PMA Prozess- und Maschinen-Automation GmbH

Interface description
Railline-CAN-Bus

PMA

CE

9499-040-90211

Operator's guide, please read before using product

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Content

I General

Thank you very much for buying a rail line series device. This document describes the CAN-Bus interface functions of field bus coupler RL CAN, which is called bus coupler in the following description, and the system capability of the various module versions of the rail line series (CI45-1xx-2.., KS45-1xx-2..., TB45-1xx-2....and the RL400 modules), called "function module" in the following description. The term " device" applies to both bus coupler and function modules.

Bus couplers with a CAN-Bus interface permit the transmission of process, parameter and configuration data. Field bus connection is via a sub-D socket at the top of the bus coupler. The serial communication interface facilitates connections to supervisory systems, visualization tools, etc.

Another standard interface is the non-bussable 'BluePort®' front-panel (PC) interface. It is used for direct connection of the 'BlueControl®' tool which runs on a PC.

Communication on the RL CAN is according to the master/slave principle. The bus coupler is always CANopen slave.

The most important features of the bus connection with their physical and electrical properties are:

- Network topology
  Linear bus, with bus termination at both ends.

- Transfer medium
  screened, twisted 2-wire copper cable

- Cable length (without repeater)
  Cable length dependent on transfer rate, max. 1000m

- Transfer rates
  The following transfer rates are supported:
  10 … 1000 kBit/s

- Adressing
  01 ... 99

  Default 1

I-1 References

Further information:

[1] Homepage of the CAN Bus - User Organization
http://www.semiconductors.bosch.de/en/20/can/index.asp

[2] ISO 11898-1:2003, Part 1: Data link layer and physical signalling

[3] ISO 11898-2:2003, Part 2: High-speed medium access unit

Other documentations of rail line series:

[4] Universal transmitter UNIFLEX CI 45

- Data sheet CI 45 9498 737 48313
- Operating note CI 45 9499 040 71441
- Operating manual CI 45 9499 040 71711

[5] Universal controller KS 45

- Data sheet KS 45 9498 737 48513
- Operating note KS 45 9499 040 71541
- Operating manual KS 45 9499 040 71811

[6] Temperaturbegrenzer TB 45

- Data sheet TB 45 9498 737 48413
- Operating note TB 45 9499 040 71641
- Operating manual TB 45 9499 040 71911

[7] RL 400 components

- Operating note RL 422-1 9499-047-13141
- Operating note RL 422-0 9499-047-13241
- Operating note RL 422-2 9499-047-13341
- Operating note RL 423-x 9499-047-13441
- Operating note RL 461 9499-047-13541
- Operating note RL 452-0 9499-047-13641
- Operating note RL 451-x 9499-047-13741
- Operating note RL CAN-rail 9499-047-14541
- Operating note RL PWR 9499-047-14641
- Operating note RL Di-AC 443-0 9499-047-14741
- Operating note RL TC 424-0 9499-047-14841
- Operating note RL TC-O2 424-1 9499-047-14941
- Operating note RL TC 424-2 9499-047-15041
- Operating note RL Ai 422-0 9499-047-15141
- Operating note RL Ao 431-0 9499-047-15241

I-2 Additional information

Information on bus coupler and function module parameter addresses is given in documentation 9499-040-78111.

II Safety hints

This device was built and tested in compliance with VDE 0411-1 / EN 61010-1 and was shipped in safe condition.

The device meets European guideline 89/336/EEC (EMC) and is provided with the CE-marking.

The device was tested before delivery and has passed the tests stipulated in the test plan. To maintain this condition and to ensure safe operation, the user must follow the hints and warnings given in this operating manual and operate the device in compliance with the information provided in this manual.

The device is provided exclusively for use as a measuring and control unit in technical systems.

Warning
If the device is damaged to an extent that safe operation is not possible, it must not be taken into operation.

ELECTRICAL CONNECTION

The electrical connections must conform to local standards (e.g. VDE 0100). The input leads must be kept separate from signal and mains leads.

A circuit breaker or a power switch must be provided for the device and marked accordingly in the installation. The circuit breaker or power switch must be installed near the device and should be easily accessible for the operator.

COMMISSIONING

Before device switch-on, ensure that the rules given below were followed:

- Ensure that the supply voltage corresponds to the specification on the type label.
- All covers required for contact safety must be fitted.
- Before device switch-on, check, if other equipment and/or facilities connected in the same signal loop is / are not affected. If necessary, appropriate protective measures must be taken.
- The device may be operated only when mounted in its enclosure.
- The temperature limits specified for operation of the device must be met before and during operation.

Warning
During operation, the ventilation slots of the housing must not be covered.

Warning
The measurement inputs are designed for measurement of circuits which are not connected directly with the mains supply (CAT I). The measurement inputs are designed for transient voltage peaks up to 800V against PE.

SHUT-DOWN

For permanent shut-down, disconnect the instrument from all voltage sources and protect it against accidental operation.

Before instrument switch-off, check that other equipment and / or facilities connected in the same signal loop is / are not affected. If necessary, appropriate measures must be taken.

II-1 Maintenance, modification and repair

The devices need no particular maintenance.

No operable controls are mounted inside the device, i.e. the operator must not open it.

Modification, maintenance and repair may be carried out only by trained, authorized persons. For this purpose, the user is invited to contact the PMA service.

Warning
When opening the devices, or when removing covers and components, live parts or terminals can be exposed.

Caution
When opening the devices, electrostatically sensitive components can be exposed.

The PMA service address and contact information are as given below:

PMA Prozeß- und Maschinen-Automation GmbH
Miramstraße 87
D-34123 Kassel

Tel. +49 (0)561 / 505-1257
Fax +49 (0)561 / 505-1357
e-mail: mailbox@pma-online.de

II-2 Cleaning

Housing and front panel of the device can be cleansed using a dry, lint-free cloth.

II-3 Spare parts

The following accessories are permitted as spare parts for the device:

Description	Order-No.
Connector set with screw terminals	9407-998-07101
Connector set with spring clamp terminals	9407-998-07111
Bus connector for fitting in top-hat rail	9407-998-07121

III Quick start

For installing a rail line system, please, proceed as follows:

- Determine system concept and function modules.
- Determine the function module order behind the bus coupler.
- Mount a bus connector for each module on the top-hat rail and push them together.
- To mount the bus coupler, snap it onto the left bus connector.
- Mount the function modules analogously in the planned order.
- Connect the bus coupler to the supply voltage.
- Address the bus coupler
- Set a unique address for each function module, which should start with 1 for the module next to the bus coupler, followed by module no. 2, etc. Please, don't leave an address gap.Adjusting the addresses can be done via front-panel keyboard or BlueControl® engineering tool.
- Write the engineering for each individual function module. Determine which data should be read and / or written via the field bus (menu Bus data (read) / Bus data (write)). Note the order of selected data.
- Make the function module wiring.
- Configure the bus coupler according to the order of fitted function modules. Please, specify the actually fitted device types exactly.
- Connect the CANopen cable with the device.
- Start exchanging data with the coupler !

IV Commissioning

IV-1 Hints for installation

- Measurement and data lines should be kept separate from control and power supply cables.
- Sensor measuring cables should be twisted and screened, with the screening connected to earth.
- External contactors, relays, motors, etc. must be fitted with RC snubber circuits to manufacturer specifications.
- The unit must not be installed near strong electric and magnetic fields.

Warning
- The unit is not suitable for installation in explosion-hazarded areas.
- Faulty connection can lead to the destruction of the instrument.
- The device may be operated only in environments for which it is suitable due to its protection type.
- The housing ventilation slots must not be covered.
- In plants where transient voltage peaks are susceptible to occur, the devices must be equipped with additional protective filters or voltage limiters!
- Please, follow the instructions given in the safety hints.

Caution!

The device contains electrostatically sensitive components.

IV-2 Dimensions

The bus coupler dimensions are shown in the following drawing. For the function module data, see the relevant operating manuals.

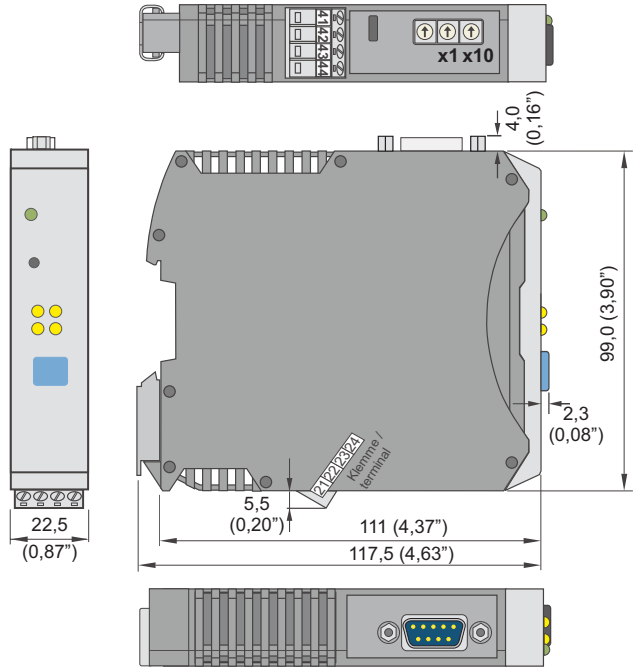


Abb. 1 Dimensions

IV-3 Mounting

Connection between bus coupler and function modules is via bus connectors, which snap onto the top-hat rail. Several devices are mounted side by side with high packing density. The bus links between the devices are made directly via the bus connectors.

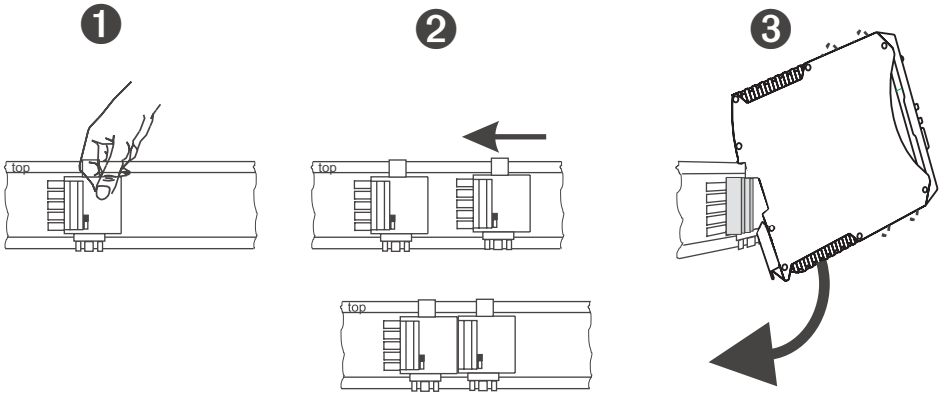


Abb. 2 Mounting steps

The instruments are provided for vertical mounting on 35 mm top-hat rails to EN 50022.

The place of installation should be exempt of vibration, aggressive fluids (e.g. acid, lye), liquids, dust or other suspended matters.

Instruments of the rail line family can be mounted directly side by side. For mounting and dismounting, the min. distance above and below the instrument from other equipment should be 8 cm.

For installation of the bus connection, proceed as follows:

1. Snap on the bus connectors (delivered with the device) onto the top-hat rail
2. For high-density mounting, push the bus connectors together.
3. Clip the instruments onto the top-hat rail via the bus connectors - the internal system bus connection is ready!

Please, mount the bus coupler in the leftmost position and fit the function modules right of the bus coupler in the required order.

rail line instruments do not contain parts for which maintenance is compulsory and need not be opened by the customer.

Warning
A field bus coupler can energize max. 16 function modules. For connecting a higher number of modules RL PWR power supply modules must be used.

IV-3.1 Dismounting

Dismounting is in the inverse order of the steps described above.

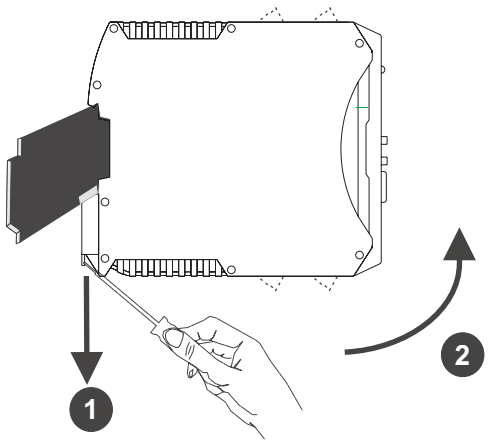


Abb. 3 Dismounting

IV-4 Electrical connection

IV-4.1 Bus coupler supply voltage

A system comprising bus coupler and one or several function modules is energized centrally via the bus coupler. Central energization reduces the wiring expenditure considerably.

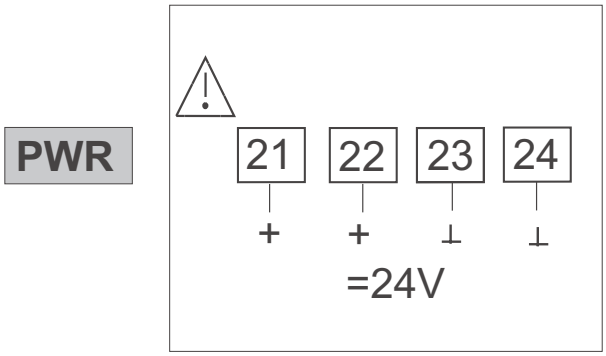


Abb. 4 Anschluss Energieeinspeisung Buskoppler

Warning
Energization at the function modules is not permissible

A bus coupler can energize max. 16 function modules.
The system can be extended to max. 62 modules.
For every extension (16 modules) a power module is necessary.

