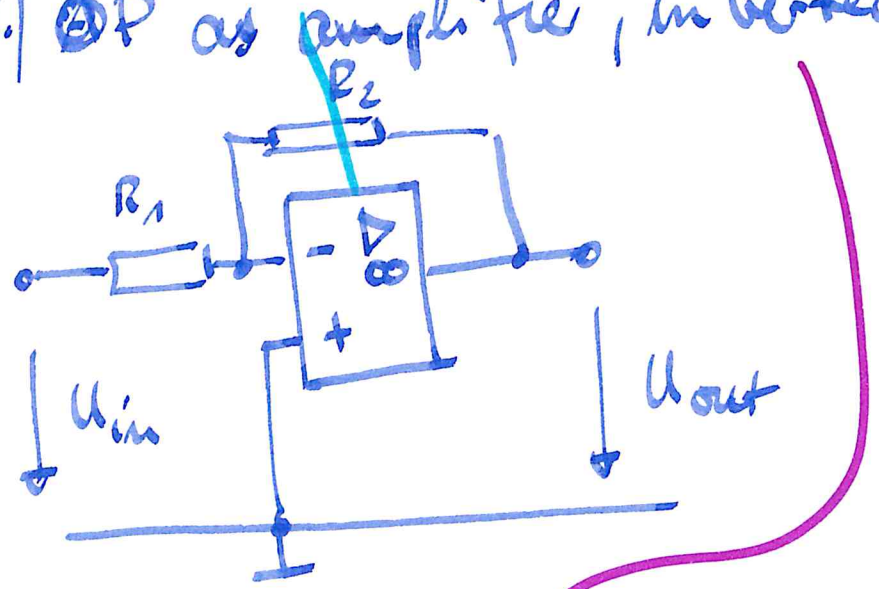
Electronic devices, 16.06.19

Summary OP

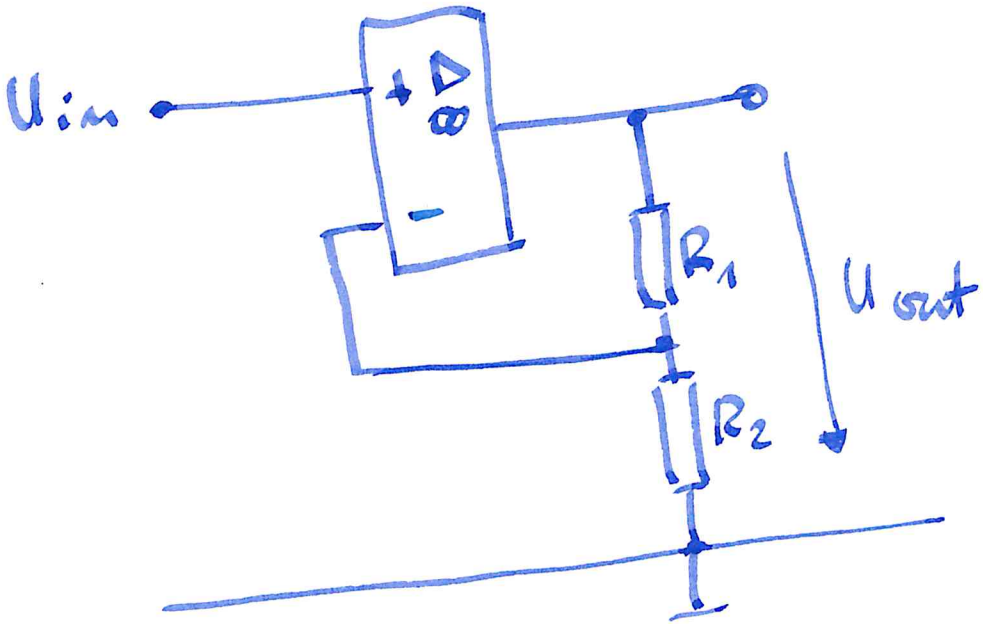
1.) OP as amplifier, inverted



$$v = \frac{U_{out}}{U_{in}} = -\frac{R_2}{R_1}$$

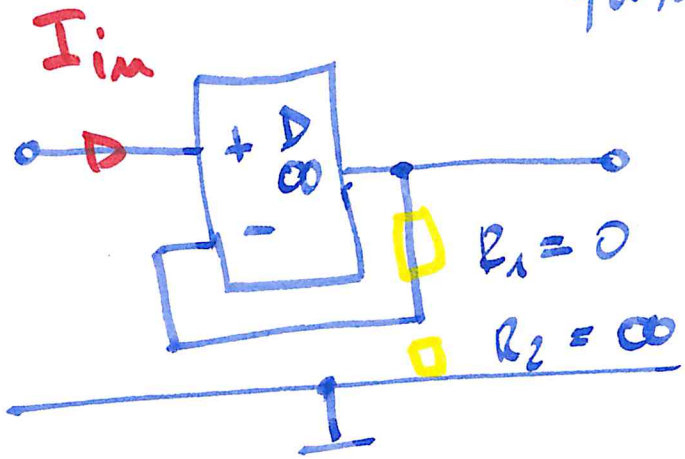
