

## Hex Differential Amplifier G123-816

### Application Notes

#### 1 Scope

These application notes are a guide to applying the G123-816 Hex Differential Amplifier. They tell you how to install, connect and adjust the Hex Differential Amplifier. They do not tell you how to design the closed loop system in which it is used.

#### 2 Description

The G123-816 Hex Differential Amplifier is used to condition six differential signals into six single ended  $\pm 10V$  signals, suitable for Moog Servo Controller (MSC) and Programmable Servo Controller (PSC) analog inputs. Switches inside the module enable five different types of voltage and current input signals to be selected. They are: 4-20mA, 0 to  $\pm 10V$ , 0 to  $\pm 5V$ , 0 to 10V and 0 to 5V.

As well as producing a PSC/MSC compatible signal, the amplifier has double pole (optional, one) low pass noise and anti-alias filters that have roll-off frequencies selected by two plug-in resistors.

#### 3 Installation

##### 3.1 Placement

A horizontal DIN rail, mounted on the vertical rear surface of an industrial steel enclosure, is the intended method of mounting. The rail release clip of the G123-816 should face down, so the front panel and terminal identifications are readable and so the internal electronics receive a cooling airflow. An important consideration for the placement of the module is electro magnetic interference (EMI) from other equipment in the enclosure. For instance, VF and AC servo drives can produce high levels of EMI. Always check the EMC compliance of other equipment before placing the G123-816 close by.

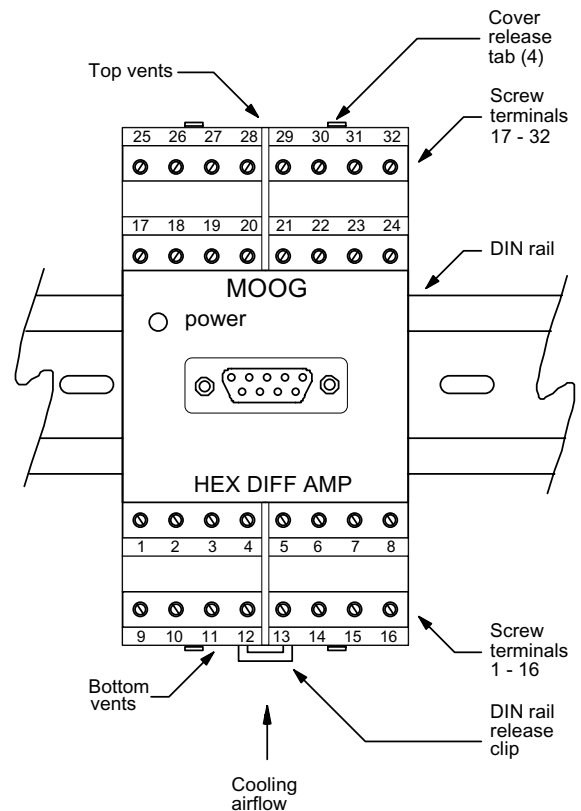
##### 3.2 Cooling

Vents in the top and bottom sides of the G123-816 case provide cooling for the electronics inside. These vents should be left clear. It is important to ensure that equipment below does not produce hot exhaust air that heats up the G123-816.

##### 3.3 Wiring

The use of crimp "boot lace ferrules" is recommended for the screw terminals. Allow sufficient cable length so the circuit card can be withdrawn from its case with the wires still connected. This enables switch and resistor changes on the circuit card to be made while the card is still connected. An extra 100mm, for cables going outside the enclosure, as well as wires connecting to adjacent DIN rail units, is adequate.

If only one of the two differential inputs is being used, the unused input should be connected to signal ground (0V ref). Signal ground should also be connected back to signal ground of the device providing the input signal.



##### 3.4 EMC

The G123-816 emits radiation well below the level called for in its CE mark test. Therefore, no special precautions are required for suppression of emissions. However, immunity from external interfering radiation is dependent on careful wiring techniques. The accepted method is to use shielded cables for all connections and to radially terminate the cable shields, in an appropriate grounded cable gland, at the point of entry into the industrial steel enclosure. If this is not possible, chassis ground screw terminals are provided on the G123-816. Exposed wires should be kept to a minimum length. Connect the shields at both ends of the cable to chassis ground.

