

The logo for Omniflex is written in a white, elegant cursive script. The letters are fluid and interconnected, with a prominent 'O' at the start and a long, sweeping underline that extends under the 'flex' portion of the word. The background is a solid blue with a large, lighter blue abstract shape that resembles a stylized 'O' or a wave, partially overlapping the logo.

Omniflex

Advancing the UK's nuclear industry



How Omniflex is advancing the UK's nuclear industry

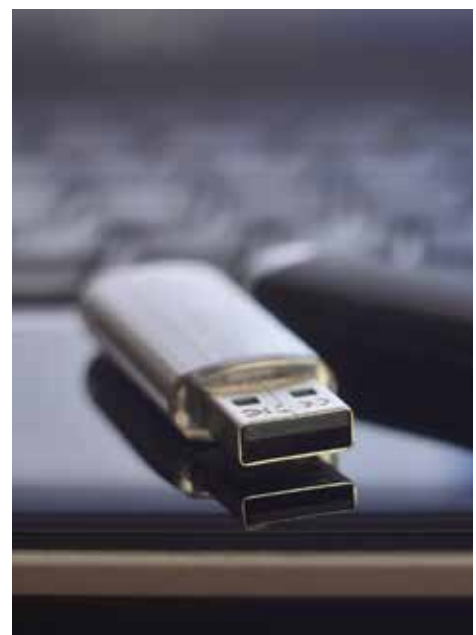
Arguably, there is no industry as highly regulated as the nuclear sector and none where mission-critical safety systems matter more. Here, Gary Bradshaw, director of remote monitoring specialist Omniflex, explains how the nuclear sector can benefit by adopting new systems that save time and money while also improving plant safety.

Commercial off-the-shelf (COTS) products



Commercial off-the-shelf (COTS) products are ready-made, packaged solutions that are available to be bought off-the-shelf and can then be adapted by the end user to meet their needs.

These purchases are often alternatives to custom equipment and one-off developments. To date, the highly regulated environment in the nuclear sector has made many sites reluctant to adopt COTS products, even though they offer some key advantages.



Radiological monitoring systems

Networking radiological monitors

All UK-based nuclear facilities must adhere to strict guidelines for the radiological monitoring systems used to monitor the levels of alpha, beta and gamma radiation in the air.

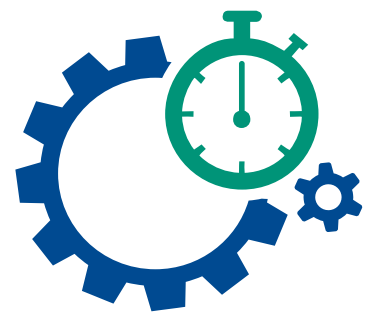


Conforming to regulations

Regulations from the Health and Safety Executive (HSE) and the Office of Nuclear Regulators (ONR), have created demand for real-time and historical data monitoring and the creation of safe areas for operators to collect data without entering radioactive areas. To meet this demand, networking of radiological monitors became the industry standard.

An added layer of complexity

However, networking the monitors adds a layer of complexity. Because traditional nuclear radiation monitoring systems are bespoke, the field of radiation protection instruments needs to be manually networked to a bespoke panel, requiring a skilled professional to spend days wiring and testing each bespoke unit.



Externally verified

Each of these must then be inspected by an external engineer from a regulating authority to check for human errors, before it can be certified for use which, again, can take days to complete.

The RPN1 Gateway

When the National Nuclear Laboratory (NNL) was tasked with installing 130 data collection points to connect large volumes of radiation protection instruments at Sellafield's nuclear site, it was not feasible to use traditional methods. It would have taken months to complete and would add significant cost by installing expensive power and network cabling.

To overcome this problem, We engineered **the RPN1 device**

The RPN1 is a gateway device, developed to simplify the process of data collection from a variety of radiation protection, from different manufacturers, via their RS485 communications ports and connects them to the plant's standalone radiological surveillance SCADA system.



Cost

The RPN1 eliminates the need to run miles of expensive power cables to each monitor, because it connects directly to a Fibre+Power ring network.



Secure power

It takes its power directly from the facility's secure mains supply, via distributed power and network interface boxes located around the nuclear facility.



Wired up

It then uses hybrid power/fibre Ethernet data cables to power and network each RPN1 in a self-healing ethernet ring topology.



