

# DRA004 – DRA009 Generic 3 Channel Isolation Amplifier

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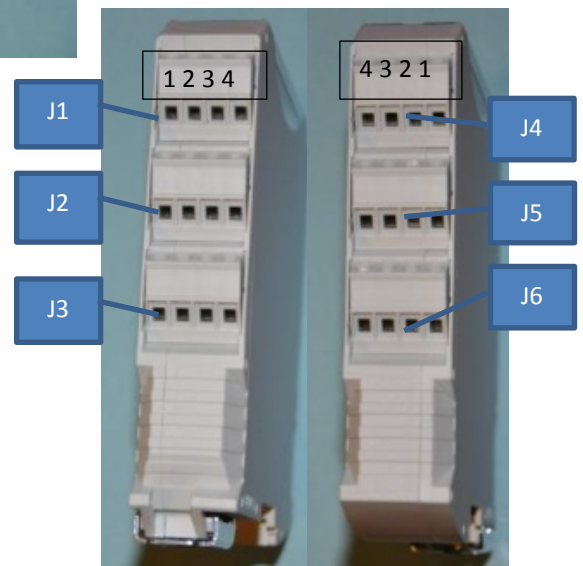
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# DRA004 Generic 3 Channel Isolation Amplifier



The DRA004 is DIN Rail mounting generic 3 channel isolation amplifier that can be configured during manufacture. Standard options are offered with 3 types of inputs, External Current Shunt, Internal Current Shunt and Internal Voltage Divider. It can also be offered as a customised unit with the input scaling and configuration defined by the user.



### Inputs

1	2	3	4	Left Side
Current1 In	Current1 Out	Voltage1+	Voltage1-	J1
Current2 In	Current2 Out	Voltage2+	Voltage2-	J2
Current3 In	Current3 Out	Voltage3+	Voltage3-	J3

### Outputs

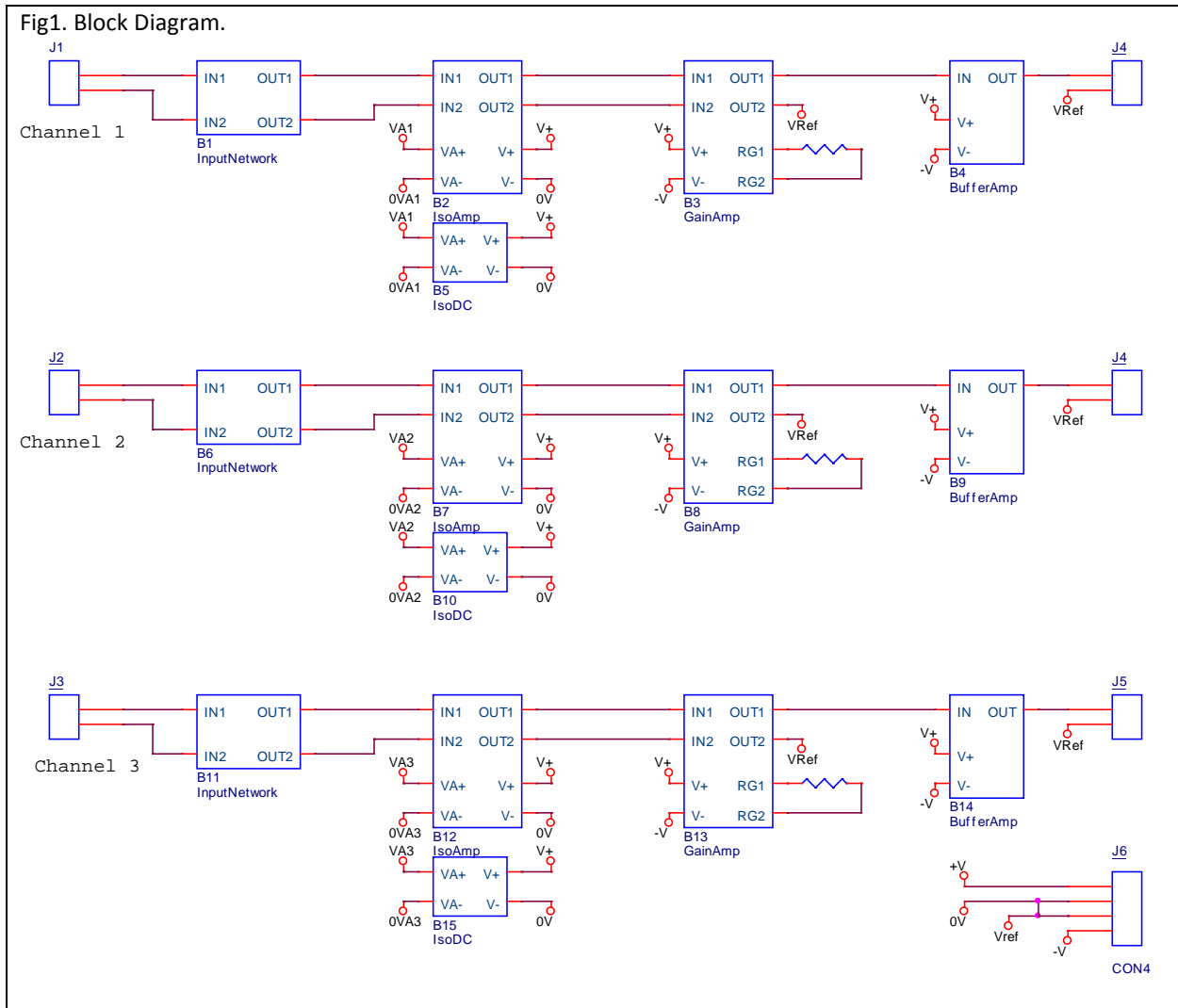
4	3	2	1	Right Side
Vref	Channel2	Vref	Channel1	J4
NC	NC	Vref	Channel3	J5

