



GammALERT SYSTEM

EARLY WARNING Gamma Ray
ENVIRONMENTAL RADIOACTIVITY
MONITORING SYSTEM

with data and alarm transmission in real-time



- Radioactive Monitoring Networks
- Supervision of borders, airports and railway stations

- Hospital Surveillance
- Nuclear Power Plants
- Radioactive Waste Storage



GENERAL DESCRIPTION**GammALERT SYSTEM**

The **GammALERT SYSTEM** has been developed having in mind the importance of counting on a first quality early warning Gamma Ray Environmental Radioactivity Monitoring Solution with application in an extensive range of possible utilizations, such as in monitoring networks for early warning civil protection, with coverage of wide areas; hospital surveillance at radiation therapy wards; supervision at borders, airports, railway stations; accidental radiation generated by Nuclear Power Plants, storage and truck/train transportation of fusionable materials, etc...

The **GammALERT SYSTEM** can be made up of one or more **Remote Measuring Stations** that would store and transmit gamma radiation levels in the air as well as alarms to a **Central Receiving Station** and /or to the Civil Protection Authorities in case of an event.

The **Remote Measuring Station** consists of two main parts:

- The first one is a very advanced digital gamma detector Model GammaMETER-RS04.
- The second element is the Data Acquisition and Transmission Unit Model GammaDATA-2000C, that receives the digital signal generated by the gamma detector RS04, storing all the measurements and calculations on its internal memory. Data and alarms, are also Transmitted by the GammaData-2000C Unit to a Central Receiving Station and to the Civil Protection Authorities.

Both the GammaMETER-RS04 and the GammaDATA-2000C unit that configure the Remote Radioactive Monitoring Station, are described below.

GENERAL DESCRIPTION**GammaMETER-RS04**

The Gamma detector, type RS04 has been designed for measuring radioactivity of gamma radiation. It is calibrated in the quantity of "ambient dose equivalent rate" [$H^*(10)$], its measuring range comprises 9 decades (from 10 nSv/h up to 10 Sv/h). This wide measuring range permits detecting minor changes in the ambient natural radioactivity as well as measuring high dosage rates. The detector is available in two versions: type RS04/H for wide energy range and type RS04/L for low energy range.



The **GammaMETER RS-04** consists on a proportional counter tube of type NPGD02. A large number of these counter tubes have been in operation in several European countries for many years and have set a new worldwide environmental surveillance standard. This specific model is unique as it is the only that is able to cover a 9-decade measuring range with a single detector.

One of the major advantages is that the counter tube's sensitivity to natural ambient radiation is rather high despite its wide measuring range. The tube's durability is practically independent of the number of pulses. After a high dose irradiation the detector can be regenerated automatically by a one month refresh (out of operation).

The signal processing unit was developed on the basis of extensive experiences gained over many years. This microprocessor processes the signals of the detector tube, converts them into the quantity of ambient dose equivalent rate [$H^*(10)$], controls continuously the operation of the detector, stores the measured data and ensures the communication between the detector and Gamma Data-2000C Unit.

An extra stable high-voltage unit ensures the solid operation of the counter tube. Additionally all electric in- and outputs are equipped with special protection filters (NEMP¹) providing excellent lightning protection.

