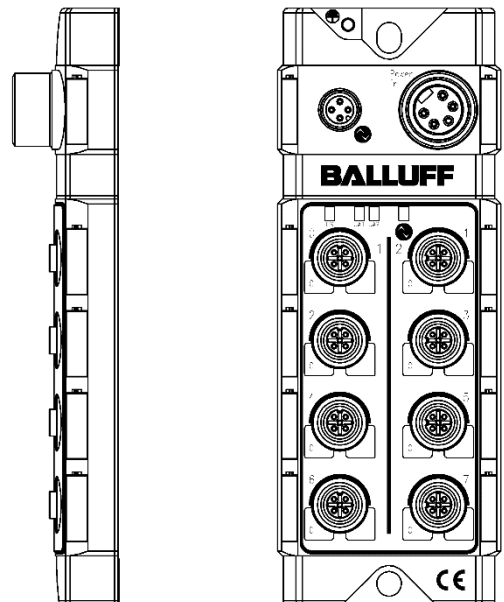


# BALLUFF

**BNI IOL-252-000-Z013**  
**BNI IOL-252-S01-Z013**  
**BNI IOL-256-000-Z013**  
**BNI IOL-256-S01-Z013**

**User's Guide**









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## 1 General

1.1. Structure of the manual	This manual is structured such that one chapter is builds on the other. Chapter 1: General Chapter 2: Basic safety instructions .....														
1.2. Typographical conventions	The following typographical conventions are used in this manual.														
Enumerations	Enumeration is shown in the form of lists with bullets. <ul style="list-style-type: none"> <li>• Keyword 1</li> <li>• Keyword 2</li> </ul>														
Actions	Action instructions are indicated by a preceding triangle. The result of an action is indicated by an arrow. <ul style="list-style-type: none"> <li>➤ Action instruction 1</li> <li>↪ Result of action</li> <li>➤ Action instruction 2</li> </ul> Actions can also be indicated as numbers in parentheses. <ul style="list-style-type: none"> <li>(1) Step 1</li> <li>(2) Step 2</li> <li>(3)</li> </ul>														
Syntax	Numbers: Decimal numbers are shown without additional information (e.g., 123), hexadecimal numbers are shown with the additional indicator hex (e.g., 00 <sub>hex</sub> ).														
Cross-references	Cross references indicate where further information on the subject can be found.														
1.3. Symbols	<hr/> <table border="0" style="width: 100%;"> <tr> <td style="width: 30px;"></td> <td>Note This symbol indicates general notes.</td> </tr> </table> <hr/> <table border="0" style="width: 100%;"> <tr> <td style="width: 30px;"></td> <td>Attention! This symbol indicates a safety instruction that must be followed without exception.</td> </tr> </table> <hr/>		Note This symbol indicates general notes.		Attention! This symbol indicates a safety instruction that must be followed without exception.										
	Note This symbol indicates general notes.														
	Attention! This symbol indicates a safety instruction that must be followed without exception.														
1.4. Abbreviations	<table border="0" style="width: 100%;"> <tr> <td style="width: 150px;">BNI</td> <td>Balluff Network Interface</td> </tr> <tr> <td>O</td> <td>Standard output port</td> </tr> <tr> <td>DPP</td> <td>Direct parameter page</td> </tr> <tr> <td>IOL</td> <td>IO-Link</td> </tr> <tr> <td>EMC</td> <td>Electromagnetic Compatibility</td> </tr> <tr> <td>FE</td> <td>Function ground</td> </tr> <tr> <td>SPDU</td> <td>Service Protocol Data Unit</td> </tr> </table>	BNI	Balluff Network Interface	O	Standard output port	DPP	Direct parameter page	IOL	IO-Link	EMC	Electromagnetic Compatibility	FE	Function ground	SPDU	Service Protocol Data Unit
BNI	Balluff Network Interface														
O	Standard output port														
DPP	Direct parameter page														
IOL	IO-Link														
EMC	Electromagnetic Compatibility														
FE	Function ground														
SPDU	Service Protocol Data Unit														
1.5. Deviating views	Product views and illustrations in this user's guide may differ from the actual product. They are intended only as illustrative material.														

