

Sensor and motion algorithm software expansion for STM32Cube

| Application | Sample applications | | | |
|-------------|--|----------|----------|----------|
| Middleware | MotionAC | MotionAD | MotionAR | MotionAT |
| | MotionAW | MotionCP | MotionDI | MotionEC |
| | MotionFA | MotionFD | MotionFX | MotionGC |
| | MotionGR | MotionID | MotionMC | MotionPE |
| | MotionPM | MotionPW | MotionSD | MotionSM |
| | MotionSP | MotionTL | MotionVC | |
| | Hardware Abstraction | | | |
| | STM32Cube Hardware Abstraction Layer (HAL) | | | |
| Hardware | STM32 Nucleo expansion boards | | | |
| | X-NUCLEO-IKS01A2 (Sense) X-NUCLEO-IKS01A3 (Sense) X-NUCLEO-IKS02A1 (Sense) | | | |
| | STM32 Nucleo development board | | | |

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|--|
|  Magnetometer Calibration  Gyroscope Calibration  Accelerometer Calibration  FFT & Vibration Monitoring |
|  Sensor Fusion  eCompass  Tilt Sensing  Vertical Context  Airplane Detection  Dynamic Inclinometer |
|  Activity Recognition for Mobile Devices  Carry Position  Gesture Recognition  Pedometer  Fall Detection |
|  Activity Recognition for Wearable Devices  Activity Recognition for Wrist  Pose Estimation  Motion Intensity Detection  Standing vs Sitting/Desk Detection  Fitness Activities  Active Time  Pedometer  Sleep Monitoring |



| Product summary | |
|---|---|
| Sensor and motion algorithm software expansion for STM32Cube | X-CUBE-MEMS1 |
| Motion MEMS and environmental sensor expansion board for STM32 Nucleo | X-NUCLEO-IKS01A2/X-NUCLEO-IKS01A3/X-NUCLEO-IKS02A1 |
| STM32 Nucleo development board | STM32 Nucleo |
| Applications | Climate control Connectivity Lighting Controls Metering Personal Care and Hygiene Sensing Smart farming Tracking Virtual - Augmented Reality |

Features

- Complete software to build applications using the following sensors:
 - temperature and humidity sensors: HTS221 for X-NUCLEO-IKS01A2 and X-NUCLEO-IKS01A3
 - pressure sensor: LPS22HB for X-NUCLEO-IKS01A2, LPS22HH for X-NUCLEO-IKS01A3 and LPS33HW via DIL24 interface
 - temperature sensors: STTS751 for X-NUCLEO-IKS01A3 and STTS22H via DIL24 interface
 - motion sensors: LSM303AGR and LSM6DSL for X-NUCLEO-IKS01A2, LIS2MDL, LIS2DW12 and LSM6DSO for X-NUCLEO-IKS01A3, ISM330DHCX, IIS2DLPC and IIS2MDC for X-NUCLEO-IKS02A1, and ASM330LHH, ISM303DAC, ISM330DLC, LIS2DH12, LSM6DSOX, A3G4250D, AIS2DW12, AIS328DQ, AIS3624DQ, H3LIS331DL, LIS3MDL, LSM6DSR, LSM6DSRX and LSM6DSO32 via DIL24 interface
 - audio sensor: IMP34DT05 for X-NUCLEO-IKS02A1
- Several examples to show the innovative inertial and environmental sensors
- Sample application to transmit real-time sensor data to a PC
- Compatible with the [Uicleo-GUI](#) graphical user interface to display sensor data and configure outputs
- Sample implementation available on the X-NUCLEO-IKS01A2/X-NUCLEO-IKS01A3/X-NUCLEO-IKS02A1 boards connected to a NUCLEO-F401RE, NUCLEO-L152RE, NUCLEO-L476RG or NUCLEO-L073RZ development board
- Advanced motion libraries with sample applications
- Package compatible with STM32CubeMX, can be downloaded from and installed directly into STM32CubeMX
- Easy portability across different MCU families, thanks to STM32Cube
- Free, user-friendly license terms

Description

The X-CUBE-MEMS1 expansion software package for STM32Cube runs on the STM32 and includes drivers that recognize the sensors and collect temperature, humidity, pressure and motion data.

The expansion is built on STM32Cube software technology to ease portability across different STM32 microcontrollers.