$\triangleright$ ∞ } ideal OP

2.) OP as amplifier, not inverted



$$v = 1 + \frac{R_1}{R_2}$$

3.) OP as impedance transformer



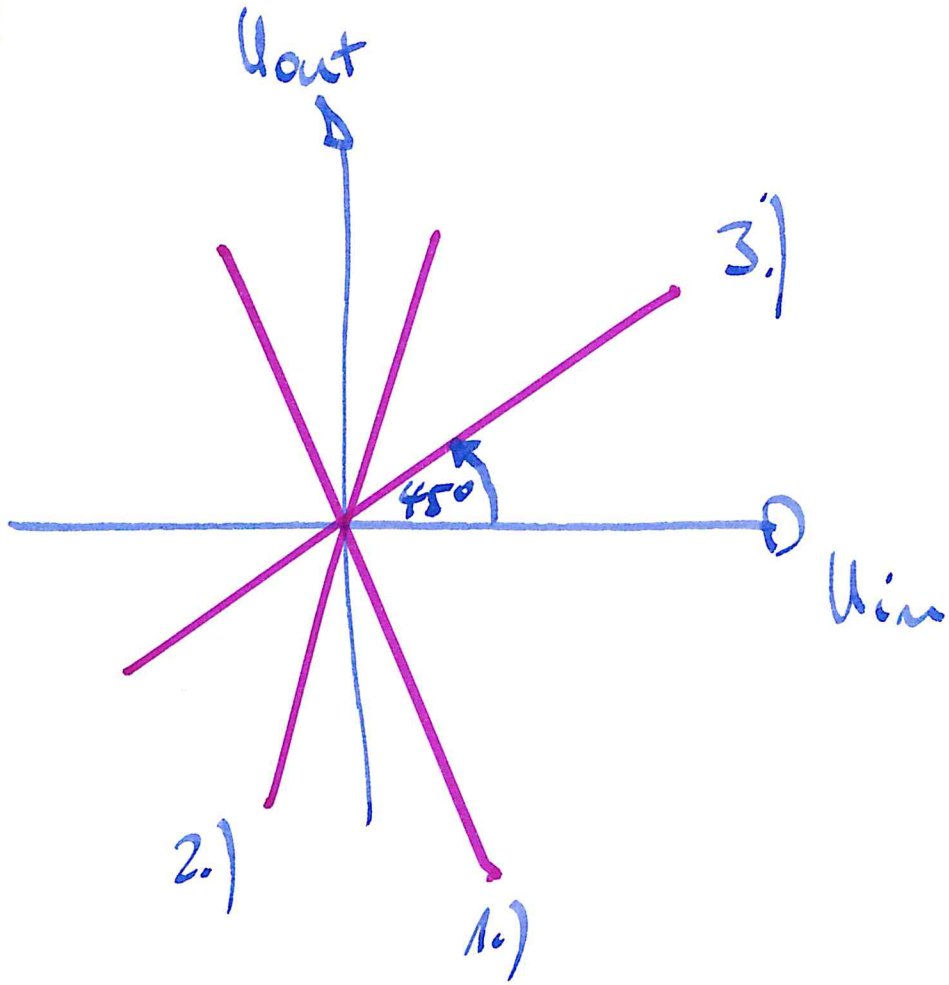
$$\left[v = 1 + \frac{R_1}{R_2} = 1 + \frac{0}{\infty} = 1 \right]$$

