ABOUT ENOCEAN NFC TOOLS

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Observe precautions! Electrostatic sensitive devices!

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Published by EnOcean GmbH, St.-Martin-Straße 76, 81541 Munich, Germany
www.enocean.com, info@enocean.com, phone +49 (89) 6734 689-0

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1 Introduction

This application note gives an overview of the NFC tools that EnOcean provides for its NFC-enabled energy harvesting products. It explains the benefits of NFC for these products, describes the two available tools, and shows which users each tool is intended for.

More information about NFC in combination with energy harvesting is given in the white paper [8] and in the user manuals of the respective products.

1.1 References

[1] EnOcean NFC Configurator, product page:
https://www.enocean.com/en/product/enocean-nfc-configurator/

[2] EnOcean Tool app, product page:

https://www.enocean.com/en/product/enocean-tool/

[3] EnOcean Tool app, tutorial video: https://youtu.be/rfqTBlPfd_Q

[4] STM 550 multisensor module, product page:
https://www.enocean.com/en/product/stm-550-multisensor-module/

[5] EMDC motion detector with illumination sensor, product page:
https://www.enocean.com/en/product/motion-detector-with-illumination-sensor-emdc-oem/

[6] PTM 216B pushbutton transmitter module, product page:
https://www.enocean.com/en/product/ptm-216b/

[7] PTM 535BZ transmitter module, product page:
https://www.enocean.com/en/product/ptm-535bz/

[8] White paper "NFC and EnOcean Energy Harvesting – the Perfect Duo for the IoT":
https://www.enocean.com/wp-content/uploads/redaktion/pdf/white_paper/c1216en_-_white_paper_nfc_energy_harvesting_en.pdf

[9] NXP NT3H2111/NT3H2211 NTAG I²C plus, product data sheet:
https://www.nxp.com/docs/en/data-sheet/NT3H2111_2211.pdf

2 EnOcean and NFC

2.1 What Is NFC?

Near Field Communication (NFC) is a wireless communication technology for very short distances. It always connects two devices and is used for simple transactions, data exchange, pairing, and wireless connections.

NFC communication takes place between an active device, the NFC reader, and a passive NFC interface, the NFC tag. The two devices must be within a few centimeters of each other. This short range gives a high level of data privacy.

Energy harvesting devices typically use the read/write mode of NFC. In this mode, the NFC reader reads and writes device-specific data, configuration, and commissioning parameters. An example of an NFC tag with energy harvesting is the NXP NTAG I²C plus [9].

2.2 Why NFC for EnOcean?

NFC is a low-power standard that uses energy harvesting itself. The NFC tag is powered by the energy that it harvests from the radio field of the NFC reader. In this way, NFC connects even self-powered devices, such as EnOcean switches and sensors, to the Internet of Things (IoT).

The NFC interface does not need the primary energy source of the EnOcean device, such as the actuation of a switch or the light on a solar cell. NFC therefore integrates easily into EnOcean energy harvesting devices without hardware constraints and adds many benefits.

With NFC, the parameters and settings of NFC-enabled EnOcean modules can be customized. Self-powered switch and sensor modules with an NFC interface are configured and commissioned quickly and easily, even inside their packaging. An external NFC reader or an NFC app on a smartphone or tablet is used for this. NFC adds the following capabilities:

1. Read the unique product identification and all specific parameters, such as IDs, link tables, tags, functions, EnOcean Equipment Profile (EEP), and other preconfigured settings. For example, it can be read whether a PTM switch module is configured for a single rocker or a double rocker.
2. Write product information to the integrated NFC tag, such as the product ID, switch design, provider, location, and function.
3. Configure and commission devices quickly and easily, on site and off site. For example, the radio protocol of the PTM 535BZ, BLE or Zigbee Green Power, is selected via NFC [7].
4. Update the application firmware.

2.3 Energy Harvesting and NFC: The Perfect Pair

Smart buildings and IoT applications need sensor systems that are quick and easy to install. A single building can contain thousands of sensors that deliver the data for individual and demand-based processes. With NFC, modern EnOcean devices are configured and installed simply and quickly, exactly as required by each application and environment.

