EXDUL-316E

EDP No.: A-384340

EXDUL-316S

EDP No.: A-384320

Firmware Version 4.05

10 optocoupler isolated digital inputs
8 optocoupler isolated digital outputs (common ground)
2 16-bit counters
LCD Display (EXDUL-316E only)

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user‘s guide

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Disclaimer

The information in this manual is intended to be accurate and reliable. The company Messcomp Datentechnik GmbH assumes no liability for the use of the multi functional module EXDUL-316 and this documentation, neither for direct nor indirect damages.

Important Information:

This manual was made up for modules EXDUL-316E and EXDUL-316S. EXDUL-316E additionally provides an LCD display, all other functions are identical. For EXDUL-316S all commands and functions concerning the LCD display are not applicable.

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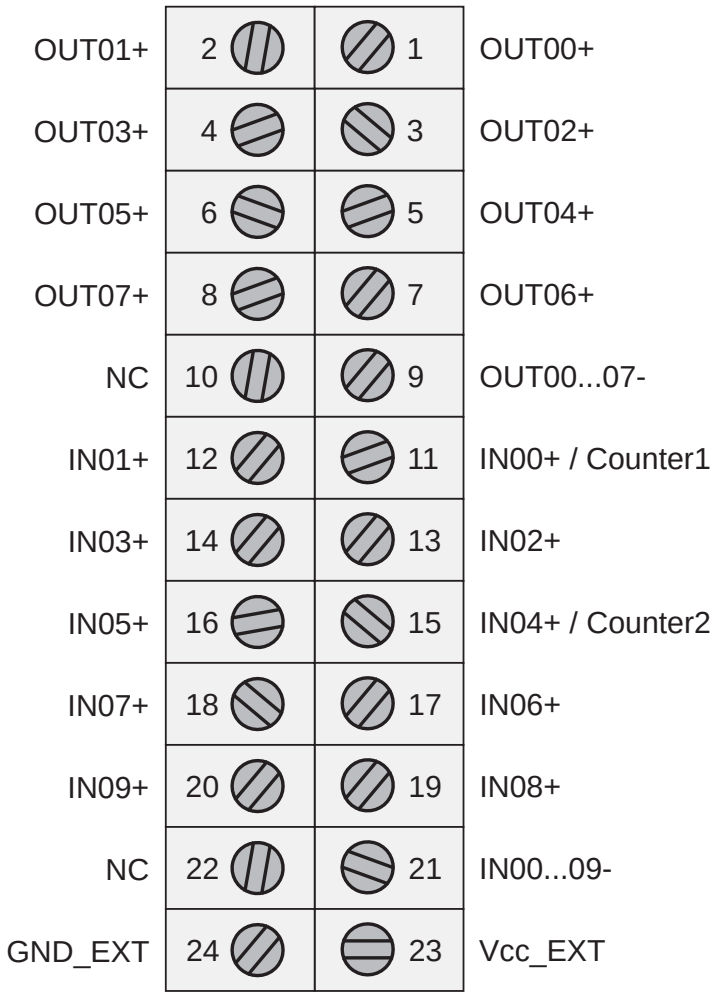
1. Introduction

Data acquisition modules EXDUL-316E and EXDUL-316S provide 10 digital inputs and 8 digital outputs of high quality which are galvanically isolated by high-quality optocouplers and fitted with additional protection diodes. All input optocouplers have integrated schmitt trigger function. Special high-power output optocouplers handle a maximum switching current of 150 mA. Two of the ten input optocouplers are programmable and usable as digital counters if required. EXDUL-316E additionally provides a user programmable LCD display showing I/O and counter status information or user specific data.
Connection to a computer is made simply and conveniently Plug-and-Play via a USB port. The required power supply can be provided via USB port or by an external voltage source. The module provides a 24-pin screw terminal to connect inputs and outputs as well as external power supply. The compact chassis enables the module to be used with a notebook as a portable device. For mechanical engineering control applications it can also be easily wall mounted or attached to DIN mounting rail.

2. Connection Terminals

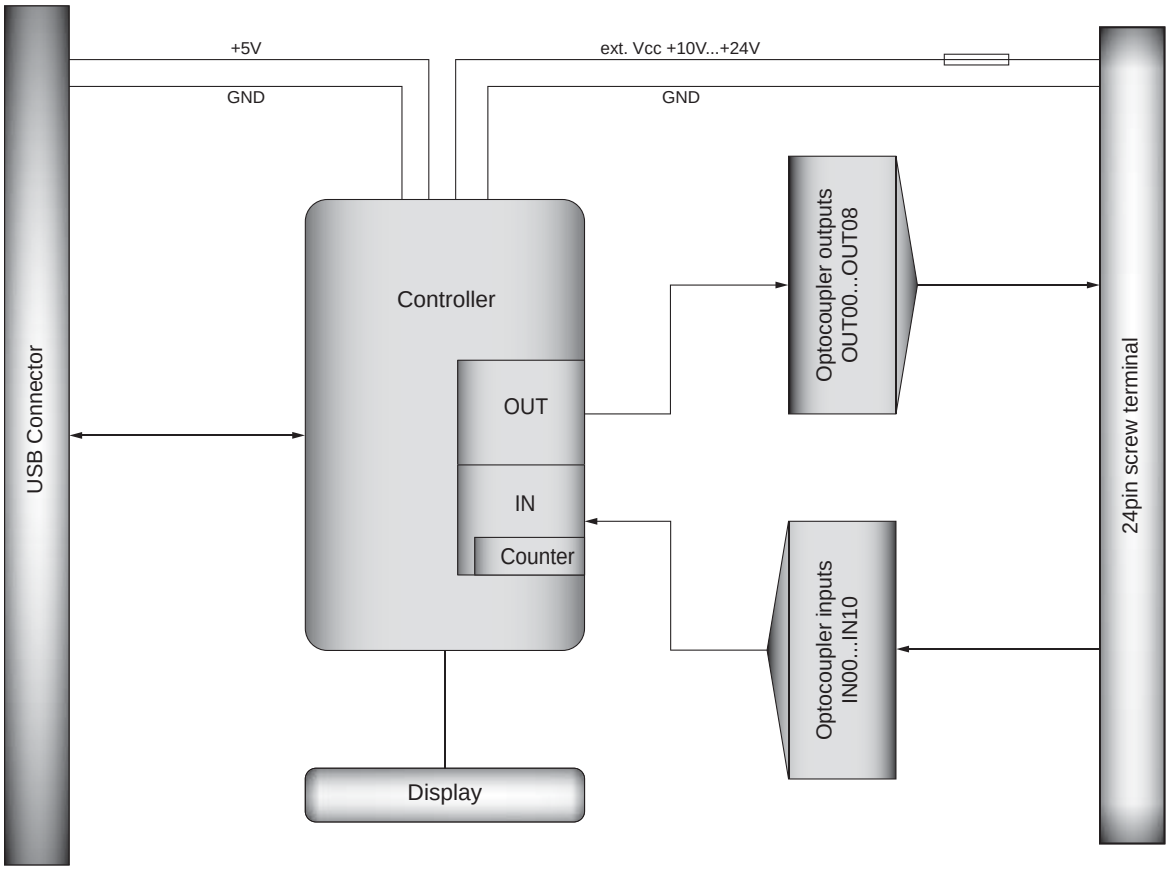
2.1 Terminal Assignment of CN1



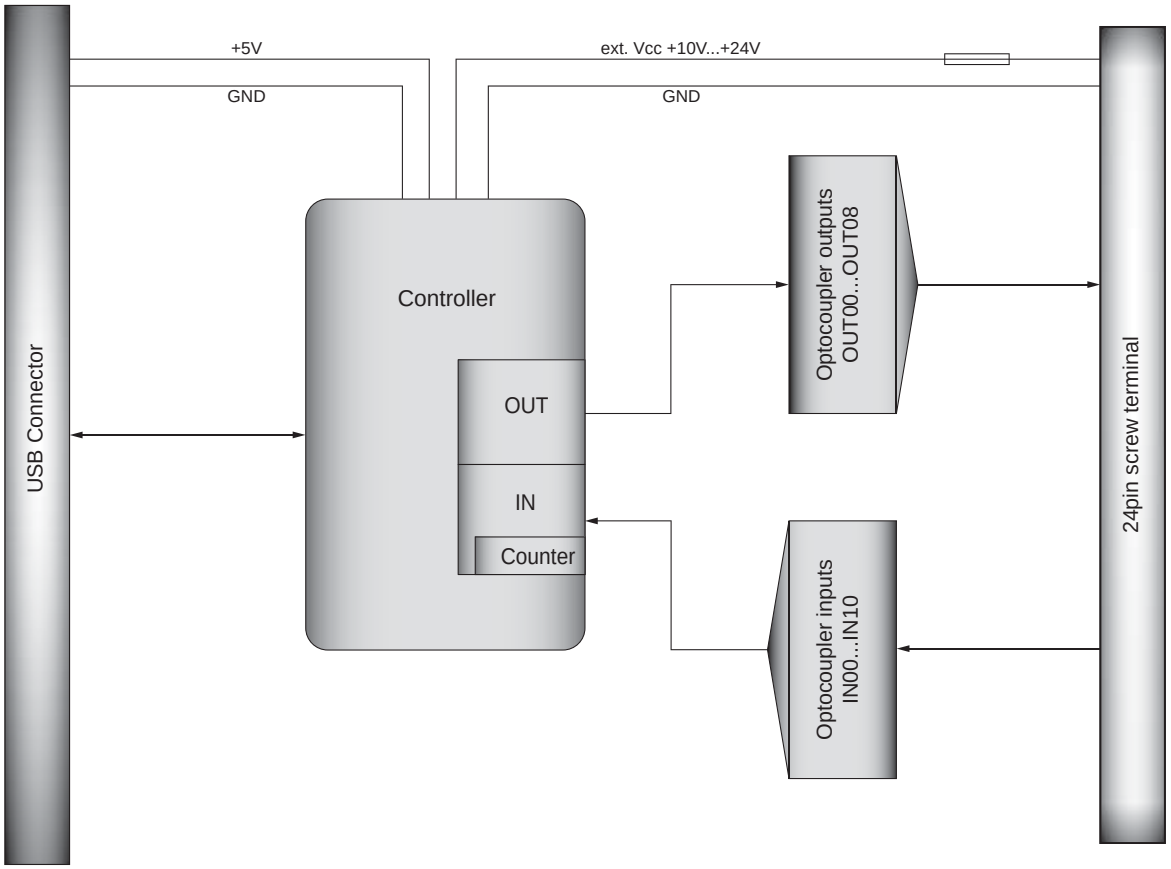
Vcc_EXT:
Connector for external voltage source
GND_EXT:
Ground connection when using external voltage source
NC:
Not connected

