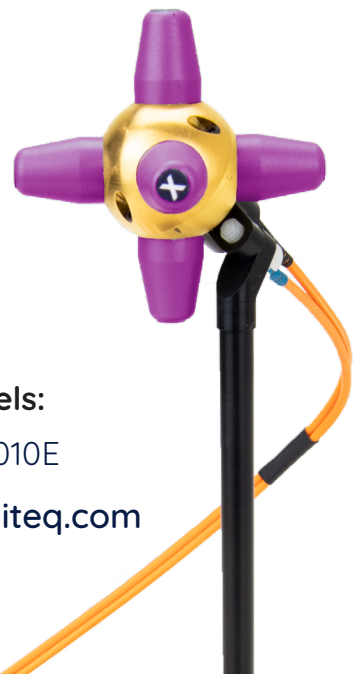Essential
*Series*

# raditeq
# Product Manual

Models:

RSS2010E

www.raditeq.com

# RadiSense® Product Manual

This product manual pertains to the RadiSense® series.

RadiSense® Models: RSS2010E**- By Raditeq**
RadiSense® LASER card: LPS2001B **- By Raditeq**

Read this manual carefully before operating the product and make sure all the safety instructions are strictly followed.

For your convenience, a Quick Start Guide has been added to this product.  This Quick Start Guide contains the basic start-up steps and the safety warnings.

Please keep the Quick Start Guide (and this regular manual) close at hand when you operate your new Raditeq product(s).

Please contact your local reseller if you have any questions.

## Supplier Information

**Raditeq B.V.**
Vijzelmolenlaan 3
3447 GX, Woerden
The Netherlands

Tel.:              +31 (0)348 200 100
Internet:         www.raditeq.com
Email:            sales@raditeq.com

Publish Date: 08/03/2024

All trademarks used in this manual are the property of their respective owners

# Table of contents

# WARNINGS & PRECAUTIONS

Read the contents of this product manual carefully and become familiar with the safety markings, the product instructions and the handling of the system. Please refer to the applicable product manual(s) for further information regarding the operation and control of the product(s).

This product requires a protective earth connection. The mains power source for the equipment must supply an uninterrupted safety ground to the IEC input connector(s).

This equipment is designed to be used as a plug-in card for the RadiCentre® series. Do not use this card on its own or in combination with any other mainframe. Using this product with any other mainframe can cause harm and will void warranty.

To make the product as safe as possible, this plug-in card has its own safety interlock system that is designed to work with the RadiCentre® series.

Only Raditeq qualified maintenance personnel is allowed to perform maintenance and/or repair service on the equipment.

This product® contains materials that can be recycled and reused to minimize material waste. At the 'end-of-life', specialized companies can dismantle the discarded system to collect the reusable and recyclable materials. If your product is at its 'end-of-life', please return it to your local reseller or to Raditeq for recycling.

Position the product in such a fashion that power cables are easily accessible or connect the equipment to a mains network that can be easily disconnected from the mains.

For cleaning, use a clean, dry cloth (or a damp cloth where needed) and wipe the surface of equipment.

This product contains no hazardous substances as described in the RoHS Directive (2011/65/EU).

This product contains embedded software, which is field upgradeable from the RadiCentre® using the USB-A connection port on the backside panel of the RadiCentre®. For more information about updating your Raditeq plug-in card, please read the RadiCentre® manual.

The RadiSense® system is a closed loop fibre system and therefore classified as a Class 1M laser system according to EN60825-1:2014 and EN60825-2:2005. In order to provide laser safety in case of a fibre failure or accidental disconnection of the fibres, the RadiSense® system is provided with an Automatic Laser Shut down (ALS) as described in the EN60825-2:2005.

> INVISIBLE LASER RADIATION - DO NOT EXPOSE USERS OF TELESCOPIC OPTICS
> **Class 1M LASER product**
> Max. 500 mW at 808 nm

Although the RadiSense® system does not emit any harmful laser light under normal circumstances, never look into any of the fibre optic connectors.

As a safety precaution, products that use a laser can only be turned on using a laser Code. This code can be entered using the touchscreen of the RadiCentre® system (In combination with the RadiCentre® CTR1004B or CTR1009B).

As a safety precaution, the RadiSense® series can be started by following a dedicated starting procedure as described later in the RadiSense® product manual. (In combination with the RadiCentre® CTR1001S)

Make sure that the fibre optic cables are installed correctly before activating the system. Do not activate the system if the fibre optic cables show any sign of damage or tampering.
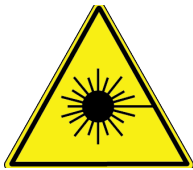
Only use optic fibre cables supplied by Raditeq, or one of her official Resellers. Using alternative cables will result in (burn) damage to the probe and fibres. the use of 3rd party cables also results in a void of warranty.

# LASER - safety measures

The RadiSense® uses a high-power laser to supply energy to a remote measuring device. The wavelength of this laser is approximately 808nm. This infrared laser is invisible to the human eye.

INVISIBLE LASER RADIATION - DO NOT

EXPOSE USERS OF TELESCOPIC OPTICS

**Class 1M LASER product**

Max. 500 mW at 808 nm

During normal operation, exposure to laser radiation is not possible because the RadiSense® uses a fibre-coupled closed loop system with Automatic Laser Shut-down (ALS). However, we ask that you comply with the following precautions for your own safety:

**NEVER** look into any of the fibre optic connectors. The laser emits a beam that is invisible to the naked eye. Such light may cause permanent eye damage. Avoid eye or skin exposure to direct or scattered radiation.

- Assign a 'laser safety officer' in your company. The 'laser safety officer' is responsible for reviewing the safety precautions.

- Check and connect all fibre optic cables before activating the system.

- Do not activate the system if the fibre optic cables show any sign of damage or tampering.

- The RadiCentre® system is equipped with a remote interlock system.

- The remote interlock connection should be connected to an 'emergency master disconnect'.

- A visual 'LASER ON' indicator LED will light up when the laser is activated. This LED on the front panel of the RadiCentre® system serves as a reminder to the operator that one or more lasers are switched on.

# Introduction

**Product Introduction**
The RadiSense® E-field sensor is the fastest wideband sensor designed for electric field strength measurements. The sensors are small and fully optically isolated to minimize field perturbation.

Applications for the E-field sensor are:

•        Radiated immunity field monitoring

•        Anechoic chambers 18 point - calibration

•        EMC emission & immunity testing

•        Field homogeneity measurements

•        RF broadcast and welding radiation-hazard monitoring

## RadiCentre® System

The RadiCentre® is a modular EMC/RF test system that serves as the interface between user and computer for all the RadiCentre® plug-in cards and modules.

## RadiMation® Software

RadiMation ® is the EMC software package from Raditeq used for remote control and automated testing of the RadiCentre® plug-in cards and modules and is sold separately.

## RadiField® Electric Field Generator

The patented RadiField® Triple A is no less than a revolution in EMC immunity testing. A complete paradigm shift involves a combination of high-level integration and a field combining technique, making several discrete components like combiner, coupler, power meters and cabling superfluous. This product is sold separately.

## The RadiSense® Series

Raditeq brings over 30 years of expertise in the field of EMC. In addition to designing both large and small EMC/RF projects for clients in automotive, military, and space industries, Raditeq offers considerable proficiency in anechoic chamber calibrations and conducting EMC immunity and emission tests. The extensive experience gained over three decades shapes Raditeq's vision in designing E-field probes, with pivotal decisions being made from the user's perspective.

The RadiSense® is a laser-powered electric field strength probe renowned for its exceptional measurement accuracy. This E-field probe is versatile, suitable for both emission and immunity testing for EMC purposes, as well as calibrations of measurement setups in environments such as anechoic chambers, GTEM and TEM cell configurations, and more. The RadiSense® is reliable, precise, and versatile solution backed by a legacy of proven performance.

### Streamlined Operations

Conducting tests and calibrations can be time-consuming and demanding for engineers. Ideally, one would like to initiate a test and move on. The RadiSense, as an E-field probe, requires minimal attention during testing. Originating over 25 years ago, it was the pioneer in laser-powered E-field probes, allowing the RadiSense to operate 24/7 without interruptions for battery replacements. Its compact size and dedicated design have minimal impact on probe measurements, and when not in use, it can be conveniently placed in a corner without the need to disconnect cables. The inherently complex nature of EMC tests and calibrations underscores the importance of a user-friendly operation for the E-field probe. The RadiSense® is easily operated manually through the RadiCentre and supports a set of software commands for configuring embedded functionalities, facilitating test automation. Compatible with multiple software packages from various manufacturers, the RadiSense seamlessly integrates with Raditeq's own EMC automation software, Radimation, providing a comprehensive solution for efficient and simplified testing processes.

### Superior accuracy

Measurement errors during EMC tests or calibrations can lead to costly consequences. After all, overlooking problems or attempting to troubleshoot issues in anechoic chambers, designs, or setups that don't exist but are a result of probe measurement errors is undesirable. The RadiSense® excels in accuracy, significantly minimizing the risk of measurement errors.

The precision of the RadiSense® is meticulously determined by its well-thought-out shape, dimensions, and the materials used, effectively minimizing anisotropy and ensuring minimal impact on the uniformity of the generated field. Substantial research and development efforts have been dedicated to designing advanced data acquisition techniques applied in the RadiSense®. This includes the creation of an accurate antenna and measurement circuit that exhibits minimal drift and noise. The resulting measurement data is processed within the embedded software, utilizing sophisticated algorithms to achieve optimal linearity, frequency response, and isotropic response.

## RadiSense® System

**The RadiSense® 10:**
- RSS2010E

The RadiSense® System consists of the following items:

**RadiSense® E-field sensor (with fixed fibre cables)**
Model: RSS2010E
Electric field sensors to be used together with the RadiSupply® plug-in card including small probe stand model PST2000A with 10 cm and 15 cm poles.

**RadiSupply® plug-in card**
Model: LPS2001B
The electric field sensor plug-in card to be used in the RadiCentre® system.

**Fibre extension cable**
Model: CBL2001-10m
10-meter fibre extension cable with FC/ST connectors on both sides. Other lengths fibre extension cables are available on request.

