

## HDD 09Q Data sheet

### Electrical data

| Value                              | unit   | Pa winding |
|------------------------------------|--------|------------|
| Number of poles                    |        | 20         |
| Number of pole pairs               |        | 10         |
| Inductance/Phase                   | mH     | 2.7        |
| Resistance/Phase                   | Ohm    | 1.0        |
| Resistance/Phase-phase             | Ohm    | 2.0        |
| Back EMF/Phase-Phase RMS           | Vs/rad | 0.76       |
| Back EMF @ 1000 rpm                | V      | 80         |
| Torque constant (RMS)              | Nm/A   | 1.32       |
| Max rail voltage                   | V      | 750        |
| Recommended peak current           | A      | 18         |
| Torque at recommended peak current | Nm     | 18         |

For higher torques, see next page. The torque constant is defined as the back EMF; friction losses are ignored. Back EMF standard deviation is about 2%; the range -6% to +6% should thus include 99.7% of the motors. Data are based on a sample of over 2000 motors.

### Mechanical data (resolver feedback)

| Value | unit              | HDD09Q<br>no brake | brake |
|-------|-------------------|--------------------|-------|
| J     | kgcm <sup>2</sup> | 8.8                | 9.2   |
| Mass  | kg                | 4.7                | 5.3   |

### Holding brake

|         |                   |     |
|---------|-------------------|-----|
| Torque  | Nm                | 9   |
| J       | kgcm <sup>2</sup> | 0.4 |
| Voltage | VDC               | 24  |
| Power   | W                 | 12  |

### Insulation class

The insulation system complies with the requirements of EEC LV Directive 73/23/EEC and 93/68/EEC. Test report E991111E01.

### 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 |
|------|-------------|---------------|---------|----------|-----------------|-------|-----------|---------|
| HDD  | 09          | Q             | - Pa    | - A      | - A             | - A   | - A       | - AAA   |

**Type** HDD = shaft motor, ICM = internal coupling motor.

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

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

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

**Feedback** See the feedback list on [www.hdd.se](http://www.hdd.se)

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

**Brake** A = no brake, D = holding brake. Data see above.

**Shaft key** A = shaft with keyway (standard), B = shaft without keyway.

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

### HDD Servo Motors AB

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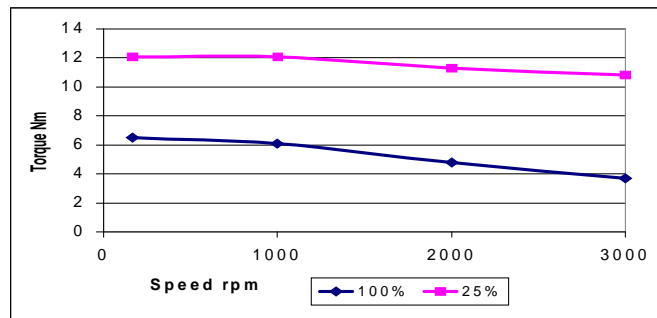
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## Torque at 90°C temp rise, in Nm

| Speed   | Duty cycle |      |
|---------|------------|------|
|         | 100%       | 25%  |
| 100rpm  | 6.5        | 12.1 |
| 1000rpm | 6.1        | 12.1 |
| 2000rpm | 4.8        | 11.3 |
| 3000rpm | 3.7        | 10.8 |



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

| Winding | Duty cycle |      |
|---------|------------|------|
|         | 100%       | 25%  |
| 100rpm  | 5.3        | 10.7 |
| 1000rpm | 4.8        | 10.4 |
| 3000rpm | 3.0        | 9.6  |

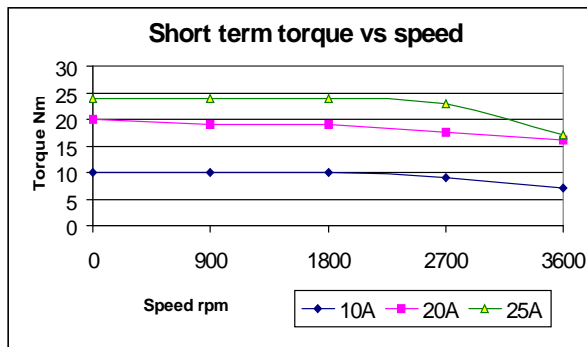
Data were measured on an HDD 09Q-Pa series motor mounted on a vertical 260 x 200 x 12 mm aluminum plate in free air, with a winding temperature rise of 90°C and driven by a commercially available inverter.

## Important note on peak torque and currents

The HDD motors are capable of high peak torques. The coupling inside the ICM is however limited to 15 Nm peak. 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 25A rms current to a HDD09Q-Pa will give some 24 Nm, but the copper winding temperature will increase with some 28°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 5 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.

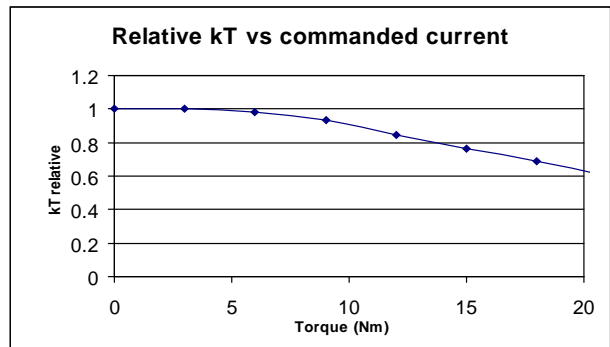
## Torque at various commanded currents

HDD 09Q-Pa at 560V rail voltage



## kT derating factor

Low speed, HDD09Q-Pa



## Maximum load on shaft at life expectancy 20,000 h (shaft motors only)

Maximal axial load (push): 350 N at 500 rpm, 100 N at 3000 rpm. Maximal axial load (pull): 50 N at all speeds.

Maximal radial load at zero axial load is given by the curves below. For special cases please contact HDD for calculations.

