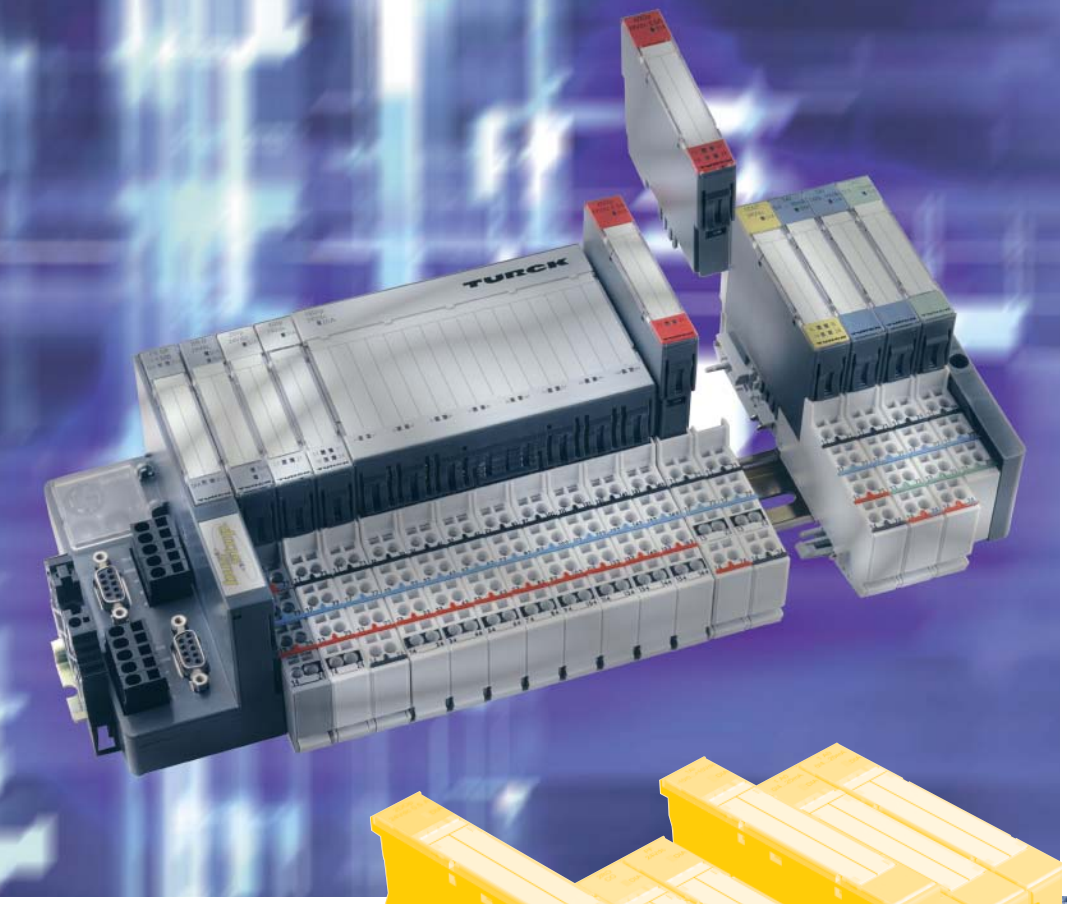
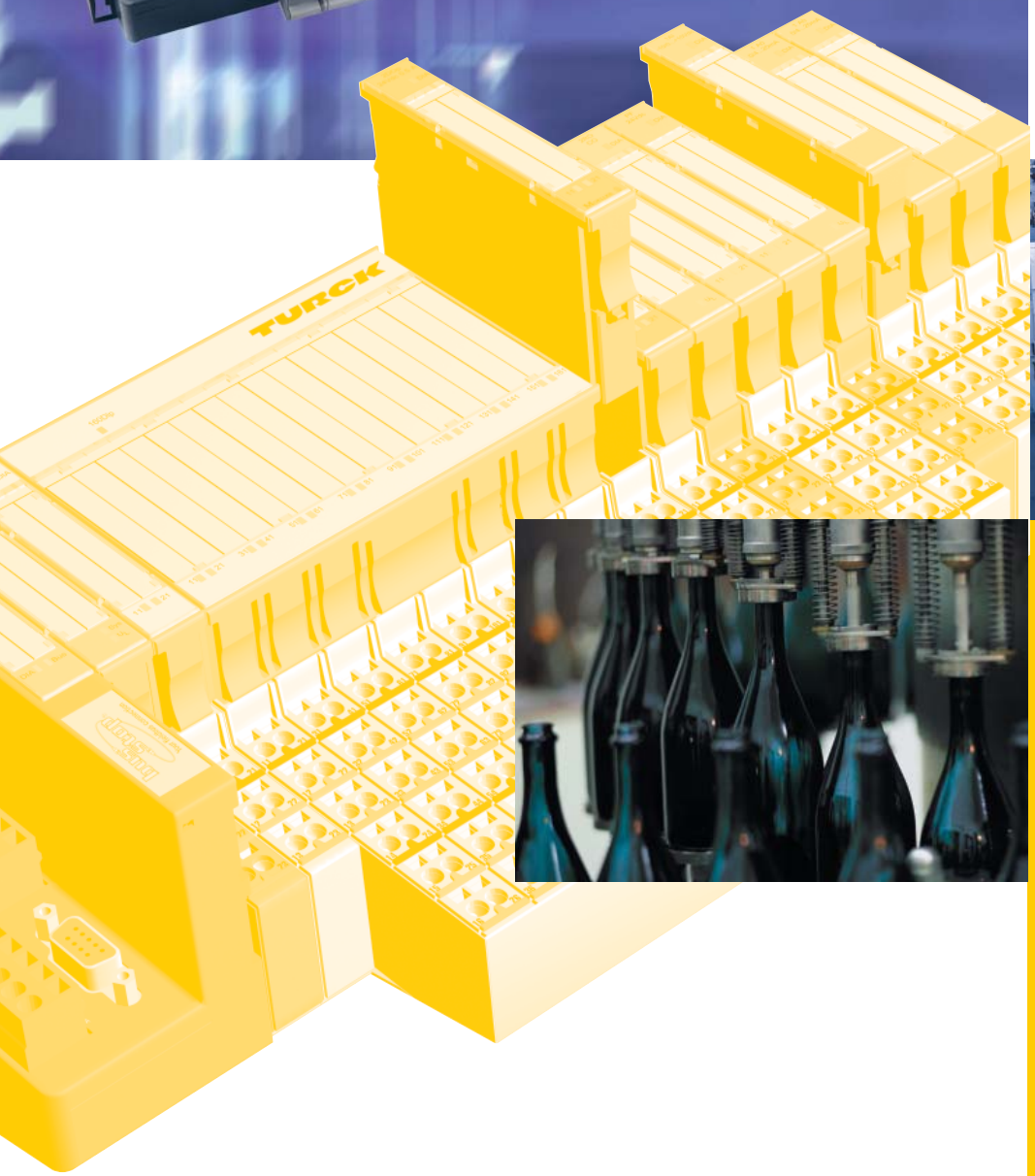
TURCK

Industrial
Automation

BL20 –

USER MANUAL FOR DeviceNet





Edition 12/2011

Safety Notes!

Before starting the installation

- Disconnect the power supply of the device.
- Ensure that devices cannot be accidentally restarted.
- Verify isolation from the supply.
- Earth and short circuit.
- Cover or enclose neighboring units that are live.
- Follow the engineering instructions of the device concerned.
- Only suitably qualified personnel in accordance with EN 50 110-1/-2 (VDE 0 105 Part 100) may work on this device/system.
- Before installation and before touching the device ensure that you are free of electrostatic charge.
- The functional earth (FE) must be connected to the protective earth (PE) or to the potential equalization. The system installer is responsible for implementing this connection.
- Connecting cables and signal lines should be installed so that inductive or capacitive interference do not impair the automation functions.
- Install automation devices and related operating elements in such a way that they are well protected against unintentional operation.
- Suitable safety hardware and software measures should be implemented for the I/O interface so that a line or wire breakage on the signal side does not result in undefined states in the automation devices.
- Ensure a reliable electrical isolation of the low voltage for the 24 volt supply. Only use power supply units complying with IEC 60 364-4-41 (VDE 0 100 Part 410) or HD 384.4.41 S2.
- Deviations of the mains voltage from the rated value must not exceed the tolerance limits given in the specifications, otherwise this may cause malfunction and dangerous operation.
- Emergency stop devices complying with IEC/EN 60 204-1 must be effective in all operating modes of the automation devices. Unlatching the emergency-stop devices must not cause restart.
- Devices that are designed for mounting in housings or control cabinets must only be operated and controlled after they have been installed with the housing closed. Desktop or portable units must only be operated and controlled in enclosed housings.
- Measures should be taken to ensure the proper restart of programs interrupted after a voltage dip or failure. This should not cause dangerous operating states even for a short time. If necessary, emergency-stop devices should be implemented.
- Wherever faults in the automation system may cause damage to persons or property, external measures must be implemented to ensure a safe operating state in the event of a fault or malfunction (for example, by means of separate limit switches, mechanical interlocks etc.).
- The electrical installation must be carried out in accordance with the relevant regulations (e. g. with regard to cable cross sections, fuses, PE).
- All work relating to transport, installation, commissioning and maintenance must only be carried out by qualified personnel. (IEC 60 364 and HD 384 and national work safety regulations).
- All shrouds and doors must be kept closed during operation.

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1.1 Documentation concept

This manual contains all information about the DeviceNet-gateway of BL20 (BL20-GW-DNET, BL20-GWBR-DNET).

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 BL20 DeviceNet-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, labelling etc. are described in a separate manual.

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

Furthermore, the manual contains a short description of the project planning and diagnostics software for TURCK I/O-systems, the software I/O-ASSISTANT.

1.2 Description of symbols used

Danger

This sign can be found next to all notes that indicate a source of hazards. This can refer to danger to personnel or damage to the system (hardware and software) and to the facility.

This sign means for the operator: work with extreme caution.

Attention

This sign can be found next to all notes that indicate a potential hazard.

This can refer to possible danger to personnel and damages to the system (hardware and software) and to the facility.

Note

This sign can be found next to all general notes that supply important information about one or more operating steps. These specific notes are intended to make operation easier and avoid unnecessary work due to incorrect operation.

1.3 Overview

Attention

Please read this section carefully. Safety aspects cannot be left to chance when dealing with electrical equipment.

This manual includes all information necessary for the prescribed use of BL20 products. It has been specially conceived for personnel with the necessary qualifications.

1.4 Prescribed use

Danger

The devices described in this manual must be used only in applications prescribed in this manual or in the respective technical descriptions, and only with certified components and devices from third party manufacturers.

Appropriate transport, storage, deployment and mounting as well as careful operating and thorough maintenance guarantee the trouble-free and safe operation of these devices.

1.5 Notes concerning planning /installation of this product

Danger

All respective safety measures and accident protection guidelines must be considered carefully and without exception.

1.6 List of revisions

In comparison to the previous manual edition, the following changes/ revisions have been made:

Table 1-1: List of revisions

Chapter	Subject/Description	new	changed	deleted
8	BL20-Approvals for Zone 2/ Division 2 → seperate manual D301255			X

Note

The publication of this manual renders all previous editions invalid.

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2.1 The basic concept

BL20 is a modular I/O system for use in industrial automation. It connects the sensors and actuators in the field with the higher-level master.

BL20 offers modules for practically all applications:

- Digital input and output modules
- Analog input and output modules
- Technology modules (counters, RS232 interface...)

A complete BL20 station counts as one station on the bus and therefore occupies one fieldbus address in any given fieldbus structure. A BL20 station consists of a gateway, power distribution modules and I/O modules.

The connection to the relevant fieldbus is made via the bus-specific gateway, which is responsible for the communication between the BL20 station and the other fieldbus stations.

The communication within the BL20 station between the gateway and the individual BL20 modules is regulated via an internal module bus.

Note

The gateway is the only fieldbus-dependent module on a BL20 station. All other BL20 modules are not dependent on the fieldbus used.

Flexibility

All BL20 stations can be planned to accommodate the exact number of channels to suit your needs, because the modules are available in block and slice design.

A BL20 station can contain modules in any combination, which means it is possible to adapt the system to practically all applications in automated industry.

Compactness

The slim design of the BL20 modules (gateway 50.4 mm / 1.98 inch, slice 12.6 mm / 0.49 inch and block 100.8 mm / 3.97 inch) and their low overall height favor the installation of this system in confined spaces.

Easy to handle

All BL20 modules, with the exception of the gateway, consist of a base module and an electronics module.

The gateway and the base modules are snapped onto a mounting rail. The electronics modules are plugged onto the appropriate base modules.

The base modules are designed as terminal blocks. The wiring is secured by tension clamp or screw connection. The electronics modules can be plugged or pulled when the station is being commissioned or for maintenance purposes, without having to disconnect the field wiring from the base modules.

2.2 BL20 components

For a detailed explanation of the individual BL20 components, please refer to chapter 2 and chapter 4. The “Appendix“ to this manual contains (amongst others) a list of all BL20 components and the assignment of electronics modules to base modules.

2.2.1 Gateways

The gateway connects the fieldbus to the I/O modules. It is responsible for handling the entire process data and generates diagnostic information for the higher-level master and the software tool I/Oassistant.

Gateways with integrated power supply

The BL20 gateways BL20-GWBR-DNET offer an integrated power supply unit for feeding the gateway and the connected I/O modules.

It is not necessary to supply each individual module with a separate voltage.

Figure 2-1: Gateway

Gateways without power supply

Note

The gateways without integrated power supply unit need an additional power supply module (bus refreshing module) which feeds the gateway an the connected I/O modules.

2.2.2 Power distribution modules

The power supply for gateways and I/O modules is fed to the power distribution modules; therefore, it is not necessary to supply each individual module with a separate voltage.

Figure 2-2: Power distribution module

2.2.3 Electronics modules

Electronics modules contain the functions of the BL20 modules (power distribution modules, digital and analog input/output modules, and technology modules).

Electronics modules are plugged onto the base modules and are not directly connected to the wiring. The assignment table in the Section “Ordering Information“ of the “Appendix“ shows the possible combinations of electronics and base modules. They can be plugged or pulled when the station is being commissioned or for maintenance purposes, without having to disconnect the field wiring from the base modules.

Figure 2-3: Electronics module in slice design

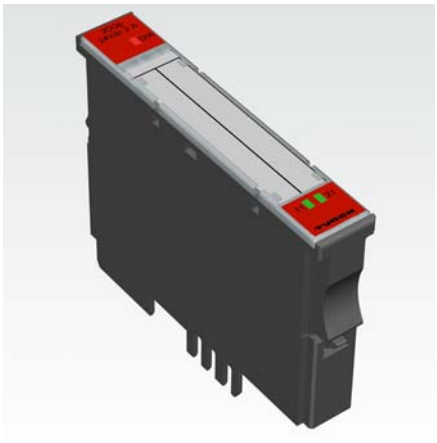
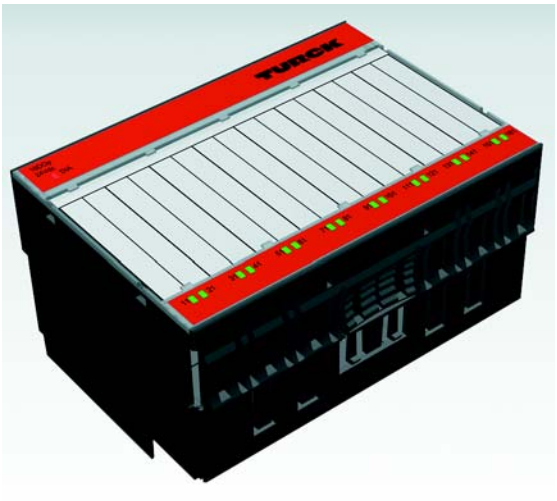


Figure 2-4: Electronics module in block design



2.2.4 Base modules

The field wiring is connected to the base modules. These are constructed as terminals in block and slice designs and are available in the following variations with either tension clamp or screw connections: 2-/3-wire (2-channel), 4-wire (2-channel) and 4x 2-/3-wire (4-channel).

The assignment table in the Section “Ordering Information“ of the “Appendix“ shows the possible combinations of electronics and base modules.

Figure 2-5: Base module with tension clamp connection

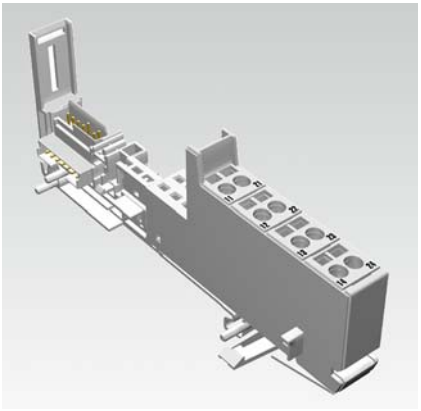


Figure 2-6: Base module with screw connection

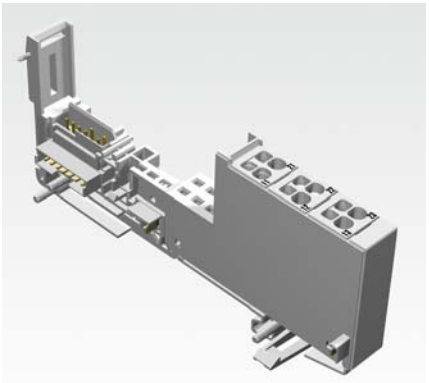
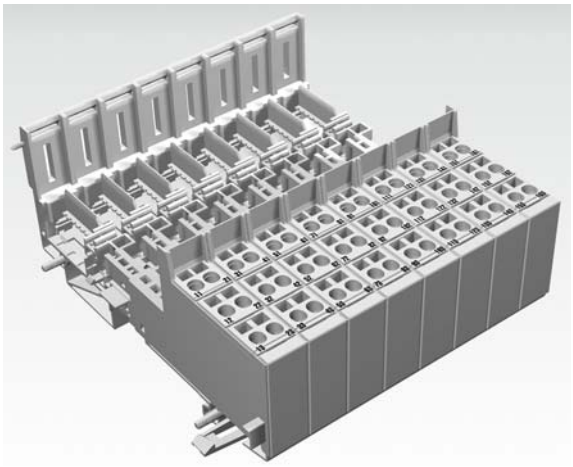


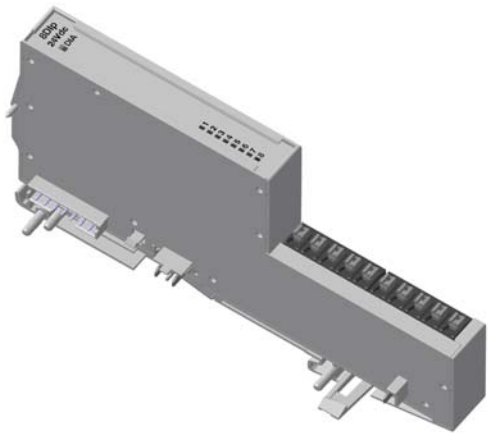
Figure 2-7: Base module in block design



2.2.5 BL20 Economy

With the BL20 Economy modules the electronics and connection technology is integrated into a single housing. Thus, the selection of a base module is unnecessary. Within a station the Economy modules can be combined with the modules with separate electronics/connection technology, provided that the base modules feature tension spring connections.

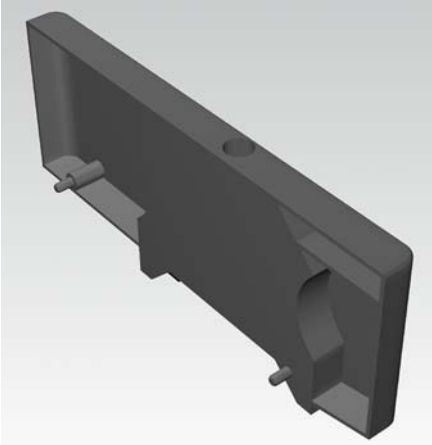
Figure 2-8: BL20 Economy



2.2.6 End plate

An end plate on the right-hand side physically completes the BL20 station. An end bracket mounted into the end plate ensures that the BL20 station remains secure on the mounting rail even when subjected to vibration.

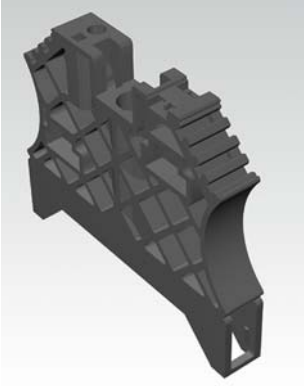
Figure 2-9: end Plate



2.2.7 End bracket

A second end bracket to the left of the gateway is necessary, as well as the one mounted into the end plate to secure the station.

