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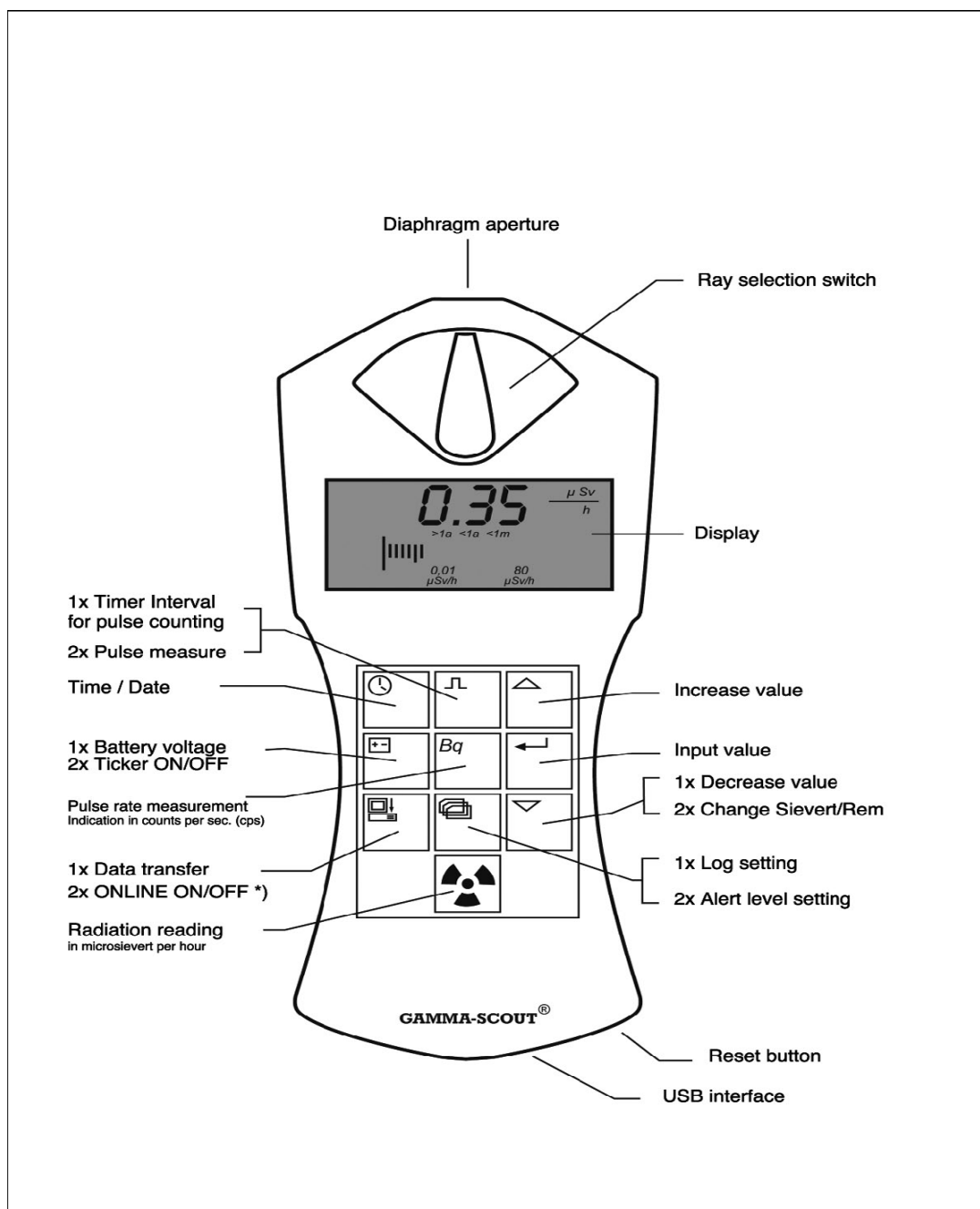
Manual Gamma-Scout





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The design below intends to give a first approach to the different features. The controlling of the GAMMA-SCOUT® via easy to read membrane switches makes it quite user friendly.





