BALLUFF

BNI IOL-102-002-Z019

IO-Link 1.1 sensor hub
With extension port
User´s Guide

Inhalt

1 Notes for the user

1.1. Structure of the manual

The manual is organized so that the sections build on one another.
Chapter 2: Basic Safety Information.
……..

1.2. Typographical Conventions

The following typographical conventions are used in this manual.

Enumerations

Enumerations are shown as a list with en-dash
- 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. 00hex).

Cross-references

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

1.3. Symbols

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

Note
This symbol indicates general notes.

1.4. Abbreviations

BNI	Balluff Network Interface
DPP	Direct Parameter Page
I-Port	Digital input port
EMC	Electromagnetic compatibility
FE	Functional Ground
IOL	IO-Link
LSB	Least Significant Bit
MSB	Most Significant Bit
SPDU	Service Protocol Data Unit

1.5. Divergent views

Product views and images can differ from the specified product in this manual. They serve only as an illustration.

2 Safety

2.1. Intended use

The BNI IOL-… acts as a decentralized input sensor module, which is connected to a higher-level IO-Link master module through an IO-Link interface.

2.2. Installation and Startup

Attention!
Installation and startup must only be carried out by trained technical personnel. Qualified personnel are people who are familiar with installation and operation of the product and have the necessary qualifications for these tasks. Any damage resulting from unauthorized tampering or improper use voids the manufacturer's guarantee and warranty. The operator must ensure that appropriate safety and accident prevention regulations are observed.

2.3. General Safety Notes

Commissioning and inspection
Before commissioning, carefully read the user's guide.
The system must not be used in applications in which the safety of persons is dependent upon proper functioning of the device.
Authorized personnel
Installation and startup must only be carried out by trained technical 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 user's guide

Obligations of the operating company
The device is a piece of equipment in accordance with EMC Class A. This device can produce RF noise. The operator must take appropriate precautionary measures. The device may only be used with an approved power supply. Use only approved cables.
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 always have good chemical and oil resistance. When used in aggressive media (such as chemicals, oils, lubricants and coolants, each in a high concentration (i.e. too little water content)), the material must first be checked for resistance in the particular application. No defect claims may be asserted in the event of a failure or damage to the BNI modules caused by such aggressive media.

Dangerous voltage

Attention!
Before maintenance, disconnect the device from the power supply.

Note
In the interests of product improvement, Balluff GmbH reserves the right to change the technical data of the product and the content of this manual at any time without notice.

