Tag Leonardo

Features

- Four antennas UWB/NFC/BLE/Qi
- Firmware upgrade via bluetooth
- NFC memory and configuration
- Wireless charging (Qi standard)

Power Supply Options

- Coin battery
- Li-ion + wireless charging
- External power

Available Sensors

Accelerometer | Magnetometer | Barometer | Temperature | Gyroscope

Tag Leonardo **Personal**
Tag Leonardo **iMU**

Tag Leonardo **Asset**

Tag Leonardo **Vehicle**

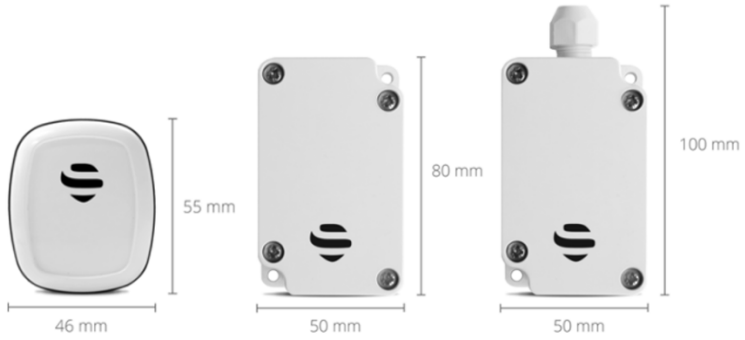
Tags are small electronic devices that are attached to objects that need to be tracked. The tags send out blinks[1] that are received by anchors[2] and forwarded to the location server for calculating the tags' position. RTLS Tags are used for asset tracking[3], vehicle tracking[4], material flow analysis and employee location tracking[5] for safety reasons.

Sewio UWB Tag Types:

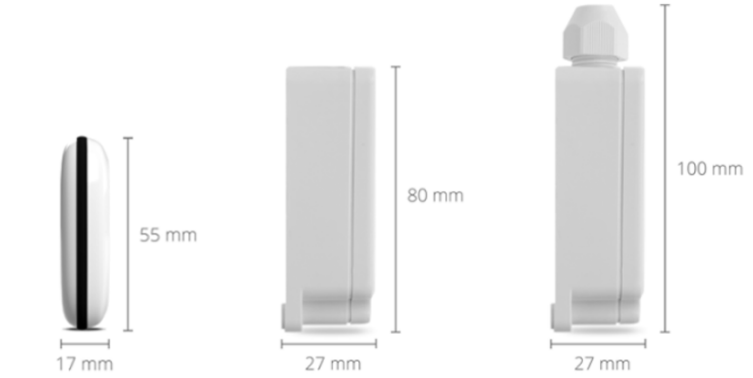
- Tag Leonardo Personal(see page 4) – a tag with wireless charging with limited set of sensor. Well suited for tracking people and finds most usage in entertainment, safety, retail, sports, museums and healthcare industry
- **Tag Leonardo Asset** (see page 11)– tailored to any asset tracking with NFC for identification and BLE for firmware upload. Right-first time choice for eKanban and material flow, benefiting customers in industry, intralogistics, warehousing and retail
- Tag Leonardo Vehicle(see page 16) – for tracking vehicles with own power supply such as AGVs, forklifts and other in industry, intralogistics, warehousing, entertainment and go-karting industry

If you have older tag models **Leonardo iMU** or **Piccolino**, see page Other Tags(see page 26)**.**

1 https://docs.sewio.net/display/PUB/RTLS+System+Communication
2 https://docs.sewio.net/display/PUB/Anchors
3 https://www.sewio.net/indoor-asset-tracking-and-material-flow-analysis/
4 https://www.sewio.net/forklift-tracking-monitoring-system/
5 https://www.sewio.net/people-employee-indoor-location-tracking-and-monitoring/



Tag Leonardo **Personal** Tag Leonardo **Asset** Tag Leonardo **Vehicle**



Tag Leonardo **Personal** Tag Leonardo **Asset** Tag Leonardo **Vehicle**

1 Tag Features Overview

See the strengths of each edition in the list and table below.

		Power Supply				Feature Set					Sensors		
Tag Name	**Enclosure**	Battery[6]	**Rechargeable**	Wireless Charging (see page 8)	**External Power**	Motion Detection[7]	**Z-axis barometer**[8] BETA	BLE[9]	NFC[10]	Button[11]	**acc**	**temp**	**baro**
LEONARDO ASSET LEONARDO ASSET OEM	IP 65	CR 2477 1000 mAh	✗	✗	✗	✓	✗	✓	✓	✓ (OEM only)	✓	✗	✗
LEONARDO PERSONAL LEONARDO PERSONAL OEM	no IP	Li-pol 300 mAh	✓	✓	✗	✓	✓	✓	✓	✓	✓	✓ *	✓ *
LEONARDO VEHICLE** LEONARDO VEHICLE OEM**	IP 65	✗	✗	✗	✓	✓	✓ (OEM only)	✓	✓	✓ (OEM only)	✓	✓	✓

* Barometer/temp sensor are assembled from January 2021.

** Tag Leonardo Vehicle does not include iMU unit (gyroscope, magnetometer) due to the EoL from December 2021.

6 https://docs.sewio.net/display/PUB/Tag+Battery
7 https://docs.sewio.net/display/PUB/Motion+Detection+and+Sleep+Modes
8 https://docs.sewio.net/display/PUB/Z-Axis+with+Barometer%2C+Configuration
9 https://docs.sewio.net/display/PUB/Tag+Firmware
10 https://docs.sewio.net/display/PUB/Tag+Leonardo+NFC+Configuration
11 https://docs.sewio.net/display/PUB/User+Button

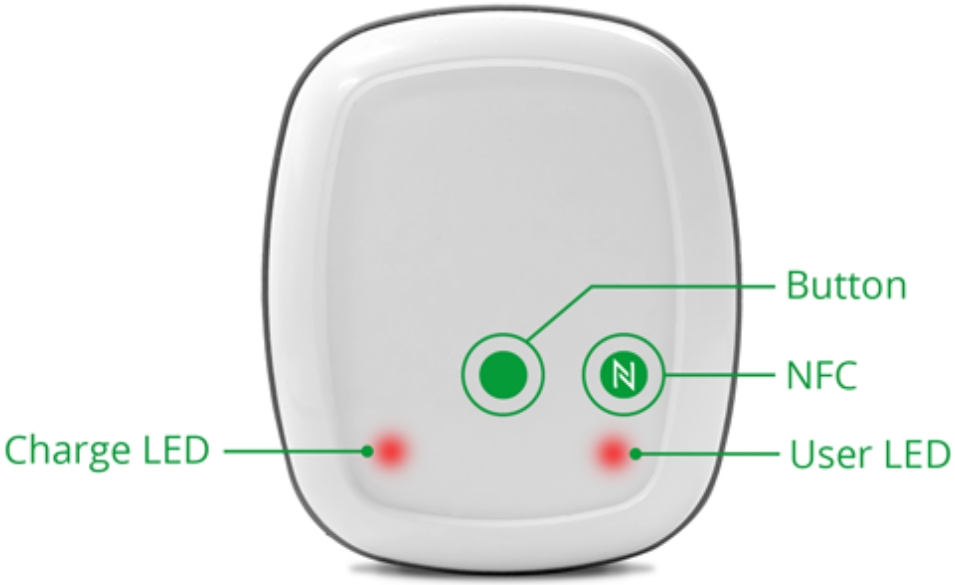
2 Tag Leonardo Personal

2.1 Overview

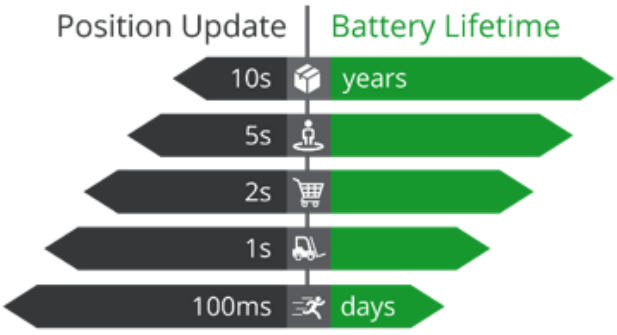
- Decawave UWB Radio, True Location
- Bluetooth Low Energy, BLE
- Near Field Communication, NFC
- Wireless Charge
- Configurable via web browser and RTLS Studio
- 300 mAh Li-pol battery

Available sensors

- Accelerometer
- Barometer



Tag Leonardo is an active mobile locator providing **superior accuracy in real-time**. Its position could be reported from **milliseconds to minutes** covering broad spectrum of applications **from industrial projects to livestock.** Battery lifetime goes up to years.



