EXDUL-371E

EDP No.: A-381715

EXDUL-371S

EDP No.: 381710

8 A/D inputs 12bit (single ended) or
4 A/D outputs12bit (differential)
2 D/A outputs12bit
3 optocoupler isolated digital inputs
2 optocoupler isolated digital outputs
16bit counter
LCD display (EXDUL-371E only)

wasco®

user‘s guide

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Important Information:

This manual was made up for modules EXDUL-371E and EXDUL-371S. EXDUL-371E additionally provides an LCD display, all other functions are identical. For EXDUL-371S all commands and functions concerning the LCD display are not applicable.

Table of Contents

1. Introduction

EXDUL-371E provides either eight single ended or four differential 12bit A/D input channels. You can adjust the input voltage ranges to be unipolar (0-5 V, 0-10 V) as well as bipolar (+/-2.5 V, +/-5 V, +/-10 V).
The conversion process including configuration of the A/D components (selection of range and channel) is triggered by software commands. It is also possible to select output voltage ranges of both of the two 12bit D/A outputs either unipolar (0-5 V, 0-10 V) or bipolar (+/-5 V, +/-10 V) via software.
Additionally the module provides three digital inputs and two digital outputs which are opto-isolated galvanically separated by high-quality optocouplers and equipped with additional protection diodes. One of the digital inputs can be used as a 16bit counter. All input optocouplers are fitted out with integrated schmitt trigger function. Special high power output optocouplers manage a maximum switching current of up to 150 mA. The programmable LCD display shows either digital I/O status information or programmable user-specific data.
An external power supply powers the module with the required operating voltage. The module provides a 24pin screw terminal block for connecting the external power supply as well as the input and output optocouplers.
The compact chassis enables the module to be used as a portable device with a notebook. For mechanical or control engineering it can also be easily wall mounted or attached to DIN mounting rail.

2. Connection Terminals

2.1 Terminal Assignment of CN1

AIN01+	2	1	AIN00+
AIN03+	4	3	AIN02+
AIN05+	6	5	AIN04+
AIN07+	8	7	AIN06+
DAGND	10	9	ADGND
AOUT01+	12	11	AOUT00+
OUT00-	14	13	OUT00+
OUT01-	16	15	OUT01+
IN00-	18	17	IN00+ / counter
IN01-	20	19	IN01+
IN02-	22	21	IN02+
GND_EXT	24	23	Vcc_EXT

Vcc_EXT:
Connector for external power supply
GND_EXT:
Ground connection when external power supply is used

