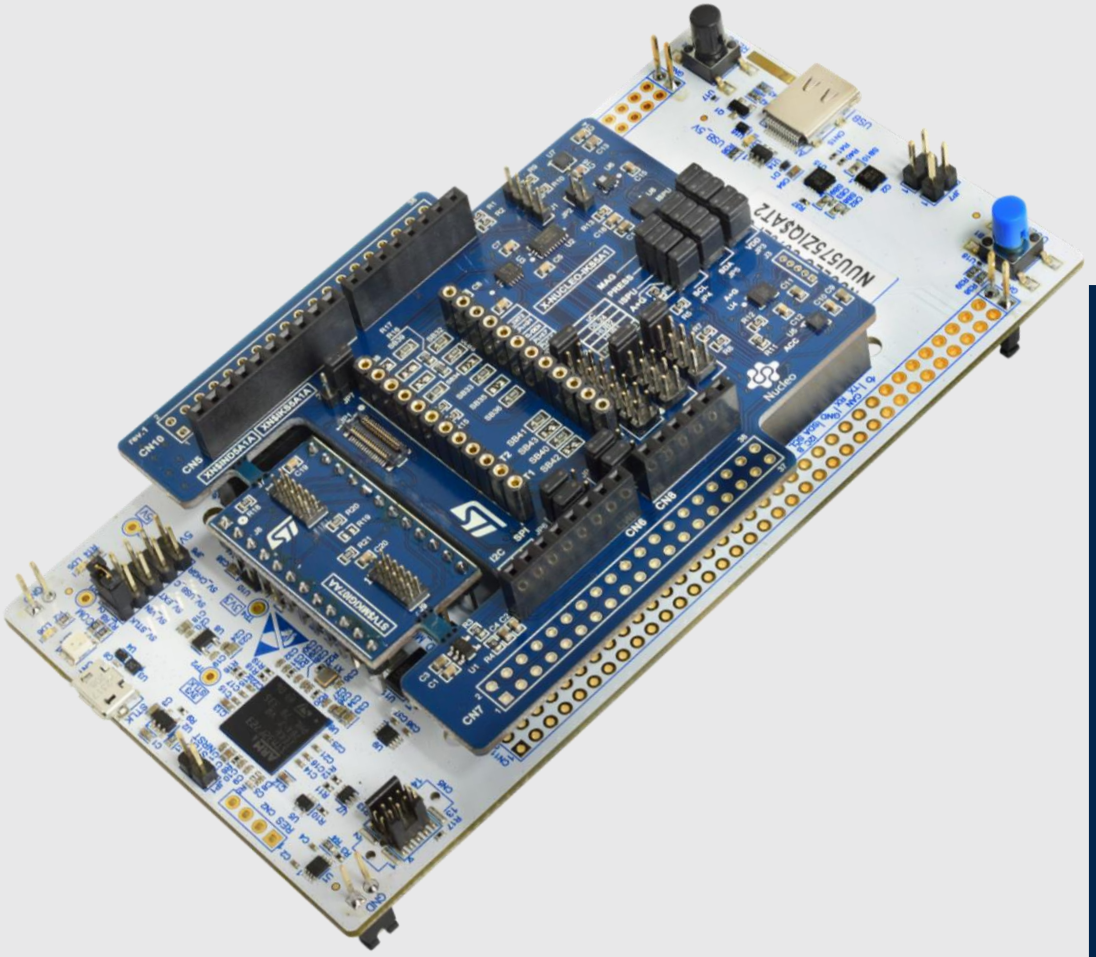

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Quick Start Guide X-NUCLEO-IKS5A1

An STM32 Nucleo expansion board for ST MEMS industrial sensors

STM32 Cube

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X-NUCLEO-IKS5A1 expansion board