2.1. Proper use  
 This guide describes the Balluff Network Interface BNI IOL-25x-xxx-Z013 for the application as a peripheral output module to establish connection of actuators. Hereby it is about an IO-Link device which communicates by means of IO-Link protocol with the superordinate IO-Link master assembly.

2.2. Installation and startup



**Note**  
 Installation and startup are to be performed only by trained specialists. Qualified personnel are persons who are familiar with the installation and operation of the product, and who fulfills the qualifications required for this activity. Any damage resulting from unauthorized manipulation or improper use voids the anufacturer's guarantee and warranty. The Operator is responsible for ensuring that applicable of safety and accident prevention regulations are complied with.

2.3. General safety instructions

**Commissioning and inspection**  
 Before commissioning, carefully read the operating manual.  
 The system must not be used in applications in which the safety of persons is dependent on the function of the device.  
**Authorized Personnel**  
 Installation and commissioning may only be performed by trained specialist personnel.  
**Intended use**  
 Warranty and liability claims against the manufacturer are rendered void by:

- Unauthorized tampering
- Improper use
- Use, installation or handling contrary to the instructions provided in this operating manual

**Obligations of the Operating Company**  
 The device is a piece of equipment from EMC Class A. Such equipment may generate RF noise. The operator must take appropriate precautionary measures. The device may only be used with an approved power supply. Only approved cables may be used.  
**Malfunctions**  
 In the event of defects and device malfunctions that cannot be rectified, the device must be taken out of operation and protected against unauthorized use.  
 Intended use is ensured only when the housing is fully installed.

2.4. Resistance to aggressive substances



**Note**  
 The BNI modules generally have a good chemical and oil resistance. When used in aggressive media (eg chemicals, oils, lubricants and coolants each in high concentration (ie, low water content)) must be checked prior application-related material compatibility. In the event of failure or damage to the BNI modules due to such aggressive media are no claims for defects.

Hazardous voltage



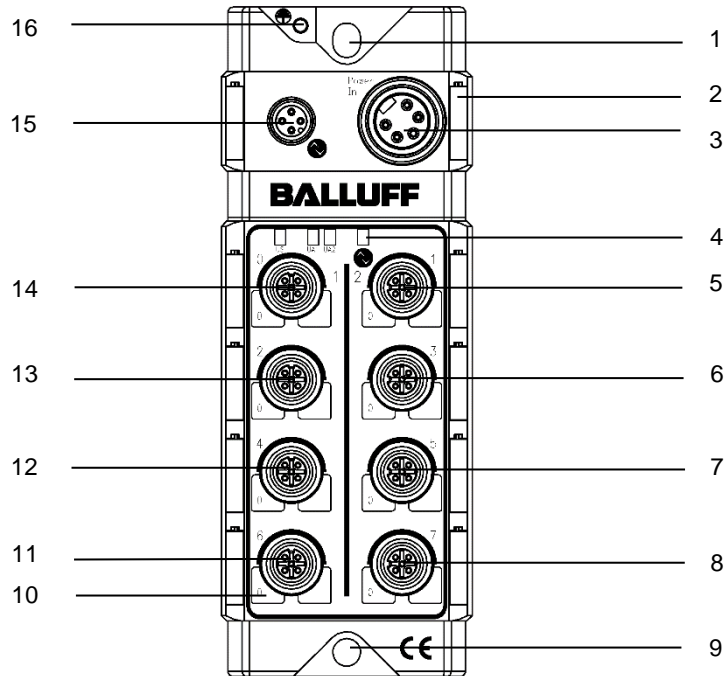
**Note**  
 Disconnect all power before servicing equipment.



**Note**  
 In the interest of product improvement, the Balluff GmbH reserves the right to change the specifications of the product and the contents of this manual at any time without notice.

3 Getting Started

3.1. Connection overview



Connection overview

- |   |                           |    |                             |
|---|---------------------------|----|-----------------------------|
| 1 | Mounting hole             | 9  | Mounting hole               |
| 2 | Label                     | 10 | Pin/Port LED: Signal status |
| 3 | Supply voltage connection | 11 | Standard output port 6      |
| 4 | Status LED                | 12 | Standard output port 4      |
| 5 | Standard output port 1    | 13 | Standard output port 2      |
| 6 | Standard output port 3    | 14 | Standard output port 0      |
| 7 | Standard output port 5    | 15 | IO-Link interface           |
| 8 | Standard output port 7    | 16 | Ground connection           |

### 3 Getting Started

#### 3.2. Mechanical connection

The modules BNI IOL-25x-xxx-Z013 are attached by using 2 M6 screws and 2 spacers.

