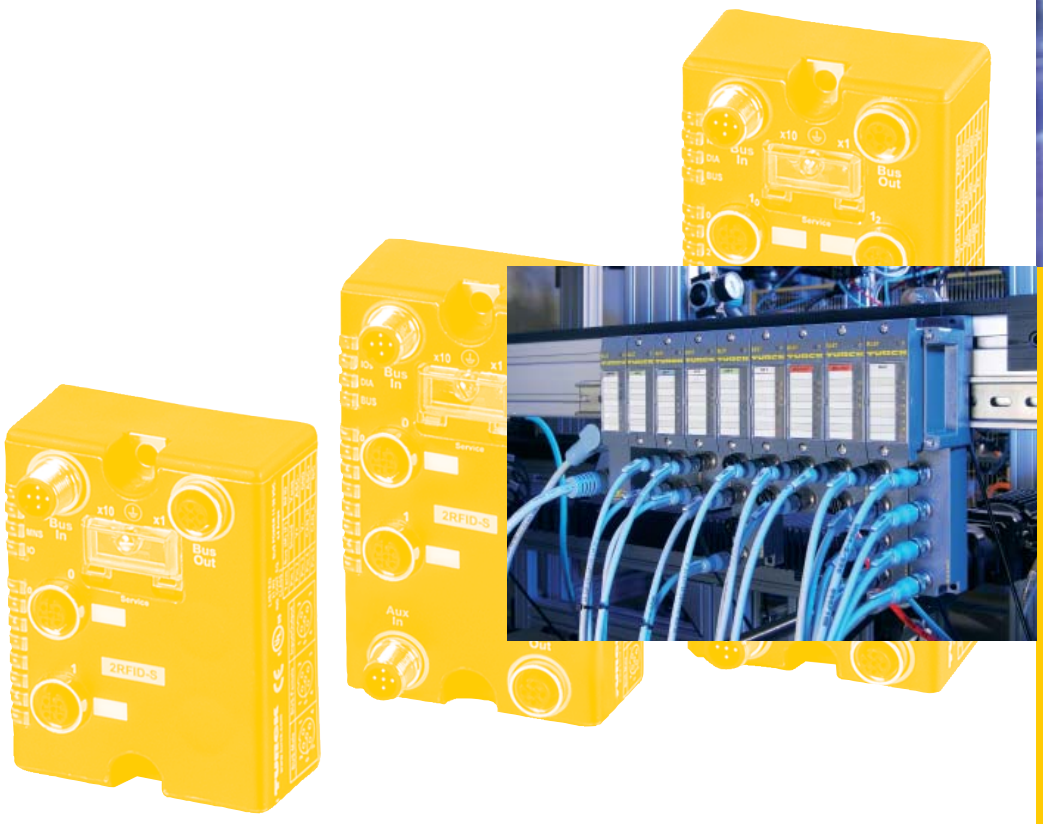
TURCK

Industrial Automation

USER MANUAL BLxx – CANOPEN-OBJECT REGISTER



Sense it! Connect it! Bus it! Solve it!

Edition 0511

Warning!
Before commencing 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 voltage supplies which meet the requirements of IEC 60 364-4-41 or. HD 384.4.41 S2 (VDE 0100 part 410).
- 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.
- 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. (respect IEC 60 364 or HD 384 or DIN VDE 0100 and national work safety regulations).
- All shrouds and doors must be kept closed during operation.

Table of Contents

1 About this manual

1.1 Documentation concept

This manual describes the CANopen object directory for TURCK BLxx-products.

If not marked especially, the object descriptions are valid for all products of the product lines BL20, BL67 and BLcompact.

1.1.1 Additional documentation

BL67

- D301006 - BL67 – User manual for CANopen
- Data sheets for the BL20-products www.turck.com

BL20

- D301108 BL20 – ECO gateway for CANopen
- D301109 - BL20 – User manual for CANopen
- Data sheets for the BL20-products www.turck.com

BLC

- Manuals and data sheets for the BLC-CANopen-products www.turck.com

1.2 General

Attention

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

1.2.1 Prescribed use

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

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.

1.2.2 Notes concerning planning/ installation of this product

Danger

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

1.3 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.

2 CANopen

2.1 CANopen

Note

The following description of CANopen is an excerpt from the homepage of CiA (CAN in Automation), the international users' and manufacturers' organization for CAN.

2.1.1 General

CANopen is an open, non-proprietary network protocol. It consists of a profile family, based on a communication profile and several device profiles. The CANopen communication profile is standardized as CiA DS-301 (Application Layer and Communication Profile).

The CANopen device profile for I/O-modules has been published as CiA DS-401 (Device Profile for I/O-Modules).

CANopen is based on the following standards:

- ISO 11 898 (Physical and Data Link Layer)Layers 1 and 2 of the ISO/OSI communication model
- CiA DS-301 (Application Layer and Communication Profile) CANopen communication profile
- CiA DS-302 (Framework for Programmable CANopen Devices) CANopen Network Management NMT
- CiA DS-401 (Device Profile for I/O-modules)
- CiA DS-406 (Device Profile for Encoders) CANopen device profile for counter modules
- CiA DS-102 (CAN Physical Layer for Industrial Applications) General application in the field sector (connectors and bit rates) on the basis of ISO 11898

2.1.2 Communication

The lower layers of CANopen are defined according to the ISO-OSI model in the ISO 11898 standard.

Communication between the individual nodes is made by transmitting "Telegrams".

4 different types of telegram message are defined for CANopen:

- Network management messages
- Service data objects SDO
- Process data objects PDO
- Predefined messages

Network Management Messages

Network management messages are used in the network to control the nodes and their operating states. This type of message makes it possible, for instance, to configure the data transmission mechanism of a node.

The Network Management objects include Boot-up message, Heartbeat protocol and NMT message.

Boot-up message, Heartbeat and Node Guarding are implemented as single CAN frames with 1-byte data field.

The NMT message is mapped to a single CAN frame with a data length of 2 byte. The CAN-Identifier is 0. The first byte contains the command specifier and the second contains the Node-ID of the device that must perform the command (in the case of Node-ID 0 all nodes have to perform the command). The NMT message transmitted by the NMT master forces the nodes to transit to another NMT state. CANopen defines the following statsus: "Initialization", "Pre-Operational", "Operational" and "Stopped".

After a "power-on", each CANopen devices is in the status "Initialization" and automatically changes to the Pre-Operational status . In this state the transmission of SDOs is allowed. If the NMT master has set one or more nodes into the state Operational, they are allowed to transmit and to receive PDOs. In the state Stopped no communication is allowed except that of NMT objects.

The state Initialization is devided into 3 sub-states. in order to enable a complete or partial reset of a node. In the sub-state Reset Application the parameters of the manufacturer-specific profile area and the standardized device profile area are set to their power-on values. In the sub-state Reset Communication the parameters of the communication profile area are set to their power-on values. The third sub-state is initializing, which a node enters automatically after power-on. Power-on values are the last stored parameters.

The **Heartbeat** protocol and **Node Guarding** (see Set up Node Guarding Protocol (page 2-9)) are for error control purposes and signals the presence of a node and its state. The Heartbeat message is a periodic message of the node to one or several other nodes. It indicates that the sending node is still working properly.

A device sends the **Boot-up message** to indicate to the NMT master that it has changed from „Initialization“ tot he state Pre-operational. This occurs whenever the device initially boots-up but also after a power-out during operation. The Boot-up message has the same identifier as the Heartbeat object, however, its data content is zero.

Service Data Objects (SDOs)

A Service Data Object (SDO) reads from entries or writes to entries of the Object Dictionary.

The SDO transport protocol allows transmitting objects of any size. The first byte of the first segment contains the necessary flow control information including a toggle bit to overcome the problem of doubly received CAN frames. The next three bytes of the first segment contain index and sub-index of the Object Dictionary entry to be read or written. The last four bytes of the first segment are available for user data. The second and the following segments (using the very same CAN identifier) contain the control byte and up to seven bytes of user data. The receiver confirms each segment or a block of segments, so that a peer-to-peer communication (client/server) takes place.

Process Data Objects (PDOs)

Process Data Objects (PDOs) are mapped to a single CAN frame using up to 8 bytes of the data field to transmit application objects. Each PDO has a unique identifier and is transmitted by only one node, but it can be received by more than one (producer/consumer communication). PDO transmissions may be driven by an internal event, by an internal timer, by remote requests and by the Sync message received:

PDO transmissions

- „Event-“ or „timer-driven“:
  An event (specified in the device profile) triggers message transmission. An elapsed timer additionally triggers the periodically transmitting of PDO-messages, even if no event has ocurred.
- Remotely requested (RTR):
  Another device may initiate the transmission of an asynchronous PDO by sending a remote transmission request (remote frame).
- Sync Master (Synchronous transmission:)
  In order to initiate simultaneous sampling of input values of all nodes, a periodically transmitted Sync message is required. Synchronous transmission of PDOs takes place in cyclic and acyclic transmission mode. Cyclic transmission means that the node waits for the Sync message, after which it sends its measured values. Acyclically transmitted synchronous PDOs are triggered by a defined application-specific event. The device transmits it's input values. Further transmission is only done if a further Sync messages occurs.

Special Function Objects

CANopen also defines three specific protocols for synchronization, emergency indication, and time-stamp transmission.

- **Synchronization object (Sync)**
  The Sync Object is broadcast periodically by the Sync Producer. This object is a central timer. The Sync Object is broadcast periodically by the Sync Producer. The time period between Sync messages is defined by the Communication Cycle Period, which may be reset by a configuration tool to the application devices during the boot-up process. There can be a time jitter in transmission by the Sync Producer due to some other objects with higher prior identifiers or by one frame being transmitted just before the Sync message. The Sync message is mapped to a single CAN frame with the identifier 128 by default.
- **Emergency object (Emcy)**
  The Emergency message is triggered by the occurrence of a device internal error situation and are transmitted from an Emergency producer on the concerned application device. This makes them suitable for interrupt type error alerts. An Emergency message is transmitted only once per 'error event'. As long as no new errors occurs on a device, no further Emergency message can be transmitted. Zero or more Emergency consumers may receive these. The reaction of the Emergency consumer is application-specific. CANopen defines several Emergency Error Codes to be transmitted in the Emergency message, which is a single CAN frame with 8 data byte.
- **Time stamp object (Time)**
  By means of Time-Stamp, a common time frame reference is provided to application devices. It contains a value of the type Time-of-Day. This object transmission follows the producer/consumer push model. The associated CAN frame has the pre-defined identifier 256 and a data field of 6-byte length.

2.2 EDS-file – Electronic data sheet

CANopen nodes are embedded in the CANopen structure by the help of a standardized EDS file (Electronic Data Sheet).

The EDS file lists all necessary Objects with their corresponding Sub-indices and the matching entries.

The latest version of a particular EDS file can be downloaded directly from the TURCK homepage www.turck.com.

2.3 BLxx and CANopen

BLxx supports the following CANopen-functions:

- SDO transfer, any length of information
- Emergency object
- Sync frame evaluation
- Event-driven PDOs
- Synchronous PDOs (clock-synchronous)
- Remote-requested PDO/polling

2.3.1 Setting up communication

Minimum Boot-up

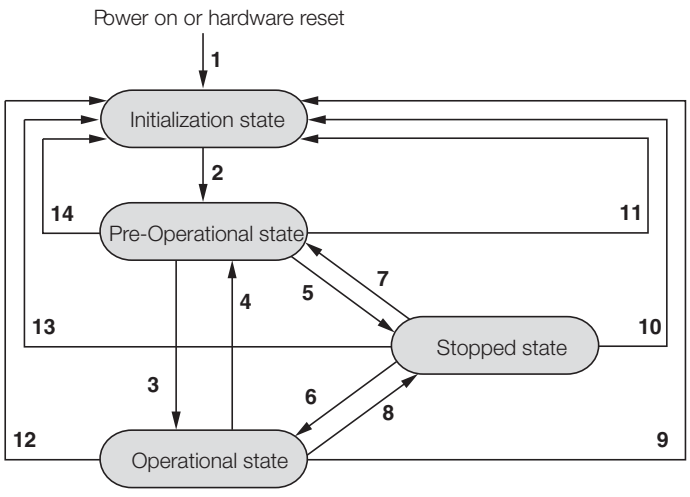
BLxx supports the Minimum Boot-up function described in CiA DS-301.

Table 1: Meaning of the abbreviations

Abbreviation	Meaning	Description
cs	NMT command specifier	A designation label for the required service
Node-ID	Node Identifier	Identifier for the node; an identification byte that is set through the DIP switches for the CAN node.

Booting with the Minimum Boot-up function is the typical application option for CANopen, and runs according to the following state diagram:

Figure1: Boot procedure with Minimum Boot-up



1 Power-on (automatic change of state to the "Initialization" condition)

2 Initialization Finished (automatic change of state to "Pre-Operational")

3 Start Remote Node (start the CAN node)

4 Enter Pre-Operational (change over to "Pre-Operational")

5 Stop Remote Node (stop the CAN node)

6 Start Remote Node (start the CAN node)

7 Enter Pre-Operational (change over to "Pre-Operational")

8 Stop Remote Node (stop the CAN node)

9 Reset Node (reset the complete CAN node)

10 Reset Node (reset the complete CAN node)

11 Reset Node (reset the complete CAN node)

12 Reset Communication (reset communication for the CAN node)

13 Reset Communication (reset communication for the CAN node)

14 Reset Communication (reset communication for the CAN node)

The following messages are exchanged in the states mentioned:

- Operational: PDO and SDO communication
- Pre-Operational: only SDO-communication

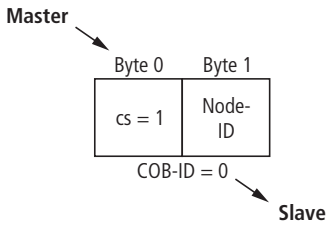
The services listed above (1 to 14) are required by CANopen or performed independently by the nodes in order to change from one state to another.

The "Stopped" state can be skipped when using Minimum Boot-up.

1 Power-on (automatic change of state to the "Initialization" condition)

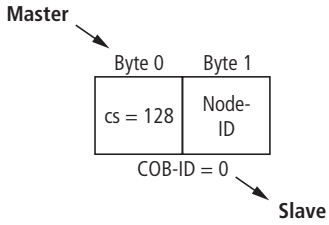
2 Initialization finished (automatic change of state to "Pre-Operational")

3, 6 Start Remote Node (start the CAN node)



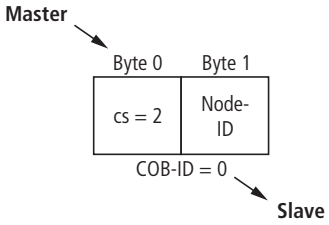
The internal change of state of the CANopen slave now requires a **pause of at least 20 ms**, before another request may be made by the master.

15, 7 Enter Pre-Operational (change over to "Pre-Operational")



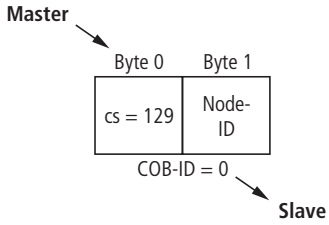
The internal change of state of the CANopen slave now requires a **pause of at least 20 ms**, before another request may be made by the master.

15, 8 Stop Remote Node (stop the CAN node)



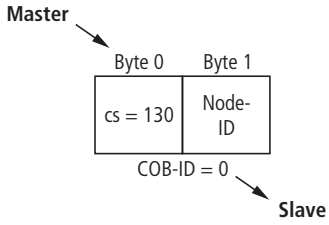
The internal change of state of the CANopen slave now requires a **pause of at least 20 ms**, before another request may be made by the master.

15, 10, 11 Reset Node (reset the complete CAN node)



The execution of this command is confirmed by a boot-up message. This is in the form of a guard frame with the data contents 00_{hex}.

15, 13, 14 Reset Communication (reset communication for the CAN node)



The execution of this command is confirmed by a boot-up message. This is in the form of a guard frame with the data contents 00_{hex}.

Identifier for the Standard Objects

Node-ID

The identifier for each device in a CANopen network is the Node-ID. he CANopen slaves can be assigned the Node-IDs 1 to 127. The maximum number of Node-IDs to be set may vary depending on the BLxx-product.

COB-ID (Communication Object Identifier)

The identifier for each communication object in a CANopen network is the COB-ID. The COB-IDs for the standard objects (digital input, digital output, analog input, analog output) are assigned automatically. The ranges for the COB-IDs are defined by the "Predefined Master-Slave Connection Set".

Each range for the COB-IDs has 127 numerical values.

The COB-IDs are calculated according to the following rule:

COB-ID = Base-ID + Node-ID

Base-ID: 128; 384; 512; 640; 768; 896; 1024; 1152; 1280; 1408; 1536; 1792

Node-ID: max. 1 to 127

Table 2: Identifiers for basic objects

COB-ID dec.	hex.	**Function**	**Application**
0	000_{hex}	Network Management (NMT)	Broadcast object
01 to 127	001_{hex} to $07F_{hex}$	free	
128	080_{hex}	Synchronization (Sync)	Broadcast object
129 to 255	081_{hex} to $0FF_{hex}$	Emergency Message	
256	100_{hex}	Timestamp	Broadcast object
257 to 384	101_{hex} to 180_{hex}	free	
385 to 511	181_{hex} to $1FF_{hex}$	Transmit PDO 1	Digital input
512	200_{hex}	free	
513 to 639	201_{hex} to $27F_{hex}$	Receive PDO 1	Digital output
640	280_{hex}	free	
641 to 767	281_{hex} to $2FF_{hex}$	Transmit PDO 2	Analog input
768	300_{hex}	free	
769 to 895	301_{hex} to $37F_{hex}$	Receive PDO 2	Analog output
896	380_{hex}	free	
897 to 1023	381_{hex} to $3FF_{hex}$	Transmit PDO 3	Analog input
1024	400_{hex}	free	
1025 to 1151	401_{hex} to $47F_{hex}$	Receive PDO 3	Analog output
1152	480_{hex}	free	
1153 to 1279	481_{hex} to $4FF_{hex}$	Transmit PDO 4	Analog input
1280	500_{hex}	free	

Table 2: Identifiers for basic objects

COB-ID dec.	COB-ID hex.	Function	Application
1281 to 1407	501_{hex} to $57F_{hex}$	Receive PDO 4	Analog output
1408	580_{hex}	free	
1409 to 1535	581_{hex} to $5FF_{hex}$	Transmit SDO	
1536	600_{hex}	free	
1537 to 1663	601_{hex} to $67F_{hex}$	Receive SDO	
1664 to 1772	680_{hex} to $6EC_{hex}$	free	
1793 to 1919	701_{hex} to $77F_{hex}$	NMT Error (Node Guarding, Heartbeat, Boot-Up)	
1920 to 2014	800_{hex} to $7DE_{hex}$	free	
2015 to 2031	$7DF_{hex}$ to $7EF_{hex}$	NMT, LMT, DBT	

Set up Node Guarding Protocol

Note

Further information on Node Guarding can be found in CiA DS-301.

Node Guarding is the name for the monitoring of network nodes by a network manager. You distinguish between active and passive Node Guarding.

In addition, the CANopen network nodes check that their network manager is operating correctly and that the network is functioning reliably.

In the default state, Node Guarding is inactive.

Active Node Guarding

To activate the Node Guarding protocol for a node, various parameters must be set for the Object Dictionary:

- [100C] = Guard time
  Given in milliseconds; the query interval (polling) that is to be expected by the network slave.
  Default = 0
- [100D] = Lifetime factor
  This factor, multiplied by the Guard time, is the time that should elapse after a Node Guarding protocol error before the network slave generates an error message via EMCY. In this way, a temporary communication problem, such as may be caused by heavy bus loading, can be bridged without a Guarding Error.
  Default = 0
- Guard-ID
  This is fixed and cannot be changed.

Guarding is initiated with the first Guard-Remote frame (Guarding-RTR) from the CANopen network manager.

The Guarding Frame of the network manager has the COBID "1793 - 1 + Node-ID" and does **not** have a data field.

Furthermore, the RTR bit in the message header must be set and the Data Length code = 1.

The node answers the telegram sent out by the network manager within the preset time (Guard time) in the "Operational" state, with the data contents **5**. The gateway answers the next polling query with the contents **133**. The following response from the gateway is with **5** again, and so on. This means that the gateway changes the state of the most significant bit after every query (i.e. the bit is toggled). If the node is in the "Pre-Operational" state, then the value of the data contents of the response telegram toggles between 127 and 255. If the node is in the "Stop" state, the value toggles between 4 and 132.

If there is no query from the network manager within the preset time, then the gateway changes to the state "Guard Fail". If output modules are fitted in the BL×× station, then their outputs will be put into defined states, depending on the objects "Error mode output" and "Error state output", or will retain the last state that was received. Any RxPDOs that are received will still be processed and output again. If the Guarding starts up again, the gateway leaves the "Guard Fail" state, but remains in the Pre-Operational state. A "Start Node" command must be generated by the network manager in order to restart the gateway (see CiA DS-301).

Passive Node Guarding

If a Guard-Time = 0 is set (see Object 100Chex – Guard Time (page 4-9)), than, passive guarding is activated. This means that the gateway answers the Guard-Remote-Frames without itself starting a Guard-Timer. The gateway does not change to the Pre-Operational state.

As an alternative to Node-/Life-Guarding, the Heartbeat mechanism (see Object 1016hex – Consumer Heartbeat Time (page 4-13) and Object 1017hex – Producer Heartbeat Time (page 4-15)) newly introduced with DS301 V4.0 is supported, which, unlike Guarding, does not require Remote frames.

Boot-up Message

After initialization (after Power-On, Reset-Node and Reset-Communication), a Boot-up message as per CiA DS-301 V4.0 is sent out. This is in the form of a guard frame with the contents 00_{hex}.

Under certain circumstances, a network manager may fail to detect a short drop-out of an BL20 gateway (for example, as a result of voltage variations). This could occur under the following conditions:

- The drop-out and initialization of the gateway happen in the time between two Guarding-Frames
- The gateway was already in the Pre-Operational state beforehand
- The last state of the toggle bit was 1

If a Boot-up message is sent out after a reset or initialization, then the drop-out mentioned above will also not be missed by the network manager.

2.3.2 Parameterization through Service Data Objects (SDO)

SDO (= Service Data Object) is a confirmed CANopen service that is primarily used for parameterization and configuration of the CANopen slaves (BL××) and less frequently for transmitting process data. "Confirmed" means that an BL××-CANopen gateway (SDO server) that is addressed by this procedure must acknowledge it through a response. In this way, the SDO client obtains information about whether the BL×× gateway that it addressed was contacted, and whether the access was achieved without any errors (error code in the response from the SDO server). SDO access means that the contents of the Object Dictionary entries for an SDO server can be read or written, and that the settings for a BL×× station can be made in this way.

Four parallel SDO servers are supported. There are three "additional" SDOs, as well as the default SDO. As a default, these are inactive, but can be parameterized and enabled through the Object Dictionary entries 1201_{hex} to 1203_{hex}.

The communication parameters for the default SDO follow the Predefined Connection Set, and cannot be modified (see CiA DS-301, V4.01).

In the following representations of the messages, the identifier of the CANopen message that is to be sent can be found below the frame, and the contents of the data byte to be transmitted are within the frame.

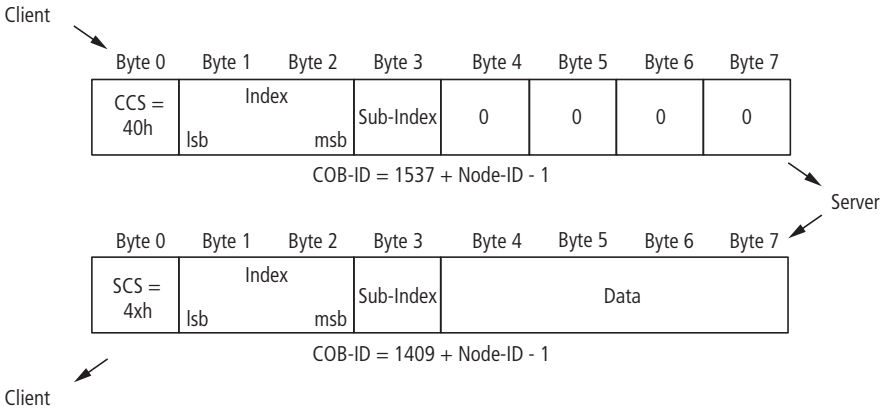
The following representations use the Expedited SDO Transfer, i.e. a maximum of 4 bytes of user data can be transferred within one telegram.

Note

CANopen also offers the possibility of segmented SDO-transfer of data with data length of more than 4 bytes.

Read (Read from Object Dictionary)

Figure2: Read (Read from Object Dictionary)



x... depending on the length of data read

LSB= Least Significant byte ? lowest value byte

MSB= Most Significant byte ? highest value byte

SCS = Server Command Specifier

CCS = Client Command Specifier

(see CiA DS-301)

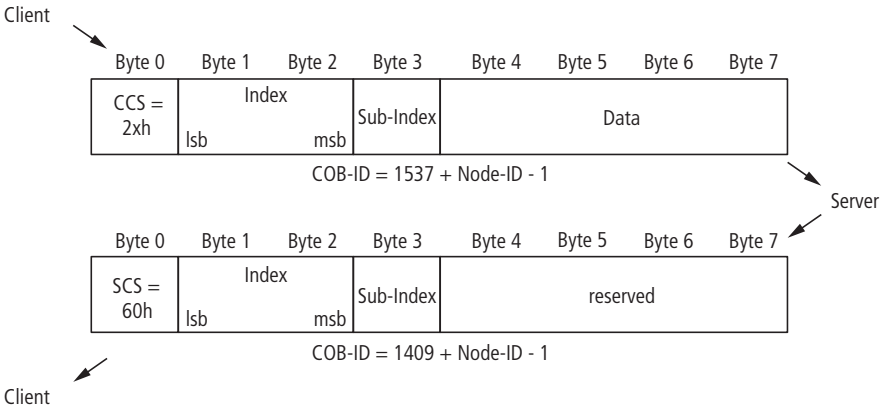
The stated COB-ID refers to the default SDO server.

Note

The information in byte 0 "SCS " can optionally contain the length information for the transmitted data bytes (see CiA DS-301, Page 9-21 ff). The information in byte 0 "SCS = $4x_{hex}$" means that no length information is present.

Write (Write to Object Dictionary)

Figure3: Write (Write to Object Dictionary)



LSB= Least Significant byte ? lowest value byte

MSB= Most Significant byte ? highest value byte

SCS = Server Command Specifier

CCS = Client Command Specifier

(see CiA DS-301)

The stated COB-ID refers to the default SDO server.

Note

The information in byte 0 "SCS " can optionally contain the length information for the transmitted data bytes (see CiA DS-301). The information in byte 0 „SCS = 60h“ means that no length information is present.

Attention

If an incorrect data length is given, the error code "Abort SDO Transfer Service" will be generated (see CiA DS-301).

Table 3: Abort codes for errors in SDO transfer

Abort code	Description
0503 0000_{hex}	Toggle bit not altered.
0504 0001_{hex}	Client server command specifier not valid or unknown.
0601 0000_{hex}	Unsupported access to an object.
0601 0001_{hex}	Attempt to write a read only object.
0601 0002_{hex}	Attempt to read a write only object.
0602 0000_{hex}	Object does not exist in the object dictionary.
06040041_{hex}	Object cannot be mapped to the PDO.
06040042_{hex}	The number and length of objects exceeds PDO length.

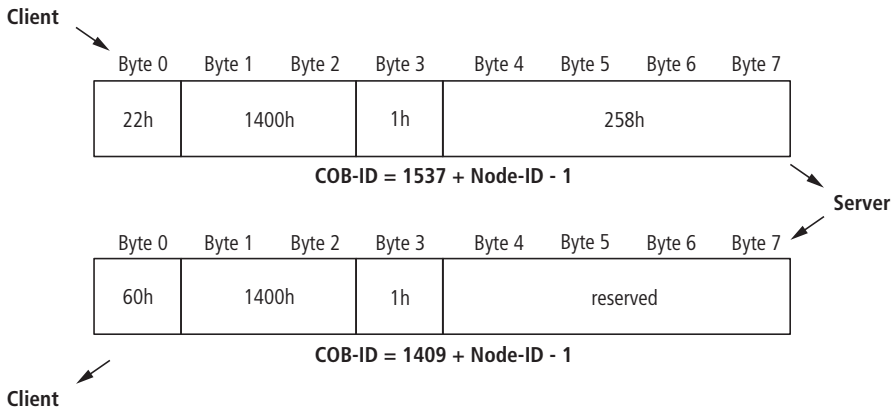
Table 3: Abort codes for errors in SDO transfer

Abort code	Description
06040043_{hex}	General parameter incompatibility reason.
06040047_{hex}	General internal incompatibility in the device.
06070010_{hex}	Data type does not match - wrong length.
$0607\ 0012_{hex}$	Data type does not match- length too high.
$0607\ 0013_{hex}$	Data type does not match- length too low.
06090011_{hex}	Sub-index does not exist.
06090030_{hex}	Value range of parameter exceeded.
06090031_{hex}	Value range of parameter written too high.
06090032_{hex}	Value range of parameter written too low
06090036_{hex}	Maximum value is less than minimum value.
08000000_{hex}	Other error
08000020_{hex}	Data cannot be stored to the application.
08000021_{hex}	Data cannot be stored to the app. because of local control.
08000022_{hex}	Data cannot be stored to the app. because of device state.

Example:

Write a new COB-ID for RxPDO 1 (ID = 258_{hex})

Figure4: Example COB-ID



Parameter Storing/Restoring

Saving of communication and application parameters is executed by a command. This means that the parameters transferred through an SDO are held in volatile memory, until they are saved by using the command "Store parameters" (Object 1010_{hex}, Sub-indices 0 to 3). All the communication and application parameters that are supported by the gateway will be saved.

The command "Restore Default parameters" (Object 1011_{hex}, Sub-indices 0 to 3) is also supported. This command resets all the communication and/or application parameters to the default values.

2.3.3 Transmission of Process Data Objects (PDO)

PDOs are fast real-time process data that are handled as unconfirmed services without a protocol overhead.

We distinguish between:

- Transmit PDOS = TPDOs
- Receive PDOs = RPDOs

PDOs can contain a maximum of 8 bytes of data. They can be assembled and configured by the user to suit the specific requirements. In addition, there are a number of transmission/transfer settings (Transmission types) for process data.

The following attributes can be set for each PDO through the object "PDO communication parameter":

Communication parameter COB-ID

The COB-ID is the CAN identifier that is used for the transmission of a PDO (object 1800_{hex} ff and 1400_{hex} ff.).

COB-IDs are used to define the priority of the message telegrams. The lowest COB-ID has the highest priority.

For communication between 2 nodes, the COB-ID of the transmit PDO must be the same as the COB-ID of the receive PDO..

Note

As delivered, each BL×× gateway has a maximum number of 8 active PDOs (0 to 8 are possible), with COB-IDs that are taken from the Predefined Master-Slave Connection Set. The compact modules of the BLCCO product line provide up to four active PDOs.

All other PDOs are inactive. This state can be seen from the invalid bit (bit 31) of the COB-ID (see also The COB-ID entries in the tables on page 2-17 ff.).

Transmission Type

The Transmission type determines under which circumstances a PDO can be transmitted or received.

The following PDO Transmission types are supported by BL××:

- Type 0 (sync, acyclic)
- Type 1 (sync, cyclic)
- Type 253 (Remote Request)
- Type 255 (Event-Driven)

Table 4: Overview of PDO Transmission Types

Transmission Type	PDO transmission				
	cyclic	acyclic	synchr.	asynchr.	only with RTR
0		×	×		
1	×		×		
253				×	×
255				×	

Type 0
The PDO will always be transmitted (TPDO) or evaluated (RPDO) if this is permitted by a Sync-Frame transmitted by the SYNC producer and the mapped contents of the BL××-CANopen gateway have changed since the last transmission.

Type 1
Immediately after receiving each Sync-Frame, the BL××-CANopen gateway puts out the mapped contents as a PDO on the network, even if they have not changed since the last transmission.

Type 253
The PDO is only transmitted if a transmitted Remote-Frame requests this from the BL××-CANopen gateway.

Attention
This Transmission Type is only allowed for TPDOs.

Type 255

In this mode of operation, the BL××-CANopen gateway does not depend on any Sync or Remote-Request for PDO communication. Whenever this is envisaged for an internal event within the BL××CANopen gateway, the gateway will transmit a PDO to the CANopen network.

The Transmission types of the individual PDOs are independent, which means that a freely mixed operation with synchronous and asynchronous PDOs is possible.

2.3.4 Inhibit Time

The setting of an Inhibit time for the PDOs (Object 1800_{hex} ff, Sub-Index 03_{hex}) is only supported for TPDOs. Unlike the other time values, which are given as multiples of 1 ms, the Inhibit time is defined as a multiple of 100 µs. However, since the time resolution of the system clock in the BL××-CANopen gateway is 1 ms, Inhibit time values below 10 x 100 µs are pointless.

2.3.5 Event Timer

The Event timer (Object 1800_{hex} ff, Sub-Index 05_{hex}) defines the maximum interval after which a TPDO will be transmitted, even though no event has occurred. This means that the Event timer determines the maximum interval between two transmissions of a TPDO.

The expiry of the interval set for the Event timer is detected as an event. If any other event occurs, the Event timer is reset and restarted.

The value of the object is interpreted as a multiple of 1 ms.

Available PDOs

BL××:
64 PDOs are supported:

- 32 Transmit-PDOs: TPDO1 to TPDO32 (Index 1800_{hex} to $181F_{hex}$)
- 32 Receive-PDOs: RPDO1 to RPDO32 (Index 1400_{hex} to $141F_{hex}$)

BLCCO:
8 PDOs are supported:

- 4 Transmit-PDOs: TPDO1 to TPDO4 (Index 1800_{hex} to 1803_{hex})
- 4 Receive-PDOs: RPDO1 to RPDO4 (Index 1400_{hex} to 1403_{hex})

The corresponding Default Master-Slave Connection Set is supported for each of the PDOs 1 to 4, so that a COB-ID distribution is not necessary for these PDOs.

If one of the COB-IDs from xPDO1 to xPDO4 is reconfigured, then the use of a COB-ID from the Default Master-Slave Connection Set can be achieved by setting this COB-ID to 0.

2.3.6 Mapping Objects in PDOs

Mapping is the assignment of objects from an Object Dictionary in a PDO for transmission/reception through the CAN-bus. More than one object can be transmitted in a single PDO.

The Mapping parameters determine which items of information are transmitted in a PDO:

Table 5: Object Dictionary for mapping parameters

PDO		**Object Dictionary entries**	
Type	**Product family**	**Range**	**Range**
Transmit-PDOs	BL20/BL67	TPDO1 to TPDO32	$1A00_{hex}$ to $1A1F_{hex}$
	BLCCO	TPDO1 to TPDO4	$1A00_{hex}$ to $1A03_{hex}$
Receive-PDOs	BL20/BL67	RPDO1 to RPDO32	1600_{hex} to $161F_{hex}$
	BLCCO	RPDO1 to RPDO4	1600_{hex} to 1603_{hex}

Default-PDOs and PDO-mappings

The 4 Transmit and 4 Receive-PDOs which are specified by the Communication Profile CiA DS-301 are supported by BL××. The mapping of these PDOs and their Transmission types are specified by the I/O-Device Profile CiA DS-401.

Note

BL67/BL20:
The Default-PDOs are only activated if the planned objects and sub-indices actually exist for the corresponding PDO. If, in a station, for example no analog I/Os are used, then the PDOs 2 to 4 are set to "Invalid" and no mapping entries will be present.

In addition to the default PDOs which are standardized by the CiA DS-301 and DS-401 profiles, other PDOs for a -CANopen gateway may be provided with mapping entries and communication parameters.

These additional PDOs (5 to 16) will be set to "Invalid" as a default (see Table 6: Overview Default-TPDOs as per CiA DS-301 und DS-401 to Table 9: Overview of the BL××-specific Default-RPDOs).

Default-PDOs as per CiA DS-301 und DS-401

The TPDOs in the following table have the following characteristics:

- The COB-ID is part of sub-index 01_{hex}
- The PDO is active!
  The first digit of the 8-digit hexadecimal COB-ID-number shows amongst others, if the PDO is valid. Active PDOs are marked by a hex-digit 7. Normally, the digit is 0 or 4. → Description of the COB-ID entry (sub-index 01hex) (page 4-29).

Overview of the Default-TPDOs as per CiA DS-301 and DS-401

Table 6: Overview Default-TPDOs as per CiA DS-301 und DS-401

Meaning	TPDO	Sub-Index 01_{hex} - "COB-ID"
1 group, digital input channels, (bits 0 to 63)	PDO1 1800_{hex}	0000 0180_{hex} + Node-ID
1 group, analog input channels, (channels 0 to 3)	PDO2 1801_{hex}	0000 0280_{hex} + Node-ID
2 group, analog input channels, (channels 4 to 7)	PDO3 1802_{hex}	0000 0380_{hex} + Node-ID
3 group, analog input channels, (channels 8 to 11)	PDO4 1803_{hex}	0000 0480_{hex} + Node-ID

Overview of the Default-RPDOs as per CiA DS-301 and DS-401

Table 7: Overview Default-RPDOs as per CiA DS-301 und DS-401

Meaning	RPDO	COB-ID
1 group, digital output channels, (bits 0 to 63)	PDO1 1400_{hex}	0000 0200_{hex} + Node-ID
1 group, analog output channels, (channels 0 to 3)	PDO2 1401_{hex}	0000 0300_{hex} + Node-ID
2 group, analog output channels, (channels 4 to 7)	PDO3 1402_{hex}	0000 0400_{hex} + Node-ID
3 group, analog output channels, (channels 8 to 11)	PDO4 1403_{hex}	0000 0500_{hex} + Node-ID

BLxx-spezifische Default-PDOs (gilt nicht für BL compact)

These additional PDOs will be set to "Invalid" as a default.

Before enabling these PDOs, the corresponding parameters must be checked. This applies especially to the COB-IDs, since these are taken from the Default Master-Slave Connection Set, and are assigned to other Node-IDs. For this reason, other nodes with the corresponding Node-ID must not be present in the network, or such nodes must not use the corresponding COB-IDs.

The Transmission type of these PDOs is generally 255.

Overview of the BLxx-specific Default-TPDOs (not valid for BL compact)

Note

The COB-ID definition for the TPDOs depends on the gateway used in the application (see EDS file for the gateways).

Table 8: Overview of the BL××-specific Default-TPDOs

		BL20- -GW-CO	BL67-GW-CO/ BL20-GWBR-CANopen
Meaning	**TPDOs**	**COB-ID TPDO**	**COB-ID TPDO**
2 group digital input channels (bits 64 to 127)	PDO5 1804_{hex}	8000 $01C0_{hex}$ + Node-ID	8000 $01C0_{hex}$ + Node-ID
3 group digital input channels (bits 128 to 191)	PDO6 1805_{hex}	8000 $02C0_{hex}$ + Node-ID	8000 $02C0_{hex}$ + Node-ID
4 group digital input channels (bits 192 to 255)	PDO7 1806_{hex}	8000 $03C0_{hex}$ + Node-ID	C000 $03C0_{hex}$ + Node-ID
5 group digital input channels (bits 256 to 319)	PDO8 1807_{hex}	8000 $04C0_{hex}$ + Node-ID	C000 $04C0_{hex}$ + Node-ID
1 group encoders (channels 0 +1)	PDO9 1808_{hex}	8000 $01E0_{hex}$ + Node-ID	C000 $01E0_{hex}$ + Node-ID
2 group encoders (channels 2 3)	PDO10 1809_{hex}	8000 $02E0_{hex}$ + Node-ID	C000 $02E0_{hex}$ + Node-ID
3 group encoders (channels 4 5)	PDO11 $180A_{hex}$	8000 $03E0_{hex}$ + Node-ID	C000 $03E0_{hex}$ + Node-ID
4 group encoders (channels 6 7)	PDO12 $180B_{hex}$	8000 $04E0_{hex}$ + Node-ID	C000 $04E0_{hex}$ + Node-ID
4 group analog input channels (channels 12 to 15)	PDO13 $180C_{hex}$	8000 $01A0_{hex}$ + Node-ID	C000 $01A0_{hex}$ + Node-ID
5 group analog input channels (channels 16 to 19)	PDO14 $180D_{hex}$	8000 $02A0_{hex}$ + Node-ID	C000 $02A0_{hex}$ + Node-ID
6 group analog input channels (channels 20 to 23)	PDO15 $180E_{hex}$	88000 000 $03A0_{hex}$ + Node-ID	C8000 000 $03A0_{hex}$ + Node-ID
7 group analog input channels (channels 24 to 27)	PDO16 $180F_{hex}$	8000 $04A0_{hex}$ + Node-ID	C000 $04A0_{hex}$ + Node-ID
1. group RS×× (channel 0)	PDO18 1811_{hex}	8000 0000_{hex}	C000 0000_{hex}
1. group RS×× (channel 1)	PDO19 1812_{hex}	8000 0000_{hex}	C000 0000_{hex}

Overview of the BL××-specific Default-TPDOs (not valid for BL compact)

Table 9: Overview of the BL××-specific Default-RPDOs

Meaning	RPDOs	COB-ID RPDO
2 group, digital input I/Os, (bits 64 to 127)	PDO5 1404_{hex}	8000 0240_{hex} + Node-ID
3 group, digital input I/Os, (bits 128 to 191)	PDO6 1405_{hex}	8000 0340_{hex} + Node-ID
4 group, digital input I/Os, (bits 192 to 255)	PDO7 1406_{hex}	8000 0440_{hex} + Node-ID
5 group, digital input I/Os, (bits 256 to 319)	PDO8 1407_{hex}	8000 0540_{hex} + Node-ID
1 group encoders (channel 0 + 1)	PDO9 1408_{hex}	8000 0260_{hex} + Node-ID
2 group encoders (channel 2 + 3)	PDO10 1409_{hex}	8000 0360_{hex} + Node-ID
3 group encoders (channel 4 + 5)	PDO11 $140A_{hex}$	8000 0460_{hex} + Node-ID
4 group encoders (channel 6 + 7)	PDO12 $140B_{hex}$	8000 0560_{hex} + Node-ID
4 group analog I/Os, (channels 12 to 15)	PDO13 $140C_{hex}$	8000 0220_{hex} + Node-ID
5 group analog I/Os, (channels 16 to 19)	PDO14 $140D_{hex}$	8000 0320_{hex} + Node-ID
6 group analog I/Os, (channels 20 to 23)	PDO15 $140E_{hex}$	8000 0420_{hex} + Node-ID
7 group analog I/Os, (channels 24 to 27)	PDO16 $140F_{hex}$	8000 0520_{hex} + Node-ID
1. group RS×× (channel 0)	PDO18 1411_{hex}	8000 0000_{hex}
1. group RS×× (channel 1)	PDO19 1412_{hex}	8000 0000_{hex}

Attention

The COB-ID for the RS×××-Module must be defined by the user!

