

C-DIAS Multi I/O Module

CIO 011

8 x digital inputs (+24V, 5mA, 5ms)

Inputs 1 – 2 useable as counter (+24V, 5mA, 1 μ s)

Input 3 useable as interrupt ((+24V, 5mA, 10 μ s)

8 x digital outputs (+24V, 2A, short-circuit protected, 400 μ s)

2 analogue inputs 0 – 10V / 12 bit / 100ms (up to version 3.1)

2 analogue inputs 0 – 10V / 12 bit / 10ms (from version 3.1)

1 analogue output \pm 10V / 12 bit / 50 μ s

The CIO 011 module has 8 digital short-circuit proof outputs +24V / 2A (positive switching) as well as 8 digital inputs +24V / 5mA / 5ms for the reading-in of the signal status "0" and "1".

Two inputs can be used as counter and one input is interrupt-capable. Beside two analogue inputs (0 – 10V) an analogue output is available for voltage output (\pm 10V). The supply voltage of each channel group is checked on low voltage.



Technical data

Digital input specifications

Number	8	
Input voltage	Typical +24V	Maximal +30V
Signal level	Low: <+8V	High: >+14V
Switching threshold	Typical +11V	
Input delay	Typical 5ms	
Input current	Typical 5mA at +24V	
Status display	Optional (green LEDs)	

Input 1 – 2	Used as a counter	
Counter function	Maximum Input frequency 25 kHz	
Signal level	Low: <+4V	High: >+8V
Threshold	Typically 6V	
Input delay	1 μ s	

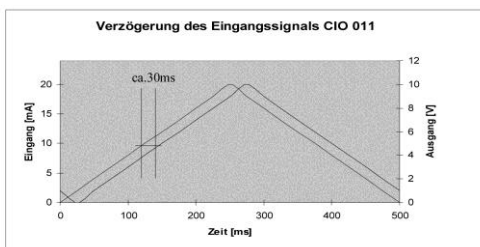
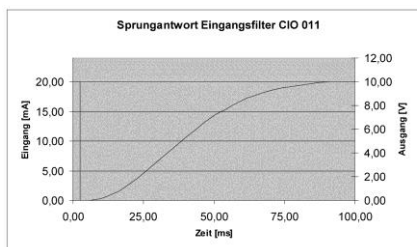
Input 3	Used as interrupt (Interrupt only functions on the local C-DIAS bus)	
Signal level	Low: <+4V	High: >+8V
Threshold	Typically +6V	
Input delay	10 μ s	

Digital output channel specifications

Number	8
Protection against short circuiting	Yes
Maximum permissible constant current / channel	2A
Maximum total current (per 4 channels)	6A (100% switch-on time)
Maximum total current (whole module)	12A (100% switch-on time)
Maximum switch-off energy of the outputs (inductive load)	Maximum 0.25 Joule/channel
Voltage drop across the supply (output switched on)	$\leq 1V$
Residual current output (switched off)	$\leq 12\mu A$
Switch-on delay	<400 μ s
Switch-off delay	<400 μ s
Status display	Optional (yellow LEDs)

Analogue input channel specifications

Number of channels	2 (4-wire connection)	
Measuring range	0 – 10V	
Measuring value	0 – 4000	
Resolution	12 bit	
Conversion time per channel	≤15µs	
Input resistor	>200kΩ	
Input filter (up to / including version 3.0)	Cut-off frequency 10Hz (100ms)	Low pass class 3
Input filter (from / including version 3.1)	Cut-off frequency 100Hz (10ms)	Low pass class 3
Reference output	+10V / ±5%	
Capacity of the reference voltage per channel	2.5mA	
Analogue channel measurement precision	±0.5% of the maximum measured value	



Diagrams valid up to HW version 3.0

Analogue output channel specifications

Number of channels	1
Output voltage	-10 to +10V DC
Output value	-2000 to +2000
Resolution	12 bit (5mV / bit)
Capacity of the output voltage	>10KΩ
Protection against short-circuiting	Yes
Transient time	<50µs
Refresh time of all channels	<1ms
Precision of the analogue channel	±0.5% of the output size

Electrical requirements

Supply voltage +24V /1-2	18 – 30V DC	
Current consumption supply voltage +24V /1-2	Corresponds to the load on the digital outputs (max. 6A / group of 4)	
Supply of the C-Dias bus	+5V	
Current consumption on the C-Dias bus (+5V supply)	Typical 5mA	Maximum 20mA
Current consumption on the C-Dias bus (+24V supply)	Typical 50mA	Maximum 70mA

