Your Global Automation Partner

TURCK

BL20-E-GW-DN
ECO Gateway for DeviceNet

Instructions for Use

Table of Contents

1 About These Instructions

These operating instructions describe the structure, functions and the use of the product and will help you to operate the product as intended. Read these instructions carefully before using the product. This is to avoid possible damage to persons, property or the device. Retain the instructions for future use during the service life of the product. If the product is passed on, pass on these instructions as well.

1.1 Target groups

These instructions are aimed a qualified personal and must be carefully read by anyone mounting, commissioning, operating, maintaining, dismantling or disposing of the device.

1.2 Documentation concept

This manual contains all information about the BL20 gateway for DeviceNet of the BL20-ECO product series BL20-E-GW-DN.

The following chapters contain a short BL20 system description, a description of the field bus system DeviceNet, exact information about function and structure of the gateway as well as all bus-specific information concerning the connection to automation devices, the maximum system extension etc.

The bus-independent I/O-modules for BL20 as well as all further fieldbus-independent chapters like mounting, labeling etc. are described in a separate manual.

- BL20 I/O-modules (Turck-Documentation-No.: English D300717)

Furthermore, the manual mentioned above contains a short description of the project planning and diagnostics software for Turck I/O-systems, the software I/O-ASSISTANT 3 (FDT/DTM).

1.3 Explanation of symbols used

The following symbols are used in these instructions:

DANGER

DANGER indicates a dangerous situation with high risk of death or severe injury if not avoided.

WARNING

WARNING indicates a dangerous situation with medium risk of death or severe injury if not avoided.

CAUTION

CAUTION indicates a dangerous situation of medium risk which may result in minor or moderate injury if not avoided.

NOTICE

NOTICE indicates a situation which may lead to property damage if not avoided.

NOTE

NOTE indicates tips, recommendations and useful information on specific actions and facts. The notes simplify your work and help you to avoid additional work.

➤ CALL TO ACTION

This symbol identifies steps that the user has to perform.

↪ RESULTS OF ACTION

This symbol identifies relevant results of steps

1.3.1 Additional documents

The following additional documents are available online at www.turck.com

- Data sheet
- Declaration of Conformity

1.4 Feedback about these instructions

We make every effort to ensure that these instructions are as informative and as clear as possible. If you have any suggestions for improving the design or if some information is missing in the document, please send your suggestions to techdoc@turck.com.

2 Notes on the Product

2.1 Product identification

These instructions apply to the BL20 gateway BL20-E-GW-DN

2.2 Scope of delivery

- BL20-E-GW-DN
- 2 end brackets

2.3 Legal requirements

The device falls under the following EU directives:

- 2014/30/EU (electromagnetic compatibility)
- 2011/65/EU (RoHS Directive)

2.4 Manufacturer and service

Hans Turck GmbH & Co. KG
Witzlebenstraße 7
45472 Muelheim an der Ruhr
Germany

Turck supports you with your projects, from initial analysis to the commissioning of your application. The Turck product database contains software tools for programming, configuration or commissioning, data sheets and CAD files in numerous export formats. You can access the product database at the following address:www.turck.de/produkte

Should you have any further questions, please contact the sales and service team in Germany under the following telephone numbers:

Sales: +49 208 4952-380

Technology: +49 208 4952-390

Internet: www.turck.de

Outside Germany, please contact your local Turck representative.

3 For Your Safety

The product is designed according to state-of-the-art technology. However, residual risks still exist. Observe the following warnings and safety notices to prevent damage to persons and property. Turck accepts no liability for damage caused by failure to observe these warning and safety notices.

3.1 Intended use

The devices are only intended for use in industrial applications.

The BL20 gateway BL20-E-GW--DN is part of the BL20 system. It forms the interface to a DeviceNet network and forwards the data collected from the field by the BL20 I/O modules within the BL20 station to the higher-level DeviceNet scanner.

The devices may only be used as described in these instructions. Any other usage shall be considered improper and Turck shall not be held liable for any resulting damage.

3.2 General safety instructions

- The device may only be assembled, installed, operated and maintained by professionally trained personnel.
- The device may only be used in accordance with applicable national and international regulations, standards and laws.
- The device only meets the EMC requirements for industrial areas and is not suitable for use in residential areas.

4 DeviceNet - Fieldbus description

4.1 General Information about DeviceNet

4.1.1 DeviceNet – system overview

DeviceNet is a low-cost communication link to connect industrial devices such as limit switches, photoelectric sensors, valve manifolds, motor starters, process sensors, bar code readers, variable frequency drives, panel displays and operator interfaces to a network and eliminate hard-wiring. The direct connectivity provides improved communication between devices as well as important device-level diagnostics not easily accessible or available through hard-wired I/O interfaces.

DeviceNet is based on a broadcast-oriented communications architecture - the Controller Area Network (CAN). CAN uses the CSMA/BA bus arbitration method. CSMA/BA assures that the highest priority message always gets transmitted.

The DeviceNet protocol further defines message priorities such that I/O messages are given top priority and configuration messages have lower priority.

DeviceNet allows Peer-to-Peer data exchange (in which any DeviceNet product can produce and consume messages) and Master/Slave operation (called the Predefined Master/Slave Connection Set.)

The organization which observes product compliance with the DeviceNet Specifications, is the ODVA (www.ODVA.org).

4.1.2 Maximum system extension

A DeviceNet network supports up to 64 nodes and an unlimited amount of I/O. The bus uses a trunkline-dropline topology.

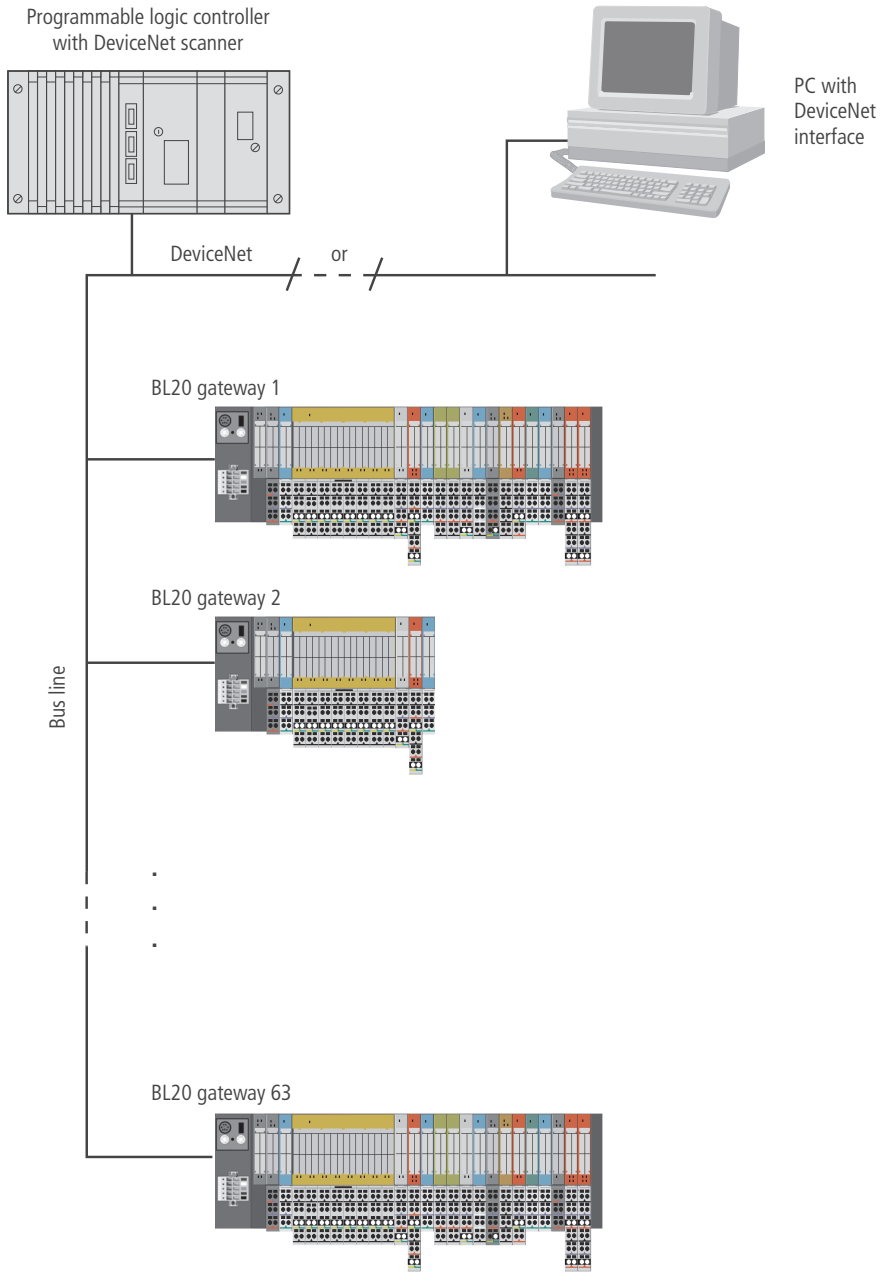


Fig. 1: Maximum system extension

4.1.3 Addressing

The valid range of DeviceNet node addresses is 0 to 63. The station default node address is 63. Each node's address must be set initially. The address is set using the decimal rotary coding switches on the gateway; it can also be set with a DeviceNet configuration tool but it is not possible to allocate address directly via the bus.

4.1.4 Power distribution

Bus power and communication are supplied on a single cable. Bus power is 24 VDC and supplies current to operate the node as well as current to power input devices.

4.1.5 EDS files

Electronic data sheets, or EDS files, are specifically formatted ASCII files that contain detailed information about the device, including I/O data size and the device's configurable parameters. The information in an EDS guides a user through the steps necessary to configure a device. EDS files are available on disk or from the Turck website (www.turck.com).

4.1.6 Communication rate/cycletTime

The DeviceNet specification defines three transmission speeds: 125, 250 and 500 kbps.

All nodes on a network must communicate at the same rate. The complete cycle time of a DeviceNet system is affected by several factors:

- the number of nodes being scanned
- the amount of data produced and consumed by the nodes
- type of I/O messaging (change of state, strobe, poll)
- network communication rate
- device time-out and explicit messaging traffic
- the cycle time of the control program

All of these factors must be considered when calculating the cycle time of a particular network.

4.1.7 Maximum ratings

The DeviceNet bus uses a trunk and drop topology. The trunk is the main communication cable and requires a 121 Ω resistor at both ends of the cable.

The length of the cable depends on the communication rate and the cable type.

Drops are branches off the trunk and may be from 0 to 6 m (20 ft). The cumulative drop lengths are dependent on the communication rate. The table below shows the maximum ratings for a trunk using a thick, mid or thin trunk cable in a DeviceNet network with the maximum number of 64 nodes:

Baud rate (max.)	Thick cable length (max.)	Mid cable length (max.)	Thin cable length (max.)	Drop length (cumulative)	Drop length (max.)
125 kbps	500 m (1640 ft)	300 m (984 ft)	100 m (328 ft)	6 m (20 ft)	156 m (512 ft)
250 kbps	250 m (820 ft)		100 m (328 ft)	6 m (20 ft)	78 m (256 ft)
500 kbps	100 m (328 ft)		100 m (328 ft)	6 m (20 ft)	39 m (128 ft)

NOTE

The exact specifications relating to maximum cable lengths when using other types of cables (Thin Cable, Flat Cable, Cable II, Cable I) can be found in the ODVA DeviceNet Specification Rel. V2.0, Appendix B.

4.1.8 Mixed operation with other station types

In addition to the BL20 gateway, it is possible to integrate other stations, for example, station types and modules from the WIN bloc range or third-party devices that comply with the DeviceNet communications protocol, in to the fieldbus system; thus enabling mixed operation. This makes the DeviceNet system extremely flexible and suitable for use in the most difficult of industrial environments.

4.2 Object model

All DeviceNet devices are described based on an unambiguous object model. Each device is exactly defined with the aid of objects.

The following graphic shows the most important objects of a DeviceNet device.

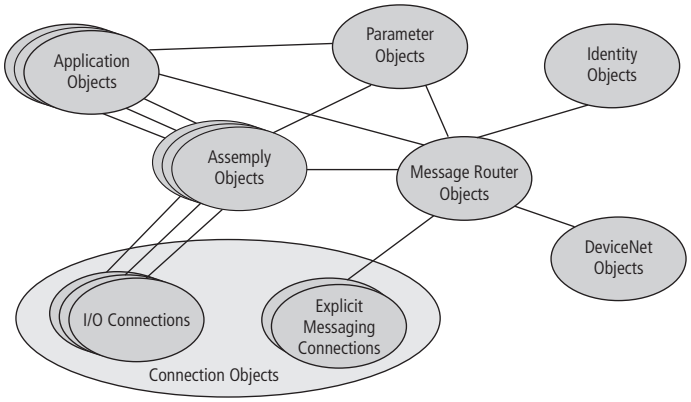


Fig. 2: DeviceNet network

The objects depicted in the graphic can be divided in to 3 groups:

4.2.1 Management objects

Define DeviceNet-specific data and functions; these must be supported by all DeviceNet devices:

Identity object

The Identity Object (Class Code 01Hex) contains all data necessary to clearly identify a node within a network, such as, Vendor ID, Device Type and Product Code. In addition, it contains the current status of a device, the serial number and the product name.

Instance Attributes

The following attributes are the most important attributes of the Identity Object in order to clearly identify a device.:

Attr. No.	Attribute Name	Get/ Set	Type	Description
2 (0×02)	DEVICE TYPE	G	UINT	Indicates the general type of product. Communications Adapter 12_{dez} = 0×0C
3 (0×03)	PRODUCT CODE	G	UINT	Identifies a particular product within a device type. Default: 27301
4 (0×04)	REVISION Major Minor	G	STRUCT OF: USINT USINT	Revision of the item the Identity Object is representing. For example: 0x01 0x06
5 (0×05)	STATUS	G	WORD	
6 (0×06)	SERIAL NUMBER	G	UDINT	Contains the ident-no. of the product.
7 (0×07)	PRODUCT NAME	G	SHORT_ STRING	BL20-E-GW-DN

Device Status

Bit	Name	Definition
0 to 1	reserved	Default = 0
2	Configured	TRUE → The application of the device has been configured (≠ default-settings).
3	reserved	Default = 0
4 to 7	reserved	Default = 0
8 to 15	reserved	Default = 0

Message Router object

The Message Router Object (Class Code 02Hex) makes it possible to access all classes and instances in the device via Explicit Messages.

4.2.2 Connection objects

Define the messages exchanged via DeviceNet:

- DeviceNet-Object

The DeviceNet-Object (Class Code 03Hex) must be supported by every device. It defines the physical connection of a device and the DeviceNet network. That means, it contains, amongst other things, the device address (MAC ID) and the currently set baud rate.

- Connection Object

The Connection Object (Class Code 05Hex) is supported by all DeviceNet devices in at least one instance. It defines the connection to the data via I/O Messages or Explicit Messages, the path and the length of the produced/consumed data, the CAN-Identifier used for the connection, time monitoring as well as the behavior in the case of error.

4.2.3 Application specific objects

Define device-specific data and functions (Application Objects, Parameter Object, Assembly Object).

- Application Objects

Application Objects describe simple applications in automation technology. These are either predefined in the DeviceNet object library or they are defined by the user.

- Parameter Object

The Parameter Object (Class Code 0FHex) is an interface to the configuration data and the parameters of a device. It contains an instance for each parameter, which is linked to the parameter to be set.

- Assembly Objects

The Assembly Object (Class Code 04Hex) offers the user a mapping option, meaning, data from attributes of differing instances in different classes can be summarized in a single attribute of an instance from an Assembly Object.

4.3 The DeviceNet communications profile

DeviceNet is based on a connection-oriented communications model. That means that it is only possible to exchange data via specified connections assigned to the devices.

The communication between the slaves in the DeviceNet network can be carried out either via I/O Messages or via Explicit Messages.

4.3.1 I/O messages

I/O Messages serve to exchange high priority process and application data over the network. The communication between the slaves in the DeviceNet network is carried out according to the Server/Client Model, which means, a producing application transmits data to another or a number of consuming applications. It is quite possible that information is passed to a number of Application Objects in a single device.

The communication between the devices via I/O Messages requires that an IO Message is set up. This can be achieved either by activating a static I/O Connection Object, which already exists in the device, via the predefined Master/Slave Connection Set, or via a dynamically set up I/O Connection Object. The latter can be set up via an Explicit Messaging Connection Object, which already exists in the device.

4.3.2 Explicit messages

Explicit Message are used to transmit low-priority configuration data, general management data or diagnostic data between two specific devices. This is a point-to-point connection in a Server/Client System that requires that a request from a client always has to be confirmed by a response from the server.

As is the case with the I/O Messages, the communication between devices using Explicit Massages requires that a Connection Object, the Explicit Messaging Connection Object, is set up. This can be achieved either by activating a static Connection Object, which already exists in the device, via the Predefined Master/Slave Connection Set, or dynamically via the so-called UCMM port (Unconnected Message Manager Port) of a device.

4.3.3 Predefined master/slave connection cet

The Group 2 Only Unconnected Explicit Message Port of the Predefined Master/Slave Connection Set provides an interface with which it is possible to assign up to 4 predefined connections. This model is based on the Master/Slave principle.

The predefined Connection Objects occupy the instances 1 to 4 in the Connection Object (Class ID 5):

Explicit messages

Group 2 Explicit Request/Response Message (Class ID 5, Instance ID 1)

I/O messaging connection

- Polled I/O Connection (Class ID 5, Instance ID 2)
- Bit-Strobe I/O Connection (Class ID 5, Instance ID 3)
- Change of State (COS)/ Cyclic I/O Connection (Class ID 5, Instance ID 4)

4.3.4 Communications Profile of the BL20 DeviceNet Gateway

The DeviceNet gateway behaves as a DeviceNet Server in the network; the scanner of the higher-level controller operates as a DeviceNet Client.

The following DeviceNet communications types are supported:

- Polled I/O Connection
- COS Connection
- Cyclic I/O Connection
- Bit-Strobe I/O Connection
- UCMM
- Offline Connection Set
- Device Heartbeat Message
- Device Shut Down Message

Polled I/O connection

A Polled I/O Connection establishes a conventional Master/Slave relationship between a controller and a DeviceNet device. A Polled I/O Connection is a point-to-point connection between two slaves on the fieldbus. The master (Client) transmits a Poll-Request to the slave (Server) who then answers with a Poll-Response.

COS I/O connection

COS (Change Of State) I/O Connections establish event-controlled connections. That means that the DeviceNet devices generate messages as soon as a change of status occurs.

Cyclic I/O connection

Messages are triggered time-controlled in Cyclic I/O connections by means of a time generator.

Bit-Strobe I/O connection

A Bit-Strobe I/O Connection is a connection between a DeviceNet Client and an undefined number of Servers, the Servers being queried by transmitted commands via a Client. The length of the commands is limited to 8 bytes, with each possible node address in the system being assigned a bit within these 8 bytes. Servers respond with up to 8 bytes of I/O Data

UCMM

The DeviceNet gateway offers the option of setting up dynamic Connection Objects via the UCMM port (Unconnected Message Manager Port).

This is the only supported method. The Group2 Only method is not supported.

Offline connection set

The offline connection set makes it possible to communicate with a node, which is in Communication-Fault but not in the Bus-OFF. It is not normally possible to communicate with such a node via the network; it either has to be switched off manually or re-initialized by turning it off and on. It is possible to communicate with just such a node over the network with the help of the Offline Connection Set.

Device heartbeat message

Device Heartbeat Messages enable DeviceNet devices to disclose their own statuses in configured intervals. These messages are configured in the Identity Object.

Device shut down message

If a device has to shut itself down due to internal errors or statuses, it can sign off from the controller with a defined Device Shut Down Message.

Consistency value

The non-volatile Required Configuration Memory can be tested with the assistance of the Consistency Value.

5 Eco-Gateway for DeviceNet

5.1 Introduction

This chapter contains a description of BL20-ECO-gateways for the standardized fieldbus DeviceNet. The chapter is divided up as follows: a description of functions, general and specific technical data, a description of addressing and status displays.

5.1.1 Function

The BL20 gateways enable BL20 modules to operate on DeviceNet. The gateway is the connection between the BL20 modules and a DeviceNet host system. It regulates the process data between the I/O level and the fieldbus and generates diagnostic data for the higher-level host system.

Information is made available to the software tool I/O-ASSISTANT 3 (FDT/DTM) via the service interface.

5.2 Technical data

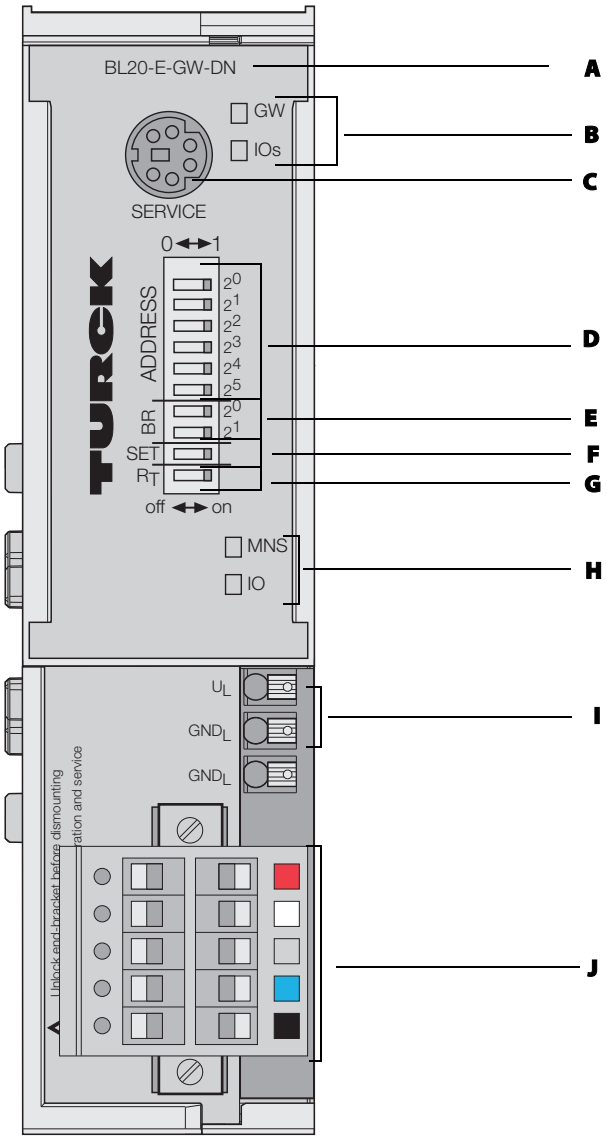


Fig. 3: Gateway BL20-E-GW-DN

A Type designation
B LEDs for BL20 module bus
C Service interface
D DIP switches for Node-ID
E DIP switches for bit rate
F SET -DIP switch
G DIP switch for the terminating resistor
H LEDs for DeviceNet
I Field supply
J DeviceNet-Open Style Connector

Structure of a BL20-ECO gateway

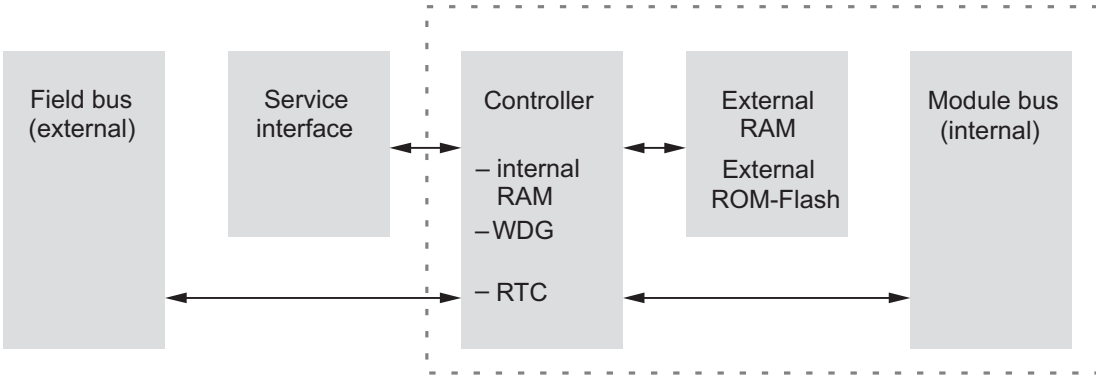


Fig. 4: Structure of a BL20-E-GW-DN

5.2.1 General technical data of a station

WARNING

Defective power supply unit

Danger to life due to dangerous voltages on touchable parts

➤ Only use SELV or PELV power supplies in accordance with EN ISO 13849-2, which allow a maximum of max. 60 VDC or 25 VAC in the event of a fault.

Technical data	
Supply voltage/auxiliary voltage	
U_{sys} (V+) Nominal value (provision for other modules)	24 V DC
I_{sys} (at maximum station extension) → see **Maximum system extension (page 58)**	Approx. 0.5 A
Permissible range	According to EN 61131-2 (18 to 30 V DC)
Max. field current	8 A
Residual ripple	According to EN 61131-2
Isolation voltage (U_L to U_{SYS})	500 V_{eff} U_L against V+ (fieldbus)
Voltage anomalies	See EN 61131-2 (incl. voltage break of 10 ms)
I_{MB} (supply of module bus nodes)	700 mA
Connection technology	Push-in tension clamp terminals, see s. **p. 26**
Physical interfaces	
fieldbus	
Protocol	DeviceNet
Transmission rate	125 kBit/s, 250 kBit/s, 500 kBit/s, autobaud can be set using DIP switches

Technical data	
Isolation voltage (field to U_{sys} and to U_L)	500 V_{eff}
fieldbus connection	Open Style Connector, max. wire cross section 2.5 mm^2
Address setting	Via DIP-switch (addresses 0 to 63)
Terminating resistor	Via DIP-switch
Service interface	
Connection	RS232 via PS2/ mini DIN female connector
Ambient conditions	
Ambient temperature	
– $t_{Ambient}$	0…+55 °C/32…131 °F For vertical installation, the gateway can be positioned both at the top and bottom. Sufficient ventilation and heat dissipation must be ensured.
– t_{Store}	-25…+85 °C / 13…185 °F
Relative humidity according to EN 61131-2/EN 50178	5…95 % (indoor), Level RH-2, no condensation (storage at 45 °C, no function test)
Climatic tests	According to IEC 61131-2
Resistance to vibration according to IEC 61131-2	
10…57 Hz, constant amplitude 0.075 mm / 0.003 inch, 1 g	Yes
57…150 Hz, constant acceleration 1 g	Yes
Mode of vibration	Frequency sweeps with a change in speed of 1 Octave/min
Period of oscillation	20 frequency sweeps per axis of coordinate
Shock resistant according to IEC 68-2-27	18 shocks, sinusoidal half-wave 15 g peak value/11 ms, in each case in ± direction per space coordinate
Resistance to repetitive shock according to IEC 68-2-29	1 000 shocks, half-sinus 25 g peak value/6 ms, in each case in ± direction per space coordinate
Topple and fall according to IEC 68-2-31 and free fall according to IEC 68-2-32	
Height of fall (weight < 10 kg)	1.0 m
Height of fall (weight 10 to 40 kg)	0.5 m
Test runs	7
Device with packaging, electrically tested printed-circuit board.	
Electromagnetic compatibility (EMC) according to EN 50 082-2 (Industry)	
Static electricity according to EN 61 000-4-2	
– Discharge through air (direct)	8 kV

Technical data	
– Relay discharge (indirect)	4 kV
Electromagnetic HF fields according to EN 61 000-4-3 and ENV 50 204	10 V/m
Conducted interferences induced by HF fields according to EN 61 000-4-6	10 V
Fast transients (Burst) according to EN 61 000-4-4	
Emitted interference according to EN 50 081-2 (Industry)	According to EN 55 011 Class A, Group 1

NOTE

This device can cause radio disturbances in residential areas and in small industrial areas (residential, business and trading). In this case, the operator can be required to take appropriate measures to suppress the disturbance at his own cost.

Approvals and tests

Designation	
Approvals	CE cULus
Tests (EN 61131-2)	
Cold	DIN IEC 68-2-1, temperature -25 °C / -13 °F, duration 96 h; not in use
Dry heat	DIN IEC 68-2-2, Temperature +85 °C / 185 °F, duration 96 h; device not in use
Damp heat, cyclic	DIN IEC 68-2-30, temperature +55 °C / 131 °F, duration 2 cycles every 12 h; device in use
Pollution severity according to IEC 664 (EN 61 131-2)	2
Protection class according to IEC 529	IP20 (not evaluated by UL)
MTTF	449 years according to SN 29500 (Ed. 99) 20 °C

5.2.2 Technical data for the push-in tension clamp terminals

Designation	
Protection class	IP20 (not evaluated by UL)
Insulation stripping length	8 mm + 1/ 0.32 inch + 0,039
Max. wire range	0.14…1.5 mm^2/0.0002…0.0023 $inch^2$/26…16 AWG
Crimpable wire	
"e" solid core H 07V-U	0.14…1.5 mm^2/0.0002…0.0023 $inch^2$/26…16 AWG
"f" flexible core H 07V-K	0.5…1.5 mm^2/0.0008…0.0023 $inch^2$/25…16 AWG
"f" with ferrules according to DIN 46228/1 (ferrules crimped gas-tight)	0.25…1.5 mm^2/0.0004…0.0023 $inch^2$/30…16 AWG

5.3 Connection options at the gateways

NOTE

The minimum temperature rating of the cable to be connected to the field wiring terminals must be min. 75 °C.

5.3.1 Power supply

The BL20-E-GW-DN has push-in tension clamps for:

- Field supply voltage (U_L, GND_L)

and

- System supply (U_{SYS}, GND_{SYS})

5.3.2 Fieldbus connection via Open Style Connector

An Open Style Connector (5-pole female connector + DeviceNet male connector) is available for connecting the gateway to the fieldbus DeviceNet (see Volume 3, DeviceNet Adaptation of CIP, section 8-3.12.2.).

Pin	Signal	Description
1, 2 - red	V +	Supply voltage (24 V DC), U_{sys}
3, 4 - white	CAN_H	Non-inverted data signal (dominant high)
5, 6	Shield	Shielding braid, not insulated
7, 8 - blue	CAN_L	Inverted data signal (dominant low)
9, 10 - black	V-	Ground reference, U_{sys}

NOTE

The supply and signal lines must have a rated temperature of 75 °C.