3. System Components

3.1 Block Diagram EXDUL-371E

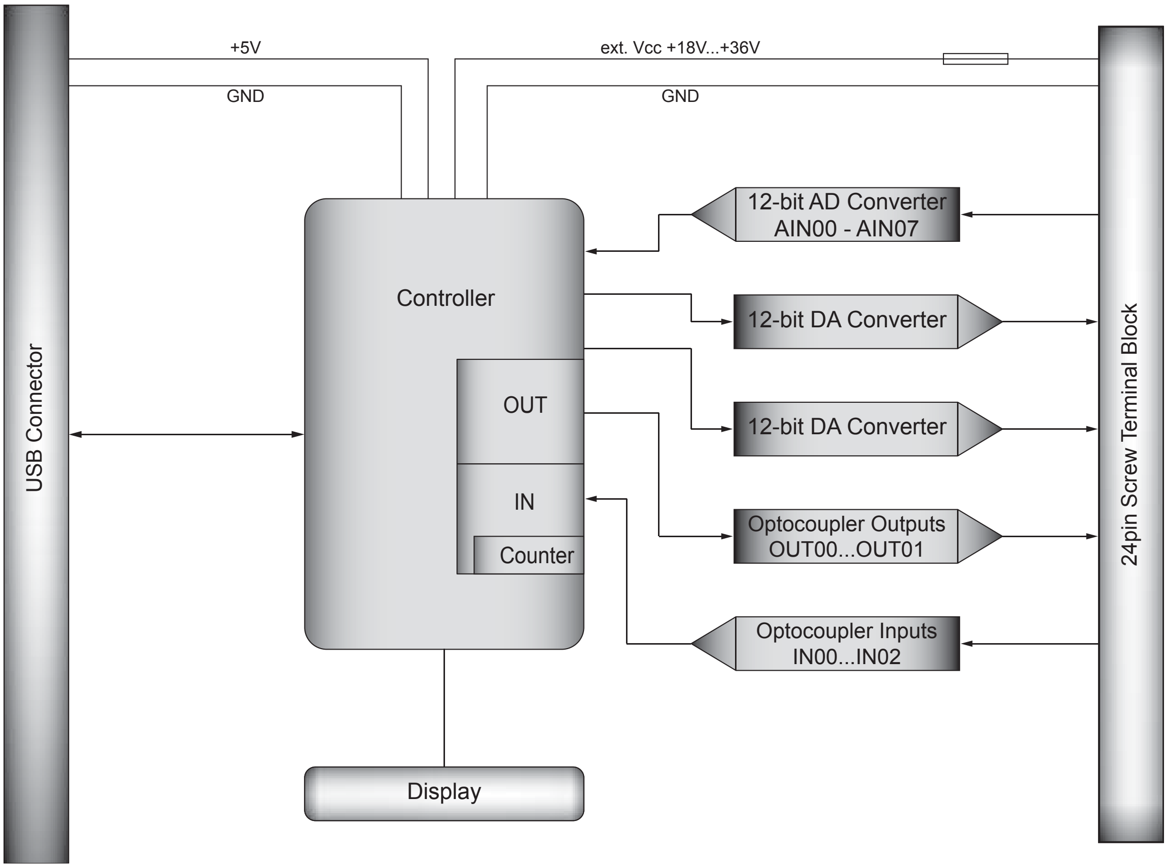

Figure 3.1 : Block Diagram EXDUL-371E

3.2 Block Diagram EXDUL-371S

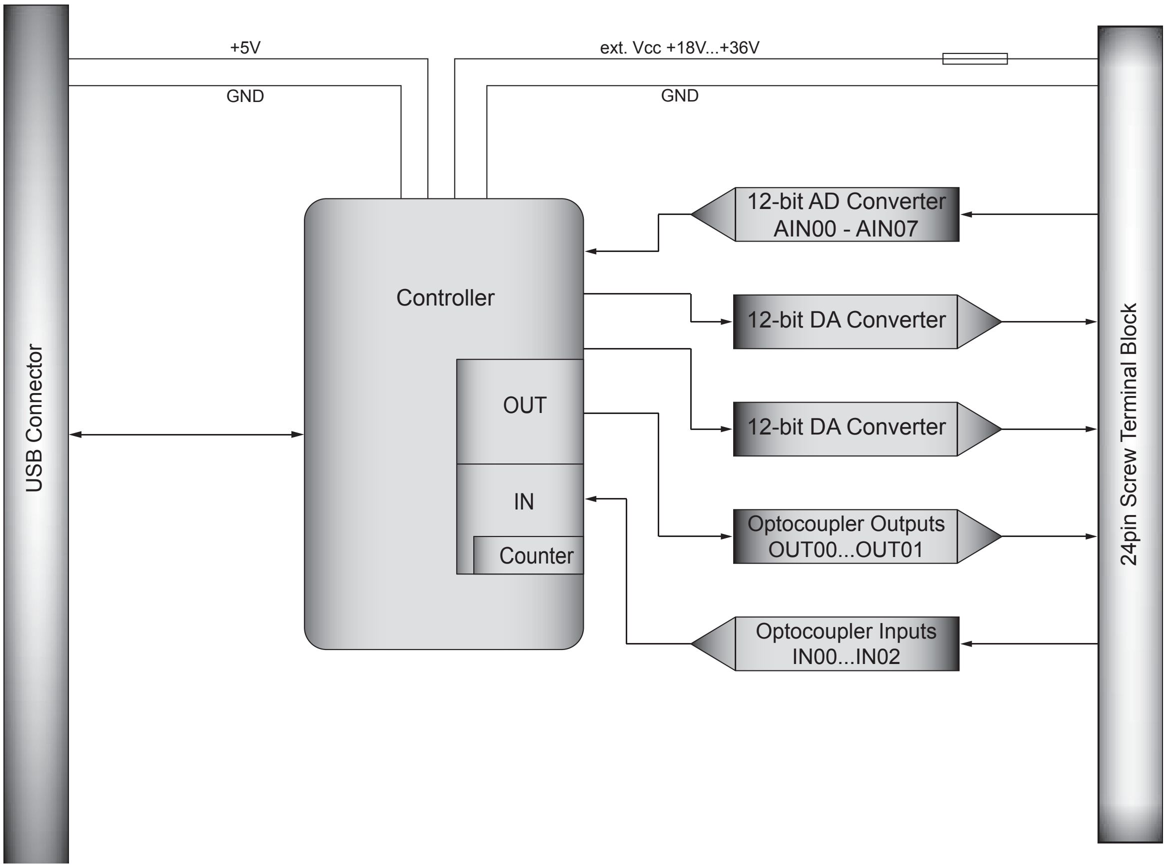

Figure 3.2 : Block Diagram EXDUL-371S

3.3 A/D Inputs
8 inputs single-ended (se)
or 4 inputs differential (diff)
or combined se/diff software selectable
Resolution: 12 bit
Input voltage range:
unipolar: 0..5 Volt, 0..10 Volt
bipolar: +/-5 Volt, +/-10 Volt
Absolute Accuracy: typ 0.1 % +/- 1 LSB
Input resistor: unipolar 42 kΩ
bipolar 31 kΩ
Over voltage protection: 20V
Measuring cycle: max. 1 ms

3.4 D/A Outputs
2 outputs
Resolution: 12 bit
AA: typ 0.1 % +/- 1 LSB
Output voltage range
unipolar: 0..5 Volt, 0..10 Volt
bipolar: +/-2.5 Volt, +/-5 Volt, +/-10 Volt
Output current: max +/-5 mA

3.5 Optocoupler Inputs
3 channels, galvanically separated
1 of the channels progammable as a counter input
Optocoupler with integrated schmitt trigger function
Over voltage protection diodes
Input voltage range
high = 10..30 Volt
low = 0..3 Volt
Input frequency: max. 10 kHz

3.6 Optocoupler Outputs
2 channels, galvanically isolated
High capacity optocouplers
Reverse polarity protection
Output current: max. 150 mA
Switching voltage: max. 50 V

3.7 Counter
1 programmable digital 16bit counter (allocated to the first optocoupler input)
counting frequency: max. 5 kHz

3.8 LCD Display
Matrix display with 2 lines and 16 columns displaying 16 characters each line
Programmable to display user specific data or I/O status

4. Initializing

Connecting to a computer is made quickly and easily in a Plug-and-Play manner via USB port. An external voltage source powers the module with the required operating voltage.

4.1 Connecting to a USB Port

The EXDUL-371E / EXDUL-371S provides a USB 2.0 interface and can be connected directly to the computer or a USB hub using the enclosed USB connecting cable. The connection supports hot-plug function, that means, it is possible to connect the module even while system is operating.

4.2 Power Supply via USB Port

If only the USB port is used to power the device (no other voltage source is connected) only certain basic functions are supported. It is possible to communicate via USB and write or read the optocoupler inputs or outputs, but all analog components and the LCD display are not placed at the disposal. The full scope of features of the EXDUL-371E /EXDUL-371S can only be used, if the module is powered by an external power supply.

4.3 External Power Supply

EXDUL-371E / EXDUL-371S firmware automatically detects when an external voltage source is connected. Applying a voltage between +18V and +36 V across Vcc_EXT and GND_EXT (see figure terminal assignment) immediately causes 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-371E only)

During initializing resp. starting the module the display shows the module name as an information message. After five seconds the module name will be replaced by either digital I/O status display or UserLCD display depending upon LCD display configuration.

4.5 LCD display while operating (EXDUL-371E only)

Starting the module the display switches from info display to digital I/O status display or UserLCD display after five seconds 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 modus is selected by calling the designated command before the last shutdown of the system, values from memory areas UserLCD1m and UserLCD2m are indicated instead of I/O status display. Data from both registers are indicated until new user data are written to the display UserLCD line1 and UserLCD line2. To avoid a „screen-burn“ while in operation the display switches from I/O status or UserLCD display to info display for five seconds approximately every minute.

5. 8 A/D Inputs 12bit

The EXDUL-371 provides 8 single ended or 4 multiplexed 12bit A/D input channels with programmable input voltage range. When conversion is triggered, the computer will transfer configuration data for conversion (channel, range) in the form of two Bytes. After error corrections (such as an offset error) the module submits a measured value transformed in a voltage value in µV as a response.

5.1 Single ended Operation

In single ended operating mode max. 8 input channels are at your disposal. All input voltage ranges are measured against ground of the A/D components (see figure 5.1). Find a more detailed description of circuitry in chapter 10.4

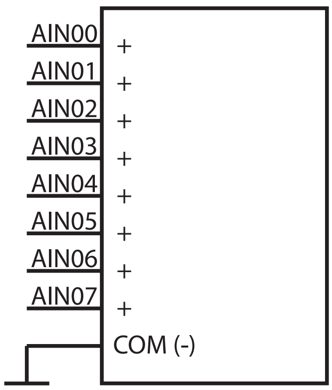

Figure 5.1 A/D converter single ended

As mentioned before, one Byte for channel selection will be added to the command for measuring the voltage.
Please see table 5.1 to choose the proper channel for each value at single ended measurement.

Channel Byte	Channel selection single ended								
	1	2	3	4	5	6	7	8	A G N D
0_{dez}	+								-
1_{dez}		+							-
2_{dez}			+						-
3_{dez}				+					-
4_{dez}					+				-
5_{dez}						+			-
6_{dez}							+		-
7_{dez}								+	-

Table 5.1 A/D converter single ended measurement

Example: For a single ended measurement of channel 3 the voltage source's positive pole has to be connected to AIN03 and the negative pole to AGND. The channel Byte of the command contains the value 2_{dez}.

5.2 Differential Operation

In differential operating mode max. 4 input channels are at your disposal. In differential mode each channel provides one positive and one negative input (see figure 5.2-1). Please note, all channels must be referenced to the ground (AGND) as well. Find a more detailed description of circuitry in chapter 10.5.

A differential measurement can reduce commonly occurring noisy voltage on both of the signal lines and analog ground.

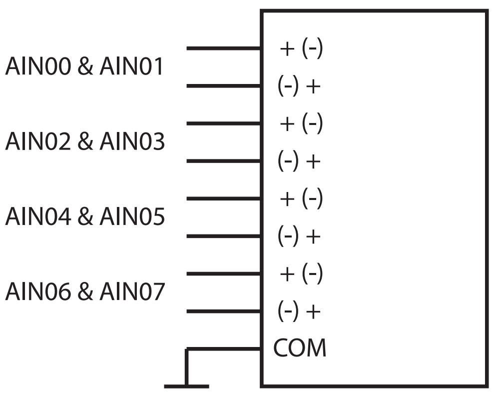

Figure 5.2-1
A/D converter differential measurement

Here too, the proper channel is selected likewise via the channel byte added to the command for measuring the voltage. You can find appropriate values in following table:

Channel Byte	Differential channel selection								
	1	2	3	4	5	6	7	8	AGND
8_{dez}	+	-							
9_{dez}			+	-					
10_{dez}					+	-			
11_{dez}							+	-	
12_{dez}	-	+							
13_{dez}			-	+					
14_{dez}					-	+			
15_{dez}							-	+	

Table 5.2 A/D converter differential measurement

Serving as an example now the difference between two voltages shall be measured at the inputs AIN05 and AIN06. For this you have to connect the first voltage to AIN05 and the second one to AIN06 (see figure 5.2-2).
Caution: if you run a unipolar measurement please make sure, that the one voltage refers to the „+“ in the table, whichever is the higher!
Now either the value 10_{dez} or the value 14_{dez} when measured bipolar (a negative differential voltage results) can be used as channel byte.

