

# MODEL GM-A



**SENSOTEC**

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**Sensotec, Inc.**

**Model GM-A Amplified Cell Indicator  
Instruction Manual**

**Sensotec Part Number: 008 - 0256 - 00**

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2080 Arlingate Lane

Columbus, Ohio 43228

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**IMPORTANT!** IT IS RECOMMENDED THAT YOU READ THIS DOCUMENT THOROUGHLY BEFORE APPLYING POWER TO THIS UNIT. THIS DOCUMENT CONTAINS INFORMATION ON WIRING, CALIBRATION, AND USE OF FEATURES.

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# THE MODEL GM-A AMPLIFIED CELL INDICATOR

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## 1.0 INTRODUCTION

**Sensotec's** Model GM-A Amplified Cell Indicator is designed to provide excitation voltage to internally-amplified transducers and to display their outputs in engineering units. Excitation supplied is +/- 15 volts at up to 30 milliamperes. The GM-A can display the output from 0 to 5 volt and 4 to 20 milliamperes output amplified cells. It is housed in a rugged 1/8 DIN Noryl enclosure for easy panel mounting. The display uses 0.56" bright LED indicators.

- Full 4-1/2 digit, 0.56-inch display
- Display in any engineering unit desired
- Full 20,000 count resolution
- Accepts 0-5 volt or 4-20 mA inputs
- 0-5 volt output
- 1/8 DIN "panel meter size" case
- 30-volt amplified cell excitation
- 110 or 220 volt power

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## **2.0 DESCRIPTION**

### **2.1 CONFIGURATION**

Within the GM-A's enclosure there are three printed circuit boards. The Main Board contains the circuitry for the power supply and the A/D converter. The Amplifier Board contains a low-gain differential amplifier, offsetting circuitry, and a reference circuit. The Display Board solders to the Main Board, and contains all circuitry needed to drive the LED display and decimal points. Access to the OFFSETTING and the SCALING potentiometers is obtained by snapping off the front bezel and removing the lens. The entire unit may be quickly panel or rack-mounted with the snap-on attachments supplied with every unit.

### **2.2 SPECIFICATIONS**

#### GENERAL:

No. of Channels	1
Case Material	Noryl Plastic
Temperature, Storage	-20 deg. F to 200 deg. F.
Temperature, Operating	32 deg. F to 130 deg. F.

#### TRANSDUCER INTERFACE:

Cell Excitation	+/- 15 volts
Types of Inputs Accepted	0-5 volts, 4-20 mA
Transducer Current Drive	30 mA (max)
Input Gain Range	1-6
Offset Capability	+/- 40%

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## AMPLIFIER CHARACTERISTICS:

Full-Scale Output	5 volts
Output Impedance	< 2 ohms
Accuracy	+/- 0.02%
Frequency Response	> 250 Hz.
Common Mode Rejection	> 80 dB.
Offset Capability	+/- 40%

## DIGITAL DISPLAY CHARACTERISTICS:

#Characters Displayed	4-1/2
Conversions per Second	3
Scaling	0-19999
Scaling Method	Potentiometer
Polarity Indication	"-" for negative
Decimal Point Selection	Push-on Terminal
Display Size	0.56"
Overrange Indication	Flashing Display
Resolution	1/20,000
Type	LED

## PHYSICAL CHARACTERISTICS:

Weight	2.4 lbs.
Mounting	bench, panel or rack
DIN Size	1/8 DIN

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## POWER SUPPLY CHARACTERISTICS:

Power Requirements	115VAC/220VAC (factory-set, field changeable)
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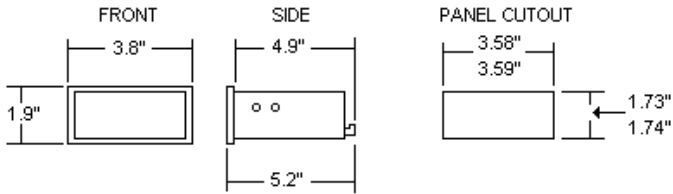
### **3.0 UNPACKING, INSTALLATION, AND WIRING**

The Model GM-A is shipped in a single container. Inspect the unit for shipping damage, and gently shake and listen for loose components prior to energizing it. Report shipping damage to the carrier; it is his responsibility to safely transport the unit. If there is transportation damage and you have difficulty getting the problem resolved, contact **Sensotec** at (614) 486-7723. We will attempt to assist in resolving the situation.

