

# SAG-A BEACON



## **Stand-alone Gamma Alarm System** *for Gamma and X dose equivalent $H^*(10)$ rate measurement*

- Light: 3 kg
- Resistant to physical shocks and drops from 1.60 m
- Quick insertion of the Dolphy® Evolution
- Reduced periodical calibration downtime and customer service
- 40-day battery life
- Recovery of 32 000 measurements on a USB flash drive
- Airtight and splash-proof



## Wide range of connectivity options (networks and relays)

### Network linking

Can be inserted anywhere in the monitoring network.

The double connector can extend the network to other equipment.

### Probe (remote display)

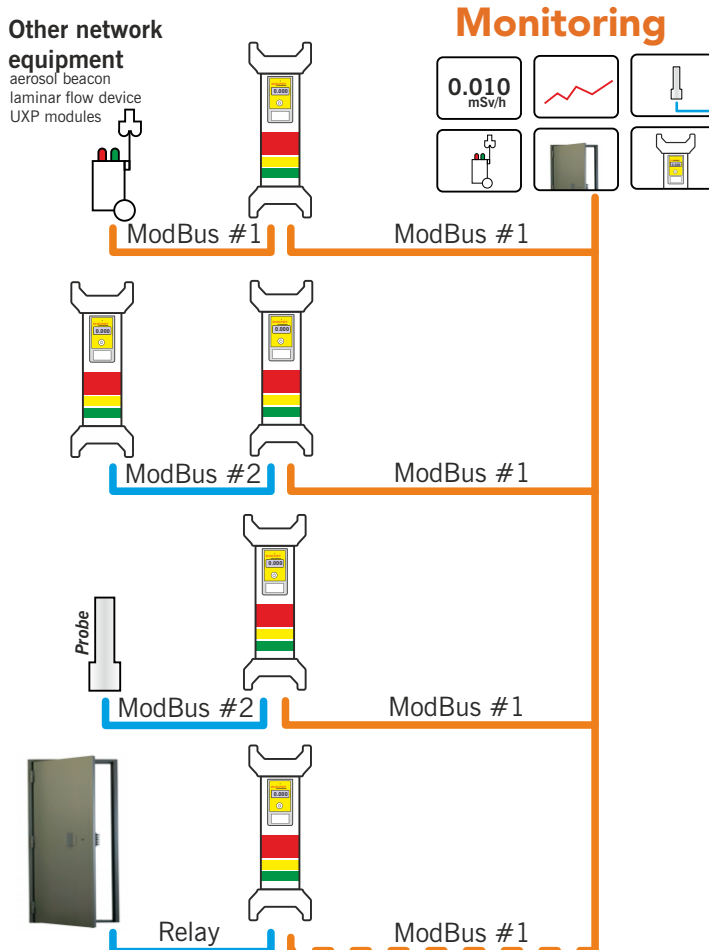
The secondary network (ModBus #2) can connect 2 beacons. The first displays the dose rate and the alarms of the second one.

### Remote probe

A remote probe is currently in development. It will plug into one of the two RS 485 ports on the beacon.

### Status report

3 relay outputs enable the control of safety systems.

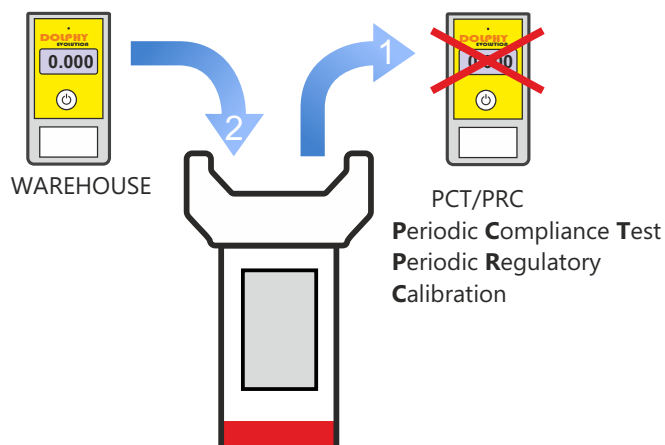


## Quick insertion of the Dolphy® Evolution

Designed to reduce downtime thanks to the quick insertion of any Dolphy® Evolution.

