

STM32 Nucleo starter pack with LoRa® HF band sensor and gateway



Picture is not contractual. Refer to Product packaging.

Product status link

P-NUCLEO-LRWAN2



## Features

- **NUCLEO-L073RZ** development board (from STMicroelectronics)
  - **STM32L073RZT6** Arm® Cortex®-M0+ ultra-low-power MCU at 32 MHz with 192-Kbyte Flash memory, 20-Kbyte SRAM and 6-Kbyte data EEPROM
  - 1 user LED
  - 1 user and 1 reset push-buttons
  - 32.768 kHz crystal oscillator
  - On-board ST-LINK/V2-1 debugger/programmer with USB re-enumeration capability: mass storage, Virtual COM port, and debug port
  - Board connectors
    - Mini-AB USB connector for the ST-LINK
    - ARDUINO® Uno V3 expansion connector
    - ST morpho extension pin headers for full access to all STM32 I/Os
- **NUCLEO-F746ZG** development board (from STMicroelectronics)
  - **STM32F746ZGT6** Arm® Cortex®-M7 high-performance MCU at 216 MHz with 1-Mbyte Flash memory and 320-Kbyte SRAM
  - 3 user LEDs
  - 1 user and 1 reset push-buttons
  - Ethernet compliant with IEEE-802.3-2002
  - USB OTG full speed or device only
  - 32.768 kHz crystal oscillator
  - On-board ST-LINK/V2-1 debugger/programmer with USB re-enumeration capability: mass storage, Virtual COM port, and debug port
  - Board connectors
    - Micro-AB USB connector for the ST-LINK
    - ST Zio expansion connector including ARDUINO® Uno V3
    - ST morpho extension pin headers for full access to all STM32 I/Os
    - USB with Micro-AB
    - Ethernet RJ45
- **I-NUCLEO-LRWAN1** LoRa® HF band (868/915/923 MHz) sensor expansion board (from USI®)
  - USI® WM-SG-SM-42 low-power long-range LoRaWAN® module, based on the STM32L052 MCU and Semtech SX1272 transceiver
  - STMicroelectronics **HTS221** temperature and humidity sensor
  - STMicroelectronics **LPS22HB** pressure sensor
  - STMicroelectronics **LSM303AGR** accelerometer and gyroscope sensor
- **LRWAN\_GS\_HF1** LoRa® HF band (868/915/923 MHz) gateway expansion board (from RisingHF)
  - SX1301/SX1257 HF baseband data concentrator and transceiver
    - Automatically adaptive to spreading factor from SF12 to SF7 in each of 8 channels
    - High sensitivity down to -140 dBm at 300 bit/s
    - 6 dBm output power
    - Support LoRaWAN® protocol Class A and Class C
    - Support Semtech packet forwarder
    - Support DNS and NTP

## Description

The P-NUCLEO-LRWAN2 STM32 Nucleo starter pack for LoRa® technology and high-performance (G)FSK/OOK/(G)MSK modulations is a development tool to learn and quickly develop low-power wide-area network (LPWAN) solutions. The pack contains both an LPWAN end-node and its related gateway. It is compatible with various LoRaWAN® network server providers. P-NUCLEO-LRWAN2 is intended for countries granting radio-communications access in frequency bands higher than 800 MHz.

On the gateway side, the NUCLEO-F746ZG board, based on a high-performance STM32F7 Arm® 32-bit microcontroller, controls a RisingHF ARDUINO® expansion board (LRWAN\_GS\_HF1) used as a basic LoRaWAN® packet forwarder. In that way, data coming from the development node can reach LoRaWAN® network servers directly.

On the sensor-node side, the NUCLEO-L073RZ, based on an ultra-low-power STM32L0 Arm® 32-bit microcontroller, controls a USI® I-NUCLEO-LRWAN1 ARDUINO® expansion board used as a sensor node.

The I-NUCLEO-LRWAN1 end-node is an ARDUINO® compatible expansion board. This board is designed by USI® around a LoRa® module powered by an STM32L05 device hosting a friendly AT command stack. This makes user development and access to the LoRa® technology easier. In addition, this expansion board features several sensors from STMicroelectronics: accelerometer and gyroscope (LSM303AGR), MEMS pressure (LPS22HB), and humidity and temperature (HTS221).

