3 Hardware Installation

☞ All necessary installation works must be done by a dedicated installation specialist. Please contact the local selling unit or dealer for further information.

⚠WARNING

Unqualified installation on building or construction machinery

This may result in personal and material damage.

Precautions:

- Only an appropriately trained and qualified specialist may install this product on building or construction machinery.

4 Operation

4.1 Pedestrian Tag

4.1.1 General Working Information

Wearing the pedestrian tag

The iCON PA tag comes with a clip that allows for different wearing options (Fig. 8). For choosing an optimal wearing option you need to balance the importance of detection performance against wearing comfort:

a **Pocket:** This wearing option offers a good compromise between performance and wearing comfort. The high position of the tag still ensures a good detection performance due to less obstructions, while at the same time the tag is comfortable to wear.

b **Belt:** This wearing option is the most comfortable position, but results in the lowest detection performance due to a lot of obstructions.

c **Helmet:** This wearing option ensures the highest detection performance due to the best "visibility" but it compromises the wearing comfort.

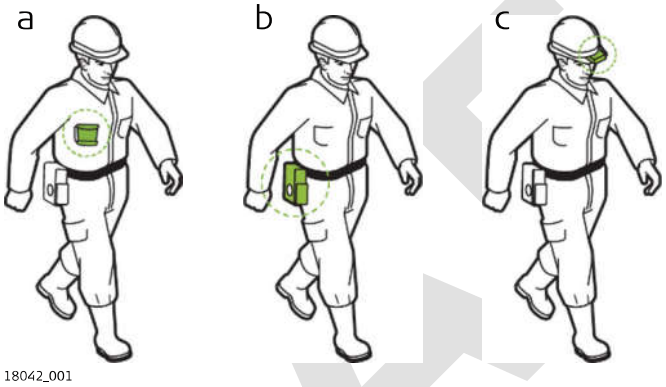


Fig. 8: Wearing options for the pedestrian tag

4.1.2 Status Indicators

Operating status

During normal operation

To indicate normal operating status, the tag provides a visual "heartbeat" indication every 30 seconds for 0.1 seconds. The LED colour indicates the remaining operation time based on the battery charge level.

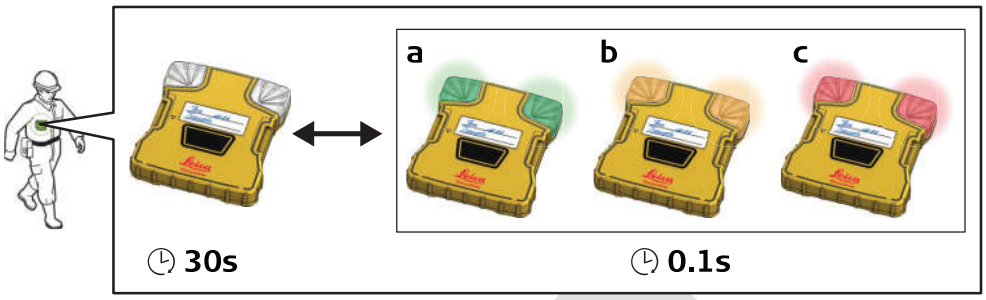
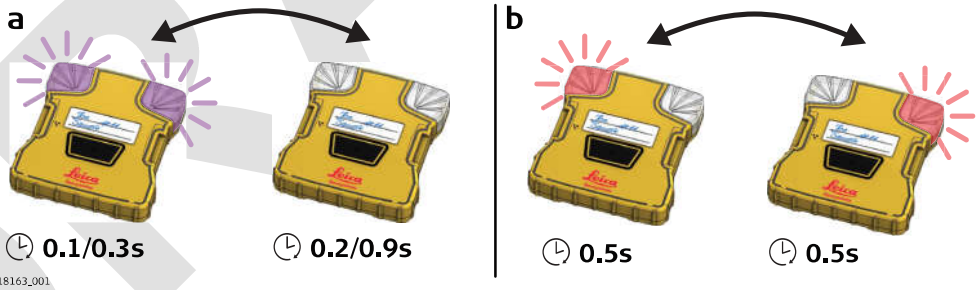


Fig. 9: Visual "heartbeat" indication

a Battery has sufficient charge for operation. Remaining operation time is more than two hours.
b Battery charge is low. Remaining operation time is less than two hours.
c Battery charge is critically low with insufficient charge for correct operation. Battery needs to be recharged.