2.2 Feature Set

Feature	Description
POSITIONING	Accurate positioning based on integrated UWB radio. Tag emits UWB blinks and RTLS provides precise True Location via API.
MOTION DETECTOIN	Motion detection unit enables to save energy. The tag may transmit only during the movement.
FIRMWARE UPDATE	Bluetooth interface is used for wireless firmware update.
CONFIGURATION	Tag Leonardo Asset is configured wirelessly[12] through RTLS Studio or via Android device through NFC[13] interface. NFC: Provides zero-spend energy reconfiguration. Tag Leonardo Asset might be reconfigured even without battery.
BAROMETER	Provides raw atmospheric pressure data or could be used for direct Z-axis estimation.

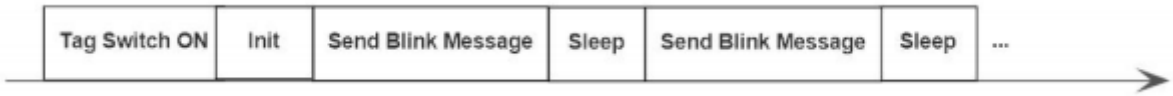
The only difference between Tag Leonardo iMU and Tag Leonardo Personal are additional sensors: 9-axis inertial unit and barometer equipped with Tag Leonardo iMU.

2.3 Switch On the Tag

Tag is initialized after it is turned on by holding the button for two seconds. For more info about the button functionality please continue here[14].

If the tag's battery is depleted, it is **powered ON automatically during the charging** once the battery voltage reaches 3.3 V.

After the initialization phase, the tag sends location blink message periodically with given refresh interval. For time between position updates, the Tag goes into sleep modes. There are several sleep modes available suitable for different use-cases, please read more information here.



12 https://docs.sewio.net/display/DOC1/Tag+Wireless+Configuration
13 https://docs.sewio.net/display/DOC1/Tag+Leonardo+NFC+Configuration
14 https://docs.sewio.net/display/PUB/User+Button

The blink message is received by set of Anchors [15]and it is forwarded to RTLS Studio[16] via Ethernet of WiFi backhaul, where position is calculated. The blink message can be optionally equipped with sensor data. All the data is further disseminated trough the API[17]. First steps with Sewio Real Time Location System are described here[18].

2.4 Tag Battery

To read more about Tag's battery see section Tag Battery[19].

Also, see section about **Charging** (see page 8)and Storage Tag recomendation. (see page 9)

2.5 Number of Tags within RTLS System

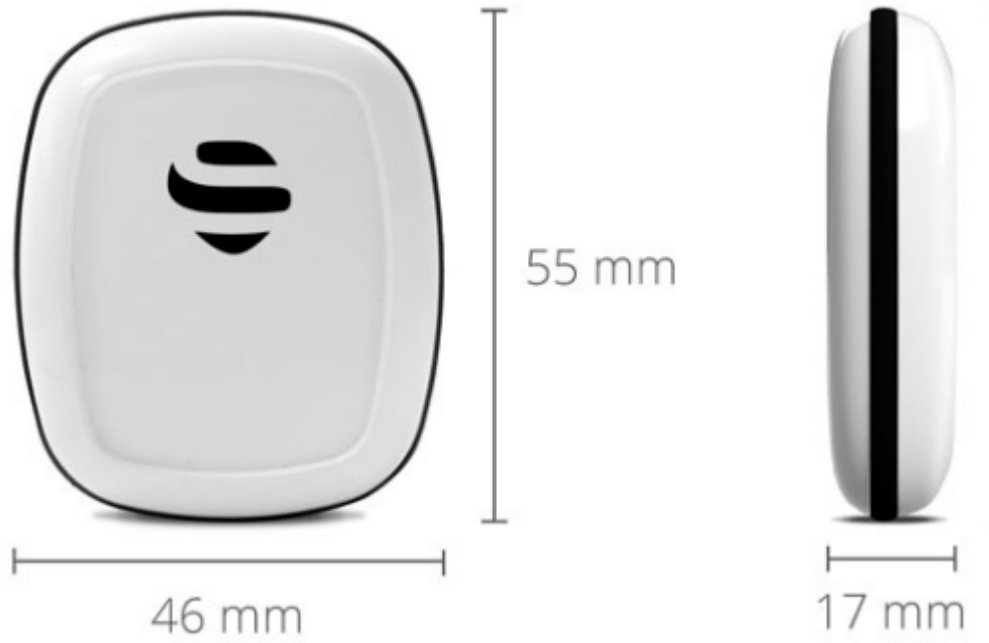
Please read following section[20].

2.6 RF Profile

Please read following section[21].

2.7 Technical Parameters

15 https://docs.sewio.net/display/PUB/Anchors
16 https://docs.sewio.net/display/PUB/RTLS+Studio
17 https://docs.sewio.net/display/PUB/API
18 https://docs.sewio.net/display/PUB/RTLS+UWB+Kit
19 https://docs.sewio.net/display/PUB/Tag+Battery
20 https://docs.sewio.net/pages/viewpage.action?pageId=3244815
21 https://docs.sewio.net/display/PUB/UWB+Channels+and+Profiles



Size	46 x 55 x 17
Weight	30 g
Power Supply	Internal Li-pol 300 mAh
Operating Conditions	-20 ~ 60 °C 20 – 85% humidity without condensation
Charging Temperature	0 ~ 45 °C
Charging Device	Only Qi compliant charger.
Charging Time / Current	5.5h / 73mA
Warm-up Time	Immediate
Maximum Refresh Interval	50ms / 20Hz
Absolute Maximum Refresh Interval*	10ms / 100Hz

Environment	Industrial Warehouse Manufacturing Retail Sports Tracking Livestock
UWB, Channel 5	6500 MHz / -41.3dBm
Bluetooth Low Energy	2400 MHz
Enclosure	no IP
Approvals	RED/CE

*not recommended - might lead to sub-optimal server performance.

2.8 Part Number

PN	Name
SWT05-01-00	Tag Leonardo Personal
SWT05-00-00	Tag Leonardo Personal OEM

OEM Partnumbers does not includes enclosures and are delivered in ESD bag.

Please read Tag Leonardo OEM Terms of Use(see page 24).

2.9 ⚠Safety and Proper Handling

- Do not use deformed or damaged product or battery.
- Do not modify the product.
- Protect the product from excessive moisture.
- Do not charge or use the product if liquid has entered.
- Protect the product from excessive heat.
- Do not expose the product to excessive pressure.
- Do not over-discharge the Tag's battery, below 2.75V. Over-discharging can damage the performance of the Tag's battery. It should be noted that the battery would be at an over-discharged state by its self-discharge characteristics in case the cell is not used for long time. In order to prevent over-discharging, the battery shall be charged periodically to maintain between 3.7V and 4.1V.