#### **3.1 MOUNTING THE UNIT**

For panel mounting, cut a rectangular hole 3.58" in width by 1.73" in height. Remove the panel mounting brackets by unsnapping them from the sides of the Model GM-A. Place the model GM-A through the panel cutout and reattach the panel mounting brackets to the sides of the case. Use a small screwdriver to tighten the panel mounting bracket adjusting screws until the case is pulled tightly into the panel.





**Figure 3.1 -- GM-A Dimensions**

### **3.2 WIRING TO THE AMPLIFIED CELL**

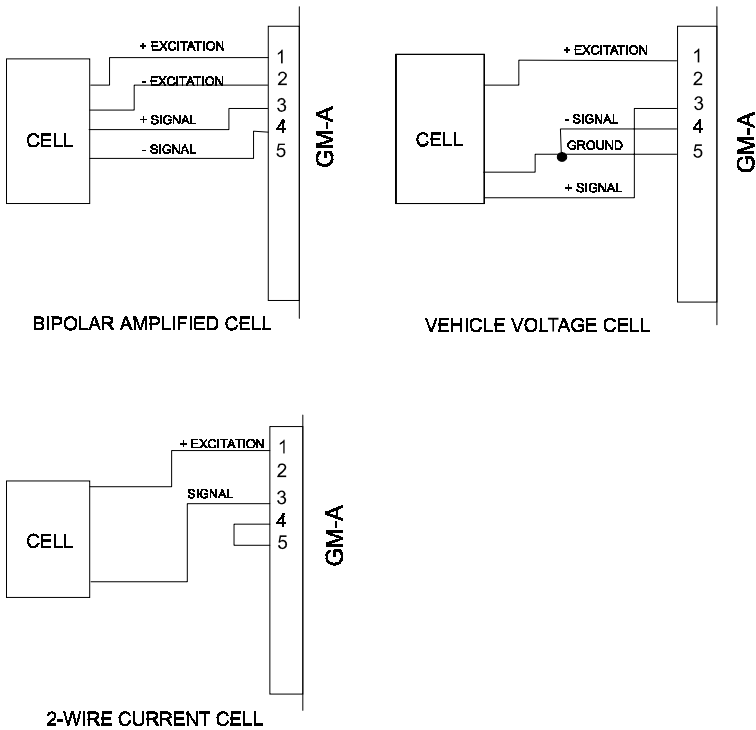
All connections to the GM-A are made through the rear-panel 15-pin connector. Each pin is labelled with its function, and pins are numbered from the left as you look at the rear of the instrument. Thus, the leftmost terminal is marked +EXC but is also be called terminal 1. The connector may be wired before it is attached to the GM-A. Three different amplified cell types may be used wuth the GM-A; each has a different connection pattern. Figure 3.2 diagrams the three connection patterns.

### **3.3 WIRING THE OUTPUT**

If the 0-5 V output of the Model GM-A is to be used, wire to the -OUTPUT (#5) and +OUTPUT (#6) respectively. Observe the correct polarity.

### 3.4 POWER CONNECTIONS

AC power is connected to the unit on the AC HI (#15), AC LO (#14) and CHASSIS (#13) terminals. Observe that the AC LO terminal (#14) is connected to the AC power line neutral (white wire). The AC HI terminal (#15) connects to the "hot" side of the AC power (black wire). 110 volts, 60 Hz. Is the normal power for the Model GM-A, but 220 volts, 50 Hz. May be provided through jumpering on the Main Board. Contact Sensotec for instructions on this modification..



