


LED pattern	Status	Possible causes
 <p>18069.001</p>	Right LED is permanently on in green.	Charging is finished.

#### 4.1.5

### Updating the tag firmware

### Firmware update

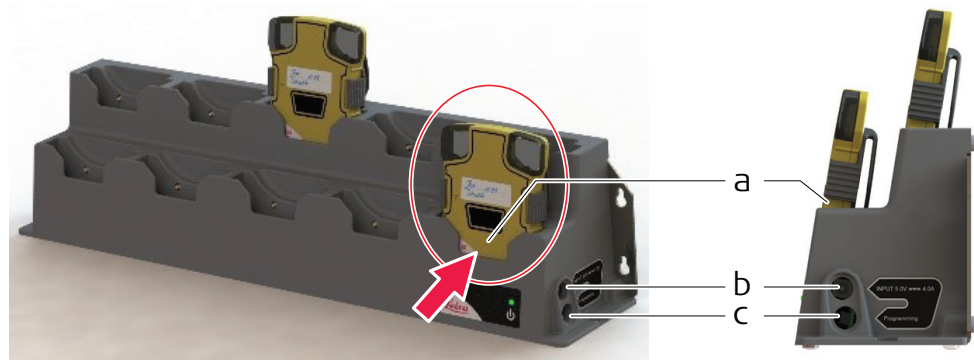
#### ⚠ CAUTION

#### Incorrect configuration by unqualified personnel

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.



18165.001

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. Select the correct firmware file in the section **Firmware Installation**.

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
 <small>18068.001</small>	Both LEDs are permanently on in blue.	No Firmware installed. Firmware on the tag is not correct or update was not successful.
 <small>18257.001</small>	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

---

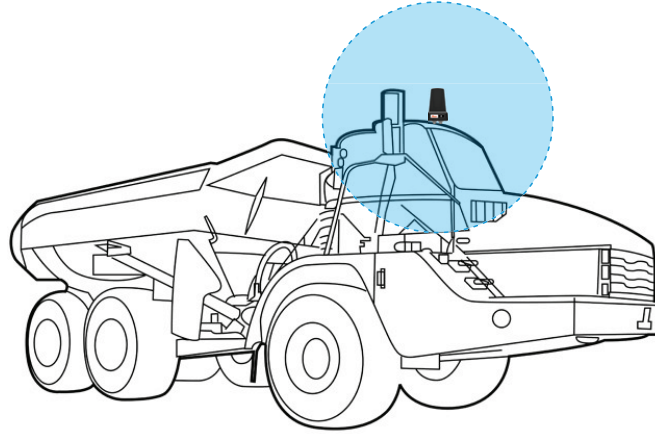
### 4.2.1

### General Working Information

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#### 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).



