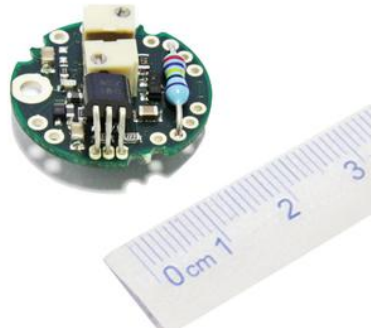


## Strain Gauge or Load Cell Embedded Analog Amplifier



*A range of high performance robust signal conditioners in a miniature OEM format and designed specifically for fitting inside load cells*

### Introduction

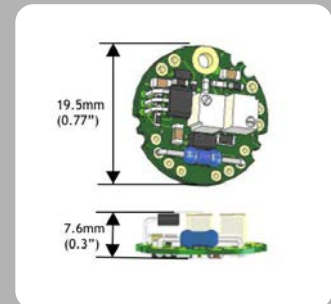
Load Cell Central's ICA family offers high stability and fast response strain gauge or load cell amplifier, converting a strain gauge input into a volt or mA output. Its sub-miniature design enables it to be fitted into the majority of transducers for a wide range of signal conditioning for strain gauges, load cells, pressure and torque transducers. Available in 6 versions, 5 with high performance and ICA5S with industrial stability.

The ICAH range offers very low drift over wide operating temperatures.

Optional (ILE) in line enclosure to convert a standard load cell to a conditioned load cell output.

### Specification at a Glance

- Standardized mounting hole for faster & easier installation
- New generation improved performance of up to 400% (High stability version) over operating temperature
- ROHS compliant
- Standardized excitation 5 V DC
- Multi layer printed circuit board & additional filtering to improve EMC performance
- ICA6 model to provide  $\pm 10$  V output from uni-polar 14-24 V supply
- Plated through holes for wire connections
- Full CE approval



### User Benefits

- Available in 6 different versions
- Small & compact, reduced height of just 7.6 mm
- Low drift
- Robust design, reverse polarity & short circuit protected
- Fast calibration procedure

### Ideal Applications

- Automotive
- Lifting & Handling
- Silo & Weighing
- Hazardous Areas
- Agriculture



## Related Product



**ILE**  
Field enclosure for ICA analogue and  
DCell data converters



**ICASATEX**  
ATEX Intrinsically Safe, OEM strain  
gauge converter, 4-20mA 2 wire

## Case Study

The ETS Formula SAE Team from the University of Quebec is renowned for its lightweight and ergonomic car design, its excellent suspension design and its scientific approach to vehicle validation and development.

The 2011 car features new suspension and steering packages designed from scratch. The new steering system was designed to reduce driver effort while allowing clear feedback from the tires back to the driver. In order to validate set up and troubleshoot various systems on the car, loads in all suspension and steering links needed to be quantified. To do so, the team needed strain gauges on all suspension and steering links.

### The Application:

A race car generates a lot of electromagnetic noise from the ignition and telemetry systems. This means that there must be minimal wiring length between the strain gauges and the amplifiers. Secondly, to provide representative data, the weight of the whole system must not alter the dynamics of the car.

### The Solution:

The strain gauges and embedded ICA amplifiers were integrated to the data acquisition system already in place. The resulting data was used in several phases of the project. Here are a few examples:

The recorded suspension loads allowed further refinements of the chassis load case which yields a lighter, yet rules-compliant chassis design.

The recorded steering loads allowed the team to characterize driver effort and also allowed a new target to be set for a steering system design balancing steering response, feedback and effort.



During the validation and development phase, the strain gauges allowed the team to monitor the wheel load fluctuation for better spring-damper selection and adjustment. Also, load transfer characteristics were monitored for validation and diagnosis purposes.