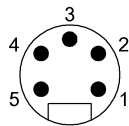
#### 3.3. Electrical connection

The BNI IOL-25x modules have a separate supply voltage connection. Power is provided through the 7/8" male plug. The module is divided into two segments. 4 or 8 outputs respectively can be switched for each segment. The segments are galvanic isolated from each other.

The connection of communication takes place through the IO-Link interface. Power for the IO-Link interface is provided by the host IO-Link Master directly and it is galvanic isolated from the supply voltage of both output segments.

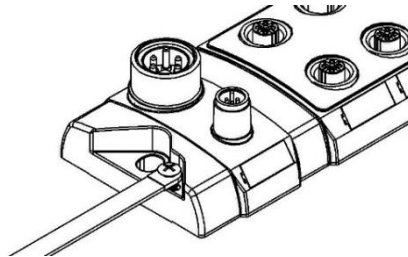
#### Power supply of the outputs

Power IN (7/8", male)



Pin	Function
1	GND, reference potential segment 1
2	GND, reference potential segment 2
3	FE, Function earth
4	+24V, power supply, outputs segment 2
5	+24V, power supply, outputs segment 1

#### Function ground

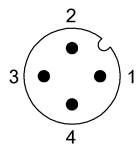


#### Note

The FE connection from the housing to the machine must be low-impedance and kept as short as possible.

#### IO-Link interface

IO-Link (M12, A-coded, male)



Pin	Function
1	Power supply controller, +24V, max 1,1A
2	-
3	GND, Reference potential
4	C/Q, IO-Link data transmission channel

#### Connecting the actuator hub

- Connection protection ground to FE terminal, if present.
- Connecting the power supply of the segments.
- Connect the incoming IO-Link line to the actuator hub.



#### Note

A standard 3 wire sensor cable is used for connection to the host IO-Link master.

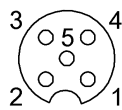
3 Getting Started

Module version

Hub versions	Digital port
BNI IOL-252-000-Z013	8 outputs
BNI IOL-252-S01-Z013	8 outputs with additional diagnostics
BNI IOL-256-000-Z013	16 outputs
BNI IOL-256-S01-Z013	16 outputs with additional diagnostics

Actuator interface

Standard output port ( M12, A-coded, female)



Pin	Function
1	-
2	Output 2 <sup>1)</sup>
3	GND
4	Output 1
5	FE

1) In case of BNI IOL-252-... not used



Note  
Maximum 2A per output.  
Total current of segment supply is maximum 9A.



Note  
Unused O-port socket must be fitted with cover caps to ensure IP67 protection rating.



Note  
Tightening torque: M12 – 0,4 Nm  
7/8 – 1,5 Nm



## IO-Link Data

**BNI IOL-252-000-Z013**

Data transmission rate	COM2 (38,4 kBaud)
Frame type	2.3
Minimal cycle time	3 ms
Process data cycle time	3 ms, at minimal cycle time
Process data length	1 Bytes output

**BNI IOL-252-S01-Z013**

Data transmission rate	COM2 (38,4 kBaud)
Frame type	1
Minimal cycle time	3 ms
Process data cycle time	18 ms, at minimal cycle time
Process data length	4 Bytes input, 1 Bytes output

**BNI IOL-256-000-Z013**

Data transmission rate	COM2 (38,4 kBaud)
Frame type	2.4
Minimal cycle time	3 ms
Process data cycle time	3 ms, at minimal cycle time
Process data length	2 Bytes output

**BNI IOL-256-S01-Z013**

Data transmission rate	COM2 (38,4 kBaud)
Frame type	1
Minimal cycle time	3 ms
Process data cycle time	24 ms, at minimal cycle time
Process data length	7 Bytes input, 2 Bytes output