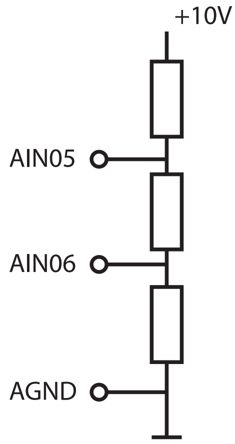

Figure 5.2-2

i n

Caution: please take particular care to ensure, that the difference between the inputs is limited to the input voltage range at the highest.
An input voltage of +10V at AIN05 and an output voltage of -10V at AIN06 would result in a difference of +20V which is not measurable.

5.3 Combination of single ended and differential Measurement

The measurement methods can also be varied channel by channel when required or even changed „on the fly“ between each single measurement as shown in figure 5.3.

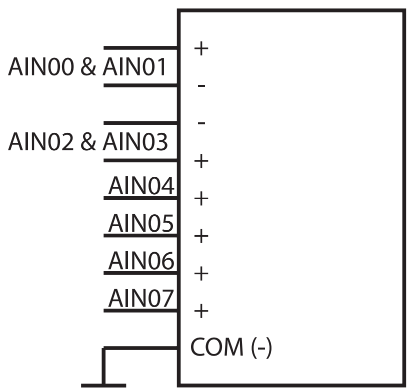

Figure 5.3

5.4 Input Voltage Range

To measure a voltage several input voltage ranges are at your disposal. So you can run the measurement unipolar (0-5V, 0-10V) or bipolar (+/-5V, +/-10V). Together with its measurement command to the module the computer will pass over a range byte to select the required voltage range.
Following compilation shows each single ranges and the corresponding byte values:

Input voltage range	
Byte value	unipolar
0	0-10V
1	0-5V
	bipolar
2	+/-10V
3	+/-5V

Table 5.4 A/D converter input voltage ranges

5.5 Adjustment of the A/D Inputs

The module is adjusted at an ambient temperature of about 20°C when finally tested by our production department. If there should be a considerable divergence in temperature at the end-user, the A/D component of the module can be adjusted to the ambient conditions subsequently. Please find the required software on the enclosed CD or visit our website.

6. 2 D/A Outputs 12bit

The EXDUL-371 provides two digital/analog converters. Both of them can operate with different output voltage ranges. You can use unipolar (0-5V, 0-10V) as well as bipolar ranges (+/-2.5V, +/-5V, +/-10V).

6.1 Output Voltage Range

Both of the D/A converter provide a variable output voltage range. You can choose between unipolar or bipolar ranges by a configuration byte (range byte), which is added to the conversion command triggered by the computer to the module. This selection can be changed „on-the-fly“ , i.e. you can select the range bipolar +/-10V for the one voltage issue (for example -7V) and the range bipolar +/-5V for a subsequent issue (for example -3V), to achieve a higher resolution.
Please see appropriate allocation of range byte value and output voltage range in following table:

Output voltage range	
range byte	unipolar
0	0-10V
1	0-5V
	bipolar
2	+/-10V
3	+/-5V
4	+/-2.5V

Table 6.1 D/A converter output voltage ranges

6.2 Adjustment of the D/A Outputs

The module is adjusted at an ambient temperature of about 20°C when finally tested by our production department. If there should be a considerable divergence in temperature at the end-user, the D/A component of the module can be adjusted to the ambient conditions subsequently. Please find the required software on the enclosed CD or visit our website.

7. Installing the Windows® Drivers

When you connect the USB module EXDUL-371E / EXDUL-371S to your PC for the first time, Windows® automatically will detect a new hardware and will search for a suitable driver.

To install the driver indicate the directory and setup file called „wascoxmfe_v0**x**.inf“ to the windows hardware wizard (fill in the version number of the INF file instead of x, for example wascoxmfe_v0**6**.inf)

Having updated the driver database the hardware wizard will inform you of the successful driver installation.

The Windows® Device Manager will now show your USB module EXDUL-371E / EXDUL-371S as a “Wasco-USB-Kommunikationsport COMx“ in its directory connections tree (COM/LTP). All Windows® software can access to the virtual interface as if it were a real COM port.

8. Programming under Windows®

8.1 Overwiew

After successful installation the USB module EXDUL-371E / EXDUL-371S is shown as a “Wasco-USB-Kommunikationsport COMx“ in your Windows® Device Manager. This is a CDC device (Communications Device Class), that is adressed via a virtual COM port.
This virtual COM port operates like a normal COM interface and can be accessed by default Windows® drivers, it is not necessary to install any additional drivers.

8.2 Communication with EXDUL-371

Data is exchanged by transmitting and receiving a block of 23 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.

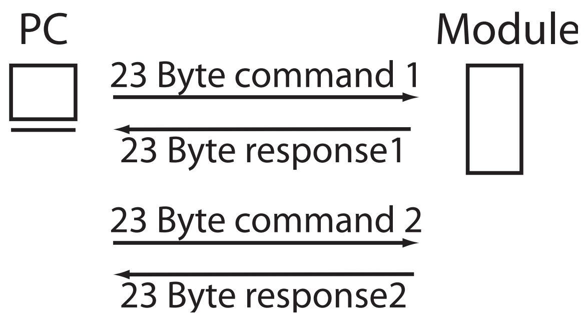

Figure 8.2 Communications model

8.3 Windows® Functions for Programming

You can program EXDUL-371E / EXDUL-371S either via WIN32 API functions or very conveniently via an already existing serial port object in a programming language. You can find sample programs 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 parameters of the device)

8.4 Register HW Identification and Serial Number

Byte	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
HW identifier	E	X	D	U	L	-	3	7	1	v	1	.	0	2		
	45_{hex}	58_{hex}	44_{hex}	55_{hex}	$4C_{hex}$	$2D_{hex}$	33_{hex}	37_{hex}	31_{hex}	76_{hex}	31_{hex}	$3E_{hex}$	30_{hex}	32_{hex}	20_{hex}	20_{hex}
S/N	1	0	4	4	0	2	6									
	01_{hex}	00_{hex}	04_{hex}	04_{hex}	00_{hex}	02_{hex}	06_{hex}	FF_{hex}	FF_{hex}	FF_{hex}	FF_{hex}	FF_{hex}	FF_{hex}	FF_{hex}	FF_{hex}	FF_{hex}

Table 8.4 Register HW identification and serial number

The module name as well as the firmware version is stored in the HW identification register and can be used for verifying the product identity. Hardware identification ends with a blank.

The table above serves as an example for module EXDUL-371 with firmware version 1.02. The line HW identification shows each Hex value and the corresponding ASCII character.

Register Serial Number can only be read by the user. The serial number in the table above serves as a format example. The line S/N displays each Hex value and the corresponding ASCII character for serial number 1044026.

8.5 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}

Table 8.5 Memory areas

In each register UserA, UserB, UserLCD1m* and UserLCD2m* 16 digits (16 Byte) are at your disposal for your own use. Data remains stored when you switch off, registers 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 table above shows each Hex value and the corresponding ASCII character.

*: Applicable for EXDUL-371E only!

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If you start the module in UserLCD mode activated, the EXDUL-371E displays data from memory register UserLCD1m* and UserLCD2m* untill new user data is written to the LCD display in lines UserLCD-line1 and UserLCD-line2

8.6 Display Register UserLCD-line1*, UserLCD-line2* and LCD Contrast*

If UserLCD mode is activated you can write to both of the UserLCD-line1 and UserLCD-line2 any 16 characters. Once entered this will be displayed instead of 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.

