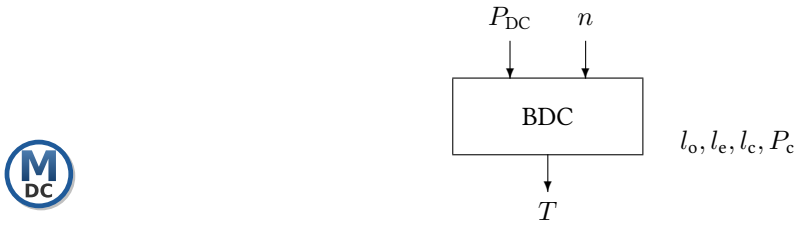
Block BDC

The BDC block calculates the torque of a brushless direct current motor.



Name	BDC
Function	se0007
Inputs	2
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Group	S

Inputs

1	DC power P_{DC} / W
2	Rotational speed n / s^{-1}

Outputs

1	Torque T / N m

Parameters

1	Ohmic losses l_{o} / $\mathrm{W\,N^{-1}\,m^{-2}}$
2	Electronic losses l_{e} / W
3	Core losses l_{c} / $\mathrm{W\,s^2}$
4	Cut in power P_{c} / W

Strings

None

Description

According to Lenz law the torque of a motor is calculated as

$$T = c_{\mathrm{m}} I$$

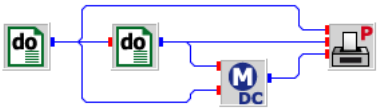
where $c_{\mathrm{m}} = dlBN$ is the motor constant with rotor diameter d, conductor length l, magnetic field density B, and N the number of conductors (2 windings each).

When loss mechanisms like ohmic (copper) losses $c_1 T^2$, constant power for the supply of the power conditioning unit c_2, and iron losses $c_3 n^2$ are considered the motor DC power can be modeled by the function

$$P_{\mathrm{DC}} = 2\pi n T + c_1 T^2 + c_2 + c_3 n^2$$

where $2\pi n T = V_{\mathrm{emf}} I$ is the mechanical power resulting from the induced back emf and the motor current.

bdc.vseit



The DC power of a brushless DC motor is varied between zero and 350 watt by a DO block. The rotational speed of the motor is varied between zero and 45 per second in steps of five by a second DO block.

The torque is plotted as a function of the DC power by a PLOTP block.