**Figure 3.2 -- Hookup of Cells to GM-A**

**Note: Be sure to select which type of transducer you are using on the "type" connectors on the amplifier circuit board.**

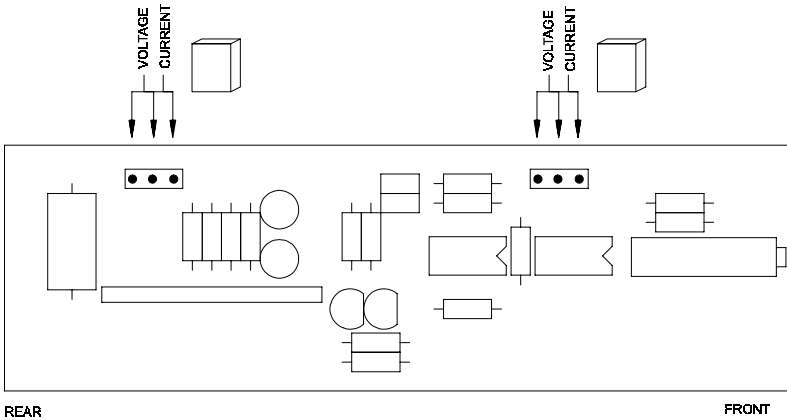
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## 4.0 INITIAL ADJUSTMENTS/SETUP

### 4.1 TRANSDUCER TYPE JUMPER

On the Amplifier Board a selection must be made for the type (Voltage or Current) which corresponds to the amplified cell being used with the GM-A. Figure 4.1 illustrates the two choices. To get to the Amplifier Board, follow these steps:

1. Remove power from the GM-A by unplugging it from the wall.
2. Remove the rear connector from the GM-A.
3. Remove the bezel and lens from the GM-A.
4. Slide the circuit board assembly out from the front of the case.
5. The Amplifier Board is the rightmost vertical board. The jumpers are located at 2 places near the top of this board. Select either the "Current" or "Voltage" position, depending on which type of amplified cell you are using. Install both jumpers.
6. Reassemble the GM-A.



**Figure 4.1 -- Location of Cell "Type" Jumper**

## **4.2 OFFSET ADJUSTMENT**

The Offset Adjustment serves to null the output for the no-signal condition of the amplified cell. This is important, because current-output cells usually have 4 milliamperes of output current under a no-stimulus condition on the cell. Perform the adjustment as follows:

1. Remove the bezel and lens.
  
2. Establish a no-stimulus condition on the amplified cell; for example, 0 psig on pressure cells, 0 lbs on load cells.
  
3. Adjust the OFFSET potentiometer, located on the Amplifier Board to give a zero-volt output. This output is easily read on the +OUTPUT (#6) and -OUTPUT (#5) pins on the back connector.

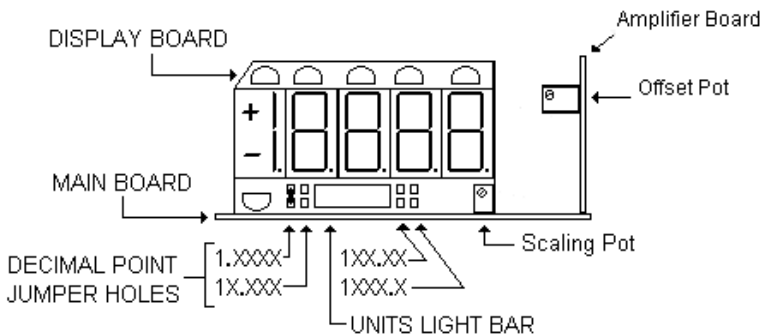
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4. Replace the lens and bezel.

### 4.3 FULL-SCALE ADJUSTMENT

The full-scale adjustment serves to set the GM-A output to 5 volts under a full-scale stimulus to the amplified cell. The adjustment is made with the SPAN potentiometer LOCATED ON THE CELL ITSELF, not on the GM-A.

1. Establish a full-scale stimulus on the amplified cell. For example, if the cell is a 500 psi pressure cell, establish a 500 psi condition on it.

