BALLUFF

BNI EIP-507-005-Z040
BNI EIP-527-005-Z040

IP67 Module
4 IO-Link Class A and 8 in- and outputs
4 IO-Link Class B and 4 inputs
User's Guide

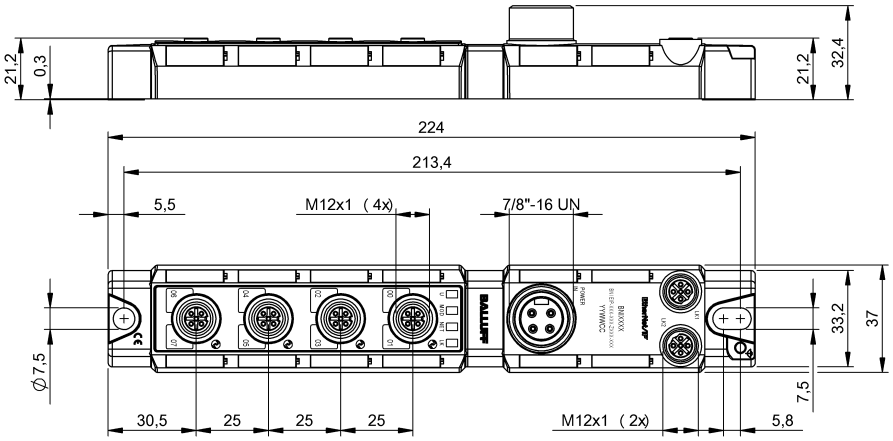


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1 General

1.1. Structure of the manual

This manual is structured such that one chapter builds on the other.
Chapter 2: Basic safety instructions
Chapter 3: Main steps for installing the device
……..

1.2. Typographical Conventions

The following typographical conventions are used in this manual.

Enumerations

Enumeration is shown in the form of bulleted lists.

- 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
↳ Result of action
➢ Action instruction 2

Actions can also be indicated as numbers in parentheses.

(1) Step 1
(2) Step 2

Syntax

Numbers:
Decimal numbers are shown without additional information (e.g. 123),
Hexadecimal numbers are shown with the additional indicator hex (e.g., 00_{hex}) or the prefix "0x" (e.g., 0x00).

Cross-references

Cross-references indicate where additional information on the topic is located.

1.3. Symbols

Note
This symbol indicates general notes.

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

1.4. Abbreviations

BNI	Balluff Network Interface
I	Standard input port
EIP	EtherNet/IP™
EMC	Electromagnetic Compatibility
FE	Function ground
O	Standard output port

1.5. Deviating views

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

1.6. Disposal



This product is covered by WEEE Directive 2012/19/EU on waste electrical and electronic equipment.

Dispose of the product properly and not as part of the regular waste stream. The regulations of the respective country are to be observed. Information is provided by the national authorities.
Or return the product to us for disposal.

2 Safety

2.1. Intended use

The BNI EIP-… is a decentralized IO-Link, input and output module for connecting to the EtherNet/IP™ network.

2.2. Installation and Startup

Attention!
Installation and startup are to be performed by trained technical personnel only. Skilled specialists are people who are familiar with the work such as installation and the operation of the product and have the necessary qualifications for these tasks. Any damage resulting from unauthorized tampering or improper use shall void warranty and liability claims against the manufacturer. The operator is responsible for ensuring that the valid safety and accident prevention regulations are observed in specific individual cases.

2.3. General Safety Notes

Commissioning and inspection
Before commissioning, carefully read the User's Guide.
The system must not be used in applications in which the safety of persons depends on the function of the device.

Intended use
Warranty and liability claims against the manufacturer shall be rendered void by damage from:

- Unauthorized tampering
- Improper use
- Use, installation or handling contrary to the instructions provided in this User's Guide.

Obligations of the owner/operator!
The device is a piece of equipment in accordance with EMC Class A. This device can produce RF noise. The owner/operator must take appropriate precautionary measures against this for its use. The device may be used only with a power supply approved for this. Only approved cables may be connected.

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.
Approved use is ensured only when the housing is fully installed.

2.4. Resistance to Aggressive Substances

Attention!
The BNI modules always have good chemical and oil resistance. When used in aggressive media (such as chemicals, oils, lubricants and coolants, each in a high concentration (i.e. too little water content)), the material must first be checked for resistance in the particular application. No defect claims may be asserted in the event of a failure or damage to the BNI modules caused by such aggressive media.

Dangerous Voltage

Attention!
Before working on the device, switch off its power supply.

Note
In the interest of continuous improvement of the product,
Balluff GmbH reserves the right to change the technical data of the product and the content of these instructions at any time without notice.

3 First Steps

3.1. Module Overview

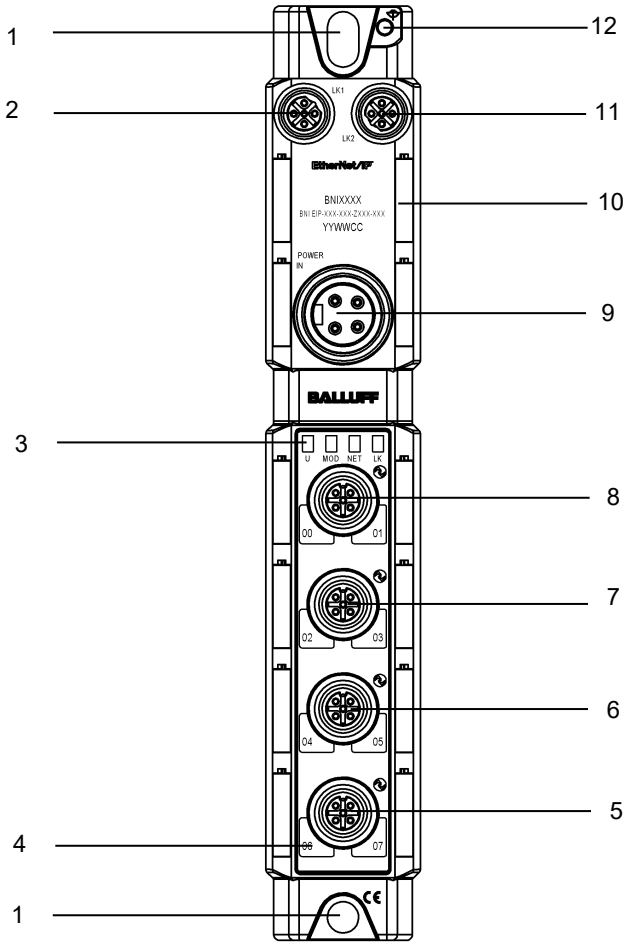


Figure – Overview BNI EIP-5x7-005-Z040

1	Mounting hole	7	Port 02 / 03
2	EtherNet/IP™-Port 1	8	Port 00 / 01
3	Status-LEDs	9	Power IN
4	Pin/Port-LEDs	10	Labels
5	Port 06 / 07	11	EtherNet/IP™-Port 2
6	Port 04 / 05	12	Ground connection

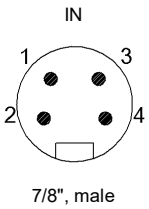
3 First Steps

3.2. Mechanical Connection

The module is secured by means of two M6 screws and two washers.
Insulation support is available separately.

3.3. Electrical Connection

Power supply

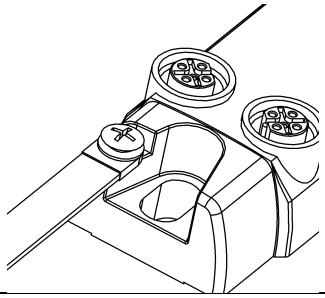


7/8", male

	Pin	Function	Description
Class A	1	+24 V	Actuator supply
	2	+24 V	Module / sensor supply
	3	0 V	GND module / sensor and actuator supply
	4		
Class B	1	P24	Separate supply voltage (+)
	2	+24 V	Module / sensor supply
	3	0 V	GND module / sensor supply
	4	N24	Separate supply voltage (-)

Note
Provide sensor/bus power and actuator power from separate power sources if possible. The total current of the module must not exceed 9 A, even if the module is looped through a circuit.

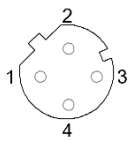
Grounding



Note
The functional ground connection between housing and machine must have a low impedance and be as short as possible.

Ethernet-IP-interface

M12, D-coded, female

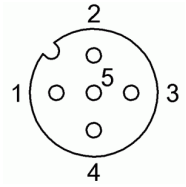


Pin	Function	Description
1	Tx+	Transmit Data +
2	Rx+	Receive Data +
3	Tx-	Transmit Data -
4	Rx-	Receive Data -

3 First Steps

Ports

M12, A-coded, female



Pin	Function	
	Class A	**Class B**
1	+24V 1.6 A	+24V 1.6A
2	Input/output 2A	P24
3	0V	0V
4	IO-Link input/output 2A IO-Link	Input/ IO-Link
5	n. c.	N24

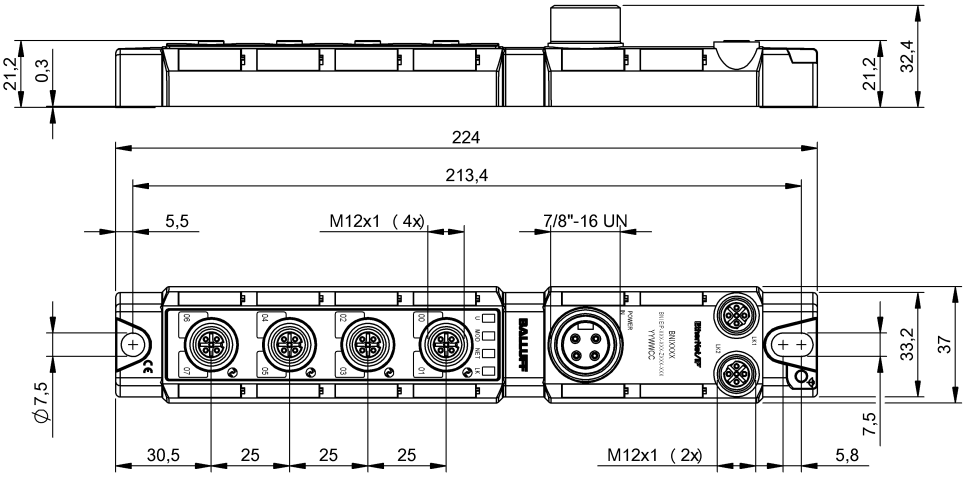
Note
The digital inputs conform to the input characteristics in EN61131-2, Type 3.

Note
The IO-Link output is powered from the sensor supply.

Note
Unused I/O ports must be provided with cover caps to comply with degree of protection IP67.