Voltage surveillance

Supply voltage +24V /1-2	Supply voltage <18V (Error LED lights red)
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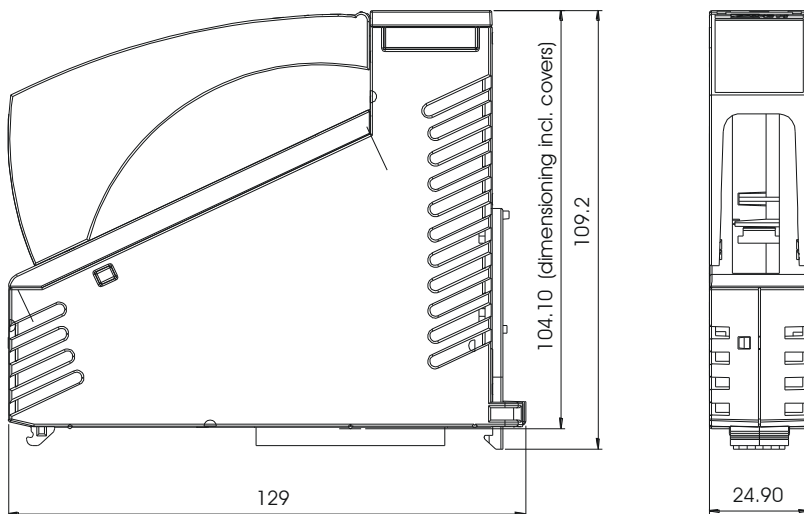
Miscellaneous

Article number	12-013-011	With status display (green, yellow and red LEDs)
Hardware version	1.x - 4.x	
Standard	UL (E247993)	

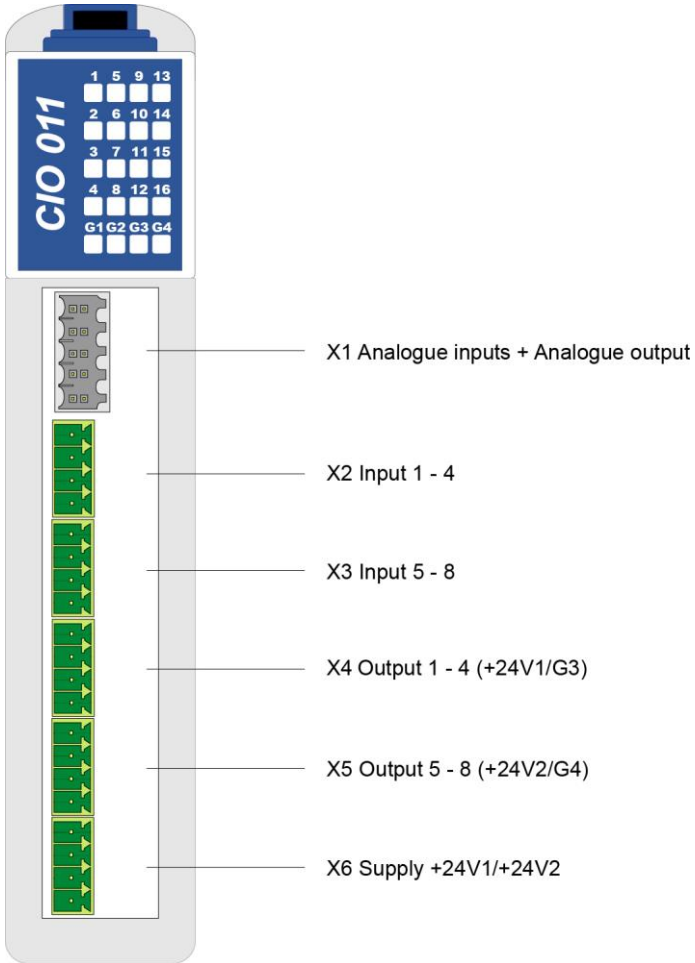
Environmental conditions

Storage temperature	-20 – +85°C	
Environmental temperature	0 – +60°C	
Humidity	0 – 95%, without condensation	
EMV stability	In accordance with EN 61000-6-2:2001 (industrial)	
Resistance to shocks	EN 60068-2-27	150m/s ²
Protective system	EN 60529	IP 20

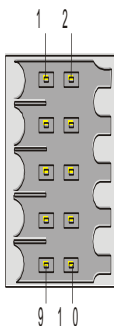
Mechanical dimensions



Connections

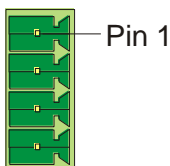


X1: Plug analogue inputs + analogue output



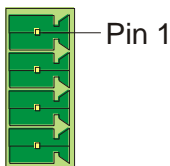
Pin	Function
1	AI1-
2	AI1+
3	AGND
4	+10V
5	AI2-
6	AI2+
7	AGND
8	+10V
9	AGND
10	AOUT