#### 4 Power supply

24V DC nominal, 22 to 28V

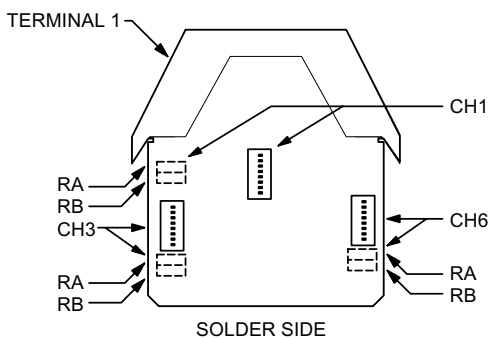
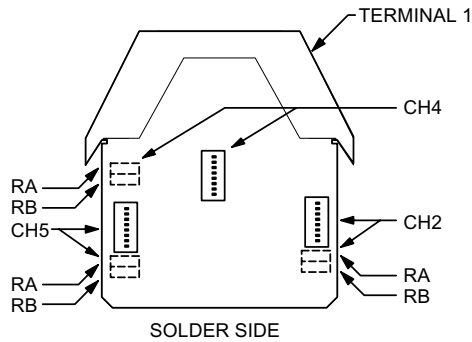
55mA @ 24V

If an unregulated supply is used, the bottom of the ripple waveform is not to fall below 22 V.

It is recommended that the M205, 250mA T (slow blow) fuse, supplied with the unit, be placed in series with the +24V input to protect the electronic circuit. There is a spare fuse in the cover of the fuse holder. Replacement fuses should be compliant with IEC 127-2 sheet 3.

## 5 Set-up adjustments

Each of the six channels has an eight position selector switch, to configure the input signal, and two plug-in resistors to set the anti-alias roll-off frequency. The diagram and tables below show their location and functions. The input signal and two pole filter tables also appear on the side of the amplifier case.



### 5.1 Input signal

Set the selector switch for each of the six channels to match the required input signal type. The selector switches are too small to be operated with a finger or nail. A fine blade screw driver or a pen is necessary. Note that the G123-816 is shipped with the switches selected for  $\pm 10V$  input.

Input Signal Switch Setup								
Input	Switch Position							
	1	2	3	4	5	6	7	8
4-20mA	✓		✓			✓	✓	
0 to $\pm 10V$					✓			
0 to $\pm 5V$					✓			
0 to +10V				✓		✓		
0 to +5V		✓				✓	✓	

### 5.2 Anti-alias filter, two pole

Install resistors RA and RB to give the required roll-off frequency.

The plug in resistors should be:

- Metal film
- 1% tolerance
- 50 PPM/C° tempco

Two types that could be used are:

- Roderstein type no: MK2 0207
- Beyschlag type no: MBB 0207

This size resistor is generally referred to as "a quarter watt".

A starting point for the anti-alias roll-off is to select a frequency that is half the frequency of the S period of the PSC/MSC. For instance, if the S period is 1.5mS half the frequency would be 333Hz. There is no 333Hz selector, so select the next lowest frequency, which is 250Hz.

Note that the G123-816 is shipped with the resistors selected for a two pole, 1kHz roll-off.

Filter Setup – 2 Pole		
Hz	RA	RB
25	150k	240k
50	75k	130k
100	39k	62k
150	24k	43k
200	18k	33k
250	15k	24k
500	7k5	13k
1000	3k9	6k2

### 5.3 Anti-alias filter, one pole

To configure the output filter as single pole, remove C4, 14 and 25 on each card, load a zero Ohm resistor in RB position and load RA as per the table below.

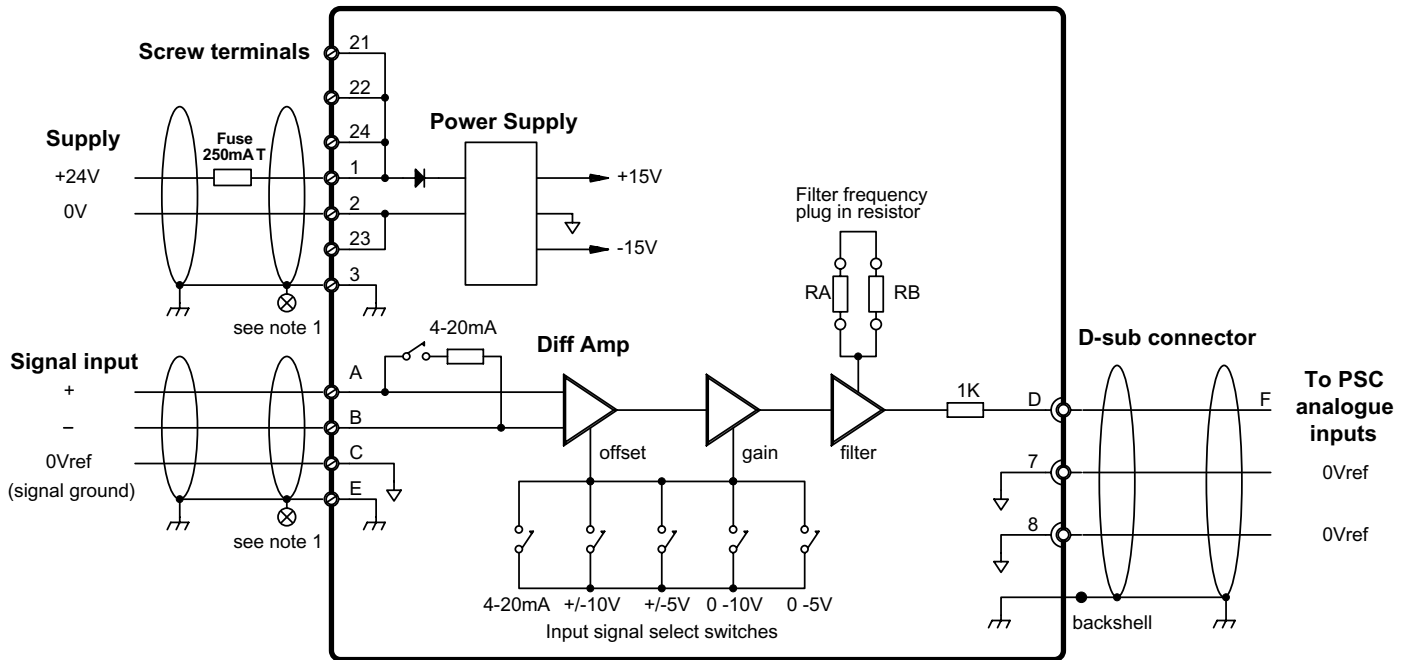
It is beyond the scope of these application notes to recommend how to choose between one and two pole filter configuration.