3. System Components

3.1 Block Diagram EXDUL-316E



3.2 Block Diagram EXDUL-316S



3.3 Optocoupler Inputs

10 channels, galvanically isolated
Common ground connection (cathodes connected)
2 of the channels progammable as digital counters
Optocouplers with integrated schmitt trigger function
Overvoltage protection diodes
Input voltage range: low = 0....3 Volt high = 10.....30 Volt
Input frequency: max. 10 kHz

3.4 Optocoupler Outputs

8 channels galvanically isolated
Common ground (emitter connected)
High-capacity optocouplers
Reverse polarity protection
Output current: max. 150 mA
Switching voltage: max. 50 V

3.5 Digital Counters

2 programmable 16-bit counters
(2 of the 10 optocoupler inputs are assigned)
Counting frequency: max. 5 kHz

3.6 LCD Display (EXDUL-316E only)

Matrix display with 2 lines and 16 columns performing 16 signs each line
Info display while booting-up
I/O status display, UserLCD display or Counter display while operating

4. Initial Start-up

Connecting the EXDUL-316 to a computer is made simply and conveniently Plug-and-Play via a USB port. The necessary operating voltage for the module can be supplied via the USB port or via an external voltage source.

4.1 Connecting to a USB Port

EXDUL-316E / EXDUL-316S is equipped with USB 2.0 interface and can be connected directly to the computer or via USB hub using the enclosed USB connecting cable. The module is hot pluggable, so it can be connected even while the system is already operating.

4.2 Power Supply via USB Port

If the USB port is used to power the device, then the operating voltage will be +5V. It may be necessary to configure your system software to obtain appropriate power requirements (see chapter Technical Data)

4.3 Power Supply via an External Voltage Source

EXDUL-316E / EXDUL-316S firmware will automatically detect when an external voltage source is used. Applying a voltage between +10V and +24 V across Vcc_EXT and GND_EXT (see fig. Terminal Assignment), will immediately cause the device to switch to „external“ source. The power supply from the USB port will automatically be interrupted.

4.4 LCD Display while Starting-up (EXDUL-316E only)

While booting-up an info display appears in the first line of the display with the name of the module. Once the boot-up process is finished I/O status or UserLCD is displayed depending on the settings.

4.5 LCD Display while Operating (EXDUL-316E only)

Once the boot-up process is finished the display switches from info display to I/O status display or UserLCD display or counter display depending on LCD display configuration. When I/O status display is selected, line1 indicates the active input states, line2 the output states. If the UserLCD display modus is selected values from memory areas UserLCD1m and UserLCD2m are indicated instead of I/O status display. Data from UserLCD1m und UserLCD2m are displayed until new user data are written to the display via UserLCD line1 and UserLCD line2.

To avoid a „screen-burn“ while in operation the display switches from I/O status or UserLCD display to extended info display for five seconds approximately every minute (see chart)

Display	Explanation
EXDUL-316 u c	u = Vcc via USB, c = USB connected
EXDUL-316 e c	e = Vcc external, c = USB connected
EXDUL-316 e n	e = Vcc external, n = USB not connected

5. Installing Windows® Drivers

When you connect the USB-module EXDUL-316E / EXDUL-316S into your computer for the first time, Windows® automatically detects a new device and searches for a suitable driver.

To install the driver indicate the directory and setup file called „wascoxm-fe.inf“ to the Windows hardware wizard.

After driver database has been updated the hardware wizard will inform you about the successful installation of the driver.

The Windows® Device Manager will now show your USB-module EXDUL-316E / EXDUL-316S as a “Wasco-USB-Kommunikationsport COMx“ in its directory connections (COM/LTP) tree. All Windows® software can access to the virtual interface as if it were a real COM port.

6. Programming under Windows®

6.1 Overview

After successful installation the USB-module EXDUL-316E / EXDUL-316S is shown as a wasco USB communication port COMx in your Windows® Device Manager. This is a CDC device (Communications Device Class), that is adressed via a virtual COM port.
The access to this virtual COM port operates like a normal COM interface of default Windows® driver, and it is not necessary to install any additional drivers.

6.2 Communication with EXDUL-316

Data is exchanged by transmitting and receiving a block of 3 bytes via the virtual COM interface.

Every valid transmission string will be replied by a defined result or confirmation string.

The last result or confirmation string has to be read before transmitting a new string.

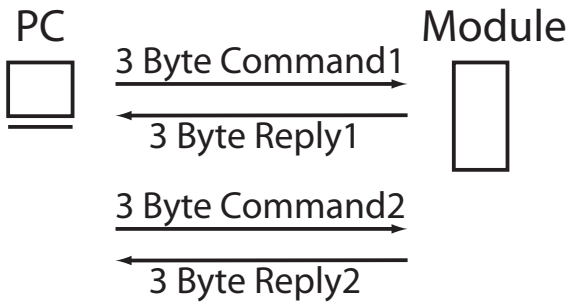


Figure 6.2 Communication model

6.3 Windows® Functions for Programming

You can program EXDUL-316E / EXDUL-316S either via WIN32 API functions or very conveniently via an already existing serial port object in a programming language. You can find examples in your installation directory on your computer after having installed the software.

Windows® functions for programming:
– CreateFile
– GetCommState
– SetCommState
– WriteFile
– ReadFile
– DCB structure (describes the control parameter of the device)

6.4 Register config, HW Identification, Serial Number

Byte	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Config	00	00	01	11	00	0F	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF
HW Identifier	E	X	D	U	L	-	3	1	6	V	4	.	0	5		
S/N	1	0	4	4	0	2	6	FF	FF	FF	FF	FF	FF	FF	FF	FF

All settings are saved in the CONFIG register and automatically restored when you restart your computer or when you connect to another computer.
The values arise from CONFIG commands (A2, A3 and A8), the data in CONFIG register remains effective until it is overwritten by the CONFIG commands or reset to factory settings (delivery status) by a default reset.

Config-Byte	Function
0	reserved
1	Output state at start or restart/reset
2	LCD contrast value (High-Byte)*
3	LCD contrast value (Low-Byte)*
4	Display Mode

The module name is stored in the HW identification register and the user there can verify the product identity. Hardware identifier ends with a blank.
Register SERIAL NUMBER serves for internal purposes and only can be read by the user.

*: EXDUL-316E only

6.5 Memory Areas UserA, UserB, UserLCD1m* and UserLCD2m*

Byte	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
UserA																
	20_{hex}	20_{hex}	20_{hex}	20_{hex}	20_{hex}	20_{hex}	20_{hex}	20_{hex}	20_{hex}	20_{hex}	20_{hex}	20_{hex}	20_{hex}	20_{hex}	20_{hex}	20_{hex}
UserB																
	20_{hex}	20_{hex}	20_{hex}	20_{hex}	20_{hex}	20_{hex}	20_{hex}	20_{hex}	20_{hex}	20_{hex}	20_{hex}	20_{hex}	20_{hex}	20_{hex}	20_{hex}	20_{hex}
UserLCD1m*																
	20_{hex}	20_{hex}	20_{hex}	20_{hex}	20_{hex}	20_{hex}	20_{hex}	20_{hex}	20_{hex}	20_{hex}	20_{hex}	20_{hex}	20_{hex}	20_{hex}	20_{hex}	20_{hex}
UserLCD2m*																
	20_{hex}	20_{hex}	20_{hex}	20_{hex}	20_{hex}	20_{hex}	20_{hex}	20_{hex}	20_{hex}	20_{hex}	20_{hex}	20_{hex}	20_{hex}	20_{hex}	20_{hex}	20_{hex}

In each register UserA, UserB, UserLCD1m* and UserLCD2m* 16 digits (16 byte) are at your proposal for your own use. Data remains stored when you switch off, registries can be set back to factory settings (delivery status) by a default reset. In delivery status in all of the four user memory areas each digit is set to the Hex value 20 corresponding to a blank in ASCII code. The top illustration shows every Hex value and the respective ASCII character.

If UserLCD mode is activated the data from memory areas UserLCD1m* and UserLCD2m* will be displayed as long as you not write out new user data to the UserLCD line1 or UserLCD line2 of the LCD display.

6.6 Display Register UserLCD-Line1*, UserLCD-Line2* and LCD Contrast*

If UserLCD mode is activated you can write any 16 characters to both of the UserLCD-line1 and UserLCD-line2. Once the data is entered this will overwrite displayed data from UserLCD1m and UserLCD2m. Data from UserLCD-line1 and UserLCD-line2 will **not** be stored at switch off.
You can adjust LCD display contrast in register LCD contrast. This adjustment remains stored at switch off.

