C-DIAS Multi I/O Module   **CIO 014**

8 x digital inputs (+24V, 5mA, 5ms)
   inputs 1 – 2 useable as counter (+24V, 5mA, 1µs)
   input 3 useable as interrupt (+24V, 5mA, 10µs)
8 x digital outputs (+24V, 2A, short-proof, 400µs)
2 analog inputs 0 – 10V / 12Bit / 100ms
1 analog outputs 0 – 20mA / 12Bit

The CIO 014 modules have eight positive switching, +24V / 2A, short circuit proof digital outputs and eight digital inputs for reading of signal conditions one and zero. Two inputs can be used as counters and one input is interrupt capable.
In addition to the two analog inputs (0 – 10V), an analog current output (0 – 20mA) is available. The supply voltage of each channel group is monitored for low voltage levels.

Technical Data

Digital input specifications

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

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	1µs	

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	10μs	

Digital output channel specifications

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

Analog input channel specification

Number of channels	2
Measurement range	0 – 10V
Measurement value	0 – 4000
Resolution	12Bit
Conversion time per channel	≤15µs
Input resistance	>200kΩ
Input filter	Cutoff frequency 10Hz (100ms) / Low pass 3. system
Reference output	+10V / ±5%
Capacity of Reference voltage per channel	2,5mA
Measurement accuracy of analog channel	±0,5% of maximum measurement value
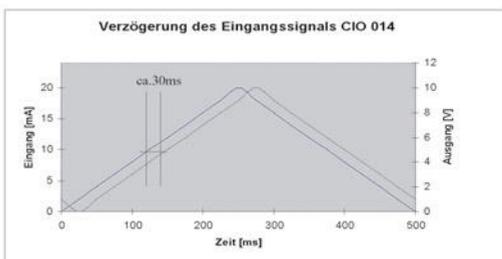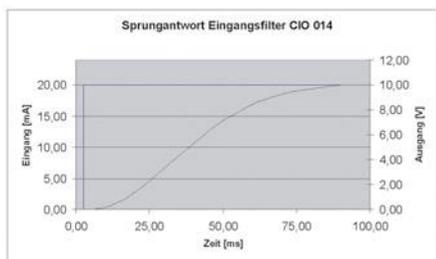
Analog output channel specification

Number of channels	1
Output current	0 – 20mA
Output values	0 to 4000
Resolution	12Bit (5µA/Bit)
Short circuit proof current output	Yes
Resistance of current output	Maximum resistance: 500Ω
Rise time	<5ms
Analog channel accuracy 0 to 20 mA	±1% of output value

Electrical requirements

Supply voltage +24 V /1-2	18 – 30V DC	
Current consumption of voltage supply +24 V /1-2	Depends on the digital output load (max. 6 A per group of 2)	
Supply from C-Dias bus	+5V	
Current consumption on C-Dias bus (+5 V supply)	Typically 5mA	Maximum 20mA
Current consumption on C-Dias-Bus (+24 V supply)	Typically 50mA	Maximum 70mA

Voltage monitor

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

Miscellaneous

Article number	12-013-014 with status display (LEDs green, yellow and red)
Standardization	UL (E247993)

Environmental conditions

Storage temperature	-20 – +85°C	
Environmental temperature	0 – +60°C	
Humidity	0 – 95%, uncondensed	
EMV stability	EN 61000-6-2 (Industry area)	
Shock resistance	EN 60068-2-27	150m/s²
Protection	EN 60529	IP 20

c

Mechanical Dimensions
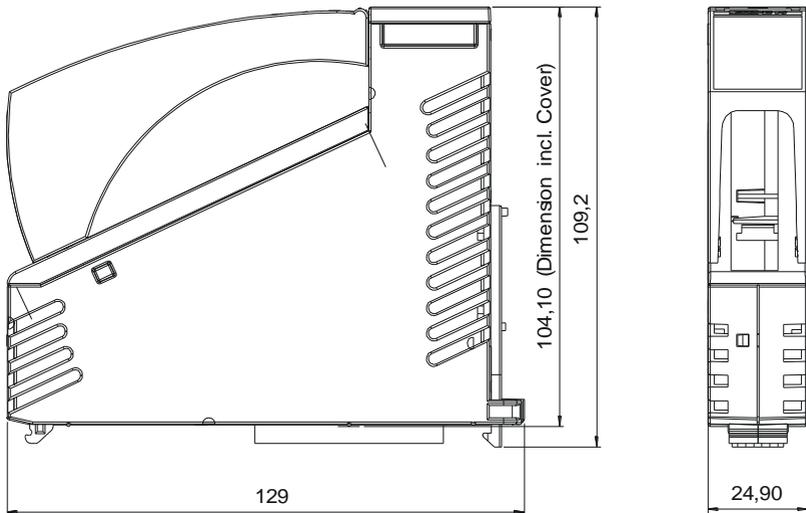
# Connector Layout

