

TransducerM Datasheet

TM200

TransducerM is an attitude and heading reference system (AHRS) with 9-axis IMU



Version	Date	Revision Info
V1.1.1	Mar 1, 2019	Derived from TMx00_Datasheet_EN_V122. Parameters updated.
V1.2.1 (R)	April 12, 2019	Release version. Product photo updated.
V1.2.2 (R)	April 16, 2019	Release version. Minor update.

* This document is non-public and is only for intended recipients.
 * Actual product might be different from the photo illustrated.
 * Specifications are subject to change without notice.

Introduction

SYD Dynamics TransducerM Series is a complete solution for motion sensing applications, capable of providing computed data for determining orientation of an object in 3D space.

Out-of-box, it provides orientation data in terms of Euler angles, Quaternion, and, most commonly used Roll/Pitch/Yaw all of which can be computed with the reference to world frame (based on Earth's magnetic field and gravity direction). It can also output calibrated raw sensor data, including angular rate, acceleration and magnetometer measurement ^[1].

Magnetometer is equipped with 'Active Magnetic Field Compensator' to detect and remove disturbances and ensure stable heading.

Products comparison as below^[2]

FEATURES		PRODUCT SERIES				
		TransducerM TM100	TransducerM TM200	TransducerM TM300	TransducerM TM500	
Sensors	3-Axis: Gyroscope and Accelerometer	●	●	●	●	
	3-Axis: Magnetometer	●	●	●	●	
Features	Sensor Fusion	●	●	●	●	
	Sensor Fusion Profiles	-	●	●	●	
	Vibration Resistant	-	● (Basic)	● (Mid)	● (Full)	
	Configuration GUI	○	●	●	●	
	Run-time calibration API	-	-	●	●	
	Digital Compass Function	-	-	○	●	
	Essential Factory Calibration	●	●	●	●	
	Thermal Calibration	-	-	○	●	
	Interfaces	UART	●	●	●	●
		CAN Bus	-	-	●	●
USB		-	-	-	○	
Output	Calibrated Raw Data Output	●	●	●	●	
	Roll, Pitch, Yaw Output	●	●	●	●	
	Internal Update Rate	280-370Hz	280-370Hz	290-450Hz	800Hz	
	Max Output Data Rate (ODR)	≤100Hz	<200Hz	200Hz	200Hz	
	Precision ODR selectable by Hz	-	-	○	●	
Performance	Static Accuracy (Roll-Pitch)	1°	0.7°	0.5°	0.3°	
	Static Accuracy (Yaw)	2.5°	2.0°	1.0°	0.8°	
	Dynamic Accuracy (Roll-Pitch) ^[3]	3°	2.5°	2.0°	0.5°	
Operation Condition	Temperature	0-70°C	0-70°C	-20-85°C	-40-85°C	
	Voltage	5V	5V	5V	5V, or 9-36V	
	IP Rate	PCBA Unprotected	Module Up to IP50	Up to IP67	Up to IP67	
Application	Consumer, Education, Laboratory, Hobby	Consumer, Education, Laboratory, Hobby	Commercial application, Laboratory	Commercial application, Heavy-duty- Industrial, Laboratory		
Standard Warranty	1 year	1 year	1-3 year	1-3 year		
Extended Warranty	-	-	○	○		

● Standard ○ Optional - Not Available

[1] For accelerometers and magnetometers, they are calibrated to 'units' and are accurate in terms of vector direction but not their absolute values. E.g. accelerometer may output 1.0 meaning equal to earth gravity magnitude.

[2] Specifications are subject to change without notice.

[3] According to tests in laboratory environment, typical performance. Actual performance may vary.

TransducerM TM200, Product specification Table

The TransducerM TM200 features the following key characteristics

- Update rate: 300Hz – 470Hz depending on the computational load
- Accelerometer: $\pm 8g$ range (16-bit ADC), 260Hz bandwidth, 0.5%fs non-linearity, 1kHz sampling rate
- Gyroscope: $\pm 2000^\circ/s$ range (16-bit ADC), 256Hz bandwidth, 0.2%fs non-linearity, 8kHz sampling rate
- Magnetometer: ± 1.3 Gauss range (12-bit ADC), 0.1%fs non-linearity, 75Hz sampling rate

The TransducerM TM200 output performance and highlights

- Static accuracy for Roll and Pitch, 0.7° RMS
- Dynamic accuracy for Roll and Pitch, 2.5° RMS
- Yaw drifting can be zeroed using static start up.
- Improved accuracy. Typical drifting on ground vehicle $\leq 2.0^\circ/\text{min}$ shortly after static start up.
- Sturdy housing. Short period reverse voltage protection. Improved ESD protection on TXD and RXD port.
- Adjustable UART baud rate.

