



## WIND TURBINE: Pressure & Temperature Sensor Solutions!

*Paine Electronics offers a wide selection of pressure and temperature sensing solutions designed to help build and maintain a comprehensive real-time measurement system, enabling wind power utilities and private organizations the ability to continuously monitor their assets and to constantly assess their systems performance by building in dynamic operational and safety features.*

<http://www.paineelectronics.com/energy.htm>

Today's computer-based wind turbine control systems monitor, process and communicate to a wide network of pressure and temperature sensors, helping to ensure optimal turbine performance and safety. Within this networked maze of pressure and temperature sensors, Paine provides pressure and temperature measurement solutions, with many protocols and outputs (*Programmable Digital, 4-20mA, VDC, mV/V & more...*) to support the signals that are monitored by these control systems. Signals that help make split second decisions such as adjustments to valves for pitch and yaw, hydraulic pressure measurements for pumps to control rotation and/or direction, to temperature measurements for advanced emergency breaking safety systems.

Paine's strength in supporting these measurements is based on our innovative proprietary sensing technology providing the rapid and highly accurate detection of changes in the toughest, most remote applications. In particular, our sensors help wind turbine control systems operators, compare, analyze and control hydraulic data against defined operational performance requirements (e.g., min and max pressures or temperatures), by either confirming normal system performance or helping to identify abrupt changes that may fall outside normal operating ranges.

For example, low pressures, caused by failure of a pump or valve, may lead to the inadequate supply and pressure to accumulators or, in extreme cases, may cause complete system failure to pitch systems. High pressures and/or high temperatures may intensify wear on valves, pumps and rotational shafts that may also cause additional failures within subsequent subsystems. Similarly, changes in pressure within the hydraulic distribution system as a result of high pressure may help to detect valve and/or pump operation problems. Maintaining pressure and system temperature levels within reasonable ranges helps to ensure both reliable operation and safety.



Designed to operate in the toughest environments, our **DIGITAL** sensors represent a significant advancement in how effectively operators can monitor information more accurately. By enabling the rapid detection of hydraulic and temperature changes as well as abnormal hydraulic conditions, our state-of-the-art **DIGITAL** sensing technology can add tremendous **VALUE** in managing your wind turbine control systems by more efficiently providing rapid, **ACCURATE** information to enhance operational performance, reduce possible failures, lower operational and maintenance expenses, increase system and information quality, optimize system performance and increasing overall system integrity.



## Typical Applications:

- Hydraulic measurements of high pressure pump oil flow (pitch controls / blade angle positioning).
- Active hydraulic power braking pressure and temperature measurements.
  - *Active brakes are hydraulic pressure applied systems used for stopping and holding.*
- Hydrostatic transmission pump pressure.
- Accumulator pressure measurements.
  - *To stop the pitch system of the wind turbine in case of a system failure pressure sensors are used to monitor this pressure. The pitch system requires a very specific level of pressure in the accumulators to move the rotor blades to the 0° or safe position before stopping in the event of a failure.*
- Cooling system pressure and temperature measurements.
  - *In order to cool and lubricate generators, gearboxes and generators, pressure monitoring of the water and internal lubrication for cooling is required.*
- Gearbox temperature monitoring.
  - *The main gearbox of a wind turbine usually consists of enclosed planetary gears. One very important sensing parameter during operation is the gearbox oil temperature.*
- Generator temperature measurements.
- Bearing, Motor & Shaft temperature measurements.

**Visit our website for our complete line of pressure, temperature and combination solutions: <http://www.paineelectronics.com/energy.htm>**

**NEED A CUSTOM DESIGN?** We have designed pressure and temperature measurement solutions since 1951 for more unique requirements than we can count. Drawing from thousands of top-level designs, we can customize or modify an existing product or design and manufacture a completely new one to fit your needs. With your **IMAGINATION** and our design team, **ANYTHING IS POSSIBLE!**

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