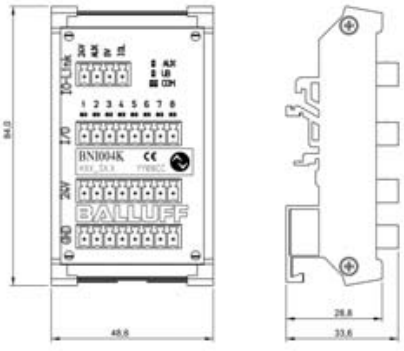
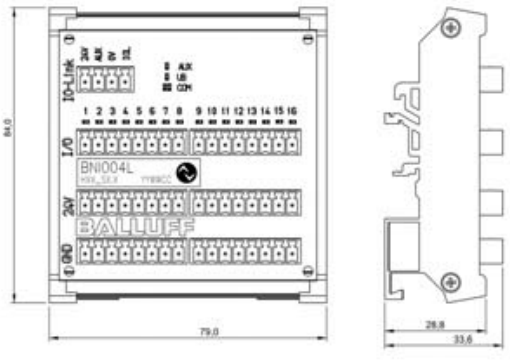
BALLUFF

BNI IOL-309-000-K024
BNI IOL-309-000-K024-001
BNI IOL-310-000-K025
BNI IOL-310-000-K025-001
BNI IOL-310-000-K025-C09

User´s Guide





Content

1 Notes

1.1. Structure of the guide

The guide is organized so that the section build on one another.
Section 2: Basic safety information
……..

1.2. Typographical conventions

The following typographical conventions are used in this guide.

Enumerations

Enumerations are shown in list form with bullet points.

- Entry 1,
- Entry 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.

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).

Cross references

Cross references indicate where additional information on the topic can be found.

1.3. Symbols

Attention!
This symbol indicates a security notice which must be observed.

Note
This symbol indicates general notes.

1.4. Abbreviations

BCD	Binary coded switch
BNI	Balluff Network Interface
DPP	Direct Parameter Page
EMC	Electromagnetic Compatibility
I-Port	Digital Input port
FE	Function earth
IOL	IO-Link
LSB	Least Significant Bit
MSB	Most Significant Bit
SP	Switching point
SPDU	Service Protocol Data Unit

1.5. Differing views

Product views and images in this manual may differ from the product described. They are intended to serve only as illustrations.

1.6. Disposal

This product falls under the the current EU Directive for WEEE, waste of electrical and electronic equipment for protecting you and the environment from possible hazards and responsible handling of natural resources.

Dispose of the product properly and not as part of the normal waste stream. Observe the regulations of the respective country. Information can be obtained from the national authorities. Or return the product to us for disposal.

2 Sicherheit

2.1. Intended use

This guide describes the Balluff Network Interface BNI IOL-… 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. 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 manufacturer'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 notes

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.

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 First Steps

3.1. Connection overview

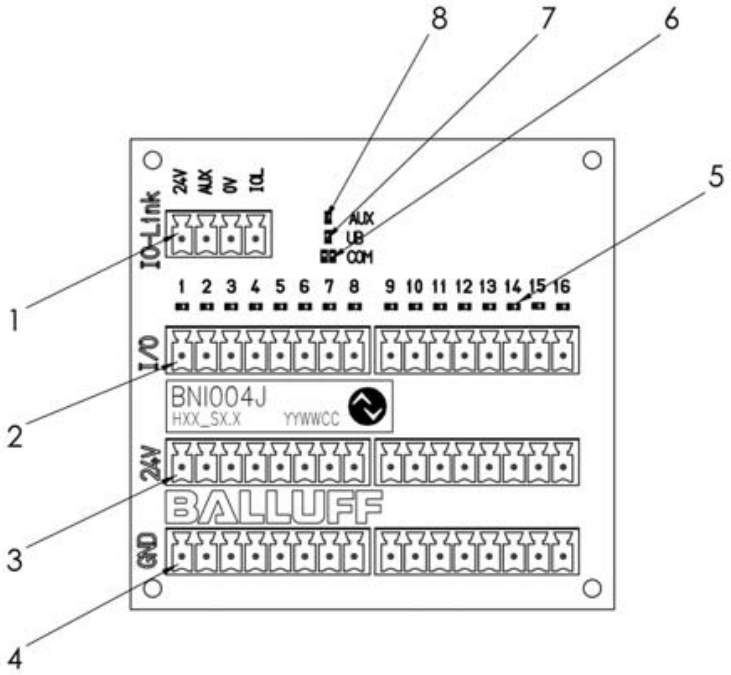


Figure 3-1: BNI IOL-309/310-000-K024/K025

1 IO-Link Interface
2 Port 1-8/16 Input/Output
3 Port 1-8/16 24V
4 Port 1-8/16 GND
5 Status LED: Port 1-8/16
6 Status LED: Communication
7 Status LED: Supply Module
8 Status LED: Supply Module AUX

3 First Steps

3.2. Mechanical connection

BNI IOL-309/310-000-K024/K025: Standard DIN rail mounting

3.3. Electrical connection

The sensor hub modules require no separate supply voltage connection. Power is provided through the IO-Link interface by the host IO-Link Master.

