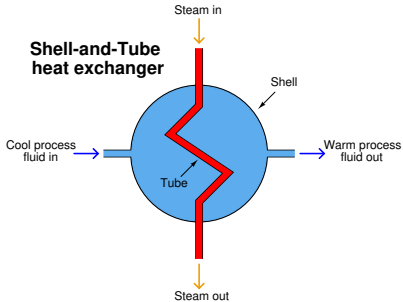
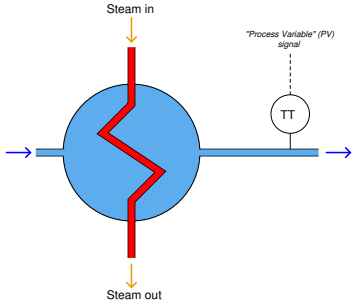
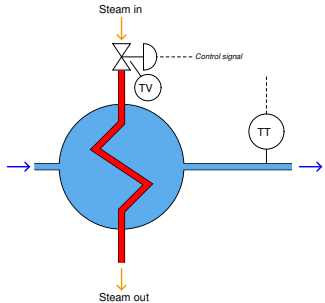
Grunnleggende prinsipper for tilbakekoblet regulering



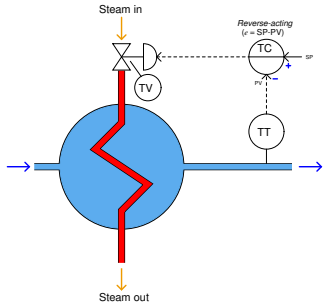
Grunnleggende prinsipper for tilbakekoblet regulering



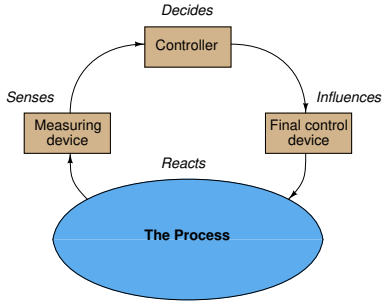
Grunnleggende prinsipper for tilbakekoblet regulering



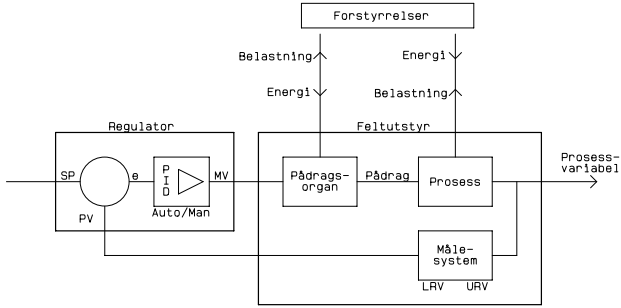
Grunnleggende prinsipper for tilbakekoblet regulering



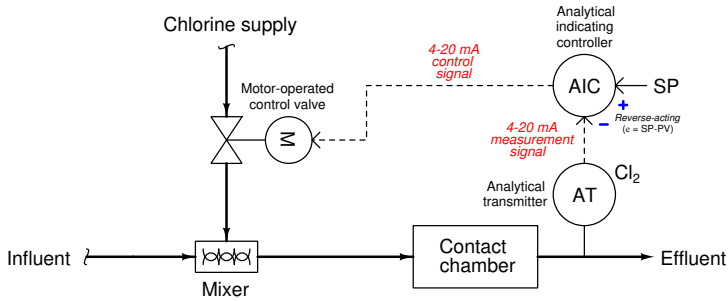
Grunnleggende prinsipper for tilbakekoblet regulering



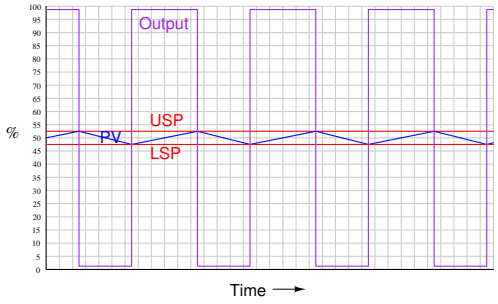
Grunnleggende prinsipper for tilbakekoblet regulering



