UM3240 Industrial Actuator and Sensor Node User Manual

Contents

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Introduction
FP-IND-IODOUT1 is an STM32Cube function pack that lets you enable IO-Link communication between P-NUCLEO-IOD3A1 or P-NUCLEO-IOD04A1 or P-NUCLEO-IOD7A1 kits and an IO-Link master through the L6362A or L6364Q transceivers mounted on the STEVAL-IOD003V1 and X-NUCLEO-IOD02A1, respectively.

The function pack integrates an IO-Link demo-stack and management of the IPS2050H and IPS2050H-32, dual high-side switches mounted on the X-NUCLEO-OUT03A1 and X-NUCLEO-OUT04A1, respectively. The function pack also integrates an IO-Link demo-stack for the management of the IPS4260LM quad low-side intelligent power switch mounted on the X-NUCLEOOUT07A1. FP-IND-IODOUT1 also includes the IODD file to be uploaded to your IO-Link master.

The software included in the package can be used in IAR, Keil, and STM32CubeIDE integrated development environments.

1 FP-IND-IODOUT1 software expansion for STM32Cube

1.1 Overview
FP-IND-IODOUT1 is an STM32 ODE function pack and expands STM32Cube functionality.
The software enables the control of the IPS2050H/IPS2050H-32/IPS4260LM devices that acts like actuators, through the IO-Link communication line. Furthermore, it enables IO-Link data transfer to/from the IO-Link transceivers L6362A and L6364Q.

For the L6364Q only, the software allows reading of its internal temperature sensor.
The key package features are:

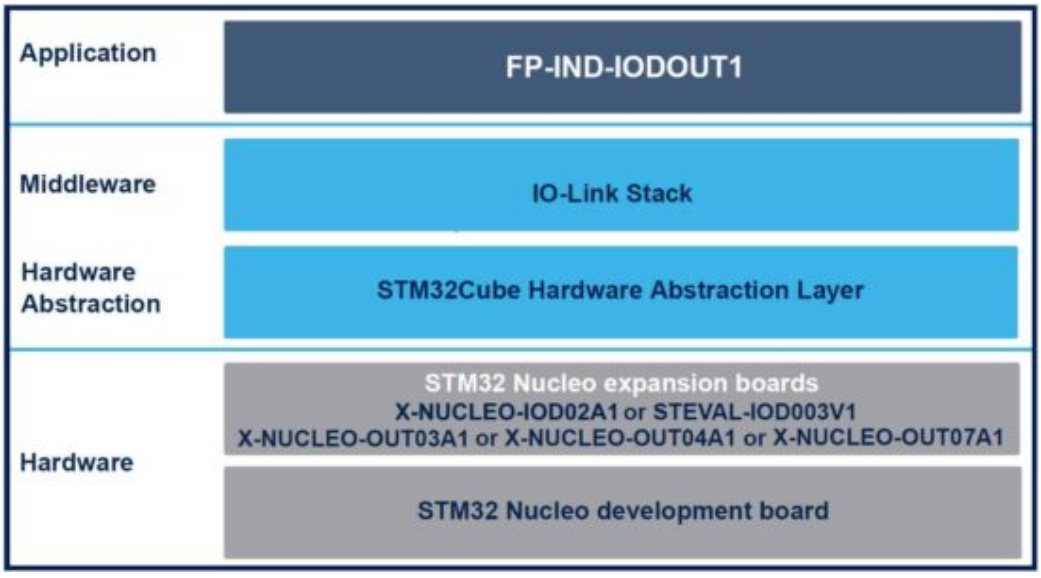
- Complete firmware to develop industrial IO-Link actuator and sensor nodes
- Middleware libraries and drivers featuring IO-Link stack for L6362A and L6364Q
- Drivers to provide commands to IPS2050H/IPS2050H-32/IPS4260LM
- Ready-to-use binary to evaluate P-NUCLEO-IOD3A1 and P-NUCLEO-IOD04A1 and P-NUCLEO-IOD7A1 as an industrial IO-Link actuator and sensor node
- Easy portability across different MCU families, thanks to STM32Cube
- Free, user-friendly license terms

1.2 Architecture

The application software accesses the stacked shields through the following software layers:

