thermoscientific

Operating Instructions DB-070 E

RadEye AB100

Multi-Purpose Survey Meter

REVISIONS SHEET:

Rev.	Rev. state	Dept. resp.	Name	Rev. page	Cat. *)	Explanation
	10.12.07	RM&P-EH	Pij			**>V1.32**
A	16.04.08	RM&P-EH	Pij	6-5, 9-1, 7-15.	I	
B	30.7.08	RM&P-EH	Pij	Cpl	A	**>V1.50** Low Battery warning Set Date/Time
C	6.10.08	RM&P-EH	Pij	4-10	A	Adjusting the display unit
D	12.10.09	RM&SI-M	Löw Ff	8-1 0-7, back	A C	Order No. Name of comany
E	15.07.11	RM&SI-EH	Pij	Cpl	A	**>V1.68** Set HV, Manual data logging, accumulated counts
F	22.01.13	RM&SI-EH	Pij	Cover 10-2 10-8	I A	Photo added Degree of protec-tion IP 53 **>V1.72**
G	24.04.15	RM&SI-EH	Pij	Cpl.	A	>**V.175** Ratemeter Tau Contrast Language See ECN 80232

Rev.	Rev. state	Dept. resp.	Name	Rev. page	Cat. *)	Explanation
H	13.08.18	FSI-E	Ff	Cover 0-8	C	ECN 81044 ECN 81515
I	04.05.21	FSI-E	Ff	0-9	C	ECN 83926

*) Category C: editorial correction
I: clearing improvement
A: substantial amendment

Explanations must be given, at least with Category A.

CONTENTS:

SAFETY INSTRUCTIONS

The RadEye AB100 is not well suited for pulsed radiation. Depending on the sensitivity of the detector and the conditions of the pulsed field, there can be a significant under-response

The instrument must not be used in explosive atmosphere.

Do not use the unit if error messages appear on the screen.

WEEE Compliance:

This product is required to comply with the European Union's Waste Electrical & Electronic Equipment (WEEE) Directive 2012/19/EU. It is marked with the following symbol:

Thermo Fisher Scientific has contracted with one or more recycling/disposal companies in each EU Member State, and this product should be disposed of or recycled through them. Further information on Thermo Fisher Scientific compliance with these Directives, the recyclers in your country, and information on Thermo Fisher Scientific products which may assist the detection of substances subject to the RoHS Directive are available at https://www.thermofisher.com/us/en/home/industrial/environmental/environmental-learning-center/environmental-resource-library/epm-weee-compliance.html

1. Introduction

The RadEye AB100 is a modern contamination meter for surface contamination with excellent alpha/beta discrimination.

A plastic scintillator coated with zinc sulfide with an incorporated photo-multiplier thereby serves as radiation detector.

The last 1600 mean and maximum values are recorded internally and can be read out via serial interface. Additionally the RadEye AB100 logs the last 250 alarms, errors and changes of the configuration. All events can be read out via serial interface.

A real time clock is provided to add a time stamp to all buffer data. The characteristic feature of the RadEye AB100 is the use of sophisticated low power technology components and microprocessor based fully automatic self checks. No maintenance is required.

All or selected menu functions described in 3.1 can be configured to be invisible and inaccessible by the user.
Thus the instrument can be configured to both, an extremely simple mode allowing just LCD-illumination and

alarm acknowledgment to a very versatile mode for the more experienced user.

2. Installation and start-up

2.1 Scope of delivery

The RadEye AB100 is delivered in a box together with two C cells and an operating manual.

Ordering information for accessories see chapter 11.

2.2 Inserting the battery

The two C-Alkaline cells as delivered with the instrument allow about 1200 h of normal operation.
C size rechargeable batteries can be used as well.

- Switch off the measuring instrument.
- Open the cover of the battery compartment.
- Exchange the batteries according to the shown polarity.
- Close the compartment cover.
- Switch on the unit again. (see chapter 2.3)

The instrument continues working in the operating mode set last (see chapter 3.2).
The measured values in the history memory remain stored.
The real time clock for time stamp of history values and logbook continue operation, if batteries are exchanged without delays. If Real Time Clock is set, actual time and date is displayed for 3 s (see chapter 2.3).
After selection of the counter tube the RadEye AB100 first display 0.00 cps. After the first detector pulse the measurement will be started.

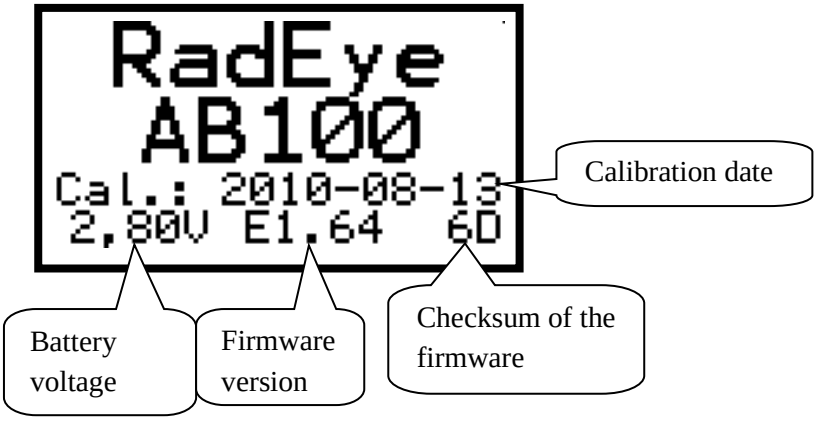
If correct timing information of logbook and history is required, the Real Time Clock should be set by means of the PC-program.

To keep RTC running during battery exchange, batteries must be exchanged without delays.
RTC will always be reset, if instrument is stored without batteries for more than 10 seconds.
History data and measurement parameters are stored permanently, even if batteries are removed.

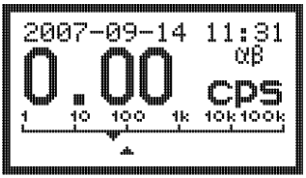
Even without RTC information the relative time information of logbook and history is corrected to the actual PC clock time during read out unless the batteries had not been removed between the event and the data read out.

2.3 Switching the unit on

To switch on the RadEye AB100, **keep** the ON button pressed for **at least one second**. The sound generator (beeper) is initiated. The start screen is displayed for two seconds



If the real time clock is set, actual time and date is displayed for 3s.



When the parameter set is selected, the corresponding high voltage is set and the RadEye SX first displays 0.00 cps. After the first detector pulse the measurement will be started. The RadEye SX starts working with the parameters previously selected (operation mode, calibration factor, alarm thresholds etc.). The selected parameter set is displayed in the top line of the LCD.

Unless the RadEye AB100 is set up for a specific detector ordered in conjunction with the device or otherwise specified by the customer when placing the order, the following values are set by the factory before delivery:

Alarm 1 for Count Rate αβ	15 cps
Alarm 2 for Count Rate αβ	30 cps
Alarm 1 for Count Rate α	1 cps
Alarm 2 for Count Rate α	2 cps
Alarm 1 for Activity αβ	45 Bq
Alarm 2 for Activity αβ	90 Bq
Alarm 1 for Activity α	1 Bq
Alarm 2 for Activity α	2 Bq
Channel setup	Beta only
Acoustic alarm (Sound)	active
LED alarm indication	active
Vibrator alarm indication	active
Acoustic count rate indication	Single Pulse
Single Pulse Divisor:	10 *)
Autosend	off
History recording interval	120 s *)
Energy threshold #1 (beta):	30 mV *)
Energy threshold #2	1150 mV *)
Energy threshold #3 (alpha):	1150 mV *)
Energy threshold #4	1220 mV *)

*) These parameters can only be changed through the serial interface by means of the configuration software.

With the setting of the history recording interval of 120 s, the last 52 hours of operation will be stored in the history memory.

These parameters (except calibration parameters) can be changed with the help of RadEye buttons and the optional PC-program „RadEye.exe“, version **1.25** and greater, and the cable 42540/29 or 42540/26.
The calibration parameters can only be changed via PC-software.

3. Configuration

3.1 Menu functions

To enter the operating menu, please press the "◄/Menu" key. Scrolling through the single menu options is effected by the ▲ / ▼ keys.
The display returns to its initial default setting in case no key has been activated for more than 10 seconds.
The "✓" behind some menu items marks the function as active.
The menu consists of a main menu and several sub menus. Some menu options are disabled for some operation modes and display modes.

Using the PC-Software and an interface adapter, any of the functions can be hidden. This allows the user to be given only the functions necessary to accomplish his measurement duties, thus simplifying the handling considerably.

The ▲ / ▼ keys are used to scroll through the menu.

To select a menu option, release the ◄ key as the respective menu option has been reached.

The meaning of the Menu key may change with the selected menu. The meaning is shown on the bottom of the display.

Change: Edit values

Off, **On**: Switching a function on and off

Select: Select a default display mode

Yes: Confirmation of an action

Exit: Exit menu

In Change menu the ▲/▼ arrow keys are used to change a digit of an alarm value.

3.1.1 Menu structure

MENU DISPLAY	SUBMENU DISPLAY	DESCRIPTION OF THE FUNCTION ACTIVATED BY THE LEFT KEY	MENU DISPLAY VISIBLE IN	
			COUNT RATE (CPS, CPM)	ACTIVITY (BQ, DPS, DPM, BQ/CM²)
Switch off		RadEye is switched off. Time and stored data are maintained	✓	✓
Background	Start measure-ment	Start background measurement	✓	✓
	Set parameter	Edit preset time and preset count for background measurement		
	Scaler netto	Scaler with background subtraction		
	Ratemeter netto	Ratemeter with background sub-traction		
Backlight		If selected the backlight is always on. Otherwise the backlight extin-guishes after 10s	✓	✓

MENU DISPLAY	SUBMENU DISPLAY	DESCRIPTION OF THE FUNCTION ACTIVATED BY THE LEFT KEY	MENU DISPLAY VISIBLE IN	
			COUNT RATE (CPS, CPM)	ACTIVITY (BQ, DPS, DPM, BQ/CM²)
Measuring unit	cps	Select Count rate (cps)	✓	✓
	cpm	Select Count rate (cpm)		
	Bq	Select Activity (Bq)		
	dps	Select Activity (dps)		
	dpm	Select Activity (dpm)		
	Bq/cm^2	Select Activity (Bq/cm^2)		
Operation mode	Ratemeter ADF	Select Ratemeter mode with filter type ADF	✓	✓
	Ratemeter Tau	Select Ratemeter mode with classic linear ratemeter		
	Scaler	Select Scaler mode		
Scaler param-eter	PresetTimeMode	Scaler mode with fixed time	✓	✓
	PresetCountMode	Scaler mode with fixed count number		
	Set time/count	Edit preset time and preset count		
	Auto restart	Auto restart of scaler measurements		
Nuclide table		Displays the stored nuclides		✓

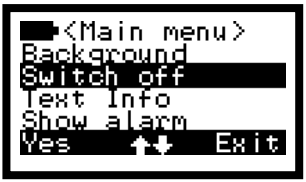
MENU DISPLAY	SUBMENU DISPLAY	DESCRIPTION OF THE FUNCTION ACTIVATED BY THE LEFT KEY	MENU DISPLAY VISIBLE IN	
			COUNT RATE (CPS, CPM)	ACTIVITY (BQ, DPS, DPM, BQ/CM²)
Alarm αβ		Allows setting of Alarm 1 and 2 for count rate mode (cps, cpm) or activity (Bq, dps, dpm, Bq/cm²).	✓	✓
Alarm α		Allows setting of Alarm 1 and 2 for count rate mode (cps, cpm) or activity (Bq, dps, dpm, Bq/cm²)..	✓	✓
Settings	Battery type	Selection of battery type: recharge-able or non-rechargeable batteries. Correct low battery warning de-pends on this setting.	✓	✓
	Autosend	If activated, the instrument sends a data string periodically to the infrared port. This is used for radio transmission units.		
	Single Pulse	Enabling and disabling of single pulse indication. Activation is done by audio keys (right button and top button). Alternative to “Finder”.		
	Finder	Enabling and disabling of audible		

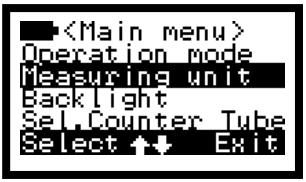
MENU DISPLAY	SUBMENU DISPLAY	DESCRIPTION OF THE FUNCTION ACTIVATED BY THE LEFT KEY	MENU DISPLAY VISIBLE IN	
			COUNT RATE (CPS, CPM)	ACTIVITY (BQ, DPS, DPM, BQ/CM²)
		radiation intensity. Activation is done by audio keys (right button and top button). Alternative to "Single Pulse".		
	Set Time/Date	Set time and date of the real time clock.		
	Set HV	Set the high voltage		
	Language	Set the menu language to English, Russian, German or French		
	Edit Tau	Set time constant for linear rateme-ter		
	Contrast	Adjusts the contrast of the LCD display		
Alarm indica-tion	LED	Enabling and disabling of the optical alarm	✓	✓
	Sound	Enabling and disabling of the acoustic alarm and the audible indication of keystrokes		
	Vibrator	Enabling and disabling of the vibration alarm		

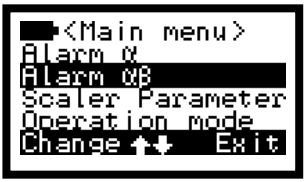
MENU DISPLAY	SUBMENU DISPLAY	DESCRIPTION OF THE FUNCTION ACTIVATED BY THE LEFT KEY	MENU DISPLAY VISIBLE IN	
			COUNT RATE (CPS, CPM)	ACTIVITY (BQ, DPS, DPM, BQ/CM²)
Show alarm		Display of alarms stored in alarm log.	✓	✓
Text info		Displays the text stored in the RadEye	✓	✓

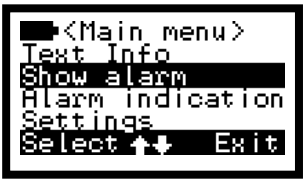
3.1.2 Main menu

The main menu offers the following displays:







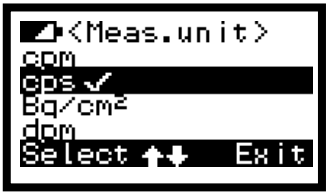


The above illustration depicts all menu options for the main menu possible for count rate mode. Some menu option may be different for activity mode.

