Confidex Viking™ and Confidex Viking Tough™ user guide

CONTENTS:

APPLICATION NOTE

1   General information

This document presents how to use and install Confidex Viking™ and Confidex Viking Tough™ beacons. Installing the beacon as guided in these instructions will provide best usage for Confidex Viking™ beacons.

2   Applicable products

| Product family	Product name	Item number
Confidex Viking™	Confidex Viking™ Classic	3003597
Confidex Viking™	Confidex Viking™ Quuppa	3003108
Confidex Viking Tough™	Confidex Viking Tough™ Classic	3002662
Confidex Viking Tough™	Confidex Viking Tough™ Quuppa	3003220

3 Confidex Viking™ beacon radiation efficiency

Picture below shows Confidex Viking™ beacon radiation patterns on three different attachment materials. Radiation patterns, pictured below, conform to how the PCB is placed inside beacon, approximately in a 45° angle. Radiation efficiency changes when attaching beacon to certain materials. Listed below are directional radiation measurements done for Confidex Viking™ beacon taken in two orientations, from azimuth 0° angle and in 90° elevation.

Best radiation efficiency is always towards the front of the beacon. In the middle of tag, diagonally, there are two segments that radiate with lesser efficiency. This can mean worse than normal read range distance in some spots depending on how Confidex Viking™ beacons are placed.
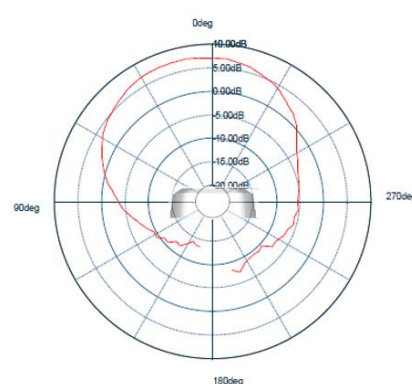
Radiation pattern measurements in Azimuth 0° angle.
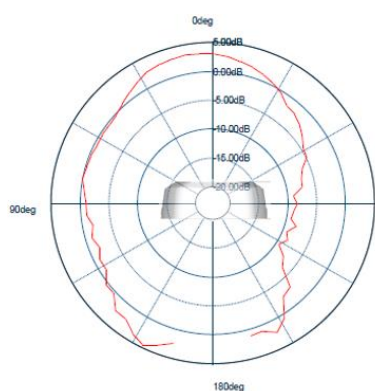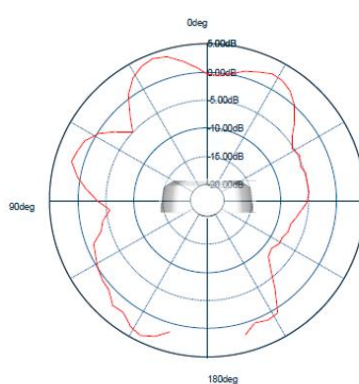
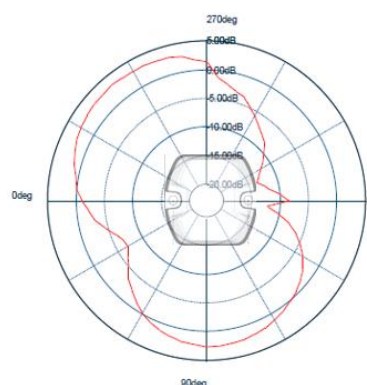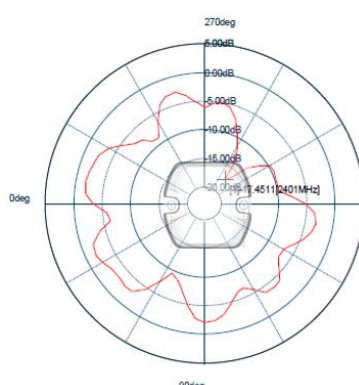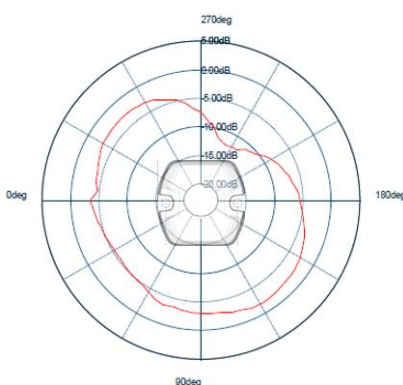| Picture 1. In free space | Picture 2. On concrete | Picture 3. On steel |

Radiation pattern measurements in 90° elevation angle.

| Picture 1. In free space | Picture 2. On concrete | Picture 3. On steel |

Because board orientation is not specified in production, radiation pattern can be mirrored in practice. If your positioning system has gateways or readers, please take beacon orientation into consideration to ensure best performance.

Tip: Deciding beacon main board orientation

Confidex Viking Classic™ beacon orientation can be seen from the dot that is left on the top cover. The dot is an ejector pin mark from injection molding and can be felt with a finger. This side is the **bottom** of the beacon: antenna on the main board is in 45° clockwise orientation.