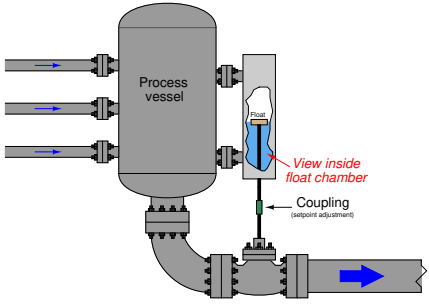
Grunnleggende prinsipper for tilbakekoblet regulering



Av/På regulering



Proporsjonal regulator



Formel for proporsjonal regulator

$$MV = K_p e + bias$$

MV = Regulatorens utgang

e = Error(avvik) (Forskjellen mellom PV og SP)

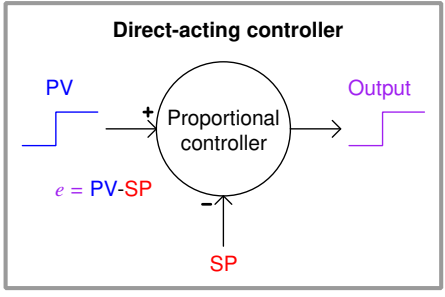
K_p = Proporsjonalforsterkning

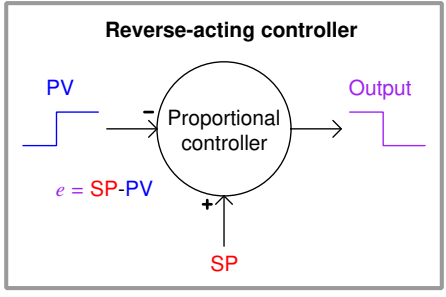
b = Bias

Direkte eller reverserende regulator

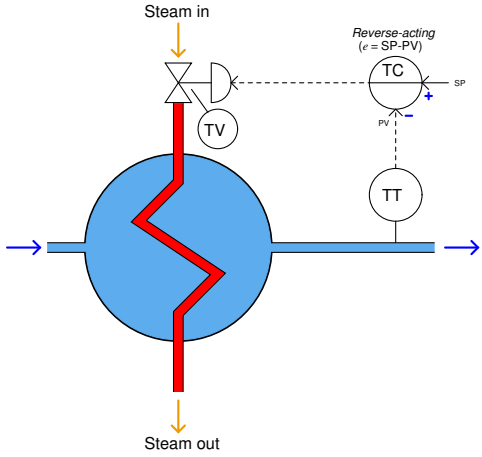
$$m = K_p(\mathrm{PV} - \mathrm{SP}) + b \qquad \text{(Direct-acting proportional controller)}$$

$$m = K_p(\mathrm{SP} - \mathrm{PV}) + b \qquad \text{(Reverse-acting proportional controller)}$$

