

BNI ECT-507-005-Z040

BNI ECT-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

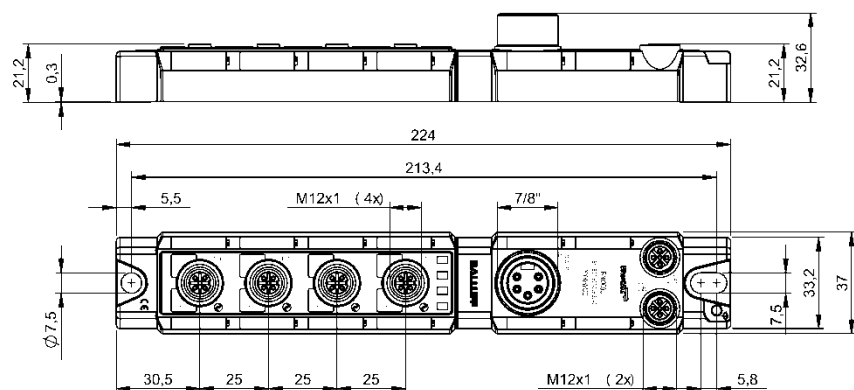


Table of Contents

1	General	3
1.1.	Structure of the manual	3
1.2.	Typographical Conventions	3
	Enumerations	3
	Actions	3
	Syntax	3
	Cross-references	3
1.3.	Symbols	3
1.4.	Abbreviations	3
1.5.	Differing views	3
1.6.	Disposal	4
2	Safety	5
2.1.	Intended use	5
2.2.	Installation and Startup	5
2.3.	General Safety Notes	5
2.4.	Resistance to Aggressive Substances	5
	Dangerous Voltage	5
3	First Steps	6
3.1.	Module Overview	6
3.2.	Mechanical Connection	7
3.3.	Electrical Connection	7
	Power supply	7
	Grounding	7
	EtherCAT™ interface	7
	IO-Link Port	8
4	Technical Data	9
4.1.	Dimensions	9
4.2.	Mechanical Data	9
4.3.	Operating conditions	9
4.4.	Electrical Data	9
4.5.	Ethernet	9
4.6.	Function indicators	10
	Module Status	10
	Port-Pin LEDs	10
	Port	10
5	Integration	11
5.1.	EtherCAT™	11
	Device data	11
	Input/output buffer	11
5.2.	Project Planning	11
5.3.	Integration into Project Planning Software	12
	Installing ESI files	12
	Automatic scanning	12
	Manually attach device	13
	Required setting on the device	14
	Station alias	15
	Configuring IO-Link module	16
5.4.	Bit mapping and function	17
	Inputs pin 4	17
	Inputs pin 2	17
	Outputs pin 4	17
	Outputs pin 2	17
	IO-Link modules	17
	SIO module	17
	Short-circuit	17
	Pin 4 / Pin 2	17

Restart Pin 4 / Pin 2 (Class A only)	17
IO-Link state	18
Sensor short circuit	18
5.5. Startup	19
Configuration of the modules	19
Validation	20
Parameter server	20
Upload flag on the IO-Link device	21
Safe state	21
5.6. IO-Link parameterization	22
Control	22
Status	22
Example - CoE setting	22
Example - Read	23
Example - Write	23
6 Object list	24
6.1. Input Process Data (Pin 2) Ch. x (0x2000 – 0x2FFF)	24
6.2. Input Process Data (Pin 4) Ch. x (0x2000 – 0x2FFF)	24
6.3. Additional IO-Link Configuration Data (Pin 4) Ch. x (0x2000 – 0x2FFF)	24
6.4. Additional IO Configuration Data (Pin 2) Ch. x (0x2000 – 0x2FFF)	24
6.5. Module Status (0x2A02)	24
6.6. Output Process Data Ch. x (0x3000 – 0x3FFF) (Class A only)	24
6.7. IO-Link Service Data Ch. x (0x4000 – 0x4FFF)	24
6.8. IO-Link Configuration Data Ch. x (0x8000 – 0x8FFF)	25
6.9. IO-Link Information Data Ch. x (0x9000 – 0x9FFF)	25
6.10. IO-Link Diagnosis Data Ch. x (0xA000 – 0xAFFF)	25
6.11. IO-Link Status Data Ch. x (0xF100)	25
6.12. Configuration without ESI	26
Master Control	26
Process data length	26
Example	26
7 Web Server	27
7.1. General Information	27
7.2. Navigation / Info	28
7.3. Login/Logout	29
7.4. "Home" dialog	30
7.5. "Ports" dialog	32
No appropriate IODD uploaded	32
Appropriate IODD uploaded	33
7.6. "IODD" dialog	35
7.7. "Config" dialog	36
7.8. "Log" dialog	38
8 Appendix	40
8.1. Scope of Delivery	40
8.2. Order number	40
8.3. Ordering information	40

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
ECT	EtherCAT™
EMC	Electromagnetic Compatibility
FE	Function ground
O	Standard output port
EoE	Ethernet over EtherCAT™
CoE	CAN application protocol over EtherCAT™
HF	High-frequency
PLC	Programmable Logic Controller
IODD	IO-Link Device Description
ISDU	Index Service Data Unit
DNS	Domain Name System
ESI	EtherCAT™ Slave Information (device description in XML format)

1.5. Differing views

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

EtherCAT® is registered trademark and patented technology, licensed by Beckhoff Automation GmbH, Germany.

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 ECT-... is a decentralized IO-Link input and output module for connecting to the EtherCAT™ 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 preAttention!ary 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

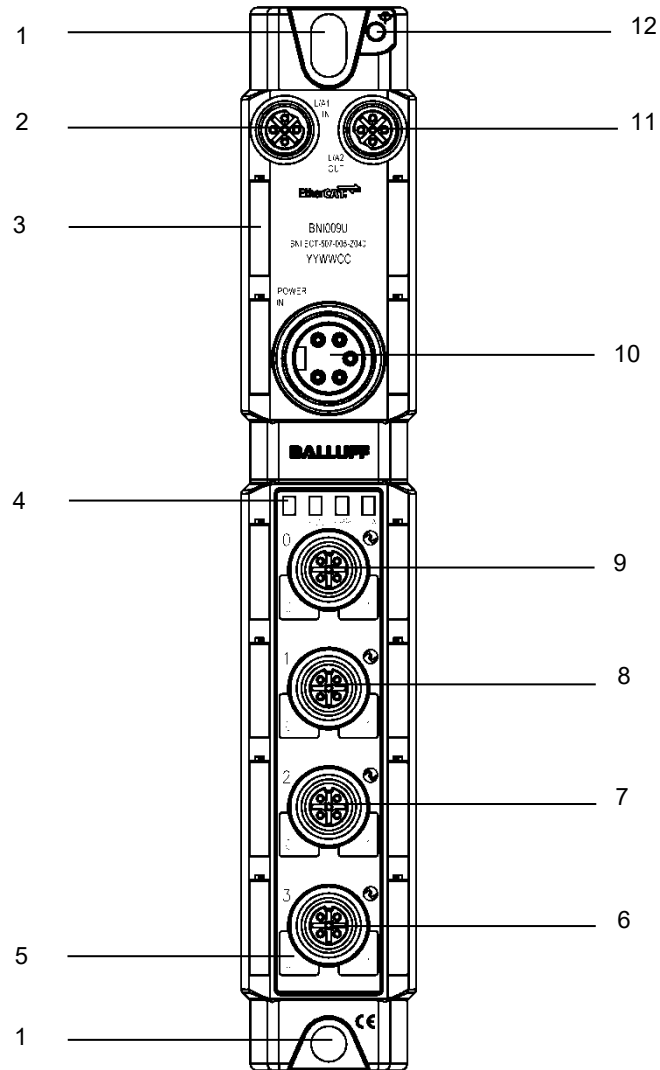


Figure – Overview BNI ECT-5xx-005-Z040

- | | | | |
|---|------------------------------------|----|----------------------|
| 1 | Mounting hole | 8 | Port 1 |
| 2 | EtherCAT™-Port 1 IN | 9 | Port 0 |
| 3 | Labels | 10 | Power IN |
| 4 | Status LED: communication / module | 11 | EtherCAT™-Port 2 OUT |
| 5 | Pin/port LED: signal status | 12 | Ground connection |
| 6 | Port 3 | | |
| 7 | Port 2 | | |

