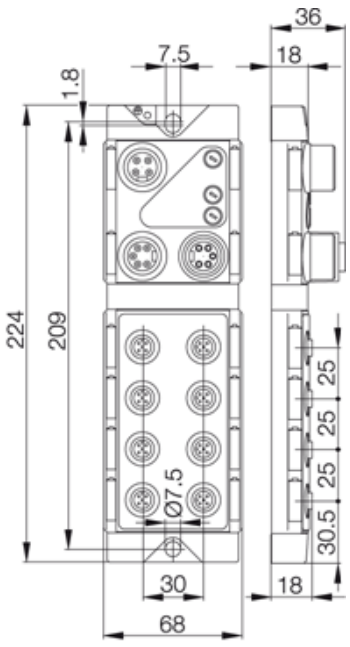
BALLUFF

BNI DNT-104-000-Z004
BNI DNT-202-000-Z005
BNI DNT-302-000-Z005
BNI DNT-305-000-Z005
BNI DNT-305-007-Z005

User´s Guide



Contents

1 User instructions

1.1. Structure of the guide

The guide is organized so that the sections build on one another.
Chapter 2: Safety
Chapter 3: First steps
…….

1.2. Typographical conventions

The following typographical conventions are used in this guide.

Enumerations

Enumerations are shown as a list with a bullet points.

- Entry 1,
- Entry 2.

Actions

Action instructions are indicated by a preceding triangle. The result of an action is indicated by an arrow.

➢ Action instruction 1.
↳ Action result.
➢ Action instruction 2.

Syntax

Numbers:
Decimal numbers are shown without additional indicators (e.g., 123),
hexadecimal numbers are shown with the additional indicator hex (e.g., 00_{hex}).

Cross-references

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

1.3. Symbols

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

Note
This symbol indicates general notes.

1.4. Abbreviations

BCD	Binary coded switch
BNI	Balluff Network Interface
CAN	Controller Area Network
CIP	Common Industrial Protocol
CRC	Cyclic Redundancy Check
DNT	DeviceNet
DR	Baud rate (data rate)
EMC	Electromagnetic Compatibility
FE	Function earth
I port	Digital input port
I/O port	Digital input and/or output port
NA	Node address ODVA
ODVA	Open DeviceNet Vendor Association
O-port	Digital 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.

2 Safety

2.1. Proper use

The BNI DNT-... serves as a decentral in- and output module for connecting to a DeviceNet network

2.2. Installation and startup

Attention!
Installation and startup are to be performed only by trained specialists. Qualified personnel are persons who are familiar with the installation and operation of the product, and who fulfills the qualifications required for this activity. Any damage resulting from unauthorized manipulation or improper use voids the manufacturer's guarantee and warranty. The Operator is responsible for ensuring that applicable of safety and accident prevention regulations are complied with.

2.3. General safety instructions

Commissioning and inspection
The operating company shall be responsible for observance of locally applicable safety instructions.
Before commissioning, carefully read the operating manual.
The system must not be used in applications in which the safety of persons is dependent on the function of the device.
Authorized Personnel
Installation and commissioning may only be performed by trained specialist personnel.
Intended use
Warranty and liability claims against the manufacturer are rendered void by:

- Unauthorized tampering
- Improper use
- Use, installation or handling contrary to the instructions provided in this operating manual

Obligations of the Operating Company
The device is a piece of equipment from EMC Class A. Such equipment may generate RF noise. The operator must take appropriate precautionary measures. The device may only be used with an approved power supply. Only approved cables may be used.
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.

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.

Hazardous voltage

Attention!
Disconnect all power before servicing equipment.

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

3.1. Connection overview BNI DNT-104-000-Z004

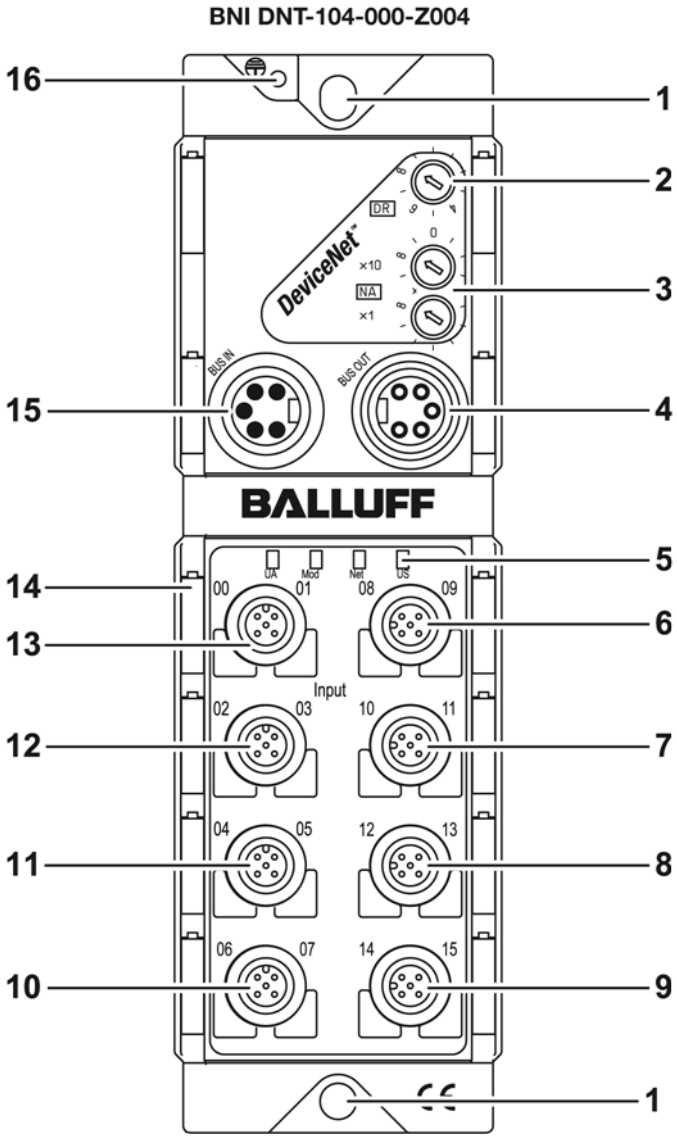


Fig. 3.1: Connection overview BNI DNT-104-000-Z004

1	Mounting hole	9	Standard I Port 7
2	Baud rate switch	10	Standard I Port 3
3	Address switches	11	Standard I Port 2
4	7/8" Bus OUT	12	Standard I Port 1
5	Status LED	13	Standard I Port 0
6	Standard I Port 4	14	Label
7	Standard I Port 5	15	7/8" Bus IN
8	Standard I Port 6	16	Ground

