M0010646

SANMOTION

MOTION CONTROLLER

C

BL 210/B

Bus link module

Project engineering manual

SANYO DENKI

Record of Revision

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Contents

1 Introduction 7

1.1 Purpose of the document 7
1.2 Preconditions 7
1.3 Intended Use 8
1.4 Notes on this document 8
1.4.1 Contents of document 8
1.5 Documentation for further reading 8

2 Safety notes 10

2.1 Representation 10
2.2 General safety instructions 11

3 Description of the module 12

3.1 Front view 12
3.2 Accessories 13
3.2.1 Connector strip 13

4 Displays and operating elements 14

4.1 Status LED (STAT) 14
4.1.1 CAN Status LEDs 14

5 Connections and wiring 15

5.1 Power supply 15
5.2 Adding modules 15
5.2.1 Connection example 15
5.3 CAN Interface 16
5.3.1 Pin assignment, connection example 17
5.3.2 Cable and plug specification 17
5.3.3 Maximum cable length 17
5.3.4 CAN bus termination 18
5.4 EMC and wiring guidelines 18

6 Configuration 19

6.1 Baud rate and address settings 19
6.1.1 Baud rate 19
6.1.2 CAN address 20
6.2 Heartbeat / Guarding 21

7 Programming notes 22

7.1 CANOpen short description 22
7.1.1 Terms used 22
7.1.2 Device model 22
7.1.3 Communication modes 23
7.1.4 Transmission rates 23
7.1.5 CANOpen services 23
7.2 Object directory 24
7.3 Mapping of add-on modules 24
7.3.1 AM 280/A 25
7.3.2 AM 299/A 25
7.3.3 AM 299/B 25
7.3.4 DM 260/A, DM 262/A 26
7.3.5 DM 272/A 26
7.3.6 DM 276/A 27
7.3.7 MM 240/A 27
7.4 Default PDO mapping 28
7.5 Example for the calculation of power consumption and bus load 30
7.5.1 Example 1: Typical configuration 30
7.5.2 Example 2: Minimum configuration 31
7.6 Firmware update 32

8 Operating behavior 33

8.1 Response to module errors 33
8.2 Network Management 33
8.2.1 Module states 33
8.2.2 Status transitions 34
8.2.3 Boot Up Message 35
8.2.4 Node Monitoring 35

9 Diagnosis 37

9.1 Emergency Message 37
9.2 Error codes 39

10 Disposal 41

10.1 Disposal of the module 41

11 Technical Data 42

11.1 In general 42

11.2 Environmental conditions 42
11.3 CAN Interface 42
11.4 Dimensions, Weight 42

12 EC directives and standards 44

12.1 EC directives 44
12.2 Standards 44
12.2.1 General procedures and safety principles 44
12.2.2 EMC guideline 44
12.2.3 Electrical safety and fire protection 44
12.2.4 Environmental and surrounding conditions Operation with compact flash card or SSD 44
12.3 Standards for the American market 44
12.3.1 UL test for industrial control equipment 44

13 Appendix: Object descriptions 45

13.1 General objects 45
13.1.1 Device Type (Object 0x1000) 53
13.1.2 Error Register (Object 0x1001) 53
13.1.3 Status Register (Object 0x1002) 54
13.1.4 Error Memory (Object 0x1003) 54
13.1.5 Sync Message (Sync Identifier, Object 0x1005) 54
13.1.6 Device Name (Object 0x1008) 55
13.1.7 Software Version (Object 0x100A) 55
13.1.8 Guard Time (Object 0x100C) 55
13.1.9 Life Time Factor (Object 0x100D) 55
13.1.10 Emergency Identifier (Object 0x1014) 55
13.1.11 Inhibit Time EMCY (Emergency Delay Timer, Object 0x1015) 55
13.1.12 Heartbeat Producer (Object 0x1017) 56
13.1.13 Device Identification (Identity Object, Object 0x1018) 56
13.1.14 Error Behavior (Object 0x1029) 56
13.1.15 Communication Parameter RxPDO (Object 0x1400 .. 0x1407) 57
13.1.16 Mapping RxPDO (Object 0x1600 .. 0x1607) 57
13.1.17 Communication Parameter TxPDO (Object 0x1800 .. 0x1807) 58
13.1.18 Configuration Parameter TxPDO (Object 0x1810 .. 0x1813) 59
13.1.19 Mapping TxPDO (Object 0x1A00 .. 0x1A07) 59
13.1.20 Interrupt PDO (Object 0x1A10 .. 0x1A13) 60
13.1.21 Firmware Update (Object 0x2001) 61
13.1.22 Status Info (Object 0x2002) 61

13.1.23 K-Bus Module Mapping (Object 0x2010 .. 0x201B) 62
13.1.24 K-Bus ID List 62
13.1.25 K-Bus Module Hardware Information (Object 0x2020 .. 0x202B) 64
13.1.26 BL 210/B Hardware Information (Object 0x2030) 64
13.1.27 SYNC Timeout (Object 0x2200) 65
13.2 K-Bus Module-Specific Objects 66
13.2.1 Interrupt Status Line 1 to 4 (Object 0x5000 .. 0x5003) 66
13.2.2 AM 299/B Configuration (Object 0x5012) 66
13.2.3 AM 280 Configuration (Object 0x5013) 67
13.2.4 DM 27x Reset Short Circuit (Object 0x5020) 67
13.2.5 DM 27x Configuration Short Circuit (Object 0x5021) 68
13.2.6 MM 240 Configuration (Object 0x5030) 68
13.2.7 MM 240 Initialization Zero Impulse (Object 0x5031) 69
13.2.8 MM 240 Period Counter (Object 0x5032) 69
13.2.9 MM 240 Status (Object 0x5033) 69
13.2.10 MM 240 Impulse Counter (Object 0x5034) 70
13.2.11 MM 240 Timestamp (Object 0x5035) 70
13.2.12 Read Digital Inputs 8-Bit (Object 0x6000) 71
13.2.13 DM 27x Configuration debouncing 8-Bit (Object 0x6003) 71
13.2.14 Interrupt On / Off (Object 0x6005) 71
13.2.15 Interrupt Mask Low-to-High 8-Bit (Object 0x6007) 71
13.2.16 Interrupt Mask High-to-Low 8-Bit (Object 0x6008) 72
13.2.17 Read Digital Inputs 16-Bit (Object 0x6100) 72
13.2.18 DM 27x Configuration Debouncing 16-Bit (Object 0x6103) 73
13.2.19 Interrupt Mask Low-to-High 16-Bit (Object 0x6107) 73
13.2.20 Interrupt Mask High-to-Low 16-Bit (Object 0x6108) 73
13.2.21 Write Digital Outputs 8-Bit (Object 0x6200) 74
13.2.22 Write Digital Outputs 16-Bit (Object 0x6300) 74
13.2.23 Read Analog Inputs (Object 0x6401) 74
13.2.24 MM 240 Counter 32-Bit (Object 0x6402) 75
13.2.25 Write Analog Outputs (Object 0x6411) 75
13.2.26 Write PWM Outputs (Object 0x6414) 76

1 Introduction

1.1 Purpose of the document

This document describes the structure of the BL 210/B (bus link module).

Additionally described are the CANOpen protocol, the network management and the object directory.

Information

This manual is not addressed to end costumers! Necessary safety notes for the end costumer have to be taken into the costumer manual in the respective national language by the machine builders and system providers.

1.2 Preconditions

This document contains information for persons with the following skills:

Target group	Knowledge and skills pre-requirement
Project engineer	Basic technical training (University of Applied Science/University level, engineering degree or corresponding professional experience). Knowledge in: • working mode of a PLC, • safety regulations, • the application.
Operator	Basic technical training (Vocational high school, engineering degree or corresponding professional experience). Knowledge in: • safety regulations, • working mode of machine or plant, • principal functions of the application, • system analysis and troubleshooting, • setting options at the operating installations.
Service technician	Basic technical training (Vocational high school, engineering degree or corresponding professional experience). Knowledge in: • working mode of a PLC, • safety regulations, • working mode of machine or plant, • diagnosis possibilities, • systematic error analysis and rectification.

1.3 Intended Use

The BL 210/B was developed for control applications in industrial machines. The typical applications areas include injection molding machines, robots, presses, machine tools and similar.

The BL 210/B may only be used for the types of use described in the technical descriptions and only in conjunction with recommended/approved third-party equipment/installations.

The BL 210/B has been developed, manufactured, tested and documented in accordance with the appropriate guidelines and standards. Therefore, the products do not pose any danger to the health of persons or a risk of damage to other property or equipment under normal circumstances, provided that the instructions and safety precautions are properly observed.

1.4 Notes on this document

This manual is integral part of the product. It is to be retained over the entire life cycle of the product and should be forwarded to any subsequent owners or users of the product.

1.4.1 Contents of document

- Description of the BL 210/B
- Description of wiring (including EMC guidelines)
- Description of the configuration
- Information on the CANOpen protocol
- Explanation of the network management
- Listing of the objective directory
- Technical data

1.5 Documentation for further reading

The following documents are to be observed depending on the system solution used:

If you are using the CP23x:

Doc.No.	Name	Target group
M0007034	Automation system	• Project engineer • Electrician • Programmer • Commissioning foreman • Service technician

If you are using the CP24x:

Doc.No.	Name	Target group
M0010436	System manual	• Project engineer • Electrician • Programmer • Commissioning foreman • Service technician

2 Safety notes

2.1 Representation

At various points in this manual you will see notes and precautionary warnings regarding possible hazards. The symbols used have the following meaning:



DANGER!

- **Indicates an imminently hazardous situation which will result in death or serious bodily injury if the corresponding precautions are not taken.**



WARNING!

- **Indicates a potentially hazardous situation which can result in death or serious bodily injury if the corresponding precautions are not taken.**



CAUTION!

- **Means that if the corresponding safety measures are not taken, a potentially hazardous situation can occur that may result in property injury or slight bodily injury.**

CAUTION

- **CAUTION used without the safety alert symbol indicates a potentially hazardous situation which, if not avoided, may result in damage to property.**



- **This symbol reminds you of the possible consequences of touching electro-statically sensitive components.**

Information

Useful practical tips and information on the use of equipment are identified by the "Information" symbol. They do not contain any information that warns about potentially dangerous or harmful functions.

2.2 General safety instructions



WARNING!

- **It is absolutely essential to observe the safety instructions in the system manual.**
- **The module is defined as "open type equipment" (UL508) or as "open equipment" (EN 61131-2) and must therefore be installed in a control cabinet.**

CAUTION

Improper use of the assembly or the control system leads to irreparable damage!

- **Turn off the power supply before inserting or removing the module. Otherwise, the module can be destroyed or undefined signal states can lead to damage of the control system.**

3 Description of the module

The BL 210/B is a bus coupler of the “SANMOTION C” control system. It is used to operate modules of the system as decentralized I/O clusters at other controls. The BL 210/B is connected with a Host-control via CAN. A maximum of 12 modules can be supplied and operated.

3.1 Front view

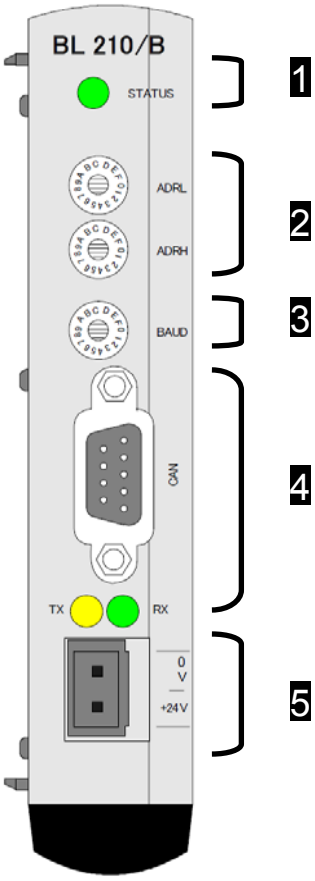


Fig.3-1: Front view BL 210/B

1 … Status LED	2 … Address switches
3 … Baud rate switch	4 … CAN interface with Status LEDs
5 … Power supply	

Information

The type plate is stored on the module in an EEPROM and can be read out by the application.

3.2 Accessories

3.2.1 Connector strip

CAN connection: 9-pole DSUB plug

The following 9-pole DSUB plug connector is recommended for the BL 210/B:

made by J.S.T. Mfg. Co.,Ltd

plug: JEZ-9S-3(LF)(SN)

J cover set: J-C9-1C

Please select the inch screw thread of No.4-40UNC as screw rock.

The DSUB plug connector is not included in the delivery of SANYO DENKI.

Voltage supply: Standard male connectors with grid dimension 5.08 mm

The following female connector can be used for the BL 210/B:

COMBICON Plug made by Phoenix Contact

MSTB 2.5/2-ST-5.08

or Omnimate Raster made by Weidmuller

BLZ5.08/2

The appropriate female connectors are not included in the delivery of SANYO DENKI, but the following connector can be purchased from SANYO DENKI.

Order number	Contents
AL-00591171-01	MSTB 2.5/2-ST-5.08

4 Displays and operating elements

4.1 Status LED (STAT)

The 2-colour status LED (green or red) indicates the current operating status of the BL 210/B.

Indication	Meaning
dark	No supply voltage
red	Run-up state “INIT” or Module error (K=BUS error, …) or K-BUS module disconnected
red flashing	Run-up state “Pre-Operational”
green	Firmware status: "RUN" (process data traffic running)

For further information see chapter "Operating behavior".

CAUTION

As long as one of the Status LEDs is still on after deactivation of the system, do not remove or insert modules or option modules in the system. Otherwise charging and discharging of back-up capacitors may lead to a thermal overload (electric arc) of the contacts.

4.1.1 CAN Status LEDs

The module has two CAN Status LEDs (RX- and TX-LEDs) per CAN interface, which are activated from the Microcontroller.

Display	Significance
RX-LED (green)	briefly lights up on receipt of a CAN-message.
TX-LED (yellow)	briefly lights up on transmission of a CAN-message.

5 Connections and wiring

5.1 Power supply

WARNING!

Danger of personal injury due to electric shock!

- **Supply the device exclusively from power sources that have an extra low voltage (e.g. SELV or PELV according to EN 61131-2)**
- **Connect only voltages and power circuits to connections, terminals and interfaces up to 50 V rated voltage that have a secure disconnect for hazardous voltages (e.g. with sufficient isolation).**

CAUTION!

Fire hazard during module failure!

- **10 Amp external line fuse must be provided in the final application.**

5.2 Adding modules

Up to 12 modules can be added to the bus link module.

The BL 210/B makes the following output available for the supply of the modules:

	Output:
5 V on K-Bus (logic supply):	8.5 W
24 V on K-Bus (analog support voltages):	45 W

To guarantee stable functioning of the module cluster the power demand on the added-on modules must not exceed the specified power values.

Information

For the calculation of the number of modules that can be added, the performance values specified in the technical data of the respective project engineering manual under "Power consumption 5 V on the K-Bus" and "Power consumption 24 V on the K-Bus" must be used.