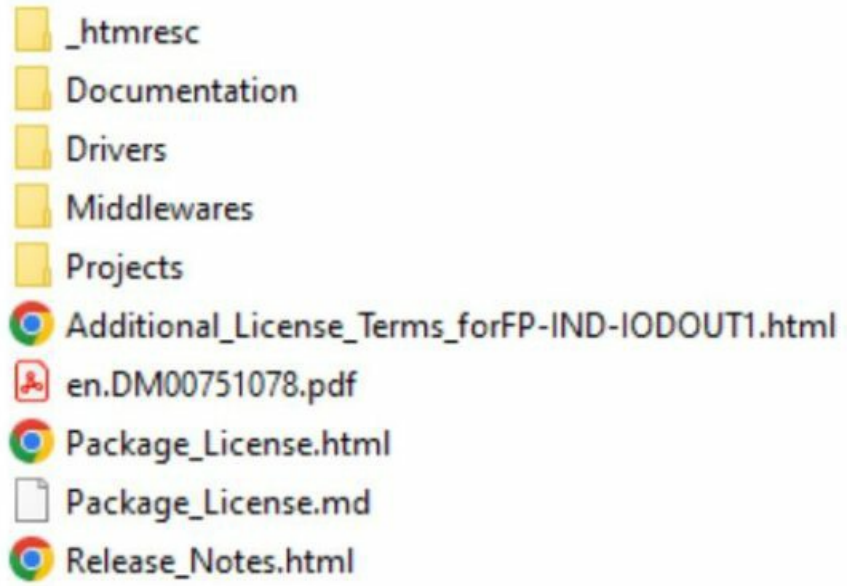
- the STM32Cube HAL layer, which provides a simple, generic, multi-instance set of application programming interfaces (APIs) to interact with the upper application, library, and stack layers. It has generic and extension APIs and is directly built around a generic architecture and allows successive layers like the middleware layer to implement functions without requiring specific hardware configurations for a given microcontroller unit (MCU). This structure improves library code reusability and guarantees an easy portability on other devices.
- the board support package (BSP) layer, which supports all the peripherals on the STM32 Nucleo except the MCU. This limited set of APIs provides a programming interface for certain board-specific peripherals like the LED, the user button, etc. This interface also helps in identifying the specific board version.

Figure 1. FP-IND-IODOUT1 software architecture



1.3 Folder structure

Figure 2. FP-IND-IODOUT1 package folder structure



The following folders are included in the software package:

- _htmresc: contains graphics for html documents.
- Documentation: contains a compiled HTML file generated from the source code detailing the software components and APIs (one for each project).
- Drivers: contains the HAL drivers and the board-specific drivers for each supported board or hardware platform, including those for the on-board components, and the CMSIS vendor-independent hardware abstraction layer for the Arm Cortex-M processor series.
- Middlewares: libraries and protocols featuring the IO-Link ministack.
- Projects: contains the sample application implementing an industrial IO-Link actuator and sensor node.
  This application is provided for the NUCLEO-L073RZ and NUCLEO-G071RB and NUCLEO-L452RE platforms in three development environments: IAR Embedded Workbench for Arm, MDK-ARM software development environment, and STM32CubeIDE. For the P-NUCLEO-IOD3A1 the application is provided for the NUCLEO-L073RZ and NUCLEO-L452RE platforms. For the P-NUCLEO-IOD04A1 and P-NUCLEOIOD7A1 the application is provided for the NUCLEO-L073RZ and NUCLEO-G071RB platforms.

1.4 APIs

Detailed technical information with full user API function and parameter descriptions are in a compiled HTML file in the “Documentation” folder.

1.5 Sample application description with P-NUCLEO-IOD3A1

The sample application is provided in the Projects folder, using the STEVAL-IOD003V1 with L6362A transceiver and X-NUCLEO-OUT03A1 with the IPS2050H.
Ready-to-build projects are available for multiple IDEs. You can upload one of the binary files provided with FPIND-
IODOUT1 via STM32 STLINK Utility, STM32CubeProgrammer, or the programming feature in your IDE.
To evaluate the FP-IND-IODOUT1 firmware, it is necessary to upload the IODD file on the control tool of your IO-Link Master and connect it to the STEVAL-IOD003V1 by a 3-wire cable (L+, L-/GND, CQ). Section 2.3 shows an example where the IO-Link Master is the P-NUCLEO-IOM01M1 and the related control tool is the IO-Link Control Tool developed by TEConcept (ST partner). Alternatively, you can use another IO-Link Master with the related control tool.

