



# Drinking Water and Waste Water Gamma Radiation Monitor

Model Series: **NEXGAMMA-2**

**NEXGAMMA-2,  
NEXGAMMA-2G,  
NEXGAMMA-2LE**



- World's only PAG-Level Gamma Water Monitor
- Full SCADA Compatibility
- **Optional** – Alpha, Beta, Tritium, Radon Detection
- **Optional** – Submersible Gamma Probe

## Applications

- Monitor Water Against Radioactive Gamma Contaminants
- Drinking Water
- Waste Water
- Ground or Surface Water
- Liquid-Waste-Stream from Laboratory or Plant
- Industrial Process Water

## Features

- Measures at or Below EPA/DHS PAG Levels Protective Action Guideline Levels and Military Drinking Water Limits
- Rugged Real Time, Continuous, In-line or Transportable
- Isotope Identifier – Detector Type: NaI (TI) or HPGe
- Highly Sensitive Gamma Spectrum (MCA)
- High Sensitivity and Wide Range
- No Reagent Tanks to Fill, No Waste Stream
- Alarm - Audio / Visual – User Settable, Easy Calibration


## Problem

Drinking water and waste water sources are vulnerable to accidental or knowing contamination by individuals, groups, industry, medical labs, terrorists and from naturally occurring radioactive materials (NORM). As yet very few water and waste water districts have real-time radiation monitors in place to protect the water and the public. The NexGamma-2 is helpful because **discharge permits require data analysis of waste water.**

**Real-Time Radiation Monitoring of Industrial Process  
Water Has Not Been Available Until Now.**



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## Solution

For the first time in a **Continuous Real Time radiation monitor** the TA's **NEXGAMMA-2** solves this problem by continuously monitoring water using Gamma radiation scintillation detectors with (NaI) crystals.

- Information is analyzed and displayed in units of picoCuries per liter. User settable measurement units.
- Calculations are updated every minute, every hour and every day.
- Longer update times correspond with greater precision and increased sensitivity.
- Sensitivities meet or exceed DHS Protective Action Guideline Levels.
- TA Tried and True sample collection and measurement technology measures Gamma from any radioactive liquids.
- Measurements of radiation concentration and total discharge are logged 24 hr/day, 7 day/week.
- Determines and identifies individual radionuclides.

## Description

**The NEXGAMMA-2 Monitors come with three detector choices:**

**NEXGAMMA-2, NEXGAMMA-2G, NEXGAMMA-2LE. Please see the following charts for details.**

The **NEXGAMMA-2** is a multi-channel water monitor/controller for measuring of Gamma-emitting radionuclides. It simultaneously measures individual Gamma isotopes. The electronics are microprocessor with color LCD display. The pre-amps are plug in modules allowing change or addition of functions at a later date, and allow rapid repair by module replacement in the field. The modular system is covered by TA's unique exchange warranty system in addition to the full one year warranty. On-site warranties available in many areas.

Detector shields are made of (2") welded steel or aluminum housing suitable for filling with lead or other material. They are designed for a long useful life and easy decontamination. Gamma Spec shield can be opened for cleaning with little effort. All connections are sealed against leaks. The standard water moving system is based on a high precision pump with a 2.5 liter flow through helix or optional 20 liter tank.

### Three Ways for Continuous Real-Time Monitoring of Gamma Radiation in Water

#### How To Select The Optimum Method

#### 1. Put submersible probe directly into the river or lake - Optional

**Pro:** It is simple, No pump needed, the lake acts like a very high volume tank, so system sensitivity will be good

**Con:**

- Submersible probes cost more, can break or leak or be contaminated easily, and a valuable detector may be subject to theft
- User must do his measurement next to the lake or install special signal transmission
- Submersible probe only works if there is a river, lake, or sump. It is not useful for water flowing in a pipe

#### 2. Pump water into a tank with a probe in the center - Optional

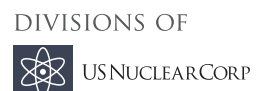
**Pro:** A big tank can give good sensitivity

**Con:**

- A big tank can have slow "wash-out" characteristics. This means that the 'new' tank water currently being measured may contain residual water from previous measurement activity
- Overtime the tank may collect sand, algae or other contaminants. Therefore an uncontaminated/CLEAN tank may be difficult to thoroughly clean and expensive to replace



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**3. OPTIMUM METHOD** - Pump the water in through a TA Helix Hose; one that twines (spirals) around the detector and returns back to the source of the water - **STANDARD**

**PRO:** There is no mixing of old water with new water. All water is fresh assuring accurate measurement. In case of contamination, replacement of spiral tube is quick and inexpensive.