3.1.3 Background

"Start Bgr.meas." starts the background measurement. "Set parameter" edit the preset time and count for background measurement. "Ratem.netto" enables the ratemeter mode with background subtraction. "Scaler netto" enables scaler mode with background subtraction.

3.1.4 Measuring unit

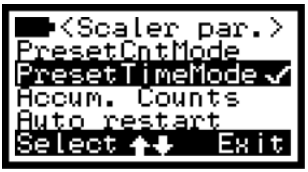


This submenu is used to select the measuring unit for Ratemeter and Scaler measurements.

3.1.5 Operation mode

This submenu is used to select between ratemeter with ADF, ratemeter with classic linear filter and scaler mode. The "✓" shows the active configuration.

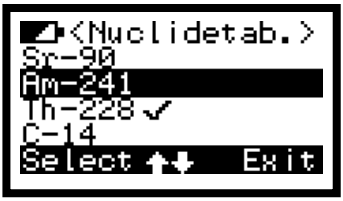
3.1.6 Scaler parameter



This submenu is used to set the parameters for Scaler measurements. Preset TimeMode is used to measure a defined time. Preset CntMode is used to measure a defined number of counts. With "Auto restart" the RadEye AB100 restarts automatically the

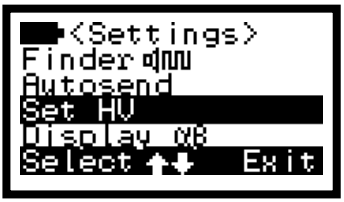
measurement. “Set Time/Count” edit the preset time and count. “Accum. Counts” shows all counts within the measurement time instead of mean value.

3.1.7 Nuclide table



The submenu Nuclide table is only available in activity mode (Bq, dps, dpm, Bq/cm²).

3.1.8 Settings



In this submenu it is possible to select between audible single pulse indication and finder mode. With “Autosend” the RadEye sends a data string periodically to the infrared port. “Batt.type” is used to set the correct threshold for warning message “LOW BATT” for accumulators (NiMH) and primary cells (Alkaline). With “Alpha Sound” and “Alpha LED” activated each alpha pulse generates an audible resp. optical indication. With “Set Date/Time” the user can set the date of the real time clock. “Display αβ” shows the count rate inclusive α rate. With “Display β”

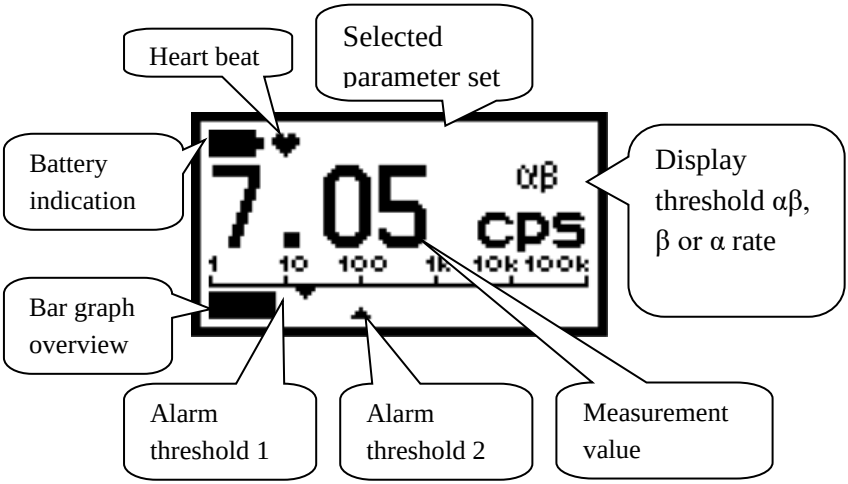
α rate is subtracted. “Set HV” result to another submenu where the high voltage can be set manually or via automated plateau measurement.
“Edit Tau” is used to edit the fixed time constant from 1..60s.
“Language” is used to change the menu language of the RadEye between English, German, French and Russian.
Set the display contrast with menu item “Contrast”.

3.1.9 Alarm indication

The submenu alarm indication is used to select the LED, sound and vibrator for alarming.

3.2 Ratemeter

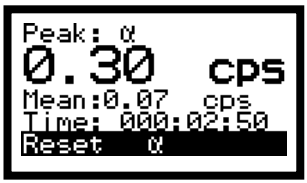
The standard display set by factory is indication of the actual count rate.



Pressing the Info – key shows upon the

- 1st click: Mean value and max value of αβ threshold are shown together with the time indicated since the last reset.
- 2nd click: the mean value and max value of α threshold together with the time indicated since the last re-set.
- 3rd click: standard display

After 10 seconds or after 3rd click standard display is activated again.

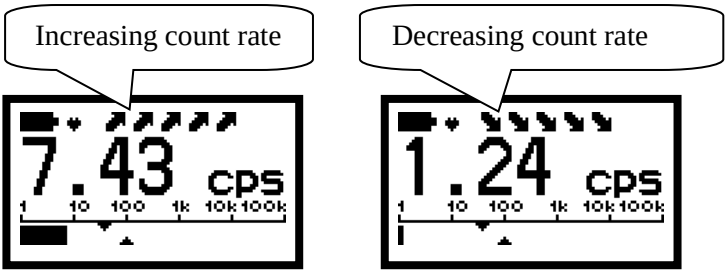


1st click 2nd click

The ratemeter can be set to the actual value by pressing the "Menu/◄" button for more than 2s.

3.2.1 Trend indication

A trend indication is given, if the measured count rate is increasing or decreasing.



For accurate measurements, only readings without trend indication should be used.
A trend indication is not given at count rates of less than 1 cps.

3.2.2 Ratemeter Tau

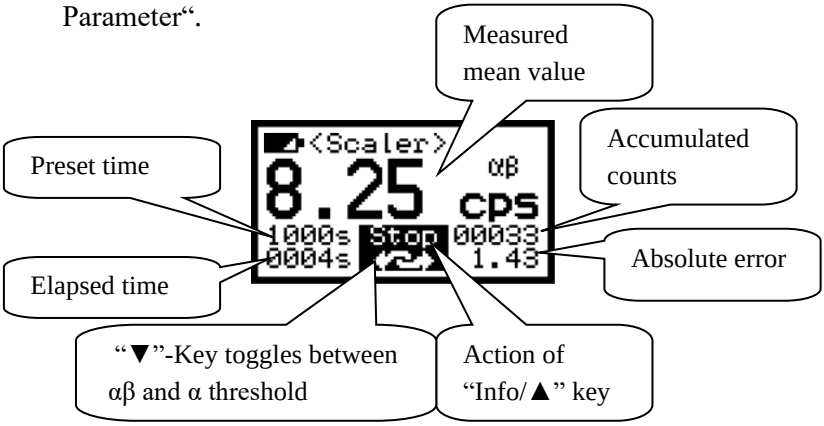
This operation mode uses a single time constant instead of the proprietary ADF for filtering the measurement value. The time constant (Tau) be edited with menu item "Edit Tau" in sub menu "Settings" (see 4.16).

3.3 Scaler mode

To enter the Scaler mode select in the submenu “Operation mode” the option “Scaler“.

3.3.1 Mean value

The Scaler mode starts with the parameter set in submenu „Scaler Parameter“.



To start the measurement, press the “Info/▲” key. While the measurement is in progress “Stop” is blinking.
Accumulated counts are limited to 99999 counts. “Accumulated counts” is not displayed with selected option “Scaler netto”. If accumulated counts are greater than 99999, “#####” is displayed.

The absolute error is calculated as follows:

$$F = \sqrt{\frac{R_M}{t_M} - \frac{R_0}{t_0}}$$

F: absolute error in cps

R_M: measuring value in cps

t_M: Measuring time in s

R_0: Background count rate *)

t_0: Background measuring time *)

*) Background count rate and background measuring time are only used in combination with “Scaler netto”

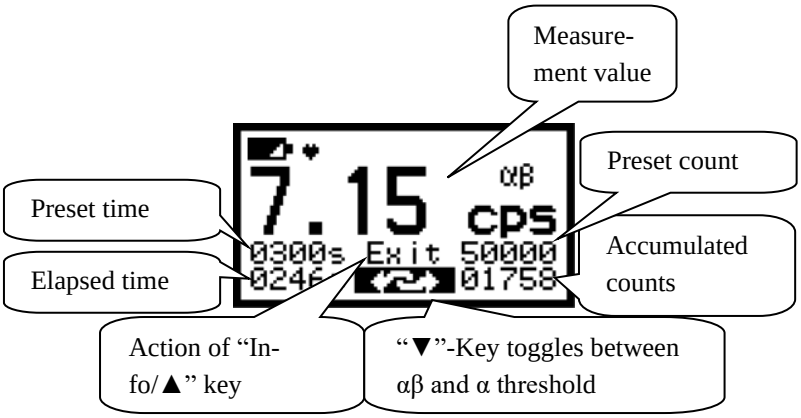
3.3.2 Accumulated counts

With accumulated counts selected via radeye.exe the RadEye AB100 shows the collected counts within the measurement time in place of the mean value. This option is only available in combination with measurement unit “cps” and “cpm”.

3.4 Background measurement

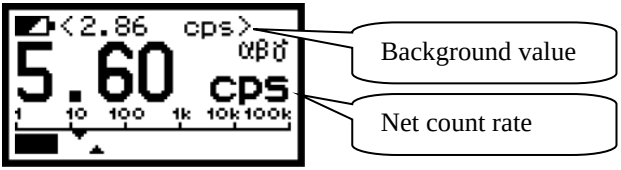
To enter background measurement select in submenu “Background” “Start Bgr.meas”.

The background measurement starts with the parameter set in submenu option „Set parameter“. To start the measurement, press the “Info/▲” key. While the measurement is in progress “Exit” is blinking.



The measurement is finished if either the elapsed time arrived the preset time or the accumulated counts reached preset count.

The user is asked whether to save this value („Yes“), or to discard this measurement (“No”) .
With menu option “Ratem. netto” or “Scaler netto” is selected this background value will be subtracted from the measurement.



3.5 Alarm thresholds

There are two alarm thresholds each allocated to count rate αβ threshold, count rate α threshold, activity αβ threshold and activity α threshold.

Configuration of the alarms is possible via infrared interface (chapter 7.3) or via the menu.
As to the alarm activation, please also read chapter 4.2.

3.6 Alarm threshold based on the relative standard deviation (sigma threshold)

The alarm thresholds refer to the basic display set. If the sigma value set ranges between 2 and 9, the first alarm threshold is calculated from the count rate of the background Ratemeter according to the following empirical equation:

$$As1 = Cnt + n * \frac{\sqrt{Cnt * T + Av}}{T}$$

where
- As1: Alarm threshold 1
- Cnt: Count rate of the background Ratemeter
- n: sigma value set between 2 and 9
- T: Measuring time (see table below) or fixed measuring time
- Av: Additional value (see table below)

Count rate	Measuring time	Additional value	ADF	Linear ratemeter
0…<8 cps	10 s	80	x	
8…<32 cps	5s	40	x	
>32 cps	1s	0	x	
All count rates	Preset time constant (1..60s)	0		x

Thus the actual alarm threshold adjusts itself automatically to the existing background radiation level. The actual setting of the alarm threshold 1 can be observed at the bar graph threshold mark. At power on of the instrument, the background Ratemeter starts with its preset maximum background value, reaching its final value after about 2 minutes.
Using the menu option **Alarm αβ**, the exact value of the alarm threshold currently valid at the respective background can be displayed.

On acknowledgment of an alarm, the background Ratemeter is set to the actual count rate display. Accordingly the alarm threshold is increased.
There will be no further alarms at background conditions and normal sensitivity will be established again automatically after about two minutes.

Alarm α und **Akt. α** are always fixed values without sigma alarm.

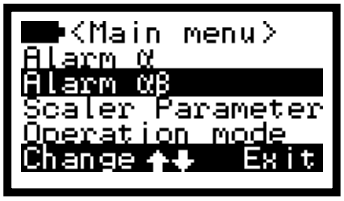
Recommended Sigma values:
Sigma = 6 enables radiation monitoring with floating reference background. Setting a minimum count rate for the Alarm 1 via the PC-configuration program is recommended to avoid false alarms once a very low background had been learned.

