

CONTROLE AUTOMÁTICO III

# CONTROLE PID APLICADO A UMA PLANTA TÉRMICA CONTROLANDO A FONTE QUENTE E A FONTE DE RESFRIAMENTO

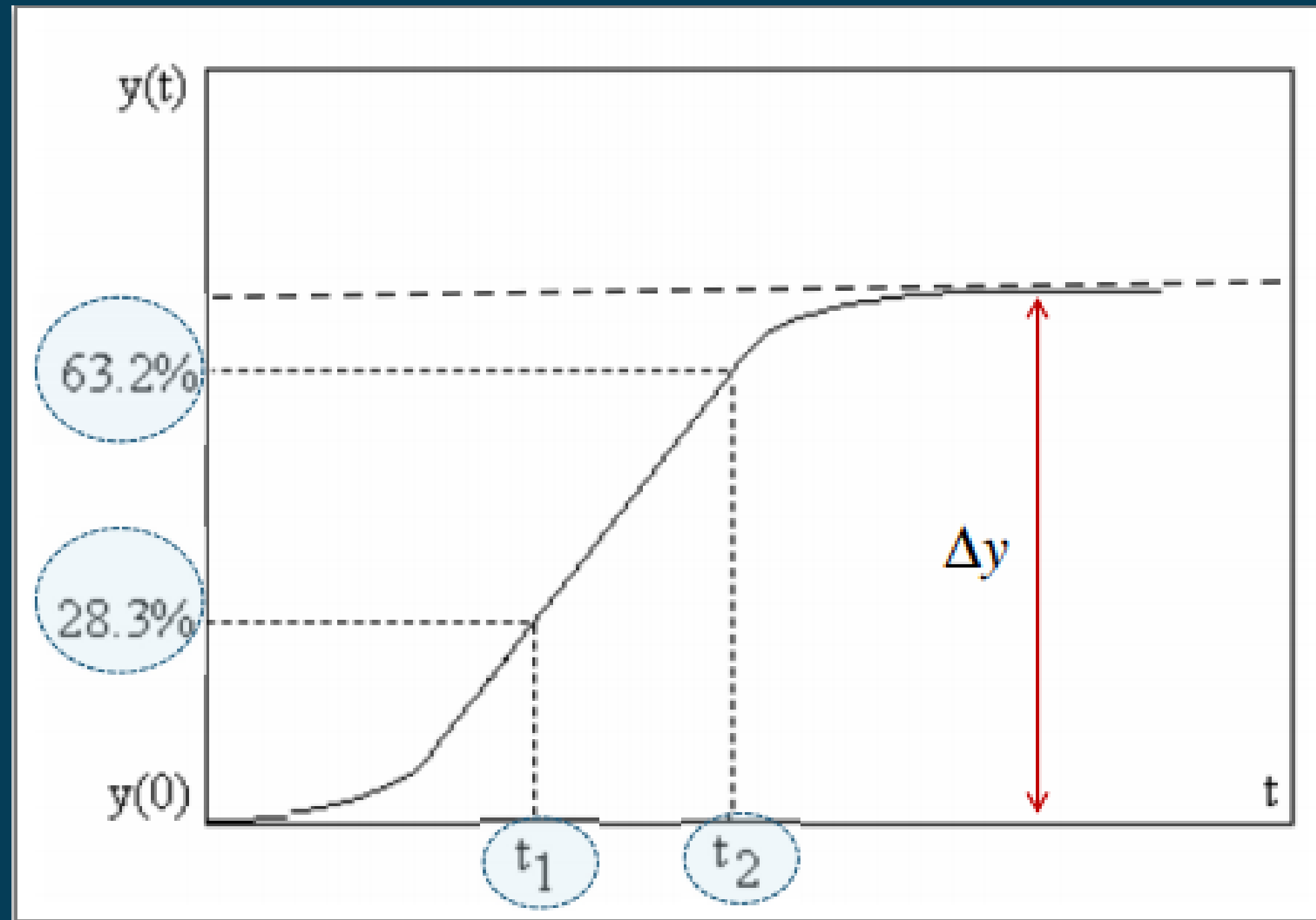


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William Rodrigues Silva

