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Datasheet

Brushed DC Motor, 20 W, 24 V dc, 8.1 Ncm, 5300 rpm

RS Stock number 235-7831

MGM 9 2 3 2 2 R 24 V 19:1 2 C 500 L A212

MGM	Unit type	M = Motor; MGM = Gearmotor
9	Motor frame size	8 = 30 mm; 9 = 40 mm; 14 = 54 mm
2	Connection and mounting face	1 = leads, 3 holes; 4 = terminals, 4 holes; 2 = leads, 4 holes; 5 = leads, 2 holes; 3 = terminals, 3 holes; 6 = terminals, 2 holes
3	Magnetisation	Factory assigned. Refer to specification sheets
2	Motor length	1 = shortest; 7 = longest
2R	Motor bearing option	1R = 1 ball bearing; 2 R = 2 ball bearings
24 V	Motor voltage	
19:1	Gear ratio for MGM series	
	Encoder code:	
2 C	Number of channels	1C; 2C; 3C
500	Number of lines	(see table page 11)
L	Option	R = rotary pulse indicator; L = line driver
A212	Factory assigned suffix	

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Motor selection guide

To select the correct motor size, please refer to the safe operation torque curves. They provide steady state continuous torque ratings for each motor. The curves depict worst case conditions. Ratings may be significantly higher for intermittent operation or if the thermal dissipation capacity of the motor is increased by any additional cooling surface.
To select the correct motor winding, first choose the winding rated closest to your supply voltage. The next step is to check that the available voltage will produce the required speed using the following equation:

$$U = \left\{ \left[\frac{M}{K_T} \right] + I_0 \right\} \cdot R + BEMF \cdot \frac{n}{1000}$$

The result of this calculation must be lower than your supply voltage.

Example: An application requires a motor to deliver 20 mNm at 5000 rpm. A supply voltage of max. 24 V is available.

1) The smallest motor to fullfill these conditions is found with the safe operation torque curves. The graph on page 7 indicates that it is the M 9234 motor.

2) The voltage check with the 24 V winding provides the following result:

$$U = \left(\frac{20}{36.5} + 0.16 \right) \cdot 3 + 3.8 \cdot \frac{5000}{1000}$$

U = 21.1 V which meets the requirement. For more details, please refer to the publication *PORTESCAP IRON CORE DC MOTORS APPLICATION NOTE*. This document explains in detail the calculations needed to check and define each aspect of an application.

Gearmotor selection guide

Applications which require output shaft speeds of less than 1000 rpm or a very high torque, will require a gearmotor. The gear ratio must match the load torque to the capacity of the motor but should also keep the motor speed below the maximum recommended gearbox input speed in order to reduce noise and mechanical wear.

Example: An application requires 1.4 Nm at a speed of 50 rpm.

1) Select the gearbox type which can transmit the required torque. According to page 3 data, the MGM 9000, wide face option gearbox will be suitable.

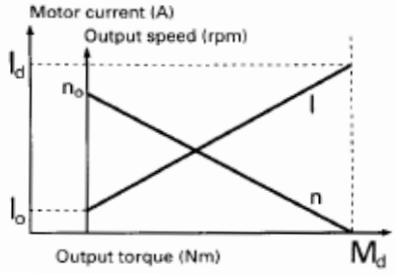
2) Select a gear ratio. The first step is to divide the max. recommended input speed by the requested output speed and select the closest available gear ratio. The gear ratio selected is 66:1. The motor will run at 3250 rpm.

3) Calculate motor torque using the equation below taking the gear ratio i and the gear efficiency η into account:
$M_{mot.} = M\ out / (i \times \eta)$
$M_{mot} = 1{,}4 / (66 \times 0.66) = 33$ mNm.

4) The next step is to choose the motor capable of delivering this torque. This is described in the Motor selection guide.

Characteristic curves of DC motors

You may draw the current and speed vs. torque curves for each motor at indicated supply voltage by using the catalogue data as shown below.
The speed vs. torque curve can be drawn using the no-load speed and the stall torque.
The current vs. torque curve can be drawn using the no-load current and stall current.



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Definitions of characteristics

All values are specified at 25°C.

Back-EMF constant
Indicates the back-EMF voltage induced per 1000 rpm.

Connections
The motor rotates clockwise (when viewed from the shaft end) with positive voltage on terminal 1 or on the red wire.

Drawings
Unspecified tolerances are ± 0.15 mm.

Inductance
Is measured at 1 kHz and at the motor terminals.

Measuring voltage
Supply voltage for which the provided characteristics have been measured. Motors may be operated at lower or higher voltages depending upon the application's output power requirement.

Mechanical time constant
Is the time needed by the motor to reach 63% of it's no-load or final speed without an external inertial load.

No-load speed
Speed reached by the unloaded motor when operated at the measuring voltage.