Setting alarm thresholds:
The menu options **Alarm αβ**, **Alarm α**, **Alarm Activity αβ** and **Alarm Activity α** allow the alarm thresholds to be modified. For this setting, the user has 255 seconds time. Changing the value is effected by pressing the left (Change) button if the corresponding "Alarm" is selected:
To increment the number, press the arrow keys ▲ ▼. To go on to the next digit or to quit the edit mode, menu use arrow keys◄►. Once the last number has been set, quit the editing mode by pressing the "Exit"-key. Then, the value set is saved and after 10s the unit returns to the basic display.

Example:

The counting rate alarm for αβ threshold must be changed.

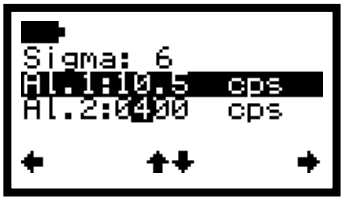
Press “Menu” key, and up/down arrow keys until
Alarm αβ is selected



Then enter change menu by pressing “Change” key.

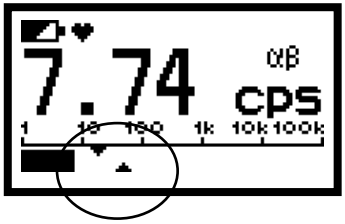
Edit value by pressing ▲ or ▼keys select digit by ◄ or ►keys

Sigma-Alarm:”--“: Al.1 can be set as a constant threshold



Sigma-Alarm 2…9. Al.1 is calculated from the actual background. Actual value is displayed.
Pre unit “k” may be chosen as well.

Leaving the last digit with the right arrow key:
Confirm storage of edited value pressing “yes”



The set points of the actual alarm thresholds can be seen as triangles on the intensity bar scale. The upper mark shows alarm threshold 1, the lower mark shows alarm threshold 2.

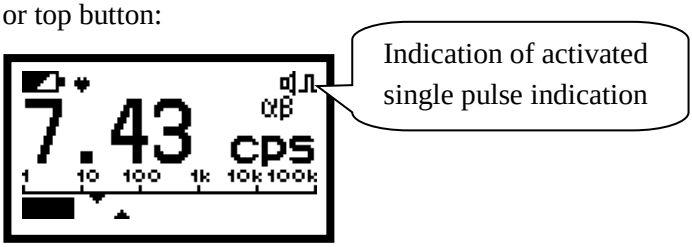
4. Operation

4.1 Audible single pulse indication (recommended)

With the single pulse indication being selected, each pulse of the detector generates a short audible signal emitted by the beeper.

An audible alarm signal caused by exceeding the alarm threshold is not given while single pulse indication or finder mode is active.

The single pulse indication must be enabled in the menu.
It is activated and deactivated by two times pressing the right (►) or top button:



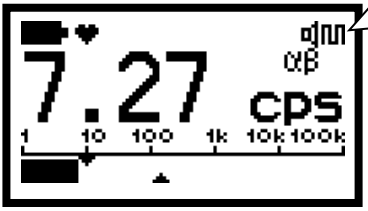
For high background count rates it is possible adjust this audible indication via the PC-software RadEye.exe. The “single pulse divisor” is set to 10, so that after every 10 detected radiation particles 1 audible pulse would be generated.

Finder mode:

In the Finder mode, the sound frequency depends on the pulse rate of the detector. The more detector pulses above the count rate that is present at the moment of the activation of the finder mode are captured by the detector, the higher the tone. Unlike the single pulse indication as described in section 4.1, this mode is controlled by the microprocessor and is thus slightly delayed upon rapid changes of the count rate.

The finder mode must be enabled in the menu.

It is activated and deactivated by two times pressing the right (►) or top button:



Indication of activated finder mode

4.2 Alarm indication

Each time the first alarm threshold is exceeded, the alarm devices beeper, LED and the vibrator become active, if they are enabled.

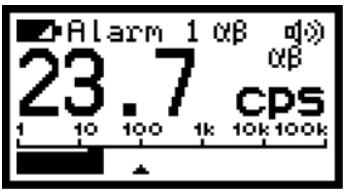
Alarm 1 αβ threshold:
LED slowly blinking, two frequency alarm tone and vibrator every second

Alarm 2 αβ threshold:
LED quick blinking, continuous alarm tone and vibrator every second

Alarm 1 α threshold:
LED constantly on, two frequency alarm tone and vibrator every two seconds

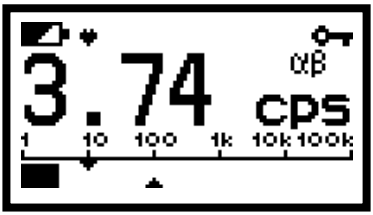
Alarm 2 α threshold:
LED constantly on, continuous alarm tone and vibrator every two seconds

The alarm tone and vibrator are acknowledged by a short key (►) depression, the LED remains activated. The alarm is extinguished, once the measured value falls below the first alarm threshold.



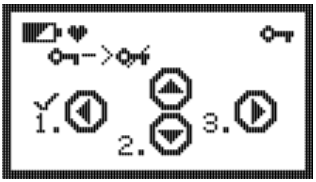
4.3 Key Lock

Pressing the "on/▼" key for at least 5 seconds, locks the key pad:



This increases battery time because of additional power consumption by illumination of the LCD or other unintended operations is avoided.

Unlocking is performed according to the LCD instructions upon pressing any key:

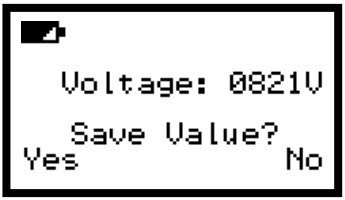


Press left key first, then lower key and then right key.

4.4 Setting high voltage

4.4.1 Manual setting

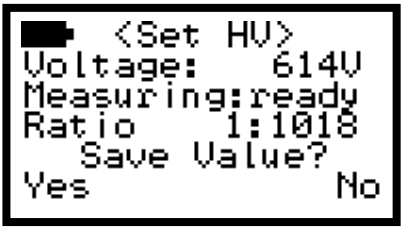
The high voltage can be set via sub menu “Settings” → “Set HV”. → “Manual” The voltage can be adjusted up to 1400V. After confirming the high voltage is stored to the actual parameter set in this RadEye AB100 related to the parameter set.



4.4.2 Automatic setting

Using a Sr-90 source the high voltage can be set automatically. Place a Sr-90 source to the RadEye AB100 and start the adjustment with “Settings” → “Set HV”. → “Automatic”.

Beginning from 500V the high voltage is set via crossover Rate 1 / Rate 3 (=Ratio). The HV is set when “Ratio” is between.1:950 and 1:1050.



If the RadEye has found its voltage, the user is asked to save this value.

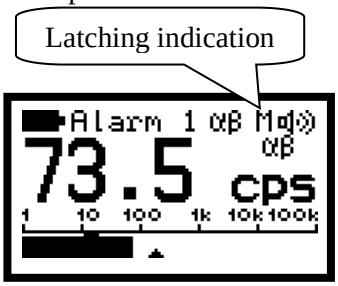
4.5 Earphone

For alarming in noisy environments or for undercover investigations an earphone is available. See ordering information page 2-1.

The earphone is connected at the bottom of the instrument after opening the rubber protection seal.

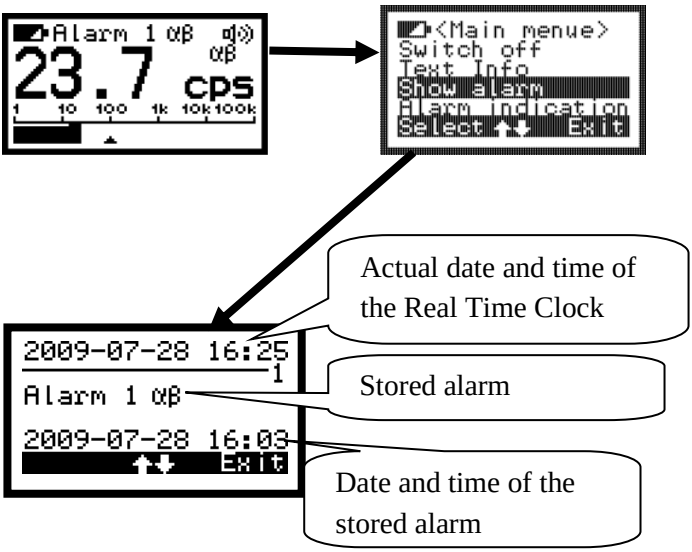
4.6 Alarm latching

Via PC-program it is possible to configure a alarm latching.
Alarm latching means the alarm is stored for the configured time from 0 s (= off) to 9999 s.
A latched alarm is indicated by an “M” near by the alarm indicator. When the alarm is acknowledged the RadEye returns to normal operations.



4.7 Show alarm

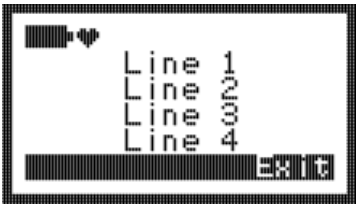
By selecting the menu point “show alarm” the alarms stored in the alarm log are displayed together with the time of alarm and the actual time.



By pressing “▲/▼“ keys you can scroll through the alarm log. By pressing the “►“ button the display returns to the menu.

4.8 Text Info

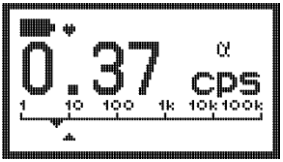
Via PC program “RadEye.exe” it is possible to place a text information in the RadEye. This text information can be displayed with the menu function “Text Info”.



4.9 Display modes

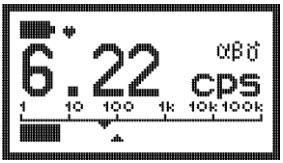
Pressing the "▼"/On – key in ratemeter ADF or Tau mode shows upon the

- 1st click: The measuring value of the α threshold together with a bar graph.



- 2nd click: Dual display of the measuring values of the αβ threshold and α threshold without a bar graph.

- 3rd click: The measuring value of the αβ threshold together with a bar graph.



- 4rd click: Graphical overview of rate 1

The selected display configuration is stored in the EEPROM.

4.10 Subtraction of α rate

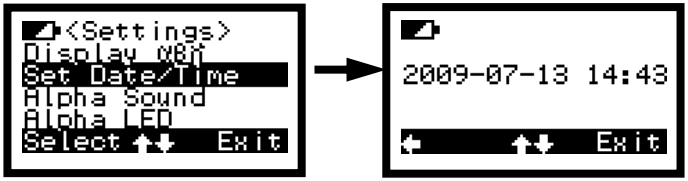
Via the PC-program “RadEye.exe” or menu function “Display β” it is possible to subtract α rate from αβ rate. In this case it is displayed a “β” instead of “αβ”.
To switch between β and αβ press the left (“Menu”) button.

Display of αβ rate

Display of β rate

4.11 Set Date and Time

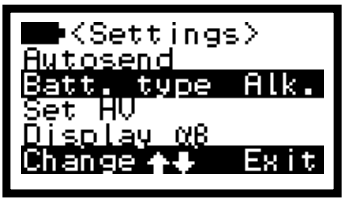
Setting of date and time takes place via menu function Setting → Set Date/Time.



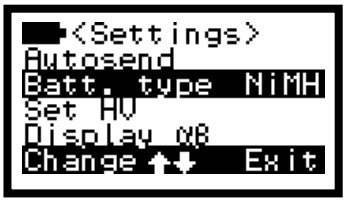
The setting uses the format YYYY-MM-DD hh:mm. The fields are selected with the keys right/left. With the keys up/down the Year, month, day, hour or minute can be changed. After setting the date and time the real time clock is set and is used for alarm logbook and history.

4.12 Battery type

Selection of battery type: Rechargeable or non-rechargeable batteries. It is needed for correct low battery warning. Type “Alk.” means battery type alkaline and has a threshold of 2.1V. Type “NiMH” means rechargeable NiMH-battery and has a threshold of 2.35V. See also chapter 0.



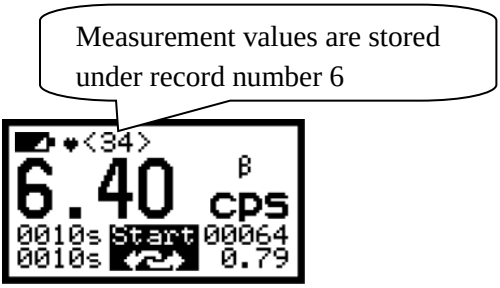
Battery type “Alkaline”



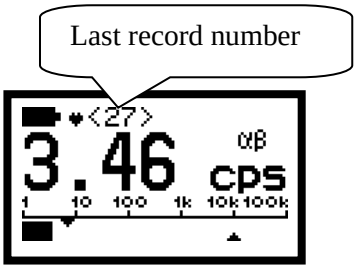
Battery type “NiMH”

4.13 Manual data logging

Measurement values in Scaler mode are stored in with history with a record number. The record number is shown in the display.



When setting the history time interval to 0s the actual counting rate with a record number is stored in the history by a long press on ▲/Info key. The last saved record is shown in the display.



4.14 Change menu language

Via menu item “Language” in submenu “Settings” the user may change the language of the RadEye menu.

4.15 Adjust display contrast

Here, the user can adjust the display contrast. This function is called in sub menu “Settings” “Contrast”

4.16 Edit tau

The parameter of the time constant can be accessed via the menu item “Edit tau” in sub menu “Settings”. This value is used as filter time constant in operation mode “Ratemeter Tau”.

