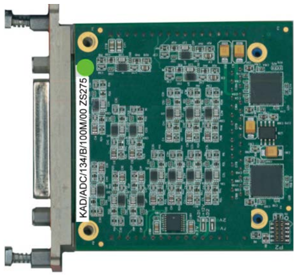
KAD/ADC/134

Full/1/2-bridge ADC (voltage excitation, strain gages, shunt resistor, 6.25 kHz b/w) - 16ch at 25 ksps



Key Features

- 16 full or ½ bridge, potentiometer or differential-ended input channels
- Ordering input range (100 mV, 10V)
- High accuracy (<0.02% FSR typical)
- 8 programmable bipolar voltage excitation outputs
- Short on any channel does not affect others
- 16-bit simultaneous sampling on each channel

Applications

- High impedance bridge sensors
- Differential voltage measurement
- Strain gage measurement

Overview

The KAD/ADC/134 is used to condition and digitize up to 16 differential ended analog channels. At the heart of the KAD/ADC/134 is a hard-wired state-machine that oversamples all channels at a rate between 100 ksps and 200 ksps and digitally filters any noise above the user-programmable cutoff frequency.

This is achieved using cascaded, half-band, Finite-Impulse-Response (FIR) filters followed by an 8th order Butterworth IIR filter with a default cutoff point set at one quarter of the sampling frequency ($f_c = f_s / 4$). In FIR mode, the IIR filter is bypassed, with samples being outputted directly from the FIR filter. All signals are sampled simultaneously. Thus, when several channels are sampled at different sampling rates, at the start of an acquisition cycle all channels are aligned.

Excitation on the KAD/ADC/134 is programmable using four D/A converters, each of which is connected to two pairs of drivers. If more than eight excitations are required, each excitation output can be connected to two bridges.

The KAD/ADC/134 is available with a ±100 mV and ±10V input range.

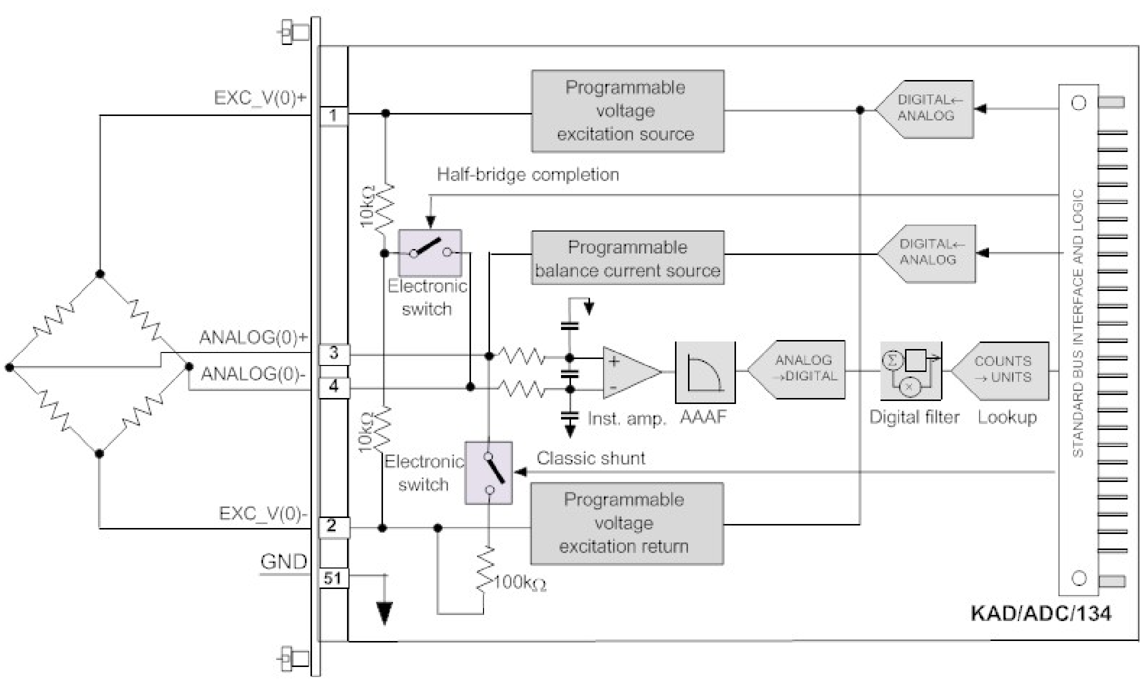


Figure 1: First of 16 channels on the KAD/ADC/134

Specifications

All values provided in the following specification tables are valid within the operating temperature range specified under "Environmental ratings" in the "General specifications" table. Module specifications are met for up to 97% of Full Scale Range (FSR).

