

INVERTERS

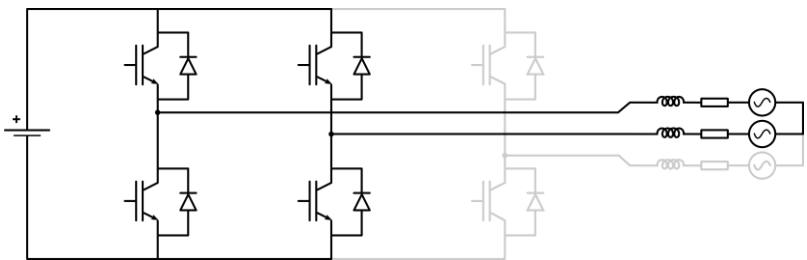
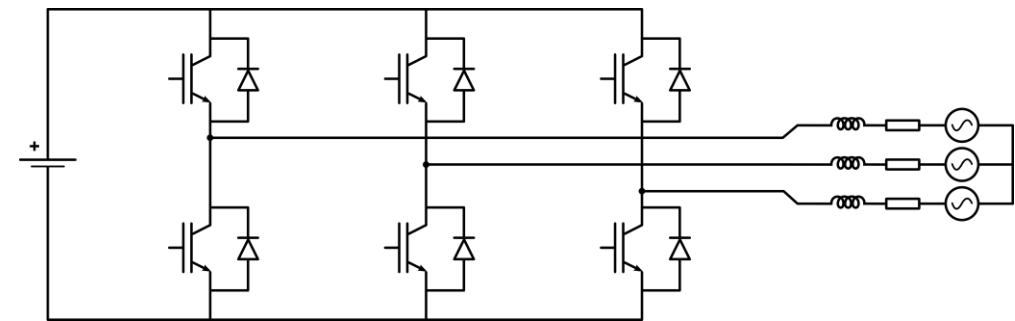
THREE-PHASE INVERTER

- How do we get three-phase balanced voltages?
- Basic modulation techniques.
- Is it an inverter or a rectifier?
- Notable applications.

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Three-phase inverter

How do we get three-phase AC balanced voltages?



How do we get AC voltages?

u_{aN}	0V	U_B	U_B	0V
u_{bN}	0V	0V	U_B	U_B
u_{ab}				

$$u_{an} = u_{aN} - u_{nN}$$

$$u_{bn} = u_{bN} - u_{nN}$$

$$u_{cn} = u_{cN} - u_{nN}$$

$$u_{ab} = u_{aN} - u_{bN}$$

$$u_{bc} = u_{bN} - u_{cN}$$

$$u_{ca} = u_{cN} - u_{aN}$$

How do we get balanced voltages?

