enocean alliance
Building Smarter Connectivity

System Specification

EnOcean Alliance Certification Handbook

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EXECUTIVE SUMMARY

A proper review of every device shipped is an important step to secure a correct functioning of every single device, especially in an eco-system spread widely and highly versatile. There, working interoperability is an essential asset.
The EnOcean Alliance developed and agreed upon a specification, which describes the certification steps to be passed by every device before being introduced into the market(s).
These steps are:

(1) Air Interface
(2) Radio Performance (Optional)
(3) Communication Profiles
(4) Energy Harvesting of self-supplied devices (Optional)

This document – the *EnOcean Alliance Certification Handbook* – provides

- the umbrella for the overall objective,
- guidance to the engineers and managers tasked with approval of their devices,
- details the certification process,
- explains the roles and the operational flow

As such this document amends the set of system specification and supplies the information for a pragmatic implementation of these system specifications. This document describes how to apply the set of certification specifications of the EnOcean Alliance as supporting tools during the development process and – with respect to interoperability - as verification tool during the acceptance / approval testing of a product.

Manufacturers of technology platforms, radio modules or products based on the EnOcean technology [1] wishing to use the interoperability or appropriate logo or name their product accordingly are obliged to pass the Certification Program detailed in this handbook. The membership level of the manufacturer must be Participant or Promoter to be entitled for the EnOcean Alliance Certification Program

This document is owned by the Technical Working Group (TWG) of the EnOcean Alliance. It is maintained and will be progressed within the authority of the Certification Manager.

REVISION HISTORY

Ver.	Editor	Change	Date
0.1	AP	Draft Document created, based on template of the EnOcean Alliance, text complete	Sep 30, 2016
0.2	AP	Internal review, incorporation of graphics and tables	Oct 30, 2016
0.3	AP	Results of certification workshop incorporated	Nov 18, 2016
0.4	AP	Incorporated input from BoD Mtg, feedback from review, integrated EnOcean Alliance logo usage guidelines	Mar 05, 2017
0.5	AP	Further improvements and alignments	Mar 07, 2017
0.6	AP	BoD requirements	May 26, 2017
0.7	AP	BoD decisions of last board call documented	Jun 26, 2017
0.8	AP	Corrections after first internal review	Jun 29, 2017
1.0	AP	Bookkeeping and update of dates, small improvements	Jan 30, 2018
1.1	AP	Document status modified to RELEASED; added Disclaimer; Applying ISO 31-0 for correct displaying of numbers; Downsizing of the document by merging chapters	Jan 29, 2019
1.2	AP	Extension of certification Level 2 to all products, renaming certification levels, radio performance and energy harvesting certification optional for level 3.	Oct 01, 2022
1.3	AP	Renaming existing certification levels and introducing levels for IoT systems	Jan 7, 2025

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1. Introduction and Motivation

1.1. General

System planers, system-integrators and users demand reliable devices and procedures which facilitate the implementation of versatile solutions with an increasing offer of use cases of EnOcean technology. The EnOcean Alliance Certification Program – linked with a corresponding marking on devices – is THE tool for the EnOcean Alliance to help secure interoperability of EnOcean-based devices.

It covers all elements of the communication adequately defined. The primary objective of the EnOcean Alliance Certification Program is a self-declaration of the device manufacturer, similar to the European CE-declaration. As a part of the program an optional extension for a supplementary verification by an independent and accredited test laboratory is foreseen straight from the beginning.

The "EnOcean Alliance Certification Handbook" – this document – forms a kind of a bracket for the entire process and secures a smooth execution of the certification process. On one side it supports the unification and by this the traceability of the certification's documentation, at the other side it is a guideline for the product development process, supporting the development-based product quality and thus the desired product interoperability.

In combination with an adequate product labelling – within a continuously growing market of suppliers and products – planers, system integrators, and users can identify reliably EnOcean-based devices interoperating with each other.

Chapter 1, Introduction and Motivation, provides an insight into the philosophy of the *EnOcean Alliance Certification Program*. The approach chosen and its pragmatic implementation will be detailed, and the objective will be explained. Then delivering the definitions of the certification levels, their conditions and validity dates. This chapter is amended by the definitions and references.

Chapter 2, the Certification Process, outlines the different roles involved in this process, and details the phases of the process. A third sub-chapter explains how certification shall work as a part of product implementation and shows that certification is a supportive process to achieve product quality and not an additive burden. The roll-out of the process concludes this chapter.

Chapter 3, *Certification Rules*, contains the definitions of the *EnOcean Alliance Technology Logo* as well as the conditions for its appliance. It details the *approval of the certification status* and indicates the action in case of wrong test results or violation of the certification process.

1.2. Philosophy

Member companies of the EnOcean Alliance offer products or services to very dynamic and rapidly developing markets. To a large extent member companies are specialists in their part of the market; very seldom they provide all elements for a consistent system / data network / communication chain. Most of them provide elements of a communication infrastructure which require elements from other member companies to interact with for a seamless transport of data. A typical installation of products based on EnOcean technology could be built with sensors supplied by company A, connected to gateways from company B, and serving actuators from company C. Such an installation will only work successfully and efficiently if all of its components are able to communicate properly with each other and by this provide the functionality these components and the network were designed for.