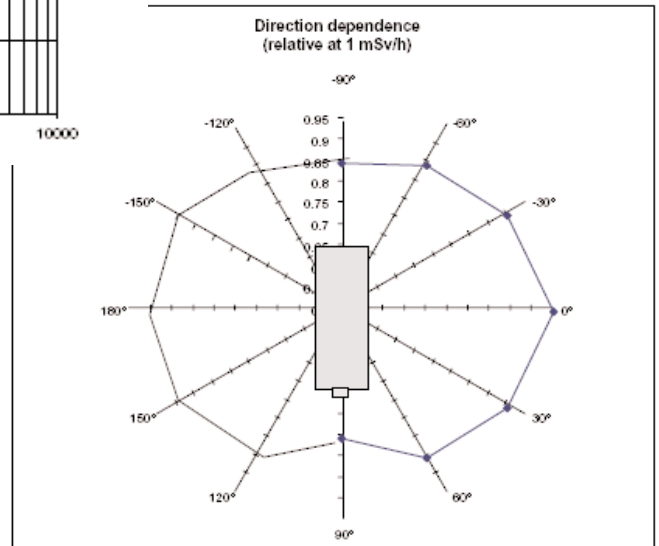
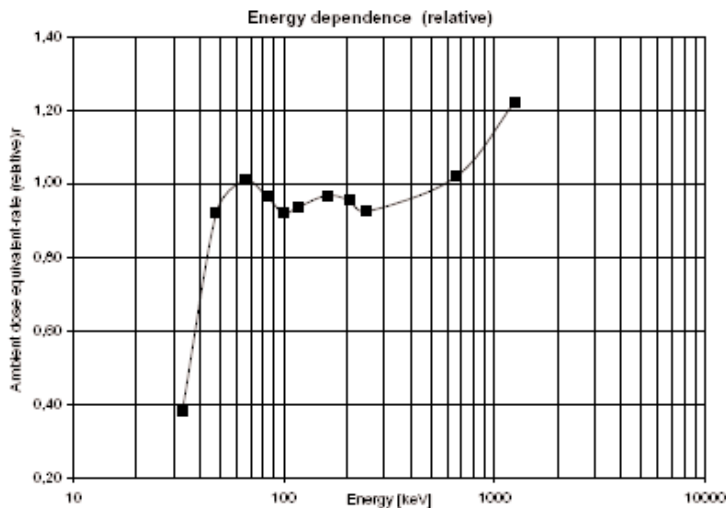
The complete equipment of the detector is housed in a waterproof aluminum tube with a wall thickness of 2 mm. The connector is waterproof, too.

¹ Nuclear Electromagnetic Pulse

TECHNICAL SPECIFICATIONS (1 of 2)

GammaMETER-RS04

Type	RS04H/232, RS04H/485	RS04L/232, RS04L/485
	Proportional counter, Type NPGD 02 with energy compensation	
	Type C8051F022 Silicon Labs, compatible with Intel 8051	
Measuring range	10 nSv/h ÷ 10 Sv/h	10 nSv/h ÷ 15 mSv/h
Energy Range (±30%, ref. Cs-137)	H*(10) ≤ 30 mSv/h: 40 keV ÷ 3 MeV H*(10) > 30 mSv/h: 100 keV ÷ 3MeV	40 keV ÷ 3 MeV
Temperature Range	-30°C ÷ +70°C	
Temperature Dependence	H*(10) ≤ 1 mSv/h: ±3% H*(10) > 1 mSv/h: -20%, +50%	
Measuring uncertainty	H*(10) ≤ 1 Sv/h: ±10% H*(10) > 1 Sv/h: ±15%	
Output	RS-232 or RS-485	
Real time clock	Yes	
Data Storage memory	Yes	
Real time data	Yes	
Power Consumption	max. 50 mA (10,5V _{DC} ÷ 13,8 V _{DC})	
Dimensions	Ø76 mm x 500 mm	
Weight	ca. 2,5 kg	



TECHNICAL SPECIFICATIONS (2 of 2)

GammaMETER-RS04

Adjustable parameters in type RS04/232 and RS04/485:

- Date, time
- Data storage period
- History limit
- 8 alarm level with hysteresis
- Resetting (zeroing) of the accumulated dose values
- Able/disable of generating reports (in type RS485 disable is default)

Available data and parameters:

- Ambient dose-equivalent rate
- Accumulated dose-equivalent values at alarm levels.
- Ambient dose-equivalent values, measured in the last 10 minutes in 1 minute interval
- Ambient dose-equivalent rate values measured in the last 72 hours and in 10 minutes interval
- Reports
- Status (Power voltage/current, temperature inside, etc.)