For further information: See system manual.

5.2.1 Connection example

The BL 210/B supplies the I/O-modules added-on with 5 V (logic supply) and additionally with 24 V (analog support voltage).

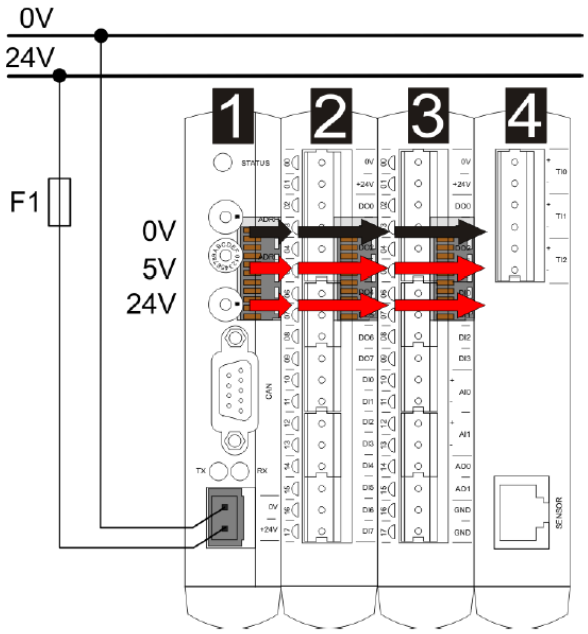


Fig.5-1: Voltage supply of the BL 210/B and the added on modules

1 …Bus link module	2 …Digital hybrid module
3 …Analog hybrid module	4 …else module

5.3 CAN Interface

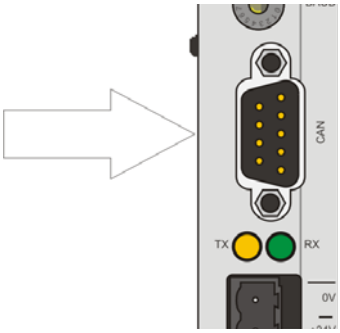


Fig.5-2: Position of the CAN interface

The CAN interface is used to connect the BL 210/B with CAN participants via-CANOpen protocol.

5.3.1 Pin assignment, connection example

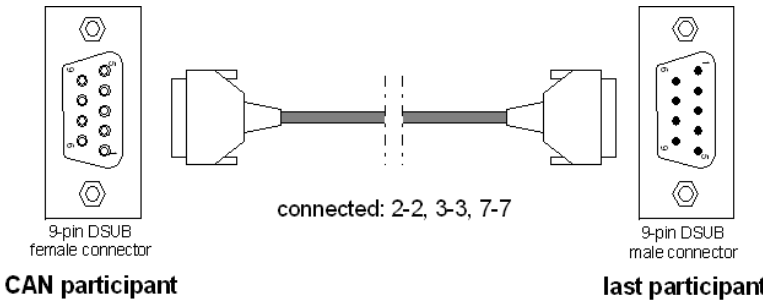


Fig.5-3: CAN connection at the module: 9-pole D-SUB male connector

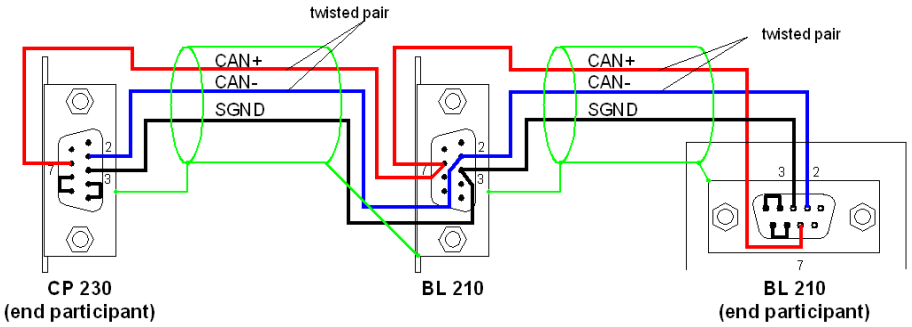


Fig.5-4: Connection example for CAN circuit

Information

Both SGND (Signal Ground) and GND (optional ground) connections are connected internally. The designation was selected to correspond with the standard CiA (CAN in Automation).

Further information: See system manual.

5.3.2 Cable and plug specification

Further information: See system manual.

5.3.3 Maximum cable length

The maximum cable length depends mainly on the set baud rate and partially on the specific line delay in the bus cables used. With modules currently in use, the following ratio between Baud rate and possible maximum cable length results, whereby the lengths for the standard cable types with 6 ns/m line delay and 5.2 ns/m line delay are specified. The "typical" cable lengths specified can be assumed in most industrial application cases.

Baud rate	Max. cable length typical		Max. cable length guaranteed	
	6 ns/m run time	5.2 ns/m run time	6 ns/m run time	5.2 ns/m run time
125 kbit/s	561 m	647 m	542 m	625 m
250 kbit/s	269 m	311 m	250 m	289 m
500 kbit/s	124 m	143 m	104 m	120 m
800 kbit/s	61 m	70 m	42 m	48 m
1 Mbit/s	40 m	46 m	21 m	24 m

Information

The length specifications in the table are maximum values based on ideal conditions. The practical cable length is reduced by poor shielding contact, strong interference, stub lines and poor cable quality. In addition, the cable length depends on the properties of the other CAN bus line participants.

We recommend dimensioning the CAN cable so that it is only as long as absolutely necessary.

The Baud rate can be individually adjusted via configuration for each CAN circuit.

For further information to the configuration see the documentation of the included configuration tool.

5.3.4 CAN bus termination

To activate the bus termination at the first and last participant, both the pins 4 and 5 (TERM1) must be connected as well as the pins 8 and 9 (TERM2).

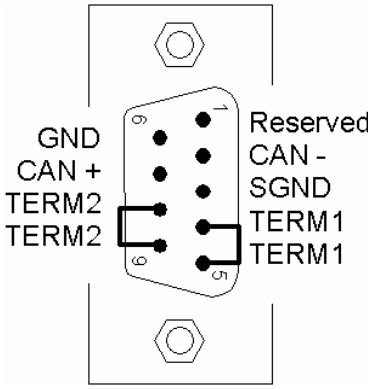


Fig.5-5: CAN interface with activated bus termination

5.4 EMC and wiring guidelines

Pay attention from the outset to careful wiring and shielding.

Further information: See system manual.

6 Configuration

General information

A “SANMOTION C” system needs data for the configuration of system performance, its I/O-devices and interfaces. The system reads this data during the start-up operation and allocates them to its components and devices.

Configuration data is created by included configuration tools or by editing configuration files.

For further information to the configuration see the documentation of the included configuration tool.

Information

A maximum of 4 modules can be operated with an interrupt on the K-Bus.

6.1 Baud rate and address settings

The Baud rate and the CAN address are set via a rotary switch on the front panel of the module.

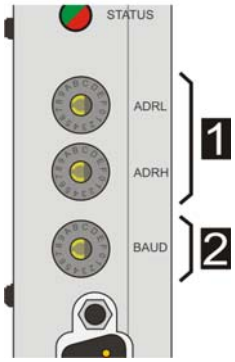


Fig.6-1: Position of the CAN address switches and the Baud rate switch

1	…CAN address switch
2	…Baud rate switch

6.1.1 Baud rate

The Baud rate must be selected according to the length of the cable. See *chapter 5.3.3 "Maximum cable length"*.

The following Baud rates can be set via rotary switch:

Switch position	Baud rate
0	Delivery condition, not allowed during operation, see information
1	125 kBit/s
2	250 kBit/s
3	500 kBit/s
4	800 kBit/s
5	1 MBit/s
6 - F	Not allowed

Information

The BL 210/B is delivered with the Baud-switch position 0. It is mandatory that it is set accordingly. If the Baud-switch position is invalid, the communication with the BL 210/B is disabled (Status LED illuminates red). To increase the robustness of the CAN-network, the Baud rate should be selected accordingly lower.

The set Baud rate must match the Baud rate configured with the configuration tool or an error is issued.

The firmware adopts the adjusted Baud rate once during start-up of the BL 210/B. It is not possible to change the Baud rate during operation.

Data transfer time

The data transfer time is required to calculate the bus load. It also specified how long the transfer of a single Bit takes.

Baud rate	Data transfer time per bit
125 kBit/s	8 µs
250 kBit/s	4 µs
500 kBit/s	2 µs
800 kBit/s	1.25 µs
1 MBit/s	1 µs

6.1.2 CAN address

The CAN address must be set in every case. No CAN address may appear twice in the CAN network.

Information

The BL 210/B occupies 3 successive CAN addresses, starting with the one that is configured. The is necessary since the CANopen standard provides for only 4 PDOs for receiving and transmitting for a device, whereas the BL 210/B uses up to 12 PDOs.

The CAN-address (Node ID) is set via the two address switches in the range from 1 (0x01) to 127 (0x7F) of the BL 210/B. The addresses of 0x00 and 0x80 to 0xFF are invalid.

Example:

Node ID = 28 (0x1C) ADRH: 1 ADRL: C

The firmware adopts the adjusted address rate once during start-up of the BL 210/B. It is not possible to change the address during operation.

Information

If the address setting is invalid, the communication with the BL 210/B is disabled (Status LED illuminates red).

6.2 Heartbeat / Guarding

In case the module is not operated in synchronous-cyclical mode, this monitoring function is used to detect a module failure.

7 Programming notes

7.1 CANOpen short description

CANOpen is a widely used CAN-application layer that was developed by the association CAN-in-Automation (CiA, http://www.can-cia.org) and which meanwhile has been accepted as international standard.

The BL 210/B supports CAN-protocols CANOpen in accordance with DS301 V4.01 and device profiles in accordance with DS401 V2.0. These can be downloaded at the address listed above.

7.1.1 Terms used

CAN:

Controller Area Network is an internationally standardized serial Bus system.

NMT:

Network Management Telegram is one of the operating elements of the CANOpen specification. The network management is used to initialize the network and to monitor the nodes.

SDO:

Service data objects make a service for the access to the object directory available. Each CANOpen device requires at least one SDO server which accepts and processes SDO requirements from other devices.

PDO:

Process data objects make available a faster option for transporting process data when compared to SDO transfers with low priority and which are overloaded with protocol data.

Bus load:

The bus load [%] specifies the temporal load on the bus line with telegrams. It is recommended that the calculated bus load does not exceed 50%, to retain sufficient reserves for the SDOs and the other messages.

7.1.2 Device model

CANOpen consists of the protocol definition (communication profile) and the device profiles that standardize the data content for the respective device class. The Process Data Objects (PDO) are used for swift communication of the input and output data. The CANOpen device parameter and process data are structured in an object directory. The access on any data of this object directory is made via these service data objects (SDO). Further to these, there are a number of special objects (and/or telegram types) for the network management (NMT), synchronization, error messages etc.

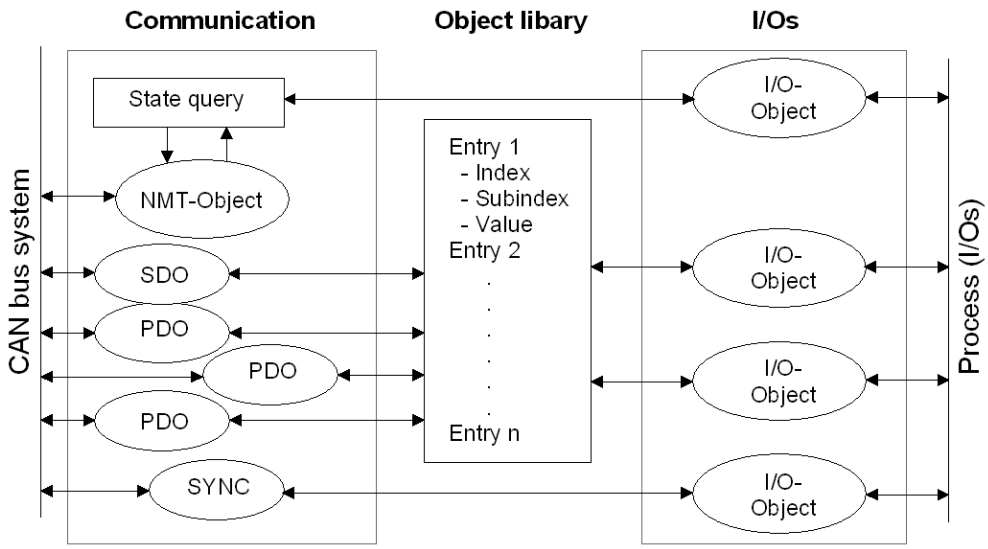


Fig. 7-1: Communication model

7.1.3 Communication modes

CANOpen defines multiple communication modes for the input/output data (PDOs):

- Event-driven:

  Telegrams are sent out as soon as their content has changed. In this case not the process image is constantly transferred but only the changes thereof.

- Cyclical synchronous:

  A SYNC telegrams triggers the modules to adopt the previously received output data and to send new input data.

- Requested:

  The modules are triggered to send their input data via a CAN data request telegram.

The requested communication mode is set via the parameter "Transmission Type".

7.1.4 Transmission rates

Transmission rates from 125 kBaud to 1 MBaud are available to cater for the different lengths of the Bus. The effective utilization of the bus bandwidth means that CANOpen attains short system reaction times at comparatively now data rates. See the chapter Baud rates and address settings.

7.1.5 CANOpen services

The following CANOpen-services are supported (for CanOpen-Slave):

- NMT (Network Management Telegram)
- Boot Up Message
- Node monitoring (Nodeguarding/Heartbeat)
- SDO-transfer (expedited/segmented)
- SYNC - Consumer
- Emergency
- PDO

7.2 Object directory

In the CANOpen device model the object directory forms the link between the application and the CANOpen communication unit. It is dynamically generated by the bus link module and contains the communication and application objects of all available modules on the K-Bus.

Information

The object directory is only required for the application programming when objects are to be access directly without use of the end point data made available by the system.

Each entry in the object directory represents an object and is identified by a 16-bit index. An index in turn can contain up to 256 sub-indices. This enables the differentiation of 254 element up to 65536 * independent of the "11-bit identifiers". (The sub-indices 0 and 255 cannot be freely used).

In profiles the assignment of communication and device objects to a respective index is precisely defined; this means that with the object directory a unique interface is defined between the application and communication toward the outside.

For example, every CANOpen node in the network knows that at index 1017h the heartbeat interval is located, and every node or configuration program has access to it for reading or writing.

The object directory contains all objects that exist independent of the K-Bus configuration, but whose properties are partly dependent on the K-Bus configuration.

In addition, every type of supported K-Bus module contains a set of objects, which will only be displayed in case a corresponding K-Bus module exists.

For detailed information about the individual objects, see chapter "Appendix: Object description".

7.3 Mapping of add-on modules

The module mapping contains a description of the modules based on their objects. It is created by the IO system and is used for the access to module data via PDO or SDO data transfer.

