



GAMMA-SCOUT®

Measures Radioactivity Easily and Reliably.

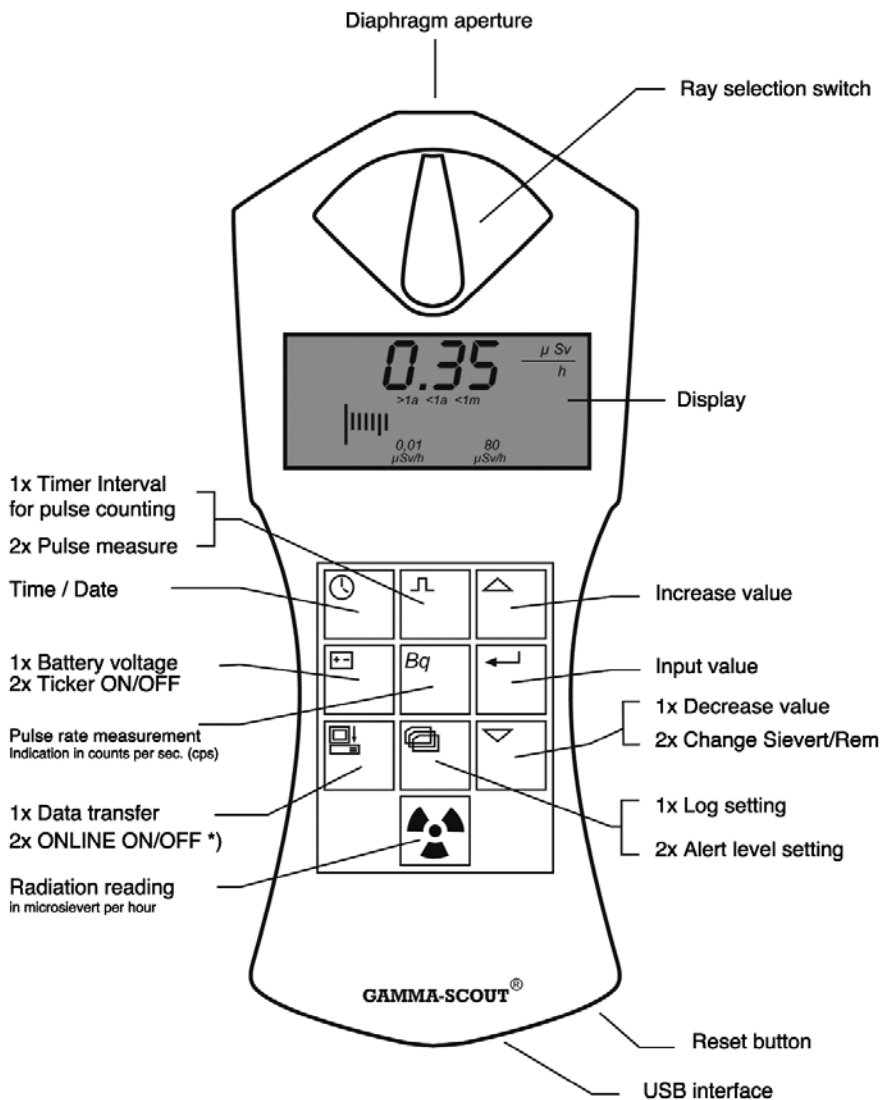


Information about GAMMA-SCOUT®,
instruction for TOOLBOX software
(processes GAMMA-SCOUT® data), and
Technical Support available at

gamma-scout.com

Radiation Detector with USB-Port

GAMMA-SCOUT® is a user-friendly device. The following design is an introduction to GAMMA-SCOUT's different features.



*) Only for ONLINE Model

„1x“, „2x“ will say one or two pushes on the button

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Functions and Features (all models)

- **Easy Reading:** In measuring mode (button ) , the display shows the current radiation measurement reading. The display also temporarily shows the average H of the last day (24h, 12 am to 12 am).
- **Large Scale:** GAMMA-SCOUT® is calibrated across a wide scale (0.01 up to 1000.00 $\mu\text{Sv/h}$).
- **Tested Calibration:** Each GAMMA-SCOUT® radiation meter is subjected to a final test. This test is supervised by the Institute of Radiation Protection; a government controlled university for Applied Technology. The tested device must be in a confidence interval of 5% in comparison to a master. This master is adjusted to a gauged reference Cs-137 emitter.
- **Reference Isotope Not Equal to Cs-137:** The conversion from impulses per time into the dose rate is based on Cs-137. If other isotopes are present, the impulses per time can be directly displayed, and can be converted by using personal charts.
- **Dose Rate and Dose:** GAMMA-SCOUT® can be used as a dose meter (cumulative radiation).
- **Change of Sievert to Rem:** The dose rate may be displayed in Sievert or Rem.
- **Energy-Saving Permanent Operation:** The GAMMA-SCOUT® monitors radiation day and night and logs data for later download. Due to sophisticated electronics, its battery lasts for years. The model "RECHARGEABLE" works with a rechargeable battery.
- **Data Storage:** GAMMA-SCOUT® stores all registered pulses in its internal memory and keeps them ready for you to use when desired. 32,000 Readings: For constant monitoring of the environmental data, the interval of data storage is set on a value of one per week. This equals 600 years of memory capacity. The user can set up smaller intervals (page 13), which maxes out the memory capacity sooner. To clear the memory content, see below.
- **Certification:** GAMMA-SCOUT® meets all European CE standards as well as the "FCC 15 standard" of the USA. GAMMA-SCOUT® may be carried on aircraft.