Only the Dolphy® Evolution is sent for inspection during PCT / PRC (EDF internal process) and maintenance operations. The beacon makes self-tests to check its proper functioning at every boot.

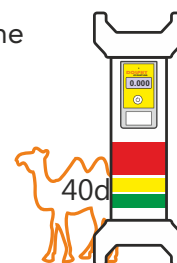
The beacon downtime lasts for less than 1 minute. The Dolphy® Evolution replacement can be done in situ.



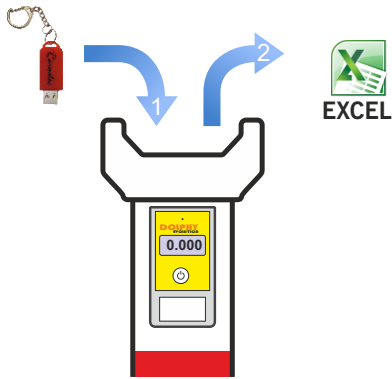
## Extended battery life

Using its onboard batteries and the optimization of its power consumption, the SAG-A has a 40-day battery life without alarm.

The beacon lasts up to 64 hours in alarm mode.



## Data recovery on a USB flash drive

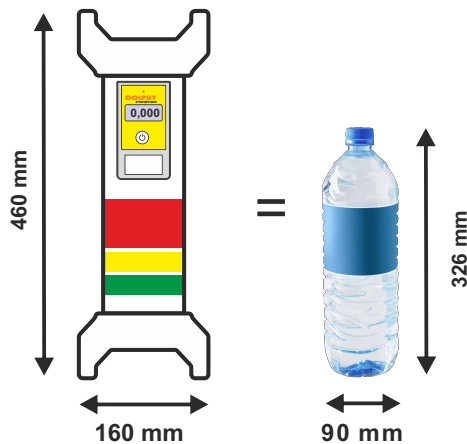


Automatic measurement and temperature recording every 30 seconds (every second during the alarm first 10 seconds).

Recovery of 32 000 recordings on a USB flash drive in CSV format, Excel compatible.

Beacon status update logfile (alarm, start up, threshold settings, failures...)

## Reduced dimensions - Mini weight



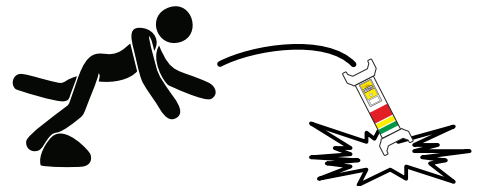
The figure opposite shows the real dimensions of the SAG-A beacon. Its dimensions are 460 mm x 160 mm x 160 mm.

In addition to being compact, it is also extremely light as it weighs less than 3 kg.

## Highly resistant

The SAG-A is designed to be as resistant as possible. Its cylindrical shape and its bumper design allow for maximum shock absorptions and drops up to 1.60 m.

The beacon polycarbonate body resists repeated hammer blows !



## Protection

The protection class IP65 means that the SAG-A is fully protected against dust and splashing water from all directions.

This feature allows the beacon to be used in the rain and wet environment (in a standalone mode, not connected).

The SAG-A beacon is designed to float temporarily.



## Technical characteristics (for a SAG-A coupled to a Dolphy® Evolution)



### Detection characteristics

**Type:** ambient gamma EDR H\*(10) monitoring device

**Reference radionuclide:**  $^{137}\text{Cs}$

**Effective range:** 0.010 mSv/h to 99.9 mSv/h

**Display range:** 0.001 mSv/h to 99.9 mSv/h

**Response time:** < 2 s on all the measurement range

**Energy range:** from 50 keV to 1.5 MeV



### Alarm characteristics

**PCT/PRC overdue:** "PCT/PRC" and malfunction alarm

**Various indications:** low battery, charge, remote measurement display, power supply connected by a LED on the front side