Information

In the standard application case, the application programmer does not need this information since the IO system makes all process data available via endpoints of the application.

However, should access to special objects (data) of a CAN module be necessary, this can occur via the interfaces made available by the CAN library functions. For the clear identification of a data object, a K-Bus-ID, the set address switch position, as well as the Index and the Sub-Index of the data object are required. Please refer to the object list for information about which objects are available. The mapping specifies which objects make a special module available.

7.3.1 AM 280/A

- 4 analog voltage inputs, resolution 14-bit.
- 4 analog voltage outputs, resolution 12-bit.
- possible errors: Sensor failure (Error code: 0x3000, see chapter "Error codes")

For each AM 280/A , the object 0x5013 is extended by one subindex, the objects 0x6401 and 0x6411 by 4 subindexes.

Objects used:

0x5013: 1 subindex (AM 28x Configuration)

0x6401: 4 subindexes (Read analog inputs)

0x6411: 4 subindexes (Write analog outputs)

For detailed information about the objects used, see appendix "Object descriptions".

7.3.2 AM 299/A

- 4 digital inputs.
- 4 digital outputs.
- 2 analog inputs, resolution 12 bit.
- 2 analog outputs, resolution 12 bit.
- possible errors: Sensor failure (Error code: 0x3000, see chapter "Error codes")

For each AM 299/A the objects 0x6000 and 0x6020 are extended by one subindex, the objects 0x6401 and 0x6411 are extended by 2 subindexes. The 4 digital inputs and/or outputs can therefore only be mapped as one collective group of 8 (the 4 higher Bits are invalid).

Objects used:

0x6000: 1 subindex (Read digital inputs)

0x6200: 1 subindex (Write digital outputs)

0x6401: 2 subindexes (Read analog inputs)

0x6411: 2 subindexes (Write analog outputs)

For detailed information about the objects used, see appendix "Object descriptions".

7.3.3 AM 299/B

- 4 digital inputs.
- 4 digital outputs or 2 motor bridge outputs (PWM), resolution 12 bit.

- 2 analog inputs, resolution 12 bit.
- 2 analog outputs, resolution 12 bit.
- possible errors: Sensor failure (Error code: 0x3000, see chapter "Error codes")

For each AM 299/B the objects 0x5012, 0x6000 and 0x6020 are extended by one subindex, the objects x6401, 0x6411 and 0x6414 are extended by 2 subindexes. The 4 digital inputs can therefore only be mapped as one collective group of 8 (the 4 higher Bits are invalid).

Objects used:

0x5012: 1 subindex (AM 299/B Configuration)

0x6000: 1 subindex (Read digital inputs)

0x6200: 1 subindex (Write digital outputs)

0x6401: 2 subindexes (Read analog inputs)

0x6411: 2 subindexes (Write analog outputs)

0x6414: 2 subindexes (Write PWM-outputs)

For detailed information about the objects used, see appendix "Object descriptions".

7.3.4 DM 260/A, DM 262/A

- 8 digital inputs.
- 8 digital outputs.
- 2 inputs can be configured as interruptible (DI0 and/or DI1).
- possible errors: None

For each DM 260/A or DM 262/A the objects 0x6000, 0x6007, 0x6008 and 0x6200 are extended by one subindex. The 8 inputs and/or outputs can therefore be mapped only as a group. From the K-Bus-side the two Interrupt-inputs share one Interrupt line.

Objects used:

0x6000: 1 subindex (Read digital inputs)

0x6005: no subindex (Activate Interrupt globally)

0x6007: 1 subindex (Interrupt-mask for rising edge)

0x6007: 1 subindex (Interrupt-mask for falling edge)

0x6200: 1 subindex (Write digital outputs)

For detailed information about the objects used, see appendix "Object descriptions".

7.3.5 DM 272/A

- 8 digital inputs.
- 8 digital outputs.
- 2 inputs can be configured as interruptible (DI0 and/or DI1).
- possible errors: Short circuit (Error code: 0x2320, see chapter "Error codes")

For each DM 272/A , the objects 0x5020, 0x5021, 0x6000, 0x6003, 0x6007, 0x6008 and 0x6200 are extended by one subindex. The 8 inputs and/or outputs can therefore be mapped only as a group. From the K-Bus-side the two Interrupt-inputs share one Interrupt line.

Objects used:

0x5020: 1 subindex (DM 27x Reset short-circuit)

0x5021: 1 subindex (DM 27x Configuration short-circuit)

0x6000: 1 subindex (Read digital inputs)

0x6003: 1 subindex (DM 27x Configuration debouncing)

0x6005: no subindex (Activate Interrupt globally)

0x6007: 1 subindex (Interrupt-mask for rising edge)

0x6008: 1 subindex (Interrupt-mask for falling edge)

0x6200: 1 subindex (Write digital outputs)

For detailed information about the objects used, see appendix "Object descriptions".

7.3.6 DM 276/A

- 6 digital inputs.
- 8 digital outputs.
- 2 inputs can be configured as interruptible (DI0 and/or DI1).
- possible errors: Short circuit (Error code: 0x2320, see chapter "Error codes")

For each DM 276/A , the objects 0x5020, 0x5021, 0x6000, 0x6003, 0x6007, 0x6008 and 0x6200 are extended by one subindex. The 6 inputs or 8 outputs can therefore only be mapped together as a group. From the K-Bus-side the two Interrupt-inputs share one Interrupt line.

Objects used:

0x5020: 1 subindex (DM 27x Reset short-circuit)

0x5021: 1 subindex (DM 27x Configuration short-circuit)

0x6000: 1 subindex (Read digital inputs)

0x6003: 1 subindex (DM 27x Configuration debouncing)

0x6005: no subindex (Activate Interrupt globally)

0x6007: 1 subindex (Interrupt-mask for rising edge)

0x6008: 1 subindex (Interrupt-mask for falling edge)

0x6200: 1 subindex (Write digital outputs)

For detailed information about the objects used, see appendix "Object descriptions".

7.3.7 MM 240/A

- 2 Encoder inputs.
- 2 Latch inputs.

- possible errors: Sensor break, track error, counter overflow error, zero impulse error (Error codes: 0x5030 - 0x5035, see chapter "Error codes")

For each MM 240/A the objects 0x5030, 0x5031, 0x5032, 0x5033, 0x5034, 0x5035 and 0x6402 are extended by 2 subindexes.

Objects used:

0x5030: 2 subindexes (MM 240 Configuration)

0x5031: 2 subindexes (MM 240 Zero pulse initialization)

0x5032: 2 subindexes (MM 240 Period Counter)

0x5033: 2 subindexes (MM 240 Status)

0x5034: 2 subindexes (MM 240 Impulse Counter)

0x5035: 2 subindexes (MM 240 Timestamp)

0x6402: 2 subindexes (MM 240 Counter)

For detailed information about the objects used, see appendix "Object descriptions".

Module mapping (0x201x):

0x201x/0:	0x06
0x201x/1:	K-Bus-ID
0x201x/2:	Interrupt PDO-Number (Channel 1), is made up of:
	0x5036 (Timestamp), first 4 Byte
	0x5034 (Latched Counter), last 4 Byte
0x201x/3 - 0x201x/8:	Mapping for application objects
0x201x/9:	Interrupt PDO number (channel 2)
0x201x/10 - 0x201x/...:	Mapping for application objects

Difference between latch and zero impulse event:

To differentiate whether a latch or zero impulse event has occurred, the value of the timestamp is used (zero impulse does not have a timestamp).

Timestamp = 0xFFFF FFFF -> zero impulse

Timestamp = 0xFFFF FFFF -> latch impulse

A simultaneous occurrence of zero impulse and latch event on a single channel cannot be transmitted in one PDO. In this case the zero impulse event is transmitted in the next cycle.

7.4 Default PDO mapping

The bus link module creates a default PDO mapping which facilitates the access to CAN objects without the otherwise necessary existence of an IO system. If a standard control with IO system is inserted, the IO system overwrites this default PDO mapping.

Information

For standard applications of the control the information listed in the following thus has no relevance.

In principle the Default PDO-Mapping contains a type-pure PDO-structure; i.e. analog and digital data are not mixed in one PDO. The Default PDO-Mapping is created according to the CANOpen specifications of the DS 401 2.0. Due to the type-purity the PDOs can also remain unused and/or have omissions.

To establish a connection between the data objects mapped in the PDOs and the IO-connections of the hardware, the K-Bus module mapping is used.

The sequence in which the BL 210/B sorts the modules at the bus is as follows:

1. -	10. -	19. -
2. -	11. AM 280/A	20. DM 272/A
3. -	12. -	21. DM 276/A
4. DM 260/A	13. -	22. MM 240/A
5. DM 262/A	14. -	23. -
6. AM 299/A	15. -	24. DI 266/A
7. AM 299/B	16. -	25. DO 276/A
8. -	17. -	26. -
9. -	18. -	27. -

The objects for the K-Bus module mapping are located in the object directory of the indices 0x2010 to 0x201B. Thus, each one of the maximally 12 K-bus modules has one object available. These objects describe as off Sub-Index 2 the objects that are assigned to the K-Bus module (data objects), which in turn are assigned to the IO-connections.

Information

Exception: MM 240/A, details see chapter "Mapping of add-on modules.

The PDO-Mapping also refers to these data objects, so that it is possible to determine which data of a PDO correspond with which IO-connection.

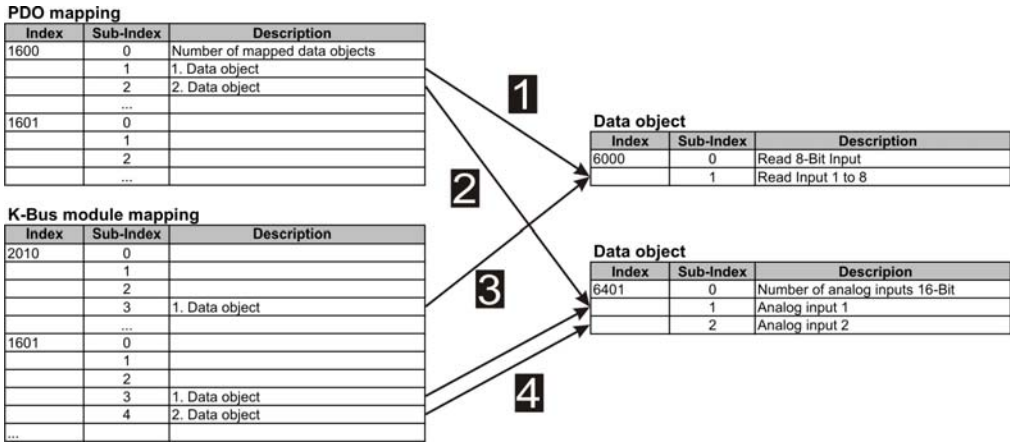


Fig.7-2: Default PDO mapping

According to above image the following assignment follows:

- the first TxPDO consists of:

- 1: Byte 1: 8 Bit digital inputs
- 2: Byte 2 and Byte 3: 1 analog input 16 Bit

- 3: The 8 Bit digital inputs come from the K-Bus module which is described in object 0x2010
- 4: The analog input comes from the K-Bus module which is described in object 0x2011

7.5 Example for the calculation of power consumption and bus load

For transmission via CAN 8 RxPDOs, 8 TxPDOs and 4 Interrupt-PDOs are available for each cycle; 1 PDO (Process Data Object) consists of 8 bytes.

RxPDOs:	Input value (DI, AI, TI) of the modules
TxPDOs:	Output values (DO, AO, PWM) of the modules
Interrupt-PDOs:	Interrupt values of modules MM 240/A, DI 2xx/A and DM 2xx/A

7.5.1 Example 1: Typical configuration

Calculation of the power consumption

The BL 210/B provides 8.5 W for add-on modules.

Add-on module:	Power consumption:
Digital hybrid module	0.4 W
Digital hybrid module	0.4 W
Temperature module and temperature measurement sensor	0.6 W
Analog hybrid module	0.3 W
Total	**1.7 W < 8.5 W**

Calculation of the bus load

Determined:

- **Baud rate: 500 kBit**
- **Cycle time: 10 ms**

Data volume:

	Input	Output
Digital hybrid module	1 Byte	1 Byte
Digital hybrid module	1 Byte	1 Byte
Temperature module and temperature measurement sensor	3 Byte	0 Byte
Analog hybrid module	8 Byte	8 Byte
Analog hybrid module	8 Byte	8 Byte
Total	**21 Byte**	**18 Byte**

This results in the following suggestion for a PDO-mapping:

RxPDO1	8 Byte (AM 280/A)	TxPDO1	8 Byte (AM 280/A)
RxPDO2	2 Byte (DIs)	TxPDO2	2 Byte (DOs)
RxPDO3	8 Byte (AM 280/A)	TxPDO3	8 Byte (AM 280/A)
RxPDO4	3 Byte (TM 240/A)		

The PDO is set together of one data overhead (addressing, object numbers,...) with 8 Byte and the user data specified above. The data transfer time is 2 µs per Bit.

Overhead RxPDO1:	8 Byte * 8 Bit = 64 Bit * 2 µs = 128 µs
User data RxPDO1:	8 Byte * 8 Bit = 64 Bit * 2 µs = 128 µs
Overhead RxPDO2:	8 Byte * 8 Bit = 64 Bit * 2 µs = 128 µs
User data RxPDO2:	2 Byte * 8 Bit = 16 Bit * 2 µs = 32 µs
Overhead RxPDO3:	8 Byte * 8 Bit = 64 Bit * 2 µs = 128 µs
User data RxPDO3:	8 Byte * 8 Bit = 64 Bit * 2 µs = 128 µs
Overhead RxPDO4:	8 Byte * 8 Bit = 64 Bit * 2 µs = 128 µs
User data RxPDO4:	3 Byte * 8 Bit = 24 Bit * 2 µs = 48 µs
Overhead TxPDO1:	8 Byte * 8 Bit = 64 Bit * 2 µs = 128 µs
User data TxPDO1:	8 Byte * 8 Bit = 64 Bit * 2 µs = 128 µs
Overhead TxPDO2:	8 Byte * 8 Bit = 64 Bit * 2 µs = 128 µs
User data TxPDO2:	2 Byte * 8 Bit = 16 Bit * 2 µs = 32 µs
Overhead TxPDO3:	8 Byte * 8 Bit = 64 Bit * 2 µs = 128 µs
User data TxPDO3:	8 Byte * 8 Bit = 64 Bit * 2 µs = 128 µs
Overhead Sync-Signal:	8 Byte * 8 Bit = 64 Bit * 2 µs = 128 µs
Total:	1648 µs

At a cycle time of 10 ms this corresponds with a bus load of 16.48%.

7.5.2 Example 2: Minimum configuration

Calculation of the power consumption

The BL 210/B provides 8.5 W for add-on modules.

