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Symmetric Components Formulas

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List of 27 Symmetric Components Formulas

Symmetric Components

Line Sequence Impedance

1) Fault Impedance using A-Phase Current

Open Calculator

fx $$Z_{f(line)} = \frac{V_{1(line)} + V_{2(line)} + V_{0(line)}}{I_{a(line)}}$$

ex $$7.831281\Omega = \frac{13.51V + 16.056V + 17.5V}{6.01A}$$

2) Fault Impedance using Positive Sequence Current

Open Calculator

fx $$Z_{f(line)} = \frac{V_{1(line)} + V_{2(line)} + V_{0(line)}}{3 \cdot I_{1(line)}}$$

ex $$7.840021\Omega = \frac{13.51V + 16.056V + 17.5V}{3 \cdot 2.0011A}$$

3) Negative Sequence Impedance for Delta Connected Load

Open Calculator

fx $$Z_{2(line)} = \frac{V_{2(line)}}{I_{2(line)}}$$

ex $$-44.476454\Omega = \frac{16.056V}{-0.361A}$$

4) Positive Sequence Impedance for Delta Connected Load

Open Calculator

fx $$Z_{1(line)} = \frac{V_{1(line)}}{I_{1(line)}}$$

ex $$6.751287\Omega = \frac{13.51V}{2.0011A}$$

5) Sequence Impedance

Open Calculator

fx $$Z_{s(line)} = \frac{V_{s(line)}}{I_{s(line)}}$$

ex $$1.75\Omega = \frac{7V}{4A}$$

6) Zero Sequence Impedance for Delta Connected Load

Open Calculator

fx $$Z_{0D(line)} = \frac{V_{0(line)}}{I_{0(line)}}$$

ex $$7.954545\Omega = \frac{17.5V}{2.20A}$$

7) Zero Sequence Impedance for Star Connected Load

Open Calculator

fx $$Z_{0S(line)} = Z_{s(line)} + \left(3 \cdot Z_{f(line)}\right)$$

ex $$25.271\Omega = 1.751\Omega + (3 \cdot 7.84\Omega)$$

Sequence Current & Voltage

8) Negative Phase Current for Delta Connected Load

Open Calculator

$$I_2 = \frac{3 \cdot V_2}{Z_d}$$

$$-0.466667\text{A} = \frac{3 \cdot -1.4\text{V}}{9\Omega}$$

9) Negative Sequence Current for Star Connected Load

Open Calculator

$$I_2 = \frac{V_2}{Z_y}$$

$$-0.339806\text{A} = \frac{-1.4\text{V}}{4.12\Omega}$$

10) Negative Sequence Voltage for Delta Connected Load

Open Calculator

$$V_2 = \frac{Z_d \cdot I_2}{3}$$

$$-1.38\text{V} = \frac{9\Omega \cdot -0.46\text{A}}{3}$$

11) Negative Sequence Voltage for Star Connected Load

Open Calculator

$$V_2 = I_2 \cdot Z_y$$

$$-1.8952\text{V} = -0.46\text{A} \cdot 4.12\Omega$$

12) Positive Sequence Current for Delta Connected Load

Open Calculator

fx $$I_1 = \frac{3 \cdot V_1}{Z_d}$$

ex $$2A = \frac{3 \cdot 6V}{9\Omega}$$

13) Positive Sequence Current for Star Connected Load

Open Calculator

fx $$I_1 = \frac{V_1}{Z_y}$$

ex $$1.456311A = \frac{6V}{4.12\Omega}$$

14) Positive Sequence Voltage for Delta Connected Load

Open Calculator

fx $$V_1 = \frac{Z_d \cdot I_1}{3}$$

ex $$6V = \frac{9\Omega \cdot 2A}{3}$$

15) Positive Sequence Voltage for Star Connected Load

Open Calculator

fx $$V_1 = Z_y \cdot I_1$$

ex $$8.24V = 4.12\Omega \cdot 2A$$

16) Symmetric Component Current using Sequence Impedance

Open Calculator

fx $$I_s = \frac{V_s}{Z_s}$$

ex $$4.005714\text{A} = \frac{7.01\text{V}}{1.75\Omega}$$

17) Symmetric Component Voltage using Sequence Impedance

Open Calculator

fx $$V_s = I_s \cdot Z_s$$

ex $$7.0175\text{V} = 4.01\text{A} \cdot 1.75\Omega$$

18) Zero Sequence Current for Star Connected Load

Open Calculator

fx $$I_0 = \frac{V_0}{Z_y + (3 \cdot Z_f)}$$

ex $$2.187365\text{A} = \frac{60.59\text{V}}{4.12\Omega + (3 \cdot 7.86\Omega)}$$

