C-DIAS Analogue Input Module CAI 085

8 x inputs 0 – 10V
8 x inputs -10 – +10V (from HW-V 2.0)

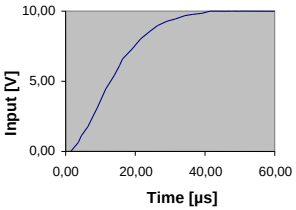
This analogue input module is used for the detection of electrical voltages in the range of 0 – 10V (-10 - +10 V from HW-V 2.0)direct voltage (difference inputs).

Technical data

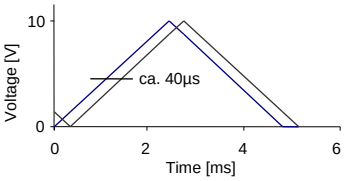
Analogue channel specifications

Number of channels	8	
Measuring range	0 – 10V	
Measured value	0 – 4000	Open input delivers 0
Resolution	12 bit	
Transformation time per channel	≤14µs	
Input filter	50µs (20kHz)	Low pass class 3
Common-mode range	+/-10V	
Precision of the analogue channel	+/-0.5% of the maximum measured value	

Response of the input filter



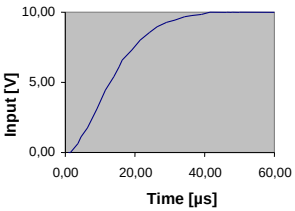
Delay of the input signal



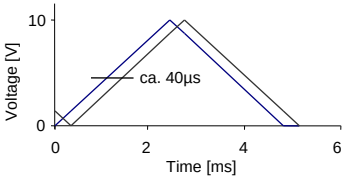
Analogue channel specifications (from HW-V 2.0)

Number of channels	8	
Measuring range	-10 – +10V	
Measured value	±2000d	Open input delivers 0
Resolution	12 bit	
Transformation time per channel	≤14µs	
Input filter	50µs (20kHz)	Low pass class 3
Common-mode range	±10V	
Precision of the analogue channel	±0.75% of measurement range	

Response of the input filter



Delay of the input signal



Electrical requirements

Supply of the C-DIAS Bus	+5V and +24V	
Current consumption on the C-DIAS bus (+5V supply)	Typically 10mA	Maximum 20mA
Current consumption on the C-DIAS bus (+24V supply)	Typically 50mA	Maximum 70mA

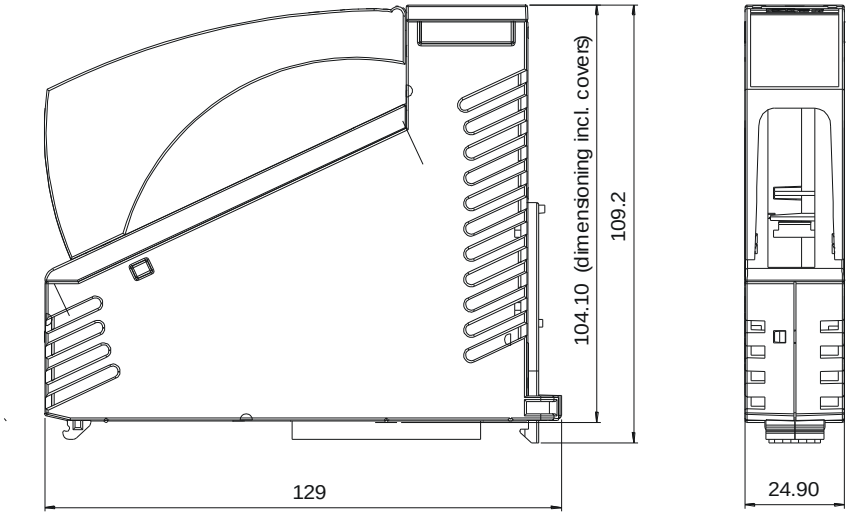
Miscellaneous

Article number	12-009-085
Hardware version	1.x – 2.x
Standardization	UL (E247993)