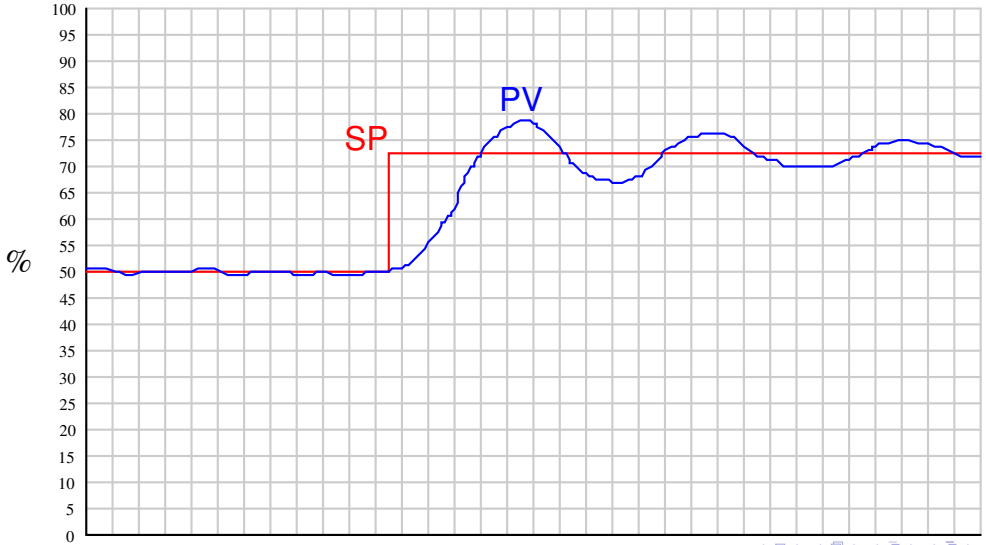




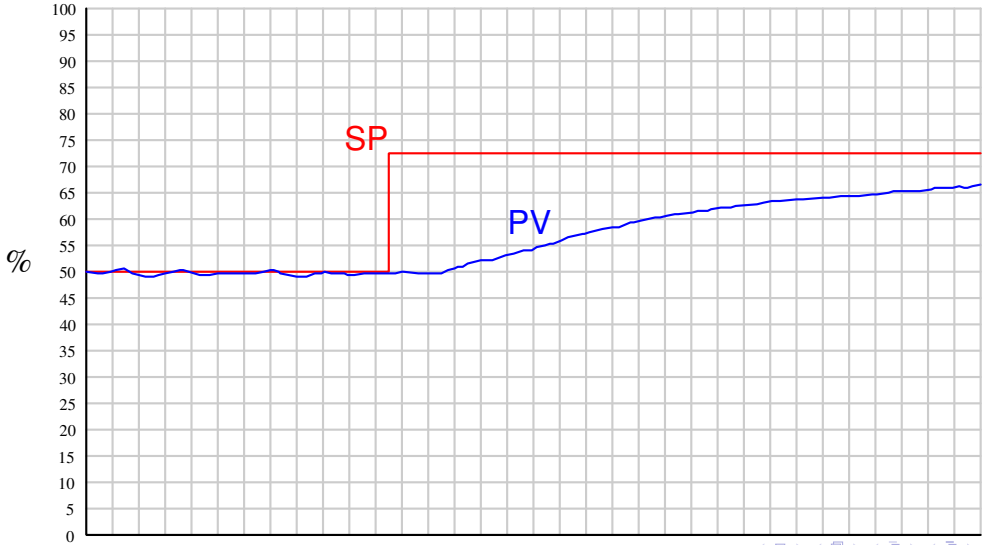
Direkte eller reverserende regulator?



