

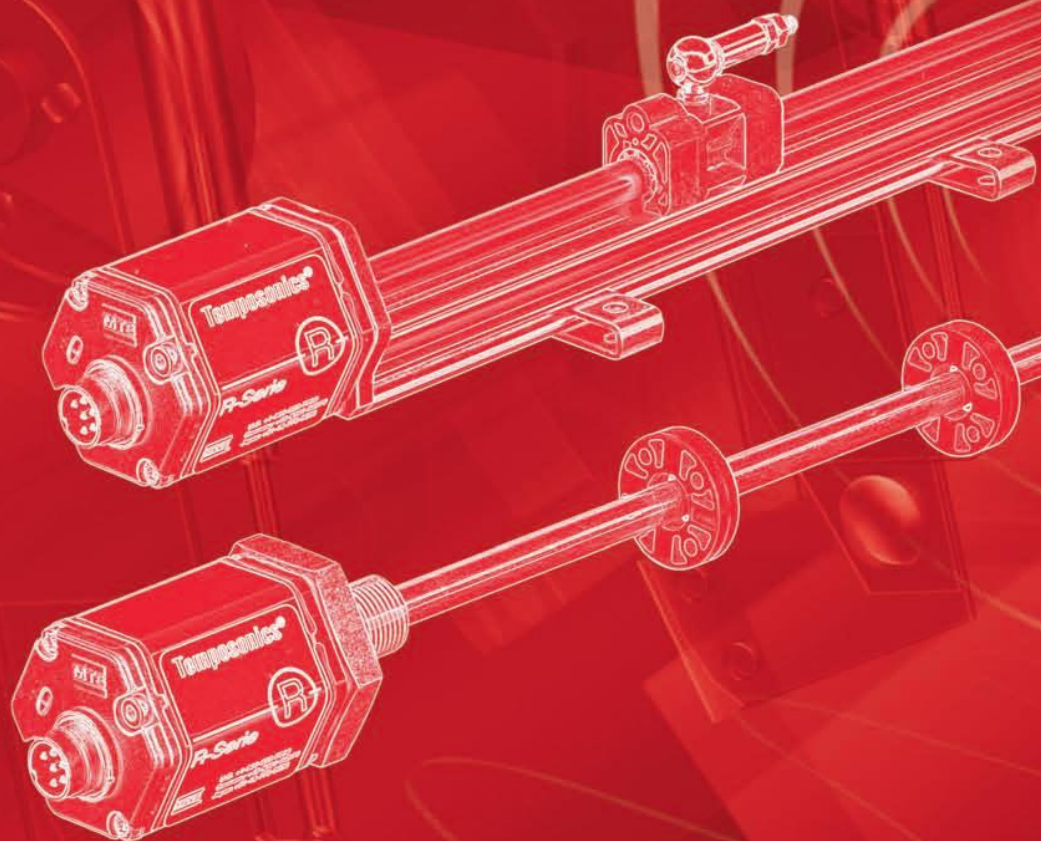
# Temposonics®



Magnetostrictive, Absolute, Non-contact  
Linear-Position Sensors

Document Part Number  
551075 Revision D

## Industrial Product Catalog

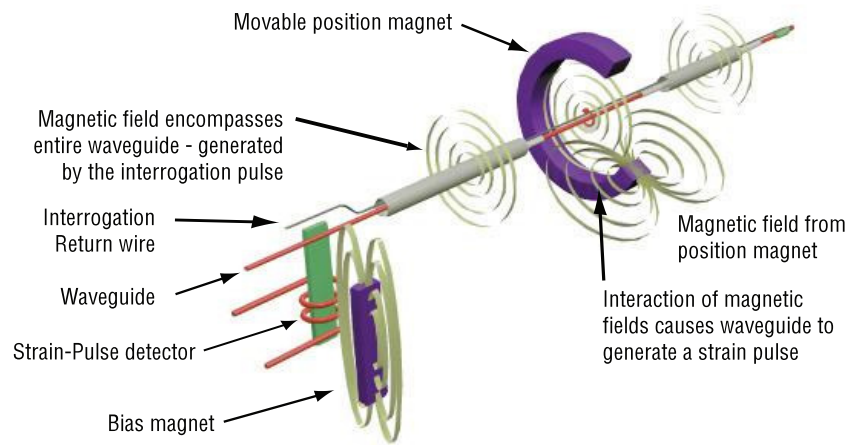


**Serving the Americas, Canada, Australia and New Zealand**

*The Measurable Difference*

# Magnetostrictive principle - Technology at its best

## Time-Based Magnetostrictive Position Sensing Principle



### Technology that guarantees precision and reliability

The best linear-position sensors provide absolute position measurement giving higher productivity and greater safety for machine and automation devices. MTS linear-position sensors outperform the competition, deliver accuracy and reliability under the most difficult conditions, providing excellent value for our customers. Our success is a result of more than 35 years of technology leadership, vertically integrated manufacturing processes and unsurpassed levels of customer 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. Tellermann's original design was used to develop Temposonics brand sensors: the first magnetostrictive position sensors, a technology that guarantees precision and reliability without equal.

### Magnetostriction - what it is and how it works

The heart of MTS sensors is the ferromagnetic measuring element, also known as the waveguide, and a movable position magnet that generates a direct-axis magnetic field in the waveguide. When a current or interrogation pulse passes through the waveguide, a second magnetic field is created radially around the waveguide.

The interaction between the magnetic field in the waveguide and the magnetic field produced by the position magnet generates a strain pulse which travels at a constant sonic speed from its point of generation, the measurement point, to the end of the waveguide where it is detected by the sensor electronics.