X1 Analog inputs + Analog output

X2 Input 1 - 4

X3 Input 5 - 8

X4 Output 1 - 4 (+24V1/G3)

X5 Output 5 - 8 (+24V2/G4)

X6 Supply +24V1/+24V2
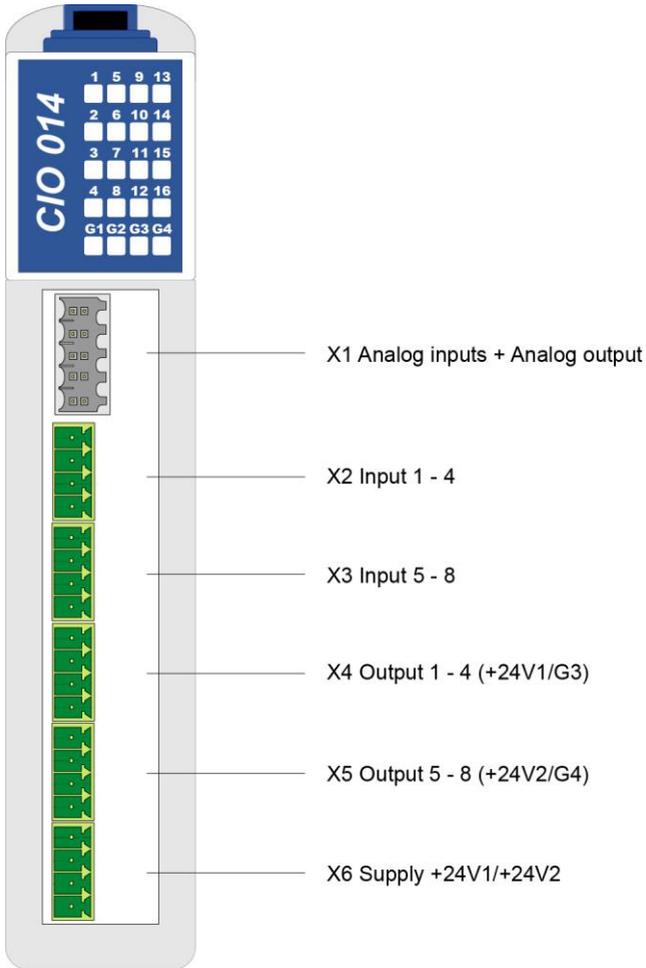
X1: Analog input + Analog output connector
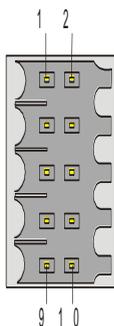
Pin	Function
1	AI1-
2	AI1+
3	AGND
4	+10V
5	AI2-
6	AI2+
7	AGND
8	+10V
9	AGND
10	AOUT

X2: Input connector 1 – 4
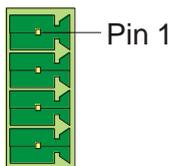
Pin	Function
1	Input 1
2	Input 2
3	Input 3
4	Input 4

X3: Input connector 5 – 8
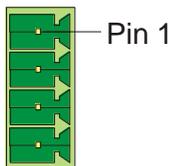
Pin	Function
1	Input 5
2	Input 6
3	Input 7
4	Input 8

X4: Output connector 1 – 4 (+24V1/G3)
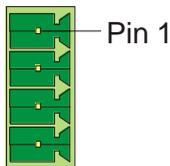
Pin	Function
1	Output 1
2	Output 2
3	Output 3
4	Output 4

X5: Output connector 5 – 8 (+24V2/G4)

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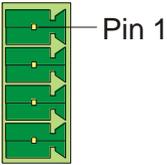
Pin	Function
1	Output 5
2	Output 6
3	Output 7
4	Output 8

X6: Power connector (G+)

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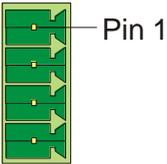
Pin	Function
1	+24V1 (for output 1 – 4)
2	+24V2 (for output 5 – 8)
3	EXGND
4	EXGND

Applicable connector plugs

Connector plug with spring terminal:
Phoenix Contact: FK-MCP 1,5/ 4-ST-3,5
Weidmüller: 10-pol. bus socket B2L/B2CF 3,5/10

Connector plug Screw terminal:
Phoenix Contact: MC 1,5/ 4-ST-3,5

The complete CKL 035 C-DIAS connector set with spring terminals is available from Sigmatek under the article number 12-600-035

Status Display

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.
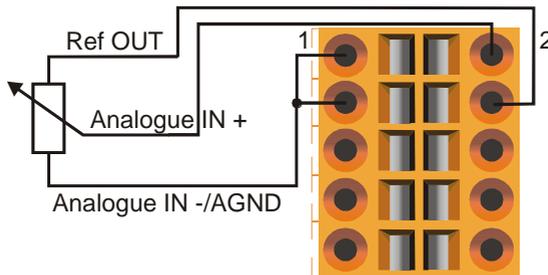

