Position Sensors
For use in hazardous locations
With over 50 years of sensor experience, Balluff is a leading global sensor specialist with its own line of connectivity products for every area of factory automation. Balluff is based in Germany and has a tight international network of 54 representatives and subsidiaries.

Balluff stands for comprehensive systems from a single source, continuous innovation, state-of-the-art technology, highest quality, and greatest reliability. That’s not all: Balluff also stands for exceptional customer orientation, customized solutions, fast worldwide service, and outstanding application assistance.

High-quality, innovative products tested in our own accredited laboratory and a quality management system certified according to DIN ISO 9001 (EN 2008) form a secure foundation for optimized added value for our customers.

Whether electronic and mechanical sensors, rotary and linear transducers, identification systems or optimized connection technology for high-performance automation, Balluff masters not only the entire technological variety with all of the different operating principles, but also provides technology that fulfills regional quality standards and is suitable for use worldwide. Wherever you are in the world, Balluff technology is never far away. You won’t have to look far for you nearest Balluff expert.

Balluff products increase performance, quality and productivity around the world every day. They satisfy prerequisites for meeting demands for greater performance and cost reductions on the global market. Including in the most demanding areas. No matter how stringent your requirements may be, Balluff delivers state-of-the-art solutions.

Benefit from comprehensive sensor expertise from a single source. Achieve solutions suited to your requirements.

Additional information can be found in our catalogs "Object Detection" and "Linear Position Sensing and Measurement", or on the internet at: www.balluff.com
Linear Position Sensor Ex
Filling Level Sensor in Zone 0/1

BTL5-_1-M...-B-DEXA- ...
Rod version “DEXA” is the safe and reliable approach for filling level applications in Zone 0. A cotter pin prevents the float from getting lost. Floats, see page 14.
*Not approved for USA and Canada.

Applications
■ Filling stations
■ Tank systems
■ Refineries
■ Chemical industry
■ Pharmaceuticals

Caution!
Before design, installation and startup please familiarize yourself with the user’s guide to be found at www.balluff.com.

Installation examples

Note: Not all products are approved for use in all global hazardous area jurisdictions. Please consult Balluff or refer to product technical documentation to ensure that the product certifications meet the requirements of the region in which the product will be used.

Zone 0

Zone 1
The Ex sensor has a M18×1.5 mounting thread. We recommend that the magnet mounting area is made of non-magnetizable material. If magnetizable materials are used, the measures shown above should be observed. Sealing is at the flange mounting surface using the supplied O-ring 15.4×2.1 with M18×1.5 thread. *Not approved for USA and Canada.
**Linear Position Sensor DEX**

**General data**

Pressure-resistant up to 600 bar, high repeatability, non-contact, robust

The DEX Sensor is a robust position feedback system for measuring ranges between 25 and 4000 mm as well as use under extreme ambient conditions.

**Ex protection type "d" – flameproof encapsulation**

Sensors designated Ex d IIB + H2 T6 Ga/Gb meet the requirements for electrical equipment in potentially explosive areas. When in use you must follow applicable safety regulations, such as:

- Explosion protection guidelines (EX-RL)
- Constructing electrical equipment in potentially explosive atmospheres (EN 60079-14)
- Ignition protection type "d", flameproof encapsulation (EN 60079-1)

*Not approved for USA and Canada*

Position sensors from category II 1/2 G designated Ex d IIB+H2 T6 meet the requirements for electrical equipment in areas containing potentially explosive gases. Requirements for areas containing flammable dust are also fulfilled in accordance with category II 3D designated Ex tD IP 67 T85°C, A zone 22.

**Series Rod DEX BTL5**

**Part number** BTL5--M--D--DEX--

**Shock load**
- 100 g/6 ms in accordance with EN 60068-2-27
- 100 g/2 ms in accordance with EN 60068-2-29

**Vibration**
- 12 g, 10...2000 Hz in accordance with EN 60068-2-6

**Operating temperature**
- –40...+60 °C

**Polarity reversal protected** yes

**Overvoltage protection** TransZorb protection diodes

**Dielectric strength** 500 V DC (GND to housing)

**Degree of protection as per IEC 60529** IP 67

**Housing material** Stainless steel 1.4305

**Flange and tube material** Tube stainless steel 1.4571, flange 1.4571 or 1.4429 or 1.4404

**Housing attachment**
- Model B thread M18×1.5
- model Z 3/4" 16 UNF
- model K fit 18h6 with 6 cheese-head screws

**Connection** Cable connection

**EMC testing**

<table>
<thead>
<tr>
<th>Test Type</th>
<th>Requirement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Radio interference emission</td>
<td>EN 55016-2-3 (industrial and residential area)</td>
</tr>
<tr>
<td>Static electricity (ESD)</td>
<td>EN 61000-4-2 Severity level 3</td>
</tr>
<tr>
<td>Electromagnetic fields (RFI)</td>
<td>EN 61000-4-3 Severity level 3</td>
</tr>
<tr>
<td>Electrical fast transient bursts</td>
<td>IEC 61000-4-4 Severity level 4</td>
</tr>
<tr>
<td>Conducted interference induced by high-frequency fields</td>
<td>EN 61000-4-6 Severity level 3</td>
</tr>
</tbody>
</table>

Please enter code for output signal, interface, coding, rated length, model, rod end, and connection in the part number.

