BCD-XXX 6-CAN

BCD Thumbwheel Switchset with CAN Interface

Product Manual

UL: 07-01-08-02

Product - Manual 631

UL: 07-01-05-06

Product - Manual 635

UL: 07-02-08-03

Product - Manual 637

UL: 07-02-09-01

Product - Manual 637+

UL: 07-02-10-01

Product - Manual 637f

UL: 07-05-03-05

Product - Manual CAN - 630 Standard

UL: 10-06-05

Software - Manual BIAS - Commands

Thanks for your confidence choosing our product.

These operating instructions present themselves as an overview of the technical data and features.

Please read the operating instructions before operating the product.

If you have any questions, please contact your nearest SSD Drives representative.
Improper application of the product in combination with dangerous voltage can lead to injuries.
In addition, damage can also occur to motors or other products.
Therefore please observe our safety precautions strictly.

Safety precautions

We assume that, as an expert, you are familiar with the relevant safety regulations, especially in accordance with VDE 0100, VDE 0113,VDE 0160, EN 50178, the accident prevention regulations of the employers liability insurance company and the DIN regulations and that you are able to use and apply them.
As well, relevant European Directives must be observed.

Depending on the kind of application, additional regulations e.g. UL, DIN are subject to be observed.
If our products are operated in connection with components from other manufacturers, their operating instructions are also subject to be observed strictly.

1.1 Introduction

A) <u>without</u> LED-display
B) <u>witht</u> LED-display

The BCD Thumbwheel switchset with/without LED display has been designed for display and remote control of single parameters (like position or speed) in systems using a CANopen network for communication.

A) The BCD switchset normally is supplied as a 6 decade Version, built into a DIN housing.
    (Preset range 0...999 999).
    With supplementary ordering information "Option VZ000", the unit is supplied in a
    5 decade plus sign version.
    (Range -99 999 ... 0 ... +99 999)

A) Both versions are suitable for communication on the CANopen parameter channel, accessing adjustable register codes of a network participant.

B) The unit is built into a DIN housing and have a 6 decade, 15mm size LED-display and a BCD switchset with a 6 decade Version, built into a DIN housing
    (Preset range 0...999 999).
    With supplementary ordering information "Option VZ000", the unit is supplied in a
    5 decade plus sign version.
    (Range -99 999 ... 0 ... +99 999)

B) With this unit the data are transmitted as process data (PDO).

In connection with devices of the 630 series from SSD Drives, values can be loaded into the variables with this device according to the set addresses, which are then further processed in operating mode 5.
The value on the display is activated with a CAN-command in the BIAS - program.

A configuration example, commissioning and application can be found in **chapter 10**.

1.2 Model Code

Marking	Standard				
	a	b	c	d	e
Model:	**BCD**	-XXX	**6**	**CAN**	XXXXX

Marking	Description	
a	**BCD**	= BCD Thumbwheel Switchset
b	XXX	= Option for LED - display
	LED	= with LED - display
c	**6**	= 6 decades or 5 decades + sign
d	**CAN**	= Bus-Interface
e	XXXXX	= Option sign VZ000

1.3 Typical Example

A typical example of an order corresponding to the Model Code would be:

Model: BCD–LED 6–CAN–VZ000

BCD	=	BCD Thumbwheel Switchset
- LED	=	with LED - display
6	=	5 decades + sign
-CAN	=	Bus-Interface
-VZ000	=	sign +/-