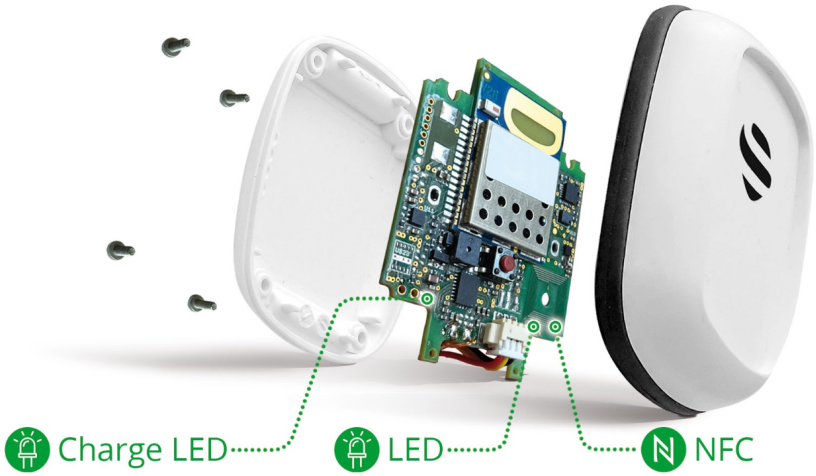
2.10 Tag Leonardo Personal Charging

Charging procedure

1. Put the tag on the Qi charger pad.
2. Charger should indicate charging status via LED within a few seconds, the same should be indicated on the tag' s charger LED.
3. Charging time for Tag Leonardo Personal is approximately 5,5 hours. (charging current set to 73mA)
4. After the charging is done, charger would indicate the ready status via LED.

Additional Instructions

- Charging can be done only within 0 ~ 45 °C, never charge the tag outside specified temperature range.
- Never put any other object between tag and charger.
- Charging can be done only with Qi compliant charger[22].
- Tag was tested with following Qi chargers: Samsung Fast Charge (EP-PN920), Samsung (EP-PA510), Adata (CW0050).



2.11 Tag Leonardo Personal Storage Consideration

The tags are equipped with Lithium polymer batteries. Over-discharging can damage the Tag's battery permanently. It should be noted that the battery would be at an over-discharged state by its self-discharge in case

22 https://en.wikipedia.org/wiki/Qi_(standard)

the cell is not used for a longer period. To prevent over-discharging, the tag's battery shall be charged periodically to maintain between 3.7V and 4.1V.

⚠ ☞ We recommend storage the tags in a power-off state. Tag should be charged before storing it in the warehouse.

⚠Once the Li-pol battery voltage drops below 3.0V[23], it is necessary to arrange the **recharging within days.** Otherwise, battery self-discharge can further deplete the battery, and it may not be rechargeable again.

2.11.1 Storage of tags in the power-off state

During long-term storage, it is recommended to check the condition of the batteries **every 3 months**, and if the voltage drops below 3.6V[24], the tags should be recharged.

2.11.2 Storage of tags in the power-on state

Only the tags with enabled Sleep mode can be stored in a power-on state. Otherwise, the tags would still transmit the UWB blinks, and the batteries would discharge quickly.

During long-term storage in the power-on state, the battery level should be **checked every 2 months**, and if the voltage drops below 3.6V[25], the tags should be recharged. If the tags in the warehouse are exposed to any vibrations that could wake them up from a sleep mode, the check period should be shortened.

⚠ **Storage with Sleeping mode**

Be sure the place where the tag with sleeping mode enabled is outside the busy area where frequent vibrations may occur. The vibration can wake up the tag, which then starts transmitting UWB blinks

On this page:

23 https://docs.sewio.net/display/PUB/Tag+Battery+Value
24 https://docs.sewio.net/display/PUB/Tag+Battery+Value
25 https://docs.sewio.net/display/PUB/Tag+Battery+Value

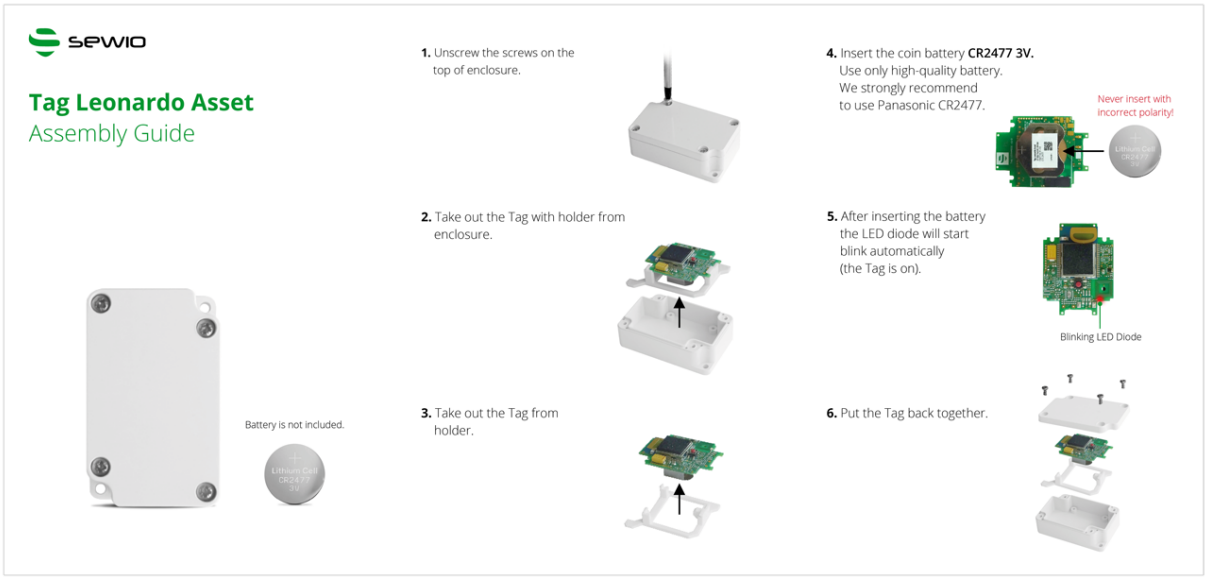
3 Tag Leonardo Asset

3.1 Overview

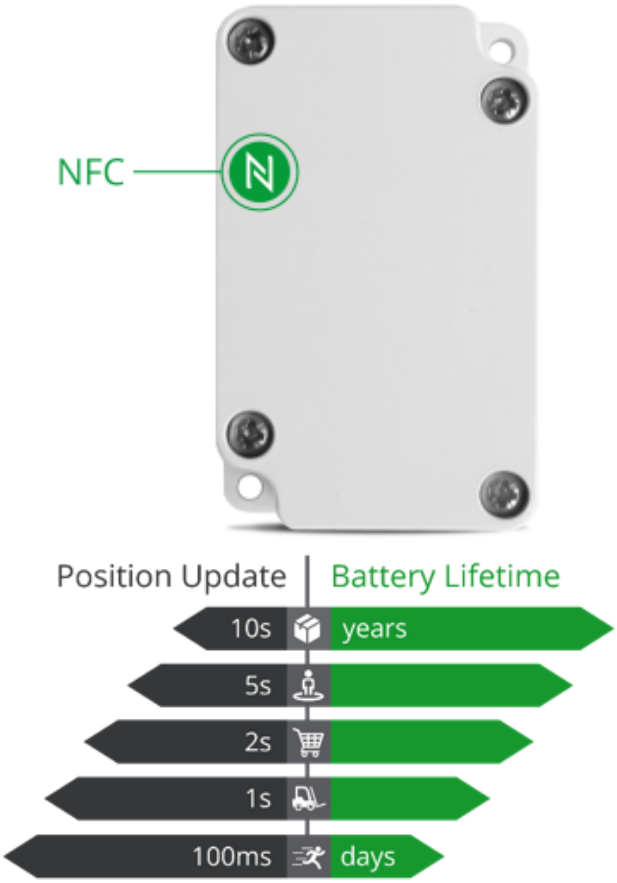
- Decawave UWB Radio, True Location
- Bluetooth Low Energy, BLE
- Near Field Communication, NFC
- Configurable via web browser and RTLS Studio
- Powered from 1000 mAh CR2477 battery (it is not included)

☞ Please read assembly guide before use:

Tag Leonardo Asset-Assembly Guide.pdf[26]



26 https://sewio.sharepoint.com/:b:/s/marketing/EfkWYgwa_MdLq-eachhH6XkBb8EnwDF4Tn_XpTmwRbkCwA?e=zfE9t5



Tag Leonardo is an active mobile locator providing **superior accuracy in real-time**. Its position could be reported from **milliseconds to minutes** covering broad spectrum of applications **from industrial projects to livestock.** Battery lifetime goes up to years.