2. Adjust the amplified cell's SPAN (or GAIN) potentiometer to give a 5-volt output from the GM-A. Measure this output on the +OUTPUT (#6) and -OUTPUT (#5) pins on the GM-A's back connector.



**Figure 4.2 -- Location of OFFSET and SCALING Adjustment**

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## **4.4 SCALING ADJUSTMENT**

Scaling establishes the relationship between a full-scale (5 volt) output signal on the GM-A and the value displayed under full-scale conditions.

1. When adjusting full-scale (in the previous section), a full-scale stimulus was used on the amplified cell. Leave this stimulus on the cell, so that the output of the GM-A is 5 volts.

2. Remove the bezel and lens from the GM-A.

3. The scaling potentiometer is located immediately below the right side of the display, on the Main Board. Adjust this potentiometer for the desired full-scale reading.

4. Using the decimal point jumper furnished, set the decimal point at the desired location, as shown in figure 4.2.

5. Replace the lens and bezel.

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## **5.0 OPERATIVE ADJUSTMENTS**

The GM-A has no operative adjustments. Any alteration of operating point is accomplished on the amplified cell itself.

## **6.0 OPTIONS**

The GM-A is offered with an option, a bench-mount adapter bracket for use when the instrument is not panel-mounted. This option is ordered as a separate part number, 060-6804-01.

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## 7.0 TROUBLESHOOTING GUIDE

<u>Symptom/Problem</u>	<u>Action/Troubleshooting</u>
Erratic Display	Check electrical connections for continuity and wiring code for pin layout.
No Display/No Output	Check Power connections. Check amplified cell hookup per section 3.0.
Blinking Display	Indicates a signal level greater than full-scale; make sure wires are all connected and that the transducer is within its range.
Incorrect Readout Value	Check amplified cell range on label. Review Set-up procedure.

## 8.0 DRAWINGS

Customers desiring to repair failed boards themselves can request appropriate drawings from **Sensotec**, at a nominal charge. Note that any attempt to repair the unit by anyone other than **Sensotec's** Customer Service voids the product warranty.



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## 9.0 GLOSSARY OF SIGNAL CONDITIONING TERMS

Accuracy -- The combined error of non linearity, repeatability, and hysteresis expressed as a percent of full-scale output.

Characters Displayed -- The number of digits in a display. Some of the digits may be active (part of the quantizing process), and some may be passive (displaying a constant zero).

Common-Mode Rejection -- The ability of an instrument to reject the effects of signals such as noise, that appear on all signal lines. Expressed as a logarithmic ratio at a particular maximum voltage.

Conversions Per Second -- The number of times per second that an analog-to-digital converter ranges and quantizes a given input.

Counts -- The total number of steps of resolution of an instrument.

dB -- 20 times the log to the base 10 of the ratio of two numbers.

DIN (Deutsche Industrie Norm) -- A set of German standards, now being recognized throughout the world. A 1/8 DIN standard specifies an outer bezel dimension of 96 mm (3.78") X 48 mm (1.77").

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Excitation -- The voltage applied to the strain-gage transducer or amplified cell by the signal conditioning device.

Frequency Response -- The range of frequencies over which the output voltage will follow the sinusoidally-varying stimulus input within the specified accuracy of the instrument.

Full-Scale Output -- The maximum output derived from the signal conditioner when the transducer is at its full-scale value. For example, a 100 psi pressure applied to a 100 psi transducer will cause a full-scale output from the signal conditioner. Full-scale output is usually 5 volts.

Gain Range -- The range of signal multiplication factors for a given signal conditioner.

Input Impedance -- The resistance of the input circuit of a signal conditioner. If this value is large, the signal conditioner will not load the transducer output excessively.

Linearity -- The maximum deviation of a calibration curve from the best-fit straight line calibration curve, expressed as a percentage of full-scale value.

LSD (Least Significant Digit) -- The rightmost active digit in a display.

MSD (Most Significant Digit) -- The leftmost digit in a display.

