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User manual

RADI-CEM

Updated to the Software Version: 0.01
Updated to Firmware Version: 0.01

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SAFETY NOTES

Read before using the product

MPB works to provide the best safety conditions available and complies with the latest safety standards.

The instrumentation described in this manual was produced, tested and left the factory in conditions that fully comply with European standards.

To ensure the correct use of the product, these general instructions must be read and applied before and for any use of the instrumentation.

The RADI-CEM is made for industrial environments and should be used by authorized staff only.

MPB disclaims any responsibility for a use of the device different from explained in the manual.

In order to keep the 24 months warranty, please do not remove the seals of the instrument.

Declaration of conformity

C E

(according to EMC 89/336/EEC directive and low voltage 73/23/EEC)

This is to certify that the product: RADI-CEM
complies with the following European standards:

Safety: CEI EN 61010-1 (undated reference, applies to all editions)
EMC: EN 61326-1 (undated reference, applies to all editions)

This product complies also with the 2006/95/CE Low voltage directive
requirements and with EMC 2004/108/CE directive

MPB S.r.l.

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1. General information

1.1. Introduction

The RADI_CEM is a selective PPE (Personal Protection Equipment) that measures the magnetic field strength to which the operator is subjected, in a frequency range from 40 Hz to 10 kHz and with a level range from 300 nT to 20 mT.

1.2. System description

The RADI_CEM is extremely lightweight and compact so easy to use for the operator. Suitable for any work environment, it allows setting the alarm level and type (vibration, sound, LED), the automatic identification of the frequency and the battery replacement directly on the field, together with the data downloading via USB.

Figure 1

1.3. System composition and optional accessories

Standard composition:
- RADI-CEM
- Protective bag

Options:
- Tripod support
- Harness

1.4. Technical specifications

Measurement Type	Selective
Sensor Type	3-axis winding
Frequency Range 3dB 1dB 3dB	@ Full Band 40 Hz…48 Hz 48 Hz…2 kHz 2 kHz…10 kHz
Level Range Resolution Overload Dynamic	300 nT ... 20 mT 10 nT 22 mT 96 dB
Measurement Error Linearity Absolute Error	@ 48 ... 500 Hz - 1uT...10 mT 1.2dB 1.6dB
Unit of Measure	Auto range: uT; mT; A/m; kA/m
Measures	Auto identification of the frequency with and without harmonics; selective at 50 Hz or 60 Hz; with and without harmonics or the only harmonics of 50 Hz or 60 Hz; Broadband in the 40 Hz...400 Hz LB range Broadband in the 400 Hz...10 kHz HB range
Data logger Recording Time Interval	 8h ; 12h; 24h; 7 days; memory filling 5…10..30..120 sec
Display	LCD 2 lines x 16 characters backlight
Configuration	From administrator
Multi-functions LED	Green LED – measure in progress Blue LED - storing in progress Red LED – alarm threshold exceeded
I/O Interface	USB
Alarm	Type - Sound (selectable) - Vibration (selectable) - Red LED (default)
Sleep	20min; 60min; disabled
Date and Time	Settable by the operator
Reference Standards	Directive 2013/35/EC
Operating Temperature	-10°…40°C
Certificate of Calibration	Standard; LAT
Dimensions	118 x 79 x 25 mm
Weight	125g
Options	tripod support; harness

Technical specifications may change without notice

2. Operating principle
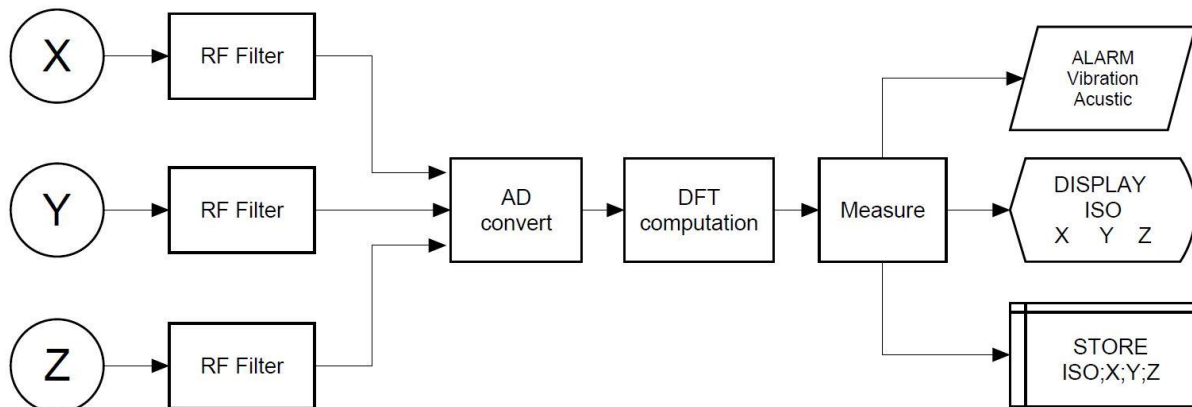
The block diagram below represents the RADI-CEM:

Figure 2

3. Use and operations

3.1. Turn on/off & menus

To turn on the unit, press the on button for at least one second, to turn it off press it for at least three seconds. To access the menu, press the ESC key and then the ARROW key to scroll through the menus. To enter a menu, press the WHEEL key. Confirm the selection once entered a menu by pressing the WHEEL or the ESC key.