Real time

This allows the network to maintain uptime and data integrity in the event of any RPN1 or single network failure.

The installation of
the RPN1 across the
Sellafield site helped
NNL save over £1m
in costs

Omniflex



Fast installation



Reduced hours



ISO 9001

The revolution...

The RPN1 device is an off-the-shelf product that can be installed in minutes and eliminates thousands of man hours of work. Furthermore, it is standardised to meet ISO 9001 quality levels so there is no need for additional third-party inspections during the installation and testing of the system.



The NNL project

The installation of the RPN1 across the Sellafield site helped NNL save over £1m in costs, ensured that the time spent by personnel in the active areas was greatly reduced, and greatly accelerated the delivery and active service of the system.

The units have since been used on other Sellafield buildings at the site and are specified to be used on new projects planned over the next five years. The technological developments of the RPN1 led to Omniflex winning the Nuclear Decommissioning Authority's Innovation Award in 2016.



Switching to wireless

Sellafield Ltd. recognised that, for ongoing projects during its decommissioning phase, connecting its radiation protection instruments (RPIs) wirelessly offered several key advantages over traditional wired networking methods.

They don't require an infrastructure overhaul or third-party certification and can be easily moved between different locations. Crucially, they also reduce operator radiation exposure by eliminating the need for onsite inspections.

Sellafield Ltd. engaged Omnicom to design and manufacture a suitable wireless interface to all its RPI manufacturers' monitors, leading to the creation of the W3 Wireless Interface Node.

The W3 is a plug-and-play system that was commissioned for use at the Sellafield nuclear site to meet the demands of the industry. It offers many advantages over traditional monitoring systems, all of which lead to greater on-site safety and significant cost savings.

In a nuclear plant,
acting decisively
in the moments
following an
emergency can
mean the difference
between averting
danger and a major
catastrophe

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Universal interface

With a universal interface it can be set up in minutes, eliminating thousands of hours spent installing and testing systems in active areas on-site.



Reduces radiation

It reduces personal radiation dose-rates that operators are exposed to because they can now monitor radiation levels remotely.



Standardised product

There is no need for additional third-party verification because it is a standardised product, made to ISO 9001 standards.

