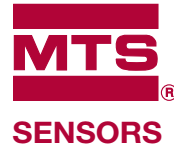


Liquid-Level Sensors

with Temposonics®
Magnetostrictive Technology



550673 C

Liquid Propane Gas Applications Idea



The application problem

A regional gas utility had to dramatically cut costs through the use of automation at their gas distribution terminal. All pertinent information was data linked via a DCS system to an operations center located remotely from the distribution terminal. The primary requirements the customer had for this application were:

- Level and temperature measurement
- High degree of accuracy
- Installation through existing tank ports
- Ease of maintenance without interruption of vessel integrity

The customer needed to accurately measure changing levels of propane in their tanks under varying seasonal temperatures. Temperature measurement was needed on each tank in order to calculate standard volume under all climactic conditions.

Since this application involved existing pressurized vessels, minimal intrusions into the tank were preferred. The customer desired one measuring device to measure both variables (product level and temperature), reasoning that fewer process connections allowed for less chance of leakage and would eliminate the need for reworking the tank.

The customer required a gauge that was easy to maintain without removing the vessel from service. This was important due to the long periods between tank down time due to the extended heating fuel season.

The liquid-level sensor solution

The customer chose the MTS level MR analog gauge as the best solution. The gauge features:

- Dual-loop gauge with HART® communications
- Dual-cavity explosion-proof enclosure
- 180 in. rigid sensor pipe with a 4 in., 150 lb welded flange process connection and a critical service float

This MTS level gauge measures level and temperature simultaneously in one gauge and outputs these values via the 2 independent analog output channels or via HART communications. The critical service float is designed for applications which require a long service life without access to the float. An RTD (Resistive Temperature Device) is incorporated to measure temperature.

The dual-cavity explosion-proof enclosure allows easy access to wiring for installation and troubleshooting without opening the electronics side of the enclosure.

The contained sensor pipe and user-replaceable magnetostrictive sensor cartridge and electronics allow instrument technicians to perform service or maintenance without violating vessel pressure integrity.

MTS level gauges use magnetostrictive technology, ensuring high accuracy and minimizing the need for scheduled maintenance or recalibration.

All specifications are subject to change. Please contact MTS for specifications that are critical to your needs.