Interoperability of technologies and products made by its member companies is THE key objective and key asset of the EnOcean Alliance. It has to be safeguarded by the product manufacturers (OEMs) by means of focused design of hardware and software.

To secure the proper communication the EnOcean Alliance defined a communication architecture consisting of the

- Air interface, i.e. the standards ISO / IEC 14543-3-1X (defining the physical and data link layer)
- EnOcean Equipment Profiles and Generic Profiles (defining the data link and network layer)
- Security of EnOcean Radio Networks (encryption functionality of presentation layer)
- Supplementing procedures like Remote Management and Remote Commissioning

These system specifications are created and maintained by the Technical Working Group (TWG) of the EnOcean Alliance.

To support a proper implementation of the system specifications the TWG of the EnOcean Alliance developed a set of certification specifications following the OSI-layer model. In technical wording, interoperability requires devices which perform as specified and in a repeatable manner at all layers. In detail:

- At the physical layer: The air interface must be compliant with the EnOcean-standards ISO / IEC 14543-3-1X. Optionally, a defined minimum communication range must be achieved
- At the data link and network layer: the scheduling and logical compliance with communication sequences / flows
- At the presentation layer: the encryption of raw data and the authentication of a whole message

- At the application layer: the correct coding / decoding of information, the compliance to defined schedules and conformal processing of transmitted data

In addition, optionally for self-powered devices: the ability to collect energy from the ambient environment over a certain timeframe to secure proper operation of the device over a defined period beyond.

The

- *Air Interface Certification Specification ASK* [2] and *Air Interface Certification Specification FSK* [5] verifies the correct design of an EnOcean radio implementation – e.g. a transceiver module – according to ISO / IEC 14543-3-1X [1]; it verifies the physical layer of the communication architecture. Without a stable radio implementation higher layer communication will not work. In combination with the *Radio Performance Certification Specification* [3], it is ensured that radio implementations of different manufacturers will communicate reliably with each other.
- *Radio Performance Certification Specification* [3] verifies the transmitter and receiver performance of the product; in combination with the *Air Interface Certification Specifications,* it verifies the physical layer of the communication architecture. Thus, it provides the foundation for a solid wireless connectivity between two devices, a pre-requisite for smooth communication between two devices or within a network. A sufficient and proper radio performance – mainly reflected in the achievable radio range – is among the most important parameters of any wireless product. Even in scenarios with “reliable radio links” it is important to optimize the link budget to its best as a reserve for e.g. future layout or furniture changes inside buildings. Occupancy and un-occupancy – especially in high use scenarios – might also result in a strong impact to the link budget.
- *Communication Profiles Certification Specification* [4] verifies the correct design and implementation of the communication protocols; it verifies the data link and the network layer of the communication architecture. This pretty comprehensive specification provides procedures and reference data to verify the implementation of the link protocol chosen – EEP or Generic Profiles – as well as the correctness of the teach-in procedure required to pair devices prior to starting regular communication. It is based on the system specifications available by the EnOcean Alliance – the *EEP-Specification*, the system specification *Generic Profiles* and the system specifications *Remote Commissioning* and *Remote Management*. By means of defined data-containers, the test result will be documented, and the reproducibility of test cases will be achieved.
- *Energy Harvesting Certification Specification* [6] provides test-procedures and test-cases to verify the energy concept of an energy self-sustaining devices, covering the

combination of energy generation, energy management and energy consumption. It will deliver information on the endurance of a device with energy storage fully loaded in absence of any further harvestable energy. A sufficient energy performance – e.g. for a daylight supplied sensor mainly reflected in the "dark-time" in combination with the "minimum illumination scenario" to harvest sufficient energy – is among the most important parameters of any wireless and energy self-sustaining products, especially for EnOcean-based products. Even in scenarios with sufficient ambient energy it is important to optimize the energy concept to its best as a reserve for e.g. long dark times (poor lighting) or bad positioning of the device.

- *Security of EnOcean Networks* [7] specification describes security measures for wireless communication in EnOcean networks, which are primarily designed for energy efficiency and low maintenance. It includes mechanisms such as encryption and authentication to ensure the integrity and confidentiality of transmitted data. The specification outlines how these security features should be implemented to protect networks from unauthorized access and other security risks. The EnOcean Alliance does not specify any security certification tests. When secure messages are sent according to the specification and can be decoded properly then no extra tests need to be specified.

Energy Harvesting	Application Layer	Energy Harvesting Cert. Spec (Part 4)
EEP x.y.z, GP, Reman, Recom	Application Layer	Communication Profiles Cert. Spec (Part 3)
Encryption and Authentication	Presentation Layer	Security of EnOcean Networks Spec.
Application notes from module provider	Physical Layer	Radio Performance Certification Spec. (part 2)
ISO/IEC 14543-3-1x	Physical, Network and Datalink Layer	Air Interface Certification Spec. (part 1)

Fig. 2 EnOcean Certification Specifications mapped on the System Specifications

Interoperable Procedures and sequences defined by the EnOcean Alliance, e.g. Smart Ack, are verified by application of the test-cases specified as appendix to each system specification (when available). These are currently not part of the certification program.