3 Getting Started

3.2. Connection overview BNI DNT-202-000-Z005

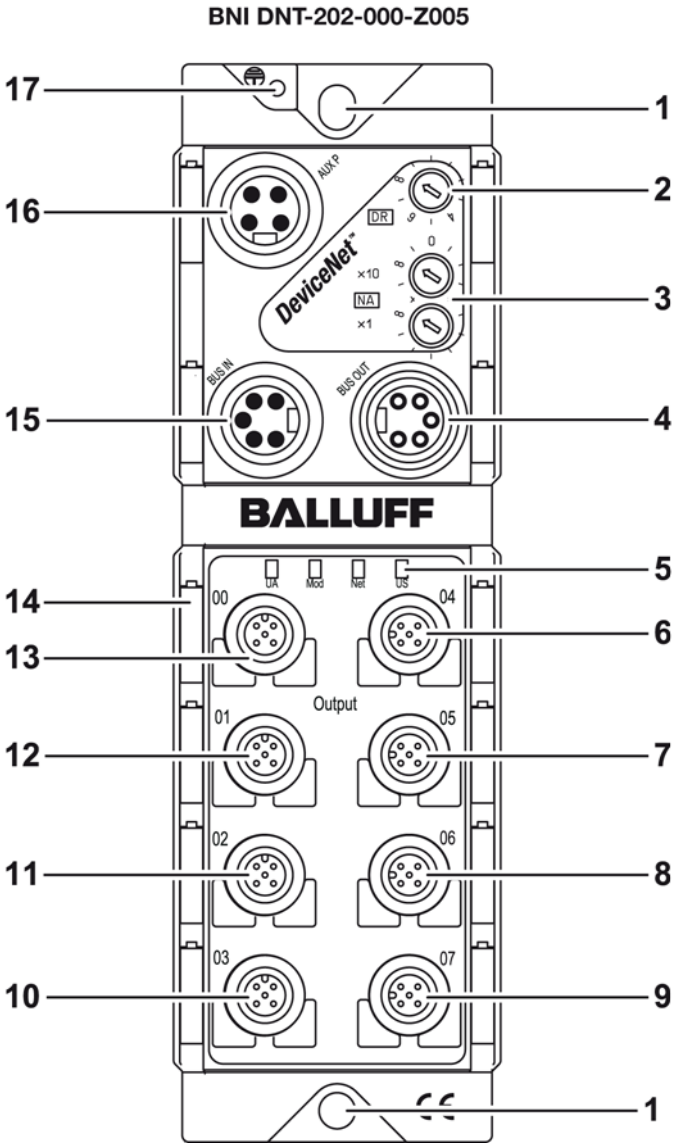


Fig. 3.2: Connection overview BNI DNT-202-000-Z005

1	Mounting hole	9	Standard O Port 7
2	Baud rate switch	10	Standard O Port 3
3	Address switches	11	Standard O Port 2
4	7/8" Bus OUT	12	Standard O Port 1
5	Status LED	13	Standard O Port 0
6	Standard O Port 4	14	Label
7	Standard O Port 5	15	7/8" Bus IN
8	Standard O Port 6	16	Power supply POWER IN
		17	Ground

3.3. Connection overview BNI DNT-302-000-Z005

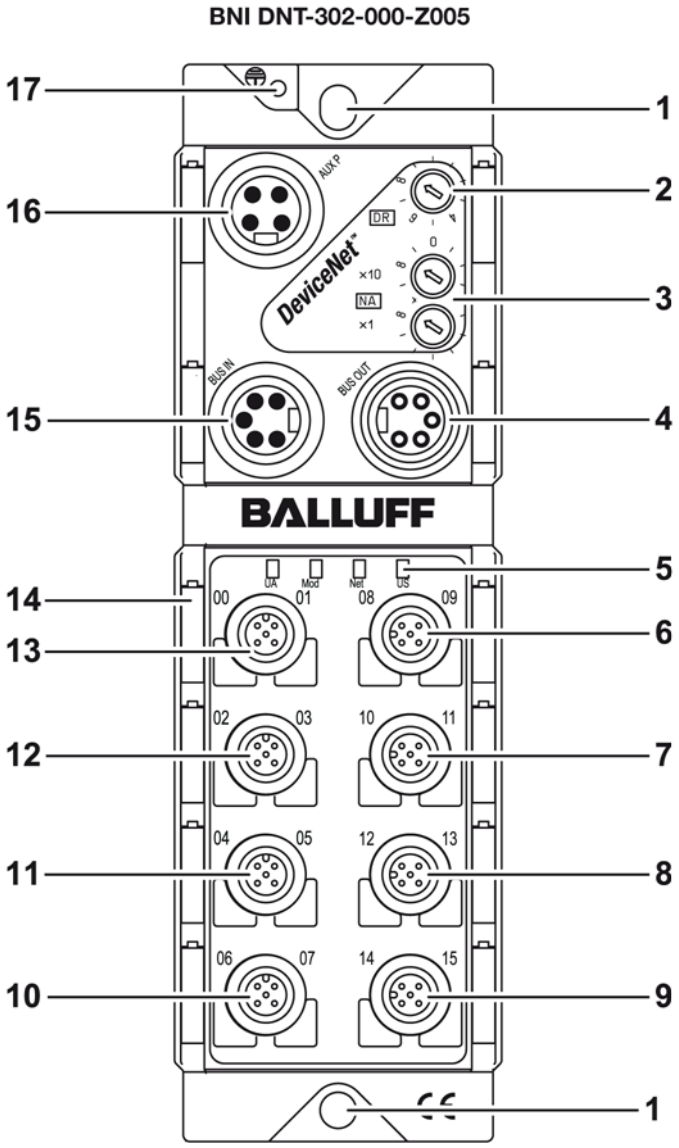


Fig. 3.3: Connection overview BNI DNT-302-000-Z005

1	Mounting hole	9	Standard I/O Port 7
2	Baud rate switch	10	Standard I/O Port 3
3	Address switches	11	Standard I/O Port 2
4	7/8" Bus OUT	12	Standard I/O Port 1
5	Status LED	13	Standard I/O Port 0
6	Standard I/O Port 4	14	Label
7	Standard I/O Port 5	15	7/8" Bus IN
8	Standard I/O Port 6	16	Power supply POWER IN
		17	Ground

3 Getting Started

3.4. Connection overview BNI DNT-305-000-Z005

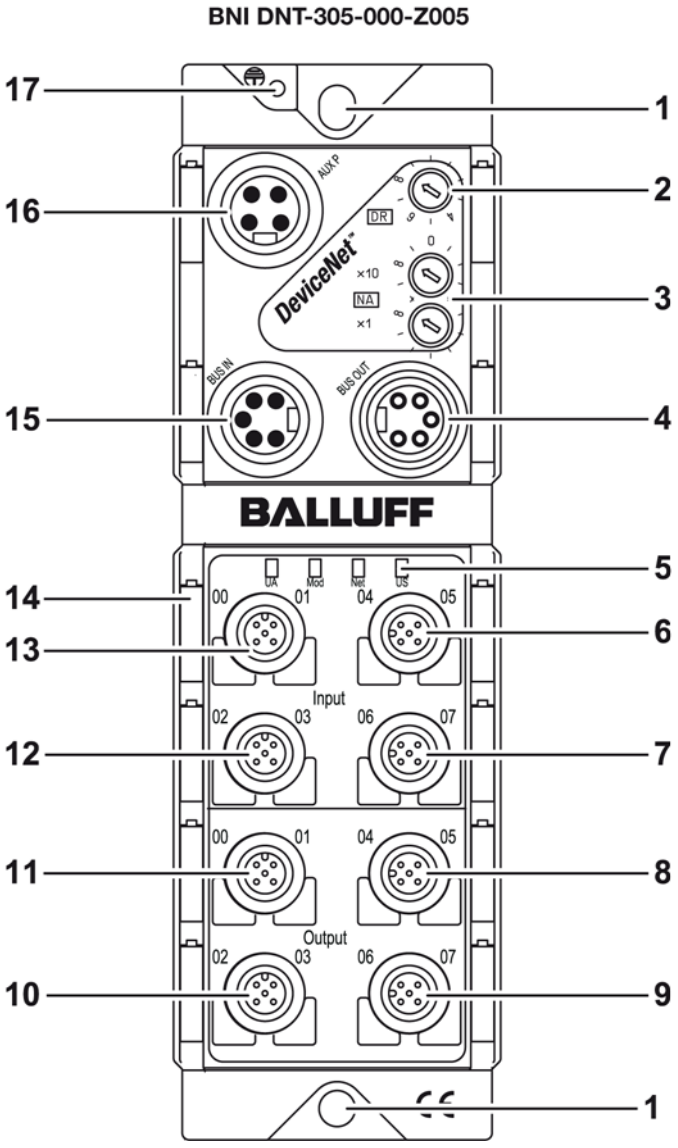


Fig. 3.3: Connection overview BNI DNT-305-000-Z005

1	Mounting hole	9	Standard O Port 7
2	Baud rate switch	10	Standard O Port 3
3	Address switches	11	Standard O Port 2
4	7/8" Bus OUT	12	Standard I Port 1
5	Status LED	13	Standard I Port 0
6	Standard I Port 4	14	Label
7	Standard I Port 5	15	7/8" Bus IN
8	Standard O Port 6	16	Power supply POWER IN
		17	Ground