$I_{in} \simeq 0$

$$z_{in} = \frac{U_{in}}{I_{in}} \longrightarrow \infty$$

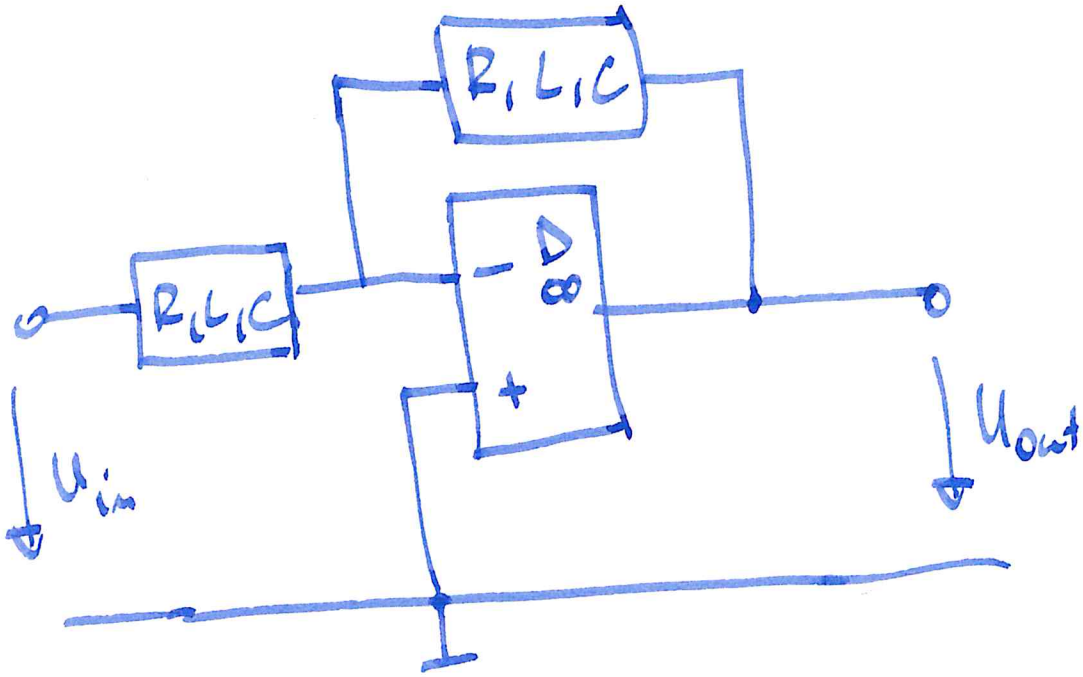
z_{in} ↓

Input impedance



$$\left\{ v = 1 = \frac{U_{out}}{U_{in}} \right. \Rightarrow \quad U_{out} = U_{in}$$

