UM1486
User manual

iNEMOENgine_PW8 software package

Introduction

This document describes the features of the iNEMOENgine_PW8 software package and the device firmware upgrade (DFU) procedure to upload it to the microcontroller of the STEVAL-MKI119V1 MEMS sensor demonstration kit.

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1 Software package description

The iNEMOENgine_PW8 software package includes the following directory structure:

- **Doc**: contains the license agreement for the software, the release notes and this document
- **DFU**: contains the installation package for the software needed to upgrade the firmware of the STEVAL-MKI119V1 demonstration kit
- **Firmware**: contains the binary file that can be flashed to the microcontroller of the STEVAL-MKI119V1 using the DFU software

2 iNEMOENgine

The iNEMOENgine_PW8 software package includes the iNEMOENgine library.

The iNEMOENgine is a new, advanced software engine that fuses accelerometer, gyroscope and magnetometer data to deliver accurate and reliable motion-sensing information that is easy to integrate into smart consumer devices.

The iNEMOENgine fuses data from the integrated 9-axis sensor suite with advanced algorithms that use true high-number-of-states adaptive Kalman filtering.

The iNEMOENgine's adaptive filters converge so that correct heading data overrides magnetic distortions and anomalies, resulting in more accurate and reliable data.

iNEMO allows the correction of:

- magnetic distortions registered on the magnetometers
- dynamic distortion measured by the accelerometers
- inherent drift of the gyroscope over time

The iNEMO engine integrates all 9 inertial axes plus compass with complex fusion algorithms, so the output of the sensor cluster is optimized.

This allows for faster, easier integration into smart consumer devices and higher performance of the solution as a whole.

Library output:

- Quaternions four number hpr system
- Rotation: heading, pitch, and roll
- Linear acceleration: device frame linear accelerations
- Gravity: device frame gravity acceleration

3 Device upgrade procedure (DFU)

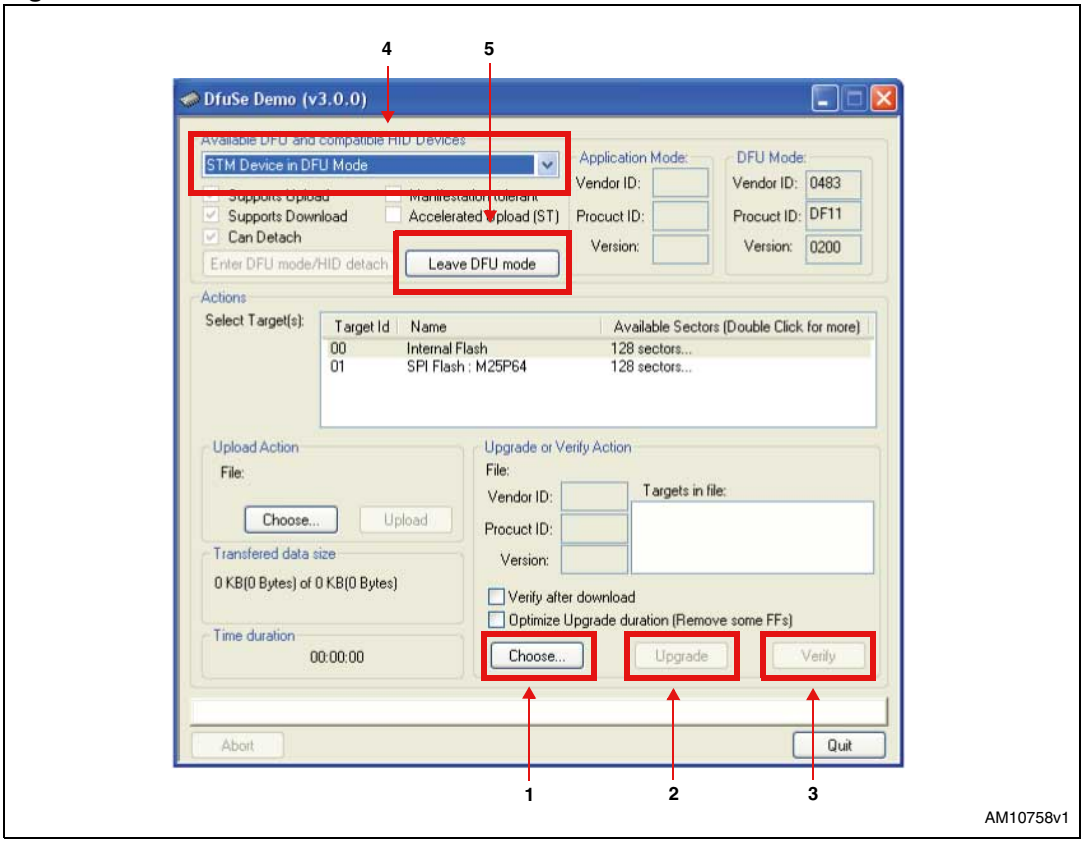
3.1 DFU software installation

Run the DfuSe_Demo_V3.0_Setup.exe file located in the DFU directory of the software package. The InstallShield Wizard will guide you to install the DfuSe applications and source code on your computer. When the software is successfully installed, click the “Finish” button. You can then explore the driver directory.