**Coupling set**
Model: CPL2001A
Coupling set consisting of a FC/PC and ST/PC coupling to connect the extension fibre optic cable to the sensor fibre optic cable.

Standard included supporting documentation in the form of:

- USB stick containing:
- The (digital) product manual and Quick Start Guide.
- Factory verification certificate (Raditeq)

- Optional - The calibration certificate for the field sensor
  (if an ISO/IEC 17025 accredited calibration certification was ordered).
- Hardcopy of the Quick Start Guide.
- Lint free cleaning wipes

# Fibre Optic Cables

Use an extension fibre to connect the sensors to the plug-in card mounted in the RadiCentre®. This extension fibre is a robust duplex fibre optic cable and uses dissimilar connectors to avoid faulty connections. The fibre optic cable with FC connectors feeds laser light to the field sensor. The fibre optic cable with ST connectors is used for bi-directional data communication between the field sensor and the plug-in card.
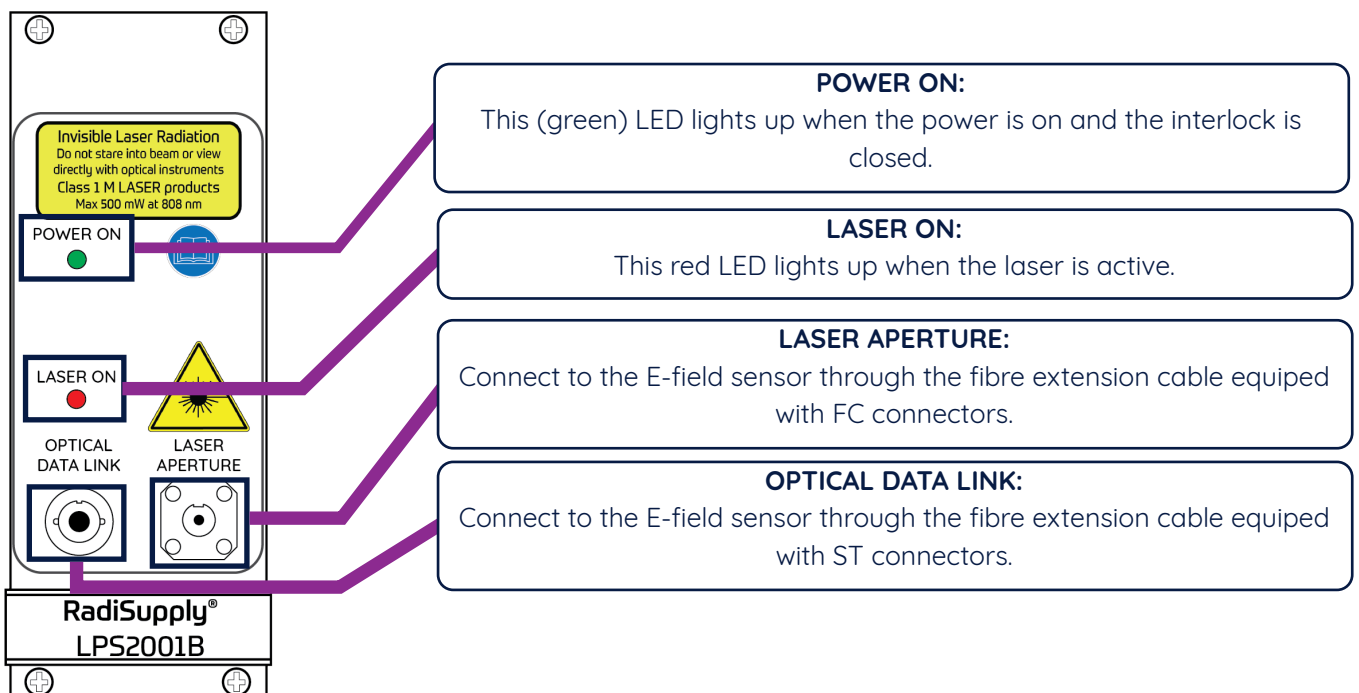
To ensure the safe and correct operation of the sensor, only use the RadiSense® with the original supplied or ordered fibres optic cables. Do not use other fibres optic cables than those supplied by Raditeq.

Fibre optic extension cables with different lengths up to 100 meters are available on request. Note that for the probe to correctly function the fibre optic cable can be extented by a maximum of two coupling sets.

Contact your local reseller for more detailed information.

## RadiSupply® plug-In card, rear Panel
The following connections and indicators are found at the back panel of the RadiSupply® plug-in card:



**POWER ON:**
This (green) LED lights up when the power is on and the interlock is closed.

**LASER ON:**
This red LED lights up when the laser is active.

**LASER APERTURE:**
Connect to the E-field sensor through the fibre extension cable equiped with FC connectors.

**OPTICAL DATA LINK:**
Connect to the E-field sensor through the fibre extension cable equiped with ST connectors.
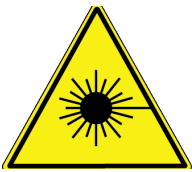
## Laser - safety measures

The RadiSense® uses a high-power laser to supply energy to a remote measuring device. The wavelength of this laser is approximately 808nm. This infrared laser is invisible to the human eye.

INVISIBLE LASER RADIATION - DO NOT

EXPOSE USERS OF TELESCOPIC OPTICS

**Class 1M LASER product**

Max. 500 mW at 808 nm

During normal operation, exposure to laser radiation is not possible because the RadiSense® uses a fibre-coupled closed loop system with Automatic Laser Shutdown (ALS). However, we ask that you comply with the following precautions for your own safety:

**NEVER** look into any of the fibre optic connectors. The laser emits a beam that is invisible to the naked eye. Such light may cause permanent eye damage. Avoid eye or skin exposure to direct or scattered radiation.

- Assign a 'laser safety officer' in your company. The 'laser safety officer' is responsible for reviewing the safety precautions.

- Check and connect all fibre optic cables before activating the system.

- Do not activate the system if the fibre optic cables show any sign of damage or tampering.

- The RadiCentre® system is equipped with a remote interlock system.

- The remote interlock connection should be connected to an 'emergency master disconnect'.

- A visual 'LASER ON' indicator LED will light up when the laser is activated. This LED on the front panel of the RadiCentre® system serves as a reminder to the operator that one or more lasers are switched on.

RadiCentre® 2-slot and 7-slot specific:

- A 'LASER Code' is required to activate the RadiCentre® 2-slot and 7-slot systems. This LASER code enables the power supply to all installed (laser) modules.

- (Please refer to Chapter 'Installation' for the default laser code).

- To prevent accidental activation of the laser, an 'Acknowledge' button will appear directly after the laser 'Start' button is pressed. The laser will only be activated if this button is pressed within a 4 seconds time frame.

RadiCentre® single-slot specific:

The RadiCentre® Slim model CTR1001S is  often used in combination with the RadiSense® electric field probe series. The RadiSense® is a laser powered probe which is powered from the RadiCentre®. As an additional safety measure the RadiCentre® has a safety feature which needs to be triggered before the laser can be activated.

Since the RadiCentre® Slim model CTR1001S does not have a touch-screen. Instead a specific activation procedure combined with audible warnings is used.

**To activate the laser in the RadiCentre® Single, follow these steps:**

1. Press the 'Start' button on the back panel (of the RadiCentre® CTR1001S) and hold it.

2. Five loud 'beep' sounds can be heard; four short beeps followed by one long beep.

3. On the fifth 'beep' the laser link is activated and the red 'laser ON' LED (on the RadiSupply® card) lights up.

4. Release the 'Start' button.

**This means that:**

- If the activation process is to be interrupted, release the 'Start' button (before the fifth 'beep'). The laser will not be activated.

- If the activation process is interrupted (and released 'Start' button by accident), the laser will not be activated.

- The user is warned by an audible warning when the start button is pressed by accident (i.e. without the intention to activate the laser).

To prevent accidental activation of the laser, an auditory warning will alert you of the laser activation procedure (if the 'Start' button is being pressed). To interrupt the activation process, all you must do is release the 'Start' button.

# Fibre handling and maintenance

The fibre optic cables in the RadiSense® are a crucial part of the system. Improper handling and poor maintenance can cause deterioration and/or permanent damage. Please read the following handling and maintenance guidelines to ensure both your safety and the quality of the product.

Please note, that dirt, grease and/or dust can burn into the fibre optic cable when high power laser light is guided through rendering the fibre useless or severely damaged. To prevent this, follow the guidelines below.

Handling guidelines

- Always place the plastic end-caps on the fibre optic cable connectors when they are not in use. Only use the supplied end caps.

- Never touch the tip of the fibre optic cable connector (core surface). If the tip of the connector is (accidentally) touched, use the supplied alcohol wipes to clean it before usage!

- Never drop the fibre optic cable connectors, as this may damage the core surface.

- Never bend the fibre optic cables beyond the minimum bend radius of <5 cm, as this will break the fibre optic cable core.

- Never pull the fibre optic cable connector out of a coupling by its orange jacket, always pull the connector.

- Fasten the connectors by hand only, never use tools.

- Do not stand on or crush the fibres optic cable.

- Do not apply mechanical stress (pull) to the fibres optic cable.

