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1 Safety Advisory

Read this manual before installing and operating the BIW Transducer.

1.1 Proper application

The BIW transducer is intended to be installed in a machine or system. Together with a controller (PLC) or a processor it comprises a position measuring system and may only be used for this purpose.

Unauthorized modifications and non-permitted usage will result in the loss of warranty and liability claims.

1.2 Qualified personnel

This guide is intended for specialized personnel who will perform the installation and setup of the system.

1.3 Use and inspection

The relevant safety regulations must be followed when using the transducer system. In particular, steps must be taken to ensure that should the transducer system become defective no hazards to persons or property can result. This includes the installation of additional safety limit switches, emergency shutoff switches and maintaining the permissible ambient conditions.

1.4 Scope

This guide applies to the model BIW1-A/C/E/G transducer.

An overview of the various models can be found in section 6 Versions (indicated on product label) on page 6.

Note: For special versions, which are indicated by an -SA_ _ _ designation in the part number, other technical data may apply (affecting calibration, wiring, dimensions etc.).

2 Function and Characteristics

2.1 Characteristics

BIW transducers feature:
- High resolution and repeatability
- Immunity to shock, vibration and RF fields
- Absolute output signal rising or falling (selectable)
- Guided sensor element
- 32 kHz sampling rate
- Potential-free

The oscillator circuit is excited via the sender/sensor element at a sampling rate of 32 kHz, couples a signal into the receiver sensor element at the momentary position. The position value is immediately available on the output and is an absolute signal.

2.2 Function

The BIW transducer contains a sender/receiver sensor element and an oscillator circuit, sealed in an aluminum extruded housing. The oscillator is attached to a rod which in turn is attached to the moving member of the machine whose position is to be determined.
3 Installation

3.1 Transducer installation

Any orientation is permitted. Mount the transducer on a level surface of the machine using the mounting brackets. Observe the recommended spacing of the mounting brackets.

1. Align transducer with sliding rod.
2. Tighten mounting screws to a maximum of 2 Nm.

Ensure that no strong electrical fields are present in the immediate vicinity of the transducer.

Fig. 3-1: Dimensional drawing (BIW1...P1-S115 transducer)

Housing length

<table>
<thead>
<tr>
<th>BIW1-....M0100-P1-S115</th>
<th>Nominal length 100</th>
<th>A = 200</th>
<th>B = 110</th>
<th>C = 80</th>
</tr>
</thead>
</table>

Mechanical zero point

<table>
<thead>
<tr>
<th>BIW1-....M0360-P1-S115</th>
<th>Nominal length 360</th>
<th>A = 460</th>
<th>B = 370</th>
<th>C = 345</th>
</tr>
</thead>
</table>

Electrical zero point

<table>
<thead>
<tr>
<th>BIW1-....M0750-P1-S115</th>
<th>Nominal length 750</th>
<th>A = 850</th>
<th>B = 760</th>
<th>C = 740</th>
</tr>
</thead>
</table>

Electrical stroke = mechanical stroke

<table>
<thead>
<tr>
<th>BIW1-....M0100-P1-S115</th>
<th>Nominal length 100</th>
<th>A = 200</th>
<th>B = 110</th>
<th>C = 80</th>
</tr>
</thead>
</table>

Clamp spacing

<table>
<thead>
<tr>
<th>Nominal length</th>
<th>BIW1-....M0360-P1-S115</th>
<th>A = 460</th>
<th>B = 370</th>
<th>C = 345</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIW1-....M0750-P1-S115</td>
<td>Nominal length 750</td>
<td>A = 850</td>
<td>B = 760</td>
<td>C = 740</td>
</tr>
</tbody>
</table>

Table 3-1: Dimensions

Table 3-2: Examples

Available nominal lengths ➔ section 6.2
4 Wiring

**Note the following when making electrical connections:**

System and control cabinet must be at the same ground potential.

To ensure the electromagnetic compatibility (EMC) which Balluff warrants with the CE Mark, the following instructions must be strictly followed.

BIW transducer and the processor/control must be connected using shielded cable.

Shielding: Copper filament braided, 85% coverage.

The shield must be tied to the connector housing in the BKS connector (Fig. 4-3); see instructions accompanying the connector.

The cable shield must be grounded on the control side, i.e., connected to the protection ground.

Pin assignments can be found in Table 4-1. Connections on the controller side may vary according to the controller and configuration used.

---

<table>
<thead>
<tr>
<th>Pin</th>
<th>BIW1-A310...</th>
<th>BIW1-C310...</th>
<th>BIW1-E310...</th>
<th>BIW1-G310...</th>
<th>Cable BKS</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>0 V</td>
<td>0 V</td>
<td>0 V</td>
<td>0 V</td>
<td>GY gray</td>
</tr>
<tr>
<td>5</td>
<td>0...10 V</td>
<td>0...20 mA</td>
<td>4...20 mA</td>
<td>-10...+10 V</td>
<td>GN green</td>
</tr>
</tbody>
</table>

**Supply voltage:**

| 6   | GND          | BU blue      |
| 7   | +24 V DC     | BN brown     |

**Output slope:**

| 1   | Output slope - | YE yellow    |
| 4   | Output slope + | RD red       |

Reserve leads must remain unconnected.

| 3   | Reserved      | PK pink      |
| 8   | Reserved      | WH white     |

Table 4-1: Wiring assignment

---

**Note:** The slope selection is not applied until the unit is reset or powered off/on.

---

**Fig. 4-1:** BIW1-A310-M...S115 with controller and BKS-S115-PU05, Connection example

**Output slope**

To have the output voltage rise starting at the zero point, jumper Pin 4 and Pin 1.

To have the output voltage fall starting at the zero point, leave Pin 4 unconnected.