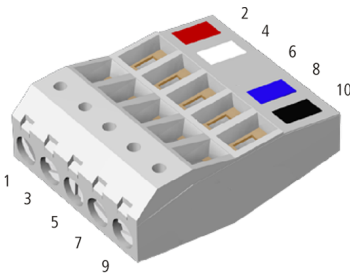


Fig. 5: DeviceNet female connector (top: connection level)

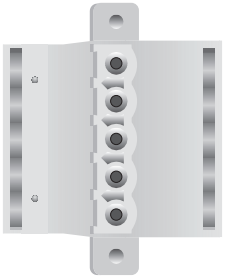


Fig. 6: DeviceNet female connector (viewed from below)

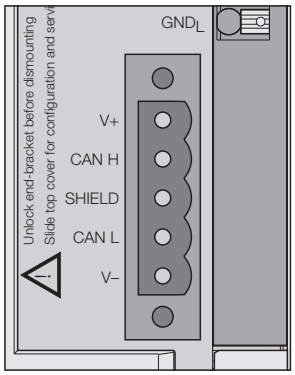


Fig. 7: DeviceNet male connector on the gateway

Shielding of the gateway

The shielding concept for the BL20-E-GW-DN is similar to that of the BL20-GWBR-DNET. No compensating current should flow through the shielding. To achieve this, a reliable system of equipotential bonding must be installed.

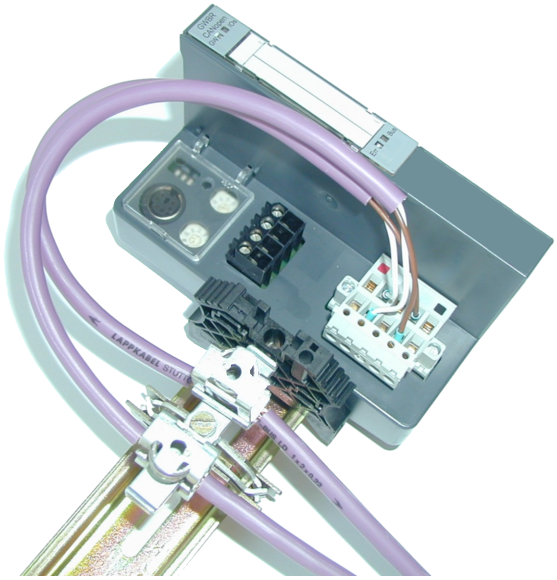


Fig. 8: Shielding connection, here for an BL20-GWBR-DNET

NOTICE

Incorrect cabling

Destruction of the gateways electronics

➤ Do not mix-up the connectors for power supply and bus connection

5.4 Service interface connection

In order to connect the service interface on the gateway with a PC and the I/O-ASSISTANT 3 (FDT/DTM) software (project planning and diagnostics software), a cable with a pin assignment, different from the PS2 standard pin assignment, has to be used. Standard commercial cables will have to be rewired!

- I/O-ASSISTANT-KABEL-BL20/BL67

5.4.1 Connection through an I/O-ASSISTANT cable

The I/O-ASSISTANT-cables have a PS/2 male connector (connection for female connector on gateway) and a SUB-D female connector (connection for male connector on PC).

The service interface can be found under the upper label of the gateway. Pull the label upwards out of the housing in order to reach the service interface.

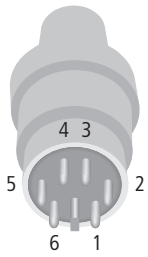


Fig. 9: PS/2 male connector on the connection cable to the gateway (top view)

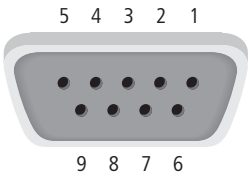


Fig. 10: 9-pole SUB-D female connector on the cable for connecting to PC (top view)

Pin	BL20 gateway PS/2 female connector	SUB-D interface at the PC	Pin
1	CLK	DTR, DSR	4, 6
2	GND	GND	5
3	DATA	–	–
4	n.c. (DATA2)	RxD	2
5	+5 V	RTS	7
6	n.c. (CLK2)	TxD	3

5.5 Setting the node-ID

The setting of the MAC-ID for the BL20-ECO gateway for DeviceNet is done via the DIP switches 2^0 to 2^5 at the gateway.

These DIP switches can be found under the gateway's upper label.

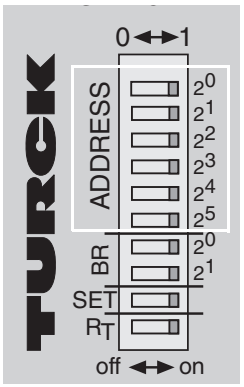


Fig. 11: DIP-switches for Node-ID setting

NOTE

Pull the label upwards out of the housing in order to reach the DIP-switches.

The gateway's bus address results from the addition of the valences (2^0 to 2^5) of the switched DIP-switches (position = 1).

Default setting:

0×3FH = ADR 63

Example:
Bus address 38 = 0×26 = 100110

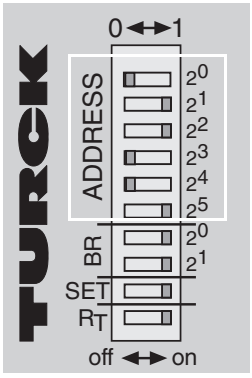


Fig. 12: Bus address 38

The internal module bus does not require any addressing.

5.6 Setting the bit rate

The gateway BL20-E-GW-DN offers 2 DIP switches for setting the bit rate (**BR**).

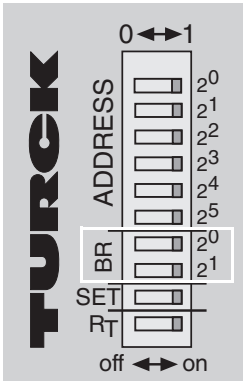


Fig. 13: DIP switches for setting the bit rate

5.6.1 DIP switch settings

DIP switch no.	Bit rate			
	autobaud	125 kBit/s	250 kBit/s	500 kBit/s
2^0	1	0	1	0
2^1	1	0	0	1

NOTE

Setting the autobaud function via the gateway's ODVA DeviceNet Standard Classes (Class = 3, Instance = 1, Attribute = 0x64: 0 = disable/1 = enable) is only possible when the device is set to the autobaud mode "11" via its DIP switches (see the table above).

Once that is done, the bit rate can be changed via the standard ODVA DeviceNet Class (Class = 3, Instance = 1, Attribute = 0x02) as long as the device switches remain in the autobaud position "11".

All other switch settings ("00", "10","01") define a fixed baud rate. In this case, any setting done in the ODVA DeviceNet Class will be ignored and the device works with the bit rate set at the switches.

All new settings become valid only after a power-cycle!

5.7 SET switch

After setting the SET switch from Off → On → Off, the Current Configuration of the station is saved as the Actual Configuration and is also saved to the both the Temp-Required Configuration Memory and the Required Configuration Memory. The LED "GW" flashes.

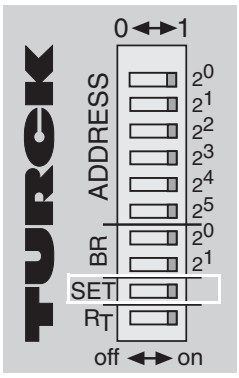


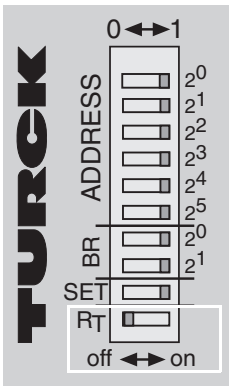
Fig. 14: SET switch

5.7.1 Activating the bus terminating resistor

If the gateway is used as the first or the last station in the bus communication, the fieldbus line has to be terminated using a terminating resistor.

The BL20-E-GW-DN allows the activation of the resistors $\mathbf{R_T}$ using the last DIP-switch.

Bus terminating resistor switched off:



Bus terminating resistor switched on:

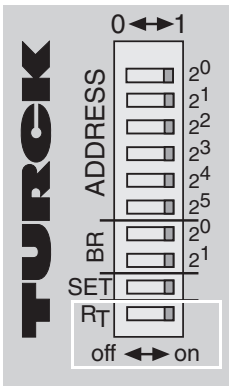


Fig. 15: Bus terminating resistor R_T

5.7.2 Configuring the BL20 station using a configuration tool

The configuration of a BL20 station is temporarily saved to the Temp-Required Configuration Memory when it is being configured with the aid of a configuration tool. To save this configuration as the reference configuration for the process data traffic in the Required Memory of the gateway, the following command must be carried out: SET_CFG _REQUEST (VSC100, Object Instance 2, Attribute No. 112).

NOTE

If the station configuration in the temporary memory no longer corresponds to the actual station configuration, then this is indicated by the "IOs" LED flashing (for further information see: Section "Status Indicators").

The command LOAD_CURRENT_CFG (VSC100, Object Instance 2, Attribute No. 112) loads the Current Configuration of the station from the Actual Configuration Memory into the Temp-Required and Required Configuration Memories.

The command RESTORE_OLD_GFG (VSC100, Object Instance 2, Attribute No. 112) loads the Required Configuration into the temporary memory.

NOTE

All temporarily saved configuration changes instigated by the configuration software are overwritten by the commands LOAD_CURRENT_CFG and RESTORE_OLD_GFG.

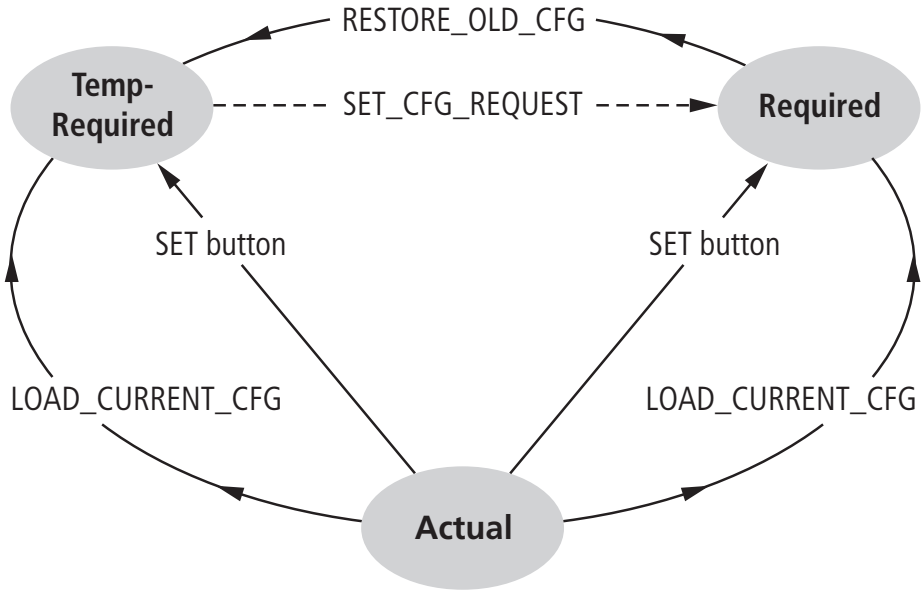


Fig. 16: Accepting the station configuration

The coupling of the DeviceNet gateway to programmable logic controllers (PLC) and the integration in to a DeviceNet network is described in chapter 3.

5.7.3 Reading-in of station configuration without configuration tool

The current BL20 station configuration at the gateway is saved to the non-volatile Required Memory of the gateway using the SET switch on the gateway, thus making it possible for the configuration to be read out by the DeviceNet scanner. This means that the BL20 Station can be configured without the need for a configuration tool.

5.8 Status indicators/diagnostic messages

The gateway transmits the following diagnostics: the status of the BL20 station, the communication via the internal module bus, the communication to CANopen and the status of the gateway.

Diagnostic messages are displayed in two ways:

- via individual LEDs
- via the software of the respective host system (i. e. PLC)

5.8.1 Diagnostic messages via LEDs

Every BL20 gateway displays the following statuses via LEDs:

- 2 LEDs for module bus communication (module bus LEDs): GW and IOs
- 2 LEDs for DeviceNet communication (fieldbus LEDs): MNS and IOs

LED	Status	Meaning	Remedy
GW	Off	No voltage	Check the voltage supply at the Bus Refreshing module. If the mains voltage is correctly connected, contact your Turck representative.
	Green	5 V DC operating voltage available; firmware active; gateway is ready to operate and transmit	-
	Green, flashing slowly, 1 Hz and IOs LED red	Firmware not active, software download necessary	Re-install the firmware or contact your Turck representative.
	green, blinking, 1 Hz	U_L: undervoltage V+: undervoltage (Open Style connector)	Check that the supply voltage is within the permissible range.
	Green flashing fast, 4 Hz	Firmware active, gateway hardware defect.	Replace the gateway.

LED	Status	Meaning	Remedy
IOs	Off and LED GW off	No voltage	Check the voltage supply at the Bus Refreshing module.
	Green	Module bus active; configured list of modules corresponds to current list at the gateway; communication active.	-
	Green flashing	Station is in force mode of the I/O-ASSISTANT	Deactivate the force mode of the I/O-ASSISTANT 3 (FDT/DTM).
	Red and LED GW off	Controller is not ready or V_{cc} level is not within the required range.	Check the Bus Refreshing module to the right of the gateway and its wiring. If the mains voltage is correctly connected, contact your Turck representative.
	Red	Module-bus error	Check the individual BL20 modules for correct mounting.
	Red flashing, 1 Hz	Non-adaptable modification of the physical list of modules.	Compare the engineering of your BL20 station with the physical list of modules. Check the construction of your BL20 station for defect or incorrectly fitted electronic modules.
	Red flashing fast, 4 Hz	No module bus communication	Ensure that the guidelines for the use of power distribution modules have been observed.
	Red/green flashing	The engineered and current list of modules do not correspond; data exchange is still active.	Check your BL20 station for: – pulled modules – incorrectly fitted modules – subsequently fitted modules

The function, meaning and color as well as the frequency of flashing of the LEDs "MNS" and "IO" are precisely defined in the ODVA.

LED	Status	Meaning	Remedy
MNS	OFF	Duplicate MAC ID-Check active	-
	Green	Connection(s) established, device status OK	-
	Green flashing, slowly	No connection established, device status OK	-
	Red	Network error	Check your devices for possible double MAC IDs. Check if the CAN controller is set to BUS OFF.
	Red flashing	Connection(s) are in Time Out	Check if the fieldbus cable is interrupted. Check if a fieldbus connector has been pulled. Check the 24 V fieldbus voltage.

LED	Status	Meaning	Remedy
IO	Green	Outputs are controlled and data exchange is active.	-
	Green flashing, slowly	At least one input/output is in the status "Idle State".	-
	Red	At least one input/output has an error.	
	Red flashing	At least one input/output is in Faulted State.	-

6 Connection to automation sevices

6.1 Introduction

This chapter contains detailed information about connecting a BL20 station to other automation devices, for example, programmable logic controllers (PLC) that comply with the DeviceNet profile.

DeviceNet is based on the DeviceNet specification of the Open DeviceNet Vendors Association (ODVA) Rel. V2.0, Vol. 1 and 2.

BL20 is compatible with all automation devices that comply with the communications profile according to the ODVA specification.

More detailed information concerning the individual controller systems and DeviceNet modules can be found in the respective manuals provided by the manufacturers.

The modules with which BL20 is to communicate must comply with the ODVA specification and the communication profile described therein.

This manual contains a description of the connection to the SLC 500 controller, and the 1747-SDN Scanner Module manufactured by Allen Bradley. Designations for hardware and software used in this manual are registered and protected trademarks of the respective manufacturer.

6.2 Electronic Data Sheet – EDS file

The BL20 gateway can be integrated in to the DeviceNet structure with the aid of a standardized EDS file. The classes, instances and accompanying attributes of the BL20 modules are listed in the EDS file.

BL20 offers two different versions of EDS files: 6827xxxVy.eds and 6827xxxVy_SP.eds, which can be used according to the application. The EDS file 6827xxxVy_SP.eds provides the means for processing the selected instance of one module.

The respective current version of the EDS file is available from Turck. It is also possible to make an update by downloading the file from the Turck Homepage: www.turck.com. The following table shows the restrictions that result from the use of the respective EDS files.

	6827xxxVy.eds	**6827xxxVy_SP.eds**
Engineering	online / offline	online / -
ADR	3	–
Supported instances	≤ 62 (incl. Power supply modules)	
Gateway parameterization	3	3
Monitoring	Diagnostic/ Parameter	Diagnostic/ Parameter/ Input/Output
Possible number of each module type, configurable with the EDS-file. (Do not exceed the max. number of supported instances; the necessary number of power supply modules has to be planned additionally)	16 BL20-xAI-I 16 BL20-xAI-PT/NI-2/3 16 BL20-4AI-UI 16 BL20-xAO-U 8 BL20-1CNT-24VDC 32 BL20-xDI-x	50 BL20-xAI-I 50 BL20-xAI-PT/NI-2/3 28 BL20-4AI-UI 28 BL20-1CNT-24VDC 62 BL20-xDI-x 62 BL20-xDO-x

	6827xxxVy.eds	6827xxxVy_SP.eds
Advantage	Simplification of substitution of gateway and module at the same time	faster handling; max. no. of modules is restricted only by BL20 system limits

6.3 Mapping of process data

The process image of the BL20 gateway is depicted in WORD format (16 bit). The process data of successive modules of the same type, with process data of less than 1 word, are grouped together until 16 bits of process data is reached. The process data is written in a new word when:

- 16-bit input data is reached and further input modules follow
- 16-bit output data is reached and further output modules follow
- An input module, whose process data length cannot be completely incorporated in the preceding word, follows on from another input module
- An output module, whose process data length cannot be completely incorporated in the preceding word, follows on from another output module

6.3.1 Data mapping for the BL20-E-GW-DN

Produced Data (Word No.)	Input Data
0	Status Register of the Gateway (Mapping can be disabled using attr. 138 in VSC 100, Object Instance 2, **Gateway Class (VSC 100, 64h) (page 96)**)
1 to n	Input data of modules.
n + x	Summarized diagnostic data (s. **p. 42**). Can be enabled/disabled using VSC102, Object Instance 3, attr. 104, **Object Instance 3, diagnostic instance** (page 104).
n + y	Scheduled diagnostic data (s. **p. 42**). Can be enabled/disabled using VSC102, Object Instance 3, attr. 105, **Object Instance 3, diagnostic instance** (page 104).
Consumed Data (Word No.)	Output Data
0	Control Register of the Gateway (Mapping can be disabled using attribute 139 "GW CONTROL REGISTER" in **Gateway Class (VSC 100, 64h)**, Object Instance 2, s. **p. 96**)
1- n	Output data of the modules.

NOTE

The data mapping can be structured individually. All parts except for the in- and output data of the station can be enabled/ disabled independently from each other.

6.3.2 Data mapping for an example station

Gateway BL20-E-GW-DN

- Module A: BL20-2DI-24VDC-P
- Module B: BL20-4DI-24VDC-P
- Module C: BL20-4DI-24VDC-P
- Module D: BL20-4DI-24VDC-P
- Module E: BL20-4DI-24VDC-P
- Module F: BL20-1AO-I(0...20MA)
- Module G: BL20-2DO-24VDC-0.5A-P
- Module H: BL20-2DO-24VDC-0.5A-P
- Module I: BL20-2DO-24VDC-0.5A-P
- Module J: BL20-2DI-24VDC-P
- Module K: BL20-1AI-U(-10/0...10VDC)
- Module L: BL20-2DO-24VDC-2A-P

The example station transmits a minimum 4 word input data (without diagnostics) and 3 word output data.

Produced Data (Word No.)	**Input Data (WORD Format) (Bit 15...→ ..0)**
0	Status Register of the Gateway (Mapping can be disabled via VSC100, instance 2., attr. 132 (84h)
1	D3, ..., D0; C3, ..., C0; B3, ..., B0; A1, A0
2	J1, J0, E3, ..., E0
3	K15, K14, ...K1, K0
3 + y	Possible summarized diagnostic data (s. p. 42). Can be enabled/disabled using VSC102, Object Instance 3, attr. 104, s. p. 104.
3 + z	Possible scheduled diagnostic data (s. p. 42). Can be enabled/disabled using VSC102, Object Instance 3, attr. 105, s. p. 104.
Consumed Data (Word No.)	**Output Data (WORD Format) (Bit 15...→ ... 0)**
0	Control Register of the Gateway (Mapping can be disabled via VSC100, instance 2., attr. 133 (85h)
1	F15, F14, ... F1, F0
2	L1, L0, I1, I0;H1, H0; G1, G0
3	-

6.4 Diagnostic options

6.4.1 Summarized diagnostics

The summarized diagnostic data mode will send back 1 bit for each slice within the station. This bit will be "0" if there are no diagnostic flags set on the slice. If there are any diagnostic events on the slice the bit will be set to "1".

Values:

0 = ok

1 = module sends diagnostics, wrong module or module pulled (acc. to VSC 100, Gateway Class, Attr. 116, s. p. 96).

The diagnostic bits are placed at the end of the input data. The diagnostic data start WORD aligned (see s. p. 42).

6.4.2 Scheduled diagnostics

The scheduled diagnostic data map is a time sliced module related data block, which holds diagnostic data of all modules with active diagnostics using a round robin mechanism.

This diagnostic "window" visualizes a specific module diagnostic data for approx. 125 ms and changes over to the next active diagnostics afterwards. This is done automatically by the gateway.

The data length for the scheduled diagnostics is set according to properties of the modules attached to the gateway.

Word	Byte	Data
0	0	Slot number of the module which sends the diagnostic data.
	1	State of the diagnostic message: bit 5 = 1: diagnostic active bit 6 = 1: wrong module bit 7 = 1: module pulled (acc. to VSC 100, Gateway Class, Attr. 116, s. p. 96)
n		Module diagnostics from the module actually referenced by the round robin mechanism.

The scheduled diagnostic data is placed at the end of the input data and after the summarized diagnostic data (see s. p. 42).

6.5 Status register of the gateway

The Status Register of the gateway is assembled as follows:

Status Bit No.	Designation	Meaning
0 to 7	MESSAGE REGISTER	The Message Register of the Status Register is considered as a group of 8 bits (00h to FFh). The list of message and error codes are contained in the tables below: – **Status register: message codes** – **Status register: error codes**
8	OUTPUTS NOT PROCESSING	The BL20 outputs are no longer controlled by the process data of an I/O connection.
9	MODULE LIST WARNING	The current module list at the gateway has been modified, meaning: a module has been added, a module has been pulled or a module has been placed on a slot, which was pre-configured as empty.
10	LOCAL FORCE MODE	The force mode of the I/O-ASSISTANT 3 (FDT/DTM) is active, meaning, the outputs are being controlled by the I/O-ASSISTANT 3 (FDT/DTM).
11	MODULE DIAG	At least one module has a diagnostic message. Which module is transmitting a diagnostic message and what type of message this is indicated in Attribute 116 "MODULE DIAG SUMMARY" of the Gateway Class 100, Gateway Instance 2.
12	NO FIELDBUS PWR	The fieldbus voltage supply at the fieldbus connector is not guaranteed. This bit can only be read out by the I/O-ASSISTANT 3 (FDT/DTM) via the service interface on the gateway.
13	MODULE LIST ERROR	The current module list at the gateway has been modified, meaning, at least one module has been replaced by a module with a different catalogue number.
14	MODULEBUS FAULT	Hardware error. The module bus communication is interrupted.
15	CMD CONFIRMATION	This bit reflects the ACTIVATE COMMAND bit of the Control Register. The execution of a command from the Command Register (Control Register) is confirmed by setting this bit.

6.5.1 Status register: message codes

Message Codes	Designation	Description
00h	MSG OK	No error
01h to 0Fh	Reserved	-
10h	ADD EXPL ESTABLISHED	There is at least one Explicit Message between the gateway and another slave.
11h to 1Fh	Reserved	-
20h	MODULE ID UNKNOWN	At least one module on the BL20 station is unknown, meaning, it is neither represented by an existing Vendor Specific Classes nor is it listed in the EDS file. Nevertheless, the module is taking part in process data exchange.

6.5.2 Status register: error codes

Error Codes	Designation	Description
80h to CF	Reserved	-
D0h	DUP MAC ID ERROR	The Duplicate MAC ID Check has failed, because there is a module on the network with the same MAC ID. This status can only be read out by the I/O-ASSISTANT 3 (FDT/DTM) via the service interface on the gateway.
D1h	MAC ID ERROR	The set MAC ID has exceeded the 63 address limitation.
D2h	BAUDRATE NOT PERMITTED	The baud rate set using the DIP switches on the gateway is not permissible.
D3h to DFh	Reserved	-
E0h	EEPROM ERROR	Internal error. Gateway replacement required. This status can only be read out by the I/O-ASSISTANT 3 (FDT/DTM) via the service interface on the gateway.
E1h	ROTARY CODING SWITCH, DIP SWITCH ERROR	
E2h	ROM/FLASH CRC ERROR	
E3h to EF	Reserved	-
F0h	CFG MODIFICATION IN PROGRESS	The station's configuration at the gateway is being modified.
F1h to FE	Reserved	-
FFh	CMD PROCESSING ERROR	An error has occurred as a command was being executed. The command will not be carried out.

6.6 Control register of the gateway

The Control Register of the gateway is assembled as follows:

Control Bit No.	Designation	Meaning
0 to 7	COMMAND REGISTER	The Message Register of the Status Register is considered as a group of 8 bits (00h to FFh). The list of Command Codes is contained in **Control register: command codes**
9 to 14	Reserved	-
15	ACTIVATE COMMAND	The execution of a command of the Command Register (Control Bit 0 to 7) is initiated by setting the bit (0 → 1).

6.6.1 Control register: command codes

Command Codes	Designation	Description
00h	ABORT CMD	A pending command is aborted, no other command is given.
01h to 7Fh	Reserved	-
80h	FORCE OUTPUTS OFF	The output of Consumed Data is stopped. The outputs are no longer operated via I/O Connections; they are switched off. This command can be revoked either by using the command FORCE OUTPUTS PROCESSING or via a Reset.
81h	FORCE OUTPUTS FAULT VALUES	
82h	FORCE OUTPUTS HOLD	
83h	FORCE OUTPUTS PROCESSING	The exchange of process data is taking place again. The outputs are communicating via I/O Connections.
84h to EFh	Reserved	-
F0h	MODULEBUS SHUTDOWN	The transmission of data via the module bus is stopped. The reaction of the individual BL20 modules depends on their respective parameterization.
F1h	RESTART MODULE BUS	The transmission of data via the module bus will be started. The module list at the gateway will be read in. The exchange of data between the gateway and the modules is taking place again.
F2h tot FFh	Reserved	-

6.7 Connection to the controller SLC 500 from Allen Bradley

6.7.1 Setting up communications with the software tool "RSLinx"

The Allen Bradley software tool "RSNetworx" (version 3.00.00) from Rockwell Automation is used to configure the connection of a BL20 gateway with an Allen Bradley SLC 500. Before a connection to this tool can be established, access to the DeviceNet must be created using the software "RSLinx" (version 2.20.02) from Rockwell Automation.

The following explains the creation of a connection via the node 1770-KFD.

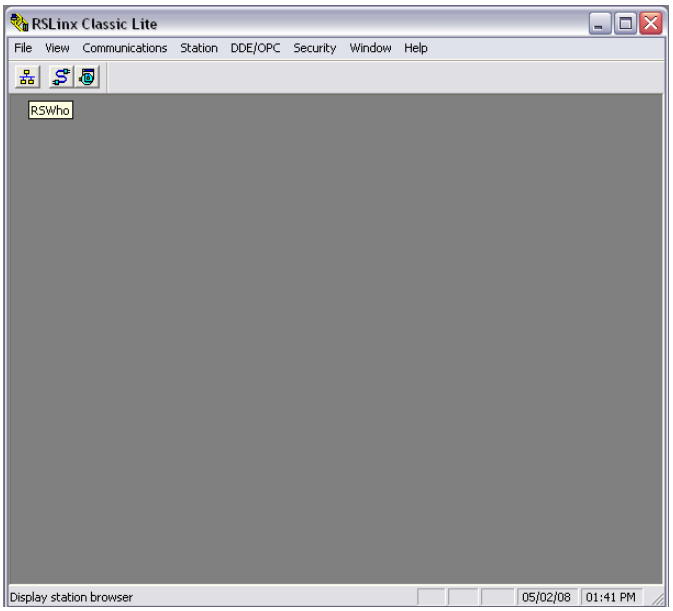


Fig. 17: Software "RSLinx" from Allen Bradley

The selection of the DeviceNet Driver module is made using the "Communications → Configure Drivers" command.

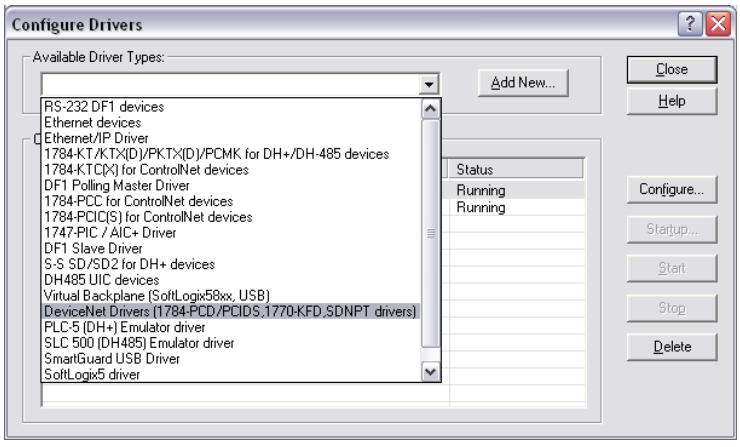


Fig. 18: Selecting the driver type category

Once the type of device has been selected, click the "Add new" button to select the driver module, for example, the 1770-KFD.

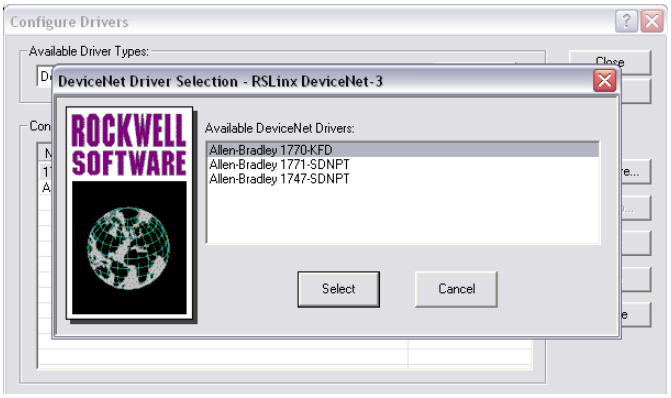


Fig. 19: Selecting the DeviceNet Driver module

The node is configured in the window that opens, which means for example, that the data transmission rate, the serial interface, the node address as well as the baud rate are entered.