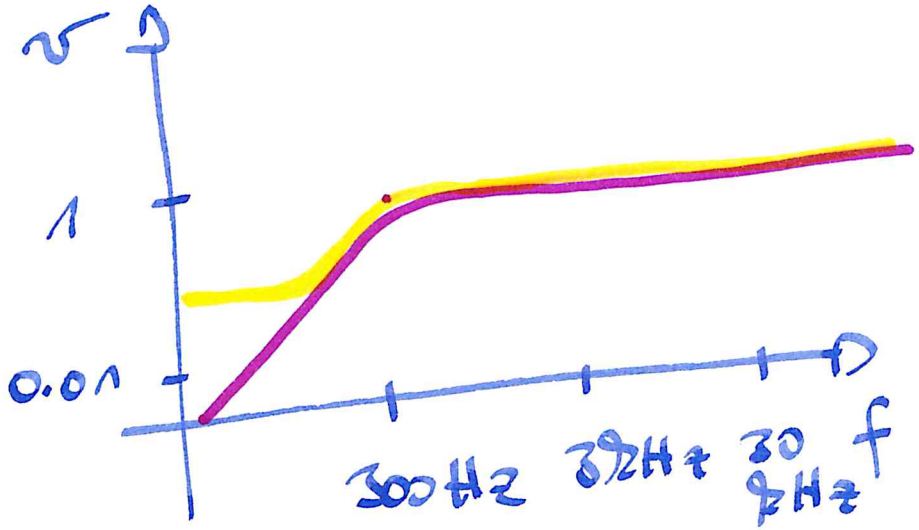
4.) Filtering



R,L,C ≙ R,L,C - Network

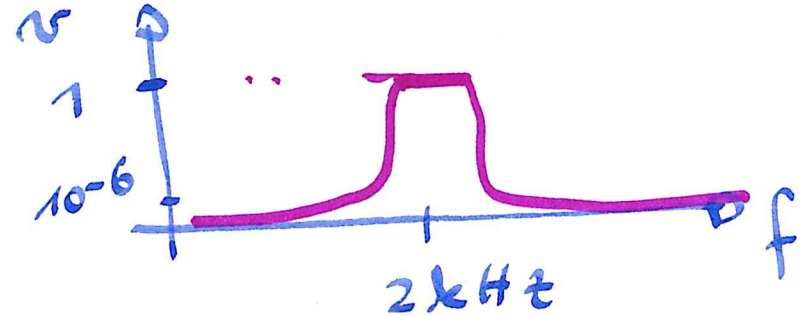
→ see Wikipedia Butterworth-Filter

Filter 1

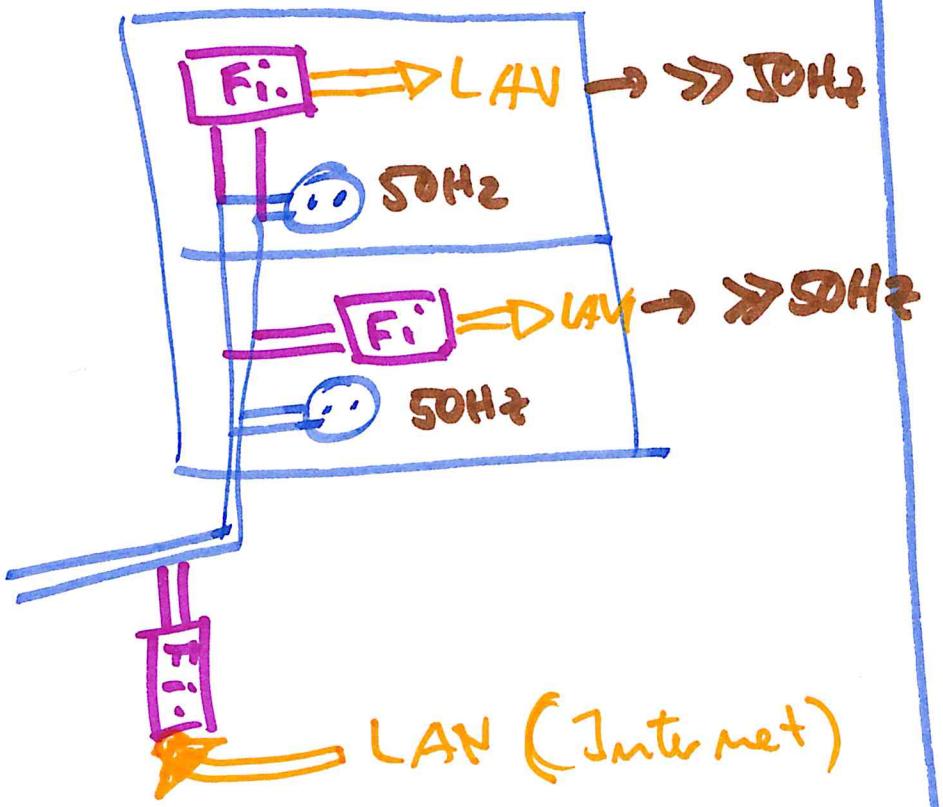


⇒ the gain depends on the frequency

Filter 2:



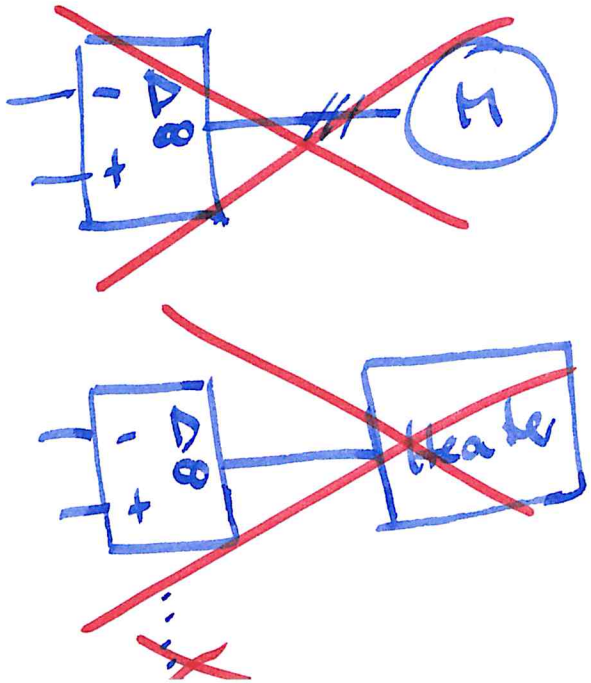
Fritz 3 : Power LAN



5.) Application of OP in ADC, DAC

} see our script yesterday + Friday

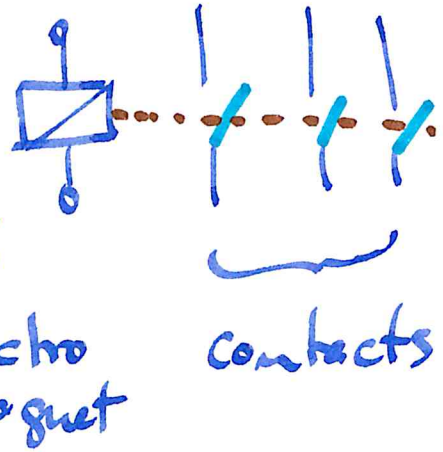
6.) Home :



⇒ it is not possible, because the output power is too small.