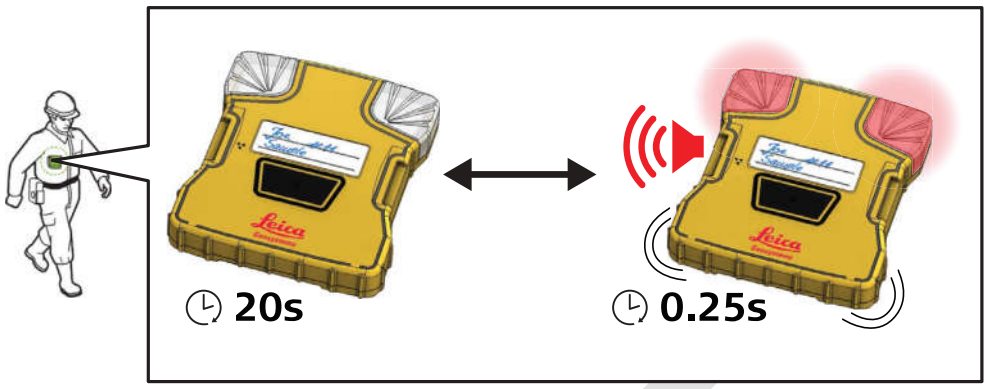
During shipping

At delivery, a special shipping firmware is installed on the tag in order to comply with battery shipping regulations. This firmware disables all transmit functions and makes sure that the battery charge level is low enough for shipping. In order to operate the tag, update it with the standard firmware. Refer to "4.1.5 Firmware update".



a Shipping firmware installed on the tag, tag is not operable. Battery charge level is low enough for shipping.
b Shipping firmware installed on the tag, tag is not operable. Battery charge level is too high for shipping.

Error on the tag

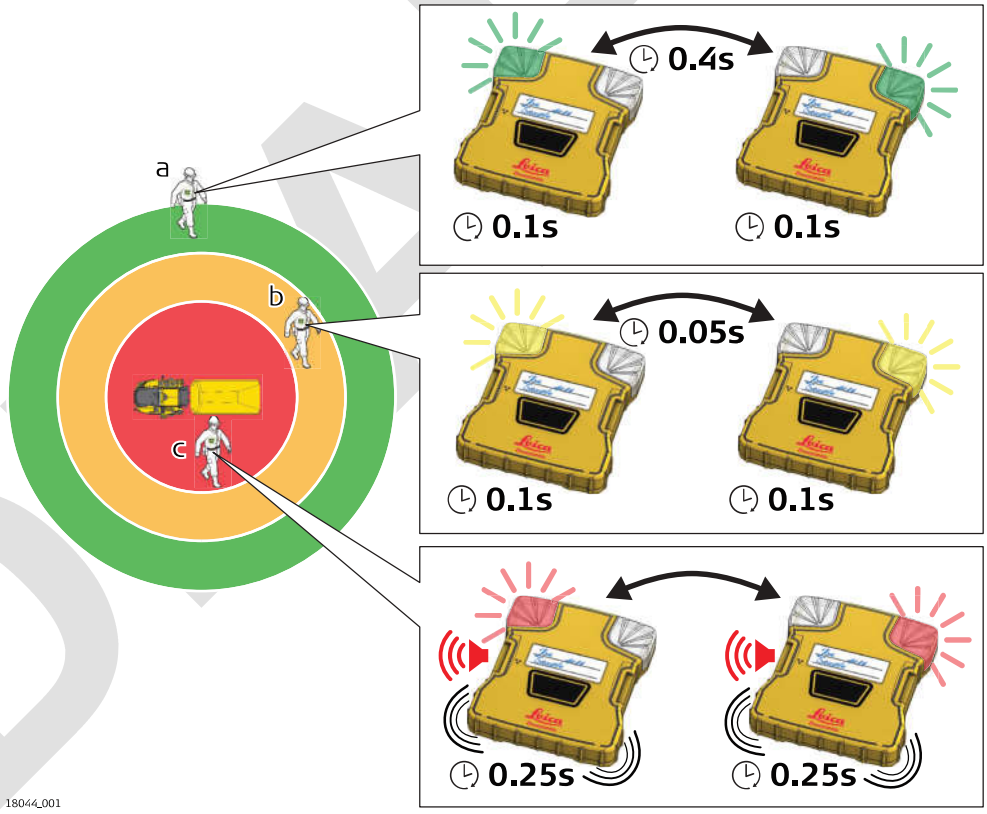


18164_001

Alarm signals

Alarms to indicate proximity to a machine

The iCON PA system supports three different detection zones. Each zone has a specific alarm signal which is clearly distinguishable from the alarms of the other zones.