Hardware overview 1/3

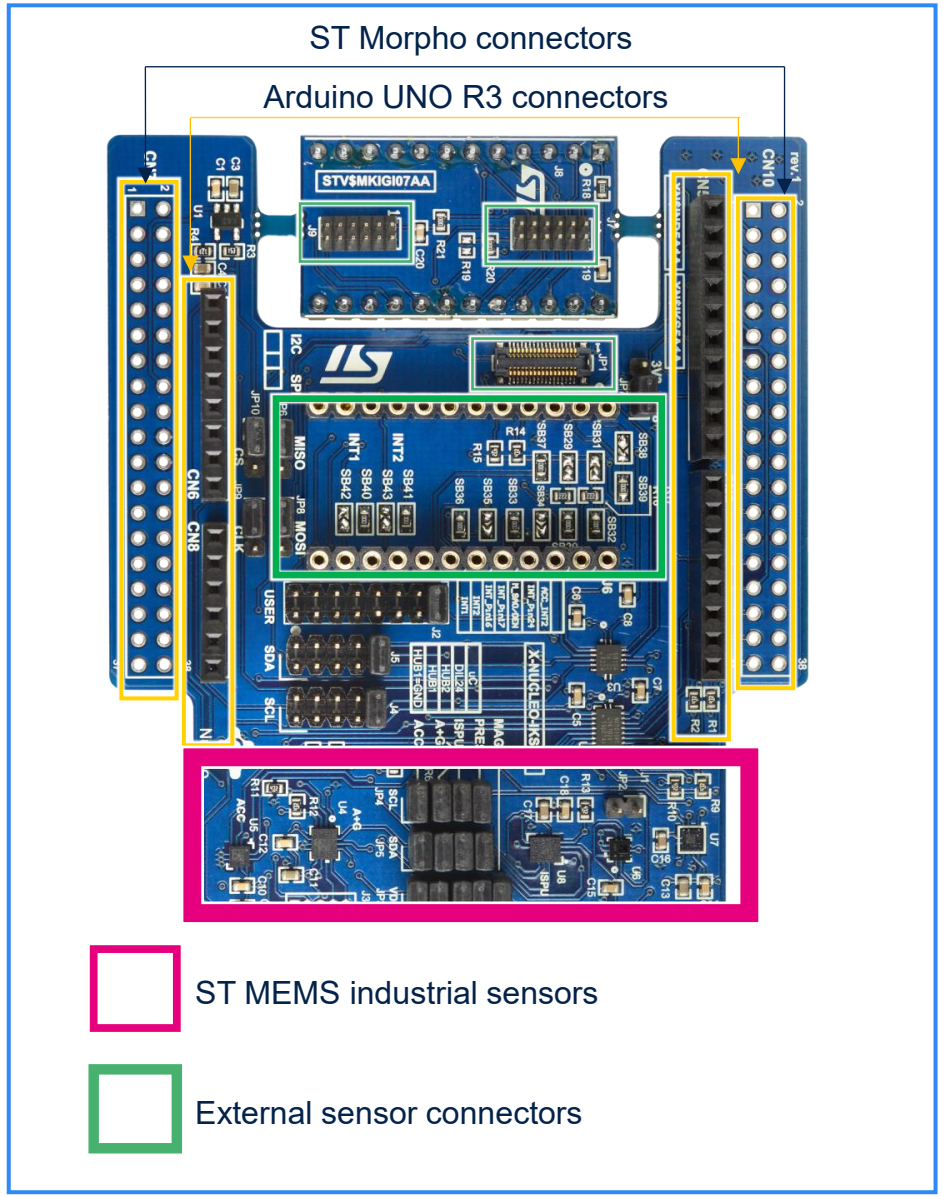
Hardware Description

The X-NUCLEO-IKS5A1 is an STM32 Nucleo expansion board to control and develop custom applications with the latest industrial ST MEMS sensors. On board are mounted:

- IIS2DULPX 3-axis accelerometer
- ISM330IS: 3-axis accelerometer + 3-axis gyroscope with ISPU
- ISM6HG256X: 6-axis IMU with AI and embedded sensor fusion
- IIS2MDC: 3-axis magnetometer
- ILPS22QS: high precision nano pressure sensor

Main Features:

- Easy **development** with ST MEMS industrial sensors
- Compatible with ST MEMS **adapter kits**



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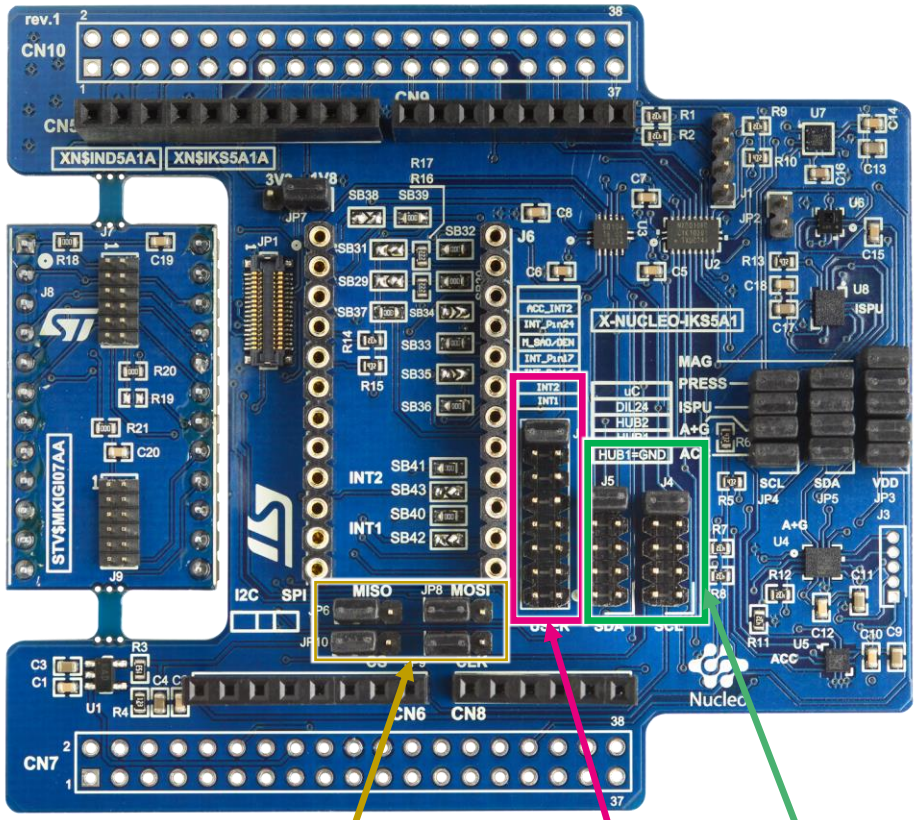
X-NUCLEO-IKS5A1