⇒ therefore we use
- relais, contactors
- transistors, thyristors
- diodes

relais, Contactor

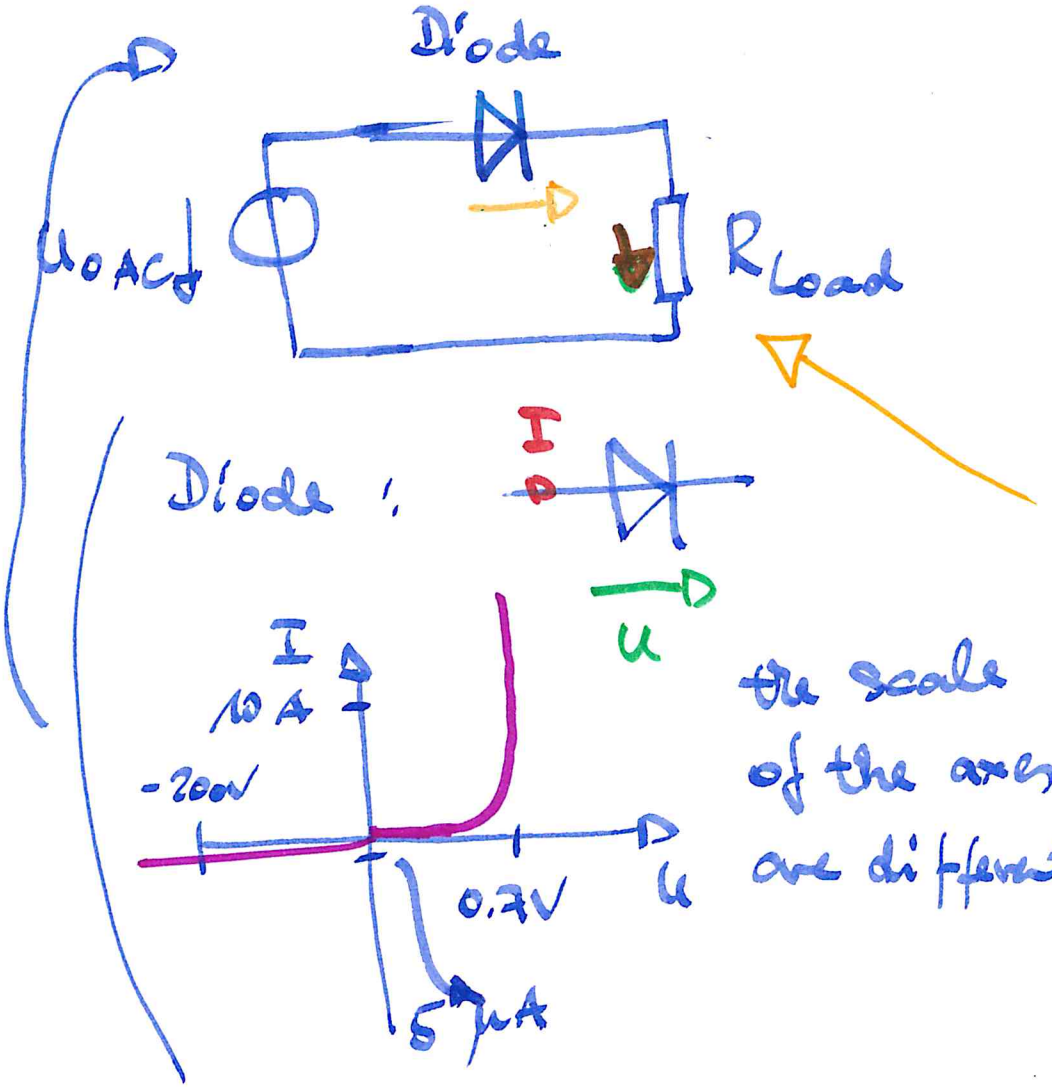


⇒ here page 5 of script ET15 JT

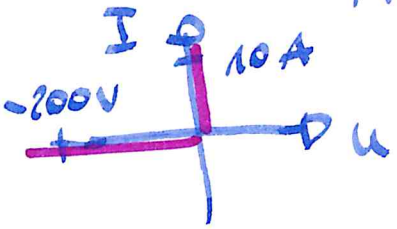
⇒ here page 6 of script ET15 JT

7) Diodes in application

- one way rectifier

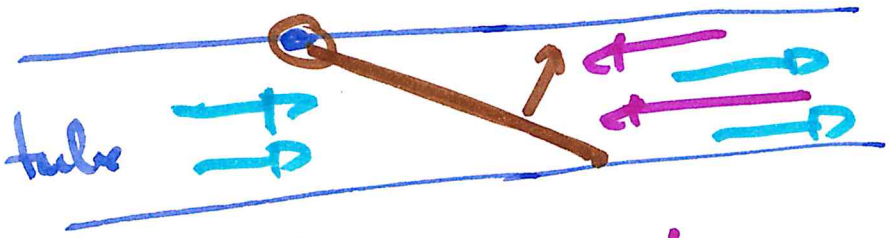


