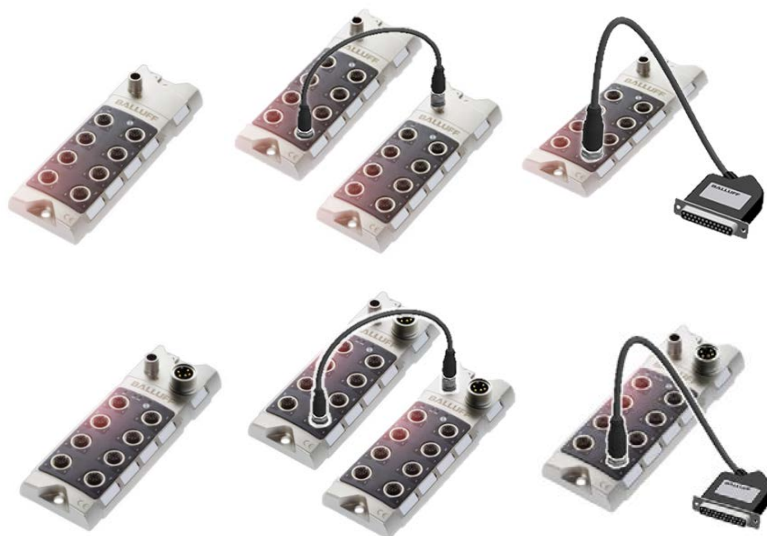


BNI IOL-302-002-Z042  
BNI IOL-302-S02-Z012  
BNI IOL-302-S02-Z013  
BNI IOL-302-S02-Z026  
IO-Link 1.1 Sensor/Actuator Hub  
with extension port  
User's Guide



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## 1 User Instructions

**1.1. About this Manual** This manual describes the Balluff IO-Link I/O module, also called a sensor/actuator hub. The IO-Link protocol is used to link to the higher-level master module. In terms of function, this compact, cost-effective module is similar to a passive splitter box; it records digital sensor signals and transmits them over the IO-Link interface. It passes control signals coming over IO-Link to the connected actuators.

**1.2. Structure of the Manual** The manual is organized so that the sections build on one another. Chapter 2: Basic safety information.  
.....

**1.3. Typographical Conventions** The following typographical conventions are used in this manual.

**Enumerations** Enumerations are shown as a list with an 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 <sub>hex</sub> (e. g. 00<sub>hex</sub>).

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

### 1.4. Symbols



**Attention!**

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



**Note**

This symbol indicates general notes.

### 1.5. Abbreviations

BNI	Balluff Network Interface
DPP	Direct Parameter Page
GND	Ground
I/O port	Digital input/output port
IOL	IO-Link
ISDU	Indexed Service Data Unit (former SPDU)
EMC	Electromagnetic compatibility
FE	Function earth
LSB	Least Significant Bit
MSB	Most Significant Bit
SC	Short circuit
UA	Actuator supply
US	Sensor supply

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

## 2 Safety

### 2.1. Intended Use

The BNI IOL-... acts as a decentralized input/output 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 Instructions

#### 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 manual.

#### 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. Only use 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 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!

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

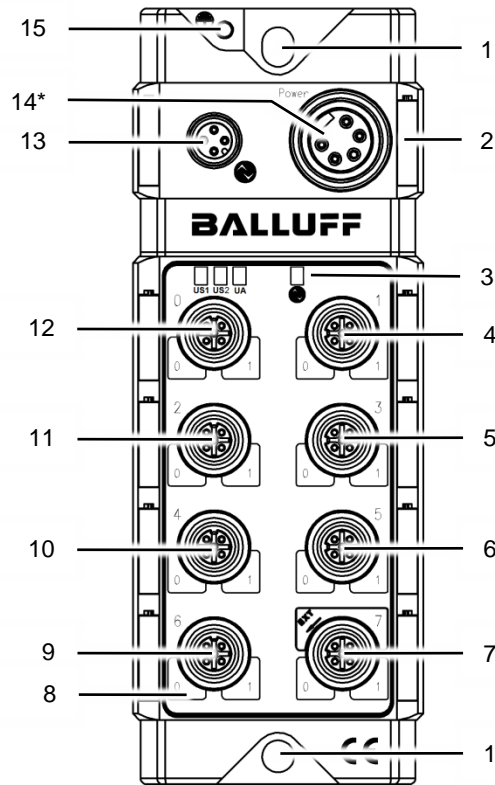


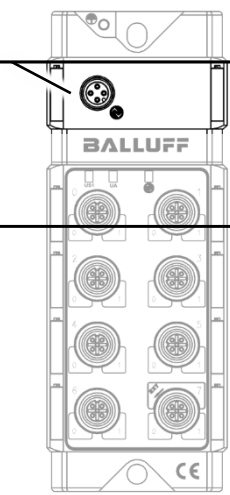
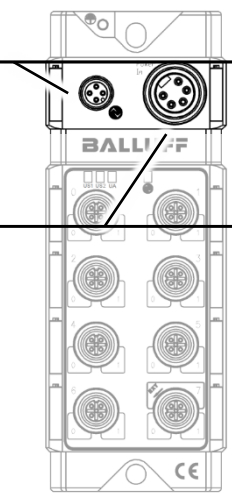
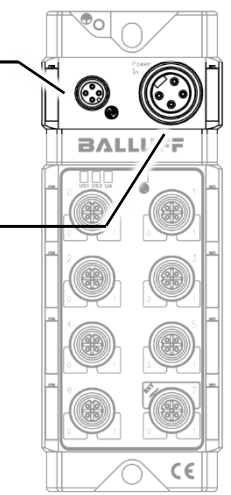
Figure 3.1: Connection overview

- |                                |  |
|--------------------------------|--|
| 1 Mounting hole                | 9 Port 6   |
| 2 Label                        | 10 Port 4  |
| 3 Communication state          | 11 Port 2  |
| 4 Port 1                       | 12 Port 0  |
| 5 Port 3                       | 13 IO-Link interface   |
| 6 Port 5                       | 14* Auxiliary supply connector<br>(device variant dependent,<br>see 'Power Connections') |
| 7 Port 7 / Extension Port      | 15 FE connection   |
| 8 Pin/Port LED : Signal status |  |

## 3 First Steps

### 3.2. Power connections

Three different connector types used for power supply of the module (US1), sensors (US2) and actuators (UA). Following connectors are available based on device as follow:

	BNI IOL-302-002-Z042 BNI IOL-302-S02-Z012	BNI IOL-302-S02-Z013	BNI IOL-302-S02-Z026
			
Power Type	Connector used		
US1 (Module and Sensors)	M12	M12 (for Module only)	M12 (for Module only)
US2 (Sensors)	–	Aux 7/8" (5 pins)	Aux 7/8" (4 pins)
UA (Actuators)	M12	Aux 7/8" (5 pins)	Aux 7/8" (4 pins)



## 3 First Steps

### 3.3. Mechanical Connection

The BNI IOL modules are fastened with using 2 M6 screws and 2 spacers.

### 3.4. Electrical Connection

The BNI IOL-... modules do not require a separate supply voltage connection. Supply voltage for the module is provided via the IO-Link interface and the higher-level IO-Link master module. However, auxiliary connector may be used for powering sensors and actuators which is connected to the module. Connectors described in previous chapter.

#### Function earth

The modules are equipped with a ground (FE) connection.

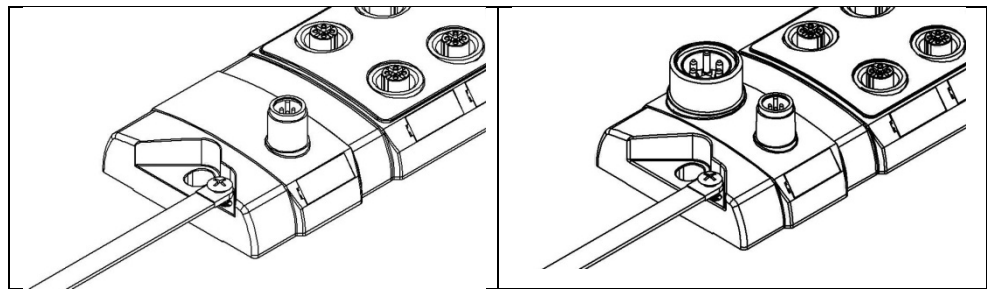


Figure 3.2: FE connection

- Connect the sensor hub module to the ground connection.



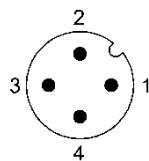
#### Note

The FE 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). This connector is used for powering the module. In some devices, this connector is also used for powering sensors and/or actuators which is connected to the module.

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



Pin	Requirement
1	Supply voltage for module (US1), +24 V, max. 4 A
2*	Supply voltage for actuators (UA), +24 V, max. 4 A
3	GND, reference potential
4	C/Q, IO-Link data transmission channel

\* Only for BNI IOL-302-002-Z042 and BNI IOL-302-S02-Z012



#### Attention!

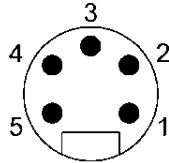
**Overcurrent.** Defective or absent fusing of the supply voltage for the sensor and actuator will result in their damage or destruction.

Use a fuse or an intelligent power supply (current monitoring designed for maximum 4 A) which turns off power when overcurrent is present.

3 First Steps

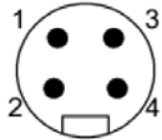
**Auxiliary Supply connection (device dependent)**

Power In (7/8", male) connector for BNI IOL-302-S02-Z013



Pin	Function
1	GND (0 V) module, sensor and actuator supply
2	
3	FE, function earth
4	Power supply sensors (US2), +24 V, max. 9 A
5	Power supply actuators (UA), +24 V, max. 9 A

Power In (7/8", male) connector for BNI IOL-302-S02-Z026



Pin	Function
1	Actuator power supply (UA) +24V, max 9A
2	Sensor power supply (US2) +24V, max 9A
4	GND (0 V) module, sensor and actuator supply
5	



**Attention!**

**Overcurrent.** Defective or absent fusing of the supply voltage for the sensor and actuator will result in their damage or destruction. Use a fuse or an intelligent power supply (current monitoring designed for maximum 9 A) which turns off power when overcurrent is present.

**Connecting the sensor hub**

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



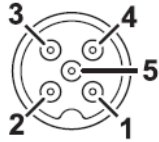
**Note**

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

3 First Steps

**Digital sensors / actuators**

Digital Input / Output port (M12, A-coded, female)



Pin	Requirement
1	+24V, 200mA
2	PNP Input 2 / PNP Output 2
3	0V, GND
4	PNP Input 1 / PNP Output 1
5	FE



**Note**

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

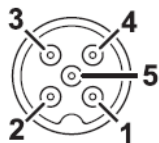


**Note**

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

**Extension port**

Port-7 (M12, A-coded, female) when Extension Port function activated



Pin	Requirement
1	+24V, 2A (Sensor/Module supply)
2	+24V, 2A (Actuator supply)
3	0V, GND
4	Communication
5	FE



**Note**

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

## 3 First Steps

### 3.5. Device variants

Four device variants are described within this User's Guide. All these four devices have similar functionality with minor differences. All topics and features are valid for all four device variants except as noted.

Device variants	Functionality
BNI IOL-302-002-Z042	16 Digital Inputs / Outputs (freely configurable), IO-Link V1.1 with extension port
BNI IOL-302-S02-Z012	16 Digital Inputs / Outputs (freely configurable) with single channel monitoring, IO-Link V1.1 with extension port
BNI IOL-302-S02-Z013	16 Digital Inputs / Outputs (freely configurable) with single channel monitoring, IO-Link V1.1 with extension port
BNI IOL-302-S02-Z026	16 Digital Inputs / Outputs with single channel monitoring, IO-Link V1.1 with extension port

### 3.6. Extension Port

These modules provide using the Port 7 in various ways. By default, it is used as a digital I/O port, where both pin 2 and pin 4 can be used as a digital input or output. Additionally this port can be used as an Extension Port by making a corresponding entry in the ISDU parameter with an index of 55hex. This makes it possible to operate one of the following modules connected to the Port 7:

- Device alone
- Same device variant as itself
- 22/24 Valve Plug Terminal



**4 Configuration Overview**

**4.1. Introduction** This document provide information of four devices. Each Device can be configured in one of five modes using the extension port. The result is 20 different configurations. Before the detailed technical data, here are an overview and a summary about the main features and properties.

**4.2. Process Data In** Following table shows the content and structure of the Process Data In. Availability and content depends on what device variant is used. Detailed description can be found at next chapters.

Device variants	Digital Input State		Diagnostic Info					
	Pin4	Pin2	Voltage Monitoring	Output Port Monitor				
				Short Connection		Actuator Warning		
Byte 0	Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7	
BNI IOL-302-002-Z042	●	●	○	○	○	○	○	○
BNI IOL-302-S02-Z012	●	●	●	●	●	●	●	●
BNI IOL-302-S02-Z013	●	●	●	●	●	●	●	●
BNI IOL-302-S02-Z026	●	●	●	●	●	○	○	○

● = available, ○ = not available

**4.3. Process Data Out** Following table shows the content and structure of the Process Data Out. Availability and content depends on what device variant is used. Detailed description can be found at next chapters.




Device variants	Digital Output State	
	Pin4	Pin2
Byte 0	Byte 1	
BNI IOL-302-002-Z042	●	●
BNI IOL-302-S02-Z012	●	●
BNI IOL-302-S02-Z013	●	●
BNI IOL-302-S02-Z026	●	●

● = available, ○ = not available

4 Configuration Overview

4.4. Configuration of the Extension Port

Following devices accepted to connect to the Extension Port

Configuration	Use Case
Device alone (Extension Port not active)	
Device with same device	
Device with BNI IOL-751-V08-K007	
Device with BNI IOL-751-V10-K007	
Device with BNI IOL-751-V13-K007	

The device connected to the Extension Port is called 'Second Device' in the User Manual.

---

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

---

**i Note**  
The process data length depends on the configuration.

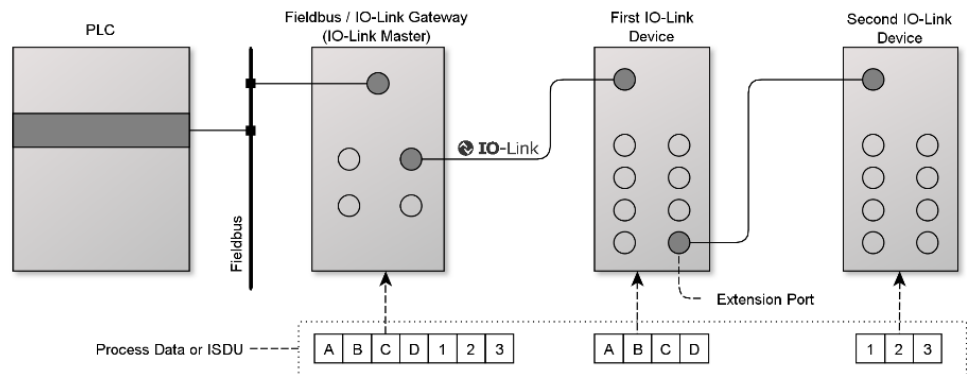
---

The configuration of the extension port can be performed via the parameter 0x55. If the data storage or the validation is used, it must be configured on the validation (compatible). Depending on the system, the device ID has to be entered (table parameter data) or the device ID is read out from the IODD.