IV-4.2 Energization via RL PWR power supply module

Power supply module RL PWR is used for energization of function modules with system interface via the bus connector in the top-hat rail.

For connecting a higher number of function modules to the bus coupler than permissible for energization, additional power supply modules must be used.

Applications:

- Supplementary energization of additional function modules
- Repartition to different installation levels (e.g. two rows in a control cabinet)
- Set-up of separate potential levels
- One power supply module can energize up to 16 function modules.

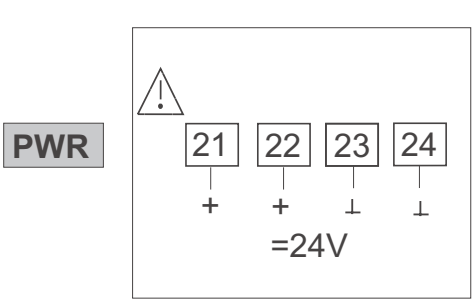


Abb. 5 Connection and Example RL PWR module

Warning

Energizing at the function modules is not permitted.
High-density mounting with other partial systems is not permissible.

Cascade connection of power supply modules is not permissible (see above).

IV-5 CAN-Bus set-up

As cable a pairwisely twisted and screened 4-core bus cable according to ISO 11898 is recommended.

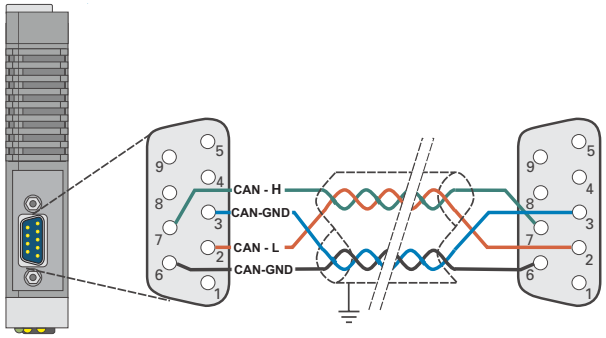


Abb. 6 Cabling possibility

Terminating resistors between CAN-H and CAN-B at the cable end.
For procedure, see chapter **Fehler! Verweisquelle konnte nicht gefunden werden.**
For screening, see chapter IV-7.7

IV-6 Connector plug

Field bus connection is via a “standard” CANopen connector. The connector is a sub-D socket to IEC 61158. Connection must be done by the customer.

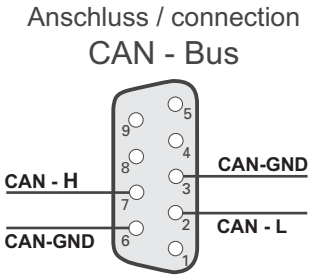


Abb. 7 Bus connecting plug

IV-7 CAN Physical Layer

There are several standards concerning the CAN physical layer. The most important standard for general application is the "CAN high-speed standard ISO 11898-2". The recommendations given below are based mainly on this standard, and are valid regardless of the CAN protocol used (CANopen / DeviceNet).

IV-7.1 ISO 11898-2 nodes:

A node that conforms to ISO 11898-2 consists of a µC with CAN controller (possibly integrated) that is connected with a CAN transceiver via Rx and Tx lines. In turn, the transceiver is connected to the CANbus via the differential CAN-H and CAN-L leads. On the KSvario, this (transceiver) connection is galvanically isolated.

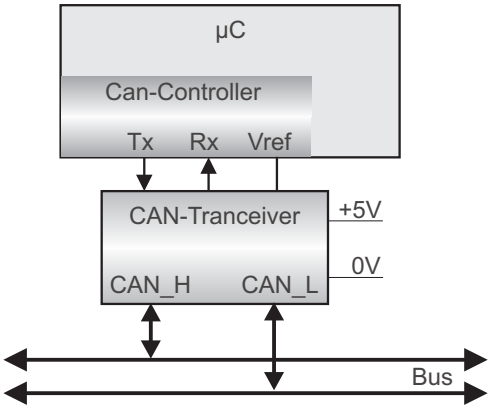


Abb. 8 CAN node

The nominal CANbus signal levels are called "Recessive" (nominal voltage of 2,5 V for CAN-H and CAN-L) and "Dominant" (nominal 3,5 V for CAN-H, and 1,5 V for CAN-L).

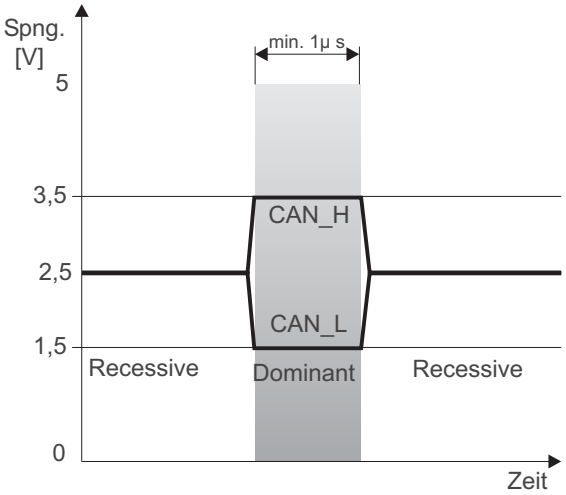


Abb. 9 Bus level

IV-7.2 Bitrates and bus lengths

The maximum usable bus length in a CAN network is determined by numerous factors, but mainly by the following physical effects:

- Delay times of the connected bus node (with/without opto-coupler), and delay time of the bus cable (propagation delay)
- Different scanning periods within a CAN bit cell, due to oscillator tolerances of the individual bus nodes
- Signal amplitude attenuation, caused by the ohmic resistance of the bus cable and the input impedances of the bus nodes

The practical bus lengths described below are based on ISO 11898-2 compliant transceivers with standard bus cables. However, with high bitrates (1 Mbit/s and 800 kbit/s) considerably shorter bus lengths might result, due to number & speed of the possible optocouplers (galvanic isolation).

IV-7.3 Practical bus lengths

CAN-profile	baud-rate	bus lengths	Nominal bit-time
CANopen	1 MBd	30 m	1 µs
CANopen	800 kBd	50 m	1,25 µs
CANopen/DeviceNet	500 kBd	100 m	2 µs
CANopen/DeviceNet	250 kBd	200 m	4 µs
CANopen/DeviceNet	125 kBd	500 m	8 µs
CANopen	50 kBd	1000 m *)	20 µs
CANopen	20 kBd	2500 m *)	50 µs
CANopen	10 kBd	5000 m *)	100 µs

*) With large cable lengths, galvanic isolation and repeaters are essential

Additional information on bus lengths is given in the CiA "DS-102" (CANopen) standard and the ODVA "DeviceNet Specifications Volume I, Release 2.0", especially Appendix A and B.

IV-7.4 Cable-parameters

ISO 11898-2 defines several DC and AC parameters for cables used in CANbus networks (typically, twisted cable pairs with defined electrical properties are used). The most important AC parameters are 120. cable impedance and a nominal propagation delay of 5 ns/m. Recommendations for bus cables and terminating resistors are given in the table below:

Bus-length	Bus cable (Z: 120 Ohm, tp: 5ns/m		Terminating resistor	Max. bitrate
	Specific. resistance	Cable cross section		
0 ..40 m	70 mOhm/m	0,25mm², 0,34mm² AWG 23, AWG 22	124 Ohm, 1%	1 MBd @ 40m
40 m .. 300 m	<60 mOhm/m	0,34mm², 0,6mm² AWG 22, AWG 20	127 Ohm, 1%*)	> 500 kBd @ 100m
300 m .. 600 m	<40 mOhm/m	0,5mm², 0,6mm² AWG 20	127 Ohm, 1% *)	> 100 kBd @ 500m
600 m ..1 km	<26 mOhm/m	0,75mm², 0,8mm² AWG 18	127 Ohm, 1% *)	> 50 kBd @ 1 km

*) With large cable lengths, a higher value for the terminating resistor (150...300 .) helps to reduce attenuation.

Further recommendations for CAN networks (especially with extended networks):

- Galvanic isolation is necessary with large lengths (e.g. 400 m of bus cable)
- Separate ground lead is advisable
- The voltage drop (potential difference) between the ground potentials of transceivers should be kept low (less than 2 V). If necessary, the supply voltage should be connected at the mid-point of the cable length.
- The overall input impedance of the bus nodes should be > 500 Ω
- If drop lines are used, they should be kept as short as possible in order to prevent/reduce reflections.

More detailed information is available from CiA (CANopen), the relevant chip manufacturers, and in the Internet.

IV-7.5 Terminating resistors

The CAN bus must be terminated with 120 Ohm. Termination is required also, if lines are short and Baud rates are low, since with CAN, it has the additional function of a combined pull-up and pull-down resistor for all bus sharing devices.

Termination of both bus cable ends of a segment using terminating resistors ensures that:

- A defined rest potential on the line is set,
- Line reflections are minimized, and
- A nearly constant load behaviour on the bus is set.

Without termination, there are not only reflections, but both CAN lines don't have a reference potential. In practice, a one-end termination is sufficient with short lines. Ideally, however, each of the two bus ends (and only the ends) should be terminated with 120 Ohm.

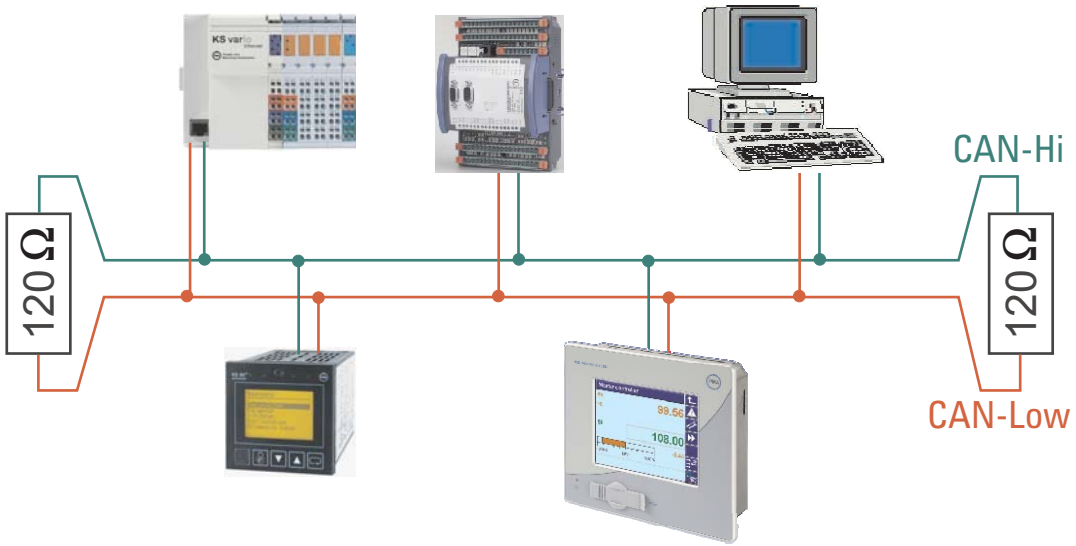


Abb. 10 CAN-Bus termination

IV-7.6 Cable layout

For connecting the field instruments, suitable bus cables for the application must be used. The wiring must comply with the general hints and regulations (e.g. VDE 0100):

- Cable layout in buildings (inside and outside cabinets)
- Cable layout outside buildings
- Potential compensation
- Cable screening
- Measures against interference voltages
- Length of tap line

In particular, the following information must be taken into account:

- With RS 485 technology, max. 32 field units can be connected in a segment at a bus cable. Several segments can be coupled by means of repeaters.
- The bus topology should be a line of max. 1000m length per segment. Extension by means of repeaters is permissible.
- The bus cable connection must be a "daisy chain" between field instruments rather than star-shaped.
- If possible, tap lines should be avoided to prevent reflections causing communication trouble. With higher transfer rates, tap lines are not permissible.
- The general hints for low-interference signal and bus cable wiring are applicable (see operating note „EMC – General information" (9407-047-09118)).
- To increase the transfer safety, pairwisely twisted and screened bus cables can be used.

IV-7.7 Screening

The type of screening connection is dependent mainly on the expected interference.