**Probe saturation:** 'SAT' display

**Probe malfunction:** 'SENSOR FAULT' display

**Visual alarm:** 3 warning light towers (green, yellow and red)

**Sound alarm:** buzzer > 85 dBA at 30 cm

**Threshold:** 1.6 mSv/h factory pre-set and configurable via key switch



### Electrical characteristics

**Battery life:** 40 days without alarm / 64 hours in alarm mode

**Charger:** 12 V identical to that of the LED Precaution signs

**Charging time:** about 1 day (may be used while charging)



top view



### Connectivity

**Relays:** 3 dry relay contact outputs (On, Failure, Alarm) :

- 40 W with 48 VDC

- 60 VA with 24 VAC max - on resistive charge

**Network connectivity:** 2 x 2 RS 485 Modbus/Jbus (EDF beacon supervision compatible)



### Mechanical and environmental characteristics

**Protection class:** IP 65

**Operating temperature:** from -20 °C to +50 °C

**Sensitivity to temperature:** < 0.1 %/°C on the whole range

**Housing materials:** polycarbonate and polyurethane

**Weight:** 3.0 kg (with Dolphy® Evolution)

**Dimensions:** 460 x 160 x 160 mm



bottom view



### Regulatory compliance

**Compliance:** IEC 60532-3: 2010



# Sentinelle 360



## **Source output signal for gammagraphic inspections** **by detecting increases of ambient Gamma and X-ray radiations**

- The sensitivity of the beacon is adapted to the use of sources such as Cobalt 60 and Selenium 75
- Light and sound indication adapted to site conditions with a 360° visibility
- The polycarbonate and Polyurethane alloy resists physical shocks and drops from 1 m
- A self-test at every boot and a permanent probe and battery inspection ensure a proper functioning of the device throughout its use
- Its long battery life allows for several gammagraphic inspections without recharging
- Its light weight (1.8 kg) and its integrated handle make the beacon easy to carry
- Airtight and splash-proof (IP65), it can be used inside and outside



## Technical characteristics



### Detection characteristics

**Type:** source output signal system for gammagraphic inspections

**Response time:** < 10s for variations of about a factor 10 when the dose rate > 20  $\mu\text{Sv/h}$   
< 2s beyond 1 mSv/h

**Energy range:** from 80 keV to 1.5 MeV



### Alarm characteristics

**Threshold:** calculated automatically from 20  $\mu\text{Sv/h}$  to 2 mSv/h

**Sound:** buzzer > 95 dBA at 30 cm

**Visual:** 360° red tower light with flash LEDs



### Electrical characteristics

**Charge:** 12VDC / 1A supply (provided)

**Battery life without alarm:** 40 days

**Battery life with alarm:** 80 hours



### Mechanical and environmental characteristics

**Dimensions:** 340 x 160 x 160 mm

**Weight:** 1.8 kg

**Protection rate:** IP65



### Regulatory compliance

**Compliance:** CEI 60846-1 : 2009 (within the limits of the applicable chapters)

# Dolphy Evolution



Dolphy Evolution

- New generation of Dolphy Gamma radiation meter
- Referent device at French nuclear sites
- One single switch
- Made for dose rates greater than 10  $\mu\text{Sv/h}$
- In compliance with standards IEC60846-1:2009



## Technical characteristics



### Detection characteristics

**Reference value:** Ambient dose equivalent  $H^*(10)$  rate

**Detector:** Energy compensated Geiger Müller from 60 keV to 1.5 MeV

**Unit:** mSv/h

**Reference source:**  $^{137}\text{Cs}$

**Sensitivity:** 0.7 C/s  $\mu\text{Sv/h}$  for the  $^{137}\text{Cs}$

**Display range:** between 0.001 mSv/h and 100.00 mSv/h

**Effective measurement range:** between 0.01 mSv/h and 99.9 mSv/h

**Response time:** < 2 s during a significant dose rate variation

**Alarm threshold:** 1.6 mSv/h



### Electrical characteristics

**Power supply:** 9 V battery

**Battery life:** 400 hours for a dose rate of 0.01 mSv/h



### Mechanical and Environmental characteristics

**Dimensions:** 120 x 65 x 22 mm

**Weight:** 220 g with battery

**Alarm sound level:** 80 dBA at 30 cm

**Protection class:** IP65/IP67 (with pouch)

## Application and use

Radiation meter intended for operators working in areas with high dose equivalent rates.  
Scrolling message, ease of use and reading.

