

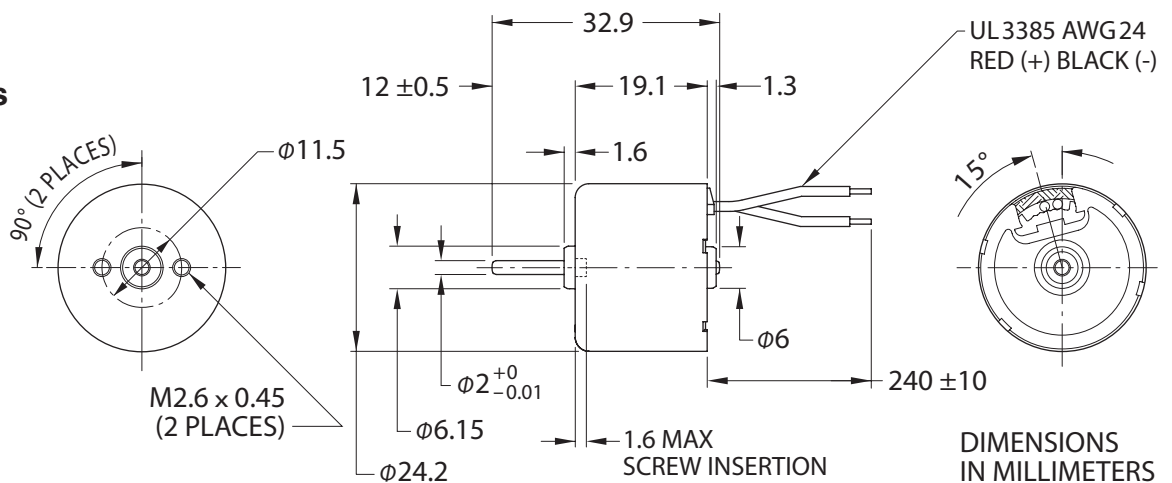
Brushless DC Motors

13H Series for Home Appliances and Office Automation Equipment

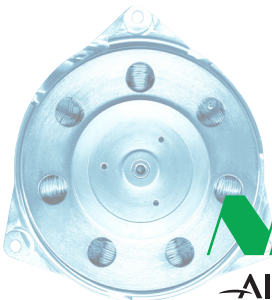
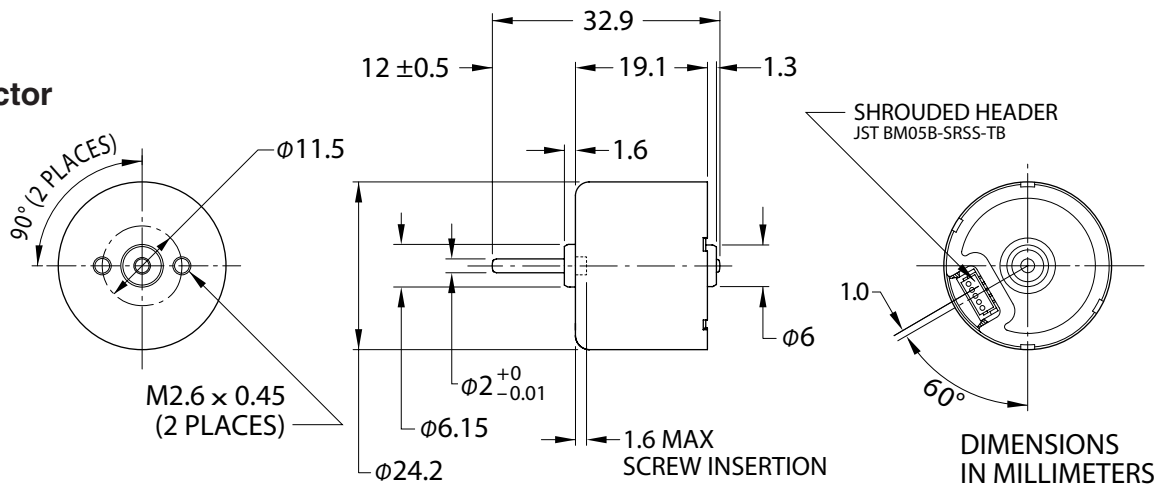
- ▄▄▄▄ 3-Phase, 12-Pole Brushless DC Motors
- ▄▄▄▄ Clockwise Rotation (CCW Optional)
- ▄▄▄▄ Hall Effect Commutation
- ▄▄▄▄ Locked Rotor Protection*
- ▄▄▄▄ Quiet Operation
- ▄▄▄▄ Comprehensive Control/Signal Functions Available
- ▄▄▄▄ Low Inertia
- ▄▄▄▄ Compact $\varnothing 24.2 \times 19.1$ mm Case