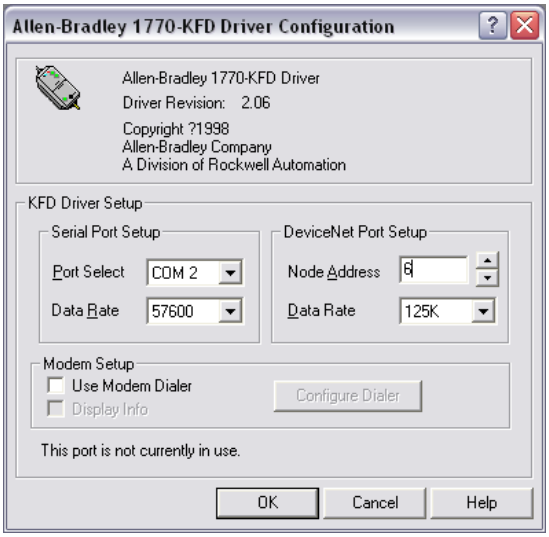


Fig. 20: Configuring the 1770-KFD

The connection to the DeviceNet is established following successful configuration of the KFD tool.

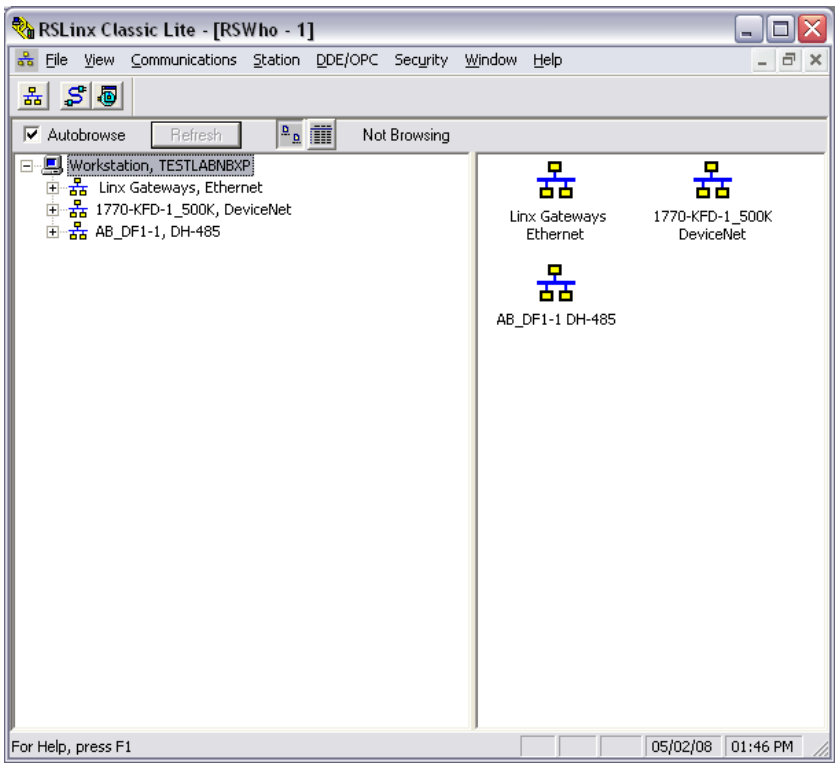


Fig. 21: Depicting the DeviceNet network in RSLinx

6.7.2 Configuring the DeviceNet network with RSNetworx

The BL20 gateway is integrated in to the DeviceNet network using the configuration software RSNetworx from Allen Bradley.

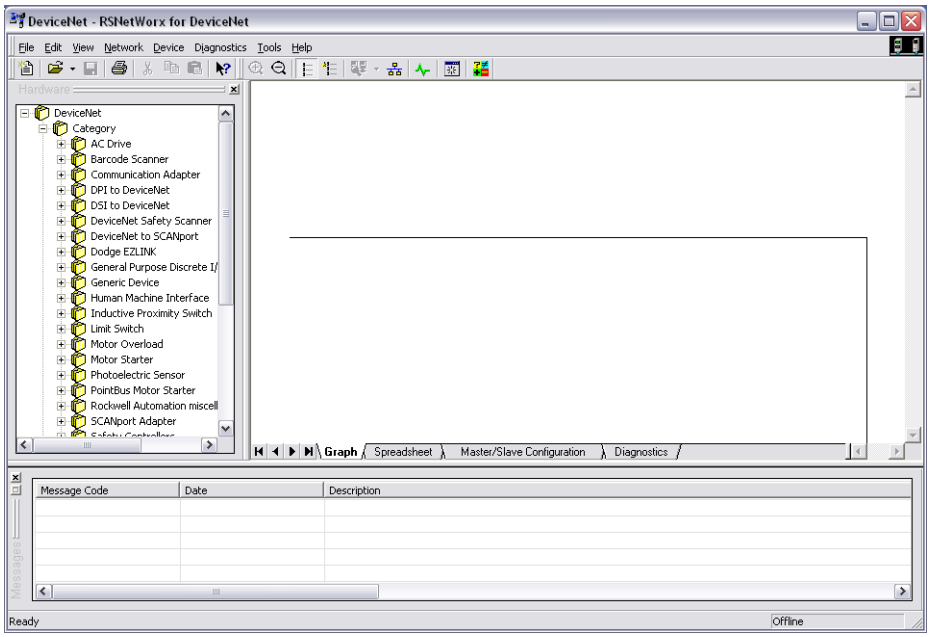


Fig. 22: The Software RSNetworx

Reading in the EDS file

- Create a new or open an existing project.
- Open the EDS Wizard using the "Tools → EDS Wizard" command.

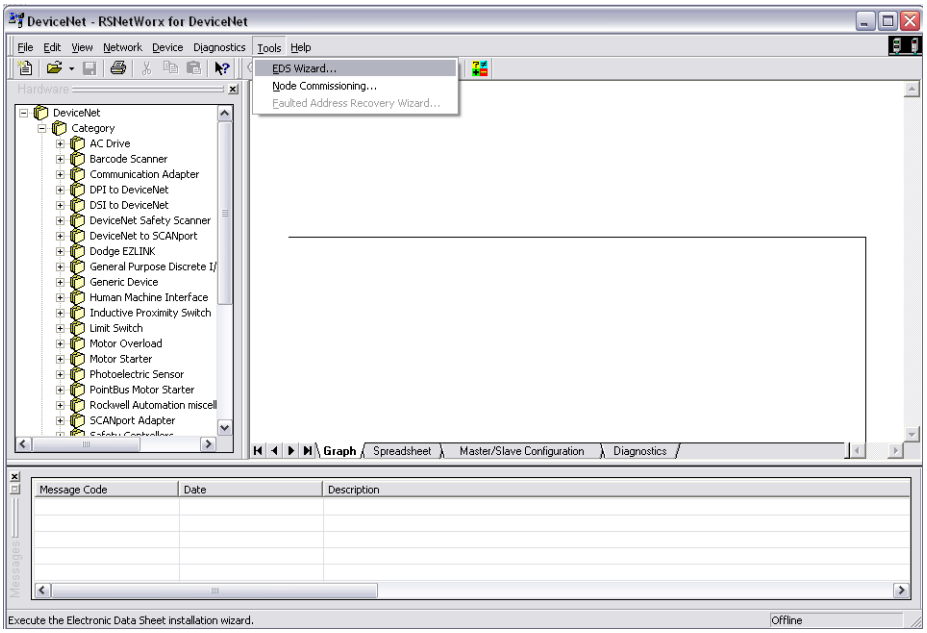


Fig. 23: Opening the EDS Wizard

Click the "Register an EDS file(s)" button to add the EDS file to be registered to the program's database.

Fig. 24: Registering the EDS File

The BL20 gateway appears in the hardware catalogue of the software following correct registering of the EDS file.

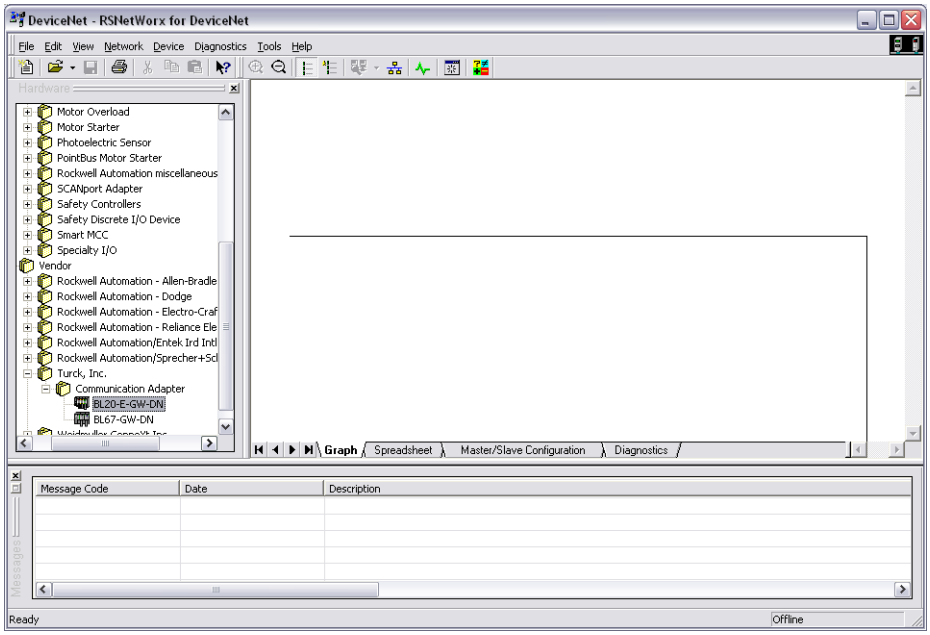


Fig. 25: Hardware catalog with BL20 gateway

Offline configuration of the network

The network nodes are selected from the hardware catalogue using the drag-and-drop operation or by double-clicking on the product name. In this example, the Allen Bradley "1747-SDN Scanner Module" and the DeviceNet driver module "1770-KFD RS232 Interface" are used as well as the BL20 gateway.

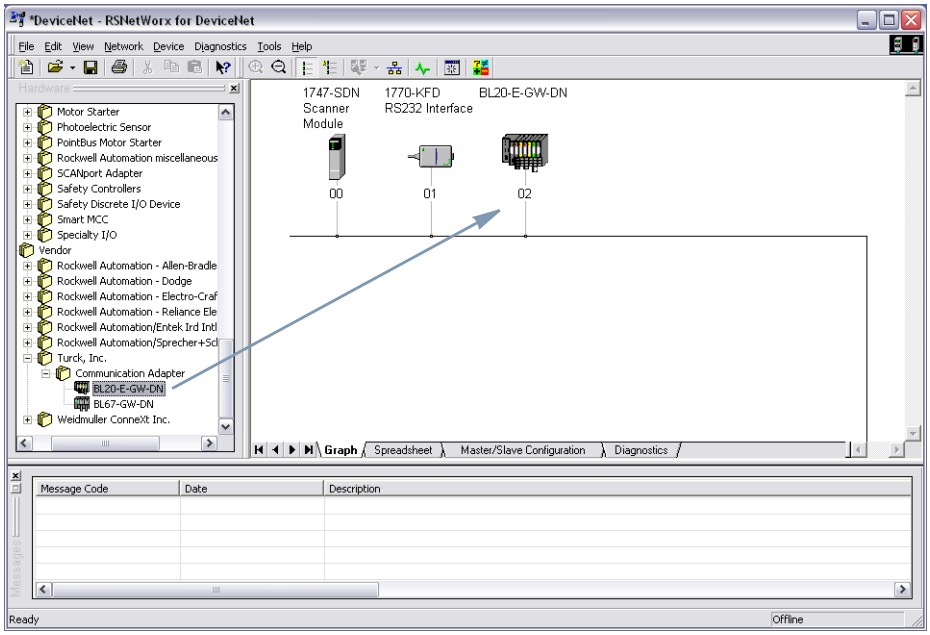


Fig. 26: Selecting the BL20 gateway

NOTE

It should be observed when configuring the network that the node address of the KFD tool matches the address that was allocated when establishing communications in RSLinx.

Configuration of the DeviceNet gateway and the connected BL20 station

The DeviceNet gateway is configured via the "Device → Device properties" command.

The allocation of a station name and the node address is made in the "General" tabbed page.

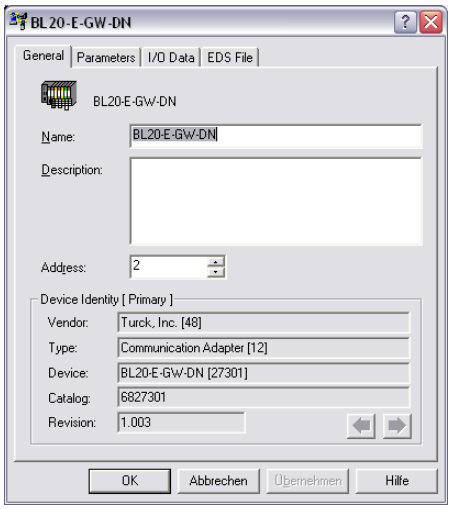


Fig. 27: Setting the node address of the BL20 gateway

Setting the gateway parameters

The gateway parameters are set in the "Device Parameters" tabbed page, where the gateway and the connected modules can be parameterized offline.

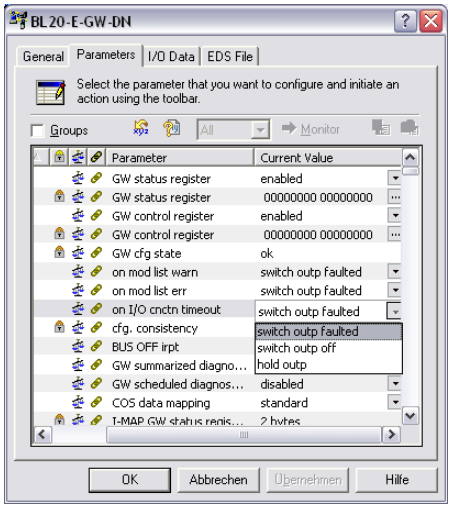


Fig. 28: Setting the Gateway Parameters

The gateway parameters occupy the lines 1 to 27". The following IDs are reserved for the BL20 I/O modules.

Offline configuration of the BL20 station

The offline configuration of the BL20 station is also carried out in this tabbed page.

Double-click the text "EMPTY BASE TERMINAL". The respective I/O modules can be selected from the pull-down menu that opens.

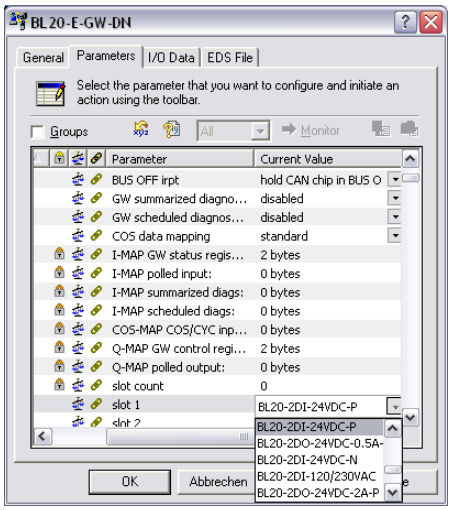


Fig. 29: Selecting the BL20 modules

Online mode

Change to the online mode following the offline configuration of the station using the "Network → Online" command or by clicking the corresponding button on the toolbar.

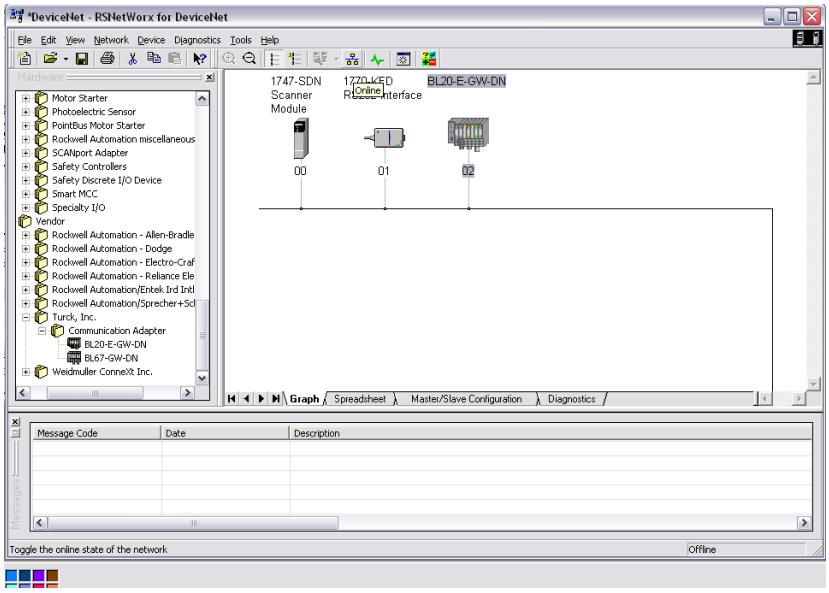


Fig. 30: Changing to the online mode

Including the BL20 station in the scan list of the DeviceNet scanner

In order for the 1747-SDN Scanner Module of the SLC 500 to be able to communicate with the BL20 gateway the BL20 gateway has to be included in the scan list of the 1747-SDN Scanner Module.

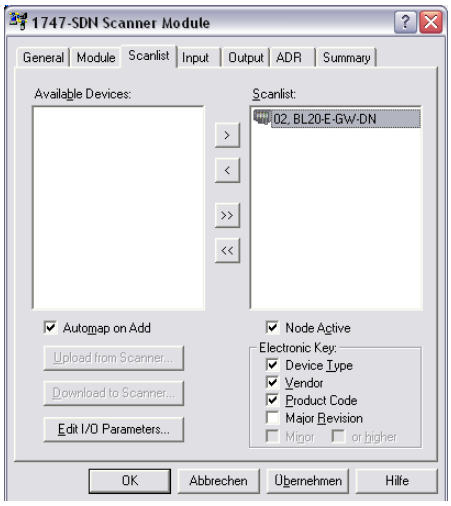


Fig. 31: Incorporating the BL20 Station in the Scan List

Click the "Edit I/O Parameters" button to determine the type of process data exchange (Bit Strobe, COS, Cyclic, Polling) as well as the exact length of input and output data for the respective station.

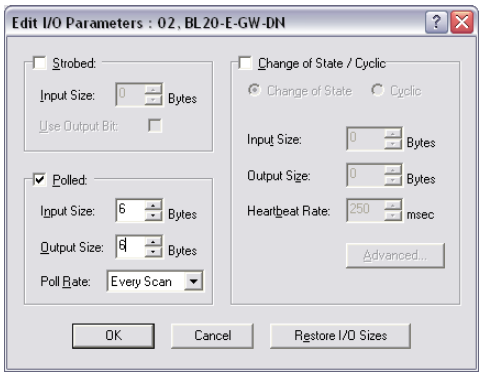


Fig. 32: Setting the type of data transmission

Mapping the input and output data

The tabbed pages "Input" and "Output" display the address of the input and output data in the controller. These can either be automatically mapped by clicking the "AutoMap" button or assigned by setting a start word in the "Start word" box. The addresses set here are accessed in a program in the SLC 500.

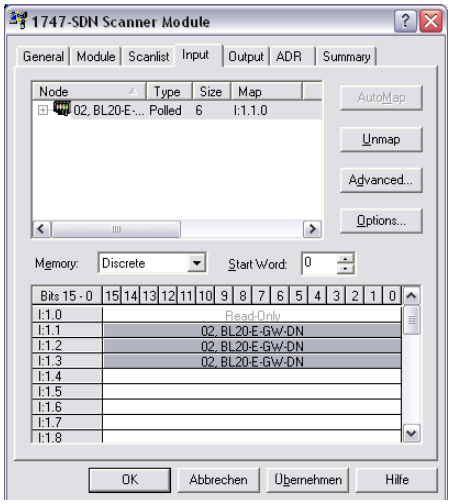


Fig. 33: Mapping the input data

Parameterization and diagnostic of the BL20 station

Double-click the BL20 gateway icon to open the "BL20-E-GW-DN" window. The parameters of all the modules in the BL20 station are contained in the tabbed page "Parameters".

The lines 1 to 27 relate to the gateway, thereafter the BL20 modules follow in the order in which they were plugged in the station.

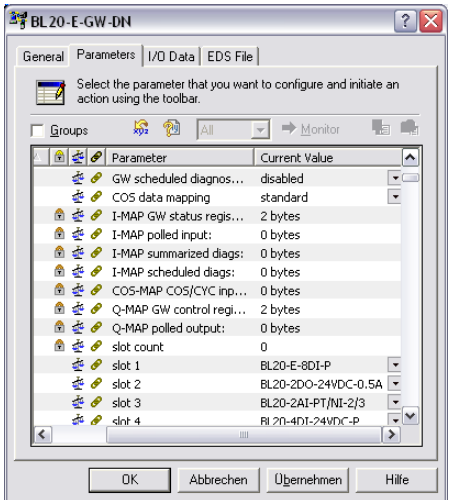


Fig. 34: Station parameters

Status register and control register of the gateway

The Status Register and the Control Register of the gateway are displayed in positions two and three of the gateway-specific data.

The following shows the Status Register with the error message "module list warning". This message indicates that the module list saved in the gateway does not correspond to the current one now attached to the gateway.

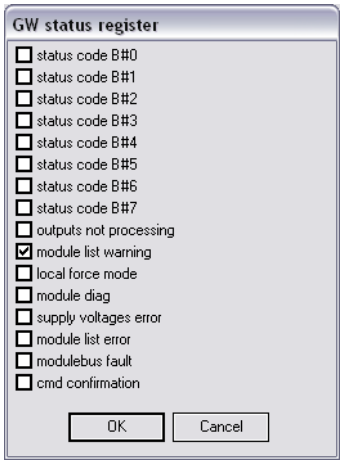


Fig. 35: Status register with "module list warning"

Please refer to **Status register of the gateway** and **Control register of the gateway** for a detailed description of the Status Register and the Control Register as well as their bit assignments.

The section **Status register: message codes** shows the message codes for Bit 0 to Bit 7 of the Status Register.

BL20 station diagnostics

Activate the "Groups" box and select the module group for which the parameters and diagnostics are to be displayed.

As an example, the following indicates a "value range error" at an analog input module.

Fig. 36: Diagnostic example of an analog input module

6.7.3 Parameterization of the BL20 station

The BL20 modules are also parameterized in the "BL20-E-GW-DN" window.

Double-click the line with the parameters of the respective module to open the window with the parameter settings.

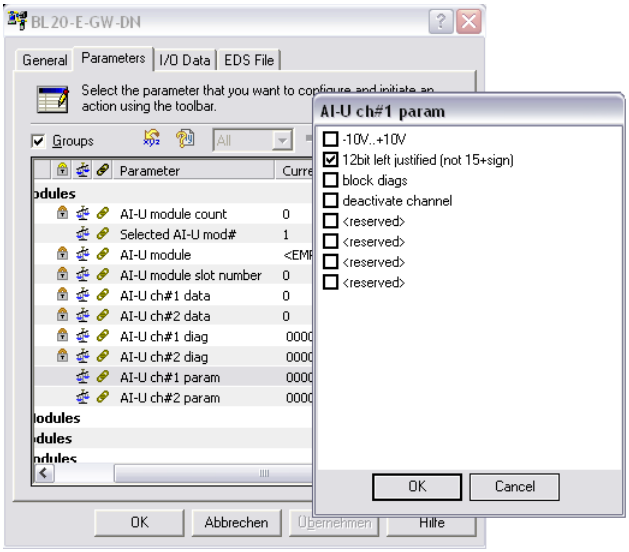


Fig. 37: Setting the parameters of a BL20 module

Altered parameter settings are loaded in to the BL20 gateway by clicking the appropriate button.

7 Guidelines for Station Planning

7.1 Random module arrangement

The arrangement of the I/O-modules within a BL20 station can basically be chosen at will.

Nevertheless, it can be useful with some applications to group certain modules together.

NOTE

A mixed usage of gateways of the BL20 ECO and the BL20 standard product line and I/O modules of both product lines (base modules with tension clamp terminals) is possible without any problems.

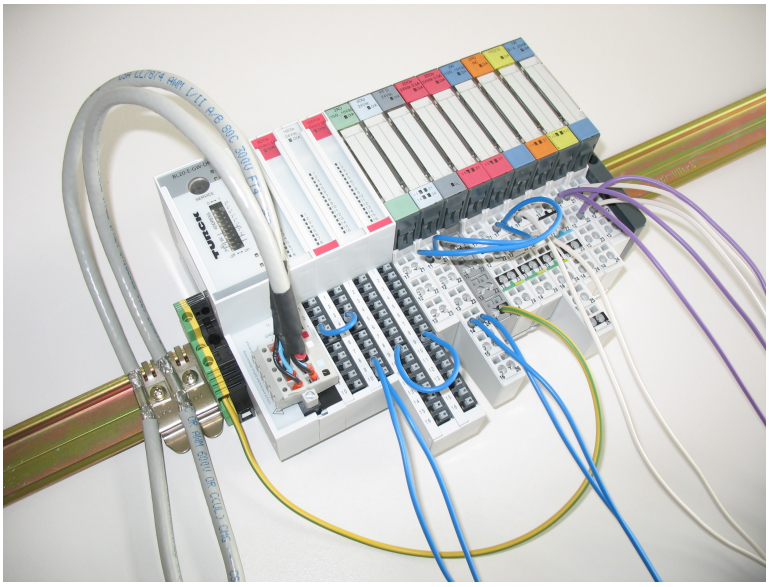


Fig. 38: Example of a station structure with ECO gateway (here for DeviceNet), Eco and standard I/O modules

NOTE

Only base modules with tension clamp connection and ECO modules can be used next to the gateway.

To be able to use base modules with screw connection, a supply module (BR or PF) with screw connection must first be configured.

7.1.1 Complete planning

The planning of a BL20 station should be thorough to avoid faults and increase operating reliability. If there are more than two empty slots next to one another, the communication is interrupted to all following BL20 modules.

The system supply of a BL20 station is provided by a common, external voltage source, independent of the number of bus refreshing modules used in the station. This prevents the occurrence of potential equalization currents within the BL20 station.

7.2 Maximum system extension

The maximum number of modules within BL20 station with the gateway BL20-E-GW-DN depends on the following factors:

- The maximum permissible number of **252** communication bytes which are transmitted via the module bus from the modules to the gateway must not be exceeded.
- If the maximum sum of the modules' nominal current consumptions right to the gateway (max. sum $\Sigma\ I_{MB}$ = **700 mA**) is reached, a Bus Refreshing module has to be used in order to provide the module bus voltage.
  Right to the Bus Refreshing module, the sum of the modules' current consumptions can amount to **1,5 A**.
- The station must not exceed the station limits of max. **62** modules.

Further limitations can occur using Power Feeding modules BL20-PF-24VDC-D/ BL20-PF-120/230VACD. They are used to build up potential groups or in case of insufficient power supply. Ensure that a sufficient number of Bus Refreshing and Power Feeding modules are used if the system is extended to its maximum.

NOTE

If the system limits are exceeded, the software I/O-ASSISTANT 3 (FDT/DTM) generates an error message when the user activates the command "Station Verify station".

For the calculation of the maximum system extension, the following table contains an overview about communication bytes as well as about the modules' nominal current consumptions:

Module	Number of communication bytes	Nominal current consumption at the module bus
BL20-BR-24VDC-D	2	-
BL20-PF-24VDC-D	2	28 mA
BL20-PF-120/230VAC-D	2	25 mA
BL20-2DI-24VDC-P	1	28 mA
BL20-2DI-24VDC-N	1	28 mA
BL20-2DI-120/230VAC	1	28 mA
BL20-4DI-24VDC-P	1	29 mA
BL20-4DI-24VDC-N	1	28 mA
BL20-4DI-NAMUR	5	40 mA
BL20-E-8DI-24VDC-P	1	15 mA
BL20-E-16DI-24VDC-P	2	15 mA
BL20-E-16DI-24VDC-N	2	15 mA
BL20-16DI-24VDC-P	2	45 mA
BL20-32DI-24VDC-P	4	30 mA
BL20-1AI-I(0/4...20MA)	3	41 mA
BL20-2AI-I(0/4...20MA)	5	35 mA

Module	Number of communication bytes	Nominal current consumption at the module bus
BL20-1AI-U(-10/0...+10VDC)	3	41 mA
BL20-2AI-U(-10/0...+10VDC)	5	35 mA
BL20-2AI-PT/NI-2/3	5	45 mA
BL20-2AI-THERMO-PI	5	45 mA
BL20-4AI-U/I	9	30 mA
BL20-2DO-24VDC-0.5A-P	2	32 mA
BL20-2DO-24VDC-0.5A-N	2	32 mA
BL20-2DO-24VDC-2A-P	2	33 mA
BL20-2DO-120/230VAC-0.5A	2	35 mA
BL20-4DO-24VDC-0.5A-P	2	30 mA
BL20-E-8DO-24VDC-0.5A-P	2	15 mA
BL20-E-16DO-24VDC-0.5A-P	2	25 mA
BL20-E-16DO-24VDC-0.5A-N	2	15 mA
BL20-16DO-24VDC-0.5A-P	3	120 mA
BL20-32DO-24VDC-0.5A-P	5	30 mA
BL20-1AO-I(0/4...20MA)	4	39 mA
BL20-2AO-I(0/4...20MA)	7	40 mA
BL20-2AO-U(-10/0...+10VDC)	7	43 mA
BL20-2DO-R-NC	1	28 mA
BL20-2DO-R-NO	1	28 mA
BL20-2DO-R-CO	1	28 mA
BL20-1CNT-24VDC	9	40 mA
BL20-1RS232	9	140 mA
BL20-1RS485/422	9	60 mA
BL20-1SSI	9	50 mA
BL20-E-1SWIRE	9	60 mA
BL20-E-2RFID-S	9	30 mA
BL20-E-4IOL	9	40 mA
BL20-E-4IOL-10	9	40 mA

7.3 Power supply

7.3.1 Power supply to the gateway

The gateways BL20-E-GW-DN offer an integrated power supply (see also **Service interface connection** s. **p. 30**)

7.3.2 Module bus refreshing

NOTICE

Use of Bus Refreshing modules

Galvanic coupling of V+/ V- and the supplied voltage U_{sys} /GND_{sys} possible

➤ To avoid communication problems: do not use Bus Refreshing modules with BL20-E-GW-DN.

The number of BL20 modules, which can be supplied via the internal module bus by the gateway or a Bus Refreshing module depends on the modules' nominal current consumptions at the module bus.

NOTE

The sum of the nominal current consumptions of the modules following directly the gateway BL20-E-GW-DN must not exceed 700 mA. If a Bus Refreshing module is mounted, the sum of the current consumptions which follow the Bus Refreshing module must not exceed 1,5 A.

NOTE

The Bus Refreshing modules which are used in a station with BL20-E-GW-CO have to be combined with the base modules BL20-P3T-SBB-B or BL20-P4T-SBBC-B (tension clamp) or with the base modules BL20-P3S-SBB-B or BL20-P4S-SBBC-B (screw terminals).

With the system supply, it must be ensured that the same ground potential and ground connections are used. Compensating currents flow via the module bus if different ground potentials or ground connections are used, which can lead to the destruction of the Bus Refreshing module.

All Bus Refreshing modules are connected to one another via the same ground potential.

The power to the module bus is supplied via the connections 11 and 21 on the base module.