8.7 Command and Data Format

Data is exchanged by transmitting and receiving strings. Every transmitting or receiving string consists of 23 bytes (1 byte per character). Each string comprises of four command bytes, 16 Data bytes and three error bytes.
Configuration or output commands are confirmed by returning the relevant string. Reading commands are replied by a string with an operation code and the read value.

*: Applicable for EXDUL-371E only!

8.8 Index of Commands

Hex code	Description
0C 00 00 00	Write UserA
0C 00 00 01	Read UserA
0C 00 00 02	Write UserB
0C 00 00 03	Read UserB
0C 00 03 07	Write UserLCD1m
0C 00 03 09	Read UserLCD1m
0C 00 03 08	Write UserLCD2m
0C 00 03 0A	Read UserLCD2m
0C 00 03 00	Write UserLCD-line1
0C 00 03 02	Read UserLCD-line1
0C 00 03 01	Write UserLCD-line2
0C 00 03 03	Read UserLCD-line2
0C 00 03 04	UserLCD mode enable / disable
0C 00 03 05	Read UserLCD mode status
0C 00 03 0B	Write LCD contrast
0C 00 03 0C	Read LCD contrast
0C 00 04 01	Read HW identification
0C 00 05 01	Read serial number
08 00 01 01	Read optocoupler input port
08 00 00 00	Write optocoupler output port
08 00 00 01	Read optocoupler output port (status request)

*: Applicable for EXDUL-371E only!

09 00 00 00	Start counter
09 00 00 01	Stop counter
09 00 00 02	Read counter status
09 00 00 03	Read counter
0A 00 00 01	D/A conversion adjusted
0A 00 00 03	A/D conversion adjusted
0C 00 0C 0F	Factory reset (restore basic status)

8.9 Command Composition

8.9.1 Writing in area UserA and UserB

Example: type character string EXDUL-371 in register UserA and UserB

Byte	Transmission	Response	Description
0	0C	0C	Command code 1st Byte
1	00	00	Command code 2nd Byte
2	00	00	Command code 3rd Byte
3	00 (UserA) 02 (UserB)	00 (UserA) 02 (UserB)	Command code 4th Byte
4	45	45	Data 1st character E_{asci}
5	58	58	Data 2nd character X_{asci}
6	44	44	Data 3rd character D_{asci}
7	55	55	Data 4th character U_{asci}
8	4C	4C	Data 5th character L_{asci}
9	2D	2D	Data 6th character $-_{asci}$
10	33	33	Data 7th character 3_{asci}
11	37	37	Data 8th character 7_{asci}
12	31	31	Data 9th character 1_{asci}
13	20	20	Data 10th character $[blank]_{asci}$
14	20	20	Data 11th character $[blank]_{asci}$
15	20	20	Data 12th character $[blank]_{asci}$
16	20	20	Data 13th character $[blank]_{asci}$
17	20	20	Data 14th character $[blank]_{asci}$
18	20	20	Data 15th character $[blank]_{asci}$
19	20	20	Data 16th character $[blank]_{asci}$
20...22			kept for error code / error detection

8.9.2 Reading from areas UserA and UserB

Example: read character string EXDUL-371 from register UserA and UserB

Byte	Transmission	Response	Description
0	0C	0C	Command code 1st Byte
1	00	00	Command code 2nd Byte
2	00	00	Command code 3rd Byte
3	01 (UserA) 03 (UserB)	01 (UserA) 03 (UserB)	Command code 4th Byte
4	xx	45	Data 1st character E$_{asci}$
5	xx	58	Data 2nd character X$_{asci}$
6	xx	44	Data 3rd character D$_{asci}$
7	xx	55	Data 4th character U$_{asci}$
8	xx	4C	Data 5th character L$_{asci}$
9	xx	2D	Data 6th character -$_{asci}$
10	33	33	Data 7th character 3$_{asci}$
11	37	37	Data 8th character 7$_{asci}$
12	31	31	Data 9th character 1$_{asci}$
13	xx	20	Data 10th character [blank]$_{asci}$
14	xx	20	Data 11th character [blank]$_{asci}$
15	xx	20	Data 12th character [blank]$_{asci}$
16	xx	20	Data 13th character [blank]$_{asci}$
17	xx	20	Data 14th character [blank]$_{asci}$
18	xx	20	Data 15th character [blank]$_{asci}$
19	xx	20	Data 16th character [blank]$_{asci}$
20...22			kept for error code / error detection

8.9.3 Writing in UserLCD1m* and UserLCD2m*

Example: type character string EXDUL-371 in Register UserLCD1m* and UserLCD2m*

Byte	Transmission	Response	Description
0	0C	0C	Command code 1st Byte
1	00	00	Command code 2nd Byte
2	03	03	Command code 3rd Byte
3	07 (UserLCD1m) 08 (UserLCD2m)	07 (UserLCD1m) 08 (UserLCD2m)	Command code 4th Byte
4	45	45	Data 1st character E$_{asci}$
5	58	58	Data 2nd character X$_{asci}$
6	44	44	Data 3rd character D$_{asci}$
7	55	55	Data 4th character U$_{asci}$
8	4C	4C	Data 5th character L$_{asci}$
9	2D	2D	Data 6th character -$_{asci}$
10	33	33	Data 7th character 3$_{asci}$
11	37	37	Data 8th character 7$_{asci}$
12	31	31	Data 9th character 1$_{asci}$
13	20	20	Data 10th character [blank]$_{asci}$
14	20	20	Data 11th character [blank]$_{asci}$
15	20	20	Data 12th character [blank]$_{asci}$
16	20	20	Data 13th character [blank]$_{asci}$
17	20	20	Data 14th character [blank]$_{asci}$
18	20	20	Data 15th character [blank]$_{asci}$
19	20	20	Data 16th character [blank]$_{asci}$
20...22			kept for error code / error detection

*: applicable for EXDUL-371E only

8.9.4 Reading from UserLCD1m* and UserLCD2m*

Example: read character string EXDUL-371 from register UserLCD1m* and UserLCD2m*

Byte	Transmission	Response	Description
0	0C	0C	Command code 1st Byte
1	00	00	Command code 2nd Byte
2	03	03	Command code 3rd Byte
3	09 (UserLCD1m) 0A (UserLCD2m)	09 (UserLCD1m) 0A (UserLCD2m)	Command code 4th Byte
4	xx	45	Data 1st character E_{asci}
5	xx	58	Data 2nd character X_{asci}
6	xx	44	Data 3rd character D_{asci}
7	xx	55	Data 4th character U_{asci}
8	xx	4C	Data 5th character L_{asci}
9	xx	2D	Data 6th character $-_{asci}$
10	xx	33	Data 7th character 3_{asci}
11	xx	37	Data 8th character 7_{asci}
12	xx	31	Data 9th character 1_{asci}
13	xx	20	Data 10th character $[blank]_{asci}$
14	xx	20	Data 11th character $[blank]_{asci}$
15	xx	20	Data 12th character $[blank]_{asci}$
16	xx	20	Data 13th character $[blank]_{asci}$
17	xx	20	Data 14th character $[blank]_{asci}$
18	xx	20	Data 15th character $[blank]_{asci}$
19	xx	20	Data 16th character $[blank]_{asci}$
20...22			kept for error code / error detection

*: applicable for EXDUL-371E only

8.9.5 Writing in UserLCD1* and UserLCD2*

Example: type character string EXDUL-371 in UserLCD1* resp. UserLCD2*

Byte	Transmission	Response	Description
0	0C	0C	Command code 1st Byte
1	00	00	Command code 2nd Byte
2	03	03	Command code 3rd Byte
3	00 (UserLCD1) 01 (UserLCD2)	00 (UserLCD1) 01 (UserLCD2)	Command code 4th Byte
4	45	45	Data 1st character E_{asci}
5	58	58	Data 2nd character X_{asci}
6	44	44	Data 3rd character D_{asci}
7	55	55	Data 4th character U_{asci}
8	4C	4C	Data 5th character L_{asci}
9	2D	2D	Data 6th character $-_{asci}$
10	35	33	Data 7th character 3_{asci}
11	31	37	Data 8th character 7_{asci}
12	36	31	Data 9th character 1_{asci}
13	20	20	Data 10th character [blank]$_{asci}$
14	20	20	Data 11th character [blank]$_{asci}$
15	20	20	Data 12th character [blank]$_{asci}$
16	20	20	Data 13th character [blank]$_{asci}$
17	20	20	Data 14th character [blank]$_{asci}$
18	20	20	Data 15th character [blank]$_{asci}$
19	20	20	Data 16th character [blank]$_{asci}$
20...22			kept for error code / error detection

