

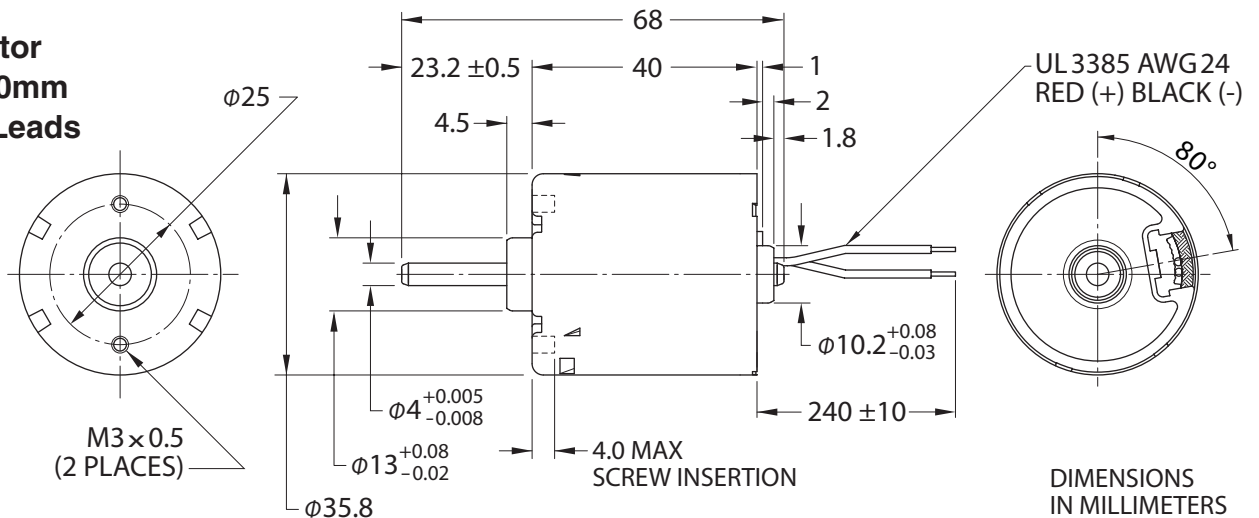
# Brushless DC Motors

## 22H Series for Home Appliances and Office Automation Equipment

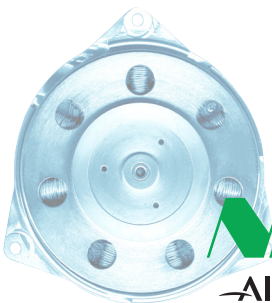
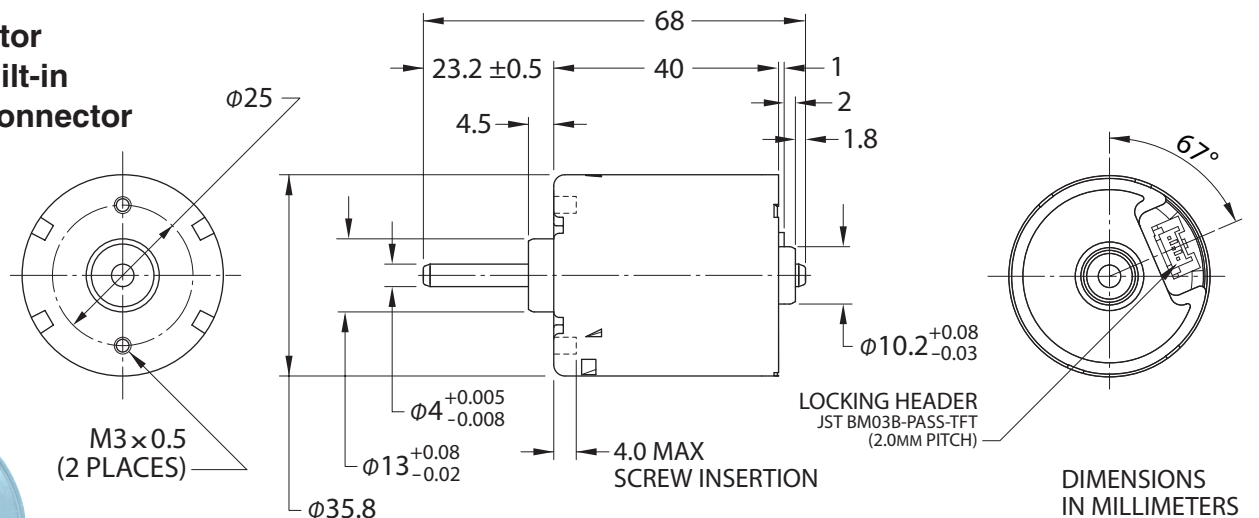
- ▄▄▄▄ 3-Phase, 12-Pole Brushless DC Motors
- ▄▄▄▄ Clockwise Rotation (CCW Optional)
- ▄▄▄▄ Hall Effect Commutation
- ▄▄▄▄ Locked Rotor Protection\*
- ▄▄▄▄ Quiet Operation
- ▄▄▄▄ Comprehensive Control/Signal Functions Available
- ▄▄▄▄ Low Inertia
- ▄▄▄▄ Compact  $\phi 35.8 \times 40\text{mm}$  Case