- For suppression of electric fields, one end of the screening must be connected to earth. Always realize this measure at first.
- However, suppression of interference due to an alternating magnetic field is possible only, when the both ends of the screening are connected to earth. With earth circuits, however, note the screening effect is reduced by galvanic interference on the reference potential.
- If several devices are linked to a single bus, the screen must be connected at each device, e.g. by means of screen clamps.
- Short distance bus screening must have a large-surface, low-resistance connection to a central protective earth, e.g. via screening terminals

IV-8 CAN-Bus - Settings

IV-8.1 Bus address and baudrate

The bus sharing device address of a bus coupler and the Baud rate for bus communication must be set using three rotary coding switches on the bottom of the device:

- Bus sharing device address:
  Range:
  01 … 99

- Baud rate:

Switch	Baud rate
0	20 kBit
1	50 kBit
2	100 kBit
3	125 kBit
4	250 kBit
5	500 kBit
6	800 kBit
7	1000 kBit

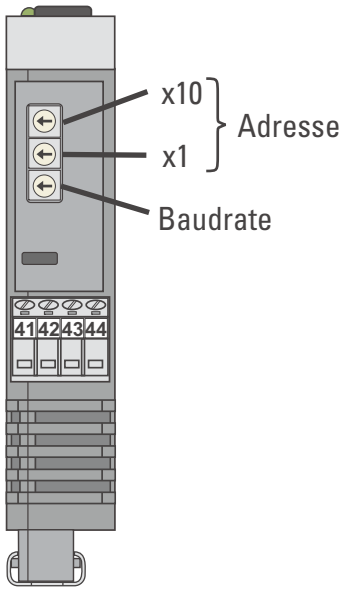


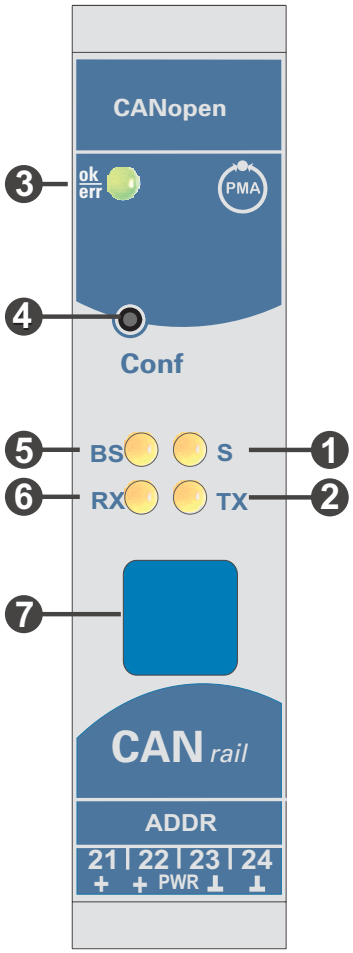
Abb. 11

For each device in a CAN-net a different address must be set.

When defining the device address, take care that a unique address is defined for each field instrument. Otherwise, abnormal behaviour of the overall bus can be caused. In this case, the bus master won't be able to communicate with the connected slaves.

IV-9 Display

Five bus coupler indicator LEDs indicate various operating statuses.



	Signification	
❶	LED	System bus status
S	off:	off
	blinks:	off
	on:	Communication active
❷	LED	CAN – Bus
TX	on:	Transmission active
❸	LED	Device status *
	green:	OK
	yellow:	Initialization
	yellow blinking:	Deviation to configuration
	red:	No configuration
	red blinking:	Module failure
❹	Configuration key	
❺	LED	CAN – Bus status
BS	off:	Init
	blinks:	Preoperational
	on:	Operational
❻	LED	CAN - Bus
RX	on:	Receive active
❼	PC connection for engineering tool	

* " green- yellow- red- off" alternating display: internal error status

V System design

Up to 16 function modules can be connected and energized at a bus coupler. System extension is possible by using power supply modules:

- Up to 62 function modules can be addressed logically by a bus coupler.
- Up to 4 installation levels can be set up.
- The max. permissible extension is 10 m.

V-1 System structure

Using power supply modules offers many advantages:

- The number of function modules connectable to a bus coupler can be extended.
- The function modules can be distributed to different levels in the control cabinet.
- A potential-isolated power supply is possible.

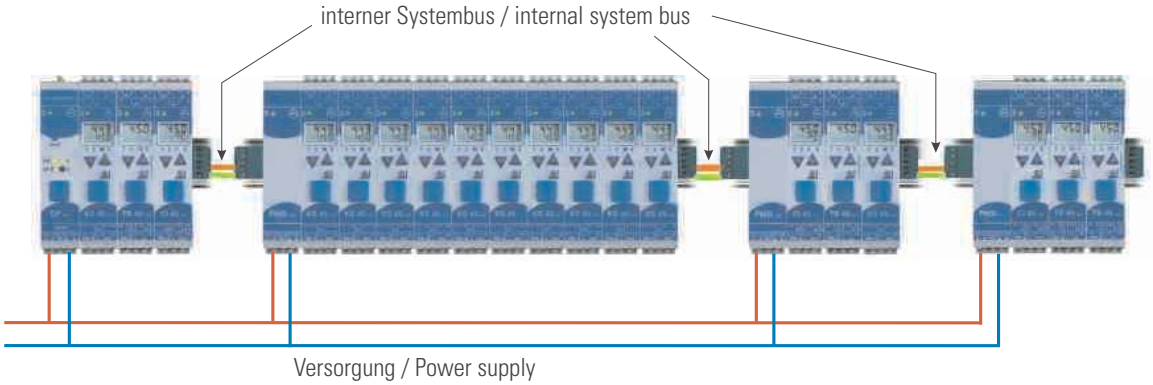


Abb. 12 Smple for system structure

The overall system length including cables must not exceed 10 m. Max. 3 m cable length between two groups is permissible.

V-1.1 Hints for set up

For connecting the function modules energized by the bus coupler and the function modules energized by the power supply module, proceed as follows:

1. Insert a connector (e.g. 9407-998-07141) on the right side of the group with the bus coupler into the bus connector in the top-hat rail.
2. Insert a connector (e.g. 9407-998-07131) on the left side of the group with the power supply module into the bus connector.
3. Use twisted and screened two-wire bus cable. Connect conductor 1 with the lower contact S5 and conductor 2 with contact S4.

4. Terminate the system bus with a terminating resistor LT = 100. For this, insert a connector (e.g. 9407-998-07141) on the right side of the last group with a power supply module into the bus connector. Connect the resistor across terminals S4 - S5.

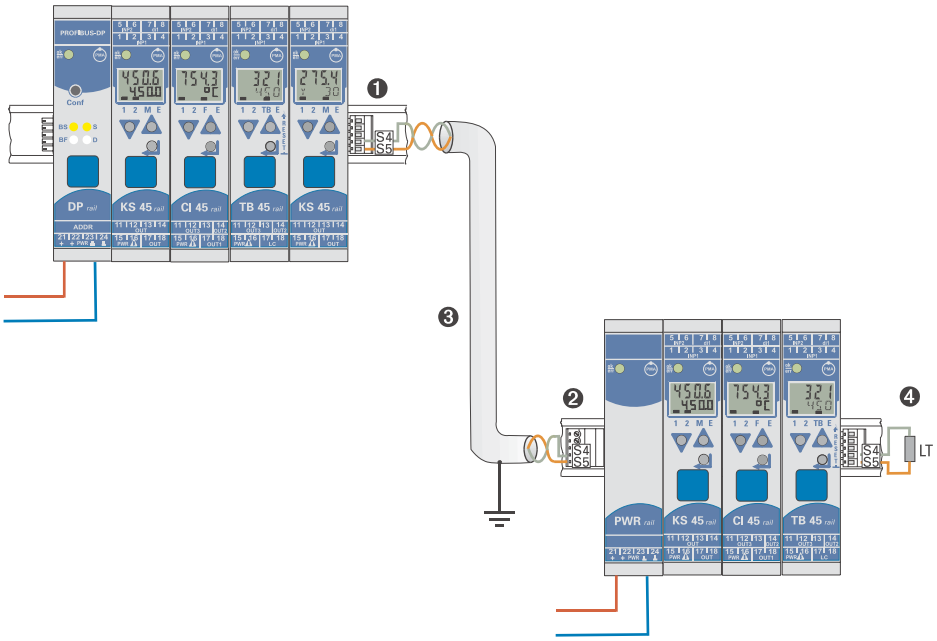


Abb. 13 Connection set up

Warning

Don't interconnect a bus coupler and one or several power supply modules via bus connector. Connections via contacts S1 to S3 can lead to damage of the connected devices!

V-1.2 Operation without bus coupler

Power supply module RL PWR can be used also for energization of function modules with system interface, if the use of a bus coupler is planned only for the future, or if only a single function module version may be available due to reduced stock-keeping.

VI CAN-Objects

VI-1 Objects for system configuration

The data for system configuration are taken over and stored only, if the object 0x1010 Store Parameters Sub-Index 4 save manufacture parameters with signature „save“ is written.

VI-1.1 Object 0x5001 Module Status

Index: 0x5001	Objectname [Module Status]		
Sub-Index	Designation	Access	Remark
00	Number of connected modules	RO	
01	Module 1	RO	Signification see below
...	Module …	RO	
3E	Module 62	RO	

Statusbyte							
D7	D6	D5	D4	D3	D2	D1	D0

Bit-No.	Signification (if Dx = 1)	Module	Reason
D0	Sensor alarm occurred	XX45	Sensor break, short circuit or wrong polarity detected
		RL451	Output not energized
		RL422, RL461	Override, and the channel is activated
		RL423	Sensor break, short circuit, override, and the channel is activated.
		RL424	Sensor break, short circuit, override, and the channel is activated. Sensor break detection is possible only with TC input.
D1	Limit exceeded	XX45	Limit exceeded, heating current alarm
		RL451	when an error (open circuit or short circuit) is detected on an activated channel which has been enabled via error mask
D2	Device-specific information	XX45	Device error occurred Maintenance manager signal (operating hours, number of switching cycles)
		RL xxx	EEPROM error
D3	Write value out of limits	XX45	Setpoint out of the adjusted limits Value out of the permissible limits
		RL 442, RL 443	Faulty output value
		RL 451	when a value > 0xff is sent to the module (not possible, because byte is sent)
		RL 452	Bit is set, when a value > 0x0f is sent to the module.
		RL 461, RL 431	Bit is set, when a value which leads to D/A converter override is sent to an output channel
D4	Communication error		Module not installed, module failure or error on the system bus
D5	Deviation from actual configuration		The configuration does not correspond with the installed module.
D6	reserved		
D7	reserved		

VI-1.2 Object 0x1027 Module list

Index: 0x1027	Objectname [Module list]		
Sub-Index	Designation	Access	Remark
00	Number of connected modules	RO	
01	Module-ID 1	RO	Signification see below
...	Module-ID …	RO	
3E	Module-ID 62	RO	

The defined system configuration is entered into the module list. The configuration is represented via hardware identification of the relevant module (see following table):

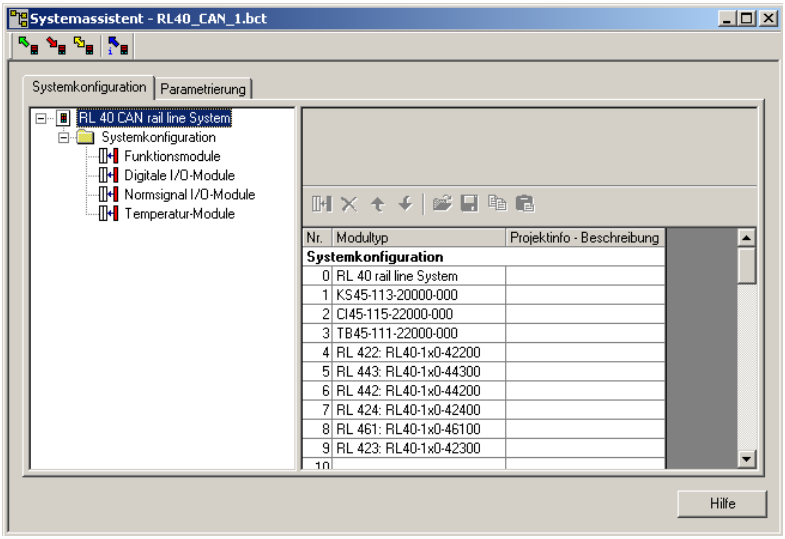


Abb. 14 Liste der Module in BlueControl

Übersicht über die Hardwarekennungen

Hardware characteristic		Module versions	Code-number
decimal	Hex	CI45	
4097	1001	CI45 (1 Relay)	CI45-1x3-200x0-xxx
4098	1002	CI45 (1 Relay, Option 1)	CI45-1x3-210x0-xxx
4099	1003	CI45 (1 Relay, Option 2)	CI45-1x3-220x0-xxx
4100	1004	CI45 (2 Relay)	CI45-1x5-200x0-xxx
4101	1005	CI45 (2 Relay, Option 1)	CI45-1x5-210x0-xxx
4102	1006	CI45 (2 Relay, Option 2)	CI45-1x5-220x0-xxx
decimal	Hex	KS45	
4197	1065	KS45 (2 Relay, di = Contact input)	KS45-1x1-200x0-xxx
4198	1066	KS45 (2 Relay, di = Optocoupler)	KS45-1x1-210x0-xxx
4199	1067	KS45 (2 Relay, di = Contact input, 2. Universal input)	KS45-1x1-220x0-xxx
4200	1068	KS45 (2 Relay, di = Optocoupler, 2. Universal input)	KS45-1x1-230x0-xxx
4201	1069	KS45 (2 Relay + Analog output, di = Contact input)	KS45-1x3-200x0-xxx
4202	106A	KS45 (2 Relay + Analog output, di = Optocoupler)	KS45-1x3-210x0-xxx
4203	106B	KS45 (2 Relay + Analog output, di = Contact input, 2.Universal input)	KS45-1x3-220x0-xxx
4204	106C	KS45 (2 Relay + Analog output, di = Optocoupler, 2. Universal input)	KS45-1x3-230x0-xxx
4205	106D	KS45 (2 Optocoupler outp. input) + Relay, di = Contact input, HC	KS45-1x5-200x0-xxx
4206	106E	KS45 (2 Optocoupler outp. input)+ Relay, di = Optocoupler, HC	KS45-1x5-210x0-xxx

