BALLUFF

BNI IOL-772-002-E032

IO-Link Version 1.1

M18 Universal Cable I/O Interface

User´s Guide

Contents

1 User Instructions

1.1. Structure of the Manual

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

1.2. Typographical Conventions

The following typographical conventions are used in this manual.

Enumerations

Enumerations are shown as a list with 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 “hex” (e.g. 00_{hex}).

Cross references

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

1.3. Symbols

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

Note
This symbol indicates general notes.

1.4. Abbreviations

BNI	Balluff Network Interface
DPP	Direct Parameter Page
I/O port	Digital input/output port
IOL	IO-Link
EMC	Electromagnetic compatibility
FE	Function ground
LSB	Least Significant Bit
MSB	Most Significant Bit
ISDU	Indexed Service Data Unit
GND	Ground
US	Supply voltage sensor
UA	Supply voltage actuator

1.5. Deviating views

Product views and illustrations in this guide may differ from the actual product. They are intended only as illustrative material.

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 interest of product improvement, the Balluff GmbH reserves the right to change the specifications of the product and the contents of this manual at any time without notice.

2.5. Hot housing surface

Warning!
Risk of burning on hot surface!
The housing heats up even under normal operating conditions.
Keep away hands and objects from the housing. Avoid contact of objects on the housing. Fire hazard!

3 Getting started

3.1. Connection overview

1	Connector IO-Link	3	Status LED „COM“ / „US”
2	Status LED „UA“	4	Cable 1,3 meters

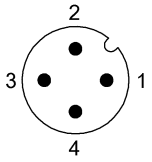
3.2. Electrical connection

The BNI IOL-772-002-E032 modules do not require a separate supply voltage connection. Supply voltage is provided via the IO-Link interface and the higher-level IO-Link master module.

IO-Link connection

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

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



Pin	Requirement
1	Supply voltage for controller US, +24 V
2	Supply voltage for actuators UA, +24 V
3	GND, reference potential
4	C/Q, IO-Link data transmission channel

Connecting the cable I/O interface

- Connect the function ground to the device housing.
- Connect the incoming IO-Link cable to the cable I/O interface module.

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

Function ground

Note
The housing of the BNI IOL-772-002-E032 must be connected to the function ground and it must be low-impedance and kept as short as possible.

Module variant

Variant	Digital pin
BNI IOL-772-002-E032	8 digital inputs/outputs, freely configurable

3 Getting started

Pin assignment Digital input/output pins: 1,3 meters long PUR ECOLAB cable with 10 free wires.

Requirement	Wire color
0 V, GND	Black
Input 1 / Output 1	Lila
Input 2 / Output 2	White
Input 3 / Output 3	Brown
Input 4 / Output 4	Green
Input 5 / Output 5	Yellow
Input 6 / Output 6	Grey
Input 7 / Output 7	Pink
Input 8 / Output 8	Blue
US Supply +24 V	Red

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

4 IO-Link Interface

4.1. IO-Link Data

BNI IOL-772-002-E032	
Transmission rate	COM 2 (38,4 kBaud)
Minimum cycle time	8,4 ms
Process data length	1 byte input, 1 byte output

4.2. Process Data/ Input Data

BNI IOL-772-002-E032
Process data length of 1 byte:

Byte	0							
Bit	7	6	5	4	3	2	1	0
Description	Input 8	Input 7	Input 6	Input 5	Input 4	Input 3	Input 2	Input 1

4.3. Process Data/ Output Data

BNI IOL-772-002-E032
Process data length of 1 byte:

Byte	0							
Bit	7	6	5	4	3	2	1	0
Description	Output 8	Output 7	Output 6	Output 5	Output 4	Output 3	Output 2	Output 1

4.4. Parameter Data/ Demand Data

	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 04 70hex
	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-772-002-E032
		13hex 19	0	Product ID	7 bytes		BNI00AE
		14hex 20	0	Product text			M18 Universal Cable IO Interface
		15hex 21	0	Serial number	16 bytes		0hex
		16hex 22	0	Hardware revision			
		17hex 23	0	Firmware revision			
		18hex 24	0	Application Specific Tag	32 bytes	Read / Write	0hex

	DPP	ISDU		Parameter	Data width	Access rights	Default Value
	Index	Index	Sub-index				
Parameter data		40hex 64	0 1-8	Inversion	1 byte	Read / Write	0hex
		41hex 65	0 1-8	Pin Direction	1 byte	Read / Write	0hex
		42hex 66	0 1-16	Fault State	2 bytes	Read / Write	0hex
		44hex 68	0 1-8	Power Monitoring	1 byte	Read	-
		45hex 69	0 1-8	Actuator Short Circuit	1 byte	Read	-
		46hex 70	0 1-8	Actuator Warning	1 byte	Read	-
		54hex 84	0	Serial number	16 bytes	Read / Write	16x00hex

4 IO-Link Interface

Inversion 40hex

Byte	0							
Bit	7	6	5	4	3	2	1	0
Sub-inde	8	7	6	5	4	3	2	1
Description	Inversion Input 8	Inversion Input 7	Inversion Input 6	Inversion Input 5	Inversion Input 4	Inversion Input 3	Inversion Input 2	Inversion Input 1

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

Pin Direction 41hex

Byte	0							
Bit	7	6	5	4	3	2	1	0
Sub-inde	8	7	6	5	4	3	2	1
Description	Direction Signal 8	Direction Signal 7	Direction Signal 6	Direction Signal 5	Direction Signal 4	Direction Signal 3	Direction Signal 2	Direction Signal 1

Direction of signal (x):
0 – Input
1 – Output

Fault State
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 pin.