6.7 Index of Commands

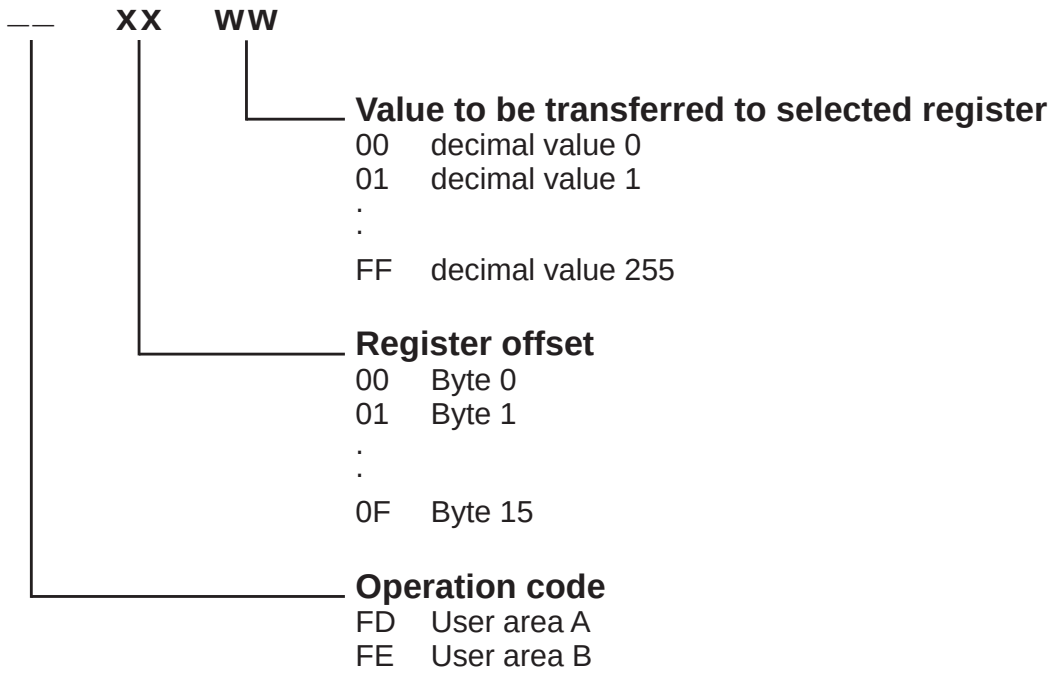
Hexcode	Description
D0 03 16	EXDUL-316 Default Reset (restoring delivery settings)
FD xx ww	Writing user area A
FE xx ww	Writing user area B
E0 xx 00	Reading configuration area
EC xx 00	Reading HW identifier
ED xx 00	Reading user area A
EE xx 00	Reading user area B
EF xx 00	Reading serial number
01 03 00	Reading optocoupler input port
02 kk 0x	Reading of single optocoupler inputs
01 13 00	Reading counter1
01 23 00	Reading counter2
81 03 ww	Writing optocoupler output port
82 kk 0x	Writing of single optocoupler outputs
83 kk 0x	Reading of single optocoupler outputs

Hexcode	Description
81 13 00	Start counter1
81 13 FF	Stop counter1
81 23 00	Start counter2
81 23 FF	Stop counter2
A1 03 mm	Writing operation mode byte
A2 03 mm	Writing output port reset value
A3 03 mm	Writing display mode byte*
A8 ww ww	Writing LCD contrast setting value*
AF xy ww	Writing user LCD area*

*: EXDUL-316E only

6.8 Command Composition

6.8.1 Writing Data to Registers in User Area A and B

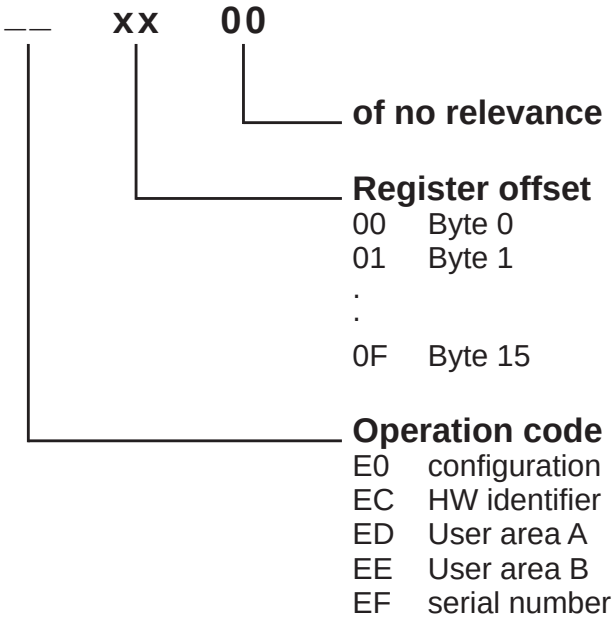


Areas User A and User B comprise of 16 digits each (16 bytes), into both of them is to write byte by byte

For example: Type STEUERUNG in User area A

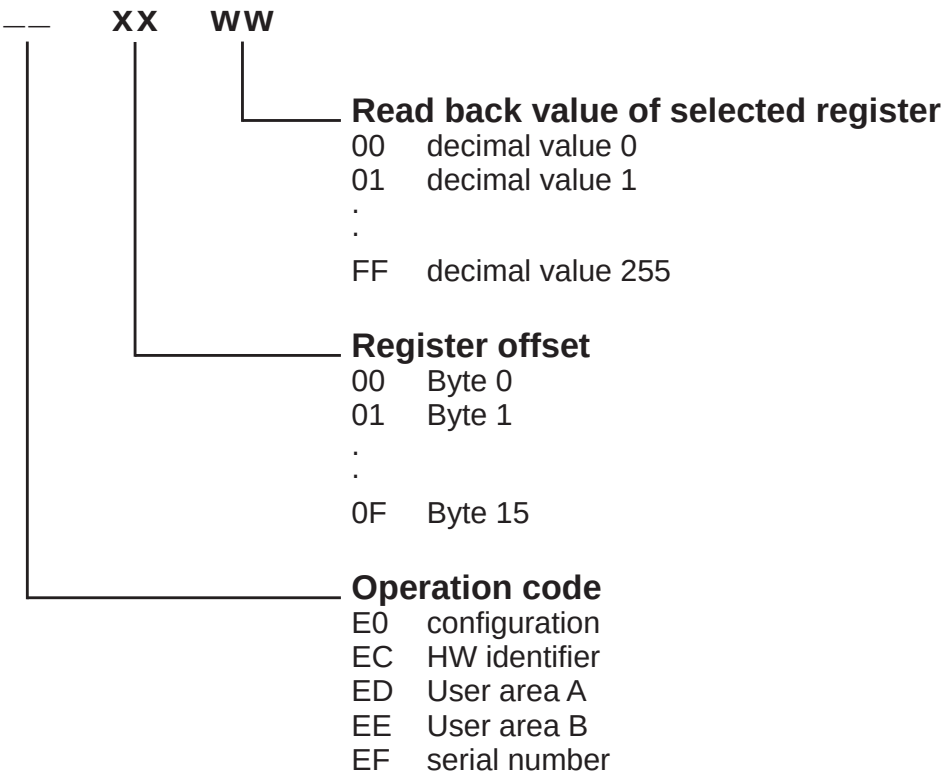
Writing	**Response**
FD_{hex} 00_{hex} 53_{hex}	FD_{hex} 00_{hex} 53_{hex}
FD_{hex} 01_{hex} 54_{hex}	FD_{hex} 01_{hex} 54_{hex}
FD_{hex} 02_{hex} 45_{hex}	FD_{hex} 02_{hex} 45_{hex}
FD_{hex} 03_{hex} 55_{hex}	FD_{hex} 03_{hex} 55_{hex}
FD_{hex} 04_{hex} 45_{hex}	FD_{hex} 04_{hex} 45_{hex}
FD_{hex} 05_{hex} 52_{hex}	FD_{hex} 05_{hex} 52_{hex}
FD_{hex} 06_{hex} 55_{hex}	FD_{hex} 06_{hex} 55_{hex}
FD_{hex} 07_{hex} $4E_{hex}$	FD_{hex} 07_{hex} $4E_{hex}$
FD_{hex} 08_{hex} 47_{hex}	FD_{hex} 08_{hex} 47_{hex}

6.8.2 Reading Data from Area User A and User B, Serial Number, config and HW Identifier



All areas comprise of 16 digits each (16 bytes) and are read byte by byte. Hardware identifier ends with a blank (20_{hex}).

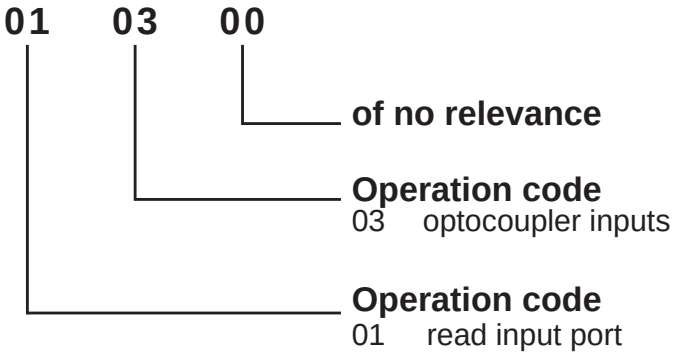
Adapter Response



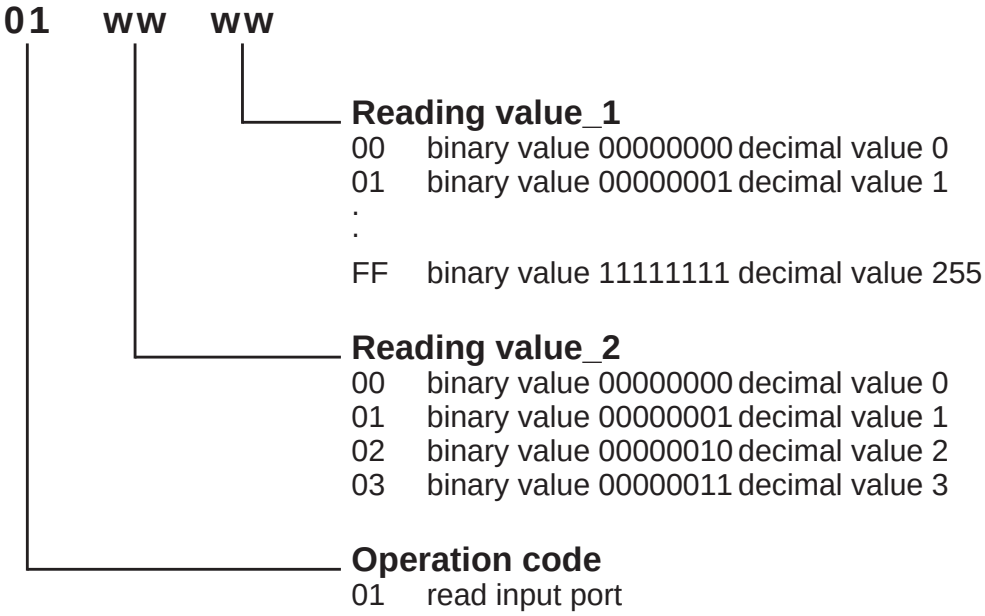
For Example:
Reading the first 9 digits of register User area A. The stated response is valid for the word STEUERUNG (see chapter 6.8.1 Writing to User Area A)

