



VISHAY SERNICE

www.vishay.com

The DNA of tech.®

Sensors

Application Note

USB Encoder Interface User Manual

By Aissatou Diop

GENERAL INFORMATION



ATTENTION!

Observe Precautions for Handling Electrostatic-Sensitive Devices!

1. OVERVIEW

The USB encoder interface is a kit designed to help evaluate Vishay's digital encoders. This kit, along with its respective software modules, can be used to demonstrate and test each sensor's functionalities, allowing the user to quickly understand how various settings affect the encoder's results. To get an overview of available encoders that are compatible with the demonstration kit, as well as to download the software modules and board design files, please visit:

www.vishay.com/en/landingpage/USB_Encoder/.

The following document covers what you get in the box and how to use the kit to explore our encoder products.

This USB encoder interface is planned for customer evaluation and testing only; Vishay is not responsible for any different uses.

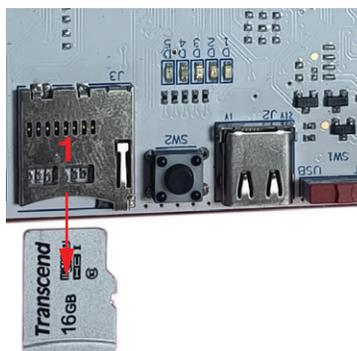
2. KIT CONTENTS

The USB encoder interface includes:

- An electronic board that makes the connection between the computer and Vishay encoder
- Software
- A micro-SD card
- A male USB-A to male USB-C cable

3. QUICK START GUIDE

STEP 1: remove the micro-SD card from the USB encoder interface (J3 on the top side)



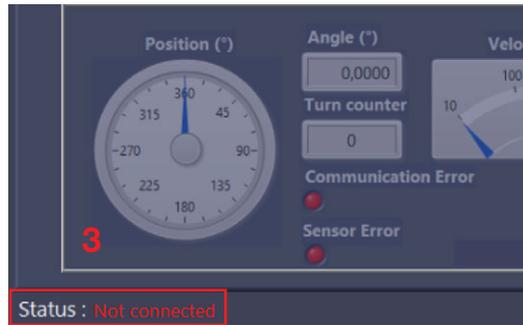
The DNA of tech.®

USB Encoder Interface User Manual

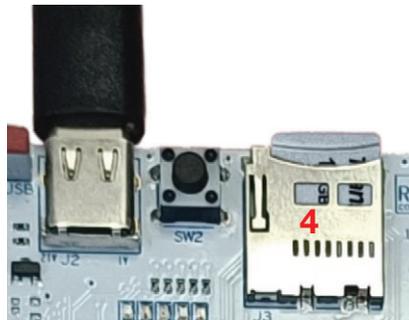
STEP 2: use the micro-SD card to install the drivers and application software on the computer.

Drivers and applications software can also be downloaded from the Vishay website

STEP 3: launch the Vishay user interface (the state will be “Not connected”)



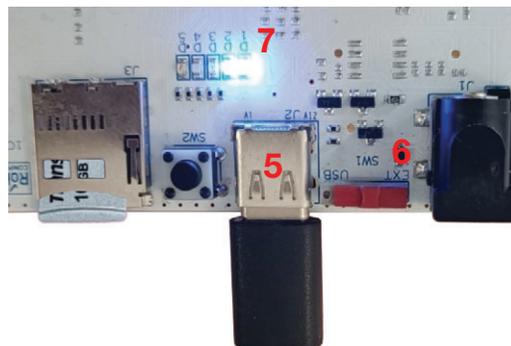
STEP 4: replace the micro-SD card on the USB encoder interface



STEP 5: connect the USB cable to the connector (J2), plug the male USB-C to the USB encoder interface, and then plug the male USB-A cable into the computer

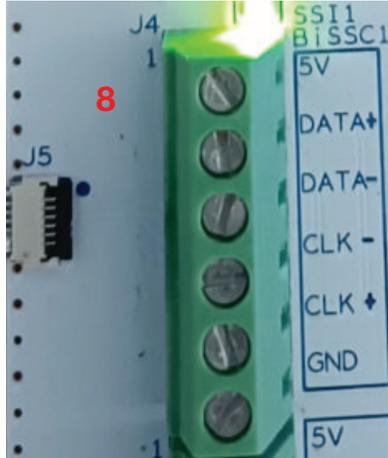
STEP 6: put the power selection switch (SW1) in the right position, the blue LED (D1) will be on

STEP 7: wait 10 seconds (typically) for the green LED (D2) to come on (not blinking)



USB Encoder Interface User Manual

STEP 8: connect a Vishay sensor to the suitable connector (for example, J4 or J5 for an SSI interface)

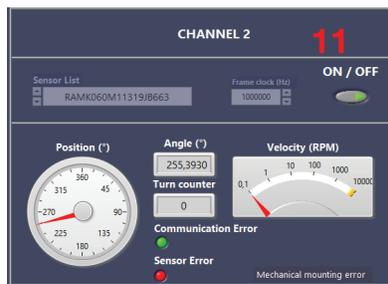


STEP 9: with the software, select the encoder reference (for example, channel 1 for a J4 or J5 connection)

STEP 10: enter the frame clock frequency for the selected channel



STEP 11: click on the “ON / OFF” button to power on the encoder and check that the corresponding LED (D6, D7, D8, or D9) is turned on