**22H Motor with 240mm Power Leads**



**22H Motor with Built-in 3-Pin Connector**



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# Brushless DC Motors

## 22H Series

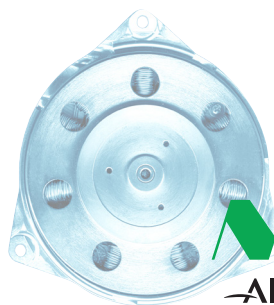
### Electrical and Mechanical Characteristics

Parameter	Symbol	Conditions	Min.	Nom.	Max.	Units
Operating Voltage	$V_M$	Model 22H-12	8.0	12	15	V
		Model 22H-24	15	24	26.4	V
Operating Current	$I_{Run}$	Continuous operation at nominal $V_M$ , $T_A = +20^\circ\text{C}$				
		Model 22H-12, Type 1	—	—	1.38	A
		Model 22H-12, Type 2	—	—	1.64	A
		Model 22H-12, Type 3	—	—	1.47	A
		Model 22H-12, Type 4	—	—	0.88	A
		Model 22H-24, Type 1	—	—	—	A
		Model 22H-24, Type 2	—	—	0.94	A
		Model 22H-24, Type 3	—	—	0.91	A
		Model 22H-24, Type 4	—	—	0.74	A
		Model 22H-24, Type 5	—	—	0.53	A
Run Torque	$T_{Run}$	Continuous operation at nominal $V_M$ , $T_A = +20^\circ\text{C}$				
		Model 22H-12, Type 1	—	—	13	mN·m
		Model 22H-12, Type 2	—	—	22	mN·m
		Model 22H-12, Type 3	—	—	29	mN·m
		Model 22H-12, Type 4	—	—	33	mN·m
		Model 22H-24, Type 1	—	—	—	mN·m
		Model 22H-24, Type 2	—	—	14	mN·m
		Model 22H-24, Type 3	—	—	27	mN·m
		Model 22H-24, Type 4	—	—	36	mN·m
		Model 22H-24, Type 5	—	—	42	mN·m
Power	$P_{OUT}$	Continuous operation at nominal $V_M$ , $T_A = +20^\circ\text{C}$				
		Model 22H-12, Type 1	—	—	7.7	W
		Model 22H-12, Type 2	—	—	9.6	W
		Model 22H-12, Type 3	—	—	9.1	W
		Model 22H-12, Type 4	—	—	7.8	W
		Model 22H-24, Type 1	—	—	—	W
		Model 22H-24, Type 2	—	—	9.2	W
		Model 22H-24, Type 3	—	—	11	W
		Model 22H-24, Type 4	—	—	8.7	W
		Model 22H-24, Type 5	—	—	4.8	W
No Load Speed	$\omega_{NL}$	Model 22H-12, Type 1, $V_M = 12\text{V}$	—	6550	—	rpm
		Model 22H-12, Type 2, $V_M = 12\text{V}$	—	5300	—	rpm
		Model 22H-12, Type 3, $V_M = 12\text{V}$	—	4100	—	rpm
		Model 22H-12, Type 4, $V_M = 12\text{V}$	—	2850	—	rpm
		Model 22H-24, Type 1, $V_M = 24\text{V}$	—	8650	—	rpm
		Model 22H-24, Type 2, $V_M = 24\text{V}$	—	7000	—	rpm
		Model 22H-24, Type 3, $V_M = 24\text{V}$	—	5000	—	rpm
		Model 22H-24, Type 4, $V_M = 24\text{V}$	—	3300	—	rpm
		Model 22H-24, Type 5, $V_M = 24\text{V}$	—	2150	—	rpm
		Rotor Inertia	$J_M$		—	18.5
Sound Pressure	$N_M$	No load, $f = 0$ to 20 kHz, 30 cm from motor	—	—	50	dB(A)
Operating Temperature	$T_A$	Relative humidity 5% - 90%, non-condensing	10	—	50	$^\circ\text{C}$
Life Expectancy†	$L_{10}$	Continuous operation, no load, $T_A = +20^\circ\text{C}$	5,000	—	—	hours
Motor Weight	$W_M$		—	145	—	g