$$u_{an} = R_a \cdot i_a + L_a \cdot \frac{di_a}{dt} + e_a$$

$$u_{bn} = R_b \cdot i_b + L_b \cdot \frac{di_b}{dt} + e_b$$

$$u_{cn} = R_c \cdot i_c + L_c \cdot \frac{di_c}{dt} + e_c$$

$$R_a = R_b = R_c$$

$$L_a = L_b = L_c$$

$$e_a + e_b + e_c = 0$$

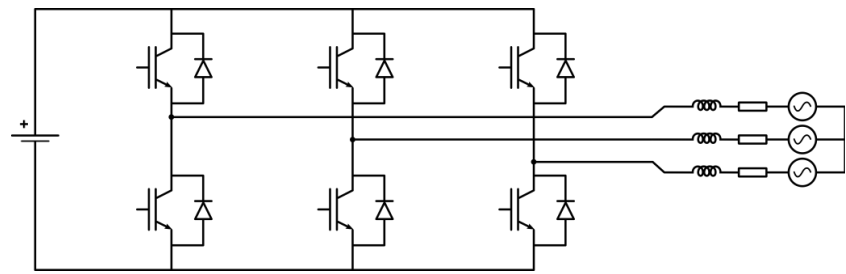
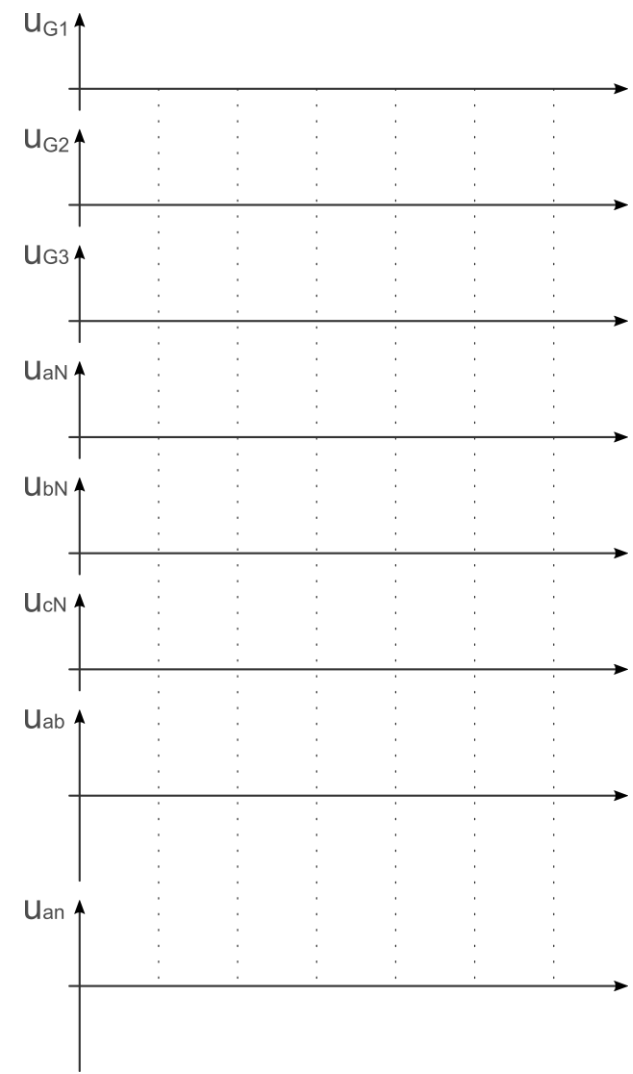
$$i_a + i_b + i_c = 0$$

u_{aN}	0V	U_B	0V	U_B	0V	U_B	0V	U_B
u_{bN}	0V	0V	U_B	U_B	0V	0V	U_B	U_B
u_{cN}	0V	0V	0V	0V	U_B	U_B	U_B	U_B
u_{an}								

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Three-phase inverter

How do we get three-phase AC balanced voltages?



$$u_{ab} = u_{aN} - u_{bN}$$
$$u_{bc} = u_{bN} - u_{cN}$$
$$u_{ca} = u_{cN} - u_{aN}$$