The position of the magnet is determined with high precision and speed by accurately measuring the time elapsed between the application of the interrogation pulse and the arrival of the resulting strain pulse with a high speed counter. Using the elapsed time to determine position of the permanent magnet provides an absolute position reading that never needs recalibration or re-homing after a power loss. Non-contact sensing eliminates wear, and guarantees the best durability and output repeatability.

With our extensive know-how of ferromagnetic materials, magnetic effects and time-based measurement processes, MTS remains unrivaled in performance standards for non-contacting position measurement of the highest precision.

## MTS Temposonics® linear-position sensors

### Technology Positioned for Cost-Effective, Accurate, Reliable Performance in Industrial Machine Control Applications

#### R-Series sensors

Rod and Profile-style sensors



#### G-Series sensors

Rod and Profile-style sensors



#### Flexible mounting options

Including external machine mounting or in-cylinder installations (hydraulic & pneumatic)



#### E-Series sensors

Economical Profile and Rod-and-cylinder style sensors



Whether you call them position transducers, linear-displacement sensors, distance or linear-position sensors, MTS Sensors provides the most reliable and accurate magnetostrictive position sensors in the world. Temposonics sensors are ideal for monitoring and measurement systems, for machine control involving hydraulic, pneumatic, electromechanical or even manual positioning in industrial or commercial applications.

#### Temposonics® linear-position sensors out perform, out measure and out last the competition

MTS Sensors enable applications to work smarter and harder. Our full line of standard and custom linear-position sensors can fit virtually every type of industrial and commercial application imaginable.

#### Temposonics® linear-position sensors provide unmatched flexibility

With a variety of mounting, output and configuration options and can be easily installed in a cylinder or externally mounted to your machine.

Temposonics sensors are a cost-effective, high-performance, high-quality alternative to linear pots or linear encoders. When you add affordable cost to reliable, repeatable performance and zero maintenance, the choice is obvious, Temposonics.

