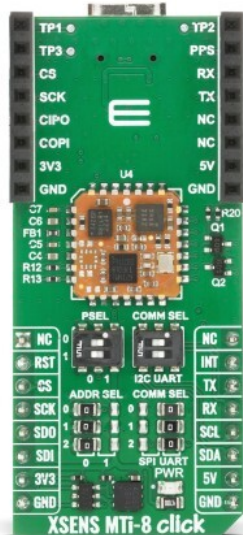


## XSENS MTi-8 Click



PID: MIKROE-6660

**XSENS MTi-8 Click** is a compact add-on board designed for high-accuracy positioning (RTK-supported), and orientation tracking in demanding outdoor embedded applications. It is based on the [MTi-8-5A](#), an RTK-enhanced GNSS/INS module from [Xsens](#) that combines GNSS positioning with advanced inertial sensing and real-time sensor fusion. This Click board™ features Xsens' sensor fusion algorithm with output data rates up to 100 Hz for high-speed dead-reckoning, delivering roll and pitch accuracy of 0.5° RMS, yaw accuracy of 1° RMS (with GNSS aiding), and position accuracy down to 1cm + 1ppm CEP in RTK mode. It integrates a high-range gyroscope, accelerometer, and magnetometer, supports external RTK-capable GNSS receivers over UART and offers flexible interface selection via UART, SPI, or I2C, along with USB Type-C configuration. It is ideal for robotics, autonomous vehicles, precision agriculture, surveying systems, and other outdoor navigation and motion-tracking applications requiring high accuracy and reliability.

For more information about **XSENS MTi-8 Click** visit the official [product page](#).

### How does it work?

XSENS MTi-8 Click is based on the MTi-8-5A, an RTK-enhanced Global Navigation Satellite System (GNSS) and inertial navigation system (INS) module from Xsens, designed for high-accuracy positioning (RTK-supported), orientation tracking, and motion analysis in demanding outdoor embedded applications. The MTi-8-5A delivers cm-level GNSS/INS performance through an interface to an external GNSS receiver and leverages Xsens' optimized strapdown sensor fusion algorithm to perform high-speed dead-reckoning calculations of up to 100 Hz, enabling precise capture of high-frequency motion dynamics. This advanced sensor fusion engine ensures reliable, drift-compensated orientation and position tracking, while providing

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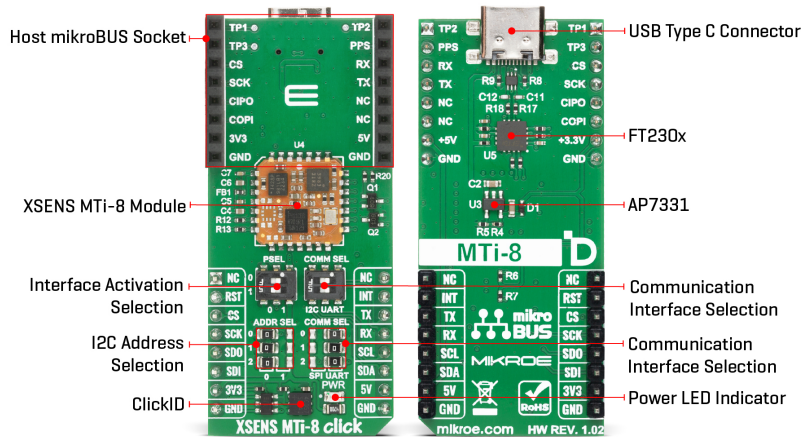


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automatic sensor calibration in a cost-effective and compact solution suitable for robotics, autonomous systems, unmanned vehicles, precision agriculture, surveying, and other outdoor navigation applications.



In terms of sensor fusion performance, the module achieves roll and pitch accuracy of 0.5 degrees RMS, yaw/heading accuracy of 1 degree RMS, position accuracy of 1 cm +1ppm CEP when operating in RTK mode, and velocity accuracy of 0.05m/s RMS, ensuring stable and precise navigation data even under dynamic conditions. The integrated inertial sensors include a gyroscope with a standard full-scale range of 2000 degrees per second and an in-run bias stability of 6 degrees per hour, an accelerometer with a standard full-scale range of 16g and an in-run bias stability of 40 micro-g, and a magnetometer with a standard full-scale range of  $\pm 8$  Gauss, total RMS noise of 0.5 milli-Gauss, and a resolution of 0.25 milli-Gauss, providing highly reliable raw motion and magnetic field measurements for robust orientation estimation.

