

## *System Specification – Executive Summary*

# **Generic Profiles V 1.0**

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### Executive Summary

This is an extract from the document that provides the specification of Generic Profiles. The full specification includes the Generic Profiles appendix document. The full version is currently available to EnOcean Alliance members.

Generic Profiles are a significant evolution of EnOcean Equipment Profiles (EEPs) with an innovative approach, but they do not render EEPs obsolete. Both EnOcean Equipment Profiles and Generic Profiles describe the data communication of products utilizing the EnOcean Radio Protocol and enables manufacturers to develop interoperable products. The key strength of Generic Profiles is to enable devices to have self-described dynamic communication.

With this capability, new products can be developed without submission of their profiles to the EnOcean Alliance, allowing an unlimited variety of possibilities.

## System Specification – Executive Summary

### Table of Contents (of the summary)

1. Introduction .....	3
1.1. “Generic” – definition .....	3
2. Communication layers .....	3
3. Convention .....	4
3.1. Approach .....	4
3.2. Channel characterization.....	4
3.3. Example.....	5
Data channel definition .....	5
4. Teach-in Process.....	5
4.1. Procedure .....	6
5. Compatibility with EEP .....	6
5.1. Coexistence .....	6
6. Remote Management.....	6
7. Generic Profiles Appendix.....	7
8. Table of contents (of the full version) .....	8

# System Specification – Executive Summary

## 1. Introduction

EnOcean GmbH developed the structure of the EnOcean Equipment Profiles (EEP) to achieve a standardized communication between devices applying EnOcean's energy harvesting and wireless technology. Based on this structure the EnOcean Alliance created and maintains a system specification by its Technical Working Group (TWG). This specification summarizes all profiles for different application and implementation scenarios developed by the members of the EnOcean Alliance.

A growing number of EEPs and an even faster time-to-market requirement created the need for new communication architecture between the various devices within an EnOcean wireless infrastructure.

In November 2010 the EnOcean Alliance tasked a team within the TWG to draft a communication architecture which can overcome the challenges seen for the upcoming three to five years. Two objectives were followed up by the team – (1) a communication architecture able to handle the large variety of sensors and actuators without creating a complex system, and (2) a communication architecture which requires an administrative effort much lower than today's EEP-scheme.

### 1.1. “Generic” – definition

The ideal objective was a “generic specification” which could mean: a device of a manufacturer communicates with a device of another manufacturer and the ability to exchange data in field without additional product change / update is possible.

## 2. Communication layers

Computer network protocols are using abstraction layers for hiding implementation details for a particular set of functionality. To confine the tasks, abstraction layers for Generic Profiles communication are applied.

Generic Profile communication defines the following layers, similar to the OSI layer model:

Layer	Services
Application	Product specific software application / Generic Profile message generation
Presentation	Radio telegram processing
Session	Not used for Generic Profiles
Transport	Not used for Generic Profiles
Network	Addressing telegrams / R-ORG / Status processing

FIGURE 2.1: LAYER MODEL OF GENERIC PROFILES

Adopting such a view of the tasks one will be independent from the radio, serial or any other communication type to exchange the Generic Profiles messages.

## System Specification – Executive Summary

### 3. Convention

The EnOcean Equipment Profiles consist of a set of tables to define each officially supported device and its transmitted data. The specific definition of a device is referenced by the EEP number (R-ORG, FUNC, TYPE). The Generic Profiles approach instead defines a language to communicate the to-be-used transmitted data format (e.g. types and ranges). The devices become self describing on their data structures in communication.

To handle the huge variety of possible data this language has to be versatile and compact.

#### 3.1. Approach

The data sent over-the-air is generally the result of an analogue-to-digital conversion, the state of a counter in the transmitting device or etc. To conserve energy, these raw measurements are transmitted directly, using only as many bits as the native conversion produced. To determine the actual value, it is necessary to have a set of parameters to map the pure digital values into physical units. Declaring this set of parameters will enable the receiver to recalculate the originally measured value as a preparation for further processing.

The Generic Profiles include a language definition with a parameter selection that covers every possible measured value to be transmitted. Therefore, the approach does not only define parameters for the value recalculation algorithm but also includes specific signal definition. (e.g. physical units).