Part Number: 05-05 550673 Revision C
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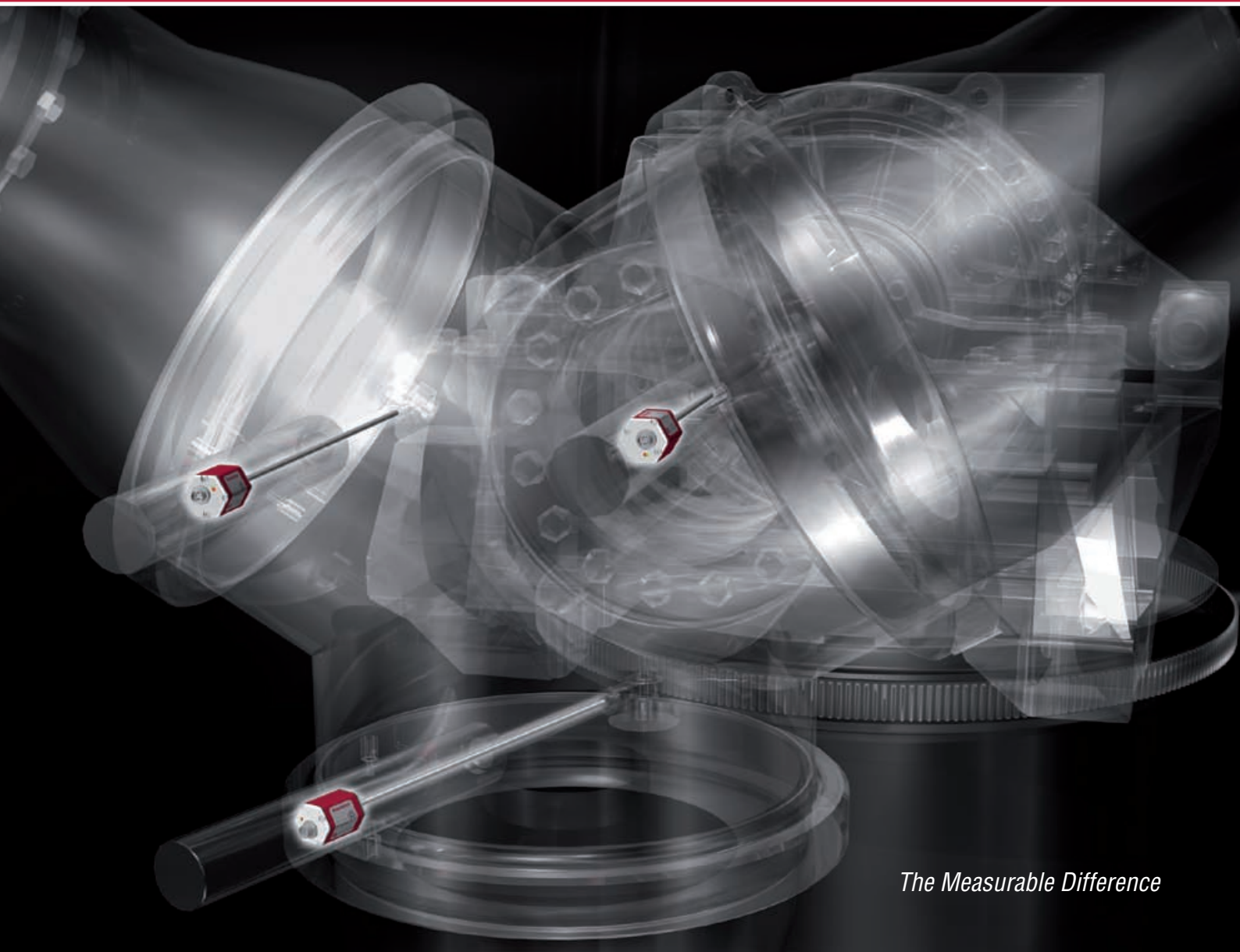
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Temposonics[®]

Absolute, Non-Contact Position Sensors

Wind Energy

Sensors for precise and reliable position measurement – *Successful where others fail*



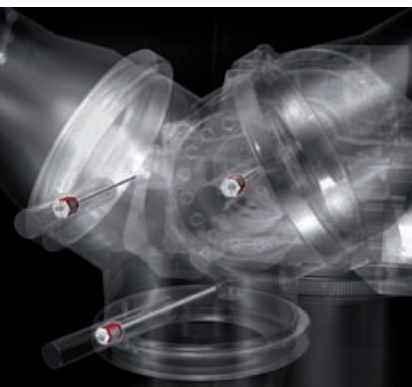
The Measurable Difference

It's a question of efficiency

An important part of wind turbines is the hydraulic pitch control. Whenever the wind velocity and direction change, the pitch control adjusts the angle of the rotor blades by a few degrees to maximize the output for all wind speeds. When the wind velocity exceeds the maximum permissible generator output, the blades are adjusted away from the optimum position to reduce the aerodynamic efficiency and maintain constant rotation. Conversely, the blades are turned back into the wind whenever the wind speed drops again.

Actively controlling the rotation speed not only enables peak efficiency but also reduces the stress on the rotor, the tower and the foundation for increased safety and longevity.

Temposonics® sensors are used for the position feedback in the closed loop control for the pitch of the rotor blades. They measure position with high accuracy even under harsh environment that wind turbines operate in with tremendous aerodynamic forces and continuously changing wind conditions. They guarantee reliable operation and functionality in the difficult maintenance situations of wind turbines due to rotor height or the challenging climatic conditions of offshore turbines. MTS Sensors has decades of experience in delivering high-performance, high-quality sensors.