13H Motor with 240mm Power Leads



13H Motor with Built-in 5-Pin Connector



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Brushless DC Motors

13H Series

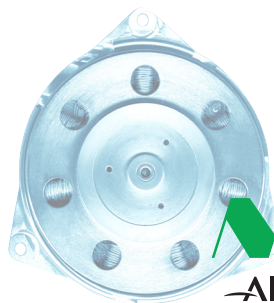
Electrical and Mechanical Characteristics

Parameter	Symbol	Conditions	Min.	Nom.	Max.	Units
Operating Voltage	V_M	Model 13H-12	8.0	12	15	V
		Model 13H-24	15	24	26.4	V
Operating Current	I_{Run}	Continuous operation at nominal V_M , $T_A = +20^\circ\text{C}$				
		Model 13H-12, Type 1	—	—	0.57	A
		Model 13H-12, Type 2	—	—	0.60	A
		Model 13H-12, Type 3	—	—	0.52	A
		Model 13H-12, Type 4	—	—	0.44	A
		Model 13H-12, Type 5	—	—	0.37	A
		Model 13H-24, Type 1	—	—	—	A
		Model 13H-24, Type 2	—	—	0.39	A
		Model 13H-24, Type 3	—	—	0.38	A
		Model 13H-24, Type 4	—	—	0.31	A
Run Torque	T_{Run}	Continuous operation at nominal V_M , $T_A = +20^\circ\text{C}$				
		Model 13H-12, Type 1	—	—	2.5	mN·m
		Model 13H-12, Type 2	—	—	4.2	mN·m
		Model 13H-12, Type 3	—	—	4.6	mN·m
		Model 13H-12, Type 4	—	—	5.2	mN·m
		Model 13H-12, Type 5	—	—	5.6	mN·m
		Model 13H-24, Type 1	—	—	—	mN·m
		Model 13H-24, Type 2	—	—	2.2	mN·m
		Model 13H-24, Type 3	—	—	3.4	mN·m
		Model 13H-24, Type 4	—	—	4.5	mN·m
Power	P_{OUT}	Continuous operation at nominal V_M , $T_A = +20^\circ\text{C}$				
		Model 13H-12, Type 1	—	—	2.2	W
		Model 13H-12, Type 2	—	—	2.6	W
		Model 13H-12, Type 3	—	—	1.9	W
		Model 13H-12, Type 4	—	—	1.6	W
		Model 13H-12, Type 5	—	—	0.8	W
		Model 13H-24, Type 1	—	—	—	W
		Model 13H-24, Type 2	—	—	2.8	W
		Model 13H-24, Type 3	—	—	3.2	W
		Model 13H-24, Type 4	—	—	2.5	W
No Load Speed	ω_{NL}	Model 13H-12, Type 1, $V_M = 12\text{V}$	—	11,000	—	rpm
		Model 13H-12, Type 2, $V_M = 12\text{V}$	—	9,300	—	rpm
		Model 13H-12, Type 3, $V_M = 12\text{V}$	—	7,700	—	rpm
		Model 13H-12, Type 4, $V_M = 12\text{V}$	—	6,200	—	rpm
		Model 13H-12, Type 5, $V_M = 12\text{V}$	—	5,000	—	rpm
		Model 13H-24, Type 1, $V_M = 24\text{V}$	—	17,800	—	rpm
		Model 13H-24, Type 2, $V_M = 24\text{V}$	—	14,550	—	rpm
		Model 13H-24, Type 3, $V_M = 24\text{V}$	—	12,000	—	rpm
		Model 13H-24, Type 4, $V_M = 24\text{V}$	—	8,700	—	rpm
		Rotor Inertia	J_M		—	0.7
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		—	30	—	g

Note: Values of maximum current, torque and output power are typical under stated operating conditions with motors mounted on 170 cm² 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.



