 1.6 mm p-p (2 ... 25 Hz), 4 g (25 ... 100 Hz), 1 octave / min.		

**Power supply**

Voltage supply range ■ 8 ... 36 V DC

Reverse polarity protection ■ yes

Current consumption (without load) ■ 25 mA type., 40 mA max.

Power-up time ■ &lt; 2 s

**Output signal**

 Output type ■ PNP  
 ■ NPN  
 ■ Digital (push-pull)

Current load ■ 100 mA max.

Short circuit protection ■ yes

 Voltage drop ■ PNP: (+Vs - 0.5 V) ± 0.2 V, Rload = 10 kΩ  
 ■ NPN: (+0.5 V) ± 0.5 V, Rload = 10 kΩ

Leakage current ■ ± 100 µA max.

 Switching logic ■ Normally open (NO), active low  
 ■ Normally closed (NC), high enabled

**Process conditions**

Type	Process connection	BCID	Process temperature continuous [°C]	Process pressure [bar]	Process temperature t < 1 h [°C]	Process pressure t < 1 h [bar]
			Tamb < 50 °C	Tamb < 50 °C		
LBFi	G 1/2 A ISO 228-1	G07	-40 ... 115	-1 ... 100	135	-1 ... 100
LBFi	1/2-14 NPT	N02	-40 ... 115	-1 ... 100	135	-1 ... 100
LBFH/I	G1/2 A hygienic	A03	-40 ... 115	-1 ... 10	135	-1 ... 5
LBFi	G1/2 A hygienic, length 82 mm	A03	-40 ... 115	-1 ... 100	135	-1 ... 100

## 14. Configuration overview

### 14.1 Adaptive trigger

The adaptive trigger is a plug-and-play solution. With the adaptive trigger, manual sensor configuration is not required, since the trigger will automatically configure the output signal to react to a new medium. The adaptive trigger is very useful for applications with sticky media or for applications where the medium is changed frequently.

Normally, it is not necessary to configure the adaptive trigger, but if the advanced setup is enabled, it is possible to define low and high set points for the adaptive trigger window and a damping. The steady detection function ensures that the input signal is steady for 1 second before the switch output reacts. If the steady detection function is inactive, the switch output will react immediately to each input change.

To ensure a fully functional adaptive trigger, the following conditions have to be fulfilled:

- The sensor has to be in air during startup.
- The input signal has to be steady.
- The difference between the value for untriggered and the value for triggered must be more than 3 %.
- If a new medium with a DC value lower than the previously configured DC value has to be detected, the sensor tip should be cleaned before the new medium is filled in the tank or pipe.

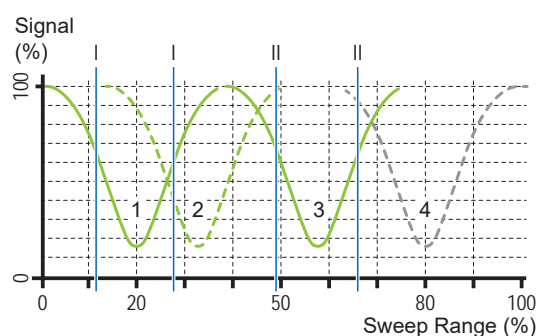
For more information, refer to the HELP menu in FlexProgram.

#### Adaptive trigger – Output setup

SW1 (NO) / SW2 (NO)	Factory setting
Advanced setup	Disabled
Set point low	0 %
Set point high	100 %
Damping	0 ms
Steady detection	Active

## 14.2 Window trigger

The window trigger is used to cause a sensor switch to react within a specific range, for example, in order to isolate a specific medium. The switching window can be configured within a range from 0 ... 100 %. The window trigger is recommended for detecting and separating different layers, for example oil from water or foam from beer.



- 1 Good conductive medium
- 2 Adhesion from good conductive adhesive medium
- 3 Oily medium
- 4 Air

Configuration example for a vessel that can be filled with either a good conductive adhesive medium (e.g. fruit preparation) or with an oily medium (e.g. chocolate mix).

Switch windows I and II in this example are set to achieve the following goals:

- to detect the fruit preparation (1)
- to exclude adhesion from fruit preparation (2)
- to identify the chocolate mixture (3)

For more information, refer to the HELP menu in FlexProgram.

