

Temposonics®

Magnetostrictive, Absolute, Non-contact
Linear-Position Sensors



**Temposonics® MH-Series Sensors Enable the
Next Generation of Vehicle Steering Systems**

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MH-Series Model MH In-Cylinder*

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TECHNOLOGY ADVANCEMENTS

In the past few years, the agricultural industry has gained new tools that, even 20 years ago, would have seemed more like scenes from a science fiction movie than something found in the field. GPS-guided



agricultural equipment has quickly become the gold standard in large crop harvesting operations. These applications use real-time communication with satellites in geosynchronous orbit to guide equipment along extremely precise paths. The end results are better fuel efficiency and an assurance that the equipment is not missing crops or running across even inches of the same terrain.

Over compensation for lack of control, repeated during a prolonged period will result in inefficiencies that can lead to significant losses of production time and profits. The advancements of the past 15 years in GPS and new vehicle steering were possible thanks to several innovations in the industry. Advanced joystick and steer-by-wire systems allowed for greater vehicle control. The evolution of wireless satellite communication and related electronics played important roles as well.

These systems, however, would not meet the needs of the modern agricultural industry without the ability to reliably and consistently control every moving part of the steering system. This was accomplished through the use of advanced linear positioning sensors and electronics embedded into the vehicles' hydraulic cylinders.

The MH-Series sensors from MTS Sensors, are ideal for GPS and joystick controlled steer-by-wire agricultural machines due to several factors inherent in the technology and in-cylinder design, most notably:

-Durability. The sensors are designed to withstand the high shock and vibration levels typical in the off highway environment and are well protected when embedded inside the hydraulic cylinder.

-Accuracy and repeatability. Utilizing absolute, rather than incremental measurement, MH-Series sensors can provide accurate position feedback and do not lose their position or require recalibration when power is cycled.

-Environmental Resistance. These sensors are unaffected by Electro Magnetic Interference (EMI). Additionally, full integration into a sealed hydraulic cylinder means they are well protected against dust, water and other environmental factors.

Temposonics® MH-Series Sensors, embedded into sealed hydraulic cylinders, provide reliable and consistent linear position feedback to the steering control system, ensuring that the vehicle stays on course with considerably less maintenance cost and no recalibration requirements.

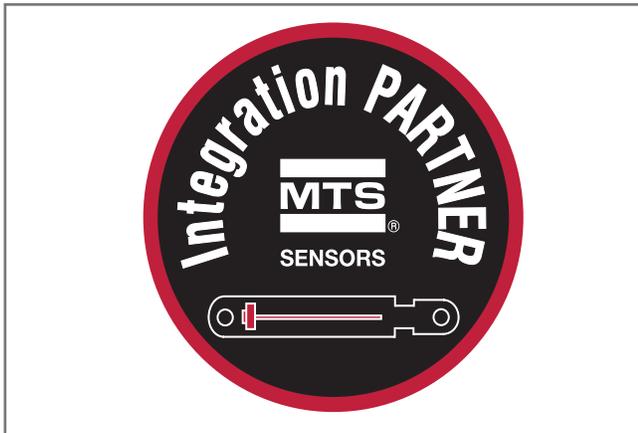
NEW CHALLENGES

The "Smart Cylinder" integration in these systems helped to drive innovation but met multiple roadblocks and challenges. Retrofitting designs and equipment required embedding sensors into existing cylinder and steering sub-systems – which were not optimized for these applications. While this enabled easier implementation of GPS and other advanced steering systems, it did not remove the need for complex mechanical adjustments and time-consuming steering alignments during assembly and service.

While the “Smart Cylinder” integration was a significant technological step forward, there was still a lot of room for improvement.

NEW SOLUTIONS

MTS Sensors has developed solutions that improve upon those past designs and directly address the issues experienced during assembly and service. Working with the cylinder manufacturers and Original Equipment Manufacturers (OEMs), different sub-systems have been reviewed and mechanical redundancies have been removed.



The next generation of steering systems is designed around the inherent benefits of the sensor, rather than relying upon less ideal retrofit solutions. One current focus point is in steering cylinders, where the alignment of the subsystem has historically been performed using a turnbuckle adjustment. Using the absolute positioning inherent in MH-Series sensors, the OEM can now perform a one-time calibration of the alignment, and the machine can utilize this value thereafter. This simplified alignment sequence lowers assembly cost and increases manufacturing throughput. The new alignment sequence offers the same benefits during service and maintenance operations as well.

The length required for the turnbuckle can now be used to provide additional cylinder travel. This additional travel could be used to reduce steering radius, or to improve the durability of the system by preventing the cylinder from bottoming out.



NEW VALUE

Today, these solutions are already found in many different agricultural machines, including the steering systems of tractors, combine harvesters, sprayers and any other equipment where the required level of precision necessitates that there is a closed loop feedback between the steering system and the GPS-enabled mapping software.

Innovations in the design, development and integration of advanced positioning sensors add value at every point in the manufacturing, maintenance and operational processes. The benefits extend to everyone in the chain, from OEMs, who are experiencing lower costs and more efficient installation methods, to the equipment owners, where precision steering and maintenance considerations are improving both their yield and reducing their operational costs.

For more information on MTS Sensors, please visit www.mtssensors.com or contact a local MTS representative.

**The linear position output from the sensor is processed by a steering Electronic Control Unit (ECU). The ECU translates the steering parameters provided by a joystick or GPS receiver mounted on top of the agricultural equipment. Due to the high resolution feedback from the magnetostrictive sensor, the ECU will always know the exact position of the steering cylinder. This allows for high speed, accurate and repeatable vehicle control at all times.*

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