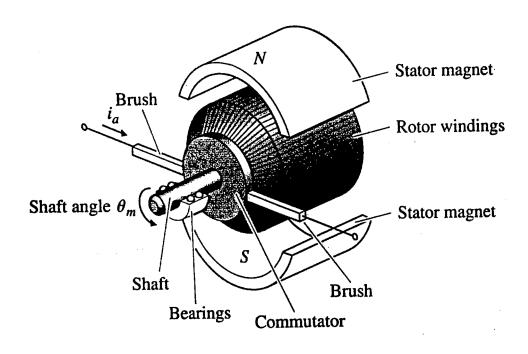
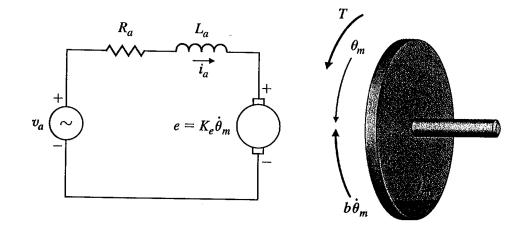
# Motors

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#### 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	nless specifie	
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	Α
Continuous stall current	IS	4.8	7.5	Α
Peak acceleration (no load)	AP	256	167	krad/s <sup>2</sup>
ntrinsic Motor Constants				
ntrinsic Motor Constants  Torque constant	KT	4.26 3.01	11.91	oz-in/A
Torque constant	KT	4.26 3.01 3.15	11.91 8.41 8.80	oz-in/A N-cm/A
		3.01	8.41	oz-in/A
Torque constant  Back EMF constant	KE	3.01 3.15	8.41 8.80	oz-in/A N-cm/A V/krpm
Torque constant  Back EMF constant  Terminal resistance	KE RT	3.01 3.15 1.207	8.41 8.80 0.85	oz-in/A N-cm/A V/krpm
Torque constant  Back EMF constant  Terminal resistance  Armature resistance	KE RT RA	3.01 3.15 1.207 0.940 0.9	8.41 8.80 0.85 0.66 4.0	oz-in/A N-cm/A V/krpm Ω Ω oz-in N-cm oz-in/krpm
Torque constant  Back EMF constant Terminal resistance Armature resistance Average friction torque	KE RT RA TF	3.01 3.15 1.207 0.940 0.9 0.6 0.16	8.41 8.80 0.85 0.66 4.0 2.8 1.32	oz-in/A N-cm/A V/krpm Ω Ω oz-in

## Back EMF constant, torque constant

		25	s°C Ambient u	nless 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	Α
Continuous stall current	IS	4.8	7.5	Α
Peak acceleration (no load)	AP	256	167	krad/s <sup>2</sup>

Intrinsic	Motor	Constants
Torque	consta	ınt

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 <sup>2</sup> kg-cm <sup>2</sup>
Armature inductance	L	<100	<100	μΗ

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

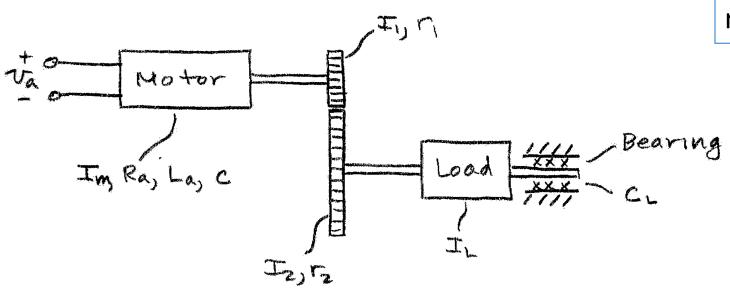
$$K_T = 8.41 \frac{\text{N-cm}}{\text{A}} = 0.0841 \frac{\text{N-m}}{\text{A}}$$

$$K_E = 8.80 \frac{\text{V}}{\text{krpm}}$$

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

$$K_E = 0.0841 \text{ V-sec}$$

## Motor example



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