X-NUCLEO-IKS5A1 expansion board
Hardware overview 2/3

Top view

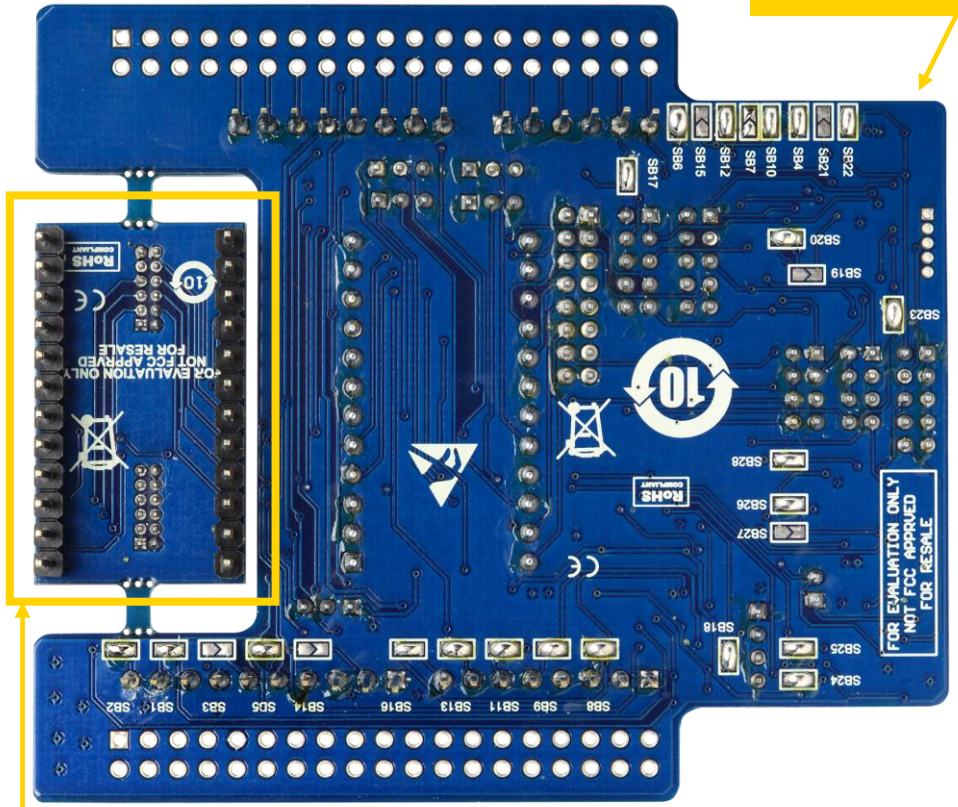


SPI/I2C selection (on DIL24)

