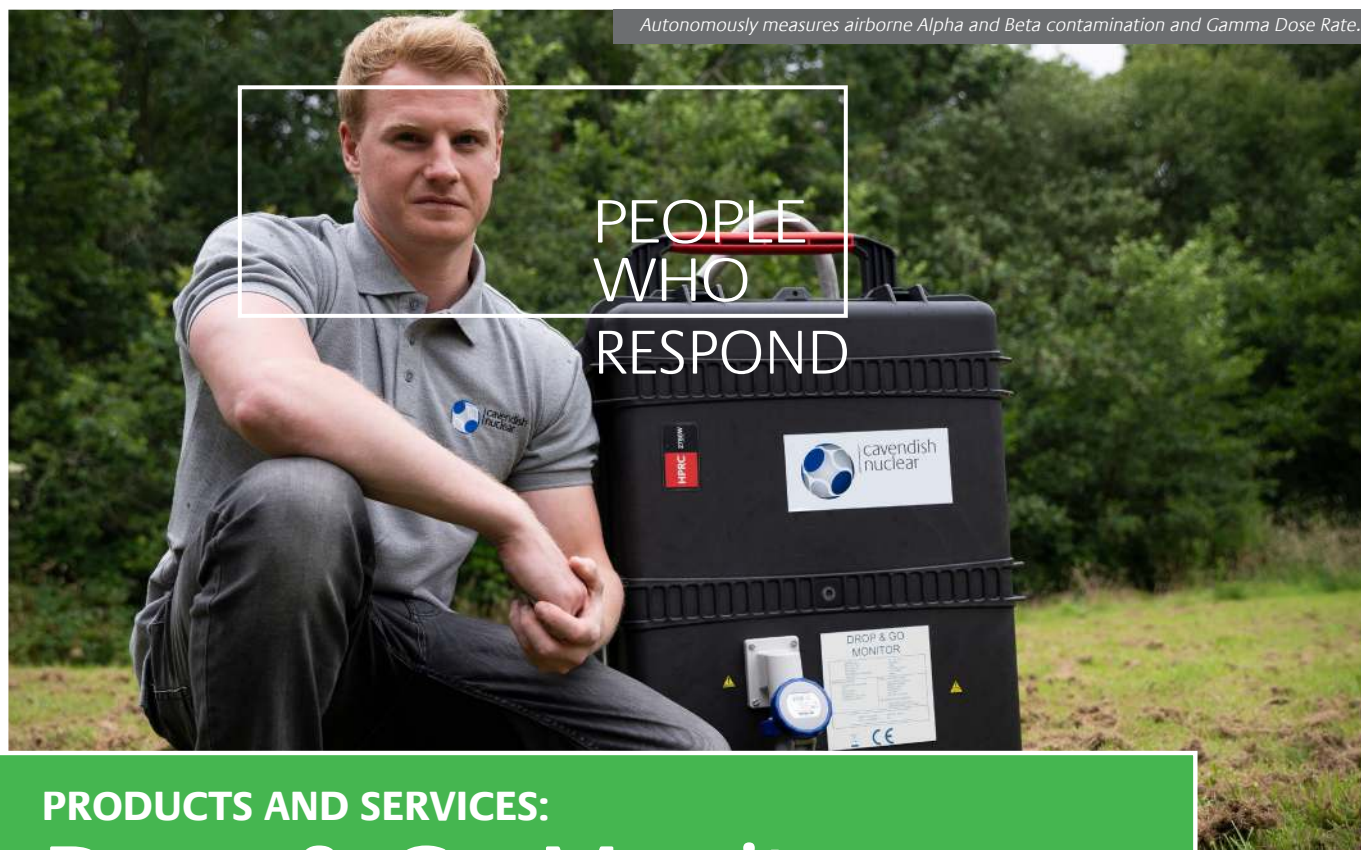


Autonomously measures airborne Alpha and Beta contamination and Gamma Dose Rate.



PEOPLE
WHO
RESPOND

PRODUCTS AND SERVICES:

Drop & Go Monitor

OVERVIEW

Cavendish Nuclear's Drop & Go Monitor is a portable instrument which autonomously measures airborne Alpha and Beta contamination and Gamma Dose Rate. This measured radiometric data (together with positional and status information) is transmitted via the 3G/4G mobile phone network back to a secure cloud based service which can be accessed from any location via a standard internet browser with access to the internet.

PERFORMANCE

Alpha Contamination measurement:

Efficiency For Alpha Detection –
24% for all Alpha up to 5.7 MeV

Beta Contamination measurement

Efficiency For Beta Detection –
24% for ^{36}Cl or ^{90}Sr , 15% for ^{60}Co

Gamma Dose Rate measurement

Linearity: $\pm 10\%$ from 1 $\mu\text{Sv/h}$ to
100 mSv/h (137Cs radiation).

Energy Response: 70 keV to 7 MeV $\pm 30\%$
normalized to 137Cs.

