



# HSM 09N Data sheet

## Electrical data

Value	unit	Pa winding	Ma winding	Fa winding
Number of poles		20	20	20
Number of pole pairs		10	10	10
Inductance/Phase	mH	4.9	1.2	0.034
Resistance/Phase	Ohm	1.9	0.47	0.013
Resistance/Phase-phase	Ohm	3.9	0.94	0.026
Back EMF/Phase-Phase RMS	Vs/rad	0.84	0.42	0.070
Back EMF @ 1000 rpm	V	88	44	7.3
Torque constant (RMS)	Nm/A	1.46	0.73	0.12
Max rail voltage	V	750	750	750
Recommended peak current	A	13	26	156
Torque at recommended peak current	Nm	16.4	16.4	16.4

For higher torques, see next page

## Mechanical data

Value unit	Singleturn		Multiturn	
	no brake	brake	no brake	brake
J kgcm <sup>2</sup>	7.8	-	8.2	-
Mass kg	3.8	-	4.1	-
Len mm	127.9	-	127.9	-

## Insulation class

The insulation system complies with the requirements of EEC LV Directive 73/23/EEC and 93/68/EEC. Test report E9911111E01.

## Protection class

HDD motors comply with the requirements for IP-65. IP-67 is available on request.

## Thermistor

Overheat protection consists of triple PTC thermistors (one on each phase).

R @ 25 C	100 to 350 Ohm
R @ 145 C	< 1650 Ohm
R @ 155 C	> 4 kOhm

## Motor name structure

Type	Flange size	Stator length	Winding	Feedback	Power connector	Brake	Shaft key	Options
HSM	09	- N	- Pa	- ST	- A	- A	- A	- AAA

**Type** HSM = Hollow Shaft Motor

**Flange size** Approximate in cm. 09 = 92 mm.

**Stator length** J (shortest), N, Q (longest).

**Winding** Pa: suitable for 3000 rpm at rail voltage 560V  
Ma: suitable for 3000 rpm at rail voltage 320V  
Fa: suitable for 3000 rpm at rail voltage 48V

**Feedback** ST/SN = SinCos single/multiturn.

**Power connector** Many different pinouts available; see [www.hdd.se](http://www.hdd.se)

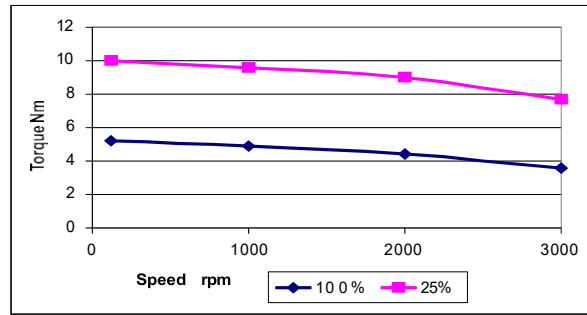
**Brake** A = no brake (no other option available for HSM motors)

**Shaft key** A (no options available for HSM motors)

**Options** AAA = standard. For other options please contact HDD.

### Torque at 90°C temp rise, in Nm

Speed	Duty cycle	
	100%	25%
100rpm	5.2	10.0
1000rpm	4.9	9.6
2000rpm	4.4	9.0
3000rpm	3.6	7.7



### Current at 90°C temp rise, in Ampere rms

Duty cycle	100%			25%		
	Pa	Ma	Fa	Pa	Ma	Fa
locked rotor	3.4	6.3				
100rpm	3.9	7.4	47	7.8	14.7	94
1000rpm	3.8	7.2	46	7.6	14.4	91
3000rpm	3.3	6.3	40	6.9	13.0	83

Data were measured on an HSM 09N-Pa series motor mounted on a vertical 260 x 200 x 12 mm aluminum plate in free air, with a winding temperature rise of 90°C and driven by a commercially available inverter.

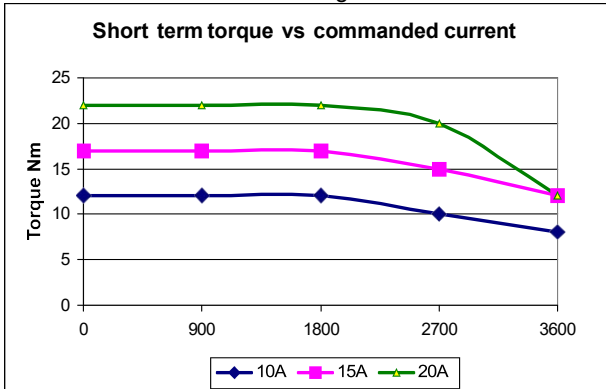
Data for Ma windings were calculated.

### Important note on peak torque and currents

The HSM motors are capable of high peak torques. At very high peak torques the permitted pulse time is very limited as a high current in a very small motor causes rapid temperature rise in the copper winding. The protection thermistor will not react fast enough to protect the winding during high pulse loads. A 20A rms current to a HSM09N-Pa will give some 23.3 Nm, but the copper winding temperature will increase with some 42°C per second. This is not a problem for short pulses of < 0.5 seconds as long as the rms value of the current is kept below some 3.3 A. The short term torque graph below represents acceleration ramps at various commanded currents; the actual currents are lower as the driver has not been able to compensate for the high acceleration.

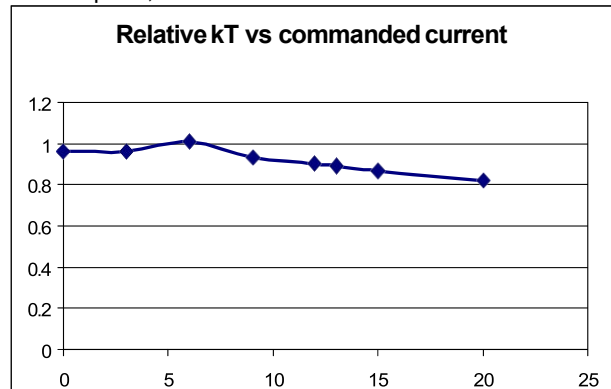
### Torque at various commanded currents

HSM 09N-Pa at 560V rail voltage



### kT derating factor

Low speed, HSM 09N-Pa



### Maximum load on shaft at life expectancy 20,000 h

Maximal axial load (push): 1600 N at 500 rpm, 650 N at 3000 rpm.

Maximal axial load (pull): 50 N at all speeds.

Maximal radial load is given by the curves below.