## Options

Pouch

# Dolphy Nano



- Adapted to the measure of low ambient dose equivalent rate.
- Easy to use (only one button).
- Visualization of the estimation of dose received during an intervention.
- Threshold of adjustable alarm.
- Ideal for Qualified Expert in Radioprotection.
- Compact and sturdy.





## Specifications



### Sensing characteristics

**Reference size :** Ambient dose equivalent rate  $H^*(10)$

**Detector :** Geiger Müller compensated in energy from 33 keV to 1,25 MeV

**Unit :**  $\mu\text{Sv/h}$

**Reference source :**  $^{137}\text{Cs}$

**Sensitivity :** 1,6 c/s per 1  $\mu\text{Sv/h}$

**Display range :** 0,01  $\mu\text{Sv/h}$  to 9990  $\mu\text{Sv/h}$

**Effective range :** 0,5  $\mu\text{Sv/h}$  (depends on the time allowed to the measure) to 9990  $\mu\text{Sv/h}$

**Response time :** < 10 s from 0,5  $\mu\text{Sv/h}$



### Build characteristics

**Dimensions :** 120 x 65 x 38 mm

**Weight :** 180 g (including battery)

**IP code :** Ip54



### Power supply

**9 Volt battery**

**Operation :** 50 to 325 hours according to dose rate and alarm

## Application and use

Measure of the ambient dose rate and search for «hot spots».

Zoning control

Currently used in hospital environment by radiographers

Measure of environment

Easy to use, anybody can use it

# Dolphy Beta



## **Dolphy Beta**

***A compact contamination survey meter design for your safety***

- Adapted for the measure or the screening for surface contamination
- Usable for alpha contamination (if the type of contamination is known)
- Small, sturdy, robust
- Easy to use





## Technical characteristics



### Detector

**Measurement unit :** Bq

**Detector :** GM PANCAKE sensible to beta from 15 keV and alpha from 4.5 MeV

**Unity :** Bq, c/s

**Reference source :** Cobalt 60

**Sensitivity to  $\alpha$  et  $\beta$  :** 0.15 c/s/Bq

**Response time :** < 1 s for any significant variation between 0 and 700 Bq

**Integration time :** Automatic from 0.5 to 60 seconds CID system.



### Electrical characteristics:

**Power supply :** 9 V Battery (PP3/6F22/6LR61) Automatic battery direction recognition

**Battery-life :** 80 hours for activity of 100 Bq



### Mechanical and environmental characteristics:

**Dimensions :** 114 x 72 x 34 mm

**Weight :** 320 g with battery

**IP code :** IP54

## Application and use

This device is adapted for the measure or the screening for surface contamination of beta rays. It is usable for alpha contamination provided that the type of contamination is known. Ideal for the surface contamination control on bench or materials.



**Wireless radiation meter with radio transmitter**  
**Monitoring of the dose rate or the ambient dose equivalent**

- Ability to display the measurements of 5 radiation meters
- Controls, protects and informs the exposed workers
- Possibility of PC online or offline recording of the information from each device
- Can record up to 20 000 dose rate measurements

