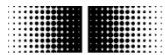


## **Baumer Explosion Protection Guideline**

### **Scope**

This document contains recommendations for ATEX installations of suitable Baumer sensors. The information given must not be understood as a specification and Baumer does not assume any responsibility for the information provided.



Contents

**1 Protection concepts used by Baumer.....3**

1.1 Intrinsic safety (Ex i) .....3

1.2 Tight enclosure (Ex t).....4

1.3 Non-sparking (Ex nA) .....4

**2 Product specifics.....5**

2.1 General .....5

2.2 Temperature sensors .....5

2.2.1 Passive Pt100 sensors (simple apparatus) .....5

2.2.2 Temperature transmitters.....5

2.3 Pressure sensors .....5

2.4 Point level switches .....5

2.4.1 General CleverLevel installation constraints .....5

2.4.2 LFFS .....6

2.4.3 LBFS .....6

2.4.4 LBFH/I .....6

2.5 Inductive proximity switches IFRM ##X.....6

2.6 FlexProgrammer 9701 .....7

**3 Barrier and isolator selection for intrinsic safety (Ex i) installations .....7**

3.1 Quick application finder .....7

3.2 Intrinsic safety installation concepts .....7

3.2.1 Analog 2-wire current loop sensor .....7

3.2.2 Analog 2-wire current loop sensor with relays.....8

3.2.3 Switching sensor with single PNP output .....9

3.2.4 Switching sensor with single push-pull output.....9

3.2.5 Switching sensor with two PNP outputs .....10

3.2.6 Switching sensor with two push-pull outputs .....11

3.2.7 Switching sensor with NAMUR interface .....11

3.3 Reference for barrier and isolator models .....12

3.4 Intrinsic safety check .....14

3.4.1 B28RD100 .....14

3.4.2 BISOSW1 .....16

3.4.3 B30RS075 .....17

3.4.4 BNAMUR1 .....18

**4 Appendix .....19**

4.1 Flowchart for associated apparatus selection .....19

4.1.1 Point level switches .....19

4.1.2 Temperature sensors .....20

4.1.3 Pressure sensors .....21

4.1.4 Inductive proximity switches .....22

4.2 Considerations for fail-safe operation.....23

4.3 Marking overview for ATEX and IECEx used for Baumer products .....24

4.4 List of figures .....25

4.5 Documentation history.....25

# 1 Protection concepts used by Baumer

Note: BU Motion and pressure transmitter X9 are excluded.

## 1.1 Intrinsic safety (Ex i)

- Zones 0, 1, 2 (gas) [Class I Division 1/2 (gases)] and zones 20, 21, 22 (dust) [Class II Division 1/2 (dusts)]
- Limit the energy of sparks and surface temperatures
- Ex i safety barrier or isolator required (associated apparatus)
- No IO-Link via barrier or isolator possible

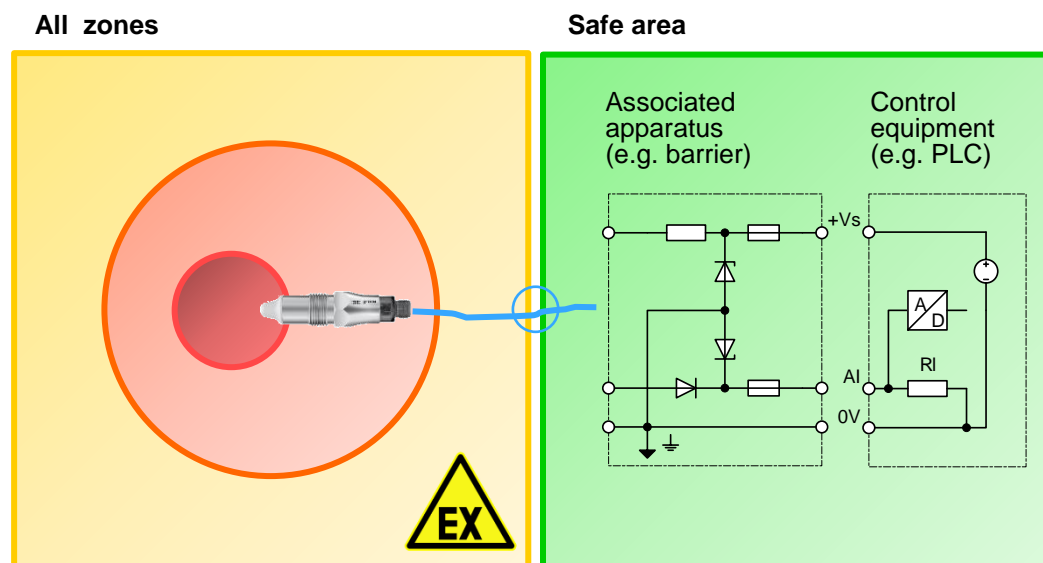


Figure 1: Schematic for a gas “ia” installation of a CleverLevel (LBFH/I) (ATEX II 1 G Ex ia IIC T4 Ga)



Figure 2: Examples of Ex i associated apparatus (“barriers”)

## 1.2 Tight enclosure (Ex t)

- Zones 20, 21, 22 (dust) [Class II Division 1/2 (dusts)]
- Standard protection for dusts
- Rugged and tight enclosure, no hot surfaces
- Ingression protection required (e.g. IP6x)
- Use insulated cables to IP6x
- Must not be unplugged in operation (only for defined maintenance)

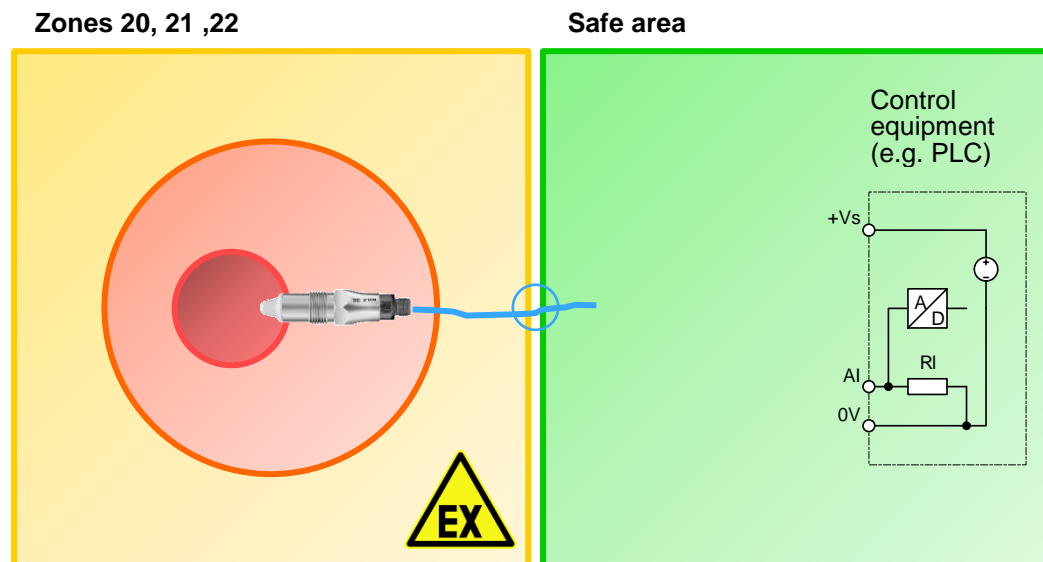


Figure 3: Schematic for a dust “ta” installation of a CleverLevel (ATEX II 1 D Ex ta IIC T100 °C)