*: applicable for EXDUL-371E only

8.9.6 Reading from UserLCD1* and UserLCD2*

Example: read character string EXDUL-371 from UserLCD1* resp. UserLCD2*

Byte	Transmission	Response	Description
0	0C	0C	Command code 1st Byte
1	00	00	Command code 2nd Byte
2	03	03	Command code 3rd Byte
3	02 (UserLCD1) 03 (UserLCD2)	02 (UserLCD1) 03 (UserLCD2)	Command code 4th Byte
4	xx	45	Data 1st character E_{asci}
5	xx	58	Data 2nd character X_{asci}
6	xx	44	Data 3rd character D_{asci}
7	xx	55	Data 4th character U_{asci}
8	xx	4C	Data 5th character L_{asci}
9	xx	2D	Data 6th character $-_{asci}$
10	xx	33	Data 7th character 3_{asci}
11	xx	37	Data 8th character 7_{asci}
12	xx	31	Data 9th character 1_{asci}
13	xx	20	Data 10th character [blank]$_{asci}$
14	xx	20	Data 11th character [blank]$_{asci}$
15	xx	20	Data 12th character [blank]$_{asci}$
16	xx	20	Data 13th character [blank]$_{asci}$
17	xx	20	Data 14th character [blank]$_{asci}$
18	xx	20	Data 15th character [blank]$_{asci}$
19	xx	20	Data 16th character [blank]$_{asci}$
20...22			kept for error code / error detection

*: applicable for EXDUL-371E only

8.9.7 Writing UserLCD mode

Example: enable UserLCD mode

Byte	Transmission	Response	Description
0	0C	0C	Command code 1st Byte
1	00	00	Command code 2nd Byte
2	03	03	Command code 3rd Byte
3	04	04	Command code 4th Byte
4	01	01	01 = enable / 00 = disable
5...19			reserved, without relevance for this command
20...22			kept for error code / error detection

8.9.8 Reading UserLCD mode

Example: UserLCD mode is enabled

Byte	Transmission	Response	Description
0	0C	0C	Command code 1st Byte
1	00	00	Command code 2nd Byte
2	03	03	Command code 3rd Byte
3	05	05	Command code 4th Byte
4	xx	01	01 = enable / 00 = disable
5...19			reserved, without relevance for this command
20...22			kept for error code / error detection

*: applicable for EXDUL-371E only

8.9.9 Reading of HW identification

Example: reading of hardware identifier EXDUL-371V1.02

Byte	Transmission	Response	Description
0	0C	0C	Command code 1st Byte
1	00	00	Command code 2nd Byte
2	04	04	Command code 3rd Byte
3	01	01	Command code 4th Byte
4	xx	45	Data 1st character E_{asci}
5	xx	58	Data 2nd character X_{asci}
6	xx	44	Data 3rd character D_{asci}
7	xx	55	Data 4th character U_{asci}
8	xx	4C	Data 5th character L_{asci}
9	xx	2D	Data 6th character $-_{asci}$
10	xx	33	Data 7th character 3_{asci}
11	xx	37	Data 8th character 7_{asci}
12	xx	31	Data 9th character 1_{asci}
13	xx	76	Data 10th character v_{asci}
14	xx	31	Data 11th character 1_{asci}
15	xx	2E	Data 12th character $._{asci}$
16	xx	30	Data 13th character 0_{asci}
17	xx	32	Data 14th character 2_{asci}
18	xx	20	Data 15th character $[blank]_{asci}$
19	xx	20	Data 16th character $[blank]_{asci}$
20...22			kept for error code / error detection

8.9.10 Reading of Serial Number

Example: reading of serial number 1044026

Byte	Transmission	Response	Description
0	0C	0C	Command code 1st Byte
1	00	00	Command code 2nd Byte
2	05	05	Command code 3rd Byte
3	01	01	Command code 4th Byte
4	xx	01	Data 1st character 1_{dez}
5	xx	00	Data 2nd character 0_{dez}
6	xx	04	Data 3rd character 4_{dez}
7	xx	04	Data 4th character 4_{dez}
8	xx	00	Data 5th character 0_{dez}
9	xx	02	Data 6th character 2_{dez}
10	xx	06	Data 7th character 6_{dez}
11...19	xx	20	reserved, without relevance for this command
20...22			kept for error code / error detection

8.9.11 Reading optocoupler input port

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...3 V; 1 = high = 10...30 V)

Input channel	**IN02**	**IN01**	**IN00**
Terminal screw	21	19	17
Input level	0	1	1
Display*	A	E	E

Byte	Transmission	Response	Description
0	08	08	Command code 1st Byte
1	00	00	Command code 2nd Byte
2	01	01	Command code 3rd Byte
3	01	01	Command code 4th Byte
4	xx	03	read value (00...07)
5...19			reserved, without relevance for this command
20...22			kept for error code / error detection

*: applicable for EXDUL-371E only

8.9.12 Writing to optocoupler output port

Example: enable optocoupler OUT01,
(1 = optocoupler connected, 0 = optocoupler not connected)

Output channel	OUT01	OUT00
Terminal screw	15	13
Connection state	1	0
Display*	E	A

Byte	Transmission	Response	Description
0	08	08	Command code 1st Byte
1	00	00	Command code 2nd Byte
2	00	00	Command code 3rd Byte
3	00	00	Command code 4th Byte
4	5C	02	Transfer value (00...03)
5...19			reserved, without relevance for this command
20...22			kept for error code / error detection

*: applicable for EXDUL-371E only

8.9.13 Readback optocoupler output port (status request)

Example: enable optocoupler at channel OUT01,
(1 = optocoupler connected, 0 = optocoupler not connected)

Output channel	**OUT01**	**OUT00**
Terminal screw	15	13
Connection state	1	0
Display*	E	A

Byte	Transmission	Response	Description
0	08	08	Command code 1st Byte
1	00	00	Command code 2nd Byte
2	00	00	Command code 3rd Byte
3	01	01	Command code 4th Byte
4	xx	02	Transfer value (00...03)
5...19			reserved, without relevance for this command
20...22			kept for error code / error detection

*: applicable for EXDUL-371E only

8.9.14 Start counter

Every start command will reset the counter to 0. The counter then begins counting upwards, ranging from 0...65535.

Byte	Transmission	Response	Description
0	09	09	Command code 1st Byte
1	00	00	Command code 2nd Byte
2	00	00	Command code 3rd Byte
3	00	00	Command code 4th Byte
4...19			reserved, without relevance for this command
20...22			kept for error code / error detection

8.9.15 Readback started counter (status request)

Example: counter started

Byte	Transmission	Response	Description
0	09	09	Command code 1st Byte
1	00	00	Command code 2nd Byte
2	00	00	Command code 3rd Byte
3	02	02	Command code 4th Byte
4	xx	01	01 = counter started (00 = counter stopped)
5...19			reserved, without relevance for this command
20...22			kept for error code / error detection

8.9.16 Stop counter

Byte	Transmission	Response	Description
0	09	09	Command code 1st Byte
1	00	00	Command code 2nd Byte
2	00	00	Command code 3rd Byte
3	01	01	Command code 4th Byte
4...19			reserved, without relevance for this command
20...22			kept for error code / error detection

8.9.17 Read counted value

Example 1: Read counted value 2047 (without overflow)

Byte	Transmission	Response	Description
0	09	09	Command code 1st Byte
1	00	00	Command code 2nd Byte
2	00	00	Command code 3rd Byte
3	03	03	Command code 4th Byte
4	xx	00	Overflow flag (set when counting range exceeded)
5	xx	07	reading value (Highbyte - 00...FF)
6	xx	FF	reading value (Lowbyte - 00...FF)
7...19			reserved, without relevance for this command
20...22			kept for error code / error detection

Counted value = reading value High-Byte x 256 + reading value Low-Byte

Example 2: Read counted value 2047 counting range exceeded (with overflow)

Byte	Transmission	Response	Description
4	xx	01	Overflow flag (set when counting range exceeded)
5	xx	07	reading value (Highbyte - 00...FF)
6	xx	FF	reading value (Lowbyte - 00...FF)

Counted value = reading value High-Byte x 256 + reading value Low-Byte

8.9.18 Write LCD contrast value*

This command adjusts display contrast. Values are valid from 0 up to 4095, the display contrast will reduce the more the value increases. Comfortable display contrast will be achieved with values ranging from 800 up to 1800.