This Click board™ communicates with MCU using the UART interface as its default communication interface but also has the possibility for the user to use other interfaces such as SPI and I2C if he wants to configure the module and write the library by himself. The desired interface selection can be performed through the peripheral selection pins by positioning SMD switch labeled as PSEL to an appropriate position (the switch positions corresponding to specific interfaces are in the attached schematic). The module reads the state of these pins at Start-Up and configures its peripheral interface. To change the selected interface, the logic levels of those pins must be set first, and then the module needs to be reset.

The selection between UART/I2C and SPI/I2C interfaces can be performed by positioning SMD jumpers and switch labeled as COMM SEL to an appropriate position. The user can also configure the I2C address by positioning SMD jumpers labeled as ADDR SEL to an appropriate position. Note that all the jumpers must be placed to the same side, or else the Click board™ may become unresponsive. The GNSS receiver interface is provided over UART with support for NMEA, UBX, and beta SBF/GSOF protocols, enabling integration with high-precision RTK-capable external GNSS receivers for high-accuracy positioning (RTK-supported). Additionally, the module supports a barometer interface over SPI interface, allowing further enhancement of altitude estimation when combined with GNSS and inertial data.

This Click board™ is equipped with the USB type C connector. It allows the module to be powered and configured by a personal computer (PC) using [FT230X](#), a highly integrated USB to UART bridge solution from FTDI which has been designed to operate with USB host controllers by using as little bandwidth as possible when compared to the total USB bandwidth available.

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This module that can also be configured easily by the free downloadable [Xsens MT Software Suite](#) which includes MT Manager (GUI for Windows/Linux), SDK, example codes and drivers for many platforms including ROS.

The XSENS MTi-8 Click has 2 power supply pins. The first pin represents the main power supply of the module powered via a low dropout linear regulator [AP7331](#) from Diodes Incorporated that receives a 5V power supply from USB to UART solution and gives 3.3V on its output that is used as the main power supply of the module. The second pin represents the digital supply voltage and is powered by 3.3V directly from the mikroBUS™ socket.

The board also features an onboard host mikroBUS™ socket that exposes only the auxiliary SPI and UART interfaces from the module, enabling additional communication and system expansion. A dedicated PPS pin provides a synchronization Pulse-Per-Second (sync PPS) signal for precise timing applications. In addition to being available on the mikroBUS socket, the default PWM, RST, and AN pins are also routed to dedicated test points next to the socket, simplifying debugging and signal access during development.

This Click board™ can operate with either 3.3V or 5V logic voltage levels. This way, both 3.3V and 5V capable MCUs can use the communication lines properly. Also, this Click board™ comes equipped with a library containing easy-to-use functions and an example code that can be used as a reference for further development.

## Specifications

Type	Motion
Applications	Ideal for robotics, autonomous vehicles, precision agriculture, surveying systems, and other outdoor navigation and motion-tracking applications requiring high accuracy and reliability
On-board modules	MTI-8-5A - RTK-enhanced Global Navigation Satellite System (GNSS) and inertial navigation system (INS) module from Xsens
Key Features	RTK-enhanced GNSS/INS module, centimeter-level positioning accuracy, high-speed dead-reckoning with AttitudeEngine™, roll and pitch accuracy of 0.5° RMS and yaw accuracy of 1° RMS, velocity accuracy of 0.05m/s RMS, integrated high-range gyroscope and accelerometer, ±8 Gauss magnetometer, selectable communication interfaces, USB-to-UART bridge for direct PC configuration, onboard host mikroBUS™ socket, and more
Interface	I2C,SPI,UART,USB
Feature	ClickID
Compatibility	mikroBUS™
Click board size	L (57.15 x 25.4 mm)
Input Voltage	3.3V,5V

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## Pinout diagram

This table shows how the pinout on XSENS MTi-8 Click corresponds to the pinout on the mikroBUS™ socket (the latter shown in the two middle columns).