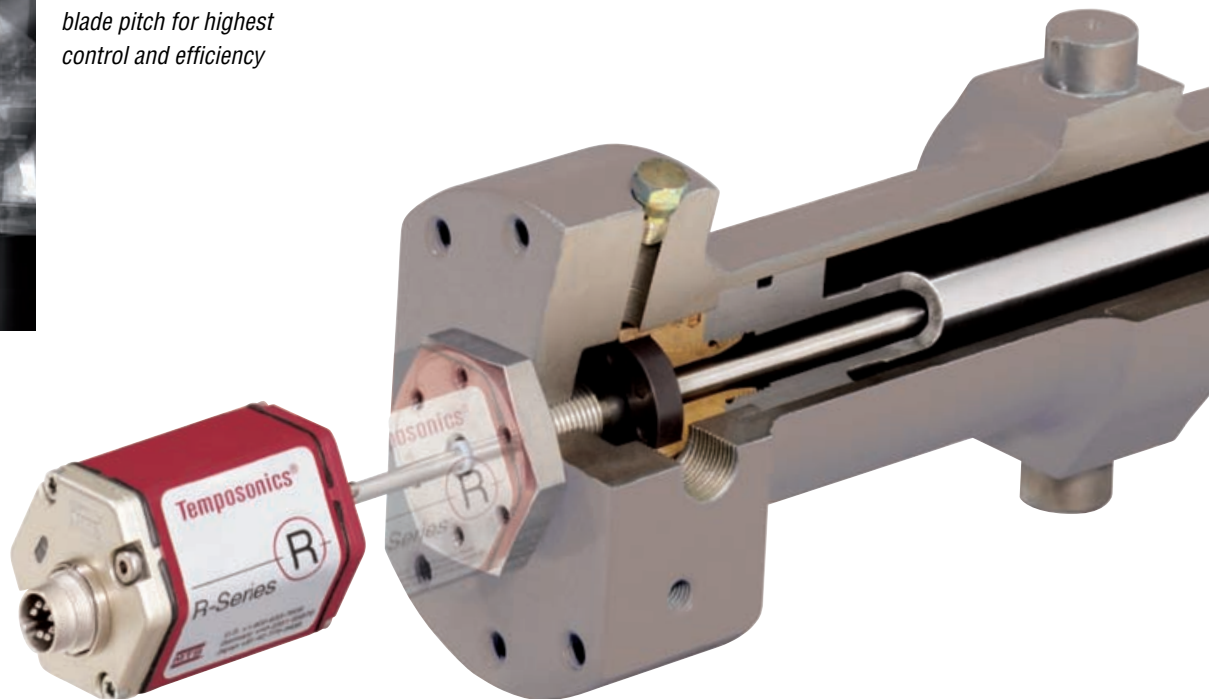
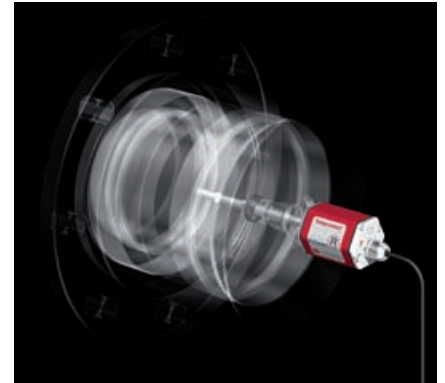
Absolute position feedback of the rotor blade pitch for highest control and efficiency

Rotor locks

To ensure highest safety during maintenance, locking cylinders keep the rotor blades of wind turbine stationary and positioned precisely. The extending and retracting movement of the locking bolt makes the wind turbine lock and unlock.

The detection of locking/unlocking position can be monitored with MTS position sensors.

