THE KINEXON ePaper Tag (Rechargeable) - User Manual

Paperless Logistics/Manufacturing

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1 Introduction

The KINEXON ePaper Tag is the Ultra-Wideband basic component for a paperless material and goods handling in industry. The ePaper solution combines high precision UWB localization technology with smart process visualization. The KINEXON ePaper Tag can be placed on workpieces and load carriers without leaving any residue to track their entire value-added process. In addition, an integrated display automatically informs about production steps that have already been completed and those that are still pending. As a result, all information is digitized, repeated and printing processes are eliminated. KINEXON ePaper solution is flexible and provides complete control and maximum flexibility for dynamic production.

The combination of high precision real time localization and smart visualization is the key to a paperless production. There are various potential use cases such as:

- ePaper-based workflow-instructions for shop floor employees.
- Real-time interaction through configurable button (e.g. signal for replenishment).
- Dynamic labeling with current status of the product or material.
- Digitization of all production & process relevant information.


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CUSTOMER
KINEXON GmbH
LAST UPDATE
01.04.2020 19:38:51
HISTORY
01.04.2020 17:34 Assembly started
01.04.2020 18:31 Assembly completed

2 Safety Information

- Read and follow all instructions before using the KINEXON ePaper Tag.
- Never open the case of the KINEXON ePaper Tag. There are no user serviceable parts or replaceable parts inside the case.
- Do not use the KINEXON ePaper Tag if it has been damaged.
- Use the Tag according to the following specifications. KINEXON will not take any responsibility or liability in case of accidents caused by misuse of the battery:
    - Stop using the device immediately and stay away from battery if:
        - The battery was exposed to high temperatures (60 °C or above).
        - The battery shows signs of leakage.
        - There is a noticeable odor coming from the battery.
    - Avoid directly hitting or dropping the battery.

3 Disclaimer

The information in this document is subject to change without notice. KINEXON GmbH assumes no responsibility for inaccuracies or omissions and specifically disclaims any liabilities, losses, or risks, personal or otherwise, incurred as a consequence, directly or indirectly, of the use or application of any of the contents of this document. For the latest documentation, contact KINEXON GmbH.

4 Intended Use

This manual describes the setup and use of the KINEXON ePaper Tag. Use this product only for the purpose it was designed for.

5 Key Facts

RF Specifications

Positioning Principle	Real Time Location System (RTLS), Radio-based, Ultra-wideband (UWB)
Frequency Range	UWB (IEEE 802.15.4a): 4.25 - 4.75 GHz, 6.25 - 6.75 GHz
Update Rate	Configurable, typically 1 Hz in motion, 0.1 Hz in standstill
Positioning Data	3D (x, y, z)
Positioning Accuracy	< 20 cm (depending on environment)

Physical Specifications

Display	4.2“, 85 x 64 mm (400x300 pixel) 2-color: black/white, display update time 3 s (25°C) 3-color: black/white/red, display update time 14 s (25°C)
Button	Two buttons for status and manual event trigger (event sent via RF)
Indicators	Two LEDs (Status and Action)
Accelerometer	3-axis, +/-2 g to +/-16g, up to 200 Hz
Battery	Built-in 2750mAh lithium-ion rechargeable battery
Battery Lifetime	~ 6 month on a single charge (depending on update rate)
Wireless Charging	YES, Inductive charging using KINEXON charging cradle
Charging Time	~ 16 hours for a full charge to 100%
System Power	3.7V / 200 mA
Material	Acrylonitrile styrene acrylate (ASA)
Weight	180g
Dimensions	Device only: (141 x 104.3 x 14.2) mm Incl. holder: (168.8 x 104.3 x 24.6) mm

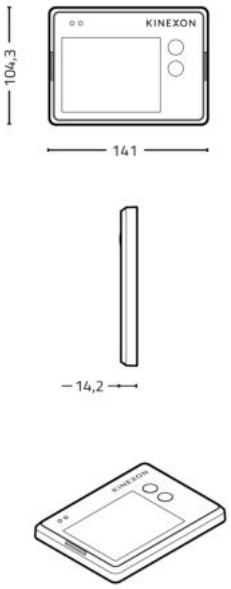
Environmental Specifications

Operating Temperature	0 °C to +50 °C incl. battery 0 °C to +30 °C incl. battery during charging
Storage Temperature	-20 °C to +45 °C incl. battery (for 1 month) -10 °C to +35 °C incl. battery (for 6 month)

Environmental Specifications

Protection Class	IP67
Regulatory Compliance (cert. ongoing)	• FCC Part 15 subpart C • 15.250 (for indoor and outdoor use) • ETSI EN 302065-1 • ETSI EN 303883 • ETSI TS 103361 • SRRC • Draft EN 301 489 - 1, -33 • EN 61000-4-2, -4-3 • EN 62479 • 1999/519/EC • UN 38.3 • IEC 62133