## Technical characteristics



### Detection characteristics

**Detector:** Energy compensated Geiger Müller from 33 keV to 1.25 MeV

**Unit:** mSv/h

**Reference source:**  $^{137}\text{Cs}$

**Sensitivity:** 0.7 c/s /  $\mu\text{Sv/h}$  for the  $^{137}\text{Cs}$

**Display range:**

**Ambient dose equivalent rate:** from 0.001 mSv/h to 160.00 mSv/h

**Ambient dose equivalent:** from 0.0001 mSv to 99 999 mSv

**Effective measurement range:** from 0.01 mSv/h to 160 mSv/h

**Response time:** < 2 s during a significant variation



### Radio transmission characteristics

**Transmission frequency:** 433.92 MHz

**Transmission power:** 10 mW maximum

**Open air range:** 400 m with the antenna deployed



### Mechanical and environmental characteristics

**Dimension:** 120 x 65 x 22 mm

**Weight:** 180 g with battery

**Alarm sound level:** 85 dBA at 30 cm

**Protection class:** IP54



### Electrical characteristics

**Power supply:** 9 V battery

**Battery life:** 20 hours for a dose rate < 1 mSv/h (radio communication working, without alarm and without backlight)



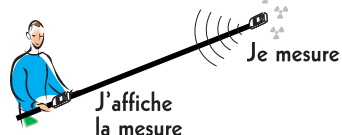
## Application & use

Allows for the remote control of integrated doses during risky operations

Ability to record and recover data.

Usable as a mobile supervision station during an emergency intervention allowing up to 5 operators to stay connected.

### Télé-Mesure



### Enregistrement



### Télé-Surveillance



## Options

Nemedio (communication/ PC interface).

Pole to facilitate the hot spot contact measurements, at 0.5 m and 1 m.

Recording stand allowing long-term measurements.

Battery kit, mounting kit, remote sensor, telescopic pole.

# NEO Environment

- This device is adapted for the measure or the screening during ADR process or waste management.
- High sensitivity adjustable probe which simplifies the measures above and below the containers.





## Technical characteristics



### Detection characteristics

**Detector :** GM high volume

**Sensitivity :** 16 c/s  $\mu$ Sv/h for the Césium 137

**Reference value :** Energy compensated GM:  $H^*(10)$  - Unit  $\mu$ Sv/h

Non compensated GM: Screening - Units c/s ( $\mu$ Sv/h possible depending of the REA)

**Measurement range :** between 10 nGy/h and 1 mGy/h

**Display :** Mean value and graphic trend graph

Statistical precision (LUCID 2)

**Alarm :** Audible: 85dbA at 30cm

Mechanical: Vibrate



### Mechanical and environmental characteristics

**Weight :** NEO + probe : 1120g

Telescopic rod: 980g

NEO + probe + telescopic rod : 2100g

**IP code :** NEO : IP50

Probe : IP65

**Dimension of the telescopic rod :** Length unfold : 140cm  
Length fold : 43cm



### Electrical characteristics

**Power supply :** 9 V battery

**Battery life :** 80 hours for a dose rate < 1mSv/h without radio, 20h with radio.

## Application & uses

Container control

High sensitivity to diffused radiation, adapted for the waste control.

Quick detection for small dose rate variations : < 2s approximately for a variation of 0,2 $\mu$ Sv/h

Detection of gamma radiation sources hidden or ambient dose equivalent rate out of irradiation area.

## Options

Nemedio (communication/interface PC)

Battery kit

# Nemedio



## **Nemedio**

***Monitoring and data recovery for Neo radiation meters***

- Enables Neo advanced configuration
- Oversees several Neo by PC (real-time values and trend curves)
- Measurements recovery in Excel format of one or several radio remote Neo
- Time saving before, during and after the intervention (configuration, monitoring and analysis)



www.carmelec.fr



## Technical characteristics



### Interface

**PC connection :** USB 2.0

Supplied with avec Nekipo PC software

**Media:** CD Rom

**System requirements:** Windows



### Mechanical and environmental characteristics

**Dimension:** 155 x 120 x 44 mm (at the most and excluding the antenna)

**Antenna:** length 168 mm



### Electrical characteristics

**Power supply:** USB port

**Transmission frequency:** 433,92 MHz

**Transmission power:** 10 mW maximum

**Open air range:** 400 m with the antenna deployed

## Application & use

- Advance preparation of risky interventions and/or of specific operation recordings
- On site monitoring of an entire network (up to 10 Neo)
- Recovery of dose rate recordings to study the effectiveness of an intervention
- Facilitates and ensures better intervention preparation:

operators' name or site implementation setting

alarm threshold setting over dose rate and/or estimated rate

recording interval preparation...