# O Modelo Real



# Método de Smith



# Método de Smith

$$G(s) = \frac{K}{\tau s + 1} e^{-Ls}$$

$$\tau = 1.5(t_{63.2} - t_{28.3})$$

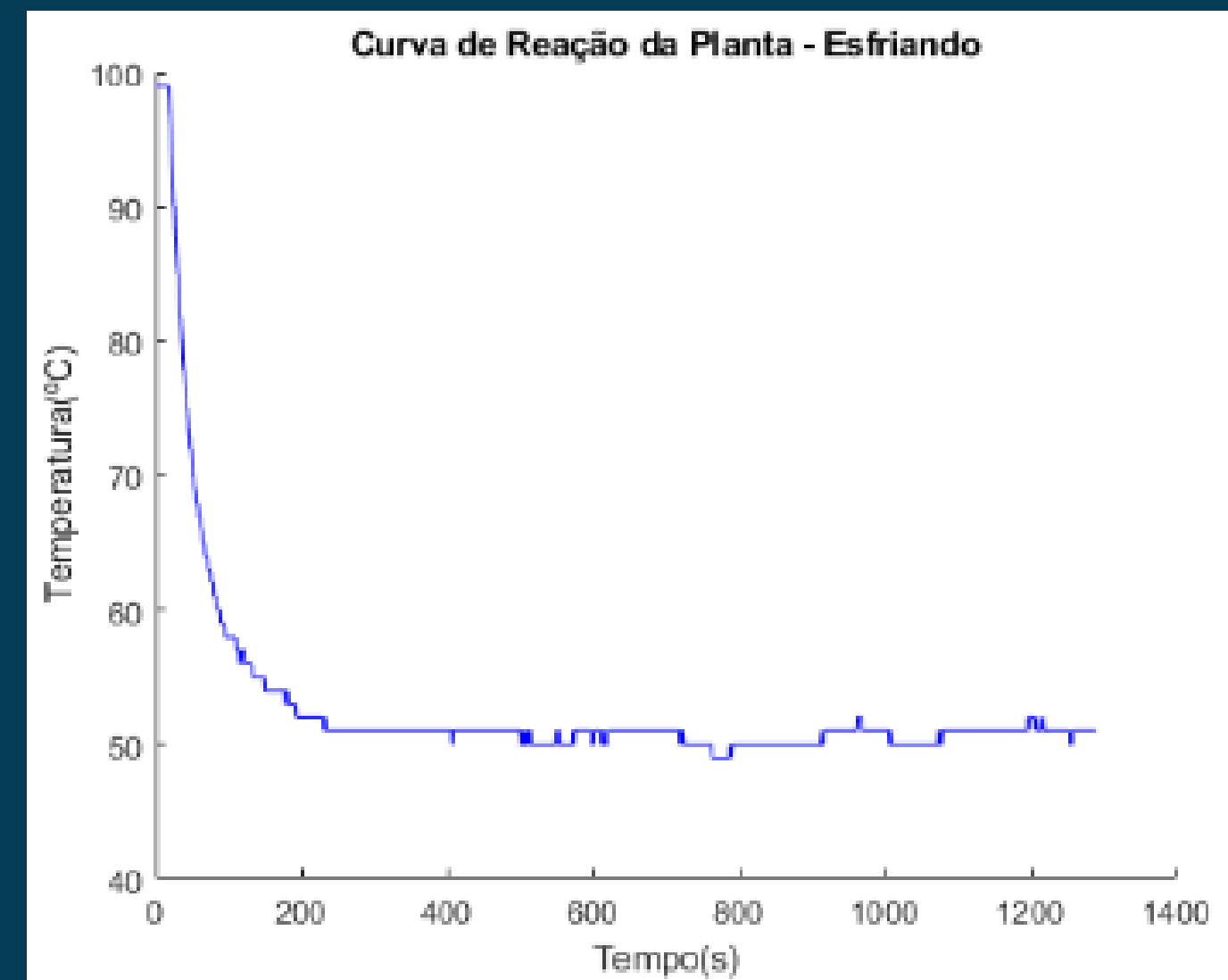
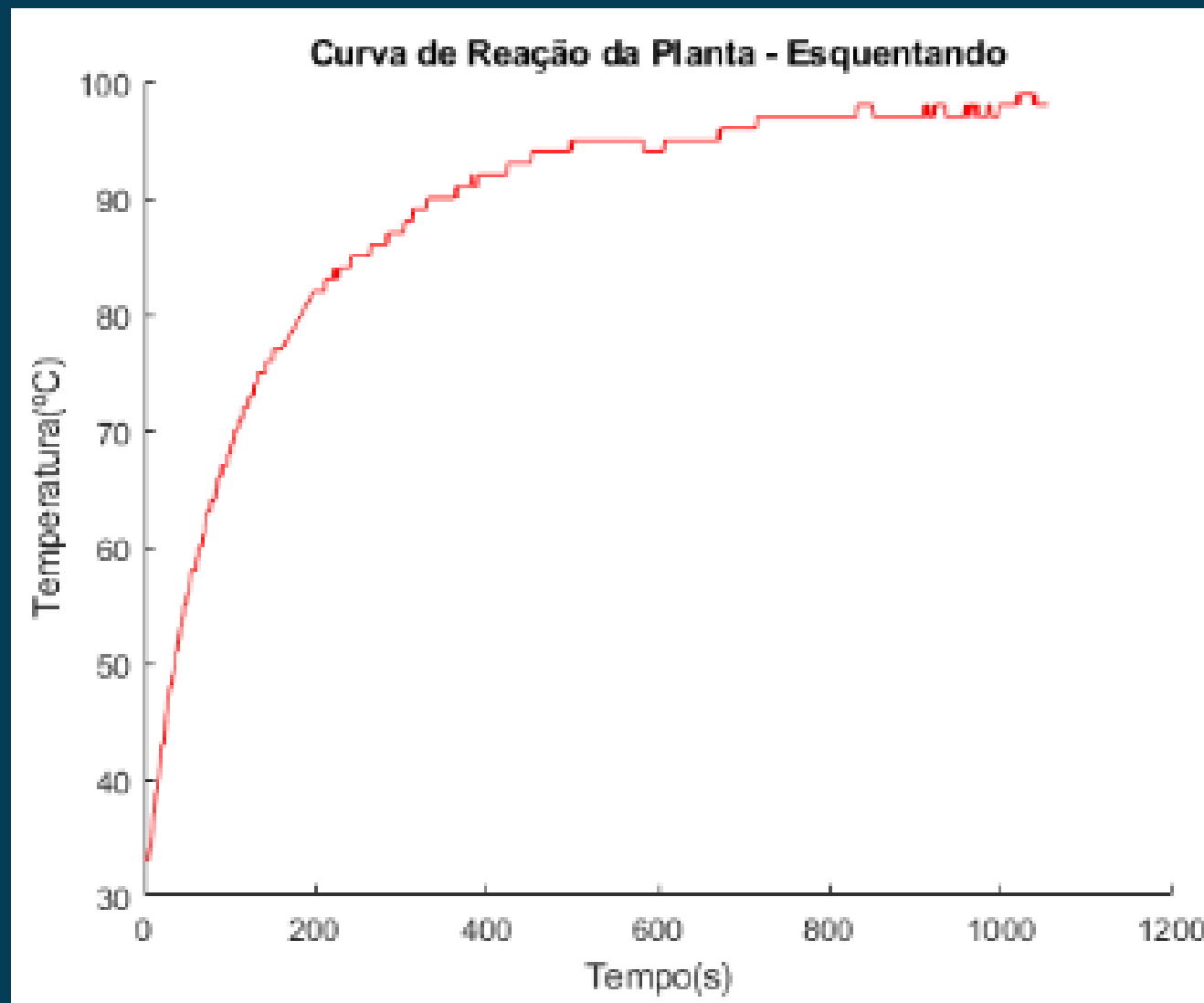
$$L = 1.5\left(t_{28.3} - \frac{t_{63}}{3}\right)$$

