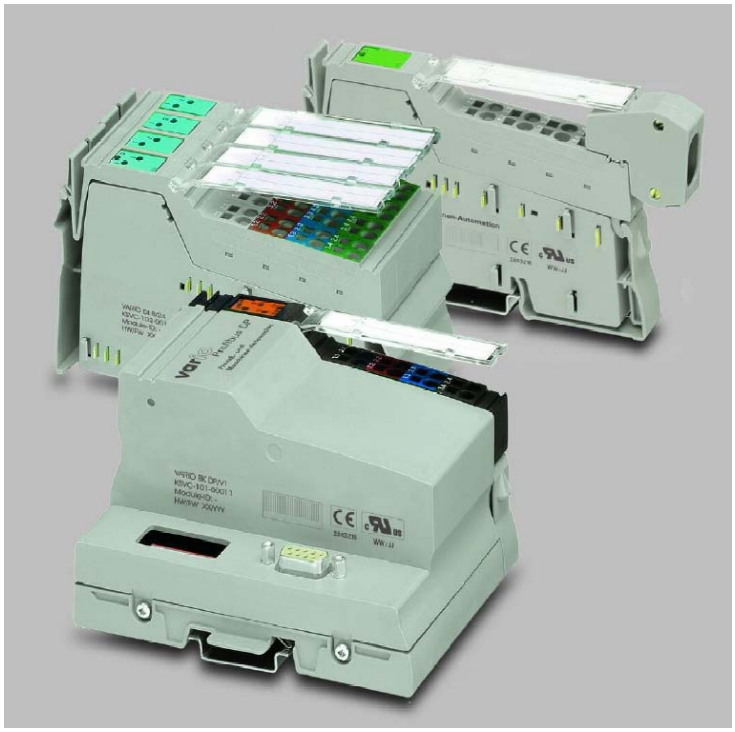
CD AUTOMATION SRL

CD VAR-IO CANOPEN BUSCOUPLER

(PRELIMINARY MANUAL)



Operating Instructions

CAN open 9499 040 69918

09/2005

1. Introduction

1.1 General:

The CD Var-io possesses a CAN interface, over which all data necessary for the enterprise (parameter and configuration data) can be sent to the automatic controller. Likewise an appropriate master (PC or control) can call all process data up. In accordance with "CANopen" the accesses are arranged in SDO (Service Data Objects) and PDO (Process Data Objects). SDOs intended for configuration and parameterizing of bus participants are and PDOs for the usual operating value.

The communication services implemented in the CD Var-io is based on the "CANopen Application Layer and Communication of profiles" (CIA Draft standard 301).

1.2 Technical data

- 2 SDO channels
- 4 send PDOs (TPDO), synchronous/asynchronously
- 4 receipt PDOs (RPDO), asynchronously
- Mapping of the PDOS
    - Standard technique
    - Multiplexing during channel-wise transmission
    - multiplexing with indicated transmission
- Data format: Float, Fixpoint1 and Integer
- Baud rates from 10kBaud to 1Mbaud
- NMT- services
- LSS- services
- Heartbeat
- Store/Restore
- Predefined Master/Slave Connection Set

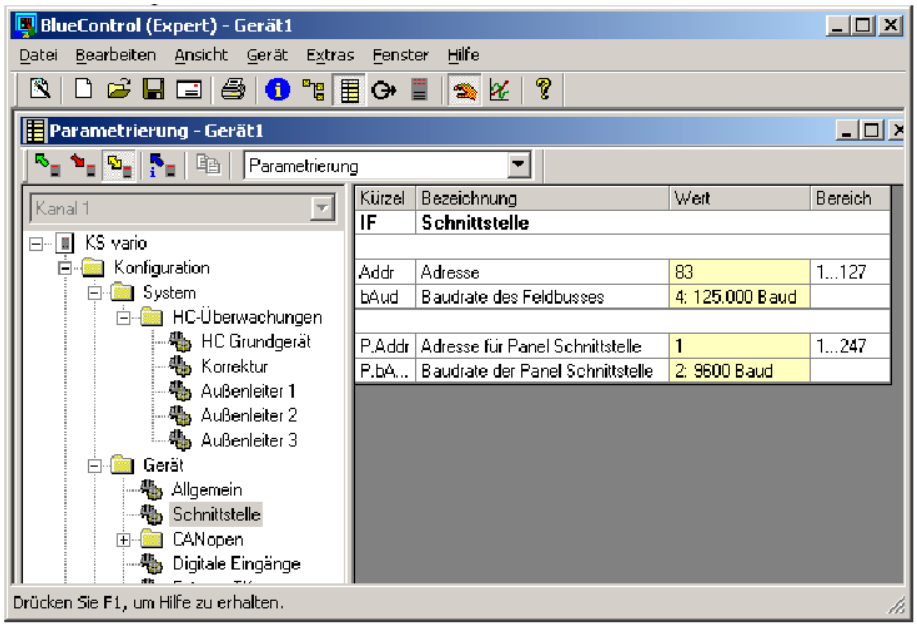
1.3 **Predefined Master/Slave Connection set**

The COB IDs will assign in the CD Var-io in accordance with Predefined Master/Slave Connection set. Exceptions form the PDOs, with them can by separate attitude of it be deviated.

Object	Functions-Code	COB_ID Range	Index in the object listing
Broadcast-Nachrichten			
NMT	0000	0	-
Sync	0001	0x80	0x1005h
Punkt-zu-Punkt_Nachrichten			
TPDO1	0011	0x181-0x0x1FF	0x1800
RPDO1	0100	0x201-0x27F	0x1400
TPDO2	0101	0x281-0x2FF	0x1801
RPDO2	0110	0x301-0x37F	0x1401
TPDO3	0111	0x381-0x3FF	0x1802
RPDO3	1000	0x401-0x47F	0x1402
TPDO4	1001	0x481-0x4FF	0x1803
RPDO4	1010	0x501-0x57F	0x1403
Default-TSDO	1011	0x581-0x5FF	0x1200
Default-RSDO	1100	0x601-0x67F	0x1200
LSS	1111	0x7E4/0x7E5	

1.4 **Start-up of the CD Var-io at CAN bus:**

The equipment has on delivery the address knoten on 255 and the Baud rate on 20 kBaud. With the address knoten 255 the equipment starts in the LSS mode. If this is not wished, then an address knoten is within the range of 1 - 127 to adjust. These attitudes can be made with the help of the BlueControl® by means of the BlueControl® interface or the LSS services by the CAN bus.