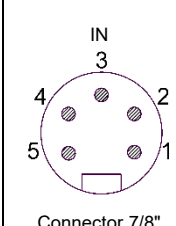
3 First Steps

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

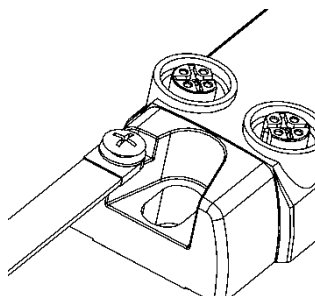
	Pin	Function	Description
	1	0 V	GND module / sensor and actuator supply
	2	FE	Function ground
	3	+24 V	Module / sensor supply
	4	+24 V	Actuator supply
	5	N24	Separate supply voltage (-)
	6	0 V	GND module / sensor supply
	7	FE	Function ground
	8	+24 V	Module / sensor supply
	9	P24	Separate supply voltage (+)

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



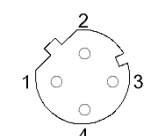
Note



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

EtherCAT™ interface

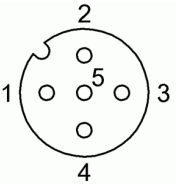
M12, D-coded, female

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

3 First Steps

IO-Link Port

M12, A-coded, female

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



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



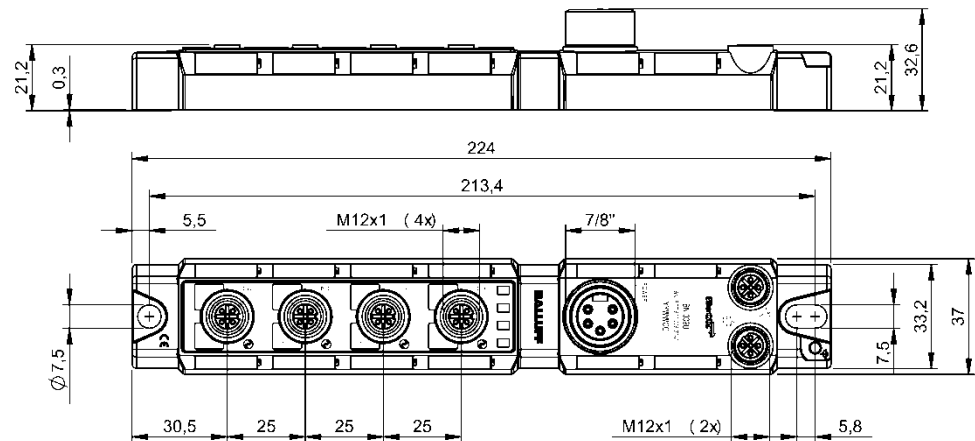
Note
The IO-Link output is powered from the sensor supply.



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)
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. 380 g

4.3. Operating conditions

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

4.4. Electrical Data

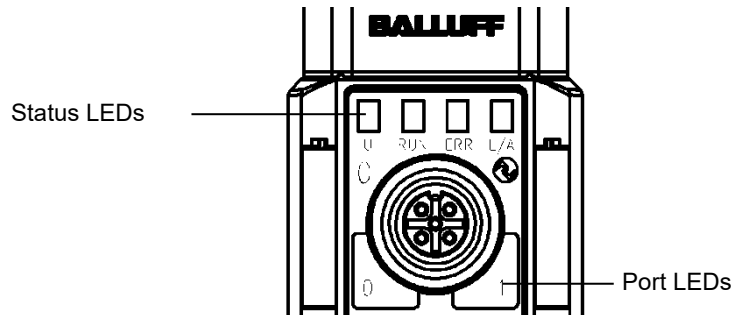
Supply voltage	18...30.2 V DC, in accordance with EN 61131-2
Ripple	< 1%
Input current at 24 V	130 mA

4.5. Ethernet

Ethernet port	2 x 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	100 Mbps
Max. cable length	100 m
Flow control	Full duplex

4 Technical Data

4.6. Function indicators



Module Status

LED	Indicator	Function
U	Green	Supply voltage OK
	Red, flashing	Supply voltage < 18 V
	Red, solid on	Supply voltage < 11 V
RUN	Off	The device is in the INIT state
	Green, flashing	The device is in the PRE-OPERATIONAL state
	Green, single flashing	The device is in the SAFE OPERATIONAL state
	Green	The device is in the OPERATIONAL state
ERR	Off	No error
	Red, flashing	Invalid configuration
	Red, single flashing	Local error
	Red double flashing	Application watchdog timeout
	Red	Error in the application
L/A	Green flashing	Data transfer

Port-Pin LEDs

LED „0“ – Port Pin 4

LED „1“ – Port Pin 2

Port

Standard port

Status	Function
Off	State the of input or output pin is 0
Yellow	State the of input or output pin is 1
Both LEDs flashing red	Sensor power supply short circuit between pin 1 and pin 3
Red	Short circuit at the output on pin 2 / 4 to pin 3

IO-Link port

Status	Function
Green	IO-Link – connection active
Green, flashing	No IO-Link – connection
Green, rapid flashing	IO-Link pre-operate during data storage
Red, rapid flashing	Validation failed / incorrect configuration of the IO-Link data length
	Data storage failed / incorrect device for data storage
Red	IO-Link short circuit pin 4 to pin 3

5.1. EtherCAT™

The communication between the BNI ECT-5x7-005-Z040 and the controlling system is done via EtherCAT™.

The system consists of the following components:

- Bus master
- Bus module/slaves (in this case the bus module BNI ECT-5x7-005-Z040)

Device data

To parameterize the bus master according to type, device data are available to the Bus module BNI ECT-5x7-005-Z040 in the form of three ESI files.

Input/output buffer

The data exchange with the host system takes place in the input and output buffer. The size of these buffers must be configured by the master.

5.2. Project Planning

In the project planning, the bus module BNI ECT-5x7-005-Z040 is represented as a modular device. The device data needed for the project planning are stored in the ESI files. The data modules of the inputs/outputs of the IO-Link port and possible additional modules are shown in the project administration software in relation to slots.

The ESI files make the possible data modules (inputs/outputs, IO-Link ports of various data width and other additional modules) available.

For the configuration of the BNI ECT-5x7-005-Z040 the appropriate data modules are assigned to a specific slot.

5 Integration

5.3. Integration into Project Planning Software

For example, the connection of the BNI ECT-507-005-Z040 to a Beckhoff TwinCAT controller is shown with the TwinCAT System Manager. The exact procedure depends on the project planning software used.

