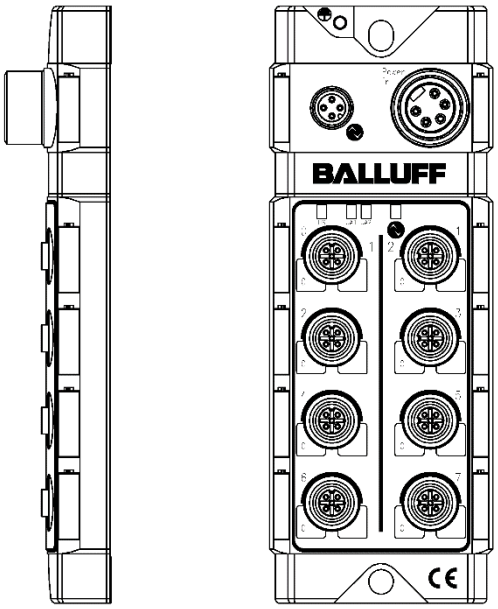
BALLUFF

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.

- Keyword 1
- Keyword 2

Actions

Action instructions are indicated by a preceding triangle. The result of an action is indicated by an arrow.

➢ Action instruction 1
↳ Result of action
➢ Action instruction 2

Actions can also be indicated as numbers in parentheses.

(1) Step 1
(2) Step 2
(3)

Syntax

Numbers:
Decimal numbers are shown without additional information (e.g., 123),
hexadecimal numbers are shown with the additional indicator hex (e.g., 00_{hex}).

Cross-references

Cross references indicate where further information on the subject can be found.

1.3. Symbols

Note
This symbol indicates general notes.

Attention!
This symbol indicates a safety instruction that must be followed without exception.

1.4. Abbreviations

BNI	Balluff Network Interface
O	Standard output port
DPP	Direct parameter page
IOL	IO-Link
EMC	Electromagnetic Compatibility
FE	Function earth
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 Safety

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

Attention!
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

Attention!
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.

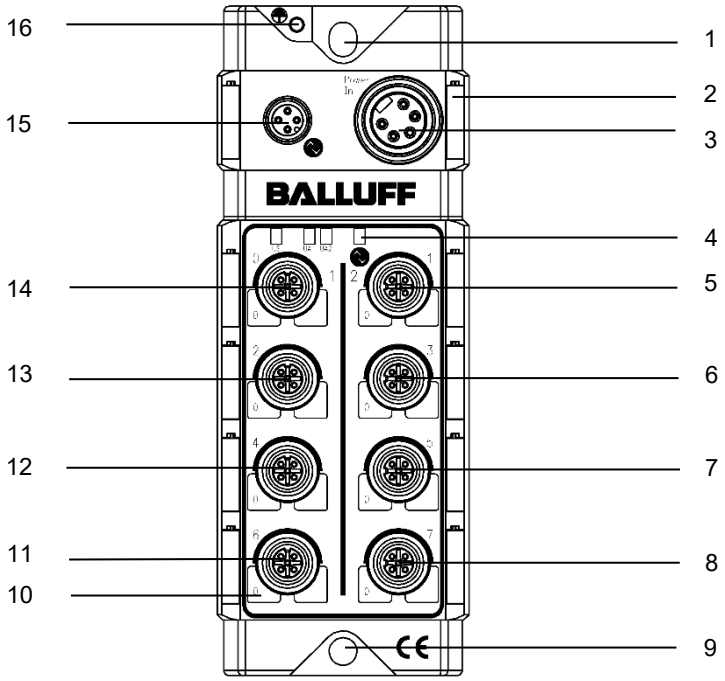
Hazardous voltage

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

3.2. Mechanical connection

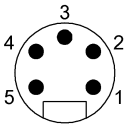
The modules BNI IOL-25x-xxx-Z013 are attached by using 2 M6 screws and 2 spacers.

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.