TABLE 1	General specifications				
PARAMETER	MIN.	TYP.	MAX.	UNITS	CONDITION/DETAILS
Slots	–	–	1	–	Can be placed in any user-slot in any combination.
Mass					
	–	95	–	g	
	–	3.35	–	oz	Design metric is grams.
Height above chassis					For recommended clearance requirements see the *CON/KAD/002/CP* data sheet.
bare connector	–	–	11	mm	
bare connector	–	–	0.43	in.	Design metric is millimeters.
Access rate	–	–	2	Msps	Maximum combined access rate for read and write.
Power consumption					To attain these figures for ±12V, see "Unused differential ended inputs" on page 11.
+5V	135	160	180	mA	
+7V	10	20	30	mA	Excludes current used by excitation.
-7V	15	25	35	mA	Excludes current used by excitation.
+12V	50	60	95	mA	No floating inputs. See "Unused differential ended inputs" on page 11.
-12V	55	70	100	mA	No floating inputs. See "Unused differential ended inputs" on page 11.
total power	2.11	2.68	3.70	W	Particular combinations of chassis and Acra KAM-500 modules may have power or current limitations. For details, see *TEC/NOT/016 - Power dissipation, TEC/NOT/049 - Power estimation*, and the relevant chassis data sheet.
Environmental ratings					See *Environmental Qualification Handbook*.
operating temperature	-40	–	85	°C	Chassis base/side plate temperature.
storage temperature	-55	–	105	°C	

TABLE 2	Differential ended analog inputs				
PARAMETER	MIN.	TYP.	MAX.	UNITS	CONDITION/DETAILS
Inputs	–	–	16	–	
Sampling rate					While the sampling rate can be set individually, each must have a power of two times any other (¼, ½ ...2, 4).
ANALOG[15:0]	0.5	–	25,000	sps	For IIR setting of Filter Mode.
ANALOG[15:0]	4	–	25,000	sps	For FIR setting of Filter Mode.
Input voltage					
operating range	-10	–	10	V	KAD/ADC/134/10V. Primary gain = 1.
operating range	-100	–	100	mV	KAD/ADC/134/100m. Primary gain = 100.
overvoltage protection	-40	–	40	V	Voltages outside of this range can damage input.

TABLE 2	Differential ended analog inputs (continued)				
PARAMETER	MIN.	TYP.	MAX.	UNITS	CONDITION/DETAILS
DC error					DC signal averaged over 200 samples without excitation.
gain = 1	–	0.01	0.05	%FSR	KAD/ADC/134/10V
gain = 2	–	0.02	0.08	%FSR	KAD/ADC/134/10V
gain = 4	–	0.04	0.14	%FSR	KAD/ADC/134/10V
gain = 8	–	0.08	0.25	%FSR	KAD/ADC/134/10V
gain = 1	–	0.02	0.08	%FSR	KAD/ADC/134/100m.
gain = 2	–	0.04	0.14	%FSR	KAD/ADC/134/100m.
gain = 4	–	0.08	0.25	%FSR	KAD/ADC/134/100m.
gain = 8	–	0.16	0.44	%FSR	KAD/ADC/134/100m.
AC gain error					
for 0 Hz < f_{in} ≤ 2 kHz	-	0.1	0.3	%FSR	Filter Mode set to either FIR or IIR. Gain = 1, f_s = 25 kHz, f_c = f_s / 4 (f_{in} : input signal frequency; f_s : sampling frequency; f_c : filter cutoff frequency).
for 2 kHz < f_{in} ≤ 4 kHz	-	0.25	0.5	%FSR	Filter Mode set to IIR: Gain = 1, f_s = 25 kHz, f_c = f_s / 4.
for 2 kHz < f_{in} ≤ 3.5 kHz	-	0.25	0.5	%FSR	Filter Mode set to FIR: Gain = 1, f_s = 25 kHz, f_c = f_s / 4.
Effective number of bits	11.5	12	–	bits	Secondary gain of 1 at 25 ksps, f_c = f_s / 4.
Crosstalk	–	-90	-80	dB	
Common mode					
voltage range (KAD/ADC/134/100m)	-5	–	6	V	Operational voltage range. Tested with a Full Scale Range (±100 mV) differential input signal, that is, both inputs remain within the range of -5.1V to +6.1V with respect to internal GND (pin 51).
voltage range (KAD/ADC/134/10V)	-5	–	5	V	Operational voltage range. Tested with a Full Scale Range (±10V) differential input signal, that is, both inputs remain within ±15V of internal GND (pin 51).
rejection ratio (KAD/ADC/134/100m)	70	80	–	dB	Applies within the above common mode voltage range, 0 ≤ f ≤ f_c.
rejection ratio (KAD/ADC/134/10V)	73	80	–	dB	Applies within the above common mode voltage range, 0 ≤ f ≤ f_c.
Analog filter					Analog filter is Butterworth.
poles	–	–	4	–	
filter cutoff -3 dB	11.9	12.5	13.1	kHz	
Digital filter					For IIR setting of Filter Mode, digital filter is Butterworth.
poles	–	–	8	–	
filter cutoff -3 dB	0.25	–	16	f_s	The maximum value is limited to 6.25 kHz.
0.1 dB bandwidth	–	0.8	–	f_c	
aliasing to 0.1 dB band	–	–	-65	dB	
aliasing to f_c	–	–	-65	dB	
Filter delay	–	2.0	–	ms	Measured for f_{in} = f_c = 1 kHz (f_{in} : input signal frequency). See “Understanding filter delays (IIR filter mode)” on page 10.

