TURCK

Industrial
Automation

USER MANUAL
RFID SYSTEM

SET-UP WITH
CANOPEN

BL ident®

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Edition 11/08

Safety instructions!

Prior to installation work

- Switch device to zero voltage
- Protect device from restart
- Determine voltage free state
- Earth and short-circuit
- Cover or construct a barrier around neighboring parts/components under voltage
- Please follow the respective instructions for mounting the device.
- Only staff appropriately qualified per EN 50 110-1/-2 (VDE 0105 Section 100) may handle the device/system.
- When performing the installation, please pay heed to the requirement of conducting a statical discharge on your person prior to touching the device.
- The function earth (FE) must be connected to the protective earth (PE) or the potential equalization. The builder is responsible for the design of this connection.
- Connection -and signal lines are to be installed in such a way that inductive and capacitive controls may not have a diminishing impact on automation functions.
- Automation engineering equipment and its service components are to be installed in such a way that they are protected from accidental operation.
- In order to prevent that a line or wire breakage on the signal side does not lead to undefined states in the automation equipment, respective safety measures are to be implemented on the hard- and software side during the I/O coupling operation.
- Please ensure a safe, electrical isolation of the low voltage with a 24 volt supply. Only use power supplies that meet the requirements per IEC 60 364-4-41 or rather HD 384.4.41 S2 (VDE 0100 Section 410).
- Variations or rather deviations of the supply voltage from the nominal value may not exceed the tolerance limits specified in the technical data, otherwise function errors and dangerous conditions can not be ruled out.
- EMERGENCY STOP per IEC/EN 60 204-1 must remain active in all operational states of the automation equipment. Unlocking the EMERGENCY STOP feature must not initiate a restart operation.
- Built-in devices for housings or cabinets may only be operated or serviced when they are installed, and table devices or portables only when the housing is closed.
- Precautions are to be made so that a program may be correctly restarted after it has been interrupted by voltage drops and power failures. Here dangerous operating conditions must not occur also short-term. If need be, force EMERGENCY STOP.
- At locations where occurring failures of the automation equipment may cause injury to persons or damage to property, external measures must be taken that also guarantee or rather force a safe operational status in case of error or breakdown (for example, with the help of independent limit value switches, mechanical locks, etc.).
- The electrical installation must be done per the respective instructions (for example, line diameter, fuse protection, earthing equipment conductor).
- Only qualified, expert staff may complete all work related to transport, installation, startup and maintenance. (Follow IEC 60 364 or rather HD 384 or DIN VDE 0100 and national accident prevention regulations).
- Keep all covers and doors closed during operation.

0 About this manual

Concept of documentation

The first chapter of this manual provides an overview of the TURCK *BL ident*®-system.

The second chapter contains all information for mounting and installation.

The third chapter contains a start-up instruction diagram of the interface-module with the addition "-S".

The Glossar provides explanatory notes to many RFID- and CANopen-specific terms.

Explanations of used symbols

Warning

This symbol appears next to an alert which points to a source of danger. This may refer to injury of persons and damage to systems (hard- and software).
For the user this symbol means: Please, proceed with extreme causion.

Attention

This symbol appears next to an alert which points to a potential source of danger. This may refer to possible injury of persons and damage to systems (hard- and software) and installations.

Note

This symbol appears next to general instructions which point out important information concerning the procedure for one or more operational steps.

The relevant instructions may faciliate the work and may help prevent redundancy caused by incorrect operational steps, for example.

Attention
Please, consider it mandatory to read this chapter because safe handling of electrical devices should not be left to chance.

This manual contains the required information for the start-up of the TURCK *BL ident*®-system.
The concept was specifically created for qualified staff with the necessary technical know-how.

Intended use

Warning
The devices described in this manual must be used only in the intended applications found in this manual and the respective technical description, and only together with certifed external devices and -components.

The correct and safe operation of the devices is based on the prerequisite of proper transport, storage, assembly and mounting, as well as carefuly operation and maintenance.

Instructions for project planning / installation of product

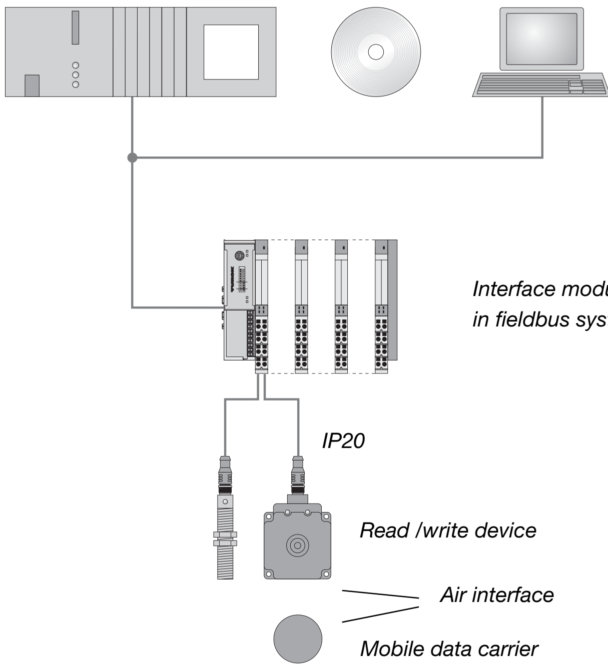
Warning
It is imperative that the instructions be followed for the safety and accident prevention for the respective application.

1 The TURCK *BL ident®*-system

Schematic diagram of the identification system *BL ident*®

The TURCK *BL ident*®-system has multiple levels. Each level offers opportunities for variation. An application that is adjusted to the complete system is possible.

Figure 1: System overview



Support for *BL ident*®-projects

The following software and documents will provide additional support for project planning, installation and startup:

- For simulation and optimization of an application, please access the internet and go to http://www.turck.com...for a free "*BL ident*®-simulator".
- D101583 - "Installation of the *BL ident*®-system“ - This manual contains the technical details of the available TURCK-data carriers and the TURCK read/write devices.
- D101581 - "Interface module for fieldbus connection". This manual describes the professional operation of the *BL ident*®-interface modules.
- D101607 - This manual contains a software description of a so-called "handheld" (programming device) which allows Read and Write access of data independent of location.
- D101585 - This manual contains a hardware description of a so-called "handheld" (programming device) which allows Read and Write access of data independent of location.
- D101640 - "Set-up programmable gateways with CoDeSys"
- D101642 - "Set-up with DeviceNet™“
- D101644 - "Set-up with EtherNet/IP™“
- D101648 - "Set-up in PROFINET with the Proxy Ident Function Block“

The list of manuals may be downloaded from the internet.

Networking with *BL ident*®-systems

Based on the possibility to integrate *BL ident*®-systems in (existing) bus-systems, the opportunity exists to network together multiple *BL ident*®-systems.

Valid are the guidelines for the maximum extension of the respective, active bus system.

Identification systems with radio frequency technology (RFID)

RFID is an abbreviation for radio frequency identification.

A RFID-system consists of a data carrier, a device for Read and Write access to the data carrier, as well as other devices used for data transfer and processing.

The transfer of data from the data carrier to the read/write head occurs contact-free with the help of electromagnetic waves. The type of transmission is insensitive to dirt and temperature fluctuations.

The data carriers may be directly affixed to a product. This is why the term "mobile data memory" is used as well. Other terms for the data carrier are TAG or transponder. The data content may consist of production and manufacturing data. The data that identifies the product is important here. This is where the description "identification system" comes from.

Further reaching possibilities are a result of the fact that the data content can be changed by writing to the data carrier. Because of this production-/manufacturing processes can be retraced. Logistics/distribution may be optimized.

The "identification systems" may be integrated into (existing) fieldbus automation systems (for example CANopen). The connection to the respective fieldbus system is done with suitable interface modules.

Performance characteristics and applications of the*BL ident*®-system

To meet the requirements of a variety of applications, the TURCK *BL ident* ®-system offers multiple possibilities for combining data carriers and read/write heads, as well as interface modules to connect automation systems (for example, CANopen).

Performance characteristics of the TURCK *BL ident* ®-system are as follows:

Protection class

Some data carriers, as well as the applicable read/write heads have a high mechanical protection class (for example, **IP67**) and therefore may be used in the toughest industrial applications.

The read/write heads are also available in IP69K (wash-down design).

Connection to the fieldbus-system is realized with suitable TURCK interface modules. The interface-modules for CANopen are available in the protection class IP20. TURCK connection cables with the suitable protection class complement the identification system.

Temperature-resistant data carriers up to 210°C are available for the high temperature range.

Life cycle

The life cycle is a result of the possible read/write operations to the data carrier.

FRAM data carriers can provide for an **unlimited** number of Read operations and 10^{10} Write operations.

EEPROM data carriers can provide for an **unlimited** number of Read operations and 10^4 or 10^5 Writer operations.

The data carriers do not require batteries.

Transfer frequency

The TURCK *BL ident* ®-system operates with a transfer frequency of 13.56 MHz in the HF-band or with a country-specific transfer frequency in the UHF-range (860-960 MHz) between the data carriers and the read/write heads.

HF: Systems that operate with this transfer frequency are to a large extent insensitive to electromagnetic interferences. Therefore the 13.56 MHz transfer frequency has developed into the standard in many RFID applications.

UHF: Systems in this frequency band gain higher read/write ranges compared to HF, typically several meters. The carrier frequencies are country-specific, and in Europe, for example, they are between 865 and 868 MHz.

Models

Data carriers

HF: For the HF-operating frequency, TURCK supplies round, flat data carriers, for example, with 16, 20, 30 and 50 mm diameters.

The high temperature data carriers have a cylindric design (for example, 22 x 125 mm).

Inlays and adhesive labels have a foil thickness (size, for example, 43 x 43 mm).

Special designs are suitable for installation in and mounting on metal. Other designs are data carriers in a glass cylinder housing or as a flat bank card format. Some data carriers have holes so that they may be affixed with screws.

UHF: Data carriers for UHF have different designs and mounting possibilites and are optimized for either small housing dimensions or large data transfer ranges. Data carriers with high protection class, also for the application in the field are available, as well as data carriers for direct mounting on metall or imprinted tags.

TURCK supplies data carriers for customized solution upon request.

Read/write heads

HF: Read/write heads are available in different designs, from the standard unified threads M18 and M30 to cuboid designs Q14, CK40, Q80, S32XL including Q80L400 and Q350 for long distances of up to 500 mm.

UHF: Different cuboid designs are available, for example as compact read/write head in a housing with approx. 100 mm x 80 mm x 35 mm edge length (L x W x D) or in dimensions approx. 240 mm x 240 mm x 40 mm for high data transfer ranges of several meters. The read/write heads have protection class IP67 and are suitable for the application in the field. The quality of the air-data transfer between data carrier and read/write head is continuously checked, also when in operation. Each disturbance of the air interface is immediately diagnosed and signalled per LED-chain.

Memory slot

The memory capacity of the data carrier for the HF-range is 64 or 128 Byte (48 or 112 Byte user data) with an EEPROM-memory and 2 or 8 KiByte (2000 or 8000 Byte user data) with a FRAM-memory. For the UHF-range there is an EEPROM-data carrier with 110 Byte (94 Byte user data).

FRAM: (Ferroelectric Random Access Memory), non-volatile, longer life cycle because of a greater number of read/write operations and faster Write operations compared to EEPROM.

EEPROM: (Electrically eraseable programmable read only memory), non-volatile.

The data carrier for the HF-operating frequency meet the communication standard ISO 15693.

The data carriers in the UHF-frequency band meet the communication standard ISO 18000-6C and EPCglobal Class 1 Gen 2.

Relative speed of data carrier to read/write head

Note

The speed with which the data carrier can pass by the read/write head is influenced by the data volume to be processed and varies according to the respective combination of read/write head and data carrier that is being used.
This is why numerical data for max. speed and data volumes can only be seen as examples!

The speed with which the data carrier can pass by the read/write head may be increased, for example, with the data carrier TW-R50-K2 and the read/write head TN-CK40-H1147 to up to 2.5 m/s for 8 Bytes at a distance of 36 mm. With the help of the "*BL ident*®-simulator“ (see below) the application parameters "speed", "data volume" and "range" can be changed. The optimum combination read/write head and data carrier for the respective application is apparent in the simulator.

The simulator is online at http://www.turck.com... In any case, please follow the instructions including limits in this chapter.

Note

Next to the data processing time in the read/write head, the processing time within the complete installation of the identification system must also be taken under consideration.(„System overview” page 1-2). Depending on the application, the time for data transfer and processing within the complete installation may vary!
If your application requires a fast sequence of data carriers, it may be necessary to decrease the speed with which the data carrier passes by the read/write head.
When in doubt, we recommend to empirically determine the possible speed!

Note

The transfer curves (max. read/write distance, length of transfer zone) only represent typical values and test lab conditions.
Because of component tolerances, installation situation of the application, ambient conditions and interferences caused by materials (especially metals) the distances that can be reached may differ up to 30 %.
This is why it is absolutely necessary to test the application (especially during Read and Write when movement occurs) under real conditions!
In addition, the recommended distance from data carrier to read/write head should be complied with if possible in order to gain errorless read/write operations despite of possible discrepancies.
Depending on the actual transfer curve of the respective application, the parameters of reachable pass over speeds (Read and Write on the Fly) and the max. transferable data volume also change.

Read range / Write range

The reachable read/write distances depend on the respective combination of data carrier and read/write head. The possible read/write distance is influenced by the data volume to be written and to be read, and by the speed with which the data carrier passes by the read/write head. The read/write heads that use UHF-operating frequencies will reach a distance of several meters. read/write heads that operate with 13.56 MHz (HF) transfer frequencies will reach shorter distances. Here the longest distance (approx. 500 mm) will be reached with the model TNLR-Q350-H1147 if a round data carrier with a 50 mm diameter is used.

With the help of the software "*BL ident*®-simulator“ the application parameters "speed", "range" and "data volume" may be changed. Therefore an optimum combinantion read/write head and data carrier may be selected for the appropriate application.

You may find the simulator online at http://www.turck.com...

Figure 2: BL ident®-simulator

Compatibility

All technical data refer to the *BL ident*®-system, this means to the combination of *BL ident*®-data carriers, read/write heads and interface modules. Entirely different values may be valid for data carriers of other manufacturers. This is why external products may only be used after they have been released by TURCK.

Applications (examples):

The performance characteristics described in the prior chapter support the application of a TURCK *BL ident*®-system in the following industries:

- Automobile
- Transport and handling
- Machine building
- Food and beverages
- Chemical industry
- Pharmaceutical and petrochemical industries

The application in all areas is possible here, like:

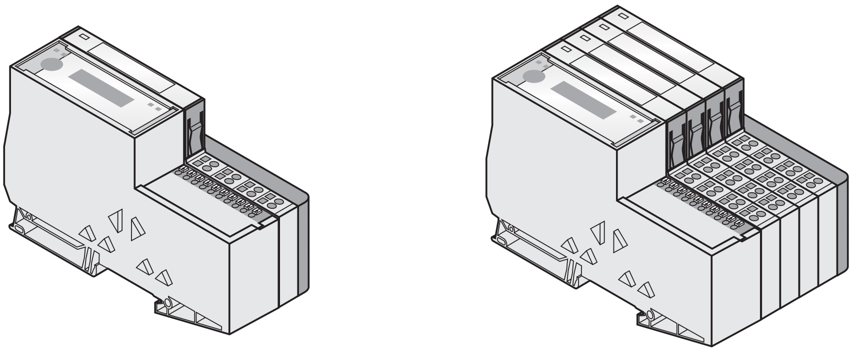
- Assembly lines
- Materials handling
- Industrial manufacturing
- Inventory and storage
- Logistics
- Distribution
- Consignment
- Transport logistics

2 Assembly and installation

Diagrams and designs of the interface modules

The *BL ident*®-CANopen-interface is available with 2, 4, 6, and 8 channels. Interface modules with the addition "S" (Simple) indicate that a user-friendly start-up is possible. A maximum of 4 byte user data + 4 byte control/status data can be transferred per PDO-8 byte transfer with a Write or Read command.

Figure 3: BL ident®-interface modules with the protection class IP20 (2- and 8-channel)



Supply voltage

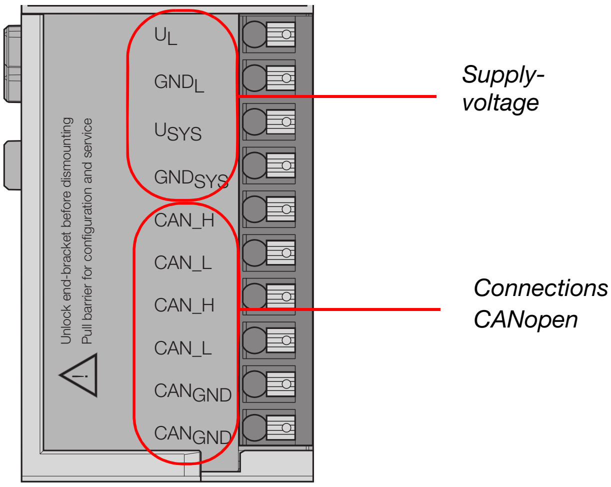
The *BL ident*®-interface module is supplied via the push-in spring-type terminal U_L/GND_L and U_{SYS}/GND_{SYS} (field supply and system supply).

The supply voltage must be within the range of 18 to 30 VDC (nominal value 24 VDC).

The **system supply voltage (U_{SYS}/GND_{SYS})** is 5 VDC (from 24 VDC) transformed, and approx. 0.5 A when the station is fully expanded. This voltage is internally transmitted with a wire pair of the 7-wire module bus and serves to supply the electronic components of the module on the module's bus side.

The **field supply voltage** (U_L/GND_L) is 24 VDC and can supply maximum 10 A. This voltage is led through the interface module via a power bus. The electronic components of the module on the fieldbus side and the connected read/write devices are fed by the field supply voltage ("Connections of read/write heads" page 2-7).

Figure 4: Gateway connection level



Fieldbus connection CANopen

The fieldbus CANopen is connected with push-in spring-type terminals (Figure 4).

Note
If the BL20-gateway is used as first or last participant within the bus communication, the fieldbus cable must be terminated with a terminating resistance!

The terminating resistance is switched on via DIP-switches ("Activation of the bus terminating resistance" page 2-5).

Note
The bus must be shielded; this is done via a shield clamp, SHLD-terminal, positioned on the mounting rail!

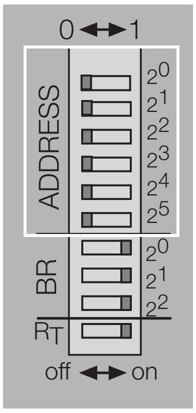
Note
Potential equalization impedance ≤ 1/10 shield impedance

Setting of Node-ID

Setting of the Node-ID of the BL20-ECO-Gateway for CANopen is done with the DIP-switches on the gateway.

Those are positioned below the top plug-in tag of the gateway.

Figure 5: DIP-switch on the gateway



Note

Pull the insert foil out of the housing from the top to reach the DIP-switches.

Attention

The Node-ID of an ECO-gateway is limited to values from 1 to 63.
Other participants on the CANopen bus may use Node-IDs up to 127. Each Node-ID may only be used once on the CANopen bus.

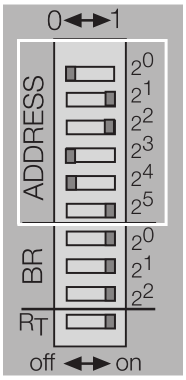
The fieldbus address of the gateway is the sum of adding the values (2^0 to 2^5) of the active-switched DIP-switches (switch setting = 1).