## 1.3 Non-sparking (Ex nA)

- Zone 2 (gas) only [Class I Division 2 (gases)]
- No arcs, sparks or hot surfaces
- Enclosure ingress protection min. IP54
- “Ex nA” moved to “Ex ec” by regulations, but is still valid

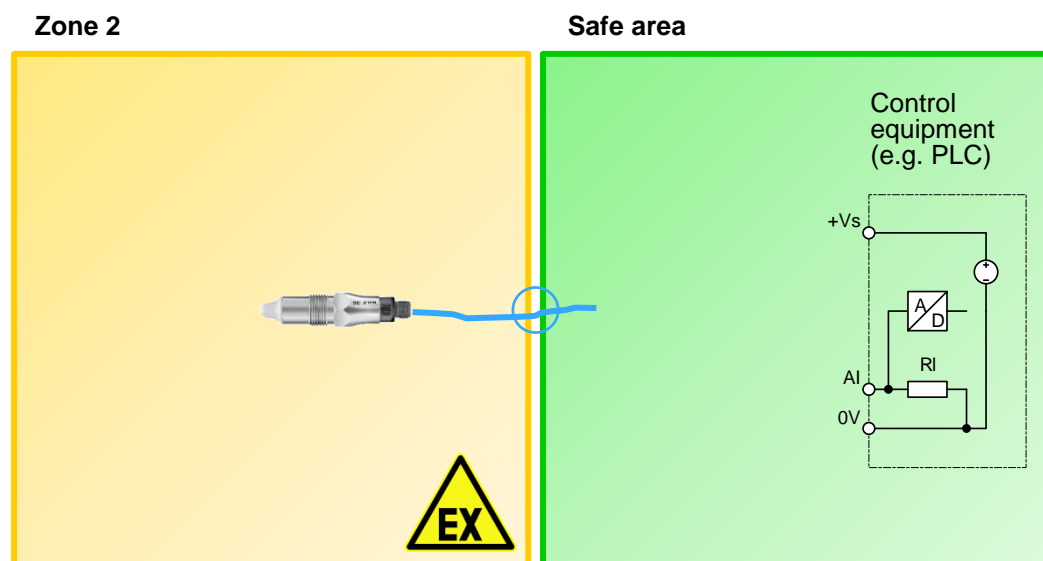


Figure 4: Schematic for a gas zone 2 “nA” installation of a CleverLevel (ATEX II 3 G Ex nA IIC T4 Gc)

## 2 Product specifics

### 2.1 General

All Baumer Ex-certified products are only applicable for surface installation (ATEX group II), i.e. not for mining (ATEX group I).

Any dual stamping for gas and dust (like LBFS-4xxxx.x) does not mean that the unit can be used in an atmosphere which is hazardous for both gas and dust (hybrid mixture). In this case, a dedicated assessment has to be made by the operator which we cannot support. Once such a unit has been connected to any other than an intrinsically safe circuit, it must not be used in an intrinsically safe installation again.

### 2.2 Temperature sensors

#### 2.2.1 Passive Pt100 sensors (simple apparatus)

There are dedicated three-channel Zener barriers available, however, they aren't recommended, because of accuracy loss and difficulties to match intrinsic safety limit values. Also most Ex i isolators with integrated Pt100 to 4-20-mA converter do not match the limit values of our "simple apparatus" specification.

Temperature sensors with integrated Baumer FlexTop head transmitters are recommended instead.

#### 2.2.2 Temperature transmitters

All FlexTop transmitters have ATEX certification, either as single module or mounted in a thermometer, like TFRx or TCR6. The interface is an analog 2-wire current loop with HART protocol as option. It's ideal for being transferred through a Zener barrier, because current loop signals are tolerant to loop resistance without degrading performance.

### 2.3 Pressure sensors

Ex-certified pressure sensors are PBMx, PFMx, and Y91-3. ATEX compatibility is restricted to 4-20-mA interface with exception of Y91-2, which is also available with voltage output, however no application is given in this document for it. There is also a constraint for cable output connection of PBMx, which has been discontinued for gas due to risk of carryover gas through the cable between different zones.

For PBMx: The pressure transmitters can be mounted in boundary walls, which separates the areas according to category 1 (EPL Ga) - requirements (zone 0) from areas according to category 2 (EPL Gb) - requirements (zone 1). In this case, the process connection must be sufficiently sealed according to EN 60079-26, art. 4.6, e.g. the protection class IP67 according to EN 60529. Please refer to the appropriate installation instructions for more details.

### 2.4 Point level switches

#### 2.4.1 General CleverLevel installation constraints

For all CleverLevel, no barrier is required for dust (ta) and non-sparking (nA, zone 2) applications.

When using a standard barrier, there are some boundary conditions. The supply voltage comes to a borderline level when anticipating all worst case conditions. For that reason the output load resistance should be greater than 10 kOhm. The max. output voltage is limited to the actual supply voltage arriving after the barrier's resistor, which is not within the threshold range of a standard digital PLC input. For that reason the output signal has to be evaluated with an analog input type.

If a digital input type should be used in the PLC, the Ex i isolator PROFSI3 is recommended.

## 2.4.2 LFFS

### 2.4.2.1 Versions

There are separate versions for gas (ia), dust (tD, new: ta) and non-sparking (nA, zone 2).

### 2.4.2.2 Intrinsic safety installation constraints for LFFS

For gas (ia) only Ex i isolator PROFSI3 can be used.

## 2.4.3 LBFS

### 2.4.3.1 Versions

For legacy reasons, there are two separate versions for gas (ia) and dust (ta) available (LBFS-1xxxx.x and LBFS-2xxxx.x). If there is no mandatory requirement to order these legacy versions, please chose the combined version for ia and ta (LBFS-4xxxx.x). (LBFS-3xxxx.x) is the version for non-sparking applications (nA, zone 2).

### 2.4.3.2 Intrinsic safety installation constraints for LBFS

For gas (ia) applications only Ex i isolator PROFSI3 can be used.

Only PNP-output configuration (at ordering choice) can be used. Please refer to section 3.2.3 for details.

## 2.4.4 LBFH/I

### 2.4.4.1 Versions

There are two versions: combined gas/dust (ia/ta) and non-sparking (nA, zone 2). Both versions are approved to ATEX and IECEx, however, there is currently no UL certificate.

### 2.4.4.2 Intrinsic safety installation constraints for LBFH/I

PNP and push-pull output configuration can be used, however push-pull is preferred due to lower leakage current for the IO-Link capable output in particular. Please refer to section 3.2.4 for details.

The LED current consumption is slightly higher when showing yellow, rather than green or blue color. In factory default setting, both outputs are switching antivalent with equal switching windows; with this configuration there will never be a yellow LED indication.

Nevertheless, both outputs can be used simultaneously with some restrictions, if there is a requirement for different sensor thresholds using different demanding media. In this case the proper function has to be evaluated and tested with respect to min. supply voltage and PLC input level. Please refer to section 3.2.5 for more information.

LBFH/I have a quite big inductance integrated which supports the qTeach feature; therefore only gas group IIB can be accepted (EN 60079, 50-%-rule), please see section 3.4 for details.

## 2.5 Inductive proximity switches IFRM ##X...

All Baumer Ex i inductive proximity switches are connected by a 2-wire NAMUR interface. In addition there are Ex t versions with transistor switching outputs and tight enclosure for Ex dust applications in zone 22.