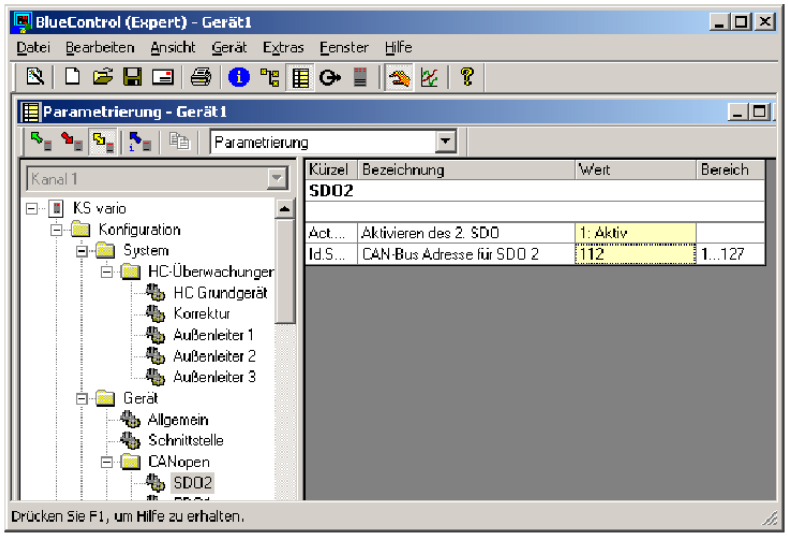
After the start, CD Var-io (with valid address knoten) is the equipment in the "Pre operational mode". One can communicate over the CAN interface by means of SDOs. After the bus and device configuration, the master must be able to use CD Var-io into "operational mode" to set (NMT start) over also PDOs. To be used, PDOs must be configured first. One difference between "asynchronous PDOs" and "synchronous PDOs" is that Asynchronous PDOs is sent at changed process values. The master sends synchronous PDOs on requirement. In addition the master sends a SYNC Frame.

2. Service data objects (SDO)

An SDO is logically fixed on exactly two partners - 1 master and 1 Slave. Since the CD Var-io possesses 2 SDO channels, it is possible to access from two different SDO sDO-Master at the same time on the CD Var-io. The data communication by SDO is a confirmed service. With the help of the SDOs configuration and parameterization of the automatic controller can be made by single accesses. In addition, all control data, which will usually transfer over PDOs, can be addressed over SDOs. The used COB ID depends on the adjusted device address:

For the transmission DO this value is appropriate within the range of 1409 - 1535 (0x581 - 0x5FF).

For the receipt DO within the range of 1537 - 1663 (0x601 - 0x67F)



The 2. SDO channel can be adjusted with the help of the BlueControl®. In the example shown become the 2. SDO channel activated and it is used the CAN bus address 112, so that the COBIds 1520 (0x5f0) and/or. 1648 (0x670) to be used. The addresses of the two SDO channels must differ. The COB ID of the 1. SDO channel one defines by the adjusted address knoten ("Predefined Connection set"). A configuration over CAN bus is likewise possible. It is made by the objects with the Index/Subindex 0x1201/1 and 0x1201/2. Device-specific instructions, like mode change (Pre operation mode, operation mode etc.), can only over the 1. SDO channel take place.

By means of SDOs maximally 4 byte utilizable data can be transferred. The remaining 4 byte is used as follows:

1 byte for the COMMAND: Kind of the transmission
2 byte for the index: Object identification (e.g. 0x2476 for desired value)
1 byte for the Subindex:

Channel number in the following is given in each case an example of a SDO Datenframes of vintages and of letters.

Example 1.

A master sends a desired value to a CD Var-io with address knoten 4: The structure of the message is as follows:

COB_ID = SDO an Knoten 4 = 0x600 + 4 = 0x604
CMD = Schreibzugriff = 0x2B = 0x2B
INDEX = Sollwert = 0x2476 = 0x2476
SUBINDEX = z.B. Regler 1 = 01 = 0x01
WERT = 30,0°C *) = 300 *) = 0x12C
*) Fixpoint1- Darstellung, d.h. 1 feste Nachkommastelle.

			8 data bytes							
	COB-ID	**LEN**	**Cmd**	**Index**		**Sub.**	**Daten**			
Anforderung (Master)	0x604	0x08	0x2B	0x76	0x24	0x01	0x2c	0x01	0x00	0x00
Antwort (KSvario)	0x584	0x08	0x60	0x76	0x24	0x01	0x00	0x00	0x00	0x00

Example 2.

A master reads an actual value of a CD Var-io with address knoten 2: The structure of the message is as follows:

COB_ID = SDO an Knoten 2 = 0x600 + 2 = 0x602
CMD = Lesezugriff = 0x40 = 0x40
INDEX = Sollwert = 0x2441 = 0x2441
SUBINDEX = z.B. Regler 3 = 03 = 0x03

			8 data bytes							
	COB-ID	**LEN**	**Cmd**	**Index**		**Sub.**	**Daten**			
Anforderung (Master)	0x602	0x08	0x40	0x41	0x24	0x03	0x00	0x00	0x00	0x00
Antwort (KSvario)	0x582	0x08	0x4B	0x41	0x24	0x03	0xFA	0x00	0x00	0x00

WERT = 0x00FA = 250 = 25,0°C

3. **Process data objects (PDO)**

In the CD Var-io are made available 4 receipt PDOs (RPDO) and 4 send PDOs (TPDO). PDOs are unconfirmed services and have maximally 8 byte utilizable data. All arriving messages arrived, in the order like them, are processed. A priority treatment of special messages is not possible. Sending and receiving from PDOs are only in "operational the mode" possible.

3.1 Application

The datatransfer over PDOs is meaningful for example if actual values and status values of the automatic controller are to be kept constantly current in the master. In this case one will use asynchronous PDOs, which send the respective changed data automatically with changes of value on the automatic controller to the master. Another example would be the cyclic requirement of actual values by a control unit. In this case the CD Var-io PDOs can send synchronized to a measurement act (SYNC EVENT).

3.2 attitude of the communication parameters for receipt PDOs

For the receipt PDO (RPDO), only the COB ID is to be adjusted. In principle a COB ID from the range knows 385 - 1407 (0x181 - 0x57F for the PDO) to be used. In the "Predefined Connection set" the adjusted device address for the definition of the COB ID one consults. With a device address 5 the here following COB Ids

÷ For RPDO1 517 (0x205)

÷ RPDO2 773 (0x305)

÷ RPDO3 1029 (0x405)

÷ RPDO4 1285 (0x505) the CD Var-io can PDOs only asynchronously receive.

3.2.1. Attitude for receipt PDO over CAN bus

The attitude over CAN bus is made by the following objects:

÷ RPDO1 over index 0x1400 and sub index 1st

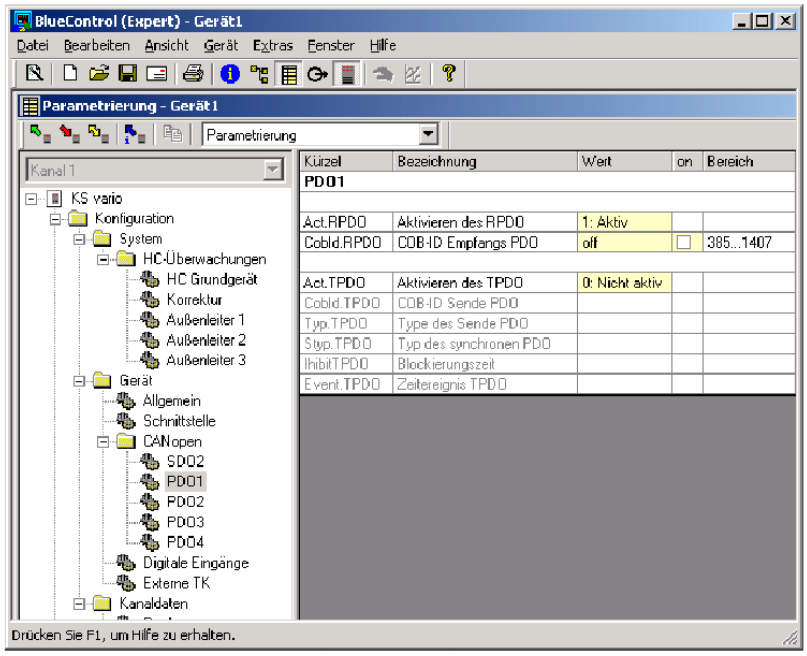
÷ RPDO2 over index 0x1401 and sub index 1st

÷ RPDO3 over index 0x1402 and sub index 1st

÷ RPDO4 over index 0x1403 and sub index 1. If the Hoechstwertigste bit of the 32 bits DATE is set, then the RPDO is not active.