Reading	Response
ED_{hex} 00_{hex} 00_{hex}	ED_{hex} 00_{hex} 53_{hex}
ED_{hex} 01_{hex} 00_{hex}	ED_{hex} 01_{hex} 54_{hex}
ED_{hex} 02_{hex} 00_{hex}	ED_{hex} 02_{hex} 45_{hex}
ED_{hex} 03_{hex} 00_{hex}	ED_{hex} 03_{hex} 55_{hex}
ED_{hex} 04_{hex} 00_{hex}	ED_{hex} 04_{hex} 45_{hex}
ED_{hex} 05_{hex} 00_{hex}	ED_{hex} 05_{hex} 52_{hex}
ED_{hex} 06_{hex} 00_{hex}	ED_{hex} 06_{hex} 55_{hex}
ED_{hex} 07_{hex} 00_{hex}	ED_{hex} 07_{hex} $4E_{hex}$
ED_{hex} 08_{hex} 00_{hex}	ED_{hex} 08_{hex} 47_{hex}

6.8.3 Reading Optocoupler Inputs



Adapter Response



Example:

Reading inputs from optocoupler input port. The voltage thresholds for an input to be considered a logic low and logic high are shown below. This example assumes that the correct voltages has been applied to each input optocoupler pin (0 = low = 0...3V; 1 = high = 10...30V)

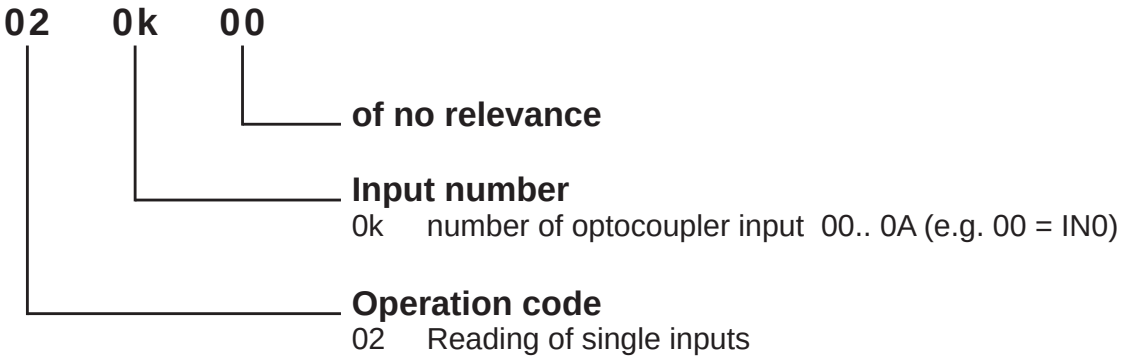
Input channel	IN09	IN08	IN07	IN06	IN05	IN04	IN03	IN02	IN01	IN00
Terminal screw	20	19	18	17	16	15	14	13	12	11
Input level	1	0	1	1	1	1	0	0	1	1
Display*	E	A	E	E	E	E	A	A	E	E

Writing
01_{hex} 03_{hex} 00_{hex}

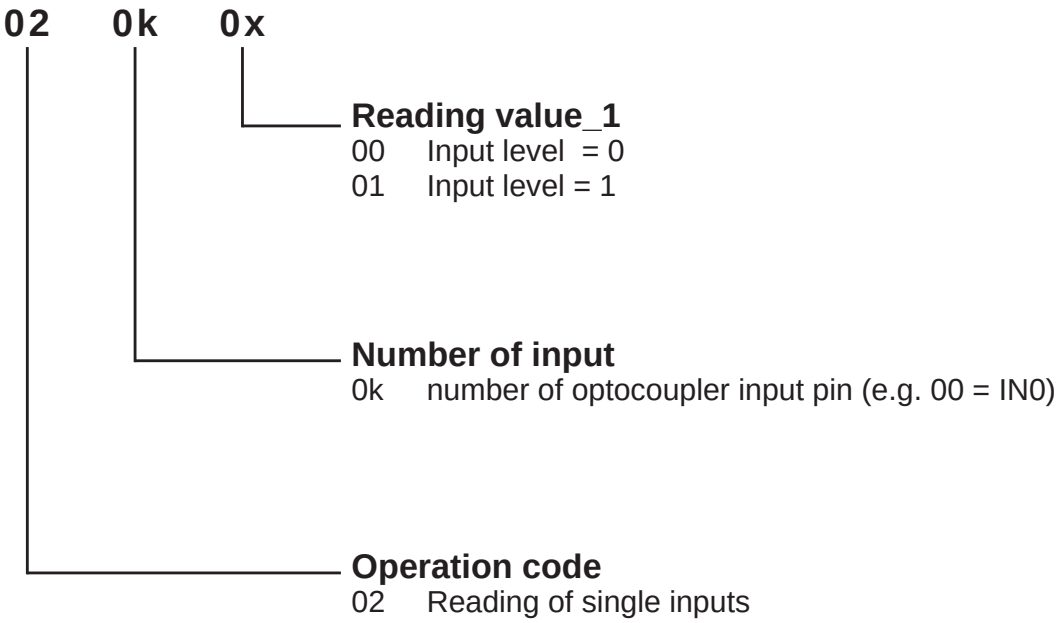
Response
01_{hex} 02_{hex} $F3_{hex}$

*: EXDUL-316E only

6.8.4 Reading of Single Optocoupler Inputs

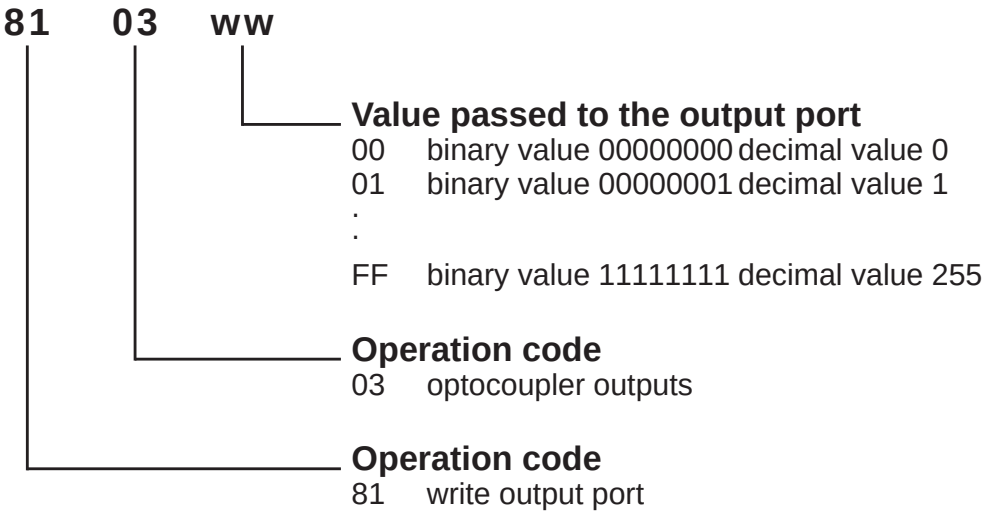


Adapter Response



*: EXDUL-316E only

6.8.5 Writing to Optocoupler Output Port



Example:
Enable optocoupler OUT02, OUT03, OUT04 and OUT06
(1 = optocoupler connected, 0 = optocoupler not connected)

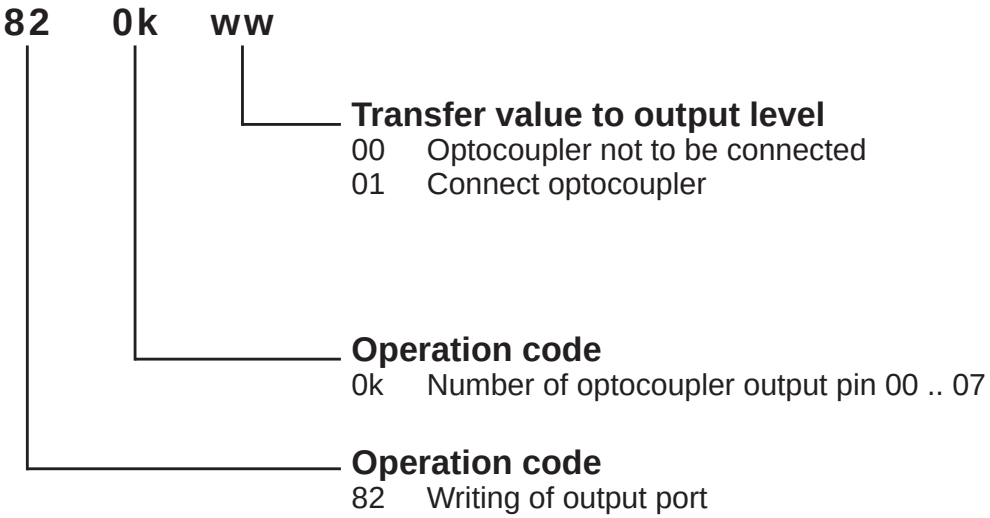
Output channel	OUT07	OUT06	OUT05	OUT04	OUT03	OUT02	OUT01	OUT00
Terminal screw	8	7	6	5	4	3	2	1
connection state	0	1	0	1	1	1	0	0
Display*	A	E	A	E	E	E	A	A