The NFC reader exchanges data with the NFC interface of the self-powered EnOcean module over a distance of a few centimeters. Typical NFC readers are NFC-enabled smartphones and tablets or a PC with an external NFC reader. The short distance between the two devices protects the transmitted data.

3 Benefits of NFC for IoT Applications

NFC in EnOcean energy harvesting products is a future-proof step in the fast-growing IoT market. In this market, connected intelligent systems are the basis for digital buildings and services. A key success factor of such projects is the simple commissioning and programming of thousands of different sensors in a building. These sensors deliver the data that is needed for individual and demand-based optimization.

NFC benefits all players in the IoT value chain, such as OEM product manufacturers, OEM customers, building automation planners, and end users at home:

- **Flexible configuration:** Products with NFC-enabled EnOcean devices are configured for the individual customer requirements, either by the OEM before delivery or later by the user in the field. OEMs only need to stock the basic product and make the required settings, such as device parameters, just before shipment. This saves storage costs. OEMs also respond faster to individual customer requests, for example for EEP settings, commissioning, or specific security requirements.
- **Commissioning without power:** NFC allows off-site commissioning without power. Link tables, security codes, and other parameters of line-powered devices can be changed while the device is not powered and still packed in its box. This allows fast changes of preconfigured product packages and simple error diagnosis.
- **Product information on the device:** Specific product information can be written to the NFC tag of every EnOcean product. Examples are the digital business card of the installer or service provider, the switch design (single or double rocker), and the symbols on the rocker (lighting or shutter control).

3.1 Two Complementary NFC Tools from EnOcean

EnOcean provides two NFC tools that complement each other:

- **EnOcean NFC Configurator:** a PC application for advanced OEM users. It works with an external USB NFC reader, offers the best NFC range, and gives access to all functions.
- **EnOcean Tool:** an app for smartphones and tablets with Android or iOS. It has a reduced feature set and is easy to use.

Table 1 compares the two tools.

Table 1 Comparison of the EnOcean NFC tools

Feature	EnOcean NFC Configurator	EnOcean Tool
Platform	Windows PC	Smartphone or tablet with Android or iOS
NFC interface	External USB NFC reader from Elatec	Integrated NFC interface of the mobile device
Target users	Advanced OEM users	Installers in the field and all other users
Parameters	All accessible device parameters	Common parameters, limited feature set
Special functions	Save, load, export, and clone configurations, batch programming of small quantities	Display of BLE sensor values and signal strength, solar cell power and energy balance

Important: Before any configuration is changed, the user should be familiar with the device functions. If the current or changed NFC configuration is unclear, execute a factory reset as described in the user manual of the device. The factory reset sets all configuration registers back to their default values. When the NFC configuration is complete and all functions work as required, it is recommended to lock the NFC configuration interface. To do this, change

the NFC PIN code from its default value to a different, secret value. Make sure that the new PIN code is recorded and stored safely.

4 EnOcean NFC Configurator (PC Application with External NFC Reader)

EnOcean provides the EnOcean NFC Configurator free of charge to OEM partners. This PC application is used to configure and commission EnOcean GmbH products with an NFC interface. It reads and writes all accessible parameters of a product. Configured device parameters can be stored in a file, for example to clone the configuration to other devices or to share it with other users. The application also offers a simple batch programming function for small quantities and logs the process.

The EnOcean NFC Configurator is an advanced development tool. It supports the most complete set of the device's settings and therefore requires detailed technical knowledge. It may only be used to read and configure products that were purchased from EnOcean through authorized sales channels, together with the special Elatec NFC reader described below.