Beacon labels should be placed in the right orientation depending on this, but otherwise main board orientation is not specified in production. Performance-wise, beacons signal beam strength is good towards the front in either orientation.

4 Installing Confidex Viking™ beacons

Generic tips on how to decide placing Confidex Viking™ beacons:

- Depending on your positioning system: place beacons evenly, approximately 10 m (33 ft) from each other. The closer beacons are to each other, the better the coverage.

- Take into consideration that installing a beacon to or next to metal structures can affect signal. This can mean better or worse radiation efficiency.

4.1 Ceiling mounting

- Install beacons so that they are facing down

- Install beacon in the middle of a path

- Ceiling height should be at least 3-4 meters to ensure good signal beam coverage.

4.2 Wall mounting

- Install beacons back cover against the wall

- Place beacons above eyesight level to avoid people and objects obstructing signal, for example in 2 - 2,5 m (6,2 - 8,2 ft) height

- Beacon radiation pattern should be taken into consideration – installing beacons in 45° angle is suggested

- Wall mounting provides at best 99 meters transmit range in outside conditions. Inside, for example in an office environment, at least 20 - 50 m read range should be expected. This depends on how many obstacles are in front of beacon's signal.

4.3 Asset tracking application

- Take radiation patterns from chapter 3 into consideration when installing Viking™ beacons. This should depend on your positioning system and your BLE reader/locator orientation.

Example of installation planning in beacon application:

1. Place beacons first on pathways and rooms that are most used

2. Place beacons next to stairs, escalators, and elevators in every floor

3. If you are planning to use positioning outside, place beacons next to exits and the perimeter of building

4. Lastly, place beacons everywhere else evenly to ensure good coverage.

4.4   Installing Viking™ Quuppa tags

Based on the above antenna design analysis and radiation pattern test result, below are the application notes specifically for BLE based positioning systems that use a reader, for example Quuppa locator.

- Reading from the front surface is always recommended.

- If the receiver is installed on the celling face down, the best orientation for the tag is having the tag horizontally placed, face up.
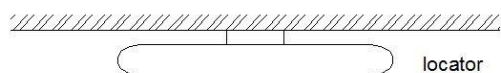
- If it's not possible to have the tag horizontally placed (e.g., vertically), the recommended orientation is in 45-50° clockwise rotation.
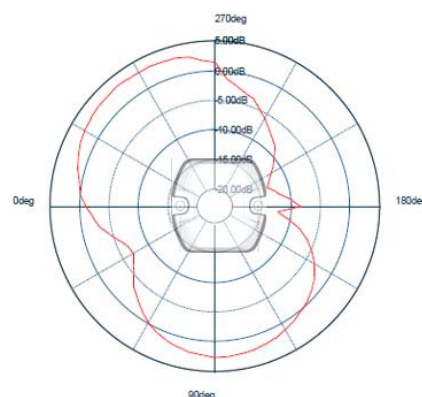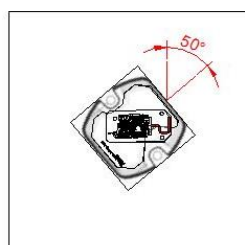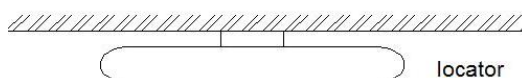
- If the receiver is vertically placed, for example installed on the wall, the best orientation of the tag is also vertically placed, directly facing the receiver antenna.

Tag vertically (side face up)
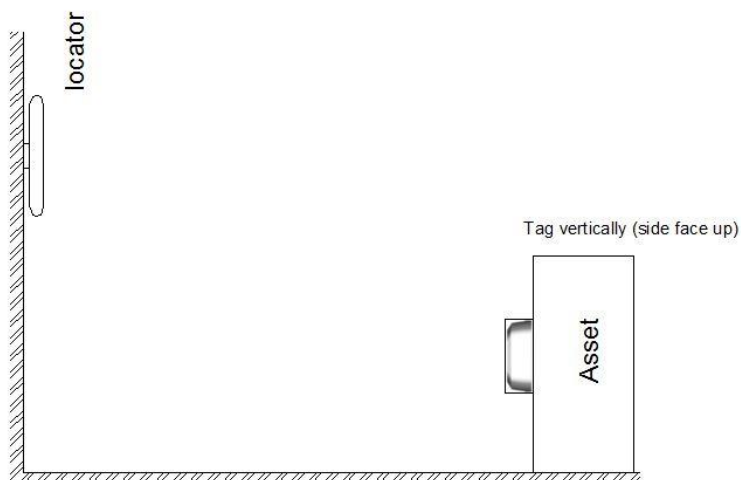
- If the tag cannot be placed vertically, but only horizontally: the best orientation of the tag is in 45° clockwise rotation.