4 Configuration Overview

4.5. Data handling with the Extension Port

When the Extension Port is activated, the content and length of the Process Data (or ISDU) are calculated as the union of the process data (or ISDU) provided by the two parties.  
 PD result = PD of first device + PD of second device  
 ISDU result = ISDU of first device + ISDU of second device  
 The '+' operation means addition of the secondary Device.



Chapter 5-10 provide detailed information about the devices and their configurations.

## 5 Configuration: Device alone, extension port off

**Forewords:** Chapter 5 describes detailed info about four device variants, when Extension Port is not activated.

All info is valid for each device variant except as noted.

### 5.1. Device Variants

This chapter describes the following device variants.  
Extension Port not activated.

Device variants		
BNI IOL-302-002-Z042 BNI IOL-302-S02-Z012	BNI IOL-302-S02-Z013	BNI IOL-302-S02-Z026
		

### 5.2. Extension Port Configuration

Factory default configuration is Extension Port off.

Configuration	ISDU Index 55 <sub>hex</sub> (85) value
<b>Device alone (Extension Port not active)</b>	<b>0</b>
Device with same device	1
Device with BNI IOL-751-V08-K007	2
Device with BNI IOL-751-V10-K007	3
Device with BNI IOL-751-V13-K007	4

### 5.3. IO-Link Data

Device variants	Length (Byte)		Minimum cycle time	Transfer rate
	PD-IN	PD-OUT		
BNI IOL-302-002-Z042	2	2	4.4 ms	COM2
BNI IOL-302-S02-Z012	8	2	6.2 ms	COM2
BNI IOL-302-S02-Z013	8	2	6.2 ms	COM2
BNI IOL-302-S02-Z026	6	2	5.6 ms	COM2

COM2 = 38.4 kBaud





**5 Configuration: Device alone, extension port off**

**5.5. Process Data/ Output Data**

Process Output data is the output state for all device variants.

●	●	●	●	Output state of...	Byte		0								1							
					Bit	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0	
																						Port 7 Pin 4

● = available, ○ = not available

**5.6. Parameter Data/ Identification Data and Device Parameter**

	DPP		ISDU		Parameter	Data width	Access rights	Default value
	Index	Index	Sub-index	Sub-index				
Identification Data	07hex				Vendor ID	2 bytes	Read only	0378hex
	08hex							
	09hex							
	0Ahex				Device ID	3 bytes		05 0E 10hex 05 0E 20hex 05 0E 30hex 05 0E 40hex
	0Bhex							
		10hex 16	0		Vendor name	7 bytes		BALLUFF
		11hex 17	0		Vendor text	15 bytes		www.balluff.com
		12hex 18	0		Product name			BNI IOL-302-002-Z042 BNI IOL-302-S02-Z012 BNI IOL-302-S02-Z013 BNI IOL-302-S02-Z026
		13hex 19	0		Product ID	7 bytes		BNI00CM BNI00CN BNI0046 BNI00CP
		14hex 20	0		Product text			Sensor/Actor Hub M12 Sensor/Actor Hub M12 Sensor/Actor Hub M12 Sensor/Actor Hub M12
	15hex 21	0		Serial number	16 bytes	various		
	16hex 22	0		Hardware Revision				
	17hex 23	0		Firmware Revision				
	18hex 24	0		Application Specific Tag	32 bytes	Read / Write	0hex	
Device Para.		0Chex 12	0	Access Locks Data Storage Lock	2 bytes	Read / Write	0hex	

5 Configuration: Device alone, extension port off

5.7. Parameter Data  
- Device  
Configuration -  
Overview

●	●	●	●	ISDU		Parameter	Data width	Access rights	Default Value
				Index	Sub-index				
●	●	●	●	40 <sub>hex</sub> 64	0 1-16	Inversion of the inputs	2 bytes	Read / Write	0 <sub>hex</sub>
●	●	●	○	41 <sub>hex</sub> 65	0 1-16	Port direction: inputs/outputs	2 bytes	Read / Write	0 <sub>hex</sub>
●	●	●	●	42 <sub>hex</sub> 66	0 1-8	Pin 4 safe state	2 bytes	Read / Write	0 <sub>hex</sub>
●	●	●	●	43 <sub>hex</sub> 67	0 1-8	Pin 2 safe state	2 bytes	Read / Write	0 <sub>hex</sub>
●	●	●	●	44 <sub>hex</sub> 68	0 1-16	Voltage monitoring	2 bytes	Read	-
●	●	●	●	45 <sub>hex</sub> 69	0 1-16	Output monitoring	2 bytes	Read	-
●	●	●	○	46 <sub>hex</sub> 70	0 1-16	Actuator warning	2 bytes	Read	-
●	●	●	●	54 <sub>hex</sub> 84	0	Serial number	16 bytes	Read / Write	16x00 <sub>hex</sub>
●	●	●	●	55 <sub>hex</sub> 85	0	Extension port	1 byte	Read / Write	0 <sub>hex</sub>

● = parameter available, ○ = parameter not available

Note: Port Direction Parameter 41<sub>hex</sub> not needed on BNI IOL-302-S02-Z026

**5 Configuration: Device alone, extension port off**

**5.8. Parameter Data  
– Details**

**Inversion of the inputs**  
40hex

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	16	15	14	13	12	11	10	9
Inversion of...	Port 7 Pin 4	Port 6 Pin 4	Port 5 Pin 4	Port 4 Pin 4	Port 3 Pin 4	Port 2 Pin 4	Port 1 Pin 4	Port 0 Pin 4	Port 7 Pin 2	Port 6 Pin 2	Port 5 Pin 2	Port 4 Pin 2	Port 3 Pin 2	Port 2 Pin 2	Port 1 Pin 2	Port 0 Pin 2

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

**Port direction**  
41hex

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	16	15	14	13	12	11	10	9
Direction of...	Port 7-Pin4	Port 6-Pin4	Port 5-Pin4	Port 4-Pin4	Port 3-Pin4	Port 2-Pin4	Port 1-Pin4	Port 0-Pin4	Port 7-Pin2	Port 6-Pin2	Port 5-Pin2	Port 4-Pin2	Port 3-Pin2	Port 2-Pin2	Port 1-Pin2	Port 0-Pin2

Not needed for BNI IOL-302-S02-Z026

**Direction of port (x):**  
0 – Input  
1 – Output

**5 Configuration: Device alone, extension port off**

**Safe state of the outputs**  
42hex, 43hex

The safe state parameter makes it possible to configure the outputs in case of a fault. If no IO-Link communication is possible or the "valid flag" of the output process data has not been set by the master, then each output adopts the configured status.

The following statuses can be configured for each output pin.

Value		Output state (Safe state)
bin	dec	
00	0	Output is 0V
01	1	Output is 24V
10	2	Current status is maintained
11	3	Not defined

**Safe state of the outputs on Pin 4**  
42hex

Byte	0								1							
	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	
Safe state of...	Port 3 Pin 4		Port 2 Pin 4		Port 1 Pin 4		Port 0 Pin 4		Port 7 Pin 4		Port 6 Pin 4		Port 5 Pin 4		Port 4 Pin 4	

**Safe state of the outputs on Pin 2**  
43hex

Byte	0								1							
	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	
Safe state of...	Port 3 Pin 2		Port 2 Pin 2		Port 1 Pin 2		Port 0 Pin 2		Port 7 Pin 2		Port 6 Pin 2		Port 5 Pin 2		Port 4 Pin 2	

**5 Configuration: Device alone, extension port off**

**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					12	11	10*	9
Voltage monitoring	SC Port 7 Pin 1	SC Port 6 Pin 1	SC Port 5 Pin 1	SC Port 4 Pin 1	SC Port 3 Pin 1	SC Port 2 Pin 1	SC Port 1 Pin 1	SC Port 0 Pin 1	-	-	-	-	Outputs off (UA too low)	Undervoltage UA	Undervoltage US2*	Undervoltage US1

\* Available in BNI IOL-302-S02-Z013 and BNI IOL-302-S02-Z026

**Output monitoring**  
45hex

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	16	15	14	13	12	11	10	9
Short-circuit of...	Port 7 Pin 4	Port 6 Pin 4	Port 5 Pin 4	Port 4 Pin 4	Port 3 Pin 4	Port 2 Pin 4	Port 1 Pin 4	Port 0 Pin 4	Port 7 Pin 2	Port 6 Pin 2	Port 5 Pin 2	Port 4 Pin 2	Port 3 Pin 2	Port 2 Pin 2	Port 1 Pin 2	Port 0 Pin 2

**Actuator warning**  
46hex

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	16	15	14	13	12	11	10	9
Actuator Warning of...	Port 7 Pin 4	Port 6 Pin 4	Port 5 Pin 4	Port 4 Pin 4	Port 3 Pin 4	Port 2 Pin 4	Port 1 Pin 4	Port 0 Pin 4	Port 7 Pin 2	Port 6 Pin 2	Port 5 Pin 2	Port 4 Pin 2	Port 3 Pin 2	Port 2 Pin 2	Port 1 Pin 2	Port 0 Pin 2

Not available for BNI IOL-302-S02-Z026

**5 Configuration: Device alone, extension port off**

**Setting the serial number 54hex**

The serial number has a factory default value, 16 ASCII characters, example: 0E-G550389-1D-26. However the device's serial number cannot be modified, for compatibility reasons this parameter allows to give a custom specific serial number.



**Note**

The "Factory reset" command sets serial number back to the factory default value.

**Configuration of the extension port 55hex**

Configuration	ISDU Index 55hex value
Device alone (Extension Port not active)	0
Device with same device	1
Device with BNI IOL-751-V08-K007	2
Device with BNI IOL-751-V10-K007	3
Device with BNI IOL-751-V13-K007	4



**Note**

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

## 6 Configuration: BNI IOL-302-002-Z042 extended with same device

Forewords: Chapter 6-9 describes configurations when Extension Port is activated. This device variant has no diagnostic information inside the process data in.



### 6.1. Extension Port Configuration

Configuration	ISDU Index 55 <sub>hex</sub> (85) value
Device alone (Extension Port not active)	0
<b>Device with same device</b>	<b>1</b>
Device with BNI IOL-751-V08-K007	2
Device with BNI IOL-751-V10-K007	3
Device with BNI IOL-751-V13-K007	4

### 6.2. IO-Link Data

BNI IOL-302-002-Z042 with same device	
Transfer rate	COM2 (38.4 kBaud)
Minimum cycle time	5.6 ms
Process data length	4 bytes input, 4 bytes output



6 Configuration: BNI IOL-302-002-Z042 extended with same device

6.3. Process Data/  
Input Data

Byte	0								1							
Bit	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0
Input state of...	Extension Port Connection State	Port 6 Pin 4	Port 5 Pin 4	Port 4 Pin 4	Port 3 Pin 4	Port 2 Pin 4	Port 1 Pin 4	Port 0 Pin 4	Extension Port Validation State	Port 6 Pin 2	Port 5 Pin 2	Port 4 Pin 2	Port 3 Pin 2	Port 2 Pin 2	Port 1 Pin 2	Port 0 Pin 2

Byte	4								5							
Bit	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0
Input state of...	Extension Port															
	Port 7 Pin 4	Port 6 Pin 4	Port 5 Pin 4	Port 4 Pin 4	Port 3 Pin 4	Port 2 Pin 4	Port 1 Pin 4	Port 0 Pin 4	Port 7 Pin 2	Port 6 Pin 2	Port 5 Pin 2	Port 4 Pin 2	Port 3 Pin 2	Port 2 Pin 2	Port 1 Pin 2	Port 0 Pin 2

6.4. Process Data/  
Output Data

Byte	0								1							
Bit	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0
Output state of...	-	Port 6 Pin 4	Port 5 Pin 4	Port 4 Pin 4	Port 3 Pin 4	Port 2 Pin 4	Port 1 Pin 4	Port 0 Pin 4	-	Port 6 Pin 2	Port 5 Pin 2	Port 4 Pin 2	Port 3 Pin 2	Port 2 Pin 2	Port 1 Pin 2	Port 0 Pin 2

Byte	2								3							
Bit	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0
Output state of...	Extension Port															
	Port 7 Pin 4	Port 6 Pin 4	Port 5 Pin 4	Port 4 Pin 4	Port 3 Pin 4	Port 2 Pin 4	Port 1 Pin 4	Port 0 Pin 4	Port 7 Pin 2	Port 6 Pin 2	Port 5 Pin 2	Port 4 Pin 2	Port 3 Pin 2	Port 2 Pin 2	Port 1 Pin 2	Port 0 Pin 2

6 Configuration: BNI IOL-302-002-Z042 extended with same device

6.5. Parameter Data/ Identification Data and Device Parameter

	DPP	ISDU		Parameter	Data width	Access rights	Default value
	Index	Index	Sub-index				
Identification data	07hex			Vendor ID	2 bytes	Read only	0378hex
	08hex						
	09hex			Device ID	3 bytes		05 0E 11hex
	0Ahex						
	0Bhex						
		10hex 16	0	Vendor name	7 bytes		BALLUFF
		11hex 17	0	Vendor text	15 bytes		www.balluff.com
		12hex 18	0	Product name			BNI IOL-302-002-Z042 with BNI IOL-302-002-Z042
		13hex 19	0	Product ID			BNI00CM with BNI00CM
		14hex 20	0	Product text			Sensor/Actor Hub M12 extended with Sensor/Actor Hub M12
		15hex 21	0	Serial number	16 bytes		various
		16hex 22	0	Hardware Revision			
	17hex 23	0	Firmware Revision				
Device Para.		18hex 24	0	Application Specific Tag	32 bytes	Read / Write	0hex
		0Chex 12	0	Access Locks Data Storage Lock	2 bytes	Read / Write	0hex

