NUCLEAR AND RADIATION PROTECTION

PRODUCT CATALOGUE

bertin technologies

EDITO

Bertin Technologies is a French engineering company that specialises in mastering advanced technologies for critical environments.

With over 60 years of experience in industrial innovation, the company designs, manufactures and markets a wide range of systems and instruments to detect, measure and monitor ionising radiation.

Bertin Instruments uses its nuclear instrumentation offer to protect people, workers and the environment and therefore responds to the major issues related to the control of radioactivity.

OUR RESOURCES

In order to carry out its projects under conditions that are often highly regulated, Bertin Technologies deploys substantial technological and industrial resources:

- Two clean rooms for clean environment integration
- COFRAC accredited laboratory for calibration
- Workshops and logistics platform
- Services and maintenance in the factory or on site

OUR SOLUTIONS

Through the Bertin Instruments brand, the instrumentation activity of Bertin Technologies offers a complete range of equipment for critical applications:

- DOSIMETRY
- CONTAMINATION CONTROL
- RADIAMETRICS
- ACCESS CONTROL
- PROFESSIONAL RADON MONITORING
- RADIOLOGICAL ENVIRONMENTAL MONITORING

bertin technologies

CON-TENTS

IONISING RADIATION DETECTION
AND MEASUREMENT SOLUTIONS

CHAPTER 01

HEALTH PHYSICS & RADIATION PROTECTION SOLUTIONS

With over 60 years of experience in measuring ionising radiation, Bertin Instruments designs state-of-the-art equipment for radiation protection and radiological risk characterisation.

Its ambition is to monitor the environment, control processes in nuclear facilities and protect workers and the public who may be exposed to radioactivity.

01
CONTAMINATION AND DOSE RATE METER

SAPHYRAD E & C
Multiprobe contamination meter

α β

The SaphyRAD is a versatile multiprobe contamination meter used for monitoring Alpha and Beta contamination in harsh environments.

It is equipped with a powerful algorithm to allow very fast and reliable detection of ionising radiation in a variety of civil applications.

The SaphyRAD has been designed ergonomically to be held with gloves on. Its large colour display makes the results perfectly easy to read.

The SaphyRAD is compatible with all analogue probes on the market and is equipped with a proximity sensor.

MARKETS

- NUCLEAR INDUSTRY
- RESEARCH & DEVELOPMENT
- NORM INDUSTRIES & RECYCLING
- CIVIL SECURITY
- HEALTH SECTOR

Transport case

Probe 31 cm²

Probe 100/170 cm²

Floor stand for SaphyRAD E & C and SaphyRAD S

Gamma probe

SAPHYRAD S
Multiprobe survey meter

α β γ

The SaphyRAD S is a multiprobe survey meter developed to cover the needs of the nuclear and security market. This rugged, sensitive and functional survey meter monitors and measures dose and Gamma dose rates in harsh environments.

This survey meter can also be connected to an external intelligent probe for use for contamination monitoring, detection and measurement of Alpha, Beta, Gamma and X-ray radiation.

MARKETS

- CIVIL SECURITY
- NUCLEAR INDUSTRY

01

CONTAMINATION AND DOSE RATE METER

Transport case

SAPHYRAD MS
Military multiprobe survey meter

α β γ X n

The SaphyRAD MS is a multiprobe survey meter dedicated to defence and security operations in CBRN risk situations.

Different configurations are available to best suit different situations for use: to lift any doubts, to search for sensitive material, for radiological emergency situations.

It is equipped with a wide range of intelligent probes, and therefore can detect, measure and identify Alpha, Beta, Gamma, Neutron and X-ray radiation. It can also monitor the dose and dose rate received by the operator.

MARKETS

DEFENCE

CIVIL SECURITY

01
DOSE RATE AND SURVEY METERS

MINITRACE CSDF
Contamination meter, survey meter and multifunction dosimeter

α β γ

A compact multifunction instrument, the MiniTRACE CSDF monitors both contamination (Bq) and radiation (Gamma dose rate µSv/h).

The MiniTRACE CSDF is versatile with several measurement modes: survey meter mode with its energy-compensated counter and contamination meter mode integrating a library of radioelements allowing to carry out a control of surface contamination directly or by means of a smear support (Bq/cm²). A specific mode is also available for liquid sample control (Bq/l). As it is intuitive and easy to use, it can be operated by experts or non-specialist users.

MARKETS

- NUCLEAR INDUSTRY
- CIVIL SECURITY
- RESEARCH & HEALTH
- WASTE TREATMENT PLANTS
- RADIATION PROTECTION FOR WORKERS

MINITRACE S10/S100
Gamma survey meter

γ X

The MiniTRACE γ is an intuitive device used to measure Gamma and X-rays, as well as to fight against radiological risks incurred by workers in controlled areas (nuclear power plants, research and training centres, nuclear medicine departments, etc.).

MARKETS

- NUCLEAR INDUSTRY
- RESEARCH & HEALTH
- RADIATION PROTECTION FOR WORKERS

MINITRACE S5
Survey meter

α β χ γ

The MiniTRACE S5 is a survey meter designed to improve the safety of workers in nuclear power plant, reprocessing plant, research centre and hospital control areas. Its is simple to use for quick and easy detection of potential contamination points in control areas.

MARKETS

- NUCLEAR INDUSTRY
- RESEARCH & HEALTH
- WASTE TREATMENT PLANTS
- RADIATION PROTECTION FOR WORKERS

01
DOSE RATE AND SURVEY METERS

6150 AD RANGE
Portable Gamma and X-ray survey meter

γ X

The 6150 AD multi-probe survey meter is designed to measure Gamma and X-ray radioactivity in nuclear and industrial facilities.

Suitable for searching for radioactive sources or products, this robust, waterproof instrument can also indicate dose rate and cumulative dose, or measure Alpha, Beta and Gamma surface contamination using a wide range of external probes.

MARKETS

- **NUCLEAR INDUSTRY**
- **CIVIL SECURITY**
- **RADIATION PROTECTION FOR WORKERS**

The Teletector 6150 AD T is a probe fitted with a telescopic rod extendable to 4 25 m, connected to the 6150 AD survey meter.
It enables Beta and Gamma radiation to be measured remotely over a very wide measurement range.

AD 17 probe

The AD 17 probe is a GM counter with a circular end window. Sensitive to Alpha, Beta and Gamma radiation, it can be used to monitor surface contamination, including wipe surveys.

AD B probe

The highly sensitive ADb probe, connected to the 6150 AD survey meter, measures very low Gamma and X-ray dose rates over a wide energy range.
Waterproof and temperature-compensated, it can be used for environmental mapping.

Connected to the 6150 AD 5 survey meter, the 6150 AD 15 (high flux) probe enables remote Gamma and X-ray dose rate measurements.
They are used, for example, in nuclear reactor pools or glove boxes in research centers.

AD 15H probe

01 DOSIMETRY

SKYDOSE
Operational teledosimetry system

γ X

Skydose is an operational dosimetry system, designed to measure & monitor, in real time, the ambient dose level received by response teams of eight people working in areas with high exposure to ionising radiation. It can also be used for real-time protection of first responders in crisis situations.

An intervention kit consists of eight Saphydose γ i RT teledosimeters, one Portable Digital Assistant (PDA), one Easydose G configuration software, one Saphyr portable reader, and three autonomous ZIGBEE routers. By optimising the exposition of operators, it aims at improving their conditions of intervention through a continuous process of individual and collective dose reduction (ALARA principle).

MARKETS

- NUCLEAR INDUSTRY
- RADIATION PROTECTION FOR WORKERS
- CIVIL SECURITY

DOSIMETRY MANAGEMENT

FLEXIDOSE SOFTWARE
Dosimetry management software

LMF3 READER
Multifunction reader compatible with Saphydose γ i dosimeters and Skydose teledosimetry system

SAPHYDOSE GAMMA I
Isotropic electronic dosimeter

γ X

The Saphydose γi is an isotropic electronic dosimeter that can provide real-time whole body dose equivalent Hp(10) measurements (cumulative dose and instantaneous dose equivalent rate).

As it is specially designed for the radiation protection of people exposed to ionising radiation, it is used to detect of Gamma and X-rays, in controlled or hazardous areas. Reliable and ergonomic, it features a robust aluminum casing for high resistance to electromagnetic fields. It can be used individually or in conjunction with our dosimetry management system.

MARKETS

- NUCLEAR INDUSTRY
- DEFENCE
- RADIATION PROTECTION FOR WORKERS
- CIVIL SECURITY

01
PROCESS MONITORING

IF104
High dose rate measuring system

γ X

The IF104 is a handheld dose rate meter for measuring high levels of Gamma and X-ray dose rates (up to 300 Gy/h), compatible with three sealed probes SHF, SHI and SEC, whose data it processes and displays. It can operate on mains or battery power, with an autonomy of approximately 40 hours, and can be used in fixed or mobile stations.

MARKETS

NUCLEAR INDUSTRY

RADIATION PROTECTION FOR WORKERS

SEC probe

SHF probe

SHI probe

ANDREA TCR SYSTEM
Processing and display unit

ANDREA TCR is a processing and display unit designed to be used with all monitoring systems in nuclear facilities, reprocessing plants, accelerators and laboratories. It is also used for continuous monitoring of the Gamma dose rate in the rooms for the health and safety of staff and for monitoring radioactive waste containers.

BAB A7
Alpha and Beta aerosol beacon

α β γ

The BAB A7 beacon continuously monitors and measures the concentration of artificial Alpha and Beta radioactive aerosols. There is an option to add an external probe to measure ambient Gamma radiation. All data measured by the BAB A7 is displayed in real time or can be accessed remotely. Its powerful algorithm allows for optimal Radon compensation.

The beacon is available in both stationary and mobile versions, to meet the varied needs of its users, such as effluent or construction site monitoring. Versions compatible with the VD/VR and Skylink communication standards are available.

MARKETS

ENVIRONMENTAL PROTECTION

NUCLEAR INDUSTRY

DISMANTLING

RADIATION PROTECTION FOR WORKERS

01 TECHNICAL SPECIFICATIONS

	SAPHYRAD S	SAPHYRAD MS
TYPE OF DEVICE	**Portable multiprobe survey meter**	
APPLICATIONS/ MARKETS	Nuclear/Safety/Industry	Defence
TYPE OF RADIATION	α, β, γ & X	
PROBES	A/B100, A/B170, AB16, G10, GSP145	Gamma GSP145, Beta BCP16, Alpha ACP123, Alpha AWCP75 pen, X XCP11
MEASURING UNIT	c/s, nSv/h, cps	
MEASURING RANGE	Between 0.05 µGy/h and 10 Gy/h	
ENERGY RANGE	Between 50 keV and 3 MeV	
DIMENSIONS	Monitor: 194 x 115 x 51 mm	
AUTONOMY	Up to 34 hours	
WEIGHT	620 g	
POWER SUPPLY TYPE	4 AA Lithium or Alkaline batteries or 4 AA NiMh rechargeable batteries	
PROTECTION INDEX	IP 65	
TEMPERATURES	From -20°C to +50°C	
ALARM	1 red LED, 1 buzzer (adjustable level), 1 vibrator	
ACCESSORIES & OPTIONS	External probes Simulation probe Cable 25m	External probes (Alpha, Beta, Gamma, x, wounds) Sample control case Transport case PC Software Kit Telescopic rod
BENEFITS	Robust: designed for use in harsh environments Large, high-resolution colour display Integrated simulation mode for training Designed for use with CBRN personal protective clothing Integrated GPS Specific algorithm for fast and reactive detection Large dose rate range: from 0.05 µSv/h to 10 Sv/h Complete range of external probes for source tracking and measuring multiple contamination, specially designed for use by non-radiation specialists	