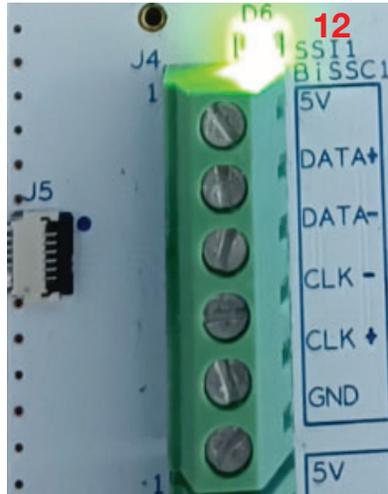




The DNA of tech.®

USB Encoder Interface User Manual

STEP 12: the corresponding LED must be on (D6, for example)



USB Encoder Interface User Manual

4. BOARD DESCRIPTION

4.1 ELECTRICAL CHARACTERISTICS

- For one sensor: it is recommended to use a USB for the power supply (max. current generated by the computer's USB)
- For two sensors: it is required to use the external power supply

$$I_{supply} = I_{100\text{ mA}} + I_{Sensor1} + I_{Sensor2}$$

- The USB encoder interface is protected over the power supply's reverse polarity
- The external power supply shall be 5 V ± 0.5 V

4.2 PCB OVERVIEW

Shows the complete PCB top side of the USB encoder interface.

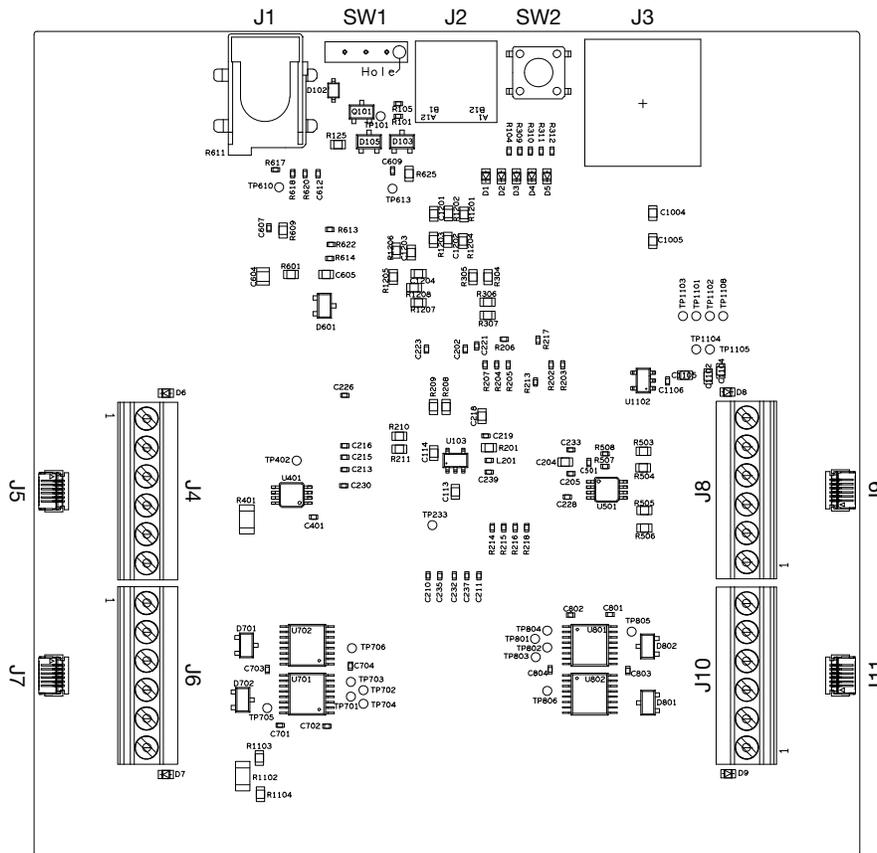


Fig. 1 - PCB top side of the USB encoder interface

USB Encoder Interface User Manual

4.3 CONNECTOR AND LED DESCRIPTION

LABEL DESCRIPTION	
LABEL	DESCRIPTION
J1	Connector for 5 V external power supply
SW1	Jumper to select 5 V external or USB power supply
J2	USB connector for power supply and computer communication
SW2	Reset button
J3	Micro-SD card connector
J4	Encoder SSI1 wire to board connector
J5	SSI1 FFC connector
J6	Encoder SPI1 wire to board connector
J7	SPI1 FFC connector
J8	Encoder SSI2 wire to board connector
J9	SSI2 FFC connector
J10	Encoder SPI2 wire to board connector
J11	SPI2 FFC connector
D1	Board power indicator LED (blue)
D2	Status indicator LED (green). Flashes while initiating the evaluation board system and remains lit when the board is ready to use.
D3	Reserved
D4	Boot loader indicator LED
D5	Not used
D6	SSI Interface No. 1 power indicator LED (green)
D7	SPI Interface No. 1 power indicator LED (green)
D8	SSI Interface No. 2 power indicator LED (green)
D9	SPI Interface No. 2 power indicator LED (green)

4.4 MICRO-SD CARD

At delivery, the micro-SD card contains the following files:

- PC LabVIEW software installer
- ⚠ FPGA bitstream, this file must not be moved or deleted

Check the updated version of these files on Vishay's website.