**Con:** The volume of water in the spiral tube is less than the water volume in a big tank or in the lake.

A wide range of pump capacities are available to meet user specific needs. The entire system is mounted in a rugged, wheeled, self-contained rugged cabinet. The NEXGAMMA-2 comes complete with all cabling tubing and connectors in place and is ready to operate. 115 Volt 60Hz is standard; 220 Volt 50/60 Hz is optional.

## Isotope Identification System


The water is measured for Gamma-emitter content, using an advanced high resolution MCA analyzer. The energy range is user settable. For example the MCA can be set for Gamma energy of 10 KeV to 3 MeV or above.

Peak Detection and Isotope Identification **TA SMART-PEAK™** Software detects radiation peaks even at very low Gamma concentration. In the event of high activity and during system calibration, the isotope identifier function takes over and displays the exact radioactive nuclides in the water.

ISOTOPE	DETECTION LIMITS			SENSOR METHOD	
	LOW	LOW	HIGH	RESPONSE RATE -	
	KBq/m <sup>3</sup>	pCi/L	pCi/L	SLOW	FAST
<sup>58</sup> Co	3.7 x 10 <sup>-1</sup> KBq/m <sup>3</sup>	10 pCi/L	1 x 10 <sup>7</sup>	3" x 3" Na" (T") Crystal	Intrinsic HPGe
<sup>60</sup> Co	1 x 10 <sup>0</sup> KBq/m <sup>3</sup>	27 pCi/L	1 x 10 <sup>7</sup>	3" x 3" Na" (T") Crystal	Intrinsic HPGe
<sup>131</sup> I	5 x 10 <sup>-1</sup> KBq/m <sup>3</sup>	13.5 pCi/L	3 x 10 <sup>6</sup>	3" x 3" Na" (T") Crystal	Intrinsic HPGe
<sup>137</sup> Cs	6 x 10 <sup>-1</sup> KBq/m <sup>3</sup>	16.2 pCi/L	6 x 10 <sup>6</sup>	3" x 3" Na" (T") Crystal	Intrinsic HPGe
<b>OPTIONS</b>	<b>pCi/L</b>				
TRITIUM	0.2 µCi/l		1 x 10 <sup>6</sup>	Bed of Crushed Scintillation Crystals	
RADON	100 pCi/l		2,000 pCi/l	Expel Radon Gas into Ion chamber	
ALPHA – <sup>238</sup> U	3,000 pCi/l		2 x 10 <sup>7</sup>	5" Dia Dual PM Tube 1,000 ml chamber	
<sup>210</sup> Po	3,000 pCi/l		2 x 10 <sup>7</sup>	5" Bed of Crushed Scintillation Crystals	
BETA – <sup>40</sup> K	3,000 pCi/l		2 x 10 <sup>7</sup>	5" Dia Dual PM Tube 1,000 ml chamber	
<sup>137</sup> C	3,000 pCi/l		2 x 10 <sup>7</sup>	1100 cm <sup>2</sup> Beta Scintillator	
<sup>90</sup> Sr	200 pCi/l		1 x 10 <sup>6</sup>	1100 cm <sup>2</sup> Beta Scintillator	



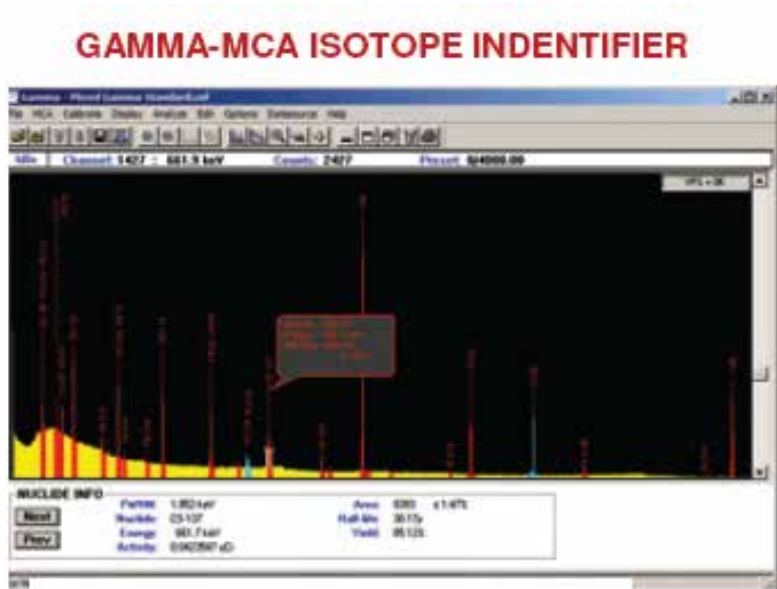
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## DATA: Analysis

In each peak or area of interest, the net counts are automatically converted to user settable units, of picoCuries/liter or KBq/m<sup>3</sup> (using the detector efficiencies automatically measured and stored previously by NEXGAMMA-2 semi-automatic self-calibration procedure).