4 Technical Data

4.1. Dimensions



4.2. Mechanical Data

Housing material	Zinc die casting, matte nickel-plated
Enclosure rating per IEC 60529	IP 67 (only in plugged-in and screwed-down state)
Power supply	7/8" 4-pol, male
Dimensions (W x L x H in mm)	37 x 224 x 32.6
Mounting type	2-hole screw attachment
Ground connection	M4
Weight	Approx. 350 g

4.3. Operating conditions

Ambient temperature Storage temperature	-40 °C ... 70 °C -40 °C ... 70 °C

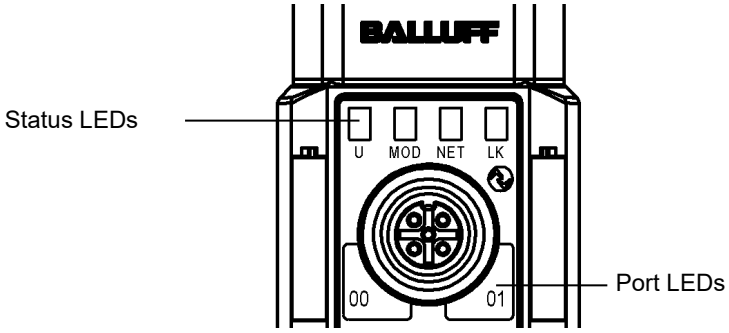
4.4. Electrical Data

Supply voltage	18...30.2 V DC, in accordance with EN 61131-2
Ripple	< 1%
Input current at 24 V	130 mA

4.5. Ethernet

Ethernet port	2 x 10 Base-/100Base-Tx
Connection for Ethernet port	M12 socket, D-coded
Cable types in accordance with IEEE 802.3	Shielded, twisted pair min. STP CAT 5/ STP CAT 5e
Data transmission rate	10/100 Mbps
Max. cable length	100 m
Flow control	Half-/Full duplex

4.6. Function indicators



Module Status

LED	Indicator	Function
U	Green	Supply voltage OK
	Red	Supply voltage < 18 V
MOD	Green, flashing	Incorrect or no configuration of the module
	Green	Module is working
	Red, flashing	Fixed bus clock is not possible
	Red-Green, flashing	Initial sequence
NET	Off	Module has no IP address
	Green, flashing	Module has IP, but no connection established
	Green	Connection established
	Red, flashing	Connection timeout
	Red-Green, flashing	Initial sequence
LNK	Green	Data transfer

Port

Each port has two bicolored LEDs for displaying the I/O statuses.

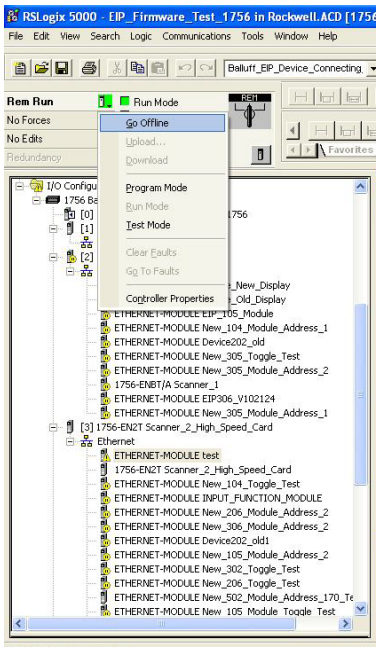
	Display	Status	Description
I/O port	Off	I/O status	The status of the input or output pins is 0
	Yellow	I/O status	The status of the input or output pins is 1
	Red, flashing	Short-circuit	Short-circuit between pin 1 and 3
	Red	Short-circuit	Short-circuit at dedicated pin
IO-Link port	Green	IO-Link	IO-Link communication active
	Green, flashing	IO-Link	No IO-Link communication
	Green, rapidly flashing	IO-Link	IO-Link pre-operate during data storage
	Red	Short-circuit	Short-circuit at pin 4
	Red, rapidly flashing	IO-Link	Validation failed / Data storage failed / Wrong device for data storage

5 Integration

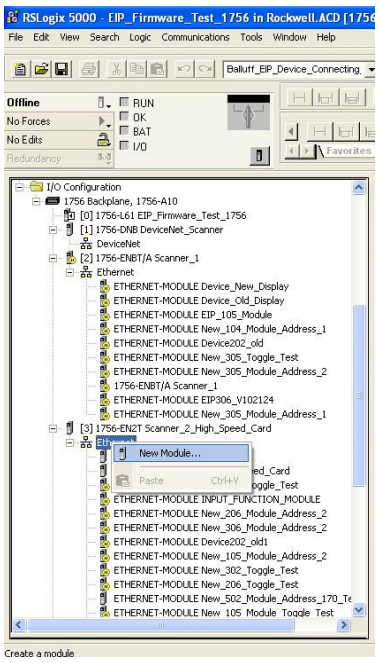
5.1. Integration in Rockwell RS Logix 5000

Here you see an example of how the module can be integrated into a Rockwell RS Logix 5000:

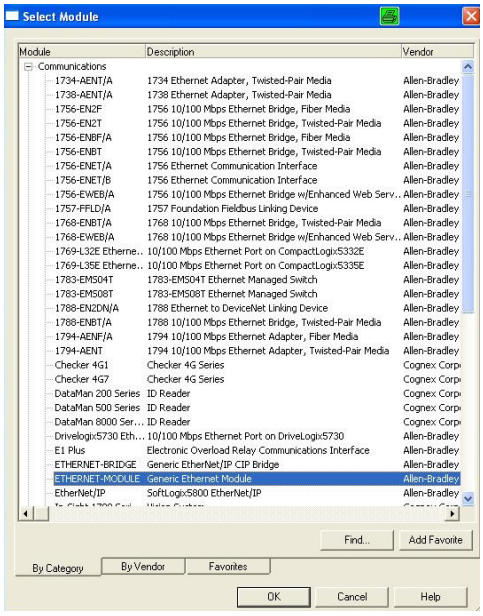
First go offline



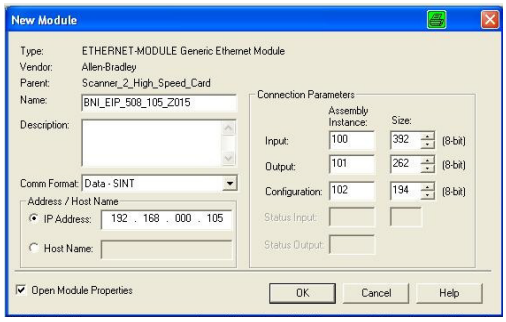
Right-click Ethernet (on the correct scanner card)
Select a new module



Then select the general Ethernet module as the ETHERNET module in the communication path

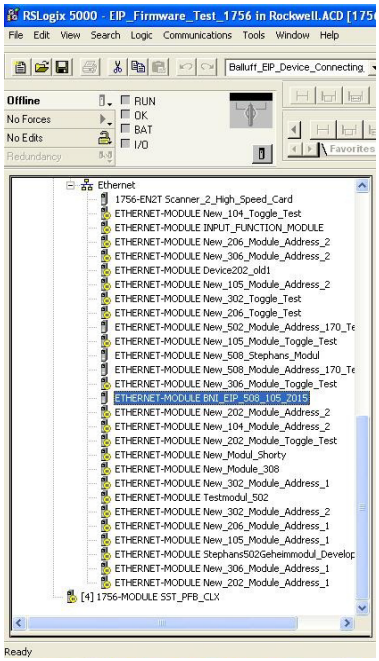


Now enter a user-defined tag name to select the general format Data-SINT, to enter the IP address of the module and to enter the correct connection parameters.

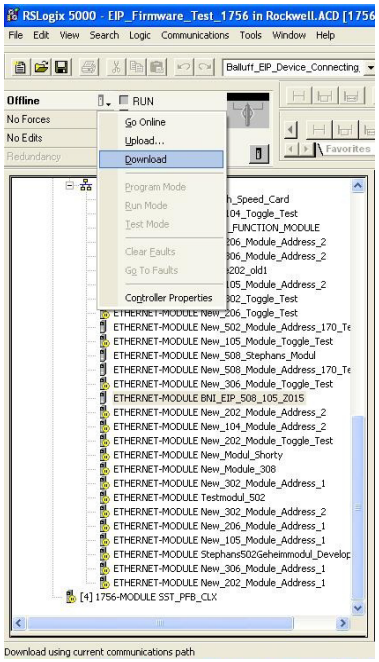


5 Integration

The new module and corresponding controller tags are generated automatically.



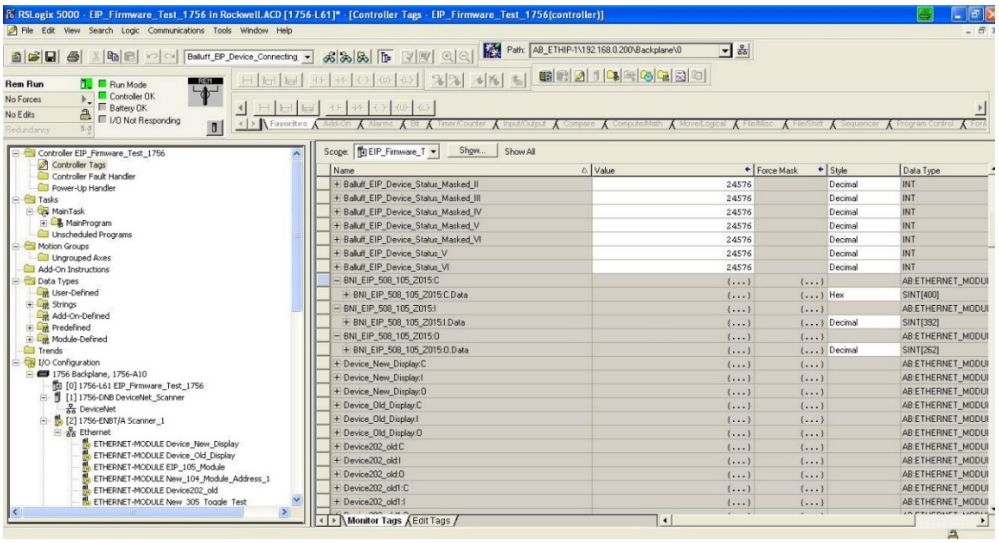
Then download the configuration



When the download is done, you can observe and control the tags using the Controller Tags option. Make sure you select the correct tag name, which you configured beforehand.

The input, output and configuration data for this is described on the following pages.

You can use these tags for the programming, too.



5 Integration

5.2. Address Specifications

These settings are factory-set.

IP-Adresse: 192.168.1.1
Subnetmaske: 255.255.255.0
Gatewayadresse: 192.168.1.1

5.3. Data Configuration

Please enter the following values in the control system. They describe the data sizes of the input, output and configuration data.

	Instanc ID	Data length				
		502	508	507	527	508-C06
Input	100	200	392	196	196	128
Output	101	134	262	130	128	86
CONFIG	102	98	194	98	98	0

5.4. Configuration Data

The following tables show an allocation of the configuration data sequence. The standard values specified below describe a configuration with the IO-Link function at Pin 4 and standard I/O functions at Pin 2 and 4 of each port. The input and output functions of the configured standard I/O ports are set via the process data.

BNI EIP-502-105-XXXX, BNI EIP-507-005-Z040, BNI EIP-527-005-Z040

Byte	Slot	Module part	Description
0…1	1	Module	General configuration for the entire module
2…25	2	IO-Link port 0	Configuration of IO-Link port 0
26…49	3	IO-Link port 1	Configuration of IO-Link port 1
50…73	4	IO-Link port 2	Configuration of IO-Link port 2
74…97	5	IO-Link port 3	Configuration of IO-Link port 3

BNI EIP-508-105-XXXX

Byte	Slot	Module part	Description
0…1	1	Module	General configuration for the entire module
2…25	2	IO-Link port 0	Configuration of IO-Link port 0
26…49	3	IO-Link port 1	Configuration of IO-Link port 1
50…73	4	IO-Link port 2	Configuration of IO-Link port 2
74…97	5	IO-Link port 3	Configuration of IO-Link port 3
98…121	6	IO-Link port 4	Configuration of IO-Link port 4
122…145	7	IO-Link port 5	Configuration of IO-Link port 5
146…169	8	IO-Link port 6	Configuration of IO-Link port 6
170…193	9	IO-Link port 7	Configuration of IO-Link port 7

Note
The BNI EIP-508-XXX-XXXX-C06 has no configuration data. These are fixed and can not be changed.