2.1 without LED-display
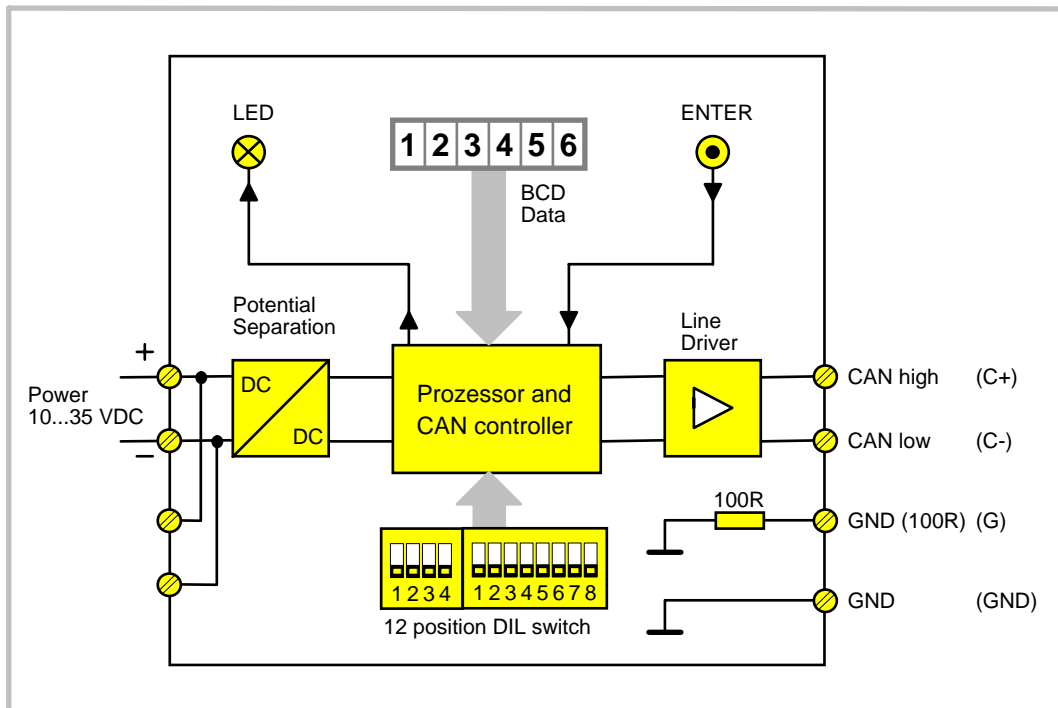
2.2 with LED-display
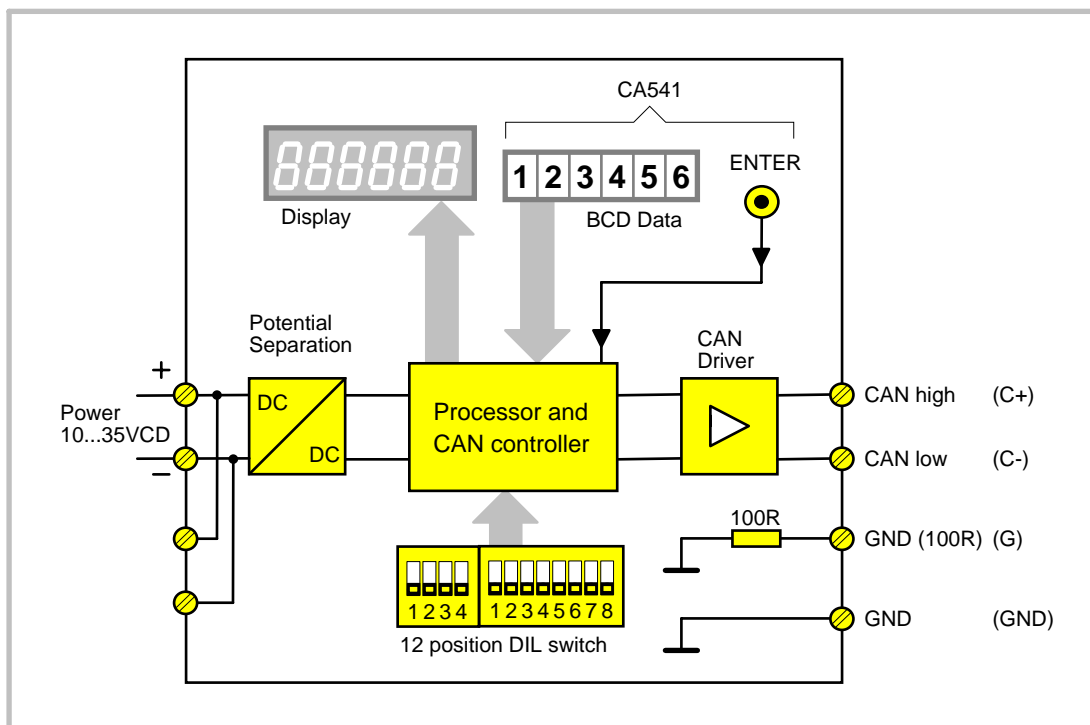
2.3 Backplane of the unit

Screw terminals and DIL switches for setup are located on the backplane of the unit.
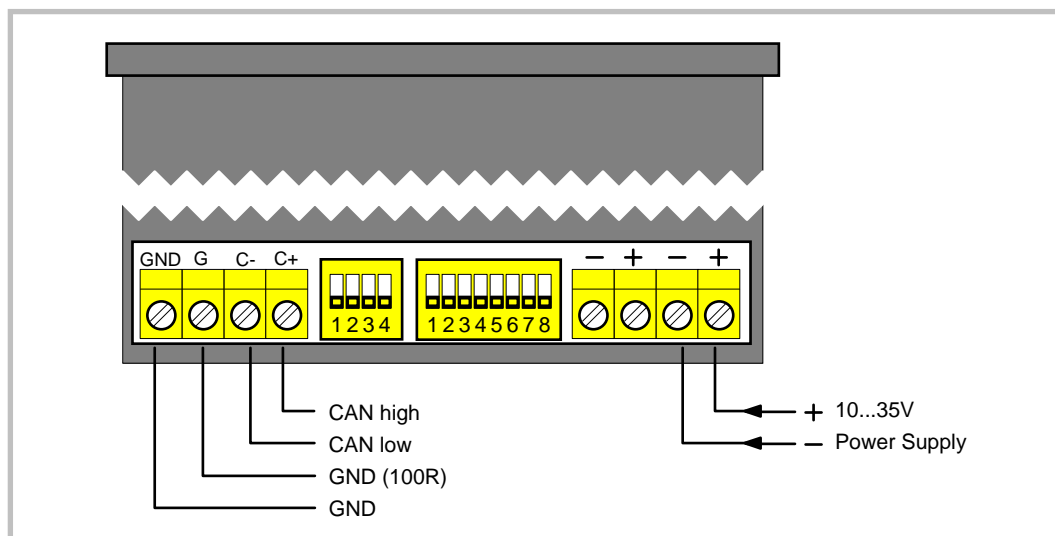
2.4 Cables for CAN-communication

The following cabels are recommended for CAN communication, depending on the cable length:

Up to 300m:

Length $<$ 300m	
Cable type	LIYCY 2 x 2 x 0,5 mm² (twisted and screened)
Resistance	$\leq 40\ \Omega$ /km
Capacity	≤ 130 nF/km

More than 300m

Length $>$ 300m	
Cable type	CYPIMF 2 x 2 x 0,5 mm² (twisted and screened)
Resistance	$\leq 40\ \Omega$ /km
Capacity	≤ 60 nF/km

Please use the leads like shown:

Pair 1 (white/brown)	CAN-Low and CAN-High
Pair 2 (green/yellow)	GND

2.5 Bus termination

Both <u>extreme</u> ends of the CAN network must be terminated by a 120 Ohms resistor.
The shield must be connected to earth potenial.
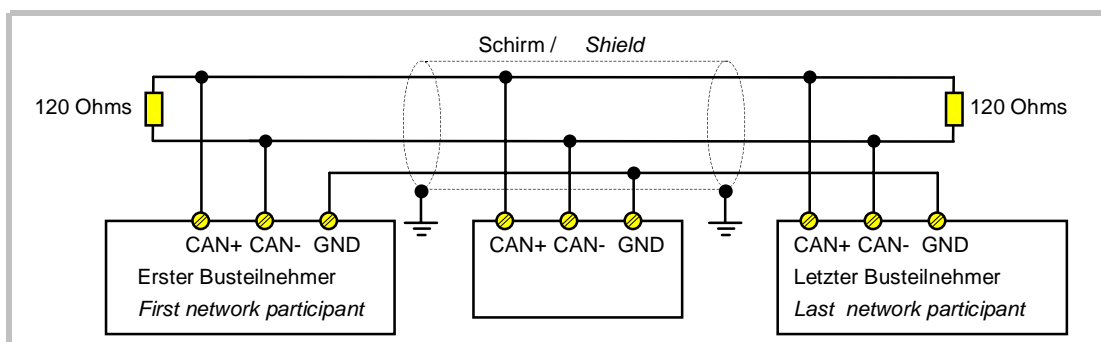
3.1　Cable length

Depending on the Baud rate, the following maximum cable length must not be exceeded:

Baud rate (kBit / s)	50	125	250	500	1000
Cable length (m)	1000	550	250	110	25

3.2　Baud rate

Setting the baud rate uses positions 1 to 3 of the 4-position DIL switch on the rear:


```
0 0 0  =  1 000 kBaud        "0"  =  OFF
1 0 0  =    500 kBaud        "1"  =  ON
0 1 0  =    250 kBaud
1 1 0  =    125 kBaud
0 0 1  =     50 kBaud
1 0 1  =     20 kBaud
0 1 1  =     10 kBaud
1 1 1  =     10 kBaud
```

Beispiel :
Example : 500 kBaud
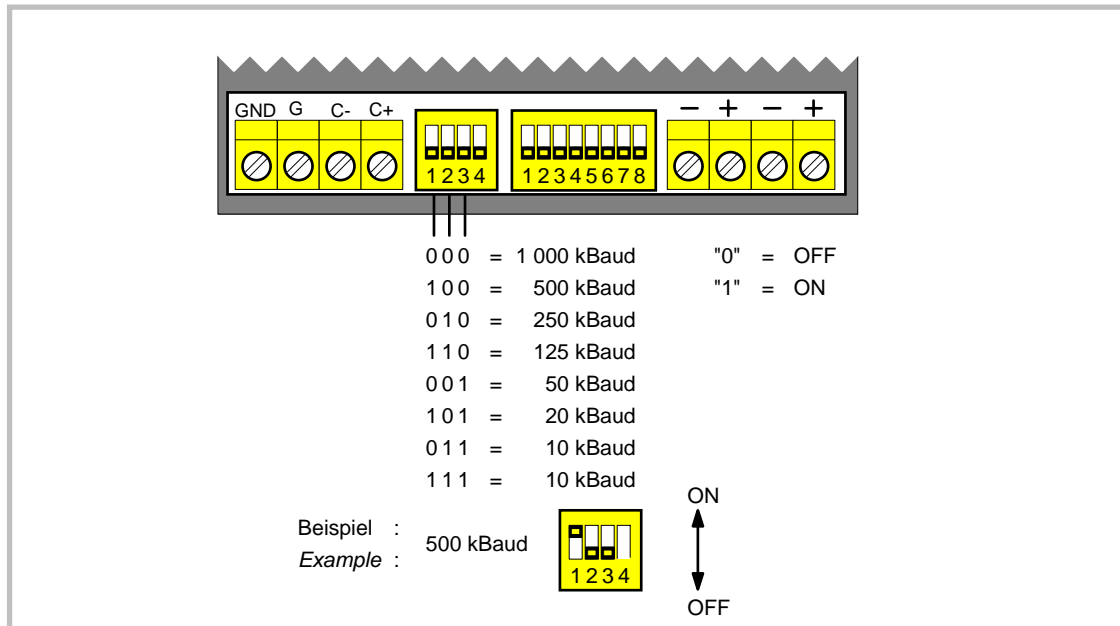
Switch position 4 defines the most significant digit of the front thumbwheel switches to be transmitted as a number or a sign:

OFF: 0...9

ON: +/-
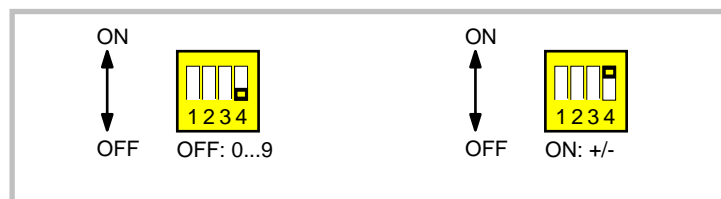
The version with a sign (option VZ000) requires position 4 to be "ON" at any time !

4.1   without LED-display

Positions 1-5 of the 8-position DIL switch select the unit address of the target device (00-31).

Position 6 switch off !!!

