

Turbine Dynamics



Down Hole Power and EM Telemetry

“Performance beyond Expectation”

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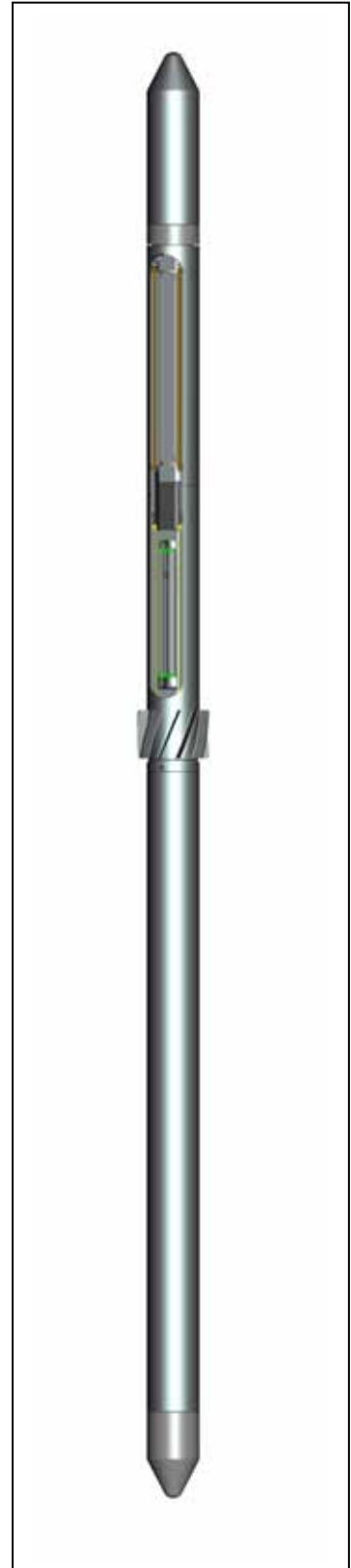
100 Watt Turbine Alternator Specification.

Our 100 Watt closed loop turbine alternator is the World's first self regulating down hole generator that combines high power and high temperature performance within a low volume package for the most demanding MWD/LWD environments. Aimed at complementing and/or replacing lithium battery stacks, this turbine generator embodies entirely new technology to dramatically improve current levels of build, reliability and performance for the 21st Century drilling market. Unlike any other development in this field, this instrument provides a clear route for 350°F (175°C) and 392°F (200°C) MWD/LWD tools including a 100 Watt EM Telemetry tool capable of working along side existing EM Telemetry systems to improve range, data rate and down hole service time. Initially configured for 4¾ inch collars, the alternator can be easily adapted for other collar sizes and flow conditions. Detailed flow loop reports are available from our web site.

Basic Machine:

Mechanical:

Tool Length = 44.1 inches (1120mm)
Tool Width = 2.165 inches (55mm)
Weight = 31 lbs (14Kg)
Impeller OD = Test results available from 2.6” to 2.95” impellers.
(Impeller OD can be changed to suit the customer’s application)
Collar OD = Typically 4-3/4 inches.
Collar ID = Typically 2-13/16 inches.
(Collar ID can be changed to suit precise customer configuration.)



Environmental:

- Pressure Rating = 25,000 Psi
- Max Temperature = 302°F (150°C at full power. 175°C under development)
- Operating temperature = -6°F < Temp < 305°F. (-21°C < T < 151°C).
- The maximum rate of change of temperature shall be 9°F (5°C) per minute.
- Survival temperature = 392°F (200°C) not operating.
- Fluids = Water or Oil based Muds.
- Other fluid types and density may be subject to impeller design considerations.
- 4-3/4" Flow rate = Up to 600GPM. (See test reports for details)
- R&M Period = 350 Hours minimum @ 302°F (150°C)
- Qualifying Vibration = 20g for two hours per axis.
(Swept sine from 30Hz to 500Hz)
- Alternatively, the unit shall survive a random vibration test of 20g for two hours per axis at 0.8g² per Hz from 30Hz to 500Hz.
- Shock = Three shocks per axis, 1000g, 0.5ms half sine.

Electrical:

- Output Power = 100 Watts, Closed Loop Controlled and Regulated.
= 200 Watts Open Loop (Unregulated)
- Output Voltage = 30VDC (Typical but programmable for any Vout)
- Output Ripple = 2Vrms (Full load max.)
- Output Current = 3 Amps DC (max)
- Thermal Shutdown = 320°F (160°C) (min)
- Through conductors = Up to 8 available end to end for customer signals.
- Connectors = Lemo 19 Way max.
(Other connectors available upon request)
- Defined Outputs = 30VDC, 0V, RPM.
- Speed = TTL(5V) RPM pulses proportional to speed.
- Battery Switching = Automatic via integral diode.

Servicing:

- Field Service Period = 350 Hours minimum @ 302°F (150°C)
- Field Service Components = Impeller & rotor/stator bearings.