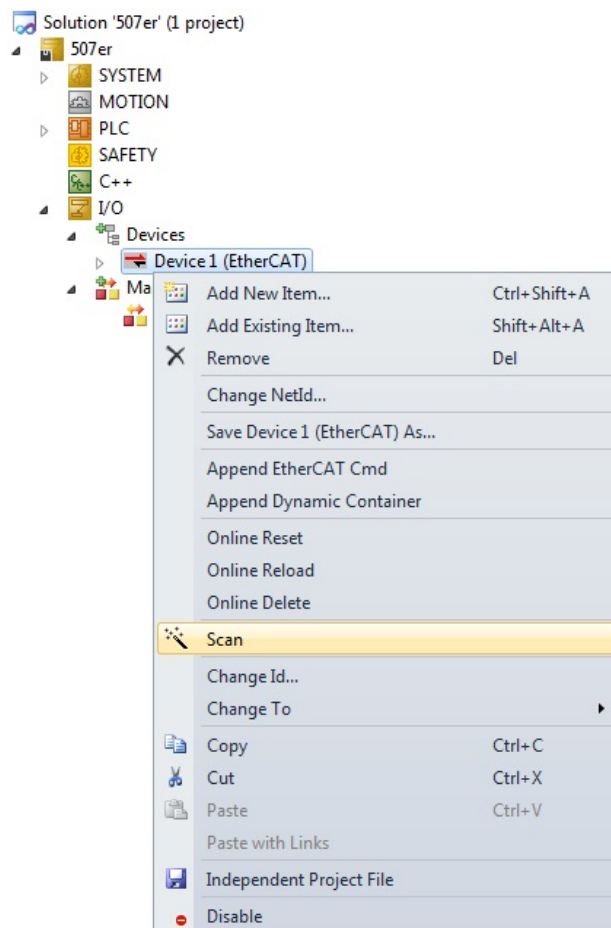
Installing ESI files

The device description has the following name: Balluff BNI ECT-5x7-005-Z040_xxxxxx.xml
Copy the file to the corresponding TwinCAT directory.
If the default settings were used when installing TwinCAT 3, this is
C:\TwinCAT\3.1\Config\Io\EtherCAT.

The installed devices will be available the next time the TwinCAT System Manager is started.

Automatic scanning

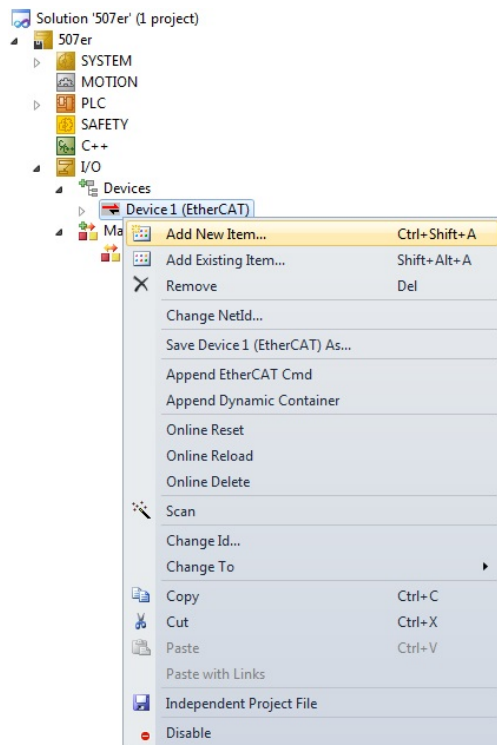
- Before connecting devices to the EtherCAT™ network the EtherCAT™ system must be in a safe, power-off state.
- Turn on power and start the TwinCAT System Manager in Config mode.
- Scan BNI ECT-5x7-005-Z040 as a box



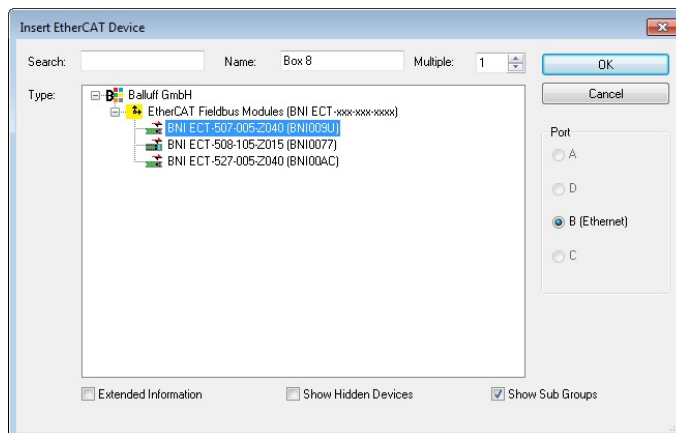
5 Integration

Manually attach device

- Before connecting devices to the EtherCAT™ network the EtherCAT™ system must be in a safe, power-off state.
- Turn on power and start the TwinCAT System Manager in Config mode.
- Attach the box



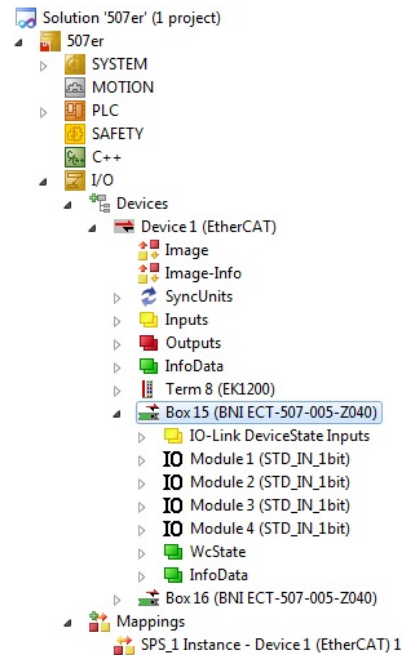
Select the appropriate box



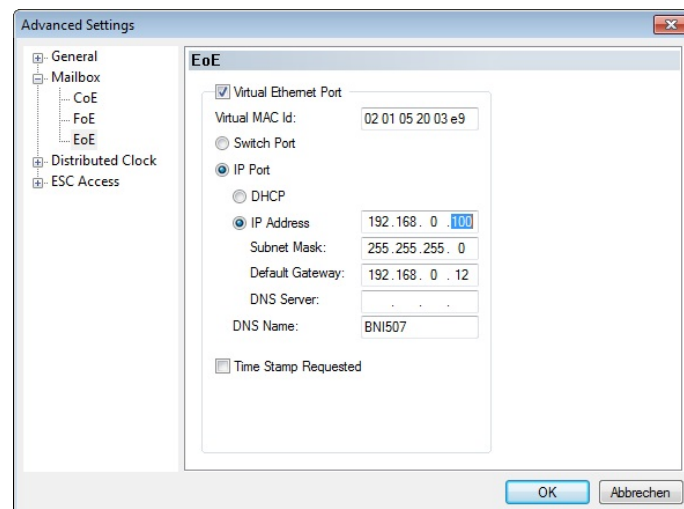
5 Integration

Required setting on the device

After the automatic scanning or manual addition, the device appears in the tree structure of TwinCAT and already has the default configuration.