Writing
81_{hex} 03_{hex} $5C_{hex}$

Response
81_{hex} 03_{hex} $5C_{hex}$

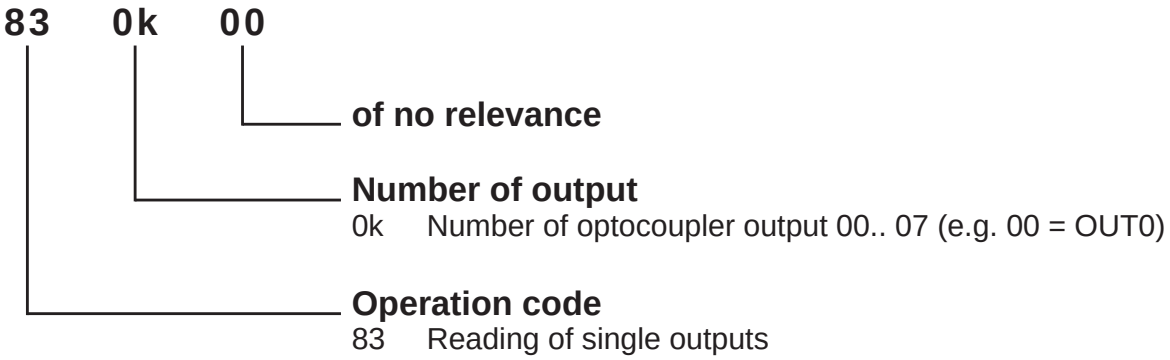
* display for EXDUL-316E only

6.8.6 Writing of Single Optocoupler Outputs

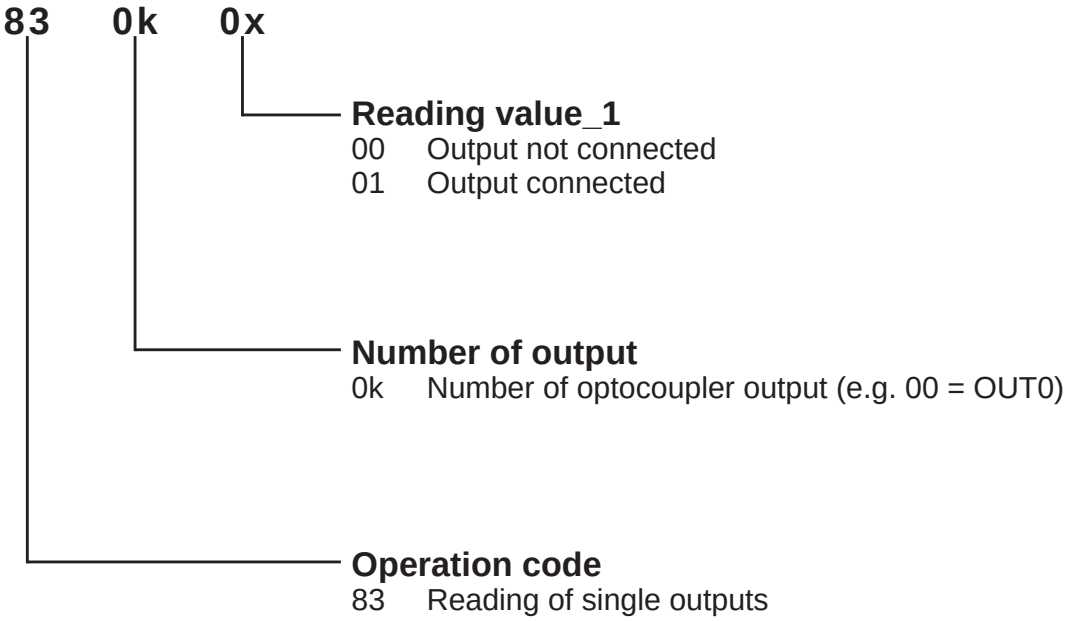


*: EXDUL-316E only

6.8.7 Reading of Single Optocoupler Outputs

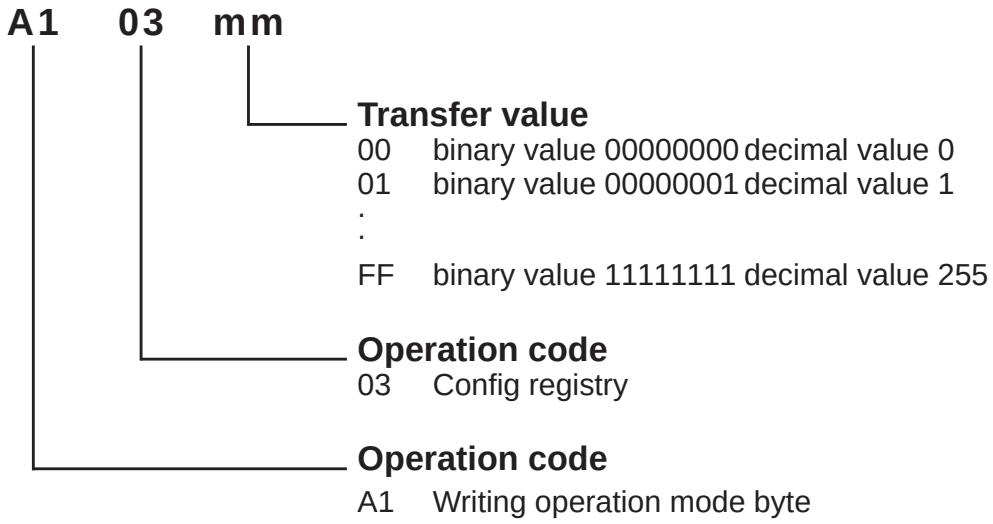


Adapter Response



*: EXDUL-316E only

6.8.8 Writing Operation Mode Byte

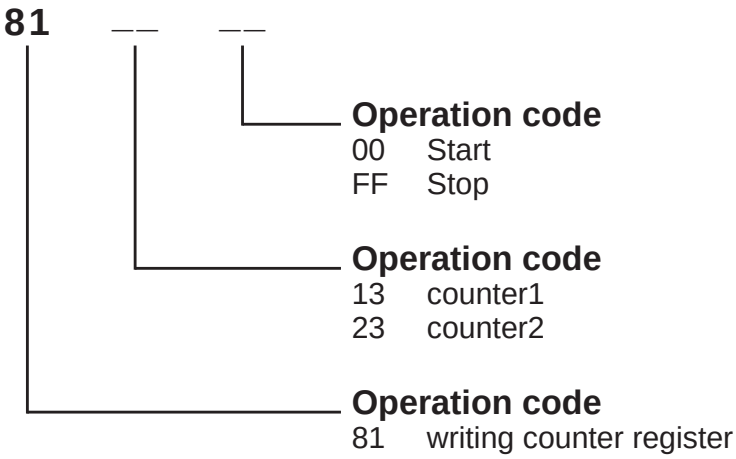


Structure of transfer value:

Bit								Function
7	6	5	4	3	2	1	0	
x	x	1		x	x	x	x	Counter2 Start at Reset
x	x	0		x	x	x	x	Counter2 no Start at Reset
x	x		1	x	x	x	x	Counter1 Start at Reset
x	x		0	x	x	x	x	Counter1 no Start at Reset

Bit 0 to 3 as well as Bit 6-7 are reserved.

6.8.9 Start and Stop of Counters



Example:
Start counter1

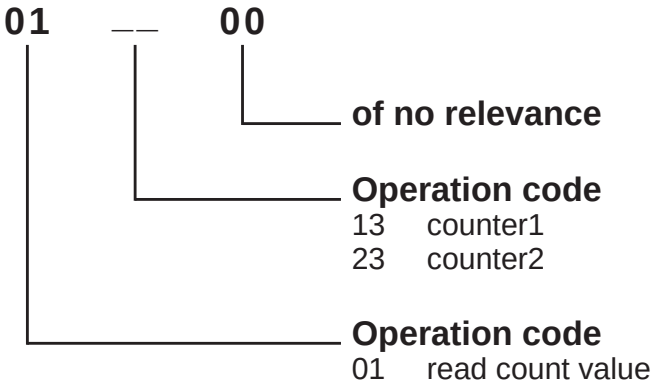
Writing	**Response**
81_{hex} 13_{hex} 00_{hex}	81_{hex} 13_{hex} 00_{hexx}

Stop counter2

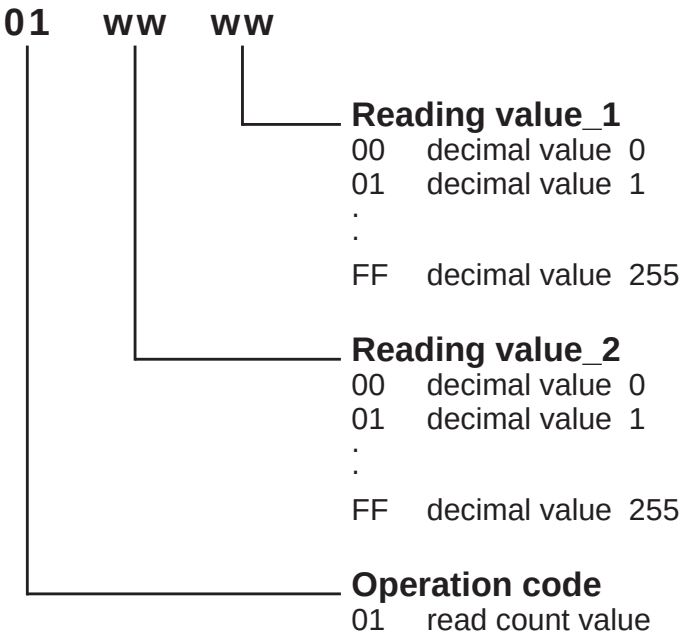
Writing	**Response**
81_{hex} 23_{hex} FF_{hex}	81_{hex} 23_{hex} FF_{hex}

Counter1 and counter2 are 16-bit counters ranging from 0 .... 65535. Every start command will reset the selected counter to 0 and then it starts to count upwards.