Position measurement in rotor lock cylinders for maximum safety



Electronics & sensor element easily replaceable

Sensors for wind turbines

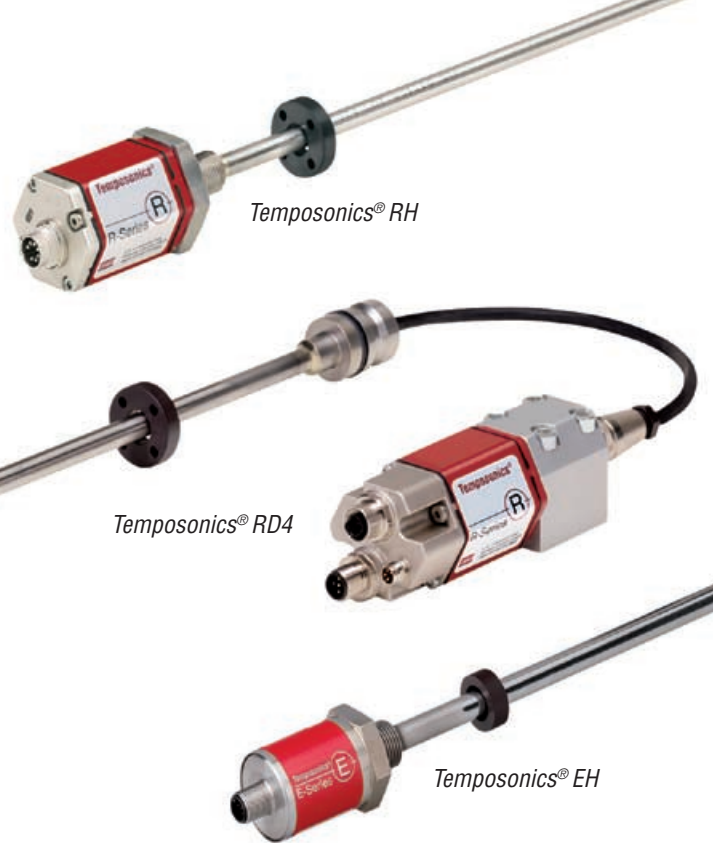
Temposonics® RH: High-performance sensor for in cylinder-integration

Temposonics® RD4: Detached electronics for space limited mounting

Temposonics® EH: Compact cost-efficient solution for general purpose applications

Main features:

- Unmatched tolerance to shocks and vibrations
- Best immunity to EMC
- IP67 (RH, RD4), IP69K (EH) ingress protection
- Linearity $< \pm 0.01\%$ Full Scale
- Repeatability $< \pm 0.001\%$ Full Scale
- Update time up to 10 kHz
- Operating temperature -40°C to 75°C



Benefits for wind turbines

Relating to the difficult maintenance conditions Temposonics® sensors offer several benefits:

● **Absolute, non-contact sensing with highest quality**

Temposonics® sensors are wear-free over years and measure without rehoming. This implies reduced maintenance expenditure and increased availability

● **Highest reliability and high precision**

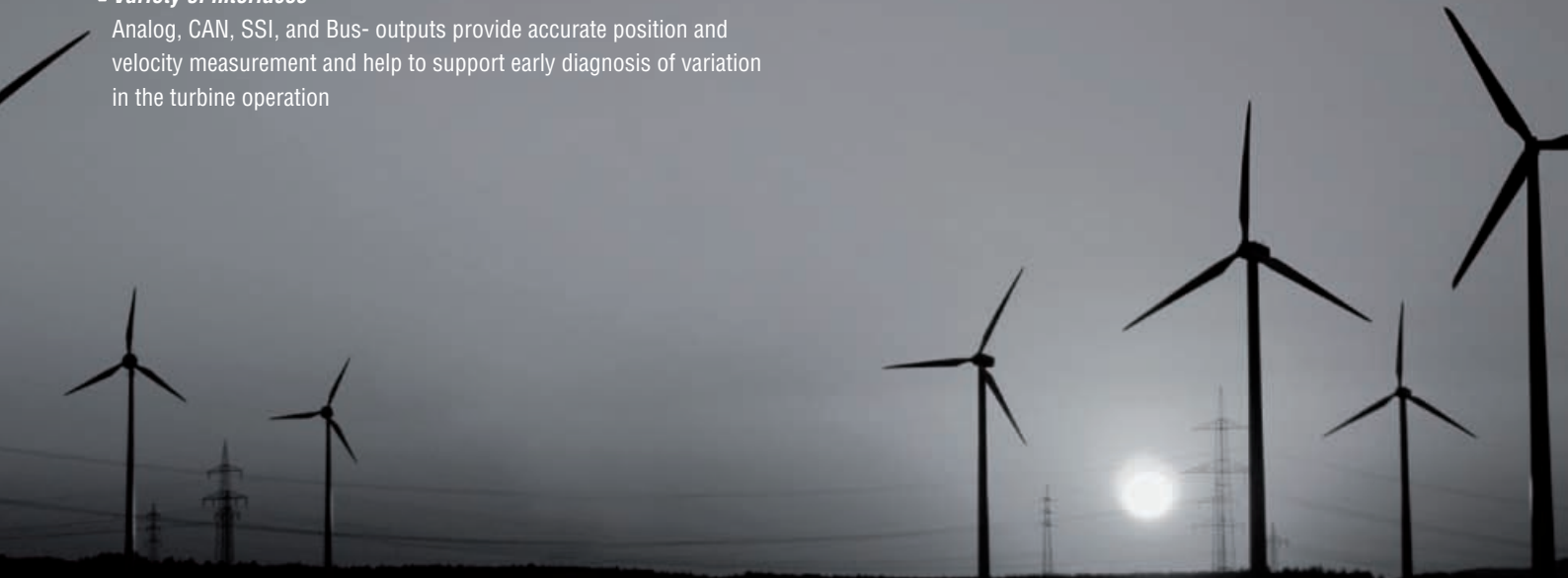
Their unmatched tolerance to shock & vibrations makes Temposonics® sensors first choice to the challenging environment of the wind turbines and guarantee highest control and efficiency