**Scope of delivery**

- Position Sensor
- User’s Guide

Please order separately:

- Floats, see page 14
- Position markers, see catalog “Linear Position Sensing and Measurement”

Note: Not all products are approved for use in all global hazardous area jurisdictions. Please consult Balluff or refer to product technical documentation to ensure that the product certifications meet the requirements of the region in which the product will be used.
Housing B, metric mounting thread
Cable outlet axial, radial

Model J, flange Ø 18 mm, pitch circle Ø 76.2 mm,
Cable outlet radial

Caution!
Before design, installation and startup please
familiarize yourself with the user’s guide to be
found at www.balluff.com.

Approvals:

IECEx: Ex d IIB+H2 T6 G a/Gb
CSA/NEC: None
Ordering example:
Analog interface no zero- or end-point setting possible

**BTL5** - **-** - **M** - **-** - **-** - **DEX** - **-**

**Output signal**
A11 0...10 V and 10...0 V Rising and falling
E10 4...20 mA, rising
E17 20...4 mA, falling
C10 0...20 mA, rising
C17 20...0 mA, falling
G11 -10...10 V and 10...-10 V rising and falling

**Standard nominal strokes [mm]**
0-25...4000 mm in 1-mm increments

**Design**
B
J
Z

**Rod end**
A Float stop
B Short safety stop

**Connection**
Axial cable outlet only for model B, Z
KA02 PUR cable 2 m
KA05 PUR cable 5 m
KA10 PUR cable 10 m
KA15 PUR cable 15 m
Radial output
K02 PUR cable 2 m
K05 PUR cable 5 m
K10 PUR cable 10 m
K15 PUR cable 15 m

Ordering example:
Digital pulse interface

**BTL5** - **1** - **M** - **-** - **-** - **DEX** - **-**

**Interface**
P Pulse interface P

**Standard nominal strokes [mm]**
see above analog interface DEX

**Design**
B
J
Z

**Rod end**
A Float stop
B Short safety stop

**Connection**
see above analog interface DEX

Ordering example:
SSI interface

**BTL5-S1** - **-** - **M** - **-** - **-** - **DEX** - **-** for asynchronous operation

**BTL5-S1** - **B** - **M** - **-** - **-** - **DEX** - **-** for synchronous operation

**Coding**
0 Binary code rising (24-bit)
1 Gray code rising (24-bit)
6 Binary code rising (25-bit)
7 Gray code rising (25-bit)

**System resolution**
1 1 µm
2 5 µm
3 10 µm
4 20 µm
5 40 µm

**Standard rated length [mm]**
see above analog interface DEX

**Design**
B
J
Z

**Rod end**
A Float stop
B Short safety stop

**Connection**
See above analog interface DEX
The TA12 has been specially developed for use in potentially explosive atmospheres. The important demands of the oil and gas industry for high reliability and ease of servicing are combined in the TA12 system. The TA12 comprises a robust flameproof Ex housing and an electronics module that is easily accessible and exchanged for servicing. Spare electronics modules can be ordered from Balluff Service department.

**Fields of application**
- Hydraulically or pneumatically actuated valves
- Clutch travel monitoring for compressors
- Level monitoring
- Level control
- Position sensing in hydraulic cylinders in Ex areas

**Series**
- Rod J-DEXC-TA12

**Part number**
- BTL5-__-M__-__-J-DEXC-TA12

**Shock load**
- 100 g/6 ms in accordance with EN 60068-2-27

**Vibration**
- 12 g, 10...2000 Hz as per EN 60068-2-6

**Operating temperature**
- –20...+80 °C for T5

**Storage temperature**
- –40...+100 °C outside of Ex zone

**Degree of protection**
- IP 68

**Housing material**
- Stainless steel 1.4301 (other materials on request)

**Protective tube**
- Stainless steel 1.4571

**Pressure rating**
- 600 bar max.

**Connection**
- Screw terminals

**Cable entry**
- Ex cable gland BTL-A-AD09-M-00EX or Ex installation pipe system

**EMC testing**
- Radio interference emission: EN 55016-2-3 (industrial and residential area)
- Static electricity (ESD): EN 61000-4-2 Severity level 3
- Electromagnetic fields (RFI): EN 61000-4-3 Severity level 3
- Electrical fast transient bursts (Burst): EN 61000-4-4 Severity level 3
- Conducted interference induced by high-frequency fields: EN 61000-4-6 Severity level 3

Please enter the code for the output signal, interface, coding, system solution, software configuration, baud rate, rated length, and connection in the part number.