(if the scale is not different (11)



⇒ electric value

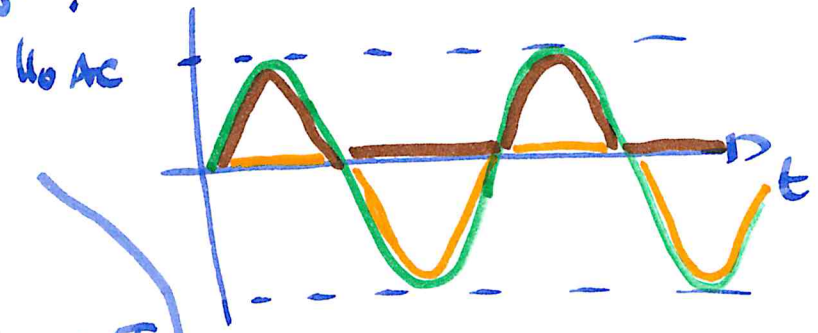
example for valve :



Grate can go

Grate can not go

Note :

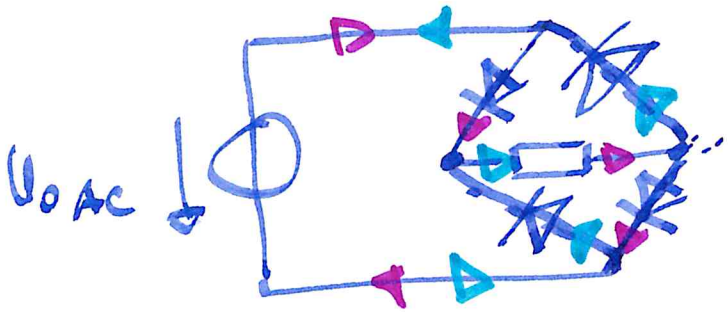


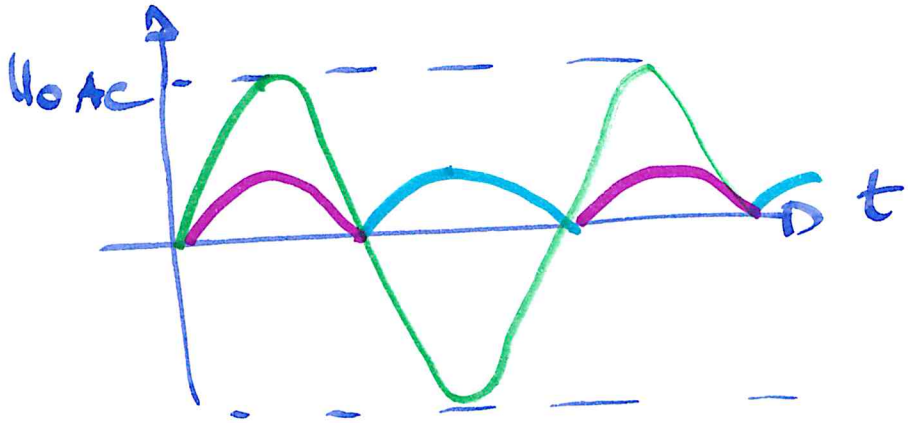
R_{load} =

$(U_R = U_{load} = R_{load} \cdot I$

(12 (also called half wave rectifier)