18044_001

Fig. 10: Alarms to indicate proximity to a machine

a **Far:** Left and right LED flash alternately green.
b **Near:** Left and right LED flash alternately yellow.
c **Close (danger zone):** Left and right LED flash alternately red. Buzzer and vibration generator emit a high-frequency alarm signal.

4.1.3 The Acknowledge Key

Functionalities

Acknowledging an alarm

A person wearing the pedestrian tag can acknowledge an alarm, thus silencing the audible and vibratory alarm signals.

☞ To acknowledge an alarm, press the acknowledge key once.

Running the self check of the tag

The pedestrian tag comes with an integrated self-check functionality which includes checking the battery status. (Refer to the section "Battery charge levels".)

☞ To run the self check, press the acknowledge key twice within a second.

Performing a hard reset of the tag

A hard reset is only possible when the tag is inserted into the gang charger. (Refer to the section "Performing a hard reset".)

4.1.4 Batteries

Battery charge levels

The battery status of the pedestrian tag is constantly monitored by the iCON PA system. The battery status is indicated in the following situations:

- during normal operation as visual "heartbeat". Refer to the section "Operating status".
- when running the integrated self check of the pedestrian tag. Refer to "4.1.3 The Acknowledge Key".
- when the integrated self check is automatically performed after removing the tag from the gang charger.

Indication of self check

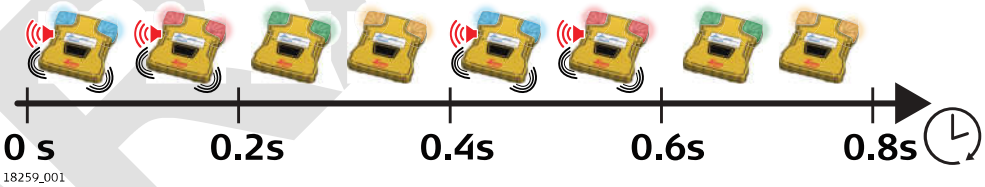


Fig. 11: Indication of self check

Indication of battery charge level at the end of the self check

Fig. 12: Indication of battery charge levels

a Battery has sufficient charge for operation. Remaining operation time is more than two hours.
b Battery charge is low. Remaining operation time is less than two hours.
c Battery charge is critically low with insufficient charge for correct operation. Battery needs to be recharged.

Charging the tag battery

For charging a pedestrian tag, use the provided gang charger. The gang charger allows you to charge up to 10 pedestrian tags simultaneously.

18076_001

Fig. 13: 10-bay gang charger

1. Connect the power adapter of the gang charger to a suitable power source.
2. Connect the gang charger to the power adapter.
   The Power LED of the gang charger lights up green.
3. Insert the pedestrian tag into a free bay of the gang charger.
   The LEDs of the tag indicate the charging status. Refer to the section "Indication of battery status".

☞ Before removing the tag from the charger in order to wear it, make sure that it is fully charged.

☞ When removing the tag from the charger, the tag automatically performs the integrated self check. The battery charge level is indicated at the end of the self check.

Indication of battery status

When inserting the pedestrian tag into the gang charger, the tag LEDs indicate the battery status. The left LED indicates the battery health. The right LED indicates the battery charge level.

Battery health

LED pattern		Status	Possible causes
 18065_001	Left LED is permanently on in green.	Battery health is ok.	n/a

LED pattern		Status	Possible causes
 18072_001	Left LED is permanently on in red.	Battery end-of-life.	Battery capacity is not sufficient anymore. Replace the battery.

Battery charge level

LED pattern		Status	Possible causes
 18070_001	Both LEDs are off.	Tag is not communicating.	Battery is flat.
 18066_001	Right LED flashes red at intervals of 2 seconds.	Charging not started yet.	Several causes are possible. For example, temperature might be outside the allowed range for charging.
 18067_001	Right LED flashes blue at intervals of 2 seconds.	Charging in progress.	n/a
 18069_001	Right LED is permanently on in green.	Charging is finished.	n/a

4.1.5 Firmware update

Updating the tag firmware

⚠CAUTION

Incorrect configuration by unqualified personal

Incorrect configuration will render a tag inoperable, that is, not being able to communicate with machine anchors. Thus, the tag will neither detect and indicate nearby machines nor will nearby machines be able to detect the tag.

- Only an appropriately trained and qualified specialist may configure and update the firmware of a tag.

To update the firmware of a pedestrian tag, use the designated slot of the gang charger. See Fig. 14.