decimal	Hex	TB45	
4297	10C9	TB45 (2 Relay, di = Contact input)	TB45-1x1-200x0-xxx
4298	10CA	TB45 (2 Relay, di = Contact input, Option 1)	TB45-1x1-210x0-xxx
4299	10CB	TB45 (2 Relay, di = Optocoupler)	TB45-1x1-220x0-xxx
4300	10CC	TB45 (2 Relay, di = Optocoupler, Option 1)	TB45-1x1-230x0-xxx
4301	10CD	TB45 (2 Relay + Analog output, di = Contact input)	TB45-1x3-200x0-xxx
4302	10CE	TB45 (2 Relay + Analog output, di = Contact input, Option 1)	TB45-1x3-210x0-xxx
4303	10CF	TB45 (2 Relay + Analog output, di = Optocoupler)	TB45-1x3-220x0-xxx
4304	10D0	TB45 (2 Relay + Analog output, di = Optocoupler, Option 1)	TB45-1x3-230x0-xxx

decimal	Hex	SG45	
4397	112D	SG45 (2 Relay)	SG45-1x5-200x0

decimal	Hex	RL 442	
512	200	RL 442-0 (PNP)	RL40-1x0-44200-xxx
513	201	RL 442-1 (NPN)	RL40-1x0-44210-xxx
514	202	RL 442-2 (potential free)	RL40-1x0-44220-xxx

decimal	Hex	RL 443	
544	220	RL 443-0	RL40-1x0-44300-xxx

decimal	Hex	RL 451	
592	250	RL 451-0	RL40-1x0-45100-xxx
593	251	RL 451-1 (Free wheeling diode)	RL40-1x0-45110-xxx

decimal	Hex	RL 452	
608	260	RL 452-0	RL40-1x0-45200-xxx

decimal	Hex	RL 422	
768	300	RL 422-0	RL40-1x0-42200-xxx

decimal	Hex	RL 431	
848	350	RL 431-0	RL40-1x0-43100-xxx

decimal	Hex	RL 461	
864	360	RL 461-0	RL40-1x0-46100-xxx

decimal	Hex	RL 423	
1024	400	RL 423-0 (Pt100)	RL40-1x0-42300-xxx
1025	401	RL 423-1 (Pt1000)	RL40-1x0-42310-xxx
1026	402	RL 423-2 (Pt100/P1000)	RL40-1x0-42320-xxx

decimal	Hex	RL 424	
1040	410	RL 424-0 (2xTC)	RL40-1x0-42400-xxx
1041	411	RL 424-1 (2xTC/O2)	RL40-1x0-42410-xxx
1042	412	RL 424-2 (4xTC)	RL40-1x0-42420-xxx

VI-1.3 Object 0x5027 Module revision state

Index: 0x5027	Objectname [Module revision state]		
Sub-Index	Designation	Access	Remark
00	Number of connected modules	RO	
01	Module 1	RO	
...	Module …	RO	
3E	Module 62	RO	

In the module list "revision state" the revision state of the associated module is listed.

VI-1.4 Object 0x5028 Module data type

Index: 0x5028	Objectname [Module data type]		
Sub-Index	Designation	Access	Remark
00	Number of connected modules	RO	
01	Module 1	RW	Datatype / Value
...	Module …	RW	Byte 0x0008
3E	Module 62	RW	Integer (16 Bit) 0x0048
			Float 0x0088

In the list module data type the data type of the associated module is listed.

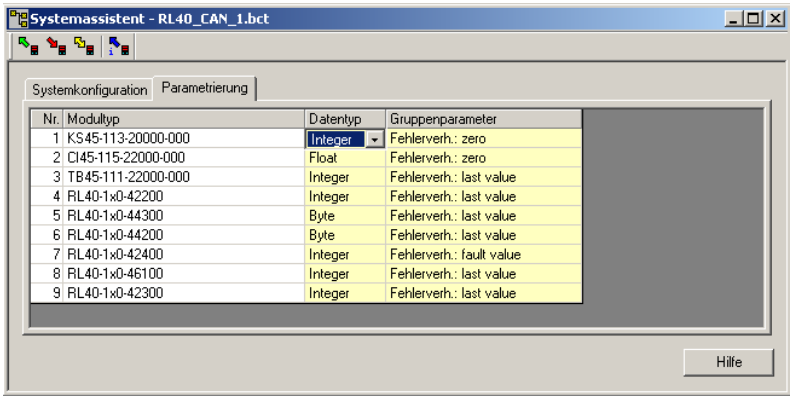


Abb. 15 Selecting the data type with BlueControl

VI-1.5 Object 0x5029 Module fault mode

Index: 0x5029	Objectname [Module fault mode]		
Sub-Index	Designation	Access	Remark
00	number of connected modules	RO	
01	Module 1	RW	Error type / Value
...	Module …	RW	Last value 0
3E	Module 62	RW	Zero 1
			Fault value 2

In the fault mode list the behaviour in case of an error is listed.

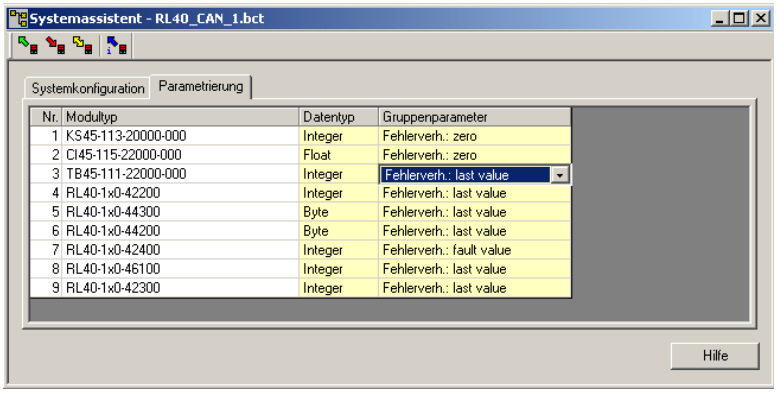


Abb. 16 Auswahl des Fehlverhaltens mit BlueControl

VI-2 Module parameter read/write

Reading and writing parameters of a module happens via SDO-access. .

*SDO-blockaccess to module parameters is **not** possible!*

Structure of SDO-access is described in the following table

Byte							
1	2	3	4	5	6	7	8
Access type	Index		Sub Index	Reference data			
ZA_CAN	I_low	I_high	SI	D1	D2	D3	D4

- Access type

ZA_CAN	Access type
0x2F	1 Byte write access (for ui8 objects)
0x2B	2 Byte write access (for ui16, si16 objects)
0x23	4 Byte write access (for ul32, sl32, float objects)
0x40	Read access

- Index

The index is deducted from the modbus addresses of the module.

I_high		I_low	
X	Y	Y	Y

X = 2 if Modbus address < 0x4000 — In the range 0x2000...0x2FFF Word, Integer (2 Byte) objects are stated

X = 3 if Modbus address >=0x4000 — In the range 0x3000...0x3FFF Long, Float (4 Byte) objects arte stated.

YYY = Modbus address UND linked to 0x0FFF

- Sub Index

The Sub Index equates the respective modul address.

Read example

Tx 0601 40 00 24 01 00 00 00 00 Modul 1 Address 0x0400 read

Rx 0581 4B 00 24 01 00 00 00 00

Write example

Tx 0601 2B 00 21 01 01 00 00 00 1. Start write parameterization Module 1 address 0x0100 Value = 1

Rx 0581 60 00 21 01 00 00 00 00

Tx 0601 2B 00 24 01 01 00 00 00 2. Write parameter 1 Module 1 address 0x0400 Value = 1

Rx 0581 60 00 24 01 00 00 00 00

Tx 0601 2B 01 24 01 03 00 00 00 Write parameter 2 Module 1 address 0x0401 Value = 1

Rx 0581 60 01 24 01 00 00 00 00

: Write parameter n

Tx 0601 2B 02 21 01 01 00 00 00 3. Write end parameterization Module 1 address 0x0102 Value = 1

Rx 0581 60 02 21 01 00 00 00 00 Only after this instruction the data get checked, stored and taken over by the module,

VI-3 Processdata Objects PDO

Process data are transmitted as multiplexed PDO´s (MPDO) to the CAN-Bus.

Process data are displayed in the following objects according to data direction and data type.

VI-3.1 Objekt 0x51xx process data input short

Index: 0x51xx	Objectname [PAB In 16bit channel xx]		
Sub-Index	Designation	Access	Remark
00	Number of entries	RO	
01	modulee 1	R	
...	modulee …	R	
3E	modulee 62	R	

xx : Channel, maximum numbers depending on module

VI-3.2 Object 0x52xx process data output short

Index 0x52xx	Objectname [PAB Out 16bit channel xx]		
Sub-Index	Designation	Access	Remark
00	Number of entries	RO	
01	modulee 1	W	
...	modulee …	W	
3E	modulee 62	W	

xx : Channel, maximum numbers depending on module

VI-3.3 Object 0x53xx process data input float

Index: 0x53xx	Objectname [PAB In float channel xx]		
Sub-Index	Designation	Access	Remark
00	Number of entries	RO	
01	modulee 1	R	
...	modulee …	R	
3E	modulee 62	R	

xx : Channel, maximum numbers depending on module

VI-3.4 Object 0x54xx process data output float

Index: 0x54xx	Objectname [PAB Out float channel xx]		
Sub-Index	Designation	Access	Remark
00	Number of entries	RO	
01	modulee 1	W	
...	modulee …	W	
3E	modulee 62	W	

xx : Channel, maximum numbers depending on module

VI-3.5 Object 0x55xx process data input byte

Index: 0x53xx	Objectname [PAB In byte channel xx]		
Sub-Index	Designation	Access	Remark
00	Number of entries	RO	
01	modulee 1	R	
...	modulee …	R	
3E	modulee 62	R	

xx : Channel, maximum numbers depending on module

VI-3.6 Object 0x56xx process data output byte

Index: 0x54xx	Objectname [PAB Out byte channel xx]		
Sub-Index	Designation	Access	Remark
00	Number of entries	RO	
01	modulee 1	W	
...	modulee …	W	
3E	modulee 62	W	

xx : channel, maximale Anzahl ist vom module abhängig

VI-3.7 Implementation CAN-Bus

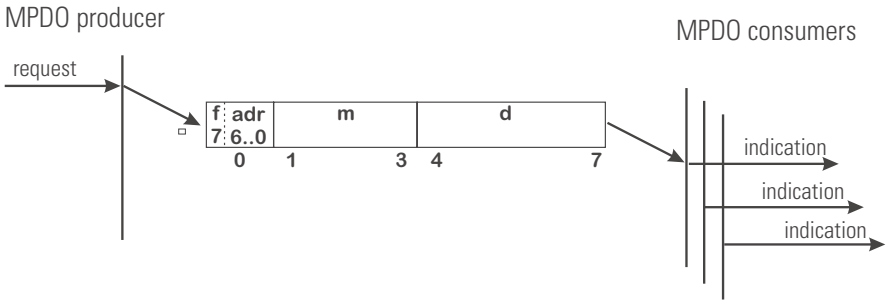


Abb. 17 CANopen application layer and communication profile (Protocol MPDO write)

f:	adress type	0: Source Adressing
		1: Destination Adressing
Addr	node-ID of the MPDO consumer in destination adressing or MPDO producer in source adressing.	
		0: Reserved for source addressing mode. Adresses all CANopen devices in the network that are configured for MPDO reception in destination adressing mode.
		1..127: Addresses the CANopen device in the network with the same node-ID

m: multiplexer. Represents the index/sub-index of the process data to be transferred by the MPDO. Depending on the address type in the index/sub-index is used to identify the data from the transmitting CANopen device (source adressing) or to identify the data on the receiving CANopen device (destination addressing).

d: process data. Data length lower than 4 bytes is filled up to fit 32-bit

Examples for receive PDO´s

send value 1 to module 1 channel 1 as Byte								
Id	Byte 0	Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7
201	81	00	56	01	01	00	00	00
	Node-ID + 0x80	Object 0x5600		module 1	Value = 1			

send value 1 to module 1 channel 1 as Short								
Id	Byte 0	Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7
201	81	00	52	01	01	00	00	00
	Node-ID + 0x80	Object 0x5200		module 1	Value = 1			

send value 1 to module 1 channel 1 as Float								
Id	Byte 0	Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7
201	81	00	54	01	00	00	80	3F
	Node-ID + 0x80	Object 0x5400		module 1	Value = 1			

send value 1 to module 2 channel 1 as Short								
Id	Byte 0	Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7
201	81	01	52	01	01	00	00	00
	Node-ID + 0x80	Object 0x5201		module 1	Value = 1			

send value 1 to module 2 channel 2 as Short								
Id	Byte 0	Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7
201	81	01	52	02	01	00	00	00
	Node-ID + 0x80	Object 0x5201		module 2	Value = 1			

Examples for transmit PDO´s

module 1 channel 1 sends Value 1 as Short								
Id	Byte 0	Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7
181	01	00	51	01	01	00	00	00
	Node-ID	Object 0x5100		module 1	Value = 1			

module 2 channel 2 sends Value 1 as Float								
Id	Byte 0	Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7
181	01	01	53	02	00	00	80	3F
	Node-ID	Object 0x5301		module 2	Value = 1			

module 3 channel 3 sends Value 1as Byte								
Id	Byte 0	Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7
181	01	02	55	03	01	00	00	00
	Node-ID	Object 0x5502		module 3	Value = 1			

VI-3.8 Emergency messages

The coupler generates emergency messages on the CANBus from the status messages of the modules with following meaning:

module 1 sends errormessage with information xx								
Id	Byte 0	Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7
181	01	50	81	xx	00	00	00	00
Errormessage	module 1	Device Hardware	Generic Error	modulestatus	Value = 1			

The meaning of the status messages can be found under [2].