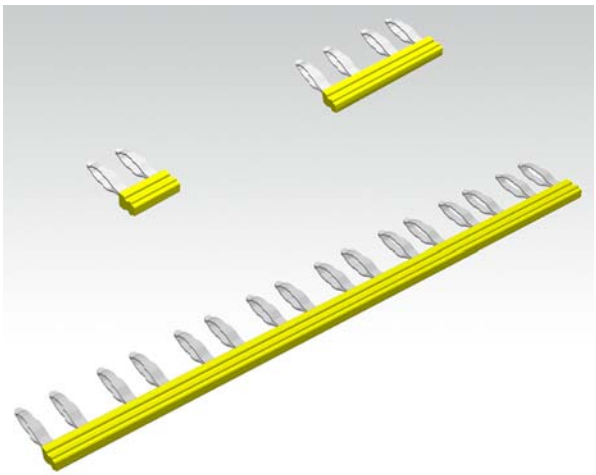
Figure 2-10: End bracket



2.2.8 Jumpers

Jumpers (QVRs) are used to bridge a connection level of a 4-wire base module. They can be used to connect potentials in relay modules (bridging the relay roots); thus considerably reducing the amount of wiring.

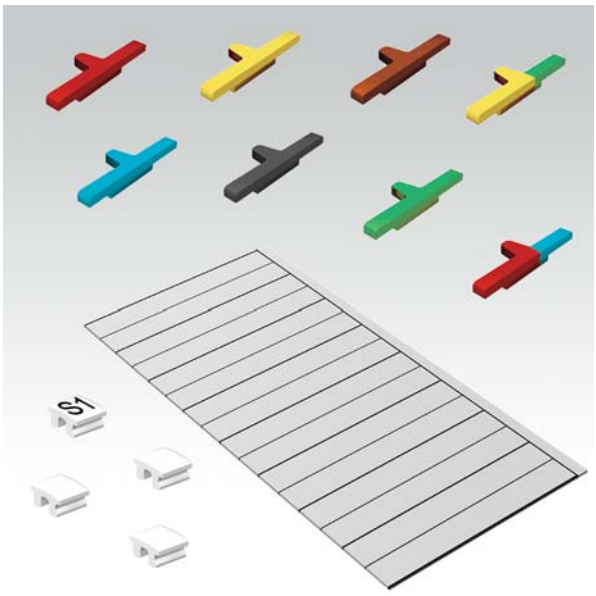
Figure 2-11: Jumpers



2.2.9 Marking material

- Labels: for labeling BL20 electronics modules.
- Markers: for colored identification of connection levels of BL20 base modules.
- Dekafix connector markers: for numbering the mounting slots on BL20 base modules.

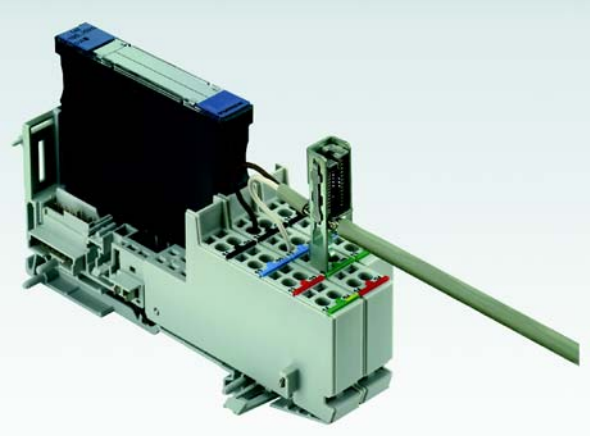
Figure 2-12: Marking material



2.2.10 Shield connection, 2-pole for analog modules

The 2-pole shield connection can be used to connect signal-cable shielding to the base modules of analog input and output modules. A special tension-clamp operating tool (BL20-ZBW5-2) is required to mount the shield connection onto the base module.

Figure 2-13: Shield connection



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3.1 General information about DeviceNet

3.1.1 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.

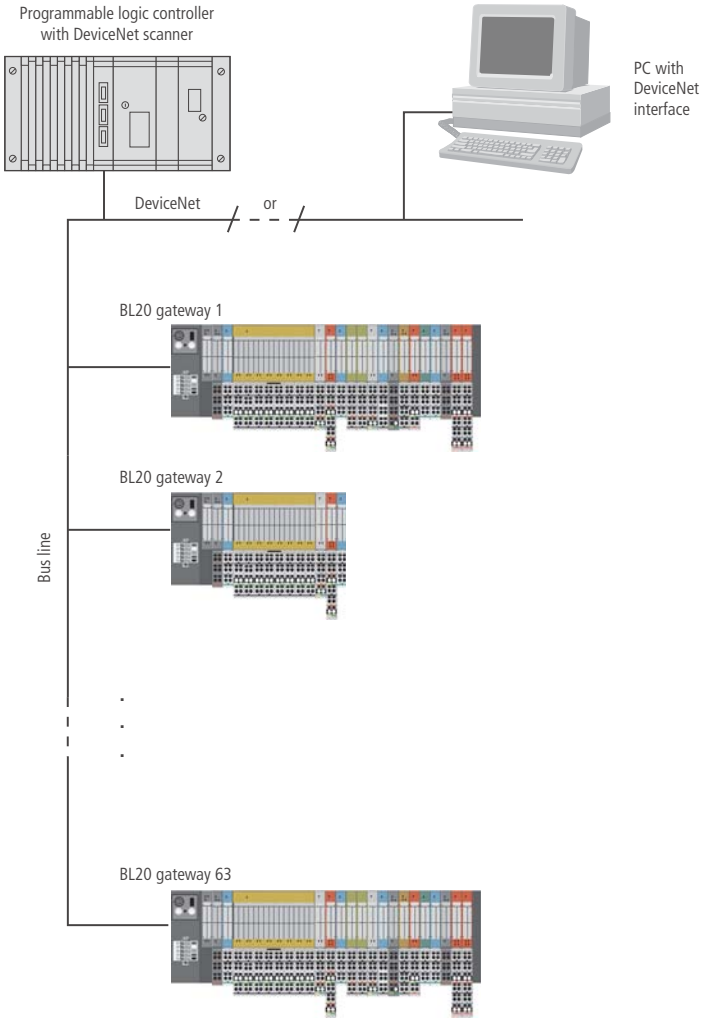
The DeviceNet protocol further defines message priorities such that I/O messages are given top priority and configuration messages have lower priority.

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.)

3.1.2 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.

Figure 3-1: Maximum system extension



3.1.3 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 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.

3.1.4 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.

3.1.5 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 webside (www.turck.com).

3.1.6 Communication rate / cycle time

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
- he 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.

3.1.7 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:

Table 3-1: Maximum cable length

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.

3.1.8 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 profile, 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.

3.2 Reading-in of station configuration without configuration tool

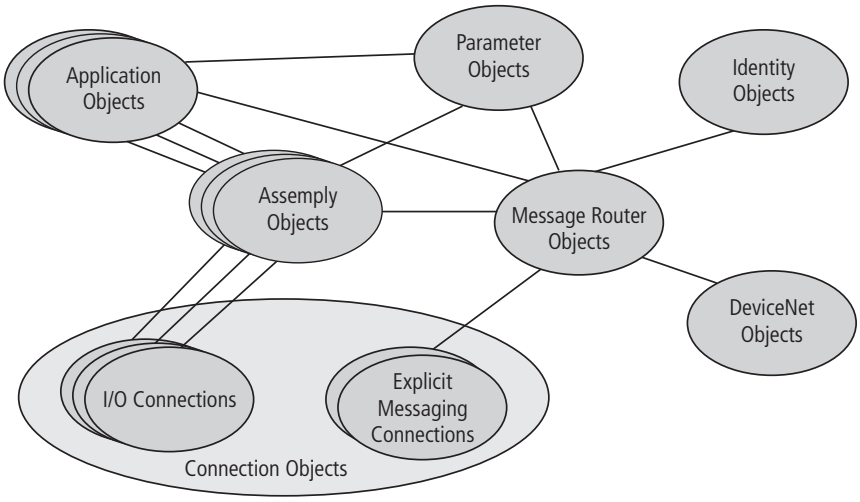
The current BL20 station configuration at the gateway is saved to the non-volatile Required Memory of the gateway when the SET button on the gateway is pressed, thus making it possible for the configuration to be read out by the DeviceNet scanner (please refer to chapter 4, BL20 Gateways for DeviceNet). This means that the BL20 Station can be configured without the need for a configuration tool.

3.3 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.

Figure 3-2: DeviceNet network



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

3.3.1 Management Objects

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

3.3.2 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.

3.3.3 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.

3.3.4 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.

3.3.5 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.

3.4 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.

3.4.1 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 a IO Messaging Connection Object 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.

3.4.2 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.

3.4.3 Predefined Master/Slave Connection Set

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)

3.4.4 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. The servers answer a request with 8 bytes as well.

UCMM

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

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.

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4.5

4.1 Introduction

This chapter contains a description of the BL20 gateways for the standardized fieldbus DeviceNet. The chapter is divided in to the following: a description of the functions, general and specific technical data, a description of address setting and the status indicators, the device profile, and the communications profile. In addition, it contains general explanatory notes about the DeviceNet fieldbus.

4.1.1 Function

The BL20 gateway makes it possible to operate a BL20 station on DeviceNet. The communication between the BL20 gateway and the higher-level controller complies with ODVA specification Rel. V2.0 and corresponds to the communications model described therein. It regulates the entire data traffic between the I/O level and the fieldbus. Information for the Software I/O-ASSISTANT is made available via the service interface.

Note

BL20 gateways for DeviceNet can only be used as DeviceNet-Servers.

The gateway supports the three DeviceNet baud rates 125 Kbit/s, 250 Kbit/s and 500 Kbit/s.

4.1.2 Versions

The gateways for the DeviceNet fieldbus system are available in two different versions:

- BL20-GW-DNET: this is the standard version of the gateway.
- BL20-GWBR-DNET: the complete functionality of the BL20-GW-DeviceNet is provided. In addition, a supply unit has been integrated into the gateway.

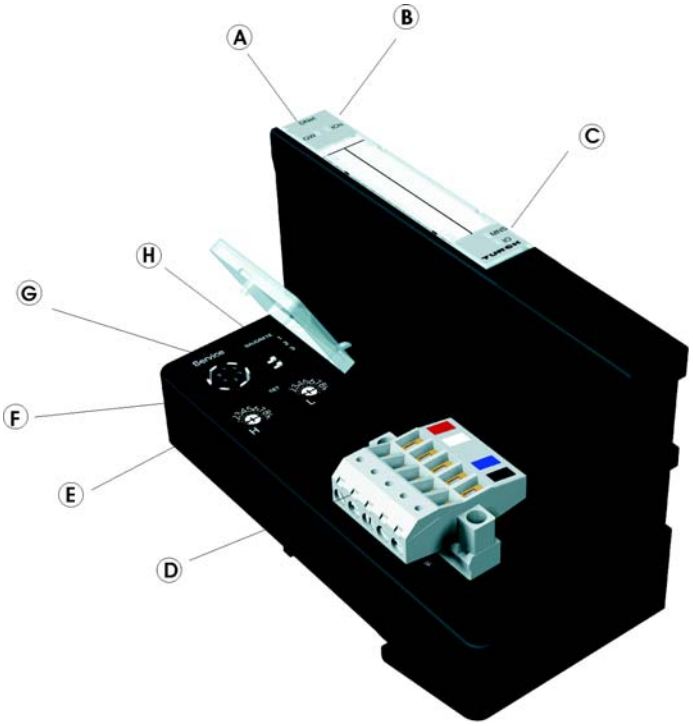


Figure 4-1: BL20-GW-DNET

A *Type designation*
B *LEDs for BL20 module bus*
C *LEDs for DeviceNet*
D *Fieldbus connection via Open Style connector (5-pole/ supplied with matching plug)*
E *Decimal rotary encoding switch to set the MAC ID*
F *Configuration button to accept the present station configuration*
G *Service interface*
H *DIP-switch to set the bit transmission rate*

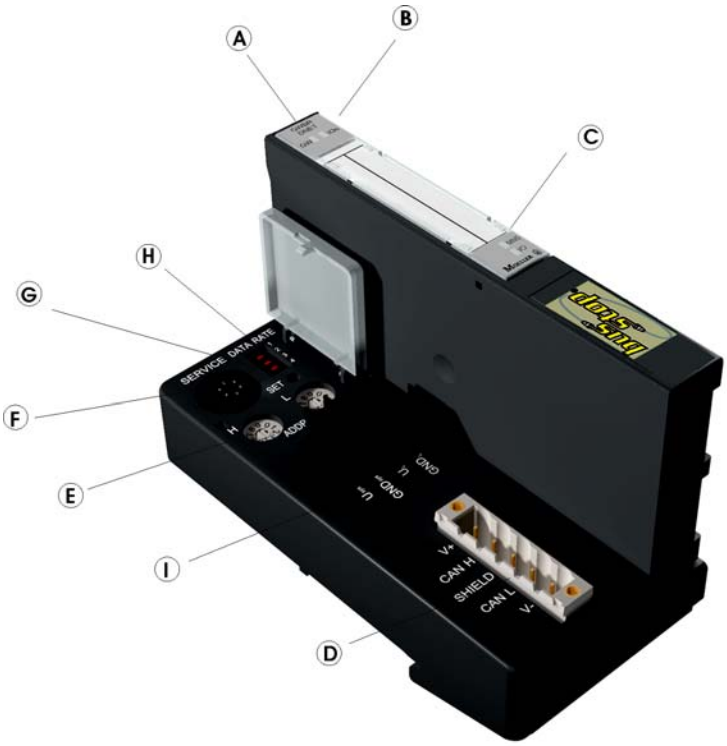


Figure 4-2: BL20-GWBR-DNET

A *Type designation*
B *LEDs for BL20 module bus*
C *LEDs for DeviceNet*
D *Fieldbus connection via Open Style connector (5-pole/ supplied with matching plug)*
E *Decimal rotary encoding switch to set the MAC ID*
F *Configuration button to accept the present station configuratio*
G *Service interface*
H *DIP-switch to set the bit transmission rate*
I *Screw terminals for field supply and system supply voltage*

4.1.3 Connection and setting options

The gateway has the following connection and setting options:

- **PS/2 female connector:** This is the service interface for connecting the gateway with the software tool I/O-ASSISTANT. This software allows BL20 station users to parameterize, configure and carry out diagnostics of their stations. The interface is a 6-pole mini DIN plug-in connection (female). Special connection cables or commercially available keyboard and adapter cables can be uses for connecting to a PC serial interface.
- **Open Style Connector:** the fieldbus connection is made via a DeviceNet Open Style Connector on the gateway and the appropriate DeviceNet female connector.
- **Two decimal rotary coding switches:** are used to set the DeviceNet address of the gateway.
- **DIP switches:** are used to set the baud rate and the bus terminating resistor.
- **SET button**: when the SET button is pressed, it saves the actual configuration of the station to the non-volatile memory of the gateway.

4.2 Technical data

4.2.1 General technical data

Relating to a station

Note

The auxiliary power supply must comply with the stipulations of SELV (Safety Extra Low Voltage) according to IEC 364-4-41.

Table 4-1: General technical data (station)

Supply voltage/ auxiliary voltage	
Nominal value (provision for other modules)	24 V DC
Permissible range	according to EN 61 131-2 (18 to 30 V DC)
Residual ripple	according to EN 61 131-2
Potential isolation	Yes, via optocoupler
Ambient conditions	
Ambient temperature	
– $t_{Ambient}$	0 to +55 °C / 32 to 131 °F
– t_{Store}	-25 to +85 °C / 13 to 185 °F
Relative humidity	according to IEC 61 131-2/ EN 50 178
Climatic tests	according to IEC 61131-2
Noxious gas	– SO^2: 10 ppm (rel. humidity < 75 %, non-condensing) – H_2S: 1.0 ppm (rel. humidity < 75 %, non-condensing)
Resistance to vibration according to IEC 61131-2	
10 to 57 Hz, Constant amplitude 0.075 mm / 0.003 inch, 1g	Yes
57 to 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	
Weight	< 10 kg
Height of fall	1.0 m / 39.37 inch
Weight	10 to 40 kg
Height of fall	0.5 m / 19.69 inch
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
– 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	
Interference criteria A: unrestricted operation, normal operating behavior	1 kV
Interference criteria B: temporary interference, normal operation possible	2 kV
Emitted interference according to EN 50 081-2 (Industry)	according to EN 55 011 Class A, Group 1
Reliability	
Operational life MTBF	min. 120000 h
Electronic modules pull/ plug cycles	20
Tests according to EN 61 131-2	
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
Temperature change	DIN IEC 68-2-14, temperature 0 to +55 °C / 32 to 131 °F, duration 2 cycles, temperature change per minute; device in use
Pollution severity according to IEC 664 (EN 61 131-2)	
Protection class according to IEC 529	IP20

Danger

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

Table 4-2: Approvals

Approvals
CE
CSA
UL

Base modules

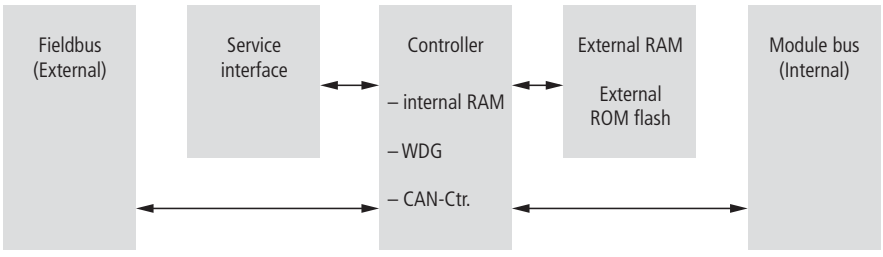
Table 4-3: technical data for base modules

Protection class	IP 20
Measurement data according to VDE 0611 Part 1/8.92/ IEC 947-7-1/1989	
Insulation stripping length	8 mm / 0.32 inch
Max. wire range	0.5 to 2.5 mm^2 / 0.0008 to 0.0039 $inch^2$ / 20 to 12 AWG
Crimpable wire	
"e" solid core H 07V-U	0.5 to 2.5 mm^2 / 0.0008 to 0.0039 $inch^2$ / 20 to 12 AWG
"f" flexible core H 07V-K	0.5 to 1.5 mm^2 / 0.0008 to 0.0023 $inch^2$ / 20 to 16 AWG
"f" with ferrules according to DIN 46228/1 (ferrules crimped gas-tight)	0.5 to 1.5 mm^2 / 0.0008 to 0.0023 $inch^2$ / 20 to 16 AWG
Plug gauge according to IEC 947-1/1988	A1
TOP connection technology	Tension clamp or screw connection

4.2.2 Structure diagram of a gateway

The BL20 DeviceNet gateway has the following structure:

Figure 4-3: Gateway structure



4.2.3 BL20-GW-DNET

Table 4-4: General technical data

Supply voltage		
	Nominal value	5 V DC (distribution by the Bus Refreshing module)
	Permissible range	4.8 to 5.2 V DC
	Restriction on EN61131-2	The supply energy required to bridge a supply interruption up to 10ms is not stored. Please secure the Usys for BL20-BR-24VDC-D modules by using an appropriate power supply unit!
Current consumption from module bus		
	Maximum	250 mA
Diagnostic Interface		
	Diagnostic interface	PS/2 socket
	Fieldbus connections	Open Style connector
	Fieldbus shielding connection	via DeviceNet cable
	Transfer rate	125 kBit/s, 250 kBit/s, 500 kBit/s
	Fieldbus termination	via DIP-switch
	2 decimal rotary encoding switches, labelled for setting the MAC ID of the gateway.	

4.2.4 BL20-GWBR-DNET

Table 4-5: General technical data

Supply		
Field supply		
	U_L Nominal value (range)	24 V DC (18 to 30 V DC)
	I_L max. field current	10 A
	Isolation voltage (U_L to U_{SYS}/ U_L to fieldbus/U_L to FE)	500 V_{eff}
	Connections	2-pole screw terminal
System supply		
	U_{SYS} nominal value (range)	24 V DC (18 to 30 V DC)
	I_{SYS} (for I_{MB} = 1.2 A/U_{SYS} = 18 V DC)	max. 900 mA
	I_{MB} (supply to the module bus stations)	1.2 A
	Isolation voltage (U_{SYS} to U_L/ U_{SYS} to fieldbus/U_{SYS} to FE)	500 V_{eff}
	Connections	2-pole screw terminal
Physical interfaces		
Fieldbus		50.6 x 114.8 x 74.4 / 1.99 x 4.52 x 2.93
	Transfer rate	125 kBit/s, 250 kBit/s, 500 kBit/s
	Isolation voltage (fieldbus to U_{SYS}/ fieldbus to U_L/fieldbus to FE)	500 V_{eff}
	Fieldbus connections	Socket: MSTBV 2,5/5-GF-5.08 GY AU/Phoenix Contact
		Plug: ™ STBP 2,5/5-STF-5.08 AB GY AU/Phoenix Contact (included in delivery)
	Fieldbus shielding connection	Via connector
	MAC ID setting	2 rotary decimal encoding switches
	Service Connections	PS/2 socket

4.2.5 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 field bus DeviceNet.