4.17 Adjusting the display unit

The display unit can be set in 3 positions:

In order to change the position the locking has to be released. Press the knob on the left side and keep it pressed. The display unit moves slightly to the right

Now the display unit can be moved to the desired position. After releasing the knob, the display unit moves back to the left into the new locked position.

5. Measurement units

5.1 General Count Rate Measurements (cps; cpm)

These are the most general measurement units (cps = counts per second; cpm = counts per minute). The displayed value is independent of any specific calibration factor which may not be available for a contamination with unknown nuclides. Either gross count measurements or net count measurements can be performed. The selection can be performed by the PC-settings or in the menu <Background> by tagging <Ratem. netto> and/or <Scaler netto>. The background count rate for these netto measurements can be determined via a background measurement in the menu <Background>. The derived background count rate can be stored and is used for all following net measurements. This value is always displayed in the top section of the LCD in order to remind the user that the measured value has been corrected by that particular count rate value.

5.2 Surface Contamination (Bq; dps; dpm; Bq/cm^2)

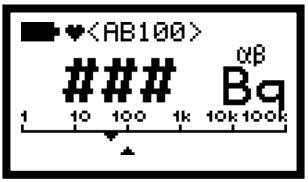
Up to 16 nuclides for each counter tube together with their related calibration factors can be stored in the RadEye AB100. The name of isotopes, the number of available nuclides as well as their 4 Pi efficiency can be edited in the PC-software.

The user of the RadEye AB100 can select the required isotope in the menu <Nuclide>. This selected nuclide (e.g. Co-60) is displayed in the LCD (eventually alternating to the subtracted background activity in case of a net measurement).

If a no nuclide is configured, the RadEye AB100 shows "###".

If a nuclide is configured only with α- or β-value, the measurement without value creates also the RadEye AB100 display "###".

For example: β efficiency for Sr-90 is set to 45% and α efficiency is set to 0%. The display for α contamination is "### Bq".



6. Functional test

When the instrument is switched on, it will show zero count rate or activity until the first detector pulse occurs.
The radiation meter performs continuous self-check routines. A timeout for the detector can be configured via the PC-software. A complete failure of the detector during operation will be indicated after the timeout on the LCD and be announced by the beeper. The same applies to the battery voltage.

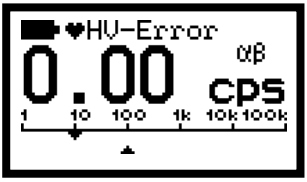
6.1 Functional test

To carry out a simple test, shortly press any key. A short audible pulse has to be released and the LC display is illuminated for some seconds.

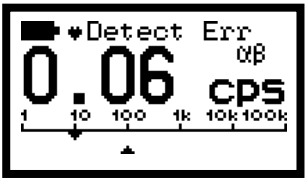
The heart symbol next to the battery indicator must be “beating”. This indicates that the cyclic tasks as calculating measurement values and checking for alarm thresholds are active.

6.2 Failure indication

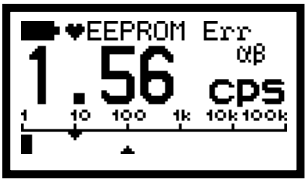
In case of a failure the beeper generates a melody every 32 s. The corresponding failure message is displayed in the LCD:



Error high voltage generation



No detector pulse within configured time

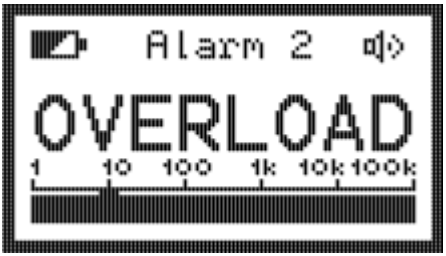


EEPROM with calibration data shows EEPROM Read or EEPROM Write error.

A Watchdog Error indicates that the microcontroller has problems to work on its tasks in a given timeframe. Reasons are strong electromagnetic pulses, firmware errors or hardware issues.

6.3 Overload indication

If the count rate exceeds the maximum level previously defined via radeye.exe an overload is given



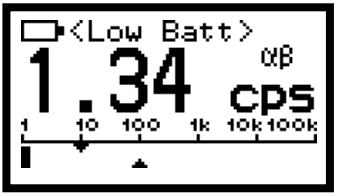
6.4 Response test with test adapter

The test-adapter 42506/8371 offers a convenient way to verify the radiation response performance of the RadEye AB100. This "check source" contains 80 g of natural Lu2O3 (which corresponds to approximately 4000 Bq Lu-176). Due to self-absorption in the Lu2O3 ceramics bulk material, the beta surface emission rate is only approximately 80 1/s, which results in a net count rate of the RadEye AB100 of 45 cps. The operational advantage of the test-adapter is given by the fact that each and every individual adapter has the same emission rate, and that due to the long life time (3.6E10 years), which exceeds the age of the universe significantly, neither source specimen, nor half life corrections need to be performed. Furthermore the specific radioactivity (approximately 48 Bq/g) of natural Lu2O3 is well below the threshold

values according to IATA, respectively NRC (USA) or StrSchV(Germany) in respect to the scope of dangerous goods definition and transport regulations of radioactive material.

6.5 Low Battery warning

If the battery voltage is below the configured threshold (see chapter 4.12) the following warning appears:



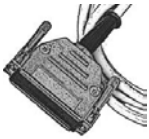
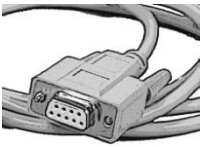
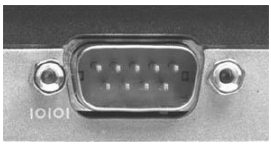
The beeper generates a melody every 32s. This acoustic warning can be suppressed by pressing the alarm acknowledge key. After 8h this warning comes up again. The battery needs to be changed. However, the RadEye can still be operated for several hours.
If the battery voltage falls below 2V, the battery symbol starts flashing. An acoustic warning is generated every 8s and can't be acknowledged. The battery needs to be changed as soon as possible. Dead batteries may leak. Remove them from the RadEye to prevent corrosion.
Battery life is significantly decreased at low temperatures. Cells which give a mid-scale voltage reading in a warm building may fail rapidly if the instrument is then operated outdoors in winter.

7. Connection to a PC

7.1 Connection to a PC

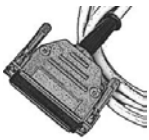
A RadEye unit can be connected to a PC either by either serial interface or USB interface

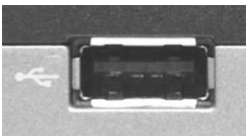
The optional serial adapter cable is used to connect to a RS232 port of a PC.

This serial port is selected directly in the RadEye.EXE software.

Alternatively, the optional USB connection cable is used to connect to an USB port.





Using the USB connection requires the installation of driver software that will generate a virtual serial port that can be selected in the RadEye.EXE software. The driver is delivered on the RadEye.EXE software installation CD ROM.

Installation of a connection cable

Using the hardware provided and without exerting too much force attach the connections of the adapter cable to the PC and to the RadEye AB100.

7.2 Starting RadEye.exe

Once the RadEye.EXE program has been started, device parameters are displayed on the screen.

7.2.1 RadEye AB100 Device Parameters

The Frame "RadEye AB100" contains the unit's serial number and version number of the software. Click on the Read button, the Parameters of RadEye AB100 will be read out from device and shown in the Frame.

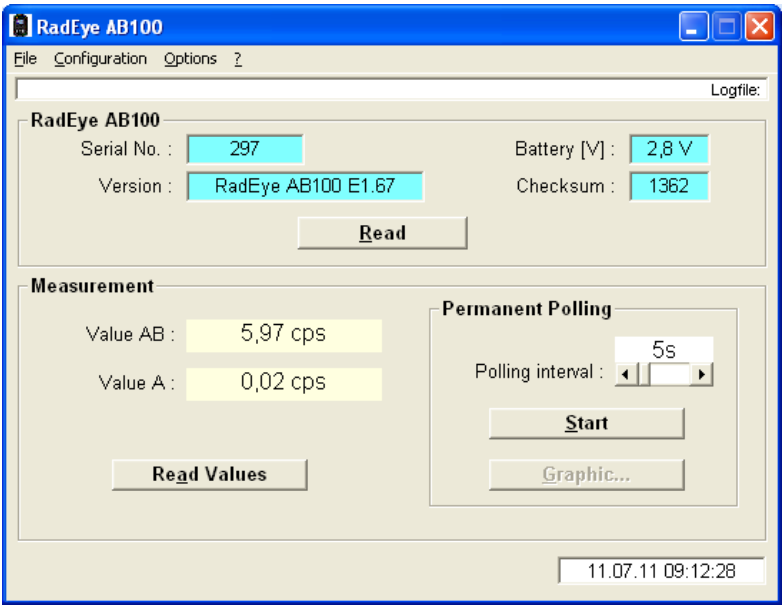


Figure 7-1: Main Window

7.2.2 Measurements

After pressing the button Read Values the current Count rate and the current displayed measurement value is displayed in this frame.

With button Start the measured value is read from the unit at a certain polling interval. Use the scroll bar to define the polling interval. You can select a value between 1 and 3600 seconds.

The measured value can be displayed numerically and graphically. Click on Graphic…. A diagram is displayed that gives a representation of the measurement values versus the time.

The current measured value is added at the right-hand side, and the diagram is shifted to the left. Up to 100 measured values can

be represented. The graduation of the ordinate is automatically adjusted to the measured values supplied by the unit.

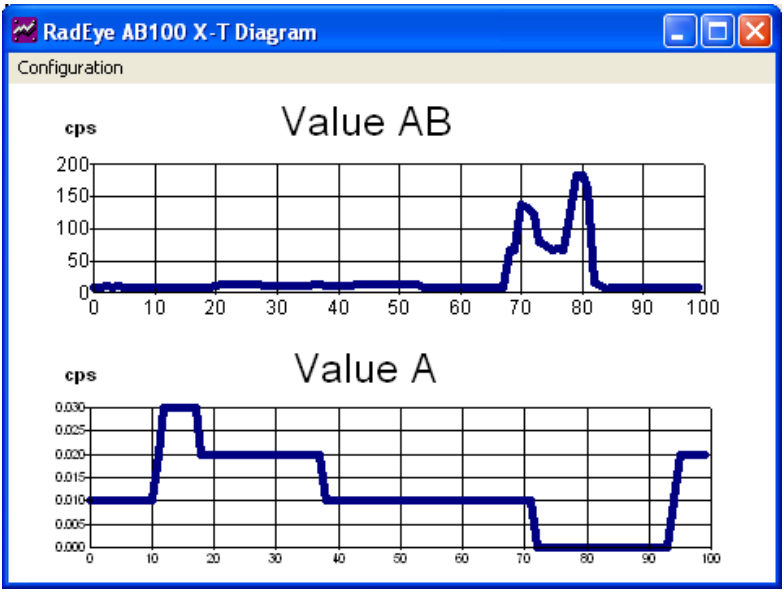


Figure 7-2: Measurement graphics

7.2.3 Creating a Measurement File

The actual measured values can be stored in a measurement file.

To do this, open the File menu, click on **Open Logfile...**, and enter path and name. The file is stored with the file name extension ".log".

If another file of the same name exists, the system asks whether that file shall be overwritten or the new measured data shall be appended to the existing data.

Once you have pressed OK to confirm the entries, the measurement logfile is created and the polling measured data is stored in the scan interval you have defined. An open measurement file is indicated by the name and the path of the measurement logfile that appears in the top right-hand corner of the window.

To terminate data storage, open the File menu and select the **Close Logfile** menu item. No further data is recorded.

Open the **File / View Logfile...** menu to view the measurement logfile.

For training and demonstration a prior recorded logfile can be replayed by opening **Replay logfile**.

With the buttons Start and Stop together with the polling interval the replay can be controlled.

Close Replay switches back to accessing measurement values via infrared interface.

The measurement logfile is an ANSI text file with columns that are separated by <TAB>. This enables this file to be read easily into other programs (such as Excel) where the data can be processed.

The first line of the measurement logfile contains the unit name, the file name, and the path. Serial number and Device identification are specified on the second line.

Date and time of the measurement are specified in the columns under the field names "mm.dd.yy" and "hh:mm:ss". The time setting corresponds to the PC system time.

The "Counter" column contains the numerical value of the counter measurement. The "Unit" column informs about the unit.

7.2.4 Select serial interface

Via **Configuration / Com settings**... menu another window is opened from which you may select the corresponding interface. An error message is displayed if the interface is not available. “Read RadEye” is used to check if the right Com port is selected. With “Search RadEye” the program checks every available Com port for a RadEye. Please do not use the option “Connected via Bluetooth”.

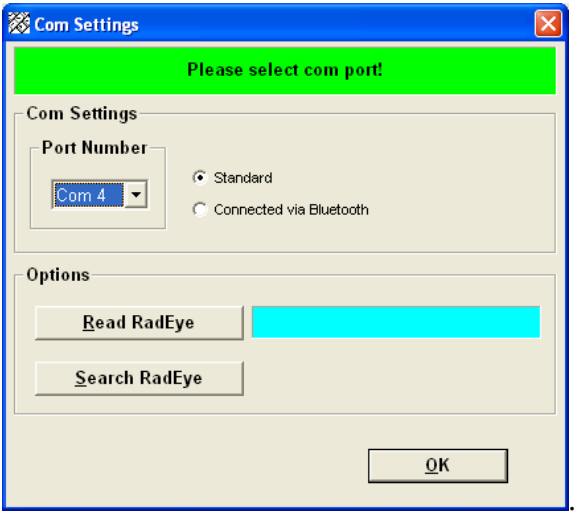


Figure 7-3: Select serial interface

7.3 Configuration

On the **Configuration** / **RadEye AB100…** menu, the following parameters can be modified:

7.3.1 Password protection

The configuration of the RadEye can be protected with a password.

