## SensorsX

# SX-MIXNC Series

Industrial-Grade MEMS IMU

Motion & Inertial | 6-Axis Industrial IMU with Attitude Output



| | | |
|---|---|---|
| **±400 °/s**<br>Gyroscope Range (X, Y, Z) | **±6 g**<br>Accelerometer Range (X, Y, Z) | **IP67**<br>Ingress Protection Rating |
| **RS-232 Standard / RS-422, RS-485, CAN Optional**<br>Communication Interfaces | **−40 to +85 °C**<br>Operating Temperature (−40 to +185 °F) | **5 – 30 V DC / 0.3 W**<br>Power Supply / Consumption |

## ■ PRODUCT OVERVIEW

The SX-MIXNC Series is an industrial MEMS inertial measurement unit integrating a three-axis gyroscope and a three-axis accelerometer. It outputs angular rate, acceleration, and roll, pitch, and yaw data, with compensation for temperature effects, sensor misalignment, and nonlinearity. The standard configuration provides an RS-232 interface with a 200 Hz output data rate. RS-422, RS-485, and CAN configurations are available on request. The unit operates from 5–30 V DC and features IP67 ingress protection for industrial automation, robotics, attitude control, and platform stabilization applications.



## ■ KEY FEATURES

| | |
|---|---|
| ◆ Three-axis gyroscope, ±400 °/s measurement range | ◆ Three-axis accelerometer, ±6 g measurement range |
| ◆ Ingress protection rating: IP67 | ◆ Standard RS-232 interface; optional RS-422, RS-485, and CAN interfaces |
| ◆ Power supply range: 5–30 V DC | ◆ Small size: 36.0 × 35.0 × 18.0 mm (1.42 × 1.38 × 0.71 in) |
| ◆ Weight: 100 g (3.53 oz) | ◆ Operating temperature: −40 °C to +85 °C (−40 °F to +185 °F) |


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## ■ TYPICAL APPLICATIONS

### Application Fields

- Vibration Resistance and Attitude Control
- Automated Machinery
- Robot Control
- Stability and Control of the Platform

## ■ PERFORMANCE SPECIFICATIONS

| | |
|---|---|
| **Gyroscope** | |
| Measuring Range: X, Y, Z | ±400 °/s |
| Bias Instability | 4 °/h |
| Random Walk | 0.5 °/√hr |
| Non-Linearity | 200 ppm |
| Non-Linearity Accuracy | 0.1% FS |
| Orthogonality | 200 ppm |
| Bandwidth | 40–116 Hz |
| **Accelerometer** | |
| Measuring Range: X, Y, Z | ±6 g |
| Bias Instability | 30 μg |
| Random Walk | 0.07 m/s/√hr |
| Non-Linearity | 200 ppm |
| Non-Linearity Accuracy | 0.1% FS |
| Orthogonality | 200 ppm |
| Bandwidth | 40–240 Hz |
| **Attitude Measurement** | |
| Roll Angle Range | 180° |
| Pitch Angle Range | 90° |
| Heading Angle Range | 180° |
| Dynamic Accuracy | 0.5° |
| Resolution | 0.01° |

## ■ ELECTRICAL SPECIFICATIONS

| | |
|---|---|
| **Power** | |
| Voltage | 5–30 V DC |
| Power Consumption | 0.3 W |
| **Output Signal** | |
| Interface | RS-232 (RS-422, RS-485, and CAN available as custom options) |
| Output Frequency | 200 Hz |
| **Electrical Connection** | |
| Connection | 4-wire cable, Φ6.0 ± 0.1 mm (Φ0.236 ± 0.004 in) — see Wiring Diagram |


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## ■ ENVIRONMENTAL SPECIFICATIONS

| | |
|---|---|
| **Temperature** | |
| Working Temperature | −40 to +85 °C (−40 to +185 °F) |
| Storage Temperature | −55 to +105 °C (−67 to +221 °F) |
| **Mechanical & Environmental** | |
| Ingress Protection | IP67 |
| **Weight & Size** | |
| Size | 36.0 × 35.0 × 18.0 mm (1.42 × 1.38 × 0.71 in) |
| Weight | 100 g (3.53 oz) |