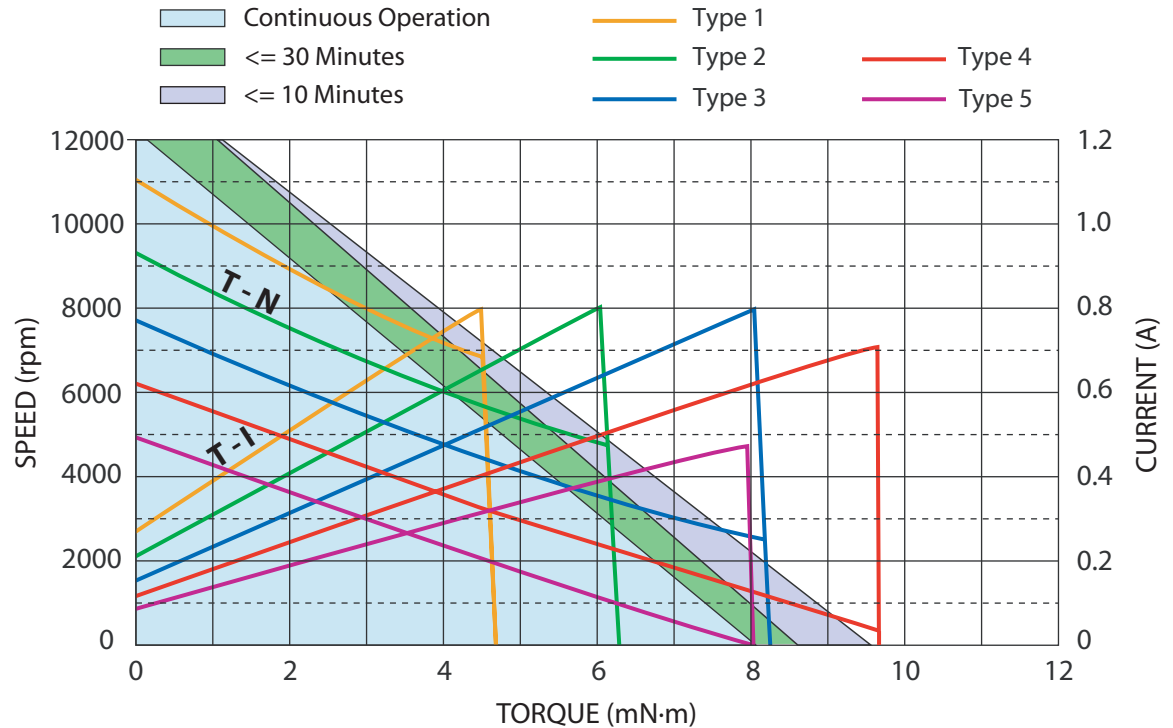
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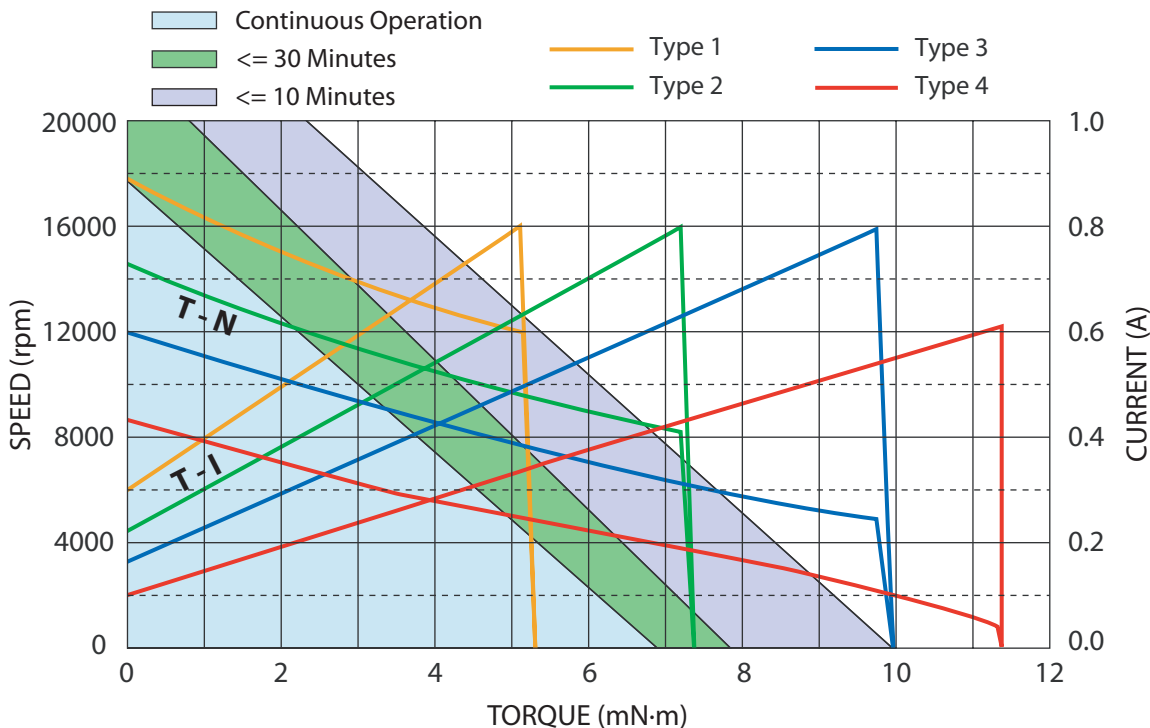
13H Series