Table 4-6: Pin assignment of the DeviceNet female connector

1,2 - red	V +	Supply voltage (24 V DC)
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

Figure 4-4: DeviceNet female connector (top: connection level)

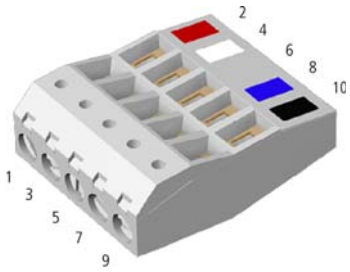


Figure 4-5: DeviceNet female connector (viewed from below)

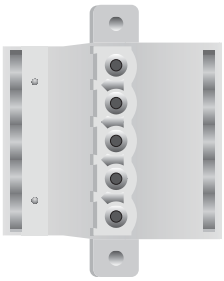


Figure 4-6: DeviceNet male connector on the gateway

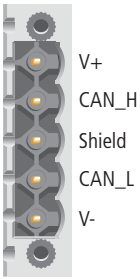
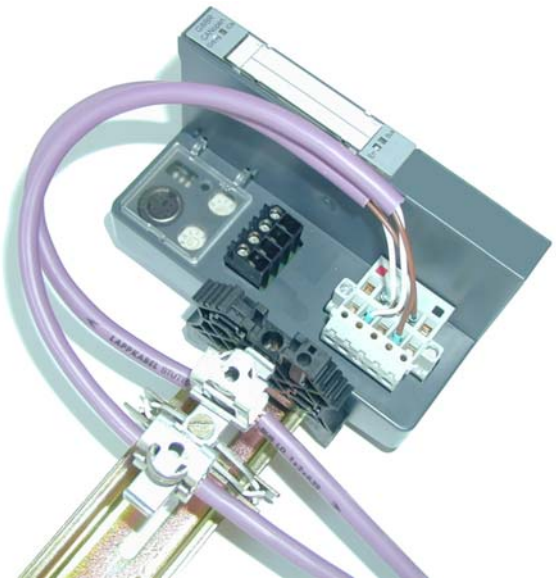


Figure 4-7: Shielding connection for an BL20-GWBR-DNET



Attention

No compensating current should flow through the shielding.
To achieve this, a reliable system of equipotential bonding must be installed.

4.3 Service interface connection

Two types of cables can be used to utilize the service interface of the gateway for the purpose of connecting a PC with the
I/O-Assistant (engineering and diagnostic software).

- BL20 connection cable (BL20-PS2-CABLE)
- Commercially available PS/2 cable with adapter cable

The pin assignments differ in these two options.

4.3.1 Connection with BL20 cable

BL20 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).

Figure 4-8: PS/2 male connector on the connection cable to the gateway (top view)

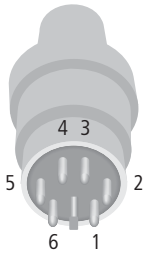
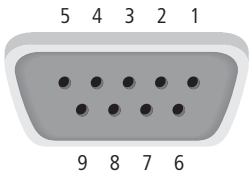


Figure 4-9: 9-pole SUB-D female connector on the cable for connecting to PC (top view)



The table below shows the pin assignments when using a PS/2 cable and adapter cable:

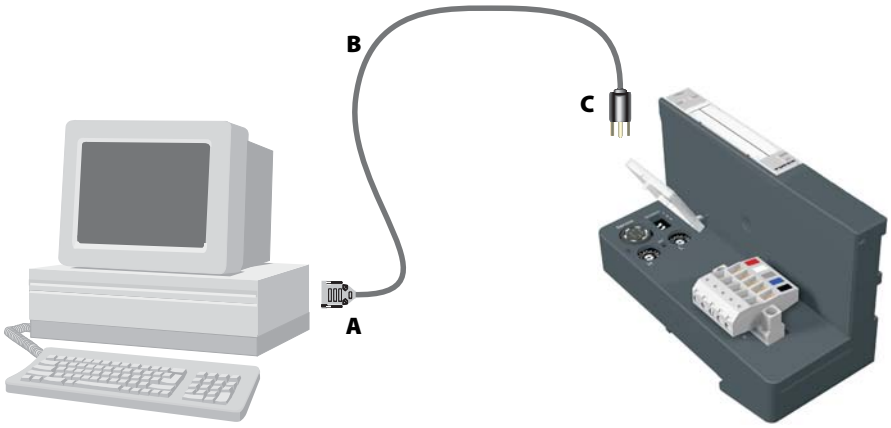
Table 4-7: Pin assignment when using PS/2 cable and adapter

A *This connection is not supported by all adapter cables.*

PS/2			**9-pole serial interface on PC**	
Pin	**Standard PS/2 male connector**	**Gateway: PS/2 female connector**	**Pin**	**Male connector**
1	CLK	+5V Gw	4, 6 **A**	DTR, DSR
2	GND	GND	5	GND
3	DATA	–	–	–
4	n.c. (DATA2)	TxD	2	RxD
5	+5V	/CtrlMode	7	RTS
6	n.c. (CLK2)	RxD	3	TxD

Figure 4-10: Connection between a PC and BL20 gateway via a BL20 connection cable

A *SUB-D female connector*
B *BL20 connection cable*
C *PS/2 male connector*



4.3.2 Connection using commercially available cables

A further option to connect the service stations and the BL20 gateway is to use commercially available connection and adapter cables.

The following two cables are necessary:

- 1 x PS/2 cable (PS/2 male connector/PS/2 male connector) (commercially available keyboard extension cable)
- 1 x adapter cable (PS/2 female connector/SUB-D female connector) (commercially available extension cable for a PC mouse)

Figure 4-11: PS/2 female connector on the gateway (top view)

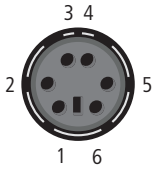
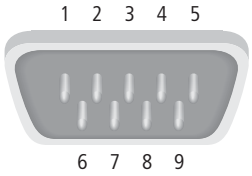


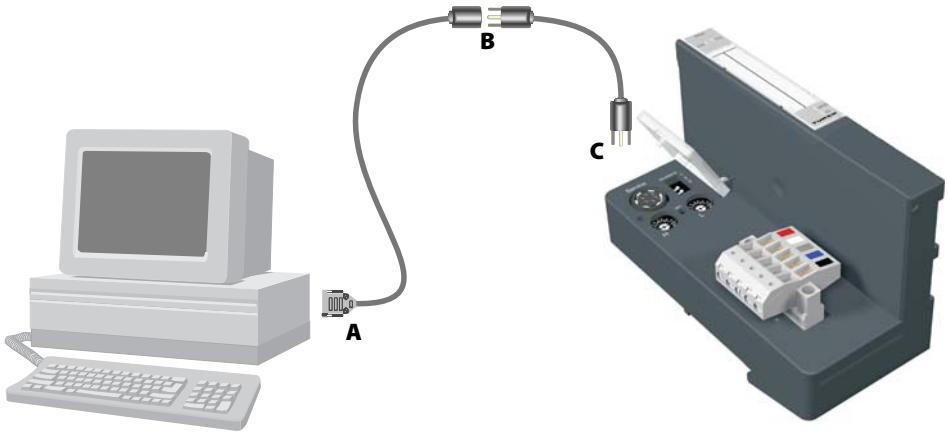
Figure 4-12: 9-pole SUB-D male connector on a PC (top view)



The following graphic of a PS/2 male connector / PS/2 male connector connection is a 6-wire 1:1 connection.

Figure 4-13: Connection between a PC and BL20 gateway using a commercially available cable

A *SUB-D female connector*
B *PS/2 female connector <–> PS/2 male connector*
C *PS/2 male connector*



4.4 Setting up communications

4.4.1 Address setting

The address setting of the DeviceNet gateway on DeviceNet is performed via two decimal rotary coding switches on the gateway. These switches are positioned under a cover just below the service interface.

Figure 4-14: Rotary coding switches for address setting

Attention

DeviceNet allows a maximum of 64 addresses (MAC IDs) to be assigned (00 to 63). Each address may be allocated only once in the entire bus structure.

The rotary coding switches are marked with H for high (1. digit of the double-digit decimal number) and L for low (2. digit of the double-digit decimal number). Thus, the switch marked L is used to set the digits 0 to 9, and the switch marked H is used to set the digits 0 to 6.

It is not necessary to address the module bus.

Note

The protective cover for the rotary coding switches must be closed once the address setting procedure is complete.

4.4.2 Setting the baud rate

Figure 4-15: DIP switches for setting the baud rate and connecting the bus terminating resistor

The baud rate is set with the aid of the DIP switches on the gateway. One of three possible baud rates will be supported depending on the setting:

Table 4-8: Setting the baud rate

Baud rate (kbit/s)	DIP switch (position)	
	No. 1	No. 2
125	0	0
250	0	1
500	1	0
Reserved	1	1

Note
All other switch settings can lead to error messages. Switch No. 3 has no function.

4.4.3 Connecting the bus terminating resistor (only for BL20-GW-DNET)

The bus terminating resistor can be connected via the DIP switch number 4 on the gateway.

Table 4-9: Connecting the terminating resistor

Bus termination	DIP switch (position)
	No. 4
Not connected	0
Connected	1

Note

Switching in the termination resistor through a DIP-switch is only possible with BL20-GW-DNET! On BL20-GWBR-DNET an external terminating resistor has to be used!

4.4.4 Accepting a BL20 configuration

The DeviceNet gateway has three different memory areas available for saving the station configuration (number and type of the I/O modules that follow the gateway, and module parameter settings).

- **Actual Configuration Memory**
  Saves data of modules that follow the gateway and their parameter settings.
- **Temp-Required Configuration Memory**
  Temporary memory for the station configuration, should this, for example, be altered by a configuration tool.
- **Required Configuration Memory**
  Non volatile memory of the complete station configuration. The list of modules contained in the Required Memory serves as a reference list for the exchange of process data.

4.4.5 SET button

The Current Configuration of the station is saved as the Actual Configuration when the SET button on the gateway is pressed for approx. 10 seconds; it is also saved to the both the Temp-Required Configuration Memory and the Required Configuration Memory. The LED "GW" flashes.

Table 4-10: SET button for accepting the Current Configuration of the station

4.4.6 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").

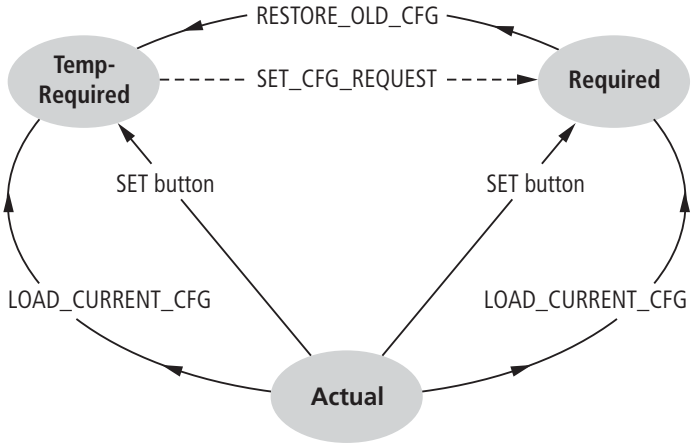
The command LOAD_CURRENT_CFG (VSC100, Object instance 2, Attribute No. 112) loads the Current Configuration of the station from the Actual Configuration Memory into the Temp-Required and Required Configuration Memories.

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.

Figure 4-16: 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 5.

4.5 Status indicators

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 IO

Table 4-11: LED indicators

LED	Status	Meaning	Remedy
GW	^	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 LED IOs red	Firmware not active, software download necessary	Re-install the firmware or contact your Turck representative.
	Additional diagnosis indication for BL20-GWBR-DNET		
	green, blinking, 1 Hz	U_{SYS}: undervoltage or overvoltage U_L: undervoltage V+: undervoltage (Open Style connector)	Check that the supply voltage is within the permissible range.
GW	Green flashing fast, 4 Hz	Firmware active, gateway hardware defect.	Replace the gateway.
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/Oassistant.	Deactivate the force mode of the I/Oassistant.
	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.

Table 4-11: LED indicators

LED	Status	Meaning	Remedy
IOs	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..

Table 4-12: LED indicators

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 field bus connector has been pulled. Check the 24 V fieldbus voltage.
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.	-

4.6 Device profile of the BL20 DeviceNet gateway

The BL20 DeviceNet gateway is based on the communications adapter profile according to ODVA specifications Rel. V2.0 (ODVA: Open DeviceNet Vendor Association).

It supports the following classes:

Table 4-13: Supported classes

Standard DeviceNet Classes	**Class Code**	
	dec.	hex.
Identity Class	1	01
Message Router Class	2	02
DeviceNet Class	3	03
Assembly Class	4	04
Connection Class	5	05
Off-link Connection Manager Class	6	06
Acknowledge Handler Class	43	2B
Vendor Specific Classes, see page 10-1.		

4.6.1 VSC-Vendor Specific Classes

As well as supporting the above standard DeviceNet classes, the DeviceNet gateway supports the following Vendor Specific Classes:

Table 4-14: VSC-Vendor Specific Classes

Class Code		**Name** → Description
dec.	hex.	
100	64	**Gateway Class** → Contains data and settings concerning the gateway and the BL20 system as a whole.
101	65	**Terminal Slot Class** → Contains data concerning the base modules
102	66	**Process Data Class** →Contains the entire process data
104	68	**Digital Input Module Class** → Describes the modules of the type BL20-*DI-*
105	69	**Digital Output Module Class** → Describes the modules of the type BL20-*DO-*
106	6A	**Analog Input Voltage Module Class** → Describes the modules of the type BL20-*AI-U*
107	6B	**Analog Output Voltage Module Class** → Describes the modules of the type BL20-*AO-U*

Table 4-14: VSC-Vendor Specific Classes

Class Code		**Name** → Description
108	6C	**Analog Input Current Module Class** → Describes the modules of the type BL20-*AI-I*
109	6D	**Analog Output Current Module Class** → Describes the modules of the type BL20-*AO-I*
110	6E	**Analog Input RTD Module Class** → Describes the modules of the type BL20-*AI- PT/NI
111	6F	**Analog Input THERMO Module Class** → Describes the modules of the type BL20-*AI-THERMO-PI
112	70	**Counter Module Class** → Describes the modules of the type BL20-*CNT-*
114	72	**RS232 Module Class** → Describes the modules of the type BL20-1RS232
115	73	**RS485/422 Module Class** → Describes the modules of the type BL20-1RS232
116	74	**SSI Module Class** → Describes the modules of the type BL20-1SSI

4.7 Behavior by module replacement

BL20 modules can be replaced for maintenance purposes when the station is either online or offline.

The module bus communication continues without problem if the new module is of the same type as the old module; reference criterion is the identical catalogue number. All previously carried out parameter settings are saved in the non-volatile memory of the gateway; thus allowing them to be entered in to the new module from the gateway.

Any deviation between the new and the old station configuration will be indicated by flashing LED "IOs" (please refer to Section "Status Indicators").

Note

If the current configuration of the station and the altered station configuration do not match, meaning, if the new module differs from the pulled module, the LED IOs flashes red. The new module does not take part in exchanging process data; the process data are set to "0".

4.7.1 Replacing a gateway

It should be observed that those parameter settings of the gateway being replaced that differ from the gateway default parameters are not accepted.

The stations can be put in to operation again without the need for configuration tools. Once a gateway has been replaced, the station's configuration is saved in the new gateway by pressing the SET button.

The module parameters are all aved in the non-volatile memory of the modules, and can be read out by the gateway pressing the SET button.

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5.1 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.

5.2 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 6827005V1_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.

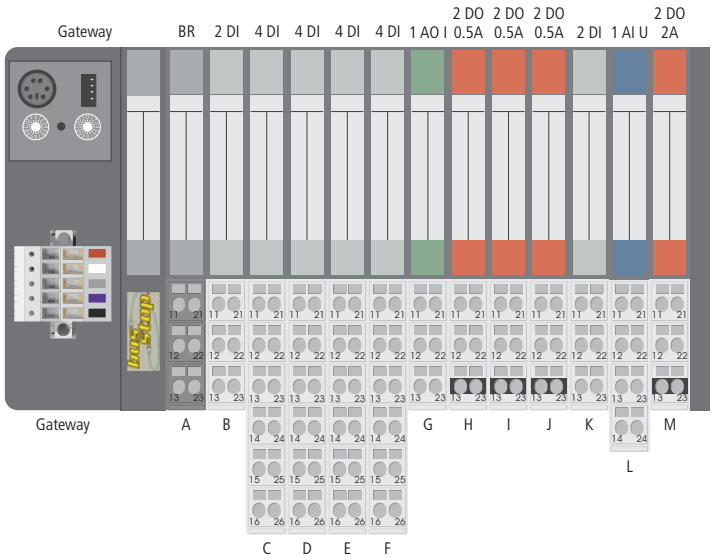
	6827xxxVy.eds	**6827xxxVy_SP.eds**
Engineering	online / offline	online / -
ADR	3	–
Supported instances	F 74 (incl. Power supply modules)	
Gateway parameterization	3	3
Monitoring	Diagnostic/Parameter	Diagnostic/Parameter/Input/ Output
Maximum of each module type, configurable with the EDS-file. (Do not exceed the max. number of supported instances; necessary number of power supply modules has to be planned additional)	16 BL20-xAI-I 16 BL20-xAI-U 16 BL20-xAI-PT/NI-2/3 16 BL20-xAI-THERMO-PI 16 BL20-xAO-I 16 BL20-xAO-U 8 BL20-1CNT-24VDC 32 BL20-xDI-x 32 BL20-xDO-x	71 BL20-xAI-I 71 BL20-xAI-U 71 BL20-xAI-PT/NI-2/3 71 BL20-xAI-THERMO-PI 71 BL20-xAO-I 71 BL20-xAO-U 31 BL20-1CNT-24VDC 72 BL20-xDI-x 72 BL20-xDO-x
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

5.3 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

Figure 5-1: Example station



5.3.1 Data mapping for gateways with Maj. Rev. < 5.0

Table 5-1: Process image of example station

Produced Data (Word No.)	**Input Data (WORD Format) (Bit 15...→...0)**
0	Status Word of the Gateway (Mapping can be disabled via VSC100, instance 2., attr. 132 (84h), page 10-10)
1	E3, ..., E0; D3, ..., D0; C3, ..., C0; B1, B0
2	K1, K0, F3, ..., F0
3	L15, L14, ...L1, L0
Consumed Data (Word No.)	**Output Data (WORD Format) (Bit 15...→... 0)**
0	Control Word of the Gateway (Mapping can be disabled via VSC100, instance 2., attr. 133 (85h), page 10-10)
1	G15, G14, ... G1, G0
2	M1, M0, J1, J0; I1, I0; H1, H0
3	-

The example station transmits 4 word input data and 3 word input data accordingly.

5.3.2 Data mapping for gateways with Maj. Rev. ≥ 5.0

Table 5-2: Data mapping for gateways with Maj. Rev. ≥ 5.0

Produced Data (Word No.)	**Input Data**
0	Status Word of the Gateway (Mapping can be disabled using attr. 138 in VSC 100, Object instance 2, page 10-9)
1 to n	Input data of modules (without RFID).
n + x	RFID status word of variable length. Values from "0 = disabled" to "2 = full: 6 bytes". See VSC 102, Table 10-12: Object instance 6, RFID status interface instance.
n + y	Summarized diagnostic data (page 5-7). Can be enabled/disabled using VSC102, Object instance 3, attr. 104, page 10-15.
n + z	Scheduled diagnostic data (page 5-8). Can be enabled/disabled using VSC102, Object instance 3, attr. 105, page 10-15.
Consumed Data (Word No.)	**Output Data**
0	Control Word of the Gateway (Mapping can be disabled using attribute 139 "GW CONTROL REGISTER" in Gateway class (VSC 100), Object instance 2, page 10-10)
1- n	Output data of the modules (without RFID).
n + x	RFID control word of variable length. Values from "0 = disabled" to "200". See VSC 102, Table 10-11: Object instance 5, RFID command interface instance.

Note

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

5.4 Diagnostic options

5.4.1 Summarized diagnostics

Note

The Summarized Diagnostics possibility is only implemented in gateways with Maj. Rev. ≥ 5.0.

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 pullled (acc. to VSC 100, Gateway Class, Attr. 116, page 10-9).

The diagnostic bits are placed at the end of the input data. The diagnostic data start WORD aligned (see page 5-7).

5.4.2 Scheduled diagnostics

Note
The Scheduled Diagnostics possibility is only implemented in gateways with Maj. Rev. ≥ 5.0.

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, page 10-9)
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 diagnositic data (see page 5-6).

5.5 Status word of the gateway

The Status Word of the gateway is assembled as follows::

Table 5-3: Meaning of the status bit

Status Bit No.	Designation	Meaning
0 to 7	MESSAGE REGISTER	The Message Register of the Status Word is considered as a group of 8 bits (00h to FFh). The list of message and error codes are contained in the tables below: – Table 5-4: Status Word Message Codes – Table 5-5: Status Word 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 is active, meaning, the outputs are being controlled by the I/O-ASSISTANT.
Status Bit No.	**Designation**	**Meaning**
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 **A**	The fieldbus voltage supply at the fieldbus connector is not guaranteed.
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 Word. The execution of a command from the Command Register (Control Word) is confirmed by setting this bit.