Default setting:

0×3FH = ADR 63

Example:
Bus address 38 = 0×26 = 100110

Figure 6: Bus address 38



The internal module bus does not require addressing.

Setting the bit rate

The gateway BL20-E-GW-CO has more than 3 DIP-switches for setting the bit rate (**BR**).

Figure 7: DIP-switches for setting the bit rate

DIP-switch No.	Bit rate							
	reserved	**20 kBit/s**	**50 kBit/s**	**125 kBit/s**	**250 kBit/s**	**500 kBit/s**	**800 kBit/s**	**1 MBit/s**
2^0	1	0	1	0	1	0	1	0
2^1	1	1	0	0	1	1	0	0
2^2	1	1	1	1	0	0	0	0

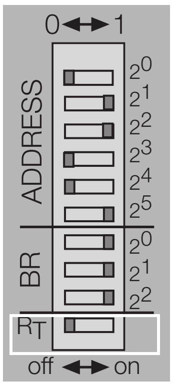
Activation of the bus terminating resistance

If the BL20-gateway is used as first or last participant within the bus communication, the fieldbus cable must be terminated with a terminating resistance!

The BL20-E-GW-CO allows the switching on of a resistance $\mathbf{R}_T$ via the bottom DIP-switch.

Figure 8: Bus terminating resistance R_T

Bus terminating resistance switched off:



Bus terminating resistance switched on:

Service interface

The service interface connects the *BL ident*®- interface module with a PC. The interface module can be projected with the software I/O-ASSISTANT, and diagnostic messages can be displayed.

The connection between service interface and PC must be done with a ready-made cable specifically made for this purpose.

- BL20-connection cable (I/O-ASSISTANT-ADAPTER-CABLE-BL20/BL67)

The BL20-cable has a PS/2 connector (connection for female connector on gateway) and a SUB-D female connector (connection for male connector on PC).

Note

The service interface is positioned below the top plug-in tag of the gateway. Pull the foil out of the housing from the top to reach the service interface.

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

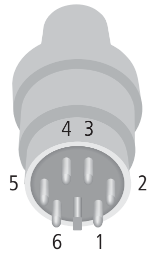


Figure 10: 9-pole SUB-D female connector on the connection cable to the PC (top view)

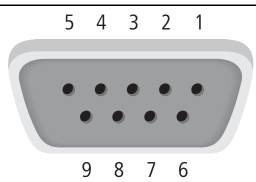


Table 1: Pin assignment PS/2- and SUB-D interface

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

Connections of read/write heads

Ready-made connection cables

The following table displays ready-made connection cables with a coupling to connect the read/write head and an open end to connect the spring-type terminals of the interface module. The connection to the spring-type terminals of the interface module is explained in Chapter "Connection terminals when connection cables RK4.5T... and WK4.5T... are used." page 2-9 and Chapter "Connection terminals when the connection cable FB4.5T... is used." page 2-9.

Table 2: Ready-made connection cables (BL20)

Type description (Ident number)	**Coupling[A]** **straight = s** **angled = a**	**2m**	**5 m**	**10 m**	**25 m**	**50 m**
RK4.5T-2/S2500 (8035244)	s	x				
RK4.5T-5/S2500 (6699206)	s		x			
RK4.5T-10/S2500 (6699207)	s			x		
RK4.5T-25/S2500 (6699421)	s				x	
RK4.5T-50/S2500 (6699422)	s					x
RK4.5T-2/S2500 (8035245)	a	x				
RK4.5T-5/S2500 (6699208)	a		x			
RK4.5T-10/S2500 (6699209)	a			x		
RK4.5T-25/S2500 (6699423)	a				x	
RK4.5T-50/S2500 (6699424)	a					x
For the food and beverage range (FB = Food and Beverage) - IP69K						
FB-RK4.5T-5/S2502 (8036404)	s		x			
FB-RK4.5T-10/S2502 (8036405)	s			x		
FB-RK4.5T-25/S2502 (8037011)					x	

A *The "coupling" serves to connect the read/write head*

Characteristics of the connection cables of type RK... and WK....

- Shielded
- PUR outer jacket, PVC, silicone- and halogen-free
- Highly flexible
- Crosslinked by irradiation, resistant to weld flash, oils
- High mechanical durability
- Approval Ⓤ

Characteristics of the connection cables of type FB....

- Shielded
- PVC outer jacket,
- Approval Ⓤ,

Connection cables for mounting a coupling

The *BL ident*® suitable cable "KABEL-BLIDENT-100M" can be self-assembled. For this purpose mount the M12-coupling "B8151-0/9" (6904604) to connect the read/write head.

Table 3: Pin assignment

Channel	Pin assignment of connector	Signal	Color mapping
1	1	$V_{S/L\text{-}Head}$ B)	Brown
	3	GND	Blue
	2	Data-	Black
	4	Data+	White

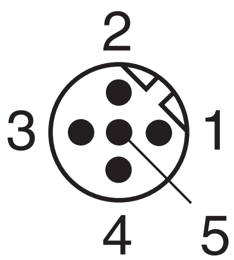


Figure 11: Pin assignment connector

Note

Terminate the open end of the connector cable according to the following two chapters!

Connection terminals when connection cables RK4.5T... and WK4.5T... are used.

Figure 12: Connection of the read/write head (transceiver) for connection cables RK4.5T... and WK4.5T...

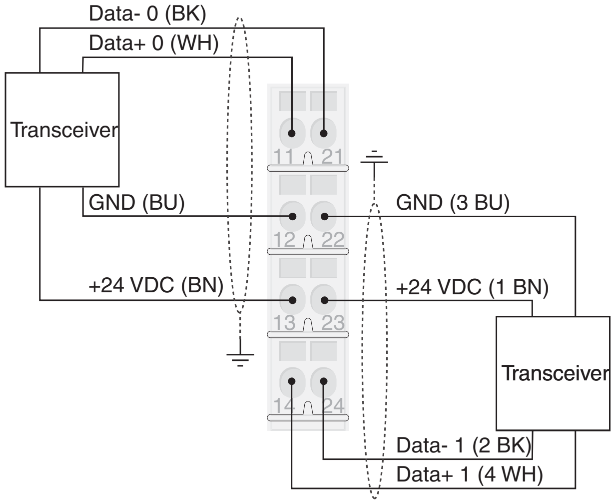


Table 4: Color mapping of the connection cables RK4.5T... and WK4.5T...

Signal	Color mapping
$V_{S/L\text{-}Head}$	Brown (BN)
GND	Blue (BU)
Data-	Black (BK)
Data+	White (WH)

Connection terminals when the connection cable FB4.5T... is used.

Figure 13: Connection of the read/write head (transceiver) for the connection cable FB4.5T...

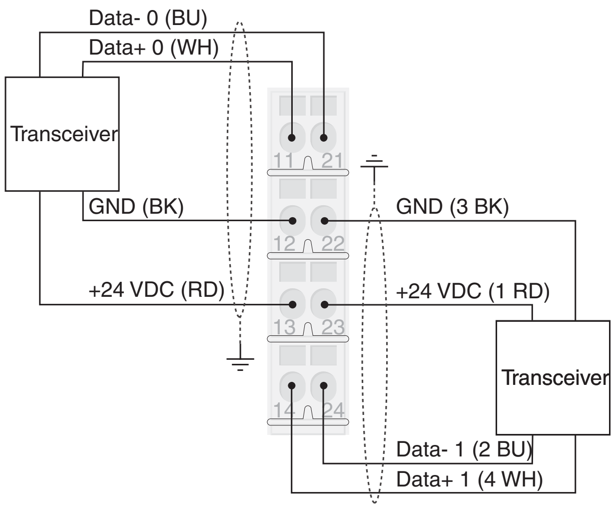


Table 5: Color mapping of the connection cable FB4.5T...

Signal	Color mapping
$V_{S/L\text{-}Head}$	Red (RD)
GND	Black (BK)
Data+	White (WH)
Data-	Blue (BU)

Diagnostics via LEDs

LEDs of the fieldbus side

Each BL20-gateway has the following status indicators in form of an LED:

- 2 LEDs for the module bus communication (module bus LEDs): GW and IOs
- 2 LEDs for the CANopen communication (fieldbus LEDs): ERR and BUS

Table 6: LED displays

LED	Status	Meaning	Remedy
GW	OFF	No voltage supply of CPU.	Check the wiring on the gateway.
	green	5 V DC operating voltage present, firmware active, gateway ready for operation and sending	-
	green blinking, 1 Hz	Low voltage of U_{sys} or U_L	Check whether the voltage supply is within the acceptable range.
	green blinking, 1 Hz IOs: red	Firmware inactive.	Reload firmware.
	green blinking, 4 Hz	Firmware active, hardware of gateway defective.	Replace the gateway.

Table 6: (cont.) LED displays

LED	Status	Meaning	Remedy
IOs	OFF	No voltage supply of CPU.	Check the wiring on the gateway.
	green	Configured constellation of module bus participants corresponds to the real one; communication active.	-
	green blinking, 1 Hz	Station is in force mode of the I/O-ASSISTANT	Deactivate the force mode of the I/O-ASSISTANT.
	red and LED "GW" on OFF	Controller not ready for operation or U_{sys}- gauge not within the required range.	Check the voltage supply U_{sys} on the gateway.
	red	Module bus not ready for operation.	Check whether the single BL20-modules are correctly mounted.
	red blinking, 1 Hz	Inadaptable modification of the real constellation of the module bus participant	Compare the projection of your BL20-station to the real constellation. Check the construction of your BL20-station for defective or wrongly plugged electronic modules.
	red blinking, 4 Hz	No module bus communication	Check the station configuration and the voltage on the gateway and on the supply modules.
	red/ green blinking, 1 Hz	Adaptable modification of the real constellation of the module bus participants	Check your BL20-station for pulled or new, not projected modules.
ERR	OFF	Communication between BL20 CANopen-Gateway and other CANopen participants is error free.	–
	red	Communication between BL20 CANopen-Gateway and other CANopen participants is defective or interrupted; possible causes: – CAN-BusOff – Heartbeat-error – Guarding-error – Transmit-timeout	– Check whether the fieldbus is terminated with a terminating resistance when the BL20-CANopen-Gateway is the last participant in the bus topology. – Check the CANopen cable for damage and correct connection. – Check whether the right bit rate is set. – Check whether the NMT-Master continues to operate correctly.

Table 6: (cont.) LED displays

LED	Status	Meaning	Remedy
BUS	green	Configured constellation of module bus participants corresponds to the real one; communication active.	-
	red	NMT-Slave-State of the BL20-CANopen-Gateway is "Stopped"	– "Reset-Node"-command from NMT-Master is needed for the respective node. – If the command is unsuccessful, execute voltage reset on node if need be.
	orange	NMT-Slave-State of the BL20-CANopen-Gateway is "Preoperational"	"Start-Node"-command from NMT-Master is needed.
ERR + BUS	alter-nately blinking red, 4 Hz	Invalid Node-ID set	Set the correct Node-ID of the gateway with the DIP-switches (1 to 63).

LEDs for RFID-connections

Table 7: RFID-connections

LED	Status	Meaning	Remedy
DIA	OFF	Normal data exchange	
	red	Module bus communication failure	Check whether more than 2 neighboring electronic modules have been pulled. Relevant are those modules which are positioned between the gateway and this module.
	red blinking, 0.5 Hz	Diagnosis present	
RW 0 **RW 1**	OFF	No tag within the received range	
	green	Tag within the received range	
	green blinking 2 Hz	Data transfer from / to tag	
	red	Error in read/write head	
	red blinking 2 Hz	Short circuit read/write head supply	

Technical data

Warning
This device may cause radio interference in living quarters and small industry (living-, business- and commercial areas, small business). Additional attenuation measures are needed!

Attention
The auxiliary supply must meet the requirements of the safety low voltage (SELV = Safety extra low voltage) per IEC 364-4-41.

General technical specifications of a station

Attention
The auxiliary supply must meet the requirements of the safety low voltage (SELV = Safety extra low voltage) per IEC 364-4-41.

Table 8: Technical specifications

Name/Description	Value / Type
Supply voltage/auxiliary power	
U_{sys} C) (nominal value)	24 V DC
I_{sys} B) (at station's maximum expansion)	approx. 500 mA
U_L C)(nominal value)	24 V DC
Max. field current I_L A)	10 A
Approved range	per EN 61131-2 (18 to 30 V DC)
Ripple	per EN 61131-2
Isolation voltage (U_L contra U_{SYS})	500 V_{rms}
Voltage anomalies	per EN 61131-2
I_{MB} (supply of module bus participants)	700 mA
Connection technology	Push-in-spring-type terminal LSF of company Weidmueller
Physical interfaces	
Fieldbus	
Protocol	CANopen
Transfer rate	20 kBit/s to 1 Mbit/s

Table 8: Technical specifications

Name/Description	Value / Type
Isolation voltage (fieldbus contra U_{sys} and contra U_L)	500 V_{rms}
Fieldbus connection technology	Push-in-spring-type terminal LSF of company Weidmueller
Setting of addresses	with DIP-switches (addresses 1 to 63)
Service interface	
Connection technology	RS232 to PS2/ Mini DIN female connector
Ambient conditions	
Ambient temperature	
– $t_{Ambient}$	0 to +55 °C
– t_{Store}	- 25 to +85 °C
relative humidity per EN 61131-2/EN 50178	5 to 95 % (indoor), level RH-2, no condensation (storage at 45 °C, no functional check)
Climate tests	per IEC 61131-2
Vibration resistance	
10 to 57 Hz, constant amplitude 0.075 mm, 1 g	yes
57 to 150 Hz, constant acceleration 1 g	yes
Oscillation type	Frequency cycles with a rate of change of 1 octave/min
Oscillation period	20 frequency cycles per coordinate axis
Shock resistance per IEC 68-2-27	18 shocks, half sine 15 g peak value / 11 ms, each in ± direction per space coordinate
Continuous shock resistance per IEC 68-2-29	1000 shocks, half sine 25 g peak value /6 ms, each in ± direction per space coordinate
Tilting over and falling	
Height of fall (weight) < 10 kg)	1.0 m
Height of fall (weight 10 to 40 kg)	0.5 m
Test cycles	7
Devices with packaging, printed circuit boards electrically tested	

Table 8: Technical specifications

Name/Description	Value / Type
Electromagnetic compatibility (EMC) per EN 50082-2 (industry)	
Static electricity per EN 61000-4-2	
– Air discharge (direct)	8 kV
– Relay discharge (indirect)	4 kV
Electromagnetic HF-fields per EN 61000-4-3 and ENV 50 204	10 V/m
Grid-bound interferences induced by HF-fields per EN 61000-4-6	10 V
Rapid transients (burst) per EN 61000-4-4	
Transient emissions per EN 50081-2 (Industry)	per EN 55011 Class A[D)], Group 1

A *The current consumption of the field supply U_L is the sum of:*
current consumption read/write head × number of read/write heads
+
current consumption per 2-channel RFID-module × number of modules

B *The current consumption of the system supply U_{SYS} is the sum of:*
current consumption of gateway
+
current consumption per 2-channel RFID-module × number of modules

C *In order to supply the electronic components of the RFID-modules current is used from both the field supply U_L as well as the system supply U_{SYS}.*

D *The use within living space may cause failure of functions. Additional attenuation measures are needed!*

Note

You may find additional technical instructions for testing the TURCK-products of the BL20-series in the catalog "Fieldbus Technology modular I/O Systems and compact I/O Modules in IP20 and IP67" (D301053).

Connection level read/write head

Table 9: Technical specifications

Name/Description	Value/Type
Number of channels	2
Nominal voltage of supply terminal (U_L)	24 VDC
Nominal voltage from field supply (U_L)	≤ 100 mA
Nominal current from module bus	≤ 30 mA
Power loss, typical	≤ 1 W
Inputs/Outputs	
Transfer rate	115.2 kBit/s
Cable length	50 m
Cable impedance	120 Ω
Potential isolation	Isolation of electronic components and field level via optocoupler
Utilization factor	1
Sensor supply	500 mA per channel, short circuit protected
Sum current (via both channels)	500 mA
Transfer rate	serial differential transfer to read/write head
Data buffer receive/send	8/8 kByte
Connection technology read/write heads	Spring-type terminal
Protection class	IP 20
Stripped isolation length	8 mm
max. terminal range	0.5 to 2.5 mm^2
Conductor suitable for clamping	
"e" single-wire H 07V-U	0.5 to 2.5 mm^2
"f" fine-wire H 07V-K	0.5 to 1.5 mm^2
"f" with wire end sleeves per DIN 46228/1 (wire end sleeves crimped on gastight)	0.5 to 1.5 mm^2
Plug gauge per IEC 947-1/1988	A1
Measuring data per VDE 0611 Section 1/8.92/IEC 947-7-1/1989	
Measuring voltage	250 V
Measuring current	17.5 A
Measuring diameter	1.5 mm^2

Table 9: (cont.) Technical specifications

Name/Description	Value/Type
Measurement surge voltage	4 kV
Degree of pollution	2

3 Start-up of a TURCK *BL ident*®-system

Start-up example with the BL20-2RFID-S-Module

The following steps for start-up are examples. Paragraph "Objects of the BL20-2RFID-S-Module" page 3-30 contains the general information.

Hardware specifications

The following hardware components are needed for the start-up example below:

- Control with CANopen-compatible CPU
- *BL ident* ®-Interface-Module "TI-BL20-E-CO-S-X"
- *BL ident* ®- read/write head (for example, "TN-CK40-H1147")
- Data carrier (for example, "TW-R50-B128" with 112 byte user data)
- Suitable connection cables

Please download D101583 which you may find in the download area of the TURCK website if you desire additional information for read/write heads and the data carriers.

Note
Please note that the firmware version of the gateway must be 2.0 or higher!

Installation of the target required for the control

In order to use a start-up and programming tool to operate the control, the specific "target" must be installed. In general, the target files or rather the target firmware can be found on the website of the respective manufacturer.

Download of the active EDS-file

The active EDS-file is used to support the configuration of the *BL ident*®-Interface-Module. To locate the active EDS-file go to:

http://www.turck.com....

In the open configuration software, you may download the active EDS-file and save it where the software can access it (for example, Extras >-Add configuration file...) or save the EDS-file directly in the folder made available by the software (for example, "EDS").

Note

EDS-file support is not required or possible with each start-up tool!

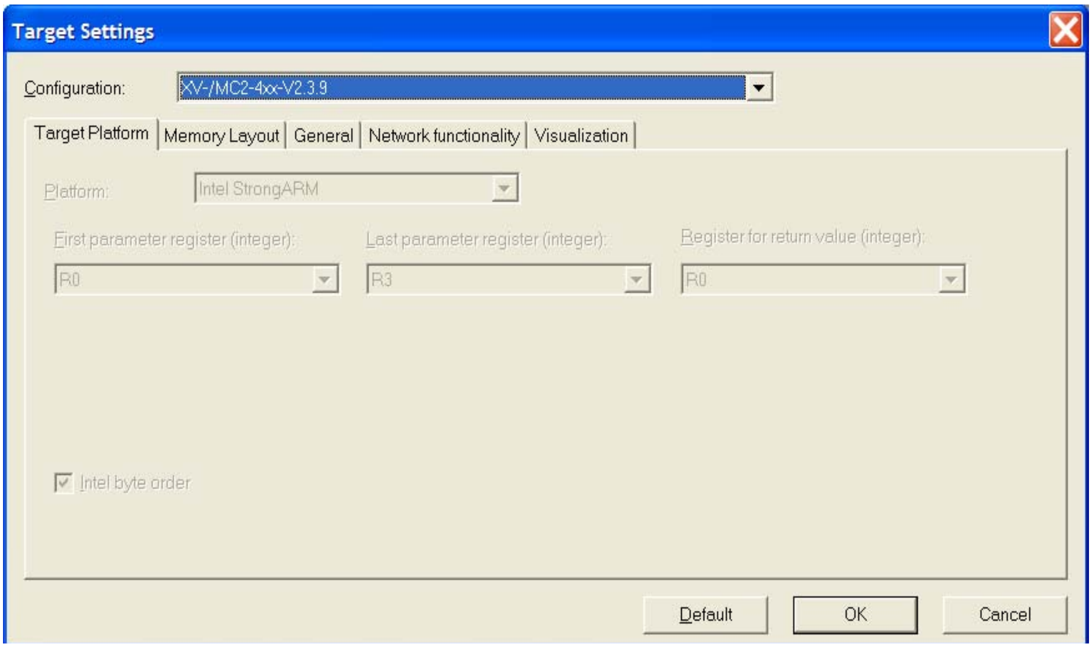
Starting the software and creating a new project

If need be, please actualize the configuration file, EDS-file (prior and after the start). Start the software (for example, CoDeSys).