The driver files are located in the “Driver” directory in the install path (C:\Program files\STMicroelectronics\DfuSe).

The documentation is located in the “C:\Program Files\STMicroelectronics\DfuSe\Sources\Doc” folder.

Figure 1. DfuSe user interface



3.2 Firmware upgrade

1. While keeping button 1 on the board (*Figure 2*, item 1) pressed, connect the device to a spare USB port on your PC. LED 1, 2 and 3 (*Figure 2*, item 2) will switch ON to signal that the microcontroller has entered DFU mode.
2. Open the Device Manager, and go to “Other devices”. Right click on the “STM32 DFU” item (*Figure 3*) and select “Update Driver...”. Use the drivers located in the “C:\Program Files\STMicroelectronics\Software\DfuSe\Driver” folder.
3. The driver is now correctly installed (*Figure 4*).
4. Run the “DfuSe demonstration” application (Start -> All Programs -> STMicroelectronics -> DfuSe -> DfuSe Demonstration or C:\Program Files\STMicroelectronics\Software\DfuSe\BIN\DfuSeDemo.exe). The STEVAL-MKI119V1 is recognized in DFU mode (*Figure 1*, item 4).
5. Click the “Choose” button (*Figure 1*, item 1) to select the DFU file provided with the package in the Firmware directory. The displayed information, such as VID, PID, Version and target number is read from the DFU file.
6. Click the “Upgrade” button (*Figure 1*, item 2) to start upgrading file content to the memory.
7. Click the “Verify” button (*Figure 1*, item 3) to verify that the data was successfully downloaded.
8. Click the “Leave DFU mode” button (*Figure 1*, item 5) or disconnect the board.

The firmware is now updated and the board ready to be used.