## 2.6 FlexProgrammer 9701

FlexProgrammer 9701 must not be used in hazardous areas. It can be connected in the safe area if terminals are available there and if:

- It is not an intrinsically safe installation, because
  - Serial resistance caused by a barrier is too high for a proper function)
  - Lines are cut by a switching repeater (e.g. PROFSI3)
- The capacitance caused by the cable is within a moderate range (max. cable length app. 20 m)

## 3 Barrier and isolator selection for intrinsic safety (Ex i) installations

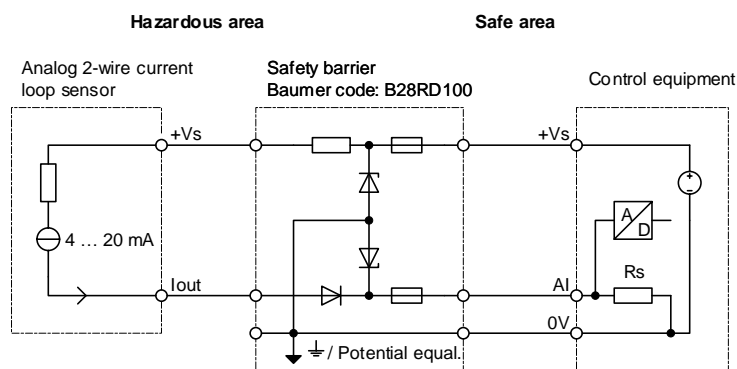
### 3.1 Quick application finder

Temperature sensors and transmitters <b>TFRx, TCR6, 2xxx</b>	<a href="#">Analog 2-wire current loop sensors</a>
Pressure sensors <b>PBMx, PFMx, Y913</b>	<a href="#">Analog 2-wire current loop sensors</a>
CombiSeries with <b>DFON</b> relays <b>TFRx, PFMx</b>	<a href="#">Analog 2-wire current loop sensor with relays</a>
Point level switches <b>LFFS, LBFS, (LBFH, LBFI)</b> with <b>PROFSI3</b>	<a href="#">Switching sensor with single PNP output</a>
Point level switches <b>LBFH, LBFI</b> with one output with <b>Zener barrier</b>	<a href="#">Switching sensor with single push-pull output</a>
Point level switches <b>LBFH, LBFI</b> with two outputs with <b>PROFSI3</b> or <b>Zener barrier</b>	<a href="#">Switching sensor with two PNP outputs</a> <a href="#">Switching sensor with two push-pull outputs</a>
Inductive proximity switches <b>IFRM ##X...</b> , <b>IFR 10.82E05</b> with <b>NAMUR isolator</b>	<a href="#">Switching sensor with NAMUR interface</a>

### 3.2 Intrinsic safety installation concepts

#### 3.2.1 Analog 2-wire current loop sensor

- Applicable for all Baumer Ex i 4-20-mA current loop sensors, e.g. PBMx, PFMx, TFRx, TCR6
- Voltage drop of app. 10 V due to series resistor (up to 360 Ohm) and return diode (2 V)
- HART compatible

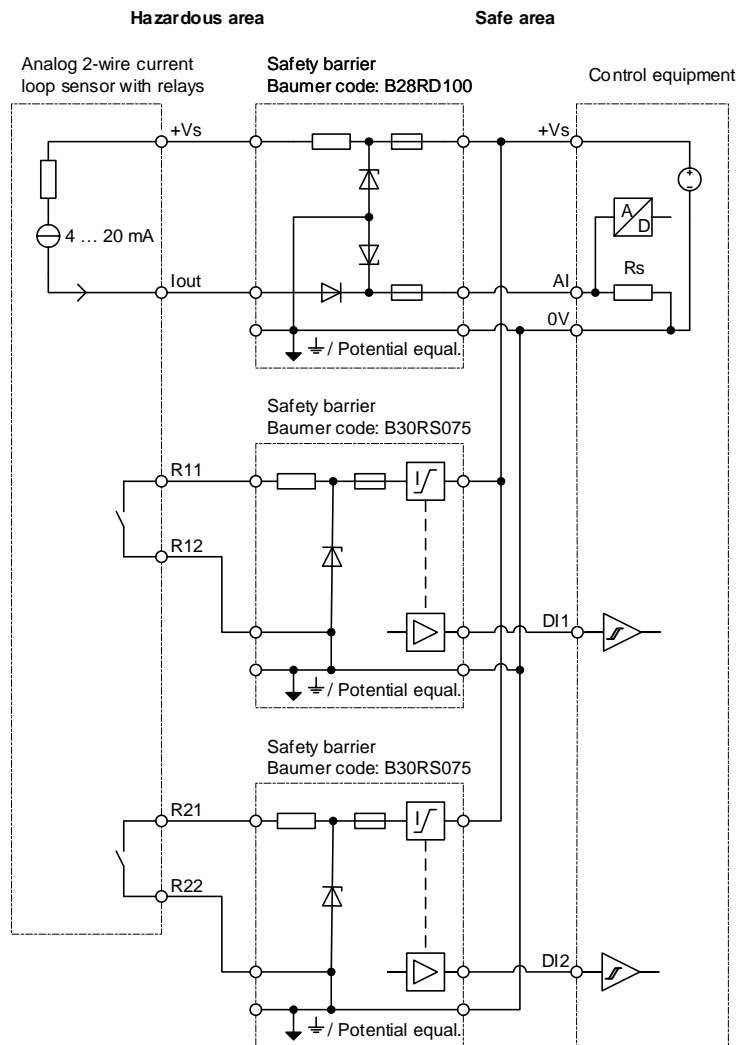


[B28RD100](#)

Figure 5: Analog 2-wire 4-20-mA current loop sensor installation

### 3.2.2 Analog 2-wire current loop sensor with relays

- Applicable in combination with relays contacts like integrated in TFRx and PFMx with DFON display
- Same points than in 3.2.1



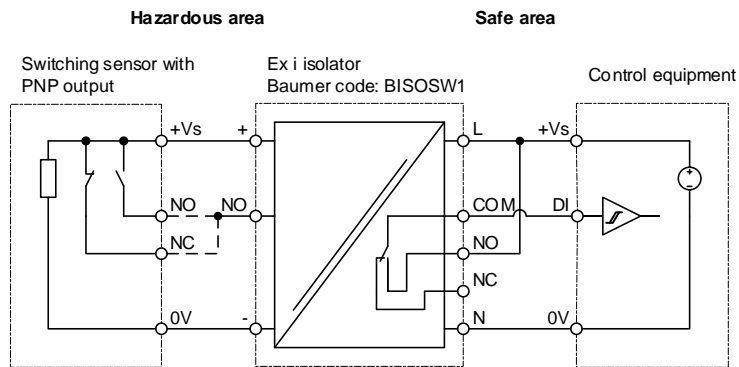
[B28RD100](#) [B30RS075](#)

**Figure 6: Analog 2-wire 4-20-mA current loop sensor installation with relay contacts**



### 3.2.3 Switching sensor with single PNP output

- Applicable for CleverLevel switches, LFFS and LBFS in particular or LBFH/I with only one output used
- An active Ex i isolator is capable to drive directly a digital PLC input.
- Normally open or normally closed (NO/NC) logic can be chosen by wiring or programming. Please check up appendix 4.2 for fail-safe operation considerations.
- For LBFH/I higher cost than Zener barrier (without taking PLC input into account)

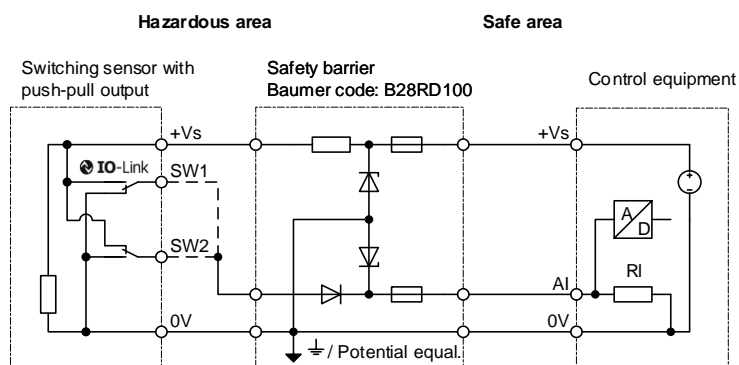


[BISOSW1 \(PROFSI3\)](#)