Module Configuration BNI EIP-502-105-XXX

Byte	Bit								Description
	7	6	5	4	3	2	1	0	
0	P3		P2		-		-		Port function *0x00: Standard I/O* *0x01: IO-Link*
1	P7		P6		-		-		

Module Configuration BNI EIP-508-105-XXX

Byte	Bit								Description
	7	6	5	4	3	2	1	0	
0	P3		P2		P1		P0		Port function *0x00: Standard I/O* *0x01: IO-Link*
1	P7		P6		P5		P4		

Module Configuration BNI EIP-507-005-Z040, BNI EIP-527-005-Z040

Byte	Bit								Description
	7	6	5	4	3	2	1	0	
0	P3		P2		P1		P0		Port function *0x00: Standard I/O* *0x01: IO-Link*
1	Reserved								

Module Configuration BNI EIP-508-XXX-XXXX-C06

The IO-Link ports are always activated.

5 Integration

IO-Link Port Configuration

Byte	Bit								Description
	7	6	5	4	3	2	1	0	
2	Basic		Time						Cycle time
3	Validation type								Validation type *0 No validation* *1 compatible (VID + DID)* *2 Identical (VID + DID + SerNum)*
4	Vendor ID 1								Vendor ID
5	Vendor ID 2								
6	Device ID 1								Device ID
7	Device ID 2								
8	Device ID 3								
9	Serial number 1								Serial number
…	…								
24	Serial number 16								
25	Parameter server								Parameter server *0x8X Enable* *0x0X Disable* *0x40 Delete* *0xX1 Enable upload* *0xX2 Disable download*
…	The data of the other IO-Link ports is structured identically and described in the following. For the BNI EIP-508-XXX-XXXX-C06 these data are not adjustable.								

Cycle Settings

This parameter can be used to influence the IO-Link communication speed. Calculated using the multiplier and the time base, the IO-Link cycle time can be increased.
The time base is described in Table B3. The multiplier is entered in decimal form from 0…63.

Bit								Description
7	6	5	4	3	2	1	0	
Time base		Multiplier						**Bit 0 to 5: Multiplier** These bits contain a 6-bit multiplier for the calculation of MasterCycleTime or MinCycle Time. Permissible values for the multiplier are 0 to 63. **Bit 6 to 7: Time Base** These bits specify the time base for the calculation of MasterCycleTime or MinCycleTime.

Possible values of MasterCycleTime and MiniCycleTime

Time base encoding	Time Base value	Calculation	Cycle Time
00	0,1 ms	Multiplier x Time Base	0,4 ms to 6,3 ms
01	0,4 ms	6,4 ms + Multiplier x Time Base	6,4 ms to 31,6 ms
10	1,6 ms	32,0 ms + Multiplier x Time Base	32,0 ms to 132,8 ms
11	Reserved	Reserved	Reserved
NOTE: The value 0,4 results from the minimum possible transmission time according to A.3.7.			

Validation Settings

No validation: validation deactivated, every device will be accepted.
Compatibility: manufacturer ID and device ID are compared to the IO-Link device data.
Identity: manufacturer ID and device ID and serial number are compared to the IO-Link device data. The IO-Link communication is only started if there is a match.

5 Integration

Parameter Server

Enable: data management functions enabled, parameter data and identification data of the IO-Link device are stored permanently.
Disable: data management functions disabled, stored parameter data and identification data of the IO-Link device remain stored.
Deleted: data management functions disabled, stored parameter data and identification data of the IO-Link device are deleted.
Enable upload:
If only the upload is enabled, the master always starts an upload of the parameter data. In this case, the upload is independent of the upload flag of the IO-Link device. If no data is stored in the Master Port, an upload likewise takes place. (e.g. after deleting the data or before the first data upload)
Enable download:
If only the download is enabled, the master always starts a download of the parameter data. In this case, the download is likewise independent of the upload flag of the IO-Link device. If no data is stored in the Master Port, however, an upload takes place first. (e.g. after deleting the data or before the first data upload)
Enable upload and download:
If the upload and download are enabled, different parameter sets are distinguished depending on the upload flag of the IO-Link device.
If no parameter data is stored in the IO-Link master port, an initial upload takes place. (e.g. after deleting the data or before the first data upload)
If the upload flag is set on the IO-Link device, an upload of the parameter data always takes place.
If no upload flag is set and parameter data has already been stored, a download of the parameter data always takes place.

Note
After the upload of the parameter data, the vendor ID and device ID of the connected IO-Link device are also still saved until the data records are deleted.
When the connected IO-Link device is started, a validation takes place. Thus, only an IO-Link device of the same type can be used for the data management.
If an IO-Link device of a different type is to be used, the contents of the parameter server must be deleted.
The data storage is supported only by IO-Link devices with IO-Link Revision 1.1.

Upload Flag on the IO-Link Device

The upload flag is needed to overwrite already saved data in the parameter server with new parameter data of the same IO-Link device.

To enable the upload flag of an IO-Link device,
the data value 0x05 must be entered in the index 0x02, subindex 0.
(For information about configuration via IO-Link, refer to the "Web Server" chapter under "Device Properties" or the "Configuration via Explicit Messages" chapter under "IO-Link Device Parameterization")

QuickConnect

The QuickConnect function makes it faster to boot up and integrate the BNI EIP-5x7x-005-Z040 modules.

Enabling QuickConnect automatically takes over all necessary port properties on the module:

- Static IP address
- Ports at 100 Mbps full-duplex
- Auto-negotiation disabled
- Auto MDI-X disabled
- Prepared for linear topology

You can configure **QuickConnect** via the following class instance attribute of the explicit messages:

Class	Instance	Attribute	Value
245 (0xF5)	1 (0x01)	12 (0x0C)	0: disabled (default) **1: enabled**

Note
For QuickConnect to be enabled, ACD (Address Conflict Detection) must also be enabled. This is switched on by default.

The **ACD** can be reviewed and changed using the following class instance attributes of the explicit messages:

Class	Instance	Attribute	Value
245 (0xF5)	1 (0x01)	10 (0x0A)	0: disabled **1: enabled**(default)

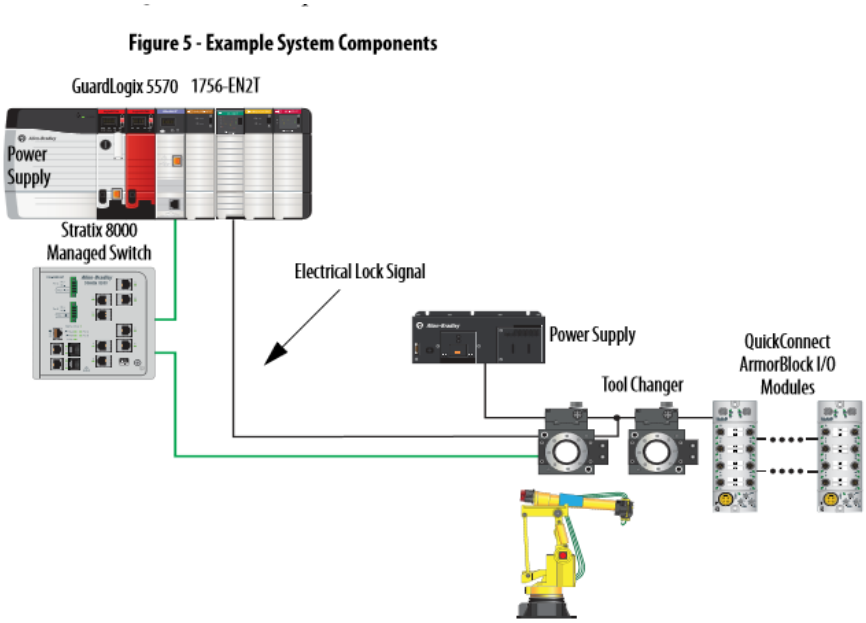
6 Configuration via Explicit Messages

Rockwell Automation Products that are Compatible with QuickConnect

Component	Supported Rockwell Automation Products
Controller	ControlLogix® controllers: • ControlLogix 5570 controllers • ControlLogix 5560 controllers GuardLogix controllers: • GuardLogix 5570 controllers • GuardLogix 5560 controllers CompactLogix controllers: • CompactLogix 5370 L3 controllers • CompactLogix 5370 L2 controllers • CompactLogix 5370 L1 controllers Compact GuardLogix Controllers • Compact GuardLogix 5370 L3 controllers
EtherNet/IP managed switch on the controller side	Stratix® switches: • Stratix 2500 switches • Stratix 5400 switches • Stratix 5410 switches • Stratix 5700 switches • Stratix 8000/8300 switches • Stratix 6000 switches
EtherNet/IP communication modules	• 1756-EN2T, firmware revision 4.003 or later • 1756-EN2TR, firmware revision 4.003 or later • 1756-EN3TR, firmware revision 4.003 or later • 1756-ENBT, firmware revision 6.002 or later
A maximum of 20 EtherNet/IP-based I/O modules with QuickConnect capability on the tool side For average connection times per number of modules, see Average Timing with Rockwell Automation Products on page 54. For network topology and architecture restrictions on the tool side, see Table 2 on page 14.	ArmorBlock® I/O modules: • 1732E-16CFGM12QCR • 1732E-16CFGM12QCWR • 1732E-12x4M12QCDR • 1732E-16CFGM12P5QCR • 1732E-16CFGM12P5QCWR • 1732E-12X4M12P5QCDR
Application logic that uses generic CIP Messages to inhibit and uninhibit I/O modules	Studio 5000 Logix Designer® application, version 21.00.00 or later or RSLogix 5000® software, version 20.01.02

Source:
Allen-Bradley Ethernet/IP QuickConnect Application Technique
Page 13

Example with Rockwell Components



Source:
Allen-Bradley Ethernet/IP QuickConnect Application Technique, Page 11

Please also note the following:

- Direct connection between PLC and QuickConnect slave with crossover cable
- Slave-to-slave connection using patch cable
- For setting up the topology, only the linear topology with a maximum of 20 modules on the tool side is permitted.
- If needed, only one managed switch may be used between the PLC and Ethernet/IP slave.
- To trigger the QuickConnect sequence, an electrical lock signal is required that reads in the supply voltage of the QuickConnect slaves via the controller.

6 Configuration via Explicit Messages

PLC Program

Add Application Logic

Add ladder logic to inhibit and uninhibit QuickConnect I/O modules:

- Run this logic in a periodic task with a recommended 10 ms update rate.
- The logic examples that are shown configure two ArmorBlock I/O modules. Modify the code to configure as many as 20 ArmorBlock I/O modules.

IMPORTANT A connection time of 500 ms with 20 QuickConnect modules is supported with only a ControlLogix 1756-L7*x* controller and 1756-EN2T communication module. For average connection times per number of modules, see Average Timing with Rockwell Automation Products on page 54.

