



Figure 1 : Directional Drilling

## Brushless DC motors for down hole and directional drilling.

The recovery of petroleum and natural gas requires constant innovation and improvement of technology. This technology used for deep drilling processes are exposed to extreme environmental conditions. Temperatures of 200+°C, high pressure and extreme shock and vibration. Brushless DC motor technology from maxon motor is utilized in various drilling applications, hydraulic valve control, communication mechanisms and measuring instrumentation.

Today over 85 percent of the world's energy use is based on fossil fuel sources such as coal, oil and gas. However, reaching these resources requires the need to drill deeper than ever before which is not a simple exercise. Down hole deep drilling equipment opens the possibility of recovering resources from depths greater than 2.5km. Recent developments allowing down hole drilling equipment to be directionally controlled has given access to formerly inaccessible oil reserves. Now drilling to 5km down and 11km across is even possible.

Extremely tough environmental conditions are commonplace globally for drilling equipment, the demands on the drill head in particular are at their highest. Brushed and brushless DC motors need to withstand the intense vibration, pressure and heat. The heavy duty brushless DC motor range produced by maxon motor are not only designed for but are rated and tested to meet these conditions. Combined with new electronics technology they allow for improved control and monitoring of drilling procedures.

### Mud flow power and more.

Using magnetic couplings a back driven motor becomes a generator. Using the mud flow for the drill turbine the brushless DC motor power is then harnessed for localized electronics in the drill head avoiding the need for batteries. The drill head position can also be detected and adjusted on the fly. This process is

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driven by precision

called Measurement While Drilling (MWD). This technology converts sensor data into pulses that are transmitted to the drilling platform. maxon heavy duty motors can actuate the mechanism, forming the communication pulses. maxon heavy duty DC motors also actuate hydraulic valves within the drill head.

maxon heavy duty motors are also available with corresponding gearboxes. The gearboxes are manufactured with the same extreme operating environments in mind. The applications typically require elevated torque for very low duty cycles. For example: Generating the mud pulses and actuating the hydraulic valves. A unique feature of the heavy duty gearbox is the through holes in the gear housing. These are ports that allow the gearhead to be submerged in oil and they facilitate the possibility for oil to circulate through the gearbox and provide elevated heat-sinking. The heavy duty DC motor also contains the oil ports and may also be used submerged in oil or in free air. The gearmotors are manufactured entirely without structural adhesives giving it the capability of withstanding extreme temperatures. This is also of particular importance when using the motor in vacuum conditions avoiding the contamination of the vacuum via outgassing. The heavy duty motor range is designed to withstand temperatures over 240°C at pressures up to 1,733 atmospheres. They can withstand vibrations to 25 Grms, impacts to 100 G.

### High efficiency DC motors at great depths

The maxon heavy duty motor range features efficiencies of up to 88% in air and over 70% submerged in oil. This makes it an ideal solution for any extreme environment such as aerospace and heavy industry. They have zero cogging making them easy to control and suitable for precise positioning.

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Application report: 3308 signs, 610 words

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Figure 3: Heavy Duty Brushless DC Motor. © 2012 maxon motor



Figure 2: Heavy Duty Gearbox. © 2012 maxon motor