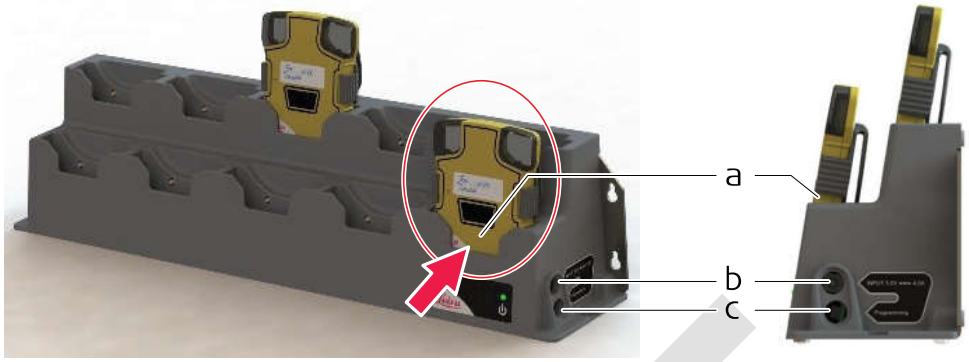


Fig. 14: Gang charger interface for firmware update

a Programming slot
b Socket for power adapter
c Socket for programming cable

Firmware update step-by-step

☞	The CRS123 programming tool and the CRS107 programming cable must be ordered separately. Install the programming tool on your computer (Windows operating system). Make sure that the firmware file for updating is available on the computer.
1.	Connect the power adapter of the gang charger to a suitable power source.
2.	Connect the gang charger to the power adapter. *The Power LED of the gang charger lights up green.*
	Connect the programming cable to the gang charger and to the computer.
3.	Insert the pedestrian tag into the programming slot.
☞	LED indication: • As long as no firmware update is ongoing, the tag starts charging. The LEDs indicate the battery status and charging progress. • If the tag has no firmware installed, both LEDs are permanently on in blue. • If both LEDs are permanently on in red, the tag might need a hard reset. Refer to the section "Performing a hard reset".
4.	Open the programming tool on the computer. In the bottom status bar, check if the tag is connected to the software.
5.	In the section **Firmware Installation**, select the correct firmware file. To start the firmware update click **Upload**.
☞	*While the update is ongoing, the software shows a progress bar.* *Both LEDs on the tag are permanently on in red.* *Once the firmware update is completed, the tag resets and goes back to charging. The LEDs indicate the respective battery status.*

LED indication

LED pattern		Status	Possible causes
 18068_001	Both LEDs are permanently on in blue.	No Firmware installed.	Firmware on the tag is not correct or update was not successful.
 18257_001	Both LEDs are permanently on in red when inserting tag into programming slot.	Tag is inoperable and needs a hard reset.	Firmware update was interrupted.
	Tag is already in the programming slot. Both LEDs are permanently on in red when starting the firmware update with the programming tool.	Firmware update in progress.	

Performing a hard reset

1. Insert the pedestrian tag into the programming slot.
2. Press the acknowledge key for more than 5 seconds.

After hard reset, the LEDs should either indicate the battery status or indicate that no firmware is installed.

4.2 Machine Anchor

4.2.1 General Working Information

Cabin anchor functionality

In order to reduce nuisance alarms, anchors mounted near the cabin of a vehicle can be assigned as cabin anchor (Anchor ID = 0). Cabin anchors suppress alarms for tags that are within the configured cabin anchor radius (Fig. 15).

