

C-DIAS Multi I/O Module

CIO 016

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

Inputs 1 – 2 can be used as a counter (+24 V, 5 mA, 1 μ s)

Input 3 can be used as an interrupt (+24 V, 5 mA, 10 μ s)

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

2 x analog inputs 0 – 10 V / 12-bit / 1 ms

1 x analog output \pm 10 V / 12-bit / 50 μ s

The CIO 016 module has 8 digital short-circuit proof +24 V / 2 A outputs (positive switching) as well as 8 digital inputs to detect the signal conditions 1 and 0.

2 inputs can be used as counters and one is interrupt capable.

In addition to 2 analog inputs (0 – 10 V), an analog output is available as a voltage output (\pm 10 V).

The power supply for each channel group is monitored for over voltage.



Technical Data

Digital input specifications

Number of inputs	8	
Input voltage	Typically +24 V	Maximum +30 V
Signal level	low: <+8 V	High : >+14 V
Switching threshold	Typically +11 V	
Input delay	Typically 5 ms	
Input current	Typically 4 mA (at + 24 V)	
Status display	Green LEDs	

Input 1 – 2	Used as counters	
Counter function	Maximum input frequency 25 kHz	
Signal level	low: <+4 V	High : >+8 V
Switching threshold	Typically 6 V	
Input delay	1 μ s	

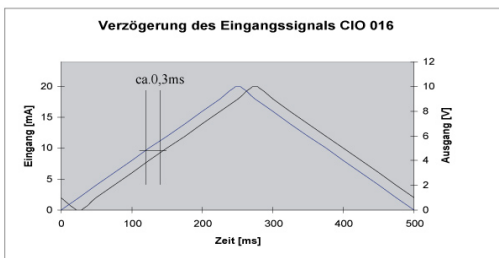
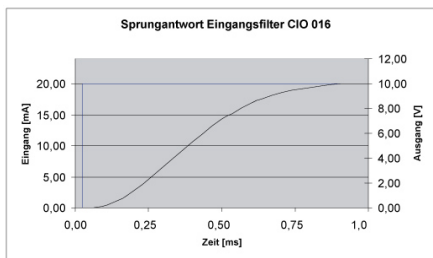
Input 3	Used as interrupt (Interrupt only functions on the local C-DIAS bus)	
Signal level	low: <+4 V	High : >+8 V
Switching threshold	Typically +6 V	
Input delay	10 μ s	

Digital output channel specifications

Number of outputs	8
Short-circuit proof	Yes
Maximum continuous current load allowed per channel	2 A
Maximum total current (per 4 channels)	6 A (100 % of on-time)
Maximum total current (entire module)	12 A (100 % of on-time)
Maximum switch-off energy of the outputs (inductive load)	Maximum 0.25 Joule/channel
Voltage drop over power supply (output active)	≤ 1 V
Residual current (inactive)	≤ 12 μ A
Turn-on delay	<400 μ s
Turn-off delay	<400 μ s
Status display	Yellow LEDs

Analog input channel specifications

Number of channels	2 (4-wire connection)	
Measurement range	0 – 10 V	
Measurement value	0 – 4000	
Resolution	12-bit	
Conversion time per channel	≤15 µs	
Input resistance	>200 kΩ	
Input filter	Cutoff frequency 1 kHz (1ms)	Low pass 3 system
Reference output	+10 V / ±5 %	
Reference voltage load per channel	2.5 mA	
Precision of Analog channel measurement	±0,5 % of maximum measurement value	



Analog output channel specifications

Number of channels	1
Output voltage	-10 to +10 V DC
Output value	-2000 to +2000
Resolution	12 bit (5 mV / bit)
Output voltage capacity	>10 KΩ
Short-circuit proof	Yes
Settling time	<50 µs
Refresh time for all channels	<1 ms
Analog channel accuracy	0.5 % of the output value