4.1. Process data /  
Input dataBNI IOL-252-000-  
Z013

No input data

4 IO-Link Interface

BNI IOL-252-S01-Z013

Byte 0								Byte 1							
7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0
Feedback port 7.0	Feedback port 5.0	Feedback port 3.0	Feedback port 1.0	Feedback port 6.0	Feedback port 4.0	Feedback port 2.0	Feedback port 0.0	-	-	-	-	-	Undervoltage UA2	Undervoltage UA1	Undervoltage US
Byte 2								Byte 3							
7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0
Short circuit port 7.0	Short circuit port 5.0	Short circuit port 3.0	Short circuit port 1.0	Short circuit port 6.0	Short circuit port 4.0	Short circuit port 2.0	Short circuit port 0.0	Warning port 7.0	Warning port 5.0	Warning port 3.0	Warning port 1.0	Warning port 6.0	Warning port 4.0	Warning port 2.0	Warning port 0.0

Signal port (x):  
 x.0: Pin 4,  
 X.1: Pin 2

BNI IOL-256-000-Z013

No input data

BNI IOL-256-S01-Z013

Byte 0								Byte 1							
7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0
Feedback port 6.1	Feedback port 4.1	Feedback port 2.1	Feedback port 0.1	Feedback port 6.0	Feedback port 4.0	Feedback port 2.0	Feedback port 0.0	Feedback port 7.1	Feedback port 5.1	Feedback port 3.1	Feedback port 1.1	Feedback port 7.0	Feedback port 5.0	Feedback port 3.0	Feedback port 1.0
Byte 2								Byte 3							
7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0
-	-	-	-	-	Undervoltage UA2	Undervoltage UA1	Undervoltage US	Short circuit port 6.1	Short circuit port 4.1	Short circuit port 2.1	Short circuit port 0.1	Short circuit port 6.0	Short circuit port 4.0	Short circuit port 2.0	Short circuit port 0.0

Signal port (x):  
 x.0: Pin 4,  
 X.1: Pin 2

Byte 4								Byte 5							
7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0
Short circuit port 7.1	Short circuit port 5.1	Short circuit port 3.1	Short circuit port 1.1	Short circuit port 7.0	Short circuit port 5.0	Short circuit port 3.0	Short circuit port 1.0	Warning port 6.1	Warning port 4.1	Warning port 2.1	Warning port 0.1	Warning port 6.0	Warning port 4.0	Warning port 2.0	Warning port 0.0

Byte 6							
7	6	5	4	3	2	1	0
Warning port 7.1	Warning port 5.1	Warning port 3.1	Warning port 1.1	Warning port 7.0	Warning port 5.0	Warning port 3.0	Warning port 1.0

Signal port (x):  
 x.0: Pin 4,  
 X.1: Pin 2

4.2. Process data /  
 Output data

BNI IOL-252-xxx-  
 Z013

Byte 0							
7	6	5	4	3	2	1	0
port 7.0	port 5.0	port 3.0	port 1.0	port 6.0	port 4.0	port 2.0	port 0.0

Signal port (x):  
 x.0: Pin 4,  
 X.1: Pin 2

BNI IOL-256-xxx-  
 Z013

Byte 0								Byte 1							
7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0
port 6.1	port 4.1	port 2.1	port 0.1	port 6.0	port 4.0	port 2.0	port 0.0	port 7.1	port 5.1	port 3.1	port 1.1	port 7.0	port 5.0	port 3.0	port 1.0