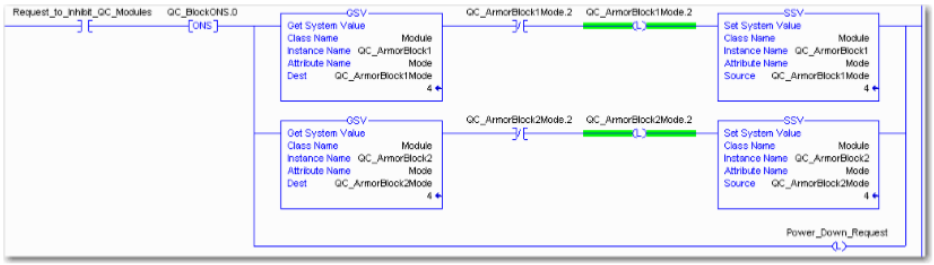
Inhibit and Power Down

Add this logic to inhibit and power down the QuickConnect modules.

1. Rung 0: Inhibit the modules.

   Before making a tool change, you must uninhibit the QuickConnect ArmorBlock I/O modules mounted to the tool before powering down. Use a GSV (Mode) instruction to monitor the present state of the modules and one SSV (Mode) instruction per module to inhibit the modules.

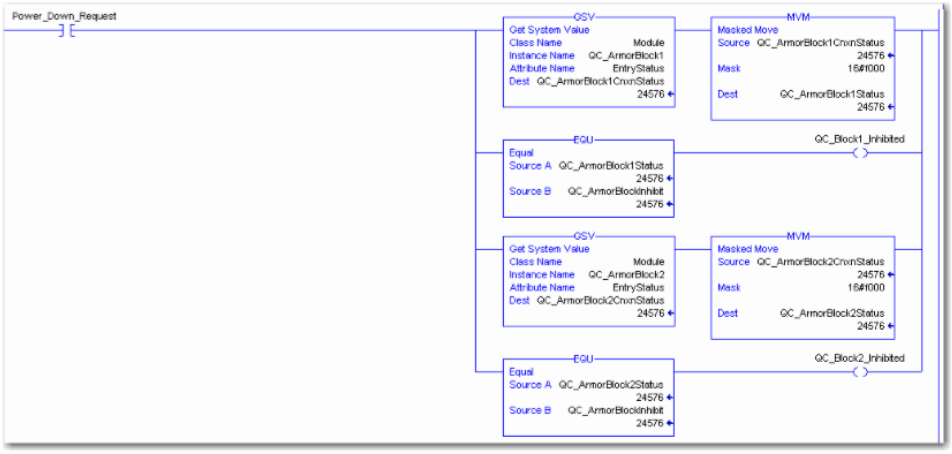
   The input condition to start the inhibit process must come from an external input. For example, as the robot is traveling back to change out the tool, this input condition must be enabled. By the time the tool is being changed, the modules are inhibited and can proceed to power down the tool and modules.



Source:
Allen-Bradley Ethernet/IP QuickConnect Application Technique, Page 32

2. Rung 1: Verify that the modules are inhibited.

   After the modules have been inhibited, verify that the modules have indeed been inhibited. Use one GSV (Entry Status) instruction per module. When the Entry Status value equals a decimal value of 24576, the module can be disconnected from the robotic arm and powered down.



3. Rung 2: Power down the modules.

   This rung verifies that all modules have been inhibited and powered down. The tool and modules can be physically disconnected from the robotic arm.



Source:
Allen-Bradley Ethernet/IP QuickConnect Application Technique, Page 33

6 Configuration via Explicit Messages

Uninhibit and Power Up

Add this logic to uninhibit and power up the QuickConnect I/O modules.

1. Rung 3: Power up the modules.

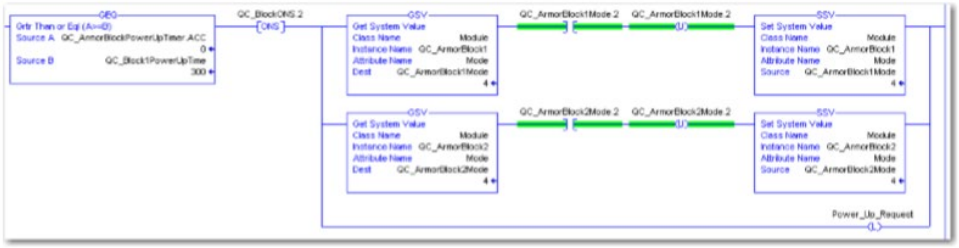
   Once the tool and module is connected, an external input module sends an electrical lock input signal. On receipt of the signal, start a timer to track how long the tool and modules have been connected.

   Every QuickConnect ArmorBlock I/O module has a delay time that is embedded in its electronic data sheet (EDS) file. This delay time is the amount of time the module takes to power up. The module takes about 300 ms to fully power up before establishing a connection to the controller.



2. Rung 4: Uninhibit the modules.

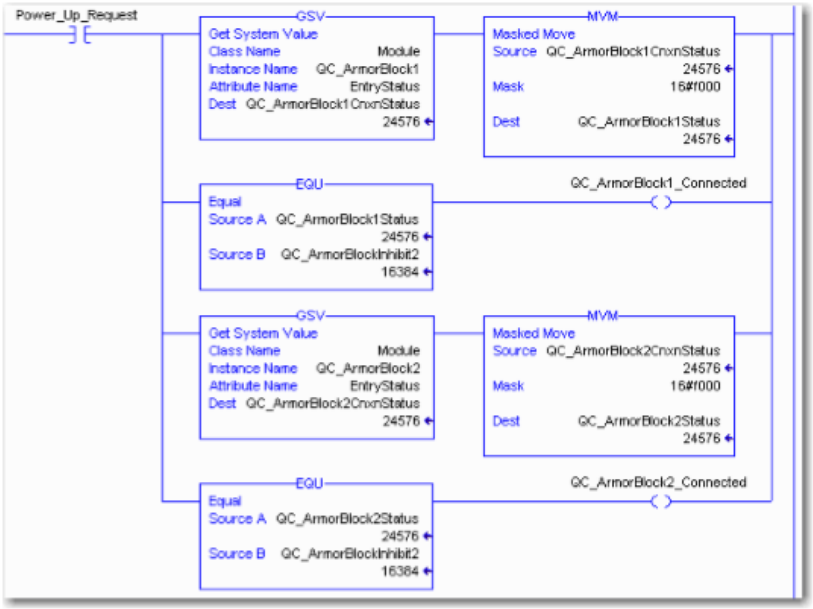
   When the Timer. Acc is greater than or equal to the module delay time (300 ms), use an SSV (Mode) instruction to uninhibit the module. Use a GSV (Mode) instruction to verify the mode of the module at powerup.



Source:
Allen-Bradley Ethernet/IP QuickConnect Application Technique, Page 34

3. (Optional) Rung 5: Verify that the modules are uninhibited.

   After the modules have been uninhibited, verify that the modules have indeed been uninhibited. Use one GSV (Entry Status) instruction per module. When the Entry Status value equals a decimal value of 16384, the module has been uninhibited.



Source:
Allen-Bradley Ethernet/IP QuickConnect Application Technique, Page 35

Fault State

A safe state that the port is to take on in the case of a loss of bus communication can be predefined for each output on the port pins.

The fault state settings can be configured using the following class instance attributes of the explicit messages.

Enable/Disable Fault State

Class	Instance	Attribute	Value
9 (0x09)	1 – m	6	0: Fault state disabled 1: Fault state enabled

Fault State Action

Class	Instance	Attribute	Value
9 (0x09)	1 – m	5	0: Output on 1: Hold last state

m: Number of outputs

Note
The fault state settings are stored only temporarily in the module. They are deleted after a power reset.
To ensure a long-term fault state configuration, the configuration has to be programmed via the PLC so that the settings are transferred to the module again when the system is restarted.

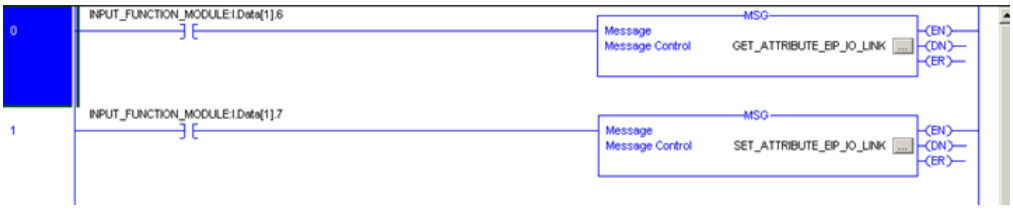
6 Configuration via Explicit Messages

IO-Link Device Parameterization

There are two options for configuring an IO-Link device connected to the IO-Link port.

- Configuration via the web server
  refer to the "Web Server" chapter under "Device Properties"
- Configuration via explicit messages

An example describes how an IO-Link can be parameterized with explicit messages via Rockwell RSLogix 5000
Explicit Messages can be parameterized
For this purpose, the "MSG" components in the PLC program are used.



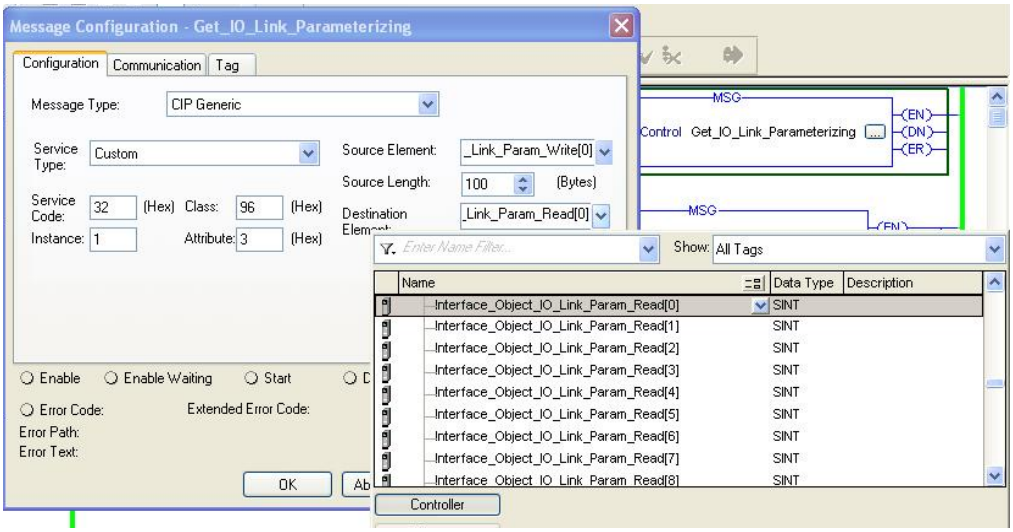
Read IO-Link Parameter

Service Code	Class	Instance	Attribute
0x32	0x96	1 - n	0x03 (Read Parameter)

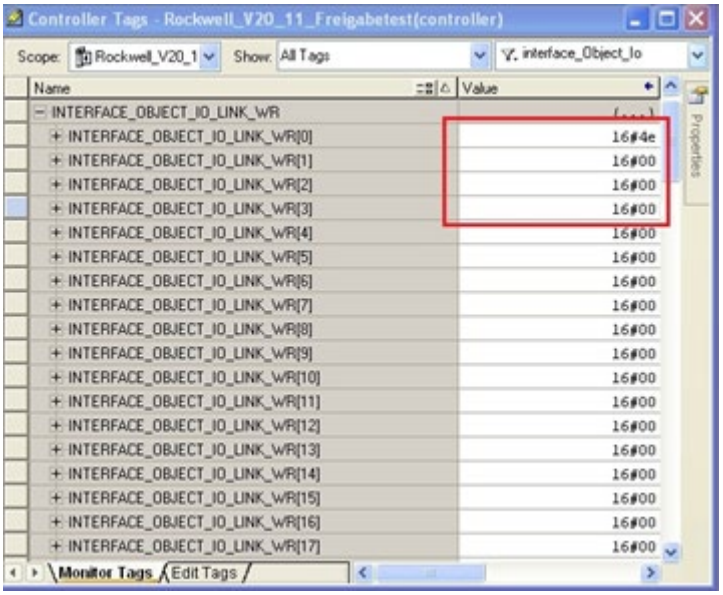
n: Number of ports

Source Length must correspond to at least the read parameters, but a larger value can also be entered. (In this example, 100 bytes)

As the Source Element (Write) and as the Destination Element (Read), create one SINT[100] array each and select the first line[0].