GAMMA-SCOUT® w/ALERT (basic functions plus alert and ticker)

- **Threshold for Dose Rate:** This model features an acoustic alert when radiation level exceeds a user programmed threshold.
- **Threshold for (cumulative) Dose:** GAMMA-SCOUT® w/ALERT offers an acoustic alarm when a user programmed threshold for the cumulative dose is exceeded.
- **Ticker:** The user can set an acoustical ticker which activates with each gamma pulse detected. To save battery resources, the signal shuts down after ten minutes and must be restarted. On devices with rechargeable batteries, the ticker will not shut down.



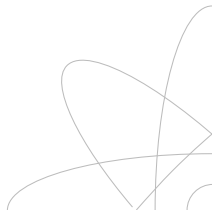
GAMMA-SCOUT® ONLINE / REAL TIME (with the functions of the Alert-model)

- **Used in Measurement Stations:** GAMMA-SCOUT® sends measured impulses in a 2 second interval (synchronized with the measurement) via USB-Port to a connected PC.



GAMMA-SCOUT® RECHARGEABLE (with the functions of the Alert-model)

- **Rechargeable** power supply, charged via USB (power supply unit or PC).





Operating Conditions, Technical Notes, CD, and User's Guide

This device complies with part 15 of the FCC rules.

Operation is subject to the following conditions:

- This device may not cause harmful interference.
- This device must accept any interference received, including interference that may cause undesired operation.
- In order to measure all gamma radiation, the sensor is not shielded.

Please take all necessary care in connection to radioactivity and observe radiation protection regulations.

This manual was updated in December, 2010. The latest version can be found on our internet page

● ○ ● **www.gamma-scout.com**

as a pdf to download. If you would like to be informed about important changes, please register on our home page in our list of clients.

Enclosed is a CD-ROM which contains a data-converting software:

GAMMA-SCOUT® TOOLBOX 4.0

- For © Windows operated Personal Computers
- Available in German and English version
- USB-Driver
- Installation Advice
- Manuals in Different Languages

Updated and interactive information, installation help, handling, and troubleshooting for the TOOLBOX software can be found in the menu "TOOLBOX" at **www.gamma-scout.com**

Notes:

- The disposal agreement according to the regulations of packaging was concluded with Susa Solutions GmbH
- The revocation clause according to distance-selling regulations at **www.gamma-scout.com**, German version, AGB (legal notes)

Your GAMMA-SCOUT® is equipped with a Geiger-Müller counter tube enabling you to detect not only gamma radiation, but alpha and beta radiation as well (currently Centronic ZP 1401, technical charts at www.centronic.uk).

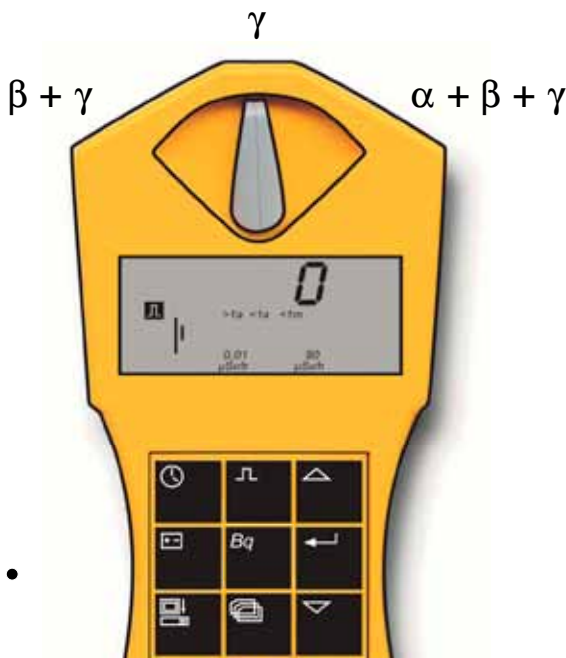


With the Radiation Selection Switch, You Can Limit the Radiation Types You Want to Measure:

- Set the selection to center position (γ symbol) if you want to detect gamma radiation only. With the switch in this position, an aluminum plate screens the counter tube window against alpha and beta radiation.
- Turn the switch to the left to the $\beta + \gamma$ symbols, if you want to measure gamma and beta radiation, but no alpha radiation. Now an aluminum foil screens the counter tube window against alpha radiation.
- Turn the switch to the right to the $\alpha + \beta + \gamma$ symbols, if you wish to measure all three radiation types. This switch position opens the counter tube window for access by the three radiation types.