3.2 Feature Set

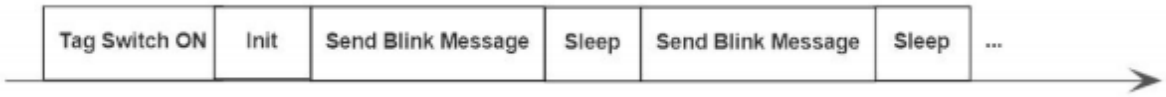
Feature	Description
POSITIONING	Accurate positioning based on integrated UWB radio. Tag emits UWB blinks and RTLS provides precise True Location via API.
MOTION DETECTOIN	Motion detection unit enables to save energy. The tag may transmit only during the movement.
FIRMWARE UPDATE	Bluetooth interface is used for wireless firmware update.

Feature	Description
CONFIGURATION	Tag Leonardo Asset is configured wirelessly[27] through RTLS Studio or via Android device through NFC[28] interface. NFC: Provides zero-spend energy reconfiguration. Tag Leonardo Asset might be reconfigured even without battery.

3.3 Switch on the Tag

Tag is initialized after it is turned on by holding the button for two seconds. For more info about the button functionality please continue here[29].

After the initialization phase, the tag sends location blink message periodically with given refresh interval. For time between position updates, the Tag goes into sleep modes. There are several sleep modes available suitable for different use-cases, please read more information here.



The blink message is received by set of Anchors [30]and it is forwarded to RTLS Studio[31] via Ethernet of WiFi backhaul, where position is calculated. The blink message can be optionally equipped with sensor data. All the data is further disseminated trough the API[32]. First steps with Sewio Real Time Location System are described here[33].

Please note that LED and button is not accessible once the enclosure is closed.

3.4 Tag Battery Lifetime

To read more about Tag's battery see section Tag Battery[34].

Also, see section about Charging (see page 8)and Storage Tag recommendation.(see page 9)

3.5 Number of Tags within RTLS System

Please read following section[35].

3.6 RF Profile

Please read following section[36].

27 https://docs.sewio.net/display/PUB/Tag+Wireless+Configuration
28 https://docs.sewio.net/display/PUB/Tag+Leonardo+NFC+Configuration
29 https://docs.sewio.net/display/PUB/User+Button
30 https://docs.sewio.net/display/PUB/Anchors
31 https://docs.sewio.net/display/PUB/RTLS+Studio
32 https://docs.sewio.net/display/PUB/API
33 https://docs.sewio.net/display/PUB/RTLS+UWB+Kit
34 https://docs.sewio.net/display/PUB/Tag+Battery
35 https://docs.sewio.net/pages/viewpage.action?pageId=3244815
36 https://docs.sewio.net/display/PUB/UWB+Channels+and+Profiles

3.7 Technical Parameters

Size	50 x 85 x 27
Weight	70 g
Power Supply	Coin Battery CR2477, 1000 mAh
Operating Conditions	-20 ~ 60 °C 20 – 85% humidity without condensation
Warm-up Time	Immediate
Absolute Maximum Refresh Intrval	50ms / 20Hz

Environment	Industrial Warehouse Manufacturing Retail Sports Tracking Livestock
UWB, Channel 5	6500 MHz / -41.3dBm
Bluetooth Low Energy	2400 MHz
Enclosure	IP65
Approvals	RED/CE FCC

3.8 Part Number

PN	Name
SWT04-01-00	Tag Leonardo Asset
SWT04-00-00	Tag Leonardo Asset OEM

OEM Part numbers does not include enclosures and are delivered in ESD bag.

Please read Tag Leonardo OEM Terms of Use(see page 24).

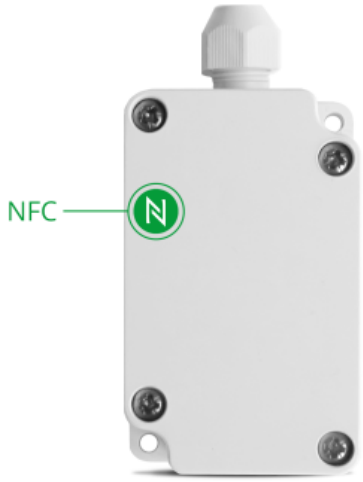
3.9 ⚠ Safety and Proper Handling

- Do not use deformed or damaged product or battery.
- Do not modify the product.
- Protect the product from excessive moisture.
- Do not use the product if liquid has entered.
- Protect the product from excessive heat.
- Do not expose the product to excessive pressure.

4 Tag Leonardo Vehicle

4.1 Overview

- Decawave UWB Radio, True Location
- Bluetooth Low Energy, BLE
- Near Field Communication, NFC
- Configurable via web browser and RTLS Studio
- 9-axis IMU (gyroscope / magnetometer / accelerometer)
- Barometer
- External Power Supply DC 7 - 35V



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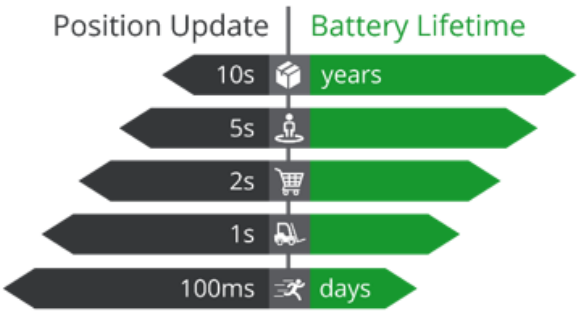


4.2 Feature Set

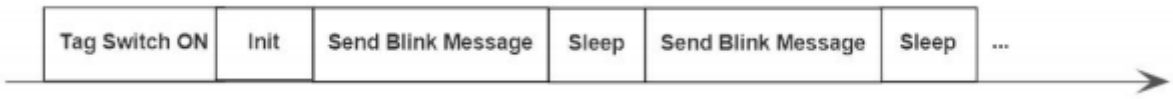
Feature	Description
POSITIONING	Accurate positioning based on integrated UWB radio. Tag emits UWB blinks and RTLS provides precise True Location via API.
MOTION DETECTOIN	Motion detection unit enables to save energy. The tag may transmit only during the movement.
FIRMWARE UPDATE	Bluetooth interface is used for wireless firmware update.
CONFIGURATION	Tag Leonardo Asset is configured wirelessly[37] through RTLS Studio or via Android device through NFC[38] interface. NFC: Provides zero-spend energy reconfiguration. Tag Leonardo Asset might be reconfigured even without battery.
RAW DATA SENSOR FUSION 3D ORIENTATION	Provides raw data from inertial unit for custom processing like hit/fall detection, jumps etc. or sensor fusion and 3D orientation. **Sensor End of Life** From December 2021, Tag Leonadrdo Vehicle does not includes gyroscope and magnetometer sensors. See block post in connection with HW change → News on Sewio Portal[39].
BAROMETER	Available for Tag Leonardo Vehicle OEM. Barometric measurement is not reachable on Tag Leonardo Vehicle since enclosure sealing. Provides raw atmospheric pressure data or could be used for direct Z-axis estimation.

4.3 Switch on the Tag

Tag is initialized after it is turned on by holding the button for two seconds. For more info about the button functionality please continue here[40].