6.6. Parameter Data/ Device Configuration

	ISDU		Parameter	Data width	Access rights	Default Value
	Index	Subindex				
Parameter data	40hex 64	0 1-32	Inversion of the inputs	4 bytes	Read / Write	0hex
	41hex 65	0 1-32	Port direction: inputs/outputs	4 bytes	Read / Write	0hex
	42hex 66	0 1-16	Pin 4 safe state	4 bytes	Read / Write	0hex
	43hex 67	0 1-16	Pin 2 safe state	4 bytes	Read / Write	0hex
	44hex 68	0 1-32	Voltage monitoring	4 bytes	Read	-
	45hex 69	0 1-32	Output monitoring	4 bytes	Read	-
	46hex 70	0 1-32	Actuator warning	4 bytes	Read	-
	54hex 84	0	Serial number	16 bytes	Read / Write	0hex
	55hex 85	0	Extension port	1 byte	Read / Write	0hex

6 Configuration: BNI IOL-302-002-Z042 extended with same device

Inversion of the inputs  
40hex

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	16	15	14	13	12	11	10	9
Inversion of...	.	Port 6 Pin 4	Port 5 Pin 4	Port 4 Pin 4	Port 3 Pin 4	Port 2 Pin 4	Port 1 Pin 4	Port 0 Pin 4	.	Port 6 Pin 2	Port 5 Pin 2	Port 4 Pin 2	Port 3 Pin 2	Port 2 Pin 2	Port 1 Pin 2	Port 0 Pin 2

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
	<b>Extension Port</b>															
Inversion of...	Port 7 Pin 4	Port 6 Pin 4	Port 5 Pin 4	Port 4 Pin 4	Port 3 Pin 4	Port 2 Pin 4	Port 1 Pin 4	Port 0 Pin 4	Port 7 Pin 2	Port 6 Pin 2	Port 5 Pin 2	Port 4 Pin 2	Port 3 Pin 2	Port 2 Pin 2	Port 1 Pin 2	Port 0 Pin 2

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

6 Configuration: BNI IOL-302-002-Z042 extended with same device

Port direction  
41hex

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	16	15	14	13	12	11	10	9
Port direction of...	-	Port 6 Pin 4	Port 5 Pin 4	Port 4 Pin 4	Port 3 Pin 4	Port 2 Pin 4	Port 1 Pin 4	Port 0 Pin 4	-	Port 6 Pin 2	Port 5 Pin 2	Port 4 Pin 2	Port 3 Pin 2	Port 2 Pin 2	Port 1 Pin 2	Port 0 Pin 2

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
	<b>Extension Port</b>															
Port direction of...	Port 7 Pin 4	Port 6 Pin 4	Port 5 Pin 4	Port 4 Pin 4	Port 3 Pin 4	Port 2 Pin 4	Port 1 Pin 4	Port 0 Pin 4	Port 7 Pin 2	Port 6 Pin 2	Port 5 Pin 2	Port 4 Pin 2	Port 3 Pin 2	Port 2 Pin 2	Port 1 Pin 2	Port 0 Pin 2

Direction of port (x):  
0 - Input  
1 - Output

6 Configuration: BNI IOL-302-002-Z042 extended with same device

**Safe state of the outputs on Pin 4**  
42hex

The safe state parameter makes it possible to configure the outputs in case of a fault. If no IO-Link communication is possible or the "valid flag" of the output process data has not been set by the master, then each output adopts the configured status.

The following statuses can be configured for each output pin.

Value		Output state (Safe state)
bin	dec	
00	0	Output is 0V
01	1	Output is 24V
10	2	Current status is maintained
11	3	Not defined

Byte	0								1							
	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	
Safe state of...	Port 3 Pin 4		Port 2 Pin 4		Port 1 Pin 4		Port 0 Pin 4		.		Port 6 Pin 4		Port 5 Pin 4		Port 4 Pin 4	

Byte	2								3							
	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0
Sub-index	12		11		10		9		16		15		14		13	
	Extension port															
Safe state of...	Port 3 Pin 4		Port 2 Pin 4		Port 1 Pin 4		Port 0 Pin 4		Port 7 Pin 4		Port 6 Pin 4		Port 5 Pin 4		Port 4 Pin 4	

6 Configuration: BNI IOL-302-002-Z042 extended with same device

Safe state of the outputs on Pin 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	
Safe state of...	Port 3 Pin 2		Port 2 Pin 2		Port 1 Pin 2		Port 0 Pin 2		.		Port 6 Pin 2		Port 5 Pin 2		Port 4 Pin 2	

Byte	2								3							
Bit	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0
Sub-index	12		11		10		9		16		15		14		13	
	Extension port															
Safe state of...	Port 3 Pin 2		Port 2 Pin 2		Port 1 Pin 2		Port 0 Pin 2		Port 7 Pin 2		Port 6 Pin 2		Port 5 Pin 2		Port 4 Pin 2	

6 Configuration: BNI IOL-302-002-Z042 extended with same device

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					12	11	10	9
Voltage monitoring	SC Port 7 Pin 1	SC Port 6 Pin 1	SC Port 5 Pin 1	SC Port 4 Pin 1	SC Port 3 Pin 1	SC Port 2 Pin 1	SC Port 1 Pin 1	SC Port 0 Pin 1	-	-	-	-	Outputs off (UA too low)	Undervoltage UA	Undervoltage US2*	Undervoltage US1

\* = Available in BNI IOL-302-S02-Z013 and BNI IOL-302-S02-Z026

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					28	27	26	25
	Extension Port															
Voltage monitoring	SC Port 7 Pin 1	SC Port 6 Pin 1	SC Port 5 Pin 1	SC Port 4 Pin 1	SC Port 3 Pin 1	SC Port 2 Pin 1	SC Port 1 Pin 1	SC Port 0 Pin 1	-	-	-	-	Outputs off (UA too low)	Undervoltage UA	Undervoltage US2*	Undervoltage US1

\* = Available in BNI IOL-302-S02-Z013 and BNI IOL-302-S02-Z026

Output monitoring  
45hex

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	16	15	14	13	12	11	10	9
Short-circuit of...	-	Port 6 Pin 4	Port 5 Pin 4	Port 4 Pin 4	Port 3 Pin 4	Port 2 Pin 4	Port 1 Pin 4	Port 0 Pin 4	Port 7 Pin 2	Port 6 Pin 2	Port 5 Pin 2	Port 4 Pin 2	Port 3 Pin 2	Port 2 Pin 2	Port 1 Pin 2	Port 0 Pin 2

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															
Short-circuit of...	Port 7 Pin 4	Port 6 Pin 4	Port 5 Pin 4	Port 4 Pin 4	Port 3 Pin 4	Port 2 Pin 4	Port 1 Pin 4	Port 0 Pin 4	Port 7 Pin 2	Port 6 Pin 2	Port 5 Pin 2	Port 4 Pin 2	Port 3 Pin 2	Port 2 Pin 2	Port 1 Pin 2	Port 0 Pin 2

6 Configuration: BNI IOL-302-002-Z042 extended with same device

Actuator warning  
46hex

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	16	15	14	13	12	11	10	9
Actuator warning of...	-	Port 6 Pin 4	Port 5 Pin 4	Port 4 Pin 4	Port 3 Pin 4	Port 2 Pin 4	Port 1 Pin 4	Port 0 Pin 4	Port 7 Pin 2	Port 6 Pin 2	Port 5 Pin 2	Port 4 Pin 2	Port 3 Pin 2	Port 2 Pin 2	Port 1 Pin 2	Port 0 Pin 2

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															
Actuator warning of...	Port 7 Pin 4	Port 6 Pin 4	Port 5 Pin 4	Port 4 Pin 4	Port 3 Pin 4	Port 2 Pin 4	Port 1 Pin 4	Port 0 Pin 4	Port 7 Pin 2	Port 6 Pin 2	Port 5 Pin 2	Port 4 Pin 2	Port 3 Pin 2	Port 2 Pin 2	Port 1 Pin 2	Port 0 Pin 2

Setting the serial number  
54hex

The serial number has a factory default value, 16 ASCII characters, example: 0E-G550389-1D-26. However the device's serial number cannot be modified, for compatibility reasons this parameter allows to give a custom specific serial number.

Configuration of the extension port  
55hex

Configuration	ISDU Index 55hex value
Device alone (Extension Port not active)	0
Device with same device	1
Device with BNI IOL-751-V08-K007	2
Device with BNI IOL-751-V10-K007	3
Device with BNI IOL-751-V13-K007	4



7 Configuration: BNI IOL-302-002-Z042 extended with 22/24 Valve Terminal



7.1. Extension Port Configuration

Configuration	ISDU Index 55 <sub>hex</sub> (85) value
Device alone (Extension Port not active)	0
Device with same device	1
<b>Device with BNI IOL-751-V08-K007</b>	<b>2</b>
<b>Device with BNI IOL-751-V10-K007</b>	<b>3</b>
<b>Device with BNI IOL-751-V13-K007</b>	<b>4</b>

7.2. IO-Link Data

BNI IOL-302-002-Z042 with 22/24 Valve Terminal	
Transfer rate	COM2 (38.4 kBaud)
Minimum cycle time	5.6 ms
Process data length	2 bytes input, 6 bytes output

**7 Configuration: BNI IOL-302-002-Z042 extended with 22/24 Valve Terminal**

**7.3. Process Data/  
Input Data**

Byte	0								1							
Bit	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0
Input state of...	Extension Port Connection State								Extension Port Validation State							
	Port 6 Pin 4	Port 5 Pin 4	Port 4 Pin 4	Port 3 Pin 4	Port 2 Pin 4	Port 1 Pin 4	Port 0 Pin 4	Port 6 Pin 2	Port 5 Pin 2	Port 4 Pin 2	Port 3 Pin 2	Port 2 Pin 2	Port 1 Pin 2	Port 0 Pin 2		

**7.4. Process Data/  
Output Data**

Byte	0								1							
Bit	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0
Output state of...	-								-							
	Port 6 Pin 4	Port 5 Pin 4	Port 4 Pin 4	Port 3 Pin 4	Port 2 Pin 4	Port 1 Pin 4	Port 0 Pin 4	Port 6 Pin 2	Port 5 Pin 2	Port 4 Pin 2	Port 3 Pin 2	Port 2 Pin 2	Port 1 Pin 2	Port 0 Pin 2		

Byte	2								3							
Bit	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0
	<b>Valve terminal on extension port</b>															
Output state of...	-	-	-	-	* Valve 12 – Coil A	Valve 11 – Coil A	Valve 10 – Coil A	Valve 09 – Coil A	Valve 08 – Coil A	Valve 07 – Coil A	Valve 06 – Coil A	Valve 05 – Coil A	Valve 04 – Coil A	Valve 03 – Coil A	Valve 02 – Coil A	Valve 01 – Coil A

\* No function for BNI IOL-751-V13-K007

Byte	4								5							
Bit	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0
	<b>Valve terminal on extension port</b>															
Output state of...	-	-	-	-	* Valve 12 – Coil B	Valve 11 – Coil B	Valve 10 – Coil B	Valve 09 – Coil B	Valve 08 – Coil B	Valve 07 – Coil B	Valve 06 – Coil B	Valve 05 – Coil B	Valve 04 – Coil B	Valve 03 – Coil B	Valve 02 – Coil B	Valve 01 – Coil B

\* No function for BNI IOL-751-V13-K007

7 Configuration: BNI IOL-302-002-Z042 extended with 22/24 Valve Terminal

7.5. Parameter Data/ Identification Data and Device Parameter

	DPP	ISDU		Parameter	Data width	Access rights	Default value
	Index	Index	Sub-index				
Identification data	07hex			Vendor ID	2 bytes	Read only	0378hex
	08hex						
	09hex			Device ID	3 bytes		05 0E 12hex
	0Ahex						05 0E 13hex
	0Bhex						05 0E 14hex
		10hex 16	0	Vendor name	7 bytes		BALLUFF
		11hex 17	0	Vendor text	15 bytes		www.balluff.com
		12hex 18	0	Product name			BNI IOL-302-002-Z042 with BNI IOL-751-V08-K007 BNI IOL-302-002-Z042 with BNI IOL-751-V10-K007 BNI IOL-302-002-Z042 with BNI IOL-751-V13-K007
		13hex 19	0	Product ID			BNI00CM with BNI006N BNI00CM with BNI006P BNI00CM with BNI006R
		14hex 20	0	Product text			Sensor/Actor Hub M12 extended with Valve Plug CG25 24 2-3 Sensor/Actor Hub M12 extended with Valve Plug CG13 24 2-3 Sensor/Actor Hub M12 extended with Valve Plug CG13 24 2-3
		15hex 21	0	Serial number	16 bytes		
		16hex 22	0	Hardware Revision			
		17hex 23	0	Firmware Revision			
	18hex 24	0	Application Specific Tag	32 bytes	Read / Write	0hex	
Device Para.		0Chex 12	0	Access Locks Data Storage Lock	2 bytes	Read / Write	0hex

7 Configuration: BNI IOL-302-002-Z042 extended with 22/24 Valve Terminal

7.6. Parameter Data/  
Device  
Configuration

	ISDU		Parameter	Data width	Access rights	Default Value
	Index	Subindex				
Parameter data	40hex 64	0 1-16	Inversion of the inputs	2 bytes	Read / Write	0hex
	41hex 65	0 1-16	Port direction: inputs/outputs	2 bytes	Read / Write	0hex
	42hex 66	0 1-40	Pin 4 safe state	10 bytes	Read / Write	0hex
	43hex 67	0 1-8	Pin 2 safe state	2 bytes	Read / Write	0hex
	44hex 68	0 1-24	Voltage monitoring	3 bytes	Read	-
	45hex 69	0 1-48	Output monitoring	6 bytes	Read	-
	46hex 70	0 1-16	Actuator warning	2 bytes	Read	-
	54hex 84	0	Serial number	16 bytes	Read / Write	0hex
	55hex 85	0	Extension port	1 byte	Read / Write	2, 3, 4hex

7 Configuration: BNI IOL-302-002-Z042 extended with 22/24 Valve Terminal

Inversion of the inputs  
40hex

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	16	15	14	13	12	11	10	9
Inversion of...	.	Port 6 Pin 4	Port 5 Pin 4	Port 4 Pin 4	Port 3 Pin 4	Port 2 Pin 4	Port 1 Pin 4	Port 0 Pin 4	.	Port 6 Pin 2	Port 5 Pin 2	Port 4 Pin 2	Port 3 Pin 2	Port 2 Pin 2	Port 1 Pin 2	Port 0 Pin 2

Inversion of port (x):

- 0 - Normal
- 1 - Inverted

Port direction  
41hex

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	16	15	14	13	12	11	10	9
Port direction of...	.	Port 6 Pin 4	Port 5 Pin 4	Port 4 Pin 4	Port 3 Pin 4	Port 2 Pin 4	Port 1 Pin 4	Port 0 Pin 4	.	Port 6 Pin 2	Port 5 Pin 2	Port 4 Pin 2	Port 3 Pin 2	Port 2 Pin 2	Port 1 Pin 2	Port 0 Pin 2

Direction of port (x):

- 0 - Input
- 1 - Output

7 Configuration: BNI IOL-302-002-Z042 extended with 22/24 Valve Terminal

**Safe state of the outputs**  
42hex

The safe state parameter makes it possible to configure the outputs in case of a fault. If no IO-Link communication is possible or the "valid flag" of the output process data has not been set by the master, then each output adopts the configured status.