3.2.2. Attitude for receipt PDO over the engineering Tool BlueControl®

In the example shown is activated the RPDO 1. Since the COB ID is switched off, the equipment uses the "Predefined Connection set", which is with an adjusted device address 5 in this case 517 (0x205).



3.3 adjusting the communication parameters for send PDOs

For the send PDO (TPDO) is to be adjusted several data. This is:

÷ COB ID.

In principle a COB ID from the range knows 385 - 1407 (0x181 - 0x57F) for the PDO. In the "Predefined Connection set" the adjusted device address for the definition of the COB ID one consults. With a device address 5 the here following COB IDs applies

- TPDO1 389 (0x185)
- TPDO2 645 (0x285)
- TPDO3 901 (0x385)
- TPDO4 1157 (0x485)

÷ mode of operation synchronous or asynchronous

- 1 - 240 synchronous. The equipment produces a TPDO after the receipt 1. and/or. 240 of system numerical control signal
- 255 asynchronous. The equipment produces a TPDO if a value in the TPDO, which can be transferred, changed.

÷ Inhibit time. The time gives to be sent on to that at the earliest a TPDO again may. In order to prevent that when fast changes the values in the TPDO very many messages are generated, it can be defined by the attitude of this value one waiting period. The attitude takes place in steps from 0,1 ms. If the value is set to 0, then no waiting period is active

÷ Event timer. The time gives after that at the latest a TPDO is on sent, even if no value changed. The attitude takes place in steps from 1 ms. if the value is set to 0, then no automatic sending is active. If gemultiplexte data are transmitted (kanalweise or by index), then the Event timer is not active.

3.3.1. Attitude for send PDO over CAN bus

The attitude over CAN bus is made by the following objects:

÷ COB ID.

- TPDO1 over index 0x1800 and sub index 1.
- TPDO2 over index 0x1801 and sub index 1.
- TPDO3 over index 0x1802 and sub index 1.
- TPDO4 over index 0x1803 and sub index 1. If the Hoechstwertigste bit of the 32 bits DATE is set, then the TPDO is active not

÷ Mode of operation synchronous or asynchronous

- TPDO1 over index 0x1800 and sub index 2.
- TPDO2 over index 0x1801 and sub index 2.
- TPDO3 over index 0x1802 and sub index 2.
- TPDO4 over index 0x1803 and sub index 2nd

÷ Inhibit time

- TPDO1 over index 0x1800 and sub index 3.
- TPDO2 over index 0x1801 and sub index 3.
- TPDO3 over index 0x1802 and sub index 3.
- TPDO4 over index 0x1803 and sub index 3rd

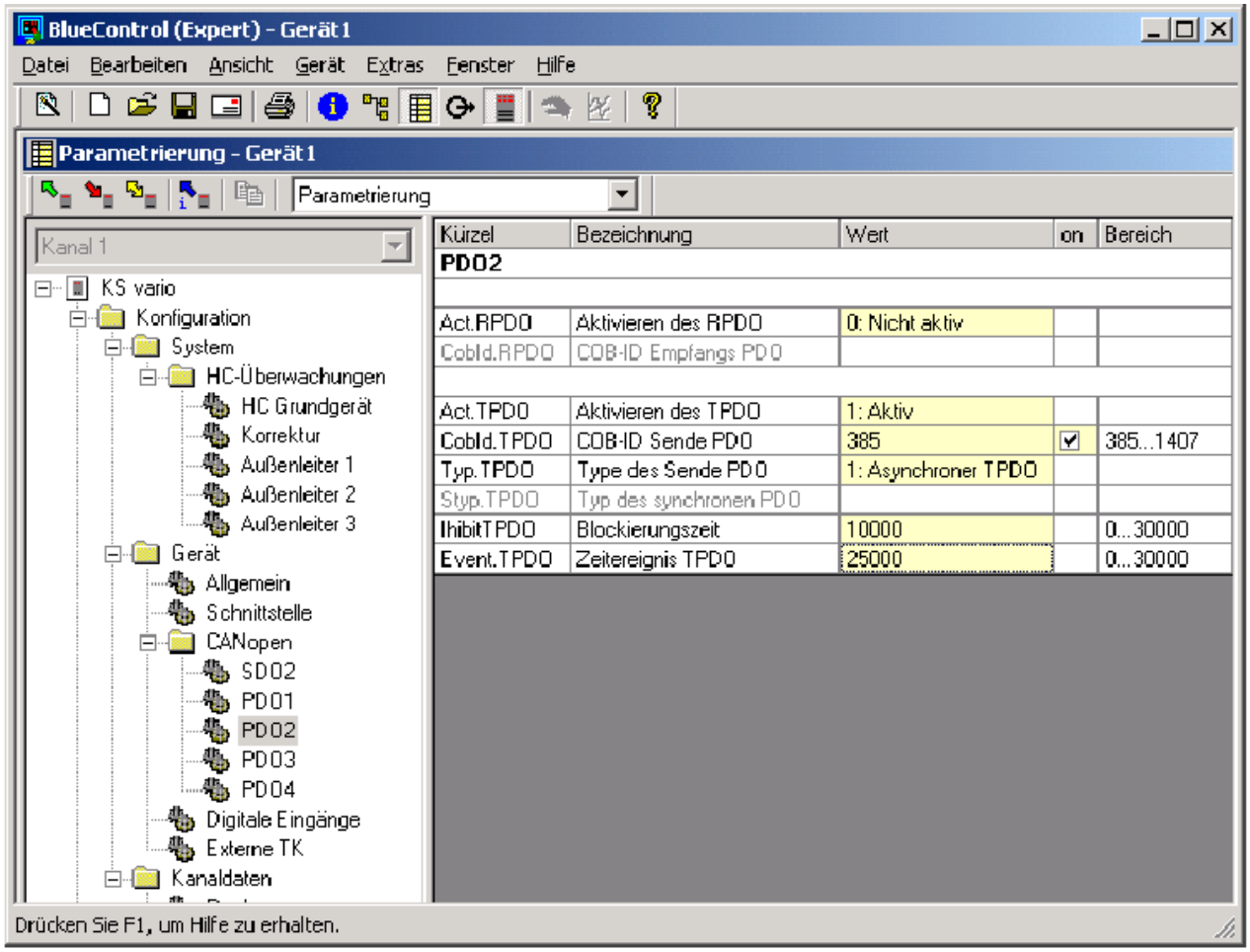
÷ Event timer

- TPDO1 over index 0x1800 and sub index 5.
- TPDO2 over index 0x1801 and sub index 5.
- TPDO3 over index 0x1802 and sub index 5.
- TPDO4 over index 0x1803 and sub index 5.