DIL24 INT selector

I2C bus selector

Bottom view



Main board
X-NUCLEO-IND5A1

Detachable add-on board
STEVAL-MKIGI07A

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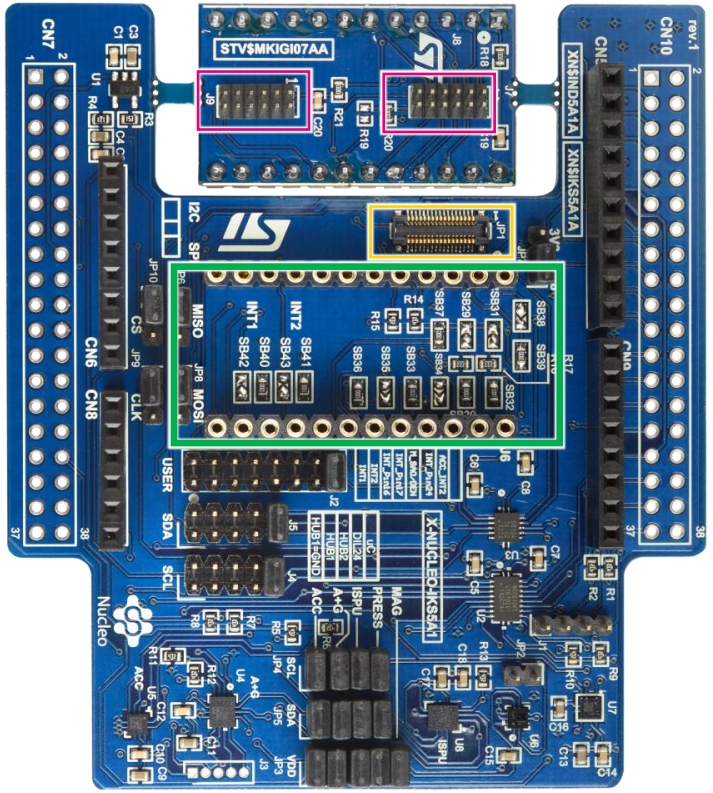
X-NUCLEO-IKS4A1 expansion board
Hardware overview 3/3

External sensor connectors

External sensors can be plugged through three different types of connectors:

- **DIL24 adapter**
  - One connector available in the main board of X-NUCLEO-IKS5A1
  - Standard DIL24 adapter for connecting add-on sensor boards directly to the main board
- **Ribbon flat cable**
  - 2 connectors available on the detachable add-on board STEVAL-MKIGI07A
  - Allows placing the sensor in a different position compared to being plugged into the main board
  - Suitable for many industrial applications
- **Flex PCB connector**
  - One connector available in the main board of X-NUCLEO-IKS5A1
  - Allows placing the sensor in a different position compared to being plugged into the main board
  - Suitable for many industrial applications



DIL24 adapter

Ribbon flat cable

Flex PCB connector

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X-NUCLEO-IKS5A1

X-CUBE-MEMS1 software package
SW architecture overview

Software Description:

- The software package X-CUBE-MEMS1 v11.3.0

Key Features:

- This software is gathering Temperature, Pressure and Motion sensor drivers for the A3G4250D, AIS2DW12, AIS2IH, AIS328DQ, AIS3624DQ, ASM330LHH, ASM330LHHX, H3LIS331DL, IIS2DLPC, IIS2DULPX, IIS2ICLX, IIS2MDC, IIS3DWB, ISM303DAC, ISM330BX, ISM330DHCX, ISM330DLC, LIS2DH12, LIS2DTW12, LIS2DU12, LIS2DUX12, LIS2DUXS12, LIS2DW12, LIS2MDL, LIS3MDL, LSM303AGR, LSM6DSL, LSM6DSO, LSM6DSO32, LSM6DSO32X, LSM6DSOX, LSM6DSR, LSM6DSRX, LSM6DSV, LSM6DSV16B, LSM6DSV16BX, LSM6DSV16X, LSM6DSV32X, LSM6DSV80X, LSM6DSV320X, LSM6DSO16IS, ILPS22QS, ILPS28QSW, LPS22CH, LPS22DF, LPS22HB, LPS22HH, LPS27HHTW, LPS28DFW, LPS33HW, LPS33K, STHS34PF80, HTS221, SGP40, SHT40AD1B, STTS22H, STTS751, IMP34DT05
- Several examples to show the innovative hardware features of the inertial and environmental sensors
- Sample application to transmit real time sensors data to a PC
- Compatible with the Unicleo-GUI graphical user interface to display sensors data and configure outputs
- Sample implementation available on X-NUCLEO-IKS5A1 or X-NUCLEO-IKS02A1 or X-NUCLEO-IKS4A1 boards connected to a NUCLEO-F401RE, NUCLEO-L152RE, NUCLEO-U575ZI-Q or NUCLEO-L073RZ development board
- Advanced Motion or Infrared libraries with sample applications available only for NUCLEO-F401RE, NUCLEO-U575ZI-Q, NUCLEO-L152RE and NUCLEO-L073RZ
- Easy portability across different MCU families, thanks to STM32Cube
- Free, user-friendly license terms