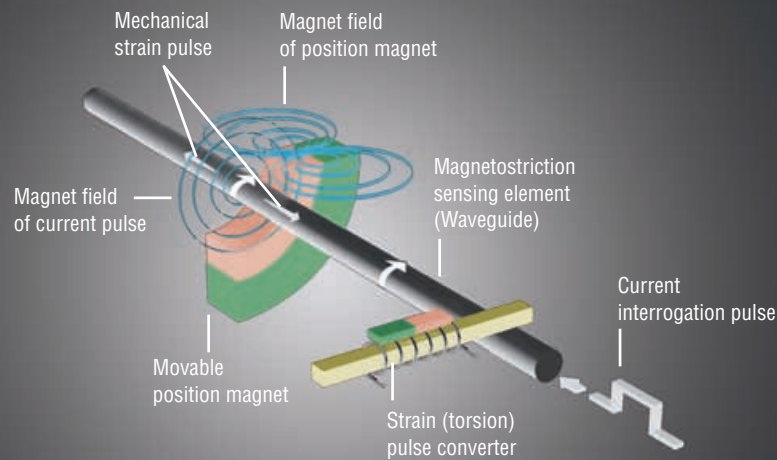
● **Modular, environmentally friendly design**

Replacement of the sensor cartridge (electronics and sensing element) without breaking the high-pressure seal is enabled

● **Variety of interfaces**

Analog, CAN, SSI, and Bus- outputs provide accurate position and velocity measurement and help to support early diagnosis of variation in the turbine operation





The magnetostrictive principle

The best linear position sensors provide absolute position measurement resulting in higher productivity and greater safety for machine and automation devices. MTS Sensors linear position sensors outperform the competition, deliver accuracy and reliability under the most difficult conditions, resulting in excellent value for our customers. Our success is due to 35 years of technology leadership, vertically integrated manufacturing processes and unsurpassed levels of support. MTS Sensors was the first to realize the promising advantages for linear position measurement contained in the magnetostrictive measuring principle developed by J. Tellermann. Tellerman's original design, was used to develop Temposonics® brand sensors: the first magnetostrictive position sensors, a technology which guarantees precision and reliability without equal.

Inside the sensor a torsional strain pulse is induced in a specially designed magnetostrictive waveguide by the momentary interaction of two magnetic fields. One field comes from a moving magnet, which passes along the outside of the transducer tube, and the other field is generated from a current pulse which is applied to the waveguide. The interaction between these two magnetic fields produces a strain pulse which travels at sonic speed along the sensor waveguide, until the pulse is detected at the head of the transducer. The position of the moving magnet is precisely determined by measuring the elapsed time between the application of the current pulse and the arrival of the strain pulse. As a result, MTS Sensors is able to create a reliable position measurement system that is capable of providing an accurate and repeatable measurement.

Service

- Technical and application support
- Start up support
- Onsite service
- Online or onsite customer training
- 3D-drawings for download

Temposonics® Hotline: +49 2351 9587-6000

Mo-Fr 8 am – 7 pm

Sa 8 am – 12 pm

Wind Energy Flyer 10092012

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