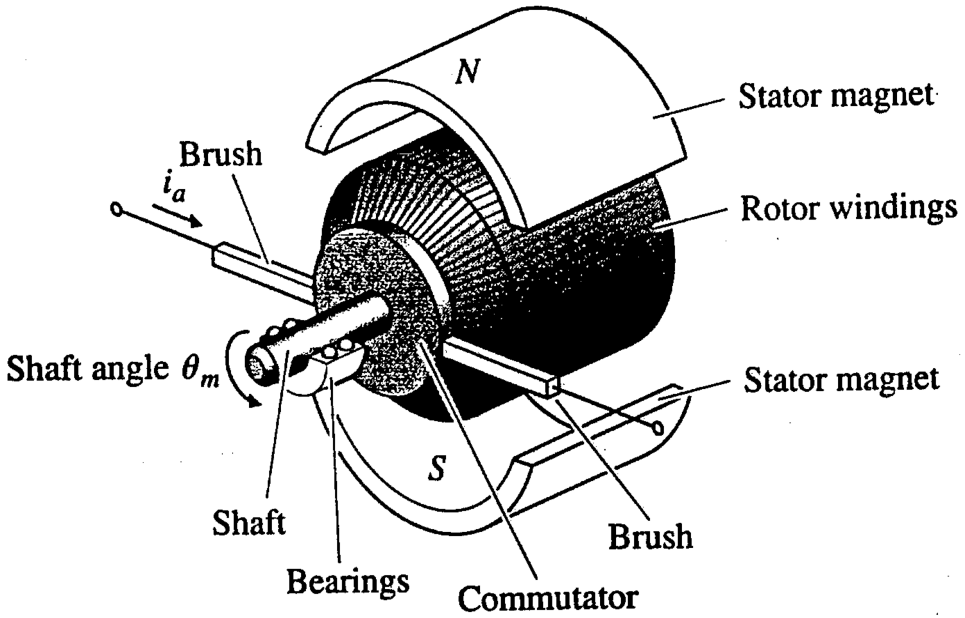
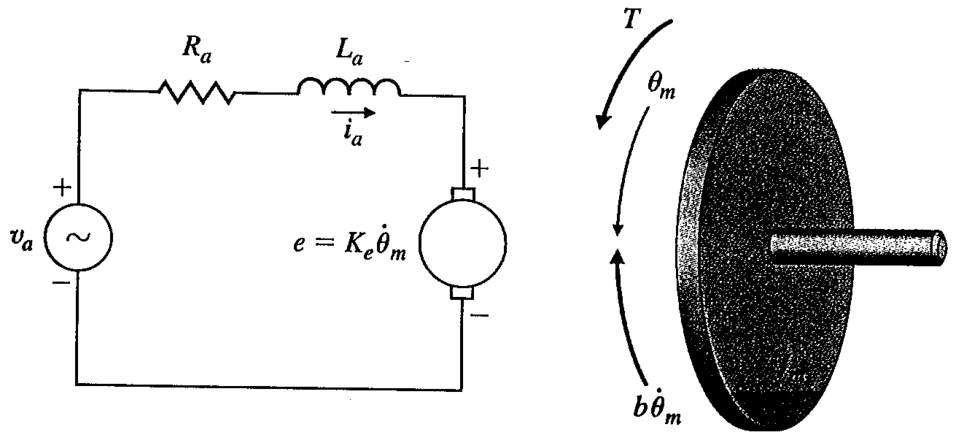
Motors

Tim McLain
Brigham Young University

Brushed DC motor





$$\frac{di_a}{dt} = \frac{1}{L_a}\left[-R_a i_a - K_e\Omega + v_a(t)\right]$$

$$\dot{\Omega} = -\frac{b}{J}\Omega + \frac{K_T}{J}i_a$$

$$\dot{\theta} = \Omega$$

Back EMF constant, torque constant

25°C Ambient unless specified

Maximum Performance		S6M4H S6M4HI	S9M4H S9M4HI	
Peak torque	TP	217 153	935 660	oz-in N-cm
Continuous stall torque	TS	20 14	85 60	oz-in N-cm
Peak current	IP	51	79	A
Continuous stall current	IS	4.8	7.5	A
Peak acceleration (no load)	AP	256	167	krad/s^2