Tag horizontally (front face up)
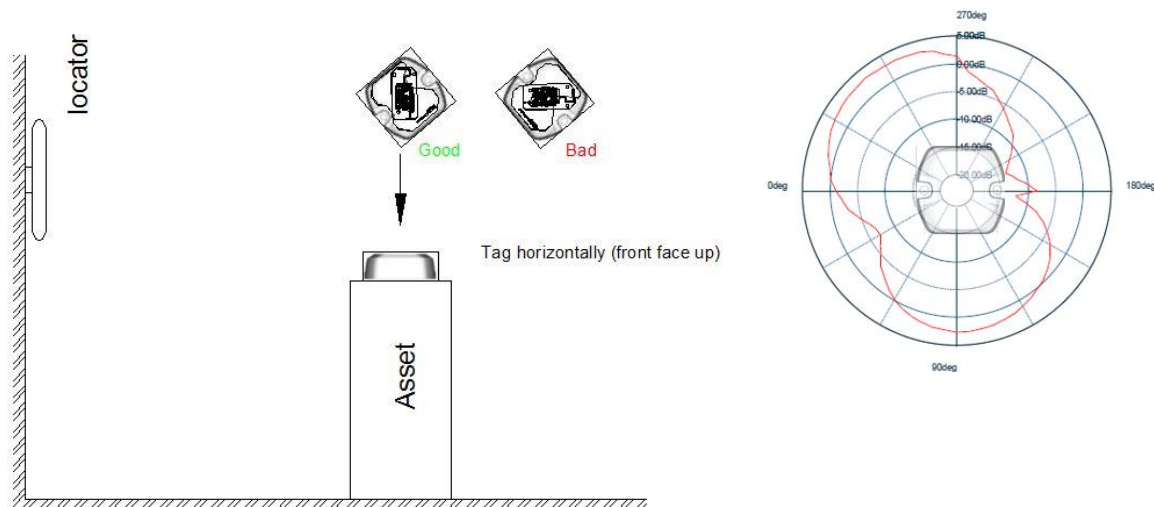
5   Technical specifications – Confidex Viking™

Reliable industrial grade Bluetooth® Low Energy beacon for industrial identify, sense and locate applications.

ELECTRICAL SPECIFICATION

Device type
Bluetooth® Low Energy beacon, Battery powered
Wireless interface protocol
Bluetooth® 4.2
NFC: ISO/IEC 14443A
Compliancy (Declaration of Conformity)
Europe (CE), USA (FCC), Canada (IC), Japan (MIC),
Australia/New Zealand (ACMA), South-Korea (KC),
Russia (EAC), Ukraine (UkrSEPRO), Brazil (ANATEL)
Operational frequency
ISM: 2401 - 2481 MHz
NFC: 13,56 MHz
SOC
Nordic Semiconductor NRF52832
Memory configuration
512 kB FLASH, 64 kB RAM
Configuration interface
Over NFC interface with Confidex Runestone™ mobile app
(available for android mobile phones in Google Play store)
Sensors*
Built-in temperature sensor, accelerometer, and Hall
effect sensor
Sensitivity
-96 dBm sensitivity (Bluetooth® Low Energy)
Read range**
Up to 200 m / 650 ft. Measured on and off metal.
Battery type (total capacity)
2 x CR2477 (2000 mAh) coin battery for maximal lifetime
Applicable surface materials
Can be attached to any surface

MECHANICAL SPECIFICATION

Encapsulation
IP68, high quality PC/ASA
Weight
45 g
Delivery format
Single, 30 units per box
(delivered radio OFF due to IATA regulations)
Tag dimensions
56 x 55 x 19 mm / 2.20 x 2.13 x 0.75 in (M5 size hole)
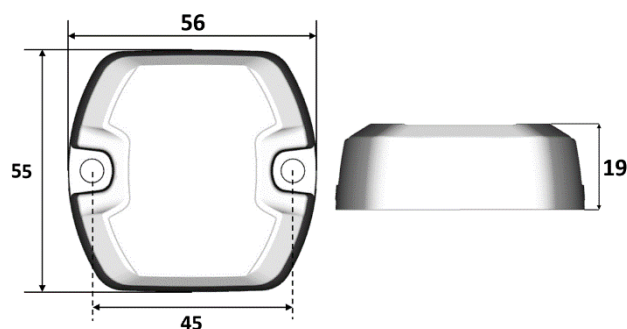
ENVIRONMENTAL RESISTANCE

Operating temperature
-20°C to +60°C / -4°F to +140°F
Water resistance
Good, tested 5 hours in 1m deep water (IP68)
Vibration resistance
JESD22-B103B, service condition 2;
3-axis vibration with 10G acceleration
ESD immunity
±8 kV according to EN 61000-4-2 (air discharge)
±4 kV according to EN 61000-4-2 (contact discharge)
Chemical resistance ***
No physical or performance changes in:
  - 168h Motor oil exposure
  - 48h Salt water (salinity 10%) exposure
  - 48h Sulfuric acid (10%, pH 2) exposure
  - 48h NaOH (10%, pH 13) exposure
Generally good resistance with moderate concentrations
of acids, alcohols, alkalis, detergents, and cleaners.
Acetone should be avoided.
Expected lifetime****
8 years with typical operating parameters

6   Technical specifications – Confidex Viking Tough™

Reliable industrial grade Bluetooth® Low Energy beacon for industrial identify, sense and locate applications.