The concentration and total activity released and MDA levels are continuously calculated and recorded. This real time information will alert the notification system. All data is saved to the hard drive in spreadsheet format.

Historical data is easily displayed on-screen and may be printed out with optional graphics printer in tabular or graphical format, showing quantitative information as well as trends. Data is recorded frequently providing excellent time-resolution.

Ethernet and USB ports (with security) provides easy access for archiving and further data analysis.

**Continuous, Reliable Data – YES                      False Alarms – NO**

Our systems have multiple layers of protections and redundancy in both the software and the physical act of reporting an alarm which prevents false alarms. This can include an optional alarm voting system providing activation of alarms only if all the data is consistent and conclusive. Data is continuously recorded to allow user interpretation.

Each alarm activates fail-safe relays. Relay contacts are available to user.

### Optional

**Triggered Aliquot:** This feature automatically collects and stores a small water sample for independent analysis whenever an alarm or event of interest occurs.

**Submersible Probe:** For easy measurement in lake, river, or sump.

**Sample Tank:** Nominal 20 liter tank, please see list of Pros and Cons - [How To Select The Optimum Method](#)



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## System Includes:

UV Lamp:	Used on inlet as algae-cide
Flat Screen Monitor:	LCD High Color Graphics
Hard Drive:	1 Terabyte
DATA Acquisition:	Board and all Cables
High Speed Ethernet access:	LAN or SCADA hookup
Specialized software:	Designed for Gamma Spectrum Detection; user friendly adaptability
Optional:	MODBUS or other protocols

## System Flow Rate

Optional:	Per Customer Requirement: Very wide range of flow rates is available
Sample temperature standard:	Up to 80° F liquid. (optional to higher temperatures)
Ambient temperature:	65° F - 100° F (wider temperatures ranges optional)
Optional:	Cooler model Cool-33 for detector and sample is used in case of higher sample or ambient temperatures AND/OR for increased precision measurements

## NOTE FOR SELECTION OF INTRINSIC HPGe DETECTOR - NEXGAMMA-2G:

NEXGAMMA-2G:	Includes an installed Dewar to maintain HPGe at proper temperature range
Optional:	An electronic cryo-cooler is available A sample pre-Cooler-33-G is installed in the NEXGAMMA-2G system

## SIZE AND WEIGHT:

### NEXGAMMA-2 & NEXGAMMA-2G


Dimensions:	<b>One cabinet:</b> 23" Wide x 31" Deep x 36" High including wheels
Wheels:	5" dia, High capacity, rugged wheels with lock and rubber tires
Shipping weight:	Standard unit: 250kg / 550 lbs - excluding shielding

### NEXGAMMA-2LE

Dimensions:	<b>Detector, Tubing Helix, Aluminum Shell:</b> 24" H x 12" Diameter <b>Electronic Console and Monitor:</b> 15" Deep x 10" High x 6" Wide
Weight:	25 kg / 55 lbs - excluding shielding
NOTE:	Lead Shot for shielding can be shipped with instrument or shipped separately Overseas customers may wish to buy locally



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SPECIFICATIONS	NEXGAMMA-2 NEXGAMMA-2G	PRINCIPAL DETECTOR CHOICES		
	PARTICULATE DETECTOR	NEXGAMMA-2	NEXGAMMA-2LE	NEXGAMMA-2G
<b>Monitoring</b>	Pre-Filter	Sample Flow	Sample Flow	Sample Flow
<b>Radiation Detected</b>	GAMMA	GAMMA	GAMMA	GAMMA
<b>Materials Monitored</b>	Particulates	Water Borne Radioactivity	Water Borne Radioactivity	Water Borne Radioactivity
<b>Scintillator Shape</b>	2" x 2"	3" x 3"	3" x 3"	User Specified
<b>Detector Crystal</b>	NaI (TI) Spectroscopic Grade	NaI (TI) Spectroscopic Grade	NaI (TI) Spectroscopic Grade	Intrinsic HPGe
<b>Shielding</b>	None – Standard ½" Recommended	2" Standard – See Chart Below	Optional – See Chart Below	2" Standard