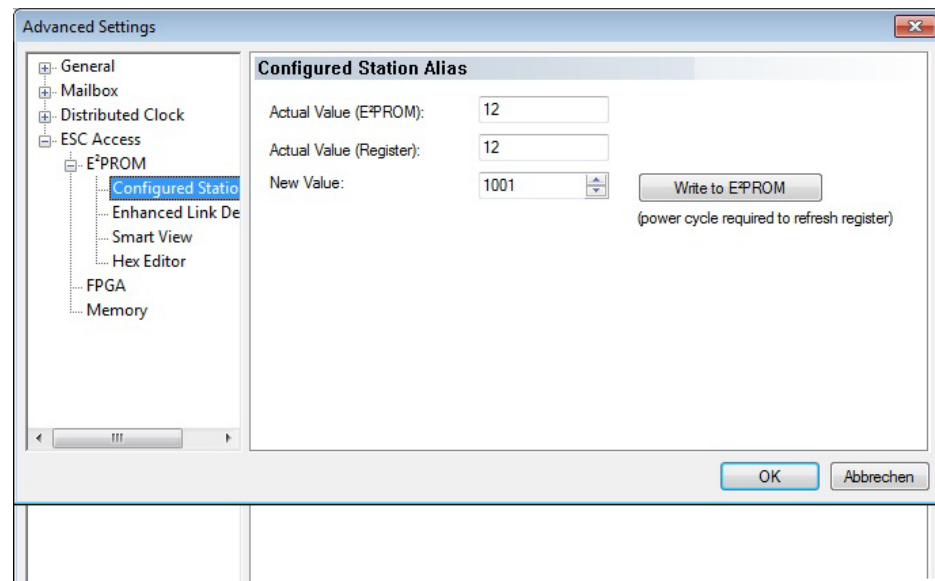


BNI ECT-5x7-005-Z040 supports EoE (Ethernet over EtherCAT™). To configure TwinCAT accordingly, select "Advanced Settings" on the EtherCAT™ tab. A valid DNS name must be entered first and then a valid IP address.



Station alias

The station alias can be entered under the following menu:
EtherCAT™ tab, select "Advanced settings".
Open ESC Access, open E²PROM and click on Configured Station.
The new value is valid only after a reset.



5 Integration

Configuring IO-Link module

BNI ECT-5x7-005-Z040 is a modular device. It has the following slot structure:

Slot number	Meaning
1-4	IO-Link ports
9-16	Unused slots, reserved for future expansions
17	Input pin 2 (only Class A)
18	Short circuit pin 2
19	Short circuit pin 4
20	Sensor short circuit
21	Module Status
22-32	Unused slots, reserved for future expansions
33	Output Pin 2 (Class A only)
34	Restart Pin 2 (Class A only)
35	Restart Pin 4 (Class A only)

The slots for future expansions are not used. A number of process data (buffer size) can be assigned to the other slots.

Slot	Module	ModuleIdent
IO IO-Link Ch.1	STD_IN_1bit	0x00001101
IO IO-Link Ch.2	STD_IN_1bit	0x00001101
IO IO-Link Ch.3	STD_IN_1bit	0x00001101
IO IO-Link Ch.4		
IO-Link Ch (reserved)		
IO-Link Ch (reserved)		
IO-Link Ch (reserved)		
IO-Link Ch (reserved)		
IO-Link Ch (reserved)		
IO-Link Ch (reserved)		
IO-Link Ch (reserved)		
IO-Link Ch (reserved)		
IO-Link Ch (reserved)		
IO-Link Ch (reserved)		
IO-Link Ch (reserved)		
IO-Link Ch (reserved)		
IO Input Pin 2		
IO Short Circuit Pin 2		
IO Short Circuit Pin 4		
IO Sensor Short Circuit		
IO Module Status		
IO Inputs (reserved)		
IO Inputs (reserved)		
IO Inputs (reserved)		
IO Inputs (reserved)		
IO Inputs (reserved)		
IO Inputs (reserved)		
IO Inputs (reserved)		
IO Inputs (reserved)		
IO Inputs (reserved)		
IO Inputs (reserved)		
IO Inputs (reserved)		
IO Output Pin 2		
IO Restart Pin 2		
IO Restart Pin 4		

Download SlotCfg (I->P)

5.4. Bit mapping and function

Bit mapping and function of the configurable modules

Inputs pin 4
Inputs pin 2
Outputs pin 4
Outputs pin 2

Signal from configured inputs or outputs are depicted in the modules
 STD_IN_1bit (input pin 4), input pin 2 as well as
 STD_OUT_1bit (output pin 4) and output pin 2.

IO-Link modules The IO-Link modules always have the same structure:

IOL_I/O_x/Bytes
 than _____ Number of process data items used (should be equal to or greater
 _____ the process data length of the IO-Link device)
 I = Input data
 O = Output data
 I/O = Both input and output data

SIO module When using the SIO module, the port starts in IO-Link mode, then performs a validation and data retention and then switches to SIO mode. It is not possible to switch later to IO-Link mode!

Short-circuit Pin 4 / Pin 2 Depicts a short circuit between a set output to ground at the respective port pin.

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Port 7	Port 6	Port 5	Port 4	Port 3	Port 2	Port 1	Port 0

Restart Pin 4 / Pin 2 (Class A only) If this function is configured, after an actuator short-circuit there is no automatic restart, but rather the port must be activated by inserting the corresponding bit.

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Port 7	Port 6	Port 5	Port 4	Port 3	Port 2	Port 1	Port 0

5 Integration

IO-Link state

In the IO-Link state, the momentary status of each port is displayed:

- 0x_0 = port disabled
- 0x_1 = port in std dig in
- 0x_2 = port in std dig out
- 0x_3 = port in communication OP
- 0x_4 = port in communication COMSTOP
- 0x1_ = watchdog detected
- 0x2_ = internal Error
- 0x3_ = invalid Device ID
- 0x4_ = invalid Vendor ID
- 0x5_ = invalid IO-Link version
- 0x6_ = invalid Frame Capability
- 0x7_ = invalid Cycle Time
- 0x8_ = invalid PD in length
- 0x9_ = invalid PD out length
- 0xA_ = no device detected

Sensor short circuit

Feedback as to the port at which a sensor supply short circuit is pending.

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Port 7	Port 6	Port 5	Port 4	Port 3	Port 2	Port 1	Port 0

5.5. Startup

In the startup, the IO-Link ports and outputs can be pre-configured. The entries are transferred when the configuration is overwritten

Transition	Protocol	Index	Data	Comment
<PS>	CoE	0x1C12:00	0x00 (0)	clear sm pdos (0x1C12)
<PS>	CoE	0x1C13:00	0x00 (0)	clear sm pdos (0x1C13)
<PS>	CoE	0x1A00:00	0x00 (0)	clear pdo 0x1A00 entries
<PS>	CoE	0x1A00:01	0x60000108 (1610613000)	download pdo 0x1A00 entry
<PS>	CoE	0x1A00:00	0x01 (1)	download pdo 0x1A00 entry count
<PS>	CoE	0x1A01:00	0x00 (0)	clear pdo 0x1A01 entries
<PS>	CoE	0x1A01:01	0x60100108 (1611661576)	download pdo 0x1A01 entry
<PS>	CoE	0x1A01:00	0x01 (1)	download pdo 0x1A01 entry count
<PS>	CoE	0x1A02:00	0x00 (0)	clear pdo 0x1A02 entries
<PS>	CoE	0x1A02:01	0x60200108 (1612710152)	download pdo 0x1A02 entry
<PS>	CoE	0x1A02:00	0x01 (1)	download pdo 0x1A02 entry count
<PS>	CoE	0x1B02:00	0x00 (0)	clear pdo 0x1B02 entries
<PS>	CoE	0x1B02:01	0x00000008 (8)	download pdo 0x1B02 entry
<PS>	CoE	0x1B02:00	0x01 (1)	download pdo 0x1B02 entry count
<PS>	CoE	0x1C13:01	0x1A81 (6785)	download pdo 0x1C13:01 index
<PS>	CoE	0x1C13:02	0x1A00 (6656)	download pdo 0x1C13:02 index
<PS>	CoE	0x1C13:03	0x1A01 (6657)	download pdo 0x1C13:03 index
<PS>	CoE	0x1C13:04	0x1A02 (6658)	download pdo 0x1C13:04 index
<PS>	CoE	0x1C13:05	0x1B02 (6914)	download pdo 0x1C13:05 index
<PS>	CoE	0x1C13:00	0x05 (5)	download pdo 0x1C13 count
<IP, PS>	CoE		3F 00 00 00 02 01 05 20 0...	eeo init
PS	CoE	0x8010:24	0x01 (1)	Set Process Data In Length
PS	CoE	0x8010:25	0x00 (0)	Set Process Data Out Length
PS	CoE	0x8010:28	0x0001 (1)	Set Master Control
PS	CoE	0x8020:24	0x01 (1)	Set Process Data In Length
PS	CoE	0x8020:25	0x00 (0)	Set Process Data Out Length
PS	CoE	0x8020:28	0x0001 (1)	Set Master Control
PS	CoE	0x8000:24	0x01 (1)	Set Process Data In Length
PS	CoE	0x8000:25	0x00 (0)	Set Process Data Out Length
PS	CoE	0x8000:28	0x0001 (1)	Set Master Control