**Scope of delivery**
- Position Sensor
- User’s Guide

Please order separately:
- Floats, see page 14
- Position markers, see catalog “Linear Position Sensing and Measurement”
Linear Position Sensor TA12

General data

Model TA12, flange Ø 18 mm, pitch circle Ø 76.2 mm

Ordering example:
Analog interface

**BTL5 - ___ - M ___ - J - DEXC - TA12**

<table>
<thead>
<tr>
<th>Output signal</th>
<th>Standard nominal strokes [mm]</th>
<th>Connection</th>
</tr>
</thead>
<tbody>
<tr>
<td>A5...0 V and 10...0 V</td>
<td>0025...4000 mm in 1-mm increments</td>
<td>TA12, Internal thread 1/2” 14 NPT</td>
</tr>
<tr>
<td>E5...4 mA, rising</td>
<td></td>
<td></td>
</tr>
<tr>
<td>E57...20 mA, falling</td>
<td></td>
<td></td>
</tr>
<tr>
<td>C50...0 mA, rising</td>
<td></td>
<td></td>
</tr>
<tr>
<td>C57...20...0 mA, falling</td>
<td></td>
<td></td>
</tr>
<tr>
<td>G51...-10...10 V and 10...-10 V rising and falling</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

BAM011T
Cable gland
1/2”-14 NPT to M20 metric

BAM011R
Programming tool for zero point and end point
**Linear Position Sensor TA12**

### General data

**Ordering example:**
- **SSI interface**
  - BTL5-S1 _ _ _ _ - M _ _ _ _ - J-DEXC - TA12 for asynchronous operation
  - BTL5-S1 _ _ _ _ - B - M _ _ _ _ - J-DEXC - TA12 for synchronous operation

<table>
<thead>
<tr>
<th>Coding</th>
<th>System resolution</th>
<th>Standard rated length [mm]</th>
<th>Connection</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Binary code rising (24-bit)</td>
<td>1 1 μm</td>
<td>Analog interface J-DEXC</td>
</tr>
<tr>
<td>1</td>
<td>Gray code rising (24-bit)</td>
<td>2 5 μm</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Binary code rising (25-bit)</td>
<td>3 10 μm</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Gray code rising (25-bit)</td>
<td>4 20 μm</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>5 40 μm</td>
<td></td>
</tr>
</tbody>
</table>

**Ordering example:**
- **CANopen interface**
  - BTL5-H1 _ _ _ _ - M _ _ _ _ - J-DEXC - TA12

<table>
<thead>
<tr>
<th>Software configuration</th>
<th>Baud rate</th>
<th>Standard rated length [mm]</th>
<th>Connection</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>0 1 Mbaud</td>
<td>Analog interface J-DEXC</td>
<td>TA12 Internal thread 1/2&quot; 14 NPT</td>
</tr>
<tr>
<td>1</td>
<td>1 800 kbaud</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>2 500 kbaud</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>3 250 kbaud</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>4 125 kbaud</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>5 100 kbaud</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>6 50 kbaud</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>7 20 kbaud</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>8 10 kbaud</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Ordering example:**
- **Profibus DP interface**
  - BTL5-T1 _ 0 - M _ _ _ _ - J-DEXC - TA12

<table>
<thead>
<tr>
<th>Software configuration</th>
<th>Standard rated length [mm]</th>
<th>Connection</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Analog interface J-DEXC</td>
<td>TA12 Internal thread 1/2&quot; 14 NPT</td>
</tr>
<tr>
<td>1</td>
<td>1 × position and 1 × velocity</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>2 × position and 2 × velocity</td>
<td></td>
</tr>
</tbody>
</table>

**Caution!**
Before design, installation and startup please familiarize yourself with the user’s guide to be found at www.balluff.com.
Dust protection zone 22

Devices in these categories are intended for use in areas where swirling dust is not expected to create an explosive atmosphere. The probability is extremely small. Even if it were to occur, it would be only for a short time.

A manufacturer’s declaration confirms that sensors designated **II 3 D T 90°C X** meet the requirements for electrical equipment for use in areas with combustible dust.

*Not approved for USA and Canada.

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Ordering example:

Digital pulse interface, for technical data refer to the user’s guide

<table>
<thead>
<tr>
<th>BTL5-P1-M__-PEX-KA02</th>
</tr>
</thead>
<tbody>
<tr>
<td>0025...5500 mm</td>
</tr>
<tr>
<td>in 1-mm increments</td>
</tr>
<tr>
<td>B M18×1.5</td>
</tr>
<tr>
<td>Z 3/4” 16 UNF</td>
</tr>
<tr>
<td>KA02 PUR cable 2 m</td>
</tr>
</tbody>
</table>

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Caution!

