BALLUFF

sensors worldwide

BNI IOL-302-000-Z026
BNI IOL-302-S01-Z026

User's Guide
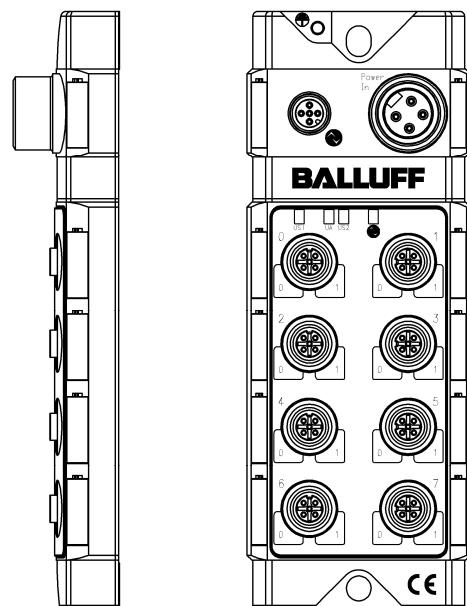
1 Notes for the user

1.1 About this guide

This guide describes the Balluff Network Interface BNI IOL-302-xxx-Z026 for the application as peripheral in-/ output module to establish connection of binary standard sensors or actuators. Hereby it is about an IO-Link device which communicates by means of IO-Link protocol with the superordinate IO-Link master assembly.

1.2 Structure of the guide

The guide is organized so that the sections build on one another:
Section 2: Basic safety information.
Section 3: The main steps for installing the device.
Section 4: IO-Link, parameter and process data for the device.´
Section 5: Technical data for the device.

1.3 Typographical conventions

The following typographical conventions are used in this guide.

1.3.1 Enumerations

Enumerations are shown in list form with bullet points:
- Entry 1,
- Entry 2.

1.3.2 Actions

Action instructions are indicated by a preceding triangle. The result of an action is indicated by an arrow.
➢ Action instruction 1.
⇒ Action result.
➢ Action instruction 2.

1.3.3 Syntax

Numbers:
– Decimal numbers are shown without additional indicators (e.g. 123),
– Hexadecimal numbers are shown with the additional indicator $_{hex}$ (e.g. 00_{hex}).

1.3.4 Cross references

Cross references indicate where additional information on the topic can be found (see section 5 „Technical data").

1.4 Symbols

i | **Note, Tipp**
This symbol indicates general notes.

⚠ | **Note!**
This symbol indicates a security notice which must be observed.

1.5 Abbreviations

BNI   Balluff Network Interface
I/O port Standard input / output port
DPP   Direct Parameter Page
IOL   IO-Link
EMC   Electromagnetic Compatibility
FE   Function earth
SPDU   Service Protocol Data Unit

2.1   Intended use

This guide describes the Balluff Network Interface BNI IOL-302-xxx-Z026 for the application as peripheral in-/ output module to establish connection of binary standard sensors or 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   General safety notes

Installation and start up
Installation and start up are to be performed only by trained specialists. Any damage resulting from unauthorized manipulation or improper use voids the manufacturer's guarantee and warranty.
The device complies with EMC Class A. Such equipment may generate RF noise. The operator must take precautionary measures accordingly.
The device must be powered only using an approved power supply (see section 5 "Technical data"). Only approved cable may be used.

Operating and testing
The operator is responsible for observing local prevailing safety regulations.
When defects and non-clearable faults occur in the device, take it out of service and secure against unauthorized use.
Approved use in ensured only when the housing is fully installed.

2.3   Meaning of the warnings

⚠ **Note!**
The pictogram used with the word "Caution" warns against a possible hazardous situation affecting the health of persons or resulting in equipment damage. Ignoring these warnings can result in injury or equipment damage.

- Always observe the described measures for preventing this danger.