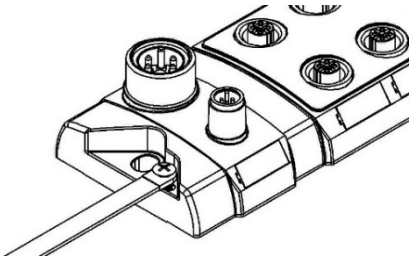
Power supply of the outputs

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

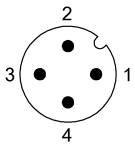
Function ground



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.

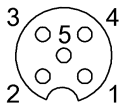
3 Getting Started

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 [1)]
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
Tightenning torque: M12 – 0,4 Nm
7/8 – 1,5 Nm

4 IO-Link Interface

4.1. 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 IO-Link Interface

4.2. Process data / Input data

BNI IOL-252-000-Z013

No input data

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 pin 4	Feedback port 5 pin 4	Feedback port 3 pin 4	Feedback port 1 pin 4	Feedback port 6 pin 4	Feedback port 4 pin 4	Feedback port 2 pin 4	Feedback port 0 pin 4	-	-	-	-	-	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 pin 4	Short circuit port 5 pin 4	Short circuit port 3 pin 4	Short circuit port 1 pin 4	Short circuit port 6 pin 4	Short circuit port 4 pin 4	Short circuit port 2 pin 4	Short circuit port 0 pin 4	Warning port 7 pin 4	Warning port 5 pin 4	Warning port 3 pin 4	Warning port 1 pin 4	Warning port 6 pin 4	Warning port 4 pin 4	Warning port 2 pin 4	Warning port 0 pin 4

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 pin 2	Feedback port 4 pin 2	Feedback port 2 pin 2	Feedback port 0 pin 2	Feedback port 6 pin 4	Feedback port 4 pin 4	Feedback port 2 pin 4	Feedback port 0 pin 4	Feedback port 7 pin 2	Feedback port 5 pin 2	Feedback port 3 pin 2	Feedback port 1 pin 2	Feedback port 7 pin 4	Feedback port 5 pin 4	Feedback port 3 pin 4	Feedback port 1 pin 4

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 pin 2	Short circuit port 4 pin 2	Short circuit port 2 pin 2	Short circuit port 0 pin 2	Short circuit port 6 pin 4	Short circuit port 4 pin 4	Short circuit port 2 pin 4	Short circuit port 0 pin 4

Byte 4								Byte 5							
7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0
Short circuit port 7 pin 2	Short circuit port 5 pin 2	Short circuit port 3 pin 2	Short circuit port 1 pin 2	Short circuit port 7 pin 4	Short circuit port 5 pin 4	Short circuit port 3 pin 4	Short circuit port 1 pin 4	Warning port 6 pin 2	Warning port 4 pin 2	Warning port 2 pin 2	Warning port 0 pin 2	Warning port 6 pin 4	Warning port 4 pin 4	Warning port 2 pin 4	Warning port 0 pin 4

Byte 6							
7	6	5	4	3	2	1	0
Warning port 7 pin 2	Warning port 5 pin 2	Warning port 3 pin 2	Warning port 1 pin 2	Warning port 7 pin 4	Warning port 5 pin 4	Warning port 3 pin 4	Warning port 1 pin 4

4 IO-Link Interface

4.3. Process data / Output data

BNI IOL-252-xxx-Z013

Byte 0							
7	6	5	4	3	2	1	0
Output port 7 pin 4	Output port 5 pin 4	Output port 3 pin 4	Output port 1 pin 4	Output port 6 pin 4	Output port 4 pin 4	Output port 2 pin 4	Output port 0 pin 4

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
Output port 6 pin 2	Output port 4 pin 2	Output port 2 pin 2	Output port 0 pin 2	Output port 6 pin 4	Output port 4 pin 4	Output port 2 pin 4	Output port 0 pin 4	Output port 7 pin 2	Output port 5 pin 2	Output port 3 pin 2	Output port 1 pin 2	Output port 7 pin 4	Output port 5 pin 4	Output port 3 pin 4	Output port 1 pin 4

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

4 IO-Link Interface

Fault state segment 1 42hex

Byte	0								1							
Bit	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0
Sub Index	4		3		2		1		8		7		6		5	
Description	Fault state port 6 pin 4		Fault state port 4 pin 4		Fault state port 2 pin 4		Fault state port 0 pin 4		Fault state port 6 pin 2*		Fault state port 4 pin 2*		Fault state port 2 pin 2*		Fault state port 0 pin 2*	