# LED Precaution Sign



## **LED Precaution Sign** *Gammagraphic inspections*

- Allows for the demarcation of an area and for radiation hazard awareness for anyone approaching or trespassing
- Motion detector causing the activation of the flashing LEDs and the alarm on the model with this option
- Hazard signaled by a colorful front side, a clear message and a 16 LEDs visual alert



## Technical characteristics



### Mechanical and environmental characteristics

**Dimensions:** 275 x 180 x 32 mm

**Weight:** 450 to 500 g (alarm option)

**Housing:** High impact polystyrene

**Sound level:** 90 dB at 30 cm (in the direction of the buzzer)



### Electrical characteristics

**Power supply:** 7.2 V battery - 700 mAh (6 units)

**Charge:** 12 VDC/1A external power supply or charging rack

**Charging time:** 6 hours

**Battery life:** 120 hours (without alarm)

## Application & use

Designed to demarcate the area during the gammagraphic inspections on industrial sites

Reference display for gammagraphic inspections at French nuclear power plants

Retractable stand, wall and barrier tape mounts

## Options

With or without alarm

Charging rack for 5 LED Precaution Signs

Individual charger

# ***LED Precaution Sign charging rack***



## ***LED Precaution Sign charging rack***

- Designed to charge up to 5 Carmelec LED Precaution Signs simultaneously
- Optimizes your storage
- Sized for the gammagraphic inspection trolleys

Date of review: 18th May 2017





## Technical characteristics



### Mechanical and environmental characteristics

**Dimensions:** 290 x 185 x 80 mm

**Weight:** 850 g



### Electrical characteristics

12 VDC 1A power supply

Charger not provided

## Application & use

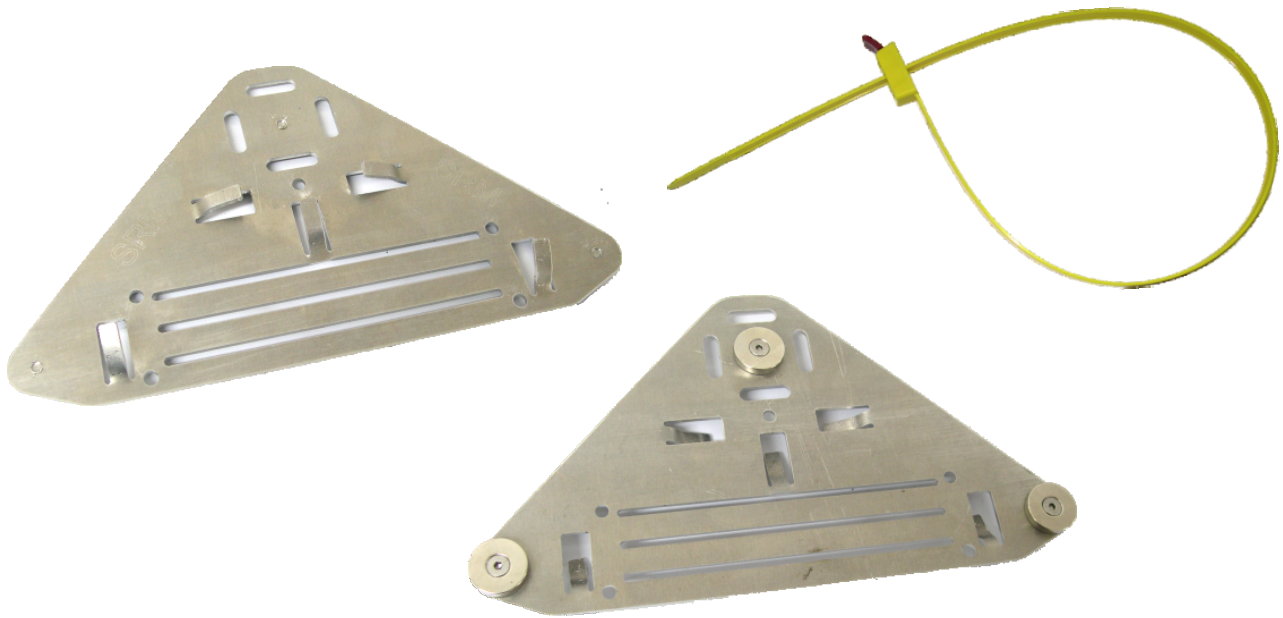
May be used for storage in the gammagraphic inspection trolleys when unplugged

The order and number of insertions make no difference

Separate automatic charge regulator for each LED Precaution Sign

Compatible with the LED Precaution Sign chargers

# Universal display support for regulatory signs



***Designed to facilitate the fixing of regulatory signs and the installation of barricade tape.***

Temporary or permanent fixing on:

- Wood or metal doors
- Concrete walls
- Caged ladders
- Scaffoldings
- Posts...