IO-Link interface

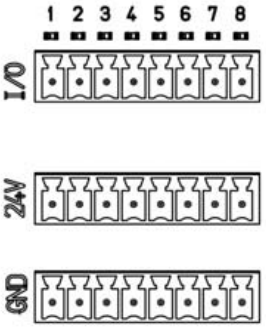
IO-Link is established by a 4 poles male.

Pin	Requirement
24V	Power supply controller, +24V, max. 1.0A
AUX	Power supply output, +24V, max. 1.6A
0V	GND references potential
IOL	C/Q, IO-Link Data transmission channel

Connecting the sensor hub

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

Connecting sensors/actuators



Pin	Requirement
I/O	Input / Output Input: EN 61131-2, type: max. 30V Output: max. 350mA Total current all output max. 1.6A
24V	+24V, Total current max. 1A
GND	GND Reference potential

Note
For the digital sensor inputs follow the input guideline per EN 61131-2, type 2.

4 IO-Link Interface

4.1. IO-Link Data

BNI IOL-309-000-K024	
Data transmission rate	COM2 (38,4 kBaud)
Minimal cycle time	3 ms
IO-Link Version	**1.0**
Frame type	2.5
Process data cycle time*	3 ms
Vendor ID	0x0378
Device ID	0x050901

* at minimal cycle time

BNI IOL-310-000-K025	
Data transmission rate	COM2 (38,4 kBaud)
Minimal cycle time	3 ms
IO-Link Version	**1.0**
Frame type	1
Process data cycle time *	12 ms
Vendor ID	0x0378
Device ID	0x050902

* at minimal cycle time

4.2. Process Data

The following process date are exchanged between IO-Link and slave:

Input Data: Data that are transmitted from the device to the master.
Output Data: Data that are transmitted from the master to the device.

Output Data

Byte	0								1*1)							
Bit	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0
Pin	8	7	6	5	4	3	2	1	16	15	14	13	12	11	10	9

Input Data

Byte	0								1*1)							
Bit	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0
Pin	8	7	6	5	4	3	2	1	16	15	14	13	12	11	10	9

*1) only in case of BNI IOL-310-000-K025

4.3. Parameter Data/ Request Data

	SPDU		Object name	Length	Range	Default value
	Index	Sub-Index				
	0x10	0	Vendor name	8 Byte		BALLUFF
	0x11	0	Vendor text	16 Byte		www.balluff.com
	0x12	0	Product name	21 Byte		BNI IOL-309-000-K024 BNI IOL-309-000-0000 BNI IOL-310-000-K025 BNI IOL-310-000-0000
	0x13	0	Product ID	7 Byte		Ordering code
	0x14	0	Product text	23 Byte		BNI IOL-310-000-K025: IO Sensor/Actuator Hub IP20 16Bit BNI IOL-309-000-K024: IO Sensor/ Actuator Hub IP20 8Bit
	0x16	0	Hardware Revision	3 Byte		
	0x17	0	Firmware Revision	3 Byte		
Parameter Data	0x40 64	0 1-16	Inversion	2 Byte	0x0000 – 0-FFFF	0x0000
	0x41 65	0 1-16	Configuration Input / Output	2 Byte	0x0000 – 0-FFFF	0x0000
	0x42 66	0 1-16	In case of error Pin 1 to Pin 16	4 Byte	0x000000 00- 0xFFFFFF FF	0x00000000
	0x44 68	0 1-16	Under voltage	2 Byte	0x0000 – 0xFFFF	0x0000
	0x45 69	0 1-16	Monitoring Outputs	2 Byte	0x0000 – 0xFFFF	0x0000
	0x47 70	0 1-16	Feedback	2 Byte	0x0000 – 0xFFFF	0x0000

Inversion (reading / writing) 0x40

Byte	0								1*1)							
Bit	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0
Pin	8	7	6	5	4	3	2	1	16	15	14	13	12	11	10	9

0 = not inverted
1 = inverted

Configuration Input / Output (reading / writing) 0x41

Byte	0								1*1)							
Bit	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0
Pin	8	7	6	5	4	3	2	1	16	15	14	13	12	11	10	9