3 First Steps

3.1. Connection Overview

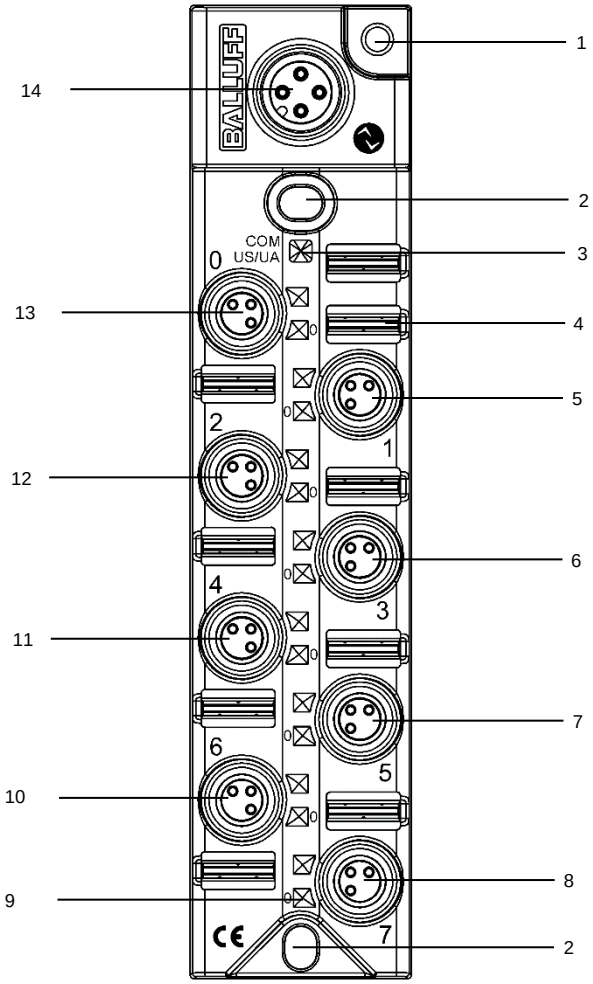


Figure 3-1: Connection overview BNI IOL-102-002-Z019

1 Ground connection
2 Mounting hole
3 Status LED: communication
4 Label
5 Port 1
6 Port 3
7 Port 5
8 Port 7, extension port
9 Pin/Port LED: signal status
10 Port 6
11 Port 4
12 Port 2
13 Port 0
14 IO-Link interface

3.2. Mechanical Connection

The BNI IOL modules are attached using 2 M4 screws and 2 washers.

3.3. Electrical Connection

The BNI IOL-102-002-Z019 modules do not require a separate supply voltage connection. Supply voltage is provided via the IO-Link interface and the higher-level IO-Link master module.

Functional ground

The modules are equipped with a ground connection

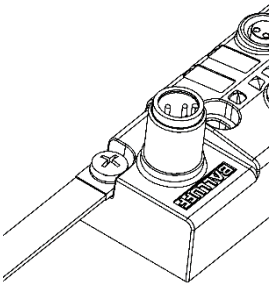


Figure 3-3: BNI ground connection IOL-…

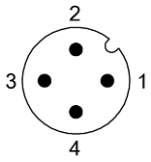
- Connect the sensor hub module to the ground connection.

Note
The functional ground connection from the housing to the machine must have low-impedance and be kept as short as possible.

IO-Link connection

The IO-Link connection is established via an M12 connector (A-coded, male).

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



Pin	Function
1	Supply voltage for controller US, +24V
2	n.c.
3	GND, reference potential
4	C/Q, IO-Link data transmission channel

3 First Steps

Connecting the sensor hub

- Connect ground conductor to the functional ground connection, if available.
- Connect the incoming IO-Link cable to the sensor hub.

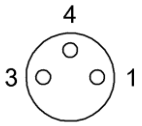
Note
A standardized sensor cable is used to connect to the higher-level IO-Link master module. Maximum length of 20 m.

Module variants

Sensor hub variants	Port 0-7
BNI IOL-102-002-Z019	IN

Sensor interface

Port



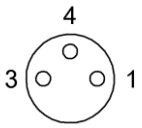
Pin	Function
1	+24V
4	In
3	0V

Note
For the digital inputs, the input guideline specified in EN 61131-2, Type 3 applies

Note
Unused input port sockets must be fitted with blind caps to ensure the IP67 degree of protection.

Extension port

Extension port (M8, female)
The port acts like a sensor interface if the extension function is disabled.



Pin	Function
1	+24V
4	IN / IOL
3	0V

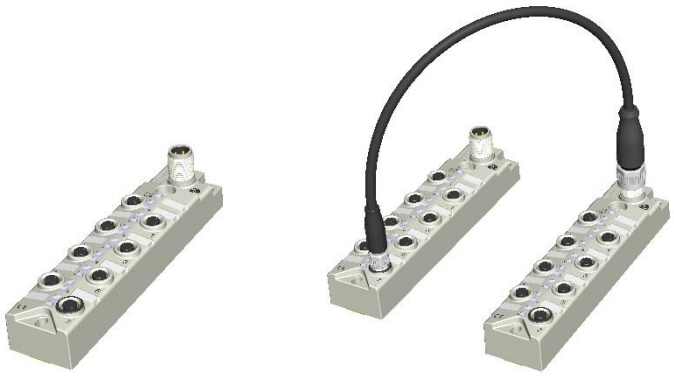
Note
A standardized sensor cable is used to connect to the device/sensor to be expanded. Maximum length of 20 m.

4 General Configuration

4.1. Extension port

The BNI IOL-102-002-Z019 module gives you the ability to use the No. 7 slot in various ways. By default, it is used as a digital Input slot, where pin 4 can be used as a digital input. This slot can be used as an extension port by making a corresponding entry in the parameter with an index of 55hex. This makes it possible to operate one of the following modules using the No. 7 slot.