$$K = \frac{\Delta_y}{\Delta_u}$$

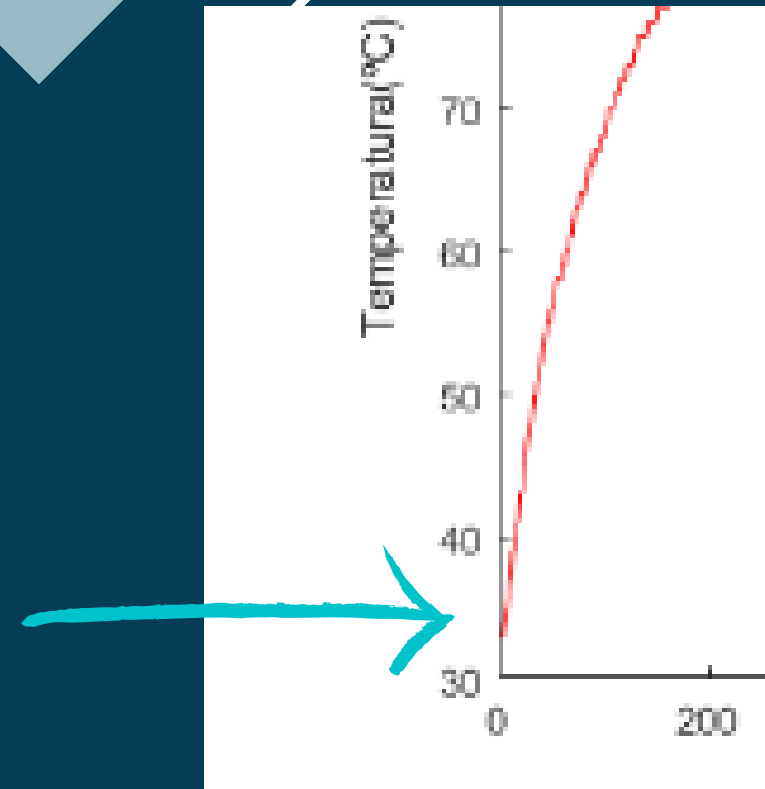
# Discretização por Tustin

$$s = \frac{2}{T} \frac{(1 - z^{-1})}{(1 + z^{-1})}$$

# Extraíndo as curvas de reação das fontes



# Obtendo a f.t. de malha aberta de cada atuador