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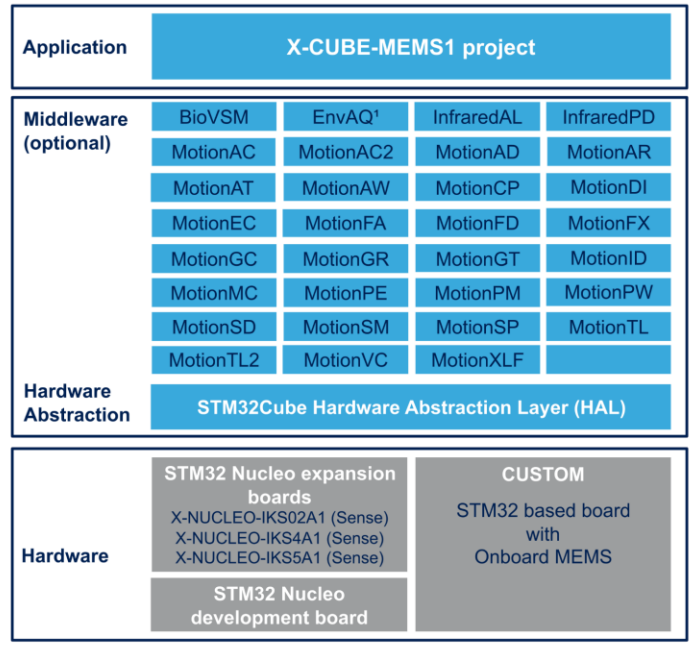
X-CUBE-MEMS1



¹Developed and maintained by Sensirion

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Demo Example: Bill Of Material

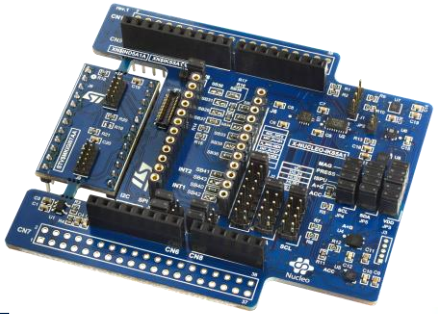
HW pre-requisites

- 1x *description* expansion board (**X-NUCLEO-IKS4A1**)
- 1x STM32 Nucleo development board of **NUCLEO-F401RE, NUCLEO-U575ZI-Q, NUCLEO-L152RE, NUCLEO-L073RZ**
- 1x USB type A to micro-B (or mini-USB) cable depending on the selected Nucleo board
- 1x Laptop/PC with Windows 10 or above
- 1x 12-pins Industrial cable (optional)
- 1x 34-pin flex connector (optional)

A to micro (or min) USB Cable

12-pins ribbon cable

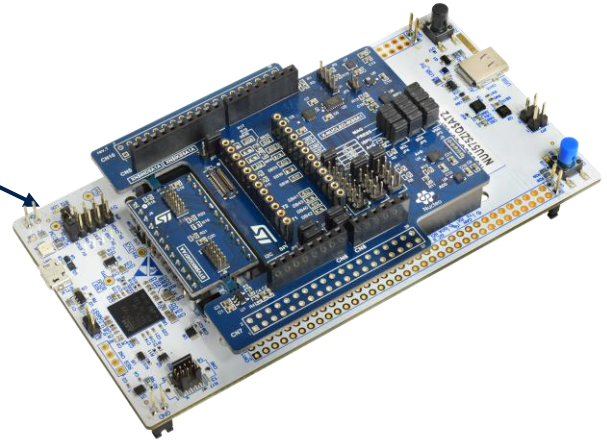
34 pin flex connector



X-NUCLEO-IKS5A1

+

NUCLEO-F401RE or
NUCLEO-L073RZ or
NUCLEO-L152RE or
NUCLEO-U575ZI-Q



NUCLEO
stacked solution

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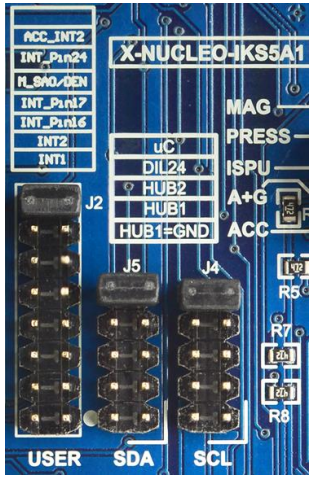
Hardware setup
Jumpers' configuration

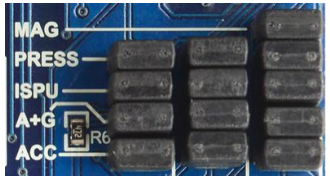
1



I2C bus enable configuration setting jumpers J4 and J5

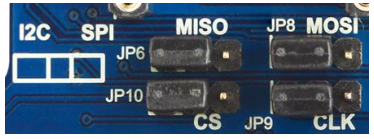
- To change I2C master (sensor HUB1/2, DIL24) move jumpers from the first row on both connectors.