TABLE 2	Differential ended analog inputs (continued)				
PARAMETER	MIN.	TYP.	MAX.	UNITS	CONDITION/DETAILS
Digital filter					For FIR setting of Filter Mode, digital filter is 15-tap Kaiser window, Beta 4 FIR filter.
poles	–	–	–	–	
filter cutoff -6 dB	0.25	–	16	f_s	The maximum value is limited to 6.25 kHz.
0.1 dB bandwidth	–	0.64	–	f_c	
aliasing to 0.1 dB band	–	–	-63	dB	
aliasing to f_c	–	–	-53	dB	
Filter delay	–	4.0	–	ms	Measured for $f_{in} = f_c = 1$ kHz (f_{in} : input signal frequency). See “Understanding filter delays (FIR filter mode)” on page 11.
Input resistance					
between inputs	8	–	–	MΩ	Module powered off.
between inputs	10	–	–	MΩ	Module powered on.
single ended input to GND	10	–	–	MΩ	Module powered off and measured at ANALOG(x)+.
single ended input to GND	10	–	–	MΩ	Module powered on and measured at ANALOG(x)+.
single ended input to GND	10	–	–	MΩ	Module powered off and measured at ANALOG(x)-.
single ended input to GND	10	–	–	MΩ	Module powered on and measured at ANALOG(x)-.
Shunt resistor					Shunt resistor can be enabled between ANALOG(x)+ and EXC_V(x)-.
resistance	–	100	–	kΩ	Nominal resistance of shunt resistor.
error	–	0.1	–	%	Initial resistor tolerance.
Half-bridge completion					
resistance	–	10	–	kΩ	Nominal resistance of each of completion resistors.
matching	–	0.05	–	%	Initial resistor ratio tolerance.
tracking TCR	–	2	–	ppm/°C	Tracking Temperature Coefficient of Resistance (TCR)
Input impedance					
between inputs	1	–	–	MΩ	Module powered on/off. Measured for f_{in} = 3 kHz with 70.7 mV_{rms} signal.
single ended input to GND	1	–	–	MΩ	Module powered off and measured at ANALOG(x)+ for f_{in} = 3 kHz with 70.7 mV_{rms} signal.
single ended input to GND	1	–	–	MΩ	Module powered on and measured at ANALOG(x)- for f_{in} = 3 kHz with 70.7 mV_{rms} signal.

TABLE 3	Bipolar DC voltage excitation outputs				
PARAMETER	MIN.	TYP.	MAX.	UNITS	CONDITION/DETAILS
Outputs	–	–	8	–	Each output shared between two channels. Applied in groups of four channels.
Output voltage					
operating range	0	–	5.1	V	Bi-polar excitation: 5V is 10V across the bridge.
resolution	–	78	–	µV	
compliance	–	–	15	mA	Per channel. Note that 30 mA is shared per two channels. See “KAD/ADC/134 shared excitations” on page 10.
short circuit current	–	–	125	mA	
short circuit duration	∞	–	–	s	Short on one channel affects the other channel, which uses the same excitation driver.
DC error					
error	–	0.1	0.2	%FSR	With a constant 175Ω load (loaded with two 350Ω bridges).
drift	–	–	0.1	%FSR	Over temperature. Included in error above specification.
noise	–	–	0.01	mV_{rms}	As measured on analog input.
Output resistance	–	0.3	0.5	Ω	

TABLE 4	Balance current outputs				
PARAMETER	MIN.	TYP.	MAX.	UNITS	CONDITION/DETAILS
Outputs	–	–	16	–	Internally connected with corresponding ANALOG(x)+ input.
Output current					
operating range	-100	–	100	µA	
resolution	–	53	–	nA	
DC error					
error	–	0.1	0.6	%FSR	With a constant 175Ω load. The impact of this error on the channel reading is usually negligible.
drift	–	0.08	0.2	%FSR	Over temperature.
noise	–	0.003	0.01	mV_{rms}	As measured on analog input.
Output resistance	2.5	6	–	MΩ	

Setting up the KAD/ADC/134

All module setup can be defined in XML using XidML® schemas (see http://www.xidml.org).

NOTE: The Balance.Target, PartReference, RangeMaximum, and RangeMinimum settings are specific to each module variant as shown under “Ordering information” on page 13. Only one variant is shown below.