Add-on module:	Power consumption:
Digital hybrid module	0.4 W
Digital hybrid module	0.4 W
Total	**0.8 W < 8.5 W**

Calculation of the bus load

Determined:

- **Baud rate: 500 kBit**
- **Cycle time: 2 ms**

Data volume:

	Input	Output
Digital hybrid module	1 Byte	1 Byte
Digital hybrid module	1 Byte	1 Byte
Total	**2 Byte**	**2 Byte**

This results in the following suggestion for a PDO-mapping:

RxPDO1 2 Byte TxPDO1 2 Byte

The PDO is set together of one data overhead (addressing, object numbers,...) with 8 Byte and the user data specified above. The data transfer time is 2 µs per Bit.

Overhead RxPDO1:	8 Byte * 8 Bit = 64 Bit * 2 µs = 128 µs
User data RxPDO1:	2 Byte * 8 Bit = 16 Bit * 2 µs = 32 µs
Overhead TxPDO1:	8 Byte * 8 Bit = 64 Bit * 2 µs = 128 µs
User data TxPDO1:	2 Byte * 8 Bit = 16 Bit * 2 µs = 32 µs
Overhead Sync-Signal:	8 Byte * 8 Bit = 64 Bit * 2 µs = 128 µs

Total	448 µs

At a cycle time of 2 ms this corresponds with a bus load of approx. 25%.

7.6 Firmware update

The “SANMOTION C” system enables a centralized, automatic update of the firmware installed on the BL 210/B. Current firmware versions can be transferred from the central processor module to the module specified for the update via USB stick.

There are two different versions of updates:

- Update of all modules of a given type
- Selecting specific modules for an update

Further information: See system manual.

After the update and the programming of the last data segment the BL 210/B will execute a reset via the Watchdog. For safety SYNC, PDO, NMT and nodeguarding are not supported during the update.

CAUTION

- **Interrupting the voltage supply during the firmware update can damage the BL 210/B (in this case the module has to be sent to SANYO DENKI).**
- **As there are no RAMs for intermediate storage of the entire Flash contents the programming of Flash must be done in smaller packages. The Flash contents may therefore be corrupted in case of transmission errors or power failure (in this case the module has to be sent to SANYO DENKI).**

Information

*The firmware of the BL 210/B is **not** compatible with the firmware of other versions of the bus link module.*

8 Operating behavior

8.1 Response to module errors

Any module error is indicated by the Status LED (red). The BL 210/B will send a status message to the bus master. Once the module error has been removed the system must be newly initialized (new startup).

8.2 Network Management

8.2.1 Module states

The states of the module are orientated at the DS301 CANOpen standard.

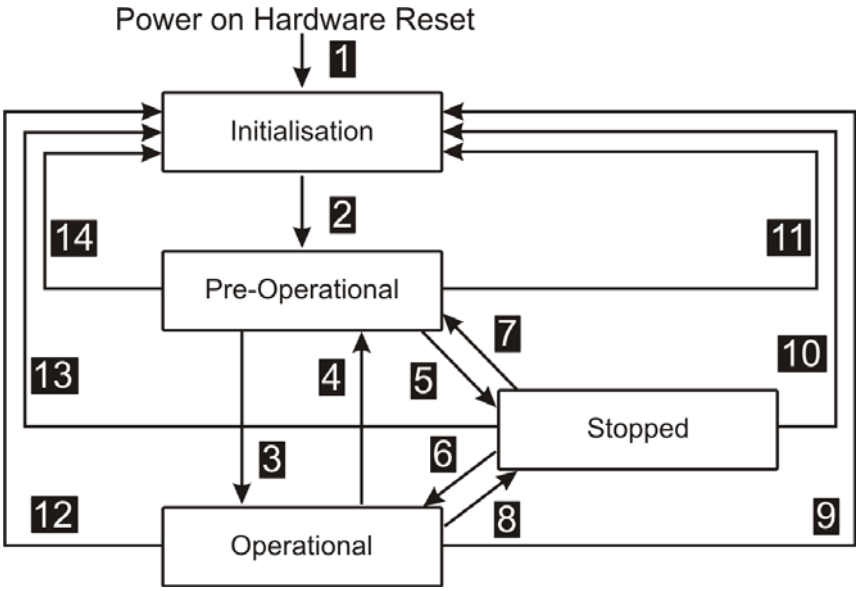


Fig.8-1: state transition diagram

The BL 210/B module knows the following communication states (according to CanOpen Minimal Boot-Up):

INITIALIZATION:

Implementing the basic initialization

PRE_OPERATIONAL:

This status is adopted independently by the module after the initialization phase. In this status the parameterization, but not the process data communication is executed. Outputs are switched off in this status and/or will be switched off during transition into this status.

OPERATIONAL:

Operating status, process and parameter data transmission permitted. PDO parameter cannot be changed in this status anymore.

STOPPED:

No process and parameter data transmission, module does not send error messages.

8.2.2 Status transitions

The module states are changed via the NMT (Network Management Service)

The corresponding CAN-message is structured the following way (2 Byte data content):

CAN-Identifier: 0x00

1) Data byte: Command-Specifier (cs)

2) Data byte: CAN address (0 addresses all nodes = broadcast)

Status transition	Command Specifier cs	Explanation
1		The initialization status is attained independently when switched on.
2		Initialization completed – transition into the status PRE_OPERATIONAL occurs automatically.
3, 6	0x01	Start_Remote_Node Starts the module, releases outputs and starts the transmission of PDOs.
4, 7	0x80	Enter PRE_OPERATIONAL Stops the PDO transmission, SDOs continue to be active.
5, 8	0x02	Stop_Remote_Node Outputs change into error status, SDO and PDO are switched off.
9, 10, 11	0x81	Reset_Node Executes a reset. All objects are reset to Power-On default.
12, 13, 14	0x82	Reset_Communication A reset of the communication functions is executed. Objects 0x1000 – 0x1FFF are reset to Power-On default.

Example 1:

The following telegram can be used to bring all modules throughout the entire network into a stop status (outputs with safe status):

CAN-Identifier:

0x00

cs=0x02

CAN address 0x00 (broadcast)

Example 2:

The following telegram is used to reset node 28(Reset):

CAN-Identifier:

0x00

cs=0x81

CAN address 0x1C (Node 28)

8.2.3 Boot Up Message

After the transition from the status INITIALIZATION to PRE-OPERATIONAL the BL 210/B sends a boot up message automatically.

Now the BL 210/B is ready for startup and able to receive SDOs and NMTs.

Structure of the boot up message according to DS 301 V4.01:

Identifier: 0x700 +CAN Address (hex) Date: 0

Example:

Boot Up message from node 28:

Identifier: 0x71C

Date: 0x00

8.2.4 Node Monitoring

The CANOpen specification describes two mechanisms for node monitoring:

Guarding and Heartbeat.

Both mechanisms are supported by the BL 210/B. Only one of the two mechanisms can be active at any one time.

Guarding

The master monitors the connected periphery via Node Guarding. Hereto the master sets remote frames (message requirement telegrams).

With the assistance of Life Guarding the periphery can recognize whether or not a master has failed in which case all outputs are set to 0. The periphery replies to the master's remote frames with the guarding message. This contains the status-code and a toggle bit. If this message does not conform with the message that the master expects, or in case the master receives no answer at all, the master assumes that an error occurred at the periphery.

Heartbeat

At the heartbeat process the periphery and the master transmit the messages cyclically. This can be done without remote frames so that fewer bus load is gener-

ated than during the guarding process. If the node monitoring is activated by Heartbeat, the BL 210/B works as heartbeat producer exclusively.

9 Diagnosis

9.1 Emergency Message

The following tables list the meaning of the Error-Codes (according to DS301).

The error buffer can be read out via object 0x1003:

Word Structure of an Emergency Message with Error Code 0x0000 - 0x6000

Byte	Designation	Acceptation
0 - 1	Error code	See next chapter "Error Codes"
2	Error register	Affected register
3	K-Bus address	Affected K-Bus module address
4	Function-ID	Function-ID of the affected K-Bus module (see chapter: "Appendix: Object descriptions".
5 - 6	Status	Module specific content (see tables). Default: 0x0000
7	Error abolition	Indicator if error got solved (see table)

Status (Byte 5 and 6) for I/O – modules

Status-Bit	I/O	Acceptation
0	IO0	0 ... OK 1 ... Sensor break or short circuit
1	IO1	
2	IO2	
3	IO3	
...	...	
15	IO15	

Every bit is for one in- or output. If modules have less interfaces, the dispensable bits are zero.

Status (Byte 5 and 6) for AM 280/x and AM 299/x – modules

Status-Bit	I/O	Acceptation
AM 280/x		
0	AI0	0 ... OK 1 ... Sensor break or short circuit
1	AI1	
2	AI2	
3	AI3	
4 - 5	n.b.	
6	K-Bus	1 ... Synchronisation error
7 - 15	n.u.	
AM 299/x		
0	AI0	0 ... OK 1 ... Sensor break or short circuit
1	AI1	
2 - 3	n.b.	-
4	K-Bus	1 ... Synchronisation error
5 - 15	n.u.	-

Status (Byte 5 and 6) for MM 240/x – modules

Bit	Acceptation
0	Describes the affected encoder input: 0 ... Encoder 0 1 ... Encoder 1
1 - 15	n.u.

Error abolition

Byte [hex]	Acceptation
0x0	Content, if a new emergency message got sent (no error abolition)
0x1	Sensor break abolished
0x2	Short circuit abolished
0x3	MM 240: Sensor break trace A abolished
0x4	MM 240: Sensor break trace B abolished
0x5	MM 240: Sensor break zero impulse abolished
0x6	MM 240: Trace error abolished
0x7	MM 240: Zero-impulse error abolished

When abolishing an emergency message cause, a new emergency message with error code 0x000 (see error code table) is triggered. Byte 7: "Error abolition" describes the solved error.

Word Structure of an Emergency Message with Error Code 0x8100 and higher

Word Structure of an Emergency Message with Error Code 0x8101

Byte	Acceptation
0 - 1	Error code
2	Error registor
3 - 4	PDO Number
5 - 7	n.u.

Word Structure of further Emergency Message with Error Code 0x8100 and higher

Byte	Acceptation
0 - 1	Error code
2	Error registor
3 - 7	PDO Number

9.2 Error codes

The following table lists the meaning of the Error-Codes (according to DS301).

The error buffer can be read out via object 0x1003:

Error Code (hex)	Significance	Reaction
0x0000	Error reset or no error	
0x2320	Short circuit at output	
0x3000	Voltage error, input voltage outside permitted range or sensor failure	according to 0x1029/3 change to XXX_ERROR
0x5000	Device hardware (Error message triggered through K-Bus module)	Change to PRE_OPERATIONAL_ERROR
0x5001	Device hardware (K-Bus)	Change to PRE_OPERATIONAL_ERROR
0x5002	Device hardware (K-Bus): Error at power-down line (remains active after start-up)	Change to PRE_OPERATIONAL_ERROR
0x5003	Device hardware (K-Bus): Error at down line (remains active after start-up)	Change to PRE_OPERATIONAL_ERROR
0x5004	There are more modules than permitted on the K-Bus	Change to PRE_OPERATIONAL_ERROR
0x5005	K-Bus WAIT-Line is blocked by a device	Change to PRE_OPERATIONAL_ERROR
0x5007	A K-Bus module was unplugged from the K-Bus	Change to PRE_OPERATIONAL_ERROR
0x5008	SERR-line active	Change to PRE_OPERATIONAL_ERROR
0x5009	At least one unknown module is attached to the K-Bus	Change to PRE_OPERATIONAL
0x500A	Several modules of the same type detected with the same address (hex-switch position)	Change to PRE_OPERATIONAL_ERROR
0x5030	MM 240: HW-counter overflow before the previous counter was reset	Change to PRE_OPERATIONAL_ERROR
0x5031	MM 240: Sensor failure line A	Change to PRE_OPERATIONAL_ERROR
0x5032	MM 240: Sensor failure line B	Change to PRE_OPERATIONAL_ERROR
0x5033	MM 240: Sensor failure zero impulse line	Change to PRE_OPERATIONAL_ERROR
0x5034	MM 240: Track error	Change to PRE_OPERATIONAL_ERROR
0x5035	MM 240: Zero impulse error A	Change to PRE_OPERATIONAL_ERROR
0x6000	Device software (Assertion failure, watchdog)	Module reset
0x8100	Communication (Sync-timeout)	According to 0x1029/1 change to XXX_ERROR
0x8101	Communication (PDO lost, missing setpoints, message in case two sequential PDO's are missing)	According to 0x1029/1 change to XXX_ERROR

Error Code (hex)	Significance	Reaction
0x8110	CAN overrun (Objects lost, overrun in CAN-controller)	According to 0x1029/1 change to XXX_ERROR
0x8120	CAN in error passive mode	According to 0x1029/1 change to XXX_ERROR Reset CAN-controller -> recover from bus off
0x8130	Life guard error or heartbeat error	According to 0x1029/1 change to XXX_ERROR
0x8140	Recovered from bus off	
0x8210	PDO not processed due to length error	The manufacturer-specific error field contains the CAN-ID of the PDO (PDO will be treated as failed and therefore the same reaction as with error 0x8101)

10 Disposal

10.1 Disposal of the module

CAUTION

Please observe the regulations regarding disposal of electric appliances and electronic devices!

- Electrical and electronic devices including their accessories must not be disposed of in the household garbage.
- The materials are recyclable in accordance with their labeling. You can make an important contribution to protecting our environment by reusing, renewing and recycling materials and old appliances

11 Technical Data

11.1 In general

Rated supply voltage:	24 V DC from the front (rated voltage tolerance 19.2 V DC to 30 V DC, in acc. with EN 61131-2) *)
Max. switch-on current:	7 A
Overvoltage category:	II
Equipment class:	III according to EN 61131-2:2007
Max. total power consumption:	58 W
- Max. own power consumption:	4.5 W
- Max. output power K-Bus 5 V:	8.5 W
- Max. output power K-Bus 24 V:	45 W
Protected against:	Reversed polarity, overload, revered feed-in, short circuit
Supply connection terminals:	Open terminals, grid dimensions 5.08 mm
Addressing on the K-Net:	16-digit address switch on front side
Protection class:	IP20

11.2 Environmental conditions

Operating temperature:	+0 °C to +55 °C
Storage temperature:	-40 °C to +70 °C
Relative humidity of air:	10 % to 95 % (non condensing)
Vibration resistance:	according to EN 61131-2:2007
Shock resistance:	according to EN 61131-2:2007

11.3 CAN Interface

CAN interface:	1
Data transmission rate:	Adjustable via rotary switch: 125 kbit/s to 1Mbit/s
Terminating resistor:	Yes, can be bridged in plug
Galvanic isolation:	No
Connection:	DSUB 9-pin pin plug

11.4 Dimensions, Weight

Height:	120 mm
Width (with / without K-Bus plug):	32.5 mm / 22.5 mm
Depth:	100 mm
Weight:	121 g

Information

****) for the power supply voltage: Chapter 5.1.1.3 of the EN61131-2 2007 is fulfilled in the severity level PS1. To achieve the severity level PS2, a power supply unit must be selected that fulfils the necessary requirements.***

12 EC directives and standards

12.1 EC directives

Guideline 2004/108/EG	EC guideline on electromagnetic compatibility
Guideline 2011/65/EU	RoHS guideline

12.2 Standards

To check the conformity of the system with the directives, the following nonbinding legal European standards were applied:

12.2.1 General procedures and safety principles

EN 61131-1:2003	Programmable controllers - Part 1

Information

This product was developed for the use in industrial areas and can cause radio interference when used in residential areas.