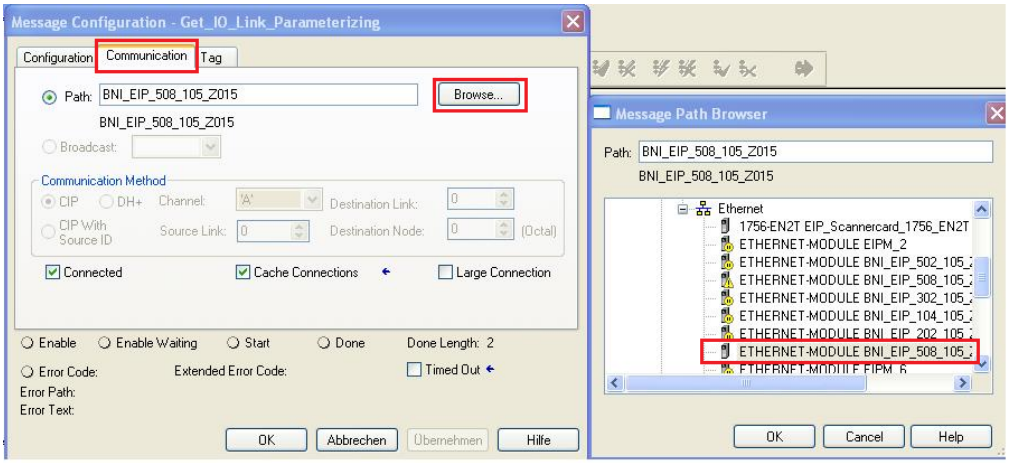


In the Source Element Array (Write), enter which index is to be read.
In this example, this is index 0x4E.



Destination Array (Read) shows the read-out value.
In case of a configuration error, the error code is likewise displayed there.

In the "Communication" window, you have to select the Ethernet module on which the configuration is to take place.



6 Configuration via Explicit Messages

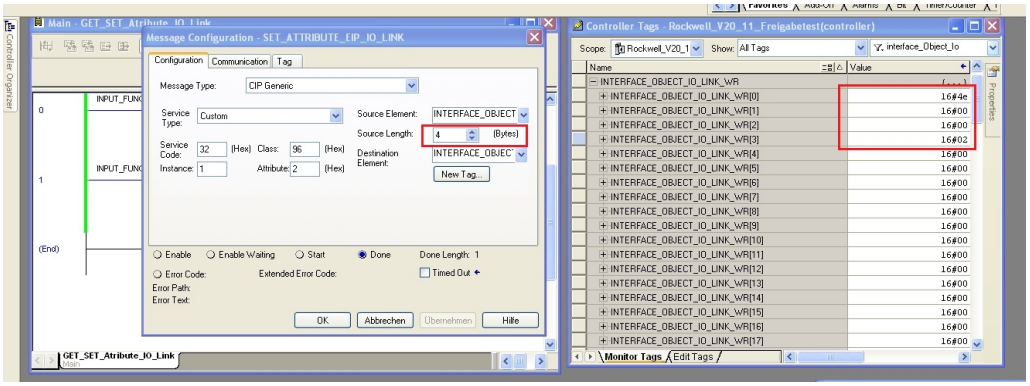
Write IO-Link Parameter

Service Code	Class	Instance	Attribute
0x32	0x96	1 - n	0x02 (Write Parameter)

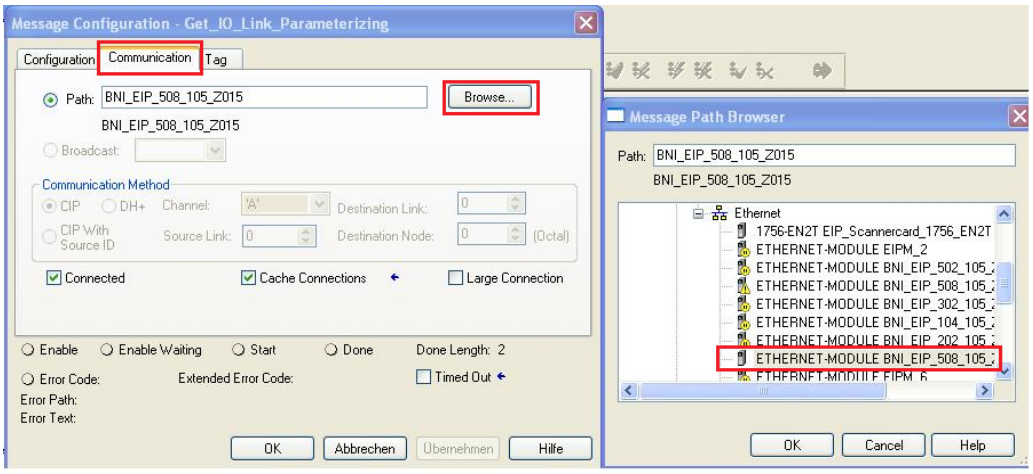
n: Number of the ports

Source Element and Destination Element are to be selected so they are identical to the previous example, "Read IO-Link parameter".
The Source Length must be exactly the same length as the parameter data to be written.

In this example, index 0x4E, subindex 0,
value 0x02 is written in Source Element Array (Write).
In case of a configuration error, an error code appears in Destination Element Array (Read).



In the "Communication" window, you likewise have to select the Ethernet module on which the configuration is to take place.



Note
The explicit messages functions are implemented in accordance with the Volume 1: Common Industrial Protocol Specification and Volume 2: Ethernet/IP Adaption of CIP.

7 Process Data

7.1. Process Data Inputs

The input data size is 196 bytes. Take a look at the tables below for the allocation of the process data inputs.

BNI EIP-507-005-Z040 and BNI EIP-527-005-Z040

Byte	Module part	Description
0…3	Standard I/O ports	Process data inputs at the standard inputs
4…51	IO-Link port 1	Process data inputs at IO-Link port 0
52…99	IO-Link port 2	Process data inputs at IO-Link port 1
100…147	IO-Link port 3	Process data inputs at IO-Link port 2
148…195	IO-Link port 4	Process data inputs at IO-Link port 3

Standard Input Data

BNI EIP-507-005-Z040

Byte	Bit								Description
	7	6	5	4	3	2	1	0	
0	I32	I34	I22	I24	I12	I14	I02	I04	Input data *I04 → Input at port 0, pin 4* *The result is 0 only if the port is configured as an IO-Link port.*
1	S3		S2		S1		S0		Short-circuit status *Short-circuit between pin 1 and 3 at the registered port*
2	O32	O34	O22	O24	O12	O14	O02	O04	Overload status *O04 → Overload at port 0, pin 4* *Only if the port is configured as an output.*
3	0	0	0	0	0	NA	PS	PA	Status of the power supply *NV: No actuator power supply* *PS: Power supply for sensor* *PA: Power supply for actuator*

BNI EIP-527-005-Z040

Byte	Bit								Description
	7	6	5	4	3	2	1	0	
0	-	I34	-	I24	-	I14	-	I04	Input data *I04 → Input at port 0, pin 4* *The result is 0 only if the port is configured as an IO-Link port.*
1	S3		S2		S1		S0		Short-circuit status *Short-circuit between pin 1 and 3 at the registered port*
2	O32	-	O22	-	O12	-	O02	-	Overload status *O04 → Overload at port 0, pin 4* *Only if the port is configured as an output.*
3	0	0	0	0	0	NA	PS	PA	Status of the power supply *NV: No actuator power supply* *PS: Power supply for sensor* *PA: Power supply for actuator*

7 Process Data

IO-Link Input Data BNI EIP-507-005-Z040 and BNI EIP-527-005-Z040

Byte	Bit								Description	
	7	6	5	4	3	2	1	0		
4 … 35									IO-Link port 0 input data	
36	0	0	0	0	0	0	DC	IOL	IO-Link status *IOL: Port in IO-Link mode* *DC: Device connected* *0: Reserved*	
37	SC	0	0	0	0	PDI	DF	VF	IO-Link error *VF: Validation failed* *SC: IO-Link short-circuit* *DF: Data storage validation failed* *PDI: Process data invalid*	
38	Vendor ID 1								Vendor ID	
39	Vendor ID 2									
40	Device ID 1								Device ID	
41	Device ID 2									
42	Device ID 3									
43	Mode		Type		0				Event 1	*Mode:* *0: Reserved* *1: Event single shot* *2: Event disappears* *3: Event appears* *Type:* *0: Reserved* *1: Notification* *2: Warning* *3: Error*
44	Event code high									
45	Event code low									
46	Mode		Type		0				Event 2	
47	Event code high									
48	Event code low									
49	Mode		Type		0				Event 3	
50	Event code high									
51	Event code low									
…	The data of the other IO-Link ports are structured identically and described in the following.									

7.2. Process Data Outputs

BNI EIP-507-005-Z040

Byte	Module part	Description
0…1	Standard I/O ports	Process data outputs at the standard inputs
2…33	IO-Link-Port 0	Process data outputs at IO-Link port 0
34…65	IO-Link Port 1	Process data outputs at IO-Link port 1
66…97	IO-Link Port 2	Process data outputs at IO-Link port 2
98…129	IO-Link Port 3	Process data outputs at IO-Link port 3

Standard Output Data

Byte	Bit								Description
	7	6	5	4	3	2	1	0	
0	O32	O34	O22	O24	O12	O14	O02	O04	Output data *O04 → Output at port 0, pin 4* *To use this function at an IO-Link port, the port has to be configured as an output.*
1	R32	R34	R22	R24	R12	R14	R02	R04	Restart *Restart of the output after a short-circuit is detected*

IO-Link Output Data

Byte	Bit								Description
	7	6	5	4	3	2	1	0	
2…33									IO-Link port 0 output data
…	The data of the other IO-Link ports are structured identically and described in the following.								

7.3. Process Data Outputs

BNI EIP-527-005-Z040

Byte	Module part	Description
0…31	IO-Link-Port 0	Process data outputs at IO-Link port 0
32…63	IO-Link Port 1	Process data outputs at IO-Link port 1
64…95	IO-Link Port 2	Process data outputs at IO-Link port 2
96…127	IO-Link Port 3	Process data outputs at IO-Link port 3

IO-Link Output Data

Byte	Bit								Description
	7	6	5	4	3	2	1	0	
0…31									IO-Link port 0 output data
…	The data of the other IO-Link ports are structured identically and described in the following.								