Before design, installation and startup please familiarize yourself with the user's guide to be found at www.balluff.com.
Ignition protection type "n", designated "EEx n"

Devices in this category are intended for use in areas where an explosive atmosphere is not expected. The probability is extremely small. Even if it were to occur, it would be only for a short time. A manufacturer’s declaration confirms that the indicated product meets the requirements for electrical equipment in potentially explosive areas. This designation combines multiple methods of ignition protection.

*Not approved for USA and Canada.

Ordering example:
Model K

B T L 5 - __________ M __________ K N E X - __________

Output signal
A11 0...10 V and 10...0 V
E10 4...20 mA, rising
E17 20...4 mA, falling
C10 0...20 mA, rising
C17 20...0 mA, falling

Standard nominal strokes [mm]
0025...4500 mm in 1-mm increments

Connection
SR32 with connector plug
K05 PUR cable 5 m

Stainless steel

Ordering example:
Rod series

B T L 7 - __________ M __________ N E X - __________

Output signal
A510 0...10 V and 10...0 V
E500 4...20 mA, rising
E570 20...4 mA, falling
C500 0...20 mA, rising
C570 20...0 mA, falling

Standard nominal strokes [mm]
0025...2000 mm in 1-mm increments

Design
B M18×1.5
Z 3/4* 16 UNF
CD M22×1.5 high-pressure resistant

Connection
S32 with connector plug
KA05 PUR cable 5 m

Please enter code for output signal, rated length, design and connection in the part number.

Please order separately:
- Floats, see page 14
- Position markers, see catalog

"Linear Position Sensing and Measurement"
Floats (Zone 0)

**BAM0147**
Cylindrical float, zone 0 permitted up to density $\rho \geq 0.7 \text{ g/cm}^3$

Orientation:
Raised dimple on upper side of float

**BAM0148**
Cylindrical float, zone 0, density of float $\rho = 0.85 \text{ g/cm}^3$ for separation layer measurement

Orientation:
2 raised dimples on upper side of float

**Interface**
A second float can be added to measure the position of the interface between two liquids, such as oil and condensed water.
Suitable: BTL2-S-4414-4Z01-Ex.

**BTL2-A-DH01-E-32-Ex**
Spacer sleeve for the float:
BAM0147
BAM0148
BAM014A
The sleeve is included.

**Caution!**
Before design, installation and startup please familiarize yourself with the user’s guide to be found at www.balluff.com.
BAM014A
Ball float, zone 0 permitted up to density $\rho \geq 0.7 \text{ g/cm}^3$

Orientation:
Raised dimple on upper side of float

BAM014E
Parabolic float, permitted up to $\rho \geq 0.6 \text{ g/cm}^3$

<table>
<thead>
<tr>
<th>Float type</th>
<th>Immersion depths given $\rho = 1 \text{ g/cm}^3$</th>
<th>Immersion depths given $\rho = 0.7 \text{ g/cm}^3$</th>
</tr>
</thead>
<tbody>
<tr>
<td>BAM014E</td>
<td>$s$ - 41 mm</td>
<td>$s$ - 57 mm</td>
</tr>
<tr>
<td>BAM014A</td>
<td>$s$ - 26 mm</td>
<td>$s$ - 40 mm</td>
</tr>
<tr>
<td>BAM0147</td>
<td>$s$ - 30 mm</td>
<td>$s$ - 39 mm</td>
</tr>
<tr>
<td>BAM0148</td>
<td>$s$ - 45 mm</td>
<td>submerges</td>
</tr>
</tbody>
</table>
Hydraulic Cylinder Sensors, Ex Protected