Create a new project and assign a project name.

In the first step of your CANopen-system configuration, please select the product name of your control. The product name can be found in the list when the respective target for the control has been successfully installed (see above). The control is also called target system.

Figure 14: Add the control to the project



Configuration of the control

The control is to work as CAN-Master. Please configure the control with your programming tool.

Now setting of different CAN-parameters is possible.

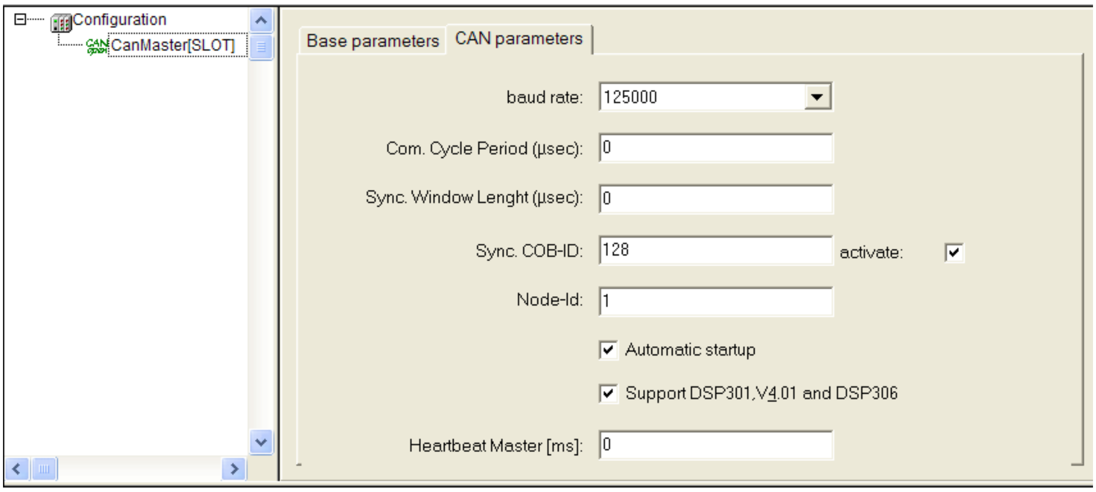


Figure 15: Setting of the parameters of the CAN-Master

Baud rate

The possible baud rate is the result of the required length of the CANopen-cable. The following table shows the suitable baud rate for the respective cable length:

Table 10: Baud rate and cable length

Baud rate (kBit/s)	Maximum cable length (m)
10	1000
20	1000
50	1000
100	650
125	500
250	250
500	100
800	50
1000	25

Note

All participants of a CANopen network must have the same baud rate/bit transfer rate settings.

Node-ID

The "Node ID" of the Master must be within the 1 to 127 range and can only be assigned once in the entire CAN-network.

Other configuration options

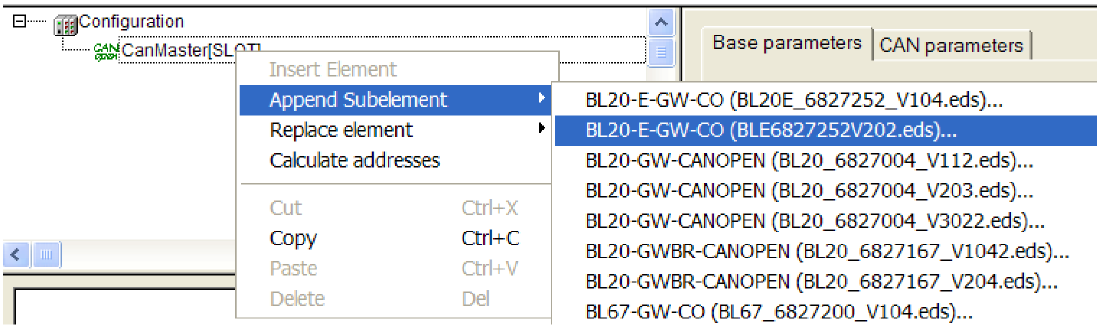
The entries "Com.Cycle Period", "Sync. Window Length" and "Sync. COB-ID" belong to the "SYNC-message" page 4-4 (synchronization message). This is a central clock-pulse generator which is cyclically sent. You may keep the settings for the *BL ident*®-project.

The active function "Automatic Start" ensures initialization and start of the CAN-bus. If this function is not available, the CAN-bus must be started in the project. The function "DSP301,V4.01 and DSP306 Support" facilitates, for example, the setting of the pulse for the heartbeat-function.

Configuration of the *BL ident*®-Interface-Module

In order to configure the interface module, first select the type of the gateway "BL20-E-GW-CO". Please ensure that the selected gateway is linked to the correct EDS-file. In the example below, the linked EDS-file is listed in parenthesis following the description of the gateway. The EDS-file must be current so that the interface module can be completely configured ("Download of the active EDS-file" page 3-4).

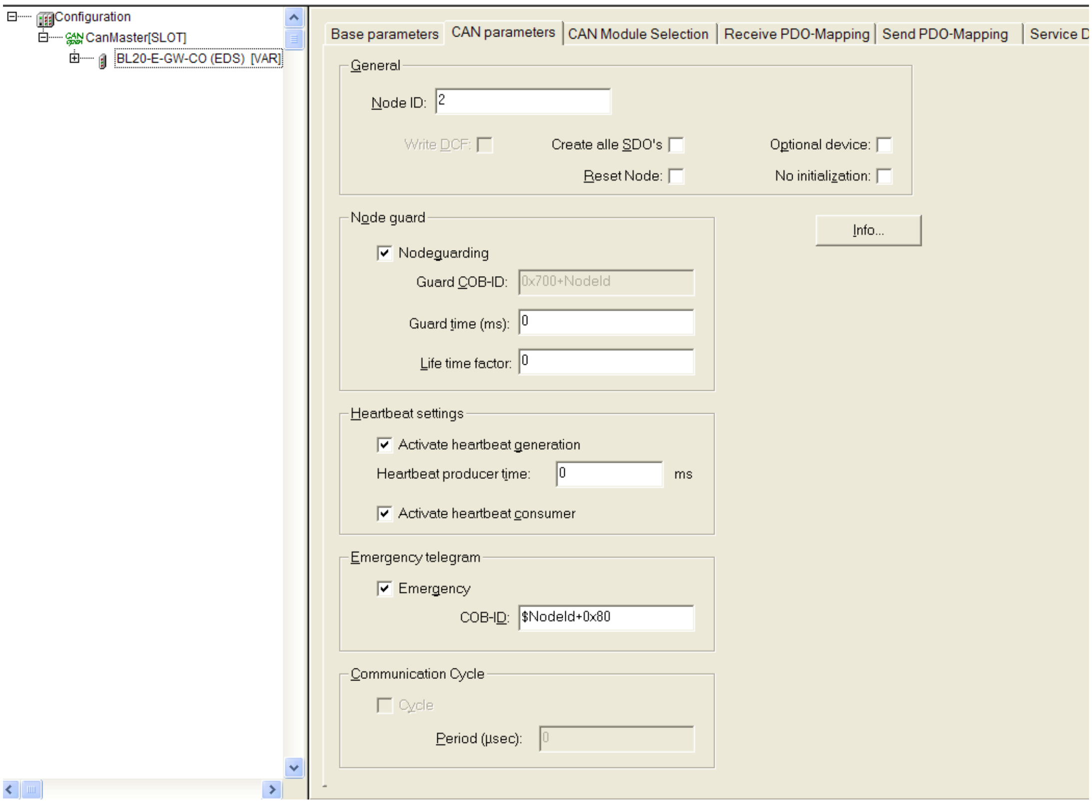
Figure 16: Configuration of the gateway "BL20-E-GW-CO"



Accept the Node-ID (0 to 63) which is set with the DIP-switch "ADDRESS" on the gateway "BL20-E-GW-CO".

The explanations for the remaining "CAN-parameters" can be found in the "Glossary" page 4-1.

Figure 17: Parameter to gateway



In order to complete the configuration of the interface module, now choose the "CAN Module Selection". Select the module "BL20-2RFID-S" from the list. If this list is incomplete, please ensure that the configured gateway is linked to the right/current EDS-file ("Configuration of the gateway "BL20-E-GW-CO"" page 3-6).

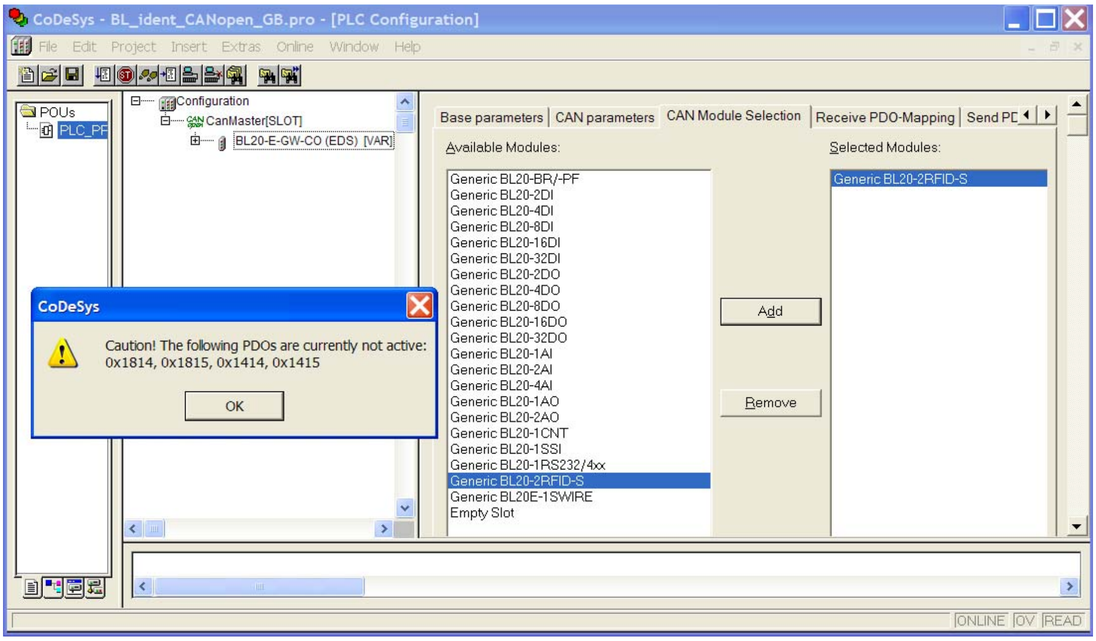


Figure 18: Module selection

PDO-communication

A PDO is transferred with 8 byte and an identifier ("COB-ID" page 4-1). A PDO-communication can be established with the following RFID-objects:

- "Object 0x5700 - 8 byte process input data" page 3-30
- "Object 0x5702 - 8 byte process output data" page 3-31
- "Object 0x5708 - 1 byte status messages" page 3-32

Establishing the PDO-communication for the first two *BL ident*®-channels

In order to minimize the configuration effort, the PDO-communication has been prepared for the first two *BL ident*®-channels or rather for the first BL20-2RFID-S-module. Because the PDO-communication is basically limited to 8 byte, the "Process image of the BL20-2RFID-S-Module" page 3-33 per channel is shortened by the last 4 byte. The process data of a channel can be completely transferred via a SDO-communication. However, this type of transfer is more extensive.

RPDO21 and RPDO22 stand prepared for the transfer of the first 8 "Process Output Data" page 3-35. TPD021 and TPD022 stand prepared for the transfer of the first 8 "Process Input Data" page 3-33.

A total of 32 RPDOs and 32 TPDOs are available for a CANopen node.

Assignment of the COB-IDs

The objects 0x1800 to 0x181F are assigned to TPDO1 to TPDO32. The objects 0x1400 to 0x141F are assigned to RPDO1 to RPDO32. These objects contain amongst others the "COB-ID" page 4-1.

The COB-ID for the process input data of the first *BL ident*®-channel of a CANopen-node is by default in the Object 0x1814, the COB-ID for the process output data is in the Object 0x1414.

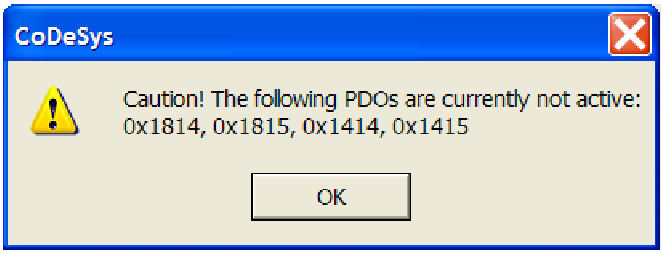


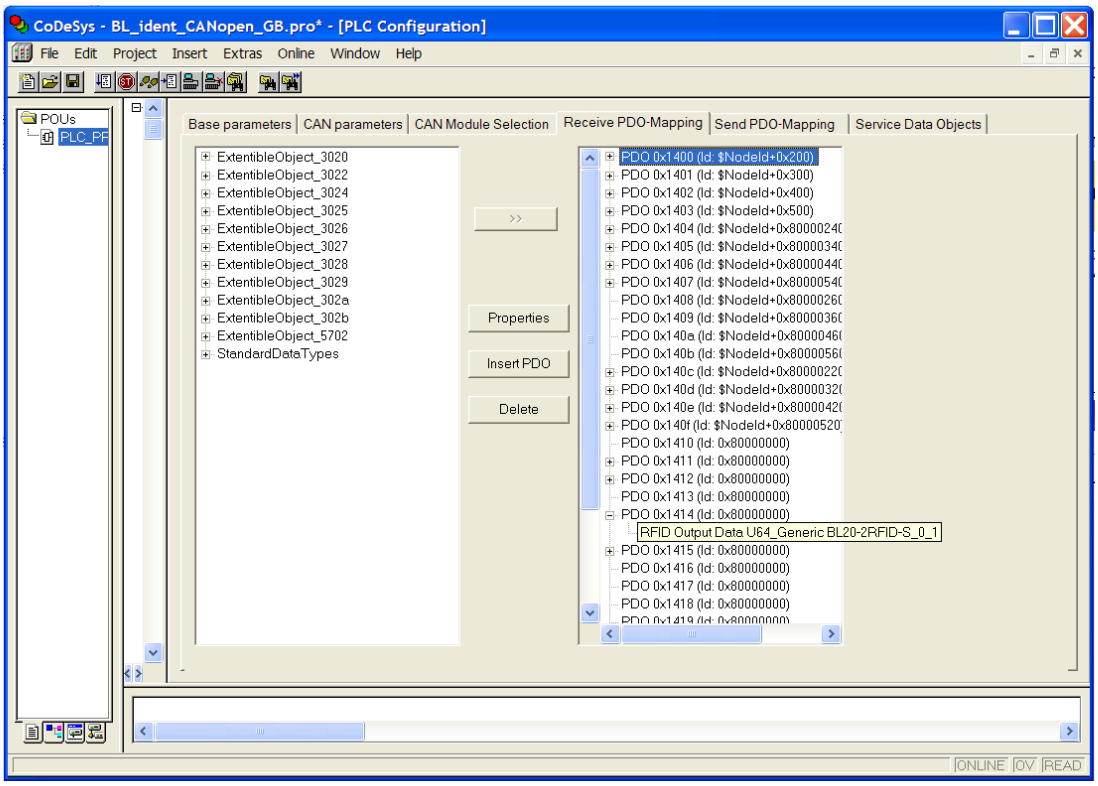
Figure 19: Message "No Entry of Valid COB-ID".

Assignment of COB-IDs in a CANopen-network automatically occurs for many standard objects following the "Predefined Master Slave Connection Set" ("Identifier for the standard objects" page 3-46).

The COB-IDs of the Objects 0x1814, 0x1815... may be freely selected; here it must be ensured that they have not been assigned already, or that they would be assigned if the CANopen-network was to be expanded. For example, all those COB-IDs can be used that result from the Node-IDs (COB-ID = Basis-ID + Node-ID) not found in the network. Please note that higher COB-IDs cause a decrease in priority of the transfer of the respective communication objects.

Select the object register, for example "Receive PDO-Mapping" to assign the COB-ID.

Figure 20: Receive PDO-Mapping



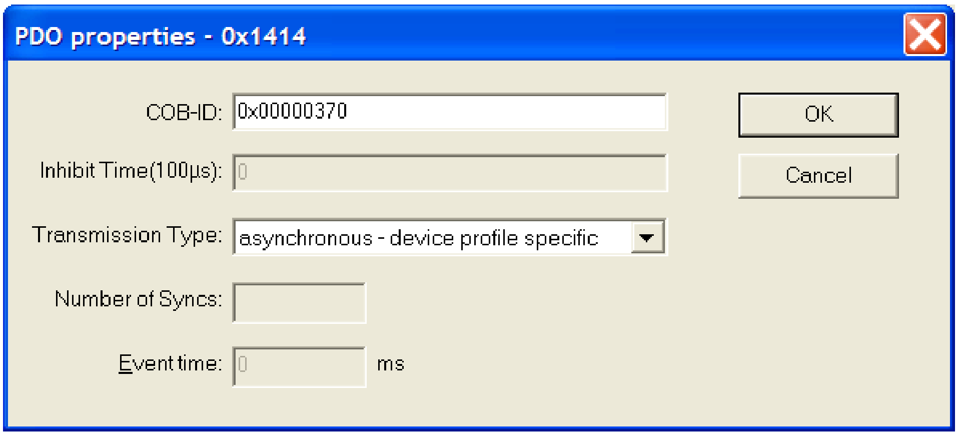
In the register select Object 0x1414 and select the object's "Features". "8" on the COB-ID digit with the highest value indicates that the respective object here (PRD021) is inactive. The link to the RFID-object 0x5702 has been established already.

In the following diagram example, the COB-ID "00000370" was entered. This COB-ID belongs to the "Analog Output" range according to the diagram in "Identifier for the standard objects" page 3-46. This COB-ID would be automatically mapped to the communication object for the process output data of the first analog channel of a station with the Node-ID "112" (COB-ID = Basis-ID + Node-ID = 768 +112 = 880 = 0x370).

Note

Please note that each COB-ID in your CANopen-network can only be used once!

Figure 21: Assignment of a "free" COB-ID



Assign COB-ID 0x00000371 for the Object 0x1415, for example.