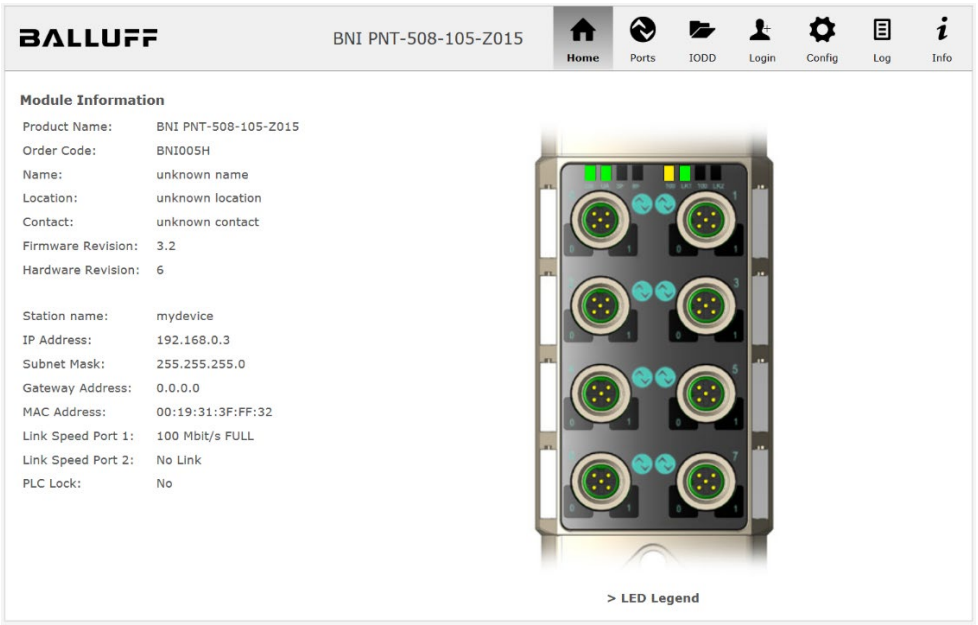
8 Web Server

8.1. General Information

The BNI fieldbus module contains an integrated web server for retrieving detailed device information and for configuring the device.

To use the web interface you must first ensure that the module has been correctly integrated into your network. In addition the IP subnet of the BNI module must be accessible from the PC on which the browser is running. Please use Internet Explorer 10 or newer as the browser; older versions may result in display problems.

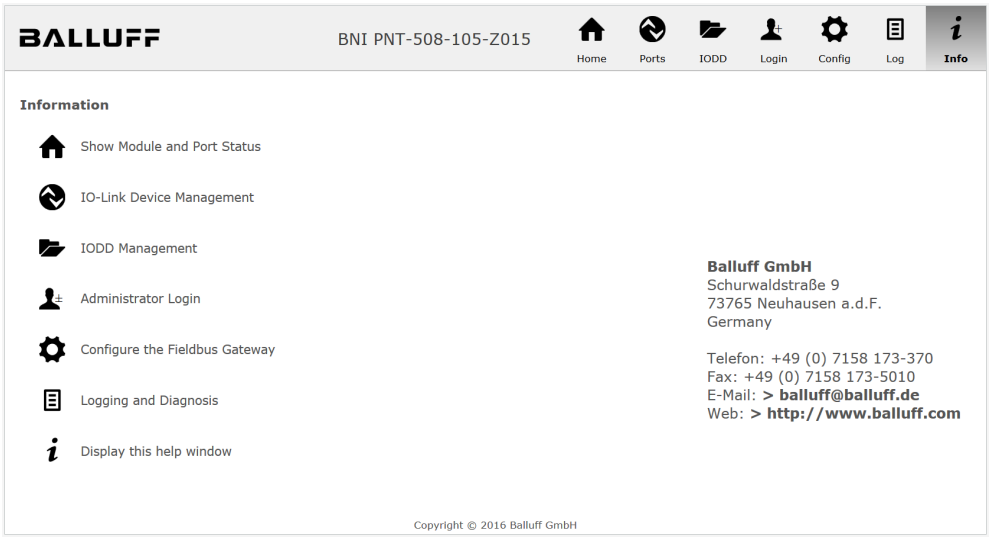
For open a connection with the web server, enter the IP address of the module in the address line of the browser. The homepage then appears with the essential device information.



8.2. Navigation / Info

The navigation bar is located in the upper area of the window, which allows you to switch between the various dialogs of the web interface. To do this click on the corresponding icon.

When the "Info" tab is selected the following overview appears:



The "BALLUFF" logo at upper right links to the international Balluff homepage.

8 Web Server

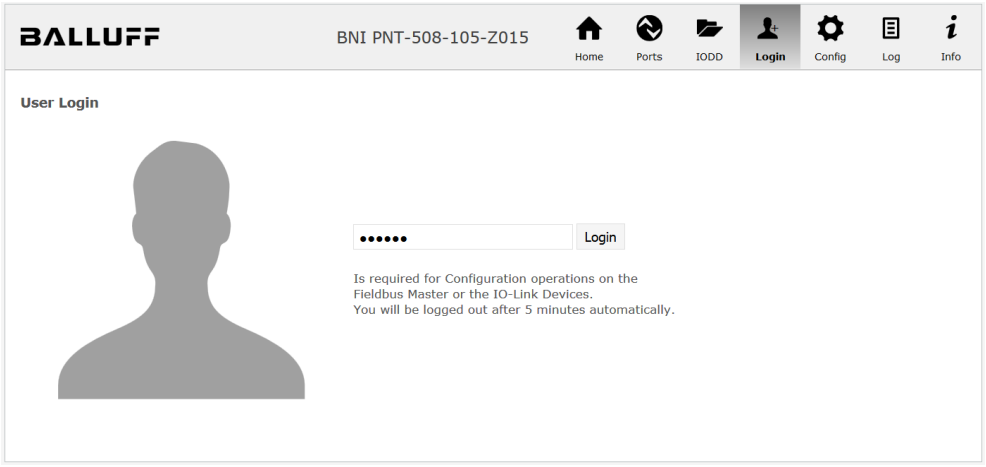
8.3. Login/Logout

To make configuration settings on the fieldbus module using the web interface, you must first log in. Functionalities which cannot be used without logging in are indicated by the grayed out buttons.

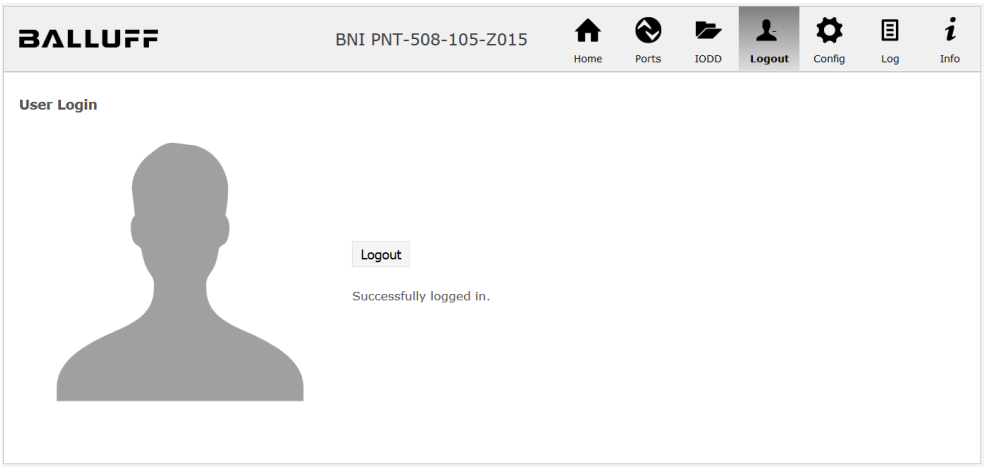
The default password is:

BNI PNT-XXX-XXX-XXXX	"BNIPNT“
BNI EIP-XXX-XXX-XXXX	"BNIEIP“
BNI ECT-XXX-XXX-XXXX	"BNIECT“

The password cannot be changed!



After successfully logging in the dialogs are shown as follows:



Use the "Logout" button to log out again. After 5 minutes of no interaction with the Webserver the user is automatically logged out.

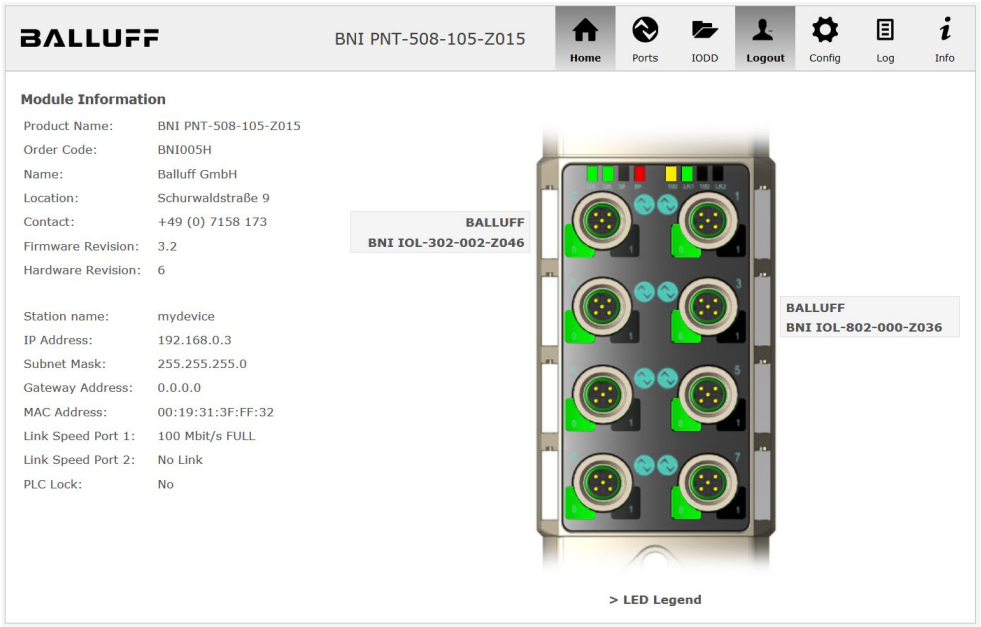
Note
For security reasons the fieldbus module shows only one login at a time with configuration access. Reading (without logging in) is however possible from multiple PCs at the same time on the fieldbus module.

8.4. "Home" dialog

Under "Home" you are given the essential information about the fieldbus itself and its network activity. You are also shown whether the configuration block was enabled by the controller (PLC).

Information is also shown about the current process data and the status of the module via the corresponding LEDs. After selecting "LED Legend" a Help dialog appears which explains the meaning of the LEDs.

If an IO-Link device is connected to one of the configured IO-Link terminals, some of the device data will be displayed in addition to the module data in the form of a link. After selecting one of these links the corresponding device dialog is opened.



8 Web Server

PNT:



EIP:



8.5. "Ports" dialog

The "Ports" dialog displays information and process data for the connected IO-Link devices. Select the desired IO-Link Port in the image of the fieldbus module on the right side to see the device data.