1.3. Definition of certification levels

The EnOcean Alliance Certification Program provides a range of certification levels which allow every platform or product manufacturer to identify the certification effort required to achieve the best degree of interoperability.

Each level confirms the interoperability of devices having the same level. Interoperability of a device with another device of a different level might not be provided at all.

All achieved certification levels enable the product to use the Technology logo (refer to chapter 3.1.) or the term “EnOcean” on the product itself, the package or the product documentation.

The following certification levels are defined:

- **Platform-Certified:** “Air interface tested”:
  This level is only for platform / radio chip / radio module manufacturers. It confirms the air interface interoperability by tests defined in the Air Interface Certification Specifications ASK [2] and FSK [5]. This certification level is the base for all other certification levels.
- **Self-Certified**: “Interoperability and Standard Security”:
  Confirms the potential interoperability of the product or device within the EnOcean eco-system (former level 2 certification).
- **Self-Certified for IoT**: “Interoperability and Enhanced Security”:
  Same as "**Self-Certified**”, but additionally with declaration that the product supports the latest EnOcean Alliance enhanced security (encryption and authentication) specification.
- **Alliance-Verified**: “Interoperability and Quality”:
  Confirms the potential interoperability of the product or device within the EnOcean eco-system AND confirms an acceptable radio range performance quality and energy harvesting quality (former level 3 certification).
- **Alliance-Verified for IoT**: “Interoperability, Quality and Enhanced Security”:
  Same as "**Alliance-Verified”**, but additionally with declaration that the product supports the latest EnOcean Alliance enhanced security (encryption and authentication) specification.

The following table shows the required certification and the level of interoperability depending on the certification level:

Certification level	Required certification	Level of Interoperability
Platform-Certified	- Air Interface	Air interface of platform, radio chip, radio module
Self-Certified	- Air Interface - Self declaration of correct use of communication Profiles	Air interface and profiles[1]
Self-Certified for IoT	- Air Interface - Self declaration of correct use of communication Profiles with Enhanced Security	Air interface, profiles[1] and Enhanced security
Alliance-Verified	- Air Interface - Radio Performance - Communication Profiles - Energy harvesting	Air interface, profiles, radio performance and energy budget
Alliance-Verified for IoT	- Air Interface - Radio Performance - Communication Profiles with Enhanced Security - Energy harvesting	Air interface, profiles, radio performance, energy budget and enhanced Security

Tab. 1 Definition of EnOcean Alliance certification levels

These certification levels are for customer end products. Platform or module manufacturers usually only need to provide the Air Interface tests to have a certified platform product.

1.4. Objective

Interoperability, as defined, means trouble-free and reliable communication between EnOcean-based wireless short-range devices created by different manufacturers. Thus, interoperability becomes a mandatory prerequisite for the implementation of distributed functionality provided by devices of different manufacturers that all must consistently apply the system specifications of the EnOcean Alliance at all levels.

In a more technical wording: interoperability requires products made in compliance with existing specifications and to perform reliably in a repeatable manner at all layers. A robust radio connection at physical layer, a reliable and matching logical connection at link and network layers, and at the application layer is the key to a successful implementation of building

[1] EEP interpretations allowed if already submitted

automation solutions and their daily worry-free operation. In a more marketing wording: interoperability is the pre-requisite for customer satisfaction.

The interoperability is defined by the system specifications of the EnOcean Alliance which will be verified by the specifications of the EnOcean Alliance Certification Program.

To pass the EnOcean Certification Levels “Alliance-Verified” or “Alliance-Verified for IoT”, a product must pass all applicable tests defined by this document. To pass the EnOcean Certification Levels “Self-Certified” or “Self-Certified for IoT”, a product must pass Air Interface Certification Tests (typically provided by module provider) and Communication Profiles Certification (typically self-test using tools provided by EnOcean Alliance, refer to the Technical Specifications on the EnOcean Alliance website).

In addition, both "Self-Certified for IoT" and Alliance-Verified for IoT" must include a declaration of implementation of the latest EnOcean Alliance enhanced security specification (typically self-test using tools provided by EnOcean Alliance, refer to the Technical Specifications on the EnOcean Alliance website).

The results of these tests are to be documented per device tested following templates provided by the EnOcean Alliance (refer to the Technical Specifications on the EnOcean Alliance website).

The proof of performance according to the specification of a particular device remains within the responsibility of the manufacturer. The result of this proof is a mandatory component of the EnOcean Certification to deliver a reliable end-to-end performance of functionality to operators and customers. For the certification levels “Alliance-Verified” or “Alliance-Verified for IoT”, *Self*-powered devices must be supplemented by a declaration of the energy concept. Only by this, the performance of a device over a defined period of time can be adequately ensured with energy collected from the ambient.

1.5. Pragmatic Implementation

The EnOcean Alliance Certification Program applies a shell principle, i.e. the manufacturer of a product applying a platform / radio chip / radio module of a supplier which passed already the EnOcean Certification Program and reached the “Platform certified” level can benefit from the certification effort spent on the platform.