Positions 7 and 8 determine the register codes to be accessed in the target 630 unit. see scetch below.
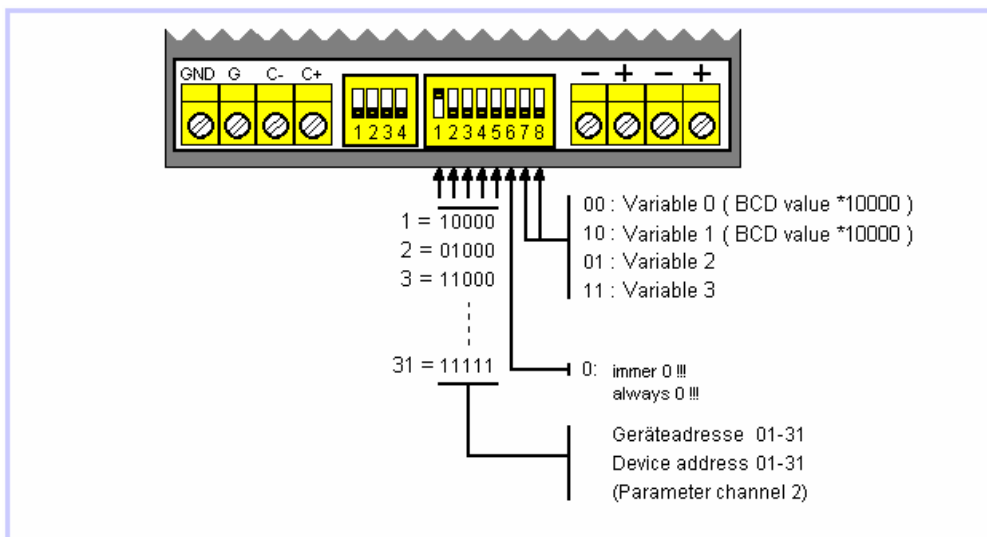
Please observe:
All DIL switch settings are only read during initialisation, changes during normal operation are not recognized! When you have changed the DIL switch settings, you must switch off the unit and power up again.

4.2   with LED-display

Positions 1 - 5 of the 8-position DIL switch select the unit address (01 - 31).

Position 8 switch on !!! Data is transmitted by Process Data Object (PDO).

Position 7 switch off !!! Data is transmitted in byte 0 - 3.

Position 6 switch on !!! Data is transmitted asynchronous by Process Data Object at PDO 2
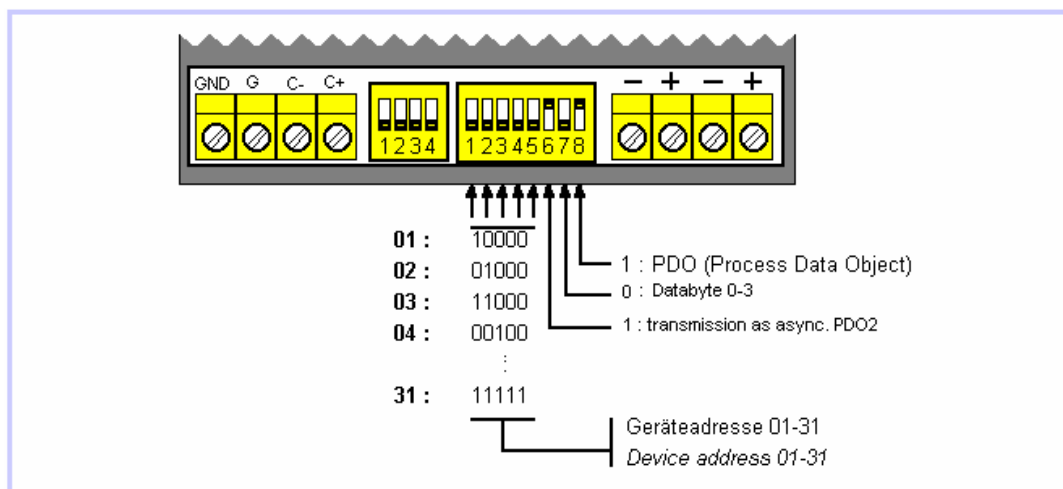
Please observe:
All DIL switch settings are only read during initialisation, changes during normal operation are not recognized! When you have changed the DIL switch settings, you must switch off the unit and power up again.

This multi purpose LED informs about the actual state of data communication, using different blinking sequences. With normal communication, this LED lights all the time. Where communication problems appear, the meaning of different blinking sequences is explained by the sub-sequent drawing:

1 ⎦‾‾‾‾‾‾‾‾‾‾‾‾‾‾‾‾‾ 1	Bus off
1 ⎣ 2 ‾‾‾‾‾‾‾‾‾‾‾‾‾ 1	Bus Warning
1 ⎣ 2 ⎣ 3 ‾‾‾‾‾‾‾‾‾ 1	no Write Response for data
1 ⎣ 2 ⎣ 3 ⎣ 4 ‾‾‾‾‾ 1	no Write Response for " Store EEProm"
1 ⎣ 2 ⎣ 3 ⎣ 4 ⎣ 5 ‾ 1	Error Response (wrong Code)
1 ⎣ 2 ⎣ 3 ⎣ 4 ⎣ 5 ⎣ 6 1	Error Response (wrong Sub Code)
1 ⎣ 2 ⎣ 3 ⎣ 4 ⎣ 5 ⎣ 6 ⎣ 7 1	Error Response (no access)

