

Migration to Hardware Version 3 of the MTi 1-series

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Note: For an overview of the differences between MTi 1-series hardware versions 1.x and 2.x, please see: [Migration to Hardware Version 2.0 of the MTi 1-series](#)

Due to global constraints in the supply of MEMS components and consequently to ensure continuity of supply of pin compatible MTi 1-series products, new sensing elements are incorporated in the hardware design of the MTi 1-series portfolio. This results in the availability of hardware version 3 of the MTi 1-series. This version will be available next to the current hardware version 2. Production of hardware version 3 will start in August 2021. In addition, the MTi 1-series' part number naming is changing to a new format. This document provides all practical information that is important for users that are migrating from hardware version 2 to hardware version 3.

Version identification

The hardware version of MTi 1-series modules can be determined in different ways, both visually and through software. The visual differences between hardware version 2 and 3 can be found in the Hardware section of this migration article. For an overview of all (past and current) hardware versions, please refer to the [MTi 1-series Datasheet](#).

In order to identify the hardware version of an MTi 1-series module through **software**, the ReqHardwareVersion low-level (Xbus) command can be used. For more information, refer to the [Low-Level Communication Protocol Document](#). The hardware version is also displayed in the Device Settings window of MT Manager.

Finally, the hardware version can be derived from the part number of your MTi module, as described in the next paragraph.

Purchasing

The products with the new hardware come with new part numbers. Please add these new part numbers, as described in Table 1, to your purchasing system.

Current (HW v2)	New (HW v3)
MTi-1	MTi-1-0I
MTi-2	MTi-2-0I
MTi-3	MTi-3-0I
MTi-7	MTi-7-0I
MTi-3-DK	MTi-3-0I-DK
MTi-7-DK	MTi-7-0I-DK

Table 1: Current and new part numbering.

Note: "0" is a number (zero), "I" is a character (capital i).

Note: for ordering, add -T, -C, -R behind the part number to indicate packaging options (not applicable to DKs):

- T = tray of 20 pcs
- C = tray of 100 pcs
- R = reel of 250 pcs

Hardware

The pinout and form factor of the MTi 1-series has remained the same, and will also remain the same during future hardware updates.

Hardware version 3.x introduces new accelerometers and gyroscopes compared to version 2.x. The magnetometer component has remained the same. Table 2 and Table 3 report comparisons of all specifications for the gyroscope and accelerometer components.

Gyroscope specification	Unit	Current (HW v2)	New (HW v3)
Standard full range	°/s	2000	2000
In-run bias stability	°/h	10	10
Bandwidth (-3 dB)	Hz	255	230
Noise density	°/s/√Hz	0.007	0.003
Sensitivity variation	%	0.05	0.05
Non-linearity	%FS	0.1	0.1
g-sensitivity (calibrated)	°/s/g	0.001	0.001
Max. output frequency (RateOfTurnHR)	Hz	800	1000

Table 2: Gyroscope specifications of MTi 1-series v2.x and v3.x.

Accelerometer specification	Unit	Current (HW v2)	New (HW v3)
Standard full range	g	16	16
In-run bias stability	μg	30	30
Bandwidth (-3 dB)	Hz	324	230
Noise density	μg/√Hz	120	70
Sensitivity variation	%	0.05	0.05

Non-linearity	%FS	0.5	0.5
Max. output frequency (AccelerationHR)	Hz	800	1000

Table 3: Accelerometer specifications of MTi 1-series v2.x and v3.x.

Because of the updated hardware components, the hardware layout of the MTi 1-series module has changed, see Figure 1. This also has consequences for the origin of measurements (Figure 2).