The platform inherits its properties to the product according to the following rules[2]:

a) If the product utilizes less than 100% of the functionalities of the platform: the product manufacturer may refer entirely to the certification results and certification approval (EnOcean Alliance Certification document) of the platform; certification testing of the

[2] Reference are the functionalities and properties which are relevant to the EnOcean Alliance Certification Program.

product is not required but recommended. The product documentation needs to state the difference(s) between platform and product. Thus, this will be documented as well in the Certification Documentation of this product. The unique Certification Number allocated by the EnOcean Alliance to the platform needs to be stated in the EnOcean Alliance Certification document of the product. The product will receive its own Certification Number.

b) If the product utilizes 100% of the functionalities of the platform and no additional functionality is added which is subject to the EnOcean Alliance Certification Program: the product manufacturer may refer entirely to the certification results and certification approval (EnOcean Alliance Certification document) of the platform; certification testing of the product is not required but recommended. The unique Certification Number allocated by the EnOcean Alliance to the platform needs to be stated in the EnOcean Alliance Certification document of the product. The product will receive its own Certification Number.

c) If the product adds additional functionality which is subject to the EnOcean Alliance Certification Program: the product is required to pass the EnOcean Alliance Certification Program but may refer to the certification results and certification approval of the platform where appropriate. If referred to certification approval of the platform the Product Documentation and the Certification Documentation of the product have to state the unique Certification Number of the platform. The product will receive its own Certification Number.

1.6. Definitions & References

1.6.1. Definitions

Antenna: A component, typically metallic, which either radiates (as used for a transmitter) or collects (as used for a receiver) electromagnetic waves.

Certification Documentation: documentation summarizing the technology platform's, radio module's or the product's criteria required for interoperability (identical with the product documentation), plus the test plan (i.e. complete list of mandatory test-cases), plus the test results. It may be amended by documentation detailing further the technology platform, radio module or product. The certification documentation is within the sole responsibility of the manufacturer and remains its property. It is to be provided by the manufacturer as basis for the approval. Once the certification results are approved by the EnOcean Alliance it qualifies the radio module / product to bear the "EnOcean Alliance certified" marking.

Certification level: each level describes which components of the Certification Program are relevant to a platform / product supposed to be certified according to this level. The certification level will be stated as part of the "EnOcean certified" seal.

Certificate number: a unique number defined and applied by the EnOcean Alliance. This certification number connects the entries in the Certified Products database with a particular product. The number is allocated automatically by the Certifed Product database as soon as all entries are completed.

Certification specification: a system specification, part of the EnOcean Alliance Certification Program. The certification program contains four specifications (refer to chapter 1.2 of this document, please). This kind of document is maintained by the TWG and reviewed regularly.

Compatibility: the capability of two or more items or components of equipment to exist or function in the same system or environment without mutual interference.

DUT: Device under Test

EEP: EnOcean Equipment Profile; it defines the communication interface of a product and abstracts it at the air interface.

Enhanced Security: refers to advanced security features designed to protect EnOcean communication for EnOcean devices. This security framework ensures data integrity, confidentiality, and authentication by using encryption and rolling code techniques. These measures prevent unauthorized access and interference, enhancing the reliability and safety of the EnOcean ecosystem. Refer to [7].

EnOcean Alliance Brand Guideline: a document owned by the BoD of the EnOcean Alliance. It defines the logos representing the message of the EnOcean Alliance to the public. This document is the sole source for the logos, their size, colours, typography and usage. Refer to [10].

EnOcean Alliance Certificate: a document demonstrating the completion of the EnOcean Alliance Certification Process. This document (refer to annex 4) has to reflect the product manufacturer's name, the product title, the signature of the Certification Manager appointed by the EnOcean Alliance and a unique certificate number.

EnOcean Alliance Certification Policy: set of rules guiding / directing the proper handling of the EnOcean Alliance Certification Program. This set is approved by the board of directors of the EnOcean Alliance. In particular it defines the authorized use of the logo "EnOcean Alliance certified" on certified technology platforms, modules and products ONLY. Chapter 3 of this document states the policy approved by the BoD of the EnOcean Alliance.

EnOcean Alliance Certification Manager: appointed by the BoD of the EnOcean Alliance. The manager's mission is to supervise the proper application of the EnOcean Alliance Certification Program, primarily by reviewing the submitted Certification Documentation. The certification manager approves the certification performed by a manufacturer, releases the data at the database and signs the EnOcean Alliance Certification Document.

EnOcean Alliance Certification Program: a structured program established and maintained by the EnOcean Alliance to secure interoperability between "EnOcean certified" products. The program is mandatory for products which should be marked with the "EnOcean certified" seal. This handbook describes the EnOcean Alliance Certification Program.

EnOcean Alliance ingredient logo: called as well "EnOcean Alliance technology logo" and owned by the EnOcean Alliance. It is the "EnOcean certified" seal of a certified product and is defined in the EnOcean Alliance Brand Guideline [10]. The usage of this seal / logo on a product or in the related product document is authorized by a successful pass of the EnOcean Alliance Certification Program and an EnOcean Certificate issued. The EnOcean Alliance ingredient logo should be used on the company literature (e.g. brochures, exhibition stands, adverts etc.). Please, refer to chapter 3.1. for further information.