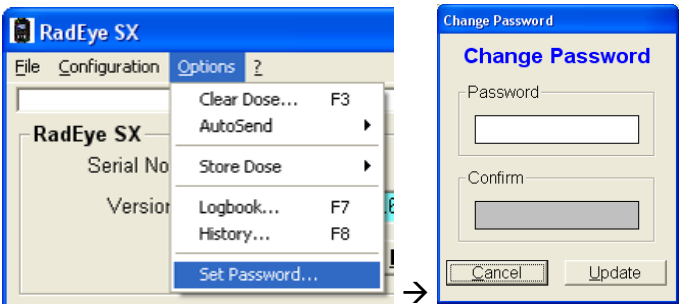


Figure 7-4: Password Setting

No password is set during the first installation of the software. A reminder window is activated, if the configuration window is opened.

Figure 7-5: Password reminder

7.3.2 General configuration

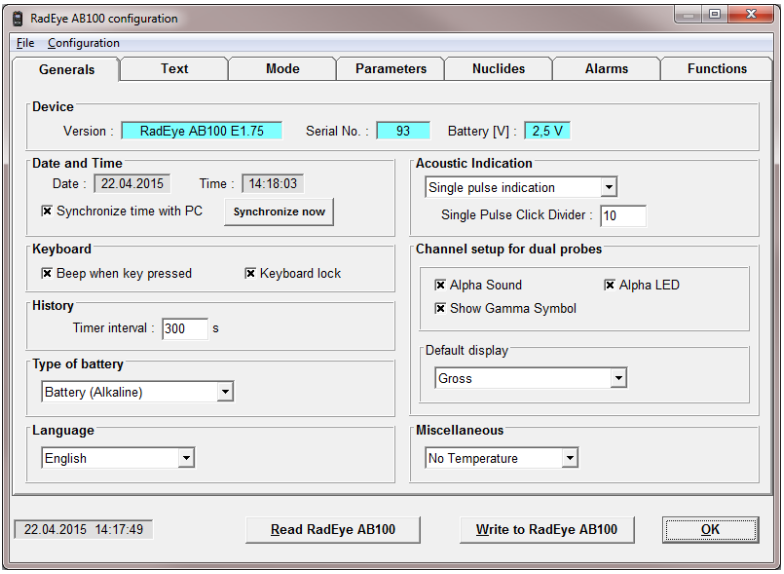


Figure 7-6: General configuration

On the tab „Generals“, the user may set the time interval for the history memory (1...43200s), the kind of the acoustic rate indication (single pulse, finder 4.1), type of battery, menu language and temperature display.

7.3.3 User defined text

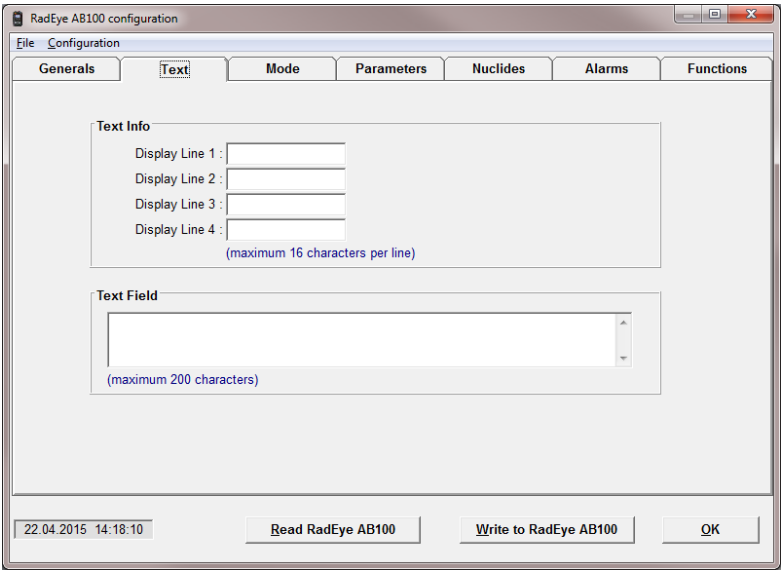


Figure 7-7: User defined text

On the tab “Text” it is possible to store a text in the RadEye. In the field “Text Info” the user can define 4 lines text, which can be displayed on the LCD by the RadEye (see 4.11).
In the field “Text Field” it is possible to store a text with up to 200 characters in the RadEye. This text can not be displayed by the RadEye.

7.3.4 Mode setting

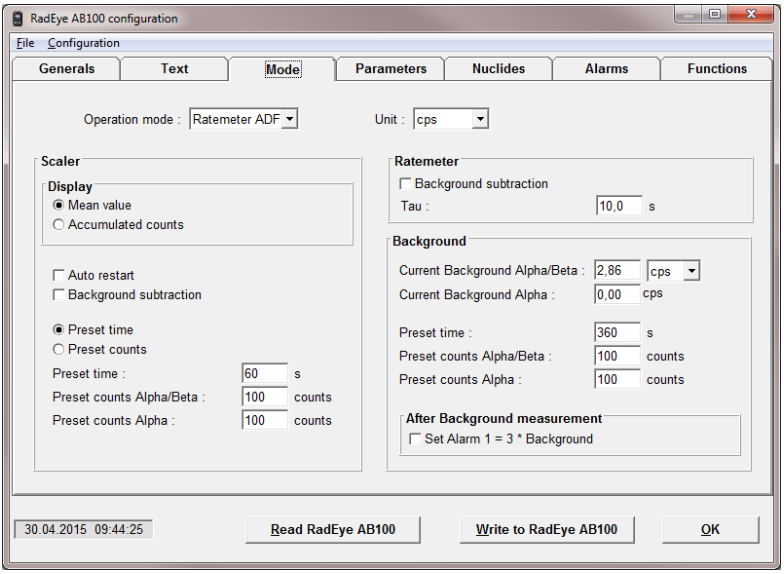


Figure 7-8: Mode setting

On the tab „Mode“, the user may set the operation mode, the physical unit, parameters for background measurement and parameters for scaler mode.

7.3.5 Parameter configuration

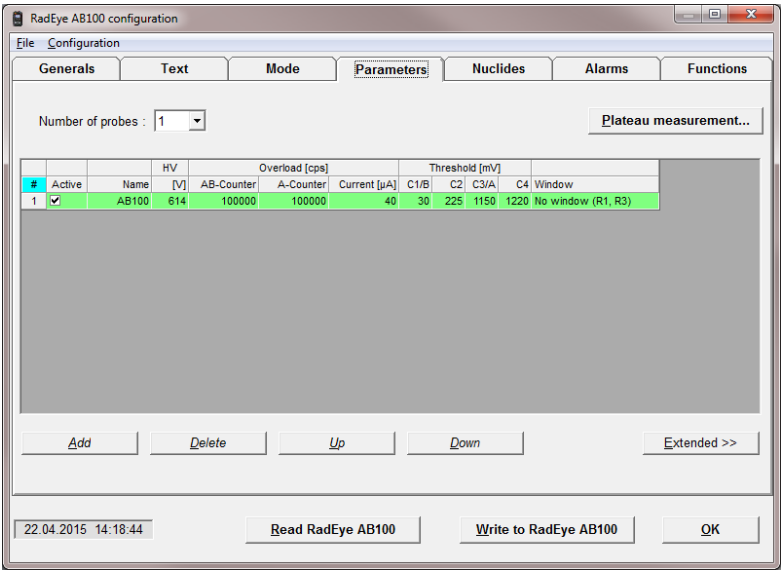


Figure 7-9: Parameter information

Active: Here, the active parameter set can be selected.
HV: High voltage for this probe.
Name: this column is used to set a name for the parameter. This name is displayed after start up the RadEye and in submenu "Select counter tube".
Overload: The columns "overload" is used for overload detection. Overload is detected if either Counter 1 has reached Overload AB Counter or Counter3 has reached Overload A or probe current has reached overload current.
Threshold: In these fields the desired thresholds in mV for each Counter can be set. These thresholds are limited between 30mV and 1220mV.

Window: Here, the right windows configuration can be set.

- no window configuration (Rate 1, Rate 3)
- Beta window (Rate 1 – Rate 2), Rate 3

With “Plateau measurement” the user is able to perform a plateau measurement (see chapter 8)

Clicking on “Extended” the user may configure some more options:

Dead time: In these fields a dead time correction factor for each counter can be edited.

The dead time corrected count rate is calculated as follows:

$$CR = \frac{CRraw}{1 - CRraw * DT}$$

CR: Count rate with dead time correction
CRraw: Raw count rate without dead time correction
DT: dead time in seconds
The denominator “1- CRraw*DT” is limited between 0.1 and 1.

7.3.6 Nuclide data

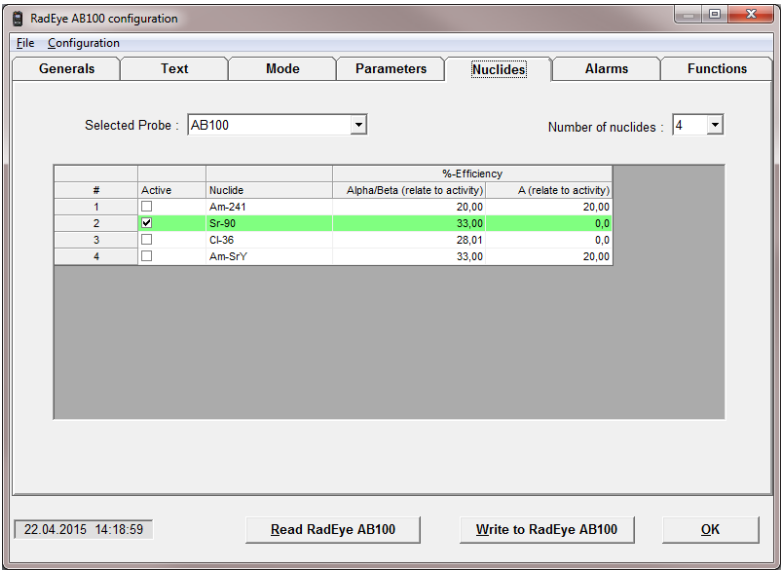


Figure 7-10: Nuclide information

On the tab „Nuclide“, the user may edit a separate nuclide table for every parameter set. Please note that in order to get meaningful alpha and beta activity related measurement data, a combined alpha/beta nuclide needs to be defined and named (e.g. Am/Cs for Am-241 (alpha) and Cs-137 (beta)

The Activity is calculated as follow:

$$Act = CR * Eff$$

Act: Activity in Bq
CR: Count rate beta or alpha channel
Eff: Efficiency for beta or alpha channel

The surface activity is calculated as follow

$$SurAct = \frac{Act}{100cm^2}$$

SurAct: Surface activity in Bq/cm²

Act: Activity in Bq

7.3.7 Alarm settings

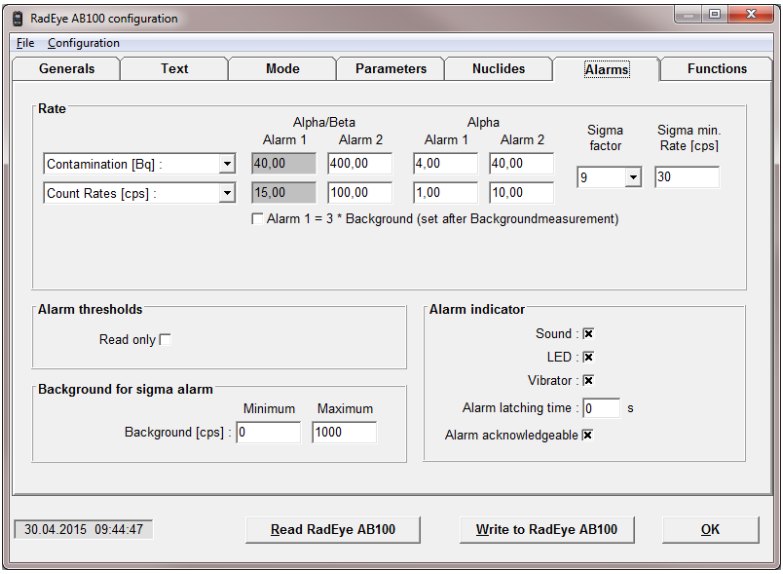


Figure 7-11: Alarm setting

The tab “Alarm” offers the user the possibility of making the alarm settings for the single basic displays. Furthermore, the options on this tab allow beeper and additional alarm monitoring processes to be configured.