VI-4 CAN-Glossary

CAN 'Controller Area Network'

CAN is a serial bus system which origins from the automobile industry. The signals are transmitted via twisted-pair wires. The noise immunity of CAN networks is especially high thanks to a number of provisions which have been taken e.g. CRC-Checks, use of differential signals, etc. CAN describes the physical bus concept incl. data link layer. The application layer, i.e. the protocol which is used is not described by CAN. Therefor one has to distinguish between CAN (physical bus) and CANopen (protocol, application layer).

CAL 'CAN Application Layer'

CAL describes a collection of communication services. CAL specifies the application layer and not the physical bus like CAN. An exact description of CAL specifications can be found in the Draft Standards CiA DS 201...207. CAL is the basic concept for CANopen, but is useable without the CANopen-specification. A CAL device only needs to support the services it actually requires. Therefore the software of a CAL node may be simpler than of a CANopen-node. It has to be noticed that different manufacturers implement different services in their devices.

CANopen

CANopen describes the standardized use of communication services and establishes a communication profil. With CANopen, devices of different manufacturers can be used in one CAN network. Differences may be found in the number of supported communication objects. In contrast to PROFIBUS-DP, CANopen provides the advantage of real multi-master-capability.

CiA 'CAN in Automation'

The international association of manufacturers and applicators, CAN in Automation was founded in 1992. The registered association currently with more than 280 member corporations was and is a strong factor in the fast and wide distribution of CAN knowledge.

Address: Am Weichselgarten 26, D-91058 Erlangen

Tel. +49-9131-69086-0, Fax. +49-9131-69086-79

CiA-Homepage: http://www.can-cia.de

Device profiles

Specification of functions and interpretation of variables for the various device families. The device profiles are described by 'DS 4xx' (Draft Standard).

DS 401: digital and analog in/outputs, e.g. Modular I/O system RM 200

DS 402: drives

DS 403: HMI, control and monitor

DS 404: MSR, measure-control-regulate

DS 405: programmable devices

DS 406: Encoder

DS 4xx: additional device profiles are being worked on

SDO 'Service Data Object'

SDOs serve the exchange of system parameters as are e.g. limit switch values, baud rate settings, PDO mappings, etc. SDOs are of great significance in the initializing phase of a CAN-Network, during the normal operation they play a minor role.

PDO 'Process Data Object'

PDOs serve the exchange of process data e.g. setting and reading of analog or digital inputs, setting of outputs, etc. After the initializing phase of the CAN-networks PDOs serve the fast data transfer between the CAN bus participants. The contents of the messages is relatively high.

PDO-Mapping

PDO-Mapping means to link objects together to one CAN-message of 8 bytes maximum. The application engineer can "pack" the data relevant to him (e.g. digital outputs) in one PDO, i.e. he can map them and so guarantee a fast data exchange of relevant data. PDO mapping needs only to be carried out, if the default values of the PDOs do not comply with the requirements of the respective application.

Communication Objects

In addition to SDOs and PDOs other communication objects have been specified:

- boot-up:	specifies starting up the CAN network
- dyn. identifier distribution:	automatic identifier distribution per software
- node guarding/life guarding:	upervising the functionality of the CAN network
- synchronization:	synchronizing of input / output, e.g. for drives
- emergency:	emergency telegrams at failures

Node-ID

Each CAN device has its own node number by which it is identified. PDOs communicate with a COB-ID of 'address + offset' on the CAN bus. The 'offset' is equivalent to the allocated Node-ID of the respective device. This results in the necessity of allocating a unique node number to each device to avoid bus conflicts.
Valid node numbers are 0 to 127, where 0 is reserved for the 'Bus-Master'.

Baud Rate

CAN is a serial bus system where the data transmission rate is given in bits per second (baud). Valid baud rates are 10k, 20k, 50k, 100k, 125k, 250k, 500k, 800k and 1000 kBaud and are set e.g. with a BCD rotating switch. RM 201 automatically recognize the baud rate which means that it is not always necessary to set the baud rate manually.

EDS files 'electronic data sheet'

EDS files describe a CANopen device and are required by the system configuration tools such as ProCANopen. They are part of the Engineering Sets 9407-999-103x1.

VI-5 Node States / Minimum Boot-Up

The Minimum Boot-Up supports **four node states**. State transitions are either triggered automatically or by a command initiated by the NMT master.

(1) Initialization

In this state the node is initialized. Three sub-states can be distinguished:

- Reset Application

Before the automatic jump into the state 'Reset Communication', the manufacturer specific and device profile specific part of the object index are initialized with the default values. This state is also run through first after the node has been switched on.

- Reset Communication

Before the automatic jump into the state 'Init', the communication profile specific part of the object index is initialized with the default values.

- Init

In this state the rest of node initialization follows. Then the device automatically jumps into the state 'Pre-Operational'.

(2) Pre-Operational

After 'Initialization', this state is achieved automatically. This state serves to parameterize the node. Node-guarding can be switched active or not active. SDO transfers are possible, PDO transfers are not supported. The SYNC telegram can be parameterized, but is not transmitted. The device can jump into every other state except 'Init'.

(3) Operational

This is the normal operational state. Node-guarding can be activated or deactivated. SDO and PDO transfers are possible. If it has been parameterized beforehand, the node sends SYNC telegrams to the bus in this state. If the settings for the PDOs or SYNC telegrams are changed in the object index in this state, i.e. whilst operation, then to keep the data consistent, it must jump once into the state 'Pre-operational' or 'Prepared' until the new settings become valid. It can jump into every other state except 'Init'.

Sometimes the jump to state 'Operational' is also called 'start node'.

(4) Prepared / (Stopped)

In this state neither SDO or PDO transfers are possible, nor SYNC telegrams can be sent. If the node monitoring had been activated previously, it is the only service which is executed. It can jump into every other state except 'Init'.

Sometimes the jump to state 'Prepared' is also called 'stop node'.

VI-5.1 Digital I/O-Modules

RL442-0	8 channel digital input PNP-logic	Hardware recognition [200]
RL442-1	8 channel digital input NPN-logic	Hardware recognition [201]
RL442-2	8 channel digital input potential free	Hardware recognition [202]
RL443-0	8 channel digital input	Hardware recognition [220]

Modbus address [dez]	[hex]	Parameter name	Access (rw)	Type

1	1	Hardware recognition	r	ushort
2	2	Revision status	r	ushort
3	3	PAB_In_Max	r	ushort
4	4	PAB_Out_Max	r	ushort
5	5	PARA_number	r	ushort
6	6	Module type	r	ushort
7	7	PAB_In_Used	r	ushort
8	8	PAB_Out_Used	r	ushort
9	9	Function recognition	r	ushort
10	A	Group parameter	r	ushort
50	32	Polarity	rw	ushort
51	33	Debounce time	rw	ushort
201	C9	Software-Version	r	ushort
202	CA	Operating version	r	ushort
203	CB	Device recognition	r	ushort
204	CC	SW_Sub_Version	r	ushort
360	168	Device name	r	string[16]
900	384	Software Date	r	string[20]

RL451-0 8 channel digital output 24V DC, 2A/channel Hardware recognition [250]
RL451-1 8 channel digital output 24V DC, 2A/channel free wheeling diode Hardware recognition [251]

Modbus address [dez]	[hex]	Parameter name	Access (rw)	Type
1	1	Hardware recognition	r	ushort
2	2	Revision status	r	ushort
3	3	PAB_In_Max	r	ushort
4	4	PAB_Out_Max	r	ushort
5	5	PARA_number	r	ushort
6	6	Module type	r	ushort
7	7	PAB_In_Used	r	ushort
8	8	PAB_Out_Used	r	ushort
9	9	Function recognition	r	ushort
10	A	Group parameter	r	ushort
50	32	Polarity	rw	ushort
51	33	Activity	rw	ushort
52	33	FaultState	rw	ushort
53	34	FaultMask	rw	ushort
54	35	ToggleEnableMask	rw	ushort
55	36	StartOnTime	rw	ushort
56	37	TogglePeriode	rw	ushort
57	38	ToggleDutyCycle	rw	ushort
201	39	Software-Version	r	ushort
202	CA	Operating version	r	ushort
203	CB	Device recognition	r	ushort
204	CC	SW_Sub_Version	r	ushort
360	168	Device name	r	string[16]
900	384	Software Date	r	string[20]

RL452-0 4 channel digitaloutput Relay Hardware recognition [260]

Modbus address [dez]	[hex]	Parameter name	Access (rw)	Type
1	1	Hardware recognition	r	ushort

2	2	Revision status	r	ushort
3	3	PAB_In_Max	r	ushort
4	4	PAB_Out_Max	r	ushort
5	5	PARA_number	r	ushort
6	6	Module type	r	ushort
7	7	PAB_In_Used	r	ushort
8	8	PAB_Out_Used	r	ushort
9	9	Function recognition	r	ushort
10	A	Group parameter	r	ushort
50	32	Polarity	rw	ushort
51	33	Activity	rw	ushort
52	33	FaultState	rw	ushort
201	39	Software-Version	r	ushort
202	CA	Operating version	r	ushort
203	CB	Device recognition	r	ushort
204	CC	SW_Sub_Version	r	ushort
360	168	Device name	r	string[16]
900	384	Software Date	r	string[20]

VI-5.2 Standard signal I/O module

RL422-0 4 channel analog input Hardware recognition [300]

Modbus address [dez]	[hex]	Parameter name	Access (rw)	Type
1	1	Hardware recognition	r	ushort
2	2	Revision status	r	ushort
3	3	PAB_In_Max	r	ushort
4	4	PAB_Out_Max	r	ushort
5	5	PARA_number	r	ushort
6	6	Module type	r	ushort
7	7	PAB_In_Used	r	ushort
8	8	PAB_Out_Used	r	ushort
9	9	Function recognition	r	ushort
10	A	Group parameter	r	ushort
50	32	Polarity	rw	ushort
51	33	Activity	rw	ushort
52	33	FaultState	rw	ushort
201	39	Software-Version	r	ushort
202	CA	Operating version	r	ushort
203	CB	Device recognition	r	ushort
204	CC	SW_Sub_Version	r	ushort
360	168	Device name	r	string[16]
900	384	Software Date	r	string[20]
1024	400	InputType Channel 1	rw	ushort
1025	401	Enabled Channel 1	rw	ushort
1026	402	Fault Value Channel 1	rw	short
1027	403	Filter time Channel 1	rw	ushort
1028	404	Filter band width Channel 1	rw	ushort
1029	405	Field value Min Channel 1	rw	short
1030	406	Field value Max Channel 1	rw	short
1031	407	Process value Min Channel 1	rw	short
1032	408	Process value Max Channel 1	rw	short

1033	409	Sensor supply channel 1	rw	ushort
1280	500	InputType Channel 2	rw	ushort
1281	501	Enabled Channel 2	rw	ushort
1282	502	Fault Value Channel 2	rw	short
1283	503	Filter time Channel 2	rw	ushort
1284	504	Filter band width Channel 2	rw	ushort
1285	505	Field value Min Channel 2	rw	short
1286	506	Field value Max Channel 2	rw	short
1287	507	Process value Min Channel 2	rw	short
1288	508	Process value Max Channel 2	rw	short
1289	509	Sensor supply channel 2	rw	ushort
1536	600	InputType Channel 3	rw	ushort
1537	601	Enabled Channel 3	rw	ushort
1538	602	Fault Value Channel 3	rw	short
1539	603	Filter time Channel 3	rw	ushort
1540	604	Filter band width Channel 3	rw	ushort
1541	605	Field value Min Channel 3	rw	short
1542	606	Field value Max Channel 3	rw	short
1543	607	Process value Min Channel 3	rw	short
1544	608	Process value Max Channel 3	rw	short
1545	609	Sensor supply channel 3	rw	ushort
1792	700	InputType Channel 4	rw	ushort
1793	701	Enabled Channel 4	rw	ushort
1794	702	Fault Value Channel 4	rw	short
1795	703	Filter time Channel 4	rw	ushort
1796	704	Filter band width Channel 4	rw	ushort
1797	705	Field value Min Channel 4	rw	short
1798	706	Field value Max Channel 4	rw	short
1799	707	Process value Min Channel 4	rw	short
1800	708	Process value Max Channel 4	rw	short
1801	709	Sensor supply channel 4	rw	ushort

RL431-0 4 Channel Analog input Hardware recognition [350]

Modbus address [dez]	[hex]	Parameter name	Access (rw)	Type
1	1	Hardware recognition	r	ushort
2	2	Revision status	r	ushort
3	3	PAB_In_Max	r	ushort
4	4	PAB_Out_Max	r	ushort
5	5	PARA_number	r	ushort
6	6	Module type	r	ushort
7	7	PAB_In_Used	r	ushort
8	8	PAB_Out_Used	r	ushort
9	9	Function recognition	r	ushort
10	A	Group parameter	r	ushort
50	32	Polarity	rw	ushort
51	33	Activity	rw	ushort
52	33	FaultState	rw	ushort
201	39	Software-Version	r	ushort
202	CA	Operating version	r	ushort
203	CB	Device recognition	r	ushort
204	CC	SW_Sub_Version	r	ushort
360	168	Device name	r	string[16]