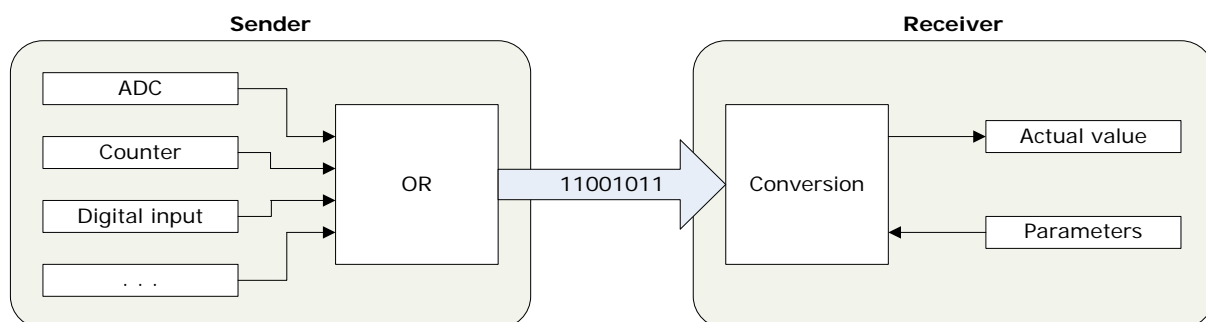


FIGURE 3.1: GENERIC DATA TRANSMISSION

For every measurement the set of parameters has to be transmitted before the first operational data exchange. This is done during the Teach-in process. Using this process the device describes its future communication self.

#### 3.2. Channel characterization

Automated processing of digital data is only possible if all information about the acquisition type of the received data is available. Through this classification a value can be combined with its physical unit and its proposed use. Therefore, three different parameters (channel type, signal type, value type) have to be communicated (full details of which can be found in the full version).

## System Specification – Executive Summary

### ‘Channel Type’

The channel type divides all channels into different functional classes of measurements. With the three defined channel types:

- ‘data’,
- ‘flag’
- ‘enumeration’

Measurement results and complex counter values are separated from single bit logical channels and enumerated values.

### 3.3. Example

#### Data channel definition

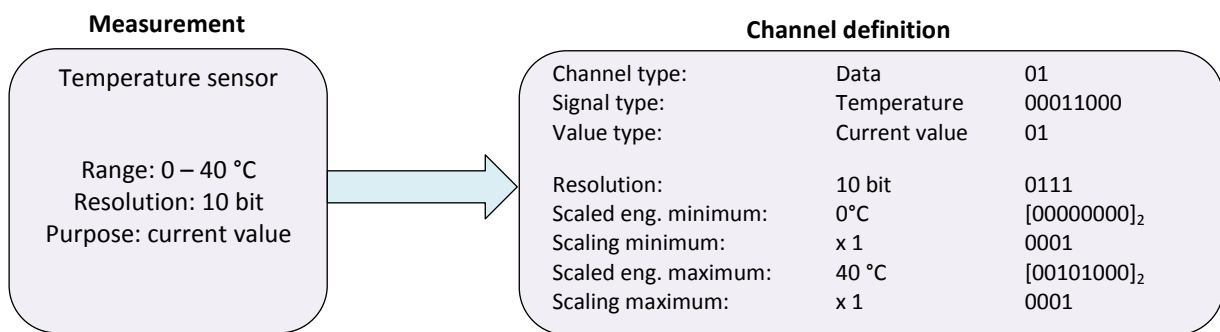


FIGURE 3.2: EXAMPLE TEMPERATURE SENSOR DEFINITION

## 4. Teach-in Process

Teach-in is the process where communication partners exchange information about how to interpret data which will be exchanged in the data communication.

Following the guidelines of the defined communication layers and Generic Profiles, every generic EnOcean device can exchange data with compatible devices.

Therefore, the interpretation of received data messages is based on two conditions:

1. Generally, the message has to be accepted first.  
That means that it has to carry a valid EnOcean ID that is known by the receiver or it can address the receivers EnOcean ID.
2. The receiver has to be aware of the user data structure.  
As this structure is almost infinitely variable due to the generic approach, the transmitter has to transmit its channel characteristics too.

The process of connecting two EnOcean radio devices and exchanging initiating information is called ‘Teach-in’ and has to be passed before the first operational communication. An

## System Specification – Executive Summary

intentional disconnection of this binding, called ‘teach-out’, is also included in the following definition.