For normal measuring, place the radiation selection switch at center position. Alpha and beta radiation are limited in range to a few centimeters or meters, so can only be detected when very close to the radiation source.

This also explains why it makes little sense to keep the radiation selection switch constantly open – an added reason being that the counter tube window may be damaged in this exposed position, for example, when poked by a pen.





Indicating Current Radiation

- Pressing the button  puts GAMMA-SCOUT® into standard mode, and its display shows you the present radiation in microsievert per hour - not only as a value, but also in the form of a bar chart. Note that for a small radiation value, this bar chart appears only as a single line. In order to visualize the volume of detected radiation, there is a bar diagram on the ground line of the display using symbols as >1a (stay for more than 1 year), <1m (less than 1 month for accumulation), etc.
- To switch from mSv to mRem and back, start from mode “measure radiation.” Press button  and confirm unit with button . All data will be displayed in the selected unit.

Indicating Average Over the Past Day (12:00 am to 12:00 am)

- Pressing the button  a second time displays the average radiation over the last day (midnight to midnight - taken from the GAMMA-SCOUT® clock) for a few seconds, again in microsievert per hour. The  symbol in the display will blink. Note that this function is not available for up to 48 hours after first operating the device, or after a reset.

Automatic Alert Level (w/ALERT version)

- When exceeding the user programmed alert level, GAMMA-SCOUT® generates an acoustic alert and displays the blinking icon . This icon continues blinking until the user shuts it off by pressing the button  twice.

○ ○ What Does a “Microsievert” Mean?

In physics, three types of radioactive radiation are known: alpha, beta and gamma radiation. They differ, not only in their physical characteristics, but also in their effects on humans. To make these three radiation types comparable in their effects on humans, a value has been created which defines the biological effects of radiation: it is referred to as dose equivalent whose unit is the sievert (called equivalent dose). The older unit was called REM. 1 REM = 0.01 Sievert (Sv). Based on the counted radiation pulses, the different components of a radiation mix are converted into a common measure for the biological effect. To reflect this, Cs-137 is used. Conversion into the dose equivalent refers to the gamma quantum of the Cs-137, radionuclide with quantum energy of 662 keV. The conversion takes place due to physical reasons with different factors dependent upon the amount of impulses per time; in the environmental field, the factor 142 impulses per minute = 1.0 Microsievert per hour.

○ ○ Normal Values of Exposure to Radiation, Limit Values

For individuals with professional exposure to radioactive sources in the EU, there are two legal upper limits:

- Dose rate limit is 6 mSv p.a. = 3 $\mu\text{Sv/h}$ (assuming 2,000 working hours per year), Category B
- Dose rate limit is 20 mSv p.a. = 10 $\mu\text{Sv/h}$ (assuming 2,000 working hours per year), Category A

(An exclusion zone exists starting at 3 mSv/h)

The natural environment in Heidelberg, Germany has a radiation level of about 0.1 - 0.2 Micro-Sv/h

Below the digits that show the measurement value, the detected dose is illustrated on a bar chart. The symbolism shows: one can be exposed to this radiation for longer than 1 year ($>1\text{a}$), until the legal maximum of 20 mSv p.a. is reached. Higher radiation shortens this time of exposure.

○ ○ Operating Range of GAMMA-SCOUT®

GAMMA-SCOUT® is used to control (constant monitoring with log) gamma radiation impact at home and on the job. Very strong gamma radiation loads, above 1000 $\mu\text{Sv/h}$ (5,000 times normal radiation in Heidelberg), cannot be measured with this technique. In case this upper limit is exceeded, GAMMA-SCOUT® displays blinking numbers and shows a warning sign  in the display. Reset the icon  by double-pressing the button . Data from overflow-status is marked with (*) in the download table. .

○ ○ Device with Rechargeable Batteries (“RECHARGEABLE”)

For customers using the GAMMA-SCOUT® above 10 $\mu\text{Sv/h}$ in a laboratory (or preferring a rechargeable power supply), we constructed the model RECHARGEABLE. This model needs a different power supply, therefore is equipped with a rechargeable battery. Charging starts automatically when the GAMMA-SCOUT® has been connected to a PC through a USB port or with the power supply unit that is included in delivery.

Charging time for power supply unit is 8 hours. Overcharging will be avoided by an internal charging circuit. A display of the charge state can be seen by using the  button.

Full charge = 4.0 V



When and Why?

GAMMA-SCOUT® can also be used as a normal Geiger counter. In this case, it simply counts the number of pulses received without converting them into the sievert unit.

Since the conversion is dependent upon the isotope of the radiation source, and since we based our conversion on Cs-137, this option is important for users who work with other isotopes and want to convert using personal charts.

GAMMA-SCOUT® stores the received pulses in its internal memory.



