

ETHSU – EASYFIT TEMPERATURE AND HUMIDITY SENSOR

ETHSU Easyfit Temperature and Humidity Sensor

21.12.2017



Observe precautions! Electrostatic sensitive devices!

Patent protected:

WO98/36395, DE 100 25 561, DE 101 50 128,
WO 2004/051591, DE 103 01 678 A1, DE 10309334,
WO 04/109236, WO 05/096482, WO 02/095707,
US 6,747,573, US 7,019,241

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REVISION HISTORY

The following major modifications and improvements have been made to this document:

Version	Author	Reviewer	Date	Major Changes
1.0	MKA	MKA	22.12.2017	First release

**Published by EnOcean GmbH, Kolpingring 18a, 82041 Oberhaching, Germany
www.enocean.com, info@enocean.com, phone +49 (89) 6734 6890**

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Important!

This information describes the type of component and shall not be considered as assured characteristics. No responsibility is assumed for possible omissions or inaccuracies. Circuitry and specifications are subject to change without notice. For the latest product specifications, refer to the EnOcean website: <http://www.enocean.com>.

As far as patents or other rights of third parties are concerned, liability is only assumed for modules, not for the described applications, processes and circuits.

EnOcean does not assume responsibility for use of modules described and limits its liability to the replacement of modules determined to be defective due to workmanship. Devices or systems containing RF components must meet the essential requirements of the local legal authorities.

The modules must not be used in any relation with equipment that supports, directly or indirectly, human health or life or with applications that can result in danger for people, animals or real value.

Components of the modules are considered and should be disposed of as hazardous waste. Local government regulations are to be observed. Packing: Please use the recycling operators known to you.

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1 RELATED DOCUMENTS

This document describes operation of ETHSU modules with their built-in firmware.

We recommend following our [application notes](#), in particular AN001: EnOcean Wireless Systems – RANGE PLANNING GUIDE, AN002: RANGE EXTENSION WITH ENOCEAN - Concept design of extending range with EnOcean networks and AN010: Short-Range Devices, Indoor Radio Propagation.

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2 GENERAL DESCRIPTION**2.1 Basic functionality**

EnOcean EasyFit ETHSU is a wireless and maintenance free temperature and humidity sensor. It requires no external components and provides on-board a calibrated temperature and humidity sensor.

Power supply is provided by a small pre-installed solar cell or an external 3 V backup battery.

An energy storage element is installed in order to bridge periods with no supply from the energy harvester.

The module provides an internal cyclic wake up every 100s. After wake up, the internal microcontroller reads the status of the temperature and humidity sensor. A radio telegram will be transmitted in case of a significant change of measured temperature or measure humidity.

In case of no relevant input change, a redundant retransmission signal (heartbeat) is sent randomly within 8 to 15 minutes to announce the current values.

In addition to the cyclic wake-up, a wake up can be triggered externally using the input for the occupancy button or the internal LRN button.

Key product features

- Fully autonomous operation under sufficient lighting with pre-installed solar cell
- Factory calibrated on-board temperature and humidity sensor
- Integrated energy storage and charging circuit
- Integrated LRN button and TX indicator LED



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2.2 Technical Data

Antenna	Helix antenna
Frequency	902.875 MHz
Data rate/Modulation type	125 kbps / FSK
Radiated Output Power (typ.)	100 dBµV/m
On-board Power Supply	Pre-installed solar cell Illumination 50-100000 lux
Auxiliary Power Supply	Option for backup battery (CR1225)
Operation time in darkness @ 25°C	typ. 4 days after full charge
Start-up time from empty energy store	typ. < 5 min @ 400 lux / 25 °C incandescent or fluorescent light
Input parameters	Temperature and humidity sensor LRN button
Temperature sensor performance	Measurement range: -20°C ... +60 °C Resolution: 0.1 K Accuracy: ±0.5 K across entire range
Humidity sensor performance	Measurement range: 0 % r.h. ... 100 % r.h. Resolution: 0.4 % r.h. Accuracy: ±4.5 % r.h. across entire range ±3.0 % r.h. between 20 ... 80 % r.h.
EnOcean Equipment Profile	A5-04-03

2.3 Environmental conditions

Operating and Storage temperature	Absolute Maximum: -20 °C ... +60 °C Recommended ¹ : +10 °C...+30 °C
Shelf life (in absolute darkness)	36 months after delivery ²
Operating and storage humidity	Maximum: 0% ... 93% r.h., non-condensing Recommended: < 60% r.h.