ELECTRICAL SPECIFICATION

Device type
  Bluetooth® Low Energy beacon, Battery powered
Air interface protocol
  Bluetooth 4.2
  NFC: ISO/IEC 14443A
Compliancy
  Europe (CE), USA (FCC), Canada (IC), Japan (MIC),
  Australia/New Zealand (ACMA), South-Korea (KC),
  Russia (EAC), Ukraine (UkrSEPRO), Brazil (ANATEL)
Operational frequency
  ISM: 2401 - 2481 MHz
  NFC: 13,56 MHz
SOC
  Nordic Semiconductor NRF52832
Memory configuration
  512 kB FLASH, 64 kB RAM
Configuration interface
  Over NFC interface with Confidex Runestone™ mobile app
  (available for android mobile phones in Google Play store)
Sensors*
   Built-in temperature sensor, accelerometer, and Hall
   effect sensor
Sensitivity
  -96 dBm sensitivity (Bluetooth® Low Energy)
Read range**
  Up to 200 m / 650 ft. Measured on and off metal.
Battery type (total capacity)
  2 x CR2477 (1900 mAh) coin battery for maximal lifetime
Applicable surface materials
  Can be attached to any surface

MECHANICAL SPECIFICATION

Encapsulation materials
 IP69K, polyurethane casting
Weight
  70 g
Delivery format
  Single, 30 units per box
  (delivered radio OFF due to IATA regulations)
Tag dimensions
  60 x 55 x 21 mm / 2.36 x 2.18 x 0.83 in
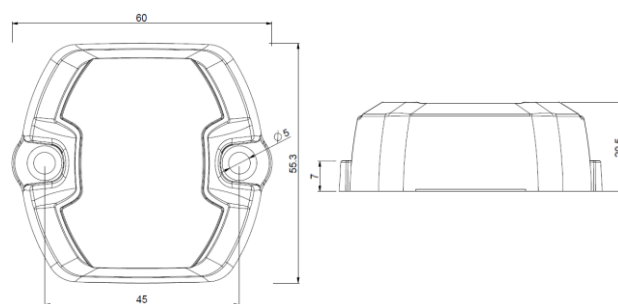
ENVIRONMENTAL RESISTANCE

Operating temperature
  -40°C to +85°C / -40°F to +185°F
  EN 60068-2-14: 2009, Test N: Change of temperature
Water resistance
  Submersible (IP69K)
Vibration resistance
  EN 60068-2-6: 2008, Test Fc: Vibration, 20G
  EN 60068-2-27: 2009, Test Ea: Shock, 40G
ESD immunity
  ±8 kV according to EN 61000-4-2 (air discharge)
  ±4 kV according to EN 61000-4-2 (contact discharge)
Chemical resistance *
  No physical or performance changes in:
     - 168h Motor oil exposure
     - 48h Salt water (salinity 10%) exposure
     - 48h Sulfuric acid (10%, pH 2) exposure
     - 48h NaOH (10%, pH 13) exposure
  Generally good resistance with moderate concentrations
  of acids, alcohols, alkalis, detergents, and cleaners.
  Acetone should be avoided.
Expected lifetime***
  8 years with typical operating parameters

7 Confidex Runestone™ beacon field configure app

Confidex Viking™ Bluetooth® Low-Energy (BLE) Industrial beacons track the location of assets and people, with optional sensors for capturing environmental data. Confidex Viking™ beacons are joining passive RFID in the asset management and tracking space. It is a new way to track that comes with tradeoffs in battery life and cost against improved functionality. Confidex designed the Viking product family to be a modular BLE beacon family that raises the bar for indoor and outdoor industrial asset tracking to gain real time location and conditioning visibility.

Confidex Viking™ beacons are designed with security in mind and have integrated secure NFC interface with unique identity keys for configuration. They do not allow changing of configuration through the Bluetooth interface. Confidex Viking™ beacons are turned on/off through the NFC interface, which prevents tampering with the beacons in public environments.
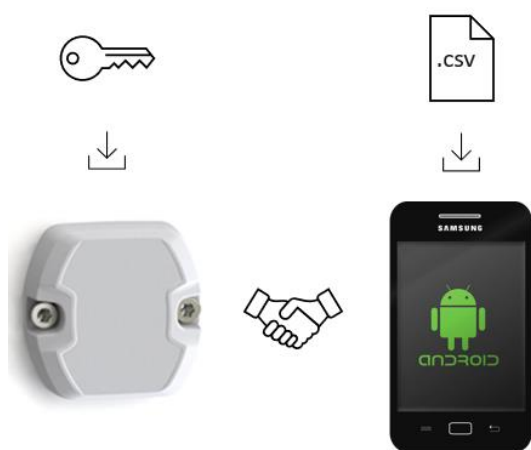
Confidex Viking™ beacons are delivered turned off (according IATA regulations), and they can be activated and operated with Confidex Runestone™ mobile application for Android mobile phones.

CONFIDEX RUNESTONE™ MOBILE APP

General information
Confidex Runestone™ mobile app is a specific application used to operate the Confidex Viking™ beacons with Confidex standard firmware. By using the Confidex Runestone™ App, the user can turn the Confidex Viking™ beacons on/off, read beacon parameters and configure the parameters over the phone NFC interface.