After the initialization phase, the tag sends location blink message periodically with given refresh interval. For time between position updates, the Tag goes into sleep modes. There are several sleep modes available suitable for different use-cases, please read more information here.

37 https://docs.sewio.net/display/PUB/Tag+Wireless+Configuration
38 https://docs.sewio.net/display/PUB/Tag+Leonardo+NFC+Configuration
39 https://portal.sewio.net/news/sunsetting_of_the_imu_sensor_in_our_tag_leonardo_portfolio
40 https://docs.sewio.net/display/PUB/User+Button



The blink message is received by set of Anchors [41]and it is forwarded to RTLS Studio[42] via Ethernet of WiFi backhaul, where position is calculated. The blink message can be optionally equipped with sensor data. All the data is further disseminated trough the API[43]. First steps with Sewio Real Time Location System are described here[44].

Please note that LED and button is not accessible once the enclosure is closed.

4.4 Power Supply

Tag Leonardo Vehicle is designed for external power supply DC 7-35 V.

Polarity:

- **Red** cable is **POSITIVE**
- **Blue** cable is **NEGATIVE**

Tag does not contains battery.

4.5 Number of Tags within RTLS

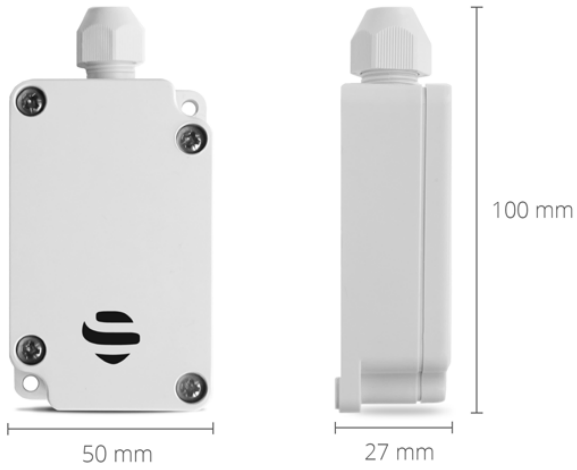
Please read following section[45].

4.6 RF Profile

Please read following section[46].

4.7 Technical Parameters

41 https://docs.sewio.net/display/PUB/Anchors
42 https://docs.sewio.net/display/PUB/RTLS+Studio
43 https://docs.sewio.net/display/PUB/API
44 https://docs.sewio.net/display/PUB/RTLS+UWB+Kit
45 https://docs.sewio.net/pages/viewpage.action?pageId=3244815
46 https://docs.sewio.net/display/PUB/UWB+Channels+and+Profiles



Size	50 x 100 x 27
Weight	104 g
Power Supply	External DC 7 - 35 V
Operating Conditions	-20 ~ 60 °C 20 – 85% humidity without condensation
Warm-up Time	Immediate
Maximum Refresh Interval	50ms / 20Hz
Absolute Maximum Refresh Interval*	10ms / 100Hz
Environment	Industrial Warehouse Manufacturing Retail Livestock
UWB, Channel 5	6500 MHz / -41.3 dBm
Bluetooth Low Energy	2400 MHz
Enclosure	IP65

Approvals	RED/CE

*not recommended - might lead to sub-optimal server performance

4.8 Part Number

PN	Name
SWT07-01-00	Tag Leonardo Vehicle
SWT07-00-00	Tag Leonardo Vehicle OEM

OEM Part numbers does not include enclosures and are delivered in ESD bag.

Please read Tag Leonardo OEM Terms of Use(see page 24).

4.9 ⚠ Safety and Proper Handling

- Do not use deformed or damaged product or battery.
- Do not modify the product.
- Protect the product from excessive moisture.
- Do not use the product if liquid has entered.
- Protect the product from excessive heat.
- Do not expose the product to excessive pressure.

5 Tag Leonardo OEM

5.1 Overview

- Decawave UWB Radio, True Location
- Bluetooth Low Energy, BLE
- Near Field Communication, NFC
- Configurable via web browser and RTLS Studio
- Power Supply Options
    - 300 mAh Li-pol battery + Wireless Charge
    - CR2477 1000mAh coin battery
    - External power supply DC 7-35V
- Sensor Options
    - Accelerometer
    - Barometer
- Variants available
    - Tag Leonardo Asset OEM
    - Tag Leonardo Personal OEM
    - Tag Leonardo Vehicle OEM

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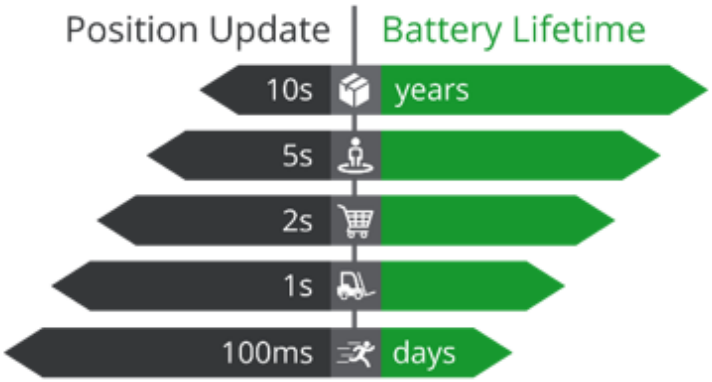
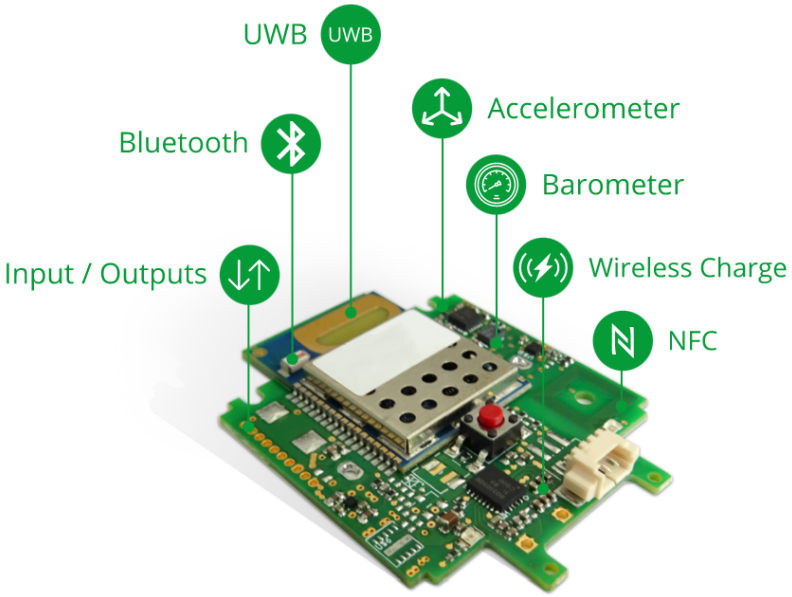


5.2 Feature Set

Tag feature set available on each Tag Leonardo OEM variant is described here[47] (table at the bottom of page).



usage	description
POSITIONING	Accurate positioning based on integrated UWB radio. Tag emits UWB blinks and RTLS provides precise True Location via API.
MOTION DETECTION	Motion detection unit enables to save energy. The tag may transmit only during the movement.

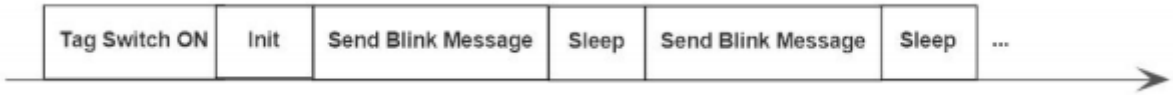
47 https://docs.sewio.net/display/PUB/Tags

usage	description
FIRMWARE UPDATE	Bluetooth interface is used for wireless firmware update.
CONFIGURATION	Tag Leonardo Asset is configured wirelessly[48] through RTLS Studio or via Android device through NFC[49] interface. NFC: Provides zero-spend energy reconfiguration. Tag Leonardo Asset might be reconfigured even without battery.
Z-AXIS	Provides raw atmospheric pressure data or could be used for direct Z-axis estimation. Available only for Tag Leonardo Personal and Vehicle.