4.5 POWER SUPPLY

The USB encoder interface can be powered in two different ways:

- External power supply through the J1 connector
- USB-C power through the J2 connector

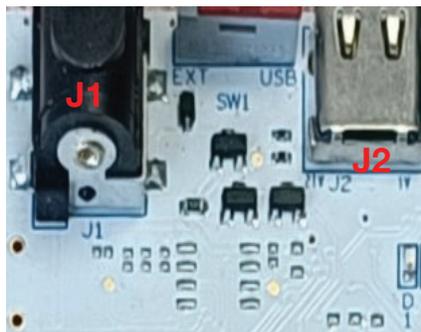


Fig. 2 - Power supply

USB Encoder Interface User Manual

4.6 SWITCH

The switch is used to choose one of the two connections to power the USB encoder interface.

Place the switch according to the pictures below to select the suitable power supply.

For one sensor, it is recommended to use the USB power supply. The external 5 V power supply is used with two sensors.

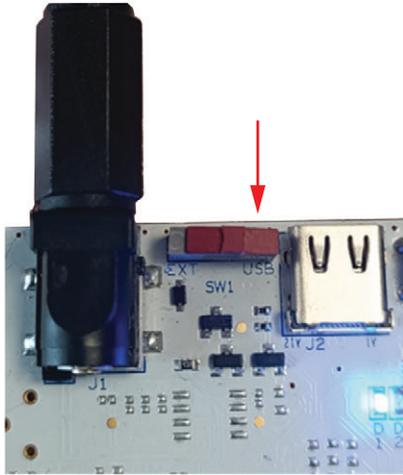


Fig. 3 - Switch for external power

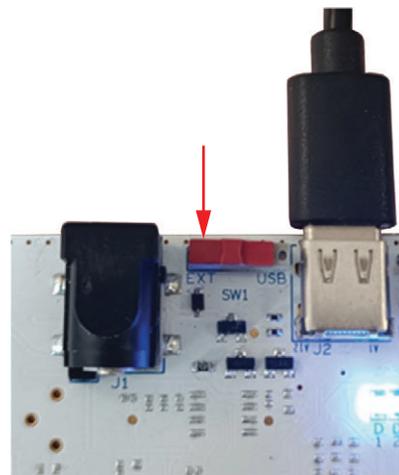


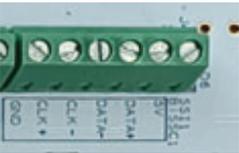
Fig. 4 - Switch for USB power

4.7 ENCODER OUTPUT CONNECTION

The USB encoder interface has been designed to perform the acquisition of two Vishay sensors simultaneously.

Depending on the encoder output (wire, FFC) and communication protocol (SSI, SPI, Biss-C), the table below gives the suitable way to connect the encoder to the USB encoder interface.

There are two types of connections for the sensor:

SCREW TERMINAL BLOCK		FFC CONNECTOR (WÜRTH ELEKTRONIK 687106182122)	
	On the board, see the signal to plug in the wires on the terminal block.		Plug in the flex cable provided with the sensor.

1. SPI Mode (see Sensor Datasheets)

SCREW TERMINAL BLOCK		FFC CONNECTOR	
J6 and J10 connectors	On the board, see the signal to plug in the wires on the terminal block.	J7 and J11 connectors	Plug in the flex cable provided with the sensor.

2. BiSS-C or SSI Mode (see Sensor Datasheets)

SCREW TERMINAL BLOCK		FFC CONNECTOR (WÜRTH ELEKTRONIK 687106182122)	
J4 and J8 connectors	On the board, see the signal to plug in the wires on the terminal block.	J5 and J9 connectors	Plug in the flex cable provided with the sensor.

USB Encoder Interface User Manual

5. SOFTWARE DESCRIPTION

To communicate with the encoder, the USB encoder interface requires the installation of a dedicated software available for download from www.vishay.com/en/landingpage/USB_Encoder/ or on a micro-SD card.

5.1 HARDWARE REQUIREMENTS

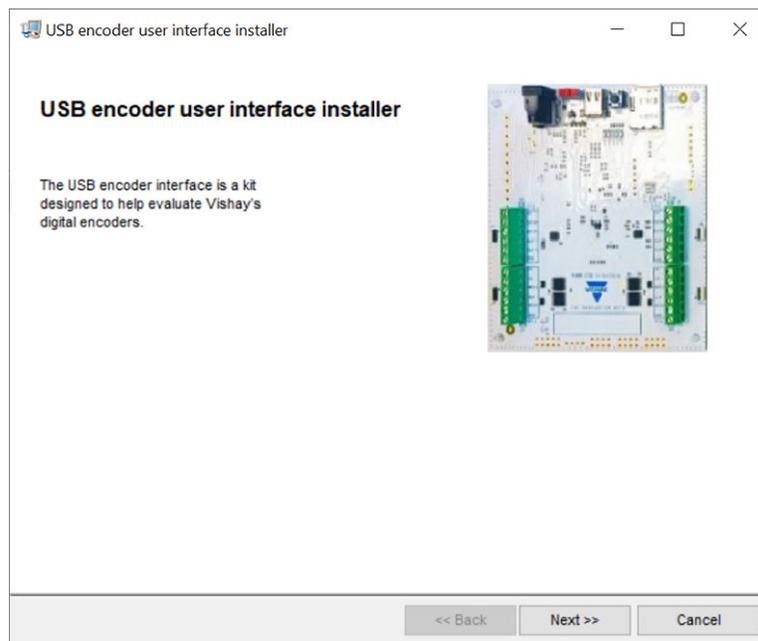
This section describes the installation and how to use the software to communicate with the encoders. The encoder interface requires a computer with the following features:

- Windows 10 or later
- Available USB port (A or C)
- Internet access for downloading the kit software
- The user must have administrative rights access to install the kit software

5.2 SOFTWARE INSTALLATION

To install the software on your computer, copy the folder “USB encoder user interface installer” from the micro-SD to your local computer. Navigate the USB encoder user interface, open the volume directory, and double-click on the install.exe file to activate the installation, as shown in the figure below.

bin	06/12/2023 11:00	Dossier de fichiers	
license	06/12/2023 11:00	Dossier de fichiers	
supportfiles	06/12/2023 11:00	Dossier de fichiers	
install.exe	27/06/2022 14:49	Application	5328 Ko
install.ini	06/12/2023 11:00	Paramètres de con...	35 Ko
nidist.id	06/12/2023 11:00	Fichier ID	1 Ko



Then the USB encoder user interface software begins the installation process, as shown in Fig. 5.