## CE & Environmental

Storage temperature - 40 to +85°C  
Operating temperature - 40 to +85°C

### CE Environmental Approvals

European EMC Directive 2004/108/EC



ICA H & S Product Sheet

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Load Cell Central follows a policy of continuous improvement and reserves the right to change specifications without notice. © 2015

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Specifications

## ICA1,2,3,6H Voltage Output Amplifiers

### ICA1H 0.1-10.1 V

Parameter	Min	Typical	Max	Units/Notes
<b>Electrical &amp; Environmental</b>				
Supply Voltage Range	13	24	30	Volts
Operating Current		22		mA Note 1
Operating Temp Range	-40		85	°C
Storage Temp Range	-40		85	°C
Reverse Polarity Protection	-30			Volts

### Measurements

Bridge Excitation	4.9	5	5.1	Volts
Bridge Impedance	350	1000	5000	Ohms
Bridge Sensitivity	0.5	2.5	150	mV/V Note 2
Output Voltage Range	0.1		+10.1	Volts
Output Load	5000			Ohms
Band Width	DC		1000	Hz
Zero Adjustment		±2		%FR
Span Adjustment		±8		%FR
Linearity		0.02		%FR
Zero Temp Stability H		0.0004	0.0015	±%FR/°C
Span Temp Stability H		0.002	0.0051	±%FR/°C

### ICA2H 0.1-5.1 V

#### Electrical & Environmental

Supply Voltage Range	8.5	12	28	Volts
Operating Current		22		mA Note 1
Operating Temp Range	-40		85	°C
Storage Temp Range	-40		85	°C
Reverse Polarity Protection	-30			Volts

#### Measurements

Bridge Excitation	4.9	5	5.1	Volts
Bridge Impedance	350	1000	5000	Ohms
Bridge Sensitivity	0.5	2.5	150	mV/V Note 2
Output Voltage Range	0.1		±5.1	Volts
Output Load	5000			Ohms
Band Width	DC		1000	Hz
Zero Adjustment		±2		%FR
Span Adjustment		±8		%FR
Linearity		0.02		%FR
Zero Temp Stability H		0.0004	0.0015	±%FR/°C
Span Temp Stability H		0.002	0.0051	±%FR/°C

## ICA3H ±10 V

### Electrical & Environmental

Supply Voltage Range	±13	±14	±15	Volts
Operating Current		22		mA Note 1
Operating Temp Range	-40		85	°C
Storage Temp Range	-40		85	°C
Reverse Polarity Protection	-30			Volts

### Measurements

Bridge Excitation	4.9	5	5.1	Volts
Bridge Impedance	350	1000	5000	Ohms
Bridge Sensitivity	0.5	2.5	150	mV/V Note 2
Output Voltage Range	-10		+10	Volts
Output Load	5000			Ohms
Band Width	DC		1000	Hz
Zero Adjustment		±2		%FR
Span Adjustment		±8		%FR
Linearity		0.02		%FR
Zero Temp Stability H		0.0004	0.0015	±%FR/°C
Span Temp Stability H		0.002	0.0051	±%FR/°C

## ICA6H ±10 V

### Electrical & Environmental

Supply Voltage Range	14	15	18	Volts Note 3
Operating Current		30		mA Note 1
Operating Temp Range	-40		85	°C
Storage Temp Range	-40		85	°C
Reverse Polarity Protection	-30			Volts

### Measurements

Bridge Excitation	4.9	5	5.1	Volts
Bridge Impedance	350	1000	5000	Ohms
Bridge Sensitivity	0.5	2.5	150	mV/V Note 2
Output Voltage Range	-10		+10	Volts
Output Load	5000			Ohms
Band Width	DC		1000	Hz
Zero Adjustment		±2		%FR
Span Adjustment		±8		%FR
Linearity		0.02		%FR
Zero Temp Stability H		0.0004	0.0015	±%FR/°C
Span Temp Stability H		0.002	0.0051	±%FR/°C