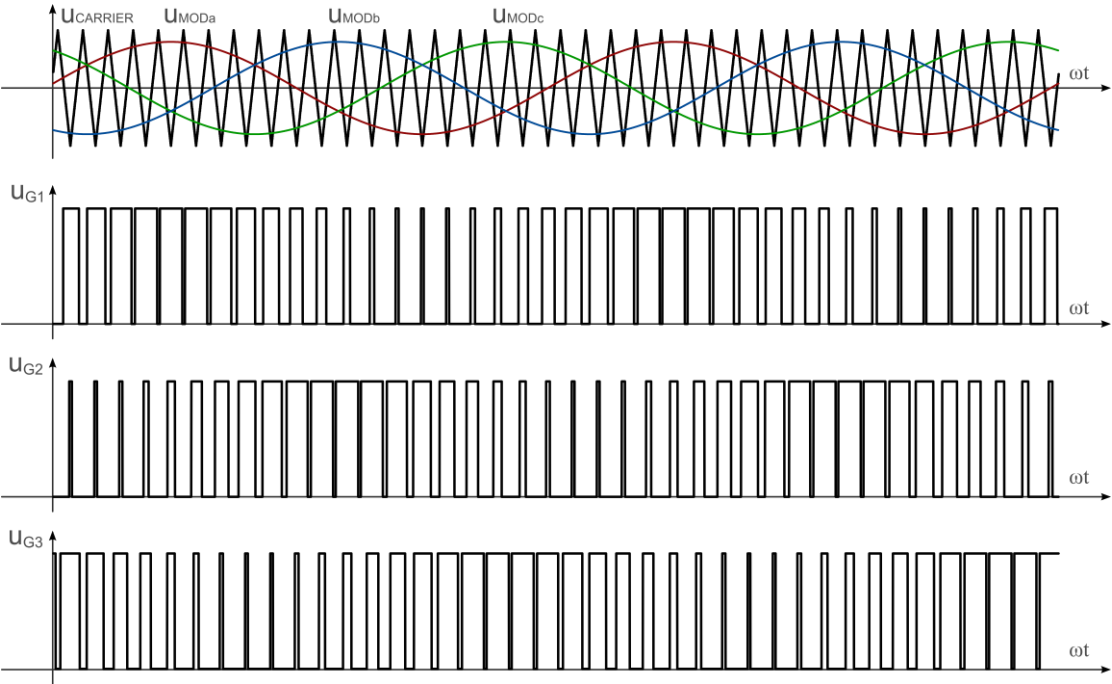
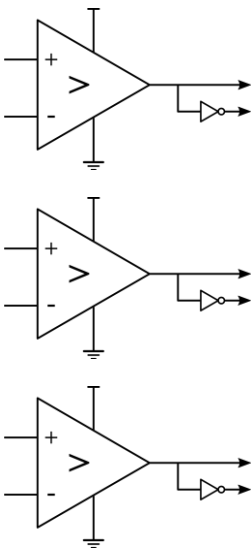
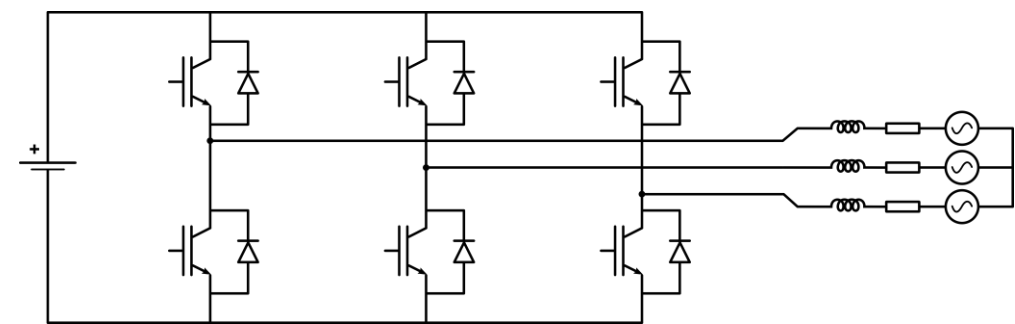
$$u_{an} = \frac{2}{3} \cdot u_{aN} - \frac{1}{3} \cdot u_{bN} - \frac{1}{3} \cdot u_{cN}$$
$$u_{bn} = \frac{2}{3} \cdot u_{bN} - \frac{1}{3} \cdot u_{aN} - \frac{1}{3} \cdot u_{cN}$$
$$u_{cn} = \frac{2}{3} \cdot u_{cN} - \frac{1}{3} \cdot u_{aN} - \frac{1}{3} \cdot u_{bN}$$

u_{aN}	0V	U_B	0V	U_B	0V	U_B	0V	U_B
u_{bN}	0V	0V	U_B	U_B	0V	0V	U_B	U_B
u_{cN}	0V	0V	0V	0V	U_B	U_B	U_B	U_B
u_{an}	0V	$\frac{2}{3}U_B$	$-\frac{1}{3}U_B$	$\frac{1}{3}U_B$	$-\frac{1}{3}U_B$	$\frac{1}{3}U_B$	$-\frac{2}{3}U_B$	0V

