# Hardware Overview

### About this document

This document is supplied as a part of the Reactec Eco-System.

### Intended purpose

This document is intended to outline the specification details of the hardware within theReactec Eco-System.

### Intended audience

This document is intended for all users of the Reactec Eco-System.

**Original instructions**

**Read this document before using the equipment**

**Retain this document for future use**

## Document information

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## Conventions used

This guide uses the following formats for safety notices.



**WARNING**

Provides important information to prevent serious problems, for example, the loss of data.



**Caution**

Provides important information to prevent serious problems, for example, the loss of data.



**Information**

Provides additional information.



**Tip**

Provides useful hints and tips.

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# 1 Reactec Eco-System

The Reactec Eco-System is a group of hardware and software components which allow the collection, organisation, and analysis of HAV (Hand Arm Vibration) exposure data, proximity data and other health risk data.

The main component of the Reactec Eco-System is the watch worn by the Operator. The watch is part of the R-LINK and HAVwear eco-systems.



**WARNING**

If the equipment described in this guide is used in a manner not specified by Reactec, the protection provided by the equipment may be impaired

## 1.1 R-LINK eco-system

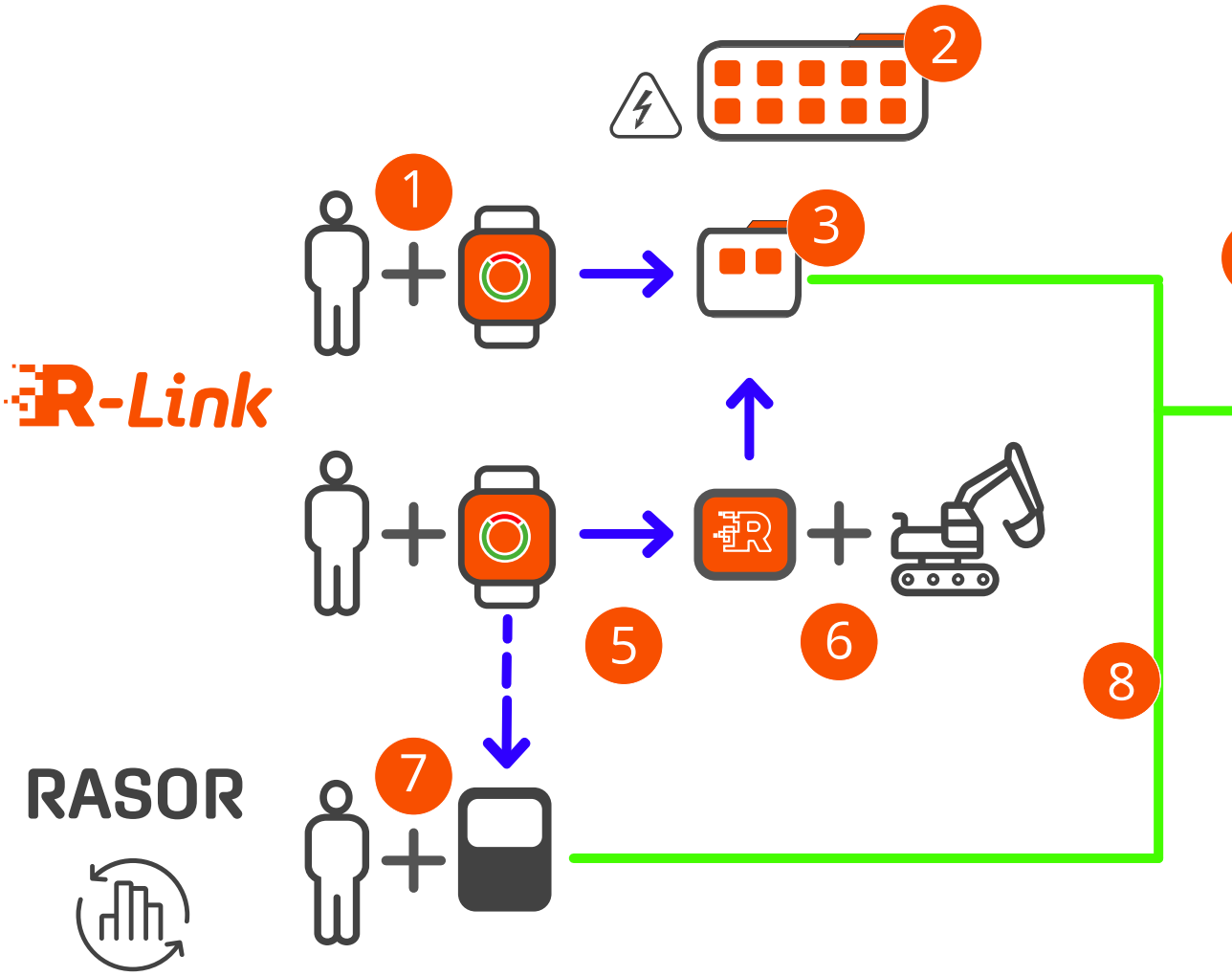



Figure 1 - R-LINK eco-system

| | | |
|---|---|---|
| 1 | R-LINK watch | Used to collect HAV and other important information. Also used to notify users of any potential hazards. |
| 2 | Charging station | Used to quickly charge the R-LINK watches. |
| 3 | 2 Bay Gateway | Used to charge two R-LINK watches and to collect data from the R-LINK watch and to then transmit this data, using mobile or networked connection, to be analysed using the cloud-based Reactec Analytics. |
| 4 | Reactec Analytics | Cloud-based software for reporting and managing your users, tools, and plant. |

| | | |
|---|---|---|
| 5 | Data transfer using Bluetooth | Data transfer from R-LINK watches to the Gateway, Beacon, or RASOR. |
| 6 | Beacon | Attached to equipment or fixed location and used to highlight potential hazards or proximity issues. |
| 7 | RASOR | Optional: RASOR captures real-time, multiple workforce risks and supports remote and lone workers with location information, slips/trips and fall detection. |
| 8 | Data transfer to Reactec Analytics | Data transmitted to Reactec Analytics using mobile or networked connection. |

## 1.2 HAVwear eco-system

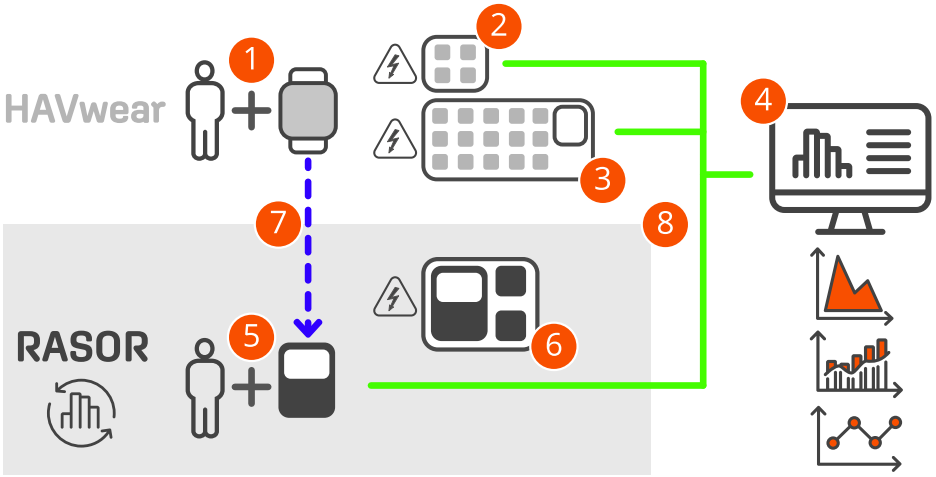



Figure 2 - HAVwear eco-system

| | | |
|---|---|---|
| 1 | HAVwear watch | Used to track HAV exposure. |
| 2 | 4-bay docking station | Used to charge four HAVwear watches and to transmit HAV data to Reactec Analytics. |
| 3 | 15-bay docking station | Used to charge 15 HAVwear watches and to transmit HAV data to Reactec Analytics. |
| 4 | Reactec Analytics | Cloud-based software for reporting and managing your users, tools, and plant. |
| 5 | RASOR | Optional: RASOR captures real-time, multiple workforce risks and supports remote and lone workers with location information, slips/trips and fall detection. |
| 6 | HAVwear Dual charger | Used to charge RASOR and two HAVwear watches. |

| | | |
|---|---|---|
| 7 | Data transfer using Bluetooth | Data transfer from HAVwear watches to RASOR. |
| 8 | Data transfer to Reactec Analytics | Data transmitted to Reactec Analytics using mobile or networked connections. |

## 1.3 Employer's responsibility

The employer is the person who operates and manages the Reactec Eco-System or allows a third party to use the system and bears legal responsibility for the system during operation for the protection of the user, personnel or third party.

### 1.3.1 Vibration regulations

When monitoring vibration exposure Reactec's wearables, HAVwear, and the R-LINK watches use a traffic light system to warn of exposure levels. The indicator lights are related to the HSE Control of Vibration at Work Regulations 2005 (Vibration Regulations).

The vibration regulations include an Exposure Action Value (EAV) and an Exposure Limit Value (ELV) based on the vibration at the grip or contact points on vibrating tools or equipment and the time spent using the equipment.



**Information**

EAV: Daily exposure to vibration of 2.5 $m/s^2$ over 8 hours that represents a clear risk requiring management. Equivalent to 100 points.

ELV: Daily exposure to vibrations of 5$m/s^2$ over 8 hours that represents a high risk above which employees must not be exposed. Equivalent to 400 points.

As an employer you may choose lower EAV or ELV threshold values depending on individual or collective risk factors or historical vibration exposure. Organisations may also use alternative values in accordance with their policies.

The watch calculates and records HAV exposure caused by operating a tool. The watch display shows the number of points the Operator has accumulated during a shift when working with vibrating tools, or alternatively displays the time remaining to reach a threshold while using a tool based on the current tool's vibration level and the exposure points already accumulated.

In addition, a colour coded indicator shows the Operator's HAV exposure relative to their EAV and ELV values.

**Table 1 - A colour-coded indicator shows Operator HAV exposure relative to EAV & ELV.**

| Indicator | Definition | HAV exposure |
|---|---|---|
| Green | Go | Below EAV.<br>Aim to stay in this region. |
| Amber | Be aware | EAV exceeded.<br>Reduce tool usage, share workload.<br>Supervisors on alert. |
| Red | Stop | ELV exceeded.<br>Stop using hand-held power tools. |

### 1.3.2 Tool tag programming

It is the employer's responsibility to adhere to legal requirements applicable to workplace health and safety and to determine vibrations that are representative of the actual vibration emissions applicable during tool use.



**Information**

Detailed information is available on the HSE website: https://www.hse.gov.uk/vibration/hav/index.htm.

Typically, there are two sources of vibration data for the purpose of calculating HAV exposure points:

- The published manufacturer's data
- Vibration measurements taken by a competent individual in the workplace

Manufacturer's test methods may not represent the vibration levels in the workplace and results can vary significantly. The employer is responsible for determining the most appropriate vibration magnitude to use in a HAV risk assessment, considering the influence of factors including:

- Variation over time
- Variation by specific task
- Variation by user
- Correct maintenance of tools and accessories

### 1.3.3 Watch exposure points

The watch calculates vibration exposure points using the HSE points system. Exposure points are calculated based on two methods:

1. Tool Exposure Points (TEP):

   The length of time a tool is in use, trigger time, and the vibration value that is programmed on the Tool Tag are combined using the HSE HAV exposure point calculation.

   It is important that the employer programs the Tool Tag with a vibration value that is representative of the actual vibration emission of the tool over time. This should take into account the specific tasks it is used for and other parameters that can cause variation.

2. Sensed Exposure Points (SEP):

   The watch has an internal capability based on the use of a tri-axial accelerometer to sense the vibration magnitude where the watch is attached to the wrist and applies an algorithm to adjust for the transmissibility through the hand to the wrist to give an approximation of the vibration at the grip point. This vibration magnitude is not compliant to the ISO standard BS EN ISO 5349 (ISO 5349) because the standard defines methods required to make measurements on a tool.

   Concurrent tool testing can be used to determine if the watch data is comparable with an ISO 5349 tool evaluation on a periodic basis.

   The watch uses the HSE calculation methodology to calculate SEP based on the length of time a tool is in use (trigger time) and the vibration magnitude sensed by the watch during use. This functionality is included for customers to determine if the sensed vibration is a more realistic representation of the risk experienced by the tool user than the static data programmed in the tool tag.



**Tip**

If SEP data is used to manage risk, the employer is responsible for determining if the watch SEP is a safe estimate of the risk faced by their employees.

**Information**

For more information on the HSE points system, refer to http://www.hse.gov.uk/vibration/hav/regulations.htm

### 1.3.4 Vibration measurement guidance

Reactec Analytics reports data collected at the point of attachment of the watch to the tool operator's wrist.

This data can be used for the following:

- To indicate a more representative vibration exposure
- To identify tool tagging errors

  Indicated by large variations to tool tag values
- To monitor the wearing of tools

  Indicated by changing measured values with time
- To identify potential operator misuse or unsafe use of tools

  Indicated by large variations to the tool tag data and or large variations between operators using the same tool
- To assess tool tag programmed values for appropriateness to the actual use of the tool

### 1.3.5 Data group management

To help analyse and report on the data gathered by the Reactec Eco-System, data can be organised into groups to create granular reports. Reactec Analytics can filter all reports to allow viewing of data by group, region, or division.

Data can be assigned to groups to reflect relationships, for example, by project. You can capture additional levels of organisation by categorising groups by region or division.

**Tip**

There is no hierarchy between regions and divisions.

#### 1.3.5.1 Example

An organisation works on civil engineering projects throughout the UK. Management responsibility is organised by region and project type. Therefore, management requires HSE reports for individual projects as well as for each region and project type.

This can be described by the following organisation units:

- Regions, for example, Scotland, Northern Ireland, England, Wales
- Divisions, for example, Roads, Rail, Demolition
- Individual projects split across locations

To produce the required reports for this organisational structure using Reactec Analytics, follow these steps:

1. Create a group for each project.
2. Assign operators or Reactec communicting devices to the appropriate group.

   This ensures that exposure data for Operators is assigned correctly, regardless of their location.
3. Create divisions for each project type and categorise the groups to the appropriate division.
4. Create regions and categorise the groups to the appropriate region.

Reports can now be run by filtering parts of the organisation as required.

**Table 2 - Example of group categorization**

| Group | Organisation Region | Organisation Division |
|---|---|---|
| Project A | Scotland | Road |
| Project B | Scotland | Rail |
| Project C | Northern Ireland | Road |
| Project D | England | Demolition |
| Project E | England | Rail |
| Project F | Wales | Road |

### 1.3.6 Location information

If a RASOR device is used by Operators while using the watch, the RASOR device collates location information using GPS technology to associate exposure data with a specific location.

When collecting data from nearby colleagues the RASOR device records the location of the RASOR user at the time it receives data from the colleagues' watch.



**Caution**

GPS technology only operates successfully outside of buildings.

### 1.3.7 Proximity (available for R-Link only)

The Proximity feature helps employers manage the movements of their employees by understanding when an R-LINK watch is within a prohibited distance of an R-LINK Beacon.

The Beacon is configured with a detection distance set in the Reactec Analytics. The Beacon is physically placed on a piece of equipment or vehicle around which the employer wants to set an exclusion zone. For larger pieces of equipment more than one Beacon may be needed.

When an R-LINK watch comes within the detection radius of the Beacon the R-LINK watch user receives a configurable alert that they are too close to the Beacon.

The R-LINK watch records data on how long the watch remained within the exclusion zone of the Beacon. Data on incursions within the exclusion zone of a Beacon help inform near misses and allow corrective actions on workflows or operator behaviour to be developed.



**WARNING**

The ability of a watch to warn of close proximity should not be relied upon as a fail-safe for collisions. The duty holder should verify satisfactory coverage has been achieved from the installed arrangement of Beacons, for example, checking for blind spots.

### 1.3.8 Social distancing (available for HAVwear only)

The SAFE-DISTANCE feature helps employers manage the movements of employees in accordance with Government guidance on social distancing.

For example, employers should plan work to ensure workers minimise time spent in close proximity to colleagues. Where possible, keep groups of workers working together in teams that are as small as possible (cohorting).

SAFE-DISTANCE is designed to indicate when two Reactec devices have come within an unsafe distance of each other for a period of time that indicates they are not social distancing.