3.1 Connection overview
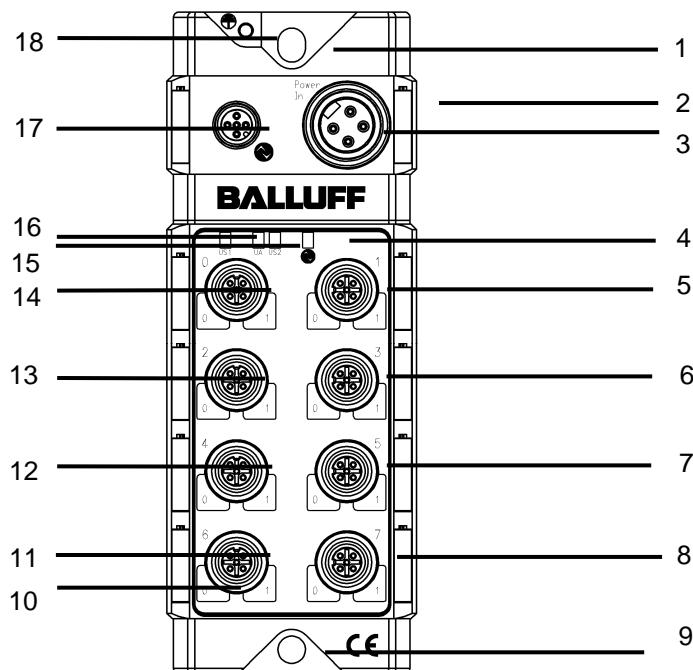
Figure 3-1: Connection overview BNI IOL-302-xxx-Z013

1	Mounting hole	10	Pin/Port LED: Signal status
2	Label	11	Standard I/O port 6
3	Supply voltage connection	12	Standard I/O port 4
4	Status LED: communication / module	13	Standard I/O port 2
5	Standard I/O port 1	14	Standard I/O port 0
6	Standard I/O port 3	15	Status LED: sensors/ actuators supply
7	Standard I/O port 5	16	Status LED: module supply
8	Standard I/O port 7	17	IO-Link interface
9	Mounting hole	18	Ground connection

3   Getting started

3.2 Mechanical connection	The BNI IOL-302-xxx-Z026 modules are attached by using 2 M6 screws and 2 spacers.
3.3 Electrical connection	The BNI IOL-302-xxx-Z026 modules require two separate supply voltage connection. The supply voltage of the module is provided through the IO-Link interface by the host IO-Link Master. The power for the sensors and actuators is provided by the 7/8" connector.

3.3.1 IO-Link interface

IO-Link (M12, A coded, male)
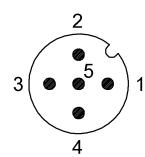
Pin	Function
1	Power supply controller, +24V, max 1,1A
2	not connected
3	GND, reference potential
4	C/Q, IO-Link data transmission channel
5	FE, function earth

Connecting the hub

➢ Connection protection ground to FE terminal, if present.
➢ Connect sensor/actuator supply.
➢ Connect the incoming IO-Link line to the hub.

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

Function earth
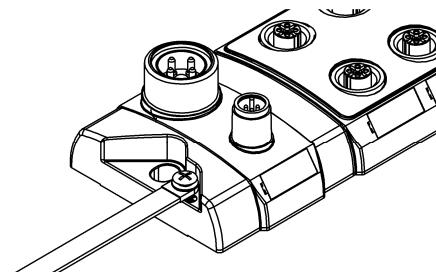
Figure 3-2: FE connection

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

Module versions

Hub versions	Digital Port
BNI IOL-302-000-Z026	16 In-/ Outputs, configurable
BNI IOL-302-S01-Z026	16 In-/ Outputs, configurable, with single channel monitoring

3.3.2. Supply voltage connection

Power In (7/8", male)
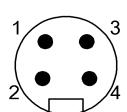
Pin	Function
1	Power supply actuators, +24V
2	Power supply sensors, +24V
3	GND, Reference potential sensor supply
4	GND, Reference potential actuator supply

3   Getting started

3.3.3 Sensor-Actuator
interface

Standard I/O port (M12, A coded, female)
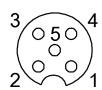
Pin	Function
1	+24V, 300mA
2	Input 2 / Output 2
3	GND
4	Input 1 / Output 1
5	FE

Note!
For the digital sensor inputs follow the input guideline per EN61131-2, type 2.

