



Operation Manual for the GRAETZ Dose Rate Meter **GammaTwin**



23.51
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1. Preface

To guarantee a faultless handling of the dose rate meter GRAETZ GammaTwin, please read the following operation manual carefully.

After having inserted the batteries and switched on the instrument, the user can immediately start measurement of ionizing radiation.

Please note: When applied in pulsed radiation fields the measuring results of the GammaTwin are not reliable as measurements are based on Geiger-Müller-tube technology. Thus, it is not suitable for pulsed X-rays.

2. Introduction

2.1 Possibilities of use

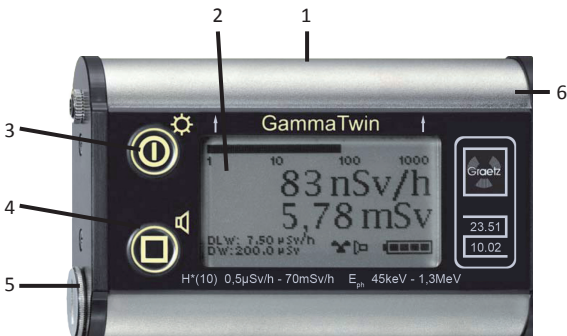
The GammaTwin is a very robust, reliable and easy to operate PTB-approved dose rate meter. It is used for the safe determination of the current local dose rate as well as the accumulated dose of photon radiation. The measurands are the ambient dose equivalent rate $\dot{H}^*(10)$ as well as the ambient dose equivalent $H^*(10)$.

The ambient dose equivalent rate $\dot{H}^*(10)$ as well as the ambient dose equivalent $H^*(10)$ are PTB-approved.

The GammaTwin offers the following features:

- ✓ activatable acoustic single-pulse indication
- ✓ activatable acoustic function control
- ✓ 4 dose and dose rate alarm thresholds each
- ✓ alternatively either simultaneous or separate indication of dose or dose rate
- ✓ automatic and continuous storage of the dose
- ✓ simple menu navigation
- ✓ illuminable display
- ✓ measured peak value of dose rate since switching on the GammaTwin

2.2 Control and display elements



- 1 privileged direction of irradiation and position of reference point in 12 mm depth
- 2 LC- display
- 3 button for ON/OFF and background illumination
- 4 button for menu and acoustic single-pulse indication
- 5 screw for battery compartment
- 6 sound source

3. Putting into operation

3.1 Before use

Before starting the instrument the user has to ensure that the GammaTwin is not damaged and is correctly equipped with two batteries of the type AAA 1,5 V (polarity acc. to the corresponding label). For perfect contacting, please tighten the screw of the battery compartment by means of a coin. Remove the protective foil from the display.

3.2 Switching ON/OFF

The GammaTwin is turned on by briefly pressing the ①-button. The instrument passes a self-test, in which the user may control the alarm signal and all segments of the display. Furthermore, the serial number, the software version as well as the check sum of the software are displayed. The PTB-approved version of the firmware and the corresponding check sum are indicated in chapter 8 (technical data). If there is no error, the GammaTwin is directly starting operation.

When pressing the button ① for more than 2 seconds during operation, the instrument is switched off and the following safety check will appear:

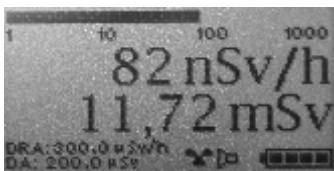


All active settings and the acoustic single pulse indication will be stored. An activated acoustic alarm or acoustic error messages have to be acknowledged before switching off the GammaTwin.

3.3 Indication

The user can either select the separate indication of dose and dose rate or the simultaneous indication („Twin“-indication). The dual „Twin“-indication is preset by GRAETZ.