SAFE-DISTANCE includes functionality to designate employees as belonging to a cohort; proximity time is recorded but does not cause watch alerts, and, when within a SAFE ZONE, any detections of other watches will not be recorded and will be regarded as false detections.



**Information**

The employer is responsible for implementing social distancing policies. SAFE-DISTANCE is an aid to provide auditable confidence of employee adherence to policy.

# 2 Reactec data protection

Reactec Analytics cloud servers that host customer data are managed by Microsoft Azure, a leading provider whose data centers are certified to ISO27001. The data center locations depend on which territory the customers are located in, please check with Reactec for your location.

## 2.1 Data transmission

Gateways, docking stations, and RASORs are collectively known as Reactec communicating devices.

Data collated by R-LINK, HAVwear, RASOR's and third-party sensors is transmitted from Reactec communication devices at regular intervals.

All data is encrypted during transmission using AES 128 CBC according to American National Standards NIST SP 800-38a. An IPSEC VPN is used between the Reactec communicating devices and the mobile phone service provider, and between them and Microsoft Azure.

Transmitted data is automatically allocated to a customer when the Reactec communicating device is allocated to a customer account. An unallocated Reactec communicating device will not function and transmit data, ensuring that data cannot be transmitted without the originator being known.

## 2.2 Data security

Data stored on Reactec Analytics web applications has a firewall to prevent intrusion and is backed up daily to a different server location. Standard Azure SQL transparent data encryption is used to encrypt data at rest using AES 256 encryption standard.

Reactec Analytics web applications and API’s are secured using TLS1.2 encryption, as are emails sent from the Analytics. The web application and network infrastructure are regularly penetration tested by a CREST certified third-party, and Azure vulnerability assessments and advanced threat protection features provide alerts on suspicious activity or changes to security baselines.

## 2.3 Data protection

For the purpose of data generated by Reactec Analytics, the reseller is a data processor only, and processes data on behalf of each customer, who remains the data controller as defined in the Data Protection Act 2018 or equivalent data protection law in other jurisdictions.



**Information**

The reseller is the system administrator commercially contracted as the supplier of access to the Reactec Analytics reports.

### 2.3.1 Software license

Upon first login to Reactec Analytics, every user is presented with the software license. The terms must be accepted to access Reactec Analytics. The software license includes a data processing agreement, so by accepting the terms, the customer gives the reseller and Reactec authority to manage and process personal data on their behalf.

The terms also give Reactec the right to use aggregated, anonymized data for analysis. Aggregated data is not confined to one customer, and the data is anonymized to remove individual and customer names. Reactec uses this “big data” to help improve the products and services offered.

### 2.3.2 Personal data

Personal data that is visible to the reseller to effectively support the system includes:

- Employee names
- ID numbers
- Authorised users' email addresses



**Information**

The reseller must be aware that some customers use National Insurance numbers or payroll numbers as ID numbers. Thus, even ID numbers can constitute personal data.

The reseller can view reports of customer data, but by default does not have access to vibration exposure reports, or other reports containing individuals' data, unless the customer chooses within the software to grant the reseller access, for example, to assist with a support issue. Such permissions can be time-limited and revoked by the customer.

Data permissions are set by the customer administrator from the ***Permissions*** tab. The ***Permissions*** tab is not visible to the reseller.

The data processor audit log allows customer administrators to identify when personal data has been accessed by reseller staff to ensure this is under authority from the customer.



**Information**

To ensure data security and validity is maintained, it is fundamental to the nature of the system that data records cannot be altered.

### 2.3.3 Customer responsibilities

Each customer is responsible for data access by their own authorised users. Access rights can vary depending on user types.

Employee access can be limited to viewing specific data or reports within specific groups. Reports can be extracted from the database at any time and can be emailed to selected authorised users.

As the Data Controller, the customer is responsible for data access requests by employees and for long-term storage of employee data. Suitable arrangements for appropriate long-term storage of paper or electronic reports must be made before their subscription expires.

In line with GDPR requirements for employee privacy, all SAFE-DISTANCE reports have an auto-deletion rule which can be configured to your business needs.

Upon termination of use of Reactec Analytics, Reactec can provide the customer with an export of data records from the database, if requested in writing within 30 days of termination.



**Information**

Reactec strongly recommends that the customer has a data policy covering use of, and access to, personal data, as well as user access and data protection policy for Reactec Analytics.

The customer's data controller must consider whether it has the necessary contents for gathering and processing personal data using Reactec Analytics.

# 3 R-LINK hardware

The R-LINK hardware is used to notify, collect and monitor your workers HAV and safety exposure information.

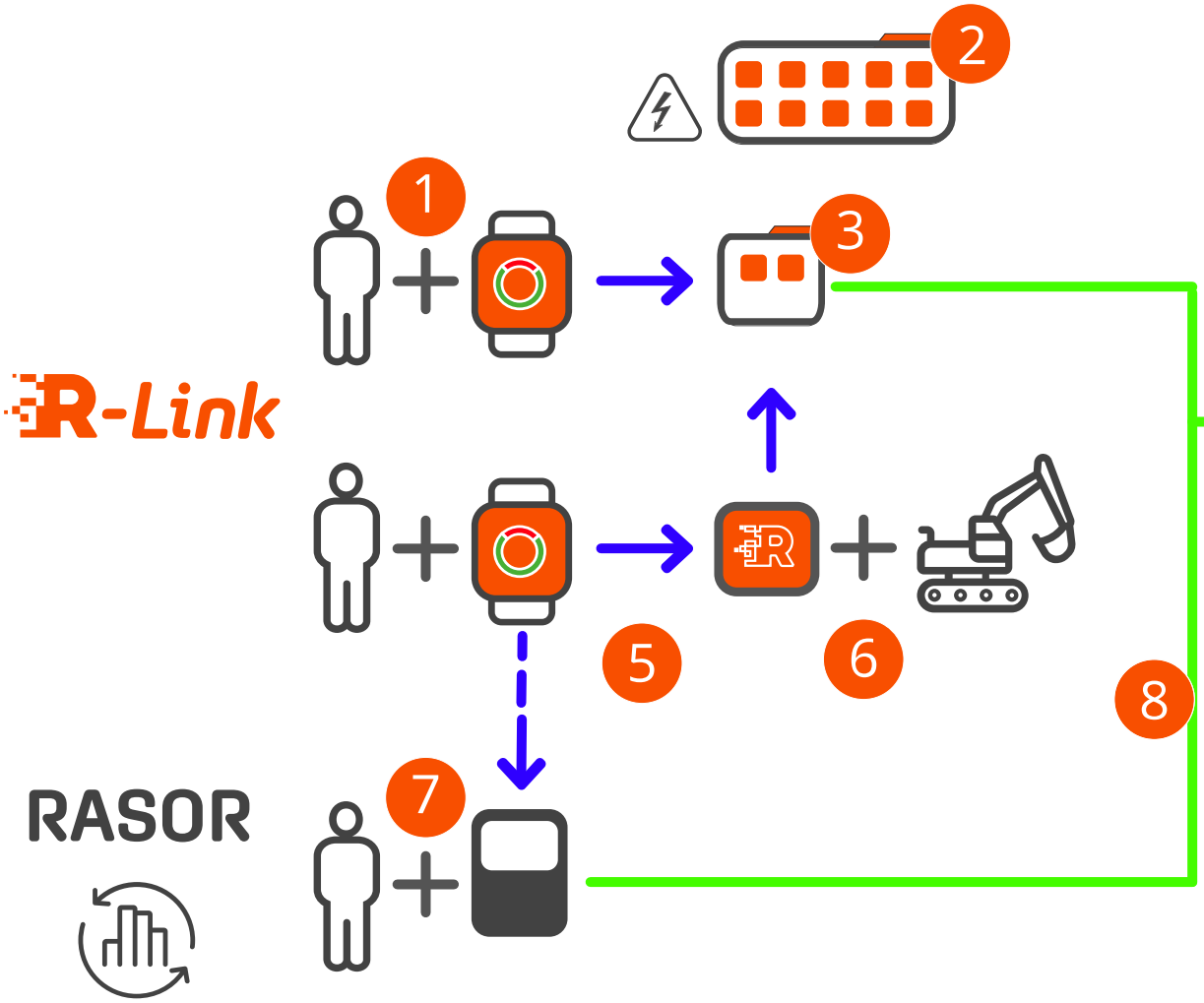



Figure 3 - R-LINK eco-system

| | | |
|---|---|---|
| 1 | R-LINK watch | Used to collect HAV and other important information. Also used to notify users of any potential hazards. |
| 2 | Charging station | Used to quickly charge the R-LINK watches. |

| | | |
|---|---|---|
| 3 | 2 Bay Gateway | Used to charge two R-LINK watches and to collect data from the R-LINK watch and to then transmit this data, using mobile or networked connection, to be analysed using the cloud-based Reactec Analytics. |
| 4 | Reactec Analytics | Cloud-based software for reporting and managing your users, tools, and plant. |
| 5 | Data transfer using Bluetooth | Data transfer from R-LINK watches to the Gateway, Beacon, or RASOR. |
| 6 | Beacon | Attached to equipment or fixed location and used to highlight potential hazards or proximity issues. |
| 7 | RASOR | Optional: RASOR captures real-time, multiple workforce risks and supports remote and lone workers with location information, slips/trips and fall detection. |
| 8 | Data transfer to Reactec Analytics | Data transmitted to Reactec Analytics using mobile or networked connection. |

## 3.1 R-LINK watch

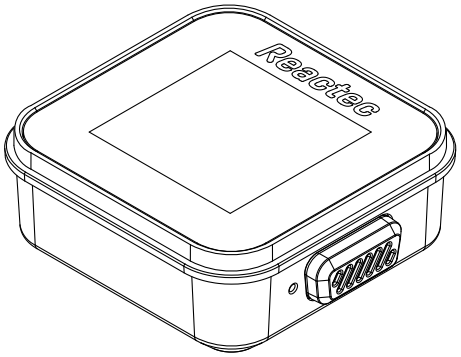



Figure 4 - R-LINK watch

### 3.1.1 Specifications

**Table 3 - R-LINK watch specifications**

| Specification | Details |
|---|---|
| Power | Internal lithium-ion rechargeable. Not user serviceable |
| Charging Power Input | 5V DC, 0.25A |

| Specification | Details |
|---|---|
| Charge time to full charge | 1 to 2 hours after a typical days use depending on enabled functions. From fully discharged 3 hours. |
| Battery life | Max battery life – 14 hours |
| Operating Environment | For Indoor and Outdoor use. Can be operated in wet and dusty environments up to Pollution Degree 4. Maximum altitude of 2000m |
| Operating temperature | -10°C to +40°C |
| Storage temperature | -20°C to +40°C |
| Humidity | up to 100% RH |
| Ingress rating | EN60529/IEC60529 to IP67 |
| Communication | 13.56MHz close range RFID, BLE 5, Ultra Wideband |
| EMC and Radio standards | EN61236-1, EN 301 489-1, EN 301-489-3, EN 301 489-17, EN 300 328, EN 300 330, EN 302 065-1, EN 302 065-2 |
| Safety standards | EN61010-1, EN IEC 62311 |
| Dimensions | 41.1 mm Width<br>41.5 mm Depth<br>16.3 mm Thickness |
| Weight | 28 grams |

### 3.1.2 Care

Keep the R-LINK watch, in particular the underneath, clean to ensure a good connection between the watch and the charging station.

An isopropanol or similar alcohol-based cleaning agent with an alcohol content of at least 70% is recommended for cleaning. Use of chemicals not fitting this description may cause damage.

The R-LINK watch is a sealed unit. Do not attempt to dismantle or modify it.

> **Caution**
>
> When placing the R-LINK watch back into a charging station, do not press down on the LCD screen of the watch. Repeated or excessive force may damage the watch.

### 3.1.3 Configuration

The watch icons displayed at the top of the screen inform the Operator of what type of protection has been enabled.




Figure 5 - R-Link watch display

| Icon | Protection |
|---|---|
| Blue cloud | In range of a Gateway |
| Purple wireless network | In range of a Gateway |
| Hard hat | Fall detection |
| Yellow hand | HAVS |
| Green location pin | Operator location |
| Red no entry | Proximity |
| Battery | Remaining battery life |

▶ *For configuration information, refer to "Configuring the watch" in the Software Administration Guide.*

### 3.1.4 How it works

The R-LINK watch is an easy-to-use and comfortable device worn on the wrist.

Signing out an R-LINK watch at the start of a working day, your employee or visitor's credentials, as entered in Reactec Analytics, then controls what type of protection they receive during the day.

A charging station is used to charge the R-LINK watch.

Data collected by the R-LINK watch is transmitted to Reactec Analytics when within 30m of a Gateway or RASOR device.

**Caution**

Before signing out a watch, the Operator must be identified in Reactec Analytics and assigned specific functionality for their watch.

- *For more information on adding an Operator, refer to the Software Administration Guide.*

**Caution**

For optimum performance, the ratio of watches to be used with a single Gateway should be limited to 30.

#### 3.1.4.1 Using the R-LINK watch to monitor HAV exposure

A watch is ready to be signed out when the Reactec **R** is displayed on the screen.

**Caution**

If a watch is removed from a 2 bay gateway or a charging station which does not display the letter **R** it will not be possible to sign it out with an operator card. If a card is not presented within 10 secs the watch will switch off and should be returned to the bay.

To monitor HAV exposure using the R-LINK watch, follow these steps:

1. Sign a watch out from a 2 bay gateway or a charging station at the start of the working day with an Operator ID Card. This ensures the correct protection credentials are on the watch for the operator including when they are alerted for EAV/ELV breaches.
2. Confirm the watch shows the yellow hand in the top bar to indicate it is enabled for HAV monitoring.

3. To tag to a tool press the right-hand button once then move the watch display close to the tool tag until a beep is heard.

   The display shows details of the tool.

   **Information**

   It is important to not continue to hold down the button when presenting the watch to a tool tag, as a connection is not achievable until the button is released.

4. Repeat this process for each tool used.

   **Caution**

   The watch remains connected to the tool after the tool use has ended unless it is connected to another tool, or the operator switches the watch OFF or connects it to an OFF tag.

   Use the display to monitor exposure levels against the EAV and ELV thresholds assigned to the individual, as the watch cumulates their HAV exposure through the working day.

   The watch display shows the operator important HAV exposure data relating to their current shift.

   The following information is displayed:

   - Operator's name
   - The tool which was last identified by the tool tagging process.
   - HAV exposure status - The watch can be configured to display one of three options:
     - Exposure Points: A customer will choose either Tool Exposure Points (TEP) or Sensed Exposure Points (SEP). The display will show a letter which is either T or S followed by three digits for the calculated points.
     - Time Remaining to EAV: displays the time remaining to reach EAV.
     - Time Remaining to ELV: displays the time remaining to reach ELV

> **Information**
>
> For more information on how to confugure the watch HAV exposure display, refer to "HAV options" in the Software Administration Guide.

5. At the end of the shift return the watch to 2 bay gateway or a charging station.

When placing the watch in a 2 bay gateway or a charging station a green light will show below the bay and the watch screen will show a charge symbol or a message to say that it is sending data to the gateway. If the light does not show immediately or if it flickers it indicates the watch is not connected to the charger bay. Ensure the watch and charger bay pins are clean and place the watch back in the bay.

When a watch is not docked at the end of every shift, it automatically resets the operator exposure points displayed on the device when it senses a period of inactivity lasting 10 hours or more.

A watch should not be removed from the wrist during a working shift. If there is reason to remove the watch from the wrist, ensure the watch is switched OFF or an OFF tag is used prior to removal.

### 3.1.4.2 R-LINK watch HAV exposure display and alerts




Figure 6 - R-LINK watch features

The watch alerts the wearer when an action threshold has been exceeded and displays their increasing HAV exposure relative to their EAV and ELV in a circular graphic. The watch creates two types of alerts activated during non-trigger time.

