Parallel RLC Circuit: Currents, Impedance and Resonance

Branch currents, total current, impedance and power factor of a parallel RLC circuit at a frequency, with its resonant frequency and Q factor.

Method: AC circuit theory (admittances in parallel)

Input parameters

Unit system: SI

Parameter	Value	Unit
Supply frequency	50.000	Hz
Resistance	100.00	Ω
Inductance	200.00	mH
Capacitance	40.000	µF
Supply voltage (rms)	230.00	V

Calculated results

Parameter	Value	Unit
Current in the resistor	2.3000	A
Current in the inductor	3.6606	A
Current in the capacitor	2.8903	A
Total current	2.4256	A
Impedance	94.823	Ω
Power factor	0.94823	
Resonant frequency	56.270	Hz
Quality factor R √(C/L)	1.4142	

Notes for this case

- Inductive: the current lags the voltage (lagging power factor).

Formula and method

$$Y = \sqrt{\frac{1}{R^2} + \left(\omega C - \frac{1}{\omega L}\right)^2}, \quad I = VY, \quad f_0 = \frac{1}{2\pi\sqrt{LC}}$$

Variables

f	Supply frequency	1/s
R	Resistance	Ω
L	Inductance	H
C	Capacitance	F
V	Supply voltage (rms)	V
I_R	Current in the resistor	A
I_L	Current in the inductor	A
I_C	Current in the capacitor	A
I	Total current	A
Z	Impedance	Ω
$\cos\varphi$	Power factor	-
f_0	Resonant frequency	1/s

Q	Quality factor R √(C/L)	-

Method and standards

Admittances add in parallel.

Assumptions and limits

- Ideal components.
- The power factor is given as a magnitude; a note says whether it is leading (capacitive, ωC > 1/ωL) or lagging (inductive).

References

• AC circuit theory (admittances in parallel)

Report details

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

This calculator online

https://calc.firecad.com/electrical/circuits/parallel-rlc-circuit

Open this case on calc.firecad.com →

Reopens the calculator with the inputs of this report.