USB Encoder Interface User Manual

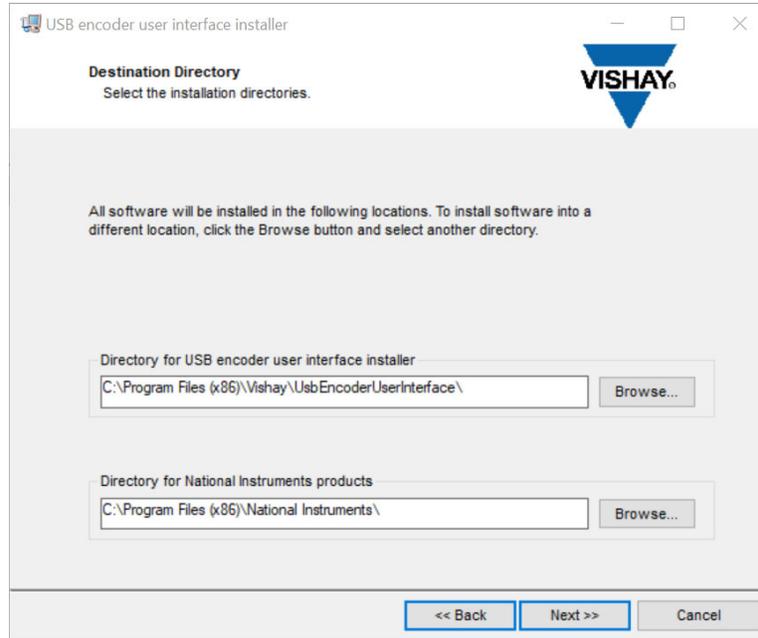


Fig. 5 - USB encoder user interface software installation prompts

Follow the prompts, as shown in Figures 6 to 13.

