Important AC Power Formulas PDF

Formulas
Examples
with Units

List of 12
Important AC Power Formulas

1) Complex Power Formula

Evaluate Formula

Formula

$$S = \sqrt{P^2 + Q^2}$$

Example with Units

$$270.5199\,\text{VA} = \sqrt{235\,\text{W}^2 + 134\,\text{VAR}^2}$$

2) Complex Power given Power Factor Formula

Evaluate Formula

Formula

$$S = \frac{P}{\cos(\Phi)}$$

Example with Units

$$271.3546\,\text{VA} = \frac{235\,\text{W}}{\cos(30°)}$$

3) Power in Single-Phase AC Circuits Formula

Evaluate Formula

Formula

$$P = V \cdot I \cdot \cos(\Phi)$$

Example with Units

$$236.4249\,\text{W} = 130\,\text{V} \cdot 2.1\,\text{A} \cdot \cos(30°)$$

4) Power in Single-Phase AC Circuits using Current Formula

Evaluate Formula

Formula

$$P = I^2 \cdot R \cdot \cos(\Phi)$$

Example with Units

$$229.1503\,\text{W} = 2.1\,\text{A}^2 \cdot 60\,\Omega \cdot \cos(30°)$$

5) Power in Single-Phase AC Circuits using Voltage Formula

Evaluate Formula

Formula

$$P = \frac{V^2 \cdot \cos(\Phi)}{R}$$

Example with Units

$$243.9305\,\text{W} = \frac{130\,\text{V}^2 \cdot \cos(30°)}{60\,\Omega}$$

6) Power in Three-Phase AC Circuits using Phase Current Formula

Evaluate Formula

Formula

$$P = 3 \cdot V_{ph} \cdot I_{ph} \cdot \cos(\Phi)$$

Example with Units

$$249.4153\,\text{W} = 3 \cdot 240\,\text{V} \cdot 0.4\,\text{A} \cdot \cos(30°)$$

7) Reactive Power Formula

Evaluate Formula

Formula

$$Q = I \cdot V \cdot \sin(\Phi)$$

Example with Units

$$136.5\,\text{VAR} = 2.1\,\text{A} \cdot 130\,\text{V} \cdot \sin(30°)$$

8) Reactive Power using Line-to-Neutral Current Formula

Evaluate Formula

Formula

$$Q = 3 \cdot I_{ln} \cdot V_{ln} \cdot \sin(\Phi)$$

Example with Units

$$134.355\,\text{VAR} = 3 \cdot 1.3\,\text{A} \cdot 68.9\,\text{V} \cdot \sin(30°)$$

9) Reactive Power using RMS Voltage and Current Formula

Evaluate Formula

Formula

$$Q = V_{rms} \cdot I_{rms} \cdot \sin(\Phi)$$

Example with Units

$$135.125\,\text{VAR} = 57.5\,\text{V} \cdot 4.7\,\text{A} \cdot \sin(30°)$$

10) Real Power in AC Circuit Formula

Evaluate Formula

Formula

$$P = V \cdot I \cdot \cos(\Phi)$$

Example with Units

$$236.4249\,\text{W} = 130\,\text{V} \cdot 2.1\,\text{A} \cdot \cos(30°)$$

11) Real Power using Line-to-Neutral Voltage Formula

Evaluate Formula

Formula

$$P = 3 \cdot I_{ln} \cdot V_{ln} \cdot \cos(\Phi)$$

Example with Units

$$232.7097\,\text{W} = 3 \cdot 1.3\,\text{A} \cdot 68.9\,\text{V} \cdot \cos(30°)$$

12) Real Power using RMS Voltage and Current Formula

Evaluate Formula

Formula

$$P = I_{rms} \cdot V_{rms} \cdot \cos(\Phi)$$

Example with Units

$$234.0434\,\text{W} = 4.7\,\text{A} \cdot 57.5\,\text{V} \cdot \cos(30°)$$

Variables used in list of AC Power Formulas above

- **I** Current *(Ampere)*
- I_{ln} Line to Neutral Current *(Ampere)*
- I_{ph} Phase Current *(Ampere)*
- I_{rms} Root Mean Square Current *(Ampere)*
- **P** Real Power *(Watt)*
- **Q** Reactive Power *(Volt Ampere Reactive)*
- **R** Resistance *(Ohm)*
- **S** Complex Power *(Volt Ampere)*
- **V** Voltage *(Volt)*
- V_{ln} Line to Neutral Voltage *(Volt)*
- V_{ph} Phase Voltage *(Volt)*
- V_{rms} Root Mean Square Voltage *(Volt)*
- **Φ** Phase Difference *(Degree)*

Constants, Functions, Measurements used in list of AC Power Formulas above

- Functions: **cos**, cos(Angle)
  Cosine of an angle is the ratio of the side adjacent to the angle to the hypotenuse of the triangle.
- Functions: **sin**, sin(Angle)
  Sine is a trigonometric function that describes the ratio of the length of the opposite side of a right triangle to the length of the hypotenuse.
- Functions: **sqrt**, sqrt(Number)
  A square root function is a function that takes a non-negative number as an input and returns the square root of the given input number.
- Measurement: **Electric Current** in Ampere (A)
  Electric Current Unit Conversion
- Measurement: **Power** in Volt Ampere (VA), Watt (W), Volt Ampere Reactive (VAR)
  Power Unit Conversion
- Measurement: **Angle** in Degree (°)
  Angle Unit Conversion
- Measurement: **Electric Resistance** in Ohm (Ω)
  Electric Resistance Unit Conversion
- Measurement: **Electric Potential** in Volt (V)
  Electric Potential Unit Conversion

Download other Important AC Circuits PDFs

- Important AC Circuit Design Formulas
- Important AC Power Formulas

Try our Unique Visual Calculators

- Winning percentage
- LCM of two numbers
- Mixed fraction

Please SHARE this PDF with someone who needs it!

This PDF can be downloaded in these languages

English Spanish French German Russian Italian Portuguese Polish Dutch

7/8/2024 | 12:33:45 PM UTC