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DC Series Generator Formulas

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List of 18 DC Series Generator Formulas

DC Series Generator

Current

1) Armature Current of Series DC Generator given Output Power

$$\text{fx } I_a = \sqrt{\frac{P_{\text{conv}} - P_{\text{out}}}{R_a}}$$

[Open Calculator !\[\]\(de95854c7ee024cfadc48187bbb781b2_img.jpg\)](#)

$$\text{ex } 0.660029\text{A} = \sqrt{\frac{165.5\text{W} - 150\text{W}}{35.58\Omega}}$$

2) Armature Current of Series DC Generator given Torque

$$\text{fx } I_a = \frac{\tau \cdot \omega_s}{V_a}$$

[Open Calculator !\[\]\(6a9b39b98eb945faa14c645ec99e4eaa_img.jpg\)](#)

$$\text{ex } 0.656545\text{A} = \frac{1.57\text{N}\cdot\text{m} \cdot 115\text{rad/s}}{275\text{V}}$$

3) Armature Current of Series DC Generator using Terminal Voltage

$$\text{fx } I_a = \frac{V_a - V_t}{R_{\text{se}} + R_a}$$

[Open Calculator !\[\]\(f1c5da15572e3e09d343161be98f508d_img.jpg\)](#)

$$\text{ex } 0.660045\text{A} = \frac{275\text{V} - 170\text{V}}{123.5\Omega + 35.58\Omega}$$



4) Load Current of Series DC Generator given Load Power 

$$fx \quad I_L = \frac{P_L}{V_t}$$

[Open Calculator !\[\]\(cbe80b694ebd74fcfe136a095b608235_img.jpg\)](#)

$$ex \quad 0.885294A = \frac{150.5W}{170V}$$

5) Load Current of Series DC Generator given Output Power 

$$fx \quad I_L = \frac{P_{out}}{V_t}$$

[Open Calculator !\[\]\(3e2231b1ad3ca8da8658228c00dd08e0_img.jpg\)](#)

$$ex \quad 0.882353A = \frac{150W}{170V}$$

Losses 6) Mechanical Losses of Series DC Generator given Converted Power 

$$fx \quad P_m = P_{in} - P_{core} - P_{stray} - P_{conv}$$

[Open Calculator !\[\]\(b792654f2cef9719eabeb6c5be00811e_img.jpg\)](#)

$$ex \quad 9W = 180W - 2.8W - 2.7W - 165.5W$$

7) Series Field Copper Loss in DC Generator 

$$fx \quad P_{se} = I_{se}^2 \cdot R_{se}$$

[Open Calculator !\[\]\(84f47badaad7772cd95667a7c387a639_img.jpg\)](#)

$$ex \quad 85.48966W = (0.832A)^2 \cdot 123.5\Omega$$



Mechanical Specifications

8) Angular Speed of Series DC Generator given Torque

$$fx \quad \omega_s = \frac{P_{in}}{\tau}$$

[Open Calculator !\[\]\(23d9fc146e83b5c3013cfa32c784f8d5_img.jpg\)](#)

$$ex \quad 114.6497 \text{ rad/s} = \frac{180 \text{ W}}{1.57 \text{ N}\cdot\text{m}}$$

9) Resultant Pitch of DC Series Generator

$$fx \quad Y_R = Y_B + Y_F$$

[Open Calculator !\[\]\(aa53ad6fea213b8b2226d3077e30533a_img.jpg\)](#)

$$ex \quad 100 = 51 + 49$$

10) Torque of Series DC Generator given Angular Speed and Armature Current

$$fx \quad \tau = \frac{V_a \cdot I_a}{\omega_s}$$

[Open Calculator !\[\]\(626ce8ac21792b9405bfddfea8e0c96a_img.jpg\)](#)

$$ex \quad 1.578261 \text{ N}\cdot\text{m} = \frac{275 \text{ V} \cdot 0.66 \text{ A}}{115 \text{ rad/s}}$$



Power

11) Converted Power of Series DC Generator given Input Power

$$fx \quad P_{\text{conv}} = P_{\text{in}} - P_{\text{stray}} - P_{\text{m}} - P_{\text{core}}$$