Adapted to all your signs:

- Radiation trefoil warning symbols
- Erasable slates
- Dose rate signs
- Carmelec's LED precaution signs
- Installation of barricade tape for the demarcation of contaminated areas, forbidden areas...



## Multi-media Mounting Kit



### Technical characteristics

**Kit includes:** An aluminium plate secured by three tear-resistant magnets.

**Dimensions:** 220 mm x 125 mm; 3 mm thick

**Weight:** 115 g

750 mm x 12 mm nylon cable tie



## Application and Use

Facilitates the installation of barricade tape allowing for the demarcation of an area.

Displays your regulatory signs on all media and at the best place.

Reduces presence and exposure time during the marking of regulatory areas.



# Gamma Radiography Camera Carrying System



## **Gamma radiography camera carrying system** **For Gam 80 and 120**

- Makes transport in caged ladders and difficult crossings easier
- Mechanical and secure locking system for the gamma radiography camera
- Weight 5 kg

Review date: 18th May 2017





## Technical Characteristics

304L stainless steel frame



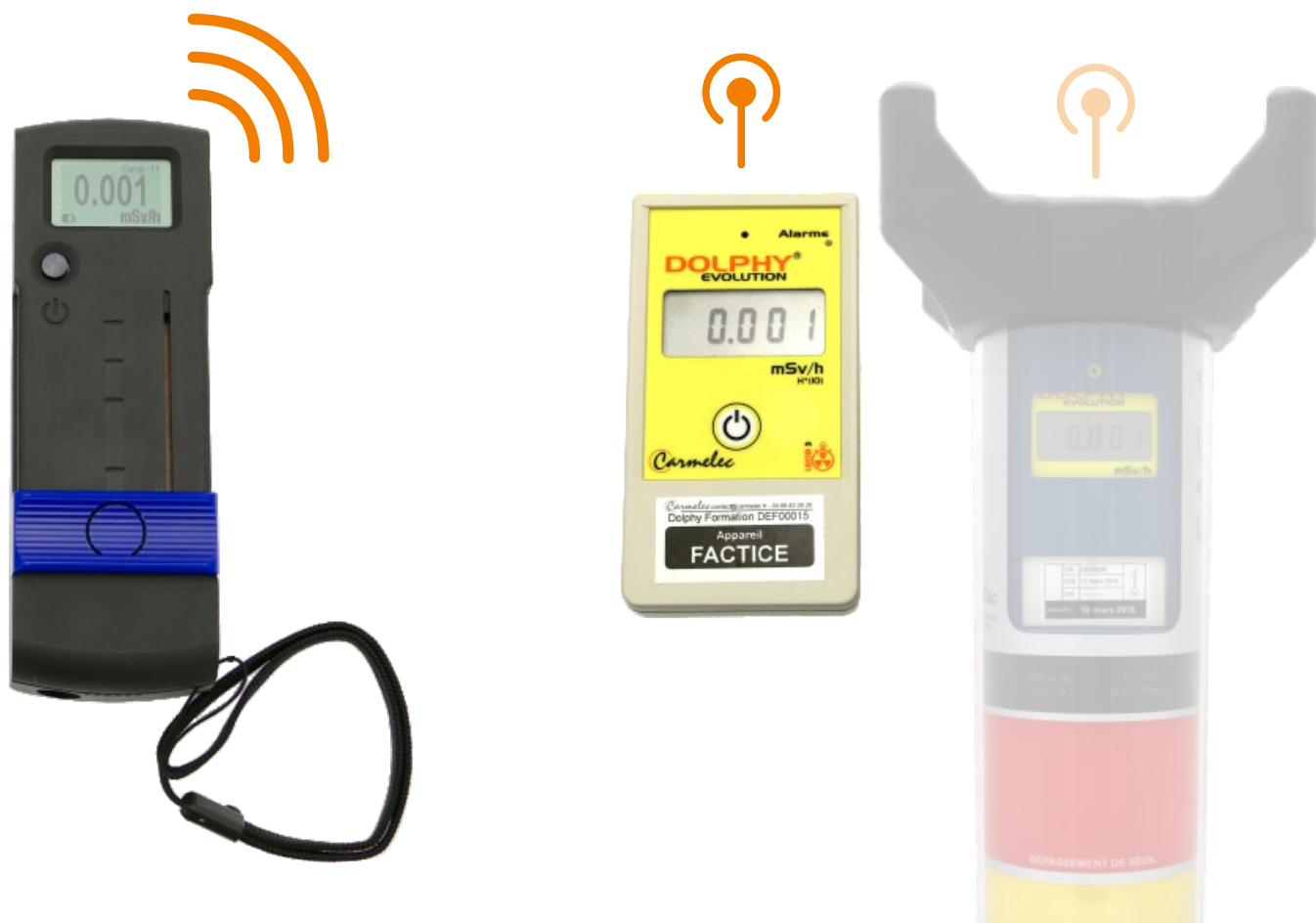
## Application & Use

Primarily designed for climbing ladders and caged ladders.

Hands free carrier to allow the user full mobility and safety.

Due to the radiation emitted by the gamma radiography camera, it is advisable not to use the device for extended periods others than when using ladders and caged ladders.

# Remote control and Dolphy® Training



## **Gamma radiation simulation system** *for training people using dose rate meters and site beacons*

- Ease of use: one single on/off switch and a sliding switch. 1<sup>st</sup> implementation < 1 minute
- Ergonomic: one-handed use, slide selector for blind use
- Realistic: statistical fluctuations around the set point
- **Compatible with Dolphy® Training and SAG-A training**

## Application and use

The Remote control Training, together with the Dolphy® Training, enables to simulate radiation situations in order to train Dolphy® Evolution future users.