3.5. Connection overview BNI DNT-305-007-Z005

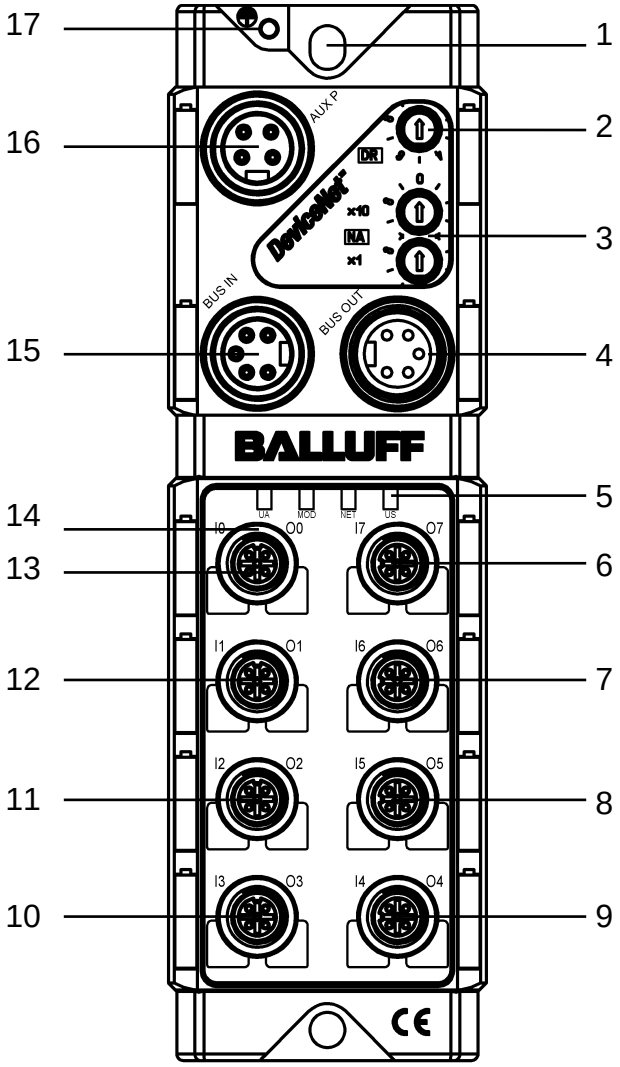


Fig. 3.3: Connection overview BNI DNT-305-000-Z005

1	Mounting hole
2	Baud rate switch
3	Address switches
4	7/8" Bus OUT
5	Status LED
6	Standard I/O Port 4
7	Standard I/O Port 5
8	Standard I/O Port 6
9	Standard I/O Port 7
10	Standard I/O Port 3
11	Standard I/O Port 2
12	Standard I/O Port 1
13	Standard I/O Port 0
14	Label
15	7/8" Bus IN
16	Power supply POWER IN
17	Ground

4 Basic knowledge

4.1. Product description

The BNI DNT-... serves as a decentral input and output module for connecting to a DeviceNet network.
For diagnostics, there are four LEDs that display operating and network states.
For the BNI DNT-104-... module, the connected devices are supplied with power by the DeviceNet power supply (internal supply). For the BNI DNT-202-..., BNI DNT-302-... and BNI DNT-305-... modules, an additional 24 VDC power supply is required for powering the sensor and actuator supply (auxiliary power).
The DeviceNet bus must be terminated with terminating resistors.

4.2. DeviceNet

DeviceNet is an open fieldbus standard which is based on the CAN protocol (layer 2 - data link layer). The protocol for the user layer is the CIP (Common Industrial Protocol), which defines the exchange of I/O data in real time and the exchange of required data.
DeviceNet is defined in EN 50325 and IEC 62026 and is represented by the ODVA (Open DeviceNet Vendor Association).
The DeviceNet protocol is object-oriented and is based on the producer-consumer model (produce and consume). Objects here are abstract representations of system components within a device, e.g., inputs or analog outputs. According to the producer-consumer model, messages are sent to the network as a data packet with identifier and priority (produced) and detected and read by other nodes (node devices in the network) that require data (consumed). As a result, the messages are not sent for specific sources and targets; rather, a messages can be received, e.g., by various objects of the same class (multicast). These I/O-messages are suitable for time-critical, controller-oriented data. DeviceNet also facilitates the transport of explicit messages, which establish a point-to-point connection between two devices. The explicit messages are suitable for the configuration of modules or for diagnostic queries.

Architecture

The bus topology with trunk lines and drop lines can support up to 64 bus participants (nodes). Both ends of the bus line must be terminated with a terminating resistor. The 4-core DeviceNet cable is used for data transmission and to supply devices with 24 V operating voltage. Data transmission rates of 125 kBaud, 250 kBaud or 500 kBaud are possible depending on the used cable and the cable length.

Communication

Each message, which every bus participant can send at any time, has a CAN identifier and its own priority. Other bus participants receive the messages according to this coding.
A CRC checksum is used for error detection.
A DeviceNet packet can contain up to 8 bytes of data.
The following communication modes (operating modes) are available for data transmission (input / output data):

Polling: the master sends a telegram with output data to the slave, which responds with a telegram containing input data.

Strobed: the master sends an output message to all slaves (broadcast message); each appropriately configured slave responds with an input message.

Change of State (COS): telegrams are sent as soon as their content changes.
The entire process data image is not sent, rather only the changes are sent. With this communication mode, the data volume on the bus line can be reduced considerably.

Cyclic: telegrams are automatically produced and sent at defined time intervals.

4 Basic knowledge

Addressing

The addressing schema of the DeviceNet protocol facilitates access to the objects of a device. The following information in contained in the addressing of an object:

Device address (MAC ID): Uniquely identifies each network node in the DeviceNet (Media Access Control Identifier).

Class ID: Uniquely identifies each object class in the DeviceNet. An object class groups objects together that are of the same type of system component. The structure and behavior of the objects of this class are defined in the class definitions.

Instance ID: Uniquely identifies each object instance in the DeviceNet. An object instance below all other instances of the same class within a device can be addressed. An instance represents an object that actually exists.

Attribute ID: The Attribute ID is an identification value that is assigned to an attribute. Attributes are parameters for object classes or object instances that can contain status information or represent properties through a configurable value. Different attributes of an object can be of different attribute types.

Service Code: The Service Code is an identification value that displays special object functions or defines a requirement or an answer.

Predefined settings for master/slave settings are available for simple DeviceNet devices ("Predefined Master/Slave Connection Set"). They make available connection objects that simplify the typical master/slave communication.

EDS file

The manufacturer makes available EDS files (Electronic Data Sheet) for configuring a DeviceNet device. The EDS file contains the communication parameters of the device and the available objects. During commissioning, it is needed together with a configuration tool.

DeviceNet system data

The main DeviceNet system data:

Characteristic	Value / meaning
Topology	Tree structure
Transmission line	Twisted, shielded, four-core cable; separate wires for data (white/blue) and supply (black/red)
Cable lengths	Main line max. 500 m (with repeaters, max. 3 km), drop line max. 6 m
Number of bus participants	Max. 64
Number of I/O points	Controller-dependent
Addresses	One MAC ID per device (0 ... 63)
Addressing	MAC ID, serial number (32 bit)
Transfer rates	depending on cable length: – 500 kBaud up to 100 m (thick cable) – 250 kBaud up to 250 m (thick cable) – 125 kBaud to 500 m (thick cable)
User data	8 bytes per telegram
Terminating resistor	121 Ω, at each end of the data line
Error detection	CRC checksum, automatic repeat
Power supply	24 V DC, tolerance +/- 4%

4 Basic knowledge

4.3. Information on planning and commissioning

DeviceNet is characterized by simplified protocols and predefined device profiles that simplify planning and use.
The following information makes getting started with the planning and commissioning of a DeviceNet network easier.

