Formulario: Control Proporcional con Bias:

$$S = \begin{cases} 1 & \textit{Acción Inversa} \\ -1 & \textit{Acción Directa} \end{cases}$$

Rango del actuador: $U = u_{\max} - u_{\min}$

Rango del sensor: $Y = y_{\max} - y_{\min}$

$$Z\% = 100\frac{Z - Z_{\min}}{Z_{\max} - Z_{\min}}$$

$$Z = Z_{\min} + \frac{Z\%}{100}\left(Z_{\max} - Z_{\min}\right)$$

$$K_p\% = \frac{100}{BP} \qquad K_p = K_p\%\frac{U}{Y}$$

$$\Delta e = -S\Delta y$$

$$\Delta u_c = -SK_p\Delta y$$

$$e_{ss} = \frac{A - \gamma\beta}{1 + K_pS\gamma}$$

$$e = A - y$$

$$u_c = K_peS$$

$$u = \beta + u_c$$

$$y = \gamma u$$

$$\beta_* = \frac{A}{\gamma} \qquad e_{ss} = 0 \text{ para } \beta_*$$

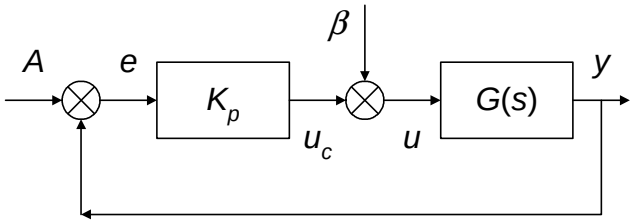
$$u = \beta + K_peS$$

$$u = \beta + K_pS\left(A - y\right)$$

Recta: $u = \left(\beta + K_pSA\right) - \left(K_pS\right)y$

$$u = \beta + K_pS\left(A - \gamma u\right)$$

$$u = \frac{\beta + K_pSA}{1 + K_pS\gamma}$$

$$y = \frac{\gamma\left(\beta + K_pSA\right)}{1 + K_pS\gamma}$$

BP: Se define la variación que debería experimentar la variable controlada, y, para que el actuador, u, vaya de su valor mínimo a su valor máximo.