Example (not valid for BLCCO)

The own Node-ID of an BL××-CANopen gateway is 1. There are more than 12 analog input channels. As a result, appropriate mapping entries are set up for TPDO13 (Object $1A0C_{hex}$), and the COB-ID (Object 180C, Sub-Index 1) is pre-loaded with the value 8000 $01A1_{hex}$. This PDO can only be enabled without alteration if a node with the Node-ID 33 (own Node-ID + 32) does not exist, or at least its TPDO1 is not used.+

The following table illustrates the systematic relationship:

Table 10: Relationship between a Node-ID and BL20-specific PDOs

PDO	**Node-ID** assigned to this COB-ID in the Default Master-Slave Connection Set	**Original PDO** assigned to this COB-ID in the Default Master-Slave Connection Set
PDO5	own Node-ID + 64 (40_{hex})	PDO1
PDO6	own Node-ID + 64 (40_{hex})	PDO2
PDO7	own Node-ID + 64 (40_{hex})	PDO3
PDO8	own Node-ID + 64 (40_{hex})	PDO4
PDO9	own Node-ID + 96 (60_{hex})	PDO1
PDO10	own Node-ID + 96 (60_{hex})	PDO2
PDO11	own Node-ID + 96 (60_{hex})	PDO3
PDO12	own Node-ID + 96 (60_{hex})	PDO4
PDO13	own Node-ID + 32 (20_{hex})	PDO1
PDO14	own Node-ID + 32 (20_{hex})	PDO2
PDO15	own Node-ID + 32 (20_{hex})	PDO3
PDO16	own Node-ID + 32 (20_{hex})	PDO4

Mappable Objects

The maximum of 64 mapping entries per PDO that is specified by Communication Profile CiA DS-301 is supported.

The following objects from the Object Dictionary can be mapped:

Table 11: Overview of mappable objects

Name	Index	Sub-index	Direction
Dummy Mapping Boolean	0001_{hex}	-	Receive
Dummy Mapping Boolean Integer8	0002_{hex}	-	Receive
Dummy Mapping Boolean Integer16	0003_{hex}	-	Receive
Dummy Mapping Boolean Integer32	0004_{hex}	-	Receive
Dummy Mapping Boolean Unsigned8	0005_{hex}	-	Receive
Dummy Mapping Boolean Unsigned16	0006_{hex}	-	Receive
Dummy Mapping Boolean Unsigned32	0007_{hex}	-	Receive
Error register	1001_{hex}	–	Transmit
Manu Spec Analog Input Range	5420_{hex}	1 to n **A**	Transmit
RS232/RS4xx RxD	5601_{hex}	1 to n	Receive
RS232/RS4xx TxD	5602_{hex}	1 to n	Transmit
RFID Input Data U64	5700	1 to n	
RFID Output Data U64	5702	1 to n	
RFID Status	5708	1 to n	
Encoder Status	5802_{hex}	1 to n	Transmit
Encoder Flags	5803_{hex}	1 to n	Transmit
SSI Native Status	5805_{hex}	1 to n	Transmit
SSI Optional Encoder Status	5806_{hex}	1 to n	Transmit
Encoder Control	5808_{hex}	1 to n	Receive
PwmStatus	5902_{hex}	1 to n	
PwmFlags	5903_{hex}	1 to n	
PwmControl	5908_{hex}	1 to n	
PwmPeriodDuration	5920_{hex}	1 to n	
Read Input 8 Bit	6000_{hex}	1 to n	Transmit
Read Input Bit (1 to 128) **A**	6020_{hex}	1 to n	Transmit
Read Input Bit (129 to 256)	6021_{hex}	1 to n	Transmit
Read Input Bit (257 to 288)	6022_{hex}	1 to n	Transmit

A *"n" depends on the used object as well as on the used product*

Table 11: Overview of mappable objects

Name	Index	Sub-index	Direction
Read Input 16 Bit	6100_{hex}	1 to n	Transmit
Read Input 32 Bit	6120_{hex}	1 to n	Transmit
Write Output 8 Bit	6200_{hex}	1 to n	Receive
Write Output Bit (1 to 128) **A**	6220_{hex}	1 to n	Receive
Write Output Bit (129 to 256) A	6221_{hex}	1 to n	Receive
Write Output Bit (257 to 288)	6222_{hex}	1 to n	Receive
Write Output 16 Bit	6300_{hex}	1 to n	Receive
Write Output 32 Bit	6320_{hex}	1 to n	Receive
Read Analog Input 16 Bit	6401_{hex}	1 to n	Transmit
Write Analog Output 16 Bit	6411_{hex}	1 to n	Receive
Preset Value for Multi-Sensor Devices	6810_{hex}	1 to n	Transmit
Position Value for Multi-Sensor Devices	6820_{hex}	1 to n	Transmit
CAM1 State Register	$6B00_{hex}$	1 to n	Transmit
Area State Register	$6C00_{hex}$	1 to n	Transmit

Procedure for Altering PDO-Mappings

The Communication Profile CiA DS-301 Version 4 defines a detailed procedure for altering PDO-mappings.

For the gateway, this results in the following method for modifying PDO-mappings:

- The node state of the gateway must be "Pre-Operational".
- The number of mapping entries (Sub-index 0) for a PDO must be set to 0.
- The mapping entries (Sub-index 1 to 64) can be written.
- The number of mapping entries (Sub-index 0) must now be set to the valid number of mapped objects.
- Alternatively, the new mapping can be saved in non-volatile memory (Store Communication parameters).

The following abort codes (Abort-Domain-Protocol) may be sent back by the gateway in case of an error:

Table 12: Abort code

Abort code	Description as per CiA DS-301	Possible cause
$0604\ 0041_{hex}$	Object cannot be mapped	Invalid object-index transferred while writing the mapping entries.
$0604\ 0042_{hex}$	Number or length of the objects exceeds the PDO length	Attempted to map too many or excessively long objects to a PDO. This will be returned on writing to the sub-index 0.

Table 12: Abort code

Abort code	Description as per CiA DS-301	Possible cause
0609 0011$_{hex}$	Sub-index does not exist.	A sub-index > 64 was addressed.
0800 0022$_{hex}$	Access not possible in this node state	Write access is only possible in the "Pre-operational" node state. Write access to Sub-indices 1 to 64 is only possible if sub-index 0 is written with value 0.

2.3.7 Commands for "Parameter Save" and "Restore Defaults"

Parameter changes that are made through SDO access are only stored in volatile memory. All alterations that are made by the user will be replaced by default values at the next Reset Communication, Reset Node or Power-ON-Boot-Up.

With BL××0, it is possible to use a command to make a permanent save of the communication and/or application parameters. This is done through the "Store parameters" command (Object 1010$_{hex}$ sub-index 1 to 3).

The command is executed by using an SDO to write the data contents 6576 6173$_{hex}$ ("save") to one of the following entries:

- 1010$_{hex}$ sub-index 1 saves all parameters
- 1010$_{hex}$ sub-index 2 saves all parameters
- 1010$_{hex}$ sub-index 3 saves all device parameters (see CiA DS-301 V4.01)

Table 13: Data contents 0x6576 6173 („save“)

	MSB			LSB
ASCII	e	v	a	s
hex	65$_{hex}$	76$_{hex}$	61$_{hex}$	73$_{hex}$

Since in some circumstances it may not be possible to restore the original memory contents after a lot of alterations, BL×× supports the "Restore default Parameter" command (Object 1011$_{hex}$ sub-index 1 to 3) with the following data contents: 6461 6F6C$_{hex}$ ("load").

Table 14: Data contents 0x6461 6F6C („load“)

	MSB			LSB
ASCII	d	a	o	l
hex	64$_{hex}$	61$_{hex}$	6F$_{hex}$	6C$_{hex}$

The division of the Sub-entries corresponds to that for the "Store parameters" command.

After the command "Restore default parameters", a Reset Node must be carried out, followed by a "Store parameters" command. The default values are only saved again when this last command is executed.

3 Object dictionary - overview of all objects

3.1 Overview of all objects

The following table provides an overview of all objects supported by the BLxx-CANopen gateway.

Table 15: Overview of all objects

Index	Name	BLxx-GWBR-CANOPEN	B67-GW-CANOPEN	BLxx-E-GW-CO	BLCCO-xxx	
Objects (according to CiA CS-301)						
1000_{hex}	Device Type	X	X	X	X	see chapter 4
1001_{hex}	Error register	X	X	X	X	
1005_{hex}	SYNC COB-ID	X	X	X	X	
1008_{hex}	Device Name	X	X	X	X	
1009_{hex}	Manufacturer Hardware Version	X	X	X	X	
$100A_{hex}$	Manufacturer Software Version	X	X	X	X	
$100C_{hex}$	Guard Time	X	X	X	X	
$100D_{hex}$	Lifetime Factor	X	X	X	X	
1010_{hex}	Store Parameters	X	X	X	X	
1011_{hex}	Restore Default Parameters	X	X	X	X	
1014_{hex}	Emcy COB-ID	X	X	X	X	
1016_{hex}	Consumer Heartbeat Time	X	X	X	X	
1017_{hex}	Producer Heartbeat Time	X	X	X	X	
1018_{hex}	Identity Object	X	X	X	X	
1020_{hex}	Verify Configuration	X	X	X	X	
1027_{hex}	Module List	X	X	X		
1200_{hex} to 1203_{hex}	Server SDO Parameters	X	X	X	X	
1400_{hex} to 1403_{hex}	Receive PDO Communication Parameters (1 to 4)	X	X	X	X	
1404_{hex} to $141F_{hex}$	Receive PDO Communication Parameters (5 to 32)	X	X	X		
1600_{hex} to 1603_{hex}	Receive PDO-Mapping Parameters (1 to 4)	X	X	X	X	
1604_{hex} to $161F_{hex}$	Receive PDO-Mapping Parameters (5 to 32)	X	X	X		

Table 15: Overview of all objects

Index	Name	BLxx-GWBR-CANOPEN	B67-GW-CANOPEN	BLxx-E-GW-CO	BLCCO-xxx	
1800_{hex} to 1803_{hex}	Transmit PDO-Parameters (1 to 4)	X	X	X	X	see chapter 4
1800_{hex} to $181F_{hex}$	Transmit PDO-Parameters (5 to 32)	X	X	X		
$1A00_{hex}$ to $1A03_{hex}$	Transmit PDO-Mapping Parameters (1 to 4)	X	X	X	X	
$1A04_{hex}$ to $1A1F_{hex}$	Transmit PDO-Mapping Parameters (5 to 32)	X	X	X		
$1F80_{hex}$	NMT Startup	X	X	X		
$1F81_{hex}$	Slave Assignment	X	X	X		
$1F82_{hex}$,	Request NMT	X	X	X		
$1F83_{hex}$	Request Guarding	X	X	X		
Manufacturer specific objects						
2000_{hex}	Serial Number	X	X	X	X	
2010_{hex}	Node Reset Modifiers	X	X	X	X	
2400_{hex}	System Voltages		X			
2401_{hex}	System Voltages		X			
3000_{hex}	XBIInputByte	X	X	X	X	see chapter 14
3002_{hex}	XBIInputWord	X	X	X	X	
3004_{hex} to $300B_{hex}$	XBIInputDWord0 to XBIInputDWord8	X	X	X	X	
3020_{hex}	XBIOutputByte	X	X	X	X	
3022_{hex}	XBIOutputByte	X	X	X	X	
3024_{hex} to $302B_{hex}$	XBIOutputDWord0 to XBIOutputDWord8	X	X	X	X	
3040_{hex}	XBIDiagByte	X	X	X	X	
3042_{hex}	XBIDiagWord	X	X	X	X	
3044_{hex} to $304B_{hex}$	XBIDiagDWord0 to XBIDiagDWord8	X	X	X	X	
3060_{hex}	XBIParamByte	X	X	X	X	

Table 15: Overview of all objects

Index	Name	BLxx-GWBR-CANOPEN	B67-GW-CANOPEN	BLxx-E-GW-CO	BLCCO-xxx	
3062_{hex}	XBIParamWord	X	X	X	X	see chapter 14
3064_{hex} to $306B_{hex}$	XBIParamDWord0 to XBIParamDWord8	X	X	X	X	
3081_{hex}	XBIReferenceModuleType	X	X	X	X	
3084_{hex}	XBIReferenceInputSize	X	X	X	X	
3085_{hex}	XBIReferenceOutputSize	X	X	X	X	
3086_{hex}	XBIReferenceDiagSize	X	X	X	X	
3087_{hex}	XBIReferenceParamSize	X	X	X	X	
3090_{hex}	XBICurrentModuleId	X	X	X	X	
3091_{hex}	XBICurrentModuleType	X	X	X	X	
3094_{hex}	XBICurrentInputSize	X	X	X	X	
3095_{hex}	XBICurrentOutputSize	X	X	X	X	
3096_{hex}	XBICurrentDiagSize	X	X	X	X	
3097_{hex}	XBICurrentParamSize	X	X	X	X	
5420_{hex}	Analog Input Mode	X	X	X	X	see chapter 8
5440_{hex}	Analog Output Mode	X	X	X	X	see chapter 9
5600_{hex}	RS232/RS4xx parameters	X	X	X	X	see chapter 10
5601_{hex}	RS232/RS4xx RxD	X	X	X	X	
5602_{hex}	RS232/RS4xx TxD	X	X	X	X	
5801_{hex}	Encoder Config	X	X	X	X	see chapter 11
5802_{hex}	Encoder Status	X	X	X	X	
5803_{hex}	Encoder Flags	X	X	X	X	
5804_{hex}	Encoder Diag	X	X	X	X	
5805_{hex}	Encoder Native Status	X	X	X	X	
5806_{hex}	Encoder Optional Encoder	X	X	X	X	
5808_{hex}	Encoder Control	X	X	X	X	
5810_{hex}	Encoder Load Prepare Value	X		X		

Table 15: Overview of all objects

Index	Name	BLxx-GWBR-CANOPEN	B67-GW-CANOPEN	BLxx-E-GW-CO	BLCCO-xxx	
5811_{hex}	Encoder Pulse Width	X		X		see chapter 11
5820_{hex}	Measuring Integration Time	X		X		
5821_{hex}	Measuring Low Limit					
5822_{hex}	Measuring High Limit					
5823_{hex}	Measuring Units Per Revolution					
5824_{hex}	Encoder Measuring Divisor	X		X		
5825_{hex}	Encoder Measuring Factor	X		X		
5827_{hex}	Encoder Measuring Time Out	X		X		
5830_{hex}	Encoder Measuring Value	X		X		
5831_{hex}	Encoder Latch Value	X		X		
5840_{hex}	SSI Diag Mapping	X	X	X		
5901_{hex}	PWM Config	X		X		
5902_{hex}	PWM Status	X		X		
5903_{hex}	PWM Flags	X		X		
5904_{hex}	PWM Diag	X		X		
5908_{hex}	PWM Control	X		X		
5910_{hex}	PWM Load Prepare Value	X		X		
5913_{hex}	PWM Duty Cycle	X		X		
5920_{hex}	PWM Period Duration	X		X		
5931_{hex}	PWM Latch Value	X		X		
I/O module objects (according to CiA CS-401)						
6000_{hex}	Read Input 8 Bit	X	X	X	X	see chapter 5 and chapter 7
6020_{hex}	Read Input Bit 1 to 128	X	X	X	X	
6021_{hex}	Read Input Bit 129 to 256	X	X	X	X	
6022_{hex}	Read Input Bit 257 to 288	X	X	X	X	
6100_{hex}	Read Input 16 Bit	X	X	X	X	
6120_{hex}	Read Input 32 Bit	X	X	X	X	

Table 15: Overview of all objects

Index	Name	BLxx-GWBR-CANOPEN	B67-GW-CANOPEN	BLxx-E-GW-CO	BLCCO-xxx	
6200_{hex}	Write Output 8 Bit	X	X	X	X	see chapter 6 and chapter 7
6206_{hex}	Error Mode Output 8 Bit	X	X	X	X	
6207_{hex}	Error Value Output 8 Bit	X	X	X	X	
6220_{hex} to 6222_{hex}	Write Output Bit 1 to 128 to Write Output Bit 257 to 288	X	X	X	X	
6250_{hex} to 6252_{hex}	Error Mode Output Bit 1 to 128 to Error Mode Output Bit 257 to 288	X	X	X	X	
6260_{hex} to 6262_{hex}	Error Value Output Bit 1 to 128 to Error Value Output Bit 257 to 288	X	X	X	X	see chapter 6
6300_{hex}	Write Output 16 Bit	X	X	X	X	
6306_{hex}	Error Mode Output 16 Bit	X	X	X	X	
6307_{hex}	Error Value Output 16 Bit	X	X	X	X	
6320_{hex}	Write Output 32 Bit	X	X	X	X	
6326_{hex}	Error Mode Output 32 Bit	X	X	X	X	
6327_{hex}	Error Value Output 32 Bit	X	X	X	X	
6401_{hex}	Read Analog Input 16 Bit	X	X	X	X	see chapter 8
6411_{hex}	Write Analog Output 16 Bit	X	X	X	X	see chapter 9
6421_{hex}	Analog Input Interrupt Trigger Auswahl	X	X	X	X	see chapter 8
6422_{hex}	Analog Input Interrupt Source	X	X	X	X	
6423_{hex}	Analog Input global Interrupt Enable	X	X	X	X	
6424_{hex}	Analog Input Interrupt Upper Limit Integer	X	X	X	X	
6425_{hex}	Analog Input Interrupt lower Limit Integer	X	X	X	X	
6426_{hex}	Analog Input Interrupt Delta Unsigned	X	X	X	X	
6427_{hex}	Analog Input Interrupt Negative Delta Unsigned	X	X	X	X	
6428_{hex}	Analog Input Interrupt Positive Delta Unsigned	X	X	X	X	

Table 15: Overview of all objects

Index	Name	BLxx-GWBR-CANOPEN	B67-GW-CANOPEN	BLxx-E-GW-CO	BLCCO-xxx	
6443_{hex}	Analog Output Error Mode	X	X	X	X	see chapter 9
6444_{hex}	Analog Output Error Value Integer	X	X	X	X	
$67FF_{hex}$	Device Type	X	X	X	X	see chapter 4
I/O module objects (according to CiA DS-406)						
6800_{hex}	Operating parameters	X	X	X	X	see chapter 11
6810_{hex}	Preset Value for Multi-Sensor Devices	X	X	X	X	
6820_{hex}	Position Value for Multi-Sensor Devices	X	X	X	X	
$6B00_{hex}$	CAM State Register	X	X	X	X	
$6B00_{hex}$	CAM Enable Register	X	X	X	X	
$6B00_{hex}$	CAM Polarity Register	X	X	X	X	
$6B10_{hex}$	CAM1 Low Limit	X	X	X	X	
$6B20_{hex}$	CAM1 High Limit	X	X	X	X	
$67FF_{hex}$	Device TypeDS401	X	X	X	X	
$6FFF_{hex}$	Device TypeDS406	X	X	X	X	

4 Device (gateway) objects

4.1 Objects of the Communication Profile (acc. to CiA DS-301)

The following table provides an overview of the supported entries in the object directory which are defined through the Communication Profile CiA DS-301.

The column **Object** shows the object type.

The column **Name** shows the predefined symbolic name of the entry.

The column **Typ** shows the entry's data type predefined in CiA DS-301.

The column **Access** shows the access options for the entry. These are:

- rw (read/write)
- ro (read only)
- const (constant) = a read-only constant

The column **M/O/C** indicates if the entry is **M**andatory, **O**ptional or **C**onditional (depending on the Device Type, e. g. modular or compact device).

Table 16: Object overview for the communication Profile CiA DS-301

Index (hex)	Object	Name	Type	Access	M/O/C
1000_{hex}	VAR	Device Type (page 4-5)	Unsigned32	const	M
1001_{hex}	ARRAY	Error Register (page 4-5)	Unsigned8	ro	M
1005_{hex}	VAR	SYNC COB-ID (page 4-6)	Unsigned32	rw	O
1008_{hex}	VAR	Device Name (page 4-7)	Vis-String	const	O
1009_{hex}	VAR	Manufacturer Hardware Version (page 4-8)	Vis-String	const	O
$100A_{hex}$	VAR	Manufacturer Software Version (page 4-8)	Vis-String	const	O
$100C_{hex}$	VAR	Guard Time (page 4-9)	Unsigned32	rw	O
$100D_{hex}$	VAR	Lifetime Factor (page 4-9)	Unsigned32	rw	O
1010_{hex}	ARRAY	Store Parameters (page 4-10)	Unsigned32	rw	O
1011_{hex}	ARRAY	Restore Default Parameters (page 4-11)	Unsigned32	rw	O
1014_{hex}	VAR	Emcy COB-ID (page 4-12)	Unsigned32	rw	O
1016_{hex}	ARRAY	Consumer Heartbeat Time (page 4-13)	Unsigned32	rw	O
1017_{hex}	VAR	Producer Heartbeat Time (page 4-15)	Unsigned16	rw	O
1018_{hex}	RECORD	Identity Object (page 4-16)	Identity	ro	O
1020_{hex}	ARRAY	Verify Configuration (page 4-17)	Unsigned32	rw	O
1027_{hex}	ARRAY	Module List (page 4-19)	Unsigned16	ro	C

Table 16: Object overview for the communication Profile CiA DS-301

Index (hex)	Object	Name	Type	Access	M/O/C
Server SDO Parameter					
1200_{hex}	RECORD	1st Server SDO Parameter (page 4-20)	SDO-Parameters	ro	O
1201_{hex}	RECORD	2nd Server SDO Parameter (page 4-20)	SDO-parameters	rw	O
1202_{hex}	RECORD	3rd Server SDO Parameter (page 4-20)	SDO-parameters	rw	O
1203_{hex}	RECORD	4th Server SDO Parameter (page 4-20)	SDO-parameters	rw	O
Receive PDO Communication Parameters					
1400_{hex}	RECORD	1st Receive PDO Parameter (page 4-21)	PDO CommPar	rw	O
1401_{hex}	RECORD	2nd Receive PDO Parameter (page 4-21)	PDO CommPar	rw	O
1402_{hex}	RECORD	3rd Receive PDO Parameter (page 4-21)	PDO CommPar	rw	O
...	...	...	...	...	...
$141F_{hex}$	RECORD	32nd Receive PDO Parameter (page 4-21)	PDO CommPar	rw	O
Receive PDO-Mapping Parameters					
1600_{hex}	ARRAY	1st Receive PDO-Mapping (page 4-24)	PDO mapping	rw	O
1601_{hex}	ARRAY	2nd Receive PDO-Mapping (page 4-24)	PDO mapping	rw	O
1602_{hex}	ARRAY	3rd Receive PDO-Mapping (page 4-24)	PDO mapping	rw	O
...	...	...	...	...	...
$161F_{hex}$	ARRAY	32nd Receive PDO-Mapping (page 4-24)	PDO mapping	rw	O
Transmit PDO Communication Parameter					
1800_{hex}	RECORD	1st Transmit PDO Parameter (page 4-27)	PDO CommPar	rw	O
1801_{hex}	RECORD	2nd Transmit PDO Parameter (page 4-27)	PDO CommPar	rw	O

Table 16: Object overview for the communication Profile CiA DS-301

Index (hex)	Object	Name	Type	Access	M/O/C
1802_{hex}	RECORD	3rd Transmit PDO Parameter (page 4-27)	PDO CommPar	rw	O
...	...	...	...	...	...
$181F_{hex}$	RECORD	32nd Transmit PDO Parameter (page 4-27)	PDO CommPar	rw	O
Transmit PDO-Mapping Parameter					
$1A00_{hex}$	ARRAY	1st Transmit PDO-Mapping (page 4-30)	PDO mapping	rw	O
$1A00_{hex}$	ARRAY	2nd Transmit PDO-Mapping (page 4-30)	PDO mapping	rw	O
$1A02_{hex}$	ARRAY	3rd Transmit PDO-Mapping (page 4-30)	PDO mapping	rw	O
...	...	...	...	...	...
$1A1F_{hex}$	ARRAY	32nd Transmit PDO Mapping (page 4-30)	PDO mapping	rw	O
NMT Master Objects					
$1F80_{hex}$	VAR	NMT Start-up (page 4-33)	Unsigned32	rw	O
$1F81_{hex}$	ARRAY	Slave Assignment (page 4-34)	Unsigned32	rw	O
$1F82_{hex}$	ARRAY	Request NMT (page 4-36)	Unsigned8	rw	O
$1F83_{hex}$	ARRAY	Request Guarding (page 4-38)	Unsigned8	rw	O

4.1.1 Object 1000_{hex} – Device Type

Object 1000_{hex} contains the Type and Function for the station.

The value FFFF 0191_{hex} indicates that all Device Profiles are supported.

Table 17: Object 1000_{hex}

Object description	
INDEX	1000_{hex}
Name	Device Type
Object code	VAR
Data type	Unsigned32
Value range	
Access	ro
PDO mapping	No
Value range	Unsigned32
Default value, BL××	FFFF 0191_{hex}
Default value, BL××	depends on the respective module

4.1.2 Object 1001_{hex} – Error Register

The object 1001_{hex} contains the Error register for the CANopen gateway. It thus contains, in one byte, the internal errors that occur.

Table 18: Object 1001_{hex}

Object description	
INDEX	1001_{hex}
Name	Error register
Object code	VAR
Data type	Unsigned8
Value range	
Access	ro
PDO mapping	Optional
Value range	Unsigned8
Default value, BL××	00_{hex}

Error register							
Bit 0	**Bit 1**	**Bit 2**	**Bit 3**	**Bit 4**	**Bit 5**	**Bit 6**	**Bit 7**
Generic	Current	Voltage	0	Comm.	0	0	Manu.

Abbreviations:

Abbr.	Meaning	Valid for Modules
generic	General error	all modules
Current	Output short-circuit/ current error	DO, AI,TC
Voltage	voltage error	PF, DO, AI, AO
Comm.	communication error	all modules
Manu.	Manufacturer-specific error	all modules

4.1.3 Object 1005_{hex} – SYNC COB-ID

Object 1005_{hex} defines the COB-ID and thus the priority (→ „Identifier for the die standard objects“) of the synchronization object (SYNC). The BLxx-CANopen-gateway is not able to generate, but only to receive, SYNC messages.

Structure of the SYNC COB-ID entry (Unsigned32):

	MSB				**LSB**
Bits	**31**	**30**	**29**	**28 to 11**	**10 to 0**
11-bit ID	×	0	0	00 0000 0000 0000 0000	11-bit Identifier
29-bit ID	×	0	1	29-bit Identifier	

Table 19: Description of the SYNC COB-ID entry

Bit no.	**Value**	**Description**
31 (MSB)	X	fixed
30	0 1	Module does not generate a SYNC message Module generates a SYNC message
29	0 1	11-bit ID (CAN 2.0A) for BLxx 29-bit ID (CAN 2.0B)
28 to 11	0 X	if bit 29 = 0 if bit 29 = 1 bits 28 to 11 of the SYNC-COB-ID
10 to 0 (LSB)	X	bits 10 to 0 of the SYNC-COB-ID

Note

Bit 30 is static, i.e. cannot be changed.

Table 20: Object 1005_{hex}

Object description	
INDEX	1005_{hex}
Name	COB-ID
Object code	VAR
Data type	Unsigned32
Value range	
Access	rw
PDO mapping	No
Value range	Unsigned32
Default value, BL××	0000 0080h

4.1.4 Object 1008_{hex} – Device Name

Object 1008_{hex} contains the manufacturer-specific device name

Table 21: Object 1008_{hex}

Object description	
INDEX	1008_{hex}
Name	manufacturer specific device name
Object code	VAR
Data type	Visible String
Value range	
Access	const.
PDO mapping	No
Value range, BL××	–
Default value	depends on the gateway/ module

4.1.5 Object 1009_{hex} – Manufacturer Hardware Version

Object 1009_{hex} contains the designation for the Hardware Version.

Table 22: Object 1009_{hex}

Object description	
INDEX	1009_{hex}
Name	Hardware version
Object code	VAR
Data type	Visible String
Value range	
Access	const.
PDO mapping	No
Value range, BL××	–
Default value, BL××	depends on the gateway/ module

4.1.6 Object $100A_{hex}$ – Manufacturer Software Version

Object $100A_{hex}$ contains the device's software version.

Table 23: Object $100A_{hex}$

Object description	
INDEX	$100A_{hex}$
Name	Software version
Object code	VAR
Data type	Visible String
Value range	
Access	const.
PDO mapping	No
Value range, BL××	–

4.1.7 Object $100C_{hex}$ – Guard Time

Object $100C_{hex}$ contains the Guard time in milliseconds. The product of "Lifetime factor" (Object $100D_{hex}$) and Guard time is the "Lifetime" for the Node Guarding.

Table 24: Object $100C_{hex}$

Object description	
INDEX	$100C_{hex}$
Name	Guard Time
Object code	VAR
Data type	Unsigned16
Value range	
Access	rw
PDO mapping	No
Value range, BL××	Unsigned16
Default value, BL××	0

4.1.8 Object $100D_{hex}$ – Lifetime Factor

If the Lifetime factor is multiplied by the Guard time, the result is the Lifetime for Node Guarding.

Example:

Guard Time .....100 ms

Lifetime Factor:.....3

With a Guard Time of 100 ms, the network nodes expect a guard telegram every 100 ms. The Lifetime factor enables a setting to be made in the BL××-gateway for how often a Guard Frame from the Master can be missed before an error condition is recognized. In this example, the relevant time would be 300 ms. The evaluation would only become active after the message had been missing for 300 ms.

Table 25: Object $100D_{hex}$

Object description	
INDEX	$100D_{hex}$
Name	Lifetime Factor
Object code	VAR
Data type	Unsigned8
Value range	
Access	rw
PDO mapping	No
Value range, BL××	Unsigned8
Default value, BL××	0

4.1.9 Object 1010_{hex} – Store Parameters

The object 1010_{hex} can be used to save parameter changes in non-volatile memory. The command is executed by writing the data contents $6576\ 6173_{hex}$ ("save") to one of the Sub-indices.

Table 26: Object 1010_{hex}

Object description	
INDEX	1010_{hex}
Name	Store Parameters
Object code	3_{hex}
Data type	Unsigned32
Value description	
Sub-index	00_{hex}
Description	Largest Supported Index
Access	ro
PDO mapping	No
Default value, BL××	3_{hex}
Sub-index	01_{hex}
Description	Save all Parameters
Access	rw
PDO mapping	No
Value range, BL××	Unsigned32
Default value, BL××	-
Sub-index	02_{hex}
Description	Save Communication Parameters
Access	rw
PDO mapping	No
Value range, BL××	Unsigned32
Default value, BL××	-
Sub-index	03_{hex}
Description	Save Application Parameters
Access	rw
PDO mapping	No
Value range, BL××	Unsigned32
Default value, BL××	-

4.1.10 Object 1011_{hex} – Restore Default Parameters

The object 1011_{hex} can be used to restore the default parameters. The command is executed by writing the data contents 6461 6F6C$_{hex}$ ("load") to one of the Sub-indices.

Table 27: Object 1011_{hex}

Object description	
INDEX	1011_{hex}
Name	Restore Default Parameters
Object code	ARRAY
Data type	3_{hex}
Value description	
Sub-index	00_{hex}
Description	Largest Supported Index
Access	ro
PDO mapping	No
Sub-index	01_{hex}
Description	Restore All Default Parameters
Access	rw
PDO mapping	No
Value range, BL××	Unsigned32
Default value, BL××	-

Table 27: Object 1011_{hex}

Object description	
Value description	
Sub-index	02_{hex}
Description	Restore Communication Parameters
Access	rw
PDO mapping	No
Value range, BL××	Unsigned32
Default value, BL××	-
Sub-index	03_{hex}
Description	Restore Application Parameters
Access	rw
PDO mapping	No
Value range, BL××	Unsigned32
Default value, BL××	-

4.1.11 Object 1014_{hex} – Emcy COB-ID

Object 1014_{hex} contains the Identifier for the Emergency Messages

	MSB				**LSB**
Bits	**31**	**30**	**29**	**28 to 11**	**10 to 0**
11-bit ID	0/1	0	0	00 0000 0000 0000 0000	11-bit Identifier
29-bit ID	0/1	0	1	29-bit Identifier	

Table 28: Description of the Emcy COB-ID entry

Bit no.	**Value**	**Description**
31 (MSB)	0 1	EMCY exists/ is valid EMCY does not exist/ is not valid
30	0	reserved (always 0)
29	0 1	11-bit ID (CAN 2.0A) ∅ for BL×× 29-bit ID (CAN 2.0B)
28 to 11	0 X	if bit 29 = 0 if bit 29 = 1 bits 28 to 11 of 29-bit-COB-ID

Table 28: Description of the Emcy COB-ID entry

Bit no.	Value	Description
10 to 0 (LSB)	X	bits 10 to 0 of COB-ID

Note
Bit 30 is static, i.e. cannot be changed.

Table 29: Object 1014_{hex}

Object description	
INDEX	1014_{hex}
Name	Emcy COB-ID
Object code	VAR
Data type	Unsigned32
Value description	
Access	rw
PDO mapping	No
Value range, BL××	Unsigned32
Default value, BL××	0000 0080_{hex} + Node-ID

4.1.12 Object 1016_{hex} – Consumer Heartbeat Time

The Heartbeat Protocol is used to monitor the operational capability of other CANopen bus nodes. The Heartbeat Protocol must be seen as an alternative to Node-/Life-Guarding, which, unlike Guarding, does not use Remote-Frames.

A device generates the Heartbeat with a specific cycle time (see object 1017_{hex} "Producer heartbeat time"). Another device receives the Heartbeat and monitors the cycle time. Another device receives the Heartbeat and monitors the cycle time.

Object 1016 defines the cycle time (interval) at which the Heartbeat is expected. This cycle time should be longer than the corresponding cycle time for the transmitter (see object 1017_{hex}). The monitoring of the Heartbeat starts when the first Heartbeat Frame is received. If the Consumer heartbeat time = 0, then the corresponding entry will not be used.

The time is set as a multiple of 1 ms.

Structure of the entry for Consumer heartbeat time (Unsigned32):

	MSB		**LSB**
Bits	31 to 24	23 to 16	15 to 0
Value	reserved (default: 00_{hex}	Node-ID	Heartbeat Time
Data type	–	Unsigned8	Unsigned16

Table 30: Object 1016_{hex}

Object description	
INDEX	1016_{hex}
Name	Consumer Heartbeat Time
Object code	ARRAY
Data type	Unsigned32
Value description	
Sub-index	00_{hex}
Description	Number of Entries
Category	Mandatory
Access	ro
PDO mapping	No
Value range, BL××	1
Default value, BL××	1
Sub-index	01_{hex}
Description	Consumer Heartbeat Time
Category	Mandatory
Access	rw
PDO mapping	No
Value range, BL××	Unsigned32
Default value, BL××	0

4.1.13 Object 1017_{hex} – Producer Heartbeat Time

The object 1017_{hex} defines the cycle time for the Heartbeat.

If the cycle time = 0, then Heartbeat will not be used. The content of the object is interpreted as a multiple of 1 ms.

Table 31: Object 1017_{hex}

Object description	
INDEX	1017_{hex}
Name	Producer Heartbeat Time
Object code	VAR
Data type	Unsigned16
Value description	
Access	rw
PDO mapping	No
Value range, BL××	Unsigned16
Default value, BL××	0

4.1.14 Object 1018_{hex} – Identity Object

Object 1018_{hex} contains general information about the BL×× gateway.

he Vendor-ID (Sub-index $_{hex}$) is a unique ID which precisely identifies the manufacturer. The manufacturer-specific Product-Code (Sub-index 02_{hex}) identifies a specific device version. The manufacturer-specific Revision-Number (Sub-index 03_{hex}) consists of a major revision number and a minor revision number. The major revision number defines a special CANopen functionality. If the CANopen functionality is expanded, then the major revision number must be incremented. The minor revision number identifies various versions that have the same CANopen functionality.

	MSB	**LSB**
Bits	31 to 16	15 to 0
Value	Major Revision Number	Minor Revision Number

Table 32: Object 1018_{hex}

Object description	
INDEX	1018_{hex}
Name	Device Specification
Object code	RECORD
Data type	Identity
Value description	
Sub-index	00_{hex}
Description	Number of Entries
Category	Mandatory
Access	ro
PDO mapping	No
Default value, BL××	4
Value description	
Sub-index	01_{hex}
Description	Manufacturer-ID
Category	Mandatory
Access	ro
PDO mapping	No
Value range, BL××	Unsigned32
Default value, BL××	0000 009C$_{hex}$

Table 32: Object 1018_{hex}

Object description	
Sub-index	02_{hex}
Description	Product Code
Category	Option
Access	ro
PDO mapping	No
Value range, BL××	Unsigned32
Sub-index	03_{hex}
Description	Revision number
Category	Option
Access	ro
PDO mapping	No
Value range, BL××	Unsigned32
Default value, BL××	No
Sub-index	04_{hex}
Description	Serial number
Category	Option
Access	ro
PDO mapping	No
Value range, BL××	Unsigned32

4.1.15 Object 1020_{hex} – Verify Configuration

Object 1020_{hex} is used to check the station configuration after a device reset.

The BL××-CANopen gateway supports the non-volatile storage of parameters. A network configuration tool or an CANopen Manager can use object 1020_{hex} to test the station configuration after a reset, and so check whether a reconfiguration is necessary. The configuration tool saves the time and date simultaneously in object 1020_{hex} and the corresponding DCF file. After a reset, the most recent configuration and the signature will be restored, either automatically on request. If the configuration values are altered by some other command, then the object will be set to 0.

The Configuration Manager compares the signature and the configuration with the values from the DCF file. If it discovers any deviations, a reconfiguration will be necessary.

Table 33: Object 1020_{hex}

Object description	
INDEX	1020_{hex}
Name	Verify Configuration
Object code	ARRAY
Data type	Unsigned16
Value description	
Sub-index	00_{hex}
Description	Number of entries
Access	rw
PDO mapping	No
Default value, BL××	02_{hex}
Sub-index	01_{hex}
Description	Configuration date
Access	rw
PDO mapping	No
Value range, BL××	Unsigned32
Default value, BL××	No
Sub-index	02_{hex}
Description	Configuration time
Access	rw
PDO mapping	No
Value range, BL××	Unsigned32
Default value, BL××	No

Note

The configuration date contains the number of days since January 01 1984. The configuration time contains the number of milliseconds since midnight.

4.1.16 Object 1027_{hex} – Module List

Object 1027_{hex} describes all the actually installed modules in a station.

It is only valid for modular devices and thus not for BLCCO.

Table 34: Object 1027_{hex}

Object description		
INDEX	1027_{hex}	
Name	Module List	
Object code	ARRAY	
Data type	Unsigned16	
Access	ro	
Value description		
Sub-index	00_{hex}	
Description	Number of connected modules	
Access	ro	
PDO mapping	No	
Value range, BL××	00_{hex} to $4A_{hex}$	
Default value, BL××	No	
Sub-index	01_{hex}	
Description	Module 1	
...	...	
	BL20	BL67
Sub-index	$4A_{hex}$	20_{hex}
Description	Module 74	Module 32

The sequential Sub-indices 01_{hex} to $4A_{hex}$ (BL20) or resp. 20_{hex} (BL67) describe the corresponding BL×× modules in the sequence in which they are installed in the station. Each entry contains a number that identifies the particular module. Each entry contains a number which identifies the respective module.

Note

There is one identifier for each type of BL×× module.