- Switch off the system before detaching the fibres optic cable.
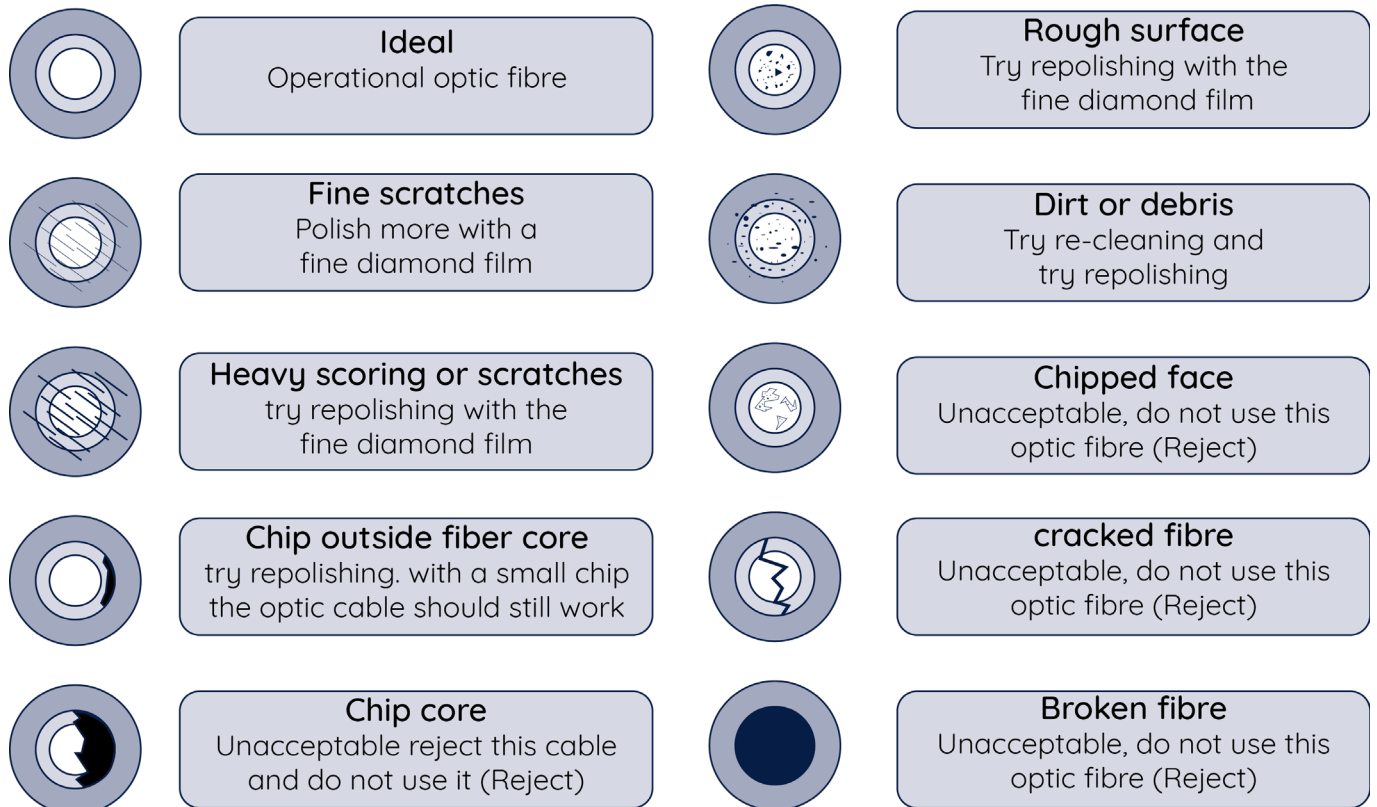
Maintenance guideline

Clean the contact surface of the fibres with the lint-free alcohol wipes before installation. Do not use other solvents or wipes. Fibres are clean and polished on delivery and do not need to be cleaned when installed for the first time, when the handling guidelines as defined.

To ensure the Fibre optic cable remains in its ideal state make sure that the ST optic fibre connectors (on the RadiSense) and the bidi link (on the LPS2001B plug-in Card) are cleaned periodically.

# Fibre conditions

Use the examples and instructions in the following figure as a guideline for further fibre maintenance. If you have doubts about the condition of the fibre optic cables, please contact your local reseller or Raditeq for assistance and/or advise.

**Note that to be able to inspect the fibre optic cable connector specialized equipment and training is required.**

**Ideal**
Operational optic fibre

**Rough surface**
Try repolishing with the fine diamond film

**Fine scratches**
Polish more with a fine diamond film

**Dirt or debris**
Try re-cleaning and try repolishing

**Heavy scoring or scratches**
try repolishing with the fine diamond film

**Chipped face**
Unacceptable, do not use this optic fibre (Reject)

**Chip outside fiber core**
try repolishing. with a small chip the optic cable should still work

**cracked fibre**
Unacceptable, do not use this optic fibre (Reject)

**Chip core**
Unacceptable reject this cable and do not use it (Reject)

**Broken fibre**
Unacceptable, do not use this optic fibre (Reject)

Make sure that if/when you disconnect the fibre cables that you clean the connectors to prevent damage to the fibre.

## Probe Stand

The RadiSense® 10 is assembled as follows:
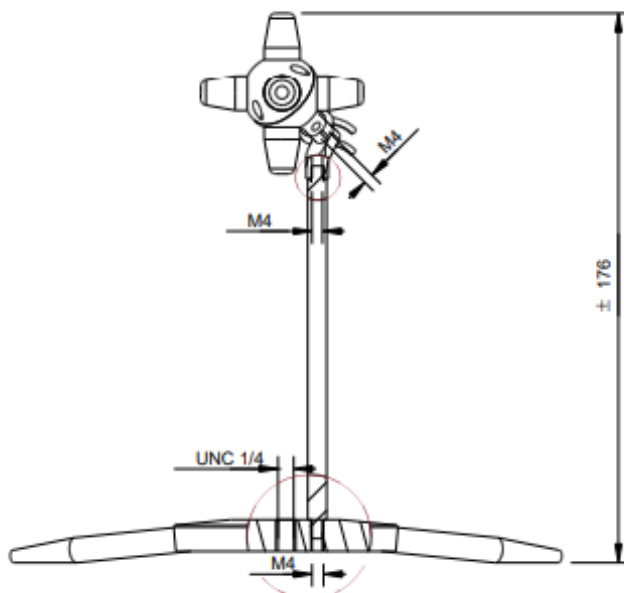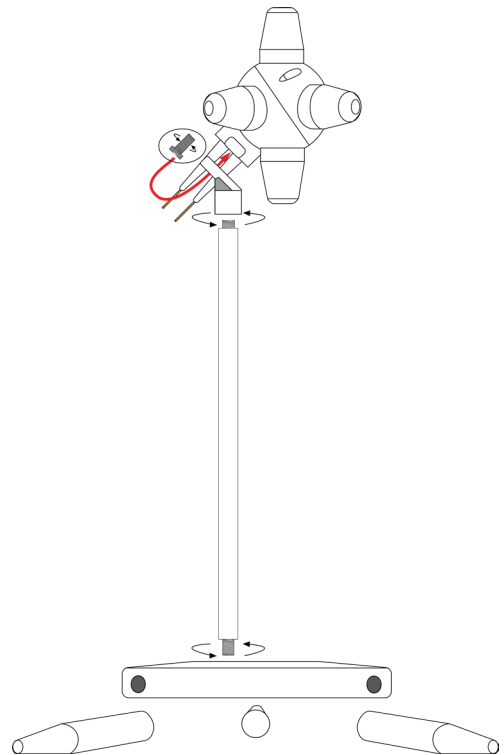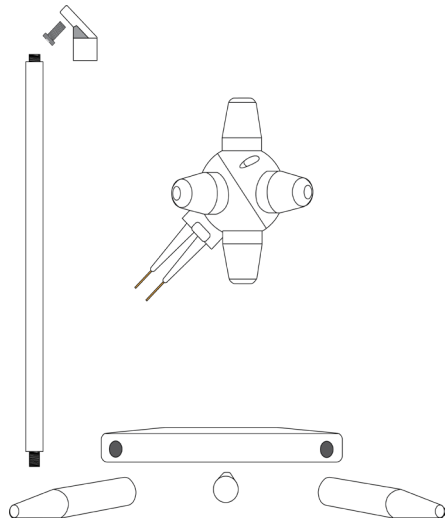






### RadiSense Probe stand Screws

The probe is provided with a probe stand. This stand can be assambled using the srewslots in the foot base and in the base of the probe (see picture). The probe makes (mainly) use of M4 (metric) screw size. the only exception is the footbase of the probe stand. the foot base has a M4 hole and a UNC 1/4 inch hole.

# Mounting Angle Usage for RadiSense® Probe:

The usage of the mounting angle with the RadiSense® probe is optional and depends on the measurement requirements:

Isotropic Measurements (Unknown Polarization):
When performing isotropic measurements of an electrical field with unknown polarization, such as in a reverb chamber or mode-stir chambers, the mounting angle is not required. (See left picture below)

Accurate Measurements with Known Polarization:
 For precise measurements of an electrical field with a known polarization, the mounting angle can be employed. This allows one axis of the RadiSense® to be positioned parallel to the field. (See right picture below)

Calibration Considerations:
In situations where an E-field sensor is calibrated axis by axis, it is recommended to use the probe in the same way during measurements for the most accurate results.

REMARK:
Placing dielectric material in close proximity to the field sensor may influence the field and lead to measurement errors. Exercise caution to prevent any interference during measurements. By understanding the polarization requirements and calibration methodology, users can choose whether to utilize the mounting angle for optimal results based on their specific measurement scenarios.
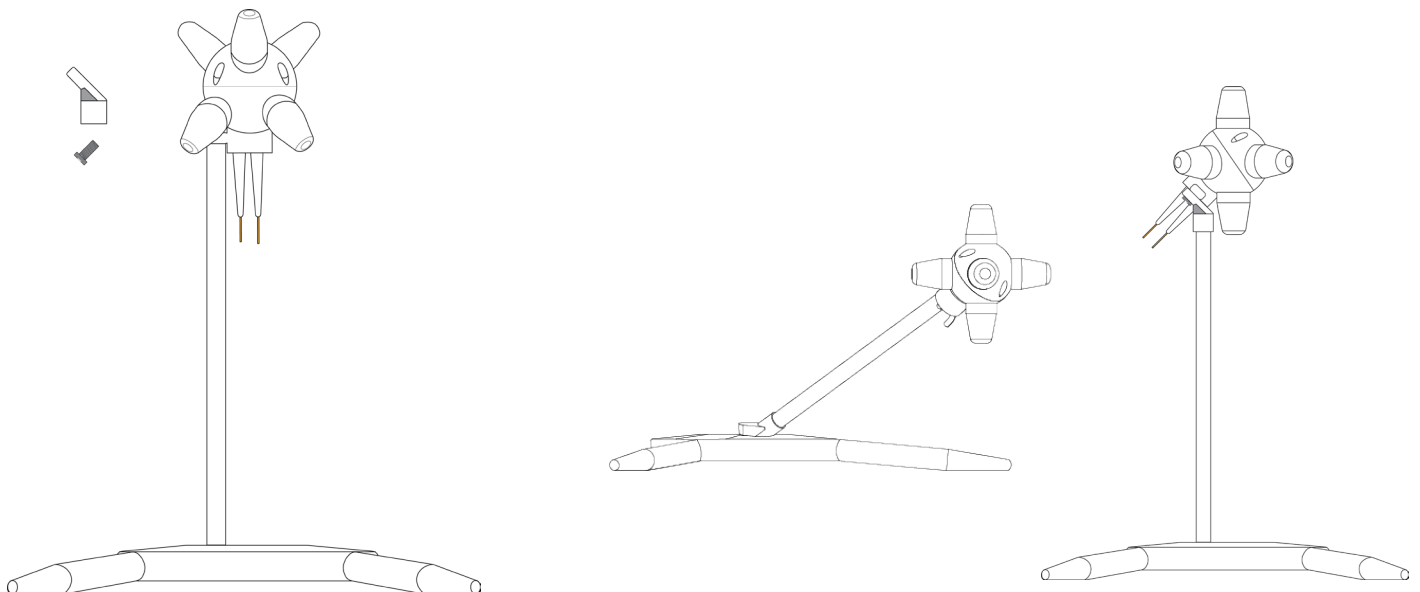
## Installation into the RadiCentre

