# C-DIAS Analog Input Module CAI 089

**Four inputs for resistance bridges with 20 mV/V**
**Four 0 – 10 V voltage inputs**


This analog input module provides 4 inputs for resistance bridges and 4 voltage inputs.
The resistance bridges, with a resolution of 20 mV/V, are powered by a 5 V supply.
Using the analog inputs, voltages from 0 to 10 V can be measured.

## Technical Data

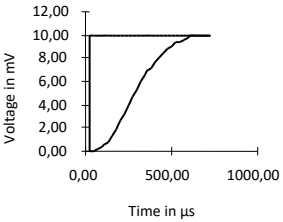
### Measuring bridge input specifications

| | | |
|---|---|---|
| Number of channels | 4 (4-wire connection) | |
| Measuring bridge resolution | 20mV/V | |
| Measurement range | 500 to 15000 parts<br>300 to 16000 parts | |
| Resolution | 14-bit | |
| Conversion time per channel | ≤1 ms | |
| Input filter | Cutoff frequency 1 kHz (1ms) | Low pass 3 system |
| Supply voltage | 5 V / ±2.5 % | |
| Maximum voltage supply capacity | 100 mA short circuit protected | |
| Precision of Analog channel measurement | ±0.3 % of the end value | |

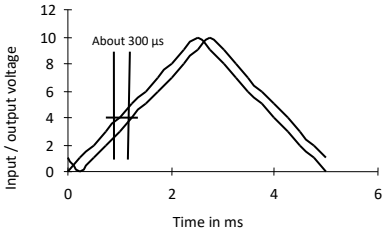
## Voltage input specifications

| | | |
|---|---|---|
| Number of channels | 4 | |
| Measurement range | -0 – +10 °C | |
| Resolution | 14-bit | |
| Conversion time per channel | ≤1 ms | |
| Input filter | Cutoff frequency 1 kHz (1ms) | Low pass 3 system |
| Precision of Analog channel measurement | ±0.3 % of the end value | |

Step response CAI 089 input filter




CAI 089 input signal delay



**Electrical requirements**

| | | |
|---|---|---|
| Power supply from C-DIAS bus | +5 V / +24 V | |
| Current consumption of C-DIAS bus (+5 V supply) | Typically 75 mA | Maximum 100 mA |
| Current consumption of C-DIAS bus (+24 V supply) Voltage supply load | Typically 140 mA | Maximum 210 mA |

**IMPORTANT:**
This module exceeds the standard current consumption for C-DIAS modules!
(+24 V: 210 mA)

If this C-DIAS module is mounted on an 8-module carrier (CMB 08x), the total current of the C-DIAS modules used must be determined and checked.

The specification for the current can be found in the module-specific documentation under "Electrical Requirements".

The total current of the +24 V supply cannot exceed 1.2 A (150 mA / slot).
This is also true for the total current of the +5 V supply, which also cannot exceed 1.2 A (150 mA / slot).

**IMPORTANT:**
La consommation de courant de ce module dépasse les valeurs typiques pour les modules C-DIAS! (+24 V: 210 mA)

Si ce module C-DIAS est monté sur un fond de panier de taille 8 (CMB 08x), le courant total des modules utilisés doit être déterminé et vérifié.

Les données de la consommation de courant sont mentionnées dans la documentation technique du module respectif dans le paragraphe "Spécifications électriques".

Le courant total de l'alimentation +24 V ne peut pas dépasser 1,2 A (150mA / module).
Cela vaut également pour le courant total de l'alimentation +5 V, lequel ne peut également pas dépasser 1,2 A (150 mA / module).

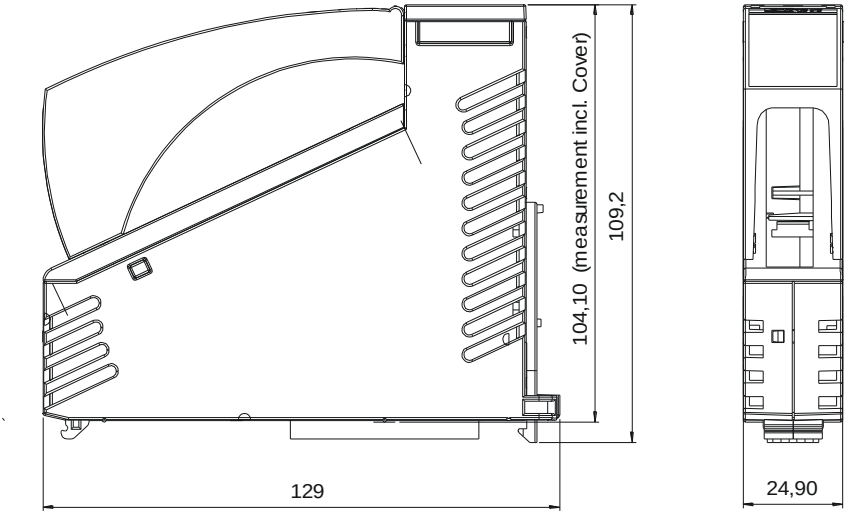
## Miscellaneous

| | |
|---|---|
| Article number | 12-009-089 |
| Hardware version | 2.x |
| Standardization | UL (E247993) |