12.2.2 EMC guideline

EN 61131-2:2007	Programmable controllers - Part 2

12.2.3 Electrical safety and fire protection

EN 61131-2:2007	Programmable controllers - Part 2

12.2.4 Environmental and surrounding conditions Operation with compact flash card or SSD

EN 61131-2:2007	Programmable controllers - Part 2

12.3 Standards for the American market

12.3.1 UL test for industrial control equipment

UL 508, 2005	Industrial Control Equipment

13 Appendix: Object descriptions

This chapter contains detailled information about the individual objects.

13.1 General objects

Legend

Index:	16-Bit entry
Sub-Index:	8-Bit entry
Attribute:	Access via SDO transfer. The following attributes are possible: • ro...read only • rw...read/write • const...constants
PDO mapping:	0 ... No PDO mapping possible 1 ... PDO mapping possible

Overview

Index	Sub-Index	Designation	Type	Attr.	Value	PDO-Mapping
0x1000	0x00	Device type	UNSIGNED32	ro	0x0000191	0
0x1001	0x00	Error register	UNSIGNED8	ro		0
0x1002		Manufacturer status register	UNSIGNED32	ro		0
0x1003		Pre-defined error field				
	0x00	Number of stored error states	UNSIGNED8	rw	0x00	0
	0x01	Actual error	UNSIGNED32	ro	-	0
	0x02	Standard error field	UNSIGNED32	ro	-	0
	…	…	…	…	…	0
	0x0A	Standard error field	UNSIGNED32	ro	-	0
0x1005		COB-ID SYNC message	UNSIGNED32	rw	0x80000080	0
0x1008		Manufacturer device name	VISIBLE_STRING	const	"BL 210/B"	0
0x100A		Manufacturer software version	VISIBLE_STRING	const	"BL210B_x.xx"	0
0x100C		Guard time	UNSIGNED16	rw		0
0x100D		Life time factor	UNSIGNED8	rw		0
0x1014		COB-ID EMCY	UNSIGNED32	ro	0x00000080	0
0x1015		Inhibit time EMCY	UNSIGNED16	rw	0	0
0x1017		Producer heartbeat time	UNSIGNED16	rw	0	0
0x1018		Identity object				
	0x00	Number of subindxes	UNSIGNED8	ro	2	0
	0x01	Vendor ID	UNSIGNED32	ro	0x00000105	0
0x1029		Error behaviour				

Index	Sub-Index	Designation	Type	Attr.	Value	PDO-Mapping
	0x00	Number of subindxes	UNSIGNED8	ro	3	0
	0x01	Communication error	UNSIGNED8	rw	0	0
	0x02	Output error	UNSIGNED8	rw	1	0
	0x03	Input error	UNSIGNED8	rw	1	0
0x1400		1st receive PDO communication parameter				
	0x00	Number of subindxes	UNSIGNED8	ro	2	0
	0x01	COB-ID used by PDO	UNSIGNED32	rw	0x200+Node ID	0
	0x02	Transmission type	UNSIGNED8	rw	1	0
0x1401		2nd receive PDO communication parameter				
	0x00	Number of subindxes	UNSIGNED8	ro	2	0
	0x01	COB-ID used by PDO	UNSIGNED32	rw	0x300+Node ID	0
	0x02	Transmission type	UNSIGNED8	rw	1	0
0x1402		3rd receive PDO communication parameter				
	0x00	Number of subindxes	UNSIGNED8	ro	2	0
	0x01	COB-ID used by PDO	UNSIGNED32	rw	0x400+Node ID	0
	0x02	Transmission type	UNSIGNED8	rw	1	0
0x1403		4th receive PDO communication parameter				
	0x00	Number of subindxes	UNSIGNED8	ro	2	0
	0x01	COB-ID used by PDO	UNSIGNED32	rw	0x500+Node ID	0
	0x02	Transmission type	UNSIGNED8	rw	1	0
0x1404		5th receive PDO communication parameter				
	0x00	Number of subindxes	UNSIGNED8	ro	2	0
	0x01	COB-ID used by PDO	UNSIGNED32	rw	0x80000000	0
	0x02	Transmission type	UNSIGNED8	rw	1	0
0x1405		6th receive PDO communication parameter				
	0x00	Number of subindxes	UNSIGNED8	ro	2	0
	0x01	COB-ID used by PDO	UNSIGNED32	rw	0x80000000	0
	0x02	Transmission type	UNSIGNED8	rw	1	0
0x1406		7th receive PDO communication parameter				
	0x00	Number of subindxes	UNSIGNED8	ro	2	0
	0x01	COB-ID used by PDO	UNSIGNED32	rw	0x80000000	0

Index	Sub-Index	Designation	Type	Attr.	Value	PDO-Mapping
	0x02	Transmission type	UNSIGNED8	rw	1	0
0x1407		8th receive PDO communication parameter				
	0x00	Number of subindxes	UNSIGNED8	ro	2	0
	0x01	COB-ID used by PDO	UNSIGNED32	rw	0x80000000	0
	0x02	Transmission type	UNSIGNED8	rw	1	0
0x1600		1st receive PDO mapping parameter				
	0x00	Number of mapped application objects in PDO	UNSIGNED8	rw		0
	0x01 .. 0x08	PDO mapping for the n-th application object to be mapped	UNSIGNED32	rw		0
0x1601		2nd receive PDO mapping parameter				
	0x00	Number of mapped application objects in PDO	UNSIGNED8	rw		0
	0x01 .. 0x08	PDO mapping for the n-th application object to be mapped	UNSIGNED32	rw		0
0x1602		3rd receive PDO mapping parameter				
	0x00	Number of mapped application objects in PDO	UNSIGNED8	rw		0
	0x01 .. 0x08	PDO mapping for the n-th application object to be mapped	UNSIGNED32	rw		0
0x1603		4th receive PDO mapping parameter				
	0x00	Number of mapped application objects in PDO	UNSIGNED8	rw		0
	0x01 .. 0x08	PDO mapping for the n-th application object to be mapped	UNSIGNED32	rw		0
0x1604		5th receive PDO mapping parameter				
	0x00	Number of mapped application objects in PDO	UNSIGNED8	rw		0
	0x01 .. 0x08	PDO mapping for the n-th application object to be mapped	UNSIGNED32	rw		0
0x1605		6th receive PDO mapping parameter				
	0x00	Number of mapped application objects in PDO	UNSIGNED8	rw		0
	0x01 .. 0x08	PDO mapping for the n-th application object to be mapped	UNSIGNED32	rw		0
0x1606		7th receive PDO mapping parameter				
	0x00	Number of mapped application objects in PDO	UNSIGNED8	rw		0
	0x01 .. 0x08	PDO mapping for the n-th application object to be mapped	UNSIGNED32	rw		0
0x1607		8th receive PDO mapping parameter				
	0x00	Number of mapped application objects in PDO	UNSIGNED8	rw		0
	0x01 .. 0x08	PDO mapping for the n-th application object to be mapped	UNSIGNED32	rw		0

Index	Sub-Index	Designation	Type	Attr.	Value	PDO-Mapping
0x1800		1st transmit PDO communication parameter				
	0x00	Number of subindxes	UNSIGNED8	ro	2	0
	0x01	COB-ID used by PDO	UNSIGNED32	rw	0x180+Node ID	0
	0x02	Transmission type	UNSIGNED8	rw	1	0
0x1801		2nd transmit PDO communication parameter				
	0x00	Number of subindxes	UNSIGNED8	ro	2	0
	0x01	COB-ID used by PDO	UNSIGNED32	rw	0x280+Node ID	0
	0x02	Transmission type	UNSIGNED8	rw	1	0
0x1802		3rd transmit PDO communication parameter				
	0x00	Number of subindxes	UNSIGNED8	ro	2	0
	0x01	COB-ID used by PDO	UNSIGNED32	rw	0x380+Node ID	0
	0x02	Transmission type	UNSIGNED8	rw	1	0
0x1803		4th transmit PDO communication parameter				
	0x00	Number of subindxes	UNSIGNED8	ro	2	0
	0x01	COB-ID used by PDO	UNSIGNED32	rw	0x480+Node ID	0
	0x02	Transmission type	UNSIGNED8	rw	1	0
0x1804		5th transmit PDO communication parameter				
	0x00	Number of subindxes	UNSIGNED8	ro	2	0
	0x01	COB-ID used by PDO	UNSIGNED32	rw	0x80000000	0
	0x02	Transmission type	UNSIGNED8	rw	1	0
0x1805		6th transmit PDO communication parameter				
	0x00	Number of subindxes	UNSIGNED8	ro	2	0
	0x01	COB-ID used by PDO	UNSIGNED32	rw	0x80000000	0
	0x02	Transmission type	UNSIGNED8	rw	1	0
0x1806		7th transmit PDO communication parameter				
	0x00	Number of subindxes	UNSIGNED8	ro	2	0
	0x01	COB-ID used by PDO	UNSIGNED32	rw	0x80000000	0
	0x02	Transmission type	UNSIGNED8	rw	1	0

Index	Sub-Index	Designation	Type	Attr.	Value	PDO-Mapping
0x1807		8th transmit PDO communication parameter				
	0x00	Number of subindxes	UNSIGNED8	ro	2	0
	0x01	COB-ID used by PDO	UNSIGNED32	rw	0x80000000	0
	0x02	Transmission type	UNSIGNED8	rw	1	0
0x1810		17th transmit PDO interrupt line 1 communication parameter Interrupt line 1				
	0x00	Number of subindxes	UNSIGNED8	ro	2	0
	0x01	COB-ID used by PDO	UNSIGNED32	rw	0x80000000	0
	0x02	Transmission type	UNSIGNED8	rw	1	0
0x1811		18th transmit PDO interrupt line 2 communication parameter Interrupt line 2				
	0x00	Number of subindxes	UNSIGNED8	ro	2	0
	0x01	COB-ID used by PDO	UNSIGNED32	rw	0x80000000	0
	0x02	Transmission type	UNSIGNED8	rw	1	0
0x1812		19th transmit PDO interrupt line 3 communication parameter Interrupt line 3				
	0x00	Number of subindxes	UNSIGNED8	ro	2	0
	0x01	COB-ID used by PDO	UNSIGNED32	rw	0x80000000	0
	0x02	Transmission type	UNSIGNED8	rw	1	0
0x1813		20th transmit PDO interrupt line 4 communication parameter Interrupt line 4				
	0x00	Number of subindxes	UNSIGNED8	ro	2	0
	0x01	COB-ID used by PDO	UNSIGNED32	rw	0x80000000	0
	0x02	Transmission type	UNSIGNED8	rw	1	0
0x1A00		1st transmit PDO mapping parameter				
	0x00	Number of mapped application objects in PDO	UNSIGNED8	rw		0
	0x01 .. 0x08	PDO mapping for the n-th application object to be mapped	UNSIGNED32	rw		0
0x1A01		2nd transmit PDO mapping parameter				
	0x00	Number of mapped application objects in PDO	UNSIGNED8	rw		0
	0x01 .. 0x08	PDO mapping for the n-th application object to be mapped	UNSIGNED32	rw		0

Index	Sub-Index	Designation	Type	Attr.	Value	PDO-Mapping
0x1A02		3rd transmit PDO mapping parameter				
	0x00	Number of mapped application objects in PDO	UNSIGNED8	rw		0
	0x01 .. 0x08	PDO mapping for the n-th application object to be mapped	UNSIGNED32	rw		0
0x1A03		4th transmit PDO mapping parameter				
	0x00	Number of mapped application objects in PDO	UNSIGNED8	rw		0
	0x01 .. 0x08	PDO mapping for the n-th application object to be mapped	UNSIGNED32	rw		0
0x1A04		5th transmit PDO mapping parameter				
	0x00	Number of mapped application objects in PDO	UNSIGNED8	rw		0
	0x01 .. 0x08	PDO mapping for the n-th application object to be mapped	UNSIGNED32	rw		0
0x1A05		6th transmit PDO mapping parameter				
	0x00	Number of mapped application objects in PDO	UNSIGNED8	rw		0
	0x01 .. 0x08	PDO mapping for the n-th application object to be mapped	UNSIGNED32	rw		0
0x1A06		7th transmit PDO mapping parameter				
	0x00	Number of mapped application objects in PDO	UNSIGNED8	rw		0
	0x01 .. 0x08	PDO mapping for the n-th application object to be mapped	UNSIGNED32	rw		0
0x1A07		8th transmit PDO mapping parameter				
	0x00	Number of mapped application objects in PDO	UNSIGNED8	rw		0
	0x01 .. 0x08	PDO mapping for the n-th application object to be mapped	UNSIGNED32	rw		0
0x1A10		17th transmit PDO interrupt line 1 mapping parameter Interrupt line 1				
	0x00	Number of mapped application objects in PDO	UNSIGNED8	rw	2	0
	0x01	Interrupt status	UNSIGNED32	rw	0x50000108	0
	0x02	Timestamp	UNSIGNED32	rw	0x50000220	0

Index	Sub-Index	Designation	Type	Attr.	Value	PDO-Mapping
0x1A11		18th transmit PDO interrupt line 2 mapping parameter Interrupt line 2				
	0x00	Number of mapped application objects in PDO	UNSIGNED8	rw	2	0
	0x01	Interrupt status	UNSIGNED32	rw	0x50000108	0
	0x02	Timestamp	UNSIGNED32	rw	0x50000220	0
0x1A12		19th transmit PDO interrupt line 3 mapping parameter Interrupt line 3				
	0x00	Number of mapped application objects in PDO	UNSIGNED8	rw	2	0
	0x01	Interrupt status	UNSIGNED32	rw	0x50000108	0
	0x02	Timestamp	UNSIGNED32	rw	0x50000220	0
0x1A13		20th transmit PDO interrupt line 4 mapping parameter Interrupt line 4				
	0x00	Number of mapped application objects in PDO	UNSIGNED8	rw	2	0
	0x01	Interrupt status	UNSIGNED32	rw	0x50000108	0
	0x02	Timestamp	UNSIGNED32	rw	0x50000220	0
0x2001		Firmwareupdate	OCTET_STRING	wo		0
	0x00	Number of subindxes	UNSIGNED8	ro	12	0
	0x01	1st K-Bus module status info	UNSIGNED8	ro		1
	0x02	2nd K-Bus module status info	UNSIGNED8	ro		1
	0x03	3rd K-Bus module status info	UNSIGNED8	ro		1
	0x04	4th K-Bus module status info	UNSIGNED8	ro		1
	0x05	5th K-Bus module status info	UNSIGNED8	ro		1
	0x06	6th K-Bus module status info	UNSIGNED8	ro		1
	0x07	7th K-Bus module status info	UNSIGNED8	ro		1
	0x08	8th K-Bus module status info	UNSIGNED8	ro		1
	0x09	9th K-Bus module status info	UNSIGNED8	ro		1
	0x0A	10th K-Bus module status info	UNSIGNED8	ro		1
	0x0B	11th K-Bus module status info	UNSIGNED8	ro		1
	0x0C	12th K-Bus module status info	UNSIGNED8	ro		1