Summary

Features of GAMMA-SCOUT® Products

- **Easy Reading:** One push of a button is enough to start radiation measurement.
- **Large Scale:** GAMMA-SCOUT® is calibrated across a wide scale (0.01 up to 50.00 $\mu\text{Sv/h}$).
- **Not linear conversion of pulses to rate:** Dose rate ($\mu\text{Sv/h}$) from pulse rate is a non linear relation. Instead of an approximation by a constant factor the conversion of the data is realized with a non linear calculation within GAMMA-SCOUT®.
- **Tested Precision:** Each GAMMA-SCOUT® radiation meter is subjected to a final test supervised by the institute of radiation protection of a government controlled university of applied technology.
- **Dose Rate and Dose:** GAMMA-SCOUT® can be used as an (cumulative) dose meter as well.
- **Change of Sievert to Rem:** The dose rate may be displayed in Sievert or Rem.
- **Permanent Operation:** The GAMMA-SCOUT® is monitoring the radiation day and night and is logging the data for later download. Due to sophisticated electronics, the battery is lasting for years.
- **Data Storage:** GAMMA-SCOUT® stores all registered pulses in its internal memory, and keeps them ready for you to use when desired.
- **Certification:** GAMMA-SCOUT® has been tested by TÜV (German Technical Control Board) for device safety. It 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

- **Threshold for Dose Rate:** This model features an audible alert when radiation level exceeds a user programmed threshold.
- **Threshold for (cumulative) Dose:** GAMMA-SCOUT® w/ALERT can give an acoustic alarm, when a user programmed threshold for the cumulative dose is exceeded.
- **Ticker:** The user can set on an acoustic ticker, beeping with each gamma pulse detected (increasing to a cascade in case of growing radiation).

GAMMA-SCOUT® ONLINE Model

- **Cyclical Data Transmission:** This model has been designed for transmitting data cyclically.

Side Data

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.

Please take all the care that is necessary in connection with radioactivity, and observe the radiation protection regulations.

This manual was updated and printed in October 2007. Furthermore the manual is found on the CD and on our [website](#)

Enclosed is a CD-ROM, which contains:

„Gamma-Toolbox“ Release 3.30, the data-converting software for

- © Microsoft-Windows based Personal Computers working with the operating Systems
- © WIN NT4.0, © WIN 2000/2003, © WIN XP (The software is available in German and English version)
- © Acrobat-Reader installation files for © Microsoft-Windows
- USB-driver
- Installation hints
- Manuals in different languages

Ray Selection Switch

Your GAMMA-SCOUT® is equipped with a Geiger-Müller counter tube enabling you to detect not only gamma rays but alpha and beta rays as well.

With the ray selection switch you can limit the ray types you want to measure:

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

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

This also explains why it makes little sense to keep the ray selection switch constantly open - an added reason being that the counter tube window may be damaged in this exposed position.



Radiation Measurement


GAMMA-SCOUT® reports the input of radioactivity fast, reliably, and permanently.



The conversion of pulses per minute to dose rate depends on the level of pulse input.

We are using four different ratios to approximate this non linear relation.


Under environmental input (about 0.2 $\mu\text{Sv/h}$) the conversion is 142 pulses/minute = 1.0 $\mu\text{Sv/h}$.

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 groundline of the display using symbols as >1a (stay for more than 1 year until accumulation of the legal maximum of 20 mSv p. a.), <1m (less than 1 month for accumulation) etc.

- For to change from mSv to mRem 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 from 00.00 until 24.00

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

Automatic alert level (w/ALERT version)

- When exceeding the user programmed alert level, GAMMA-SCOUT® generates an audio alert (a beep every 2 seconds) and displays the blinking  icon. This icon continues blinking after radiation fall back until the user has deleted it by pressing the  button twice.

What does a „microsievert“ mean?

In physics, three types of ionising rays are known: alpha, beta and gamma rays. They differ not only in their physical characteristics but also in their effects on humans. To make these three ray types comparable in their effects on humans, a value has been created which defines the biological effects of rays: it is referred to as dose equivalent

whose unit is the sievert (called equivalent dose).