Working phase	Question	Note
Planning	How many inputs and outputs are needed in total?	Implementation with one or with several DeviceNet networks.
Planning	How big is the DeviceNet System power supply?	DeviceNet system power supplies may be connected in parallel via a diode.
Planning	What overall line length is required?	It may be necessary to use repeaters.
Project administration	How are addresses to be assigned to the devices?	Errors can be avoided by using an address diagram. Identify and label addressed devices.
Installation	Where are the devices installed?	Devices with enclosure rating IP 67 should be installed close to sensors and actuators. Install devices with lower enclosure rating in the switching cabinet or in terminal boxes.
Commis-sioning	How is the system configuration performed?	In configuration mode (scanning of the DeviceNet network), the device profiles of the detected devices are automatically read by the configuration tool.
Commis-sioning	Have all DeviceNet participants been detected by the scanner?	The scanner must record all participants in the scan list and must not report any errors.
Commis-sioning	How can a simple I/O function test be performed?	Function tests can be performed using most configuration tools. Alternatively, the tests can be performed via the PLC software.

4.4. System cable

System cabling can be implemented with a round cable or with a profile flat cable.
The cables are always 4-wire; cable shielding is necessary in order to avoid interference during transmission.
The choice of suitable cables depends on their DC resistance and the transmission properties (impedance of 121 ohm). Additional auxiliary power is required for actuators.

Attention!
The maximum permissible current on the system cable is 9 A. All components as well as plugs are also designed for max. 9 A.

The following table shows the cable lengths as a function of baud rate.
The maximum drop-line length is 6 m.

Cable type	Total length for		
	125 kBaud	250 kBaud	500 kBaud
Main cable (thick cable)	500 m	250 m	100 m
Main cable (thin cable)	100 m	100 m	100 m
Main cable (flat cable)	420 m	200 m	75 m
Total length of all drop lines	156 m	78 m	39 m

Calculation of cable lengths and determination of the possible baud rate:
The length of a drop line is added to the length of the main line (trunk) if the distance from the drop to its most distant device is greater than the distance to the next terminating resistor.
Example: A drop is 3 m from the terminating resistor on the main line. The most distant device on this drop is 2 m away. The drop line does not need to be added to the main line length.

The total length of all drop lines is equal to the sum of all drop lines in the cable system. The total length of all drop lines must not exceed the max. length specified for the given transmission rate. If, for example, a baud rate of 500 kBaud is used in a network, the total length of all drop lines must not exceed 39 m.

4.5. System plug connections

Shielded mini-style connector:
7/8" 5-pin

Shielded micro-style connector:
M12, A-coded, 5-pin

4 Basic knowledge

Unshielded, open-style connector:
Screw-type connector, 5-pin

4.6. System power supply

DeviceNet devices require a DC voltage in the range from 23.76 V to 24.24 V DC (24 V +/- 1%, Class 2), which must satisfy the specifications of DeviceNet industrial power supplies.
The BNI DNT-... modules require a DC voltage in the range from 18 V to 30.2 V and thus satisfy not only the DeviceNet requirements but are also less susceptible to a voltage drop.

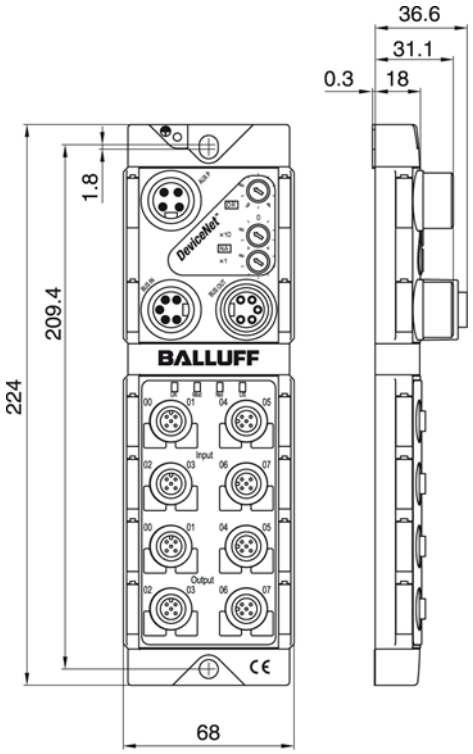
Note
Only power supplies with Schottky diode may be used.

The sensors and actuators should be supplied by different power supplies in order to achieve higher interference immunity and decoupling. Primary switched-mode power supplies are recommended. When using linear-regulated power supplies, voltage cut-off of the power supply must occur sufficiently late in the event of a malfunction.
A power supply can be used at any point in the network.
Because the DeviceNet participants are centrally supplied with power by the system power supply, there is a voltage drop on the system cable that is dependent on the load current.
Optimization of the supply can be achieved by installing the power supply at a different point in the network or by using supply lines with larger conductor cross-section.

Attention!
It must be ensured that the system voltage, measured at the most distant participant, does not drop below 18 V DC (24 V - 25%).

5 Technical data

5.1. Dimensions



5.2. Mechanical data

Housing material	Die-cast zinc nickel-plated matte finish
Fieldbus	DeviceNet: 7/8" 5-pin (male and female)
Power supply	7/8" 4-pin male
I/O ports	M12, A-coded (8 male socket)
Enclosure rating	IP67 (only in plugged-in and screwed state)
Weight	approx. 580 g

5.3. Electrical data

Supply voltage	18 ... 30.2 V DC
Ripple	< 1 %
No-load current consumption	≤ 100 mA
Service interface	Balluff

5.4. Operating conditions

Ambient temperature	-5 °C … +70 °C

6 Installation

6.1. Mechanical connection

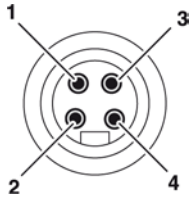
The BNI DNT-...modules can be connected directly to a mounting wall or to a machine. Be sure that the mounting base is flat to prevent any mechanical stress on the device housing. Two M6 screws and two washers are required for mounting. The maximum tightening torque is 9 Nm.

Installation

- Attach module using two screws (max. M6) and two washers.
- Do not exceed the maximum tightening torque of 9 Nm.
- Keep a distance of at least 3 mm between two modules.

6.2. Electrical connection

AUX Power (7/8" 4-pin, male)

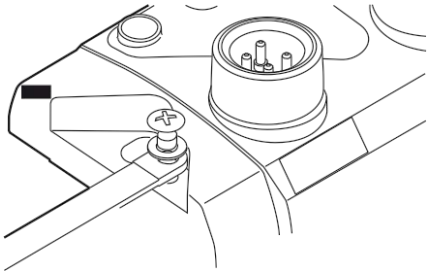


PIN	Function
1	+ 24 V output power (actuator)
2	+ 24 V input power (sensor)
3	0 V ground
4	0 V GND

Power supply

- DC voltage 24 VDC
- Provide sensor/bus power and actuator power from separate power sources if possible.
- Total current < 9 A. The total current of all modules must not exceed 9 A even when daisy chaining the actuator supply.

Function ground



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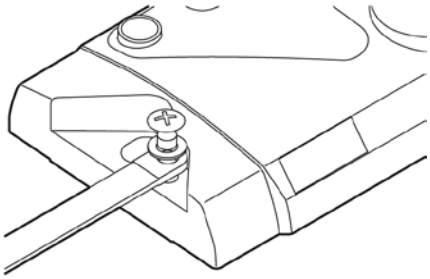


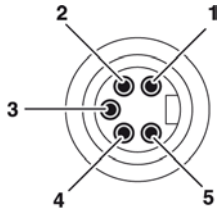
BNI DNT-104-000-Z004

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

6.3. Bus connection

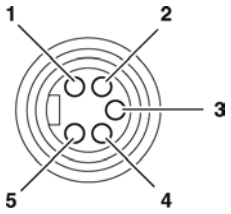
The bus connection is established using the 7/8" sockets DeviceNet IN and DeviceNet OUT. The address is set on the address switch.