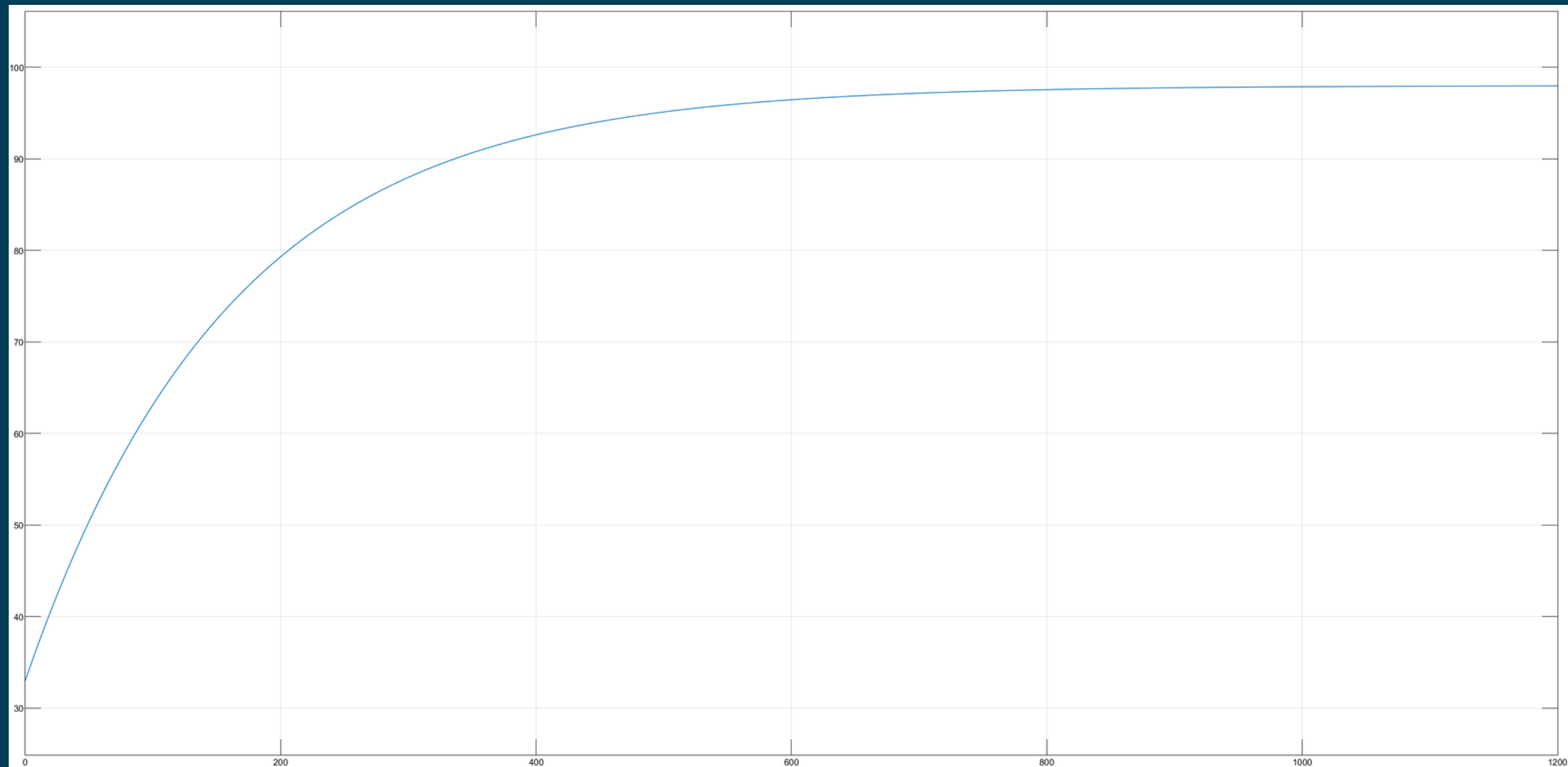
$$G(s) = \frac{65}{160,506s + 1}$$

**Função de  
transferência da  
lâmpada**

$$G(s) = \frac{-48e^{-17,502s}}{43,497s + 1}$$

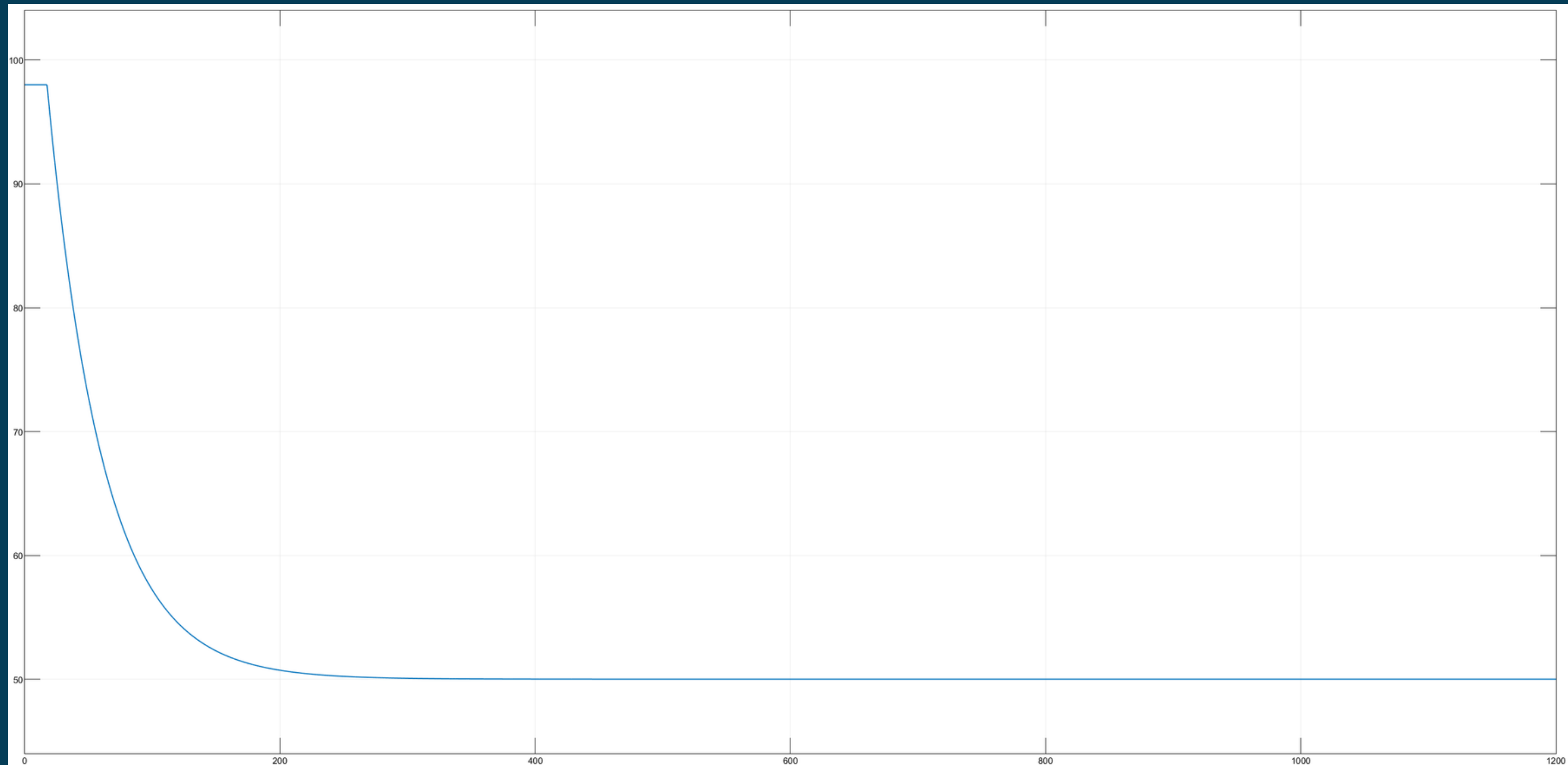
**Função de  
transferência dos  
coolers**