### Supplies

4	3	2	1	Right Side
-5.0V	Vref=0V	0V	5.0V	J6

## Block Diagram

Fig1. Block Diagram.



## Isolation

The DRA004 PCB isolates the input channels from each other and from the common output circuit. The output circuit is referenced to 0V on J6 and the input circuits have their supplies IsoDC that generate references 0VA1, 0VA2 and 0VA3. The isolation amplifier IsoAmp is approved to IEC 60747-5-5 1414Vpeak working insulation voltage.

## Input

On each input there is a network of resistors that are defined in detail below.

## Output, Scaling and Power Supply

The output of the DRA004 circuit is compatible with National Instruments' DAQ modules with a range of  $\pm 2.0V$  around  $V_{ref}$  which is internally connected to 0V. The standard gains for GainAmp convert  $\pm 50mV$  or  $\pm 200mV$  input to IsoAmp to  $\pm 2.0V$  output. Different gains and calibration can be set by the factory by adjustment of RG. There is a RC filter that limits the bandwidth to 80 kHz and the output buffer can drive a capacitive load.

## Customisation

The Input Network is offered in standard configurations as detailed below but clients can request other scaling and supply configurations. For example a customised unit can run from a single 5V supply with an external  $V_{ref}$ . The unit can be scaled up to  $\pm 200mV$  on the IsoAmp and to  $\pm 4.8V$  on the output.

## Input Network Standard Variants

Fig 2. Input Network Variants.

Type	Network	Note
Generic	<p>Generic Input Network e.g. Channel 1</p>	These 6 resistors can be fitted in different combinations for the 3 channels of DRA004. Standard arrangements are described below based on $\pm 50\text{mV}$ and $\pm 200\text{mV}$ at the input to IsoAmp.
A	<p>External Current Shunt e.g. Input Network Channel 1</p>	This network is compatible with external current shunts with a 50mV full scale rating such as Murata/Datel 3020 series.
B	<p>Internal Current Shunt e.g. Input Network Channel 1</p>	This network uses the internal RSense resistor to measure current. The resistor value is scaled to 200mV full scale at 20A peak and 14.1A continuous operation.
C	<p>External High Voltage e.g. Input Network Channel 1</p>	This network scales a $\pm 1000\text{V}$ peak input to $\pm 200\text{mV}$ at the IsoAmp input.