X2: Plug input 1 – 4



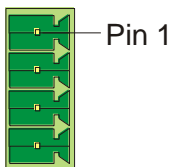
Pin	Function
1	Input 1
2	Input 2
3	Input 3
4	Input 4

X3: Plug input 5 – 8



Pin	Function
1	Input 5
2	Input 6
3	Input 7
4	Input 8

X4: Plug output 1 – 4 (+24V1/G3)



Pin	Function
1	Output 1
2	Output 2
3	Output 3
4	Output 4

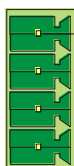
X5: Plug output 5 – 8 (+24V2/G4)



Pin 1

Pin	Function
1	Output 5
2	Output 6
3	Output 7
4	Output 8

X6: Plug supply



Pin 1

Pin	Function
1	+24V1 (for output 1 – 4)
2	+24V2 (for output 5 – 8)
3	EXGND
4	EXGND

Usable connectors

Connector with spring clamp:

Phoenix Contact: FK-MCP 1.5/ 4-ST-3.5

Weidmüller: 10-pol. bus socket B2L 3,5/10

Connector with screw clamp technique:

Phoenix Contact: MC 1.5/ 4-ST-3.5

The complete C-DIAS plug set CKL 035 with spring clamp is available from Sigmatek with the article number 12-600-035.

Status displays



LED no.	LED color	Meaning
1 – 8	green	Inputs 1 – 8
9 – 16	yellow	Outputs 1 – 8
G1 – G2	---	not used
G3 – G4	red	Error LED – missing voltage supply +24V1 (G3 for outputs 1-4) or +24V2 (G4 for outputs 5-8)

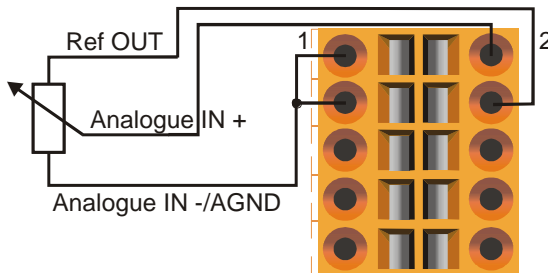
Wiring instructions

The signals detected from the analogue module are very small in comparison with the digital signals. In order to guarantee trouble free functioning it is essential to stick to a meticulous wiring arrangement:

- The 0V supply voltage connection must follow the shortest path the common 0V terminal.
- The top-hat rail must be properly connected to earth.
- The connecting wires to the sources of the analogue signals must be as short as possible and avoid lying in parallel to wires carrying digital signals.
- The signal carrying wires should be screened.
- The screening must be connected to a common screening rail.

Voltage measurement with potentiometer (odometry)

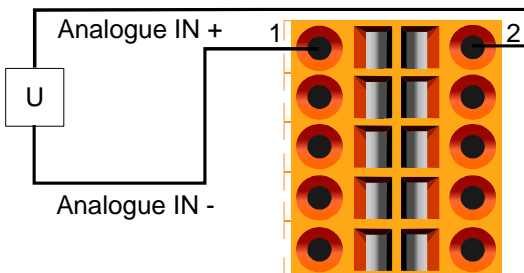
If the voltage at the analog inputs should be measured with a Potentiometer, the client "AI1_TypeOfChannel / AI2_TypeOfChannel" must be initialized with 0. The K- input must be connected to the analogue GND connection.



Connection pattern 1

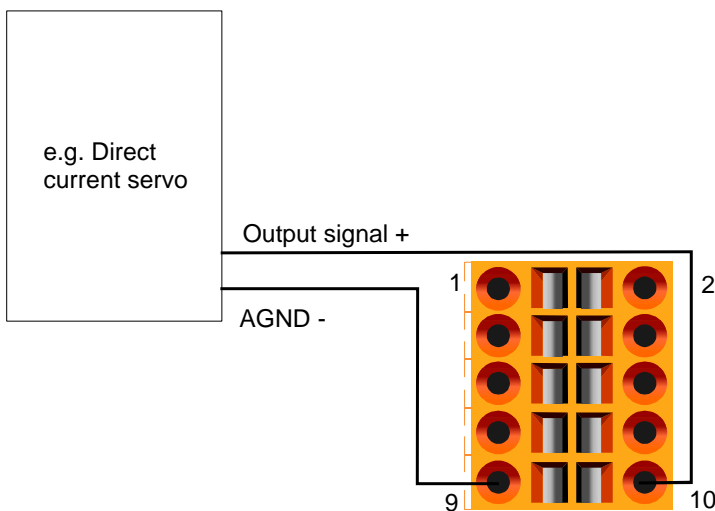
Active voltage source

If a measurement should be taken at the analog inputs with an active voltage source, the client „AI1_TypeOfChannel / AI2_TypeOfChannel“ must be initialized with 1. With **voltage sources, which are not potential free**, no connection must be made between input and GND or analogue GND.