**Please follow the instructions below on how to install the Raditeq plug-in card into the RadiCentre® correctly. NOTE: before installing and inserting a new plug-in card make sure that the RadiCentre® is turned OFF.**

### Step 1

Choose an empty slot in the RadiCentre® in which the plug-in card can be installed.
Remove the blind panel from the slot by unscrewing the four (4) screws on the panel (two at the top and two at the bottom).



### Step 2

Insert the plug-in card in the rail of the empty slot as shown in the picture A. Position the plug-in card into the slot and slowly push it, using the lower part of the plug-in card. When it reached the end of the rail, gently push and secure the plug-in card into the backplane socket.

### Step 3

When the plug-in card is inserted correctly into the backplane socket, fix it by tightening the four screws at the top and the bottom of the plug-in card (shown at B). For connection of the panels into the RadiCentre® a screwdriver type Poze, size PZ1 should be used'



### Step 4

After installation of the plug-in card, connect the AC mains power cord on the back of the RadiCentre® and switch the ON/OFF button to the ON position. The RadiCentre® can now be started by tapping the touch screen.

When installed properly, the plug-in card should be recognized and shown automatically on the front screen of the RadiCentre® when turned ON.

# Connection plugs

Place the RadiSense® E-field sensor where the field strength is to be measured.

Clean the ends of the fibre optic cable connectors if necessary and connect the fibre optic cables to both the sensor and the plug-in card. Make sure the latching pin (notch) of the FC and ST connector fits correctly in the slot of the chassis connector (in line coupling).

Connect the RadiCentre® system to the PC using any of the available interfaces of the RadiCentre® system; USB, Ethernet or IEEE-488 (optional).

**Interlock**

Make sure the interlock safety system is closed when connecting to the RadiCentre®. If the interlock system loop is not closed/connected the RadiSense® laser will not start. Note that if the interlock loop is broken whilst the laser is active, that the laser of the RadiSense® will be shut off. The Interlock loop needs to be closed or reconnected before the laser can be restarted again.

The hardware installation for the plug-in card is now complete. The user can control the plug-in card either through the touch-screen on the RadiCentre® system (only available for the 2 and 7-slot versions), or by using the control commands in combination with an external software package such as the RadiMation EMC test software.

## Laser code

As a safety precaution, products that use a laser can only be turned on using a laser code. This code can be entered into the system by use of the touch screen of the RadiCentre®.

This safety feature is linked to the RadiCentre® 2- and 7-slot version. The laser activation and safety is implemented differently in the RadiCentre® Slim.

To meet the laser safety precaution, enter the laser code in the 'LASER Code' screen and press 'OK' for confirmation.

The standard/default Laser code is **3447**
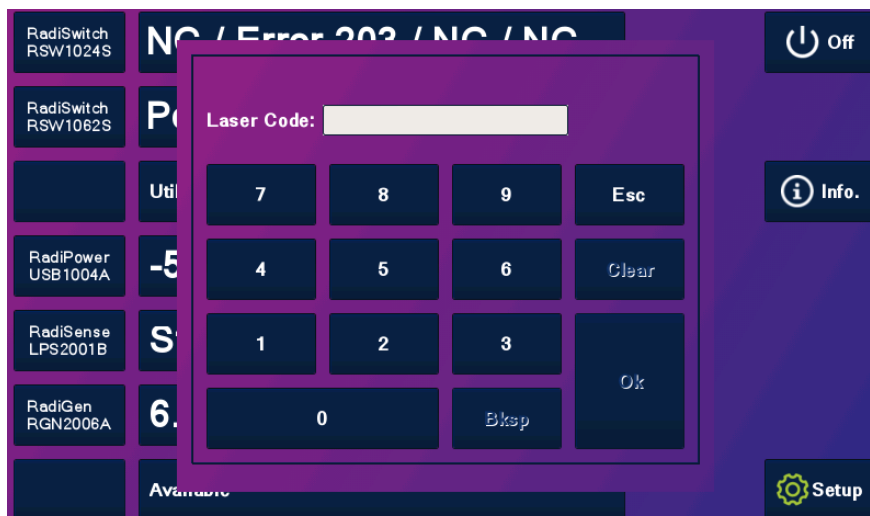
# Software configuration

To control the RadiSense from a computer, one can use either custom made software or the RadiMation® EMC software package from Raditeq, which can be downloaded from the Raditeq website. If the RadiSense® is operated manually, this chapter can be skipped.

Configuring the RadiSense® in RadiMation®

**The RadiSense® device driver is part of the field sensor device driver family**

## How to configure the RadiSense® in RadiMation®

1.  Start the latest version of RadiMation®; **https://www.raditeq.com/radimation-download**
2.  Select the button 'Device' at the top menu bar, followed by clicking 'Configure';
3.  In the configuration screen select 'Device Drivers' and Select 'Field Sensors' as driver type;
4.  Click the 'Add' button to open the selection of available drivers in RadiMation®;
5.  Enter 'RSS' in the search bar which will show all available RadiSense® drivers;
6.  Select the correct driver, double click it (Optional, rename it) and press 'OK'.
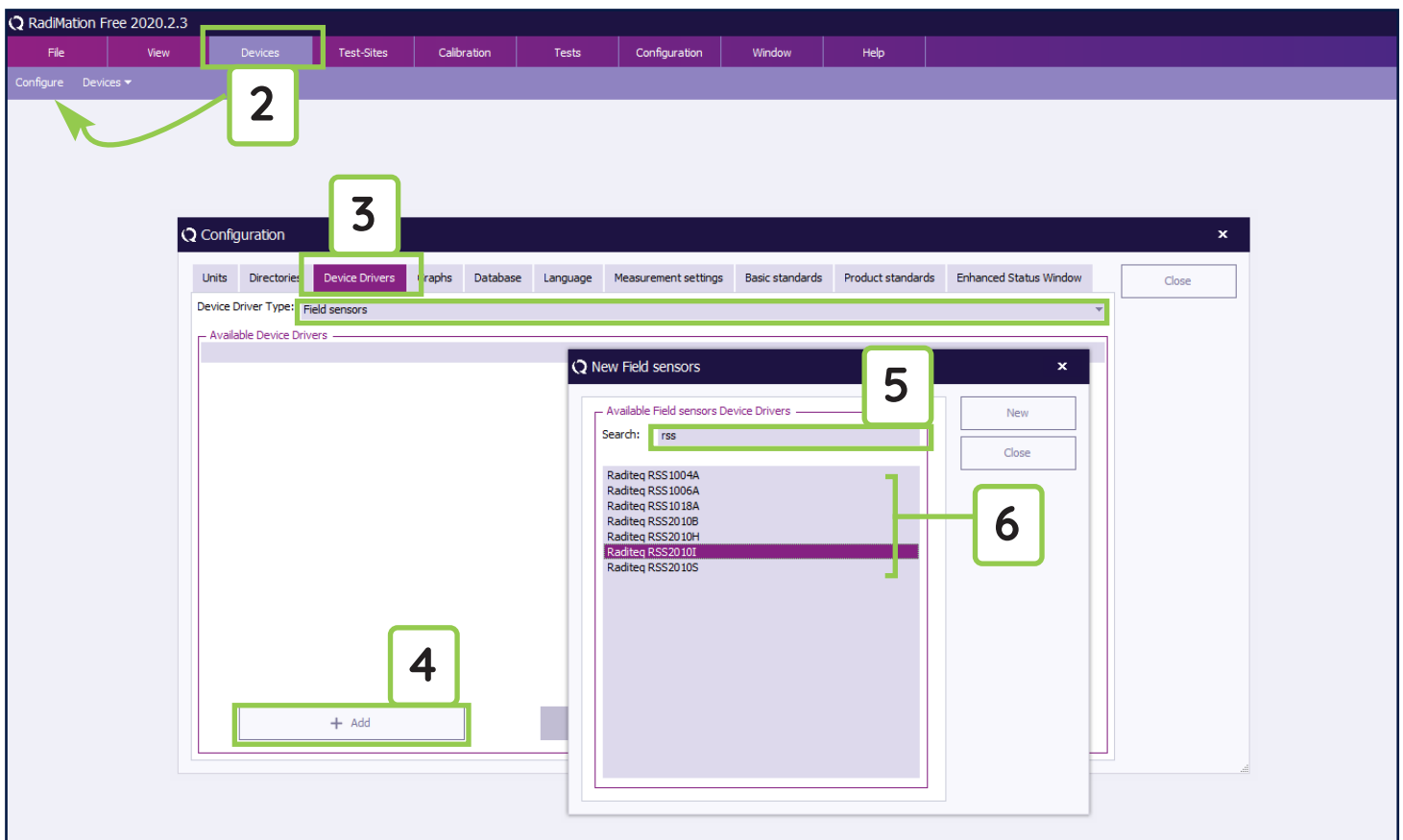
# How to connect the RadiSense® to the RadiCentre®

