

C-DIAS Analog Input Module

CAI 023

The C-DIAS module CAI 023 is used to detect analog signals from a measuring bridge. Because of internal taring (the ability to deduct an offset) and an adjustable amplifier, the module can measure especially small signals. For good temperature stability, the polarity of the power supply for the measuring bridge is permanently reversed (chopped mode).



Technical Data

Analog Channel Specification

Number of channels	1
Specified load cell value	2mV / V
Measurement range	±10mV
Measurement values	±8388608d
Resolution	24-Bit
Conversion time	5ms
Settling time	From the Hardware: 130ms From the class: digital average value filter with adjustable depth
Bridge supply voltage	+5V
Allowable load	75 to 5000Ohms
Number of filters per channel (HW)	2 (SINC ³ -Filter, FIR-Filter)
Number of filters per channel (HW class)	1 (average filter with adjustable depth)

Adjustable taring	6-Bit DAC to deduct an offset (1bit corresponds to 0,3125mV)
Adjustable amplification	:1, :2, :4, :8 ($\pm 10\text{mV}$, $\pm 5\text{mV}$, $\pm 2,5\text{mV}$, $\pm 1,25\text{mV}$) or positive range only :1, :2, :4, :8 ($+10\text{mV}$, $+5\text{mV}$, $+2,5\text{mV}$, $+1,25\text{mV}$)
Chopped Mode	Yes (The supply voltage for the bridge is permanently inverted)
Calibratable	no

Analog Channel Precision

The following filters are used for the measurement values:

- Both standard filters for the HW (SIN³-Filter, FIR-Filter, both configured with default values)
- Average value filter for the HW class with a filter time of 2.5 seconds

Noise

Range	Noise [d]	Noise [% of max. measured value]
0	± 400	$\pm 0,00250$
1	± 250	$\pm 0,00156$
2	± 200	$\pm 0,00125$
3	± 150	$\pm 0,00094$
4	± 500	$\pm 0,00313$
5	± 400	$\pm 0,00250$
6	± 250	$\pm 0,00156$
7	± 200	$\pm 0,00125$

Linearity deviation (Range 3)

Linearity deviation [d]	Linearity deviation [% of max. measured value]
± 350	$\pm 0,00219$

Temperature drift (Range 3)

Temperature drift [d/°C]	Temperature drift [% of max. measured value / °C]
± 25	$\pm 0,00016$

Linearity deviation DAC (Range 3)

Linearity deviation DAC [d]	Linearity deviation DAC [% of max. output value]
$\pm 0,15$	$\pm 0,00234$

Electrical requirements

Power supply from C-DIAS-Bus	+5V and +24V	
Current consumption of C-DIAS-Bus (+5V supply)	Typically 70mA	Maximum 100mA
Current consumption of C-DIAS-Bus (+24V supply)	Typically 20mA	Maximum 50mA

Miscellaneous

Article number	12-009-023
Hardware version	1.x
Standardization	UL (E247993)

Environmental conditions

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

Caution:

To ensure the accuracy of the card over a long period of time, it is necessary to annually compensate for component aging. This can be done through a factory alignment or calibration.

If the aging of the card has no great influence on the application, the annual calibration can be disregarded. The accuracy specification however, is then no longer guaranteed by SIGMATEK.

Additionally, a 15-minute warm up phase is to be expected!

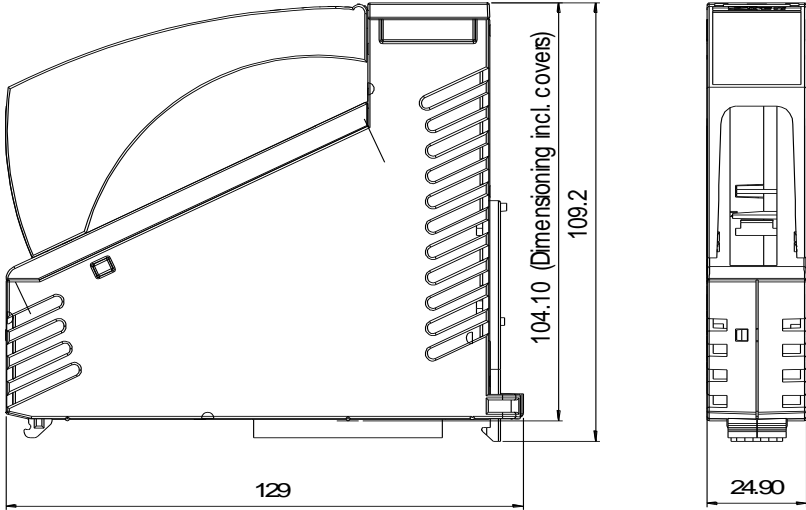
Attention:

Pour garantir la précision du module sur une longue période de temps, il est nécessaire de compenser annuellement le vieillissement des composants. Cela peut être réalisé au moyen d'un ajustement à l'usine ou de l'étalonnage.