SAPHYRAD E	SAPHYRAD C
Portable multiprobe contamination meter	
Contamination meter for use in harsh environments	
β, α+β & γ	
BCP31, ACP32, BCP100, ABCP100, BCP170, ABCP170	AB31, A32, AB100, A/B100, AB170, A/B170, A/BG170
c/s, Bq, Bq/cm²	
α: 0.01 to 100 Bq/cm2 β: 0.1 to 2,150 Bq/cm2	
α: 3 to 8 MeV β: 100keV to 2.2MeV	
Monitor: 200 x 110 x 50 mm	
Up to 45 hours	
650 g	
Li-Ion 6.8Ah	
IP 52 (monitor and probes)	
Operating temperature: between -10°C and +50°C Storage temperature: between -20°C and +45°C	
2 configurable thresholds 1 red LED, 1 buzzer (adjustable level), 1 vibrator	
Floor Stand External probes Simulation probe Calibration tool Smear test kit Transport case Configuration and maintenance software KIT mular frame for probe 100/170 cm2 Sapyrad E external probe: BCP3, BCP100, ABCP100, BCP170, ABCP170 External SaphyRAD C sensors AB31, A32, AB100, A/B100, AB170, A/B170, A/BG170	
Developed for operations in harsh environments High resolution colour LCD screen Designed for use with CBRN protective clothing Specific algorithm for fast and efficient detection Complete range of smart external probes for source tracking and measuring multiple contamination Specially designed for use by non-radiation specialists	

01 TECHNICAL SPECIFICATIONS




SAPHYRAD C/E PROBES		AB31 / BCP 31	A32/ACP32	AB100 / BCP 100	A/B100 / ABCP 100	AB170 / BCP 170	A/B170 / ABCP 170	A/BG 170
TYPE OF DETECTION		Overall α,β,γ count	Overall α count	Overall αβγ count	α/βγ discrimination	Overall αβγ count	α/βγ discrimination	
TYPE OF DETECTOR		Double GM Pancake	ZnS + plastic scintillator	Thin plastic scintillator	ZnS + thin plastic scintillator	Thin plastic scintillator	ZnS + thin plastic scintillator	ZnS + thick plastic scintillator
ACTIVE SURFACE AREA (CM^2)		31	32	100		170		
NUMBER OF TRACKS		1	1	1	2	1	2	
SENSITIVITY (CPS/BQ) - 4Π	U^{NAT}	(-)	0.088	(-)	(-)	(-)	(-)	
	^{14}C	0.0055	(-)	0.08	0.029	0.049	0.027	0.027
	^{36}CL	0.24	(-)	0.292	0.243	0.216	0.249	0.284
	^{60}CO	0.11	(-)	0.182	0.114	0.148	0.119	0.139
	^{90}SR-^{90}Y	0.29	(-)	0.327	0.291	0.286	0.286	0.285
	^{137}CS	0.188	(-)	0.314	0.286	0.311	0.283	0.275
	^{238}PU	(-)	(-)	0.183	0.149	0.167	0.158	0.163
	^{239}PU	(-)	0.160	0.17	0.142	0.157	0.158	0.162
	^{241}AM	(-)	0.175	0.164	0.142	0.168	0.152	0.160
MEASUREMENT RANGE (BQ/CM^2)		From 0.1 to 2,150	From 0.01 to 100	From 0.1 to 1,000	α: From 0.01 to 100 β: From 0.1 to 1,000	From 0.1 to 1,000	α: From 0.01 to 100 β: From 0.1 to 1,000	
ENERGY RANGE (MEV)		From 0.03 to 2.2	From 3 to 8	From 0.1 to 2.2	α: From 3 to 8 β: From 0.1 to 2.2	From 0.1 to 2.2	α: From 3 to 8 β: From 0.1 to 2.2	
DIMENSIONS (L × W × H)		235 × 136 × 93 mm	264 x 119 x 123 mm	293 × 119 × 121 mm		308 × 143 × 128 mm		
WEIGHT		640 g	600 g			740 g		
GAMMA RESPONSE ^{137}CS [CPS/(μGY/H)]		αβγ: 16	(-)	αβγ: 53	α track: 0.0068 Bγ track: 38	αβγ: 90	α track: 0.0116 Bγ track: 64.6	α track: 0.12 Bγ track: 800
BACKGROUND NOISE [CPS]		αβγ: 1.6	α: 0.08	αβγ: 3.62	α: 0.01 Bγ: 2.77	αβγ: 3.53	α: 0.01 Bγ: 3.17	α: 0.01 Bγ: 9.81
HOMOGENEITY		> 90% of the entire active area	> 85% on all active surface	> 75% of the entire active area				


SIMULATION PROBES	AB31 / BCP 31 SIM	AB 100 / BCP100 SIM AB 170 / BCP170 SIM
ACTIVE AREA	31cm^2	100cm^2
SIMULANT	LS1 liquid, SS4 powder	ZnS + 145 cm^3 plastic scintillator

SIMULANT	LS1 LIQUID	SS4 POWDER
MATERIAL	Perfluorocarbon liquid	Perfluorocarbon liquid sprayed on silicate powder
PERFORMANCES	Simulation of an alpha source (a few centimetres of emission) The simulant can also be used to simulate a soft beta source Enables a count rate of > 1000 cps at a distance of 0.5 cm	
PERSISTENCE	2 to 4 h depending on location and conditions of use Product inert after 24h	Approx. 2 h for a 0.3 g pile Product Inert after 4 h

01 TECHNICAL SPECIFICATIONS

PROBES SAPHYRAD S	G10 GAMMA PROBE	G145 HIGH SENSITIVITY GAMMA PROBE	AB16 PROBE	A/B 100 CONTAMINATION PROBE	A/B 170 CONTAMINATION PROBE
APPLICATIONS	**Remote dose trate measurement**	**Source tracking and gamma contamination detection**	**Detection of Alpha, Beta, Gamma contamination (direct or indirect)**	**Alpha and Beta contamination detection and discrimination**	**Detection and discrimination of Alpha and Beta contamination with large probe area**
TYPE OF DETECTOR	Geiger-Müller counter ZP 1314 et ZP 1202	ZnS + 145 cm^3 plastic scintillator	15.5cm^2 Pancake GM	ZnS + thin plastic scintillator 100 cm^2 surface area	ZnS + thin plastic scintillator 170 cm^2 surface area
ENERGY RANGE	From 50 keV to 3MeV	From 30 keV to 1.5 MeV	Emax > 50keV	α: From 3 to 8 MeV β: From 0.1 to 2.2 MeV	
SENSITIVITY	2 c/s/Bq (^{137}Cs)	1,000 c/s/µSv/h (^{137}Cs)	0.15 c/s/Bq (^{60}Co)	Voie α : 0.0068 c/s/µGy/h Voie Bγ : 38 c/s/µGy/h (^{137}Cs)	Voie α : 0.0116 c/s/µGy/h Voie Bγ : 64.6 c/s/µGy/h (^{137}Cs)
STANDARD BACKGROUND NOISE	0.2 cps	20cps	0.01 cps	α channel: 0.01 Bγ channel: 2.77	
WEIGHT (G)	300	650	390	600	740
DIMENSIONS	275 mm x 76 mm (L × ø)	335 mm × 84 mm × 84 mm (L × W × H)	189 mm x 130 mm (L × ø)	293 mm × 119 mm × 121 mm (L × W × H)	308 × 143 × 128 mm (L × W × H)

PROBES SAPHYRAD MS	GSP145 GAMMA PROBE	BCP16 BETA PROBE	ACP123 ALPHA PROBE	WOUND PROBE ALPHA AWCP75	XCP11 GAMMA AND X PROBE
APPLICATIONS	**Source tracking Contamination detection**	**Detection of Beta contamination (direct or smear)**	**Detection of Alpha contamination (direct or filter)**	**Detection of Alpha contamination in wounds**	**detection of low-energy X-ray and Gamma contamination**
TYPE OF DETECTOR	Plastic scintillator + Zn layer 2" x 2" x 2.2"	Pancake GM	ZnS on thin plastic	CdTe	CsI
ENERGY RANGE	From 30 keV to 1.25 MeV	max > 50 keV	From 3 to 8 MeV	From 10 to 25 keV	From 10 to 70 keV
DYNAMICS	From 0 to 150,000 cps	From 0 to 10,000 cps 1 µSv to 100 mSv	From 0 to 10,000 cps	From 0 to 10,000 cps	From 0 to 10,000 cps
SENSITIVITY	1000 cps/(µSv/h) (137Cs)	0.21 cps / Bq (Co60) without grid 0.10 cps / Bq (Co60) without grid	0.3 cps/Bq (241Am)	0.068 cps/kBq (241Am)	5 cps/kBq (241Am)
MINIMAL RESPONSE TIME	100 ms	100 ms	100 ms	100 ms	100 ms
STANDARD BACKGROUND NOISE	20 cps	From 0.01 µSv/h to 1 1 cps 0 mSv/h	0.03 cps	0.01 cps	4 cps
VOLUME (V) OR SURFACE (S)	V = 145 cm3	S = 16 cm2	S = 123 cm2	S = 25 mm2	Diameter = 38 mm Thickness = 1 mm
WEIGHT (G)	660	390	720	140	420
DIMENSIONS	335 × 84 × 84 mm3 (L × W × H)	189 × 130 mm2 (L × ø)	333 × 149 mm2 (L × ø)	194 × 16 mm2 (L × ø)	284 × 72 mm2 (L × ø)

01 TECHNICAL SPECIFICATIONS




	MINITRACE γ S10S/S10R	MINITRACE γ S100S/S100R
TYPE OF DEVICE	**Gamma survey meter**	
APPLICATION	Radiation protection of workers in harsh environments particularly in controlled zones	
TYPE OF DETECTION	γ & X	
RESPONSE TIME	1 second	
TYPE OF DETECTOR	Energy-compensated Geiger-Müller (for Gamma and X-rays)	
MEASURING UNIT	µSv/h, H*(10)	
MEASURING RANGE	From 0.5 µSv/h to 10 mSv/h	from 1 µSv/h to 100 mSv/h
ENERGY RANGE	From 42 keV to 1.8 MeV (±40%) From 2 keV to 2.8 MeV (±60%)	From 48 keV to 2 MeV (±40%) From 2 keV to 3 MeV (± 60%)
SENSITIVITY	5,500 counts per uSv	2,500 counts per uSv
DIMENSIONS	84 x 29 x 139 mm	
AUTONOMY	Up to 2,000 hours	
WEIGHT	190 g or 260 g (depending on antenna)	175 g or 250 g (depending on antenna)
POWER SUPPLY	2 batteries (LR6, AA, MN 1500)	
PROTECTION INDEX	IP 44 or IP67 with protective case	
OPERATING TEMPERATURE	Between -20°C and +50°C	
ALARMS	4 adjustable alarm thresholds; visible and audible alarm	
BENEFITS	Response time (1 second); 4 adjustable alarm thresholds; high autonomy: 2,000 hours; durable box; infrared interface; 650 dose values and dose rates; which can be stored on the internal memory (versions S10S/S10R/S100S/S100R; radio frequency transmission up to 20 km (S10R/S100R versions)	
ACCESSORIES & OPTIONS	Rubber protection; transparent pocket; belt case; cases (for 1/10 devices); wall bracket; communication kit (Interface + Dataview software)	