[Open Calculator !\[\]\(74d4806277d7e73349d8e8c0897931e9_img.jpg\)](#)

$$ex \quad 165.5W = 180W - 2.7W - 9W - 2.8W$$

12) Converted Power of Series DC Generator given Output Power

$$fx \quad P_{\text{conv}} = P_{\text{out}} + I_a^2 \cdot R_a$$

[Open Calculator !\[\]\(8bba887393ca45b761e5cb49e755e762_img.jpg\)](#)

$$ex \quad 165.4986W = 150W + (0.66A)^2 \cdot 35.58\Omega$$

Resistance

13) Armature Resistance of Series DC Generator given Output Power

$$fx \quad R_a = \frac{P_{\text{conv}} - P_{\text{out}}}{I_a^2}$$

[Open Calculator !\[\]\(799877f5c2f906134441300079881630_img.jpg\)](#)

$$ex \quad 35.5831\Omega = \frac{165.5W - 150W}{(0.66A)^2}$$



14) Armature Resistance of Series DC Generator using Terminal Voltage



$$\text{fx } R_a = \left(\frac{V_a - V_t}{I_a} \right) - R_{se}$$

[Open Calculator](#)

$$\text{ex } 35.59091\Omega = \left(\frac{275\text{V} - 170\text{V}}{0.66\text{A}} \right) - 123.5\Omega$$

15) Series Field Resistance of Series DC Generator using Terminal Voltage



$$\text{fx } R_{se} = \left(\frac{V_a - V_t}{I_a} \right) - R_a$$

[Open Calculator](#)

$$\text{ex } 123.5109\Omega = \left(\frac{275\text{V} - 170\text{V}}{0.66\text{A}} \right) - 35.58\Omega$$

Voltage & EMF

16) Armature Induced Voltage of Series DC Generator

$$\text{fx } V_a = V_t + I_a \cdot (R_a + R_{se})$$

[Open Calculator](#)

$$\text{ex } 274.9928\text{V} = 170\text{V} + 0.66\text{A} \cdot (35.58\Omega + 123.5\Omega)$$

17) Terminal Voltage of Series DC Generator

$$\text{fx } V_t = V_a - I_a \cdot (R_a + R_{se})$$

[Open Calculator](#)

$$\text{ex } 170.0072\text{V} = 275\text{V} - 0.66\text{A} \cdot (35.58\Omega + 123.5\Omega)$$



18) Terminal Voltage of Series DC Generator given Output Power [Open Calculator](#) 

fx
$$V_t = \frac{P_{\text{out}}}{I_L}$$

ex
$$170.4545\text{V} = \frac{150\text{W}}{0.88\text{A}}$$









Variables Used

- I_a Armature Current (Ampere)
- I_L Load Current (Ampere)
- I_{se} Series Field Current (Ampere)
- P_{conv} Converted Power (Watt)
- P_{core} Core Loss (Watt)
- P_{in} Input Power (Watt)
- P_L Load Power (Watt)
- P_m Mechanical Losses (Watt)
- P_{out} Output Power (Watt)
- P_{se} Series Field Loss (Watt)
- P_{stray} Stray Loss (Watt)
- R_a Armature Resistance (Ohm)
- R_{se} Series Field Resistance (Ohm)
- V_a Armature Voltage (Volt)
- V_t Terminal Voltage (Volt)
- Y_B Back Pitch
- Y_F Front Pitch
- Y_R Resultant Pitch
- T Torque (Newton Meter)
- ω_s Angular Speed (Radian per Second)



Constants, Functions, Measurements used

- **Function:** **sqrt**, sqrt(Number)
Square root function
- **Measurement:** **Electric Current** in Ampere (A)
Electric Current Unit Conversion 
- **Measurement:** **Power** in Watt (W)
Power Unit Conversion 
- **Measurement:** **Electric Resistance** in Ohm (Ω)
Electric Resistance Unit Conversion 
- **Measurement:** **Electric Potential** in Volt (V)
Electric Potential Unit Conversion 
- **Measurement:** **Angular Velocity** in Radian per Second (rad/s)
Angular Velocity Unit Conversion 
- **Measurement:** **Torque** in Newton Meter (N*m)
Torque Unit Conversion 



Check other formula lists

- [DC Generator Characteristics Formulas](#) 
- [DC Series Generator Formulas](#) 
- [DC Shunt Generator Formulas](#) 

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