Example: Display contrast value 800

Byte	Transmission	Response	Description
0	0C	0C	Command code 1st Byte
1	00	00	Command code 2nd Byte
2	03	03	Command code 3rd Byte
3	0B	0B	Command code 4th Byte
4	03	03	reading value (Highbyte - 00...0F)
5	20	20	reading value (Lowbyte - 00...FF)
6...19			reserved, without relevance for this command
20...22			kept for error code / error detection

Contrast value = transfer value High-Byte x 256 + transfer value Low-Byte (03 20 = 800)

Example: Display contrast value 1800

Byte	Transmission	Response	Description
4	07	07	Transfer value (High-Byte - 00...0F)
5	08	08	Transfer value (Low-Byte - 00...FF)

Contrast value = transfer value High-Byte x 256 + transfer value Low-Byte (07 08 = 1800)

*: applicable for EXDUL-371E only

8.9.19 Read LCD contrast value*

Example: Display contrast value 800

Byte	Transmission	Response	Description
0	0C	0C	Command code 1st Byte
1	00	00	Command code 2nd Byte
2	03	03	Command code 3rd Byte
3	0C	0C	Command code 4th Byte
4	xx	03	reading value (Highbyte - 00...0F)
5	xx	20	reading value (Lowbyte - 00...FF)
6...19			reserved, without relevance for this command
20...22			kept for error code / error detection

Contrast value = transfer value High-Byte x 256 + transfer value Low-Byte (03 20 = 800)

Example: Display contrast value 1000 (factory setting at delivery)

Byte	Transmission	Response	Description
4	xx	03	Transfer value (High-Byte - 00...0F)
5	xx	E8	Transfer value (Low-Byte - 00...FF)

Contrast value = transfer value High-Byte x 256 + transfer value Low-Byte (03 E8 = 1000)

*: applicable for EXDUL-371E only

8.9.20 D/A Conversion

Example:
Enable a voltage of +7.5V across AOUT00+ (terminal 11). For this the output voltage range of 0-10V shall be used.
+7.5V comply with +7500000µV, which are to be partitioned to three bytes.
7500000 = $7270E0_{hex}$ or
Byte 2: 7500000 / 65536 = 114 remainder 28896
Byte 1: 28896 / 256 = 112 remainder 224
Byte 0: 224

Byte	Transmission	Response	Descrption
0	0A	0A	Command code 1st Byte
1	00	00	Command code 2nd Byte
2	00	00	Command code 3rd Byte
3	01	01	Command code 4th Byte
4	00	01	AOUT00+ = 0, AOUT01+ = 1
5	00	00	Range byte (0-10V) = 0
6	xx	xx	Reserved
7	xx	xx	Reserved
8	00	00	Sign (+ = 0, - = 1)
9	72	72	Voltage value Byte 2
10	70	70	Voltage value Byte 1
11	E0	E0	Voltage value Byte 0
12...19	xx	xx	Reserved
20...22			kept for error code / error detection

Output voltage range	
Range byte	unipolar
0	0-10V
1	0-5V
	bipolar
2	+/-10V
3	+/-5V
4	+/-2.5V

8.9.21 A/D Conversion

Example:
Measuring a voltage of +7.5V across AIN03+ (terminal 4). An input voltage range of 0-10V and a single-ended measuring (channel byte = 3) as the measuring method shall be used. For other measuring methods please find the allocated values for single-ended measurements in table 5.1 in chapter 5.1 and for differential measurements in table 5.2 in chapter 5.2

You can calculate the measured voltage as follows:
Voltage = Byte2 * 65536 + Byte1 * 256 + Byte0

Byte	Transmission	Response	Description
0	0A	0A	Command code 1st Byte
1	00	00	Command code 2nd Byte
2	00	00	Command code 3rd Byte
3	03	03	Command code 4th Byte
4	03	03	Channel byte
5	00	00	Range byte (0-10V) = 0
6	xx	xx	Reserved
7	xx	xx	Reserved
8	xx	00	Sign (+ = 0, - = 1)
9	xx	72	Voltage value Byte 2
10	xx	70	Voltage value Byte 1
11	xx	E0	Voltage value Byte 0
12...19	xx	xx	Reserved
20...22			kept for error code / error detection

In this example the calculated voltage is:
Voltage = 72_{hex} * 65536 + 70_{hex} * 256 + $E0_{hex}$ = +7500000µV
(positive, as sign byte = 0)

Input voltage range	
Byte value	unipolar
0	0-10V
1	0-5V
	bipolar
2	+/-10V
3	+/-5V

8.9.22 Factory reset

Description: restores the basic status

Byte	Transmission	Response	Description
0	0C	0C	Command code 1st Byte
1	00	00	Command code 2nd Byte
2	0C	0C	Command code 3rd Byte
3	0F	0F	Command code 4th Byte
4...19			reserved, without relevance for this command
20...22			kept for error code / error detection

9. Specifications

A/D inputs
8 inputs single-ended (se)
or 4 inputs differential (diff)
or combined se/diff selectable via software
Resolution: 12 bit
Input voltage range:
unipolar: 0..5 Volt, 0..10 Volt
bipolar: +/-5 Volt, +/-10 Volt
Absolute Accuracy: typ 0.1 % +/- 1 LSB
Input resistor: unipolar 42 kΩ
bipolar 31 kΩ
Over voltage protection: 20V
Measuring cycle: max. 1 ms

D/A outputs
2 outputs
Resolution: 12 bit
AA: typ 0.1 % +/- 1 LSB
Output voltage range
unipolar: 0..5 Volt, 0..10 Volt
bipolar: +/-2.5 Volt, +/-5 Volt, +/-10 Volt
Output current: max +/-5 mA

Optocoupler inputs
3 channels galvanically isolated
1 of the channels progammable as a counter input
Optocoupler with integrated schmitt trigger function
Over voltage protection diodes
Input voltage range
high = 10..30 Volt
low = 0..3 Volt
Input frequency: max. 10 kHz

Optocoupler outputs
2 channels, galvanically isolated
High capacity optocoupler
Reverse polarity protection
Output current: max. 150 mA
Switching voltage: max. 50 V

Counter
1 programmable digital 16-bit counter (allocated to the first optocoupler input)
counting frequency: max. 5 kHz

LCD Display
Matrix display with 2 lines and 16 columns displaying 16 characters each line
Programmable to display user specific data or I/O status
Operating voltage
+18 V...+36 V (external power supply)

USB Interface
Compatible with USB 2.0
USB Connection Plug and Play (hot-pluggable, connectable at operating system)

Connection Terminals
1 * 24pin screw terminal block
1 * USB socket Type B

USB connection lines
1 * USB plug Type A
1 * USB plug Type B

Dimensions
105 mm x 89 mm x 59 mm (l x b x h)

Casing
Insulating plastic casing with integrated snap-on technology for DIN EN rail mounting. Suitable for control and engineering technology mounted to control and distribution boxes, surface mounting or mobile use on a desk.