The following statuses can be configured for each output pin.

Value		Output state (Safe state)
bin	dec	
00	0	Output is 0V
01	1	Output is 24V
10	2	Current status is maintained
11	3	Not defined

Byte	0								1							
	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	
Safe state of...	Port 3 Pin 4		Port 2 Pin 4		Port 1 Pin 4		Port 0 Pin 4		.	Port 6 Pin 4		Port 5 Pin 4		Port 4 Pin 4		

Byte	2								3							
	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0
Sub-index									31		29		27		25	
Valve terminal on extension port																
Safe State of...									* Valve 12 – Coil A		Valve 11 – Coil A		Valve 10 – Coil A		Valve 09 – Coil A	

\* No function for BNI IOL-751-V13-K007

7 Configuration: BNI IOL-302-002-Z042 extended with 22/24 Valve Terminal

Byte	4								5																							
Bit	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0																
Sub-index	23		21		19		17		15		13		11		9																	
	<b>Valve terminal on extension port</b>																															
Safe State of...	Valve 08 – Coil A				Valve 07 – Coil A				Valve 06 – Coil A				Valve 05 – Coil A				Valve 04 – Coil A				Valve 03 – Coil A				Valve 02 – Coil A				Valve 01 – Coil A			

Byte	6								7																							
Bit	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0																
Sub-index									32		30		28		26																	
	<b>Valve terminal on extension port</b>																															
Safe State of...	-				-				-				-				* Valve 12 – Coil B				Valve 11 – Coil B				Valve 10 – Coil B				Valve 09 – Coil B			

Byte	8								9																							
Bit	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0																
Sub-index	24		22		20		18		16		14		12		10																	
	<b>Valve terminal on extension port</b>																															
Safe State of...	Valve 08 – Coil B				Valve 07 – Coil B				Valve 06 – Coil B				Valve 05 – Coil B				Valve 04 – Coil B				Valve 03 – Coil B				Valve 02 – Coil B				Valve 01 – Coil B			

7 Configuration: BNI IOL-302-002-Z042 extended with 22/24 Valve Terminal

Safe state of the outputs on Pin 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	
Safe state of...	Port 3 Pin 2		Port 2 Pin 2		Port 1 Pin 2		Port 0 Pin 2		-		Port 6 Pin 2		Port 5 Pin 2		Port 4 Pin 2	

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	16	15	14	13	12	11	10	9
Voltage monitoring	SC Port 7 Pin 1	SC Port 6 Pin 1	SC Port 5 Pin 1	SC Port 4 Pin 1	SC Port 3 Pin 1	SC Port 2 Pin 1	SC Port 1 Pin 1	SC Port 0 Pin 1	-	-	-	-	Outputs off (UA too low)	Undervoltage UA	-	Undervoltage US1

Byte	2							
Bit	7	6	5	4	3	2	1	0
Sub Index	23				19		17	
Valve terminal on extension port								
Voltage monitoring	-	Overload UA	-	-	-	Undervoltage UA	-	Undervoltage US



7 Configuration: BNI IOL-302-002-Z042 extended with 22/24 Valve Terminal

Output monitoring  
45hex

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	16	15	14	13	12	11	10	9
Short-circuit of...	.	Port 6 Pin 4	Port 5 Pin 4	Port 4 Pin 4	Port 3 Pin 4	Port 2 Pin 4	Port 1 Pin 4	Port 0 Pin 4	Port 7 Pin 2	Port 6 Pin 2	Port 5 Pin 2	Port 4 Pin 2	Port 3 Pin 2	Port 2 Pin 2	Port 1 Pin 2	Port 0 Pin 2

\* No function for BNI IOL-751-V13-K007

Byte	2								3							
Bit	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0
Sub Index					39	37	35	33	31	29	27	25	23	21	19	17
Valve terminal on extension port																
Short-circuit of...	.	.	.	.	* Valve 12 – Coil A	Valve 11 – Coil A	Valve 10 – Coil A	Valve 09 – Coil A	Valve 08 – Coil A	Valve 07 – Coil A	Valve 06 – Coil A	Valve 05 – Coil A	Valve 04 – Coil A	Valve 03 – Coil A	Valve 02 – Coil A	Valve 01 – Coil A

\* No function for BNI IOL-751-V13-K007

Byte	3								4							
Bit	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0
Sub Index					40	38	36	34	32	30	28	26	24	22	20	18
Valve terminal on extension port																
Short-circuit of...	.	.	.	.	* Valve 12 – Coil B	Valve 11 – Coil B	Valve 10 – Coil B	Valve 09 – Coil B	Valve 08 – Coil B	Valve 07 – Coil B	Valve 06 – Coil B	Valve 05 – Coil B	Valve 04 – Coil B	Valve 03 – Coil B	Valve 02 – Coil B	Valve 01 – Coil B

\* No function for BNI IOL-751-V13-K007

7 Configuration: BNI IOL-302-002-Z042 extended with 22/24 Valve Terminal

Actuator warning  
46hex

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	16	15	14	13	12	11	10	9
Actuator warning of...		Port 6 Pin 4	Port 5 Pin 4	Port 4 Pin 4	Port 3 Pin 4	Port 2 Pin 4	Port 1 Pin 4	Port 0 Pin 4	Port 7 Pin 2	Port 6 Pin 2	Port 5 Pin 2	Port 4 Pin 2	Port 3 Pin 2	Port 2 Pin 2	Port 1 Pin 2	Port 0 Pin 2

Setting the serial number  
54hex

The serial number has a factory default value, 16 ASCII characters, example: 0E-G550389-1D-26. However the device's serial number cannot be modified, for compatibility reasons this parameter allows to give a custom specific serial number.

Configuration of the extension port  
55hex

Configuration	ISDU Index 55hex value
Device alone (Extension Port not active)	0
Device with same device	1
Device with BNI IOL-751-V08-K007	2
Device with BNI IOL-751-V10-K007	3
Device with BNI IOL-751-V13-K007	4

**8 Configuration: BNI IOL-302-S02-Z012 and -Z013 extended with same device**

Forewords: Devices variants with following configurations are covered  
 All these device variants have diagnostic information among the process data in.  
 The only difference is the digital output maximum current (200mA vs 2A)

BNI IOL-302-S02-Z012 with - BNI IOL-302-S02-Z012	BNI IOL-302-S02-Z013 with - BNI IOL-302-S02-Z013
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**8.1. Extension Port Configuration**

Configuration	ISDU Index 55 <sub>hex</sub> value
Device alone (Extension Port not active)	0
<b>Device with same device</b>	<b>1</b>
Device with BNI IOL-751-V08-K007	2
Device with BNI IOL-751-V10-K007	3
Device with BNI IOL-751-V13-K007	4

**8.2. IO-Link Data**

BNI IOL-302-S02-Z012 with same device	
BNI IOL-302-002-Z013 with same device	
Transfer rate	COM2 (38.4 kBaud)
Minimum cycle time	9.2 ms
Process data length	16 bytes input, 4 bytes output

8 Configuration: BNI IOL-302-S02-Z012 and -Z013 extended with same device

8.3. Process Data/  
Input Data

Byte	0								1							
Bit	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0
Input state of...	Extension Port Connection State								Extension Port Validation State							
	Port 6 Pin 4	Port 5 Pin 4	Port 4 Pin 4	Port 3 Pin 4	Port 2 Pin 4	Port 1 Pin 4	Port 0 Pin 4	Port 6 Pin 2	Port 5 Pin 2	Port 4 Pin 2	Port 3 Pin 2	Port 2 Pin 2	Port 1 Pin 2	Port 0 Pin 2		

Byte	2								3							
Bit	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0
Voltage monitoring	SC Port 7 Pin 1								SC Port 0 Pin 1							
	SC Port 6 Pin 1	SC Port 5 Pin 1	SC Port 4 Pin 1	SC Port 3 Pin 1	SC Port 2 Pin 1	SC Port 1 Pin 1	SC Port 0 Pin 1	-	-	-	-	Outputs off (UA too low)	Undervoltage UA	Undervoltage US2*	Undervoltage US1	

\* = Available in BNI IOL-302-S02-Z013

Byte	4								5							
Bit	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0
Short-circuit of...	Port 7 Pin 4								Port 7 Pin 2							
	Port 6 Pin 4	Port 5 Pin 4	Port 4 Pin 4	Port 3 Pin 4	Port 2 Pin 4	Port 1 Pin 4	Port 0 Pin 4	Port 6 Pin 2	Port 5 Pin 2	Port 4 Pin 2	Port 3 Pin 2	Port 2 Pin 2	Port 1 Pin 2	Port 0 Pin 2		

Byte	6								7							
Bit	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0
Actuator Warning of...	Port 7 Pin 4								Port 7 Pin 2							
	Port 6 Pin 4	Port 5 Pin 4	Port 4 Pin 4	Port 3 Pin 4	Port 2 Pin 4	Port 1 Pin 4	Port 0 Pin 4	Port 6 Pin 2	Port 5 Pin 2	Port 4 Pin 2	Port 3 Pin 2	Port 2 Pin 2	Port 1 Pin 2	Port 0 Pin 2		

8 Configuration: BNI IOL-302-S02-Z012 and -Z013 extended with same device

Byte	8								9							
Bit	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0
	<b>Extension Port</b>															
Input state of...	Port 7 Pin 4	Port 6 Pin 4	Port 5 Pin 4	Port 4 Pin 4	Port 3 Pin 4	Port 2 Pin 4	Port 1 Pin 4	Port 0 Pin 4	Port 7 Pin 2	Port 6 Pin 2	Port 5 Pin 2	Port 4 Pin 2	Port 3 Pin 2	Port 2 Pin 2	Port 1 Pin 2	Port 0 Pin 2

Byte	10								11							
Bit	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0
	<b>Extension Port</b>															
Voltage monitoring	SC Port 7 Pin 1	SC Port 6 Pin 1	SC Port 5 Pin 1	SC Port 4 Pin 1	SC Port 3 Pin 1	SC Port 2 Pin 1	SC Port 1 Pin 1	SC Port 0 Pin 1	-	-	-	-	Outputs off (UA too low)	Undervoltage UA	Undervoltage US2*	Undervoltage US1

\* = Available in BNI IOL-302-S02-Z013

Byte	12								13							
Bit	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0
	<b>Extension Port</b>															
Short circuit	Port 7 Pin 4	Port 6 Pin 4	Port 5 Pin 4	Port 4 Pin 4	Port 3 Pin 4	Port 2 Pin 4	Port 1 Pin 4	Port 0 Pin 4	Port 7 Pin 2	Port 6 Pin 2	Port 5 Pin 2	Port 4 Pin 2	Port 3 Pin 2	Port 2 Pin 2	Port 1 Pin 2	Port 0 Pin 2

Byte	14								15							
Bit	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0
	<b>Extension Port</b>															
Actuator Warning	Port 7 Pin 4	Port 6 Pin 4	Port 5 Pin 4	Port 4 Pin 4	Port 3 Pin 4	Port 2 Pin 4	Port 1 Pin 4	Port 0 Pin 4	Port 7 Pin 2	Port 6 Pin 2	Port 5 Pin 2	Port 4 Pin 2	Port 3 Pin 2	Port 2 Pin 2	Port 1 Pin 2	Port 0 Pin 2

8 Configuration: BNI IOL-302-S02-Z012 and -Z013 extended with same device

8.4. Process Data/  
Output Data

Byte	0								1							
Bit	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0
Output state of...	-	Port 6 Pin 4	Port 5 Pin 4	Port 4 Pin 4	Port 3 Pin 4	Port 2 Pin 4	Port 1 Pin 4	Port 0 Pin 4	-	Port 6 Pin 2	Port 5 Pin 2	Port 4 Pin 2	Port 3 Pin 2	Port 2 Pin 2	Port 1 Pin 2	Port 0 Pin 2

Byte	2								3							
Bit	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0
Output state of...	Extension Port															
	Port 7 Pin 4	Port 6 Pin 4	Port 5 Pin 4	Port 4 Pin 4	Port 3 Pin 4	Port 2 Pin 4	Port 1 Pin 4	Port 0 Pin 4	Port 7 Pin 2	Port 6 Pin 2	Port 5 Pin 2	Port 4 Pin 2	Port 3 Pin 2	Port 2 Pin 2	Port 1 Pin 2	Port 0 Pin 2

**8 Configuration: BNI IOL-302-S02-Z012 and -Z013 extended with same device**

**8.5. Parameter Data/ Identification Data and Device Parameter**

	DPP	ISDU		Parameter	Data width	Access rights	Default value
	Index	Index	Sub-index				
<b>Identification data</b>	07hex			Vendor ID	2 bytes	Read only	0378hex
	08hex						
	09hex			Device ID	3 bytes		05 0E 21hex 05 0E 31hex
	0Ahex						
	0Bhex						
		10hex 16	0	Vendor name	7 bytes		BALLUFF
		11hex 17	0	Vendor text	15 bytes		www.balluff.com
		12hex 18	0	Product name			BNI IOL-302-S02-Z012 with BNI IOL-302-S02-Z012 BNI IOL-302-S02-Z013 with BNI IOL-302-S02-Z013
		13hex 19	0	Product ID			BNI00CN with BNI00CN BNI0046 with BNI0046
		14hex 20	0	Product text			Sensor/Actor Hub M12 extended with Sensor/Actor Hub M12 Sensor/Actor Hub M12 extended with Sensor/Actor Hub M12
		15hex 21	0	Serial number	16 bytes		
		16hex 22	0	Hardware Revision			
	17hex 23	0	Firmware Revision				
	18hex 24	0	Application Specific Tag	32 bytes	Read / Write	0hex	
<b>Device Para.</b>		0Chex 12	0	Access Locks Data Storage Lock	2 bytes	Read / Write	0hex

