



## TRAIN MEASUREMENT SYSTEM

TMS-E232

### **Description:**

Designed specifically with the rail industry in mind, the Train Measurement System (TMS) features an extensive sensor suite inside of an extremely rugged package. With two angular rate sensors and a single axis accelerometer, the TMS is an ideal choice for any application measuring, roll, yaw, superelevation, truck hunting, or track irregularities.

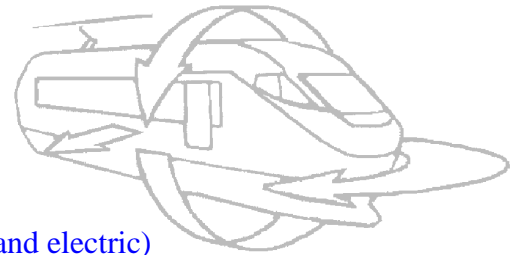


One of the cornerstones of the TMS is its rugged design. The gyros used in this package are isolated from vibration internally, and the sensor inputs are processed by an on-board microprocessor. This allows the TMS to be mounted directly to the truck underneath a rail car or locomotive. The durable enclosure that houses the TMS electronics is designed to allow for mounting in such a demanding environment.

### **Applications:**

The TMS-E232 is used in the rail industry for track testing and high speed train tilt testing. This sensor is also useful on vehicles when the required mounting location is in an extremely harsh environment.

- Solid State, Strap Down System
- Rugged, High Reliability
- Vibration Resistant
- Analog Superelevation (Roll Angle) Output
- RS-232 Serial Data Outputs
- Proven operation on head truck assembly (both diesel and electric)
- No Moving parts (No lubrication or service requirements)
- Two Year Limited Warranty
- Engineering Support



### **Watson Industries, Inc.**

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## TMS-E232 Specifications

### **Attitude**

Range: Bank (Superelevation)	±20°	
Resolution:	0.02°	Binary mode (14 bit)
Analog Scale Factor:	2°/V	±10V Output
Accuracy: Static	±0.3°	
* Accuracy: Dynamic	±2%	

### **Angular Rate**

Range: Roll, Yaw	±50°/sec	
Resolution:	0.02°/sec	Binary mode (14 bit)
Scale Factor Accuracy:	2%	
Bias: Roll, Yaw	< ±0.1°/sec	
Non-Linearity	< 0.03%	Full scale range
Bandwidth	20 Hz	

### **Acceleration**

Range: Lateral	±10g	
Resolution:	4mg	
Scale Factor Accuracy:	1%	
Bias: Lateral	< ±10mg	
Non-Linearity:	< 1%	Full scale range
Bandwidth:	20 Hz	

### **Environmental**

Temperature: Operating	-40°C to +70°C	
Temperature: Storage	-50°C to +85°C	
Vibration: Operating	5g rms	20 Hz to 2 kHz
Vibration: Survival	10g rms	20 Hz to 2 kHz
Shock: Survival	1000g	10ms ½ sine wave

### **Electrical**

Frame Rate	71.1 Hz	Maximum
Startup Time: Data	5 sec	
Startup Time: Fully operational	10 sec	
Input Power:	10 to 30VDC	6W
Input Current:	500mA @ 12VDC	250mA @ 24VDC
† Input Velocity:	±10VDC	Full scale (±400kph)
Digital Output	RS-232	
Analog Output	±10VDC	

### **Physical**

Size: Including Mounting Flanges	7.50"W x 8.25"L x 3.20"H	19 x 21 x 8.1 (cm)
Weight:	240oz (15 lb)	6800g (6.8 kg)
Connection:	MS-27656T-15B-19P	MIL-C-38999 Series 1

\* Assumes accurate velocity data.

Actual accuracy can be calculated as the listed percentage multiplied by the change in value over the entire dynamic maneuver.