DeviceNet IN (7/8" male)



PIN	Function
1	Drain
2	+VS
3	0 V
4	Can_H
5	Can_L

DeviceNet OUT (7/8" female)



PIN	Function
1	Drain
2	+VS
3	0 V
4	Can_H
5	Can_L

Connecting DeviceNet

- Connect ground conductor to FE terminal.
- Connect the incoming DeviceNet line to DeviceNet IN.
- Connect the continuing DeviceNet line to DeviceNet OUT or screw the terminating resistor to the continuing DeviceNet terminal.

Note
Both ends of the DeviceNet network must be terminated with a terminating resistor.
Unused sockets must be fitted with cover caps to ensure the IP 67 protection rating.

6.4. Connecting actuators/sensors

Provided for connecting the actuators/sensors are, depending on the module, 8 standard I-ports,
8 standard O-ports, 8 standard I/O ports or 8 configurable standard I/O ports (M12, A-coded, female).

Overview of the connection options

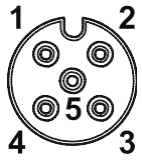
Module	Standard I-ports	Standard O-ports
BNI DNT-104-000-Z004	16	-
BNI DNT-202-000-Z005	-	8
BNI DNT-302-000-Z005	max. 16	max. 16
BNI DNT-305-000-Z005	8	8
BNI DNT-305-007-Z005	8	8

6 Installation

BNI DNT-104-000-Z004
16 standard I-ports (pin 2 and pin 4 on each port)

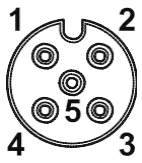
PIN	Inputs
1	+24 V, 200 mA
2	Signal 2
3	0 V, GND
4	Signal 1
5	FE, function ground

BNI DNT-202-000-Z005
8 standard O-ports (pin 4 on each port)



PIN	Outputs
1	n.c.
2	n.c.
3	0 V, GND
4	+24 V, 2 A
5	FE, function ground

BNI DNT-302-000-Z005
Max. 16 standard I-ports or max. 16 standard O-ports, freely configurable. For each port, it is possible to configure, e.g., PIN 2 as an input and PIN 4 as an output. In total, a maximum of 16 actuators or sensors can be connected.



PIN	Inputs	Outputs
1	+24 V, 200 mA	n.c.
2	Signal 2	+24 V, 2 A
3	0 V, GND	0 V, GND
4	Signal 1	+24 V, 2 A
5	FE, function ground	FE, function ground

BNI DNT-305-000-Z005
4 standard I-ports (ports 0,1,4,5 pin 2 and pin 4) and
4 standard O-ports (ports 2,3,6,7 pin 2 and pin 4)

PIN	Inputs	Outputs
1	+24 V, 200 mA	n.c.
2	Signal 2	+24 V, 2 A
3	0 V, GND	0 V, GND
4	Signal 1	+24 V, 2 A
5	FE, function ground	FE, function ground

BNI DNT-305-007-Z005
8 ports with input on pin 2 and output on pin 4

PIN	Inputs	Outputs
1	+24 V, 200 mA	n.c.
2	-	+24 V, 2 A
3	0 V, GND	0 V, GND
4	Signal 1	-
5	FE, function ground	FE, function ground

Note
Unused sockets must be fitted with cover caps to ensure the IP 67 protection rating.

6.5. Changing BNI DNT modules

Attention!
Components may be damaged by electrostatic discharge.
- De-energize device before opening.
- Observe rules for handling components that are sensitive to electrostatic discharge.

- De-energize the DeviceNet module.
- Remove connections.
- Loosen fastening screws.
- Replace the device.

7 Commissioning

7.1. Hardware settings

The baud rate and DeviceNet address are set directly on the BNI DNT-... using BCD switches.

Baud rate (DR, Data Rate)

The following baud rates can be set (Fig. 7-1, item 1):
Switch position 0: 125 kbs
Switch position 1: 250 kbs
Switch position 2: 500 kbs
Switch position 3: Autobaud (default setting)
Switch position 4-9: programmable

Note
The same baud rate must be assigned to each DeviceNet participant.
The set baud rate is read once after power is turned on.

Addressing (NA, Node Address)

- A unique address must be assigned to each bus participant.
- Permissible address range 0...63.
- Free addresses (address 64 and higher) are treated like address 99 (software address).
- The default address in the EDS file is set to address 63 during automatic addressing.
- The address is read once after power is turned on.
- Any change to the address does not become effective until power is reset on the module.

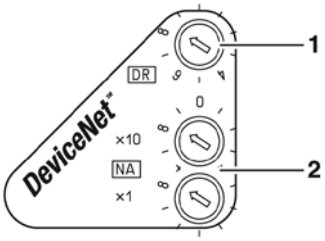


Fig. 7-1: Baud-rate switch and address switch "x10" and "x1"

1 baud-rate switch (DR) 2 address switches "x10" and "x1" (NA)

Further explanations on the baud-rate and address switches can be found on the rear of the module.

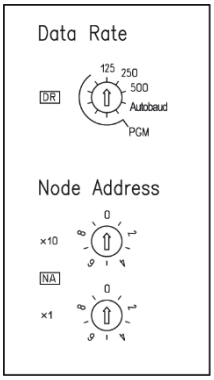


Fig. 7-2: Imprint for baud-rate and address switches on the rear of the module

7.2. I/O data image

To configure with a configuration tool, an EDS file (**E**lectronic-**D**ata-**S**heet) is necessary. The EDS files are created explicitly for a given module type and contain manufacturer- and module-specific data. The EDS files are available for download via the Internet. (www.balluff.com/software).

EDS files

Note
EDS files care created on a module-specific basis. Application-specific changes may only be performed with the permission of the manufacturer.

From the details in the device identification, the scanner creates a peripheral image of the detected slaves and maps the I/O-data according to their physical arrangement in the scan list. The scan list can be assigned to the logical addresses of the PLC according to the arrangement of the bus participants.
The I/O data of the BNI DNT modules are stored in attribute 3 of class 4 of a manufacturer-specific instance. The data can also be called up via the Explicit Message service. The data format is identical for the supported operating modes (Poll, Change of State - COS, Cyclic).

BNI DNT-104-… (DI16)

Input data and diagnostic data: 16 bits for inputs and status bit for each channel

Assembly instance 100

Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	I - 07	I - 06	I - 05	I - 04	I - 03	I - 02	I - 01	I - 00
1	I - 15	I - 14	I - 13	I - 12	I - 11	I - 10	I - 09	I - 08
2	S - 07	S - 06	S - 05	S - 04	S - 03	S - 02	S - 01	S - 00
3	S - 15	S - 14	S - 13	S - 12	S - 11	S - 10	S - 09	S - 08

I - X: Input Channel X
S - X: Short Circuit Status Channel X

BNI DNT-202-… (D08)

Output data and diagnostic data: 8 bits for outputs, status bit for each output and status of the actuator supply.

Assembly instance 100

Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	HS - 07	HS - 06	HS - 05	HS - 04	HS - 03	HS - 02	HS - 01	HS - 00
1	OL - 07	OL - 06	OL - 05	OL - 04	OL - 03	OL - 02	OL - 01	OL - 00
2								AP

HS - X: Output Handshake Port X AP: Actuator Power Status
OL -X: Overload Status Port X

Assembly instance 101

Output data and reset: 8 bits for outputs and reset bit for each output.

Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	O - 07	O - 06	O - 05	O - 04	O - 03	O - 02	O - 01	O - 00
1	R - 07	R - 06	R - 05	R - 04	R - 03	R - 02	R - 01	R - 00

O - X: Output Port X
R - X: Output Reset Port X

7 Commissioning

BNI DNT-302-… (DI16DO16)

Input data and diagnostic data: 16 bits for inputs, status bits for each channel as well as status of the sensor and actuator supply.