Note: Values of maximum current, torque and output power are typical under stated operating conditions with motors mounted on 170 cm<sup>2</sup> aluminum test fixtures.

\* Automatic shutdown at locked rotor condition: Restart at power OFF/ON.

† L10 bearing life expectancy at relative humidity 5% - 90%, non-condensing, and nominal operating voltage: The point in time at which 90 percent of a sample lot can be expected to survive. Failure criteria for life testing that establishes this figure include a 20% reduction in speed or a 20% increase in operating current.



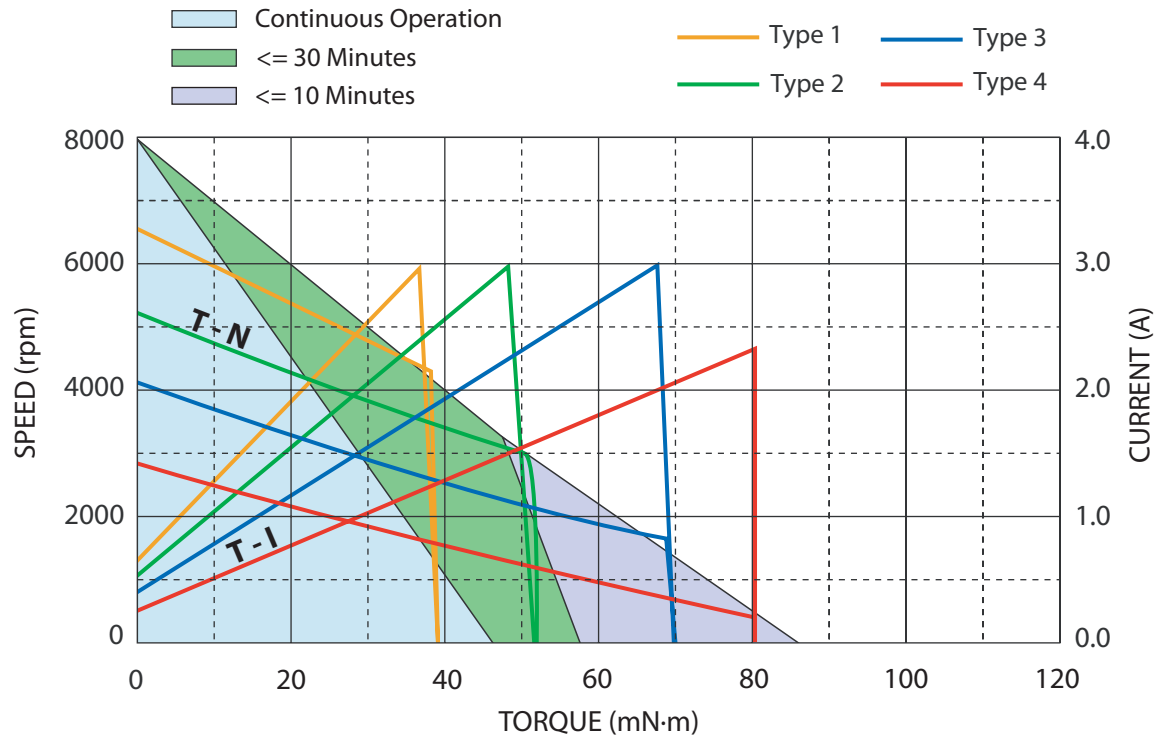
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# Brushless DC Motors