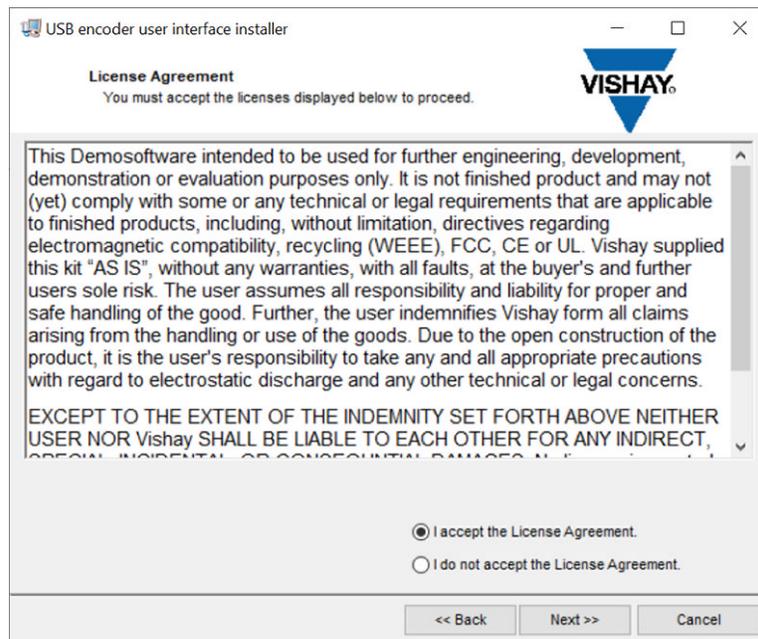


Fig. 6 - USB encoder user interface software installation prompts

USB Encoder Interface User Manual

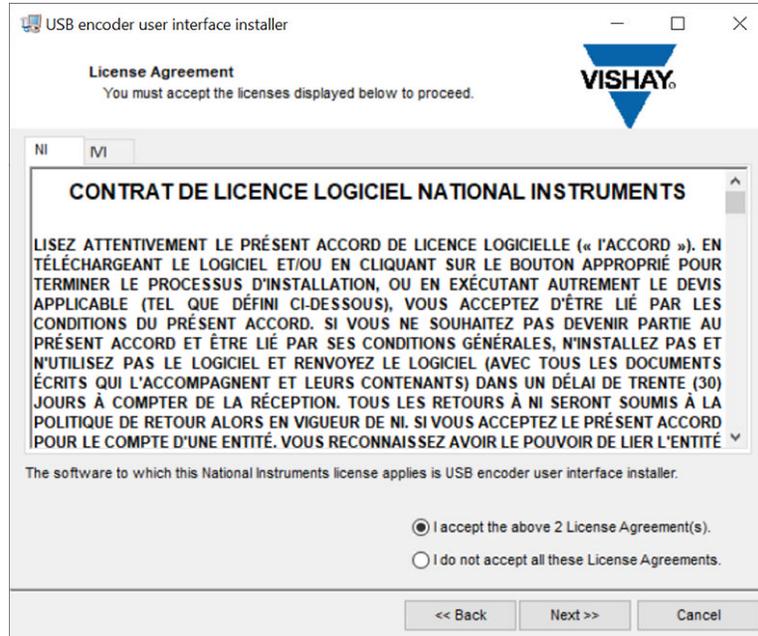


Fig. 7 - USB encoder user interface software installation prompts

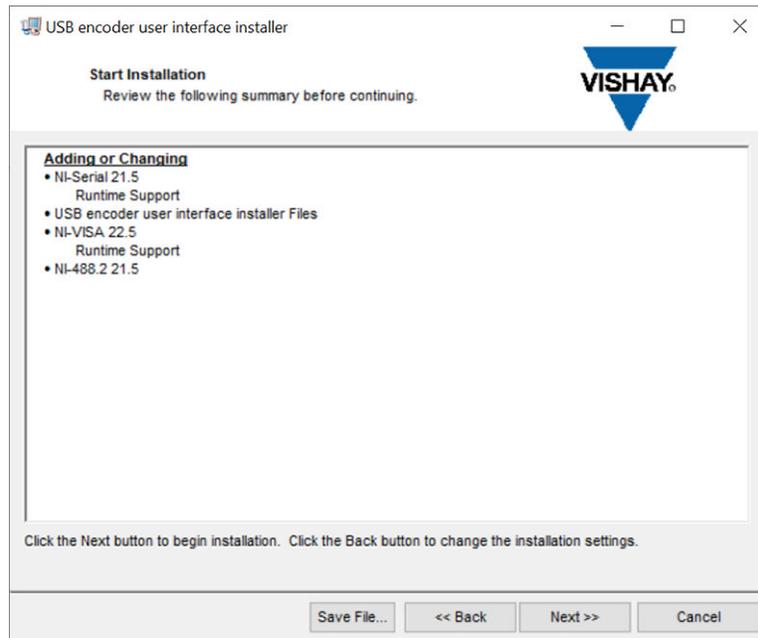


Fig. 8 - USB encoder user interface software installation prompts

USB Encoder Interface User Manual

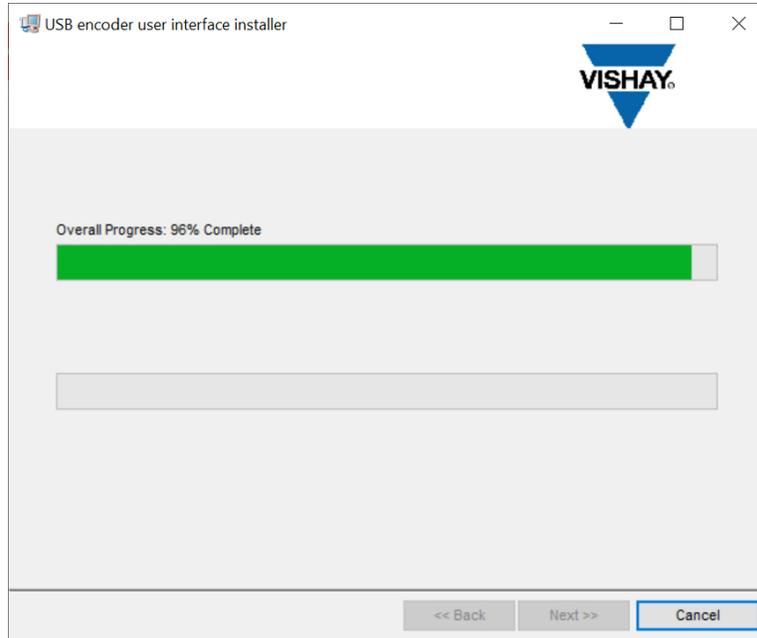


Fig. 9 - USB encoder user interface software installation prompts

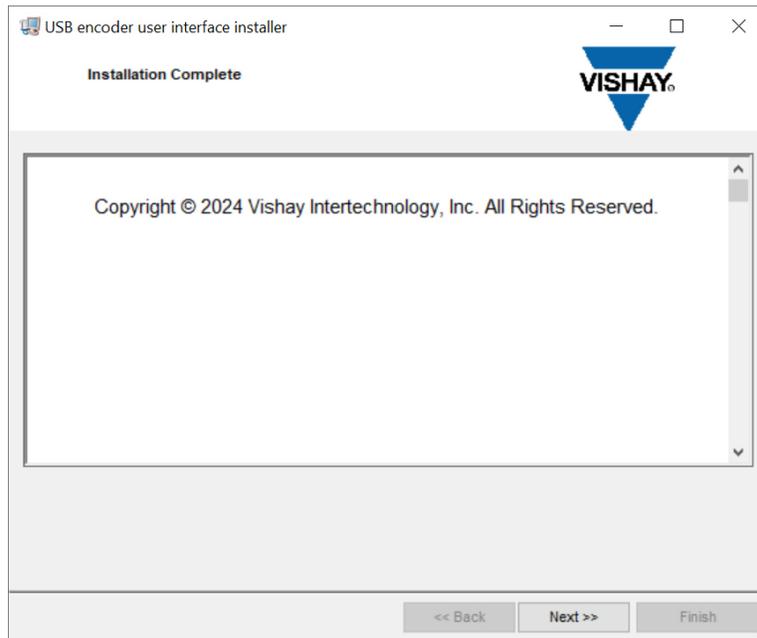


Fig. 10 - USB encoder user interface software installation prompts

USB Encoder Interface User Manual