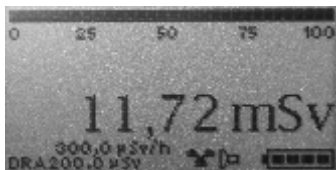
3.3.1 „Twin“-indication



Displayed elements:

- bargraph (analog/logarithmic indication of the dose rate)
- dose rate
- dose
- activated dose rate alarm threshold (DRA)
- activated dose alarm threshold (DA)
- function control (flashing once per second)
- loudspeaker symbol (when acoustic single-pulse indication is activated)
- battery symbol

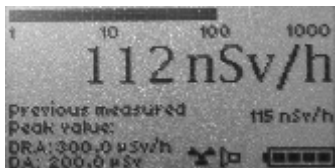
3.3.2 Dose indication



Displayed elements:

- bargraph (shows the dose in percentages of the activated alarm threshold)
- dose
- active alarm thresholds (DRA/DA – as shown above)
- function control (flashing once per second)
- loudspeaker symbol (when acoustic single-pulse indication is activated)
- battery symbol

3.3.3 Dose rate indication



Displayed elements:

- bargraph (analog/logarithmic indication of the dose rate)
- dose rate
- measured peak value since switching on the GammaTwin
- active alarm thresholds (DRA/DA – as shown above)
- function control (flashing once per second)
- loudspeaker symbol (when acoustic single-pulse indication is activated)
- battery symbol

3.4 Single-pulse indication and functional control signal

By briefly pressing the button  the acoustic single-pulse indication is activated respectively deactivated. When activated, the loudspeaker symbol is displayed and each GM-tube pulse triggers a brief sound.

This setting can be changed in the menu „Acoustics“, where it is possible to reduce the pulse rate of the background radiation in such a way that only the twentieth GM-tube pulse will trigger a sound. Additionally, a functional control signal sounds approx. every two minutes, indicating the GammaTwin is correctly working. This signal can be combined with both acoustic single-pulse indications.

3.5 Display illumination

During operation the display illumination can be turned on by pressing the button .

By briefly pressing the key once again, the illumination is turned off. For saving the batteries energy, the illumination automatically turns off after approx. 10 seconds.

During menu operation it is not possible to switch illumination on or off, because then the corresponding button has another function. Thus, the illumination has to be activated before menu operation. Illumination will switch off when leaving the menu.

3.6 Acknowledgement of acoustic alarms

Triggered alarms or error messages can be acknowledged by briefly pressing the button ①. Then, the acoustic alarm signal is switched off, but the optical warning remains still active. In case of serious errors, the GammaTwin automatically switches off after acknowledgement (see chapter 6).

4. Alarm messages

4.1 Dose and dose rate alarm

When an activated alarm threshold is exceeded, the display is blinking.

In case of an exceeded dose alarm threshold, the display switches to the dose indication and in case of an exceeded dose rate alarm threshold to the dose rate indication. If both, the dose and the dose rate alarm threshold are exceeded, the „Twin“-indication is displayed.

In case of a dose rate alarm short constant acoustic warning signals will be triggered. If the acoustic alarm has been activated in the menu, the warning signal sounds every second.

Such an alarm can be acknowledged by means of the ①-key. Thus, the acoustic alarm is switched off and the menu returns to the selected standard display. But, the triggered alarm threshold is still blinking.

The acoustic alarm will be re-triggered as soon as the measured value falls below an already acknowledged dose rate alarm threshold and is then exceeded again.

4.2 Battery alarm

The GammaTwin regularly checks the charge of the batteries. The displayed battery symbol indicates the residual capacity. When this signal starts blinking, the batteries have to be replaced as soon as possible (please also see chapter 6.2).

5. The menu

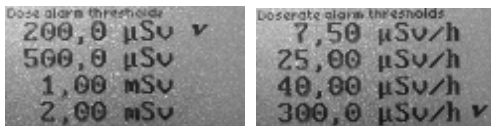
5.1 Activate the menu

The GammaTwin's menu is activated by pressing the button  for at least 2 seconds. If for 30 seconds no key is pressed during menu operation, the instrument automatically returns to the preset standard display. Settings changed within a menu point will be taken over and stored.

5.1.1 Menu operation

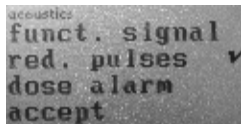
There are five different menu points the user can scroll through by means of the -button.

5.1.2 Dose and dose rate alarm thresholds



In these both menus the activated alarm threshold is marked by a hook. By using the  button it is possible to scroll through the single alarm thresholds. With the -button the inverse shown alarm threshold is chosen (black line, white figures) and activated. By pressing this -button again, the next menu point is selected.