† Required, See table below

Specifications are subject to change without notice

## TMS-E232 Input Velocity Formats

### Format

Analog:  
Binary RS-232:  
GPS RS-232:  
Pulse Counter:

### Specifications

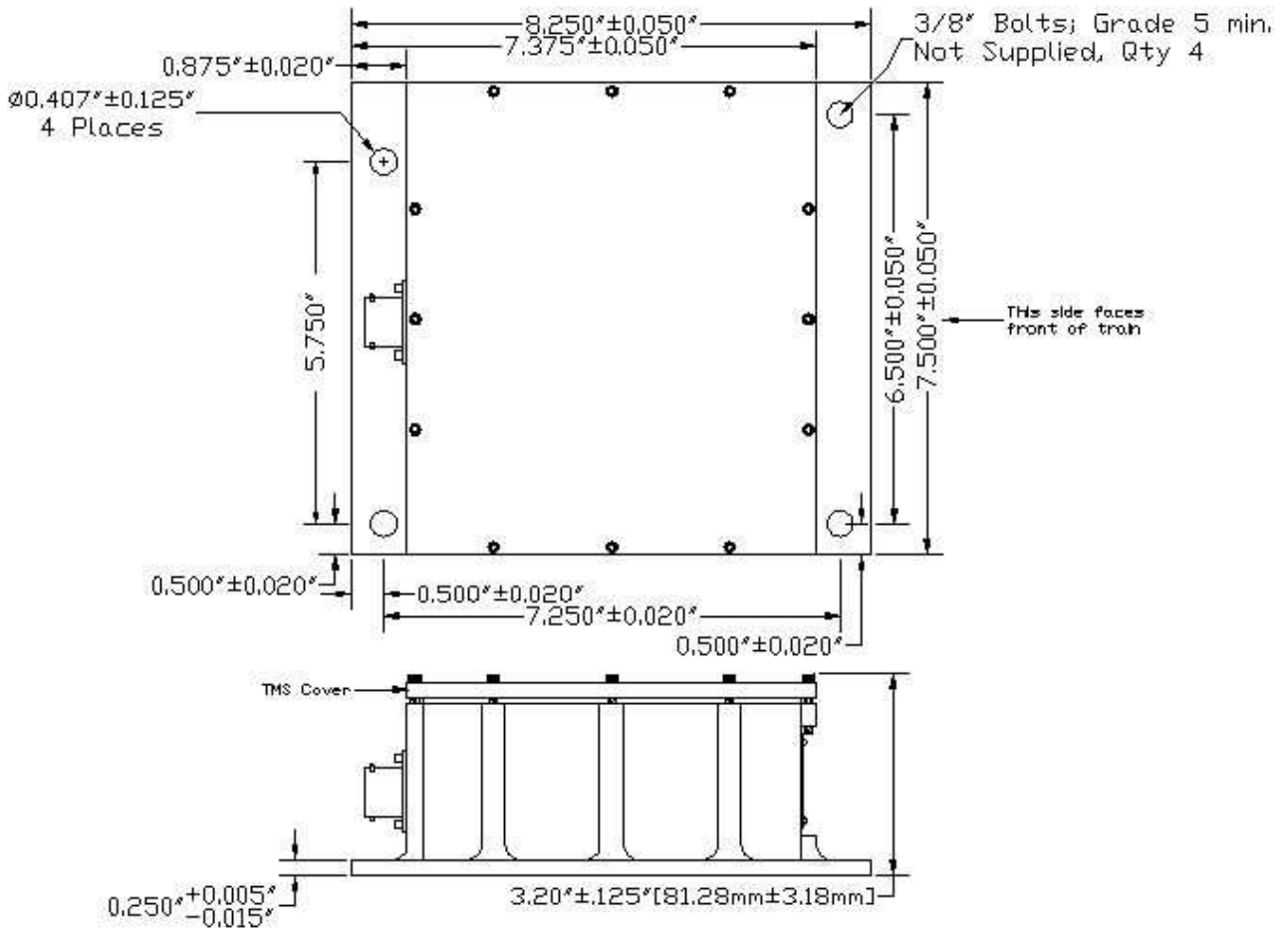
±400 kph; 40 kph / volt  
±400 kph; 14 bit (See product manual for more details)  
NMEA 183, VTG format (See product manual for more details)  
1000 to 6000 pulses per revolution; 0.5 to 2 meter diameter wheel



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## Dimensions:



03/08 DAO



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