1. Select the recently added RadiSense® driver

2. Select 'Advanced'

3. Click on the tab 'RadiCentre®'

4. Under device identification select the RadiCentre® slot number the RadiSense® plug-in card is installed in

5. When the correct slot number is chosen, continue to set the communication of the RadiSense® by clicking 'Communication tab' (next page).
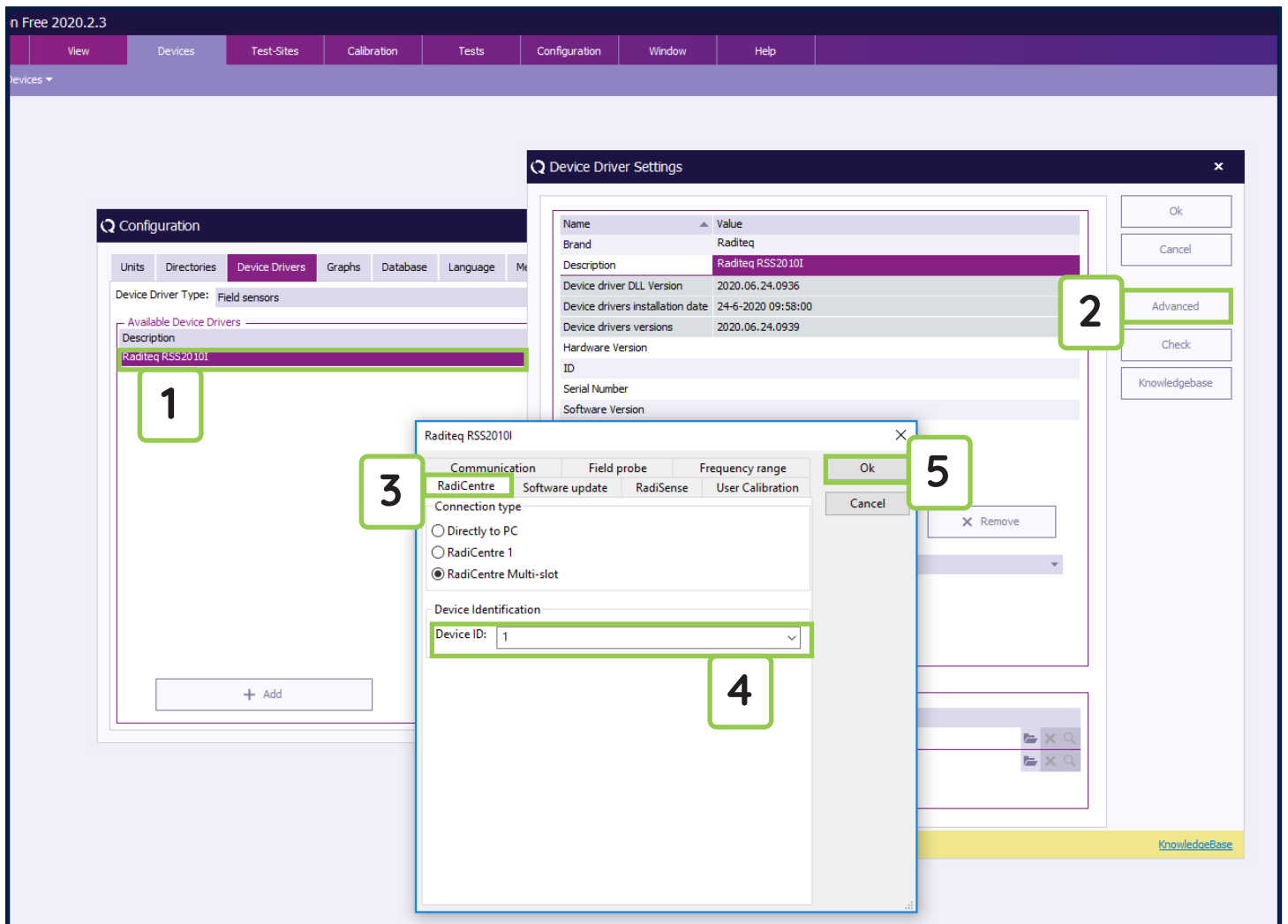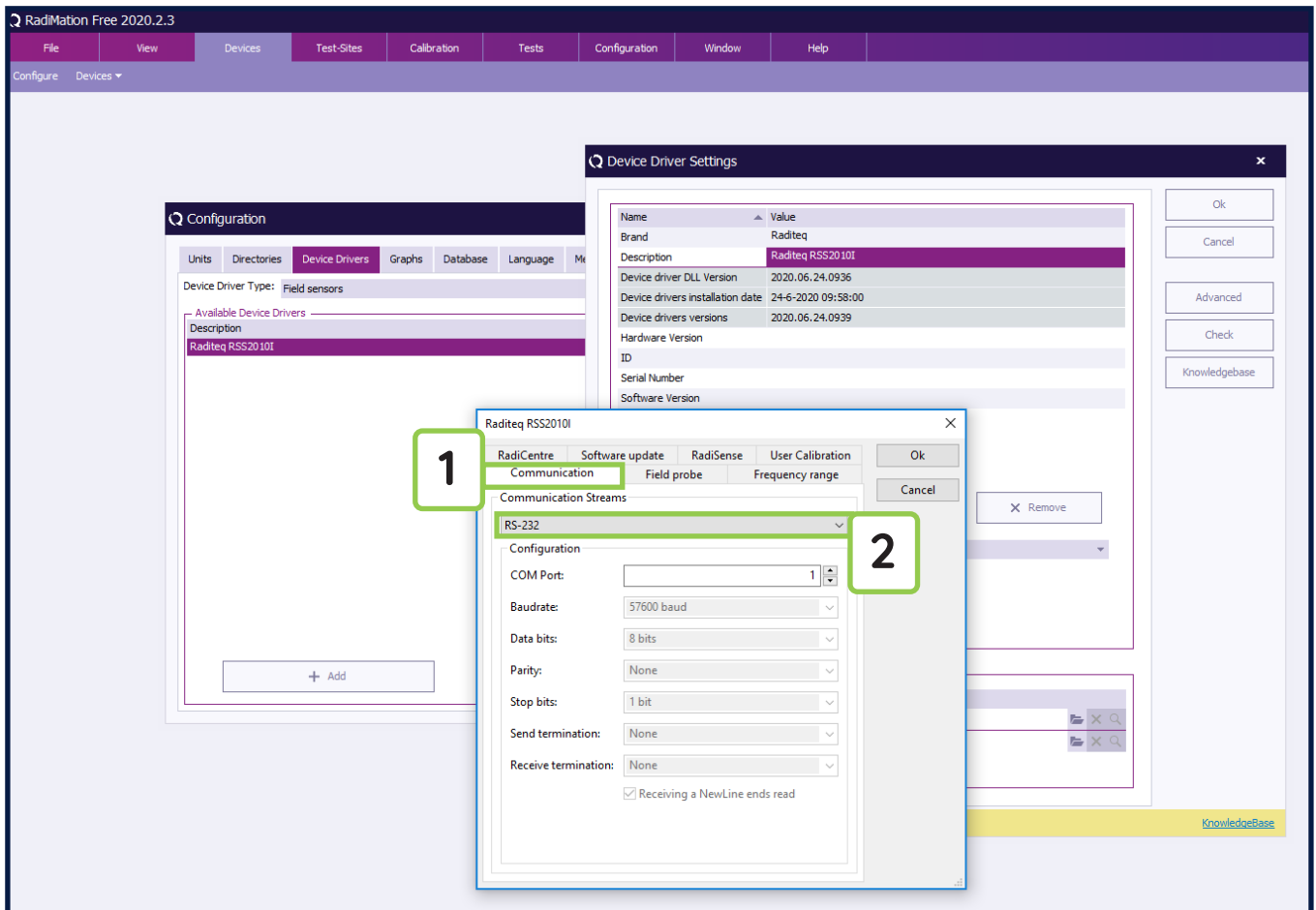
## Setup the communication of the RadiSense® to the RadiCentre®

1. When in the advanced RadiSense® 10 Driver settings click on the tab 'Communication'
2. Select the interface to used, for example:
   - GPIB
   - TCPIP
   - USB
   - VISA