	MINITRACE CSDF	MINITRACE S5
	Contamination meter, survey meter and multifunction dosimeter	**Versatile survey meter for Alpha, Beta, Gamma and X-ray measurement**
	Detection and quantification of radiation contamination	Radiation protection for workers in harsh environments, especially in controlled areas within nuclear power plants, reprocessing plants, research centres and hospitals
	α, β, γ & X	
	1 second	
	Geiger-Mueller Pancake; Active meter area: 15.55 cm^2	
	µSv/h, cps, Bq, Bq/cm2 and Bq/L	µSv/h (Note: the GM tube used is not energy compensated)
	Dose rate: 0.01 to 5,000 µSv/h Pulse: 0.0 to 10,000 cps Activity (depending on the radionuclide considered): 0 to max. 100,000 Bq Surface contamination (depending on the radionuclide): 0 to 5,000 Bq/cm^2 Food contamination: 500 to 100,000 Bq/L (Cs-137 test, 30% relative error at 1 sigma with background at 0.1 µSv/h)	From 0.01 to 5,000 µSv/h (at Cs-137)
	From 24 keV to 1.253 keV (± 40%)	> 6 keV
	4.3 counts per second/µSv/h	
	84 x 29 x 139 mm	82 x 24 x 139 mm
	Up to 2,000 hours	
	305 g (batteries included)	315 g (batteries included)
	Batteries (LR6, AA, MN 1500) with polarity protection	2 batteries (type: LR6, AA, MN 1500), protected against reverse polarity
	IP 44 or IP67 with protective case	
	Between -10°C and +40°C	
	SaphyDose γi RT, PDA Module, RT-ZB05 Router, Easydose G settings software, LMF 3 dosimeter reader, Saphyr reader, transport case, protective cover for PDA/RT-ZB05	Visible and audible. The frequency of the beep will increase according to the level of the alarm threshold (4100 Hz, the sound pressure at a distance of 30 cm is > 80 dB).
	Quick response time (1 second); Multiple measurements: *Dose rate H*(10) (µSv/h), counts per second (cps), activity (Bq), surface contamination (Bq/cm^2), food contamination (Bq/L);* choice of radionuclides measured; alarm thresholds per mode; high autonomy: 2,000 hours; durable and compact box	High sensitivity (X-rays > 6 keV) for detection of X-ray leakage in shielding, fast response (1 second), peak hold function, compact, robust, ergonomic, easy to use via 2 buttons, "Average value mode", long battery life: 2,000 hours
	Rubber cover, transparent pouch, belt case, cases (for 1/10 instruments), smear test kit, sample control kit, emergency case, airtight container for air transport, communication kit (Interface + Dataview software)	

01 TECHNICAL SPECIFICATIONS

	6150 AD5 (HIGH DOSE RATE)	6150 AD6 (LOW DOSE RATE)
TYPE OF DEVICE	**Portable survey meter**	
APPLICATIONS	Gamma and X-ray radioactivity measurement and search for radioactive sources or products in nuclear or industrial facilities	
TYPE OF DETECTION	γ & X	
TYPE OF DETECTOR	Energy compensated Geiger Müller counter (H*(10))	
MEASURING RANGE	Energy-compensated Geiger-Müller (for Gamma and X-rays)	
DOSE EQUIVALENT RATE DISPLAY RANGE	From 0.1 µSv/h to 1,000 mSv/h	From 0.01 µSv/h to 10 mSv/h
DOSE EQUIVALENT DISPLAY RANGE	From 0.1 µSv/h to 1 Sv/h	From 0.01 µSv/h to 10 mSv/h
ENERGY RANGE	From 1 µSv to 10 Sv	From 1 µSv to 100 mSv
MEASURING UNIT	µSv, µSv/h	
DIMENSIONS	130 x 80 x 29 mm	
AUTONOMY	1 000 hours	
WEIGHT	400 g	
POWER SUPPLY	Standard 9V battery	
PROTECTION INDEX	IP 67 (waterproof under 1 m of water)	
OPERATING TEMPERATURE	From -30°C to 50°C	
ALARM	Audible and visual	
BENEFITS	Lightweight, robust, waterproof and decontaminable 1000 hours of autonomy Audible and visual alarms Measurement of average & maximum dose rate, cumulative dose Digital and analog display Integrated dose and maximum dose rate memory External Alpha, Beta, Gamma probes	
ACCESSOIRES & OPTIONS	Bluetooth module, alarm station, RS485 adapter, probe multiplexer	

	6150 AD17 / AD17 SCINT α, β, γ probe for measuring surface contamination
TYPE OF DETECTOR	**Geiger-Müller thin-window counter 1.5 to 2 mg/cm²**
APPLICATIONS	6.1 cm^2
TYPE OF DETECTION	α, β & γ
PULSE RATE MEASUREMENT RANGE	wde 0.01 to 104 c/s
YIELD	^{90}Sr (β) : 55% ^{60}Co (β) : 10% ^{90}Co (γ) : 0.8%
CONNECTION CABLE	1.25 m, extendable to 100 m

	6150 ADP α, β, γ, X probe
TYPE OF DETECTOR	**Tbe LND 7312 GM « pancake » non compensé en énergie**
TYPE OF DETECTION	α, β, γ & X
SENSITIVITY TO ^{137}CS	19,000 cps / µSv
BACKGROUND NOISE COUNTING	0.74 cps
COUNTING RANGE	0.01 cps - 20,000 cps
GEOTROPISM	Pas de comptage dû au changement de position de la sonde
CALIBRATION FACTORS	^{241}Am : 0.34 (Bq/cm^2) / cps ^{14}C : 0.64 (Bq/cm^2) / cps ^{90}Sr/ ^{90}Y : 0.07 (Bq/cm^2) / cps
DETECTION THRESHOLDS	^{241}Am : 0.18 Bq/cm^2 ^{60}Co : 0.21 Bq/cm^2

	6150 AD15 (HIGH DOSE RATE) γ and X probe	6150 AD18 (LOW DOSE RATE) γ and X probe	TELETECTOR 6150 ADT Telescopic probe β and γ	TELETECTOR 6112 M Telescopic probe β, γ & X	6150 ADB Very low dose rate Gamma and X probes
TYPE OF DETECTOR	**Energy-compensated Geiger-Müller counter**				**3" x 3" ZnS-treated plastic scintillator, combined with photomultiplier**
TYPE OF DETECTION	γ & X		β & γ	β, γ & X	γ & X
ENERGY RANGE	From 65 keV to 3 MeV	From 65 keV to 1,3 MeV	From 65 keV to 3 MeV	From 65 keV to 1,3 MeV	From 23 keV to 7 MeV
DOSE MEASUREMENT RANGE	From 1 µSv to 10 Sv	From 1 µSv to 100 mSv	From 1 µSv to 10 Sv	From 5 µSv to 10 Sv	From 0.01 µSv to 1,000 µSv
DOSE RATE MEASUREMENT RANGE	from 0.01 mSv/h to 10 Sv/h	From 0.01 µSv/h to 10 mSv/h	From 0.01 µSv/h to 10 Sv/h	From 0 5 µSv/h to 10 Sv/h	From 10 nSv/h to 100 µSv/h
DIMENSIONS	Diameter: 26 mm Length: 125 mm	Diameter: 26 mm Length: 150 mm	Length: 91 to 412 cm Width: 13 cm Height: 9 cm	Length: 91 to 412 cm Width: 13 cm Height: 9 cm	353 x 195 x 96 mm

01 TECHNICAL SPECIFICATIONS

	SAPHYDOSE γ i	SKYDOSE
TYPE OF EQUIPMENT	**Hp(10) operational electronic dosimeter for X-ray and Gamma radiation**	**Hp(10) operational teledosimetry system**
APPLICATION	Provision of Hp(10) whole body dose equivalent.	Measurement and monitoring, in real time, of the dose equivalent rate of a team of 8 people working in highly exposed areas
TYPE OF RADIATION DETECTED	γ & X	
TYPE OF DETECTOR	double Silicon diode	
MEASURING RANGE	From 0.5 µSv/h to 5 Sv/h From 1 µSv to 9,999.9 mSv	
MEASURING UNIT	µSv, µSv/h	
ENERGY RANGE	Between 50 keV and 7 MeV (± 15%)	
DIMENSIONS	98 x 64 x 24 mm	98 x 64 x 24 mm (Dosimeter) 200 x 100 x 42 mm (Supervisory terminal - PDA) 190 x 100 x 90 mm (router)
AUTONOMY	Between 4,000 hours (one battery) and 8,000 hours (two batteries)	Dosimeter: 4,000 hours Zigbee module: 40 hours RT-ZB05 Router: 5 days PDA: 8 hours in operation
WEIGHT	160 g	equipped suitcase
TYPE OF BATTERY	2 x 3.6V lithium battery (Type AA)	
OPERATING TEMPERATURES	Between 0°C and +40°C	
PROTECTION INDEX	IP 65	IP 65 IP54 for the router
ALARM	Audible and visible alarm, with adjustable alarm threshold	
ACCESSORIES & OPTIONS	Protective cover, LMF 3 dosimeter reader, Flexidose dosimetry management software, Saphydose Gamma multifunctional teledosimeter reader, Saphyr dosimeter and teledosimeter reader, EasydoseG dosimeter and teledosimeter configuration software	Saphydose γ i RT, PDA module, RT-ZB05 router, Easydose G configuration software, Flexidose dosimetry management software, Saphydose γi RT teledosimeter configuration software , saphyDose Gamma i multifunctional reader for teledosimeter, LMF 3 dosimeter reader, Saphyr reader, transport case, protective cover for PDA/ RT-ZB05
BENEFITS	Isotrope EMC immunity Metal case Very good autonomy	Real-time supervision Robust Suitable for emergency situations

	BAB A7
TYPE OF EQUIPMENT	**Aerosol beacon α, β**
APPLICATION	Continuous monitoring of artificial α and β radioactive aerosols in nuclear power plants or on decommissioning sites; Low aerosol concentration monitoring with a strong Gamma background; Workplace monitoring, with a fixed or mobile beacon; Air monitoring of ventilation ducts; Monitoring of atmospheric emissions.
TYPE OF RADIATION DETECTED	α & β
TYPE OF DETECTOR	Double large-area silicon diode, 2 × 360 mm^2
MEASURING UNITS	Bq/m3 and µGy/h
FILTER	FSLW MERCK/MILLIPORE type roller Width: 40 mm, height: 20 m
MEASURING RANGE	α: From 10^(-3) to 1.10^4 Bq/m^3 β: From 10^(-2) to 1.10^4 Bq/m^3
ENERGY RANGE	β: From 100 keV to 2 MeV | α: From 2 to 5.65 MeV, artificial ROI α adjustable using software
PERFORMANCE	Gamma background compensation; Radon compensation Detection limits for radon daughter activity concentration of 37 Bq/m3 on the filter, measurement time 1 hour. - SDα = 0.3 Bq/m3 - SDβ = 2 Bq/m3
NOMINAL SUCTION FLOW RATE	6 m^3/h
TYPE OF BATTERY DIMENSIONS	460 x 630 x 260 mm^3
WEIGHT	48 kg
TYPE OF BATTERY	Sector: 230V-50 Hz single phase (110 V version available on request) Switch box power: 60 VA Pump power: 580 VA, peak current 13 Peak intensity: 13 A
TEMPERATURE	Between +5°C and +45°C
PROTECTION INDEX	IP 50
ALARM	Audible and visible alarm with two adjustable alarm thresholds for type of radiation α or β
BENEFITS	Colour LCD screen (5.7"); the measurements cannot be deleted for 21 days; Ethernet can be used to store measurement data remotely; double time constant for optimal response to abnormal air concentrations.
ACCESSORIES & OPTIONS	The SKYLINK wireless radio communication kit, Gamma radiation kit, GM-2N Gamma probe for monitoring of external exposure, GJNOV software for local maintenance and data acquisition, wireless data transmission, VD/VR communication (CEA), variants: BAB ASGA, BAB E.