0 = Input
1 = Output

*1) only in case of BNI IOL-310-000-K025

4 IO-Link Interface

In case of error Pin 1 to Pin 16 (reading / writing) 0x42

Byte	0								1*1)							
Bit	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0
Pin	8		7		6		5		4		3		2		1	
Subindex	8		7		6		5		4		3		2		1	

Byte	2*1)								3*1)							
Bit	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0
Pin	16		15		14		13		12		11		10		9	
Subindex	16		15		14		13		12		11		10		9	

00 = Output low
01 = Output high
10 = Output last state
11 = as 00

Under voltage (only reading) 0x44

Byte	0								1							
Bit	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0
Beschrei-bung	-	-	-	-	-	-	-	-	-	-	-	-	-	UA	-	UB

0 = no under voltage
1 = under voltage recognized
- = not used

Monitoring Output „Actuator short circuit“ (only reading) 0x45

Byte	0								1*1)							
Bit	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0
Pin	8	7	6	5	4	3	2	1	16	15	14	13	12	11	10	9

0 = high set and high recognized
1 = high set but low recognized

Monitoring output „Actuator Warning“ (only reading) 0x46

Byte	0								1*1)							
Bit	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0
Pin	8	7	6	5	4	3	2	1	16	15	14	13	12	11	10	9

0 = low set and low recognized
1 = low set but high recognized

*1) only in case of BNI IOL-310-000-K025

4.4. Errors

Error Code	Additional Code
Device application error: 80_{hex}	11_{hex} Index not available
	12_{hex} Subindex not available
	30_{hex} Value out of range

4.5. Events

Class / Qualifier			Code (high + low)			
Mode	**Type**	**Instance**				
Appears	Error	AL	Device Hardware	Supply	Supply low voltage	U2 = Supply +24V
$C0_{hex}$	30_{hex}	0_{hex}	5000_{hex}	0100_{hex}	0010_{hex}	0002_{hex}
$F3_{hex}$			5112_{hex}			
Disappears	Error	AL	Device Hardware	Supply	Supply low voltage	U2 = Supply +24V
80_{hex}	30_{hex}	03_{hex}	5000_{hex}	0100_{hex}	0010_{hex}	0002_{hex}
$B3_{hex}$			5112_{hex}			
Appears	Error	AL	Device Hardware	Supply	Supply periphery	
$C0_{hex}$	30_{hex}	03_{hex}	5000_{hex}	0100_{hex}	0060_{hex}	
$F3_{hex}$			5160_{hex}			
Disappears	Error	AL	Device Hardware	Supply	Supply periphery	
80_{hex}	30_{hex}	03_{hex}	5000_{hex}	0100_{hex}	0060_{hex}	
B3hex			5160_{hex}			

5 Technical Data

5.1. Dimensions

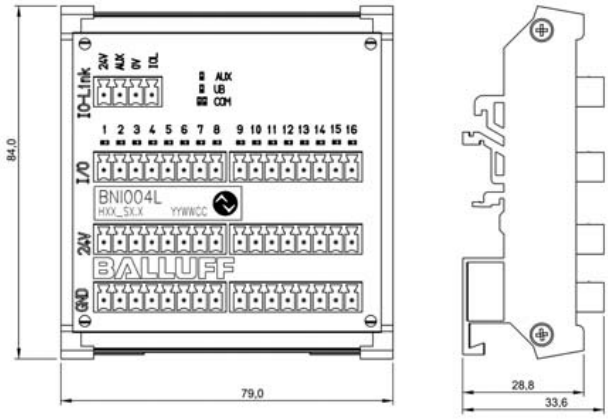


Figure 5-1: BNI IOL-310-000-K025

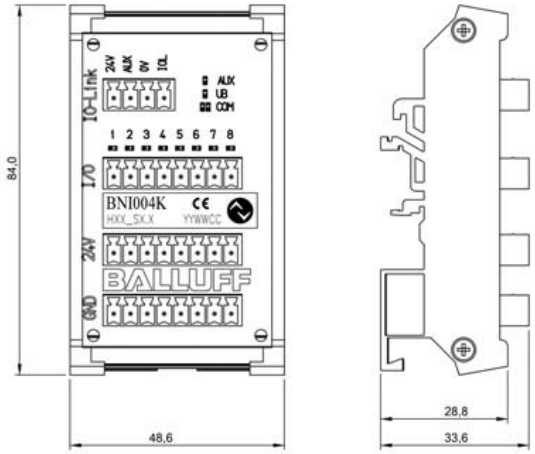


Figure 5-2: BNI IOL-309-000-K024

5.2. Mechanical Data

Housing material	PA 6.6, UL94V-0
IO-Link-Port	connecting terminal 4 poles*, 3.81mm
IO-Ports	connecting terminal 8 poles*, 3.81mm
Enclosure rating	IP20
Weight	BNI IOL-309-000-K024: 60 g BNI IOL-310-000-K025: 90 g
Dimensions	BNI IOL-309-000-K024: 48.6 x 84 x 33.6 BNI IOL-310-000-K025: 79 x 84 x 33.6