Figure 2. STEVAL-MKI119V1

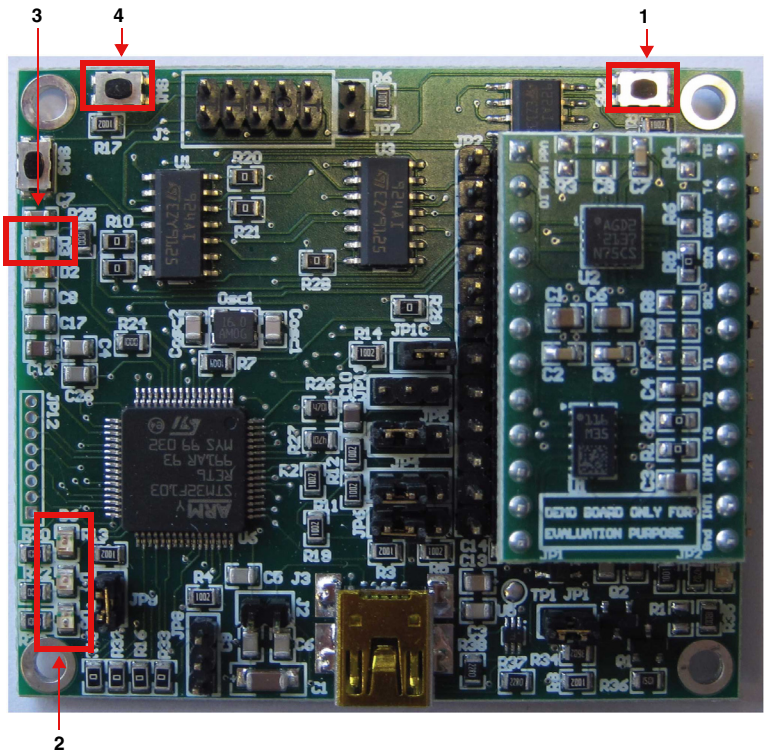


Figure 3. Device manager - no DFU driver installed

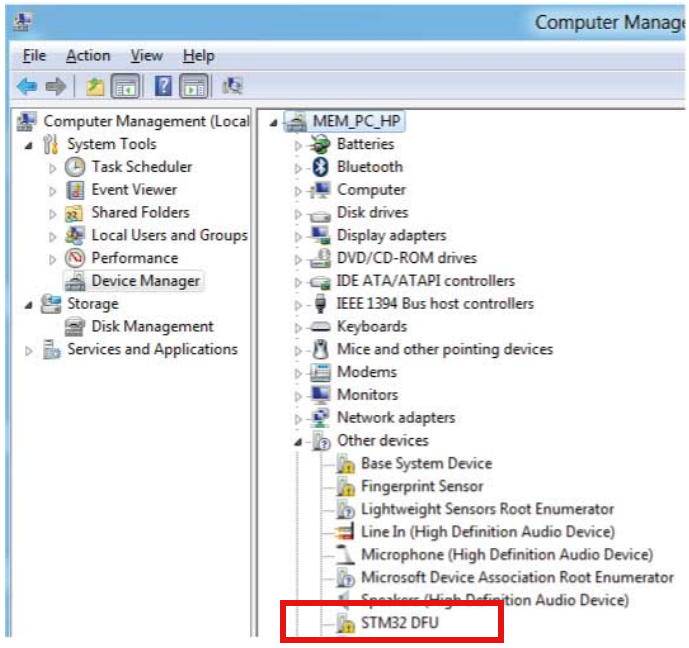
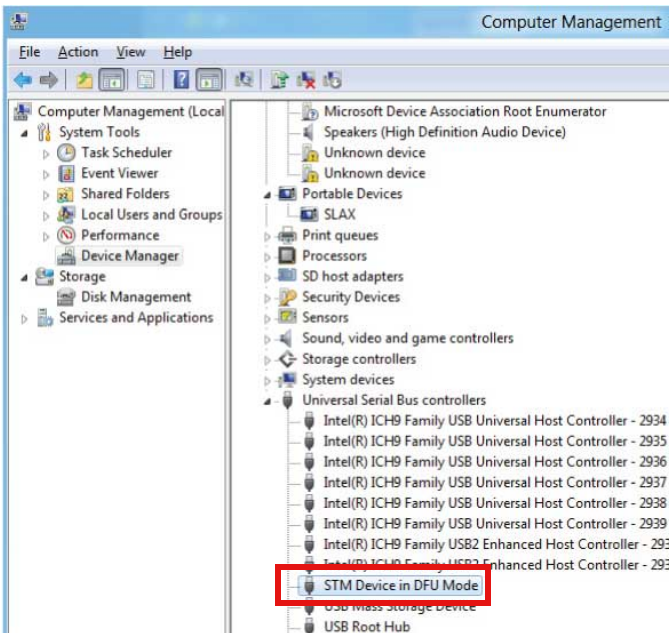


Figure 4. Device manager - DFU driver installed



4 Using the board

Once the STEVAL-MKI119V1 has been upgraded with the iNEMOENgine_PW8 software package, it allows connection through the USB interface to any PC running the Windows 8 operating system. After the kit is connected, it is recognized as an HID sensor cluster and accesses gyroscope, accelerometer, heading, inclinometer and quaternions data to be employed for user applications.