## ■ COMMUNICATION PROTOCOLS

### Software Interface Definition

Data is output via a serial port, with default parameters as follows:

| Serial Port Default Parameters | |
|---|---|
| Baud Rate | 115200 |
| Start Bit | 1 |
| Data Bits | 8 |
| Stop Bit | 1 |
| Parity Check | None |
| Output Frequency | 200 Hz |
| Byte Order | The low-order byte comes first. |

### B4 Output Protocol

The output protocol is as follows:

Example: 7F 80 04 00 0F 00 2B F3 00 00 00 00 00 00 00 00 00 00 00 00 98 1E 18

| Variable | Data Format | Endianness | Scale | Example | Parsing |
|---|---|---|---|---|---|
| Protocol header | 2 Bytes | | | 7F 80 | B4 |
| ACC_X | 2 Bytes (int16) | Little-endian | 65536.0/20.0 | 04 00 | 4 × 20.0 / 65536.0 = 0.0012 (g) |
| ACC_Y | 2 Bytes (int16) | Little-endian | 65536.0/20.0 | 0F 00 | 15 × 20.0 / 65536.0 = 0.0046 (g) |
| ACC_Z | 2 Bytes (int16) | Little-endian | 65536.0/20.0 | 2B F3 | -3285 × 20.0 / 65536.0 = -1.0025 (g) |
| GYRO_X | 2 Bytes (int16) | Little-endian | 65536.0/1260.0 | 00 00 | 0 × 1260.0 / 65536.0 = 0 (dps) |
| GYRO_Y | 2 Bytes (int16) | Little-endian | 65536.0/1260.0 | 00 00 | 0 × 1260.0 / 65536.0 = 0 (dps) |
| GYRO_Z | 2 Bytes (int16) | Little-endian | 65536.0/1260.0 | 00 00 | 0 × 1260.0 / 65536.0 = 0 (dps) |
| ROLL | 2 Bytes (int16) | Little-endian | 65536.0/360.0 | 00 00 | 0 × 360.0 / 65536.0 = 0 (degree) |
| PITCH | 2 Bytes (int16) | Little-endian | 65536.0/360.0 | 00 00 | 0 × 360.0 / 65536.0 = 0 (degree) |
| YAW | 2 Bytes (int16) | Little-endian | 65536.0/360.0 | 00 00 | 0 × 360.0 / 65536.0 = 0 (degree) |
| TEMP_BOARD | 2 Bytes (int16) | Little-endian | 65536.0/200.0 | 98 1E | 7832 ÷ 327.68 = 23.90 (°C) (75.02 °F) |
| checksum | 1 Byte | | | 18 | Checksum and inversion from ACC_X to TEMP_BOARD |

*Table 3 Description of B4 Output Protocol*

### Data Parsing Example

*Note: This example assumes that buffer contains the 20-byte payload from ACC_X through TEMP_BOARD. The two-byte protocol header and one-byte checksum are excluded.*

```
double[] sensors = new double[10];

sensors[0] = (short)((byte)buffer[0] + ((byte)buffer[1] << 8));
sensors[1] = (short)((byte)buffer[2] + ((byte)buffer[3] << 8));
sensors[2] = (short)((byte)buffer[4] + ((byte)buffer[5] << 8));
sensors[3] = (short)((byte)buffer[6] + ((byte)buffer[7] << 8));
sensors[4] = (short)((byte)buffer[8] + ((byte)buffer[9] << 8));
sensors[5] = (short)((byte)buffer[10] + ((byte)buffer[11] << 8));
sensors[6] = (short)((byte)buffer[12] + ((byte)buffer[13] << 8));
sensors[7] = (short)((byte)buffer[14] + ((byte)buffer[15] << 8));
sensors[8] = (short)((byte)buffer[16] + ((byte)buffer[17] << 8));
```


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```
sensors[9] = (short)((byte)buffer[18] + ((byte)buffer[19] << 8));

// Accel x, y, z
Ax = sensors[0] * Accel_Scale / Sensor_Scale;
Ay = sensors[1] * Accel_Scale / Sensor_Scale;
Az = sensors[2] * Accel_Scale / Sensor_Scale;

// Gyro x, y, z
Gx = sensors[3] * Rate_Scale / Sensor_Scale;
Gy = sensors[4] * Rate_Scale / Sensor_Scale;
Gz = sensors[5] * Rate_Scale / Sensor_Scale;

