

4-20 mA Instrumentation Loop Power Calculator

Reduces two-wire 4-20 mA loop supply, burden, wiring, and device data into voltage drop, transmitter margin, allowable resistance, and loop power.

Generated October 10, 2026

<https://www.elecatrix.com/circuits-components/instrumentation-loop-power-calculator/>

Inputs

Input	Value	Unit
Minimum loop supply voltage	24	V
Low loop current	4	mA
Maximum loop current	20	mA
Transmitter minimum compliance voltage	12	V
Wire loop resistance	20	ohm
Receiver or input burden	250	ohm
Barrier or isolator voltage drop	N/A	V
Other series voltage drop	N/A	V
Optional measurement resistor	N/A	ohm

Results

Result	Value	Unit
Total series resistance	270	ohm
Voltage drop at low current	1.08	V
Voltage drop at maximum current	5.4	V
Receiver voltage at maximum current	5	V
Transmitter voltage at low current	22.92	V
Transmitter voltage at maximum current	18.6	V
Compliance voltage margin	6.6	V
Maximum allowable resistance	600	ohm
Loop power at maximum current	0.48	W

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Status

Status	Value	Unit
Compliance comparison	Entered supply and series-drop assumptions leave at least the entered transmitter compliance voltage.	

Calculation details

Detail	Value	Unit
Calculation basis	The loop uses the declared minimum supply, current, and series-drop inputs. The worst-case comparison is made at the entered maximum loop current.	
Loop boundary	Two-wire 4-20 mA compliance screen only; verify transmitter data, receiver burden, barrier/isolator, HART, intrinsic safety, surge, EMC, grounding, calibration, and project procedure separately.	

Formulas

$$R_{\text{series}} = R_{\text{wire}} + R_{\text{receiver}} + R_{\text{measurement}}$$

$$V_{\text{drop}} = I R_{\text{series}} + V_{\text{barrier}} + V_{\text{other}}$$

$$V_{\text{tx}} = V_{\text{supply}} - V_{\text{drop}}$$

$$M_{\text{compliance}} = V_{\text{tx,max}} - V_{\text{compliance,min}}$$

$$R_{\text{allowable}} = \frac{V_{\text{supply}} - V_{\text{compliance,min}}}{I_{\text{max}}}$$

$$P_{\text{loop,max}} = V_{\text{supply}} \times I_{\text{max}}$$

Warnings and limitations

This is a two-wire 4-20 mA compliance-margin screen. It does not approve an intrinsically safe loop, HART communication, transmitter selection, barrier, surge protection, EMC, grounding, calibration, or hazardous-location installation.