## 1 Ordering information

To order a P-NUCLEO-LRWAN2 LoRa® HF band sensor and gateway Nucleo starter pack, refer to [Table 1](#). For a detailed description, refer to the user manual on the product web page. Additional information is available from the datasheet and reference manual of the target STM32.

**Table 1. List of available products**

Order code	Boards	User manual	Target STM32	Differentiating features
P-NUCLEO-LRWAN2	<ul style="list-style-type: none"> <li>- MB1136 (STMicroelectronics)</li> <li>- MB1137 (STMicroelectronics)</li> <li>- LRWAN_GS_HF1 (RisingHF)</li> <li>- I-NUCLEO-LRWAN1 (USI®)</li> </ul>	UM2587 <sup>(1)</sup>	<ul style="list-style-type: none"> <li>- STM32L073RZT6</li> <li>- STM32F746ZGT6</li> </ul>	LoRa® HF band (868/915/923 MHz) sensor and gateway

1. "Getting started" user manual.

### 1.1 Product marking

The stickers located on the top or bottom side of the PCB provide product information:

- Product order code and product identification for the first sticker
- Board reference with revision, and serial number for the second sticker

On the first sticker, the first line provides the product order code, and the second line the product identification.

On the second sticker, the first line has the following format: "MBxxx-Variant-yyz", where "MBxxx" is the board reference, "Variant" (optional) identifies the mounting variant when several exist, "y" is the PCB revision and "zz" is the assembly revision, for example B01. The second line shows the board serial number used for traceability.

Evaluation tools marked as "ES" or "E" are not yet qualified and therefore not ready to be used as reference design or in production. Any consequences deriving from such usage will not be at ST charge. In no event, ST will be liable for any customer usage of these engineering sample tools as reference designs or in production.

"E" or "ES" marking examples of location:

- On the targeted STM32 that is soldered on the board (For an illustration of STM32 marking, refer to the STM32 datasheet "Package information" paragraph at the [www.st.com](http://www.st.com) website).
- Next to the evaluation tool ordering part number that is stuck or silk-screen printed on the board.

### 1.2 Product packaging

The antennas in this product are assembled and locked with the boards, which was not the case in earlier versions. They do not have to be removed by users to comply with FCC regulations. The current product packaging is adapted to this configuration. Visuals and illustrations in the related technical documents may differ from the current product version.

## 2 Development environment

STM32 32-bit microcontrollers are based on the Arm® Cortex®-M processor.

*Note:* Arm is a registered trademark of Arm Limited (or its subsidiaries) in the US and/or elsewhere.



### 2.1 System requirements

- Windows® OS (7, 8 and 10), Linux® 64-bit, or macOS®
- USB Type-A or USB Type-C® to Micro-B cable (NUCLEO-F746ZG), or USB Type-A or USB Type-C® to Mini-B cable (NUCLEO-L073RZ)

*Note:* macOS® is a trademark of Apple Inc. registered in the U.S. and other countries.

Linux® is a registered trademark of Linus Torvalds.

All other trademarks are the property of their respective owners.

### 2.2 Development toolchains

- IAR Systems® - IAR Embedded Workbench®<sup>(1)</sup>
- Keil® - MDK-ARM<sup>(1)</sup>
- STMicroelectronics - STM32CubeIDE

1. On Windows® only.

### 2.3 Demonstration software

The demonstration software, included in the I-CUBE-LRWAN STM32Cube Expansion Package, is preloaded in the STM32 Flash memory of each Nucleo board for easy demonstration. The latest versions of the demonstration source code and associated documentation can be downloaded from [www.st.com](http://www.st.com).

## Revision history

**Table 2. Document revision history**

Date	Revision	Changes
9-Sep-2019	1	Initial release.
26-Sep-2019	2	Restricted the document scope to the P-NUCLEO-LRWAN2 starter pack.
21-Apr-2021	3	Added <a href="#">Product packaging</a> . Updated <a href="#">Development environment</a> .

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