• ○ ● Pulse Count with GAMMA-SCOUT®

- Press the button  to switch GAMMA-SCOUT® to the pulse count mode. The display will show the pulse symbol. Counting will not have started yet. Pressing the button  a second time will start the counting without pre-setting the measuring time.
- Press the button  if you want to set a measuring time:
 - For the measuring time to count in seconds, press the button  once.
 - For the measuring time to count in minutes, press the button  twice.
 - For measuring time to count in hours, press the button  three times.
- Now set the exact value of the desired measuring time using the  and  buttons.
- Start measuring by pressing the button  a second time. The pulse symbol flashes in the display during the measuring time.
- If a measuring time was set, the pulse symbol flashes until the end of the measuring time, after which it is steady again. The display now shows the number of pulses counted for the programmed interval.
- You can stop measuring in two ways:
 - By pressing the button  once again, the measuring result remains visible in the display.
 - By choosing another mode of operation, the measuring result disappears.

In the pulse rate measuring mode, the pulses registered by the counting tube are continuously measured and converted into a pulse rate. The unit of this pulse rate is cps (counts per second).

Information: The rate of ionization per second, which is logged in the counter tube, will be calculated. This is not identical with the activity of the isotope which is defined in Becquerel. The notation will be changed into cps (counts per second).



Indicating the Pulse Rate

- Press the button to switch to the pulse rate measuring mode. The symbol will flash for the duration of measuring. After measuring, the symbol is steady again.

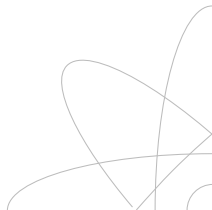
Pulse rate measuring gives the average number of pulses per second. Since radiation intensity may strongly fluctuate on a short-term basis, this indication of average rate will, of course, be more exact the longer the measuring is done.

GAMMA-SCOUT® provides you with a first result within a few seconds. Then it automatically prolongs the measuring time to 4096 seconds in order to produce the most exact average value as possible.

Example:

1024 pulses after 4096 seconds = 0.25 pulses / second
After pushing the button, the measuring intervals start again after 2 seconds.

Note: Pressing this button displays the number of measured impulses (ionized molecules) per second. Of course, this does not display the activity of the source (Becquerel). This button will be corrected (changed into cps - counts per second) as soon as possible.



GAMMA-SCOUT® has an integrated quartz clock whose display can be activated by a pushbutton. Time and date are used to register the measured radiation. With a function in the data reading program of the TOOLBOX software, the GAMMA-SCOUT® date and time can be synchronized to the PC. Choose the menu “Set any time” to set your choice of date and time (i.e. different time zones) on the GAMMA-SCOUT®.



Indicating Time and Date

- Press the button  to view the time. The display shows the set time and the symbol .
- Press the button  a second time to view the date. The display shows the set date as well as the symbol .

Setting the time

- First, view the time by pressing the button . Then press the button  to set the hours. Both hour digits flash in the display. With the  and  buttons, set the hour forward or backward as desired. Confirm the set value with the button .
- Press the button  a second time to set the minutes. Both minute digits flash in the display. With the  and  buttons, set the minutes forward or backward as desired. Confirm the set value with the button .
- If you wish to set the seconds as well, press the button  a third time. The display shows the two minute digits together with the flashing digits for the seconds. With the  and  buttons, set the seconds forward or backward as desired. Confirm the set value with the button .

Setting the Date

- Press the button  twice to view the date display. See description “setting the time.”

You can stop the setting of the clock at any time by pressing the button . For stopping the year setting, press the button  a fourth time.



GAMMA-SCOUT® is powered by a Lithium Thionyl Chloride cell of 2.7 - 3.7 voltage. The device will continue functioning until the cell voltage is down to 2.8. When the voltage drops below this value, the battery symbol will appear in the display. The data will be retained, even at total breakdown of voltage. The model RECHARGEABLE has a rechargeable power supply (via USB or power supply unit that is included in delivery)



Indicating the Battery Voltage

- Press the button  to indicate the existing battery voltage. The display will show the cell voltage available when the electronic system is under maximum load.



Battery change

The battery is soldered on the circuit board to prevent any data loss. Due to our extremely low currents (of approximately 10 microampere), plug-in batteries would constantly lead to current interruptions because the mating surface would oxidize). In case the user wants to integrate a new battery, the basic parameters can be restored by pressing the reset button after having changed the battery.

Please note: If GAMMA-SCOUT® is opened, warranty is no longer active.



Reset Pushbutton

The device can be restarted by pressing the reset pushbutton. You will find this button in the lower opening of the case beside the USB interface on the circuitboard. Any reset will set the clock back to factory standards.

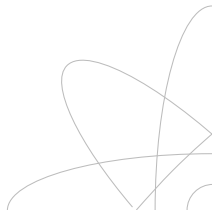
Attention:
The reset may delete your filed data.



Ticker (not available in the basic model)

- A double click of the button  will display the word “on” – which means that the ticker can be switched on now. Pressing the button  will switch on the ticker and the symbol “speaker” is displayed. In case the ticker is already on, pressing the button  switches it off. The double click will display the word “off” and the “speaker” symbol will disappear.