7.3.3 Creating potential groups

Bus Refreshing and Power Feeding modules can be used to create potential groups. The potential isolation of potential groups to the left of the respective power distribution modules is provided by the base modules.

NOTE

The system can be supplied with power independent of the potential group formation.

When using a digital input module for 120/230 V AC, it should be ensured that a potential group is created in conjunction with the Power Feeding module BL20-PF-120/230VAC-D.

NOTICE

Common potential of 24 VDC and 230 VAC field supply

Destruction of electronic

➤ Make sure that the 24 VDC and 230 VAC modules belong to separate potential groups.

7.3.4 C-rail (cross connection)

The C-rail runs through all base modules. The C-rail of the base modules for power distribution modules is mechanically separated; thus potentially isolating the adjoining supply groups.

Access to the C-rail is possible with the help of base modules with a C in their designation (for example, BL20-S4T-SBCS). The corresponding connection level is indicated on these modules by a thick black line. The black line is continuous on all I/O modules. On power distribution modules, the black line is only above the connection 24. This makes clear that the C-rail is separated from the adjoining potential group to its left.

Fig. 39: C-rail (front view)

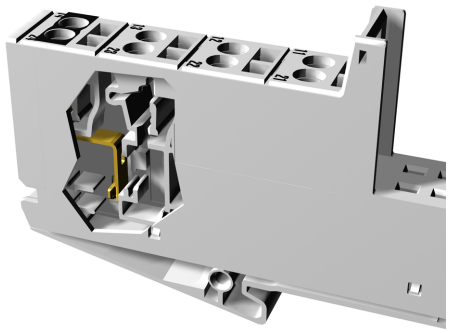


Fig. 40: C-rail front (side view)

WARNING

Incorrect C-rail load of 230 V

Possible danger to life due to electric shock

➤ Ensure that the C-rail is loaded with a maximum of 24 V DC, not 230 V.

The C-rail can be used as required by the application, for example, as a protective earth (PE). In this case, the PE connection of each power distribution module must be connected to the mounting rail via an additional PE terminal, which is available as an accessory.

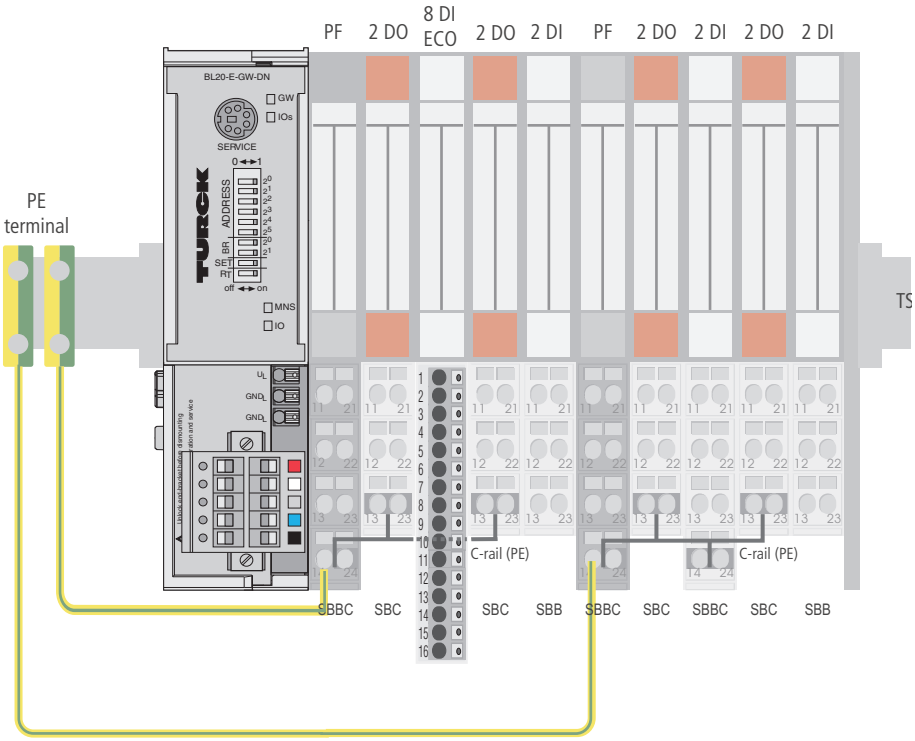


Fig. 41: Using the C-rail as a protective earth

NOTE

For information about introducing a BL20 station into a ground reference system, please read **Guidelines for Electrical Installation (page 65)**.

C-rails can be used for a common voltage supply when relay modules are planned. To accomplish this, the load voltage is connected to a Power Feeding module with the BL20-P4x-SBBC base module. All the following relay modules are then supplied with power via the C-rail.

NOTICE

Missing potential isolation

Destruction of module electronic

➤ Ensure that after using the C-rail for the common voltage supply of relay modules an additional supply module is used for the potential separation to the following modules. Only then can the C-rail serve as PE again.

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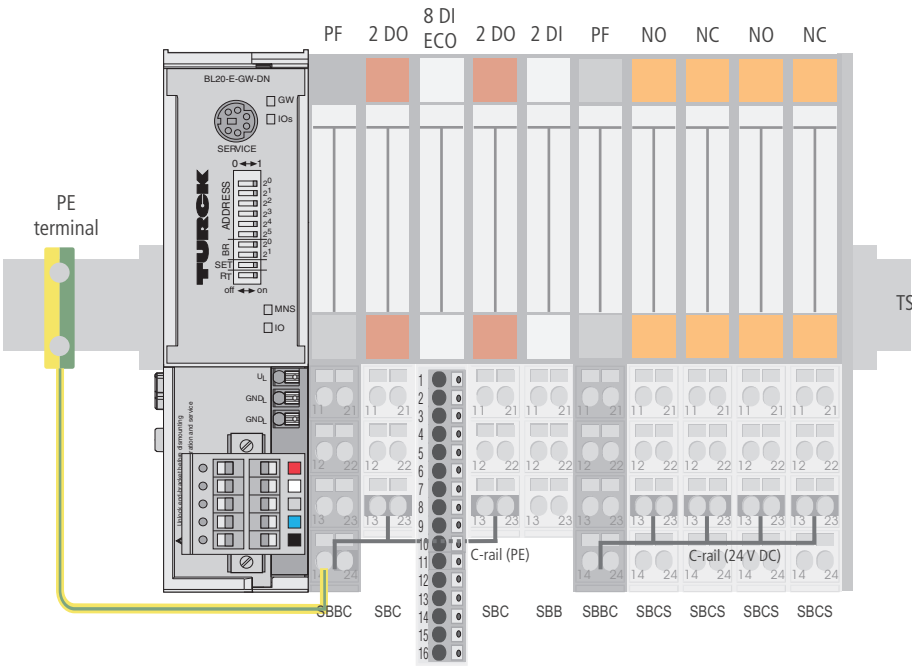

Fig. 42: Using the C-rail as protective earth and for the power supply with relay modules

Cross-connecting relay module roots is achieved by the use of jumpers. The corresponding wiring diagram including the jumpers can be found the manuals for BL20 I/O modules (German: D300716, English: D300717).

7.3.5 Direct wiring of relay modules

As well as the options mentioned above, relay modules can be wired directly. In this case, base modules without C-rail connections should be chosen to guarantee the potential isolation to the adjoining modules.

7.4 Protecting the service interface on the gateway

During operation, BL20 label protecting the service interface and the rotary coding switches must remain in place due to EMC and ESD requirements.

7.5 Plugging and pulling electronics modules

BL20 enables the pulling and plugging of electronics modules without having to disconnect the field wiring. The BL20 station remains in operation if an electronics module is pulled. The voltage and current supplies as well as the protective earth connections are not interrupted

NOTICE

Pulling or plugging of modules under load
Interruption of module bus communication, undefined states of I/Os
➤ Disconnect the station from the voltage supply
➤ Pull or plug I/O module

7.6 Extending an existing station

NOTICE

Station expansion under load
Risk of injury due to electric shock!
➤ Switch off the power supply.
➤ Secure the power supply against being switched on again.
➤ Ensure that the unit is de-energized.n.

7.7 Firmware download

Firmware can be downloaded via the service interface on the gateway using the software tool I/OASSISTANT. More information is available in the program's online help.

NOTICE

Firmware download under load
Damage of the firmware
➤ Disconnect the station from the modules bus before the download.
➤ Disconnect the field side.

8 Guidelines for Electrical Installation

8.1 General notes

8.1.1 General

Cables should be grouped together, for example: signal cables, data cables, heavy current cables, power supply cables.

Heavy current cables and signal or data cables should always be routed in separate cable ducts or bundles. Signal and data cables must always be routed as close as possible to ground potential surfaces (for example support bars, cabinet sides etc.).

8.1.2 Cable routing

Correct cable routing prevents or suppresses the reciprocal influencing of parallel routed cables.

Cable routing inside and outside of cabinets

To ensure EMC-compatible cable routing, the cables should be grouped as follows

Group 1:

- shielded bus and data cables
- shielded analog cables
- unshielded cables for DC voltage ≤ 60 V
- unshielded cables for AC voltage ≤ 25 V

Group 2:

- unshielded cables for DC voltage > 60 V and ≤ 400 V
- unshielded cables for AC voltage > 25 V and ≤ 400 V

Group 3:

- unshielded cables for DC and AC voltages > 400 V

Various types of cables within the groups can be routed together in bundles or in cable ducts.

The following group combination can be routed only in separate bundles or separate cable ducts (no minimum distance apart):

- Group 1/Group 2

The group combinations:

- Group 1/Group 3 and Group 2/Group 3

must be routed in separate cable ducts with a minimum distance of 10 cm apart. This is equally valid for inside buildings as well as for inside and outside of switchgear cabinets.

Cable routing outside buildings

Outside of buildings, cables should be routed in closed (where possible), cage-type cable ducts made of metal. The cable duct joints must be electrically connected and the cable ducts must be earthed.

WARNING

Insufficient lightning protection measures

Risk of death due to lightning strike

➤ When installing cables outside buildings, observe all applicable guidelines for internal and external lightning protection and all earthing regulations.

8.1.3 Lightning protection

The cables must be routed in double-grounded metal piping or in reinforced concrete cable ducts.

Signal cables must be protected against overvoltage by varistors or inert-gas filled overvoltage arrestors. Varistors and overvoltage arrestors must be installed at the point where the cables enter the building.

8.1.4 Transmission cables

The slaves on the bus are connected to one another with fieldbus lines that correspond to the DeviceNet specification (ODVA Spec. Rel. V2.0).

The bus cables must be terminated at the beginning and end with a bus terminating resistor. This can be connected via the number DIP switch R_T on the gateway.

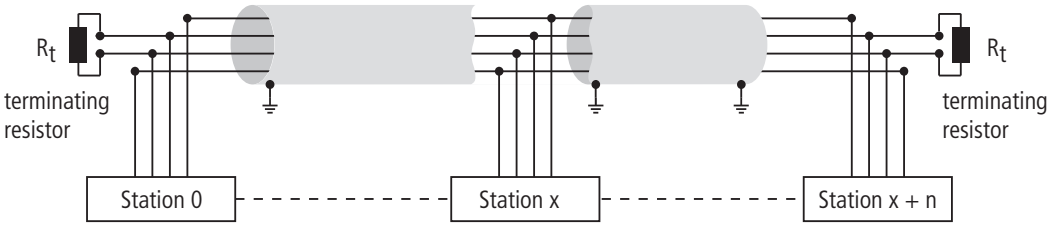

Fig. 43: Representation of a bus cable

8.1.5 Cable types

The following types of cables are used in DeviceNet:

- Thick Cable
  Thick DeviceNet cables are used mostly as rigid trunk cables.
- Thin Cable
  Thin, flexible DeviceNet cables are used for drop lines.
- Flat Cable
- Cable II
- Cable I

Please refer to the DeviceNet specifications (ODVA Spec. Rel. V2.0, Vol. 1) or the ODVA homepage: www.odva.org.

The following diagram shows the schematic construction of a "round" DeviceNet cable:

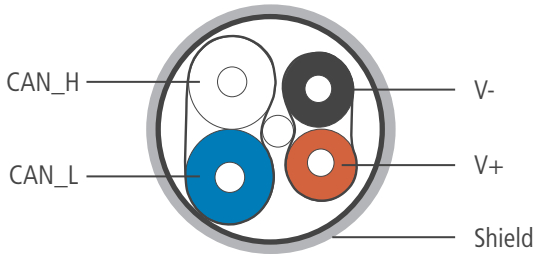

Fig. 44: DeviceNet cable schematic

8.2 Potential relationships

The potential relationship of a DeviceNet system realized with BL20 modules is characterized by the following:

- The system's power supply to the gateway, I/O modules and the field level is connected to the gateway.
- All BL20 modules (gateway, Bus Refreshing Power Feeding and I/O modules) are connected capacitively via base modules to the mounting rails.
- Separate power supplies for the system and the field level allow a potential-free installation.

The block diagram shows the arrangement of a typical BL20 with the ECO gateway BL20-E-GW-DN.

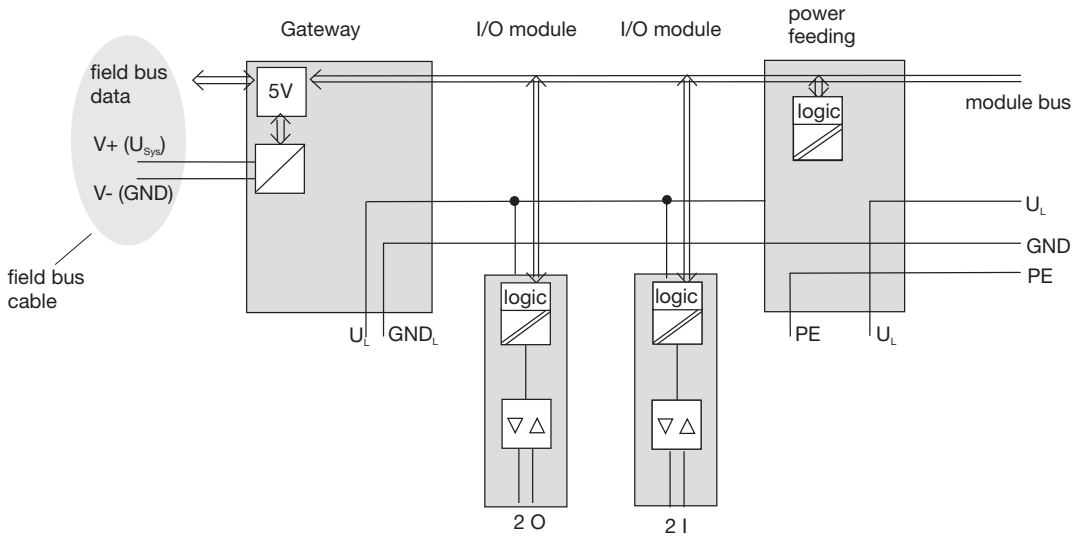

Fig. 45: Block diagram of a BL20 station with an ECO-DN gateway

8.2.1 Potential-free installation

General

In a potential-free installation, the reference potentials of control and load circuitry have to be galvanically isolated from each other.

A potential-free installation is necessary with

- All AC load circuits (for example, when using the Power Feeding module BL20-PF-120/230VAC-D)
- Floating DC load circuits

The potential-free installation does not depend on the method of grounding.

For BL20-stations with BL20-E-GW-DN

The use of the BL20-BR-24VDC-D is only allowed by using **separate** power supplies for V+(U_{sys}) / V-(GND) of the Gateway and for U_{sys} and GND of the BL20-BR-24VDC-D.

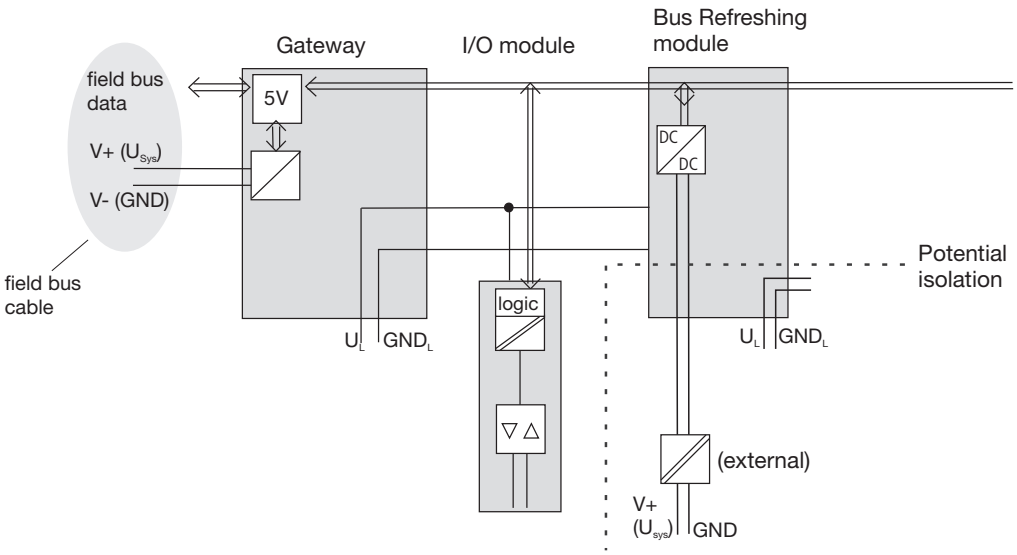

Fig. 46: Potential free installation with BL20-E-GW-DN and Bus Refreshing module

Another possibility would be to supply **both,** U_{sys} at the gateway as well as U_{sys} at the Bus Refreshing module, via the field bus cable connected to the gateway via Open Style Connector.

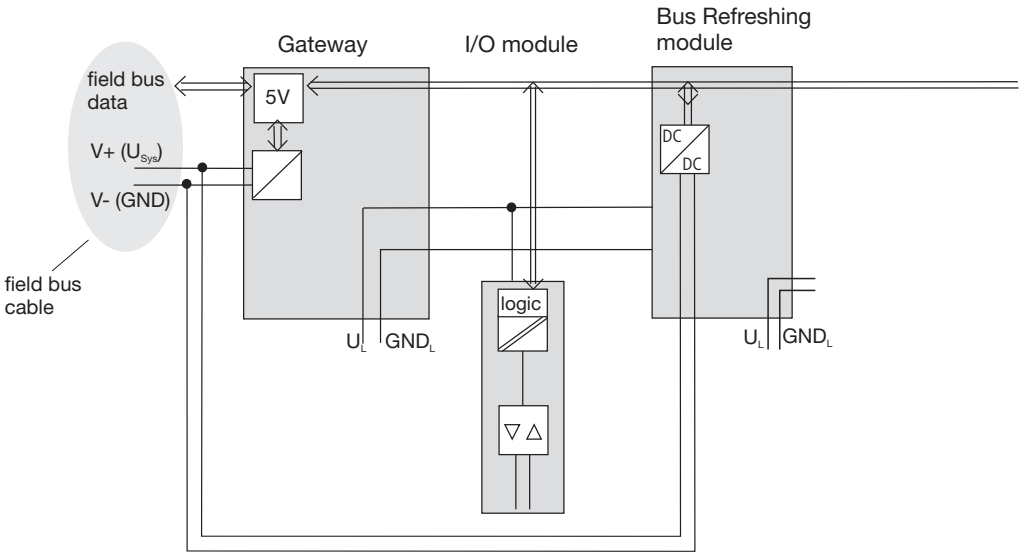

Fig. 47: Potential free installation with BL20-E-GW-DN and Bus Refreshing module

8.3 Electromagnetic Compatibility (EMC)

BL20 products comply in full with the requirements pertaining to EMC regulations. Nevertheless, an EMC plan should be made before installation. Hereby, all potential electromechanical sources of interference should be considered such as galvanic, inductive and capacitive couplings as well as radiation couplings.

8.3.1 Ensuring Electromagnetic Compatibility

The EMC of BL20 modules is guaranteed when the following basic rules are adhered to:

- Correct and large surface grounding of inactive metal components.
- Correct shielding of cables and devices.
- Proper cable routing – correct wiring.
- Creation of a standard reference potential and grounding of all electrically operated devices.
- Special EMC measures for special applications.

8.3.2 Grounding of inactive metal components

All inactive metal components (for example: switchgear cabinets, switchgear cabinet doors, supporting bars, mounting plates, top-hat rails, etc.) must be connected to one another over a large surface area and with a low impedance (grounding). This guarantees a standardized reference potential area for all control elements and reduces the influence of coupled disturbances.

- In the areas of screw connections, the painted, anodized or isolated metal components must be freed of the isolating layer. Protect the points of contact against corrosion.
- Connect all free moving groundable components (cabinet doors, separate mounting plates, etc.) by using short bonding straps to large surface areas.
- Avoid the use of aluminum components, as its quick oxidizing properties make it unsuitable for grounding.

WARNING

Grounding of inactive metal components
Danger to life due to dangerous contact voltage
➤ Connect earth to the protective conductor

8.3.3 PE connection

A central connection must be established between ground and PE connection (protective earth).

8.3.4 Earth-free operation

Observe all relevant safety regulations when operating an earth-free system.

8.3.5 Protection against high frequency interference signals

In order to comply with radiation limit values in accordance with EN 55 011/2 000, the supply lines for supplying the gateway with power are to be fed through a ferrite ring (PS416-ZBX-405). This is to be placed immediately next to the connection terminals. From there on, it is not permitted to make connections to further devices.

8.3.6 Mounting rails

All mounting rails must be mounted onto the mounting plate with a low impedance, over a large surface area, and must be correctly earthed. Use corrosion-resistant mounting rails

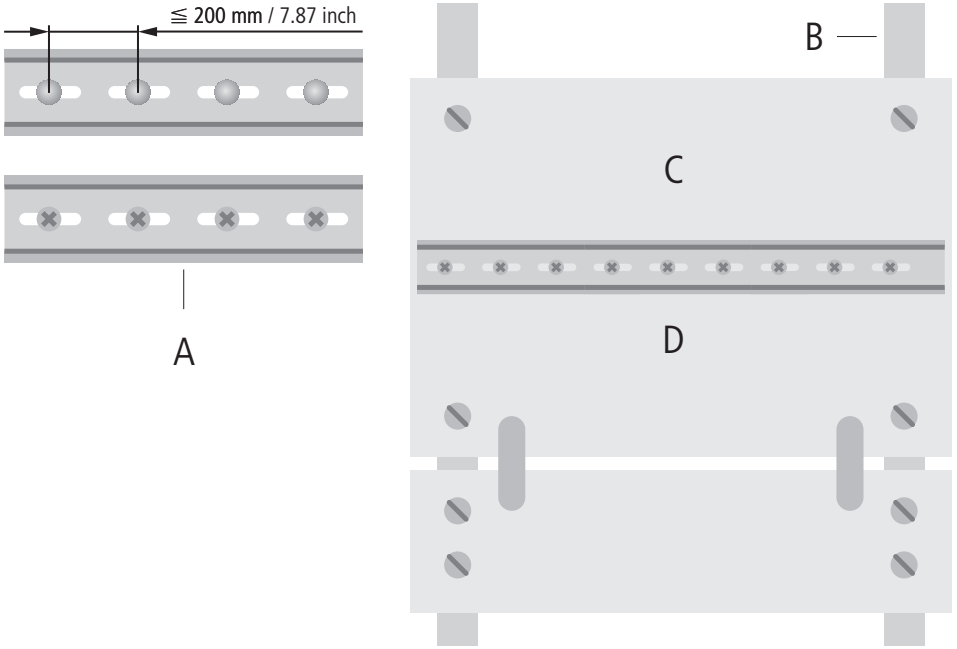

Fig. 48: Mounting options

A *TS 35*
B *mounting rail*
C *mounting plate*
D *TS 35*

Mount the mounting rails over a large surface area and with a low impedance to the support system using screws or rivets.

Remove the isolating layer from all painted, anodized or isolated metal components at the connection point. Protect the connection point against corrosion (for example with grease; caution: use only suitable grease).

8.3.7 EMC compliant cabinet installation

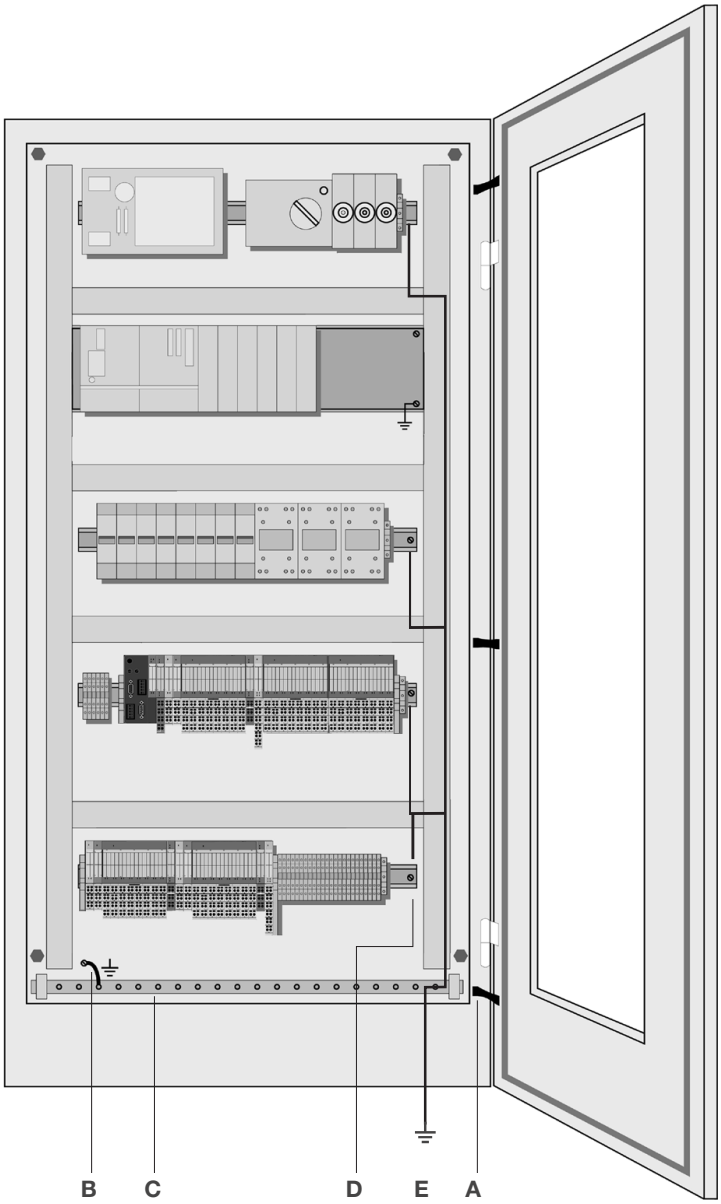

Fig. 49: EMC compliant cabinet installation

A Bonding straps
Bonding straps connect inactive metal components, if it is not possible to create a large surface area contact. Use short bonding straps with large surface areas.

B Mounting plates
Mounting plates used to hold control components must have a large surface area contact with the cabinet housing.

C Protective conductor rail
The protective conductor rail must also be connected over a large surface area to the mounting plates and additionally with an external cable (cross-section at least 10 mm2 / 0,015 inch2) to the protective conductor system to avoid interference currents.

D Protective conductor terminal block
The protective conductor terminal block must be connected to the protective conductor rail.

E Protective conductor system cable (grounding point)
The cable must be connected over a large surface area with the protective conductor system.

8.4 Shielding of cables

Shielding is used to prevent interference from voltages and the radiation of interference fields by cables. Therefore, use only shielded cables with shielding braids made from good conducting materials (copper or aluminum) with a minimum degree of coverage of 80%.

The cable shield should always be connected to both sides of the respective reference potential (if no exception is made, for example, such as high-resistant, symmetrical, analog signal cables). Only then can the cable shield attain the best results possible against electrical and magnetic fields.

A one-sided shield connection merely achieves an isolation against electrical fields.

NOTE

When installing, please pay attention to the following...

- the shield should be connected immediately when entering the system,
- the shield connection to the shield rail should be of low impedance,
- the stripped cable-ends are to be kept as short as possible,
- the cable shield is not to be used as potential compensation.

The insulation of the shielded data-cable should be stripped and connected to the shield rail when the system is used in stationary operation The connection and securing of the shield should be made using metal shield clamps. The shield clamps must enclose the shielding braid and in so doing create a large surface contact area. The shield rail must have a low impedance (for example, fixing points of 10 to 20 cm apart) and be connected to a reference potential area.

The cable shield should not be severed, but routed further within the system (for example, to the switchgear cabinet), right up to the interface connection.

NOTE

Should it not be possible to ground the shield on both sides due to switching arrangements or device specific reasons, then it is possible to route the second cable shield side to the local reference potential via a capacitor (short connection distances). If necessary, a varistor or resistor can be connected parallel to the capacitor, to prevent disruptive discharges when interference pulses occur.

A further possibility is a double-shielded cable (galvanically separated), whereby the innermost shield is connected on one side and the outermost shield is connected on both sides.

8.4.1 Potential compensation

Potential differences can occur between installation components that are in separate areas if these

- are fed by different supplies,
- have double-sided conductor shields which are grounded on different installation components.

A potential-compensation cable must be routed to the potential compensation.

Connection 1			**Connection 2**	
CAN_H	0	---------	0	CAN_H
CAN_L	0	---------	0	CAN_L
GND	0	---------	0	GND

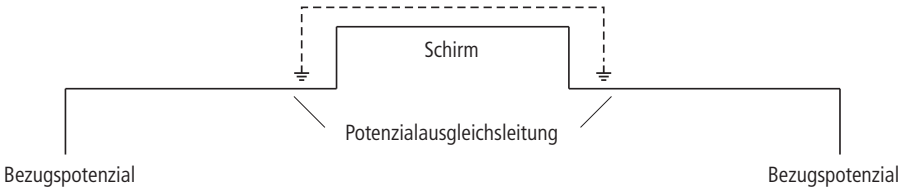

Fig. 50: Potential compensation

A potential compensation cable must have the following characteristics:

- Low impedance. In the case of compensation cables that are routed on both sides, the compensation line impedance must be considerably smaller than that of the shield connection (max. 10% of shield connection impedance).
- Should the length of the compensation cable be less than 200 m, its cross-section must be at least 16 mm^2 /0.025 $inch^2$. If the cable length is greater than 200 m, then a cross-section of at least 25 mm^2 / 0.039 $inch^2$ is required.
- The compensation cable must be made of copper or zinc coated steel.
- The compensation cable must be connected to the protective conductor over a large surface area and must be protected against corrosion.

- Compensation cables and data cables should be routed as close together as possible, meaning the enclosed area should be kept as small as possible.