Table 11: Establishing the RPDOs for Channel 1 and 2

BL ident®**-channel**	**Instance of the Object 0x5702**	**RPDO**	**Object for COB-ID**	**COB-ID**[A] **(Example)**
Channel 1	RFID Output Data U64_Generic BL20-2RIFD-S_0_1	21	0x1414	0x00000370
Channel 2	RFID Output Data U64_Generic BL20-2RIFD-S_0_2	22	0x1415	0x00000371

A *According to the table "Identification numbers for the Basis-objects" page 3-46, the COB-IDs used here are also used together with the Node-IDs 112 and 113 for the first analog output channels of the nodes and by automatic mapping. In case these COB-IDs are not free in your network, please assign other free COB-IDs.*

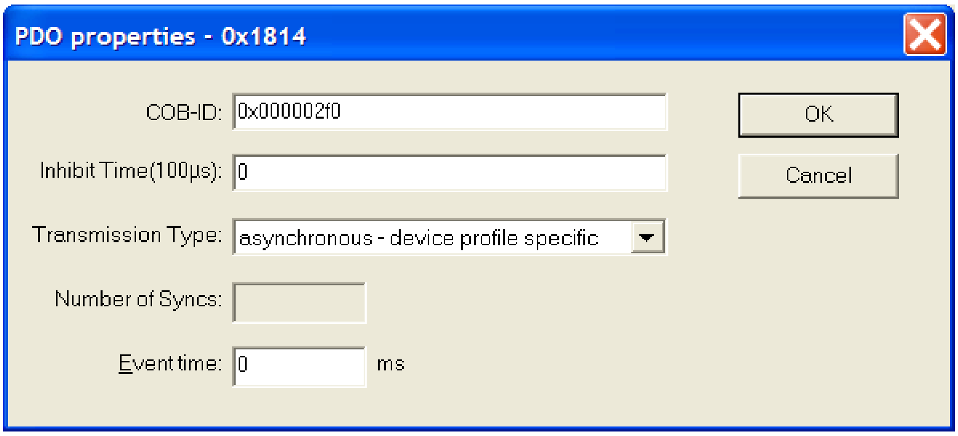
The Objects 0x1800 to 0x181F may be located under "PDO-Mapping Send", for example. For Objects 0x1814 and 0x1815 assign respectively the COB-IDs 0x000002F0 and 0x000002F1.

Table 12: Establishing the TPDOs for Channel 1 and 2

BL ident®**-channel**	**Instance of the Object 0x5700**	**TPDO**	**Object for COB-ID**	**COB-ID**[A] **(Example)**
Channel 1	RFID Input Data U64_Generic BL20-2RIFD-S_0_1	21	0x1814	0x000002F0
Channel 2	RFID Input Data U64_Generic BL20-2RIFD-S_0_2	22	0x1815	0x000002F1

A *According to the table "Identification numbers for the Basis-objects" page 3-46, the COB-IDs used here are also used together with the Node-IDs 112 and 113 for the first analog input channels of the nodes and by automatic mapping. In case these COB-IDs are not free in your network, please assign other free COB-IDs.*

Figure 22: Assignment of a "free" COB-ID



For the transfer of the *BL ident*®-process data use the "Transmission Type" page 4-4 "asynchronous - device-specific".

In the case that your network contains additional modules of the BL20-module series, Chapter "CANopen - general overviews" page 3-42 will explain how the specific module types are mapped to the RPDOs/TPDOs.

Establishing the PDO-communication for additional *BL ident*®-channels

In case that your interface module contains additional *BL ident*®-modules, they must be taken into consideration in the first step of the configuration process ("Module selection" page 3-8).

Then continue to the object register.

An instance to "Object 0x5702 - 8 byte process output data" page 3-31 is created for each configured *BL ident*®-channel. TPDO**23**, TPDO**24**, RPDO**23** and RPDO**24** can be used for the PDO-communication of the third and fourth *BL ident*®-channels, for example. The tables "BL20-specific PDOs TPDO5 to TPDO22" page 3-43 and "BL20-specific PDOs RPDO5 to RPDO22" page 3-44 show that there has been no consideration to use these PDOs. TPDDO23/24 is automatically linked to Object 0x1816/ 0x1817. RPDDO23/24 is automatically linked to Object 0x1416/0x1417. Please link the Object Instances "RFID Output Data U64_Generic BL20-2RIFD-S_1_1" (>>) to the Object 0x1416, and "RFID Output Data U64_Generic BL20-2RIFD-S_1_2" to Object 0x1417. (Mark both elements and activate ">>".)

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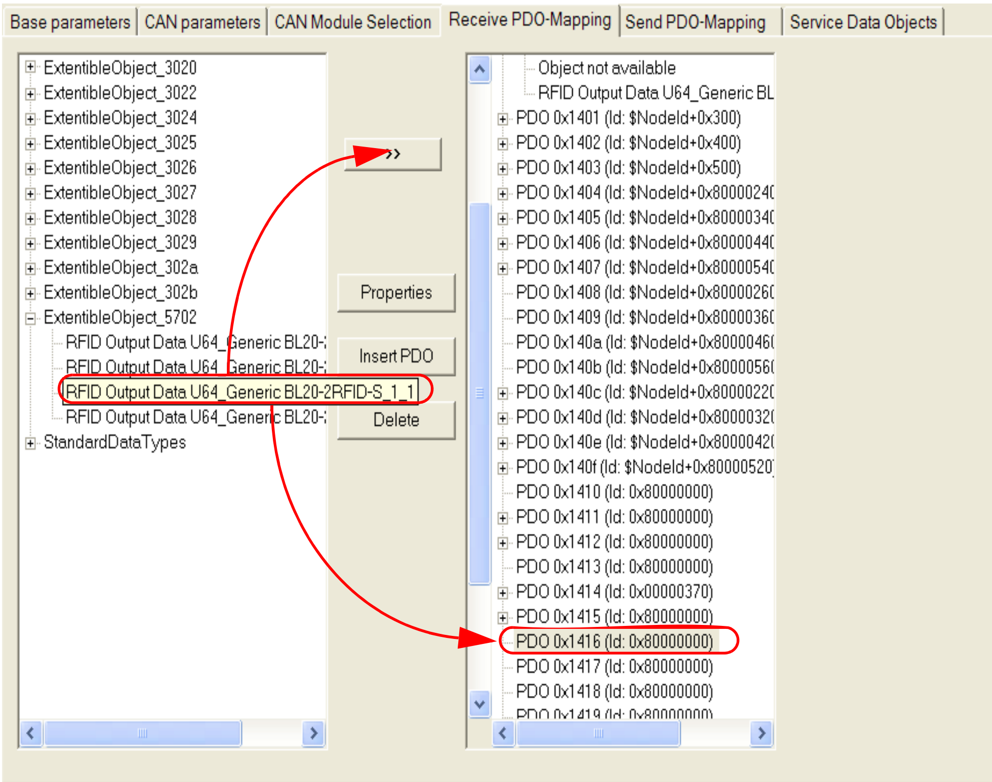
Figure 23: PDO-mapping



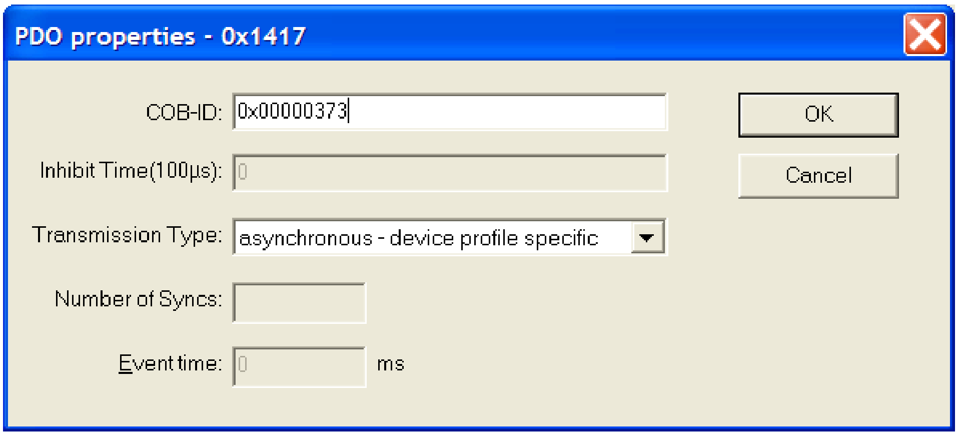
Map the COB-IDs and the RPDOs in the Objects 0x1416 and 0x1417 respectively (Properties).

Table 13: Establishing the RPDOs for Channel 1 and 4

***BL ident*® -channel**	**Instance of the Object 0x5702**	**RPDO**	**Object for COB-ID**	**COB-ID A) (Example)**
Channel 1	RFID Output Data U64_Generic BL20-2RIFD-S_0_1	21	0x1414	0x00000370
Channel 2	RFID Output Data U64_Generic BL20-2RIFD-S_0_2	22	0x1415	0x00000371
Channel 3	RFID Output Data U64_Generic BL20-2RIFD-S_1_1	23	0x1416	0x00000372
Channel 4	RFID Output Data U64_Generic BL20-2RIFD-S_1_2	24	0x1417	0x00000373

A *According to the table "Identification numbers for the Basis-objects" page 3-46, the COB-IDs used here are also used together with the Node-IDs 112, 113, 114 and 115 for the first analog output channels of the nodes and by automatic mapping. In case these COB-IDs are not free in your network, please assign other free COB-IDs.*

Figure 24: Mapping of COB_ID in the Object 0x1417



For the transfer of the *BL ident*®-process data use the "Transmission Type" page 4-4 "asynchronous - device-profile-specific".

To establish the TPDOs, please continue to the tab "PDO-Mapping Send", for example.

To establish the RPDOs please follow the steps described above for establishing the TPDOs.

Table 14: Establishing the TPDOs for Channel 1 to 4

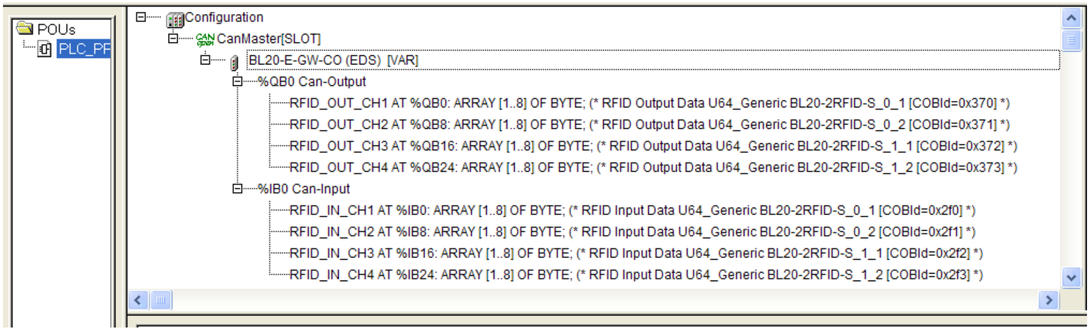
***BL ident*®-channel**	**Instance of the Object 0x5700**	**TPDO**	**Object for COB-ID**	**COB-ID[A] (Example)**
Channel 1	RFID Input Data U64_Generic BL20-2RIFD-S_0_1	21	0x1814	0x000002F0
Channel 2	RFID Input Data U64_Generic BL20-2RIFD-S_0_2	22	0x1815	0x000002F1
Channel 3	RFID Input Data U64_Generic BL20-2RIFD-S_1_1	23	0x1816	0x000002F2
Channel 4	RFID Input Data U64_Generic BL20-2RIFD-S_1_2	24	0x1817	0x000002F3

A *According to the table "Identification numbers for the Basis-objects" page 3-46, the COB-IDs used here are also used together with the Node-IDs 112, 113, 114 and 115 for the first analog input channels of the nodes and by automatic mapping. In case these COB-IDs are not free in your network, please assign other free COB-IDs.*

Assigning variable names for PDOs

Assign variable names for PDOs.

Figure 25: Names for PDOs



Compiling the variable tables for the process data

The names from "Process Input Data" page 3-33 and "Process Output Data" page 3-35 were used for the following variable tables. The following display shows an example of a structured text for CoDeSys:

```
VAR
    RESET_0:BOOL;
    XCVR_INFO_0:BOOL;
    TAG_INFO_0:BOOL;
    WRITE_0:BOOL;
    READ_0:BOOL;
    TAG_ID_0:BOOL;
    NEXT_0:BOOL;
    XCVR_0:BOOL;
    BYTE_COUNT_0:BYTE;
    Addr_Hi_0:BYTE;
    Addr_Lo_0:BYTE;
    WRITE_DATA_0:ARRAY[0..3]OF BYTE;

    TFR_0:BOOL;
    TP_0:BOOL;
    XCVR_ON_0:BOOL;
    XCVR_CON_0:BOOL;
    ERROR_0:BOOL;
    BUSY_0:BOOL;
    DONE_0:BOOL;
    ERR_CODE_LO_0:BYTE;
    ERR_CODE_HI_0:BYTE;
    READ_DATA_0:ARRAY[0..3]OF BYTE;

END_VAR
```

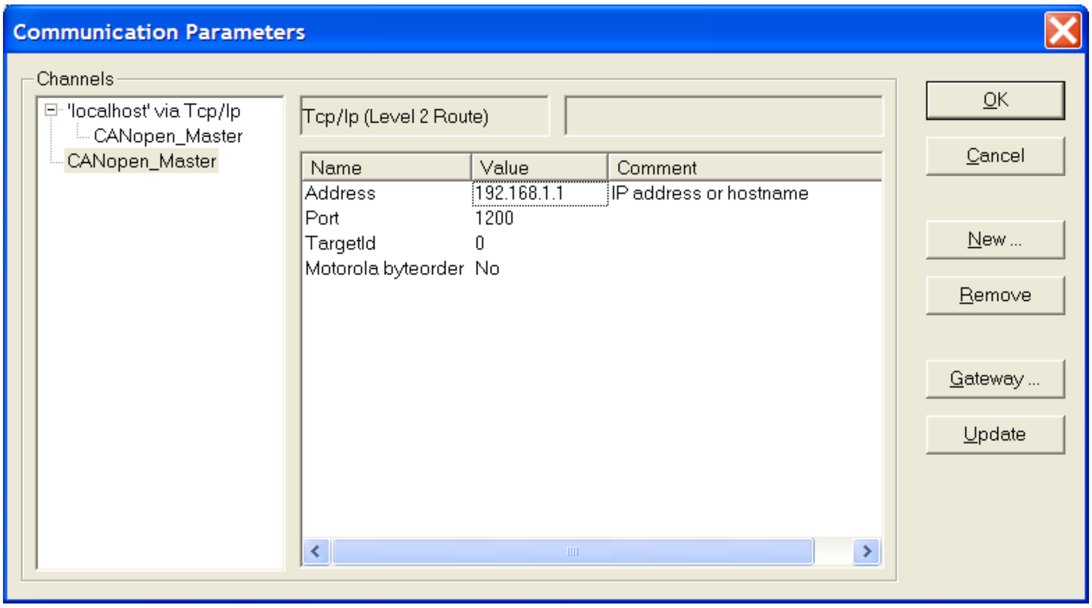
In the main program (for example, PLC_PRG), map the bits or rather bytes from the PDOs to the variables.

```
(*RFID-S Channel 1 Input Command- and Control-Bits*);
RFID_OUT_CH1[1].0:= RESET_0;
RFID_OUT_CH1[1].1:= XCVR_INFO_0;
RFID_OUT_CH1[1].2:=TAG_INFO_0;
RFID_OUT_CH1[1].3:=WRITE_0;
RFID_OUT_CH1[1].4:= READ_0;
RFID_OUT_CH1[1].5:= TAG_ID_0;
RFID_OUT_CH1[1].6:= NEXT_0;
RFID_OUT_CH1[1].7:=XCVR_0;
(*RFID-S Channel 1 Input Number of Bytes 0x3 ->4 Byte maximum*);
RFID_OUT_CH1[2]:=BYTE_COUNT_0;
(*RFID-S Channel 1 Address on Data Carrier*);
RFID_OUT_CH1[3]:=Addr_Hi_0;
RFID_OUT_CH1[4]:=Addr_Lo_0;
(*RFID-S Channel Write Data*)
RFID_OUT_CH1[5]:=WRITE_DATA_0[0];
RFID_OUT_CH1[6]:=WRITE_DATA_0[1];
RFID_OUT_CH1[7]:=WRITE_DATA_0[2];
RFID_OUT_CH1[8]:=WRITE_DATA_0[3];
(*RFID-S Channel 1 Input Status Bits*);
TFR_0:=RFID_IN_CH1[1].1;
TP_0:=RFID_IN_CH1[1].2;
XCVR_ON_0:=RFID_IN_CH1[1].3;
XCVR_CON_0:=RFID_IN_CH1[1].4;
ERROR_0:=RFID_IN_CH1[1].5;
BUSY_0:=RFID_IN_CH1[1].6;
DONE_0:=RFID_IN_CH1[1].7;
(*RFID-S Channel 1 Error Code*);
ERR_CODE_LO_0:=RFID_IN_CH1[2];
ERR_CODE_HI_0:=RFID_IN_CH1[3];
(*RFID-S Channel Read Data*)
READ_DATA_0[0]:=RFID_IN_CH1[5];
READ_DATA_0[1]:=RFID_IN_CH1[6];
READ_DATA_0[2]:=RFID_IN_CH1[7];
READ_DATA_0[3]:=RFID_IN_CH1[8];
```

Communication with control

Configure the communication between your PC and control so that you may download the newly created program into the control as the next step. For this purpose, please set the communication parameters. The IP-address of your network interface must be compatible with the IP-address of your gateway.

Figure 26: Communication parameters



Log-in and start of the program

When the configuration parameters are set, communication to the control may be established (log-in). Start the program and if need be, create the Boot-project in the Online-mode; the program will then be downloaded into the control. With the next start the program is in the control.

Activating the read/write head

The read/write head of the first channel is activated when Bit XCVR_0 is set from FALSE to TRUE. An active read/write head will create an electromagnetic field (the signal is transferred with 13,56 MHz, for example).

Figure 27: The variable "XCVR" for the read/write head

RFID_OUT_CH1[1].0 = FALSE	RFID_OUT_CH1[1] = 128	RESET_0 = FALSE
RFID_OUT_CH1[1].1 = FALSE	RFID_OUT_CH1[1] = 128	XCVR_INFO_0 = FALSE
RFID_OUT_CH1[1].2 = FALSE	RFID_OUT_CH1[1] = 128	TAG_INFO_0 = FALSE
RFID_OUT_CH1[1].3 = FALSE	RFID_OUT_CH1[1] = 128	WRITE_0 = FALSE
RFID_OUT_CH1[1].4 = FALSE	RFID_OUT_CH1[1] = 128	READ_0 = FALSE
RFID_OUT_CH1[1].5 = FALSE	RFID_OUT_CH1[1] = 128	TAG_ID_0 = FALSE
RFID_OUT_CH1[1].6 = FALSE	RFID_OUT_CH1[1] = 128	NEXT_0 = FALSE
RFID_OUT_CH1[1].7 = TRUE	RFID_OUT_CH1[1] = 128	XCVR_0 = TRUE

Note

Ensure that the read/write head is connected and activated prior to issuing additional commands.

Figure 28: read/write head is connected and switched on.