Signal port (x):  
 x.0: Pin 4,  
 X.1: Pin 2

4 IO-Link Interface

Parameter Data / Request data

	DPP	SPDU		Object name	Length	Range	Default value
	Index	Index	Sub-Index				
Identification data	07hex			Vendor ID	2 Byte	read only	0378 hex
	08 hex						
	09 hex			Device ID	3 Byte		050705hex 05070Ahex 050710hex 05070Bhex
	0A hex						
	0Bhex						
		10hex	0	Vendor name	7 Byte		BALLUFF
		11hex	0	Vendor text	15 Byte		www.balluff.com
		12hex	0	Product name	20 Byte		BNI IOL-252-000-Z013 BNI IOL-252-S01-Z013 BNI IOL-256-000-Z013 BNI IOL-256-S01-Z013
		13hex	0	Product ID	7 Byte		BNI0033 BNI003W BNI0034 BNI003Y
		14hex	0	Product text	22 Byte		Actor hub metal 8 outputs Actor hub metal 8 outputs Actor hub metal 16 outputs Actor hub metal 16 outputs
	16hex	0	Hardware Revision	1 Byte			
	17hex	0	Firmware Revision	23 Byte			
Parameter data		42hex	0 1-16	Fault state seg. 1	2 Byte	0hex...FFFFhex	0hex
		43hex	0 1-16	Fault state seg. 2	2 Byte	0hex...FFFFhex	0hex
		44hex	0 1-8	Voltage monitoring	1 Byte	0hex...FFhex	-
		45hex	0 1-16	Actuator short circuit	2 Byte	0hex...FFFFhex	-
		46hex	0 1-16	Actuator warning	2 Byte	0hex...FFFFhex	-
		47hex	0 1-16	Feedback	2 Byte	0hex...FFFFhex	-
		9Fhex	0	Suppress events	1 Byte	0hex...FFhex	0hex

Fault state segment 1

Byte 0								Byte 1																							
7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0																
Fault state 6.0				Fault state 4.0				Fault state 2.0				Fault state 0.0				Fault state 6.1*				Fault state 4.1*				Fault state 2.1*				Fault state 0.1*			

Fault state port (x)  
 00 – 0  
 01 – 1  
 10 – Last status  
 11 – Not defined

Only in case of BNI IOL-256-xxx-Z013



Note

The fault state „11“ will be interpreted by software as „00“.

Voltage monitoring

Byte 0							
7	6	5	4	3	2	1	0
.	.	.	.	.	Undervoltage UA2	Undervoltage UA1	Undervoltage US

Actuator short circuit

In case of BNI IOL-252-xxx-Z013

Byte 0							
7	6	5	4	3	2	1	0
Short circuit port 7.0	Short circuit port 5.0	Short circuit port 3.0	Short circuit port 1.0	Short circuit port 6.0	Short circuit port 4.0	Short circuit port 2.0	Short circuit port 0.0

Short circuit at signal port on port x  
 Short circuit port x.0 = Pin 4

In case of BNI IOL-256-xxx-Z013

Byte 0								Byte 1							
7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0
Short circuit port 6.1	Short circuit port 4.1	Short circuit port 2.1	Short circuit port 0.1	Short circuit port 6.0	Short circuit port 4.0	Short circuit port 2.0	Short circuit port 0.0	Short circuit port 7.1	Short circuit port 5.1	Short circuit port 3.1	Short circuit port 1.1	Short circuit port 7.0	Short circuit port 5.0	Short circuit port 3.0	Short circuit port 1.0

Short circuit at signal port on port x  
 Short circuit port x.0 = Pin 4  
 Short circuit port x.1 = Pin 2

4 IO-Link Interface

Actuator warning

In case of BNI IOL-252-xxx-Z013

Byte 0							
7	6	5	4	3	2	1	0
Actuator warning port 7.0	Actuator warning port 5.0	Actuator warning port 3.0	Actuator warning port 1.0	Actuator warning port 6.0	Actuator warning port 4.0	Actuator warning port 2.0	Actuator warning port 0.0

Actuator warning at signal port on port x  
Actuator warning port x.0 = Pin 4

In case of BNI IOL-256-xxx-Z013

Byte 0								Byte 1							
7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0
Actuator warning port 6.1	Actuator warning port 4.1	Actuator warning port 2.1	Actuator warning port 0.1	Actuator warning port 6.0	Actuator warning port 4.0	Actuator warning port 2.0	Actuator warning port 0.0	Actuator warning port 7.1	Actuator warning port 5.1	Actuator warning port 3.1	Actuator warning port 1.1	Actuator warning port 7.0	Actuator warning port 5.0	Actuator warning port 3.0	Actuator warning port 1.0

Actuator warning at signal port on port x  
Actuator warning port x.0 = Pin 4  
Actuator warning port x.1 = Pin 2