EnOcean Technology: technology which is compliant with ISO / IEC 14543-3-1X and applies EnOcean Alliance technical specifications.

Interoperability: a characteristic of a product or system, whose interfaces are completely understood, to work with other products or systems, present or future, in either implementation or access, without any restrictions. Interoperability implies Open standards by definition. Interoperability implies exchanges between a range of products, or similar products from several different vendors, or even between past and future revisions of the same product. Interoperability may be developed *post-facto*, as a special measure between two products, while excluding the rest, by using Open standards.

Interoperable product database: a database managed by the EnOcean Alliance. Product manufacturers enter the product specific information and the certification documentation into this database. Its content will be review by the certification manager. Once approved the data are visible to customers of such products. The database delivers information on the interoperability of a particular device in relation to other devices.

Legacy product: a product designed AND introduced into the market(s) before Dec 31, 2017. Such a product does not require a certification and may bear the (previous) logo of the EnOcean Alliance (refer to chapter 3.1 in combination with chapter 2.4).

Manufacturer: member of the EnOcean Alliance being legally responsible for the technology platform, radio module or product. Typically it is the company / legal entity branding a radio

chip/ module / product. This member requires the level Participant or Promoter to be entitled for the EnOcean Alliance Certification Program.

Product: end user device. It contains means for signal transmission and signal reception, typically by having a radio chip or module integrated. It may contain sensor(s) and / or actuator(s). It is sold to and applied by end-users or installation professionals.

Product Documentation: documentation summarizing the technology platform's / radio module's or the product's features and information to be provided to the applicant of a technology platform / radio module (typically a product manufacturer) or of a product (typically an installer and / or end user). It has to document the set of information indispensable for interoperability. It may be amended by information detailing further the application of the radio module or the product. The product documentation is within the sole responsibility of the manufacturer and remains its property. It may be provided by the manufacturer to the EnOcean Alliance for the product data-base. It must be provided if the manufacturer decided the technology platform / radio module/ product to bear the "EnOcean Alliance certified" marking.

Product manufacturer: a member (promoter or participant) of the EnOcean Alliance responsible for the product in the market and for eventual legal obligations; typically identified by its name on the product (branding). Same as a white label product seller.

Radio module: a technical product represented by a functional module which covers completely the functions RF-signal transmission and / or RF-signal reception. It might contain as well circuitry for energy collection and energy management. It is usually sold to companies integrating the radio module with other electronic components or into products. Typically, it is not available to end-users.

Radio module manufacturer: a member (promoter or participant) of the EnOcean Alliance responsible for the radio module in the market and for eventual legal obligations; typically identified by its name on the product (branding).

Standard Security: It primarily relies on simpler measures such as basic authentication protocols to provide a fundamental level of security and prevent unauthorized access.

Technical Working Group (TWG): the body responsible for technical and architectural matters within the EnOcean Alliance. Its main task is the creation and maintenance of the system specifications of the EnOcean Alliance. All members of the EnOcean Alliance are invited to participate and contribute to the work of the TWG.

Technology platform: a technical product represented by an integrated circuitry, or a reference design, which allows for RF signal transmission and / or RF signal reception. It might contain as well circuitry for processing power to handle higher layer communication protocols and / or

circuitry for energy collection and energy management. It is usually sold to companies integrating the technology platform with other electronic components into radio modules or even into products. Typically it is not available to end-users.

Technology platform manufacturer: a member (promoter or participant) of the EnOcean Alliance responsible for a technology platform, typically a radio module, in the market and for eventual legal obligations; typically identified by its name on the product (branding).

Test-case, mandatory: a test-case which has to be passed by the DUT. The classification "mandatory" is to be derived from legal requirements, 3rd party requirements, interoperability requirements (e.g. EnOcean Alliance Certification Program), or from manufacturer-internal requirements (e.g. quality commitments).

Test-case, optional: a test-case which may be passed by the DUT. The classification "optional" is to be derived from legal requirements, 3rd party requirements, interoperability requirements (e.g. EnOcean Alliance Certification Program), or from manufacturer-internal requirements (e.g. quality commitments). Information achieved by "optional" test-cases is largely used for confirmation of product features.

Test plan: It is a product-specific document summarizing the test-cases to be performed at least the mandatory test cases) amended by product essential information, e.g. the frequency band and the EEP(s) applied. The test plan includes a description of how to perform the testing, states the different steps of the test – in other words: it provides the essential information to reproduce the test results if so required.
A test plan template is a mandatory element of the certification documentation of a product.

1.6.2. References

[1] ISO / IEC 14543-3-1X

[2] EnOcean Certification Specification, part 1a, Air Interface ASK, EnOcean Alliance
https://www.enocean-alliance.org/aicask/

[3] EnOcean Certification Specification, part 2, Radio Performance, EnOcean Alliance
https://www.enocean-alliance.org/rpc/

[4] EnOcean Certification Specification, part 3, Communication Profiles, EnOcean Alliance
https://www.enocean-alliance.org/cpc/

[5] EnOcean Certification Specification, part 1b, Air Interface FSK, EnOcean Alliance
https://www.enocean-alliance.org/aicfsk/

[6] EnOcean Certification Specification, part 4, Energy Harvesting, EnOcean Alliance

https://www.enocean-alliance.org/eh/

[7] Security of EnOcean Radio Networks Specification
https://www.enocean-alliance.org/security/

[10] EnOcean Alliance Brand Guidelines
https://www.enocean-alliance.org/brand-guidelines/

2. The Certification Process

2.1. Roles

Approval manager: the person responsible for the approval process of a radio module or a product at the manufacturer. The positive result of an approval process is the release to serial production / customer shipment of a radio module or a product.