High pressure rated sensors, M12×1

up to 500 bar

<table>
<thead>
<tr>
<th>Size</th>
<th>M12×1</th>
<th>M12×1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Installation type</td>
<td>Flush</td>
<td>Flush</td>
</tr>
<tr>
<td>Rated switching distance s&lt;sub&gt;n&lt;/sub&gt;</td>
<td>1.5 mm</td>
<td>1.5 mm</td>
</tr>
<tr>
<td>Assured switching distance s&lt;sub&gt;a&lt;/sub&gt;</td>
<td>0...1.2 mm</td>
<td>0...1.2 mm</td>
</tr>
<tr>
<td>Pressure range</td>
<td>Oil-pressure resistant up to 350 bar</td>
<td>Oil pressure resistant up to 500 bar</td>
</tr>
<tr>
<td>PNP, NO</td>
<td>BHS004M</td>
<td>BHS0031</td>
</tr>
<tr>
<td>Supply voltage U&lt;sub&gt;s&lt;/sub&gt;</td>
<td>10…30 V DC</td>
<td>10…30 V DC</td>
</tr>
<tr>
<td>Voltage drop U&lt;sub&gt;drop&lt;/sub&gt; at I&lt;sub&gt;e&lt;/sub&gt; max.</td>
<td>1.5 V</td>
<td>2 V</td>
</tr>
<tr>
<td>Rated insulation voltage U&lt;sub&gt;i&lt;/sub&gt;</td>
<td>75 V DC</td>
<td>75 V DC</td>
</tr>
<tr>
<td>Rated operating current I&lt;sub&gt;e&lt;/sub&gt;</td>
<td>200 mA</td>
<td>200 mA</td>
</tr>
<tr>
<td>Output resistance R&lt;sub&gt;a&lt;/sub&gt;</td>
<td>33 kΩ</td>
<td>150 kΩ</td>
</tr>
<tr>
<td>Polarity reversal protected/transposition protected/short-circuit protected</td>
<td>Yes/Yes/Yes</td>
<td>Yes/Yes/Yes</td>
</tr>
<tr>
<td>Ambient temperature T&lt;sub&gt;a&lt;/sub&gt;</td>
<td>–25...+80 °C</td>
<td>–25...+90 °C</td>
</tr>
<tr>
<td>Switching frequency f&lt;sub&gt;max&lt;/sub&gt;</td>
<td>1 kHz</td>
<td>2 kHz</td>
</tr>
<tr>
<td>Degree of protection as per IEC 60529</td>
<td>IP 68 per BWN Pr. 20</td>
<td>IP 68 per BWN Pr. 20</td>
</tr>
<tr>
<td>Approvals</td>
<td>CE</td>
<td>CE</td>
</tr>
<tr>
<td>Material</td>
<td>Housing Stainless steel</td>
<td>Stainless steel</td>
</tr>
<tr>
<td>Sensing surface</td>
<td>EP</td>
<td>EP</td>
</tr>
<tr>
<td>Sealing ring material/size/replacement part number</td>
<td>FPM 70/5.85×2.4/636594</td>
<td>N70B200V/5.3×2.4/631753</td>
</tr>
<tr>
<td>Supporting ring material/size/replacement part number</td>
<td>PTFE/5.3×2.4/705918</td>
<td>PTFE/5.3×2.4/705918</td>
</tr>
<tr>
<td>Connection</td>
<td>M12 connector, 4-pin</td>
<td>M12 connector, 4-pin</td>
</tr>
</tbody>
</table>

Not approved for USA and Canada

Note: Not all products are approved for use in all global hazardous area jurisdictions. Please consult Balluff or refer to product technical documentation to ensure that the product certifications meet the requirements of the region in which the product will be used.

Sensors with ATEX approval Category 3G

Devices in this category are designed for use in areas where explosive atmospheres occur infrequently (Zone 2).

Caution!
Before design, installation and startup, please read the user’s guide found at www.balluff.com.
Hydraulic Cylinder Sensors, Ex Protected
High pressure rated sensors, M12×1, M18×1

<table>
<thead>
<tr>
<th></th>
<th>M12×1</th>
<th>M12×1</th>
<th>M12×1</th>
<th>M18×1</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Flush</td>
<td>Flush</td>
<td>Flush</td>
<td>Flush</td>
</tr>
<tr>
<td>1.5 mm</td>
<td>1.5 mm</td>
<td>1.5 mm</td>
<td>1.5 mm</td>
<td></td>
</tr>
<tr>
<td>0…1.2 mm</td>
<td>0…1.2 mm</td>
<td>0…1.2 mm</td>
<td>0…1.2 mm</td>
<td></td>
</tr>
<tr>
<td>Oil pressure resistant up to 500 bar</td>
<td>Oil pressure resistant up to 500 bar</td>
<td>Oil pressure resistant up to 500 bar</td>
<td>Oil pressure resistant up to 500 bar</td>
<td></td>
</tr>
<tr>
<td>BHS002W</td>
<td>BHS001K</td>
<td>BHS005P</td>
<td>BHS004H</td>
<td></td>
</tr>
<tr>
<td>10…30 V DC</td>
<td>10…30 V DC</td>
<td>10…30 V DC</td>
<td>10…30 V DC</td>
<td></td>
</tr>
<tr>
<td>2 V</td>
<td>2.5 V</td>
<td>2 V</td>
<td></td>
<td></td>
</tr>
<tr>
<td>75 V DC</td>
<td>75 V DC</td>
<td>75 V DC</td>
<td>75 V DC</td>
<td></td>
</tr>
<tr>
<td>200 mA</td>
<td>200 mA</td>
<td>200 mA</td>
<td>200 mA</td>
<td></td>
</tr>
<tr>
<td>150 kΩ</td>
<td>33 kΩ</td>
<td>33 kΩ</td>
<td>150 kΩ</td>
<td></td>
</tr>
<tr>
<td>Yes/Yes/Yes</td>
<td>Yes/Yes/Yes</td>
<td>Yes/Yes/Yes</td>
<td>Yes/Yes/Yes</td>
<td></td>
</tr>
<tr>
<td>2 kHz</td>
<td>1 kHz</td>
<td>400 Hz</td>
<td>2 kHz</td>
<td></td>
</tr>
<tr>
<td>IP 68 per BWN Pr. 20</td>
<td>IP 68 per BWN Pr. 20</td>
<td>IP 68 per BWN Pr. 20</td>
<td>IP 68 per BWN Pr. 20</td>
<td></td>
</tr>
<tr>
<td>CE</td>
<td>CE</td>
<td>CE</td>
<td>CE</td>
<td></td>
</tr>
<tr>
<td>Stainless steel</td>
<td>Stainless steel</td>
<td>Stainless steel</td>
<td>Stainless steel</td>
<td></td>
</tr>
<tr>
<td>N70B200V/5.3×2.4/631753</td>
<td>FPM 70/5.85×2.4/636594</td>
<td>FPM 80/6.75×1.78/149621</td>
<td>NBR 60-80/12.42x×1.78/642828</td>
<td></td>
</tr>
<tr>
<td>PTFE/5.3×2.4/705918</td>
<td>PTFE/5.3×2.4/705918</td>
<td>PTFE/10×7.0×1.8/150229</td>
<td>PTFE/15×12.2×0.7/642827</td>
<td></td>
</tr>
<tr>
<td>M12 connector, 4-pin</td>
<td>M12 connector, 4-pin</td>
<td>M12 connector, 4-pin</td>
<td>M12 connector, 4-pin</td>
<td></td>
</tr>
</tbody>
</table>