**Table 4 - Sound alerts and conditions**

| Alert condition | Alert sound |
|---|---|
| EAV level is exceeded | 2 second beep |
| EAV level is exceeded 33% | 5 second beep |
| EAV level is exceeded 66% | 10 second beep |
| ELV level is exceeded | 20 second beep |
| Confirmation of communication with a tool tag | A single beep<br>This confirms a watch has communicated with a tool tag after the watch button has been pressed and held next to a tool tag. |

**Table 5 - Vibration alerts**

| Alert condition | Vibration |
|---|---|
| Personal EAV or ELV | A vibration is activated for the same duration as the sound beeps. |
| Failed to tag alert<br>When a tool is used but the operator has not pressed the watch button and placed it next to a tool tag to initiate a connection. | Beep for 2 seconds<br>Vibrate for 5 seconds |

### 3.1.4.3 Switching the watch OFF for HAV exposure monitoring

There is an option to let operators switch the watch off from HAV monitoring detection.

When this mode is enabled the operator, at any time, can prevent the watch from detecting any HAV exposure data (TEP only).

The function is recommended for customers who are concerned about operators picking up exposure points from non tool activity, for example, driving vehicles in rough terrain.

SEP points cannot be switched off.



**Information**

For more information on how to confugure the watch HAV exposure display, refer to "HAV options" in the Software Administration Guide.

The operator switches the watch **off** during use by following a set sequence of presses of the watch button.

To switch off the watch, follow these steps:

1. Press and hold the watch right hand button continuously for 3 seconds until the display reads ***OFF***
2. Release the watch button and press the watch right hand button again.

   The display returns to show exposure points and will show OFF in the tool ID line.

After being switched OFF the watch display remains on, showing the TEP points accumulated until it was switched OFF. The watch does not collect any more TEP exposure points until a tool tag is read. The watch continues to sense SEP points.



**Information**

Switching OFF the detection of TEP points does not impact a watch which is enabled for detecting proximity to beacons.

The watch can be switched back **ON** either by reading a RFID tool tag or by following these steps:

1. Press and hold the watch right hand button continuously for 3 seconds until the display reads ***ON***
2. Release the watch button and press the watch right hand button again.

   The display returns to show exposure points.

#### 3.1.4.4 Using the R-LINK watch to monitor proximity

To monitor proximity, follow these steps:

1. Sign a watch out from a 2 bay gateway or a charging station at the start of the working day with an Operator ID Card. This ensures the correct protection credentials are on the watch for the operator.
2. Confirm the watch displays a red circle with a diagonal line in the top bar to indicate it is enabled for monitoring proximity.
3. Use the display to monitor proximity incursions.

   When the operator's watch comes within the proximity incursion distance set in Reactec Analytics for the Beacon, the operator is alerted with a sound and vibration alert and the display showing **Proximity Alert**.

   The **Proximity Alert** message remains on the display until the watch detects that it has materially moved out of the proximity incursion distance.
4. At the end of the shift return the watch to a 2 bay gateway or a charging station.

When placing the watch in a a 2 bay gateway or a charging station a green light will show below the bay and the watch screen will show a charge symbol or a message to say that it is sending data to the gateway. If the light does not show immediately or if it flickers it indicates the watch is not connected to the charger bay. Ensure the watch and charger bay pins are clean and place the watch back in the bay.

A watch should not be removed from the wrist during a working shift.

### 3.1.4.5 Proximity alerts

The proximity detection uses Ultra WideBand (UWB) technology to determine the distance between the watch and the Beacon. Each Beacon can be configured for a proximity incursion distance that ranges from 2m to 10m.

Factors can influence the consistency with which a proximity is detected including the body significantly blocking the signal between the watch and the Beacon or a reflective surface creating spurious signals.

If a watch detects a Beacon, the watch will buzz and vibrate to alert the operator that they need to check their surroundings for hazards.



**Information**

When not detecting a watch ***Exclusion Zone***, the display shows HAV exposure points or is blank for proximity only watches.

### 3.1.4.6 Using the R-LINK watch to monitor dust exposure

To monitor dust exposure you must be in possession of a Trolex XD1+ monitor.

Follow these steps:

1. Sign a watch out from a 2 bay gateway or a charging station at the start of the working day with an Operator ID Card. This ensures the correct protection credentials are on the watch for the operator.
2. Switch on the Trolex XD1+ dust monitor and keep it close by the R-Link watch.
3. Press the left hand button to display the watch menu options
4. Use the right hand button to scroll through the options, select the ***dust option***.
5. Use the right hand button to select ***Yes*** to pair to the XD-1+
6. Place the watch against the Trolex logo on the XD1+ monitor
7. A message will appear with then R-Link watch and the Trolex XD1+ monitor have been successfully paired.

### 3.1.4.7 Dust exposure display and alerts




Figure 7 - R-LINK watch face

When the R Link watch is paired with a Trolex XD1+, the display automatically toggles between the HAV exposure screen and the Dust exposure screen, showing each for 3 seconds. If either the HAV or Dust thresholds are exceeded, the watch stops toggling and displays the relevant risk threshold for the duration of the alert or alarm.

The watch alerts the wearer when a STEL (Short Term Exposure Limit) threshold is exceeded and shows increasing Dust exposure relative to the TWA (Time Weighted Average) threshold in a circular graphic. The STEL counter tracks the number of STEL alerts received during the day. The PM (particulate matter) size of the readings is displayed on the left side of the screen.

**Table 6 - Sound alerts and conditions**

| Alert condition | Alert sound |
|---|---|
| STEL is exceeded | 5 second beep |
| TWA is exceeded | 20 second beep |

**Table 7 - Vibration alerts**

| Alert condition | Vibration |
|---|---|
| Personal STEL or TWA limits exceeded | A vibration is activated for the same duration as the sound beeps. |

## 3.2 R-LINK 10-bay charging station

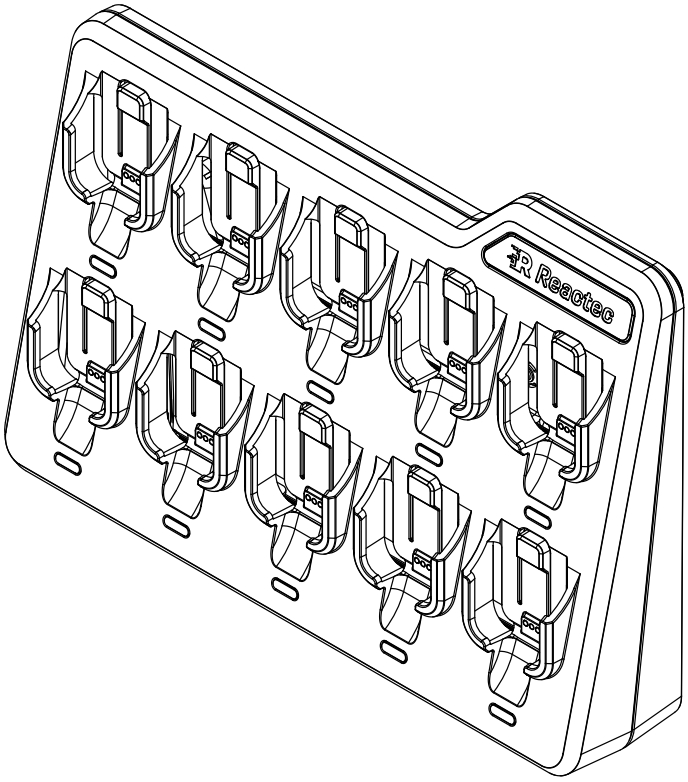



Figure 8 - 10-bay charging station

### 3.2.1 Specifications

**Table 8 - R-LINK 10-bay charging station specifications**

| Specification | Description |
|---|---|
| Power | 12V DC, 2.5A or 24V DC 1.25A. 12V DC Mains adaptor provided |
| Operating Environment | For Indoor use only. Maximum altitude of 2000m |
| Operating temperature | 0°C to +40°C |
| Storage temperature | -20°C to +40°C |
| Humidity | up to 95% RH |
| EMC Standards | EN55032, EN55035 |

| Specification | Description |
|---|---|
| Safety standards | BS EN IEC 62368-1 |
| Dimensions | 226 mm Width<br>334 mm Length<br>70 mm Thickness |
| Weight | 900 grams |

### 3.2.2 Care

To ensure continued operation, keep the charging station clean, in particular ensure the gold connector pins are free of dirt.

An isopropanol or similar alcohol-based cleaning agent with an alcohol content of at least 70% is recommended for cleaning. Use of chemicals not fitting this description may cause damage.

Apply with a cloth and with the charging station powered down.



**Information**

The charging station must not be located in outdoor or dusty environments.

### 3.2.3 Configuration

This hardware does not require any configuration.

### 3.2.4 Installation

When identifying a location for the charging station, consider the following:

- The charging station should be wall mounted with at least a 150mm clearance above and below and access to a power socket for the power lead.
- When positioning the charging station horizontally, ensure the area is clear on all sides of the charging station, with a 300mm clearance above.
- The charging station must be within communication distance of a Gateway. This is typically 80m.

► *For more information, see "Communication with a Gateway" on page 38*

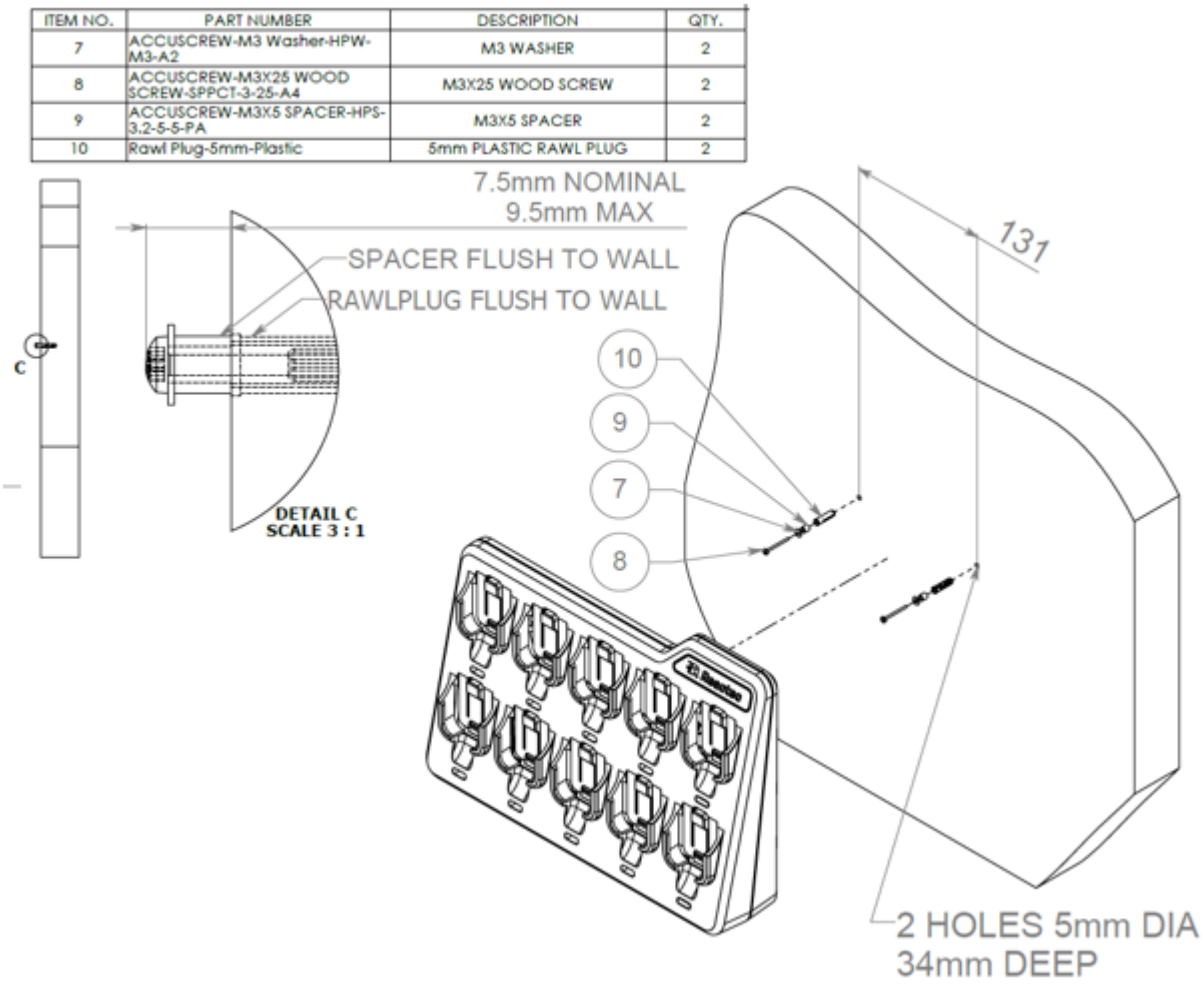



Figure 9 - R-LINK charging station

**Caution**

Do not mount or place the charging station on an unstable surface or near a heat source, such as a radiator, or in direct sunlight This can damage the units.

## 3.2.5 How it works

The 10-bay charging station is used to charge up to 10 R-LINK watches.

### 3.2.5.1 Communication with a Gateway

The charging station must be within communication distance of a Gateway. This is typically within 80m but will depend on any blocking surfaces within that 80m.

To establish that a charging station is in communication with a Gateway, the Gateway must first be powered up and connected to the internet.

▶ *For more information, see "How it works" on page 49*

With the Gateway in position, powered and connected to the internet, power up the charging station and dock at least one R-LINK watch in the charger.

After establishing power connection with the charger, the R-LINK watch searches for a nearby Gateway. If a Gateway is found and is verified as belonging to the same company as the R-LINK watch, the watch displays a blue cloud and purple wireless symbol in the top left hand corner of the display.

### 3.2.5.2 Charging station LED

When the R-LINK watch is docked the green LED below the watch is switched on. If it does not, it means the R-Link watch pins are not making good contact with the pins of the gateway. Ensure they are clean.

## 3.2.6 Troubleshooting

The installation may be unsuccessful for the following reasons:

- The charging station is not within communication distance of a Gateway (80m).
- The Gateway has been moved or powered down.

Confirm that the nearest Gateway is powered up and connected to the internet.

▶ *For more information, see "Troubleshooting" on page 49.*



**Caution**

For optimum performance, the ratio of watches to be used with a single Gateway should be limited to 30.

## 3.3 R-LINK 2 bay gateway

### 3.3.1 Specifications

**Table 9 - R-LINK 2-Bay Gateway specifications**

| Specification | Description |
|---|---|
| Power | 12V DC, 2.5A or 24V DC 1.25A. 12V DC Mains adaptor provided |
| Operating Environment | For Indoor. Maximum altitude of 2000m. |
| Operating Temperature | 0°C to +40°C |
| Storage Temperature | -20°C to +40°C |
| Humidity | up to 95% RH |
| Communications | Mobile Data (GSM900, GSM1800, NB-IoT, LTE CAT-M1), BLE 5 and UWB |
| EMC and Radio Standards | EN55032, EN55035, EN 301 489-1, EN 301 489-17, EN 301 489-52, EN 300 328, EN 301 511, EN 301 908-1, EN 301 901-13 |
| Safety Standards | EN62368-1, EN IEC 62311 |
| Dimensions | 163 mm Width<br>168 mm Length<br>51 mm Thickness |
| Weight | 400 grams |

### 3.3.2 Care

To ensure continued operation, keep the gateway clean, in particular ensure the gold connector pins are free of dirt.

An isopropanol or similar alcohol-based cleaning agent with an alcohol content of at least 70% is recommended for cleaning. Use of chemicals not fitting this description may cause damage.

Apply with a cloth and with the 2 bay gateway powered down.



**Information**

The 2 bay gateway must not be located in outdoor or dusty environments.

## 3.3.3 Configuration

Before installing the 2 bay Gateway, it should be determined if there is mobile phone signal coverage in the area. If there is no coverage, then the 2 bay Gateway

### 3.3.3.1 Confirm communications

After you have installed the 2 bay gateway perform a test to check that data is transmitted to Reactec Analytics

1. Sign out a watch from the 2 bay gateway or 10 bay charging station.
2. Connect to a tool tag and use for a short time.
3. Return the watch to the charging station.
4. Wait 2 hours.

   The data is automatically uploaded to Reactec Analytics.
5. Login to Reactec Analytics.
6. From the toolbar, select ***Admin Menu***.
7. Under ***Data*** select ***View/Upload***.
8. Confirm there is an upload record for your test.