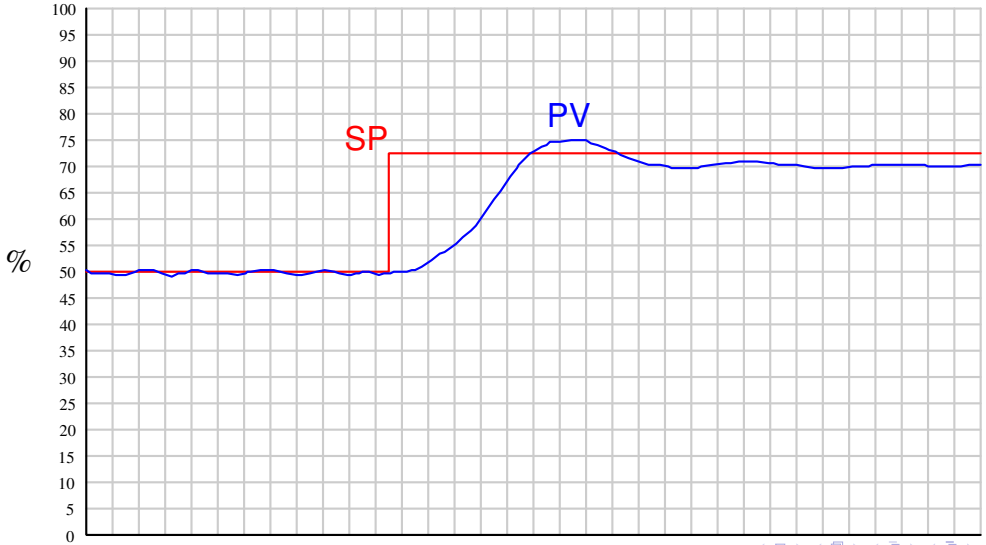
For stor prporsjonalforsterkning



For lav proporsjonalforsterkning



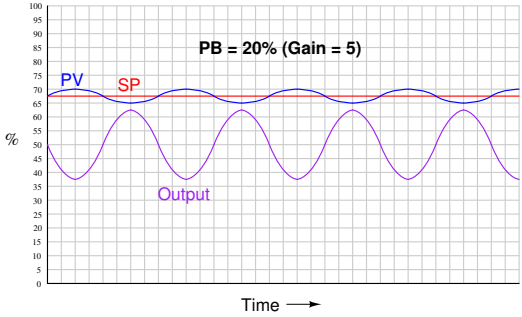
Passelig proporsjonalforsterkning

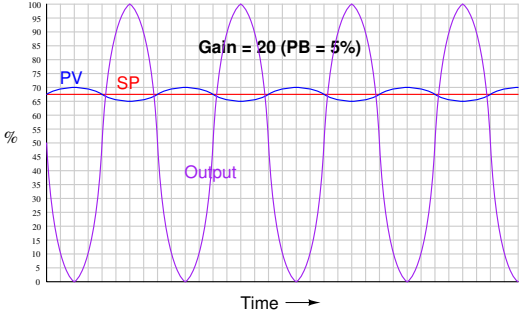


Proportionalbånd vs Proportionalforsterkning

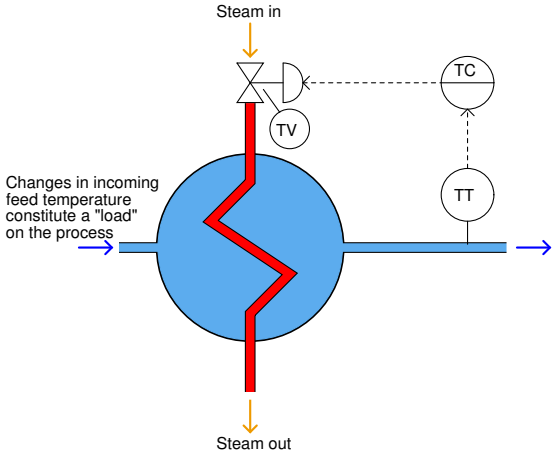
$$K_p = \frac{100\%}{\text{PB}} \qquad \text{PB} = \frac{100\%}{K_p}$$

Eksempel





BIAS (offset)


Steam in
TC
TV
TT
Changes in incoming
feed temperature
constitute a "load"
on the process
Steam out

Formel for proporsjonalregulator med BIAS

$$m = K_p(\text{SP} - \text{PV}) + b$$

Where,

MV = Controller output

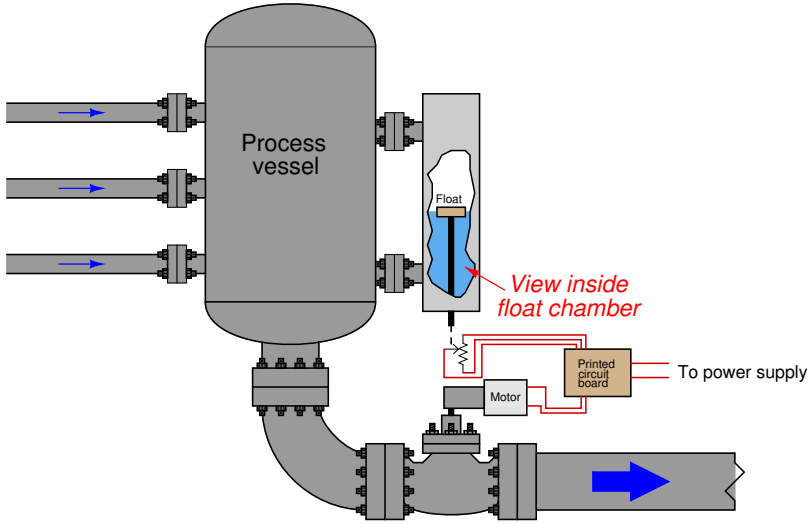
K_p = Proportional gain

SP = Setpoint

PV = Process variable

b = Bias

I-leddet


Process vessel
Float
View inside float chamber
Printed circuit board
To power supply
Motor