Electrical requirements

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

Voltage monitor

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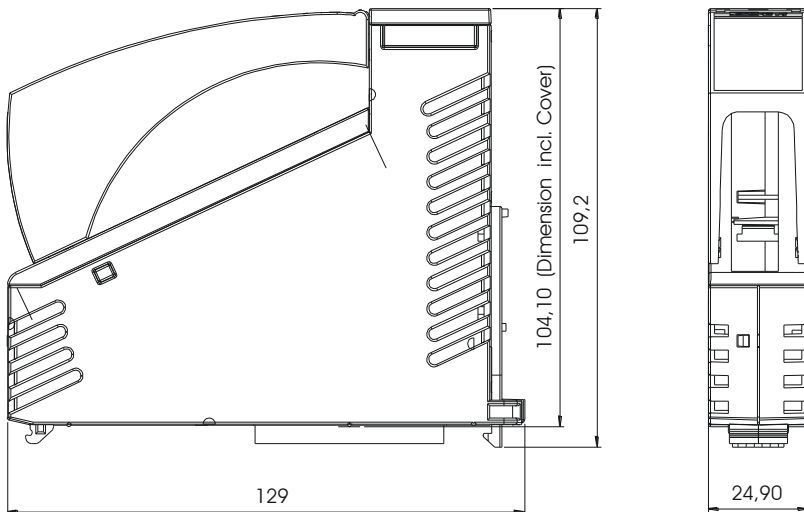
Miscellaneous

Article number	12-013-016 with status display (green, yellow and red LEDs)
Hardware version	1.x
Standard	UL in preparation

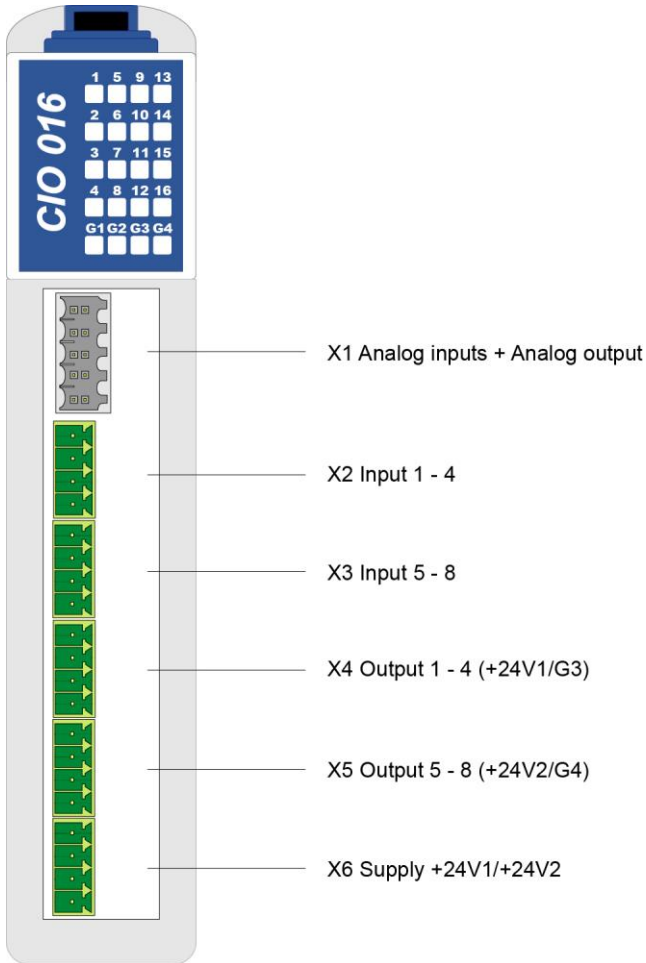
Environmental conditions

Storage temperature	-20 – +85 °C	
Environmental temperature	0 – +60 °C	
Humidity	0 - 95 %, uncondensed	
EMV stability	According to EN 61000-6-2 (industrial area)	
Shock resistance	EN 60068-2-27	150 m/s ²
Protection Type	EN 60529	IP 20

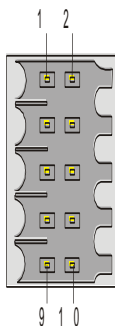
Mechanical Dimensions



Connector Layout

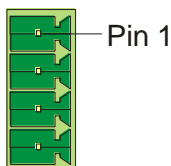


X1: Analog input + analog output connector



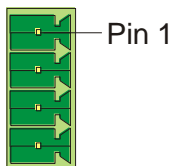
Pin	Function
1	AI1-
2	AI1+
3	AGND
4	+10 V
5	AI2-
6	AI2+
7	AGND
8	+10 V
9	AGND
10	AOUT