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Three-phase inverter

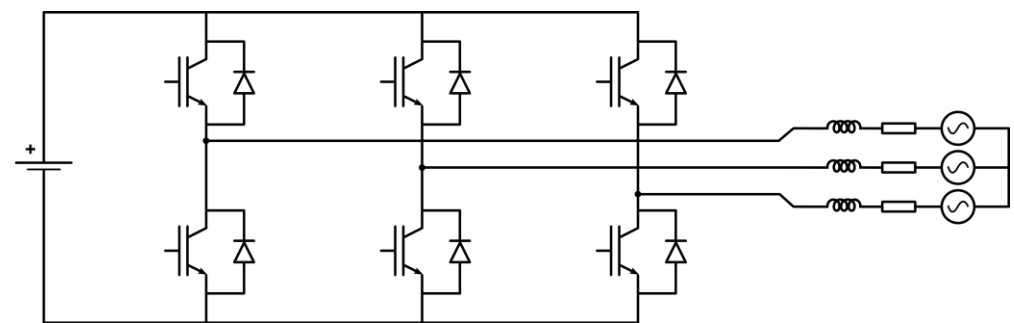
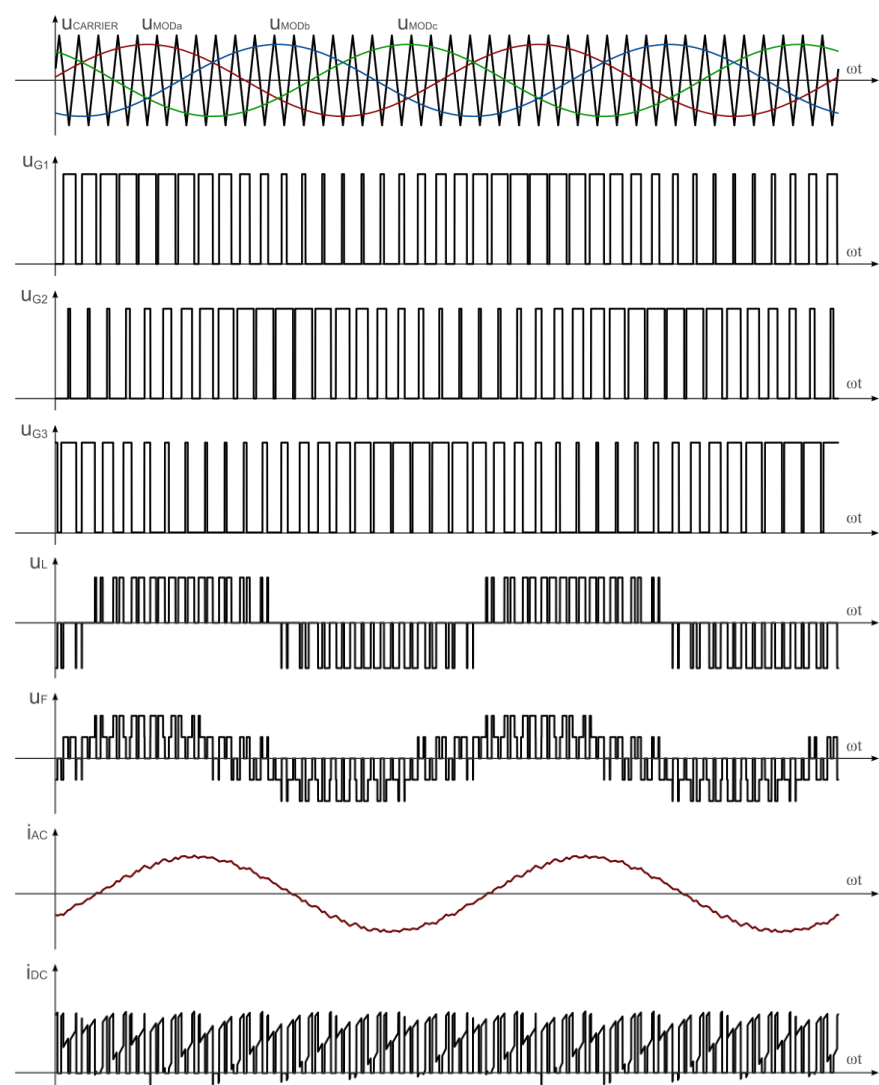
Pulse-width modulation (Sinusoidal)