3.2. Data logging and download

To enable the data logging, hold down the ESC key and press the WHEEL key.
The storage ends if:
- the number of samples has reached the limit available
- the storage period is over (e.g. 8 hours)
- the instrument is switched off and on again (when the instrument is switched off, reactivating the memorization is required)

Each time the storage is activated, the data are overwritten.

To download the data, connect the instrument to the PC via USB and click on the LOG button of the software: this will create a CSV file that can be opened through Excel.

3.3. RGB Led

- Green flashing if storage is not active and the read value is lower than the alarm threshold
- Blue flashing if the logging is active the read value is lower than the alarm threshold
- Red flashing if the measured isotropic level is above the alarm threshold

3.4. Measurement modes

Through the MODE menu, it is possible to choose the measurement type, by selecting one of the following modes:

- AUTO ➔ in the range from 40Hz to 400Hz all value are read and highest level is detect; this value is displayed with the related frequency (auto detected frequency)

  AUTO = AUTO & HARM − AUTO NOTCH

- AUTO & HARM➔ in the range from 40Hz to 400Hz the frequency related to the highest level of the magnetic field is detected and the total isotropic value is elaborated by considering the level at the fundamental frequency and the level at its related harmonic frequency

  AUTO & HARM = AUTO + AUTO NOTCH

- AUTO NOTCH➔ in the range from 40Hz to 400Hz the frequency related to the highest level of the magnetic field is detected and the total isotropic value is elaborated by considering the level of the harmonics from the detected frequency

  AUTO NOTCH = AUTO & HARM − AUTO

- 50Hz ➔ the level detected at 50Hz is displayed
- 50Hz & HARM➔ the level at 50Hz and its harmonics, is displayed
- 50Hz & NOTCH➔ the level of only the 50Hz harmonics, is displayed
- 60Hz ➔ the level detected at 60Hz, is displayed
- 60Hz & HARM➔ the level at 60Hz and its harmonics, is displayed
- 60Hz & NOTCH➔ the level of only the 60Hz harmonics, is displayed
- LOW FREQ BAND➔ broadband value, of the magnetic field, from 40Hz to 400Hz
- HIGH FREQ BAND➔ broadband value, of the magnetic field, from 400Hz to 10kHz

4. *RADI-CEM* (menu), controls and functions

4.1. Power ON

By pressing the *Power on* button ⬚ , the model of the instrument and the firmware version will appear

```
    RADI CEM
    ver x.xx
```

4.2. Measurement mode

After the *power on* procedure, the value read from the instrument will appear on the display (see *Measurement modes 3.4* and *Line 2 – sub menu 4.6*)

```
  50Hz 10.5uT
 9.89 2.79 2.31
```

4.2.1. Menu mode activation

Keep holding the *esc* button ESC and press the *arrow* button ⬚ : the first item from the menu will appear on the display

```
     ALARM
 Next      Change
```

4.2.2. Go to the next item

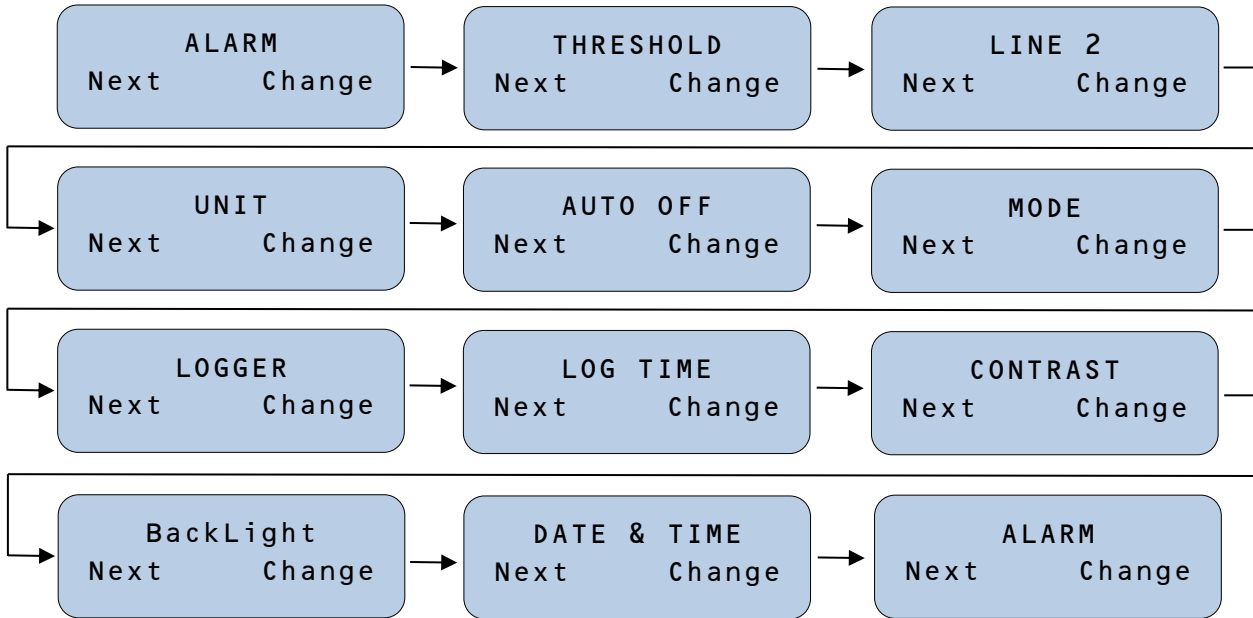Press the *arrow* button ⬚ for proceeding to the *Next* item

```
   THRESHOLD
 Next      Change
```