FLOW PATH	NEXGAMMA-2	NEXGAMMA-2G	NEXGAMMA-2LE
Water Inlet Port	X	X	X
ISCO Sampler (Optional)	X	X	
Particulate filter - Coarse	X	X	OPTIONAL
Particulate filter - Fine	X	X	
Gamma Detector for Filters	X	X	
Pressure Regulator	X	X	
Ultra Violet Sterilizer	X	X	OPTIONAL
Gamma Spec Shield – Steel Shell	X	X	
Gamma Spec Shield – Aluminum Shell			X
Main Gamma Detector with MCA	X	X	X
Mass Flow Meter	X	X	
Low Flow Alarm	X	X	X
Pump	X	X	X
Discharge Water is Clean as Sample in	X	X	X
No Liquid Scintillant or Reagents	X	X	X
Nothing Added – No Toxic or Radioactive Waste of Any Kind	X	X	X



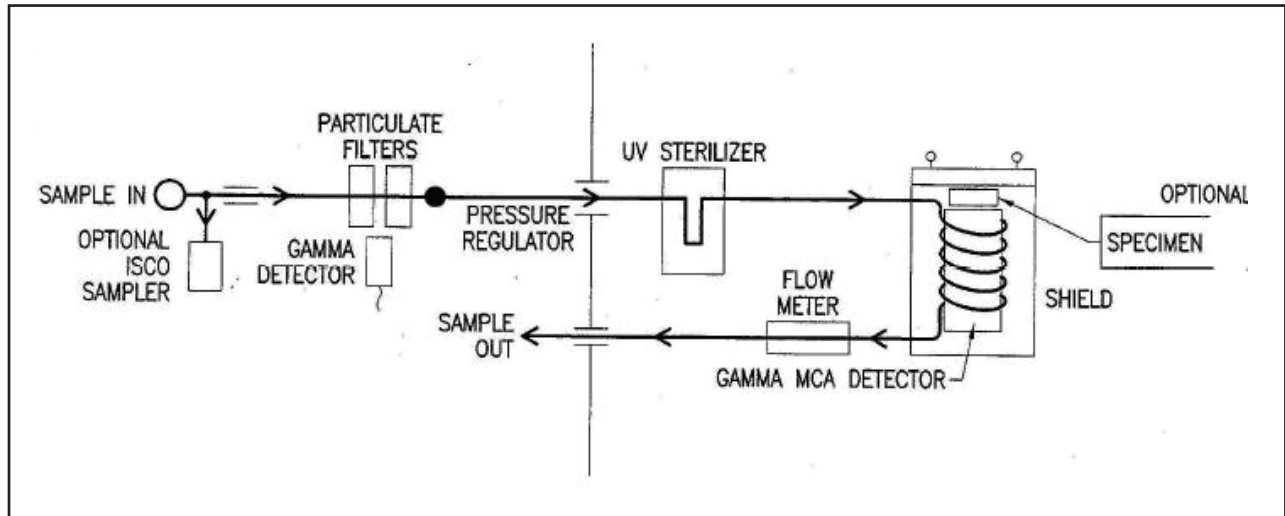
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Nexgamma-2 – Main System Flow Chart

## Flow Path – Standard Method


1. Water Inlet port
2. ISCO Sampler **Optional**
3. Particulate Filter (with Gamma Detector)
4. Pressure Regulator
5. Ultra Violet Sterilizer
6. Gamma Spec Shield
7. Main Gamma Detector with MCA
8. Mass Flow Meter
9. Low Flow Alarm
10. Metering Pump
11. Discharge water is clean and can go back into drinking water line
  - No liquid scintillant or reagents are added
  - No toxic or radioactive waste of any kind