Mechanical Drawing



Label Specifications

Device - Outer

Size: (59.5 x 15.5) mm

EUI: 128060
KNX-T5.1-2 X-X
FCC ID: XXXXXXXXXXXXXXX
CMIIT ID: XXXXYZNNNN
SRRC Product name: XXXXX

KINEXON

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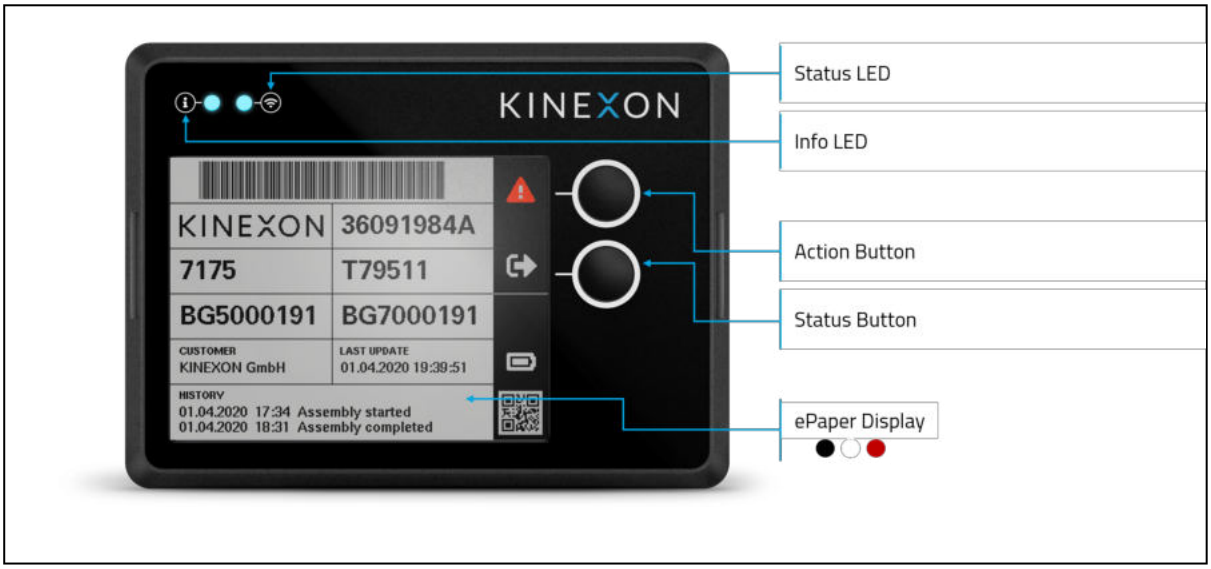
6 External Interfaces



6.1 Wireless Connection

For wireless connection a Ultra-Wideband (UWB) interface according to IEEE 802.15.4 standard is implemented.

6.2 Interaction Buttons

Action Button (Upper Button)		
Description	**Duration**	**Effect**
Short (normal) press	150ms	Toggles alarm mode status (on or off). The content of the ePaper display shown for each mode can be configured in the ePaper editor. In addition, an event event trigger can be defined in RIoT to execute customized actions.
Long press	>4s	Executes customized actions in RIoT. The action must be defined with an event trigger. Per default no action is set.
Very long press	>8s	Hardware reset
Status Button (Lower Button)		
Description	**Duration**	**Effect**

Short (normal) press	150ms	• If there is only one page configured on the RIoT web interface, the Tag refreshes the ePaper display • If there is more than one page configured on the RIoT web interface, the Tag switches the ePaper display to the next available page • If the last page is already shown, the Tag switches the ePaper display back to the first page

6.3 Visual LEDs

Info LED (Left LED)		
Color	**Type & Duration**	**Explanation**
Red	Constant, 1s	Either action or status button was pressed
Dynamic	Dynamic	Further info LED behavior including color & blinking duration can be configured on the RIoT web interface 
Power-on reset		
Green	Constant, ~1s	Tag bootloader is starting
Yellow	Constant, ~7s	Tag in Bootloader and waiting for connection
Purple	Constant, duration depends on firmware size	Tag is being bootloaded with new firmware
Status LED (Right LED)		
Color	**Type & Duration**	**Explanation**
Blue/Green	alternating flashing, infinite	Tag is running, the speed of flashing equals update rate of Aloha uplink
Blue/Red	alternating flashing, infinite	Tag is running with low battery, the speed of flashing equals update rate of Aloha uplink

Red	flashing, 1s	Tag is going to reset due to unrecoverable internal error detected by firmware
Behavior during charging (Tag is placed on the charging cradle)		
Red	3 seconds on, 3 seconds off	The Tag's battery is being recharged
Green	Constant, infinite	The Tag's battery is fully charged