## ICA4H, ICA5S Current Output Amplifiers

### ICA4H 4-20 mA

#### Electrical & Environmental

Supply Voltage Range	10	24	30	Volts Note 4
Operating Current	26		42	mA Note 1
Operating Temp Range	-40		85	°C
Storage Temp Range	-40		85	°C
Reverse Polarity Protection	-30			Volts

#### Measurements

Bridge Excitation	4.9	5	5.1	Volts
Bridge Impedance	350	1000	5000	Ohms
Bridge Sensitivity	0.5	2.5	150	mV/V Note 2
Output Current Range	4		20	mA
Output Load			1000	Ohms Note 7
Band Width	DC		1000	Hz
Zero Adjustment		±2		%FR
Span Adjustment		±8		%FR
Linearity		0.02		%FR
Zero Temp Stability S		0.0009	0.0025	±%FR/°C
Zero Temp Stability H		0.0004	0.0015	±%FR/°C
Span Temp Stability S		0.0025	0.0064	±%FR/°C
Span Temp Stability H		0.002	0.0051	±%FR/°C

### ICA5S 4-20 mA

#### Electrical & Environmental

Supply voltage Range	7.5	24	30	Volts
Operating Current	4		20	mA (2 wire)
Operating Temp Range	-40		85	°C
Storage Temp Range	-40		85	°C
Reverse Polarity Protection	-30			Volts

#### Measurements

Bridge Excitation	1.05	1.11	1.16	Volts Note 5
Bridge Impedance	350	1000	5000	Ohms Note 6
Bridge Sensitivity	0.5	2.5	55	mV/V Note 2
Output Current Range	4		20	mA
Output Load			800	Ohms
Band Width	DC		1000	Hz
Zero Adjustment		±2		%FR Note 5
Span Adjustment		±8		%FR
Linearity		0.02		%FR
Zero Temp Stability S		0.001	0.005	±%FR/°C
Span Temp Stability S		0.007	0.014	±%FR/°C

<b>ICA5A 4-20mA</b>				
<b>Electrical &amp; Environmental</b>				
Supply Voltage Range	9	24	30	Volts
Operating Current	4		20	mA (2 wire)
Operating Temp Range	-40		85	°C
Storage Temp Range	-40		85	°C
Reverse Polarity Protection	-30			Volts
<b>Measurements</b>				
Bridge Excitation	1.05	1.11	1.16	Volts Note 5
Bridge Impedance	350	1000	5000	Ohms Note 6
Bridge Sensitivity	0.5	2.5	55	mV/V Note 2
Output Current Range	4		20	mA
Output Load			700	Ohms
Band Width	DC		1000	Hz
Zero Adjustment		±2		%FR Note 5
Span Adjustment		±8		%FR
Linearity		0.02		%FR
Zero Temp Stability S		0.001	0.005	±%FR/°C
Span Temp Stability S		0.007	0.014	±%FR/°C
Notes	<p>Note 1 - With 350 Ohm load cell connected.</p> <p>Note 2 - Factory setting is the typical value shown. For other values fit an alternative calibration resistor see manuals.</p> <p>Note 3 - ICA6 maximum voltage can be increased to 24V with a 1000 Ohm load cell.</p> <p>Note 4 - The ICA4 can tolerate a lower supply voltage if the output load is reduced e.g. operation is possible at 8V provided that the load does not exceed 150 Ohm.</p> <p>Note 5 - ICA5 with 1000 Ohms load cell connected.</p> <p>Note 6 - ICA5 recommended bridge impedance is 1000 Ohms or greater.</p> <p>Note 7 - 24V minimum supply / sink mode</p>			
General Notes	<p>The voltage between either of the power supply connections and the load cell shield should not exceed 50V. Any leakage will be greater than 10M Ohms.</p> <p>FR = Full Range</p>			
<b>Environmental</b>				
Storage Temperature	-40 to +85°C			
Operating Temperature	-40 to +85°C			
Relative Humidity	95% maximum non condensing			
CE Environmental Approvals	European EMC Directive 2004/108/EC, Low Voltage Directive 2006/95/EC			