6.8.10 Reading Count Value on Counter1 and Counter2



Adapter Response



Count value = reading value_2 x 256 + reading value_1

Example:
Reading count value 2047 on counter1

Writing	Response	Display*
01_{hex} 13_{hex} 00_{hex}	01_{hex} 07_{hex} FF_{hex}	L1: 2047

* display for EXDUL-316E only

Reading count value 24319 on counter2

Writing	Response	Display*
01_{hex} 23_{hex} 00_{hex}	01_{hex} $5E_{hex}$ FF_{hex}	L2: 24319

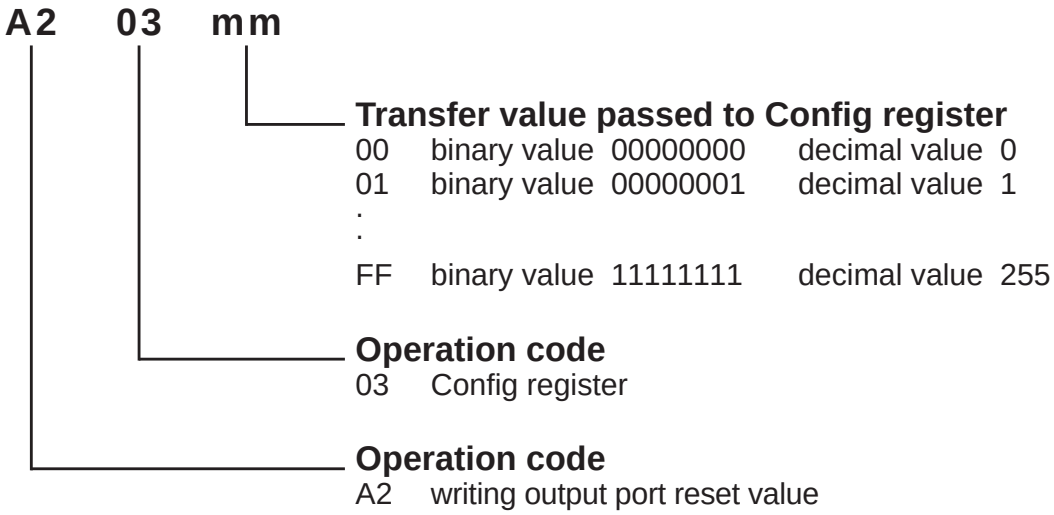
You can read out the current count value with a read command at any time and as often as you want to without interrupting the counting process. If the counting range (0 ... 65535) is exceeded, the operation code will response in a modified way (11_{hex} instead of 01_{hex}).The display will show an „F“ („Fehlerüberlauf“) before the count value.

Example:
Reading count value 2047 on counter2 after counting range being exceeded

Writing	Response	Display*
01_{hex} 23_{hex} 00_{hex}	11_{hex} 07_{hex} FF_{hex}	L1: F 2047

* display for EXDUL-316E only

6.8.11 Writing Output Port Reset Value



Example:
Optocouplers at channel OUT02, OUT03, OUT04 and OUT06 shall be enabled at next start of the module
(1 = optocoupler connected, 0 = optocoupler not connected)

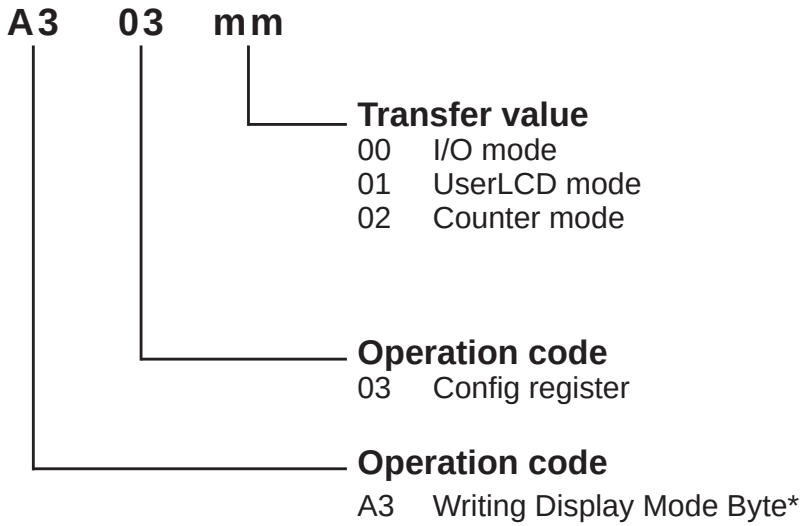
Output channel	OUT07	OUT06	OUT05	OUT04	OUT03	OUT02	OUT01	OUT00
Terminal screw	8	7	6	5	4	3	2	1
Connection state	0	1	0	1	1	1	0	0
Display*	A	E	A	E	E	E	A	A

Writing
$A2_{hex}$ 03_{hex} $5C_{hex}$

Response
$A2_{hex}$ 03_{hex} $5C_{hex}$

* display for EXDUL-316E only

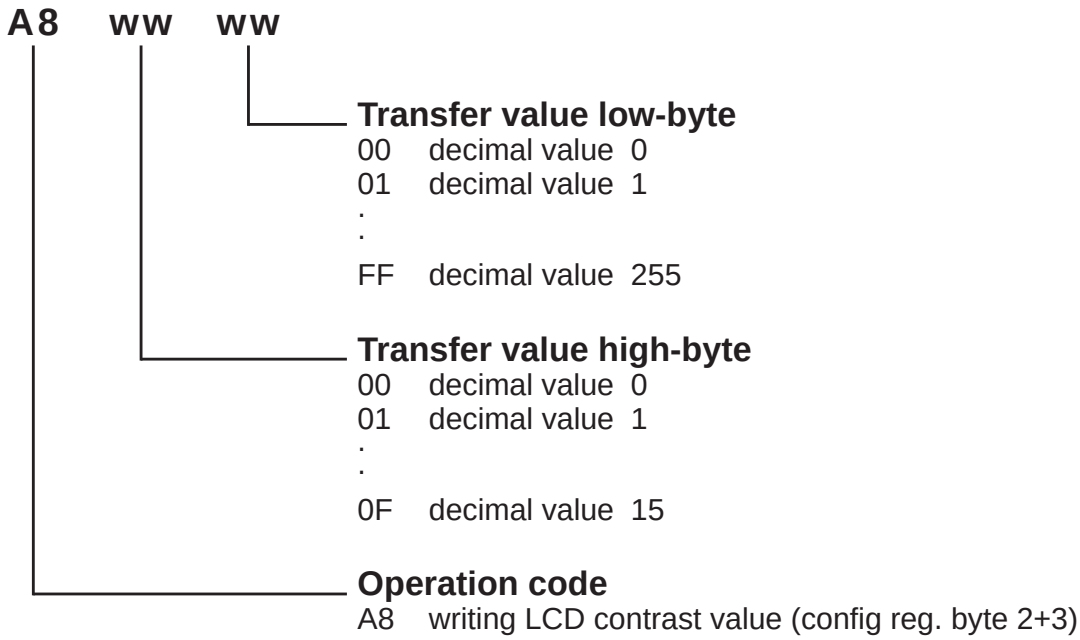
6.8.12 Writing Display Mode Byte*



The Display mode byte determines, which data is displayed in a flashing or rotational mode, respectively, alternating to a communication or refresh display

*: EXDUL-316E only

6.8.13 Write LCD Contrast Value*



Contrast value = transfer value high-byte x 256 + transfer value low-byte (0F FF = 4095)

Example:
Display contrast peak value (maximum brightness)

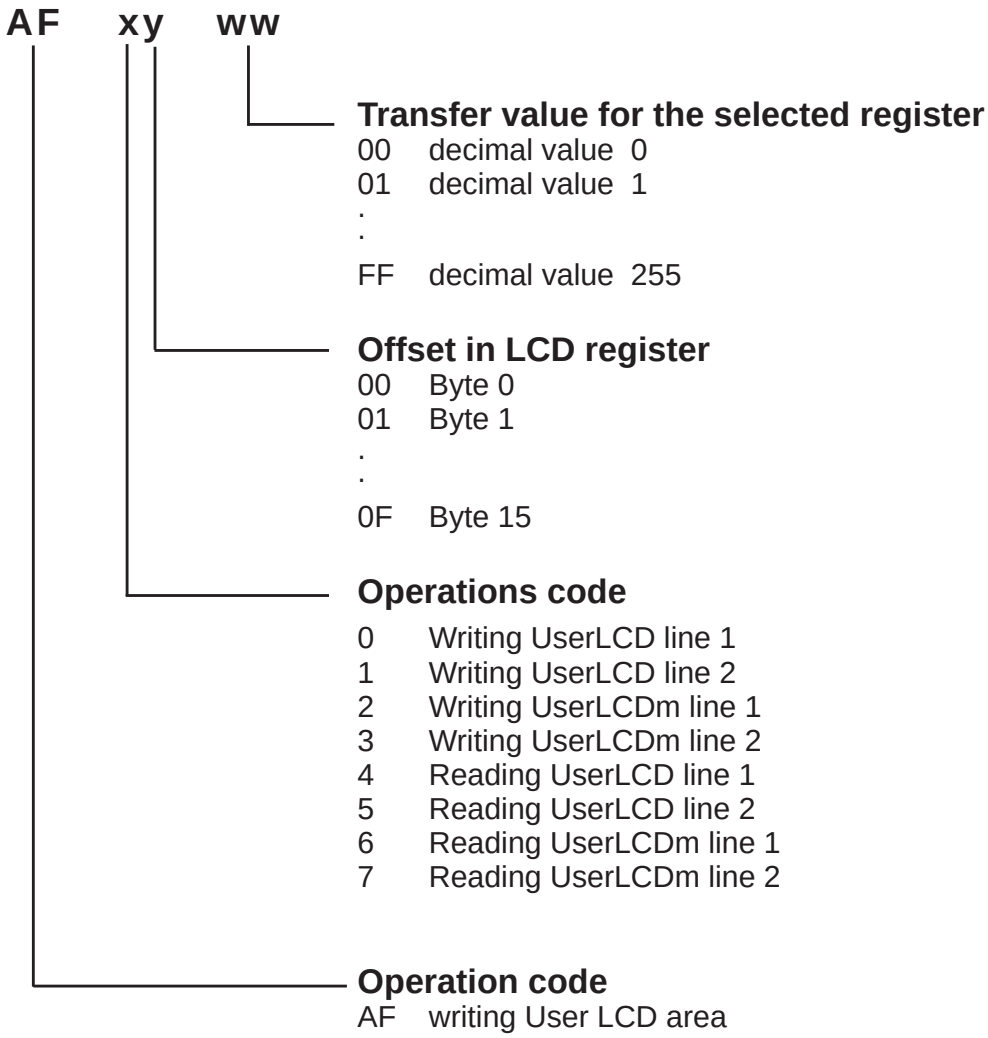
Writing	**Response**
$A8_{hex}$ $0F_{hex}$ FF_{hex}	$A8_{hex}$ $0F_{hex}$ FF_{hex}

Display contrast average value

Writing	**Response**
$C2_{hex}$ 07_{hex} FF_{hex}	$C2_{hex}$ 07_{hex} FF_{hex}

*: EXDUL-316E only

6.8.14 Writing in User LCD Area*



*: EXDUL-316E only

For example:
Type STEUERUNG into User LCD line 1:

Writing	**Response**
AF_{hex} 00_{hex} 53_{hex}	AF_{hex} 00_{hex} 53_{hex}
AF_{hex} 01_{hex} 54_{hex}	AF_{hex} 01_{hex} 54_{hex}
AF_{hex} 02_{hex} 45_{hex}	AF_{hex} 02_{hex} 45_{hex}
AF_{hex} 03_{hex} 55_{hex}	AF_{hex} 03_{hex} 55_{hex}
AF_{hex} 04_{hex} 45_{hex}	AF_{hex} 04_{hex} 45_{hex}
AF_{hex} 05_{hex} 52_{hex}	AF_{hex} 05_{hex} 52_{hex}
AF_{hex} 06_{hex} 55_{hex}	AF_{hex} 06_{hex} 55_{hex}
AF_{hex} 07_{hex} $4E_{hex}$	AF_{hex} 07_{hex} $4E_{hex}$
AF_{hex} 08_{hex} 47_{hex}	AF_{hex} 08_{hex} 47_{hex}

The command $A3_{hex}$ 03_{hex} 01_{hex} induces the display to show the UserLCD area

*: EXDUL-316E only

7. Specifications

Digital Inputs by Optocoupler

Channels	10 inputs with galvanic isolation common ground connection (cathodes connected) 2 of the channels programmable as counting inputs
Galvanic isolation	optocouplers with integrated Schmitt-Trigger function
Overvoltage protection	diodes
Input voltage range	high = 10 .... 30 V low = 0 .... 3 V
Input frequency	max. 10 kHz

Digital outputs by optocoupler

Channels	8 outputs with galvanic isolation common ground connection (emitter connected)
galvanic isolation	high-capacity optocouplers
Reverse polarity protection	diodes
Output current	max. 150mA
Switching voltage	max. 50 V

Counters

Channels	2 programmable digital 16bit counters (2 of the 10 input optocouplers are assigned)
Counting frequency	max. 5 kHz

LCD display (EXDUL-316E only)

Display	Matrix display with 2 lines and 16 columns displaying 16 characters on each line
Programmable as	I/O status display User LCD display counter display

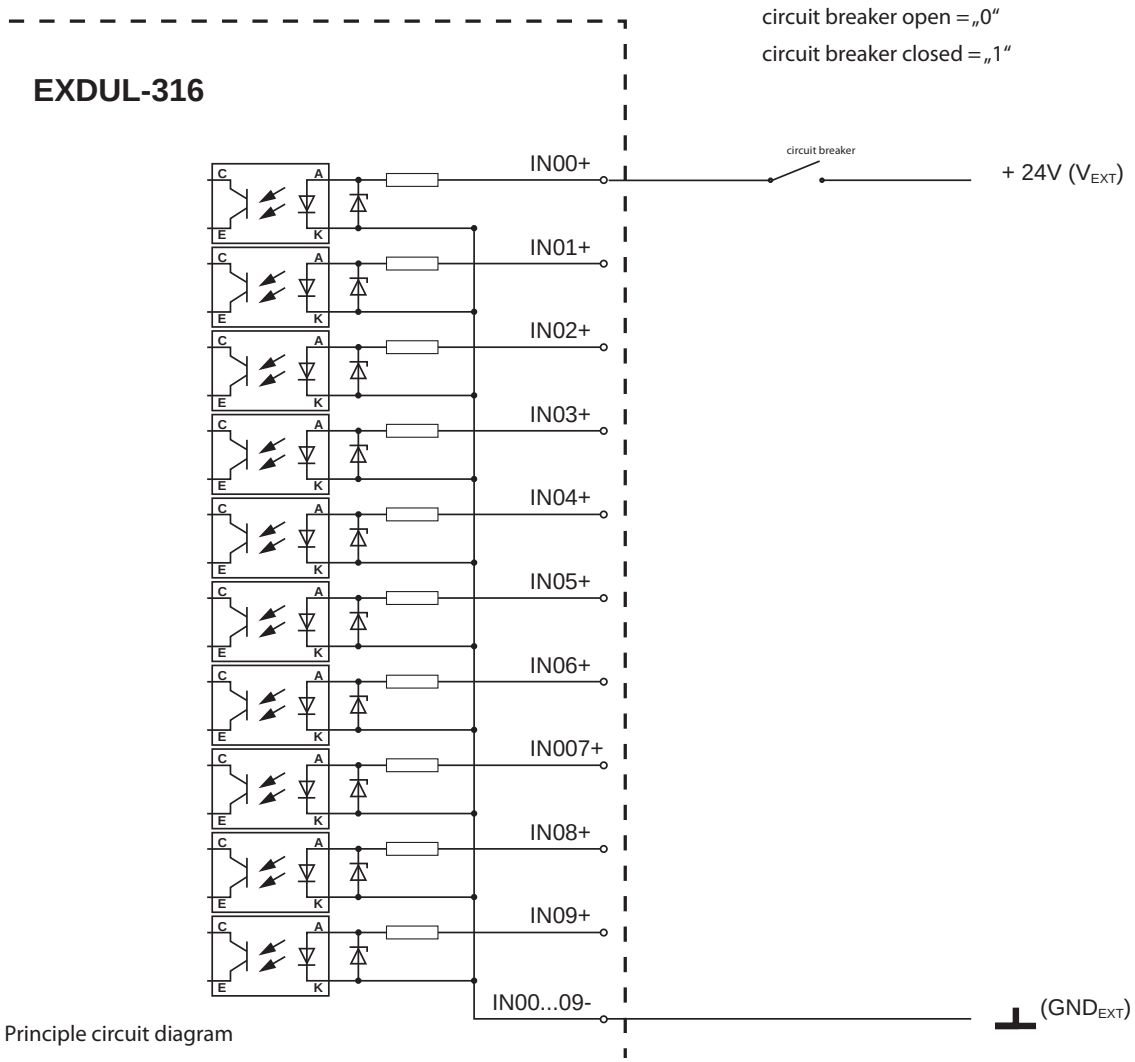
Operating voltage

Internal via USB port	+5 V (t may be necessary to configure your operating system software to obtain appropriate power requirements)
External voltage source	+ 10 V .... +24 V (using an external power supply will automatically interrupt the power supply via USB port)

USB Interface	USB 2.0 compatible USB connection Plug-and-Play (hot pluggable)
Module Connections	1 * 24-pin screw terminal 1 * USB port type B
USB Connecting Cable	1 * USB plug type A 1 * USB plug type B
Product Dimensions	105 mm x 89 mm x 59 mm (l x b x h)
Casing	Plastic casing with integrated snap-on technology for DIN EN top-hat rail mounting Suitable for control and engineering technology mounted to control and distribution boxes, surface mounting or mobile use on a desk.

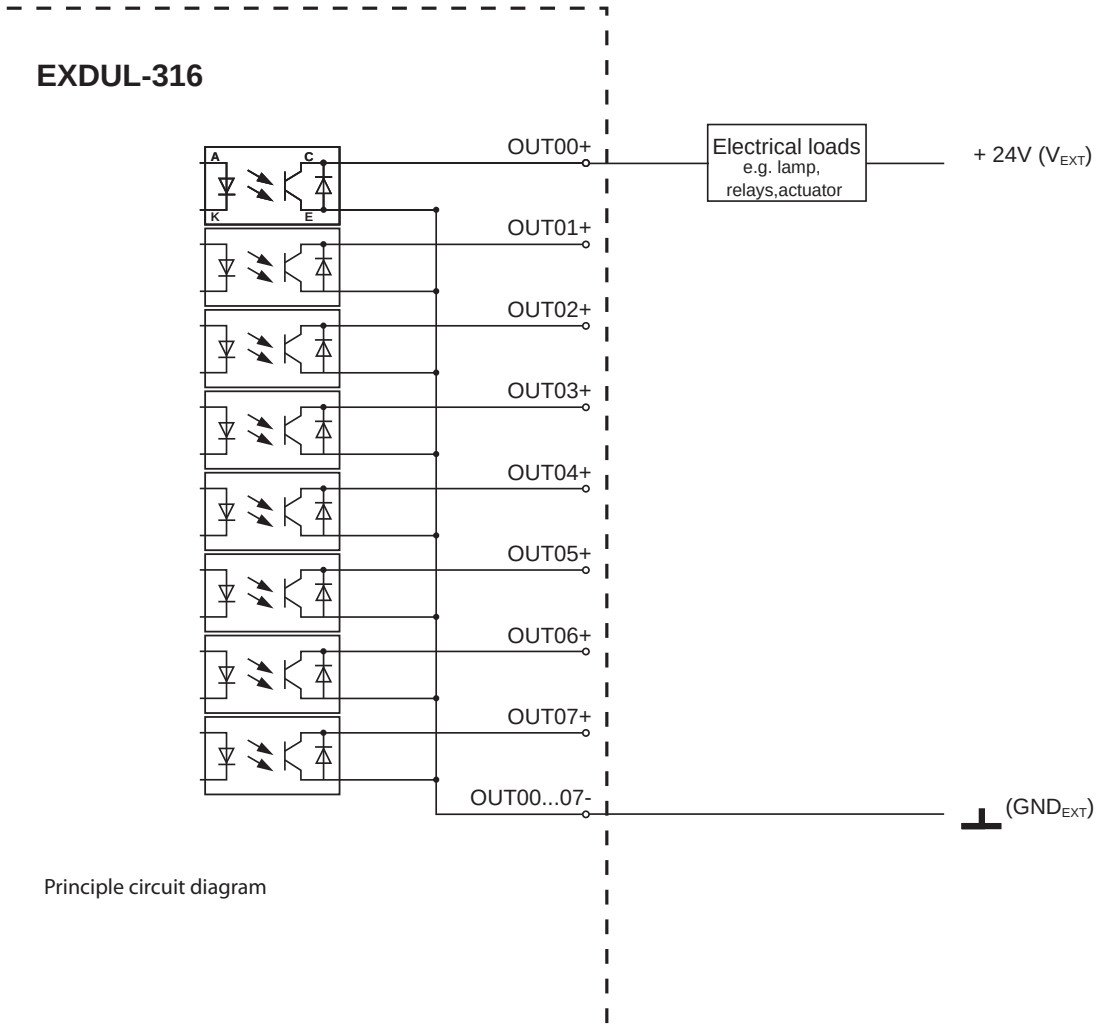
8. Examples for Circuitry

8.1 Input Circuit



Principle circuit diagram

8.2 Output Circuit



Principle circuit diagram

9. ASCII Table

Hex	Dec	Binary	sign
00	0	00000000	
01	1	00000001	
02	2	00000010	
03	3	00000011	
04	4	00000100	
05	5	00000101	
06	6	00000110	
07	7	00000111	
08	8	00001000	
09	9	00001001	
0A	10	00001010	
0B	11	00001011	
0C	12	00001100	
0D	13	00001101	
0E	14	00001110	
0F	15	00001111	
10	16	00010000	
11	17	00010001	
12	18	00010010	
13	19	00010011	
14	20	00010100	
15	21	00010101	
16	22	00010110	
17	23	00010111	
18	24	00011000	
19	25	00011001	
1A	26	00011010	
1B	27	00011011	
1C	28	00011100	
1D	29	00011101	
1E	30	00011110	
1F	31	00011111	
20	32	00100000	[blank]
21	33	00100001	!
22	34	00100010	”
23	35	00100011	#
24	36	00100100	$
25	37	00100101	%
26	38	00100110	&
27	39	00100111	’

