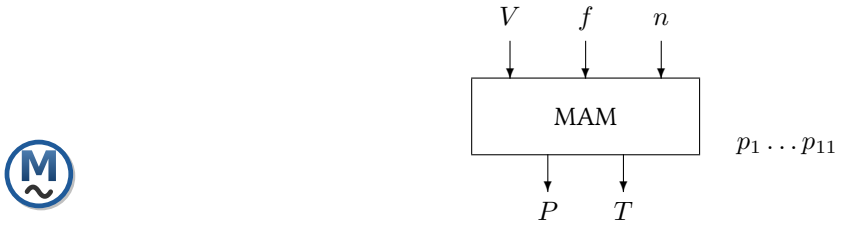
Block MAM

The MAM block calculates the torque of an asynchronous motor.



Name	MAM
Function	se0022
Inputs	3
Outputs	1
Parameters	11
Strings	0
Group	S

Inputs

1 Voltage V / V
2 Frequency f / s^{-1}
3 Rotational speed n / s^{-1}

Outputs

1 Required electrical power P_{el} / W
2 Torque T / N m

Parameters

1 Number of pole pairs N_p
2 Number of stator phases N_s
3 Ohmic stator resistance R_s / Ω
4 Ohmic rotor resistance R_r / Ω
5 Short-circuit stator reactance $\hat{X}_s$ / Ω
6 Short-circuit rotor reactance $\hat{X}_r$ / Ω
7 Open-circuit reactance $\hat{X}_{\mathrm{m}}$ / Ω
8 Nominal power core loss $\hat{P}_{\mathrm{c}}$ / W
9 Open-circuit friction loss $\hat{P}_{\mathrm{f}}$ / W
10 Nominal voltage V_{n} / V

11 Nominal frequency f_0 / s^{-1}

Strings

None

Description

The electrical power demand at the motor terminals is calculated by

$$P_{\mathrm{el}} = N_{\mathrm{p}} N_{\mathrm{s}} \left(\frac{V^2}{\zeta^2} \left(\frac{R_{\mathrm{s}} R_{\mathrm{r}}^2}{s^2} + \frac{R_{\mathrm{r}} X_{\mathrm{m}}^2}{s} + R_{\mathrm{s}} X_2^2 \right) + P_{\mathrm{c}} \right)$$

where $s = (f - n)/n$ is the per-unit slip and ζ^2 a shortcut for

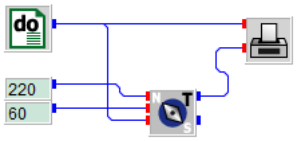
$$\zeta^2 = \left(\frac{R_{\mathrm{s}} R_{\mathrm{r}}}{s} + X_{\mathrm{m}}^2 - X_{\mathrm{s}} X_{\mathrm{r}} \right)^2 + \left(\frac{R_2 X_{\mathrm{s}}}{s} + R_{\mathrm{s}} X_{\mathrm{r}} \right)^2$$

The torque is simulated via

$$T = N_{\mathrm{p}} N_{\mathrm{s}} \left(\frac{R_{\mathrm{r}} X_{\mathrm{m}}^2 V^2}{\omega_{\mathrm{r}} \zeta^2} - T_{\mathrm{f}} \right)$$

where $\omega_{\mathrm{r}} = 2\pi f$ is the rotor's angular frequency.

mam.vseit



A DO block varies the rotaional speed of a motor axis between zero and 60 Hz in steps of 0.1 Hz. The voltage is fixed to 220 volt and the rotor frequency to 60 Hz by two CONST blocks.

The required electrical power is plotted by a PLOT block.