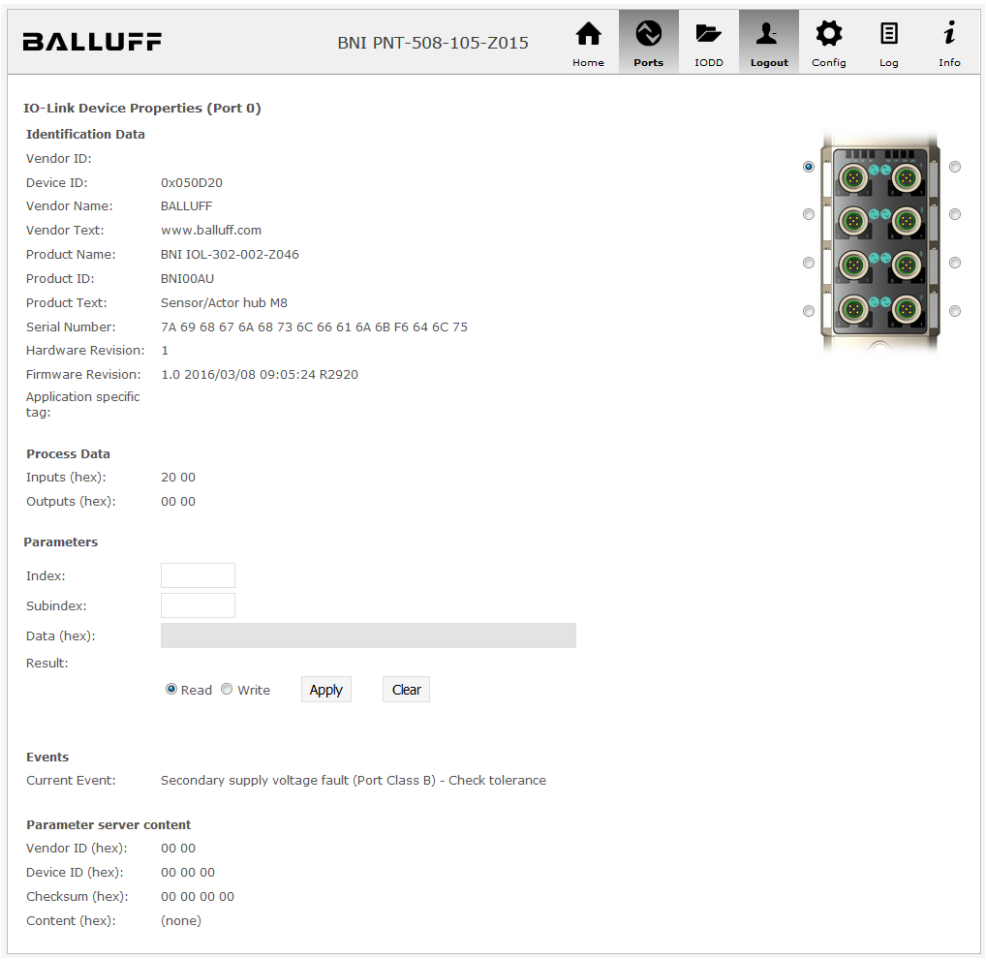
Note
The IO-Link device data are only displayed if the port is also configured as an IO-Link port!

No appropriate IODD uploaded

It is possible to read and write the configuration parameters of the IO-Link device via the "Parameters" option. The parameter indexes and subindexes of the IO-Link device are described in the corresponding separate user's guide (and follow the IO-Link conventions).

Under "Events" you can see whether a diagnostic event from the IO-Link device exists.

Under "Parameter Server Content" you can view the content of the parameter server if parameter data is stored on the parameter server.



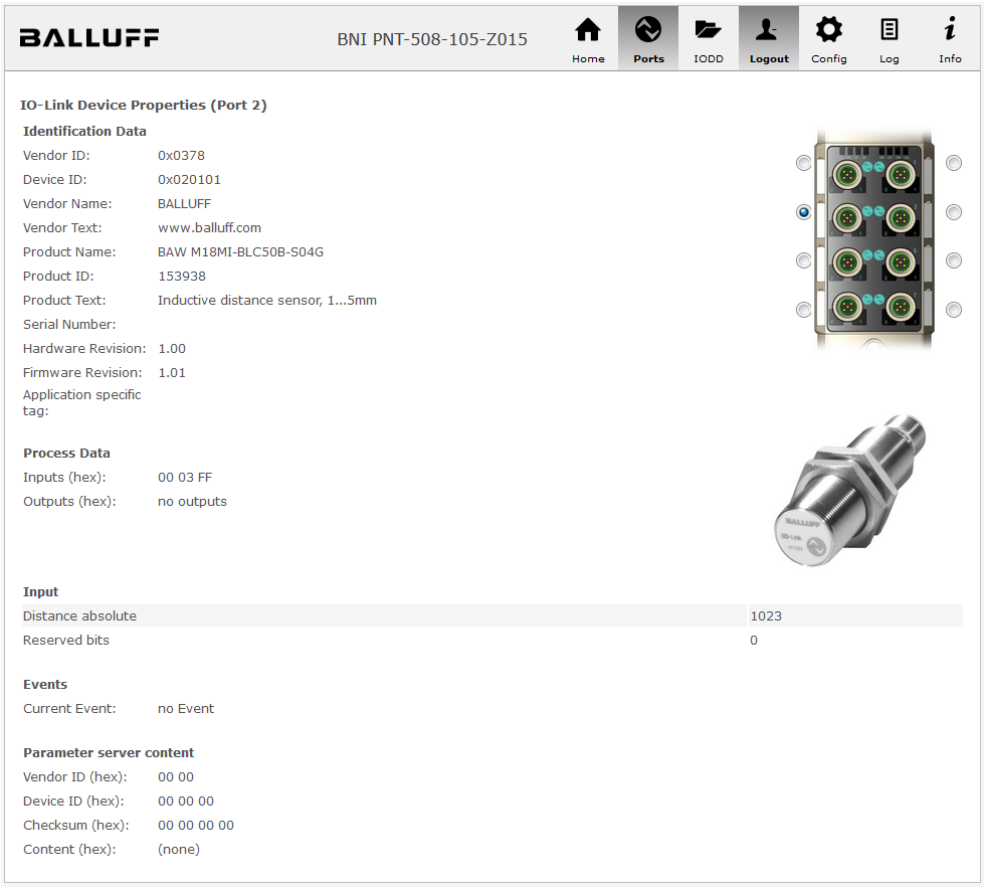
"Ports" dialog with direct parameter access

8 Web Server

Appropriate IODD uploaded

If an IODD appropriate to the IO-Link device connected to the currently selected port has been uploaded (see "Dialog "IODD"), the normal dialog for "Process Data" and "Parameters" is not displayed, but rather an expanded dialog.
Information from the IODD of the device is used so that the data can be better understood.

Thus in the following screenshot not only are the input data of the distance sensor displayed as a hex number, but also interpreted and labeled under "Input".
Since the sensor has no parameters, none are displayed.

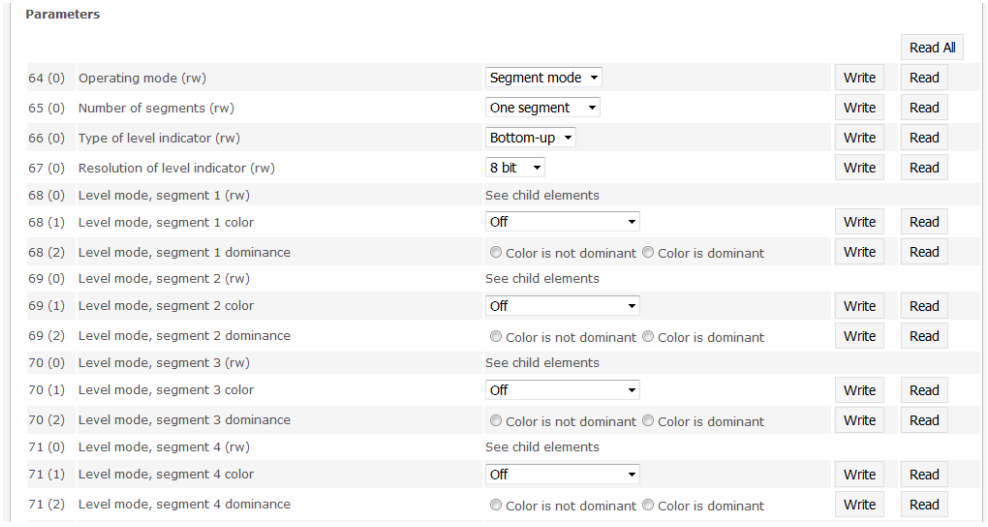


Dialog "Ports“: IODD interpretation and device image

If the IODD of the IO-Link device on the currently selected port has parameters, these are shown in table format (see following screenshot). In this example the parameters for the Balluff Smart Light are shown.
The Smart Light is a signal light which can be used in three different modes. These modes can be set using an IO-Link parameter. The parameter values and associated texts are stored in the IODD.
This means "Operation Mode" can be read out and displayed ("Read" and "Read All" buttons) or written to the device ("Write" button).

If subindexes have no buttons they cannot be individually processed but rather only the entire index at once.

Note
Each changed value must be individually written by clicking on the "Write" button!



"Ports" dialog: Parameter list of an IO-Link device with uploaded IODD

8 Web Server

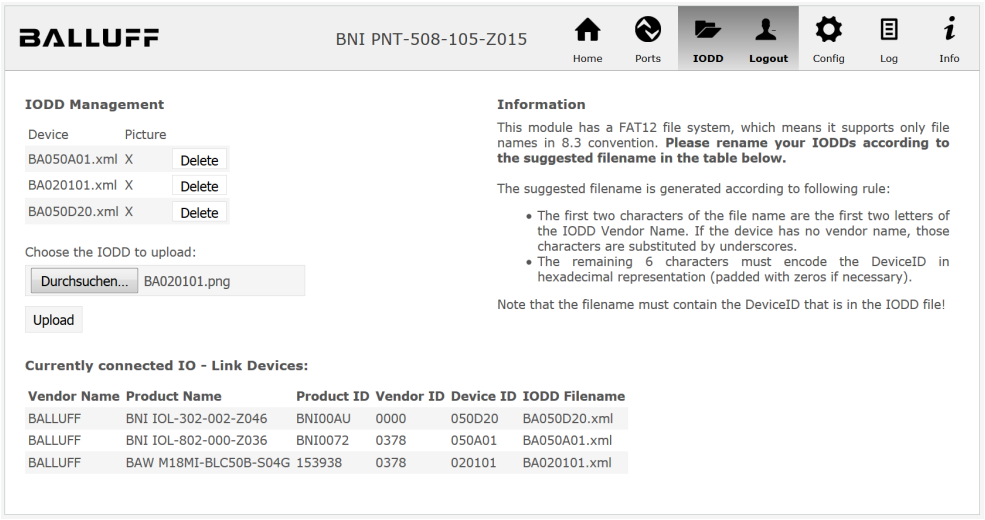
8.6. "IODD" dialog

Using this dialog you can transfer IODDs (device description files for IO-Link devices) and the associated device images to the fieldbus module, so that a detailed representation of the connected IO-Link devices in the "Ports" dialog is possible.

When IO-Link devices are connected and IO-Link ports are activated, the dialog shows a table with information about the IO-Link devices.

