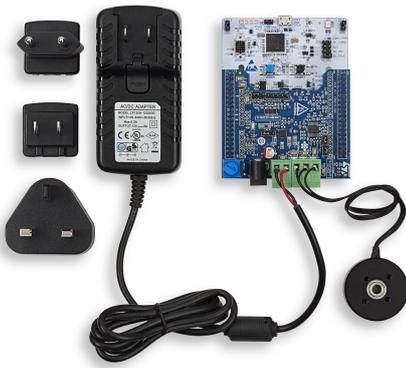## STM32 motor-control pack using the FOC algorithm for three-phase, low-voltage, and low-current motor evaluation

Picture is not contractual.

Product status link
P-NUCLEO-IHM03

Features

- X-NUCLEO-IHM16M1
  - Three-phase driver board for BLDC/PMSM motors based on STSPIN830
  - Nominal operating voltage range from 7 V dc to 45 V dc
  - Output current up to 1.5 A rms
  - Over-current, short-circuit, and interlocking protections
  - Thermal shutdown and under-voltage lockout
  - BEMF sensing circuitry
  - Support of 3-shunt or 1-shunt motor current sensing
  - Hall-effect-based sensors or encoder input connector
  - Potentiometer available for speed regulation
  - Equipped with ST morpho connectors
- NUCLEO-G431RB
  - STM32G431RB 32-bit microcontroller based on the Arm® Cortex®-M4 core at 170 MHz in LQFP64 package with 128 Kbytes of Flash memory and 32 Kbytes of SRAM
  - Two types of extension resources:
    - Arduino™ Uno V3 expansion connector
    - ST morpho extension pin headers for full access to all STM32 I/Os
  - On-board STLINK-V3E debugger/programmer with USB re-enumeration capability: mass storage, Virtual COM port, and debug port
  - 1 user and 1 reset push-buttons
- Three-phase motor:
  - Gimbal motor: GBM2804H-100T
  - Maximum DC voltage: 14.8 V
  - Maximum rotational speed: 2180 rpm
  - Maximum torque: 0.981 N·m
  - Maximum DC current: 5 A
  - Number of pole pairs: 7
- DC power supply:
  - Nominal output voltage: 12 V dc
  - Maximum output current: 2 A
  - Input voltage range: from 100 V ac to 240 V ac
  - Frequency range: from 50 Hz to 60 Hz

Description

The P-NUCLEO-IHM03 STM32 motor-control pack is a kit composed of the X-NUCLEO-IHM16M1 board, the NUCLEO-G431RB board, a brushless Gimbal motor (GBM2804H-100T), and the DC power supply.

This platform provides a motor-control solution for three-phase, low-voltage and low-current DC brushless or PMSM motors. It is based on the STSPIN830 driver and on the STM32G431RB MCU.

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For further information contact your local STMicroelectronics sales office.

www.st.com

The STSPIN830 is a compact and versatile FOC-ready driver for a three-phase motor. In a very small 4 x 4 mm QFN package, it integrates both the control logic and a fully protected low-RDSon triple-half-bridge power stage. It supports both single- and three-shunt architectures and embeds a PWM current controller based on user-settable values of reference voltage and OFF time. Thanks to a dedicated MODE input pin, the device offers the freedom to decide whether to drive it through 6 inputs (one for each power switch) or a more common 3 PWM direct-driving inputs.

The STM32G431RB is a 32-bit microcontroller based on a high-performance Arm$^®$ Cortex$^®$-M4 32-bit RISC core, with floating point unit (FPU), operating at a frequency of up to 170 MHz, embedding an advanced analog peripheral set.

The X-NUCLEO-IHM16M1 board is fully configurable and ready to support different closed-loop control, FOC or 6-steps, based on sensorless or sensor mode. It is compatible with three shunts or single shunt for current-sense measurement.

The NUCLEO-G431RB board provides an affordable and flexible way for users to try out new concepts and build prototypes with STM32G4 microcontroller. It does not require any separate probe as it integrates the STLINK-V3E debugger and programmer.

1 Ordering information

To order the P-NUCLEO-IHM03, 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	Additional content	
P-NUCLEO-IHM03	•	X-NUCLEO-IHM16M1	UM2538	STM32G431RBT6U	•	Power supply (12 V dc, 2 A)
	•	NUCLEO-G431RB			•	Gimbal motor (GBM2804H-100T)

1.1 Product marking

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 design or in production.

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

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

This board features a specific STM32 device version, which allows the operation of any bundled commercial stack/library available. This STM32 device shows a "U" marking option at the end of the standard part number and is not available for sales.

In order to use the same commercial stack in his application, a developer may need to purchase a part number specific to this stack/library. The price of those part numbers includes the stack/library royalties.

1.2 Codification

The meaning of the codification of the Nucleo board is explained in Table 2.

Table 2. Nucleo-board codification explanation

NUCLEO-XXYYZT	Description	Example: NUCLEO-G431RB
XX	MCU series in STM32 32-bit Arm Cortex MCUs	STM32G4 Series
YY	MCU product line in the series	STM32G431
Z	STM32 package pin count: • R for 64 pins	64 pins
T	STM32 Flash memory size: • B for 128 Kbytes	128 Kbytes

The order code is mentioned on a sticker placed on the top side of the board.

2   Development environment

The 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.*

arm

2.1   System requirements

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

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

2.2   Development toolchains

- Keil® MDK-ARM (see note)
- IAR™ EWARM (see note)
- GCC-based IDEs

Note: *On Windows® only.*

2.3   Demonstration software

The demonstration software, included in the X-CUBE-MCSDK STM32Cube Expansion Package, is preloaded in the STM32 Flash memory for easy demonstration of the device peripherals in standalone mode. The latest versions of the demonstration source code and associated documentation can be downloaded from *www.st.com*.

Revision history

Table 3. Document revision history

Date	Version	Changes
19-Apr-2019	1	Initial release.

IMPORTANT NOTICE – PLEASE READ CAREFULLY