3 Sec.
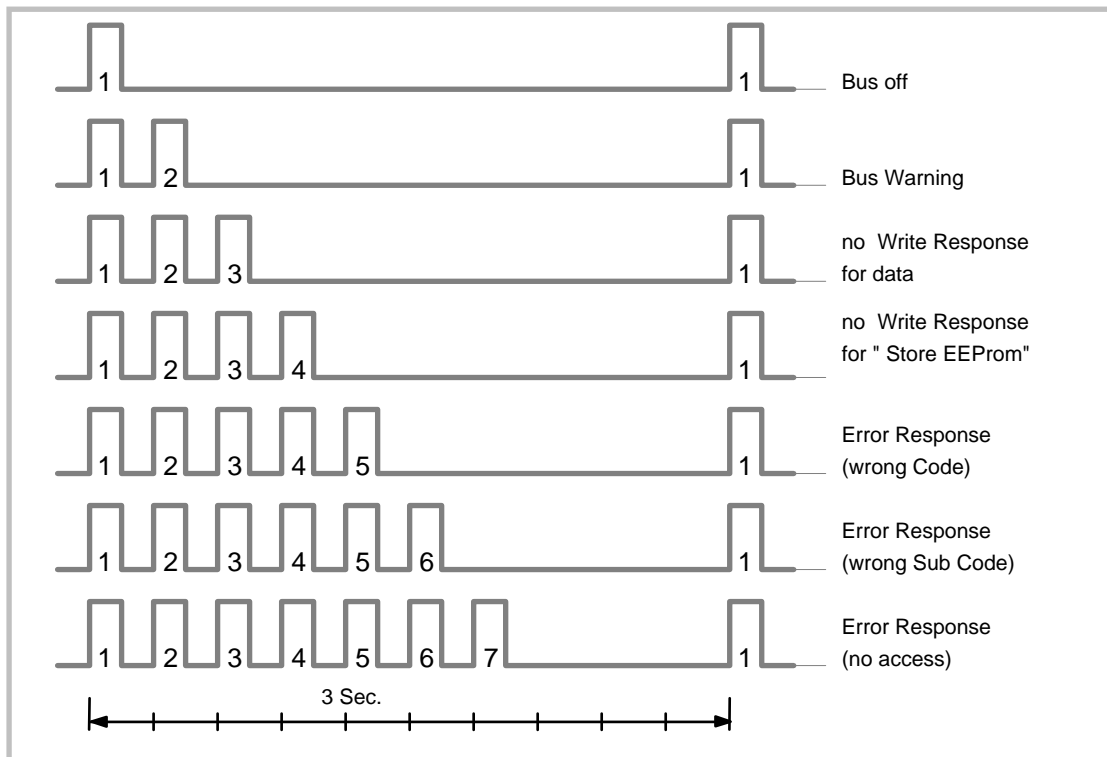
Errors 2...7 can be reset by pressing the Enter button. To reset Error 1 it is necessary to switch off the unit and power up again.

The unit transmits the data by SDO (Service Data Object) Write Request and awaits a corresponding Write Response within the next 2.5sec (Timeout). It operates similar to a CANopen master (But it is no CANopen master!). No other CANopen communication objects are supported, except the SDOs.

Identifier:	Data-Byte 0	Data-Byte 1	Data-Byte 2	Data-Byte 3	Data-Byte 4	Data-Byte 5	Data-Byte 6	Data-Byte 7
1600 (640h) + unit address (SDO on parameter-channel 2)	Command specifier: 23h (Write Request)	(low) Index (high): 5E26h (Code 473) or 5E25h (Code 474)		Sub-Index: 1 / 2	(low)	32Bit data		(high)

Important notice !!

After switching-on the device, the adjusted value is not sent automatically !
Only with activating the ENTER-key, the adjusted value can be sent.

The unit operates like a CANopen minimum capability device corresponding to CiA DS 301.

7.1   Initialization

To start the PDO communication, after power up the following NMT message (Network management) has to be sent by the drive device:

Identifier:	Data-Byte 0	Data-Byte 1	
0 (NMT)	01 (NMT "Start Remote Node")	Geräteadresse oder 00 (Alle Geräte)	*unit adress* *or* *00 (all units)*

Programming the initialization and the display value occurs with connecting the units on the drives (Series 630) on the drive side.
You can find the necessary command sequence in the chapter 7.2

7.2   Display value

The unit receives the display value and transmits the preset value by pressin the ENTER key as 32 bit-data by PDOs (Process Data Objects).

        Receive PDO (= display value)

Identifier:	Data byte 0	Data byte 1	Data byte 2	Data byte 3				
768d(300h) + unit address	low	32 bit data		high				

7.3   BCD - Schalter Wert

        Transmit PDO: (= BCD value)

Identifier:	Data byte 0	Data byte 1	Data byte 2	Datab yte 3				
640d(280h) + unit address	low	32 bit data		high				

Important notice !!

After switching-on the device, the adjusted value is not sent automatically !
Only with valid NMT message and then activating the ENTER-key, the adjusted value can be sent.

Display:	Error:
„------"	Display value unvalid - during initialization - while waiting for response - when display value range exceeded
E 001:	CAN Busoff: serious bus disturbance, CAN communication switched off (Reset only by power up)
E 002:	CAN warning (CAN error counter has exceeded warning limit): - unit is the only working device on the bus and gets no acknowledge or - light bus disturbance (non-fatal error, communication is beeing continued)
E 003:	No write response to preset value
E 004:	No write response to "Store EEPROM"
E 005: E 006: E 007:	Error response to preset value or "Store EEPROM": - wrong code - wrong Subcode - no access
E 008:	No read response to display value request
E 009: E 010: E 011:	Error response to display value request: - wrong code - wrong subcode - no access
E 012:	No read response during initialization
E 013: E 014: E 015:	Error response during initialisation: - wrong code - wrong subcode - no access
E 016:	Initialization error

9.1   without LED-display

The BCD switch is supported with devices of the 630 series as of firmware version V5.10 and of the EASYRIDER software as of version V5.10.
The necessary settings for communication with the BCD switch are made with the EASYRIDER software. In the menu "configuration", "field bus module", the baud rate and node number of the BCD switch are selected.
The settings are immediately active upon the sending of the parameters.
Execute the function "Store data in EEPROM" (F7) so that the values are permanently transferred to the drive.
The node numbers 1 - 31 are valid.
The node number 0 switches the function and the communication off.
Checking the communication with the BCD switch in done ein the menu "Diagnosis", "Field bus module" (strg + F9).
On the diagnosis page 2 in object 10 and 11, the identifiers set, the number of telegrams sent, and the status and data content of the object are displayed.

