Voyantic

Ensurance™ HF Encoder

Hardware setup guide

Ensurance™

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About Ensurance

Ensurance is a software used to manage tag personalization process activities in smart label production, including memory programming, data printing, quality testing, and data verification. The software provides a graphical user interface (GUI) for the machine operator, the necessary tools for production engineers to create and edit process definitions, and it manages processing equipment and in-process dataflow.

The Ensurance personalization system is intended to be used in production environment as a part of a machine and operated by professional personnel. It should be noted that if antennas or other radiating elements are used with the system, local regulations may limit the frequency range and transmit power that can be used. Particularly, related to RAIN/UHF reader, regulations related to features, such as channel-hopping and dwell time are specific to country. If the device is transported to different region, please check that settings and reader type comply with the local regulations.

About this document

Ensurance system can be added with an HF reader for encoding HF/NFC smart labels and reading data for the purpose of traceability, for example. Ensurance supports Ensurance HF encode for this purpose. This document describes how to set up and use the product with Ensurance, the key specifications related to personalization, and typical troubleshooting scenarios.

Related documentation

Manufacturer's technical documentation. This manual includes information on the process options and relevant performance data related to application with Ensurance. Ensurance HF encoder is built on top of Feig reader module. Refer to the manufacturer's documentation for more technical information on the reader module.

3 Technical information

3.1 Supported models

Ensurance supports HF smart label encoding only with Ensurance HF encoder. The device is based on a Feig CPR74 reader module, but a standard module alone cannot be used with Ensurance.

3.2 Functions and performance

The Ensurance HF encoder support ISO 15693, ISO 14443A, and ISO 14443-B protocols and encoding of compliant labels. The reader is operated through Ensurance software and is generally capable of reading and writing HF/NFC RFID smart label data, verifying memory contents against reference data, and performing locking operations.

As the process of programming varies between chip types, the available encoding functions are specific to chip types. In effect, some chip types are not supported immediately. Extended programming functionality and support for new chip models can be requested from Voyantic.

Generic performance specifications for Ensurance HF encoder are presented in Table 1, currently available functions for different chip types are listed on Table 2 and Table 3, and information of the compatible Snoop Pro mode in the end of this chapter.

Table 1. Generic performance specifications for Ensurance HF encoder

Supported models	**Ensurance HF encoder**
Functions	See supported functions for each chip model below
Supported protocols	ISO 15693, ISO 14443-A, ISO 14443-B
Read area	HF encoder is used together with Snoop Pro NFC antenna which limits the maximum size of the tag. Moreover, label pitch and material movement during encoding further limits the possible tag sizes in the direction of movement.
Performance	Encoding supports standard communication modes and does not add extra delay on top of the communication protocol. Encoding time depends on the IC and the tasks to be performed and must be verified case-by-case. Typical processing time is 50-500ms, largely depending on the tasks and target IC.

Table 2. Supported functions for NXP NTAG

NTAG	203	210	213
Read	x	x	x
Write	x	x	x
Lock	x	x	x
Authenticate		x	x
Write NDEF-URL message with optional counter and UID mirror activation			x
Write NDEF-Text message with optional counter and UID mirror activation			x

Table 3. Supported functions for NXP ICODE

ICODE	Sli-X	Sli-X2
Read	UID only[1]	x
Write		x
VerifyRead		x
Write NDEF-URL message with optional UID mirror activation		x
Verify NDEF-URL message contents		X
Write NDEF-TEXT message with optional UID mirror activation		X
Verify NDEF-TEXT message contents		X

[1] Sli-X support is achieved by using a subset of the Sli-X2 chip-plugin functionalities.

Snoop Pro NFC

Snoop Pro NFC is used for encoding NFC tags. Maximum tag antenna dimension: 73 mm x 100 mm

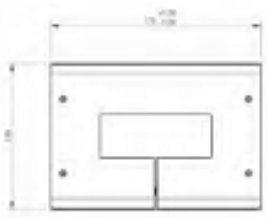

Fig 1. Available Snoop Pro models to be used with Ensurance HF encoder.