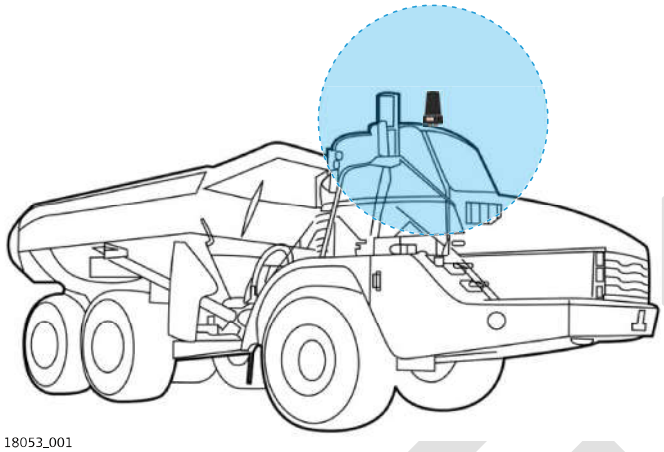


Fig. 15: Cabin anchor radius

4.2.2 Status Indicators

Machine anchor status

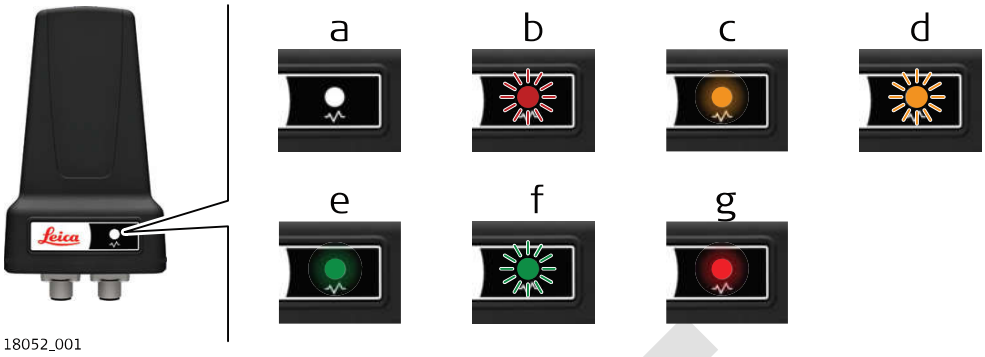


Fig. 16: Status indication for machine anchor

a **LED off**
No Power

b **LED flashing red quickly**
Anchor is starting up.

c **LED permanently on in orange**
Anchor is powered up and running in standalone mode; no tags or other anchors are in range.

d **LED flashing orange slowly**
Anchor is powered up and running in standalone mode; tags or other anchors are in range.

e **LED is permanently on in green**
Anchor is powered up and connected to main unit; no tags or other anchors are in range.

f **LED flashing green slowly**
Anchor is powered up and connected to main unit; tags or other anchors are in range.

g **LED permanently on in red**
Error on the anchor.

4.3 CRS113 LED Display Unit

4.3.1 Status Indicators

Indication of the tag position

☞ The tag position relative to the machine is only indicated when using a multiple-anchor configuration.

Since a single-anchor system cannot determine the tag position, the display unit shows a generic warning pattern. When using a multiple-anchor configuration, the system indicates the relative tag position in addition to the detected tag proximity.

a b

Fig. 17: Indication based on the anchor configuration

a Single-anchor configuration: LEDs indicate only tag proximity
b Multiple-anchor configuration: LEDs indicate tag position and tag proximity

Alarm signals

Alarms to indicate proximity to a tag

The iCON PA system supports three different detection zones. Each zone has a specific alarm signal which is clearly distinguishable from the alarms of the other zones.

☞ The following illustration applies to a multiple-anchor configuration. LED colours and behaviours (flashing or permanently on) also apply to a single-anchor configuration.

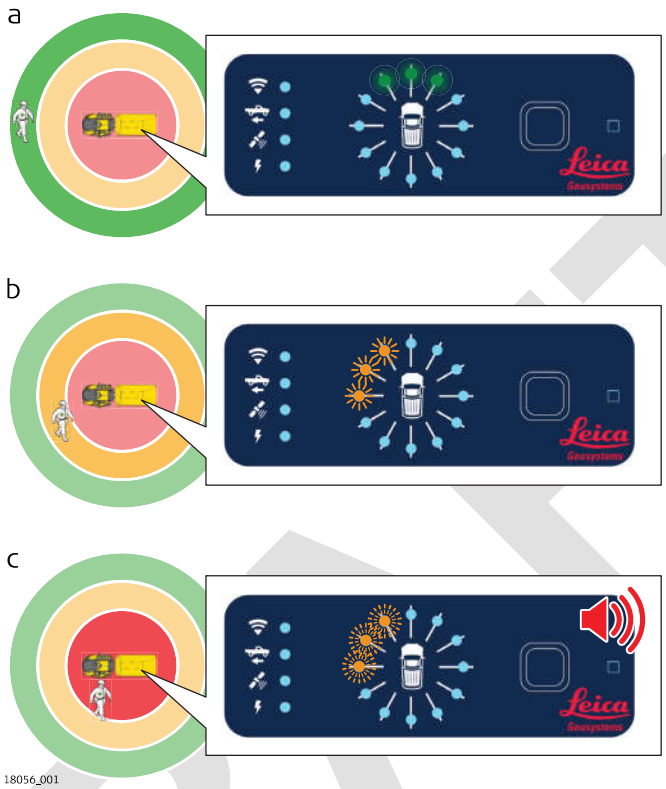


Fig. 18: Alarms to indicate proximity to a tag

a **Far:** Three LEDs permanently on in yellow, indicating the detected tag position.

b **Near:** Three LEDs slowly flashing yellow, indicating the detected tag position.

c **Close (danger zone):** Three LEDs quickly flashing yellow, indicating the detected tag position. Buzzer emits a high-frequency alarm signal.