01 TECHNICAL SPECIFICATIONS

	IF104	ANDREA TCR
TYPE OF EQUIPMENT	**High dose rate meter**	**Processing and display unit**
APPLICATION	Teleflow meter for measuring high Gamma and X-ray dose rates	Continuous monitoring of the Gamma dose rate
TYPE OF RADIATION DETECTED	γ & X	γ & X depending on the probes used
MEASURING UNIT	Sv/h, Gy/h or rad/h	
DIMENSIONS	255 x 140 x 120 mm	300 x 300 x 120 mm
AUTONOMY	Approx. 40 hours	24 VDC power supply
WEIGHT	3.2 kg	6 kg
TYPE OF BATTERY	3 Ah with integrated charger	2A on the secondary
TEMPERATURES	Between +0°C and +50°C	Between -20°C and +30°C
ALARM	Two configurable alarm thresholds; Visible and audible alarm (in case of exceeding the threshold or battery failure)	
ACCESSORIES & OPTIONS	Belt, wall mount, external alarm unit, SHF probe for high dose rate: measurements from 1 mGy/h to 300 Gy/h, SHI probe for high dose rate: measurements from 10 µGy/h to 50 Gy/h, SEC probe for extended range: measurements from 1 µGy/h to 10 Gy/h, supervision software.	Supervision PC
BENEFITS	Fixed or mobile device; Digital and analogue display; 3 interchangeable waterproof probes; robust, waterproof metal box; 25m cable as standard.	Up to 6 probes

	SHF	SHI	SHI-TCR	SEC
TYPE OF DETECTOR	**Energy compensated silicon diode Hp(10) operational electronic dosimeter for X-ray and Gamma radiation**			**2 GM tubes energy compensated**
RADIATION DETECTED	γ & X			
ENERGY RANGE	From 0.60 keV to 3 MeV			From 50 keV to 1.3 MeV
MEASURING RANGE	From 1 mGy/h to 300 Gy/h	From 10 µGy/h to 50 Gy/h		From 1 µGy/h to 10 Gy/h
DETECTION ANGLE	Centre 16 mm from the outer wall (radial exposure to the marked grooves on the probe body)	Centre 7 mm from the outer wall (axial exposure to the marked grooves on the probe body)		Centre 10 mm from the outer wall (radial exposure to the marked grooves on the probe body)
LIFETIME (CUMULATIVE DOSE)	2,800 Gy	2,800 Gy		2,000 Gy
CALIBRATION	^{137}Cs			^{60}Co or ^{137}Cs
OPERATING TEMPERATURE	Between -30°C and +60°C			
MATERIAL	Nickel-plated aluminium			Aluminium
WEIGHT	500 g (probe and 25 m cable)			3.5 g (probe and 25 m cable)
PROBE DIMENSIONS (MM)	85 × 20			280 × 32
CABLE LENGTH	25 m (standard)		10 m (standard)	25 m (standard)
BOX	Nickel aluminium			
CASING SIZE (MM)	90 × 35 × 35			
POWER SUPPLY	Through the IF 104 teleflow meter			
BENEFITS	Waterproof to a depth of 20 m			

CHAPTER 02

ENVIRONMENTAL RADIATION MONITORING SYSTEMS

Bertin Instruments is a leader in measuring radioactivity and provides a complete range of systems for environmental radiological monitoring.

The purpose of these monitoring solutions is to ensure the safety of the population and to protect the environment by measuring and/or characterising the level of radioactivity in the air, soil and water near strategic points (country borders, nuclear facilities, etc.).

02

ENVIRONMENTAL RADIATION MONITORING SYSTEMS

GAMMATRACER XL2
Autonomous Gamma probe

γ

The GammaTRACER probe is designed for the continuous measurement, recording, and retransmission of environmental Gamma dose rate values.

The probe can be equipped with GSM (2G/3G/4G/LTE), radio (ShortLINK/SkyLINK), satellite, or GPS transmission modules and can be used as part of a wireless environmental monitoring system, to transmit measured data. Data download and parameter configuration can be also performed via a local service port (Infrared, cable, and secured Bluetooth).
Various options for redundant data transmission are available.

MARKETS

- NUCLEAR INDUSTRY
- ENVIRONMENTAL PROTECTION
- NORM INDUSTRIES
- CIVIL SECURITY

GAMMATRACER SPIDER
Gamma probe for emergency measures

γ

Developed to respond to a radiological emergency scenario, the GammaTRACER Spider is a probe used for measuring the Gamma dose rate in the environment.
It is shock resistant and can be deployed from a moving vehicle or a drone to limit the exposure of first responders in contaminated areas. Data transmission to the crisis centre is provided by a secure satellite modem.

MARKETS

- NUCLEAR INDUSTRY
- DEFENCE
- NORM INDUSTRIES
- CIVIL SECURITY

02

ENVIRONMENTAL RADIATION MONITORING SYSTEMS

SPECTROTRACER AIR/SOIL
Gamma spectrometric probe

γ

The SpectroTRACER Air/Soil is a continuous monitoring system for monitoring Gamma dose rate and contamination in the environment. It is used for the spectrometric analysis of Gamma radiation, automatic identification of the detected radionuclides, and measurement of the γ activity in ambient air and in soil.

The SpectroTRACER requires minimal maintenance and can operate continuously with solar panels, even in hostile weather conditions. The SpectroTRACER is available with 3 types of detectors - NaI(Tl), $CeBr_3$ et $LaBr_3$ (Ce) - and different volumes depending on the desired measurement range of interest and resolution.

Identification of several nuclides for one measurement

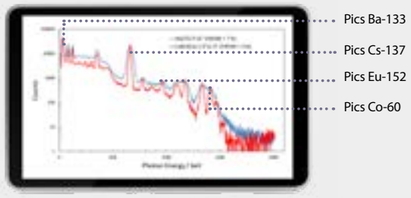


Image: comparison of the sensitivity of $LaBr_3$(Ce) and NaI(Tl) detectors for identification of nuclides

MARKETS

- NUCLEAR INDUSTRY
- ENVIRONMENTAL PROTECTION
- NORM INDUSTRIES
- CIVIL SECURITY

SPECTROTRACER AQUA
Gamma spectrometric probe

γ

The SpectroTRACER Aqua is a system used to continuously measure Gamma radiation in liquid effluents. This spectrometric probe is used to detect contamination and identify radionuclides.

The SpectroTRACER Aqua can be immersed up to 100 metres deep thanks to its waterproof casing. It is connected by a cable to a control and power supply box and can be used in a variety of fixed and mobile applications (e.g. : to measure emissions from nuclear power plants, measurement at sea, in rivers, water tanks, etc.).

MARKETS

- NUCLEAR INDUSTRY
- ENVIRONMENTAL PROTECTION
- NORM INDUSTRIES
- CIVIL SECURITY

02

ENVIRONMENTAL RADIATION MONITORING SYSTEMS

BAB-E
Aerosol beacon for the environment

α β

The BAB-E fixed beacon is used for continuous monitoring of artificial Alpha and Beta aerosols, in Gamma environments as well as in the presence of natural Radon descendants.

It has a double cover that allows it to withstand the most extreme climatic conditions for uninterrupted use outdoors (territorial surveillance, nuclear infrastructures, etc.).

The data collected by the BAB-E can be accessed remotely and in real time on the DataEXPERT supervision software.

MARKETS

NUCLEAR INDUSTRY

ENVIRONMENTAL PROTECTION

NORM INDUSTRIES

SA-200/210
Spectroscopic aerosol monitor

β γ

The SA aerosol station is intended for the combined measurement of the Beta and Gamma spectrum and the volumetric activity of particles in the environment.

It is also able to identify the detected radionuclides and compensate for the Gamma background and natural Radon descendants, thanks to a high-resolution $LaBr_3$ detector. Its high sensitivity, robust and sealed casing, and low power consumption make it ideal for emergency situations and routine operations.

MARKETS

NUCLEAR INDUSTRY

ENVIRONMENTAL PROTECTION

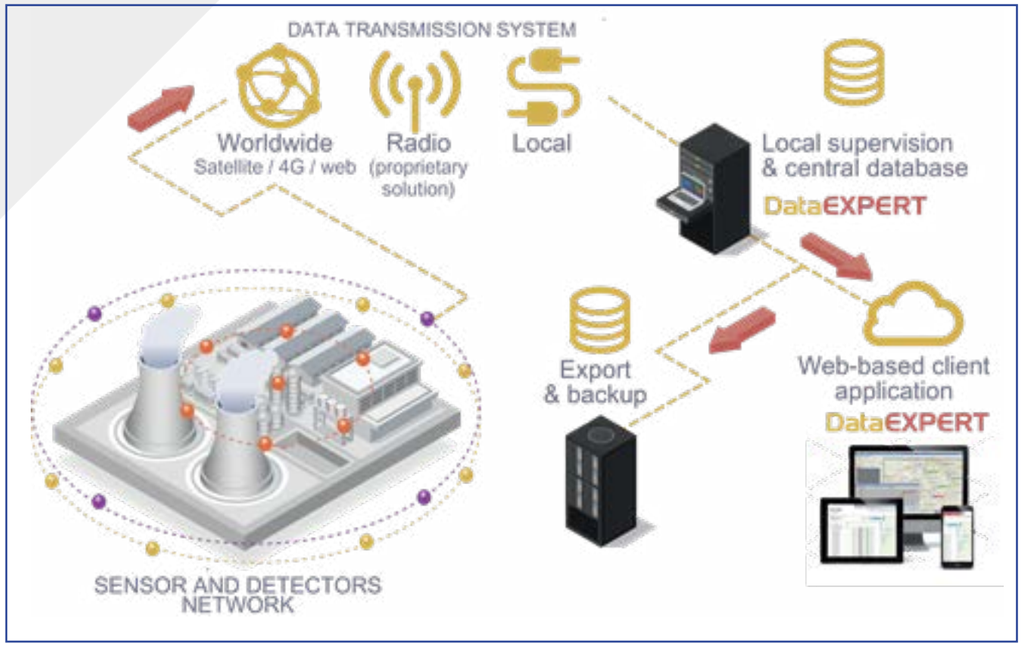
NORM INDUSTRIES

02
ENVIRONMENTAL RADIATION MONITORING SYSTEMS

DATAEXPERT 10 SOFTWARE
Data management supervision solution

DataEXPERT 10 is a software package for collecting, managing and controlling data measured by networks of probes and environmental radiological monitoring network. The software is easy to use and intuitive and it gives a detailed display of the data in the form of static or dynamic GIS background maps, the generation of tables or graphs, as well as the remote configuration of probes and sensors. Accessing the data securely is feasible from any location.

DataEXPERT 10 is available in many languages and compatible with all current versions of Windows and is accessible on desktop and laptop computers, tablets and smartphones.