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 a quantum energy of 662 keV.

Load and Limits

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. In case of any close up to these limits the individuals have to exit their exposure for some time to cool down.

Dose rate limit is 6 mSv p.a. (assuming 2000 working hours per year) = 3 μ Sv/h, Category B

Dose rate limit is 20 mSv p.a. = 10 μ Sv/h, Category A

Natural environment at Heidelberg, Germany has a radiation level of about 0.1 - 0.2 Mikro-Sv/h

Below the digits of the detected dose on the display, a bar chart is visualizing how long the user may stay in this environment, until he accumulates the x-ray load of 20 mSv p.a., the mentioned upper level for professionally X-ray exposed people.

Operating range of GAMMA-SCOUT®

GAMMA-SCOUT® is used to control x-ray impact at home and on the job. Very strong x-ray load above 1000 μ Sv/h (nuclear core conditions) cannot be measured with this technique. In case of overflowing this upper limit, GAMMA-SCOUT® displays (N.N.N.N...) and sets the icon into the display. Reset the icon by double-pressing the button. Data from overflow-status is marked with (*) in the download table.

Pulse Counting










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.


Advantage: If the measuring values are to be integrated into existing processes and procedures or if the measuring process itself is to be demonstrated or checked, the pulse counting is helpful.

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

Switching on the pulse count

- Press the button  to switch GAMMA-SCOUT® to the pulse count mode. The display then shows the pulse symbol. Counting did not yet start. A second pressing of the button  will start the counting.
- 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  button.
- 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. This makes the measuring result disappear.





Pulse Rate Measuring


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).

Info: Counts per second is not exactly the same as activity of the nucleus, given in Becquerel. We will change the icon on the membrane to cps.



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 the more exact the longer the measuring is done.

GAMMA-SCOUT® gives you a first result within a few

seconds, then automatically prolongs the measuring time up to 4096 seconds in order to produce as exact

an average value as possible.

Example:

1024 pulses after 4096 seconds = 0.25 pulses / second

Time and Date



GAMMA-SCOUT® has an integrated quartz clock whose display you can activate by pushbutton. Time and date are used to register the measured radiation. The PC-supported software has a feature to synchronize the GAMMA-SCOUT® date and time with your PC-clock. The GAMMA-SCOUT® clock serves to file data.





Set any time via your PC

- Choose the menu „Set any time“ in the TOOLBOX (data reading) software to set date and time of the GAMMA-SCOUT® by your choice (i.e. in different time zones).














Indicating time and date

- Press the button  to call the time. The display shows the time according to setting plus the  symbol.




Press the button  a second time to call the date.

The display shows the date according to setting plus the  symbol.

Setting the time

- First, call 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 hours forwards / backwards 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 forwards / backwards 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 forwards / backwards as desired. Confirm the set value with the  button.

Setting the date

- Press the button  twice to call 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.

Battery and Power Supply

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 2.7. When the voltage drops below this value, the battery symbol will appear in the display. The stored data should then be read from the internal memory. Nevertheless, the data will be retained even at total breakdown of voltage, and can then be read when the device is serviced. Indicating the battery voltage

Indicating the battery voltage

Press the button to have the existing battery voltage indicated. 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. In case the user wants to integrate a battery by himself, the basic parameters can be restored by pressing the reset-button after having changed the battery.

By opening the GAMMA-SCOUT® the warranty will be lost.


Reset button


In case of a blank display (for example because of an exposure to powerful high frequency fields) the user may restart the device by pressing the reset button. You may find this button in the lower opening of the case besides the USB interface. To prevent a touching by error and thus deleting all EEPROM data this button can only be reached from upside on the board. Any reset will set the clock on factory standards.

**Attention:
The reset may delete your filed data.**

Ticker

A double click of the button will display the word ,On□, i.e. the ticker can be switched on now.




Touching the  button will switch on the ticker and the symbol „speaker“ is displayed.