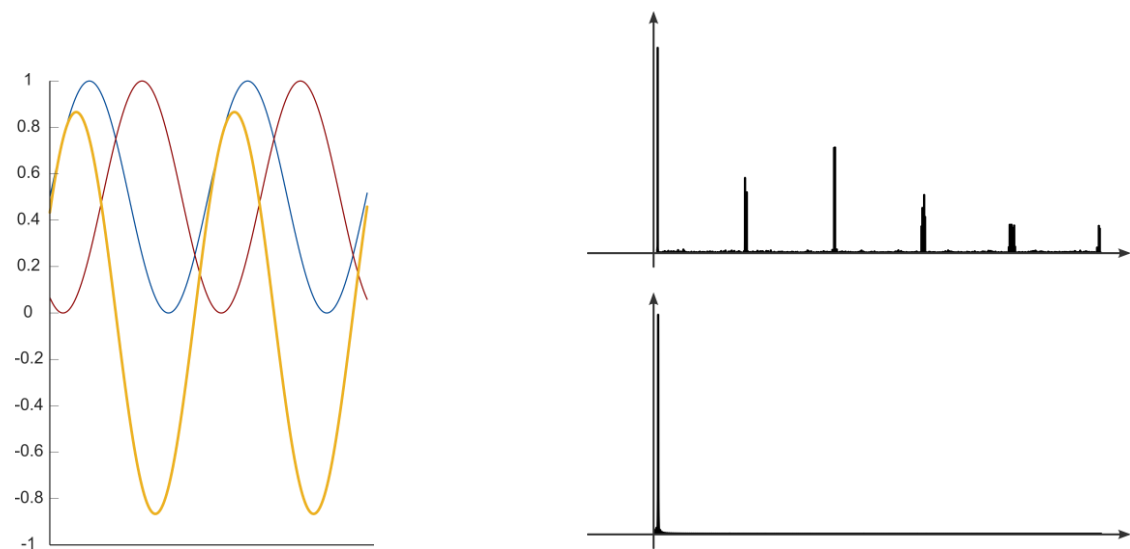
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Three-phase inverter

Pulse-width modulation (Sinusoidal)