Supported Android version and phone models
Confidex Runestone™ app is developed for all mobile phones running on Android operating system version 7 or higher. Due to different NFC chipsets and android OS implementations by mobile phone manufacturers, Confidex cannot guarantee proper NFC interface operation on all Android devices.

The Android mobile phone needs to have NFC read/write functionality. Confidex have tested correct operation with Samsung models S5 - S20, Google Pixel 2, Nokia 3, Honor 9X lite, Huawei P30 Lite. Before deployment of the beacons, it is highly recommended to 1st install and test the Confidex Runestone™ app on your Android mobile phone to verify proper NFC functionality with Confidex Viking™ beacons. Please turn to Confidex for updated list of validated Android devices.

Download and installation
The latest version of Confidex Runestone™ app can be downloaded and installed from the Google Play store. After successful installation and launching of the Confidex Runestone™ app on your Android mobile phone, it will request permissions for using Bluetooth connection which need to be granted for proper operation.

NFC and BLE operation
Confidex Viking™ beacon BLE interface is configured to non-connectable broadcast mode and the Confidex Runestone™ app communicates only over the wireless NFC interface with the beacon. Therefore, the user needs to ensure that NFC functionality of the mobile phone is turned on. It is typically found in under phone Settings -> Connections -> NFC and Payment or quick access from top of the screen next to WiFi and Bluetooth activation.

Confidex Viking™ identity keys
To be able to read and configure the Confidex Viking™ beacons, the identity of each beacon must be known by the Confidex Runestone™ app. The installed app does not contain any Confidex Viking™ beacon identities by default before first importing an identity file (csv format) including the corresponding keys. Confidex provides one identity file for all beacons with each order. You can also request it from contact.BLE@confidex.com.

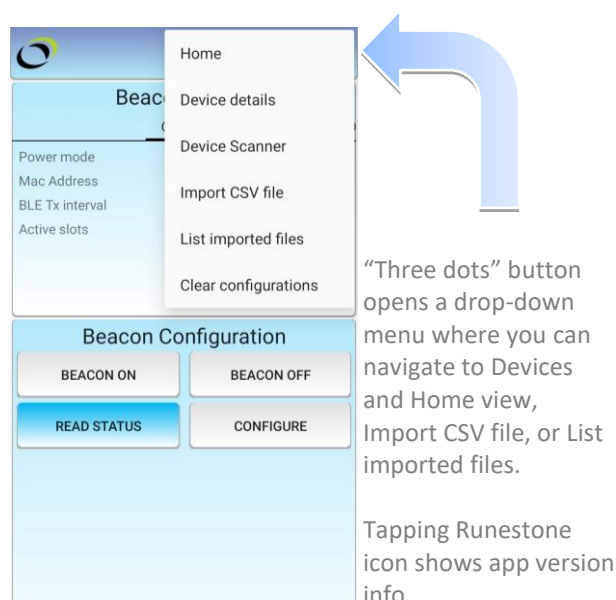Download the latest free version of Confidex Runestone™ application from Google Play Store.

Description

Confidex Runestone™ app consist of two main window, **Beacon Status** and **Beacon Configuration**, which shows the beacon configuration data and operation buttons which can be performed when a beacon is scanned with the NFC of the mobile phone. Additional functions for managing identity files, device scanner and details can be found from the drop-down menu in the top right corner.

Importing identity file (.csv)

To be able to read and configure the Confidex Viking™ beacons with the NFC of you're the mobile phone, first the identities of the beacons need to be imported into the Confidex Runestone™ app.

"Three dots" button opens a drop-down menu where you can navigate to Devices and Home view, Import CSV file, or List imported files.

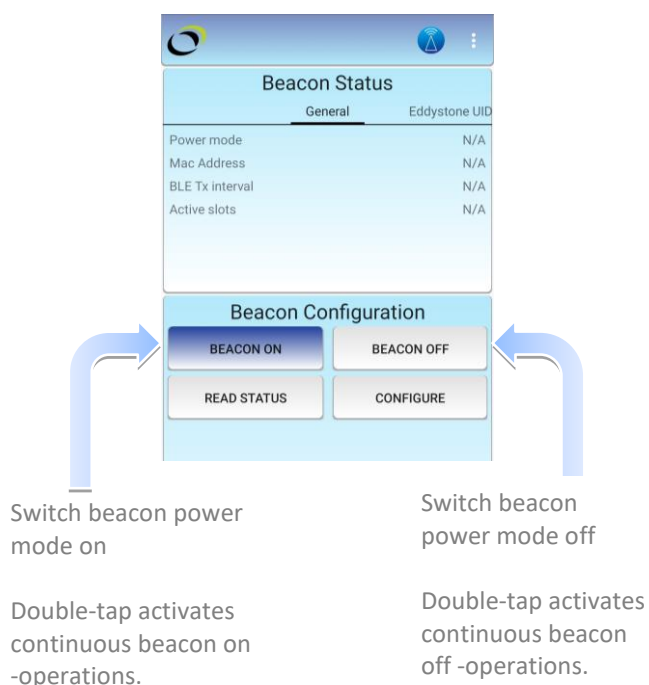Tapping Runestone icon shows app version info.