3.3 Licensing and options

HF encode and read option for Ensurance includes Ensurance HF encoder device, accessories, and Snoop Pro kit including a suitable coupling element and a selection of shielding plates. List of parts is provided in Chapter 4.1.

Regarding functionality, the Ensurance license for HF encoding is included and there are no extra license options directly linked to encoding functionality. However, additional Ensurance software license options may be required if specific in-process data processing functionality is required for the application. Ensurance licensing is discussed in the Ensurance software manual. Moreover, enabling support for non-supported chips and programming functions may require new license features or involve engineering costs.

Standard options	**Hardware:** - Ensurance HF Encoder unit - power supply, USB data cable, IO-connector - Mounting brackets - Snoop Pro, shielding plates kit, and antenna cable - USB drive installation media **Encoding capability**: - Protocols: ISO15692, ISO14443-A, ISO14443-B - Read, Write, NDEF messages, Mirror activation - NTAG-family and ICode Sli-X2 supported, other chips as per request - Encoded data verification **Data management**: - static data or data reading from file - basic in-process data conversions
Optional features	Special data conversions and encoding functions Adding support for non-supported chips and functions

4 Setup instructions

4.1 Ensurance HF encoder system parts

Ensurance HF encoder setup for Ensurance includes the reader with accessories needed for operating the reader with the Ensurance system. Normal delivery kit contents are listed below. Check that everything is available before going on with the set-up process.

Hardware

- Ensurance HF encoder unit with power supply and USB data cable
- IO-connector (D15 screw terminal breakout connector, straight)
- Antenna cable (N-SMA, 1.8m)
- Mounting brackets (4pcs)
- Snoop Pro HF encoding coupling element with shielding plates kit

Software

- Ensurance GUI is available in Ensurance installation media (license for HF encoding included)
- Manuals and other documentation provide on the USB stick

Fig 2. Ensurance HF encoder and related accessories.

Initial settings

Ensurance HF encoder is delivered read-to-use. Antenna cable, data cable, and IO cable need to be connected and machine configured to provide triggering for the device. The reader connectors, the pinout for the IO-connector, and IO signal types are described below.