*Output current reduction as a function of ambient temperature range

---

Not approved for USA and Canada
Ignition protection type
“intrinsically safe” used with
switching amplifier outside the
hazardous area

Inductive sensors to NAMUR
specification consist essentially
of an oscillator with a dampable
oscillator coil and a demodulator.

These high pressure-rated
sensors are used, for example,
in end-of-travel monitoring on
hydraulic cylinders or position
detection on valves.

They can be used in conjunction
with suitable isolating amplifiers,
such as from STAHL, in
potentially explosive systems
or spaces classified as Zone 1
or 2. The isolating amplifier
must be installed only outside
the explosive area.

Caution!
Before design, installation and
startup, please read the user’s
guide found at www.balluff.com.
You must also observe the
requirements for the EC type
examination certificate.

Sensors with Atex approval Category 2G
Devices in this category are designed for use in areas where
explosive atmospheres occur for short periods (Zone 1).

Caution!
Before design, installation and startup, please
read the user’s guide found at www.balluff.com.
Hydraulic Cylinder Sensors, IS
NAMUR, isolating amplifiers

The isolating amplifier with relay output serves as the interface between electrical signals from the hazardous area and the non-hazardous area. The input signals from NAMUR-sensors are converted using relay switching contacts—at the outputs. Input, output and auxiliary power circuits are galvanically isolated. An energy barrier prevents dangerous levels of power from reaching the sensor.

Caution!
Before design, installation and startup, please read the operating manual found at www.balluff.com.

You must also observe the requirements for the EC type examination certificate.

<table>
<thead>
<tr>
<th>Style</th>
<th>99x17.6x114.5 mm DIN</th>
<th>99x17.6x114.5 mm DIN</th>
</tr>
</thead>
<tbody>
<tr>
<td>Short Order Code</td>
<td>FHW004P</td>
<td>FHW004R</td>
</tr>
<tr>
<td>Input</td>
<td>NAMUR-specification</td>
<td>NAMUR-specification</td>
</tr>
<tr>
<td>Output relay</td>
<td>2-channel, 1 converter</td>
<td>2-channel, 1 converter</td>
</tr>
<tr>
<td>Switching voltage</td>
<td>250 V AC</td>
<td>250 V AC</td>
</tr>
<tr>
<td>Switching current</td>
<td>4 A AC</td>
<td>4 A AC</td>
</tr>
<tr>
<td>Switching capacity</td>
<td>50 W/1000 VA</td>
<td>50 W/1000 VA</td>
</tr>
<tr>
<td>Function change</td>
<td>via switch</td>
<td>via switch</td>
</tr>
<tr>
<td>Supply voltage</td>
<td>24 V DC</td>
<td>120...230 V AC</td>
</tr>
<tr>
<td>Ambient temperature</td>
<td>–20...+60 °C</td>
<td>–20...+60 °C</td>
</tr>
<tr>
<td>Relative humidity</td>
<td>≤ 95 %, no condensation</td>
<td>≤ 95 %, no condensation</td>
</tr>
</tbody>
</table>

Approvals
Designation | EX II (1) GD [EEx ia] IIC/IIB and EX II 3 G EEEx nAC II T4 |
EC type examination certificate | DMT 02 ATEX E 195 X |

For safety and other data see
EC type examination certificate.
Not approved for USA and Canada
Ignition protection type „intrinsically safe“ used with isolating amplifier outside the hazardous area

Inductive sensors to NAMUR specification consist essentially of an oscillator with a dampable oscillator coil and a demodulator.