3. When these steps are performed continue to the next steps for checking the communication of the RadiSense®.

How to check whether the RadiSense® is properly connected to RadiMation®

1.  Select 'Devices' in the top menu bar
2.  Open 'Device Drivers' and select Device driver type: 'Field Sensors'
3.  Double click the recently configured RadiSense® or click 'Edit'.
4.  Finally select the 'Check' button on the right side of the opened screen.
5.  When correctly configured, RadiMation® will notify you that the device is correctly installed.
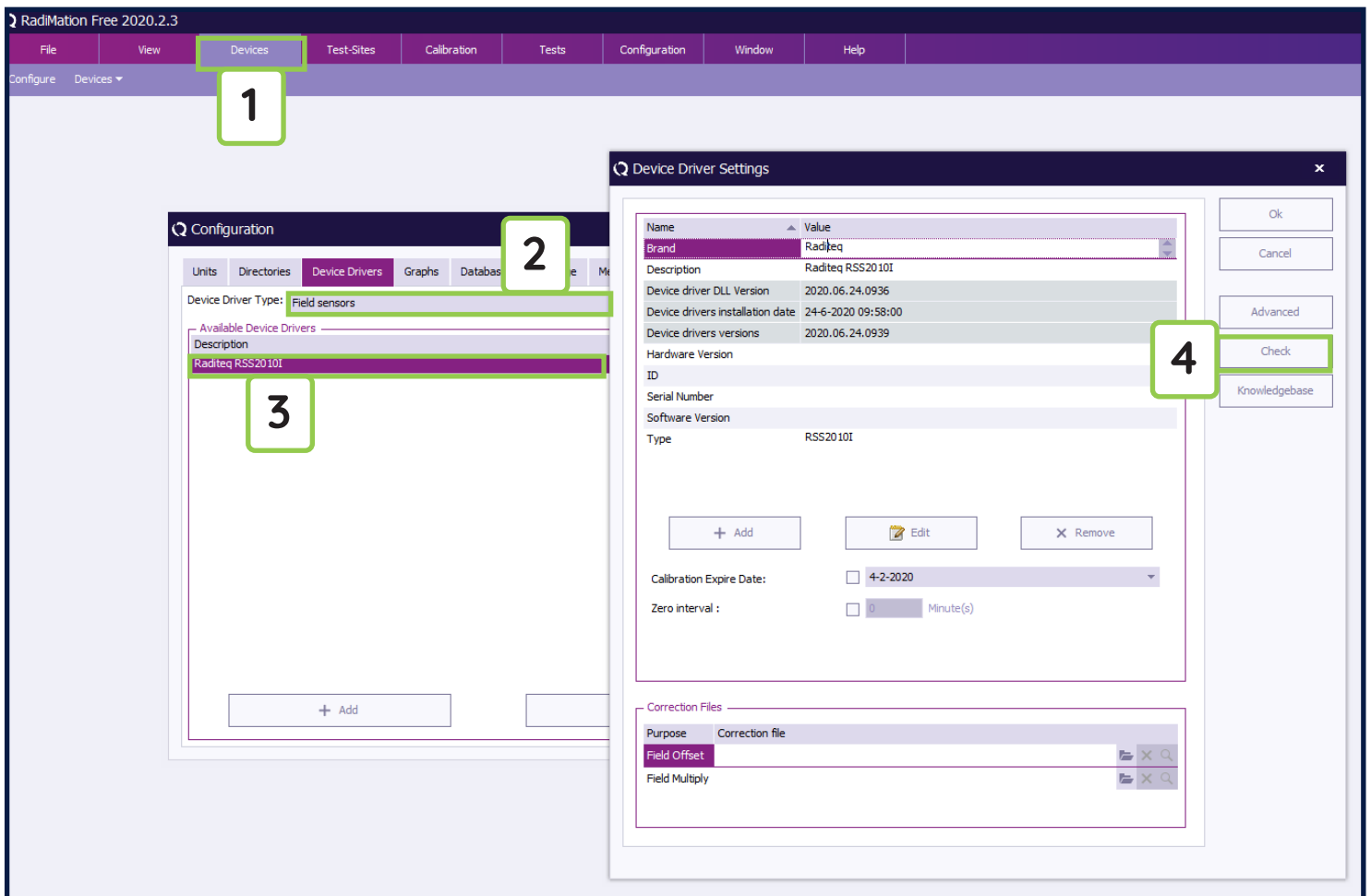


## Important information

When you need support with the configuration of your Radi-Product in RadiMation®, please consult the RadiMation® support team at: Support@radimation.com.

It is also advised to visit the RadiMation® Wiki page and the FAQ section, which can be found at: https://wiki.radimation.com

RadiMation® software can be downloaded at: https://www.raditeq.com/emc-test-software/radimation-download

## Using the RadiSense® with the RadiCentre®

### Manual Control

Once the RadiCentre® is switched on, the RadiSense® can be activated from the 'main' screen on the RadiCentre® touch-screen.

### Starting the laser powered sensor

The laser of the RadiSense® 10 field sensor can be started from the 'main' window of the RadiCentre®. To activate the sensor, press the 'Start' button for the required sensor and, within 4 seconds, the 'ACK' button. A short sound will be audible until the safety loop is closed successfully. As long as the laser is activated, the front and rear 'LASER ON'-LED's will light up to indicate laser operation.

Note if the laser code is not entered at the start-up of the RadiCentre® the laser code numpad will pop-up when activating the RadiSense® laser.
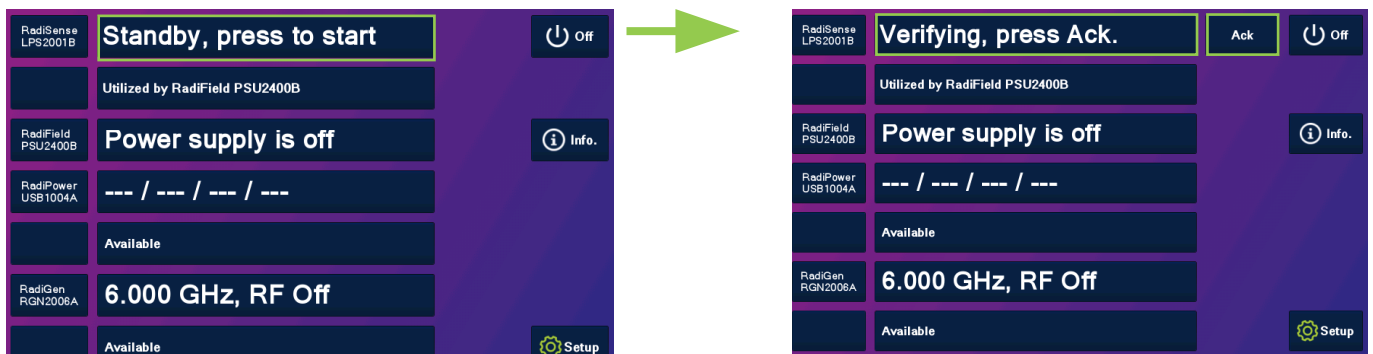
### Zeroing the probe

The 'Status' box will now indicate "Press this button to zero" and after pressing this button the zeroing of the probe will be started. As soon as the probe is zeroed, the 'STATUS' box will display the measured field strength of the probe (see below).

The E-field sensor is now powered on and will return optical data to the RadiCentre® system. As long as the probe returns optical data, the laser will continue to power the sensor. If the loop is interrupted, the laser will switch off immediately. For maximum accuracy, it is recommended to re-zero the probe whenever the probe temperature changes by more than 5 °C.

# Setting the correct measurement frequency

To measure the correct field strength, the current measurement frequency must be sent to the probe. When using the probe manually, in combination with a RadiCentre or RadiMation, the frequency can be set in the control window of the RadiCentre using the button in the left bottom corner:

When using the probe under software control in an automated test setup, the control software must set the correct frequency for each test frequency, using the correct software commands. Please refer to the programming manual how to set the correct frequency. When using RadiMation EMC software, the device driver of RadiMation will automatically take care of this.



## Select the filter setting

The probe allows the user to select different averaging filters to optimize performance for different applications. The averaging filter can be set between filter 1 and filter 12, where filter 12 is the highest filter setting with approximately 1 second update rate.

Due to the intrinsic non-linear behaviour of RF diode detectors typically used in E-field probes, the noise contribution when measuring low field strength values is significantly higher compared to the noise levels when measuring high field strength levels. Therefore, it is recommended to use a higher filter setting when measuring low field strength levels.

DYN = dynamic (16 to 128 times depending on value)

1 = 4 times average
2 = 8 times average
3 = 16 times average
4 = 32 times average
5 = 64 times average
6 = 128 times average

Please note, a lower filter setting will increase measurement speed at the cost of increased noise levels. On the other side, a higher filter setting will reduce measurement speed while reducing the noise.

### Reading probe data
Readings from the probe can be taken directly from the touch-screen display, with the RadiMation® EMC software or any other (custom made) software package.

### Probe configuration and advanced measurement data
The 'STATUS' box in the main screen of the RadiCentre® only displays the total isotropic field strength. When more advanced data is required (such as field strength of the separate axis, probe temperature, laser current etc.). You can go into the 'Instrument'-screen by pressing the 'STATUS' box of the required device from the main screen.

The 'Instrument'-screen will display the isotropic field strength in a large font, together with the field strength data of each separate axis. In addition; probe information and laser information are also displayed in the 'Instrument'-screen

The calculation of the isotropic field strength, is performed according to the following formula:

$$E_{tot} = \sqrt{E_x^2 + E_y^2 + E_z^2}$$

## RadiSense® 10 User correction calibration data
The RadiSense® 10 probe has the feature to store external (IS0/IEC 17025 accredited) calibration data as "user correction factors" inside the probe. This means that the correction data will be applied to the measured field in run time. Due to this approach, there is no longer a need to apply correction factors inside a measuring application, like RadiMation®.

The advantage of storing the calibration data inside the probe as "user correction factors", is that the data is in one place and making it easier to maintain the correct calibration information. Apart from this, the corrections can be applied to each individual axis instead of using an average correction factor for the x-, y- and z-axis, as is done in most EMC test software.

When using the "user correction factors", there are 3 parameters that need to be fulfilled:

1. A valid calibration should be stored into the probe.

2. The calibration needs to be 'turned on' in the probe.

3. The measuring frequency needs to be set when reading the field strength, in order to apply the applicable correction factor.

The RadiSense® 10 probe can store up to 200 "user correction factor" points.

**For manual uploading of the user correction data please refer to the white paper available on www.raditeq.com**

# Create and upload user correction with RadiMation®

In most cases the calibration laboratory provides correction factors for the frequency response. It is up to the user to either store this data in the probe or in the control software.

Use the following steps to create a correction file in RadiMation®:

## Create a user correction file

To create a new correction file, first start RadiMation®. When RadiMation® is started select File->New->Correction.