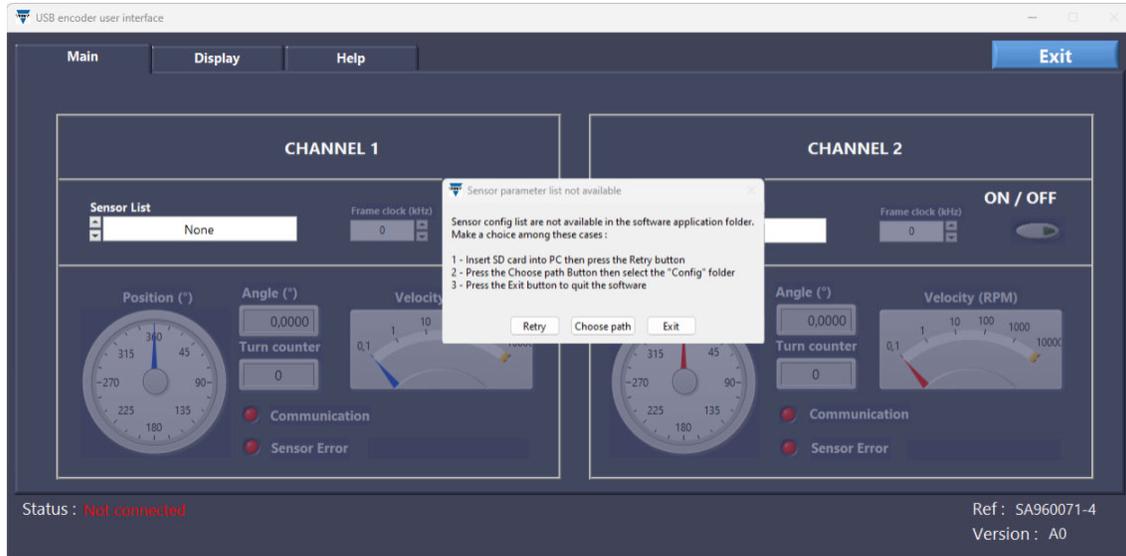


Fig. 11 - USB encoder user interface software installation prompts

You must make a choice among the three. If you opt for number 2, as in Fig. 12, you need to select the configuration folder.

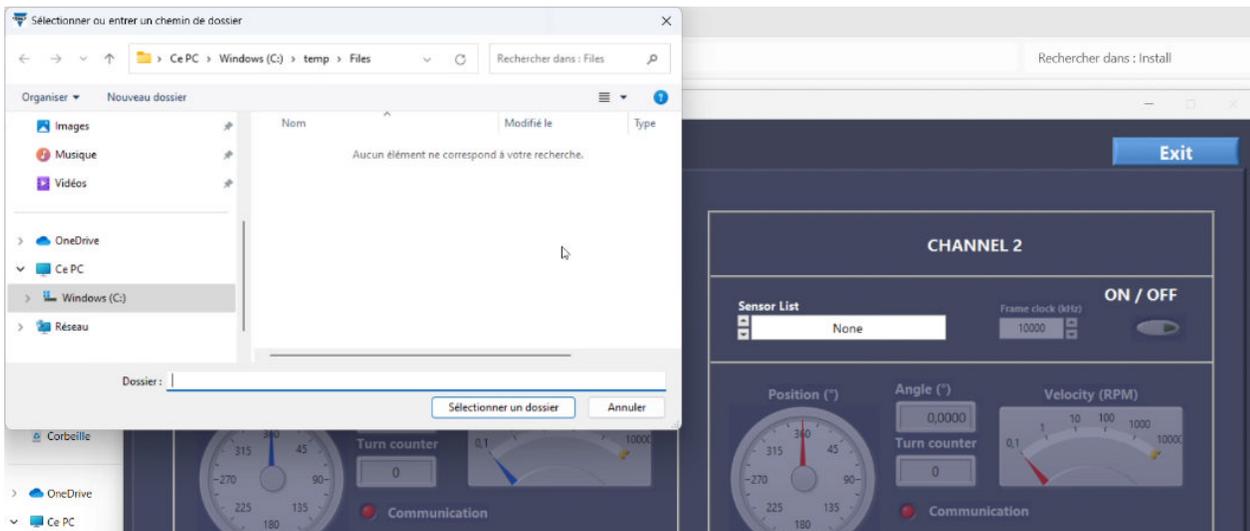


Fig. 12 - USB encoder user interface software installation prompts

USB Encoder Interface User Manual

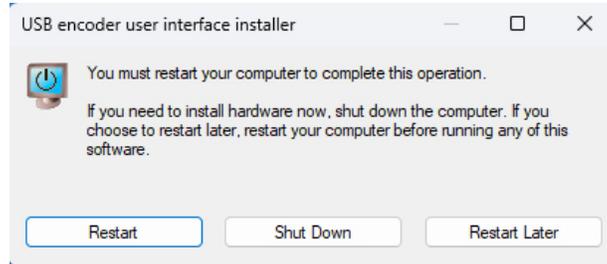


Fig. 13 - USB encoder user interface software installation prompts

You can now restart you computer.

5.3 SECTION OF THE DISPLAY

Once the software installation is complete, launch USBEncoderUserInterface.exe, as depicted below.