Stall torque
It is the maximum output torque available from the motor under a stall condition and at the rated measuring voltage.

Stall current
The specified values can be exceeded by a maximum of 100% for the 8000 and 9000 motor series and by 25% for the 14000 series.

Rated torque
It is the torque available continuously at 3000 rpm, without any additional cooling. This rating may be increased by mounting the motor to a metal surface.

Static friction torque
Friction torque losses in a motor turning at low speed. Does not include speed dependent torque losses.

Terminal resistance
Is the quotient of measuring voltage and stall current. It includes the brush resistance.

Thermal resistance
Rotor to stator gives the armature temperature rise with respect to the stator per dissipated watt. The stator to ambient value gives the stator temperature rise with respect to the ambient air per dissipated watt.

Thermal time constant
It is the time taken by the rotor or stator to reach 63 % of the final temperature corresponding to a given constant dissipated power.

Torque constant
Indicates the torque developed for a current of 1 A, as well as the EMF induced at an angular speed of 1 rad/s.

Viscous damping constant
Provides a means of calculating the viscous torque losses at any given speed.

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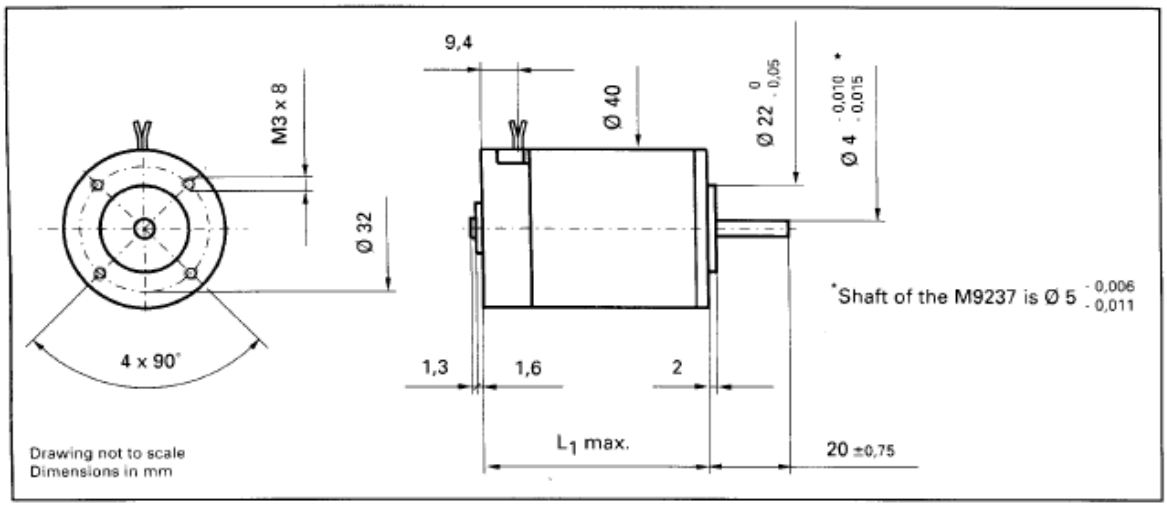
M 9000 Motor series Ø 40 mm

Motor specifications



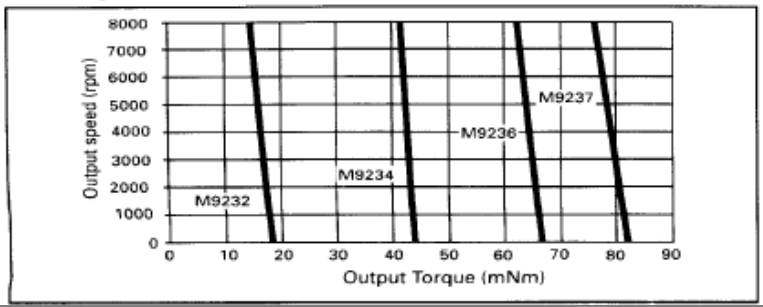
			M 9232			M 9234			M 9236			M 9237		
Rated torque[1]		mNm	17			43			67			81		
Stall torque		mNm	100			300			440			560		
No-load speed		rpm	7000			6200			4900			5300		
Speed regulation constant		rpm/mNm	70			21			11			9		
Rotor inertia		kgm² x 10⁻⁷	18.8			41.7			72.0			84.7		
Mechanical time constant		ms	14			9			9			9		
Thermal time constant		minutes	7.2			11.4			13.5			13.8		
Thermal resistance[2]	rotor-stator	°C/W	14.0			8.7			7.2			5.7		
	stator-ambient	°C/W	9.5			7.7			6.3			5.5		
Static friction torque		mNm	3.5			4.2			5.6			5.6		
Viscous damping constant		Nms x 10⁻⁶	1.83			2.61			3.54			3.71		
Motor weight		g	200			290			390			440		
Motor length L_1		mm	46.4			61.0			77.5			85.2		
Measuring voltage[3]		V	12	24	48	12	24	48	12	24	48	12	24	48
Torque constant		mNm/A	15.5	31.1	62.1	18.3	36.5	73.0	22.91	45.8	92.5	21.2	42.4	83.7
Back-EMF constant		V/krpm	1.6	3.3	6.5	1.9	3.8	7.6	2.4	4.8	9.7	2.2	4.4	8.8
Terminal resistance		ohm	1.9	7.4	29.2	0.8	3	11.5	0.7	2.5	9.7	0.6	1.9	7.0
Inductance		mH	1.2	4.6	18.6	0.6	2.5	10	0.7	2.6	10.7	0.5	2	7.7
No-load current		A	0.32	0.16	0.08	0.33	0.16	0.08	0.33	0.16	0.08	0.36	0.18	0.09
Stall current		A	6.2	3.3	1.6	14.5	8.1	4.2	16.9	9.6	4.9	21.7	13.0	6.9