## Custom (Voltage and Current Measurement)

The input network can be factory built to suit the user on request. The PCB has the following limitations:

Fig 3. Custom input network.

	RA	RB	RC	RD	RE	RF
Footprint	2512	2512	2512	2512	2512	0805
Power	100mW	100mW	3W max.	0.6W	0.6W	100mW
Voltage				500V	500V	200mV
Normal Range	OR link	OR link	2.5mR min. 14.1Arms, 20A peak.	Note: Power and volts max limits.	Note: Power and volts max limits.	Note: see *

The gain of GainAmp, see Fig 1, can be set by RG on each channel for custom scaling.

\*  $\pm 200\text{mV}$  is the maximum measurable input to the isolation amplifier.  $\pm 2\text{V}$  is the maximum without damage and  $\pm 6\text{V}$  is maximum transient for 2secs.

## Mechanical

The DRA004 and variants are packaged in a DIN rail housing from Phoenix, type ME MAX 22,5 G 3-3 KMGY with connectors MKDSO 2,5/4-6 SET KMGY.

Fig 4. Mechanical Dimensions



### Dimensions

Length	99 mm
Constructional height	114.5 mm
Width	22.5 mm



## Conformance

Fig 5. For CE mark.

Isolation Amplifier	IEC 60747-5-5
Creepage distance with pollution category 2 for PCB design.	IEC61010-1
Input Terminal	IECEE CB Scheme
Conducted emissions (DC-DC converter)	EN55022 Class A
Test Voltage	1.5kV, 50Hz, 1min.

## Product Variants

### DRA005 – 3 channel external current shunt. ( $\pm 50\text{mV}$ )

#### Inputs

Type. See Fig 2	1	2	3	4	Terminals Left Side
A	NC	NC	Current Shunt Hi	Current Shunt Lo	J1
A	NC	NC	Current Shunt Hi	Current Shunt Lo	J2
A	NC	NC	Current Shunt Hi	Current Shunt Lo	J3

#### Outputs

4	3	2	1	Right Side
Vref	Channel2	Vref	Channel1	J4
NC	NC	Vref	Channel3	J5

#### Supplies

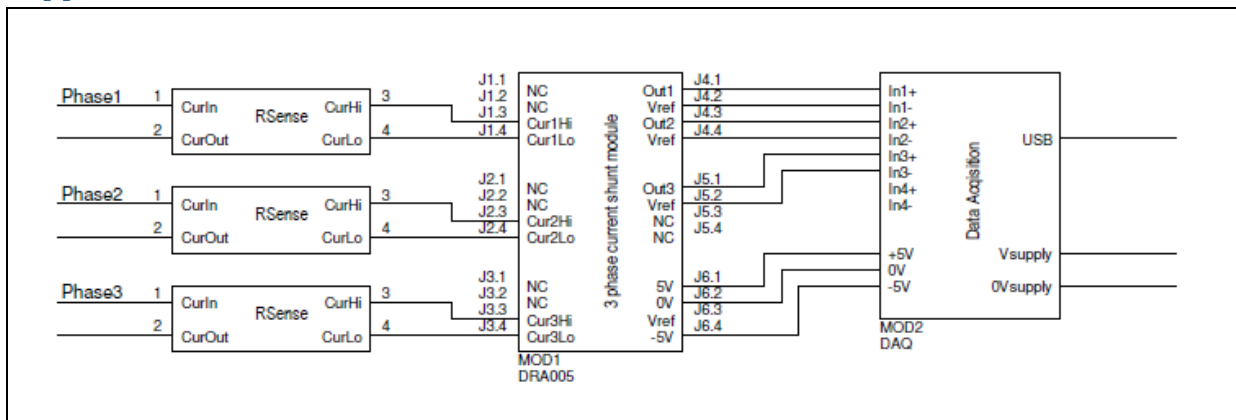
4	3	2	1	Right Side
-5.0V	Vref=0V	0V	5.0V	J6