The following steps describe how to import the .csv file:

1. Tap on the **three dots** on the upper right. This opens a drop-down menu seen on the right.

2. Choose **Import CSV file**.

3. Navigate to **Downloads** (or another folder to which you have stored the CSV file) and choose your file. Next Confidex Runestone™ app will import the selected file.

4. A message will pop up saying "Process successfully done". Press the **red exclamation mark** for the app to finish importing. The list of all imported files is shown from the **List Imported Files** option and imported files can be cleared with **Clear configurations** option.

5. Ready to read a beacon? Place the mobile phone NFC interface to the center of the Confidex Viking™ beacon and keep it still at least for 2s to allow enough time to process all data over the NFC communication protocol.

Activating Confidex Viking™ beacons

Confidex Viking™ beacons are turned off by default during the shipment. Beacons can be turned on/off with Confidex Runestone™ app by pressing either **BEACON ON** or **BEACON OFF** buttons from **Beacon Configuration** window. After selecting one of the buttons, move your phone NFC over the beacon to turn beacon on/off. Phone gives a sound and vibrates when NFC is in operation. After successful write operation, the **Power mode** setting in the **Beacon status** window changes to "On" or "Off".

Switch beacon power mode on

Double-tap activates continuous beacon on -operations.

Switch beacon power mode off

Double-tap activates continuous beacon off -operations.

Reading Confidex Viking™ beacons

READ STATUS button is read-only operation and can be used to scan beacons and to view the individual beacon information on the **Beacon Status** window.

Enable Read status   Enable Configure

APPLICATION NOTE
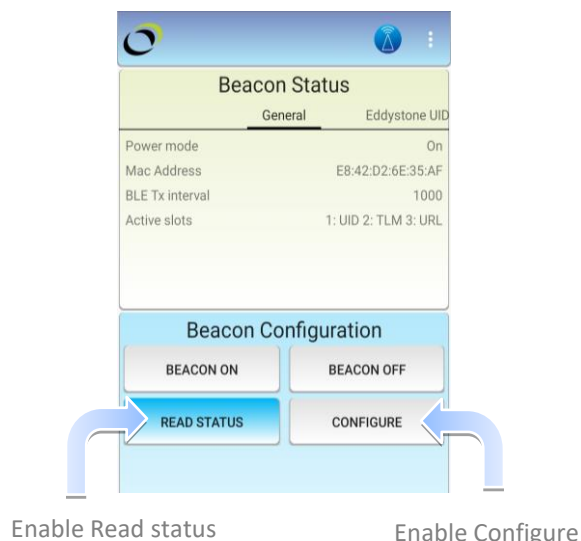
After successfully scanning of a Confidex Viking™ beacon, the **Beacon Status** window **General** tab shows the information listed in the table below. Swipe screen horizontally to access information from configured slots under other tabs. Information will stay on the screen after moving the beacon away from the NFC antenna, another beacon is scanned, or the app is restarted.

FIELD	INFO TYPE	DESCRIPTION
Power Mode	ON / OFF	Indicates beacon power mode
MAC Address	6-byte hex	Device MAC address
BLE Tx interval	1 - 10 000ms	Global Tx interval for all advertisement slots
Active Slots	1 – 5 slots	List of active advertisement slots (UID,TLM,URL,STAT,ACT)

Configuring Confidex Viking™ beacons

Most of the Confidex Viking™ beacon settings are configurable with the Confidex Runestone™ app. Settings can be changed by choosing **CONFIGURE** button from **Beacon Configuration** window. This opens the settings below the buttons where new values can be inserted. Swipe horizontally to change between tabs.
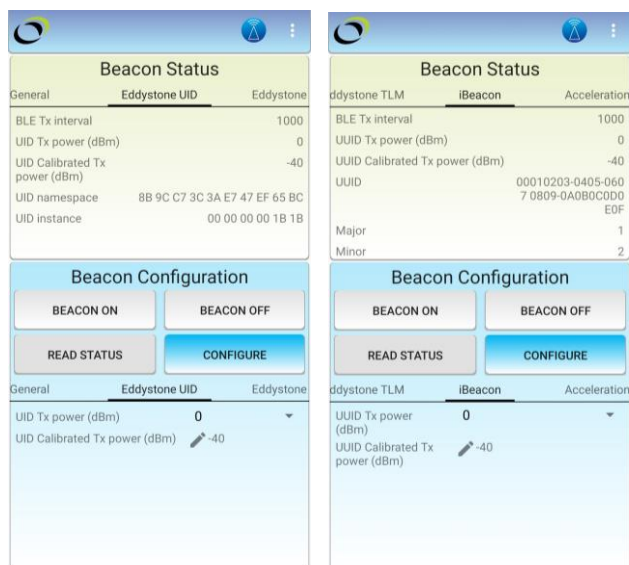
Confidex Viking™ beacons supports either Eddystone or iBeacon open frame format. Parameters for each slot can be configured by typing the new values to each tab in the **Beacon Configuration** window. After the new parameters have been set to the fields, the configuration can be written to the beacon by scanning it with the NFC interface of the mobile phone. After successful write operation, the new configuration is read and updated in **Beacon Status** window.