# Curvas de reação dos sistemas aproximados de 1ª ordem





# Curvas de reação dos sistemas aproximados de 1ª ordem



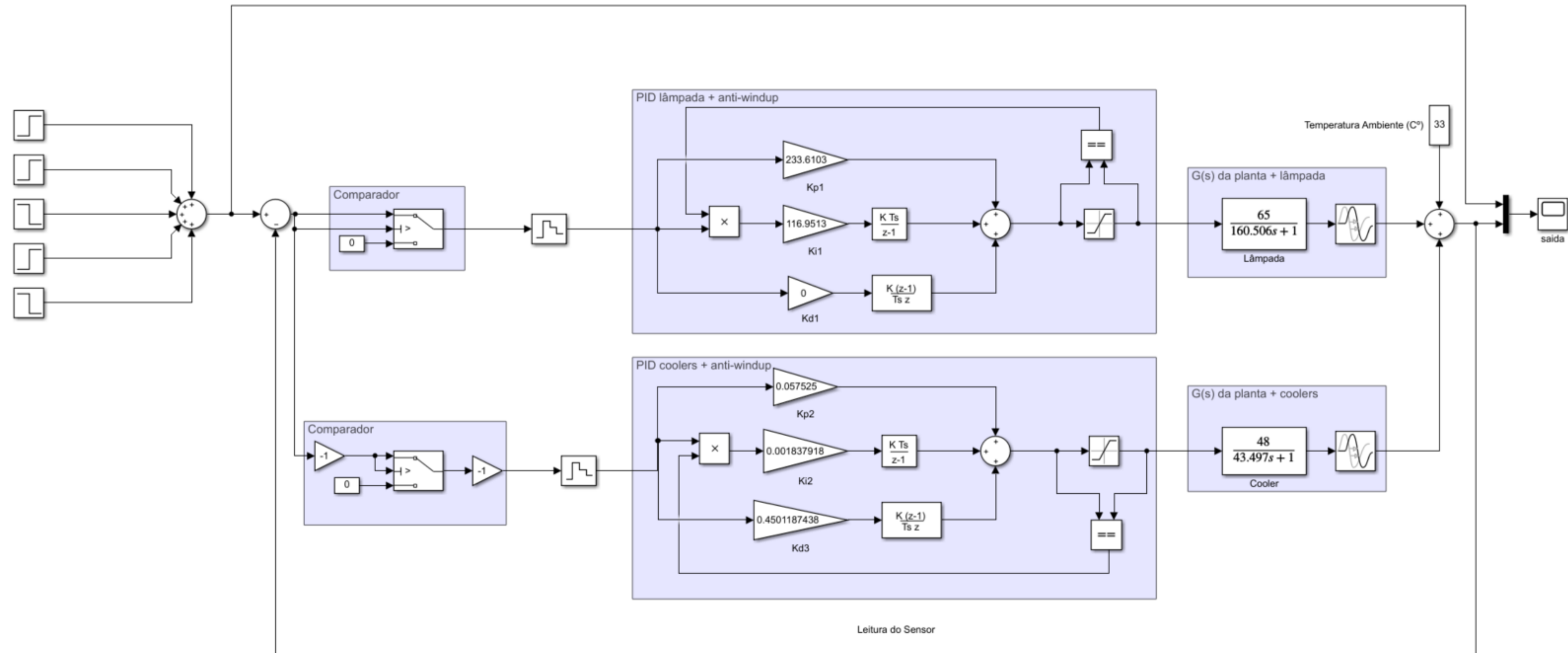
# Sintonia dos controladores

	$K_p$	$K_i$	$K_d$
<b>Ziegler-Nichols</b>	$0.6 * K_u$	$\frac{K_u}{0.6 * P_u}$	$K_u * 0.125 * P_u$