- BNI IOL-102-002-Z019



Extension port configuration

Configuration	Index 55hex value
BNI IOL-102-002-Z019	0
BNI IOL-104-002-Z019 mit BNI IOL-102-002-Z019	1

Note
The "Factory reset" command does not affect the configuration of the extension port in any way.

Note
The process data length depends on the configuration.

The extension port can be configured using parameter 0x55 (table). If data storage or validation is used, validation (identical) must be used for configuring. Depending on the system, the Device ID has to be entered (parameter data table) or the Device ID is read out from the IODD.

Setting the serial number 54hex

The serial number has a default value of 16x00hex.
In order to use the "Identity" master validation mode, a serial number can be set using this parameter.
This prevents a device from connecting to the wrong master port.

5 Configuration: "Extension off"

5.1. IO-Link Data

BNI IOL-102-002-Z019 extension off	
Transmission rate	COM2 (38,4 kBaud)
Minimum cycle time	3,2 ms
Process data length	1 Byte input

5.2. Process Data/Input Data

Byte	0							
Bit	7	6	5	4	3	2	1	0
Description	Input Port 7 Pin 4	Input Port 6 Pin 4	Input Port 5 Pin 4	Input Port 4 Pin 4	Input Port 3 Pin 4	Input Port 2 Pin 4	Input Port 1 Pin 4	Input Port 0 Pin 4

5.3. Parameter Data/Demand Data

	DPP	SPDU		Parameter	Data width	Access rights	Default Value
	Index	Index	Sub-index				
Identification Data	07hex			Vendor ID	2 Byte	Read only	0378hex
	08hex						
	09hex			Device ID	3 Byte		0x05 0B 60
	0Ahex						
	0Bhex						
		10hex	0	Vendor name	8 Byte		BALLUFF
		11hex	0	Vendor text	16 Byte		www.balluff.com
		12hex	0	Product name	20/24 Byte		BNI IOL-102-002-Z019
		13hex	0	Product ID	7 Byte		BNI0099
		14hex	0	Product text	16 Byte		Sensor Hub digital M8
		15hex	0	Serial number	16 Byte		0hex
		16hex	0	Hardware Revision			
		17hex	0	Firmware Revision			
		18hex	0	Application Specific Tag	32 Byte		0hex

	DPP	SPDU		Parameter	Data width	Access rights	Default Value
	Index	Index	Sub-index				
Parameter Data		40hex 64	0 1-8	Inversion of the inputs	1 Byte	Read / Write	0hex
		44hex 68	0 1-16	Voltage monitoring	2 Byte	Read	-
		54hex 84	0	Serial number r	16 Byte	Read / Write	16x00hex
		55hex 85	0	Extension port	1 Byte	Read / Write	-

5 Configuration: "Extension off"

Inversion of the inputs 40hex

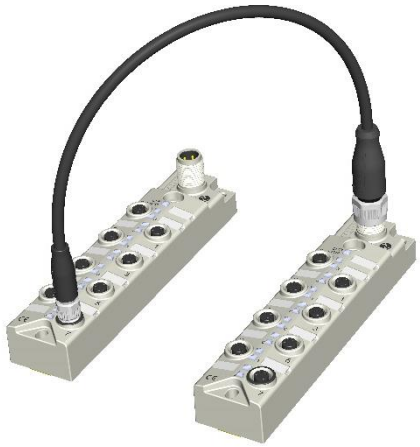
Byte	0							
Bit	7	6	5	4	3	2	1	0
Sub Index	8	7	6	5	4	3	2	1
Description	Inversion of Port 7 Pin 4	Inversion of Port 6 Pin 4	Inversion of Port 5 Pin 4	Inversion of Port 4 Pin 4	Inversion of Port 3 Pin 4	Inversion of Port 2 Pin 4	Inversion of Port 1 Pin 4	Inversion of Port 0 Pin 4

Inversion of port (x):
0 – Normal
1 – Inverted.