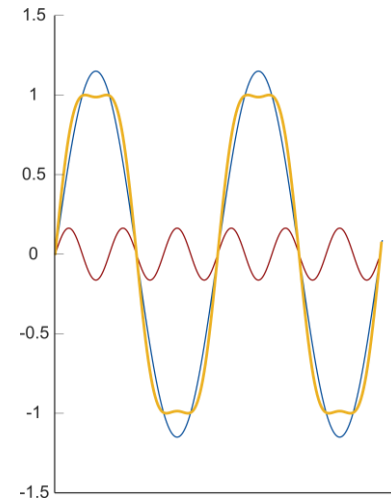
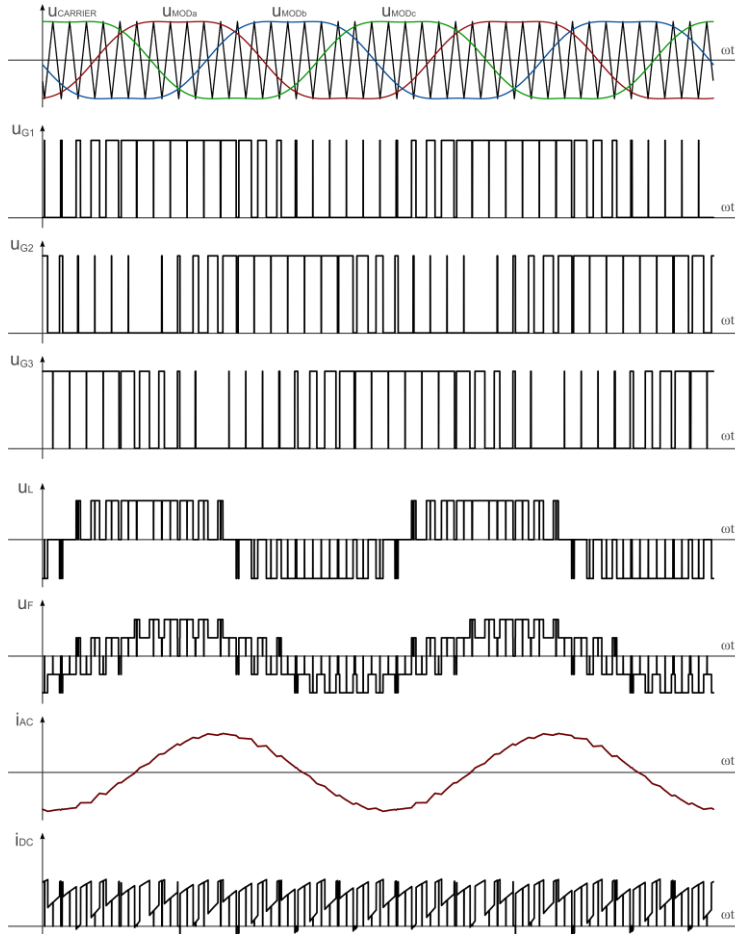
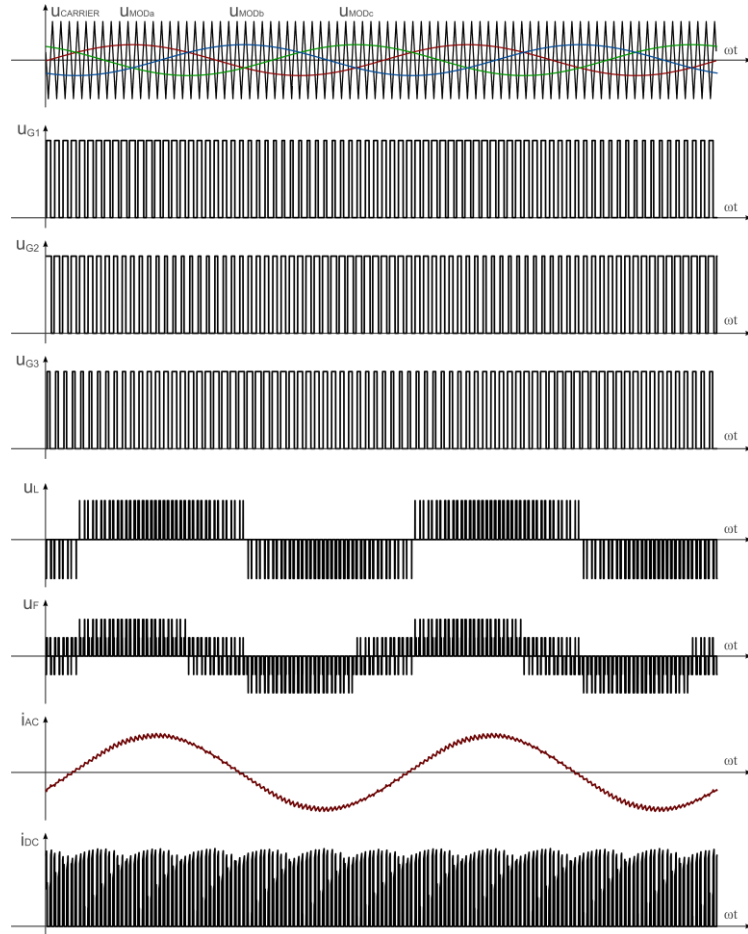
Harmonic spectrum