The module shall not be placed on conductive materials, to prevent discharge of the internal energy storages. Even materials such as conductive foam (ESD protection) may have negative impact.

2.4 Ordering Information

Type	Ordering Code	Frequency
ETHSU	S3051-D350	902.875MHz

¹ Recommended for maximum life of energy storage capacitor

² Deep discharge of the energy storage leads to degradation of performance. Therefore products have to be taken into operation after 36 months.

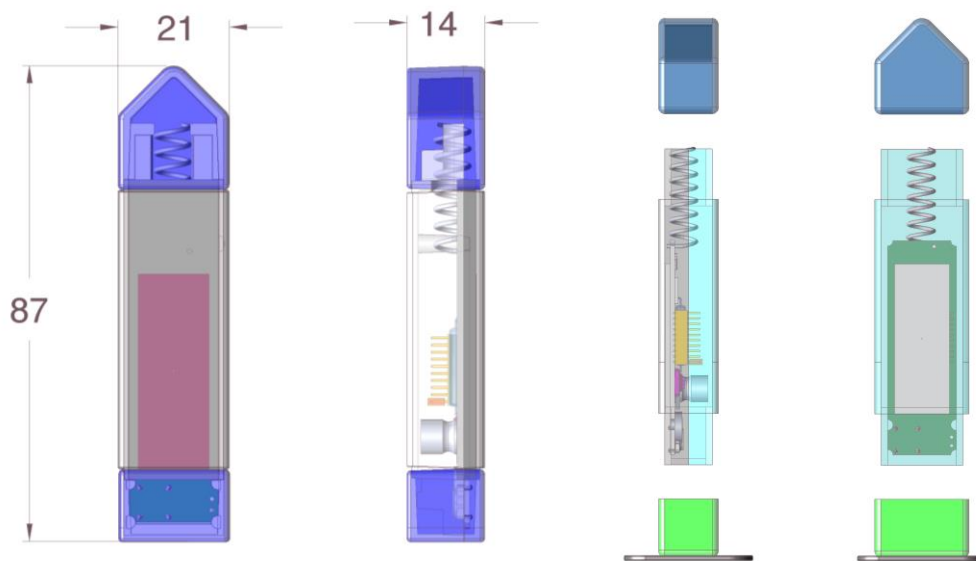
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2.5 Physical dimensions

Product dimensions	87±1 x 21±1 x 14±1 mm
Product weight	25 g

2.5.1 Mechanical Outline

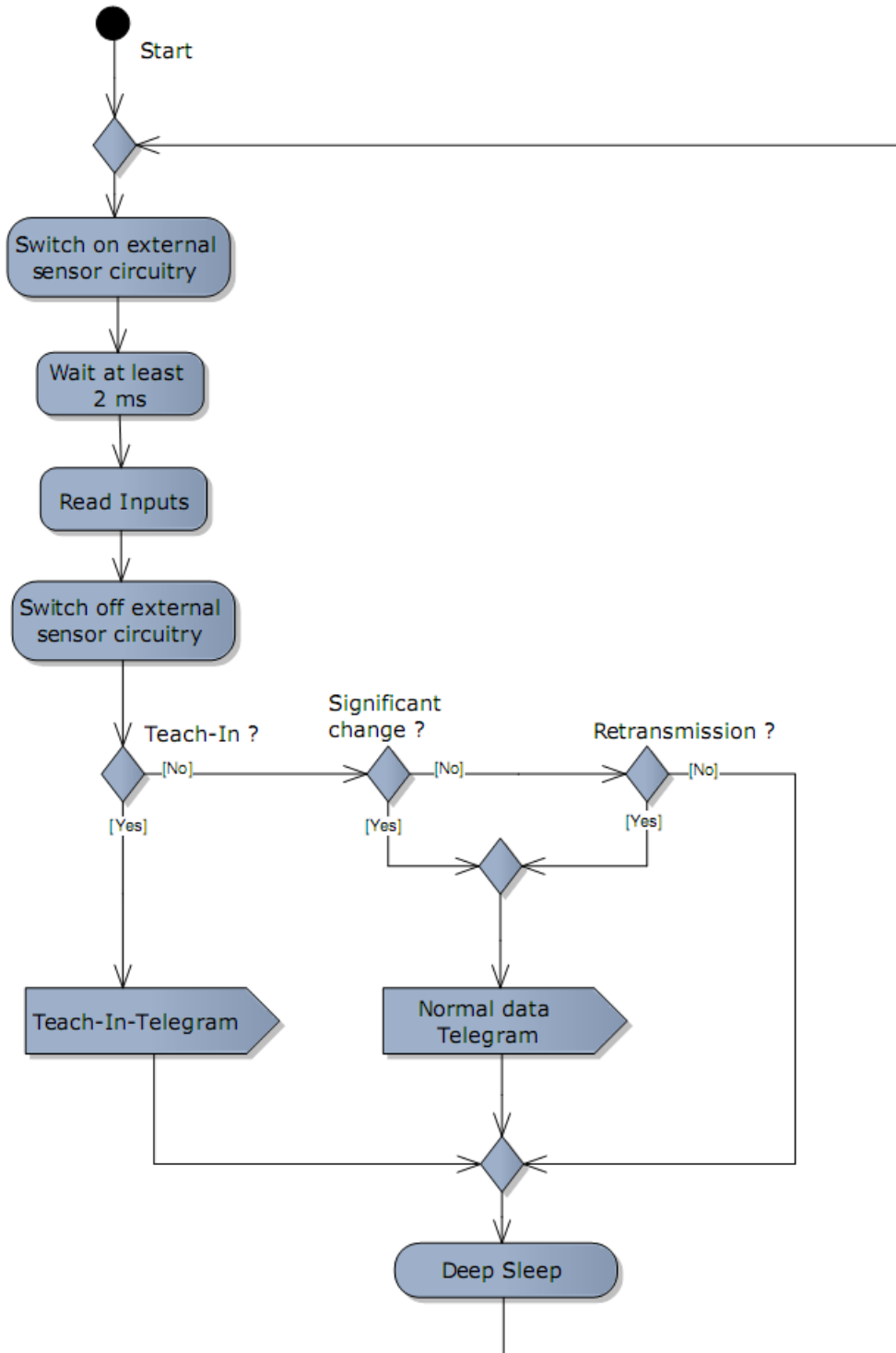
Detailed drawings are available from EnOcean.