TFR_0 = FALSE	RFID_IN_CH1[1].1 = FALSE	RFID_IN_CH1[1] = 152
TP_0 = FALSE	RFID_IN_CH1[1].2 = FALSE	RFID_IN_CH1[1] = 152
XCVR_ON_0 = TRUE	RFID_IN_CH1[1].3 = TRUE	RFID_IN_CH1[1] = 152
XCVR_CON_0 = TRUE	RFID_IN_CH1[1].4 = TRUE	RFID_IN_CH1[1] = 152
ERROR_0 = FALSE	RFID_IN_CH1[1].5 = FALSE	RFID_IN_CH1[1] = 152
BUSY_0 = FALSE	RFID_IN_CH1[1].6 = FALSE	RFID_IN_CH1[1] = 152
DONE_0 = TRUE	RFID_IN_CH1[1].7 = TRUE	RFID_IN_CH1[1] = 152

Initialization/RESET Channel 1

Ensure that the read/write head is connected and switched on prior to initialization. The initialization command is executed by setting "RESET_=0" from FALSE -> to TRUE.

Figure 29: Initialization of the 1st Channel

RFID_OUT_CH1[1].0 = TRUE	RFID_OUT_CH1[1] = 129	RESET_0 = TRUE
RFID_OUT_CH1[1].1 = FALSE	RFID_OUT_CH1[1] = 129	XCVR_INFO_0 = FALSE
RFID_OUT_CH1[1].2 = FALSE	RFID_OUT_CH1[1] = 129	TAG_INFO_0 = FALSE
RFID_OUT_CH1[1].3 = FALSE	RFID_OUT_CH1[1] = 129	WRITE_0 = FALSE
RFID_OUT_CH1[1].4 = FALSE	RFID_OUT_CH1[1] = 129	READ_0 = FALSE
RFID_OUT_CH1[1].5 = FALSE	RFID_OUT_CH1[1] = 129	TAG_ID_0 = FALSE
RFID_OUT_CH1[1].6 = FALSE	RFID_OUT_CH1[1] = 129	NEXT_0 = FALSE
RFID_OUT_CH1[1].7 = TRUE	RFID_OUT_CH1[1] = 129	XCVR_0 = TRUE

Afterwards set the variable "RESET" to "FALSE" so that you can initiate additional commands. The bits 0 to 6 of the first output byte must be set to "0" first before another command can be initiated ("Flow diagram for executing commands" page 3-29). Bit 7 (XCVR_0) remains TRUE.

Figure 30: Prerequisites for the next command

RFID_OUT_CH1[1].0 = FALSE	RFID_OUT_CH1[1] = 128	RESET_0 = FALSE
RFID_OUT_CH1[1].1 = FALSE	RFID_OUT_CH1[1] = 128	XCVR_INFO_0 = FALSE
RFID_OUT_CH1[1].2 = FALSE	RFID_OUT_CH1[1] = 128	TAG_INFO_0 = FALSE
RFID_OUT_CH1[1].3 = FALSE	RFID_OUT_CH1[1] = 128	WRITE_0 = FALSE
RFID_OUT_CH1[1].4 = FALSE	RFID_OUT_CH1[1] = 128	READ_0 = FALSE
RFID_OUT_CH1[1].5 = FALSE	RFID_OUT_CH1[1] = 128	TAG_ID_0 = FALSE
RFID_OUT_CH1[1].6 = FALSE	RFID_OUT_CH1[1] = 128	NEXT_0 = FALSE
RFID_OUT_CH1[1].7 = TRUE	RFID_OUT_CH1[1] = 128	XCVR_0 = TRUE

Writing to the data carrier / Channel 1

The command to write to a data carrier is executed by changing the command "WRITE_0" from FALSE -> to TRUE. All other remaining variables of the command- and control-byte (Bit 0 to 6, except Bit 7) must have the current output value FALSE.

4 byte user data are transferred with the help of a PDO.

The variable BYTE_COUNT_0 (number of bytes) must be specified with the value "3" (=> 4 byte).

The address "0" is activated by default. An overview of the data ranges of the read/write heads shows "User data ranges of the data carrier variants" page 3-48.

The following diagram shows that the address range "0" of the data carrier is to be specified with 4 byte and the values "1, 2, 3, 4".

Figure 31: Number of byte, address range and write data

RFID_OUT_CH1[2] = 3	BYTE_COUNT_0 = 3
RFID_OUT_CH1[3] = 0	Addr_Hi_0 = 0
RFID_OUT_CH1[4] = 0	Addr_Lo_0 = 0
RFID_OUT_CH1[5] = 1	WRITE_DATA_0[0] = 1
RFID_OUT_CH1[6] = 2	WRITE_DATA_0[1] = 2
RFID_OUT_CH1[7] = 3	WRITE_DATA_0[2] = 3
RFID_OUT_CH1[8] = 4	WRITE_DATA_0[3] = 4

Set the bit WRITE_0 from FALSE to TRUE and possibly immediately afterwards reset it ("Flow diagram for executing commands" page 3-29).

Figure 32: The Write command was activated.

RFID_OUT_CH1[1].0 = FALSE	RFID_OUT_CH1[1] = 136	RESET_0 = FALSE
RFID_OUT_CH1[1].1 = FALSE	RFID_OUT_CH1[1] = 136	XCVR_INFO_0 = FALSE
RFID_OUT_CH1[1].2 = FALSE	RFID_OUT_CH1[1] = 136	TAG_INFO_0 = FALSE
RFID_OUT_CH1[1].3 = TRUE	RFID_OUT_CH1[1] = 136	WRITE_0 = TRUE
RFID_OUT_CH1[1].4 = FALSE	RFID_OUT_CH1[1] = 136	READ_0 = FALSE
RFID_OUT_CH1[1].5 = FALSE	RFID_OUT_CH1[1] = 136	TAG_ID_0 = FALSE
RFID_OUT_CH1[1].6 = FALSE	RFID_OUT_CH1[1] = 136	NEXT_0 = FALSE
RFID_OUT_CH1[1].7 = TRUE	RFID_OUT_CH1[1] = 136	XCVR_0 = TRUE

RFID_OUT_CH1[1].0 = FALSE	RFID_OUT_CH1[1] = 128	RESET_0 = FALSE
RFID_OUT_CH1[1].1 = FALSE	RFID_OUT_CH1[1] = 128	XCVR_INFO_0 = FALSE
RFID_OUT_CH1[1].2 = FALSE	RFID_OUT_CH1[1] = 128	TAG_INFO_0 = FALSE
RFID_OUT_CH1[1].3 = FALSE	RFID_OUT_CH1[1] = 128	WRITE_0 = FALSE
RFID_OUT_CH1[1].4 = FALSE	RFID_OUT_CH1[1] = 128	READ_0 = FALSE
RFID_OUT_CH1[1].5 = FALSE	RFID_OUT_CH1[1] = 128	TAG_ID_0 = FALSE
RFID_OUT_CH1[1].6 = FALSE	RFID_OUT_CH1[1] = 128	NEXT_0 = FALSE
RFID_OUT_CH1[1].7 = TRUE	RFID_OUT_CH1[1] = 128	XCVR_0 = TRUE

The Status-byte signals readiness to execute the command:

Figure 33: Readiness to execute the command

TFR_0 = FALSE	RFID_IN_CH1[1].1 = FALSE	RFID_IN_CH1[1] = 88
TP_0 = FALSE	RFID_IN_CH1[1].2 = FALSE	RFID_IN_CH1[1] = 88
XCVR_ON_0 = TRUE	RFID_IN_CH1[1].3 = TRUE	RFID_IN_CH1[1] = 88
XCVR_CON_0 = TRUE	RFID_IN_CH1[1].4 = TRUE	RFID_IN_CH1[1] = 88
ERROR_0 = FALSE	RFID_IN_CH1[1].5 = FALSE	RFID_IN_CH1[1] = 88
BUSY_0 = TRUE	RFID_IN_CH1[1].6 = TRUE	RFID_IN_CH1[1] = 88
DONE_0 = FALSE	RFID_IN_CH1[1].7 = FALSE	RFID_IN_CH1[1] = 88

The command was successfully executed and an additional command can be initiated:

Figure 34: Command was executed.

TFR_0 = FALSE	RFID_IN_CH1[1].1 = FALSE	RFID_IN_CH1[1] = 152
TP_0 = FALSE	RFID_IN_CH1[1].2 = FALSE	RFID_IN_CH1[1] = 152
XCVR_ON_0 = TRUE	RFID_IN_CH1[1].3 = TRUE	RFID_IN_CH1[1] = 152
XCVR_CON_0 = TRUE	RFID_IN_CH1[1].4 = TRUE	RFID_IN_CH1[1] = 152
ERROR_0 = FALSE	RFID_IN_CH1[1].5 = FALSE	RFID_IN_CH1[1] = 152
BUSY_0 = FALSE	RFID_IN_CH1[1].6 = FALSE	RFID_IN_CH1[1] = 152
DONE_0 = TRUE	RFID_IN_CH1[1].7 = TRUE	RFID_IN_CH1[1] = 152

Reading from data carrier / Channel 1

The command to write to a data carrier is executed by changing the command "WRITE_0" from FALSE -> to TRUE. All other remaining variables of the command- and control-byte (Bit 0 to 6, except Bit 7) must have the current output value FALSE.

4 byte user data are transferred with the help of a PDO.

The variable BYTE_COUNT_0 (number of bytes) must be specified with the value "3" (=> 4 byte).

The address "0" is activated by default. An overview of the data ranges of the read/write heads shows "User data ranges of the data carrier variants" page 3-48.

Figure 35: Number of byte and address range

RFID_OUT_CH1[2] = 3	BYTE_COUNT_0 = 3
RFID_OUT_CH1[3] = 0	Addr_Hi_0 = 0
RFID_OUT_CH1[4] = 0	Addr_Lo_0 = 0

Set the bit READ_0 from FALSE to TRUE and possibly immediately afterwards reset it ("Flow diagram for executing commands" page 3-29).

Figure 36: The READ-command was activated.

RFID_OUT_CH1[1].0 = FALSE	RFID_OUT_CH1[1] = 144	RESET_0 = FALSE
RFID_OUT_CH1[1].1 = FALSE	RFID_OUT_CH1[1] = 144	XCVR_INFO_0 = FALSE
RFID_OUT_CH1[1].2 = FALSE	RFID_OUT_CH1[1] = 144	TAG_INFO_0 = FALSE
RFID_OUT_CH1[1].3 = FALSE	RFID_OUT_CH1[1] = 144	WRITE_0 = FALSE
RFID_OUT_CH1[1].4 = TRUE	RFID_OUT_CH1[1] = 144	READ_0 = TRUE
RFID_OUT_CH1[1].5 = FALSE	RFID_OUT_CH1[1] = 144	TAG_ID_0 = FALSE
RFID_OUT_CH1[1].6 = FALSE	RFID_OUT_CH1[1] = 144	NEXT_0 = FALSE
RFID_OUT_CH1[1].7 = TRUE	RFID_OUT_CH1[1] = 144	XCVR_0 = TRUE

RFID_OUT_CH1[1].0 = FALSE	RFID_OUT_CH1[1] = 128	RESET_0 = FALSE
RFID_OUT_CH1[1].1 = FALSE	RFID_OUT_CH1[1] = 128	XCVR_INFO_0 = FALSE
RFID_OUT_CH1[1].2 = FALSE	RFID_OUT_CH1[1] = 128	TAG_INFO_0 = FALSE
RFID_OUT_CH1[1].3 = FALSE	RFID_OUT_CH1[1] = 128	WRITE_0 = FALSE
RFID_OUT_CH1[1].4 = FALSE	RFID_OUT_CH1[1] = 128	READ_0 = FALSE
RFID_OUT_CH1[1].5 = FALSE	RFID_OUT_CH1[1] = 128	TAG_ID_0 = FALSE
RFID_OUT_CH1[1].6 = FALSE	RFID_OUT_CH1[1] = 128	NEXT_0 = FALSE
RFID_OUT_CH1[1].7 = TRUE	RFID_OUT_CH1[1] = 128	XCVR_0 = TRUE

The Status-byte signals readiness to execute the command:

Figure 37: Readiness to execute the command

TFR_0 = FALSE	RFID_IN_CH1[1].1 = FALSE	RFID_IN_CH1[1] = 88
TP_0 = FALSE	RFID_IN_CH1[1].2 = FALSE	RFID_IN_CH1[1] = 88
XCVR_ON_0 = TRUE	RFID_IN_CH1[1].3 = TRUE	RFID_IN_CH1[1] = 88
XCVR_CON_0 = TRUE	RFID_IN_CH1[1].4 = TRUE	RFID_IN_CH1[1] = 88
ERROR_0 = FALSE	RFID_IN_CH1[1].5 = FALSE	RFID_IN_CH1[1] = 88
BUSY_0 = TRUE	RFID_IN_CH1[1].6 = TRUE	RFID_IN_CH1[1] = 88
DONE_0 = FALSE	RFID_IN_CH1[1].7 = FALSE	RFID_IN_CH1[1] = 88

The command was successfully executed, and the read data is displayed as READ_DATA_0[1 to 4]. An additional command can be initiated:

Figure 38: Command was executed, the read data are displayed.

TFR_0 = FALSE	RFID_IN_CH1[1].1 = FALSE	RFID_IN_CH1[1] = 152
TP_0 = FALSE	RFID_IN_CH1[1].2 = FALSE	RFID_IN_CH1[1] = 152
XCVR_ON_0 = TRUE	RFID_IN_CH1[1].3 = TRUE	RFID_IN_CH1[1] = 152
XCVR_CON_0 = TRUE	RFID_IN_CH1[1].4 = TRUE	RFID_IN_CH1[1] = 152
ERROR_0 = FALSE	RFID_IN_CH1[1].5 = FALSE	RFID_IN_CH1[1] = 152
BUSY_0 = FALSE	RFID_IN_CH1[1].6 = FALSE	RFID_IN_CH1[1] = 152
DONE_0 = TRUE	RFID_IN_CH1[1].7 = TRUE	RFID_IN_CH1[1] = 152
ERR_CODE_LO_0 = 0	RFID_IN_CH1[3] = 0	
ERR_CODE_HI_0 = 0	RFID_IN_CH1[4] = 0	
READ_DATA_0[0] = 1	RFID_IN_CH1[5] = 1	
READ_DATA_0[1] = 2	RFID_IN_CH1[6] = 2	
READ_DATA_0[2] = 3	RFID_IN_CH1[7] = 3	
READ_DATA_0[3] = 4	RFID_IN_CH1[8] = 4	

Error messages via the input data

Occurring errors are signalled with the help of the input data and via the collective error bit "ERROR_0". The two bytes "ERR_CODE_LO_0" and "ERR_CODE_HI_0" provide detailed information for the cause of the error.

In the table "Status values" page 3-39 the first bold numerical value represents the byte ERR_CODE_LO_0, and the second bold numerical value represents the byte ERR_CODE_HI_0.

Figure 39: Display of the error "Dwell period of tag in detection range was not sufficient for successful command processing".

TFR_0 = FALSE	RFID_IN_CH1[1].1 = FALSE	RFID_IN_CH1[1] = 184
TP_0 = FALSE	RFID_IN_CH1[1].2 = FALSE	RFID_IN_CH1[1] = 184
XCVR_ON_0 = TRUE	RFID_IN_CH1[1].3 = TRUE	RFID_IN_CH1[1] = 184
XCVR_CON_0 = TRUE	RFID_IN_CH1[1].4 = TRUE	RFID_IN_CH1[1] = 184
ERROR_0 = TRUE	RFID_IN_CH1[1].5 = TRUE	RFID_IN_CH1[1] = 184
BUSY_0 = FALSE	RFID_IN_CH1[1].6 = FALSE	RFID_IN_CH1[1] = 184
DONE_0 = TRUE	RFID_IN_CH1[1].7 = TRUE	RFID_IN_CH1[1] = 184
ERR_CODE_LO_0 = 1	RFID_IN_CH1[2] = 1	
ERR_CODE_HI_0 = 2	RFID_IN_CH1[3] = 2	

Additional commands

Execute the additional commands according to the read/write command. The command TAG_ID_0 for reading the UID can not be executed with the PDO-communication limited to 8 byte. Execute this command via a SDO-communication.

SDO-communication

Objects of any size may be transferred via SDO-communication. The following RFID-objects can not be transferred via a PDO-communication; the SDO-transfer must be established:

- "Object 0x5701 - 12 byte process input data" page 3-30
- "Object 0x5703 - 12 byte process output data" page 3-31
- "Object 0x5722 - 1 byte parameter" page 3-32

Establishment of SDO-communication via the first *BL ident*®-channel

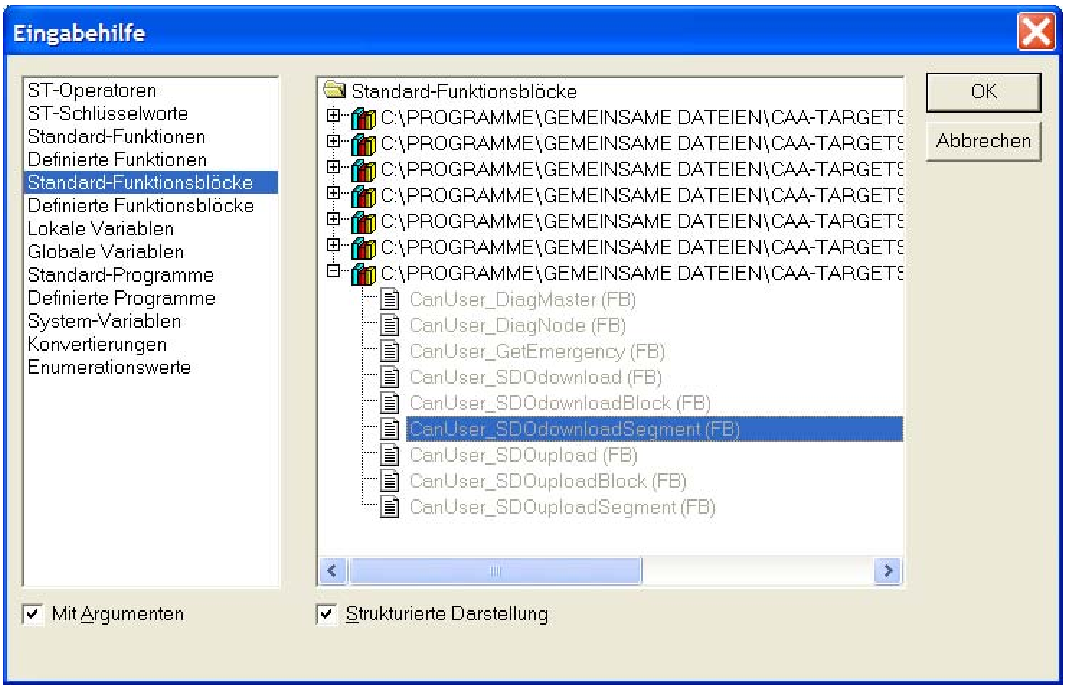
The SDO-transfer of the objects 0x5701 and 0x5703 must occur in a "segmented" fashion because these two objects represent 12 bytes. The following example shows how a SDO-communication is established with the help of function blocks.

Note

Please note that the SDO-communication does not allow simultaneous sending of multiple SDO-messages to the node. This means for the *BL ident*®-communication that a *BL ident*®-channel in a station can only be activated when the "READYMessage" has been received by the prior SDO-communication!

Select a function block that supports segmented SDO-data transfer and insert it into the master program. The standard function block is generally located in the library of the CANopen Master.

Figure 40: Function block for segmented SDO-transfer



Define the variables to control and display the content (here, 12 process output data) of the function block. Give the function block a name that matches the project, for example "RFID_CH1_SDOdownloadSegment".