Note!
Outputs: Maximum 2A per output.

Total current of actuator supply is maximum 9A

Note!
Unused I/O port socket must be fitted with cover cap to ensure IP67 protection rating.

4.1 IO-Link data   **BNI IOL-302-000-Z026**

Data transmission rate	COM2 (38,4 kBaud)
Frame type	1
Minimal cycle time	3 ms
Process data cycle time	12 ms, 3 ms, at minimal cycle time
Process data length	2 Bytes input, 2 Bytes output

BNI IOL-302-S01-Z026

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	6 Bytes input, 2 Bytes output

4.2 Process data / Input data

BNI IOL-302-000-Z026

Byte 0								Byte 1							
7	6	7	6	7	6	7	6	7	6	7	6	7	6	7	6
Input 7.0	Input 6.0	Input 5.0	Input 4.0	Input 3.0	Input 2.0	Input 1.0	Input 0.0	Input 7.1	Input 6.1	Input 5.1	Input 4.1	Input 3.1	Input 2.1	Input 1.1	input 0.1

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

BNI IOL-302-S01-Z026

Byte 0								Byte 1							
7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0
Input 7.0	input 6.0	Input 5.0	Input 4.0	Input 3.0	Input 2.0	Input 1.0	Input 0.0	Input 7.1	Input 6.1	Input 5.1	Input 4.1	Input 3.1	Input 2.1	Input 1.1	Input 0.1
Byte 2								Byte 3							
7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0
Short circuit port 7	Short circuit port 6	Short circuit port 5	Short circuit port 4	Short circuit port 3	Short circuit port 2	Short circuit port 1	Short circuit port 0	-	-	-	-	-	Under voltage UA	Untder voltage US2	Under voltage US1

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

Short circuit on port x between Pin 1 and Pin 3 Short circuit Port x = 1

where x=0...7

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

Actuator short circuit at
Signal port on port x
Short circuit port x.0=Pin4
Short circuit port x.1=Pin2

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

**4.3 Process data /
Output data**

BNI IOL-302-xxx-Z026

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

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

4   IO-Link interface

4.4 Parameter data / Request data

	DPP	SPDU		Object name	Length	Range	Default value
	Index	Index	Sub-Index				
Identification data	0x07			Vendor ID	2 Byte	read only	0x0378
	0x08						
	0x09			Device ID	3 Byte		0x05070F 0x05070E
	0x0A						
	0x0B						
		0x10	0	Vendor name	7 Byte		BALLUFF
		0x11	0	Vendor text	15 Byte		www.balluff.com
		0x12	0	Product name	20 Byte		BNI IOL-302-000-Z026 BNI IOL-302-S01-Z026
		0x13	0	Product ID	7 Byte		BNI 0050 BNI 0051
		0x14	0	Product text	22 Byte		Sensor/Actor hub metal
		0x16	0	Hardware Revision	1 Byte		
		0x17	0	Firmware Revision	23 Byte		
Parameter data		0x40	0 1-16	Inversion	2 Byte	0-FFFF	0x0000
		0x42	0 1-8	Fault state Pin4	2 Byte	0-FFFF	0x0000
		0x43	0 1-8	Fault state Pin2	2 Byte	0-FFFF	0x0000
		0x44	0 1-16	Power monitoring	2 Byte	0-FFFF	-
		0x45	0 1-16	Actuator short circuit	2Byte	0-FFFF	-

BNI IOL-302-xxx-Z026

Inversion

Byte 0								Byte 1							
7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0
Inversion 7.0	Inversion 6.0	Inversion 5.0	Inversion 4.0	Inversion 3.0	Inversion 2.0	Inversion 1.0	Inversion 0.0	Inversion 7.1	Inversion 6.1	Inversion 5.1	Inversion 4.1	Inversion 3.1	Inversion 2.1	Inversion 1.1	Inversion 0.1
Subindex															
16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1

