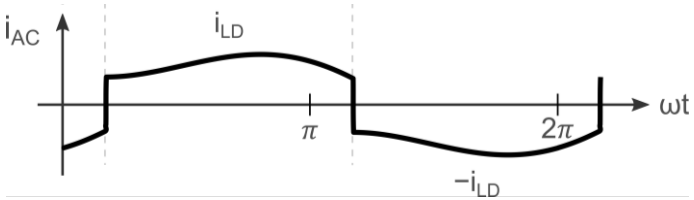
ADDITIONAL NOTES

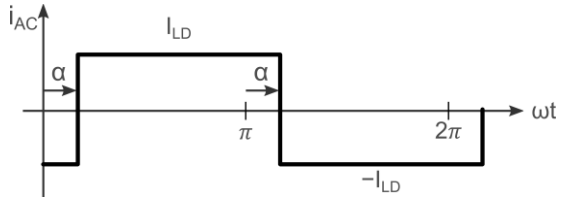
- Power quality issues.
- Application examples.
- Additional circuitry that secures proper rectifiers operation.

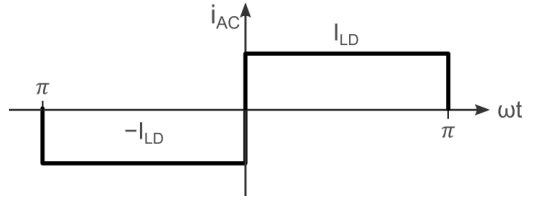
RECTIFIERS

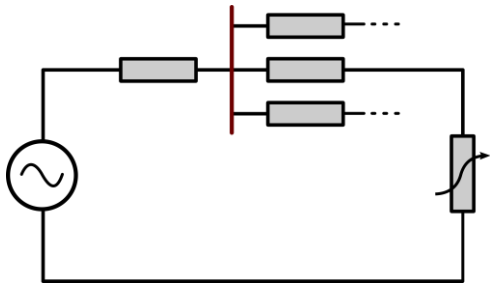
Additional notes

Power quality issues (single-phase thyristor bridge):









Harmonic analysis:

$$x(\omega t) = A_0 + \sum_{h=1}^{\infty}[A_h \cdot \cos(h\omega t) + B_h \cdot \sin(h\omega t)]$$

$$A_h = \frac{1}{\pi}\int_{-\pi}^{\pi} i_{AC}(\omega t) \cdot \cos(h\omega t) \cdot d(\omega t),$$

$$B_h = \frac{1}{\pi}\int_{-\pi}^{\pi} i_{AC}(\omega t) \cdot \sin(h\omega t) \cdot d(\omega t).$$