The BCD values depending on the DIL-switches 7 and 8 are transmitted into the variable 0 - 3, with valid baud rate setting, addressing and wiring.
The variables 0 and 1 are each multiplied with the factor 10000 !!
In the BIAS diagnosis (F9) the transmitted values are displayed.

9.2   with LED-display

9.2.1   Basic adjustment

The BCD-LED device is supported with devices of the 630 series as of firmware version V5.10 and of the EASYRIDER software as of version V5.10.
The necessary settings for communication with the BCD-LED device are made with the EASYRIDER software. In the menu "configuration", "field bus module", the baud rate and node number of the BCD switch are selected.
Mode „1" must be adjusted !!
The settings are immediately active upon the sending of the parameters.
Execute the function "Store data in EEPROM" (F7) so that the values are permanently transferred to the drive.
The node numbers 1 - 31 are valid.
The node number 0 switches the function and the communication off.
Checking the communication with the BCD switch in done ein the menu "Diagnosis", "Field bus module" (strg + F9).
On the diagnosis page 2 in object 10, the identifiers set, the number of telegrams sent, and the status and data content of the object are displayed.

The BCD value is transmitted into the variable 2, with valid baud rate setting, addressing and wiring.
In the BIAS diagnosis (F9) the transmitted value is displayed.

with LED-display

9.2.2 NMT initialization and display

9.2.2.1 NMT initialization

After switch-on the device, it is required to switch the BCD-LED device through the NMT service "Start node" into the operating state "operational".
That will be finished by sending once from the drive.
(see the following BIAS sequence)

Var [X] = 0   * NMT Identifier 0
Var [X+1] = 1   * Start node + all nodes
Var [X+2] = 0   * not used
Var [X+3] = 0   * not used
Var [X+4] = 0   * not used
CAN command [Var X]

9.2.2.2 Display value

Updating the display value occurs in the same way at the corresponding PDO 2 object identifier.
The update time can be defined freely by the programmer in the BIAS program.
The actual value is announced cyclically here in the example.

        * Step 1: load CAN command identifier

        Variable [5] = const.   * const. = 768 + node no.
        Variable [8] = 0
        Variable [9] = 0

LOOP:

        * Step 2: load 32 bit display value (example: actual value 1)

        Variable 10 = actual position 1

        * Step 3: change 32 bit Variable in CAN-word (check limits because of max. 999999 display)

        Variable [6] = Variable [10]
        Variable [7] = Variable [6] / 65536
    If Variable[10] > 0 then jump positive
        Variable [7] = Variable[7] - 1
Positive:
        CAN command Variable [5]

        Jump LOOP   * load cyclically

10.1   without LED-display

10.1.1 Description

With a decade BCD switch (value range 0 - 999999), the feed value for the 635 drive should be transferred in increments. The feed value should be used in the BIAS variable 2. The CAN bus should be set with a Baud rate of 125 k Baud. The BCD switch has the node address 1 in the CAN bus.

10.1.2 Schematic sketch and wiring
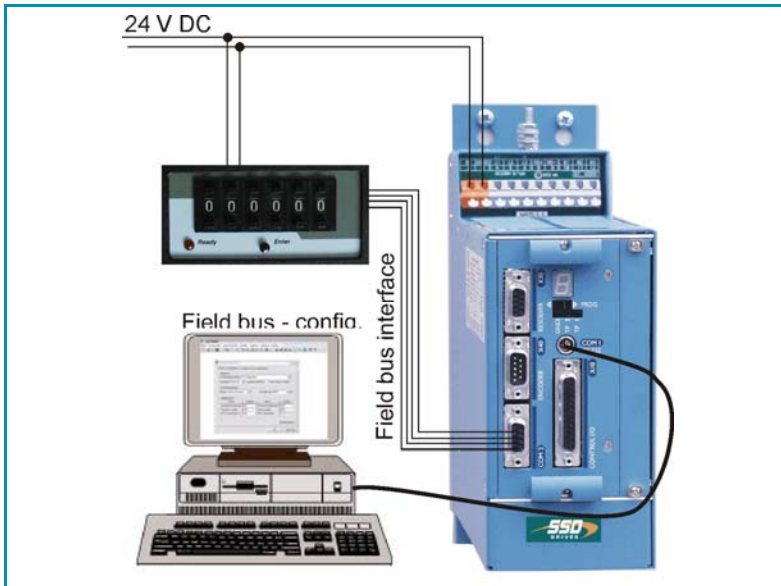
Field - BUS - configuration
    CAN - Baud rate = 3 (125 k)
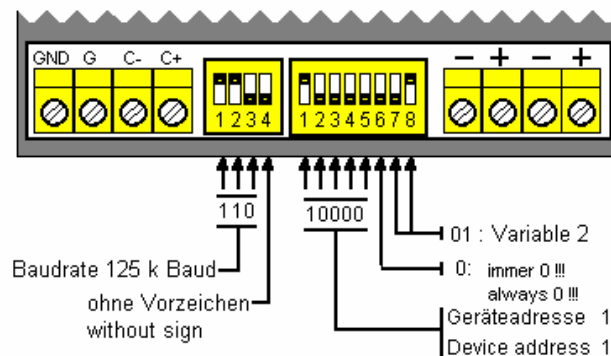   BCD - switch
    Node number = 1 variable 1 = 0

Diagnosis
    variable 1 = 0
    variable 2 = 123456

BIAS
    0009 ...
    0010 position = variable 2
    0011 start axis
    0012 move position
    0013 ...