## Specification

Power supply	-5.0V $\pm 5\%$ 25mA, +5.0V $\pm 5\%$ 180mA.
Input signal range	$\pm 50.00\text{mV}$ (from current shunt)
Maximum input signal	$\pm 200\text{mV}$ *
Input resistance	22kR
Output signal range	$\pm 2.00\text{V}$ relative to Vref (Vref internally connected to 0V)
Output resistance	100R
Maximum output signal	Supply voltage $\pm 0.2\text{V}$ .
Gain error	$\pm 0.75\%$ at $\pm 2.0\text{V}$ output.
Offset error	$\pm 2.5\text{mV}$ (offset trim built in)
Bandwidth	80kHz
Isolation	1000V channel to channel and channel to output

\*  $\pm 200\text{mV}$  is the maximum measurable input to the isolation amplifier.  $\pm 2\text{V}$  is the maximum without damage and  $\pm 6\text{V}$  is maximum transient for 2secs.

## Application



## DRA006 – 3 channel internal current shunt. ( $\pm 20A$ )

### Inputs

Type See Fig 2	1	2	3	4	Terminals Left Side
B	Current1 In	Current1 Out	NC	NC	J1
B	Current2 In	Current2 Out	NC	NC	J2
B	Current3 In	Current3 Out	NC	NC	J3

### Outputs

4	3	2	1	Right Side
Vref	Channel2	Vref	Channel1	J4
NC	NC	Vref	Channel3	J5

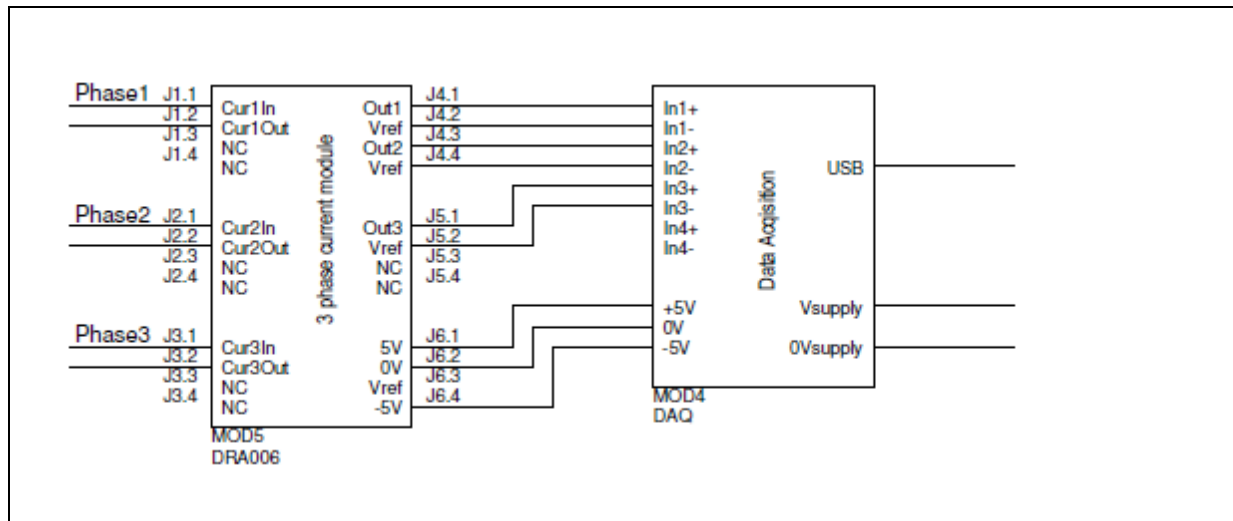
### Supplies

4	3	2	1	Right Side
-5.0V	Vref=0V	0V	5.0V	J6

## Specification

Power supply	-5.0V $\pm$ 5% 25mA, +5.0V $\pm$ 5% 180mA.
Input signal range	$\pm 20.0A$ peak.
Maximum input signal	14.1Arms continuous.
Input resistance	10.0mR 1% tolerance
Output signal range	$\pm 2.00V$ relative to Vref
Output resistance	100R
Maximum output signal	Supply voltage $\pm 0.2V$ .
Gain error	$\pm 1.75\%$ at $\pm 2.00V$ output
Offset error	$\pm 2.5mV$ (offset trim built in)
Bandwidth	80kHz
Isolation	1000V channel to channel and channel to output