Once the slope has been selected and applied and the slope selection connections removed, reselecting programs the BIW again with the other slope. This means the slope select connection must remain in place so that it stays the same even after the unit is powered off multiple times.
4  Wiring (cont.)

When routing the cable between the transducer, controller and power supply, avoid proximity to high voltage lines to prevent noise coupling. Especially critical is inductive noise caused by AC harmonics (e.g. from phase-control devices), against which the cable shield provides only limited protection.

Cable length max.  

- A/G 25 m  
- C/E 100 m

Ø 6 to 8 mm. Longer lengths may be used if construction, shielding and routing are such that external noise fields will have no effect on signal integrity.

Pin numbering for connector

Fig. 4-2: Pin arrangement BKS on BIW

view of BIW side

Fig. 4-3: Connector (optional)

Fig. 4-4: Outgoing cable

BKS-S116-PU-__  
BKS-S115-PU-__  
BKS-S115-PU-__  
BKS-S116-PU-__
5 Startup

5.1 Check connections
Although the connections are polarity reversal protected, components can be damaged by improper connections and overvoltage. Before you apply power, check the connections carefully.

5.2 Turning on the system
Note that the system may execute uncontrolled movements when first turned on or when the transducer is part of a closed-loop system whose parameters have not yet been set. Therefore make sure that no hazards could result from these situations.

5.3 Check output values
After replacing or repairing a transducer, it is advisable to verify the values for the start and end position of the sliding rod in manual mode.

5.4 Check functionality
The functionality of the transducer system and all its associated components should be regularly checked and recorded.

5.5 Fault conditions
When there is evidence that the transducer system is not operating properly, it should be taken out of service and guarded against unauthorized use.

6 Versions (indicated on part label)

Supply voltage 3 = DC 24 V potential isolated
Electr. connection: with connector S115

Type:

BIW1-A310-M0450-P1-S115

Profile form factor
Nom. length (4digits): M = metric in mm

Interface: A = 0...+10 V
C = 0...20 mA
E = 4...20 mA
G = -10...+10 V

Ordering code: BIW_ _ _

6.1 Included in shipment
Transducer with condensed guide and 2 mounting brackets.

6.2 Available lengths
The following nominal stroke lengths are available:
0075, 0100, 0130, 0150, 0175, 0225, 260, 0300, 0360, 0375, 0400, 0450, 0500, 0600, 0650, 0750
Other stroke lengths on request.

6.3 Accessories (optional)
Connectors ➔ Fig. 4-3
straight: BKS-S115-PU-_ _
right angle: BKS-S116-PU-_ _
The following are typical values at DC 24 V and room temperature. Fully operational after power-up, with full accuracy after warm-up.

Non-linearity         <± 0.02%
Resolution
A310  5 µm o. 0,15mV
G310  5 µm o. 0,21mV
C/E310 5 µm o. 0,35µA

Hysteresis 1*resolution
Repeatability  2*resolution
Supply voltage sensitivity
\( U_{a/ub} < 0.1 \text{ mV/V} \)
Warm-up phase        < 5 min
Temperature coefficient        < 20ppm/K
Shock loading
100 g/6 ms per EN 60068-2-27
Continuous shock
100 g/2 ms per EN 60068-2-29
Vibration 12 g, 10 to 2000 Hz per EN 60068-2-6
1 Individual specifications as per Balluff factory standard

Enclosure rating
per IEC 60529 IP54

7.1 Supply voltage
(external from Limited Energy Circuit as defined in IEC 61010 or Low Power Source IEC 60950 or Class 2 power supply as defined in NEC or CEC)
Supply Voltage \( U_b \) 24 V ±6 V
Current draw < 80 mA typical
Inrush < 3 A
Polarity reversal protection built-in
Overvoltage protection Transzorb diodes
Electric strength 500 V DC

7.2 Outputs
Output voltage \( U_a \):
BIW1-A310-...  0...10 V
BIW1-G310-... -10...+10 V
Output noise < 5 mV
Output current < 6 mA
Output current \( I_a \):
BIW1-C310-... 0...20 mA
BIW1-E310-... 4...20 mA
Output noise < 10 µA
Load resistance ≤ 500 Ohm
Sampling rate typ. 32 kHz (30...33 kHz)
Short circuit protection built-in
Cable length A/G < 25 m
C/E < 100 m

7.3 Dimensions, weights, ambient conditions
Nominal length ≤ 775 mm
Dimensions page 3
Weight approx. 1.0 kg/m
Housing Aluminium
Housing attachment Mounting brackets and screws max. tightening torque 2 Nm
Operating temp. -20 °C to +85 °C
Storage temp. -40 °C to +100 °C
Operating force on rod Horizontal < 10 N
Vertical < 10 N

The CE Mark verifies that our products meet the requirements of EU Directive 2004/108/EC (EMC Directive) and the EMC Law. Testing in our EMC Laboratory, which is accredited by DAtech for Testing Electromagnetic Compatibility, has confirmed that Balluff products meet the EMC requirements of the following Generic Standards:
EN 61000-6-1 (noise immunity)
EN 61000-6-2 (noise immunity)
EN 61000-6-3 (emission)
EN 61000-6-4 (emission)
and the following product standard:
EN 61326-2-3

Emission tests:
RF Emission
EN 61000-4-2 Severity level 3
Electromagnetic fields (RFI)
EN 61000-4-3 Severity level 3
Fast transients (Burst)
EN 61000-4-4 Severity level 3
Surge
EN 61000-4-5 Severity level 2
Line-induced noise induced by high-frequency fields
EN 61000-4-6 Severity level 3
Magnetic fields
EN 61000-4-8 Severity level 4

UL approval
File no. E227256

The following patents have been granted in connection with this product:
US 2003/0206007 A1;
DE 102 19 678 C1