**Figure 7: PNP switching output installation with dedicated Ex i isolator**

### 3.2.4 Switching sensor with single push-pull output

- Applicable for LBFH/I
- Push-pull outputs are the preferred choice, because there is no leakage current in off-state. This applies especially for IO-Link capable outputs which have usually a higher leakage in PNP output mode. If possible, such switching sensors should be ordered or programmed with push-pull output.
- High voltage drop of power supply due to series resistor of Zener barrier (up to 360 Ohm)
- Analog input in PLC is required, because of low high-side voltage and additional voltage drop from diode in return channel. The switching threshold should be set to 5 V and RI is preferable 10 kOhm.
- IO-Link is not applicable in intrinsically safe ATEX installations. It can be used for programming with direct connection in maintenance conditions without risk of explosive atmosphere presence.

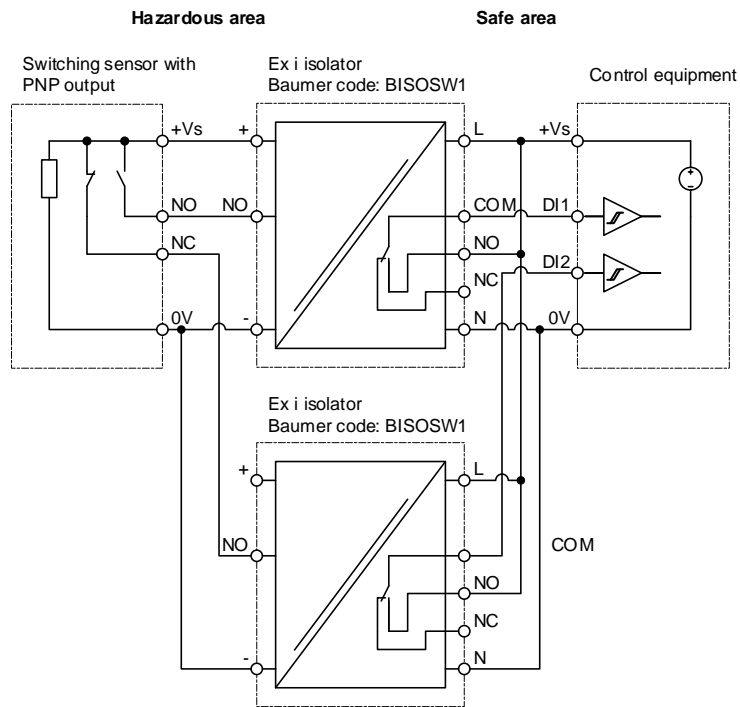


[B28RD100](#)

**Figure 8: Push-pull switching output installation**

### 3.2.5 Switching sensor with two PNP outputs

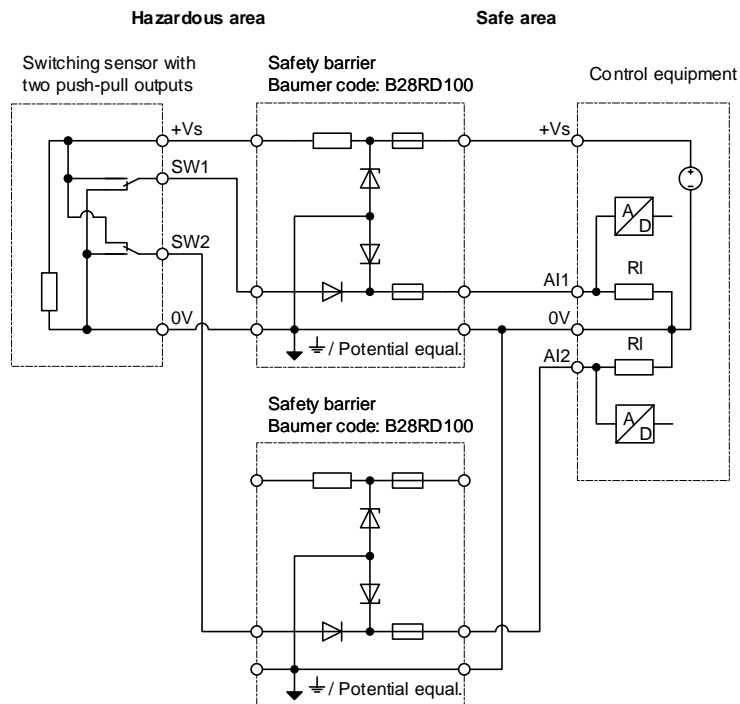
- Applicable for LBFH/I for transmitting two switching outputs with different switching window settings
- Same points as in 3.2.3 if applicable
- The switching input of the second isolator must be taken into account to prove intrinsic safety.
- According to EN 60079-14, the protection level must be reduced to "ib" (zone 1) when associated apparatus are interconnected.



**Figure 9: Two PNP switching outputs with interconnection of two Ex i isolators**

### 3.2.6 Switching sensor with two push-pull outputs

- Same points than in 3.2.4
- Second barrier with only the return diode path used must be taken into account to prove intrinsic safety.
- According to EN 60079-14, the protection level must be reduced to "ib" (zone 1) when associated apparatus are interconnected (please refer also to section 3.4.1).

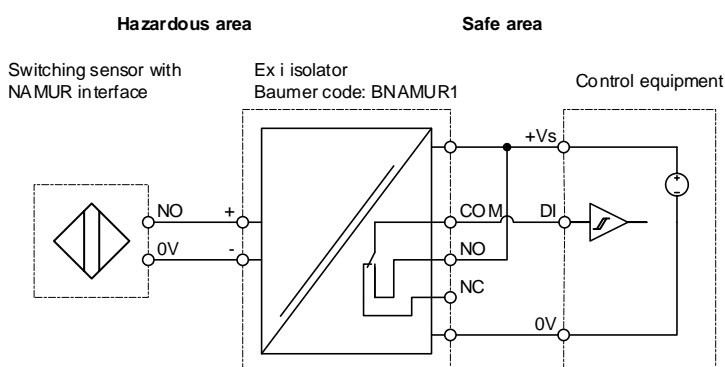


[B28RD100](#)

Figure 10: Two-channel push-pull switching output installation with equal barrier types

### 3.2.7 Switching sensor with NAMUR interface

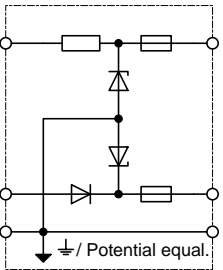

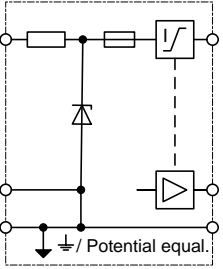

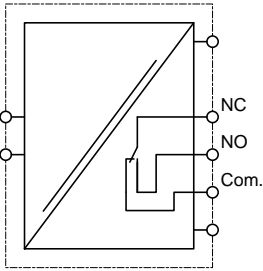
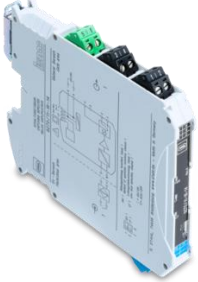
- Applicable for Ex i Baumer proximity switches, like IFRM ##X...
- The most efficient solution proposed is using an active Ex i isolator with NAMUR input.