In the EDS-file, the individual extensions to object 1027_{hex} (e.g. M1SubExt1027) for all the optional BL×× module types are listed in the section [Supported Modules]. The default values (e.g. default value=8000_{hex}) correspond to the identifiers for the particular module types (e.g.[M1ModuleInfo] ProductName=Generic BL××-BR/-PF).

4.2 Objects for the Transfer of Service Data

4.2.1 Objects 1200_{hex} to 1203_{hex} – Server SDO Default Parameters

Objects 1200_{hex} to 1203_{hex} define the priority for the transmission of SDO1 to SDO4.

The priority of the data is defined through the Identifier/ COB-ID

Table 35: Object 1200_{hex} to 1203_{hex}

Object description	
INDEX	1200_{hex} to 1203_{hex}
Name	Server SDO Parameters
Object code	RECORD
Number of Elements	3_{hex}
Data type	SDO-parameters
Value description	
Sub-index	00_{hex}
Description	Number of entries
Access	ro
PDO mapping	No
Default value, BL××	02_{hex}
Sub-index	01_{hex}
Description	COB-ID Client Server (rx)
Access	Index 1200_{hex}:ro Index 1201_{hex} to 1203_{hex}:rw
PDO mapping	No
Value range, BL××	Unsigned32
Default value, BL××	Index 1200_{hex}: 0000 0600_{hex} + Node-ID Index 1201_{hex} to 1203_{hex}:rwNo
Sub-index	02_{hex}
Description	COB-ID Server Client (rx)
Access	Index 1200_{hex}:ro Index 1201_{hex} to 1203_{hex}:rw
PDO mapping	No
Value range, BL××	Unsigned32

Table 35: Object 1200_{hex} to 1203_{hex}	**Object description**	
	Default value, BL××	Index 1200_{hex}: $0000\ 0580_{hex}$ + Node-ID Index 1201_{hex} to 1203_{hex}:rwNo

4.3 Objects for the Transfer of Process Output Data

The objects 1400_{hex} to $141F_{hex}$ define, together with objects 1600_{hex} to $161F_{hex}$, which output data have to be transferred via RPDO. In addition to that, the priority and the transmission type for the RPDO-transfer are defined.

Object 1400_{hex} defines the priority and the transmission type for the RPDO**1**. Object 1600_{hex} defines the object-index, the sub-index and the data length for the data which have to be transferred via RPDO**1**.

Objects 1401_{hex} and 1601_{hex} thus define the RPDO**2**, etc.

The priority of the data is defined through the Identifier/ COB-ID

The values are already entered by default for objects 1400_{hex} to 1403_{hex} and 1600_{hex} to 1603_{hex}.

A station with up to 64 digital outputs and 12 analog outputs therefore transfers the process output data automatically via RPDOs.

4.3.1 Object 1400_{hex} to $141F_{hex}$ – Receive PDO Comm. Default Parameters

Objects 1400_{hex} to $141F_{hex}$ define the priority for the transmission of RPDO11 to RPDO32.

The priority is defined via the identifier/COB-ID (see „Identifier for the Standard Objects") in sub-index 01_{hex}.

With the highest bit of sub-index 01_{hex}, the further content can be defined as valid/invalid. The respective highest $_{hex}$adecimal number is then > 8.

The transmission type is defined with the sub-index 02_{hex}.

Which data content is to be transferred with the RPDO1 to RPDO32 is defined with the objects 1600_{hex} to $161F_{hex}$.

Table 36: Object 1400_{hex} to $141F_{hex}$	**Object description**	**BL××**	**BLC**
	INDEX	1400_{hex} to $141F_{hex}$	1400_{hex} to 1403_{hex}
	Name	Receive PDO Parameters	
	Object code	RECORD	
	Data type	PDO CommPar	
	Value description		
	Sub-index	00_{hex}	
	Description	Maximum Number of Entries	
	Access	ro	

Table 36: Object 1400_{hex} to $141F_{hex}$

Object description	BLxx	BLC
PDO mapping	No	
Value range, BLxx	2	
Default value, BLxx	02_{hex}	
Sub-index	01_{hex}	
Description	COB-ID for the PDOs (see Table 37:)	
Access	rw	
PDO mapping	No	
Value range, BLxx	Unsigned32	
Default value, BLxx	Index 1400_{hex}: 0000 0200_{hex} + Node-ID Index 1401_{hex}: 0000 0300_{hex} + Node-ID Index 1402_{hex}: 0000 0400_{hex} + Node-ID Index 1403_{hex}: 0000 0500_{hex} + Node-ID	
	Index 1404_{hex} to $141F_{hex}$: reserved	-
Sub-index	02_{hex}	
Description	Transmission type (see Table 38:)	
Access	rw	
PDO mapping	No	
Value range, BLxx	Unsigned8	
Default value, BLxx	FF_{hex}	

Structure of the COB-ID entry

	MSB				LSB
Bits	**31**	**30**	**29**	**28 to 11**	**10 to 0**
11-bit ID	0/1	0/1	0	00 0000 0000 0000 0000	11-bit Identifier
29-bit ID	0/1	0/1	1	29-bit Identifier	

Table 37: Description of the COB-ID-entry

Bit no.	Value	Meaning
31 (msb)	0	PDO exists / is valid
	1	PDO does not exist / is invalid
30	0	RTR is possible in this PDO
	1	RTR is not possible in this PDO
29	0	11-Bit-ID (CAN 2.0A) (standard application)
	1	29-bit ID (CAN 2.0B)
28 to 11	0	if bit 29=0 (Standard application)
	X	if bit 29 = 1 bits 28 to 11 of COB-ID
10 to 0 (lsb)	X	bits 10 to 0 of COB-ID

The Transmission type (Sub-index 02_{hex}) can have the following values:

Table 38: Description of the Transmission Type

Transmission Type	PDO transmission				
	cyclic	acyclic	synchr.	asynchr.	only with RTR
0		×	×		
1	×		×		
2 to 254			reserved		
255				×	

4.3.2 Object 1600_{hex} to $161F_{hex}$ – Receive PDO-Mapping Parameter

Objects 1600_{hex} to $161F_{hex}$ (BLCCO: 1600_{hex} to 1603_{hex}) define, which data have to be transferred with RPDO1 to RPDO32 (BLCCO: RPDO1 to RPDO 4).

The data content (here: process output data) is represented by product specific mappable objects.

→ Mappable Objects (page 2-22)

For example, the process output data for the digital channels are entered in objects 6200_{hex}, 6220_{hex} etc.

The description of these objects can be found in the following chapter.

Sub-indices 01_{hex} ff. of the objects 1600_{hex} to $161F_{hex}$ (BLCCO: 1600_{hex} to 1603_{hex}) contain the object number, the sub-index and the length of the data that have to be transferred via the respective RPDO.

An RPDO can transfer a maximum number of 8 bytes (64 bit).

The number of sub-indices depends on the data length. For larger projects, it has to be calculated and entered by user.

At a data length of 8 bit, 8 sub-indices are needed to represent a total number of 64 bit. At a data length of 1 bit, 64 sub-indices are needed to represent a total number of 64 bit.

Objects 1600_{hex} to 1603_{hex} (RPDO1 to RPDO4) references by default the values for the first 64 digital output channels and for the first 12 analog output channels, provided that the values are represented by the objects 6200_{hex} (digital values) and 6411_{hex} (analog values).

Table 39: Object 1600_{hex} to $161F_{hex}$

Object description	**BLxx**	**BLCCO**
INDEX	1600_{hex} to $161F_{hex}$	1600_{hex} to 1603_{hex}
Name	Receive PDO-Mapping Parameters	
Object code	RECORD	
Data type	PDO mapping	
Value description		
Sub-index	00_{hex}	
Description	NumberOfMappedApplication Objects	Receive PDO-Mapping Parameters
Access	rw	rw
PDO mapping	No	No
Value range, BLxx	0 to 64	-
Default value, BLxx	see Table 16:	-
Sub-index	01_{hex}	
Description	1st Mapping Object	
Access	rw	
PDO mapping	No	

Table 39: Object 1600_{hex} to $161F_{hex}$

Object description	**BL××**	**BLCCO**
Value range, BL××		Unsigned32
Default value, BL××		see Table 16:
...		...
Sub-index	40_{hex}	03_{hex}
Description	64th Mapping Object	4th Mapping Object
Access	rw	rw
PDO mapping	No	No
Value range, BL××	Unsigned32	Unsigned32
Default value, BL××	No	No

Default values for objects 1600_{hex} to 1603_{hex}:

Note

The number of mapping objects, which are automatically generated by the gateway during start-up, depends on the actual physical structure of the BL××-station.

Table 40: Default values for objects 1600_{hex} to 1603_{hex}

Object	**Product**	**Sub-index**	**Default value**	**Description**	**valid for**
1600_{hex}	BL××	01_{hex}	$6200\ 0108_{hex}$	1st Mapping Object (digital output)	RPDO1
		...	...	...	
		08_{hex}	$6200\ 0808_{hex}$	8th Mapping Object (digital output)	
	BLCCO	01_{hex}	$6200\ 0108_{hex}$	1st Mapping Object (digital output)	RPDO1
1601_{hex}	BL××	01_{hex}	$6411\ 0110_{hex}$	1st Mapping Object (analog output)	RPDO2
		...	...	...	
		04_{hex}	$6411\ 0410_{hex}$	4th Mapping Object (analog output)	
	BLCCO	01_{hex}	$6411\ 0110_{hex}$	1st Mapping Object (analog output)	RPDO2

Table 40: Default values for objects 1600_{hex} to 1603_{hex}

Object	Product	Sub-index	Default value	Description	valid for
1602_{hex}	BL××	01_{hex}	6411 0510_{hex}	1st Mapping Object (analog output)	RPDO3
		...	...	...	
		04_{hex}	6411 0810_{hex}	4th Mapping Object (analog output)	
	BLCCO				
1603_{hex}	BL××	01_{hex}	6411 0910_{hex}	1st Mapping Object (analog output)	RPDO4
		...	...	...	
		04_{hex}	6411 $0C10_{hex}$	4th Mapping Object (analog output)	
	BLCCO	01_{hex}	6411 0510_{hex}	1st Mapping Object (analog output)	RPDO4

The following structure applies to the parameters for sub-indices:

Structure of the PDO Mapping entries:

MSB		LSB
Index (16 bit)	Sub-Index (8 bit)	Object length (8 bit)

Note

To change the number of mapping entries, follow the instructions in section .
Procedure for Altering PDO-Mappings (page 2-23).

4.4 Objects for the Transfer of Process Input Data

Objects 1800_{hex} to $181F_{hex}$ (BLCCO: 1800_{hex} to 1803_{hex}) define, together with objects $1A00_{hex}$ to $1A1F_{hex}$ (BLCCO: $1A00_{hex}$ to $1A03_{hex}$), which input data are transferred. Additionally they define the priority and the mode for the data transfer via TPDO.

Object 1800_{hex} defines the priority, the minimum inhibit time, the event timer and the transmission type for TPDO1. Object $1A00_{hex}$ defines the object-index, the sub-index and the data length for the data which have to be transferred via TPDO1.

Objects 1801_{hex} and $1A01_{hex}$ thus define the TPDO2, etc.

The priority of the data is defined through the Identifier/ COB-ID

The values are already entered by default for objects 1800_{hex} to 1803_{hex} and $1A00_{hex}$ to $1A03_{hex}$.

A station with up to 64 digital outputs and 12 analog outputs therefore transfers the process input data automatically via TPDOs.

4.4.1 Object 1800_{hex} to $181F_{hex}$ – Transmit PDO-Parameters

Objects 1800_{hex} to $181F_{hex}$ (BLCCO: 1800_{hex} to 1803_{hex}) define the priority, the transmission type, the inhibit time and the event timer for TPDO1 to TPDO32.

The priority is defined via the identifier/COB-ID (see „Identifier for the Standard Objects") in sub-index 01_{hex}.

With the highest bit of sub-index 01_{hex}, the further content can be defined as valid/invalid. The respective highest $_{hex}$adecimal number is then > 8.

The transmission type is defined with the sub-index 02_{hex}.

The inhibit time is defined in sub-index 03_{hex}.

The maximum time between 2 transmissions, the event timer, is defined in sub-index 05_{hex}.

Which data content is to be transferred with the RPDO1 to RPDO32 is defined with the objects $1A00_{hex}$ to $1A1F_{hex}$. (BLCCO: $1A00_{hex}$ to $1A03_{hex}$).

Table 41: Object 1800_{hex} to $181F_{hex}$

Object description	BLxx	BLCCO
INDEX	1800_{hex} to $181F_{hex}$	1800_{hex} to 1803_{hex}
Name	Transmit PDO-parameters	
Object code	RECORD	

Table 41: Object 1800_{hex} to $181F_{hex}$

Object description	**BL××**	**BLCCO**
Data type		PDO CommPar
Value description		
Sub-index		00_{hex}
Description		Highest Sub-Index Used
Access		ro
PDO mapping		No
Value range		5
Default value		No
Sub-index		01_{hex}
Description		COB-ID of the PDO
Access		rw
PDO mapping		No
Value range, BL××		Unsigned32
Default value, BL××		Index 1800_{hex}: 0000 0180_{hex} + Node-ID Index 1801_{hex}: 0000 0280_{hex} + Node-ID Index 1802_{hex}: 0000 0380_{hex} + Node-ID Index 1803_{hex}: 0000 0480_{hex} + Node-ID
	Index 1804_{hex} to $181F_{hex}$:	-
Value description		
Sub-index		02_{hex}
Description		Transmission Type
Access		rw
PDO mapping		No
Value range, BL××		Unsigned8
Default value, BL××		FFh
Sub-index		03_{hex}
Description		Inhibit Time
Access		rw
PDO mapping		No
Value range, BL××		Unsigned16

Table 41: Object 1800_{hex} to $181F_{hex}$

Object description	**BL××**	**BLCCO**
Default value, BL××		0
Sub-index		04_{hex}
Description		reserved
Sub-index		05_{hex}
Description		Event Timer
Access		rw
PDO mapping		No
Value range, BL××		Unsigned16 (0 is not used)
Default value, BL××		0

The COB-ID (sub-Index 01_{hex}) shows the following structure:

	MSB	**LSB**			
Bits	**31**	**30**	**29**	**28 to 11**	**10 to 0**
11-bit ID	0/1	0/1	0	00 0000 0000 0000 0000	11-bit Identifier
29-bit ID	0/1	0/1	1	29-bit Identifier	

Table 42: Description of the COB-ID entry (sub-index 01_{hex})

Bit no.	**Value**	**Description**
31 (MSB)	0	PDO exists / is valid
	1	PDO does not exist / is invalid
30	0	RTR is possible in this PDO
	1	RTR is not possible in this PDO
29	0	11-Bit-ID (CAN 2.0A) (standard application)
	1	29-bit ID (CAN 2.0B)
28 to 11	0	if bit 29=0 (Standard application)
	X	if bit 29 = 1 bits 28 to 11 of COB-ID
10 to 0 (LSB)	X	bits 10 to 0 of COB-ID

The Transmission type (Sub-index 02_{hex}) can have the following values:

Table 43: Transmission Type

Transmission Type	**PDO transmission**				
	cyclic	acyclic	synchr.	asynchr.	only with RTR
0		×	×		
1	×		×		
2 to 252			reserved		
253				×	×
254			reserved		
255				×	

Inhibit time

In order to avoid a permanent occupation of the field bus by high-prior messages, the Inhibit Time is defined.

With sub-Index 03_{hex}, the Inhibit time is defined as a multiple of 100 µs. However, since the time resolution of the system clock in the BL××-CANopen gateway is 1 ms, Inhibit time values below 10 x 100 µs are pointless.

Event Timer

Sub-index 03_{hex} defines the maximum interval after which a TPDO will be transmitted, even though no event has occurred. The expiry of the interval set for the Event timer is detected as an event.

If any other event occurs, the Event timer is reset and restarted.

The value of the object is interpreted as a multiple of 1 ms.

4.4.2 Objects $1A00_{hex}$ to $1A1F_{hex}$ - Transmit PDO Mapping Parameter

Die Objects $1A00_{hex}$ to $1A1F_{hex}$ (BLCCO: $1A00_{hex}$ to $1A03_{hex}$) define, which data have to be transferred with TPDO1 to TPDO32.

The data content (here: process input data) is represented by product specific mappable objects.

see Mappable Objects (page 2-22)

For example, the process input data for the digital channels are entered in objects 6000_{hex}, 6020_{hex} etc.

The description of these objects can be found in the following chapter.

Sub-indices 01_{hex} ff. of the objects $1A00_{hex}$ to $1A1F_{hex}$ (BLCCO: $1A00_{hex}$ to $1A03_{hex}$) contain the object number, the sub-index and the length of the data that have to be transferred via the respective TPDO.

A TPDO can transfer a maximum number of 8 bytes (64 bit).

The number of sub-indices depends on the data length. For larger projects, it has to be calculated and entered by user.

At a data length of 8 bit, 8 sub-indices are needed to represent a total number of 64 bit. At a data length of 1 bit, 64 sub-indices are needed to represent a total number of 64 bit.

Objects 1600_{hex} to 1603_{hex} (RPDO1 to RPDO4) references by default the values for the first 64 digital output channels and for the first 12 analog output channels, provided that the values are represented by the objects 6000_{hex} (digital values) and 6401_{hex} (analog values).

Table 44: Object $1A00_{hex}$ to $1A1F_{hex}$

Object description	**BL××**	**BLCCO**
INDEX	$1A00_{hex}$ to 1A1Fh	$1A00_{hex}$ to 1A03h
Name	Transmit PDO-Mapping Parameters	
Object code	RECORD	
Data type	PDO mapping	
Value description		
Sub-index	00_{hex}	
Description	Number of Mapped Application Objects in the PDO	Transmit PDO-Mapping Parameters
Access	rw	
PDO mapping	No	
Value range, BL××	0 deactivated 1 to 64: activated	
Default value, BL××	see Table 38:	
Sub-index	01_{hex}	
Description	1st Mapping Object	
Access	rw	
PDO mapping	No	
Value range, BL××	Unsigned32	
Default value, BL××	see page 4-32	
...		
Sub-index	40_{hex}	
Description	64th Mapping Object	
Access	rw	
PDO mapping	No	
Value range, BL××	Unsigned32	
Default value, BL××	No	

Default values for objects $1A00_{hex}$ to $1A03_{hex}$:

Note

The number of mapping objects, which are automatically generated by the gateway during start-up, depends on the actual physical structure of the BL××-station.

Table 45: Default values for objects $1A00_{hex}$ to $1A03_{hex}$

Object	Product	Sub-Index	Default value	Description	valid for
$1A00_{hex}$	BL××	01_{hex}	$6000\ 0108_{hex}$	1st Mapping Object (digital input)	TPDO1
		...	...	...	
		08_{hex}	$6000\ 0808_{hex}$	8th Mapping Object (digital input)	
	BLCCO	01_{hex}	$6000\ 0108_{hex}$	1st Mapping Object (digital input)	TPDO1
$1A00_{hex}$	BL××	01_{hex}	$6401\ 0110_{hex}$	1st Mapping Object (analog input)	TPDO2
		...	...	...	
		04_{hex}	$6401\ 0410_{hex}$	4th Mapping Object (analog input)	
	BLCCO	01_{hex}	$6401\ 0110_{hex}$	1st Mapping Object (analog input)	
$1A02_{hex}$	BL××	01_{hex}	$6401\ 0510_{hex}$	1st Mapping Object (analog input)	TPDO3
		...	...	...	
		04_{hex}	$6401\ 0810_{hex}$	4th Mapping Object (analog input)	
	BLCCO	01_{hex}	$6401\ 0510_{hex}$	1st Mapping Object (analog input)	TPDO3
$1A03_{hex}$	BL××	01_{hex}	$6401\ 0910_{hex}$	1st Mapping Object (analog input)	TPDO4
		...	...	...	
		04_{hex}	$6401\ 0C10_{hex}$	4th Mapping Object (analog input)	
	BLCCO	01_{hex}	$6401\ 0910_{hex}$	1st Mapping Object (analog input)	TPDO4

The following structure applies to the parameters for sub-indices 01_{hex} ff.:

MSB		LSB
Index (16 bit)	Sub-Index (8 bit)	Object length (8 bit)

Note

To change the number of mapping entries, follow the instructions in section Procedure for Altering PDO-Mappings (page 2-23).

4.5 Objects for network management (not valid for BLCCO)

Objects $1F80_{hex}$ to $1F83_{hex}$ are only relevant if the BL××-station is to work as a Network Management Master. The activation is done via bit 0 from object $1F80_{hex}$.

4.5.1 Object $1F80_{hex}$ – NMT Start-up

Object $1F80_{hex}$ describes the start-up behavior of BL×× in NMT (Network-Management).

Table 46: Object $1F80_{hex}$ to $1A1F_{hex}$

Object description	
INDEX	$1F80_{hex}$
Name	NMT Start-up
Object code	VAR
Data type	Unsigned32
Access	rw

Table 47: Structure of the NMT-Start-up

Bit	Value	Meaning
0	0	BL×× station is not the NMT-Master All further bits will be ignored. The objects in the network list will be ignored.
	1	BL×× is the NMT-Master
1	0	Only the explicitly selected slaves will be started.
	1	After boot-up, the service "NMT Start Remote Node All Nodes" will be performed.
2	0	BL×× moves automatically to the "Operational" state.
	1	BL×× does not automatically move to the "Operational" state. The status change is defined through the respective application.
3	0	Starting of the slave is permitted.
	1	Starting of the slave is not permitted.

Table 47: Structure of the NMT-Start-up

Bit	Value	Meaning
4	0	An error event in an obligatory slave deals with the slave individually.
	1	An error event in an obligatory slave triggers an NMT Reset All Nodes (see object $1F81_{hex}$, bit 3).
5 to 31		Reserved; set to 0

4.5.2 Object $1F81_{hex}$ – Slave Assignment

Object $1F82_{hex}$ describes, as per CiA DSP-302, all the slaves that can be connected to Network Management (NMT). It contains information on error control and on actions which will be enganged through error events. All other parameters for a slave are only valid if this slave is described in object $1F81_{hex}$.

Note

Object $1F81_{hex}$ is only valid if BL×× is defined as NMT Master (see „Object $1F80_{hex}$ “, Bit 0).

Table 48: Object $1F81_{hex}$

Object description	
INDEX	$1F81_{hex}$
Name	Slave Assignment
Object code	ARRAY
Data type	Unsigned32
Access	rw
Value description	
Sub-index	00_{hex}
Description	Maximum Number of Entries
Access	rw
PDO mapping	No
Value range	1 to 127
Default value	127
Sub-index	01_{hex}
Description	Slave with Node-ID 1
Access	rw
PDO mapping	No
Value range, BL××	Unsigned32
...	

Table 48: Object 1F81$_{hex}$

Object description	
Sub-index	3Fh
Description	Slave with Node-ID 63
Access	rw
PDO mapping	No
Value range, BL××	Unsigned32
Default value, BL××	No

Note

Each sub-index corresponds to the slave with the respective Node-ID. The sub-index with the Node-ID of the NMT-Master will be ignored.

Table 49: Structure of the object 1F81$_{hex}$ Slave Assignment

Byte	**Bit**	**Value**	**Meaning**
0	0	0	The node with this ID is not a slave.
		1	The node with this ID is not a slave. After configuration, the node will be put into the "Operational" state.
	1	0	An error event or other event detection by a slave during boot-up leads to information from the application.
		1	An error event or other event detection by a slave during boot-up leads to information from the application and to automatic start of Error Control Services.
	2	0	An error event or other event detection by a slave during boot-up does not lead to information from the application or automatic start of Error Control Services.
		1	An error event or other event detection by a slave during boot-up leads to the start of "Start Boot Slaves".
	3	0	Optional slave: the network can also be started if this node is not connected.
		1	Mandatory slave: the network will not be started if this node is not connected during the slave boot-up.
	4	0	The slave can be reset by the "NMT Reset Communication" command, depending on its state.
		1	The NMT-Master does not have to send an "NMT Reset Communication" command for this slave, if the slave is in the "Operational" state.

Table 49: Structure of the object 1F81$_{hex}$ Slave Assignment

Byte	Bit	Value	Meaning
0	5	0	Verification of the application software version is not required for this node.
		1	Verification of the application software version is required for this node.
	6	0	Automatic update of the application software (download) is not permitted.
		1	Automatic update of the application software (download) is permitted.
	7		Reserved; set to 0
1			8 bit value for the Retry Factor
2 to 3		0	16 bit value for the Guard time

4.5.3 Object 1F82$_{hex}$ – Request NMT

Object 1F82$_{hex}$ describes, as per CiA DSP-302, all the slaves that can present queries to the Network Management (NMT).

Table 50: Object 1F82$_{hex}$

Object description	
INDEX	1F82$_{hex}$
Name	Query NMT
Object code	ARRAY
Data type	Unsigned8
Access	ro/rw
Value description	
Sub-index	00$_{hex}$
Description	Supported Number of Slaves
Access	ro
PDO mapping	No
Value	128
Sub-index	01$_{hex}$
Description	Request NMT-Service for slave with Node-ID 1
Access	rw

Table 50: Object 1F82$_{hex}$

Object description	
PDO mapping	No
Value range, BL××	Unsigned8
Default value, BL××	No
Sub-index	3Fh
Description	Request NMT-Service for slave with Node-ID 63
Access	rw
PDO mapping	No
Value range, BL××	Unsigned8
Default value, BL××	No
Sub-index	80_{hex}
Description	Request NMT-Service for all slaves
Access	wo
PDO mapping	No
Value range, BL××	Unsigned8
Default value, BL××	No

For a write access to this object, the value corresponds to the state for the node to which the query is directed. For read access, the object contains the present state of the node.

Table 51: Value range

Status	**Value for Write access**	**Value for Read access**
Stopped	4	4
Operational	5	5
Reset Node	6	–
Reset Communication	7	–
Pre-Operational	127	127
unknown	–	0
Node missing	–	1

4.5.4 Object $1F83_{hex}$ – Request Guarding

Object $1F83_{hex}$ describes, as per CiA DSP-302, all the slaves that can be monitored through the Network Management (NMT).

Table 52: Object $1F83_{hex}$

Object description	
INDEX	$1F83_{hex}$
Name	Request Guarding
Object code	ARRAY
Data type	Unsigned8
Access	ro/rw
Value description	
Sub-index	00_{hex}
Description	Supported Number of Slaves
Access	ro
PDO mapping	No
Value	128
Sub-index	01_{hex}
Description	Request NMT-Service for slave with Node-ID 1
Access	rw
PDO mapping	No
Value range, BL××	Unsigned8
Value	0 = Slave being monitored at present 1 = Slave not being monitored at present
...	
Sub-index	7Fh
Description	Request Guarding for Slave with Node-ID 63
Access	rw
PDO mapping	No
Value range	Unsigned8
Value	0 = Slave being monitored at present 1 = Slave not being monitored at present

Table 52: Object $1F83_{hex}$

Object description	
Sub-index	80_{hex}
Description	Request Start/Stop Guarding for all slaves
Access	wo
PDO mapping	No
Value range, BL××	Unsigned8
Default value, BL××	No

4.6 Overview about the objects of the Device Profile (acc. to CiA DS-401 and 406)

4.6.1 Object $67FF_{hex}$ – Device Type

The object $67FF_{hex}$ specifies the type of the first device profile supported.

The object contains the value $000x0191_{hex}$.

Das Low-Word (0191_{hex}) specifies the device profile (acc. to CiA DS-401: I/O modules).

the high word ($000x_{hex}$) the I/O-types, see CiA DS-401.

Table 53: Object $67FF_{hex}$

Feature	**Description/ Value**
Name	Device Type
Object code	VAR
Data type	Unsigned32
Access	ro
Default value	No
PDO mapping	No

4.6.2 Object $6FFF_{hex}$ – Device Type

Object $6FFF_{hex}$ (corresponds to object $67FF_{hex}$ in accordance with CiA DS-406) specifies the type of the second device profile supported.

The object contains the value $000A0191_{hex}$.

The low word (0196_{hex} = 406dez) specifies the device profile.

The high word ($000A_{hex}$) describes the encoder type in accordance with CiA DS-406 (10dec = Multi Sensor Encoder Interface).

Table 54: Object $6FFF_{hex}$

Feature	Description
Name	Device Type
Object code	VAR
PDO Mapping	No
Data type	Unsigned32
Access	ro

4.7 Manufacturer specific device objects

4.7.1 Object 2000_{hex} – Serial Number

Object 2000_{hex} corresponds to sub-index 04_{hex} of object 1018_{hex} and contains the ident-number of the used BLxx-gateway.

Note

We recommend using object 1018_{hex}, sub-index 04_{hex} for the serial number.

4.7.2 Object 2010_{hex} – Node ResetModifiers

Object 2010_{hex} is used for a temporary (volatile) modification to the module behavior.

Table 55: Object 2010_{hex}

Object description	
INDEX	2010_{hex}
Name	Node ResetModifiers
Object code	ARRAY
Data type	Unsigned32
Value description	
Sub-index	00_{hex}
Description	Number of Entries
Access	ro
PDO mapping	No
Value range, BL××	Unsigned8
Default value, BL××	No
Sub-index	01_{hex}
Description	Hard Reset Node Identifier
Access	rw
PDO mapping	No
Value range, BL××	Unsigned32
Default value, BL××	No
Sub-index	02_{hex}
Description	Save Reference Reset Modifier
Access	rw
PDO mapping	No
Value range, BL××	Unsigned32
Default value, BL××	No

Table 55: Object 2010$_{hex}$

Object description	
Sub-index	03_{hex}
Description	Save Current Reset Modifier
Access	rw
PDO mapping	No
Value range, BL××	Unsigned32
Default value, BL××	No

The Hard-Reset-Modifier determines whether, in the event of a Reset Node command, a normal fast reset should be performed, or a hard processor reset, which can take several seconds to be carried out.

For writing, the value that is transferred in Unsigned 32 format will be interpreted as a string:

Table 56: Hard Reset (processor reset) selection

MSB			**LSB**
t	s	r	h
74_{hex}	73_{hex}	72_{hex}	68_{hex}

Table 57: Normal Reset selection

MSB			**LSB**
t	s	r	s
74_{hex}	73_{hex}	72_{hex}	73_{hex}

After the next Reset-Node or the next "Reset Communication" command, the operating mode will in all cases be reset to "normal Reset Node".

2010_{hex} at BL××

The Index "Save reference module list" determines that, in the event of a Reset Node command, the BL×× reference module list (Objects 3080_{hex} and 3081_{hex}) will be saved in non-volatile memory, and then followed by a hard processor reset. This hardware reset is necessary, because changes to the BL××0 reference module list cannot be dynamically accepted in the CANopen I/O mirror. If the module list is altered, all the CANopen parameters will be reset to the default values.

For writing, the value that is transferred in Unsigned 32 format will be interpreted as a string:

Table 58: Selection: "Save and Hardware-Reset"

MSB			**LSB**
v	a	s	r
76_{hex}	61_{hex}	73_{hex}	72_{hex}

Table 59: Normal Reset selection

MSB			**LSB**
t	s	r	s
74_{hex}	73_{hex}	72_{hex}	73_{hex}

After the next Reset-Node or the next "Reset Communication" command, the operating mode will in all cases be reset to "normal Reset Node".

The Index "Save Current Reset Modifier" determines that, in the event of a Reset Node command, the actual BLxx module list (Objects 3090_{hex} and 3091_{hex}) will be saved in non-volatile memory, and then followed by a hard processor reset. This hardware reset is necessary, because changes to the reference module list cannot be dynamically accepted in the CANopen I/O mirror. If the module list is altered, all the CANopen parameters will be reset to the default values.

For writing, the value that is transferred in Unsigned 32 format will be interpreted as a string:

Table 60: Save and Hard-ware-Reset selection

MSB			**LSB**
v	a	s	c
76_{hex}	61_{hex}	73_{hex}	63_{hex}

Table 61: Normal Reset selection

MSB			**LSB**
t	s	r	s
74_{hex}	73_{hex}	72_{hex}	73_{hex}

After the next Reset-Node or the next "Reset Communication" command, the operating mode will in all cases be reset to "normal Reset Node".

4.7.3 Object 2400_{hex} - System Voltages (only BL67)

This object enables the reading of up to 4 system voltages.

At the moment, the BL67-GW-CO supports the reading of U_{sys} from sub-index 1. The sub-indices 2...4 give out 0.

Table 62: Object 2400_{hex}

Object description	
INDEX	2400_{hex}
Name	System Voltages
Object code	ARRAY
Data type	Unsigned16
Access	ro
PDO mapping	No
Default value	No

4.7.4 Object 2401_{hex} - System Currents (only BL67)

This object enables the reading of up to 4 system currents.

Table 63: Object 2401_{hex}

Object description	
INDEX	2401_{hex}
Name	System Currents
Object code	ARRAY
Data type	Unsigned16
Access	ro
PDO mapping	No
Default value	No

5 Objects for digital input modules

5.1 Digital input modules BL××

The objects are used in the following modules:

Table 64: BL×× - digital input modules

Product family	Module
BL20	BL20-×DI-24VDC-P
	BL20-×DI-24VDC-N
	BL20-2DI-120/230VAC
	BL20-4DI-NAMUR
	BL20-E-×DI-24VDC-P
BL67	BL67-×DI-P
	BL67-×DI-N
	BL67-×DI-PD
BLC	miscellaneous

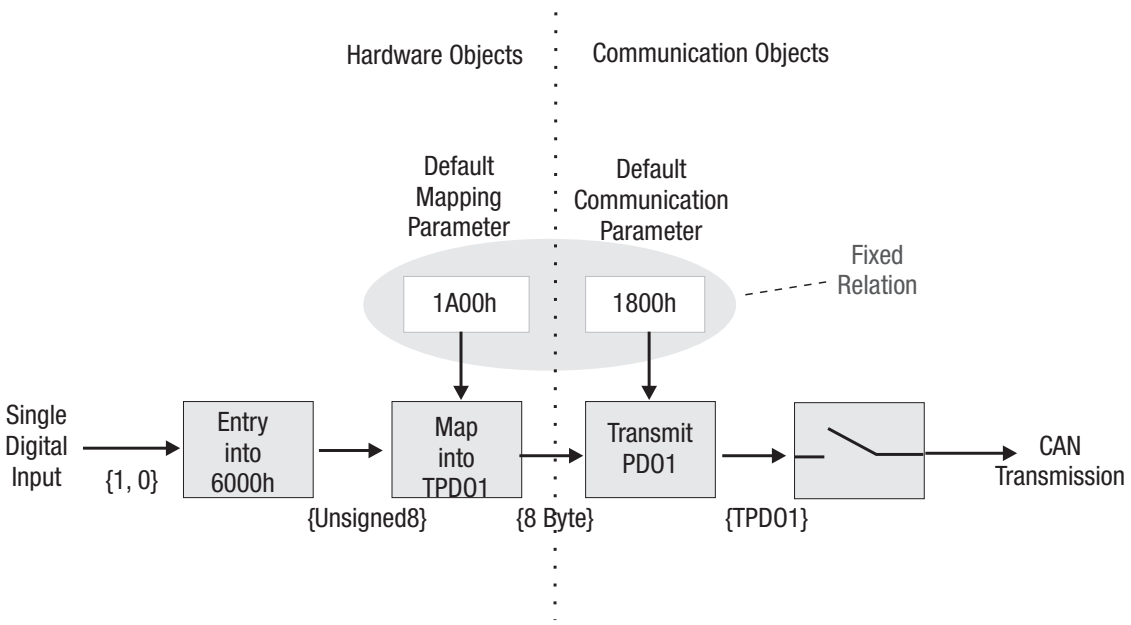
5.2 General object overview for digital input modules

Table 65: General object overview for digital input modules

Object	Name	Page
3064_{hex}	XBIParam Dword	page 14-10
6000_{hex}	Read Input 8 Bit	page 5-4
6020_{hex}	Read Input Bit 1 to 128	page 5-5
6021_{hex}	Read Input Bit 129 to 256	page 5-5
6022_{hex}	Read Input Bit 257 to 288	page 5-5
6100_{hex}	Read Input 16 Bit	page 5-6
6120_{hex}	Read Input 32 Bit	page 5-6

The following figure shows the relationship between the digital input objects for an 8-bit access:

Figure5: Relationship between the digital digital input modules (according to CiA Standard DS401)



5.2.1 Object 6000_{hex} – Read Input 8 Bit

The object presents the values for the digital input modules in 8-bit groups.

A total of 36 groups (each 8 bit) can be displayed (288 digital input channels).

PDO mapping of this object is always executed by default and automatically for the first 8 sub-indexes. This corresponds to 64 input channels.

If more than 64 input channels are present, then the PDO-mapping must be carried out by the user.

Table 66: Object 6000_{hex}

Feature	**Description/ Value**
Name	Read Input 8 Bit
Object code	ARRAY
PDO mapping	Yes
Sub-index	00_{hex}
Data type	Unsigned8
Access	ro
Default value, BL××	No
Sub-index	01_{hex} to 24_{hex}
Data type	Unsigned8
Access	ro
Default value, BL××	No

5.2.2 Object 6020_{hex} – Read Input Bit (1 to 128), Object 6021_{hex} – Read Input Bit (129 to 256), Object 6022_{hex} – Read Input Bit (257 to 288)

The objects defined the values bit-wise. Each sub-index for these objects is a Boolean value.

A total of 128 bits can be represented (128 digital input channels).

If more than 128 input channels are present, then object 6021_{hex} is used.

If more than 256 input channels are present, then object 6022_{hex} is used.

Since the number of digital input channels in a station is limited to 288, it is not possible to make use of the complete range of the array in object 6022_{hex}.

Table 67: Objects 6020_{hex}, 6021_{hex} and 6022_{hex}

Feature	Description/ Value
Name	Read Input Bit
Object code	ARRAY
PDO mapping	Yes
Sub-index	00_{hex}
Data type	Unsigned8
Access	ro
Default value, BL××	No
Sub-index	01_{hex} to 80_{hex}
Data type	Boolean
Access	ro
Default value, BL××	No

5.2.3 Object 6100_{hex} – Read Input 16 Bit

The object presents the values for the digital input modules in 16-bit groups.

A total of 18 groups (each 16 bit) can be displayed (288 digital input channels).

Table 68: Object 6100_{hex}

Feature	Description/ Value
Name	Read Input 16 Bit
Object code	ARRAY
PDO mapping	Yes
Sub-index	00_{hex}
Data type	Unsigned8
Access	ro
Sub-index	01_{hex} to 12_{hex}
Data type	Unsigned16
Access	ro

5.2.4 Object 6120_{hex} – Read Input 32 Bit

The object presents the values for the digital input modules in 32-bit groups.

A total of 9 groups (each 32 bit) can be displayed (288 digital input channels).