Instrument settings

SETUP DATA	CHOICE	DEFAULT	NOTES
Manufacturer	-	-	-
Name	ACRA CONTROL	ACRA CONTROL	Name of manufacturer.
PartReference	KAD/ADC/134/B/100m	KAD/ADC/134/B/100m	The instrument part reference.
SerialNumber	AAA/1234	AAA/1234	Unique name for each module.
Channels	-	-	-
Analog(15:0) Analog Input	-	-	-
Settings	-	-	-
Filter Mode	IIR FIR	IIR	Specifies filter mode for specific channel. IIR is 8th order Butterworth IIR filter, and FIR is 15-tap Kaiser window Beta = 4 FIR filter.
Filter Cutoff	0.25 0.5 1 2 4 8 16	0.25	Required cutoff point for the filter is the chosen value multiplied by the user sampling frequency. 0.25 is recommended as any higher may lead to aliasing. 1 is the sampling rate.
Excitation Amplitude	0 to 5.1	0.2	Required excitation (in V) for the top of the bridge. Excitation is bipolar, that means entering 5V means 10V across the bridge.
Balance.Type	CurrentShunt	CurrentShunt	Specifies the balance type to be carried out on the bridge.
Balance.Applied	-100e-6 to 100e-6	0	Shunt current (in A) applied to the bridge.
Balance.BalanceThisTime	True False	False	Specifies if balancing should be carried out this time by software.
Balance.Tolerance	0.01 to 99.99	0.1	Specifies acceptable tolerance of achieved value vs. target value, expressed as percentage of defined input range.
Balance.Target	-0.1 to 0.1	0	Specifies a value that the channel should be balanced to.
ShuntCurrent.Applied	-100e-6 to 100e-6	0	Shunt mode current (in A) added to the bridge.
Classic Shunt	Disabled Enabled	Disabled	Specifies if switch connecting classic shunt resistor is to be enabled between EXC(x)- and ANALOG(x)+ nets.
Enable Half Bridge Completion Resistors	Disabled Enabled	Disabled	Specifies if switch connecting internal completion resistors for half bridge with ANALOG(x)- is to be enabled.

Parameter definitions

NAME/DESCRIPTION	BASE UNIT	DATA FORMAT	BITS	REGISTER DEFINITION
Analog(15:0) Parameters				
Analog Analog signal data	Volt	OffsetBinary	16	R[15:0]

Configurable parameters

Analog(15:0)

SETUP DATA	CHOICE	DEFAULT	NOTES
RangeMaximum	-10 to 10	10	Range maximum for analog channel.
RangeMinimum	-10 to 10	-10	Range minimum for analog channel.

Getting the most from the KAD/ADC/134

Wiring configurations

Figures 2 to 5 in this section, show possible wiring configurations for the KAD/ADC/134.