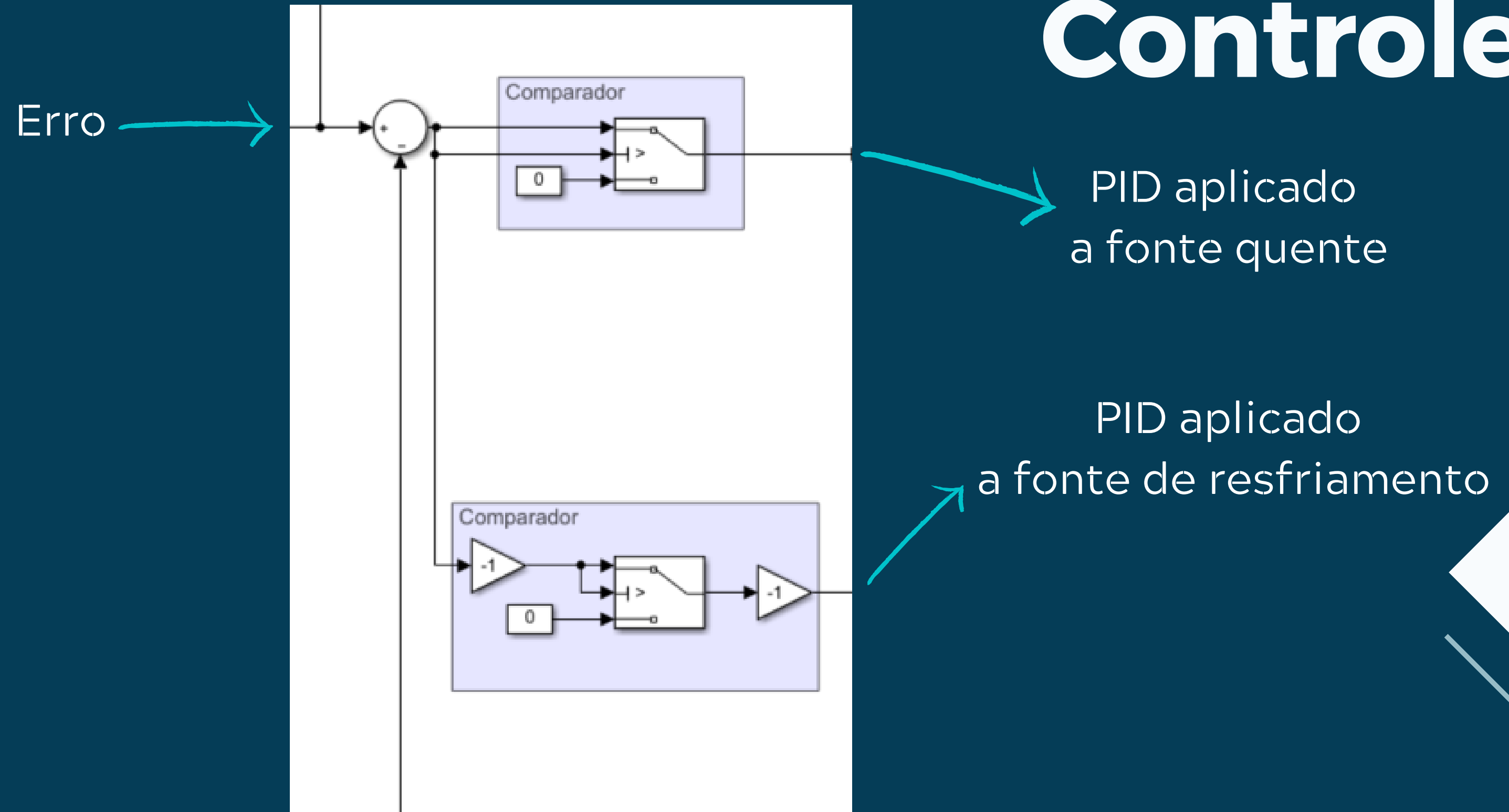
  

	$K_p$	$K_i$	$K_d$
<b>Aquecimento</b>	233.6103	116.9513	0
<b>Resfriamento</b>	0.057525	0.001837918	0.4501187438