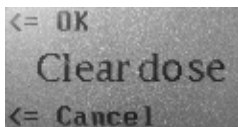
5.1.3 Acoustics



By using the -button it is possible to scroll through the lines. With the -button the inverse shown option can be selected. This selection is marked by a hook. By pushing the button 

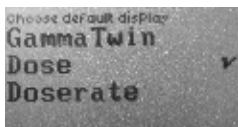
in the line „accept“, the setting is taken over and the GammaTwin changes to the next menu point.

5.1.4 Dose



In this menu the user can irrevocably clear the accumulated dose by pressing the button ①. By using the button ② it is possible to scroll to the next menu point without clearing the dose.

5.1.5 Setting basic display



Here, the user sets the indication which will appear when starting the GammaTwin and when leaving the menu.

The activated basic setting is marked by a hook. By means of the ①-button, it is possible to scroll through the display indications. With the button ② the inverse shown line can be selected and taken over as standard display. For leaving the menu, the button ③ has to be pressed again.

6. Possible defects

6.1 Error messages

Each time being switched on, the GammaTwin passes a self-test. Additionally, all important functions are continuously controlled during operation. In case of an error, the user will be informed by a corresponding error message.

6.2 Batteries discharged

If battery voltage falls below 1.8 volt, operation of the GammaTwin cannot be continued. By pressing the button ① the instrument switches off. Remove and dispose the batteries immediately, even if there are no new batteries available.

6.3 Other error messages

For all other errors the GammaTwin switches off by pressing the button ①. Switch the GammaTwin on. If the error occurs again, the GammaTwin has to be returned to GRAETZ for repair.

6.4 Switching on

- *The GammaTwin cannot be switched on.*

Control the batteries (sufficient voltage available?). If it is still not possible to switch on the instrument, return the GammaTwin to GRAETZ for repair.

- *Not all pixels are displayed during display test.*

Return the GammaTwin to GRAETZ for repair.

- *No audible signal during switching-on test.*

Return the GammaTwin to GRAETZ for repair.

- *The firmware version doesn't correspond to the value given in chapter 8.*

Return the GammaTwin to GRAETZ for repair.

- *The check sum doesn't meet the value in chapter 8.*

Return the GammaTwin to GRAETZ for repair.

6.5 Measuring operation

- *Instrument doesn't work correctly, function control is not blinking, no entries possible when operating the buttons.*

Remove the batteries for approx. one minute. If the error occurs again, the GammaTwin is defective and has to be returned to GRAETZ for repair.

Remark:

During „Twin“- or dose rate indication, the bargraph doesn't correspond to the measured value. This is correct, as the bargraph shows a minor smoothed measured value than the digital indication. Thus, tendencies can be recognized more quickly. Especially in case of lower dose rates deviations can be larger.

7. Disposal of disused devices

Old electric/electronic instruments often still contain valuable materials, but also harmful materials which have been necessary for its function.



Disused devices do not belong to residual waste. GRAETZ Strahlungsmeßtechnik GmbH takes your old device back free of charge and cares for its skilled disposal.

This applies to all instruments delivered since August 2005.

Please remember that the batteries required for operating the instrument do not belong to domestic waste. They have to be disposed as special waste. Trade is obliged to take back exhausted batteries and to care for skilled disposal.

8. Technical data

Kind of dosimeter	portable dose rate meter with built-in Geiger-Müller tube
GM-tube type	70019A
Type	GRAETZ GammaTwin
Manufacturer	GRAETZ Strahlungsmeßtechnik GmbH Westiger Straße 172 D-58762 Altena/Germany
Kind of radiation	Gamma and X-rays (for DC-installations only, not suitable for pulsed X-rays)
Adjustment/Calibration	using gamma radiation ^{137}Cs (662 keV)
Measurand	ambient dose equivalent rate $\dot{H}^*(10)$ and ambient dose equivalent $H^*(10)$
Range of photon energy	45 keV bis 1.3 MeV
Optimum direction of incident radiation	vertical on to the housing radius