Index	Sub-Index	Designation	Type	Attr.	Value	PDO-Mapping
0x2010 - 0x201B		K-Bus module mapping (modules 1- 12)				
	0x00	Number of subindxes	UNSIGNED8	ro	10	0
	0x01	K-Bus ID + address switch position	UNSIGNED16	ro		0
	0x02	1st interrupt PDO number	UNSIGNED8	rw		0
	0x03	Mapping for the n-th application object to be mapped	UNSIGNED32	ro		0
	0x04	Mapping for the n-th application object to be mapped	UNSIGNED32	ro		0
	0x05	Mapping for the n-th application object to be mapped	UNSIGNED32	ro		0
	0x06	Mapping for the n-th application object to be mapped	UNSIGNED32	ro		0
	0x07	Mapping for the n-th application object to be mapped	UNSIGNED32	ro		0
	0x08	Mapping for the n-th application object to be mapped	UNSIGNED32	ro		0
	0x09	Mapping for the n-th application object to be mapped	UNSIGNED32	ro		0
	0x0A	Mapping for the n-th application object to be mapped	UNSIGNED32	ro		0
0x2020 - 0x202B		K-Bus module hardware information (module 1 - 12)				
	0x00	Number of subindxes	UNSIGNED8	ro	10	0
	0x01	Name	VISIBLE_STRING	ro		0
	0x02	Version	UNSIGNED8	ro		0
	0x03	Hardware revision	UNSIGNED8	ro		0
	0x04	Not relevant	UNSIGNED8	ro		0
	0x05	Print number	UNSIGNED32	ro		0
	0x06	Serial number	UNSIGNED32	ro		0
	0x07	Order number	UNSIGNED32	ro		0
	0x08	Device number	UNSIGNED32	ro		0
	0x09	Initiation time	UNSIGNED32	ro		0
	0x0A	Runtime	UNSIGNED32	ro		0
0x2030		BL 210/B hardware information				
	0x00	Number of subindxes	UNSIGNED8	ro	10	0
	0x01	Name	VISIBLE_STRING	ro		0
	0x02	Version	UNSIGNED8	ro		0
	0x03	Hardware revision	UNSIGNED8	ro		0
	0x04	Not relevant	UNSIGNED8	ro		0
	0x05	Print number	UNSIGNED32	ro		0
	0x06	Serial number	UNSIGNED32	ro		0

Index	Sub-Index	Designation	Type	Attr.	Value	PDO-Mapping
	0x07	Order number	UNSIGNED32	ro		0
	0x08	Device number	UNSIGNED32	ro		0
	0x09	Initiation time	UNSIGNED32	ro		0
	0x0A	Runtime	UNSIGNED32	ro		0
0x2200		SYNC timeout	UNSIGNED16	rw	0	0

Tab.14-1: Overview of the general objects

13.1.1 Device Type (Object 0x1000)

Index	Sub-Index	Designation	Type	Attr.	Value	PDO-Mapping
0x1000	0x00	Device type	UNSIGNED32	ro	0x0000191	0

The 32Bit-value is divided up into two 16-bit-fields

1) 16-bit-field (additional information): 0000 0000 0000 wxyz

- w=1: analog outputs given
- x=1: analog inputs given
- y=1: digital outputs given
- z=1: digital inputs given

2) 16-bit-field (device profile number): 0x191

The device type provides only a rough classification of the device.

13.1.2 Error Register (Object 0x1001)

Index	Sub-Index	Designation	Type	Attr.	Value	PDO-Mapping
0x1001	0x00	Error register	UNSIGNED8	ro		0

The 8-bit value is structured the following way:

Bit	Error description
0	An error that is not specified any further occurred
1	Power failure
2	Voltage failure
3	Temperature failure
4	Communication error (Overrun CAN)
5	Device profile-specific Error
6	Reserved (always 0)
7	Manufacturer-specific error (specified in more detail in object 1003)

13.1.3 Status Register (Object 0x1002)

Index	Sub-Index	Designation	Type	Attr.	Value	PDO-Mapping
0x1002		Manufacturer status register	UNSIGNED32	Ro		0

The 32Bit-value provides information on the current status of the transceiver.

State	Value
INITIALISATION	0x00000001
PRE_OPERATIONAL	0x00000002
OPERATIONAL	0x00000004
STOPPED	0x00000008
INITIALISATION_ERROR	0x00000081
PRE_OPERATIONAL_ERROR	0x00000082
OPERATIONAL_ERROR	0x00000084
STOPPED _ERROR	0x00000088

13.1.4 Error Memory (Object 0x1003)

Index	Sub-Index	Designation	Type	Attr.	Value	PDO-Mapping
0x1003		Pre-defined error field				
	0x00	Number of saved error states	UNSIGNED8	rw	0x00	0
	0x01	Current error	UNSIGNED32	ro	-	0
	0x02	Standard error field	UNSIGNED32	ro	-	0
	…	…	…	…	…	0
	0xA	Standard error field	UNSIGNED32	ro	-	0

The Sub-Index 0x00 contains the number of error states that are stored. By writing a 0 on to the Sub-Index 0x00 the entire error memory will be deleted.

The 32Bit-value is divided up into two 16Bit-fields MSB: Addtional information (is not used and set to 0) LSB: Error Code (description of error).

According to DS301 a maximum of 16 error messages can be stored.

13.1.5 Sync Message (Sync Identifier, Object 0x1005)

Index	Sub-Index	Designation	Type	Attr.	Value	PDO-Mapping
0x1005		COB-ID SYNC message	UNSIGNED32	rw	0x80000080	0

Bit 30 of the 32Bit-value specifies whether the CAN-device sends out (1) or receives (0) SYNC-telegrams. The BL 210/B is a SYNC – consumer, which is why Bit 30 = 0.

13.1.6 Device Name (Object 0x1008)

Index	Sub-Index	Designation	Type	Attr.	Value	PDO-Mapping
0x1008		Manufacturer device name	VISIBLE_STRING	const	"BL 210/B"	0

13.1.7 Software Version (Object 0x100A)

Index	Sub-Index	Designation	Type	Attr.	Value	PDO-Mapping
0x100A		Manufacturer software version	VISIBLE_STRING	const	"BL 210/B"	0

13.1.8 Guard Time (Object 0x100C)

Index	Sub-Index	Designation	Type	Attr.	Value	PDO-Mapping
0x100C		Guard time	UNSIGNED16	rw		0

Specifies the distance between two guard-telegrams and is set by the NMTMaster or the configuration tool. In case the guard time = 0 the node will not execute a lifeguarding, but can be monitored by the master via node guarding.

13.1.9 Life Time Factor (Object 0x100D)

Index	Sub-Index	Designation	Type	Attr.	Value	PDO-Mapping
0x100D		Life time factor	UNSIGNED8	rw		0

```
life time [ms] = life time factor * guard time [ms]
```

If no guarding-telegram was received during the life time, the node will switch into error mode. In case the life time factor = 0 the node will not execute a lifeguarding, but can be monitored by the master via node guarding.

13.1.10 Emergency Identifier (Object 0x1014)

Index	Sub-Index	Designation	Type	Attr.	Value	PDO-Mapping
0x1014		COB-ID EMCY	UNSIGNED32	ro	0x00000080	0

The MSBit of the emergency identifier can be adjusted to have the device send out (1) or not send out (0) an emergency-telegram.

13.1.11 Inhibit Time EMCY (Emergency Delay Timer, Object 0x1015)

Index	Sub-Index	Designation	Type	Attr.	Value	PDO-Mapping
0x1015		Inhibit time EMCY	UNSIGNED16	rw	0	0

13.1.12 Heartbeat Producer (Object 0x1017)

Index	Sub-Index	Designation	Type	Attr.	Value	PDO-Mapping
0x1017		Producer heartbeat time	UNSIGNED16	rw	0	0

Specify the time in ms between two heartbeat-telegrams that are sent out.

13.1.13 Device Identification (Identity Object, Object 0x1018)

Index	Sub-Index	Designation	Type	Attr.	Value	PDO-Mapping
0x1018		Identity object				
	0x00	Number of subindxes	UNSIGNED8	ro	2	0
	0x01	Vendor ID	UNSIGNED32	ro	0x00000105	0

13.1.14 Error Behavior (Object 0x1029)

Index	Sub-Index	Designation	Type	Attr.	Value	PDO-Mapping
0x1029		Error behaviour				
	0x00	Number of subindxes	UNSIGNED8	ro	3	0
	0x01	Communication error	UNSIGNED8	rw	0	0
	0x02	Output error	UNSIGNED8	rw	1	0
	0x03	Input error	UNSIGNED8	rw	1	0

This object determines the behavior of the BL 210/B during error states:

- Communication error: Defines the behavior at bus-off, nodeguarding, sync-failure (0).
  Default behavior: Switches to pre-operational
- Output error: At present not used
  Default behavior: No state change
- Input error: Used for the definition of the behavior at sensor failure
  Default behavior: No state change

13.1.15 Communication Parameter RxPDO (Object 0x1400 .. 0x1407)

Object 0x1400: 1. receive PDO
....
Object 0x1407: 8. receive PDO

The minimum number of PDO-configuration objects is determined by the necessary receive-PDOs for the K-Bus-modules.

Index	Sub-Index	Designation	Type	Attr.	Value	PDO-Mapping
0x140x		Receive PDO communication parameter				
	0x00	Number of subindxes	UNSIGNED8	ro	2	0
	0x01	COB-ID used by PDO	UNSIGNED32	rw	0x200+Node ID	0
	0x02	Transmission type	UNSIGNED8	rw	1	0

The Sub-Index 0x00 specifies the number of the following parameters.

The 32Bit-value of the Sub-Index 0x01 (Communication Object Identifier) can be freely defined and is coded in the following way:

Bit 0 – Bit 10:	CAN identifier
Bit 11 – Bit 29:	Reserved
Bit 30:	Specifies whether or not access to this PDO is permitted (0) or not (1)
Bit 31:	Specifies whether the PDO exists (0) or not (1)

It is not permitted to change the identifier (Bit 0 – Bit 10) while the object exists (Bit 31 = 0).

Unlike DS401 the value 1 is used as default value for the transmission type (Sub-Index 2).

Permitted configuration values for transmission type: 0, 1 .. 240, 254

13.1.16 Mapping RxPDO (Object 0x1600 .. 0x1607)

Index	Sub-Index	Designation	Type	Attr.	Value	PDO-Mapping
0x160x		Receive PDO mapping parameter				
	0x00	Number of mapped application objects in PDO	UNSIGNED8	rw		0
	0x01 .. 0x08	PDO mapping for the n-th application object to be mapped	UNSIGNED32	rw		0

The respective Default-Mapping depends on the K-Bus configuration:

- Number
- Module types

The Default-mapping differs from DS401 and provides socalled type-pure PDOs.

Mapping changes

1) Delete PDO: Set the communication parameters in object 0x140x Bit 31 in the identifier-entry (Sub-index 0x01) to 1.

2) Deactivate mapping: Set the sub-index 0x00 of the mapping entry in object 0x160x to 0.

3) Change mapping entries: Change the sub-index 0x01 – 0x08 in object 0x160x.

4) Activate mapping: Set the sub-index 0x00 of the mapping entry in object 0x160x to the correct number of mapped objects.

5) Create PDO: Assign MessageID in object 0x140x (0x200 + Node-ID) and set Bit 31 in the identifier-entry (Sub-Index0x01) of the communication parameter to 0.

13.1.17 Communication Parameter TxPDO (Object 0x1800 .. 0x1807)

Object 0x1800: 1. Transmission PDO
Object 0x1801: 2. Transmission PDO
....
Object 0x1807: 8. Transmission PDO

The minimum number of PDO-configuration objects is determined by the necessary transmission-PDOs for the K-Bus-modules.

Index	Sub-Index	Designation	Type	Attr.	Value	PDO-Mapping
0x180x		Transmit PDO communication parameter				
	0x00	Number of subindxes	UNSIGNED8	ro	2	0
	0x01	COB-ID used by PDO	UNSIGNED32	rw	0x180+Node ID	0
	0x02	Transmission type	UNSIGNED8	rw	1	0

The sub-index 0x00 specifies the number of the following parameters.

The 32Bit-value of the sub-index 0x01 (communication object identifier) can be freely defined and is coded in the following way:

Bit 0 – Bit 10:	CAN identifier
Bit 11 – Bit 29:	Reserved
Bit 30:	Specifies whether or not access to this PDO is permitted (0) or not (1)
Bit 31:	Specifies whether the PDO exists (0) or not (1)

The sub-index 0x00 specifies the number of the following parameters.

The 32Bit-value of the sub-index 0x01 (communication object identifier) can be freely defined and is coded in the following way:

13.1.18 Configuration Parameter TxPDO (Object 0x1810 .. 0x1813)

Object 0x1810: 9. Transmission PDO
Object 0x1811: 10. Transmission PDO
Object 0x1812: 11. Transmission PDO
Object 0x1813: 12. Transmission PDO

The minimum number of PDO-configuration objects is determined by the necessary transmission-PDOs for the K-Bus-modules.

Index	Sub-Index	Designation	Type	Attr.	Value	PDO-Mapping
0x18xx		Transmit PDO communication parameter				
	0x00	Number of subindxes	UNSIGNED8	ro	2	0
	0x01	COB-ID used by PDO	UNSIGNED32	rw	0x180+Node ID	0
	0x02	Transmission type	UNSIGNED8	rw	1	0

The sub-index 0x00 specifies the number of the following parameters.

The 32Bit-value of the sub-index 0x01 (communication object identifier) can be freely defined and is coded in the following way:

Bit 0 – Bit 10:	CAN identifier
Bit 11 – Bit 29:	Reserved
Bit 30:	Specifies whether or not access to this PDO is permitted (0) or not (1)
Bit 31:	Specifies whether the PDO exists (0) or not (1)

It is not permitted to change the identifier (Bit 0 – Bit 10) while the object exists (Bit 31 = 0). Only mode 0 (interrupt-triggered) is permitted as transmission type (sub-index 2).