Note: All quoted voltages are programmable and may be changed at the customer's request.



The Advanced 100 Watt Turbine Specification.

Advanced Machine: Includes low voltage digital & analogue regulator(s)

Mechanical:

Tool Length = 56 inches (1425mm max)
Tool Width = 2.165 inches (55mm)
Weight = 45 lbs (20Kg)
Impeller OD = Test results available for 2.8 inch & 2.95 inch impellers
(Impeller OD can be changed to suit the customer's application)
Collar OD = Typically 4-3/4 inches.
Collar ID = Typically 2-13/16 inches.
(Collar ID may be changed to suit precise customer configuration.)

Environmental:

Pressure Rating = 25,000 Psi
Max Temperature = 302°F (150°C at full power. 175°C under development)
Operating temperature = -6°F < Temp < 305°F. (-21°C < T < 151°C).
The maximum rate of change of temperature shall be 9°F (5°C) per minute.
Survival temperature is 392°F (200°C) not operating.
Fluids = Water or Oil based Muds,
Other fluid types and density may be subject to impeller design considerations.
4-3/4" Flow rate = Up to 600GPM. (See test reports for details)
Qualifying Vibration = 20g for two hours per axis.
(Swept sine from 30Hz to 500Hz)
Alternatively, the unit shall survive a random vibration test of 20g for two hours per axis
at 0.8g² per Hz from 30Hz to 500Hz.
Shock = Three shocks per axis, 1000g, 0.5ms half sine.

Electrical:

Output Power = 100 Watts, Closed Loop Controlled and Regulated.
= 200 Watts Open Loop (Unregulated)
Output Voltage 1 = 30V DC (Typical but programmable for any Vout)
Output Ripple = 2Vrms (Full load max.)
Output Current = 3 Amps DC (max)
Thermal Shutdown = 320°F (160°C) (min)
Output Voltage 2 = 5V, 1A, 5 Watts @ 302°F (150°C) operating.
Thermal Shutdown = 320°F (160°C) (min)
Output Voltage 3 = ±12V, 200mA, 5 Watts @ 302°F (150°C) operating.
Thermal Shutdown = 320°F (160°C) (min)
Through conductors = Up to 5 available end to end for customer signals.
Connectors = Lemo (Other connectors available upon request)
Defined Outputs = 30V, ±12V, 5V, 0VA, OVD, RPM.
Speed = TTL(5V) RPM pulses proportional to speed.
Battery Switching = Automatic via integral diode.

Servicing:

Field Service Period = 350 Hours minimum @ 302°F (150°C)
Field Service Components = Impeller & rotor/stator bearings.



A Brief Technical Description of the Turbine Alternator.

The Turbine Dynamics closed loop alternator is a fundamental redesign of the tried and tested open loop MWD/LWD alternator used by Oil field service companies throughout the World. Nikola Tesla was the first person to recognise the importance of AC electrical machines, patenting the first multiphase rotating machine in 1888. By fusing the principles of AC generators and motors, a new self regulating and self compensating source of down hole electrical power has been created which retains all the existing MWD & LWD operational advantages with none of the disadvantages of existing open loop turbine alternators.

Our machine uses an induction brake to close the loop around a standard multiphase alternator, thereby eliminating all the disadvantages of a conventional open loop mud alternator whose output voltage is entirely at the mercy of flow rate and impeller characteristics. Closed loop control employed by our patented technology makes our turbine independent of flow rate and provides a constant voltage regardless of flow conditions or load. It regulates the output voltage with no moving parts, other than the rotor and a simple electronic regulator decides when to apply the brake and how much impeller torque to release, allowing only enough torque for voltage regulation and electrical power production.

This principle means that much higher power machines can be built with safety and confidence because there is far less reliance upon the electronics in the regulation process, a known weakness in high power and high temperature drilling environments. DC power is derived directly from the alternator's full wave rectification diodes and not through the electronic regulator as is the case with a conventional open loop machine. This feature allows us to build much more powerful alternators that can maintain their performance even in very hot Wells and against very aggressive drilling environments. Our closed loop design is therefore far more robust and reliable because it is less dependent upon the series electronic regulators that, to date, have limited MWD/LWD alternator performance and development.

Closed loop design also means better control over batch to batch manufacturing variations and more predictable wear and tear characteristics. This means that the flow characteristics of every new alternator is virtually indistinguishable from another and as they wear in service, full performance is maintained for longer periods due to the automatic compensation built into the design.

In an under balanced drilling environment where the continuity of mud density cannot be guaranteed, our turbine alternator automatically and dynamically compensates for changing drilling conditions makes this product unique amongst its peers. No other tool can alter its own speed characteristics 'on the fly' against a highly variable down hole drilling environment. Only our turbine alternator can do this and more. For more information, please see our web site or call to discuss your requirements. www.turbinedynamics.com