10.1.3 DIL-switch adjustment

10.1.4 635 C CAN-BUS configuration via EASYRIDER

The Baud rate 125 k Baud (3) and the node number 1 of the BCD switch are selected in the menu "Configuration Field bus module". The settings are immediately active upon sending the parameters. Execute the function "Store data in EEPROM" (F7) so that the values are permanently transferred to the drive.

10.1.5 Test

After configuration of the BCD device and the drive, the function can be tested.
1. Connect the devices with the CAN- connecting cable.
2. Connect the 24V at both devices.
3. S Adjust the desired value
   (e. g. 123456) and press the ENTER-key at the BCD Thumbwheel device.
4. Check the transfer with the EASYRIDER
   diagnosis → display BIAS diagnosis.
   Variable 2 = 123456

10.2 with LED-display
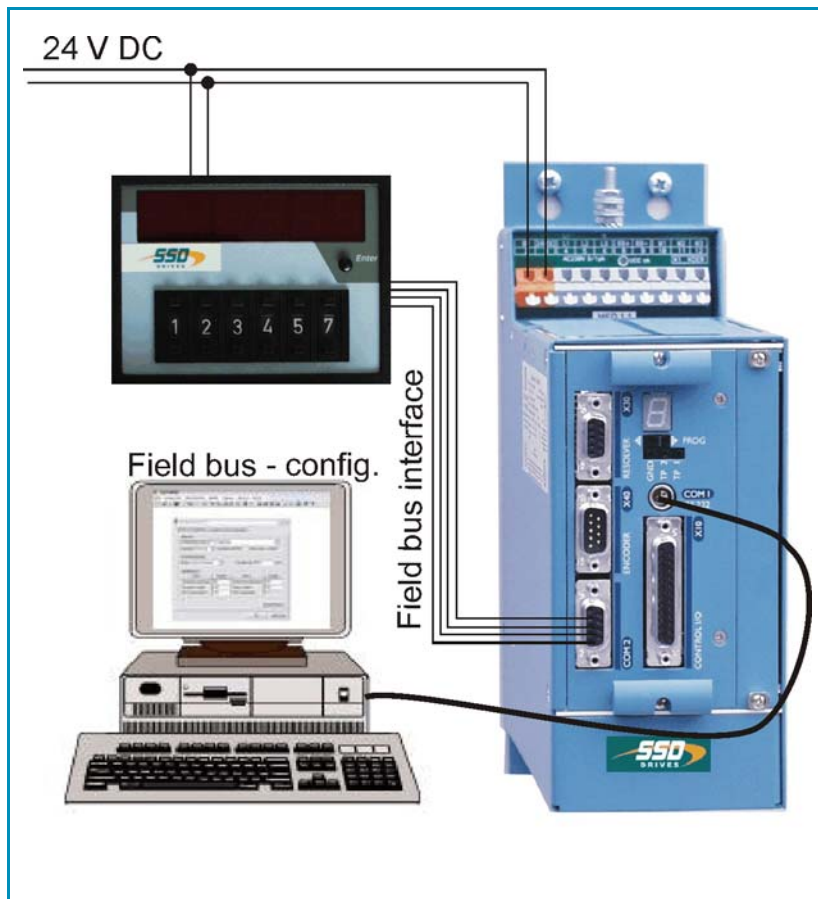
10.2.1 Description

With a 6 decade BCD-LED device (value range 0 - 999999), the feed value for the 635 drive should be transferred in increments.
The actual position should be displayed.
The CAN bus should be set with a Baud rate of 125 k Baud.
The BCD-LED device has the node address 1 in the CAN bus.

10.2.2 Schematic sketch and wiring

Field - BUS - configuration
CAN - Baud rate = 3 (125 k)
BCD - switch
Node number = 1 mode = 1

Diagnose:
> variable 1 = 0
> variable 2 = 123456

BIAS:
> 0000 Variable [20] = 0
> 0001 Variable [21] = 1
> 0002 Variable [22] = 0
> 0003 Variable [23] = 0
> 0004 Variable [24] = 0
> 0005 Can command var. [20]
> 0006 Variable [5] = 769
> 0007 Variable [8] = 0
> 0008 Variable [9] = 0
> 0009 PLC program PLC

Cycle:
> 0010 position = variable 2
> 0011 start axis
> 0012 move increment. position
> 0013 wait for pos. reached
> 0014 wait time 1000 ms
> 0015 jump cycle