4.1 System Requirements

- **Operating system:** Windows 10 (version 1909 or later) or Windows 11
- **Software framework:** .NET Core
- **Processor:** 1.5 GHz or faster
- **Memory:** 2 GB RAM or more
- **Disk space:** 200 MB or more
- **Screen resolution:** at least 1680 × 1050 pixels, a higher resolution is recommended

4.2 NFC Reader

The EnOcean NFC Configurator works only with a customized external NFC reader: the Elatec TWN4 MultiTech 2 HF with Elatec CDC firmware. The Elatec order number of this special version is T4BT-FB2BEL2-SIMPL. Only this version has the customized USB virtual COM port interface.

The NFC reader is a third-party product. Contact Elatec sales (sales-rfid@elatec.com) or an authorized Elatec distributor before the purchase and state the order number above.

4.3 Installation Step by Step

1. Order the special Elatec NFC reader with the order number T4BT-FB2BEL2-SIMPL. Check the order number carefully, because only this version has the customized USB virtual COM port interface. The NFC reader is the hardware interface between the EnOcean NFC Configurator on the PC and the NFC-enabled EnOcean devices.
2. Open the product page of the EnOcean NFC Configurator [1]. The page contains all related information.
3. Log in or register to download the application. Registration is required and free of charge.

4. After the download, connect the Elatec NFC reader to the PC and start the EnOcean NFC Configurator. The application connects to the reader automatically. The connection state, the COM port, and the reader type are shown in the upper left corner.
5. Place an NFC-enabled EnOcean device on the NFC reader. The application reads the device and shows its configuration.

4.4 Working with the NFC Configurator

The application is divided into the following function tabs:

- **Configure:** configuration of the product parameters
- **Clone:** transfer of product parameter settings to other devices
- **SmartStudio:** commissioning of the product in the EnOcean SmartStudio cloud application
- **Management:** management of product PIN codes and SmartStudio connections
- **Settings:** settings of the NFC Configurator application
- **Help:** description of the application and its functions

Figure 1 and Figure 2 show the 'Configure tab' with an STM 550 multisensor module [4] and with an EMDC motion detector [5]. The left side shows a picture of the device and the device information, such as frequency, EnOcean ID, product ID, and software version. The 'Set Function' area contains device functions, such as airplane mode, LRN telegram, function test, and factory reset. The Change Password area changes the NFC PIN code.

The right side shows the device configuration, grouped by topic, for example device configuration, security, status reporting, and the individual sensors. Almost every default setting can be customized. The buttons 'Read From Device', 'Write To Device', and 'Undo All Changes' read, write, and reset the settings. A short help text for each parameter appears when the mouse pointer is placed over the question mark symbol next to the parameter.

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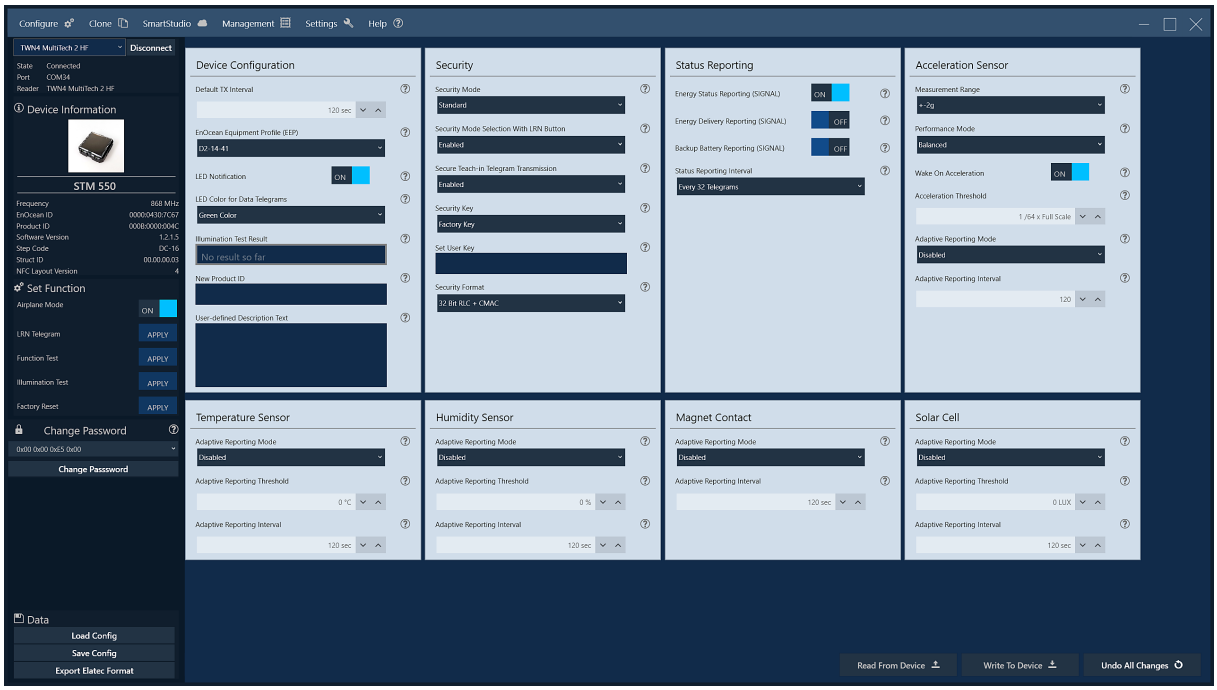