Notes	Pin	mikroBUS				Pin	Notes
	NC	1	AN	PWM	16	NC	
Reset / ID SEL	<b>RST</b>	2	RST	INT	15	<b>INT</b>	Interrupt
SPI Select / ID COMM	<b>CS</b>	3	CS	RX	14	<b>TX</b>	UART TX
SPI Clock	<b>SCK</b>	4	SCK	TX	13	<b>RX</b>	UART RX
SPI Data OUT	<b>SDO</b>	5	MISO	SCL	12	<b>SCL</b>	I2C Clock
SPI Data IN	<b>SDI</b>	6	MOSI	SDA	11	<b>SDA</b>	I2C Data
Power Supply	<b>3.3V</b>	7	3.3V	5V	10	<b>5V</b>	Power Supply
Ground	<b>GND</b>	8	GND	GND	9	<b>GND</b>	Ground

## Onboard settings and indicators

Label	Name	Default	Description
LD1	PWR	-	Power LED Indicator
SW1	PSEL	Left	Interface Activation Selection 0/1: Left position 0, Right position 1
SW2	COMM SEL	Left	Communication Interface Selection I2C/UART: Left position I2C, Right position UART
JP3-JP5	COMM SEL	Right	Communication Interface Selection SPI/UART: Left position SPI, Right position UART
JP8-JP10	ADDR SEL	Right	I2C Address Selection 0/1: Left position 0, Right position 1

## XSENS MTi-8 Click electrical specifications

Description	Min	Typ	Max	Unit
Supply Voltage	3.3	-	5	V
Gyroscope Full-Scale Range	-2000	-	+2000	deg/s
Accelerometer Full-Scale Range	-16	-	+16	g
Magnetometer Full-Scale Range	-8	-	+8	G
Magnetometer Resolution	-	0.25	-	mG
Velocity Accuracy	-	0.05	-	m/s RMS
Roll / Pitch Accuracy	-	0.5	-	deg RMS
Yaw / Heading Accuracy	-	1	-	deg RMS

## Software Support

[XSENS MTi-8 Click](#) demo application is developed using the [NECTO Studio](#), ensuring

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compatibility with [mikroSDK](#)'s open-source libraries and tools. Designed for plug-and-play implementation and testing, the demo is fully compatible with all development, starter, and mikromedia boards featuring a [mikroBUS™](#) socket.

## Example Description

This example demonstrates the initialization and use of the XSENS MTi-8 Click board. It performs device identification, configures the output data streams, and displays various sensor measurements such as orientation (quaternion and Euler angles), magnetic field, latitude and longitude, altitude, barometric pressure, temperature, and UTC time. The data is received in the MTData2 format and parsed accordingly.

## Key Functions

- `xsensmti8_cfg_setup` This function initializes Click configuration structure to initial values.
- `xsensmti8_init` This function initializes all necessary pins and peripherals used for this Click board.
- `xsensmti8_send_message` This function sends a desired command message from the Click context object.
- `xsensmti8_read_message` This function reads response message from the ring buffer and stores it in the Click context object.
- `xsensmti8_wait_message` This function waits and checks for a specific message ID in the received response.

## Application Init

Initializes the logger and the XSENS MTi-8 Click driver, resets the device, retrieves the device and firmware information, and sets the desired output configuration.

## Application Task

Continuously reads and parses the incoming MTData2 messages and displays the decoded sensor data via the logger terminal.

## Application Output

This Click board can be interfaced and monitored in two ways:

- Application Output - Use the "Application Output" window in Debug mode for real-time data monitoring. Set it up properly by following [this tutorial](#).
- UART Terminal - Monitor data via the UART Terminal using a [USB to UART converter](#). For detailed instructions, check out [this tutorial](#).

## Additional Notes and Information

The complete application code and a ready-to-use project are available through the NECTO Studio Package Manager for direct installation in the [NECTO Studio](#). The application code can also be found on the MIKROE [GitHub](#) account.

**Note:** The latest Xsens SDK for Windows and Linux is [available for download](#) on the official Xsens website.

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## Resources

[mikroBUS™](#)

[mikroSDK](#)

[Click board™ Catalog](#)

[Click boards™](#)

[ClickID](#)

## Downloads

[XSENS MTi-8 click example package](#)

[XSENS MTi-8 click 2D and 3D files v102](#)

[XSENS MTi-8 click schematic v102](#)

[MTi-8 Series datasheet](#)

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