Note! Re-configuring the active slots, the Eddystone UID namespace & instance or iBeacon UUID, Major and Minor fields are not possible with the Confidex Runestone™ app. Re-configuration of UID settings with the Confidex Runestone™ app can be optionally enabled by Confidex.

All configurable settings are listed in the following table:

GENERAL	DECSRIPTION
BLE Tx interval (ms)	Sets a global transmission interval for all advertisement slots.

EDDYSTONE	DECSRIPTION
UID namespace	Re-configure UID namespace (disabled as default)
UID instance	Re-configure UID instance (disabled as default)
UID TX power (dBm)	Sets the RF transmit power for Eddystone UID frames.
UID Calibrated Tx power (dBm)	Calibrated Tx power measure at 0m from the beacon.
URL TX power (dBm)	Sets the RF transmit power for URL frames.
URL	Set URL address to be advertised.
TLM TX power (dBm)	Sets the RF transmit power for TLM frames.
TLM Tx interval multiplier	Multiplier for transmission interval of TLM frames.

iBEACON	DECSRIPTION
UUID	Re-configure UUID namespace (disabled as default)
Major	Re-configure Major (disabled as default)
Minor	Re-configure Minor (disabled as default)
UUID TX power (dBm)	Sets the RF transmit power for iBeacon UUID frames.
UUID Calibrated TX power (dBm)	Calibrated Tx power measure at 1m from the beacon.

Statistics and Activity optional advertising slots provide statistical information from the accelerometer. Confidex Viking™ must be equipped with an accelerometer HW, the feature enabled at the factory and parameters set above zero to start broadcasting these frames.

ACC STATISTICS	DECSRIPTION
Acc TX power (dBm)	Sets the RF transmit power for ACC frames.
Acc RMS period (s)	Set accelerometer RMS sampling period.
Acc Min/Max period (s)	Set accelerometer MIN/MAX sampling period.
Acc meter ODR (Hz)	Set accelerometer sampling frequency.
Acc meter FS (G)	Set range the accelerometer measurement range.

| ACC ACTIVITY	DECSRIPTION
Activity TX power (dBm)	Sets the RF transmit power for ACT frames.
Activity threshold (mG)	Set how much acceleration is needed to start the counter.
Activity debounce time (s)	How long the acceleration value must be above set threshold to start the counter to filter out spurious events.
Activity keep active time (s)	How long flag is kept active after acceleration is below a threshold.

Device scanner tool

DEVICES SCANNER view reports and shows status log of all Confidex Viking™ beacons that have been scanned with the Confidex Runestone™ app.
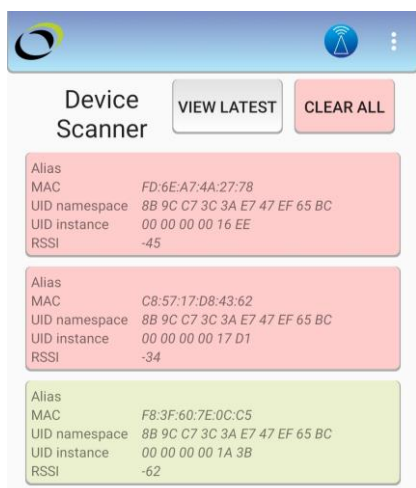
MAC address, UID namespace, UID instance, RSSI (Received Signal Strength Indication) and whether the mobile phone can hear the beacon (indicated by red or green color) are displayed for each beacon. Individual device details are viewed when pressing a beacon. Device list can be cleared by pressing the **"CLEAR ALL"** button.

Device details and graph tool

Info tab in the **DEVICE DETAILS** view shows individual beacon configuration data. Data can be copied also to clipboard. On the RSSI and Calibrated Tx power tabs, user can analyze beacon RSSI and measure the calibrated Tx power at certain distance from the beacon for proximity applications. Optional acceleration tab can be used to monitor accelerometer values and activity of the tag.

APPLICATION NOTE
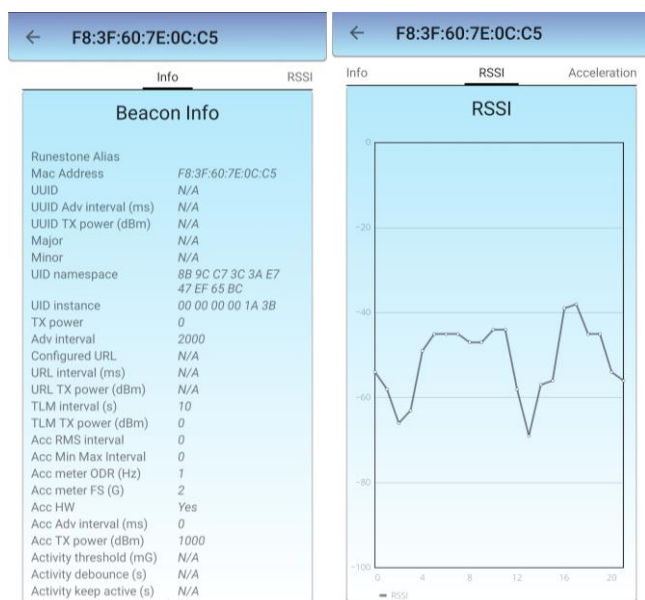
8 Safety guidelines

The device does not contain any serviceable components, do not disassemble the device.