Nom	Modifié le	Type	Taille
Config	14/05/2024 10:39	Dossier de fichiers	
Parametre.ini	02/04/2024 08:55	Fichier INI	1 Ko
USBEncoderUserInterface.aliases	03/04/2024 13:45	Fichier ALIASES	1 Ko
USBEncoderUserInterface.exe	03/04/2024 13:45	Application	3 409 Ko
USBEncoderUserInterface.ini	03/04/2024 13:45	Fichier INI	1 Ko

At the end of the application startup, the window shown in Figure 14 will appear on the screen.

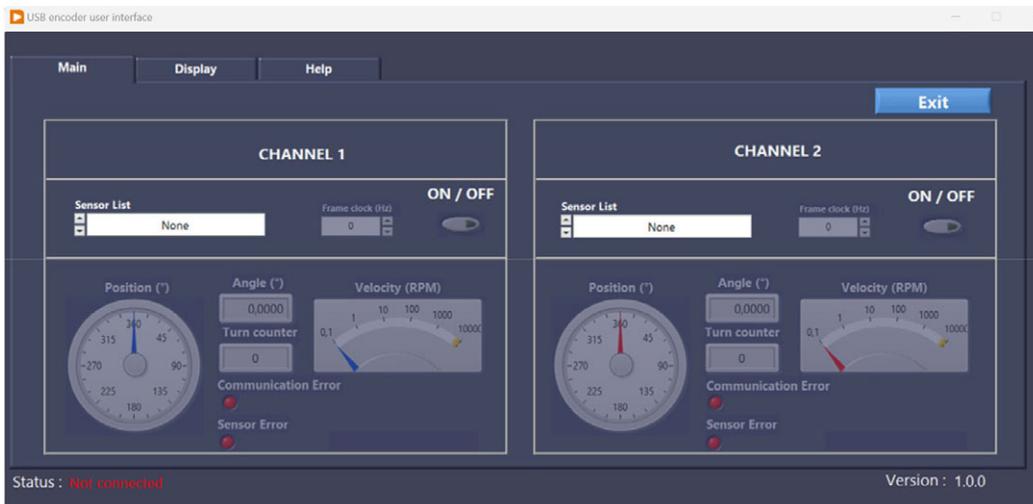


Fig. 14 - USB encoder user interface main operation screen

USB Encoder Interface User Manual

5.4 GETTING STARTED

The following steps describe how to connect the Vishay user interface and the USB encoder interface to perform measurements. The user interface has a primary window that is used to configure and read the selected sensor, along with another that is used to display sensor output in detail.

5.5 CONNECTING TO THE USB ENCODER INTERFACE

- Plug the male USB-C to the USB encoder interface and then plug the male USB-A cable into the computer. The green light (D2 on the evaluation board) will blink for 12 s before remaining lit
- Ensure that the USB encoder interface is correctly connected to the PC
- The “Status” (surrounded by red in Fig. 15) displays status information - connected, disconnected, or not connected



Fig. 15 - The display when connected to an electronic board

5.6 THE MAIN WINDOW

- After successful connection, two angular position sensors can also be connected to the USB encoder interface at the same time (see Fig. 15 for an example). Data are displayed according to the selection mode through the drop-down sensor list menu (channel 1 or channel 2)
- One encoder can be connected on each (channel 1 and 2) through the dedicated connectors
- When the encoder is properly connected, click on the drop-down list to select the encoder reference for the connected item
- This operation shall be done for each channel on which an encoder is connected
- If the encoder reference is not in the list, please download the file from the website: www.vishay.com/en/landingpage/USB_Encoder/ and add it to the configuration folder

USB Encoder Interface User Manual



Fig. 16 - "Main" tab and sensor choice

- After selecting the right sensor and channel, the user must define the frame clock frequency (kHz), as depicted in the figure below



Fig. 17 - Sensor configuration

- Frame clock (kHz) is the data acquisition frequency used by the USB encoder interface to read or write on the sensor
- Power on the encoder by clicking on the "ON / OFF" button of the desired channel. The corresponding indicator (D6, D7, D8, or D9) shall be turned on the USB encoder interface board
- When it is done, the bottom frame of the corresponding channel is enabled, and the data read from the encoder are displayed inside, as shown in Fig. 18

USB Encoder Interface User Manual



Fig. 18 - User interface running

5.7 THE “DISPLAY” TAB

- When the channel is powered on in the “Main” tab, you can switch on the “Display” tab to show the encoder position on a graph
- Click on the “Display” tab to switch to the corresponding window
- Configure the sampling time and the acquisition time
- Select the channel to show on the graph by clicking on the selection box
- Select the desired display mode of the data on the graph by clicking on “Roll” or “All” display mode. Only one mode can be selected for both channels
- Click on the “RUN / STOP” button to start the sampling of the encoder
- The sampling of the encoder will start, and the data will be shown on the graph
- The sampling of the encoder will finish at the acquisition time or if the “RUN / STOP” button is pressed
- The output frame is sampled at a constant value that can be configured from the sampling time (us) box shown in Fig. 19