18053.001

*Fig. 15: Cabin anchor radius*

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## 4.2.2

## Status Indicators

### Machine anchor status

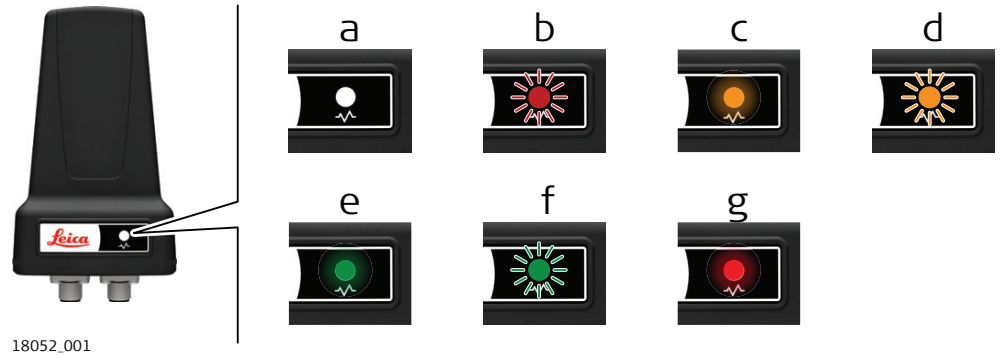


Fig. 16: Status indication for machine anchor

- 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

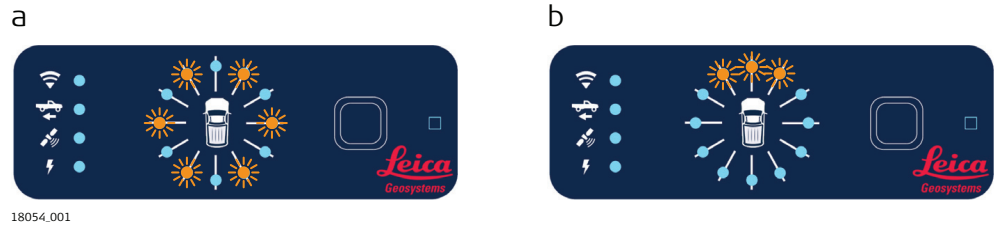
### Status Indicators

#### Indication of the tag position



The tag's 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.



18054.001

Fig. 17: Indication based on the anchor configuration

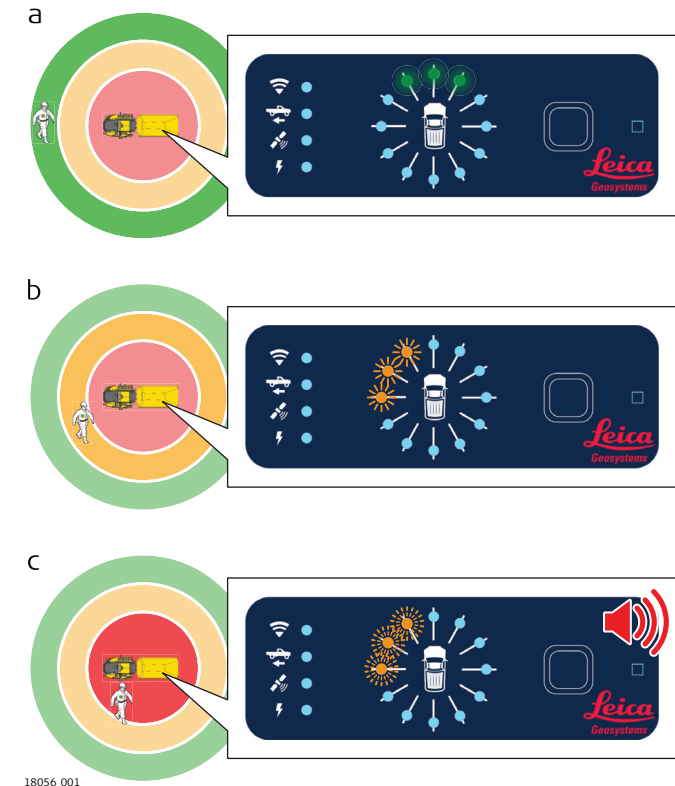
- a Single-anchor configuration: LEDs indicate only tag proximity
- b Multiple-anchor configuration: LEDs indicate tag position and tag proximity

## 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.



18056.001

Fig. 18: Alarms to indicate proximity to a tag

- a **Far:** Three LEDs permanently on in green, 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.