Connection pattern 2

Example of application: axis control for direct current servos, frequency converter



Connection pattern 3

Addressing

Address	Access	Function
00h	WR8	Digital outputs 1 – 8
01h	RD8	Digital inputs 1 – 8
02h		Reserved
03h	RD8	+24V surveillance: D0: 1 = 24V1 OK D1: 1 = 24V2 OK D2 – D7: not used
04h	WR8	IRQ input (digital input 3) D0: 1 = analyze increasing flank D1: 1 = analyze decreasing flank D2 – D7: not used
04h	RD8	IRQ-Status register D0: 1 = found increasing flank D1: 1 = found decreasing flank D2 – D7: not used
05h	-	Reserved
06h	WR8	Counter mode (digital input 1 / 2) 00: Counter 1 counts with increasing input 1 Counter 2 counts with increasing input 2 01: Reserved 02: NC 1-time input 1 = A, input 2 = B (dir) Counter 1 counts, counter 2 without function 03: NC 4-times Input 1 = A, input 2 = B Counter 1 counts, counter 2 without function
08h	RD16	Counter 1, 16 bit
0Ah	RD16	Counter 2, 16 bit
10h	WR8	Before selecting ADC channel 1, start conversion of the selected channel (data regardless)
11h	WR8	Before selecting ADC channel 2, start conversion of the selected channel (data regardless)
10h	RD8	Read ADC value 8 bit (D0 – D7) => the last converted channel
12h	RD8	Read ADC value 4 bit (D8 – D11) => the last converted channel
13h	RD8	ADC status D0: 1 = transformation finished D1 – D7: not used
14h	WR16	Write DAC value 12 bit
16h	WR8	Reference voltage 80h = switch-on reference (for ADC and DAC)
17h-1Fh	-	Reserved

Matching data CIO011 (24C02 is organized byte-wise):

Address	Data	Description
\$00	\$xx	Check sum
\$01	123	Identification
\$02	28	Module group 7=CIO
\$03	1	Modul version
\$04	19	Number channels
\$05	20	Hardware version \$20=HW 2.0
\$06-\$3F	0	FILL
\$10		Serial number
		AI-Matching data 0 – 10V ref way
\$40	\$xxxx	Check sum
\$42	12345	Identification
\$44	7	Length of the following data block in WORD
\$46	2	Number of channels
\$48	-10	AI1 Offset
\$4A	4000	AI1 Multiplikand
\$4C	4003	AI1 Divisor
\$4E	-10	AI2 Offset
\$50	4000	AI2 Multiplikand
\$52	4009	AI2 Divisor
\$54-\$7F	0	FILL
		AI-Matching data 0 – 10V
\$80	\$xxxx	Check sum
\$82	12345	Identification
\$84	7	Length of the following data block in WORD
\$86	2	Number of channels
\$88	-10	AI1 Offset
\$8A	4000	AI1 Multiplikand
\$8C	4003	AI1 Divisor
\$8E	-10	AI2 Offset
\$90	4000	AI2 Multiplikand
\$92	4009	AI2 Divisor
\$94-\$BF	0	FILL
		AO-Matching data ±10V
\$C0	\$xxxx	Check sum
\$C2	12345	Identification
\$C4	4	Length of the following data block in WORD
\$C6	1	Number of channels
\$C8	2054	AO1 Offset
\$CA	4040	AO1 Multiplikand
\$CC	4000	AO1 Divisor
\$CE-\$FF	0	FILL

Counter function

The module offers the possibility of a counter function. The inputs 1 – 2 are each assigned a counter. The maximum input frequency is 25kHz.

There are 3 configurable modes: Counter counts with positive flank
 1-x evaluation
 4-x evaluation

Assignment of the inputs to the counters:

Input	Counter
1	Counter 1
2	Counter 2

Counter mode register: With help from this register, it is possible to define the mode of each input (counter).

The following modes are available:

- 00: Counter 1 counts with positive input 1
 Counter 2 counts with positive input 2
- 01: Reserved
- 02: NC 1-x input 1 = A, input 2 = B (dir)
 Counter 1 counts, Counter 2 no function
- 03: NC 4-x input 1 = A, input 2 = B
 Counter 1 counts, Counter 2 no function

Interrupt function

The module offers the possibility to change the condition of input 3 through hardware interrupts. Using interrupts the module can be configured through the software.

The following register is available for the configuration of the input interrupt:

Interrupt status register: With the READ access the interrupt is acknowledged and the register is cleared.

For technical reasons, the interrupt function can only be used on the local C-DIAS bus!

Pour des raisons techniques, la fonction d'interruption ne peut être utilisée que sur le bus C-DIAS local!