The sub index 4 is not used.

3.3.2. Attitude for sends PDO over BlueControl®

In the example shown is activated the TPDO 2. As COB ID the firm address 385 (0x181) was assigned. It concerns an asynchronous PDO. The Inhibit time was set to 1 second, so that at the earliest after this time a renewed TPDO is generated. The Event timer stands on 25 seconds. Thus at the latest after 25 seconds a TPDO is produced, even if no data change.



3.4 attitude of the Mapping parameter of the PDOs

3.4.1. For adjustment the Mapping parameter

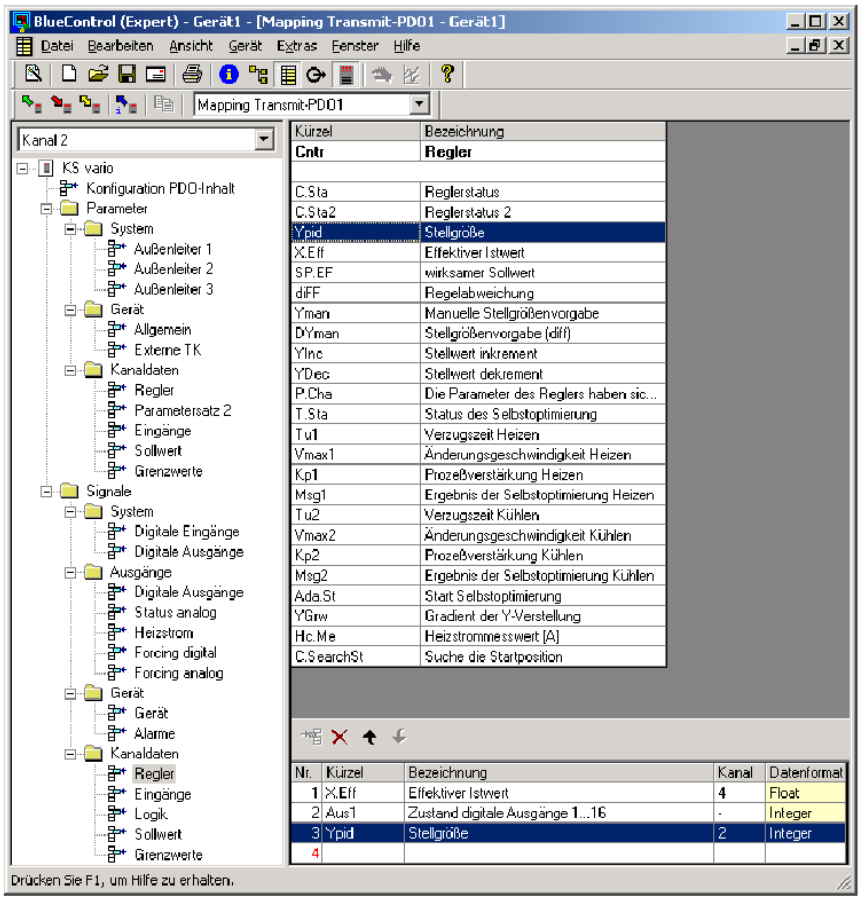
The Mapping parameter which data in the PDOs define general to be communicated. These parameters can be stopped only over the BlueControl®. Reading over the CAN bus is possible. Only parameters and signals can be used. With the data of the RPDOs it must concern recordable data. The BlueControl® guarantees by the options that these conditions are kept. Data can be transmitted both in the Integer and in the floating format. Data, which in the Integer format are communicated and in the equipment as floating value are treated, are transmitted as Fixpoint1-Date (value is multiplied by the factor 10). The number of transferable of the data in a PDO hangs both of the data type (Intege roder floating format) and of the kind of the transmission (standard or multiplexing) off. Too if many data are selected, then their entries are characterized in red. These adjusted data are not transmitted by the BlueControl® to the equipment. There are different possibilities of conveying the data in the PDO.

3.4.2. Standard techniques

In this case are assigned to the PDO the firm SDO parameter. The definition takes place via the SDO parameter and, if it concerns data out of the channel range, additionally via the Subindex. The length of the data depends on whether these were selected from the Integer range 0x2000 (2 byte) or from the floating range 0x3000 (4 byte). A mixture between 2 byte and 4 byte data is possible. Into the 8 byte, which a PDO makes available, thus maximally 4 data can be conveyed. All data of the PDO do not have to be occupied.

Integer 1 Low	DATE 1: in the automatic controller as Integer
Integer 1 High	Defined and as integer value
Fixpoint 2 Low	DATE 2: in the automatic controller as if float
Fixpoint 2 High	Defined and as integer value one selects
Float 3 Byte 1	DATE 3: in the automatic controller as if float F defined and as floating size one selects
Float 3 Byte 2	
Float 3 Byte 3	
Float 3 Byte 4	

The definition which data to use "Mapping Transmit-PDO1 are effected - 4" and/or in the BlueControl® in the mode. "Mapping Receive PDO1 - 4".



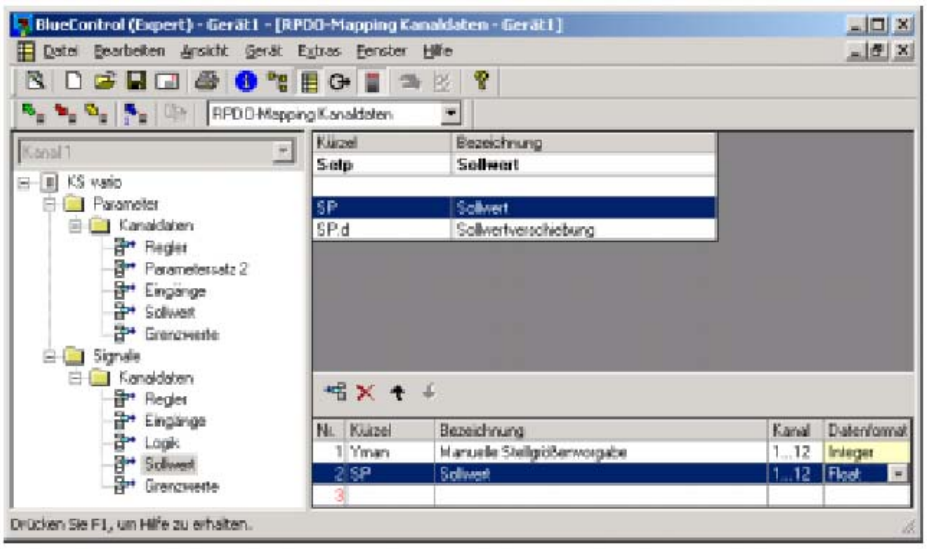
In indicated the example the following data are assigned to the TPDO1 above:
÷ Effective actual value of the automatic control loop 4 is transferred there
÷ Condition of the digital exits 1... 16
÷ Correcting variable of the automatic control loop 2 the actual value in the floating format, can the 4. Worth not to be no more occupied. Additionally there is the possibility the PDO data to transfer in the multiplexing. Here 2 alternatives are available:

3.4.3. Multiplexing during channel-wise transmission

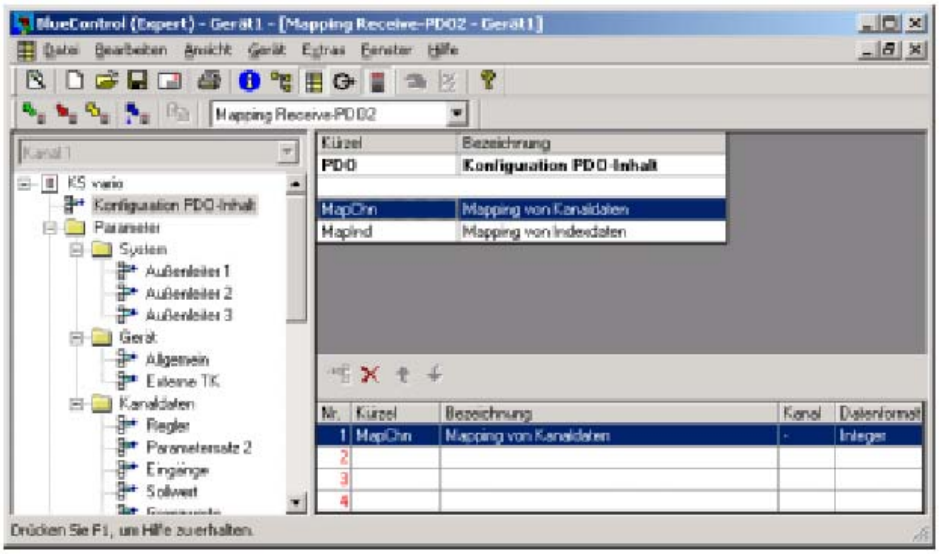
It exists to transfer the possibility the data gemultiplext kanalweise. Maximally 3 data are defined, which defined automatic control loops for everyone in the equipment will transfer. In the first 2 byte of the PDOs signaled to which channel (automatic control loop) the following data to apply. Both values can be transferred in the Integer and in the floating format.

Channel number "0" must always be	1 – 30, If the value 0 is transferred, then are the data To not use
Fixpoint 1 Low Fixpoint 1 High	Date 1: in the automatic controller as if float defined and becomes as Integer value selected
Float 2 Byte 1 Float 2 Byte 2 Float 2 Byte 3 Float 2 Byte 4	Date 2: in the automatic controller as if float defined and becomes as Floating size selected

For this the definition must take place in 2 steps. First is specified which data to be transferred are, afterwards with which PDO the transmission take place is. In the following is shown which attitudes take place must, so that this kind of the transmission is accomplished in the RPDO2.



The data that can be transmitted are specified. As 1. DATE is sent the manual correcting variable default to the CD Var-io. In the 2. DATE is conveyed the desired value. Since the desired value will transfer in the floating format, stands for 3. DATE not for the order. Out of the column channel can be taken that attitude for the channels 1 - 12 to take place can. These automatic control loops are defined in the BlueControl®. If data for the other automatic control loops are transmitted, then the values are not taken over.



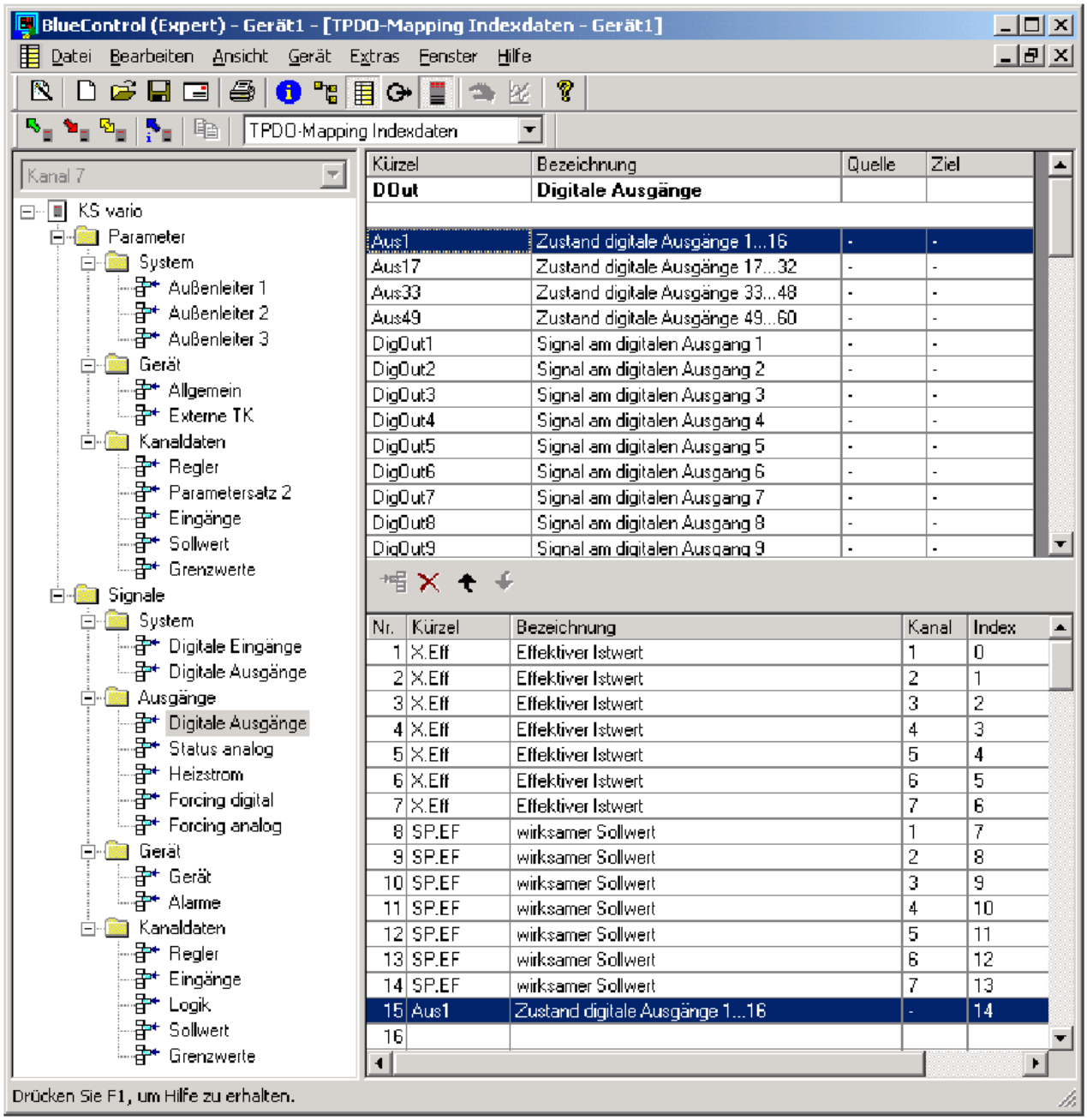
Afterwards the definition takes place, which PDO is to use the kanalweise, gemultiplexten data. In the example shown above the RPDO2 for the transmission is used kanalweise, gemultiplexten data. By the use of this transmittal mode all data of the PDO are occupied.