Table 69: Object 6120_{hex}

Feature	Description/ Value
Name	Read Input 32 Bit
Object code	ARRAY
PDO mapping	Yes
Sub-index	00_{hex}
Data type	Unsigned8
Access	ro
Sub-index	01_{hex} to 09_{hex}
Data type	Unsigned32
Access	ro

6 Objects for digital output modules

6.1 Digital output modules BL××

The objects are used in the following modules:

Table 70: BL×× - digital output modules

Product family	Module
BL20	BL20-×DO-24VDC-0.5A-P
	BL20-×DO-24VDC-0.5A-N
	BL20-2DO-24VDC-2A-P
	BL20-×DO-24VDC-0.5A-P
	BL20-2DO-120/230VAC-0.5A
	BL20-2DO-R-NC
	BL20-2DO-R-NO
	BL20-2DO-R-CO
BL67	BL67-×DO-0.5A-P
	BL67-4DO-2A-P
	BL67-4DO-4A-P
	BL67-16DO-0.1A-P
	BL67-4DO-2A-N
	BL67-8DO-0.5A-N
	BL67-8DO-R-NO
	BL67-4DI4DO-PD
	BL67-8XSG-PD
BLC	miscellaneous

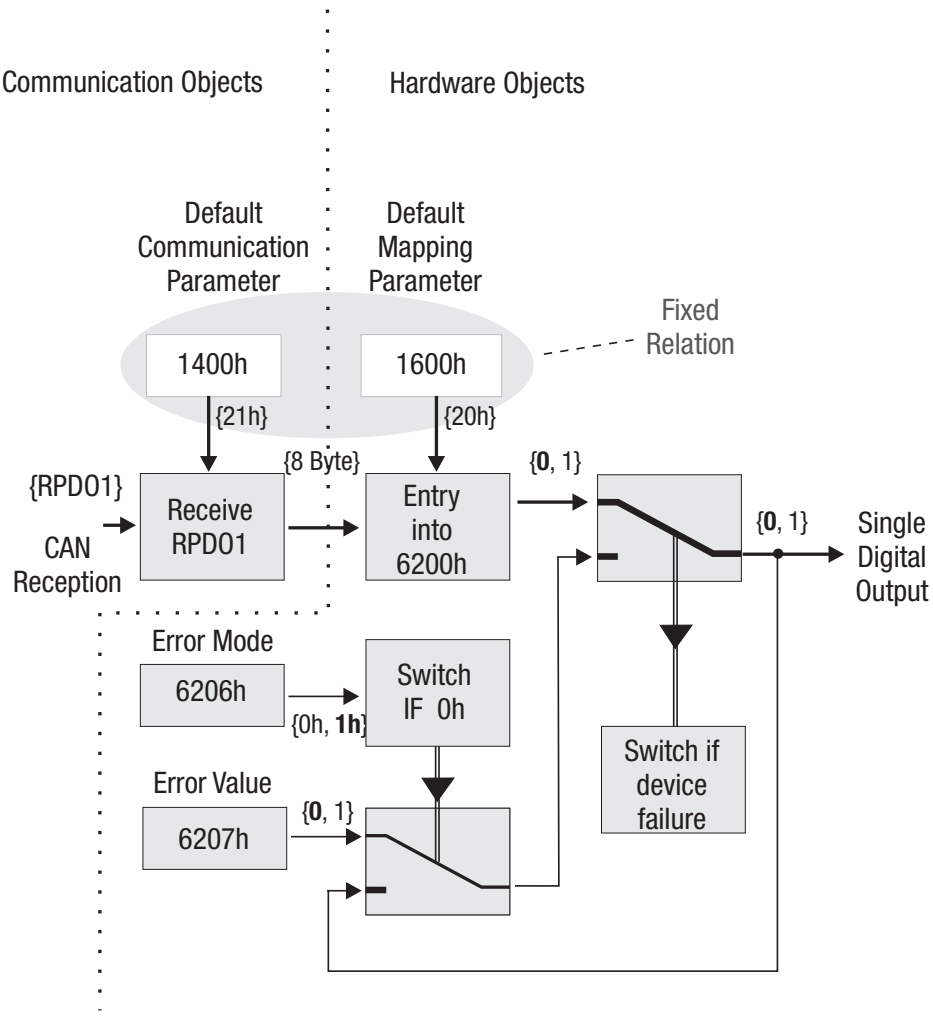
6.2 General object overview for digital output modules

Table 71: General object overview for digital output modules

Object	Name	page
6200_{hex}	Write Output 8 Bit	page 6-4
6206_{hex}	Error Mode Output 8 Bit	page 6-5
6207_{hex}	Error State Output 8 Bit	page 6-6
6220_{hex}	Write Output 8 Bit (1 to 128)	page 6-7
6221_{hex}	Write Output 8 Bit (129 to 256)	page 6-7
6222_{hex}	Write Output 8 Bit (257 to 288)	page 6-7
6250_{hex}	Error Mode Output Bit (1 to 128)	page 6-8
6251_{hex}	Error Mode Output Bit (129 to 256)	page 6-8
6252_{hex}	Error Mode Output Bit (257 to 288)	page 6-8
6260_{hex}	Error State Output Bit (1 to 128)	page 6-9
6261_{hex}	Error State Output Bit (129 to 256)	page 6-9
6300_{hex}	Write Output 16 Bit	page 6-10
6306_{hex}	Error Mode Output 16 Bit	page 6-10
6307_{hex}	Error State Output 16 Bit	page 6-11
6320_{hex}	Write Output 32 Bit	page 6-12
6326_{hex}	Error Mode Output 32 Bit	page 6-13
6327_{hex}	Error State Output 32 Bit	page 6-14

The following figure shows the relationship between the digital output objects for an 8-bit access:

Figure6: Relationship between the digital output objects (according to CiA Draft Standard DS401)



6.2.1 Object 6200_{hex} – Write Output 8 Bit

The object presents the values for the digital output modules in 8-bit groups.

A total of 36 groups (each 8 bit) can be displayed (288 digital output channels).

PDO mapping of this object is always executed by default and automatically for the first 8 sub-indexes. This corresponds to 64 digital output channels. If more than 64 output channels are present, then the PDO-mapping must be carried out by the user.

Table 72: Object 6200_{hex}

Feature	**Description/ Value**
Name	Write Output 8 Bit
Object code	ARRAY
PDO mapping	Yes
Sub-index	00_{hex}
Data type	Unsigned8
Access	ro
Default value, BL××	No
Sub-index	01_{hex} to 24_{hex}
Data type	Unsigned8
Access	rw
Default value, BL××	0

6.2.2 Object 6206_{hex} – Error Mode Output 8 Bit

The object defines values in 8-bit groups.

A total of 36 groups (each 8 bit) can be displayed (288 digital output channels).

It defines (for each digital output channel) whether or not the output should take on a substitute value in the event of an error.

The following applies:

0 The output maintains its value if an error occurs.

1 The output is set to a substitute value if an error occurs.

The substitute values for the digital output channels are defined by the Error state output object (e.g. 6207_{hex}).

Table 73: Object 6206_{hex}

Feature	Description/ Value
Name	Error Mode Output 8 Bit
Object code	ARRAY
PDO mapping	No
Sub-index	00_{hex}
Data type	Unsigned8
Access	ro
Default value, BL××	No
Sub-index	01_{hex} to 24_{hex}
Data type	Unsigned8
Access	rw
Default value, BL××	FF_{hex}

6.2.3 Object 6207_{hex} – Error State Output 8 Bit

The object defines values in 8-bit groups. A total of 36 groups (each 8 bit) can be displayed (288 digital output channels).

A substitute value is assigned to each analog channel. The substitute values will only be sent in case of an error, object Error Mode Output (6206_{hex}) is set to "1" for the respective channel.

Substitute values:

0 The output will be switched off if an error occurs.

1 The output will be switched on if an error occurs.

Table 74: Object 6207_{hex}

Feature	Description/ Value
Name	Error State Output 8 Bit
Object code	ARRAY
PDO mapping	No
Sub-index	00_{hex}
Data type	Unsigned8
Access	ro
Default value, BL××	No
Sub-index	01_{hex} to 24_{hex}
Data type	Unsigned8
Access	rw
Default value, BL××	00_{hex}

6.2.4 Object 6220_{hex} – Write Output Bit (1 to 128), Object 6221_{hex} – Write Output Bit (129 to 256), Object 6222_{hex} – Write Output Bit (257 to 288)

The objects defined the values bit-wise.

Each sub-index for these objects is a Boolean value.

A total of 128 bits can be represented (128 digital output channels).

If more than 128 output channels are present, then object 6221_{hex} is used.

If more than 256 output channels are present, then object 6222_{hex} is used.

Since the number of digital output channels in a station is limited to 288, it is not possible to make use of the complete range of the array in object 6222_{hex}.

Table 75: Objected 6220_{hex}, 6221_{hex}, 6222_{hex}

Feature	Description/ Value
Name	Write Output Bit
Object code	ARRAY
PDO mapping	Yes
Sub-index	00_{hex}
Data type	Unsigned8
Access	ro
Default value, BL××	No

Table 75: Objected 6220_{hex}, 6221_{hex}, 6222_{hex}

Feature	Description/ Value
Sub-index	01_{hex} to 80_{hex}
Data type	Boolean
Access	rw
Default value, BL××	0

6.2.5 Object 6250_{hex} – Error Mode Output Bit (1 to 128), Object 6251_{hex} – Error Mode Output Bit (129 to 256), Object 6252_{hex} – Error Mode Output Bit (257 to 288)

The objects define the values bit-wise. Each sub-index for these objects is a Boolean value.

A total of 128 bits can be represented (128 digital output channels).

If more than 128 output channels are present, then object 6251_{hex} is used. If more than 256 output channels are present, then object 6252_{hex} is used.

Since the number of digital output channels in a station is limited to 288, it is not possible to make use of the complete range of the array in object 6522_{hex}.

It defines (for each digital output channel) whether or not the output should take on a substitute value in the event of an error. The following applies:

0 The output maintains its value if an error occurs.

1 The output is set to a substitute value if an error occurs.

The substitute values for the digital output channels are defined by the Error state output objects (e.g. 6260_{hex}, 6261_{hex} and 6262_{hex}).

Table 76: Objected 6250_{hex}, 6251_{hex}, 6252_{hex}

Feature	Description/ Value
Name	Error Mode Output Bit
Object code	ARRAY
PDO mapping	No
Sub-index	00_{hex}
Data type	Unsigned8
Access	ro
Default value, BL××	No
Sub-index	01_{hex} to 80_{hex}
Data type	Boolean
Access	rw
Default value, BL××	1

6.2.6 Object 6260_{hex} – Error State Output Bit (1 to 128), Object 6261_{hex} – Error State Output Bit (129 to 256), Object 6262_{hex} – Error State Output Bit (257 to 288)

The objects define the values bit-wise. Each sub-index for these objects is a Boolean value.

A total of 128 bits can be represented (128 digital output channels).

If more than 128 output channels are present, then object 6261_{hex} is used.If more than 256 output channels are present, then object 6262_{hex} is used.

Since the number of digital output channels in a station is limited to 288, it is not possible to make use of the complete range of the array in object 6262_{hex}.

A substitute value is assigned to each analog channel. The substitute values will only be sent in case of an error, object Error Mode Output object (62506250_{hex}, 6251_{hex} and 6252_{hex}) is set to "1" for the respective channel.

Substitute values:

0 The output will be switched off if an error occurs.

1 The output will be switched on if an error occurs.

Table 77: Objected 6260_{hex}, 6261_{hex}, 6262_{hex}

Feature	Description/ Value
Name	Error State Output Bit
Object code	ARRAY
PDO mapping	No
Sub-index	00_{hex}
Data type	Unsigned8
Access	ro
Default value, BL××	No
Sub-index	01_{hex} to 80_{hex}
Data type	Boolean
Access	rw
Default value, BL××	0

6.2.7 Object 6300_{hex} – Write Output 16 Bit

The object presents the values for the digital output modules in 16-bit groups.

A total of 18 groups (each 16 bit) can be displayed (288 digital output channels).

Table 78: Object 6300_{hex}

Feature	Description/ Value
Name	Write Output 16 Bit
Object code	ARRAY
PDO mapping	Yes
Sub-index	00_{hex}
Data type	Unsigned8
Access	ro
Default value, BL××	No
Sub-index	01_{hex} to 12_{hex}
Data type	Unsigned16
Access	rw
Default value, BL××	0000_{hex}

6.2.8 Object 6306_{hex} – Error Mode Output 16 Bit

The object defines values in 16-bit groups. A total of 18 groups (each 16 bit) can be displayed (288 digital output channels).

It defines (for each digital output channel) whether or not the output should take on a substitute value in the event of an error. The following applies:

0 The output maintains its value if an error occurs.

1 The output is set to a substitute value if an error occurs.

The substitute values for the digital output channels are defined by the Error state output object (e.g. 6307_{hex}).

Table 79: Object 6306_{hex}

Feature	Description/ Value
Name	Error Mode Output 16 Bit
Object code	ARRAY
PDO mapping	No
Sub-index	00_{hex}
Data type	Unsigned8
Access	ro
Default value, BL××	No

Table 79: Object 6306_{hex}	**Feature**	**Description/ Value**
	Sub-index	01_{hex} to 12_{hex}
	Data type	Unsigned16
	Access	rw
	Default value, BL××	$FFFF_{hex}$

6.2.9 Object 6307_{hex} – Error State Output 16 Bit

The object defines values in 16-bit groups. A total of 18 groups (each 16 bit) can be displayed (288 digital output channels).

A substitute value is assigned to each analog channel. The substitute values will only be sent in case of an error, object Error Mode Output (6306_{hex}) is set to "1" for the respective channel.

Substitute values:

0 The output will be switched off if an error occurs.

1 The output will be switched on if an error occurs.

Table 80: Object 6307_{hex}	**Feature**	**Description/ Value**
	Name	Error State Output 16 Bit
	Object code	ARRAY
	PDO mapping	No
	Sub-index	00_{hex}
	Data type	Unsigned8
	Access	ro
	Default value, BL××	No
	Sub-index	01_{hex} to 12_{hex}
	Data type	Unsigned16
	Access	rw
	Default value, BL××	0000_{hex}

6.2.10 Object 6320_{hex} – Write Output 32 Bit

The object presents the values for the digital output modules in 32-bit groups.

A total of 9 groups (each 32 bit) can be displayed (288 digital output channels).

Table 81: Object 6320_{hex}

Feature	Description/ Value
Name	Write Output Bit
Object code	ARRAY
PDO mapping	Yes
Sub-index	00_{hex}
Data type	Unsigned8
Access	ro
Default value, BL××	No
Sub-index	01_{hex} to 09_{hex}
Data type	Unsigned32
Access	rw
Default value, BL××	$0000\ 0000_{hex}$

6.2.11 Object 6326_{hex} – Error Mode Output 32 Bit

The object defines values in 32-bit groups. A total of 9 groups (each 32 bit) can be displayed (288 digital output channels).

It defines (for each digital output channel) whether or not the output should take on a substitute value in the event of an error. The following applies:

0 The output maintains its value if an error occurs.

1 The output is set to a substitute value if an error occurs.

The substitute values for the digital output channels are defined by the Error state output object (e.g. 6327_{hex}).

Table 82: Object 6326_{hex}

Feature	Description/ Value
Name	Error Mode Output 32 Bit
Object code	ARRAY
PDO mapping	No
Sub-index	00_{hex}
Data type	Unsigned8
Access	ro
Default value, BL××	No
Sub-index	01_{hex} to 09_{hex}
Data type	Unsigned32
Access	rw
Default value, BL××	FFFF $FFFF_{hex}$

6.2.12 Object 6327_{hex} – Error State Output 32 Bit

The object defines values in 32-bit groups. A total of 9 groups (each 32 bit) can be displayed (288 digital output channels).

A substitute value is assigned to each analog channel. The substitute values will only be sent in case of an error, object Error Mode Output (6326_{hex}) is set to "1" for the respective channel.

Substitute values:

0 The output will be switched off if an error occurs.

1 The output will be switched on if an error occurs.

Table 83: Object 6327_{hex}

Feature	**Description/ Value**
Name	Error State Output 32 Bit
Object code	ARRAY
PDO mapping	No
Sub-index	00_{hex}
Data type	Unsigned8
Access	ro
Default value, BL××	No
Sub-index	01_{hex} to 09_{hex}
Data type	Unsigned32
Access	rw
Default value, BL××	$0000\ 0000_{hex}$

7 Objects for digital combi modules

7.1 Digital combi modules BL××

The objects are used in the following modules:

Table 84: BL×× - digital combi modules

Product family	Module
BL67	BL67-4DI-4DO-PD
	BL67-8XSG-PD
BLC	miscellaneous

7.2 General object overview for digital combi modules

Note

The objects for digital combi modules correspond to those of the digital in- and output modules. Please read chapter 5, Objects for digital input modules and chapter 6, Objects for digital output modules.

The parameterization of the combi modules is realized through the manufacturer specific objects described in the following.

Table 85: General object overview for digital combi modules

Object	Name	page
Input objects		
6000_{hex}	Read Input 8 Bit	page 5-4
6020_{hex}, 6021_{hex}, 6022_{hex}	Read Input 8 Bit	page 5-5
6100_{hex}	Read Input 16 Bit	page 5-6
6120_{hex}	Read Input 32 Bit	page 5-6
Output objects		
6200_{hex}	Write Output 8 Bit	page 6-4
6206_{hex}	Error Mode Output 8 Bit	page 6-5
6207_{hex}	Error State Output 8 Bit	page 6-6
6220_{hex}, 6221_{hex}, 6222_{hex}	Write Output 8 Bit	page 6-7
6250_{hex}, 6251_{hex}, 6252_{hex}	Error Mode Output Bit	page 6-8
6260_{hex}, 6261_{hex}	Error State Output Bit (1 to 128), Bit (129 to 256)	page 6-9
6300_{hex}	Write Output 16 Bit	page 6-10
6306_{hex}	Error Mode Output 16 Bit	page 6-10
6307_{hex}	Error State Output 16 Bit	page 6-11
6320_{hex}	Write Output 32 Bit	page 6-12
6326_{hex}	Error Mode Output 32 Bit	page 6-13
6327_{hex}	Error State Output 32 Bit	page 6-14

	Parameter object		
	3064_{hex}	XBIParam Dword	page 14-10

8 Objects for analog input modules

8.1 Analog input modules BL××

The objects are used in the following modules:

Table 86: BL×× - analog input modules

Product family	Module
BL20	BL20-×AI-I(0/4...20MA)
	BL20-×AI-U(-10/0...+10VDC)
	BL20-2AI-PT/NI-2/3
	BL20-2AI-THERMO-PI
	BL20-4AI-U/I
	BL20-E-8AI-U/I-4PT/NI
	BL20-2AIH-I
BL67	BL67-2AI-I
	BL67-2AI-V
	BL67-2AI-PT
	BL67-2AI-TC
	BL67-4AI-V/I
BLC	miscellaneous

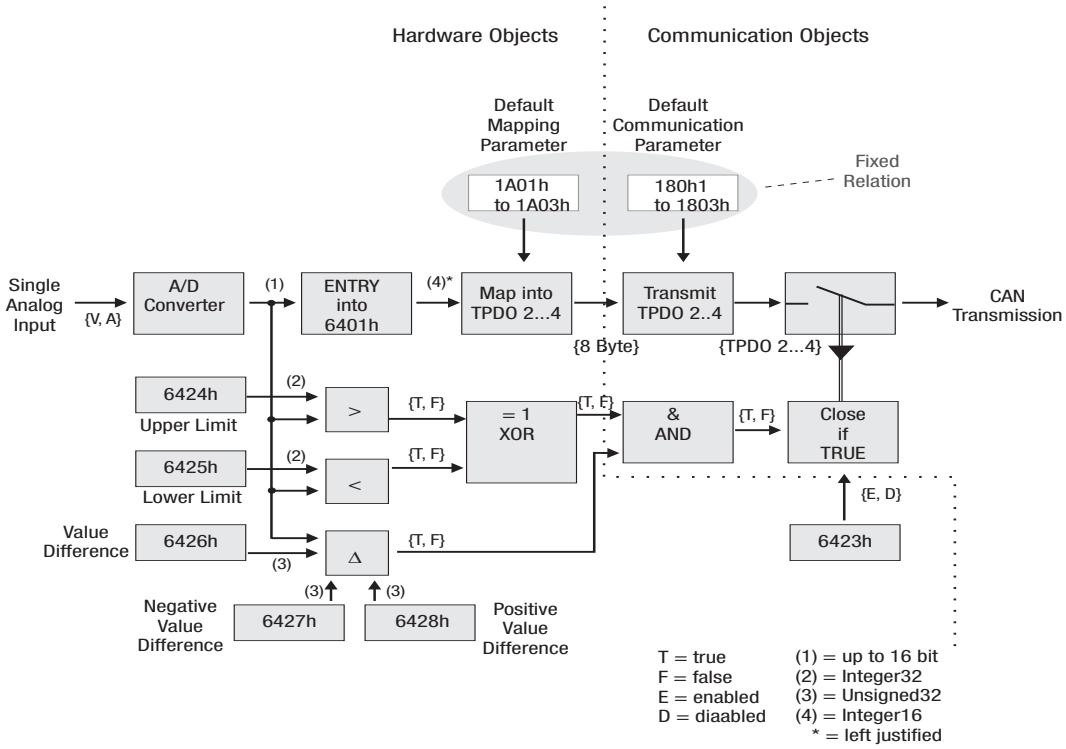
8.2 General object overview for analog input modules

Table 87: General object overview for analog input modules

Object	Name	page
5420_{hex}	Manu Spec Analog Input Range	page 8-3
6401_{hex}	Read analog Input 16 Bit	page 8-10
6421_{hex}	Analog Input Interrupt Trigger Selection	page 8-11
6422_{hex}	Analog Input Interrupt Source	page 8-13
6423_{hex}	Analog Input Global Interrupt Enable	page 8-14
6424_{hex}	Analog Input Interrupt Upper Limit Integer	Seite 8-14
6425_{hex}	Analog Input Interrupt Lower Limit Integer	Seite 8-15
6426_{hex}	Analog Input Interrupt Delta Unsigned	Seite 8-15
6427_{hex}	Analog Input Interrupt Negative Delta Unsigned	Seite 8-16
6428_{hex}	Analog Input Interrupt Positive Delta Unsigned	Seite 8-16

The following figure shows the relationship between the analog input objects for an 16-bit access:

Figure7: Relationship between the analog output objects (according to CiA Draft Standard DS401)



8.2.1 Object 5420_{hex} – Manu Spec Analog Input Range

The object defines the parameters of the analog input channels.

Write accesses initiate a parameter update via the internal BLxx-module bus.

The parameter is stored as a non-volatile parameter in the gateway and is restored with every node reset.

The Sub-indices 01_{hex} – $8E_{hex}$ define the parameters for the analog input channel 1 to 142.

Table 88: Object 5420_{hex}

Feature	Description/ Value
Name	Manu Spec Analog Input Range
Object code	ARRAY
PDO mapping	No
Sub-index	00_{hex}
Data type	Unsigned8
Access	ro
Default value, BLxx	No
Sub-index	01_{hex} bis $8E_{hex}$

Table 88: Object 5420$_{hex}$

Feature	Description/ Value
Data type	Unsigned16
Access	rw
Default value, BL××	No

The structure of the 2 bytes of parameter data depends on the module concerned.

A sub-index is assigned for **each** channel. The following explains the structure for each module type.

Analog input modules, current

Table 89: Parameters, analog input modules, current

A*Default-setting*

Byte	Bit	Parameters	Value/ meaning
n	0	current mode	0 = 0...20 mA **A** 1 = 4...20 mA
	1	Value representation	0 = Integer (15 bit + sign) **A** 1 = reserved
	2	Diagnostic	0 = release **A** 1 = block
	3	Channel x	0 = activate **A** 1 = deactivate
	4 to 7	reserved	

Analog input modules, voltage

Table 90: Parameter, analog input modules, voltage

A*Default-setting*

Byte	Bit	Parameters	Value/ meaning
n	0	voltage mode	0 = 0...10 V **A** 1 = -10...10 V
	1	Value representation	0 = Integer (15 bit + sign) **A** 1 = reserved
	2	Diagnostic	0 = release **A** 1 = block
	3	Channel x	0 = activate **A** 1 = deactivate
	4 to 7	reserved	

analog input modules, current/ voltage

Table 91: Parameter, analog input modules, current/voltage

A*Default-setting*

Byte	Bit	Parameters	Value/ meaning
n	0	Range	0 = 0...10 V/0...20 mA **A** 1 = -10...10 V/4...20 mA
	1	Value representation	0 = Integer (15 bit + sign) **A** 1 = reserved
	2	Diagnostic	0 = release **A** 1 = block
	3	Channel x	0 = activate **A** 1 = deactivate
	4	Operation mode	0 = voltage **A** 1 = current
	5 to 7	reserved	

Analog input modules, PT/Ni

Table 92: Parameter, analog input modules, PT/Ni

A*Default-setting*

Byte	Bit	Parameters	Value/ meaning
n	0	Mains suppression	0 = 50 Hz **A** 1 = 60 Hz
	1	Value representation	0 = Integer (15 bit + sign) **A** 1 = reserved
	2	Diagnostic	0 = release **A** 1 = block
	3	Channel x	0 = activate **A** 1 = deactivate
	4 to 7	Element	0000 = Pt100, -200...850 °C **A** 0001 = Pt100, -200...150 °C 0010 = Ni100, -60...250 °C 0011 = Ni100, -60...150 °C 0100 = Pt200, -200...850 °C 0101 = Pt200, -200...150 °C 0110 = Pt500, -200...850 °C 0111 = Pt500, -200...150 °C 1000 = Pt1000, -200...850 °C 1001 = Pt1000, -200...150 °C 1010 = Ni1000, -60...250 °C 1011 = Ni1000, -60...150 °C 1100 = resistance, 0...100 Ω 1101 = resistance, 0...200 Ω 1110 = resistance, 0...400 Ω 1111 = resistance, 0...1000 Ω
n +1	0	Measurement mode	0 = 2-wire **A** 1 = 3-wire

Analog input modules, 2AI-THERMO/TC

Table 93: Parameter, analog input modules, 4AI-TC

Byte	Bit	Parameters	Value/ meaning
n	0	Cold junction sensor	0 = Pt1000 **A** 1 = Pt100
	1	Value representation	0 = Integer (15 bit + sign) **A** 1 = reserved
	2	Diagnostic	0 = release **A** 1 = block
	3	Channel x	0 = activate **A** 1 = deactivate
	6 to 4	Element	0000 = Type K, -270...1370 °C 0001 = Type B, +100....1820 °C 0010 = Type E, -270...1000 °C 0011 = Type J, -210...1200 °C 0100 = Type N, -270...1300 °C 0101 = Type R, -50...1760 °C 0110 = Type S, -50...1540 °C 0111 = Type T, -270...400 °C 1000 = ±50 mV 1001 = ±100 mV 1010 = ±500 mV 1011 = ±1000 mV 1100 = Type J, -454... 2498 °F 1101 = Type J, -346... 2192 °F 1110 = Type C, 0...2320 °C 1111 = Type G, 0...2320 °C
	7	reserved	

A *Default-setting*

Analog input modules, 4AI-TC

Table 94: Parameter, analog input modules, THERMO

Byte	Bit	Parameters	Value/ meaning
n	0	Mains suppression	0 = 50 Hz **A** 1 = 60 Hz
	1	Value representation	0 = Integer (15 bit + sign) **A** 1 = reserved
	2	Diagnostic	0 = release **A** 1 = block
	3	Channel x	0 = activate **A** 1 = deactivate
	6 to 4	Element	0000 = Type K, -270...1370 °C 0001 = Type B, +100....1820 °C 0010 = Type E, -270...1000 °C 0011 = Type J, -210...1200 °C 0100 = Type N, -270...1300 °C 0101 = Type R, -50...1760 °C 0110 = Type S, -50...1540 °C 0111 = Type T, -270...400 °C 1000 = ±50 mV 1001 = ±100 mV 1010 = ±500 mV 1011 = ±1000 mV
	7	reserved	

A*Default-setting*

Analog input modules, -8AI-U/I-4PT/NI

Table 95: Module parameters BL20-E-8AI-U/I-4PT/NI

Assignment		Parameters	Meaning
Byte	Bit		
0 - 7	0 -5	Operation mode Kx	000000 = Voltage 0...10 V DC Standard **A**
			000001 = Voltage -10...10 V DC Standard
			000010 = Voltage 0...10 V DC PA (NE 43)
			000011 = Voltage -10...10 V DC PA (NE 43)
			000100 = Voltage -10...10 V DC Ext. range
			000101 = Voltage 0...10 V DC Ext. range
			001000 = Current 0 ... 20 mA Standard
			001001 = Current 4 ... 20 mA Standard
			001010 = Current 0 ... 20 mA PA (NE 43)
			001011= Current 4 ... 20 mA PA (NE 43)
			001100 = Current 0 ... 20 mA Ext. range
			001001 = Current 4 ... 20 mA Ext. range
			010000 = Pt100-200 °C ... 850 °C, 2-wire **B**
			010001 = Pt 100-200 °C ... 150 ? 2-wire
			010010 = Pt200-200 °C ... 850 °C 2-wire
			010011 = Pt200-200 °C ... 150 °C 2-wire
			010100 = Pt500-200 °C ... 850 °C 2-wire
			010101 = Pt500-200 °C ... 150 °C 2-wire
			010110 = Pt1000-200 °C ... 850 °C 2-wire
			010111 = Pt1000-200 °C ... 150 °C 2-wire
			011000 = Pt100-200 °C ... 850 °C 3-wire
			011001 = Pt100-200 °C ... 150 °C 3-wire
			011010 = Pt200-200 °C ... 850 °C 3-wire
			011011 = Pt200-200 °C ... 150 °C 3-wire
			011100 = Pt500-200 °C ... 850 °C 3-wire
			011101 = Pt500-200 °C ... 150 °C 3-wire
			011110 = Pt1000-200 °C ... 850 °C 3-wire
			011111 = Pt1000-200 °C ... 150 °C 3-wire
			100000 = Ni100, -60°C..150°C, 2-wire
			100001 = Ni100, -60°C..150°C, 2-wire

A *Default-settings*

B *In Pt, Ni and R-, measurement, only the first of the used channels is parameterized (channel 1,3,5,7).. The parameterization of the second channel will be ignored.*

Table 95: Module parameters BL20-E-8AI-U/I-4PT/NI

Assignment		Parameters	Meaning
Byte	Bit		
0 - 7	0 -5	Operation mode Kx	100010 = Ni1000, -60°C..250°C, 2-wire
			100011 = Ni1000, -60°C..250°C, 2-wire
			100100 = NI1000TK5000, -60 °C .. 150°C, 2-wire
			100101 = Ni100, -60°C..150°C, 3-wire
			100110 = Ni100, -60°C..150°C, 3-wire
			100111 = Ni1000, -60°C..250°C, 3-wire
			101010 = Ni1000, -60°C..250°C, 3-wire
			101001 = NI1000TK5000, -60 °C .. 150°C, 3-wire
			110000 = resistance, 0 ... 250 W
			110001 = resistance, 0 ... 400 W
			110010 = resistance, 0 ... 800 W
			110011 = resistance, 0 ... 1000 W
			110100 = resistance, 0 ... 2000 W
			110101 = channel not active
0 - 7	6	Value representation Kx	Integer (15bit + sign) A **A**
			12 bit (left-justified)
	7	Diagnostic Kx	release **A**
			block

8.2.2 Object 6401_{hex} – Read Analog Input 16 Bit

The object represents the measured values for the analog input modules with 16 bits for each channel.

Attention

The process data traffic for the analog input values is not started until the object 6423_{hex} is switched from the default setting FALSE to TRUE!

Attention

he possibility of 12-bit value representation (left-justified) is not useful for CANopen since all reference values (upper limit, lower limit) must be defined with 16 bits.

Table 96: Object 6401$_{hex}$

Feature	Description/ Value
Name	Read Analog Input 16 Bit
Object code	ARRAY
PDO mapping	Yes
Sub-index	00_{hex}
Data type	Unsigned8
Access	ro
Default value, BL××	No
Sub-index	01_{hex} bis $8E_{hex}$
Data type	Integer16
Access	ro
Default value, BL××	No

8.2.3 Object 6421$_{hex}$ – Analog Input Interrupt Trigger Selection

Note

Objects 6421 – 6428$_{hex}$ can be used to control the event-triggered transmission of the process input data. As well as these event-triggered control objects, the transmission frequency of the process input data is also controlled by means of objects 1800$_{hex}$ to 181F$_{hex}$.

Attention

Object 6423$_{hex}$ Analog Input Global Interrupt Enable, page 8-14 must be used in order to enable the possibility of transmitting the process input data using an interrupt signal!

The object defines which event is to trigger the transmitting of the analog input data (TPDOs) by means of an interrupt signal.

The triggering event is defined for each input channel using a corresponding sub-index of the object.

Table 97: Object 6421$_{hex}$

Feature	Description/ Value
Name	Analog Input Interrupt Trigger Selection
Object code	ARRAY
PDO mapping	No
Sub-index	00_{hex}
Data type	Unsigned8
Access	ro
Default value, BL××	No
Sub-index	01_{hex} bis $8E_{hex}$
Data type	Unsigned8
Access	rw
Default value	
– BL20	Firmware: ≤ version 4.02/ 2.02 = 0 ≥ version 4.02/ 2.02 = 7
– BL67/BLCCO	7

Table 98: Structure of the Sub-Index 01$_{hex}$ to 8E$_{hex}$

Bit	Trigger event
0	1 „upper limit“A exceeded **A** - the value at the input has exceeded the upper limit.
1	1 Input below „lower limit“ **A** - the value at the input is below the lower limit.
2	1 Input changed by more than „Delta“ **A** - the value at the input has changed by a defined "Delta" value.
3	1 Input reduced by more than „negative delta“**A** - the value at the input has reduced by a defined "Delta" value.
4	1 Input increased by more than „positive delta“ **A** - the value at the input has increased by a defined "Delta" value.
5 – 7	reserved

A *The upper/lower limit values and the delta values are defined using the objects 6424$_{hex}$, 6425$_{hex}$, 6426$_{hex}$, 6427$_{hex}$ and 6428$_{hex}$.*

Note

Several bits can be set simultaneously so that the transmitting of the input process data can be triggered by several events.

Note

The transmitting of the analog input data (TPDOs) by means of an interrupt signal is triggered repeatedly with every change of the analog input value if the value stays above the upper limit or below the lower limit.

If another triggering event occurs at the same time (e.g. increase by "Delta value"), the repeated transmitting is aborted.

8.2.4 Object 6422_{hex} – Analog Input Interrupt Source

The object indicates if an analog input channel has fulfilled a condition for triggering an interrupt signal.

The conditions were defined with object 6421_{hex}. If a condition for triggering an interrupt signal on a channel is fulfilled, the corresponding bit is set to 1. The corresponding bits for channels 0 to 31 are set in sub-index 01_{hex} and the bits for channels 32 to 63 in sub-index 02_{hex} etc.

The bits can be read using a SDO. The reading causes a bit reset to "0".

Table 99: Object 6422_{hex}

Feature	Description/ Value
Name	Analog Input Interrupt Source
Object code	ARRAY
PDO mapping	No
Sub-index	00_{hex}
Data type	Unsigned8
Access	ro
Default value, BL××	No
Sub-index	01_{hex} to 08_{hex}
Data type	Unsigned32
Access	ro
Default value, BL××	00_{hex}

8.2.5 Object 6423_{hex} – Analog Input Global Interrupt Enable

With this object the possibility of generating an interrupt signal will be enabled. If the value is set as defined per default from FALSE to TRUE, than sending the analog input values (TPDOs) can be triggered using an interrupt signal.

Table 100: Object 6423_{hex}

Feature	Description/ Value
Name	Analog Input Global Interrupt Enable
Object code	VAR
PDO mapping	No
Sub-index	00_{hex}
Data type	Boolean
Access	rw
Default value, BL××	FALSE

8.2.6 Object 6424_{hex} – Analog Input Interrupt Upper Limit Integer

The object 6424_{hex} defines the value for an upper limit.

Values above this "upper limit" can be defined as the condition for generating an interrupt signal.

→ „6421_{hex} Analog input interrupt trigger selection“, page 8-11.

Table 101: Object 6424_{hex}

Feature	Description/ Value
Name	Analog Input Interrupt Upper Limit Integer
Object code	ARRAY
PDO mapping	No
Sub-index	00_{hex}
Data type	Unsigned8
Access	ro
Default value, BL××	No
Sub-index	01_{hex} bis $8E_{hex}$
Data type	Integer32
Access	rw
Default value, BL××	00000000_{hex}

8.2.7 Object 6425_{hex} – Analog Input Interrupt Lower Limit Integer

The object 6425_{hex} defines the value for an lower limit.

Values below this "lower limit" can be defined as the condition for generating an interrupt signal. → „6421_{hex} Analog input interrupt trigger selection“, page 8-11.

Table 102: Object 6425_{hex}

Feature	Description/ Value
Name	Analog Input Interrupt Lower Limit Integer
Object code	ARRAY
PDO mapping	No
Sub-index	00_{hex}
Data type	Unsigned8
Access	ro
Default value, BL××	No
Sub-index	01_{hex} bis $8E_{hex}$
Data type	Integer32
Access	rw
Default value, BL××	00000000_{hex}

8.2.8 Object 6426_{hex} – Analog Input Interrupt Delta Unsigned

The object 6426_{hex} defines a Delta value.

Values that deviate from the input value by this "Delta value" can be defined as the condition for generating an interrupt signal. → „6421_{hex} Analog input interrupt trigger selection“, page 8-11.

Table 103: Object 6426_{hex}

Feature	Description/ Value
Name	Analog Input Interrupt Delta Unsigned
Object code	ARRAY
PDO mapping	No
Sub-index	00_{hex}
Data type	Unsigned8
Access	ro
Default value, BL××	No
Sub-index	01_{hex} bis $8E_{hex}$
Data type	Unsigned32
Access	rw
Default value, BL××	00000000_{hex}

8.2.9 Object 6427_{hex} – Analog Input Interrupt Negative Delta Unsigned

The object 6427_{hex} defines a Delta value.

Values with a **negative** deviation of the input value by more than this "Delta value" can be defined as the condition for generating an interrupt signal.

→ „6421_{hex} Analog input interrupt trigger selection“, page 8-11.

Table 104: Object 6427_{hex}

Feature	Description/ Value
Name	Analog Input Interrupt Negative Delta Unsigned
Object code	ARRAY
PDO mapping	No
Sub-index	00_{hex}
Data type	Unsigned8
Access	ro
Default value, BL××	No
Sub-index	01_{hex} bis $8E_{hex}$
Data type	Unsigned32
Access	rw
Default value, BL××	$0000\ 0000_{hex}$

8.2.10 Object 6428_{hex} – Analog Input Interrupt Positive Delta Unsigned

The object 6428_{hex} defines a Delta value.

Values with a **positive** deviation of the input value by more than this "Delta value" can be defined as the condition for generating an interrupt signal.

→ „6421_{hex} Analog input interrupt trigger selection“, page 8-11.

Table 105: Object 6428_{hex}

Feature	Description/ Value
Name	Analog Input Interrupt Positive Delta Unsigned
Object code	ARRAY
PDO mapping	No
Sub-index	00_{hex}
Data type	Unsigned8
Access	ro
Default value, BL××	No
Sub-index	01_{hex} bis $8E_{hex}$

Table 105: Object 6428$_{hex}$

Feature	Description/ Value
Data type	Unsigned32
Access	rw
Default value, BL××	00000000$_{hex}$

9 Objects for analog output modules

9.1 Analog output modules BL××

The objects are used in the following modules:

Table 106: BL×× - analog output modules

Product family	Module
BL20	BL20-×AO-I(0/4...20MA)
	BL20-2AO-U(-10/0...+10VDC)
	BL20-E-4AO-U/I
	BL20-2AOH-I
BL67	BL67-2AO-I
	BL67-2AO-V
	BL67-4AO-V
BLC	miscellaneous

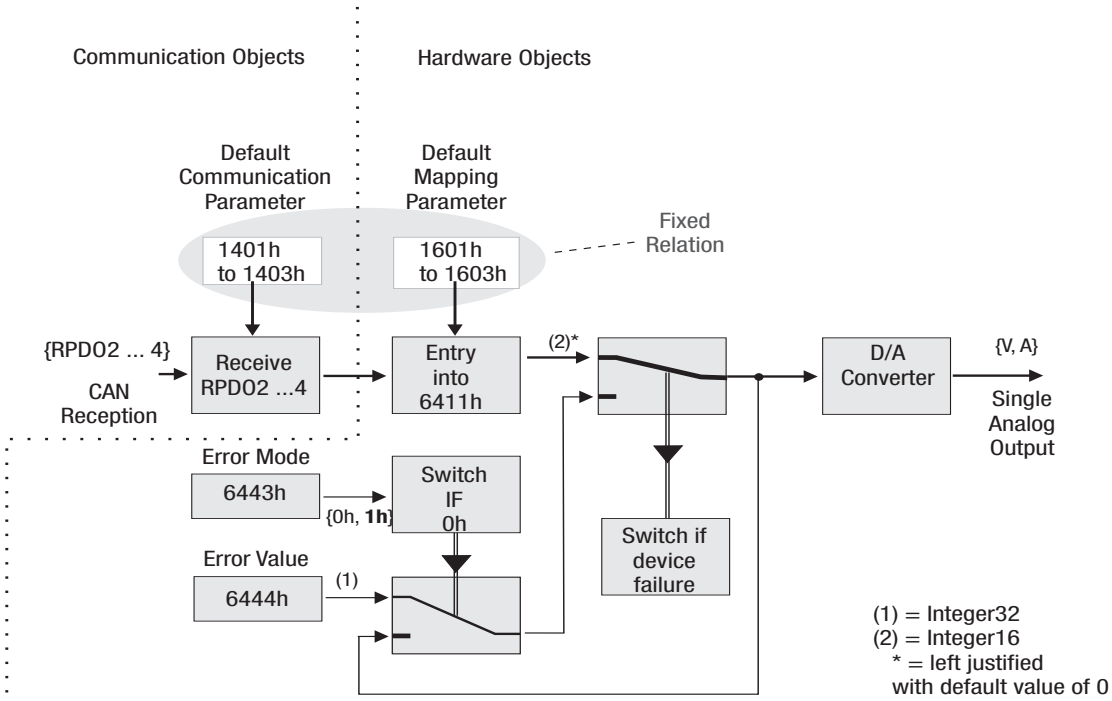
9.2 General object overview for analog output modules

Table 107: General object overview for analog output modules

Object	Name	page
5440_{i}	Manu Spec Analog Output Range	page 9-4
6411_{hex}	Write Analog Output 16 Bit	page 9-6
6443_{hex}	Analog Output Error Mode	page 9-6
6444_{hex}	Analog Output Error State	page 9-8

The following figure shows the relationship between the analog output objects for an 16-bit access:

Figure8: Relationship between the objects for analog output modules (according to CiA Draft Standard 401)



9.2.1 Object 5440_{hex} – Manu Spec Analog Output Range

The object defines the parameters of the analog output channels. Write accesses initiate a parameter update via the internal BL××-module bus.

The parameter is stored as a non-volatile parameter in the gateway and is restored with every node reset.

The Sub-indices 01_{hex} – $8E_{hex}$ define the parameters for the analog output channels 1 to 142.

Table 108: Object 5440_{hex}

Feature	Description/ Value
Name	Manu Spec Analog Output Range
Object code	ARRAY
PDO mapping	No
Sub-index	00_{hex}
Data type	Unsigned8
Access	ro
Default value, BL××	No
Sub-index	01_{hex} – $8E_{hex}$
Data type	Unsigned16
Access	rw
Default value, BL××	No

The structure of the 2 bytes of parameter data depends on the module concerned.