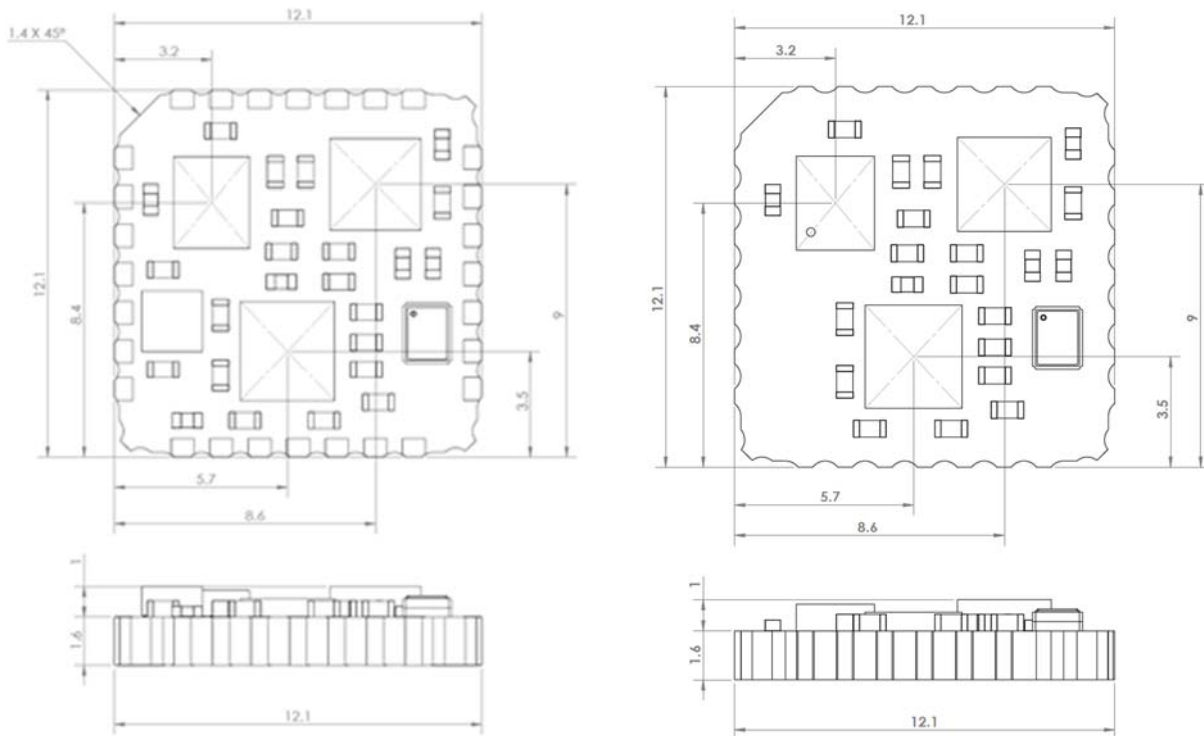
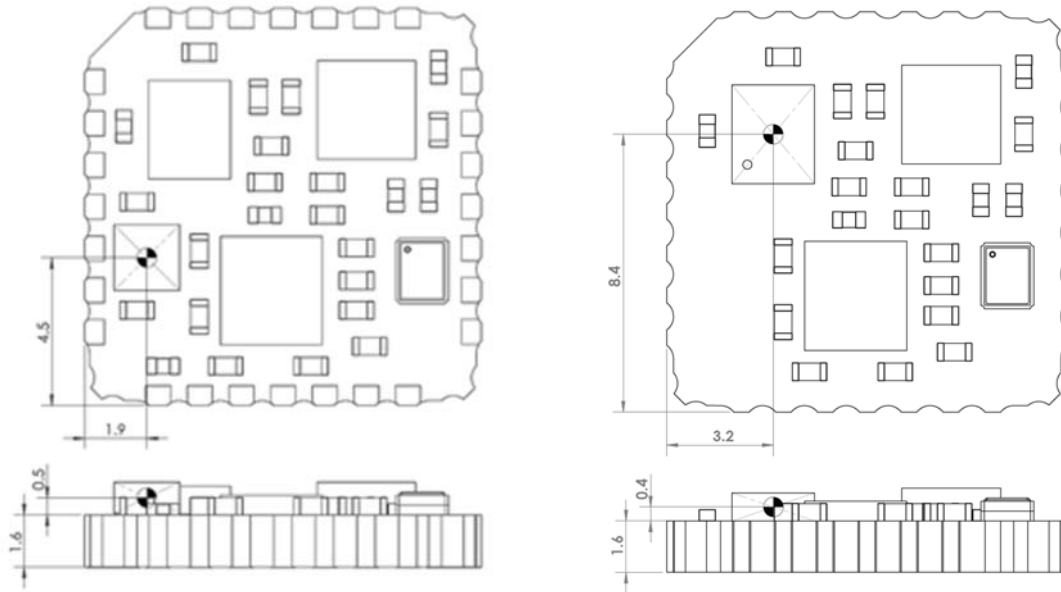


Figure 1: Component placement change of the MTi 1-series module. Left: HW version 2.x. Right: HW version 3.x.

All dimensions are in mm. General tolerances are +/- 0.1 mm.



*Figure 2: Sensor frame origin change of the MTi 1-series module. Left: HW version 2.x. Right: HW version 3.x.
All dimensions are in mm. General tolerances are +/- 0.1 mm.*

Please note that the MTi 1-series module is designed to be embedded into a PCB design through re-flow soldering. Using a (PLCC28) socket to mount the MTi is possible, but this will create mechanical stress on the PCB which can lead to a decreased performance of the module's sensing components. For further information on hardware integration, please refer to our MTi 1-series Hardware Integration Manual.

Sensor fusion performance

The integration of new hardware components does not result in a change in the sensor fusion performance of the VRU, AHRS and GNSS/INS models (MTi-2, -3 and -7), as the sensor fusion algorithms have remained the same. This was proven by various tests during which we compared the estimation accuracy of both the v2 MTi 1-series and the v3 MTi 1-series against a highly accurate (tactical grade) reference.

Software

The communication protocol (Xbus) and communication interfaces (UART, SPI, I²C) have remained unchanged. Software-wise the only difference is that the maximum output rate of the High-Rate data outputs AccelerationHR and RateOfTurnHR have increased to 1000 Hz (previously 800 Hz).

As described in the previous paragraph, the MTi 1-series v3.x are equipped with a different type of gyroscope component. Although the performance of this component is similar to, and in some aspects, better than the component used in the MTi 1-series v2.x, during testing this new gyroscope component has shown slightly lower consistency regarding its initial bias error, a parameter that cannot be compensated for during factory calibration. As a best practice we therefore recommend to initiate a [Manual Gyro Bias Estimation](#) shortly after powering up the MTi in order to achieve the best possible orientation performance. Manual Gyro Bias Estimation commands can be automatically sent by your host device by making use of our Device API or low-level (Xbus) communication.

The MTi 1-series v3.x are fully supported by MT Software Suite version 2021.2 and higher. The latest version can be downloaded at: <https://www.xsens.com/software-downloads>

Firmware

All MTi 1-series with hardware version v3.x will be produced and released with firmware version 1.14.0. It is not possible to downgrade to older firmware versions released for versions 2.x or 1.x.

Documentation

The latest available documentation can always be found at <https://www.xsens.com/xsens-mti-documentation>. At the start of August the three main documents for the MTi 1-series will be updated for this new release:

- MTi 1-series Datasheet
- MTi 1-series Development Kit User Manual
- MTi 1-series Hardware Integration Manual

Older versions of these documents can be found on [this page](#).

Support

Do you have questions? Please contact [our team of product specialists](#) or your local sales representative for more information.