Important DC Drives Formulas PDF



List of 11 Important DC Drives Formulas

Evaluate Formula (

Evaluate Formula (

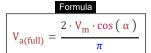
Evaluate Formula 🕝

Evaluate Formula 🕝

Evaluate Formula

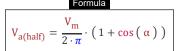
1) Single Phase Drives Formulas (7)

1.1) Average Armature Voltage of Single Phase Full-Converter Drives Formula 🕝



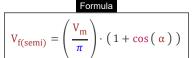
Formula Example with Units
$$V_{a(full)} = \frac{2 \cdot V_{m} \cdot \cos{(\alpha)}}{\pi} \qquad 47.9021v = \frac{2 \cdot 220v \cdot \cos{(70^{\circ})}}{3.1416}$$

1.2) Average Armature Voltage of Single Phase Half-Wave Converter Drive Formula 🕝



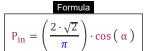


1.3) Average Field Voltage of Single Phase Semi-Converter Drives Formula 🕝



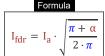
Formula Example with Units
$$V_{f(semi)} = \left(\frac{V_{m}}{\pi}\right) \cdot \left(1 + \cos\left(\alpha\right)\right) \qquad 93.9792v = \left(\frac{220v}{3.1416}\right) \cdot \left(1 + \cos\left(70^{\circ}\right)\right)$$

1.4) Input Power of Single Phase Full Converter Drives Formula 🕝



Formula Example with Units
$$P_{in} = \left(\frac{2 \cdot \sqrt{Z}}{\pi}\right) \cdot \cos\left(\alpha\right) \qquad 0.3079w = \left(\frac{2 \cdot \sqrt{Z}}{3.1416}\right) \cdot \cos\left(70^{\circ}\right)$$

1.5) RMS Value of Freewheeling Diode Current in Half Wave Converter Drives Formula 🕝



Formula Example with Units
$$I_{fdr} = I_a \cdot \sqrt{\frac{\pi + \alpha}{2 \cdot \pi}} \qquad 25 \, \text{A} = 30 \, \text{A} \cdot \sqrt{\frac{3.1416 + 70^{\circ}}{2 \cdot 3.1416}}$$

1.6) RMS Value of Thyristor Current in Half Wave Converter Drives Formula 🕝



Example with Units

$$I_{sr} = I_a \cdot \left(\frac{\pi - \alpha}{2 \cdot \pi}\right)^{\frac{1}{2}}$$

$$16.5831 \text{A} = 30 \text{A} \cdot \left(\frac{3.1416 - 70^{\circ}}{2 \cdot 3.1416}\right)^{\frac{1}{2}}$$

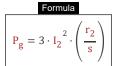
Evaluate Formula (

Evaluate Formula (

Evaluate Formula 🦳

2) Three Phase Drives Formulas [7]

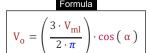
2.1) Air Gap Power in Three Phase Induction Motor Drives Formula



Example with Units



2.2) Armature Terminal Voltage in Half-Wave Converter Drives Formula 🕝

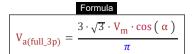


Example with Units

$$V_{o} = \left(\frac{3 \cdot V_{ml}}{2 \cdot \pi}\right) \cdot \cos\left(\alpha\right)$$

$$34.2935v = \left(\frac{3 \cdot 210v}{2 \cdot 3.1416}\right) \cdot \cos\left(70^{\circ}\right)$$

2.3) Average Armature Voltage of Three Phase Full-Converter Drives Formula 🕝



Example with Units



Evaluate Formula (

Evaluate Formula C

2.4) Average Field Voltage of Three Phase Semi-Converter Drive Formula 🕝

Formula

Example with Units

2.5) Maximum Torque in Induction Motor Drives Formula 🗂



$$\zeta_{\text{max}} = \left(\frac{3}{2 \cdot \omega_{\text{S}}}\right) \cdot \frac{{V_1}^2}{{r_1} + \sqrt{{r_1}^2 + \left(x_1 + x_2\right)^2}}$$

Evaluate Formula

Example with Units
$$127.8202 \, N^*m \, = \left(\frac{3}{2 \cdot 157 \, \text{m/s}}\right) \cdot \frac{230 \, \text{v}^2}{0.6 \, \Omega \, + \sqrt{0.6 \, \Omega^2 + \left(1.6 \, \Omega \, + 1.7 \, \Omega \, \right)^2}}$$

Variables used in list of DC Drives Formulas above

- **I**₂ Rotor Current (Ampere)
- I_a Armature Current (Ampere)
- Ifdr RMS Freewheeling Diode Current (Ampere)
- I_{sr} RMS of Source Current (Ampere)
- P_a Air Gap Power (Watt)
- Pin Input Power (Watt)
- r₁ Stator Resistance (Ohm)
- r₂ Rotor Resistance (Ohm)
- S Slip
- V₁ Terminal Voltage (Volt)
- V_{a(full)} Full Drive Armature Voltage (Volt)
- V_{a(full_3p)} Full Drive Armature Voltage in Three Phase (Volt)
- V_{a(half)} Half Drive Armature Voltage (Volt)
- V_{f(semi)} Semi Drive Field Voltage (Volt)
- V_{f(semi_3p)} Semi Drive Field Voltage in Three Phase (Volt)
- V_m Peak Input Voltage (Volt)
- V_{ml} Maximum Line Voltage (Volt)
- **V** Average Output Voltage (Volt)
- X₁ Stator Leakage Reactance (Ohm)
- X₂ Rotor Leakage Reactance (Ohm)
- α Delay Angle of Thyristor (Degree)
- ζ_{max} Maximum Torque (Newton Meter)
- ω_s Synchronous Speed (Meter per Second)

Constants, Functions, Measurements used in list of DC Drives Formulas above

- constant(s): pi,
 3.14159265358979323846264338327950288
 Archimedes' constant
- 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: 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: Speed in Meter per Second (m/s)
 Speed Unit Conversion
- Measurement: Power in Watt (W)

 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
- Measurement: Torque in Newton Meter (N*m)
 Torque Unit Conversion

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