#### Window trigger – Output setup

SW1 (NO) / SW2 (NC)	Factory setting
Switch window, min.	0 %
Switch window, max.	75.3 %
Switch window, hysteresis	2.4 %
Damping	0.1 s

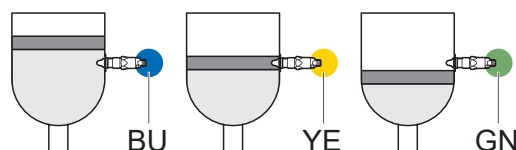
## 14.3 LED factory settings

### LED function (Standard version)

SW1*	SW2*	LED indicator
0	0	■ Green
1	0	■ Yellow
0	1	■ Blue
1	1	■ Blue
Error	Error	■ Flashing red
Short circuit	Short circuit	■ Red

\*1 = active, 0 = inactive

### Color examples



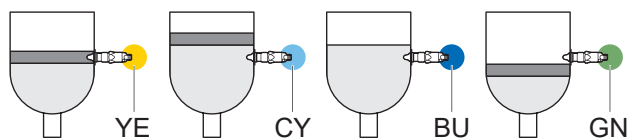
- BU = blue: SW2 active
- YE = yellow: SW1 active
- GN = green: Both switch outputs inactive.

#### LED function (Adaptive version)

SW1*	SW2*	LED indicator
0	0	■ Green
1	0	■ Yellow
0	1	■ Cyan
1	1	■ Blue
Error	Error	■ Flashing red
Short circuit	Short circuit	■ Red

\*1 = active, 0 = inactive

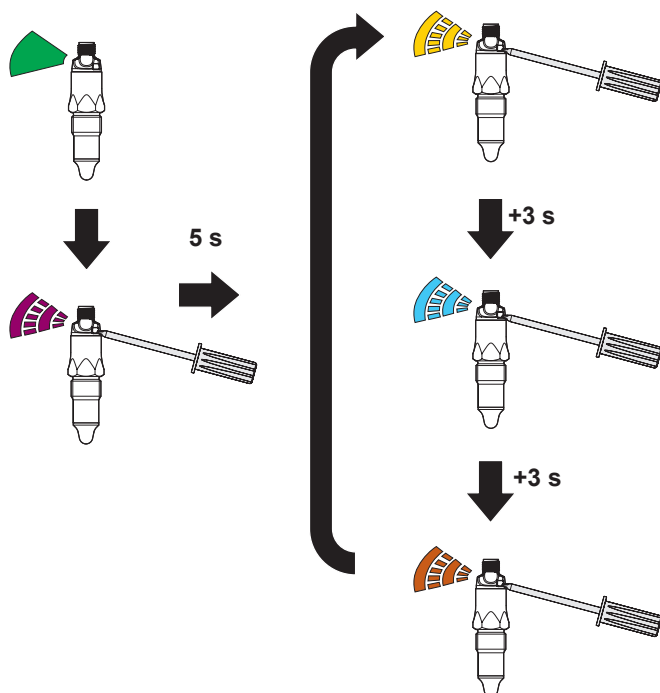
#### Color examples



- YE = SW1 active
- CY = SW2 is active
- BU = Both SW1 and SW2 are active
- GN = Both SW1 and SW2 are inactive

### 14.4 Configuration procedure with qTeach (Adaptive version)

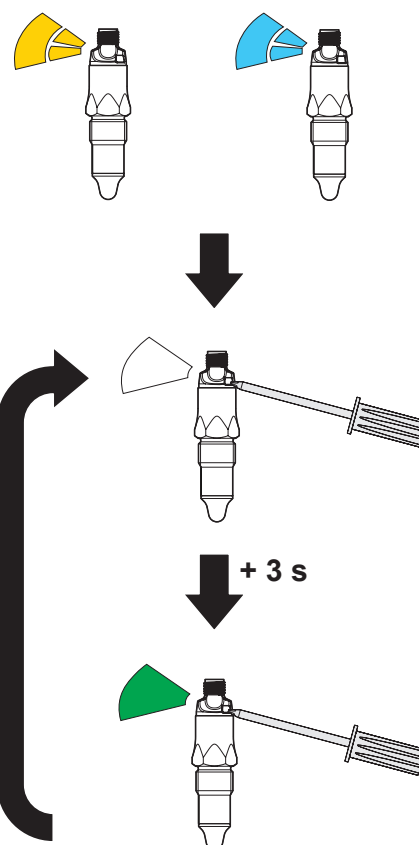
#### Step 1: Selecting the switch



A switch is selected by holding the screwdriver on the qTeach area and removing it when the LED displays the color assigned to the switch:

- Yellow: SW1
- Cyan: SW2
- Orange: Factory setting

#### Step 2: Selecting the trigger type

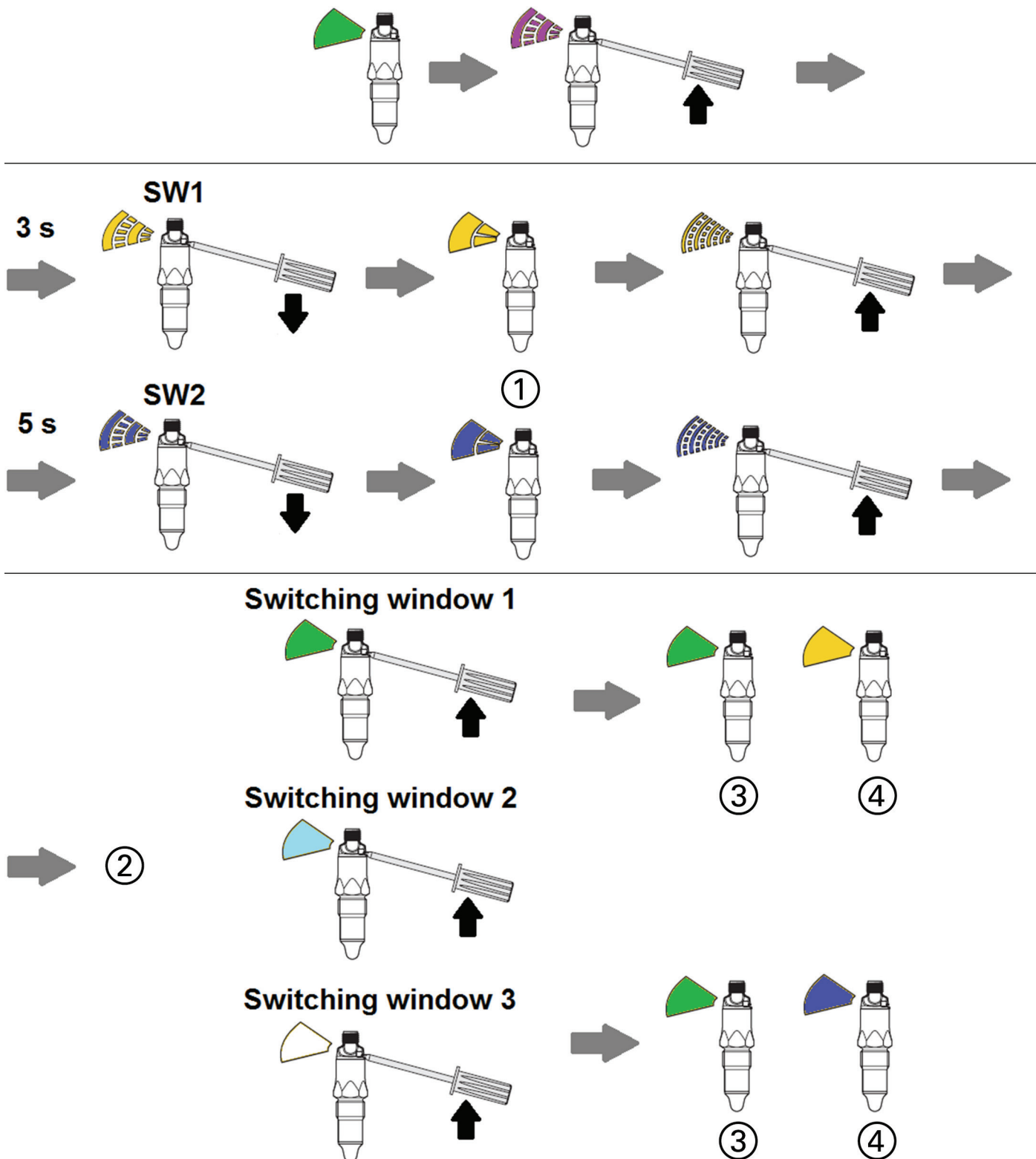


The trigger type for the selected switch can be chosen by holding the screwdriver on the qTeach area and removing it when the desired trigger type is displayed:

- White: Window trigger
- Green: Adaptive trigger



### 14.5 Configuration procedure with qTeach (Standard version)



- 1 Ready for teaching. Immerse the sensor in the medium.
- 2 Choose switching window: Hold the tool until the desired switching window appears.
- 3 No medium
- 4 With medium