Configuration of the modules

Edit CANopen Startup Entry

Transition: ☐ I -> P ☒ P -> S ☐ S -> P ☐ S -> D ☐ D -> S

Index (hex): 8000 Sub-Index (dec): 40 ☐ Validate ☐ Complete Access

Data (hexbin): 01 00

Validate Mask:

Comment: Set Master Control

Set Value Dialog

Dec: 1 Hex: 0x0001 Float: Bool: 0 1 Binary: 01 00 Bit Size: 1 8 16 32 64 ?

Index Name Flags Value

1000 1008 1009 100A 1018:0 10F3:0 1600:0 1601:0 1602:0 1A00:0 1A01:0 1A02:0 1A81:0

89 (407638921) 007-005-Z040

5 Integration

Validation

No validation: validation deactivated, every device will be accepted

Compatibility: manufacturer ID and device ID are compared to the module data.

The IO-Link communication is only started if there is a match.

Identity: manufacturer ID and device ID and serial number are compared to the module data. The IO-Link communication is only started if there is a match.

The following values are possible for the setting of the validation:

0x00 No validation

0x01 Compatible (Vendor ID + Device ID)

0x02 Identical (Vendor ID + Device ID + serial number)

Parameter server

Enable: data management functions enabled, parameter data and identification data of the IO-Link device are stored permanently.

Switched off: data management functions disabled, saved data are retained.

Deleted: data management functions disabled, saved data is deleted.

Enable upload:

Select whether an upload of parameter data to the data management of the IO-Link master port is to be carried out or not.

If the upload is enabled, the master starts a parameter data upload as soon as a device requests an upload (upload flag set) or if there is no data saved in the master port (e.g. after data has been deleted or before the first data upload)

Disable upload:

If the upload is disabled, no data upload will be started. When there is an upload request from the IO-Link device, a download (if enabled) is started because no upload may be carried out if there are different parameter sets.

Enable download:

Select whether a download of parameter data to the IO-Link device is to be carried out or not. As soon as the saved parameter data in the parameter server of the port is differentiated from the connected IO-Link device and no upload request from the IO-Link device is present, a download is carried out.

Disable download:

If the download is blocked, an upload (if enabled) of the parameter data occurs independent of the upload flag of the IO-Link device.

Disable upload and download:

If upload and download are disabled, no parameter data exchange occurs.

The IO-Link device then still communicates with the IO-Link port.

The following values are possible for the settings:

0x8X Enable

0x0X Disable

0x40 Delete

0xX1 Enable upload

0xX2 Disable download

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.

To use an IO-Link device of a different type, the contents of the parameter server must be deleted.

Upload flag on the IO-Link device

To enable the upload flag of an IO-Link device, the value 0x05 must be entered in the index 0x02, subindex 0. (Parameterization, see IO-Link Service Data on the next page)

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

Safe state

This function is a supplement to an output configuration of the respective port pin. For each port pin, a safe status can be predefined which is to be assumed in the event of a loss of bus communication.

The following values are possible for the settings:

0x00: 0

0x01: 1

0x02: last state

5 Integration

5.6. IO-Link parameterization

Via object 0x4000 (IO-Link Service Data Ch. X), IO-Link ISDU parameters can be read or written from the IO-Link device. To do this, the corresponding index and subindex must be entered. In addition, the corresponding length and the data must still be entered when writing. Via the control object, the read or write task is then started. In the Object status, the result is then displayed.

Control

Values for the Control:

- 0x00: No action
- 0x02: Write
- 0x03: Read

Status

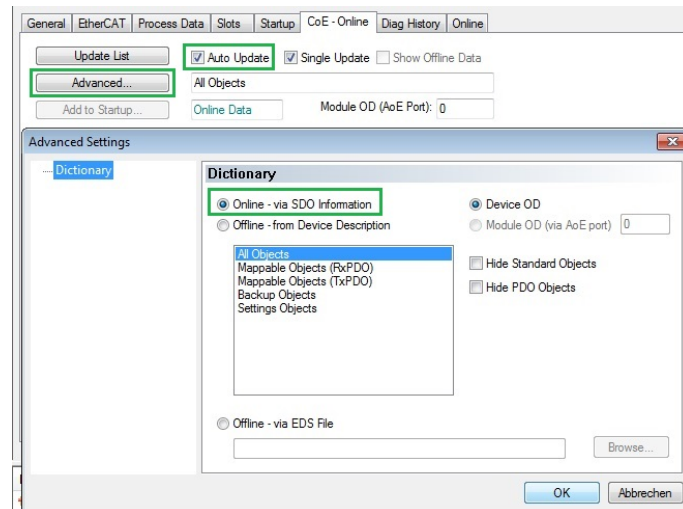
Values for the Status:

- 0x00: No activity
- 0x01: Active / Busy
- 0x02: Access
- 0x04: Error
- 0xFF: Failure

Example - CoE setting

A short example shows how Index 0x40 for a SmartLight (Mode) is changed.

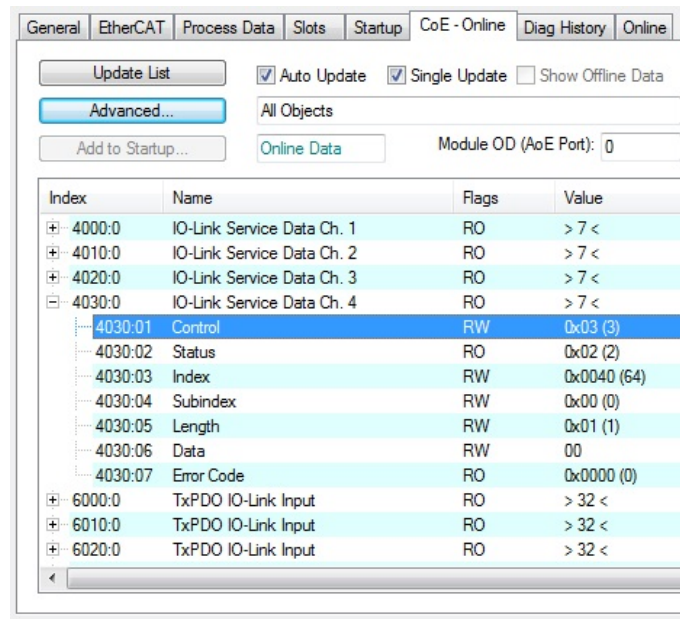
1. Select mode
2. CoE - Open Online
3. Set CoE
 - a. Under Advancedset to Online
 - b. Enable Auto Update