Formel for PI-regulator

$$MV = K_p e + \frac{1}{T_i} \int e \, dt + b$$

Where,

MV = Controller output

K_p = Proportional gain

T_i = Integral time constant (minutes)

t = Time

b = Bias

D-leddet

$$MV = K_p e + \frac{1}{T_i} \int e \, dt + T_d \frac{de}{dt} + b$$

Where,

MV = Controller output

e = Error (difference between PV and SP)

K_p = Proportional gain

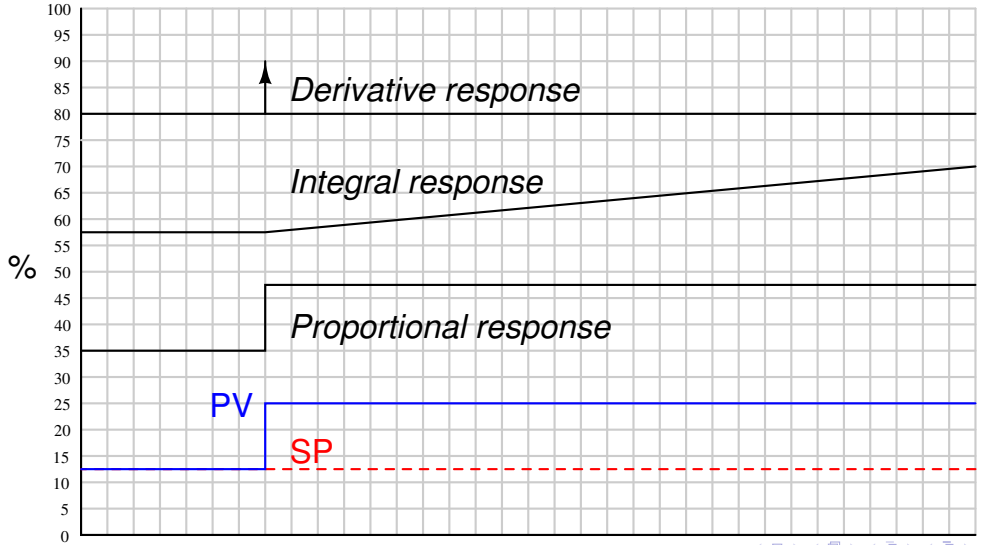
T_i = Integral time constant (minutes)

T_d = Derivative time constant (minutes)