5.3 Switch On the Tag

Tag is initialized after it is turned on by holding the button for two seconds. For more info about the button functionality please continue here[50].

After the initialization phase, the tag sends location blink message periodically with given refresh interval. For time between position updates, the Tag goes into sleep modes. There are several sleep modes available suitable for different use-cases, please read more information here.



The blink message is received by set of Anchors [51]and it is forwarded to RTLS Studio[52] via Ethernet of WiFi backhaul, where position is calculated. The blink message can be optionally equipped with sensor data. All the data is further disseminated trough the API[53]. First steps with Sewio Real Time Location System are described here[54].

5.4 Tag Battery Lifetime

To read more about Tag's battery see section Tag Battery[55].

Also, see section about **Charging** (see page 8)and Storage Tag recomendation. (see page 9)

5.5 Number of Tags within RTLS System

Please read following section[56].

48 https://docs.sewio.net/display/PUB/Tag+Wireless+Configuration
49 https://docs.sewio.net/display/PUB/Tag+Leonardo+NFC+Configuration
50 https://docs.sewio.net/display/PUB/User+Button
51 https://docs.sewio.net/display/PUB/Anchors
52 https://docs.sewio.net/display/PUB/RTLS+Studio
53 https://docs.sewio.net/display/PUB/API
54 https://docs.sewio.net/display/PUB/RTLS+UWB+Kit
55 https://docs.sewio.net/display/PUB/Tag+Battery
56 https://docs.sewio.net/pages/viewpage.action?pageId=3244815

5.6 RF Profile

Please read following section[57].

5.7 Part Number and Dimensions

PN	Name	Dimensions *
SWT04-00-00	Tag Leonardo Asset OEM	pdf[58]
SWT05-00-00	Tag Leonardo Personal OEM	pdf[59]
SWT07-00-00	Tag Leonardo Vehicle OEM	pdf[60]

*Mechanical 3D models are available via Tag Technology License Agreement[61].

5.8 ⚠Safety and Proper Handling

- Read Tag Leonardo OEM Terms of Use[62] carefully.
- Do not use deformed or damaged product or battery.
- Do not modify the product.
- Protect the product from excessive moisture.
- Do not charge or use the product if liquid has entered.
- Protect the product from excessive heat.
- Do not expose the product to excessive pressure.

5.9 Tag Leonardo OEM Terms of Use

Tag Leonardo OEM includes products:

- Tag Leonardo Personal OEM
- Tag Leonardo Asset OEM
- Tag Leonardo Vehicle OEM

Tag Leonardo OEM shall not be considered a finished end-product fit for general consumer use. Sewio assumes no liability for putting Tag Leonardo OEM on the market. Persons handling the product(s) must have electronics training and observe good engineering practice standards. As such, the goods being provided are not intended to be complete in terms of required design-, marketing-, and/or manufacturing-related protective considerations, including product safety and environmental measures typically found in end products that incorporate such semiconductor components or circuit boards.

Incorporating Tag Leonardo OEM into your own product may require re-certification.

57 https://docs.sewio.net/pages/viewpage.action?pageId=1018203
58 https://sewio.sharepoint.com/:b:/s/Releases/EbUl0kftVjlFk-DF5vY41_QBcxQJnIxuUl6OL9DGMKTF0A?e=wDYlOV
59 https://sewio.sharepoint.com/:b:/s/Releases/ETkXyxbTUSNMs0KeK9FjVmsBb0WwqEnQ5xXj4AUTsaLwXA?e=vysjzT
60 https://sewio.sharepoint.com/:b:/s/Releases/EdwGUm3fhvJIrL5GTsgjKVoBbI9nKVd4SBgTjnWU6sqZww?e=Ab6x6k
61 https://portal.sewio.net/download/tag-technology-license-agreement/
62 https://docs.sewio.net/docs/tag-leonardo-oem-terms-of-use-3244931.html

Following standards should be considered before putting final product on EU market:
Device Safety EN 62368-1 and Radio Equipment Directive 2014/53/EU.

Technical Requirements

- Tag Leonardo OEM should not be placed into other than plastic enclosure.
- No metal parts including wires should be in a proximity to the Tag Leonardo OEM board as they can affect the antenna radiation pattern.

Here are product items which should be specifically considered:

- revising product labeling, technical documentation, and declaration of conformity as appropriate
- amending risk management procedures e.g., gap measurement, sample testing and complaints monitoring

Caution! ESD sensitive device. Precaution should be used when handling the device in order to prevent permanent damage.

6 Other Tags

Sewio has got two older tags:

Sewio UWB Tag Types:

- Tag Leonardo iMU(see page 26) END OF LIFE – a tag with the full feature set and all available sensors for projects requiring data fusion from multiple sources fitting entertainment, retail, sports, museums, and the healthcare industry
- Tag Piccolino(see page 33) END OF LIFE – smallest OEM version of Tag and most affordable tags for indoor tracking projects

6.1 Tag Features Overview

See the strengths of each edition in the list and table below.

		Power Supply				Feature Set					Sensors				
Tag Name	**Enclosure**	Battery[63]	**Rechargeable**	Wireless Charging(see page 31)	**External Power**	Motion Detection[64]	**Z-axis barometer**[65] BETA	BLE[66]	NFC[67]	Button[68]	**acc**	**gyro**	**mag**	**temp**	**baro**
LEONARDO IMU LEONARDO IMU OEM	no IP	Li-pol 300 mAh	✓	✓	✗	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
PICCOLINO PICCOLINO OEM	no IP	CR2450 600 mAh	✗	✗	✗	✓	✗	✗	✗	✓ (OEM only)	✓	✗	✗	✗	✗

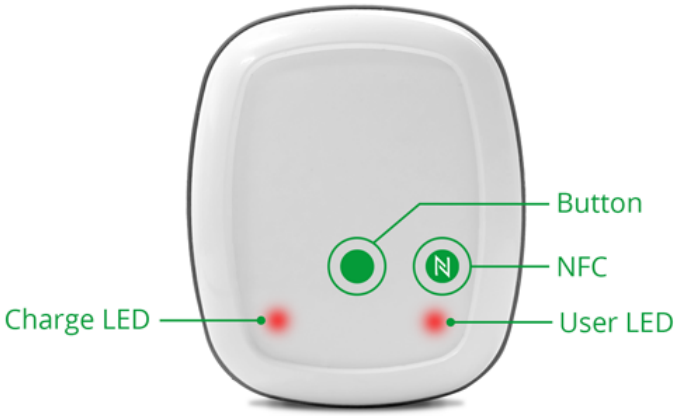
6.2 Tag Leonardo iMU

Product Stage: END OF LIFE

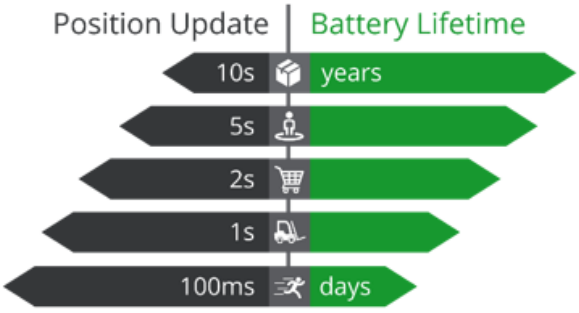
63 https://docs.sewio.net/display/PUB/Tag+Battery
64 https://docs.sewio.net/display/PUB/Motion+Detection+and+Sleep+Modes
65 https://docs.sewio.net/display/PUB/Z-Axis+with+Barometer%2C+Configuration
66 https://docs.sewio.net/display/PUB/Tag+Firmware
67 https://docs.sewio.net/display/PUB/Tag+Leonardo+NFC+Configuration
68 https://docs.sewio.net/display/PUB/User+Button

6.2.1 Overview

- Decawave UWB Radio, True Location
- Bluetooth Low Energy, BLE
- Near Field Communication, NFC
- Wireless Charge
- Configurable via web browser and RTLS Studio
- 300 mAh Li-pol battery
- **9-axis IMU (gyroscope / magnetometer / accelerometer)**
- **Barometer**



Tag Leonardo is an active mobile locator providing **superior accuracy in real-time**. Its position could be reported from **milliseconds to minutes** covering broad spectrum of applications **from industrial projects to livestock.** Battery lifetime goes up to years.