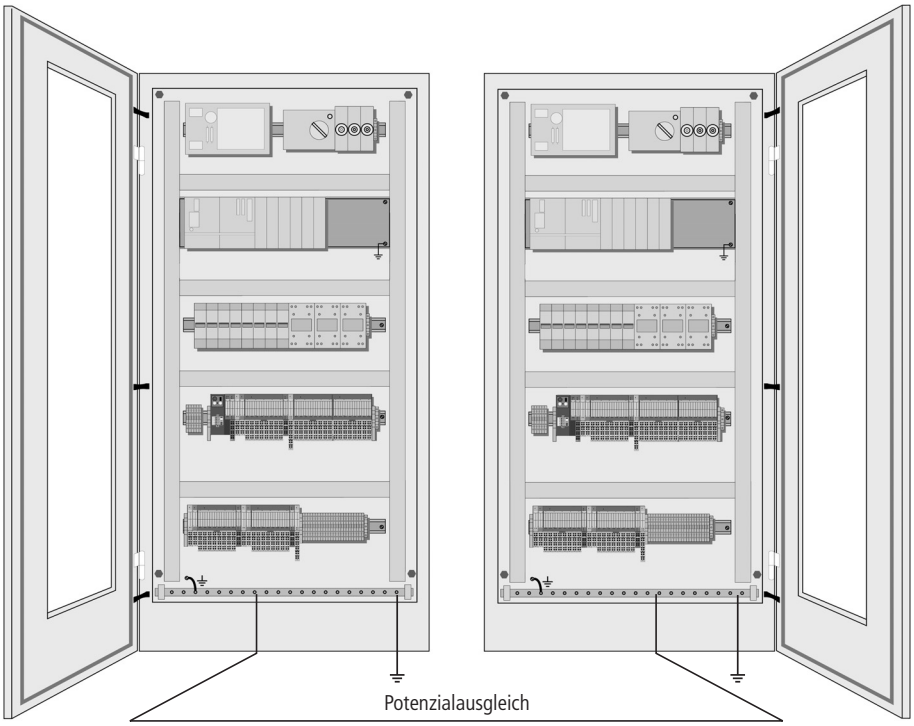

Fig. 51: Potential compensation Between switch cabinets

8.4.2 Switching inductive loads

- In the case of inductive loads, a protective circuit on the load is recommended.

8.4.3 Protection against Electrostatic Discharge (ESD)

NOTICE

Exposed metal contacts

Material damage due to electrostatic discharge

➤ Avoid to touch the metallic contacts with bare hands

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9 Integration of Technology Modules in DeviceNet

9.1 Counter module, BL20-1CNT-24VDC

9.1.1 Process input for count mode

Process input data is data from the connected field device that is transmitted via the BL20-1CNT-24VDC module to the PLC. This is transferred in an 8-byte format as follows:

- 4 bytes are used to contain the count values.
- 1 byte contains the diagnostics data.
- 2 bytes contain status information.

Structure of the data bytes in DeviceNet:

Process input data (CNT -> PLC) for Counter mode

Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	Counter value							
1								
2								
3								
	Diagnostic data							
4	ERR_ 24Vdc	ERR_ DO	ERR_ PARA	X	x	RES_ STS_A	ERR_ LOAD	STS_ LOAD
	Status information							
5	STS_ DN	STS_ UP	X	STS_ DO2	STS_ DO1	X	STS_ DI	STS_ SYN
6	STS_ ND	STS_ UFLW	STS_ OFLW	STS_ CMP2	STS_ CMP1	X	X	STS_ SYN
7	reserved							

Fig. 52: Process input data

9.1.2 Process output for count mode

The process output data is the data that is output from the PLC via the gateway to the BL20-1CNT-24VDC module.

The BL20-1CNT-24VDC module allows some parameters to be modified during operation.

The other parameters must be changed prior to commissioning.

NOTE

The current count operation is stopped if parameters are changed during operation.

NOTE

The parameters modified via the process output data are not retentive. The commissioning after a power failure is based on the parameter data of the configuration tool or default configuration.

The data is transferred in 8 byte format:

- The first four bytes provide the parameter values for load direct, load in preparation, reference value 1, reference value 2 or behavior of the digital outputs.
- Two control bytes contain the control functions for transferring the parameter values, for starting/stopping the measurement, for acknowledging errors and for resetting the status bit.
- 2 bytes are not yet assigned.

Structure of the data bytes in DeviceNet with "Load value direct", "Load value in preparation", "Reference value 1" or "Reference value 2":

Process output data (SPS → CNT)
for
Counter mode
("Load value direct", "Load value in preparation",
"Reference value 1" or "Reference value 2„)

Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	"Load value direct" "Load value in preparation", "Reference value 1" or "Reference value 2"							
1								
2								
3								
	Control data							
4	EXTF_ ACK	CTRL_ DO2	SET_ DO2	CTRL_ DO1	SET_ DO1	RES_ STS	CTRL_ SYN	SW_ GATE
5	X	X	X	LOAD_ DO_ PARAM	LOAD_ CMP_ VAL2	LOAD_ CMP_ VAL1	LOAD_ PRE-PARE	LOAD_ VAL
6	reserved							
7	reserved							

Fig. 53: Process output data with "Load value direct", "Load value in preparation", "Reference value 1" or "Reference value 2"

Structure of the data bytes in the DeviceNet fieldbus with "Function and Behavior of DO1/DO2":

Process output data (SPS → CNT)
for
Counter mode
("Function and behavior DO1/DO2")

Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	reserved		MODE_DO2		reserved		MODE_DO1	
1	Hystersis value							
2	Pulse duration							
3	reserved							
	Control data							
4	EXTF_ ACK	CTRL_ DO2	SET_ DO2	CTRL_ DO1	SET_ DO1	RES_ STS	CTRL_ SYN	SW_ GATE
5	X	X	X	LOAD_ DO_ PARAM	LOAD_ CMP_ VAL2	LOAD_ CMP_ VAL1	LOAD_ PRE-PARE	LOAD_ VAL
6	reserved							
7	reserved							

Fig. 54: Process output data with "Function and Behavior of DO1/DO2"

9.1.3 Process input for measurement mode

Process input data is data from the connected field device that is transmitted via the BL20-1CNT-24VDC module to the PLC. This is transferred in an 8-byte format as follows:

- Four bytes are used to contain the measured values.
- 1 byte contains the diagnostics data.
- 2 bytes contain status information.

Structure of the data bytes in DeviceNet:

**Process input data (CNT -> PLC)
for
Measurement mode**

Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	Measured value							
1								
2								
3								
	Diagnostic data							
4	ERR_ 24Vdc	ERR_ DO	ERR_ PARA	X	x	RES_ STS_A	ERR_ LOAD	STS_ LOAD
	Status information							
5	STS_ DN	STS_ UP	X	X	STS_ DO1	X	STS_ DI	STS_ GATE
6	X	STS_ UFLW	STS_ OFLW		STS_ CMP1	X	X	X
7	reserved							

Fig. 55: Process input data for measurement mode

9.1.4 Process output for measurement mode

The process output data is the data that is output from the PLC via the gateway to the BL20-1CNT-24VDC module.

The BL20-1CNT-24VDC module allows some parameters to be modified during operation.

The other parameters must be changed prior to commissioning.

NOTE

The current count operation is stopped if parameters are changed during the measuring operation.

NOTE

The parameters modified via the process output data are not retentive. The commissioning after a power failure is based on the parameter data of the configuration tool or default configuration.

The data is transferred in 8 byte format:

- The first four bytes represent the parameter values for Lower limit or Upper limit, Function of DO1 or Integration time.
- Two control bytes contain the control functions for transferring the parameter values, for starting/stopping the measurement, for acknowledging errors and for resetting the status bit.
- 2 bytes are not yet assigned.

Structure of the data bytes in the DeviceNet fieldbus with "Lower limit" or "Upper limit" set:

Process output data (SPS → CNT)
for
Measurement mode
("upper limit" or "lower limit")

Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	"upper limit" or "lower limit"							
1								
2								
3								
	Control data							
4	EXTF_ ACK	X	X	CTRL_ DO1	SET_ DO1	RES_ STS	X	SW_ GATE
5	X	X	X	LOAD_ DO_ PARAM	X	LOAD_ INTTIME	LOAD_ UPLIMIT	LOAD_ LOLIMIT
6	reserved							
7	reserved							

Fig. 56: Process output data with "Lower limit" or "Upper limit" set

Structure of the data bytes in the DeviceNet fieldbus with "Function of DO1 set" set:

Process output data (SPS → CNT)
for
Measurement mode
("Function of DO1")

Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	reserved						MODE_DO1	
1	X							
2	x							
3	X							
	Control data							
4	EXTF_ ACK	X	X	CTRL_ DO1	SET_ DO1	RES_ STS	X	SW_ GATE
5	X	X	X	LOAD_ DO_ PARAM	X	LOAD_ INTTIME	LOAD_ UPLIMIT	LOAD_ LOLIMIT
6	reserved							
7	reserved							

Fig. 57: Process output data with "Function of DO1" set

Structure of the data bytes in the DeviceNet™ fieldbus with "Integration Time" set:

Process output data (SPS → CNT)
for
Measurement mode
("Integration time")

Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	Integration time							
1								
2	x							
3	X							
	Control data							
4	EXTF_ ACK	X	X	CTRL_ DO1	SET_ DO1	RES_ STS	X	SW_ GATE
5	X	X	X	LOAD_ DO_ PARAM	X	LOAD_ INTTIME	LOAD_ UPLIMIT	LOAD_ LOLIMIT
6	reserved							
7	reserved							

Fig. 58: Process output data with "Integration time" set

9.2 RSxxx modules

The structure of the process image is represented with symbolic names. These correspond to the attribute names which also correspond to the relevant functions.

The bits and bit groups assigned to the names indicate numerical values.

The meaning of the numerical values is explained in the description of the attributes, **Classes and Instances of the DeviceNet gateway (page 93)**.

NOTE

The description of the process input and output data of the modules BL20-1RS232 and BL20-1RS485/422 is identical.

9.2.1 Process input data

- ACTIVE MODE = "1byte ctrl/status header"

Process input data (RSxxx -> field bus)								
Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	Status byte							
	STAT	TX_CNT_ACK		RX_CNT		RX_BYTE_CNT		
1	RX_DB_0							
2	RX_DB_1							
3	RX_DB_2							
4	RX_DB_3							
5	RX_DB_4							
6	RX_DB_5							
7	RX_DB_6							

Fig. 59: Process input data

- ACTIVE MODE = "2byte ctrl/status header"

Process input data (RSxxx -> field bus)								
Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	Status byte							
	STAT	TX_CNT_ACK		RX_CNT		RX_BYTE_CNT		
1	Diagnostic byte							
	Buf Ovfl	Frame Err	HndSh Err	Hw Failure	Prm Err	reserved		
2	RX_DB_0							
3	RX_DB_1							
4	RX_DB_2							
5	RX_DB_3							
6	RX_DB_4							

Fig. 60: Process input data

9.2.2 Process output data

The individual bits and bit groups provide numerical values.

The meaning of the numerical values is explained in the description of the attributes.

- ACTIVE MODE = "1byte ctrl/status header"

Process output data (field bus -> RSxxx)								
Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	Control byte							
	STAT RES	RX_CNT_ACK		TX_CNT		TX_BYTE_CNT		
1	TX_DB_0							
2	TX_DB_1							
3	TX_DB_2							
4	TX_DB_3							
5	TX_DB_4							
6	TX_DB_5							
7	TX_DB_6							

Fig. 61: Process output data

- ACTIVE MODE = "2byte ctrl/status header"

Process output data (field bus -> RSxxx)								
Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	Control byte							
	STAT RES	RX_CNT_ACK		TX_CNT		TX_BYTE_CNT		
1	Reset of RX_- and TX_buffer							
	reserved						RXBUF FLUSH	TXBUF FLUSH
2	TX_DB_0							
3	TX_DB_1							
4	TX_DB_2							
5	TX_DB_3							
6	TX_DB_4							
7	TX_DB_5							

Fig. 62: Process output data

RXBUF FLUSH:

The RXBUF FLUSH bit is used for clearing the receive buffer.
If STATUS RESET CONTROL = 1:
A request with RXBUF FLUSH = 1 will be ignored.

If STATUS RESET CONTROL = 0:
With RXBUF FLUSH = 1 The receive buffer is cleared.

TXBUF FLUSH:

The TXBUF FLUSH bit is used for clearing the transmit buffer.

If STATUS RESET CONTROL = 1:
A request with TXBUF FLUSH = 1 will be ignored.

If STATUS RESET CONTROL = 0:
With TXBUF FLUSH = 1 The receive buffer is cleared.

9.3 SSI-Module

The structure of the process image is represented with symbolic names. These correspond to the attribute names which also correspond to the relevant functions.

The bits and bit groups assigned to the names indicate numerical values.

The meaning of the numerical values is explained in the description of the attributes **Classes and Instances of the DeviceNet gateway (page 93)**.

9.3.1 Process input data

Process input data (SSI -> PLC)

Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
	Diagnostic messages							
0	STS STOP	X	X	ERR PARA	STS UFLW	STS OFLW	ERR SSI	SSI DIAG
	Status messages							
1	REG RD ABORT	X	REG RD ADR (MSB bis LSB)					
2	REG WR ACEPT	REG WR AKN	X	X	SSI STS3	SSI STS2	SSI STS1	SSI STS0
3	STS UP	STS DN	REL CMP2	FLAG CMP2	STS CMP2	REL CMP1	FLAG CMP2	STS CMP2
4	RX_DB_ 0							
5	RX_DB_1							
6	RX_DB_ 2							
7	RX_DB_ 3							

Fig. 63: Process input data

SSI_STS3	These four bits transfer the status bits of the SSI encoder with the status messages of the SSI module. With some SSI encoders, the status bits are transferred together with the position value.
SSI_STS2	
SSI_STS1	
SSI_STS0	

9.3.2 Process output data

Process output data (PLC → SSI)

Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	STOP	X	X	X	X	X	X	X
	Control data							
1	X	X	REG RD ADR (MSB bis LSB)					
2	REG WR	X	REG WR ADR					
3	X	X	X	CLR CMP2	EN CMP2	X	CLR CMP1	EN CMP1
4	TX_DB_3							
5	TX_DB_2							
6	TX_DB_1							
7	TX_DB_0							

Fig. 64: Process output data

9.4 SWIRE modules

9.4.1 Process input data

The field input data is transferred from the connected SWIRE-BUS to the BL20-E-1SWIRE module. The process input data is the data that is transferred by the BL20-E-1SWIRE module via a gateway to the PLC. The transfer is carried out in 8-byte format. 4 bits are reserved for each SWIRE slave. The following information can be transferred:

- Contactor coil on/off
- Motor-protective circuit-breaker off or tripped/on
- Status of the slave o.k./diagnostics message present input data

The field input data is transferred from the connected SWIRE-BUS to the BL20-E-1SWIRE module.

	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Byte 0	SWIRE Slave 2				SWIRE Slave 1			
Byte 1	SWIRE Slave 4				SWIRE Slave 3			
Byte 2	SWIRE Slave 6				SWIRE Slave 6			
Byte 3	SWIRE Slave 8				SWIRE Slave 7			
Byte 4	SWIRE Slave 10				SWIRE Slave 9			
Byte 5	SWIRE Slave 12				SWIRE Slave 11			
Byte 6	SWIRE Slave 14				SWIRE Slave 13			
Byte 7	SWIRE Slave 16				SWIRE Slave 15			

The data of SWIRE slave 1 is the data of the first physical slave on the SWIRE bus. The remaining slaves are assigned in consecutive order accordingly. The meaning of the data of an SWIRE slave depends on the product concerned.

Meaning of the 4-bit process input data on an SWIRE-DIL device:

Bit 7	Bit 6	Bit 5	Bit 4
SDx /free	free	PKZSTx	SIx

The following table shows the meaning of the data bits:

Designation	Status		Comment
SIx	**Switch status, relay x**		
		SIx supplies the switch status of the contactor coil of the SWIRE bus slave as a feedback signal. SIx makes it possible to check whether the set switch status was executed by a mechanical connection. This must take into account the time delay between the setting of an output, a mechanical execution and the subsequent feedback signal.	
	0	OFF	OFF	Contactor coil is switched off
	1	ON	ON	Contactor coil is switched on
PKZSTx	**Switch status, PKZ x**		
	0	OFF	OFF	The motor-protective circuit breaker is off or has tripped
	1	ON	ON	The motor-protective circuit breaker is switched on

Designation	Status	Comment	
SDx	**Communication error, slave x**		
	Setting the NDDIAG parameter copies the slave diagnostics message (input byte 1/bit 3) to the feedback interface. The information is provided as status information in the PLC for the user.		
	0	ON LINE	ON LINE	Status of slave x: Everything o.k.
	1	OFF LINE	OFF LINE	Status of slave x: Slave diagnostics message present

9.4.2 Process output data

Field output data is output from an BL20-E-1SWIRE module to a field device. The process output data is the data that is transferred by the PLC via a gateway to the BL20-E-1SWIRE module. The transfer is carried out in 8-byte format. 4 bits are reserved for each SWIRE slave. The following information is transferred:

- Switch status of contactor coil on/off

	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Byte 0	SWIRE Slave 2				SWIRE Slave 1			
Byte 1	SWIRE Slave 4				SWIRE Slave 3			
Byte 2	SWIRE Slave 6				SWIRE Slave 6			
Byte 3	SWIRE Slave 8				SWIRE Slave 7			
Byte 4	SWIRE Slave 10				SWIRE Slave 9			
Byte 5	SWIRE Slave 12				SWIRE Slave 11			
Byte 6	SWIRE Slave 14				SWIRE Slave 13			
Byte 7	SWIRE Slave 16				SWIRE Slave 15			

The data of SWIRE slave 1 is the data of the first physical slave on the SWIRE bus. The remaining slaves are assigned in the same way. The meaning of the data of an SWIRE slave depends on the product concerned.

Meaning of the 4-bit process output data on an SWIRE-DIL device:

Bit 7	Bit 6	Bit 5	Bit 4
free	free	free	SOx

The following table shows the meaning of the data bits:

Designation	Status	Comment	
SOx	**Relay x** **relay x**		
	SOx is transferred as the switch status of the contactor coil from the SWIRE bus master to the appropriate SWIRE bus slave.		
	0	OFF	OFF	Contactor not switched on
	1	ON	ON	Contactor is switched on

9.5 RFID modules

NOTE

For all information concerning the RFID communication interfaces see the special RFID documentation (TURCK document D101642 which can be downloaded from www.turck.com).

10 BL20-Approvals for Zone 2/ Division 2

NOTE

The Zone 2 - approval certificates for BL20 can be found in a separate manual for approvals **D301255** on **www.turck.de**.

11 Appendix

11.1 Classes and Instances of the DeviceNet gateway

11.1.1 DeviceNet standard classes

The BL20 gateway supports the following DeviceNet Standard Classes in accordance with ODVA DeviceNet specification Vol. 1 Rel. V2.0.

Class Code dec. (hex.)	Name	Description
01 (1h)	Identity	Enables clear and unambiguous identification of modules. Contains information such as name of manufacturer, product type, serial number (ident number), revision number and so forth.
02 (2h)	Message Router	Provides the means for accessing each class and each instance in the device via Explicit Messages.
03 (3h)	DeviceNet	Defines the physical connection of a device and the DeviceNet network. Contains, for example, the MAC ID of the device, the currently set baud rate, and describes switches that may be available for setting of MAC ID and baud rate.
04 (4h)	Assembly	Defines the data transmitted and received via the I/O connections (produced/consumed data) of a device.
05 (6h)	DeviceNet Connection	Defines, amongst other things, the connection to the data via the I/O messages or Explicit Messages as well as the path and length of the transmitted and received data.
06 (6h)	Off-link Connection Manager	Makes it possible to later establish connections between DeviceNet and other networks.
43 (2Bh)	Acknowledge Handler Object	Makes possible the installation of acknowledged COS/Cyclic-I/O connections.

11.1.2 VSC – Vendor Specific Classes

As well as supporting the above named DeviceNet Standard Classes, the DeviceNet gateway supports the following vendor specific classes.

It is possible to gain read (**G**= Get) and/or write (**S**= Set) access to the attributes of classes described in the following:

Class Code dec. (hex.)	Name	Description
100 (64h)	Gateway Class, s. p. 96	Contains data and settings concerning the gateway and the BL20 system as a whole.
101 (65h)	Terminal Slot Class, s. p. 101	Contains data concerning the base modules
102 (66h)	Process Data Class, s. p. 103	Contains process data
103 (67h)	Power Supply Module Class, s. p. 107	Describes the power distribution modules
104 (68h)	Digital Input Module Class, s. p. 109	Describes the modules of the type BL20-*DI-*
105 (69h)	Digital Output Module Class, s. p. 111	Describes the modules of the type BL20-*DO-*
106 (6Ah)	Analog Input Voltage Module Class, s. p. 113	Describes the modules of the type BL20-*AI-U
107 (6Bh)	Analog Output Voltage Module Class, s. p. 115	Describes the modules of the type BL20-*AO-U
108 (6Ch)	Analog Input Current Module Class, s. p. 116	Describes the modules of the type BL20-*AI-I
109 (6Dh)	Analog Output Current Module Class, s. p. 118	Describes the modules of the type BL20-*AO-I
110 (6Eh)	Analog Input RTD Module Class, s. p. 119	Describes the modules of the type BL20-*AI-PT/NI
111 (6Fh)	Analog Input THERMO Module Class, s. p. 122	Describes the modules of the type BL20-*AI-THERMO-PI
112 (70h)	Counter Module Class, s. p. 125	Describes the modules of the type BL20-*CNT-*
113 (71h)	reserved	-
114 (72h)	RS232 Module Class, s. p. 131	Describes the modules of the type BL20-1RS232
115 (73h)	RS485/422 Module Class, s. p. 137	Describes the modules of the type BL20-1RS485/422
116 (74h)	SSI Module Class, s. p. 143	Describes the modules of the type BL20-1SSI
117 (75h)	Digital Versatile Module Class, s. p. 151	No BL20-modules available in this class.
118 (76h)	Analog Versatile Module Class, s. p. 154	Describes modules of the type BL20-4AI-U/I

Class Code dec. (hex.)	Name	Description
121 (79h)	SWIRE Module Class, s. p. 156	Describes modules of the type BL20-E-SWIRE.
124 (6Ah)	RFID-S Module Class, s. p. 160	Describes modules of the type BL20-2RFID-S

Class Instance of the VSC

NOTE

The Class Instance attributes are the same for each Vendor Specific Class.

The class-specific Object Instances and the corresponding attributes are explained in the paragraphs for the different VSC.

The general VSC - Class Instance attributes are defined as follows:

Attr. No. dec. (hex.)	Attribute name	Get/ Set	Type	Description
100 (64h)	Class revision	G	UINT	States the revision number of the class (Maj. Rel. *1000 + Min. Rel.).
101 (65h)	Max. instance	G	USINT	Contains the number of the highest instance of an object created on this level in the class hierarchy.
102 (66h)	# of instances	G	USINT	Contains the number of Object Instances created in this class.
103 (67h)	Max. class attribute	G	USINT	Contains the number of the last Class Attribute to be implemented.

Gateway Class (VSC 100, 64h)

The Gateway Class contains all the parameters that concern the BL20 system and the gateway.

Class Instance

NOTE

Please refer to paragraph Class Instance of the VSC (page 95) for the description of the class instances for VSC.

Object Instance 1

Attr. No. dec. (hex.)	Attribute name	Get/ Set	Type	Description
101 (65h)	Hardware revision	G	STRUCT	Contains the hardware revision number of the gateway (USINT Maj./USINT Min.)
102 (66h)	Firmware revision	G	STRUCT	Contains the revision number of the Boot Firmware for DeviceNet (Maj./Min.).
103 (67h)	Service tool ident number	G	UDINT	Contains the BOOT ID number that serves as an identification number for the software I/O-ASSISTANT 3 (FDT/DTM)
104 (68h)	Hardware info	G	STRUCT	Contains gateway hardware information (UINT): – count (number of the following entries) – CLOCK FREQUENCY (kHz) – MAIN FLASH (in kB) – MAIN FLASH SPEED (ns) – SECOND FLASH (kB) – RAM (kB), – RAM SPEED (ns), – RAM data WIDTH (bit), – SERIAL EEPRPOM (kbit) – RTC SUPPORT (in #) – AUTO SERVICE BSL SUPPORT (BOOL) – HDW SYSTEM

Object Instance 2

Attr. No. dec. (hex.)	Attribute name	Get/ Set	Type	Description
100 (64h)	Max object attribute	G	USINT	Contains the number of the last object attribute to be implemented
101 (65h)	Hardware revision	G	STRUCT	Contains the hardware revision number of the gateway (USINT Maj./USINT Min.)
102 (66h)	Firmware revision	G	STRUCT	Contains the revision number of the Boot Firmware for DeviceNet (Maj./Min.).
103 (67h)	Service tool ident number	G	UDINT	Contains the BOOT ID number that serves as an identification number for the software I/O-ASSISTANT 3 (FDT/DTM)
104 (68h)	Hardware info	G	STRUCT	Contains gateway hardware information (UINT): – count (number of the following entries) – CLOCK FREQUENCY (kHz) – MAIN FLASH (in kB) – MAIN FLASH SPEED (ns) – SECOND FLASH (kB) – RAM (kB), – RAM SPEED (ns), – RAM data WIDTH (bit), – SERIAL EEPRPOM (kbit) – RTC SUPPORT (in #) – AUTO SERVICE BSL SUPPORT (BOOL) – HDW SYSTEM
105 (69h)	Gateway order	G	UDINT	Contains the ident number of the gateway.
106 (6Ah)	Compiler build	G	SHORT STRING	Contains the creation date of the Firmware, for example, "AUG 12 2003/11:22:01".
107 (6Bh)	System time	G	TIME	Displays the time elapsed (in ms) since the Power up of the gateway.
108 (6Ch)	Status array register	G	ARRAY	Contains all status information of the gateway. This status indicator indicates the status that was integrated in to the I/O data field, which is created at the same time as the I/O connection. Only the most significant status is saved to the Status Register of the transmitted I/O data. The "status array register" makes it possible to read all the momentary status data. ARRAY OF: USINT STAT (status information)

Attr. No. dec. (hex.)	Attribute name	Get/ Set	Type	Description
109 (6Dh)	GW status register	G	STRUCT	Status Register of the gateway (see also Status register of the gateway (page 43). This status indicator belongs to control register2 and makes it possible to read the presently available status data. STRUCT OF: USINT "status register" (status code) BYTE status FLAGS (defined bit-related status information)
110 (6Eh)	GW control register	G/S	STRUCT	Control Register of the gateway. (see also Control register of the gateway (page 45)) Makes it possible for commands to be carried out. STRUCT OF: USINT COMMAND register (command code) BYTE COMMAND FLAGS (defines bit-related commands)
111 (6Fh)	Gateway CFG state	G	ENUM USINT	Configuration Status Register of the gateway. ENUM USINT: CFG OK(0): The station configuration saved to the non-volatile memory matches the temporary and momentary station configurations. CFG MISMATCH(1): The station configuration saved to the non-volatile memory does not match the temporary configuration. Module SET MODIFIED(2): The momentary station configuration does not match the temporary configuration.
112 (70h)	Gateway CFG command	G/S	ENUM USINT	Configuration Command Register of the gateway. ENUM USINT: IDLE(0):"no action" SET CFG REQUEST(1): The temporarily saved station configuration is saved to the non-volatile memory. This saves the Power up configuration. LOAD CURRENT CFG (2): The momentary station configuration is loaded to both the temporary and the non-volatile memory of the gateway. The non-volatile memory saves the Power up configuration. RESTORE OLD CFG (3): The Required Station Configuration is saved to the temporary memory. All data saved in the temporary memory will be lost; changes will be overwritten.

Attr. No. dec. (hex.)	Attribute name	Get/ Set	Type	Description
113 (71h)	On mod. list warning	G/S	ENUM USINT	Reaction to an alteration of a module list modified by the pulling of a module or of module occupying slot configured as empty. SWITCH IO FAULTED (0): The modules are switched to Faulted State. SWITCH IO OFF (1): The gateway switches off the outputs of the modules. SWITCH IO HOLD (2): The gateway makes no further changes to the data of the I/O modules. The outputs are held. SWITCH IO PROCSSING (3): The gateway continues to exchange I/O process data.
114 (72h)	On mod. list error	G/S	ENUM USINT	Reaction to an alteration of a module list modified by plugging a false module, meaning, a module whose ident number does not match that of the pulled module. SWITCH IO FAULTED (0): The modules are switched to Faulted State. SWITCH IO OFF (1): The gateway switches off the outputs of the modules. SWITCH IO HOLD (2): The gateway makes no further changes to the data of the I/O modules. The outputs are held.
115 (73h)	On IO cnctn timeout	G/S	ENUM USINT	Reaction to the I/O connection exceeding the time limit. SWITCH IO FAULTED (0): The modules are switched to Faulted State. SWITCH IO OFF (1): The gateway switches off the outputs of the modules. SWITCH IO HOLD (2): The gateway makes no further changes to the data of the I/O modules. The outputs are held.
116 (74h)	Module Diag summary	G	ARRAY OF STRUCT	Contains the diagnostic information of all modules ARRAY OF STRUCT: USINT SLOT #: Indicates the slot number (module position) with diagnostic messages. BYTE SLOT FLAGS: Offers slot-related information. Bit 7 = 1 module missing Bit 6 = 1 wrong module plugged DWORD Diag: Contains the module diagnostic information. Module diagnostic bits that are not used are indicated by a "0".

Attr. No. dec. (hex.)	Attribute name	Get/ Set	Type	Description
117/ 118 (75h/76h)	reserved			
119 (77h)	reserved			
120 (78h)	reserved			
121 (79h)	Supply voltage field	G	UINT	Field voltage supply monitoring: 0 = U_L not in the required range (< 18 V DC) 1 = U_L in the required range (> 18 V DC)
122 (7Ah)	Supply voltage field bus	G	UINT	Monitoring of supply voltage V+ of DeviceNet: 0 = V+ not in the required range (< 11 V DC) 1 = V+ in the required range (>11 V DC)
123 -131 (7Bh - 83h)	reserved			
132 (84h)	GW Control register mapping	G/S	USINT	2 = Control Register mapped into output data (default) 4 = Control Register removed from device output data All other values are not allowed. The values are stored to the non-volatile memory of the gateway. The changes become valid after a start-up!
133 (85h)	GW status register mapping	G/S	USINT	1 = Status Register mapped into input data (default) 3 = Status Register removed from device input data All other values are not allowed. The values are stored to the non-volatile memory of the gateway. The changes become valid after a start-up!
134 (86h) - 137 (89h)	reserved			
138 (8Ah)	GW status register	G/S	ENUM USINT	Enables/disables the status register mapping in the process input data. 0 = 0 bytes (status register not mapped in process input data) 1 = 2 bytes (status register mapped in process input data)
139 (8Bh)	GW control register	G/S	ENUM USINT	Enables/disables the control register mapping in the process output data. 0 = 0 bytes (control register not mapped in process output data) 1 = 2 bytes (control register mapped in process output data)

Terminal Slot Class (VSC 101, 65h)

This class contains parameters and data for the base modules.

