FUTEK ADVANCED SENSOR TECHNOLOGY, INC. * 10 Thomas * Irvine, CA 92618 * Tel: (949) 465-0900 * Fax: (949) 465-0905 * www.futek.com

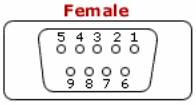
CSG110 BASIC INSTRUCTIONS

DEFAULT SETTINGS:

- Input Range: 0 to +/-2mV/V
- Excitation Voltage: 10 VDC
- Output Range: +/-10 VDC, 4-20 mA

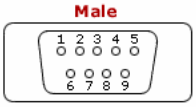
CONNECTIONS:

Female



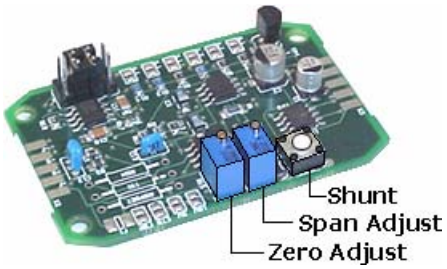
Pin	Wiring Code
1	+ Excitation/ + Sense
2	+ Signal
3	- Signal
4	- Excitation
5	Shield
7	- Sense

Male



Pin	Wiring Code
9 (RED)	+12 to 24 VDC Power
8 (GRN)	Signal (Voltage)
7 (ORG)	Return (Voltage)
6 (BLK)	Return (Power)
3	Shield
2 (BLU)	Return (Current)
1 (WHT)	Signal (Current)

STANDARD SPAN & ZERO ADJUSTMENT:



Once all connections are complete you can begin to setup the sensor/amplifier system. You will need to have the output from the CSG110 connected to a device so you can readout the voltage or current.

Apply a known load to the sensor. With the load applied and the sensor settled, use a screwdriver to adjust the output (i.e. 20mA, 10 VDC). If you are applying the full load to the sensor then you would want to adjust the CSG110 output to 10VDC or 20mA. If you are applying half of the full load then you would want to adjust the CSG110 output to exactly half of the maximum. Once your span is set, check the zero. With no load applied to the sensor, adjust the zero.

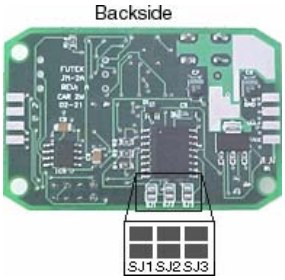
Adjusting the zero and span is done by using a screw driver to adjust the pots.

SHUNT READINGS:

Shunt resistors simulate a load on the cell thus allowing for calibration. To simulate a load first determine the value of the resistor needed (www.futek.com/shuntcalc.asp). Connect the shunt resistor in the spot labeled 'RSH'. When you would like to simulate the load to adjust the span it is necessary to press the pushbutton that corresponds to the shunt. While the shunt is enabled and the CSG110 is reading in the simulated load adjust the span (described above) to the correct output (pictured).

OUTPUT SELECTION:

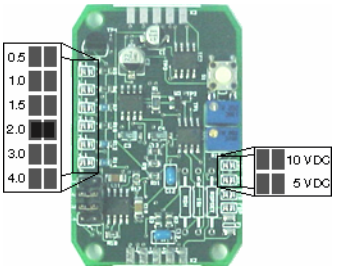
To change the current output, solder the jumpers in the fashion described in the table below:



mA Output	SJ1	SJ2	SJ3
4-20mA (DEFAULT)	CLOSED	OPEN	OPEN
0-20mA	OPEN	CLOSED	CLOSED
5-25mA	CLOSED	OPEN	CLOSED

SELECTION OF INPUT RANGE & EXCITATION VOLTAGE:

There are two excitation values available on the CSG110, 10 VDC (default) and 5 VDC. To select your excitation, simply connect the corresponding jumper.

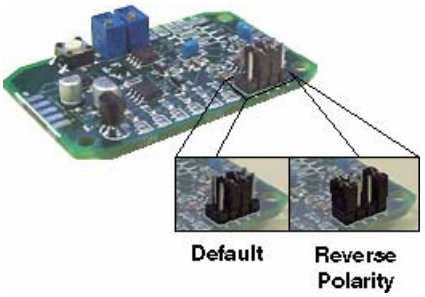


The input value range is from 0.5 to 4.0 mV/V. Select the Input value closest to your input range by soldering the corresponding jumper.

For example: *if you are using a 2mV/V sensor with the 5 VDC excitation, then you would want to solder the 1.0 (10mV) jumper. If you are using a 2mV/V sensor with 10 VDC excitation then you would want to solder the 2.0 (20mV) jumper.*

POLARITY REVERSAL:

The default polarity is shown in the picture on the left. To switch the polarity, simply move the jumpers to the positions shown in the picture on the right.



For example*: If you are using your CSG110 with a tension and compression load cell and you have tension setup as the positive direction but would like to now have compression as the positive direction all you have to do is move the jumpers from the 'Default' polarity position to the 'Reverse Polarity' position.*

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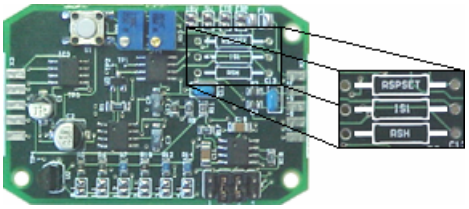
ADVANCED SPAN AND ZERO ADJUSTMENTS:



Often when using a signal conditioner it is necessary to offset the standard 0-10 VDC (or mA values) span. The CSG110 makes this simple. The user just needs to determine the correct excitation voltage and input range to create their desired span and then connect a resistor in the ISI location shown on the board to off set their zero.

