Quick Start Guide
Motion MEMS and environmental sensor expansion board for STM32 Nucleo (X-NUCLEO-IKS01A3)
Quick Start Guide Contents

- X-NUCLEO-IKS01A3: Motion MEMS and environmental sensor expansion board
  Hardware and Software overview

- Setup & Demo Examples
  Documents & Related Resources

- STM32 Open Development Environment: Overview
Motion MEMS and environmental sensor expansion board

Hardware overview (1/2)

X-NUCLEO-IKS01A3 Hardware description

- The X-NUCLEO-IKS01A3 is a motion MEMS and environmental sensor evaluation board system.

- It is compatible with the Arduino UNO R3 connector layout, and is designed around ST’s latest sensors.

**Key products on board**

**LSM6DSO**
MEMS 3D accelerometer (±2/±4/±8/±16 g) + 3D gyroscope (±125/±250/±500/±1000/±2000 dps)

**LIS2DW12**
MEMS 3D accelerometer (±2/±4/±8/±16 g)

**LIS2MDL**
MEMS 3D magnetometer (±50 gauss) +

**LPS22HH**
MEMS pressure sensor, 260-1260 hPa absolute digital output barometer

**HTS221**
Capacitive digital relative humidity and temperature

**STTS751**
Digital Temperature sensor

**DIL 24-pin**
Socket available for additional MEMS adapters and other sensors (UV index)

Latest info available at www.st.com

X-NUCLEO-IKS01A3

**Connector for the STM32 Nucleo Board**
Key features

- The X-NUCLEO-IKS01A3 is a motion MEMS and environmental sensor evaluation board system.
- All sensor sensors are connected on a single I²C bus
- Sensor I²C address selection
- Each sensor has separate power supply lines allowing power consumption measurements
- Sensor disconnection (disconnects the I²C bus as well as the power supply)
- Interrupt and DRDY signals from sensors
- DIL24 socket (compatible with STEVAL-MKI***V* MEMS adapter boards)

* is used as a wildcard character for related part number
X-CUBE-MEMS1 Software description

- The X-CUBE-MEMS1 software package is an expansion for STM32Cube, associated with the X-NUCLEO-IKS01A3 expansion board.

- It is compatible with NUCLEO-F401RE, NUCLEO-L053R8, NUCLEO-L152RE or NUCLEO-L476RG

Key features

- Complete software to build applications using environmental sensors (HTS221, LPS22HH and STTS751) and motion sensors (LIS2DW12, LIS2MDL and LSM6DSO)

- Several examples to show the innovative inertial and environmental sensors

- Sample application to transmit real-time sensor data to a PC

- Compatible with the Unicleo-GUI graphical user interface to display sensor data and configure outputs

- 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

Latest info available at www.st.com X-CUBE-MEMS1
Quick Start Guide Contents

X-NUCLEO-IKS01A3: Motion MEMS and environmental sensor expansion board
Hardware and Software overview

Setup & Demo Examples
Documents & Related Resources

STM32 Open Development Environment: Overview
Setup & demo examples

Hardware prerequisites

- 1x Motion MEMS and environmental sensor expansion board (X-NUCLEO-IKS01A3)
- 1x STM32 Nucleo development board (NUCLEO-F401RE or NUCLEO-L053R8 or NUCLEO-L152RE or NUCLEO-L476RG)
- Windows 10/8/7 - Laptop/PC
- 1x USB type A to mini-B USB cable
Setup & demo examples
Software prerequisites

- **STSW-LINK008**: ST-LINK/V2-1 USB driver
- **STSW-LINK007**: ST-LINK/V2-1 firmware upgrade
- **X-CUBE-MEMS1**
  - Copy the .zip file content into a folder on your PC
  - The package contains source code examples (Keil, IAR, System Workbench) based on **NUCLEO-F401RE** or **NUCLEO-L053R8** or **NUCLEO-L152RE** or **NUCLEO-L476RG**
X-CUBE-MEMS1 in 7 steps
Use of Unicleo-GUI with precompiled BIN FW

X-CUBE-MEMS1 for NUCLEO-F401RE or NUCLEO-L053R8 or NUCLEO-L152RE or NUCLEO-L476RG

1. www.st.com/x-nucleo

2. Select X-NUCLEO-IKS01A3

3. Download & unpack X-CUBE-MEMS1

X-CUBE-MEMS1 package structure

- Docs
  - Low-level sensor drivers
- L0 / F4 / L1 / L4 DataLogExtended
- FW src code + binary
- PC GUI (Unicleo-GUI)

4. Download & install STM32 Nucleo ST-LINK/V2-1 USB driver STSW-LINK008

5. Download / Install / Run ST-Link FW Upgrade utility STSW-LINK007
X-CUBE-MEMS1 in 7 steps

Use of Unicleo-GUI with precompiled BIN firmware

X-CUBE-MEMS1 for NUCLEO-F401RE or NUCLEO-L053R8 or NUCLEO-L152RE or NUCLEO-L476RG

6. drag and drop DataLogExtended.bin for F4 or for L0 or for L1 or for L4 on Nucleo drive

7. Open Utilities Folder in the X-CUBE-MEMS1 SW package...

...and click on the link to download and install Unicleo-GUI
X-CUBE-MEMS1 for NUCLEO-F401RE, NUCLEO-L053R8, NUCLEO-L152RE or NUCLEO-L476RG

1. Select COM port
2. Select sensors
3. Select graph plots
4. Start data logging
5. Data Log Area

Unicleo-GUI
Compile the DataLogExtended FW using a supported IDE

X-CUBE-MEMS1 for NUCLEO-F401RE, NUCLEO-L053R8, NUCLEO-L152RE or NUCLEO-L476RG

1. [www.st.com/x-nucleo](http://www.st.com/x-nucleo)