Preset parameters

Measured values in type RS04/232 and RS04/485:

- Ambient dose-equivalent rate in Sv/h
- Status
- Input power voltage in Volt-s
- Current consumption in mA-s
- High-voltage in Volt-s
- Inside temperature in °C
- Analogue power voltage (inside) in Volt-s
- The last measured counts (pulses) normalized for 1 second.
- The last measured detector current in mA-s

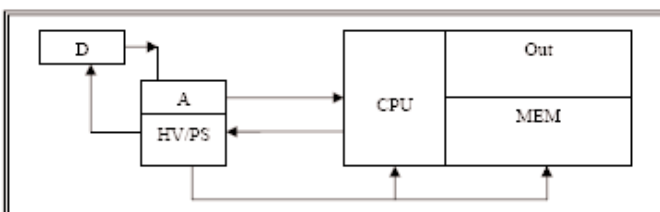


OPERATION GammaMETER-RS04

BLOCK DIAGRAM

The gamma detector consists of four main parts:

- Proportional counter, equipped with energy compensation
- Pulse and current amplifier and high-voltage unit
- Microprocessor unit
- Cover tube



- D Proportional counter tube, type NPBGD02
- A Amplifier
- PS Power Supply
- CPU Central Processor Unit
- MEM Storage memory
- Out Output unit

The proportional counter works as a pulse generator in the low dose-rate range, and as a current source (integral of the pulses) in the high dose-rate range. Both signals are processed by the microprocessor; the transition range between the two operation modes is calculated by software. In the highest dose-rate ranges the high voltage of the counter tube is reduced by 25% ÷ 30%.

THE DETECTOR

The counter tube is a proportional tube, type NPDG-02. The counter tube is filled with a special gas mixture; in the tube's axle a thin anode wire is fixed. An energy compensation filter equipped with appropriate insulation is mounted on to the tube. In the RS04 detectors the counter tubes are applied to following work points: -1700V cathode voltage and 0 V anode voltage. The energy compensation filter is connected to 0V potential in order to reduce electric disturbances.

PULSE AND CURRENT AMPLIFIER

This unit forms the pulses of the counter tube and fits them to the microprocessor. If the counts of the pulses are too high, the unit reduces the high voltage on the cathode, i.e. decreases the gas-amplification. In the current mode the AD converter processes the current of the counter tube.

MICROPROCESSOR UNIT

This unit is based on the Silicon Labs type C8051F022 microcontroller circuit. This chip is completed with the following circuits:
32 kbyte additional RAM FM25L256
Real time clock DS3231

COVER TUBE

All the parts are placed in a 2mm thick aluminium tube. The connector and the cover itself are dust protected and waterproof.