1.6 Sample application description with P-NUCLEO-IOD04A1

The sample application is provided in the Projects folder, using the X-NUCLEO-IOD02A1 with L6364Q transceiver

and X-NUCLEO-OUT04A1.

Ready-to-build projects are available for multiple IDEs. You can upload one of the binary files provided with FPIND- IODOUT1 via STM32 STLINK Utility, STM32CubeProgrammer, or the programming feature in your IDE.

To evaluate the FP-IND-IODOUT1 firmware, it is necessary to upload the IODD file on the control tool of your IO-Link Master and connect it to the X-NUCLEO-IOD02A1 by a 3-wire cable (L+, L-/GND, CQ). Section 2.3 shows an example where the IO-Link Master is the P-NUCLEO-IOM01M1 and the related control tool is the IO-Link Control Tool developed by TEConcept (ST partner). Alternatively, you can use another IO-Link Master with the related control tool.

1.7 Sample application description with P-NUCLEO-IOD7A1

The sample application is provided in the Projects folder, using the X-NUCLEO-IOD02A1 with L6364Q transceiver and X-NUCLEO-OUT07A1 with the IPS4260LM.

Ready-to-build projects are available for multiple IDEs. You can upload one of the binary files provided with FPIND- IODOUT1 via STM32 STLINK Utility, STM32CubeProgrammer, or the programming feature in your IDE. To evaluate the FP-IND-IODOUT1 firmware, it is necessary to upload the IODD file on the control tool of your IO-Link Master and connect it to the X-NUCLEO-IOD02A1 by a 3-wire cable (L+, L-/GND, CQ). Section 2.3 shows an example where the IO-Link Master is the P-NUCLEO-IOM01M1 and the related control tool is the IO-Link Control Tool developed by TEConcept (ST partner). Alternatively, you can use another IO-Link Master with the related control tool.

2 System setup guide

2.1 Hardware description

2.1.1 P-NUCLEO-IOD3A1 STM32 Nucleo pack

The P-NUCLEO-IOD3A1 is an STM32 Nucleo pack composed of the STEVAL-IOD003V1 and X-NUCLEOOUT03A1 expansion boards stacked on the NUCLEO-L073RZ or NUCLEO-L452RE development boards. The STEVAL-IOD003V1 features an IO-Link device transceiver for the physical connection to an IO-Link master, while the X-NUCLEO-OUT03A1 is an industrial digital output expansion board based on IPS2050H for STM32 Nucleo, and the NUCLEO-L073RZ or NUCLEO-L452RE are the necessary hardware resources to run the FP-INDIODOUT1 function pack and to control the transceiver and the power switch. The FP-IND-IODOUT1 combines an IO-Link demo stack library (derived from X-CUBE-IOD02) with the X-CUBE-IPS section related to the XNUCLEO- OUT03A1 and features an example of IO-Link device actuator and sensor node. The P-NUCLEOIOD3A1 can be used for evaluation purposes and as a development environment. The STM32 Nucleo pack provides an affordable and easy-to-use solution for the development of IO-Link and SIO applications, evaluation of L6362A communication features and robustness, together with the computation performance of the STM32L073RZ and STM32L452RE microcontrollers.

Figure 3. P-NUCLEO-IOD3A1 STM32 Nucleo pack

2.1.2 P-NUCLEO-IOD04A1 STM32 Nucleo pack

The P-NUCLEO-IOD04A1 is an STM32 Nucleo pack composed of the X-NUCLEO-IOD02A1 and X-NUCLEOOUT04A1 expansion boards stacked on the NUCLEO-L073RZ or NUCLEO-G071RB development boards.

The X-NUCLEO-IOD02A1 features an IO-Link device transceiver for the physical connection to an IO-Link master, while the X-NUCLEO-OUT04A1 is an industrial digital output expansion board based on IPS2050H-32 for STM32 Nucleo, and the NUCLEO-L073RZ or NUCLEO-G071RB are the necessary hardware resources to run the FP-IND-IODOUT1 function pack and to control the transceiver and the power switch.
The FP-IND-IODOUT1 combines an IO-Link demo stack library (derived from X-CUBE-IOD02) with the X-CUBEIPS section related to the X-NUCLEO-OUT04A1 and features an example of IO-Link device actuator and sensor node.

The P-NUCLEO-IOD04A1 can be used for evaluation purposes and as a development environment.
The STM32 Nucleo pack provides an affordable and easy-to-use solution for the development of IO-Link and SIO applications, evaluation of L6364Q communication features and robustness, together with the computation performance of the STM32L073RZ and STM32G071RB microcontrollers.