Operating conditions

PARAMETER	MIN	TYPICAL	MAX	UNIT
Operating voltage	4.7	5.0	5.5	V
Current	-	50	-	mA
Power consumption	225	250	275	mW
Power input	Recommended: regulated 5V through UART interface			
Temperature	0	25	70	$^\circ\text{C}$
Shock	-8	-	+8	g

Physical data

PARAMETER		UNIT
Size (L x W x H)	34 x 34 x 16 (Exclude brackets) 34 x 48 x 16 (Include brackets)	mm
Weigh	28	g
Compliance	RoHS	
Casing material	N/A	
Connectors	PH2.0-5PIN	

System parameters

Start-up time (cold)	15.0 (Typical)	seconds
Start-up time (cold. Use dynamic boot mode.)	7.0 (Typical)	seconds
Communication Interface	UART	
Data rate	UART: 115200 ~ 1M (Selectable)	bps

IMU sensor specification

PARAMETER	ACCELEROMETER	GYROSCOPE	MAGNETOMETER
DOF	3	3	3
ADC resolution, range	$\pm 8g$ 4096 LSB/g	$\pm 2000^\circ/s$ 16.38 LSB/ $(^\circ/s)$	$\pm 1.3\text{Gauss}$ 1090 LSB/Gauss

Bandwidth	256 Hz max	256 Hz max	-
Non-linearity	0.6 %fs	0.3 %fs	0.1 %fs
Noise density	0.5 mg/√Hz	0.01 °/s /√Hz	-
Internal sampling rate	1 kHz	4 kHz	160 Hz max

Module output

PARAMETER	MIN	TYP	MAX	UNIT
Update rate	280	300	370	Hz
Output rate (depending on configurations)	Example	Configuration	UART: 1M bps Inhibit Time set to zero Output: Roll Pitch Yaw	
		Output rate	100~200	
Output format	Roll/Pitch/Yaw (heading), Quaternion, Gravity direction, Calibrated raw sensor data			
Other features	FEATURE NAME		HIGHLIGHTS	
	Self-adapting filter		Improved heading accuracy	
	Sensor Fusion		Roll, pitch, yaw output	
PERFORMANCE	ROLL	PITCH	YAW	
Resolution	0.01°	0.01°	0.01°	
Angle range	±180°	±90°	0 ~ 360°	
Static accuracy	<0.7°	<0.7°	<2.0°	RMS ¹
Dynamic accuracy (inertial)	<2.5°	<2.5°	≤ 2.0°/min	RMS ^{1,2}
Repeatability (inertial)	<0.5°	< 0.5°	<0.5°	Absolute maximum ¹
Positional drift (inertial)	< 0.2 °/h	< 0.2 °/h	10.0 °/h	Static condition ¹
Turn-on bias	< 0.5°	< 0.5°	< 2.0°	

1. According to test results in laboratory environment under test conditions.
2. Including error introduced by communication latency at 115200 bps.



Software

IMU Assistant	Windows 7, 8, 8.1, 10
Functionality	Sensor configuration, calibration, data visualization, sensor data logging

Wire Definition

TransducerM TM200 features a UART port. The definition of each pin is indicated on the housing at the bottom.

Hardware Interface	PH2.0-5PIN
Picture of the Interface	

<p>Pin Definition</p>	<p>Please refer to the indication on the picture above. The UART port pins from left to right: RXD, TXD, 5V power supply and GND.</p> <p>Note: TXD and RXD are running at TTL 3.3V and are compatible with TTL5.0V</p>
<p>PH2.0-5PIN plug</p>	 <p>This photo shows a typical PH2.0-5PIN plug with cable.</p>
<p>Caution</p>	 <p>Please carefully check power supply (5V and GND) and apply correct voltage.</p> <p>Avoid connecting the module together with servos / motors using the same power supply, as power surge may happen and consequently damage the module.</p>

Mechanical Drawing

The following figure shows the 2D mechanical drawing of TransducerM TM200.

Unit: mm [inch]

Mounting holes: M3.

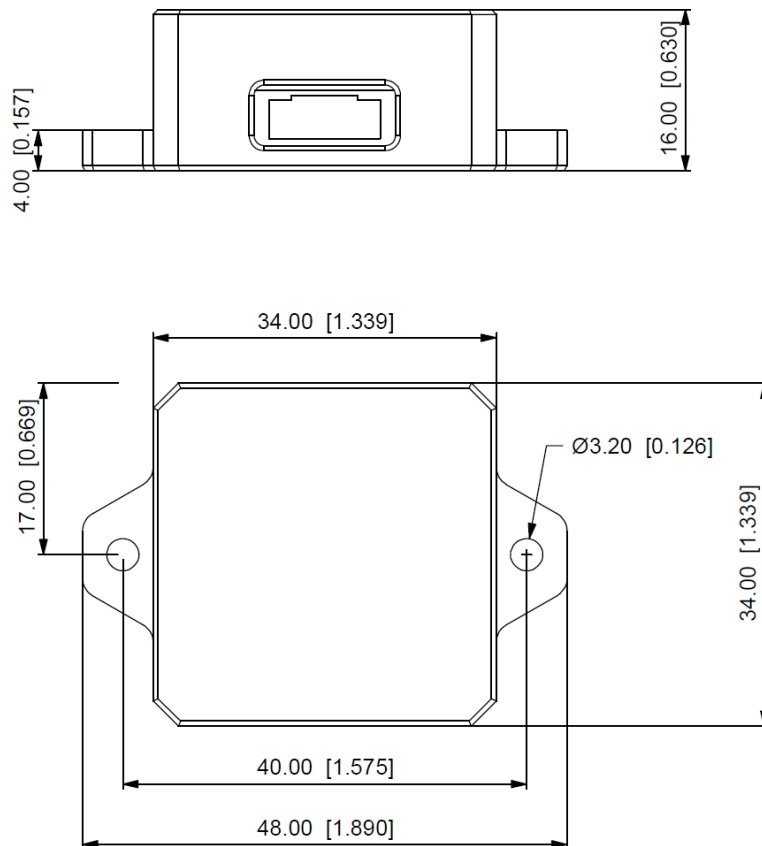


Figure 1: TransducerM TM200 Mechanical Drawing
Unit: mm [inch]