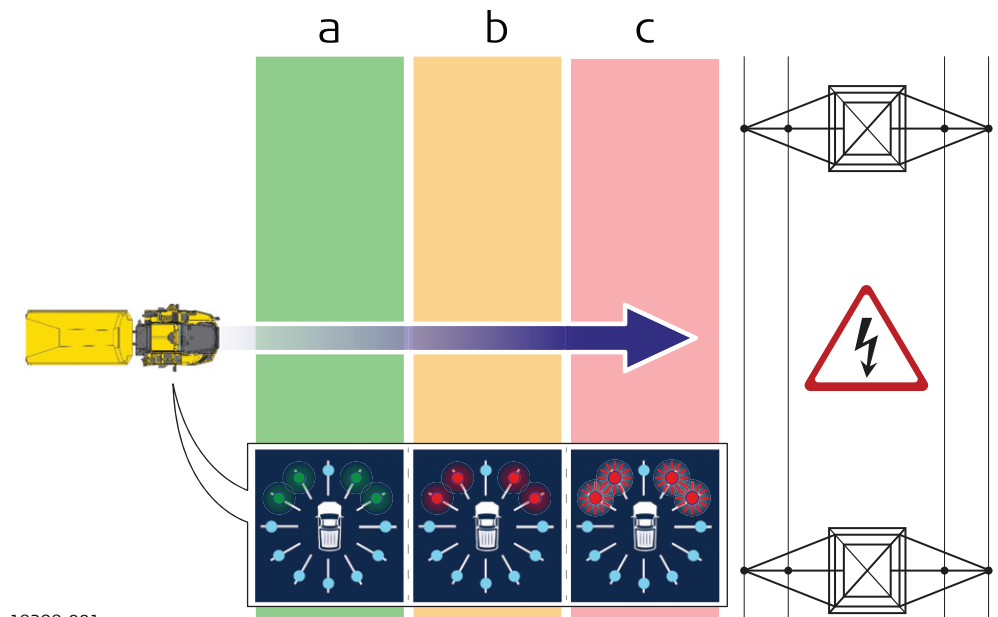
## Obstacle collision alarms

☞ This feature requires an update of iCON PA10 to CAS (Collision Avoidance System).

With CAS, the iCON PA10 system alerts machine drivers when they approach obstacles lying in driving direction. Such obstacles need to be pre-defined based on their location on site.

Examples:

- Generic obstacle
- Building
- Bridge
- Underpass
- Powerline
- "Stop" sign
- Reduced speed area
- Blast zone
- Pantograph
- Coal valve
- Stockpile edge



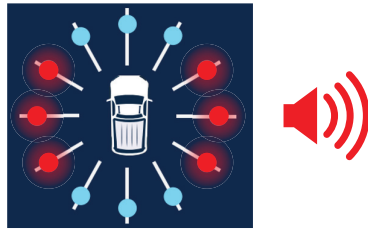
*Fig. 19: Alarms to indicate potential danger of collision*

- a Far
- b Near
- c Close

## Speeding alarm

☞ This feature requires an update of iCON PA10 to CAS (Collision Avoidance System).

With CAS, the iCON PA10 system alerts machine drivers when the speed limit is exceeded. The speed limit can be generic, but it is also possible to define speed limits specifically for different geo-fenced areas.



18399\_001

Fig. 20: Speeding alarm

### Panic alarm

Persons wearing the pedestrian tag or using the LED display unit on a machine can set off a Panic alarm to indicate the need for help. When this alarm is displayed on the LED display unit of your machine, the person in distress is within close proximity to your machine.



18104\_001

Fig. 21: Panic alarm with unknown origin



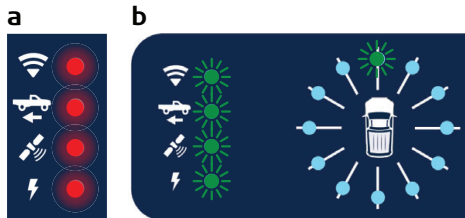
18105\_001

Fig. 22: Panic alarm with known origin

### 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 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).













18059\_001

Fig. 23: Indication of errors

- a Fatal error or alert
- b Non-fatal error

### Error codes

LEDs	Subsystem	Severity of error	Description and possible cause
<p>18299_001</p>	Flash memory	Non-fatal error	Display unit is still operable, but data is lost. Failure of flash memory.
		Fatal error	Display unit is inoperable. Failure of flash memory.