EnOcean Alliance Board of Directors (BoD): consisting of representatives of the promoters of the EnOcean Alliance. The BoD is headed by the chairman of the EnOcean Alliance. The BoD is defining the rules within the EnOcean Alliance and setting its objectives.

EnOcean Alliance Certification Manager: appointed by the BoD of the EnOcean Alliance. The manager's mission is to supervise the proper application of the EnOcean Alliance Certification Program, primarily by reviewing the submitted Certification Documentation.

EnOcean Alliance Technical Working Group (TWG): a body of the EnOcean Alliance, open to all participants and promoters. The TWG is in charge for the creation and maintenance of the system specifications of the EnOcean Alliance.

Product engineer: a person or persons who design a radio module or product and create it.

Product manufacturer: a member (promoter or participant) of the EnOcean Alliance responsible for the product in the market and for eventual legal obligations; typically identified by its name on the product (branding).

Radio module manufacturer: a member (promoter or participant) of the EnOcean Alliance responsible for the radio module in the market and for eventual legal obligations; typically identified by its name on the product (branding).

R&D manger: the person responsible for the development process of a radio module or a product.

Test engineer: a person or persons performing tests of a radio module or a product.

Test lab manager: manager of a test laboratory / test institute external to the manufacturer; preferably, it is a test laboratory / test institute accredited by the EnOcean Alliance.

Test lab engineer: a test engineer working at a test laboratory / test institute external to the manufacturer.

2.2. Phases of the Process

The EnOcean Alliance Certification Process adopts a structure of a typical product development processes. Such a product development process starts at high-level with a concept or design

phase, leading into an implementation or execution phase; a verification phase concludes such a process. The corresponding phases of the EnOcean Alliance Certification Process are the preparation phase, the testing or execution phase, and the documentation phase – following the objective of the EnOcean Alliance to

a) support the product development process and
b) without additional extra efforts.

The design-paradigm of the EnOcean Alliance Certification Process is “guidance towards interoperability along the development process”.
A Review Phase completes the certification process. This phase starts with the submission of the certification documentation to the Certification Manager of the EnOcean Alliance and is completed with the approval of the certification qualifying for a certificate.

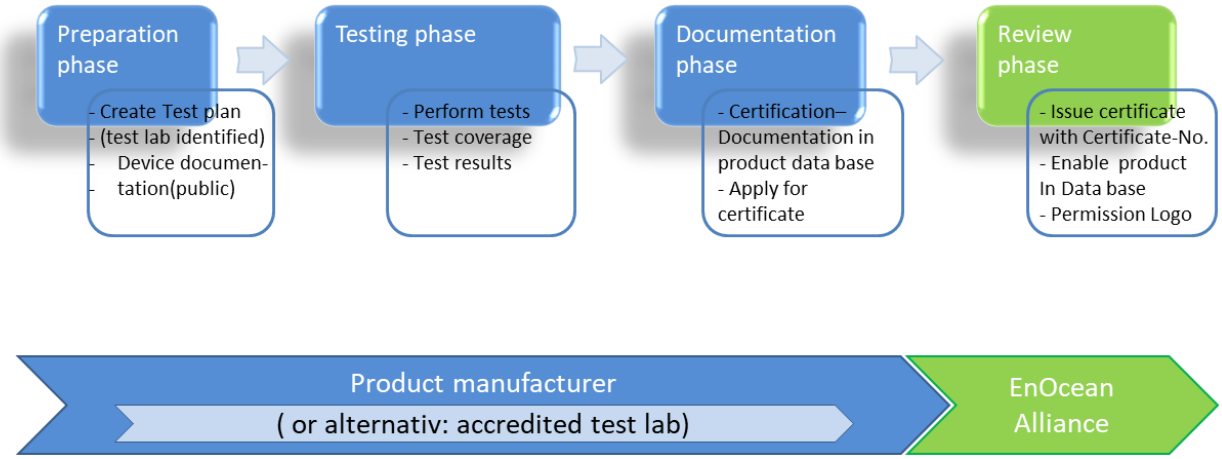

Fig. 3 EnOcean Alliance Certification Process

2.2.1. Preparation Phase

Objective: identify test-cases to be passed by DUT (mandatory, optional), and define test program to be performed with DUT

Input:

a) Product specification of DUT (as defined by manufacturer)
b) Certification Handbook (this document)
c) Certification Specification(s) of the EnOcean Alliance Certification Program, depending on the nature of the DUT
d) 3rd party requirements on DUT

Content: based on requirements specification of the radio module / product to be developed identify

