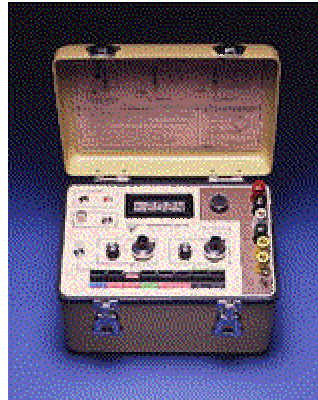


# Model P-3500 Portable Strain Indicator



## Description

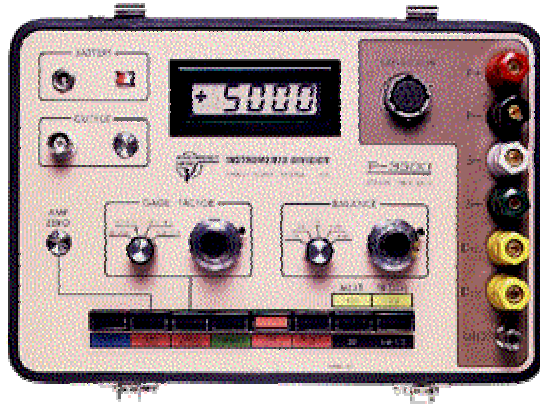
The Model P-3500 Strain Indicator is a portable, battery-powered instrument with unique features for use in stress analysis testing, and for use with strain gage based transducers. The P-3500 offers a choice of LCD or LED readouts, and incorporates many unique operating features that make it the most advanced and easy-to-use instrument of its kind. In use, the operator follows a logical sequence of setup steps by activating color-coded push-button controls to prepare the instrument for making accurate and reliable measurements.

The P-3500 also incorporates a highly stable DC amplifier, precisely regulated bridge excitation supply, and precisely settable gage factor controls.

Static measurements are displayed directly on the indicator's readout with 1 microstrain resolution. An analog output with a -3 dB bandwidth of 4 kHz is provided to drive an external oscilloscope or recorder for dynamic measurements. The instrument will accept full-, half-, or quarter-bridge strain gage inputs, and all required bridge completion components for 120, 350 and 1000 ohm gages are built in.

Bridge excitation is 2 Vdc, resulting in low gage power and negligible drift due to gage self-heating. The P-3500 operates in fully ratiometric mode. Minute changes in bridge excitation due to drift or battery deterioration do not affect accuracy of reading.

Gage factor is precisely settable (to a resolution of 0.001) by a front-panel 10-turn potentiometer, and is displayed on the digital readout when the gage factor push button is depressed.



The P-3500 operates from an internal battery pack consisting of six "D" cells, which are readily available worldwide when replacement is required. Battery life is approximately 250 to 300 hours of continuous use (approximately 200 hours with LED readout). Battery condition is monitored by a miniature front-panel meter while the instrument is on. An external line-voltage adapter is also available (115 or 230 Vac, 50 to 60 Hz).

An optional transducer input connector facilitates connection of four- or six-wire strain gage based transducers. The P-3500's unique remote-sense feature is operational whenever the remote-sense leads are connected, and no switching is required. A remote calibration resistor is also accessible via a contact closure at the transducer connector.

- **Features**
- Choice of 4-1/2 Digit LCD or LED Readout
- Manual, Direct Reading of Strain, Pressure, Torque, Load, and Other Engineering Variables
- Battery or Line-Voltage Operation
- Convenient Color-Coded Push-Button Controls
- Gage Factor Setting (to four significant digits) Displayed on Readout
- Quarter-, Half-, and Full-Bridge Circuits
- Built-in 120/1000 ohm and 350 ohm Bridge Completion
- Separate Bridge Excitation On/Off Control
- Transducer Connector with Remote-Sense
- Balance by Voltage Injection
- Analog Output
- ANSI/SEM Color-Coded Bridge Connection Terminals
- Portable, Lightweight, Rugged for Field Use

### Specifications

All specifications nominal or typical at +23 deg C unless noted.

### Range

$\pm 19\,999$  microstrain at Gage Factor  $<6.000$ .  
 $\pm (6.000/\text{GF}) \times 19\,999$  microstrain at Gage Factor  $>6.000$ .

Above ranges increased by factor of 10 when using X10 multiplier switch. Example:  $\pm 199\,990$  at Gage Factor  $<6.000$ .

### Accuracy

$\pm 0.05\%$  of reading  $\pm 3$  microstrain for Gage Factor settings of 1.000 to 9.900.  
 $\pm 0.05\%$  of reading  $\pm 20$  microstrain for Gage Factor settings of 1.000 to 9.900 when using X10 multiplier.

### Sensitivity (Resolution)

$\pm 1$  microstrain at all Gage Factor settings.  
 $\pm 10$  microstrain when using X10 multiplier.

### Gage Factor

Range 0.500 to 9.900. Precisely settable to a resolution of 0.001 by 10-turn potentiometer and four-position switch. Gage Factor accuracy  $\pm 0.02\%$  at all settings. Displayed on digital readout.

### Balance

*Coarse* : 5 switch positions: Off,  $\pm 2000$  microstrain, and  $\pm 4000$  microstrain (GF=2.000). Tolerance  $\pm 1\%$  nominal.  
*Fine* : 10-turn potentiometer with turns-counting dial,  $\pm 1050$  microstrain min. range (GF=2.000). Zero position of potentiometer calibrated for zero  $\pm 2$  microstrain.

*All balance voltages are electronically injected at input of amplifier. No bridge loading by balance controls, and no compromise of measurement range.*

### Bridge Excitation

2.0 Vdc  $\pm 0.1\%$ . Temperature stability better than  $\pm 0.02\%$  per  $^{\circ}\text{C}$ . Readings are fully ratiometric, and not degraded by variation in excitation voltage.

### Bridge Configurations

Quarter-, half-, and full-bridge circuits. Internal bridge completion provided for 120/1000 ohms and 350 ohm quarter bridges, 60 to 2000 ohm half or full bridge.

### Amplifier

*Warm-up drift* : Less than  $\pm 3$  counts at GF=2.000, cold start to ten min.  
*Random drift at constant ambient temperature* : Less than  $\pm 1$  count at GF=2.000.  
*Common-mode rejection* : Greater than 90 dB, 50 to 60 Hz.  
*Temperature effect on zero* : Less than 1 microvolt/ $^{\circ}\text{C}$  referred to input.  
*Temperature effect on span* : Less than 0.005%/ $^{\circ}\text{C}$ .  
*Input impedance* : Greater than 30 megohms.

### Calibration

Shunt calibration across 120- and 350-ohm dummy gages to simulate 5000 microstrain ( $\pm 0.05\%$ ).

### Analog Output

Linear  $\pm 2.50\text{V}$  max. Adjustable from 40 microvolt/microstrain to 440 microvolt/microstrain, nominal. Output load 2 000 ohms min. Bandwidth, DC to 4 kHz, -3 dB nominal. Noise: Less than 400 microvolts rms at 40 microvolts/microstrain output level.

### Remote Sense

Provided at the transducer connector. Remote-sense error less than  $\pm 0.001\%$ /ohm of

lead resistance.

**Power**

Internal battery pack using six "D" cells. Battery life 300 hours nominal (200 hours with LED readout), AC Optional.

**Case**

Aluminum.

**Size & Weight**

9 x 6 x 6 in (228 x 152 x 152 mm). 6.3 lb (2.9 kg) including batteries.

**Accessories**

Line voltage adapter for 115V or 230V, 50 or 60 Hz operation, 60/30mA.  
Transducer input connector.