5.3. Electrical Data

Operating voltage	18 ... 30,2 V DC, per EN 61131-2
Ripple	< 1 %
Current draw without load	< 80 mA

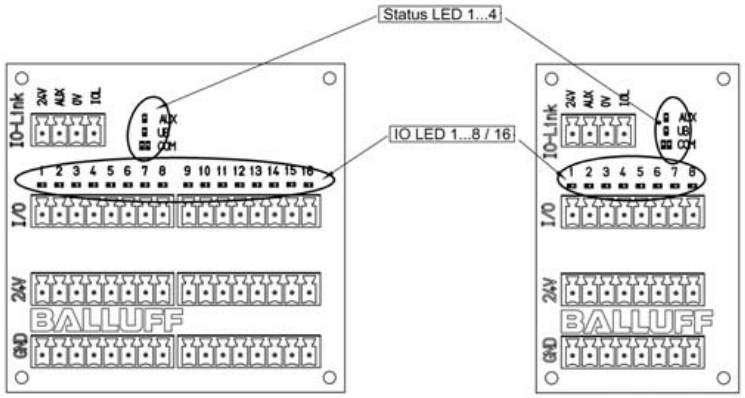
5.4. Operating conditions

Ambient temperature	-5 °C … +50 °C
Storage temperature	-25 °C … +70 °C

* Connecting terminals only available for the modules BNI IOL-309-000-K024 and BNI IOL-310-000-K025

5 Technical Data

5.5. LED Indicators



LED Indicator **Status LED 1**

Indicator	Function
Green	AUX supply voltage is OK
Out	AUX supply voltage < 18V

Status LED 2

Indicator	Function
Green	Module supply voltage is OK
Green flashing	Module supply voltage < 18V
Green, slowly flashing	Overload, total current > 1A
Out	Module is without voltage

Status LED 3/4

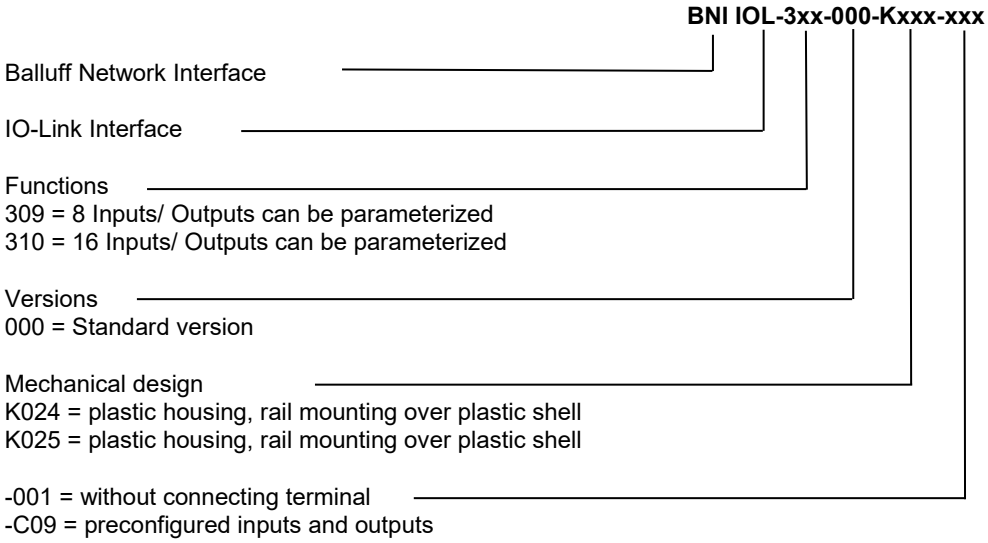
Indicator	Function
Green	No communication
Green, negative pulsed	Communication OK
Red flashing	Communication overload
Out	Module is without voltage

Status I/O LED 1…8/16

Indicator	Function
Yellow	Input/- Output signal = 1
Out	Input/- Output signal = 0

6 Appendix

6.1. Product ordering code



6.2. Order information

Product ordering code	Order code
BNI IOL-309-000-K024	BNI004K
BNI IOL-309-000-K024-001	BNI007P
BNI IOL-310-000-K025	BNI004L
BNI IOL-310-000-K025-001	BNI007R
BNI IOL-310-000-K025-C09	BNI00E6

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