Figure 1 NFC Configurator, Configure tab with an STM 550 multisensor module

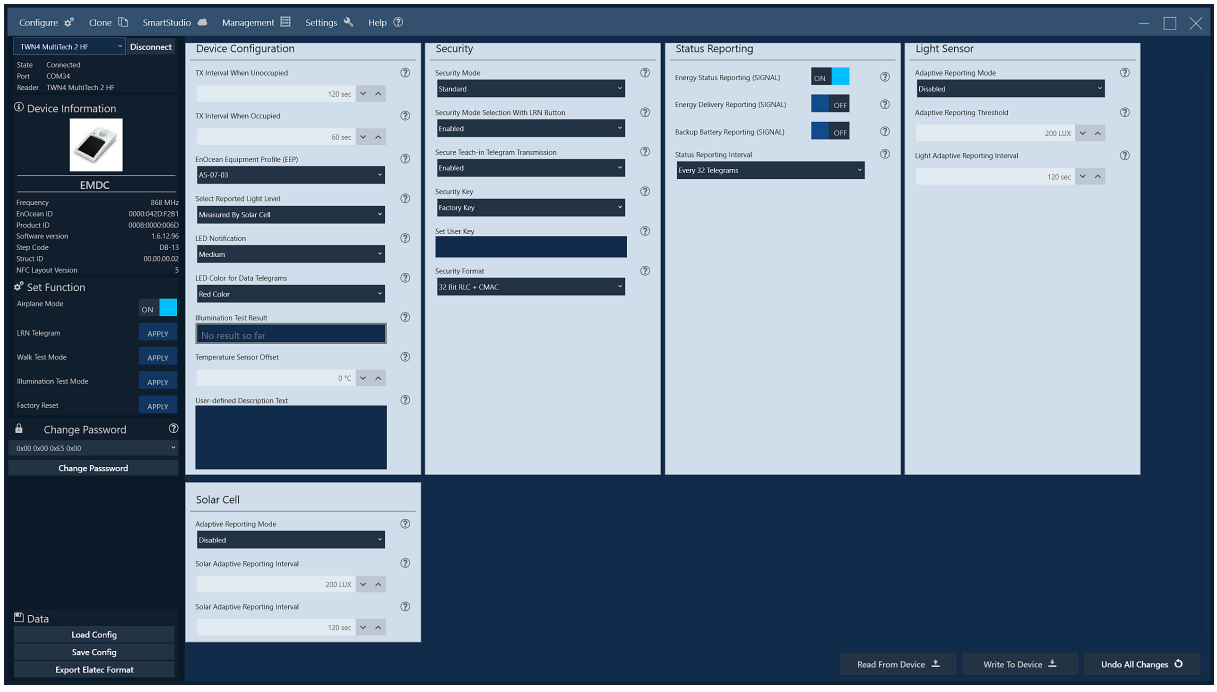


Figure 2 NFC Configurator, Configure tab with an EMDC motion detector

Note: Some settings are critical and require background knowledge. For example, some sensor settings strongly affect the energy balance of the device at its installation location. In the worst case, if the energy balance becomes negative, the communication may fail in

the long run. This applies, for example, to the TX reporting settings (adaptive reporting, performance mode, and reporting interval), the selected EEP, and the security settings.