**8.6. Parameter Data/ Device Configuration**

	ISDU		Parameter	Data width	Access rights	Default Value
	Index	Subindex				
<b>Parameter data</b>	40hex 64	0 1-32	Inversion of the inputs	4 bytes	Read / Write	0hex
	41hex 65	0 1-32	Port direction: inputs/outputs	4 bytes	Read / Write	0hex
	42hex 66	0 1-16	Pin 4 safe state	4 bytes	Read / Write	0hex
	43hex 67	0 1-16	Pin 2 safe state	4 bytes	Read / Write	0hex
	44hex 68	0 1-32	Voltage monitoring	4 bytes	Read	-
	45hex 69	0 1-32	Output monitoring	4 bytes	Read	-
	46hex 70	0 1-32	Actuator warning	4 bytes	Read	-
	54hex 84	0	Serial number	16 bytes	Read / Write	0hex
	55hex 85	0	Extension port	1 byte	Read / Write	0hex

8 Configuration: BNI IOL-302-S02-Z012 and -Z013 extended with same device

Inversion of the inputs  
40hex

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	16	15	14	13	12	11	10	9
Inversion of...	-	Port 6 Pin 4	Port 5 Pin 4	Port 4 Pin 4	Port 3 Pin 4	Port 2 Pin 4	Port 1 Pin 4	Port 0 Pin 4	-	Port 6 Pin 2	Port 5 Pin 2	Port 4 Pin 2	Port 3 Pin 2	Port 2 Pin 2	Port 1 Pin 2	Port 0 Pin 2

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															
Inversion of...	Port 7 Pin 4	Port 6 Pin 4	Port 5 Pin 4	Port 4 Pin 4	Port 3 Pin 4	Port 2 Pin 4	Port 1 Pin 4	Port 0 Pin 4	Port 7 Pin 2	Port 6 Pin 2	Port 5 Pin 2	Port 4 Pin 2	Port 3 Pin 2	Port 2 Pin 2	Port 1 Pin 2	Port 0 Pin 2

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

Port direction  
41hex

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	16	15	14	13	12	11	10	9
Port direction of...	-	Port 6 Pin 4	Port 5 Pin 4	Port 4 Pin 4	Port 3 Pin 4	Port 2 Pin 4	Port 1 Pin 4	Port 0 Pin 4	-	Port 6 Pin 2	Port 5 Pin 2	Port 4 Pin 2	Port 3 Pin 2	Port 2 Pin 2	Port 1 Pin 2	Port 0 Pin 2

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															
Port direction of...	Port 7 Pin 4	Port 6 Pin 4	Port 5 Pin 4	Port 4 Pin 4	Port 3 Pin 4	Port 2 Pin 4	Port 1 Pin 4	Port 0 Pin 4	Port 7 Pin 2	Port 6 Pin 2	Port 5 Pin 2	Port 4 Pin 2	Port 3 Pin 2	Port 2 Pin 2	Port 1 Pin 2	Port 0 Pin 2

Direction of port (x):  
0 - Input  
1 - Output



**8 Configuration: BNI IOL-302-S02-Z012 and -Z013 extended with same device**

**Safe state of the outputs on Pin 4**  
42hex

The safe state parameter makes it possible to configure the outputs in case of a fault. If no IO-Link communication is possible or the "valid flag" of the output process data has not been set by the master, then each output adopts the configured status.

The following statuses can be configured for each output pin.

Value		Output state (Safe state)
bin	dec	
00	0	Output is 0V
01	1	Output is 24V
10	2	Current status is maintained
11	3	Not defined

Byte	0								1							
	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	
Safe state of...	Port 3 Pin 4		Port 2 Pin 4		Port 1 Pin 4		Port 0 Pin 4		.		Port 6 Pin 4		Port 5 Pin 4		Port 4 Pin 4	

Byte	2								3							
	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0
Sub-index	12		11		10		9		16		15		14		13	
	Extension port															
Safe state of...	Port 3 Pin 4		Port 2 Pin 4		Port 1 Pin 4		Port 0 Pin 4		Port 7 Pin 4		Port 6 Pin 4		Port 5 Pin 4		Port 4 Pin 4	

8 Configuration: BNI IOL-302-S02-Z012 and -Z013 extended with same device

Safe state of the outputs on Pin 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	
Safe state of...	Port 3 Pin 2		Port 2 Pin 2		Port 1 Pin 2		Port 0 Pin 2		.	Port 6 Pin 2		Port 5 Pin 2		Port 4 Pin 2		

Byte	2								3							
Bit	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0
Sub-index	12		11		10		9		16		15		14		13	
	Extension port															
Safe state of...	Port 3 Pin 2		Port 2 Pin 2		Port 1 Pin 2		Port 0 Pin 2		Port 7 Pin 2		Port 6 Pin 2		Port 5 Pin 2		Port 4 Pin 2	

8 Configuration: BNI IOL-302-S02-Z012 and -Z013 extended with same device

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					12	11	10	9
Voltage monitoring	SC Port 7 Pin 1	SC Port 6 Pin 1	SC Port 5 Pin 1	SC Port 4 Pin 1	SC Port 3 Pin 1	SC Port 2 Pin 1	SC Port 1 Pin 1	SC Port 0 Pin 1	-	-	-	-	Outputs off (UA too low)	Undervoltage UA	Undervoltage US2*	Undervoltage US1

\* = Available in BNI IOL-302-S02-Z013

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					28	27	26	25
	Extension Port															
Voltage monitoring	SC Port 7 Pin 1	SC Port 6 Pin 1	SC Port 5 Pin 1	SC Port 4 Pin 1	SC Port 3 Pin 1	SC Port 2 Pin 1	SC Port 1 Pin 1	SC Port 0 Pin 1	-	-	-	-	Outputs off (UA too low)	Undervoltage UA	Undervoltage US2*	Undervoltage US1

\* = Available in BNI IOL-302-S02-Z013

Output monitoring  
45hex

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	16	15	14	13	12	11	10	9
Short-circuit of...	-	Port 6 Pin 4	Port 5 Pin 4	Port 4 Pin 4	Port 3 Pin 4	Port 2 Pin 4	Port 1 Pin 4	Port 0 Pin 4	Port 7 Pin 2	Port 6 Pin 2	Port 5 Pin 2	Port 4 Pin 2	Port 3 Pin 2	Port 2 Pin 2	Port 1 Pin 2	Port 0 Pin 2

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															
Short-circuit of...	Port 7 Pin 4	Port 6 Pin 4	Port 5 Pin 4	Port 4 Pin 4	Port 3 Pin 4	Port 2 Pin 4	Port 1 Pin 4	Port 0 Pin 4	Port 7 Pin 2	Port 6 Pin 2	Port 5 Pin 2	Port 4 Pin 2	Port 3 Pin 2	Port 2 Pin 2	Port 1 Pin 2	Port 0 Pin 2

8 Configuration: BNI IOL-302-S02-Z012 and -Z013 extended with same device

Actuator warning  
46hex

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	16	15	14	13	12	11	10	9
Actuator warning of...	-	Port 6 Pin 4	Port 5 Pin 4	Port 4 Pin 4	Port 3 Pin 4	Port 2 Pin 4	Port 1 Pin 4	Port 0 Pin 4	Port 7 Pin 2	Port 6 Pin 2	Port 5 Pin 2	Port 4 Pin 2	Port 3 Pin 2	Port 2 Pin 2	Port 1 Pin 2	Port 0 Pin 2

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
	<b>Extension port</b>															
Actuator warning of...	Port 7 Pin 4	Port 6 Pin 4	Port 5 Pin 4	Port 4 Pin 4	Port 3 Pin 4	Port 2 Pin 4	Port 1 Pin 4	Port 0 Pin 4	Port 7 Pin 2	Port 6 Pin 2	Port 5 Pin 2	Port 4 Pin 2	Port 3 Pin 2	Port 2 Pin 2	Port 1 Pin 2	Port 0 Pin 2

Setting the serial number  
54hex

The serial number has a factory default value, 16 ASCII characters, example: 0E-G550389-1D-26. However the device's serial number cannot be modified, for compatibility reasons this parameter allows to give a custom specific serial number.

Configuration of the extension port  
55hex

Configuration	ISDU Index 55hex value
Device alone (Extension Port not active)	0
Device with same device	1
Device with BNI IOL-751-V08-K007	2
Device with BNI IOL-751-V10-K007	3
Device with BNI IOL-751-V13-K007	4

**9 Configuration: BNI IOL-302-S02-Z012 and -Z013 extended with 22/24 Valve Terminal**

Forewords: Devices variants with following configurations are covered  
 All these device variants have diagnostic information among the process data in.  
 The only difference is the digital output maximum current (200mA vs 2A)

BNI IOL-302-S02-Z012 with - BNI IOL-751-V08-K007 - BNI IOL-751-V10-K007 - BNI IOL-751-V13-K007	BNI IOL-302-S02-Z013 with - BNI IOL-751-V08-K007 - BNI IOL-751-V10-K007 - BNI IOL-751-V13-K007
---	---



**9.1. Extension Port Configuration**

Configuration	ISDU Index 55 <sub>hex</sub> value
Device alone (Extension Port not active)	0
Device with same device	1
<b>Device with BNI IOL-751-V08-K007</b>	<b>2</b>
<b>Device with BNI IOL-751-V10-K007</b>	<b>3</b>
<b>Device with BNI IOL-751-V13-K007</b>	<b>4</b>

**9.2. IO-Link Data**

BNI IOL-302-002-Z042 with 22/24 Valve Terminal	
Transfer rate	COM2 (38.4 kBaud)
Minimum cycle time	7.2 ms
Process data length	8 bytes input, 6 bytes output

9 Configuration: BNI IOL-302-S02-Z012 and -Z013 extended with 22/24 Valve Terminal

9.3. Process Data/  
Input Data

Byte	0								1							
Bit	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0
Input state of...	Extension Port Connection State	Port 6 Pin 4	Port 5 Pin 4	Port 4 Pin 4	Port 3 Pin 4	Port 2 Pin 4	Port 1 Pin 4	Port 0 Pin 4	Extension Port Validation State	Port 6 Pin 2	Port 5 Pin 2	Port 4 Pin 2	Port 3 Pin 2	Port 2 Pin 2	Port 1 Pin 2	Port 0 Pin 2

Byte	2								3							
Bit	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0
Voltage monitoring	SC Port 7 Pin 1	SC Port 6 Pin 1	SC Port 5 Pin 1	SC Port 4 Pin 1	SC Port 3 Pin 1	SC Port 2 Pin 1	SC Port 1 Pin 1	SC Port 0 Pin 1	-	-	-	-	Outputs off (UA too low)	Undervoltage UA	Undervoltage US2*	Undervoltage US1

\* = Available in BNI IOL-302-S02-Z013

Byte	4								5							
Bit	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0
Short-circuit of...	Port 7 Pin 4	Port 6 Pin 4	Port 5 Pin 4	Port 4 Pin 4	Port 3 Pin 4	Port 2 Pin 4	Port 1 Pin 4	Port 0 Pin 4	Port 7 Pin 2	Port 6 Pin 2	Port 5 Pin 2	Port 4 Pin 2	Port 3 Pin 2	Port 2 Pin 2	Port 1 Pin 2	Port 0 Pin 2

Byte	6								7							
Bit	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0
Actuator Warning of...	Port 7 Pin 4	Port 6 Pin 4	Port 5 Pin 4	Port 4 Pin 4	Port 3 Pin 4	Port 2 Pin 4	Port 1 Pin 4	Port 0 Pin 4	Port 7 Pin 2	Port 6 Pin 2	Port 5 Pin 2	Port 4 Pin 2	Port 3 Pin 2	Port 2 Pin 2	Port 1 Pin 2	Port 0 Pin 2

9 Configuration: BNI IOL-302-S02-Z012 and -Z013 extended with 22/24 Valve Terminal

9.4. Process Data/  
Output Data

Byte	0								1							
Bit	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0
Output state of...	-	Port 6 Pin 4	Port 5 Pin 4	Port 4 Pin 4	Port 3 Pin 4	Port 2 Pin 4	Port 1 Pin 4	Port 0 Pin 4	-	Port 6 Pin 2	Port 5 Pin 2	Port 4 Pin 2	Port 3 Pin 2	Port 2 Pin 2	Port 1 Pin 2	Port 0 Pin 2

Byte	2								3							
Bit	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0
	<b>Valve terminal on extension port</b>															
Output state of...	-	-	-	-	* Valve 12 – Coil A	Valve 11 – Coil A	Valve 10 – Coil A	Valve 09 – Coil A	Valve 08 – Coil A	Valve 07 – Coil A	Valve 06 – Coil A	Valve 05 – Coil A	Valve 04 – Coil A	Valve 03 – Coil A	Valve 02 – Coil A	Valve 01 – Coil A

\* No function for BNI IOL-751-V13-K007

Byte	4								5							
Bit	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0
	<b>Valve terminal on extension port</b>															
Output state of...	-	-	-	-	* Valve 12 – Coil B	Valve 11 – Coil B	Valve 10 – Coil B	Valve 09 – Coil B	Valve 08 – Coil B	Valve 07 – Coil B	Valve 06 – Coil B	Valve 05 – Coil B	Valve 04 – Coil B	Valve 03 – Coil B	Valve 02 – Coil B	Valve 01 – Coil B

\* No function for BNI IOL-751-V13-K007

9 Configuration: BNI IOL-302-S02-Z012 and -Z013 extended with 22/24 Valve Terminal

9.5. Parameter Data/ Identification Data and Device Parameter

	DPP	ISDU		Parameter	Data width	Access rights	Default value
	Index	Index	Sub-index				
Identification data	07hex			Vendor ID	2 bytes	Read only	0378hex
	08hex						
	09hex						
	0Ahex						
	0Bhex			Device ID	3 bytes		05 0E 22hex 05 0E 23hex 05 0E 24hex  05 0E 32hex 05 0E 33hex 05 0E 34hex
		10hex 16	0	Vendor name	7 bytes		BALLUFF
		11hex 17	0	Vendor text	15 bytes		www.balluff.com
		12hex 18	0	Product name			BNI IOL-302-S02-Z012 with - BNI IOL-751-V08-K007 - BNI IOL-751-V10-K007 - BNI IOL-751-V13-K007 BNI IOL-302-S02-Z013 with - BNI IOL-751-V08-K007 - BNI IOL-751-V10-K007 - BNI IOL-751-V13-K007
		13hex 19	0	Product ID			BNI00CN with - BNI006N - BNI006P - BNI006R BNI0046 with - BNI006N - BNI006P - BNI006R
		14hex 20	0	Product text			Sensor/Actor Hub M12 extended with - Valve Plug CG25 24 2-3 - Valve Plug CG13 24 2-3 - Valve Plug CG13 24 2-3 Sensor/Actor Hub M12 extended with - Valve Plug CG25 24 2-3 - Valve Plug CG13 24 2-3 - Valve Plug CG13 24 2-3
		15hex 21	0	Serial number	16 bytes		various
		16hex 22	0	Hardware Revision			
	17hex 23	0	Firmware Revision				
	18hex 24	0	Application Specific Tag	32 bytes	Read / Write	0hex	
Device Para.		0Chex 12	0	Access Locks Data Storage Lock	2 bytes	Read / Write	0hex