Filter Setup – 1 Pole	
Hz	RA
25	300k
50	150k
100	75k
150	49k
200	36k
250	30k
500	15k
1000	7k5

## 6 Withdrawing the circuit card from its case

To select the input signal type switches and select the filter resistors, the circuit card needs to be withdrawn from its case. To do this, push one tab in with a pen or screwdriver while gently pulling on the top cover on that side. The cover will release approximately one mm. Repeat on the second tab on that side. Repeat on the other side and then withdraw the cover and circuit card until the required adjustment points are exposed. The rigidity of the connecting wires will hold the circuit card in position while adjustments are made.

## 7 Block-wiring diagram



⊗ Note: 1. Connect cable screen to enclosure cable gland or chassis ground terminal on G123-816.

**PIN OUT TABLE**

CH	Screw terminal				D-sub pin
	Input +	Input-	0Vref	Chassis GND	Signal to PSC
F	A	B	C	E	D
1	8	7	6	5	1
2	9	10	11	12	2
3	16	15	14	13	3
4	17	18	19	20	4
5	25	26	27	28	5
6	32	31	30	29	6

## 8 Specifications

<b>Voltage inputs:</b>	0 to $\pm 10V$ , 0 to $\pm 5V$ , 0 to 10V and 0 to 5V 25kOhm input resistance	<b>Temperature:</b>	0 to +40°C
<b>Current input:</b>	4-20mA 312Ohm load resistance	<b>Dimensions:</b>	100W x 108H x 45D
<b>Outputs:</b>	0 to $\pm 10V$ $R_{out} = 1k\Omega$	<b>Weight:</b>	220g
<b>Anti-alias filter:</b>	Double or single pole 25, 50, 100, 150, 200, 250, 500 and 1000 Hz	<b>CE mark:</b>	EN50081.1 emission EN50082.2 immunity
<b>Front panel indicator:</b>	$V_s$ , internal supply = green	<b>C tick:</b>	AS4251.1 emission
<b>Supply:</b>	24V DC nominal, 22 to 28V 55mA @ 24V, no load		
<b>Recommended supply protection:</b>	M205, 250mA T (slow blow) fuse compliant with IEC 127-2 sheet 3		
<b>Mounting:</b>	DIN rail IP 20		

This page left blank intentionally

## Internet Data

For a detailed Data Sheet and the latest version of these Application Notes, please refer to the Moog website [www.moog.com/dinmodules](http://www.moog.com/dinmodules)

# MOOG

Industrial Controls Division. Moog Inc., East Aurora, NY 14052-0018. Telephone: 716/652-3000. Fax: 716/655-1803. Toll Free 1-800-272-MOOG.

Moog GmbH. Germany. Telephone: 07031-622-0. Fax: 07031-622-100.

Moog Sarl. France. Telephone: 01 45 60 70 00. Fax: 01 45 60 70 01.

Moog Australia Pty. Ltd. Telephone: 03 9561 6044. Fax: 03 9562 0246.

Moog pursues a policy of continuous development and reserves the right to alter designs and specifications without prior notice. Information contained herein is for guidance only and does not form part of a contract.

Australia: Melbourne, Sydney, Brisbane ■ Austria: Vienna ■ Brazil: São Paulo ■ Denmark: Birkerød ■ England: Tewkesbury ■ Finland: Espoo ■ France: Rungis ■ Germany: Böblingen, Dusseldorf ■ Hong Kong: Shatin ■ India: Bangalore  
Ireland: Ringaskiddy ■ Italy: Malnate (VA) ■ Japan: Hiratsuka ■ Korea: Kwangju-Kun ■ Philippines: Baguio City ■ Singapore: Singapore ■ Sweden: Askim ■ USA: East Aurora (NY)