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

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

Fault state segment 2 43hex

Byte	0								1							
Bit	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0
Sub Index	4		3		2		1		8		7		6		5	
Description	Fault state port 7 pin 4		Fault state port 5 pin 4		Fault state port 3 pin 4		Fault state port 1 pin 4		Fault state port 7 pin 2*		Fault state port 5 pin 2*		Fault state port 3 pin 2*		Fault state port 1 pin 2*	

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

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

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

Voltage monitoring 44_{hex}

Byte	0							
Bit	7	6	5	4	3	2	1	0
Sub Index	8	7	6	5	4	3	2	1
Description	-	-	-	-	-	Undervoltage UA2	Undervoltage UA1	Undervoltage US

Actuator short circuit 45_{hex}

BNI IOL-252-xxx-Z013

Byte	0							
Bit	7	6	5	4	3	2	1	0
Sub Index	8	7	6	5	4	3	2	1
Description	Short circuit port 7 pin 4	Short circuit port 5 pin 4	Short circuit port 3 pin 4	Short circuit port 1 pin 4	Short circuit port 6 pin 4	Short circuit port 4 pin 4	Short circuit port 2 pin 4	Short circuit port 0 pin 4

BNI IOL-256-xxx-Z013

Byte	0								1							
Bit	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0
Sub Index	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1
Description	Short circuit port 6 pin 2	Short circuit port 4 pin 2	Short circuit port 2 pin 2	Short circuit port 0 pin 2	Short circuit port 6 pin 4	Short circuit port 4 pin 4	Short circuit port 2 pin 4	Short circuit port 0 pin 4	Short circuit port 7 pin 2	Short circuit port 5 pin 2	Short circuit port 3 pin 2	Short circuit port 1 pin 2	Short circuit port 7 pin 4	Short circuit port 5 pin 4	Short circuit port 3 pin 4	Short circuit port 1 pin 4

Note
Actuator short circuit: Overload or short circuit of the output signal against 0V.

4 IO-Link Interface

Actuator warning 46$_{hex}$

BNI IOL-252-xxx-Z013

Byte	0							
Bit	7	6	5	4	3	2	1	0
Sub Index	8	7	6	5	4	3	2	1
Description	Actuator warning port 7 pin 4	Actuator warning port 5 pin 4	Actuator warning port 3 pin 4	Actuator warning port 1 pin 4	Actuator warning port 6 pin 4	Actuator warning port 4 pin 4	Actuator warning port 2 pin 4	Actuator warning port 0 pin 4

BNI IOL-256-xxx-Z013

Byte	0								1							
Bit	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0
Sub Index	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1
Description	Actuator warning port 6 pin 2	Actuator warning port 4 pin 2	Actuator warning port 2 pin 2	Actuator warning port 0 pin 2	Actuator warning port 6 pin 4	Actuator warning port 4 pin 4	Actuator warning port 2 pin 4	Actuator warning port 0 pin 4	Actuator warning port 7 pin 2	Actuator warning port 5 pin 2	Actuator warning port 3 pin 2	Actuator warning port 1 pin 2	Actuator warning port 7 pin 4	Actuator warning port 5 pin 4	Actuator warning port 3 pin 4	Actuator warning port 1 pin 4

Note
Actuator warning signal: short circuit of the output signal against +24V.