Feedback

In case of BNI IOL-252-xxx-Z013

Byte 0							
7	6	5	4	3	2	1	0
Feedback port 7.0	Feedback port 5.0	Feedback port 3.0	Feedback port 1.0	Feedback port 6.0	Feedback port 4.0	Feedback port 2.0	Feedback port 0.0

Feedback at signal port on port x  
Feedback port x.0 = Pin 4

In case of BNI IOL-256-xxx-Z013

Byte 0								Byte 1							
7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0
Feedback port 6.1	Feedback port 4.1	Feedback port 2.1	Feedback port 0.1	Feedback port 6.0	Feedback port 4.0	Feedback port 2.0	Feedback port 0.0	Feedback port 7.1	Feedback port 5.1	Feedback port 3.1	Feedback port 1.1	Feedback port 7.0	Feedback port 5.0	Feedback port 3.0	Feedback port 1.0

Feedback at signal port on port x  
Feedback port x.0 = Pin 4  
Feedback port x.1 = Pin 2



Note

Actuator short circuit: overload or short circuit of the output signal against 0V.  
Actuator warning signal: short circuit of the output signal against +24V.

Suppress events

Byte 0							
7	6	5	4	3	2	1	0
.	.	.	Error output segment 2	Error output segment 1	Undervoltage UA2	Undervoltage UA1	Undervoltage US

0 – Release Event  
1 – Suppress Event

4 IO-Link Interface

4.3. Errors

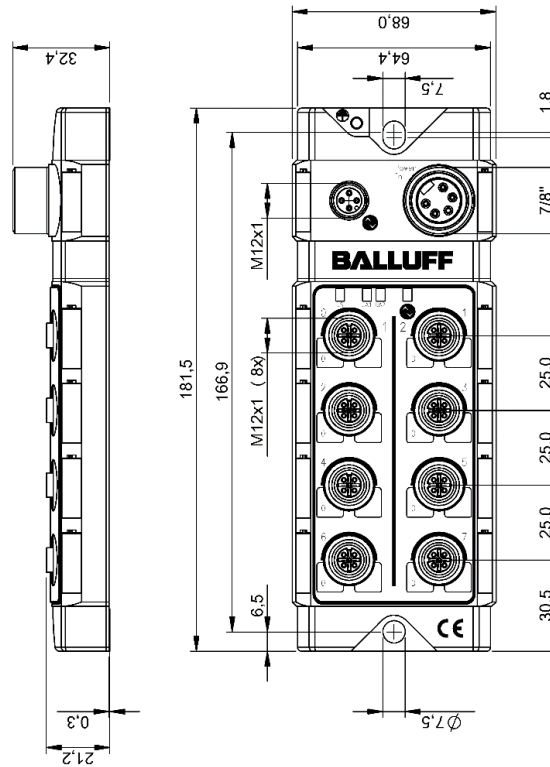
Error Code	Additional Code
Device application error 0x80	Index not available 0x11
Device application error 0x80	Subindex not available 0x12
Device application error 0x80	Value out of range 0x30

4.4. Events

Class / Qualifier			Code ( high + low )			
Mode	Type	Instance				
Appears	Error	AL	Device Hardware	Supply	Supply low voltage	U2 = Supply + 24V
0xC0	0x30	0x03	0x5000	0x0100	0x0010	0x0002
0xF3			0x5112			
Disappears	Error	AL	Device Hardware	Supply	Supply low voltage	U2 = Supply + 24V
0x80	0x30	0x03	0x5000	0x0100	0x0010	0x0002
0xB3			0x5112			
Appears	Error	AL	Device Hardware	Supply	Supply low voltage	Low UA1
0xC0	0x30	0x03	0x5000	0x0100	0x0010	0x0004
0xF3			0x5114			
Disappears	Error	AL	Device Hardware	Supply	Supply low voltage	Low UA1
0x80	0x30	0x03	0x5000	0x0100	0x0010	0x0004
0xB3			0x5114			
Appears	Error	AL	Device Hardware	Supply	Supply low voltage	Low UA2
0xC0	0x30	0x03	0x5000	0x0100	0x0010	0x0006
0xF3			0x5116			
Disappears	Error	AL	Device Hardware	Supply	Supply low voltage	Low UA2
0x80	0x30	0x03	0x5000	0x0100	0x0010	0x0006
0xB3			0x5116			
Appears	Error	AL	Device Hardware	Output	Output Stages	Segment 1
0xC0	0x30	0x03	0x5000	0x0400	0x0010	0x00
0xF3			0x5410			
Disappears	Error	AL	Device Hardware	Output	Output Stages	Segment 1
0x80	0x30	0x03	0x5000	0x0400	0x0010	0x00
0xB3			0x5410			
Appears	Error	AL	Device Hardware	Output	Output Stages	Segment 2
0xC0	0x30	0x03	0x5000	0x0400	0x0010	0x01
0xF3			0x5411			
Disappears	Error	AL	Device Hardware	Output	Output Stages	Segment 2
0x80	0x30	0x03	0x5000	0x0400	0x0010	0x01
0xB3			0x5411			