900	384	Software Date	r	string[20]
2048	800	OutputType Channel 1	rw	ushort
2049	801	Fault Value Channel 1	rw	short
2050	802	Field value Min Channel 1	rw	short
2051	803	Field value Max Channel 1	rw	short
2052	804	Process value Min Channel 1	rw	short
2053	805	Process value Max Channel 1	rw	short
2304	900	OutputType Channel 2	rw	ushort
2305	901	Fault Value Channel 2	rw	short
2306	902	Field value Min Channel 2	rw	short
2307	903	Field value Max Channel 2	rw	short
2308	904	Process value Min Channel 2	rw	short
2309	905	Process value Max Channel 2	rw	short
2560	A00	OutputType Channel 3	rw	ushort
2561	A01	Fault Value Channel 3	rw	short
2562	A02	Field value Min Channel 3	rw	short
2563	A03	Field value Max Channel 3	rw	short
2564	A04	Process value Min Channel 3	rw	short
2565	A05	Process value Max Channel 3	rw	short
2816	B00	OutputType Channel 4	rw	ushort
2817	B01	Fault Value Channel 4	rw	short
2818	B02	Field value Min Channel 4	rw	short
1819	B03	Field value Max Channel 4	rw	short
2820	B04	Process value Min Channel 4	rw	short
2821	B05	Process value Max Channel 4	rw	short

RL461-0 2/2 Channel Analog I/O Hardware recognition [360]

Modbus address [dez]	[hex]	Parameter name	Access (rw)	Type
1	1	Hardware recognition	r	ushort
2	2	Revision status	r	ushort
3	3	PAB_In_Max	r	ushort
4	4	PAB_Out_Max	r	ushort
5	5	PARA_number	r	ushort
6	6	Module type	r	ushort
7	7	PAB_In_Used	r	ushort
8	8	PAB_Out_Used	r	ushort
9	9	Function recognition	r	ushort
10	A	Group parameter	r	ushort
50	32	Polarity	rw	ushort
51	33	Activity	rw	ushort
52	33	FaultState	rw	ushort
201	39	Software-Version	r	ushort
202	CA	Operating version	r	ushort
203	CB	Device recognition	r	ushort
204	CC	SW_Sub_Version	r	ushort
360	168	Device name	r	string[16]
900	384	Software Date	r	string[20]
1024	400	InputType Channel 1	rw	ushort
1025	401	Enabled Channel 1	rw	ushort

1026	402	Fault Value Channel 1	rw	short
1027	403	Filtertime Channel 1	rw	ushort
1028	404	Filter band width Channel 1	rw	ushort
1029	405	Field value Min Channel 1	rw	short
1030	406	Field value Max Channel 1	rw	short
1031	407	Process value Min Channel 1	rw	short
1032	408	Process value Max Channel 1	rw	short
1280	500	InputType Channel 2	rw	ushort
1281	501	Enabled Channel 2	rw	ushort
1282	502	Fault Value Channel 2	rw	short
1283	503	Filter time Channel 2	rw	ushort
1284	504	Filter band width Channel 2	rw	ushort
1285	505	Field value Min Channel 2	rw	short
1286	506	Field value Max Channel 2	rw	short
1287	507	Process value Min Channel 2	rw	short
1288	508	Process value Max Channel 2	rw	short
2048	800	OutputType Channel 1	rw	ushort
2049	801	Fault Value Channel 1	rw	short
2050	802	Field value Min Channel 1	rw	short
2051	803	Field value Max Channel 1	rw	short
2052	804	Process value Min Channel 1	rw	short
2053	805	Process value Max Channel 1	rw	short
2304	900	OutputType Channel 2	rw	ushort
2305	901	Fault Value Channel 2	rw	short
2306	902	Field value Min Channel 2	rw	short
2307	903	Field value Max Channel 2	rw	short
2308	904	Process value Min Channel 2	rw	short
2309	905	Process value Max Channel 2	rw	short

VI-5.3 Temperature-Modules

RL423-0	4 Channel Resistance thermometer, 3-wire Pt100	Hardware recognition [400]
RL423-1	4 Channel Resistance thermometer, 3- wire Pt1000	Hardware recognition [400]
RL423-2	4 Channel Resistance thermometer, 3- wire Pt100 / Pt1000	Hardware recognition [400]

Modbus address [dez]	[hex]	Parameter name	Access (rw)	Type
1	1	Hardware recognition	r	ushort
2	2	Revision status	r	ushort
3	3	PAB_In_Max	r	ushort
4	4	PAB_Out_Max	r	ushort
5	5	PARA_number	r	ushort
6	6	Module type	r	ushort
7	7	PAB_In_Used	r	ushort
8	8	PAB_Out_Used	r	ushort
9	9	Function recognition	r	ushort
10	A	Group parameter	r	ushort
50	32	Polarity	rw	ushort
51	33	Activity	rw	ushort

52	33	FaultState	rw	ushort
201	39	Software-Version	r	ushort
202	CA	Operating version	r	ushort
203	CB	Device recognition	r	ushort
204	CC	SW_Sub_Version	r	ushort
360	168	Device name	r	string[16]
900	384	Software Date	r	string[20]
1024	400	Input Type Channel 1	rw	ushort
1025	401	Enabled Channel 1	rw	ushort
1026	402	Unit Channel 1	rw	ushort
1027	403	Offset Channel 1	rw	short
1028	404	Fault Value Channel 1	rw	short
1029	405	Filter time Channel 1	rw	ushort
1030	406	Filter band width Channel 1	rw	ushort
1280	500	InputType Channel 2	rw	ushort
1281	501	Enabled Channel 2	rw	ushort
1282	502	Unit Channel 2	rw	ushort
1283	503	Offset Channel 2	rw	short
1284	504	Fault Value Channel 2	rw	short
1285	505	Filter time Channel 2	rw	ushort
1286	506	Filter band width Channel 2	rw	ushort
1536	600	InputType Channel 3	rw	ushort
1537	601	Enabled Channel 3	rw	ushort
1538	602	Unit Channel 3	rw	ushort
1539	603	Offset Channel 3	rw	short
1540	604	Fault Value Channel 3	rw	short
1541	605	Filter time Channel 3	rw	ushort
1542	606	Filter band width Channel 3	rw	ushort
1792	700	InputType Channel 4	rw	ushort
1793	701	Enabled Channel 4	rw	ushort
1794	702	Unit Channel 4	rw	ushort
1795	703	Offset Channel 4	rw	short
1796	704	Fault Value Channel 4	rw	short
1797	705	Filter time Channel 4	rw	ushort
1798	706	Filter band width Channel 4	rw	ushort

RL424-0 2 Channel Thermo ouple Hardware recognition [410]

Modbus address [dez]	[hex]	Parameter name	Access (rw)	Type
1	1	Hardware recognition	r	ushort
2	2	Revision status	r	ushort
3	3	PAB_In_Max	r	ushort
4	4	PAB_Out_Max	r	ushort
5	5	PARA_number	r	ushort
6	6	Module type	r	ushort
7	7	PAB_In_Used	r	ushort
8	8	PAB_Out_Used	r	ushort
9	9	Function recognition	r	ushort
10	A	Group parameter	r	ushort
50	32	Polarity	rw	ushort
51	33	Activity	rw	ushort
52	33	FaultState	rw	ushort
201	39	Software-Version	r	ushort

202	CA	Operating version	r	ushort
203	CB	Device recognition	r	ushort
204	CC	SW_Sub_Version	r	ushort
360	168	Device name	r	string[16]
900	384	Software Date	r	string[20]
1024	400	InputType Channel 1	rw	ushort
1025	401	Input Function Channel 1	rw	ushort
1026	402	Unit Channel 1	rw	short
1027	403	external TK Channel 1	rw	short
1028	404	Offset Channel 1	rw	short
1029	405	Fault Value Channel 1	rw	short
1030	406	Filter time Channel 1	rw	ushort
1031	407	Filter band width Channel 1	rw	ushort
1032	408	Field value Min Channel 1	rw	short
1033	409	Field value Max Channel 1	rw	short
1034	40a	Process value Min Channel 1	rw	short
1035	40b	Process value Max Channel 1	rw	short
1280	500	Input Type Channel 2	rw	ushort
1281	501	Input Function Channel 2	rw	ushort
1282	502	Unit Channel 2	rw	short
1283	503	external TK Channel 2	rw	short
1284	504	Offset Channel 2	rw	short
1285	505	Fault Value Channel 2	rw	short
1286	506	Filter time Channel 2	rw	ushort
1287	507	Filter band width Channel 2	rw	ushort
1288	508	Fieldvalue Min Channel 2	rw	short
1289	509	Fieldvalue Max Channel 2	rw	short
1290	50a	Process value Min Channel 2	rw	short
1291	50b	Process value Max Channel 2	rw	short

RL424-1 2 Channel Thermocouple / O2 Hardware recognition [411]
RL424-2 4 Channel Thermocouple Hardware recognition [412]

Modbus address [dez]	[hex]	Parameter name	Access (rw)	Type
1	1	Hardware recognition	r	ushort
2	2	Revision status	r	ushort
3	3	PAB_In_Max	r	ushort
4	4	PAB_Out_Max	r	ushort
5	5	PARA_number	r	ushort
6	6	Module type	r	ushort
7	7	PAB_In_Used	r	ushort
8	8	PAB_Out_Used	r	ushort
9	9	Function recognition	r	ushort
10	A	Group parameter	r	ushort
50	32	Polarity	rw	ushort
51	33	Activity	rw	ushort
52	33	FaultState	rw	ushort
201	39	Software-Version	r	ushort
202	CA	Operating version	r	ushort
203	CB	Device recognition	r	ushort
204	CC	SW_Sub_Version	r	ushort

360	168	Device name	r	string[16]
900	384	Software Date	r	string[20]
1024	400	Input Type Channel 1	rw	ushort
1025	401	Input Function Channel 1	rw	ushort
1026	402	Unit Channel 1	rw	short
1027	403	external TK Channel 1	rw	short
1028	404	Offset Channel 1	rw	short
1029	405	Fault Value Channel 1	rw	short
1030	406	Filter time Channel 1	rw	ushort
1031	407	Filterband width Channel 1	rw	ushort
1032	408	Field value Min Channel 1	rw	short
1033	409	Field value Max Channel 1	rw	short
1034	40a	Process value Min Channel 1	rw	short
1035	40b	Process value Max Channel 1	rw	short
1280	500	Input Type Channel 2	rw	ushort
1281	501	Input Function Channel 2	rw	ushort
1282	502	Unit Channel 2	rw	short
1283	503	external TK Channel 2	rw	short
1284	504	Offset Channel 2	rw	short
1285	505	Fault Value Channel 2	rw	short
1286	506	Filter time Channel 2	rw	ushort
1287	507	Filterband width Channel 2	rw	ushort
1288	508	Field value Min Channel 2	rw	short
1289	509	Field value Max Channel 2	rw	short
1290	50a	Process value Min Channel 2	rw	short
1291	50b	Process value Max Channel 2	rw	short
1536	600	InputType Channel 3	rw	ushort
1537	601	InputFunction Channel 3	rw	ushort
1538	602	Unit Channel 3	rw	short
1539	603	external TK Channel 3	rw	short
1540	604	Offset Channel 3	rw	short
1541	605	Fault Value Channel 3	rw	short
1542	606	Filter time Channel 3	rw	ushort
1543	607	Filter band width Channel 3	rw	ushort
1544	608	Field value Min Channel 3	rw	short
1545	609	Field value Max Channel 3	rw	short
1546	60a	Process value Min Channel 3	rw	short
1547	60b	Process value Max Channel 3	rw	short
1792	700	Input Type Channel 4	rw	ushort
1793	701	Input Function Channel 4	rw	ushort
1794	702	Unit Channel 4	rw	short
1795	703	external TK Channel 4	rw	short
1796	704	Offset Channel 4	rw	short
1797	705	Fault Value Channel 4	rw	short
1798	706	Filter time Channel 4	rw	ushort
1799	707	Filter band width Channel 4	rw	ushort
1800	708	Field value Min Channel 4	rw	short
1801	709	Field value Max Channel 4	rw	short
1802	70a	Process value Min Channel 4	rw	short
1803	70b	Process value Max Channel 4	rw	short

VII Address ranges and formats

VII-1 Definition of ranges

The address is coded in 2 Byte. The highest valued 3 Bits define the transmissionformat of the data.

For RailLine devices the following formats are available:

- Integer
- Integer with 1 decimal
- FLOATformat (Float nach IEEE)

Address range		transmission data format	smallest transmittable value	biggest transmittable value	Resolution
hex	dez.				
0x0000 ... 0x1FFF	0 … 8191	Integer without decimal	-30000	+32000	+/- 1
0x2000 ... 0x3FFF	8192 ... 16383	Integer with 1 decimal	-3000.0	+3200.0	+/- 0.1
0x4000 ... 0x7FFF	16384...32768	Float (IEEE-Format)	-1.0 E+037	+1.0 E+037	+/-1.4E-045

For the integer values with and without decimals the value range -30000 bis 32000 is transmitted via interface. Scaling with factors 1 or 10 must be proceeded from the sender as well as from the receiver.

VII-2 Special values

The following special values are defined for transmission in Fehler! Textmarke nicht definiert.**Integer format**:

-31000 Sensor error
This value is returned for data that cannot deliver a reasonable value due to a sensor error

-32000 Switch off value
This function is switched off.

-32500 Undefined value
This value is returned by the device in case during a range request a data is not defined within the range (NOT DEFINED VALUE))

-32768 Equates 0x8000hex.
The value to be transmitted is out of the transmittable Integer range.

The following special values are defined for transmission in **Floatformat**:

-1.5E37 This data is not defined.
This value is returned by the device in case during a range request a data is not defined within the range

VII-3 Structure of address tables

In the following address tables the addresses of each parameter for the according data format are given das in decimal en values.