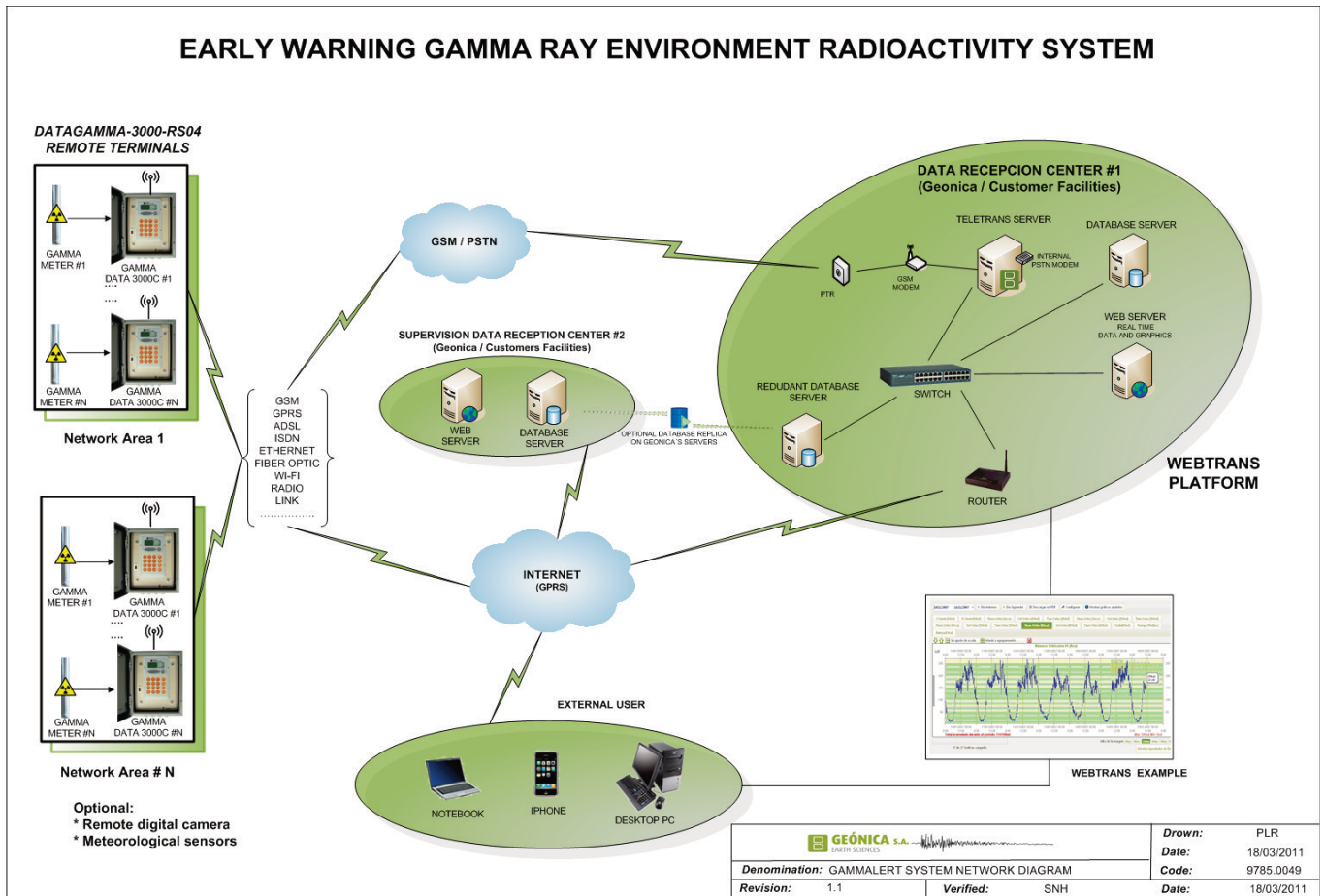
GENERAL DESCRIPTION

GammaDATA-3000C

Model **GammaDATA-3000C** is an automatic Data Acquisition and Transmission Unit, specially designed for outdoors installation in remote unattended areas, with the possibility of building radioactive environmental monitoring networks, comprising an undetermined number of field stations, and one or more Central Stations for receiving, storing, presenting and processing environmental gamma ray data and alarms generated by the Gamma Meter detector connected to this unit.

Gamma ray data and alarms can be transmitted from the Remote Measuring Station to Central Station using any of the communication options and alternative available such as: cellular networks GSM/GPRS/CDMA, point-to-point radio link, Ethernet connection, and also via satellite (INMARSAT, GOES, IRIDIUM, ARGOS, etc...). From the Central Receiving Station it is possible to manually or automatically get data and alarms in real-time from each and every one of the remote measuring stations, as well as remotely program all their functionalities.

Data transmission using TCP/IP and FTP protocols is also possible as shown in the following communication diagrams:



MAIN FEATURES**GammaDATA-3000C****Inputs/Outputs (total 16, plus 4/6 serial ports):**

- 8 Analog Input channels (differential)
- 2 Digital Inputs; 4000 V galvanic insulation
- 2 Digital Outputs; 4000 V galvanic insulation
- 4 Pulse channels (16 bits) for pluviometers, anemometers and other similar sensors with impulse output.