4.2.3. Menu mode - exit

When in any menu, press the *esc* button ESC to go back to *measurement mode* (see *Measurement mode 4.2*)

4.3. Item menu loop

When in menu mode (see *Menu mode 4.2.1*) press the *arrow* button [⇕] for browsing the following item menu:

```
    ALARM              THRESHOLD             LINE 2
Next       Change   Next       Change   Next       Change
```
⬇
```
    UNIT               AUTO OFF              MODE
Next       Change   Next       Change   Next       Change
```
⬇
```
   LOGGER              LOG TIME             CONTRAST
Next       Change   Next       Change   Next       Change
```
⬇
```
  BackLight           DATE & TIME            ALARM
Next       Change   Next       Change   Next       Change
```

4.3.1. Sub-menu activation

Select *Change* by pressing the *wheel* button [⚙] for activating the sub menu, e.g.

```
    ALARM                                    ALARM
Next       Change          [⚙]   →        NO ALARM
```

NOTE: press the *arrow* button [⇕] for changing the selection and press the *wheel* button [⚙] for confirming the selection and returning to the previous menu

4.3.2. Exit from the sub-menu and return to the previous menu

Press the *wheel* button [⚙] to go back to the previous menu, e.g.

```
    ALARM                                    ALARM
  NO ALARM            →    [⚙]   →      Next       Change
```

4.3.3. Exit from the sub-menu and return to the measurement mode

Press the *esc* button [ESC] to go back to *measurement mode*

```
    ALARM                                 50Hz 10.5uT
  NO ALARM            →   [ESC]  →       9.89 2.79 2.31
```

4.4. Alarm – sub menu

When in this sub menu (see *Item menu 4.3*) select the notification type in case of alarm from one of the following:

- `NO ALARM` ➜ all notifications are disabled
- `SOUND & VIBR.` ➜ all notifications are enabled
- `ONLY SOUND` ➜ only the sound notification is enabled
- `ONLY VIBRATION` ➜ only the vibration notification is enabled

4.5. Threshold – sub menu

When in this sub menu (see *Item menu 4.3*) the alarm level can be set in the following range:

- `10uT .. 19mT` ➜ selects the level of the alarm, at tens, hundreds or thousands of uT

4.6. Line 2 – sub menu

When in this sub menu (see *Item menu 4.3*) select the information to be displayed in the second line

- `X Y Z` ➜ signal level from the x,y,z axes
- `STATUS` ➜ battery level
- `CLOCK` ➜ date and time
- `NONE` ➜ no characters

4.7. Unit – sub menu

When in this sub menu (see *Item menu 4.3*) select the unit of measure

- `TESLA` ➜ select *tesla* for the displayed and stored data
- `AMPERE / METER` ➜ select *A/m* for displayed and stored data

4.8. Auto OFF – sub menu

When in this sub menu (see *Item menu 4.3*) select how long it will take before the device switches off;

WARNING: use this setting to avoid keeping the device on and damage the battery

- `ALWAYS ON` ➜ the device remains always on: switch it off through *Power on* ⏻
- `Off afther 20mi` ➜ switch off after 20 minutes
- `Off afther 60mi` ➜ switch off after 60 minutes

4.9. MODE – sub menu

When in this sub menu (see *Item menu 4.3*) select the elaboration type on the acquired data, by selecting from one of the following:

`AUTO; AUTO & HARM; AUTO NOTCH; 50Hz; 50Hz & HARM; 50Hz & NOTCH; 60Hz; 60Hz & HARM; 60Hz & NOTCH; LOW FREQ BAND; HIGH FREQ BAND`

For the description of the elaboration see *3.4 Measurement modes*

4.10. Logger – sub menu

When in this sub menu (see *Item menu 4.3*) select the time interval for data storing:

- `EVERY 10 sec` ➔ stores data every 10 sec
- `EVERY 30 sec` ➔ stores data every 30 sec
- `EVERY 120 sec` ➔ stores data every 120 sec (2 minutes)
- `LOGGER DISABLED` ➔ log is disabled

4.11. Log Time – sub menu

When in this sub menu (see *Item menu 4.3*) select the registration duration

- `FOR 8 hour` ➔ stores data for 8 hours
- `FOR 12 hour` ➔ stores data for 12 hours
- `FOR 24 hour` ➔ stores data for 24 hours
- `MEMORY FILLING` ➔ stores data up to complete memory filling

NOTE: the registration duration must be according to the following table:

	8 hours	12 hours	24 hours	7 days	Memory Filling
disable	No	No	No	No	No
5 sec	Yes	No	No	No	Yes
10 sec	Yes	Yes	No	No	Yes
30 sec	Yes	Yes	Yes	No	Yes
120 sec	Yes	Yes	Yes	Yes	Yes

WARNING: by configuring a high *time interval*, and a long *registration duration*, the instrument will store until memory filling.