In case the ticker had been switched on already, the double click would have displayed the word ,Off□. Using the  button would have switched off the ticker and the displayed „speaker“ will disappear.




With the ticker switched on, GAMMA-SCOUT® is making a beep for each pulse detected. Increasing radiation therefore will shift the single beeps to a growing cascade. The beeps are using 1000 times more power than the monitoring operation. Therefore we switch off the ticker internally after 10 minutes of use. If the ticker feature is used once per day, the power consumption still is in the limits of the long lasting battery. More ticker use, and this is filled, will cause a maintenance fee in case of battery change


w/ALERT - Alarm Threshold

Exceeding alert level threshold of the dose rate (w/ALERT version)

GAMMA-SCOUT® w/ALERT features an audio beep that sounds when radiation levels exceed a specific user-programmed level. The default alert level is 5 µSv/h. Along with the audio alert, the display will also show the  icon. Erasing the symbol  in the display is done by pressing the  button twice.

Programming the alert level of the dose rate

The button  pressed once is for control of the protocol (see page 13). A second pressing changes to status „alert level programming“. The set level is displayed. The  button increases, the  button decreases the threshold. The new value is displayed blinking.

The lowest possible value is 1.0 µSv/h. The step change is 1.0 µSv/h. The maximum possible alert level is 80 µSv/h. Press the button  to save the new selected level.

Counting of the (cumulative) dose

Display and reset of the dose (cumulative dose)

When the (cumulative) dose meter is running in the background, there is displayed the symbol

in the window. The dose is displayed X.XX mSv (milli Sv). Values of less than 0.01 mSv display 0.00 mSv. Start, stop, restart, and deleting of the dose display follow the chart below. Setting of the threshold for the dose see chart as well.



Log Setting

GAMMA-SCOUT® automatically logs the number of pulses measured, and stores this data in its






internal memory. This data can be read and processed by a personal computer.

The logging process is factory-set so 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 10 years.

As the following table shows, you can also set shorter logging intervals, with corresponding reductions in the storage capacity:

Logging interval	Display	Storage capacity	Memory
1 week	7d	>10 years	893 values
1 day	1d	approx. two years	768 values
1 hour	1h	four weeks	768 values
10 minutes	10 min	approx. five days	768 values
1 minute	1 min	twelve hours	768 values


Data log setting

- Press the button  to switch to log mode. The display shows the log symbol . Briefly, the bargraph will appear in addition, indicating how much log memory is still available. Each bar equals 4% 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 finally 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. The next section gives you detailed information on this subject.

GAMMA-SCOUT® automatically prolongs the logging interval to a week as soon as the memory capacity is more than 3/4 full.

Data Reading and Display (TOOLBOX Software)

Using the GAMMA-SCOUT® TOOLBOX software, you can transfer the data (Gamma-Hex-Dump), which GAMMA-SCOUT® has logged in its memory to a personal computer and convert them into

list- or graphical form for further processing. Connect your GAMMA-SCOUT® with the USB port of your personal computer, install the USB-driver and press the button  on the GAMMA-SCOUT® control panel to set the device into data transfer mode.

System requirements

© MS-Windows PC with a USB interface. GAMMA-SCOUT® TOOLBOX Software is supporting the following operating Systems at the moment: ©WIN NT 4.0, ©WIN 2000/2003, ©WIN XP.

Data download cable

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

Software installation

1. On the CD can be found

- The USB driver for ©Windows and the GAMMA-SCOUT® TOOLBOX software
- The installation routine (see picture below) and
- The multi language manuals with actual 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 "Autorun.exe" from the CD's root path manually by doubleclick.



Data Reading and Display (TOOLBOX Software)

Reading the data


Due to technical reasons (links to the MS Software on your hard disk), the reading program cannot be started directly from your CD. First the TOOLBOX software must be copied from your CD to your hard disk (see previous page "installation").