TECHNICAL SPECIFICATIONS	
OPERATING SYSTEM	Installation on a computer or server with MS Windows (all versions)
COMPATIBLE WEB BROWSERS	Internet Explorer, Firefox, Chrome for computer/servers Specific adaptive display for tablets and smartphones
DATABASE	MS SQL
COMPATIBLE PRODUCTS	All sensors and detectors from Bertin Instruments (other detectors on request)
MAPS USED	Static or dynamic GIS maps
SPECIFIC EXPORT FORMATS	xml, IRIX, xls, N42.42, others on request
OPTIONS	Online service with outsourced data hosting Modelling the dispersion of radioactivity Remote sensor configuration Bertin Cloud Solution

02 TECHNICAL SPECIFICATIONS

	GAMMATRACER XL2
TYPE OF EQUIPMENT	**Autonomous Gamma probe**
APPLICATION	Continuous measurement and recording of Gamma radiation dose rate values in the environment
TYPE OF RADIATION DETECTED	γ
TYPE OF DETECTOR/ MEASURING UNIT	Up to 3 energy-compensated Geiger-Müller tubes H*(10) Hx, KAir, X on request
MEASURING CYCLE	1, 2, 5, 10, 15, 30, 60 and 120 minutes, quick response mode 1s
INTERNAL MEMORY	12,000 measurement readings, or up to 1,000 days depending on the measurement cycle Expanding the internal memory possible with the SD card option
ENERGY RANGE	from 45 keV to 2 MeV
DOSE RATE MEASURING RANGE	10 nSv/h to 10 Sv/h
AUTONOMY	Autonomy depends on the type of communication and the measurement cycle, on average 5 years
POWER SUPPLY	Lithium batteries, rechargeable and non-rechargeable batteries
OPERATING TEMPERATURES	From - 20°C to + 50°C (optional from - 40°C to + 60°C)
RELATIVE HUMIDITY	100%
PROTECTION INDEX	IP 68 (hermetically sealed box), IP 67 cable versions
INTEGRATED SENSORS	GPS (option), temperature, humidity, movement, voltage monitors
DIMENSIONS	Ø 98 mm (Ø flange 130 mm) x 580 mm to 830 mm depending on the data transmission mode
WEIGHT	2.3 to 3.2 kg depending on the data transmission mode
ACCESSORIES AND OPTIONS	External 12V power supply, solar panel power supply, DataEXPERT monitoring software, wall/mast mount, tripod, mounting leg, long-life battery pack, weather sensors (rainfall, wind speed and direction, air pressure: temperature and humidity), transport and storage case, DACC module for ETHERNET (LAN) connection, RS232 or RS486 serial interface module, GPS module, satellite, GSM/2G/3G/4G/LTE, ShortLINK/SkyLINK radio module.
BENEFITS	Continuous, maintenance-free operation Up to 10 years of battery life Autonomous probe requiring no infrastructure Integrated self-checks Visualisation and analysis of measurements with DataEXPERT supervision software or locally via maintenance software DataVIEW PRO

	GAMMATRACER SPIDER
TYPE OF EQUIPMENT	**Autonomous quick deployment Gamma probe for emergency measures**
APPLICATION	Continuous measurement and recording of Gamma radiation dose rate values
TYPE OF RADIATION DETECTED	γ
TYPE OF DETECTOR/ MEASURING UNIT	2 energy-compensated Geiger-Müller tubes H*(10)
MEASURING CYCLE	From 1 to 120 minutes
INTERNAL MEMORY	Up to 6,800 data sets
ENERGY RANGE	From 45 keV to 2 MeV
DOSE RATE MEASURING RANGE	from 20 nSv/h to 1 µSv/h (optional 10 Sv/h)
AUTONOMY	4 years without data transmission (rechargeable battery), up to 3 years with data transmission
POWER SUPPLY	Rechargeable battery, quick to change in the field, rechargeable batteries
OPERATING TEMPERATURES	From -20°C to +50°C (optional -40 °C to +60 °C)
RELATIVE HUMIDITY	100%
PROTECTION INDEX	IP 68 (hermetically sealed box)
INTEGRATED SENSORS	GPS, temperature, movement, voltage monitors
DIMENSIONS	110 mm x 650 mm
WEIGHT	2.1 kg
ACCESSORIES AND OPTIONS	Transport and storage box, Iridium satellite modem (worldwide coverage)
BENEFITS	Innovative and ultra-fast deployment Proven emergency communication options Satellite modem (Iridium) Built-in battery for up to 4 years of use Integrated GPS Can be quickly integrated into existing monitoring networks

02 TECHNICAL SPECIFICATIONS

	SPECTROTRACER AIR/SOIL
TYPE OF EQUIPMENT	**Gamma spectrometric probe**
APPLICATION	Monitoring and continuous measurement of Gamma contamination in the environment
TYPE OF RADIATION DETECTED	γ
TYPE OF DETECTOR	$LaBr_3$(Ce) Gloss 1.5"x1.5" or 1"x1" NaI(Tl) 3"x3" or 2 "x2" $CeBr_3$ 1.5 "x1.5"
MEASURING UNIT	H*(10), Bq/m^2, Bq/m^3
MEASURING RANGE	NaI: Up to 200 µSv/h (1 Sv/h with GM) $LaBr_3$: up to 3 mSv/h (1 Sv/h with GM) $CeBr_3$: up to 3 mSv/h (1 Sv/h with GM)
ENERGY RANGE	30 keV to 2 MeV or 30 keV to 3 MeV (configurable) with 8,192 channels, 80 MHz sampling
INTEGRATED NUCLIDE LIBRARY	^{137}Cs, ^{134}Cs, ^{40}K, ^{131}I, ^{99}mTc, ^{57}Co, ^{58}Co, ^{60}Co, ^{59}Fe, ^{226}Ra, ^{152}Eu, ^{154}Eu and much more are listed in the library, can be enhanced on user demand
MEASURING CYCLE	1 min to 24 h, user-configurable
STORAGE CAPACITY	2 GB (up to one year of local storage in 10 min mode)
DIMENSIONS	Diameter: 120 x 160 mm Length: 560 mm
WEIGHT	≈ 4.8 kg depending on the type of detector
POWER SUPPLY	230 V~ 50Hz or 10-24V, 2.5W
BACK-UP BATTERY	4/6 or 10 days / charger and solar panel (optional)
TEMPERATURES	from -20C to +50°C. Option: from -30°C to +60°C
RELATIVE HUMIDITY	100%
PROTECTION INDEX	IP 68, hermetically sealed
ACCESSORIES & OPTIONS	Transport and storage case, wall bracket, tripod, mounting legs, weather station, solar panel and back-up battery, GPS, additional weather sensors (rainfall, wind speed and direction, air pressure: temperature and humidity), display/alarm module output, waterproof display, earthquake qualified version, GSM/GPRS/3G/4G/LTE module, GSM/GPRS/3G/4G/LTE and SkyLINK/ShortLINK combined radio module, DSL modem, DataEXPERT supervision software
BENEFITS	Compact, robust and reliable Optional GM tubes for extended measuring range Integrated radioelement identification Dose equivalent rate calculation - H*(10) Low power consumption 2.5 W (optional solar panel) Fixed or mobile operation (GPS option) Integrated wireless transmission system: WIFI, GSM/GPRS/3G/4G/LTE, SkyLINK and satellite Specially designed to protect against corrosion (coastal areas)

	SPECTROTRACER AQUA
TYPE OF EQUIPMENT	**Liquid contamination monitoring beacon**
APPLICATION	Continuous monitoring and measurement of Gamma contamination in liquids
TYPE OF RADIATION DETECTED	γ & χ
TYPE OF DETECTOR	$LaBr_3$ Gloss 1.5"x1.5" NaI(Tl) 3"x3" or 2 "x2" $CeBr_3$ 1.5 "x1.5"
MEASURING UNIT	H*(10), Bq/m^3, Bq/l
MEASURING RANGE	NaI: Up to 200 µSv/h $LaBr_3$: up to 3 mSv/h $CeBr_3$: up to 3 mSv/h
ENERGY RANGE	
INTEGRATED NUCLIDE LIBRARY	^{137}Cs, ^{134}Cs, ^{40}K, ^{131}I, ^{99}mTc, ^{57}Co, ^{58}Co, ^{60}Co, ^{59}Fe, ^{226}Ra, ^{152}Eu, ^{154}Eu. Other additional isotopes upon request from the user
MEASURING CYCLE	1 min to 24 h, user-configurable
STORAGE CAPACITY	2 GB (up to one year of local storage in 10 min mode)
DIMENSIONS	Diameter: 120 x 160 mm Length: 560 mm
WEIGHT	≈ 4.8 kg depending on the type of detector
POWER SUPPLY	230 V~ 50Hz or 10-24V, 2.5W
BACK-UP BATTERY	4 or 10 days / charger and solar panel (optional)
TEMPERATURES	from -20°C to +50°C. Option: from -30°C to +60°C
RELATIVE HUMIDITY	100%
PROTECTION INDEX	IP 68, hermetically sealed
OPTIONS	Solar panel and back-up battery, DataEXPERT monitoring software, weather station, seawater-resistant sensor cable, wall bracket, protection against microorganisms in seawater, transport and storage case, GPS module, GPRS/3G/4G/LTE module, GPRS/3G/4G/LTE radio module and combined SkyLINK/ShortLINK, DSL modem
BENEFITS	Can be used to a depth of 100 m Integrated radioelement identification Calculation of the volume activity (Bq/l) Low power consumption 2.5 W (optional solar panel with rechargeable battery) Integrated wireless transmission system: WIFI, GSM/GPRS/3G/4G/LTE, SkyLINK and satellite

02 TECHNICAL SPECIFICATIONS

	BAB-E
TYPE OF EQUIPMENT	**Aerosol beacon**
APPLICATION	Continuous monitoring of artificial α and β radioactive aerosols in nuclear power plants or on decommissioning sites; Low aerosol concentration monitoring with a strong Gamma background; Workplace monitoring, with a fixed or mobile beacon; Air monitoring of ventilation ducts; Monitoring of air emissions
TYPE OF RADIATION DETECTED	α & β
TYPE OF DETECTOR	double large-area SI diode, 2 × 360 mm^2
MEASURING UNIT	Bq/m^3, µGy/h
MEASURING RANGE	α: 10-3 to 5.104 Bq/m^3 β: 10-2 to 5.104 Bq/m^3
ENERGY RANGE	α: From 10^(-3) to 1.10^4 Bq/m^3 β: From 10^(-2) to 1.10^4 Bq/m^3
SUCTION FLOW RATE	5 m^3/h
DIMENSIONS	460 × 630 × 260 mm^3
WEIGHT	Between 150 kg and 250 kg depending on options
TEMPERATURES	From +5°C to +45°C
RELATIVE HUMIDITY	Up to 80% humidity without condensation
NOMINAL SUCTION FLOW RATE	6 m^3/h
TYPE OF BATTERY	460 x 630 x 260 mm^3
POWER SUPPLY	Single phase mains 230V-50Hz
CONSUMPTION	Switch box power: 60 VA Pump power: 580 VA, peak current 13
PROTECTION INDEX	IP 55 (IP 54 for ventilation openings)
ELECTROMAGNETIC COMPATIBILITY	EMC emission: EN 61000-6-4 EMC immunity: EN 61000-4-3, level 3
ALARMS	Audible and visible alarm with two adjustable alarm thresholds for type of radiation α or β
ACCESSORIES & OPTIONS	GM-xN Gamma Probes, DataEXPERT monitoring software, integrated SkyLINK/ShortLINK radio modem, detector lead shielding to reduce background noise in case of a radiological accident, local and remote alarm box
BENEFITS	Dynamic compensation for interference from ambient Gamma radiation and natural radon daughters Robust and durable box with high EMC levels Uniform sample footprint for more accurate measurement Low dust retention sampling line 96 hours of graphic memory Non-volatile memory (21 days, for storage every minute) Internal quality control tools with spectrum Compatible with DataExpert software

	SA-200	SA-210
TYPE OF EQUIPMENT	**Beta/Gamma spectroscopy aerosol monitor**	
APPLICATION	Combined measurement of the Beta and Gamma spectrum and the volumetric activity of particles in the environment	
TYPE OF RADIATION DETECTED	β & γ	
TYPE OF DETECTOR	β detector: Highly sensitive 2000 mm^2 large area PIPSI diode γ detector: 1.5" x 1.5" high resolution LaBr3 detector (2.9% for Cs137)	
ENERGY RANGE	B: 80 keV to 3 MeV γ: 50 keV to 2 MeV	
SWITCH BOX DIMENSIONS	1150 x 851 x 654 mm	
WEIGHT	Up to 250 kg depending on options	
SUCTION FLOW RATE	Low power pump - 3 m^3/h suction flow rate	
FILTER PAPER AUTONOMY	Paper roll length: 20 m	
OPERATING TEMPERATURES	From -30°C to +50°C (if power supply available) From -20°C to +50°C (with optional battery)	
RELATIVE HUMIDITY	95% without condensation	
PROTECTION INDEX	IP 55 (IP 54 for ventilation openings)	
POWER SUPPLY	Single-phase power supply 230V-50Hz or 110V~ / 60 Hz	
3.5 KVA MAX CONSUMPTION	400 VA max without optional heater and without the use of the internal plug Optional heating: 2 kVA Internal socket (can be used to power a laptop): max. power supply 1 kVA	
ELECTROMAGNETIC COMPATIBILITY	EMC emission: EN 61000-6-4 EMC immunity: EN 61000-4-3, level 3	
ALARM	In remote mode on computer (Ethernet connection)	
MEMORY	Database on local embedded computer	
COMMUNICATION	Connection to on-board PC (Ethernet)	
COMMUNICATION OPTIONS	Wireless router (GPRS, GSM, Radio, Satellite) for data transfer to central system	
ACCESSORIES & OPTIONS	Ventilation and heating kit, sample line extension, additional SpectroTRACER NaI(Tl) detector	Specific carbon filter for the measurement of β and γ particle activity, SpectroTRACER NaI(Tl) detector and an additional specific filter
BENEFITS	Aerosol β activity measurement coupled with spectra measurement High sensitivity and resolution LaBr3 detector (2.9% for Cs137) Low energy consumption Dynamic compensation of interference caused by Gamma radiation and natural Radon daughters	

CHAPTER

03

RADIATION PORTAL MONITORS

Bertin Instruments has designed a complete range of radiodiation portal monitor for vehicle, cargo and pedestrian control.