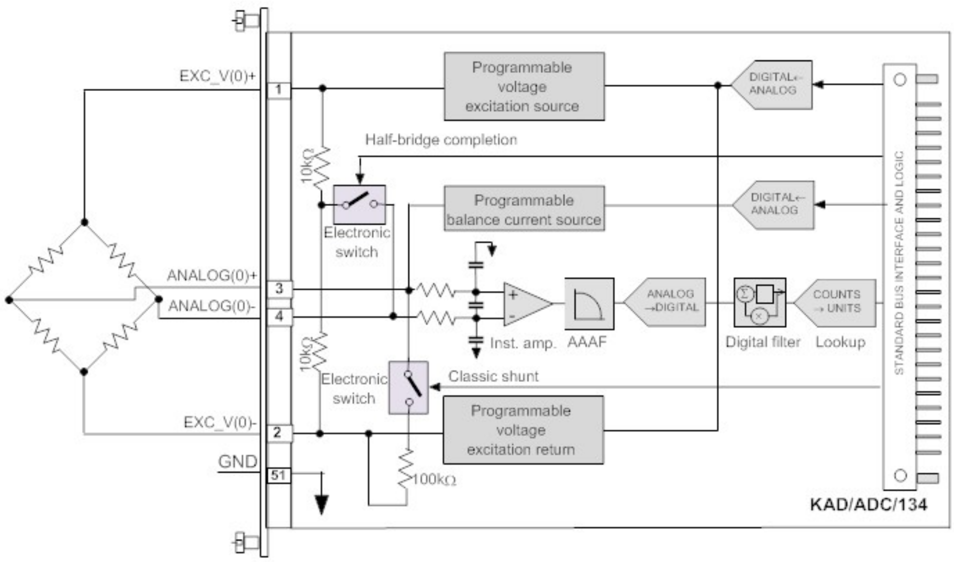


Figure 2: First channel in full-bridge configuration

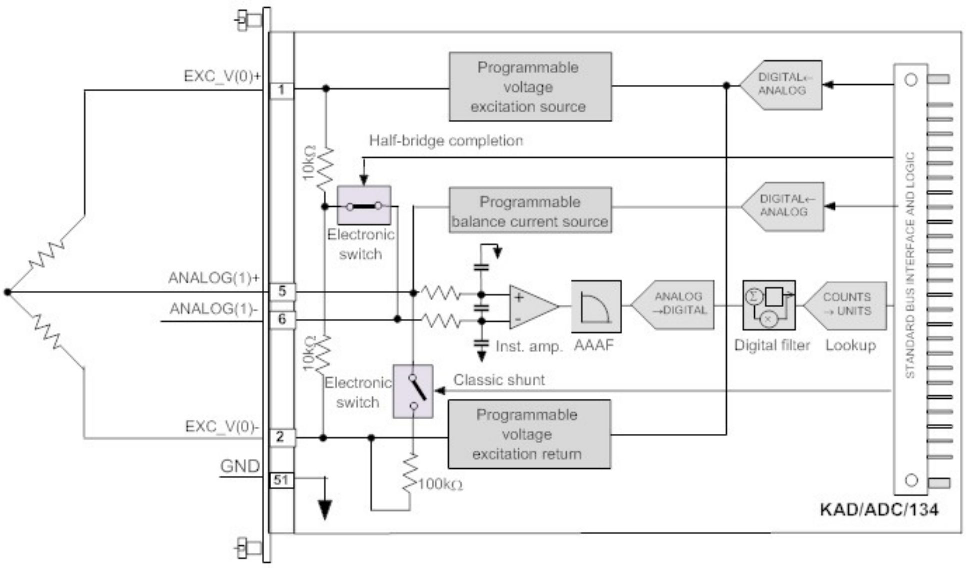


Figure 3: Second channel in half-bridge configuration, with matched pair of internal completion resistors enabled

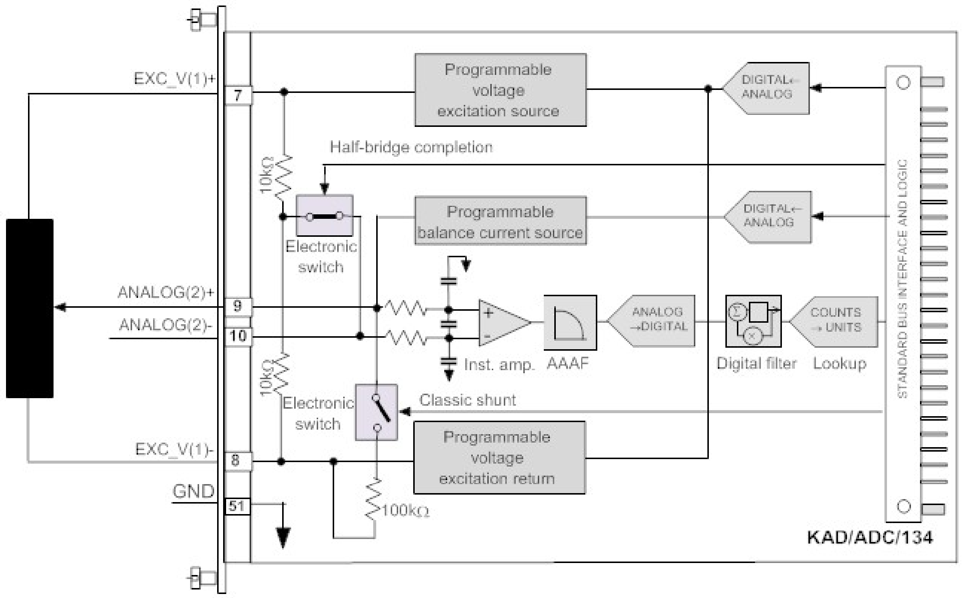


Figure 4: Third channel in potentiometer configuration, with matched pair of internal completion resistors enabled (recommended)