Standard – Helix Hose Model



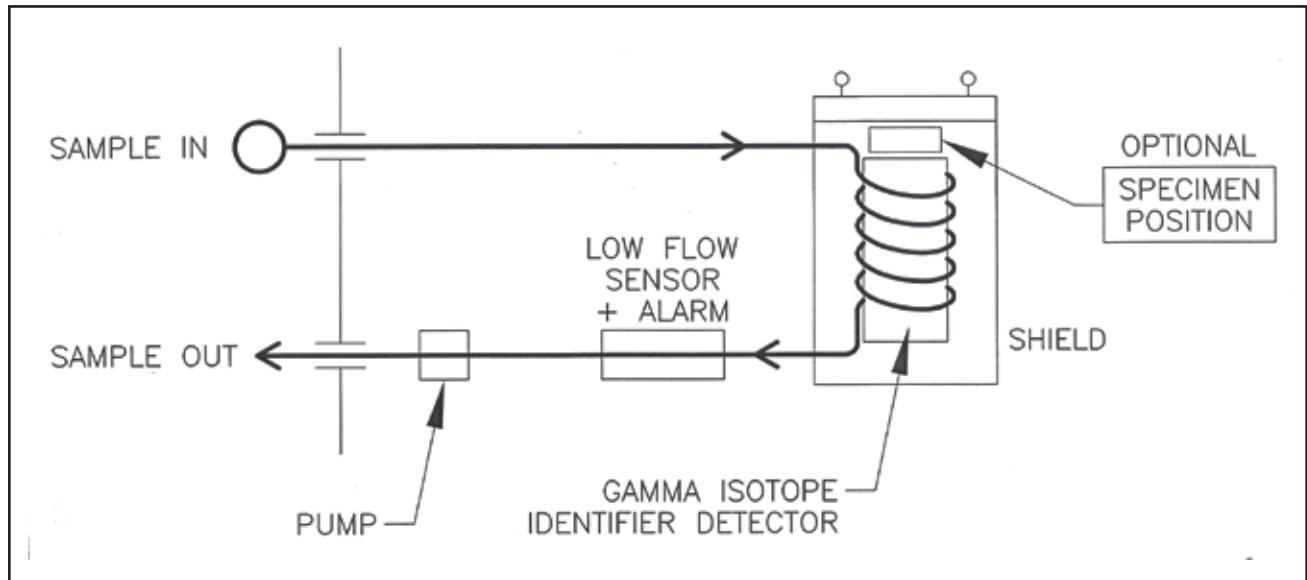
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Nexgamma-2LE – System Flow Chart

## Flow Path – NEXGAMMA-2LE Method


1. Water Inlet Port
2. Particulate Filter (with Gamma Detector) – **Optional**
3. Ultra Violet Sterilizer – **Optional**
4. Main Gamma Detector with MCA
5. Low Flow Alarm
6. Metering Pump
7. Discharge water is clean and can go back into drinking water line
  - No liquid scintillant or reagents are added
  - No toxic or radioactive waste of any kind



Standard – Helix Hose Model



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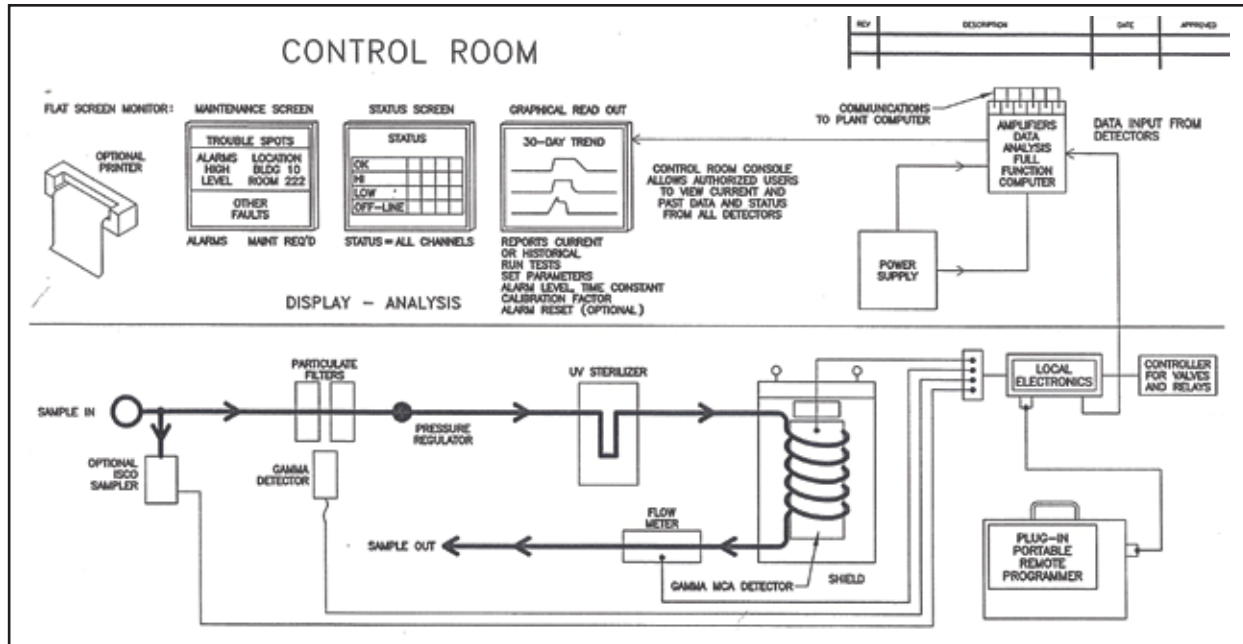
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## NEXGAMMA-2 Full Layout



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