A *This bit can only be read out by the I/O-ASSISTANT via the service interface on the gateway.*

Table 5-4: Status Word 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.

Table 5-5: Status Word Error Codes

A This status can only be read out by the I/O-ASSISTANT via the service interface on the gateway.

Error Codes	Designation	Description
80h to CF	Reserved	-
D0h	DUP MAC ID ERROR **A**	The Duplicate MAC ID Check has failed, because there is a module on the network with the same MAC ID.
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 **A**	Internal error. Gateway replacement required.
E1h	ROTARY CODING SWITCH, DIP SWITCH ERROR **A**	
E2h	ROM/FLASH CRC ERROR **A**	
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.

5.6 Control word of the gateway

The Control Word of the gateway is assembled as follows:

Table 5-6: Meaning of the control bit

Control Bit No.	Designation	Meaning
0 to 7	COMMAND REGISTER	The Message Register of the Status Word is considered as a group of 8 bits (00h to FFh). The list of Command Codes is contained in Table 5-7: Control Word 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).

Table 5-7: Control Word 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	
Command Codes	**Designation**	**Description**
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	-

5.7 Maximum topology

A bus line consists of at least two slaves. It is only possible to connect a BL20 station to the DeviceNet network via the BL20 gateway.

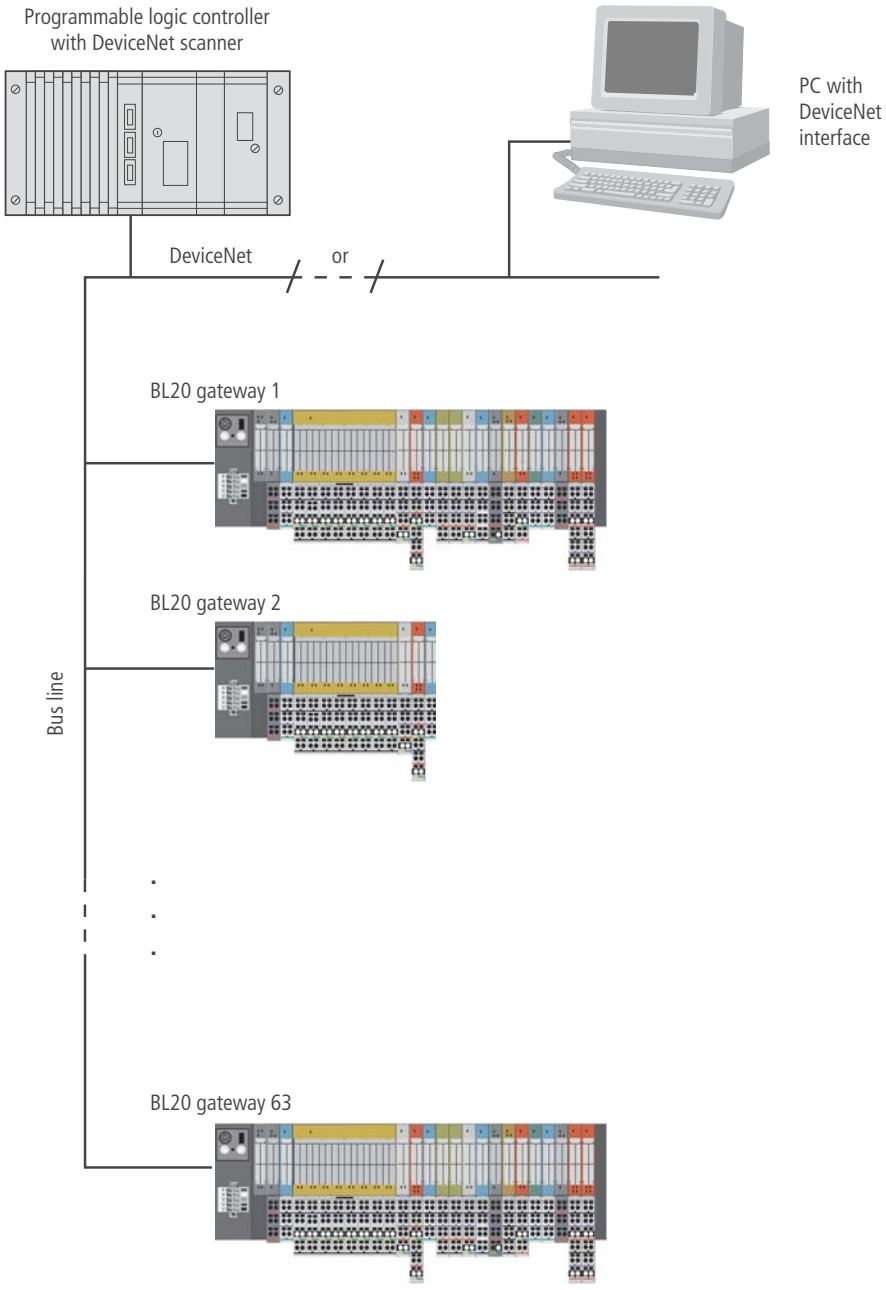
Incoming and outgoing cables are connected using an Open Style Connector in accordance with ODVA specifications. Every BL20 gateway operates as an active slave and occupies one bus address.

5.7.1 Maximum system extension

A DeviceNet bus line can consist of a maximum of 64 slaves. This maximum number must not be exceeded.

The bus addresses 00 to 63 can be set using the decimal rotary coding switches on the gateway. It is not possible to allocate address directly via the bus.

Figure 5-2: Maximum system extension



5.8 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 profile, 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.

5.9 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 when the SET button on the gateway is pressed, thus making it possible for the configuration to be read out by the DeviceNet scanner (please refer to chapter 4, BL20 Gateways for DeviceNet). This means that the BL20 Station can be configured without the need for a configuration tool.

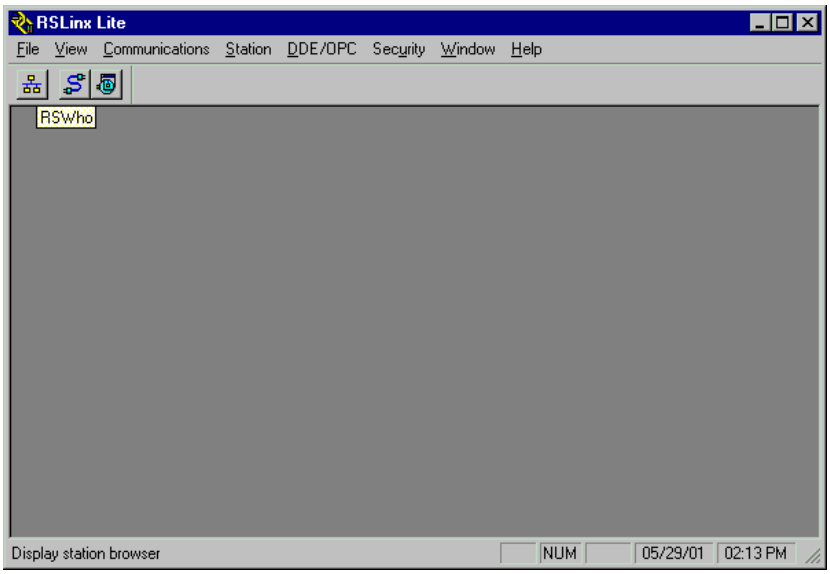
5.10 Connection to the controller SLC 500 from Allen Bradley

5.10.1 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.

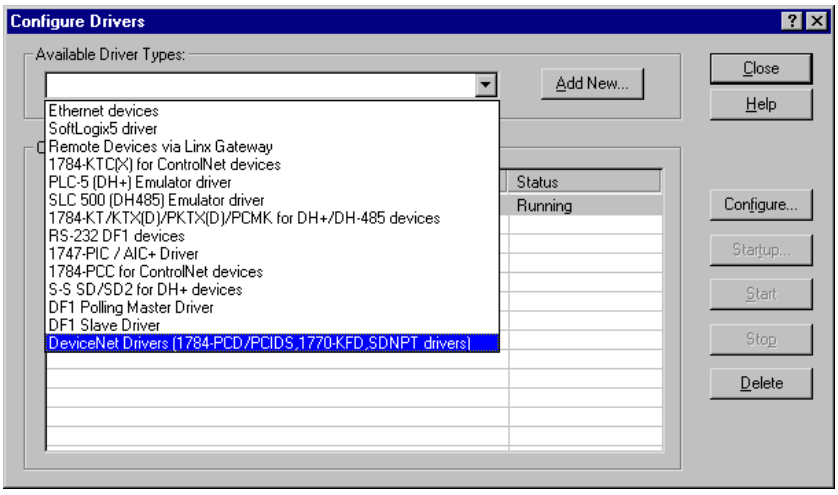
The following explains the creation of a connection via the node 1770-KFD.

Figure 5-3: Software "RSLinx" from Allen Bradley



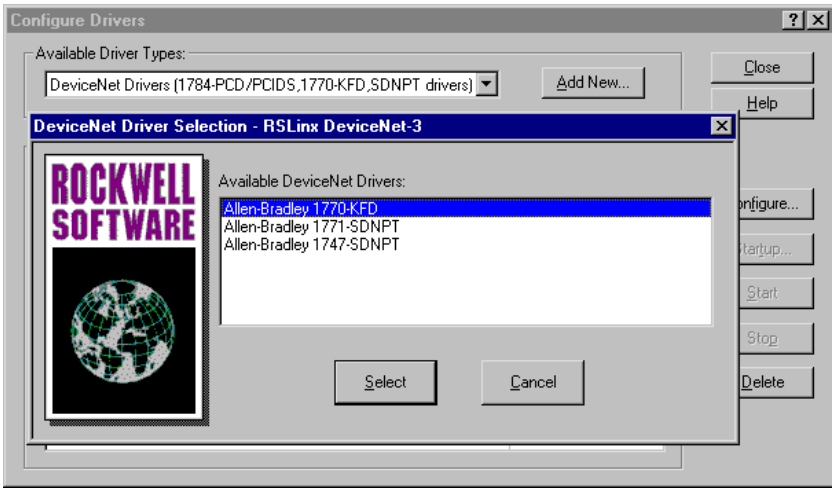
The selection of the DeviceNet Driver module is made using the "Communications → Configure Drivers" command.

Figure 5-4: Selecting the driver type category



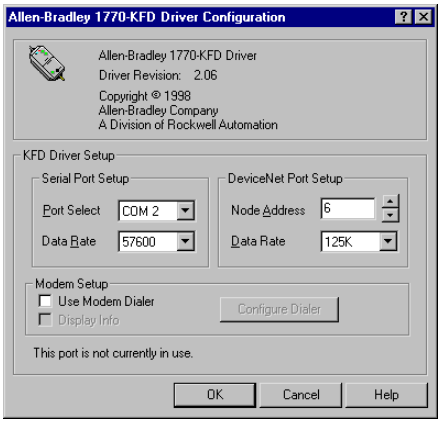
Once the type of device has been selected, click the "Add new" button to select the driver module, for example, the 1770-KFD.

Figure 5-5: Selecting the DeviceNet Driver module



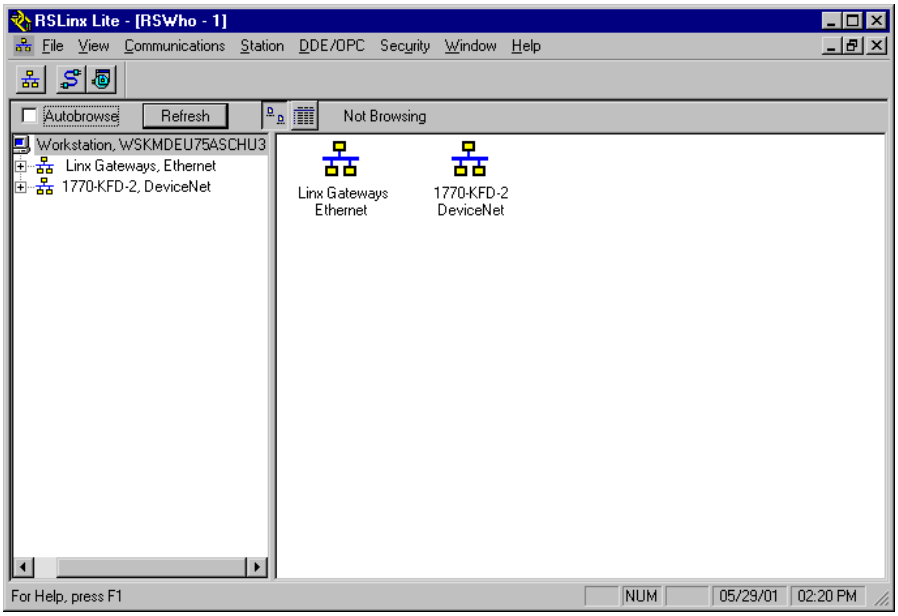
The node is configured in the window that opens, which means for example, that the data transmission rate, the serial interface, the node address as well as the baud rate are entered.

Figure 5-6: Configuring the 1770-KFD



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

Figure 5-7: Depicting the DeviceNet network in RSLinx



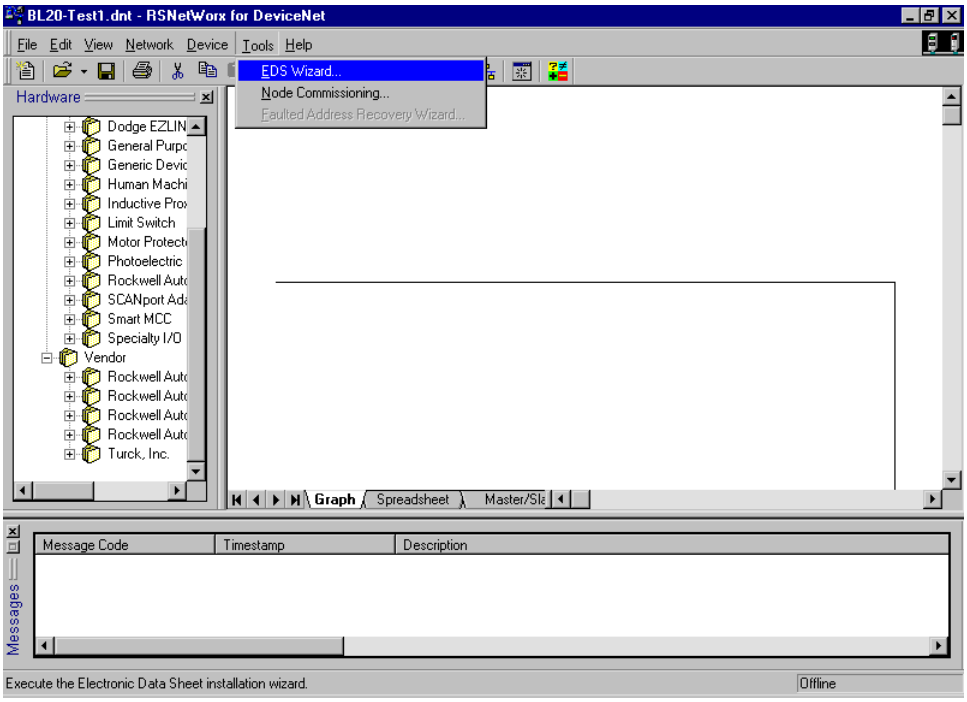
5.10.2 Configuring the DeviceNet network with RSNetworx

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

Reading in the EDS File

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

Figure 5-8: Opening the EDS Wizard

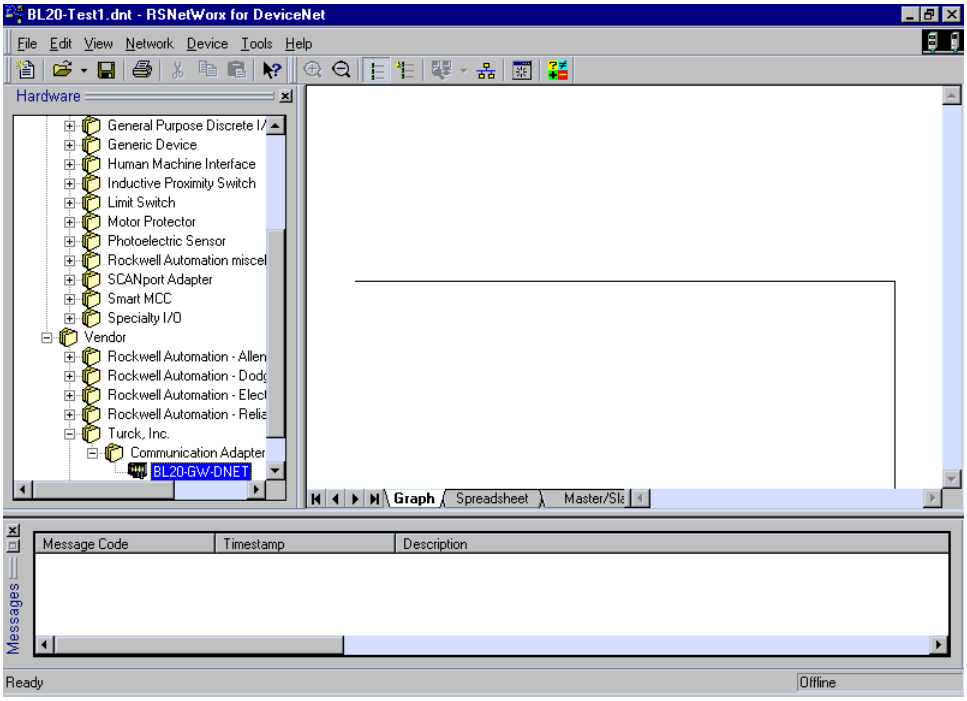


Click the "Register an EDS file(s)" button to add the EDS file to be registered to the program's database, in this case the 6827005V1.eds.

Figure 5-9: Registering the EDS File

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

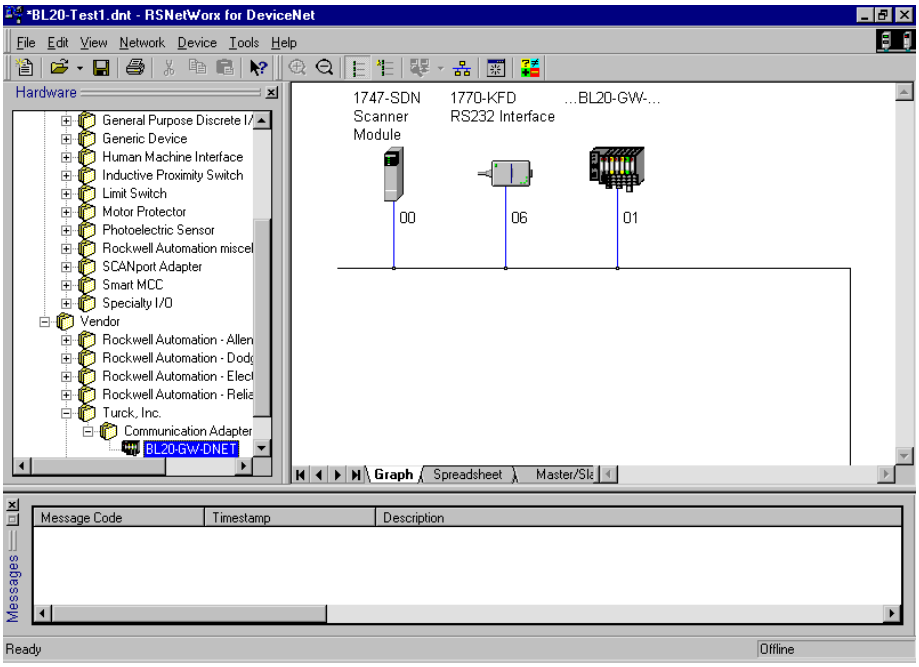
Figure 5-10: Hardware catalog with BL20 gateway



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.

Figure 5-11: Selecting the BL2mp0 gateway



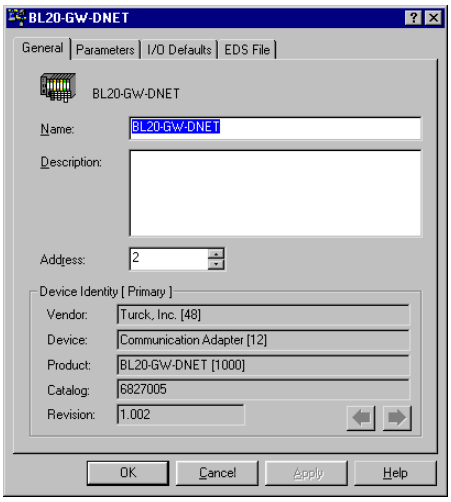
Note

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.

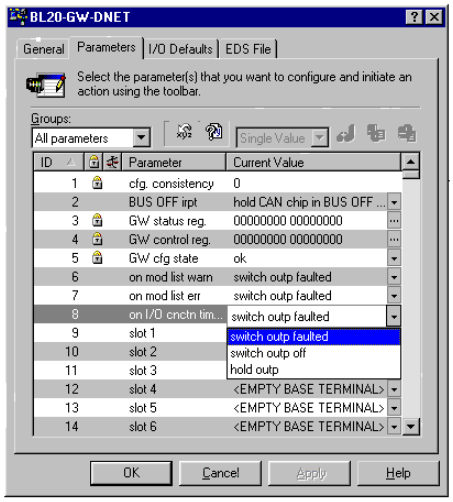
Figure 5-12: Setting the node address of the BL20 gateway



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.