A generic Teach-in procedure allows a device to connect to different radio partners. It does not prevent the case of connecting to the wrong device.

### 4.1. Procedure

The Teach-in process has a bidirectional character. Therefore, it consists of two consecutive messages:

- First, after the receiver has been switched into learn mode, the transmitter broadcasts a **Teach-in request** message.
- The receiver answers with a **Teach-in response** message which should be addressed to the transmitter.

If the receiver has bidirectional communication capabilities, then it shall transmit a Teach-in response. This is required to enable commissioning devices to see and document the Teach-in result.

## 5. Compatibility with EEP

Establishing a new concept of radio communication in a world of existing and highly integrated systems requires a strategy to connect devices from both the recent and the new approach. This means that upcoming product introductions into the market needs to consider the ‘EnOcean Equipment Profiles Specification’ as well as the ‘Generic Profiles’.

### 5.1. Coexistence

As the *Generic Profiles* (GP) are not meant to replace the *EnOcean Equipment Profiles* (EEP) immediately, the coexistence of both concepts is mandatory.

Communication between EEP devices is standardized and so is the communication between GP devices. A mixed data exchange is possible but will not be enforced by the *Generic Profiles* approach. Therefore the special *Generic Profiles* R-ORG’s allow to identify generic telegrams and manufacturers are free to implement both or just one of the concepts in their products. During the Teach-in process the two selected devices have to determine which approach they will follow for their data exchange. Unsuccessful Teach-in attempts cannot be prevented by the new approach.

By that a general compatibility of the two different profile approaches can be guaranteed even though it is not necessary that all devices have to be able to connect to each other.

## 6. Remote Management

Generic Profile based devices that are continuously powered shall support a minimum feature set from the EnOcean Remote Management specification. In addition to the Remote Management Control Commands (RMCC) such devices shall support Remote Procedure Calls (RPC) defined in Remote Commissioning Specification.

## *System Specification – Executive Summary*

### **7. Generic Profiles Appendix**

The appendix defines the variable lists, which are used in the Generic Profiles Specification. The process of Generic Profiles and usage of the following definitions is described in the Generic Profiles Specification.

Additions to the definitions in the full version of this document can be submitted to the EnOcean Alliance Technical Working Group for approval. The EAC (EEP Approval Committee) will revise the changes and will help submitters with questions and requests.

Additional definitions should be made, if a planned product cannot be sufficiently described with the existing definitions.

## System Specification – Executive Summary

### 8. Table of contents (of the full version)

1. Introduction.....	4
1.1. Introduction.....	4
1.2. “Generic” – definition .....	4
1.3. Terms & Abbreviations .....	5
1.4. Development of Generic Profiles specification.....	6
2. Communication layers.....	7
2.1. Introduction.....	7
2.2. Message types .....	7
2.3. Radio communication.....	8
2.3.1. Telegram chaining .....	9
2.4. Other communication types.....	10
3. Convention .....	12
3.1. Introduction.....	12
3.2. Approach .....	12
3.3. Parameters .....	13
3.3.1. Channel characterization.....	13
3.3.2. ADC parameters .....	14
3.4. Measurement value quantization .....	17
3.5. Examples.....	18
3.5.1. Data channel definition .....	18
3.5.2. Flag channel definition.....	19
3.5.3. ENUM channel definition .....	19
3.5.4. Quantization .....	19
4. Teach-in Process.....	21
4.1. Introduction.....	21
4.2. Procedure .....	21
4.2.1. General procedure.....	21
4.3. Definition.....	22

Generic Profiles Specification (extract)



## System Specification – Executive Summary

4.3.1. Teach-in request.....	23
Teach-in request header .....	23
4.3.2. Channel definition.....	24
4.3.3. Teach-in response.....	25
4.3.4. Channel acknowledgement .....	28
4.4. Channel indexing.....	29
4.5. Message timings .....	29
4.6. Using Smart Acknowledge for communication.....	30
4.7. Examples.....	31
4.7.1. Teach-in request message .....	31
4.7.2. Teach-in response message .....	33
5. Operational mode.....	35
5.1. Introduction.....	35
5.2. Data message definition.....	35
5.2.1. Complete Data message.....	36
5.2.2. Selective data message .....	36
6. Compatibility with EEP .....	38
6.1. Introduction.....	38
6.2. Coexistence.....	38
6.3. Transition Plan .....	39
7. Remote Management.....	41