Communication Ports (4 standard; 6 optional):

- Com 1: General purpose RS232 serial port
- Com 2: development (Dedicated)
- Com 3: General purpose, programmable RS232/422/485 serial port
- Com 4: Serial port for connection to modems GSM, GPRS, PTSN, etc.
- Com 5/6: Two additional optional ports

Storage memory:

- 64 MB internal memory.
- Optional 2GB removable SD memory card.

Data Transmission

Depending on the user requirements, Unit 3000CP is capable of transmitting the data to the central facility in several ways:

- Serial port RS232/422/485
- Cellular Modem GSM/GPRS/3G
- Ethernet connection - Radio link
- Fiber optic
- Wi-Fi/Bluetooth
- Satellite (INMARSAT, VSAT, etc)
- Internet



Such flexibility on the communication ports, inputs and outputs and memory capacity, allows the system to be connected to a large number of different sensors like anemometers, visibilimeters, rain gauges, etc., and also noise processors or digital cameras for image acquisition and transmission.

The Data Recording and Transmission Unit is mounted on a IP-67 Polypropylene housing (dimensions 41x33x18cm). Batteries, charge regulator, communications modem, keyboard and visual display (optional) are all also enclosed into the same cabinet.



TECHNICAL SPECIFICATIONS

DATA RECEPTION CENTER

HARDWARE

In the Central Station a typical configuration includes the following elements:

- Communications Hardware for the reception of data transmitted by the Remote Stations (i.e. GSM modems, switching devices, Satellite Receivers...)
- Communications (TELETRANS) Server: For querying data from the Remote Stations
- Database Server, including: Processor Power EdgeT100 or similar, including:
 - SQL Database
 - SQL License

- Web Server: That hosts the Web Hosting Service (Webtrans)
- Optional workstations: For one / several users stations management as Client mode

For a small size layout Communications SW and Database may be settle in the same Server. The Central station admits both for servers and Communication Hardware fully redundancy giving the System maximum robustness.

MANAGEMENT SOFTWARE

GEONICA SUITE is a set of software programs

GEONICA proprietary for Remote Stations configuration and Data Management. The software package runs under Windows operating system.

To facilitate the installation of each application, **GEONICA** provides **INSTALLSHIELD**, an advanced installation environment which provides the user full control over the software components, folders, total or partial uninstall/install rights, etc.

Software components are described below:

- **TELETRANS** enables the remote configuration and management of any number of terminals from the central facility (number of stations depends on the server configuration). It allows as well real time -statistical and raw- data download. Download can be done to a database or to files.

- **DATAGRAPH**. This application performs queries to the user local database and displays the data in graphical or tabular form. Statistical values with configurable periodicity, parameters value comparison between stations, variation over the time, etc is all possible with Datagraph.

- **FLASH READER**. Software application to download the data from an optional 2 GB retrievable SD card into the database. It also permits to export the data into ASCII and CSV files.

- **GAVIA**. This application gives the user the possibility to design its own graphical interface by customizing the layout of the page. The user can modify the way the different parameters are shown (bars, clocks, etc.) by creating its own environment. GAVIA allows real-time data monitoring. The operator can also set up certain thresholds triggering alarms to be distributed to a group of users via SMS or email. If the program is installed in an Operations Center, the user can configure audible alarms to be activated once the threshold is exceeded. To install Gavia, Teletrans application is required.

WEBPOSTING SOFTWARE

A very valuable option offered by **GEONICA** with the **GammALERT SYSTEM**, is the possibility of WEB Posting, in such a way to provide worldwide access via INTERNET to the historical and instant values of all the parameters measured at the remote station.

Data visualization in Internet is possible thanks to **WEBTRANS Ubiquitas** Application. User is granted to access of his account and look at the traffic parameters any number of remote terminals (number of stations depends on the server configuration).