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

Inversion
0: normal
1: inverted

4   IO-Link interface

Fault state Pin 4

7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0
Byte 0								Byte 1							
Fault state 3.0		Fault state 2.0		Fault state 1.0		Fault state 0.0		Fault state 7.0		Fault state 6.0		Fault state 5.0		Fault state 4.0	
Subindex															
4		3		2		1		8		7		6		5	

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

Fault state Pin 2

7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0
Byte 0								Byte 1							
Fault state 3.1		Fault state 2.1		Fault state 1.1		Fault state 0.1		Fault state 7.1		Fault state 6.1		Fault state 5.1		Fault state 4.1	
Subindex															
4		3		2		1		8		7		6		5	

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

Power monitoring

7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0
Byte 0								Byte 1							
Short circuit Port 7	Short circuit Port 6	Short circuit Port 5	Short circuit Port 4	Short circuit Port 3	Short circuit Port 2	Short circuit Port 1	Short circuit Port 0	-	-	-	-	-	Under voltage UA	Under voltage US2	Under voltage US1
Subindex															
16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1

Short circuit on port x between pin 1 und pin 3
Short circuit port x = 1

Actuator short circuit

7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0
Byte 0								Byte 1							
Short circuit Port 7.0	Short circuit Port 6.0	Short circuit Port 5.0	Short circuit Port 4.0	Short circuit Port 3.0	Short circuit Port 2.0	Short circuit Port 1.0	Short circuit Port 0.0	Short circuit Port 7.1	Short circuit Port 6.1	Short circuit Port 5.1	Short circuit Port 4.1	Short circuit Port 3.1	Short circuit Port 2.1	Short circuit Port 1.1	Short circuit Port 0.1
Subindex															
16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1

Actuator short circuit at signal port on port x
Short circuit Port x.0=Pin4
Short circuit Port x.1=Pin2

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

4   IO-Link interface

4.5 Error

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

4.6 Events

Class / Qualifier			Code (high + low)			
Mode	Type	Instance				
Appears	Error	AL	Device Hardware	Supply	Supply low voltage	US1
0xC0	0x30	0x03	0x5000	0x0100	0x0010	0x0002
0xF3			0x5112			
Disappears	Error	AL	Device Hardware	Supply	Supply low voltage	US1
0x80	0x30	0x03	0x5000	0x0100	0x0010	0x0002
0xB3			0x5112			
Appears	Error	AL	Device Hardware	Supply	Supply low voltage	UA
0xC0	0x30	0x03	0x5000	0x0100	0x0010	0x0004
0xF3			0x5114			
Disappears	Error	AL	Device Hardware	Supply	Supply low voltage	UA
0x80	0x30	0x03	0x5000	0x0100	0x0010	0x0004
0xB3			0x5114			
Appears	Error	AL	Device Hardware	Supply	Supply low voltage	US2
0xC0	0x30	0x03	0x5000	0x0100	0x0010	0x0005
0xF3			0x5115			
Disappears	Error	AL	Device Hardware	Supply	Supply low voltage	US2
0x80	0x30	0x03	0x5000	0x0100	0x0010	0x0005
0xB3			0x5115			
Appears	Error	AL	Device Hardware	Supply	Supply periphery	
0xC0	0x30	0x03	0x5000	0x0100	0x0060	
0xF3			0x5160			
Disappears	Error	AL	Device Hardware	Supply	Supply periphery	
0x80	0x30	0x03	0x5000	0x0100	0x0060	
0xB3			0x5160			
Appears	Error	AL	Device Hardware	Power	Output Stages	
0xC0	0x30	0x03	0x5000	0x0400	0x0010	
0xF3			0x5410			
Disappears	Error	AL	Device Hardware	Power	Output Stages	
0x80	0x30	0x03	0x5000	0x0400	0x0010	
0xB3			0x5410			