## Application



## DRA007 – 3 channel voltage. ( $\pm 1000V$ )

Inputs					
Type See Fig 2	1	2	3	4	Terminals Left Side
C	NC	NC	Voltage1 Hi	Voltage1 Lo	J1
C	NC	NC	Voltage2 Hi	Voltage2 Lo	J2
C	NC	NC	Voltage3 Hi	Voltage3 Lo	J3

Outputs				
4	3	2	1	Right Side
Vref	Channel2	Vref	Channel1	J4
NC	NC	Vref	Channel3	J5

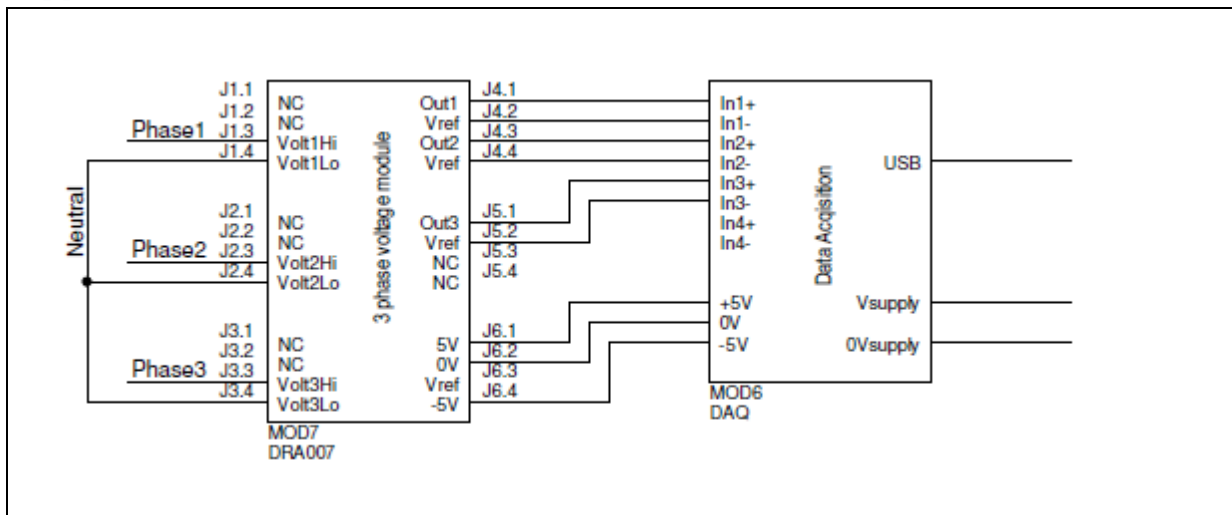
  

Supplies				
4	3	2	1	Right Side
-5.0V	Vref=0V	0V	5.0V	J6

### Specification

Power supply	-5.0V $\pm$ 5% 25mA, +5.0V $\pm$ 5% 180mA.
Input signal range	$\pm 1000V$
Maximum input signal	$\pm 1000V$
Input resistance	940kR voltage divider
Output signal range	$\pm 2.00V$ relative to Vref
Output resistance	100R
Maximum output signal	Supply voltage $\pm 0.2V$
Gain error	$\pm 1\%$ at $\pm 2.00V$ output
Offset error	$\pm 2.5mV$ (offset trim built in)
Bandwidth	80kHz
Isolation	1000V channel to channel and channel to output

### Application





## DRA008 – Single phase voltage and external current shunt. (±1000V and ±50mV)

### Inputs

Type See Fig 2	1	2	3	4	Terminals Left Side
A	NC	NC	Current Hi	Current Lo	J1
C	NC	NC	Voltage Hi	Voltage Lo	J2
	NC	NC	NC	NC	J3

