SpeedO

User Manual

Abstract:
This document introduces SpeedO, a distance and speed measurement product.

Contents

1. Product Introduction

SpeedO is a compact distance and speed measurement device developed by Beijing Shagu Technology, based on a high-performance IMU. The system efficiently runs quaternion and extended Kalman filter algorithms internally. Equipped with Bluetooth communication and a built-in battery, it is a small, high-precision distance and speed measurement device.

1.1 Functional Overview

The SpeedO device offers the following features:

- Distance and speed output
- Attitude (pitch and roll)
- Three-axis angular velocity and acceleration output
- Quaternion filtering and inertial sensor bias filtering
- Navigation data rate up to 20 Hz
- High real-time performance

The SpeedO is ideal for measuring distance and speed in rail transit vehicles.

1.2 System Performance

Table1.1 Performance

	Hardware	
Gyro	Resolution	0.06deg/s
	Angular random walk	0.2deg/$\sqrt{hr}$
	Bias stability	2deg/hr
	Temperature Drift (-40~85°C)	±0.005dps/°C
	Bias repeatability (25°C)	±3deg/s
Accelerometer	Resolution	0.07mg
	Velocity random walk	0.30mg /√hz
	Bias stability	1.5mg
	Temperature Drift (-40~85°C)	±0.1mg/°C
	Bias repeatability (25°C)	30mg

Software

Distance Accuracy (1σ)	High-Speed Train 0.5%，Subway 3%	
Distance Accuracy (1σ)	High-Speed Train 1km/hr，Subway 1km/hr	
Attitude Accuracy (1σ)	Static hold	0.001°
	Moving	High-Speed Train 0.1° Subway 0.3°
Heading Accuracy (1σ)	Static hold	0.001°
	Moving	High-Speed Train 0.5° Subway 2.0 °
Solution Data Rate	20Hz	

1.3 Electrical and Physical Characteristics

Table 1.2 Electrical and Physical Specifications

Power Supply	Built-in battery or USB Type-C 5V
Charging	USB
Power consumption	200mW
Size	75mm×65mm×25mm（L*W*H）
Operating Temperature	-40℃ - +85℃
Protection Rating	IP65

1.4 Auxiliary Features

Table 1.3 Auxiliary Feature Specifications

Bluetooth Range	>10m
Battery Time	> 8 小时
Lights	Status for operation, battery level, charging

2. Output Data

The following shows the default output of the SpeedO device. The output data rate and content can be modified via configuration commands. For details, please refer to the SpeedO Data Protocol.

Table 2.1 Default Output

Item	Default
Distance, speed, attitude, angular velocity, acceleration	20 Hz
Output Data Format	Custom text format

3. Installation and Handling Notes

- The device must be securely mounted to the carrier during use.