Figure 5-13: Setting the Gateway Parameters



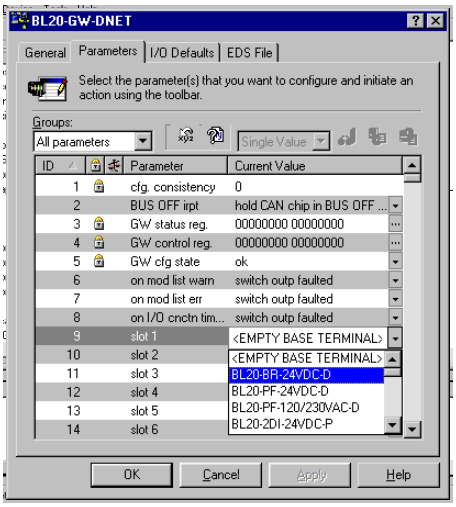
The gateway parameters occupy the lines "cfg. consistency" to "on I/O cnctn timeout". The following Ids are reserved for the BL20 I/O modules.

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.

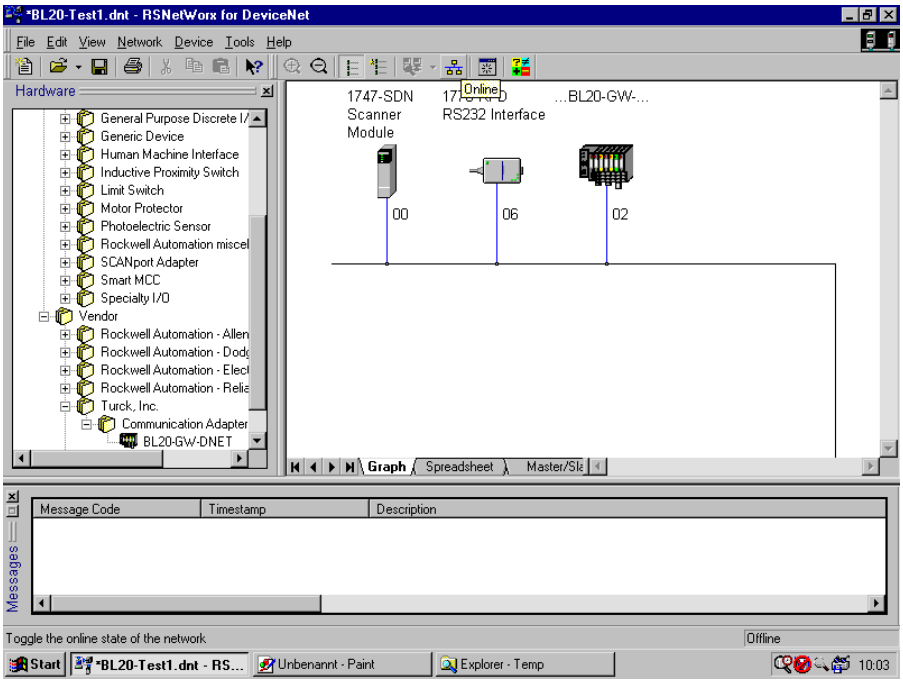
Figure 5-14: Selecting the BL20 modules



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.

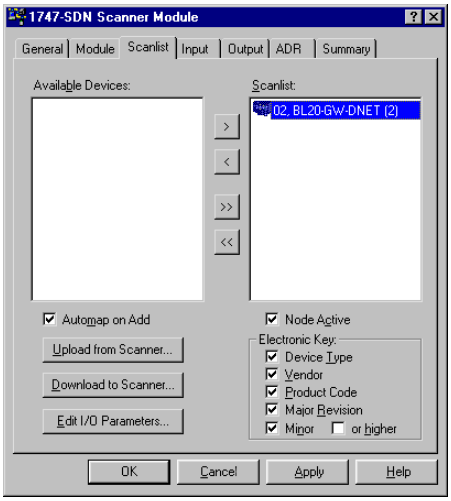
Figure 5-15: Changing to the online mode



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

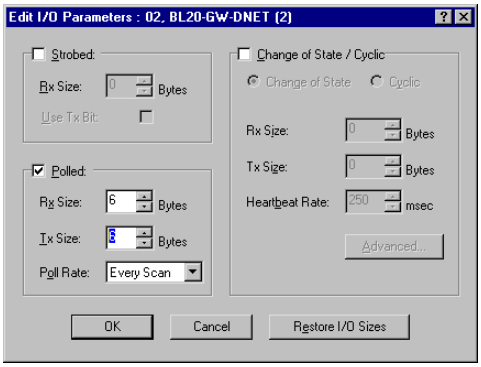
In order for the 1747-SDN Scanner Module of the SLC 500 to be able to communicate with the BL20 gateway the BL20 gateway has to be included in the scan list of the 1747-SDN Scanner Module.

Figure 5-16: 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.

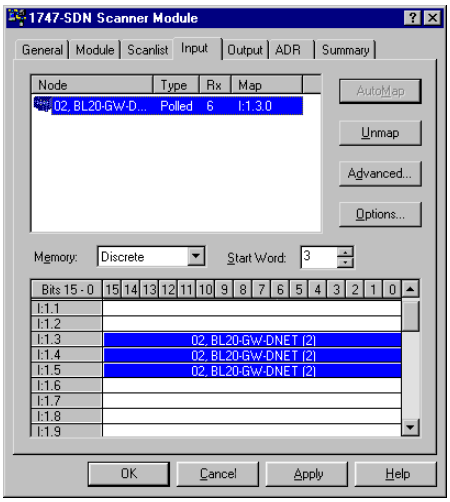
Figure 5-17: Setting the type of data transmission



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.

Figure 5-18: Mapping the input data

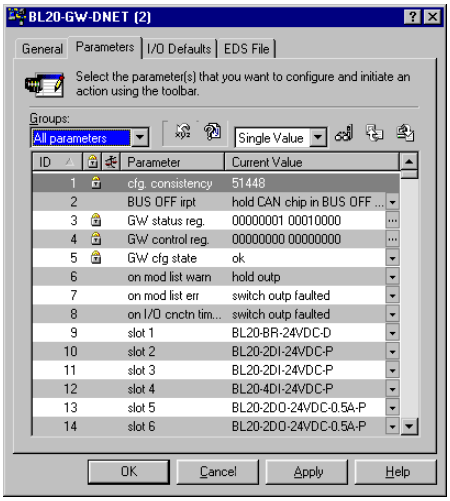


Parameterization and diagnostic of the BL20 station

Double-click the BL20 gateway icon to open the ”BL20-GW-DNET” window. The diagnostics of all the modules on the BL20 station are contained in the tabbed page ”Parameters”.

The lines "cfg. consistency" to "on I/O cnctn timeout" relate to the gateway, thereafter the BL20 modules follow in the order in which they were plugged in the station.

Figure 5-19: Station parameters

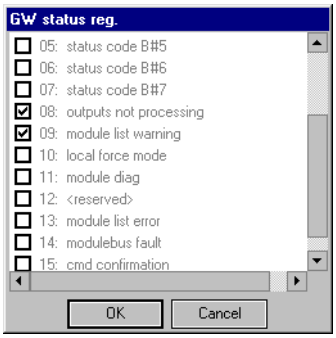


Status word and control word of the gateway

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

The following shows the Status Word 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.

Figure 5-20: Status Word with "module list warning"



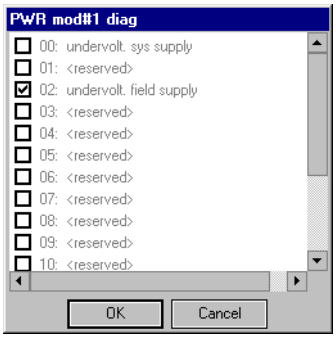
Please refer to Table 5-4: and Table 5-5: for a detailed description of the Status Word and the Control Word as well as their bit assignments.

BL20 station diagnostics

Select the module group from the pull-down menu "Groups" for which the parameters and diagnostics are to be displayed.

As an example, the following indicates that the field voltage „undervolt. field supply" is not available for a Bus Refreshing module from the module group "PWR Modules".

Figure 5-21: Diagnostic example of a Bus Refreshing module



Parameterization of the BL20 station

The BL20 modules are also parameterized in the ”BL20-GW-DNET” window.

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

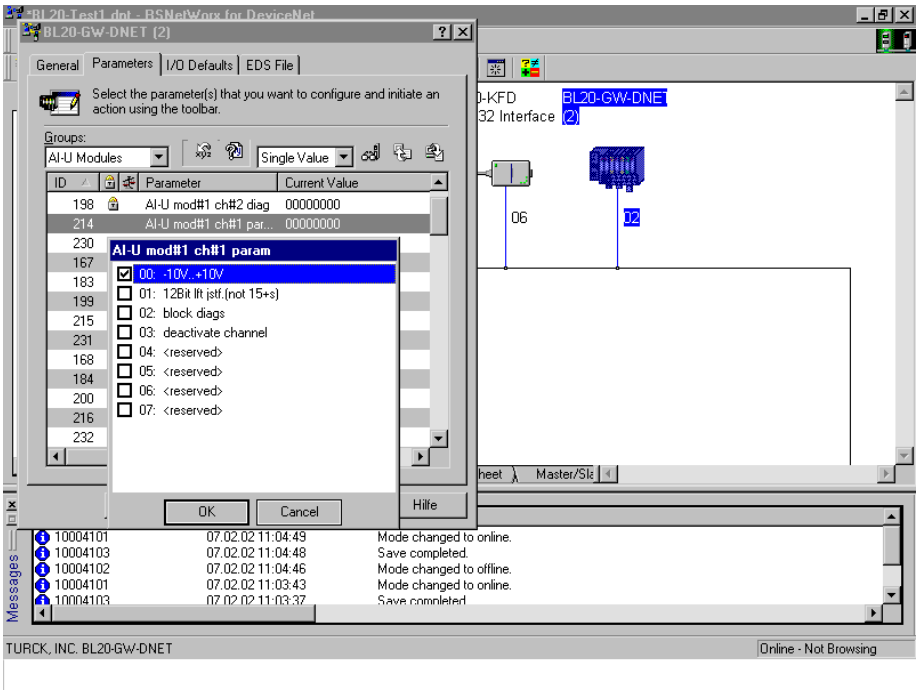


Figure 5-22: Setting the parameters of a BL20 module

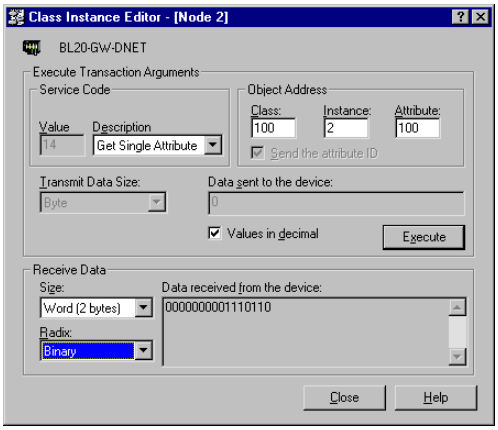
Altered parameter settings are loaded in to the BL20 gateway by clicking the appropriate button.

Explicit Messaging with the Class Instance Editor

The Class instance Editor offers the option of Explicit Messaging, meaning, direct reading or writing access to the Classes and Instances of the BL20 modules.

Please refer to the "Appendix" for a list and description of the Classes and Instances.

Figure 5-23: The Class Instance Editor



Explicit Messaging via Transaction Blocks

Allen Bradley enables Explicit Messaging for transmitting low priority configuration data, general management data or diagnostic data between two specified devices via transaction blocks of the controller software.

Note

Please refer to "Connection to the controller SLC 500 from Allen Bradley (page 5-14)" of this manual for a more detailed description of connecting BL20 DeviceNet gateways to the SLC 500 controller from Allen Bradley.

Note

Please refer to the respective manuals included in the range of supply for more detailed information about operating the software from Allen Bradley.

6 Guidelines for station planning

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6.1 Module arrangement on the mounting rail

6.1.1 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

The mixed usage of base modules with screw connections and base modules with tension clamp connections requires a further power supply module to be mounted. Thereby, it must be ensured that the base modules are fitted with the same connection technology (screw or tension clamp) as the power supply module.

6.1.2 Complete planning

The planning of a BL20 station should be thorough to avoid faults and increase operating reliability.

Attention

If there are more than two empty slots next to one another, the communication is interrupted to all following BL20 modules.

The power to BL20 systems is supplied from a common external source, independent of the number of Bus Refreshing modules on the station. This avoids the occurrence of potential compensating currents within the BL20 station.

6.1.3 Maximum system extension

A BL20 station can consist of a gateway and a maximum of 74 modules in slice design (equivalent to 1 m in length of mounting rail including the end bracket and endplate). The maximum number of modules is less when using block modules (1 block module is equivalent to 8 modules in slice design). The following overview shows the maximum number of channels possible, on condition that the entire station is made up of that respective type of channel only:

Table 6-1: Maximum system extension, process data dependent

A *plus 1 Bus Refreshing module*
B *plus 2 Bus Refreshing modules*
C *plus 3 Bus Refreshing modules*

Channels		**Modules**	
Type	Max. no.	Type	Max. no.
Digital inputs	288	BL20-4DI-24VDC-P	72 **B**
Digital outputs	288	BL20-4DO-24VDC-0.5A-P	72 **B**
Analog inputs, current	126	BL20-2AI-I(0/4...20MA)	63 **C**
Analog inputs, voltage	126	BL20-2AI-U(-10/0...+10VDC)	63 **C**
Analog inputs, PT / Ni	126	BL20-2AI-PT/NI-2/3	63 **C**
Analog inputs, Thermocouple	126	BL20-2AI-THERMO-PI	63 **C**
Analog outputs, current	126	BL20-2AO-I(0/4...20MA)	63 **C**
Analog inputs, voltage	126	BL20-2AO-U(-10/0...+10VDC)	63 **C**
Counter	31	BL20-1CNT-24VDC	31 **A**
RS232	31	BL20-1RS232	31 **A**
RS485/422	31	BL20-1RS485/422	31 **A**
SSI	31	BL20-1SSI	31 **A**

Further limitations can be placed on the maximum possible number of BL20 modules by the use of the Power Feeding modules
BL20-PF-24VDC-D or BL20-PF-120/230VAC-D; these being used either for creating potential groups or by insufficient field supply.

Attention

Ensure that a sufficient number of Power Feeding or Bus Refreshing modules are used if the system is extended to its maximum.

Note

If the system limits are exceeded, the software I/O-ASSISTANT generates an error message when the user activates the "Station → Verify" command.

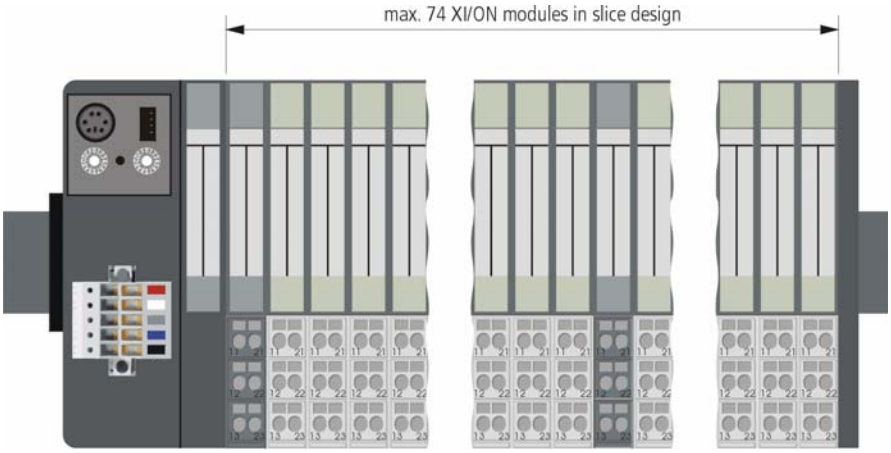


Figure 6-1: Maximum system extension BL20 DeviceNet

6.2 Power supply

6.2.1 Power supply to the gateway

Note

On a BL20 station including a gateway without integrated power supply unit, the first module to be mounted after the gateway is a Bus Refreshing module with either a BL20-P3x-SBB or a BL20-P4x-SBBC base module with tension clamp or screw connection.

6.2.2 Module bus refreshing

The number of BL20 modules that can be supplied by the gateway or a seperate Bus Refreshing module via the internal module bus depends on the respective nominal current consumption of the individual modules on the module bus.

Attention

The sum total of the nominal current consumption of the connected BL20 modules must not exceed 1.5 A .

The following examples show the calculation for the required number of Bus Refreshing modules:

Example 1:

The BL20 station consists of 20 BL20-1AI-I(0/4...20MA) modules. The number of additional Bus Refreshing modules required is calculated as follows:

Gateway		250 mA
20 BL20-1AI-I(0/4...20MA)	20 × 41 mA	820 mA
	Total:	1250 mA
Maximum permissible current via module bus:		1 500 mA

The calculation shows that no further Bus Refreshing module is required.

Example 2:

The BL20 station comprises 15 BL20-1AI-U(-10/0...+10VDC) modules, 12 BL20-2AO-U(-10/0...+10VDC) modules, 20
BL20-4DI-24VDC-P modules and 10 BL20-2DO-24VDC-0.5A-P modules.

The required number of Bus Refreshing modules is calculated as follows:

Gateway		250 mA
15 BL20-1AI-U(-10/0...+10VDC)	15 × 41 mA	615 mA
12 BL20-2AO-U(-10/0...+10VDC)	12 × 43 mA	516 mA
20 BL20-4DI-24VDC-P	20 × 29 mA	580 mA
10 BL20-2DO-24VDC-0.5A-P	10 × 32 mA	320 mA

Total:	2281 mA
Maximum permissible current via module bus	1500 mA

The calculation shows that an additional/further Bus Refreshing module is required at the latest following the last BL20-2AO module. This Bus Refreshing module is sufficient to supply the remaining modules.

Note

The power requirements of the BL20 gateway is to be considered when calculating the required number of Bus Refreshing modules.

Table 6-2: Nominal current consumption of the BL20 modules on the module bus

Module	Supply	Nominal current consumption
Gateway **with** integrated power supply unit	1 500 mA	250 mA
Gateway **without** integrated power supply unit		250 mA
(BL20-BR-24VDC-D) **A**	(1 500 mA)	
BL20-PF-24VDC-D		28 mA
BL20-PF-120/230VAC-D		25 mA
BL20-2DI-24VDC-P		28 mA
BL20-2DI-24VDC-N		28 mA
BL20-2DI-120/230VAC		28 mA
BL20-4DI-24VDC-P		29 mA
BL20-4DI-24VDC-N		28 mA
BL20-4DI-NAMUR		40 mA
BL20-E-8DI-24VDC-P		15 mA
BL20-E-16DI-24VDC-P		15 mA
BL20-16DI-24VDC-P		45 mA
BL20-32DI-24VDC-P		30 mA
BL20-1AI-I(0/4...20MA)		41 mA
BL20-2AI-I(0/4...20MA)		35 mA
BL20-1AI-U(-10/0...+10VDC)		41 mA
BL20-2AI-U(-10/0...+10VDC)		35 mA
BL20-2AI-PT/NI-2/3		45 mA

Module	Supply	Nominal current consumption
BL20-2AI-THERMO-PI		45 mA
BL20-4AI-U/I		30 mA
BL20-2DO-24VDC-0.5A-P		32 mA
BL20-2DO-24VDC-0.5A-N		32 mA
BL20-2DO-24VDC-2A-P		33 mA
BL20-2DO-120/230VAC-0.5A		35 mA
BL20-4DO-24VDC-0.5A-P		30 mA
BL20-E-8DO-24VDC-0.5A-P		15 mA
BL20-E-16DO-24VDC-0.5A-P		25 mA
BL20-16DO-24VDC-0.5A-P		120 mA
BL20-32DO-24VDC-0.5A-P		30 mA
BL20-1AO-I(0/4...20MA)		39 mA
BL20-2AO-I(0/4...20MA)		40 mA
BL20-2AO-U(-10/0...+10VDC)		43 mA
BL20-2DO-R-NC		28 mA
BL20-2DO-R-NO		28 mA
BL20-2DO-R-CO		28 mA
BL20-1CNT-24VDC		40 mA
BL20-1RS232		140 mA
BL20-1RS485/422		60 mA
BL20-1SSI		50 mA
BL20-2RFID		30 mA
BL20-E-1SWIRE		60 mA

If the power supply from the module bus is not guaranteed, thereby making a further Bus Refreshing module necessary, the software
I/O-ASSISTANT generates an error message when the user activates the command "Station → Verify".

Note

Bus Refreshing modules which do not supply the gateway with power are to be combined with either a BL20-P3T-SBB-B or an BL20-P4T-SBBC-B (tension clamp connection) base module or with the base modules BL20-P3S-SBB-B or BL20-P4S-SBBC-B (screw connection).