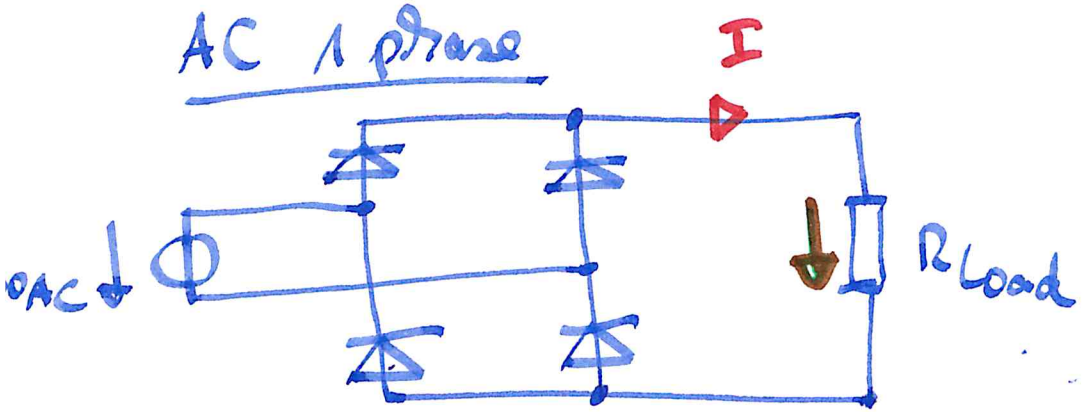
- full wave rectifier, bridge r.