1. Connect your GAMMA-SCOUT® with your PC

- Build the connection using the attached cable

2. Download the data

- Start the reading program via „toolbox.exe“. Follow the menu:

- Shift to the operation mode "Download" on the GAMMA-SCOUT®, pressing the button 
- start the download via menu (slight delay before the bar chart of the running process appears)
- File the data or skip the filing
- Delete the data (or not) and leave the program

Details and Support see www.gamma-scout.com/helpdesk.pdf

Delete data

- At the end of the data reading via menu there is the step „delete“
- Outside the reading program it is intended via a button on the GAMMA-SCOUT® (in preparation)

Technical Data

Display	Liquid-crystal display (LCD), 4-digit, numeric with dimension, quasi-analogue logarithmic bar chart. Operating mode indicators						
Ray detector	End-window alpha-beta-gamma detector counting tube according to the Geiger-Müller principle Stainless steel housing with neon halogen filling 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 50.00 μ Sv/h						
Ray types	<table border="0"> <tr> <td>α (alpha)</td> <td>from 4 MeV</td> </tr> <tr> <td>β (beta)</td> <td>from 0.2 MeV</td> </tr> <tr> <td>γ (gamma)</td> <td>from 0.1 MeV</td> </tr> </table>	α (alpha)	from 4 MeV	β (beta)	from 0.2 MeV	γ (gamma)	from 0.1 MeV
α (alpha)	from 4 MeV						
β (beta)	from 0.2 MeV						
γ (gamma)	from 0.1 MeV						
Ray selection	<table border="0"> <tr> <td>$\alpha + \beta + \gamma$</td> <td>without shielding</td> </tr> <tr> <td>$\beta + \gamma$</td> <td>Al foil approx. 0,1 mm, shields off α completely</td> </tr> <tr> <td>γ</td> <td>Al shielding approx. 3 mm, Shielding off α completely and β to 2 MeV, weakens γ less than 7% based on Cs 137</td> </tr> </table>	$\alpha + \beta + \gamma$	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
$\alpha + \beta + \gamma$	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 cost free returned devices						
Power consumption	On average less than 10 microamperes						
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						
Service	GAMMA-SCOUT GmbH & Co. KG Abtsweg 15, D-69198 Schriesheim Fax: +49 (0) 62 20 / 66 40 E-Mail: drmirow@gamma-scout.com						
State	October 2007 (Right of modification reserved)						

Technical Data

Physical Term	New unit	Old unit	Relation
Activity	Becquerel (Bq) 1 Bq = 1/s	Curie (Ci)	1 Ci = $3,7 * 10^{10}$ Bq 1 Bq = $2,7 * 10^{-11}$ Ci = 27 pCi
Ion dose I	Coulomb / kg	Röntgen (R)	1 R = $2,58 * 10^{-4}$ 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

GAMMA-SCOUT® (ONLINE Model)

ONLINE Model

The ONLINE Model has been designed to transmit data cyclically from the GAMMA-SCOUT® to a connected USB port of any Personal Computer running © Microsoft Windows.

More information is to be found on our homepage in the internet www.gamma-scout.com or within the documentation on the CD directory ONLINE_VERSION/ENGLISH. .

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Keywords

A		M	
Alert level	5, 11	Measuring time setting	7
		Memory capacity	13
B		Memory clearing	13
Bar chart	5, 6, 15, 16	Microsievert	2, 5
Battery change	10		
Becquerel	8, 17	O	
		ONLINE Model	2, 18
C			
Current radiation	5	P	
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Data download cable	14	Pulse rate measuring	8
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Data storage GAMMA-SCOUT®	2	R	
Data transfer	14	Ray selection switch	4
Date	9	Ray type measuring	4, 16
Delete data	15	Reset button	10
Dose (cumulative)	2, 6, 12	Rem	2, 5, 17
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G		Technical data	16, 17
Geiger-Müller counting tube	4, 16	Ticker	2, 10
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		Delete ...	12
		⚠	
		Delete ...	11

In this direction will find a vision of the measurement technique:
<http://www.industrial-needs.com/measuring-instruments.htm>

NOTE: "This instrument doesn't have ATEX protection, so it should not be used in potentially explosive atmospheres (powder, flammable gases)."