6.4 Tag Battery

A lithium-ion rechargeable battery is used	
Type	TPi 6535105
Nominal Voltage	3.7V
Capacity	2750mAh (10.18Wh)
Maximum Charging Current	1375mA (0.5C)
Maximum Discharging Current	5500mA (2C peak)
Size	(107 x 35 x 6.5) mm
Weight	50g

7 Hardware Variants

Variant	Description
KNX-T5.1-1.1-x	ePaper Tag with non-rechargeable battery, b/w/r display
KNX-T5.1-1.4-x	ePaper Tag with non-rechargeable battery, b/w display
KNX-T5.1-4.1-x	ePaper Tag with non-rechargeable battery, b/w/r display, Bluetooth
KNX-T5.1-4.4-x	ePaper Tag with non-rechargeable battery, b/w display, Bluetooth
KNX-T5.1-2.2-x	ePaper Tag with rechargeable battery, b/w/r display
KNX-T5.1-2.5-x	ePaper Tag with rechargeable battery, b/w display
KNX-T5.1-5.2-x	ePaper Tag with rechargeable battery, b/w/r display, Bluetooth
KNX-T5.1-5.5-x	ePaper Tag with rechargeable battery, b/w display, Bluetooth

8 Accessories

8.1 Charging Cradle

The KINEXON ePaper charging cradle can recharge up to 8 ePaper Tags at the same time. Simply place the tag with the right orientation (as depicted in the picture) and the wireless charging functionality will automatically start.

8.2 Holder

The KINEXON ePaper Tag is clipped to the holder. The holder can be mounted using following options:

- **Velcro tape**: recommended width of tape is 15mm.
- **Zip-tights**: maximum width of zip-tights is 15mm.
- **Magnets**: 18x8x4 N45 magnets hold into place with crushing-ribs that can be pressed in manually.
- **Screws**: lateral placing using countersink screws (dmax=3.5mm, dheadmax=7.2 mm), central placing using cylinder head, pan head, button head screws (dmax=5 mm, dheadmax=9.5 mm).

9 Regulatory and Legal Information

The KINEXON ePaper Tag has been designed to be in compliance with both the U.S. FCC Part 15 subpart F regulations, section 15.250 and with the European Union ETSI EN 302 065 standards. Two different versions of the KINEXON ePaper Tag are available, one version supports the FCC emissions mask (Region 1) and the second supports the ETSI standard mask (Region 2).

9.1 FCC Compliance

This device complies with 47 CFR 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. The user is cautioned that changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment. This device may not be employed for the operation of toys. Operation onboard an aircraft, a ship or a satellite is prohibited. The use of this device mounted on outdoor structures, e.g., on the outside of a building or on a telephone pole, or any fixed outdoors infrastructure is prohibited.

Moreover, the following statements apply:

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 off 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.
- Connect the equipment to 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.

User information according to FCC 15.19

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions:
(1) This device may not cause interference.
(2) This device must accept any interference, including interference that may cause undesired operation.

User information according to FCC 15.21

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

This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment.
This equipment should be installed and operated with minimum distance 20 cm between the radiator & your body.

9.2 ISED Caution

This device contains licence-exempt transmitter(s)/receiver(s) that comply with Innovation, Science and Economic Development Canada's licence-exempt RSS(s). Operation is subject to the following two conditions:

(1) This device may not cause interference
(2) This device must accept any interference, including interference that may cause undesired operation of the device.

These devices are not permitted for operation on board aircraft or satellites and shall also not be used for operating toys. The use this device mounted on a fixed outdoor infrastructure, including antennas mounted on outdoor structures such as poles or buildings, is not permitted, except for operation on board ships or land vehicles.

Cet appareil contient des émetteurs / récepteurs exemptés de licence conformes aux RSS (RSS) d'Innovation, Sciences et Développement économique Canada. Le fonctionnement est soumis aux deux conditions suivantes:
(1) Cet appareil ne doit pas causer d'interférences
(2) Cet appareil doit accepter toutes les interférences, y compris celles susceptibles de provoquer un fonctionnement indésirable de l'appareil.

Les appareils ne peuvent pas être utilisés à bord d'aéronefs ou de satellites et ils ne peuvent pas être utilisés pour faire fonctionner des jouets. L'utilisation de cet appareil monté sur une infrastructure fixe d’extérieur, comprenant les antennes montées sur des structures externes telles que des poteaux ou des bâtiments, n’est pas autorisée, sauf lorsque les structures en question sont des bateaux ou des véhicules terrestres.

This equipment complies with IC RSS-102 radiation exposure limits set forth for an uncontrolled environment.
This equipment should be installed and operated with minimum distance 20 cm between the radiator & your body.

Cet équipement est conforme aux limites d'exposition aux radiations IC RSS-102 établies pour un environnement non contrôlé.
Cet équipement doit être installé et utilisé avec une distance minimale de 20 cm entre le radiateur et votre corps.