The ergonomics has been studied to give the Remote control Training a blind one-handed use. For this purpose, there are notches providing access to presets (0.001, 0.025, 1, 2, 99 mSv/h and saturation).

A vibrate mode also helps the trainer know the current value without looking at the Remote control Training screen.



## Technical characteristics



### Power supply

Battery life:  
Charging time:

### Remote control Training

34 h  
6 h (charge provided 12 V<sub>dc</sub>)

### Dolphy® Training

13 h



### Radio

Range:

40 m in open air



### Mechanical and environmental characteristics

Weight:  
Dimensions:

180 g  
150 x 50 x 32.4 mm

170 g  
120 x 65 x 22 mm

## Application option: SAG-A Training

By inserting the Dolphy® Training into the SAG-A beacon, the trainer can simulate dose rate rises, trigger alarms and observe the trainees' behavior.



# Sentinelle 360 Training



- Replaces the first generation Sentinelle Training
- Device designed in collaboration with EDF (Electricity of France)
- Simulates the Sentinelle 360 beacon functioning
- Simulates the possible malfunctions
- Delivered with two paired remote controls

Review date: 4th July 2016





## Technical characteristics



### General characteristics

**Radio frequency:** 433.92 Mhz

**Transmission power:** 1 mW

**Range:** up to 20 m

**Controls:** Alarm, Probe malfunction, Low battery, Empty battery

**Sound level:** >95 dBA at 30 cm



### Electrical characteristics

**Charge:** 12 VDC/1A power supply (provided)

**Battery life without alarm:** 10 days

**Battery life in alarm mode:** 60 hours



### Mechanical and environmental characteristics

**Dimension:** 340 x 160 x 160 mm

**Weight:** 1.8 kg

**Protection class:** IP65

## Application & use

The sentinelle 360 Training beacon is intended for gammagraphic operator training. It has been designed to simulate alarms and malfunctions in order to put the trainee in realistic.