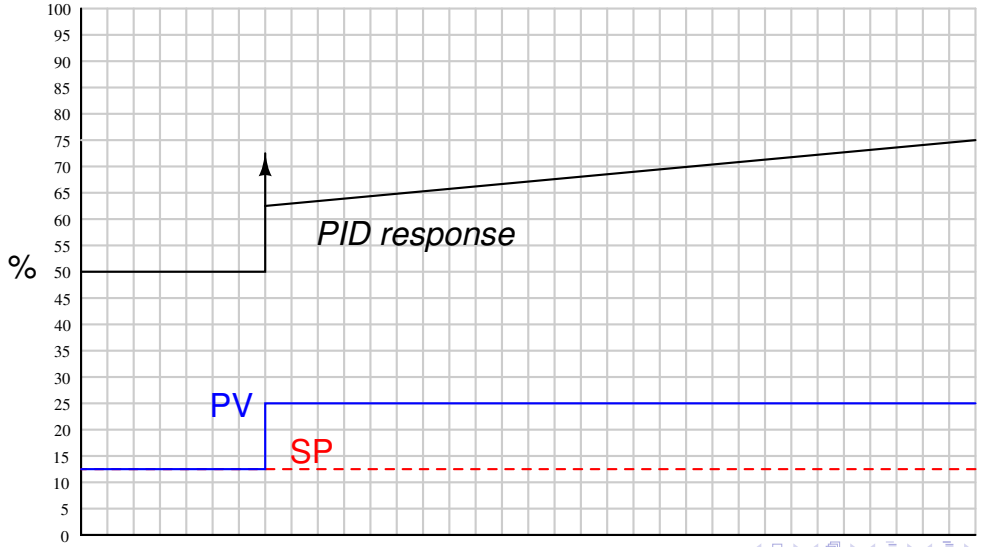
t = Time

b = Bias

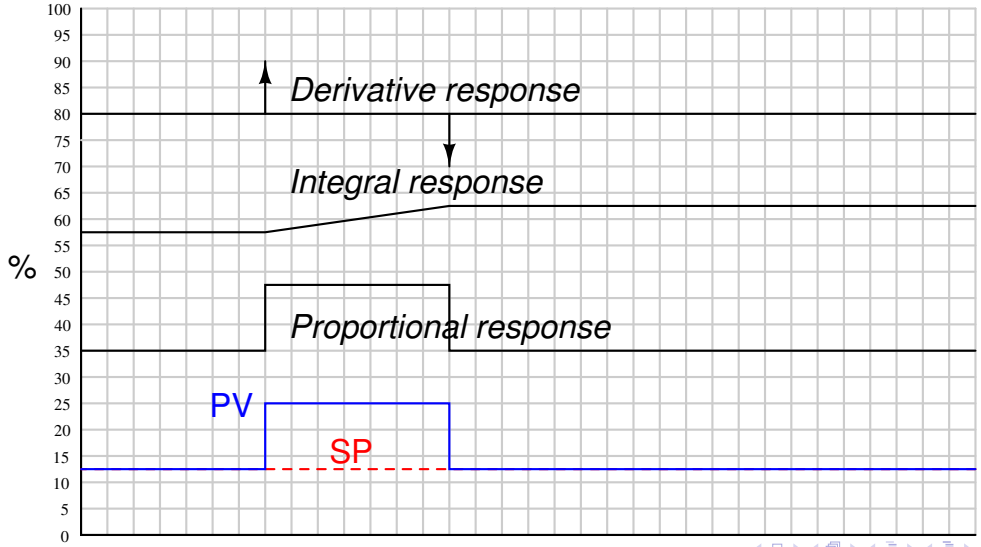
Grafisk respons av P, I og D leddene



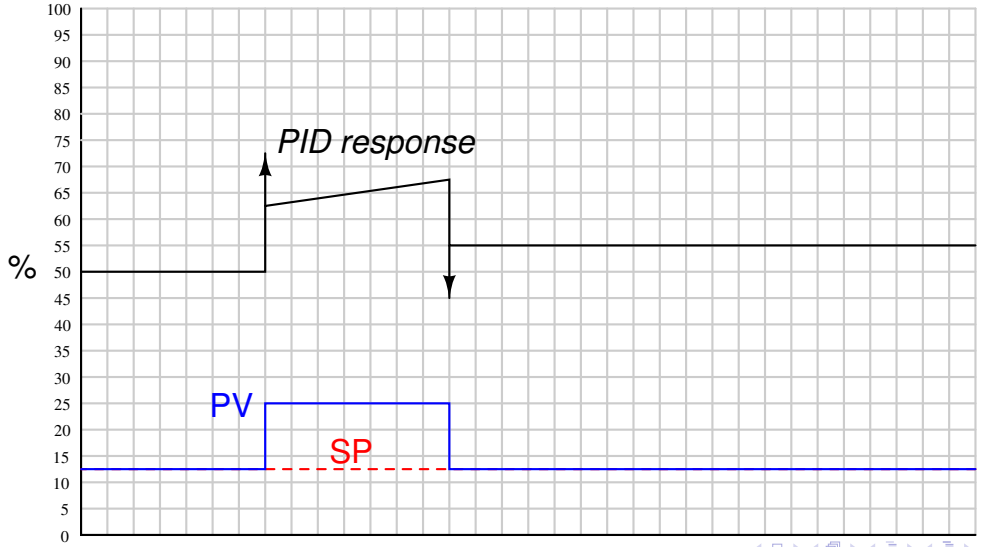
Grafisk respons av P, I og D leddene



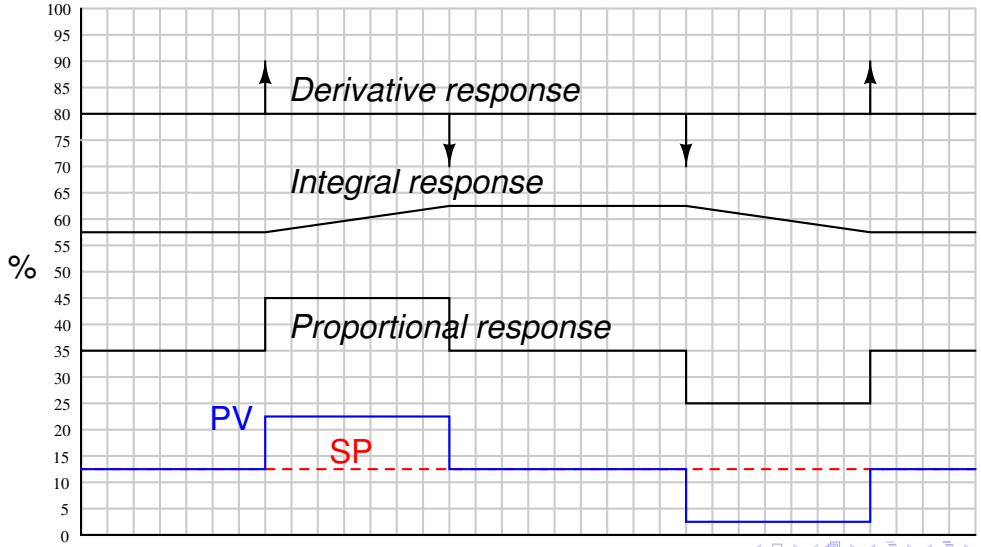
Grafisk respons av P, I og D leddene



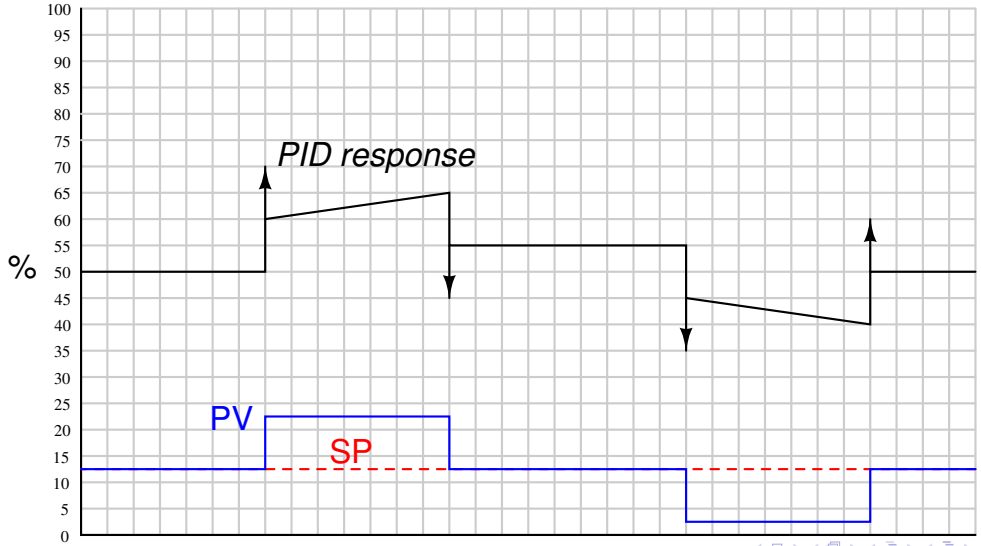
Grafisk respons av P, I og D leddene



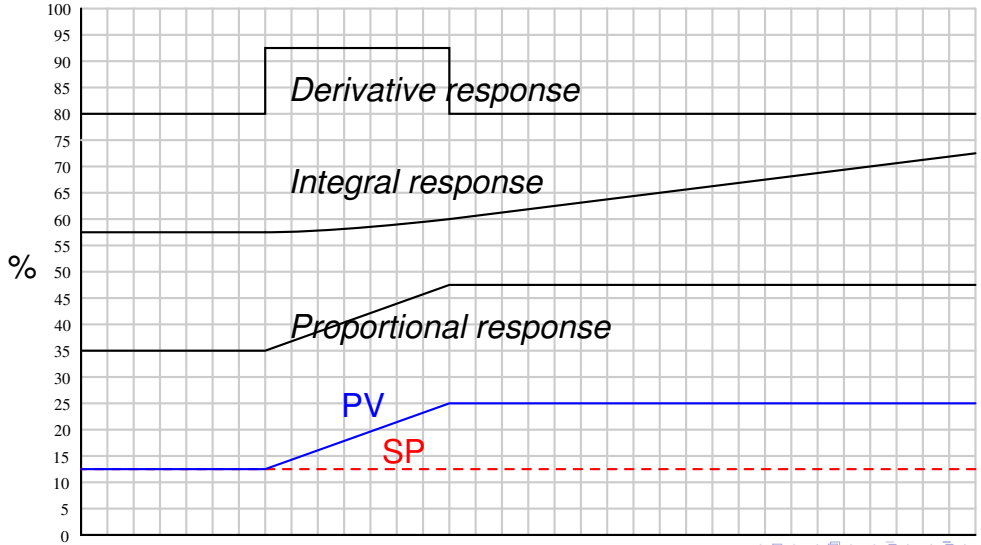
Grafisk respons av P, I og D leddene



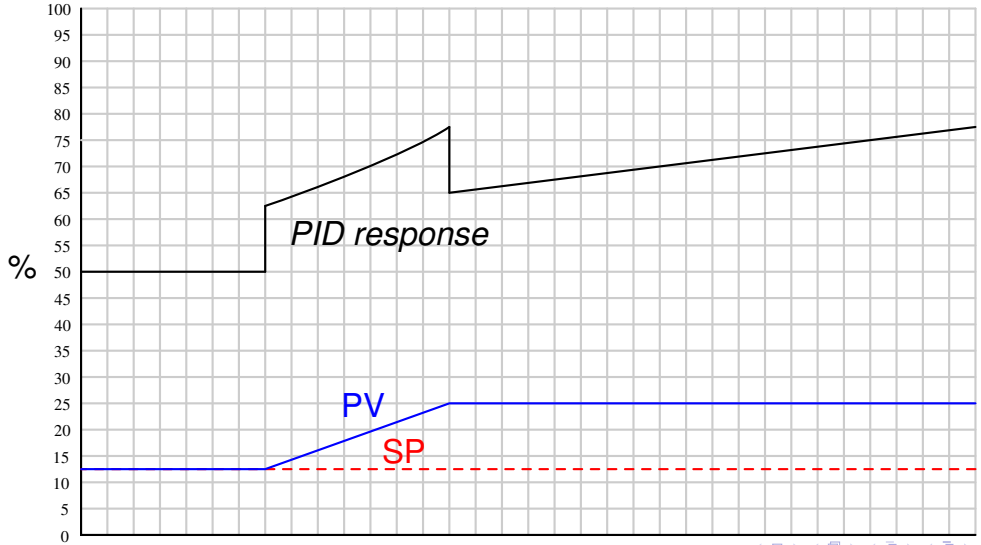
Grafisk respons av P, I og D leddene



Grafisk respons av P, I og D leddene



Grafisk respons av P, I og D leddene



Grafisk respons av P, I og D leddene

- Manual versus Automatic mode

Grafisk respons av P, I og D leddene

- Manual versus Automatic mode
- Output tracking

Grafisk respons av P, I og D leddene

- Manual versus Automatic mode
- Output tracking
- Setpoint tracking

Grafisk respons av P, I og D leddene

- Manual versus Automatic mode
- Output tracking
- Setpoint tracking
- Alarming

Grafisk respons av P, I og D leddene

- Manual versus Automatic mode
- Output tracking
- Setpoint tracking
- Alarming
- PV characterization and damping

Grafisk respons av P, I og D leddene

- Manual versus Automatic mode
- Output tracking
- Setpoint tracking
- Alarming
- PV characterization and damping
- Setpoint limits

Grafisk respons av P, I og D leddene

- Manual versus Automatic mode
- Output tracking
- Setpoint tracking
- Alarming
- PV characterization and damping
- Setpoint limits
- Output limits

Grafisk respons av P, I og D leddene

- Manual versus Automatic mode
- Output tracking
- Setpoint tracking
- Alarming
- PV characterization and damping
- Setpoint limits
- Output limits
- PID tuning security