X2: Connector inputs 1 - 4



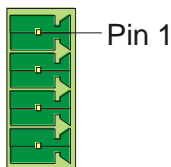
Pin	Function
1	Input 1
2	Input 2
3	Input 3
4	Input 4

X3: Connector inputs 5 - 8



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

X4: Connector outputs 1 - 4 (+24V1/G3)



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

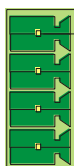
X5: Connector outputs 5 - 8 (+24V2/G4)



Pin 1

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

X6: Supply connector



Pin 1

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

Applicable connectors

Connectors with spring terminals

Phoenix Contact: FK-MCP 1,5/ 4-ST-3,5

Weidmüller: 10-pin socket strip connector B2L 3,5/10

Connector plug with screw terminal technology:

Phoenix Contact: MC 1.5/ 4-ST-3.5

The complete C-DIAS CKL 035 connector set with spring terminals is available from SIGMATEK under 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)

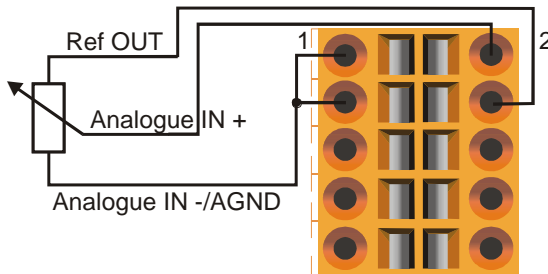
Wiring Guidelines

The signals recorded by the analog modules are very small, as compared to the digital signals. To ensure error-free operation, a careful wiring method must be followed:

- The 0 V connection of the supply voltage must be connected with the 0 V assembly point over the shortest route possible.
- The DIN rail must have an adequate mass connection.
- The lines connected to the source of the analog signals must be as short as possible and parallel wiring to digital signal lines must be avoided.
- The signal lines must be shielded.
- The shielding must be connected to a shielding bus.

Voltage Measurement with a Potentiometer (Path Measurement)

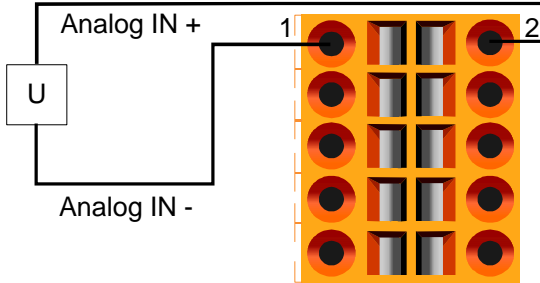
The K input must be connected to analog GND.



Schematic 1

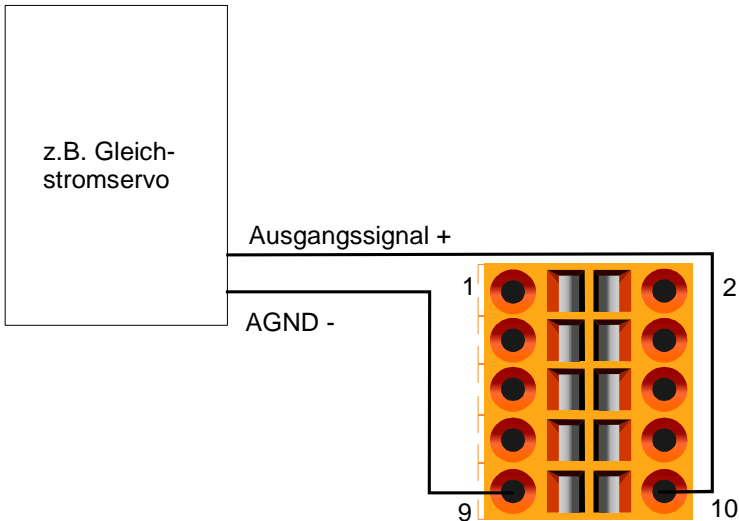
Active Voltage Source

With non potential-free voltage sources, the input and GND or analog GND cannot be connected.