These innovative, high-performance solutions are designed to fight against the spread and illegal transport of radioactive materials, while also guaranteeing the safety of goods, people and the environment with regard to radiological risk, while adapting to the needs of users.

03 RADIATION PORTAL MONITORS

RCVL
Radiological Control of Vehicle Load System

Based on global counting technology, the RCVL is designed to detect potential radioactive sources in vehicle loads. Robust, reliable, scalable and autonomous, it is available in several configurations and has numerous options to adapt to all types of vehicles and loads, as well as to the specific features of each site. It is available with plastic scintillation detectors of 5 L or 25 L volume.

MARKETS

- NUCLEAR INDUSTRY
- SECURITY
- NORM INDUSTRIES & RECYCLING

RCCL
Radiological Control of Container Load System

The RCCL is industrial equipment designed for radiological monitoring in waste containers. This system is particularly well adapted for controlling Healthcare Waste when it is released from hospitals or enters waste treatment lines. It makes measurements in dynamic and static mode, and provides real-time monitoring. Fully automatic and easy to maintain, the RCCL is available with 2.5L or 5L volume sensors.

MARKETS

- NUCLEAR INDUSTRY
- NORM INDUSTRIES & RECYCLING
- HEALTH SECTOR

RCP
Single-detection portal for the Radiological Control of Pedestrians

The RCP system offers modular and adaptable solutions to your needs in terms of detection of Gamma and/or neutron radioactive sources carried by pedestrians.

Our system takes dynamic or static measurements as the pedestrian passes in front of the detector(s). The operating principle of the system is based on the use of an ANDREA electronic switch box connected to one or two detectors and to a presence detection device that ensures that the device is measured. The detectors are available in 2.5 L or 5 L detection volume and can be fully integrated into a BDG005 case.

Pekin Airport

MARKETS

- NUCLEAR INDUSTRY
- SECURITY
- NORM INDUSTRIES
- MAJOR EVENTS

03
RADIATION PORTAL MONITORS

C3V
Gamma radiation portal monitor for vehicles

The C3V portal detector is designed to detect very low-level radioactive sources, even when they are buried in a high-density load. Responding to the needs of the nuclear industry to improve the level of radiological cleanliness of sites, this type of device is now an essential building block in the prevention of risks associated with the use and circulation of radioactive sources.

The C3V portal allows to prevent the entry of radioactive materials from an external site and the «non-dispersion» of radioactive contamination outside the site.

MARKETS

- NUCLEAR INDUSTRY
- NORM INDUSTRIES

RELATED APPLICATIONS

- NUCLEAR ACCESS CONTROL

CORAPI C3P
Whole-body gamma radiation portal monitor

The CORAPI C3P radiological inspection portal ensures that there is no contamination on a person leaving a nuclear site or a controlled area.

Its automated use means that the portal ensures a fast and reliable control with a very high sensitivity for each passage. Each of the four plastic scintillation Gamma detectors is individually managed by a specific algorithm developed by Bertin. The CORAPI C3P allows optimal detection in a volume of 200 cm x 75 cm x 60 cm. The limits of this detection volume are the motorised barriers which ensure automatic operation as a safety lock.

MARKETS

- NUCLEAR INDUSTRY
- SECURITY
- NORM INDUSTRIES

RELATED APPLICATIONS

- NUCLEAR ACCESS CONTROL

03
RADIATION PORTAL MONITORS

SAPHYGATE G
Radiation portal monitor

The SaphyGATE G is specially designed for the detection of artificial or natural low-level radioactive sources in vehicles (trucks, trains, containers) and their cargo.

The portal compensates for the screen effect caused by vehicles and automatically adapts its alarm threshold, through its intelligent algorithm.

The SaphyGATE G is based on the use of a multi-channel analyser and is a solution optimised for cost/performance that is ideally suited for radioactivity monitoring in recycling and waste treatment sites, nuclear facilities, hospitals, borders and research centres.

Its operating principle, based on the detection of a spectral anomaly, also allows the classification of the type of radio-element detected (natural, artificial medical, artificial industrial).

- Fully automatic and autonomous.
- Low false alarm rate (<1/10000).
- Adaptive alarm thresholds.
- Plastic scintillation detectors (PVT) "spectro" of 25 litres.
- Continuous operation under extreme climatic and industrial conditions.
- Complies with international standards, including IEC 62022.

MARKETS

- NUCLEAR INDUSTRY
- HOMELAND SECURITY
- NORM INDUSTRIES & RECYCLING
- WASTE TREATMENT PLANTS

SAPHYGATE GN
Special Nuclear Materials (SNM) portal monitor

The SaphyGATE GN is a new generation of Gamma-Neutron detector that uses only plastic scintillators combined with specific electronics and algorithm. It is highly sensitive and enables the effective and non-invasive fight against the illicit movement of sensitive nuclear materials, while offering an alternative solution to the use of helium-3.

The SaphyGATE GN is versatile and modular and suitable for inspection of vehicle loads, pedestrians and inside luggage.

- Developed in partnership with the LIST laboratory of the French Alternative Energies and Atomic Energy Commission (CEA).
- Patented plastic scintillation Gamma/Neutron detector technology without Helium-3 tube.
- Automatic Gamma background compensation.
- Versatile and modular: control of vehicles, pedestrians, luggage and containers with 2 versions of detectors (4 to 8 scintillators).
- Complies with international safety standards IEC 62244 and ANSI N42.35.

MARKETS

- NUCLEAR INDUSTRY
- HOMELAND SECURITY

03 TECHNICAL SPECIFICATIONS

	RCP	C3V	RCVL	RCCL
TYPE OF EQUIPMENT	**Radiological control of pedestrians**	**Portal monitor for vehicle**	**Radiological control of vehicle load**	**Radiological control of container load**
APPLICATION	Access control / Radiological monitoring of pedestrians	Access control	Access control / Detection of radioactive sources in vehicle loads	Access control / Control of waste from medical activities
TYPE OF RADIATION DETECTED	γ & n (optional)	γ	γ	
SYSTEM COMPOSITION	2 detectors ANDREA electronic switch box Presence detection kit	2 detectors Presence detection kit	2 detectors ANDREA electronic switch box Presence detection kit	
TYPE OF DETECTOR	Gamma detection: PVT (Polivinyltoluene) plastic scintillator DSPxxx-400 series + photomultiplier tube (PMT) Neutron detection: Helium-3 series ADN-TxR tubes Gamma/Neutron detection: ADM-TxR Series	Gamma detection: PVT (Polivinyltoluene) plastic scintillator DSP010 series + photomultiplier tube (PMT)	PVT (Polyvinyltoluene) plastic scintillator DSPxxx-400 Series	
VOLUME OF THE DETECTOR	DSP 001 (2.5 liters): 50 x 10 x 5 cm DSP 002 (5 liters): 100 x 10 x 5 cm DSP 010 (25 liters): 100 x 50 x 5 cm	DSP 010 (25 liters): 100 x 50 x 5 cm	DSP 002 (5 liters): 100 x 10 x 5 cm DSP 010 (25 liters): 100 x 50 x 5 cm	DSP 001 (2.5 liters): 50 x 10 x 5 cm DSP 002 (5 liters): 100 x 10 x 5 cm DSP 010 (25 liters): 100 x 50 x 5 cm
ENERGY RANGE	From 30 keV to 5 MeV	From 175 keV to 7 MeV	from 30keV to 5MeV	
WATERPROOFING THE DETECTOR	IP56	IP55	IP56	
SUPPLY VOLTAGE	22 to 26 VDC	230 VAC	22 to 26 VDC	
OPERATING TEMPERATURE	From -20°C to +50°C	From - 30 °C to + 55 °C	-	From -20°C to +50°C
OPTIONS & ACCESSORIES	ANDREA supervision software kit BVS 300 box BAC 400 box Brackets for mounting the detectors Protection for ANDREA electronic switch box (outdoor use)	Wireless transmission Battery	ANDREA supervision software kit BVS 300 box Connection to the weighing system via RS 485 link	ANDREA supervision software kit BVS 300 box Brackets for mounting the detectors

03 TECHNICAL SPECIFICATIONS

	SAPHYGATE GN	SAPHYGATE G
TYPE OF EQUIPMENT	**Gamma/Neutron radiation portal monitor**	**Gamma radiation portal monitor**
APPLICATION	Interior security Nuclear access control Homeland security Border control	Control of waste and recycled materials Nuclear access control Control of hospital waste
TYPE OF RADIATION DETECTED	γ & n	γ
SYSTEM COMPOSITION	1 to 4 Gamma/Neutron detectors Electronic switch box Presence detection kit Central monitoring unit (optional) Alarm reporting (optional)	1 to 4 plastic scintillation detectors DSP-010-SG lead shielding Software solution Presence detection kit Central unit
TYPE OF DETECTOR	Plastic scintillator PVT (Polyvinyltoluene)	PVT (Polyvinyltoluene) plastic scintillator
VOLUME OF THE DETECTOR	GN104 liters: 1,300 x 400 x 200 mm GN52/54 liters : 1,300 x 400 x 100 mm	25 litres: 1000 x 500 x 50 mm
ENERGY RANGE	From 50 keV to 7 MeV	From 30 keV to 7MeV
CENTRAL UNIT	Human Machine Interface (HMI) designed for PC (Optional embedded screen)	Industrial PC with MS Windows and a 12» TFT XGA colour touch screen
PROTECTION INDEX	IP 65 (detector) IP 55 (central unit)	IP 65 (detector) IP 55 (central unit)
OPERATING TEMPERATURE	From -30°C to +55°C	From -20°C to +50°C
WEIGHT		400 kg with lead covering and support
COMPLIANCE	International standards (IEC 62244, ANSI N42.35 and ANSI N42.42)	International standards (including IEC-62022)
ACCESSORIES	BVS 300 box Camera Ultrasonic sensor Site supervision software Multisite supervision software	Camera Cable extension kit External alarm signal Traffic light GSM/SMS modules Train control option

03 ACCESSORIES

SAPHYGATE G	SAPHYGATE GN	RCVL DSP002/ DSP010	RCCL	CORAPI C3P	RCP	C3V
Cable extension kit There are 2 kits: - A connection kit - A cable extension kit	BVS 300 alarm box	BAC 400 alarm and acknowledgement box	BAC 400 alarm and acknowledgement box	Data supervision software	Option: ANDREA monitoring kits (Ethernet or USB)	Supervision software
BVS 300 alarm box	Outdoor camera	Option: ANDREA monitoring kits (Ethernet or USB)	Option: ANDREA monitoring kits (Ethernet or USB)	BAC 400 alarm and acknowledgement box	Option: BVS 300 alarm box	
Signalling light	Ultrasonic sensor	Option: BVS 300 alarm box	Option: BVS 300 alarm box	1 emergency opening switch	BAC 400 alarm and acknowledgement box	
Outdoor camera	Local supervision software	Lead covering kits	Lead covering kits	Supervision software	Lead covering kits	
Alarm classification	Multi-site supervision software	Connection kit	Connection kit		Connection kit	
Local supervision software						
Option: ultrasonic sensor for train control						
Multi-site supervision software						

CHAPTER

04 PROFESSIONAL RADON MONITORING

Radon is a radioactive gas that emanates naturally from the ground that can be hazardous to human health in high concentrations. In order to protect people and workers, Bertin Instruments has developed a complete range of equipment for professional Radon monitoring.
In terms of reliability, stability, robustness and response time, our high-performance solutions cover the entire range of applications related to indoor and outdoor Radon measurement. They can be used for surveys in homes, workplaces, in the research sector and for geological studies. They are internationally recognised as benchmarks in the field.