10. Circuitry Examples

10.1 Wiring of the Optocoupler Inputs

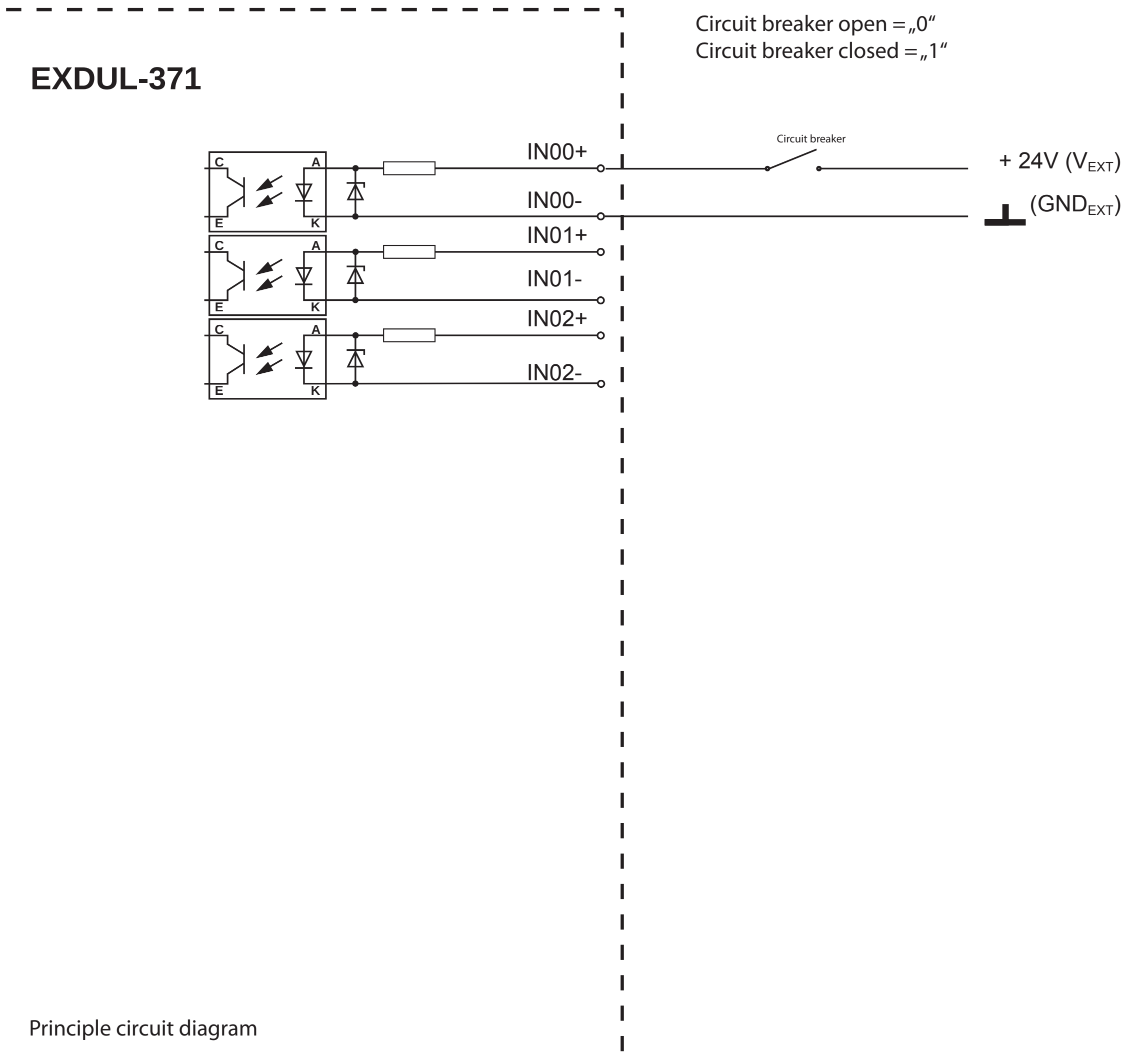

Figure 10.1 Optocoupler input wiring

10.2 Wiring of the Optocoupler Outputs

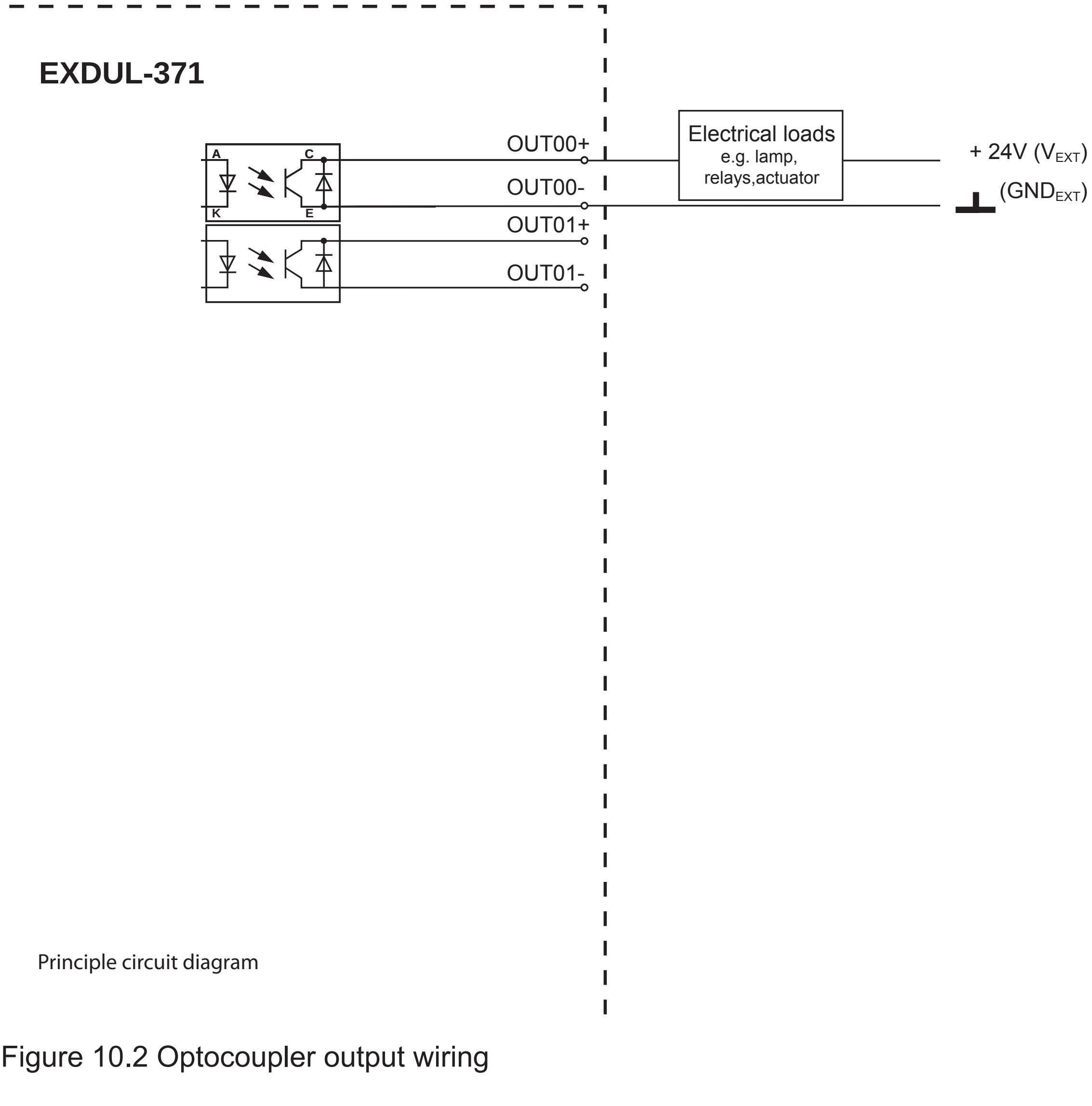

Figure 10.2 Optocoupler output wiring

10.3 Circuit of the D/A Outputs

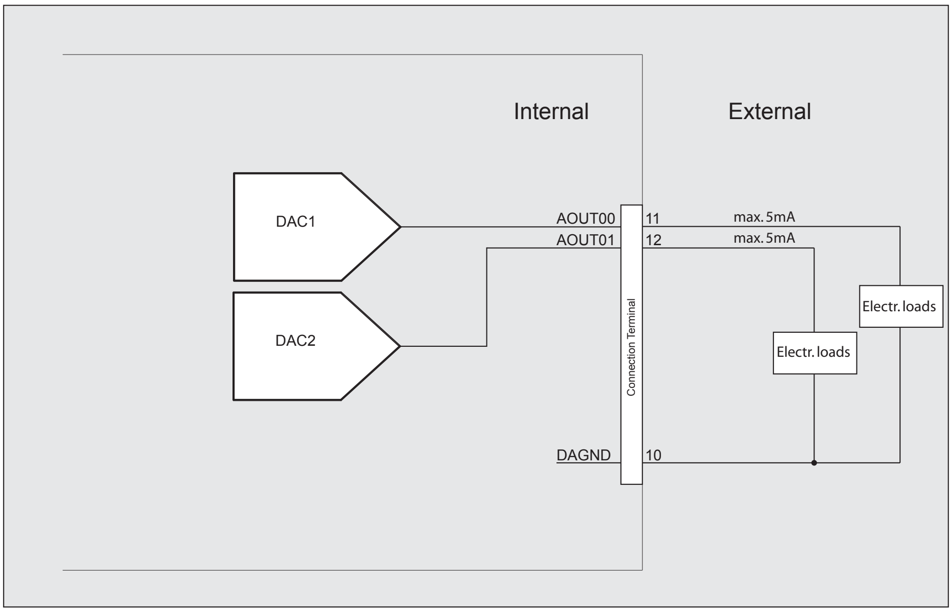

Figure 10.3 Circuit of both of the D/A outputs

10.4 Circuit of the A/D Inputs single ended

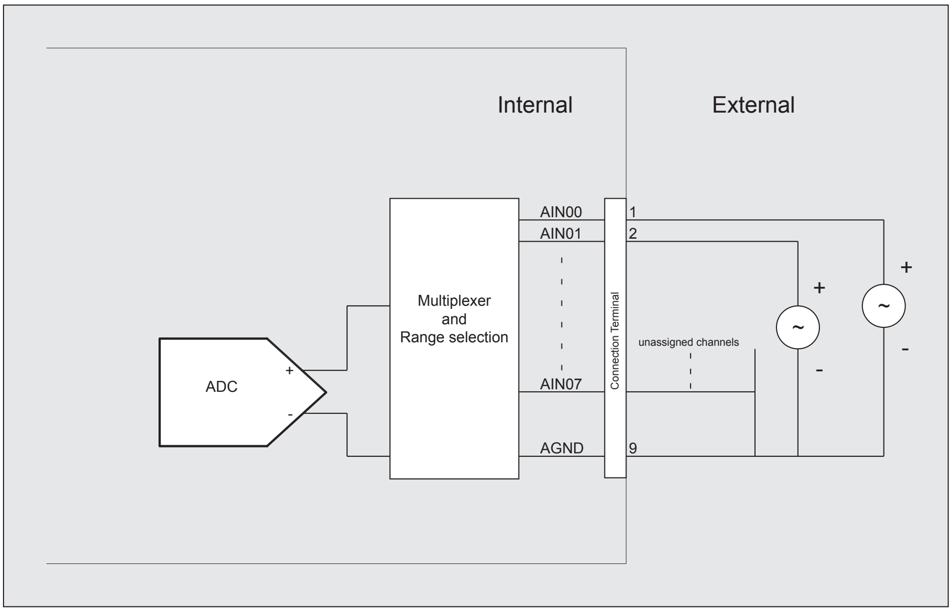

Figure 10.4 Circuit of the A/D inputs (single ended)

10.5 Circuit of the A/D Inputs differential

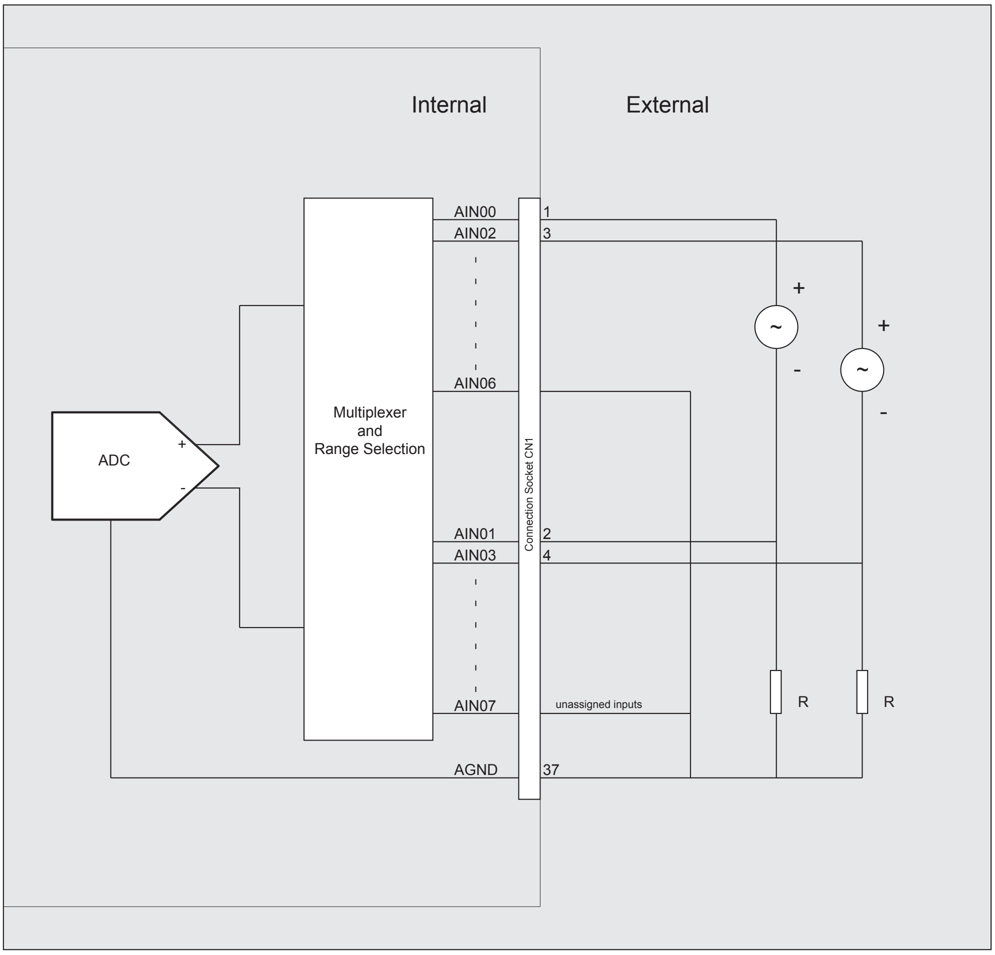

Figure 10.5 Circuit of the A/D inputs (differential)

11. 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	

12. 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 must therefore always be reviewable, 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 using any tools on any components, boards or equipment. Any electric charges saved in 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 values 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 are valid for a component you must consult a specialist.

Apart from that, the compliance with building regulations and safety instructions of all kinds (VDE, TÜV, professional associations, industrial injuries corporation, etc.) is duty of the user/customer.

13. CE Declaration of Conformity

This is to certify, that the products

EXDUL-371E EDV number A-381715
EXDUL-371S EDV number A-381710

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 Class 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, 25.11.2013

Reference system for intended use

The multi functional modules EXDUL-371E and EXDUL-371S 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
Interface:	EXDUL-371E EXDUL-371S	A-381715 A-381710