Figure 6-2: Power supply when using a gateway with integrated power supply unit

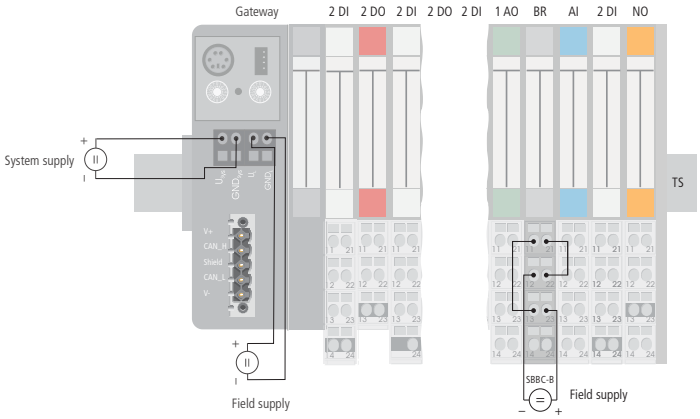
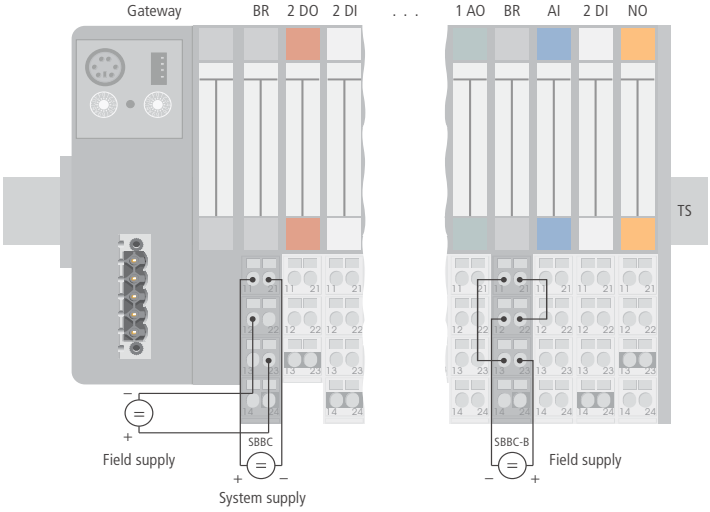


Figure 6-3: Possible supply options for Bus Refreshing modules



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.

6.2.3 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.

Attention

Ensure that the correct base modules are planned for when using Bus Refreshing modules.

Figure 6-4: Example for creating potential groups with BL20-GWBR-DNet

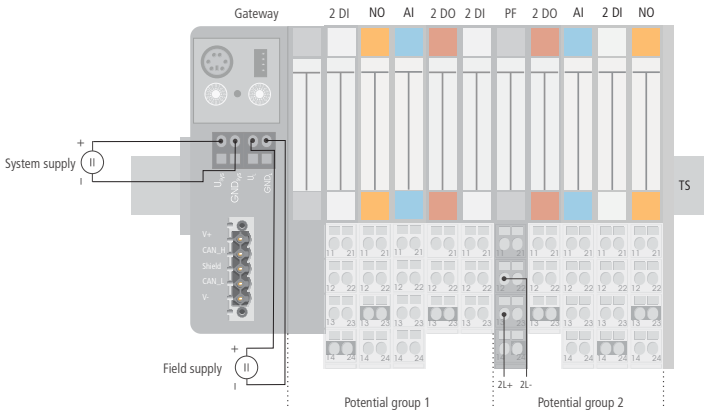
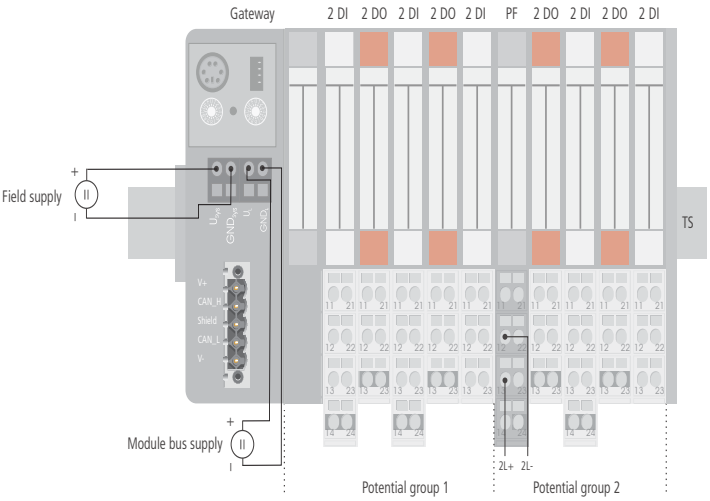


Figure 6-5: Example for creating potential groups with BL20-GW-DNet



Note

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

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.

Attention

It is not permitted to use the modules with 24 V DC and 120/230 V AC field supply in a joint potential group.

6.2.4 Protecting the service interface on the gateway

During operation, the cover protecting the service interface and the hexadecimal rotary coding-switches must remain closed due to EMC and ESD.

Figure 6-6: BL20 Gateway 1.5 MB with tension clamp connection

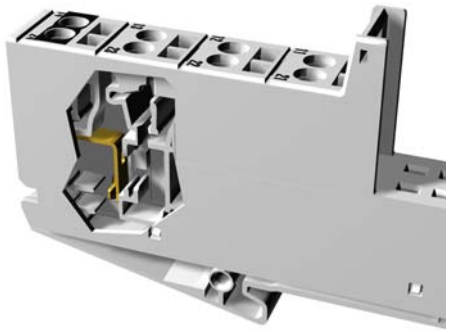
6.2.5 C-rail (cross connection)

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.

Figure 6-7:
C-rail front view

Figure 6-8:
C-rail side view



Danger

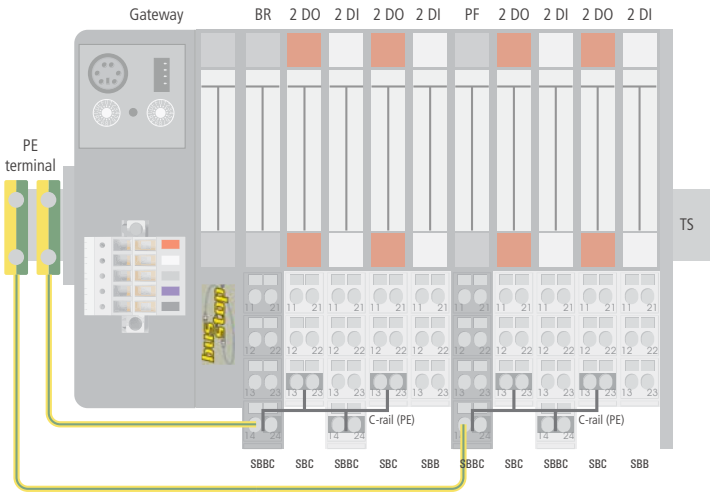
It is permitted to load the C-rail with a maximum of 24 V. Not 230 V!

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.

Note

For information about introducing a BL20 station into a ground reference system, please read chapter 7.

Figure 6-9: Using the C-rail as a protective earth

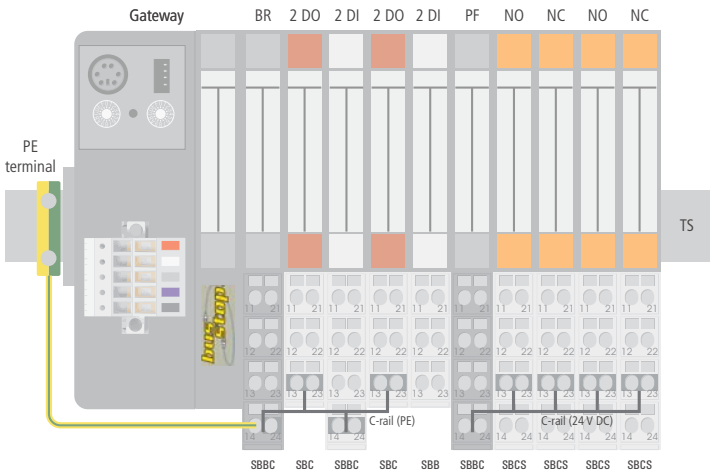


C-rails can be used for a common voltage supply when relay modules are planned. To accomplish this, the load voltage is connected to a Power Feeding module with the BL20-P4x-SBBC base module with tension clamp or screw connection. All the following relay modules are then supplied with power via the C-rail.

Attention

When relay modules are planned and the C-rail is used for a common voltage supply, a further power distribution module must be used for the potential isolation to the following modules. The C-rail can only again be used as a PE following potential isolation.

Figure 6-10: 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 in the BL20 manual for I/O modules (D300717).

6.2.6 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.

6.3 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.

Attention

If the field and system supplies remain connected when electronics modules are plugged or pulled, short interruptions to the module bus communications can occur in the BL20 station. This can lead to undefined statuses of individual inputs and outputs of different modules.

6.4 Extending an existing station

Attention

Please note that extensions to the station (mounting further modules) should be carried out only when the station is off-circuit.

Once alterations have been made to the order of the modules on the BL20 station, the new configuration must be saved to the "actual configuration memory" of the BL20 gateway. This is done by either pressing the SET button between the two decimal rotary coding switches (see chapter 4) or by making the appropriate settings in the configuration software (see chapter 5).

6.5 Firmware download

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

Attention

The station should be disconnected from the fieldbus when downloading.

Firmware must be downloaded by authorized personnel only.

The field level must be isolated.

7 Guidelines for electrical installation

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7.1 General Notes

7.1.1 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.).

7.1.2 Cable routing

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

7.1.3 Cable routing inside and outside of cabinets

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

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

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

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.

Danger

Observe all valid guidelines concerning internal and external lightning protection and grounding specifications when routing cables outside of buildings.

7.1.4 Lightning protection

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

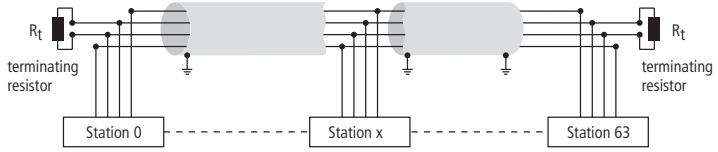
Signal cables must be protected against overvoltage by varistors or inert-gas filled overvoltage arrestors. Varistors and overvoltage arrestors must be installed at the point where the cables enter the building.

7.1.5 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 4 DIP switch on the gateway.

Figure 7-1: Representation of a bus cable



7.1.6 Cable types

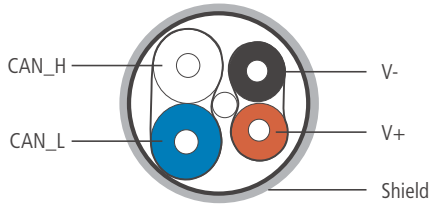
The following types of cables are used in DeviceNet:

- 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:

Figure 7-2: DeviceNet cable schematic



7.2 Potential relationships

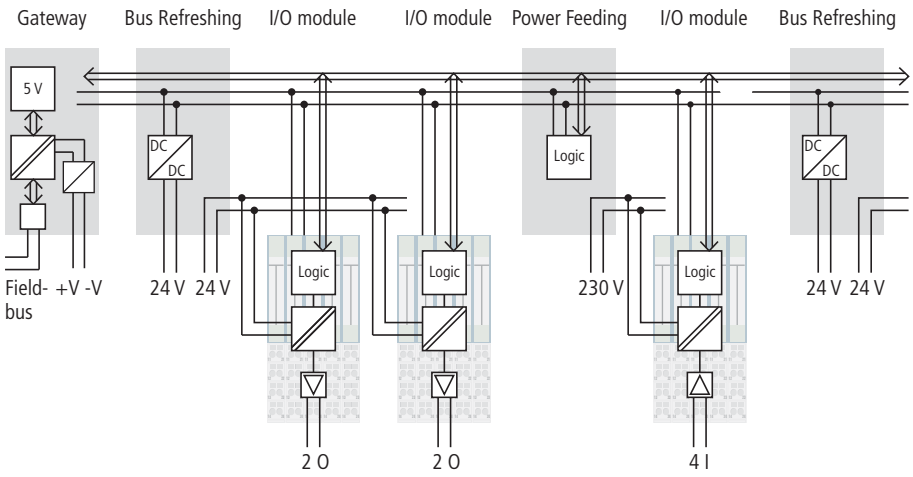
7.2.1 General

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 distributed via a Bus Refreshing module.
- 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 station.

Table 7-1: Potential relationships in a typical BL20 station



7.2.2 Potential-free installation

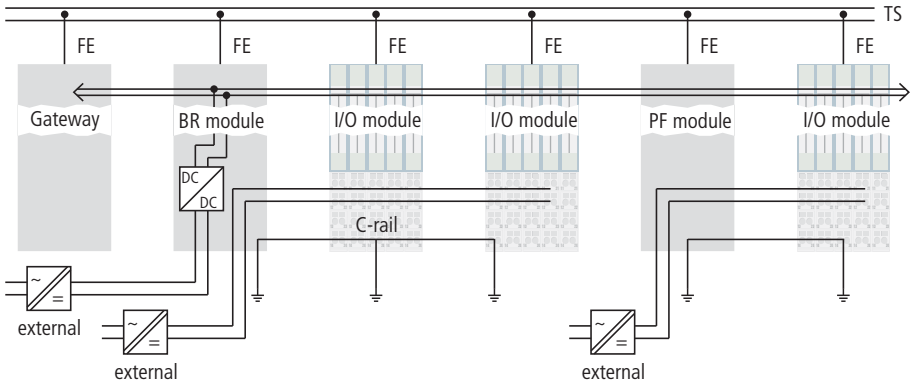
In a potential-free installation, the reference potentials of control and load circuitry are galvanically isolated from each other.

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.^

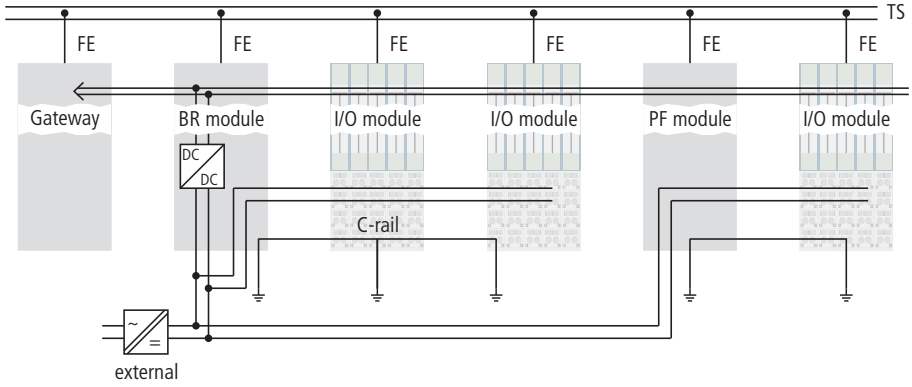
Table 7-2: Potential-free installation



7.2.3 Non-isolated installation

In a non-isolated installation, the reference potentials of the control and load circuitry are galvanically connected.

Table 7-3: Non-isolated installation



7.3 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.

7.3.1 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.

7.3.2 Grounding of inactive metal ccomponents

All inactive metal components (for example: switchgear cabinets, switchgear cabinet doors, supporting bars, mounting plates, tophat 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 rust.
- 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.

Danger

The grounding must never – including cases of error – take on a dangerous touch potential. For this reason, always protect the ground potential with a protective cable.

7.3.3 PE connection

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

7.3.4 Earth-Free operation

Observe all relevant safety regulations when operating an earthfree system.

Protect against high frequency interference signals

Attention

In order to comply with radiation limit values in accordance with EN 55 011/2 000, the supply lines of the power distribution module BL20-BR-24VDC-D for supplying the gateway with power are to be fed through a ferrite ring (BL20PS416-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.

7.3.5 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.

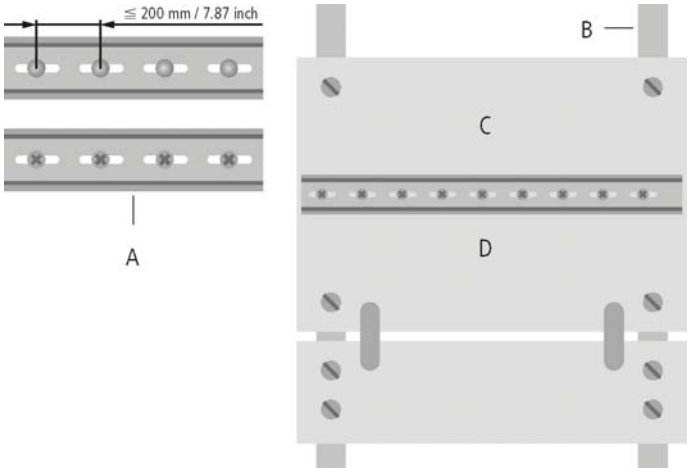


Figure 7-3: Mounting options

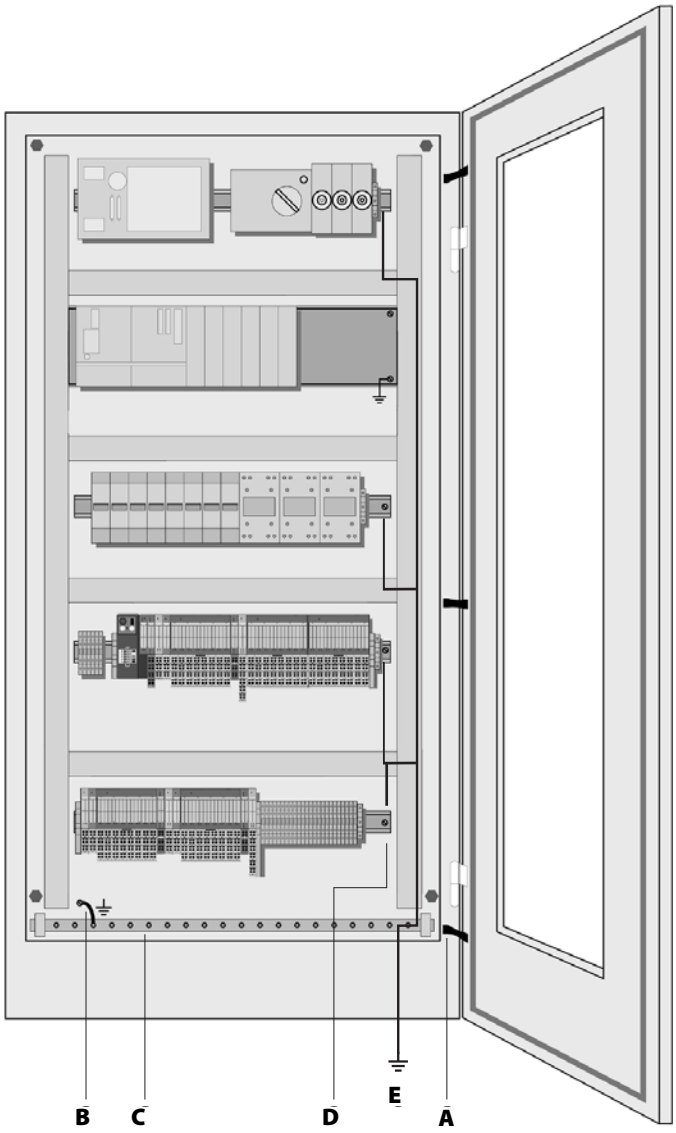
A *TS 35*
B *Mounting rail*
C *Mounting plate*
D *TS 35*

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).

7.3.6 EMC compliant cabinet installation

Figure 7-4: EMC compliant cabinet installation



7.4 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.

Attention

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 a bonding conductor.

If the data cable is connected via a SUB-D connector, the shielding should never be connected via pin 1, but to the mass collar of the plug-in connector.

The insulation of the shielded data-cable should be stripped and connected to the shield rail when the system is not in 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.

7.5 Potential compensation

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

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

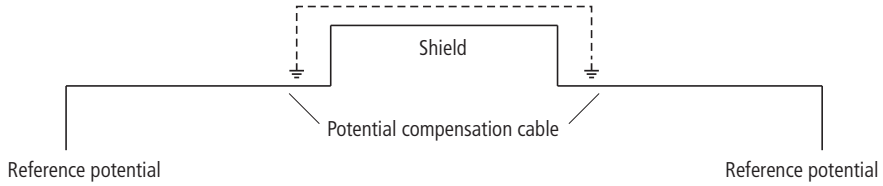
A potential-compensation cable must be routed to the potential compensation.

Danger

Never use the shield as a potential compensation.