# Sistema Malha Fechada com PID discretizado

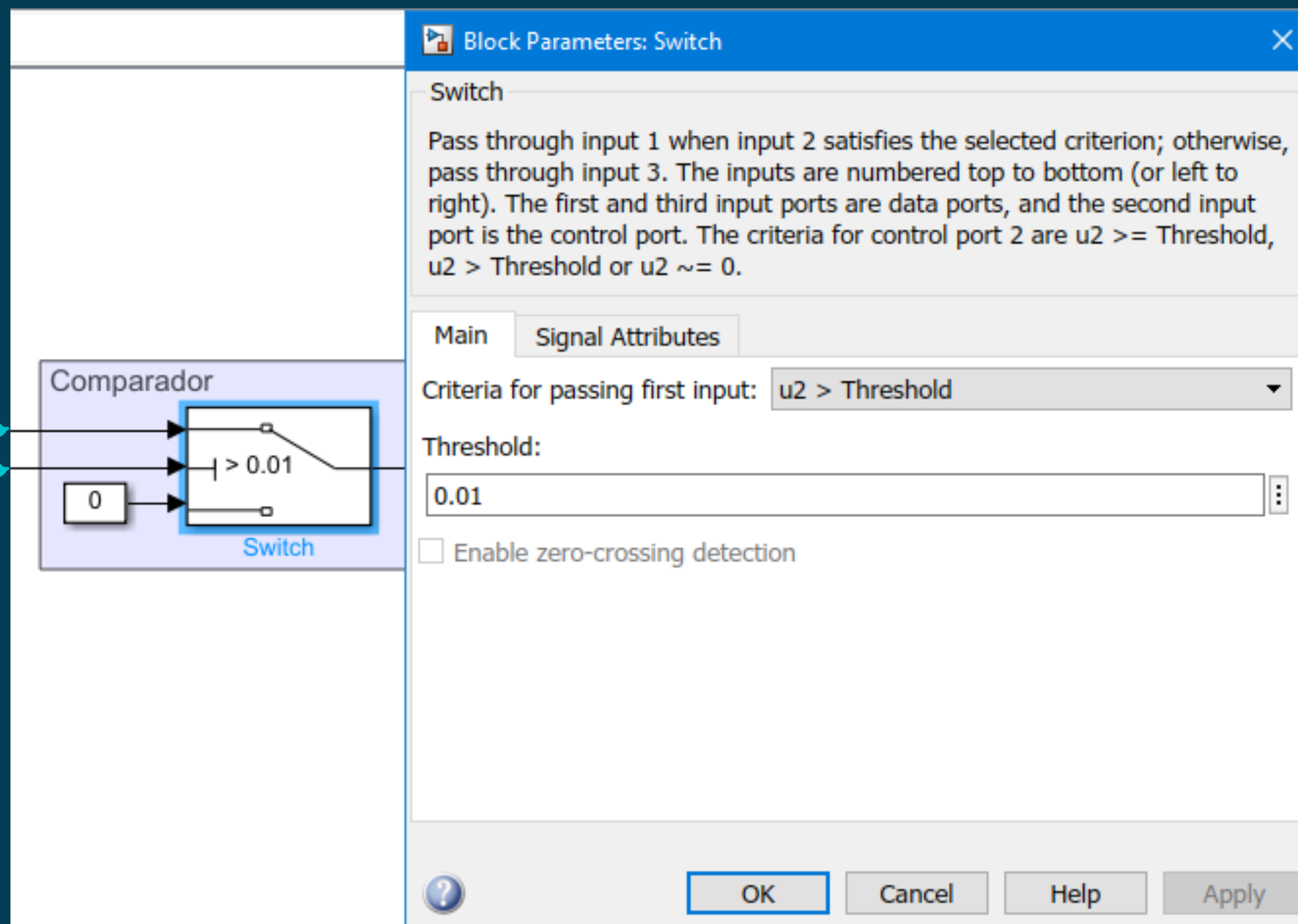


# Chaveamento de Controle

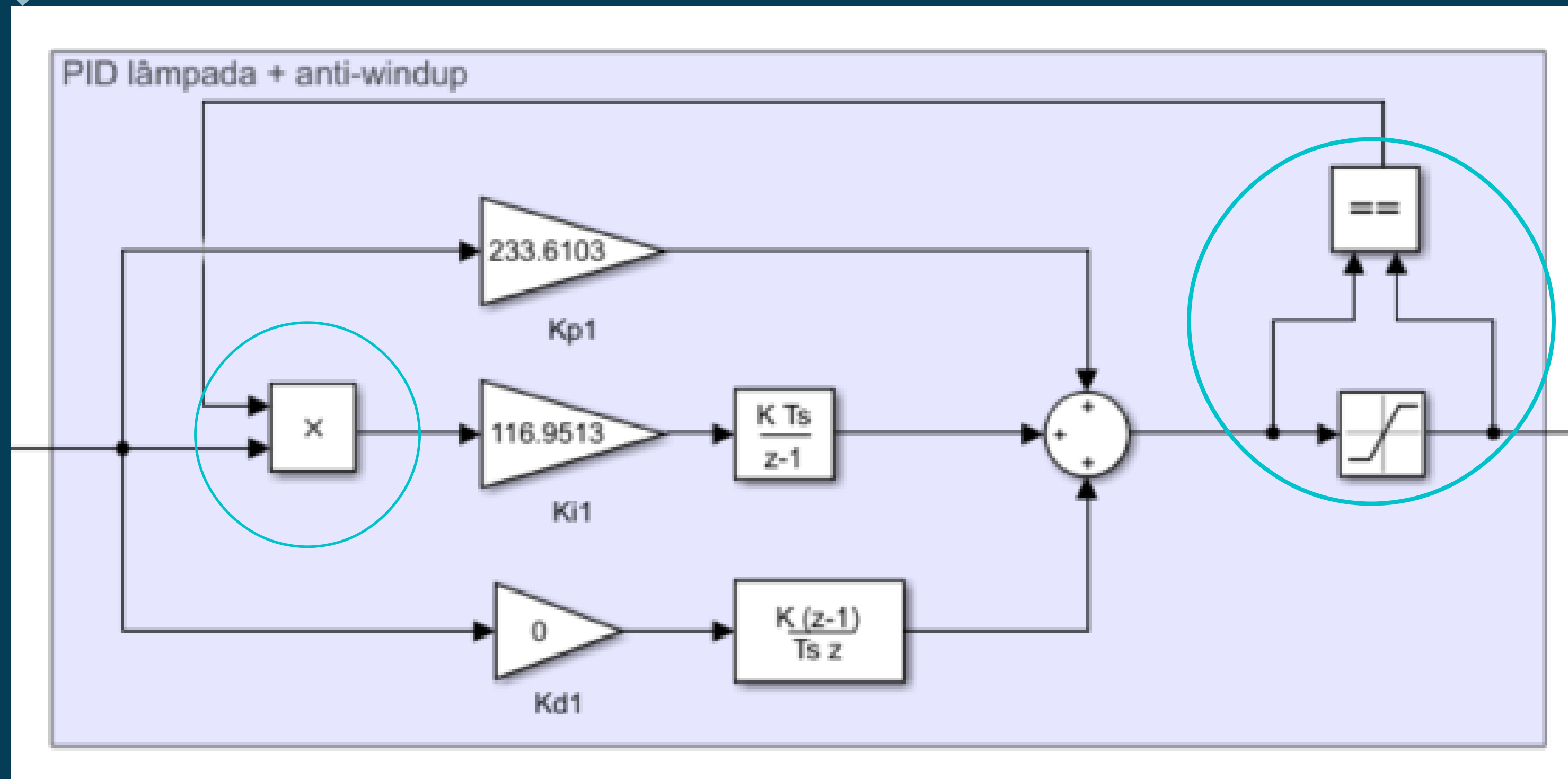


# Chaveamento de Controle