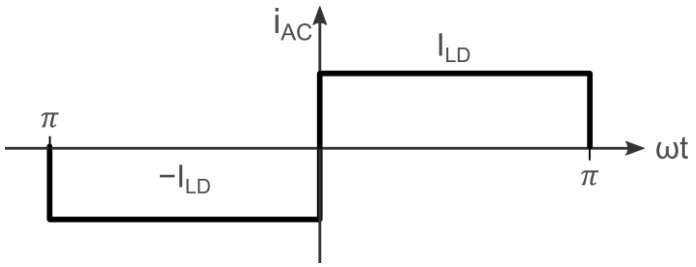
$I_{ACrms} =$

$i_{AC} =?$

RECTIFIERS

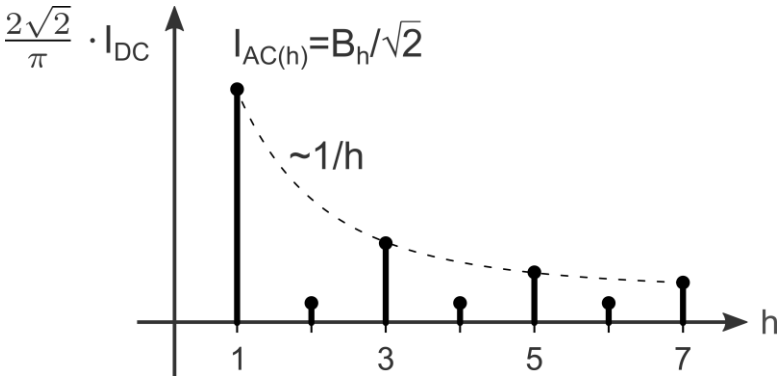
Additional notes

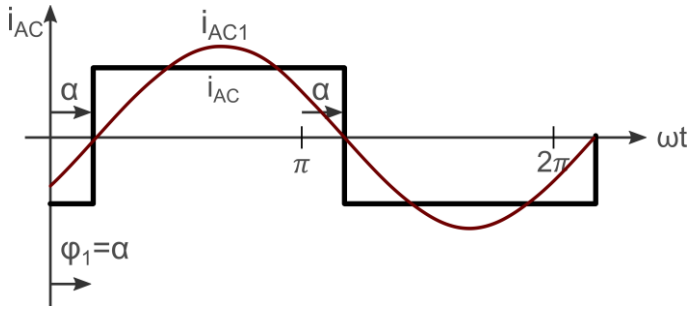
Power quality issues (single-phase thyristor bridge) - harmonics:



$$A_h = \frac{1}{\pi}\int_{-\pi}^{\pi} i_{AC}(\omega t)\cdot\cos(h\omega t)\cdot d(\omega t) \qquad A_h = 0$$

$$B_h = \frac{1}{\pi}\int_{-\pi}^{\pi} i_{AC}(\omega t)\cdot\sin(h\omega t)\cdot d(\omega t)$$



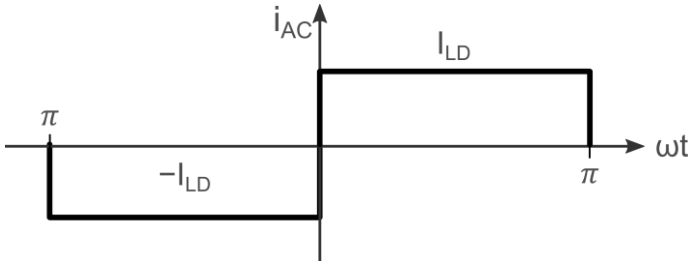


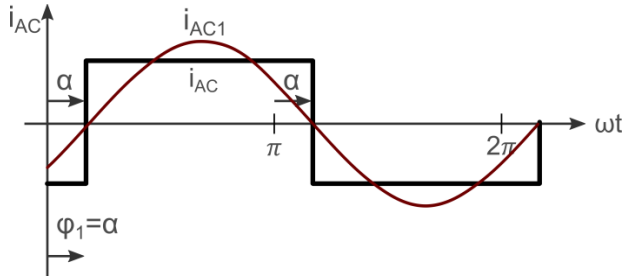
$$x(\omega t) = A_0 + \sum_{h=1}^{\infty}[A_h\cdot\cos(h\omega t) + B_h\cdot\sin(h\omega t)]$$

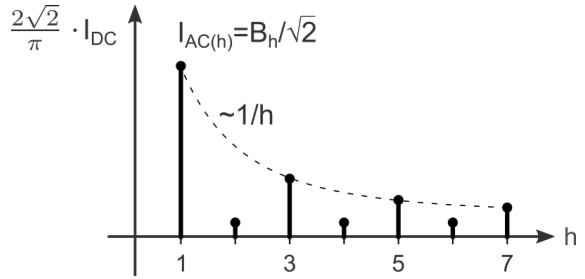
RECTIFIERS

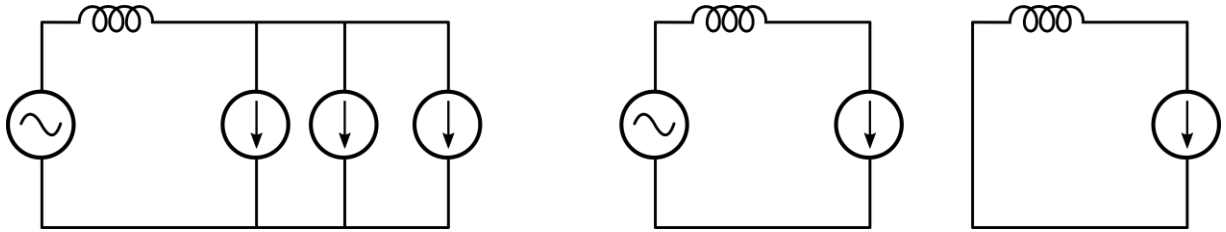
Additional notes

Power quality issues (single-phase thyristor bridge) - harmonics:









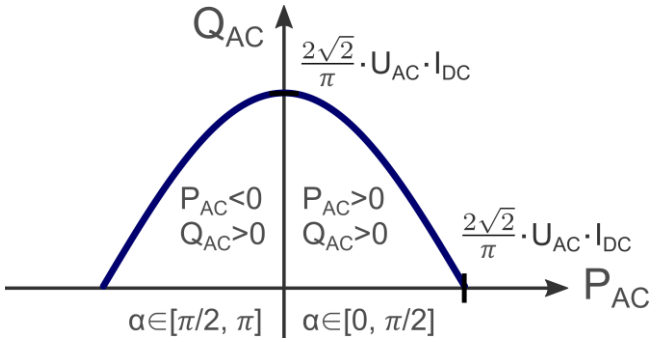
$def.: P_{AC} =$

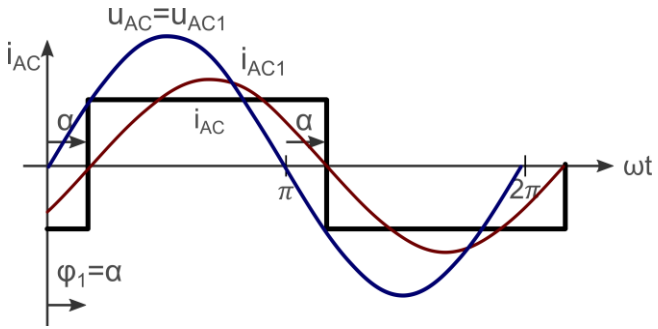
$def.: Q_{AC} =$

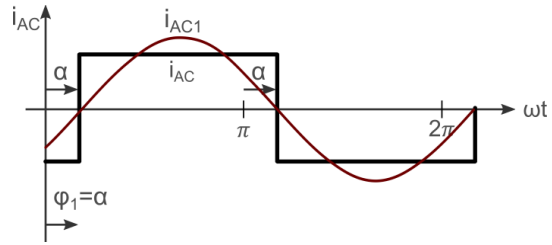
RECTIFIERS

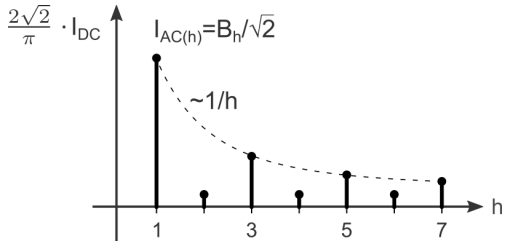
Additional notes

Power quality issues (single-phase thyristor bridge) - harmonics:



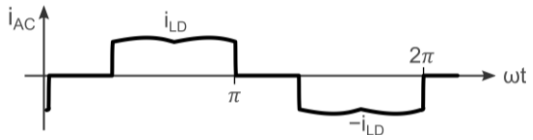


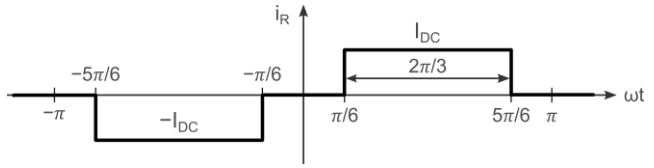




RECTIFIERS

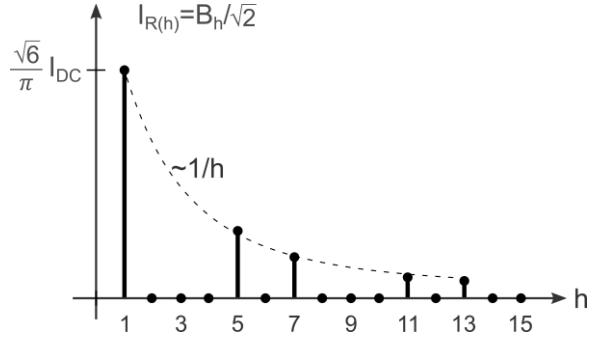
Additional notes





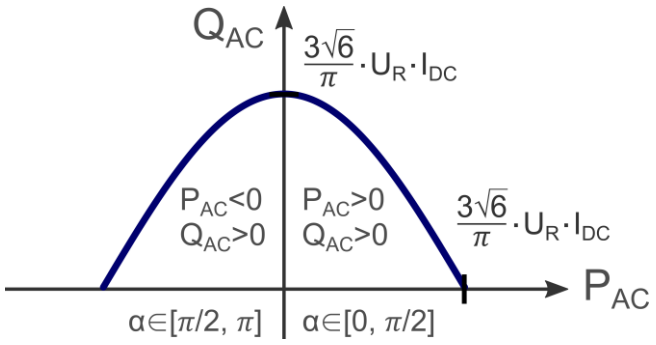
Power quality issues (three-phase thyristor bridge) - harmonics:

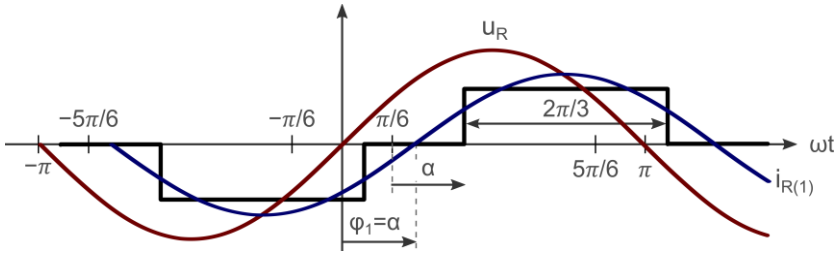
$I_{ACrms} =$



$P_{AC} =$

$Q_{AC} =$

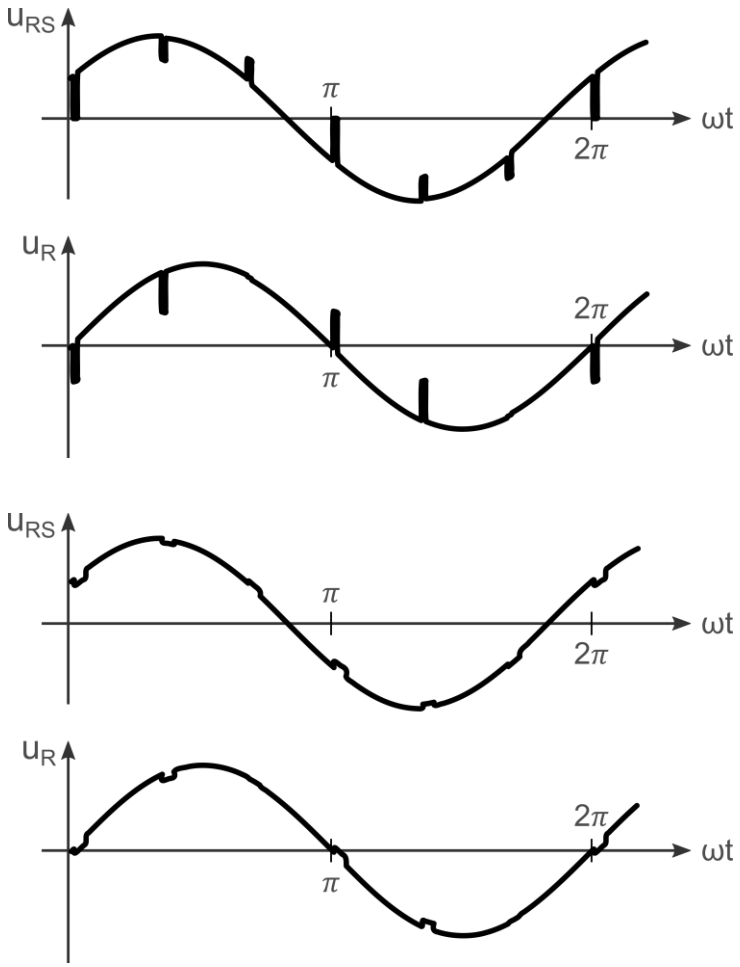


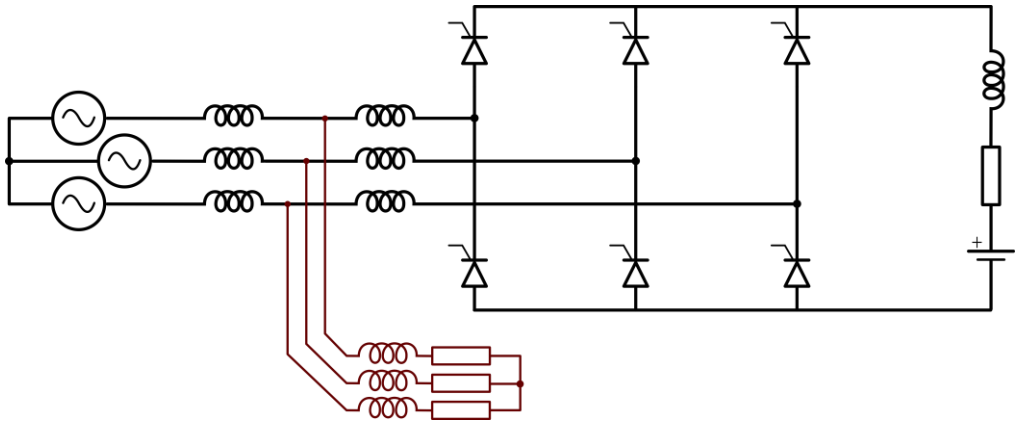


RECTIFIERS

Additional notes

Power quality issues (thyristor bridges) – voltage deviations:

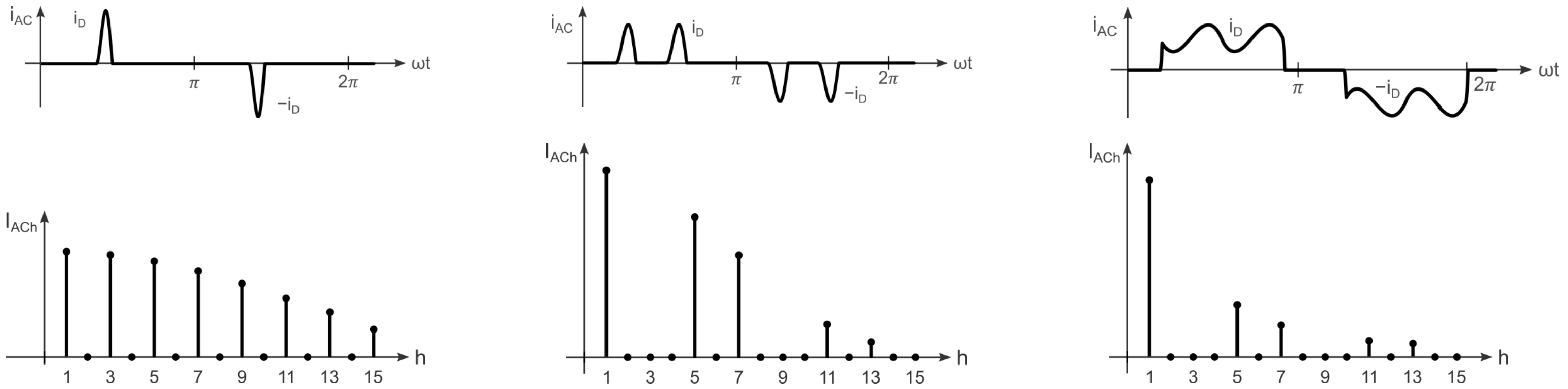




RECTIFIERS

Additional notes

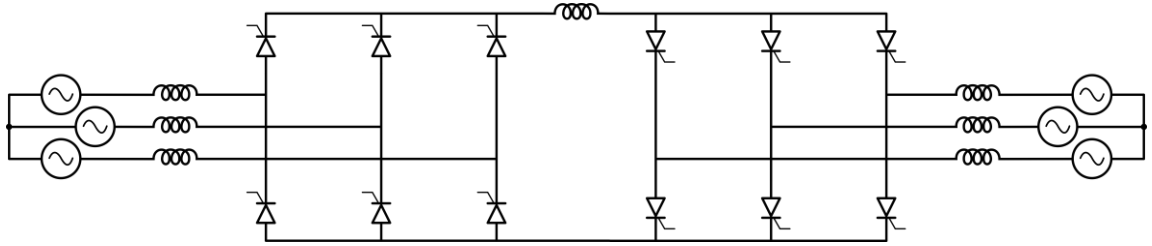
Power quality issues (diode bridges) - harmonics :