9 Configuration: BNI IOL-302-S02-Z012 and -Z013 extended with 22/24 Valve Terminal

9.6. Parameter Data/  
Device  
Configuration

	ISDU		Parameter	Data width	Access rights	Default Value
	Index	Subindex				
Parameter data	40 <sub>hex</sub> 64	0 1-16	Inversion of the inputs	2 bytes	Read / Write	0 <sub>hex</sub>
	41 <sub>hex</sub> 65	0 1-16	Port direction: inputs/outputs	2 bytes	Read / Write	0 <sub>hex</sub>
	42 <sub>hex</sub> 66	0 1-40	Pin 4 safe state	10 bytes	Read / Write	0 <sub>hex</sub>
	43 <sub>hex</sub> 67	0 1-8	Pin 2 safe state	2 bytes	Read / Write	0 <sub>hex</sub>
	44 <sub>hex</sub> 68	0 1-24	Voltage monitoring	3 bytes	Read	-
	45 <sub>hex</sub> 69	0 1-48	Output monitoring	6 bytes	Read	-
	46 <sub>hex</sub> 70	0 1-16	Actuator warning	2 bytes	Read	-
	54 <sub>hex</sub> 84	0	Serial number	16 bytes	Read / Write	0 <sub>hex</sub>
	55 <sub>hex</sub> 85	0	Extension port	1 byte	Read / Write	2, 3, 4 <sub>hex</sub>

Inversion of the  
inputs  
40<sub>hex</sub>

Byte	0								1							
	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	16	15	14	13	12	11	10	9
Inversion of...	.	Port 6 Pin 4	Port 5 Pin 4	Port 4 Pin 4	Port 3 Pin 4	Port 2 Pin 4	Port 1 Pin 4	Port 0 Pin 4	.	Port 6 Pin 2	Port 5 Pin 2	Port 4 Pin 2	Port 3 Pin 2	Port 2 Pin 2	Port 1 Pin 2	Port 0 Pin 2

Inversion of port (x):

- 0 – Normal
- 1 – Inverted

Port direction  
41<sub>hex</sub>

Byte	0								1							
	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	16	15	14	13	12	11	10	9
Port direction of...	.	Port 6 Pin 4	Port 5 Pin 4	Port 4 Pin 4	Port 3 Pin 4	Port 2 Pin 4	Port 1 Pin 4	Port 0 Pin 4	.	Port 6 Pin 2	Port 5 Pin 2	Port 4 Pin 2	Port 3 Pin 2	Port 2 Pin 2	Port 1 Pin 2	Port 0 Pin 2

Direction of port (x):

- 0 - Input
- 1 - Output

9 Configuration: BNI IOL-302-S02-Z012 and -Z013 extended with 22/24 Valve Terminal

**Safe state of the outputs**  
42hex

The safe state parameter makes it possible to configure the outputs in case of a fault. If no IO-Link communication is possible or the "valid flag" of the output process data has not been set by the master, then each output adopts the configured status.

The following statuses can be configured for each output pin.

Value		Output state (Safe state)
bin	dec	
00	0	Output is 0V
01	1	Output is 24V
10	2	Current status is maintained
11	3	Not defined

Byte	0								1							
	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	
Safe state of...	Port 3 Pin 4		Port 2 Pin 4		Port 1 Pin 4		Port 0 Pin 4		.	Port 6 Pin 4		Port 5 Pin 4		Port 4 Pin 4		

Byte	2								3							
	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0
Sub-index									31		29		27		25	
Valve terminal on extension port																
Safe State of...	.	.	.	.	.	.	.	.	.	* Valve 12 – Coil A	Valve 11 – Coil A	Valve 10 – Coil A	Valve 09 – Coil A	.	.	.

\* No function for BNI IOL-751-V13-K007

9 Configuration: BNI IOL-302-S02-Z012 and -Z013 extended with 22/24 Valve Terminal

Byte	4								5							
Bit	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0
Sub-index	23		21		19		17		15		13		11		9	
	<b>Valve terminal on extension port</b>															
Safe State of...	Valve 08 – Coil A		Valve 07 – Coil A		Valve 06 – Coil A		Valve 05 – Coil A		Valve 04 – Coil A		Valve 03 – Coil A		Valve 02 – Coil A		Valve 01 – Coil A	

Byte	6								7							
Bit	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0
Sub-index									32		30		28		26	
	<b>Valve terminal on extension port</b>															
Safe State of...									* Valve 12 – Coil B	Valve 11 – Coil B		Valve 10 – Coil B		Valve 09 – Coil B		

\* No function for BNI IOL-751-V13-K007

Byte	8								9							
Bit	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0
Sub-index	24		22		20		18		16		14		12		10	
	<b>Valve terminal on extension port</b>															
Safe State of...	Valve 08 – Coil B		Valve 07 – Coil B		Valve 06 – Coil B		Valve 05 – Coil B		Valve 04 – Coil B		Valve 03 – Coil B		Valve 02 – Coil B		Valve 01 – Coil B	

9 Configuration: BNI IOL-302-S02-Z012 and -Z013 extended with 22/24 Valve Terminal

Safe state of the outputs on Pin 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	
Safe state of...	Port 3 Pin 2		Port 2 Pin 2		Port 1 Pin 2		Port 0 Pin 2		-		Port 6 Pin 2		Port 5 Pin 2		Port 4 Pin 2	

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	16	15	14	13	12	11	10	9
Voltage monitoring	SC Port 7 Pin 1	SC Port 6 Pin 1	SC Port 5 Pin 1	SC Port 4 Pin 1	SC Port 3 Pin 1	SC Port 2 Pin 1	SC Port 1 Pin 1	SC Port 0 Pin 1	-	-	-	-	Outputs off (UA too low)	Undervoltage UA	Undervoltage US2*	Undervoltage US1

\* = Available in BNI IOL-302-S02-Z013

Byte	2							
Bit	7	6	5	4	3	2	1	0
Sub Index	23					19		17
Valve terminal on extension port								
Voltage monitoring	-	Overload UA	-	-	-	Undervoltage UA	-	Undervoltage US

9 Configuration: BNI IOL-302-S02-Z012 and -Z013 extended with 22/24 Valve Terminal

Output monitoring  
45hex

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	16	15	14	13	12	11	10	9
Short-circuit of...	.	Port 6 Pin 4	Port 5 Pin 4	Port 4 Pin 4	Port 3 Pin 4	Port 2 Pin 4	Port 1 Pin 4	Port 0 Pin 4	Port 7 Pin 2	Port 6 Pin 2	Port 5 Pin 2	Port 4 Pin 2	Port 3 Pin 2	Port 2 Pin 2	Port 1 Pin 2	Port 0 Pin 2

Byte	2								3							
Bit	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0
Sub Index					39	37	35	33	31	29	27	25	23	21	19	17
Valve terminal on extension port																
Short-circuit of...	.	.	.	.	* Valve 12 – Coil A	Valve 11 – Coil A	Valve 10 – Coil A	Valve 09 – Coil A	Valve 08 – Coil A	Valve 07 – Coil A	Valve 06 – Coil A	Valve 05 – Coil A	Valve 04 – Coil A	Valve 03 – Coil A	Valve 02 – Coil A	Valve 01 – Coil A

\* No function for BNI IOL-751-V13-K007

Byte	3								4							
Bit	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0
Sub Index					40	38	36	34	32	30	28	26	24	22	20	18
Valve terminal on extension port																
Short-circuit of...	.	.	.	.	* Valve 12 – Coil B	Valve 11 – Coil B	Valve 10 – Coil B	Valve 09 – Coil B	Valve 08 – Coil B	Valve 07 – Coil B	Valve 06 – Coil B	Valve 05 – Coil B	Valve 04 – Coil B	Valve 03 – Coil B	Valve 02 – Coil B	Valve 01 – Coil B

\* No function for BNI IOL-751-V13-K007

9 Configuration: BNI IOL-302-S02-Z012 and -Z013 extended with 22/24 Valve Terminal

Actuator warning  
46hex

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	16	15	14	13	12	11	10	9
Actuator warning of...	.	Port 6 Pin 4	Port 5 Pin 4	Port 4 Pin 4	Port 3 Pin 4	Port 2 Pin 4	Port 1 Pin 4	Port 0 Pin 4	Port 7 Pin 2	Port 6 Pin 2	Port 5 Pin 2	Port 4 Pin 2	Port 3 Pin 2	Port 2 Pin 2	Port 1 Pin 2	Port 0 Pin 2

Setting the serial number  
54hex

The serial number has a factory default value, 16 ASCII characters, example: 0E-G550389-1D-26. However the device's serial number cannot be modified, for compatibility reasons this parameter allows to give a custom specific serial number.

Configuration of the extension port  
55hex

Configuration	ISDU Index 55hex value
Device alone (Extension Port not active)	0
Device with same device	1
Device with BNI IOL-751-V08-K007	2
Device with BNI IOL-751-V10-K007	3
Device with BNI IOL-751-V13-K007	4

**10 Configuration: BNI IOL-302-S02-Z026 extended with same device**

Forewords: Devices variant with following configuration are covered.  
 All these device variant have diagnostic information among the process data in.



**10.1. Extension Port Configuration**

Configuration	ISDU Index 55 <sub>hex</sub> value
Device alone (Extension Port not active)	0
<b>Device with same device</b>	<b>1</b>
Device with BNI IOL-751-V08-K007	2
Device with BNI IOL-751-V10-K007	3
Device with BNI IOL-751-V13-K007	4

**10.2. IO-Link Data**

BNI IOL-302-S02-Z026 with same device	
Transfer rate	COM2 (38.4 kBaud)
Minimum cycle time	8.0 ms
Process data length	12 bytes input, 4 bytes output

10 Configuration: BNI IOL-302-S02-Z026 extended with same device

10.3. Process Data/  
Input Data

Byte	0								1							
Bit	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0
Input state of...	Extension Port Connection State								Extension Port Validation State							
	Port 6 Pin 4	Port 5 Pin 4	Port 4 Pin 4	Port 3 Pin 4	Port 2 Pin 4	Port 1 Pin 4	Port 0 Pin 4		Port 6 Pin 2	Port 5 Pin 2	Port 4 Pin 2	Port 3 Pin 2	Port 2 Pin 2	Port 1 Pin 2	Port 0 Pin 2	

Byte	2								3							
Bit	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0
Voltage monitoring	SC Port 7 Pin 1	SC Port 6 Pin 1	SC Port 5 Pin 1	SC Port 4 Pin 1	SC Port 3 Pin 1	SC Port 2 Pin 1	SC Port 1 Pin 1	SC Port 0 Pin 1	-	-	-	-	Outputs off (UA too low)	Undervoltage UA	Undervoltage US2	Undervoltage US1

Byte	4								5							
Bit	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0
Short-circuit of...	Port 7 Pin 4	Port 6 Pin 4	Port 5 Pin 4	Port 4 Pin 4	Port 3 Pin 4	Port 2 Pin 4	Port 1 Pin 4	Port 0 Pin 4	Port 7 Pin 2	Port 6 Pin 2	Port 5 Pin 2	Port 4 Pin 2	Port 3 Pin 2	Port 2 Pin 2	Port 1 Pin 2	Port 0 Pin 2



10 Configuration: BNI IOL-302-S02-Z026 extended with same device

Byte	6								7							
Bit	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0
	<b>Extension Port</b>															
<b>Input state of...</b>	Port 7 Pin 4	Port 6 Pin 4	Port 5 Pin 4	Port 4 Pin 4	Port 3 Pin 4	Port 2 Pin 4	Port 1 Pin 4	Port 0 Pin 4	Port 7 Pin 2	Port 6 Pin 2	Port 5 Pin 2	Port 4 Pin 2	Port 3 Pin 2	Port 2 Pin 2	Port 1 Pin 2	Port 0 Pin 2

Byte	8								9							
Bit	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0
	<b>Extension Port</b>															
<b>Voltage monitoring</b>	SC Port 7 Pin 1	SC Port 6 Pin 1	SC Port 5 Pin 1	SC Port 4 Pin 1	SC Port 3 Pin 1	SC Port 2 Pin 1	SC Port 1 Pin 1	SC Port 0 Pin 1	-	-	-	-	Outputs off (UA too low)	Undervoltage UA	Undervoltage US2	Undervoltage US1

Byte	10								11							
Bit	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0
	<b>Extension Port</b>															
<b>Short-circuit of...</b>	Port 7 Pin 4	Port 6 Pin 4	Port 5 Pin 4	Port 4 Pin 4	Port 3 Pin 4	Port 2 Pin 4	Port 1 Pin 4	Port 0 Pin 4	Port 7 Pin 2	Port 6 Pin 2	Port 5 Pin 2	Port 4 Pin 2	Port 3 Pin 2	Port 2 Pin 2	Port 1 Pin 2	Port 0 Pin 2

10 Configuration: BNI IOL-302-S02-Z026 extended with same device

10.4. Process Data/  
Output Data

Byte	0								1							
Bit	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0
Output state of...	-	Port 6 Pin 4	Port 5 Pin 4	Port 4 Pin 4	Port 3 Pin 4	Port 2 Pin 4	Port 1 Pin 4	Port 0 Pin 4	-	Port 6 Pin 2	Port 5 Pin 2	Port 4 Pin 2	Port 3 Pin 2	Port 2 Pin 2	Port 1 Pin 2	Port 0 Pin 2

Byte	2								3							
Bit	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0
Output state of...	Extension Port															
	Port 7 Pin 4	Port 6 Pin 4	Port 5 Pin 4	Port 4 Pin 4	Port 3 Pin 4	Port 2 Pin 4	Port 1 Pin 4	Port 0 Pin 4	Port 7 Pin 2	Port 6 Pin 2	Port 5 Pin 2	Port 4 Pin 2	Port 3 Pin 2	Port 2 Pin 2	Port 1 Pin 2	Port 0 Pin 2