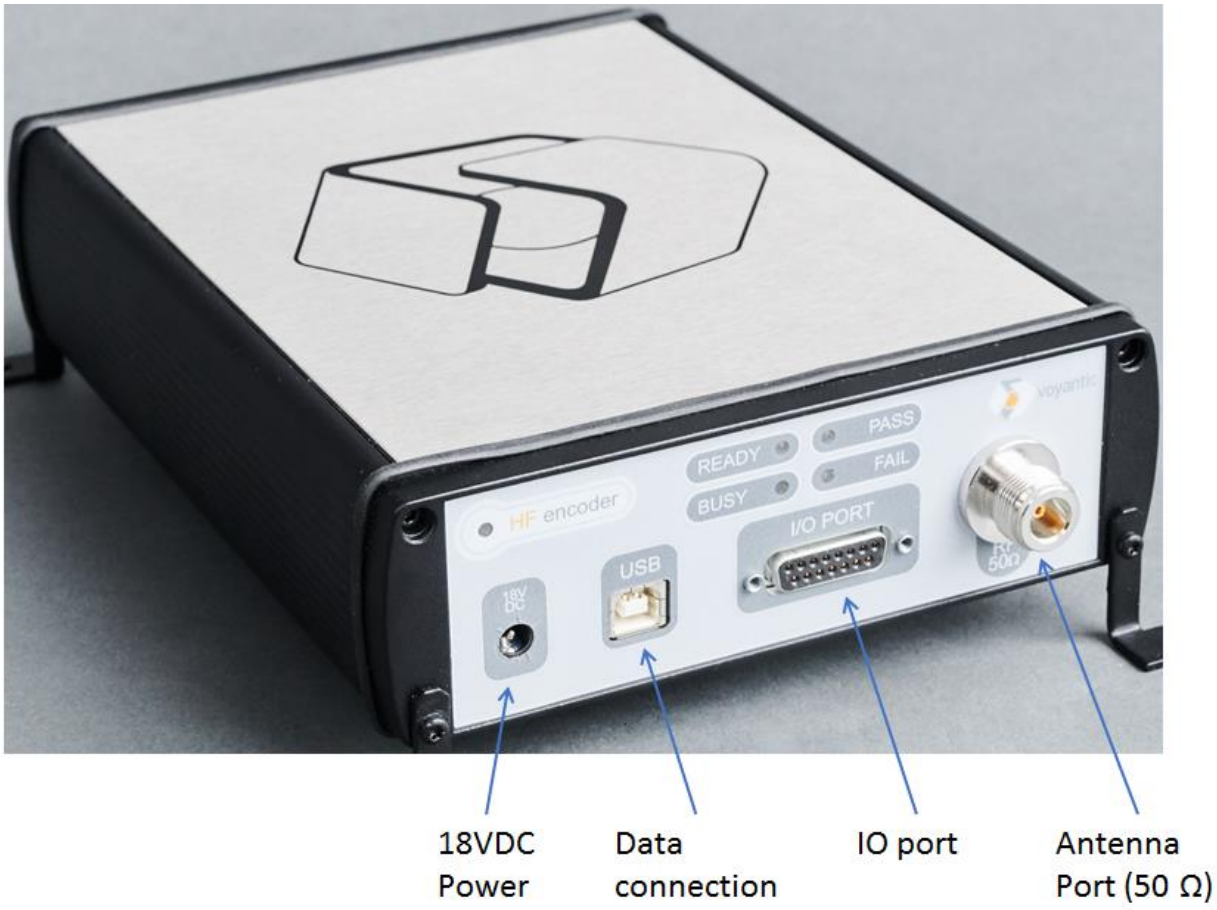

Fig 3. Ensurance HF encoder connectors.

Table 4. Ensurance HF encoder IO-port pinout.

Pin	Signal type	Pin	Signal type
1	< not connected >	9	< reserved for future use >
2	< reserved for future use >	10	< reserved for future use >
3	GND	11	OUT: +5V, max load 400mA
4	GND	12	IN: logic low level for Pin 7 and Pin 8
5[1]	IN: Trig-	13[2]	IN: logic high level for Pin 7 and Pin 8
6[1]	IN: Trig+	14	< not connected >
7[1]	OUT: Busy/Ready signal	15	< not connected >
8[1]	OUT: Pass/Fail signal	-	

[1] Internally isolated using an optocoupler

[2] Signals on Pin 7 and Pin 8 are individually pulled-up to this voltage reference through an internal 1k resistor.