Temposonics®  
Technology



## PLASTICS & RUBBER MANUFACTURING

### Temposonics® Technology



#### Superior Performance

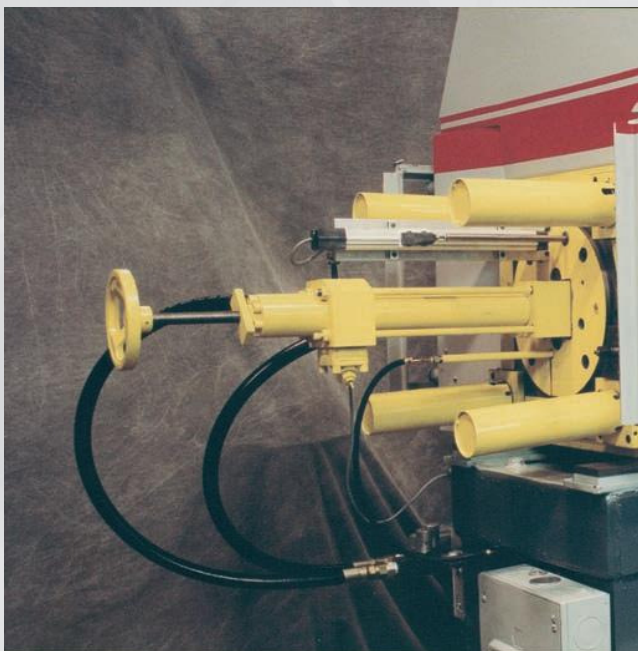
High performance machines require high performance sensing solutions, and Temposonics technology has been the leader in precision magnetostrictive-based linear position sensing for more than 35 years.

Continuous investment in research and development has enabled MTS to produce the world's highest resolution magnetostrictive sensors, with the fastest update rates for high speed motion control, the tightest non-linearity specifications, and the latest in high performance fieldbus compatible outputs.

The wide range of Temposonics high performance sensors allow you to design, manufacture, and deliver the world's most productive manufacturing machines, and for your customers to deliver high quality and cost optimized products. In a globally competitive environment, superior performance enables high quality, high productivity solutions. Don't settle for less, choose MTS Temposonics Technology!

Markets  
We Serve

## Plastics & Rubber Manufacturing



#### Higher Performance, Lower Cost

The world's highest performance injection molding machines, blow molding machines, tire presses, and extrusion filtration systems utilize Temposonics technology to deliver high speed, high quality results. High speed industrial networks combined with precision Temposonics sensors, help these machines produce highly precise products while delivering world-class productivity. Multi-position sensing optimizes costs by controlling two or more motion axes with a single sensor. Resolutions to 0.5  $\mu\text{m}$  enable precision clamp and mold positioning. Legendary Temposonics reliability means that your machine is up and running. High quality and world class productivity – Temposonics Technology delivers.

### Primary & Secondary Woodworking



#### Optimizing Productivity

MTS Temposonics sensors are designed and built to withstand the rigors of sawmill applications and have been that industry's standard for more than 35 years. Recent advances in high speed serial interfaces, enhanced shock and vibration resistance, and the availability of a precision velocity signal (simultaneous with position signal) have enabled new machine control algorithms that increase speed and improve yields. This adds up to increasing productivity and more profitable mill operations. MTS has led the way for more than 35 years, and our newest generation of sensors carries the tradition forward.

### Fluid Power; Hydraulic & Pneumatic Cylinders



#### Operational Efficiency Plus High Performance

High performance, durability and value have made MTS' Temposonics sensor technology the standard for in-cylinder applications in the hydraulics industry for more than 35 years. In addition to superior features like linearity compensation, resistance to shock and vibration and EMI immunity, our innovative modular design allows for easy replacement of the sensing element and electronics without breaking the cylinder's high-pressure seal, thus significantly reducing maintenance costs and downtime. This means your machines are up and your operations are running at peak efficiency.