A sub-index is assigned for each channel. The following explains the structure for each module type.

Analog output modules, current

Table 109: Parameter, analog Analog output modules, current

A*Default-setting*

Byte	Bit	Parameters	Value/ meaning
n	0	Current mode	0 = 0...20 mA **A** 1 = 4...20 mA
	1	Value representation	0 = Integer (15 bit + sign) **A** 1 = reserved
	3	Channel x	0 = activate **A** 1 = deactivate
n +1 and n + 2		substitute value A1	The substitute value will be transmitted if the respective parameters of the gateway have been set to "output substitute value".

Analog output modules, voltage

Table 110: Parameters, analog output modules, voltage

A*Default-setting*

Byte	Bit	Parameters	Value/ meaning
n	0	Current mode	0 = 0...10 V **A** 1 = -10...10 V
	1	Value representation	0 = Integer (15 bit + sign) **A** 1 = reserved
	3	Channel x	0 = activate **A** 1 = deactivate
n +1 and n + 2		substitute value A1	The substitute value will be transmitted if the respective parameters of the gateway have been set to "output substitute value".

analog output modules, current/ voltage

Table 111: Parameters, analog output modules, current/ voltage

A*Default-setting*

Byte	Bit	Parameters	Value/ meaning
n	0 - 3	voltage	0000 = -10...10 V DC Std **A** 0001 = 0...10 V DC Std 0010 = -10...10 V DC PA (NE 43) 0011 = 0...10 V DC PA (NE 43) 0100 = -10...10 V DC Ext. range 0101 = 0...10 V DC Ext. range
		current	1000 = 0 ... 20 mA Std **A** 1001 = 4 ... 20 mA Std 1010 = 0 ... 20 mA PA (NE 43) 1011 = 4 ... 20 mA PA (NE 43) 1100 = 0 ... 20 mA Ext. range 1101 = 4 ... 20 mA Ext. range
		deactivate	1111
	4	Value representation	0 = Integer (15 bit + sign) **A** 1 = 12 bit (left-justified)
	5	Diagnostics	0 = release **A** 1 = block
	6+7	Behavior on module bus error Ax	00 = output substitute value 01 = hold current value
n + 1		Substitute value A x / LOW Byte	
n + 2		Substitute value A x / HIGH Byte	

9.2.2 Object 6411_{hex} – Write Analog Output 16 Bit

The object represents the values for the analog output modules with 16 bits for each channel.

Table 112: Object 6411_{hex}

Feature	Description/ Value
Name	Write Analog Output 16 Bit
Object code	ARRAY
PDO mapping	Yes
Sub-index	00_{hex}
Data type	Unsigned8
Access	ro
Default value, BL××	No
Sub-index	01_{hex} to $8E_{hex}$
Data type	Integer16
Access	rw
Default value, BL××	00_{hex}

9.2.3 Object 6443_{hex} - Analog Output Error Mode

It defines (for each digital output channel) whether or not the output should take on a substitute value in the event of an error. The Sub-indices 01_{hex} – $8E_{hex}$ define the parameters for the analog output channels 1 to 142.

The following applies:

00_{hex} The output maintains its value if an error occurs.

$_{hex}$The output is set to the substitute value if an error occurs.

The substitute values for the analog output channels are defined by the Analog Output Error State object (6444_{hex}).

Table 113: Object 6443_{hex}

Feature	**Description/ Value**
Name	Analog Output Error Mode
Object code	ARRAY
PDO mapping	No
Sub-index	00_{hex}
Data type	Unsigned8
Access	ro
Default value, BL××	No
Sub-index	01_{hex} to $8E_{hex}$
Data type	Unsigned16
Access	rw
Default value, BL××	00_{hex}

9.2.4 Object 6444_{hex} – Analog Output Error State

A substitute value is assigned to each analog channel. The substitute values will only be sent in case of an error, object Analog Output Error Mode (6443_{hex}) is set to "01_{hex}".

The Sub-indices 01_{hex} to $8E_{hex}$ define the parameters for the analog output channels 1 to 142.

Table 114: Object 6444_{hex}

Feature	**Description/ Value**
Name	Analog Output Error State
Object code	ARRAY
PDO mapping	No
Sub-index	00_{hex}
Data type	Unsigned8
Access	ro
Default value, BL××	No
Sub-index	01_{hex} to $8E_{hex}$
Data type	Unsigned16
Access	rw
Default value, BL××	0000 0000_{hex}

10 Objects for RS232/RS4xx modules

10.1 RS××× modules BL××

The objects are used in the following modules:

Table 115: BL×× - RS××× modules

Product family	Module
BL20	BL20-1RS232
	BL20-1RS485/422
BL67	BL67-1RS232
	BL67-1RS485/422
BLC	miscellaneous

10.2 Allgemeine Objektübersicht für RS232/RS4××-Module

Table 116: General object overview for RS232/RS4×× modules

Object	Name	page
5600_{hex}	RS232/RS4xx parameters	page 10-2
5601_{hex}	RS232/RS4xx RxD	page 10-4
5602_{hex}	RS232/RS4xx TxD	page 10-7

10.2.1 Object 5600_{hex} – RS232/RS4xx Parameters

The parameter setting of the BL20-1RS××× module enables communication with different data terminal devices. The handshake procedure (software/hardware) can be selected. The number of data bits embedded in the telegram, the type of parity, the number of stop bits, the bit transmission rate and the XON/XOFF character used must be configured in the module with the appropriate parameters in order to adapt it to the data format of the data terminal device.

4 bytes are used for the module parameters.

Table 117: Object 5600_{hex}

Feature	Description
Name	RS232/RS4xx parameters
Object code	ARRAY
Data type	Unsigned32
Access	rw
Default value	No
PDO mapping	No

	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Byte 0	Disable Diagnostics	Disable Reduced Control	X	Select RS485	Bit Rate			
Byte 1	X	X	Flow Control		Data	Parity		Stop
Byte 2	XONChar							
Byte 3	XOFFChar							

Table 118: Parameters BL××-1RS×××

A*Default-setting*

Parameters	Value/ meaning
DisableDiagnostics (Diagnostics)	0 = Diagnostics activated
	1 = Diagnostics deactivated This controls the separate field bus-specific diagnostics signal - not the diagnostics signal embedded in the process input data (object 5601_{hex}).
DisableReducedCtrl	The diagnostics messages are not part of the process input data (object 5601_{hex}). Bytes1 to 7 can therefore be used for the user data.
	1 = The diagnostics messages are contained in byte 1 of the object 5601_{hex} (irrespective of "DisableDiagnostics"). Byte 0 contains the status and control byte. Bytes 2 to 7 are available for the user data. The structure of the object 5602_{hex} is also changed by this setting. At the location of the first data byte, byte 1 of the object 5602_{hex} contains a byte with two control bits. These can initiate a clearing of the receive and transmit buffer.
BitRate Data rate	0000 = reserved 0001 = 300 bps 0010 = 600 bps 0011 = 1200 bps 0100 = 2400 bps 0101 = 4800 bps 0110 = 9600 bps **A** 0111 = 14400 bps 1000 = 19200 bps 1001 = 28800 bps 1010 = 38400 bps 1011 = 57600 bps 1100 = 115200 bps 1101 = reserved 1110 = reserved 1111 = reserved

FlowControl	00 = none **A** 01 = XON/XOFF 10 = RTS/CTS 11 = reserved
Data bits	0 = 7 **A** 1 = 8
Parity	00 = none 01 = odd (The parity bit is set so that the number of bits set to 1 (data and parity bit together) is odd.) **A** 10 = even (The parity bit is set so that the number of bits set to 1 (data and parity bit together) is even.)
Stop bits	0 = 1 1 = 2 **A**
XONChar	0 to 255 XON character (17 **A**) This character is used to start the data transfer of the data terminal device with software handshake activated.
XOFFChar	0 to 255 XOFF character (19 **A**) This character is used to stop the data transfer of the data terminal device with software handshake activated.

10.2.2 Object 5601_{hex} – RS232/RS4xx RxD

Process input data is data that is transmitted from the connected field device via the BL20-1RS××× module to the communication partner (e.g. PLC). The data received from the device by the BL20-1RS××× module is entered in a 128 byte receive buffer and then transferred in segments to the communication partner via the module bus and the gateway.

The transmission is realized in a 8-byte format which is structured as follows:

- 6 bytes or 7 bytes are used to contain the user data.
- 1 byte contains the diagnostics data depending on the parameter setting.
- 1 status byte is required to ensure trouble-free transmission of the data.

Table 119: Object 5601_{hex}

Feature	**Description**
Name	RS232/RS4xx RxD
Object code	ARRAY
Data type	Unsigned64
Access	ro
Default value	No
PDO mapping	Yes

Structure of the data bytes with DisableReducedControl = 1 (in object 5600_{hex}):

	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Byte 0 (Status)	STAT	TX_CNT_ACK		RX_CNT		RX_BYTE_CNT		
Byte 1 (Diag.)	BufOfl	Frame Err	HndShErr	Hw_ Failure	PrmErr	X	X	X
Byte 2	data byte 0							
...	...							
Byte 7	data byte 5							

Structure of the data bytes with DisableReducedControl = 0 (in object 5600_{hex}):

	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Byte 0 (Status)	STAT	TX_CNT_ACK		RX_CNT		RX_BYTE_CNT		
Byte 1	data byte 0							
...	...							
Byte 7	data byte 6							

Table 120: Meaning of the data bits

Designation	Value	Description
STAT	0-1	1 The communication with the data terminal equipment (DTE) is error free 0 The communication with the data terminal equipment (DTE) is disturbed. A diagnosis 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 (Object 5602_{hex}).
TX_CNT_ACK	0-3	The value TX_CNT_ACK is a copy of the value TX_CNT. The value TX_CNT was transferred together with the last data segment of the process output data. The value TX_CNT_ACK is a confirmation of successful acceptance of the data segment using TX_CNT.
RX_CNT	0-3	This value is transferred together with every data segment. The RX_CNT values are sequential: 00->01->10->11->00... (decimal: 0->1->2->3->0...) Errors in this sequence show the loss of data segments.
RX_BYTE_CNT	0-7	Number of the valid bytes in this data segment.

Table 120: Meaning of the data bits

Designation	Value	Description
BufOvfl	Bit 7	0 = ok
		1 = buffer overflow Overflow of the receive-buffer (RX-buffer).
FrameErr	Bit 6	0 = ok
		1 = frame error The module has to be parameterized for adaptation to the data structure of the data terminal equipment (DTE). A frame error occurs in case of inconsequent parameterization (number of data bits, stop bits, method of parity,...).
HndShErr	Bit 5	0 = ok
		11 = Data flow control error The DTE connected t the module does not react to XOFF or RTS handshake. The internal receive-buffer may overflow (buffer-overflow = 1).
HwFailure	Bit 4	0 = ok
		1 = Hardware failure The module has to be replaced (e.g. error in EEPROM or UART).
PrmErr	Bit 3	0 = ok
		1 = Parameterization error The parameter settings can not be supported.

10.2.3 Object 5602_{hex} – RS232/RS4xx TxD

Process output data are data which are sent from the PLC via the gateway and the RS×××-module to a connected field device.

The data received from the PLC are loaded into the 64-bit transmit-buffer in the RS×××-module.

The transmission is realized in a 8-byte format which is structured as follows:

- 6 bytes or 7 bytes are used to contain the user data.
- If parameterized, 1 byte contains, signals to start the flushing of transmit- and receive buffer.
- 1 control byte is required to ensure trouble-free transmission of the data.

Table 121: Object 5602_{hex}

Feature	Description
Name	RS232/RS4xx TxD
Object code	ARRAY
Data type	Unsigned64
Access	rw
Default value	No
PDO mapping	Yes

Structure of the data bytes with DisableReducedControl = 1 (in object 5600_{hex}):

	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Byte 0 (Status)	STAT RES	RX_CNT_ACK		TX_CNT		TX_BYTE_CNT		
Byte 1 (Diag.)	reserved						RXBUF FLUSH	TXBUF FLUSH
Byte 2	data byte 0							
...	...							
Byte 7	data byte 5							

Structure of the data bytes with DisableReducedControl = 0 (in object 5600_{hex}):

	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Byte 0 (Status)	STAT RES	RX_CNT_ACK		TX_CNT		TX_BYTE_CNT		
Byte 1	data byte 0							
...	...							
Byte 7	data byte 6							

Table 122: Meaning of the data bits

Designation	Value	Description
STATRES	0-1	The STATRES bit is used for resetting the STAT bit of the process input data (object 5601_{hex}). The STAT bit is reset (from 0 to 1) with the transition from 1 to 0 (falling edge). If this bit is 0, all changes in the data fields TX_BYTE_CNT, TX_CNT and RX_CNT_ACK are ignored. The clearing of the receive and transmit buffer by RXBUF FLUSH/TXBUF FLUSH is possible. The value 1 or the transition from 0 to 1 disables the clearing of the receive and transmit buffer by the RXBUF FLUSH/TXBUF FLUSH.
RX_CNT_ACK	0-3	The value RX_CNT_ACK is a copy of the value RX_CNT. The value RX_CNT was transferred together with the last data segment of the process input data (Object 5601_{hex}). The value RX_CNT_ACK is a confirmation of successful acceptance of the data segment using RX_CNT.
TX_CNT	0-3	The value TX_CNT is transferred together with every data segment of the process output data. The TX_CNT values are sequential: 00->01->10->11->00... (decimal: 0->1->2->3->0...) Errors in this sequence show the loss of data segments.
TX_BYTE_CNT	0-7	Number of the valid bytes in this data segment.
RXBUF FLUSH	0-1	The RXBUF FLUSH bit is used for clearing the receive buffer. If STATRES = 1: A request with RXBUF FLUSH = 1 will be ignored. If STATRES = 0: RXBUF FLUSH = 1 will clear the receive buffer.
TXBUF FLUSH	0-1	The TXBUF FLUSH bit is used for clearing the transmit buffer. If STATRES = 1: A request with TXBUF FLUSH = 1 will be ignored. If STATRES = 0: TXBUF FLUSH = 1 will clear the receive buffer.

11 Objects for Encoder modules (SSI, CNT)

11.1 Encoder module BL××

The objects are used in the following modules:

Table 123: BL×× -Encoder modules

Product family	Module
BL20	BL20-1CNT-24VDC
	BL20-1SSI
	BL20-E-2CNT-2PWM
BL67	BL67-1SSI
	BL67-1CNT/ENC
BLC	miscellaneous

11.2 General object overview for encoder modules

Table 124: General object overview for encoder modules

Object	Name	Page
5800_{hex}	Encoder Basic Mode	Seite 11-6
5801_{hex}	Encoder Config	Seite 11-7
5802_{hex}	Encoder Status	Seite 11-11
5803_{hex}	Encoder Flags	Seite 11-13
5804_{hex}	Encoder Diag	Seite 11-14
5805_{hex}	SSI Native Status	Seite 11-16
5806_{hex}	SSI Optional Encoder status	Seite 11-18
5808_{hex}	Encoder Control	Seite 11-19
5810_{hex}	Encoder Load Prepare	page 11-19
5811_{hex}	Encoder Pulse Width	page 11-22
5820_{hex}	Measuring Integration Time	page 11-23
5821_{hex}	Measuring Low Limit	page 11-24
5822_{hex}	Measuring High Limit	page 11-24
5823_{hex}	Measuring Units Per Revolution	page 11-25
5824_{hex}	Measuring Divisor	page 11-26
5825_{hex}	Measuring Factor	page 11-26
5827_{hex}	Measuring Timeout	page 11-27
5830_{hex}	Measuring Value	page 11-28

5831_{hex}	Encoder Latch Value	page 11-28
5840_{hex}	Diag Mapping	page 11-29
5901_{hex}	PWM Config	page 11-30
5902_{hex}	PWM Status	page 11-33
5903_{hex}	PWM Flags	page 11-34
5904_{hex}	PWM Diag	page 11-35
5908_{hex}	PWM Control	page 11-36
5910_{hex}	PWM Load Prepare	page 11-38
5913_{hex}	PWM Duty Cycle	page 11-38
5920_{hex}	PWM Period Duration	page 11-39
5931_{hex}	PWM Latch Value	page 11-39
6800_{hex}	Operating Parameters	Seite 11-40
6810_{hex}	Preset Value for Multi-Sensor Devices	Seite 11-40
6820_{hex}	Position Value	Seite 11-41
$6B00_{hex}$	CAN State Register	Seite 11-42
$6B00_{hex}$	CAM Enable Register	Seite 11-44
$6B00_{hex}$	CAM Polarity Register	Seite 11-45
$6B10_{hex}$	CAM Low Limit	Seite 11-46
$6B20_{hex}$	CAM High Limit	Seite 11-47
$6B30_{hex}$	CAM1 Hysteresis	Seite 11-48
$6C00_{hex}$	Area State Register	Seite 11-49
$6C01_{hex}$	Work Area Low Limit	Seite 11-50
$6C02_{hex}$	Work Area High Limit	Seite 11-51
$6D00_{hex}$	Operating Status	Seite 11-52
$6D01_{hex}$	SingleTurn Resolution (rotary), Measuring step (linear)	Seite 11-52
$6D02_{hex}$	Number of Distinguishable Revolutions	Seite 11-52
$6FFF_{hex}$	Device Type	Seite 11-52

11.2.1 Object 5800_{hex} – Encoder Basic Mode

The object 5800_{hex} affects parts of the module parameters:

Write accesses initiate a parameter update via the internal module bus. The parameter is stored as a non-volatile parameter in the gateway and is restored with every node reset.

This object is used in the following modules. In all other encoder modules, this objects can only be found for compatibility reasons.

- BL20-1CNT-24VDC
- BL67-1CNT/ENC

Table 125: Object 5800_{hex}

Feature	Description
Name	Encoder Basic Mode
Object code	ARRAY
PDO mapping	No
Sub-index	00_{hex}
Data type	Unsigned8
Access	ro
Default value, BL××	No
Sub-index	01_{hex} - 47_{hex}
Data type	Unsigned32
Access	rw
Default value, BL××	No

BL20-1CNT-24VDC

The object 5800_{hex} affects the operation mode parameters of the BL20 counter module. It serves amongst others for setting the count operation or the measurement operation mode.

Structure of the data bytes for the count operation:

	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Byte 0	reserved		Counter mode					
Byte 1	reserved	Main count direction		Synchroni-zation	Function DI		Digital input DI	Gate func-tion
Byte 2	reserved							
Byte 3	reserved							

X = reserved

Note

Please find a detailed description of the parameters in the table Meaning of the parameter bits of BL20-1CNT-24VDC (page 11-69).

Structure of the data bits in the measurement mode:

	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Byte 0	reserved		Measurement mode					
Byte 1	reserved				Function DI		Digital input DI	reserved
Byte 2	reserved							
Byte 3	reserved							

Note

Please find a detailed description of the parameters in the table Meaning of the parameter bits of BL20-1CNT-24VDC (page 11-69).

BL67-1CNT/ENC

For this module, this object describes **parameter byte 14**.

Byte 14 of the modules' parameter data serves for defining the number of the register from the register interface (REG_PARA; REG_COUNTER_VALUE, REG_LOWER_LIMIT etc. see D300529) whose content has to be mapped into the process input data of the module.

The default value for the module BL67-1CNT/ENC is 32 (register-no. 32 „REG_COUNTER_VALUE“).

11.2.2 Object 5801_{hex} – Encoder Config

The object takes effect on parts of the respective module parameters and serves for configuration setting. Write accesses initiate a parameter update via the internal module bus. The parameter is stored as a non-volatile parameter in the gateway and is restored with every node reset.

This object is used in the following modules. In all other encoder modules, this objects can only be found for compatibility reasons.

- BLxx-1SSI
- BL20-1CNT-24VDC

- BL20-E-2CNT-2PWM
- BL67-1CNT/ENC

Table 126: Object 5801$_{hex}$

Feature	Description
Name	Encoder Config
Object code	ARRAY
Data type	Unsigned32
Access	rw
Default value	No
PDO mapping	No

BLxx-1SSI

The Object Encoder Config takes effect on parameter bytes 0 ... 3 of the BL20-SSI module.

Structure of the data bytes 0 to 3 for the SSI-module:

	Bit 7	**Bit 6**	**Bit 5**	**Bit 4**	**Bit 3**	**Bit 2**	**Bit 1**	**Bit 0**
Byte 0 (Status)	reserved		DIS_ERR_ SSI	reserved				
Byte 1		INVALID_BITS_MSB			INVALID_BITS_LSB			
Byte 2	reserved				SSI_BIT_RATE			
Byte 3	SSI_CODE_ G/D	reserved	SSI_FRAME_LENGTH					

Note

Please find a detailed description of the parameters in the table Meaning of the parameter bits of BLxx-1SSI (page 11-68).

BL20-1CNT-24VDC

The Object Encoder Config takes effect on parameter bytes 12 ... 15 of the counter module.

Count operation:

	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Byte 0	Function Do2			Function DO1			diagnostic DO1	substitute value DO1
Byte 1	direction input (B)	sensor (A)		sensor/ input filter (DI)	sensor/ input filter (BI)	sensor/ input filter (A)	signal evaluation (A B)	
Byte 2	reserved		behavior CPU/ master stop		reserved			Common diagnostics
Byte 3	reserved							

Note

Please find a detailed description of the parameters in the table Meaning of the parameter bits of BL20-1CNT-24VDC (page 11-69).

Structure of the data bytes for the measurement operation:

	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Byte 0				Function DO1			diagnostic DO1	substitute value DO1
Byte 1	direction input (B)	sensor (A)		sensor/ input filter (DI)	sensor/ input filter (BI)	sensor/ input filter (A)	signal evaluation (A B)	
Byte 2	reserved		behavior CPU/ master stop		reserved			Common diagnostics
Byte 3	reserved							

Note

Please find a detailed description of the parameters in the table Meaning of the parameter bits of BL20-1CNT-24VDC (page 11-69).

BL20-E-2CNT-2PWM

Object Encoder Config takes effect on parameter bytes 0...2 and 10 (channel 1), or respectively 3...5 and 12 (channel 2) of the BL20-E-2CNT-2PWM.

Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	input A1	input B1	input Z1	res.	diag-nostic CNT1	measure-ment mode CNT1	main count direction CNT1	
1	filter Z1		filter A1, B1		res.	pull up Z1	res.	threshold input A,B,Z CNT1
2	mode Z1				mode CNT1			
3	input A2	input B2	input Z2	res.	diagnostic	measure-ment mode CNT2	main count direction CNT2	
4	filter Z2		filter A2, B2		res.	pull up Z2	res.	threshold input A,B,Z CNT2
5	mode Z2				mode CNT2			
...	Object 5901							
10	res.	ADR AUX REG1 RD DATA						
...	Object 5901							
12	res.	ADR AUX REG3 RD DATA						
...	Object 5901							

Note

Please find a detailed description of the parameters in the table Meaning of the parameter bits of BL20-E-2CNT-2PWM (page 11-72).

BL67-1CNT/ENC

The Object Encoder Config has effect on parameter bytes 0 ... 0.3 of the BL67-1CNT/ENC module.

Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	input A	input B	reserved	count direction	Signal evaluation		input filter (A B)	
1	input Z	reserved	Sync. with Z	reserved	Encoder signal	Function DO3	Function DI3	PullUp Z
2	threshold input A, B and Z							
3	reserved		Measure-ment mode	Counter mode	Gate	Gate function		
...								

input = input

Sync. = synchronization

Note

Please find a detailed description of the parameters in table Meaning of the parameter bits of BL67-1CNT/ENC (page 11-74).

11.2.3 Object 5802_{hex} – Encoder Status

The object Encoder Status displays the status of the modules' count direction.

This object is used in the following modules. In all other encoder modules, this objects can only be found for compatibility reasons.

- BLxx-1SSI
- BL20-1CNT-24VDC
- BL20-E-2CNT-2PWM
- BL67-1CNT/ENC

Table 127: Object 5802_{hex}

Feature	Description
Name	Encoder Status
Object code	ARRAY
Data type	Unsigned8
Access	ro
Default value	No
PDO mapping	Yes

BLxx-1SSI

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
STS_DNS	STS_UP	reserved					

Note

Please find a detailed description of the status bits in the process input in table Meaning of the process input bits of BL××-1SSI (page 11-59).

BL20-1CNT-24VDC

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
STS_DN	STS_UP	reserved	STS_DO2	STS_DO1	reserved	STS_DI	STS_ GATE

Note

Please find a detailed description of the status bits in the process input in table Meaning of the process input bits of BL20-1CNT-24VDC (page 11-61).

BL20-E-2CNT-2PWM

The object 5802_{hex} supplies the following status messages:

- count direction
- status of in- and outputs
- operation status of the counter

Structure of the data bytes

Sub-index 0×00 ≤ **n** ≥ 0×47	Bit 7 (msb)	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0 (lsb)
n = CNT1	STS_CNT1_ DN	STS_CNT1_ UP	STS_CNT1 _SFKT_EN	STS_DBP1	D1	STS_CNT1 _GENERAL _EN	Z1	STS_CNT1 _RUN
n + 1 = CNT2	STS_CNT2_ DN	STS_CNT2_ UP	STS_CNT2 _SFKT_EN	STS_DBP2	D2	STS_CNT2 _GENERAL _EN	Z2	STS_CNT2 _RUN

Note

Please find a detailed description of the status bits in the process input in table Meaning of the process input bits of BL20-E-2CNT-2PWM (page 11-63).

BL67-1CNT/ENC

Bits 6 and 7 of the object Encoder Status describe the up/down direction of the current values.

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
STS_DNS	STS_UP	reserved					

Note

Please find a detailed description of the status bits in the process input in table Meaning of the process input bits of BL67-1CNT/ENC (page 11-66).

11.2.4 Object 5803_{hex} – Encoder Flags

The object contains volatile status messages as well as module flags.

This object is used in the following modules. In all other encoder modules, this objects can only be found for compatibility reasons.

- BL××-1SSI
- BL20-1CNT-24VDC
- BL20-E-2CNT-2PWM
- BL67-1CNT/ENC

Table 128: Object 5803_{hex}

Feature	Description
Name	Encoder Flags
Object code	ARRAY
Data type	Unsigned8
Access	rw
Default value	No
PDO mapping	Yes

BL××-1SSI

The bits STS_OFLW and STS_UFLW are volatile status bits for the SSI module.

Writing the object with any value will reset the markers FLAG_CMP1 and FLAG_CMP2.

Exception:

if the relevant condition for setting a marker is still fulfilled, this marker will continue to remain set.

Structure of the data byte

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
reserved	STS_ UFLW	STS_ OFLW	FLAG_ CMP2	FLAG_ CMP1	reserved		

Note

Please find a detailed description of the status bits in the process input in table Meaning of the process input bits of BL××-1SSI (page 11-59).

BL20-1CNT-24VDC

The object reads byte 6 of the check-back interface of the counter module.

This byte sends the stored status of some module flags.

The flags are reset by writing this object with any value.

Exception:

if the relevant condition for setting a marker is still fulfilled, this marker will continue to remain set.

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
STS_ND	STS_ UFLW	STS_ OFLW	STS_ CMP2	STS_ CMP1	reserved		STS_SYN

Note

Please find a detailed description of the status bits in the process input in table Meaning of the process input bits of BL20-1CNT-24VDC (page 11-61).

BL20-E-2CNT-2PWM

Sub-index 0×00 ≤ **n** ≥ 0×47	Bit 7 (msb)	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0 (lsb)
n = CNT1	MSG_ CNT1_ND	MSG_ CNT1_ UFLW	MSG_ CNT1_ OFLW	MSG_ CNT1_ CMP1	MSG_ CNT1_ CMP0	MSG_ CNT1_SW_ LR	MSG_ CNT1_ SFKT	MSG_ CNT1_ FQE
n + 1 = CNT2	MSG_ CNT2_ND	MSG_ CNT2_ UFLW	MSG_ CNT2_ OFLW	MSG_ CNT2_ CMP1	MSG_ CNT2_ CMP0	MSG_ CNT2_SW_ LR	MSG_ CNT2_ SFKT	MSG_ CNT2_ FQE

Note

Please find a detailed description of the status bits in the process input in table Meaning of the process input bits of BL20-E-2CNT-2PWM (page 11-63).

BL67-1CNT/ENC

The flags are reset by writing this object with any value.

Exception:

if the relevant condition for setting a marker is still fulfilled, this marker will continue to remain set.

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
STS_ZC	STS_ UFLW	STS_ OFLW	reserved				

Note

Please find a detailed description of the status bits in the process input in table Meaning of the process input bits of BL67-1CNT/ENC (page 11-66).

11.2.5 Objekt 5804_{hex} – Encoder Diag

This object reads the diagnostic byte of the encoder module.

This object is used in the following modules. In all other encoder modules, this objects can only be found for compatibility reasons.

- BL××-1SSI
- BL20-1CNT-24VDC
- BL20-E-2CNT-2PWM

- BL67-1CNT/ENC

Table 129: Object 5804$_{hex}$

Feature	Description
Name	Encoder Diag
Object code	ARRAY
Data type	Unsigned8
Access	ro
Default value	No
PDO mapping	No

BLxx-1SSI

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
reserved			ERR_ PARA	STS_ UFLW	STS_ OFLW	ERR_ SSI	SSI_ DIAG

Note

Please find a detailed description of the status bits in the process input in table Meaning of the diagnostic bits of BLxx-1SSI (page 11-77).

BL20-1CNT-24VDC

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
MEAS._ MODE	OPER._ MODE	ERR_PARA				ERR_ 24Vdc	ERR_DO

Note

Please find a detailed description of the status bits in the process input in table Meaning of the diagnostic bits of BL20-1CNT-24VDC (page 11-77).

BL20-E-2CNT-2PWM

Sub-index 0×00 ≤ **n** ≥ 0×47	Bit 7 (msb)	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0 (lsb)
n = CNT1	HW_ERR	CNT1_ PAR_ERR	CNT1_ERR _UFLW	CNT1_ERR _OFLW	reserved			
n + 1 = CNT2	HW_ERR	CNT2_ PAR_ERR	CNT2_ERR _UFLW	CNT2_ERR _OFLW	reserved			

Note

Please find a detailed description of the status bits in the process input in table Meaning of the diagnostic bits of BL20-E-2CNT-2PWM (page 11-79).

BL67-1CNT/ENC

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
ERR_ PARA	reserved	DIA_DO3	DIA_DO2	DIA_DO1	DIA_DO0	STS_ OFLW	STS_ UFLW

Note

Please find a detailed description of the status bits in the process input in table Meaning of the diagnostic bits of BL67-1CNT/ENC (page 11-79).

11.2.6 Object 5805_{hex} – Encoder Native Status

The object Encoder Native Status reads bytes 0 to 1 the the module's process input data.

This object is used in the following modules. In all other encoder modules, this objects can only be found for compatibility reasons.

- BL××-1SSI
- BL20-E-2CNT-2PWM
- BL67-1CNT/ENC

Table 130: Object 5805_{hex}

Feature	Description
Name	Encoder Native Status
Object code	ARRAY
Data type	Unsigned16
Access	rw
Default value	No
PDO mapping	Yes

BL××-1SSI

Writing the object with any value will reset the non-volatile flags FLAG_CMP1 and FLAG_CMP2.

Exception:

if the relevant condition for setting a marker is still fulfilled, this marker will continue to remain set.

	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Byte 0	STS_ STOP	reserved		ERR_ PARA	STS_ UFLW	STS_ OFLW	ERR_ SSI	SSI_ DIAG
Byte 1	STS_ UP	STS_ DN	REL_ CMP2	FLAG_ CMP2	STS_ CMP2	REL_ CMP1	FLAG_ CMP1	STS_ CMP1

Note

Please find a detailed description of the status bits in the process input in table Meaning of the process input bits of BL××-1SSI (page 11-59).

BL20-E-2CNT-2PWM

The object reads the process input bytes 0 to 1 (channel 1) and 2 to 3 (channel 2) of the module.

Sub-index 0×00 ≤ **n** ≥ 0×47	Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
n = CNT1	0	A1	B1	Z1	STS_CNT1_DIR	STS_CNT1_LOGMSG	STS_CNT1_SFKT_EN	STS_CNT1_RUN	STS_CNT1_GENERAL_EN
	1	MSG_CNT1_SW_LR	MSG_CNT1_SFKT	MSG_CNT1_FQE	MSG_CNT1_ND	MSG_CNT1_OFLW	MSG_CNT1_UFLW	MSG_CNT1_CMP1	MSG_CNT1_CMP0
n + 1 = CNT2	2	A2	B2	Z2	STS_CNT2_DIR	STS_CNT2_LOGMSG	STS_CNT2_SFKT_EN	STS_CNT2_RUN	STS_CNT2_GENERAL_EN
	3	MSG_CNT2_SW_LR	MSG_CNT2_SFKT	MSG_CNT2_FQE	MSG_CNT2_ND	MSG_CNT2_OFLW	MSG_CNT2_UFLW	MSG_CNT2_CMP1	MSG_CNT2_CMP0

Note

Please find a detailed description of the status bits in the process input in table Meaning of the process input bits of BL20-E-2CNT-2PWM (page 11-63).

BL67-1CNT/ENC

The object reads the module's process input bytes 1 and 2.

Writing the object with any value will reset the non-volatile flags STS_ZC, STS_OFLW and STS_UFLW.

Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
1	ERR_PARA	SYNC_AKN	reserved					count direction
2	REG_WR_ACEPT	REG_WR_AKN	reserved			STS_ZC	STS_OFLW	STS_UFLW

Note

Please find a detailed description of the status bits in the process input in table Meaning of the process input bits of BL67-1CNT/ENC (page 11-66).

11.2.7 Object 5806_{hex} – Optional Encoder Status

The object Optional Encoder Status reads different bytes of the module's process input data.

This object is used in the following modules. In all other encoder modules, this objects can only be found for compatibility reasons.

- BL××-1SSI
- BL20-E-2CNT-2PWM
- BL67-1CNT/ENC

Table 131: Object 5806_{hex}

Feature	Description
Name	Optional Encoder Status
Object code	ARRAY
Data type	Unsigned8
Access	ro
Default value	No
PDO mapping	Yes

BL××-1SSI

The object Optional Encoder Status reads byte 2 of the process input data of the BL××-1SS module. Bits 6 and 7 are masked out.

Structure of the data byte

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
masked (0)	masked (0)	reserved		SSI_ STS3	SSI_ STS2	SSI_ STS1	SSI_ STS0

Note

Please find a detailed description of the status bits in the process input in table Meaning of the process input bits of BL××-1SSI (page 11-59).

BL20-E-2CNT-2PWM

The object reads process input byte 6 of the 2CNT-2PWM module. Bits 5 to 7 are masked out.

Sub-index 0×00 ≤ n ≥ 0×47	Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0 (lsb)
n = CNT1	0	reserved						STS_DBP1	D1
n + 1 = CNT2	0	reserved						STS_DBP2	D2

Note

Please find a detailed description of the status bits in the process input in table Meaning of the process input bits of BL20-E-2CNT-2PWM (page 11-63).

BL67-1CNT/ENC

The object reads process input byte 0 of the BL67-1CNT/ENC module.

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
reserved	A	B	Z	DI3	DI2	DI1	DI0

Note

Please find a detailed description of the status bits in the process input in table Meaning of the process input bits of BL67-1CNT/ENC (page 11-66).

11.2.8 Object 5808_{hex} – Encoder Control

Object 5808_{hex} writes and reads the different bytes of the modules' control interface and therefore serves for influencing the module during operation.

This object is used in the following modules. In all other encoder modules, this objects can only be found for compatibility reasons.

- BLxx-1SSI
- BL20-1CNT-24VDC
- BL20-E-2CNT-2PWM
- BL67-1CNT/ENC

Table 132: Object 5808_{hex}

Feature	Description
Name	Encoder Control
Object code	ARRAY
Data type	Unsigned8
Access	rw
Default value	No
PDO mapping	Yes

BLxx-1SSI

The object writes or reads byte 0 of the control interface of the SSI-module.

At the moment, only bit 7 (STOP) is used.

Note

Please find a detailed description of the control bits in the process output in table Meaning of the process output bits of BLxx-1SSI (page 11-53).

BL20-1CNT-24VDC

The object Encoder Control writes or reads byte 4 of the module's control interface.

Count operation

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
reserved	CTRL_ DO2	SET_DO2	CTRL_ DO1	SET_DO1	reserved	CTRL_SY N	SW_GAT E

Measurement mode

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
reserved			CTRL_ DO1	SET_DO1	reserved		SW_GAT E

Note

Please find a detailed description of the control bits in the process output in table Meaning of the process output bits of BL20-1CNT-24VDC (page 11-54).

BL20-E-2CNT-2PWM

The object Encoder Control writes or reads byte 0 (channel 1), or respectively byte 1 (channel 2) of the module's process output data.

	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
n = CNT1	reserved	CNT1_ SINGLE	CNT1_ SW_LR	CNT1_ SFKT_ DISABLE	reserved	CNT1_ LOGMSG	CNT1_ ENABLE	CNT1_ GENERAL _DISABLE
n + 1 = CNT2	reserved	CNT2_ SINGLE	CNT2_ SW_LR	CNT2_ SFKT_ DISABLE	reserved	CNT2_ LOGMSG	CNT2_ ENABLE	CNT2_ GENERAL _DISABLE

Note

Please find a detailed description of the control bits in the process output in table Meaning of the process output bits of BL20-E-2CNT-2PWM (page 11-56).

BL67-1CNT/ENC

The object reads process input byte 0 of the BL67-1CNT/ENC module.

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
DO3	DO2	DO1	DO0	reserved	RES_ STS	SYNC_ REQ	GATE

Note

Please find a detailed description of the control bits in the process output in table Meaning of the process output bits of BL67-1CNT/ENC (page 11-58).

11.2.9 Object 5810_{hex} – Encoder Load Prepare Value

The object Setting the counter's count value to this value is event-driven. This object is used in the following modules. In all other encoder modules, this objects can only be found for compatibility reasons.

- BL20-1CNT-24VDC
- BL20-E-2CNT-2PWM
- BL67-1CNT/ENC

Table 133: Object 5810_{hex}

Feature	Description
Name	Encoder Control
Object code	ARRAY
Data type	Unsigned8
Access	rw
Default value	No
PDO mapping	Yes

BL20-1CNT-24VDC

The object takes effect on the function „Load in preparation LOAD_PREPARE" in the module's control interface.

BL20-E-2CNT-2PWM

The object writes or reads register 23_{hex} (channel 1), or respectively register 43_{hex} (channel 2) of the module's register interface.

BL67-1CNT/ENC

The object writes or reads register $2c_{hex}$ (44) of the module's register interface.

11.2.10 Object 5811_{hex} – Encoder Pulse Width

The object serves for setting the pulse duration.

This object is used in the following modules. In all other encoder modules, this objects can only be found for compatibility reasons.

- BL20-1CNT-24VDC
- BL20-E-2CNT-2PWM

Table 134: Object 5811_{hex}

Feature	Description
Name	Encoder Pulse Width
Object code	ARRAY
Data type	Unsigned16
Access	rw
Default value	No
PDO mapping	No

BL20-1CNT-24VDC

The object takes effect on the module'S parameter byte 11 and serves for setting the pulse duration at DO1 and DO2 in the count operation.

BL20-E-2CNT-2PWM

The object writes or reads register 30_{hex} (channel 1), or respectively register 50_{hex} (channel 2) of the module's register interface.

The time is set in 1ms/ bit.

Value range: 0 ms to 65535 ms (1min 5s).

11.2.11 Object 5820_{hex} – Measuring Integration Time

The object serves for setting the integration time.

This object is used in the following modules. In all other encoder modules, this objects can only be found for compatibility reasons.

- BL20-1CNT-24VDC
- BL20-E-2CNT-2PWM

Table 135: Object 5820_{hex}

Feature	Description
Name	Measuring Integration Time
Object code	ARRAY
Data type	Unsigned 32
Access	rw
Default value	-
PDO mapping	No

BL20-1CNT-24VDC

The object takes effect on parameter byte 8 and 9 and serves for setting the integration time in measurement mode.

Valid values are 1 to 1000.

Note

The object is only valid, if the counter module works in measurement mode.

BL20-E-2CNT-2PWM

The object writes or reads register 29_{hex} (channel 1), or respectively register 49_{hex} (channel 2) of the module's register interface.

For the frequency measurement and the rotation speed measurement, the integration time is entered in 10 ms/ bit.

11.2.12 Object 5821_{hex} – Measuring Low Limit

This object is used to set the module's lower limit in measurement mode.

This object is used in the following modules. In all other encoder modules, this objects can only be found for compatibility reasons.

- BL20-1CNT-24VDC

Table 136: Object 5821_{hex}

Feature	Description
Name	Measuring Low Limit
Object code	ARRAY
Data type	Unsigned 32
Access	rw
Default value	-
PDO mapping	No

BL20-1CNT-24VDC

The object takes effect on parameter byte 2 and 4 and serves for setting the lower limit in measurement mode.

Permissible value range:
0 to 16777214

Note
The object is only valid, if the counter module works in measurement mode.

11.2.13 Object 5822_{hex} – Measuring High Limit

This object is used to set the module's upper limit in measurement mode.

This object is used in the following modules. In all other encoder modules, this objects can only be found for compatibility reasons.