Dynamic Range: 0.1 $\mu\text{Sv/h}$ to 100 mSv/h
(10 $\mu\text{R/hr}$ –10 R/hr)

Polar Response: $\pm 20\%$ over 4π for 137Cs.



Lightweight and portable, the Drop & Go Monitor can be used anywhere.

OUR PRODUCT IN DETAIL

Application and Measurement

The Drop & Go Monitor is suitable for a large variety of diverse applications such as:

- Emergency situation where rapid deployment at any locations is required
- Temporary monitoring of areas to measure the radiation levels workers are being exposed to
- Semi-permanent monitoring of areas which are changing due to decommissioning or construction
- Permanent monitoring

Alpha, Beta and Gamma Measurements

The Alpha and Beta contamination measurements are made by continuously drawing air into the monitor. The airborne particulate material is deposited on filter paper which is then monitored by a silicon radiation detector for simultaneous measurement of both Alpha and Beta radioactivity.

The radiometric data is recorded as:

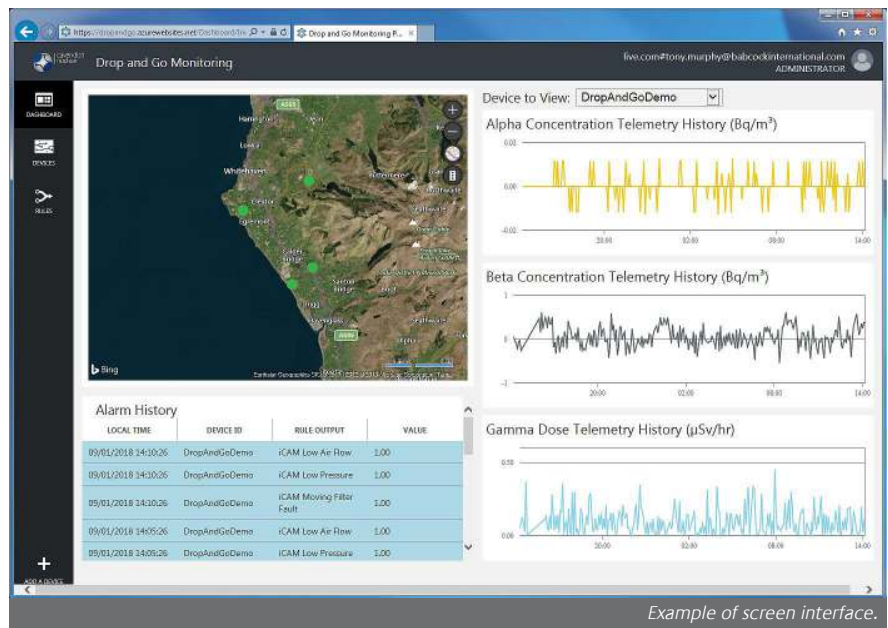
- Measured Integrated Alpha Activity concentration (Bq.h/m³)
- Measured Integrated Beta Activity concentration (Bq.h/m³)
- Gamma Dose Rate (µSv/hr)

The filter paper requires regular replacement, and is supplied via a moving filter roll (providing in excess of 255 changes) which automatically moves to a new filter position in the following scenarios:

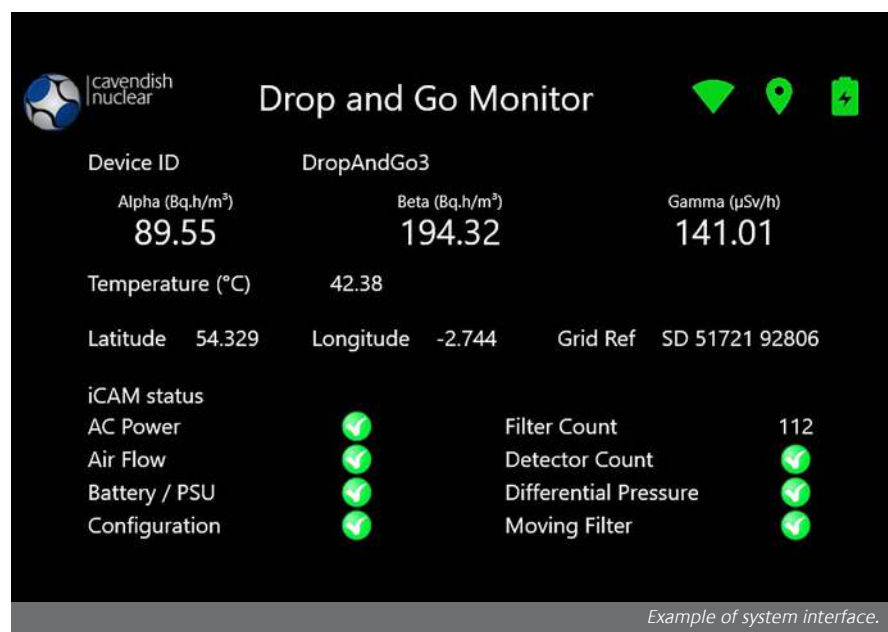
- Pre-set time interval
- Pre-set air volume
- High filter pressure drop
- Low flow
- High activity
- High radon/thoron background

Deployment and Operation

The Drop & Go Monitor can be deployed by two people lifting it to its place of operation, or by one person wheeling it in position. Within 10 minutes of powering on, the monitor will have taken one measurement of Alpha and Beta contamination and Gamma Dose Rate and transmitted to the server. A local display of these radiation readings and current status of the monitor is available locally so that the operator can confirm operation (as well as successful 3G/4G mobile transmission) prior to leaving the monitor measuring.