Connection 1				Connection 2
V+	0	---------	0	V+
CAN_H	0	---------	0	CAN_H
CAN_L	0	---------	0	CAN_L
V-	0	---------	0	V-

Table 7-4: Potential compensation

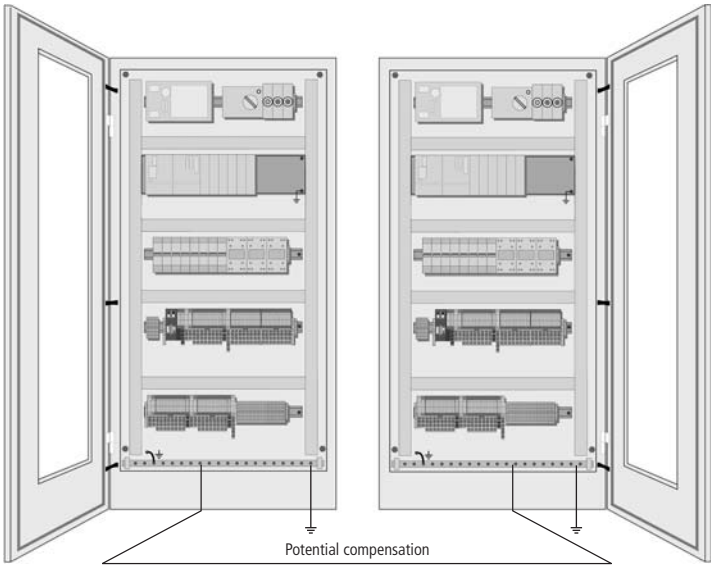


A potential compensation cable must have the following characteristics:

- 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, then 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.

Figure 7-5: Potential compensation between switchgear cabinets



7.5.1 Switching inductive loads

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

7.5.2 Protection against Electrostatic Discharge (ESD)

Attention

Electronic modules and base modules are at risk from electrostatic discharge when disassembled. Avoid touching the bus connections with bare fingers as this can lead to ESD damage.

7.6 Bus connection

Two Sealed Mini-Style Connectors (1 male connector + 1 female connector) are available for connecting the gateway to the fieldbus DeviceNet (in accordance with ODVA Spec. Rel. V2.0)

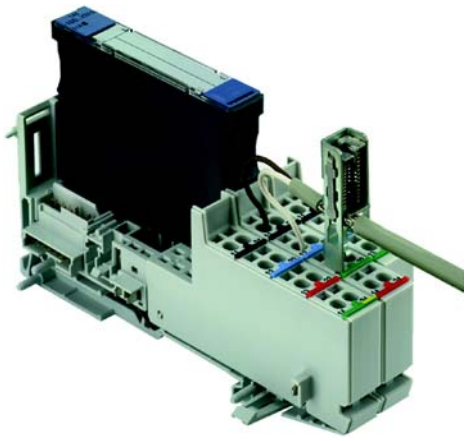
The shield connection is made via the shielding braid of the DeviceNet cable.

For detailed information about the bus connection of the gateway please refer to chapter 4.

7.7 Two-pole shield connection

Shielded cables can be used for analog input and output signals. The connection between the shield and the respective base module can be made via a shield connection, which is available as an accessory.

Figure 7-6: Two-pole shield connection for analog modules



The shield connection is to be mounted in the corresponding connection level of the base module. The following cable diameters are permissible for the shield connection:

Diameter of the shielding braid: max. 4.9 mm / 0.19 inch

Outer diameter of the cable: max. 6.5 mm / 0.26 inch

8 Integration of Technology Modules in DeviceNet

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8.1 Counter module, BL20-1CNT-24VDC

8.1.1 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 Behaviour 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":

Table 8-1: PDOut with "Load value direct/ in preparation", "Reference value 1" or "Reference value 2"

X = reserved

Bit	**7**	**6**	**5**	**4**	**3**	**2**	**1**	**0**
Byte								
0	Load value direct, Load value in preparation, Reference value 1 or Reference value 2							
1								
2								
3								
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_ PREPARE	LOAD_ VAL
6	X							
7	X							

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

Table 8-2: PDOut with "Function and Behaviour of DO1/ DO2"

A *X = reserved*

Bit	**7**	**6**	**5**	**4**	**3**	**2**	**1**	**0**
Byte								
0	X	X	MODE_DO2				MODE_DO1	
1	Hysteresis value							
2	Pulse duration							
3								
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_ PREPARE	LOAD_ VAL
6	X							
7	X							

8.1.2 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:

Table 8-3: PDIn

X = reserved

Bit	**7**	**6**	**5**	**4**	**3**	**2**	**1**	**0**
Byte								
0	Count value							
1								
2								
3								
4 (Diagn.)	ERR_ 24Vdc	ERR_ DO	ERR_ PARA	X	X	RES_ STS_A	ERR_ LOAD	STS_ LOAD
5 (Status)	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	X							

8.1.3 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.

Table 8-4: PDOut with "Lower limit" or "Upper limit" set

X = reserved

Bit	**7**	**6**	**5**	**4**	**3**	**2**	**1**	**0**
Byte								
0	Lower limit or upper limit							
1								
2								
3								
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	X							
7	X							

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

Table 8-5: PDOut with "Function of DO1" set

X = reserved

Bit	**7**	**6**	**5**	**4**	**3**	**2**	**1**	**0**
Byte								
0	X						MODE_DO1	
1	X							
2	X							
3	X							
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	X							
7	X							

Structure of the data bytes in the DeviceNet with "Integration time" set:

Table 8-6: PDOut with "Integration time" set

X = reserved

Bit	**7**	**6**	**5**	**4**	**3**	**2**	**1**	**0**
Byte								
0	Integation time							
1								
2	X							
3	X							
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	X							
7	X							

8.1.4 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:

Table 8-7: PDOut with "Integration time" set

X = reserved

Bit	**7**	**6**	**5**	**4**	**3**	**2**	**1**	**0**
Byte								
0	Measured value							
1								
2								
3								
4 (Diagn.)	ERR_ 24Vdc	ERR_ DO	ERR_ PARA	X	X	RES_ STS_A	ERR_ LOAD	STS_ LOAD
5 (Status)	STS_ DN	STS_ UP	X	X	STS_ DO1	X	STS_ DI	STS_ GATE
6 (Status)	X	STS_ UFLW	STS_ OFLW	X	STS_ CMP1	X	X	X
7	X							

8.2 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, chapter 10.

Note

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

8.2.1 Process input data

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

Table 8-8: Process input data

	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Byte 0 (Status)	STATUS	TX COUNT ACKNOWLEDGE		RX COUNT		RX BYTE COUNT		
Byte 1	Data Byte 0							
...								
Byte 7	Data Byte 6							

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

Table 8-9: Process input data

	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Byte 0 (Control)	STATUS	TX COUNT ACKNOWLEDGE		TX COUNT		TX BYTE COUNT		
Byte 1 (Diag.)	PROCESS DIAGNOSTICS DATA							
Byte 2	Data Byte 0							
...								
Byte 7	Data Byte 5							

8.2.2 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"

Table 8-10: Process output data

	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Byte 0 (Control)	STATUS RESET CONTROL	RX COUNT ACKNOWLEDGE		TX COUNT		TX BYTE COUNT		
Byte 1	Data Byte 0							
...								
Byte 7	Data Byte 6							

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

Table 8-11: Process output data

	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Byte 0 (Control)	STATUS RESET CON-TROL	RX COUNT ACKNOWLEDGE		TX COUNT		TX BYTE COUNT		
Byte 1 (Diag.)	reserved						RXBUF FLUSH	TXBUF FLUSH
Byte 2	Data Byte 0							
...								
Byte 7	Data Byte 5							

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.

8.3 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, chapter 10.

8.3.1 Process input data

Table 8-12: Process input data

	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
PZDE								
Byte 0	DIAGNOSTICS AND STATUS							
Byte 2	RESULT WRITE OPERATION		X **B**	X	SSI_ STS3 **A**	SSI_ STS2 **A**	SSI_ STS1 **A**	SSI_ STS0 **A**
Byte 3	RESULT READ OPERATION	X	ADDRESS READ REGISTER					
Byte 4	VALUE READ REGISTER Byte 0							
...								
Byte 7	VALUE READ REGISTER Byte 3							

A *Status-Bits from SSI encoder*
B *X = reserved*

Table 8-13: Meaning of data bits 0 to 3 (Byte 2)

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	

8.3.2 Process output data

Table 8-14: Process output data

	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
PZDA								
Byte 0	CONTROL							
Byte 2	X	X **B**	ADDRESS READ REGISTER					
Byte 3	WRITE OPERA-TION	X	ADDRESS WRITE REGISTER					
Byte 4	VALUE WRITE REGISTER Byte 0							
...								
Byte 7	VALUE WRITE REGISTER Byte 3							

A *Status-Bits from SSI encoder*
B *X = reserved*

8.4 SWIRE-modules

Process input

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

Table 8-15: Data structure

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

Process input data of SWIRE-DIL slaves

The following information can be transferred for SWIRE-DIL slaves (manufacturer: Moeller):

- Contactor coil on/off
- Motor-protective circuit-breaker off (tripped) / on
- Status of the slave (online / diagnostics)

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

Table 8-16: Process input for SWIRE-DIL

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

The following table shows the meaning of the data bits:

Table 8-17: 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	Contactor coil is switched off
	1 ON	Contactor coil is switched on
PKZSTx	**Switch status, PKZ x**	
	0 OFF	The motor-protective circuitbreaker is off or has tripped
	1 ON	The motor-protective circuitbreaker is switched on
SCx	**Communication error, slave x**	
		Setting the SC_{DIAG}Sx parameter sets the SCx bit in the process input data. The information is provided as status information in the PLC for the user.
	0 ON LINE	Status of slave x: Everything o.k.
	1 OFF LINE	Status of slave x: Slave diagnostics message present

Process output

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

Table 8-18: Data structure

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

Process output data of SWIRE-DIL slaves

The following information can be transferred for SWIRE-DIL slaves (manufacturer: Moeller):

- Switch status of contactor coil on/off

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

Table 8-19: Process output for bei SWIRE-DIL

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

The following table shows the meaning of the data bits:

Table 8-20: Data bits

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

8.5 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).

9 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.

10 Appendix

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10.1 Classes and Instances of the DeviceNet-gateway

10.1.1 DeviceNet standard classes

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

Table 10-1: DeviceNet Standard Classes

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.

10.1.2 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:

Table 10-2: VSC-Vendor Specific Classes

Class Code dec. (hex.)	Name	Description
100 (64h)	Gateway Class	Contains data and settings concerning the gateway and the BL20 system as a whole.
101 (65h)	Terminal Slot Class	Contains data concerning the base modules
102 (66h)	Process Data Class	Contains process data
103 (67h)	Power Supply module class	Describes the power distribution modules
104 (68h)	Digital input module class	Describes the modules of the type BL20-*DI-*
105 (69h)	Digital output module class	Describes the modules of the type BL20-*DO-*
106 (6Ah)	Analog input voltage module class	Describes the modules of the type BL20-*AI-U
107 (6Bh)	Analog output voltage module class	Describes the modules of the type BL20-*AO-U
108 (6Ch)	Analog input current module class	Describes the modules of the type BL20-*AI-I
109 (6Dh)	Analog output current module class	Describes the modules of the type BL20-*AO-I
110 (6Eh)	Analog input RTD module class	Describes the modules of the type BL20-*AI- PT/NI
111 (6Fh)	Analog input THERMO module class	Describes the modules of the type BL20-*AI-THERMO-PI
112	Counter module class	Describes the modules of the type BL20-*CNT-*
113	reserved	Describes the modules of the type BL20-*CNT-*
114	RS232 module class	Describes the modules of the type BL20-1RS232
115	RS485/422 module class	Describes the modules of the type BL20-1RS485/422
116	SSI module class	Describes the modules of the type BL20-1SSI
117	Digital versatile module class	Describes for example modules of the type BL20-4DI-NAMUR

Table 10-2: VSC-Vendor Specific Classes

Class Code dec. (hex.)	Name	Description
118	Analog versatile module class	Describes modules of the type BL20-4AI-U/I
120	RFID module class	Describes modules of the type BL20-2RFID-A.
121	SWIRE module class	Describes modules of the type BL20-E-SWIRE.

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:.

Table 10-3: Class instance

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)

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 10-4, for the description of the class instance for the VSC.

Object instance 1

Table 10-4: Object instance 1, Boot 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)	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
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

Table 10-5: Object instance 2, Gateway 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)	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.).

Table 10-5: Object instance 2, Gateway Instance

Attr. No. dec. (hex.)	Attribute name	Get/ Set	Type	Description
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
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)
109 (6Dh)	GW status register	G	STRUCT	Status Register of the gateway (see also Status word of the gateway, page 5-9). 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)

Table 10-5: Object instance 2, Gateway Instance

Attr. No. dec. (hex.)	Attribute name	Get/ Set	Type	Description
110 (6Eh)	GW control register	G/S	STRUCT	Control Register of the gateway. (see also Control word of the gateway, page 5-11) 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.

Table 10-5: Object instance 2, Gateway Instance

Attr. No. dec. (hex.)	**Attribute name**	**G**et/ **S**et	**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.

Table 10-5: Object instance 2, Gateway Instance

Attr. No. dec. (hex.)	Attribute name	Get/ Set	Type	Description
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".
117/ 118 (75h/ 76h)	reserved			
The following attributes are only valid for the **BL20-GWBR-DNET**				
119 (77h)	System supply voltage	G	UINT [mV]	Undervoltage detection for the system supply.
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			
The following attributes are only valid for gateways with Maj. Rev. ≥ 5.0				
132 (84h)	GW control word mapping	G/S	USINT	Only for gateways with Maj. rev. < 5.0 2 = Control word mapped into output data (default) 4 = Control word 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!

Table 10-5: Object instance 2, Gateway Instance

Attr. No. dec. (hex.)	**Attribute name**	**G**et/ **S**et	**Type**	**Description**
133 (85h)	GW status word mapping	G/S	USINT	Only for gateways with Maj. rev. < 5.0 1 = Status word mapped into input data (default) 3 = Status word 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)

This class contains parameters and data for the base modules.

Class instance

Note

Please refer to paragraph Class instance of the VSC, page 10-4, for the description of the class instances for VSC.

Object instance

Table 10-6: Object instances

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.

Table 10-6: Object instances

Attr. No. dec. (hex.)	**Attribute name**	**G**et/ **S**et	**Type**	**Description**
107 (6Bh)	Module output bit count	G	UINT	States the number of output bits (consumed bits) of the module.
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)

This class contains the process-relevant information.

Class instance

Note

Please refer to paragraph Class instance of the VSC, page 10-4, for the description of the class instance for the VSC.

Object instance 1, standard input process data (compressed)

Table 10-7: 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.

Note

The following object instances of VSC 102 (Object instance 2 to Object instance 8) are only valid for gateways with Maj. Rev. ≥ 5.0.

Object instance 2, standard output process data (compressed)

Table 10-8: 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

Table 10-9: 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 (page 5-7). 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 (page 5-8). 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

Table 10-10: 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 (compatible to all gateways Maj. Rev. < 5.0): 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

Table 10-11: 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

Table 10-12: 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

Table 10-13: 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

Table 10-14: 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, page 10-72

Power supply module class (VSC103)

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 10-4, for the description of the class instances for VSC.

Object instance

Table 10-15: 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-PF-24VDC"
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.

Table 10-15: Object instance

Attr. No. dec. (hex.)	**Attribute name**	**G**et/ **S**et	**Type**	**Description**
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)	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)

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

Class instance

Note

Please refer to paragraph Class instance of the VSC, page 10-4, for the description of the class instances for VSC.

Object instance

Table 10-16: 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, "BL20-4DI-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 page 10-18
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.

Table 10-16: Object instance

Attr. No. dec. (hex.)	**Attribute name**	**G**et/ **S**et	**Type**	**Description**
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.
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)

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

Class instance

Note

Please refer to paragraph Class instance of the VSC, page 10-4, for the description of the class instances for VSC.

Object instance

Table 10-17: 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 page 10-18
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.

Table 10-17: Object instance

Attr. No. dec. (hex.)	**Attribute name**	**G**et/ **S**et	**Type**	**Description**
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.
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)

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 10-4, for the description of the class instances for VSC.

Object instance

Table 10-18: 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 page 10-18
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.

Table 10-18: Object instance

Attr. No. dec. (hex.)	Attribute name	Get/ Set	Type	Description
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 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 para-meter 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)

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 10-4, for the description of the class instances for VSC.

Object instance

Table 10-19: 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 page 10-18
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.

Table 10-19: Object instance

Attr. No. dec. (hex.)	Attribute name	Get/ Set	Type	Description
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.
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)

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 10-4, 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).

Table 10-20: Object instance

Attr. No. dec. (hex.)	**Attribute name**	**G**et/ **S**et	**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

Table 10-20: Object instance

Attr. No. dec. (hex.)	**Attribute name**	**G**et/ **S**et	**Type**	**Description**
128 - 135 (80h - 87h)	Mode para-meter 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 20mA 1 = 4 to 20mA 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)

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 10-4, 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).

Table 10-21: Object instance

Attr. No. dec. (hex.)	**Attribute name**	**G**et/ **S**et	**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 para-meter 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 20mA 1 = 4 to 20mA Bit 1: Value representation: 0 =Integer (15Bit + sign) 1 =12Bit (left-justified) Bit 2 to 7:reserved

Table 10-21: Object instance

Attr. No. dec. (hex.)	**Attribute name**	**G**et/ **S**et	**Type**	**Description**
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)

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 10-4, for the description of the class instances for VSC.

Object instance

Table 10-22: 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 page 10-18
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.

Table 10-22: Object instance

Attr. No. dec. (hex.)	**Attribute name**	**G**et/ **S**et	**Type**	**Description**
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.
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

Table 10-22: Object instance

Attr. No. dec. (hex.)	**Attribute name**	**G**et/ **S**et	**Type**	**Description**
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 = 50Hz mains suppression 1 = 60Hz 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
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...100Ω 13: resistance: 0...200Ω 14: resistance: 0...400Ω 15: resistance: 0...1000Ω 16 to 255: reserved

Analog input THERMO module class (VSC111)

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 10-4, for the description of the class instances for VSC.

Object instance

Table 10-23: 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-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 page 10-18
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.

Table 10-23: Object instance

Attr. No. dec. (hex.)	**Attribute name**	**G**et/ **S**et	**Type**	**Description**
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.
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 para-meter 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 = 50Hz mains suppression 1 = 60Hz 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

Table 10-23: Object instance

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: +/-50mV 9: +/-100mV 10: +/-500mV 11: +/-1000mV 12 to 255: reserved

Counter1 module class (VSC112)

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.

Table 10-24: 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 page 10-18
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.

Table 10-24: Object 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
112 (70h)	Counter diag	G	WORD	CNT: 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

Table 10-24: Object instance

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 **A**	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

A *Depends on the selected operating mode (CNT/ MSRM) and are not supported in the other operating mode. Please refer to Attribute No. 113 BASIC MODE.*

Table 10-24: Object instance

Attr. No. dec. (hex.)	Attribute name	Get/ Set	Type	Description
116 (74h)	Function DI **A**	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 synchronization **A**	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 **A**	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 parameterization 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 parameterization on reaching or overshooting the upper limit.
121 (79h)	MSRM integration **A**	G/S	USINT	Defines the integration time. Integration [*10ms]
122 (7Ah)	CNT hysteresis **A**	G/S	USINT	Defines the hysteresis, meaning the differential threshold value. Hysteresis
123 (7Bh)	CNT pulse duration **A**	G/S	USINT	Defines the pulse duration. Pulse duration [*2ms]
124 (7Ch)	MSRM pulses per revolution **A**	G/S	UINT	Defines the number of pulses per revolution. 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

A *Depends on the selected operating mode (CNT/ MSRM) and are not supported in the other operating mode. Please refer to Attribute No. 113 BASIC MODE.*

Table 10-24: Object instance

Attr. No. dec. (hex.)	**Attribute name**	**G**et/ **S**et	**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 **A**	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 **A**	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 **A**	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: 2.5ms / 200kHz – 1: 25ms / 20kHz – 2 to 255:reserved

A *Depend on the selected operating mode (CNT/ MSRM) and are not supported in the other operating mode. Please refer to Attribute No. 113 BASIC MODE.*

Table 10-24: Object instance

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: 2.5ms / 200kHz – 1: 25ms / 20kHz – 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: 2.5ms / 200kHz 1: 25ms / 20kHz 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)

This Class contains all information and parameters for RS232 modules.

Class instance

Note

Please refer to paragraph Class instance of the VSC, page 10-4, for the description of the class instances for VSC.

Object instance

Table 10-25: 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 page 10-18
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.

Table 10-25: Object instance

Attr. No. dec. (hex.)	**Attribute name**	**G**et/ **S**et	**Type**	**Description**
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.
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.

Table 10-25: Object instance

Attr. No. dec. (hex.)	**Attribute name**	**G**et/ **S**et	**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 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.
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.

Table 10-25: Object instance

Attr. No. dec. (hex.)	**Attribute name**	**G**et/ **S**et	**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 RS232 (0...7) + transmission is released/ charged immediately
126 (7Eh)	reserved			

Table 10-25: Object instance

Attr. No. dec. (hex.)	**Attribute name**	**G**et/ **S**et	**Type**	**Description**
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.

Table 10-25: Object instance

Attr. No. dec. (hex.)	Attribute name	Get/ Set	Type	Description
129 (81h)	Bit rate	G/S	ENUM USINT	Used to set the baudrate 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
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)

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

Class instance

Note

Please refer to paragraph Class instance of the VSC, page 10-4, for the description of the class instances for VSC.

Object instance

Table 10-26: 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 page 10-18
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.