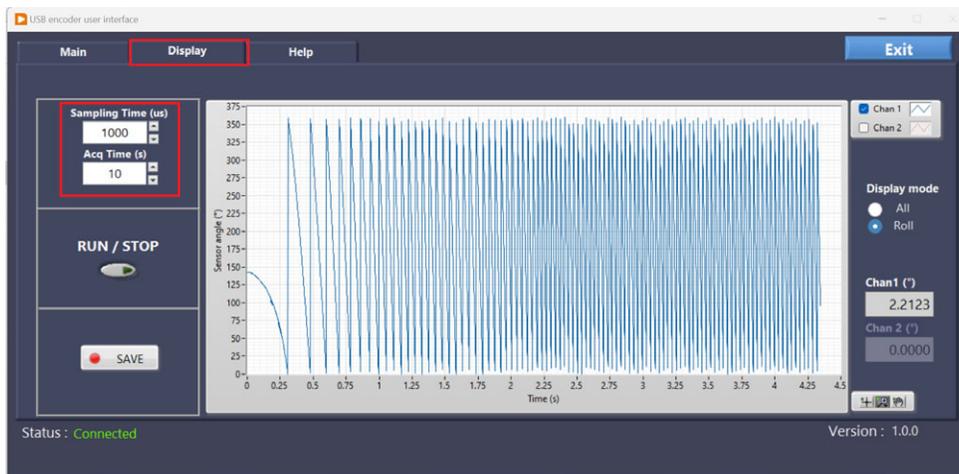


Fig. 19 - Acquisition data sensor in “Roll” display mode

USB Encoder Interface User Manual

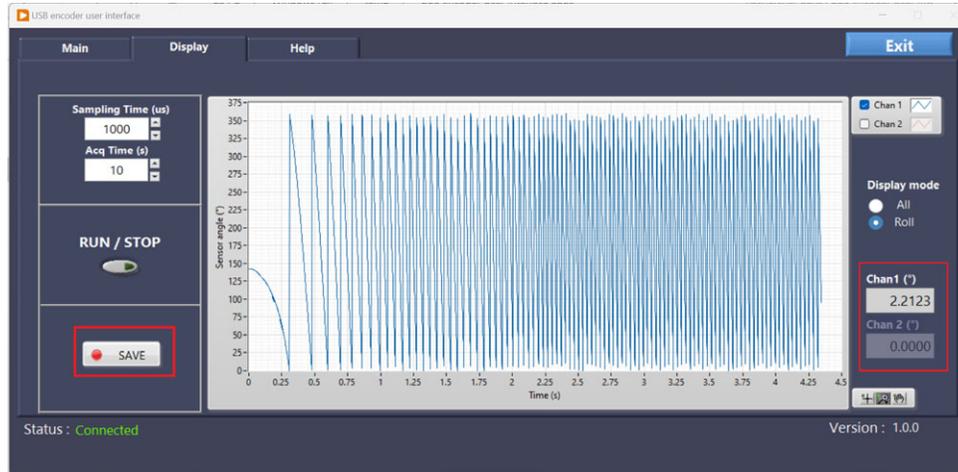


Fig. 20 - Acquisition data sensor in “Roll” display mode

- The value of Chan1 (*) or Chan2 (*) on the “Display” tab is the report of the angle value on the “Main” tab
- The power “ON / OFF” button on the “Main” tab enables or disables the parameter on the “Display” tab
- At the end of the sampling of the encoder, the data of the graph can be recorded in an Excel file by clicking on the “SAVE” button
- This opens a dialog box to select the location to save the Excel files

The Excel file data format is as described below:

- Time: this is the sampling time
- Sensor_value: binary angle value converted in decimals
- Sensor_angle: angle value in degrees
- Sensor_status: if applicable refer to the sensor datasheet
- Sensor_turn: multi-turn counter value if applicable
- Frame_error: if applicable, when there is an error in the frame, this indicator is set to 1, otherwise it is 0
- The rest of columns represent the complete frame encoded in decimals

Time	Sensor_value	Sensor_angle	Sensor_status	Sensor_turn	Frame_error	Frame_1	Frame_2	Frame_3	Frame_4	Frame_5	Frame_6
0	191530	263.026428	0	-5954	0	142	139	235	176	168	128
0.00007	191694	263.251648	0	-5954	0	142	139	235	179	56	128

Fig. 21 - Output Excel format file

USB Encoder Interface User Manual

5.8 “HELP” TAB

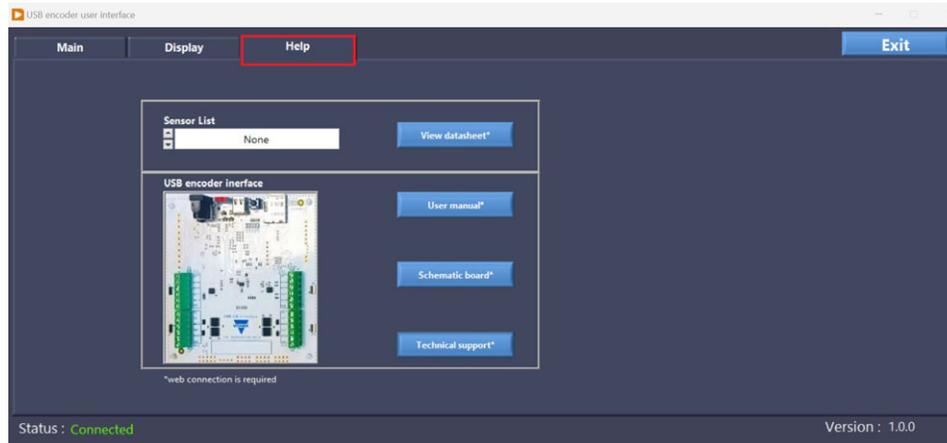


Fig. 22 - “Help” tab

When the “Help” tab is clicked, the window shows a tool to find support and documentation.

- By clicking on the “Sensor List” drop-down to select the encoder reference, this enables the “View Datasheet” button to open it
- By clicking on the “User Manual,” you open this application note
- By clicking on the “[Schematic Board](#),” you open the schematic of the USB encoder interface board
- By clicking on the “[Technical Support](#),” you can find information about technical support if you need help