10 Configuration: BNI IOL-302-S02-Z026 extended with same device

10.5. Parameter Data/ Identification Data and Device Parameter

	DPP	ISDU		Parameter	Data width	Access rights	Default value
	Index	Index	Sub-index				
Identification data	07hex			Vendor ID	2 bytes	Read only	0378hex
	08hex						
	09hex			Device ID	3 bytes		05 0E 41hex
	0Ahex						
	0Bhex			Vendor name	7 bytes		BALLUFF
	10hex 16	10hex 16	0				
	11hex 17	11hex 17	0	Vendor text	15 bytes		www.balluff.com
	12hex 18	12hex 18	0	Product name			BNI IOL-302-S02-Z026 with BNI IOL-302-S02-Z026
	13hex 19	13hex 19	0	Product ID			BNI00CP with BNI00CP
	14hex 20	14hex 20	0	Product text			Sensor/Actor Hub M12 extended with Sensor/Actor Hub M12
	15hex 21	15hex 21	0	Serial number	16 bytes		various
16hex 22	16hex 22	0	Hardware Revision				
17hex 23	17hex 23	0	Firmware Revision				
	18hex 24	0	Application Specific Tag	32 bytes	Read / Write	0hex	
Device Para.		0Chex 12	0	Access Locks Data Storage Lock	2 bytes	Read / Write	0hex

10.6. Parameter Data/ Device Configuration

	ISDU		Parameter	Data width	Access rights	Default Value
	Index	Subindex				
Parameter data	40hex 64	0 1-32	Inversion of the inputs	4 bytes	Read / Write	0hex
	42hex 66	0 1-16	Pin 4 safe state	4 bytes	Read / Write	0hex
	43hex 67	0 1-16	Pin 2 safe state	4 bytes	Read / Write	0hex
	44hex 68	0 1-32	Voltage monitoring	4 bytes	Read	-
	45hex 69	0 1-32	Output monitoring	4 bytes	Read	-
	54hex 84	0	Serial number	16 bytes	Read / Write	0hex
	55hex 85	0	Extension port	1 byte	Read / Write	0hex

10 Configuration: BNI IOL-302-S02-Z026 extended with same device

Inversion of the inputs  
40hex

Byte	0								1							
	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	16	15	14	13	12	11	10	9
Inversion of...	-	Port 6 Pin 4	Port 5 Pin 4	Port 4 Pin 4	Port 3 Pin 4	Port 2 Pin 4	Port 1 Pin 4	Port 0 Pin 4	-	Port 6 Pin 2	Port 5 Pin 2	Port 4 Pin 2	Port 3 Pin 2	Port 2 Pin 2	Port 1 Pin 2	Port 0 Pin 2

Byte	2								3							
	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															
Inversion of...	Port 7 Pin 4	Port 6 Pin 4	Port 5 Pin 4	Port 4 Pin 4	Port 3 Pin 4	Port 2 Pin 4	Port 1 Pin 4	Port 0 Pin 4	Port 7 Pin 2	Port 6 Pin 2	Port 5 Pin 2	Port 4 Pin 2	Port 3 Pin 2	Port 2 Pin 2	Port 1 Pin 2	Port 0 Pin 2

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

10 Configuration: BNI IOL-302-S02-Z026 extended with same device

**Safe state of the outputs on Pin 4**  
42hex

The safe state parameter makes it possible to configure the outputs in case of a fault. If no IO-Link communication is possible or the "valid flag" of the output process data has not been set by the master, then each output adopts the configured status.

The following statuses can be configured for each output pin.

Value		Output state (Safe state)
bin	dec	
00	0	Output is 0V
01	1	Output is 24V
10	2	Current status is maintained
11	3	Not defined

Byte	0								1							
	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	
Safe state of...	Port 3 Pin 4		Port 2 Pin 4		Port 1 Pin 4		Port 0 Pin 4		-		Port 6 Pin 4		Port 5 Pin 4		Port 4 Pin 4	

Byte	2								3							
	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0
Sub-index	12		11		10		9		16		15		14		13	
Extension port																
Safe state of...	Port 3 Pin 4		Port 2 Pin 4		Port 1 Pin 4		Port 0 Pin 4		Port 7 Pin 4		Port 6 Pin 4		Port 5 Pin 4		Port 4 Pin 4	

10 Configuration: BNI IOL-302-S02-Z026 extended with same device

Safe state of the outputs on Pin 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	
Safe state of...	Port 3 Pin 2		Port 2 Pin 2		Port 1 Pin 2		Port 0 Pin 2		.		Port 6 Pin 2		Port 5 Pin 2		Port 4 Pin 2	

Byte	2								3							
Bit	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0
Sub-index	12		11		10		9		16		15		14		13	
	Extension port															
Safe state of...	Port 3 Pin 2		Port 2 Pin 2		Port 1 Pin 2		Port 0 Pin 2		Port 7 Pin 2		Port 6 Pin 2		Port 5 Pin 2		Port 4 Pin 2	

10 Configuration: BNI IOL-302-S02-Z026 extended with same device

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					12	11	10	9
Voltage monitoring	SC Port 7 Pin 1	SC Port 6 Pin 1	SC Port 5 Pin 1	SC Port 4 Pin 1	SC Port 3 Pin 1	SC Port 2 Pin 1	SC Port 1 Pin 1	SC Port 0 Pin 1	-	-	-	-	Outputs off (UA too low)	Undervoltage UA	Undervoltage US2	Undervoltage US1

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					28	27	26	25
	Extension Port															
Voltage monitoring	SC Port 7 Pin 1	SC Port 6 Pin 1	SC Port 5 Pin 1	SC Port 4 Pin 1	SC Port 3 Pin 1	SC Port 2 Pin 1	SC Port 1 Pin 1	SC Port 0 Pin 1	-	-	-	-	Outputs off (UA too low)	Undervoltage UA	Undervoltage US2	Undervoltage US1

10 Configuration: BNI IOL-302-S02-Z026 extended with same device

Output monitoring  
45hex

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	16	15	14	13	12	11	10	9
Short-circuit of...	-	Port 6 Pin 4	Port 5 Pin 4	Port 4 Pin 4	Port 3 Pin 4	Port 2 Pin 4	Port 1 Pin 4	Port 0 Pin 4	Port 7 Pin 2	Port 6 Pin 2	Port 5 Pin 2	Port 4 Pin 2	Port 3 Pin 2	Port 2 Pin 2	Port 1 Pin 2	Port 0 Pin 2

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															
Short-circuit of...	Port 7 Pin 4	Port 6 Pin 4	Port 5 Pin 4	Port 4 Pin 4	Port 3 Pin 4	Port 2 Pin 4	Port 1 Pin 4	Port 0 Pin 4	Port 7 Pin 2	Port 6 Pin 2	Port 5 Pin 2	Port 4 Pin 2	Port 3 Pin 2	Port 2 Pin 2	Port 1 Pin 2	Port 0 Pin 2

Setting the serial number  
54hex

The serial number has a factory default value, 16 ASCII characters, example: 0E-G550389-1D-26. However the device's serial number cannot be modified, for compatibility reasons this parameter allows to give a custom specific serial number.

Configuration of the extension port  
55hex

Configuration	ISDU Index 55hex value
Device alone (Extension Port not active)	0
Device with same device	1
Device with BNI IOL-751-V08-K007	2
Device with BNI IOL-751-V10-K007	3
Device with BNI IOL-751-V13-K007	4



11 Configuration: BNI IOL-302-S02-Z026 extended with 22/24 Valve Terminal



11.1. Extension Port Configuration

Configuration	ISDU Index 55 <sub>hex</sub> value
Device alone (Extension Port not active)	0
Device with same device	1
<b>Device with BNI IOL-751-V08-K007</b>	<b>2</b>
<b>Device with BNI IOL-751-V10-K007</b>	<b>3</b>
<b>Device with BNI IOL-751-V13-K007</b>	<b>4</b>

11.2. IO-Link Data

BNI IOL-302-002-Z042 with 22/24 Valve Terminal	
Transfer rate	COM2 (38.4 kBaud)
Minimum cycle time	6.8 ms
Process data length	6 bytes input, 6 bytes output

11 Configuration: BNI IOL-302-S02-Z026 extended with 22/24 Valve Terminal

11.3. Process Data/  
Input Data

Byte	0								1							
Bit	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0
Input state of...	Extension Port Connection State								Extension Port Validation State							
	Port 6 Pin 4	Port 5 Pin 4	Port 4 Pin 4	Port 3 Pin 4	Port 2 Pin 4	Port 1 Pin 4	Port 0 Pin 4	Port 6 Pin 2	Port 5 Pin 2	Port 4 Pin 2	Port 3 Pin 2	Port 2 Pin 2	Port 1 Pin 2	Port 0 Pin 2		

Byte	2								3							
Bit	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0
Voltage monitoring	SC Port 7 Pin 1	SC Port 6 Pin 1	SC Port 5 Pin 1	SC Port 4 Pin 1	SC Port 3 Pin 1	SC Port 2 Pin 1	SC Port 1 Pin 1	SC Port 0 Pin 1	-	-	-	-	Outputs off (UA too low)	Undervoltage UA	Undervoltage US2	Undervoltage US1

Byte	4								5							
Bit	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0
Short-circuit of...	Port 7 Pin 4	Port 6 Pin 4	Port 5 Pin 4	Port 4 Pin 4	Port 3 Pin 4	Port 2 Pin 4	Port 1 Pin 4	Port 0 Pin 4	Port 7 Pin 2	Port 6 Pin 2	Port 5 Pin 2	Port 4 Pin 2	Port 3 Pin 2	Port 2 Pin 2	Port 1 Pin 2	Port 0 Pin 2

11 Configuration: BNI IOL-302-S02-Z026 extended with 22/24 Valve Terminal

11.4. Process Data/  
Output Data

Byte	0								1							
Bit	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0
Output state of...	-	Port 6 Pin 4	Port 5 Pin 4	Port 4 Pin 4	Port 3 Pin 4	Port 2 Pin 4	Port 1 Pin 4	Port 0 Pin 4	-	Port 6 Pin 2	Port 5 Pin 2	Port 4 Pin 2	Port 3 Pin 2	Port 2 Pin 2	Port 1 Pin 2	Port 0 Pin 2

Byte	2								3							
Bit	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0
	<b>Valve terminal on extension port</b>															
Output state of...	-	-	-	-	* Valve 12 – Coil A	Valve 11 – Coil A	Valve 10 – Coil A	Valve 09 – Coil A	Valve 08 – Coil A	Valve 07 – Coil A	Valve 06 – Coil A	Valve 05 – Coil A	Valve 04 – Coil A	Valve 03 – Coil A	Valve 02 – Coil A	Valve 01 – Coil A

\* No function for BNI IOL-751-V13-K007

Byte	4								5							
Bit	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0
	<b>Valve terminal on extension port</b>															
Output state of...	-	-	-	-	* Valve 12 – Coil B	Valve 11 – Coil B	Valve 10 – Coil B	Valve 09 – Coil B	Valve 08 – Coil B	Valve 07 – Coil B	Valve 06 – Coil B	Valve 05 – Coil B	Valve 04 – Coil B	Valve 03 – Coil B	Valve 02 – Coil B	Valve 01 – Coil B

\* No function for BNI IOL-751-V13-K007

11 Configuration: BNI IOL-302-S02-Z026 extended with 22/24 Valve Terminal

11.5. Parameter Data/ Identification Data and Device Parameter

	DPP		ISDU		Parameter	Data width	Access rights	Default value
	Index	Index	Sub-index	Sub-index				
Identification data	07hex				Vendor ID	2 bytes	Read only	0378hex
	08hex							
	09hex				Device ID	3 bytes		05 0E 42hex 05 0E 43hex 05 0E 44hex
	0Ahex							
	0Bhex							
		10hex 16		0	Vendor name	7 bytes		BALLUFF
		11hex 17		0	Vendor text	15 bytes		www.balluff.com
		12hex 18		0	Product name			BNI IOL-302-S02-Z026 with - BNI IOL-751-V08-K007 - BNI IOL-751-V10-K007 - BNI IOL-751-V13-K007
		13hex 19		0	Product ID			BNI00CP with - BNI006N - BNI006P - BNI006R
		14hex 20		0	Product text			Sensor/Actor Hub M12 extended with - Valve Plug CG25 24 2-3 - Valve Plug CG13 24 2-3 - Valve Plug CG13 24 2-3
	15hex 21		0	Serial number	16 bytes			
	16hex 22		0	Hardware Revision				
	17hex 23		0	Firmware Revision				
	18hex 24		0	Application Specific Tag	32 bytes	Read / Write	0hex	
Device Para.		0Chex 12		0	Access Locks Data Storage Lock	2 bytes	Read / Write	0hex

11.6. Parameter Data/ Device Configuration

	ISDU		Parameter	Data width	Access rights	Default Value
	Index	Subindex				
Parameter data	40hex 64	0 1-16	Inversion of the inputs	2 bytes	Read / Write	0hex
	42hex 66	0 1-40	Pin 4 safe state	10 bytes	Read / Write	0hex
	43hex 67	0 1-8	Pin 2 safe state	2 bytes	Read / Write	0hex
	44hex 68	0 1-24	Voltage monitoring	3 bytes	Read	-
	45hex 69	0 1-48	Output monitoring	6 bytes	Read	-
	54hex 84	0	Serial number	16 bytes	Read / Write	0hex
	55hex 85	0	Extension port	1 byte	Read / Write	2, 3, 4hex

11 Configuration: BNI IOL-302-S02-Z026 extended with 22/24 Valve Terminal

Inversion of the inputs  
40hex

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	16	15	14	13	12	11	10	9
Inversion of...	.	Port 6 Pin 4	Port 5 Pin 4	Port 4 Pin 4	Port 3 Pin 4	Port 2 Pin 4	Port 1 Pin 4	Port 0 Pin 4	.	Port 6 Pin 2	Port 5 Pin 2	Port 4 Pin 2	Port 3 Pin 2	Port 2 Pin 2	Port 1 Pin 2	Port 0 Pin 2

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

Safe state of the outputs  
42hex

The safe state parameter makes it possible to configure the outputs in case of a fault. If no IO-Link communication is possible or the "valid flag" of the output process data has not been set by the master, then each output adopts the configured status.

The following statuses can be configured for each output pin.

Value		Output state (Safe state)
bin	dec	
00	0	Output is 0V
01	1	Output is 24V
10	2	Current status is maintained
11	3	Not defined

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	
Safe state of...	Port 3 Pin 4		Port 2 Pin 4		Port 1 Pin 4		Port 0 Pin 4		.	Port 6 Pin 4		Port 5 Pin 4		Port 4 Pin 4		

Byte	2								3							
Bit	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0
Sub-index									31		29		27		25	
	Valve terminal on extension port															
Safe State of...	.	.	.	.	.	.	.	.	* Valve 12 – Coil A	Valve 11 – Coil A	Valve 10 – Coil A	Valve 09 – Coil A	.	.	.	.