RFID_SDOOUT_CH1:ARRAY[0..11]OF BYTE;

xStart_OUT_CH1:BOOL;

xReady_OUT_CH1:BOOL;

iStatus_OUT_CH1:INT;

RFID_CH1_SDOdownloadSegment:CanUser_SDOdownloadSegment;

RFID_SDOIN_CH1:ARRAY[0..11]OF BYTE;

xStart_IN_CH1:BOOL;

xReady_IN_CH1:BOOL;

iStatus_IN_CH1:INT;

RFID_CH1_SDOuploadSegment:CanUser_SDOuploadSegment;

dwLen_IN_CH1:DWORD;

Figure 41: Project-specific name

```
RFID_CH1_SDOdownloadSegment(
    wDrvNr:= ,
    bNodeNr:= ,
    dwLen:= ,
    wIndex:= ,
    bSubIndex:= ,
    pTxData:= ,
    xStart:= ,
    xReady=> ,
    iStatus=> ,
    dwAbortCode=> );
```

Transfer the following values into your function block:

RFID_CH1_SDOdownloadSegment(

wDrvNr:= 0, (*always 0 after definition of the function block*)

bNodeNr:=2, (*Node-ID set on the gateway *)

dwLen:= 12, (*maximum data length to be transferred*)

wIndex:= 16#5703, (*here the data content is the *BL ident*®-object 5703*)

bSubIndex:=1, (**BL ident*®-channel number*)

pTxData:= ADR(RFID_SDOOUT_CH1), (*memory location for the data*)

xStart:= xStart_OUT_CH1, (*START-Bit for the SDO-communication is automatically and immediately reset*)

xReady=>xReady_OUT_CH1, (*STATUS-Bit of the SDO-communication, for example for handshake*)

iStatus=> iStatus_OUT_CH1); (*additional Status/Error information for SDO-communication*)

RFID_CH1_SDOdownloadSegment(

DrvNr:= 0, (*always 0 after definition of the function block*)

bNodeNr:=2, (*Node-ID set on the gateway *)

wIndex:= 16#5701, (*here the data content is the *BL ident*®-object 5701*)

bSubIndex:=1, (**BL ident*®-channel number*)

dwLenMax:= 12, (*maximum data length to be transferred*)

pRxData:=ADR(RFID_SDOIN_CH1), (*memory location for the data*)

xStart:=xStart_IN_CH1, (*START-Bit for the SDO-communication is automatically and immediately reset*) xReady=>xReady_IN_CH1, (*STATUS-Bit of the SDO-communication, for example for handshake*)

iStatus=> iStatus_IN_CH1), (*additional Status/Error information for SDO-communication*)

dwLen=> dwLen_IN_CH1); (*transferred data length*)

Activation of the read/write head and initialization

Establish the online connection to your control (log-in), download the new/modified program and start it. The read/write head is activated by setting the bit 7 in the "Process Input Data" page 3-33. The first byte of the process input data is the value "128". Download this new value into the control.

Figure 42: Activation of the read/write head

```
⊟-RFID_SDOOUT_CH1
   RFID_SDOOUT_CH1[0] = 128
   RFID_SDOOUT_CH1[1] = 0
   RFID_SDOOUT_CH1[2] = 0
   RFID_SDOOUT_CH1[3] = 0
   RFID_SDOOUT_CH1[4] = 0
   RFID_SDOOUT_CH1[5] = 0
   RFID_SDOOUT_CH1[6] = 0
   RFID_SDOOUT_CH1[7] = 0
   RFID_SDOOUT_CH1[8] = 0
   RFID_SDOOUT_CH1[9] = 0
   RFID_SDOOUT_CH1[10] = 0
   RFID_SDOOUT_CH1[11] = 0
```

By setting the bit to start SDO-communication (here, xStart_OUT_CH1) and by downloading the value into the control, the command "Activate the read/write head" is executed. The reset of the bit is automatic.

Figure 43: Activation of the communication

```
xStart_OUT_CH1 = FALSE <:= TRUE>
```

Please check whether the read/write head is switched on and connected by setting xStart_IN_CH1 to TRUE and then downloading it into the control. The value of the first byte of the input data RFID_SDOIN_CH1[0] shows "152" (binary: 10011000).

Execute an initialization ("RESET") with the RFID_SDOOUT_CH1[0]=129 and then xStart_OUT_CH1=TRUE prior to executing additional commands. As is the case with all commands the bit for initialization must first be reset with the RFID_SDOOUT_CH1[0]=128 followed by xStart_OUT_CH1=TRUE. With the help of xStart_IN_CH1=TRUE you can check whether RFID_SDOIN_CH1[0]=152 is displayed and thus the readiness for additional commands exists.

Note
Please note the "Flow diagram for executing commands" page 3-29!

Reading the UID

You may execute reading of the UIDs after having completed the activation of the read/write head and the initialization as described above.

Retracing of the following steps is easier when you focus on "Process image of the BL20-2RFID-S-Module" page 3-33:

1 In order to read the UID, please set Bit 5 in addition to Bit 7 in Byte 1 (RFID_SDOOUT_CH1[0]=160), set Byte 2 (RFID_SDOOUT_CH1[1]) to "7" and download the changed data into the control.

2 Initiate the SDO-transfer of the output data via CANopen by setting and downloading xStart_OUT_CH1=TRUE.

3 Initiate the SDO-transfer of the input data via CANopen by setting and downloading xStart_IN_CH1=TRUE. The process image displays RFID_SDOIN_CH1[0]=88, this means the command is executed as soon as a data carrier is within the detection range of the read/write head.

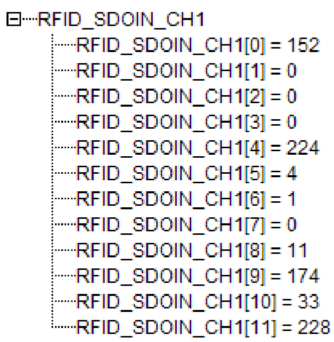
4 Reset the value of Byte 1 to 128 (RFID_SDOOUT_CH1[0]=128) and download it into the control.

5 Initiate the SDO-transfer of the output data via CANopen by setting and downloading xStart_OUT_CH1=TRUE.

6 Now execute the command.

7 With xStart_IN_CH1=TRUE and by downloading it into the control you will receive the desired data in RFID_SDOIN_CH1[0] to RFID_SDOIN_CH1[11]. RFID_SDOIN_CH1[0]=152 means that the last command was successfully executed and you may issue more commands.

Figure 44: Process input data with UID

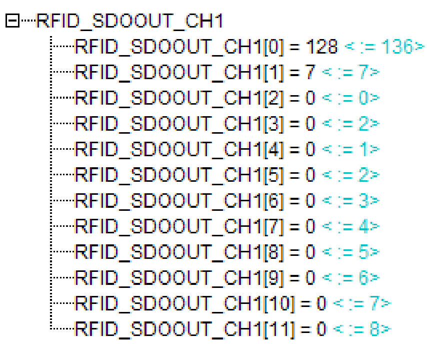


Writing of 8 data bytes to the data carrier

Retracing of the following steps is easier when you focus on "Process image of the BL20-2RFID-S-Module" page 3-33:

1 In order to write 8 bytes to the data carrier, please also set Bit 3 to Bit 7 in Byte 1 (RFID_SDOOUT_CH1[0]=136), set Byte 2 (RFID_SDOOUT_CH1[1]) to "7" and enter the address in Byte 2 and Byte 3 on the data carrier. Download the changed data into the control.

Figure 45: Writing of 8 Bytes to the Address 2



2 Initiate the SDO-transfer of the output data via CANopen by setting and downloading xStart_OUT_CH1=TRUE.

3 Initiate the SDO-transfer of the input data via CANopen by setting and downloading xStart_IN_CH1=TRUE. The process image displays RFID_SDOIN_CH1[0]=88, this means the command is executed as soon as a data carrier in within the detection range of the read/write head.

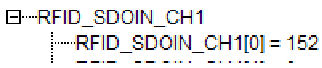
4 Reset the value of Byte 1 to 128 (RFID_SDOOUT_CH1[0]=128) and download it into the control.

5 Initiate the SDO-transfer of the output data via CANopen by setting and downloading xStart_OUT_CH1=TRUE.

6 Now execute the command.

7 With xStart_IN_CH1=TRUE and by downloading it into the control you will receive RFID_SDOIN_CH1[0]=152. This means that the last command was successfully executed and you may issue additional commands.

Figure 46: Process input data - Status-byte

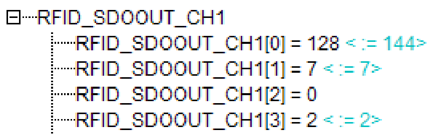


Reading of 8 data bytes

Retracing of the following steps is easier when you focus on "Process image of the BL20-2RFID-S-Module" page 3-33:

1 In order to read 8 bytes from the data carrier, please also set Bit 4 to Bit 7 in Byte 1 (RFID_SDOOUT_CH1[0]=144), set Byte 2 (RFID_SDOOUT_CH1[1]) to "7" and enter the address in Byte 2 and Byte 3 on the data carrier. Download the changed data into the control.

Figure 47: Reading of 8 Bytes from the Address 2



2 Initiate the SDO-transfer of the output data via CANopen by setting and downloading xStart_OUT_CH1=TRUE.

3 Initiate the SDO-transfer of the input data via CANopen by setting and downloading xStart_IN_CH1=TRUE. The process image displays RFID_SDOIN_CH1[0]=88, this means the command is executed as soon as a data carrier is within the detection range of the read/write head.

4 Reset the value of Byte 1 to 128 (RFID_SDOOUT_CH1[0]=128) and download it into the control.

5 Initiate the SDO-transfer of the output data via CANopen by setting and downloading xStart_OUT_CH1=TRUE.

6 Now execute the command.

7 With xStart_IN_CH1=TRUE and by downloading it into the control you will receive the desired data in RFID_SDOIN_CH1[0] to RFID_SDOIN_CH1[11]. RFID_SDOIN_CH1[0]=152 means that the last command was successfully executed and you may issue more commands.

Figure 48: Process input data with status byte and the read data

```
⊟ RFID_SDOIN_CH1
   RFID_SDOIN_CH1[0] = 152
   RFID_SDOIN_CH1[1] = 0
   RFID_SDOIN_CH1[2] = 0
   RFID_SDOIN_CH1[3] = 0
   RFID_SDOIN_CH1[4] = 1
   RFID_SDOIN_CH1[5] = 2
   RFID_SDOIN_CH1[6] = 3
   RFID_SDOIN_CH1[7] = 4
   RFID_SDOIN_CH1[8] = 5
   RFID_SDOIN_CH1[9] = 6
   RFID_SDOIN_CH1[10] = 7
   RFID_SDOIN_CH1[11] = 8
```

Error messages during SDO-transfer

If errors have occurred during command execution, the Status-bit 5 of the process input data will display it (for example, RFID_SDOIN_CH1[0]=184). In addition, Byte 1 and Byte 2 of the process input data will send an exact code concerning the cause of the error.

Paragraph "Alerts and error messages" page 3-39 provides an overview with explanations of the error code.

Figure 49: Process input data with error message and error code

```
⊟ RFID_SDOIN_CH1
   RFID_SDOIN_CH1[0] = 184
   RFID_SDOIN_CH1[1] = 1
   RFID_SDOIN_CH1[2] = 2
   RFID_SDOIN_CH1[3] = 0
   RFID_SDOIN_CH1[4] = 0
   RFID_SDOIN_CH1[5] = 0
   RFID_SDOIN_CH1[6] = 0
   RFID_SDOIN_CH1[7] = 0
   RFID_SDOIN_CH1[8] = 0
   RFID_SDOIN_CH1[9] = 0
   RFID_SDOIN_CH1[10] = 0
   RFID_SDOIN_CH1[11] = 0
```

Parameterization

Parameterization of the BL20-2RFID-S-module is only needed when the error RFID_SDOIN_CH[1]=**1** and RFID_SDOIN_CH[2]=**02** was sent together with the process input data at start-up. In this case the parameter "Bridging Time [n*4ms]" is available for each channel.

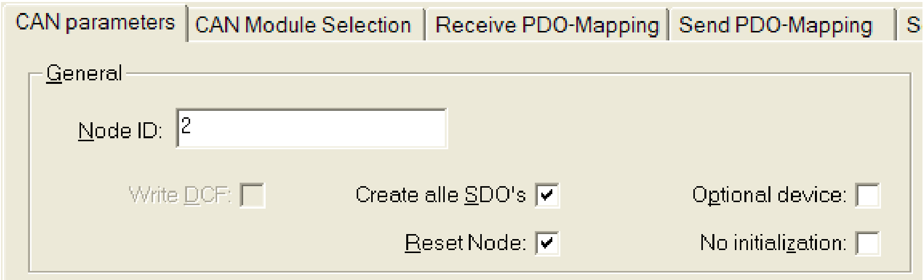
If the error message "Dwell period of the tag in the detection range was not long enough for successful command processing." page 3-39 appears, please check whether your application supports "Adherence to recommended minimum distances", a decrease in speed or data volume. The specifications for "recommended" and "maximum distance" are described in the D101583 manual in the chapter "Operating data".

If you can not meet the recommended distances, or in the case that the error in connection with the recommended distances continues to be displayed because of external reasons, setting of the parameter "Bridging Time [n*4ms]" may provide a solution.

Parameter CANopen is displayed with the object 0x5722.

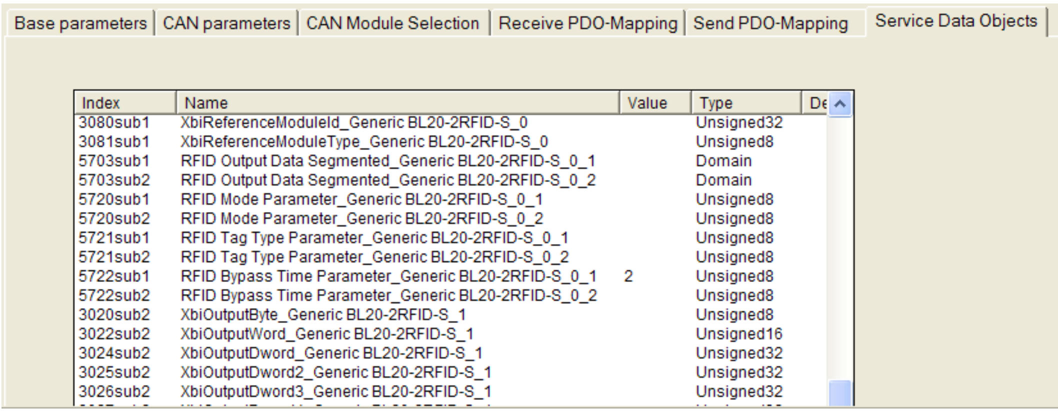
With respective parameterization the content of the SDOs is transferred from the project when the control is started.

Figure 50: Parameterization for SDO-transfer



Read Paragraph "Determination of the parameter value "Bridging Time [n*4ms]"" page 3-38 and directly enter the value into the SDO 0x5722sub1 (for Channel 1). The value is transferred with the next start of the control.

Figure 51: Description of the Object 0x5722



In case you do not wish to restart the control in order to change the parameters, please establish a SDO-communication as previously described, use a SDO-function that is suitable for transferring smaller data volumes, for example "CanUser_SDOdownload".

Flow diagram for executing commands

The values of the command Bits (TAG-ID, Read, WRITE) can be reset to the output value "0" prior or after command execution. The two following diagrams show the status messages depending on the procedural sequence:

Figure 52: Resetting the command bit after execution

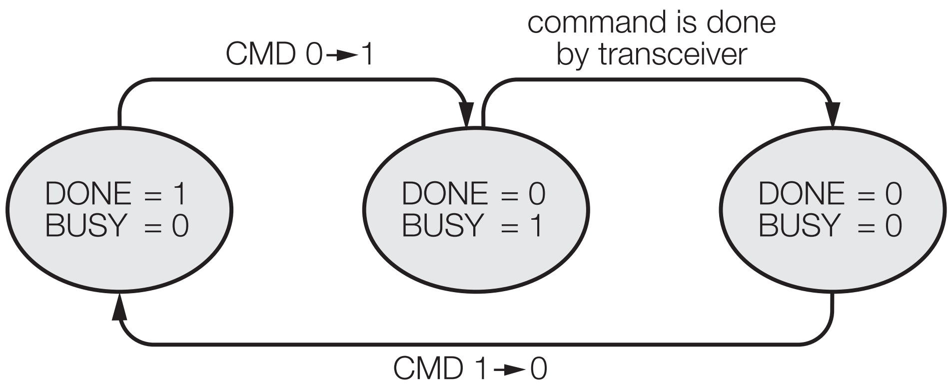
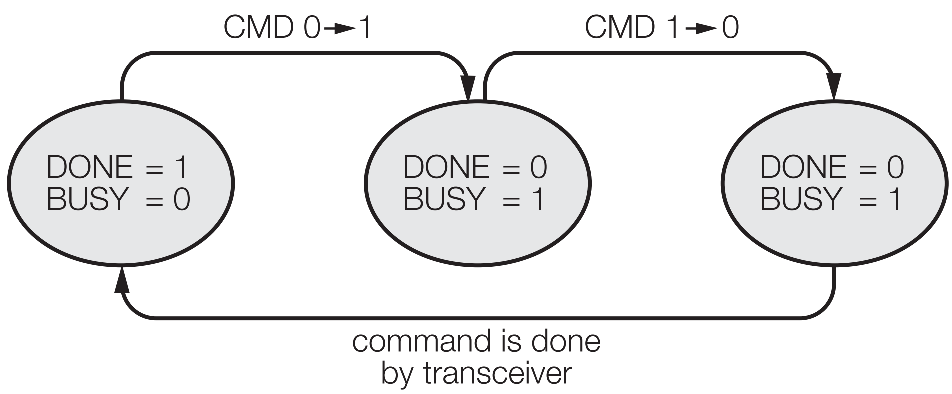


Figure 53: Resetting the command bit after execution



Objects of the BL20-2RFID-S-Module

Object 0x5700 - 8 byte process input data

The first 8 byte of the "Process Input Data" page 3-33 of a *BL ident*®-channel are displayed in Object 0x5700. Thus the range of the read-data is limited to 4 byte. The 8 byte transfer format consists of the following:

- 1 byte status messages
- 2 byte error code
- 1 byte reserved
- 4 byte read data

Table 15: Object 0x5700

INDEX	**0x5700**
Name	RFID Input Data U64
Object-code	ARRAY
Data type	Unsigned 64
Access	ro
Default value	No
PDO-mapping	Yes

Object 0x5701 - 12 byte process input data

The first 12 byte of the "Process Input Data" page 3-33 of a *BL ident*®-channel are displayed in Object 0x5701. The 12 byte transfer format consists of the following:

- 1 byte status messages
- 2 byte error code
- 1 byte reserved
- 8 byte read data

Table 16: Object 0x5701

INDEX	**0x5701**
Name	RFID Input Data Segmented
Object-code	ARRAY
Data type	Domain
Access	ro
Default value	No
PDO-mapping	No

Object 0x5702 - 8 byte process output data

The first 8 byte of the "Process Output Data" page 3-35 of a *BL ident*®-channel are displayed in Object 0x5702. Thus the range of the write-data is limited to 4 byte. The 8 byte transfer format consists of the following:

- 4 Byte Command and Control Bits
- 4 Byte Write Data

Table 17: Object 0x5702

INDEX	0x5702
Name	RFID Output Data U64
Object-code	ARRAY
Data type	Unsigned 64
Access	rw
Default value	No
PDO-mapping	Yes

Object 0x5703 - 12 byte process output data

The first 12 byte of the "Process Output Data" page 3-35 of a *BL ident*®-channel are displayed in Object 0x5703. The 12 byte transfer format consists of the following:

- 4 Byte Command and Control Bits
- 8 Byte Write Data

Table 18: Object 0x5703

INDEX	0x5703
Name	RFID Output Data Segmented
Object-code	ARRAY
Data type	Domain
Access	rw
Default value	No
PDO-mapping	No

Object 0x5708 - 1 byte status messages

The first 1 byte of the "Process Input Data" page 3-33 of a *BL ident*®-channel are displayed in Object 0x5708. This byte contains all status messages (DONE, BUSY, ERROR...):

Table 19: Object 0x5708

INDEX	**0x5708**
Name	RFID Status
Object-code	ARRAY
Data type	Unsigned8
Access	ro
Default value	No
PDO-mapping	Yes

Object 0x5722 - 1 byte parameter

The Object 0x5722 displays the "Parameter" page 3-38 "Bridging Time" to a *BL ident*®-channel. Parameter setting is only needed when the error message "Dwell period of the tag in the detection range was not long enough for successful command processing." page 3-39 appears at start-up. In this case, please read Paragraph "Determination of the parameter value "Bridging Time [n*4ms]"" page 3-38.