13.1.19 Mapping TxPDO (Object 0x1A00 .. 0x1A07)

Index	Sub-Index	Designation	Type	Attr.	Value	PDO-Mapping
0x1A0x		Transmit PDO mapping parameter				
	0x00	Number of mapped application objects in PDO	UNSIGNED8	Rw		0
	0x01 .. 0x08	PDO Mapping for the n-th application object to be mapped	UNSIGNED32	rw		0

The respective Default-Mapping depends on the K-Bus configuration:

- Number
- Module types

The default-mapping differs from DS401 and provides socalled type-pure PDOs.

Mapping changes: To change the mapping the following order must be observed:

1) Delete PDO: Set the communication parameters in object 0x180x Bit 31 in the identifier-entry (sub-index 0x01) to 1

2) Deactivate mapping: Set the sub-index 0x00 in object 0x1A0x of the mapping entry to 0

3) Change mapping entries: Change the sub-index 0x01 – 0x08 in object 0x1A0x

4) Activate mapping: Set the sub-index 0x00 of the mapping entry in object 0x1A0x to the correct number of mapped objects

5) Create PDO: Assign MessageID in object 0x180x (0x180 + Node-ID) and set Bit 31 in the identifier-entry (sub-index0x01) of the communication parameter to 0.

13.1.20 Interrupt PDO (Object 0x1A10 .. 0x1A13)

The K-Bus provides an interrupt-mechanism for modules with the corresponding functionality. There are 4 Interrupt lines that can be assigned exclusively to the individual modules. Each module can occupy only one line. The firmware determines the allocation. In case more than 4 modules want to cover one interrupt an error will be issued.

Index	Sub-Index	Designation	Type	Attr.	Value	PDO-Mapping
0x1A1x		17th transmit PDO interrupt line 1 mapping parameter Interruptleitung 1				
	0x00	Number of mapped application objects in PDO	UNSIGNED8	rw	2	0
	0x01	Interrupt status	UNSIGNED32	rw	0x50000108	0
	0x02	Timestamp	UNSIGNED32	rw	0x50000220	0

The sub-index 0x00 specifies the number of the following parameters. If a module triggers an interrupt during normal operations, the BL 210/B will secure a time stamp and the Interrupt status register, which shall be transmitted via PDO in the next cycle. This way no asynchronous PDO will be transmitted.

The interrupt-function of the K-Bus-module is switched of in the default status. The PDOs for the transmission of Interrupts are configured in the following way:

1) Entering the interrupt-PDO-Number (0x10 for line 1 to 0x13 for line 4) in the K-Bus module mapping.

2) This way the interrupt-mapping for this PDO is entered automatically into the previous mapping as follows:

   - Interrupt status register of the K-Bus-module (length is module-specific mapped from object 0x500x/1

   - Timestamp mapped from object 0x500x/2
     This way the interrupt-mapping for this PDO is entered automatically into the previous mapping.

3) If no interrupt-PDO is free (max. 4) the SDO-abort code 0x06060000 is sent to the control.

4) Configuration of the interrupt mask via the objects 0x6007 (rising edge) and object 0x6008 (falling edge). This is only possible if the 1. step was successful.

5) After the configuration of all Interrupt-objects the interrupt function can be released again via the object 0x6005.

Switching the interrupt function off:

1) Either the interrupt mask(s) for the corresponding module are reset or the object 0x6005 is deactivated in order to reset the Interrupt function of all modules.

2) Entering the interrupt-PDO-number 0 into the K-Bus-module mapping (0x201x/2), so that the line is free again and can be used for another interrupt- enabled K-Bus module.

The timestamp object transmitted with the PDO contains the timestamp (in μs relative to the last SYNC-telegram) of the interrupt time.

13.1.21 Firmware Update (Object 0x2001)

This object can be used to execute a Firmware update of the BL 210/B.

Index	Sub-Index	Designation	Type	Attr.	Value	PDO-Mapping
0x2001		Firmware update	OCTET_STRING	wo		0

Further information: See system manual.

13.1.22 Status Info (Object 0x2002)

The state of each connected module can be read out via this object.

Index	Sub-Index	Designation	Type	Attr.	Value	PDO-Mapping
0x2002		Status info				
	0x00	Number of subindixes	UNSIGNED8	ro	12	0
	0x01	1st K-Bus module status info	UNSIGNED8	ro		1
	0x02	2nd K-Bus module status info	UNSIGNED8	ro		1
	0x03	3rd K-Bus module status info	UNSIGNED8	ro		1
	0x04	4th K-Bus module status info	UNSIGNED8	ro		1
	0x05	5th K-Bus module status info	UNSIGNED8	ro		1
	0x06	6th K-Bus module status info	UNSIGNED8	ro		1
	0x07	7th K-Bus module status info	UNSIGNED8	ro		1
	0x08	8th K-Bus module status info	UNSIGNED8	ro		1
	0x09	9th K-Bus module status info	UNSIGNED8	ro		1
	0x0A	10th K-Bus module status info	UNSIGNED8	ro		1
	0x0B	11th K-Bus module status info	UNSIGNED8	ro		1
	0x0C	12th K-Bus module status info	UNSIGNED8	ro		1

13.1.23 K-Bus Module Mapping (Object 0x2010 .. 0x201B)

This object contains the K-Bus-configuration and represents it on the profile specific objects starting as of 0x6000.

Index	Sub-Index	Designation	Type	Attr.	Value	PDO-Mapping
0x2010		1st K-Bus module mapping				
	0x00	Number of subindixes	UNSIGNED8	ro	10	0
	0x01	K-Bus ID + address switch position	UNSIGNED16	ro		0
	0x02	1st interrupt PDO number	UNSIGNED8	rw		0
	0x03	Mapping for the n-th application object to be mapped	UNSIGNED32	ro		0
	0x04	Mapping for the n-th application object to be mapped	UNSIGNED32	ro		0
	0x05	Mapping for the n-th application object to be mapped	UNSIGNED32	ro		0
	0x06	Mapping for the n-th application object to be mapped	UNSIGNED32	ro		0
	0x07	Mapping for the n-th application object to be mapped	UNSIGNED32	ro		0
	0x08	Mapping for the n-th application object to be mapped	UNSIGNED32	ro		0
	0x09	Mapping for the n-th application object to be mapped	UNSIGNED32	ro		0
	0x0A	Mapping for the n-th application object to be mapped	UNSIGNED32	ro		0
	0x03	Mapping for the n-th application object to be mapped	UNSIGNED32	ro		0
0x2011 - 0x201B		2nd - 12th K-Bus module mapping				0

The PDO-Mapping can be used to establish an assignment between the IO's of the K-Bus-modules and the PDO-structure.

Subindex 0:	Biggest supported sub-index. In case the object does not describe a module (module is not given) the value 0 is entered
Subindex 1:	K-Bus ID and address switch position of the module (higher Byte: KBus ID + lower Byte: address switch position)
Subindex 2:	Mapping of the module: Structure as PDO-mapping: Index, sub-index, object length

With the help of these objects the representation can be established between the PDO mapping and the physical I/O of the K-Bus module.

13.1.24 K-Bus ID List

Identifier	Module	Description
0x00	-	-
0x01	-	-
0x02	DM 260/A	Digital mixed module: 8 inputs/ 8 outputs (0.5A and/or 1A)
0x04	AM 299/A	Analog mixed module with differential analog inputs

Identifier	Module	Description
0x05	AM 299/B	Analog mixed module with single-ended analog inputs and PWM
0x06	-	-
0x07	DM 262/A	Digital mixing module: 8 inputs/ 8 outputs (2A)
0x08	-	-
0x09	-	-
0x0A	-	-
0x0B	AM 280/A	4 analog in 14bit + 4 analog out 12bit voltage inputs/outputs
0x0C	-	-
0x0D	-	-
0x0E	-	-
0x0F	-	-
0x15	-	-
0x16	-	-
0x17	DM 272/A	Digital mixed module: 8 inputs / 8 outputs (2A)
0x18	DM 276/A	Digital mixed module: 6 inputs / 8 outputs (2A)
0x19	MM 240/A	Incremental module with 2 encoder inputs and 2 digital inputs
0x1A	-	-
0x1D	-	-
0x1E	-	-
0x1F	-	-

Information

Field bus modules are not supported.

13.1.25 K-Bus Module Hardware Information (Object 0x2020 .. 0x202B)

This objects contain the hardware information of the connected modules.

Index	Sub-Index	Designation	Type	Attr.	Value	PDO-Mapping
0x2020		1st K-Bus Modul hardware information				
	0x00	Number of subindxes	UNSIGNED8	ro	10	0
	0x01	Name	VISIBLE_STRING	ro		0
	0x02	Version	UNSIGNED8	ro		0
	0x03	Hardware revision	UNSIGNED8	ro		0
	0x04	Not relevant	UNSIGNED8	ro		0
	0x05	Print number	UNSIGNED32	ro		0
	0x06	Serial number	UNSIGNED32	ro		0
	0x07	Order number	UNSIGNED32	ro		0
	0x08	Device number	UNSIGNED32	ro		0
	0x09	Initiation time	UNSIGNED32	ro		0
	0x0A	Runtime	UNSIGNED32	ro		0
0x2021 - 0x202B		2nd - 12th K-Bus module hardware information				

Subindex name	Subindex number [hex]	Description
Number of subindxes	Subindex 0:	Biggest supported sub-index In case the object does not describe a module (module is not given) the value 0 is entered
Name	Subindex 1:	Name of the K-Bus module
Version	Subindex 2:	Version number of the K-Bus module
Hardware revision	Subindex 3:	Hardware revision number
Not relevant	Subindex 4:	Not relevant
Print number	Subindex 5:	Print number
Serial number	Subindex 6:	Serial number
Order number	Subindex 7:	Order number
Device number	Subindex 8:	Device number
Initiation time	Subindex 9:	Point in time of the initial start-up (described in sec. since 1.1.1970), currently not used
Runtime	Subindex A:	Operating time [h]

13.1.26 BL 210/B Hardware Information (Object 0x2030)

This object contains the hardware information of the BL 210/B.

Index	Sub-Index	Designation	Type	Attr.	Value	PDO-Mapping
0x2020		BL 210/B Hardware information				
	0x00	Number of subindxes	UNSIGNED8	ro	10	0
	0x01	Name	VISIBLE_STRING	ro		0
	0x02	Version	UNSIGNED8	ro		0
	0x03	Hardware revision	UNSIGNED8	ro		0
	0x04	Not relevant	UNSIGNED8	ro		0
	0x05	Print number	UNSIGNED32	ro		0
	0x06	Serial number	UNSIGNED32	ro		0
	0x07	Order number	UNSIGNED32	ro		0
	0x08	Device number	UNSIGNED32	ro		0
	0x09	Initiation time	UNSIGNED32	ro		0
	0x0A	Runtime	UNSIGNED32	ro		0

Subindex name	Subindex number [hex]	Description
Number of subindxes	Subindex 0:	Biggest supported sub-index In case the object does not describe a module (module is not given) the value 0 is entered
Name	Subindex 1:	Name of the K-Bus module
Version	Subindex 2:	Version number of the K-Bus module
Hardware revision	Subindex 3:	Hardware revision number
Not relevant	Subindex 4:	Not relevant
Print number	Subindex 5:	Print number
Serial number	Subindex 6:	Serial number
Order number	Subindex 7:	Order number
Device number	Subindex 8:	Device number
Initiation time	Subindex 9:	Point in time of the initial start-up (described in sec. since 1.1.1970), currently not used
Runtime	Subindex A:	Operating time [h]

13.1.27 SYNC Timeout (Object 0x2200)

This object is used to set the maximum permitted time interval in ms to monitor the income of the SYNC-telegram.

Default: 0 -> monitoring deactivated; Value: Time in ms.

In case the SYNC-telegram does not arrive within the specified time a corresponding object 0x1029/01 reacts.

Index	Sub-Index	Designation	Type	Attr.	Value	PDO-Mapping
0x2200		SYNC timeout	UNSIGNED16	rw	0	0

13.2 K-Bus Module-Specific Objects

See detailed information about which device-specific objects are available for a specific K-Bus module in subsection "Mapping of add-on modules" under "Programming notes".

13.2.1 Interrupt Status Line 1 to 4 (Object 0x5000 .. 0x5003)

The sub index 0x00 contains the number of the following parameters.

Index	Sub-Index	Designation	Type	Attr.	Value	PDO-Mapping
0x5000		Interrupt status line 1				
	0x00	Number of subindxes	UNSIGNED8	ro	2	0
	0x01	Interrupt status 1	UNSIGNED8	ro		1
	0x02	Interrupt timestamp 1	UNSIGNED32	ro		1

Interrupt status 1

Bit	Designation	Acceptation
0 – 1	Interrupt status DI0	00 ... No Interrupt 01 ... Falling edge 10 ... Rising edge
2 – 3	Interrupt status DI1	
4 – 7	Not used	

Only the 4 low order bits are used.

Timestamp:

Time in µs between the start of the last update-cycle and the interrupt.

The timestamp is transmitted with the interrupt PDO in cyclic mode (see description of object "0x1a10 - 0x1a13 - Interrupt-PDO"). The timestamp is definite up to a cycle time of 100 ms.

Information

Cycle times longer than 100 ms can result in an internal timer overflow.

13.2.2 AM 299/B Configuration (Object 0x5012)

Index	Sub-Index	Designation	Type	Attr.	Value	PDO-Mapping
0x5012		AM 299/B Config				
	0x00	Number of subindxes	UNSIGNED8	ro		0
	0x01	Configregister	UNSIGNED16	rw		1

Configregister

Bit	Designation	Acceptation
0	Operating mode	0 ... PWM, motor bridge 1 ... Digital outputs
1 – 15	Not used	

13.2.3 AM 280 Configuration (Object 0x5013)

Index	Sub-Index	Designation	Type	Attr.	Value	PDO-Mapping
0x5013		AM 280 Config				
	0x00	Number of subindxes	UNSIGNED8	ro		0
	0x01	Configregister	UNSIGNED16	rw		1

Configregister

Bit	Designation	Acceptation
0 – 1	Configuration AI0	00 ... 0 V to +10 V 01 ... -10 V to +10 V 10 ... 0 mA to 20 mA 11 ... 4 mA to 20 mA
2 – 3	Configuration AI1	
4 – 5	Configuration AI2	
6 – 7	Configuration AI3	
8 - 9	Configuration AO0	00 ... 4 mA to 20 mA 01 ... 0 mA to 20 mA 11 ... -10 V to +10 V
10 - 11	Configuration AO1	
12 - 13	Configuration AO2	
14 - 15	Configuration AO3	

The actual possible configuration is depending on the number of analog channels of the analog module.