## 3.3.4 Installation

When identifying a location for the 2 bay gateway, consider the following:

- The 2 bay gateway should be wall mounted with at least a 150mm clearance above and below and access to a power socket for the power lead.
- If positioning the 2 bay gateway horizontally, ensure the area is clear on all sides of the Gateway, with a 300mm clearance above.
- The 2 bay gateway housing includes two mounting points.

| 2 | PART NUMBER | DESCRIPTION | QTY. |
|---|---|---|---|
| 1 | SPPCT-4-20-A2 | No.8 (4mm) x 20mm Fully Threaded Pozi Pan Head Stainless Steel (A2) | 2 |
| 2 | Rawl Plug-6mm-Plastic | 6mm PLASTIC RAWL PLUG | 2 |
| 3 | 100-0007 | 2 BAY GATEWAY | 1 |

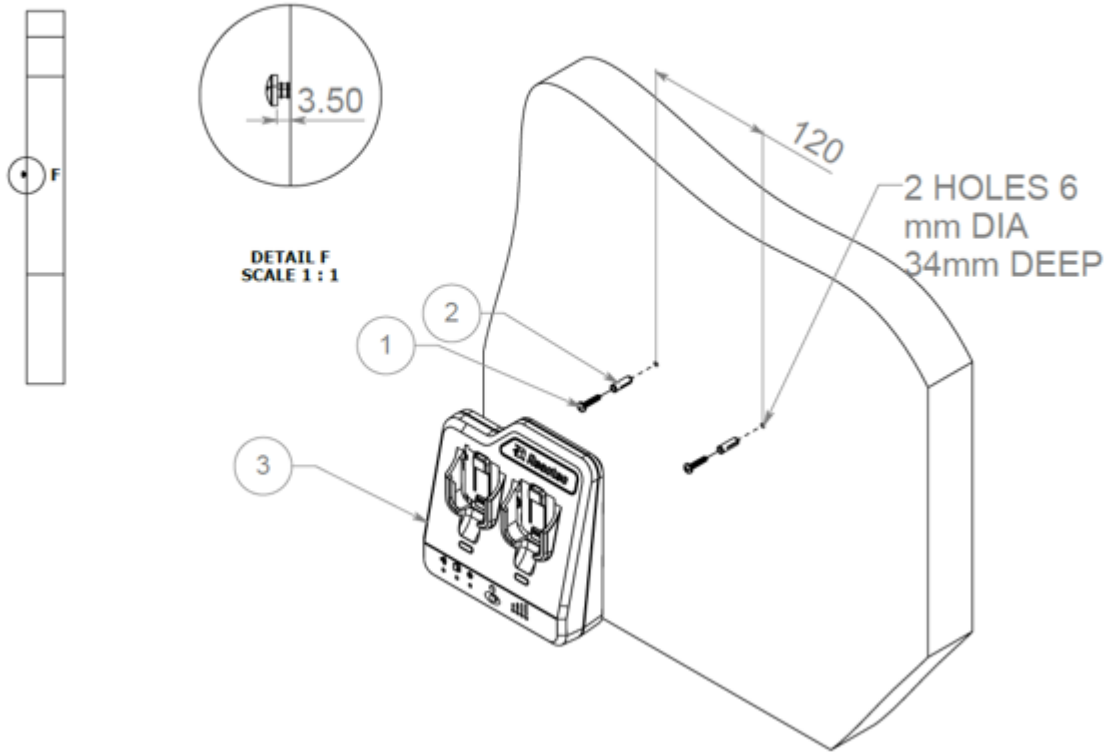



Figure 10 - R-LINK 2 Bay Gateway

**Caution**

Do not mount or place the 2 bay gateway on an unstable surface or near a heat source, such as a radiator, or in direct sunlight. This can damage the unit.

### 3.3.4.1 Connect to a mobile network

Connecting to a mobile network is the default connectivity for the 2 Bay Gateway and requires no specific installation work.

After powered up, the white LED's at the bottom of the 2 Bay Gateway will flash, if there is a mobile phone network available the LEDs will go solid. The number of LED's lit, indicates the strength of signal.

Provided at least two LEDs are lit, there is adequate mobile phone signal coverage to ensure successful operation.

#### 3.3.4.2 Connect to a private Wi-Fi network

To connect to a private Wi-Fi network requires a Wi-Fi network for which the password is known to be accessible and the availability of a device which can access the Wi-Fi network.

1. Clear old WiFi credentials by pressing the reset button for 5 seconds then release. The blue LED next to the Wi-Fi symbol will flash for 2 seconds to signal a reset has been successful. The blue LED and white LED's will flash alternately for 20 seconds to confirm the device is ready to receive credentials.

   > **Caution**
   >
   > If the blue LED and white LED’s do not flash alternately for 20 seconds then the reset step has not been completed correctly and should be repeated.

2. Using a mobile phone/laptop/pc, go in to the **settings**, find the Gateway within your device list.

   > **Tip**
   >
   > The network will be named Reactec followed by the ID number of the Gateway, this helps customers with multiple Gateways identify the correct one that is being connected. Use the QR code to view the ID number on the Gateway.

3. Once connected to the Reactec network, the device will automatically open a browser displaying the 5 strongest Wi-Fi networks available.
4. Select your chosen network.
5. Enter the **password** then select **submit**.

   If successful, a message will appear saying **credentials received** and the blue LED light on the Gateway will chnage to solid blue which confirms connection to the WiFi network.

## 3.3.5 How it works

The 2-bay gateway is used to collect and transmit data to Reactec Analytics and to charge up to 2 R-LINK watches .

### 3.3.5.1 Gateway LED sequence

When the R-LINK watch is docked the green LED below the watch is switched on. If it does not, it means the R-Link watch pins are not making good contact with the pins of the gateway. Ensure they are clean.

## 3.3.6 Troubleshooting

If using the 2 bay gateway only, to confirm connectivity, do the following:

- Dock an R-LINK watch and check for the blue cloud and purple wireless symbol in the top left hand corner of the display.
- If the watch is not connected, the charging connection pins are not making contact with the R-LINK watch. This would be the case if the bay LED fails to light when an R-LINK watch is docked. Ensure the connection pins are clean and sitting proud.

If using the 2 bay gateway with 10 bay charging stations, to confirm connectivity, do the following:

- Dock an R-LINK watch and check for the blue cloud and purple wireless symbol in the top left hand corner of the display. If the watch is not connected to the Gateway move the charging station closer to the Gateway.
- The charging connection pins are not making contact with the R-LINK watch. This would be the case if the bay LED fails to light when an R-LINK watch is docked. Ensure the connection pins are clean and sitting proud.



**Caution**

For optimum performance, the ratio of watches to be used with a single 2 bay Gateway should be limited to 30.

The installation may be unsuccessful for the following reason:

- **Connected using a mobile network;** the 2 bay Gateway may have lost connectivity. The four LEDs at the bottom show if the Gateway has adequate mobile network coverage.

  Try moving the Gateway's location to improve coverage.
- If no mobile network signal can be obtained use a private Wi-Fi network as an alternative.

The Gateway has a reset functionality and should be used with caution:

- **Short Press** (<3 seconds): Triggers a start up communication with the Analytics.

  A troubleshooting option to be used to trigger communication with the Analytics which will cause an operator list to be downloaded and a firmware update if a firmware update is pending.
- **Long Press** (>3 seconds): Resets WiFi credentials.

  A troubleshooting option to be used if unable to successfully connect to WiFi
- **Reset Press** (>20 seconds): Full reset including erasure of flash memory.

  A trouble shooting option to be undertaken when advised by Reactec technical support



**WARNING**

If any data is pending on the 2 bay gateway when the Reset Press option is used, all data will be lost. 2 bay gateway's should always be power cycled and all other troubleshooting options explored first.

## 3.4 R-LINK gateway

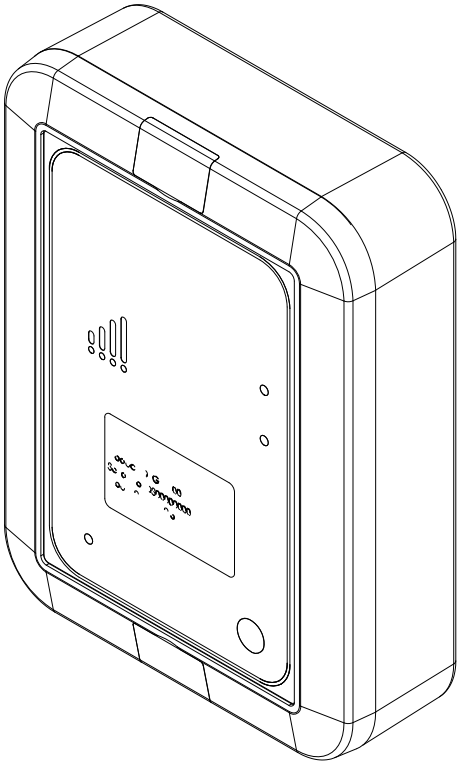


Figure 11 - R-LINK Gateway

### 3.4.1 Specifications

**Table 10 - R-LINK Gateway specifications**

| Specification | Description |
|---|---|
| Power | 12V DC, 2.5A or 24V DC 1.25A. 12V DC Mains adaptor provided |
| Operating Environment | For Indoor and Outdoor use. Can be operated in wet and dusty environments up to Pollution Degree 4. When external power input is disconnected rubber cap must to be fitted to the connector to ensure no water ingress. Maximum altitude of 2000m. |
| Operating Temperature | -10°C to +40°C |

| Specification | Description |
|---|---|
| Storage Temperature | -20°C to +40°C |
| Humidity | up to 100% RH |
| Ingress Rating | EN60529/IEC60529 to IP66 |
| Communications | Mobile Data (GSM900, GSM1800, NB-IoT, LTE CAT-M1), BLE 5 and UWB |
| EMC and Radio Standards | EN55032, EN55035, EN 301 489-1, EN 301 489-17, EN 301 489-52, EN 300 328, EN 301 511, EN 301 908-1, EN 301 901-13 |
| Safety Standards | EN62368-1, EN IEC 62311 |
| Dimensions | 130 mm Width<br>170 mm Length<br>45 mm Thickness |
| Weight | 400 grams |

### 3.4.2 Care

To ensure continued operation, keep the gateway clean.

An isopropanol or similar alcohol-based cleaning agent with an alcohol content of at least 70% is recommended for cleaning. Use of chemicals not fitting this description may cause damage.

Apply with a cloth and with the gateway powered down.

### 3.4.3 Configuration

Before installing the Gateway, it should be determined if there is mobile phone signal coverage in the area. If there is no coverage, then the Gateway must have access to a private Wi-Fi network as an alternative.

- *For more information, refer to "Configuring Gateways" in the Software Administration Guide.*

#### 3.4.3.1 Confirm communications

After you have installed the charging station, perform a test to check that data is transmitted to Reactec Analytics using the Gateway.

1. Sign out a watch from the charging station.
2. Connect to a tool tag and use for a short time.
3. Return the watch to the charging station.
4. Wait 2 hours.

   The data is automatically uploaded to Reactec Analytics.
5. Login to Reactec Analytics.
6. From the toolbar, select ***Admin Menu***.
7. Under ***Data*** select ***View/Upload***.
8. Confirm there is an upload record for your test.

### 3.4.4 Installation

When identifying a location for the Gateway, consider the following:

- The Gateway should be wall mounted with at least a 150mm clearance above and below and access to a power socket for the power lead.
- If positioning the Gateway horizontally, ensure the area is clear on all sides of the Gateway, with a 300mm clearance above.
- The Gateway housing includes two mounting points. Refer to the following drawing for the details of the mounting points.

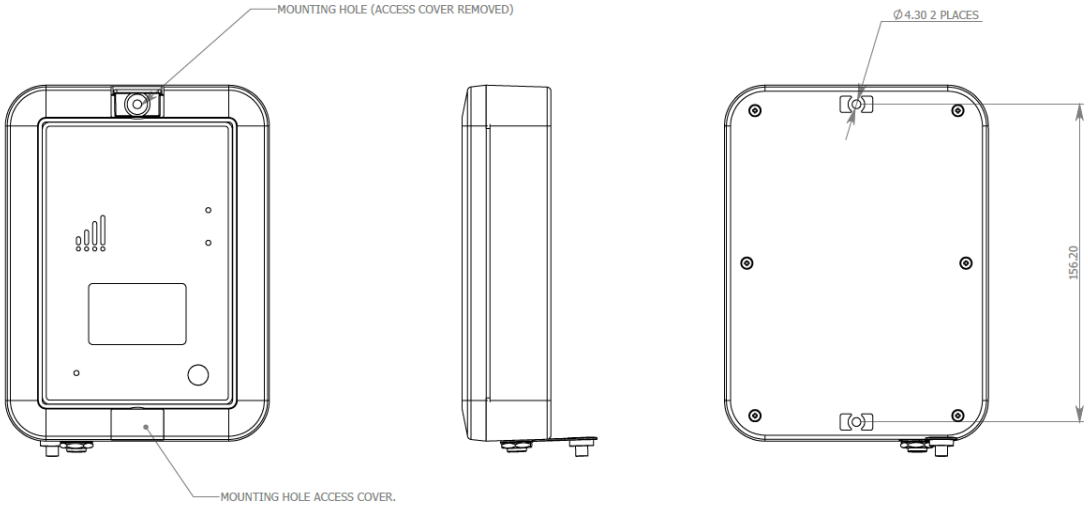



Figure 12 - R-LINK Gateway

**Caution**

Do not mount or place the Gateway on an unstable surface or near a heat source, such as a radiator, or in direct sunlight. This can damage the unit.

### 3.4.4.1 Connect to a mobile network

Connecting to a mobile network is the default connectivity for the Gateway and requires no specific installation work.

After powered up, the white LED's on the left hand side of the Gateway will flash, if there is a mobile phone network available the LEDs will go solid. The number of LED's lit, indicates the strength of signal.

Provided at least two LEDs are lit, there is adequate mobile phone signal coverage to ensure successful operation.

### 3.4.4.2 Connect to a private Wi-Fi network

To connect to a private Wi-Fi network requires a Wi-Fi network for which the password is known to be accessible and the availability of a device which can access the Wi-Fi network.

1. Clear old WiFi credentials by pressing the reset button for 5 seconds then release. The blue LED next to the Wi-Fi symbol will flash for 2 seconds to signal a reset has been successful. The blue LED and white LED's will flash

alternately for 20 seconds to confirm the device is ready to receive credentials.

> **Caution**
>
> If the blue LED and white LED's do not flash alternately for 20 seconds then the reset step has not been completed correctly and should be repeated.

2. Using a mobile phone/laptop/pc, go in to the **settings**, find the Gateway within your device list.

> **Tip**
>
> The network will be named Reactec followed by the ID number of the Gateway, this helps customers with multiple Gateways identify the correct one that is being connected. Use the QR code to view the ID number on the Gateway.

3. Once connected to the Reactec network, the device will automatically open a browser displaying the 5 strongest Wi-Fi networks available.
4. Select your chosen network.
5. Enter the **password** then select **submit**.

   If successful, a message will appear saying **credentials received** and the blue LED light on the Gateway will chnage to solid blue which confirms connection to the WiFi network.

### 3.4.5 How it works

The Gateway is used to collect and transmit data to Reactec Analytics.

### 3.4.6 Troubleshooting

To confirm connectivity, do the following:

- Dock an R-LINK watch and check for the blue cloud and purple wireless symbol in the top left hand corner of the display. If the watch is not connected to the Gateway move the charging station closer to the Gateway.

- The charging connection pins are not making contact with the R-LINK watch. This would be the case if the bay LED fails to light when an R-LINK watch is docked. Ensure the connection pins are clean and sitting proud.

> **Caution**
>
> For optimum performance, the ratio of watches to be used with a single Gateway should be limited to 30.

The installation may be unsuccessful for the following reason:

- **Connected using a mobile network;** the Gateway may have lost connectivity. The four LEDs on the left side show if the Gateway has adequate mobile network coverage.

  Try moving the Gateway's location to improve coverage.
- If no mobile network signal can be obtained use a private Wi-Fi network as an alternative.

The Gateway has a reset functionality and should be used with caution:

- **Short Press** (<3 seconds): Triggers a start up communication with the Analytics.

  A troubleshooting option to be used to trigger communication with the Analytics which will cause an operator list to be downloaded and a firmware update if a firmware update is pending.
- **Long Press** (>3 seconds): Resets WiFi credentials.