Voltage monitoring 44hex

Byte	0								1							
Bit	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0
Sub Index	8	7	6	5	4	3	2	1								9
Description	Short-circuit Port 7 Pin 1	Short-circuit Port 6 Pin 1	Short-circuit Port 5 Pin 1	Short-circuit Port 4 Pin 1	Short-circuit Port 3 Pin 1	Short-circuit Port 2 Pin 1	Short-circuit Port 1 Pin 1	Short-circuit Port 0 Pin 1	-	-	-	-	-	-	-	Undervoltage US

6 Configuration: extended with BNI IOL-102-002-Z019



6.1. IO-Link Data

BNI IOL-102-002-Z019 extended with BNI IOL-102-002-Z019	
Transmission rate	COM2 (38,4 kBaud)
Minimum cycle time	3,5 ms
Process data length	2 Byte input

6.2. Process Data/Input Data

Byte	0							
Bit	7	6	5	4	3	2	1	0
Description	-	Input Port 6 Pin 4	Input Port 5 Pin 4	Input Port 4 Pin 4	Input Port 3 Pin 4	Input Port 2 Pin 4	Input Port 1 Pin 4	Input Port 0 Pin 4

Byte	1							
Bit	7	6	5	4	3	2	1	0
	Extension port							
Description	Input Port 7 Pin 4	Input Port 6 Pin 4	Input Port 5 Pin 4	Input Port 4 Pin 4	Input Port 3 Pin 4	Input Port 2 Pin 4	Input Port 1 Pin 4	Input Port 0 Pin 4

6 Configuration: extended with BNI IOL-102-002-Z019

6.3. Parameter Data/Demand Data

	DPP	SPDU		Parameter	Data width	Access rights	Default Value
	Index	Index	Sub-index				
Identification Data	07hex			Vendor ID	2 Byte	Read only	0378hex
	08hex						
	09hex			Device ID	3 Byte		0x05 0B 61
	0Ahex						
	0Bhex						
		10hex	0	Vendor name	8 Byte		BALLUFF
		11hex	0	Vendor text	16 Byte		www.balluff.com
		12hex	0	Product name	20/24 Byte		BNI IOL-102-002-Z019 with BNI IOL-102-002-Z019
		13hex	0	Product ID	7 Byte		BNI0099
		14hex	0	Product text	16 Byte		Sensor Hub digital M12
		15hex	0	Serial number	16 Byte		0hex
		16hex	0	Hardware Revision			
		17hex	0	Firmware Revision			
		18hex	0	Application Specific Tag	32 Byte		0hex

	DPP	SPDU		Parameter	Data width	Access rights	Default Value
	Index	Index	Sub-index				
Parameter Data		40hex 64	0 1-16	Inversion of the inputs	2 Byte	Read / Write	0hex
		44hex 68	0 1-32	Voltage monitoring	4 Byte	Read	-
		54hex 84	0	Serial number	16 Byte	Read / Write	16x00hex
		55hex 85	0	Extension port	1 Byte	Read / Write	1hex

6 Configuration: extended with BNI IOL-102-002-Z019

Inversion of the inputs 40hex

Byte	0							
Bit	7	6	5	4	3	2	1	0
Sub Index		7	6	5	4	3	2	1
Description	-	Inversion of Port 6 Pin 4	Inversion of Port 5 Pin 4	Inversion of Port 4 Pin 4	Inversion of Port 3 Pin 4	Inversion of Port 2 Pin 4	Inversion of Port 1 Pin 4	Inversion of Port 0 Pin 4

Byte	2							
Bit	7	6	5	4	3	2	1	0
Sub Index	24	23	22	21	20	19	18	17
	Extension port							
Description	Invertierung Port 7 Pin 4	Invertierung Port 6 Pin 4	Invertierung Port 5 Pin 4	Invertierung Port 4 Pin 4	Invertierung Port 3 Pin 4	Invertierung Port 2 Pin 4	Invertierung Port 1 Pin 4	Invertierung Port 0 Pin 4

Inversion of port (x):
0 - Normal
1 - Inverted

6 Configuration: extended with BNI IOL-102-002-Z019

Voltage monitoring 44hex

Byte	0								1							
Bit	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0
Sub Index	8	7	6	5	4	3	2	1						11		9
Description	Short-circuit Port 7 Pin 1	Short-circuit Port 6 Pin 1	Short-circuit Port 5 Pin 1	Short-circuit Port 4 Pin 1	Short-circuit Port 3 Pin 1	Short-circuit Port 2 Pin 1	Short-circuit Port 1 Pin 1	Short-circuit Port 0 Pin 1	-	-	-	-	-	Undervoltage UA	-	Undervoltage US