[1] Continuous torque rating at 3000 rpm
[2] Based on IEC 34, suspended in free air
[3] Other voltage ratings available

Iron core DC motor with 7 slots, skewed stack
Standard version with self-aligning bronze bearings
Maximum coil temperature 155° C
Max. axial static force for press-fit 150 N

Indicates the standard windings

Safe operation torque curves



Please refer to these curves to select the motor frame size for your load

A motor can operate continously at any load point (torque and speed) on the left of the respective motor curve. The motors offer higher torque capabilities when mounted on a metal surface.

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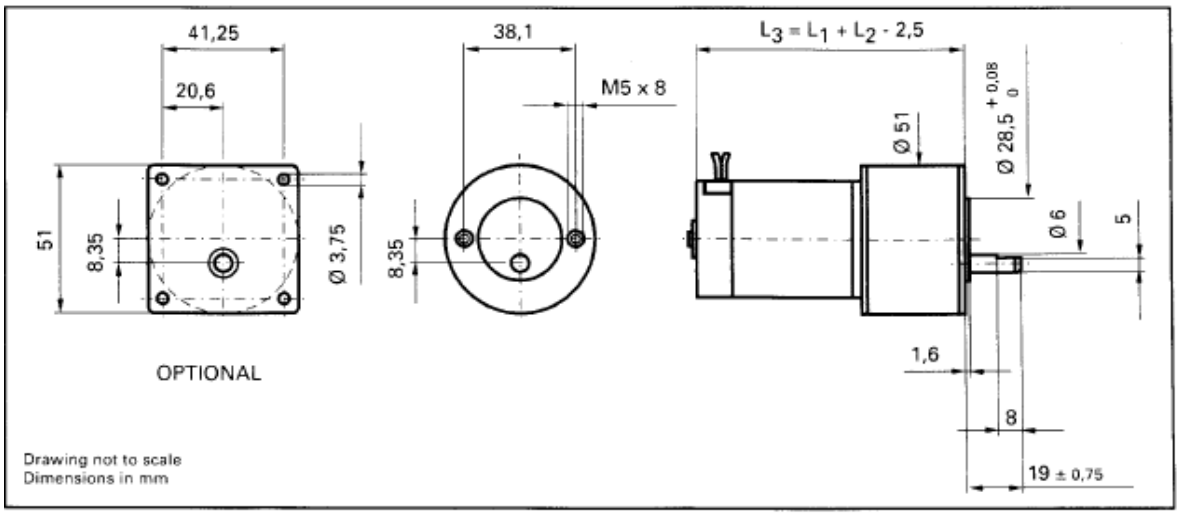
Gearmotor MGM 9000 specifications



Continuous torque rating		1.2 Nm	standard gearing			
		2.1 Nm	high torque option			
		3.5 Nm	high torque, wide face option			
Static output torque		2 Nm	with standard gearing			
Recommended input speed		4000 rpm				
Standard reduction ratios		5.9	19.7	66	218	728
Non-standard reduction ratios		11.5	38	128	426	1420
Efficiency		0.81	0.73	0.66	0.59	0.53
Length L_2	mm	34.9	34.9	34.9	34.9	34.9
Rotation	cw/ccw	cw	ccw	cw	ccw	cw
Weight	g	167	178	188	198	208

Spur gearbox
Recommended max. input power 20 W
Standard version with sleeve bearings, ball bearings optional
Average backlash 2.5° at no-load

Standard gearmotor MGM 9532, 12 V (motor M 9232) available from stock
Gearmotor combinations with motors M 9234, M 9236 and M 9237 available on request
Gearbox options for the M 9000 motor series: spur gearboxes K 38, K 40, RG 1/8, RG 1/9
planetary gearboxes R 32, R 40
(refer to page 10 for detailed information)

Motor - Encoder version