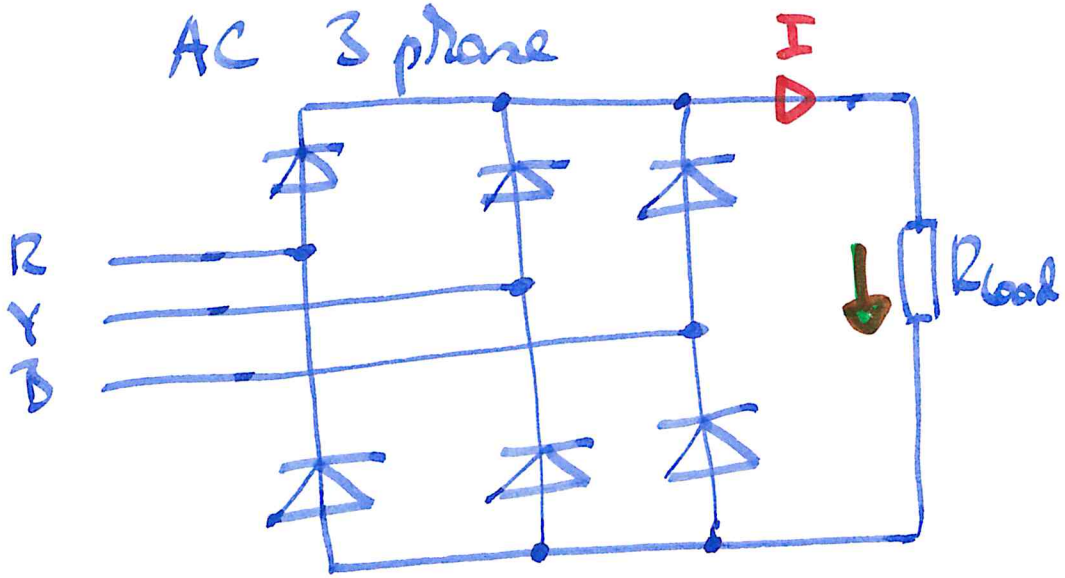


better circuit diagram

AC 1 phase

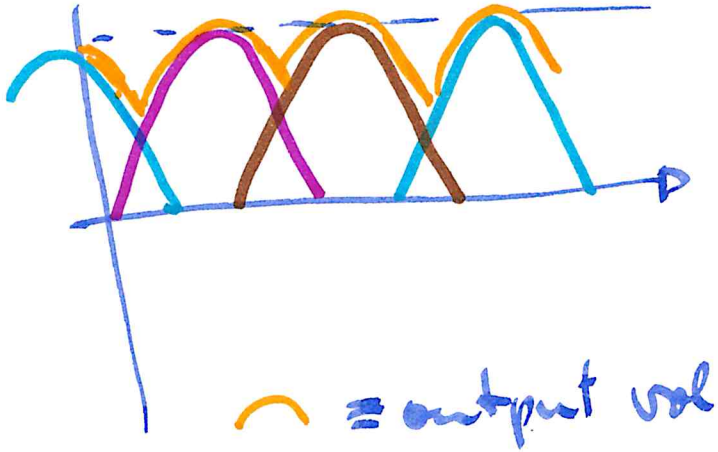


AC 3 phase



voltage diagram see: Wikipedia:
Dreiphasen gleichrichter

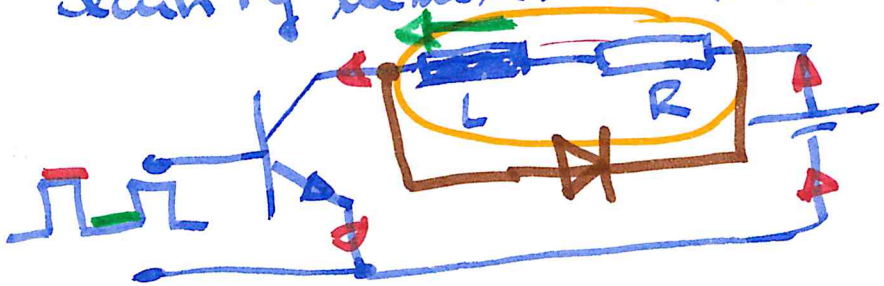
or. 3 phase bridge rectifier bei google



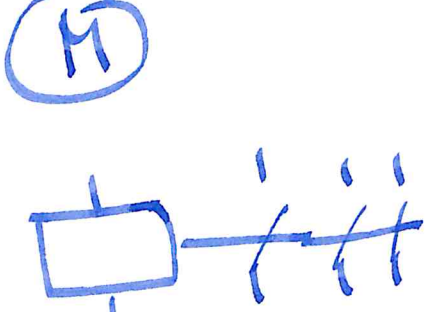
⌒ = output voltage:
~~smallest~~
smallest voltage
ripple ? + ++

Another application of a diode:

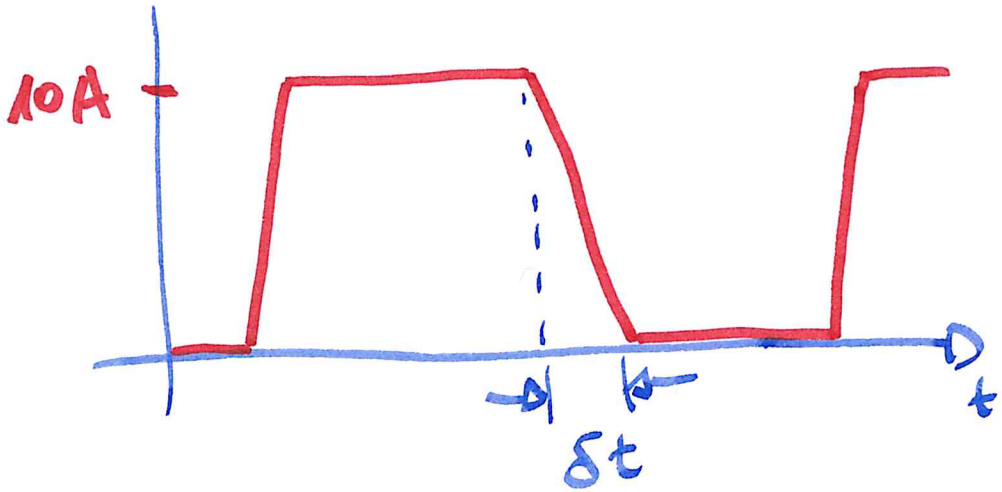
Security element in switching



(M)

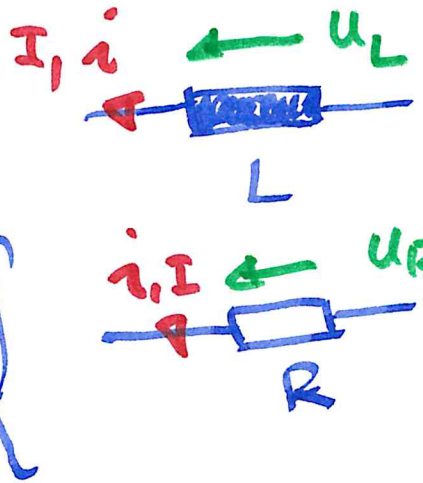


can be substituted



this δt is very small, for ex. 1 ms, 10 µs ...

photo



$u_L = L \frac{di}{dt}$

$u_R = I \cdot R$

Example:

$L = 2\,H$; $\delta t = 10\,\mu s$ ~~$10\,\mu s$~~ $10\,ms$

$\Delta I = \delta I = 0A - 10A = -10A$

$$u_L = 2H \cdot \frac{di}{dt} = 2H \frac{\delta I}{\delta t}$$

$$= 2 \frac{Vs}{A} \frac{-10A}{10\,\mu s} = -20\,V$$

$$= -2 \cdot 10^6 V = -2\,MV$$ ~~$-2\,MV$~~ $-2\,kV$

⇒ Diode connection