**Markets  
We Serve**



## Motion Simulation



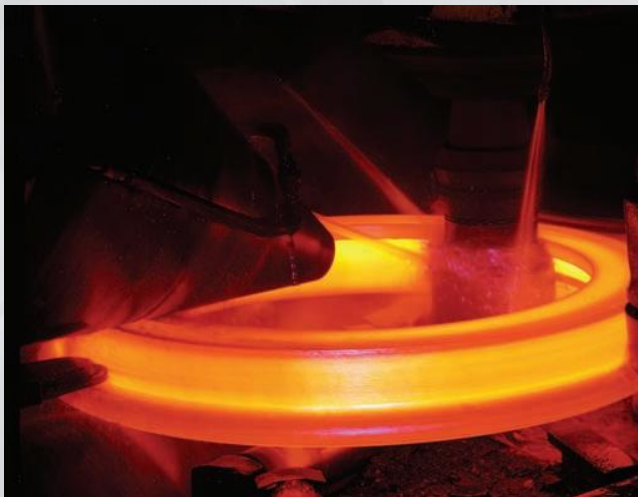
### Entertainment Industry

For coordination with video display, position feedback of audience seat movement is a growing need in the entertainment industry.

Temposonics sensors deliver:

- Superior response and accuracy; achieves higher simulated motion fidelity
- Replaceable sensing element eliminates the need to drop hydraulic pressure or break hydraulic seal
- Embedded or detached electronics available for short installation envelopes
- Simultaneous position and velocity outputs enable high performance servohydraulic positioning

## Steel Manufacturing and Metal Forming



### Superior Speed and Accuracy

Our high-speed R-Series SSI position sensors continue to get faster and more accurate making them an ideal choice for a wide range of machine tool applications. Our SSI sensor also comes with a host of housing and installation options such as the NEMA Type 4X housing and high shock and vibration mechanics to improve immunity and operation in the harshest production environments.

- Resolution down to  $0.5 \mu\text{m}$  ( $0.00002 \text{ in.}$ )
- Accuracy as good as  $\pm 10 \mu\text{m}$  ( $\pm 0.0004 \text{ in.}$ )
- Cycle times as low as  $100 \mu\text{sec.}$

## Process Industries



## Other Application Examples



### Quality Manufacturing

By optimizing machine performance and product flow control, Temposonics sensors offer:

- Superior accuracy with higher consistency between changeovers and reduced setup time
- Precise and repeatable positioning for smoother, more controlled motion
- Improved efficiency, yield, and throughput while maintaining quality

### MTS Temposonics Sensors Continues to Provide More Application Solutions

Where ever demanding performance is required, Temposonics sensor's provide the trusted solution. A wide range of industries and automation processes that rely on Temposonics state-of-the-art technology is continuously increasing.

- Assembly automation
- Primary metal production
- Paper and textiles
- Robotics
- Glass cutting
- Food and beverage
- Adhesive dispensing
- Material handling and packaging
- Test & measurement
- Wind turbines
- Medical equipment
- Power generation
- Control systems

Markets  
We Serve





## R-SERIES

Smart sensor models for fast, high precision and synchronized position control applications



**Model RH**  
Rod style housing  
for use in hydraulic/  
pneumatic cylinders



**Model RP**  
Aluminum extrusion profile  
housing easily mounts on  
machine surface



**Model RF**  
Flexible rod housing for mounting  
along an arc or for limited  
installation space



**Model RD4**  
Rod style housing with  
detached electronics and  
mounting block. Ideal for use  
in clevis mounted cylinders.

### OUTPUT

**Voltage:** 0 to 10 Vdc, 10 to 0 Vdc, -10 to +10 Vdc, +10 to -10 Vdc  
Additional output ranges available between -10 and +10 Vdc

**Current:** 4 to 20 mA, 20 to 4 mA  
Additional output ranges available between 0 and 20 mA.

**SSI (Synchronous Serial Interface):** Gray or binary format, data length selectable, synchronous / asynchronous measurement, optional parity and error bit.

**Fieldbus:** CANbus, DeviceNet, Profibus-DP, EtherCAT®, POWERLINK™

### MEASURING RANGE

25 to 7,620 mm  
(1 to 300 in.)

25 to 5,080 mm  
(1 to 200 in.)

250 to 10,060 mm  
(10 to 396 in.)  
Contact factory for longer  
lengths.

25 to 5,080 mm  
(1 to 200 in.)

### RESOLUTION

**Voltage and Current:** 16 Bit, 0.0015%

**Digital:** SSI; 0.5 µm (0.00002 in.), Profibus, EtherCAT®, POWERLINK™; 1 µm (0.00004 in.), CANbus, DeviceNET; 2 µm (0.00008 in.).