04
PROFESSIONAL RADON MONITORING

ALPHAGUARD
Portable Radon monitor

The AlphaGUARD is an ultra-sensitive portable monitor used in professional Radon monitoring. The AlphaGUARD is recognised as the leading instrument in this market, offering high detection efficiency, a wide measurement range, a fast and continuous response, and high calibration stability without frequent maintenance.

- Reference instrument for professional radon monitoring
- Guaranteed calibration stability for 5 years
- Robust and reliable
- Automatic background correction
- Complete range of accessories for measuring Radon in air, water, soil, building materials, etc.
- Adapted to extreme weather conditions (temperature and humidity)

RELATED APPLICATIONS

- Radon monitoring in homes and workplaces
- Scientific research and applications
- Geological studies
- Nuclear industry
- NORM Industry

ALL-TERRAIN MONITORING

WATER

The presence of Radon in water is monitored with the AquaKIT.

SOIL GAS

The measurement of radon on soil is carried out by using the soil gas probe.

ALPHAE
Radon concentration meter

The AlphaE is an ultra-small continuous radon monitor for time-resolved radon monitoring in buildings, outdoor as well as in mines.

With its long battery life, it can operate for up to 6 months without interruption, making it ideal for radon monitoring in buildings or hard-to-reach areas (mines, cellars, etc.). All the data collected can be displayed, exploited and exported with Bertin Instruments' DataVIEW software.

MARKETS

- NUCLEAR INDUSTRY
- HEALTH & RESEARCH
- NORM INDUSTRIES & RECYCLING
- CIVIL CONSTRUCTION

04 TECHNICAL SPECIFICATIONS

	ALPHAGUARD D50	ALPHAGUARD DF2000
TYPE OF DETECTOR	**Ionisation chamber, HV ≈ 750 VDC**	
OPERATING MODE	3D-alpha spectroscopy and current mode	
TOTAL/ACTIVE VOLUME OF THE DETECTOR	0.62 litres / 0.56 litres	
BACKGROUND SIGNAL DUE TO INTERNAL CONTAMINATION	<1 Bq/m³	
RADON (RN-222) MEASUREMENT RANGE	2 Bq/m³ to 50,000 Bq/m³	2 Bq/m³ to 2,000,000 Bq/m³
THORON (RN-220) MEASUREMENT RANGE	N/A	2 Bq/m³ to 2,000,000 Bq/m³
DETECTOR SENSITIVITY	1 cpm at 20 Bq/m³	Rn mode: 1 cpm at 20 Bq/m³ Rn/Tn mode: 1 cpm at 60 Bq/m³ (Rn) 1 cpm at 140 Bq/m³ (Tn)
CALIBRATION	5 year warranty (low maintenance)	
LINEARITY ERROR / CALIBRATION STABILITY	<3% on the full range	
MEASUREMENT MODES AND CYCLES	10 min, 60 min (diffusion)	10 min, 60 min (diffusion) 1 min, 10 min (flow) 10 min (Rn/Tn mode) Interval mode (applicable in flow mode)
STORAGE CAPACITY	Up to 60,000 measurement points ~ 400 days with 10 min cycles ~ 2,500 days with 60 min cycles	Up to 60,000 measurement points ~ 40 days with 1 min cycles ~ 400 days with 10 min cycles ~ 2,500 days with 60 min cycles
AUTONOMY	Up to 10 days (diffusion mode)	Up to 10 days (diffusion mode) >10 h
WEIGHT (INCLUDING BATTERY)	6.2 kg	7 kg
DIMENSIONS	Without handle: 282 mm × 340 mm × 123 mm With handle: 329 mm × 355 mm × 123 mm	
SENSITIVITY TO GAMMA RADIATION	No interference for Gamma environments below 0.2 mSv/h	
CONDITIONS FOR USE -TEMPERATURE -ATMOSPHERIC PRESSURE -HUMIDITY	-10°C to + 50°C 700 mbar to 1100 mbar 0% rH to 95% rH (non-condensing)	
EXTERNAL POWER CONSUMPTION	100 to 240 V (400 mA) 50 to 60 Hz	
ACCESSORIES & OPTIONS	Radon box: radon surface exhalation measurement AlphaPM: radon progeny measurement AquaKIT: radon in water measurement (samples) REM1: radon in water measurement (continuous) Soil Gas Probe: radon in soil measurement DataVIEW PRO: Software for read out / parametrization / analysis / reporting Emanation and calibration container and other accessories for calibration, remote data transmission, stationary monitoring, etc	

	ALPHAE
TYPE OF DETECTOR	**Diffusion chamber with silicon diode**
MEASURING RANGE	20 Bq/m³ to 10 MBq/m³
DOSE CALCULATION	Based on a configurable equilibrium factor and dose conversion factor (preset standard values)
DETECTOR SENSITIVITY	3 cph at 100 Bq/m³
DOSE RANGE	0 to 1 Sv (0 to 10 rem)
MEASURING CYCLE	Adjustable from 1 min to 12 hours
STORAGE CAPACITY	8500 data (between 7 and 4250 days depending on the measurement cycle)
DIFFUSION TIME	Typically 1 to 2 hours (adjustable smoothing factor)
BACKGROUND NOISE COMPENSATION	Adjustable by the user
ADDITIONAL SENSORS (MEASURING RANGE)	Temperature: from - 40°C to + 80°C Pressure: 800 to 1,100 hPa Humidity: 0% to 99% Movement of the device
OPERATING CONDITIONS: - TEMPERATURE - HUMIDITY	From - 20°C to + 50°C 5% to 90% without condensation (if >80% the AlphaE must be protected in its dedicated humidity protection bag)
BATTERIES (RECHARGEABLE)	Up to 6 months (rechargeable via USB)
INTERFACE	USB, cable incl. charging unit
DISPLAY	6 digit LCD + 5 digit alphanumeric, backlighting
DIMENSIONS	111 mm x 78 mm x 36 mm
WEIGHT	213 g
HOUSING	Aluminium
PROTECTION INDEX	IP40 without protection, IP51 with belt holder, IP62 with dust protection bag
ACCESSORIES & OPTIONS	Wall support, belt pouch, transport case, dust protection bag, humidity protection bag, free DataVIEW software for viewing and setting up data, dataview PRO software (including advanced functions)

CHAPTER

05 ON-DEMAND SYSTEMS

Able to accelerate innovation in demanding markets, Bertin Instruments is involved in creating specific and complex on-demand systems.

Thanks to its mastery of cutting-edge technologies and major engineering trades (mechanical, electrical, electronic, optical, etc.), Bertin Instruments designs and develops fixed and mobile solutions for the largest players (industrial groups, government services) as well as for SMEs, both in France and abroad:

- Radiation protection,
- Environmental and Radon monitoring,
- Radiological control of access and processes.

Bertin Instruments plays a role in many markets, such as nuclear, security and defence, health, recycling and waste treatment markets, among others. Bertin Instruments shows its adaptability by integrating its products and technological bricks into complex systems for the detection and monitoring of ionising radiation, even in difficult environments and in compliance with the most demanding design standards, to help you fulfil your projects in the shortest possible time.

Bertin Instruments also forms and maintains first-class industrial and academic partnerships, in order to expand on its expertise and extend its field of competence. Bertin participates in thesis projects, collaborative projects, subcontracting or joint laboratories such as:

- CEA – LETI: particle collection, chemical and biological analysis
- CEA – LIST: measurement of ionising radiation
- ONERA: optical architecture and new generation multispectral infrared cameras

Bertin Instruments is also committed to supporting its customers throughout the life span of their nuclear instrumentation products and systems, as a supplier of top-of-the-range services. From development and manufacturing to installation, training and maintenance, Bertin Instruments remains at your side and provides a personalised after-sales service.

05
ON-DEMAND SYSTEMS

SURFACE CONTAMINATION CONTROL
Business case n°1: Self-supported system for measuring contamination on roads - CST-28N

This measuring system is self-supporting and autonomous. It has a very large detector (1800 cm^2), based on a dual proportional gas flow meter (Ar/CO2 or Ar/CH4 mixture), to cover large areas more quickly. It uses its 2 measurement channels to discriminate between α and β radiation.

Finally, the CST-28N operates in both dynamic detection mode and static measurement mode for accurate contamination analysis.

Irreproachable radiation cleanliness is required from nuclear operators, who must protect workers from radioactive spills within their facilities and during the transport of waste within their site.

Following this logic, and in order to eliminate any risk of soil contamination during waste evacuation between the reactor building and outdoor areas, Bertin Instruments has developed an α, β and γ contamination monitor called CST-28N, dedicated to the control of roadways over large areas.

- **Reliable detection**: low sensitivity to shock and vibration (reduced false alarm rate).
- **Gamma background discrimination**: electronic processing is used to separate the pulses made from to each type of radiation α and β and subtracts the part of the ambient γ radiation by anti-coincidence and subtraction.
- **Ergonomic and easy to use**: this is a simple tractor that includes a speed controller, with little adjustment required before use.
- **Long battery life**: 8 hours, the equivalent of a working day.
- It can be t**ransported on a trailer** and it can easily be used on several sites by the same nuclear operator.

SURFACE CONTAMINATION CONTROL
Business case n°2: Radiological Control Machine for Linens - CORALI

To comply with the regulations in force, nuclear operators must demonstrate the absence of radioactive contamination on linen used by workers in the Controlled Zone, after it has been washed and put back into circulation. This control is frequently carried out manually with a contamination meter equipped with a probe. The resulting measurement is unreliable, and the process is time-consuming and generates repetitive movements for the operators.

In order to make the measurement more mechanical and reliable, Bertin Instruments supplies radiological linen inspection machines called CORALI. It automatises Alpha and Beta radiological control of different types of linen to keep a traceability of the controls carried out each day.

The machine also automatically separates contaminated and non-contaminated linen and disposes of it in the appropriate treatment channel. The installation is equipped with large-area proportional gas meters, which makes it particularly effective for detecting Alpha. It is available in two versions depending on the needs of the operator: vertical control (on a hanger) or horizontal control (flat) of laundry.