Class Instance

NOTE

Please refer to paragraph Class Instance of the VSC (page 95) for the description of the class instances for VSC.

Object Instance

Attr. No. dec. (hex.)	Attribute name	Get/ Set	Type	Description
100 (64h)	Max object attribute	G	USINT	Contains the number of the last object attribute to be implemented.
101 (65h)	Module present	G	BOOL	0 = module missing, base module without electronic module. 1 = module is plugged
102 (66h)	Slot state	G	ENUM USINT	NOT USED (0): A non-occupied slot is not taking part in process data traffic. It is not responding to data transmitted or received via I/O Connection Messages. PROCESSING (1): A BL20 module, recognized by the fieldbus is occupying a slot. Data transfer is taking place with the other fieldbus devices via I/O Connection Messages. ALLOCATED (2): The slot is not occupied, but has been reserved for a certain electronic module. The process data are set to 0. WRONG MODULE (3): The wrong module has been plugged in the slot, meaning, it supports process data lengths that were not previously defined or it is a different type of module. This false module will not be made known to the fieldbus and will not take part in process data traffic. The process data for this slot are set to 0.
103 (67h)	Module ID	G	DWORD	Contains the ID of the BL20 module.
104 (68h)	Module diag bit count	G	UINT	States the number of diagnostic bits of the module.
105 (69h)	Module param bit count	G	UINT	States the number of parameter bits of the module.
106 (6Ah)	Module diag bit count	G	UINT	States the number of input bits (produced bits) of the module.
107 (6Bh)	Module output bit count	G	UINT	States the number of output bits (consumed bits) of the module.

Attr. No. dec. (hex.)	Attribute name	Get/ Set	Type	Description
108 (6Ch)	Module SUBMODE	G	USINT	Contains the Submode ID of the BL20 module.
109 (6Dh)	Module group count	G	USINT	States the number of internal groups of the module.
110 (6Eh)	Diag	G	ARRAY OF BYTE	Contains the diagnostic information of the module.
111 (6Fh)	Param	G/S	ARRAY OF BYTE	Contains the parameters of the module.
112 (70h)	Input	G	ARRAY OF BYTE	Contains the input data (produced data) of the module.
113 (71h)	Output	G/S	ARRAY OF BYTE	Contains the output data (consumed data) of the module.
114 (72h)	Referenced VSC	G	USINT	The VSC that represents this BL20 module. If this module is contained in the internal gateway library, then it is listed in a specific VSC that describes the typical attributes of the module.
115 (73h)	Referenced VSC instance	G	USINT	The VSC Instance that represents this BL20 module. If this module is contained in the internal gateway library, then it is listed in a specific VSC that describes the typical attributes of the module.
116 (74h)	Module registered index	G/S	ENUM USINT	Contains the index numbers specified in all the module lists.

Process Data Class (VSC102, 66h)

This class contains the process-relevant information.

Class Instance

NOTE

Please refer to paragraph Class Instance of the VSC (page 95) for the description of the class instances for VSC.

Object Instance 1, standard input process data (compressed)

Attr. No. dec. (hex.)	Attribute name	Get/ Set	Type	Description
100 (64h)	Max object attribute	G	USINT	Contains the number of the last object attribute to be implemented.
101 (65h)	Attribute list	G	ARRAY OF USINT	List of all attributes that are supported by this Instance.
102 (66h)	Standard packed process input data	G	ARRAY OF WORD	Input process data, 16-bit aligned, compressed.
103 (67h)	Process data byte count	G	USINT	The number of bytes that are exchanged with this Instance.

Object Instance 2, standard output process data (compressed)

Attr. No. dec. (hex.)	Attribute name	Get/ Set	Type	Description
100 (64h)	Max object attribute	G	USINT	Contains the number of the last object attribute to be implemented.
101 (65h)	Attribute list	G	ARRAY OF USINT	List of all attributes that are supported by this Instance.
102 (66h)	Standard packed process output data	G/S	ARRAY OF WORD	Output process data, 16-bit aligned, compressed.
103 (67h)	Process data byte count	G	USINT	The number of bytes that are exchanged with this Instance.

Object Instance 3, diagnostic instance

Attr. No. dec. (hex.)	Attribute name	Get/ Set	Type	Description
104 (68h)	GW summarized diagnostics	G/S	BOOL	0 = disabled 1 = enabled: 1 bit of diagnosis per slot mapped at the end of the input data image. The actual data is loaded to the non-volatile memory of the gateway. Changes become valid after a start-up!
105 (69h)	GW scheduled diagnostics	G/S	BOOL	0 = disabled 1 = enabled: time sliced module related data block using a round robin mechanism. The actual data is loaded to the non-volatile memory of the gateway. Changes become valid after a start-up!
106 (6Ah)	reserved			
107 (6Bh)	I-MAP summarized diags	G	USINT	Contains the number of summarized diagnostic bytes. Changes become valid after a start-up!
108 (6Ch)	I-MAP scheduled diags	G	USINT	Contains the number of scheduled diagnostics bytes. Changes become valid after a start-up!

Object Instance 4, COS/CYCLIC instance

Attr. No. dec. (hex.)	Attribute name	Get/ Set	Type	Description
104 (68h)	COS data mapping	G/S	ENUM USINT	The actual data are loaded to the non-volatile memory of the gateway. Changes become valid after a start-up! 0 = standard: Data of COS message = Data of polled produced message (input data). 1 = process input data (only the process data input image is transferred to scanner) **2 to 7:** **RFID operation modes** 2 = 16 bytes of RFID- data mapped into a COS message ... 7 = 512 bytes of RFID-data mapped into a COS message (For detailed information, please refer to the special RFID-documentation D101642)

Object Instance 5, RFID command interface instance

Attr. No. dec. (hex.)	Attribute name	Get/ Set	Type	Description
105 (69h)	Q-MAP RFID cmd interface	G	UINT	Contains the number of RFID command interface bytes. (For further information see the special RFID documentation, document number D101642.) The actual data are loaded to the non-volatile memory of the gateway. The changes become valid after a start-up!
104 (68h)	RFID cmd interface length	G/S	USINT	Values 0 to 200 Bytes (only even byte values allowed). 0 = disabled Required min. length depends on RFID commands used. (For further information see the special RFID documentation, document number D101642.)

Object Instance 6, RFID status interface instance

Attr. No. dec. (hex.)	Attribute name	Get/ Set	Type	Description
103 (67h)	I-MAP RFID status interface	G	UINT	Contains the number of RFID status interface bytes. The actual data is loaded to the non-volatile memory of the gateway. The changes become valid after a start-up!
104 (68h)	RFID status interface	G/S	USINT	Defines the length of the RFID status data within the process input data: 0 = disabled: 0 bytes 1 = reduced: 4 bytes 2 = full: 6 bytes

Object Instance 7, RFID last updated channel data instance

Attr. No. dec. (hex.)	Attribute name	Get/ Set	Type	Description
104 (68h)	Oldest updated channel	G	USINT	Contains the number of the channel with the oldest data (FIFO). Only accessible via Explicit Messaging.

Object Instance 8, RFID CIP support

Attr. No. dec. (hex.)	Attribute name	Get/ Set	Type	Description
104 (68h)	RFID CIP support	G	USINT	0 = disabled 1 = enabled: = access via RFID CIP (expl. msg. read/write) to VSC120, attributes 113 and 114, s. p. 161

Power Supply Module Class (VSC103, 67h)

This class contains all the relevant information and parameters for the power distribution modules.

Class Instance

NOTE

Please refer to paragraph Class Instance of the VSC (page 95) for the description of the class instances for VSC.

Object Instance

Attr. No. dec. (hex.)	Attribute name	Get/ Set	Type	Description
100 (64h)	Max object attribute	G	USINT	Contains the number of the last object attribute to be implemented.
101 (65h)	Module present	G	BOOL	0 = module missing, base module without electronic module. 1 = module is plugged
102 (66h)	Terminal slot number	G	USINT	The slot number of the base module belonging to the module (base module to the right of the gateway = No. 1). Corresponds to the respective Instance Number within the TERMINAL SLOT CLASS.
103 (67h)	Module ID	G	DWORD	Contains the module ID.
104 (68h)	Module order number	G	UDINT	Contains the ident number of the module.
105 (69h)	Module order name	G	SHORT STRING	Contains the name of the module.
106 (6Ah)	Module revision	G	USINT	Contains the revision number of the module firmware.
107 (6Bh)	Module type ID	G	ENUM USINT	Describes the module type: – 0x00: type of module unknown (default) – 0x01: digital module – 0x11: analog voltage mod. – 0x12: analog current mod. – 0x13: analog RTD mod. – 0x14: analog THERMO mod. – 0x1F: analog volt./curr. mod. – 0x22: counter/incr. encoder 32bit – 0x28: SSI interface – 0x31: starter, mechanical – 0x32: starter, electronical – 0x41: RS232 mod. – 0x42: RS485/RS422 mod. – 0x51: CVI mod. – etc.
108 (6Ch)	Module command interface	G/S	ARRAY	The control interface of the module. ARRAY OF: BYTE: Control byte sequence

Attr. No. dec. (hex.)	Attribute name	Get/ Set	Type	Description
109 (6Dh)	Module response interface	G	ARRAY	Response interface of the module. ARRAY OF: BYTE: Response byte sequence
110 (6Eh)	Diag size	G	UINT	Indicates the number of diagnostic bits of the module.
111 (6Fh)	Diag	G	WORD	Contains the diagnostic information of the module. WORD: Bit for bit assignment according to module specification.
112 (70h)	Module registered index	G	ENUM USINT	Contains the index numbers specified in all the module lists.

Digital Input Module Class (VSC104, 68h)

This Class contains all information and parameters for digital input modules.

Class InstanceObject Instance

NOTE

Please refer to paragraph Class Instance of the VSC (page 95) for the description of the class instances for VSC.

Attr. No. dec. (hex.)	Attribute name	Get/ Set	Type	Description
100 (64h)	Max object attribute	G	USINT	Contains the number of the last object attribute to be implemented
101 (65h)	Module present	G	BOOL	0 = module missing, base module without electronic module. 1 = module is plugged
102 (66h)	Terminal slot number	G	USINT	The slot number of the base module belonging to the module (base module to the right of the gateway = No. 1). Corresponds to the respective Instance Number within the TERMINAL SLOT CLASS.
103 (67h)	Module ID	G	DWORD	Contains the module ID.
104 (68h)	Module order number	G	UDINT	Contains the ident number of the module.
105 (69h)	Module order name	G	SHORT STRING	Contains the name of the module, for example, "BL20-4DI-P".
106 (6Ah)	Module revision	G	USINT	Contains the revision number of the module firmware.
107 (6Bh)	Module type ID	G	ENUM USINT	Describes the module type: see attribute 107 (6Bh) on s. p. 107
108 (6Ch)	Module command interface	G/S	ARRAY	The control interface of the BL20 module. ARRAY OF: BYTE: Control byte sequence
109 (6Dh)	Module response interface	G	ARRAY	Response interface of the BL20 module. ARRAY OF: BYTE: Response byte sequence
110 (6Eh)	Produced data size	G	UINT	Contains information concerning the range of data produced by the module.
111 (6Fh)	Produced data	G	DWORD	Contains the input data of the module. DWORD: Bit for bit assignment according to module specification.
112 (70h)	Diag size	G	UINT	Contains information concerning the range of the diagnostic data of the module.
113 (71h)	Diag	G/S	DWORD	Contains the diagnostic information of the module. DWORD: Bit for bit assignment according to module specification.

Attr. No. dec. (hex.)	Attribute name	Get/ Set	Type	Description
114 (72h)	Param size	G	UINT	Contains information concerning the range of parameters of the module.
115 (73h)	Params	G/S	DWORD	Contains the parameters of the module. DWORD: Bit for bit assignment according to module specification.
116 (74h)	Module registered index	G	ENUM USINT	Contains the index numbers specified in all the module lists.

Digital Output Module Class (VSC105, 69h)

This Class contains all information and parameters for digital output modules.

Class Instance

NOTE

Please refer to paragraph Class Instance of the VSC (page 95) for the description of the class instances for VSC.

Object Instance

Attr. No. dec. (hex.)	Attribute name	Get/ Set	Type	Description
100 (64h)	Max object attribute	G	USINT	Contains the number of the last object attribute to be implemented.
101 (65h)	Module present	G	BOOL	0 = module missing, base module without electronic module. 1 = module is plugged
102 (66h)	Terminal slot number	G	USINT	The slot number of the base module belonging to the module (base module to the right of the gateway = No. 1). Corresponds to the respective Instance Number within the TERMINAL SLOT CLASS.
103 (67h)	Module ID	G	DWORD	Contains the module ID.
104 (68h)	Module order number	G	UDINT	Contains the ident number of the module.
105 (69h)	Module order name	G	SHORT STRING	Contains the name of the module, for example, "BL20-4DO-0.5A-P".
106 (6Ah)	Module revision	G	USINT	Contains the revision number of the module firmware.
107 (6Bh)	Module type ID	G	ENUM USINT	Describes the module type: see attribute 107 (6Bh) on s. p. 107
108 (6Ch)	Module command interface	G/S	ARRAY	The control interface of the BL20 module. ARRAY OF: BYTE: Control byte sequence
109 (6Dh)	Module response interface	G	ARRAY	Response interface of the BL20 module. ARRAY OF: BYTE: Response byte sequence
110 (6Eh)	Consumed data size	G	UINT	Contains information concerning the range of data consumed by the module.
111 (6Fh)	Consumed data	G	DWORD	Contains the output data of the module. DWORD: Bit for bit assignment according to module specification.
112 (70h)	Diag size	G	UINT	Contains information concerning the range of the diagnostic data of the module.

Attr. No. dec. (hex.)	Attribute name	Get/ Set	Type	Description
113 (71h)	Diag	G/S	DWORD	Contains the diagnostic information of the module. DWORD: Bit for bit assignment according to module specification.
114 (72h)	Param size	G	UINT	Contains information concerning the range of parameters of the module.
115 (73h)	Params	G/S	DWORD	Contains the parameters of the module. DWORD: Bit for bit assignment according to module specification.
116 (74h)	Module registered index	G	ENUM USINT	Contains the index numbers specified in all the module lists.

Analog Input Voltage Module Class (VSC106, 6Ah)

This Class contains all information and parameters for analog input modules (voltage).

Class Instance

NOTE

Please refer to paragraph Class Instance of the VSC (page 95) for the description of the class instances for VSC.

Object Instance

Attr. No. dec. (hex.)	Attribute name	Get/ Set	Type	Description
100 (64h)	Max object attribute	G	USINT	Contains the number of the last object attribute to be implemented.
101 (65h)	Module present	G	BOOL	0 = module missing, base module without electronic module. 1 = module is plugged
102 (66h)	Terminal slot number	G	USINT	The slot number of the base module belonging to the module (base module to the right of the gateway = No. 1). Corresponds to the respective Instance Number within the TERMINAL SLOT CLASS.
103 (67h)	Module ID	G	DWORD	Contains the module ID.
104 (68h)	Module order number	G	UDINT	Contains the ident number of the module.
105 (69h)	Module order name	G	SHORT STRING	Contains the name of the module, for example, "BL20-2AI-V".
106 (6Ah)	Module revision	G	USINT	Contains the revision number of the module firmware.
107 (6Bh)	Module type ID	G	ENUM USINT	Describes the module type: see attribute 107 (6Bh) on s. p. 107
108 (6Ch)	Module command interface	G/S	ARRAY	The control interface of the BL20 module. ARRAY OF: BYTE: Control byte sequence
109 (6Dh)	Module response interface	G	ARRAY	Response interface of the BL20 module. ARRAY OF: BYTE: Response byte sequence
110 (6Eh)	Module registered index	G	ENUM USINT	Contains the index numbers specified in all the module lists.
111 (6Fh)	Number of supported channels	G	USINT	States the number of analog input channels supported by this module Instance.

Attr. No. dec. (hex.)	Attribute name	Get/ Set	Type	Description
112 - 119 (70h - 77h)	Produced data	G	INT	Contains the data transmitted by the analog input module of channels No. 1 to No. 8. Only those channels are supported that are contained in attribute 111, "Number of supported channels". Attribute 112 contains the data for channel 1, attribute 119 for channel 8.
120 - 127 (78h - 7Fh)	Diag data	G	BYTE	Contains the diagnostic data of the channels 1 to 8 of the analog input module. Only those channels are supported that are defined in attribute 111, "Number of supported channels". Attribute 120 contains the data for channel 1, attribute 127 for channel 8. BYTE diag: Bit0: 0 =ok 1 =measurement value range error Bit1 to 7: reserved
128 - 135 (80h - 87h)	Mode parameter data	G/S	BYTE	Contains the diagnostic data of the channels 1 to 8 of the analog input module. Only those channels are supported that are defined in attribute 111, "Number of supported channels". Attribute 128 contains the data for channel 1, attribute 135 for channel 8. BYTE mode: Bit0: Voltage mode: 0 =0...10V 1 =-10V...+10V Bit 1: Value representation 0 =Integer (15Bit + sign) 1 =12Bit (left-justified) Bit 2: Diagnostic: 0 = enable 1 = disable Bit 3 to 7: reserved

Analog Output Voltage Module Class (VSC107, 6Bh)

This Class contains all information and parameters for analog output modules (voltage).

Class Instance

NOTE

Please refer to paragraph Class Instance of the VSC (page 95) for the description of the class instances for VSC.

Object Instance

Attr. No. dec. (hex.)	Attribute name	Get/ Set	Type	Description
100 (64h)	Max object attribute	G	USINT	Contains the number of the last object attribute to be implemented.
101 (65h)	Module present	G	BOOL	0 = module missing, base module without electronic module. 1 = module is plugged
102 (66h)	Terminal slot number	G	USINT	The slot number of the base module belonging to the module (base module to the right of the gateway = No. 1). Corresponds to the respective Instance Number within the TERMINAL SLOT CLASS.
103 (67h)	Module ID	G	DWORD	Contains the module ID.
104 (68h)	Module order number	G	UDINT	Contains the ident number of the module.
105 (69h)	Module order name	G	SHORT STRING	Contains the name of the module, for example, "BL20-2AO-V".
106 (6Ah)	Module revision	G	USINT	Contains the revision number of the module firmware.
107 (6Bh)	Module type ID	G	ENUM USINT	Describes the module type: see attribute 107 (6Bh) on s. p. 107
108 (6Ch)	Module command interface	G/S	ARRAY	The control interface of the BL20 module. ARRAY OF: BYTE: Control byte sequence
109 (6Dh)	Module response interface	G	ARRAY	Response interface of the BL20 module. ARRAY OF: BYTE: Response byte sequence
110 (6Eh)	Module registered index	G	ENUM USINT	Contains the index numbers specified in all the module lists.
111 (6Fh)	Number of supported channels	G	USINT	States the number of analog input channels supported by this module Instance.
112 - 119 (70h - 77h)	Consumed data	G	INT	Contains the data received by the analog output module of channels No. 1 to No. 8. Only those channels are supported that are contained in attribute 111, "Number of supported channels". Attribute 112 contains the data for channel 1, attribute 119 for channel 8.

Attr. No. dec. (hex.)	Attribute name	Get/ Set	Type	Description
120 - 127 (78h - 7Fh)	Diag data	G	BYTE	Contains the diagnostic data of the channels 1 to 8 of the analog output module. Only those channels are supported that are defined in attribute 111, "Number of supported channels". Attribute 120 contains the data for channel 1, attribute 127 for channel 8. BYTE diag: Bit 0 to 7: reserved
128 - 135 (80h - 87h)	Mode parameter data	G/S	BYTE	Contains the diagnostic data of the channels 1 to 8 of the analog output module. Only those channels are supported that are defined in attribute 111, "Number of supported channels". Attribute 128 contains the data for channel 1, attribute 135 for channel 8. BYTE mode: Bit0: Voltage mode: 0 = 0...10V 1 = -10V...+10V Bit1: Value representation 0 = Integer (15Bit + sign) 1 = 12Bit (left-justified) Bit2 to 7: reserved
136 - 143 (88h - 8Fh)	Fault value parameter data	G/S	INT	Contains the Fault Value-Definition of the channels 1 to 8 of the analog output modules. Only those channels are supported that are defined in attribute 111, "Number of supported channels". Attribute 136 contains the data for channel 1, attribute 143 for channel 8.

Analog Input Current Module Class (VSC108, 6Ch)

This Class contains all information and parameters for analog input modules (current).

Class Instance

NOTE

Please refer to paragraph **Class Instance of the VSC (page 95)** for the description of the class instances for VSC.

Object Instance

The Object Instances/ attributes of the analog input modules (current) correspond to those of the analog input modules (voltage). Differences are only to be found in the attributes no. 112 to 135 that concern the measurement ranges of the modules (current or voltage measurements).

Attr. No. dec. (hex.)	Attribute name	Get/ Set	Type	Description
112 - 119 (70h - 77h)	Produced data	G	INT	Contains the data transmitted by the analog input module of channels No. 1 to No. 8. Only those channels are supported that are contained in attribute 111, "Number of supported channels". Attribute 112 contains the data for channel 1, attribute 119 for channel 8.
120 - 127 (78h - 7Fh)	Diag data	G	BYTE	Contains the diagnostic data of the channels 1 to 8 of the analog input module. Only those channels are supported that are defined in attribute 111, "Number of supported channels". Attribute 120 contains the data for channel 1, attribute 127 for channel 8. BYTE diag: Bit 0: 0 = ok 1 = measurement value range error Bit 1: 0 =ok 1 =open circuit (only measurement range 4 to 20 mA) Bit 2 to 7: reserved
128 - 135 (80h - 87h)	Mode parameter data	G/S	BYTE	Contains the diagnostic data of the channels 1 to 8 of the analog input module. Only those channels are supported that are defined in attribute 111, "Number of supported channels". Attribute 128 contains the data for channel 1, attribute 135 for channel 8. BYTE mode: Bit 0: Current mode: 0 = 0 to 20 mA 1 = 4 to 20 mA Bit 1: Value representation: 0 =Integer (15 Bit + sign) 1 =12 Bit (left-justified) Bit 2: Diagnostic: 0 = enable 1 = disable Bit 3 to 7:reserved

Analog Output Current Module Class (VSC109, 6Dh)

This Class contains all information and parameters for analog output modules (current).

Class Instance

NOTE

Please refer to paragraph Class Instance of the VSC (page 95) for the description of the class instances for VSC.

Object Instance

The Object Instances/attributes of the analog output modules (current) correspond to those of the analog output modules (voltage). Differences are only to be found in the attributes no. 112 to 143 that concern the measurement ranges of the modules (current or voltage measurements).

Attr. No. dec. (hex.)	Attribute name	Get/ Set	Type	Description
112 - 119 (70h - 77h)	Consumed data	G	INT	Contains the data received by the analog output module of channels No. 1 to No. 8. Only those channels are supported that are contained in attribute 111, "Number of supported channels". Attribute 112 contains the data for channel 1, attribute 119 for channel 8.
120 - 127 (78h - 7Fh)	Diag data	G	BYTE	Contains the diagnostic data of the channels 1 to 8 of the analog output module. Only those channels are supported that are defined in attribute 111, "Number of supported channels". Attribute 120 contains the data for channel 1, attribute 127 for channel 8. BYTE diag: Bit 0 to 7: reserved
128 - 135 (80h - 87h)	Mode parameter data	G/S	BYTE	Contains the diagnostic data of the channels 1 to 8 of the analog output module. Only those channels are supported that are defined in attribute 111, "Number of supported channels". Attribute 128 contains the data for channel 1, attribute 135 for channel 8. BYTE mode: Bit 0: Current mode: 0 = 0 to 20 mA 1 = 4 to 20 mA Bit 1: Value representation: 0 =Integer (15Bit + sign) 1 =12Bit (left-justified) Bit 2 to 7:reserved
136 - 143 (88h - 8Fh)	Fault value parameter data	G/S	INT	Contains the Fault Value-Definition of the channels 1 to 8 of the analog output modules. Only those channels are supported that are defined in attribute 111, "Number of supported channels". Attribute 136 contains the data for channel 1, attribute 143 for channel 8.

Analog Input PT100/NI Module Class (VSC110, 6Eh)

This Class contains all information and parameters for analog input modules for PT100/NI sensors (current).

Class Instance

NOTE

Please refer to paragraph Class Instance of the VSC (page 95) for the description of the class instances for VSC.

Object Instance

Attr. No. dec. (hex.)	Attribute name	Get/ Set	Type	Description
100 (64h)	Max object attribute	G	USINT	Contains the number of the last object attribute to be implemented.
101 (65h)	Module present	G	BOOL	0 = module missing, base module without electronic module. 1 = module is plugged
102 (66h)	Terminal slot number	G	USINT	The slot number of the base module belonging to the module (base module to the right of the gateway = No. 1). Corresponds to the respective Instance Number within the TERMINAL SLOT CLASS.
103 (67h)	Module ID	G	DWORD	Contains the module ID.
104 (68h)	Module order number	G	UDINT	Contains the ident number of the module.
105 (69h)	Module order name	G	SHORT STRING	Contains the name of the module, for example, "BL20-2AI-PT".
106 (6Ah)	Module revision	G	USINT	Contains the revision number of the module firmware.
107 (6Bh)	Module type ID	G	ENUM USINT	Describes the module type: see attribute 107 (6Bh) on s. p. 107
108 (6Ch)	Module command interface	G/S	ARRAY	The control interface of the BL20 module. ARRAY OF: BYTE: Control byte sequence
109 (6Dh)	Module response interface	G	ARRAY	Response interface of the BL20 module. ARRAY OF: BYTE: Response byte sequence
110 (6Eh)	Module registered index	G	ENUM USINT	Contains the index numbers specified in all the module lists.
111 (6Fh)	Number of supported channels	G	USINT	States the number of analog input channels supported by this module Instance.
112 - 119 (70h - 77h)	Produced data	G	INT	Contains the data received by the analog input module of channels No. 1 to No. 8. Only those channels are supported that are contained in attribute 111, "Number of supported channels". Attribute 112 contains the data for channel 1, attribute 119 for channel 8.

Attr. No. dec. (hex.)	Attribute name	Get/ Set	Type	Description
120 - 127 (78h - 7Fh)	Diag data	G	BYTE	Contains the diagnostic data of the channels 1 to 8 of the analog input module. Only those channels are supported that are defined in attribute 111, "Number of supported channels". Attribute 120 contains the data for channel 1, attribute 127 for channel 8. BYTE diag: Bit 0: 0 = ok 1 = measurement value range error Bit 1: 0 = ok 1 = open circuit Bit 2: 0 = ok 1 = short-circuit
128 -135 (80h -87h)	Mode parameter data	G/S	BYTE	Contains the diagnostic data of the channels 1 to 8 of the analog input module. Only those channels are supported that are defined in attribute 111, "Number of supported channels". Attribute 128 contains the data for channel 1, attribute 135 for channel 8. BYTE mode: Bit 0: Mains suppression 0 = 50 Hz mains suppression 1 = 60 Hz mains suppression Bit 1: value representation: 0 = Integer (15Bit + sign) 1 = 12Bit (left-justified) Bit 2: Diagnose: 0 = release 1 = block Bit 3:Channel: 0 = activate channel 1 = deactivate channel Bit 4: Measurement mode: 0 = 2-wire 1 = 3-wire Bit 5 to 7: reserved

Attr. No. dec. (hex.)	Attribute name	Get/ Set	Type	Description
136 -143 (88h - 8Fh)	Sensor parameter data	G/S	ENUM USINT	Contains the sensor-specific parameter data of the channels 1 to 8 of the analog input module. Only those channels are supported that are defined in attribute 111, "Number of supported channels". Attribute 136 contains the data for channel 1, attribute 143 for channel 8. ENUM USINT: Element: 0: PT100, -200...850 °C 1:PT100, -200...150 °C 2: NI100, -60...250 °C 3:NI100, -60...150 °C 4:PT200, -200...850 °C 5: PT200, -200...150°C 6: PT500, -200...850 °C 7: PT500, -200...150 °C 8: PT1000, -200...850 °C 9: PT1000, -200...150 °C 10: NI1000, -60...250 °C 11: NI1000, -60...150 °C 12: resistance: 0...100 Ω 13: resistance: 0...200 Ω 14: resistance: 0...400 Ω 15: resistance: 0...1000 Ω 16 to 255: reserved

Analog Input THERMO Module Class (VSC111, 6Fh)

This Class contains all information and parameters for analog input modules for thermocouples.

Class Instance

NOTE

Please refer to paragraph Class Instance of the VSC (page 95) for the description of the class instances for VSC.

Object Instance

Attr. No. dec. (hex.)	Attribute name	Get/ Set	Type	Description
100 (64h)	Max object attribute	G	USINT	Contains the number of the last object attribute to be implemented.
101 (65h)	Module present	G	BOOL	0 = module missing, base module without electronic module. 1 = module is plugged
102 (66h)	Terminal slot number	G	USINT	The slot number of the base module belonging to the module (base module to the right of the gateway = No. 1). Corresponds to the respective Instance Number within the TERMINAL SLOT CLASS.
103 (67h)	Module ID	G	DWORD	Contains the module ID.
104 (68h)	Module order number	G	^	Contains the ident number of the module.
105 (69h)	Module order name	G	SHORT STRING	Contains the name of the module, for example, "BL20-2AI-TC".
106 (6Ah)	Module revision	G	USINT	Contains the revision number of the module firmware.
107 (6Bh)	Module type ID	G	ENUM USINT	Describes the module type: see attribute 107 (6Bh) on s. p. 107
108 (6Ch)	Module command interface	G/S	ARRAY	The control interface of the BL20 module. ARRAY OF: BYTE: Control byte sequence
109 (6Dh)	Module response interface	G	ARRAY	Response interface of the BL20 module. ARRAY OF: BYTE: Response byte sequence
110 (6Eh)	Module registered index	G	ENUM USINT	Contains the index numbers specified in all the module lists.
111 (6Fh)	Number of supported channels	G	USINT	States the number of analog input channels supported by this module Instance.
112 - 119 (70h - 77h)	Produced data	G	INT	Contains the data received by the analog input module of channels No. 1 to No. 8. Only those channels are supported that are contained in attribute 111, "Number of supported channels". Attribute 112 contains the data for channel 1, attribute 119 for channel 8.