19) Zero Sequence Voltage for Star Connected Load

Open Calculator

fx $$V_0 = (Z_y + 3 \cdot Z_f) \cdot I_0$$

ex $$60.663\text{V} = (4.12\Omega + 3 \cdot 7.86\Omega) \cdot 2.19\text{A}$$

Transformer Sequence Impedance

20) Delta Impedance using Star Impedance

Open Calculator

fx $Z_{d(xmer)} = Z_{y(xmer)} \cdot 3$

ex $20.223\Omega = 6.741\Omega \cdot 3$

21) Leakage Impedance for Transformer given Positive Sequence Voltage

Open Calculator

fx $Z_{Leakage(xmer)} = \frac{V_{1(xmer)}}{I_{1(xmer)}}$

ex $6.746627\Omega = \frac{13.5V}{2.001A}$

22) Leakage Impedance for Transformer given Zero Sequence Current

Open Calculator

fx $Z_{Leakage(xmer)} = \left(\frac{V_{0(xmer)}}{I_{0(xmer)}}\right) - 3 \cdot Z_{f(xmer)}$

ex $6.703801\Omega = \left(\frac{17.6V}{2.21A}\right) - 3 \cdot 0.42\Omega$

23) Negative Sequence Impedance for Transformer

Open Calculator

fx $$Z_{2(xmer)} = \frac{V_{2(xmer)}}{I_{2(xmer)}}$$

ex $$-44.597222\Omega = \frac{16.055V}{-0.36A}$$

24) Neutral Impedance for Star Connected Load using Zero Sequence Voltage

Open Calculator

fx $$Z_{f(xmer)} = \frac{\left(\frac{V_{0(xmer)}}{I_{0(xmer)}}\right) - Z_{y(xmer)}}{3}$$

ex $$0.4076\Omega = \frac{\left(\frac{17.6V}{2.21A}\right) - 6.741\Omega}{3}$$

25) Positive Sequence Impedance for Transformer

Open Calculator

fx $$Z_{1(xmer)} = \frac{V_{1(xmer)}}{I_{1(xmer)}}$$

ex $$6.746627\Omega = \frac{13.5V}{2.001A}$$

26) Star Impedance using Delta Impedance

Open Calculator

fx $$Z_{y(xmer)} = \frac{Z_{d(xmer)}}{3}$$

ex $$6.74\Omega = \frac{20.22\Omega}{3}$$

27) Zero Sequence Impedance for Transformer

Open Calculator

fx $$Z_{0(xmer)} = \frac{V_{0(xmer)}}{I_{0(xmer)}}$$

ex $$7.963801\Omega = \frac{17.6V}{2.21A}$$

Variables Used

- I_0 Zero Sequence Current *(Ampere)*
- $I_{0(line)}$ Zero Sequence Current Line *(Ampere)*
- $I_{0(xmer)}$ Zero Sequence Current Xmer *(Ampere)*
- I_1 Positive Sequence Current *(Ampere)*
- $I_{1(line)}$ Positive Sequence Current Line *(Ampere)*
- $I_{1(xmer)}$ Positive Sequence Current Xmer *(Ampere)*
- I_2 Negative Sequence Current *(Ampere)*
- $I_{2(line)}$ Negative Sequence Current Line *(Ampere)*
- $I_{2(xmer)}$ Negative Sequence Current Xmer *(Ampere)*
- $I_{a(line)}$ A-Phase Current Line *(Ampere)*
- I_s Symmetric Component Current *(Ampere)*
- $I_{s(line)}$ Symmetric Component Current Line *(Ampere)*
- V_0 Zero Sequence Voltage *(Volt)*
- $V_{0(line)}$ Zero Sequence Voltage Line *(Volt)*
- $V_{0(xmer)}$ Zero Sequence Voltage Xmer *(Volt)*
- V_1 Positive Sequence Voltage *(Volt)*
- $V_{1(line)}$ Positive Sequence Voltage Line *(Volt)*
- $V_{1(xmer)}$ Positive Sequence Voltage Xmer *(Volt)*
- V_2 Negative Sequence Voltage *(Volt)*
- $V_{2(line)}$ Negative Sequence Voltage Line *(Volt)*

- $V_{2(xmer)}$ Negative Sequence Voltage Xmer *(Volt)*
- V_s Symmetric Component Voltage *(Volt)*
- $V_{s(line)}$ Symmetric Component Voltage Line *(Volt)*
- $Z_{0(xmer)}$ Zero Sequence Impedance Xmer *(Ohm)*
- $Z_{0D(line)}$ Zero Sequence Impedance Delta Line *(Ohm)*
- $Z_{0S(line)}$ Zero Sequence Impedance Star Line *(Ohm)*
- $Z_{1(line)}$ Positive Sequence Impedance Line *(Ohm)*
- $Z_{1(xmer)}$ Positive Sequence Impedance Xmer *(Ohm)*
- $Z_{2(line)}$ Negative Sequence Impedance Line *(Ohm)*
- $Z_{2(xmer)}$ Negative Sequence Impedance Xmer *(Ohm)*
- Z_d Delta Impedance *(Ohm)*
- $Z_{d(xmer)}$ Delta Impedance Xmer *(Ohm)*
- Z_f Fault Impedance *(Ohm)*
- $Z_{f(line)}$ Fault Impedance Line *(Ohm)*
- $Z_{f(xmer)}$ Fault Impedance Xmer *(Ohm)*
- $Z_{Leakage(xmer)}$ Leakage Impedance Xmer *(Ohm)*
- Z_s Sequence Impedance *(Ohm)*
- $Z_{s(line)}$ Sequence Impedance Line *(Ohm)*
- Z_y Star Impedance *(Ohm)*
- $Z_{y(xmer)}$ Star Impedance Xmer *(Ohm)*

Constants, Functions, Measurements used

- Measurement: **Electric Current** in Ampere (A)
  Electric Current Unit Conversion
- Measurement: **Electric Resistance** in Ohm (Ω)
  Electric Resistance Unit Conversion
- Measurement: **Electric Potential** in Volt (V)
  Electric Potential Unit Conversion

Check other formula lists

- **Open Conductor Fault Formulas**
- **Shunt Faults Formulas**
- **Symmetric Components Formulas**

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