

INFORMATION WHERE YOU NEED IT: AT-THE-BIT

Gunnar Energy's Torped™ Active Magnetic Ranging system provides real time ranging data at the bit, allowing for maximum directional drilling control for your wellbore intersect or collision avoidance challenges.

The Torped™ magnetic bit sub is installed between the bit and bit box of the motor or RSS, and generates a magnetic field that does not interfere with the MWD, but can be readily detected by the Torped™ wireline receiver in the offset wellbore. Taking advantage of industry leading sensor performance and signal processing techniques, the Torped™ system delivers the greatest range and precision of any comparable system on the market today, thereby guaranteeing the highest probability of a successful first-time intersection.

ENABLES ANY DIRECTIONAL DRILLING ASSEMBLY

The Torped™ system does not require electrical or communications integration with any downhole MWD or RSS system. This allows for the seamless deployment of the system with the customers' chosen directional drilling service provider while avoiding costly integration or compatibility concerns. Vendor neutral characteristics of the Torped™ system include:

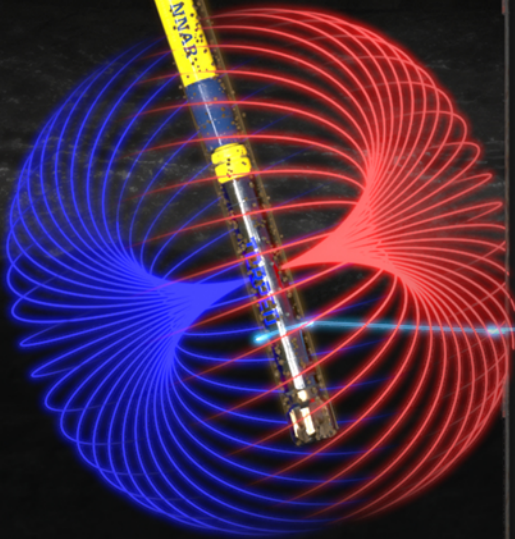
- MWD/DD professionals of any vendor can be quickly trained to operate the system independently, thereby eliminating the need for additional personnel on location

- Various and custom magnet sub sizes allow for the deployment of the Torped™ system in virtually any BHA

- Proprietary software automatically interprets the ranging data and generates a new well plan to intersect or avoid a target well, an industry first.

GYRO COMPATIBLE FOR VERTICAL INTERSECT APPLICATIONS

The Torped™ system is compatible with Gunnar's gyro module, which can be installed in combination with the receiving sensor for vertical cased hole intercept applications. The Gyro Module is fully compatible with the Torped sensors' communications protocol, allowing the magnetic receiver/gyro assembly to be run on mono-conductor wireline, an industry first.



GENERAL SPECIFICATIONS

| | |
|---|---|
| MAX OD | 1.875 in [47.6 mm] |
| MAX TEMPERATURE | 347°F [175°C] |
| MAX PRESSURE | 15,000 psi |
| LENGTH (with fishing head) | 79.15 in [2.01 m] |
| DETECTION RANGE (with receiver in casing) | 275 ft [84 m] |
| DISTANCE ACCURACY | 3% |
| DIRECTION ACCURACY | 5° |
| WIRELINE COMPATIBILITY | Mono-conductor |
| CONNECTION | 1 - 3/16 in 12 GO |
| MAGNET SUB SIZES | 8 in, 6.5 in, 4.75 in |
| GYRO LENGTH | 46.125 in [1.17 m] |
| GYRO OD | 1.875 in [47.6 mm] |
| SUB LENGTH (4.75 in) | 26 in [0.66 m] |
| SOFTWARE | Proprietary software automatically generates a new intersect well plan after each ranging shot, an industry first |

FIT FOR PURPOSE APPLICATIONS

Wellbore Intercept

- Coal Bed Methane Intersection
- Closed Loop Geothermal
- Horizontal Directional Drilling (HDD) Guidance and Intersections
- Solution Mining
- Enhanced O&G Recovery

Relative Wellbore Spacing

- Collision Avoidance
- SAGD - Wellbore Twinning
- Lateral to Lateral positioning

UNRESTRICTED USE - ANY APPLICATION, ANY LOCATION

The Torped™ system can be deployed in geothermal, civil, mining, construction, and oil and gas projects alike. Without restrictions or limitations of use, any directional drilling service provider can now perform accurate, repeatable, long distance magnetic ranging at a location of their choosing worldwide.