With the ticker switched on, GAMMA-SCOUT® beeps for each pulse detected. Therefore, increasing radiation will shift the single beeps to a growing cascade. The beeps are using 500 times more power than the monitoring operation at environmental impact. Therefore, the ticker is switched off internally after 10 minutes of use. If the ticker is used once per day, the power consumption is still within the limits of a long-lasting battery. If the ticker is used more often, the battery will last for a shorter period. In this case, a maintenance fee will be charged for a battery change. Number and duration of ticker use is locked internally.





Exceeding Alert Level Threshold of the Dose Rate (w/ALERT version)

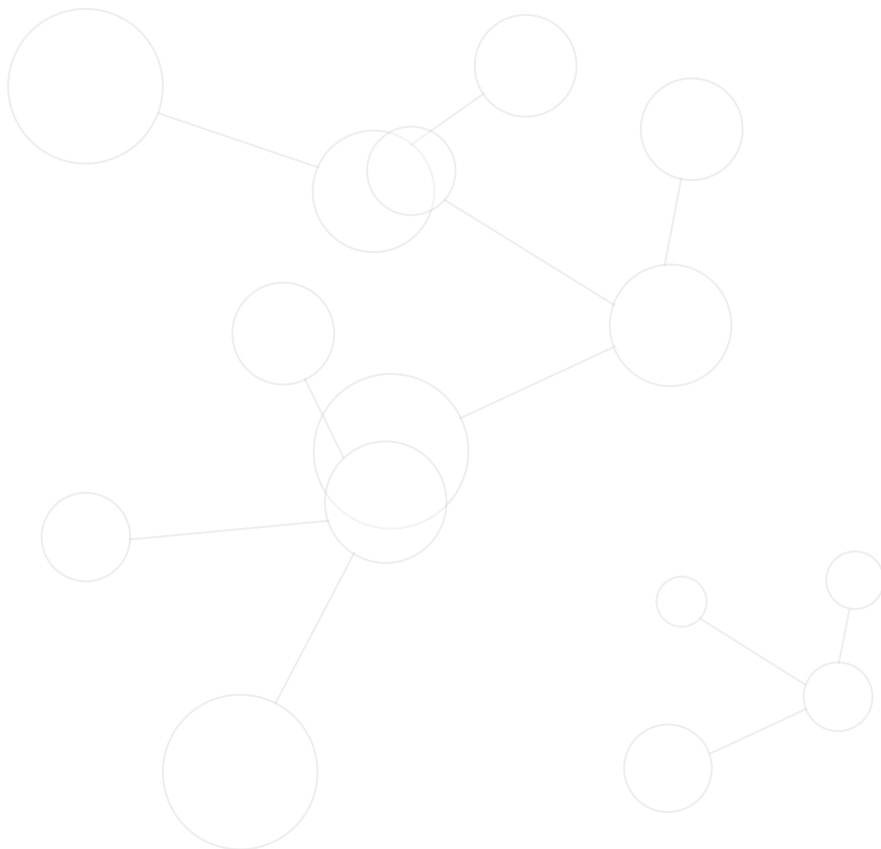
GAMMA-SCOUT® w/ALERT features an acoustic beep that sounds when radiation levels exceed a specific user-programmed level (every 8 seconds and interval of 3 tones). The default alert level is 5 $\mu\text{Sv/h}$. If this value is exceeded by measurement of radioactivity, this will be shown with an additional symbol  in the display. Erasing the symbol  in the display is done by pressing the button twice .



Individual Programming of Alert Level of the Dose Rate

Pressing the button  once controls the protocol (see page 12). A second pressing changes to status “alert level programming.” The set level is displayed. The button  increases the threshold; the button  decreases the threshold. The new value is displayed, blinking.