After selecting the new correction file the following screen shall be presented. To add the required X, Y and Z correction column press the 'Columns/Units' button shown on this screen.
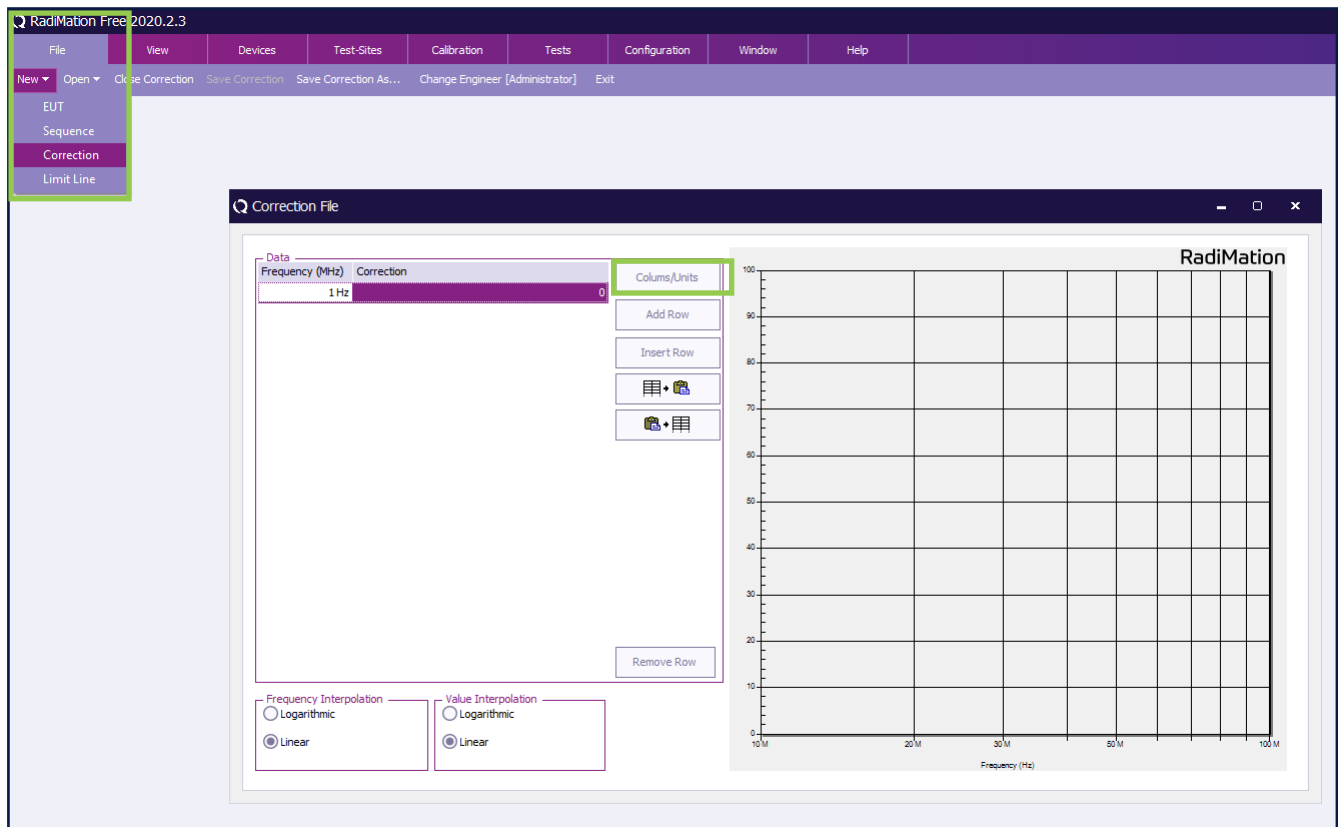
## Add calibration data into the correction file
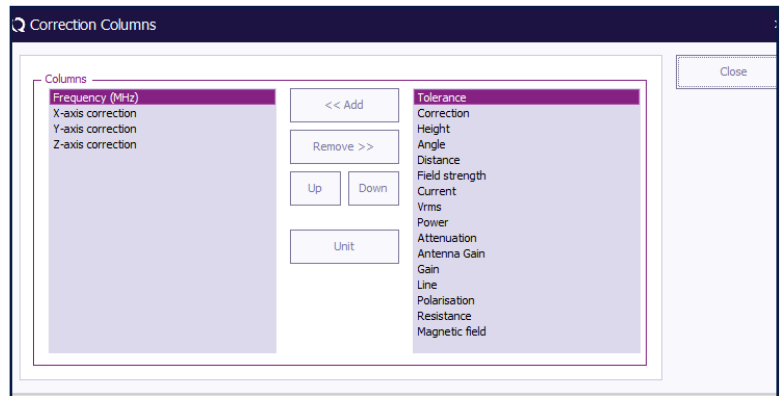
After adding the required column types the user correction data can be filled into the correction file. This can be done manually, by entering the determined calibration values, or by using the 'Copy/Paste' function when calibration data is available as a Microsoft™ Excel file.



**WARNING: Make sure that the correction file contains:**

- Only the columns: "Frequency", "X-axis correction", "Y-axis correction" and "Z-axis correction"

- At least one (1) frequency row, and at most 200 frequency rows

- The frequencies are listed in increasing order, and at least differ by 1 kHz

- The frequency values are between 1000 Hz and 99999 MHz

- Axis correction values are between 0.01 and 3.00, with a maximum precision of 1/100. (so, 1.234 is too precise)

After filling in this data into the correction file, this could for example look like the following (typical RadiSense® 10 frequency response correction data).
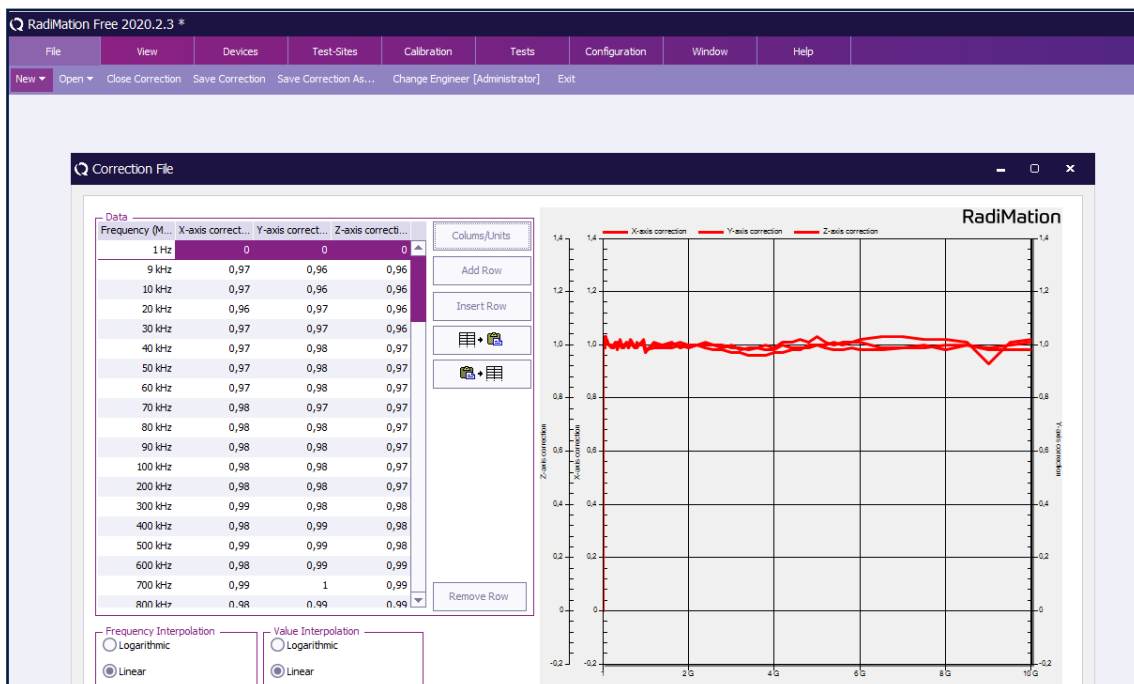
# Program the correction file into the probe

When opening the device driver settings for the RadiSense® 10 probe in RadiMation® the following screens are presented.

1. Click on the advanced button to open the advanced configuration dialog for the RadiSense® 10 device driver.

2. Select the 'User Calibration' tab. This will show the following screen

3. Browse the Correction file and select OK

4. Click 'program calibration table'.
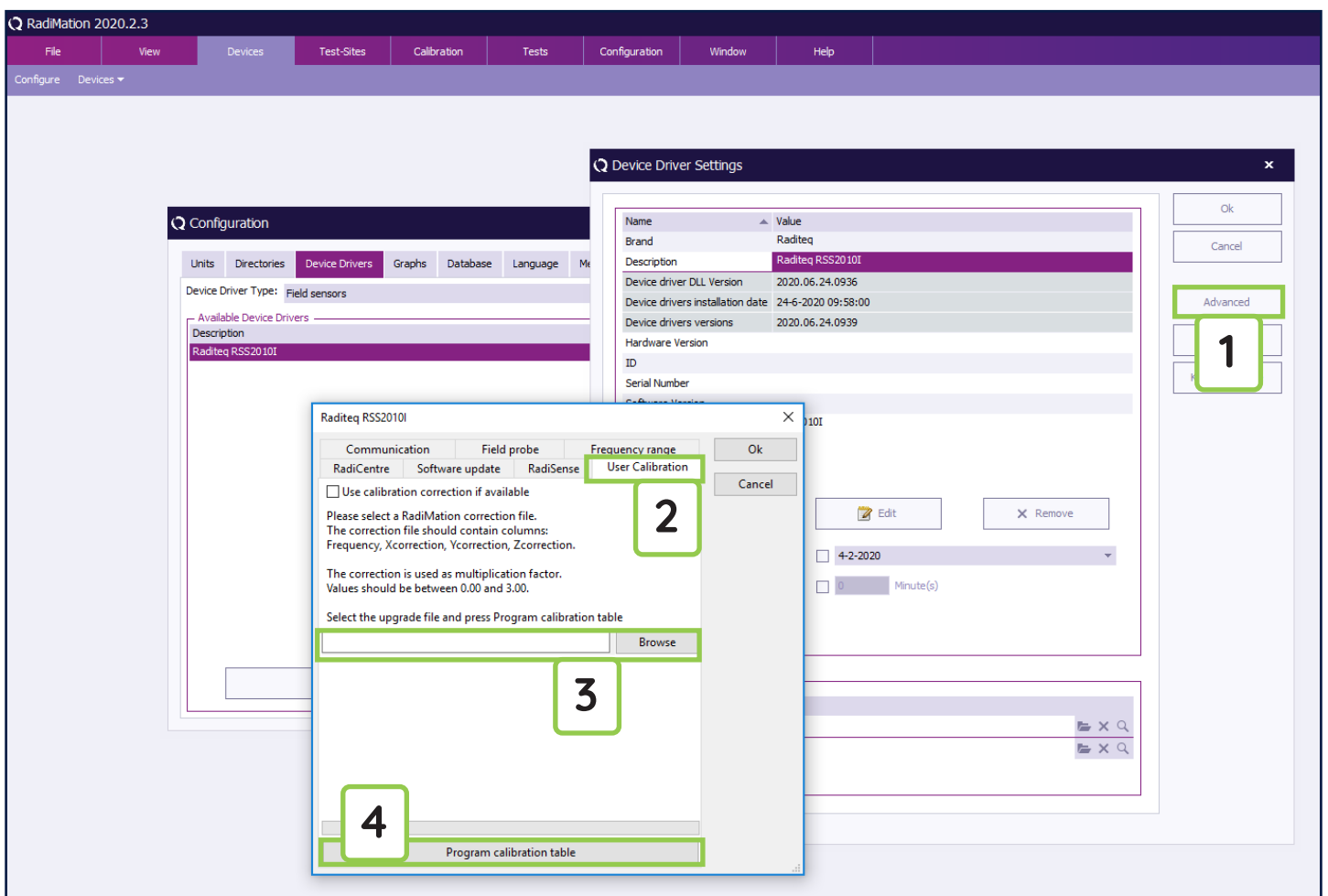


# Enabling the user correction file

To enable the use of the user correction calibration table, check the "Use calibration correction if available" checkbox as shown on the previous image. This will enable the usage of the user calibration table during initialisation of the RadiSense® 10 when starting a test.