Performance Characteristics—12V Motors⁽¹⁾

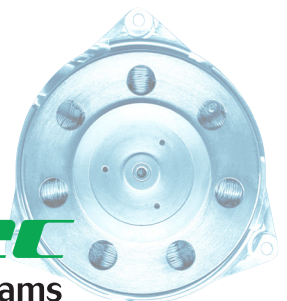


(1) Motors mounted on 170 cm² aluminum fixtures, $T_A = +20^\circ\text{C}$.

Performance Characteristics—24V Motors⁽¹⁾



(1) Motors mounted on 170 cm² aluminum fixtures, $T_A = +20^\circ\text{C}$.



Brushless DC Motors

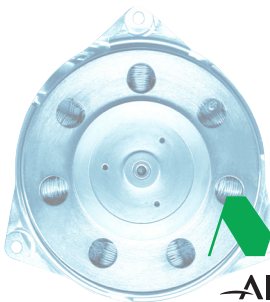
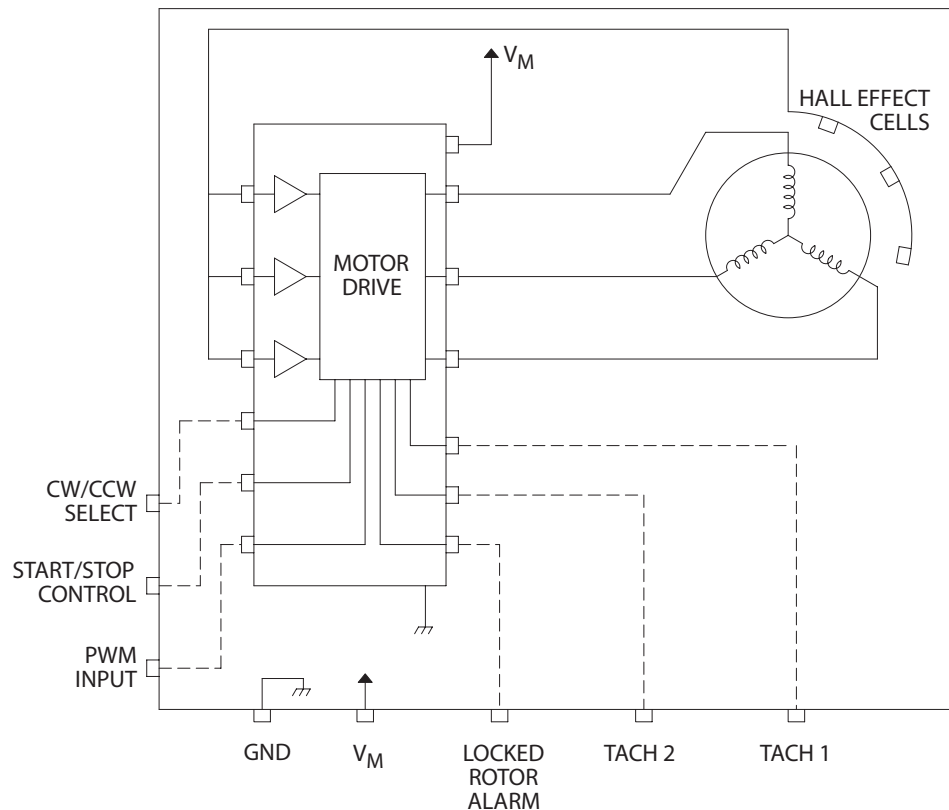
13H Series

Motor and Drive Circuit Options

Feature	13H Standard	13H Options
Direction of Rotation ⁽¹⁾	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	12 mm	7 mm or 22 mm
Bearing Type	Sleeve	Ball
Motor Terminations⁽²⁾		
Power In	V_M	—
Ground	GND	—
CW/CCW Select	—	High = CW/Low = CCW.
Start/Stop Control	—	High = Start/Low = Stop.
PWM Input	—	$f_{in} = 500 \text{ Hz to } 50 \text{ kHz}$, $V_{in(Low)} < 1.0V$, $V_{in(High)} = 2.5 \text{ to } 5.0V$, 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.

⁽¹⁾ Rotational orientation: Looking toward the load end of the motor shaft.

⁽²⁾ Series 13H designs support any three (max.) of six motor termination options shown above.



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