Environmental conditions

Storage temperature	-20 – +85°C	
Operating temperature	0 – +60°C	
Humidity	0 – 95%, without condensation	
EMV stability	In accordance with EN 61000-6-2 (industrial)	
Resistance to shocks	EN 60068-2-27	150m/s²
Protective system	EN 60529	IP 20

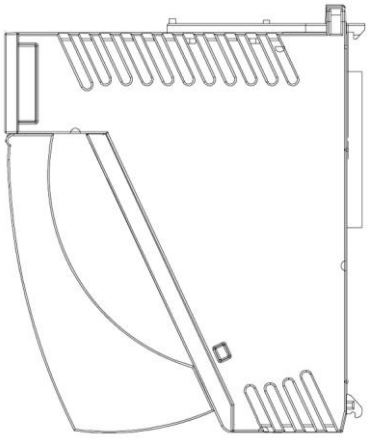
Mechanical dimensions



Mounting position

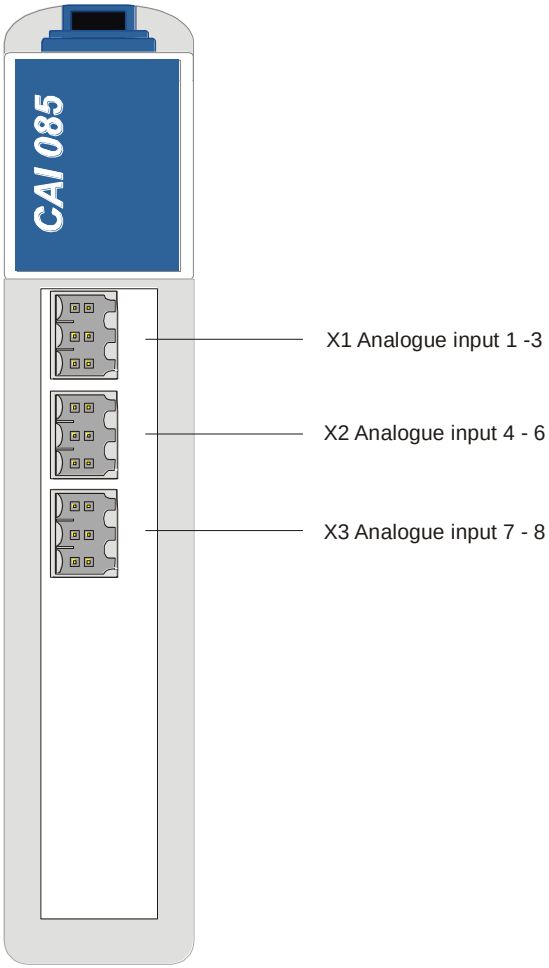
To ensure optimal cooling of the module, the CAI 085 must be mounted as shown (standing). For an angled mounting position, forced convection (cooling fan) must be used.

Top

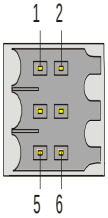


Bottom

Connections

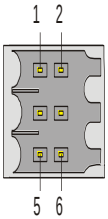


X1: Plug input 1 - 3



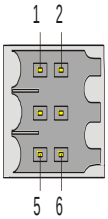
Pin	Function
1	Input 1-
2	Input 1+
3	Input 2-
4	Input 2+
5	Input 3-
6	Input 3+

X2: Plug input 4 - 6



Pin	Function
1	Input 4-
2	Input 4+
3	Input 5-
4	Input 5+
5	Input 6-
6	Input 6+

X3: Plug input 7 – 8



Pin	Function
1	Input 7-
2	Input 7+
3	Input 8-
4	Input 8+
5	not used
6	not used

Useable connectors

X1-X3: 6-pole Weidmüller plug B2L/B2CF 3,5/6

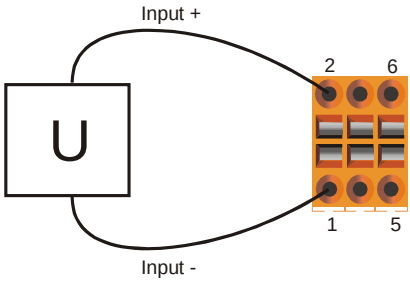
The complete C-DIAS plug set CKL 042 with spring clamp is available from Sigmatek with the article number 12-600-042.