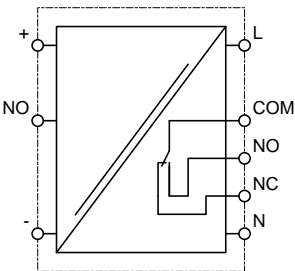



[BNAMUR1](#)

Figure 11: 2-wire NAMUR interface installation with Ex i isolator with NAMUR input

### 3.3 Reference for barrier and isolator models

Baumer code	Baumer accessories	
<p><a href="#">B28RD100</a></p> <p>Safety barrier Baumer code: B28RD100</p> 	<p>Dual-channel safety barrier (with diode return channel) <a href="#">ZEX-ALL.B28RD100</a> (11217062)</p>  <p>Placement in zone 2 or safe area</p>	
<p><a href="#">B30RS075</a></p> <p>Safety barrier Baumer code: B30RS075</p> 	<p>Single-channel safety barrier (for potential-free contacts) <a href="#">ZEX-ALL.B30RS075</a> (11217063)</p>  <p>Placement in zone 2 or safe area</p>	
<p><a href="#">BNAMUR1</a></p> <p>Ex i isolator Baumer code: BNAMUR1</p> 	<p>Switching repeater (NAMUR Ex i field circuit) <a href="#">ZEX-ALL.BNAMUR1</a> (11217065)</p>  <p>Placement in zone 2 or safe area</p>	

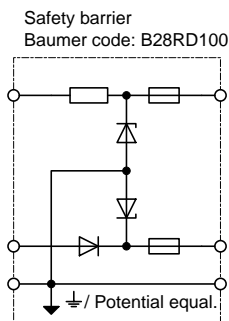
Baumer code	Baumer	
<p><a href="#">BISOSW1</a></p> <p>Ex i isolator Baumer code: BISOSW1</p> 	<p>Switching repeater (CleverLevel Ex i)</p> <p><a href="#">PROFSI3</a> (11049888)</p>  <p>Placement in safe area or for dust in zones 21, 22 with IP6x protection</p>	

### 3.4 Intrinsic safety check

Note: The statements given here do not replace proof of intrinsic safety. They only serve as support to select the suitable components. All information is given without guarantee.

#### 3.4.1 B28RD100

- Two-channel safety barrier
- Resistor for power supply
- Diode as return channel



All Ex i Baumer sensors with analog 2-wire 4-20 mA current loop signal				
Item	Sensors <sup>1</sup>	ZEX-ALL.B28RD100 (I + II)		
U <sub>o</sub>	≤ 28 V	28 V		
I <sub>o</sub>	≤ 100 mA	93 mA		
P <sub>o</sub>	≤ 700 mW	651 mW		
Gas group		IIC	IIB	
C <sub>o</sub>	≥ 60 nF	83 nF	650 nF	
L <sub>o</sub>	≥ 1.5 mH **	2.2 mH	14 mH	

\*\* Multiplied by 100 from actual max. value to exclude 50%-rule

Result: suitable for gas group IIC

Baumer LBFH, LBFI (one output)				
Item	Sensors <sup>1</sup>	ZEX-ALL.B28RD100 (I + II)		
U <sub>o</sub>	≤ 30 V	28 V		
I <sub>o</sub>	≤ 100 mA	93 mA		
P <sub>o</sub>	≤ 750 mW	651 mW		
Gas group		IIC	IIB	
C <sub>o</sub>	≥ 63 nF	83 nF / 2 *	650 nF / 2 *	
L <sub>o</sub>	≥ 617 μH	2.2 mH / 2 *	14 mH / 2 *	

\* 50%-rule has to be applied, because  $L_o = 617 \mu\text{H} > 1\% \cdot 2.2 \text{ mH} = 22 \mu\text{H}$

Result: suitable for gas group IIB

<sup>1</sup> Limit values: smallest for U<sub>i</sub>, I<sub>i</sub>, P<sub>i</sub>, greatest for C<sub>i</sub>, L<sub>i</sub>; C<sub>c</sub> and L<sub>c</sub> for cables are not considered

Baumer LBFH, LBFI (two outputs)				
Item	Sensors <sup>2</sup>	ZEX-ALL.B28RD100 (I + II)		ZEX-ALL.B28RD100 (II)
U <sub>o</sub>	≤ 30 V	28 V		28 V
I <sub>o</sub>	≤ 100 mA	93 mA		3 mA
P <sub>o</sub>	≤ 750 mW	651 mW		21 mW
Interconnection of two barriers with Co and Lo calculated				
Gas group		IIC		IIB
Co	≥ 63 nF	55 nF ***	67 nF ***	240 nF ***
Lo	≥ 617 μH	830 μH ***	500 μH ***	13 mH ***

\*\*\* Values Co and Lo calculated with PTB software "ispark" V 6.2 with U<sub>o</sub> = 28 V and I<sub>o</sub> = 96 mA, safety factor 1.5 (zones 0/1):

IIC

Co	55 nF	67 nF	83 nF			
Lo	830 μH	500 μH	200 μH			

IIB

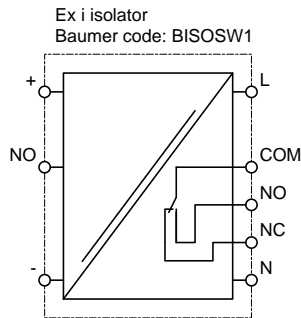
Co	240 nF	290 nF	350 nF	430 nF	570 nF	650 nF
Lo	13 mH	2 mH	1 mH	500 μH	200 μH	100 μH

Result: suitable for gas group IIB; according to EN 60079-14 restriction to "ib" and therefore zone 1

<sup>2</sup> Limit values: smallest for U<sub>i</sub>, I<sub>i</sub>, P<sub>i</sub>, greatest for C<sub>i</sub>, L<sub>i</sub>; C<sub>c</sub> and L<sub>c</sub> for cables are not considered

### 3.4.2 BISOSW1

- Galvanically isolated switching repeater
- Dedicated design to CleverLevel
- Relay output



Baumer LFFS, LBFS				
Item	Sensors <sup>3</sup>	PROFSI3		
U <sub>o</sub>	≤ 30 V	25.2 V		
I <sub>o</sub>	≤ 100 mA	99 mA		
P <sub>o</sub>	≤ 750 mW	623 mW		
Gas group		IIC	IIB	
C <sub>o</sub>	≥ 43 nF	107 nF	820 nF	
L <sub>o</sub>	≥ 1 mH **	3 mH	11 mH	

\*\* Multiplied by 100 from actual max. value to exclude 50%-rule

Result: suitable for gas group IIC

Baumer LBFH, LBFI (one output)				
Item	Sensors <sup>3</sup>	PROFSI3		
U <sub>o</sub>	≤ 30 V	25.2 V		
I <sub>o</sub>	≤ 100 mA	99 mA		
P <sub>o</sub>	≤ 750 mW	623 mW		
Gas group		IIC	IIB	
C <sub>o</sub>	≥ 63 nF	107 nF / 2 *	820 nF / 2 *	
L <sub>o</sub>	≥ 617 μH	3 mH / 2 *	11 mH / 2 *	

\* 50%-rule has to be applied, because L<sub>o</sub> = 617 μH > 1 % · 3 mH = 30 μH