Intrinsic Motor Constants				
Torque constant	KT	4.26 3.01	11.91 8.41	oz-in/A N-cm/A
Back EMF constant	KE	3.15	8.80	V/krpm
Terminal resistance	RT	1.207	0.85	Ω
Armature resistance	RA	0.940	0.66	Ω
Average friction torque	TF	0.9 0.6	4.0 2.8	oz-in N-cm
Viscous damping constant	KD	0.16 0.11	1.32 0.93	oz-in/krpm N-cm/krpm
Moment of inertia	JM	0.00085 0.060	0.0056 0.396	oz-in s^2 kg-cm^2
Armature inductance	L	<100	<100	μH

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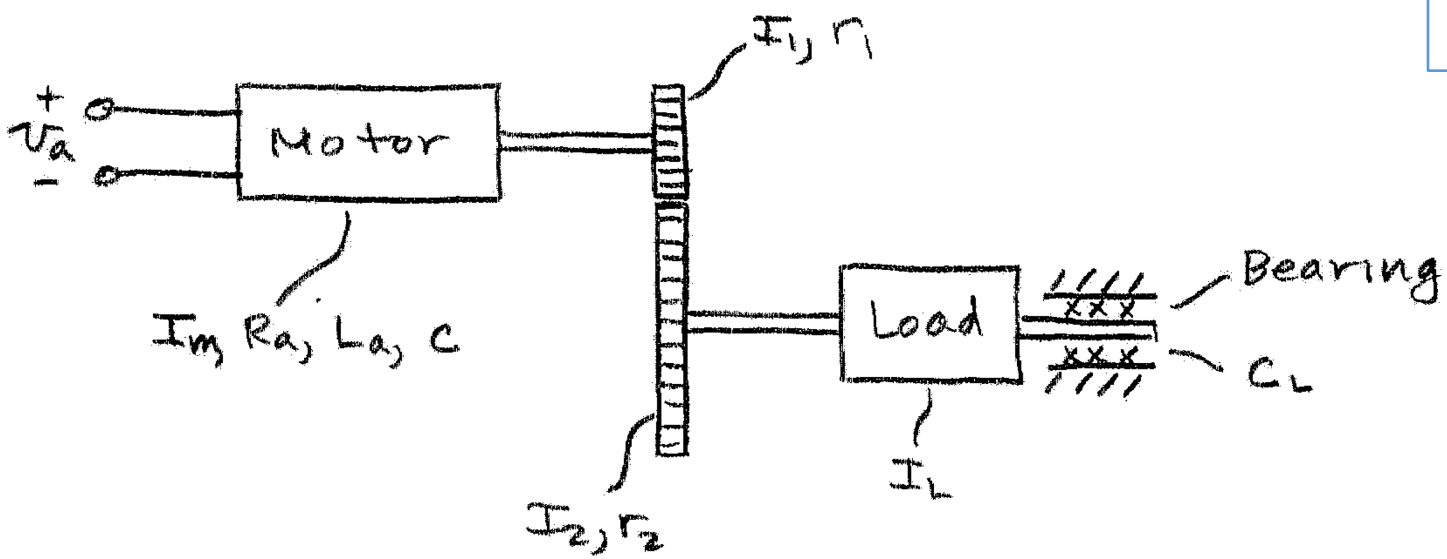
$$T = K_T i_a$$
$$V = K_E \Omega$$

$$K_T = 8.41 \frac{\text{N-cm}}{\text{A}} = 0.0841 \frac{\text{N-m}}{\text{A}}$$

$$K_E = 8.80 \frac{\text{V}}{\text{krpm}}$$
$$= \frac{8.80 \text{ V}}{\text{krpm}} \left(\frac{1 \text{ krpm}}{1000 \text{ rev/min}} \right) \left(\frac{1}{2\pi \text{rad/rev}} \right) \left(\frac{60 \text{ sec}}{\text{min}} \right)$$
$$K_E = 0.0841 \text{ V-sec}$$

Motor example



What does this motor do in response to a 15 V step input?