// Roll, Pitch, Yaw
Roll = sensors[6] * Angle_Scale / Sensor_Scale;
Pitch = sensors[7] * Angle_Scale / Sensor_Scale;
Yaw = sensors[8] * Angle_Scale / Sensor_Scale;

TempX = sensors[9] * Temp_Scale / Sensor_Scale;
```

Remarks:
1. Acceleration unit is g (g = 9.80665 m/s² = 32.174 ft/s²), angular value unit is degree, the unit of the gyroscope rotation speed is dps.
2. Accel_Scale = 20, Rate_Scale = 1260, Angle_Scale = 360, Sensor_Scale = 65536, Temp_Scale = 200.

## ■ MECHANICAL DIMENSIONS

**Overall dimensions: 36.0 (L) × 35.0 (W) × 18.0 (H) mm (excluding mounting holes and connectors), as shown below.**

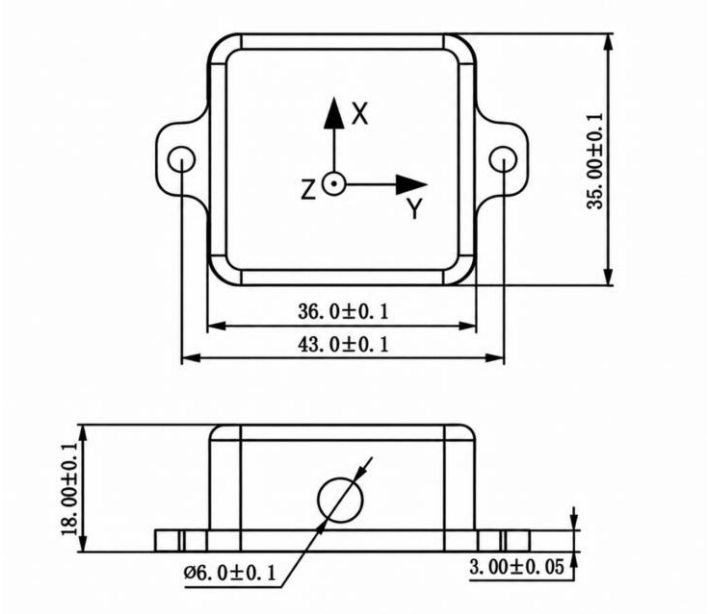



*Figure 1 Mechanical dimensions (unit: mm)*

### Key Dimensions

| Dimensions — mm (in) | |
|---|---|
| Body Length | 36.0 ± 0.1 mm (1.417 ± 0.004 in) |
| Mounting Hole Center-to-Center Spacing | 43.0 ± 0.1 mm (1.693 ± 0.004 in) |
| Body Width | 35.00 ± 0.1 mm (1.378 ± 0.004 in) |
| Height | 18.00 ± 0.1 mm (0.709 ± 0.004 in) |
| Mounting Ear Thickness | 3.00 ± 0.05 mm (0.118 ± 0.002 in) |
| Cable Diameter | Φ6.0 ± 0.1 mm (Φ0.236 ± 0.004 in) |


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## ■ WIRING DIAGRAM

### Electrical Interface

The wire assignments for the standard RS-232 configuration are listed below.

### Wire Assignments

| Wire No. | Wire Color | Signal | Description |
|---|---|---|---|
| 1 | Red | VDD | Power supply 5–30 V |
| 2 | Green | TXD | RS-232 Output |
| 3 | Yellow | RXD | RS-232 Input |
| 4 | Black | GND | Power ground |

## ■ ORDERING INFORMATION

**Complete model number example: SX-MIXNC-04006g1801**

| | |
|---|---|
| **Angular Velocity Measurement Range** | |
| **0400** | ±400 °/s |
| **Acceleration Measurement Range** | |
| **6g** | ±6 g |
| **Angle Measurement Range (Roll / Heading Angle Range)** | |
| **180** | 180° |
| **Output** | |
| **1** | RS-232 |
| **2** | RS-485 |
| **3** | RS-422 |
| **4** | CAN |
| **Customization Options** | |
| **D** | Custom Configuration — Specify Requirements When Ordering |

*Example: SX-MIXNC-04006g1801D represents an SX-MIXNC Series IMU with a ±400 °/s gyroscope range, a ±6 g accelerometer range, a ±180° attitude angle range, an RS-232 interface, and a custom configuration.*


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