- **Fully automatic measurement** which guarantees the reproducibility and traceability of the control, in compliance with regulations. The CORALI saves time for the operators by sorting the linen and sending it to the appropriate treatment channel.
- **It is a high-performance algorithm**, as a result of our expertise in radioactivity detection, allowing us to carry out the measurement with precision and achieve high detection performance.
- **Continuous, real-time contamination monitoring** via two large, thin-window proportional gas meters located above and below the linen, ensuring optimum performance for Alpha and Beta radiation detection. The machine's counters are placed as close as possible to the linens to optimise the measurement.
- **Two modes of operation of the machine**: a "continuous" mode for fast and automatic operation, as well as a "step-by-step" mode more suited to Alpha detection. The user selects the desired mode type at the beginning of the measurement campaign.
- **Optimised and simplified Human Machine Interface** for users and allowing access to many parameters in "expert" mode.

05
ON-DEMAND SYSTEMS

RMS - RADIOLOGICAL MONITORING NETWORK
Business case n°3: Renovation of the KRT monitoring chains

The KRT chains are used for protecting on-site workers and fulfil an essential function by ensuring continuous monitoring of Gamma radiation in the vicinity of equipment likely to release radioactivity.

This three-stage project (study and design, equipment qualification, installation and commissioning) results from four years of research and development, and marks the entry of Bertin Instruments' into the demanding market of classified fixed monitoring systems inside nuclear facilities.

The Grand Carénage, a major industrial programme, aims to extend the operating life of French nuclear power plants up to 60 years. This project involves a series of major maintenance and modernisation work on the power generation facilities, as well as on the systems dedicated to radiation protection for operators.

Following a call for tender from EDF, the industrial consortium, which consists of Bertin Instruments, Clemessy and Ineo, was selected with the aim of making the operation of the KRT monitoring chains of 24 French nuclear reactors more reliable and sustainable.

- **Maintenance of the KRT monitoring chains** for 24 reactors in 11 power plants of 1,300 MW and 1,450 MW.
- **Monitoring of the ambient dose rate** as well as the exposure to radioactivity via fixed and portable Gamma beacons with digital display.
- **Continuous measurement of global volumetric Gamma activity** of fluids using a fixed monitoring system for the reactor building circuit.
- **Improved radiation protection for operators** against possible radiation leakage and dispersion.
- **Qualification of the KRT monitoring chains**.

RMS - RADIOLOGICAL MONITORING NETWORK
Business case n°4: Radiological measuring probe - NAVIRAD RS

On French Navy ships, it is important to ensure the radiation protection of personnel when faced with nuclear and radiological risk. This hazard may come from within the ship (in the case of nuclear-powered ships or ships carrying nuclear loads) or from outside (armed nuclear conflict or radiological incident on an external civil or military installation).

Bertin Instruments has developed a system for alerting and measuring Gamma radiation rapidly to meet the needs of the French Navy with regard to protection against this type of threat. This system is based on a network of radiological measurement probes called NAVIRAD connected to the building's network via a connection box. This system can be integrated into surface ships (FREMM frigates, PAN nuclear aircraft carriers, PHA amphibious helicopter carriers) and also submersible ships (SNLE, SNA).

The NAVIRAD probe is fully waterproof and resistant to sea waves and salt spray in extreme conditions (-30° to +60°C). The NAVIRAD environmental sensor is also available in an ACTISUB version, a coated version that can be placed in a watertight bell for deep immersion.

- Radiation detection and warning for buildings operating in a CBRN threat environment.
- High measurement dynamics: 10 nSv/h to 10 Sv/h with two Geiger-Müller detectors.
- No blinding up to 1000 Sv/h.
- Reduced number of probes (≈ 4) to cover an entire surface vessel and effectively protect the crew from radiological threats.

05
ON-DEMAND SYSTEMS

ERMS - RADIOLOGICAL ENVIRONMENT MONITORING NETWORKS

Business case n°5:
Navy Nuclear Surveillance System - 2SNM

The French Navy is the 2nd largest nuclear operator in France. For over 45 years, it has been using nuclear energy to implement a deterrence policy, through its oceanic (Submarine Nuclear Launchers) and naval (Mirage 2000N and Rafale) components. Its four military ports (Brest, Toulon, Ile-Longue and Cherbourg) also house nuclear-powered vessels in operation, both under construction and being dismantled, notably the Charles de Gaulle nuclear aircraft carrier, the nuclear-powered submarines and the nuclear attack submarines.

Therefore, sound management of nuclear energy implies paying permanent attention to the safety and protection of personnel, neighbouring populations and the environment. In order to measure the impact of nuclear activities, prevent incidents and provide a rapid and appropriate response to crises, Bertin Instruments has designed and deployed a radiological environmental monitoring system 2SNM.
Its role is to collect real-time measurements of the levels of natural and artificial radioactivity, Gamma radiation, as well as the Beta activity of noble gases and Alpha/Beta activity of aerosols.

2SNM is composed of about fifty measurement channels at each site, and is based on four types of equipment linked to a centralisation system that collects all the measurement data and generates an alarm in the event of a critical threshold.

These are:

- The GammaTRACER XL2 probe is designed for the continuous measurement, recording and retransmission of environmental Gamma dose rate values;
- The PGM200 beacon, for the measurement of Alpha and Beta activities of aerosols as well as the measurement of Beta activities of noble gases;
- The SODAR station, for measuring winds at altitude;
- A weather station, with a 3D anemometer and a rain gauge.

High sensitivity over a wide measurement range.

Flexibility: each beacon is designed to operate autonomously within the surveillance network, and to set off widespread alarms through a mix of fibre optic and wireless radio transmission modules. The data collected by the beacons can be accessed remotely through a monitoring software (not provided by Bertin).

Highly adaptable: 2SNM allows the monitoring and prediction of waste, but also the location and assessment of the radiological risk to the population and the environment. This radiation monitoring network is particularly suitable for routine use, but also for emergency operations.

Resilience: the components of the 2SNM system are particularly resistant to hostile climatic conditions and extreme operational stresses such as earthquakes and marine submersion.

Total energy autonomy thanks to solar panel power supply. In the event of a total loss of power, these autonomous stations can operate for up to 15 days.

05 ON-DEMAND SYSTEMS

ERMS - RADIOLOGICAL ENVIRONMENT MONITORING NETWORKS

Business case n°6: Environmental Radiation Monitoring System for Bruce Power Nuclear Station

Bertin Instruments has proven experience in this field, which it uses to deliver fully autonomous solutions, forming a real network dedicated to the continuous monitoring of radioactivity in the air and soil.

The Bruce Power Nuclear Generating Station received a total of 8 SA200NG and SA210ING aerosol stations, 49 fixed stations and 10 mobile stations based on the SpectroTRACER spectrometric probe.

Bruce Power is located in the province of Ontario, Canada, and is the world's most powerful nuclear power plant, with 8 reactors in operation and producing the equivalent of 6300 MW of electricity.

After the Fukushima nuclear accident in 2011, the plant launched a call for tender to strengthen its radiological environmental monitoring system.

These systems play a crucial role in being deployed around facilities to improve responsiveness in the event of a radiological incident, thereby protecting the environment, neighbouring populations and plant operators.

- **SpectroTRACER Air/Soil probe** equipped with LaBr3 (Ce) scintillation detectors, an additional GM tube and a GPS for the measurement of Gamma dose rate values in air and soil.
- **SA aerosol stations dedicated** to the continuous measurement of Beta and Gamma radioactive particles and the identification of radionuclides in the air.
- **Low energy consumption** and autonomous operation: this makes the equipment particularly adapted for emergency situations, thanks to its back-up battery.
- **Robust equipment and low maintenance**: resistant to extreme operational climatic conditions (earthquakes, etc.).
- **Operation with Gamma dose rates up to 1 Sv/h.**
- **Redundant communication interfaces**: cell/3G modem and Globalstar satellite modem for reliable, centralised data transmission.

RADON

Business case n°7: Radon monitoring in building materials – AlphaGUARD DF2000

Over recent years, there has been an increase in the monitoring of radon gas exposure in enclosed spaces on an international scale. Additionally, it has become necessary to carry out mitigation actions to reduce its concentration, especially in building structures through which Radon naturally emanates from the soil.

Vahanen Building Physics LTD, a Finnish construction and real estate company, has investigated the issue of airtightness of radon membranes by evaluating the diffusion coefficient of the gas in different materials. The company has a laboratory that specialises in Radon measurements and uses the professional monitor AlphaGUARD to carry out its measurements.

The AlphaGUARD is a reference instrument designed by Bertin is highly versatile and its numerous accessories are used to monitor Radon in air, water, soil and building materials.

- **Use of the AlphaGUARD DF2000** and its **pumping function** within a **laboratory facility,** by connecting to a test chamber in a closed gas circuit.
- **High sensitivity** and **high measurement performance.**
- **Quantification of the pathways** of Radon gas within different materials in order to assess their **permeability.**
- **Improving indoor air quality** by measuring Radon.
- **Reliable and accurate measurements** thanks to the AlphaGUARD's 5-year calibration stability guarantee.

CHAPTER

06

SERVICE OFFER

Bertin Technologies plays a role throughout the product life cycle from research & development to installation and maintenance in operational conditions, and has developed skills and know-how to offer a wide range of services from preventive and corrective maintenance to metrology.

Bertin Technologies' teams intervene in the factory and on site, whether it is their equipment or that of other manufacturers. They are also able to offer a wide range of training courses on the use and maintenance of products or on the principles of radioactivity measurement.

06
SERVICE OFFER

A COMPLETE RANGE OF SERVICES FOR YOUR RADIATION PROTECTION EQUIPMENT

Bertin Technologies offers many technical solutions to maintain its equipment in good working order and to guarantee its reliability throughout its life cycle, to support its clients in preventing radiological risks.

To do so, Bertin Technologies has a multidisciplinary team of over 70 people, specialising in optics, metrology, electronics, radiation protection, as well as logistics and purchasing.

Our technicians are located throughout France to guarantee optimal responsiveness and local service to our customers.

They are specialists in the metrology of radioactivity measuring devices, and are trained and authorised to intervene rapidly on nuclear, industrial and military sites, whatever the installation and its operating constraints.

The Bertin Technologies team is available and versatile, and is present at every stage of the systems and instruments maintenance process, to provide optimal services covering a wide range of customer needs (on Bertin products and those from other manufacturers):

- **INSTALLATION AND SERVICING**
- **RADIATION CONTROL SERVICES IN METROLOGY, VERIFICATION AND CALIBRATION**
- **PREVENTIVE MAINTENANCE AND PERIODIC REGULATORY CONTROL**
- **CORRECTIVE MAINTENANCE**
- **TRAINING**
- **TRACEABILITY OF OPERATIONS**

Bertin Technologies also provides training for your technicians and international assistance by offering remote services and diagnostics, to reduce waiting time and on-site interventions. The purpose of these training sessions is also to make your teams aware of radiation protection through personalised support in the handling, operation and maintenance of instruments.

Its factory production and service unit covers more than 3,000 m2 and is located in Thiron-Gardais in the Eure-et-Loir. Dedicated to the manufacture, repair and calibration of high value-added instruments, it mainly deals with products from optronics (Defence), radiation protection (Nuclear) and air biocollectors (Life Sciences) ranges. This facility also includes a calibration laboratory equipped with two radiation casemates with accreditation from the French Accreditation Committee (COFRAC) under no. 2.6158, in the field of ionising radiation. The first is dedicated to dosimetry, the second to radiametry.

Each year, nearly 8,000 radioactivity measuring instruments are controlled and repaired by Bertin Technologies, in addition to the 20,000 dosimeters used by workers on EDF sites.

NOTES

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Bertin Technologies S.A.S
Parc d'Activités du Pas du Lac - 10 bis, avenue Ampère - 78180 Montigny Le Bretonneux, France

www.bertin-technologies.com
sales-rad@bertin.group