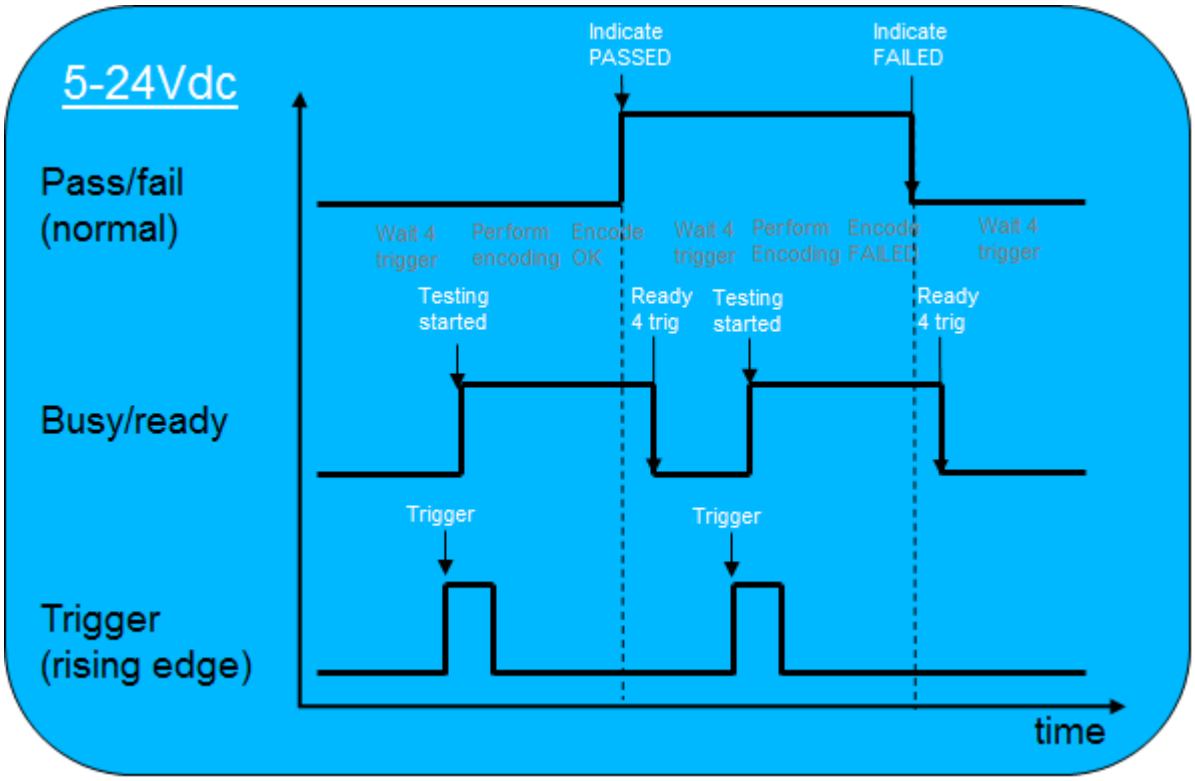

Fig 4. Ensurance HF encoder signals (default settings). Pass/fail and busy/ready signal polarity can be inverted, and their signal level is defined by the reference voltage on IO-adapter (pin 13).

4.2 Preparation for job

Preparation of the device for a production job requires two steps:

1. Generate encoding task list and define appropriate device settings

   Task list and device settings are managed and occupied by Ensurance software and they're included as part of personalization recipe, i.e. collection of files which define what processes are involved in the production job, what is done in each step, and how to manage data. Moreover, also the generic reader operational settings are included in the case files. Available settings are listed in the table below. Recipe files are can be done either manually or by using Ensurance case builder software. Instructions on how to do this are described in Ensurance case builder manual.

2. Choose appropriate shielding plate and Snoop Pro coupling element

   Snoop Pro coupling element defines maximum size for a label to be processed, and the area is further narrowed down by choosing a shielding plate with an appropriate opening size. In addition to physical dimensions of the tag, its movement must be considered, as the label/tag needs to stay in the field of view, i.e. shielding plate opening, throughout the whole encoding process. Moreover, it's recommended that there's at least 5mm clearance from the edges of the opening while programming, and there should only be a single label in the opening when the encoding process is started.

Table 5. Ensurance HF encoder settings available for the operator.

SETTING	VALUE
Trigger mode defines the type and polarity of trigger signal. This should be set according to the trigger source. Mode 3 (trigger on rising edge) needs to be applied with Reelsurance Pro.	0 = low state 1 = high state 2 = falling edge 3 = rising edge
Trigger timeout defines the maximum time to wait for a new trigger in ms. Value of -1 disables timeout function. Use -1 if not sure what value to add.	Timeout in ms (I32) -1 = no timeout
Busy/ready signal polarity defines whether busy state is indicated with high level (normal) or low level (inverted)	TRUE = inverted / low FALSE = normal / high
Pass/fail signal polarity defines whether passed state is indicated with high level (normal) or low level (inverted)	TRUE = inverted / low FALSE = normal / high

5 Maintenance and troubleshooting

5.1 Maintenance

Ensurance HF encoder is practically maintenance free hardware but it's recommended to take care of the cleanliness of the connectors and handle and use the device with care and according to the user instructions. In case of issues, technical support through support@voyantic.com.