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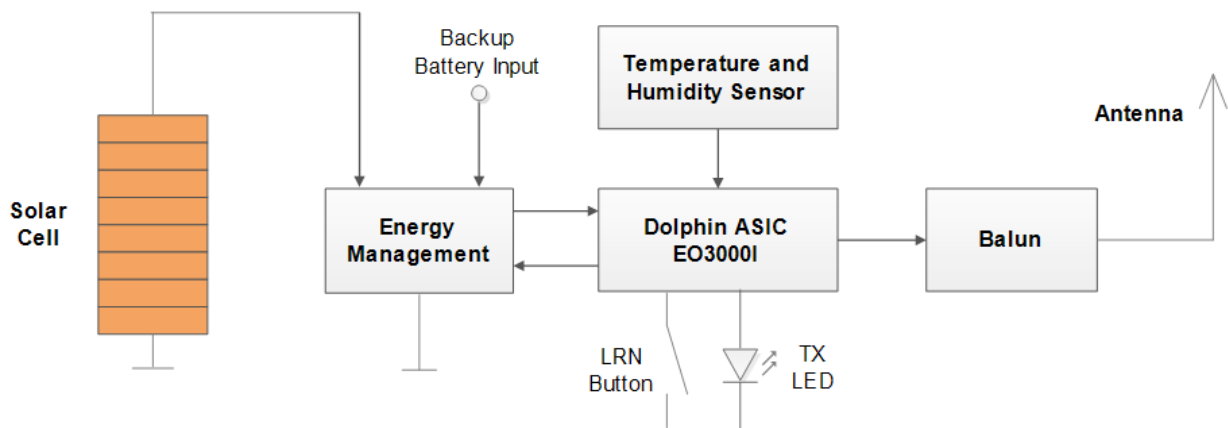
3 FUNCTIONAL DESCRIPTION

3.1 Simplified firmware flow chart



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3.2 Simplified device block diagram



3.3 Radio telegram format

ETHSU transmits telegram data according to EEP (EnOcean Equipment Profile) A5-04-03 which encodes a temperature range of Temperature -20 ... 60°C with 10 Bit and a Humidity range of 0 ... 100 % r.h. with 8 Bit.

3.3.1 Teach-in telegram

If the user presses the LRN button then the module transmits a teach-in telegram.

With this special teach-in telegram it is possible to identify the manufacturer of a device and the function and type of a device via the EEP or GP used.

By default EnOcean Manufacturer ID is set. Customers should configure the module to use their own Manufacturer ID.

3.3.2 Transmit timing

The setup of the transmission timing allows avoiding possible collisions with data packages of other EnOcean transmitters as well as disturbances from the environment.

