C-DIAS-Temperature Recording module CAI 088

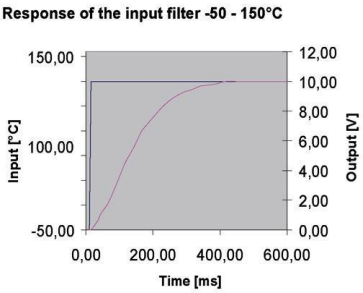
8 x Temp. inputs –50 °C to +150 °C

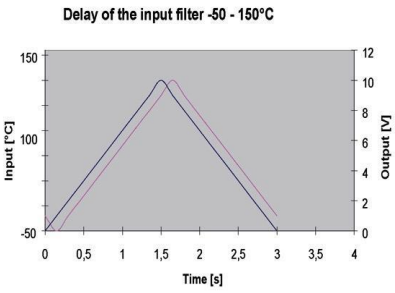
This analog input module is used to record temperatures from –50 °C to +150 °C with a PT 100 temperature sensor.

Technical Data

Analog channel specifications

Number of channels	8	
Measurement range	-50 °C to +150 °C	
Sensor range	80,31 Ohm – 157,31 Ohm	
Measurement values	0 – 4000	Open inputs supply 4095
Resolution	12 Bit	
Conversion time per channel	≤14 µs	
Applicable sensor type	PT 100	
Input filter	0,5 s	Low pass 3. system
Measurement accuracy of Analog channels	±0,7 % of the maximum measurement value	





Electrical requirements

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

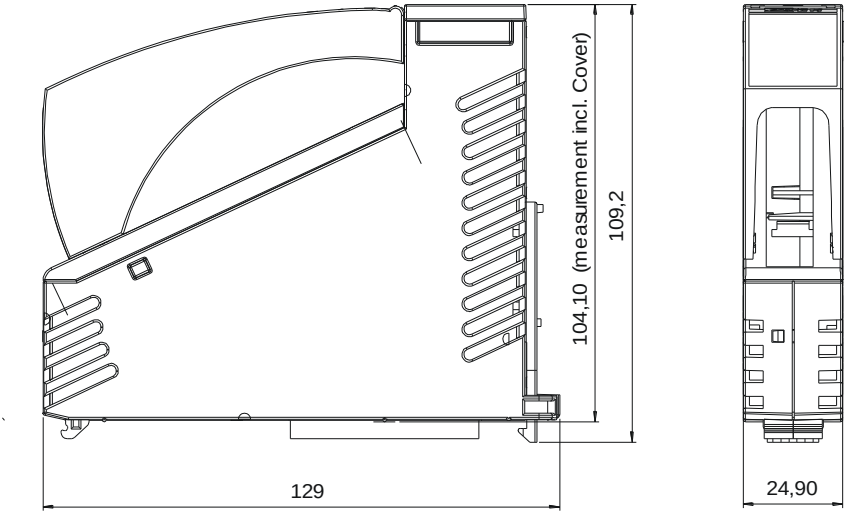
Miscellaneous

Article number	12-009-088
Hardware version	1.x
Standardization	UL (E247993)

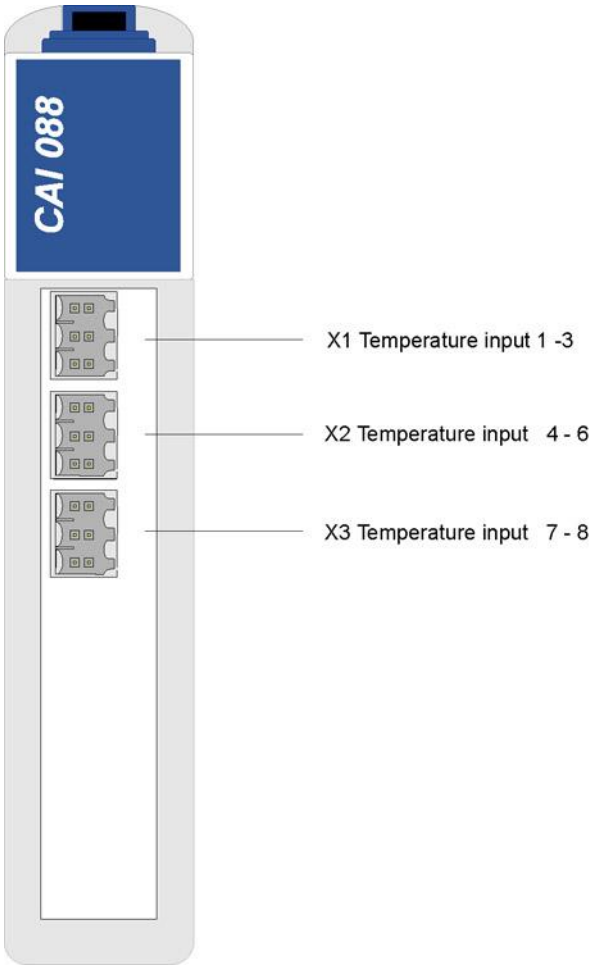
Environmental conditions

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

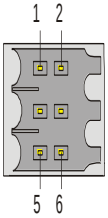
Mechanical Dimensions



Connector Layout

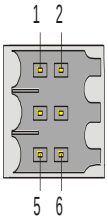


X1: Temperature input connector 1 - 3



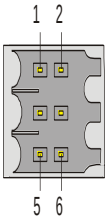
Pin	Function
1	Temperature input 1-
2	Temperature input 1+
3	Temperature input 2-
4	Temperature input 2+
5	Temperature input 3-
6	Temperature input 3+