E.g. 5 sec *time interval* and a 7 days *duration of registration*, the data will be stored every 5 seconds until the memory filling.

To be sure to reach the desired *duration of registration*, make sure to respect the limits above.

4.12. Contrast – sub menu

When in this sub menu (see *Item menu 4.3*) select the display contrast:

- `LOW LEVEL` ➔ low level for the display contrast
- `MEDIUM LEVEL` ➔ medium level for the display contrast
- `HIGH LEVEL` ➔ high level for the display contrast

4.13. Back Light – sub menu

When in this sub menu (see *Item menu 4.3*) select the duration of the backlight lighting from the previous time a button was pressed:

- `off 1 min` ➔ backlight off after 1 minute
- …
- `off 10 min` ➔ backlight off after 10 minutes
- `ALWAYS ON` ➔ backlight is kept always on

WARNING: the *always on* setting affects the battery consumption (not recommended)

4.14. Date & Time – sub menu

When in this sub menu (see *Item menu 4.3*) set date and time

- `gg/MM − hh:mm:ss` ➔ gg = day; MM = month; hh:mm:ss = time

press the *arrow* button [↯] to update the value of the flashing cursor

press the *wheel* button [⚙] to confirm the value and proceed to the next item.

For confirming all data, skip all fields (by pressing the *wheel* button [⚙]) and go back to the previous menu:

```
      DATE & TIME
   Next      Change
```

5. *RADI-CEM* (software), controls and functions

5.1. Installation

Launch the setup file (setup.exe) and eventually click **YES/Execute** in the pop up window. Please note that the RADI-CEM SW can require to be "executed as administrator".
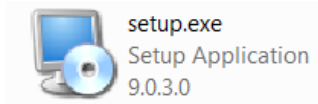