Hex	Dec	Binary	sign
28	40	00101000	(
29	41	00101001	)
2A	42	00101010	*
2B	43	00101011	+
2C	44	00101100	,
2D	45	00101101	-
2E	46	00101110	.
2F	47	00101111	/
30	48	00110000	0
31	49	00110001	1
32	50	00110010	2
33	51	00110011	3
34	52	00110100	4
35	53	00110101	5
36	54	00110110	6
37	55	00110111	7
38	56	00111000	8
39	57	00111001	9
3A	58	00111010	:
3B	59	00111011	;
3C	60	00111100	<
3D	61	00111101	=
3E	62	00111110	>
3F	63	00111111	?
40	64	01000000	@
41	65	01000001	A
42	66	01000010	B
43	67	01000011	C
44	68	01000100	D
45	69	01000101	E
46	70	01000110	F
47	71	01000111	G
48	72	01001000	H
49	73	01001001	I
4A	74	01001010	J
4B	75	01001011	K
4C	76	01001100	L
4D	77	01001101	M
4E	78	01001110	N
4F	79	01001111	O

Hex	Dec	Binary	sign
50	80	01010000	P
51	81	01010001	Q
52	82	01010010	R
53	83	01010011	S
54	84	01010100	T
55	85	01010101	U
56	86	01010110	V
57	87	01010111	W
58	88	01011000	X
59	89	01011001	Y
5A	90	01011010	Z
5B	91	01011011	[
5C	92	01011100	
5D	93	01011101	]
5E	94	01011110	^
5F	95	01011111	_
60	96	01100000	`
61	97	01100001	a
62	98	01100010	b
63	99	01100011	c
64	100	01100100	d
65	101	01100101	e
66	102	01100110	f
67	103	01100111	g
68	104	01101000	h
69	105	01101001	i
6A	106	01101010	j
6B	107	01101011	k
6C	108	01101100	l
6D	109	01101101	m
6E	110	01101110	n
6F	111	01101111	o
70	112	01110000	p
71	113	01110001	q
72	114	01110010	r
73	115	01110011	s
74	116	01110100	t
75	117	01110101	u
76	118	01110110	v
77	119	01110111	w
78	120	01111000	x
79	121	01111001	y
7A	122	01111010	z
7B	123	01111011	{

Hex	Dec	Binary	sign
7C	124	01111100	|
7D	125	01111101	}
7E	126	01111110	
7F	127	01111111	
80	128	10000000	
81	129	10000001	
82	130	10000010	
83	131	10000011	
84	132	10000100	
85	133	10000101	
86	134	10000110	
87	135	10000111	
88	136	10001000	
89	137	10001001	
8A	138	10001010	
8B	139	10001011	
8C	140	10001100	
8D	141	10001101	
8E	142	10001110	
8F	143	10001111	
90	144	10010000	
91	145	10010001	
92	146	10010010	
93	147	10010011	
94	148	10010100	
95	149	10010101	
96	150	10010110	
97	151	10010111	
98	152	10011000	
99	153	10011001	
9A	154	10011010	
9B	155	10011011	
9C	156	10011100	
9D	157	10011101	
9E	158	10011110	
9F	159	10011111	
A0	160	10100000	
A1	161	10100001	
A2	162	10100010	
A3	163	10100011	
A4	164	10100100	
A5	165	10100101	
A6	166	10100110	
A7	167	10100111	

Hex	Dec	Binary	sign
A8	168	10101000	
A9	169	10101001	
AA	170	10101010	
AB	171	10101011	
AC	172	10101100	
AD	173	10101101	
AE	174	10101110	
AF	175	10101111	
B0	176	10110000	
B1	177	10110001	
B2	178	10110010	
B3	179	10110011	
B4	180	10110100	
B5	181	10110101	
B6	182	10110110	
B7	183	10110111	
B8	184	10111000	
B9	185	10111001	
BA	186	10111010	
BB	187	10111011	
BC	188	10111100	
BD	189	10111101	
BE	190	10111110	
BF	191	10111111	
C0	192	11000000	
C1	193	11000001	
C2	194	11000010	
C3	195	11000011	
C4	196	11000100	
C5	197	11000101	
C6	198	11000110	
C7	199	11000111	
C8	200	11001000	
C9	201	11001001	
CA	202	11001010	
CB	203	11001011	
CC	204	11001100	
CD	205	11001101	
CE	206	11001110	
CF	207	11001111	
D0	208	11010000	
D1	209	11010001	
D2	210	11010010	
D3	211	11010011	

Hex	Dec	Binary	sign
D4	212	11010100	
D5	213	11010101	
D6	214	11010110	
D7	215	11010111	
D8	216	11011000	
D9	217	11011001	
DA	218	11011010	
DB	219	11011011	
DC	220	11011100	
DD	221	11011101	
DE	222	11011110	
DF	223	11011111	
E0	224	11100000	
E1	225	11100001	
E2	226	11100010	
E3	227	11100011	
E4	228	11100100	
E5	229	11100101	
E6	230	11100110	
E7	231	11100111	
E8	232	11101000	
E9	233	11101001	
EA	234	11101010	
EB	235	11101011	
EC	236	11101100	
ED	237	11101101	
EE	238	11101110	
EF	239	11101111	
F0	240	11110000	
F1	241	11110001	
F2	242	11110010	
F3	243	11110011	
F4	244	11110100	
F5	245	11110101	
F6	246	11110110	
F7	247	11110111	
F8	248	11111000	
F9	249	11111001	
FA	250	11111010	
FB	251	11111011	
FC	252	11111100	
FD	253	11111101	
FE	254	11111110	
FF	255	11111111	

10. Release Notes

Firmware Version 4.05

- speed optimization
- command reset deleted
- modifications upon accessing to LCD display
- new commands for accessing to single optocoupler channels and for reading of the optocoupler output port

11. Product Liability Act

Information for Product Liability

The Product Liability Act (Act on Liability for Defective Products - ProdHaftG) in Germany regulates the manufacturer‘s liability for damages caused by defective products.

The obligation to pay compensation can be given, if the product’s presentation could cause a misconception of safety to a non-commercial end-user and also if the end-user is expected not to observe the necessary safety instructions handling this product.

It therefore always must be verifiable, that the end-user was made familiar with the safety rules.

In the interest of safety, please always advise your non-commercial customer of the following safety instructions:

Safety instructions

The valid VDE-instructions must be observed, when handling products that come in contact with electrical voltage.

Especially the following instructions must be observed:
VDE100; VDE0550/0551; VDE0700; VDE0711; VDE0860.
The instructions are available from:
Vde-Verlag GmbH
Bismarckstr. 33
10625 Berlin

* unplug the power cord before you open the unit or make sure, there is no current to/in the unit.

* You only may start up any components, boards or equipment, if they are installed inside a secure touch-protected casing before. During installation there must be no current to the equipment.

* Make sure that the device is disconnected from the power supply before you use any tools on any components, boards or equipment. Any electric charges stored in any components in the device are to be discharged prior.

* Voltaged cables or wires, which are connected with the unit, the components or the boards, must be tested for insulation defects or breaks. In case of any defect the device must be immediately taken out of operation until the defective cables are replaced.

* When using components or boards you must strictly comply with the characteristic data for electrical sizes shown in the corresponding description

* As a non-commercial end-user, if it is not clear whether the electrical characteristic data given in the provided description is valid for a component you must consult a specialist.

The compliance with building and safety instructions of every kind (VDE, TÜV, industrial injuries corporation, etc.) are entirely the responsibility of the user/customer.

12. CE Declaration of Conformity

This is to certify, that the products

EXDUL-316E, EDV-No. A-384340
EXDUL-316S, EDV-No. A-384320

comply with the requirements of the EC directives. This declaration will lose its validity, if the instructions given in this manual for the intended use of the products are not fully complied with.

EN 5502 Klasse B
IEC 801-2
IEC 801-3
IEC 801-4
EN 50082-1
EN 60555-2
EN 60555-3

The following manufacturer is responsible for this declaration:

Messcomp Datentechnik GmbH
Neudecker Str. 11
83512 Wasserburg

given by

Dipl.Ing.(FH) Hans Schnellhammer

Wasserburg, 29.10.2008

Reference System for Intended Use

The multi functional modules EXDUL-316E and EXDUL-316S are not stand-alone devices. The CE-conformity only can be assessed when using additional computer components simultaneously. Thus the CE conformity only can be confirmed when using the following reference system for the intended use of the multi functional modules:

Control Cabinet:	Vero IMRAK 3400	804-530061C 802-563424J 802-561589J
19“ Casing:	Vero PC Casing	145-010108L
19“ Casing:	Additional Electronic	519-112111C
Motherboard:	GA-586HX	PIV 1.55
Floppy-Controller:	on Motherboard	
Floppy:	TEAC	FD-235HF
Grafic Card:	Advantech	PCA-6443
PC Card:	EXDUL-316E EXDUL-316S	A-384340 A-384320