The ‘Settings’ tab also contains a hidden expert mode, which can be switched on and off. The expert mode is restricted to advanced partners who were specially trained by EnOcean.

The ‘Help tab’ (Figure 3) describes the function tabs and the configuration steps. Questions about the operation of the EnOcean NFC Configurator can be sent to support@enocean.com.

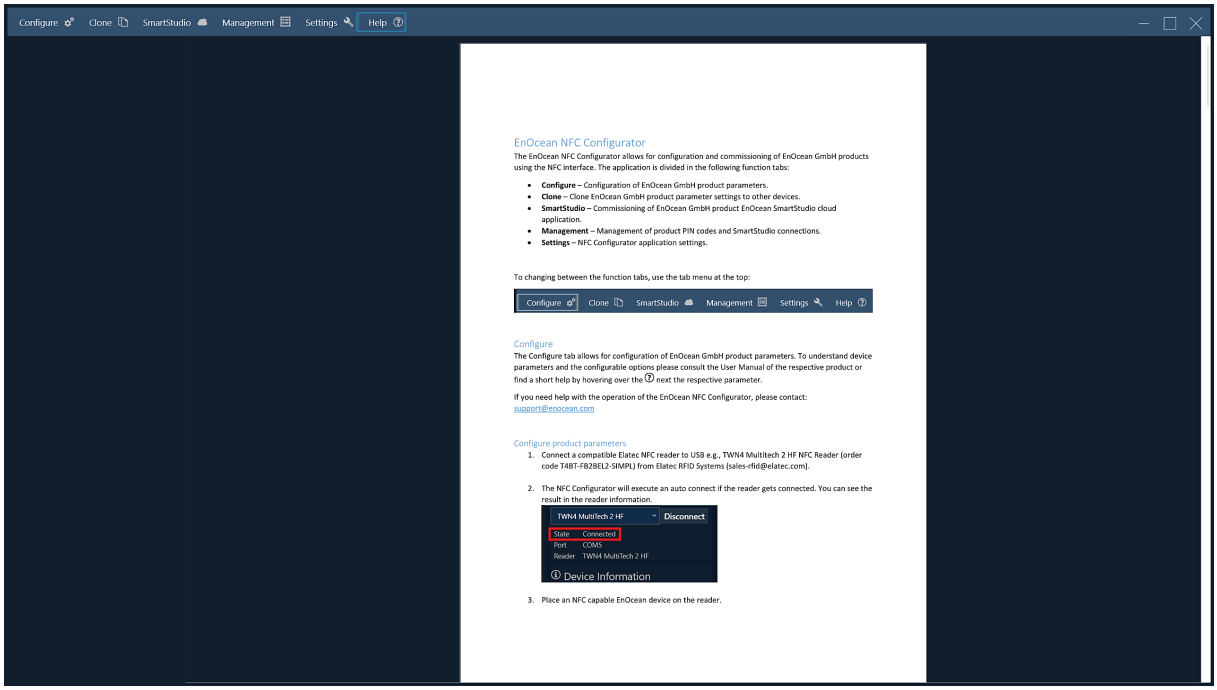


Figure 3 NFC Configurator, Help tab

A customized configuration can be saved, loaded, exported, or used to clone other devices. In the ‘Clone’ tab (Figure 4), the check boxes select the parameter groups that are transferred. The buttons ‘Read Parameters from Device’ and ‘Write Parameters to Device’ transfer the configuration. ‘Load Config’ and ‘Save Config’ in the ‘Data’ area store the configuration in a file or load it from a file.