Byte	0								1							
Bit	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0
Sub-index	4		3		2		1		8		7		6		5	
Description	Fault State Signal 4		Fault State Signal 3		Fault State Signal 2		Fault State Signal 1		Fault State Signal 8		Fault State Signal 7		Fault State Signal 6		Fault State Signal 5	

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

Power Monitoring
44hex

Byte	0							
Bit	7	6	5	4	3	2	1	0
Sub-index						3	2	1
Description	-	-	-	-	-	Short Circuit at US	Undervoltage UA	Undervoltage US

4 IO-Link Interface

Actuator Short Circuit 45hex

Byte	0							
Bit	7	6	5	4	3	2	1	0
Sub-index	8	7	6	5	4	3	2	1
Description	Short circuit Signal 8	Short circuit Signal 7	Short circuit Signal 6	Short circuit Signal 5	Short circuit Signal 4	Short circuit Signal 3	Short circuit Signal 2	Short circuit Signal 1

Actuator Warning 46hex

Byte	0							
Bit	7	6	5	4	3	2	1	0
Sub-index	8	7	6	5	4	3	2	1
Description	Warning Signal 8	Warning Signal 7	Warning Signal 6	Warning Signal 5	Warning Signal 4	Warning Signal 3	Warning Signal 2	Warning Signal 1

Setting the serial number 54hex

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

4.5. 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

4.6. Events

IO-Link Revision 1.0	
Event code	**Description**
0x5112	Low sensor voltage (US)
0x5114	Low actuator voltage (UA)
0x5410	Output stages
IO-Link Revision 1.1	
Event code	**Description**
0x5111	Low sensor voltage (US)
0x5112	Low actuator voltage (UA)
0x7710	Short circuit

5 IO-Link functions

5.1. 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.

5.2. 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. For information about the configuration of data storage and validation, please refer to the operating manual of the respective IO-Link master.

5.3. Block Configuration

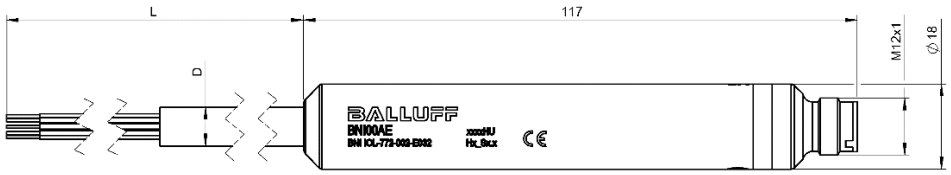
The device supports block configuration. This allows all parameters in a data block to be consistently imported from a controller or a configuration tool into the device.

5.4. Reset factory setting

The factory settings on the device can be restored by carrying out the "restore factory settings" system command.
82hex must be written to Index 2 Subindex 0 for the command.

6 Technical Data

6.1. Dimensions



6.2. Mechanical Data

Housing material	Stainless Steel housing
IO-Link port	M12, A-coded, male
Dimensions (H x W in mm)	117 x 18 without cable
Cable length	1,3 m
Weight	235 g incl. cable

6.3. Electrical data

Operating voltage	18...30.2 V DC, per EN 61131-2
Ripple	< 1%
Current consumption without load	≤ 50 mA
Load current (US)	Max. 1,4 A
Load current (UA)	Max. 1,0 A
Load current per pin	Max. 400 mA
Inputs	PNP, Type 3

6.4. Operating conditions

Ambient temperature	-5° C…+60 °C
Storage temperature	-25° C ...+ 70 °C
Degree of protection	IP69K and IP68 (only when plugged-in)

6.5. Used cable

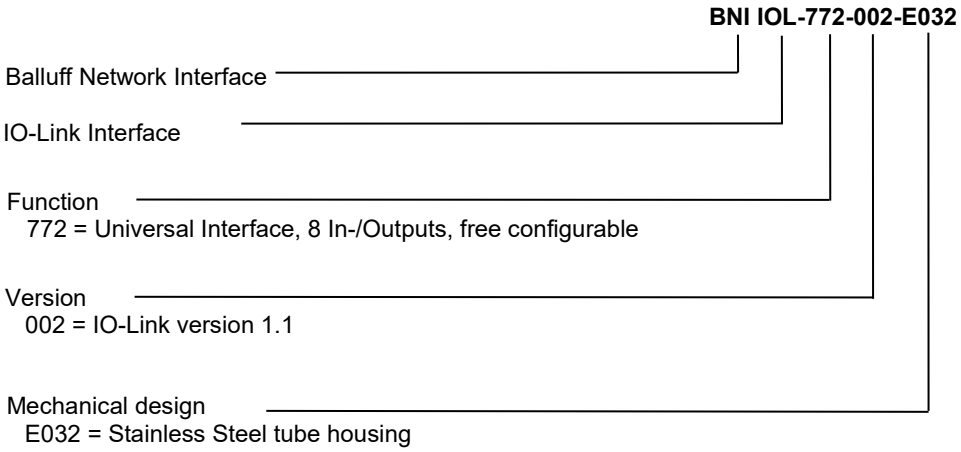
Flexible PUR Control cable
UL Style 20223
Outer diameter 10 mm

6.6. LED indicator

	Indicator	Function
IO-Link communication	Green	No communication
	Green, negatively pulsed	Communication OK
	Green, flashing with 1 Hz	U_S undervoltage < 18V
	Off	Module is without voltage
U_A LED	Green	Actuator power supply OK
	Green, flashing with 1 Hz	U_A undervoltage < 18 V
	Off	U_A not available

7 Appendix

7.1. Type Code



7.2. Order Information

Type	Order code
BNI IOL-772-002-E032	BNI00AE

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