2. Select X-NUCLEO-IKS01A3

3. Download & unpack X-CUBE-MEMS1

4. Flash and run the project.

X-CUBE-MEMS1 package structure

- Docs
- Low-level sensor drivers
- L0 / F4 / L1 / L4 example (DataLogExtended FW)
- PC GUI (Unicleo-GUI)

```
\STM32CubeExpansion_MEMS1_V6.0.0\Projects\STM32F401RE-Nucleo\Examples\IKS01A3\DataLogExtended\EWARM
```
X-CUBE-MEMS1 for NUCLEO-F401RE, NUCLEO-L053R8, NUCLEO-L152RE or NUCLEO-L476RG

- Drag and drop DataLogTerminal.bin on Nucleo drive
- Configure the serial line monitor (speed, LF)
Documents & related resources

All documents are available in the DESIGN tab of the related products webpage

X-NUCLEO-IKS01A3:

- Gerber files, BOM, Schematics
- DB3851: Motion MEMS and environmental sensor expansion board for STM32 Nucleo – Data brief
- UM2559: Getting started with the X-NUCLEO-IKS01A3 motion MEMS and environmental sensor expansion board for STM32 Nucleo – User manual

X-CUBE-MEMS1:

- DB2442: Sensor and motion algorithm software expansion for STM32Cube – Data brief
- UM1859: Getting started with the X-CUBE-MEMS1 motion MEMS and environmental sensor software expansion for STM32Cube – User manual
- Software Setup File

Consult www.st.com for the complete list
Quick Start Guide Contents

X-NUCLEO-IKS01A3: Motion MEMS and environmental sensor expansion board
Hardware and Software overview

Setup & Demo Examples
Documents & Related Resources

STM32 Open Development Environment: Overview
The STM32 Open Development Environment (ODE) consists of a set of stackable boards and a modular open SW environment designed around the STM32 microcontroller family.

STM32Cube development software

STM32 Nucleo development boards

STM32 Nucleo expansion boards (X-NUCLEO)

STM32Cube expansion software (X-CUBE)

Function Packs (FP)

www.st.com/stm32ode
STM32 Nucleo Development Boards (NUCLEO)

- A comprehensive range of affordable development boards for all the STM32 microcontroller series, with unlimited unified expansion capabilities and integrated debugger/programmer functionality.
STM32 Nucleo Expansion Boards (X-NUCLEO)

- Boards with additional functionality that can be plugged directly on top of the STM32 Nucleo development board directly or stacked on another expansion board.

Example of STM32 expansion board (X-NUCLEO-IKS01A1)

- Sense
- Connect
- Power
- Move/Actuate
- Interact

DIL24 support for new devices
Motion MEMS sensors
Environmental sensors
www.st.com/x-nucleo
### STM32 Open Development Environment

#### Software components

- **STM32Cube software (CUBE)** - A set of free tools and embedded software bricks to enable fast and easy development on the STM32, including a Hardware Abstraction Layer and middleware bricks.

- **STM32Cube expansion software (X-CUBE)** - Expansion software provided free for use with the STM32 Nucleo expansion board and fully compatible with the STM32Cube software framework. It provides abstracted access to expansion board functionality through high-level APIs and sample applications.

- **Compatibility with multiple Development Environments** - The STM32 Open Development Environment is compatible with a number of IDEs including IAR EWARM, Keil MDK, and GCC-based environments. Users can choose from three IDEs from leading vendors, which are free of charge and deployed in close cooperation with ST. These include Eclipse-based IDEs such as Ac6 System Workbench for STM32 and the MDK-ARM environment.

---

**Tools & IDEs**

| IAR EWARM, Keil MDK-ARM, GCC-based IDEs (e.g. Ac6 System Workbench for STM32) |

**Applications**

| Sample applications | Application examples (e.g. based on ST OpenSoftwareX) |

**Middleware**

<table>
<thead>
<tr>
<th>STM32Cube middleware</th>
<th>Upper level middleware (e.g. ST OpenSoftwareX)</th>
</tr>
</thead>
<tbody>
<tr>
<td>STM32Cube expansion middleware</td>
<td></td>
</tr>
</tbody>
</table>

**Hardware Abstraction**

| STM32Cube Hardware Abstraction Layer (HAL) |

**Hardware**

| STM32 Nucleo expansion boards (X-NUCLEO) |

| STM32 Nucleo developer boards |

---

**OPEN LICENSE MODELS:** STM32Cube software and sample applications are covered by a mix of fully open source BSD license and ST licenses with very permissive terms.

[www.st.com/stm32cube](http://www.st.com/stm32cube)  
[www.st.com/x-cube](http://www.st.com/x-cube)
STM32 Open Development Environment
Building block approach

The building blocks

- **Sense**
  - Accelerometer, gyroscope
  - Inertial modules, magnetometer
  - Pressure, temperature, humidity
  - Proximity, microphone

- **Connect**
  - Bluetooth LE, Sub-GHz radio
  - NFC, Wi-Fi, GNSS

- **Translate**
  - Audio amplifier
  - Touch controller
  - Operation Amplifier

- **Move / Actuate**
  - Stepper motor driver
  - DC & BLDC motor driver
  - Industrial input / output

- **Power**
  - Energy management & battery

- **Process**
  - General-purpose microcontrollers
  - Secure microcontrollers

- **Software**

Your need

Our answer

COLLECT
TRANSMIT
ACCESS
CREATE
POWER
PROCESS

www.st.com/stm32ode