

Transducer Simulator 4 Operating Instructions

The Transducer Load Cell Simulator 4 is a valuable and versatile diagnostic tool. Simulator 4 was designed by people who use simulators day in and day out for their own use. It will give you years of precision service if you take a few minutes to learn how to use and maintain it.

What is a Load Cell Simulator? - Simulators provide a convenient, repeatable way to generate signals identical to those that strain gauge load cells and pressure transducers produce when load is applied to them. These signals can then be used to calibrate or test indicators, amplifiers, or power supplies with a known stable signal.

What kind of signals will I get out of the Simulator? - Simulators, like the load cells they simulate, are passive devices. You don't get anything out until you put something in. What you put in is the Excitation Voltage. The output of the simulator is proportional to the signal applied. If, for example, we "excite" the simulator with 10.00 VDC with the selector switch set to 1.00 mV/V, the output would be $10 \times 0.001 = 0.010\text{V}$ or 10 mV. If we change the excitation to 15.00 VDC, then the output would be $15 \times 0.001 = 0.015\text{V}$ or 15 mV. The simulator always provides a signal which is proportional to the input voltage. Precision simulators, such as the Simulator 4, can be used with a precision power supply to provide a laboratory source of millivolt reference.

What kind of cells can I simulate? - The Simulator 4 main bridge is set for 350Ω cells, the industry standard. The simulator can also be used to test instrumentation connected to 240Ω , 400Ω , 700Ω , 1000Ω or 3000Ω cells provided the excitation supply can excite one 350Ω bridge. Compute the current required to excite the bridge by using the following formula:

$$\text{Indicator Excitation Voltage} / 350\Omega = \text{Bridge Current in amps}$$

Example: if we have an indicator with a 5VDC excitation voltage, then $(5 \text{ VDC}) / (350\Omega) = 0.0143 \text{ A}$. The Simulator 4 will work with this system if the excitation supply can provide more than 0.014 A (14 mA).

The power loading switch of the Simulator 4 also allows loading the power supply of an indicator with up to 8 - 350Ω cells or 16 - 700Ω cells.

What excitation voltages can I use? - The Simulator 4 was designed for use with excitation voltages of 5 VDC - 15 VDC. The maximum excitation voltage must not exceed 15 VDC!

Can I use Simulator 4 with AC excitations? - Bridge simulators like the Simulator 4 will work with many low frequency AC excitation supplies of $\pm 7.5 \text{ VAC}$ or lower. The switching frequency should be less than 100 Hz for best results. Caution: Certain AC excitation instruments are very sensitive to inductive loading. The Simulator 4 uses very stable wire-wound resistors which are designed to minimize induction. However, some induction is present and may cause problems with some meters.



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Can I use the simulator in wet or dirty environments? - The construction materials of the Simulator 4 were carefully selected to make the simulator accurate and rugged. The rotary switches are all environmentally sealed. If the simulator is used outdoors in rain or snow, excessive moisture can build up around components and cause leakage. This doesn't damage the simulator; just dry it out. Use a desiccant inside the simulator if the unit is left outdoors for extended periods of time. Clean the simulator by wiping off the face with a soft cloth or use isopropyl alcohol wipes. If you fear contamination has gotten under the front face, remove the four stainless steel screws on the corners and remove the simulator assembly. Clean the inside of the enclosure and reassemble.

What kind of cables should I use? - Load cell simulators should be wired like load cells. Use shielded load cell wire with the shield connected at the indicator and unconnected at the simulator. Important: If the indicator has any kind of remote sensing capability, use it! Make your standard cables six-wire cables. Use #22 A.W.G. or #20 A.W.G. cable if possible. Connect the +Excitation and the +Sense to the +EXC terminal on the simulator. Connect the -Excitation and the -Sense to the -EXC terminal on the simulator. The simulator can then simulate a six-wire system and verify that the sense amplifiers are working on the meter.

What kind of accuracy can I expect from the simulator? - The simulator has characteristics equal to or better than a strain gauge load cell. The background noise of the simulator is approximately 250 nV. The temperature coefficient of the simulator is less than 5 ppm/°C with bridge tracking of < 1 ppm/°C. The linearity of the simulator is always <±0.05% of full scale and <±0.02% in most cases. The repeatability is <±0.01% of full scale. The absolute accuracy of each step is ±0.05% of full scale. A detailed calibration report for the individual simulator is available for a nominal charge.

A stable, repeatable simulator can be invaluable in many situations. No scale inspection or test should be complete without a detailed simulator test. The data should be recorded at the customer's site and in the service agency's permanent record about this scale and installation. The information must include the serial number of the simulator used to make the test. If the indicator should fail, or be damaged by lightning, the system can be returned to operation with the same simulator until a test truck can arrive.

What are all the knobs and buttons about? - Every control and function has been carefully designed to be useful for technicians who work with strain gauge and pressure transducer instrumentation. The value of calibrated steps cover the ranges used with almost any scale installation.

- Carefully calibrated 1.75, 2.00 and 3.00 mV/V outputs duplicate the most common outputs of cells.
- The full range from 0-3.00 mV/V with 0.25 mV/V steps allows testing meter linearity at several steps along the calibration curve. The calibrated +0.25 mV/V deadload offset is required for many newer meter designs which require a significant deadload at zero for proper digital calibration.
- The multirange vernier allows easy, stable adjustment between steps. This helps the technician test multiple setpoints in even the most complex batching routines. The six-way binding posts accept cables or connectors. All metal parts are stainless steel and the entire simulator is constructed so that the enclosure can be easily replaced if damaged.