Table 20: Object 0x5722

INDEX	**0x5722**
Name	RFID Bypass Time Parameter
Object-code	ARRAY
Data type	Unsigned8
Access	rw
Default value	No
PDO-mapping	No

Process Input Data

Table 21: Input Data

Byte	Bit							
	7	**6**	**5**	**4**	**3**	**2**	**1**	**0**
0[A)]	DONE	BUSY	ERROR	XCVR_ CON	XCVR_ ON	TP	TFR	res.
1		2 Byte Error Code ("Alerts and error messages" page 3-39)						LSB
2	MSB							
3	res.	res.	res.	res.	res.	res.	res.	res.
4	8 Byte Read Data (READ_DATA)							
5								
6								
7								
8								
9								
10								
11								

A *Byte-number*

Meaning of the status bits

The following table explains the meaning of the status bits of the above listed process input data:

Table 22: Meaning of the status bits

Name	**Meaning**
DONE	**1**: At this time, the system does not process a command and is ready for the next command. **0**: All arriving commands, except the RESET-command, are ignored. DONE only switches to status "1" when all command bits (READ,WRITE ..) are "0". "Flow diagram for executing commands" page 3-29
BUSY	**1**: The system is currently processing a command. **0**: Execution of a command was completed. BUSY is not the inversion of DONE and possibly can not be used with a handshake-operation. Use the variable DONE to set up a handshake-operation.

Table 22: Meaning of the status bits

Name	Meaning
ERROR	**1**: An error has occurred during command execution. If this flag follows a write command (WRITE), for example, the data of the send-buffer were not written to the data carrier. If this flag follows a read command, no data was read from the data carrier and no new data was stored in the received data buffer. **0**: The last Write or Read command was successfully executed. The received data buffer contains valid data. Detailed information is provided via the two byte error code. The table "Status values" page 3-39 provides the meaning of the error code.
XCVR_CON	**1**: The read/write head is correctly connected to the BL20-2RFID-S-module. **0**: The read/write head is **incorrectly** connected to the BL20-2RFID-S-module at this time.
XCVR_ON	**1**: The transfer with 13.56 MHz from read/write head to data carrier is active. **0**: The transfer with 13.56 MHz from read/write head to data carrier is **inactive**.
TP (Tag present)	**1**: A data carrier is within the detection range of the read/write head and is recognized by the read/write head. **0**: There is no data carrier within the detection range of the read/write head or the read/write head did not recognize the data carrier.
TFR (Tag Fully Read)	**1**: All data ranges of the data carrier were fully read by the *BL ident*®-system, and the data carrier still is within the detection range (TP=1). Automatic reading always occurs when a data carrier is within the detection range of the read/write head. The time between TP=1 and TFR=1 can not be considered as a reference time for a read and write command. If only few bytes are read or written with a read/write command, the command is executed significantly faster compared to the full reading of a 2000 byte data carrier, for example. With TFR=1 read/write commands can directly access already stored data. **0**: All data ranges of the data carrier have not been fully read by the *BL ident*®-system at this time, or the data carrier is not within the detection range of the read/write head. This automatic read process is interrupted by all user commands; the TFR-bit keeps its current value. The process is restarted if no other commands exist and TP=1.

Note
Depending on the system and in many cases, the status bit "BUSY" can not be used for a handshake-operation!

Note
Paragraph "Alerts and error messages" page 3-39 displays the 2-byte error code decoded.

Process Output Data

Table 23: Output Data Byte

	Bit							
	7	6	5	4	3	2	1	0
0[A]	XCVR	NEXT	TAG-ID	READ	WRITE	TAG _INFO	XCVR _INFO	RESET
1	res.	res.	res.	res.	res.	Byte Count2	Byte Count1	Byte Count0
2	MSB	AddrHi						LSB
3	MSB	AddrLo						LSB
4	8 Byte read/write Data (WRITE_DATA)							
5								
6								
7								
8								
9								
10								
11								

A *Byte-number*

Meaning of the command bits/control bits

Note
If more than one command bit has been set via TAG_ID, READ, WRITE, TRANSCEIVER_INFO or TAG_INFO, the BL20-2RFID-S-module will generate an error message! The Bit "XCVR" must always be set to execute a command so that the read/write head remains active!

The following table provides the meaning of the command Bits of the process output data shown above.

Table 24: Meaning of the command bits

Name	Meaning
XCVR	**1**: The read/write head is activated (the signal is transferred with 13.56 MHz). **0**: The read/write head is deactivated (there is no signal transfer). When XCVR = 0 is set while the *BL ident*®-system executes a command, the command is completed first. The read/write head is only switched off when the Status-Bit is "DONE = 1".
NEXT	**1**: Exactly one command can be executed with the same data carrier. If an additional command is initiated with the same data carrier, the status bit remains BUSY = 1. The *BL ident*®-system must be reset (RESET), or the command must be executed with a different data carrier. **0**: Function is not used.
TAG_ID	**0 -> 1**: The command to read the UID is initiated with the increasing edge. The command is executed when a data carrier is within the detection range of the read/write head. ("UID" page 4-5) **0**: Function is not used.
READ	**0 -> 1**: The Read-command is initiated with the increasing edge. The command is executed when a data carrier is within the detection range of the read/write head. The Byte number "ByteCount0..ByteCount2" is read from the data carrier address "AddrLo, AddrHi". **0**: Function is not used.
WRITE	**0 -> 1**: The Write-command is initiated with the increasing edge. The command is executed when a data carrier is within the detection range of the read/write head. The Byte number "ByteCount0..ByteCount2" is written to the data carrier address "AddrLo, AddrHi". **0**: Function is not used.
TAG_INFO	**0 -> 1**: The command TAG_INFO (information for data carrier) is initiated with the increasing edge. The command is executed when a data carrier is within the detection range of the read/write head. Together with the process input data the information is sent to the data carrier in the read data range with the following 8 byte: Byte 0: Number of blocks 1 of the data carrier (this means 27 -> 28 blocks) Byte 1: Number of (byte-1) per block (this means 3 -> 4 byte per block) Byte 2: Is not supported (DSFID - data carrier format) Byte 3: Is not supported (AFI - application recognition) Byte 4: Is not supported (ICID - IC-identification (is not supported) Byte 5 to Byte 7: "0" **0**: Function is not used.

Table 24: Meaning of the command bits

Name	Meaning
TRANSCEIVER _INFO	**0 -> 1**: The command TRANSCEIVER_INFO (information for read/write head) is initiated and executed with the increasing edge. Together with the process input data the information is sent to the read/ write head in the read data range with 8 byte: The content of the information can be configured. The content of the information is selected with "AddrHi, AddrLo". **0×00F0**: The first 8 byte of the ORDER_ID (here: product description) are sent, for example "TNER-Q80" = 0×54 4E 45 52 2D 51 38 30(ASCII-table) **0×00F1**: The second 8 byte of the ORDER_ID (here: product description) are sent, for example: "-H1147\0\0" = 0×2D 48 31 31 34 37 5C 00 5C 00 **0×00F2**: The third 8 byte of the ORDER_ID (here: product description) are sent. **0×00F3**: The fourth 8 byte of the ORDER_ID (here: product description) are sent. **0×00F4**: The hardware- and firmware versions of the read/write head are sent. Byte 0: Part x of the hardware version **x**.y. Byte 1: Part y of the hardware version x.**y**. Byte 2: Letter V = 0×56 of the firmware version **V**x.y.z. Byte 3: Part x of the firmware version **x**.y.z. Byte 4: Part y of the firmware version Vx.**y**.z. Byte 5: Part z of the firmware version Vx.y.**z**. Byte 6 to Byte 7: is not used.
RESET	**0 -> 1**: A "Reset" of the *BL ident*®-system is completed with the increasing edge. When the status bit "BUSY" is set, the execution of the active command is interrupted and the status bit "DONE" is set. The status bit "ERROR" and the two byte error message (error code) of the process input data are deleted.
ByteCount0..2	Number of Byte-1 which still need to be read (READ) or written (WRITE). 111 (0×7) -> 8 byte remain to be read/written.
AddrHi, AddrLo	Array of the length 2 byte. Repeats the start address of the memory range in the data carrier which is to be accessed via the write or read command. The writable/readable start addresses of the data carrier can be ≠ 0. The Paragraph "Overview of Turck data carriers" page 3-48 contains information for the writable/readable start addresses of the data carrier versions.
WRITE_DATA	Write data - array of the length 8 byte.

Parameter

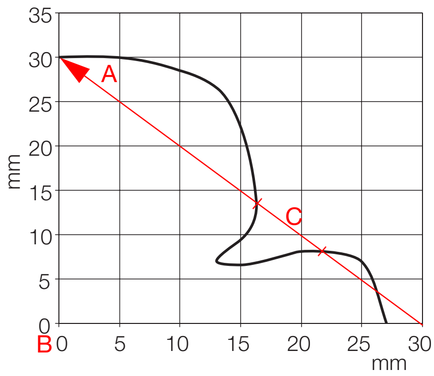
Currently only the parameter "Bridging Time [n*4ms]" is transferred with the 1 byte parameter data image.

Determination of the parameter value "Bridging Time [n*4ms]"

The parameter "Bridging Time [n*4ms]" is the result of the used components, the distances, the speed of the data carrier to the read/write head and other external interferences.

Therefore measure all needed bridging times directly on location. The following diagram shows the typical run of the detection range:

Figure 54: Detection range of a read/write head



A *Distance bridged by the data carrier when passing by the read/write head.*
B *Center of the read/write head.*
C *Section of the distance that needs to be bridged.*

The time in which the data carrier stays in section C in the above diagram may not exceed "Bridging Time K1[n*4ms]".The data carrier must be within the detection range of the read/write head before the bridging time elapses so that the transfer can continue.

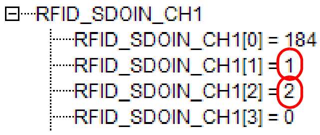
Additional diagrams for the detection ranges of different read/write heads and data carriers are shown in the manual D101583 in the Chapter "Pass Over Paths".

The LEDs of the read/write head or rather the status bit "TP" of the process input data indicate if the data carrier is within the detection range or not.

Alerts and error messages

At start-up of an interface module type "TI-BL20-E-CO-S-X", the error- and alert-code is displayed with two byte of the process input data. The first bold digit of the error-code in the below table is displayed by the second byte of the process input data, the last two bold digits are displayed by the third byte.

Figure 55: Two error byte of the process input data



The following table explains the significance of STATUS values:

Table 25: Status values

Status value of "APPLO_DB".STATUS	Significance of the error code
RFID standard profile	
DW#16#E**1**FE**01**xx	Tag memory error (for example, CRC error)
DW#16#E**1**FE**02**xx	Dwell period of the tag in the detection range was not long enough for successful command processing. For information concerning the possible cause and correction of this error, please refer to the "Determination of the parameter value "Bridging Time [n*4ms]"" page 3-38 for BLxx-2RFID-S-Modules.
DW#16#E**1**FE**03**xx	The indicated address range or command does not match the used tag type.
DW#16#E**1**FE**04**xx	Tag is defective and must be replaced.
DW#16#E**1**FE**08**xx	Tag in the transfer range does not have the expected UID.
DW#16#E**1**FE**09**xx	Tag does not support the current command.
DW#16#E**1**FE**0A**xx	At least one part of the indicated range in the tag is write protected.
DW#16#E**4**FE**01**xx	Supply of the read/write head was switched off because of increased current consumption, for example short circuit.
DW#16#E**4**FE**03**xx	Antenna or rather transmitter of the read/write head is switched off. "Activating the read/write head" page 3-17 required.
DW#16#E**4**FE**05**xx	The requested data volume exceeds the capacity of the internal memory.
DW#16#E**4**FE**06**xx	A parameter of the active command is not supported.
DW#16#E**4**FE**07**xx	An error with no details was indicated by the cyclic status word (for example, antenna out of service). The error is independent of the active command.

Table 25: (cont.) Status values

Status value of "APPLO_DB".STATUS	Significance of the error code
***BL ident*® specific error code**	
DW#16#E**4**FE**8**0××	There is no read/write head connection.
DW#16#E**4**FE**81**xx	The read/write head is defective.
DW#16#E**4**FE**84**xx	Telegram content is invalid (for tags of type TW-R22-HT-B64). Range is write protected or not present.
DW#16#E**4**FE**88**xx	The supply of the read/write head is insufficient.
DW#16#E**4**FE**89**xx	The read/write head sends permanent CRC-errors on the RS485-line. EMC problem?
DW#16#E**4**FE**8A**xx	The Ident-unit sends permanent CRC-errors on the RS485-line. EMC problem?
DW#16#E**4**FE**9**0××	The read/write head does not recognize a command sent via Get.
RFID standard profile	
DW#16#E**5**FE**01**xx	The Ident-unit indicates a wrong sequence No. (SN).
DW#16#E**5**FE**02**xx	The PIB-FB indicates a wrong sequence No.
DW#16#E**5**FE**04**xx	The Ident-unit indicates an invalid data block No.
DW#16#E**5**FE**05**xx	The PIB-FB indicates an invalid data block No.
DW#16#E**5**FE**07**xx	The PIB-FB indicates an invalid data block length.
DW#16#E**5**FE**09**xx	The Ident unit executes a hardware reset (Init_Active is set to "1"), Init (Bit 15 within the cyclic "Control Word") is expected by the PIB.
DW#16#E**5**FE**0A**xx	The command code "CMD" and the respective command acknowledgement do not match. Involved here is a software or synchronization error which is not permitted during normal operation.
DW#16#E**5**FE**0B**xx	The sequence of the telegram for receipt acknowledgement is wrong.
DW#16#E**5**FE**0C**xx	Synchronization error (Distance of step of AC_H/AC_L and CC_H/CC_L in the cyclic "Control Word" is wrong). A new initialization must be done.
DW#16#E**6**FE**01**xx	Invalid command
DW#16#E**6**FE**02**xx	The Ident-unit indicates an invalid command-index.
DW#16#E**6**FE**05**xx	The Ident-unit indicates that at this time only write commands (Write-Config) are allowed.
***BL ident*® specific error code**	
DW#16#E**6**FE**8**0××	No previous tag was recognized, no UID was stored (at Next).

Table 25: (cont.) Status values

Status value of "APPLO_DB".STATUS	**Significance of the error code**
DW#16#E**6**FE**FF**xx	Unknown error
RFID standard profile	
DW#16#E**7**FE**01**xx	Only command INIT is permitted in this state (indicated by PIB).
DW#16#E**7**FE**02**xx	CMDSEL > CMDDIM or command code "CMD" is not allowed.
DW#16#E**7**FE**03**xx	The PIB indicates: Parameter "Length" of command is too long for the global data range which is reserved within TXBUF.
DW#16#E**7**FE**04**xx	RXBUF Overrun (more data was received than can be stored in the memory RXBUF).
DW#16#E**7**FE**05**xx	In any case, the next command must be the "INIT"-command. All other commands are rejected.
DW#16#E**7**FE**06**xx	The index is outside the range 111/112 and therefore wrong.
DW#16#E**7**FE**07**xx	BLxx-2RFID-y does not respond to the INIT-command. Check whether the right bit rate is set.
DW#16#E**7**FE**08**xx	Timeout during initialization.
DW#16#E**7**FE**09**xx	Repeating the command is not supported by PIB*.
DW#16#E**7**FE**0A**xx	Error during determination of data package size within the PIB.

CANopen - general overviews

Default PDOs per CiA DS-301 and DS-401

The TPDO of the following table have these characteristics:

- The "COB-ID" page 4-1 is displayed in the respective object and is part of the sub-index 0x01.
- The PDO is active!
  The first digit of the 8-digit hex-digit of the COB-ID indicates amongst others whether the PDO is activated. Active PDOs are identified by a HEX-digit < 7. In general, the digit is 0 or 4.

Overview of default-TPDOs per CiA DS-301 and DS-401

Table 26: Default TPDO1 to TPDO4

Meaning	TPDO	Object to the TPDO with COB-ID	Sub-index 0x01 of the Object = COB-ID
1. Group digital input channels (Bits 0 to 63)	TPDO1	0x1800	0000 0180_{hex} + Node-ID
1. Group of analog input channels (Channels 0 to 3)	TPDO2	0x1801	0000 0280_{hex} + Node-ID
2. Group of analog input channels (Channels 4 to 7)	TPDO3	0x1802	0000 0380_{hex} + Node-ID
3. Group of analog input channels (Channels 8 to 11)	TPDO4	0x1803	0000 0480_{hex} + Node-ID

Overview of the default-RPDOs per CiA DS-301 and DS-401

Table 27: Default TPDO1 to TPDO4

Meaning	RPDO	Object to the RPDO with COB-ID	Sub-index 0x01 of the Object = COB-ID
1. Group digital output channels (Bits 0 to 63)	RPDO1	0x1400	0000 0200_{hex} + Node-ID
1. Group of analog output channels (Channels 0 to 3)	RPDO2	0x1401	0000 0300_{hex} + Node-ID
2. Group of analog output channels (Channels 4 to 7)	RPDO3	0x1402	0000 0400_{hex} + Node-ID
3. Group of analog output channels (Channels 8 to 11)	RPDO4	0x1403	0000 0500_{hex} + Node-ID

BL20-specific default PDOs

These additional PDOs are set per default to "Invalid" by the "8" of the first hexadecimal digit.

A release of these PDOs occurs when you set the first hexadecimal digit to "0". Please ensure that the COB-ID in the CANopen network has not been assigned!

Overview of the BL20-specific default-TPDOs

Note
The COB-ID definition of the TPDOs depends on the gateway used in the application (please refer to EDS-file for the gateway).