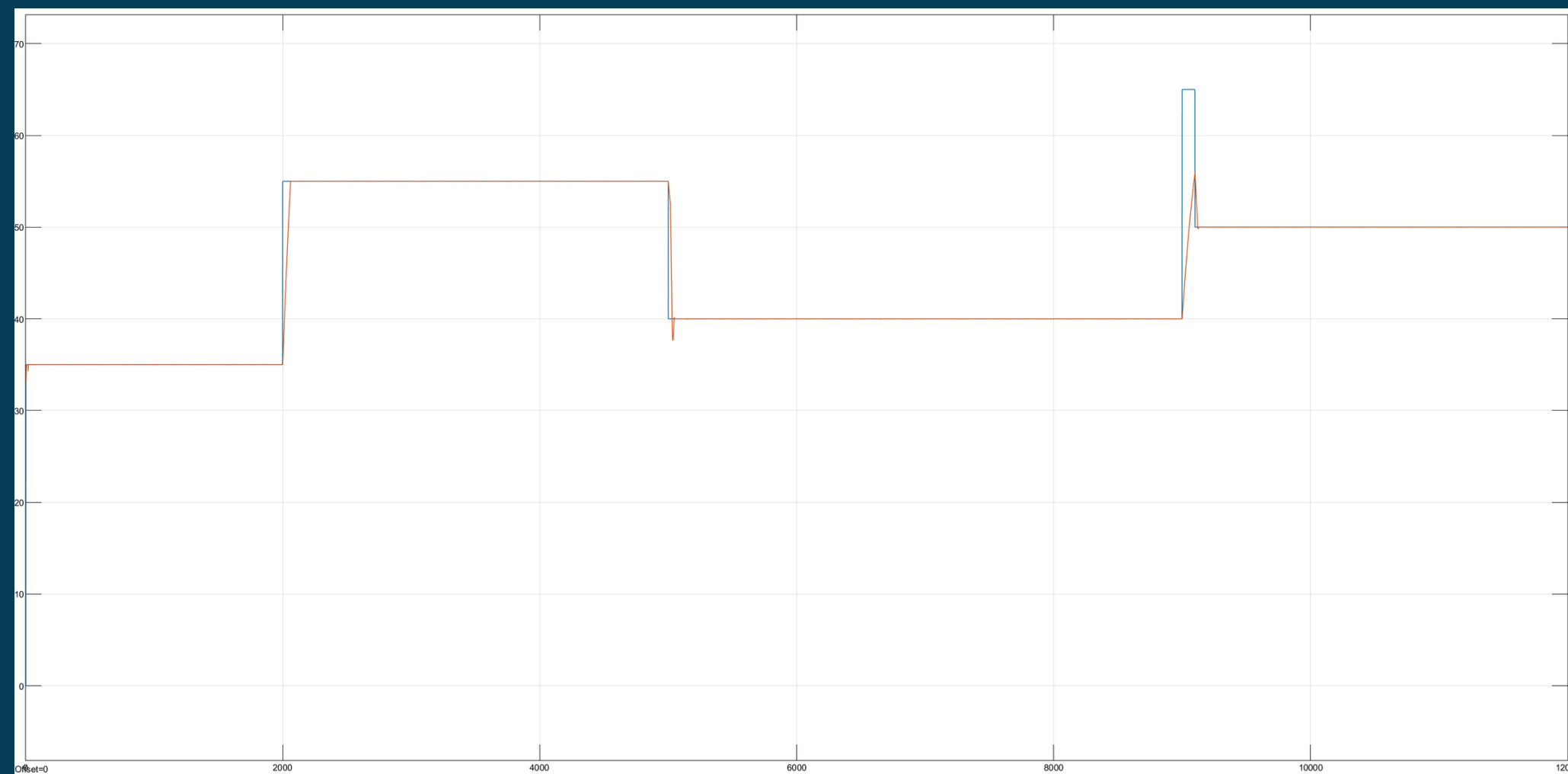
Erro

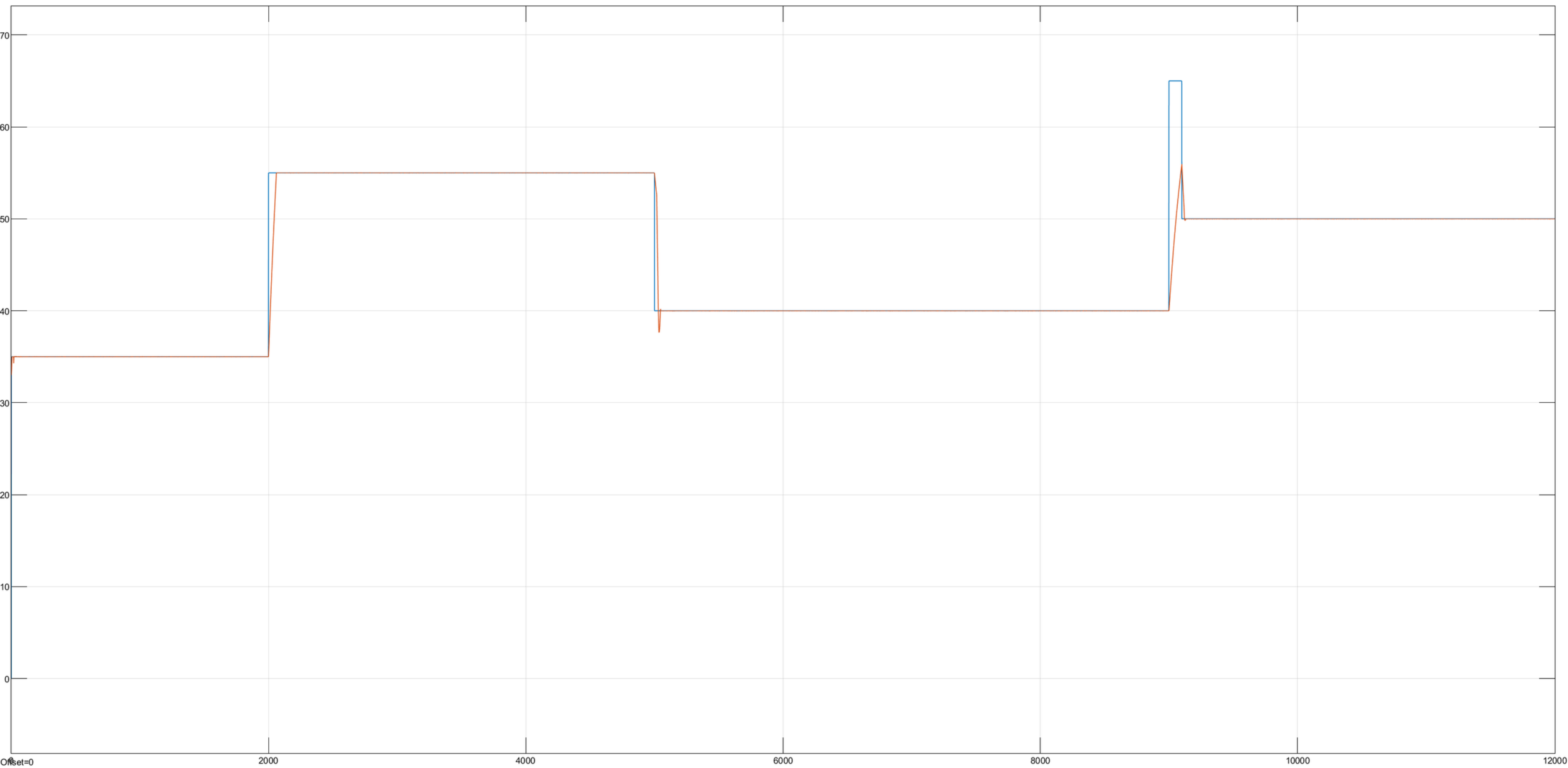


# Filtro Anti-Windup



# Resposta do Sistema Controlado





Offset=0



# Deficiência encontrada