3.4.4. Multiplexing with indicated transmission

It can be defined up to 120 data, which will addressed transfer by an index. Only data will transfer in the Integerformat. The structure of such PDOs looks as follows:

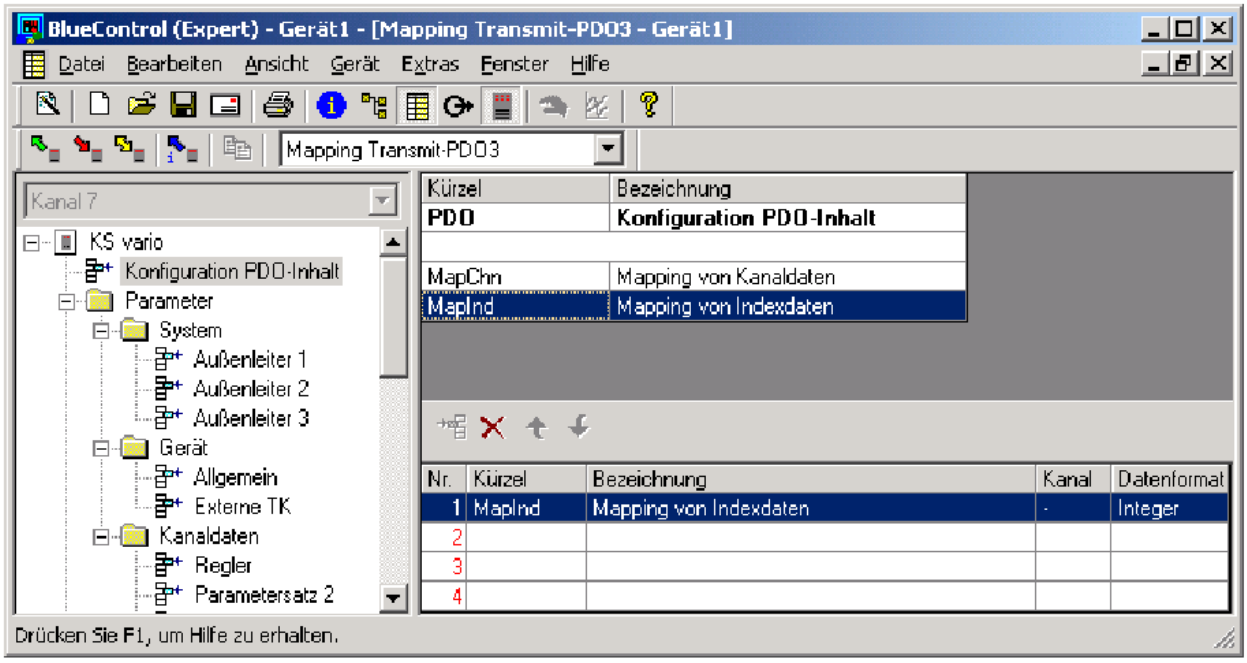
Index	1 - 118, is transferred the value 0, then the data are not to be used
"0" must always be	
Fixpoint 1 Low	DATE according to the index number. in the automatic controller as if float defined and becomes as integer value selected
Fixpoint 1 High	
Integer 2 Low	DATE with index number + 1. in the automatic controller as Integer defined and becomes as integer value selected
Integer 2 High	
Integer 3 Low	DATE with index number + 2. in the automatic controller as Integer defined and becomes as integer value selected
Integer 3 High	

For this the definition must take place in 2 steps. First defines which data to be transferred are, afterwards with which PDO the transmission take place is. In the following is shown which attitudes take place must, so that this kind of the transmission is accomplished in the TPDO3.



For the data communication maximally 120 data are available. All data are transmitted in the Integerformat. Data in the equipment as floating value to be worked on, are transmitted as fixed POINT 1 (DATE is multiplied by the factor 10). In the above example the following data for the transmission were defined:

DATE 1 - 7 actual value automatic control loops of the 1 - 7
DATE 8 - 14 desired value of the automatic control loops 1 - 7
DATE 15 condition of the digital exits 1 - 16



Afterwards the definition takes place, which PDO is to use gemultiplexten data by the index. In the example shown above the TPDO3 for the transmission of the data gemultiplexten by the index is used. By the use of this transmittal mode, all data of the PDO are occupied.

The definition of the data for channel-wise access or by index, independently of the check field "interface parameters will transfer" from the BlueControl® to always transfer. is possible for

3.5 vintages of the Mapping parameter over CAN bus

Reading the Mapping parameter over CAN bus. The following indices are used:
÷ RPDO1 over index 1600 and Subindex 1 - 3rd
÷ RPDO2 over index 1601 and Subindex 1 - 3rd
÷ RPDO3 over index 1602 and Subindex 1 - 3rd
÷ RPDO4 over index 1603 and Subindex 1 - 3rd
÷ TPDO1 over index 1A00 and Subindex 1 - 3rd
÷ TPDO2 over index 1A01 and Subindex 1 - 3rd
÷ TPDO3 over index 1A02 and Subindex 1 - 3rd
÷ TPDO4 over index 1A03 and Subindex 1 - 3.

For the Mapping of index data the value becomes 0x2FFF, for which Mapping transfer 0x2FFE from channel data the value.

3.5 vintages of the Mappingparameter over CAN bus reading the Mappingparameter over CAN bus. The following indices are used:

÷ RPDO1 over index 1600 and Subindex 1 - 3rd
÷ RPDO2 over index 1601 and Subindex 1 - 3rd
÷ RPDO3 over index 1602 and Subindex 1 - 3rd
÷ RPDO4 over index 1603 and Subindex 1 - 3rd
÷ TPDO1 over index 1A00 and Subindex 1 - 3rd
÷ TPDO2 over index 1A01 and Subindex 1 - 3rd
÷ TPDO3 over index 1A02 and Subindex 1 - 3rd
÷ TPDO4 over index 1A03 and Subindex 1 - 3.

For the Mapping of index data the value becomes 0x2FFF, for which Mapping transfer 0x2FFE from channel data the value.

4. NMT services

The following NMT services (COB ID 0x00) are supported:
÷ changes to operational the mode (instruction code 0x01)
÷ Changes to the stop mode (instruction code 0x02)
÷ Changes to Pre operational the mode (instruction code 0x80)
÷ RESET communication interface (instruction code 0x82)
÷ RESET knot (instruction code 0x81) after start the CAN network is the CD Var-io in the Pre OI mode.
That is, that it can be addressed only over SDOs. If the CD Var-io is set into the OI mode, can be communicated also over the approved PDOs.

CD Var-io in operational mode set:

		2 data bytes	
COB-ID	**LEN**	**Command**	**Node**
0x00	2	0x01	<Nummer>

CD Var-io in stop mode set:

		2 data bytes	
COB-ID	**LEN**	**Command**	**Node**
0x00	2	0x02	<Nummer>

CD Var-io in Pre operational mode set:

		2 data bytes	
COB-ID	**LEN**	**Command**	**Node**
0x00	2	0x80	<Nummer>

Reset Node:

		2 data bytes	
COB-ID	**LEN**	**Command**	**Node**
0x00	2	0x81	<Nummer>

Warning Note: RESET Node leads to a hardware RESET of the CD Var-io, i.e. he is only after some seconds again attainable over the CAN bus. All COMMAND parameters are put back to the default values.