2



I2C bus and VDD (VDDIO) on soldered devices
To disable soldered device is mandatory to remove proper jumper to interrupt VDD and I2C bus on selected device

3



Select I2C or SPI communication protocol on DIL24
modifying JP6, JP8, JP9 and JP10

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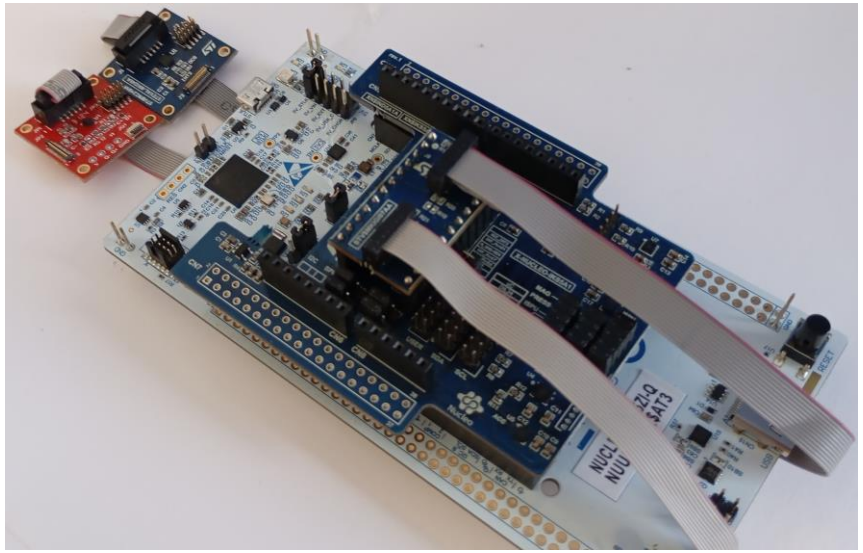
More details on pin configurations, power modes and capabilities are contained int the ***UM3550***

Demo Example: software tools

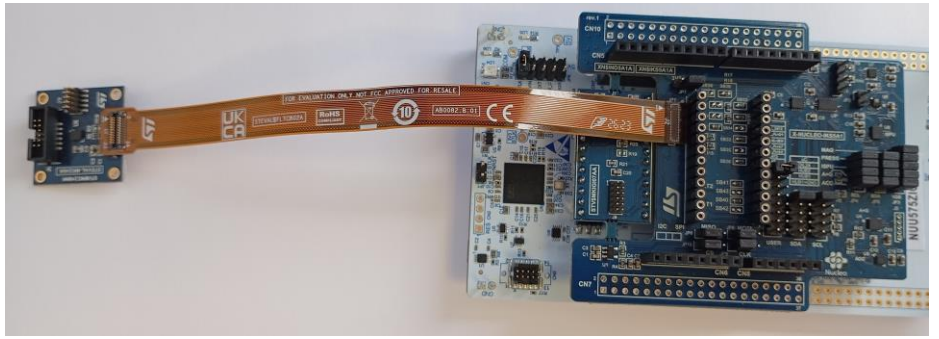
SW pre-requisites

- STM32CubeIDE : All-in-one multi-OS software tool for programming STM32 products or
  STSW-LINK009: ST-LINK/V2-1 USB driver
- STM32CubeMonUCPD : Monitoring and configuration software tool for STM32 USB-C and Power Delivery 3.0 applications
- X-CUBE-MEMS1 : software package including the application examples for NUCLEO-F401RE, NUCLEO-U575ZI-Q, NUCLEO-L152RE and NUCLEO-L073RZ to be associated with the X-NUCLEO-IKS5A1
- MEMS Studio : Software solution for MEMS sensors with graphical no-code design of algorithms and development of embedded AI features

Demo Examples for different operating modes



Two different adapter boards connected via two ribbon cable



External board connected via flex cable

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Documents & related resources

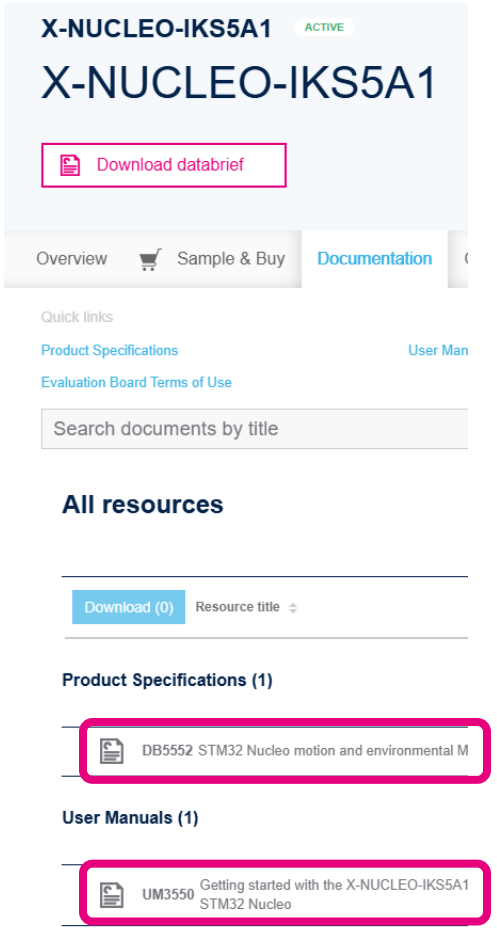
All documents are available in the DOCUMENTATION tab of the related products webpage