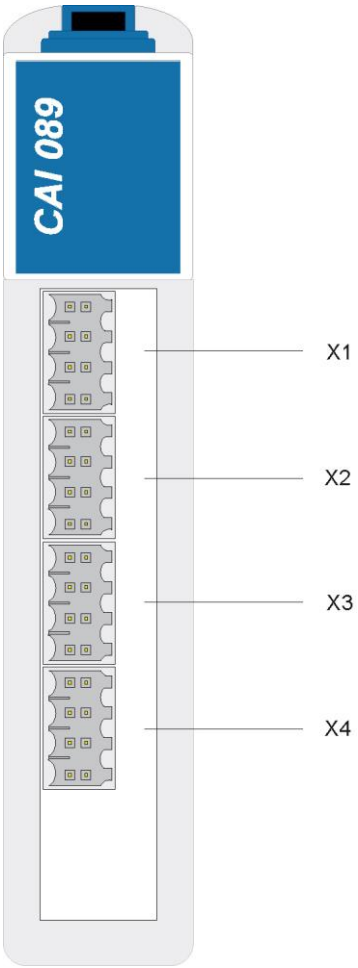
## Environmental conditions

| | | |
|---|---|---|
| Storage temperature | -20 – +85 °C | |
| Operating temperature | 0 – +60 °C | |
| Humidity | 0 - 95 %, uncondensed | |
| EMV stability | According to EN 61000-6-2 (industrial area) | |
| Shock resistance | EN 60068-2-27 | 150 m/s² |
| Protection Type | EN 60529 | IP20 |

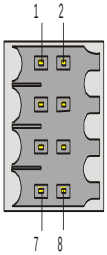
## Mechanical Dimensions



## Connector Layout

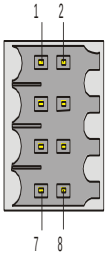


**X1:**



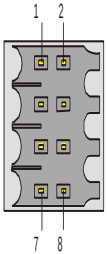

| Pin | Assignment |
|---|---|
| 1 | Bridge input 1- |
| 2 | Bridge input 1+ |
| 3 | AGND |
| 4 | +5 V supply voltage |
| 5 | Bridge input 2- |
| 6 | Bridge input 2+ |
| 7 | AGND |
| 8 | +5 V supply voltage |

**X2:**



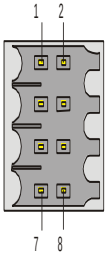

| Pin | Assignment |
|---|---|
| 1 | Bridge input 3- |
| 2 | Bridge input 3+ |
| 3 | AGND |
| 4 | +5 V supply voltage |
| 5 | Bridge input 4- |
| 6 | Bridge input 4+ |
| 7 | AGND |
| 8 | +5 V supply voltage |

**X3:**




| Pin | Assignment |
|---|---|
| 1 | Voltage supply 1- |
| 2 | Voltage supply 1+ |
| 3 | AGND |
| 4 | N.C. |
| 5 | Voltage supply 2- |
| 6 | Voltage supply 2+ |
| 7 | AGND |
| 8 | N.C. |

**X4:**




| Pin | Assignment |
|---|---|
| 1 | Voltage supply 3- |
| 2 | Voltage supply 3+ |
| 3 | AGND |
| 4 | N.C. |
| 5 | Voltage supply 4- |
| 6 | Voltage supply 4+ |
| 7 | AGND |
| 8 | N.C. |

N.C. – not connected

### Applicable connectors

**X1, X4:** 8-pin Weidmüller plug B2L/B2CF 3,5/8

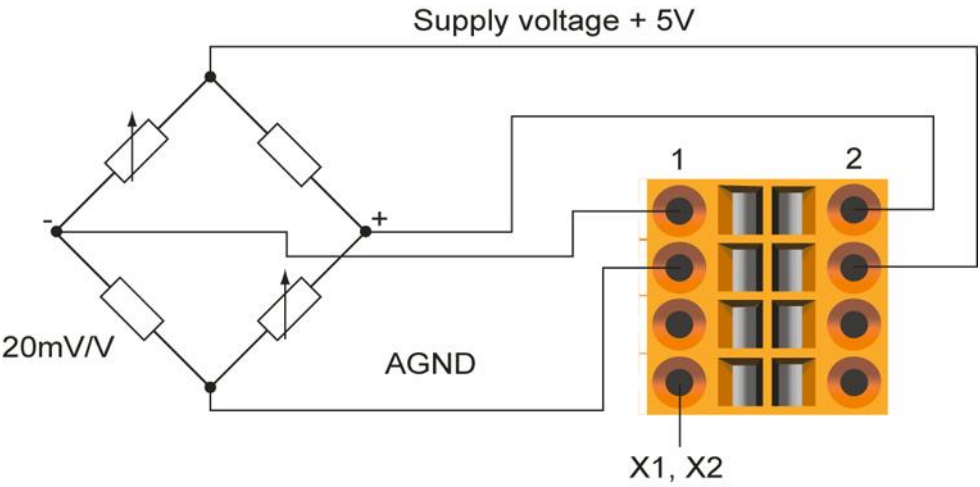
The complete C-DIAS CKL 047 connector set with spring terminals is available from SIGMATEK under the article number 12-600-047.