CALCULATING THE CORRECT INPUT JUMPER, EXCITATION SETTING & RESISTOR VALUE
Determining Input value and Excitation settings:

1) It is first necessary to find out your sensor 'Rated Output' in mV/V (listed on sensor certificate).

Example: 2mV/V

2) Determine your desired output from the CSG110. 0-10 VDC is the standard output.

Example: I would like the 0-2mV/V sensor range to correspond to 2.5 VDC – 5 VDC output from the CSG110.

3) Determine your desired CSG110 output span. This would be your **Maximum** CSG110 Output minus your **Minimum** CSG110 Output.

Example: In this example, our maximum CSG110 output would be 5 VDC (Corresponding to 2mV/V) and our Minimum CSG110 output would be 2.5 VDC (Corresponding to 0 mV/V). Thus the total Span would equal 5 – 2.5 = 2.5 VDC

4) Now that you know what you would like your output to be (Step 2) and you know the span range (Step 3) you must vary the Input Jumpers and Excitation Jumpers to create this range. The formula for this is:

CSG110 Output Span = (Rated Output x Excitation) / Input Range

The two known values are the:
CSG110 Output Span, which refers to your desired span (Step 3)
Rated Output which refers to the output of the sensor (Step 1)

The two variables are the:
Excitation, this can either be 5 VDC or 10 VDC (See 'SELECTION OF EXCITATION VALUE')
Input Range, this can either be 0.5, 1.0, 1.5, 2.0, 3.0, or 4.0 (See 'INPUT VALUE ADJUSTMENT')

Vary the *Excitation* and *Input Range* until you get a CSG110 Output Span that is equal to (or vary close to) you span (calculated in Step 3). Sometimes it is helpful to make a chart to keep track of the span values.

Input Value \ Excitation	10	5
0.5	~~10.0~~	~~20.0~~
1	~~20.0~~	10.0
1.5	~~13.3~~	6.7
2	10.0	5.0
3	6.7	3.3
4	5.0	2.5

Example:
Rated Output (Step 1) = 2mV/V,
Span = 2.5 VDC (Step 3)
Excitation can be 5 or 10 VDC
Input Range can be 0.5, 1.0, 1.5, 2.0, 3.0, 4.0 mV,
**The formula above was used to fill in the table to the right.*

*As you can see in the table, using a **5 VDC** excitation and the **4.0 mV** jumper will give you an output span of 2.5. Thus, set your jumpers accordingly.*

**Any of the spans that come out to be more than 10VDC (Span limit of the CSG110) will not work. Therefore they are crossed off in the table.*

The instructions for calculating the resistance value (to shift the zero) are below:
In this example is 2.5 V corresponds to the Low CSG110 output.

5) Now we must offset the zero. First we need to calculate the GAIN, the equation to do this is below.

Gain = (CSG110 Span x 1000) / (Rated Output x Excitation)

Where:
The *CSG110* Span is calculated in Step 3
The *Rated Output* is determined in Step 1
The *Excitation* is determined in Step 4

Example:
Gain = (2.5 x 1000) / (2 x 5) = 250

6) Now that we know our Gain we can calculate how many mV are required to shift the zero the desired amount. The equation for this is below

Zero Offset = Zero Shift / Gain

Where:
Zero Shift is the amount of volts that the zero output from the CSG110 needs to be shifted
Gain is calculated in (Step 5)

Example:
2.5 / 250 = 0.010 V or 10mV = Zero Offset

7) Now that all of the necessary values are calculated you can use the equation below to calculate the resistance necessary to shift the zero.

Rz = Resistance Needed
Zo = Zero Offset in Volts (Step 6)
E = Excitation (Step 4)
Br = Bridge Resistance of your sensor

$Rz = -Br (|Zo| - 0.5E) / (2Zo)$

Example:

*Rz = -350 (|0.01| - 0.5(5)) / (2*0.01) = 43575*
Thus, a resistor of 43.575K ohms is necessary to offset the zero.

8) Now that the input range and excitation have been determined and the resistance necessary for a zero shift of 2.5V is known, all you need to do is complete the setup.
First make sure that you have soldered together the correct input range jumper (4.0) and excitation jumper (5.0). Next take your 43.5K ohm resister and solder it in to the ISI location on the CSG110 board (Shown below).

ADJUSTING THE SPAN
The input jumpers vary from 0.5, 1.0, 1.5, 2.0, 3.0, and 4.0. This allows for a large variety of input ranges. However, it sometimes happens that the Rated Output from the sensor is not exactly 2.0mV/V or 3.0mV/V. The CSG110 does have a -20 to 4.5 % of R.O. adjustment range so a sensor with an output close to that of the input ranges will work fine. However, when the Rated Output of the sensor falls between two of the input ranges it is necessary to use a resistor to adjust the output of the sensor.

To adjust the output of the sensor when using the CSG110 all you have to do is disconnect the ETR (Excitation Thru) jumper and connect a resistor to the RSPSET location (pictured). Use the equation below to calculate the value of the resistor needed.

Rs = Span Resistance Needed
Do = Desired output
Br = Bridge Resistance
Ao = Actual Output
Rs = (Ao/Do – 1)*Br

Example:
Br = 350 ohm *Do = 2.0 mV/V* *Ao = 2.5 mV/V*

*Rs = (2.5/2.0-1)*350 = 87.5 ohms.*

You can also visit our span calculator at www.futek.com/spancalc.aspx to find the span resistance value.