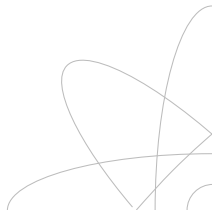
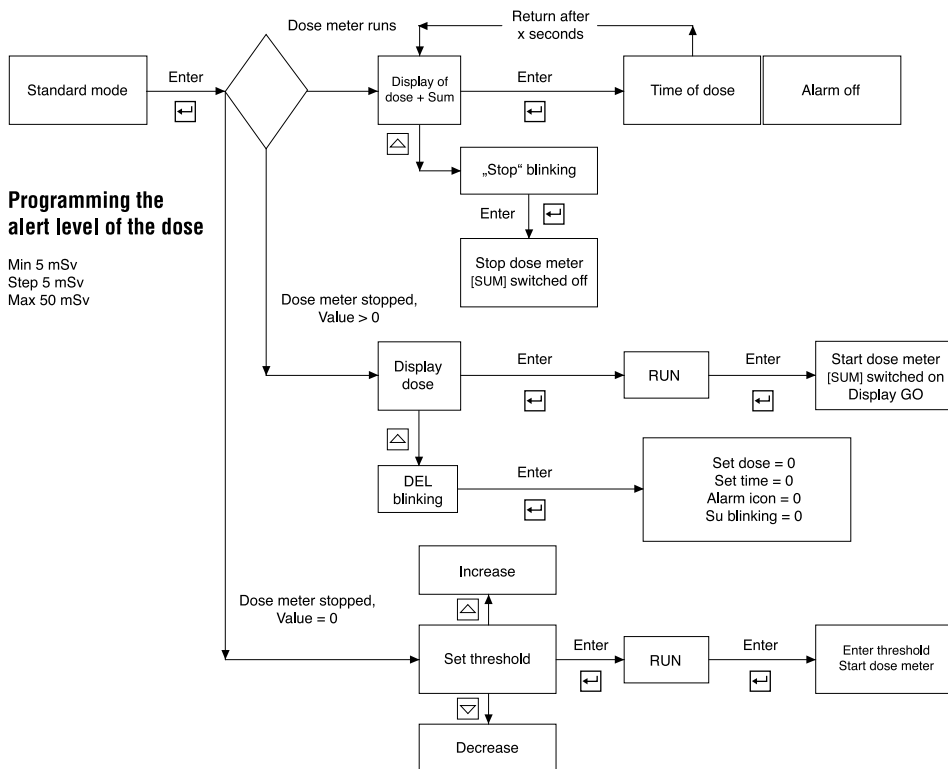
The lowest value (threshold possible to insert) is 0.1 $\mu\text{Sv/h}$. The step change is 0.1 $\mu\text{Sv/h}$ in the lower level, and becomes wider in the higher level (try out). The maximum possible alert level is 950 $\mu\text{Sv/h}$. Press the  button to save the new selected level.





Display and Reset of the Dose (cumulative dose)

When the (cumulative) dose meter is running, the symbol is displayed Σ in the window. The dose is displayed X.XX mSv. Values of less than 0.01 mSv display 0.00 mSv. To start, stop, restart, and delete the dose display, follow the chart below. See chart for setting the threshold for the dose. At the end of the branches, automatic return to standard operating mode.



GAMMA-SCOUT® automatically logs the number of pulses measured, and stores this data in its internal memory. With the TOOLBOX software, this data can be read and processed fast and comfortably by a personal computer (for exact instructions, go to www.gamma-scout.com/toolbox.pdf).

The logging process is factory-set in a way that GAMMA-SCOUT® will accumulate the pulses each week, storing them as weekly values. On this basis, the capacity of the memory is sufficient to log the weekly values over a period of 600 years.

As the following table demonstrates, you can also set shorter logging intervals, with corresponding reductions in the storage capacity. When the storage capacity is filled up, the logging stops. So far, there has not been a single case where an overwriting was requested.

Logging interval	Display	Storage capacity	Logging interval	Display	Storage capacity
1 week	Pr. 7d	approx. 615 years	10 minutes	Pr. 10min	approx. 7.3 month
3 days	Pr. 3d	approx. 263 years	5 minutes	Pr. 5min	approx. 3.7 month
1 day	Pr. 1d	approx. 88 years	2 minutes	Pr. 2min	approx. 1.5 month
12 hours	Pr. 12h	approx. 44 years	1 minute	Pr. 1min	approx. 20 days
2 hours	Pr. 2h	approx. 7.3 years	30 seconds	Pr. 30s	approx. 10 days
1 hour	Pr. 1h	approx. 3.7 years	10 seconds	Pr. 10s	approx. 3 days
30 minutes	Pr. 30min	approx. 1.8 years			
Clear log	PdEL	Clear data			



Data Log Setting

- Press the button  to switch to log mode. The display shows the log symbol . Briefly, the bar chart will also appear, indicating how much log memory is currently occupied. Each bar equals 1,000 values. So based on 32,000 values, that would be 3% of memory.
- By pressing the  button, you select more frequent logging and, consequently, shorter logging intervals.
- By pressing the  button, you select less frequent logging and, consequently, longer logging intervals.
- By pressing the  button, you enter the final selected value of logging interval.
- You can transfer the logged data to a personal computer at any time, and then clear the memory of your GAMMA-SCOUT® for fresh use.

GAMMA-SCOUT® automatically prolongs the logging interval to a week as soon as the memory capacity is more than 3/4 full. In this case, you can only set up shorter logging intervals after storage has been cleared.

Clearing the Storage

- Push the button  twice to clear the storage .

Using the GAMMA-SCOUT® TOOLBOX software, you can read-out and transfer the data, which GAMMA-SCOUT® has logged in it's memory, to a personal computer and convert them into a list for further processing. Connect your GAMMA-SCOUT® with the USB port of your personal computer. Data will automatically be read-out and displayed. We do not want to overload this manual, so this is only a brief description of the procedure. You will find the whole process under the link "TOOLBOX" in our website www.gamma-scout.com.



System Requirements

The GAMMA-SCOUT® TOOLBOX software requires ©MS-Windows PC with a USB interface.



Data Download Cable

The cable between the USB-PC-interface and the USB-Port of the GAMMA-SCOUT® is included in the box.