Attr. No. dec. (hex.)	Attribute name	Get/ Set	Type	Description
120 - 127 (78h - 7Fh)	Diag data	G	BYTE	Contains the diagnostic data of the channels 1 to 8 of the analog input module. Only those channels are supported that are defined in attribute 111, "Number of supported channels". Attribute 120 contains the data for channel 1, attribute 127 for channel 8. BYTE diag: Bit 0: 0 = ok 1 = measurement value range error Bit 1: 0 =ok 1 =open circuit Bit 2 to 7: reserved
128 - 135 (80h - 87h)	Mode parameter data	G/S	BYTE	Contains the diagnostic data of the channels 1 to 8 of the analog input module. Only those channels are supported that are defined in attribute 111, "Number of supported channels". Attribute 128 contains the data for channel 1, attribute 135 for channel 8. BYTE mode: Bit 0: Mains suppression 0 = 50 Hz mains suppression 1 = 60 Hz mains suppression Bit 1: value representation: 0 =Integer (15Bit + sign) 1 =12Bit (left-justified) Bit 2: Diagnose: 0 = release 1 = block Bit 3:Channel: 0 = activate channel 1 = deactivate channel Bit 4 to 7: reserved

Attr. No. dec. (hex.)	Attribute name	Get/ Set	Type	Description
136 - 143 (88h - 8Fh)	Sensor parameter data	G/S	ENUM USINT	Contains the sensor-specific parameter data of the channels 1 to 8 of the analog input module. Only those channels are supported that are defined in attribute 111, "Number of supported channels". Attribute 136 contains the data for channel 1, attribute 143 for channel 8. ENUM USINT: Element: 0: Type K -270...1370 °C 1: Type B 100...1820 °C 2: Type E -270...1000 °C 3: Type J -210...1200 °C 4: Type N -270...1300 °C 5: Type R -50...1760 °C 6: Type S -50...1540 °C 7: Type T -270...400 °C 8: +/-50 mV 9: +/-100 mV 10: +/-500 mV 11: +/-1000 mV 12 to 255: reserved

Counter1 Module Class (VSC112, 70h)

This Class contains all information and parameters concerning the counter module.

Object Instance

Two different operating modes can be selected for the counter module: counter mode and measurement mode.

Different attributes are supported depending on the operating mode selected, meaning, with certain attributes the operating mode has to be defined. The operating mode is determined in attribute 113.

Attr. No. dec. (hex.)	Attribute name	Get/ Set	Type	Description
100 (64h)	Max object attribute	G	USINT	Contains the number of the last object attribute to be implemented.
101 (65h)	Module present	G	BOOL	0 = module missing, base module without electronic module. 1 = module is plugged
102 (66h)	Terminal slot number	G	USINT	The slot number of the base module belonging to the module (base module to the right of the gateway = No. 1). Corresponds to the respective Instance Number within the TERMINAL SLOT CLASS.
103 (67h)	Module ID	G	DWORD	Contains the module ID.
104 (68h)	Module order number	G	UDINT	Contains the ident number of the module.
105 (69h)	Module order name	G	SHORT STRING	Contains the name of the module, for example, "BL20-1RS232".
106 (6Ah)	Module revision number	G	USINT	Contains the revision number of the module firmware.
107 (6Bh)	Module type ID	G	ENUM USINT	Describes the module type: see attribute 107 (6Bh) on s. p. 107
108 (6Ch)	Module command interface	G/S	ARRAY	The control interface of the BL20 module. ARRAY OF: BYTE: Control byte sequence
109 (6Dh)	Module response interface	G	ARRAY	Response interface of the BL20 module. ARRAY OF: BYTE: Response-byte sequence
110 (6Eh)	Module registered index	G	ENUM USINT	Contains the index numbers specified in all the module lists.
111 (6Fh)	Number of supported channels	G	USINT	States the number of analog input channels supported by this module Instance.

Attr. No. dec. (hex.)	Attribute name	Get/ Set	Type	Description
112 (70h)	Counter diag	G	WORD	Contains the diagnostic data of the counter module. Bits 0 to 7 apply to the counter mode (CNT); bits 8 to 15 the counter mode (MSRM). **CNT:** Bit0: 0 = ok 1 = short-circuit/open circuit Bit1: 0 = ok 1 = short-circuit in sensor power supply 24 V DC Bit2: 0 = ok 1 = upper limit wrong Bit3: 0 = ok 1 = lower limit wrong Bit4: 0 = ok 1 = it is not permitted to invert the level of the digital input when using the latch retrigger function Bit5: 0 = ok 1 = main count direction wrong Bit6: 0 = ok 1 = counter operating mode wrong Bit7: 0 = CNT Mode NOT active 1= CNT Mode active **MSRM:** Bit 8: 0 = ok 1 = short- circuit/open circuit Bit9: 0 = ok 1 = short-circuit in sensor power supply 24 V DC Bit10: 0 = ok 1 = sensor pulse wrong Bit11: 0 = ok 1 = integration time wrong

Attr. No. dec. (hex.)	Attribute name	Get/ Set	Type	Description
112 (70h)	Counter diag	G	WORD	MSRM: Bit12: 0 = ok 1 = upper limit wrong Bit13: 0 = ok 1 = power limit wrong Bit14: 0 = ok 1 = measurement operating mode wrong Bit15: 0 = measurement Mode NOT active 1 = measurement Mode active
113 (71h)	Basic mode	G/S	ENUM USINT	Defines the operating mode of the counter module; hence, it must be written first. The definition of the operating mode in this attribute is the prerequisite for all further Instances and attributes in this class. Operating mode (basic mode): – 0: CNT: continuous count – 1: CNT: single-action count – 2: CNT: periodical count – 3: MSRM: frequency measurement – 4: MSRM: revolutions measurement – 5: MSRM: period duration measurement – 6 to 255: reserved
114 (72h)	CNT gate function	G/S	ENUM USINT	The gate function defines the counter's reaction to the resetting of the internal release. Gate function: – 0: CNT: abort count procedure – 1: CNT: interrupt count procedure – 2 to 255: reserved
115 (73h)	Digital input DI	G/S	ENUM USINT	Defines if the digital input of the module will be inverted or not. USINT digital input DI: – 0:normal – 1:inverted – 2 to 255:reserved

Attr. No. dec. (hex.)	Attribute name	Get/ Set	Type	Description
116 (74h)	Function DI	G/S	ENUM USINT	Defines the function of the digital input. Function DI: – 0: input – 1: HW gate – 2: CNT: latch retrigger when edge positive – 3: CNT: synchronization when edge positive – 4 to 255: reserved
117 (75h)	CNT synchroniza-tion	G/S	ENUM USINT	Defines the kind of synchronization. Synchronization: – 0: CNT: single-action – 1: CNT: periodical – 2 to 255:reserved
118 (76h)	CNT main count direction	G/S	ENUM USINT	Defines the main count direction: – 0: CNT: none – 1: CNT: up – 2: CNT: down – 3 to 255: reserved
119 (77h)	Lower limit	G/S	DINT	Defines the lower limit of the module. The module reacts according to its parameter-ization on reaching or undershooting the lower limit.
120 (78h)	Upper limit	G/S	DINT	Defines the upper limit of the module. The module reacts according to its parameter-ization on reaching or overshooting the upper limit.
121 (79h)	MSRM integration	G/S	USINT	Defines the integration time. Integration [*10 ms]
122 (7Ah)	CNT hysteresis	G/S	USINT	Defines the hysteresis, meaning the differ-ential threshold value. Hysteresis
123 (7Bh)	CNT pulse duration	G/S	USINT	Defines the pulse duration. Pulse duration [*2 ms]
124 (7Ch)	MSRM pulses per revolution	G/S	UINT	Defines the number of pulses per revolu-tion. Pulses per revolution
125 (7Dh)	Fault value DO1	G/S	BOOL	Defines the substitute value of the digital output DO1. Fault value DO1: FALSE:0 = off, 0V TRUE: 1 = on, 24V

Attr. No. dec. (hex.)	Attribute name	Get/ Set	Type	Description
126 (7Eh)	Diagnostic DO1	G/S	BOOL	Defines if the diagnostic data of the DO1 are transmitted to the gateway. Diagnostic DO1: – FALSE: on Diagnostic data of the DO1 are being transmitted – TRUE: off Diagnostic data of the DO1 are not being transmitted
127 (7Fh)	Function DO1	G/S	ENUM USINT	Defines the function of the output DO1. Function DO1: 0: output 1: CNT: on when count value ≥ reference value 2: CNT: on when count value ≤ reference value 3: CNT: pulse when count value = reference value 4: MSRM: outside of limit 5: MSRM: below lower limit 6: MSRM: above upper limit 7 to 255:reserved
128 (80h)	CNT function DO2	G/S	ENUM USINT	Defines the function of the output DO2. This is not a physical output, meaning, the value from this output is read in the process input image only. Function DO2: – 0: output – 1: CNT: on when count value ≥ reference value – 2: CNT: on when count value ≤ reference value – 3: CNT: pulse when count value = reference value – 4 to 255:reserved
129 (81h)	Signal evaluation	G/S	ENUM USINT	Defines the kind of signal evaluation. Signal evaluation: – 0: pulse and direction – 1: rotary sensor: single – 2: CNT: rotary sensor: double – 3: CNT: rotary sensor: fourfold – 4 to 255: reserved
130 (82h)	Sensor/input filter (A)	G/S	ENUM USINT	Defines the value of the input filter A. Sensor/input filter (A): – 0: 2.5 ms / 200 kHz – 1: 25 ms / 20 kHz – 2 to 255:reserved

Attr. No. dec. (hex.)	Attribute name	Get/ Set	Type	Description
131 (83h)	Sensor/input filter (B)	G/S	ENUM USINT	Defines the value of the input filter B. Sensor/input filter (B): – 0: 2.5 ms / 200 kHz – 1: 25 ms / 20 kHz – 2 to 255: reserved
132 (84h)	Sensor/input filter (DI)	G/S	ENUM USINT	Defines the value of the input filter DI. Sensor/input filter (DI): 0: 2.5 ms / 200 kHz 1: 25 ms / 20 kHz 2 to 255: reserved
133 (85h)	Sensor (A)	G/S	ENUM USINT	Defines the sensor mode. ENUM USINT sensor (A): – 0: normal – 1: inverted – 2 to 255: reserved
134 (86h)	Direction input B	G/S	BOOL	States if the direction input B will be inverted. Direction input B: – FALSE: normal – TRUE: inverted
135 (87h)	Group diagnostics	G/S	BOOL	Defines if the group diagnostic will be transmitted to the gateway or not. Group diagnostic: – FALSE: release – TRUE: block
136 (88h)	On I/O connection fault	G/S	ENUM USINT	Defines the behavior of the module in the cased of an I/O Connection Fault of the gateway. Behavior by I/O Connection Fault (parameter name of the counter: CPU/master STOP): – 0: turn off DO1 – 1: proceed with operating mode – 2: DO1 switch to Fault Value – 3: DO1 hold last value – 4 to 255:reserved

RS232 Module Class (VSC114, 72h)

This Class contains all information and parameters for RS232 modules.

Class Instance

NOTE

Please refer to paragraph Class Instance of the VSC (page 95) for the description of the class instances for VSC.

Object Instance

Attr. No. dec. (hex.)	Attribute name	Get/ Set	Type	Description
100 (64h)	Max object attribute	G	USINT	Contains the number of the last object attribute to be implemented.
101 (65h)	Module present	G	BOOL	0 = module missing, base module without electronic module. 1 = module is plugged
102 (66h)	Terminal slot number	G	USINT	The slot number of the base module belonging to the module (base module to the right of the gateway = No. 1). Corresponds to the respective Instance Number within the TERMINAL SLOT CLASS.
103 (67h)	Module ID	G	DWORD	Contains the module ID.
104 (68h)	Module order number	G	UDINT	Contains the ident number of the module.
105 (69h)	Module order name	G	SHORT STRING	Contains the name of the module, for example, "BL20-1RS232".
106 (6Ah)	Module revision number	G	USINT	Contains the revision number of the module firmware.
107 (6Bh)	Module type ID	G	ENUM USINT	Describes the module type: see attribute 107 (6Bh) on s. p. 107
108 (6Ch)	Module command interface	G/S	ARRAY	The control interface of the BL20 module. ARRAY OF: BYTE: Control byte sequence
109 (6Dh)	Module response interface	G	ARRAY	Response interface of the BL20 module. ARRAY OF: BYTE: Response-byte sequence
110 (6Eh)	Module registered index	G	ENUM USINT	Contains the index numbers specified in all the module lists.
111 (6Fh)	Number of supported channels	G	USINT	States the number of analog input channels supported by this module Instance.
112 (70h)	RX byte count	G	USINT	Number of the valid bytes (0 to 7) in this data segment.

Attr. No. dec. (hex.)	Attribute name	Get/ Set	Type	Description
113 (71h)	RX count	G	USINT	This value is transferred together with every data segment of the process input data. The RX count values are sequential: 00->01->10->11->00... (decimal: 0->1->2->3->0...) Errors in this sequence show the loss of data segments.
114 (72h)	TX count acknowledge	G	USINT	This value is a copy of the value TX count. TX count has been transmitted together with the last data segment of the process output data. TX count acknowledge is an acknowledge for the successful transmission of the data segment with TRANSMIT count.
115 (73h)	Status	G	BOOL	0 = The communication with the data terminal equipment (DTE) is disturbed. A diagnostic message is generated if the parameter "Diagnostics" is set to "0 = release". The diagnostic data show the cause of the communication disturbance. The user has to set back this bit in the process output data by using STATRES. 1 = The communication with the data terminal equipment (DTE) is error free
116 (74h)	Process diagnostics data	G	BYTE	Contains the diagnostic information: The diagnostic data are part of the process input data, if ACTIVE MODE = 1 or "2bytes ctrl/status header" is set. Diagnostics messages: – Bit 0 to Bit 2: reserved – Bit 3: 0 = ok 1 = "parameter error": The set parameter values are not supported. – Bit 4: 0 = ok 1 = "hardware failure": The module has to be replaced, e.g. EEPROM or UART may be defect. – Bit 5: 0 = ok 1 = "handshake error": The DTE connected to the module does not answer a XOFF or RTS handshake. This may cause a overflow in the internal receive-buffer.

Attr. No. dec. (hex.)	Attribute name	Get/ Set	Type	Description
116 (74h)	Process diagnostics data	G	BYTE	– Bit 6: 0 = ok 1 = "frame error": The module has to be parameterized to be adapted to the data structure of the connected DTE. A "frame error" occurs if the parameterization (number of data bits, stop bits, parity) is not correct. – Bit 7: 0 = ok 1 = "buffer overflow": Overflow in the RX-buffer. – Bit 8 to Bit 15: reserved
117 (75h)	RX data	G	ARRAY OF BYTE	Defines the receive-data (0...7).
118 (76h)	RX data and release	G	ARRAY OF BYTE	Defines the data received via RS232 (0...7) + acknowledge for reception
119 (77h)	TX BYTE count	G/S	USINT	Number of the valid user data bytes in this data segment. I
120 (78h)	TX count	G/S	USINT	This value is transferred together with every data segment. The TX count values are sequential: 00->01->10->11->00... (decimal: 0->1->2->3->0...) Errors in this sequence show the loss of data segments.
121 (79h)	RX count acknowledge	G/S	USINT	This value is a copy of RX count. RX count has been transmitted together with the last data segment of the process input data. RX count acknowledge is an acknowledge for the successful transmission of the data segment with RX count.
122 (7Ah)	Status reset control	G/S	BOOL	STATRES: This bit is set to reset the STAT bit in the process input data. With the change from 1 to 0 the status bit is reset (from 0 to 1). If this bit is 0, all changes in TRANSMIT BYTE count, TRANSMIT count and RECEIVE count acknowledge are ignored. Flushing the transmit-/ receive-buffer with Process control data (Attr. 123) is possible. If this bit is 1 or with the change from 0 to 1, the flushing of the transmit-/ receive-buffer with Process control data (Attr. 123) is not possible.
123 (7Bh)	Process control data	G/S	BYTE	Bit 0 = transmit-buffer flush, Bit 1 = receive-buffer flush

Attr. No. dec. (hex.)	Attribute name	Get/ Set	Type	Description
124 (7Ch)	TX data	G/S	ARRAY OF BYTE	Defines the transmit-data (0...7)
125 (7Dh)	TX data and release	S	ARRAY OF BYTE	Defines the data to be transmitted via RS232 (0...7) + transmission is released/ charged immediately
126 (7Eh)	reserved			
127 (7Fh)	Diagnostics	G	WORD	Contains the diagnostic messages (low byte): Diagnostics messages: – Bit 0 to Bit 2: reserved – Bit 3: 0 = ok 1 = "parameter error": The set parameter values are not supported. – Bit 4: 0 = ok 1 = "hardware failure": The module has to be replaced, e.g. EEPROM or UART may be defect. – Bit 5: 0 = ok 1 = "handshake error": The DTE connected to the module does not answer a XOFF or RTS handshake. This may cause a overflow in the internal receive-buffer. – Bit 6: 0 = ok 1 = "frame error": The module has to be parameterized to be adapted to the data structure of the connected DTE. A "frame error" occurs if the parameterization (number of data bits, stop bits, parity) is not correct. – Bit 7: 0 = ok 1 = "buffer overflow": Overflow in the RX-buffer. – High byte: reserved
128 (80h)	Active mode	G/S	BOOL	0 = "1byte ctrl/status header": The diagnostic data are not part of the process input data, 7 bytes of user data are available. 1 = "2byte ctrl/status header": The diagnostic data are part of the process input data, 6 bytes of user data are available.

Attr. No. dec. (hex.)	Attribute name	Get/ Set	Type	Description
129 (81h)	Bit rate	G/S	ENUM USINT	Used to set the bit rate for the gateway: 0= reserved 1 = 300 bps 2 = 600 bps 3 = 1200 bps 4 = 2400 bps 5 = 4800 bps 6 = 9600 bps 7 = 14400 bps 8 = 19200 bps 9 = 28800 bps 10 = 38400 bps 11 = 57600 bps 12 = 115200 bps ... 15 = reserved)
130 (82h)	Disable diagnostics	G/S	BOOL	0 = "released": The diagnostic function is activated. 1 = "blocked": The diagnostic function is deactivated.
131 (83h)	Flow control	G/S	ENUM USINT	0 = "off": data flow control is deactivated 1 = XON/XOFF Software-handshake is activated 2 = RTS/CTS Hardware-handshake is activated 3: reserved
132 (84h)	Data width	G/S	ENUM USINT	0 = "7 bits" 1 = "8 bits"
133 (85h)	Parity	G/S	ENUM USINT	0 = "none" 1 = "odd" The number of the bits set to 1 is odd (incl. data and parity bit). 2 = "even" The number of the bits set to 1 is even (incl. data and parity bit).
134 (86h)	Stop	G/S	ENUM USINT	Number of the stop bits. 0 = "1 bit" 1 = "2 bits"
135 (87h)	XON character	G/S	USINT	XON character This sign is used to start the data transfer to the data terminal equipment (DTE) with the activation of the software handshake. 0 - 255 default: 17/ 11h

Attr. No. dec. (hex.)	Attribute name	Get/ Set	Type	Description
136 (88h)	XOFF character	G/S	USINT	XOFF character This sign is used to stop the data transfer to the data terminal equipment (DTE) with the activation of the software handshake. (0 - 255) default: 19/ 13h

RS485/422 Module Class (VSC115, 73h)

This Class contains all information and parameters for RS485/422 modules.

Class Instance

NOTE

Please refer to paragraph Class Instance of the VSC (page 95) for the description of the class instances for VSC.

Object Instance

Attr. No. dec. (hex.)	Attribute name	Get/ Set	Type	Description
100 (64h)	Max object attribute	G	USINT	Contains the number of the last object attribute to be implemented.
101 (65h)	Module present	G	BOOL	0 = module missing, base module without electronic module. 1 = module is plugged
102 (66h)	Terminal slot number	G	USINT	The slot number of the base module belonging to the module (base module to the right of the gateway = No. 1). Corresponds to the respective Instance Number within the TERMINAL SLOT CLASS.
103 (67h)	Module ID	G	DWORD	Contains the module ID.
104 (68h)	Module order number	G	UDINT	Contains the ident number of the module.
105 (69h)	Module order name	G	SHORT STRING	Contains the name of the module, for example, "BL20-1RS485/422".
106 (6Ah)	Module revision number	G	USINT	Contains the revision number of the module firmware.
107 (6Bh)	Module type ID	G	ENUM USINT	Describes the module type: see attribute 107 (6Bh) on s. p. 107
108 (6Ch)	Module command interface	G/S	ARRAY	The control interface of the BL20 module. ARRAY OF: BYTE: Control byte sequence
109 (6Dh)	Module response interface	G	ARRAY	Response interface of the BL20 module. ARRAY OF: BYTE: Response-byte sequence
110 (6Eh)	Module registered index	G	ENUM USINT	Contains the index numbers specified in all the module lists.
111 (6Fh)	Number of supported channels	G	USINT	States the number of analog input channels supported by this module Instance.
112 (70h)	RX byte count	G	USINT	Number of the valid bytes (0 to 7) in this data segment.

Attr. No. dec. (hex.)	Attribute name	Get/ Set	Type	Description
113 (71h)	RX count	G	USINT	This value is transferred together with every data segment of the process input data. The RX count values are sequential: 00->01->10->11->00... (decimal: 0->1->2->3->0...) Errors in this sequence show the loss of data segments.
114 (72h)	TX count acknowledge	G	USINT	This value is a copy of the value TX count. TX count has been transmitted together with the last data segment of the process output data. TX count acknowledge is an acknowledge for the successful transmission of the data segment with TRANSMIT count.
115 (73h)	Status	G	BOOL	0 = The communication with the data terminal equipment (DTE) is disturbed. A diagnostic message is generated if the parameter "Diagnostics" is set to "0 = release". The diagnostic data show the cause of the communication disturbance. The user has to set back this bit in the process output data by using STATRES. 1 = The communication with the data terminal equipment (DTE) is error free,
116 (74h)	Process diagnostics data	G	BYTE	Contains the diagnostic information: The diagnostic data are part of the process input data, if ACTIVE MODE = 1 or "2bytes ctrl/status header" is set. Diagnostics messages: – Bit 0 to Bit 2: reserved – Bit 3: 0 = ok 1 = "parameter error": The set parameter values are not supported. – Bit 4: 0 = ok 1 = "hardware failure": The module has to be replaced, e.g. EEPROM or UART may be defect.

Attr. No. dec. (hex.)	Attribute name	Get/ Set	Type	Description
116 (74h)	Process diagnostics data	G	BYTE	– Bit 5: 0 = ok 1 = "handshake error": The DTE connected to the module does not answer a XOFF or RTS handshake. This may cause a overflow in the internal receive-buffer. – Bit 6: 0 = ok 1 = "frame error": The module has to be parameterized to be adapted to the data structure of the connected DTE. A "frame error" occurs if the parameterization (number of data bits, stop bits, parity) is not correct. – Bit 7: 0 = ok 1 = "buffer overflow": Overflow in the RX-buffer. – Bit 8 to Bit 15: reserved
117 (75h)	RX data	G	ARRAY OF BYTE	Defines the receive-data (0...7).
118 (76h)	RX data and release	G	ARRAY OF BYTE	Defines the data received via RS485/422 (0...7) + acknowledge for reception
119 (77h)	TX byte count	G/S	USINT	Number of the valid user data bytes in this data segment. I
120 (78h)	TX count	G/S	USINT	This value is transferred together with every data segment. The TX count values are sequential: 00->01->10->11->00... (decimal: 0->1->2->3->0...) Errors in this sequence show the loss of data segments.
121 (79h)	RX count acknowledge	G/S	USINT	This value is a copy of RX count. RX count has been transmitted together with the last data segment of the process input data. RX count acknowledge is an acknowledge for the successful transmission of the data segment with RX count.

Attr. No. dec. (hex.)	Attribute name	Get/ Set	Type	Description
122 (7Ah)	Status reset control	G/S	BOOL	STATRES: This bit is set to reset the STAT bit in the process input data. With the change from 1 to 0 the status bit is reset (from 0 to 1). If this bit is 0, all changes in TRANSMIT BYTE count, TRANSMIT count and RECEIVE count acknowledge are ignored. Flushing the transmit-/ receive-buffer with Process control data (Attr. 123) is possible. If this bit is 1 or with the change from 0 to 1, the flushing of the transmit-/ receive-buffer with Process control data (Attr. 123) is not possible.
123 (7Bh)	Process control data	G/S	BYTE	Bit 0 = transmit-buffer flush, Bit 1 = receive-buffer flush
124 (7Ch)	TX data	G/S	ARRAY OF BYTE	Defines the transmit-data (0...7)
125 (7Dh)	TX data and release	S	ARRAY OF BYTE	Defines the data to be transmitted via RS485/422 (0...7) + transmission is released/ charged immediately
126 (7Eh)	reserved			
127 (7Fh)	Diagnostics	G	WORD	Contains the diagnostic messages (low byte): Diagnostics messages: – Bit 0 to Bit 2: reserved – Bit 3: 0 = ok 1 = "parameter error": The set parameter values are not supported. – Bit 4: 0 = ok 1 = "hardware failure": The module has to be replaced, e.g. EEPROM or UART may be defect. – Bit 5: 0 = ok 1 = "handshake error": The DTE connected to the module does not answer a XOFF or RTS handshake. This may cause a overflow in the internal receive-buffer.

Attr. No. dec. (hex.)	Attribute name	Get/ Set	Type	Description
127 (7Fh)	Diagnostics	G	WORD	– Bit 6: 0 = ok 1 = "frame error": The module has to be parameterized to be adapted to the data structure of the connected DTE. A "frame error" occurs if the parameterization (number of data bits, stop bits, parity) is not correct. – Bit 7: 0 = ok 1 = "buffer overflow": Overflow in the RX-buffer. – High byte: reserved
128 (80h)	Active mode	G/S	BOOL	0 = "1byte ctrl/status header": The diagnostic data are not part of the process input data, 7 bytes of user data are available. 1 = "2byte ctrl/status header": The diagnostic data are part of the process input data, 6 bytes of user data are available.
129 (81h)	Bit rate	G/S	ENUM USINT	Used to set the bit rate for the gateway: 0 = reserved, 1 = 300 bps 2 = 600 bps 3 = 1200 bps 4 = 2400 bps 5 = 4800 bps 6 = 9600 bps 7 = 14400 bps 8 = 19200 bps 9 = 28800 bps 10 = 38400 bps 11 = 57600 bps 12 = 115200 bps ... 15 = reserved)
130 (82h)	Disable diagnostics	G/S	BOOL	0 = "released": The diagnostic function is activated. 1 = "blocked": The diagnostic function is deactivated.
131 (83h)	Flow control	G/S	ENUM USINT	0 = "off": data flow control is deactivated 1 = XON/XOFF Software-handshake is activated 2 = RTS/CTS Hardware-handshake is activated 3 = reserved
132 (84h)	Data width	G/S	ENUM USINT	0 = "7 bits" 1 = "8 bits"

Attr. No. dec. (hex.)	Attribute name	Get/ Set	Type	Description
133 (85h)	Parity	G/S	ENUM USINT	0 = "none" 1 = "odd" The number of the bits set to 1 is odd (incl. data and parity bit). 2 = "even" The number of the bits set to 1 is even (incl. data and parity bit).
134 (86h)	Stop	G/S	ENUM USINT	Number of the stop bits. 0 = "1 bit" 1 = "2 bits"
135 (87h)	XON character	G/S	USINT	XON character This sign is used to start the data transfer to the data terminal equipment (DTE) with the activation of the software handshake. 0 - 255 default: 17/ 11h
136 (88h)	XOFF character	G/S	USINT	XOFF character This sign is used to stop the data transfer to the data terminal equipment (DTE) with the activation of the software handshake. (0 - 255) default: 19/ 13h
137 (89h)	RS××× mode	G/S	ENUM USINT	0 = "RS422": Parameterization as 422 1 = "RS485": Parameterization as 485

SSI Module Class (VSC116, 74h)

This Class contains all information and parameters for SSI- modules.

Class Instance

NOTE

Please refer to paragraph Class Instance of the VSC (page 95) for the description of the class instances for VSC.

Object Instance

Attr. No. dec. (hex.)	Attribute name	Get/ Set	Type	Description
100 (64h)	Max object attribute	G	USINT	Contains the number of the last object attribute to be implemented.
101 (65h)	Module present	G	BOOL	0 = module missing, base module without electronic module. 1 = module is plugged
102 (66h)	Terminal slot number	G	USINT	The slot number of the base module belonging to the module (base module to the right of the gateway = No. 1). Corresponds to the respective Instance Number within the TERMINAL SLOT CLASS.
103 (67h)	Module ID	G	DWORD	Contains the module ID.
104 (68h)	Module order number	G	UDINT	Contains the ident number of the module.
105 (69h)	Module order name	G	SHORT STRING	Contains the name of the module, for example, "BL20-1SSI".
106 (6Ah)	Module revision number	G	USINT	Contains the revision number of the module firmware.
107 (6Bh)	Module type ID	G	ENUM USINT	Describes the module type: see attribute 107 (6Bh) on s. p. 107
108 (6Ch)	Module command interface	G/S	ARRAY	The control interface of the BL20 module. ARRAY OF: BYTE: Control byte sequence
109 (6Dh)	Module response interface	G	ARRAY	Response interface of the BL20 module. ARRAY OF: BYTE: Response-byte sequence
110 (6Eh)	Module registered index	G	ENUM USINT	Contains the index numbers specified in all the module lists.
111 (6Fh)	Number of supported channels	G	USINT	States the number of analog input channels supported by this module Instance.

Attr. No. dec. (hex.)	Attribute name	Get/ Set	Type	Description
112 (70h)	Diagnostics and status	G	WORD	Bit 0: – 0 = No enabled status signal is active (SSI_STSx = 0). – 1 = "group diagnostics" At least one enabled status signal is active (SSI_STSx = 1). Bit 1: – 0 = SSI encoder signal present. – 1 = "SSI error/open circuit" SSI encoder signal faulty. (e.g. due to a cable break). Bit 2: – 0 = A comparison of the register contents has produced the following result: (REG_SSI_POS) ≤ (REG_UPPER_LIMIT) – 1 = "error POS > UPPER LIMIT" A comparison of the register contents has produced the following result: (REG_SSI_POS) > (REG_UPPER_LIMIT) Bit 3: – 0 = A comparison of the register contents has produced the following result: (REG_SSI_POS) ≥ (REG_LOWER_LIMIT) – 1 = "error POS < LOWER LIMIT" A comparison of the register contents has produced the following result: (REG_SSI_POS) < (REG_LOWER_LIMIT) Bit 4: – 0 = The parameter set of the module has been accepted. – 1 = "parameterization error" Operation of the module is not possible with the present parameter set. Bit 5 to 6: reserved Bit 7: – 0 = The SSI encoder is read cyclically. – 1 = "SSI communication suspended" Communication with the SSI encoder is stopped as STOP = 1 (process output) or ERR_PARA = 1.