6.2.2 Feature Set

Feature	Description
POSITIONING	Accurate positioning based on integrated UWB radio. Tag emits UWB blinks and RTLS provides precise True Location via API.
MOTION DETECTOIN	Motion detection unit enables to save energy. The tag may transmit only during the movement.
FIRMWARE UPDATE	Bluetooth interface is used for wireless firmware update.
CONFIGURATION	Tag Leonardo Asset is configured wirelessly[69] through RTLS Studio or via Android device through NFC[70] interface. NFC: Provides zero-spend energy reconfiguration. Tag Leonardo Asset might be reconfigured even without battery.
RAW DATA SENSOR FUSION 3D ORIENTATION	Provides raw data from inertial unit for custom processing like hit/fall detection, jumps etc. or sensor fusion and 3D orientation.
BAROMETER	Provides raw atmospheric pressure data or could be used for direct Z-axis estimation. Available only for Tag Leonardo IMU

The only difference between Tag Leonardo iMU and Tag Leonardo Personal are additional sensors: 9-axis inertial unit and barometer equipped with Tag Leonardo iMU.

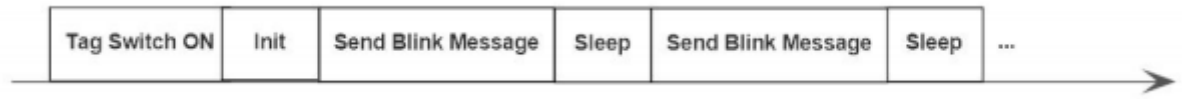
6.2.3 Switch On the Tag

Tag is initialized after it is turned on by holding the button for two seconds. For more info about the button functionality please continue here[71].

If the tag's battery is depleted, it is **powered ON automatically during the charging** once the battery voltage reaches 3.3 V.

After the initialization phase, the tag sends location blink message periodically with given refresh interval. For time between position updates, the Tag goes into sleep modes. There are several sleep modes available suitable for different use-cases, please read more information here.

69 https://docs.sewio.net/display/PUB/Tag+Wireless+Configuration
70 https://docs.sewio.net/display/PUB/Tag+Leonardo+NFC+Configuration
71 https://docs.sewio.net/display/PUB/User+Button



The blink message is received by set of Anchors [72]and it is forwarded to RTLS Studio[73] via Ethernet of WiFi backhaul, where position is calculated. The blink message can be optionally equipped with sensor data. All the data is further disseminated trough the API[74]. First steps with Sewio Real Time Location System are described here[75].

6.2.4 Tag Battery

To read more about Tag's battery see section Tag Battery[76].

Also, see section about **Charging** (see page 8)and Storage Tag recomendation. (see page 9)

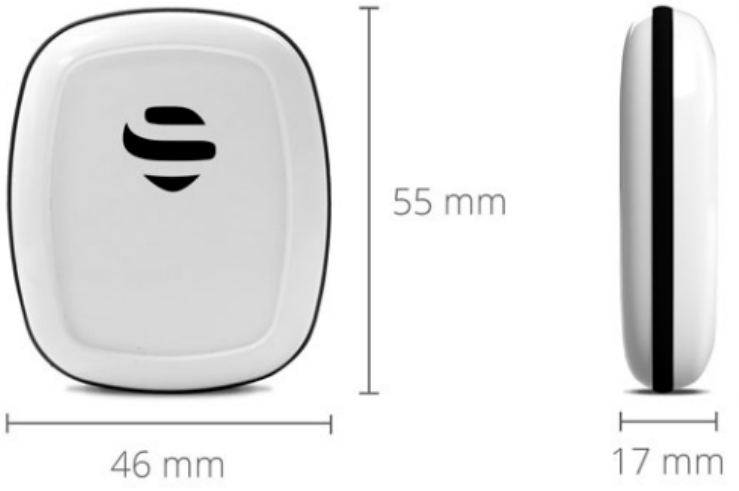
6.2.5 Number of Tags within RTLS System

Please read following section(see page 26).

6.2.6 RF Profile

Please read following section[77].

6.2.7 Technical Parameters



72 https://docs.sewio.net/display/PUB/Anchors
73 https://docs.sewio.net/display/PUB/RTLS+Studio
74 https://docs.sewio.net/display/PUB/API
75 https://docs.sewio.net/display/PUB/RTLS+UWB+Kit
76 https://docs.sewio.net/display/PUB/Tag+Battery
77 https://docs.sewio.net/display/PUB/UWB+Channels+and+Profiles

Size	46 x 55 x 17
Weight	30 g
Power Supply	Internal Li-pol 300 mAh
Operating Conditions	-20 ~ 60 °C 20 – 85% humidity without condensation
Charging Temperature	0 ~ 45 °C
Charging Device	Only Qi compliant charger.
Charging Time / Current	5.5h / 73mA
Warm-up Time	Immediate
Maximum Refresh Interval	50ms / 20Hz
Absolute Maximum Refresh Interval*	10ms / 100Hz
Environment	Industrial Warehouse Manufacturing Retail Sports Tracking Livestock
UWB, Channel 5	6500 MHz / -41.3dBm
BlueTooth Low Energy	2400 MHz
Approvals	RED/CE

*not recommended - might lead to sub-optimal server performance

6.2.8 Part Number

PN	Name
SWT06-01-00	Tag Leonardo iMU
SWT06-00-00	Tag Leonardo iMU OEM

OEM Partnumbers does not includes enclosures and are delivered in ESD bag.

Please read Tag Leonardo OEM Terms of Use(see page 24).

6.2.9 ⚠Safety and Proper Handling

- Do not use deformed or damaged product or battery.
- Do not modify the product.
- Protect the product from excessive moisture.
- Do not charge or use the product if liquid has entered.
- Protect the product from excessive heat.
- Do not expose the product to excessive pressure.
- Do not over-discharge the Tag's battery, below 2.75V. Over-discharging can damage the performance of the Tag's battery. It should be noted that the battery would be at an over-discharged state by its self-discharge characteristics in case the cell is not used for long time. In order to prevent over-discharging, the battery shall be charged periodically to maintain between 3.7V and 4.1V.

6.2.10 Tag Leonardo iMU Charging

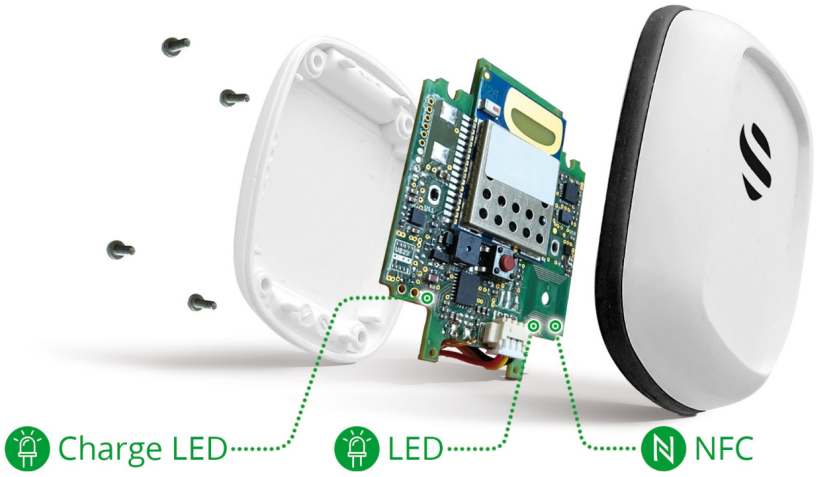
Charging procedure

1. Put the tag on the Qi charger pad.
2. Charger should indicate charging status via LED within a few seconds, the same should be indicated on the tag' s charger LED.
3. Charging time for Tag Leonardo Personal is approximately 5,5 hours. (charging current set to 73mA)
4. After the charging is done, charger would indicate the ready status via LED.