7.3.8 Menu configuration

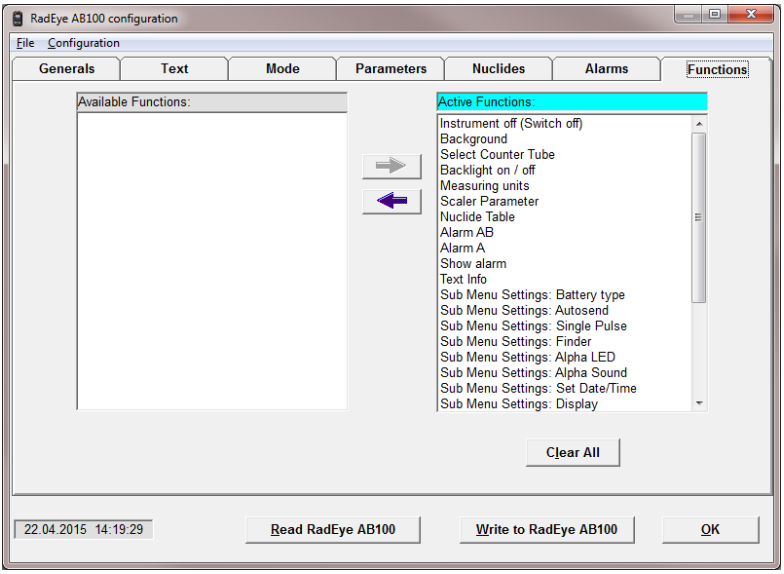


Figure 7-12: Menu selection

On the “Functions” tab, the functions available to the user can be selected to speed up access to frequently needed functions. For example, if LED alarm is always active and rate level indication is never used, these functions can be hidden for the user.
Once the setting of the parameters is finished, these parameters have to be sent to the RadEye AB100 by clicking on the Write to RadEye AB100 button.
Parameters including the selected menu configuration can be saved with **File / Save as…** as parameter file (*.cfg). A saved configuration can be reloaded using the menu **File / Open…** and sent to RadEye AB100.

7.4 History

Via the **Options** / **History** menu, the values stored in the RadEye AB100 data memory can be read out, represented in a x/t diagram and saved to the hard disk of the computer. These data subsequently can be read in and further processed in a spreadsheet program.

Time interval of History storing can be set from 1s to 43200 s (12 hours). 1600 measurement values can be stored.

If batteries are removed, the time reference is lost. In the diagram time information is only provided for history values with valid timing entries.

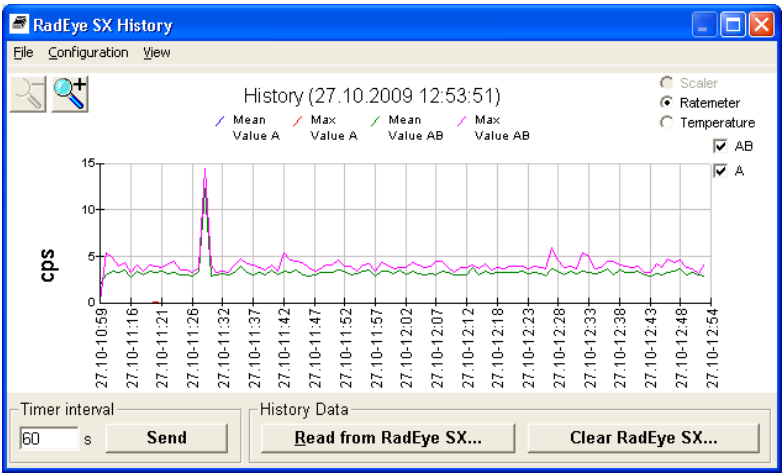


Figure 7-13: History read out

Clicking at the graph, each individual, stored measured value can be displayed:

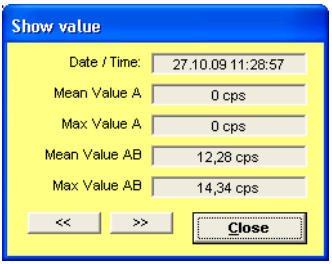


Figure 7-14: Single history value indication

7.5 Logbook

Changes in configuration, occurring alarms and errors are logged in a buffer.
These saved events can be read out via **Options / Logbook…** .
The logbook is shown as a table, and can be saved to PC hard disc or printed.
The logbook has a maximum of 250 data sets. Several events at the same time are saved as one record. At the display every event is shown in one line for better overview. The date and time of the PC is used for time relation.

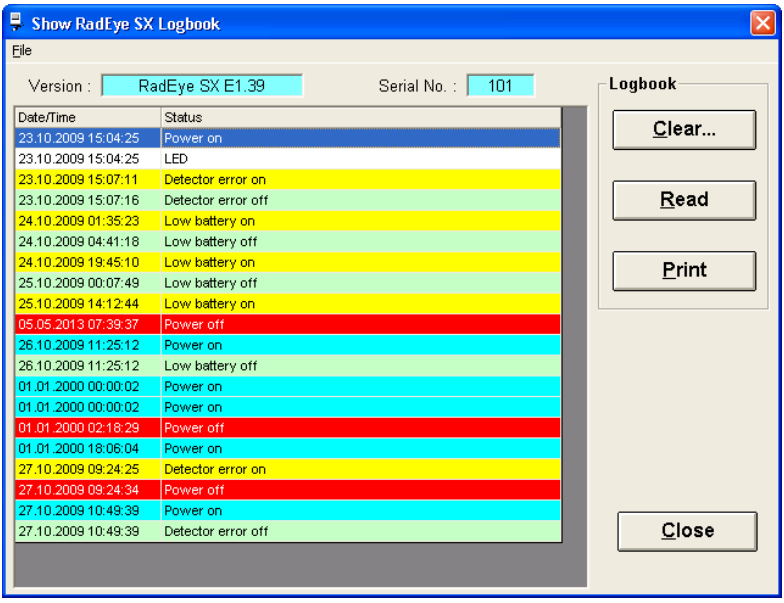


Figure 7-15: Logbook

8. Plateau measurements

Selecting on tab “probe” the “Plateau measurement” button opens the “Plateau measurement” test Program.

After starting the plateau Program the following window is shown on the screen:

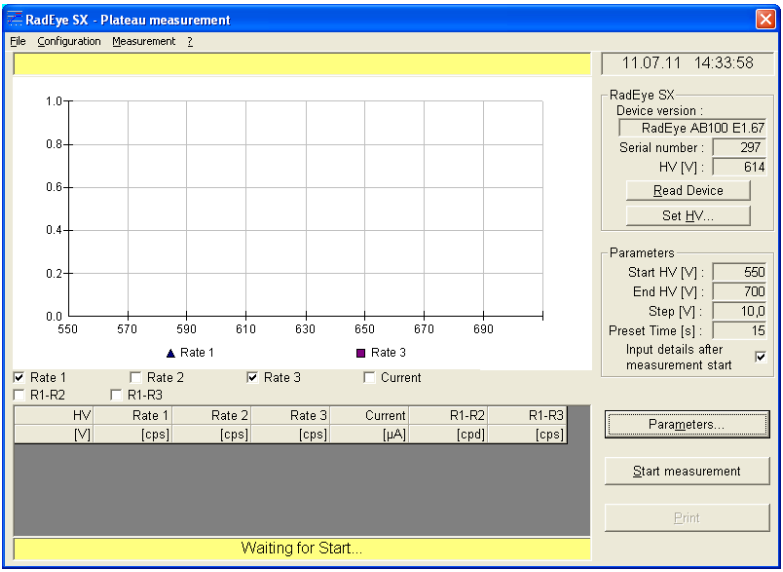


Figure 8-1: Start screen plateau measurement

The display area incorporates the title of the plateau measured

(located above the plateau chart), the plateau's graphic chart, the list of plateau data including the selected measured values (Rate 1, Rate 2, etc.) and the status display beneath the list.

The version, serial number and high voltage of the RadEye AB100 are shown in the Device frame

The "Parameters" frame shows the actual parameters for the plateau measurement. Each time a plateau is loaded, the respective parameters saved are shown on the screen.

By pressing the "Parameter" button the parameter window is opened

Pressing "Start plateau measurement" will start a new measurement

To print the plateau measurement indicated using your current Windows printer press the "Print" button. This button only becomes active when the plateau measurement has been completely terminated or after loading a saved plateau measurement

By double-clicking on the graphic chart, the latter can be enlarged.

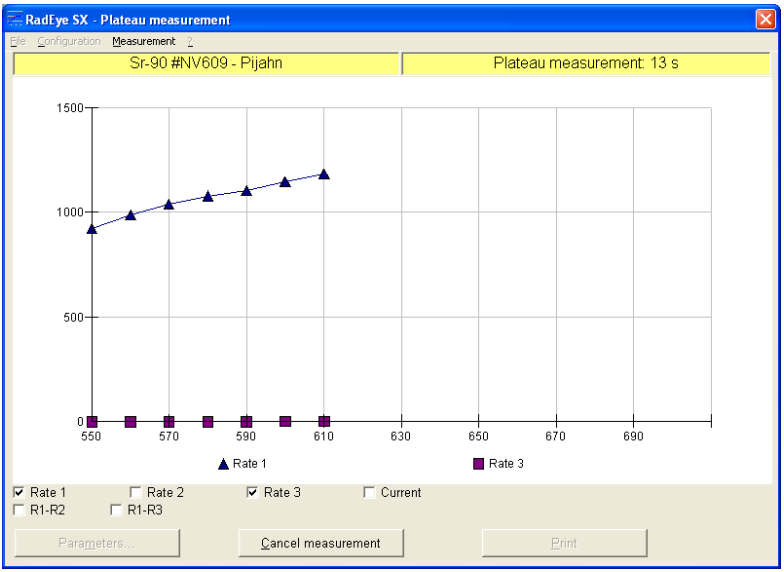


Figure 8-2 Plateau measurement

To return to the normal display mode, double-click on the graphic chart once more.

8.1.1 The “Status” display

The “Status” display shows the current state of a plateau measurement.

The following messages may be displayed:

- “Waiting for measurement start” (Plateau measurement is ready to be started!)
- “Plateau not started!” (The plateau measurement has failed to start!)

- “Plateau measurement: 10 s” (The current plateau measurement is running, and 10 seconds remains, i.e. the remaining measuring time is displayed).
- “Plateau measurement complete!” (The plateau measurement is ready for evaluation and printout; a new plateau measurement can be started).
- “Reset HV 10 s” (The plateau measurement has been terminated/cancelled and the high voltage is re-set to the operating voltage. The remaining waiting time is displayed.

8.1.2 Plateau measurement parameters

The voltage values for the start and the end of the plateau measurement are entered into the corresponding text boxes marked “Start HV [V]” and “End HV [V]”.

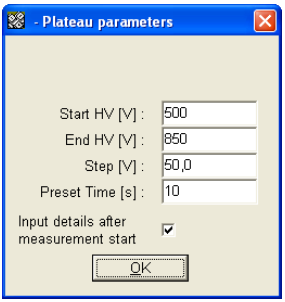


Figure 8-3 Plateau parameter

The text box “Step” defines the step size, i.e. the amount of volts by which the voltage is increased after each individual measurement. The measuring time for an individual measurement must be entered into the “Preset time [s]” text box.

The approximate total time for a plateau measurement can be calculated using the following formula:
((EndHV - StartHV) / Step + 1) * (Measuring time + 2 s) + 6 s

The maximum total permitted high voltage is 1,400 V, the maximum total number of steps is limited to 99. In the event that a high voltage is entered which exceeds the maximum permitted value, the following warning appears on the screen when you exit the window:
Invalid HV! HV > HV max. The Program then automatically returns to the entry mode for the plateau measurement parameters.

If the number of steps exceeds the maximum permitted number a corresponding warning will also be issued.

The “Input details after measurement start” text box provides an additional possibility for identifying the plateau.

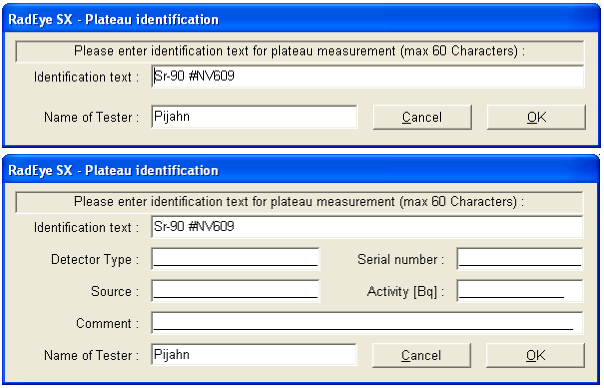


Figure 8-4 with and without “Enter details after measurement start”

By pressing the [OK] button the user is prompted to either confirm or negate the question “Accept parameter?” By pressing the [No] button you will quit the plateau measurement parameters entry mode and any modifications made will be cancelled. To adopt the new plateau measurement parameters, press [Yes] and the plateau parameter entry mode is quit automatically.

8.1.3 Starting a plateau measurement

Once the user has pressed the “Start measurement” button, the Program checks whether a stored plateau has been loaded and the displayed plateau parameters are up-to-date. In the event that the displayed parameters are no longer the current ones, the current plateau parameters will be displayed and the user is prompted to start the measurement process. Then an “identification text” needs to be entered. This identification text is shown in the title box and is saved together with the plateau. It serves to later identify the plateau measurement.

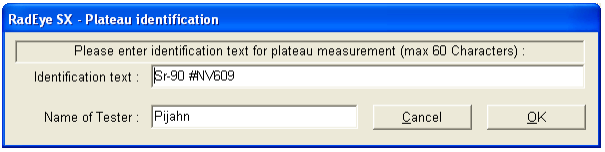


Figure 8-5 Plateau identification text

After completing the entry of the identification text, the value of the high voltage is first set to its start value and a there is a 6 second wait during the stabilization period. Then the first individual measurement is started.