Attr. No. dec. (hex.)	Attribute name	Get/ Set	Type	Description
112 (70h)	Diagnostics and status	G	WORD	Bit 8: – 0 = A comparison of the register contents has produced the following result: (REG_SSI_POS) ≠ (REG_CMP1) – 1 = "CMP1 register value matches POS" A comparison of the register contents has produced the following result: (REG_ SSI_POS) = (REG_CMP1) Bit 9: – 0 = Default status, i.e. the register contents have not yet matched (REG_SSI_POS) = (REG_CMP1) since the last reset. – 1= "CMP1 flag set" The contents of the registers match: (REG_SSI_POS) = (REG_CMP1). This marker must be reset with bit 9 of the "Control" attribute. Bit 10: – 0 = A comparison of the register contents has produced the following result: (REG_SSI_POS) < (REG_CMP1) – 1 = "POS ≥ CMP1 register value" A comparison of the register contents has produced the following result: (REG_ SSI_POS) ≥ (REG_CMP1) Bit 11: – 0 = A comparison of the register contents has produced the following result: (REG_SSI_POS) ≠ (REG_CMP2) – 1 = "CMP2 register value matches POS" A comparison of the register contents has produced the following result: (REG_ SSI_POS) = (REG_CMP29 Bit 12: – 0 = Default status, i.e. the register contents have not yet matched (REG_SSI_POS) = (REG_CMP2) since the last reset. – 1 = "CMP2 flag set" The contents of the registers match: (REG_SSI_POS) = (REG_CMP2). This marker must be reset with bit 12 of the "Control" attribute.

Attr. No. dec. (hex.)	Attribute name	Get/ Set	Type	Description
112 (70h)	Diagnostics and status	G	WORD	Bit 13: – 0 = A comparison of the register contents has produced the following result: (REG_SSI_POS) < (REG_CMP2) – 1 = "POS ≥ CMP2 register value". A comparison of the register contents has produced the following result: (REG_SSI_POS) ≥ (REG_CMP2) Bit 14: – 0 = The SSI encoder values are incremented or the values are constant. – 1 = "counting downwards" The SSI encoder values are decremented. Bit 15: – 0 = The SSI encoder values are decremented or the values are constant. – 1 = "counting upwards" The SSI encoder values are incremented.
113 (71h)	Result write operation	G		Bit 0 to 5: reserved Bit 6: – 0 = No modification of the data in the register bank by process output, i.e. WRITE OPERATION = 0. A write job would be accepted with the next telegram of process output data. (handshake for data transmission to the register.) – 1 = "control register write acknowledged" A modification of the register contents by a process output was initiated, i.e. WRITE OPERATION = 1. A write job would not be accepted with the next telegram of process output data.
113 (71h)	Result write operation	G		Bit 7: – 0 = The writing of user data for process output to the register addressed with "Address write register" in the process output data could not be executed. – 1 = "control register write accepted" The writing of user data for process output to the register addressed with "Address write register" in the process output data could be executed successfully.

Attr. No. dec. (hex.)	Attribute name	Get/ Set	Type	Description
114 (72h)	Result read operation	G	BYTE	Bit 0 to 6: reserved Bit 7: 0 = The reading of the register stated in "Address read register" was accepted and executed. The content of the register is located in "Value read register". 1 = "register read operation aborted" The reading of the register stated in "Address read register" was not accepted. "Value read register" is zero.
115 (73h)	Address read register	G	UINT	Address of the input register with contents stated in "Value read register" when "Result read operation" = 0.
116 (74h)	Value read register	G	DWORD	Content of the register to be read if "Result read operation" = 0. If "Result read operation" = 1, "Value read register" = 0.
117 (75h)	Control	G/S	WORD	Bit 0 to 6: reserved Bit 7: – 0 = Request to read the SSI encoder cyclically – 1 = "suspend communication requested" Request to interrupt communication with the encoder Bit 8: – 0 = Default status, i.e. the data bits 8 to 10 of the "Diagnostics and status" attribute always have the value 0, irrespective of the actual SSI encoder value. – 1 = "compare/flag CMP1 active" Comparison active, i.e. the data bits 8 to 10 of the "Diagnostics and status" attribute always have a value based on the result of the comparison with the actual SSI encoder value. Bit 9: – 0 = Default status, i.e. reset of Bit 9 of the "Diagnostics and status" attribute not active. – 1 = "clear CMP1 flag" Reset of bit 9 of the "Diagnostics and status" attribute active.

Attr. No. dec. (hex.)	Attribute name	Get/ Set	Type	Description
117 (75h)	Control	G/S	WORD	Bit 10: reserved Bit 11: 0 = Default status, i.e. the data bits 11 to 13 of the "Diagnostics and status" attribute always have the value 0, irrespective of the actual SSI encoder value. 1 = "compare/flag CMP2 active" Comparison active, i.e. the data bits 11 to 13 of the "Diagnostics and status" attribute always have a value based on the result of the comparison with the actual SSI encoder value. Bit 12: 0 = Default status, i.e. no reset of Bit 12 of the "Diagnostics and status" attribute active. 1 = "clear CMP2 flag" Reset of bit 12 of the "Diagnostics and status" attribute active.
				Bit 13 to 15: reserved
118 (76h)	Address read register	G/S	UINT	Address of the register with contents stated in "Value read register" when "Result read operation" 7 = 0.
119 (77h)	Address write register	G/S	UINT	Address of the register to be written with "Value write register".
120 (78h)	Value write register	G/S	DWORD	Value to be written to the register with the address stated at "Address write register".
121 (79h)	Write operation	G/S	BOOL	0 = Default status, i.e. there is no request to overwrite the content of the register address stated at "Address write register" with "Value write register". Bit 6 of the "Result write operation" attribute is reset (=0) if necessary. 1 = Request to overwrite the content of the register at the address "Address write register" with "Value write register".
122 (7Ah)	Write register and execute	S	STRUCT OF UINT DWORD	The structure contains both parts: – Address of the register to be written. – Value to be written. The write operation is executed without checking whether a write job is already present.

Attr. No. dec. (hex.)	Attribute name	Get/ Set	Type	Description
123 (7Bh)	Diagnostics	G	WORD	Bit 0: – 0 = No enabled status signal is active (SSI_STSx = 0). – 1 = "group diagnostics" At least one enabled status signal is active (SSI_STSx = 1). Bit 1: 0 = SSI encoder signal present. – 1 = "SSI error/open circuit" SSI encoder signal faulty. (e.g. due to a cable break). Bit 2: – 0 = A comparison of the register contents has produced the following result: (REG_SSI_POS) ≤ (REG_UPPER_LIMIT) – 1 = "error POS > UPPER LIMIT" A comparison of the register contents has produced the following result: (REG_SSI_POS) > (REG_UPPER_LIMIT) Bit 3: – 0 = A comparison of the register contents has produced the following result: (REG_SSI_POS) ≥ (REG_LOWER_LIMIT) – 1 = "error POS < LOWER LIMIT" A comparison of the register contents has produced the following result: (REG_SSI_POS) < (REG_LOWER_LIMIT) Bit 4: – 0 = The parameter set of the module has been accepted. – 1 = "parameterization error" Operation of the module is not possible with the present parameter set. Bit 5 to 15: reserved
124 (7Ch)	Check mode	G/S	WORD	Bit 0 to 4: reserved
				Bit 5: 0 = ZERO test of data cable. 1 = "disable SSI error detection" After the last valid bit, a ZERO test of the data cable is not carried out.
				Bit 6 to 15: reserved
125 (7Dh)	Invalid bits LSB	G/S	USINT	Number of invalid bits on the LSB side of the position value supplied by the SSI encoder. The meaningful word width of the position value transferred to the module bus master is as follows: FRAME LENGTH - INVALID BITS MSB - INVALID BITS LSB. The invalid bits on the LSB side are removed by shifting the position value to the right, starting with the LSB. (Default 0 Bit = 0hex). INVALID BITS MSB + INVALID BITS LSB must always be less than FRAME LENGTH.

Attr. No. dec. (hex.)	Attribute name	Get/ Set	Type	Description
126 (7Eh)	Bit rate		ENUM USINT	0 = "1 Mbps" 1 = "500 kbps" 2 = "250 kbps" 3 = "100 kbps" 4 = "125 kbps" 5 = "83 kbps" 6 = "71 kbps" 7 = "62.5 kbps" 8 to 15: reserved
128 (80h)	Frame length	G/S	USINT	Number of bits of the SSI data frame. FRAME LENGTH must always be greater than INVALID_BITS. **A** Default: 25 = 19hex
129 (81h)	Kind of coding SSI	G/S	BOOL	0 = "Binary code" 1 = "GRAY code"
130 (82h)	Invalid bits MSB	G/S	USINT	Number of invalid bits on the MSB side of the position value supplied by the SSI encoder. The meaningful word width of the position value transferred to the module bus master is as follows: FRAME LENGTH - INVALID BITS MSB - INVALID BITS LSB. The invalid bits on the MSB side are zeroed by masking the position value. I NVALID BITS MSB + INVALID BITS LSB must always be less than FRAME LENGTH. Default: 0 = 0hex

Digital Versatile Module Class (VSC117, 75h)

This class contains all information and parameters for digital versatile modules.

NOTICE

In this class, chosen parameter options can only be deactivated by activating another option of this parameter.

Class Instance

NOTE

Please refer to paragraph Class Instance of the VSC (page 95) for the description of the class instances for VSC.

Object Instance

Attr. No. dec. (hex.)	Attribute name	Get/ Set	Type	Description
100 (64h)	Max object attribute	G	USINT	Contains the number of the last object attribute to be implemented.
101 (65h)	Module present	G	BOOL	0 = module missing, base module without electronic module. 1 = module is plugged
102 (66h)	Terminal slot number	G	USINT	The slot number of the base module belonging to the module (base module to the right of the gateway = No. 1). Corresponds to the respective Instance Number within the TERMINAL SLOT CLASS.
103 (67h)	Module ID	G	DWORD	Contains the module ID.
104 (68h)	Module order number	G	UDINT	Contains the ident number of the module.
105 (69h)	Module order name	G	SHORT STRING	Contains the name of the module, for example, "BL20-4DO-0.5A-P".
106 (6Ah)	Module revision	G	USINT	Contains the revision number of the module firmware.
107 (6Bh)	Module type ID	G	ENUM USINT	Describes the module type: see attribute 107 (6Bh) on s. p. 107
108 (6Ch)	Module command interface	G/S	ARRAY	The control interface of the BL20 module. ARRAY OF: BYTE: Control byte sequence
109 (6Dh)	Module response interface	G	ARRAY	Response interface of the BL20 module. ARRAY OF: BYTE: Response byte sequence
110 (6Eh)	Module registered index	G	ENUM USINT	Contains the index numbers specified in all the module lists.
111 (6Fh)	Module output channel count	G	USINT	Contains the number of input channels supported by the module.

Attr. No. dec. (hex.)	Attribute name	Get/ Set	Type	Description
112 (70h)	Module input channel count	G	USINT	Contains the number of output channels supported by the module.
Input data				
113 (71h)	Module input_1	G	DWORD	Input data of the module (according to channels).
114 (72h)	Module input_2	G	DWORD	Input data of the module (according to channels).
Output data				
115 (73h)	Module output_1	G	DWORD	Output data of the module (according to channels).
116 (74h)	Module output _2	G	DWORD	Output data of the module (according to channels).
Diagnosis data				
117 (75h)	Open circuit error_1	G	DWORD	This attribute contains diagnosis information about open circuit errors (according to channels).
118 (76h)	Open circuit error_2	G	DWORD	This attribute contains diagnosis information about open circuit errors (according to channels).
119 (77h)	Short circuit output error_1	G	DWORD	This attribute contains diagnosis information about output short-circuits (according to channels).
120 (78h)	Short circuit output error_2	G	DWORD	This attribute contains diagnosis information about output short-circuits (according to channels).
121 (79h)	Short circuit sensor error_1	G	DWORD	This attribute contains diagnosis information about sensor short-circuits (according to channels).
122 (7Ah)	Short circuit sensor error_2	G	DWORD	This attribute contains diagnosis information about sensor short-circuits (according to channels).
123 (7Bh)	Cable error_1	G	DWORD	This attribute contains diagnosis information about a wire break (channel 1 to 32).
124 (7Ch)	Cable error_2	G	DWORD	This attribute contains diagnosis information about a wire break (channel 33 to 64).
Parameter data				
125 (7Dh)	Open circuit monitoring mode_1	G/S	DWORD	Enables the wire break detection mode (channel 1 to 32).
126 (7Eh)	Open circuit monitoring mode_12	G/S	DWORD	Enables the wire break detection (channel 33 to 64).
127 (7Fh)	Invert input data_1	G/S	DWORD	The input signal is inverted (channel 1 to 32).

Attr. No. dec. (hex.)	Attribute name	Get/ Set	Type	Description
128 (80h)	Invert input data_2	G/S	DWORD	The input signal is inverted (channel 33 to 64).
129 (81h)	Invert output data_1	G/S	DWORD	The output signal is inverted (channel 1 to 32).
130 (81h)	Invert output data_2	G/S	DWORD	The output signal is inverted (channel 33 to 64).
131 (82h)	reserved	-	-	-
132 (83h)	reserved	-	-	-
133 (84h)	Auto recovery output_1	G/S	DWORD	The outputs switch on automatically after an overload.
134 (85h)	Auto recovery output_2	G/S	DWORD	The outputs switch on automatically after an overload.
135 (86h)	reserved	-	-	-
136 (87h)	reserved	-	-	-
137 (88h)	Retriggered recovery output_1	G/S	DWORD	The outputs (channel 1 to 32) have to be retriggered in case of an overload.
138 (89h)	Retriggered recovery output_2	G/S	DWORD	The outputs (channel 33 to 64) have to be retriggered in case of an overload.
139 (8Ah)	Enable high side output driver_1	G/S	DWORD	Enables the high side output driver of channels (channel 1 to 32).
140 (8Bh)	Enable high side output driver_2	G/S	DWORD	Enables the high side output driver of channels (channel 33 to 64).
141 (8Ch)	Enable low side output driver_1	G/S	DWORD	Enables the low side output driver of channels (channel 1 to 32).
142 (8Dh)	Enable low side output driver_2	G/S	DWORD	Enables the low side output driver of channels (channel 33 to 64).
143 (8Eh)	Filter 2500 µs channel 1	G/S	DWORD	Enables the input filter of the channel (channel 1 to 32).
144 (8Fh)	Filter 2500 µs channel 2	G/S	DWORD	Enables the input filter of the channel (channel 33 to 64).
145 (90h)	Fault value	G/S	DWORD	Activates the fault value for the channel (channel 1 to 32).
146 (91h)	Fault value	G/S	DWORD	Activates the fault value for the channel (channel 33 to 64).
147 (92h)	Block Diagnostics	G/S	DWORD	Channel specific diagnostic information is blocked (channel 1 to 32).
148 (93h)	Block Diagnostics	G/S	DWORD	Channel specific diagnostic information is blocked (channel 33 to 64).

Analog Versatile Module Class (VSC118, 76h)

This class contains all information and parameters for analog versatile modules.

NOTICE

In this class, chosen parameter options can only be deactivated by activating another option of this parameter.

Class Instance

NOTE

Please refer to paragraph Class Instance of the VSC (page 95) for the description of the class instances for VSC.

Object Instance

Attr. No. dec. (hex.)	Attribute name	Get/ Set	Type	Description
100 (64h)	Max object attribute	G	USINT	Contains the number of the last object attribute to be implemented.
101 (65h)	Module present	G	BOOL	0 = module missing, base module without electronic module. 1 = module is plugged
102 (66h)	Terminal slot number	G	USINT	The slot number of the base module belonging to the module (base module to the right of the gateway = No. 1). Corresponds to the respective Instance Number within the TERMINAL SLOT CLASS.
103 (67h)	Module ID	G	DWORD	Contains the module ID.
104 (68h)	Module order number	G	UDINT	Contains the ident number of the module.
105 (69h)	Module order name	G	SHORT STRING	Contains the name of the module, for example, "BL20-4DO-0.5A-P".
106 (6Ah)	Module revision	G	USINT	Contains the revision number of the module firmware.
107 (6Bh)	Module type ID	G	ENUM USINT	Describes the module type: see attribute 107 (6Bh) on s. p. 107
108 (6Ch)	Module command interface	G/S	ARRAY	The control interface of the BL20 module. ARRAY OF: BYTE: Control byte sequence
109 (6Dh)	Module response interface	G	ARRAY	Response interface of the BL20 module. ARRAY OF: BYTE: Response byte sequence
110 (6Eh)	Module registered index	G	ENUM USINT	Contains the index numbers specified in all the module lists.
111 (6Fh)	Module input channel count	G	USINT	Contains the number of input channels supported by the module.

Attr. No. dec. (hex.)	Attribute name	Get/ Set	Type	Description
112 (70h)	Module output channel count	G	USINT	Contains the number of output channels supported by the module.
Input data				
113 (71h) to 128 (80h)	Module input 1 to Module input 16	G	UINT	Input data of the module (according to channels).
Output data				
129 (81h) to 144 (8Fh)	Module output_1 to Module output_16	G	DWORD	Output data of the module (according to channels).
Diagnosis data				
145 (90h)	Range error	G	WORD	Indicates an over- or undercurrent of 1 % of the set current/voltage range; whereby, undercurrents can only be recognized with those modules that have a set current range of 4 to 20 mA.
146 (91h)	Open circuit error	G	WORD	Indicates an open circuit in the signal line for the operating mode
147 (92h)	Short circuit error	G	WORD	
148 (93h)	reserved	-	-	-
Parameter data				
149 (94h) to 164 (A4h)	Channel 1 to Channel 16	G/S	UINT	Activates or deactivates the corresponding channel.
165 (A5h) to 180 (B4h)	Operating mode channel 1 to Operating mode channel 16	G/S	ENUM	Sets the operating mode for the channel 0 = deactivate channel 1 = -10V...+10V 2 = 0V...+10V 3 = 0 mA...20 mA 4 = 4 mA...20 mA
181 (B5h) to 196 (C4h)	Value representation channel 1 to Value representation channel 16	G/S	ENUM	Sets the value representation for the channels: 0 = default 1 = 16bit integer 2 = 12bit left justified + diagnostics.

SWIRE Module Class (VSC121, 79h)

This class contains all the parameters and information for the BL20-E-SWIRE module.

NOTICE

In this class, chosen parameter options can only be deactivated by activating another option of this parameter.

Class Instance

NOTE

Please refer to paragraph Class Instance of the VSC (page 95) for the description of the class instances for VSC.

Object Instance

Attr. No. dec. (hex.)	Attribute name	Get/ Set	Type	Description
100 (64h)	Max object attribute	G	USINT	Contains the number of the last object attribute to be implemented.
101 (65h)	Module present	G	BOOL	0 = module missing, base module without electronic module. 1 = module is plugged
102 (66h)	Terminal slot number	G	USINT	The slot number of the base module belonging to the module (base module to the right of the gateway = No. 1). Corresponds to the respective Instance Number within the TERMINAL SLOT CLASS.
103 (67h)	Module ID	G	DWORD	Contains the module ID.
104 (68h)	Module order number	G	UDINT	Contains the ident number of the module.
105 (69h)	Module order name	G	SHORT STRING	Contains the name of the module, for example, "BL20-4DO-0.5A-P".
106 (6Ah)	Module revision	G	USINT	Contains the revision number of the module firmware.
107 (6Bh)	Module type ID	G	ENUM USINT	Describes the module type: see attribute 107 (6Bh) on s. p. 107
108 (6Ch)	Module command interface	G/S	ARRAY	The control interface of the module. ARRAY OF: BYTE: Control byte sequence
109 (6Dh)	Module response interface	G	ARRAY	Response interface of the module. ARRAY OF: BYTE: Response byte sequence
110 (6Eh)	Module registered Index	G	ENUM USINT	Contains the index numbers specified in all the module lists.
111 (6Fh)	Number of supported input channels	G	USINT	Shows the number of input channels supported by this module instance.

Attr. No. dec. (hex.)	Attribute name	Get/ Set	Type	Description
112 (70h)	Number of supported output channels	G	USINT	Shows the number of output channels supported by this module instance.
SWIRE data				
113 (71h)	Input1_DWORD	G	DWORD	Contains the first 4 bytes of the process input data.
114 (72h)	Input2_DWORD	G	DWORD	Contains the last 4 bytes of the process input data
115 (73h)	Output1_DWORD	G	DWORD	Contains the first 4 bytes of the process output data.
116 (74h)	Output2_DWORD	G	DWORD	Contains the last 4 bytes of the process output data
117 (75h)	Diag common error	G	WORD	One bit per SWIRE slave shows if diagnostics messages are present or not Slave 1 belongs to bit 0, slave 2 to bit 1 etc. 0: o.k. 1: One/several diagnostics messages present
118 (76h)	Diag config error	G	WORD	One bit per SWIRE slave shows the configuration state of the slave: Slave 1 belongs to bit 0, slave 2 to bit 1 etc. 0: The bus is in data exchange mode 1: The configuration was not accepted, the bus does not switch to data exchange mode. (LED SW flashing)
119 (77h)	Diag communication error	G	WORD	One bit per SWIRE slave shows possible communication errors. Slave 1 belongs to bit 0, slave 2 to bit 1 etc. 0: o.k. 1: A communication error is present, such as a slave is no longer reached, its internal time-out has elapsed or communication is faulty. The master cannot carry out data exchange with at least one slave.
120 (78h)	Diag PKZ error	G	WORD	One bit per SWIRE slave shows if the PKZ has tripped or not: Slave 1 belongs to bit 0, slave 2 to bit 1 etc. 0: No PKZ has tripped or diagnostics function has been deactivated via the parameter setting. 1: At least one PKZ has tripped.

Attr. No. dec. (hex.)	Attribute name	Get/ Set	Type	Description
121 (79h)	Param common operation modes	G/S	Byte	Bit 0: reserved
				Bit 1 = Automatic SWIRE configuration: 0: The physically present configuration of the SWIRE bus is only accepted as the ACTUAL configuration by pressing the CFG button. The comparison with the SET configuration is then carried out 1: The physically present configuration is automatically accepted as the ACTUAL configuration and then compared with the SET configuration.
121 (79h)	Param common operation modes	G/S	Byte	Bit 2 = PLC configuration check 0: Configuration check based on device ID. Only SWIRE slaves with a device ID completely matching the set configuration are accepted on the bus 1: All slaves are mapped in 4Bit INPUT / 4Bit OUTPUT without checking the device ID.
121 (79h)	Param. common operation modes	G/S	Byte	Bit 3 = Configuration check 0: No data exchange with a slave with an incomplete / incorrect configuration. 1: The bus also goes into operation with the correctly configured slaves even if the configuration is incomplete. This means in position oriented addressing: All slaves detected by the daisy chain configuration with a position that matches the set configuration are started up. Slaves that do not match the set configuration are inactive.
				Bit 4 to bit 6: reserved

Attr. No. dec. (hex.)	Attribute name	Get/ Set	Type	Description
122 (7Ah)	Param. error report control	G/S	BYTE	Bit 0 = Slave error field 0: Single diagnostics is activated 1: Single diagnostics is not activated
				Bit 1 = Group error - Slave error 0: Group diagnostics is activated 1: Group diagnostics is not activated
				Bit 2 = PKZ error field 0: Single diagnostics is activated 1: Single diagnostics is not activated
				Bit 3 = Group error - PKZ error 0: Group diagnostics is activated 1: Group diagnostics is not activated
				Bit 4 = Configuration error field 0: Single diagnostics is activated 1: Single diagnostics is not activated
				Bit 5 = Group error - Configuration error 0: Group diagnostics is activated 1: Group diagnostics is not activated
				Bit 6 = Error message - UAUX 0: Error message UAUXERR activated 1: Error message UAUXERR not activated Bit 7: reserved
124 (7Ch)	Lifeguarding time	G/S	USINT	02_{hex}-FF_{hex} Default: 64_{hex} Disconnect: FF_{hex} Setting of lifeguarding time, time-out time up to automatic reset of the slaves in the event of communication failure. (n × 10 ms) (Default 1s)
125 (7Dh)	Process data slave diag	G/S	WORD	Input bit communication error, slave x 0: Slave diagnostics message from Byte 1 / Bit 7 is accepted in the feedback interface as Bit4 1: Slave diagnostics message from Byte 1 / Bit 7 is accepted in the feedback interface as Bit4
126 (7Eh), 127 (7Fh)	reserved			
128 (7Eh) - 143 (8Fh)	Param. SWIRE type ident slave 1 - Param. SWIRE type ident slave 16	G/S	BYTE	Bit 0 to bit 3 = Variant ID FF_{hex} = No slave 20_{hex} = SWIRE-DIL-MTD

RFID-S Module Class (VSC124, 7Ch)

This class contains all information and parameters for the modules BL20-2RFID-S.

NOTICE

In this class, chosen parameter options can only be deactivated by activating another option of this parameter.

Class Instance

NOTE

Please refer to paragraph Class Instance of the VSC (page 95) for the description of the class instances for VSC.

Object Instance

NOTE

The object instances of VSC 124 represent the individual RFID-S channels, not the complete modules!

Attr. No. dec. (hex.)	Attribute name	Get/ Set	Type	Description
100 (64h)	Max object attribute	G	USINT	Contains the number of the last object attribute to be implemented.
101 (65h)	Module present	G	BOOL	0 = module missing, base module without electronic module. 1 = electronics module is plugged
102 (66h)	Terminal slot number	G	USINT	The slot number of the base module belonging to the module (base module to the right of the gateway = No. 1). Corresponds to the respective Instance Number within the TERMINAL SLOT CLASS.
103 (67h)	Module ID	G	DWORD	Contains the module ID.
104 (68h)	Module order number	G	UDINT	Contains the ident number of the module.
105 (69h)	Module order name	G	SHORT STRING	Contains the name of the module, for example, "BL20-2RFID-S".
106 (6Ah)	Module revision	G	USINT	Contains the revision number of the module firmware.
107 (6Bh)	Module type ID	G	ENUM USINT	Describes the module type: see attribute 107 (6Bh) on s. p. 107
108 (6Ch)	Module command interface	G/S	ARRAY	The control interface of the module. ARRAY OF: BYTE: Control byte sequence
109 (6Dh)	Module response interface	G	ARRAY	Response interface of the module. ARRAY OF: BYTE: Response byte sequence

Attr. No. dec. (hex.)	Attribute name	Get/ Set	Type	Description
110 (6Eh)	Diag size	G	UINT	Indicates the number of diagnostic bits of the module.
111 (6Fh)	Diag	G	WORD	Contains the diagnostic information of the module. WORD: Bit for bit assignment according to module specification.
112 (70h)	Module registered index	G	ENUM USINT	Contains the index numbers specified in all the module lists.
113 (71h)	Module output data	G	ARRY OF BYTE	Process data output information.
114 (72h)	Module input data	G	ARRY OF BYTE	Process data input information.
115 (73h)	Bypass time channel 1	G/S	WORD	Bypass time in ms
116 (74h)	Bypass time channel 2	G/S	WORD	Bypass time in ms

NOTE

For further information concerning the RFID communication interfaces see the special RFID documentation which can be downloaded from www.turck.com.

11.2 Nominal Current Consumption and Power Loss

Nominal current consumption of the BL20 modules from supply terminal I_{EL}

Modules	Power supply	Nominal current consumption
Gateway		–
BL20-BR-24VDC-D	10 A	
BL20-PF-24VDC-D	10 A	
BL20-PF-120/230VAC-D	10 A	
BL20-2DI-24VDC-P		≤ 20 mA
BL20-2DI-24VDC-N		≤ 20 mA
BL20-2DI-120/230VAC		≤ 20 mA
BL20-4DI-24VDC-P		≤ 40 mA
BL20-4DI-24VDC-N		≤ 40 mA
BL20-16DI-24VDC-P		≤ 40 mA
BL20-32DI-24VDC-P		≤ 30 mA
BL20-1AI-I(0/4...20MA)		≤ 50 mA
BL20-2AI-I(0/4...20MA)		≤ 12mA
BL20-1AI-U(-10/0...+10VDC)		≤ 50 mA
BL20-2AI-U(-10/0...+10VDC)		≤ 12 mA
BL20-2AI-PT/NI-2/3		< 30 mA
BL20-2AI-THERMO-PI		< 30 mA
BL20-2DO-24VDC-0.5A-P		20 mA (when load current = 0)
BL20-2DO-24VDC-0.5A-N		20 mA (when load current = 0)
BL20-2DO-24VDC-2A-P		< 50 mA (when load current = 0)
BL20-4DO-24VDC-0.5A-P		≤ 25 mA (when load current = 0)
BL20-16DO-24VDC-0.5A-P		< 30 mA
BL20-2DO-120/230VAC-0.5A		< 20 mA (when load current = 0)
BL20-1AO-I(0/4...20MA)		≤ 50 mA
BL20-2AO-I(0/4...20MA)		≤ 50 mA
BL20-2AO-U(-10/0...+10VDC)		≤ 50 mA
BL20-2DO-R-NC		< 20 mA
BL20-2DO-R-NO		< 20 mA
BL20-2DO-R-CO		< 20 mA
BL20-1CNT-24VDC		< 50 mA (when load current = 0)
BL20-2RFID-S		< 100 mA (when load current = 0)

Modules	Power supply	Nominal current consumption
BL20-E-4IOL		80 mA
BL20-E-4IOL-10		80 mA

11.3 Power Loss of the Modules

Modules	Power loss (typical)
Gateway	–
BL20-BR-24VDC-D	–
BL20-PF-24VDC-D	–
BL20-PF-120/230VAC-D	–
BL20-2DI-24VDC-P	0.7 W
BL20-2DI-24VDC-N	0.7 W
BL20-2DI-120/230VAC	< 1 W
BL20-4DI-24VDC-P	< 1 W
BL20-4DI-24VDC-N	< 1 W
BL20-16DI-24VDC-P	< 2.5 W
BL20-32DI-24VDC-P	< 4.2 W
BL20-1AI-I(0/4...20MA)	< 1 W
BL20-2AI-I(0/4...20MA)	< 1 W
BL20-1AI-U(-10/0....+10VDC)	< 1 W
BL20-2AI-U(-10/0...+10VDC)	< 1 W
BL20-2AI-PT/NI-2/3	< 1 W
BL20-2AI-THERMO-PI	1 W
BL20-2DO-24VDC-0.5A-P	1 W
BL20-2DO-24VDC-0.5A-N	1 W
BL20-2DO-24VDC-2A-P	1 W
BL20-4DO-24VDC-0.5A-P	< 1 W
BL20-16DO-24VDC-0.5A-P	< 4 W
BL20-2DO-120/230VAC-0.5A	< 1 W
BL20-1AO-I(0/4...20MA)	< 1 W
BL20-2AO-I(0/4...20MA)	< 1 W
BL20-2AO-U(-10/0...+10VDC)	< 1 W
BL20-2DO-R-NC	1 W
BL20-2DO-R-NO	1 W

Modules	Power loss (typical)
BL20-2DO-R-CO	1 W
BL20-1CNT-24VDC	1.3 W
BL20-2RFID-S	≤ 1 W
BL20-E-4IOL	< 2 W
BL20-E-4IOL-10	< 2 W

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