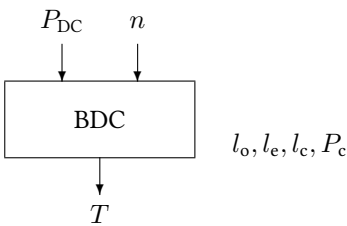


Block BDC

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



Name	BDC
Function	se0007
Inputs	2
Outputs	1
Parameters	4
Strings	0
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 / W N⁻¹ m⁻²
- 2

Electronic losses l_e / W
- 3

Core losses l_c / W s²
- 4

Cut in power P_c / W

Strings

None

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

$$T = c_m I$$

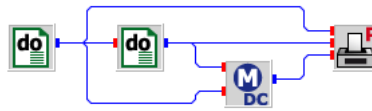
where $c_m = dlBN$ is the motor constant with rotor diameter d , conductor length l , magnetic field density B , and N the number of conductors (2 windings each).

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

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

where $2\pi n T = V_{emf} I$ 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.