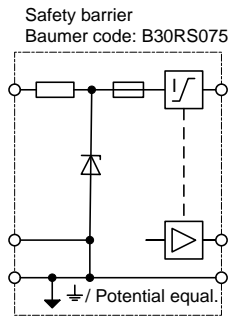
Result: suitable for gas group IIB

<sup>3</sup> Limit values: smallest for U<sub>i</sub>, I<sub>i</sub>, P<sub>i</sub>, greatest for C<sub>i</sub>, L<sub>i</sub>; C<sub>c</sub> and L<sub>c</sub> for cables are not considered



### 3.4.3 B30RS075

- Single-channel safety barrier
- Dedicated to contact evaluation
- Integrated active current limiter controlling a switching output



Baumer DFON Relay outputs (TFRx, PFMx)				
Item	Sensors <sup>4</sup>	ZEX-ALL.B30RS075		
<b>U<sub>o</sub></b>	≤ 30 V	25.2 V		
<b>I<sub>o</sub></b>	≤ 75 mA	60 mA		
<b>P<sub>o</sub></b>	≤ 750 mW	378 mW		
<b>Gas group</b>		IIC	IIB	
<b>C<sub>o</sub></b>	≥ 10 nF	107 nF	820 nF	
<b>L<sub>o</sub></b>	≥ 1 mH **	6.2 mH	25 mH	

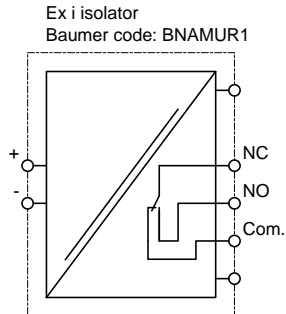
\*\* Multiplied by 100 from actual max. value to exclude 50%-rule

Result: suitable for gas group IIC

<sup>4</sup> Limit values: smallest for U<sub>i</sub>, I<sub>i</sub>, P<sub>i</sub>, greatest for C<sub>i</sub>, L<sub>i</sub>; C<sub>c</sub> and L<sub>c</sub> for cables are not considered

### 3.4.4 BNAMUR1

- Galvanically isolated switching repeater
- Dedicated to inductive proximity switches with NAMUR interface



Baumer IFRM ##X..., IFR 10.82E05, IFRM 05X95/509348				
Item	Sensors <sup>5</sup>	ZEX-ALL.BNAMUR1		
U <sub>o</sub>	≤ 13 V	9.6 V		
I <sub>o</sub>	≤ 20 mA	10 mA		
P <sub>o</sub>	≤ 65 mW	25 mW		
Gas group		IIC	IIB	
C <sub>o</sub>	≥ 100 nF	3600 nF	26000 nF	
L <sub>o</sub>	≥ 20 mH **	300 mH	1000 mH	

\*\* Multiplied by 100 from actual max. value to exclude 50%-rule

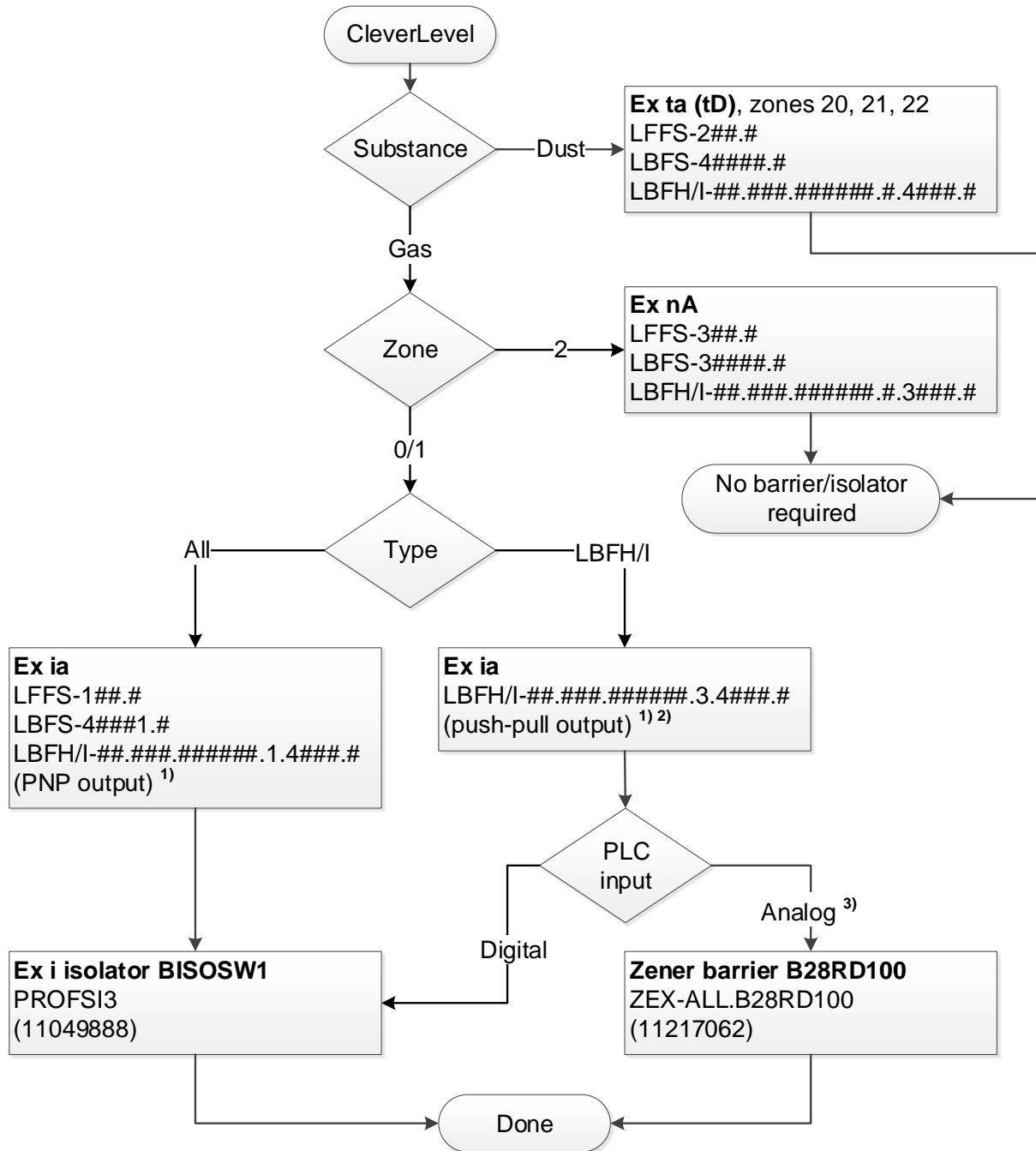
Result: suitable for gas group IIC

<sup>5</sup> Limit values: smallest for U<sub>i</sub>, I<sub>i</sub>, P<sub>i</sub>, greatest for C<sub>i</sub>, L<sub>i</sub>; C<sub>c</sub> and L<sub>c</sub> for cables are not considered