These sensors can be used in conjunction with suitable isolating amplifiers such as STAHL in explosive systems or zones (see ATEX-marking).

The isolating amplifier must be installed only outside the explosive area.

Caution!
Before design, installation and startup, please read the user’s guide found at www.balluff.com. You must also observe the requirements for the EC type examination certificate.

---

**Size**

<table>
<thead>
<tr>
<th>Ø 6.5 mm</th>
<th>M8×1</th>
</tr>
</thead>
</table>

**Installation type**

<table>
<thead>
<tr>
<th>Flush</th>
<th>Flush</th>
</tr>
</thead>
</table>

**Rated switching distance**

<table>
<thead>
<tr>
<th>1 mm</th>
<th>1 mm</th>
</tr>
</thead>
</table>

**Assured switching distance**

<table>
<thead>
<tr>
<th>0...0.8 mm</th>
<th>0...0.8 mm</th>
</tr>
</thead>
</table>

**Short Order Code**

<table>
<thead>
<tr>
<th>BES02ZR</th>
<th>BES02ZT</th>
</tr>
</thead>
</table>

**Rated operating voltage**

<table>
<thead>
<tr>
<th>8.2 V DC</th>
<th>8.2 V DC</th>
</tr>
</thead>
</table>

**Supply voltage**

<table>
<thead>
<tr>
<th>7.7...9 V DC</th>
<th>7.7...9 V DC</th>
</tr>
</thead>
</table>

**Rated insulation voltage**

<table>
<thead>
<tr>
<th>75 V DC</th>
<th>75 V DC</th>
</tr>
</thead>
</table>

**Output Signal: NAMUR**

<table>
<thead>
<tr>
<th>Current change (no trigger response)</th>
<th>Current change (no trigger response)</th>
</tr>
</thead>
<tbody>
<tr>
<td>≤ 1 mA</td>
<td>≥ 2.1 mA</td>
</tr>
<tr>
<td>≥ 2.1 mA</td>
<td>≤ 1 mA</td>
</tr>
</tbody>
</table>

**Self-locking (undamped)**

<table>
<thead>
<tr>
<th>≤ 1 mA</th>
<th>≥ 2.1 mA</th>
</tr>
</thead>
</table>

**Conductive (damped)**

<table>
<thead>
<tr>
<th>≤ 1 mA</th>
<th>≥ 2.1 mA</th>
</tr>
</thead>
</table>

**Rated series resistance**

<table>
<thead>
<tr>
<th>1 kΩ</th>
<th>1 kΩ</th>
</tr>
</thead>
</table>

**Polarity reversal protected**

| no* | no* |

**Ambient temperature**

<table>
<thead>
<tr>
<th>–20...+70 °C</th>
<th>–20...+70 °C</th>
</tr>
</thead>
</table>

**Switching frequency**

<table>
<thead>
<tr>
<th>2 kHz</th>
<th>2 kHz</th>
</tr>
</thead>
</table>

**Function indicator**

| No | No |

**Degree of protection per IEC 60529**

<table>
<thead>
<tr>
<th>IP 67</th>
<th>IP 67</th>
</tr>
</thead>
</table>

**Material Housing**

<table>
<thead>
<tr>
<th>Brass-coated</th>
<th>Brass-coated</th>
</tr>
</thead>
</table>

**Sensing surface**

<table>
<thead>
<tr>
<th>PBT</th>
<th>PBT</th>
</tr>
</thead>
</table>

**Possible installation variations**

Connection

- 2 m PVC cable, 2×0.14 mm²
- 2 m PVC cable, 2×0.14 mm²

**Maximum internal capacitance**

| 80 nF | 80 nF |

**Maximum internal inductance**

| 0.07 mH | 0.07 mH |

**Connected to approved intrinsically safe circuits with the highest values**

<table>
<thead>
<tr>
<th>U = 15 V</th>
<th>U = 15 V</th>
</tr>
</thead>
<tbody>
<tr>
<td>I = 50 mA</td>
<td>I = 50 mA</td>
</tr>
<tr>
<td>P = 120 mW</td>
<td>P = 120 mW</td>
</tr>
</tbody>
</table>

**Approvals**

Conformity to standards

- EN 50014:1997+A1+A2
- EN 50020
- EN 50014:1997+A1+A2
- EN 50020
- BVS 05 ATEX E 163
- PTB 05 ATEX 2075
- BVS 05 ATEX E 163
- PTB 05 ATEX 2075
- Designation
  - Ex II 2G EEx ia IIC T6
  - Ex II 1D Ex iaD 20 T90°C
  - Ex II 2G EEx ia IIC T6
  - Ex II 1D Ex iaD 20 T90°C

*Power restriction when using an approved intrinsically safe isolating amplifier

Not approved for USA and Canada

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Sensors in accordance with marking
For use in Zone 1 or Zone 20.