The tables have the following structure:

Name	r/w	Adr.	Integer	real	Type	value/off	description
		base 1dP					

- Name — Name of the date
- r/w — admitted access type: r = read , w = write
- Adr. Integer — Address for Integer-value
- base — Integer without decimal;
- 1 dP — Integer with 1 decimal;
- real — FLOATnumber / Float (IEEE-Format)
- Type — internal data type
- Value/off — admitted value range, switch off value available
- Description — Explanations

VII-4 Internal data types

The data used in the device is assigned to the following data types:

- Float
  Floating point number
  Range: -1999 ... -0.001, 0, 0.001 ... 9999
- INT
  Positive integer number
  Range: 0 ... 65535
  Exception: switch-off value '-32000'
- Text
  Text string consisting of n characters, presently defined n=5
  permissible characters: 20H...7FH
- Long
  positive integer long number
  Range: 0 … 99999
- Enum
  Selection value

VII-5 Addresstables

The address tables of the process values, parameters and configuration data for the function modules UNIFLEX CI 45, KS 45 and TB 45 you can find in the documentation 9499-040-78111.

VII-6 Annex Status / Control - Information

The meaning of the selctable status and control informations for transmittable bus data (read/write) are explained in this chapter.

VII-6.1 Measuring transducer UNIFLEX CI 45

Status words

Name	r/w	Type	value/off	Description
St.Di	r	Int	...	Status of digital inputs or of keys (binary coded).
			Bit 0: Input di1,	
			Bit 8: Status Enter-Key,	
			Bit 9: Status Dekrement-Key,	
			Bit 10: Status Inkrement-Key	
St.Ain	r	Int	0...127	Bitcoded status of analog inputs (error, e.g. short circuit
			Bit 0 Break at Input 1	
			Bit 1 Reverse polarity at Input 1	
			Bit 2 Short circuit at Input 1	
			Bit 3 Not used	
			Bit 4 Break at Input 2	
			Bit 5 Reverse polarity at Input 2	
			Bit 6 Short circuit at Input 2	
			Bit 7-15 Not used	
St.Ala	r	Int	…	Status of alarms: Bitwise coded status of the single alarms as limit breaks.
			Bit 0 Upcoming/stored Limit break1	
			Bit 1 Upcoming/stored Limit break2	
			Bit 2 Upcoming/stored Limit break3	
			Bit 3-7 Not used	

				Bit 8 Upcoming Limit break1 Bit 9 Upcoming Limit break2 Bit 10 Upcoming Limit break3 Bit 11-15 Not used

St.Do	r	Int	0...15	Status of digital outputs
				Bit 0 digital Output1 Bit 1 digital Output2 Bit 2 digital Output3

Fail	r	Enum	Enum_InpFail	Status of digital outputs
			1	no error
			2	sensor break
			3	reverse polarity at the input
			4	Short circuit at the input

Control words

Name	r/w	Type	value/off	Description
F.Di	r	Int	...	Forcing of digital inputs. Forcing means the external control of a device input. The device takes over the value on this input.((Preset for device inputs with superimposed control e.g. for function testing.)
				Bit 0 Forcing for digital Input 1
F.Do	r	Int	...	Forcing of digital outputs. Forcing means the external control of at least one output. The device takes no influence on this output (Using of free device outputs with superimposed control.)
				Bit 0 Forcing digital Output1 Bit 1 Forcing digital Output2 Bit 2 Forcing digital Output3

VII-6.2 Universalcontroller KS 45

Statuswords

Name	r/w	Type	value/off	Description
St.Di	r	Int	...	Status of digital inputs or keys (binary coding).
				Bit 0: Input di1,

				Bit 8: Status Enter-Key, Bit 9: Status Dekrement-Key, Bit 10: Status Inkrement-Key
St.Ain	r	Int	0...127	Bitcoded status of analog inputs (errors, e.g.short circuit)
				Bit 0 Break at Input 1 Bit 1 Reverse polarity at Input 1 Bit 2 Short circuit at Input 1 Bit 3 Not used Bit 4 Break at Input 2 Bit 5 Reverse polarity at Input 2 Bit 6 Short circuit at Input 2 Bit 7-15 Not used
St.Ala	r	Int	…	Status of alarms: Bitwise coded status of the alarms as limit break and Loop.
				Bit 0 Upcoming/stored Limit break1 Bit 1 Upcoming/stored Limit break2 Bit 2 Upcoming/stored Limit break3 Bit 3 Not used Bit 4 Upcoming/ stored loop alarm Bit 5 Upcoming/ stored heating current alarm Bit 6 Upcoming/ stored SSR Alarm Bit 7 Not used Bit 8 Upcoming Limit break1 Bit 9 Upcoming Limit break2 Bit 10 Upcoming Limit break3 Bit 11 Not used Bit 12 Upcoming Loop Alarm Bit 13 Upcoming Heizstromalarm Bit 14 Upcoming SSR Alarm Bit 15 Not used
St.Do	r	Int	0...15	Status of the digital outputs
				Bit 0 digital Output1 Bit 1 digital Output2 Bit 2 digital Output3
Fail	r	Enum	Enum_InpFail	Status of the digital outputs

			1 no error 2 sensor break 3 reverse polarity at the input 4 Short circuit on Input	
Ada.St	r	Enum	Enum_AdaStart	Start / Stop of adaption. After the start signal the controller waits until the process is in a stable status (PIR). Then optimization starts. The optimization can be stopped at any time by the user. After successful optimization the controller withdraws the signal automatically.
			0 Stop of adaption leads to abortion of the adaption, the controller merges to standard operation, with the parameter values valid before adaption. 1 The start of the adaption starts from manual operation or regular controller operation.	
St.Tune	r	Enum	0…65535	Status information of self optimization e.g. actual status and optional results, warnings and error messages.
			Bit 0 Process at rest; 0 no; 1 yes Bit 1 Operating mode: Controller self adjustment; 0 Off; 1 On Bit 2 Result of controller self adjustment; 0 OK; 1 Error Bit 3 - 7 Not used Bit 8 - 11 Result of heating test 0 0 0 0 no message / test is running 0 0 0 1 successful 0 0 1 0 successful with danger of exceeding set point 0 0 1 1 Error: Faulty output action 0 1 0 0 Error: No process reaction 0 1 0 1 Error: Low reversal point 0 1 1 0 Error: Danger of exceeded setpoint 0 1 1 1 Error: Output step change too small 1 0 0 0 Error: Set point reserve is too small Bit 12 - 15 Result of cooling attempt (as heating attempt)	
St.Prog	r	Enum	0…255	The programmer status contains e.g. information which point in the program has been reached, in bitwise code.
			Bit 0,1,2 Type of segment 0: rising,	

		1: falling
		2: holding
	Bit 3	Program Run
	Bit 4	Program End
	Bit 5	Program Reset
	Bit 6	Program start slope is missing
	Bit 7	Program BandHold + FailHold
	Bit 8	Programmer active

Control words

Name	r/w	Type	value/off	Description
F.Di	r	Int	...	Forcing of digital inputs. Forcing means the external control of a device input. The device takes over the value on this input.((Preset for device inputs with superimposed control e.g. for function testing.)
			Bit 0 Forcing of digital Input 1	
F.Do	r	Int	...	Forcing of digital outputs. Forcing means the external control of at least one output. The device takes no influence on this output (Using of free device outputs with superimposed control.)
			Bit 0 Forcing digital Output1	
			Bit 1 Forcing digital Output2	
			Bit 2 Forcing digital Output3	

VII-6.3 Temperature limiter TB 45

Status words

Name	r/w	Type	value/off	Description
St.Di	r	Int	...	Status of digital inputs or of keys (binary coded).
			Bit 0: Input di1,	
			Bit 8: Status Enter-Key,	
			Bit 9: Status Dekrement-Key,	
			Bit 10: Status Inkrement-Key	
St.Ain	r	Int	0...127	Bitcoded status of analog inputs (errors, e.g.short circuit))
			Bit 0 Break at Input 1	
			Bit 1 Reverse polarity at Input 1	
			Bit 2 Short circuit at Input 1	

				Bit 3 Not used Bit 4 Break at Input 2 Bit 5 Reverse polarity at Input 2 Bit 6 Short circuit at Input 2 Bit 7-15 Not used
St.Ala	r	Int	…	Status of alarms: Bitwise coded status of the single alarms as limit breaks.
				Bit 0 Upcoming/stored Limit break1 Bit 1 Upcoming/stored Limit break2 Bit 2 Upcoming/stored Limit break3 Bit 3-7 Not used Bit 8 Upcoming Limit break1 Bit 9 Upcoming Limit break2 Bit 10 Upcoming Limit break3 Bit 11-15 Not used
St.Do	r	Int	0...15	Status of digital outputs
				Bit 0 digital Output1 Bit 1 digital Output2 Bit 2 digital Output3
Fail	r	Enum	Enum_InpFail	Status of digital outputs
				1 no error 2 sensor break 3 reverse polarity at the input 4 Short circuit on Input

VII-6.4 DMS measuring transducer SG 45

Statuswords

Name	r/w	Type	value/off	Description
St.Di	r	Int	...	Status of digital inputs or Keys (binary coded).
				Bit 0: Input di1, Bit 8: Status Enter-Key, Bit 9: Status Dekrement-Key, Bit 10: Status Inkrement-Key

St.Ain	r	Int	0...127	Bitcoded status of analog inputs (Error, e.g.Short circuit)
			Bit 0 Break at Input 1	
			Bit 1 Reverse polarity at Input 1	
			Bit 2 Short circuit at Input 1	
			Bit 3 Not used	
			Bit 4 Break at Input 2	
			Bit 5 Reverse polarity at Input 2	
			Bit 6 Short circuit at Input 2	
			Bit 7-15 Not used	

St.Ala	r	Int	…	Status of alarms: Bitwise coded status of the alarms as limit break
			Bit 0 Upcoming/stored Limit break1	
			Bit 1 Upcoming/stored Limit break2	
			Bit 2 Upcoming/stored Limit break3	
			Bit 3-7 Not used	
			Bit 8 Upcoming Limit break1	
			Bit 9 Upcoming Limit break2	
			Bit 10 Upcoming Limit break3	
			Bit 11-15 Not used	

St.Do	r	Int	0...15	Status der digitalen outputs
			Bit 0 digitalOutput1	
			Bit 1 digitalOutput2	
			Bit 2 digitalOutput3	

Fail	r	Enum	Enum_InpFail	Status der digitalen outputs
			1 no error	
			2 sensor break	
			3 reverse polarity at the input	
			4 Short circuit on Input	

Control words

Name	r/w	Type	value/off	Description
F.Di	r	Int	...	Forcing of digital inputs. Forcing means the external control of a device input. The device takes over the value on this input.((Preset for device inputs with superimposed control e.g. for function testing.)

			Bit 0 Forcing for digital Input 1	
F.Do	r	Int	...	Forcing of digital outputs. Forcing means the external control of at least one output. The device takes no influence on this output (Using of free device outputs with superimposed control.)
			Bit 0 Forcing digital Output1 Bit 1 Forcing digital Output2 Bit 2 Forcing digital Output3	

VIII Engineering Tool BlueControl®

This chapter describes the use of the system assistant of the BlueControl® tool for rail line – devices.

The system assistant is available only in the Expert-Version.

The proceeding described in the following text is not necessary for the PROFIBUS-DP – bus coupler RL DP, as the settings are made via busmaster-parameterization tool.

VIII-1 Defining the configuration

Before starting the operation of a field bus node, the configuration must be defined. Enter the order, the function module type and the device version.

The coupler module selected under device selection is always assigned position "0" automatically. This is the head station of the rail line system. The overall field bus communication is handled via this module.

The following modules are distinguished according to function modules, digital I/O modules, standard signal I/O modules and temperature modules.

Composing the system

❶ Double-click the module, or click the module and button "Add" (**1**) in window "System configuration" to select the module type.

❷ Define the exact device version.

❸ Define the order.
Press the buttons "Shift" up (**3**) or down (**4**) by one position to determine the order.
Press button "Delete" (**2**) to remove an entry.
Buttons (**5**) to (**8**) are used to edit module-specific data (import, export, copy and insert).
Assigned keys:

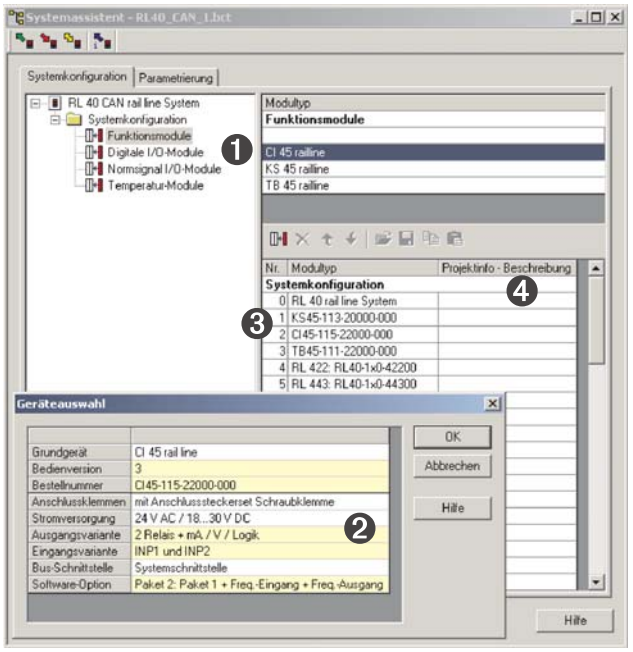


Abb. 18 Function module selection in the system view

See also on-line help of the tool, accessible via button "Help".