Reset Communication:

		2 data bytes	
COB-ID	**LEN**	**Command**	**Node**
0x00	2	0x82	<Nummer>

This instruction is implemented with a Node ID 0 by to all knoten, is another Node ID indicated implements only the addressed participants the instruction. After the instruction "RESET communication interface" and "RESET knot" is the equipment in Pre operation the mode. The equipment takes this condition likewise after switching on of the tension on. Around communication over the PDOs to accomplish to be able switching is into operational the mode necessary.

5. SYNC

Like already to be described synchronous PDO data by means of system numerical control messages evaluated by the CD Var-io or sent. The appropriate CD Var-io must be in the operation mode and synchronous PDOs must configure to be. A system numerical control message is a so-called "Broadcast" (message to all participants in the net) and by the master is as follows sent:

		2 data bytes	
COB-ID	**LEN**	**Command**	**Node**
0x80	2		

6. LSS services

The LSS services are in accordance with CiA/DS305 version 1.1.1 at the disposal and/or special extensions are to the following descriptions of service the associated COB ID's are 2021 (master = Slave), and/or. 2020 (Slave = the CD Var-io in each case Slave is. With a address knoten of 255 (delivering condition) equipment in the LSS mode.

6.1 Switching minutes (SWITCH mode Protocols)

6.1.1. Global change-over into the operation/configuration mode M = S

0	1	2	3	4	5	6	7
cs = 04	mode	r	r	r	r	r	r

cs LSS command specifier
mode 0: switches to operation mode
1: switches to configuration mode
r reserved

6.1.2. Selective changeover into the operation/configuration mode

LSS condition is getoggelt. It recognized whether a suitable participant in the bus is.

M => S

0	1	2	3	4	5	6	7
cs = 64	vendor-id				r	r	r

M => S

0	1	2	3	4	5	6	7
cs = 65	product-id				r	r	r

M => S

0	1	2	3	4	5	6	7
cs = 66	revision number				r	r	r

M => S

0	1	2	3	4	5	6	7
cs = 67	serial number				r	r	r

S => M

0	1	2	3	4	5	6	7
cs = 68	r	r	r	r	r	r	r

6.2 Configuration Protocols

6.2.1. **Configuration of the knoten ID** the equipment in the configuration mode is given a new address knoten. After switching into the operation mode implements the equipment a Power On Reset

M => S

0	1	2	3	4	5	6	7
cs = 17	NID	r	r	r	r	r	r

cs LSS command specifier
NID the knot ID which can be adjusted again
r reserved

S => M

0	1	2	3	4	5	6	7
cs = 17	error code	spec. error	r	r	r	r	r

cs LSS command specifier
error code 0: no error
1: not ID incorrectly
spec. error
r reserved

6.2.2 Configuration Baud rate

M => S

0	1	2	3	4	5	6	7
cs = 19	table selecto r	table index	r	r	r	r	r

cs LSS command specifier
NID die neu einzustellende Knoten-ID
r reserved

S => M

0	1	2	3	4	5	6	7
cs = 19	error code	spec. error	r	r	r	r	r

cs LSS command specifier
error code 0: kein Fehler
1: Knoten-ID fehlerhaft
spec. error
r reserved

6.3.1 Inquiry Protocols

6.3.1 Inquiry of the Vendor ID

M => S

0	1	2	3	4	5	6	7
cs = 90	r	r	r	r	r	r	r

S => M

0	1	2	3	4	5	6	7
cs = 90	vendor id				r	r	r

cs LSS command specifier
r reserved

6.3.2 Inquiry of the Product code

M => S

0	1	2	3	4	5	6	7
cs = 91	r	r	r	r	r	r	r

S => M

0	1	2	3	4	5	6	7
cs = 91	product code				r	r	r

cs LSS command specifier
r reserved

6.3.3 Inquiry of the revision NUMBER

M => S

0	1	2	3	4	5	6	7
cs = 92	r	r	r	r	r	r	r

S => M

0	1	2	3	4	5	6	7
cs = 92	revision number				r	r	r

cs LSS command specifier
r reserved

6.3.4 Inquiry of the Serial NUMBERS

M => S

0	1	2	3	4	5	6	7
cs = 93	r	r	r	r	r	r	r

S => M

0	1	2	3	4	5	6	7
cs = 93	serial number				r	r	r

cs LSS command specifier
r reserved

6.3.5 Inquiry of the knoten ID

M => S

0	1	2	3	4	5	6	7
cs = 94	r	r	r	r	r	r	r

S => M

0	1	2	3	4	5	6	7
cs = 94	NID	r	r	r	r	r	r

cs LSS command specifier
NID Node-ID
r reserved

6.3.6 Identification minutes (identification Protocols)

6.4.1. Identify from participants not configured

M => S

0	1	2	3	4	5	6	7
cs = 76	r	r	r	r	r	r	r

cs LSS command specifier
r reserved

S => M

0	1	2	3	4	5	6	7
cs = 80	r	r	r	r	r	r	r

cs LSS command specifier
r reserved

7. Memory and shop by parameters (Store/Restore)

7.1 Non volatile storing of parameters (index 0x1010)

To be supported by the following variants:
÷ all parameters (Subindex 1)
÷ Communication parameter (Subindex 2) the behavor does not differentiate between itself, there only the communication parameters of the PDOs and 2.
SDO channel captive in the EEPROM to be stored. After a RESET Node or switching on of the tension on the equipment with these adjusted data starts.

7.2 loading of stored parameters (index 0x1011)

To be supported by the following variants:
÷ all parameters (Subindex 1)
÷ communication parameter (Subindex 2)
The behavior does not differentiate between itself, there only the communication parameters of the PDOs and 2. SDO channel to be again loaded. Became attitudes on the communication parameters of the PDOs or 2. SDO made and are to be cancelled again these, and then by this instruction the parameters captive stored in the EEPROM are again loaded. With the instruction "RESET communication interface" is initialized the CAN bus interface with this stored configuration.

8. Heartbeat

8.1 Configuration as Heartbeat producer (index 0x1017):

For this the time in 1 ms steps entered in some Heartbeat signal to be produced is. The value 0 registered in such a way takes place no signal generation.

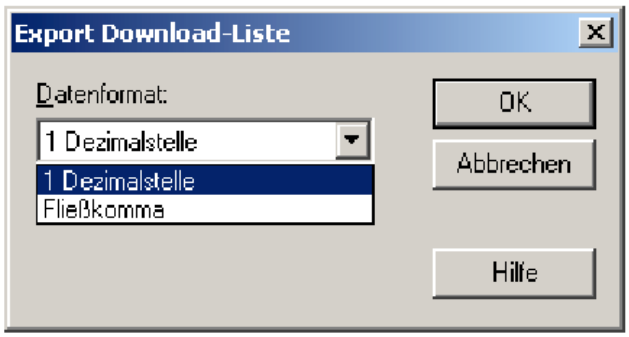
8.2 Configuration as Heartbeat Consumer (index 0x1016):

2 monitorings can do adjusted werden(Subindex 1 and/or Subindex 2): The time in 1 ms steps, which can be supervised, is to be entered. The adjusted time must be clearly longer (min. 100 ms longer) than the adjusted time at the producer. In the value for the time which can be supervised in the top the knot ID of the producer is registered. If the value 0 is registered, then no monitoring takes place.