Example of screen interface.



Example of system interface.

Data and Security

The data is transmitted every 5 minutes back to the cloud where it can be viewed through a standard web browser and is updated automatically. Alarms can be set at operator specified levels so alerts can be generated to any values going outside allowable ranges, whether this be with the radiation levels or the status information.

Alternatively, the data can be downloaded from a standard web browser and analysed offline. The data is exported as a .csv file so can be easily imported to Excel for further analysis.

The data is transmitted over the 3G/4G mobile phone network by utilising dual SIM cards:

- Standard SIM (operator choice) for normal operation
- Anywhere SIM for operation when the standard SIM has no reception (It picks the best 3G/4G mobile signal from all operators)

The monitor automatically prioritises to the standard SIM during normal operation. When there is no signal (due to bad signal area or mobile mast not functioning) it switches automatically to the Anywhere SIM

The monitor can also operate without mobile data transmission (either for security reasons or lack of 3G/4G mobile signal). All data measured by the monitor is automatically stored on a USB memory stick within the monitor

which can be retrieved at any time during operation (and replaced with another USB memory stick).

All data communications are secured end-to-end with all monitors and user connections requiring authentication before being able to access the service or data.

Each Drop and Go Monitor must be registered with the cloud service to generate a unique security token that is supplied with each data packet sent from the monitor. Only data from registered monitors is accepted by the cloud service for analysis and display. Communications from the monitor to the cloud use MQTT protocol and the connection is secured using the

Transport Layer Security standard (TLS).

User login uses federated identity to authenticate via one of the industry standard authentication providers or by integration with an organisation's on-premises Active Directory domain. The connection from the user's browser to the cloud application is secured using the HTTPS protocol and TLS.

The monitor requires 230Vac, 50Hz mains and can be powered from the following:

- standard building mains supply
- standard portable petrol / diesel generator
- portable propane gas powered generator – this would give up to 6 days operating time without

attending the monitor. 2 propane gas cylinders can be used such that every 3 days, a single gas cylinder is switched out so there is no downtime in operation

There is a small UPS provided as part of the monitor functionality to enable it to continue partial functioning if there is a loss in power. This enables the Gamma Dose Rate to continue being transmitted as well as the status information (which will show that the monitor has lost power). The operator viewing the data and status on the web browser will be alerted to the loss in power within 5 minutes.

SPECIFICATIONS

DIMENSIONS	Height	800mm Additional 170mm for air inlet pipe 1070mm with both top and bottom handles extended
	Width	586.5mm
	Depth	388mm
WEIGHT		49kg (excludes mains cable and any generator or propane gas cylinders)
ELECTRICAL SUPPLY	Autonomy	> 30 mins (Only Gamma Dose Rate readings are valid in the absence of Mains power)
ENVIRONMENTAL	Ambient Temperature	-7°C to 27°C
	Humidity	30% to 85% non-condensing
	EMC	EN61326-2-1:2013 Electrical Equipment for Measurement, Control and Laboratory Use and encompasses the requirements of EN 50130-4:2011 & A1:2014 Emissions to Class B (low voltage power supply network which supplies buildings used for domestic purposes) Immunity to Basic (low voltage from the public mains network)
The monitor is rated as IP65 and suitable for operation in an outdoor environment. Suitable protection may be required in extreme temperatures.		
SAFETY	LVD	EN61010-1:2010 Safety Requirements for Electrical Equipment for Measurement, Control and Laboratory Use
CERTIFICATIONS	The monitor CE marked to the following directives. EMC Directive 2014/30/EU LV Directive 2014/35/EU RoHS Directive 2011/65/EU	
OPTIONS	Alternative measurement units for Alpha and Beta contamination readings can be displayed e.g Activity on filter: Bq, µCi, counts/second (as CPS) or disintegrations per minute (DPM) Integrated airborne activity concentration: hr/m ³ , µCi-hr/cc or DAC-hr Mean airborne activity concentration over preset time interval: Bq/m ³ , µCi/cc or DAC	
	Other sensors can be added to the system to measure other parameters dependent on customer requirements Alternative functionality on the web browser for analysing the monitored data Specific site specific operator variables can be setup for the various radiometric algorithms	



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