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 connecting wires to the analogue inputs must be as short as possible and avoid lying in parallel to wires carrying digital signals.
- The signal carrying wires should be double or triple pole screened, or at least twisted together.

Connection of the signal source



Addressing

Address	Access		Function
16#00	READ	WORD	Measured voltage value
16#02	READ	BYTE	Bit 0: AD converter ready
16#00	WRITE	BYTE	Bit 0-2: Channel selection analogue Input 000 Channel 1 001 Channel 2 010 Channel 3 011 Channel 4 100 Channel 5 101 Channel 6 110 Channel 7 111 Channel 8 Bit 3 : 0 Bit 4 : 1 Bit 5 : 0 Bit 6 : 1 Bit 7 : 0

Addressing from HW-V 2.0

Address	Access		Function
16#00	READ	WORD	Measured voltage value
16#02	READ	BYTE	Bit 0: AD converter ready
16#00	WRITE	BYTE	Bit 0-2: Channel selection analogue Input 000 Channel 1 001 Channel 2 010 Channel 3 011 Channel 4 100 Channel 5 101 Channel 6 110 Channel 7 111 Channel 8 Bit 3 : 0 (range 0: 0 – 10V; 1: ±10V) Bit 4 : 1 Bit 5 : 0 Bit 6 : 1 Bit 7 : 0

For hardware matching, the matching values for offset, multiplier and divisor are determined at the factory. These values are saved in a serial EEPROM found in the module.

Data in EEPROM

Module data (organized byte-wise)

Address	Data	Description
$00	$xx	Check sum
$01	123	Identification
$02	5	Module group 5 = CAI
$03	4	Variant 4 = CAI085
$04	8	Number of channels
$05	$1x	Hardware version $10 = HW-V1.0, $11 = HW-V1.1, …
$10		Serial number

AI matching data (0-10 V) (organized word-wise)

Address	Data	Description
$40	$xxxx	Check sum
$42	12345	Identification
$44	25	Length of the following data block in WORD
$46	$0008	Number of channels (8x AI)
$48	e.g. 0000	Offset for 0°C channel-1
$4A	e.g. 4000	Gain-Multiplicand channel-1
$4C	e.g. 4050	Gain-Divisor channel-1
$4E - $52	-	Matching values channel-2
$54 - $58	-	Matching values channel-3
$5A - $5E	-	Matching values channel-4
$60 - $64	-	Matching values channel-5
$66 - $6A	-	Matching values channel-6
$6C - $70	-	Matching values channel-7
$72 - $76	-	Matching values channel-8

Calculation of the analogue value read-in

e.g.:

Offset	0000
Gain Multiplicand	4000
Gain Divisor	4050

AI matching data (-10V - +10V) (organized word-wise)

Address	Data	Description
$80	$xxxx	Check sum
$82	12345	Identification
$84	25	Length of the following data block in WORD
$86	$0008	Number of channels (8x AI)
$88	e.g. 0000	Offset for 0°C channel-1
$8A	e.g. 4000	Gain-Multiplicand channel-1
$8C	e.g. 4050	Gain-Divisor channel-1
$8E - $92	-	Matching values channel-2
$94 - $98	-	Matching values channel-3
$9A - $9E	-	Matching values channel-4
$A0 - $A4	-	Matching values channel-5
$A6 - $AA	-	Matching values channel-6
$AC - $B0	-	Matching values channel-7
$B2 - $B6	-	Matching values channel-8

Conversion formula for analogue inputs

VALUE = (analogue input value + offset) * gain multiplicand / gain divisor

Example

e.g.: Value for 0 V: (0000+0000) * 4000 / 4050 = 0000
Value for 10 V: (4050+0000) * 4000 / 4050 = 4000

Operating diagram

Read-out of the analogue channel