Indication of errors

The display unit performs a self check upon power up.

- To indicate an error, all four status LEDs at the left are permanently on in red (a). Specific information on the error code is given by the indicators for tag position and proximity. Refer to the following table.
- On first restart after an update, the LEDs might display a "non-fatal" error for 30 seconds (b).

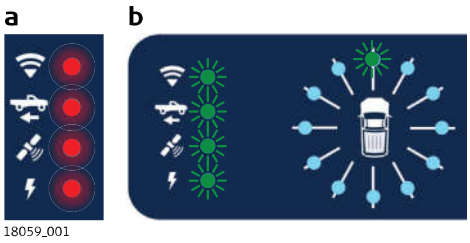
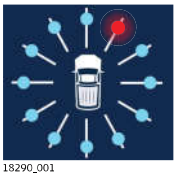
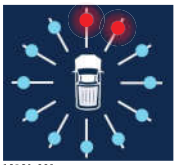
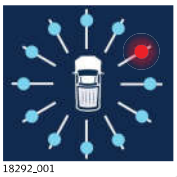
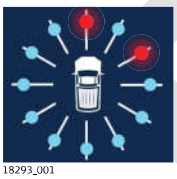
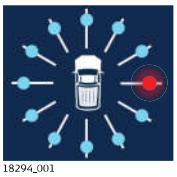
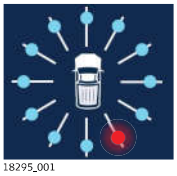
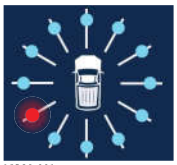
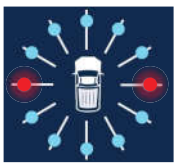


Fig. 19: Indication of errors

a Fatal error or alert
b Non-fatal error

Error codes

LEDs	Subsystem	Severity of error	Possible cause
 18289_001	Flash memory	Non-fatal error Display unit is still operable, but data is lost.	Failure of flash memory.
		Fatal error Display unit is inoperable.	
 18290_001	Serial number	Fatal error	Invalid serial number. ☞ Contact support.
 18291_001	Dataport	Alert	Failed to send dataport hearbeat message.
 18292_001	GPS receiver	Fatal error	Unable to communicate with or to configure GPS module.
 18293_001	GPS antenna	Fatal error	GPS antenna defective or bad connection.
 18294_001	Power supply	Fatal error	Power supply defective or voltage too low/high.

LEDs	Subsystem	Severity of error	Possible cause
 18295_001	Configuration	Fatal error	Configuration file contains errors or is not present.
 18296_001	Firmware	Fatal error	Firmware corrupt. ☞ Upload new firmware.
 18297_001	Generic	Various	Generic error. Currently not used - depends on firmware version.
 18298_001	GPIO	Fatal error	Error in GPIO configuration or hardware problem.
 18302_001	Machine Anchor	Fatal error	• Communications error; anchors are inoperable • Malfunction of anchors • Fault in the system wiring • Anchors are disconnected ☞ Inform your dispatcher or supervisor about the error and follow their instructions.

4.3.2 The Acknowledge Key

Functionalities

Acknowledging an alarm

Machine drivers of machines on which the LED display unit is installed can acknowledge an alarm, thus silencing the audible signal.

☞ To acknowledge an alarm, press the acknowledge key once.

5 Care and Transport

5.1 Transport

Transport in the field

When transporting the equipment in the field, always make sure that you carry the product in its original container.

Transport in a road vehicle

Never carry the product loose in a road vehicle, as it can be affected by shock and vibration. Always carry the product in its container and secure it.

For products for which no container is available use the original packaging or its equivalent.

☞

For units that are exposed to high mechanical forces, for example through frequent transport or rough handling, it is recommended to carry out test measurements periodically.

Shipping

When transporting the product by rail, air or sea, always use the complete original Leica Geosystems packaging, container and cardboard box, or its equivalent, to protect against shock and vibration.

Shipping, transport of batteries

When transporting or shipping batteries, the person responsible for the product must ensure that the applicable national and international rules and regulations are observed. Before transportation or shipping, contact your local passenger or freight transport company.

5.2 Storage

Product

Respect the temperature limits when storing the equipment, particularly in summer if the equipment is inside a vehicle. Refer to "6 Technical Data" for information about temperature limits.