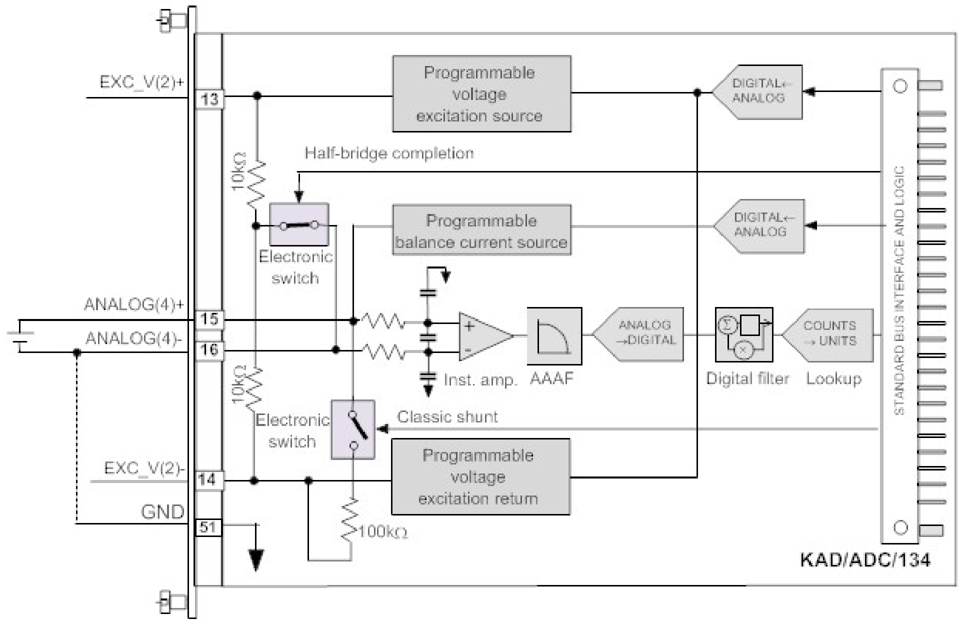


Figure 5: Fifth channel in differential ended configuration, with matched pair of internal completion resistors enabled (bias current return path)

Bias current return path

As shown in Figure 5 on page 9, the analog inputs can be used as differential inputs (that is, not from a bridge). In this case, if the signal source is isolated with respect to the Acra KAM-500 (for example a battery), a common-mode resistance between the negative input and ground (GND) should be used to provide a return for bias currents and reduce common-mode noise pick-up. Bias currents are in the order of nA. In order to correctly setup return path for bias currents, excitation for a specific channel should be set to voltage mode (any value from range), and either completion resistors should be enabled to internally pull-down to around 0V (middle voltage between bipolar excitation) or an external path to GND should be used, for example short (0Ω) to GND (as shown by the dotted line in Figure 5 on page 9).

NOTE: When analog inputs are used as differential inputs, setting the balance to zero is required.

KAD/ADC/134 shared excitations

The KAD/ADC/134 has 16 differential input channels and eight symmetrical excitation channels that can each provide a total of 30 mA. There are more input channels than excitations, this means that excitations must be shared across sensors if there are more sensors than excitations.

The rules for shared excitations are:

1. The same voltage must be selected for them.
2. The total current drawn must not exceed 30 mA.

The following example includes two 350Ω full bridges. It uses the KAD/ADC/134 inputs ANALOG(0) and ANALOG(1). It shares the excitation output EXC_V(0).

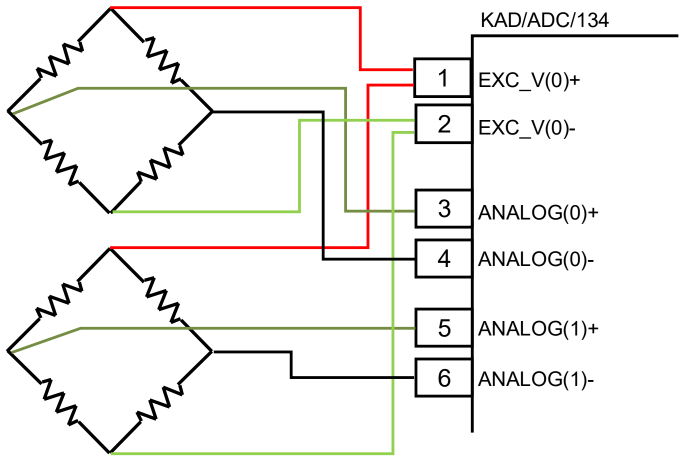


Figure 6: Sample wiring of bridge sensors with shared excitation

It is important to ensure that the current does not exceed 15 mA for each bridge. If all resistors are exactly 350Ω then there is the current i down each bridge arm with the following equation.

i = ((EXC_V+) - (EXC_V-)) / (350+350)

The excitation voltage must be set up in such a way that the current is less than 7.5 mA per arm (there are four arms, two per sensor, and 30 mA available).

Therefore the limit is nominally:

((EXC_V+) - (EXC_V-)) = 700 x 0.0075

((EXC_V+) - (EXC_V-)) = 5.25

also EXC_V+ = - EXC_V-

So maximum excitation should nominally be a maximum ±2.625V for the 350Ω bridge. Allowing 5% tolerance, 2.5V is recommended for the bridge.

Excitation setup

Excitation can contribute error to the overall measurement, so it is recommended to use as close as possible to full-scale excitation, to minimize the percentage error.

For optimal accuracy ensure each channel uses its corresponding excitation. If the excitation is not used, it should be set to the minimum value.

Excitation drift on potentiometer configurations

We recommend a full-bridge input configuration for the KAD/ADC/134. With this configuration the differential input amplifier removes common mode voltage or common mode pickup noise on the input lines. A similar configuration can be achieved with a potentiometer by using completion resistors, however, only the common mode voltage error present in the excitation would be compensated.

NOTE: For the KAD/ADC/134, internal completion resistors can be enabled by changing the Enable Half Bridge Completion Resistors setting to Enabled (see Figure 4 on page 9).