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Noise and Ripple -- Noise is randomly-occurring low-level signal not related to the stimulus. Ripple is periodic noise, usually associated with the signal conditioner power supply. Both noise and ripple limit the ability of a signal conditioner to handle small signals.

Resolution -- The smallest change in input signal which produces a one-digit change in the display.

Shunt Cal -- The change in electrical output of a transducer which is caused by momentarily placing a fixed, known resistance between one leg of a strain-gage transducer and one of the excitation leads. This causes the bridge to become unbalanced by a precise, known amount, and permits the verification of proper gain in the signal conditioning system.

Signal Conditioner -- An instrument which provides precise electrical drive to a transducer, and accepts and amplifies the transducer output. It may also digitize and display the output in engineering units.

Span Adjustment -- The ability to adjust the gain of a signal conditioner so that a specified display span in engineering units corresponds to a specified signal span.

Zero Adjustment -- The adjustment of the displayed value to zero when no output signal is being issued by the transducer.



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# ***APPENDIX***

## **A.1.1 LIMITED WARRANTY ON PRODUCTS**

Any of our products which, under normal operating conditions, proves defective in material in workmanship within one year from the date of shipment by SENSOTEC, will be repaired or replaced free of charge provided that you obtain a return material authorization from SENSOTEC and send the defective product, transportation charges prepaid with notice of the defect, and establish that the product has been properly installed, maintained, and operated within the limits of rated and normal usage. Replacement product will be shipped F.O.B. our plant. The terms of this warranty do not extend to any product or part thereof which, under normal usage, has an inherently shorter useful life than one year. The replacement warranty detailed here is the buyer's exclusive remedy, and will satisfy all obligations of SENSOTEC whether based on contract, negligence, or otherwise. SENSOTEC is not responsible for any incidental or consequential loss or damage which might result from a failure of any SENSOTEC product. This express warranty is made in lieu of any and all other warranties, express or implied, including implied warranty of merchantability or fitness for particular purpose. Any unauthorized disassembly or attempt to repair voids this warranty.

## **A.1.2 SERVICE UNDER WARRANTY**

Advanced authorization is required prior to the return to SENSOTEC. Before returning the items, either write to the Customer Service Department c/o SENSOTEC, Inc., 2080 Arlingate Lane, Columbus, Ohio 43228, or call (800) 848-6564 with: 1) a part number; 2) a serial number for the defective product; 3) a technical description\* of the defect; 4) a no-charge purchase order number (so products can be returned to you correctly); and 5) ship and bill addresses. Shipment to SENSOTEC shall be at Buyer's expense and repaired or replacement items will be shipped F.O.B. our plant in Columbus, Ohio. Non-verified problems or defects may be subject to an evaluation charge. Please return the original calibration data with the unit.

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### **A.1.3 NON-WARRANTY SERVICE**

Advance authorization is required prior to the return to SENSOTEC. Before returning the item, either write to the Customer Service Department c/o SENSOTEC, Inc., 2080 Arlingate Lane, Columbus, Ohio 43228, or call (800) 848-6564 with: 1) a model number; 2) a serial number for the defective product; 3) a technical description\* of the malfunction; 4) a purchase order number to cover SENSOTEC's repair cost; and 5) ship and bill addresses. At this time you will be issued a Return Material Authorization number (RMA#) on which to ship the unit(s) back to SENSOTEC. Shipment to SENSOTEC shall be at Buyer's expense and repaired items will be shipped to you F.O.B., our plant in Columbus, Ohio. Please return the original calibration data with the unit.

### **A.1.4 REPAIR WARRANTY**

All repairs of SENSOTEC products are warranted for a period of 90 days from date of shipment. This warranty applies only to those items which were found defective and repaired, it does not apply to products in which no defect was found and returned as is or merely recalibrated. Out of warranty products may not be capable of being returned to the exact original specifications or dimensions.

\* Technical description of the defect: In order to properly repair a product, it is necessary for SENSOTEC to receive information specifying the reason the product is being returned. Specific test data, written observations on the failure and the specific corrective action you require, is needed.

