

# Component Inputs

## Component Input Parameters

This page details all input parameters used across the VIC Matrix Calculator modules. Understanding what each parameter means and how to determine its value is essential for accurate calculations.

## Choke Design Inputs

### Core Parameters

Parameter	Symbol	Units	Description
Core Type	—	—	Toroid, E-core, rod, bobbin, or air-core
Core Material	—	—	Ferrite mix, iron powder, or air
Relative Permeability	$\mu_r$	—	Material permeability (1 for air, 2000+ for ferrite)
AL Value	$A_l$	nH/turn <sup>2</sup>	Inductance factor (from core datasheet)
Outer Diameter	OD	mm	Core outer diameter (toroids)
Inner Diameter	ID	mm	Core inner diameter (toroids)
Height	H	mm	Core height/thickness

#### Finding Core Parameters:

- Check manufacturer datasheet for  $A_i$  and  $\mu_r$
- Measure physical dimensions with calipers
- For unknown cores, estimate  $\mu_r$  from material type

## Wire Parameters

Parameter	Symbol	Units	Description
Wire Gauge	AWG	AWG	American Wire Gauge number
Wire Material	—	—	Copper, aluminum, silver
Number of Turns	N	turns	Total turns wound on core
Number of Layers	$n_{\text{layers}}$	—	Winding layers (affects parasitic C)
Winding Style	—	—	Single, bifilar, or multi-filar

## Bifilar-Specific Parameters

Parameter	Description
Choke Role	Primary (L1), Secondary (L2), or Bifilar Set
Coupling Coefficient	k value between bifilar windings (typically 0.95-0.99)
Inter-winding Insulation	Thickness and material of insulation between wires

## Water Profile Inputs

### Electrode Geometry

Parameter	Symbol	Units	Description
Electrode Type	—	—	Parallel plates, concentric tubes, tube array

Parameter	Symbol	Units	Description
Electrode Area	A	cm <sup>2</sup>	Active electrode surface area
Electrode Gap	d	mm	Distance between electrodes
Inner Radius	r <sub>i</sub>	mm	Inner tube radius (cylindrical)
Outer Radius	r <sub>o</sub>	mm	Outer tube radius (cylindrical)
Tube Length	L	cm	Submerged tube length
Number of Tubes	n	—	Tube pairs in array

## Water Properties

Parameter	Symbol	Units	Description
Water Conductivity	$\sigma$	$\mu\text{S/cm}$	Electrical conductivity of water
Water Temperature	T	°C	Operating temperature
Dielectric Constant	$\epsilon_r$	—	Relative permittivity (~80 for water at 20°C)

### Measuring Conductivity:

- Use a TDS or conductivity meter
- Distilled water: 1-10  $\mu\text{S/cm}$
- Tap water: 200-800  $\mu\text{S/cm}$
- If unknown, 500  $\mu\text{S/cm}$  is a reasonable tap water estimate

## Circuit Profile Inputs

## Component Selection

Parameter	Description
Primary Choke (L1)	Select from saved choke designs or enter values
Secondary Choke (L2)	Select from saved choke designs or enter values
Water Profile (WFC)	Select from saved water profiles or enter values
Primary Capacitor (C1)	Capacitance value for primary resonance
Tuning Capacitor	Optional capacitor in parallel with WFC

## Operating Parameters

Parameter	Symbol	Units	Description
Operating Frequency	$f_{op}$	kHz	Pulse generator frequency
Input Voltage	$V_{in}$	V	Peak pulse voltage
Duty Cycle	D	%	Pulse on-time percentage
Source Resistance	$R_s$	$\Omega$	Driver output impedance

## Direct Value Entry

If you have measured values for components (rather than designing from scratch), you can enter them directly:

### For Chokes:

- Inductance (measured at low frequency)
- DC Resistance (measured with ohmmeter)
- Self-Resonant Frequency (if known)

### For WFC:

- Capacitance (measured with LCR meter)
- ESR or solution resistance

**Best Practice:** When possible, measure actual component values and compare to calculated values. This helps identify measurement errors and improves your understanding of the calculator's accuracy for your specific components.

*Next: Simulation Tab Explained →*

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Revision #1

Created 2026-01-01 20:45:14 UTC by Chris Bake

Updated 2026-01-01 20:45:24 UTC by Chris Bake