### Outputs

4	3	2	1	Right Side
Vref	Channel2	Vref	Channel1	J4
NC	NC	NC	NC	J5

### Supplies

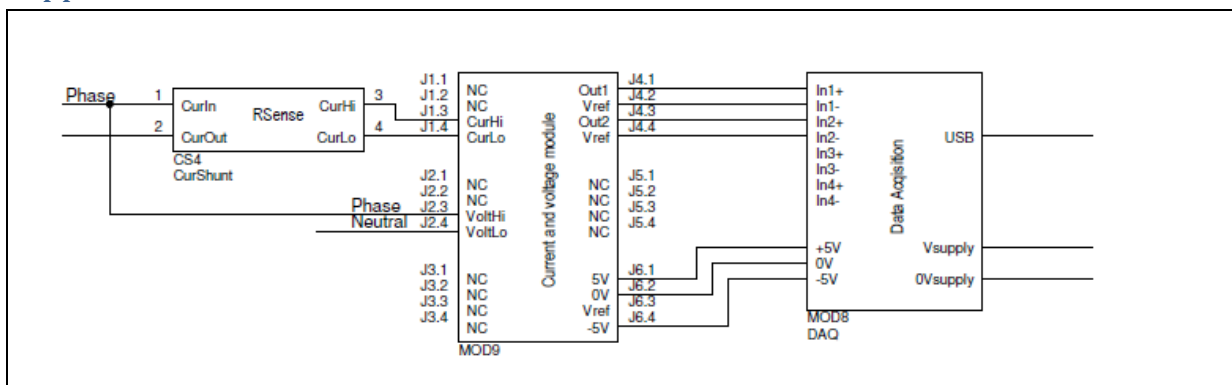
4	3	2	1	Right Side
-5.0V	Vref=0V	0V	5.0V	J6

## Specification

Power supply	-5.0V±5% 15mA, +5.0V±5% 120mA.
Current Channel:	
Input signal range	±50.00mV (from current shunt)
Output signal range	±2.00V relative to Vref
Gain error	±0.75% at 2.00V output
Maximum input signal	±200mV *
Input resistance	22kR
Voltage Channel:	
Input signal range	±1000V
Maximum input signal	±1000V
Input resistance	940kR voltage divider
Output signal range	±2.00V relative to Vref
Gain error	±1% at ±2.00V output.
Output resistance	100R
Maximum output signal	Supply voltage ±0.2V
Offset error	±2.5mV (offset trim built in)
Bandwidth	80kHz
Isolation	1000V channel to channel and channel to output

\* ±200mV is the maximum measurable input to the isolation amplifier. ±2V is the maximum without damage and ±6V is maximum transient for 2secs.

## Application



## DRA009 – Single phase voltage and internal current shunt. (±1000V and ±20A)

### Inputs

Type See Fig 2	1	2	3	4	Terminals Left Side
B	Current In	Current Out	NC	NC	J1
C	NC	NC	Voltage Hi	Voltage Lo	J2
	NC	NC	NC	NC	J3

### Outputs

4	3	2	1	Right Side
Vref	Channel2	Vref	Channel1	J4
NC	NC	NC	NC	J5

### Supplies

4	3	2	1	Right Side
-5.0V	Vref=0V	0V	5.0V	J6

## Specification

Power supply	-5.0V±5% 15mA, +5.0V±5% 120mA.
Current Channel:	
Input signal range	±20.0A peak.
Maximum input signal	14.1Arms continuous.
Input resistance	10.0mR 1% tolerance
Output signal range	±2.00V relative to Vref
Gain error	±1.75% at 2.00V output
Voltage Channel:	
Input signal range	±1000V
Maximum input signal	±1000V
Input resistance	940kR voltage divider
Output signal range	±2.00V relative to Vref
Gain error	±1% at ±2.00V output.
Output resistance	100R
Maximum output signal	Supply voltage ±0.2V
Offset error	±2.5mV (offset trim built in)
Bandwidth	80kHz
Isolation	1000V channel to channel and channel to output

## Application