## 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:

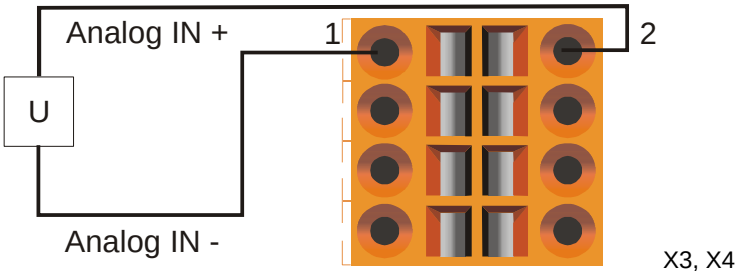
- The DIN rail must have an adequate mass connection.
- The lines connected to the source of the analog signals must be as short as possible and parallel wiring to digital signal lines must be avoided.
- The signal lines must be shielded.
- The shielding should be connected to a shielding bus.

### Measuring Bridge Circuit with 20mV/V



**Active Voltage Source**

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




Schematic 2

## Addressing

| Address | RD/WR | Function / Bits |
|---|---|---|
| $00 | RD16 | 14-bit reference voltage for the analog measurement value |
| $02 | RD16 | Analog measurement value channel 1, 14 Bits, 20 mV/V |
| $04 | RD16 | Analog measurement value channel 2, 14 Bits, 20 mV/V |
| $06 | RD16 | Analog measurement value channel 3, 14 Bits, 20 mV/V |
| $08 | RD16 | Analog measurement value channel 4, 14 Bits, 20 mV/V |
| $0A | RD16 | Analog measurement value channel 5, 14 Bits, 0-10 V |
| $0C | RD16 | Analog measurement value channel 6, 14 Bits, 0-10 V |
| $0E | RD16 | Analog measurement value channel 7, 14 Bits, 0-10 V |
| $10 | RD16 | Analog measurement value channel 8, 14 Bits, 0-10 V |
| | | |
| $16 | WR8 | ADC-DAC configuration: Bit 7 Enable 10 V-Reference |
| | | |
| $16 | RD8 | ADC-DAC Status: Bit 0 10 V Reference OK<br>Bit 1 5 V voltage supply OK<br>Bit 7 10 V Reference enabled |
| | | |
| $17 | RD8/WR8 | Difference input ON/OFF<br>Bit 4 = channel 5, Bit 5 = channel 6, Bit 6 = channel 7, Bit 7 = channel 8<br>0 = ON, 1 = OFF |
| | | |
| $18 | RD8 | PLL Status register<br>Bit 1 = PLL online<br>Bit 0 = PLL lock (PLL engaged) |
| $19 | RD8/WR8 | PLL configuration register Bit 0...3: Period of the PLL base time in ms |
| | | |
| $1A | RD8 | Reserved |
| | | |
| $1B | RD8 | Xilinx Version |

# Calibration data (the serial EEPROM is organized by bite)

| Address | Data | Description |
|---|---|---|
| $00 | $xx | Check sum |
| $01 | 123 | Identification |
| $02 | 5 | Module group 5=CAI |
| $03 | 16 | Module version |
| $04 | 8 | Number of channels |
| $05 | 10 | Hardware version $10=HW 1.0 |
| $06-$3F | 0 | FILL |
| $10 | | Serial number |
| | | |
| | | **AI calibration data 4 x 20 mV/V 4 x 0-10 V** |
| $40 | $xxxx | Check sum |
| $42 | 12345 | Identification |
| $44 | 28 | Length of the following data blocks in WORD |
| $46 | 8 | Number of channels |
| $48 | | AI0 Offset = Reference voltage at the time of calibration |
| $4A | | AI0 Multiplicand is not used |
| $4C | | AI0 Divisor is not used |
| $4E | | AI1 Offset |
| $50 | | AI1 Multiplicand |
| $52 | | AI1 Divisor |
| $54 | | AI2 Offset |
| $56 | | AI2 Multiplicand |
| $58 | | AI2 Divisor |
| $5A | | AI3 Offset |
| $5C | | AI3 Multiplicand |
| $5E | | AI3 Divisor |
| $60 | | AI4 Offset |
| $62 | | AI4 Multiplicand |
| $64 | | AI4 Divisor |
| $66 | | AI5 Offset |
| $68 | | AI5 Multiplicand |
| $6A | | AI5 Divisor |
| $6C | | AI6 Offset |
| $6E | | AI6 Multiplicand |
| $70 | | AI6 Divisor |
| $72 | | AI7 Offset |
| $74 | | AI7 Multiplicand |
| $76 | | AI7 Divisor |
| $78 | | AI8 Offset |
| $7A | | AI8 Multiplicand |
| $7C | | AI8 Divisor |
| $7E-$7F | 0 | FILL |