- Refer to "Environmental Specifications" for information about storage temperature range.
- Remove batteries from the product and the charger before storing.
- After storage recharge batteries before using.
- Protect batteries from damp and wetness. Wet or damp batteries must be dried before storing or use.
- A storage temperature range of 0°C to +30°C/+32°F to 86°F in a dry environment is recommended to minimise self-discharging of the battery.
- At the recommended storage temperature range, batteries containing a 40% to 50% charge can be stored for up to one year. After this storage period the batteries must be recharged.

5.3 Cleaning and Drying

Product and Accessories

- Use only a clean, soft, lint-free cloth for cleaning. If necessary, moisten the cloth with water or soapy water. Do not use other liquids; these may attack the product surface.

Charger and AC/DC power supply

Use only a clean, soft, lint-free cloth for cleaning.

Cables and plugs	Keep plugs clean and dry. Blow away any dirt lodged in the plugs of the connecting cables.
Damp products	Dry the product, the container, the foam inserts and the accessories at a temperature not greater than 40 °C and clean them. Do not repack until everything is completely dry.

6 Technical Data

6.1 Dimensions

Dimensions

Type	Dimensions [mm] (L x W x H)
CRS101 machine anchor	151 x 81 x 45
CRS103 pedestrian tag	71.6 x 14.4 x 85.8
CRS113 LED display unit	81 x 30 x 20
CRS110/CRS111 main unit (without connectors)	81 x 30 x 126
CRS145 antenna	107 x 91 (Ø x H)

6.2 Weight

Weight

Type	Weight [g]
CRS101 machine anchor	170
CRS103 pedestrian tag	84
CRS113 LED display unit	60
CRS110/CRS111 main unit (without cables)	260
CRS145 antenna	620

6.3 Environmental Specifications

iCON PA10 components

Temperature

Type	Operating temperature [°C]/[°F]	Storage temperature [°C]/[°F]
CRS101 machine anchor	–40 to +85/-40 to +185	–40 to +85/-40 to +185
Internal battery of CRS103 tag	Charging: –5 to +40/-23 to +104 Discharging: –20[1)] to +50/-4 to +122	–20 to +60/-4 to +140
CRS103 pedestrian tag	–20[1)] to +50/-4 to +122	–20 to +60/-4 to +140
CRS113 LED display unit	–40 to +85/-40 to +185	–40 to +85/-40 to +185
CRS110/CRS111 main unit	–40 to +85/-40 to +185	–40 to +85/-40 to +185
CRS145 antenna	–40 to +85/-40 to +185	–40 to +85/-40 to +185
CRS106 gang charger and AC/DC power supply	–20 to +85/-4 to +185	

[1)] Operation below this temperature is possible, but operating time is less than 14 hours.

Humidity

Type	Protection
All products	Max 95 % non condensing The effects of condensation are to be effectively counteracted by periodically drying out the product.

Protection against water, dust and sand

Type	Protection
All products	IP67 (IEC 60529)
Exception: Charger and AC/DC power supply	Only operate in dry environments, for example in buildings and vehicles.

6.4 Electrical Data

Main iCON PA10 components

Type	Power supply	Power consumption
CRS101 machine anchor	External supply voltage (cable): 9-36 VDC	40 mA (at 24 VDC)
CRS103 pedestrian tag	External supply voltage (charger): 4.6-6 VDC (5 V typical)	60 mA (at 5 VDC)
CRS113 LED display unit	External supply voltage (cable): 12-28 VDC (nominal)	< 10 mA (typical, at 12 VDC)
CRS110/CRS111 main unit	External supply voltage (cable): 12-28 VDC (nominal)	< 100 mA (typical)
CRS145 antenna	External supply voltage (cable): 3.3-5 VDC	max. 20 mA
CRS106 gang charger	External supply voltage (charger): 4.6-6 VDC (5 V typical)	**Charging 1 tag:** 50-350 mA (300 mA typical) **Charging 10 tags:** 500-3500 mA (3000 mA typical)

Internal battery of CRS103 pedestrian tag

Internal battery	Value
Type	Li-Po
Voltage	3.7 V
Capacity	950 mAh (minimum), 1000 mAh (typical)
Operating time	Up to 14 hours of continuous operation at normal conditions.
Charging time	Typical charging time with CRS106 gang charger is 3-5 hours at room temperature.