Table 10-26: Object instance

Attr. No. dec. (hex.)	Attribute name	Get/ Set	Type	Description
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.
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.

Table 10-26: Object instance

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.

Table 10-26: Object instance

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.

Table 10-26: Object instance

Attr. No. dec. (hex.)	**Attribute name**	**G**et/ **S**et	**Type**	**Description**
				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 baudrate 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"

Table 10-26: Object instance

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)

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

Class instance

Note

Please refer to paragraph Class instance of the VSC, page 10-4, for the description of the class instances for VSC.

Object instance

Table 10-27: 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 page 10-18
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.

Table 10-27: Object instance

Attr. No. dec. (hex.)	**Attribute name**	**G**et/ **S**et	**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.

Table 10-27: Object instance

Attr. No. dec. (hex.)	**Attribute name**	**G**et/ **S**et	**Type**	**Description**
112	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

Table 10-27: Object instance

Attr. No. dec. (hex.)	Attribute name	Get/ Set	Type	Description
112	Diagnostics and status	G	WORD	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. 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. 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.

Table 10-27: Object instance

Attr. No. dec. (hex.)	**Attribute name**	**G**et/ **S**et	**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.

Table 10-27: Object instance

Attr. No. dec. (hex.)	Attribute name	Get/ Set	Type	Description
117 (75h)	Control	G/S	WORD	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. 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	STRUCTOF 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.

Table 10-27: Object instance

Attr. No. dec. (hex.)	**Attribute name**	**G**et/ **S**et	**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

Table 10-27: Object instance

Attr. No. dec. (hex.)	Attribute name	Get/ Set	Type	Description
125 (7Dh)	Invalid bits LSB **A**	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.
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. INVALID BITS MSB + INVALID BITS LSB must always be less than FRAME LENGTH. Default: 0 = 0hex

A *INVALID_BITS: INVALID BITS MSB + INVALID BITS LSB*

Digital versatile module class (VSC117)

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

Attention

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 10-4, for the description of the class instances for VSC.

Object instance

Table 10-28: Object instance

Attr. No. dec. (hex.)	**Attribute name**	**G**et/ **S**et	**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 page 10-18
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

Table 10-28: Object instance

Attr. No. dec. (hex.)	Attribute name	Get/ Set	Type	Description
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.
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).

Table 10-28: Object instance

Attr. No. dec. (hex.)	Attribute name	Get/ Set	Type	Description
Parameter data				
125 (7Dh)	Open circuit monitoring mode_2	G/S	DWORD	Enables the wire break detection mode (channel 1 to 32).
126 (7Eh)	Open circuit monitoring mode_1	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).
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_1	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).

Table 10-28: Object instance

Attr. No. dec. (hex.)	Attribute name	Get/ Set	Type	Description
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 2500µs channel 1	G/S	DWORD	Enables the input filter of the channel (channel 1 to 32).
144 (8Fh)	Filter 2500µs 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)

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

Attention

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 10-4, for the description of the class instances for VSC.

Object instance

Table 10-29: 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 page 10-18
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

Table 10-29: Object instance

Attr. No. dec. (hex.)	Attribute name	Get/ Set	Type	Description
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.
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	-	-	-

Table 10-29: Object instance

Attr. No. dec. (hex.)	Attribute name	Get/ Set	Type	Description
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 = 0mA..20mA 4 = 4mA..20mA
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.

RFID module class (VSC120)

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

Note

The RFID module class (VSC120) is only implemented in gateways with Maj. Rev. ≥ 5.0.

Attention

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 10-4, for the description of the class instance for the VSC.

Object instance

Note

The object instances of VSC120 represent the individual RFID channels, not the complete modules!

Table 10-30: 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, "BL20-2RFID-A".
106 (6Ah)	Module revision	G	USINT	Contains the revision number of the module firmware.

Table 10-30: Object instance

Attr. No. dec. (hex.)	Attribute name	Get/ Set	Type	Description
107 (6Bh)	Module type ID	G	ENUM USINT	Describes the module type: see attribute 107 (6Bh) on page 10-18
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)	Module input channel count	G	USINT	Contains the number of input channels supported by the module.
112 (70h)	Module output Channel count	G	USINT	Contains the number of output channels supported by the module.
RFID data				
113 (71h)	TAG data producing	G	ARRY OF BYTE	Provides access to the RFID response data.
114 (72h)	TAG data consuming	G/S	ARRY OF BYTE	Consumes the RFID command data.
RFID info				
115 (73h)	Command interface version	G	USINT	Contains the version of the command interface.
116 (74h)	CMD interface enabled	G	BOOL	Shows if the command interface attribute of the RFID is enabled (see VSC102, object instance 5, attr.104 (68h).
117 (75h)	Status interface version	G	USINT	Contains the version of the status interface.
118 (76h)	Status interface enabled	G	BOOL	Shows if the status interface attribute of the RFID is enabled (see VSC102, object instance 6, attr.104 (68h).
119 (77h)	COS mode enabled	G	BOOL	Shows if the explicit use of COS messages for RFID data is enabled.
120 (78h)	RFID CIP support	G	BOOL	Shows if the CIP access for the RFID handling is enabled.

Table 10-30: Object instance

Attr. No. dec. (hex.)	Attribute name	Get/ Set	Type	Description
121 (79h)	RFID available channels	G	BYTE	Contains the list of the available RFID channels. Bit 0 = RFID channel 1 ... Bit 7 = RFID channel 8.
122 (7Ah)	RFID faulty channels	G	BYTE	Contains the list of the faulty RFID channels. Bit 0 = RFID channel 1 ... Bit 7 = RFID channel 8.
123 (7Bh)	RFIDexecuting channels	G	BYTE	Contains the list of the executing RFID channels. Bit 0 = RFID channel 1 ... Bit 7 = RFID channel 8.
124 (7Ch)	RFID data holding channels	G	BYTE	Contains the list of the data holding RFID channels. Bit 0 = RFID channel 1 ... Bit 7 = RFID channel 8.
125 (7Dh)	RFID TAG present channels	G	BYTE	Contains the list of the present RFID TAG channels. Bit 0 = RFID channel 1 ... Bit 7 = RFID channel 8.
126 (7Eh)	RFID oldest data channel	G	USINT	Contains the number of the channel holding the oldest RFID data.
127 (7Fh)	RFID latest data channel	G	USINT	Contains the number of the channel holding the latest RFID data.

Note

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

SWIRE module class (VSC121)

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

Note

The SWIRE module class (VSC121) is only implemented in gateways with Maj. Rev. ≥ 5.0.

Attention

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 10-4, for the description of the class instance for the VSC.

Object instance

Table 10-31: Object instance

Attr. No. dec. (hex.)	**Attribute name**	**G**et/ **S**et	**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 page 10-18

Table 10-31: Object instance

Attr. No. dec. (hex.)	**Attribute name**	**G**et/ **S**et	**Type**	**Description**
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.
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)

Table 10-31: Object instance

Attr. No. dec. (hex.)	**Attribute name**	**G**et/ **S**et	**Type**	**Description**
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 timeout 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.
121 (79h)	Param common operation modes	G/S	Byte	Bit 0: reserved Bit 1 - Automatic SWIRE configuration 0: Manual SWIRE configuration: To store the physical structure of the SWIRE bus in the BL20-E-1SWIRE, the CFG button of the BL20-E-1SWIRE must be pressed manually (only functions if the SW LED is flashing). 1: Automatic SWIRE configuration: If the physical structure of the SWIRE bus does not match the configuration stored in the BL20-E-1SWIRE on power up, the physical structure is stored automatically in the BL20-E-1SWIRE.
				Bit 2 - PLC configuration check 0: PLC configuration check is active. The configuration stored in BL20-E-1SWIRE is compared with the SET configuration stored in the PLC. Only SWIRE slaves in the SWIRE bus are accepted that have a device ID completely matching the SET configuration. 1: PLC configuration check is not active. All slaves are mapped in 4Bit INPUT / 4Bit OUTPUT without checking the device ID.

Table 10-31: Object instance

Attr. No. dec. (hex.)	Attribute name	Get/ Set	Type	Description
121 (79h)	Param. common operation modes	G/S	Byte	Bit 3 - Configuration check 0: Bus-oriented: If the PLC configuration check is activated, data exchange is only started if the configuration stored in the BL20-E-1SWIRE fully matches the SET configuration stored in the PLC. Modifying the bus during operation causes the system to be aborted. 1: Slave oriented: If the PLC configuration check is activated, data exchange is started with all SWIRE slaves that match the SET configuration stored in the PLC. The SWIRE slaves that do not match the SET configuration stored in the PLC do not perform any data exchange.
				Bit 4 - Moeller conformance (from version VN 01-04) 0: Default behavior 1: The BL20-E-1SWIRE master responds according to the Moeller SWIRE Conformance criteria.
				Bit 5 to bit 6: reserved
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

Table 10-31: Object instance

Attr. No. dec. (hex.)	**Attribute name**	**G**et/ **S**et	**Type**	**Description**
124 (7Ch)	Rerserved / Lifeguarding time	G/S	USINT	02_{hex}-FF_{hex}, Default: 64_{hex}, Disconnect: FF_{hex} Setting of lifeguarding time, timeout time up to automatic reset of the slaves in the event of communication failure. (n ∞ 10ms) (Default 1s). **(Lifeguarding time only up to version VN 01-03)**
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

10.2 Nominal current consumption and power loss

Table 10-32: 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

Table 10-32: Nominal current consumption of the BL20 modules from supply terminal I_{EL}

Modules	Power supply	Nominal current consumption
BL20-2DO-R-CO		< 20 mA
BL20-1CNT-24VDC		< 50 mA (when load current = 0)
BL20-2RFID-A		< 100 mA (when load current = 0)

Table 10-33: Nominal current of the BL20 modules on the module bus

Modules	Power supply	Nominal current consumption
Gateway		≤ 250 mA
BL20-BR-24VDC-D	1500 mA	
BL20-PF-24VDC-D		≤ 28 mA
BL20-PF-120/230VAC-D		≤ 25 mA
BL20-2DI-24VDC-P		≤ 28 mA
BL20-2DI-24VDC-N		≤ 28 mA
BL20-2DI-120/230VAC		≤ 28 mA
BL20-4DI-24VDC-P		≤ 29 mA
BL20-4DI-24VDC-N		≤ 28 mA
BL20-16DI-24VDC-P		≤ 45 mA
BL20-32DI-24VDC-P		≤ 30 mA
BL20-1AI-I(0/4...20MA)		≤ 41 mA
BL20-2AI-I(0/4...20MA)		≤ 35 mA
BL20-1AI-U(-10/0...+10VDC)		≤ 41 mA
BL20-2AI-U(-10/0...+10VDC)		≤ 35 mA
BL20-2AI-PT/NI-2/3		≤ 45 mA
BL20-2AI-THERMO-PI		≤ 45 mA
BL20-2DO-24VDC-0.5A-P		≤ 32 mA
BL20-2DO-24VDC-0.5A-N		≤ 32 mA
BL20-2DO-24VDC-2A-P		≤ 33 mA
BL20-4DO-24VDC-0.5A-P		≤ 30 mA
BL20-16DO-24VDC-0.5A-P		≤ 45 mA
BL20-2DO-120/230VAC-0.5A-P		< 35 mA
BL20-1AO-I(0/4...20MA)		≤ 39 mA
BL20-2AO-I(0/4...20MA)		≤ 40 mA
BL20-2AO-U(-10/0...+10VDC)		≤ 43 mA
BL20-2DO-R-NC		≤ 28 mA
BL20-2DO-R-NO		≤ 28 mA
BL20-2DO-R-CO		≤ 28 mA

Table 10-33: Nominal current of the BL20 modules on the module bus

Modules	Power supply	Nominal current consumption
BL20-1CNT-24VDC		≤ 40 mA
BL20-2RFID-A		30 mA
BL20-E-1SWIRE		60 mA

10.3 Power loss of the modules

Table 10-34: Power loss of the BL20 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
BL20-2DO-R-CO	1 W
BL20-1CNT-24VDC	1.3 W

11 Glossary

A

Acknowledge

Acknowledgment of a signal received.

Active metal component

Conductor or conducting component that is electrically live during operation.

Address

Identification number of, e.g. a memory position, a system or a module within a network.

Addressing

Allocation or setting of an address, e. g. for a module in a network.

Analog

Infinitely variable value, e. g. voltage. The value of an analog signal can take on any value, within certain limits.

Attribute

Attributes represent the data that a device makes available via the DeviceNet fieldbus (e. g. status of an object, serial number of the device, process data).

Automation device

A device connected to a technical process with inputs and outputs for control. Programmable logic controllers (PLC) are a special group of automation devices.

B

Baud

Baud is a measure for the transmission speed of data. 1 Baud corresponds to the transmission of one bit per second (Bit/s).

Baud rate

Unit of measurement for data transmission speeds in Bit/s.

Bidirectional

Working in both directions.

Bit Strobe

A Bit Strobe I/O connection is a connection between a DeviceNet client and an undetermined number of servers, these being queried by commands sent by the client.

Bonding strap

Flexible conductor, normally braided, that joins inactive components, e. g. the door of a switchgear cabinet to the cabinet main body.

Bus

Bus system for data exchange, e. g. between CPU, memory and I/O levels. A bus can consist of several parallel cables for data transmission, addressing, control and power supply.

Bus cycle time

Time required for a master to serve all slaves or stations in a bus system, i. e. reading inputs and writing outputs.

Bus line

Smallest unit connected to a bus, consisting of a PLC, a coupling element for modules on the bus and a module.

Bus system

All units which communicate with one another via a bus.

C

Capacitive coupling

Electrical capacitive couplings occur between cables with different potentials. Typical sources of interference are, e. g. parallel-routed signal cables, contactors and electrostatic discharges.

Check-back interface

The check-back interface is the interface from the counter module to the BL20's internal module bus. The bits and bytes are converted by the BL20 gateway from the respective type of communication applicable to the fieldbus in to the module-specific bits and bytes.

Class

A group of Objects that all describe the same system components. All Objects of a Class are identical in form and behavior, they can though contain different attributes.

Coding elements

Two-piece element for the unambiguous assignment of electronics and base modules.

Configuration

Systematic arrangement of the I/O modules of a station.

Control interface

The control interface is the interface from the BL20's internal module bus to the counter module. The commands and signals directed to the counter module are converted by the BL20 gateway from the respective type of communication applicable to the fieldbus in to the module-specific bits and bytes.

COS

Change of State Connections are event controlled connections. This means the DeviceNet devices generate messages as soon as a change of state takes place.

CPU

Central Processing Unit. Central unit for electronic data processing, the processing core of the PC.

Cyclic

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

D

Digital

A value (e. g. a voltage) which can adopt only certain statuses within a finite set, mostly defined as 0 and 1.

DIN

German acronym for German Industrial Standard.

E

EDS

Electronic Device Data Sheet which contains standardized DeviceNet station descriptions. They simplify the planning of the DeviceNet nodes.

EIA

Electronic Industries Association – association of electrical companies in the United States.

Electrical components

All objects that produce, convert, transmit, distribute or utilize electrical power (e. g. conductors, cable, machines, control devices).

EMC

Electromagnetic compatibility – the ability of an electrical part to operate in a specific environment without fault and without exerting a negative influence on its environment.

EN

German acronym for European Standard.

ESD

Electrostatic Discharge.

F

Field power supply

Voltage supply for devices in the field as well as the signal voltage.

Fieldbus

Data network on sensor/actuator level. A fieldbus connects the equipment on the field level. Characteristics of a fieldbus are a high transmission security and real-time behavior.

Force Mode

Software mode which enables the user to set his plant to a required state by forcing certain variables on the input and output modules.

G

GND

Abbreviation of ground (potential „0").

Ground

Expression used in electrical engineering to describe an area whose electrical potential is equal to zero at any given point. In neutral grounding devices, the potential is not necessarily zero, and one speaks of the ground reference.

Ground connection

One or more components that have a good and direct contact to earth.

Ground reference

Potential of ground in a neutral grounding device. Unlike earth whose potential is always zero, it may have a potential other than zero.

H

Hexadecimal

System of representing numbers in base 16 with the digits 0 ... 9, and further with the letters A, B, C, D, E and F.

HW gate

A hardware release, which is controlled via the digital input on the module. This release is configured as a function of the digital input. It is set by change of edge from 0-1 at the input, and reset by a change change of edge 1-0.

The hardware release is called "HW gate" in the controller and parameters.

Hysteresis

A sensor can get caught up at a certain point, and then "waver" at this position. This condition results in the counter content fluctuating around a given value. Should a reference value be within this fluctuating range, then the relevant output would be turned on and off in rhythm with the fluctuating signal.

I

Impedance

Total effective resistance that a component or circuit has for an alternating current at a specific frequency.

Inactive metal components

Conductive components that cannot be touched and are electrically isolated from active metal components by insulation, but can adopt voltage in the event of a fault.

Inductive coupling

Magnetic inductive couplings occur between two cables through which an electrical current is flowing. The magnetic effect caused by the electrical currents induces an interference voltage. Typical sources of interference are for example, transformers, motors, parallel-routed network and HF signal cables.

Instance

An Instance is defined as being an Object that is actually set up in a device.

Intelligent modules

Intelligent modules are modules with an internal memory, able to transmit certain commands (e. g. substitute values and others).

L

Load value

Predefined value for the counter module with which the count process begins.

Latch-retrigger function

This function saves the current internal counter content of the electronics module at the digital input when there is a change of status, and the count procedure is "retriggered". That means, the current internal counter content is saved at the point in time the change of status occurs. The counter is subsequently reloaded with the load value and then continues to count.

Lightning protection

All measures taken to protect a system from damage due to overvoltages caused by lightning strike.

Low impedance connection

Connection with a low AC impedance.

LSB

Least Significant Bit

M

Mass

All interconnected inactive components that do not take on a dangerous touch potential in the case of a fault.

Master

Station in a bus system that controls the communication between the other stations.

Master/slave mode

Mode of operation in which a station acting as a master controls the communication between other stations in a bus system.

Module bus

The module bus is the internal bus in a BL20 station. The BL20 modules communicate with the gateway via the module bus which is independent of the fieldbus.

MSB

Most Significant Bit

Multi-master mode

Operating mode in which all stations in a system communicate with equal rights via the bus.

N

NAMAUR

German acronym for an association concerned with standardizing measurement and control engineering. NAMUR initiators are special versions of the two-wire initiators. NAMUR initiators are characterized by their high immunity to interference and operating reliability, due to their special construction (low internal resistance, few components and compact design).

O

Overhead

System administration time required by the system for each transmission cycle.

P

PLC

Programmable Logic Controller.

Polling

Establish a Polled I/O Connection, i. e. a conventional Master/Slave relationship between a controller and a DeviceNet device.

Potential compensation

The alignment of electrical levels of electrical components and external conductive components by means of an electrical connection.

Potential free

Galvanic isolation of the reference potentials in I/O modules of the control and load circuits.

Potential linked

Electrical connection of the reference potentials in I/O modules of the control and load circuits.

Protective earth

Electrical conductor for protection against dangerous shock currents. Generally represented by PE (protective earth).

R

Radiation coupling

A radiation coupling appears when an electromagnetic wave hits a conductive structure. Voltages and currents are induced by the collision. Typical sources of interference are e. g. sparking gaps (spark plugs, commutators from electric motors) and transmitters (e. g., radio), that are operated near to conducting structures.

Reaction time

The time required in a bus system between a reading operation being sent and the receipt of an answer. It is the time required by an input module to change a signal at its input until the signal is sent to the bus system.

Reference potential

Potential from which all voltages of connected circuits are viewed and/or measured.

Repeater

Amplifier for signals transmitted via a bus.

Root-connecting

Creating a new potential group using a power distribution module. This allows sensors and loads to be supplied individually.

RS 485

Serial interface in accordance with EIA standards, for fast data transmission via multiple transmitters.

S

Serial

Type of information transmission, by which data is transmitted bit by bit via a cable.

Setting parameters

Setting parameters of individual stations on the bus and their modules in the configuration software of the master.

Shield

Conductive screen of cables, enclosures and cabinets.

Shielding

Description of all measures and devices used to join installation components to the shield.

Short-circuit proof

Characteristic of electrical components. A short-circuit proof part withstands thermal and dynamic loads which can occur at its place of installation due to a short circuit.

Station

A functional unit or I/O components consisting of a number of elements.

SW gate

A software release, which has to be controlled via the control bit SW_GATE. The software release can only be set by means of a change of edge (from 0-1) of the control bit SW_GATE. Resetting of this bit resets the software release.
The software release is called "SW gate" in the controller.

T

Terminating resistance

Resistor on both ends of a bus cable used to prevent interfering signal reflections and which provides bus cable matching. Terminating resistors must always be the last component at the end of a bus segment.

To ground

Connection of a conductive component with the grounding connection via a grounding installation.

Topology

Geometrical structure of a network or the circuitry arrangement.

U

UART

Universal Asynchronous Receiver/Transmitter. UART is a logic circuit which is used to convert an asynchronous serial data sequence to a parallel bit sequence or vice versa.

Unidirectional

Working in one direction.

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