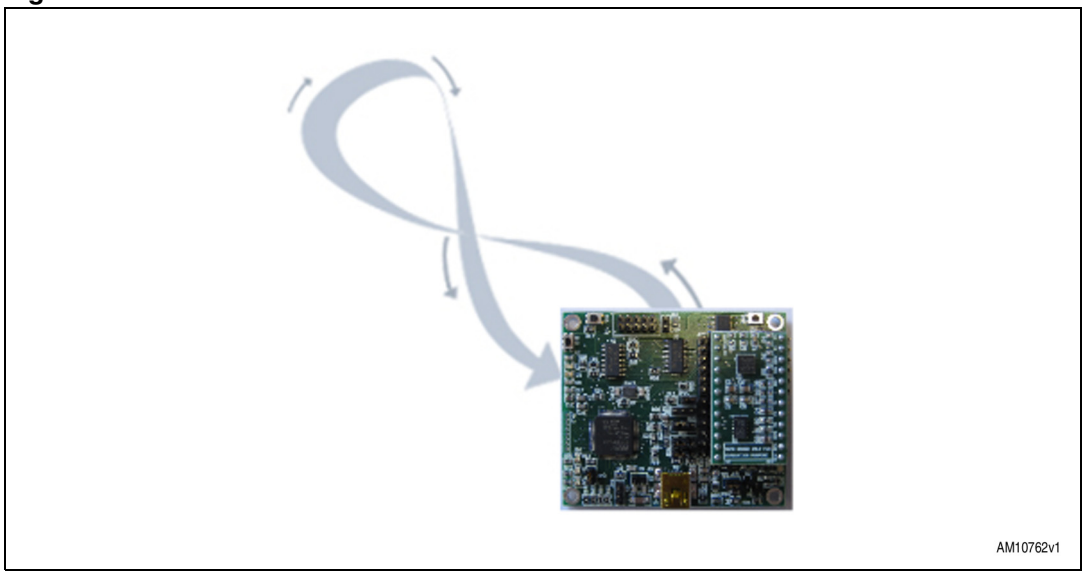
4.1 Board calibration

Before using the board for the first time, calibration is required. To enable the calibration routine, press button 3 (*Figure 2*, item 4). LED D6 of the board (*Figure 2*, item 2) will remain ON until the calibration routine is completed.

Two movements may be executed to calibrate the board:

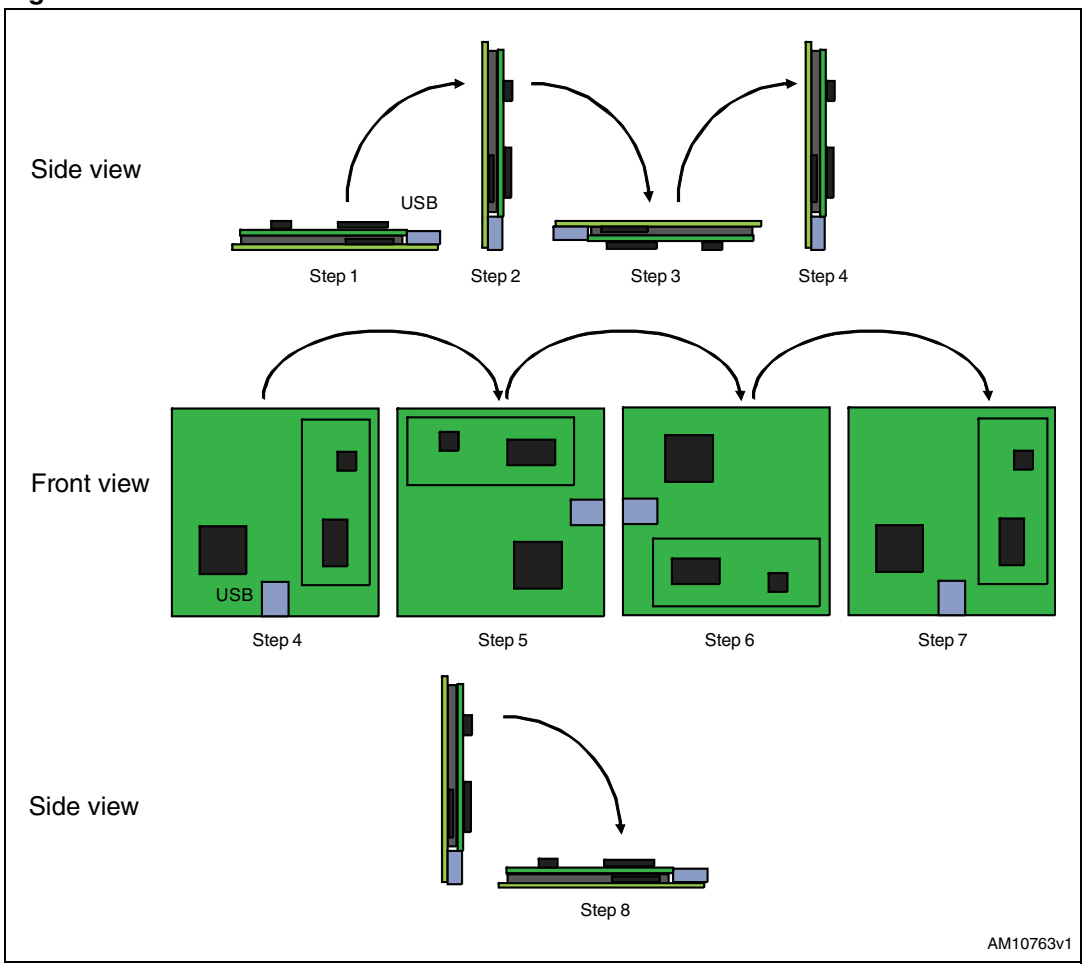
1. Move the board in the space as shown in *Figure 5*

Figure 5. Free movement calibration



2. Move the board in the space as described in *Figure 6*

Figure 6. Fixed movement calibration



5 Revision history

Table 1. Document revision history

Date	Revision	Changes
02-Nov-2011	1	Initial release.