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Three-phase inverter

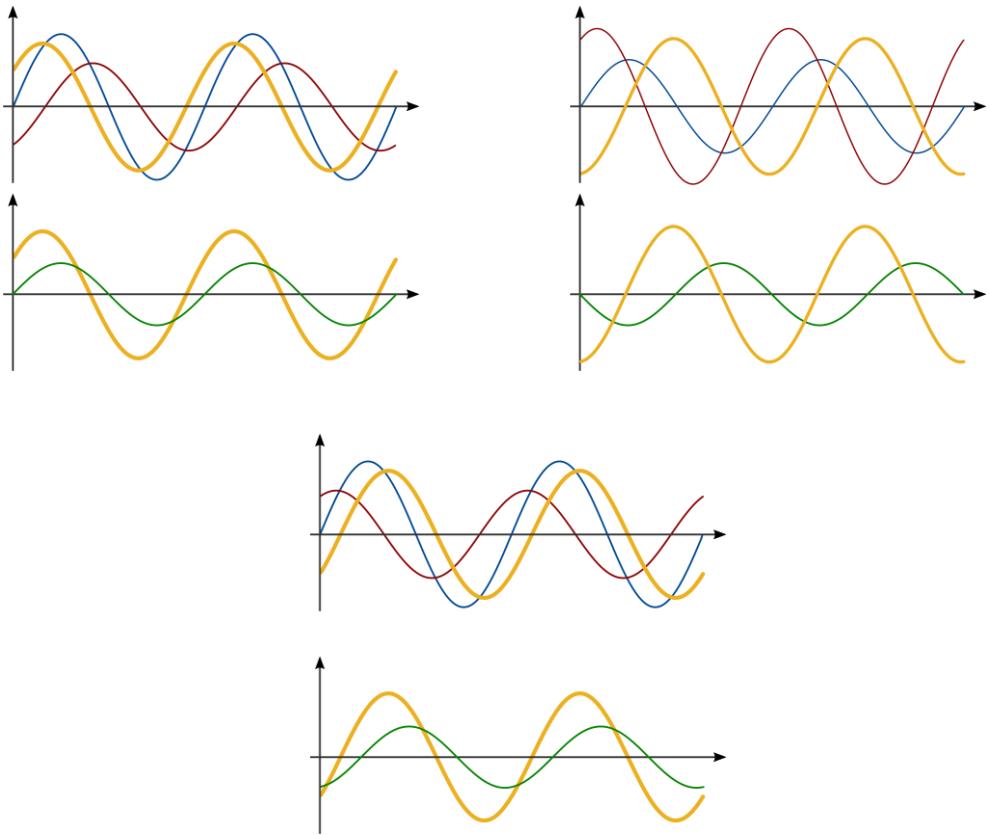
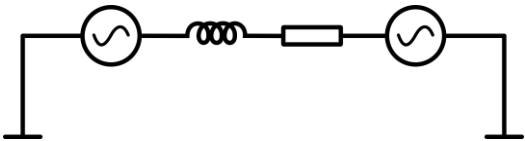
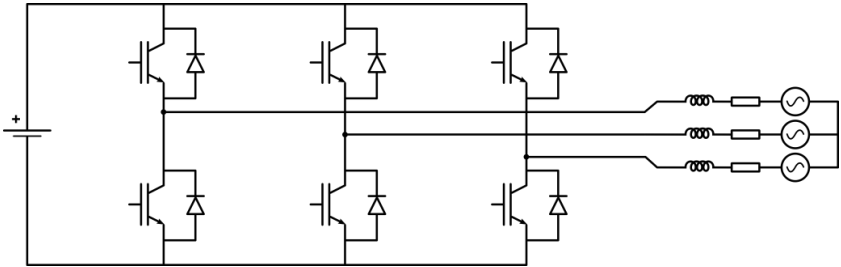
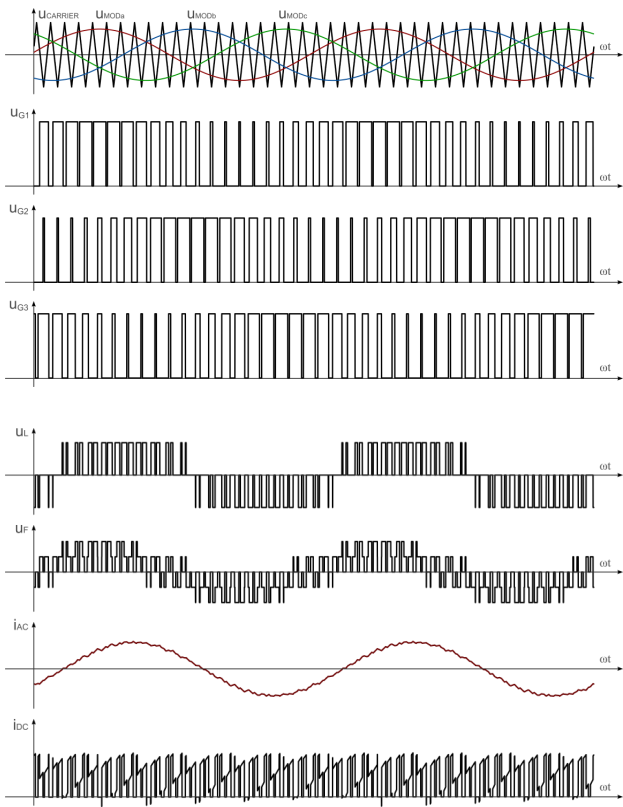
Pulse-width modulation (Sinusoidal*)