Software installation

1. The following can be found on the CD

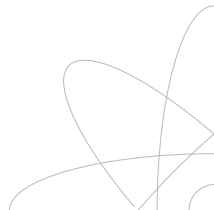
- The USB driver for ©Windows and the GAMMA-SCOUT® TOOLBOX software
- The installation program
- The multi language manuals with updated information

2. Installation of the USB driver

- Insert the CD ROM to your CD drive
- Connect the GAMMA-SCOUT® with your PC using the attached cable. Follow the menu

3. Installation of the TOOLBOX software

- Put the CD ROM into your CD drive
- The installation routine starts automatically (when autostart function is enabled). Otherwise, start "Toolboxinstaller.exe" which is found on the CD ROM.





Reading the Data

First, the software must be installed from your CD to your hard disk (see “installation”).

1. Connect your GAMMA-SCOUT® with your PC

- Connect GAMMA-SCOUT® with PC using the USB cable that is part of delivery

2. Download the data

- Start the reading program via “toolbox.exe.”
Follow the menu: The data transfer starts automatically.

For Details and Troubleshooting, see www.gamma-scout.com/toolbox.pdf



Delete data

- At the end of the data reading, you delete the data with the menu “delete.”
- If you are not in the reading program, you use the button  (page 13).

Display	Liquid-crystal display (LCD), 4-digit, numeric with dimension, quasi-analogue logarithmic bar chart Operating mode indicators	
Radiation Detector	End-window counting tube according to the Geiger-Müller principle Stainless steel housing Measuring length 38.1 mm, measuring diameter 9.1 mm Mica window 1.5 to 2 mg/cm ² Zero rate <10 pulses per minute with screening by 3mm Al and 50mm Pb Operating temperature -20 bis +60°C, operating voltage approx. 450 V Calibrated scale 0.01 μ Sv/h up to 1000.00 μ Sv/h	
Radiation Types	α	from 4 MeV
	β	from 0.2 MeV
	γ	from 30 keV
Radiation Selection	$\alpha + \beta + \gamma$	without shielding
	$\beta + \gamma$	Al foil approx. 0.1 mm, shields off α completely
	γ	Al shielding approx. 3 mm, Shielding off α completely and β to 2 MeV, weakens γ less than 7% based on Cs-137
Recycling	We recycle returned devices cost-free	
Power Consumption	Less than 10 microamperes under environmental radiation	
Memory	2 Kbyte	
Housing	Impact-resistant plastic	
Dimensions	Length 163 mm x width 72 mm x height 30 mm	
Interference Protections	European CE standard, US-standard FCC-15 Data-reset is no malfunction	
Service	GAMMA-SCOUT GmbH & Co. KG Abtsweg 15, D-69198 Schriesheim, GERMANY Fax: +49 (0) 62 20 / 66 40 email: drmirow@gamma-scout.com	
Last Revised	December, 2010 (Rights of modification reserved)	

Scientific definitions see „www.hpa.org.uk/radiation/glossary“



Physical Term	New unit	Old unit	Relation
Activity	Becquerel (Bq) 1 Bq = 1/s	Curie (Ci)	1 Ci = $3,7 \cdot 10^{10}$ Bq 1 Bq = $2,7 \cdot 10^{-11}$ Ci = 27 pCi
Ion dose I	Coulomb / kg	Röntgen (R)	1 R = $2,58 \cdot 10^{-4}$ C/kg 1 C/kg = 3876 R
Energy dose D	Gray (Gy)	Rad (rd)	1 rd = 0,01 Gy 1 Gy = 100 rd
Equivalent dose H	Sievert (Sv)	Rem (rem)	1 rem = 0,01 Sv 1 Sv = 100 rem
Effective Dose H_E	Sievert (Sv) 1 Sv = 1 J / kg		Calculated value / radiation protection



Calibration

Under environmental radiation, fatigue of material for the counter tube is not expected, therefore no re-calibration is needed. Yet, due to the ISO certification, periodical calibration is required. For this purpose, our service offers two options:

• Minor Calibration

The device to be tested is handed out to an assembler who tests it for 72 hours, comparing it to a master. The master is adjusted to a gauged reference source (Cs-137). Data is recorded.

Currently, this costs 50 Euro, before sales taxes. Normally the ISO auditors accept this form of calibration.

• Major Calibration

We contact the Director of the Institute for Radiation Protection at the University of Mannheim. We arrange terms of metering points, wording of the records, fees and appointment dates directly.