setup.exe
Setup Application
9.0.3.0

Figure 3

The SW installer comes with instructions in English language only.
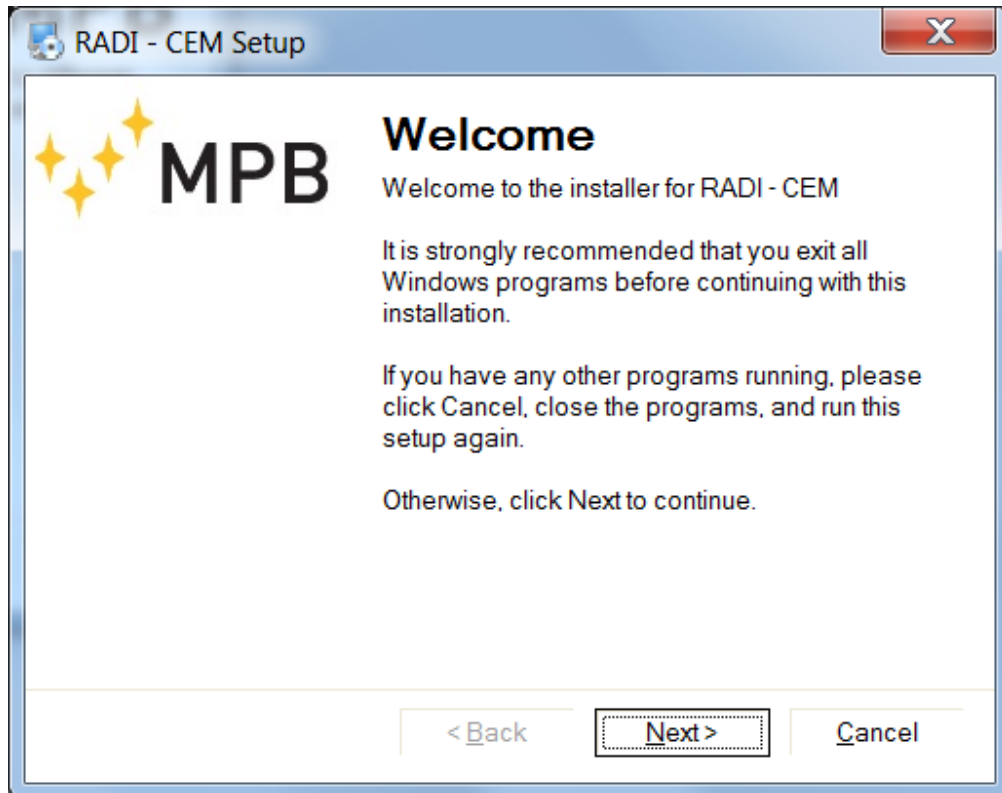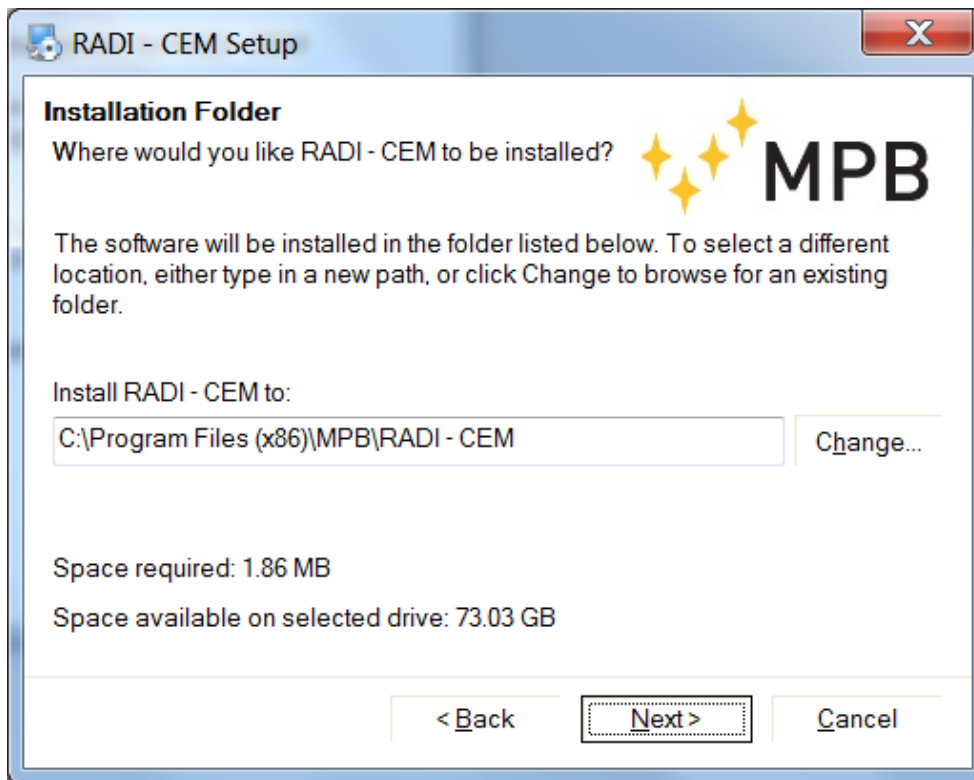Click **Next** on all four steps to proceed with the installation.
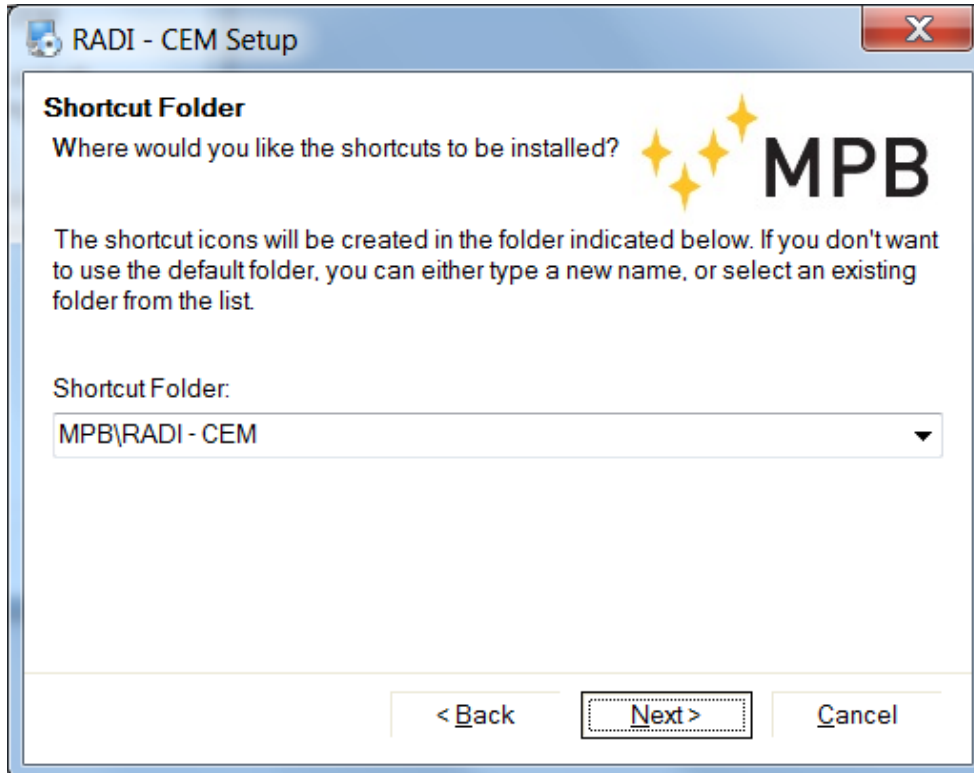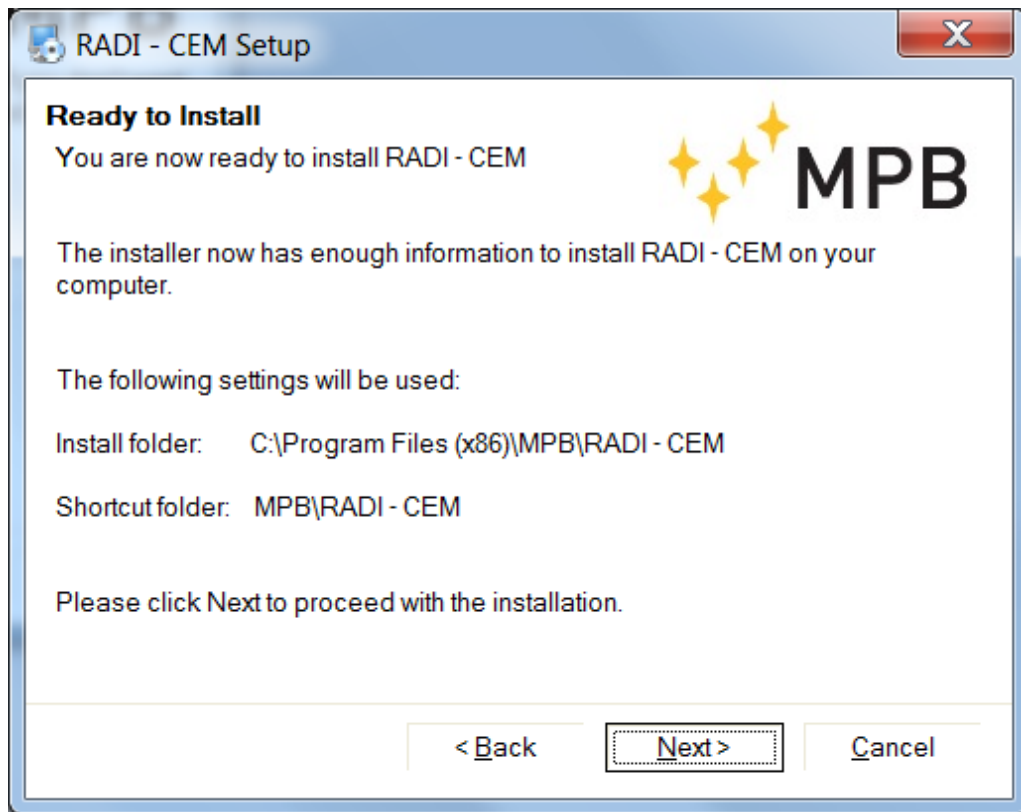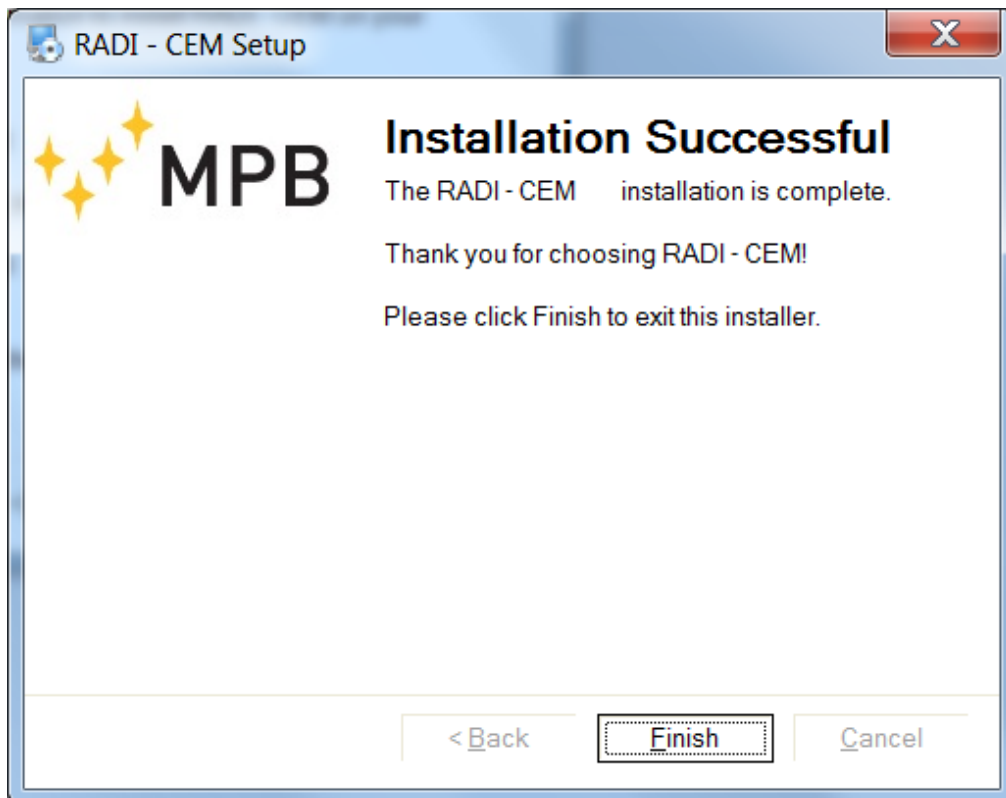