Compensation for lead resistance

In bridge applications, if the lead resistance can be measured or estimated, add the voltage drop across the leads to the excitation voltage. For example, for each 0.5Ω lead in a 350Ω full-bridge, where ±2.5V (5V) is desired across the bridge, the excitation should be set to 2.5V + (0.5 x 5 / 350) = 2.507.

Understanding filter delays (IIR filter mode)

The Acra KAM-500 uniquely samples all signals at the start of an acquisition cycle and at equal intervals of time thereafter. Signals sampled at the same sample rate are always sampled at the same time, independently of how they are stored or transmitted. (This has significant advantages for issues such as time correlation.) However, before signals are sampled they are filtered to remove noise components that might alias. The recommended cutoff point is one quarter the sampling frequency, as this results in the maximum filtering of aliasing frequencies. The Acra KAM-500 filters signals using over-sampling signal processing techniques. The following figure shows a delay for an 8th order filter where f_c = 1 kHz. All filters cause a delay inversely proportional to the filter cutoff frequency (f_c), so to calculate the delay for other f_c values, multiply the delay by (1 kHz. / f_c). The frequency axis then needs to be rescaled to the new f_c by dividing the frequency values by (1 kHz. / f_c). For example, an 8th order Butterworth filter with an f_c of 1 kHz. delays a 1 kHz. signal by 1ms; a filter with an f_c of 10Hz delays a 10Hz signal by 0.1s. The delay for IIR filters (for example Butterworth) varies with the input frequency.

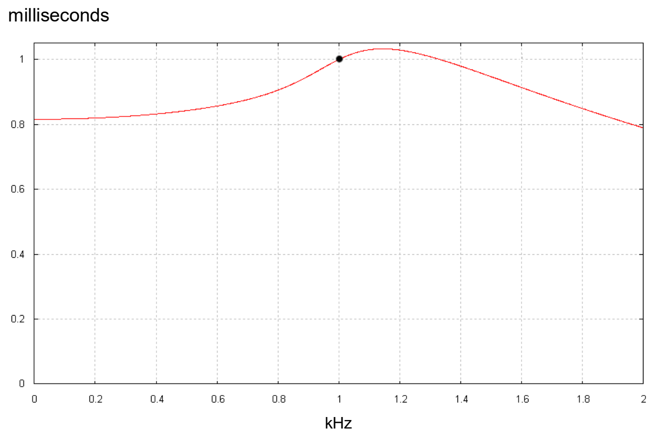


Figure 7: Filter delay for 8th order Butterworth filter where f_c = 1 kHz

The filter delay for the KAD/ADC/134 is:

$$T_D \approx T_A + \frac{1}{f_C} + T_{Butterworth8}(f)$$

T_D is the filter delay

T_A (analog filter delay) ≈ 0

Understanding filter delays (FIR filter mode)

The Acra KAM-500 uniquely samples all signals at the start of an acquisition cycle and at equal intervals of time thereafter. Signals sampled at the same sample rate are always sampled at the same time independently of how they are stored or transmitted. (This has significant advantages for issues such as time correlation.) However, before signals are sampled they are filtered to remove noise components that might alias. The recommended cutoff point is one quarter the sampling frequency, as this results in the maximum filtering of aliasing frequencies. The Acra KAM-500 filters signals using over-sampling signal processing techniques. All filters cause a delay inversely proportional to the filter cutoff frequency (f_c).

The filter delay for this mode is:

$$T_D \approx T_A + \frac{4}{f_c}$$

T_D is the filter delay

T_A (analog filter delay) ≈ 0

Unused differential ended inputs

Unused inputs should not be left floating, as this may increase current consumption from the ±12V backplane lines. Floating inputs may cause the output voltage of the instrumentation amplifier to approach one of the supply rails, which causes increased quiescent currents within specific channel circuits. Each unused differential ended input should be shorted together within its pair or connected to GND.