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Three-phase inverter

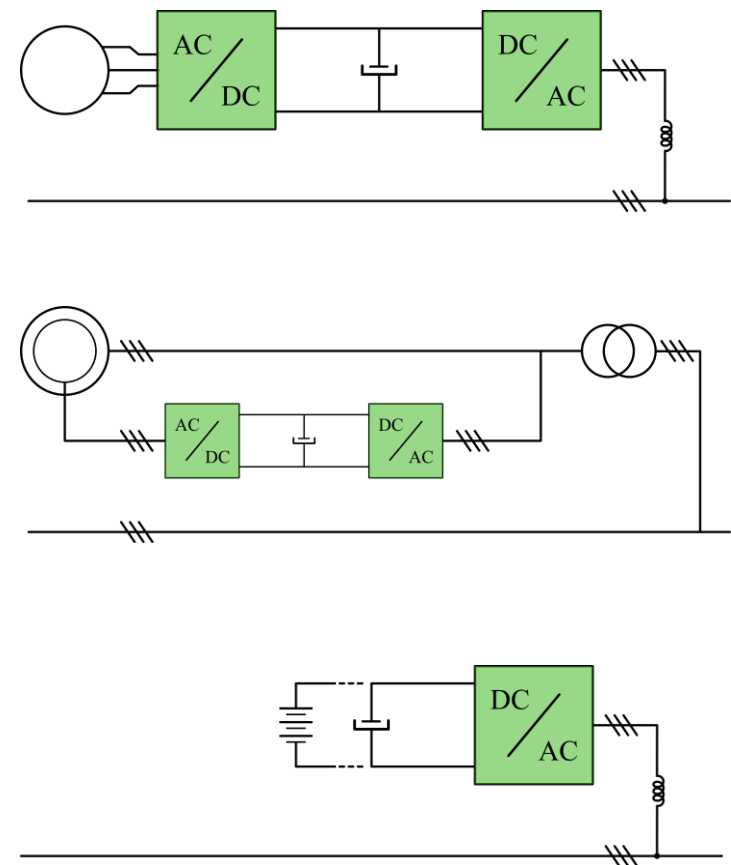
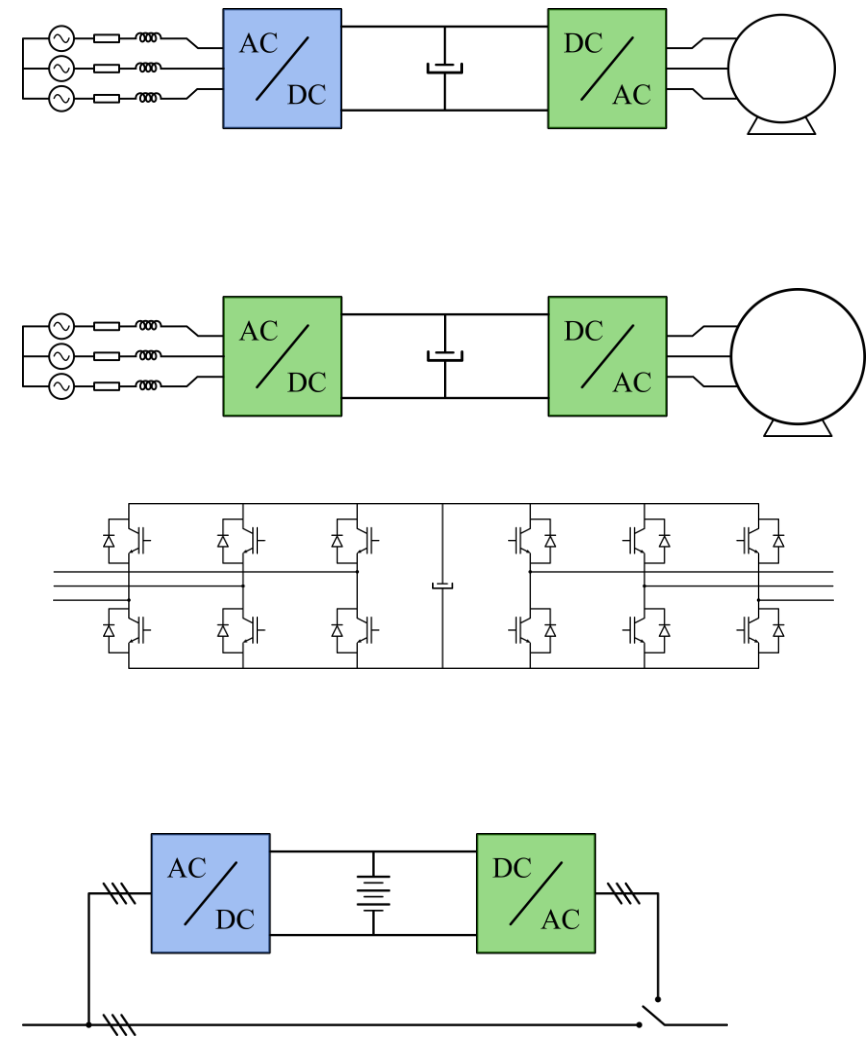
Is it an inverter or a rectifier?



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Three-phase inverter

Notable applications



INVERTERS

Three-phase inverter - important notes

- PWM and square-wave modulations,
- Transistor bridge - both an inverter and a rectifier,
- Inductive-resistive loads are driven,
- Several quite important applications.