LEDs	Subsystem	Severity of error	Description and possible cause
 <small>18290_001</small>	Serial number	Fatal error	Invalid serial number. 👉 Contact support.
 <small>18291_001</small>	Data port	Alert	Failed to send data port heartbeat message.
 <small>18292_001</small>	GPS/GNSS receiver	Fatal error	Unable to communicate with or to configure GPS/GNSS module.
 <small>18293_001</small>	GPS/GNSS antenna	Fatal error	GPS/GNSS antenna defective or bad connection.
 <small>18294_001</small>	Power supply	Fatal error	Power supply defective or voltage too low/high.
 <small>18295_001</small>	Configuration	Fatal error	Configuration file contains errors or is not present.
 <small>18296_001</small>	Firmware	Fatal error	Firmware is corrupt. 👉 Upload new firmware.
 <small>18297_001</small>	Generic	Various	Generic error. Currently not used - depends on firmware version.
 <small>18298_001</small>	GPIO	Fatal error	Error in GPIO configuration or hardware problem.
 <small>18302_001</small>	Machine Anchor	Fatal error	<ul style="list-style-type: none"> <li>• Communications error; anchors are inoperable</li> <li>• Malfunction of anchors</li> <li>• Fault in the system wiring</li> <li>• Anchors are disconnected</li> </ul> 👉 Inform your dispatcher or supervisor about the error and follow their instructions.



**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.

**Setting off the Panic alarm**

Machine drivers can set off a Panic alarm to indicate the need for help. The Panic alarm is displayed on all iCON PA display units within communication range, enabling drivers of nearby machines to render assistance. (Refer to "Alarm signals" in "4.3.1 Status Indicators".)




To set off the Panic alarm, press the acknowledge key longer than 6 seconds.

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## 5 Care and Transport

### 5.1 Transport

<b>Transport in the field</b>	When transporting the equipment in the field, always make sure that you carry the product in its original container.
<b>Transport in a road vehicle</b>	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.
<b>Shipping</b>	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.
<b>Shipping, transport of batteries</b>	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

<b>Product</b>	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. <ul style="list-style-type: none"><li>• Refer to "6 Technical Data" for information about storage temperature range.</li><li>• Remove batteries from the product and the charger before storing.</li><li>• After storage recharge batteries before using.</li><li>• Protect batteries from damp and wetness. Wet or damp batteries must be dried before storing or use.</li><li>• 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.</li><li>• 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.</li></ul>
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### 5.3 Cleaning and Drying

<b>Product and Accessories</b>	<ul style="list-style-type: none"><li>• 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.</li></ul>
<b>Charger and AC/DC power supply</b>	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.

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**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.

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## 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 <sup>1)</sup> to +50/-4 to +122	-20 to +60/-4 to +140
CRS103 pedestrian tag	-20 <sup>1)</sup> 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	-20 to +85/-4 to +185

<sup>1)</sup> Operation below this temperature is possible, but operating time is less than 14 hours.

## Humidity

Type	Protection
All products	Maximum 95 % non-condensing To avoid the effects of condensation, periodically dry out the instrument.

## Protection against water, dust and sand

Type	Protection
All products	IP67 (IEC 60529)
<b>Exception:</b> 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 V DC	40 mA (at 24 V DC)
CRS103 pedestrian tag	External supply voltage (charger): 4.6-6 V DC (5 V typical)	60 mA (at 5 V DC)
CRS113 LED display unit	External supply voltage (cable): 12-28 V DC (nominal)	< 10 mA (typical, at 12 V DC)
CRS110/CRS111 main unit	External supply voltage (cable): 12-28 V DC (nominal)	< 100 mA (typical)
CRS145 antenna	External supply voltage (cable): 3.3-5 V DC	max. 20 mA
CRS106 gang charger	External supply voltage (charger): 4.6-6 V DC (5 V typical)	<b>Charging 1 tag:</b> 50-350 mA (300 mA typical) <b>Charging 10 tags:</b> 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>.



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 products without radio transmitter or receiver:

- FCC Part 15 (applicable in US)



- 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 in the CRS111 main unit

#### 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) L'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 Ω nominal	50 Ω nominal
Wi-Fi gain	5 dBi	5 dBi
RF gain	3 dBi	3 dBi
GPS/GNSS 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 on the CRS111 main unit must be mounted more than 20 cm away from any other antenna and from the human body.

**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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**Leica Geosystems AG**

Heinrich-Wild-Strasse  
CH-9435 Heerbrugg  
Switzerland  
Phone +41 71 727 31 31

[www.leica-geosystems.com](http://www.leica-geosystems.com)



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