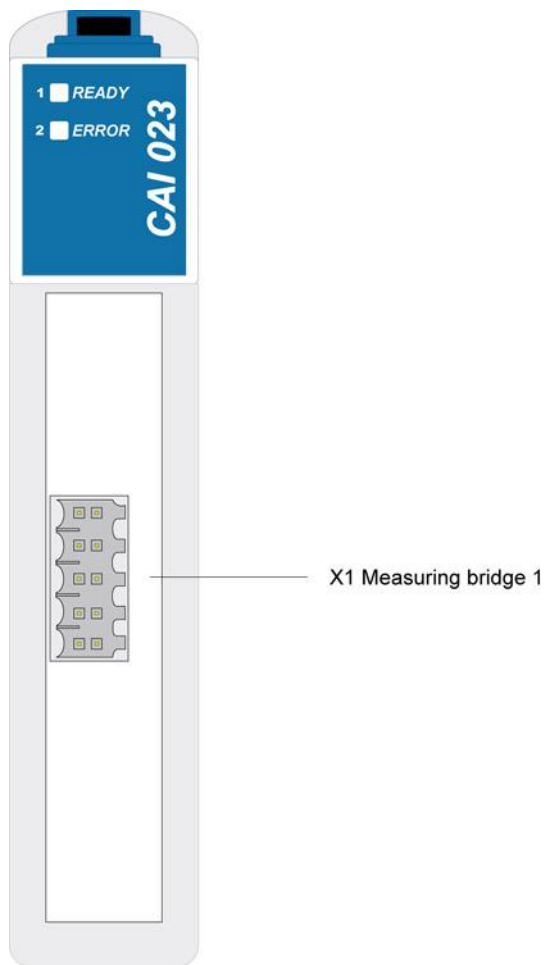
Si le vieillissement du module n'a pas une grande influence sur l'application, l'étalonnage annuel peut ne pas être pris en considération. Toutefois dans ce cas la spécification concernant la précision n'est plus garantie par SIGMATEK.

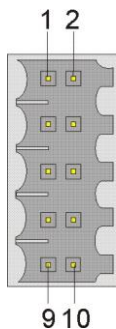
En outre, une période d'échauffement de 15 minutes est nécessaire!

Mechanical Dimensions



Connector Layout



X1: Measuring bridge 1

Pin	Function
1	Signal input 1-
2	Signal input 1+
3	Reference input 1-
4	Reference input 1+
5	Reference output 1- (GND)
6	Reference output 1+
7	Reference output 1- (GND)
8	Reference output 1+
9	Earth connection 1 (shield)
10	Earth connection 1 (Shield)

Applicable connectors

X1: 10-pin Weidmüller plug B2L/B2CF 3,5/10

The complete C-DIAS CKL 049 connector set with spring terminals is available at SIGMATEK under the article number 12-600-049.

Status Display



LED No.	LED Color	Description
1	Green	READY Lights when card is ready for operation.
2	Red	ERROR Lights when the power supply for the bridge is shorted.

Wiring Guidelines

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

- The 0 V connection for the power supply must be connected to the 0 V collection point over the shortest route possible.
- The connections to the analog inputs must be as short as possible and avoid parallel wiring to digital signal lines.
- The signal lines should be 2-, 3- or 4-pin shielded or twisted wires.

General Information

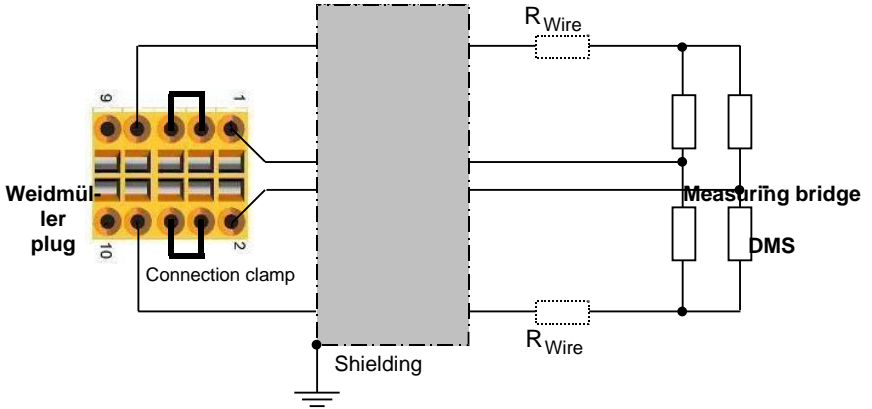
More information on the following connection types can be found in the C-DIAS analog input-wiring document:

- Voltage measurement
- Current measurement
- Distance measurement
- Temperature measurement with thermo resistors
- Temperature measurement with thermo elements
- Measuring bridge

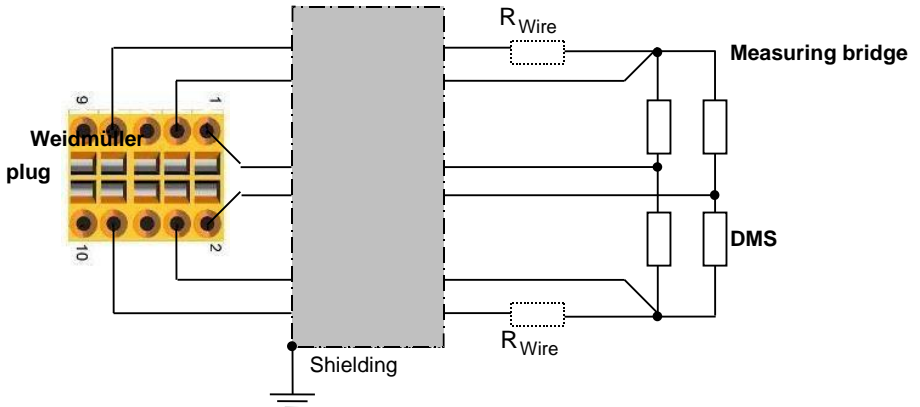
Connection Variations

For measurements with resistive wire strips, two wiring methods are possible:

- 4-wire measurement:** the advantage of this variation is that a 4-pin connection cable to the DMS can be used. The voltage drop on the power supply lines for the bridge cannot be compensated.



- 6-wire measurement:** This variation offers the advantage of voltage compensation for the bridge power supply directly on the DMS.



Addressing

Address (hex)	Size (Byte)	Access	Description
0000	3	r	SPI ADC master 1 Rx Register
0000	3	w	SPI ADC master 1 Tx Register
0003	1	r/w	SPI ADC master 1 Communication Register
0004	1	r	SPI ADC master 1 Status Register Bit 0: temperature ok (1 = ok) Bit 1: bridge error (1 = error) Bit 2: communication ready (1 = ready) Bit 3: read out error (1 = error) Bit 4: ADC ready (1 = ready)
0004	1	w	SPI ADC master 1 Reset Register Bit 0: ADC Reset (1 = reset) Bit 1: ADC Sync (1 = sync active)
0005	8	-	Reserved
000D	1	w	Digital Output Register 1 Bit 0: Inamp1_a0_n Bit 1: Inamp1_a1_n Bit 2: Inamp1_a2_n Bit 3: Inamp1_wr

000D	1	r	Digital Output Register 1 Bit 0: Inamp1_a0_n Bit 1: Inamp1_a1_n Bit 2: Inamp1_a2_n Bit 3: Inamp1_wr
000E	2	-	reserved
0010	3	r	SPI ADC master 2 Rx Register
0010	3	w	SPI ADC master 2 Tx Register
0013	1	r/w	SPI ADC master 2 Communication Register
0014	1	r	SPI ADC master 1 Status Register Bit 0: temperature ok (1 = ok) Bit 1: bridge error (1 = error) Bit 2: communication ready (1 = ready) Bit 3: read out error (1 = error) Bit 4: ADC ready (1 = ready)
0014	1	w	SPI ADC master 1 Reset Register Bit 0: ADC Reset (1 = reset) Bit 1: ADC Sync (1 = sync active)
0015	8	-	Reserved
001D	1	w	Digital Output Register 2 Bit 0: Inamp2_a0_n Bit 1: Inamp2_a1_n Bit 2: Inamp2_a2_n Bit 3: Inamp2_wr

001D	1	r	Digital Output Register 2 Bit 0: Inamp2_a0_n Bit 1: Inamp2_a1_n Bit 2: Inamp2_a2_n Bit 3: Inamp2_wr
001E	210	-	reserved
00F0	4	r/w	Address Space Extender SPI address register
00F4	4	r/w	Address Space Extender SPI data register
00F5	6	-	reserved
00FB	1	r	FPGA Version

Calibration Data

Address	Data	Description
\$00	\$xx	Check sum
\$01	123	Identification
\$02	5	Module group 5=CAI
\$03	12	Module version 12=CAI023
\$04	1	Number of channels
\$05	10	Hardware version \$10=HW 1.0
\$06-\$3F	0	FILL
\$10		Serial number