Connector pinout of the KAD/ADC/134

PIN	NAME	SEE SPECIFICATIONS TABLE	COMMENT
1	EXC_V(0)+	Bipolar DC voltage excitation outputs	Excitation to top of bridge
2	EXC_V(0)-	Bipolar DC voltage excitation outputs	Excitation to bottom of bridge
3	ANALOG(0)+	Differential ended analog inputs	Analog input
4	ANALOG(0)-	Differential ended analog inputs	Analog input
5	ANALOG(1)+	Differential ended analog inputs	Analog input
6	ANALOG(1)-	Differential ended analog inputs	Analog input
7	EXC_V(1)+	Bipolar DC voltage excitation outputs	Excitation to top of bridge
8	EXC_V(1)-	Bipolar DC voltage excitation outputs	Excitation to bottom of bridge
9	ANALOG(2)+	Differential ended analog inputs	Analog input
10	ANALOG(2)-	Differential ended analog inputs	Analog input
11	ANALOG(3)+	Differential ended analog inputs	Analog input
12	ANALOG(3)-	Differential ended analog inputs	Analog input
13	EXC_V(2)+	Bipolar DC voltage excitation outputs	Excitation to top of bridge
14	EXC_V(2)-	Bipolar DC voltage excitation outputs	Excitation to bottom of bridge
15	ANALOG(4)+	Differential ended analog inputs	Analog input
16	ANALOG(4)-	Differential ended analog inputs	Analog input
17	ANALOG(5)+	Differential ended analog inputs	Analog input
18	ANALOG(5)-	Differential ended analog inputs	Analog input
19	EXC_V(3)+	Bipolar DC voltage excitation outputs	Excitation to top of bridge
20	EXC_V(3)-	Bipolar DC voltage excitation outputs	Excitation to bottom of bridge
21	ANALOG(6)+	Differential ended analog inputs	Analog input
22	ANALOG(6)-	Differential ended analog inputs	Analog input
23	ANALOG(7)+	Differential ended analog inputs	Analog input
24	ANALOG(7)-	Differential ended analog inputs	Analog input
25	EXC_V(4)+	Bipolar DC voltage excitation outputs	Excitation to top of bridge
26	EXC_V(4)-	Bipolar DC voltage excitation outputs	Excitation to bottom of bridge
27	ANALOG(8)+	Differential ended analog inputs	Analog input
28	ANALOG(8)-	Differential ended analog inputs	Analog input
29	ANALOG(9)+	Differential ended analog inputs	Analog input
30	ANALOG(9)-	Differential ended analog inputs	Analog input
31	EXC_V(5)+	Bipolar DC voltage excitation outputs	Excitation to top of bridge
32	EXC_V(5)-	Bipolar DC voltage excitation outputs	Excitation to bottom of bridge
33	ANALOG(10)+	Differential ended analog inputs	Analog input
34	ANALOG(10)-	Differential ended analog inputs	Analog input
35	ANALOG(11)+	Differential ended analog inputs	Analog input
36	ANALOG(11)-	Differential ended analog inputs	Analog input
37	EXC_V(6)+	Bipolar DC voltage excitation outputs	Excitation to top of bridge
38	EXC_V(6)-	Bipolar DC voltage excitation outputs	Excitation to bottom of bridge
39	ANALOG(12)+	Differential ended analog inputs	Analog input
40	ANALOG(12)-	Differential ended analog inputs	Analog input
41	ANALOG(13)+	Differential ended analog inputs	Analog input
42	ANALOG(13)-	Differential ended analog inputs	Analog input
43	EXC_V(7)+	Bipolar DC voltage excitation outputs	Excitation to top of bridge
44	EXC_V(7)-	Bipolar DC voltage excitation outputs	Excitation to bottom of bridge
45	ANALOG(14)+	Differential ended analog inputs	Analog input
46	ANALOG(14)-	Differential ended analog inputs	Analog input
47	ANALOG(15)+	Differential ended analog inputs	Analog input
48	ANALOG(15)-	Differential ended analog inputs	Analog input
49	DNC		Do not connect
50	GND	Internal ground	
51	GND	Internal ground	
52	CHASSIS	Chassis	

Ordering information

PART NUMBER	DESCRIPTION
KAD/ADC/134/B/100m	Full/½-bridge ADC (voltage excitation, strain gages, shunt resistor, 6.25 kHz b/w, ±100 mV) - 16ch at 25 ksps
KAD/ADC/134/B/10V	Full/½-bridge ADC (voltage excitation, strain gages, shunt resistor, 6.25 kHz b/w, ±10V) - 16ch at 25 ksps

By default, the standard mating connector (CON/KAD/002/CP) is included with each module in the shipment. Its part number will be added to the Confirmation of Order unless an alternative option is specified (see the *Cables* data sheet).

The KAD/ADC/134 uses power from the ±7V power line for excitation and therefore cannot be used with the KAM/CHS/04L, KAM/CHS/05F, KAM/CHS/03F, or KAM/CHS/02F chassis.

Revision history

REVISION	DIFFERENCES	STATUS
KAD/ADC/134/B	High impedance per channel when powered off; improvements to digital filter type selection patterns and module power-on specifications	Recommended for new programs
KAD/ADC/134	First release	Not recommended for new programs

Supporting software

SOFTWARE	DETAILS
DAS Studio 3	User interface for setup and management of data acquisition, network switches, recorders and ground stations in an integrated environment
KSM-500	This module is supported by the KSM-500 suite of software tools

Related documentation

DOCUMENT	DETAILS
DOC/DBK/001	Acra KAM-500 Databook
DOC/HBK/002	Environmental Qualification Handbook
DOC/MAN/030	DAS Studio 3 User Manual
TEC/NOT/001	Strain gages and ideal bridges
TEC/NOT/016	Power dissipation
TEC/NOT/049	Power estimation

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