13.2.4 DM 27x Reset Short Circuit (Object 0x5020)

Index	Sub-Index	Designation	Type	Attr.	Value	PDO-Mapping
0x5020		DM 27x reset short circuit				
	0x00	Number of subindxes	UNSIGNED8	ro		0
	0x01	Reset register	UNSIGNED16	rw		1

Reset register

Bit	Designation	Acceptation
0 – 7	Reset short circuit for group 0	0 ... Do not reset short circuit 1 ... Reset short circuit
8 – 13	Reset short circuit for group 1	
14 - 15	Not used	

13.2.5 DM 27x Configuration Short Circuit (Object 0x5021)

Index	Sub-Index	Designation	Type	Attr.	Value	PDO-Mapping
0x5020		DM 27x Config short circuit				
	0x00	Number of subindxes	UNSIGNED8	ro		0
	0x01	Configregister	UNSIGNED16	rw		1

Configregister

Bit	Designation	Acceptation
0	Short circuit scan configuration for group 0: DO0 - DO7	0 ... Short circuit scan OFF 1 ... Short circuit scan ON
1	Short circuit scan configuration for group 1: DO8 - DO13	
2 – 15	Reserved	

13.2.6 MM 240 Configuration (Object 0x5030)

Index	Sub-Index	Designation	Type	Attr.	Value	PDO-Mapping
0x5030		MM 240 Config				
	0x00	Number of subindxes	UNSIGNED8	ro		0
	0x01	Configregister	UNSIGNED16	rw		1

Configregister

Bit	Designation	Acceptation
0	Enable encoder	0 ... Interface disabled 1 ... Interface enabled
1	Encoder type (also valid for trace A, trace B and zero pulse)	0 ... 24 V digital input interface (HTL) 1 ... RS422 standard interface
2	Counter mode 0	See description subsequent to table
3	Counter mode 1	See description subsequent to table
4	Enable zero pulse	0 ... Zero pulse monitoring disabled 1 ... Zero pulse monitoring enabled
5	Enable latch	0 ... Latch functions disabled 1 ... Latch functions enabled
6	Latch type (only accessible via address 0x00, affects both inputs (0, 1))	0 ... Sink wiring 1 ... Source wiring
7	Latch edge	0 ... Falling edge (active to inactive) 1 ... Rising edge (inactive to active)
8	Latch debounce level 0	See description subsequent to table
9	Latch debounce level 1	See description subsequent to table
10	Ignore counter direction	Only for counter mode 00. 0 ... Trace B used for setting counting direction 1 ... Trace B disabled (counting upwards automatically)
11 - 15	Not used	

Counter mode

C. m. 1	C. m. 0	Acceptation
0	0	Counter: Trace A (Positive edge counts) Direction: Trace B (0 ... Upwards, 1 ... Downwards. See also "Ignore counter direction")
0	1	Single evaluation
1	0	Double evaluation
1	1	Quad evaluation

Latch debounce level

D. l. 1	D. l. 0	Acceptation
0	0	No debouncing
0	1	500 µs
1	0	1 ms
1	1	No debouncing

13.2.7 MM 240 Initialization Zero Impulse (Object 0x5031)

Index	Sub-Index	Designation	Type	Attr.	Value	PDO-Mapping
0x5031		MM 240 zero impulse init				
	0x00	Number of subindxes	UNSIGNED8	ro		0
	0x01	Zero impulse init register interface	UNSIGNED16	rw		1

Depending on the resolution of the transducer, one rotation triggers a specific number of distance pulses. If this value differs from the value in the register, an error occurs and sets the bit "Error null impulse" in the status register.

13.2.8 MM 240 Period Counter (Object 0x5032)

Index	Sub-Index	Designation	Type	Attr.	Value	PDO-Mapping
0x5032		MM 240 period counter				
	0x00	Number of subindxes	UNSIGNED8	ro		0
	0x01	Period counter interface	SIGNED32	ro		1

Period counter interface

This register contains a 24-Bit cycle duration, which can be interpreted as a velocity value too.

13.2.9 MM 240 Status (Object 0x5033)

Index	Sub-Index	Designation	Type	Attr.	Value	PDO-Mapping
0x5033		MM 240 status				
	0x00	Number of subindxes	UNSIGNED8	ro		0
	0x01	Status interface	UNSIGNED8	rw		1

Status interface

Bit	Designation	Acceptation
0	Period ready	Bit is set, if a valid velocity value is determined and written into velocity register. Bit is reset by readout of the status register.
1	Null impulse	Bit is set, if a null impulse occurs. Bit is reset by readout of the status register, if null impulse disappeared.
2	Latch impulse	Bit is set, if a latch impulse occurs. Bit is reset by readout of the status register, if latch impulse disappeared.
3	Counter underrun	Bit is set, if a counter underrun occurs. Bit is reset by readout of the status register.
4	Counter overflow	Bit is set, if a counter overflow occurs. Bit is reset by readout of the status register.
5	Latch state	Bit displays the current latch input level.
6	Error period	Bit is set, if a period counter overflow occurs. Bit is reset by readout of the status register.
7	Reserved	-

13.2.10 MM 240 Impulse Counter (Object 0x5034)

Index	Sub-Index	Designation	Type	Attr.	Value	PDO-Mapping
0x5034		MM 240 impulse counter				
	0x00	Number of subindxes	UNSIGNED8	ro		0
	0x01	Impulse counter interface	UNSIGNED32	rw		1

The object 0x5033 "MM 240 Status" (Bit 1 and Bit 2) specifies if it is a 32 bit zero impulse counter or a 32 bit latch impulse counter.

13.2.11 MM 240 Timestamp (Object 0x5035)

Index	Sub-Index	Designation	Type	Attr.	Value	PDO-Mapping
0x5035		MM 240 timestamp				
	0x00	Number of subindxes	UNSIGNED8	ro		0
	0x01	Timestamp interface	UNSIGNED32	rw		1

Timestamp interface

Time in µs between the latch event and the current K-Bus access (first access in the current cycle). Register only valid, if Bit 2 of object 0x5033 displays a latch impulse.

13.2.12 Read Digital Inputs 8-Bit (Object 0x6000)

Index	Sub-Index	Designation	Type	Attr.	Value	PDO-Mapping
0x6000		Read input 8-Bit				
	0x00	Number of inputs 8 Bit	UNSIGNED8	ro		0
	0x01	Read input 1 to 8	UNSIGNED8	ro		0

Read Input 1 to 8

Every bit is for a digital input:

Bit	Digital input
0	DI0
1	DI1
...	...
7	DI7

13.2.13 DM 27x Configuration debouncing 8-Bit (Object 0x6003)

Index	Sub-Index	Designation	Type	Attr.	Value	PDO-Mapping
0x6003		DM27x config debounce 8-Bit				
	0x00	Number of subindxes	UNSIGNED8	ro		0
	0x01	Config register	UNSIGNED8	rw		1

Configregister

Bit	Designation	Acceptation
0	Debouncing time	0 ... 1 ms 1 ... 100 ms
1 – 7	Not used	-

13.2.14 Interrupt On / Off (Object 0x6005)

Index	Sub-Index	Designation	Type	Attr.	Value	PDO-Mapping
0x6005		Global interrupt enable digital 8-Bit	BOOLEAN	rw	TRUE	0

FALSE (0) ... Disable all interrupts

TRUE (1) ... Enable all interrupts

13.2.15 Interrupt Mask Low-to-High 8-Bit (Object 0x6007)

Index	Sub-Index	Designation	Type	Attr.	Value	PDO-Mapping
0x6007		Interrupt mask low-to-high 8-Bit				
	0x00	Number of input 8-Bit	UNSIGNED8	ro		0
	0x01	Interrupt low to high 1 to 8	UNSIGNED8	rw	0x00	1

Interrupt low to high 1 to 8

Mask to activate the interrupts for rising edges of the single digital inputs (DI):

Bit	Designation	Acceptation
0	Interrupt low to high DI0	0 ... 1 ms 1 ... 100 ms
1	Interrupt low to high DI1	
2 - 7	Not used	-

Can only be activated for DI0 and DI1.

13.2.16 Interrupt Mask High-to-Low 8-Bit (Object 0x6008)

Index	Sub-Index	Designation	Type	Attr.	Value	PDO-Mapping
0x6007		Interrupt mask high to low 8-Bit				
	0x00	Number of input 8-Bit	UNSIGNED8	ro		0
	0x01	Interrupt high to low 1 to 8	UNSIGNED8	rw	0x00	1

Interrupt high to low 1 to 8

Mask to activate the interrupts for falling edges of the single DIs.

Bit	Designation	Acceptation
0	Interrupt high to low DI0	0 ... 1 ms 1 ... 100 ms
1	Interrupt high to low DI1	
2 - 7	Not used	-

Can only be activated for DI0 and DI1.

13.2.17 Read Digital Inputs 16-Bit (Object 0x6100)

Index	Sub-Index	Designation	Type	Attr.	Value	PDO-Mapping
0x6100		Read input 16-Bit				
	0x00	Number of inputs 16-Bit	UNSIGNED8	ro		0
	0x01	Read input 1 to 16	UNSIGNED16	ro		1

Read input 1 to 16

Every bit is for a digital input:

Bit	Digital input
0	DI0
1	DI1
...	...
15	DI15

13.2.18 DM 27x Configuration Debouncing 16-Bit (Object 0x6103)

Index	Sub-Index	Designation	Type	Attr.	Value	PDO-Mapping
0x6103		DM27x config debounce 16-Bit				
	0x00	Number of subindxes	UNSIGNED8	ro		0
	0x01	Configregister	UNSIGNED16	rw		0

Configregister

Bit	Designation	Acceptation
0	Debouncing time	0 ... 1 ms 1 ... 100 ms
1 - 15	Not used	-

13.2.19 Interrupt Mask Low-to-High 16-Bit (Object 0x6107)

Index	Sub-Index	Designation	Type	Attr.	Value	PDO-Mapping
0x6107		Interrupt Mask low to high 16-Bit				
	0x00	Number of inputs 16-Bit	UNSIGNED8	ro		0
	0x01	Interrupt low to high 1 to 16	UNSIGNED16	rw	0x00	0

Interrupt low to high 1 to 16

Mask to activate the interrupts for rising edges of the single DIs.

Bit	Designation	Acceptation
0	Interrupt low to high DI0	0 ... 1 ms 1 ... 100 ms
1	Interrupt low to high DI1	
2 -15	Not used	-

Can only be activated for DI0 and DI1.

13.2.20 Interrupt Mask High-to-Low 16-Bit (Object 0x6108)

Index	Sub-Index	Designation	Type	Attr.	Value	PDO-Mapping
0x6108		Interrupt mask high to low 16-Bit				
	0x00	Number of inputs 16-Bit	UNSIGNED8	ro		0
	0x01	Interrupt high to low 1 to 16	UNSIGNED16	rw	0x00	0

Interrupt high to low 1 to 16

Mask to activate the interrupts for falling edges of the single DIs.

Bit	Designation	Acceptation
0	Interrupt high to low DI0	0 ... 1 ms 1 ... 100 ms
1	Interrupt high to low DI1	
2 -15	Not used	-

Can only be activated for DI0 and DI1.

13.2.21 Write Digital Outputs 8-Bit (Object 0x6200)

Index	Sub-Index	Designation	Type	Attr.	Value	PDO-Mapping
0x6200		Write output 8-Bit				
	0x00	Number of outputs 8-Bit	UNSIGNED8	ro		0
	0x01	Write output 1 to 8	UNSIGNED8	rw		1

Write output 1 to 8

Every bit is for one digital output:

Bit	Digital output
0	DO0
1	DO1
...	...
7	DO7

13.2.22 Write Digital Outputs 16-Bit (Object 0x6300)

Index	Sub-Index	Designation	Type	Attr.	Value	PDO-Mapping
0x6300		Write output 16-Bit				
	0x00	Number of outputs 16-Bit	UNSIGNED8	ro		0
	0x01	Write output 1 to 16	UNSIGNED16	rw		1

Write output 1 to 16

Every bit is for one digital output:

Bit	Digital output
0	DO0
1	DO1
...	...
15	DO15

13.2.23 Read Analog Inputs (Object 0x6401)

Index	Sub-Index	Designation	Type	Attr.	Value	PDO-Mapping
0x6401		Read analog input 16-Bit				
	0x00	Number of analog inputs 16-Bit	UNSIGNED8	ro		0
	0x01	Analog input	SIGNED16	ro		1

Analog input

Contains the analog value of an analog input. The range of voltage is configure-able.

Coherent values if using an AI, AO or AM – module

Voltage (0 .. 10 V)	Digital analog-value [Dec]
0 V	- 32768
1 V	- 26215
10 V	32767

Voltage (-10 V .. 10 V)	Digital analog-value [Dec]
- 10.485 V	- 32768
- 10 V	- 31250
0 V	0
1 V	3125
10 V	31250
10.485 V	32767

Current	Digital analog-value [Dec]
- 0.8 mA	- 32768
0 A	0
4 mA	6301
20 mA	31508
20.8 mA	32767

13.2.24 MM 240 Counter 32-Bit (Object 0x6402)

Index	Sub-Index	Designation	Type	Attr.	Value	PDO-Mapping
0x6402		MM 240 counter 32-Bit				
	0x00	Number of subindxes	UNSIGNED8	ro		0
	0x01	Counter interface	UNSIGNED32	ro		1

Counter interface

The object contains the absolute transducer count.

13.2.25 Write Analog Outputs (Object 0x6411)

Index	Sub-Index	Designation	Type	Attr.	Value	PDO-Mapping
0x6411		Write analog output 16-Bit				
	0x00	Number of analog outputs 16-Bit	UNSIGNED8	ro		0
	0x01	Analog output	SIGNED16	rw		1

Analog output

Contains the analog value of one analog output. The range of current is configureable.

Coherent values if using an AI, AO or AM – module

Voltage	Digital analog-value [Dec]
- 10 V	- 32768
0 V	0
1 V	3277
10 V	32767

Current (0 .. 20 mA)	Digital analog-value [Dec]
0 A	- 32768
4 mA	-19661
10 mA	0
20 mA	32767

Current (4 .. 20 mA)	Digital analog-value [Dec]
4 mA	- 32768
12 mA	0
20 mA	32767

13.2.26 Write PWM Outputs (Object 0x6414)

Index	Sub-Index	Designation	Type	Attr.	Value	PDO-Mapping
0x6414		Write manufacturer-specific analog output				
	0x00	Number of analog outputs	UNSIGNED8	ro		0
	0x01	Analog output	SIGNED16	rw		1

Analog output

Contains a single PWM value. Range from - 100 % (- 255) to + 100 % (+ 255).

1 % correspondes to 2,55 [Dec], 1 [Dec] correspondes to ca. 0,392 %.

Release
Revision A May. 2013

Precautions For Adoption

⚠Cautions

The possibility of moderate or minor injury
and the occurrence of physical damage are assumed
when the precautions at right column are not observed.
Depending on the situation,
this may cause serious consequences.
Be sure to follow all listed precautions.

⚠Cautions

- Be sure to read the instruction manual before using this product.
- Take sufficient safety measures and contact us before applying this product to medical equipment that may involve human lives.
- Contact us before adapting this product for use with equipment that could cause serious social or public effects.
- The use of this product in high motion environments where vibration is present, such as in vehicles or shipping vessels, is prohibited.
- Do not convert or modify any equipment components.

* Please contact our Business Division for questions and consultations regarding the above.

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