  A troubleshooting option to be used if unable to successfully connect to WiFi
- **Reset Press** (>20 seconds): Full reset including erasure of flash memory.

  A trouble shooting option to be undertaken when advised by Reactec technical support

> **WARNING**
>
> If any data is pending on the Gateway when the Reset Press option is used, all data will be lost. Gateway's should always be power cycled and all other troubleshooting options explored first.

## 3.5 R-LINK beacon

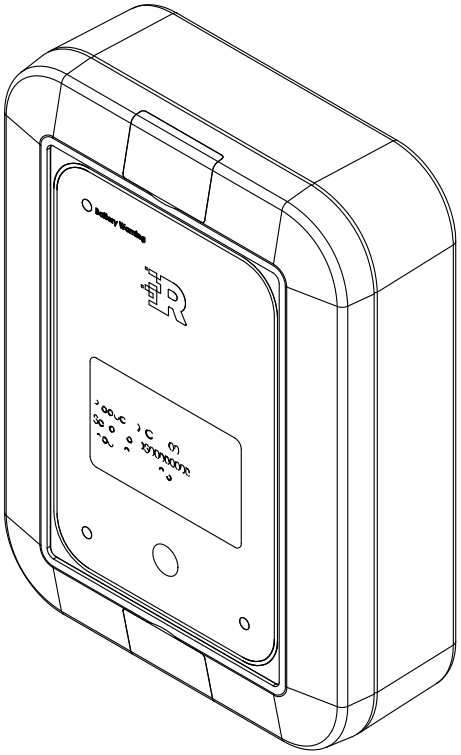


Figure 13 - R-LINK Beacon

### 3.5.1 Specifications

**Table 11 - R-LINK beacon specifications**

| Specification | Description |
|---|---|
| Power | 12V DC, 2.5A or 24V DC 1.25A. 12V DC Mains adaptor provided or Internal lithium-ion rechargeable. Not user serviceable |
| Charge time to full charge | Typically 8 hours |
| Battery life | Max battery life – 100 hours |

| Specification | Description |
|---|---|
| Operating Environment | For Indoor and Outdoor use. Can be operated in wet and dusty environments up to Pollution Degree 4. When external power input is disconnected rubber cap must to be fitted to the connector to ensure no water ingress. Maximum altitude of 2000m. |
| Operating temperature | -10°C to +40°C |
| Storage temperature | -20°C to +40°C |
| Humidity | up to 100% RH |
| Ingress rating | EN60529/IEC60529 to IP66 |
| Communications | BLE 5 and UWB |
| EMC and Radio Standards | EN55032, EN55035, EN 301 489-1, EN 301 489-17, EN 301 489-19, EN 300 328, EN 302 065-1, EN 302 065-2, EN 303 413 |
| Safety standards | EN62368-1, EN IEC 62311 |
| Dimensions | 110 mm Width<br>150 mm Length<br>40 mm Thickness |
| Weight | 250 grams (excl battery) 450 grams (with battery) |

### 3.5.2 Care

To ensure continued operation, keep the Beacon clean.

An isopropanol or similar alcohol-based cleaning agent with an alcohol content of at least 70% is recommended for cleaning. Use of chemicals not fitting this description may cause damage.

Apply with a cloth and with the Beacon powered down.

### 3.5.3 Configuration

Before installing the Beacon it should be decided if the Beacon is to be operated with battery power or directly connected to the power of a vehicle.

> **Caution**
>
> If connecting to the power of a vehicle, a trained automotive technician will be required.

Before using a Beacon the required exclusion zone distance (radius) in meters must be decided. All Beacons or individual Beacons can be configured for specific warning radius ranging from 2m to 10m.

The default for all Beacons is 10m.

You can override the Beacon global settings on a unit by unit basis.

You can change the Beacon mode and update the proximity settings for example Alert type and proximity incursion distance.

To update these settings, follow these steps:

1. On the toolbar, select ***Admin Menu***.
2. Select ***Beacon Devices*** .
3. Select ***Edit*** for the Beacon you need to override settings for.
4. To edit the settings, from ***Settings*** select ***Override global settings*** and update each field for your requirements.
5. Select ***Save***.

### 3.5.4 Installation

Reactec provides a variety of mounting attachments designed to securely affix beacons to vehicles and other surfaces, either permanently or temporarily, to support the creation of exclusion zones. While every effort has been made to ensure these mounting solutions are robust and secure, it remains the responsibility of the client to ensure each beacon is mounted in such a manner that it will not become detached from the vehicle or other surface and to assess any risk posed to the specific environment should such an event occur.

When identifying a location for the Beacon, consider the following:

- The beacon should be mounted as high as possible on the vehicle above head height. It is preferable to have the beacon protrude above metal surfaces. A range of attachment brackets are available to install as best suits the vehicle.
- For large vehicles it may be necessary to mount two beacons at diagonally opposite corners
- Ensure the Beacon is fully charged before installing.
- The Beacon housing includes two mounting points. Refer to the following drawing for the details of the mounting points.

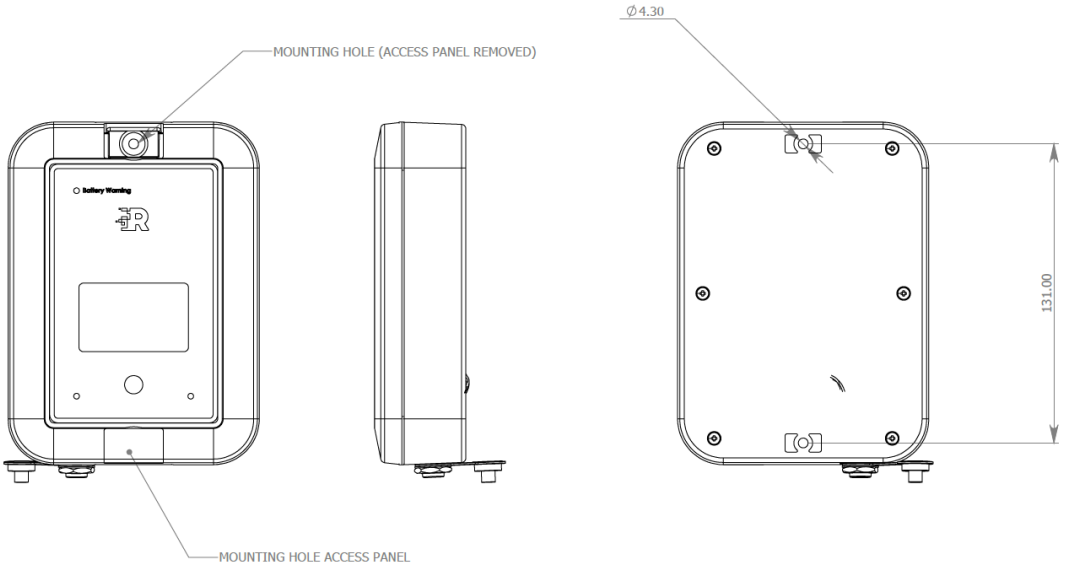



Figure 14 - R-LINKBeacon

### 3.5.4.1 Confirm detections

After you have installed the Beacon, test the Beacon to ensure it is alerting nearby R-LINK watches as required and check that data is transmitted to Reactec Analytics.

1. Sign out a watch from the charging station.
2. Move around the beacon from different directions and distances.

   The watch beeps and vibrates and displays an **Proximity Alert** message when the watch and Beacon detect that they are within the proximity incursion distance set in Reactec Analytics.

   The Beacon detection accuracy is 30cm but this depends on whether the line-of-sight to the Beacon is blocked by metal surfaces and to some extent the body.

Arms should be moved naturally during the test. If the detection arc is unsatisfactory consider adding another Beacon in any blind spots.

3. Return the watch to the charging station.
4. Wait 2 hours while the data is automatically uploaded to Reactec.
5. Login to Reactec Analytics.
6. Select ***Proximity to Danger > Incursion Spot Check***.
7. Confirm there is an upload record for your test.

### 3.5.5 How it works

The Beacon is attached to plant or machinery and transmits information to any watch that comes within its range.

The Beacon is used to make operators aware of potentially hazardous moving plant or machinery.

Beacon LED light sequences:

Centred R-Logo LED:

- **Flashing blue** when a firmware upgrade is in progress.
- **Flashing white** when an operator is pairing or configuring the Beacon
- When the power button is pressed for 20 seconds, the R-logo LED will **flash blue** for 3 seconds

Centred R-Logo LED when the Beacon is in beacon **proximity exclusion zone** mode:

- **Solid green** when the Beacon has power and there are no current incursions
- **Flashing red** when the Beacon has detected a proximity incursion

Centred R-Logo LED when the Beacon is in beacon **proximity safe zone** mode:

- **Solid white** when the Beacon has power and there are no operators within the safe zone
- **Flashing green** when the Beacon has detected an r-Link watch within the safe zone



**Caution**

The reset option for a beacon is to move it from field configured range back to gateway set range. The power button should be pressed for 20 secs after which the Blue R-Logo LED is on for 3 secs. After this event the range reverts to the last range the beacon received from a gateway and will be controlled by any further Analytics updates if in range of a gateway.

Battery LED:

- **Solid amber** when the battery life falls below 20%
- **Flashing amber** when the Beacon is connected to mains power which indicates the battery is charging. When charging is complete the LED will go off.

Cloud LED:

- **Solid blue** indicates when a Gateway is in range
- **Flashing blue** indicates data is transferring between the Beacon and a Gateway

**Stand-by Mode:**

Beacons can be put into stand-by mode by double-clicking the power button. To exit stand-by mode, hold the power button for 5 seconds.

In stand-by mode, the cloud LED flashes slowly while all other LEDs are off. In stand-by mode, the cloud LED flashes slowly while all other LEDs are off.

A battery-powered beacon will automatically enter stand-by mode when a power cable is plugged in. To exit stand-by mode, unplug the power cable and then press the power button for 5 seconds.

### 3.5.6 Troubleshooting

The installation may be unsuccessful for the following reasons:

- The Beacon is not fully charged.
- A metal surface is blocking the detection arc of the Beacon.

  Consider moving the location of the Beacon or adding a second Beacon for blind spots.
- The beacon has not been configured correctly in Reactec Analytics.

## 3.6 R-LINK strap

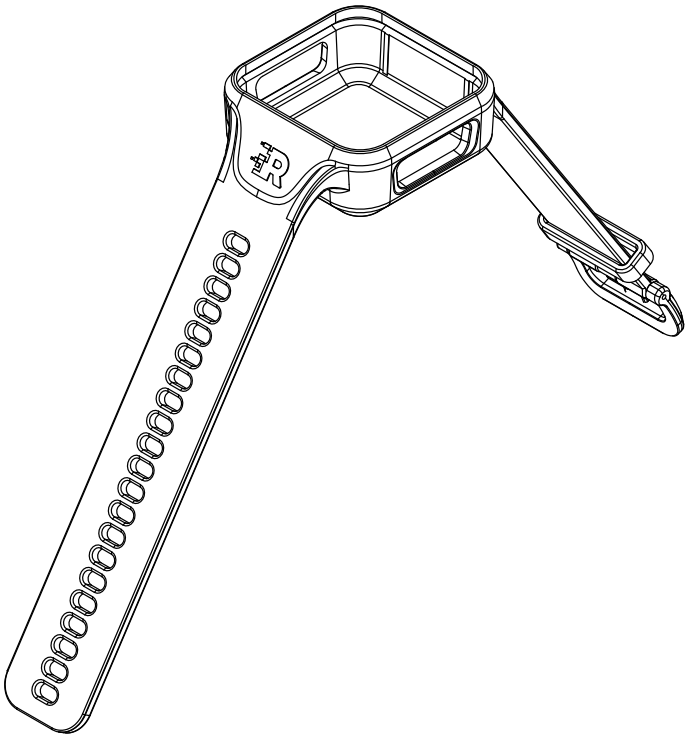


Figure 15 - R-LINK strap

### 3.6.1 Specifications

**Table 12 - R-LINK strap specifications**

| Specification | Description |
|---|---|
| Dimensions | 225mm Length |
| Material | Thermoplastic Polyurethane (TPU) - Estane SKN 85C0 |

### 3.6.2 Care

The R-LINK strap is not impermeable to ingress of fluids, dirt and contaminants and therefore it should be assessed for suitability before using in the work place.

The R-LINK strap is personal to the individual operator and should always be subject to appropriate occupational hygiene procedures regarding cleaning and replacement.

### 3.6.3 Configuration

There are no configuration requirements for this item.

## 3.7 R-LINK quick release strap

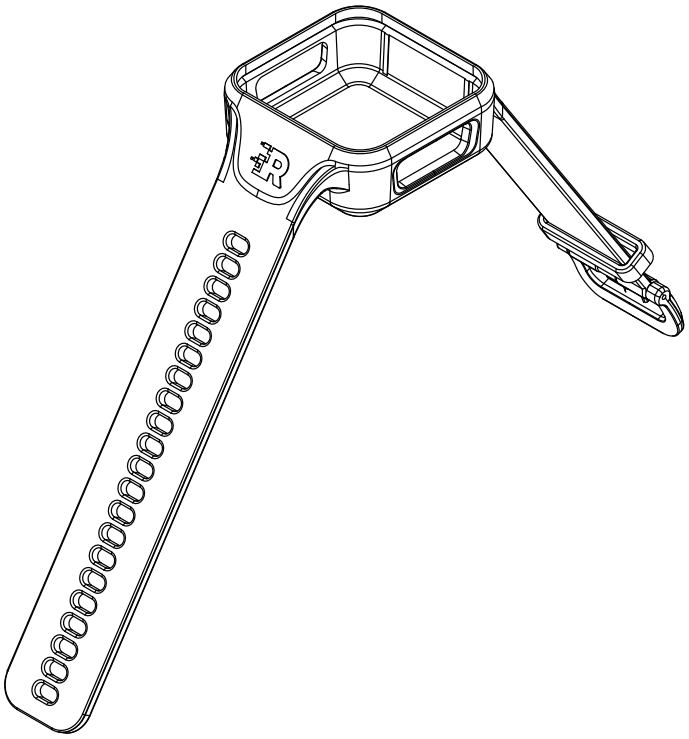


Figure 16 - R-LINK quick release strap

The quick release strap is intended for applications where the duty holder requires the strap to break away with a force of around 35N. The specific force needed depends on several factors such as point of application of the force. Duty holders are responsible for assessing the strap's suitability for their specific use cases.

### 3.7.1 Specifications

**Table 13 - R-LINK strap specifications**

| Specification | Description |
|---|---|
| Dimensions | 225mm Length |
| Material | Thermoplastic Polyurethane (TPU) - Estane SKN 85C0 |

### 3.7.2 Care

The R-LINK strap is not impermeable to ingress of fluids, dirt and contaminants and therefore it should be assessed for suitability before using in the work place.

The R-LINK strap is personal to the individual operator and should always be subject to appropriate occupational hygiene procedures regarding cleaning and replacement.

### 3.7.3 Configuration

There are no configuration requirements for this item.

## 3.8 R-LINK fabric strap



Figure 17 - R-LINK fabric strap

### 3.8.1 Specifications

**Table 14 - R-LINK strap specifications**

| Specification | Description |
|---|---|
| Dimensions | 200mm Length |
| Material | Elastic Textile |

### 3.8.2 Care

The R-LINK strap is not impermeable to ingress of fluids, dirt and contaminants and therefore it should be assessed for suitability before using in the work place.

The R-LINK strap is personal to the individual operator and should always be subject to appropriate occupational hygiene procedures regarding cleaning and replacement.

### 3.8.3 Configuration

There are no configuration requirements for this item.

# 4 HAVwear hardware

The HAVwear hardware is used to notify, collect and monitor your workers HAV and safety exposure information.