Additional Instructions

- Charging can be done only within 0 ~ 45 °C, never charge the tag outside specified temperature range.
- Never put any other object between tag and charger.
- Charging can be done only with Qi compliant charger[78].
- Tag was tested with following Qi chargers: Samsung Fast Charge (EP-PN920), Samsung (EP-PA510), Adata (CW0050).

78 https://en.wikipedia.org/wiki/Qi_(standard)



6.2.11 Tag Leonardo iMU Storage Consideration

The tags are equipped with Lithium polymer batteries. Over-discharging can damage the Tag's battery permanently. It should be noted that the battery would be at an over-discharged state by its self-discharge in case the cell is not used for a longer period. To prevent over-discharging, the tag’s battery shall be charged periodically to maintain between 3.7V and 4.1V.

⚠ ☞ We recommend storage the tags in a power-off state. Tag should be charged before storing it in the warehouse.

⚠ ⚠Once the Li-pol battery voltage drops below 3.0V[79], it is necessary to arrange the **recharging within days.** Otherwise, battery self-discharge can further deplete the battery, and it may not be rechargeable again.

79 https://docs.sewio.net/display/PUB/Tag+Battery+Value

Storage of tags in the power-off state

During long-term storage, it is recommended to check the condition of the batteries **every 3 months**, and if the voltage drops below 3.6V[80], the tags should be recharged.

Storage of tags in the power-on state

Only the tags with enabled Sleep mode can be stored in a power-on state. Otherwise, the tags would still transmit the UWB blinks, and the batteries would discharge quickly.

During long-term storage in the power-on state, the battery level should be **checked every 2 months**, and if the voltage drops below 3.6V[81], the tags should be recharged. If the tags in the warehouse are exposed to any vibrations that could wake them up from a sleep mode, the check period should be shortened.

> **Storage with Sleeping mode**
>
> Be sure the place where the tag with sleeping mode enabled is outside the busy area where frequent vibrations may occur. The vibration can wake up the tag, which then starts transmitting UWB blinks

On this page:

6.3 Tag Piccolino

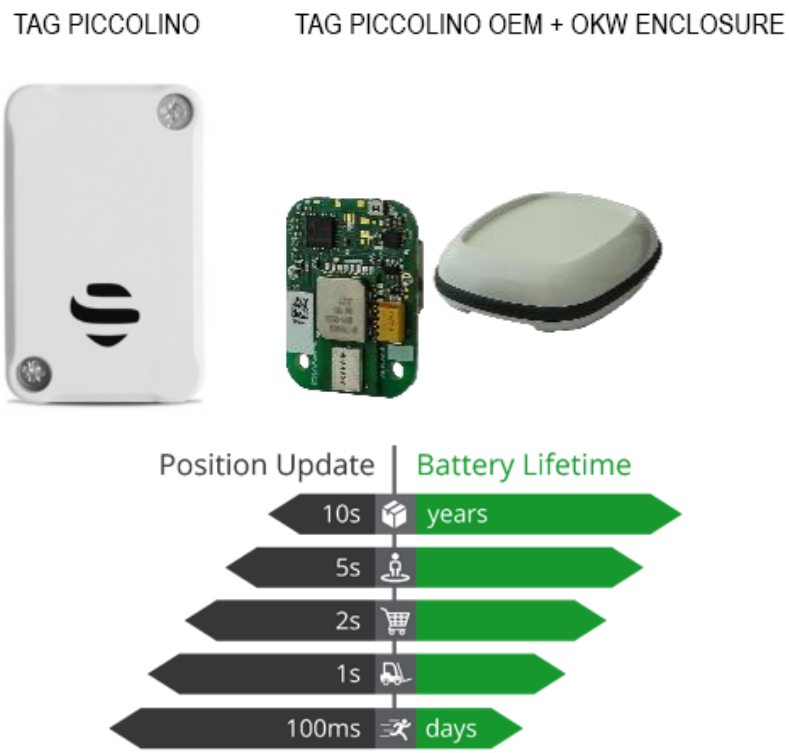
Product Stage: END OF LIFE

6.3.1 Overview

- Decawave UWB Radio, True Location
- Movement Detection / Sensor Data
- Powered from coin battery CR2450 600mAh
- Wireless Tag Configuration via RTLS Studio

Datasheet Factsheet

80 https://docs.sewio.net/display/PUB/Tag+Battery+Value
81 https://docs.sewio.net/display/PUB/Tag+Battery+Value



Tag Leonardo is an active mobile locator providing **superior accuracy in real-time**. Its position could be reported from **milliseconds to minutes** covering broad spectrum of applications **from industrial projects to livestock.** Battery lifetime goes up to years.

6.3.2 Feature Set

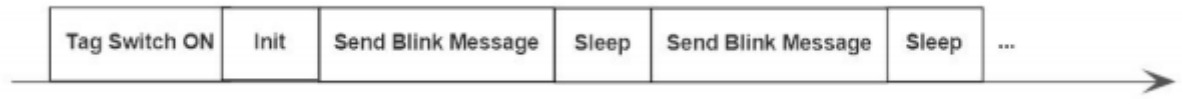
Feature	Description
POSITIONING	Accurate positioning based on integrated UWB radio. Tag emits UWB blinks and RTLS provides precise True Location via API.

6.3.3 Switch on the Tag

Tag is initialized after it is turned on by holding the button for two seconds. For more info about the button functionality please continue here[82].

After the initialization phase, the tag sends location blink message periodically with given refresh interval. For time between position updates, the Tag goes into sleep modes. There are several sleep modes available suitable for different use-cases, please read more information here.

82 https://docs.sewio.net/display/PUB/User+Button



The blink message is received by set of Anchors [83]and it is forwarded to RTLS Studio[84] via Ethernet of WiFi backhaul, where position is calculated. The blink message can be optionally equipped with sensor data. All the data is further disseminated trough the API[85]. First steps with Sewio Real Time Location System are described here[86].

6.3.4 Tag Battery Lifetime

To read more about Tag's battery see section Tag Battery[87].

Also, see section about **Charging** (see page 8)and Storage Tag recommendation.(see page 9)

6.3.5 Number of Tags within RTLS System

Please read following section[88].

6.3.6 RF Profile

Please read following section[89].

6.3.7 Part Number

PN	Name
SWT03-02-00	Tag Piccolino (Industrial Housing)
SWT03-00-00	Tag Piccolino OEM

Tag Piccolino OEM does not includes enclosure, and it is delivered in ESD bag.

6.3.8 ⚠Safety and Proper Handling

- Do not use deformed or damaged product or battery.
- Do not modify the product.
- Protect the product from excessive moisture.
- Do not charge or use the product if liquid has entered.
- Protect the product from excessive heat.

83 https://docs.sewio.net/display/PUB/Anchors
84 https://docs.sewio.net/display/PUB/RTLS+Studio
85 https://docs.sewio.net/display/PUB/API
86 https://docs.sewio.net/display/PUB/RTLS+UWB+Kit
87 https://docs.sewio.net/display/PUB/Tag+Battery
88 https://docs.sewio.net/pages/viewpage.action?pageId=3244815
89 https://docs.sewio.net/display/PUB/UWB+Channels+and+Profiles

- Do not expose the product to excessive pressure.

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