Connection pattern 1

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.
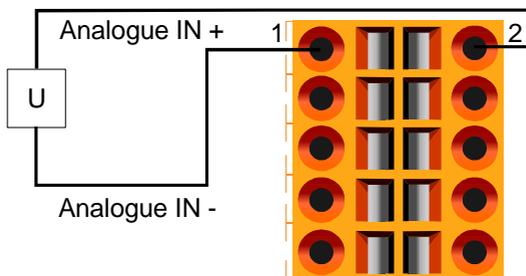
Connection pattern 2

Example of application: axis control for direct current servos, frequency converter
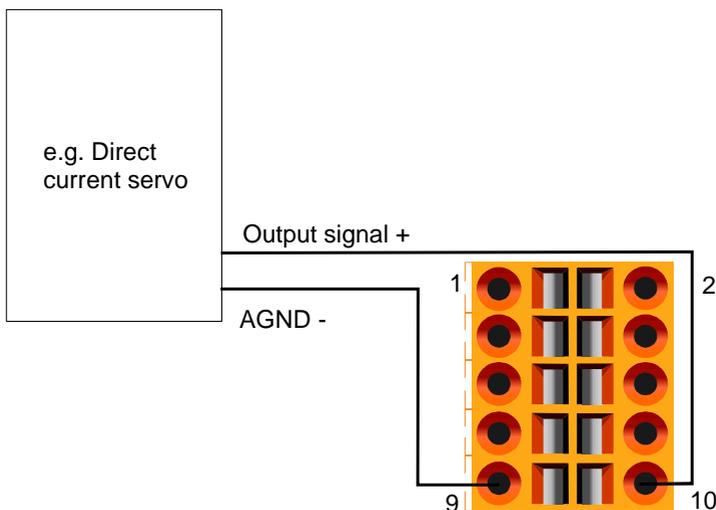
Connection pattern 3

Addressing

Address	Access	Function
00h	WR8	Digital Output 1 – 8
01h	RD8	Digital Input 1 – 8
02h		Reserved
03h	RD8	+24V monitor: D0: 1 = 24V1 OK D1: 1 = 24V2 OK D2 – D7: not used
04h	WR8	IRQ-Input (Digital Input 3) D0: 1 = evaluate rising flanks D1: 1 = evaluate falling flanks D2 – D7: Not used
04h	RD8	IRQ status register D0: 1 = rising flanks recognized D1: 1 = falling flanks recognized 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 no Function
		03: NC 4-fach Input 1 = A, Input 2 = B
		    Counter 1 counts, Counter 2 no Function

08h	RD16	Counter 1, 16-Bit
0Ah	RD16	Counter 2, 16-Bit
10h	WR8	ADC Select channel 1, start previously selected channel conversion (Data does not matter)
11h	WR8	ADC select channel 2, start previously selected channel conversion (Data does not matter)
10h	RD8	ADC- read 8-Bit value (D0 – D7) -> last converted channel
12h	RD8	ADC- 4-Bit read value (D8 – D11) -> last converted channel
13h	RD8	ADC-Status D0: 1 = conversion complete D1 – D7: Not used
14h	WR16	DAC- Write value, 12-Bit
16h	WR8	Reference voltage 80h = enable reference (f9r ADC and DAC)
17h-1Fh	-	Reserved

CIO 014 Calibration Data (24C02 is organized by byte):

Address	Data	Description
$00	$xx	Check sum
$01	123	Identification
$02	28	Module group7=CIO
$03	1	Module variation
$04	19	Number of channels
$05	20	Hardware version $20=HW 2.0
$06-$3F	0	FILL
$10		Serial number
		AI Calibration data 0 – 10Vref path
$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 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 – 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 Multiplicand
$8C	4003	AI1 Divisor
$8E	-10	AI2 Offset
$90	4000	AI2 Multiplicand
$92	4009	AI2 Divisor
$94-$BF	0	FILL
		AO-Calibration data 0 – 20mA
$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 Multiplicand
$CC	4000	AO1 Divisor
$CE-$FF	0	FILL

Counter Function

This module provides a counter function; the inputs one and two are assigned as counters. The maximum input frequency is 25kHz.

There are three configurable modes: counter counts with rising flanks
1x evaluation
2x evaluation

The inputs are assigned to the counter as follows:

Input	Counter
1	Counter 1
2	Counter 2

Counter Mode register: With help from this register, the mode can be defined for each input (counter).

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 no Function
03:	NC 4x input 1 = A, input 2 = B Counter 1 counts, Counter 2 no Function

Interrupt Function

This module also offers the possibility to change the status of input 3 using hardware interrupts. The module can be configured through the software for this function. The following register is available for configuring 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!

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