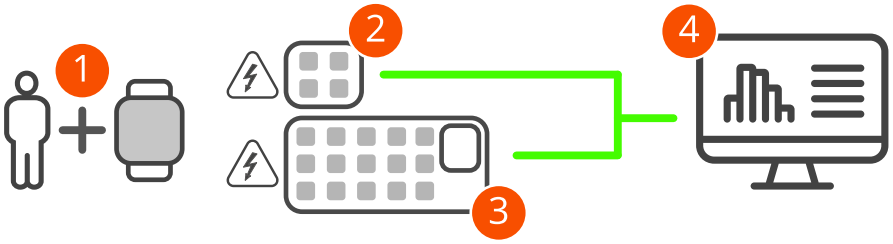



Figure 18 - HAVwear eco-system

| | | |
|---|---|---|
| 1 | HAVwear watch | Used to track HAV exposure. |
| 2 | 4-bay docking station | Used to charge four HAVwear watches and to transmit HAV data to Reactec Analytics. |
| 3 | 15-bay docking station | Used to charge 15 HAVwear watches and to transmit HAV data to Reactec Analytics. |
| 4 | Reactec Analytics | Cloud-based software for reporting and managing your users, tools, and plant. |

## 4.1 HAVwear watch




Figure 19 - HAVwear watch

### 4.1.1 Specifications

**Table 15 - HAVwear watch specifications**

| Specification | Description |
|---|---|
| Power | Internal lithium-ion rechargeable battery. Not user serviceable |
| Charge time to full charge | After a typical days use - 33 minutes<br>From fully discharged - three hours<br>With SAFE-DISTANCE enabled a battery will be heavily depleted after one days use |
| Battery Life | Max battery life - 36 hours<br>With SAFE-DISTANCE enabled - 12 hours |
| Operating Temperature | -10°C to +35°C |
| Storage Temperature | -20°C to +40°C |
| Humidity | up to 100% RH |
| Ingress Rating | EN60529/IEC60529 to IP67 |
| Tool tag communications | 13.56MHz close range inductive data communication |

| Specification | Description |
|---|---|
| EMC and radio standards | EN301 489-1, EN301 489-3, EN302 291-2, EN61326-1 |
| Safety standards | EN61010-1 |
| Dimensions | 37mm x 38mm x 15mm. LCD 17mm x 17mm |
| Weight | 38 grams |

### 4.1.2 Care



**Caution**

When placing the HAVwear back into a docking station or dual charger, do not press down on the LCD screen of the unit. Repeated or excessive force to this window may damage the unit.

Keep the HAVwear watch, in particular the underneath, clean to ensure a good connection between the HAVwear and docking station.

An isopropanol or similar alcohol-based cleaning agent with an alcohol content of at least 70% is recommended for cleaning. Use of chemicals not fitting this description may cause damage.

The HAVwear watch is a sealed unit. Do not attempt to dismantle or modify it.

### 4.1.3 Configuration

▶ *For more information, refer to section "Configuring the watch" in the Software Administration Guide.*

### 4.1.4 How it works

The HAVwear watch, worn on a tool operator's wrist, monitors hand arm vibration (HAV) exposure during a shift. The display informs the wearer of their exposure points and thresholds. Vibration and sound alerts inform the wearer of increasing levels of exposure.

Data collected by the HAVwear watch is transmitted to Reactec Analytics when it is placed in a docking station or when within 30m of a RASOR device.

The watch is an easy-to-use and comfortable device that monitors hand arm vibration (HAV) exposure and breaches of social distance guidelines over the duration of an operator's shift.

A docking station is used to charge, collect and transmit data from the watch.

Operators sign a watch out of the docking station at the start of each shift using their Operator ID Card. This assigns the watch to the operator for that shift.

Before using each tool, press and release the watch button and place the watch face close to a tool tag, until a beep sounds which will indicate that the watch is connected to a tool tag. This should happen within 5 seconds.



**Information**

It is important to not continue to hold down the button when presenting the watch to a tool tag, as a connection is not achievable until the button is released.

Current HAV risk assessment exposure levels are shown on the watch display. The watch indicator lights use a traffic light system (green, amber, red) to indicate when specified exposure action values are reached. This allows the operator to take action to limit further exposure.

A docking station is used to charge, collect and transmit data from the watch.

Operators sign a watch out of the docking station at the start of each shift using their Operator ID Card. This assigns the watch to the operator for that shift and ensures the correct HAV action exposure limits are on the watch for that operator.

#### 4.1.4.1 Using watch to monitor HAV exposure

If using the watch to monitor HAV exposure before using each tool within a shift press and release the watch button and place the watch face close to the tool tag to enable communication for approximately 5 seconds or until a beep sound is made.

Check the watch displays the tool ID. If the tool ID does not match the tool tag, repeat the process.

Repeat this process for each tool used during the shift. In the event an operator fails to tag a tool, and the watch detects tool use, a sound and vibration alert will be made for 5 seconds.

The watch remains connected to the tool after the tool use has ended unless it is connected to another tool, or the operator switches watch OFF or connects it to an OFF tag.

Check the watch display regularly during the shift to monitor exposure.

The watch counts up the HAV exposure in points as the operator uses the power tool.

**Table 16 - HAVwear Indicator lights and alerts**

| Lights | Description | Alerts | Operator actions |
|---|---|---|---|
| Green | Remains below EAV (action value) | | GO - Below EAV. Aim to stay in this region |
| Amber 1 | <33% of Gap between EAV and ELV | 2 second vibration and buzzer alert | BE AWARE – EAV Exceeded. Reduce tool usage, share workload – supervisors on alert |
| Amber 2 | >33% < 66% of Gap between EAV and ELV | 5 second vibration and buzzer alert | |
| Amber 3 | >66% of Gap between EAV and ELV | 10 second vibration and buzzer alert | |
| Red | Greater than ELV (limit value) | 20 second vibration and buzzer alert | STOP – ELV exceeded. Stop using hand held power tools |

At the end of the shift return the watch to a dual charger or docking station.

When placing the watch into a dual charger or docking station bay, the green LED next to the bay lights continuously after 10 seconds to confirm that the connection between the watch and docking station is good.

If the green LED is not on 10 seconds after docking, then there is an error with the connection. The watch should be removed and the contact points on the back of the watch cleaned to ensure there is no dirt contaminating the connection points. If the error remains contact Reactec technical support.

When a watch is not being docked at the end of every shift it automatically resets the operator exposure points displayed on the device when it senses a period of inactivity lasting 10 hours or more.

A watch should not be removed from the wrist during a working shift. If there is reason to remove the watch from the wrist, ensure an OFF tag is used prior to removal, or the watch is switched OFF.

> **Information**
>
> Place the watch into the docking station or dual charger retaining clips and press down on the orange plastic moulding of the watch to ensure it is firmly clipped into place.
>
> Do not press down on the LCD display of the watch as repeated or excessive force to this display may damage the watch.

#### 4.1.4.2 HAVwear HAV exposure display

When signed out to an operator, the watch display shows the operator important HAV exposure data relating to their current shift. The following information is displayed:

- **Operator's name**: Display as four characters. Character 1 of forename plus first three characters of surname.
- **Exposure Points**: A customer will choose either Tool Exposure Points (TEP) or Sensed Exposure Points (SEP). The display will show a letter which is either T or S followed by three digits for the calculated points.
- The tool which was last identified by the RFID read process. Displays as alpha numeric characters, the first four characters of the tool manufacturer model number.
- The stage along the exposure indicator scale is as follows:

|  |  |  |  |  |
|---|---|---|---|---|
| When lit operator below EAV | When operator has breached EAV and < 33% of EAV | When operator > 33% of EAV | When operator > 66% of EAV | When lit operator breached ELV |

- Status of battery charge in increments of 25%, 50%, 75% and 100%.

The watch alerts the wearer when an action threshold has been exceeded and indicator lights are three colour-coded lights which show the operator's HAV

exposure relative to their EAV and ELV as they work with vibrating tools. The lights indicate when the operator must take corrective action.

► *For more information, see "Vibration regulations" on page 12*

When an operator's HAV exposure is below their EAV, the green indicator light is shown, indicating the operator's risk level and may continue working.

As an operator's HAV exposure reaches their EAV, the first amber indicator light is visible. This indicates that the operator should endeavour to reduce any further HAV exposure for that shift. This can be achieved, for example, by switching to a tool that has a lower vibration. The two further amber lights are displayed as the total exposure action value points increase.

If an operator's HAV exposure reaches their ELV, the red indicator light displays. This indicates that the operator must stop using vibrating tools for the remainder of their shift.

When a watch is not docked at the end of a shift it will automatically reset the operator exposure points displayed on the watch when it senses a period of inactivity lasting 10 hours or more.

#### 4.1.4.3 HAV alerts - noise and vibration

The watch creates two types of alerts activated during non-trigger time.

**Sound Alert**

A sound is used to alert the following:

- When the personal EAV level is exceeded – the sound beeps for 2 seconds
- When the personal EAV level is exceeded 33% - the sound beeps for 5 seconds
- When the personal EAV is exceeded 66% - the sound beeps for 10 seconds
- When the personal ELV is exceeded - the sound beeps for 20 seconds

**Vibration Alert**

A vibration is activated as follows:

- When the personal EAV level is exceeded – the watch vibrates for 2 seconds
- When the personal EAV level is exceeded 33% - the watch vibrates for 5 seconds
- When the personal EAV is exceeded 66% - the watch vibrates for 10 seconds
- When the personal ELV is exceeded - the watch vibrates for 20 seconds

**Failed to TAG Alert**

When a tool is used but the operator has not pressed the watch button and placed it next to a tool tag to connect them, the watch does the following:

- Beep for 2 seconds
- Vibrate for 5 seconds

**Confirmation of communication with a tool tag**

A single beep sounds to confirm a watch has communicated with a tool tag after the watch button has been pressed and held next to a tool tag.

#### 4.1.4.4 Using the watch for SAFE-DISTANCE

If using the watch to monitor SAFE-DISTANCE exposure data only, simply sign out a watch from a docking station at the start of the shift and dock it back at the end of the shift.

If watch alerts you to a proximity contact follow company guidelines on how to socially distance.

If given access to a SAFE-ZONE area as identified with a SAFE-ZONE tag it has been deemed that the area includes safeguards to physically protect you from the potential transmission of germs by nearby individuals.

When entering an **Enclosed** SAFE-ZONE as identified on the tag, press and release the watch button and place the watch face close to the SAFE-ZONE tag to enable communication for approximately 5 seconds or until a beep sound is made.

Check the watch displays ***SAFE***. If another watch or RASOR comes into close proximity while you are tagged to the SAFE-ZONE, their proximity is not detected and you are not alerted.

When entering an **Open** SAFE-ZONE as identified on the SAFE-ZONE tag, press and release the watch button and place the watch face close to the SAFE-ZONE tag to enable communication for approximately 5 seconds or until a beep sound is made.

Check the watch displays ***SAFE***. If another watch or RASOR comes into close proximity while you are tagged to the SAFE-ZONE their proximity is not detected and you are not alerted if they are also tagged into a SAFE-ZONE.

If the approaching individuals have not been tagged into any type of SAFE ZONE, their proximity is detected and you are alerted.

When leaving a SAFE-ZONE press and release the watch button and place the watch face close to the SAFE-ZONE tag to enable communication for approximately 5 seconds or until a beep sound is made.

The SAFE-ZONE tag includes a time out period. Within 1 minute from the time out period the watch beeps to remind you to re-tag to the SAFE-ZONE tag should you continue to be within the safe area.

#### 4.1.4.5 Watch SAFE-DISTANCE display

When signed out to an operator, the watch display shows HAV exposure data relating to their current shift unless it detects proximity contact with another device.

When the watch has detected a proximity contact, the watch displays the message ***TOO NEAR***

The ***TOO NEAR*** message remains on the display until the watch detects that the other watch has materially moved further away.

When connected to a SAFE-ZONE tag, the display reads ***SAFE*** for SAFE-DISTANCE only watch. For fully enabled watches the display toggles between the word ***SAFE*** and ***HAV*** exposure.




Figure 20 - HAVwear SAFE-DISTANCE image

#### 4.1.4.6 SAFE-DISTANCE alerts - noise and vibration

SAFE-DISTANCE proximity detection relies on the detection of a Bluetooth (BLE) signal within one watch of a signal emitted by a second watch.

The strength of the signal is used to indicate the proximity of the two watches. The standard sensitivity setting of your watch is to detect if the distance between the two watches is less than 2m. This creates a record of close proximity by the watch.

Factors can influence the consistency with which a proximity is detected including the body significantly blocking the signal between the two watches or a reflective surface creating spurious signals.

A watch determines that a proximity has been detected should the signal strength indicate that the other watch is close and the strength of signal is maintained for at

least 5 seconds. This approach avoids watches being close for very short periods such as walking past and raising false alarms.

- The watch constantly scans for other watches
- If a watch detects a number of consistent signals that tells it another watch is too close for more than 5 seconds, the watch receives a short buzz
- The other watch only buzzes if that watch has also detected that another watch is too close for more than 5 seconds. This is usually the case but not always as one watch may have a different environment to the other, for example, how the watch face is orientated relative to the body
- After the short buzz has been emitted if the watch does not detect that you have moved away by 10% of the detected signal, it gives a second longer buzz after 30 seconds
- A long buzz is repeated every 30 seconds until you move away
- There can be a delay until receiving the long buzz – which can therefore be received after you have moved away. The display returns to HAV points or SAFE when the watch has detected that you have moved away
- When not detecting a watch TOO NEAR, the display shows HAV exposure points or blanks for SAFE-DISTANCE only watches.



**Information**

When an operator connects to a SAFE-ZONE tag, they no longer receive any alerts and individuals who come into close proximity to them are not detected as it is assumed that while connected to the SAFE-ZONE tag they are physically protected by a barrier that may allow radio signals to transmit through.

### 4.1.4.7 Switching the watch OFF for HAV exposure monitoring

Switching the watch OFF or use of an OFF tag is recommended after using tools with a vibration magnitude >5m/s2 to ensure TEP points are not accumulated for non tool use, for example, riding in a vehicle. SEP points cannot be switched OFF.

#### Switch the watch OFF

The watch can be switched OFF by an operator. Before a watch can be switched OFF a flag must be set with Reactec Analytics Reports by a company Administrator to enable this functionality.

► *For more information, refer to the Software Administration Guide*

If the flag has been set within Reactec Analytics Reports a tool user may prevent a watch from registering exposure points by the following actions.

- Press and hold continuously the watch button for 5 seconds until the display reads OFF? in the central points display line.
- Release the watch button and press the watch button again.
- The display will return to show exposure points in the central display line and will show OFF in the tool ID line.
- After switched OFF the watch display will remain on showing the points accumulated until it was switched OFF, but the watch does not collect any more TEP exposure points until a tool tag is read. The watch continues to sense SEP points

The watch is returned to an ON state by pressing the watch button once and placing the watch face close to a tool tag to enable communication for approximately 5 seconds or until a beep sound is made. The operator should take care to ensure the display identifies the tool ID and repeat the tool tag read process until it does.

To program an OFF tag, refer to the Tool Tag Manager Guide and use the following details:

- Tool ID: OFF
- Manufacturer: OFF
- Model: OFF
- Description: OFF
- Vibration Level: 0m/s2

## 4.2 15-bay docking station




Figure 21 - 15-bay docking station

### 4.2.1 Specifications

**Table 17 - 15-bay docking station specifications**

| Specification | Description |
|---|---|
| Power | 12V DC, 2.5A. Mains adaptor provided |
| Operating Temperature | 0C to +40C |
| Storage Temperature | 0C to +40C |
| Humidity | Up to 95% RH |
| Ingress Rating | EN60529/IEC60529 to IP20 |
| Tool Tag communications | 13.56MHz close range inductive data communication |
| Mobile Data communications | GSM-900 and GSM-1800 |
| EMC and Radio Standards | EN301 489-1, EN301 489-3, EN301 511, EN302 291-2, EN55022, EN55024 |
| Safety Standards | EN62368-1 |
| Dimensions | 338mm x 180mm x 50mm. LCD 69mm x 69mm |
| Weight | 1025 grams |

### 4.2.2 Care

Keep the docking station, in particular the HAVwear bays, clean to ensure a good connection between the HAVwear watches and the docking station. This ensures efficient recharging and downloading capabilities.

An isopropanol or similar alcohol-based cleaning agent with an alcohol content of at least 70% is recommended for cleaning. Use of chemicals not fitting this description may cause damage.

Apply with a cloth and with the docking station powered down.

### 4.2.3 Configuration

Docking stations are shipped with the latest firmware. If new firmware is released, the firmware is automatically updated when the docking station is connected to either a mobile network or networked connection.

### 4.2.4 Installation

Before installing the Docking Station, it should be determined if there is mobile phone signal coverage in the area. If not then the Ethernet connector should be used to connect via a LAN.

Before installing for use with a LAN it should be determined if the LAN is to be configured for DHCP or a Static IP address.