- BL20-1CNT-24VDC

Table 137: Object 5822_{hex}

Feature	Description
Name	Measuring High Limit
Object code	ARRAY
Data type	Unsigned 32
Access	rw
Default value	-
PDO mapping	No

BL20-1CNT-24VDC

The object takes effect on parameter byte 5 and 7 and serves for setting the upper limit in measurement mode.

Permissible value range: 1 to 16777215

Note

The object is only valid, if the counter module works in measurement mode.

11.2.14 Object 5823_{hex} – Measuring Units Per Revolution

Object 5823hex is used to set the sensor pulses per revolution.

This object is used in the following modules. In all other encoder modules, this objects can only be found for compatibility reasons.

- BL20-1CNT-24VDC

Table 138: Object 5823_{hex}

Feature	Description
Name	Measuring Units Per Revolution
Object code	ARRAY
Data type	Unsigned 16
Access	rw
Default value	-
PDO mapping	No

BL20-1CNT-24VDC

The object is used to set the sensor pulses per revolution for the counter module.

Value range: 1 to 65535.

11.2.15 Object 5824_{hex} – Measuring Divisor

The object serves for scaling the measured value.

This object is used in the following modules. In all other encoder modules, this objects can only be found for compatibility reasons.

- BL20-E-2CNT-2PWM
- BL67-1CNT/ENC

Table 139: Object 5824_{hex}

Feature	Description
Name	Measuring Divisor
Object code	ARRAY
Data type	Unsigned32
Access	rw
Default value	-
PDO mapping	No

BL20-E-2CNT-2PWM

The object writes or reads register $2B_{hex}$ (channel 1), or respectively Register $4B_{hex}$ (channel 2) of the module's register interface.

BL67-1CNT/ENC

The object writes or reads register 38_{hex} (56) of the module's register interface.

11.2.16 Object 5825_{hex} – Measuring Factor

The object serves for scaling the measured value.

This object is used in the following modules. In all other encoder modules, this objects can only be found for compatibility reasons.

- BL20-E-2CNT-2PWM
- BL67-1CNT/ENC

Table 140: Object 5825_{hex}

Feature	Description
Name	Measuring Factor
Object code	ARRAY
Data type	Unsigned 32
Access	rw
Default value	-
PDO mapping	No

BL20-E-2CNT-2PWM

The object writes or reads register $2A_{hex}$ (channel 1), or respectively Register $4A_{hex}$ (channel 2) of the module's register interface.

BL67-1CNT/ENC

The object writes or reads register 34_{hex} (52) of the module's register interface.

11.2.17 Object 5827_{hex} – Measuring Timeout

The object defines the time out after which, in period duration measurement, a message is generated. The current period duration measurement is monitored.

This object is used in the following modules. In all other encoder modules, this objects can only be found for compatibility reasons.

- BL20-E-2CNT-2PWM
- BL67-1CNT/ENC

Table 141: Object 5827_{hex}

Feature	Description
Name	Measuring Timeout
Object code	ARRAY
Data type	Unsigned 32
Access	rw
Default value	-
PDO mapping	No

BL20-E-2CNT-2PWM

The object writes or reads register $2D_{hex}$ (channel 1), or respectively Register $4D_{hex}$ (channel 2) of the module's register interface.

BL67-1CNT/ENC

The object writes or reads register $3c_{hex}$ (60) of the module's register interface.

11.2.18 Object 5830_{hex} – Measuring Value

The object reads the measured value.

This object is used in the following modules. In all other encoder modules, this objects can only be found for compatibility reasons.

- BL20-E-2CNT-2PWM
- BL67-1CNT/ENC

Table 142: Object 5830_{hex}

Feature	Description
Name	Measuring Value
Object code	ARRAY
Data type	Unsigned 32
Access	rw
Default value	-
PDO mapping	No

BL20-E-2CNT-2PWM

The object writes or reads register 21_{hex} (channel 1), or respectively register 41_{hex} (channel 2) of the module's register interface.

BL67-1CNT/ENC

The object writes or reads register 30_{hex} (48) of the module's register interface.

11.2.19 Object 5831_{hex} – Encoder Latch Value

The object reads the value of the counters' latch-register.

This object is used in the following modules. In all other encoder modules, this objects can only be found for compatibility reasons.

- BL20-E-2CNT-2PWM

Table 143: Object 5831_{hex}

Feature	Description
Name	Encoder Latch Value
Object code	ARRAY
Data type	Unsigned 32
Access	rw
Default value	-
PDO mapping	No

BL20-E-2CNT-2PWM

The object writes or reads register 28_{hex} (channel 1), or respectively register 48_{hex} (channel 2) of the module's register interface.

11.2.20 Object 5840_{hex} – Diag Mapping

This object is used in the following modules. In all other encoder modules, this objects can only be found for compatibility reasons.

- BLxx-1SSI

BLxx-1SSI

The object writes or reads register 51 (REG_SSI_MASK) of the module.

REG_SSI_MASK contains the SSI encoder diagnostics transferred. Some SSI encoders not only transfer the position value in the data frame that they transfer to the module but also supply additional status messages.

It is advisable to include these status messages in the application in order to analyze the measured value.

Writing the REG_SSI_MASK register allows up to four individual bits to be taken from the SSI encoder data frame and transferred to the SSI_STSx bits of the process input data.

Table 144: Object 5840_{hex}

Feature	**Description**
Name	SSI Diag Mapping
Object code	ARRAY
Data type	Unsigned32
Access	rw
Default value	No
PDO mapping	No

Masking through REG_SSI_MASK:

process input data		**REG_SSI_MASK**							
	Byte	Bit 7	Bit 6	B 5	B 4	B 3	B 2	B 1	B 0
SSI_STS0	0	EN_ D0_RMS0	EN_D0_DS	X	SSI_FRAME_BIT_SEL0				
SSI_STS1	1	EN_ D1_RMS1	EN_D1_DS	X	SSI_FRAME_BIT_SEL1				
SSI_STS2	2	EN_ D2_RMS2	EN_D2_DS	X	SSI_FRAME_BIT_SEL2				
SSI_STS3	3	EN_ D3_RMS3	EN_D3_DS	X	SSI_FRAME_BIT_SEL3				

Table 145: Bit-meaning

A*Default-setting*

Designation	**Value**	**Description**
EN_Dx_RMSx	0 **A**	The mapping of the SSI status messages into the process input data is not activated.
	1	The mapping of the SSI status messages into the process input data is not activated.

Table 145: Bit-meaning

Designation	Value	Description
EN_ Dx_DS	0 **A**	The evaluation of the SSI status messages for bit 0 of the diagnostics is not activated.
	1	The evaluation of the SSI status messages for bit 0 of the diagnostics is activated.
SSI_FRAME_BIT_SEL	0 **A**	Definition of the selected bits in the frame of the SSI encoder Default: 0

The following applies to bit 0 (SSI group diagnostics) of the diagnostics interface and SSI_DIAG of the process input data:

(SSI_STS0 & EN_D0_DS) || (SSI_STS1 & EN_D1_DS) ||
(SSI_STS2 & EN_D2_DS) || (SSI_STS3 & EN_D3_DS)

11.2.21 Object 5901_{hex} – PWM Config

This object is used in the following modules.

- BL20-E-2CNT-2PWM

Table 146: Object 5901$_{hex}$

Feature	Sub-index	Description
Name		PWM Config
Object code		ARRAY
Data type	0×00	Unsigned 8
	0×01 to 0×47	Unsigned 32
Access	0×00	ro
	0×01 to 0×47	rw
Default value	0×00	-
PDO mapping		No

BL20-E-2CNT-2PWM

The object affects the configuration parameters of the PWMx:

Sub-index 0×00 ≤ **n** ≥ 0×47	**Byte**	**Bit 7**	**Bit 6**	**Bit 5**	**Bit 4**	**Bit 3**	**Bit 2**	**Bit 1**	**Bit 0 (lsb)**
n = PWM1	0	diagnostic PWM1	X	mode D1 (0×3F)					
	1	**Bit 15**	**Bit 14**	**Bit 13**	**Bit 12**	**Bit 11**	**Bit 10**	**Bit 9**	**Bit 8**
		DBP1 STS MODE 0×00		substitute value P1 0×00	substitute value D1 0×00	mode PWM1 0×00			
	2	**Bit 23**	**Bit 22**	**Bit 21**	**Bit 20**	**Bit 19**	**Bit 18**	**Bit 17**	**Bit 16**
		X							
	3	**Bit 31 (msb)**	**Bit 30**	**Bit 29**	**Bit 28**	**Bit 27**	**Bit 26**	**Bit 25**	**Bit 24**
		X	ADR AUX REG1 WR DATA (0×60)						

Sub-index 0×00 ≤ **n** ≥ 0×47	**Byte**	**Bit 7**	**Bit 6**	**Bit 5**	**Bit 4**	**Bit 3**	**Bit 2**	**Bit 1**	**Bit 0 (lsb)**
n + 1 = PWM2	0	diagnostic PWM2	X	mode D2 (0×3F)					
	1	**Bit 15**	**Bit 14**	**Bit 13**	**Bit 12**	**Bit 11**	**Bit 10**	**Bit 9**	**Bit 8**
		DBP2 STS MODE 0×00		substitute value P2 (0×00)	substitute value D2 0×00	mode PWM2 0×00			
	2	**Bit 23**	**Bit 22**	**Bit 21**	**Bit 20**	**Bit 19**	**Bit 18**	**Bit 17**	**Bit 16**
		X							
	3	**Bit 31 (msb)**	**Bit 30**	**Bit 29**	**Bit 28**	**Bit 27**	**Bit 26**	**Bit 25**	**Bit 24**
		X	ADR AUX REG3 WR DATA (0×70)						

( ) = default parameterization

Note

Please find a detailed description of the parameters in the table Meaning of the parameter bits of BL20-E-2CNT-2PWM (page 11-72).

11.2.22 Object 5902_{hex} – PWM Status

This object is used in the following modules.

- BL20-E-2CNT-2PWM

BL20-E-2CNT-2PWM

The object supplies the following status messages:

- output status
- operation status of the PWM

Table 147: Object 5902_{hex}

Feature	Sub-index	Description
Name		PWM Status
Object code		ARRAY
PDO mapping		Yes
Data type	0×00	Unsigned 8
	0×01 to 0×47	Unsigned 8
Access	0×00	ro
	0×01 to 0×47	ro
Default value	0×00	-
	0×01 to 0×47	-

Structure of the data byte

Sub-index 0×00 ≤ **n** ≥ 0×47	Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
n = PWM1	0	X	X	STS_ DBP1	D1	STS_ PWM1_ LOGMSG	STS_ PWM1_ SFKT_EN	STS_ PWM1_ RUN	STS_ PWM1_ GENERAL _EN
n + 1 = PWM2	0	X	X	STS_ DBP2	D2	STS_ PWM2_ LOGMSG	STS_ PWM2_ SFKT_EN	STS_ PWM2_ RUN	STS_ PWM2_ GENERAL _EN

Note

Please find a detailed description of the status bits in the process input in table Meaning of the process input bits of BL20-E-2CNT-2PWM (page 11-63).

11.2.23 Object 5903_{hex} – PWM Flags

This object is used in the following modules.

- BL20-E-2CNT-2PWM

BL20-E-2CNT-2PWM

The object supplies the following status messages:

- reaching of limit values
- execution of a SW latch retrigger
- an event defined as special function (SFKT) has occurred
- a time out in the count pulse measurement occurred

Table 148: Object 5903_{hex}

Feature	Sub-index	Description
Name		PWM Flags
Object code		ARRAY
PDO mapping		Yes
Data type	0×00	Unsigned 8
	0×01 to 0×47	Unsigned 8
Access SDO	0×00	ro
	0×01 to 0×47	rw
Access PDO	0×01 to 0×47	r
Default value	0×00	-
	0×01 to 0×47	-

Note

By means of this access, the messages are reset automatically after reading.

Structure of the data byte

Sub-index 0×00 ≤ **n** ≥ 0×47	Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
n = PWM1	0	X	X	X	X	MSG_ PWM1_ DO_ERR	MSG_ PWM1_ SFKT	MSG_ PWM1_ NDDC	MSG_ PWM1_ SW_LR
n + 1 = PWM2	0	X	X	X	X	MSG_ PWM2_ DO_ERR	MSG_ PWM2_ SFKT	MSG_ PWM2_ NDDC	MSG_ PWM2_ SW_LR

Note

Please find a detailed description of the status bits in the process input in table Meaning of the process input bits of BL20-E-2CNT-2PWM (page 11-63).

11.2.24 Object 5904_{hex} – PWM Diag

This object is used in the following modules.

- BL20-E-2CNT-2PWM

BL20-E-2CNT-2PWM

The object reads the module's diagnostic byte.

Table 149: Object 5904_{hex}

Feature	Sub-index	Description
Name		PWM Diag
Object code		ARRAY
PDO mapping		–
Data type	0×00	Unsigned 8
	0×01 to 0×47	Unsigned 8
Access	0×00	ro
	0×01 to 0×47	ro
Default value	0×00	-
	0×01 to 0×47	-

Note

By means of this access, the messages are reset automatically after reading.

Structure of the data byte

Sub-index 0×00 ≤ **n** ≥ 0×47	Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
n = PWM1	0	HW_ERR	PWM1_ PAR _ERR	X	X	X	X	P1_DIAG	D1_DIAG
n + 1 = PWM2	0	HW_ERR	PWM2_ PAR _ERR	X	X	X	X	P2_DIAG	D2_DIAG

Note

Please find a detailed description of the status bits in the process input in table Meaning of the diagnostic bits of BL20-E-2CNT-2PWM (page 11-79).

11.2.25 Object 5908_{hex} – PWM Control

This object is used in the following modules.

- BL20-E-2CNT-2PWM

BL20-E-2CNT-2PWM

The object provides the following control functions:

- general enable of the function
- start/ stop of the signal output
- Freezing the module's error messages to enable reading them without data loss
- enabling or disabling of the special function
- executing a software latch retrigger
- Setting the single/ continuous signal output

Table 150: Object 5908_{hex}

Feature	Sub-index	Description
Name		PWM Control
Object code		ARRAY
PDO mapping		Yes
Data type	0×00	Unsigned 8
	0×01 to 0×47	Unsigned 16
Access SDO	0×00	ro
	0×01 to 0×47	rw
Access PDO	0×01 to 0×47	r
Default value	0×00	-
	0×01 to 0×47	-

Note

By means of this access, the messages are reset automatically after reading.

Structure of the data byte

Sub-index 0×00 ≤ **n** ≥ 0×47	**Byte**	**Bit 7**	**Bit 6**	**Bit 5**	**Bit 4**	**Bit 3**	**Bit 2**	**Bit 1**	**Bit 0 (lsb)**
n = PWM1	0	X	PWM1 _SINGLE	PWM1_ SW_LR	PWM1_ SFKT_ DISABLE	X	PWM1_ LOGMSG	PWM1_ ENABLE	PWM1_ GENERAL_ DISABLE
	1	**Bit 15 (msb)**	**Bit 14**	**Bit 13**	**Bit 12**	**Bit 11**	**Bit 10**	**Bit 9**	**Bit 8**
		X	X	X	X	X	X	SET_P1	SET_ D1
n + 1 = PWM2	0	X	PWM2_SI NGLE	PWM2_ SW_LR	PWM2_ SFKT_ DISABLE	X	PWM2_ LOGMSG	PWM2_ ENABLE	PWM2_ GENERAL_ DISABLE
	1	**Bit 15 (msb)**	**Bit 14**	**Bit 13**	**Bit 12**	**Bit 11**	**Bit 10**	**Bit 9**	**Bit 8**
		X	X	X	X	X	X	SET_P2	SET_D2

Note

Please find a detailed description of the status bits in the process input in table Meaning of the process output bits of BL20-E-2CNT-2PWM (page 11-56).

11.2.26 Object 5910_{hex} – PWM Load Prepare Value

This object is used in the following modules.

- BL20-E-2CNT-2PWM

BL20-E-2CNT-2PWM

The object contains the load value (load value register, PWM1 no. 0×64, PWM2 no. 0×74) for the "prepared loading" of the counters. Setting the count value of the signals to be given out to this value is event-driven.

Table 151: Object 5910_{hex}

Feature	Sub-index	Description
Name		PWM Load Prepare Value
Object code		ARRAY
PDO mapping		-
Data type	0×00	Unsigned 8
	0×01 to 0×47	Integer 32
Access	0×00	ro
	0×01 to 0×47	rw
Default value	0×00	-
	0×01 to 0×47	-

11.2.27 Object 5913_{hex} – PWM Duty Cycle

This object is used in the following modules.

- BL20-E-2CNT-2PWM

BL20-E-2CNT-2PWM

The object serves for setting the Duty Cycle of the PWM pulse (Register for Duty Cycle): PWM1, no. 0×64/ PWM2, no. 0×71.)

Table 152: Object 5913_{hex}

Feature	Sub-index	Description
Name		PWM Duty Cycle
Object code		ARRAY
PDO mapping		-
Data type	0×00	Unsigned 8
	0×01 to 0×47	Integer 32
Access	0×00	ro
	0×01 to 0×47	rw
Default value	0×00	-
	0×01 to 0×47	-

11.2.28 Object 5920_{hex} – PWM Period Duration

The object contains the value for the period duration of the PWM (register for period duration: PWM1, no. 0×60/ PWM2, no. 0×70.)

Table 153: Object 5920_{hex}

Feature	Sub-index	Description
Name		PWM Period Duration
Object code		ARRAY
PDO mapping		Yes
Data type	0×00	Unsigned 8
	0×01 to 0×47	Integer 32
Access SDO	0×00	ro
	0×01 to 0×47	rw
Access PDO	0×01 to 0×47	rw
Default value	0×00	-
	0×01 to 0×47	-

11.2.29 Object 5931_{hex} – PWM Latch Value

The object reads the value of the PWMs' latch-register (PWM1, no. 0×66/ PWM2 no. 0×76).

Table 154: Object 5931_{hex}

Feature	Sub-index	Description
Name		PWM Latch Value
Object code		ARRAY
PDO mapping		-
Data type	0×00	Unsigned 8
	0×01 to 0×47	Unsigned 32
Access	0×00	ro
	0×01 to 0×47	ro
Default value	0×00	-
	0×01 to 0×47	-

11.2.30 Object 6800_{hex} – Operating Parameters

Note

Object 6800_{hex} (corresponds to object 6000_{hex} in accordance with CiA DS406) has no meaning with BL20×× and only exists because it is a "mandatory" object in accordance with DS406.

Table 155: Object 6800_{hex}

Feature	Description
Name	Operating Parameters
Object code	VAR
Data type	Unsigned16
Access	rw
Default value	00h
PDO mapping	No

11.2.31 Objekt 6810_{hex} – Preset Values for Multi-Sensor Devices

The corresponds to object 6010_{hex} in accordance with CiA DS406 and is used for zero point adaption of the system.

This object is used in the following modules. In all other encoder modules, this objects can only be found for compatibility reasons.

- BL××-1SSI
- BL20-1CNT-24VDC
- BL20-E-2CNT-2PWM
- BL67-1CNT/ENC

Table 156: Object 6810_{hex}

Feature	Description
Name	Position Value for Multi-Sensor Devices
Object code	ARRAY
Data type	Integer32
Access	rw
Default value	No
PDO mapping	Yes

BL××-1SSI

The content of this object is added to the SSI encoder value. The calculated value is stored to object 6820_{hex}.

BL20-1CNT-24VDC

The object writes the load value for the counter value.

BL20-E-2CNT-2PWM

The object writes the load value for the counter value.

BL67-1CNT/ENC

The object writes the load value for the counter value.

11.2.32 Object 6820_{hex} – Position Value

This object is used in the following modules. In all other encoder modules, this objects can only be found for compatibility reasons.

- BL××-1SSI
- BL20-1CNT-24VDC
- BL20-E-2CNT-2PWMI
- BL67-1CNT/ENC

Table 157: Object 6820_{hex}

Feature	Description
Name	Position Value for Multi-Sensor Devices
Object code	ARRAY
Data type	Integer32
Access	ro
Default value	No
PDO mapping	Yes

BL××-1SSI

Object 6820_{hex} (corresponds to object 6020_{hex} as per CiA DS406) contains the SSI encoder value of the BL××-1SSI module. The content of the object contains a value that is added to correct the measured value for a zero point adjustment.

BL20-1CNT-24VDC

Object 6820_{hex} (corresponds to object 6020_{hex} as per CiA DS406) contains the counter value of the module.

BL20-E-2CNT-2PWM

Object 6820_{hex} (corresponds to object 6020_{hex} as per CiA DS406) contains the counter value of the module.

BL67-1CNT/ENC

Object $6820_{\mathbf{hex}}$ (corresponds to object $6020_{\mathbf{hex}}$ as per CiA DS406) contains the counter value of the module.

11.2.33 Object $6B00_{hex}$ – CAM State Register

The object CAM State register indicates in accordance with DS406 whether the actual counter status is within the range defined by CAM1 Low limit and CAM1 High limit (object $6B10_{hex}$ and $6B20_{hex}$).

This object is used in the following modules. In all other encoder modules, this objects can only be found for compatibility reasons.

- BLxx-1SSI
- BL20-1CNT-24VDC
- BL20-E-2CNT-2PWM

Table 158: Object $6B00_{hex}$

Feature	Description
Name	CAM State Register
Object code	ARRAY
Data type	Unsigned8
Access	ro
Default value	No
PDO mapping	Yes

Structure of the data byte:

	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
channel 1	X	X	X	X	X	X	X	STAT_ CAM1

X = reserved

Table 159: Meaning of the data bits

Designation		Description
STAT_CAM1 **A**	0	The counter value lies within the following range: compare value2 ≤ counter value compare value1 or the conditions for activating this status message has not been fulfilled.
	1	The counter value lies out of the following range: compare value2 ≤ counter value compare value1

A *Object $6B02_{hex}$ can be used to invert the values.*

BLxx-1SSI

For this module, the object behavior is as defined per DS406. Special configuration settings are not necessary.

BL20-1CNT-24VDC

The behavior of the BL20 counter module is only according to DS406, if the configuration and the operation mode is the following:

- Operation mode is set to „count".
- The operation mode for DO1 is set to "On when cnt. value ref. value1"

- The operation mode for DO2 is set to "On when cnt. value ref. value2"
- The enable bits for DO1 and DO2 are set.

Please observe the following:

- Object $6B10_{hex}$ "CAM1 Low Limit" corresponds to reference value2 of the BL20-counter module.
- Object $6B20_{hex}$ "CAM1 High Limit" corresponds to reference value1 of the BL20-counter module.
- The both outputs DO1 and DO2 are assigned to the 2 reference values.
- Object $6B00_{hex}$ „CAM 1 State Register“ provides the result of the AND relation of the two outputs DO1 and DO2.

BL20-E-2CNT-2PWM

For this module, the object behavior is as defined per DS406. Special configuration settings are not necessary.

The following applies:

STS_DBPx = 1

at (REG_CNTx_CMP0) ≤ (REG_CNTx_CNT) < (REG_CNTx_CMP1)

Structure of the data byte

Sub-index 0×00 ≤ **n** ≥ 0×47	**Byte**	**Bit 7**	**Bit 6**	**Bit 5**	**Bit 4**	**Bit 3**	**Bit 2**	**Bit 1**	**Bit 0 (lsb)**
n = CNT1	0	X	X	X	X	X	X	X	STAT_ CAM1(STS _DBP1)
n + 1 = CNT2	0	X	X	X	X	X	X	X	STAT_ CAM2(STS _DBP2)

Note

The function is only given, if DBPx STS MODE = 00 is parameterized, see Abschnitt „Meaning of the parameter bits of BL20-1CNT-24VDC“.

11.2.34 Object $6B01_{hex}$ – CAM1 Enable Register

The object activates or deactivates the status message concerning the comparison result (Object $6B00_{hex}$).

This object is used in the following modules. In all other encoder modules, this objects can only be found for compatibility reasons.

- BLxx-1SSI
- BL20-1CNT-24VDC
- BL20-E-2CNT-2PWM

Table 160: Object $6B01_{hex}$

Feature	Description
Name	CAM Enable register
Object code	ARRAY
Data type	Unsigned8
Access	rw
Default value	No
PDO mapping	No

Structure of the data byte:

	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
channel 1	X	X	X	X	X	X	X	EN_CAM1
channel 2	X	X	X	X	X	X	X	EN_CAM2

X = reserved

Table 161: Meaning of the data bits

Designation		Description
EN_CAM1	0	Object $6B00_{hex}$ is blocked.
	1	Object $6B00_{hex}$ is released.

11.2.35 Object $6B02_{hex}$ – CAM Polarity Register

The object $6B02_{hex}$ can invert the status message for the comparison result (Object $6B00_{hex}$).

This object is used in the following modules. In all other encoder modules, this objects can only be found for compatibility reasons.

- BL××-1SSI
- BL20-1CNT-24VDC
- BL20-E-2CNT-2PWM

Table 162: Object $6B02_{hex}$

Feature	Description
Name	CAM Polarity Register
Object code	ARRAY
PDO mapping	No
Sub-index	00_{hex}
Data type	Unsigned8
Access	ro
Default value	No
Sub-index	01_{hex} - 47_{hex}
Data type	Unsigned8
Access	rw
Default value	0_{hex}

Structure of the data byte:

	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
channel 1	X	X	X	X	X	X	X	POL_ CAM1
channel 2	X	X	X	X	X	X	X	POL_ CAM2

X = reserved

Table 163: Meaning of the data bits

Designation		Description
POL_CAM1	0	The status message of object $6B00_{hex}$ is not inverted.
	1	The status message of object $6B00_{hex}$ is inverted.

11.2.36 Object $6B10_{hex}$ – CAM1 Low Limit

The object is the same as object 6310_{hex} in accordance with CiA DS406 which defines a lower switch limit for the count range.

This object is used in the following modules. In all other encoder modules, this objects can only be found for compatibility reasons.

- BL××-1SSI
- BL20-1CNT-24VDC
- BL20-E-2CNT-2PWM

Table 164: Object $6B10_{hex}$

Feature	Description
Name	CAM1 Low Limit
Object code	ARRAY
PDO mapping	No
Sub-index	00_{hex}
Data type	Unsigned8
Access	ro
Default value	No
Sub-index	01_{hex} - 47_{hex}
Data type	Unsigned32
Access	rw
Default value	No

BL××-1SSI

Object CAM1 Low Limit corresponds to the reference value2 (CmpVal2) of the SSI module.

BL20-1CNT-24VDC

The object corresponds to the reference value2 of the counter module

The logical output DO2, whose behavior can be configured in manifold ways, is assigned to reference value 2 and thus to object CAM1 Low Limit.

If reference value2 serves as lower limit, depends on the configuration of DO2. In order to achieve a CAM-function as per DS406 a special configuration is necessary, see description of Object $6B00_{hex}$ – CAM State Register (page 11-42).

BL20-E-2CNT-2PWM

The object corresponds to the reference value CMP0 of the counter module

The object writes or reads register 26_{hex} (channel 1), or respectively register 46_{hex} (channel 2) of the module's register interface.

11.2.37 Object $6B20_{hex}$ – CAM1 High Limit

The object is the same as object 6320_{hex} in accordance with CiA DS406 which defines an upper switch limit for the count range.

This object is used in the following modules. In all other encoder modules, this objects can only be found for compatibility reasons.

- BL××-1SSI
- BL20-1CNT-24VDC
- BL20-E-2CNT-2PWM

Table 165: Object $6B20_{hex}$

Feature	Description
Name	CAM1 High Limit
Object code	ARRAY
PDO mapping	No
Sub-index	00_{hex}
Data type	Unsigned8
Access	ro
Default value	No
Sub-index	01_{hex} - 47_{hex}
Data type	Integer32
Access	rw
Default value	0000_{hex}

BL××-1SSI

Object CAM1 High Limit corresponds to the reference value1 (CmpVal1) of the SSI module.

BL20-1CNT-24VDC

The object corresponds to the reference value1 of the counter module

The logical output DO1, whose behavior can be configured in manifold ways, is assigned to reference value1 and thus to object CAM1 High Limit.

If reference value1 serves as upper limit, depends on the configuration of DO1.

In order to achieve a CAM-function as per DS406 a special configuration is necessary, see description of Object $6B00_{hex}$ – CAM State Register (page 11-42).

BL20-E-2CNT-2PWM

The object corresponds to the reference value CMP1 of the counter module

The object writes or reads register 27_{hex} (channel 1), or respectively register 47_{hex} (channel 2) of the module's register interface.

11.2.38 Object $6B30_{hex}$ – CAM1 Hysteresis

Per DS406, the object defines a hysteresis value which serves as offset for the switch points CAM1 Low Limit and CAM1 High Limit in case of switching-on and -off.

This object is used in the following modules. In all other encoder modules, this objects can only be found for compatibility reasons.

- BL20-1CNT-24VDC
- BL20-E-2CNT-2PWM

Table 166: Object $6B31_{hex}$

Feature	Description
Name	CAM1 Hysteresis
Object code	ARRAY
PDO mapping	No
Sub-index	00_{hex}
Data type	Unsigned8
Access	ro
Default value	No
Sub-index	01_{hex} - 47_{hex}
Data type	Unsigned16
Access	rw
Default value	No

BL20-1CNT-24VDC

The object defines the hysteresis value for reference value2 (CAM1 Low Limit - Object $6B10_{hex}$) and reference value1 (CAM1 High Limit Object $6B20_{hex}$).

Note

The object $6B30_{hex}$ is only valid, if the counter module works in count mode.

BL20-E-2CNT-2PWM

The object defines the hysteresis value for compare values CMP0 and CMP1 which affects the digital output Dx and the STS_DBPx assigned to the counter.

The object writes or reads register $2F_{hex}$ (channel 1), or respectively Register $4F_{hex}$ (channel 2) of the module's register interface.

11.2.39 Object $6C00_{hex}$ – Area State Register

Object $6C00_{hex}$ (corresponds to Object 6400_{hex} acc. to CiA DS406) contains two status bits per channel which report an underflow at the lower count limit (Object $6C01_{hex}$ Work Area Low Limit) and an overflow at the upper count limit (Object $6C02_{hex}$ Work Area High Limit).

The status bits are non-volatile. All status messages are reset by writing Object 5803_{hex} with any value.

This object is used in the following modules. In all other encoder modules, this objects can only be found for compatibility reasons.

- BL20-1CNT-24VDC
- BL20-E-2CNT-2PWM

Table 167: Object $6C00_{hex}$

Feature	Description
Name	Area State Register
Object code	ARRAY
PDO mapping	No
Sub-index	00_{hex}
Data type	Unsigned8
Access	ro
Default value	No
Sub-index	01_{hex} - 47_{hex}
Data type	Unsigned8
Access	ro
Default value	No

BL20-1CNT-24VDC

Structure of the data byte

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
X	X	X	X	X	STS_ UFLW	STS_ OFLW	X

Note

Please find a detailed description of the status bits in the process input in table Meaning of the process input bits of BL20-1CNT-24VDC (page 11-61).

BL20-E-2CNT-2PWM

Structure of the data byte

Sub-index 0×00 ≤ **n** ≥ 0×47	**Byte**	**Bit 7**	**Bit 6**	**Bit 5**	**Bit 4**	**Bit 3**	**Bit 2**	**Bit 1**	**Bit 0 (lsb)**
n = CNT1	0	X	X	X	X	X	MSG_ CNT1_ UFLW	MSG_ CNT1_ OFLW	X
n + 1 = CNT2	0	X	X	X	X	X	MSG_ CNT2_ UFLW	MSG_ CNT2_ OFLW	X

Note

Please find a detailed description of the status bits in the process input in table Meaning of the process input bits of BL20-E-2CNT-2PWM (page 11-63).

11.2.40 Object $6C01_{hex}$ – Work Area Low Limit

Object $6C01_{hex}$ (corresponds to 6401_{hex} acc. to CiA DS406) defines the value for the lower count limit.

In case of an underflow, bit 2 in object $6C00_{hex}$ and bit 6 object 5803_{hex}in are set.

This object is used in the following modules. In all other encoder modules, this objects can only be found for compatibility reasons.

- BL20-1CNT-24VDC
- BL20-E-2CNT-2PWM

Table 168: Object $6C01_{hex}$

Feature	**Description**
Name	Work Area Low Limit
Object code	ARRAY
PDO mapping	No
Sub-index	00_{hex}
Data type	Unsigned8
Access	ro
Default value	No
Sub-index	01_{hex} - 47_{hex}
Data type	Unsigned32
Access	rw
Default value	No

BL20-1CNT-24VDC

Note
The object $6B30_{hex}$ is only valid, if the counter module works in count mode.

BL20-E-2CNT-2PWM

The object writes or reads register 24_{hex} (channel 1), or respectively register 44_{hex} (channel 2) of the module's register interface.

11.2.41 Object $6C02_{hex}$ – Work Area High Limit

Object $6C02_{hex}$ (corresponds to 6402_{hex} acc. to CiA DS406) defines the value for the upper count limit. In case of an overflow, bit 1 in object $6C00_{hex}$ and bit 56 object 5803_{hex}in are set. In all other encoder modules, this objects can only be found for compatibility reasons.

- BL20-1CNT-24VDC
- BL20-E-2CNT-2PWM

Table 169: Object $6C02_{hex}$

Feature	Description
Name	Work Area High Limit
Object code	ARRAY
PDO mapping	No
Sub-index	00_{hex}
Data type	Unsigned8
Access	ro
Default value	No
Sub-index	01_{hex} - 47_{hex}
Data type	Unsigned32
Access	rw
Default value	No

BL20-1CNT-24VDC

Note
The object $6B30_{hex}$ is only valid, if the counter module works in count mode.

BL20-E-2CNT-2PWM

The object writes or reads register 25_{hex} (channel 1), or respectively register 45_{hex} (channel 2) of the module's register interface.

11.2.42 Object $6D00_{hex}$ – Operating Status, Object $6D01_{hex}$ – SingleTurn Resolution (rotary), Measuring step (linear), Object $6D02_{hex}$ – Number of Distinguishable Revolutions

Note

The objects $6D00_{hex}$ to $6D02_{hex}$ (correspond to objects 6500_{hex} to 6502_{hex} acc. to CiA DS406) only exist because they are mandatory objects acc. to DS406 and do not have any importance for BL××. The objects are always set to 0 in BL××.

11.2.43 Object $6FFF_{hex}$ – Device Type

Object $6FFF_{hex}$ (corresponds to object $67FF_{hex}$ in accordance with CiA DS406) specifies the type of the second device profile supported.

The object contains the value $000A0191_{hex}$.

The low word ($0196_{hex} = 406_{dez}$) specifies the device profile.

The high word ($000A_{hex}$) describes the encoder type in accordance with CiA DS-406: (10_{dec} = Multi Sensor Encoder Interface).

Table 170: Object $6FFF_{hex}$

Feature	Description
Name	Device Type
Object code	VAR
PDO Mapping	No
Data type	Unsigned32
Access	ro

11.3 Process output/ control interface of the Encoder modules

11.3.1 Meaning of the process output bits of BL××-1SSI

Table 171: Meaning of the process output bits of BL××-1SSI, alphabetically sorted

Designation	Value	Description
CLR_CMPx	0	Default status, i.e. reset of FLAG_CMPx not active.
	1	Reset of FLAG_CMPx active.
EN_CMPx	0	Default status, i.e. the data bits REL_CMPx, STS_CMPx and FLAG_CMPx always have the value 0, irrespective of the actual SSI encoder value.
	1	Default status, i.e. the data bits REL_CMPx, STS_CMPx and FLAG_CMPx always have a value based on the result of the comparison with the SSI encoder value.
REG_RD_ADR	0...63	Address of the register to be read. If the read operation is successful (REG_RD_ABORT = 0), the user data is located in REG_RD_DATA of the process input data (bytes 0 to 3).
REG_WR	0	Default status, i.e. there is no request to overwrite the content of the register with the address stated at REG_WR_ADR with REG_WR_DATA. Bit REG_WR_AKN (seeAbschnitt „Meaning of the process input bits of BL××-1SSI“) is reset (0) if necessary.
	1	Request to overwrite the content of the register with address REG_WR_ADR with REG_WR_DATA.
REG_WR_ADR	0...63	Address of the register, which has to be written with REG_WR_DATA.
REG_WR_DATA	0... 232-1	Value which has to be written to the register with the address REG_WR_ADR.
STOP	0	Request to read the SSI encoder cyclically
	1	Request to interrupt communication with the encoder

11.3.2 Meaning of the process output bits of BL20-1CNT-24VDC

Table 172: Meaning of the process output bits of BL20-1CNT-24VDC, alphabetically sorted

Designation	Value	Description
CTRL_DOx	0	The output DOx is blocked.
	1	The output DOx is released.
CTRL_SYN	0 → 1	Release synchronization: A rising edge at the physical DI input enables the counter value to be set (synchronized) once/periodically to the load value.
EXTF_ACK	1	Error acknowledgement The error bits must be acknowledged with the control bit EXTF_ACK after the cause of the fault has been rectified. This control bit must then be reset again. Any new error messages are not set while the EXTF_ACK control bit is set!
Hysteresis value	0 to 255	The reference value 1/2 can be assigned a hysteresis value in order to generate a response at DO1/DO2 with hysteresis. This will prevent the excessive on and off switching of DO1/DO2 if the count value fluctuates too quickly around the reference value.
Pulse duration	0 to 255	unit: ms If the DO1/DO2 outputs are set to indicate counter status =reference value1/2, a longer pulse is some-times required to indicate equal values.
LOAD_CMP_VALx	1	Parameterization: "reference value x" The value in bytes 0 to 3 is accepted as a reference value x.
LOAD_DO_ PARAM	0 → 1	Parameter definition of the DO1 physical output and the virtual output DO2. DO1 and DO2 can indicate the status of data bit SET_DO1 and SET_DO2 or comparison results. The latest telegram (MODE_DO1 and MODE_DO2) indicates the function required for DO1 and DO2.
LOAD_INTTIME	0 → 1	Parameterization: "Integration time" Bytes 0 to 1 of this process output represent a factor for defining the Integration time for frequency measurement and for determining the rotational speed. The integration time can be adjusted between 10 ms and 10 s in 10 ms increments and is produced by multiplying the factor x 10 ms. With period duration measurement, this factor determines the number of periods measured in order to calculate a mean value. A factor 1 to 1000 (1_{hex} to $3E8_{hex}$) is permissible.

Table 172: Meaning of the process output bits of BL20-1CNT-24VDC, alphabetically sorted

Designation	Value	Description
LOAD_LOLIMIT	0 → 1	Parameter setting of the lower measuring limit The value in bytes 0 to 3 is accepted as lower measuring limit. LOAD_LOLIMIT: 0 to 199 999 999 x10^{-3} Hz 0 to 24 999 999 x 10^{-3} U/min 0 to 99 999 999 ms
LOAD_PREPARE	0 → 1	Parameterization: "Load counter in preparation" The value in bytes 0 to 3 is accepted as a load value.
LOAD_UPLIMIT	0 → 1	Parameter setting of the upper measuring limit The value in bytes 0 to 3 is accepted as upper measuring limit. LOAD_UPLIMT: 1 to 200 000 000 x 10^{-3} Hz 1 to 25 000 000 x 10^{-3} U/min 1 to 100 000 000 ms
LOAD_VAL	0 → 1	Parameterization: "Load counter directly" The value in bytes 0 to 3 is accepted as new counter value.
MODE_DOx		MODE_DOx is only valid, if LOAD_DO_PARAM: 0 → 1 The output DOx can show the status of the data bit SET_DOx or comparison results, if CTRL_DOx = 1. MODE_DOx defines which function DO2 is to accept: – 00 The output DOx shows the status of the control bit SET_DOx. This must be released with CTRL_DOx = 1. – 01 Output DOx indicates: Counter value ≥ reference value x – 10 Output DOx indicates: Counter value ≤ reference value x – 11 Output DOx indicates: Counter value = reference value x A pulse is generated for indicating equal values. The pulse duration is defined by byte 2 of this process output.
RES_STS	0 → 1	0 → 1 Initiate resetting of status bits. Status bits STS_ND, STS_UFLW, STS_OFLW, STS_CMP2, STS_CMP1, STS_SYN (process input) are reset. Bit RES_STS_A = 1 (process input) acknowledges that the reset command has been received. RES_STS can now be reset to 0.
SET_DOx		f CTRL_DOx = 1 and the physical output DOx is set to indicate the value SET_DOx, DOx can be set and reset directly with SET_DOx. DO1 can be set for this function via the process output (MODE_DOx = 00 and LOAD_DO_PARAM 0 → 1). The output DOx can also be set before commissioning via the separate parameter data. The default setting for DOx is to display the value of SET_DOx.
SW_GATE	0 → 1	Counting is started (release).
	1 → 0	Counting is stopped.