With each default transmission cycle, 3 identical sub-telegrams are transmitted within 40ms. Transmission of a sub-telegram lasts approximately 1.2ms. The delay between the three transmission bursts is affected at random.

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4 Application Information

4.1 Transmission range

The main factors that influence the system transmission range are type and location of the antennas of the receiver and the transmitter, type of terrain and degree of obstruction of the link path, sources of interference affecting the receiver, and “Dead” spots caused by signal reflections from nearby conductive objects. Since the expected transmission range strongly depends on this system conditions, range tests should categorically be performed before notification of a particular range that will be attainable by a certain application.

The following figures for expected transmission range may be used as a rough guide only:

- Line-of-sight connections: Typically 30 m range in corridors, up to 100 m in halls
- Plasterboard walls / dry wood: Typically 30 m range, through max. 5 walls
- Ferroconcrete walls / ceilings: Typically 10 m range, through max. 1 ceiling
- Fire-safety walls, elevator shafts, staircases and supply areas should be considered as screening.

The angle at which the transmitted signal hits the wall is very important. The effective wall thickness – and with it the signal attenuation – varies according to this angle. Signals should be transmitted as directly as possible through the wall. Wall niches should be avoided. Other factors restricting transmission range:

- Switch mounted on metal surfaces (up to 30% loss of transmission range)
- Hollow lightweight walls filled with insulating wool on metal foil
- False ceilings with panels of metal or carbon fiber
- Lead glass or glass with metal coating, steel furniture

The distance between EnOcean receivers and other transmitting devices such as computers, audio and video equipment that also emit high-frequency signals should be at least 0.5 m.

A summarized application note to determine the transmission range within buildings is available as download from www.enocean.com.

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5 Regulatory information

ETHSU has been certified according to FCC (US) and ISED (CA) regulations. Changes or modifications not expressly approved by EnOcean could void the user's authority to operate the equipment.

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5.1 FCC (United States) Certificate

<TO BE INSERTED>

5.2 FCC (United States) Regulatory Statement

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.

To comply with FCC/IC RF exposure limits for general population / uncontrolled exposure, the antenna(s) used for this transmitter must be installed to provide a separation distance of at least 20 cm from all persons and must not be co-located or operating in conjunction with any other antenna or transmitter

Warning

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

Interference

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 off and on, the user is encouraged to try to correct the interference by one of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

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5.3 IC (Industry Canada) Certificate

<TO BE INSERTED>

5.4 IC (Industry Canada) Regulatory Statement**5.4.1 English version**

This radio transmitter has been approved by Industry Canada to operate with the antenna types listed with the maximum permissible gain indicated. Antenna types not included in this list, having a gain greater than the maximum gain indicated for that type, are strictly prohibited for use with this device.

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.

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to ICES-003. 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 off and on, the user is encouraged to try to correct the interference by one of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help

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5.4.2 French version

PRUDENCE: Changements ou modifications pourraient annuler le droit de l'utilisateur à utiliser l'équipement non autorisées.

Conformément à la réglementation d'Industrie Canada, le présent émetteur radio peut fonctionner avec une antenne d'un type et d'un gain maximal (ou inférieur) approuvé pour l'émetteur par Industrie Canada. Dans le but de réduire les risques de brouillage radioélectrique à l'intention des autres utilisateurs, il faut choisir le type d'antenne et son gain de sorte que la puissance isotrope rayonnée équivalente (p.i.r.e.) ne dépasse pas l'intensité nécessaire à l'établissement d'une communication satisfaisante.

Le présent appareil est conforme aux CNR d'Industrie Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes:

1. L'appareil ne doit pas produire de brouillage, et
2. L'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

Ces limites sont conçues pour fournir une protection raisonnable contre les interférences nuisibles dans une installation résidentielle. Cet équipement génère, utilise et peut émettre une énergie de radiofréquence et, s'il n'est pas installé et utilisé conformément aux instructions, il peut causer des interférences nuisibles aux communications radio. Cependant, il n'existe aucune garantie que des interférences ne se produiront pas dans une installation particulière.

Si cet équipement provoque des interférences nuisibles à la réception radio ou télévision, ce qui peut être déterminé en mettant l'équipement hors et sous tension, l'utilisateur est encouragé à essayer de corriger l'interférence par une ou plusieurs des mesures suivantes:

- Réorienter ou déplacer l'antenne de réception.
- Augmentez la distance entre l'équipement et le récepteur.
- Connecter l'équipement à une sortie sur un circuit différent de celui sur lequel le récepteur est branché.
- Consulter le revendeur ou un technicien radio / télévision expérimenté pour de l'aide