Alternating Current
Generation and Characteristics

Applied Mechatronics

Module 5.1.1

by Wolfgang Neff

Generation (1)

- Single-Phase Current
  - Chapter 6.7: Erzeugung von Wechselstrom
- Three-Phase Current
  - Chapter 7.1: Erzeugung von Drehstrom

Characteristics (1)

- Terms
  - Chapter 6.6: Wechselstrom und Wechselspannung
- Mathematics
  - Chapter 6.2: Winkelfunktionen: Sinus, Cosinus, …

Vector Representation (1)

- Vector Representation
  - Chapter 6.8: Zeigerdarstellung
- Phase Shift
  - Chapter 6.9: Phasenverschiebung
- Mathematics
  - See Addendum

Addendum (1)

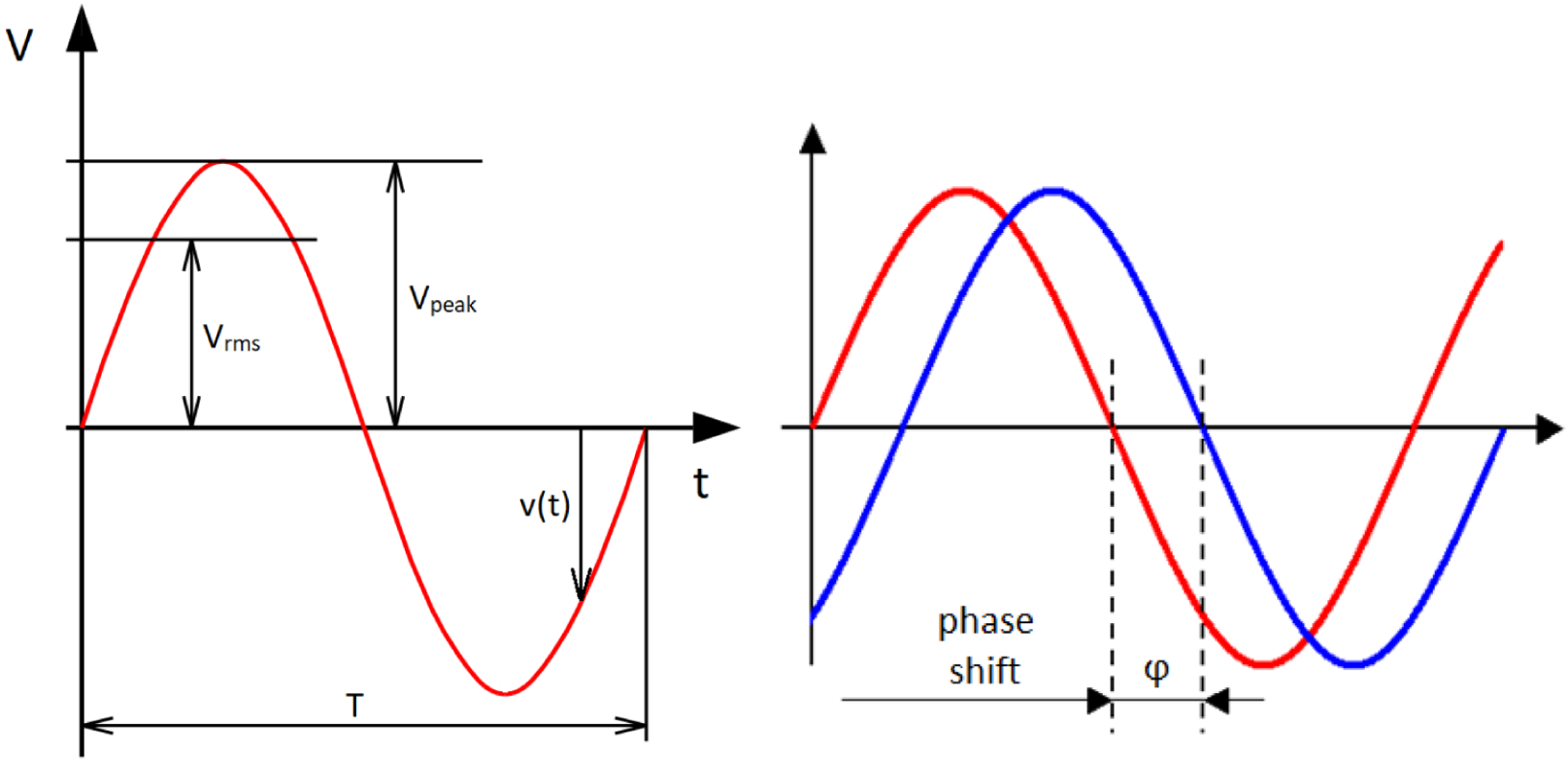
- Terms
  - Period T
    - Unit: seconds
  - Frequency f
    - Relation: $f = \frac{1}{T}$
    - Unit: hertz
  - Angular Frequency ω
    - Relation: $\omega = 2\pi f$
    - Unit: radians per second