11.3.3 Meaning of the process output bits of BL20-E-2CNT-2PWM

Table 173: Meaning of the process output bits of BL20-E-2CNT-2PWM, alphabetically sorted

Bit	Value	Meaning
AUX_REGx_WR_DATA, Byte 0 ... AUX_REG1_WR_DATA, byte 3	0 ... 2^{32}-1	Value which is written to the register with the address defined in ADR AUX REGx WR DATA in the parameterization.
AUX_REG1_ WR_EN ... AUX_REG3_ WR_EN	0	Disabling the writing of register data with the register contents in AUX_REGx_WR_DATA. his option avoids an unintentional writing to the registers in the register interface during a module power-up.
	1	Writing of the Register interface with the register contents in AUX_REGx_WR_DATA is enabled.
CNTx_ENABLE	0	Not activated
	1	Enable counter CNTx (SW gate)
CNTx_GENERAL_ DISABLE	0	Count function unit CNTx is generally enabled
	1	Counter function unit is generally disabled
CNTx_LOGMSG	0	The messages in the MSG-bits in the process input/ check-back interface are active.
	1	With a change from 0 → 1 the MSG data are held and actual incoming messages are stored to the register REG_CNTx_LOGMSG. Before switching to REG_CNTx_LOGMSG, this register is set to "0". With a change from 1 1 → 0 , all data from REG_CNTx_LOGMSG are copied to the MSG-bits in the check-back interface.
CNT1_SFKT_DISABLE	0	The special function of input Zx is enabled depending on the parameterization in "mode Zx".
	1	The special function of input Zx is disabled.
CNTx _SINGLE	0	Single enabling of CNTx
	1	Continuous enabling of CNTx
CNTx_SW_LR	0	Not activated
	1	A (SW) latch retrigger has to be executed at counter CNTx with a change from 0 ®→ 1.
PWMx_ ENABLE	0	Not activated
	1	Enable output PWMx (The enable is done either per SW- **or** per HW gate.)

Table 173: Meaning of the process output bits of BL20-E-2CNT-2PWM, alphabetically sorted

Bit	Value	Meaning
PWMx_GENERAL_DISABLE	0	Not activated
	1	Output PWMx generally enabled
PWMx_LOGMSG	0	The messages in the MSG-bits in the process input/ check-back interface are active.
	1	With a change from 0 → 1 the MSG data are held and actual incoming messages are stored to the register REG_CNTx_LOGMSG. Before switching to REG_CNTx_LOGMSG, this register is set to "0". With a change from 1 → 0, all data from REG_CNTx_LOGMSG are copied to the MSG-bits in the check-back interface.
PWMx_SINGLE	0	Single enabling of PWMx
	1	Continuous enabling of PWM
PWMx_SFKT_DISABLE	0	Enable the special function of input Zx depending on the parameterization.
	1	Disable the special function of input Zx depending on the parameterization.
PWMx_SW_LR	0	Not activated
	1	A latch retrigger has to be executed at counter PWMx with a change from 0 → 1 .
REG_RD_ADR	0...127	Address of the register which has to be read. If RD_ABORT = 0, then the user data can be found in REG_RD_DATA in the process input/ check-back interface.
REG_WR	0	Initial state
	1	Triggering a write command. The register of which the address has been defined with REG_WR_ADR, will be written with data from REG_WR_DATA.
REG_WR_ADR	0...127	Address of the register, which has to be written with REG_WR_DATA (see below).
REG_WR_DATA, byte 0 ... REG_WR_DATA, byte 3	0 ... 2^{32}-1	Value which, during a write operation, has to be written to the register selected with REG_WR_ADR (see above).
SET_ Dx	0	Clearing of bit Dx
	1	Setting the bit Dx

Table 173: Meaning of the process output bits of BL20-E-2CNT-2PWM, alphabetically sorted

Bit	Value	Meaning
SET_ Px	0	Clearing of bit Px
	1	Setting the bit Px

11.3.4 Meaning of the process output bits of BL67-1CNT/ENC

Table 174: Meaning of the process output bits of BL67-1CNT/ENC, alphabetically sorted

Bit	Value	Meaning
DOx	0	Digital output DOx = 0
	1	Digital output DOx = 1
GATE	0	Counter inactive
	1	Counter active, depending on parameter Gate function
REG_RD_ADR	0 to 127	Address of the register which has to be read. If RD_ABORT = 0, the user data can be found in REG_RD_DATA in the status interface (bytes 4-7).
RES_STS		During the change from 0 to 1 the counter status bits (STS_UFLW and STS_OFLW) are reset.
REG_WR	0	Initial state
	1	Command: write register Request to overwrite the content of the register with address REG_WR_ADR with REG_WR_DATA.
REG_WR_ADR	0 to 127	Address of the register, which has to be written with REG_WR_DATA.
REG_WR_DATA	0 to 2^{32}-1	Value which, during a write operation, has to be written to the register selected with REG_WR_ADR.
SYNC_REQ	1	Synchronization request The bit SYNC_AKN of the status interface is reset.

11.4 Meaning of the process input bits of the Encoder modules

11.4.1 Meaning of the process input bits of BL××-1SSI

Table 175: Meaning of the process input bits of BL××-1SSI, alphabetically sorted

Designation	Value	Description
ERR_PARA	0	The parameter set of the module has been accepted.
	1	Operation of the module is not possible with the present parameter set.
ERR_SSI	0	SSI encoder signal present.
	1	SSI encoder signal faulty. (e.g. due to a cable break).
FLAG_CMPx	0	Default status, i.e. the register contents have not yet matched (REG_SSI_POS) = (REG_CMPx) since the last reset.
	1	The contents of the registers match (REG_SSI_POS) = (REG_CMPx). This marker must be reset with CLR_CMPx = 1 in the process output data.
REG_RD_ABORT	0	The reading of the register defined in REG_RD_ADR has been accepted and executed. The content of the register can be found in the user data (REG_RD_DATA, byte 0-3).
	1	Reading of the register defined in REG_RD_ADR has not been accepted. The user data range (REG_RD_DATA Bytes 0-3) is zero.
REG_RD_DATA	0... 2^{32}-1	Content of the register to be read if REG_RD_ABORT=0. If REG_RD_ABORT =1, then REG_RD_DATA=0.
REG_RD_ADR	0...63	Address of the register to be read. If the read operation is successful (REG_RD_ABORT = 0), the user data is located in REG_RD_DATA of the process input data (bytes 0 to 3).
REG_WR_ACEPT	0	Writing the user data from the process output to the register addressed with REG_WR_ADR in the process output could not be done.
	1	Writing the user data from the process output to the register addressed with REG_WR_ADR in the process output was successful.

Table 175: Meaning of the process input bits of BL××-1SSI, alphabetically sorted

Designation	Value	Description
REG_WR_AKN	0	No modification of the data in the register bank by process output, i.e. REG_WR = 0. A write job would be accepted with the next telegram of process output data. (handshake for data transmission to the register.)
	1	A modification of the register contents by a process output was initiated, which means REG_WR = 1 → Abschnitt „Meaning of the process output bits of BL××-1SSI“. A write job would not be accepted with the next telegram of process output data.
REL_CMPx	0	A comparison of the register contents has produced the following result: (REG_SSI_POS) < (REG_CMP1)
	1	A comparison of the register contents has produced the following result: (REG_ SSI_POS) ≥ (REG_CMP1)
REL_CMPx	0	A comparison of the register contents has produced the following result: (REG_SSI_POS) < (REG_CMPx)
	1	A comparison of the register contents has produced the following result: (REG_SSI_POS) ≥ (REG_CMP2)
SSI_DIAG	0	No enabled status signal is active (SSI_STSx = 0).
	1	At least one enabled status signal is active (SSI_STSx = 1)
SSI_STSx	0	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.
	1	
STS_CMP1	0	A comparison of the register contents has produced the following result: (REG_SSI_POS) ≠ (REG_CMP1)
	1	A comparison of the register contents has produced the following result: (REG_ SSI_POS) = (REG_CMP1)
STS_CMP2	0	A comparison of the register contents has produced the following result: (REG_SSI_POS) ≠ (REG_CMP1)
	1	A comparison of the register contents has produced the following result: (REG_ SSI_POS) = (REG_CMP2)

Table 175: Meaning of the process input bits of BL××-1SSI, alphabetically sorted

Designation	Value	Description
STS_DN (LED DN)	0	The SSI encoder values are incremented or the values are constant.
	1	The SSI encoder values are decremented.
STS_OFLW	0	A comparison of the register contents has produced the following result: (REG_SSI_POS) ≤ (REG_UPPER_LIMIT)
	1	A comparison of the register contents has produced the following result: (REG_SSI_POS) > (REG_UPPER_LIMIT)
STS_UFLW	0	A comparison of the register contents has produced the following result: (REG_SSI_POS) ≥ (REG_LOWER_LIMIT)
	1	A comparison of the register contents has produced the following result: (REG_SSI_POS) < (REG_LOWER_LIMIT)
STS_UP (LED UP)	0	The SSI encoder values are decremented or the values are constant.
	1	The SSI encoder values are incremented.
STS_STOP	0	The SSI encoder is read cyclically.
	1	Communication with the SSI encoder is stopped as STOP = 1 (process output) or ERR_PARA = 1.

11.4.2 Meaning of the process input bits of BL20-1CNT-24VDC

Table 176: Meaning of the process input bits of BL20-1CNT-24VDC, alphabetically sorted

Designation	Value	Description
ERR_24Vdc	1	Short-circuit sensor supply: This diagnostics information must be acknowledged with the EXTF_ACK (process output) control bit.
ERR_DO	1	Short-/open circuit/excess temperature at the output DO1: This diagnostics information must be acknowledged with the EXTF_ACK (process output) control bit.

Table 176: Meaning of the process input bits of BL20-1CNT-24VDC, alphabetically sorted

Designation	Value	Description
ERR_LOAD	1	Error with load function Control bits LOAD_DO_PARAM, LOAD_CMP_VAL2, LOAD_CMP_VAL1, LOAD_PREPARE and LOAD_VAL must not be set at the same time during the transfer. An incorrect value was transferred with the control bits. Example: The values for "load load value directly" or "load load value in preparation" have been chosen above the upper or below the lower count limit.
ERR_PARA	0	The parameter definition is correct as per specification.
	1	There is a parameter error. ERR_PARA is a group diagnostics bit. With the separate diagnostics message bits 3 to 6 describe the parameter errors in more detail.
RES_STS_A	0	The last process output telegram contained: RES_STS = 0.
	1	Resetting of status bits running. The last process output telegram contained: RES_STS = 1.
STS_CMP1	1	Status comparator 1 This status bit indicates a comparison result for comparator 1 if: the output DO1 is released with CTRL_DO1 = 1 and a comparison is run via MODE_DO1 = 01, 10 or 11. Otherwise STS_CMP1 simply indicates that the output is or was set. STS_CMP1 is also set if DO1 SET_DO1 = 1 when the output is not released. This bit must be reset by the RES_STS control bit.
STS_CMP2	1	Status comparator 2 This status bit indicates a comparison result for comparator 2 if: the output DO2 is released with CTRL_DO2 = 1 and a comparison is run via MODE_DO2 = 01, 10 or 11. Otherwise STS_CMP2 simply indicates that the output is or was set. STS_CMP2 is also set if DO1 SET_DO2 = 1 when the output is not released. This bit must be reset by the RES_STS control bit.
STS_DN	1	Status direction down.
STS_DI	1	The DI status bit indicates the status of digital input DI.
STS_DO1	1	The DO1 status bit indicates the status of digital output DO1.
STS_DO2	1	The DO2 status bit indicates the status of digital output DO2.
STS_GATE	1	Counting operation running.

Table 176: Meaning of the process input bits of BL20-1CNT-24VDC, alphabetically sorted

Designation	Value	Description
STS_LOAD	1	Status of load function is set, if the Load function is running.
STS_ND	1	Status zero crossing Set on crossing zero in counter range when counting without main direction. This bit must be reset by the RES_STS control bit.
STS_OFLW	1	Status upper count limit Set if the counter goes above the upper count limit. This bit must be reset by the RES_STS control bit.
STS_UFLW	1	Status lower count limit Set if the count value goes below the lower count limit. This bit must be reset by the RES_STS control bit.
STS_UP	1	Status direction up.
STS_SYN	1	Status synchronization After synchronization is successfully completed the STS_SYN status bit is set. This bit must be reset by the RES_STS control bit.

11.4.3 Meaning of the process input bits of BL20-E-2CNT-2PWM

Table 177: Meaning of the process input bits of BL20-E-2CNT-2PWM, alphabetically sorted

Bit	Value	Meaning
CNTx		
STS_CNTx_GENERAL_EN	1	Function enabled
STS_CNTx_RUN	1	CNTx Counter ready to count
STS_CNTx_SFKT_EN	1	Special function of Z disabled for CNTx
STS_CNTx_LOGMSG	0	Status of MSG bits actual
	1	Status of MSG bits are held
STS_CNTx_DIR	0	CNTx Counter counts down
	1	CNTx Counter counts up

Table 177: Meaning of the process input bits of BL20-E-2CNT-2PWM, alphabetically sorted

Bit	Value	Meaning
Ax, Bx, Zx	0	Digital input is ‚LOW'
	1	Digital input is ‚HIGH'
MSG_CNTx_CMP0	1	The counter CNTx reports that the compare value CMP0 was reached.
MSG_CNTx_CMP1	1	The counter CNTx reports that the compare value CMP1 was reached.
MSG_CNTx_UFLW	1	The counter CNTx reports the lower count limit was reached.
MSG_CNTx_OFLW	1	The counter CNTx reports the upper count limit was reached.
MSG_CNTx_ND	1	The counter CNTx reports a zero crossing.
MSG_CNTx_FQE	1	The counter CNTx reports an error in frequency/ period duration measurement. Error cause: Max. length of the no-pulse period reached. The value cannot be displayed correctly in the register for the "pulses per integration time" REG_CNTx_IPI due to a multiplicator which has been set too high in register REG_CNTx_MUL.
MSG_CNTx_SFKT	1	The event according to there parameterized special function CNTx_SFKT_DISABLE did occur .
MSG_CNTx_SW_LR	1	The function Latch-Retrigger has been activated via bit CNTx_SW_LR = 1.
PWMx		
MSG_PWM1x_SW_LR	1	The function Latch-Retrigger has been activated via bit PWMx_SW_LR = 1.
MSG_PWMx_NDDC	1	The counter PWMx reports a zero crossing.
MSG_PWMx_SFKT	1	The event according to there parameterized special function PWMx_SFKT_DISABLE did occur .
MSG_PWMx_DO_ERR	1	One of the outputs Px (Px_DIAG) or Dx (Dx_DIAG) of the corresponding PWMx-channel sent an error.
STS_PWMx_GENERAL_EN	1	Function enabled, with a change from 0 Æ→ 1 the channel is set to the initial state
STS_PWMx_RUN	1	PWMx-signal output active
STS_PWMx_SFKT_EN	1	Special function of Z enabled for PWMx
STS_PWMx_LOGMSG	0	Status of MSG bits actual
	1	Status of MSG bits are held

Table 177: Meaning of the process input bits of BL20-E-2CNT-2PWM, alphabetically sorted

Bit	Value	Meaning
Communication		
Dx	0	Digital output is ‚LOW'
	1	Digital output is 'HIGH'
STS_DBPx	1	Status of the information defined through DBPx STS MODE.
STS_CONFIG _ERR	1	In REG_CONFIG_ERR an error is reported
REG_RD_ABORT	0	The reading of the register defined in REG_RD_ADR has been accepted and executed. The content of the register can be found in the user data (REG_RD_DATA).
	1	Reading of the register defined in REG_RD_ADR has not been accepted. The register content (REG_RD_DATA) is zero.
REG_WR_AKN	0	A change of register contents had been assigned through a process output.
	1	No change of register contents through a process output. (Write access REG_WR to the register interface is only possible, if this bit was zero before; handshake for data transfer to the registers).
REG_WR_ACEPT	0	Writing the user data from the control interface to the register addressed with REG_WR_ADR in the control interface could not be done.
	1	Writing the user data from the control interface to the register addressed with REG_WR_ADR in the control interface was successful.
REG_RD_ADR	0 to 127	Address of the input register of which the content is shown in the user data (REG_RD_DATA) in the check-back interface if REG_RD_ABORT = 0.
User data		
REG_RD_DATA	0 ... 2^{32}-1	Content of the register of which the address is transferred in the process input data (REG_RD_ADR) if REG_RD_ABORT = 0. If not, If not, If not, REG_RD_DATA = 0.
AUX_REGx_RD_DATA	0 ... 2^{32}-1	Value, which is read from the register with the address defined in the parameterization in ADR_AUX_REGx_RD_DATA.

11.4.4 Meaning of the process input bits of BL67-1CNT/ENC

Table 178: Meaning of the process input bits of BL67-1CNT/ENC, alphabetically sorted

Bit	Value	Meaning
A, B, Z	0	Digital input A, B or Z = 0
	1	Digital input A, B or Z = 1
AUX_RD_DATA	0 to 2^{32}-1	Content of the register which has been defined via parameter byte 14 (see Abschnitt „Meaning of the parameter bits of BL67-1CNT/ENC“).
DI0 to DI3	0	Digital input DIx = 0
	1	Digital input DIx = 1
ERR_PARA	0	The last change in parameters is valid.
	1	Faulty/ inconsistent parameter data.
REG_ACT_RD_ ADR	0 to 127	Address of the actually read input register.
REG_RD_ABORT	0	REG_RD_ADR valid → The reading of the register defined in REG_RD_ADR has been accepted and executed. The content of the register can be found in the user data (REG_RD_DATA, byte 0-3).
	1	REG_RD_ADR error → Reading the register defined in REG_RD_ADR not accepted. The value in the user data area (REG_RD_DATA, byte 0-3) is zero.
REG_RD_DATA	0 to 2^{32}-1	Content of the register selected by REG_RD_ADR. If RD_ABORT = 0, if not REG_RD_DATA = 0.
REG_WR_ACCEPT	0	REG_WR_ADR error → During REG_WR = 1 the register addressed in REG_WR_ADR in the control interface could **not** successfully be written with user data.
	1	REG_WR_ADR valid → During REG_WR = 1 the register addressed in REG_WR_ADR in the control interface could not successfully be written with user data.
REG_WR_AKN	0	No change in the in the registers → No change of register contents through a process output. A write access (REG_WR) to the register bank is only possible when this bit was previously zero; handshake for data transfer to the registers.
	1	Register contents updated → A change of register contents had been assigned through a process output.

Table 178: Meaning of the process input bits of BL67-1CNT/ENC, alphabetically sorted

Bit	Value	Meaning
STS_OFLW	1	Counter value exceeded upper limit of counter range.
STS_UFLW	1	Counter value below lower limit of counter range
STS_ZC	1	Counter value crossed zero value
SYNC_AKN	1	Encoder synchronized with zero-position.
count direction	0	Up
	1	Down

11.5 Parameter interface of the Encoder modules

11.5.1 Meaning of the parameter bits of BL××-1SSI

Table 179: Meaning of the parameter bits of BL××-1SSI, alphabetically sorted

A*Default-setting*

Designation	Value	Description
DIS_ERR_SSI	Sensor idle data cable test	
	0 **A**	Activate: ZERO test of data cable.
	1	Deactivate: After the last valid bit, a ZERO test of the data cable is not carried out.
INVALID_BITS_ LSB	Invalid bits (LSB)	
	0 to 15	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: SSI_FRAME_LEN - 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. INVALID_BITS_MSB +INVALID_BITS_LSB must always be less than SSI_FRAME_LEN. Default 0 bit = 0_{hex} **A**
INVALID_BITS_ MSB	Number of invalid bits (MSB)	
	0 to 7	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: SSI_FRAME_LEN - 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 SSI_FRAME_LEN.

Table 179: Meaning of the parameter bits of BL××-1SSI, alphabetically sorted

Designation	Value	Description
SSI_BIT_RATE	Data rate	
	0	1000000 bps
	1	500000 bps
	2	250000 bps
	3	125000 bps
	4	100000 bps
	5	83000 bps
	6	71000 bps
	7	62500 bps
	8 to 15	reserved
SSI_CODE_G/D	0 **A**	SSI encoder sends data in binary code
	1	SSI encoder sends data in Gray code
SSI_FRAME_ LENGTH	Data frame bits	
	1 to 32	Number of bits of the SSI data frame. SSI_FRAME_LEN must always be greater than INVALID_BITS. Default: 25 = 19_{hex} **A**

11.5.2 Meaning of the parameter bits of BL20-1CNT-24VDC

Table 180: Meaning of the parameter bits of BL20-1CNT-24VDC, alphabetically sorted

Designation	Value	Description
Diagnostic DOx	0 **A**	Diagnostic activated
	1	Diagnostic deactivated
Digital input DI	0 **A**	normal
	1	inverted
Substitute value DO	0 **A**	0
	1	1

A *Default-setting*

Table 180: Meaning of the parameter bits of BL20-1CNT-24VDC, alphabetically sorted

Designation	Value	Description
Function DI	00 **A**	input
	01	HW gate
	10	Latch-Retrigger when edge pos. (only count operation)
	11	Synchronization when edge pos. (only count operation)
Function DOx	00 **A**	output
	01	– on when cnt value >= ref. value (count operation) – outside of limit (measurement operation)
	10	– on when cnt value <= ref. value (count operation) – below lower limit (measurement operation)
	11	– on when cnt value = ref. value (count operation) – above upper limit (measurement operation)
Sensor pulse per revolution	1**A** to 65535	
Main count direction	00 **A**	None
	01	Up
	10	Down
Hysteresis	0 **A** to 255	Unsigned8
Pulse duration DOx	0 **A** to 255	[n*2ms], Unsigned8
integration time	1 to 1000	[n*10ms]**,** 10 **A**
Measurement mode	100000	Frequency measurement **A**
	100001	Revolutions speed measurement
	100010	Period duration measurement
Upper limit	1 to 16777215 x 10^{-3}	
Upper limit (HWORD)	0 **A** to 255	Unsigned8
Upper limit (LWORD)	0 **A** to 65535	
Upper count limit	0 to + 2147483647 (2^{31}-1)	
Upper count limit (HWORD)	0 to 32767 **A**	Unsigned16
Upper count limit (LWORD)	0 to 65535 **A**	Unsigned16

Table 180: Meaning of the parameter bits of BL20-1CNT-24VDC, alphabetically sorted

Designation	Value	Description
direction input (B)	0 **A**	normal
	1	inverted
group diagnostics	0 **A**	release
	1	block
sensor (A)	0 **A**	normal
	1	inverted
Sensor/ input filter (x)	0 **A**	2,5 µs (200 kHz)
	1	25 µs (20 kHz)
Signal evaluation (A, B)	00 **A**	pulse and direction
	01	rotary sensor: single
	10	rotary sensor: double
	11	rotary sensor: fourfold
Synchronization	0 **A**	single-action
	1	periodical
Gate function	0 **A**	abort count procedure
	1	interrupt count procedure
Lower limit	0 to 16 777 214 x 10^{-3}	
Lower limit (HWORD)	0 **A** to 255	Unsigned8
Lower limit (LWORD)	0 **A** to 65535	
Lower count limit	-2147483648 (-2^{31}) bis 0	
Lower count limit (HWORD)	-32768**A** to 0	Signed16
Lower count limit (LWORD)	-3 2 768 to 32 767	0 **A**, Signed16
Behaviour CPU/ master STOP	00 **A**	turn off DO1
	01	proceed with operating mode
	10	DO1 switch to substitute value
	11	DO1 hold last value

Table 180: Meaning of the parameter bits of BL20-1CNT-24VDC, alphabetically sorted

Designation	Value	Description
Counter mode	100000 **A**	continuous count
	100001	single counting
	100010	periodical counting

11.5.3 Meaning of the parameter bits of BL20-E-2CNT-2PWM

Table 181: Meaning of the parameter bits of BL20-E-2CNT-2PWM, alphabetically sorted

Bit	Value	Meaning
ADR AUX REGx WR DATA		Address of the basic write registers (Default: ADR AUX REG1 WR DATA = 0x60, ADR AUX REG2 WR DATA = 0x61, ADR AUX REG3 WR DATA = 0x70)
ADR AUX REGx RD DATA		Address of the basic read registers (Default: ADR AUX REG1 RD DATA = 0x20, ADR AUX REG2 RD DATA = 0x21, ADR AUX REG3 RD DATA = 0x40)
DBPx STS MODE	00 **A**	STS_DBPx = 1 at (REG_CNTx_CMP0) <= (REG_CNTx_CNT) < (REG_CNTx_CMP1)
	01	reserved
	10	
	11	STS_DBPx = Px
Diagnostic CNTx, Diagnostic PWMx	0	Diagnostic messages of the function unit activated in diagnostic interface **A**
	1	Diagnostic messages of the function unit deactivated in diagnostic interface A
Input Ax, Input Bx, Input Zx,	0 **A**	Signal logic remains (LOW = 0 / HIGH = 1)
	1	Invert signal before processing

Table 181: Meaning of the parameter bits of BL20-E-2CNT-2PWM, alphabetically sorted

Bit	Value	Meaning
Substitute value Px, Dx	0 **A**	The output of the substitute value depends on the parameterization of the used gateway (see documentation for the BL20-gateways).
Filter Ax, Bx	00	2 µs **A**
	01	16 µs
	10	reserved
	11	
Filter Zx	00	2 µs **A**
	01	16 µs
	10	reserved
	11	
Main count direction CNTx	00	Basic function **A**
	01	None
	10	Up
	11	Down
Measurement mode CNTx	0	Frequency measurement **A**
	1	Period duration measurement
Mode CNTx	0000 **A**	Pulse direction, single sample
	0001	Pulse direction, double sample
	0010	AB mode, single sample
	0011	AB mode, double sample
	0100	AB mode, four samples
	0101 to 1110	reserved
	1111	AB only input
Mode Dx		Definition of the function for Dx (Default = 11 1111 → simple output, can be controlled via process data) Please find additional assignment in the general module documentation (Turck-documentation number: D301224)

Table 181: Meaning of the parameter bits of BL20-E-2CNT-2PWM, alphabetically sorted

Bit	Value	Meaning
Mode PWMx	0000 **A**	PD DC Definition:
	0001	HT LT Definition
	0010 to 0111	reserved
	1111	P just output
Mode Zx	0000	Alarm input CNT
	0001 **A**	HW gate CNT
	0010	Single Latch-Retrigger CNT
	0011	Continuous latch retrigger CNT
	0100	Single L.-R. and HW gate CNT
	0101	Continuous L.-R. and HW gate CNT
	0110	reserved
Pull Up Zx	0 **A**	Pull Up resistance 20 kΩ off
	1	Pull Up resistance 20 kΩ on
Threshold input A,B,Z CNTx	0 **A**	Threshold 7.5V (only valid for Ax, Bx, Zx)
	1	Threshold 2.5V (only valid for Ax, Bx, Zx)

11.5.4 Meaning of the parameter bits of BL67-1CNT/ENC

Table 182: Meaning of the parameter bits of BL67-1CNT/ENC, alphabetically sorted

Bit	Value	Meaning
Input x	0 **A**	normal
	1	inverted
Input filter (A, B)	00 **A**	500 kHz
	01	50 kHz
	10	5 kHz
	11	reserved

Table 182: Meaning of the parameter bits of BL67-1CNT/ ENC, alphabetically sorted

Bit	Value	Meaning
Function DI3	0 **A**	input
	1	encoder-GND
Function DO3	0 **A**	output
	1	encoder power supply
Encoder signal	0 **A**	Push-pull input (single ended): Signal evaluation between A, B, Z and GND. The inputs /A, /B and /Z are internally connected to GND.
	1	RS422-input: Signal evaluation between A, B, Z and /A, /B, /Z
Measurement mode	0 **A**	Frequency measurement
	1	Period duration measurement
PullUp Z	0 **A**	The PullUp-resistance for input Z is switched off.
	1	The PullUp-resistance for input Z is switched on.
REG_AUX_ADR	0 to 127 Default: 48 **A**	Definition of the register number from the register interface (REG_PARA; REG_COUNTER_VALUE, REG_LOWER_LIMIT etc.), whose content should be mapped into byte 8 - 11 of the process input data.
Signal evaluation (A, B)	00	1 x: rising edge at A
	01	1 x: falling edge at A
	10 **A**	2 x: both edges at A
	11	4 x: both edges at A and B (only incremental encoders)
Threshold input A, B, Z	0000 0001 0010 0011 0100 0101 0110 0111 1000 1001 1010 1011 **A** 1100 1101 1110 1111	1V 1,5 V 2 V 2,5 V 3 V 4 V 5 V 6 V 7 V 8 V 9 V 10 V 12 V 14 V 16 V 18 V

Table 182: Meaning of the parameter bits of BL67-1CNT/ ENC, alphabetically sorted

Bit	Value	Meaning
Synchronization with Z	0 **A**	single-action If a signal is pending at Z and if, at the same time, the bit SYNC_REQ = 1 (see Abschnitt „Meaning of the process output bits of BL67-1CNT/ENC“ control interface: byte 1, bit 6), then the counter is synchronized once with the load value.
	1	periodical If a signal is pending at Z and if, at the same time, the bit SYNC_REQ = 1 (see Abschnitt „Meaning of the process output bits of BL67-1CNT/ENC“ control interface: byte 1, bit 6), then the counter is synchronized once with the load value.
Gate	0 **A**	normal
	1	inverted
Gate function	000	Counter permanently inactive
	001	DI0 is HW-gate
	010	DI1 is HW-gate
	011	DI2 is HW-gate
	100	DI3 is HW-gate
	101	Z is gate
	110 **A**	only SW-gate
	111	reserved
Count mode	0 **A**	encoder
	1	pulse and direction
Count direction	0 **A**	Up
	1	Down

11.6 Diagnostic interface of the Encoder modules

11.6.1 Meaning of the diagnostic bits of BL××-1SSI

Table 183: Meaning of the diagnostic bits of BL××-1SSI, alphabetically sorted

Designation	Value	Description
ERR_PARA	0	The parameter set of the module has been accepted.
	1	Operation of the module is not possible with the present parameter set.
ERR_SSI	0	SSI encoder signal present.
	1	SSI encoder signal faulty. (e.g. due to a cable break).
SSI_DIAG	0	No enabled status signal is active (SSI_STSx = 0).
	1	At least one enabled status signal is active (SSI_STSx = 1).
SSI_OFLW	0	SSI encoder value below / equal to upper limit.
	1	SSI encoder value above upper limit. Overflow occurred.
SSI_UFLW	0	SSI encoder value above / equal to lower limit.
	1	SSI encoder value below lower limit. Underflow occurred.

11.6.2 Meaning of the diagnostic bits of BL20-1CNT-24VDC

Table 184: Meaning of the diagnostic bits of BL20-1CNT-24VDC, alphabetically sorted

Designation	Description
Count operation	
ERR_24Vdc	Short-circuit sensor supply: This diagnostics information must be acknowledged with the EXTF_ACK (see Meaning of the process output bits of BL20-1CNT-24VDC (page 11-54)) control bit.
ERR_DO	Short-/open circuit/excess temperature at the output DO1: This diagnostics information must be acknowledged with the EXTF_ACK (see Meaning of the process output bits of BL20-1CNT-24VDC (page 11-54)) control bit.

Table 184: Meaning of the diagnostic bits of BL20-1CNT-24VDC, alphabetically sorted

Designation	Description
ERR_PARA	**Bit 2:** End of counter range wrong The following parameter errors are indicated: Upper count limit = lower count limit Upper count limit ≤ lower count limit Upper count limit 0
	Bit 3: Start of counter range wrong Lower count limit = upper count limit Lower count limit ≥ upper count limit lower count limit 0
	Bit 4: Invert-DI+latch-retr. not perm. It is not permitted to invert the level of the digital input when using the latch-retrigger-function
	Bit 5: Main count direction wrong Wrong parameter value for defining the main count direction (Object 5800_{hex} – Encoder Basic Mode (page 11-6), byte 1, bit 5 and 6). Permissible values: 00 = none 01 = up 10 = down
OPER._MODE	Wrong parameter value for defining the operation mode (Object 5800_{hex} – Encoder Basic Mode (page 11-6), byte 0, bit 0-5).
Measurement mode	
ERR_24Vdc	see above
ERR_DO	see above
ERR_PARA	**Bit 2:** Sensor pulse wrong
	Bit 3: Integration time wrong The value for the integration time is incorrect Object 5820_{hex} – Measuring Integration Time (page 11-23). Permissible value range: 1 to 1000
	Bit 4: Upper limit wrong The value for the upper limit time is incorrect . Permissible value range: 1 to 16777215
ERR_PARA	**Bit 5:** Lower limit wrong The value for the lower limit time is incorrect . Permissible value range: 0 to 16777214
OPER._MODE	Wrong parameter value for defining the operation mode (Object 5800_{hex} – Encoder Basic Mode (page 11-6), byte 0, bit 0-5).

Table 184: Meaning of the diagnostic bits of BL20-1CNT-24VDC, alphabetically sorted

Designation	Description
MEAS._MODE	This message is always shown in conjunction with other diagnostics messages and indicates that messages refer to an active measurement mode.

11.6.3 Meaning of the diagnostic bits of BL20-E-2CNT-2PWM

Table 185: Diagnostics of the BL20-E-2CNT-2PWM

Diagnostic message	Values	Meaning
CNT1_PAR_ERR, CNT2_PAR_ERR, PWM1_PAR_ERR, PWM2_PAR_ERR	0	Parameter set of function unit correct
	1	Faulty / inconsistent parameters, wrong parameterization
P1_DIAG, P2_DIAG, D1_DIAG, D2_DIAG	0	No diagnostic message
	1	Diagnosis pending at channel (short circuit)
HW_ERR	0	No diagnostic message
	1	"Hardware error" Display of common errors of the module's hardware (e.g. CRC-error, adjustment error….). Change of device necessary.

11.6.4 Meaning of the diagnostic bits of BL67-1CNT/ENC

Table 186: Meaning of the diagnostic bits of BL67-1CNT/ENC, alphabetically sorted

Diagnostic message	Values	Meaning
STS_OFLW	0	no overflow
	1	Counter value exceeded upper limit of counter range.
STS_UFLW	0	no underflow
	1	Counter value below lower limit of counter range.
DIA_DOx	0	output OK
	1	Short circuit or overload at output x

Table 186: Meaning of the diagnostic bits of BL67-1CNT/ ENC, alphabetically sorted

Diagnostic message	Values	Meaning
ERR_PARA	0	The last change in parameters is valid.
	0	Faulty/ inconsistent parameter data.

12 Objects for SWIRE modules

12.1 Motor starter modules BL20

The objects are used in the following modules:

Table 187: BL20 - motor starter modules

Product family	Module
BL20	BL20-E-1SWIRE

12.2 General object overview for SWIRE modules

Table 188: General object overview for SWIRE modules

Object	Name	page
Input data		
6000_{hex}	Read Input 8 bit	page 5-4
...		
6120_{hex}	Read Input 32 bit	page 5-6
Output data		
6200_{hex}	Write Output 8 bit	page 6-4
...		
6320_{hex}	Write Output 32 bit	page 6-12
Diagnostic data		
3040_{hex}	XBIDiag Byte	page 14-8ff.
3042_{hex}	XBIDiag Word	
3044_{hex}	XBIDiag Dword	
3045_{hex}	XBIDiag Dword2	
3046_{hex}	XBIDiag Dword3	
3047_{hex}	XBIDiag Dword4	
Parameter data		
3060_{hex}	XBIParam Byte	page 14-9ff.
3062_{hex}	XBIParam Word	
3064_{hex}	XBIParam DWord	
3065_{hex}	XBIParam DWord2	
...		
$306B_{hex}$	XBIParam Dword8	

12.2.1 Representation of process input data

The process input data of the SWIRE modules is represented by objects 6000_{hex}, 6020_{hex}, 6021_{hex}, and 6022_{hex}, 6100_{hex} or 6120_{hex} for **digital input channels** of a station.

The user can choose between 4 different formats for representing the values:

- Only one bit represented by each SUB-index (objects 6020_{hex}, 6021_{hex} and 6022_{hex}), see page . page 5-5
- 8 bits represented by each SUB-index (object 6000_{hex}), page 5-5
- 16 bits represented by each SUB-index (object 6100_{hex}), page 5-5
- 32 bits represented by each SUB-index (object 6120_{hex}), page 5-5

PDO mapping of object 6000_{hex} is always executed by default and automatically for the first 8 sub-indexes. This corresponds to the 64 bits of the SWIRE feedback interface. If more than 64 process input data items are present, the PDO mapping must be carried out by the user. A total of 36 groups of 8 bits each can be displayed (288 bits).

If the representation of the data bits is **not** required with the object 6000_{hex} or if another arrangement of the mapped objects is required, PDO mapping must be carried out by the user.

Process input

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

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

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

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

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

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

The following table shows the meaning of the data bits:

Table 189: 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 circuit breaker is off or has tripped
	1	ON	The motor-protective circuit breaker is switched on
SDx	**Communication error, slave x**		
	Setting the NDDIAG parameter copies the slave diagnostics message (input byte 1/bit 3) to the feed-back interface. The information is provided as status information in the PLC for the user.		
	0	ON LINE	Status of slave x:
	1	OFF LINE	Status of slave x: diagnostics available

12.2.2 Representation of process output data

The process input data of the SWIRE modules is represented by objects 6200_{hex}, 6220_{hex}, 6221_{hex}, and 6222_{hex}, 6300_{hex} or 6320_{hex} for **digital input channels** of a station.

The user can choose between 4 different formats for representing the values:

- Only one bit represented by each SUB-index (objects 6220_{hex}, 6221_{hex} and 6222_{hex}), page 6-7 ff.
- 8 bits represented by each SUB-index (object 6200_{hex}), page 6-4.
- 16 bits represented by each SUB-index (object 6300_{hex}), page 6-10.
- 32 bits represented by each SUB-index (object 6320_{hex}), page 6-12.

PDO mapping of object 6200_{hex} is always executed by default and automatically for the first 8 sub-indexes. This corresponds to the 64 bits of the SWIRE control interface. If more than 64 process output data items are present, the PDO mapping must be carried out by the user. A total of 36 groups of 8 bits each can be displayed (288 bits).

If the representation of the data bits is **not** required with the object 6200_{hex} or if another arrangement of the mapped objects is required, PDO mapping must be carried out by the user.

Process output

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

Switch status of contactor coil on/off

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

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

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

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

The following table shows the meaning of the data bits:

Table 190: Meaning of the data bits

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

12.2.3 Representation of diagnostic data

The 8 bytes of diagnostics data for the SWIRE module are represented by the manufacturer specific objects 3044_{hex}, „XBIDiag Dword“ and 3045_{hex}, „XBIDiag Dword2“ of the CANopen gateway.

A sub-index of these objects can represent a maximum number of 4 bytes. Larger diagnostics data volumes are distributed on the following objects. The sub-index also belongs to the module number.

The following table shows the assignment of the parameter data bytes of the SWIRE-module to the manufacturer specific objects:

Byte-No.	**0**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**
	8 Diagnostic bytes of the SWIRE-module								free							
Object-no. in (hex)	3044 (see page 14-8)				3045 (see page 14-8)				3046				3047			

Use the objects 3044_{hex} and 3045_{hex} to access all the diagnostics data. The **sub-index** of the objects has to correspond to the slot-number of the module in the station.