(1) the certification specification(s) of the EnOcean Alliance Certification Program applicable to the radio module / product
(2) the test plan for the DUT consisting of
    a) the test-cases within each certification specification **mandatory** for an approval considering legal, 3rd party, EnOcean Alliance, and company-internal requirements
    b) the test-cases within each certification specification **optional** for an approval considering legal, 3rd party, EnOcean Alliance, and company-internal requirements
    c) the test-cases to be defined in addition to EnOcean Alliance Certification Program to ensure a) interoperability with (a set of) all devices, and b) to prove the features designed of a radio module / product
(3) the test laboratory to execute the EnOcean Alliance Certification Program
(4) the body collecting the results of the certification program and compiling the certification documentation

Output:

a) test plan for DUT,
b) test laboratory executing the tests,
c) body summarizing test results and providing input to certification documentation
d) documentation required for EnOcean Alliance, legal reasons, 3rd parties

Driving party: approval manager

Involved parties (at least): product engineer, test engineer,

2.2.2. Testing Phase or Execution Phase

Objective: execution and successful completion of test cases defined (refer to 2.2.1, please),

Input:

a) test plan for DUT (output of 2.2.1),
b) Certification Specification(s) of the EnOcean Alliance Certification Program

Content: based on the test program defined during the Preparation Phase

(1) perform the test-cases identified as mandatory according to the appropriate certification specification and manufacturer-internal specification
(2) document the test results as input to the certification documentation
(3) in case of non-passed test-cases decide upon further proceeding
(4) perform the test-cases identified as optional according to the appropriate certification specification and manufacturer-internal specification
(5) document the test results as input to the certification documentation
(6) in case of non-passed test-cases decide upon further proceeding
(7) all test-cases defined as mandatory during the Preparation Phase have to be passed

Output:

a) test results for each test case per test plan, documented as per requirement of respective certification specification
b) documentation of device specific parameters, e.g. frequency band, EEP(s), events, heartbeat, etc.
c) device specific information required for legal reasons or 3rd parties

Driving party: test engineer

Involved parties (at least): test lab manager[3], test lab engineer, product engineer, approval manager

2.2.3. Documentation Phase

Objective: documentation of the results of the tests performed during the Execution Phase (refer to 2.2.2, please) as part of product documentation, as part of the documentation required for legal[4] and 3rd party reasoning[5], and as part of the certification documentation of the EnOcean Alliance

[3] Test lab manager and test lab engineer are required to participate if the certification program would be executed by one of the accredited test laboratories.
[4] E.g., FCC, RED, CE conformity declaration
[5] E.g., VDE testing, compliance with EN xxx xx

Input:

a) test results for each test case per test plan (output of 2.2.2)
b) device specific parameters, e.g. frequency band, EEP(s), events, heartbeat, etc. (output of 2.2.2)

Content: based on the test program defined during the Preparation Phase and the results of the test-cases performed during the Execution Phase

(1) ensure all mandatory test-cases are passed
(2) review result of test, compile the product documentation and the certification documentation as per the templates available and requirements of the certification specifications
(3) enter product data into the product interoperability database of the EnOcean Alliance (if you don't want to have the product public then send all this by E-Mail to the EnOcean Alliance Certification Manager)
(4) an EnOcean Alliance Certification Application will be created containing a summary of the data submitted. A template is available at the Technical Documents section of the EnOcean Alliance homepage. This document is to be signed by a manager authorized
(5) submit signed EnOcean Alliance Certification application to the EnOcean Alliance Certification Manager by storing it at the product database entry in the section of certification files.

Output:

a) signed certification application as per template
b) product specific information

Both entered into the product interoperability database of the EnOcean Alliance

Driving party: approval manager

Involved parties (at least): product engineer, test engineer, product manager, quality manager

2.2.4. Review Phase

Objective: secure high-level of quality of interoperability as specified by the EnOcean Alliance

Input:

a) product specific information
b) EnOcean Alliance Certification Application (signed by authorized manager of submitter)

Both entered into the product interoperability database of the EnOcean Alliance (output of 2.2.3)

Content: based on the certification documentation submitted by a manufacturer for a specific product

(1) review the EnOcean Alliance Certification Application submitted
(2) review the certification documentation with respect to completeness of
    - all mandatory product information
    - all "mandatory" test cases completed and passed
(3) review result of individual test-cases on sample basis (decision by the EnOcean Alliance Certification Manager)
(4) in case of positive reviews: approve product for "EnOcean Alliance certified" seal from certification perspective, sign EnOcean Certification Document, maintain copy of the EnOcean Certification Document of this product and return original to the submitter
(5) in case of negative review(s): contact approval manager of submitting manufacturer to
    - understand gap in certification process
    - request details on test-cases not performed or failed
    - request test or re-test of DUT (i.e. re-start at Preparation Phase or Execution Phase)
    - repeat Review Phase
(6) in case of positive reviews and negative feedback from the field[6]:
    - identify test-case(s) in doubt
    - understand the difference between reports from the field and test documentation available
    - in case of confirmed discrepancies: contact approval manager of submitting manufacturer to
        - understand gap in certification process
        - request details on test-cases not performed or failed
        - request test or re-test of DUT (i.e. re-start at Preparation Phase or Execution Phase)
        - repeat Review Phase
    - in case of confirmed discrepancies: mark the product in product interoperability database (till issue is resolved and its resolution confirmed)
    - inform BoD and suggest next steps