Feedback

BNI IOL-252-xxx-Z013

Byte	0							
Bit	7	6	5	4	3	2	1	0
Sub Index	8	7	6	5	4	3	2	1
Description	Feedback port 7 pin 4	Feedback port 5 pin 4	Feedback port 3 pin 4	Feedback port 1 pin 4	Feedback port 6 pin 4	Feedback port 4 pin 4	Feedback port 2 pin 4	Feedback port 0 pin 4

BNI IOL-256-xxx-Z013

Byte	0								1							
Bit	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0
Sub Index	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1
Description	Feedback port 6 pin 2	Feedback port 4 pin 2	Feedback port 2 pin 2	Feedback port 0 pin 2	Feedback port 6 pin 4	Feedback port 4 pin 4	Feedback port 2 pin 4	Feedback port 0 pin 4	Feedback port 7 pin 2	Feedback port 5 pin 2	Feedback port 3 pin 2	Feedback port 1 pin 2	Feedback port 7 pin 4	Feedback port 5 pin 4	Feedback port 3 pin 4	Feedback port 1 pin 4

Suppress events $9F_{hex}$

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

0 - Release Event
1 - Suppress Event

4 IO-Link Interface

4.4. Errors

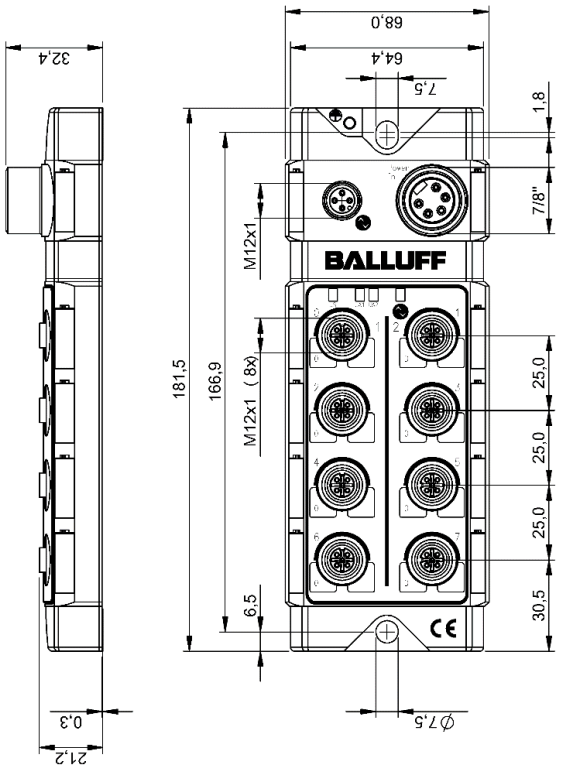
Error Code	Description
0x8011	Index not available
0x8012	Subindex not available
0x8030	Value out of range

4.5. Events

Event Code	Description
0x5112	Low sensor voltage (US)
0x5114	Low actor voltage (UA1) Segment 1
0x5116	Low actor voltage (UA2) Segment 2
0x5410	Output Stages Segment 1
0x5411	Output Stages Segment 2

5 Technical data

5.1. Dimensions



5.2. Mechanical data

Housing material	Die-cast zinc housing
IO-Link port	M12, A-coded, male, 5 poles
O-ports	M12, female, 5 poles
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

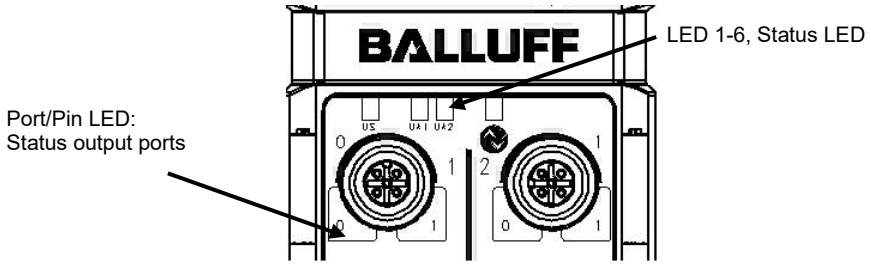
Ambient temperature	-5 °C … +70 °C
Storage temperature	-25 °C … +70 °C

5.4. Electrical data

Supply voltage	18….30.2 V DC, per EN 61131-2
Ripple	< 1%
Current consumption without load	≤ 65 mA

5 Technical data

5.5. LED indicators



Port/Pin-LEDs

LED „0“ – port pin 4
LED „1“ – port pin 2

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: Imax, Over-current

6 Appendix

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

www.balluff.com

No. 899447-726 EN •03.129256 •Edition K19 •Replaces Edition E17 •Subject to modifications.

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