Byte	2								3							
Bit	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0
Sub Index	24	23	22	21	20	19	18	17	32	31	30	29	28	27	26	25
	Extension port															
Description	Short-circuit Port 7 Pin 1	Short-circuit Port 6 Pin 1	Short-circuit Port 5 Pin 1	Short-circuit Port 4 Pin 1	Short-circuit Port 3 Pin 1	Short-circuit Port 2 Pin 1	Short-circuit Port 1 Pin 1	Short-circuit Port 0 Pin 1	-	-	-	-	-	-	-	Undervoltage US

Setting the serial number 54hex

The serial number has a default value of 16x00hex.
In order to use the "Identity" master validation mode, a serial number can be set using this parameter.
This prevents a device from connecting to the wrong master port.

7 Diagnosis

7.1. Error Codes/ Errors

Error Code	Description
0x8011	Index not available
0x8012	Subindex not available
0x8023	Access Denied
0x8033	Parameter length overrun
0x8034	Parameter length underrun
0x8035	Function not available
0x8036	Funtcion temporarily not available

7.2. Events

IO-Link Revision 1.0	
Event Code	**Description**
0x5112	Low sensor voltage (US)
0x5114	Low actor voltage (UA)
0x5410	Output Stages
0x8DF0	Retry at the extension port
0x8DF1	Device lost at the extension port
0x8DF2	Wrong device at the extension port
IO-Link Revision 1.1	
Event Code	**Description**
0x5111	Low sensor voltage (US)
0x5112	Low actor voltage (UA)
0x7710	Short circuit
0x8DF0	Retry at the extension port
0x8DF1	Device lost at the extension port
0x8DF2	Wrong device at the extension port

8 IO-Link Functions

8.1. IO-Link Version 1.0 / 1.1

This device can be operated with an IO-Link master according to IO-Link version 1.0 and version 1.1. Version-specific functions such as data storage (version 1.1) are only supported in combination with a suitable IO-Link master.

8.2. Data Storage

Each IO-Link master of IO-Link version 1.1 features data storage in which an image of the IO-Link device configuration can be stored. When a device is replaced, the stored configuration is automatically transferred to the new device. This guarantees minimal downtime. Validation must be switched on in order to use the data storage. For information about the configuration of data storage and validation, please refer to the user's guide of the respective IO-Link master.

8.3. Block Configuration

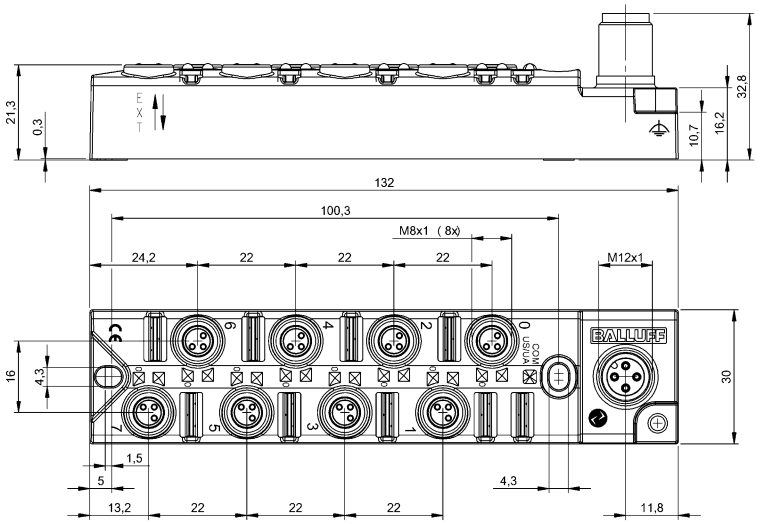
The device supports block configuration. This allows all parameters in a data block to be consistently imported from a controller or a configuration tool into the device.

8.4. Resetting to Factory Settings

The factory settings on the device can be restored by running the "restore factory settings" system command.
0x82 must be written to Index 2 Subindex 0 for the command.
The extension port setting is not reset in this process.