SPS LOOP

SPS:
0020 Variable [10] = real position 1
0021 Variable [6] = Variable [10]
0022 Variable [7] = Variable [6] / 65536
0023 If Variable[10] > 0 then jump Positive
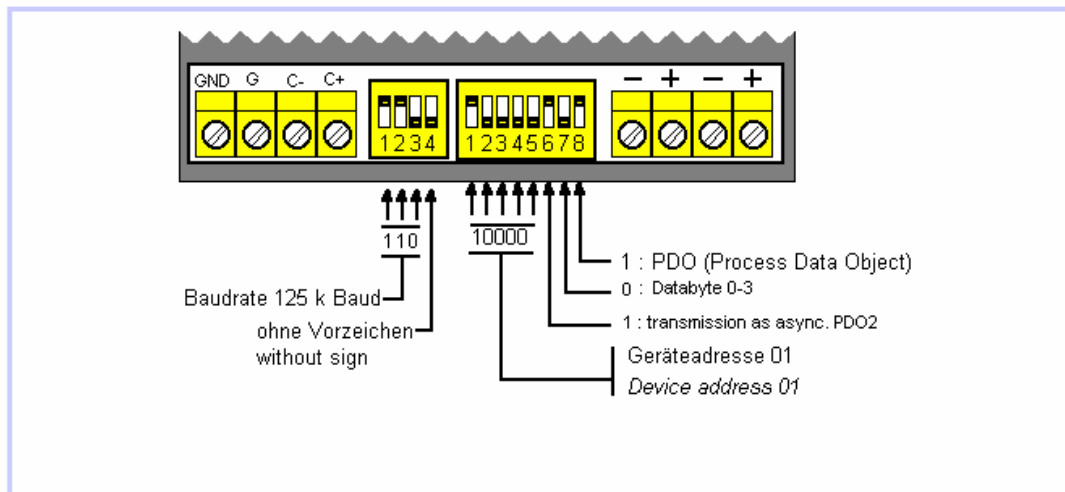0024 Variable [7] = Variable[7] – 1
Positive
0025 CAN commando Variable [5]
0026 end of program; mode = 0

with LED-display

10.2.3 DIL-switch adjustment

10.2.4 635 CAN-BUS configuration via EASYRIDER

The Baus rate 125 k Baud (3) and the node number 1 of the BCD switch are selected in the menu "Configuration Field bus module".

Adjust mode „1" !!

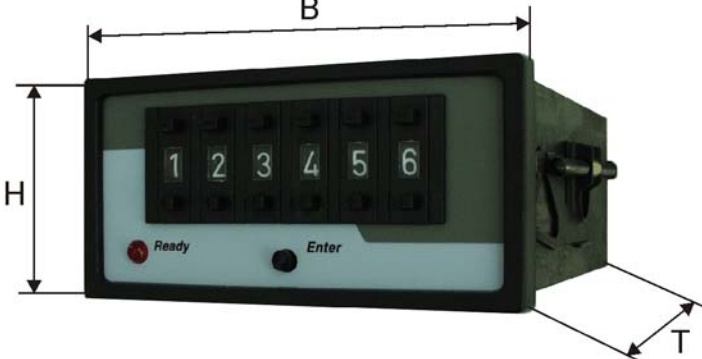The settings are immediately active upon sending the parameters.
Execute the function "Store data in EEPROM" (F7) so that the values are permanently transferred to the drive

10.2.5 Test
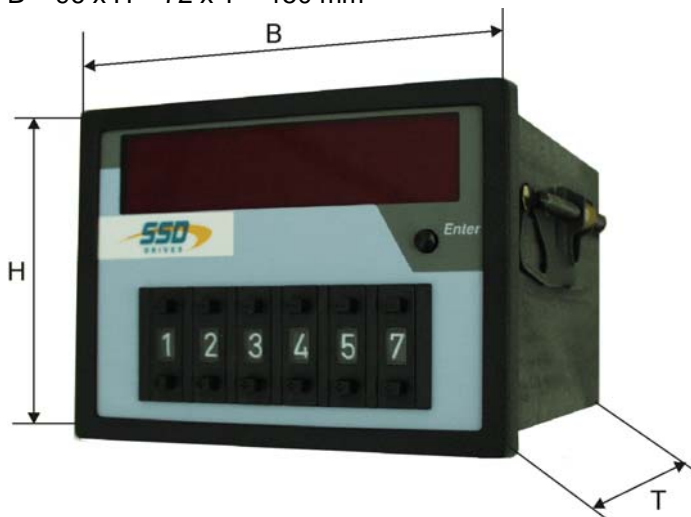
After configuration of the BCD device and the drive, the function can be tested.
1. Connect the devices with the CAN- connecting cable.
2. Connect the 24V at both devices.
3. Load BIAS program and parameter, power on and activate drive.
4. Adjust the desired value (e. g. 123456)
   and press the ENTER-key
   at the BCD Thumbwheel device.
5. Check the transfer with the EASYRIDER
   diagnosis → display BIAS diagnosis.
   Variable 2 = 123456
6. check display.

11.1 ohne LED-Anzeige

Supply Voltage	10...35 VDC
Current Consumption	depending on Voltage
Comunication profile	DIN ISO 11898, CANopen (CiA DS301)
Baud rate	20.....1000 kBits/s (adjustable)
Range of transmission	0.....999 999 (CA306) - 99 999....+ 99 999 (CA306 / VZ000)
Dimensions	B = 96 x H= 48 x T= 150 mm
Panel cutout	B = 91 x H = 43 mm
Temperature Range	0...45°C
EMC immunity	EN50082-2
Weight	250g

11.2 mit LED-Anzeige

Supply Voltage	10...35 VDC
Current Consumption	depending on Voltage
Comunication profile	DIN ISO 11898, CANopen (CiA DS301)
Baud rate	20.....1000 kBits/s (adjustable)
Range of transmission	0.....999 999 (CA306) - 99 999....+ 99 999 (CA306 / VZ000)
Anzeige	LED 15mm -99 999 … 999 999
Dimensions	B = 96 x H = 72 x T = 150 mm
Panel cutout	B = 91 x T = 67 mm
Temperatur-Bereich	0...45°C
EMC immunity	EN50082-2
Weight	350g

Version	Modification	Chapter	Date	Name	Comment
V01.26SA00	New		27.06.2000	WO	Zusammenfassung
V0205	Separation German / English SSD Drives		15.07.2005	N. Dreilich	Logos

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