Output:

a) product-specific certificate of the EnOcean Alliance Certification Program
b) product-specific certification notice in interoperability database of EnOcean Alliance visible publically

[6] i.e. product passed all four phases of the certification process and is qualified for "EnOcean Alliance certified" seal

c) product tested is entitled to receive a certificate “Self-Certified for IoT” or “Alliance-Verified for IoT”

Driving party: EnOcean Alliance Certification Manager

Involved parties (at least): approval manager of manufacturer, product manager of manufacturer, product engineer of manufacturer

Remark: the review phase should be completed within two weeks following complete submission of certification documentation of the platform / product and submission of the EnOcean Alliance Certification Application signed by an authorized manager.

2.3. Certification, part of the Product Implementation

In general there are two ways to execute a certification process:

a) certification by external test laboratories providing a certificate amended by test documentation, and

b) self-certification by the device manufacturer confirming a positive pass of the test-cases declared to be mandatory.

The EnOcean Alliance decided to focus on the self-certification and allow for third party certification as an alternative. In consequence this requires the certification process to allow for a range of test environments while ensuring reproducibility of the test results at the same time – with other words: test cases have to be robust and tolerant to achieve the objective *interoperability*, the certification process needs to be stringent. The philosophy adopted follows the intention of the European *CE-Certification*. Whichever way will be chosen by the device manufacturer the certification program covers all elements essential for reliable communication between two or more devices.

An EnOcean Alliance self-certification requires several steps to be performed by the manufacturer of the device which can be performed without significant additional effort as part of the anyhow required verification of the product development. The execution of the individual certification test cases will follow the test specifications developed by the EnOcean Alliance. By this means, it will be ensured that all devices will undergo an identical test process and the test coverage as well as the test results will be comparable and reproducible independently from the individual device manufacturer.

Alternatively, the test process defined and the test cases specified can be applied by independent external test laboratories / certification institutes.

2.4. Tools supporting the certification

The EnOcean Alliance supports the tester by different tools:

- Profile Checking Tool
  This Windows-Program in combination with a USB-Stick checks the correct coding and decoding of any profile related data and supports enhanced security products.
- Template for a test report for Air Interface testing.
- Template for a test report for Radio Performance testing.
- Template for a Multi-Product certification application.

3. Certification Rules

3.1. EnOcean Alliance Technology Logo for certified products

Please note: this chapter is for information. The only valid reference for logos and their appliances is the EnOcean Alliance Brand Guideline.

A non-certified legacy product is entitled to bear the previous logo of the EnOcean Alliance (with "dolphin icon").

Only certified products or technology platforms are entitled to bear the technology logo of the EnOcean Alliance (ingredient logo)[7] [10] (refer to fig. 4).

Fig. 4 EnOcean Alliance technology/ingredient logo

Any non-certified product may NOT bear any new logo of the EnOcean Alliance (with "leaf icon" e.g. as in fig. 4) nor the term "EnOcean".

When promoting final products or technology platforms, the EnOcean Alliance technology logo (=ingredient logo) and graphics **can only be used on products or technology platforms owning an EnOcean Alliance Certificate as described in this Certification Handbook**. The EnOcean Alliance technology logo (=ingredient logo) does not replace any regulatory certification necessary.

In this case, the EnOcean Alliance technology logo (=ingredient logo) can be used on final products based on wireless standard ISO/ IEC 14543-3-1X [1] and EnOcean Alliance's intellectual property (e.g. EnOcean Equipment Profiles) and on product-related or platform-related documentation (e.g. data sheets, user manual, application notes) to communicate a certified

[7] Reference for the Technology logo of the EnOcean Alliance: EnOcean Alliance Brand Guideline [10], chapter 1.

product or platform with the EnOcean Alliance and to distinguish from other standards in the marketplace.

Examples: On certified products,
On packages of certified products,
On technical documentation (e.g. data sheet, user manual) of certified products

The EnOcean Alliance Brand Guideline is available for download at [10]:

This guideline defines all logos detailed above, their minimum size, the color guidelines, the typography and the usage rules.

The technology logo of the EnOcean Alliance (ingredient logo) – please, refer to the usage policy as described in the brand guidelines –is available for download at [10]:

Please note: this chapter is for information. The only valid reference for logos and their appliances is the EnOcean Alliance Brand Guideline.

3.2. Approval of certification status

Once the certification testing will be completed and the documentation will be submitted (refer to chapter 2.2.3) the approval manager of the product manufacturer may enter the data of the product and the product documentation into the *certified product* database. By doing so the approval manager initiates the Review Phase of the Certification Process (refer to chapter 2.2.4).

The Review Phase (refer to 2.2.4, please), starting with the submission of the *EnOcean Alliance Certification* application and ending with the assignment of a unique certification number will normally not exceed two weeks. Once this Review Phase is passed the product is approved to be marked with the “EnOcean Alliance certified” seal, i.e. the EnOcean Alliance technology logo.

In case of a negative result of the Review Phase the EnOcean Alliance Certification Manager will contact the submitter and recommend further steps to secure the interoperability of the product.