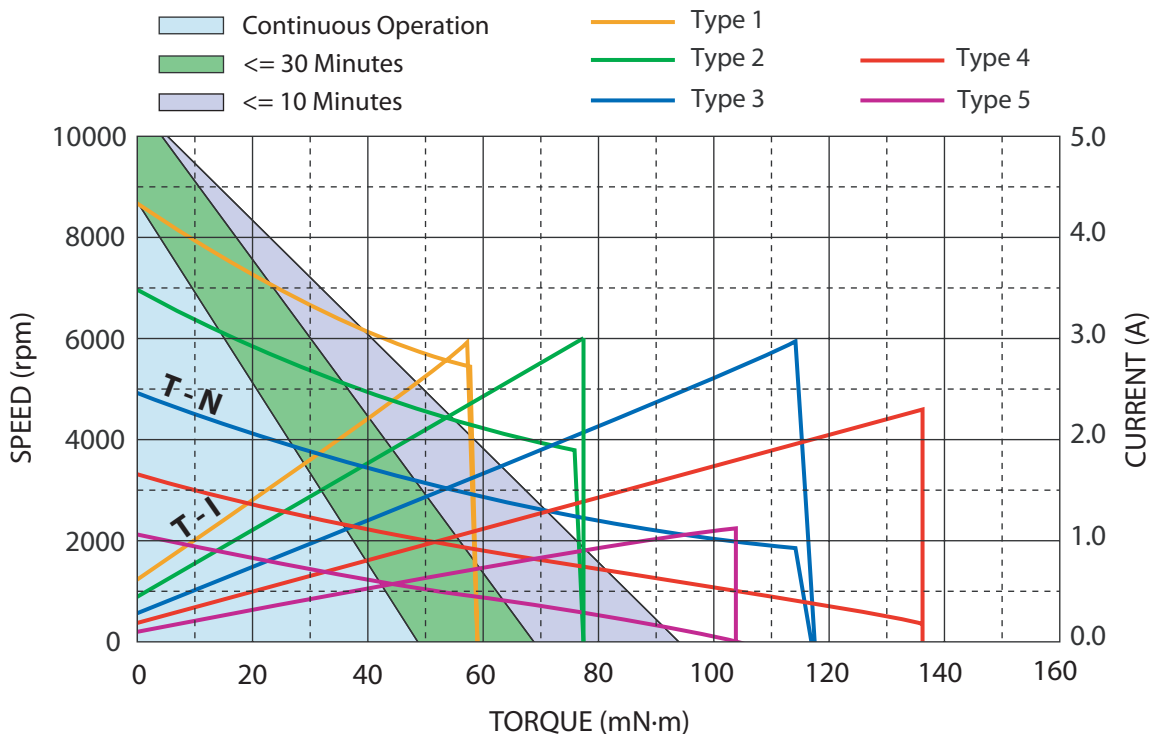
## 22H Series

### Performance Characteristics—12V Motors<sup>(1)</sup>

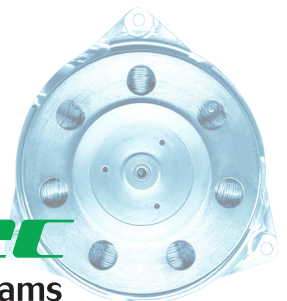


(1) Motors mounted on 170 cm<sup>2</sup> aluminum fixtures, T<sub>A</sub> = +20°C.

### Performance Characteristics—24V Motors<sup>(1)</sup>



(1) Motors mounted on 170 cm<sup>2</sup> aluminum fixtures, T<sub>A</sub> = +20°C.