X-NUCLEO-IKS5A1 :

- Databrief DB5552: STM32 NUCLEO motion and environmental MEMS expansion board for industrial applications
- User manual UM3550: Getting started with the X-NUCLEO-IKS5A1 motion MEMS and environmental sensor expansion board for STM32 Nucleo
- Schematic, Gerber files, BOM

X-CUBE-MEMS1 :

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



Consult www.st.com for the complete list

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STM32Cube Ecosystem

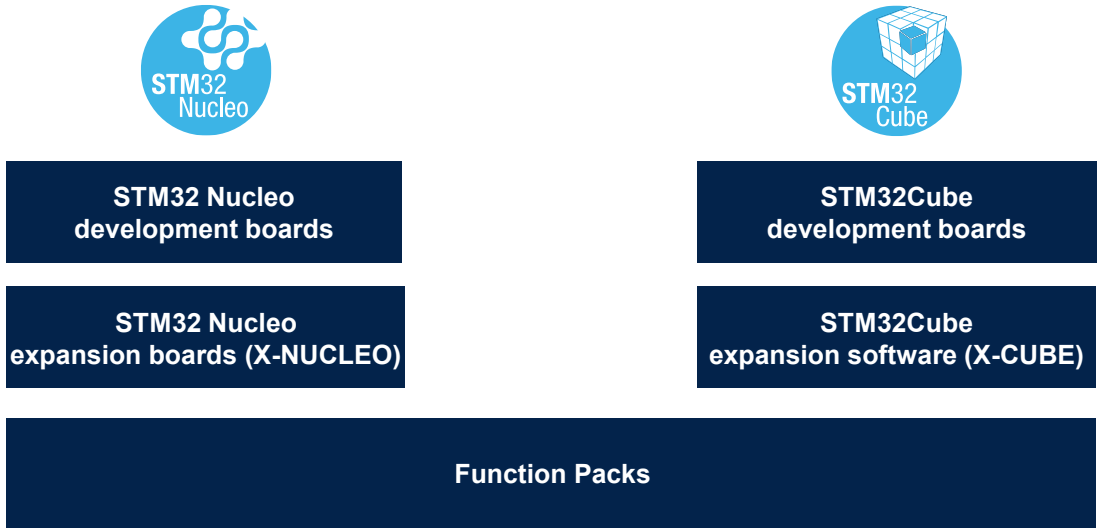
FAST, AFFORDABLE PROTOTYPING AND DEVELOPMENT

STM32Cube is a key enabler for developers, empowering them to reach greater success. Providing a comprehensive suite of professional development tools and embedded software components, STM32Cube enables developers to better differentiate their product, streamline design cycles, and save costs. It enables fast prototyping with leading-edge components combining STM32 32-bit microcontroller family with other leading-edge ST components connected via expansion boards.

The STM32Cube Ecosystem includes the following five elements:

- STM32 Nucleo development boards. A comprehensive range of affordable development boards for all STM32 microcontroller series, with unlimited unified expansion capability, and with integrated debugger/programmer
- STM32 Nucleo expansion boards. Boards with additional functionality to add sensing, control, connectivity, power, audio or other functions as needed. The expansion boards are plugged on top of the STM32 Nucleo development boards. More complex functionalities can be achieved by stacking additional expansion boards
- STM32Cube software. A set of free-of-charge tools and embedded software bricks to enable fast and easy development on the STM32, including a Hardware Abstraction Layer, middleware and the STM32CubeMX PC-based configurator and code generator
- STM32Cube expansion software. Expansion software provided free of charge for use with STM32 Nucleo expansion boards, and compatible with the STM32Cube software framework
- STM32Cube Function Packs. Pre-integrated application SW package including a set of key building blocks used in most popular application domains such as cloud, wearables, IoT, and home and building automation. Built by leveraging the modularity and interoperability of STM32 Nucleo development boards and expansions, with STM32Cube software and expansions.

The Ecosystem is compatible with a wide range of development environments including STM32CubeIDE, IAR EWARM, Keil MDK-ARM, and GCC/LLVM-based IDEs, with the possibility to integrate various tools such as STM32CubeMX, STM32CubeProgrammer or STM32CubeMonitor.