X2: Temperature input connector 4 - 6



Pin	Function
1	Temperature input 4-
2	Temperature input 4+
3	Temperature input 5-
4	Temperature input 5+
5	Temperature input 6-
6	Temperature input 6+

X3: Temperature input connector 7 – 8



Pin	Function
1	Temperature input 7-
2	Temperature input 7+
3	Temperature input 8-
4	Temperature input 8+
5	Do not use
6	Do not use

Applicable connectors

X1-X3: 6-pin. Weidmüller connector B2L/B2CF 3,5/6

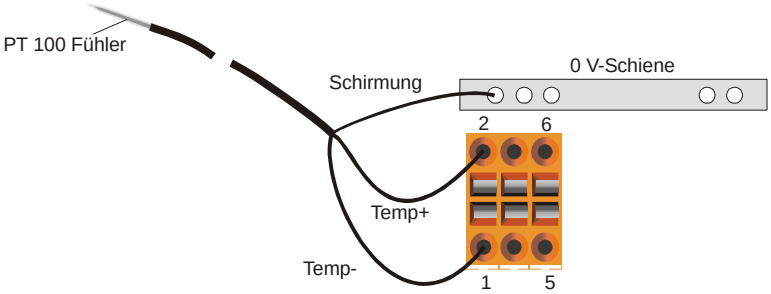
The complete C-DIAS connector set is available at Sigmatek under the article number 12-600-042.

Wiring Guidelines

The signals received by the analog module are small in comparison to the digital signals. To ensure error-free operation, a careful wiring technique must be followed.

- The 0 V connection to the voltage supply must be connected to the 0 V collection point over the shortest route possible.
- Connection lines to the analog inputs must be as short as possible and parallel connections to digital signal lines must be also be avoided.
- The signal lines should be 2-pin or 3-pin shielded wire or at least twisted pair.

Direct connection to the thermal element of the control.



Note:

Temperature measurement with thermal resistors

2-wire measurement

For 2-wire measurement, a short sensor line is recommended since the resistance of the wire influences the measurement.

Addressing

Address	Access		Function
16#00	READ	WORD	Temperature measurement value
16#02	READ	BYTE	Bit 0 : AD-converter ready
16#00	WRITE	BYTE	Bit 0-2: channel select temp. 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

For the hardware calibration, the values for offset, multiplier and divisor are determined at the manufacturer. These values are stored in a serial EEPROM found in the module.

Data in the EEPROM

Module data (organized by byte)

Address	Data	Description
$00	$xx	Checksum
$01	123	Identification
$02	5	Module group 5 = CAI
$03	11	Variant 11 = CAI088
$04	8	Number of channel
$05	$1x	Hardware version $10 = HW-V1.0, $11 = HW-V1.1, …
$10		Serial number

AI Calibration Data (organized by Word)

Address	Data	Description
$40	$xxxx	Checksum
$42	12345	Identification
$44	25	Length of the following data block in word
$46	$0008	Number of channels (8x AI)
$48	- 143	Offset for 0 °C Channel -1
$4A	I.e. 4000	Gain Multiplier Channel -1
$4C	3458	Gain Divisor Channel -1
$4E - $52	-	Calibration values Channel -2
$54 - $58	-	Calibration values Channel -3
$5A - $5E	-	Calibration values Channel -4
$60 - $64	-	Calibration values Channel -5
$66 - $6A	-	Calibration values Channel-6
$6C - $70	-	Calibration values Channel-7
$72 - $76	-	Calibration values Channel-8

Calculation for the analog input values

I.e.:	Offset	-143
	Gain multiplicand	4000
	Gain divisor	3458

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Conversion formula for the analog inputs

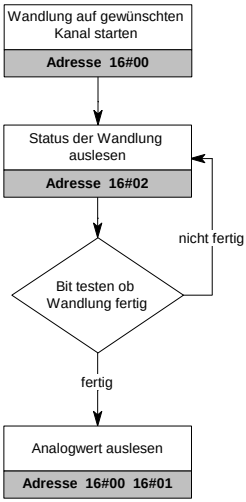
Value = (Analog input value - Offset) * Gain multiplicand / Gain divisor

Example

I.e.: value for -50 °C: (143 -143) * 4000 / 3458 = 0000
value for +150 °C: (3615 -143) * 4000 / 3458 = 4000

Operating diagram

Reading analog channels



Interpolation table for the FeCuNi(j) DIN 43710 thermal filter

°C	BITS
-50,0	0
-45,2	1
-40,4	2
-35,6	3
-30,8	4
-26	5
-21,2	6
-16,4	7
-11,5	8
-6,6	9
-1,7	10
3,2	11
8,1	12
13,0	13
17,9	14
22,8	15
27,7	16
32,7	17
37,7	18
42,7	19
47,7	20
52,7	21
57,7	22
62,7	23
67,8	24
72,8	25
77,9	26
82,9	27
88,0	28
93,1	29
98,2	30
103,3	31
108,5	32
113,6	33
118,7	34
123,9	35
129,1	36
134,3	37
139,5	38
144,7	39
150,0	40