5.1. Dimensions



5.2. Mechanical data

Housing material	Die-cast zinc housing
IO-Link port	M12, A-coded, male
O-ports	M12, female, 5poles
Enclosure rating per IEC 60529	IP 67 (only when plugged in and threaded in)
Weight	500 g
Dimensions (W x H x D in mm)	68 x 181,5 x 32,4

5.3. Operating conditions

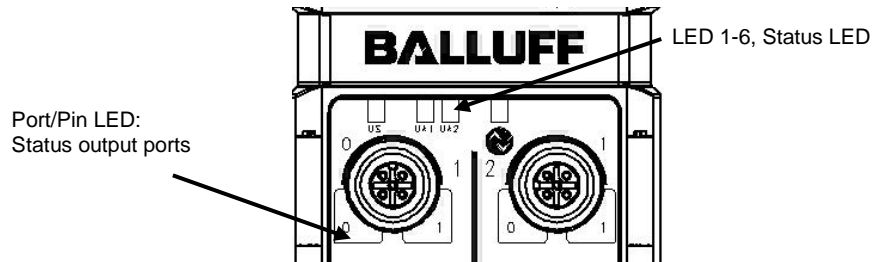
Operating temperature	-5 °C ... +55 °C
Storage temperature	-25 °C ... +70 °C
EMV / EMC EN 61000-4-2/3/4/5/6	Severity level 2B/3A/4B/2B/3A
Vibration/shock	EN 60068-2-6, EN 60068-2-27 EN 60068-2-29, EN 60068-2-64

5.4. Electrical data

Supply voltage	18...30.2 V DC, per EN 61131-2
Ripple	< 1%
Current consumption without load	≤ 90 mA

5 Technical data

5.5. LED indicators



Status LED

LED	Indicator	Function
LED 1	Green / Red	Supply module ok / Undervoltage
LED 3	Green / Red	Supply segment 1 / Undervoltage
LED 4	Green / Red	Supply segment 2 / Undervoltage
LED 6	Green / Green flashing	Communication error / Communication ok

LED O-ports  
Standard

Indicators	Function LED Pin 2 / Pin 4
Out	Output signal = 0
Yellow, static	Output signal = 1
Red	Output port: I <sub>max</sub> , Over-current

6.1. Typ Code

**BNI IOL-25x-xxx-Z013**

Balluff Network Interface

IO-Link Interface

Functions

252 = 8 outputs

256 = 16 outputs

Versions

000 = Standard version

S01 = version with additional diagnostics

Mechanical design

Z013 = Die-cast zinc housing, matte nickel plated

Bus connection and power supply 1xM12 external thread

O-ports: 8xM12, female, 5-poles, internal thread

Supply voltage segment 1&2: 1x7/8" external thread

6.2. Order information

Product ordering code	Ordering code
BNI IOL-252-000-Z013	BNI0033
BNI IOL-252-S01-Z013	BNI003W
BNI IOL-256-000-Z013	BNI0034
BNI IOL-256-S01-Z013	BNI003Y

6.3. Scope of delivery

BNI IOL-...-Z013 consists of the following components:

- IO-Module
- 4 filler plugs M12
- Ground connection band
- Screw M4x6
- 20 Labels
- User's guide

[www.balluff.com](http://www.balluff.com)

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No. 899447-726 EN • 02.123983 • Edition E17 • Replaces Edition 1311 • Subject to modifications.