Assembly instance 100

Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	I - 07	I - 06	I - 05	I - 04	I - 03	I - 02	I - 01	I - 00
1	I - 15	I - 14	I - 13	I - 12	I - 11	I - 10	I - 09	I - 08
2	S - 07	S - 06	S - 05	S - 04	S - 03	S - 02	S - 01	S - 00
3	S - 15	S - 14	S - 13	S - 12	S - 11	S - 10	S - 09	S - 08
4	OL - 07	OL - 06	OL - 05	OL - 04	OL - 03	OL - 02	OL - 01	OL - 00
5	OL - 15	OL - 14	OL - 13	OL - 12	OL - 11	OL - 10	OL - 09	OL - 08
6							SP	AP

I - X: Input Channel X
S - X: Short Circuit Status Channel X
OL - X: Overload Status Channel X
SP: Sensor Power Status
AP: Actuator Power Status

Assembly instance 101

Output data and reset: 16 bits for outputs and reset bit for each channel.

Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	O - 07	O - 06	O - 05	O - 04	O - 03	O - 02	O - 01	O - 00
1	O - 15	O - 14	O - 13	O - 12	O - 11	O - 10	O - 09	O - 08
2	R - 07	R - 06	R - 05	R - 04	R - 03	R - 02	R - 01	R - 00
3	R - 15	R - 14	R - 13	R - 12	R - 11	R - 10	R - 09	R - 08

O - X: Output Channel X
R - X: Output Reset Channel X

BNI DNT-305-000-… DI8DO8)

Input data and diagnostic data: 8 bits for inputs and status bits for each output.

Assembly instance 100

Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	I - 07	I - 06	I - 05	I - 04	I - 03	I - 02	I - 01	I - 00
1	S - 07	S - 06	S - 05	S - 04	S - 03	S - 02	S - 01	S - 00
2	HS - 07	HS - 06	HS - 05	HS - 04	HS - 03	HS - 02	HS - 01	HS - 00
3	OL - 07	OL - 06	OL - 05	OL - 04	OL - 03	OL - 02	OL - 01	OL - 00

I - X: Input Port X
S - X: Short Circuit Status Port X
HS - X: Output Handshake Port X
OL - X: Overload Status Port X

Assembly instance 101

Output data and reset: 8 bits for outputs and reset bit for each output.

Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	O - 07	O - 06	O - 05	O - 04	O - 03	O - 02	O - 01	O - 00
1	R - 07	R - 06	R - 05	R - 04	R - 03	R - 02	R - 01	R - 00

O - X: Output Channel X
R - X: Output Reset Channel X

BNI DNT-305-007-… DI8DO8)

Input data and diagnostic data: 8 bits for inputs and status bits for each output.

Assembly instance 100

Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	I - 07	I - 06	I - 05	I - 04	I - 03	I - 02	I - 01	I - 00
1	ISC - 07	RSV - 06	RSV - 05	OVLT - 04	RSV - 03	RSV - 02	RSV - 01	RSV - 00

I - X: Input Port X
ISC=Input Short Circuit RSVD=Reserved OFLT=Output Fault O=Output
Output Fault: When the bit is set, it indicates an output fault on this block.
Input Short Circuit: When this bit is set, it indicates a short circuit on this block.

Assembly instance 101

Output data and reset: 8 bits for outputs and reset bit for each output.

Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	O - 07	O - 06	O - 05	O - 04	O - 03	O - 02	O - 01	O - 00

O - X: Output Channel X

7 Commissioning

7.3. Parameter configuration

The BNI DNT modules can be configured in various ways. The following tables contain information on configuring the modules.

BNI DNT-104-000-Z004 (DI16)

Parameter	Description	Class	Instance	Attribute	Data Type	Data Size (Bit)
Param 1	Heartbeat	F	1	1	UDINT	32
Param 2	Input Values	F	2	1	WORD	16
Param 3	Status Values	F	3	1	WORD	16

BNI DNT-202-000-Z005 (DO8)

Parameter	Description	Class	Instance	Attribute	Data Type	Data Size (Bit)
Param 1	Heartbeat	F	1	1	UDINT	32
Param 2	Handshake Values	F	2	1	BYTE	8
Param 3	Overload Values	F	3	1	BYTE	8
Param 4	Power Status	F	4	1	BYTE	8
Param 5	Output Values	F	5	1	BYTE	8
Param 6	Restart Values	F	6	1	BYTE	8
Param 7	00 Fault Setting	9	1	64	USINT	8
Param 8	01 Fault Setting	9	2			
Param 9	02 Fault Setting	9	3			
Param 10	03 Fault Setting	9	4			
Param 11	04 Fault Setting	9	5			
Param 12	05 Fault Setting	9	6			
Param 13	06 Fault Setting	9	7			
Param 14	07 Fault Setting	9	8			
Param 15	00 Idle Setting	9	1	65	USINT	8
Param 16	01 Idle Setting	9	2			
Param 17	02 Idle Setting	9	3			
Param 18	03 Idle Setting	9	4			
Param 19	04 Idle Setting	9	5			
Param 20	05 Idle Setting	9	6			
Param 21	06 Idle Setting	9	7			
Param 22	07 Idle Setting	9	8			

BNI DNT-302-000-Z005 (DI16DO16)

Parameter	Description	Class	Instance	Attribute	Data Type	Data Size (Bit)
Param 1	Heartbeat	F	1	1	UDINT	32
Param 2	Input Values	F	2	1	WORD	16
Param 3	Status Values	F	3	1	WORD	16
Param 4	Overload Values	F	4	1	WORD	16
Param 5	Power Status	F	5	1	BYTE	8
Param 6	Output Values	F	6	1	WORD	16
Param 7	Restart Values	F	7	1	WORD	16
Param 8	00 Fault Setting	9	1	64	USINT	8
Param 9	01 Fault Setting	9	2			
Param 10	02 Fault Setting	9	3			
Param 11	03 Fault Setting	9	4			
Param 12	04 Fault Setting	9	5			
Param 13	05 Fault Setting	9	6			
Param 14	06 Fault Setting	9	7			
Param 15	07 Fault Setting	9	8			
Param 16	08 Fault Setting	9	9			
Param 17	09 Fault Setting	9	A			
Param 18	10 Fault Setting	9	B			
Param 19	11 Fault Setting	9	C			
Param 20	12 Fault Setting	9	D			
Param 21	13 Fault Setting	9	E			
Param 22	14 Fault Setting	9	F			
Param 23	15 Fault Setting	9	10			
Param 24	00 Idle Setting	9	1	65	USINT	8
Param 25	01 Idle Setting	9	2			
Param 26	02 Idle Setting	9	3			
Param 27	03 Idle Setting	9	4			
Param 28	04 Idle Setting	9	5			
Param 29	05 Idle Setting	9	6			
Param 30	06 Idle Setting	9	7			
Param 31	07 Idle Setting	9	8			
Param 32	08 Idle Setting	9	9			
Param 33	09 Idle Setting	9	A			
Param 34	10 Idle Setting	9	B			
Param 35	11 Idle Setting	9	C			
Param 36	12 Idle Setting	9	D			
Param 37	13 Idle Setting	9	E			
Param 38	14 Idle Setting	9	F			
Param 39	15 Idle Setting	9	10			

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BNI DNT-305-xxx-Z005 (DI8DO8)

Parameter	Description	Class	Instance	Attribute	Data Type	Data Size (Bit)
Param 1	Heartbeat	F	1	1	UDINT	32
Param 2	Input Values	F	2	1	BYTE	8
Param 3	Status Values	F	3	1	BYTE	8
Param 4	Overload Values	F	4	1	BYTE	8
Param 5	Handshake Values	F	5	1	BYTE	8
Param 6	Power Status	F	6	1	BYTE	8
Param 7	Output Values	F	7	1	BYTE	8
Param 8	Restart Values	F	8	1	BYTE	8
Param 9	00 Fault Setting	9	1	64	USINT	8
Param 10	01 Fault Setting	9	2			
Param 11	02 Fault Setting	9	3			
Param 12	03 Fault Setting	9	4			
Param 13	04 Fault Setting	9	5			
Param 14	05 Fault Setting	9	6			
Param 15	06 Fault Setting	9	7			
Param 16	07 Fault Setting	9	8			
Param 17	00 Idle Setting	9	1	65	USINT	8
Param 18	01 Idle Setting	9	2			
Param 19	02 Idle Setting	9	3			
Param 20	03 Idle Setting	9	4			
Param 21	04 Idle Setting	9	5			
Param 22	05 Idle Setting	9	6			
Param 23	06 Idle Setting	9	7			
Param 24	07 Idle Setting	9	8			

7.4. Project configuration with RSNetWorx

Shown here as an example is the project configuration of the BNI DNT modules using the RSNetWorx software. The exact procedure depends on the project planning software used.