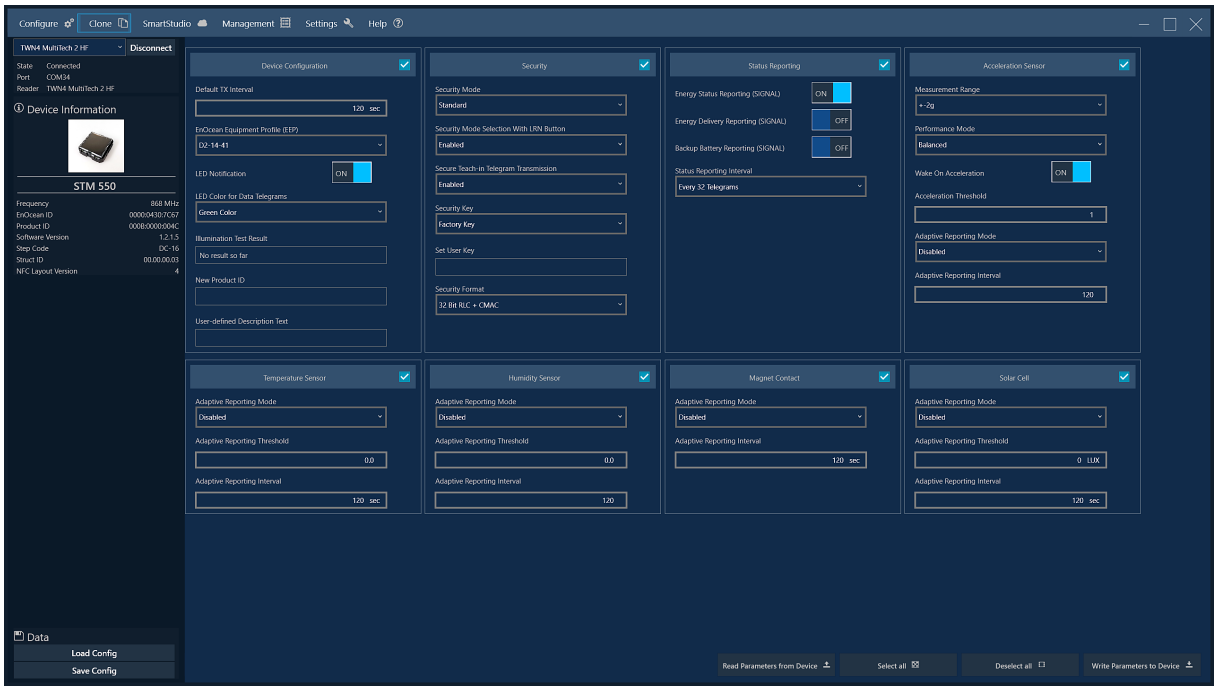


Figure 4 NFC Configurator, Clone tab

5 EnOcean Tool (App for Smartphones and Tablets)

The EnOcean Tool is an easy-to-use app with a limited feature set for smartphones and tablets. It is designed for installers in the field and supports all typical tasks, such as setting devices to operation mode, triggering learn (LRN) telegrams and changing common parameters.

With the EnOcean Tool, the properties of selected EnOcean devices are determined, and device information is read out quickly at any location. The NFC interface of the mobile device connects directly to the NFC-enabled EnOcean module. No additional gateway or interface is required.

5.1 Requirements

The app requires a smartphone or tablet with Android or iOS and an integrated NFC interface. For iOS, an iPhone 7 or newer with iOS 13 or later is required.

5.2 Features

The EnOcean Tool is a complementary tool for all users. With the app, the user can:

- Read and write device-specific data, such as the function and location of the device and the contact data of the service or installation provider, independent of the radio frequency of the device
- Read and change the EnOcean Equipment Profile (EEP) of the device, as described in its user manual

- Tune the energy balance for the specific use case with the selected EEP and reporting interval
- Monitor the current power of the solar cell and the energy balance
- Set up advanced security and encryption settings

Compared with the PC-based NFC Configurator, some features of the app are intentionally limited. This makes the app easier to use for its target group. However, the app offers a unique feature for EnOcean modules that use Bluetooth Low Energy (BLE). It displays all transmitted sensor values, such as temperature, humidity, light, and room occupancy, together with the current radio signal strength, directly on the smartphone. A standard smartphone without any additional hardware can therefore check the full function of NFC-enabled EnOcean BLE transmitters anywhere in the field.

