

Trusted Positioning

continuous • accurate • affordable

Trusted Machine Navigator (T-MN)

Industrial machine control applications range from vehicle control for mining to autonomous submersible guidance applications. There are many precision solutions available to end users, and although they are very accurate and reliable, these products are typically very expensive. Other low-cost solutions using GPS-only cannot be relied upon in all environments and even in good environments cannot be used to provide full attitude solutions.



The **Trusted Machine Navigator (T-MN)** has been designed to minimize cost of the inertial system through MEMS and use all available wireless signals for a customized application, thus decreasing cost, maintaining accuracy, and providing reliability not previously available, using either existing hardware or a custom built system.

Applications

The **T-MN** can be used to enhance accuracy and reliability, while decreasing cost for:

- Machine guidance in GPS denied environments - mining, downtown construction
- Heading determination systems - crane control, agriculture machine control
- Urban road surveys



Advantages

- Full navigation solution (3D position, 3D velocity, 3D attitude)
- High rate solution and low latency for guidance - Up to 1kHz
- Smoothing options available for further accuracy improvements
- Custom hardware and software options available
- Uncontrolled - no ITAR or similar restrictions

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T-MN Packages

	Basic	Plus*	Premium
GNSS	x	S x	x
Accelerometers	x	x	x
Gyroscopes	x	x	x
Magnetometers		x	x
Barometer		x	x
Odometer		x	x
Real Time (100 Hz)	x	x	x
Real Time (1 kHz)		x	x
Real Time with Smoothing			x

All products are guidance and control capable. Customization is available.
*S= additional sensors option, SM= additional sensors and modules option

T-MN Example Specifications

GNSS Outage Duration	Higher Cost Option Example ¹				Lower Cost Option Example ²			
	Position RMS Error (m)		Attitude RMS Error (deg)		Position RMS Error (m)		Attitude RMS Error (deg)	
	Horizontal	Vertical	Roll/ Pitch	Azimuth	Horizontal	Vertical	Roll/Pitch	Azimuth
1Hz GNSS Updates	0.45	0.35	0.06	0.04	1.61	1.54	0.25	0.30
10 secs.	1.19	0.69	0.07	0.05	2.48	2.52	0.31	0.42
30 secs.	3.99	1.18	0.08	0.09	9.50	3.53	0.42	0.54
1 min.	10.42	2.05	0.13	0.12	24.44	7.09	0.51	0.61
2 min.	27.49	4.15	0.16	0.18	65.51	12.75	0.84	0.90
5 min.	68.63	12.68	0.20	0.55	190.59	25.21	1.56	2.69
10 min.	166.12	26.35	0.30	1.20	565.03	38.40	2.80	6.82

Inertial sensor bill-of-materials

~\$5,000 - \$8,000^{3,4}

- Combination of Fibre Optic Gyroscopes with MEMS gyroscopes and MEMS accelerometers
- Gyroscopes have an average bias stability of 5 degrees/hour

~\$120 - \$400^{3,4}

- Low-cost MEMS gyroscopes and MEMS accelerometers.
- Gyroscopes have a bias stability of 25 degrees/hour

Notes: ¹Initialized using GPS with Dual Antenna, SBAS and OmniStar. ²Initialized using GPS with Dual Antenna (0.5m baseline) and SBAS. ³Dependant on volume. ⁴Subject to third party pricing. Copyright © 2011.

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