> ⚠ **Attention!**
> When commissioning the network, observe the operating manuals of all used devices.

Requirements:

- Proper structure of the DeviceNet network
- Each DeviceNet participant must be assigned the same baud rate
- Each DeviceNet participant must be assigned a unique address in the network
- Supply voltage for the bus participants is switched on
- The scanner has recognized the bus participants
- The PC with the project configuration software is connected to the DeviceNet

Installing the ESD file

The latest ESD files of the modules are required for project configuration. The ESD files contain manufacturer- and device-specific information, such as vendor ID, device class, possible operating modes.

➢ Install ESD files in RSNetWorx.

Scanning the network

➢ Click the "Online" button in the RSNetWorx task bar.
➢ Confirm the confirmation requests.
↳ RSNetWorx scans the network.
↳ The DeviceNet bus participants are detected.

Configuring the module

Check the configuration of the module and set parameters for the module.

➢ Right-click to select the BNI DNT module.
↳ The context menu opens.
➢ On the context menu, select "Properties".
↳ The "Properties" dialog box opens.

7 Commissioning

Configuring the module

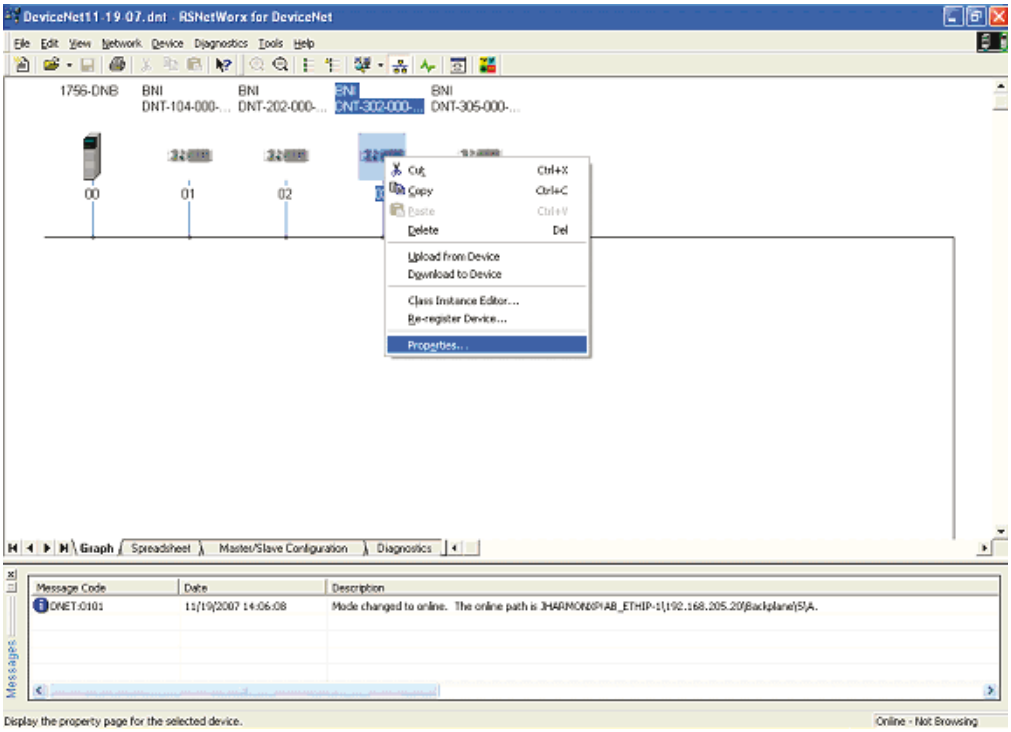

Fig. 7-3: Call up properties for the module

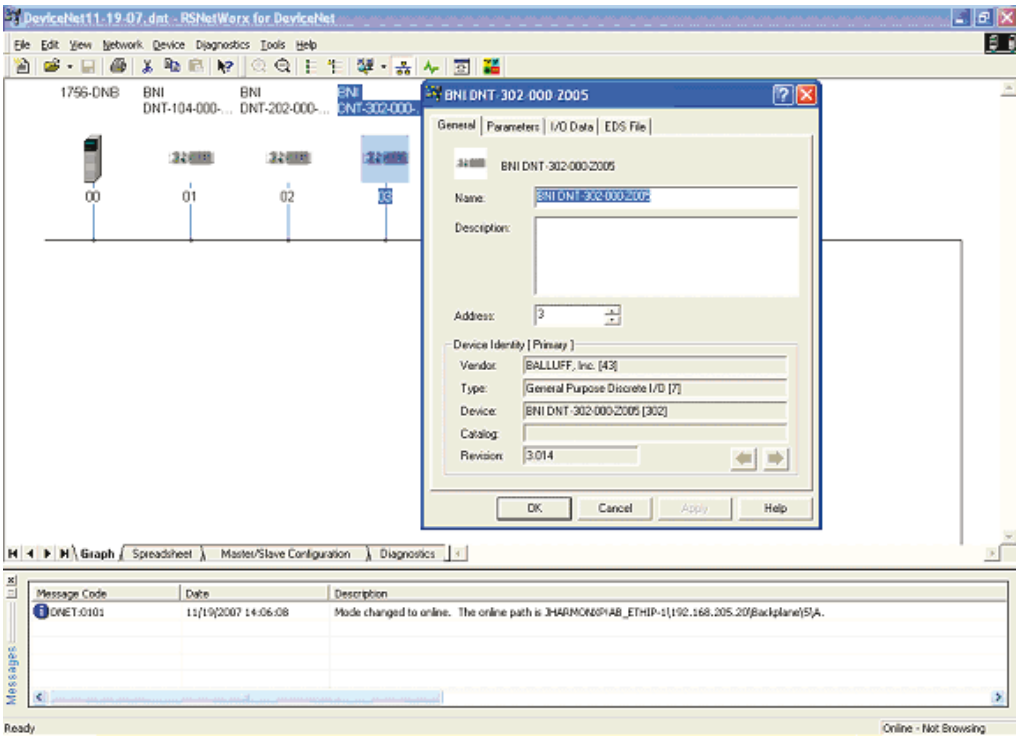

Fig. 7-4: General device information

Checking and setting parameters

Switch to the "Parameters" tab. All device parameters and device diagnostics are displayed.

- Double-click on the "Parameter" column to change the configuration.
- Click on a list field in the "Current Value" column to change a setting.

