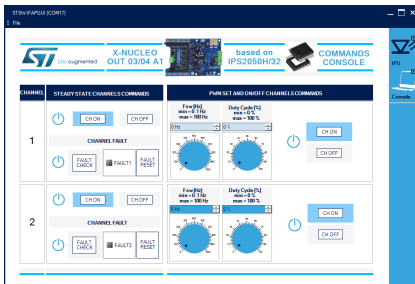


## Demonstration firmware for NUCLEO-F401RE enabling STSW-IFAPGUI on X-NUCLEO-OUT03A1 and X-NUCLEO-OUT04A1 expansion boards



### Features

- Full control of the X-NUCLEO-OUT03A1 and X-NUCLEO-OUT04A1 expansion boards via the STSW-IFAPGUI graphical user interface
- Control of:
  - channel applications
  - output channel switching frequency and duty cycle configuration
  - visualization of diagnostic signals (OR-ed overload and over-temperature per-channel diagnostic)

### Description

The STSW-OUT3F4 firmware runs on the NUCLEO-F401RE development board and allows the control of the X-NUCLEO-OUT03A1 or X-NUCLEO-OUT04A1 expansion boards using the STSW-IFAPGUI graphical user interface.

The STSW-OUT3F4 contains the software routines that enable the USB-based communication between NUCLEO-F401RE and the system where STSW-IFAPGUI runs, and the control of the X-NUCLEO-OUT03A1 or X-NUCLEO-OUT04A1.

The firmware can control a single expansion board (X-NUCLEO-OUT03A1 or X-NUCLEO-OUT04A1).

The STSW-IFAPGUI is based on a common engine and several plug-ins designed to communicate through USB connection with the application layer running on the NUCLEO-F401RE development board stacked with the expansion board.

Product summary	
Demonstration firmware for NUCLEO-F401RE enabling STSW-IFAPGUI on X-NUCLEO-OUT03A1 and X-NUCLEO-OUT04A1	STSW-OUT3F4
Industrial digital output expansion board based on IPS2050H for STM32 Nucleo	X-NUCLEO-OUT03A1
Industrial digital output expansion board based on IPS2050H-32 for STM32 Nucleo	X-NUCLEO-OUT04A1
STM32 Nucleo-64 development board with STM32F401RE MCU	NUCLEO-F401RE
Graphical user interface for the industrial IPS and IO-Link transceiver evaluation boards based on STM32 Nucleo	STSW-IFAPGUI
Applications	Industrial Safety Industrial Tools

# 1 How to control a single expansion board

This application scenario is based on the default on-board switches and resistors configuration of X-NUCLEO-OUT03A1 (or X-NUCLEO-OUT04A1).

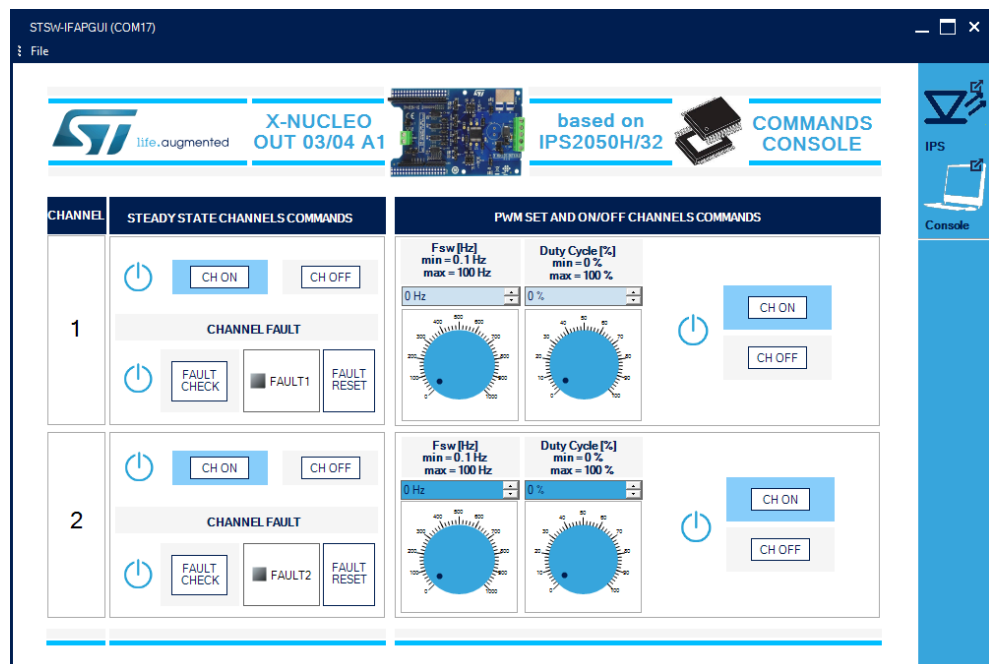
- Step 1.** Stack the X-NUCLEO-OUT03A1 (or X-NUCLEO-OUT04A1) on the NUCLEO-F401RE board flashed with the STSW-OUT3F4 firmware through the Arduino connectors.
- Step 2.** Connect the two stacked boards to your PC or laptop USB port through a mini-USB cable. The STM32 is supplied via USB (3.3 V) and the flashed firmware starts running. Press the black button on the NUCLEO-F401RE board to reset the firmware.
- Step 3.** Launch the STSW-IFAPGUI. When the application starts, the firmware running on the STM32 is automatically detected and a COM port is opened for communication.