❹ Project information:
The first 30 characters of the relevant module project information are shown as follows:

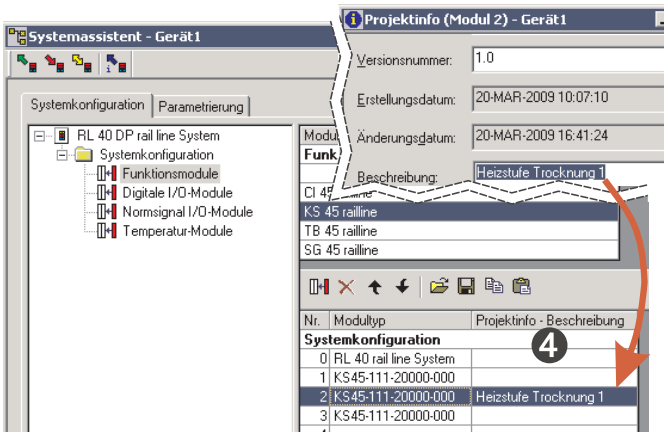


Abb. 19 Project information

Setting the parameters of the coupler module

The RL CAN bus coupler settings can be made on the parameter page.

Proceed as follows:

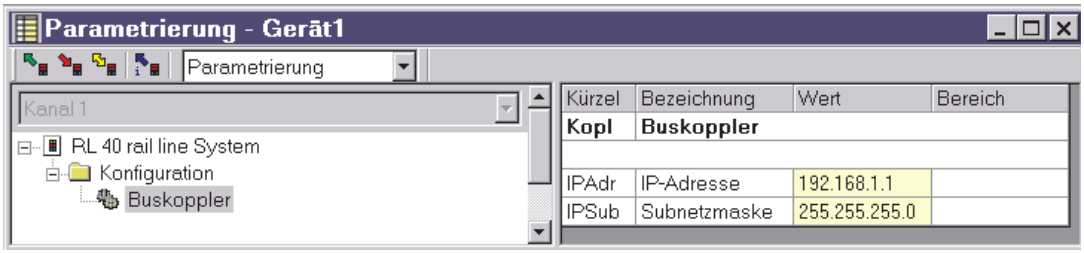


Abb. 20 Setting the parameters of the coupler module

- Click module type no. 0 “RL 40 rail line system” in the system wizard
- Double-click “RL 40 rail line system” or select it via menu “View - Parameter”.

- Click button “Bus coupler”..

❹ Determine the start-up behaviour:
- With automatic address
- Without automatic address

❺ Defining the CAN address.
If CAN address “0” is set using the hardware switches on the coupler module, the node address defined in this position is valid.

Setting the parameters of the modules

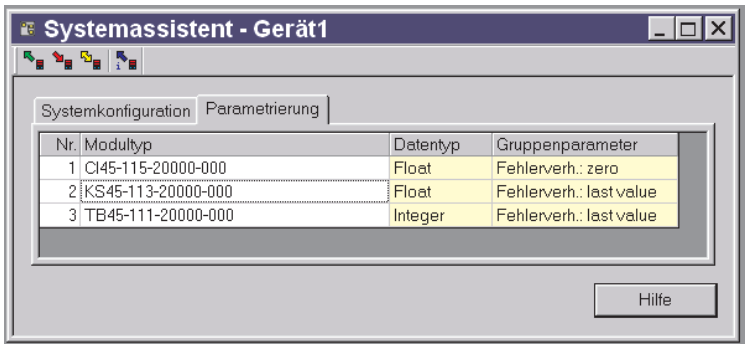


Abb. 21 Configuring the module behaviour

❻ On page "Parameter" , the module parameters for the behaviour in the system are set.

- The data type describes the format of the process data transferred via the bus (integer / floating point). The process data themselves are determined when setting the parameters of the individual modules.
- The group parameter determines which value is output by the modules in the event of failure of bus communication between external master (PLC) and bus coupler.

Addressing the modules

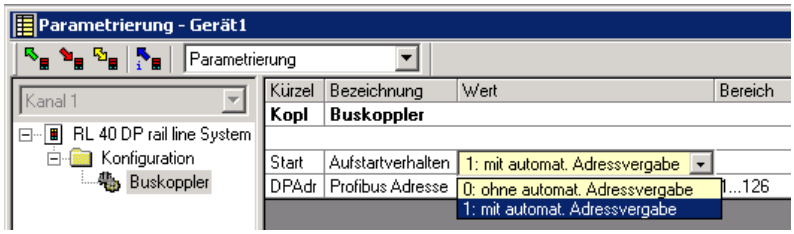


Abb. 22

❼ There are two possibilities to address the function modules:

With automatic address:

To use the automatic address recognition, both the bus coupler and the function module must be set to automatic address recognition.

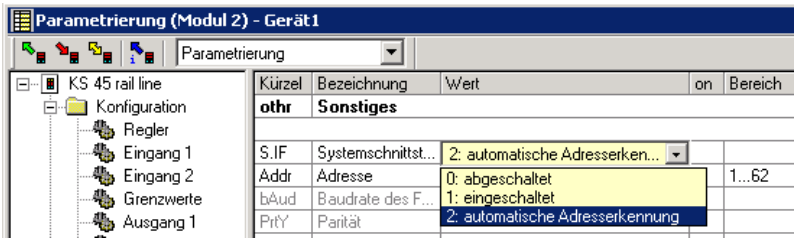


Abb. 23

If RLxxx modules are used in a system, only automatic address recognition is possible.
To activate the address recognition, the CONF key on the bus coupler must be actuated during approx. 2 seconds.

Without automatic address :

Set the bus coupler to "no automatic address", and set parameter S.IF (system interface) to "1:active" for the function modules. Subsequently, assign addresses 1 to n to the function modules (xx45) in the order of installation, starting at the coupler (via front panel key or engineering tool).

❽ Send the configuration defined via the front panel interface to the bus coupler, where it will be saved

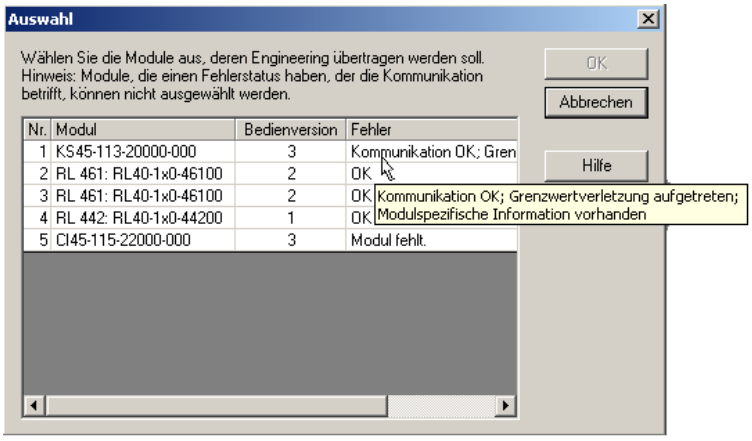


Abb. 24 Error display

If the defined configuration does not correspond with the actually installed function modules, the corresponding error text is displayed.

With combined error messages, the complete text can be displayed by positioning the pointer on the text during approx. 1s.

Explanation of messages:

Message text	Description	Module	Causes
OK	Everything ok		• The communication is OK, no module error
No communication	Communication error		• Module not installed • Module failure • Error on system bus
Wrong module	Deviation from defined configuration		• Defined configuration does not correspond with installed module.
Communication OK	No communication error		• Module error
Input/output error	Sensor alarm occurred	XX45	• Sensor break, short circuit or wrong polarity detected
		RL451	• Output energization not provided.
		RL422 RL461	• Override, and the channel is activated.
		RL423	• Sensor break, short circuit, override, and the channel is activated.
		RL424	• Sensor break, short circuit, override, and the channel is activated. Sensor break detection is possible only with TC input.
Limit exceeded	Module limit values are exceeded	XX45	• Limit value exceeded, heating current alarm
		RL451	• when an error (open circuit or short circuit) is detected on an activated channel which has been enabled via error mask
Module-specific information available	Device-specific information	XX45	• Device error occurred or maintenance manager signal (operating hours, number of switching cyles)
		RL xxx	• EEPROM error
Write value out of limits	Write value out of limits	XX45	• Setpoint out of the adjusted limits • Value out of permissible limits
		RL 442 RL 443	• Faulty output value

RL 451	• when a value > 0xff is sent to the module (not possible, because byte is sent).
RL 452	• Bit is set, when a value > 0x0f is sent to the module.
RL 461 RL 431	• Bit is set, when a value which leads to D/A converter override is sent to the output channel.

Combined error messages are also possible.
Example: The error message "No connection" means " no communication" +"faulty module"

Reset error messages can be indicated only after a second request.

VIII-2 Comparison with the defined configuration

When loading an engineering from the field bus coupler, the actually defined configuration is read. If the error message "No communication" or "Faulty module" is not displayed, the defined configuration corresponds to the actual configuration.

VIII-3 View process data on the buscoupler

Press button "Connection to device" to build up an on-line connection to the bus coupler. The following information is indicated for each configured function module:

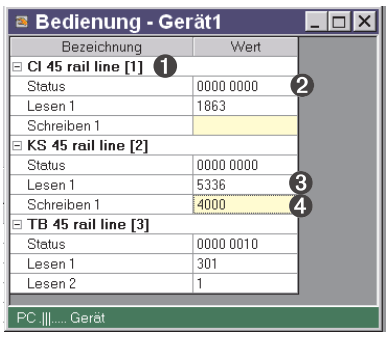


Abb. 25 Survey of process data

❶ Function module type with position number.

❷ Error status (see below)

❸ Read process data, values read by the module (defined in the module engineering)

❹ Written process data, data to be written by the bus coupler (defined in the module engineering)

Structure of status information:

Bit-No.	Signification (if Dx = 1)	module	reason	corresponds to error
D0	Sensor alarm occurred	XX45	Sensor break, short circuit or wrong polarity detected	Input / output error
		RL451	Output energization not provided.	
		RL422 RL461	Override, and the channel is activated.	
		RL423	Sensor break, short circuit, override, and the channel is activated.	
		RL424	Sensor break, short circuit, override, and the channel is activated. Sensor break detection is possible only with TC input.	
D1	Limit value exceeded	XX45	Limit value exceeded, heating current alarm	Limit value exceeded
		RL451	when an error (open circuit or short circuit) is detected on an activated channel which is enabled via error mask.	
D2	Device-specific information	XX45	Device error occurred Maintenance manager signal (operating hours, number of switching cycles)	Module-specific information available
		RL xxx	EEPROM error	
D3	Write value out of limits	XX45	Setpoint out of adjusted limits Value out of permissible limits	Write value out of range
		RL 442 RL 443	Faulty output value	
		RL 451	when a value > 0xff is sent to the module (not possible, since byte is sent).	
		RL 452	Bit is set, when a value > 0x0f is sent to the module.	
		RL 461 RL 431	Bit is set, if a value which leads to D/A converter override is sent to an output channel.	
D4	Communication error		Module not installed, module failure or system bus error	No communication
D5	Deviation from defined configuration		Defined configuration does not correspond with the installed module.	Faulty module
D6	reserved			
D7	reserved			

Write values can be forced in online mode if no fieldbus interface is connected.

VIII-4 Function module – edit engineering

VIII-4.1 Single engineering

A device engineering can be transmitted on different ways to the function module:

- Connection via front interface of the module
- Connection via front interface of the bus coupler and transmission via internal system bus.

In the last case the module is addressed the following way:

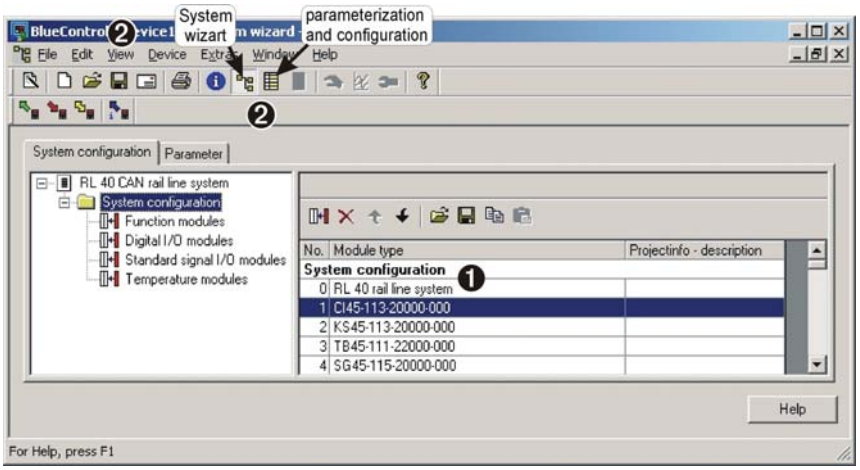


Abb. 26 Function module engineering

❶ Click the selected module in the system assistant.

❷ Press the push-button "parameterization and configuration" or select the menu "view parameterization".

❸ Load the device engineering from the module, edit the engineering and restore it to the device.

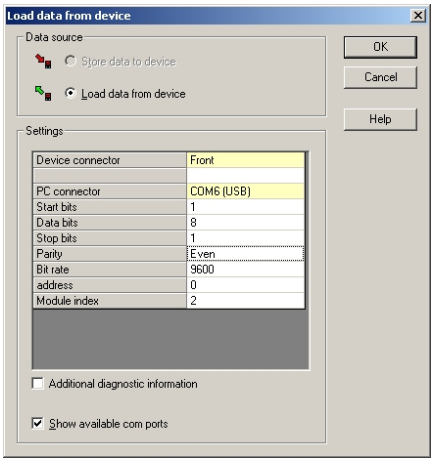


Abb. 27 Select transmission route

For transmission the device connection "front" must be selcted. The module index is inserted automatically.