5.2 Troubleshooting

Typical issues related to the application of Ensurance HF encoder are related to programming procedure, or Snoop Pro settings and adjustment. If programming procedure is performed for the first time, it is likely that the issues are related to compatibility of the chip with the encoding procedure. Once the encoding setup is ready and tested, the programming should normally proceed without issues unless there are connectivity issues with the machine or Ensurance software. When facing issues, first check that cables are securely connected and then start troubleshooting communication issues by following the steps presented below.

1. Check that programming works in a static setup. Take a single label in the field of view of encoding antenna and try running the encoding operation there. If the process involves dynamically acquired data, fixed data contents can be used to perform this verification test. If there are issues with programming in the static setup, they may be related to chip compatibility with the encoding procedure.

    a. Check IC type and compatibility with encoding actions and plugins used. Procedure for programming of HF labels are specific to IC models. Especially there are differences in special NFC features such as activating and application of mirror functions and implementation of the procedure needs to be done with respect to chip properties. In Ensurance, to be successful with encoding, the correct IC/chip plugin needs to be specified as a part of task definitions. Refer to Ensurance case builder manual for more information on this topic.

    b. One generic way to define encoding procedure is to read the memory map of the chip to be programmed and then copy the page contents for each tag to be encoded. Usage of write function is somewhat uncomplicated if the suitable page size is known beforehand. However, some parts of the chip memory may be locked or need to be programmed in a certain order. For more information, refer to IC manufacture's documentation.

2. Check Snoop Pro setup

    a. Check that Snoop Pro is installed with the correct shielding plate and verify that the opening size is large enough to allow enough space around the tag with at least 5mm of clearance throughout the whole programming procedure.

    b. Check that the correct antenna port is connected. Snoop Pro HF coupling element feature two ports enabling user to choose between two different antenna coils. If programming fails with the smaller one (port 1), try programming with the larger one (port 2)

3. Check trigger timing and verify that there is only a single tag in the field of view of the antenna when starting the encoding procedure. Neighboring tags need to be efficiently shorted by the shielding plate when reader inventories the tag-to-be-programmed. After inventory, this does not matter anymore unless there's a power re-cycle operation performed as a part of the procedure.

4. Check speed settings and verify that the tag remains in the field of view of the antenna throughout the whole programming procedure. There might be differences how tags tolerate the loading by the shielding plate, but to be sure, the it's recommended to set speed so that the that is all the time inside the shielding plate opening with a 5mm margin. Encoding of HF labels in continuous movement is typically impossible due to the lengthy programming procedure.

Table 6. Examples of troubleshooting topics and possible resolutions for solving the issues.

#	*DESCRIPTION*	*TROUBLESHOOTING*
1	Programming fails	Check encoding configuration files to find erroneous settings of functions incompatible with the label IC.
2	Programming of certain memory fails	Memory may be locked, or programming may require following a specific procedure. Check chip datasheet and settings for more information.
3	Programming fails, although it worked fine before	If the programming procedure has been proven successful before, it's likely that either antenna setup or trigger timing is wrong. Check that Snoop Pro is installed with the correct shielding plate and that trigger position matches with the antenna positioning. Machine installation typically allows adjusting the antenna position and the tag-to-be-programmed needs to be in the field of view of the antenna throughout the whole encoding procedure. With Snoop pro the usable are is 5mm inside the shielding plate opening.
4	Programming works when tag stays still, but fails in continuous mode	When using Snoop Pro, movement of the tag is allowed, but tag must stay in the field of view throughout the procedure. HF tag encoding typically takes relatively long time and may have to be done in intermittent mode to allow enough time for programming.