**Figure 1. STSW-IFAPGUI COM port opened**



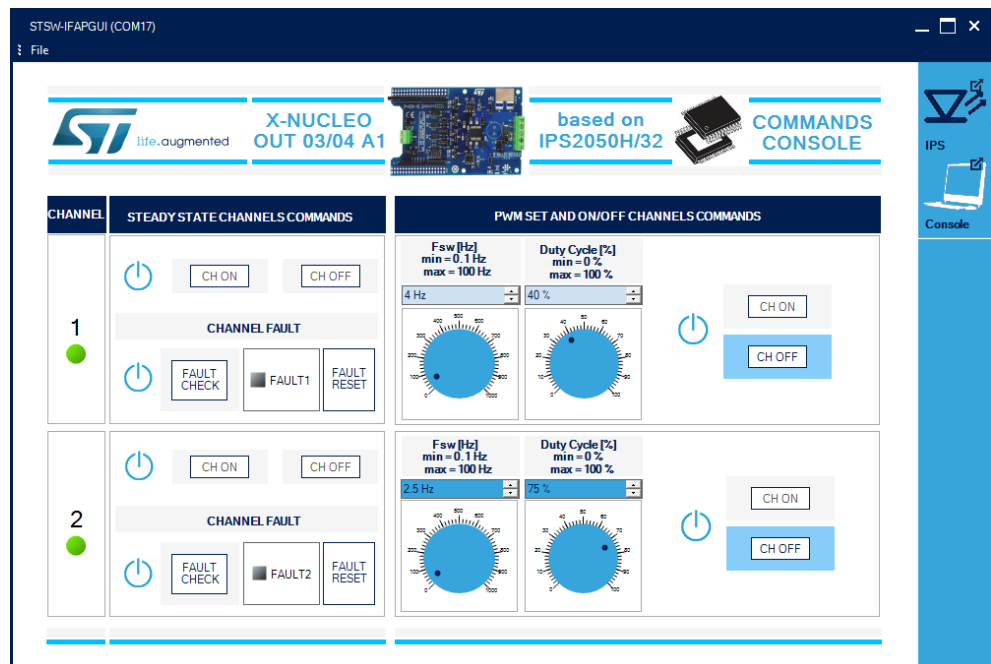
- Step 4.** Click on the GUI STM32 Nucleo icon after it turns blue (it remains green until the firmware identification is complete). The STSW-IFAPGUI appears on the screen.

**Figure 2. STSW-IFAPGUI main control panel**



- Step 5.**
- Use the left side of the GUI to manage steady state (channel 1 or channel 2, or both) for **IPS2050H-32**
  - Use the right side of the GUI to manage its PWM settings.
- Step 6.** Connect the load and supply the power stage of the **X-NUCLEO-OUT03A1** (or **X-NUCLEO-OUT04A1**) with a 24 V rail via the CN1 connector.
- Step 7.** Select the desired switching frequency and duty cycle of the output channel through the **[PWM SET AND ON/OFF CHANNELS COMMANDS]** on the right side of the GUI.
- Step 8.** The output channel steady state can be activated / deactivated by clicking on the **[CH ON / CH OFF]** buttons on the left side of the GUI in the **[STEADY STATE CHANNELS COMMANDS]** section, for the desired input channel.
- Step 9.** Click on the **[FAULT CHECK]** button on the left side of the GUI for the desired input channel to monitor the on/off status on the FAULT pin on **IPS2050H** (or **IPS2050H-32**) (FAULT1 for channel 1, FAULT2 for channel 2).
- You can stop monitoring the per-channel fault status by clicking again on the related **[FAULT CHECK]** button.
- Press **[FAULT RESET]** button to reset the channel fault status.

**Figure 3. STSW-IFAPGUI in action**



## Revision history

**Table 1. Document revision history**

Date	Revision	Changes
15-Nov-2021	1	Initial release.

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