When the measurement is complete the values of the counter tubes are read and shown graphically in the form of a chart and also as a table. Subsequently the high voltage is increased by the step size entered. After a stabilization time of 2 s has elapsed the next measurement will start. This procedure is repeated until the end voltage entered has been reached.
While the plateau measurement is being carried out all of the buttons and menu functions are locked except for the stop button.

8.1.4 Printing the plateau

The “Print” button only becomes active after loading or measuring a plateau. Once the button has been pressed, the plateau is printed using the Windows printer that is currently installed.

8.1.5 Saving a measured plateau

A measured plateau is automatically saved after the last measurement has been completed. Both the measured values and the parameters are saved to a monthly file. The name of the file is RadEyeAB100_yymm.plt, where mm stands for the month, and yy for the year (Example: The monthly file of January 2010 is named RadEyeAB100 _1001.plt).

8.1.6 Displaying saved plateau data

Use the “File” “Open” menu point to open a dialog window where any desired monthly file “RadEyeAB100_*.plt” can be selected and reviewed.

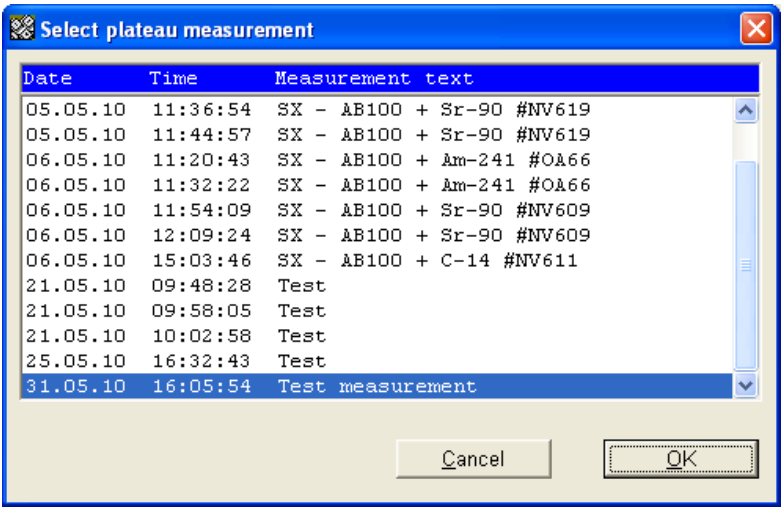


Figure 8-6 Selecting a saved plateau

8.1.7 Setting the high voltage (HV)

Click on “Set HV” opens the corresponding window.

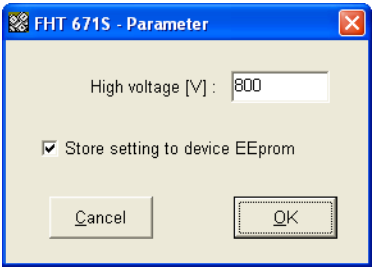


Figure 8-7 Setting HV

This window allows the value that was entered for the high voltage to be applied to the selected amplifier. Pressing the [OK] button sends this value to the amplifier.

If you want to use this high voltage value as standard, activate the “Store setting to device EEprom” check box. This allows the high voltage value set to remain even when the device is switched on and off.

8.1.8 The “Y axis” frame

Activating the “Automatic” option box causes the Y axis to be adjusted automatically as a function of the measured values. If another type of plateau display is required, you need to click on the “User defined” option box. Once the “User defined” option box has been activated, the text entry box in this frame becomes active, allowing a manual entry to be made by the user. Here, the desired maximum value for the Y axis has to be entered.

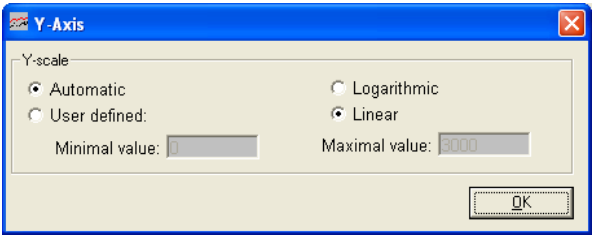
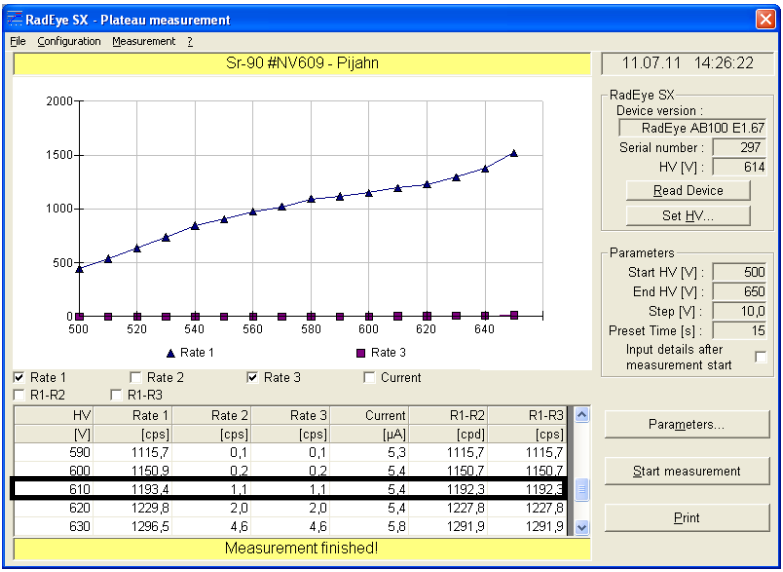


Figure 8-8 Setting the scale

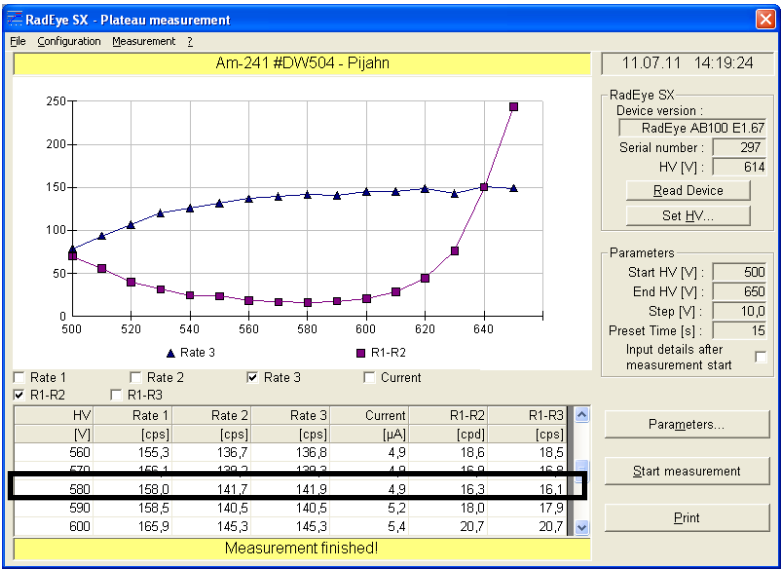
8.1.9 Plateau examples

8.1.9.1 Beta plateau



The high voltage is set via crossover Rate 1 / Rate 3. The HV is set when Rate 3 is less than 0.1% of Rate 1.

8.1.9.2 Alpha Plateau



The high voltage is set, when the window R1- R3 is at its minimum.

9. Trouble Shooting

9.1 RadEye AB100 doesn't power on

9.1.1 Press "On" for at least one second

Keep the button "▼" pressed until the LED and the sound is active. If the button is pressed only shortly, then the start up routine is not activated. The LED may flash then only very shortly.

9.1.2 Check battery

If the RadEye does not respond to a long press (> 1s) of the "▼" button, then please use the following step by step procedure:
A) Remove the current batteries
B) Check the battery contacts
C) Check the required orientation of the batteries according to the printed "+" symbols in the battery compartment.
D) Insert two -"C" batteries with sufficient capacity: Rechargeable batteries should be completely loaded, non rechargeable batteries should supply together at least 2.3 Volt under load.
E) Press the "▼" button for more than one second (see also 2.3)

9.2 Reading data from the start up screen

The start up screen shows important data like the last calibration, the current voltage and the firmware version.

This screen stays active as long as the "▼" button is kept pressed during the power on of the RadEye device.

9.3 The RadEye doesn't show the menu items as described in the manual

The items available in the RadEye menu can be disabled or enabled via the RadEye.EXE software. The factory setting has all menu functions enabled. Please refer to chapter 7.3.8, menu settings. Next, please check the firmware version of your RadEye SX and compare your version number with the revision table chapter 12.2. The revision table shows the introduction of new functions together with the according firmware version.

9.4 The RadEye shows an error message in the display's top line

Please refer also to chapter 6.2. If one of the following failures is indicated, then the RadEye must be repaired by the Thermo Scientific bench repair team:

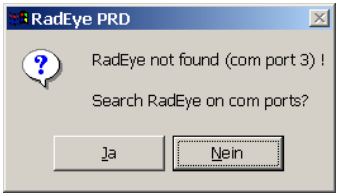
```
HV-Error
Detect Err
EEPROM Err
Watchdog*
```

Please contact our Customer Service for more details.

*) Please see the failure description in the above referenced chapter. If the failure was related to a strong electromagnetic pulse scenario and the failure went away afterwards, then a repair may not be necessary. A diligent observation of the RadEye proper operation after the failure is strongly recommended.

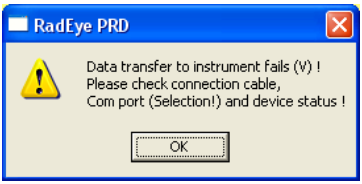
9.5 The RadEye is not found in the software

If the connection between the RadEye and the computer can't be established with a selected serial port (COM port), then the program shows the bellow message first:



The RadEye.EXE software offers to search for a connection to the RadEye unit on other available serial ports.

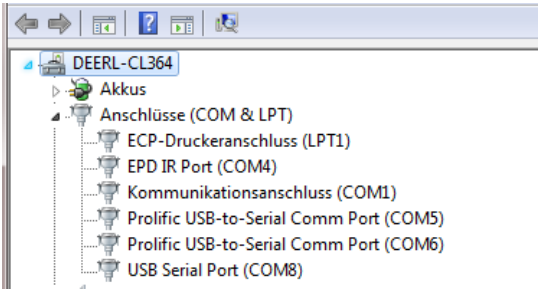
If there is a faulty connection between the unit and the computer, the program shows the error message “Data transfer to instrument fails”



In this case, you must check whether:

- The RadEye has been positioned correctly in the desktop holder (with rubber boot) and the RadEye is turned on.
- The infrared transmission windows are clean
- The correct serial interface has been selected.

It is recommended to use the Windows system tools to determine the occupation of the currently active serial ports. Virtual serial ports are labeled accordingly for identification.



Device Manager showing the virtual driver for „Prolific USB-to-Serial Comm Port“ at COM 5 and COM 6 and “USB Serial Port” at COM 8

Open next the serial interface step window in the RadEye.EXE software: **Configuration / Com settings...** menu. The used serial port has to be selected next.

9.6 RadEye lost date and time settings

The date and time information is lost, each time the batteries are removed or below the required voltage for operation. The simplest way to program the date and time is to use the "synchronize" function of the optional RadEye.EXE software. Please refer to chapter 7.3.2. Else the current date and time can be set also through the RadEye's menu "Settings" / "Set Date / Time"

9.7 RadEye's battery status is lower than expected

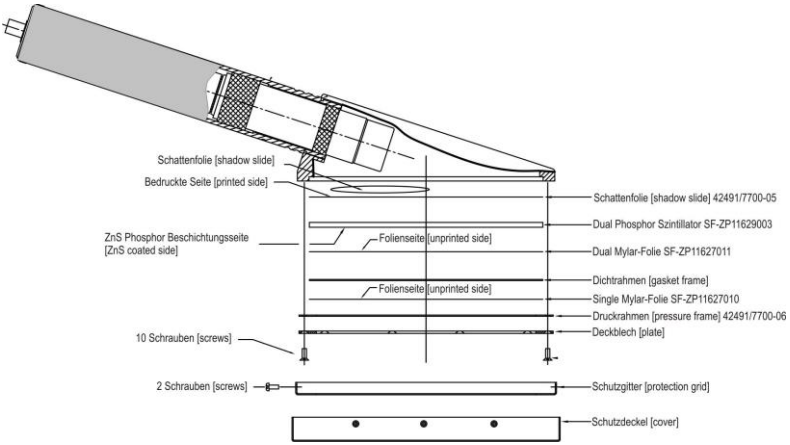
Please check if the correct battery type is selected under "settings" / "Batt. type" and change the type in case. Rechargeable batteries supply a voltage of 1.2V each, while Alkaline batteries provide 1.5V.

9.8 History data shows the wrong time and date

See chapter 7.3.2.

10. Maintenance

Replacing the window foil



The foils cover the foil frame. After removing of the protective grid (2 ea. screws), the outer foil frame (single mylar foil) is within reach. After dismantling the cover sheet and the pressure frame (10 ea. screws), the outer foil frame can be easily taken out and changed.

In order to change the second foil frame, the sealing frame has to be removed. After removal, the defective foil frame has to be carefully unfixed from the scintillator.