Schematic 2

Example application: axis control for a DC servo, frequency converter.



Schematic 3

Addressing

Address	Access	Function
00h	WR8	Digital output 1 – 8
01h	RD8	Digital input 1 – 8
02h		Reserved
03h	RD8	+24 V monitor: D0: 1 = 24V1 OK D1: 1 = 24V2 OK D2 – D7: not used
04h	WR8	IRQ input (digital input 3) D0: 1 = Evaluate rising flank D1: 1 = Evaluate falling flank D2 – D7: not used
04h	RD8	IRQ status register D0: 1 = Rising flank detected D1: 1 = Falling flank detected D2 – D7: not used
05h	-	Reserved
06h	WR8	Counter mode (digital input 1 / 2) 00: Counter 1 counts with rising input 1 Counter 2 counts with rising input 2 01: Reserved 02: NC 1x input 1 = A, input 2 = B (dir) Counter 1 counts, Counter 2 has no function 03: NC 4x input 4 = A, input 2 = B Counter 1 counts, Counter 2 has no function
08h	RD16	Counter 1, 16 bits
0Ah	RD16	Counter 2, 16 bits
10h	WR8	Select ADC channel 1, firs select start channel conversion (data doesn't matter)
11h	WR8	Select ADC channel 2, firs select start channel conversion (data doesn't matter)
10h	RD8	Read 8-bit ADC value (D0 – D7) -> last channel converted
12h	RD8	Read 4-bit ADC value (D8 – D11) -> last channel converted
13h	RD8	ADC status D0: 1 = Conversion complete D1 – D7: not used
14h	WR16	Write 12-bit DAC value
16h	WR8	Reference voltage 80 h = enable reference (for ADC and DAC)
17h-1Fh	-	Reserved

CIO 016 Calibration data (24C02 is organized by byte):

Address	DATA	Description
\$00	\$xx	Check sum
\$01	123	Identification
\$02	28	Module group 7= CIO
\$03	6	Module variant
\$04	19	Number of channels
\$05	10	Hardware version \$20=HW 2.0
\$06-\$3F	0	FILL
\$10		Serial number
		AI calibration data 0 – 10 Vref path
\$40	\$xxxx	Check sum
\$42	12345	Identification
\$44	7	Length of the following data blocks in WORD
\$46	2	Number of channels
\$48	-10	AI1 Offset
\$4A	4000	AI1 Multiplicand
\$4C	4003	AI1 Divisor
\$4E	-10	AI2 Offset
\$50	4000	AI2 Multiplicand
\$52	4009	AI2 Divisor
\$54-\$7F	0	FILL
		AI calibration data 0 – 10 V
\$80	\$xxxx	Check sum
\$82	12345	Identification
\$84	7	Length of the following data blocks in WORD
\$86	2	Number of channels
\$88	-10	AI1 Offset
\$8A	4000	AI1 Multiplicand
\$8C	4003	AI1 Divisor
\$8E	-10	AI2 Offset
\$90	4000	AI2 Multiplicand
\$92	4009	AI2 Divisor
\$94-\$BF	0	FILL
		AO calibration data ±10 V
\$C0	\$xxxx	Check sum
\$C2	12345	Identification
\$C4	4	Length of the following data blocks in WORD
\$C6	1	Number of channels
\$C8	2054	AO1 Offset
\$CA	4040	AO1 Multiplicand
\$CC	4000	AO1 Divisor
\$CE-\$FF	0	FILL

Counter function

The module provides a counter function. The inputs 1 – 2 are each assigned a counter. The maximum input frequency is 25 kHz.

There are three configurable modes: The counter counts with a rising flank
 1x evaluation
 4x evaluation

Assigning inputs the counters:

Input	Counter
1	Counter 1
2	Counter 2

Counter mode register: With help from this register, the mode can be defined for two inputs (counters) each.

The following modes are available:

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

Interrupt function

The module can be through the hardware so that status changes in input 3 can be reported through hardware interrupts.

The following registers are available for the configuration of the interrupt input:

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!