Addendum (2)

- Terms (continued)
  - Phase Angle φ
    - Unit: radians
  - Instantaneous Value
    - Voltage: v(t) (for example)
  - Peak Value
    - Voltage: V_{peak}, $\hat{V}$ (for example)
  - Effective Value (root mean square voltage)
    - Relation: $V_{rms} = \frac{1}{\sqrt{2}}\hat{V}$ (sinusoidal voltages, only)

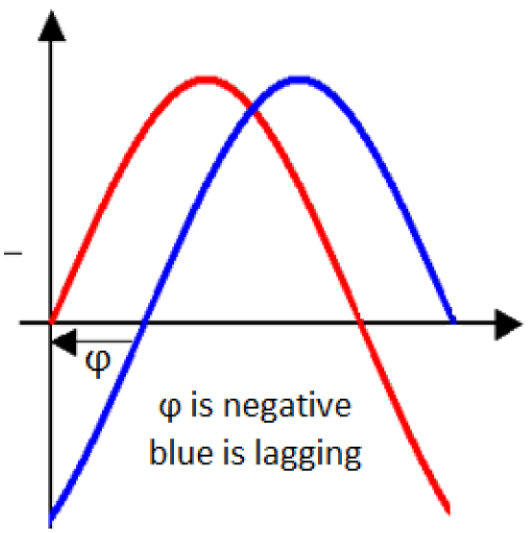
Addendum (3)

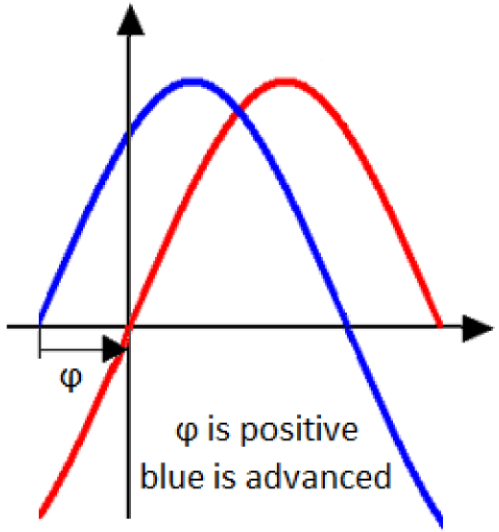
- Illustrations



Addendum (4)

- Instantaneous Value
  - $v(t) = \hat{V} \cdot \sin(\omega t + \varphi)$ (voltage)
  - $i(t) = \hat{I} \cdot \sin(\omega t + \varphi)$ (current)





Bibliography

- SEYR, SIGURD and SCHWAIGER, HERBERT, 2014, Elektrotechnik Grundlagen mit angewandter Mathematik. Wien : Jugend & Volk. ISBN 978-3-7100-2873-1.