9 Technical Data

9.1. Dimensions



9.2. Mechanical Data

Housing material	Die-cast zinc, matte nickel plated
Weight	245 g
Dimension (L × B × H)	30 x 132 x 32,8 (mm)

9.3. Electrical Data

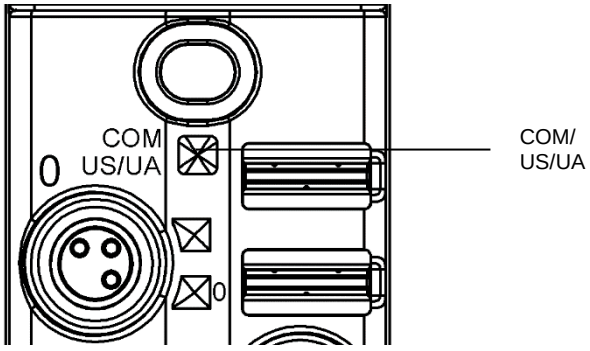
Supply voltage	18 ... 30,2 V DC, corresponding to EN 61131-2
Ripple	< 1 %
Current consumption without load (extension off)	≤ 90 mA
Load current (PIN 1)	max. 200 mA (temperature-dependent)
Total current US	3,5 A
Inputs	PNP, type 3

9.4. Operating conditions

Ambient temperature	-5 °C … +70 °C
Storage temperature	-25 °C … +70 °C
Degree of protection	IP67 (only in plugged-in and screwed state)

10 Function Indicators

10.1. Function Indicators



LED indicator module status

LED	Status	Function
COM US/UA	Green	Communication error
	Green flashing	Communication OK
	Red fast flashing	Undervoltage < 18 V

10 Function Indicators

Digital LED indicators for inputs/outputs

LED 2, input Pin 4

Status	Function
Off	Input signal = 0
Yellow	Input signal = 1
Red	Port: short-circuit

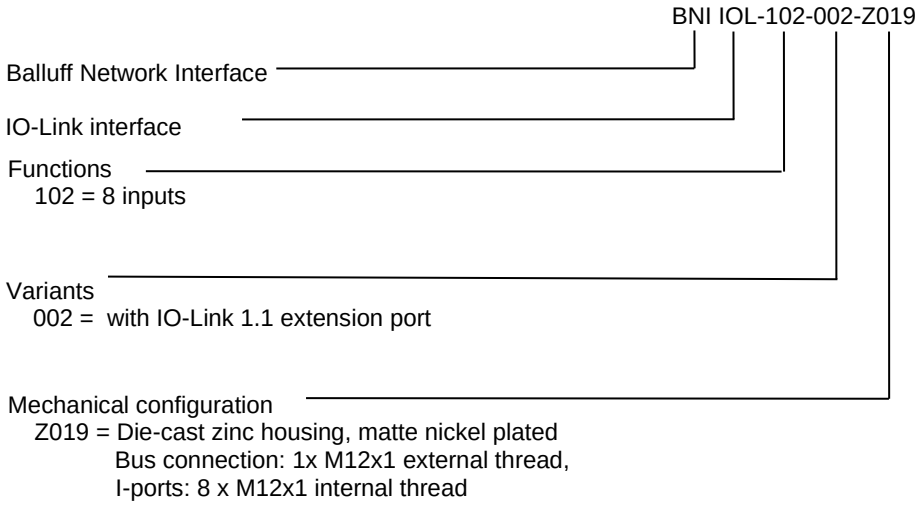
Extension port

The table is valid if the extension port is active. If the extension port is used as a standard input, then the description from "Digital LED indicators for inputs" can be used.

Status	Function
Green	IO-Link – connection active
Green flashing	No IO-Link connection or faulty IO-Link device
Red flashing	Incorrect IO-Link device or incorrect configuration
Red	Port: short-circuit

11 Appendix

11.1. Type Code



11.2. Ordering Information

Type code	Type code
BNI IOL-102-002-Z019	BNI0099

Notes

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Nr. 931609-726 EN • 03. 130615 • Edition A21 • Replaces Edition H20 • Subject to modification

Balluff GmbH
Schurwaldstrasse 9
73765 Neuhausen a.d.F.
Germany
Tel. +49 7158 173-0
Fax +49 7158 5010
balluff@balluff.de

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