# Brushless DC Motors

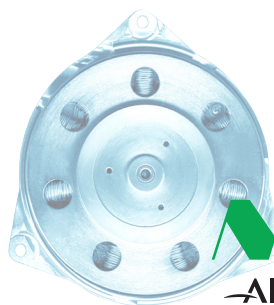
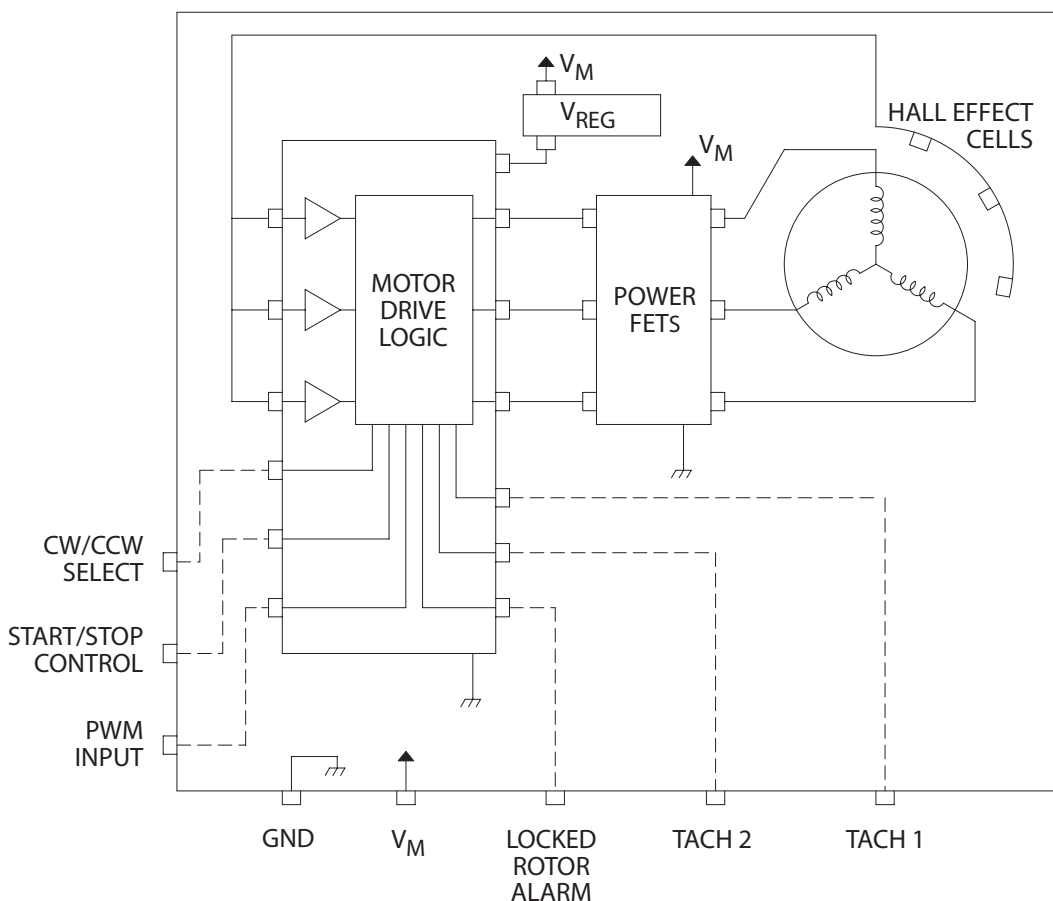
## 22H Series

### Motor and Drive Circuit Options

Feature	22H Standard	22H Options
Direction of Rotation <sup>(1)</sup>	CW	CCW (also see rotational direction control option below)
Shape of Motor Shaft	Round	D-Cut
Surface of Motor Shaft	Smooth	Knurled
Length of Motor Shaft	23.2mm	18.2mm or 28.2mm
Diameter of Motor Shaft	4.0mm	3.17mm
Bearing Type	Sleeve	Ball
Motor Terminations <sup>(2)</sup>		
Power In	$V_M$	—
Ground	GND	—
CW/CCW Select	—	High = CW/Low = CCW.
Start/Stop Control	—	High = Start/Low = Stop.
PWM Input	—	$f_{in} = 500 \text{ Hz to } 50 \text{ kHz}$ , $V_{in(Low)} < 1.0\text{V}$ , $V_{in(High)} = 2.5 \text{ to } 5.0\text{V}$ , duty cycle = 20% to 100%.
Locked Rotor Alarm	—	Open-collector circuit, high-pass/low-fail, $I_C = 3.0 \text{ mA}$ , maximum.
Tachometer 1	—	Open-collector circuit, $I_C = 3.0 \text{ mA}$ , maximum, square wave pulses per revolution = motor poles/2.
Tachometer 2	—	Open-collector circuit, $I_C = 3.0 \text{ mA}$ , maximum, square wave pulses per revolution = motor poles $\times 3/2$ .

<sup>(1)</sup> Rotational orientation: Looking toward the load end of the motor shaft.

<sup>(2)</sup> Series 22H designs support any four (max.) of six motor termination options shown above.



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