\* No function for BNI IOL-751-V13-K007

11 Configuration: BNI IOL-302-S02-Z026 extended with 22/24 Valve Terminal

Byte	4								5							
Bit	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0
Sub-index	23		21		19		17		15		13		11		9	
	<b>Valve terminal on extension port</b>															
Safe State of...	Valve 08 – Coil A		Valve 07 – Coil A		Valve 06 – Coil A		Valve 05 – Coil A		Valve 04 – Coil A		Valve 03 – Coil A		Valve 02 – Coil A		Valve 01 – Coil A	

Byte	6								7							
Bit	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0
Sub-index									32		30		28		26	
	<b>Valve terminal on extension port</b>															
Safe State of...	-		-		-		-		* Valve 12 – Coil B		Valve 11 – Coil B		Valve 10 – Coil B		Valve 09 – Coil B	

\* No function for BNI IOL-751-V13-K007

Byte	8								9							
Bit	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0
Sub-index	24		22		20		18		16		14		12		10	
	<b>Valve terminal on extension port</b>															
Safe State of...	Valve 08 – Coil B		Valve 07 – Coil B		Valve 06 – Coil B		Valve 05 – Coil B		Valve 04 – Coil B		Valve 03 – Coil B		Valve 02 – Coil B		Valve 01 – Coil B	

11 Configuration: BNI IOL-302-S02-Z026 extended with 22/24 Valve Terminal

Safe state of the outputs on Pin 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	
Safe state of...	Port 3 Pin 2		Port 2 Pin 2		Port 1 Pin 2		Port 0 Pin 2		-		Port 6 Pin 2		Port 5 Pin 2		Port 4 Pin 2	

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	16	15	14	13	12	11	10	9
Voltage monitoring	SC Port 7 Pin 1	SC Port 6 Pin 1	SC Port 5 Pin 1	SC Port 4 Pin 1	SC Port 3 Pin 1	SC Port 2 Pin 1	SC Port 1 Pin 1	SC Port 0 Pin 1	-	-	-	-	Outputs off (UA too low)	Undervoltage UA	Undervoltage US2	Undervoltage US1

Byte	2							
Bit	7	6	5	4	3	2	1	0
Sub Index	23					19		17
<b>Valve terminal on extension port</b>								
Voltage monitoring	-	Overload UA	-	-	-	Undervoltage UA	-	Undervoltage US

11 Configuration: BNI IOL-302-S02-Z026 extended with 22/24 Valve Terminal

Output monitoring  
45hex

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	16	15	14	13	12	11	10	9
Short-circuit of...	.	Port 6 Pin 4	Port 5 Pin 4	Port 4 Pin 4	Port 3 Pin 4	Port 2 Pin 4	Port 1 Pin 4	Port 0 Pin 4	Port 7 Pin 2	Port 6 Pin 2	Port 5 Pin 2	Port 4 Pin 2	Port 3 Pin 2	Port 2 Pin 2	Port 1 Pin 2	Port 0 Pin 2

Byte	2								3							
Bit	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0
Sub Index					39	37	35	33	31	29	27	25	23	21	19	17
Valve terminal on extension port																
Short-circuit of...	.	.	.	.	* Valve 12 – Coil A	Valve 11 – Coil A	Valve 10 – Coil A	Valve 09 – Coil A	Valve 08 – Coil A	Valve 07 – Coil A	Valve 06 – Coil A	Valve 05 – Coil A	Valve 04 – Coil A	Valve 03 – Coil A	Valve 02 – Coil A	Valve 01 – Coil A

\* No function for BNI IOL-751-V13-K007

Byte	3								4							
Bit	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0
Sub Index					40	38	36	34	32	30	28	26	24	22	20	18
Valve terminal on extension port																
Short-circuit of...	.	.	.	.	* Valve 12 – Coil B	Valve 11 – Coil B	Valve 10 – Coil B	Valve 09 – Coil B	Valve 08 – Coil B	Valve 07 – Coil B	Valve 06 – Coil B	Valve 05 – Coil B	Valve 04 – Coil B	Valve 03 – Coil B	Valve 02 – Coil B	Valve 01 – Coil B

\* No function for BNI IOL-751-V13-K007

Setting the serial number  
54hex

The serial number has a factory default value, 16 ASCII characters, example: 0E-G550389-1D-26. However the device's serial number cannot be modified, for compatibility reasons this parameter allows to give a custom specific serial number.

Configuration of the extension port  
55hex

Configuration	ISDU Index 55hex value
Device alone (Extension Port not active)	0
Device with same device	1
Device with BNI IOL-751-V08-K007	2
Device with BNI IOL-751-V10-K007	3
Device with BNI IOL-751-V13-K007	4



12 Error Codes and Events

12.1. 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	Function temporarily unavailable

12.2. Events

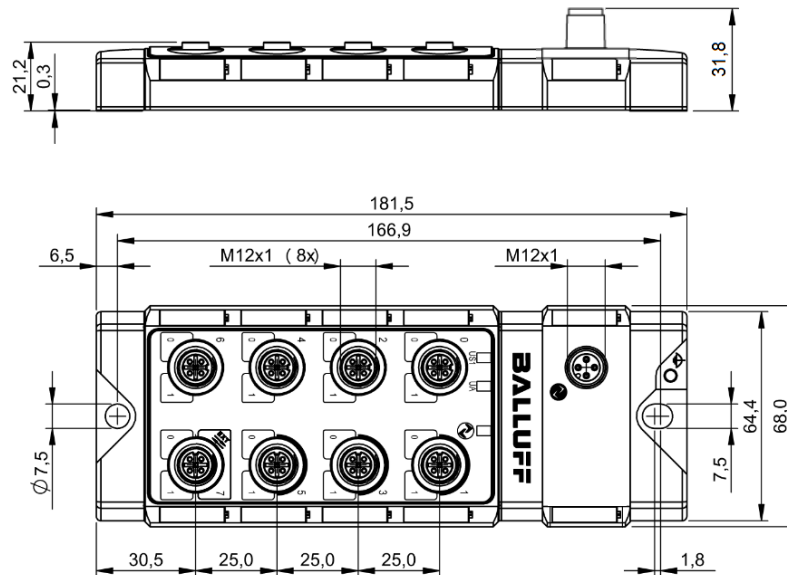
IO-Link Revision 1.0	
Event code	Description
0x5112	Low sensor voltage (US)
0x5114	Low actuator voltage (UA)
0x5410	Output stages
0x8DF0	Retry at the extension port
0x8DF1	Device lost at the extension port
0x8DF2	Wrong device at the extension port
IO-Link Revision 1.1	
Event code	Description
0x5111	Low sensor voltage (US)
0x5112	Low actuator voltage (UA)
0x7710	Short circuit or Actuator Warning
0x8DF0	Retry at the extension port
0x8DF1	Device lost at the extension port
0x8DF2	Wrong device at the extension port

### 13 IO-Link Functions

- 13.1. 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.
- 13.2. 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 operating manual of the respective IO-Link master.
- 13.3. 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.
- 13.4. Restoring the Factory Settings** The factory settings on the device can be restored by carrying out the "restore factory settings" system command.  
0x82 must be written to Index 2 Subindex 0 for the command.

14 Technical Data for Z012 and Z042 house

14.1. Dimensions



14.2. Mechanical Data

Housing material	Die-cast zinc housing
IO-Link port	IO-Link port M12, A-coded, male
PNP I/O ports	M12x1, A-coded, female (8 piece)
Weight	approx. 530 g
Dimensions (H x W x D, without connector)	68 x 181,5 x 31,8 (mm)

14.3. Electrical Data

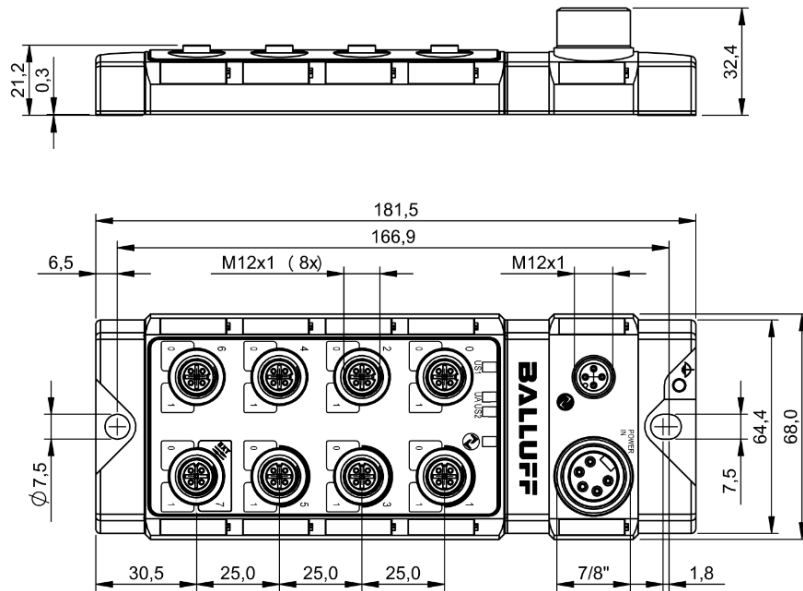
Supply voltage	18–30.2 V DC, corresponding to EN 61131-2
Supply power on M12 connector	4 A
Ripple	< 1%
Current consumption without load	≤ 50 mA
Load current (Pin 1)	max. 200 mA
Load current per output (Pin 2, Pin 4)	max. 200 mA for BNI IOL-302-S02-Z012 max. 2 A for BNI IOL-302-002-Z042
Load current per Extension Port (Pin 2)	max. 2 A
Inputs	PNP, Type 3

14.4. Operating conditions

Ambient temperature	-5 °C ... +55 °C
Storage temperature	-25 °C ... +70 °C
Degree of protection	IP67 (only in plugged-in and screwed state)

15 Technical Data for Z013 and Z026 house

15.1. Dimensions



15.2. Mechanical Data

Housing material	Die-cast zinc housing
IO-Link port	IO-Link port M12, A-coded, male
PNP I/O ports	M12x1, A-coded, female (8 piece)
Weight	approx. 540 g
Dimensions (H x W x D, without connector)	68 x 181,5 x 32,4 (mm)

15.3. Electrical Data

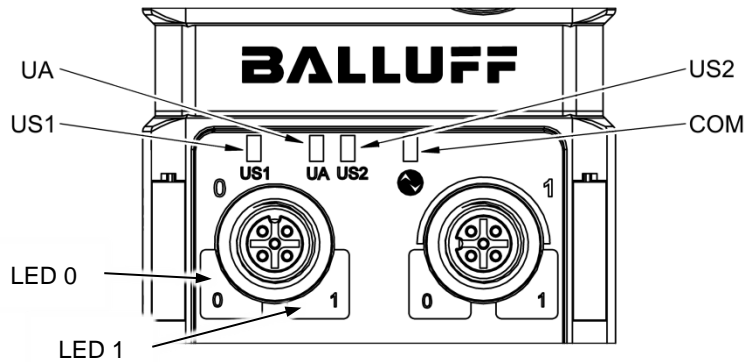
Supply voltage	18–30.2 V DC, corresponding to EN 61131-2
Supply power on M12 connector	4 A
Supply power on 7/8" connector	9 A
Ripple	< 1%
Current consumption without load	≤ 50 mA
Load current (Pin 1)	max. 200 mA
Load current per output (Pin 2, Pin 4)	max. 2 A
Load current per Extension Port (Pin 2)	max. 2 A
Inputs	PNP, type 3

15.4. Operating conditions

Ambient temperature	-5 °C ... +55 °C
Storage temperature	-25 °C ... +70 °C
Degree of protection	IP67 (only in plugged-in and screwed state)

16 Function Indicators

16.1. Function Indicators



LED indicator module status

LED name	Indicator	Function
COM	Green	No communication
	Green, flashing	IO-Link Communication OK
US1	Green	Module supply OK
	Red	Undervoltage < 18 V
	Off	Module without voltage
UA	Green	Actuator power supply OK
	Red	Undervoltage < 18 V
US2*	Green	Sensor supply OK
	Red	Undervoltage < 18 V

\* = Available in BNI IOL-302-S02-Z013 and BNI IOL-302-S02-Z026

Digital LED indicators for inputs/outputs

LED 0 = input/output on Pin 4, LED 1 = input/output on Pin 2

Indicator	Request / Signal
Yellow	Input/output signal = 1
Red	Sensor power supply short-circuit, actuator warning, actuator short circuit
Off	Input/output signal = 0

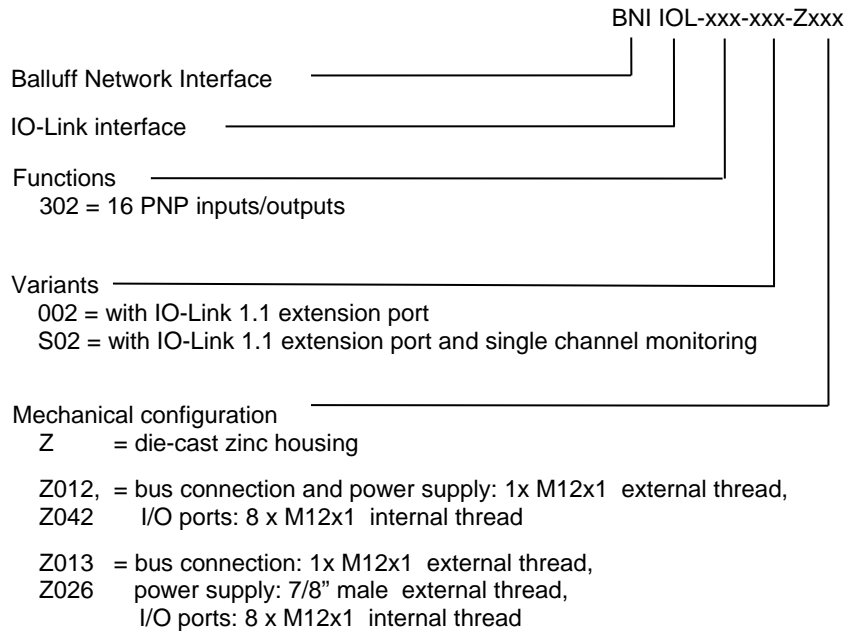
Extension port

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

Status	Function
Green	IO-Link - connection active
Green, flashing	No IO-Link connection or faulty IO-Link device
Quick, red flashing	Incorrect IO-Link device or incorrect configuration
Red	IO-Link short-circuit on Pin 4

17 Appendix

17.1. Type Code



17.2. Ordering Information

Type code	Ordering code
BNI IOL-302-002-Z042	BNI00CM
BNI IOL-302-S02-Z012	BNI00CN
BNI IOL-302-S02-Z013	BNI0046
BNI IOL-302-S02-Z026	BNI00CP

Notes

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