

Open loop PID tuning Formule IMC

$$\tau_C := \max(0.1\tau_P, 0.8t_d)$$

Controllore P

Guadagno del controllore

$$K_C := \frac{0.202}{K_P} \cdot \left(\frac{t_d}{\tau_P} \right)^{-1.219}$$

Controllore PI

Guadagno del controllore

Reset time del controllore

$$K_C := \frac{1}{K_P} \cdot \frac{\tau_P}{t_d + \tau_C}$$

$$\tau_I := \tau_P$$

Controllore PID

Guadagno del controllore

Reset time del controllore

tempo derivativo del controllore

$$K_C := \frac{1}{K_P} \cdot \frac{\tau_P + 0.5 \cdot t_d}{\tau_C + 0.5 \cdot t_d}$$

$$\tau_I := \tau_P + 0.5 \cdot t_d$$

$$\tau_D := \frac{\tau_P \cdot t_d}{2 \cdot \tau_P + t_d}$$

Open loop PID tuning Formule 1° met. Ziegler e Nichols

Controllore P

Guadagno del controllore

$$K_C := \frac{\tau_P}{K_P \cdot t_d}$$

Controllore PI

Guadagno del controllore

Reset time del controllore

$$K_C := 0.9 \cdot \frac{\tau_P}{K_P \cdot t_d}$$

$$\tau_I := 3t_d$$

Controllore PID

Guadagno del controllore

Reset time del controllore

tempo derivativo del controllore

$$K_C := 1.2 \cdot \frac{\tau_P}{K_P \cdot t_d}$$

$$\tau_I := 2t_d$$

$$\tau_D := 0.5t_d$$

Open loop PID tuning Formule Cohen e Coon**Controllore P**

Guadagno del controllore

$$K_C := \frac{\tau_P}{K_P \cdot t_d} \left(1 + \frac{t_d}{3 \cdot \tau_P} \right)$$

Controllore PI

Guadagno del controllore

$$K_C := \frac{\tau_P}{K_P \cdot t_d} \left(0.9 + \frac{t_d}{12 \cdot \tau_P} \right)$$

Reset time del controllore

$$\tau_I := \frac{30 + 3 \cdot \frac{t_d}{\tau_P}}{9 + 20 \cdot \frac{t_d}{\tau_P}} t_d$$

Controllore PID

Guadagno del controllore

$$K_C := \frac{\tau_P}{K_P \cdot t_d} \left(\frac{4}{3} + \frac{t_d}{4 \cdot \tau_P} \right)$$

Reset time del controllore

$$\tau_I := \frac{32 + 6 \cdot \frac{t_d}{\tau_P}}{13 + 8 \cdot \frac{t_d}{\tau_P}} t_d$$

tempo derivativo del controllore

$$\tau_D := \frac{4}{11 + 2 \cdot \frac{t_d}{\tau_P}} t_d$$

Closed loop PID tuning Formule 2° met. Ziegler e Nichols**Controllore P**

Guadagno del controllore

$$K_C := \frac{K_u}{2}$$

Controllore PI

Guadagno del controllore

$$K_C := 0.45 \cdot K_u$$

Reset time del controllore

$$\tau_I := \frac{P_u}{1.2}$$

Controllore PID

Guadagno del controllore

$$K_C := 0.6 \cdot K_u$$

Reset time del controllore

$$\tau_I := \frac{P_u}{2}$$

tempo derivativo del controllore

$$\tau_D := \frac{P_u}{8}$$