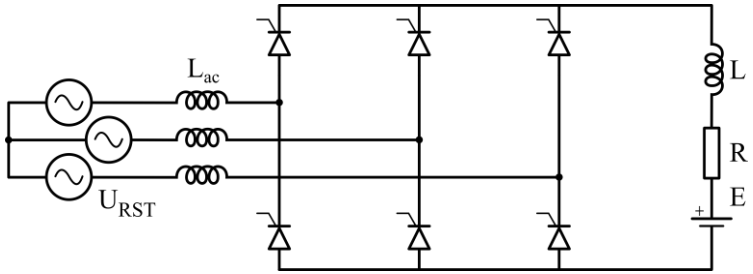


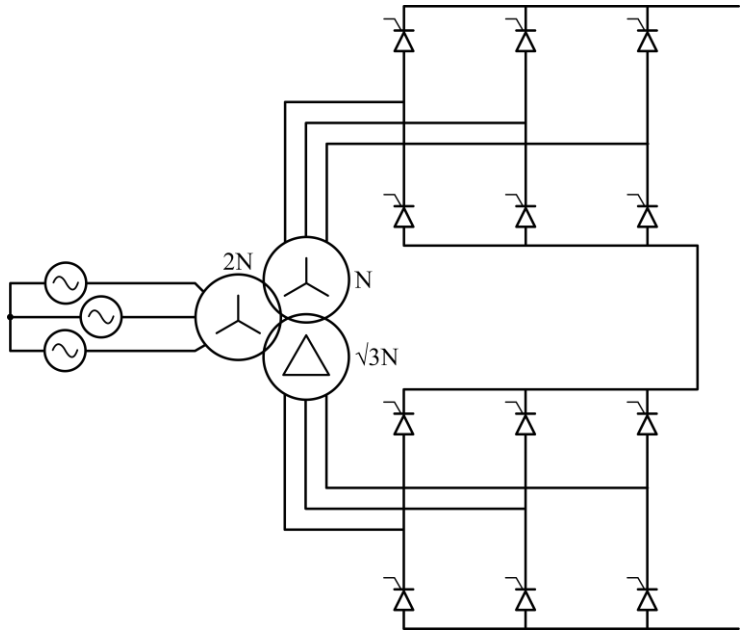
RECTIFIERS

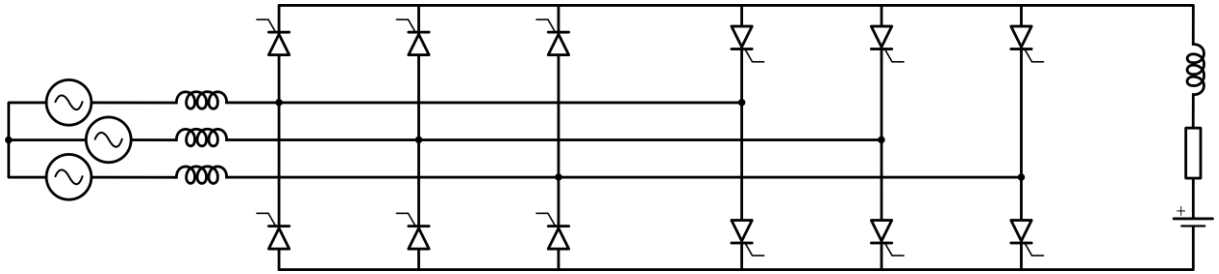
Additional notes

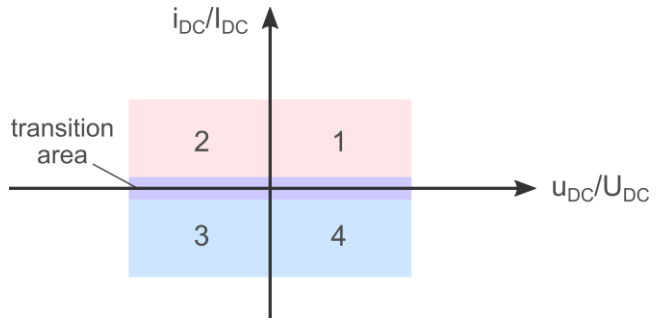
Thyristor bridges – application examples:







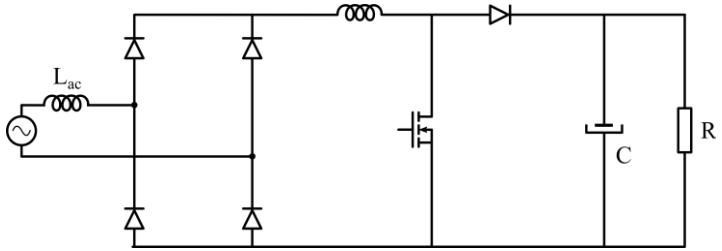


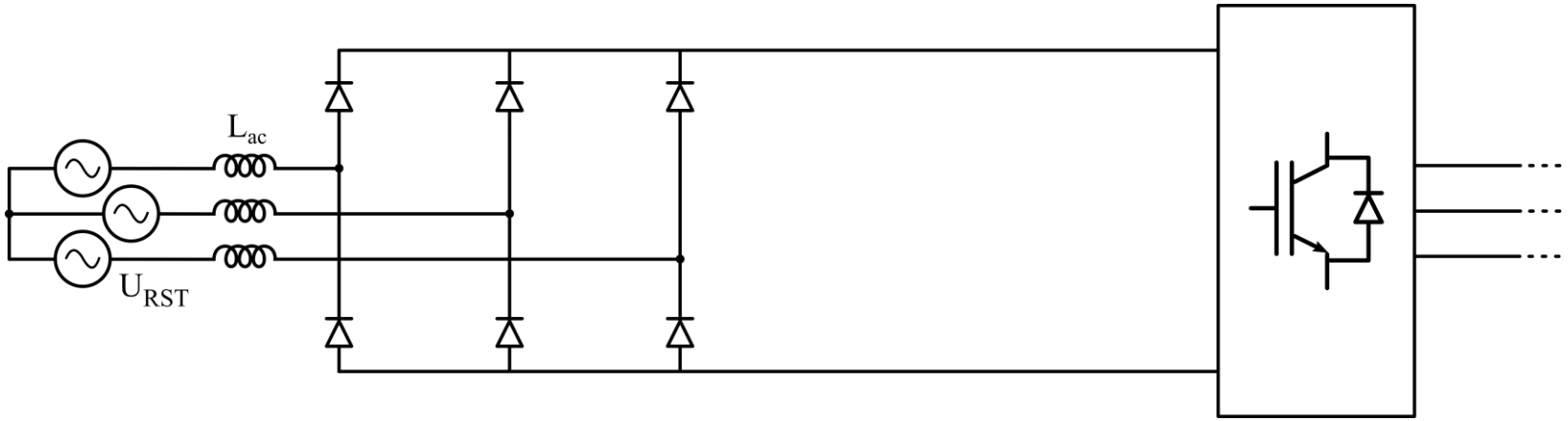


RECTIFIERS

Additional notes

Diode bridges – application example:



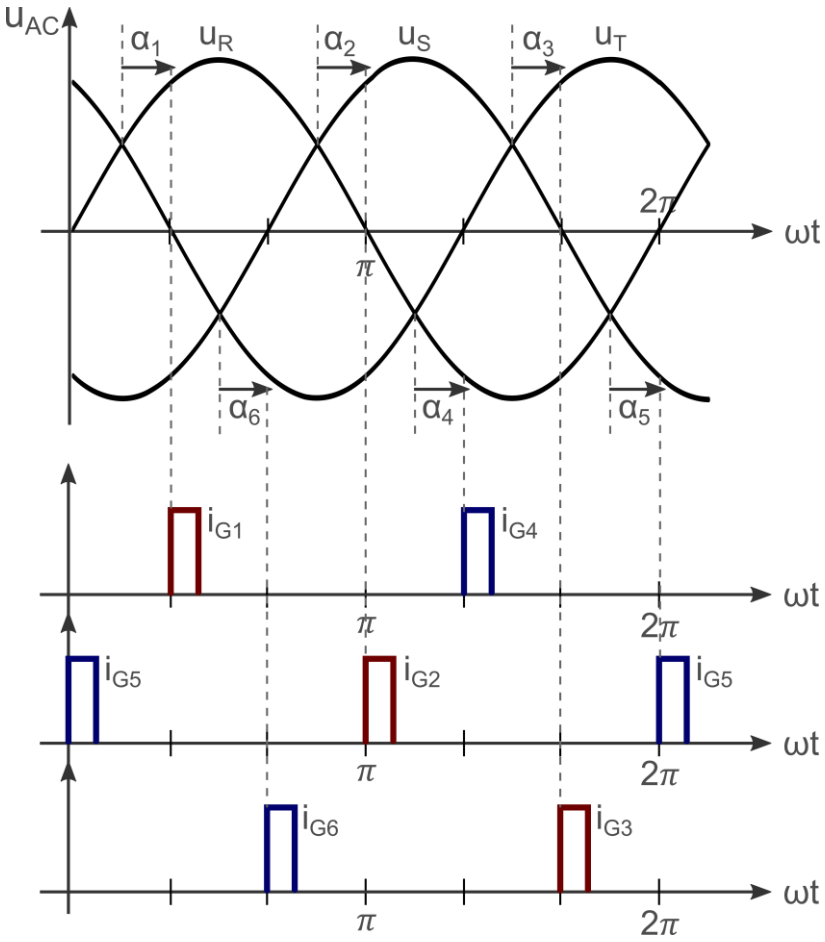


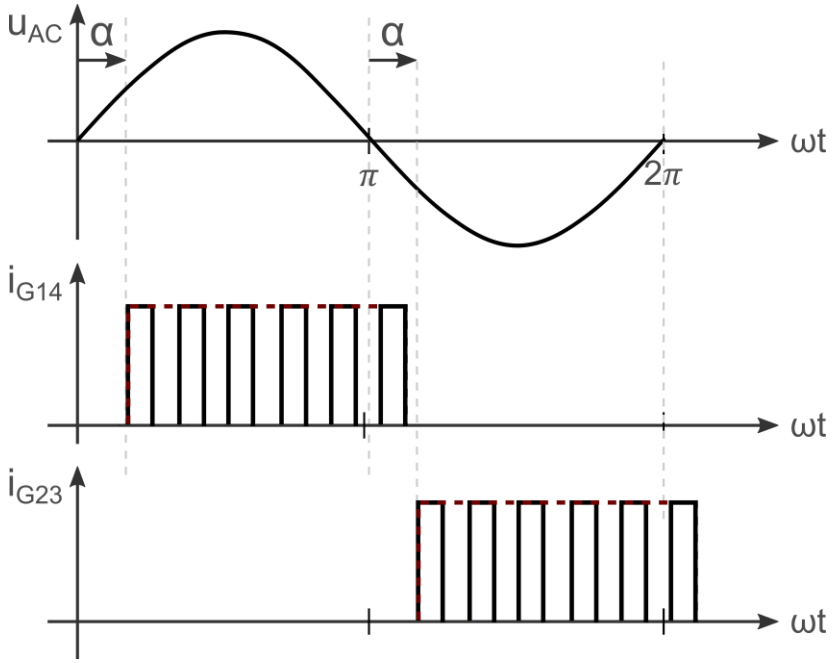
Additional circuitry that secures proper rectifiers operation:

RECTIFIERS

Additional notes

Thyristor bridges – synchronization:





RECTIFIERS

Additional notes

- Harmonic analysis is of particular importance when addressing rectifiers,
- The rectifiers (can) cause significant power quality problems,
- Additional filtering can be used to mitigate power quality problems,
- Thyristor rectifiers generally consume reactive power,
- Both diode and thyristor bridges have large applicability,
- Diode bridges necessitate additional circuitry to operate safely,
- Thyristor bridges necessitate a continuous gate current or a train of gate current pulses if discontinuous operating mode (can) happen.