5.3 Installation and Use Step by Step

1. Download the app from the App Store or from Google Play. The QR codes and links in the current EnOcean user manuals lead directly to the download. Alternatively, open the product page of the EnOcean Tool [2] or search for "EnOcean Tool" in the app store. The app is available in English and German.
2. Install the app on the smartphone or tablet.
3. Watch the short tutorial video [3].
4. Switch on the NFC function of the mobile device, if it is not already on.
5. Start the app. Place the back of the NFC-enabled EnOcean device in direct contact with the back of the smartphone, under the NFC antenna of the smartphone. If the app does not find the device immediately, move the device slightly.
6. When the app has found the device, continue as required by the application. Scroll on the display to see all device-specific information, functions, and select the required settings. Figure 5 shows examples for the STM 550 [4], the PTM 216B [6], and the EMDCA [5]. If in doubt, tap the ⓘ button in the upper right corner to open the help section for the product. More details are given in the user manual of the device, for example in the sections about configuration via NFC and about the NFC interface and its parameters.

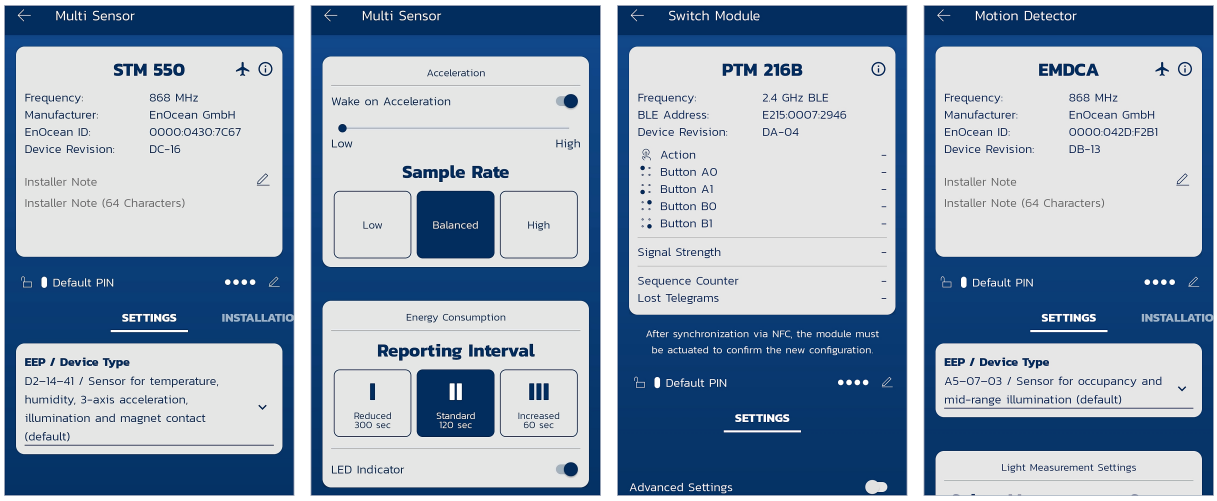


Figure 5 EnOcean Tool app, examples for STM 550, PTM 216B, and EMDCA

6 Key Benefits at a Glance

Figure 6 summarizes the key benefits of NFC in EnOcean devices.

NFC and EnOcean – Key Benefits at a Glance:

1. **NFC-enabled devices (sensors and switches), which had no configuration at all, can now be adjusted for the application and tuned in performance.**
2. **Smartphones can now talk to EnOcean devices directly without a gateway.**
3. **Anybody can configure EnOcean devices using an NFC-enabled smartphone or NFC reader.**

Figure 6 NFC and EnOcean, key benefits at a glance

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