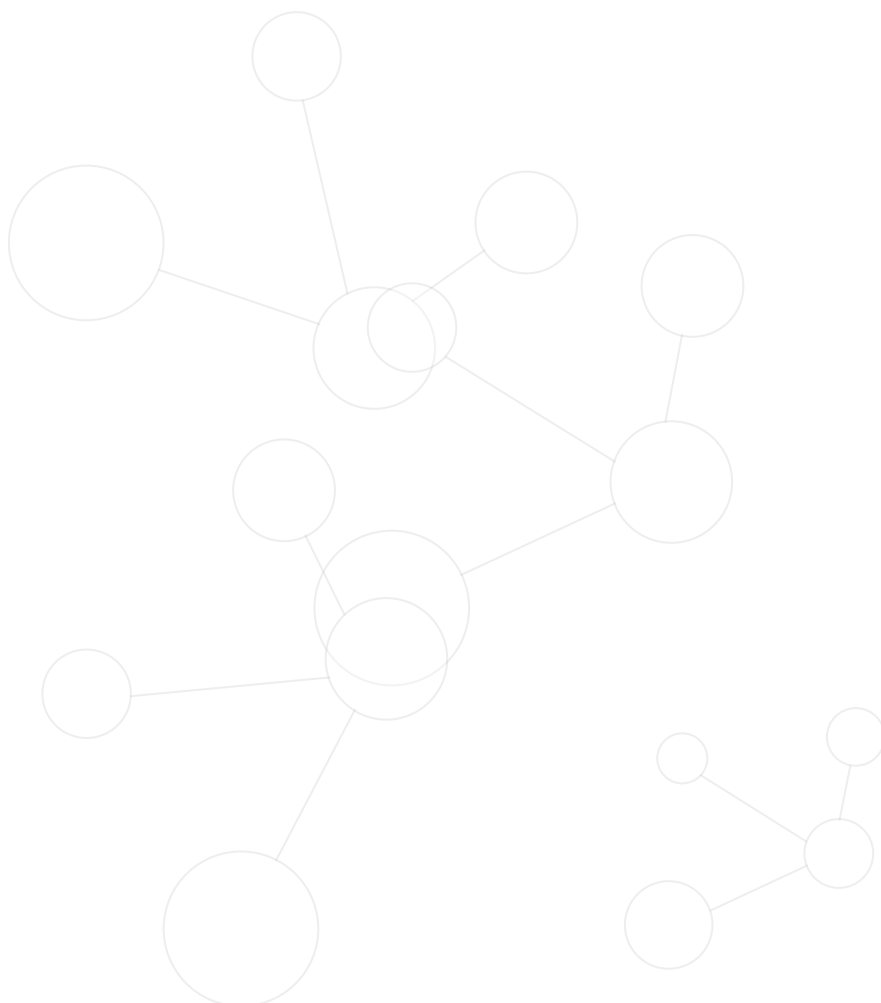


ONLINE Model / REAL TIME

The ONLINE Model has been designed to transmit data cyclically (synchronized with the measuring). The interface of the GAMMA-SCOUT® receives its power supply from the USB interface of the PC. The GAMMA-SCOUT® interface is needed for a constant connection with a PC (online).

The cycles in which the data will be transmitted to the computer screen can be chosen by the user (within limits). Shortest cycle is a transmission every two seconds.

More information for this model is available in the menu "ONLINE" located on the CD ROM that is included in delivery. The information can also be downloaded at www.gamma-scout.com.

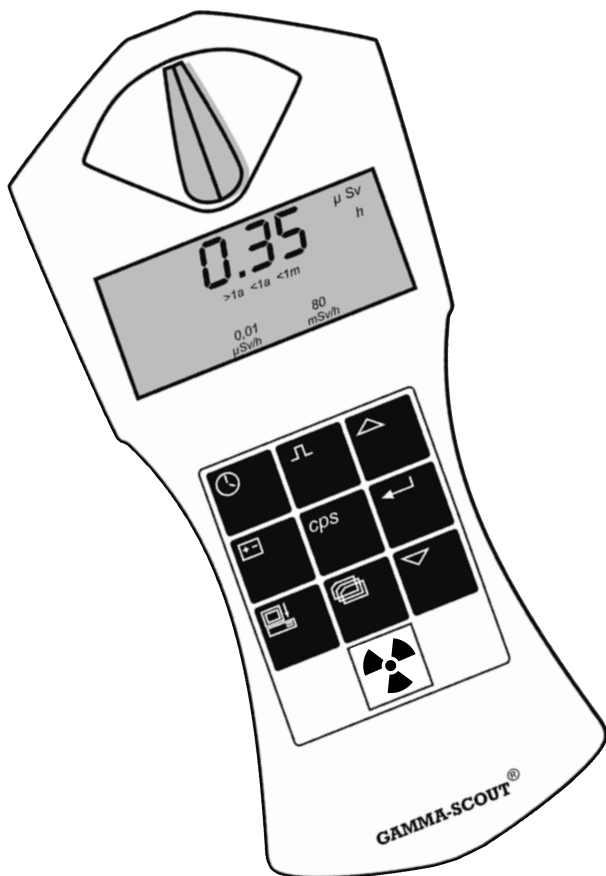


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Dr. Mirow
GAMMA-SCOUT GmbH & Co. KG

Postfach / P.O. Box 1346
Abtsweg 15
D-69198 Schriesheim
Fax ++49 (0) 62 20 / 66 40
drmirow@gamma-scout.com

www.gamma-scout.com

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