## 4 Appendix

### 4.1 Flowchart for associated apparatus selection

#### 4.1.1 Point level switches

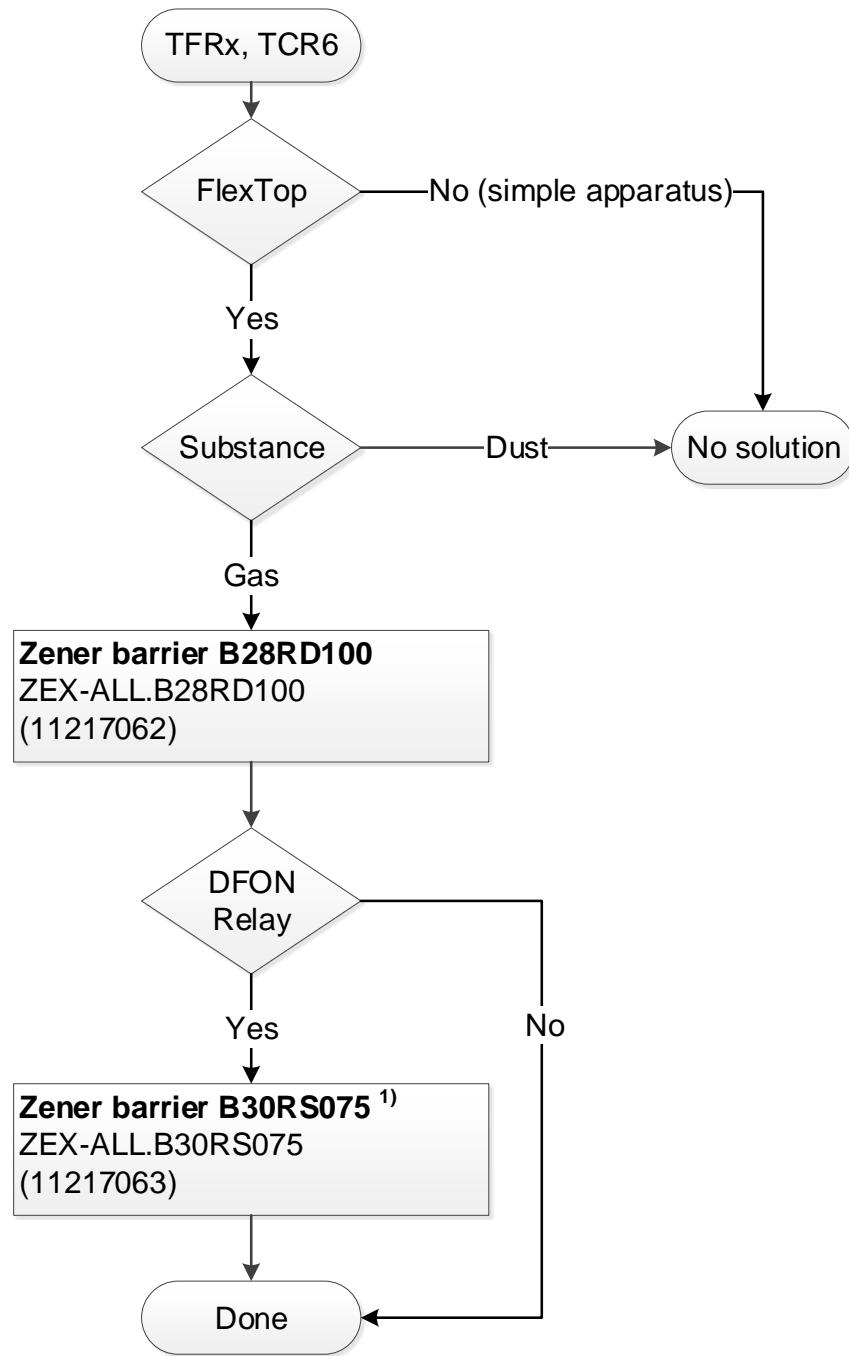


1) No solution with NPN output available

2) Push-pull output has less leakage current in off-state and is therefore preferred

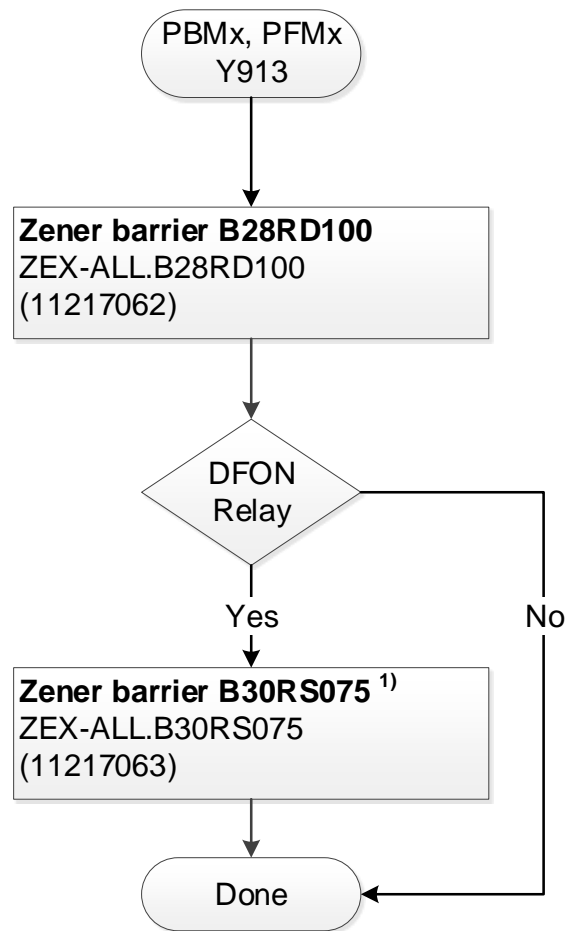
3) Low voltage level of switching signal; threshold of PLC input should be set to 5 Volt.