Figure 4

Figure 5

Figure 6

Figure 7

Figure 8

At installation completed, a screen as above will appear: click **Finish** to end the installation.

5.2. Connecting the instrument

1) Start the RADI-CEM Software, connect the USB cable to the computer and to the instrument: at the first connection, wait for the driver installation, at the end of which a notification of the operating system will appear
2) Click on the **Connect** button and, in case of successful connection, the battery status will be shown
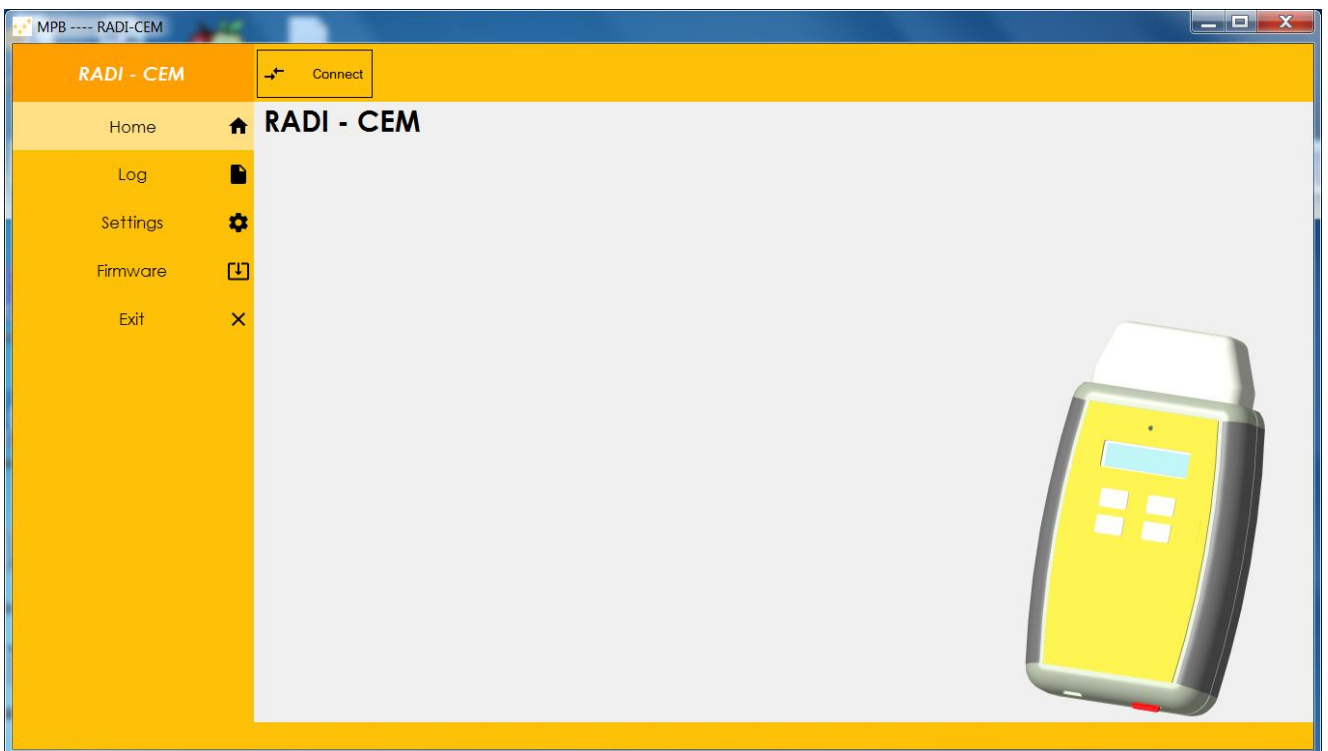

Figure 9

5.3. Configuration

From the side menu, click on **Settings**: if the instrument is connected to the PC you will see the *Configuration successfully imported*, otherwise you will have to connect it
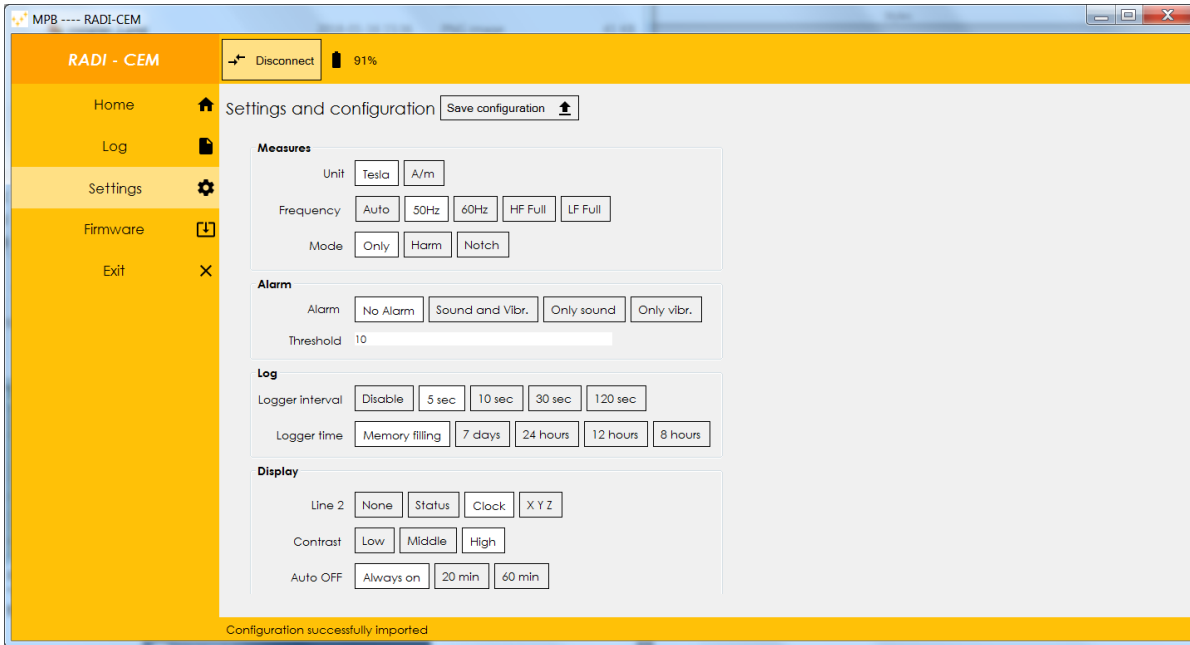