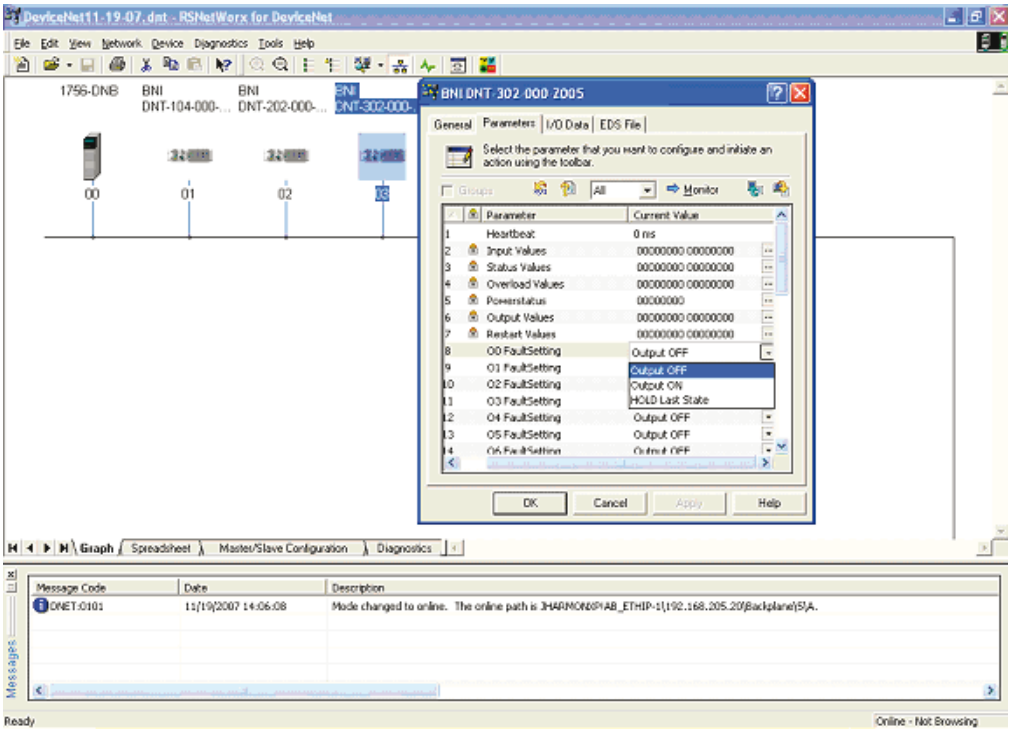

Fig. 7-5: Check and set module parameters

7 Commissioning

Checking the connection type and I/O data length

➢ Switch to the "I/O Data" tab.
↳ The set connection type (operating mode) and the I/O data length are displayed and can be changed.

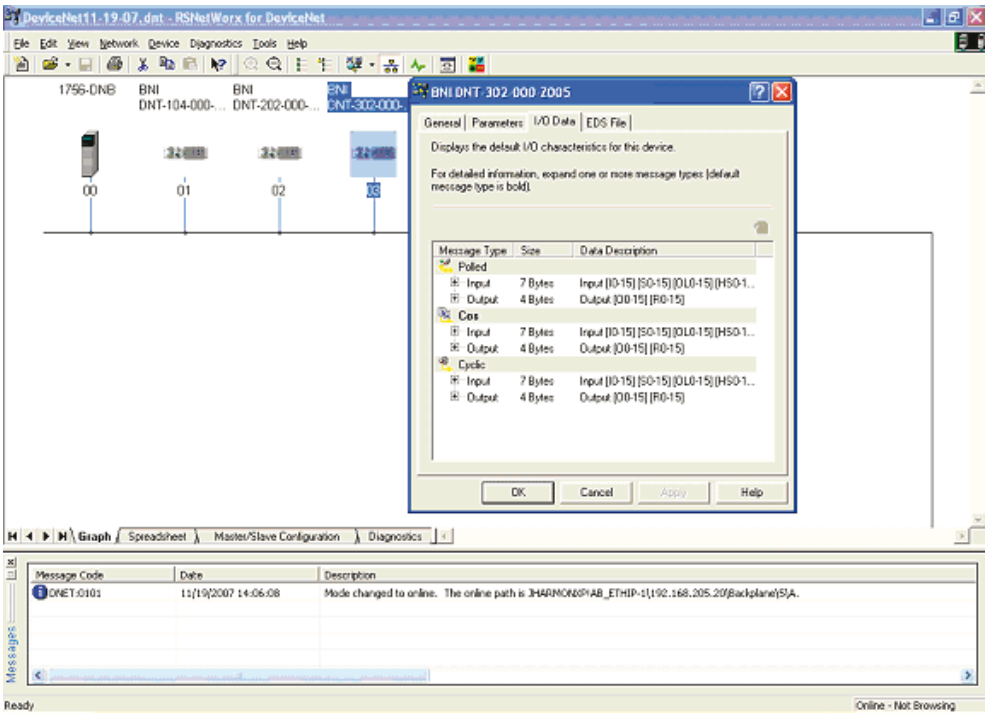

Fig. 7-6: Connection type (operating mode) and length of the I/O data

Saving the configuration

The configuration must be transferred to the module (download). The configuration is stored in the module.

Checking the scan list

The I/O data lengths of the module must be entered correctly in the scan list. The detected operating module for the module must also match the configuration.

Saving the scan list

The scan list must be transferred to the scanner (download). The scanner then establishes a connection to the module. It is now possible to access the module data from the PLC.

8 Diagnostics

8.1. Function indicators

Profibus LED indicators

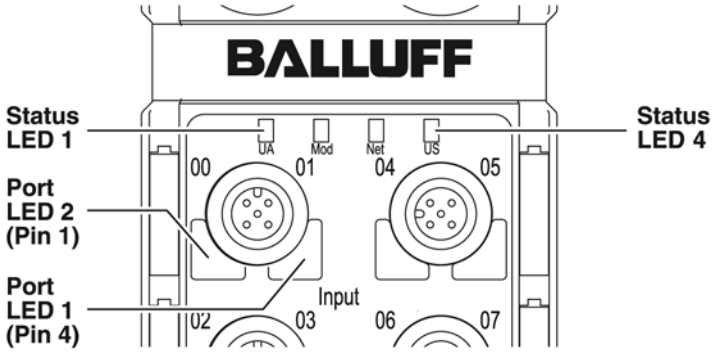

Fig. 8-1: LED indicators for bus and I/O ports

Status LEDs

LED	Display	Function
LED 1	Green/red	Vo supply voltage (AUX Output Power)*
LED 2	Green/red	Mod Module
LED 3	Green/red	Net Network
LED 4	Green/red	Vs supply voltage (AUX Input Power)**

* This display is not present on the BNI DNT-104-…
** This display is not present on the BNI DNT-104-… and BNI DNT-202-…

LED indicators I/O ports

Each M12 port (I/O interface) is assigned two 2-color LEDs which indicate the configuration or operating states.

Standard I/O port LEDs

Display	Request / Signal	
	LED 1 (Pin 4)	
off	Output = 0	Input = 0
Green	Output = 1	Input = 1
Red	I Output > Imax	Input: SC*
	LED 2 (Pin 2)	
off	Output = 0	Input = 0
Green	Output = 1	Input = 1
Red	I Output > Imax	Input: SC*

*****SC= Short circuit detection on pin 1. In this case both LEDs are red.

9 Appendix

9.1. Type code

BNI DNT-x0x-00x-Z00x

Balluff Network Interface

DeviceNet

Functions
104 = 16 standard inputs
202 = 8 standard outputs 2 A
302 = max. 16 inputs and/or max. 16 outputs 1.6 A
305 = 8 standard inputs + 8 standard outputs 2 A

Variants
000 = no variant
007 = Input on pin 4, Output on pin 2

Mechanical configuration
Z004 = material: die-cast zinc housing
Bus connection: 7/8" female thread and 7/8" male thread
IO ports: 8 x M12 female thread
Z005 = material: die-cast zinc housing
Bus connection: 7/8" female thread and 7/8" male thread
Supply voltage: 7/8" male thread
IO ports: 8 x M12 female thread

9.2. Ordering information

Type	Ordering code
BNI DNT-104-000-Z004	BNI0001
BNI DNT-202-000-Z005	BNI0002
BNI DNT-302-000-Z005	BNI0003
BNI DNT-305-000-Z005	BNI0004
BNI DNT-305-007-Z005	BNI00C0

Scope of delivery

The delivery includes the following components

- DeviceNet module
- 4x M12 dummy plugs
- Ground strap
- M4x6 screw
- Lock washer
- 20 labels

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No. 895063-726 E •03.127257 • Edition I18 • Replaces Edition E16 •Subject to modifications