4.1.2 Temperature sensors



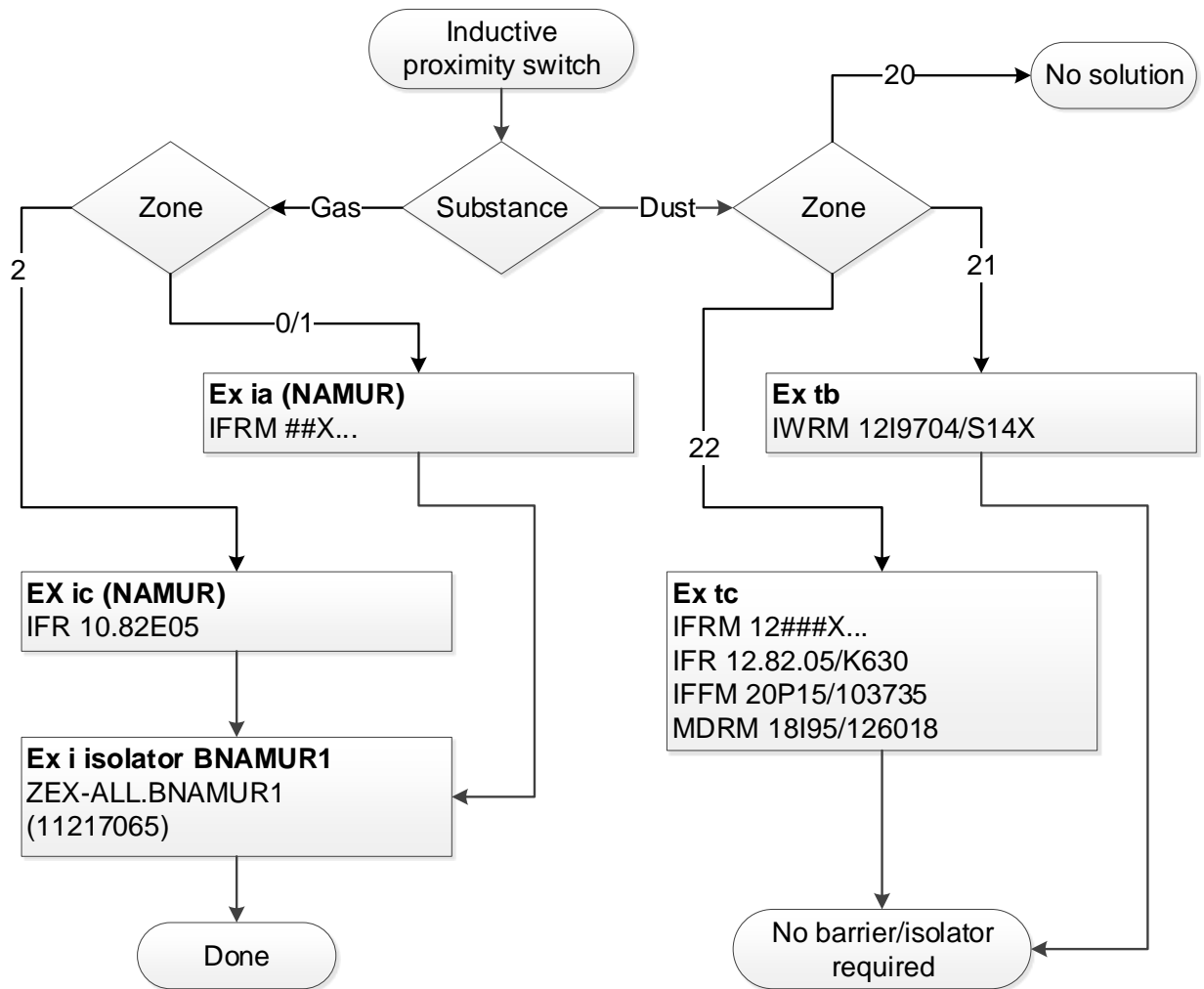
1) One barrier per relay contact

4.1.3 Pressure sensors



1) One barrier per relay contact

4.1.4 Inductive proximity switches



## 4.2 Considerations for fail-safe operation

It depends on the fail-safe position of the application whether NO or NC is the choice for CleverLevel output. The operator should consider that in case of any wire break or power loss the safe switching status should be entered. I.e. in case of an overflow protection the contact should open when medium is detected, but in case of a dry run protection the contact should also open when **no** medium is detected.

### NO and NC choice for CleverLevel product family

CleverLevel	Programming by FlexProgram	Two antivalent outputs NO/NC with factory setting	Selection by power supply polarity
LFFS	x		x
LBFS	x	x	
LBFH/I	x	x	

Note: In all cases PNP output has been considered, however digital (push-pull) will work as well. There is an internal switch in the PROFSI3 (accessible after removing the front cover), where its relay logic can be inverted.

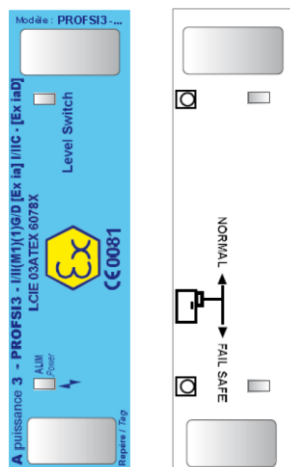


Figure 12: PROFSI3 front cover and its reversal side

### Signal logic vs. application

Application	Medium detected	CleverLevel		PROFSI3	
		PNP output NO	PNP output NC	Relay output NO	Switch "Fail Safe"
Overflow protection	No		active	closed	NORMAL
	Yes		inactive	open	
Dry run detection	No	inactive		open	NORMAL
	Yes	active		closed	

In case of power down or wire break of CleverLevel, it should enter the critical status (marked in red). For all fail-safe applications the used relay output contact of PROFSI3 is always normally open (NO), because it is the defined status in case of power down. In addition no inversion of the PROFSI3 relay's switching logic has to be chosen (internal switch always set to "NORMAL").

**Configuration vs. application**

Application	CleverLevel PNP output	PROFSI3 relay output contact	PROFSI3 Switch "Fail Safe"
Overfill protection	NC	NO	NORMAL
Dry run detection	NO	NO	NORMAL




Please note that the relay contact "NO" of PROFSI3 is open (not closed) for both critical status "overfill" and "dry run" of the appropriate application. If wired according to the schematic above you will read "zero" or "low" in these cases.

**Conclusion**

Dependent on the application "overfill protection" or "dry run detection", only the CleverLevel output logic NO/NC has to be selected appropriately. There are no choices for PROFSI3, neither switch "Fail Safe", nor wiring in such cases. However, related to other goals the available choices of PROFSI3 can be selected, of course.

**4.3 Marking overview for ATEX and IECEx used for Baumer products**

The overview contains all protection concepts covered in this document and shows them with one example each for ATEX and IECEx.

		Group	Category/ substance	Concept/ prot. level	Substance group	Temperature class	Equipment protection level
 		II	1 G	Ex ia	IIC	T4	Ga (optional)
				Ex ia	IIC	T4	Ga
X I: mining ✓ II: other	<b>Zone</b>	G: gas		ia, ib, ic, nA	II: gases	T1 – T6	G: gas
		D: dust		ia, ib, ic, ta, tb, tc	III: dusts	Txxx °C	D: dust
		1: two faults	ia, ta	i: intrinsic safety t: tight enclosure nA: non sparking	Ignitability A, B, C	Ignition/glow temperature	a: very high
		2: one fault	ib, tb				b: high
3: normal op.	ic, tc, nA	c: normal					
Gas	0	1G	ia	IIA, IIB, IIC More critical →	T3: 200 °C T4: 135 °C T5: 100 °C More critical ↓	Ga	
	1	2G	ib			Gb	
	2	3G	ic, nA			Gc	
Dust	20	1D	ia, ta	IIIA, IIIB, IIIC More critical →	Txxx °C	Da	
	21	2D	ib, tb			Db	
	22	3D	ic, tc			Dc	



#### 4.4 List of figures

Figure 1: Schematic for a gas “ia” installation of a CleverLevel (LBFH/I) (ATEX II 1 G Ex ia IIC T4 Ga).....	3
Figure 2: Examples of Ex i associated apparatus (“barriers”).....	3
Figure 3: Schematic for a dust “ta” installation of a CleverLevel (ATEX II 1 D Ex ta IIIC T100 °C).....	4
Figure 4: Schematic for a gas zone 2 “nA” installation of a CleverLevel (ATEX II 3 G Ex nA IIC T4 Gc) .....	4
Figure 5: Analog 2-wire 4-20-mA current loop sensor installation .....	7
Figure 6: Analog 2-wire 4-20-mA current loop sensor installation with relay contacts.....	8
Figure 7: PNP switching output installation with dedicated Ex i isolator .....	9
Figure 8: Push-pull switching output installation .....	9
Figure 9: Two PNP switching outputs with interconnection of two Ex i isolators .....	10
Figure 10: Two-channel push-pull switching output installation with equal barrier types.....	11
Figure 11: 2-wire NAMUR interface installation with Ex i isolator with NAMUR input.....	11
Figure 12: PROFSI3 front cover and its reversal side.....	23

#### 4.5 Documentation history

Version	Date	Reviewed by	Amendment / Supplement / Description
V1.00	19.03.2019	fep	First release
V1.10	25.03.2019	fep	Minor revisions, removed “increased safety”, IP67->IP6x
V1.11	03.04.2019	fep	LBFS/LFFS w/o standard barrier (missing max. Is reduction)
V1.20	12.04.2019	fep	Flowchart added, minor revisions
V1.21	16.04.2019	fep	Headline changed, “General” in 2.1 added dual use of gas/dust
V1.22	10.05.2019	fep	Minor changes, intrinsic not in general in chapter 2
V1.31	26.07.2019	fep	Application pictures changed, accessories references, minor changes
V1.32	03.10.2019	fep	Threshold changed to 5 V, added boundary for pressure sensors, flowchart: “Switch” renamed to “Digital”, minor changes
V1.40	27.07.2020	fep	Inter-connected PROFSI3 for two switching outputs added, marking overview and list of figures included, minor corrections