	Bit 7	**Bit 6**	**Bit 5**	**Bit 4**	**Bit 3**	**Bit 2**	**Bit 1**	**Bit 0**
Byte 1	GENERAL $_{ERR}$	U_{SWERR}	free	COM_{ERR}	free	RDY_{ERR}	free	SW_{ERR}
Byte 2	free	U_{AUXERR}	TYP_{ERR}	free	PKZ_{ERR}	free	SD_{ERR}	free
TYP_{ERR} field								
Byte 3	TYP_{ERR}	$TYP_{ERR}S7$	$TYP_{ERR}S6$	$TYP_{ERR}S5$	$TYP_{ERR}S4$	$TYP_{ERR}S3$	$TYP_{ERR}S2$	$TYP_{ERR}S1$
Byte 4	TYP_{ERR}'S16	$TYP_{ERR}S15$	$TYP_{ERR}S14$	$TYP_{ERR}S13$	$TYP_{ERR}S12$	$TYP_{ERR}S11$	$TYP_{ERR}S10$	$TYP_{ERR}S9$
Slave diagnostics bit field								
Byte 5	$SD_{ERR}S8$	$SD_{ERR}S7$	$SD_{ERR}S6$	$SD_{ERR}S5$	$SD_{ERR}S4$	$SD_{ERR}S3$	$SD_{ERR}S2$	$SD_{ERR}S1$
Byte 6	$SD_{ERR}S16$	$SD_{ERR}S15$	$SD_{ERR}S14$	$SD_{ERR}S13$	$SD_{ERR}S12$	$SD_{ERR}S11$	$SD_{ERR}S10$	$SD_{ERR}S9$
PKZ field								
Byte 7	PKZ_{ERR} S8	PKZ_{ERR} S7	PKZ_{ERR} S6	PKZ_{ERR} S5	PKZ_{ERR} S4	PKZ_{ERR} S3	PKZ_{ERR} S2	PKZ_{ERR} S1
Byte 8	PKZ_{ERR} S16	PKZ_{ERR} S15	PKZ_{ERR} S14	PKZ_{ERR} S13	PKZ_{ERR} S12	PKZ_{ERR} S11	PKZ_{ERR} S10	PKZ_{ERR} S9

The following table shows the meaning of the diagnostic bits:

Byte	Design.	Status		Comment
Byte 1	SW_{ERR}	**SWIRE MASTER**		
		The configuration was accepted according to the parameter setting and the SWIRE bus is in data exchange mode.		
		0	Data exchange	The bus is in data exchange mode
		1	Offline	The configuration was not accepted, the bus does not switch to data exchange mode. (SW LED flashing)
	RDY_{ERR}	**SPS SLAVE**		
		Parameter setting is faulty. The ACTUAL configuration was accepted according to the SET configuration and the data exchange with the higher-level is o.k.		
		0	Data exchange	The bus is in data exchange mode
		1	Offline	The configuration was not accepted, the bus does not switch to data exchange mode. (Rdy LED flashing)
	COM_{ERR}	**Communication SWIRE**		
		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.		
		0	OK	No error present.
		1	faulty	An error is present
	U_{SWERR}	**Voltage U_{SW}**		
		Voltage fault in U_{SW}, voltage (17 V DC) for supplying the SWIRE slaves		
		0	OK	No error present.
		1	under voltage	An error is present
	GENE-RAL$_{ERR}$	**Error message**		
		The creation of a function block shows that systems/function blocks for the general checking of a slave for any diagnostics messages present only check the first byte.		
		0	None	No diagnostics message present
		1	present	One/several diagnostics messages present
Byte 2	SD_{ERR}	**Communication SWIRE slave**		
		If the parameter SD_{ERR}A is set for group diagnostics, this bit indicates an error as soon as only one slave on the bus sets its SD error bit.		
		0	OK	No error is present or diagnostics function has been deactivated via the parameter setting.
		1	faulty	An error is present

Byte	Design.	Status		Comment
	PKZ_{ERR}	**Overcurrent protective circuit-breaker**		
		If the parameter $PKZ_{ERR}A$ is set for group diagnostics, this bit indicates an error as soon as only one PKZ of a slave has tripped.		
		0	OK	No PKZ has tripped or diagnostics function has been deactivated via the parameter setting.
		1	tripping	At least one PKZ has tripped.
	TYP_{ERR}	**Configuration**		
		If the TYP_{ERR} parameter is set for group diagnostics, this bit indicates an error as soon as the ACTUAL configuration of a slave does not match the SET configuration for this position.		
		0	OK	The ACTUAL configuration fully matches the SET configuration or diagnostics function has been deactivated via the parameter.
		1	faulty	The actual configuration does not fully match set configuration.
	U_{AUXERR}	$_{\text{Voltage U}}$**AUX**		
		If the $U_{AUXERR}A$ parameter is activated, $_{AUXERR}$ will generate an error message as soon as the power supply goes below the level at which the function of the relays is not guaranteed.		
		0	OK	Contactor supply voltage is o.k. (> 20 VDC) or diagnostics function has been deactivated via this parameter.
		1	under voltage	Contactor supply voltage is not o.k. (< 18 VDC).
Byte 3.4	$TYP_{ERR}Sx$	**Device configuration, slave x**		
		Info field for the individual indication of a configuration error as error message. If the $TYP_{INFO}A$ parameter has been set for single diagnostics, this bit field indicates the error, as soon as the ACTUAL configuration of the slave was not accepted and is therefore not enabled for data exchange. The diagnostics LED of the slave flashes.		
		0	OK	No configuration error is present and the slave is in data exchange mode or diagnostics function has been deactivated via the parameter setting.
		1	incorrect	No configuration error present and the slave is NOT in data exchange mode.
Byte 5.6	$SD_{ERR}Sx$	**Communication, slave x**		
		Info field for the individual indication of the release of the slave diagnostics as error message. If the $SD_{INFO}A$ is set for single diagnostics, this bit field indicates the error as soon as the slave diagnostic message of the slave Sx is triggered.		
		0	OK	No error is present or diagnostics function has been deactivated via the parameter setting.
		1	Offline	A diagnostics message is present.

Byte	Design.	Status		Comment
Byte 7.8	$PKZ_{ERR}Sx$	**Overcurrent protective circuit-breaker, slave x**		
		Info field for the individual indication of the tripping a motor-protective circuit-breaker (PKZ) as error message. If the $PKZ_{INFO}A$ is set for single diagnostics, this bit field indicates the error as soon as the PKZ of the slave Sx has tripped.		
		0	OK	The PKZ of the slave has not tripped or diagnostics function has been deactivated via the parameter setting.
		1	tripped	The PKZ of the slave has tripped.

12.2.4 Representation of parameter data

The 24 bytes of parameter data for the SWIRE module are represented by the manufacturer specific objects 3064_{hex}, „XBIParam Dword“ to 3069_{hex}, „XBIParam Dword6“ of the CANopen gateway.

A sub-index of these objects can represent a maximum number of 4 bytes. Larger parameter data volumes are distributed on the following objects. The sub-index also belongs to the module number.

The following table shows the assignment of the parameter data bytes of the SWIRE module to the manufacturer specific objects:

Byte no.	**0**	**1**	**2**	**3**	**4**	**5**	**6**	**7**
Object no.	Parameter bytes 0 to 7 of the SWIRE-module							
	3064_{hex} (see page 14-10)				3065_{hex} (see page 12-13)			
Byte no.	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**
Object no.	Parameter bytes 8 to 15 of the SWIRE-module							
	3066_{hex} (see page 12-13)				3067_{hex} (see page 12-13)			
Byte no.	**16**	**17**	**18**	**19**	**20**	**21**	**22**	**23**
Object no.	Parameter bytes 16 to 23 of the SWIRE-module							
	3068_{hex} (see page 12-13)				3069_{hex} (see page 12-13)			

Use the objects 3064_{hex} and 3069_{hex} to access all the parameter data. The sub-index of the objects has to correspond to the slot-number of the module in the station.

The structure of the parameter data will be described in the following:

	Bit 7	**Bit 6**	**Bit 5**	**Bit 4**	**Bit 3**	**Bit 2**	**Bit 1**	**Bit 0**
Byte 1	reserved	free	free	free	MNA	Configuration	Disable Cfg	free
Byte 2	free	U_{AUXERR}	TYP_{ERR}	TYP_{INFO}	PKZ_{ERR}	PKZ_{INFO}	SD_{ERR}	SD_{INFO}
Byte 3	reserved							
Byte 4	Life guarding time							
Byte 5	$SD_{DIAG}S8$	$SD_{DIAG}S7$	$SD_{DIAG}S6$	$SD_{DIAG}S5$	$SD_{DIAG}S4$	$SD_{DIAG}S3$	$SD_{DIAG}S2$	$SD_{DIAG}S1$
Byte 6	$SD_{DIAG}S16$	$SD_{DIAG}S15$	$SD_{DIAG}S14$	$SD_{DIAG}S13$	$SD_{DIAG}S12$	$SD_{DIAG}S11$	$SD_{DIAG}S10$	$SD_{DIAG}S9$
Byte 7	reserved							
Byte 8	reserved							
Byte 9 - 24	Type designation slave 1 - 16							

The following table shows the meaning of the parameter bits:

Table 191: Module parameters

Parameter name	Value	
Byte 1		
Disable Cfg	Disabling of the acceptance of the physically present configuration as ACTUAL configuration on manual pushbutton actuation.	
	0 = inactive **A**	The physically present configuration of the SWIRE bus is only accepted as the ACTUAL configuration by pressing the CFG button. The comparison with the SET configuration is then carried out.
	1 = active	The physically present configuration is automatically accepted as the ACTUAL configuration and then compared with the SET configuration.
Configuration	PLC configuration check The configuration check parameter enables a comparison of the set and actual configuration based on the device ID.	
	0 = active **A**	Configuration check based on device ID. Only SWIRE slaves with a device ID completely matching the set configuration are accepted on the bus.
	1 = inactive	All slaves are mapped in 4Bit INPUT/ 4Bit OUTPUT without checking the device ID.
MNA active/ passive	Configuration check If the ACTUAL configuration of the SWIRE bus does not match the SET configuration, the master only exchanges data with the correctly configured and functional slaves.	
	0 = Bus based **A**	No data exchange with a slave with an incomplete / incorrect configuration.
	1 = Slave based	The bus also goes into operation with the correctly configured slaves even if the configuration is incomplete. All slaves detected by the daisy chain configuration with a position that matches the set configuration are started up. Slaves that do not match the set configuration are inactive.
SD_{INFO}	Slave error field Activate slave diagnostics info field $SD_{ERR}Sx$. As soon as a slave on the bus sets its error bit, this is indicated individually as an error depending on the parameter setting.	
	active	Single diagnostics is activated
	inactive	Single diagnostics is not activate

A*Default-setting*

Table 191: Module parameters

A*Default-setting*

Parameter name	Value	
Byte 2		
SD_{ERR}	Group error - slave error Activate slave diagnostics SD_{ERR}Sx. As soon as only one slave on the bus sets its error bit, this is indicated as a group error depending on the parameter setting.	
	0 = active **A**	Group diagnostics is activated
	1 = inactive	Group diagnostics is not activated
PKZ_{INFO}	PKZ error field Activate slave diagnostics info field PKZ_{ERR}Sx. As soon as a slave on the bus clears its PKZ bit, this is indicated as an individual error depending on the parameter setting.	
	0 = active **A**	Single diagnostics is activated
	1 = inactive	Single diagnostics is not activate
PKZ_{ERR}	Group PKZ error field Activate slave diagnostics PKZ_{ERR}Sx. As soon as a slave on the bus clears its PKZ bit, this is indicated as an individual error depending on the parameter setting.	
	0 = active **A**	Single diagnostics is activated
	1 = inactive	Single diagnostics is not activate
TYP_{INFO}	Configuration error field As soon as a slave on the bus does not match the set configuration and therefore cannot be started, this is indicated as an individual error depending on the parameter set.	
	0 = active **A**	Single diagnostics is activated
	1 = inactive	Single diagnostics is not activate
TYP_{ERR}	Group configuration error field Activate slave diagnostics TYP_{ERR}Sx. As soon as only one slave on the bus is incorrectly configured, this is indicated as an error depending on the parameter setting.	
	0 = active **A**	Group diagnostics is activated
	1 = inactive	Group diagnostics is not activated
U_{AUXERR}	Error message Voltage U_{AUX} Activate system diagnostics U_{AUXERR}. U_{AUXERR} will generate an error message as soon as the power supply goes below a level at which the function of the relays is not guaranteed.	
	0 = active **A**	Error message U_{AUXERR} activated
	1 = inactive	Error message U_{AUXERR} not activated
Byte 3	reserved	

Table 191: Module parameters

Parameter name	Value	
Byte 4		
Lifeguarding	0x02-0xFF 0x64 **A**	Lifeguarding time of the SWIRE slaves Setting of lifeguarding time of SWIRE slaves , timeout time up to automatic reset of the slaves in the event of communication failure. (n × 10ms) (Default 1s) 0xFF: Lifeguarding off
Byte 5, 6		
$SD_{DIAG}Sx$	Input bit communication error, slave x Slave diagnostics message from Byte 1 / Bit 7 is accepted in the feedback interface as Bit 4	
	0 = active **A**	$SD_{DIAG}Sx$ is accepted
	1 = inactive	$SD_{DIAG}Sx$ is not accepted
Byte 7, 8	reserved	
Byte 9 to 24		
Device ID, slave x	TYPE setting for the LIN slave at position x on the SWIRE bus	
	0x20	SWIRE-DIL-MTB (: 0xFF)
	0xFF	Basic setting (no slave)

Object 3064_{hex} – XBI Param Dword

The object XBIParam Dword reads the first Param-Dword (byte 0...3) of a module on the module bus. The sub-index 1 to 74 corresponds to the module number of the module in the station.

Table 192: Object 3064_{hex}

Feature	Description
Name	XBIParam Dword
Object code	ARRAY
PDO mapping	No
Data type	Unsigned32
Access	rw
Default value	No

Object 3065_{hex} – XBI Param Dword

The object XBIParam Dword reads the first Param-Dword (byte 4..0.7) of a module on the module bus. The sub-index 1 to 74 corresponds to the module number of the module in the station.

Table 193: Object 3065_{hex}

Feature	Description
Name	XBIParam Dword2
Object code	ARRAY
PDO mapping	No
Data type	Unsigned32
Access	rw
Default value	No

Object 3066_{hex} – XBIParam Dword3

The object XBIParam Dword3 reads the third Param-Dword (byte 8...11) of a module on the module bus. The sub-index 1 to 74 corresponds to the module number of the module in the station.

Table 194: Object 3066_{hex}

Feature	Description
Name	XBIParam Dword3
Object code	ARRAY
PDO mapping	No
Data type	Unsigned32
Access	rw
Default value	No

Object 3067_{hex} – XBIParam Dword4

The object XBIParam Dword4 reads the fourth Param-Dword (byte 12...15) of a module on the module bus. The sub-index 1 to 74 corresponds to the module number of the module in the station.

Table 195: Object 3067_{hex}

Feature	Description
Name	XBIParam Dword4
Object code	ARRAY
PDO mapping	No
Data type	Unsigned32
Access	rw
Default value	No

Object 3068_{hex} – XBIParam Dword5

The object XBIParam Dword5 reads the fifth Param-Dword (byte 16...19) of a module on the module bus. The sub-index 1 to 74 corresponds to the module number of the module in the station.

Table 196: Object 3068_{hex}

Feature	Description
Name	XBIParam Dword5
Object code	ARRAY
PDO mapping	No
Data type	Unsigned32
Access	rw
Default value	No

Object 3069_{hex} – XBIParam Dword6

The object XBIParam Dword6 reads the first Param-Dword (byte 20...24) of a module on the module bus. The sub-index 1 to 74 corresponds to the module number of the module in the station.

Table 197: Object 3069_{hex}

Feature	Description/ Value
Name	XBIParam Dword6
Object code	ARRAY
PDO mapping	No
Data type	Unsigned32
Access	rw
Default value	No

13 Objects for RFID-modules

13.1 RFID-S-module BL20

The objects are used in the following modules:

Table 198: BL20-RFID-S

Product family	Module
BL20	BL20-2RFID-S

13.2 General object overview for RFID-S-modules

Table 199: General object overview for RFID-S-modules

Object	Name	page
5700_{hex}	8 byte process input data	Seite 13-2
5701_{hex}	12 byte process input data	Seite 13-3
5702_{hex}	8 byte process output data	Seite 13-3
5703_{hex}	12 byte process output data	Seite 13-4
5708_{hex}	1 byte status messages	Seite 13-4
5722_{hex}	1 byte parameters	Seite 13-5

13.3 Object 5700_{hex} - 8 byte process input data

The first 8 bytes of the process input data of a BL ident®-channel are displayed in Object 5700_{hex}.

Thus the range of the read-data is limited to 4byte. The 8 byte transfer format consists of the following:

- 1 byte status messages
- 2 byte error code
- 1 byte reserved
- 4 byte read data

Table 200: Object 5700_{hex}

Feature	Description
Name	RS232/RS4xx parameters
Object code	ARRAY
Data type	Unsigned32
Access	rw
Default value	No
PDO mapping	Yes

13.4 Object 5701$_{hex}$ - 12 byte process input data

The 12 byte of the "Process Input Data" of BL ident ®-channel are displayed in object $_{hex}$.

The 12 byte transfer format consists of the following:

- 1 byte status messages
- 2 byte error code
- 1 byte reserved
- 8 byte read data

Table 201: Object 5701$_{hex}$

Feature	Description
Name	RFID Input Data Segmented
Object code	ARRAY
Data type	Domain
Access	ro
Default value	No
PDO mapping	No

13.5 Object 5702$_{hex}$ - 8 byte process output data

The 8 byte of the "Process output Data" of BL ident ®-channel are displayed in object 5702$_{hex}$.

The 8 byte transfer format consists of the following:

- 4 byte command and control bits
- 4 byte write data

Table 202: Object 5702$_{hex}$

Feature	Description
Name	RFID Output Data U64
Object code	ARRAY
Data type	Unsigned64
Access	rw
Default value	No
PDO mapping	Yes

13.6 Object 5703_{hex} - 12 byte process output data

The 12 byte of the "Process output Data" of BL ident ®-channel are displayed in object 5703_{hex}.

The 12 byte transfer format consists of the following:

- 4 byte command and control bits
- 8 byte write data

Table 203: Object 5703_{hex}

Feature	Description
Name	RFID Output Data Segmented
Object code	ARRAY
Data type	Domain
Access	rw
Default value	No
PDO mapping	No

13.7 Object 5708_{hex} - 1 byte status messages

1 byte of the "Process Input Data" of BL ident ®-channel is displayed in 5708_{hex}. This byte contains all status messages (DONE, BUSY, ERROR...):

The 12 byte transfer format consists of the following:

Table 204: Object 5708_{hex}

Feature	Description
Name	RFID Status
Object code	ARRAY
Data type	Unsigned8
Access	ro
Default value	No
PDO mapping	Yes

13.8 Object 5722_{hex} - 1 byte parameter

The Object 5722_{hex} displays the parameter "Bypass time" to a BL ident ®-channel.

This parameter setting is only needed when the error message "Dwell period of the tag in the detection range was not sufficient for successful command processing." appears at start-up.

Table 205: Object 5722_{hex}

Feature	Description
Name	RFID Bypass Time Parameter
Object code	ARRAY
Data type	Unsigned8
Access	rw
Default value	No
PDO mapping	No

14 Manufacturer specific objects

14.1 General

The manufacturer specific objects used in BL×× can be divided into 2 groups:

- module-related manufacturer specific objects ((2000$_{hex}$ to 2FFF$_{hex}$ and 4000$_{hex}$ to 5FFF$_{hex}$)
- slot-related objects (3000$_{hex}$ to 3FFF$_{hex}$)

14.1.1 Module related manufacturer specific objects

The module-related objects (2000$_{hex}$ to 2FFF$_{hex}$ and 4000$_{hex}$ to 5FFF$_{hex}$) refer to special BL×× device types. They describe special functions for these types of devices which cannot be represented using the device profiles defined by the CiA.

Table 206: Module-related manufacturer specific objects

Object no.		Description
Gateway		
2000$_{hex}$	Serial Number	see chapter 4: Device (gateway) objects
2010$_{hex}$	Node Reset Modifiers	
2400$_{hex}$	System Voltages	
2401$_{hex}$	System Voltages	
Analog input modules		
5420$_{hex}$	Analog Input Mode	see chapter 8: Objects for analog input modules
Analog outputs		
5440$_{hex}$	Analog Output Mode	see chapter 9: Objects for analog output modules
RS232/485/422		
5600$_{hex}$	RS232/RS4xx parameters	see chapter 10: Objects for RS232/RS4xx modules
5601$_{hex}$	RS232/RS4xx RxD	
5602$_{hex}$	RS232/RS4xx TxD	
Encoder (SSI, counter)		
5801$_{hex}$	Encoder Config	see chapter 11: Objects for Encoder modules (SSI, CNT)
5802$_{hex}$	Encoder Status	
5803$_{hex}$	Encoder Flags	
5804$_{hex}$	Encoder Diag	
5805$_{hex}$	Encoder Native Status	

Table 206: Module-related manufacturer specific objects

Object no.		Description
5806_{hex}	Encoder Optional Encoder	
5808_{hex}	Encoder Control	
5810_{hex}	Encoder Load Prepare Value	
5811_{hex}	Encoder Pulse Width	
5820_{hex}	Measuring Integration Time	
5821_{hex}	Measuring Low Limit	
5822_{hex}	Measuring High Limit	
5823_{hex}	Measuring Units Per Revolution	
5824_{hex}	Encoder Measuring Divisor	
5825_{hex}	Encoder Measuring Factor	
5827_{hex}	Encoder Measuring Time Out	
5830_{hex}	Encoder Measuring Value	
5831_{hex}	Encoder Latch Value	
5840_{hex}	SSI Diag Mapping	
PWM		
5901_{hex}	PWM Config	see chapter 11: Objects for Encoder modules (SSI, CNT)
5902_{hex}	PWM Status	
5903_{hex}	PWM Flags	
5904_{hex}	PWM Diag	
5908_{hex}	PWM Control	
5910_{hex}	PWM Load Prepare Value	
5913_{hex}	PWM Duty Cycle	
5920_{hex}	PWM Period Duration	
5931_{hex}	PWM Latch Value	

Address assignment

In module-related objects, all modules of one module type within one BL××-station are counted and considered as one module group. The sub-index of the respective module defines the position of the module within this group (not the slot number).

Example:

A BL20-station contains 3 module type RS232:

To address the parameters of the **2.** RS232 module in the station, object $5600_{hex,}$ Sub-Index **2** zu wählen.

14.1.2 Slot-related manufacturer specific objects

The slot related objects (3000_{hex} to $3FFF_{hex}$) are available for **each** module type in the BL××-product families. They do **not** depend on the respective device type.

The slot-related objects have to be used for certain device types for which no additional manufacturer specific device-type-related objects are defined (e.g. for parameterization).

The following table shows the slot-related objects for the BL××-system and defines for which modules they **have to be** used.

Table 207: Slot-related manufacturer specific objects

Object no.		To be used in module-type
Input objects		
3000_{hex}	XBlInputByte	
3002_{hex}	XBlInputWord	
3004_{hex} to $300B_{hex,}$	XBlInputDWord0 to XBlInputDWord8	
Output objects		
$3020_{hex,}$	XBlOutputByte	
$3022_{hex,}$	XBlOutputByte	
3024_{hex} to $02B_{hex}$	XBlOutputDWord0 to XBlOutputDWord8	
Diagnosis objects		
$3040_{hex,}$	XBlDiagByte	SWIRE, page 12-6
$3042_{hex,}$	XBlDiagWord	
3044_{hex} to 3 $04B_{hex}$	XBlDiagDWord0 to XBlDiagDWord8	
Parameter objects		
$3060_{hex,}$	XBlParamByte	SWIRE, page 12-10
$3062_{hex,}$	XBlParamWord	
3064_{hex} to $306B_{hex}$	XBlParamDWord0 to XBlParamDWord8	xDI-NAMUR, page 14-10 xDI-xDO-PD, page 5-2 xXSG-PD, page 5-2 SWIRE, page 12-6
Gateway objects		
3081_{hex}	XBlReferenceModuleType	
3084_{hex}	XBlReferenceInputSize	
3085_{hex}	XBlReferenceOutputSize	
3086_{hex}	XBlReferenceDiagSize	
3087_{hex}	XBlReferenceParamSize	
3090_{hex}	XBlCurrentModuleId	

3091_{hex}	XBlCurrentModuleType
3094_{hex}	XBlCurrentInputSize
3095_{hex}	XBlCurrentOutputSize
3096_{hex}	XBlCurrentDiagSize
3097_{hex}	XBlCurrentParamSize

Address assignment

In the slot-related objects, the sub-index defines the slot at which the respective module is located within the BL××-station.

14.1.3 Process input objects

Object 3000_{hex} - XBlInputByte

Table 208: Object 3000_{hex}

Feature	Description/ Value
Name	XBlInputByte
Object code	VAR
Data type	Unsigned8
Access	ro
PDO mapping	
– Sub-index 0	No
– Sub-index 1 and 2	Yes

Object 3002_{hex} - XBlInputWord

Table 209: Object 3002_{hex}

Feature	Description/ Value
Name	XBlInputWord
Object code	VAR
Data type	
– Sub-index 0	Unsigned8
– Sub-index 1 and 2	Unsigned16
Access	ro
PDO mapping	
– Sub-index 0	No
– Sub-index 1 and 2	Yes

Object 3004_{hex} - XBIInputDWord0 to Object $300B_{hex}$- XBIInputDWord8

Table 210: Object 3004_{hex} to $300B_{hex}$

Feature	Description/ Value
Name	XBIInputDWordx
Object code	VAR
Data type	
– Sub-index 0	Unsigned8
– Sub-index 1 and 2	Unsigned32
Access	ro
PDO mapping	
– Sub-index 0	No
– Sub-index 1 and 2	Yes

14.1.4 Process output objects

Object 3020_{hex}- XBIOutputByte

Table 211: Object 3020_{hex}

Feature	Description/ Value
Name	XBIOutputByte
Object code	VAR
Data type	Unsigned8
Access	rww
PDO mapping	
– Sub-index 0	No
– Sub-index 1 and 2	Yes

Object 3022_{hex} - XBIOutputWord

Table 212: Object 3022_{hex}

Feature	Description/ Value
Name	XBIOutputWord
Object code	VAR
Data type	
– Sub-index 0	Unsigned8
– Sub-index 1 and 2	Unsigned16
Access	rww
PDO mapping	
– Sub-index 0	No
– Sub-index 1 and 2	Yes

Object 3024_{hex} - XBIOutputDWord0 to Object $302B_{hex}$- XBIOutputDWord8

Table 213: Object 3024_{hex} to $302B_{hex}$

Feature	Description/ Value
Name	XBIOutputDWordx
Object code	VAR
Data type	
– Sub-index 0	Unsigned8
– Sub-index 1 and 2	Unsigned32
Access	rww
PDO mapping	
– Sub-index 0	No
– Sub-index 1 and 2	Yes

14.1.5 Diagnosis objects

object 3040$_{hex}$ – XBIDiag Byte

The object reads the module's first diagnostic byte on the module bus. The sub-index 1 to 74 corresponds to the slot number of the module in the BL××-station.

Table 214: Object 3040$_{hex}$

Feature	Description
Name	XBIDiagByte
Object code	ARRAY
PDO mapping	No
Data type	Unsigned8
Access	ro
Default value	No

object 3042$_{hex}$ – XBIDiagWord

The object reads the module's first diagnostic word on the module bus. The sub-index 1 to 74 corresponds to the slot number of the module in the BL××-station.

Table 215: Object 3042$_{hex}$

Feature	Description
Name	XBIDiagWord
Object code	ARRAY
PDO mapping	No
Data type	Unsigned16
Access	ro
Default value	No

Object 3044$_{hex}$ – XBIDiagDword to Object 3047$_{hex}$ – XBIDiagDword4

The object XBIDiagDword reads the first diagnostic-Dword (byte 0...3) of a module on the module bus, XBIDiagDword2 reads the second diagnostic-Dword (byte 4...7) etc.. The sub-index 1 to 74 corresponds to the slot number of the module in the BL××-station.

Table 216: Object 3044$_{hex}$ to 3047$_{hex}$

Feature	Description
Name	XBIDiagDwordx
Object code	ARRAY
PDO mapping	No
Data type	Unsigned32
Access	ro

Table 216: Object 3044_{hex} to 3047_{hex}	Feature	Description
	Default value	No

14.1.6 Parameter objects

Objects 3060_{hex} „XBIParamByte“ to 306Bhex „XBIParamDWord8“ are used to parameterize the BL××-modules byte-by-byte, word-by-word or Dword-by-Dword.

All modules which have according to the CANopen-profile no parameter objects, **have to be** parameterized using these objects.

Attention

The sub-index corresponds to the slot-number of the BL××-module within this BL××-station.

Note

Objects 3000_{hex} to 3097_{hex} allow direct access to the internal module bus of the station.

Objekt 3060_{hex} - XBIParamByte

Table 217: Object 3060_{hex}	Feature	Description/ Value
	Name	XBIParamByte
	Object code	ARRAY
	Data type	Unsigned8
	Access	rw
	Default value	No
	PDO mapping	No

Object 3062_{hex} - XBIParamWord

Table 218: Object 3062_{hex}	Feature	Description/ Value
	Name	XBIParamWord
	Object code	ARRAY
	Data type	Unsigned16
	Access	rw
	Default value	No
	PDO mapping	No

object 3064_{hex} – XBIParamDword to object 3069_{hex} – XBIParamDword8

Table 219: object 3064_{hex} to 3069_{hex}

Feature	Description/ Value
Name	XBIParam Dword
Object code	ARRAY
Data type	Unsigned32
Access	rw
Default value	No
PDO mapping	No

The structure of the parameter data depends on the respective module.

In the following, the data structure is described for each module-type for which the parameterization using this object is necessary:

- **BLxx-4DI-NAMUR**

Table 220: Parameters BLxx-4DI-NAMUR

A*Default-setting*

Byte	Bit	Name	Description
0	0	Input filter x	0 = deactivated (input filter 0,25 ms) **A** 1 = activated (input filter 2,5 ms)
	1	Digital input x	0 = normal **A** 1 = inverted
	2	Short-circuit monitoring x	0 = deactivated **A** 1 = activated
1	3	Short circuit diagnosis x	0 = deactivated **A** 1 = activated
	4	Open circuit monitoring x	0 = deactivated **A** 1 = activated
	5	Open circuit diagnosis x	0 = deactivated **A** 1 = activated
2	6	Input on diagnostic x	0 = output substitute value **A** 1 = hold current value
	7	Substitute value on diag x	0 = off **A** 1 = on

4DI-PD

Table 221: Parameters 4DI-PD

A*Default-setting*

Byte	Bit	Name	Description
0	0	Input filter 0	0 = deactivated (input filter 0,25 ms) **A** 1 = activated (input filter 2,5 ms)
	...	...	
	3	Input filter 3	
1	0	Digital input 0	0 = normal 1 = inverted
	...	...	
	3	Digital input 3	
2	0	Operation Mode Group A	0 = normal **A** 1 = open-circuit monitoring
	1	Operation Mode Group B	

4DI-PD

Table 222: Parameters 4DI-PD

A*Default-setting*

Byte	Bit	Name	Description
0	0	Input filter 0	0 = deactivated (input filter 0,25 ms) **A** 1 = activated (input filter 2,5 ms)
	...	...	
	3	Input filter 7	
1	0	Digital input 0	0 = normal 1 = inverted
	...	...	
	3	Digital input 7	
2	0	Operation Mode Group A	0 = normal **A** 1 = open-circuit monitoring
	...	...	
	3	Operation Mode Group D	

4DI4DO-PD

Table 223: Parameters 4DI4DO-PD

A*Default-setting*

Byte	Bit	Name	Description
0	0	Input filter 0	0 = deactivated (input filter 0,25 ms) **A** 1 = activated (input filter 2,5 ms)
	...	...	
	3	Input filter 3	
1	0	Digital input 0	0 = normal **A** 1 = inverted
	...	...	
	3	Digital input 3	
2	0	Output on overcurrent 0	0 = automatic recovery **A** 1 = controlled recovery
	...	...	
	3	Output on overcurrent 3	

8XSG-PD

Table 224: Parameters 8XSG-PD

A*Default-setting*

Byte	Bit	Name	Description
0	0	Input filter 0	0 = deactivated (input filter 0,25 ms) **A** 1 = activated (input filter 2,5 ms)
	...	...	
	7	Input filter 7	
1	0	Digital input 0	0 = normal **A** 1 = inverted
	...	...	
	3	Digital input 7	
2	0	Output on overcurrent 0	0 = automatic recovery **A** 1 = controlled recovery
	...	...	
	7	Output on overcurrent 7	
3	0	Output 0	0 = deactivate **A** 1 = activate
	...	...	
	7	Output 7	

SWIRE

see Representation of parameter data (page 12-10)

15 Diagnostics - Emergency Frames

15.1 General

the state of the BL××-station, the communication through the internal modules bus, the communication with CANopen, the state of the gateway itself.

Diagnostics messages are indicated in two different ways:

- through the individual LEDs, see the additional documentation (page 1-2)
- through Emergency Frames in a CANopen configuration tool (software)

15.2 Structure of the emergency frames

BL×× CANopen supports Emergency Frames (EMCY) as standardized in CiA DS-301.

The COB-IDs for the EMCY telegrams are defined by the Predefined Master-Slave Connection Set:

COB-ID = 129 - 1 + Node-ID

In the event of a communication error, not only the Emergency Error Code but also the Error register (see Table 225: Bit assignment of the Error register) and additional information will be transmitted, so that the error can be more precisely identified.

Only a part of the 5 bytes is used for the additional information. The remaining bytes are then 0.

Byte	0	1	2	3	4	5	6	7
Data contents	Error code		Error register	Additional information				

15.2.1 Emergency Error-Codes

Designation	**0**	**1**	**2**	**3**	**4**	**5**	**Meaning**
	Error code (hex.)		**Error register** (see also Table 225:)	**Additional information A, B**			
Error reset / no error	0000_{hex}		bit 0, bit 1 set	"0" or module no. **C**	Error code		Error reset
Input current too high	2110_{hex}		bit 0, bit 1 set	module no.	channel no.	0	Input current too high
Input current too low	2130_{hex}		bit 0, bit 1 set	module no.	channel no.	0	Input current too low
Output current too high	2310_{hex}		bit 0, bit 1 set	module no.	channel no.	0	Output current too high
Output current out of range	2323_{hex}		bit 0, bit 1 set	module no.	channel no.	0	Output current below or above the permissible range
Load dump at outputs	2330_{hex}		bit 0, bit 1 set	module no.	channel no.	0	Output current too low
AI U voltage out of range	3003_{hex}		bit 0, bit 2 set	module no.	channel no.	0	Input voltage of an AI-module outside of the permissible
Mains voltage too high	3110_{hex}		bit 0, bit 2 set	0	channel no.	0	System voltage too high

Designation		0	1	2	3	4	5	Meaning
		Error code (hex.)		Error register (see also Table 225:)	Additional information A, B			
Mains voltage too low		3120_{hex}		bit 0, bit 2 set	module no.	channel no.	0	System voltage too low
Output voltage too low		3320_{hex}		bit 0, bit 2 set	module no.	channel no.	0	Field voltage too low
Additional modules	SSI / RSxxx Error **D**	7000_{hex}		bit 0, bit 7 set	module no.	channel no. (always 1)	Module Error Code	Error in SSI or RS×××-module (∅ page 15-8 ff.)
Additional modules	General module error	7010_{hex}		bit 0, bit 7 set	0	0	0	(→ page 15-5 ff.)
Additional modules	Change of diagnosis	7011_{hex}		bit 0, bit 7 set	module no.			
Additional modules	Module list change ok	$707A_{hex}$		bit 0, bit 7 set	module no.	0	0	I/O module list, adaptable change, e.g. module removed
Additional modules	Module list change not ok	$707D_{hex}$		bit 0, bit 7 set	module no.	0	0	I/O module list, incompatible
Additional modules	Module list extended	$707E_{hex}$		bit 0, bit 7 set	module no.	0	0	I/O module list extended
Additional modules	Module list shortened	$707F_{hex}$		bit 0, bit 7 set	module no.	0	0	1 module removed from I/O module list
Communication warning		8100_{hex}		bit 0, bit 4 set	2	0	0	CAN communication faulty (at least one of the error counters for the CAN controller of the CANopen gateway has reached the value 96)
Communication transmit timeout		8100_{hex}		bit 0, bit 4 set	3	0	0	The CANopen gateway was not able to transmit a frame within the specified time
Life guard / Heartbeat error		8130_{hex}		bit 0, bit 4 set	0	0	0	The CANopen gateway has detected an error in the CANopen Guarding or Heartbeat Protocol, e.g. a time-out.
Recovered from Bus OFF		8140_{hex}		bit 0, bit 4 set	0	0	0	The system has left the CAN-Bus Off state, i.e. the CAN controller for the CANopen gateway has moved out of this serious fault condition.
External Error		9009_{hex}		bit 0, bit 4 set	0	0	0	Force Mode is active, i.e. the outputs of the station are not under the control of CANopen at the moment.

A *In total, bytes 3 to 7 of the Emergency Frame can be used to display additional information. At the moment, only byte 3 to 5 are used (if necessary). Byte 6 and 7 are not listed.*

Unused bytes of additional information are 0.

B*If the error message is related to the gateway itself (voltage module at the gateway), the value for module- and channel number is "0".*

C*In this case, the module number is only displayed, if the previous and already reset error was an error with Error code 7011_{hex}. For all other errors, this byte is "0".*

D*An integration of this additional information is only possible, if the type of the respective module can be defined by means of the module number.*

Note

The Error code of the Emergency Frame can only be read out using a special analysis tool.

15.2.2 Error register

Table 225: Bit assignment of the Error register

A*M = mandatory*
B*O = optional*

Error register	M/O	Meaning
Bit 0	M **A**	Generate the error message
Bit 1	O **B**	current error
Bit 2	O	voltage error
Bit 3	O	temperature error
Bit 4	O	communication error (overrun, error state)
Bit 5	O	device-profile-specific error
Bit 6	O	reserved
Bit 7	O	manufacturer-specific error

15.3 Emergency codes for module diagnostics

15.3.1 General module error codes

Designation Meaning	byte 01	Byte 2	Byte 3	Byte 4
General module error General module error	**Error code**	**Error register**	**Additional information**	Additional information
	7010_{hex}	bit 0, bit 7 set (see also Table 225:)	reserved	channel number for multi-channel modules)
Change of Dia. (change in byte 0 to 3 of the diagnostic data)				
	7011_{hex}	bit 0, bit 7 set (see also Table 225:)	Module number	channel number for multi-channel modules)

15.3.2 Digital output modules

Designation Meaning	byte 01	Byte 2	Byte 3	Byte 4
Output current too high: Current too high	**Error code**	**Error register**	**Additional information**	Additional information
	2310_{hex}	bit 1 set (see also Table 225:)	Module number	channel number for multi-channel modules)
Load dump at outputs: Open circuit or current too low (threshold:				
	2330_{hex}	bit 1 set (see also Table 225:)	Module number	channel number for multi-channel modules)

Note

For the exact byte assignment of the Emergency frame, please see "Structure of the Emergency Frames", page 15-2.

15.3.3 Analog Input Modules

Analog input modules, current

Designation Meaning	byte 01	Byte 2	Byte 3	Byte 4
Input current too high: The input current is outside of the permissible range. **A**	**Error code**	**Error register**	**Additional information**	Additional information
	2110_{hex}	bit 1 set (see also Table 225:)	Module number	channel number for multi-channel modules)
Input current too low: Open circuit or input current (for the measuring range 4 to 20 mA) too low. The threshold is 3 mA.				
	2130_{hex}	bit 1 set (see also Table 225:)	Module number	channel number for multi-channel modules)

A*The threshold for this error message is 1% over the upper measuring range value or 1 % below the lower measuring range value.*

Note

For the exact byte assignment of the Emergency frame, please see "Structure of the Emergency Frames", page 15-2.

Analog input modules, voltage

Designation Meaning	byte 01	Byte 2	Byte 3	Byte 4
AI U voltage out of range: Wire break or the input voltage is outside of the permissible range.	**Error code**	**Error register**	**Additional information**	Additional information
	3003_{hex}	bit 2 set (see also Table 225:)	Module number	channel number for multi-channel modules)

Note

For the exact byte assignment of the Emergency frame, please see "Structure of the Emergency Frames", page 15-2.

Analog input modules, PT/Ni

Designation Meaning	byte 01	Byte 2	Byte 3	Byte 4
Output current too high: Current too high (threshold: approx. 5 Ω; only with temperature measuring ranges)	**Error code**	**Error register**	**Additional information**	Additional information
	2310_{hex}	bit 1 set (see also Table 225:)	Module number	channel number for multi-channel modules)
Output current out of range: The input current is outside of the permissible range. **A**				
	2323_{hex}	bit 1 set (see also Table 225:)	Module number	channel number for multi-channel modules)
Load dump at outputs: Open circuit or current too low (threshold:				
	2330_{hex}	bit 1 set (see also Table 225:)	Module number	channel number for multi-channel modules)

A*The threshold for this error message is 1% over the upper measuring range value or 1 % below the lower measuring range value.*

Note

For the exact byte assignment of the Emergency frame, please see "Structure of the Emergency Frames", page 15-2.

Analog Input modules, THERMO/ TC

Designation Meaning	byte 01 Error code	Byte 2 Error register	Byte 3 Additional information	Byte 4 Additional information
AI U voltage out of range: Wire break or the input voltage is outside of the permissible range. **A**				
	3003_{hex}	bit 2 set (see also Table 225:)	Module number	channel number for multi-channel modules)

Note

For the exact byte assignment of the Emergency frame, please see "Structure of the Emergency Frames", page 15-2.

15.3.4 Technology modules

RS232/RS4××-modules

Designation Meaning	Byte 0 + 1: +Error code	Byte 2 Error register	Byte 3	Byte 4	Byte 5	Meaning
Additional modules	7000_{hex}	Bit 8 set (see also Table 225:)	module no.	Channel number (always = 1)	08_{hex}	Parameter error
					10_{hex}	Hardware failure
					20_{hex}	Handshake error
					30_{hex}	Frame error
					40_{hex}	RX buffer overflow

Note

For the exact byte assignment of the Emergency frame, please see "Structure of the Emergency Frames", page 15-2.

SSI-module

Designation Meaning	Byte 0 + 1: Error code	Byte 2 Error register	Byte 3	Byte 4	Byte 5	Meaning
Additional modules	7000_{hex}	Bit 8 set (see also Table 225:)	module no.	Channel number (always = 1)	01_{hex}	SSI-Diag
					02_{hex}	SSI-Error
					04_{hex}	Overflow-Error
					08_{hex}	Underflow-Error
					10_{hex}	Parameter error

Counter/Encoder/PWM

Designation Meaning	byte 01	Byte 2	Byte 3	Byte 4
Output current too high: Current too high	**Error code**	**Error register**	**Additional information**	Additional information
	2310_{hex}	bit 1 set (see also Table 225:)	Module number	channel number for multi-channel modules)
Output current out of range: The input current is outside of the permissible range. **A**				
	2323_{hex}	bit 1 set (see also Table 225:)	Module number	channel number for multi-channel modules)

SWIRE-module

Designation Meaning	Byte 0 + 1: Error code	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7
Additional modules	7000_{hex}	module no.	Diag byte 0	Diag byte 1	Diag byte 2 | 4 | 6	Diag byte 3 | 5 | 7

Bytes 6 and 7 of the Emergency frame contain the result of the bitwise OR relation of the mentioned diagnostic bytes (see Channel number (see page 12-6 ff.).

16 Index

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