- *For more information, refer to "Configuring Docking Stations" in the Software Administration Guide.*

When identifying a location for the Docking Station, consider the following:

The Docking Station should be wall mounted with at least a 150mm clearance above and below.

If the Docking Station must be placed horizontally, ensure the area is clear on all sides of the Docking Station, with a 300mm clearance above.

Ensure that the installation site does not block, cover or insert obstructions through the openings on the Docking Station.

**Information**

Alternatively, the Docking Station can be powered directly from a 12V DC vehicle supply. For this type of supply, a 5A fuse must be fitted and it is recommended that a second battery which provides a minimum of 100 Ah is installed in the vehicle.

Plug the vehicle supply cable into the Docking Station and lock the screw connector in place.

**Caution**

Do not mount or place the Docking Station on an unstable surface or near a heat source, such as a radiator, or in direct sunlight. This can damage the unit.

### 4.2.5 How it works

The 15-bay docking station has the following functions:

- Stores and charges up to 15 watches
- Uploads data to Reactec Analytics for all docked watches

Docking stations are central units which provide data archiving, transmission of data to Reactec Analytics and charging for watches.

**Caution**

The docking stations must be operated in a weatherproof environment.

The docking station assigns a watch to an operator when signed out at the start of a shift. When the watch is returned, the docking station automatically downloads tool usage (HAV exposure) data and recharges the watch.

All data downloaded by the docking station is transmitted by the docking station to Reactec Analytics for analysis.

Connection to the docking station is done using a mobile network signal. In the event a signal is not available the communications module can be connected to a local area network by configuring the DHCP or a Static IP address.

#### 4.2.5.1 15-bay docking station display

The LCD screen displays continuously the following:

- Last GPRS successful communication date and time
- GPRS signal strength

The following is displayed when required:

- Internal data memory reaching full – displayed when memory level >75% of capacity.
- Unable to read card message when presence of an Operator ID Card identified but cannot be read
- Internal battery available and charge level of battery – when mains power disconnected only
- Inadequate internal battery power. Power the Docking Station on to charge the battery.

#### 4.2.5.2 Docking station bay LED sequence

When a watch is docked, the linking sequence is triggered by the docking station. The linking sequence has three possible results.

If the communication between the watch and docking station, and the watch battery is OK, then the green LED stays on.

If the communication between the watch and docking station fails, the red LED flashes. If the red LED turns solid red, then the watch should be removed and then re-docked.

If the battery connection or charging process fails, then both the green LED and red LED flashes. In this condition the watch should be removed and re-docked.

If there is an error during the linking sequence, the docking station restarts sequence again. If, after five attempts, the error persists the LEDs stays on as described above.

If no LEDs are illuminated it is possible the watch is not correctly seated in the bay, however it should be noted that immediately after a watch is placed in the bay it may take a minute or two for all data to be downloaded and the watch to be returned to active status during which time no LEDs are illuminated.

## 4.3 4-bay docking station




Figure 22 - 4-bay docking station

### 4.3.1 Specifications

**Table 18 - 4-bay docking station specifications**

| Specification | Description |
|---|---|
| Power | 12V DC, 2.5A. Mains adaptor provided |
| Operating Temperature | 0C to +40C |
| Storage Temperature | 0C to +40C |
| Humidity | Up to 95% RH |
| Ingress Rating | EN60529/IEC60529 to IP20 |
| Mobile Data communications | GSM-900 and GSM-1800 |
| EMC and Radio Standards | EN301 489-1 v1.9.2, EN301 511 v9.0.2, EN301 489-7 v1.3.1, EN55022:2010, EN55024:2010 |
| Safety Standards | EN62368-1 |
| Dimensions | 180mm x 180mm x 50mm |
| Weight | 300 grams |

### 4.3.2 Care

Keep the docking station, in particular the HAVwear bays, clean to ensure a good connection between the HAVwear watches and the docking station. This ensures efficient recharging and downloading capabilities.

An isopropanol or similar alcohol-based cleaning agent with an alcohol content of at least 70% is recommended for cleaning. Use of chemicals not fitting this description may cause damage.

Apply with a cloth and with the docking station powered down.

### 4.3.3 Configuration

Docking stations are shipped with the latest firmware. If new firmware is released, the firmware is automatically updated when the docking station is connected to a mobile network.

### 4.3.4 Installation

Before installing the Docking Station, it should be determined if there is mobile phone signal coverage in the area.

When identifying a location for the Docking Station, consider the following:

- The Docking Station should be wall mounted with at least a 150mm clearance above and below.
- If the Docking Station must be placed horizontally, ensure the area is clear on all sides of the Docking Station, with a 300mm clearance above.
- Ensure that the installation site does not block, cover or insert obstructions through the openings on the Docking Station.



**Information**

Alternatively, the Docking Station can be powered directly from a 12V DC vehicle supply. For this type of supply, a 5A fuse must be fitted and it is recommended that a second battery which provides a minimum of 100 Ah is installed in the vehicle.

Plug the vehicle supply cable into the Docking Station and lock the screw connector in place.

> **Caution**
>
> Do not mount or place the Docking Station on an unstable surface or near a heat source, such as a radiator, or in direct sunlight. This can damage the unit.

### 4.3.5 How it works

The 4-bay docking station has the following functions:

- Stores and charges up to four watches
- Uploads data to Reactec Analytics for all docked watches

Docking stations are central units which provide data archiving, transmission of data to Reactec Analytics and charging for watches.

> **Caution**
>
> The docking stations must be operated in a weatherproof environment.

The docking station assigns a watch to an operator when signed out at the start of a shift. When the watch is returned, the docking station automatically downloads tool usage (HAV exposure) data and recharges the watch.

All data downloaded by the docking station is transmitted by the docking station to Reactec Analytics for analysis.

Connection to the docking station is done using a mobile network signal. In the event a signal is not available the communications module can be connected to a local area network by configuring the DHCP or a Static IP address.

#### 4.3.5.1 4-bay docking station signal strength LEDs

GPRS (mobile network) signal strength is displayed on the 4-bay docking station using a series of four white LEDs. While the docking station can communicate with signal strength of less than 10 (one LED illuminated) it is recommended that the docking station is relocated to an area with stronger signal.

The LEDs are illuminated incrementally based on the following GPRS signal strength levels:

- <5 = no LEDs
- 5-10 = 1 LED
- 10-15 = 2 LEDs
- 15-20 = 3 LEDs
- >20 = 4 LEDs

#### 4.3.5.2 Docking station bay LED sequence

When a watch is docked, the linking sequence is triggered by the docking station. The linking sequence has three possible results.

If the communication between the watch and docking station, and the watch battery is OK, then the green LED stays on.

If the communication between the watch and docking station fails, the red LED flashes. If the red LED turns solid red, then the watch should be removed and then re-docked.

If the battery connection or charging process fails, then both the green LED and red LED flashes. In this condition the watch should be removed and re-docked.

If there is an error during the linking sequence, the docking station restarts sequence again. If, after five attempts, the error persists the LEDs stays on as described above.

If no LEDs are illuminated it is possible the watch is not correctly seated in the bay, however it should be noted that immediately after a watch is placed in the bay it may take a minute or two for all data to be downloaded and the watch to be returned to active status during which time no LEDs are illuminated.

## 4.4 HAVwear strap



Figure 23 - HAVwear strap

The HAVwear wrist strap attaches a HAVwear watch, mounted in a HAVwear holder, to the user's wrist.

### 4.4.1 Specifications

**Table 19 - HAVwear strap specifications**

| Specification | Description |
|---|---|
| Weight | 0.010kg |
| Lengths | Short (230mm)<br>Long (280mm)<br>Extra Long (325mm) |

### 4.4.2 Care

The HAVwear strap is made from nylon webbing and is not impermeable to ingress of fluids, dirt and other contaminants and as such should be assessed for suitability prior to introduction into the workplace.

The HAVwear wrist strap is personal to the individual operator and should always be subject to appropriate occupational hygiene procedures regarding cleaning and replacement.

> **Caution**
>
> The HAVwear wrist strap is not suitable for hot work unless fully covered by appropriate gauntlets.

### 4.4.3 Configuration

There are no configuration requirements for this item.

## 4.5 HAVwear quick-release strap



Figure 24 - Quick-release strap

The quick-release wrist strap is intended for environments where there is a requirement for quick-release mechanisms for operator safety and is designed to a break force of 35n.

### 4.5.1 Specifications

**Table 20 - HAVwear strap specifications**

| Specification | Description |
|---|---|
| Dimensions | Short 240mm<br>Long 285mm<br>Extra Long 320mm |
| Weight | 0.013kg |

### 4.5.2 Care

The HAVwear quick-release strap is made from nylon webbing and is not impermeable to ingress of fluids, dirt and other contaminants and as such should be assessed for suitability prior to introduction into the workplace.

The HAVwear quick-release strap is personal to the individual operator and should always be subject to appropriate occupational hygiene procedures regarding cleaning and replacement.

> **Caution**
>
> The HAVwear quick-release strap is not suitable for hot work unless fully covered by appropriate gauntlets.

### 4.5.3 Configuration

There are no configuration requirements for this item.

## 4.6 HAVwear holder



Figure 25 - HAVwear holder

The HAVwear holder attaches a HAVwear watch to a HAVwear wrist strap.

### 4.6.1 Specifications

**Table 21 - HAVwear holder specifications**

| Specification | Description |
|---|---|
| Dimensions | To fit standard HAVwear watch |
| Weight | 0.006kg |

### 4.6.2 Care

An isopropanol or similar alcohol-based cleaning agent with an alcohol content of at least 70% is recommended for cleaning. Use of chemicals not fitting this description may cause damage.

### 4.6.3 Configuration

There are no configuration requirements for this item.

# 5 RASOR hardware

RASOR is used to collect live data from R-LINK or HAVwear watches and transmit that data directly to Reactec Analytics.




Figure 26 - RASOR eco-system

| | | |
|---|---|---|
| 1 | RASOR | Optional: RASOR captures real-time, multiple workforce risks and supports remote and lone workers with location information, slips/trips and fall detection. |
| 2 | Real-time data collection | Real-time data collected from watches. |
| 3 | Dual charger | Used to charge RASOR. |
| 4 | Data transfer to Reactec Analytics | Data transmitted to Reactec Analytics using mobile or networked connection. |

## 5.1 RASOR




Figure 27 - RASOR device

### 5.1.1 Specifications

**Table 22 - RASOR unit specifications**

| Specification | Description |
|---|---|
| Power | Internal lithium-ion rechargeable battery. Not user serviceable |
| Charge time to full charge | After a typical day of use - one hour<br>From fully discharged - three hours |
| Battery life | Max battery life - 24 hours<br>With SAFE-DISTANCE enabled a battery will be heavily depleted after one day of use |
| Operating temperature | -10C to +40C |
| Storage temperature | -20C to +40C |
| Humidity | Up to 100% RH |
| Ingress rating | EN60529/IEC60529 to IP67 |

| Specification | Description |
|---|---|
| RFID communications | 13.56MHz close range inductive data communication |
| Mobile data communications | GSM-900 and GSM-1800 |
| Wireless personal area network | Bluetooth Low Energy 4.2 |
| EMC and radio standards | EN 55032, EN 55035, EN 301 489-1, EN 301 489-3, EN 301 489-17, EN 301 489-52, EN 300 330, EN 300 328, EN 301 511 |
| Safety standards | EN62368-1 |
| Dimensions | 62mm x 92mm x 15mm (belt clip not fitted). Display 29mm x 36mm |
| Weight | 120 grams |

## 5.1.2 Care

Keep the RASOR, in particular the underneath, clean to ensure a good connection between the RASOR and dual charger.

An isopropanol or similar alcohol-based cleaning agent with an alcohol content of at least 70% is recommended for cleaning. Use of chemicals not fitting this description may cause damage.



**Caution**

The RASOR is a sealed unit. Do not attempt to dismantle or modify it.

### 5.1.2.1 Battery care



**Caution**

The RASOR battery is not replaceable. Attempting to replace the battery will damage the RASOR.

The RASOR is a rechargeable product with the following battery life and charging requirements:

- Recharge the RASOR fully before storing it, when not stored in a powered dual charger
- While a RASOR is stored on a powered dual charger, the dual charger tops up the RASOR battery charge as required
- Recharge the RASOR on a monthly basis for at least one hour

## 5.1.3 Configuration

RASOR has two modes of working.

- RASOR is assigned to an individual by signing out using an Operator ID Card – the **Operator Mode**.
- RASOR is permanently located in a powered dual charger for the purpose of collecting data for anyone who moves within range of the RASOR – the **Hub Mode**.

The **Hub Mode** is a configurable mode set within Reactec Analytics.

The default setting is for this is **Operator Mode**.

If you operate a RASOR in a fixed location within a powered dual charger you should apply the **Hub Mode** setting using Reactec Analytics.

## 5.1.4 How it works

The RASOR gathers data from nearby watches and then transmits this data, using a mobile connection, to Reactec Analytics.

### 5.1.4.1 RASOR display

When assigned to an operator, the RASOR display shows the operator identity and battery level to indicate that it is ready for them to use through their shift.

The RASOR display goes blank after 2 minutes of inactivity, pressing any button wakes up the device which results in the top level menu being displayed.

To move through the display menus and select the required data to view, the operator follows arrows on the display to press either the left or right button on the RASOR.

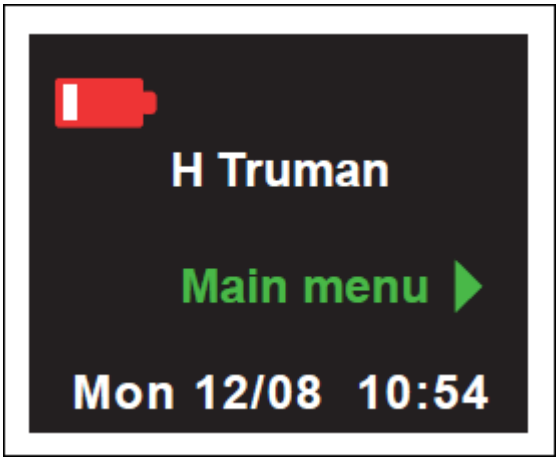



Figure 28 - RASOR display

### 5.1.4.2 RASOR alerts

The RASOR creates a noise alert in response to both routine alerts and more critical alarms.

Routine alerts are transmitted every 15 minutes (default) and will contain details of the alert along with operator ID, time/date information and location of the RASOR at the time of the alert.

The detection of a routine alert either from internal RASOR sensors or nearby watch (or other sensors) causes the RASOR to emit a short buzz (5 seconds) and prompt the RASOR user to acknowledge the alert.

Regardless of whether the alert is acknowledged the RASOR communicates the status change at the next scheduled upload.

Alert notifications:

- HAV EAV breach
- Moderate SAFE-DISTANCE proximity contact
- A slip, trip, or fall, not resulting in fall being detected
- Data from 3rd party sensors not defined as critical

### 5.1.4.3 RASOR alarms (critical alerts)

The detection of an alarm either from internal RASOR sensors or nearby watch (or other sensors) causes the RASOR to emit a long buzz (20 seconds) and inform the user that an alarm condition has been met.

The RASOR user is prompted to acknowledge the alarm.

Data about the alarm is immediately communicated to Reactec Analytics.

Reactec Analytics can be configured to send an email and/or SMS message.

If the wearer is also wearing a watch then a message is sent to the watch and initiate the ELV breach notification on the watch.

Alarm notifications from internal RASOR sensors:

- Panic Button activated
- Man Down

Alarm notifications from nearby watch or third party sensors:

- HAV ELV breach
- Sustained SAFE-DISTANCE proximity contact
- Data from third party sensors defined as an Alarm

If the check-in functionality is enabled an alarm is raised if the Operator fails to check in during the configured time.

If the RASOR loses mobile connection an alarm is raised when the check in time expires, even if the operator has pushed the check in button on his RASOR. In this case, the check in message is sent from RASOR as soon as it reconnects with the mobile network, and this cancels the alarm.

The check-in functionality can be disabled on the Operator ***Check-In Options*** in Reactec Analytics by selecting ***Admin Menu > Operator Check-In Options***.