Table 28: BL20-specific PDOs TPDO5 to TPDO22

Meaning	TPDO	Object to the TPDO	Sub-index 0x01 of the Object + Node-I = COB-ID
2. Group digital input channels (Bits 64 to 127)	TPDO5	0x1804	0x8000 01C0 + Node-ID
3. Group digital input channels (Bits 128 to 191)	TPDO6	0x1805	0x8000 02C0 + Node-ID
4. Group digital input channels (Bits 192 to 255)	TPDO7	0x1806	0x8000 03C0 + Node-ID
5. Group digital input channels (Bits 256 to 319)	TPDO8	0x1807	0x8000 04C0 + Node-ID
1. Group encoders (Channels 0 + 1)	TPDO9	0x1808	0x8000 01E0 + Node-ID
2. Group encoders (Channels 2 + 3)	TPDO10	0x1809	0x8000 02E0 + Node-ID
3. Group encoders (Channels 4 + 5)	TPDO11	0x180A	0x8000 03E0 + Node-ID
4. Group encoders (Channels 6 + 7)	TPDO12	0x180B	0x8000 04E0 + Node-ID
4. Group of analog input channels (Channels 12 to 15)	TPDO13	0x180C	0x8000 01A0 + Node-ID
5. Group of analog input channels (Channels 16 to 19)	TPDO14	0x180D	0x8000 02A0 + Node-ID
6. Group of analog input channels (Channels 20 to 23)	TPDO15	0x180E	0x8000 03A0 + Node-ID

Table 28: BL20-specific PDOs TPDO5 to TPDO22

Meaning	TPDO	Object to the TPDO	Sub-index 0x01 of the Object + Node-I = COB-ID
7. Group of analog input channels (Channels 24 to 27)	TPDO16	0x180F	0x8000 04A0 + Node-ID
1. Group RS×× (Channel 0)	TPDO18	0x1811	0x8000 0000
1. Group RS×× (Channel 1)	TPDO19	0x1812	0x8000 0000
1. Group RFID-S (Channel 1)	TPDO21	0x1814	0x8000 0000
1.Group RFID-S (Channel 2)	TPDO22	0x1815	0x8000 0000

Overview of the BL20-specific default-RPDOs

The transfer-type of these PDOs is 255 by default.

Table 29: BL20-specific PDOs RPDO5 to RPDO22

Meaning	RPDO	Object to the RPDO	Sub-index 0x01 of the Object = COB-ID
2. Group of digital I/Os (Bits 64 to 127)	RPDO5	0x1404	0x8000 0240 + Node-ID
3. Group of digital I/Os (Bits 128 to 191)	RPDO6	0x1405	0x8000 0340 + Node-ID
4. Group of digital I/Os (Bits 192 to 255)	RPDO7	0x1406	0x8000 0440 + Node-ID
5. Group of digital I/Os (Bits 256 to 319)	RPDO8	0x1407	0x8000 0540 + Node-ID
1. Group encoders (Channels 0 + 1)	RPDO9	0x1408	0x8000 0260 + Node-ID
2. Group encoders (Channels 2 + 3)	RPDO10	0x1409	0x8000 0360 + Node-ID
3. Group encoders (Channels 4 + 5)	RPDO11	0x140A	0x8000 0460 + Node-ID
4. Group encoders (Channels 6 + 7)	RPDO12	0x140B	0x8000 0560 + Node-ID

Table 29: BL20-specific PDOs RPDO5 to RPDO22

Meaning	RPDO	Object to the RPDO	Sub-index 0x01 of the Object = COB-ID
4. Group of analog I/Os (Channels 12 to 15)	RPDO13	0x140C	0x8000 0220 + Node-ID
5. Group of analog I/Os (Channels 16 to 19)	RPDO14	0x140D	0x8000 0320 + Node-ID
6. Group of analog I/Os (Channels 20 to 23)	RPDO15	0x140E	0x8000 0420 + Node-ID
7. Group of analog I/Os (Channels 24 to 27)	RPDO16	0x140F	0x8000 0520 + Node-ID
1st Group RS×× (Channel 0)	RPDO18	0x1411	0x8000 0000
1st Group RS×× (Channel 1)	RPDO19	0x1412	0x8000 0000
1st Group RFID-S (Channel 0)	RPDO21	0x1414	0x8000 0000
1st Group RFID-S (Channel 1)	RPDO22	0x1415	0x8000 0000

Note
The COB-IDs starting at PDO 18 are to be set by the user.

Identifier for the standard objects

Node-ID

Each device in a CANopen network is identified by the Node-ID. The CANopen slaves can be assigned to the Node-IDs 1 to 127.

Note

In regards to the BL20-E-GW-CO, the range of the Node-ID is limited from 1 to 63 (please refer to "Setting of Node-ID" on pages 3-10).

COB-ID (Communication Object Identifier)

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

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

The COB-IDs are determined with the following rule:

COB-ID = Basis-ID + Node-ID

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

Node-ID 1 to 127 (→ for the BL20-E-GW-CO 1 to 63)

Table 30: Identification numbers for the Basis-objects

COB-ID		**Function**	**Application**
dec.	hex.		
0	$000_{hex.}$	Network management (NMT)	Broadcast-object
01 to 127	001_{hex} to $07F_{hex}$	Free	
128	$080_{hex.}$	Synchronization (SYNC)	Broadcast-object
129 to 255	081_{hex} to $0FF_{hex}$	Emergency message	
256	$100_{hex.}$	Timestamp	Broadcast-object
257 to 384	101_{hex} to 180_{hex}	Free	
385 to 511	181_{hex} to $1FF_{hex}$	Transmit PDO 1	Digital input
512	$200_{hex.}$	Free	
513 to 639	201_{hex} to $27F_{hex}$	Receive PDO 1	Digital output
640	$280_{hex.}$	Free	
641 to 767	281_{hex} to $2FF_{hex}$	Transmit PDO 2	Analog input
768	$300_{hex.}$	Free	
769 to 895	301_{hex} to $37F_{hex}$	Receive PDO 2	Analog output
896	$380_{hex.}$	free	
897 to 1023	381_{hex} to $3FF_{hex}$	Transmit PDO 3	Analog input

Table 30: Identification numbers for the Basis-objects

COB-ID		Function	Application
dec.	hex.		
1024	$400_{hex.}$	free	
1025 to 1151	401_{hex} to $47F_{hex}$	Receive PDO 3	Analog output
1152	$480_{hex.}$	free	
1153 to 1279	481_{hex} to $4FF_{hex}$	Transmit PDO 4	Analog input
1280	$500_{hex.}$	Free	
1281 to 1407	501_{hex} to $57F_{hex}$	Receive PDO 4	Analog output
1408	$580_{hex.}$	Free	
1409 to 1535	581_{hex} to $5FF_{hex}$	Transmit SDO	
1536	$600_{hex.}$	Free	
1537 to 1663	601_{hex} to $67F_{hex}$	Receive SDO	
1664 to 1772	680_{hex} to $6EC_{hex}$	Free	
1793 to 1919	701_{hex} to $77F_{hex}$	NMT Error (Node Guarding, Heartbeat, Boot-Up)	
1920 to 2014	800_{hex} to $7DE_{hex}$	Free	
2015 to 2031	$7DF_{hex}$ to $7EF_{hex}$	NMT, LMT, DBT	

User data ranges of the data carrier variants

Access to the data ranges of the data carriers

If you use a different data carrier as indicated in "Hardware specifications" page 3-3 or if you desire to access certain ranges of the data carrier, you must write the respective value in the third and fourth byte of the process output data. For the start address recalculate the decimal value listed in the below table into a binary value. The 8 bits with the low value provide the value for the fourth byte. The bits with the high value are displayed with Byte 3. For example, Address 1600 of a FRAM-data carrier is binary 110 01000000. The value 0x6 (6) must be entered into Byte 3, and the value 0x40(64) into Byte 4.

Figure 56: Display of Address 1600 - as an example

```
RFID_OUT_CH1[3] = 16#06     Addr_Hi_0 = 16#06
RFID_OUT_CH1[4] = 16#40     Addr_Lo_0 = 16#40
```

Overview of Turck data carriers

The data carriers type **I-Code SL2** are writable and readable from byte No. 0 to byte No. 111.

The table describes the data structure of the data carrier:

- TW-I14-B128
- TW-L43-43-F-B128
- TW-L82-49-P-B128
- TW-R16-B128
- TW-R20-B128
- TW-R30-B128
- TW-R50-B128
- TW-R50-90-HT-B128
- ...

Table 31: Data structure of the I-Code SL2-data carrier

Byte No. (StartAddress)	Content	Access	Block No. (a block contains four byte)
-16 to -9	UID	Read only via "SDO-communication" page 3-22	-4 to -3
-8 to -5	Tag information	Read only via specific commands	-2
-4 to -1	Conditions for Write access		-1
0 to 111	User data range	Read / write via "PDO-communication" page 3-8	0 to 27

The data carriers type **I-Code SL1** are writable and readable from the byte No. 18 to the byte No. 63.

The table describes the data structure of the data carrier:

- TW-R16-B64
- TW-R22-HT-B64
- ...

Table 32: Data structure of the I-Code SL1-data carrier

Byte No. (StartAddress)	Content	Access	Block No. (a block contains 4 byte)
0 to 7	UID	Read only via "SDO-communication" page 3-22	0 to 1
8 to 11	Conditions for Write access	Read only via specific command	2
12 to 15	Special functions (for example, EAS / QUIET)	Read / write via specific commands	3/4
16	family code		
17	application identifier		
18 to 63	User data range	Read / write via "PDO-communication" page 3-8	4/5 to 15

The data carriers type **FRAM** are writable and readable from byte No. 0 to byte No. 1999.

The table describes the data structure of the data carrier:

- TW-R20-K2
- TW-R30-K2
- TW-R50-K2
- TW-R50-90-HT-K2
- ...

Table 33: Data structure of the FRAM-data carrier

Byte No. (StartAddress)	**Content**	**Access**	**Block No. (a block contains 8 byte)**
0 to 1999	User data range	Read / write via "PDO-communication" page 3-8	0 to 249
2000 to 2007	UID	Read only via "SDO-communication" page 3-22	250
2008 to 2015	AFI, DSFID, EAS	Read / write (with limitations) via specific commands	251
2016 to 2047	Special functions (for example, EAS / QUIET)	Read only via specific command	252 to 255

4 Glossary

A

Automation device

Control device with inputs and outputs that is connected to a technical process. Programmable logic controllers (PLC) belong to a special group of automation devices.

B

Bulk reading

Simultaneous, unequivocal recognition of multiple RFID data carriers which are directed around a read/write head (transceiver).

Bus

Bus system for the data transfer between hardware components (for example, CPU, memory, I/O-level). A bus may consist of multiple parallel cables for the transfer of data (addressing, control and power supply).

Bus system

The total of all devices that communicate with each other via a bus.

C

COB-ID

Communication **Ob**ject **I**dentifier. The identification number for each communication object in a CANopen-network.

Configuration

Systematic mapping of a station's I/O-modules.

CPU

Abbr. for "Central Processing Unit". Central device for data processing, the core of the processor.

D

DIN

Abbr. for "Deutsches Institut für Normung e.V" - German Institute for Standardization Membership Corporation.

Distribution

Distribution involves all activities concerning the transfer of goods between economic entities.

E

Earth

In electrical engineering the term for conductive earth of which its electrical potential is zero at each point. Within the vicinity of grounding equipment the electrical potential of the earth may differ from zero; in this case the term "common ground reference potential" is used.

EDS - electronic data sheet

Electronic data sheets that must be written using a standardized text format. Configuration tools can read EDS-files and use them to communicate with the respective device and if need be to set its parameters.

EEPROM - Electrically Erasable Programmable Read-Only Memory

EEPROM describes a non-volatile, electronic memory component. An EEPROM consists of a field effect transistor matrix with insulated floating gate in which each transistor represents a bit.

EMC

Electromagnetic compatibility (EMC) identifies the generally desireable state in which technical devices are not interfering with each other based on unintentional electric or electromagnetic effects.

Emergency

Emergency objects are activated by a serious, device-internal error. An emergency message can be sent only once per error. As long as no other errors occurr on the device, no additional emergency objects are sent. Multiple emergency consumers may also receive the error messages. The response of the consumers is user-specific. CANopen defines "Emergency Error Codes" which are sent in the emergency object. The emergency object consists of a single CAN-message with 8 byte data and supports the emergency frames (EMCY) specified per CiA DS-301.

F

Fieldbus

Data network at sensor-/actuator level. A fieldbus connects the devices in the field with a control device. High transfer safety and real time behavior are characteristic for the fieldbus.

FRAM - Ferroelectric Random Access Memory

FRAM describes a non-volatile electronic memory type based on crystals with ferroelectric features.

G

Guard COB-ID

The identification number for node-guarding. This COB-ID is fixed and can not be changed.

Guard Time

Inquiry interval time (indication in milliseconds) at "Node Guarding" page 4-3 to be expected by the network-slave.

H

Heartbeat

The heartbeat-protocol serves to check the operability of other CANopen-bus participants. With the help of the heartbeat-signals the CANopen-node informs all participants of a CANopen-network that it is operable even if no data transfer has occurred for an extended period of time. The failure of a CANopen-node can be registered by all participants! The "Heartbeat Producer Time" defines the cycle time for the hearbeat.

hexadecimal

Number system with the basis 16. The count starts at 0 to 9 and continues with the letters A, B, C, D, E and F.

I

IEC 61131

IEC 61131 is an international standard which covers the basics for programmable controllers.

Inhibit Time

Minimum off-time for send An off-time between two send operations is defined with the help of Inhibit Time so that messages with high priorities are not constantly occupying the bus. Is only supported in connection with TPDOs.

Initialization

At initialization the storage space (for example, variables, code, buffer,...) needed for execution is reserved and filled up with start values.

IP - International Protection

The protection class (IP) identifies the suitability of electrical operating devices (for example, devices, installation material) in regards to different ambient conditions, also the protection of people against potential dangers when the electric operating devices are being used.

L

Lifetime factor

This factor multiplied by "Guard Time" page 4-2 equals the time that is supposed to pass from an error in the node-guarding protocol to the error message of the network-slave per EMCY. Thus a communication difficulty with a temporary occurrence, for example high bus load, can be waited on.

Logistics

Logistics involves the teachings of comprehensive planning, control, execution, allocation, optimization and control of processes for the movement from one location to another of goods, data, energy and persons as well as the needed means of transport.

LSB

Abbr. for "Least Significant Bit". Bit with the least significance.

M

Master

The Master controls access of a master-slave operation in the fieldbus range.

MSB

Abbr. for "Most Significant Bit". Bit with the most significance.

N

Node Guarding

The control of the network-nodes with the help of a network-manager is called node-guarding. In addition the CANopen-network participants check whether their network-manager continuous to operate regularly and whether the network continues to function. Node-guarding is inactive in the default status. In order to activate the node-guarding protocol on a participant, different parameters must be set via the object registry.

P

Parameterization

Setting of parameters of the individual bus participants or rather their modules in the configuration software of the DP-Master.

PIB

Abbr. for "Proxy Ident Function Block". This function block represents an Ident system in the control. This is why there exists a uniform program interface for the actual application.

PLC

Abbr. for programmable controller.

Process Data Objects (PDOs)

Process data objects (PDOs) are transferred in a single CAN-message. Here, all 8 byte of the data field can be used to transfer application objects. Each PDO must have a clear CAN-identifier and must be transferred by only one device. But it can be received by more than one device ("Producer/Consumer"-communication). PDO-transfers may be initiated by an internal event ("event-driven") as well as an internal timer ("timer-driven") or by a request from another device ("Remote requests") or by the Sync-messages.

R

Read/write head

The read/write head (also read/write device) creates an electromagnetic high-frequency field. This is how data is transferred and the data carrier (transponder) is supplied with power. The data is displayed with the help of modulation of the electromagnetic field.

Repeater

In the field of digital communication technology, the repeater is a signal regenerator which receives a signal in the bit physical layer then regenerates it and resends it. Noise as well as jitter of the run time and the pulse format are removed from the received signal during this type of regeneration.

RFID

Radio Frequency Indentification

RFID-technology

This technology supports a contact free transfer of data with the help of an electromagnetic alternating field. his type of transfer is also called radio frequency technology. A "Tag" page 4-4 is used as data carrier.

RTR-Remote Transmission Request

A set RTR-Bit (Remote Transmission Request) identifies a remote-frame (recessive). With the help of a remote-frame, a participant may request from another one to send its data.

S

SDO-service data objects

A service data object (SDO) reads entries from the object registry or writes entries into the object registry. The SDO-transfer protocol permits to transfer objects of any size. The first byte of the first segment contains the needed flow control information. Amongst others it contains a toggle-bit to solve the problem of doubly received CAN-messages. The next three byte of the first segment contain the index and sub-index of the entry into the object registry which is to be read from or written to. The last four byte of the first segment are available for user data. The second and all following segments (that use the same CAN-identifier) contain the Control-byte and up to seven byte user data. The receiver acknowledges each segment or a segment block so that a "Peer-to-Peer"-communication ("Client/Server") takes place.

Station

Function block or assembly, consisting of multiple components.

STEP 7

STEP 7 is the current programming software of the Simatic-S7-PLC-family of the company Siemens AG and is the sequence to STEP 5.

SYNC-message

The receipt of a synchronization telegram simultaneously initiates the transfer of the process data by all receivers. Thus it is possible to simultaneously set outputs or to parallel-read inputs. The gateway BL20-E-GW-CO is not able to generate any SYNC-messages but it can only receive them. The synchronous transfer of PDO can occurr in both the the cyclic and acyclic transfer mode. Cyclic transfer means that the device is waiting for the Sync-message and afterwards, it will send the measured values. The time between two Sync-messages is defined by the communication cylce period (Com Cycle Period). Acyclically transferred synchronous PDO are also activated by a user-specificy event. The device transfers its input values. Another transfer only occurrs when another Sync-message is present.

T

Tag

RFID-tags are small transponders in an application suitable enclosure, for example, sticker, chip card, tag.

Transceiver

Sender and receiver combination

The RFID technology uses transceivers in form of so-called "Readers". These devices send a signal first which the transponder (for example, RFID-tag) acknowledges by sending a response which in turn is received by the transceiver and sent to a (computer) system for further processing.

Transmission Type

The transmission type determines under which conditions a PDO is sent or received.
The following PDO transmission types are supported by BL20:

- Type 0 (sync, acyclic). The PDO is always sent (TPDO) or evaluated (RPDO) when a SYNC-frame sent by a SYNC-producer permits it, and when the mapped content of the BL20-CANopen-Gateways has been changed since the last send.
- Type 1 (sync, acyclic). Immediately after each received Sync-frame, the BL20-CANopen-Gateway sends the mapped content of the PDO to the network even if it did not change since the last send.
- Type 253 (remote request - PDO / Polling (upon request)). The PDO is only sent when a sent remote-frame of the BL20-CANopen-Gateway requests it. This transmission type is only permitted for TPDOs.
- Type 255 (event driven). In this operating mode, the BL20-CANopen-Gateway does not depends on a Sync or Remote-Request in regards to the PDO-communication. Always when an internal event in the BL20-CANopen-Gateway plans for it, it sends a PDO to the CANopen-network.

Transponder

(**Trans**mitter + Res**ponder**)
A transponder consists of a microchip (with an unique identification No.), a send-/receive-antenna and an enclosure. Data is transferred between a read-device and a transponder via electromagnetic waves.

Transponder-Technology

(also "RFID-technology" page 4-3)

U

UHF - Ultra High Frequency

This frequency range belongs to the microwave range. RIFD functions in Europe with 865..868 MHz / USA 902..928 MHz / Japan 955MHz / China 840..845 MHz und 920..925 MHz.

UID

English abbr. for "Unique Identifier". The UID is an unique serial No. for transponders. As address it refers to the data belonging to the transponder rather the tagged product. This data may be stored in a data base, for example.

TURCK

Industrial
Automation

Support RFID
Tel. +49 (0) 208 4952-4666
E-Mail rfid-support@turck.com

Hans Turck GmbH & Co. KG
Witzlebenstraße 7
45472 Mülheim an der Ruhr
Germany
Tel. +49 (0) 208 4952-0
Fax +49 (0) 208 4952-264
E-Mail more@turck.com
Internet www.turck.com

D101763 1108