5 Integration

Example - Read

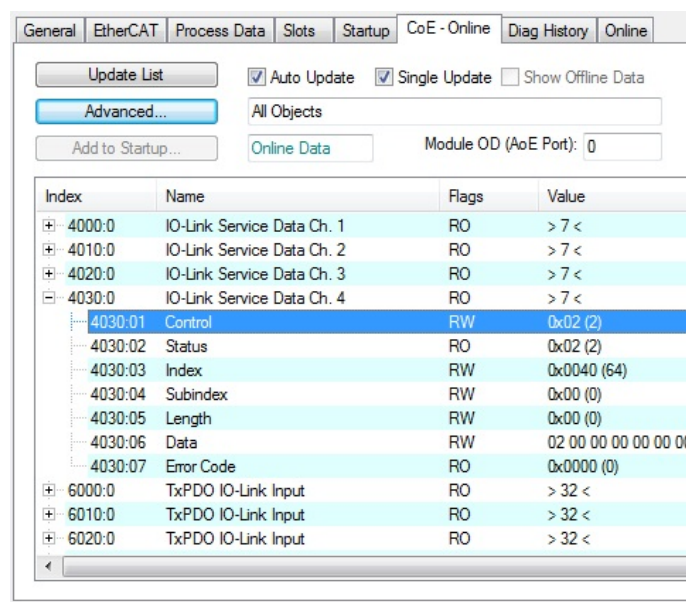
4. In Port select 4030:0 (here Channel 4)
5. First read the index, i.e. double-click 4030:03 and specify the respective index - 0x0040 (64)
6. Now in Control write command 0x03



7. Then the contents of the index is read and displayed in Data.

Example - Write

8. To write, change the data, specify the length and use the command 0x02.



9. The data are written and the parameters changed in the device.

6 Object list

6.1. Input Process Data (Pin 2) Ch. x (0x2000 – 0x2FFF)

Index	Sub-index	Name	DataType	Access	Description/Value
0x20n0 n = 0..3	0x01	Input Pin 2	BOOLEAN	RO	
	0x02	Actor Short Circuit Pin 2	BOOLEAN	RO	

6.2. Input Process Data (Pin 4) Ch. x (0x2000 – 0x2FFF)

Index	Sub-index	Name	DataType	Access	Description/Value
0x20n1 n = 0..3	0x01	Actor Short Circuit Pin 4	BOOLEAN	RO	
	0x02	Sensor supply short circuit	BOOLEAN	RO	

6.3. Additional IO-Link Configuration Data (Pin 4) Ch. x (0x2000 – 0x2FFF)

Index	Sub-index	Name	DataType	Access	Description/Value
0x20n2	0x01	Safe State	UINT8	RW	
	0x02	Validation Type	UINT8	RW	
n = 0..3	0x03	Parameter Server	UINT8	RW	

6.4. Additional IO Configuration Data (Pin 2) Ch. x (0x2000 – 0x2FFF)

Index	Sub-index	Name	DataType	Access	Description/Value
0x20n3 n = 0..3	0x01	Safe State	UINT8	RW	

6.5. Module Status (0x2A02)

Index	Sub-index	Name	DataType	Access	Description/Value
0x2A02	0x01	UA low	BOOLEAN	RO	
	0x02	US low	BOOLEAN	RO	
	0x03	no UA	BOOLEAN	RO	

6.6. Output Process Data Ch. x (0x3000 – 0x3FFF) (Class A only)

Index	Sub-index	Name	DataType	Access	Description/Value
0x30n0	0x01	Output Pin 2	BOOLEAN	RO	
	0x02	Restart Pin 2	BOOLEAN	RO	
0x30n1 n = 0..3	0x01	Restart Pin 4	BOOLEAN	RO	

6.7. IO-Link Service Data Ch. x (0x4000 – 0x4FFF)

Index	Sub-index	Name	DataType	Access	Description/Value
0x40n0 n = 0..3	0x01	Control	UINT8	RW	0: no control action 3: read 2: write
	0x02	Status	UINT8	RO	0: no activity 1: busy 2: success 4: error 0xFF: failure
	0x03	Index	UINT16	RW	
	0x04	Subindex	UINT8	RW	
	0x05	Length	UINT8	RW	
	0x06	Data	UINT232	RW	
	0x07	Error Code	UINT16	RO	

**6.8. IO-Link Configuration
Data Ch. x
(0x8000 –
0x8FFF)**

Index	Sub-index	Name	DataType	Access	Description/ Value
0x80n0 n = 0..3	0x04	Device ID	UINT32	RW	
	0x05	Vendor ID	UINT32	RW	
	0x06	Product ID	UINT32	RW	
	0x08	Serial Number	UINT32	RW	
	0x20	IO-Link Revision	UINT8	RW	
	0x21	Frame Capability	UINT8	RW	
	0x22	Min Cycle Time	UINT8	RW	
	0x24	Process Data In Length	UINT8	RW	
	0x25	Process Data Out Length	UINT8	RW	
	0x28	Master Control	UINT16	RW	

**6.9. IO-Link Information
Data Ch. x
(0x9000 –
0x9FFF)**

Index	Sub-index	Name	DataType	Access	Description/ Value
0x90n0 n = 0..3	0x04	Device ID	UINT32	RO	
	0x05	Vendor ID	UINT32	RO	
	0x06	Product ID	UINT32	RO	
	0x08	Serial Number	UINT32	RO	
	0x20	IO-Link Revision	UINT8	RO	
	0x21	Frame Capability	UINT8	RO	
	0x22	Min Cycle Time	UINT8	RO	
	0x24	Process Data In Length	UINT8	RO	
	0x25	Process Data Out Length	UINT8	RO	

**6.10. IO-Link Diagnosis
Data Ch. x
(0xA000 –
0xAFFF)**

Index	Sub-index	Name	DataType	Access	Description/ Value
0xA0n0 n = 0..3	0x01	IO-Link State	UINT8	RO	
	0x02	Lost Frames	UINT8	RO	

**6.11. IO-Link Status Data
Ch. x (0xF100)**

Index	Sub-index	Name	DataType	Access	Description/ Value
0xF100	0x01		UINT8	RO	
	0x02		UINT8	RO	
	0x03		UINT8	RO	
	0x04		UINT8	RO	
	0x05		UINT8	RO	
	0x06		UINT8	RO	
	0x07		UINT8	RO	
	0x08		UINT8	RO	

6 Object list

6.12. Configuration without ESI

The ports can also be configured without incorporating an ESI. To do this, the object 0x8000 must be set in the Master Control and the respective length of the process data.

Master Control

Values for the Master Control:

- 0x0003: Port in IO-Link Mode
- 0x0001: Port in Standard Input
- 0x0002: Port in Standard Output

Process data length

Process data length for IO-Link ports:

- 1 byte: 0x08
- 2 bytes: 0x16
- 4 bytes: 0x83
- 6 bytes: 0x85
- 8 bytes: 0x87
- 10 bytes: 0x89
- 16 bytes: 0x8F
- 24 bytes: 0x97
- 32 bytes: 0x9F

Process data length for a standard input-/output port:

- 0x01

Example

MasterControl = 3 --> IO-Link				
IO-Link size	Process data in length		Process data out length	
	hex	dez	hex	dez
IOL_I_1byte	0x08	8	0x00	0
IOL_I_2byte	0x16	22	0x00	0
IOL_I_4byte	0x83	131	0x00	0
IOL_I_6byte	0x85	133	0x00	0
IOL_I_8byte	0x87	135	0x00	0
IOL_I_10byte	0x89	137	0x00	0
IOL_I_16byte	0x8F	143	0x00	0
IOL_I_24byte	0x97	151	0x00	0
IOL_I_32byte	0x9F	159	0x00	0
IOL_I_1byte/O_1bytes	0x08	8	0x08	8
IOL_I_2byte/O_2bytes	0x16	22	0x16	22
IOL_I_2byte/O_4bytes	0x16	22	0x83	131
IOL_I_4byte/O_4bytes	0x83	131	0x83	131
IOL_I_4byte/O_2bytes	0x83	131	0x16	22
IOL_I_2byte/O_8bytes	0x16	22	0x87	135

7.1. 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.