## RadiSense® specifications

### RadiSense® general specifications

| Connection specifications (optical) | |
|---|---|
| Laser power | Max. 0,5 W output at aperture |
| Wavelength | 808 nm |
| Laser connector | FC/PC |
| Data connector | ST/PC |
| Fibre optic cable type | HCS, duplex |
| Standard fibre optic cable length | Circa 2,5 m fixed to sensor, 10 m extension with couplings Other lengths available on request - Maximum of two coupling sets can be use in a single RadiSense® system. |
| Max fibre length | 100 m |
| **Safety** | |
| Laser product classification | Class 1M according to EN 60825-1 and EN60825-2 |
| Safety measures | Code (RadiCentre®), Remote interlock system (RadiCentre®), LED indications for LASER ON, Audible warning signals, Redundant closed loop safety system |
| Laser switch on time | approx. 50 ms |
| Laser switch off time | < 10 ms |
| **Conditions & Warranty** | |
| Temperature range | 0 ℃  to 40 ℃ |
| Relative humidity | 10 – 90% (non-condensing) |
| | |
| Warranty | 3 years warranty on Hardware 1 year warranty on Calibration Certificate (see warranty condtions for more information) |
| | |

| Performance | RSS2010E |
|---|---|
| Measuring range | 0,5 to 200 V/m |
| Frequency range | 20 MHz to 10 GHz |
| Frequency response | 20 MHz – 1 GHz --> -3 dB/+1,5 dB<br>1 GHz to 10 GHz --> -3 dB/+3,5 dB |
| Resolution | 0.01 V/m |
| Linearity ([1]) | ± 0.5 dB ± 0.5 V/m |
| Isotropic deviation ([2]) | ± 0,5 dB up to 1 GHz, typical 0,25 dB<br>< ± 1 dB from 1 GHz up to 3 GHz<br>< ± 5 dB from 3 GHz up to 10 GHz |
| Measurement speed (X,Y, Z & ETot) | 15 measurements/s |
| **Dimensions** | |
| Shape of housing | Spherical |
| Total electrical dimensions | 4.9 * 4.9 * 4.9 cm (117 cm$^3$) |
| Diameter of Spherical housing | 2.5 cm (0.98 in) |
| **Environmental conditions** | |
| Temperature range (operating) | 0 °C to 40 °C<br>(32 °F to 104 °F) |
| Relative humidity (operating) | 10 % to 90 % RH<br>(non-condensing) |
| **Power consumption** | |
| Factory adjustment data | Internally stored |
| Accredited calibration ([3]) | Traceable, accredited calibration<br>with calibration certificate (optional) |
| Optical LASER power | Max. 0.5 Watt at aperture @ 808 nm |
| Laser safety class | Class 1M |
| **Interfaces & cables** | |
| F.O. connector LASER | FC/PC fibre |
| F.O. connector data | ST/PC fibre |
| Fiber length ([4]) | 100 m maximum (Optional) |
| **Safety** | |
| Interlock | External Interlock & closed loop safety system |
| Warranty | 3 Years [5] |

1) Linearity is defined over a range of ± 6 dB from the reference point (for example 20 V/m) as defined in the IEC61000-4-3 standard.

2) Isotropy is the maximum deviation from the geometric mean as defined by IEEE 1309-2013.

3) This calibration data can be stored inside the probe as user correction data.

4) Probe is delivered with 2.5 m fixed + 10 m extension fiber and FC/ST in-line coupling set as a standard. Additional fiber lengths are sold separately

5) Three years warranty will be granted only after you register the product at www.raditeq.com. Without registration, a 1 year warranty period applies.

- All specifications are measured after 30 minutes warm-up time.
- Typical specifications indicate that the measured values are met on at least 80% of the points.

## Warranty Conditions

Raditeq B.V. offers a standard warranty term of three (3) years on their products, calculated from the shipping date, under the condition that the product is registered on www.raditeq.com. For registration of the product, the customer should provide the product model, serial number and the responsible reseller (if applicable). If the product is not registered, a limited warranty term of one (1) year will be applicable.

## Return Material Authorization (RMA) & Warranty repair

If a defect occurs to our product within the warranty term, a Return Material Authorization (RMA) 'Warranty Repair' request can be issued using the RMA link at www.raditeq.com/support. Upon receipt of the request, an RMA number will be provided. Please do not send the product without this RMA number! The defective product should be shipped to our service department at the following address:

Raditeq B.V. – Service Department
Vijzelmolenlaan 3
3447GX  WOERDEN
The Netherlands

There will be no charge for repair services (materials or labour) within the (extended) warranty term.
These warranty terms are not applicable to:

- Normal wear and tear
- Fibre optic cables
- Products that have been improperly used
- Products that have been used outside their specified range
- Products that have been improperly installed and/or maintained
- Products that have been modified without approval of Raditeq
- Calibration and/or re-calibration of the product

Repair services on products that are not covered by the Raditeq warranty will be charged to the customer.

## Repairs outside warranty

If a defect is not covered under warranty, an RMA fixed-repair can be ordered on the RMA link: www.raditeq.com/support If a re-calibration is needed after repair, this calibration should be ordered separately. The calibration will be performed at the ISO17025 accredited calibration laboratories of DARE!! Calibrations, based on the applicable service code / prices.

## Warranty after repair

For repairs outside the original warranty period, a limited warranty of six months is applicable on the performed repair. Shipping conditions are the same as with repairs that are covered within the original warranty period.

## Shipping

The customer will need to arrange shipping and cover for the costs (like e.g. transportation costs, duties, taxes) for sending the defect product the service department of Raditeq in The Netherlands. Raditeq will arrange the courier and cover for the costs for the return shipment after repair.

# EU Declaration of Conformity

We

**Raditeq B.V.**

of

**Vijzelmolenlaan 3**
**NL-3447GX Woerden**
**The Netherlands**

Declare under our sole responsibility that the

| | |
|---|---|
| **Product:** | **RadiSense®** |
| **Models:** | **RSS2010E** |

Are in accordance with the European directives:

**EMC Directive 2014/30/EU**

**Low Voltage Directive 2014/35/EU**

**RoHS Directive: 2015/863/EU**

Per the provisions of the applicable requirements of the following harmonized standards:

**Emission:**     EN 61326-1:2013, Class A1
Electrical equipment for measurement, control and laboratory use.

**Immunity:**     EN 61326-1:2013, Industrial level, performance criteria A
Electrical equipment for measurement, control and laboratory use.

**Safety:**     EN 61010-1:2010, Safety requirements for electrical equipment
for measurement, control, and laboratory use

EN60825-1:2014, Safety of laser products - Part 1: Equipment
classification and requirements

**The technical construction files are maintained at the address specified above.**

| | |
|---|---|
| **Date of issue:** | Publish Date: 08/03/2024 |
| **Place of issue:** | Woerden, The Netherlands |
| **Authorized by:** | P.W.J. Dijkstra |
| **Title of authority:** | Director |

# Declaration of Conformity

In accordance with UK Government Guidance

1. **Product Model / Type:**
   a.  Product:          The RadiSense® - Electric Field Probe
   b.  Model:            **RSS2010E**
   c.  Batch/Serial:     **RSS2010**
   d.  Specifications:   Field Probe

2. **Manufacturer:**
   a.  Name:             Raditeq B.V.
   b.  Address:          **Vijzelmolenlaan 3 | NL-3447GX Woerden | The Netherlands**

3. This declaration is issued under the sole responsibility of the product manufacturer.

4. The object of the declaration described above is in conformity with the relevant UK Statutory Instruments and their amendments:

   | | | |
   |---|---|---|
   | **2008** | **No 1597** | The supply of Machinery (Safety) Regulations 2008 |
   | **2016** | **No 1101** | The Electrical Equipment Safety Regulations 2016 |
   | **2016** | **No 1091** | The Electromagnetic Compatibility Regulations 2016 |
   | **2012** | **No 3032** | The Restriction of the Use of Hazardous Substances in Electrical and Electronic Equipment Regulations 2012 |

5. We hereby declare that the product described above, to which this declaration of conformity refers to, is in conformity with the essential requirements of the following standards:

   | Reference & Date | Title |
   |---|---|
   | 2014/30/EU | **EMC Directive** |
   | 2014/35/EU | **Low Voltage Directive** |
   | 2015/863/EU | **RoHS Directive** |

6. **Additional Information:**
   The technical documentation for the machinery is available from:

   Name:           Raditeq B.V.
   Address:        Vijzelmolenlaan 3 | 3447 GX Woerden | The Netherlands

   Place of issue:  Woerden, The Netherlands
   Date of Issue:   01/03/2023
   Name:            P.W.J. Dijkstra
   Function:        Director