Figure 10

It is possible to edit the following settings:

- Measure:
    - o Unit of measure of the magnetic field
    - o Frequency of the measured signal
    - o Signal processing mode
- Alarm:
    - o Alarm type
    - o Alarm threshold (dynamic step: 10uT up to 90uT, 100uT up to 900uT, 1mT up to 19mT).
- Log:
    - o Recording time interval
    - o Max recording time
    - o Eligible configuration

	8 hours	12 hours	24 hours	7 days	Memory Filling
disable	No	No	No	No	No
5 sec	Yes	No	No	No	Yes
10 sec	Yes	Yes	No	No	Yes
30 sec	Yes	Yes	Yes	No	Yes
120 sec	Yes	Yes	Yes	Yes	Yes

- Display:
  - Text that appears in the second line
  - Display contrast
  - Time of self power down of the instrument

To save the new instrument configuration, click on Save configuration.

5.4. Log download

With the instrument connected to the PC, it will be possible to download the measurement log in csv format, by clicking on the **Log button.**

Note:

- the field separator is ';'
- the date format is yyyy / MM / dd
- the time format is hh / mm / ss

5.5. Firmware update

1) Switch on and connect the instrument, execute the "RADI - CEM.exe" provided

2) Click on "Firmware" on the Software, the Software will close automatically

3) Run the "BSL_USB_GUI.exe" available in the "FW_upgrade" folder

4) Click "Next"→ "Select Firmware" then select the file "RADI_CEM01_v**x.xx**.txt" from the FW upgrade folder
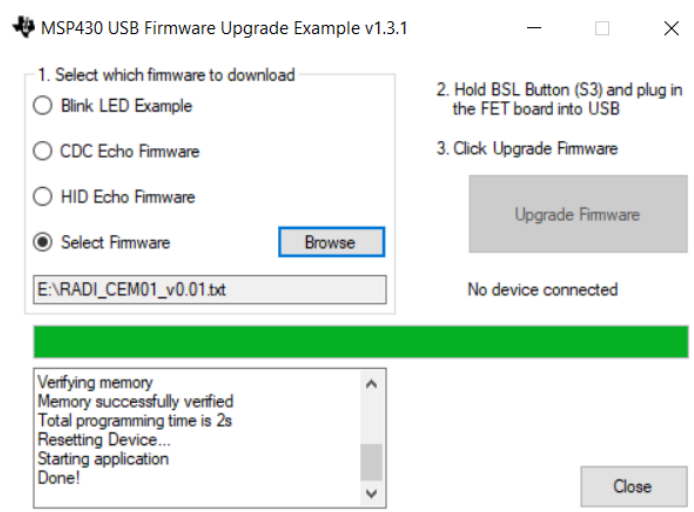
5) Click on "*Upgrade Firmware*" and wait for "*Done!*", bottom left of the screen
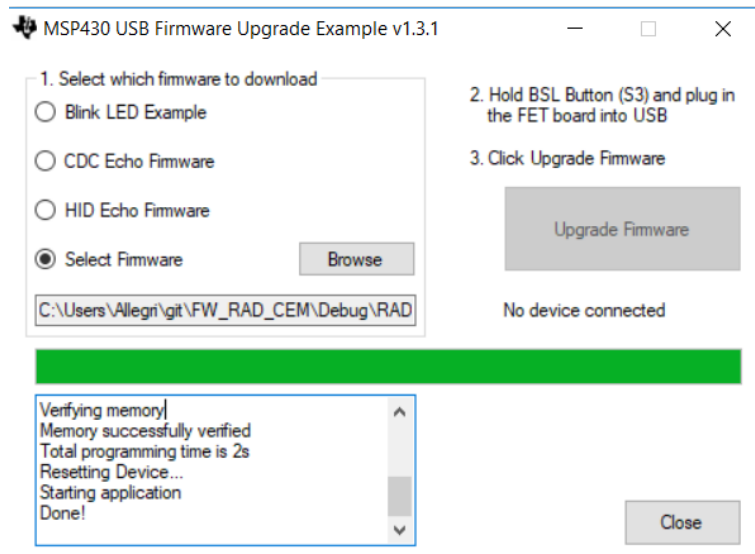
6) At the end of the process, the device will be updated to the last FW version: now close the applications, disconnect and turn the instrument off.

Further information: www.gruppompb.uk.com

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