### FEATURES

**Position & Velocity Measurement (see data sheets)**

**Simultaneous Multi-Position Measurements:**

**Voltage and Current;** 2 positions

**POWERLINK;** up to 4 positions

**Profibus, CANbus, EtherCAT;** up to 20 positions

**SSI:** position difference between 2 magnets

Handheld programmers and PC programming kits allow adjustment of the measurement stroke length and sensor parameters.

### DIAGNOSTICS

Sensor LED's indicate sensor status, field bus activity and diagnostics.

**CUSTOM AND SPECIAL FUNCTION SENSORS (REFER TO WWW.MTSENSORS.COM)**



**MODEL GB SENSOR**



**MODEL MH  
SENSOR**



**C-SERIES MODELS CS/CM SENSORS**



**MODEL CR SENSOR**



## G-SERIES

Programmable sensor models that offer built-in diagnostics, backward compatibility and upgraded performance for legacy sensor retrofits

## E-SERIES

Economical sensor models for simplistic position feedback applications



**Model GH**  
Rod style housing for use in hydraulic/pneumatic cylinders



**Model GP**  
Aluminum extrusion profile housing easily mounts on machine surface



**Models GT2/GT3**  
Rod style housing contains 2 or 3 fully redundant measuring systems for enhanced safety applications



**Model EP**  
Aluminum extrusion profile housing easily mounts on machine surface



**Model ER**  
Rod-and-cylinder housing provides versatile mounting options and internal magnet



**Model EP2**  
Magnet is secured to the moving machine part and travels over the sensor housing

**Voltage:** 0 to 10 Vdc, 10 to 0 Vdc, -10 to +10 Vdc, +10 to -10 Vdc  
Additional output ranges available between -10 and +10 Vdc

**Current:** 4 to 20 mA, 20 to 4 mA  
Additional output ranges available between 0 and 20 mA

**Voltage:** 0 to 10 Vdc and 10 to 0 Vdc

**Current:** 4 to 20 mA, 20 to 4 mA

**Voltage:**  
0 to 10 Vdc

**Digital Pulse:** Start / Stop or PWM

**Digital Pulse:** Start / Stop

**Voltage and Current:**  
50 to 2540 mm  
(2 to 100 in.)  
**Digital Pulse:**  
50 to 7620 mm  
(2 to 300 in.)

**Voltage and Current:**  
50 to 2540 mm  
(2 to 100 in.)  
**Digital Pulse:**  
50 to 5080 mm  
(2 to 200 in.)

**Voltage and Current:**  
50 to 2900 mm  
(2 to 115 in.)

**Voltage and Current:**  
50 to 1525 mm  
(2 to 60 in.)

**Voltage and Current:**  
75 to 1500 mm  
(3 to 60 in.)

4, 6, 9, 12, 15, 18,  
21, 24, 30, 36, 42,  
48, 54 and 60 in.

**Voltage and Current:** Infinite  
(controller dependent and restricted by output ripple)

**Voltage and Current:** Infinite  
(controller dependent and restricted by output ripple)

**Voltage:** Infinite  
(controller dependent and restricted by output ripple)

**Digital Pulse:**  
5  $\mu$ m, dependent on controller

**Digital Pulse:** 10  $\mu$ m, dependent on controller

**Simultaneous Multi-Position Measurement**  
for Start / Stop (controller dependant)

Sensor parameters upload feature for Start/Stop models

Handheld programmers and PC programming kits allow adjustment of the measurement stroke length and sensor parameters.

Sensor LEDs provide status and diagnostics for easy troubleshooting

### ACCESSORIES



**CONNECTIONS & CABLES**



**MAGNETS & FLOATS**



**PROGRAMMING TOOLS**



**EXPLOSION-PROOF HOUSING**



**PROTECTIVE HOUSINGS**

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All Temposonics sensors are covered by US patent number 5,545,984. Additional patents are pending.  
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