Substances contained in the product and/or the battery may be harmful if handled or disposed improperly.

The product does not contain any comestible substances nor substances of nutritional value. Do not eat the product.

Dispose this product only in accordance with waste and recycling protocols.

Confidex VikingTM products are RoHS and REACH compliant.

9 Compliancy

We, Confidex Ltd., located at Lumpeenkatu 6, 33900 Tampere, Finland, declare under our sole responsibility that the Confidex Viking™ and Confidex Viking Tough™ product families are compliant with the standards, directives and other essential requirements required for the following certifications and declaration of conformity:

Country of DoC (marking)	Certification / registration number	Product marking
EU (CE)	MODEL: CFXBLE-1	CE
USA (FCC)	FCC ID: 2AMK9-CFXBLE-1	FC
Canada (IC)	IC: 22897-CFXBLE1	IC
Japan (MIC)	ℝ 005-102395	
South-Korea (KC)	R-R-CFO-CFXBLE-1	
Australia/New-Zealand (RCM)	RCMP20608 001	
Brazil (ANATEL)	ANATEL: 16608-20-13502	ANATEL
Russia (EAC, FAC)	EAEU N RU D-FI.RA01.V.83516/20	EAC
Ukraine (UkrSEPRO)	UA.032.CT.0402-20	

EU Declaration of Conformity

1. **Product model:** CFXBLE-1

2. **Name and address of the manufacturer or his authorised representative:**

Confidex Ltd.
Lumpeenkatu 6
33900 Tampere, Finland
contact.ble@confidex.com

3. This declaration of conformity is issued under the sole responsibility of the manufacturer.

4. **Object of the declaration:**

Equipment: 2.4 GHz ISM Band Transceiver Tag (including standard BLE and Quuppa proprietary channels)
Brand name: Confidex Viking™
Model/type: CFXBLE-1

5. The object of the declaration described above is in conformity with the relevant Union harmonization legislation:

Low Voltage Directive (LVD) 2014/35/EU
Radio Equipment Directive (RED) 2014/53/EU
Restriction of Hazardous Substances (RoHS) Directive 2015/863/EU

6. References to the relevant harmonised standards used or references to the other technical specifications in relation to which conformity is declared:

LVD:
- IEC 60950-1:2005 + A1:2009 + A2:2013

EMC:
- prEN 301 489-1 (2.2.1), prEN 301 489-3 (2.1.1) & prEN 301 489-17 (3.2.1)
- EN 300 328 (2.1.1)
- EN 300 330 (2.1.1)

RoHS:
- Directive 2015/863/EU, amending Annex II to directive 2011/65/EU

7. **Signed for and on behalf of:**

Tampere 12.5.2020

Manufacturer
Confidex Ltd.

_____

Petteri Lavikko
VP Engineering
Confidex Ltd.

Federal Communications Commission (FCC)
Statement (USA)

FCC PART 15 STATEMENTS FOR USER'S MANUAL
THIS DEVICE COMPLIES WITH PART 15 OF THE FCC RULES. OPERATION IS SUBJECT TO THE FOLLOWING TWO CONDITIONS. (1) THIS DEVICE MAY NOT CAUSE HARMFUL INTERFERENCE, AND (2) THIS DEVICE MUST ACCEPT ANY INTERFERENCE RECEIVED, INCLUDING INTERFERENCE THAT MAY CAUSE UNDESIRED OPERATION.

Warning: Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate this equipment.

Note: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment o and on, the user is encouraged to try to correct the interference by one or more of the following measures:
• Reorient or relocate the receiving antenna.
• Increase the separation between the equipment and receiver.

This device meets the FCC and IC requirements for RF exposure in public or uncontrolled environments.

Canada: Industry Canada (IC) Statement

IC Notice to Users English/French in accordance with RSS GEN Issue 3:
This device complies with Industry Canada license exempt RSS standard(s).
Operation is subject to the following two conditions:
1. this device may not cause interference, and
2. this device must accept any interference, including interference that may cause undesired operation of the device.

Cet appareil est conforme avec Industrie Canada RSS standard e empts de licence s . Son u lisa on est soumise Les deu condi ons suivantes:
1. cet appareil ne peut pas provoquer d'interf rences et . cet appareil doit accepter Toute interf rence, y compris les interf rences qui peuvent
causer un mauvais fonctionnement du dispositive
This Class B digital apparatus complies with Canadian ICES-003. Cet appareil num rique de la classe B est conforme la norme NMB-003 du Canada.