The software comes with a sample implementation of the drivers running on the X-NUCLEO-IKS01A2/X-NUCLEO-IKS01A3/X-NUCLEO-IKS02A1 expansion boards connected to a featured STM32 Nucleo development board.

The software provides sample applications and advanced motion libraries (MotionAC, MotionAD, MotionAR, MotionAT, MotionAW, MotionCP, MotionDI, MotionEC, MotionFA, MotionFD, MotionFX, MotionGC, MotionGR, MotionID, MotionMC, MotionPE, MotionPM, MotionPW, MotionSD, MotionSM, MotionSP, MotionTL and MotionVC).

1 Detailed description

1.1 What is STM32Cube?

STM32Cube is a combination of a full set of PC software tools and embedded software blocks running on STM32 microcontrollers and microprocessors:

- **STM32CubeMX** configuration tool for any STM32 device; it generates initialization C code for Cortex-M cores and the Linux device tree source for Cortex-A cores
- **STM32CubeIDE** integrated development environment based on open-source solutions like Eclipse or the GNU C/C++ toolchain, including compilation reporting features and advanced debug features
- **STM32CubeProgrammer** programming tool that provides an easy-to-use and efficient environment for reading, writing and verifying devices and external memories via a wide variety of available communication media (JTAG, SWD, UART, USB DFU, I2C, SPI, CAN, etc.)
- **STM32CubeMonitor** family of tools (**STM32CubeMonRF**, **STM32CubeMonUCPD**, **STM32CubeMonPwr**) to help developers customize their applications in real-time
- **STM32Cube MCU and MPU packages** specific to each STM32 series with drivers (HAL, low-layer, etc.), middleware, and lots of example code used in a wide variety of real-world use cases
- **STM32Cube expansion packages** for application-oriented solutions

1.2 How does this software complement STM32Cube?

This software is based on the STM32CubeHAL hardware abstraction layer for the STM32 microcontroller.

The package extends **STM32Cube** by providing a board support package (BSP) for the sensor expansion board. The drivers abstract the hardware low-level details and allow the applications to access sensor data in a hardware-independent manner.

The package includes several sample applications that the developer can use to start experimenting with the code. A sample application has been developed to enable sensor data logging on a PC; a Windows PC utility (**Unicleo-GUI**) is available on www.st.com, to allow the developer choose among various sensors available on the expansion board and set the appropriate delay/interval among consecutive data points.

Sensor data can be logged to a file selected by the user.

The package is compatible with **STM32CubeMX**. It can be downloaded from and installed directly into **STM32CubeMX**, as detailed in UM1718 (freely available on www.st.com).

Revision history

Table 1. Document revision history

| Date | Revision | Changes |
|-------------|----------|--|
| 07-Nov-2014 | 1 | First release. |
| 19-Dec-2014 | 2 | Modified the document title, features and description text on the cover page. Added Section 1: Detailed description. |
| 17-Jun-2015 | 3 | Updated: Title on the cover page. |
| 20-Oct-2015 | 4 | Updated: Overall system architecture, features and description on the cover page. |
| 21-Dec-2015 | 5 | Updated cover image |
| 22-Dec-2015 | 6 | Updated How does this software complement STM32Cube? |
| 04-Nov-2016 | 7 | Updated cover image Updated hardware compatibility information for X-NUCLEO-IKS01A2 expansion board and associated sensors. |
| 20-Mar-2017 | 8 | Updated cover image, features, description and How does this software complement STM32Cube? |
| 20-Sep-2017 | 9 | Updated cover page image and description. |
| 14-Nov-2017 | 10 | Updated cover page title. |
| 09-Jul-2018 | 11 | Updated cover page image, features and description. |
| 20-Dec-2018 | 12 | Updated cover page features and Section 1.2 How does this software complement STM32Cube? |
| 18-Feb-2019 | 13 | Updated cover page image. Added X-NUCLEO-IKS01A3 expansion board compatibility information. |
| 05-Jun-2019 | 14 | Updated cover page image, features and description. |
| 25-Nov-2019 | 15 | Updated cover page image, product summary table, features and description. Updated Section 1.1 What is STM32Cube?. Added X-NUCLEO-IKS02A1 expansion board compatibility information. |
| 14-May-2020 | 16 | Updated cover page image. Added references to MotionAD and MotionDI libraries. |

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