Angle of incidence	$\pm 45^\circ$ referred to the reference orientation of incident radiation
Normal position	horizontal, reading from above
Dimensions of the detector	46 mm, $\varnothing$ 19 mm (effective length 39 mm)
Position of the detector	inside the device parallel to the longitudinal side above the display
Position of reference point	approx. in the middle of the instrument on the axis of the sound source, marked by a dot-like marking on the housing
Rated ranges of:	
- relative humidity	0 up to 95%, IP54
- outside air pressure	100 up to 1300 hPa, influence negligible
- temperature	-20°C bis +60°C
Range of indication:	
- dose rate	0 nSv/h - 70 mSv/h
- dose	0 nSv - 1.0 Sv
Measuring range:	
- dose rate	0.5 μ Sv/h - 70 mSv/h
- dose	0.5 μ Sv - 1.0 Sv

Dose rate alarm thresholds ¹⁾	7.5 $\mu\text{Sv/h}$ 25 $\mu\text{Sv/h}$ 40 $\mu\text{Sv/h}$ 300 $\mu\text{Sv/h}$
Dose alarm thresholds ¹⁾	200 μSv 500 μSv 1000 μSv 2000 μSv
Coefficient of variation depending on the dose rate	$\leq 15\%$ (see figure 1)
Linearity of dose rate indication in the measuring range	$\pm 10\%$
Average life time of the GM-tube	$6 \cdot 10^{10}$ counts (corresponding to approx. 10 Sv)
Sensitivity of the GM-tube (at 662keV, ^{137}Cs)	1.6 counts/s / $\mu\text{Sv/h}$
Dead time of the GM-tube	$\leq 60 \mu\text{s}$
Response time	3 - 60 s (depending on the measuring range)
Cycle time	1 s
Max. possible measuring time at a dose of 0,5 μSv	approx. 10 h

Power supply	2 batteries 1.5 V type AAA
Operating voltage	2.2 – 3.4 V
Acoustic control	with the dose rate increasing single-pulse indication
Alarm signal	approx. 80 dB(A) in 0.3 m distance
Software or	version 1.4 with check sum 627B version 1.5 with check sum 5958

REMARK:

It is possible that the alarm signal is not sufficient for extremely loud working environments.

¹⁾ The alarm thresholds are preset by GRAETZ.
Upon request, any value within the measuring range can be set by GRAETZ.

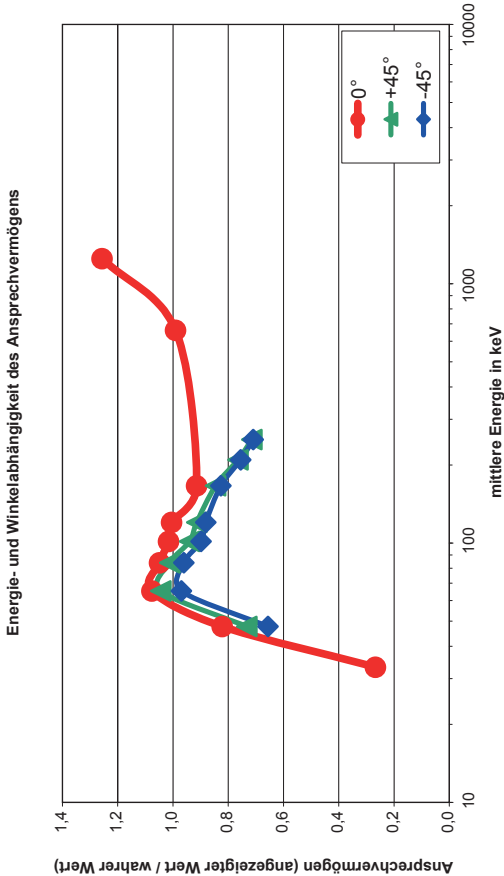


Fig. 1 (page 29) shows the diagram „energy and angle dependence as a function of the response“ (indicated value/real value) for different radiation energies.

Red curve:

incident radiation in the preferred direction

Green/blue curve:

45° angle referred to the incident radiation

9. Repair and maintenance

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<http://www.graetz.com>

