# Strain Gauge Bridge Output (Quarter, Half, Full)

Output voltage of a strain gauge Wheatstone bridge for a strain and gauge factor in quarter, half and full bridge arrangements, with quarter-bridge non-linearity.

**Method:** Wheatstone bridge with strain gauges; ΔR/R = GF ε

## Input parameters

Unit system: SI

| Parameter | Value | Unit |
|---|---|---|
| Gauge factor | 2.0000 | |
| Strain<br>500 με = 0.0005. | 5.0000e-04 | |
| Excitation voltage | 5.0000 | V |
| Arrangement | Quarter bridge (one active gauge) | |

## Calculated results

| Parameter | Value | Unit |
|---|---|---|
| Bridge output | 1.2494 | mV |
| Linear approximation | 1.2500 | mV |
| Non-linearity (exact vs linear) | -0.049975 | % |

**Notes for this case**

- Half and full bridges with opposite strains are linear and compensate temperature; the quarter bridge is not.
- Half and full bridge outputs assume the active gauges see equal and opposite strain (bending). For axial loading with Poisson gauges the output is smaller: GF ε (1 + ν)/4 × V_ex for a half bridge and GF ε (1 + ν)/2 × V_ex for a full bridge.

## Formula and method

$$V_o = V_{ex}\,\frac{GF\varepsilon/4}{1+GF\varepsilon/2}\;(\tfrac{1}{4}),\quad V_o = V_{ex}\,\frac{GF\varepsilon}{2}\;(\tfrac{1}{2}),\quad V_o = V_{ex}\,GF\varepsilon\;(\text{full})$$

### Variables

| | | |
|---|---|---|
| $GF$ | Gauge factor | - |
| $\varepsilon$ | Strain | - |
| $V_{ex}$ | Excitation voltage | V |
| $\text{bridge}$ | Arrangement | - |
| $V_o$ | Bridge output | V |
| $V_{lin}$ | Linear approximation | V |
| $e_{nl}$ | Non-linearity (exact vs linear) | - |

### Method and standards

Bridge equations.

### Assumptions and limits

- Equal arms, ideal bridge.
- Half and full bridge outputs assume the active gauges see equal and opposite strain, as in bending. With axial loading and Poisson gauges the output is smaller: $GF\varepsilon(1+\nu)/4 \times V_{ex}$ for a half bridge and $GF\varepsilon(1+\nu)/2 \times V_{ex}$ for a full bridge.

### References

- Wheatstone bridge with strain gauges
- ΔR/R = GF ε

## Report details

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|---|---|
| Report reference | FCC-DP5E-1TGZ (the same inputs always give the same reference) |
| Generated | 17 November 2026, 19:46 UTC |
| Calculator | Strain Gauge Bridge Output (Quarter, Half, Full) |
| Method last reviewed | 12 November 2026 |
| Software release | FireCAD Calc, release of 17 November 2026 |
| Release checks | 3 reference cases of this calculator, computed independently, are checked on every release |

Results are for engineering estimation. Verify critical designs against the referenced standards and your own data.

### This calculator online

https://calc.firecad.com/instrumentation/signals-calibration/strain-gauge-bridge

Open this case on calc.firecad.com →

Reopens the calculator with the inputs of this report.