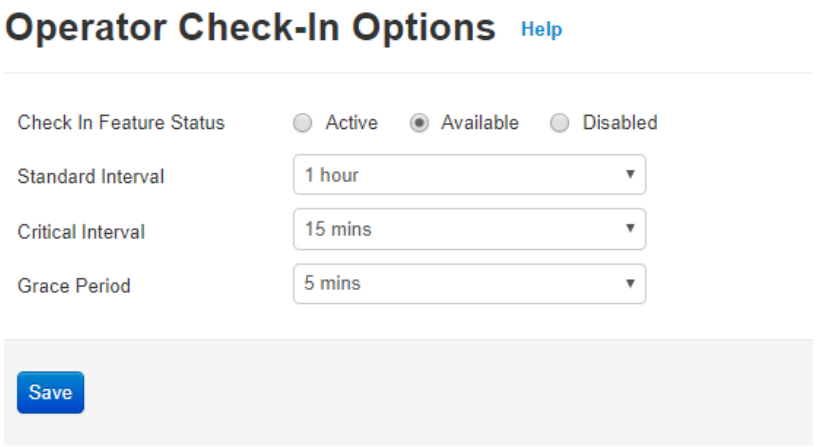



Figure 29 - Operator check-in options page

**Information**

Disabling Check-In also disables Fall Detection

The Panic function can also be disabled on the RASOR options page. Select ***Admin Menu > RASOR Options***.

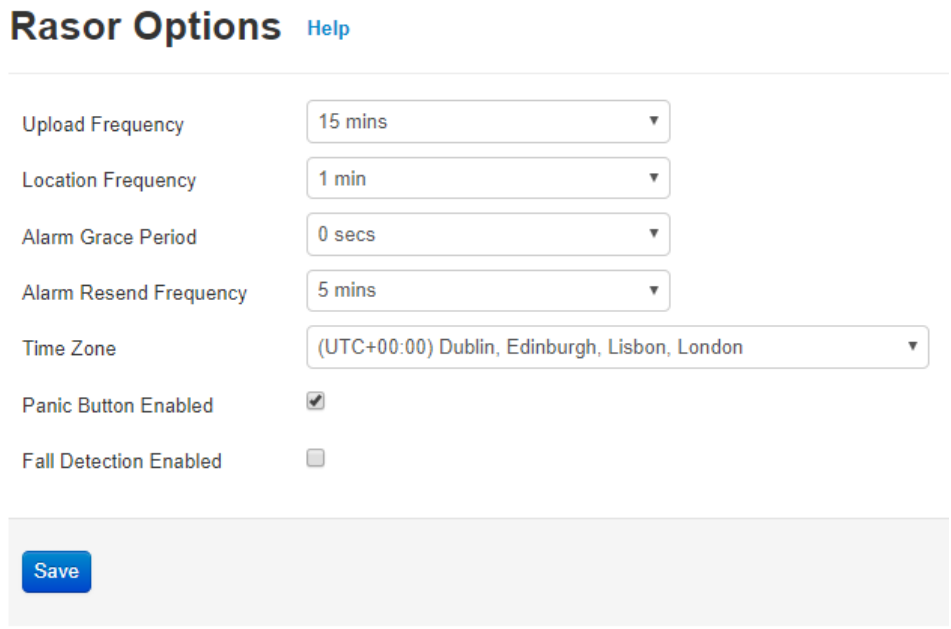



Figure 30 - RASOR options page

## 5.2 RASOR single charger unit

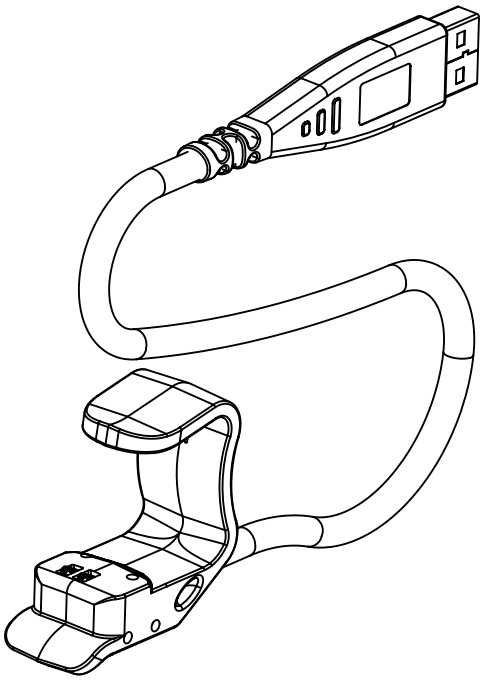


Figure 31 - RASOR single charger

### 5.2.1 Specifications

**Table 23 - RASOR single charger specifications**

| Specification | Description |
|---|---|
| Power | |
| Operating Temperature | |
| Storage Temperature | |
| Humidity | |
| Ingress Rating | |
| Safety Standards | |
| Dimensions | 1020mm Length |
| Weight | |

### 5.2.2 Care

Keep the single charger, in particular the connectors at each end, clean to ensure a good connection between the single charger and RASOR watch and USB device. This ensures efficient recharging capabilities.

An isopropanol or similar alcohol-based cleaning agent with an alcohol content of at least 70% is recommended for cleaning. Use of chemicals not fitting this description may cause damage.

Apply with a cloth and with the single charger disconnected from the power source.

### 5.2.3 Configuration

There are no configuration requirements for this item.

## 5.3 RASOR dual charger unit




Figure 32 - RASOR dual charger unit

### 5.3.1 Specifications

**Table 24 - RASOR dual charger unit specifications**

| Specification | Description |
|---|---|
| Power | 12V DC, 2.5A. Mains adaptor provided |
| Operating Temperature | 0C to +40C |
| Storage Temperature | 0C to +40C |
| Humidity | Up to 95% RH |
| Ingress Rating | EN60529/IEC529 to IP20 |
| EMC | EN 55032, EN 55024, EN 55035 |
| Safety Standards | EN62368-1 |
| Dimensions | 180mm x 180mm x 50mm |
| Weight | 300 grams |

### 5.3.2 Care

Keep the dual charger, in particular the RASOR and HAVwear watch bays, clean to ensure a good connection between the RASOR and HAVwear watch and dual charger. This ensures efficient recharging and downloading capabilities.

An isopropanol or similar alcohol-based cleaning agent with an alcohol content of at least 70% is recommended for cleaning. Use of chemicals not fitting this description may cause damage.

### 5.3.3 Configuration

There are no configuration requirements for this item.

### 5.3.4 Installation

When identifying a location for the Dual Charger, consider the following:

- The Dual Charger should be wall mounted with at least a 150mm clearance above and below.
- If the Dual Charger must be placed horizontally, ensure the area is clear on all sides of the Dual Charger, with a 300mm clearance above.
- Ensure that the installation site does not block, cover or insert obstructions through the openings on the Dual Charger.



**Information**

Alternatively, the Docking Station can be powered directly from a 12V DC vehicle supply. For this type of supply, a 5A fuse must be fitted and it is recommended that a second battery which provides a minimum of 100 Ah is installed in the vehicle.

Plug the vehicle supply cable into the Docking Station and lock the screw connector in place.



**Caution**

Do not mount or place the Docking Station on an unstable surface or near a heat source, such as a radiator, or in direct sunlight. This can damage the unit.

## 5.3.5 How it works

The dual charger unit has the following functions:

- Stores and charges up to two HAVwear devices and one RASOR
- Uploads data to Reactec Analytics for all docked HAVwear devices

The dual charger is a central unit which provides charge management for the RASOR and up to two HAVwear watches and enables 2G connectivity to Reactec Analytics using a docked RASOR device.

The dual charger must be operated in a weatherproof environment.

The dual charger assigns a watch to an operator when signed out at the start of a shift. When the watch is returned, the dual charger automatically charges the watch.

When a RASOR is returned to the dual charger, the data gathered by both the RASOR and any previously or subsequently docked watch, are transmitted to Reactec Analytics for analysis.

### 5.3.5.1 Dual charger watch LED sequence

When a watch is docked, the linking sequence is triggered by the dual charger. The linking sequence has three possible results:

- If the communication between the watch and dual charger, then the green LED stays on.
- If the communication between the watch and dual charger fails the red LED flashes. If the red LED turns solid red, then the watch should be removed and then re-docked.
- If the battery connection or charging process fails then both the green LED and red LED flashes. In this condition the watch should be removed and re-docked.

If there is an error during the linking sequence, the dual charger restarts sequence again. If, after 5 attempts, the error persists the LEDs stay on as described above.

If no LEDs are illuminated it is possible the watch is not correctly seated in the bay, however it should be noted that immediately after a watch is placed in the bay it may take a minute or two for all data to be downloaded and the watch to be returned to active status during which time no LEDs are illuminated.

#### 5.3.5.2 Dual charger RASOR LED sequence

When a RASOR is returned to a powered dual charger the screen prompts the operator to log out by pressing the ***LH*** button.

The operator should log out if their work is finished for the day.

If their workday is not finished but he wishes to place the RASOR in the dual charger for safe keeping for instance if they are driving to another location, they should return the RASOR to the dual charger and leave it in place.

If a RASOR remains in a power dual charger for 4 hours with no further use, the RASOR automatically logs out and no longer assigned to the individual who had docked it.

A RASOR which has not been logged OFF can be removed from the dual charger before the 4 hour period for ongoing use as an assigned device.

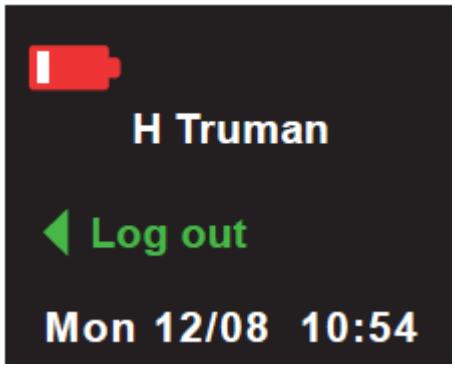



Figure 33 - RASOR Display

When a RASOR is docked, the linking sequence is triggered by the dual charger. The linking sequence has 3 possible results:

- If the communication between the RASOR and dual charger, then the green LED stays on.
- If the communication between the RASOR and dual charger fails the red LED flashes. If the red LED turns solid red, then the watch should be removed and then re-docked.

- If the battery connection or charging process fails then both the green LED and red LED flashes. In this condition the RASOR should be removed and re-docked

If there is an error during the linking sequence, the dual charger restarts sequence again. If, after 5 attempts, the error persists the LEDs stays on as described above.

If log out is not selected the RASOR screen displays as below until the end of the 4 hour period, after which the display goes blank.

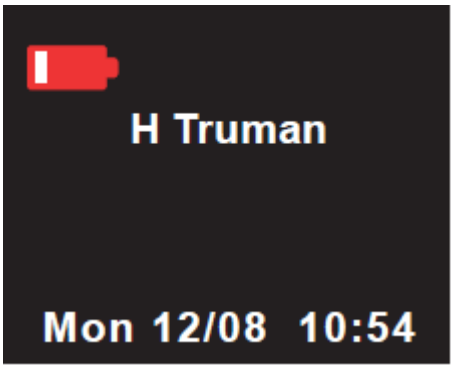



Figure 34 - RASOR Display

# 6 ID cards




Figure 35 - ID cards

ID cards (MIFARE Classic 1KB), or CSCS cards, are cards provided to each Operator to uniquely identify them in Reactec Analytics.

Operators use their ID card or CSCS card, to sign out a watch at the start of a shift. This identifies the Operator to the watch, ensuring the correct exposure action value (EAV), exposure limit value (ELV), and safety data is used.

Each Operator must have their own ID card assigned with individual information.

## 6.1 Specifications

**Table 25 - ID cards specifications**

| Specification | Description |
|---|---|
| Supported types of ID cards | RFID Cards (MIFARE Classic 1KB)<br>RFID CSCS Cards<br>Compatible existing company RFID cards |
| Supported protocols | MIFARE 1k<br>MIFARE Classic EV1<br>ISO 15693 |

## 6.2 Care

There are no care requirements for this item.

## 6.3 Configuration

► *For configuration information, refer to the ID Card Manager Guide.*

# 7 RFID Tool tags

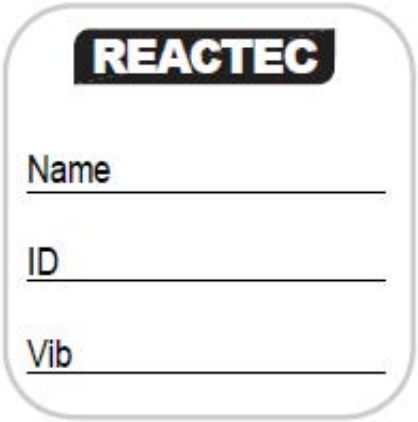



Figure 36 - RFID Tool tag

## 7.1 RFID Tool tags

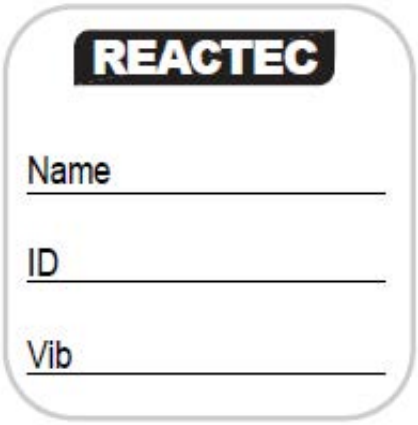



Figure 37 - RFID Tool tag

## 7.2 Specifications

**Table 26 - Tool tag specifications**

| Specification | Description |
|---|---|
| Dimensions | 30mm x 30mm |
| Weight | 0.002kg |

## 7.3 RFID Slimflex Tool tags



Figure 38 - RFID Tool tag

## 7.4 Specifications

**Table 27 - Tool tag specifications**

| Specification | Description |
|---|---|
| Dimensions | 87mm x 25mm x 3mm |
| Weight | 6g |

## 7.5 RFID Disc Tool tags



Figure 39 - RFID Tool tag

## 7.6 Specifications

**Table 28 - Tool tag specifications**

| Specification | Description |
|---|---|
| Diameter | 20mm |
| Weight | 1g |

## 7.7 Bluetooth Tool tags




Figure 40 - Bluetooth Tool tag

## 7.8 Specifications

**Table 29 - Bluetooth Tool tag specifications**

| Specification | Details |
|---|---|
| Power | 225mAh CR2032 Li 3V battery |
| Material | PA66 Zytel 101E NC010 Blue casing filled with WEVOPUR 552FL+ WEVONAT 300 |
| Battery life | Up to 2 years of battery life, depending on advertisement configuration |
| Operating Environment | For Indoor and Outdoor use. |
| Operating temperature | -20°C to +60°C |
| Storage temperature | -20°C to +40°C |
| Humidity | up to 85% RH |
| Ingress rating | Weatherproof to IP67 |
| Communication | |
| EMC and Radio standards | Bluetooth, FCC, IC, CE and RCM certified |
| Safety standards | RoHS and REACH compliant |
| Dimensions | 32.1mm x 22.1mm x 5.3mm |
| Weight | 7 grams |

## 7.9 Care

There are no care requirements for this item.

## 7.10 Configuration

► *For configuration information, refer to the Tool Tag Manager Guide.*

## 7.11 SAFE-ZONE tags

SAFE-ZONE tags look similar to tool tags with different external markings and intended for a very different application.




Figure 41 - SAFE-ZONE Tag

SAFE-ZONE tags contain information that enables the proximity detection of a watch to be switched off. This is intended for situations were an individual is physically protected from transmission of germs but may be able to detect signals from other devices which are in proximity.

The SAFE-ZONE tag is programmed with the following information:

- The zone type – open or enclosed (see below)
- The name of the location of the tag (up to 32 characters)
- The number of minutes after which the operator will be automatically tagged out of the Safe Zone (defaults to 10 minutes, can be set to zero if no timeout is required).
- Optionally the latitude and longitude of the location of the tag

You are responsible for deciding if any information is to be displayed on the SAFE-ZONE tag.

# 8 RFID Read/Writer




Figure 42 - RFID read/writer

## 8.1 Specifications

**Table 30 - RFID Read/Writer specifications**

| Specification | Description |
|---|---|
| Dimensions | 59mm x 59mm x 11.4mm |
| Weight | approx. 70grams |
| Connector/Cable | USB type A connector<br>150cm cable length |

## 8.2 Care

There are no care requirements for this item.

## 8.3 Configuration

► *For configuration information, refer to the ID Card Manager Guide.*