**Wiring diagrams**

- BES G06.../M08...
- BES M12.../M18.../M30...
- Unicompact

---

1. Connected to NAMUR isolating amplifier
2. Connected to NAMUR isolating amplifier
5. Connector body potential compensation
Proximity Sensors, IS
NAMUR, M12×1, M18×1, M30×1.5, 40×40 mm

<table>
<thead>
<tr>
<th>M12×1 mm</th>
<th>M18×1 mm</th>
<th>M30×1.5 mm</th>
<th>40×40×66 Unicompact</th>
<th>40×40×66 Unicompact</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flush</td>
<td>Flush</td>
<td>Flush</td>
<td>Flush</td>
<td>Non flush</td>
</tr>
<tr>
<td>4 mm</td>
<td>8 mm</td>
<td>15 mm</td>
<td>20 mm</td>
<td>35 mm</td>
</tr>
<tr>
<td>0…3.2 mm</td>
<td>0…6.5 mm</td>
<td>0…12.2 mm</td>
<td>0…16.2 mm</td>
<td>0…28.4 mm</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>BES02ZU</th>
<th>BES02ZW</th>
<th>BES02ZY</th>
<th>BES02ZZ</th>
<th>BES0300</th>
</tr>
</thead>
<tbody>
<tr>
<td>8.2 V DC</td>
<td>8.2 V DC</td>
<td>8.2 V DC</td>
<td>8.2 V DC</td>
<td>8.2 V DC</td>
</tr>
<tr>
<td>7.7...9 V DC</td>
<td>7.7...9 V DC</td>
<td>7.7...9 V DC</td>
<td>7.7...9 V DC</td>
<td>7.7...9 V DC</td>
</tr>
<tr>
<td>75 V DC</td>
<td>75 V DC</td>
<td>75 V DC</td>
<td>75 V DC</td>
<td>75 V DC</td>
</tr>
</tbody>
</table>

Current change:
(no trigger response)

≤ 1 mA ≤ 1 mA ≤ 1 mA ≤ 1 mA ≤ 1 mA
≥ 2.1 mA ≥ 2.1 mA ≥ 2.1 mA ≥ 2.1 mA ≥ 2.1 mA

1 kΩ 1 kΩ 1 kΩ 1 kΩ 1 kΩ

-25...+70 °C -25...+70 °C -25...+70 °C -25...+70 °C -25...+70 °C

700 Hz 400 Hz 100 Hz 200 Hz 100 Hz

LED No No No No No

IP 67 IP 67 IP 67 IP 67 IP 67

Brass-coated Brass-coated Brass-coated PPE/PPS PPE/PPS

PBT PBT PBT PBT PBT

–25...+70 °C –25...+70 °C –25...+70 °C –25...+70 °C –25...+70 °C

Ex II 2G Ex ia IIC T6
Ex II 1D Ex iaD 20 T90°C

Not approved for USA and Canada

M12 connector, 4-pin
M12 connector, 4-pin
M12 connector, 4-pin
M12 connector, 5-pin
M12 connector, 5-pin

210 nF 200 nF 230 nF 250 nF 220 nF

0.115 mH 0.19 mH 0.21 mH 0.45 mH 0.71 mH

U = 15 V U = 15 V U = 15 V U = 15 V U = 15 V

I = 50 mA I = 50 mA I = 50 mA I = 50 mA I = 50 mA

P = 120 mW P = 120 mW P = 120 mW P = 120 mW P = 120 mW

EN 50014:1997+A1+A2
EN 50020

BVS 05 ATEX E 162 X
BVS 05 ATEX E 162 X

Ex II 2G Ex ia IIC T6
Ex II 1D Ex iaD 20 T90°C

Not approved for USA and Canada

Permissible installation variations for Unicompact

Fig. 1 Fig. 2 Fig. 3 Fig. 4 Fig. 5 Fig. 6
Balluff North America
Florence, Kentucky USA

Balluff’s Florence, Kentucky United States headquarters is located just south of Cincinnati, Ohio. Our customers are in industries such as automotive, machine tool, robotics, injection molding, packaging, material handling, and more.

In addition to sales, marketing, and logistic functions, this facility manufactures Micropulse® magnetostrictive linear position sensors and warehouses over 60,000 products.

The Balluff Global Network
Systems and Services

Industrial Networking and Connectivity

Industrial Identification

Object Detection

Linear Position Sensing and Measurement

Fluid Sensors

Accessories

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www.balluff.com

Doc. no. 923961/Mat. no. 248454 EN
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