9. Configuration and parametrization over CAN bus

The CD Var-io can be configured and parameterized over the CAN bus simplest be configured with the help of the engineering Tool (BlueControl®) over the BlueControl® interface. A configuring directly over the CAN bus is however also possible. For this the BlueControl® offers the export to a complete list of the parameters and configuration data. This Download list contains the identical data record, which also the BlueControl® sends to the automatic controller.

In the BlueControl® under, so a Download list (* csv) can be stored. It can to be selected whether the automatic controller-internal floating data as floating values or as Fixpoint1-Werte in the Download list to be put down be supposed.



The following expression shows a cutout of a Download list in the floating format:

```
Name;Index;Subindex;Wert
Config;8193;0;1
ConF_othr_UseStatErr;8203;0;0
ConF_othr_Unit;8204;0;1
ConF_othr_PowerOnContrOff;8205;0;0
ConF_othr_IntMasterMod1;8207;0;0
ConF_othr_IntMasterMod2;8208;0;0
ConF_othr_IntMasterMod3;8209;0;0
ConF_othr_IntMasterMod4;8210;0;0
...
PArA_SEtP_tSt.2;13424;2;10.0
PArA_SEtP_Gefuehrt.2;9329;2;0
PArA_Cntr_Pb1.2;13462;2;14.095582
PArA_Cntr_Pb2.2;13463;2;14.095582
PArA_Cntr_ti1.2;13464;2;1.9706573
PArA_Cntr_ti2.2;13465;2;1.9706573
PArA_Cntr_td1.2;13466;2;1.9706573
PArA_Cntr_td2.2;13467;2;1.9706573
PArA_Cntr_t1.2;13468;2;0.40000001
PArA_Cntr_t2.2;13469;2;0.40000001
...
PArA_Lim3_L.30;13597;30;-10.0
```

```
PArA_Lim3_H.30;13598;30;10.0
PArA_Lim3_HYS.30;13599;30;1.0
PArA_Out1_HcLim.30;13628;30;-32000.0
PArA_Out2_HcLim.30;13658;30;-32000.0
Config;8193;0;0
```

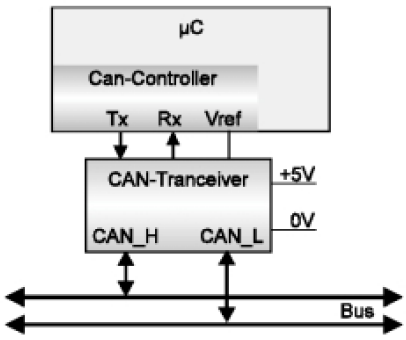
In each line DATE is described. The name, the index, the Subindex and the value are separate by semicolon. At the beginning of the transmission the CD Var-io is switched into the configuration mode, afterwards configuration data and parameter are transferred. At the end the configuration mode is switched off again and the automatic controllers initializes themselves. The initialization phase lasts approx.. 5 seconds, then works the automatic controller with new data.

10. CAN Physical Layer

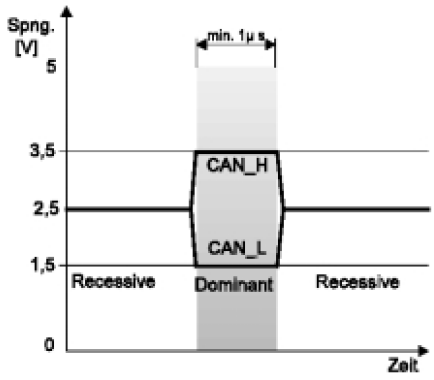
It gives a row of standardized standards concerning CAN to Physical Layers. The most important for general applications is "CAN high speed standard ISO 11898-2". The following recommendations are based primarily on this standard and apply independently of used CAN minutes (CANopen/DeviceNet).

10.1 ISO 11898-2

Knot an ISO 11898-2 conformal knot consists of one µC with CAN CONTROLLER (possibly also integrated), which by Rx and Tx-LINE is connected with a CAN Transceiver. The Transceiver again is attached with the differential CAN h and CAN l lines at the CAN bus. This (Transceiver -) connection is galvanically separately implemented with the CD Var-io.



The nominal CAN Buspegel become with the CAN bus with "Recessive" (nominal tension of 2,5 V for CAN h and CAN l) and "Dominant" (nominal 3,5V for CAN h and 1,5V for CANL) designates.



10.2 Baud rates and bus lengths

The maximum, usable bus length in a CAN network by a multiplicity of influences one determines, particularly by the following physical effects:
÷ deceleration time of the attached bus knoten (with/without opto couplers) and deceleration time of the bus cable (propagation delays)
÷ different scanning times within a CAN bit cell, due to oscillator tolerances of the individual bus knoten
÷ signal amplitudes absorption, due to the Ohm's resistance of the bus cable and the input impedances of the bus address Bus-knoten.

In the following specified practical bus lengths can be achieved when using ISO 11898-2 conformal Transceivern with standard bus cables. With the high Baud rates (1 MBd/800 kBd) it can come however by the number/amount of that possibly available opto couplers (galv. separation) to substantially shorter bus lengths!

10.3 practical bus lengths

Baudrate in kBd	Buslänge in m	Nominelle Bit-Time in µs
1000	30	1
800	50	1,25
500	100	2
250	200	4
125	500	8
50	1000 *)	20
20	2500 *)	50
10	5000 *)	100

*) With large cable lengths the use of galv. separations and Repeatern is compellingly necessary

Further references to the bus lengths can also the standard CiA "DS-102" (CANopen to be taken.

10.4 Cable parameters

ISO 11898-2 some DC and/or AC parameter for in CAN bus networks applicable cables (typically cables with defined electrical characteristics, twisted in pairs, are used). The important AC parameters are 120 ohms of cable impedance and a nominal "propagation delay" from 5 ns/m! Recommendations for regarding whom those the bus cables and terminal resistances can be inferred from the following table:

Bus length	Bus cable (Z: 120 Ohm, tp: 5ns/m		Terminal resistance	Max. Bit-Rate
	Spec. Resistance	Cable diameter		
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 is a higher value for the terminal resistance (150.. 300 ohms) helpfully, for the reduction of the absorption.

Further recommendations for CAN of networks (particularly also with large expansion):
÷ galv. separations are necessarily with large lengths (e.g. with 400m bus cable)
÷ separate Ground line are meaningfully
÷ the voltage drop (difference of potential) between the Ground potentials of the Transceiver should be small (small 2V). Feed of the power pack evtl. in the center of the cable
÷ the total input impedance of the bus address knoten 500 ohms should be
÷ possibly necessary branch lines should as possible be as short, in order to avoid/reduce reflections.

Large information is the CiA (CANopen), to get the various chip manufacturers and in the InterNet.

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