Figure 4. P-NUCLEO-IOD04A1 STM32 Nucleo pack

2.1.3 P-NUCLEO-IOD7A1 STM32 Nucleo pack

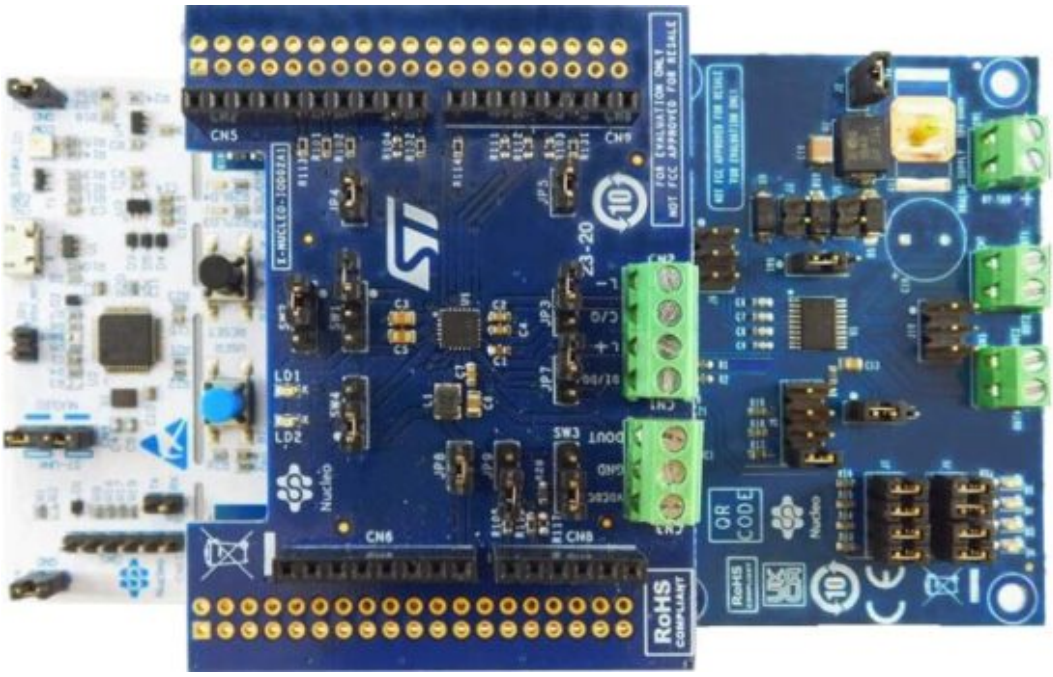
The P-NUCLEO-IOD7A1 is an STM32 Nucleo pack composed of the X-NUCLEO-IOD02A1 and X-NUCLEOOUT07A1 expansion boards stacked on the NUCLEO-G071RB or NUCLEO-L073RZ development boards.

The X-NUCLEO-IOD02A1 features an IO-Link device transceiver for the physical connection to an IO-Link master, while the X-NUCLEO-OUT07A1 is an industrial digital output expansion board based on IPS4260LM for STM32 Nucleo, and the NUCLEO-G071RB or NUCLEO-L073RZ are the necessary hardware resources to run the FP-IND-IODOUT1 function pack and to control the transceiver and the power switch.

The FP-IND-IODOUT1 combines an IO-Link demo stack library (derived from X-CUBE-IOD02) with the X-CUBEIPS section related to the X-NUCLEO-OUT07A1 and features an example of IO-Link device actuator and sensor node.

The P-NUCLEO-IOD7A1 can be used for evaluation purposes and as a development environment.
The STM32 Nucleo pack provides an affordable and easy-to-use solution for the development of IO-Link and SIO applications, evaluation of L6364Q communication features and robustness, together with the computation performance of the STM32G071RB and STM32L073RZ microcontrollers.

Figure 5. P-NUCLEO-IOD7A1 STM32 Nucleo pack


CN5
CN9
CN6
CN8
LD1
LD2
SW3
CN7
CN2
JP3
JP7
JP4
JP5
JP8
Nucleo
QR CODE
RoHS COMPLIANT

Documents / Resources

	ST UM3240 Industrial Actuator and Sensor Node [pdf] User Manual UM3240 Industrial Actuator and Sensor Node, UM3240, Industrial Actuator and Sensor Node, Sensor Node

References

- User Manual