6.5 Other Technical Data

Antenna specifications

Type	Antenna pattern	Typical accuracy
Integrated antenna of CRS101 machine anchor	Omnidirectional	± 20 cm over the temperature range
Integrated antenna of CRS103 pedestrian tag	Omnidirectional	± 20 cm over the temperature range

Main unit

Type	LTE bands
CRS110	1, 3, 4, 7, 8, 28 (EMEA, APAC)
CRS111	2, 4, 5, 7, 17 (AMERICAS)

6.6 Conformity to National Regulations

6.6.1 General

Conformity to national regulations

For CRS101, CRS103, CRS110, CRS111:

- FCC Part 15 (applicable in US)
- Hereby, Leica Geosystems AG declares that the radio equipment type CRS101, CRS103, CRS110, CRS111 is in compliance with Directive 2014/53/EU and other applicable European Directives.
  The full text of the EU declaration of conformity is available at the following Internet address: http://www.leica-geosystems.com/ce.

CE Class 1 equipment according to European Directive 2014/53/EU (RED) can be placed on the market and be put into service without restrictions in any EEA member state.

- The conformity for countries with other national regulations not covered by the FCC part 15 or European Directive 2014/53/EU has to be approved prior to use and operation.

For CRS113:

For products without radio transmitter or receiver:

CE
- Hereby, Leica Geosystems AG declares that the product/s is/are in compliance with the essential requirements and other relevant provisions of the applicable European Directives.
  The full text of the EU declaration of conformity is available at the following Internet address:
  http://www.leica-geosystems.com/ce.

6.6.2 Radio Transmitter RS9110N1122 and NRF905

IC Canadian Compliance

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

Under Industry Canada regulations, this radio transmitter may only operate using an antenna of a type and maximum (or lesser) gain approved for the transmitter by Industry Canada. To reduce potential radio interference to other

users, the antenna type and its gain should be so chosen that the equivalent isotropically radiated power (e.i.r.p) is not more than that necessary for successful communication.This device complies with Industry Canada license-exempt RSS standard(s).

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

Le présent émetteur radio a été approuvé par Industrie Canada pour fonctionner avec les types d'antenne énumérés ci-dessous et ayant un gain admissible maximal et l'impédance requise pour chaque type d'antenne. Les types d'antenne non inclus dans cette liste, ou dont le gain est supérieur au gain maximal indiqué, sont strictement interdits pour l'exploitation de l'émetteur.Conformément à la réglementation d'Industrie Canada, le présent émetteur radio peut fonctionner avec une antenne d'un type et d'un gain maximal (ou inférieur) approuvé pour l'émetteur par Industrie Canada. Dans le but de réduire les risques de brouillage radioélectrique à l'intention des autres utilisateurs, il faut choisir le type d'antenne et son gain de sorte que la puissance isotrope rayonnée équivalente (p.i.r.e.) ne dépasse pas l'intensité nécessaire à l'établissement d'une communication satisfaisante.Le présent appareil est conforme aux CNR d'Industrie Canada applicables aux appareils radio exempts de licence.L'exploitation est autorisée aux deux conditions suivantes :(1) Ll'appareil ne doit pas produire de brouillage.

(2) L'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

Antenna types

	QF036 antenna	QF037/CRS145 antenna
Mounting type	Through hole	Magnetic
Weight	480 g	620 g
Impedance	50 Ohm nominal	50 Ohm nominal
WiFi gain	5 dBi	5 dBi
RF gain	3 dBi	3 dBi
GPS gain	5 dBi	5 dBi

Radio Frequency (RF) Exposure Compliance Statement

The radiated RF output power of the instrument is below the Health Canada's Safety Code 6 exclusion limit for portable devices (radiated element separation distance between the radiating element and user and/or bystander is below 20 cm).

NOTICE

The antennas must be mounted more than 20 cm away from any other antenna and from the human body.

6.6.3 Dangerous Goods Regulations

Dangerous Goods Regulations

Many products of Leica Geosystems are powered by Lithium batteries.

Lithium batteries can be dangerous under certain conditions and can pose a safety hazard. In certain conditions, Lithium batteries can overheat and ignite.

☞ When carrying or shipping your Leica product with Lithium batteries onboard a commercial aircraft, you must do so in accordance with the **IATA Dangerous Goods Regulations**.

☞ Leica Geosystems has developed **Guidelines** on "How to carry Leica products" and "How to ship Leica products" with Lithium batteries. Before any transportation of a Leica product, we ask you to consult these guidelines on our web page (http://www.leica-geosystems.com/dgr) to ensure that you are in accordance with the IATA Dangerous Goods Regulations and that the Leica products can be transported correctly.

☞ Damaged or defective batteries are prohibited from being carried or transported onboard any aircraft. Therefore, ensure that the condition of any battery is safe for transportation.

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- when it has to be **right**

Leica Geosystems