The fieldbus module file system supports only device names in "8+3" format, i.e. with a restricted name length. Since IODD files are generally published with a long file name, these must be renamed and given a shorter naming scheme on the PC before uploading to the fieldbus module.
For this a help setting is provided in the dialog, with the associated required IODD file name for the currently connected IO-Link devices shown in the bottom section of the list (column IODD Filename).

Image files without IODD can also be uploaded; the images are still displayed in the "Ports" dialog.



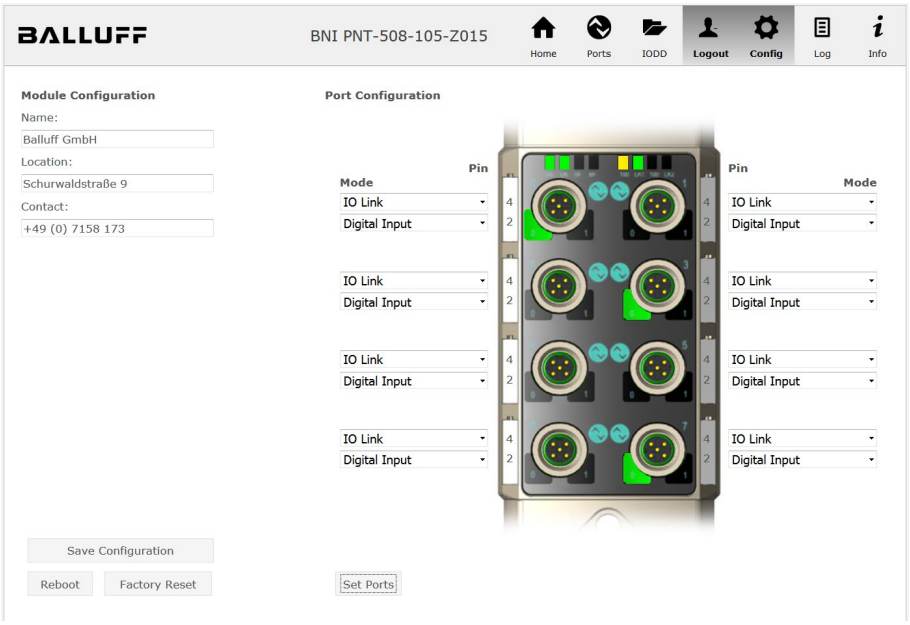
Using the "Delete" button you can delete IODDs and device images from the fieldbus when needed.

Note
Before selecting the IODD it must be renamed on the PC to the file name which is shown in the table in the "IODD Filename" column!

8.7. "Config" dialog

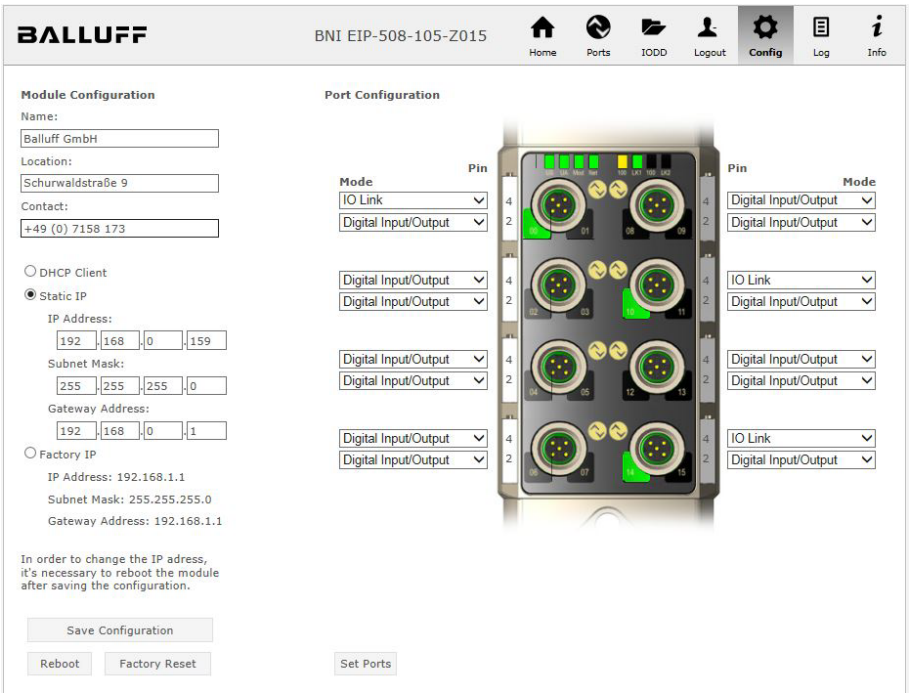
The configuration page enables configuration of the module. You can change both the module information texts and the port configuration.
The "Set Ports" action is not permanently stored in the device and is lost after the next reboot or reset.

PNT / ECT:



8 Web Server

EIP:



The parameter set “Module Configuration” on the left side is used by clicking "Save Configuration" and permanently stored in the device.
The "Reboot" button reboots the device as if the power to the module had been turned off and on again.
Clicking on "Factory Reset" deletes the configuration and log files saved in the device and then performs a reboot, so that the device is restored to the default factory configuration as on delivery.

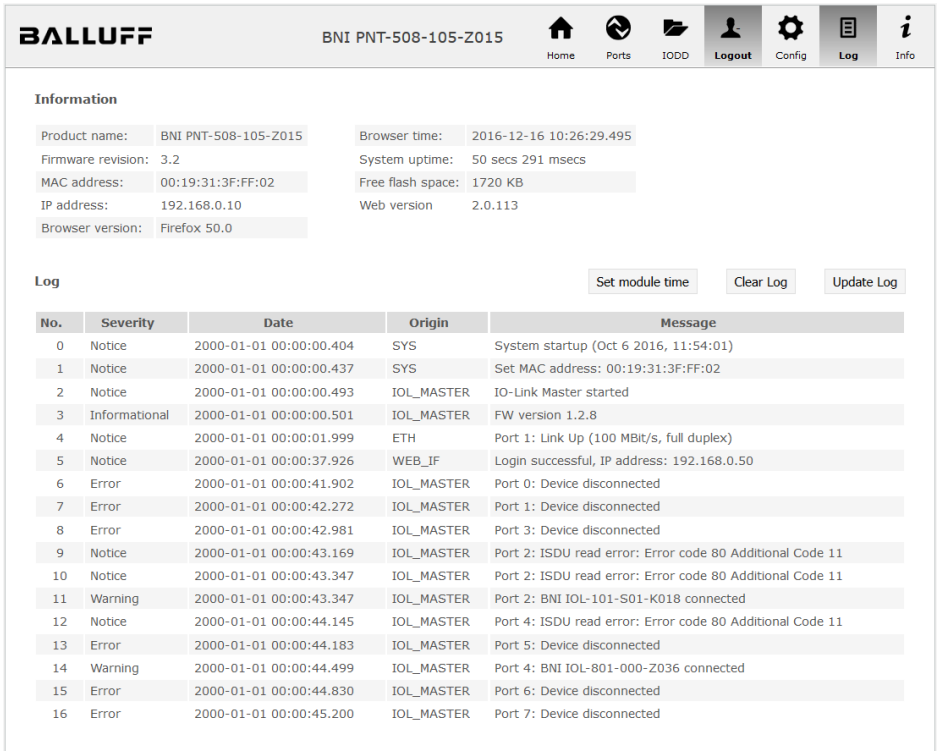
"Log" dialog

This dialog provides general service information about the device as well as a logging function.

The upper table (see screenshot below) contains important information for all service inquiries.

Note
If you have a detailed question about a specific situation, send us a screenshot of this Web site or print the site as a PDF.

Logging shows events which have occurred in chronological order. This provides a tool for detailed troubleshooting in equipment.



No.	Severity	Date	Origin	Message
0	Notice	2000-01-01 00:00:00.404	SYS	System startup (Oct 6 2016, 11:54:01)
1	Notice	2000-01-01 00:00:00.437	SYS	Set MAC address: 00:19:31:3F:FF:02
2	Notice	2000-01-01 00:00:00.493	IOL_MASTER	IO-Link Master started
3	Informational	2000-01-01 00:00:00.501	IOL_MASTER	FW version 1.2.8
4	Notice	2000-01-01 00:00:01.999	ETH	Port 1: Link Up (100 MBit/s, full duplex)
5	Notice	2000-01-01 00:00:37.926	WEB_IF	Login successful, IP address: 192.168.0.50
6	Error	2000-01-01 00:00:41.902	IOL_MASTER	Port 0: Device disconnected
7	Error	2000-01-01 00:00:42.272	IOL_MASTER	Port 1: Device disconnected
8	Error	2000-01-01 00:00:42.981	IOL_MASTER	Port 3: Device disconnected
9	Notice	2000-01-01 00:00:43.169	IOL_MASTER	Port 2: ISDU read error: Error code 80 Additional Code 11
10	Notice	2000-01-01 00:00:43.347	IOL_MASTER	Port 2: ISDU read error: Error code 80 Additional Code 11
11	Warning	2000-01-01 00:00:43.347	IOL_MASTER	Port 2: BNI IOL-101-S01-K018 connected
12	Notice	2000-01-01 00:00:44.145	IOL_MASTER	Port 4: ISDU read error: Error code 80 Additional Code 11
13	Error	2000-01-01 00:00:44.183	IOL_MASTER	Port 5: Device disconnected
14	Warning	2000-01-01 00:00:44.499	IOL_MASTER	Port 4: BNI IOL-801-000-Z036 connected
15	Error	2000-01-01 00:00:44.830	IOL_MASTER	Port 6: Device disconnected
16	Error	2000-01-01 00:00:45.200	IOL_MASTER	Port 7: Device disconnected

8 Web Server

Events are classified using the "**Severity**“ column:

Internal Error (Emergency, Alert, Critical)
→ The fieldbus module has detected a fault in itself (hardware or software) which should not occur during normal operation. If this happens, the module must be serviced or replaced.

External Error (Error, Warning)
→ The fieldbus module has detected what may be a non-permissible event which is affecting the module from the outside. The system may require troubleshooting.

Event (Informational, Notice)
The fieldbus module has detected an important normal operating event and reports it. These may include for example configuration actions over the web interface and other configuration interfaces which are also recorded.

Clicking on "Set Module Time” sends the current browser time to the fieldbus module but does not permanently store it. After a reset, reboot or loss of power the time begins to run again from the year 2000.

Clicking on "Update Log” refreshes the display, and "Clear Log” deletes all entries. The log entries are stored in a ring buffer.

9 Appendix

9.1. Scope of Delivery

The BNI EIP comprises the following elements:

- IO-Link block
- 4x M12 dummy plugs
- Ground strap
- M4x6 screw
- 20 informational signs

9.2. Order number

BNI EIP-5x7-005-Z040

Balluff Network Interface

Ethernet IP

Functions
507 = 4 IO-Link Ports Class A
527 = 4 IO-Link Ports Class B

Variants
005 = 2-Port-Switch

Mechanical version
Z040 = IO-Link Minimaster housing made of die-cast zinc
Data transmission: 2 x M12x1 internal thread
Power: 7/8“ external thread
Sensor connections: 8 x M12x1 internal thread

9.3. Ordering information

Product order code	Order code
BNI EIP-507-005-Z040	BNI009T
BNI EIP-527-005-Z040	BNI00AA

Notes

www.balluff.com

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