When changing the detector, the shadow foil must be fit in accurately. During all repairs, all components have to be mounted correctly (external light sensitivity).

10.1 Spare Parts

Description	**Part No.**
Cover upper part assembled, without front foil	42506/7038
Cover upper part assembled incl. Cylinder bolt, vibration gum and key button without front foil	42506/7055
Front foil RadEye AB100	42506/703033
Cylinder bolt 4x6mm and key button (pack=5ea)	42506/703010R
4 Key buttons	42506/703007
PCB RadEye SX for AB100 comp.	42506/8315B
LCD Module	SM165712108
Foil replacement kit	SF-ZP11627010

11. Optional Accessories

Earphone for RadEye series (425067037)

The usage of the earphone is recommended, if the RadEye is switched into FINDER mode and disturbance through noisy environment shall be compensated.

The earphone is plugged into the RadEye's socket at bottom of the unit. The cable length is 1.2m.

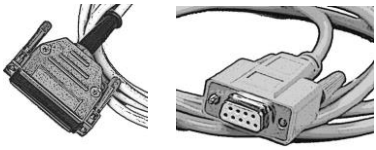
Lutetium Test-Adapter for RadEye AB100 (425068371)

The test-adapter 42506/8371 offers a convenient way to verify the radiation response performance of the RadEye AB100. This

“check source” contains 80 g of natural Lu2O3. For more details see chapter 6.4.

IR connection cable serial (4254029)

The IR plug of the connection cable can be fixed easily by screws at the desktop holder. The PC connection plug is a 9 pin sub D type for serial COM ports.



Please see chapter **Fehler! Verweisquelle konnte nicht gefunden werden.** for details. Cable length = 1.2 m

IR connection cable USB (4254026)

The IR plug of the connection cable can be fixed easily by screws at the desktop holder. The PC connection plug is a type for USB ports.

Please see chapter **Fehler! Verweisquelle konnte nicht gefunden werden.** for details. Cable length = 1.2 m

12. Technical data

12.1 RadEye AB100

Radiation type	Alpha, Beta, Gamma, X-ray radiation
Measured quantities:	Count rate (cps, cpm) Surface contamination (Bq, dps, dpm, Bq/cm^2)
Measuring range:	Default: 0.01…100,000 cps (Beta, Gamma) 0.01…10,000 cps (Alpha)
Window surface	100 cm²
Window density	1mg/cm²
Transmission of grille	85%
Gamma sensitivity	32 cps at 1µSv/h (Cs-137)
Nuclide efficiency	See Table 9-1
Linearity error	Max. ±10% up to 100,000cps
Surface homogeneity	See Table 9-2 and 9-3
High voltage range	100V…1400V
Thresholds	4 (30 mV to 1220 mV, 1 mV resolution)

Maximum number of parameter sets that can be loaded	16 parameter sets with adjustable high voltage, dead time correction, overload threshold, timeout etc. for detector failure. Default values are available
Alarm threshold:	Two alarm thresholds for count rate αβ, count rate α, activity αβ, activity α. Default setting: see chapter 2.3
Audible alarm intensity:	At least 80 dB(A) at a distance of 30 cm
Working temperature:	-20°C ... + 50°C
Storage temp:	-25°C … + 50°C
Ambient air pressure:	700 hPa … 1100 hPa
Relative humidity:	10 ... 90 % at 35°C not condensing
Operating voltage:	1,8 ... 4 V, Battery low voltage starting from 2.1 V
Degree of protection:	IP 53 according to EN 60 529
EMC:	Disturbance emission : EN 61000-6-3 Immunity : EN 61000-6-2
Size:	350 mm x 100 mm x 190 mm
Weight:	around 900g including C cells
Internal memory:	The last 1600 measured values are saved and can be read out via PC program. Max- and mean value. The time interval is factory preset to 120s by default. Logbook with 250 entries for changes of configuration, occurring alarms and errors.

Averaging filters:	Filter type: **A**dvanced **D**igital **F**ilter (ADF) Digital RC-Filter with time constant 1s.....180s, depending on counting rate changing.
Power consumption:	≈ 5 mA normal operation without alarm signals and LCD illumination
	≈ 45 mA with illuminated LC display
	≈ 9 mA LED alarm
	≈ 35 mA acoustic alarm
	≈ 25 mA vibraton alarm
Battery service life:	≈ 1200h using two alkaline C cells depending on the selected probe and operating mode
	≈ 600h using 4000mAh NiMH battery

Nuclide	E_{max} [MeV]	efficiency (Imp/s)/Bq α	efficiency (Imp/s)/Bq α + β + γ	Surface emission response (Imp/s)/s-1 α	Surface emission response (Imp/s)/s-1 α + β + γ
^{241}Am	5,4	**20%**	**30%**	**42%**	**83%**
^{14}C	0,15		**5.5%**		**10 %**
^{60}Co	0,32		**16%**		**32%**
^{36}Cl	0,71		**30%**		**49%**
^{137}Cs	1,17		**32%**		**52%**
^{90}Sr/^{90}Y	2,26	**< 0.03%**	**33%**	**< 0.1%**	**50%**

Table 12-1: Typical efficiency and surface emission response for standard test sources (10x10 cm)

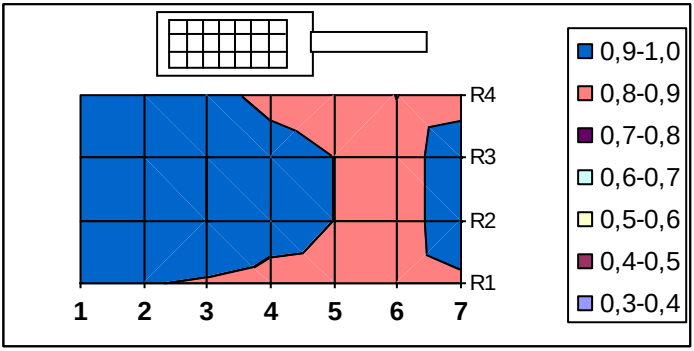


Table 12-2: Typical surface homogeneity for Beta radiation Cl-36

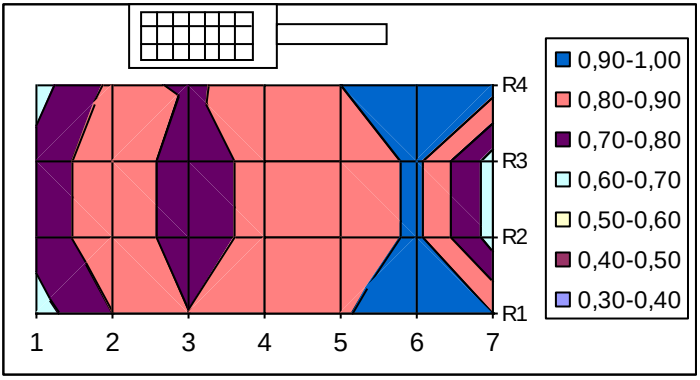


Table 12-3: Typical surface homogeneity for Alpha radiation Ra-226

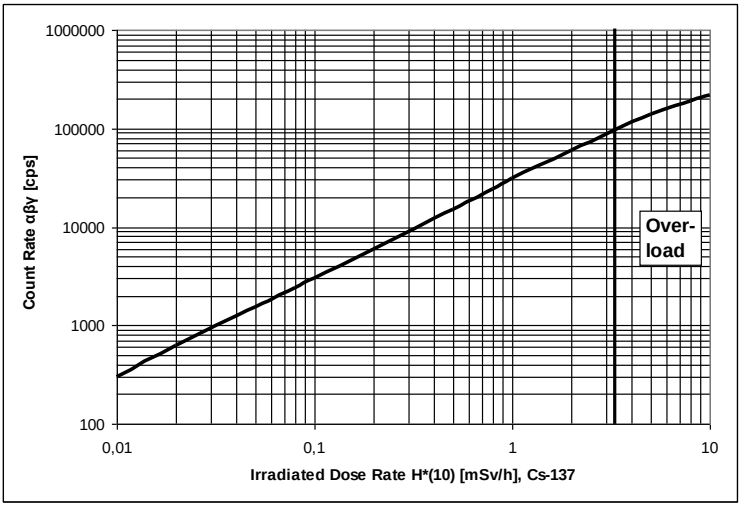


Diagram 12-1: Count rate versus irradiated dose rate

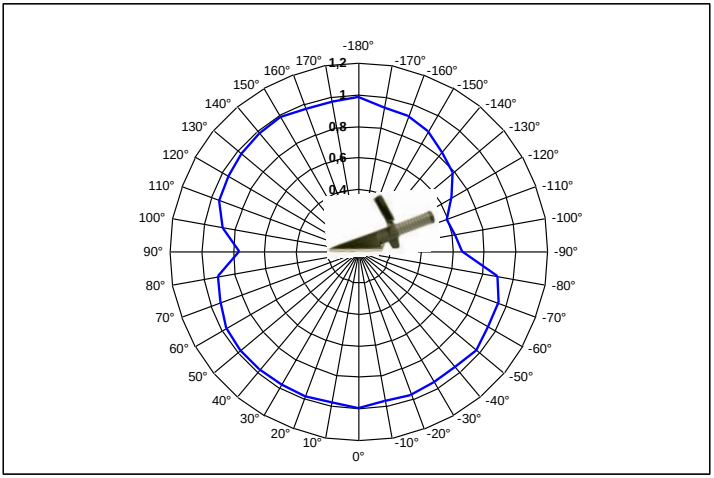


Diagram 12-2: Angular response with Cs-137, normalized

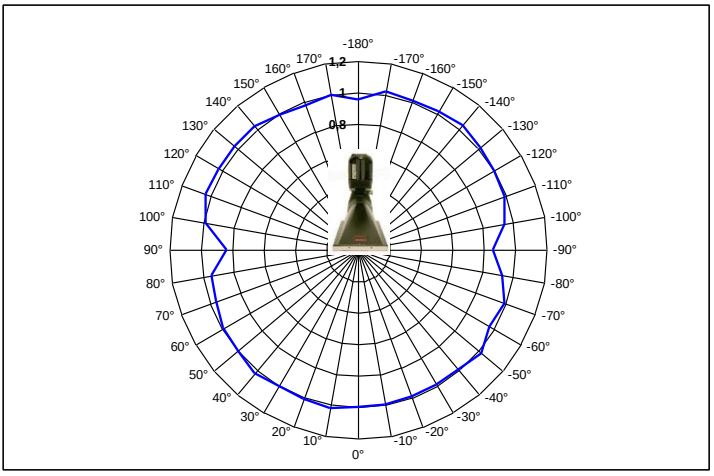


Diagram 12-3: Angular response with Cs-137, normalized

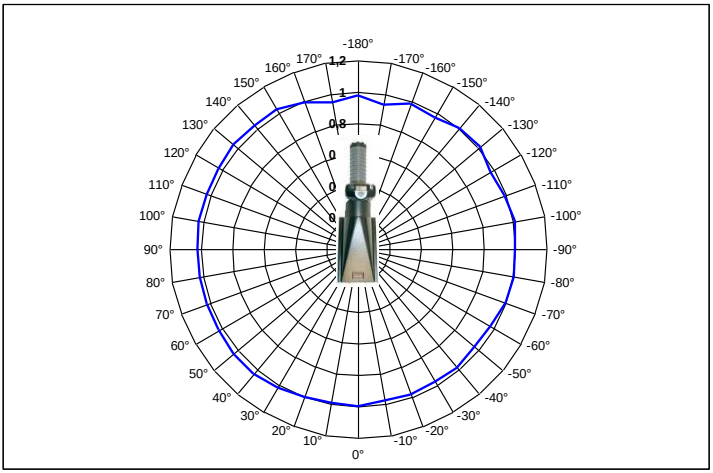


Diagram 12-4: Angular response with Cs-137, normalized

12.2 Firmware revisions

V 1.32
First edition

V 1.50

- Improved Battery low warning
- After EEPROM-error the default parameter are loaded into the memory but not written to the EEPROM
- Overload display for α set to 10kcps
- Subtraction of α rate selectable via submenu “Set-tings”

V 1.68

- Manual data logging
- New menu function “Set HV”
- Accumulated counts
- Settable thresholds

V 1.72

- Display of “###” if no nuclide is configured.
- Max. allowable alarm threshold changed from 200 kcps to 700 kcps
- Slower behavior of trend arrows

V 1.75

- Scaler mode can be controlled remotely
- Rounding error in measuring unit “cpm” and “dpm” fixed
- Menu item “Display α/αβ” was disabled. Now it is visible again.
- New function: “Alarm acknowledge” enable/disable. If Alarm acknowledge is disabled the acoustic and vibration alarm cannot be muted.
- New function: Set alarm threshold to 3xbackground. After background measurement the user is asked if the alarm threshold for beta threshold should be set to 3xbackground count rate.
- LED flash and a double beep at the end of a scaler measurement.
- Data set number is increased at the start of a scaler measurement.
- Lowest settable voltage: 100V. Before the voltage could be set to 0V
- New menu items “Display contrast” and “Language” in sub menu “Settings”
- Feature "beta window in activity mode" removed
- A classic linear ratemeter filter can be selected instead of ADF.
- The ratemeter can be set to the actual value by a long press on the “Menu/◀” button.

13. Service contact

To request repair or calibration services, please use the online RGA (Return Goods Authorization)
process at:

http://www.thermoscientific.com/servicerepair

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