5   Technical data

5.1 Dimensions
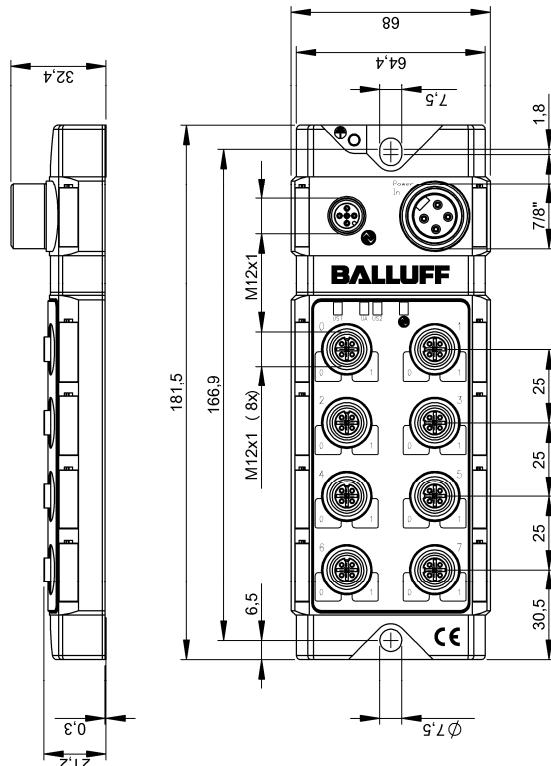
Figure 5-1: Dimensions BNI IOL-302-xxx-Z013

5.2 Mechanical data

Housing material	Die-cast zinc housing
IO-Link port	M12, A coded, male
Supply voltage connection	7/8" male, 4 poles
I/O-ports	M12, female, 5 poles
Enclosure rating per IEC 60529	IP 67 (only when plugged in and threaded in)
Dimensions (B x H x T in mm)	68 x 181,5 x 32,4
Weight	ca. 500 gr.

5.3 Electrical data

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

5.4 Operating conditions

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

5.5 LED indicators


Port/Pin LED:
Status input / output
ports
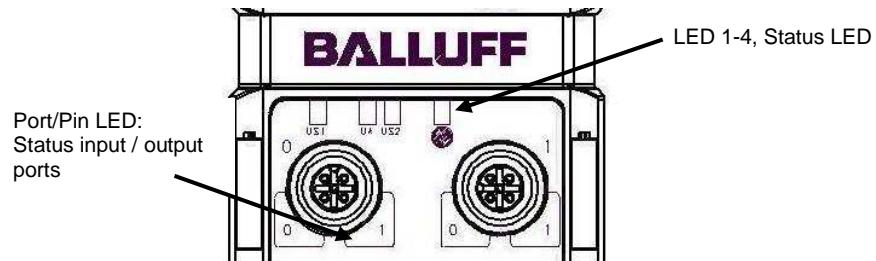
LED 1-4, Status LED

Figure 5-2: Indication LEDs

Status LEDs

BNI IOL-302-xxx-Z013

LED	Indicator	Function
LED 1	Green / Red	Supply module ok / Under voltage
LED 2	Green / Red	Supply actuators ok / Under voltage
LED 3	Green / Red	Supply sensors ok / Under voltage
LED 4	Green / Green flashing	Communication error / Communication ok

**LED I/O-ports
standard**

Indicator	Function LED Pin 2 / Pin 4
OFF	Input signal / Output signal = 0
Yellow, static	Input signal / Output signal = 1
Red	Input port: KS, Short circuit Output port: Imax, Over-current, Short circuit

Product ordering code   **BNI IOL-302-xxx-Z026**

Balluff Network Interface ───────────

IO-Link Interface ───────────

Functions
302 = 16 dig. Inputs/ Outputs

Versions ───────────
000 = Standard version
S01 = Single channel monitoring

Mechanical design ───────────
Z026 = Die-cast zinc housing, matte nickel plated
        Bus connection and power supply: 1xM12 male, external thread
        Power supply: 1x7/8" male, external thread
        I/O-Ports: 8xM12, female, 5-poles, internal thread

Order information

Product ordering code	Order code
BNI IOL-302-000-Z026	BNI0050
BNI IOL-302-S01-Z026	BNI0051

Scope of delivery   BNI IOL… consists of the following components:
- IO-Module
- 4 filler plugs M12
- Ground connection-band
- Screw M4x6
- 20 Labels
- User's guide

www.balluff.com