The screenshot displays the web interface for the Balluff BNI PNT-508-105-Z015 module. The interface includes a header with the Balluff logo, the device model number, and a navigation menu with icons for Home, Ports, IODD, Login, Config, Log, and Info. The main content area is titled 'Module Information' and lists the following details:

- Product Name: BNI PNT-508-105-Z015
- Order Code: BNI005H
- Name: unknown name
- Location: unknown location
- Contact: unknown contact
- Firmware Revision: 3.2
- Hardware Revision: 6
- Station name: mydevice
- IP Address: 192.168.0.3
- Subnet Mask: 255.255.255.0
- Gateway Address: 0.0.0.0
- MAC Address: 00:19:31:3F:FF:32
- Link Speed Port 1: 100 Mbit/s FULL
- Link Speed Port 2: No Link
- PLC Lock: No

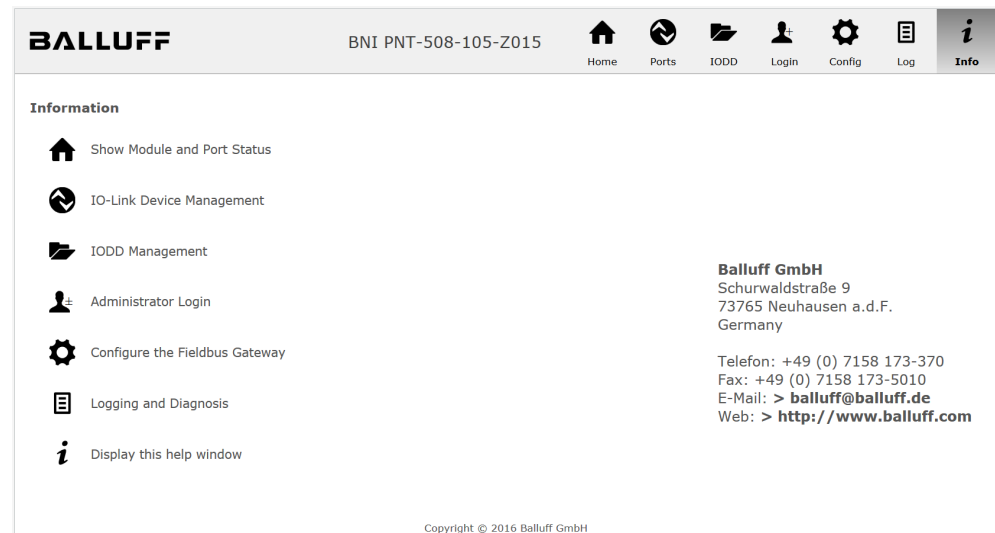
To the right of the text is a photograph of the physical module, which is a vertical black unit with eight circular ports arranged in a 4x2 grid. Above the ports are several status LEDs. Below the photograph is a link labeled '> LED Legend'.

7 Web Server

7.2. 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.

7.3. 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.

7 Web Server

7.4. "Home" dialog

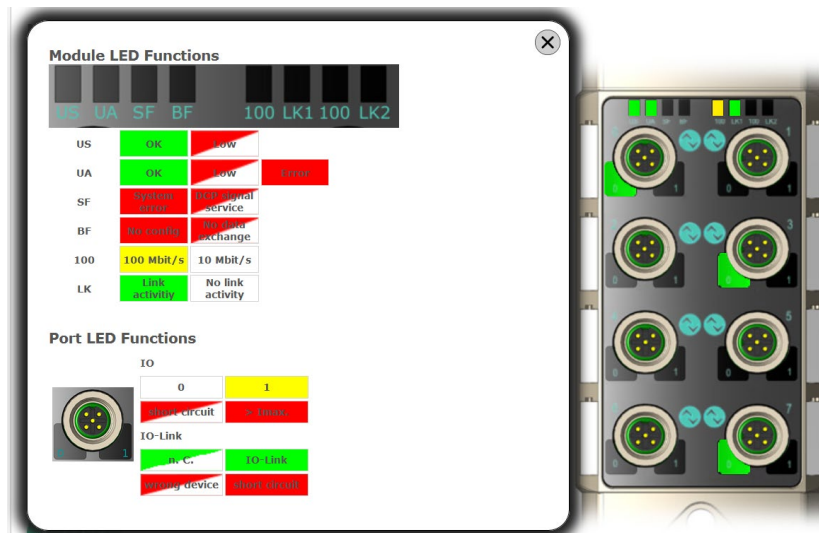
Under "Home" you are given the essential information about the fieldbus itself and its network activity. You are also shown whether the configuration block was enabled by the controller (PLC).

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.



PNT:



EIP:



7 Web Server

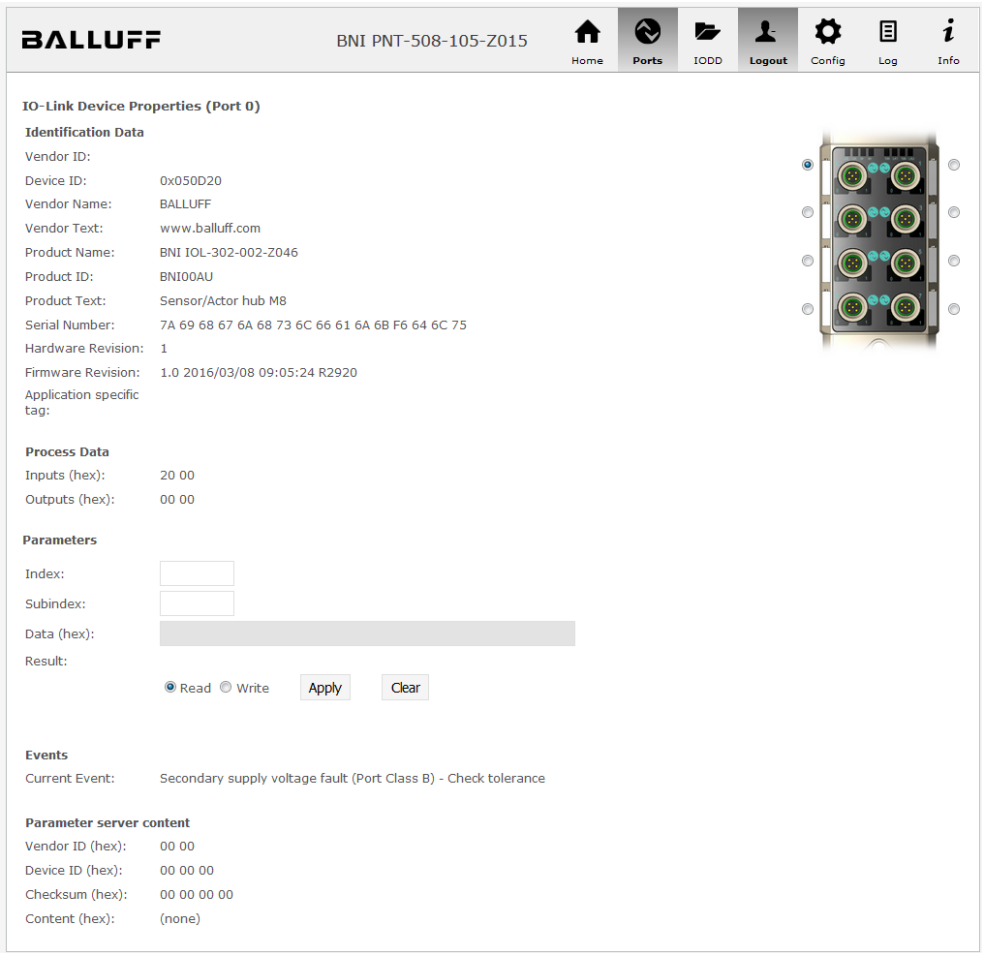
7.5. "Ports" dialog The "Ports" dialog displays information and process data for the connected IO-Link devices. Select the desired IO-Link Port in the image of the fieldbus module on the right side to see the device data.