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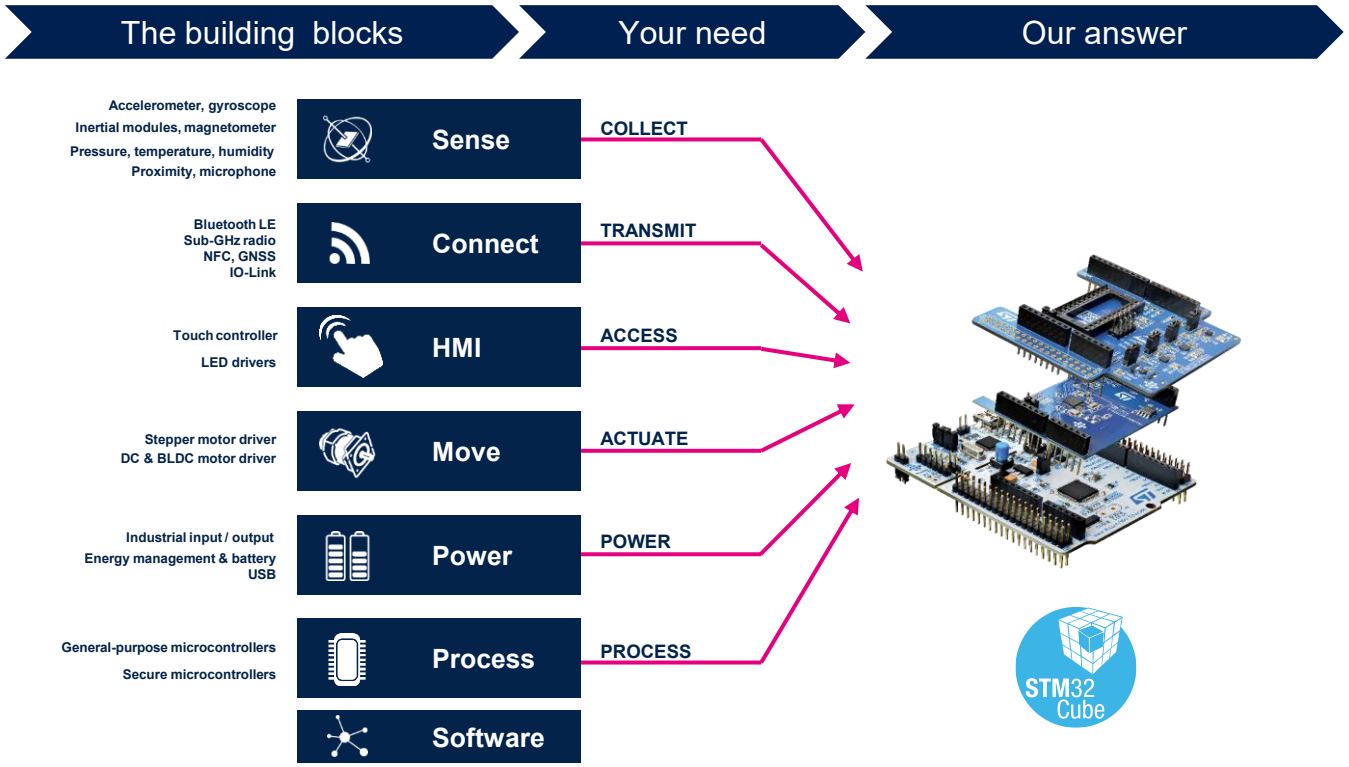
STM32Cube Ecosystem: all that you need

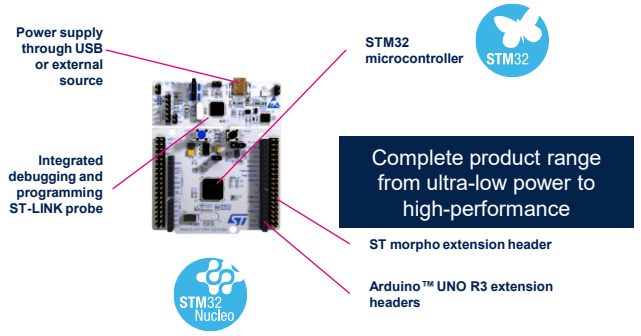
The combination of a broad range of expandable boards based on leading-edge commercial products and modular software, from driver to application level, enables fast prototyping of ideas that can be smoothly transformed into final designs.

To start your design:

- Choose the appropriate STM32 Nucleo development board (NUCLEO) and expansion (X-NUCLEO) boards (sensors, connectivity, audio, motor control etc.) for the functionality you need.
- Select your development environment (IAR EWARM, Keil MDK and GCC/LLVM-based IDEs) and use the free STM32Cube tools and software such as STM32CubeMX, STM32CubeIDE, STM32CubeProgrammer, STM32CubeMonitor.
- Download all the necessary software to run the functionality on the selected STM32 Nucleo expansion boards.
- Compile your design and upload it to the STM32 Nucleo development board.
- Then start developing and testing your application.

Software developed with STM32Cube prototyping hardware can be directly used in an advanced prototyping board or in an end product design using the same commercial ST components, or components from the same family as those found on the STM32 Nucleo boards.





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