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

**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.

BALLUFF BNI PNT-508-105-Z015

Home Ports IODD Logout Config Log Info

IO-Link Device Properties (Port 2)

Identification Data

Vendor ID: 0x0378
 Device ID: 0x020101
 Vendor Name: BALLUFF
 Vendor Text: www.balluff.com
 Product Name: BAW M18MI-BLC50B-S04G
 Product ID: 153938
 Product Text: Inductive distance sensor, 1...5mm
 Serial Number:
 Hardware Revision: 1.00
 Firmware Revision: 1.01
 Application specific tag:

Process Data

Inputs (hex): 00 03 FF
 Outputs (hex): no outputs

Input

Distance absolute	1023
Reserved bits	0

Events

Current Event: no Event

Parameter server content

Vendor ID (hex): 00 00
 Device ID (hex): 00 00 00
 Checksum (hex): 00 00 00 00
 Content (hex): (none)

Dialog "Ports": IODD interpretation and device image

7 Web Server

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!

Parameters

				Read All	
64 (0)	Operating mode (rw)	Segment mode ▾	Write	Read	
65 (0)	Number of segments (rw)	One segment ▾	Write	Read	
66 (0)	Type of level indicator (rw)	Bottom-up ▾	Write	Read	
67 (0)	Resolution of level indicator (rw)	8 bit ▾	Write	Read	
68 (0)	Level mode, segment 1 (rw)	See child elements			
68 (1)	Level mode, segment 1 color	Off ▾	Write	Read	
68 (2)	Level mode, segment 1 dominance	☐ Color is not dominant ☐ Color is dominant	Write	Read	
69 (0)	Level mode, segment 2 (rw)	See child elements			
69 (1)	Level mode, segment 2 color	Off ▾	Write	Read	
69 (2)	Level mode, segment 2 dominance	☐ Color is not dominant ☐ Color is dominant	Write	Read	
70 (0)	Level mode, segment 3 (rw)	See child elements			
70 (1)	Level mode, segment 3 color	Off ▾	Write	Read	
70 (2)	Level mode, segment 3 dominance	☐ Color is not dominant ☐ Color is dominant	Write	Read	
71 (0)	Level mode, segment 4 (rw)	See child elements			
71 (1)	Level mode, segment 4 color	Off ▾	Write	Read	
71 (2)	Level mode, segment 4 dominance	☐ Color is not dominant ☐ Color is dominant	Write	Read	

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

7.6. "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.

BALLUFF BNI PNT-508-105-Z015

Home Ports **IODD** Logout Config Log Info

IODD Management

Device	Picture	
BA050A01.xml	X	Delete
BA020101.xml	X	Delete
BA050D20.xml	X	Delete

Choose the IODD to upload:

BA020101.png

Information

This module has a FAT12 file system, which means it supports only file names in 8.3 convention. **Please rename your IODDs according to the suggested filename in the table below.**

The suggested filename is generated according to following rule:

- The first two characters of the file name are the first two letters of the IODD Vendor Name. If the device has no vendor name, those characters are substituted by underscores.
- The remaining 6 characters must encode the DeviceID in hexadecimal representation (padded with zeros if necessary).

Note that the filename must contain the DeviceID that is in the IODD file!

Currently connected IO - Link Devices:

Vendor Name	Product Name	Product ID	Vendor ID	Device ID	IODD Filename
BALLUFF	BNI IOL-302-002-Z046	BNI00AU	0000	050D20	BA050D20.xml
BALLUFF	BNI IOL-802-000-Z036	BNI0072	0378	050A01	BA050A01.xml
BALLUFF	BAW M18MI-BLC50B-S04G	153938	0378	020101	BA020101.xml

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!

7 Web Server

7.7. "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:

BALLUFF BNI PNT-508-105-Z015

Home Ports IODD Logout Config Log Info

Module Configuration

Name: Balluff GmbH

Location: Schurwaldstraße 9

Contact: +49 (0) 7158 173

Save Configuration

Reboot Factory Reset

Port Configuration

Mode Pin

IO Link 4

Digital Input 2

IO Link 4

Digital Input 2

IO Link 4

Digital Input 2

IO Link 4

Digital Input 2

Pin Mode

IO Link 4

Digital Input 2

IO Link 4

Digital Input 2

IO Link 4

Digital Input 2

IO Link 4

Digital Input 2

Set Ports

EIP:

BALLUFF BNI EIP-508-105-Z015

Home Ports IODD Logout Config Log Info

Module Configuration

Name: Balluff GmbH

Location: Schurwaldstraße 9

Contact: +49 (0) 7158 173

☐ DHCP Client

☒ Static IP

IP Address: 192.168.0.159

Subnet Mask: 255.255.255.0

Gateway Address: 192.168.0.1

☐ Factory IP

IP Address: 192.168.1.1

Subnet Mask: 255.255.255.0

Gateway Address: 192.168.1.1

In order to change the IP address, it's necessary to reboot the module after saving the configuration.

Save Configuration

Reboot Factory Reset

Port Configuration

Mode Pin

IO Link	4	4	IO Link	4
Digital Input/Output	2	2	Digital Input/Output	2
Digital Input/Output	4	4	IO Link	4
Digital Input/Output	2	2	Digital Input/Output	2
Digital Input/Output	4	4	Digital Input/Output	4
Digital Input/Output	2	2	Digital Input/Output	2
Digital Input/Output	4	4	IO Link	4
Digital Input/Output	2	2	Digital Input/Output	2

Set Ports

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.

7 Web Server

7.8. "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.

BNI PNT-508-105-Z015

Home

Ports

IODD

Logout

Config

Log

Info

Information

Product name: BNI PNT-508-105-Z015

Browser time: 2016-12-16 10:26:29.495

Firmware revision: 3.2

System uptime: 50 secs 291 msec

MAC address: 00:19:31:3F:FF:02

Free flash space: 1720 KB

IP address: 192.168.0.10

Web version: 2.0.113

Browser version: Firefox 50.0

Log

Set module time

Clear Log

Update Log

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

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.

8.1. Scope of Delivery

The BNI ECT comprises the following elements:

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

8.2. Order number

BNI EÇT-5x7-005-Z040

Balluff Network Interface

EtherCAT™

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: 4 x M12x1 internal thread

8.3. Ordering information

Product order code	Order code
BNI ECT-507-005-Z040	BNI009U
BNI ECT-527-005-Z040	BNI00AC

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