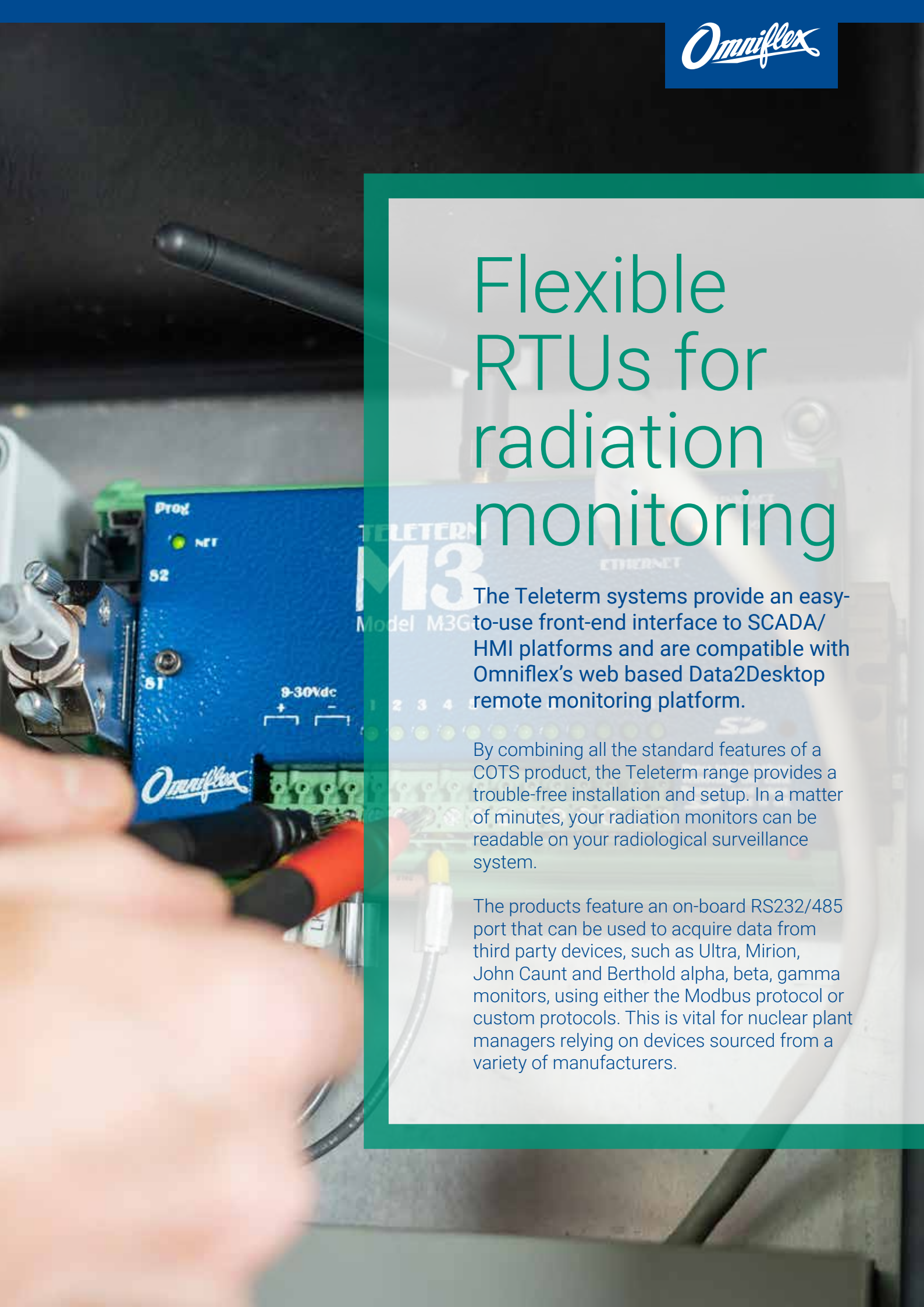
Pushing the boundaries

The nuclear industry must continue to push the boundaries of what COTS systems can offer by working with manufacturers to develop innovative new technologies that meet industry demands.

Networking radiological monitors isn't the only way that nuclear sites can improve on safety, they must upgrade their alarm systems to better alert operators in the event of a crisis.

Sitting at the heart of both the RPN1 and the W3 is Omniflex's Teleterm technology, a state-of-the-art remote terminal unit (RTU) range designed to expand the possibilities of remote monitoring

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The background of the entire page is a photograph of an Omniflex Teleterm M3 device. The device is blue and has various ports and labels. A hand is visible in the foreground, plugging a cable into one of the ports. The text "TELETERM M3 Model M3G" is visible on the device's face. The overall scene is dimly lit, with the device being the primary focus.

Flexible RTUs for radiation monitoring

The Teleterm systems provide an easy-to-use front-end interface to SCADA/HMI platforms and are compatible with Omniflex's web based Data2Desktop remote monitoring platform.

By combining all the standard features of a COTS product, the Teleterm range provides a trouble-free installation and setup. In a matter of minutes, your radiation monitors can be readable on your radiological surveillance system.

The products feature an on-board RS232/485 port that can be used to acquire data from third party devices, such as Ultra, Mirion, John Caunt and Berthold alpha, beta, gamma monitors, using either the Modbus protocol or custom protocols. This is vital for nuclear plant managers relying on devices sourced from a variety of manufacturers.

Teleterm M3

Omniflex's Teleterm M3 radiological protection gateway is a state-of-the-art RTU designed to enable communications with a wide range of devices using most network options, including ethernet, Modbus, radio, 3G, satellite and Conet.

Furthermore, it comes equipped with twelve digital or analogue configurable I/O, which enables full environmental monitoring covering not only radiation, but also other parameters like temperature, pressure and humidity etc. It is also fitted with an onboard SD card for data logging, which is ideal for data auditing purposes, especially for post-event analysis.



Teleterm D3

The Teleterm D3 comes with built-in lithium batteries, so provides battery back-up in the event of mains power failure (DC powered options are also available).

It also has a built-in LCD display, allowing you to view the data locally from the connected radiation monitors. Furthermore, it has eight digital or analogue configurable I/O and can communicate using ethernet, Modbus, radio, satellite and 3G options.



Teleterm S3

The Teleterm S3 is solar powered, making it well-suited for site perimeter or remote area applications where power is an issue and you want to collect radiation data and send it back to a central control station, such as coastal gamma monitors.

The S3 comes equipped with five digital or analogue configurable I/O and can communicate using Modbus, radio, satellite and 3G options.

An industry-proven cable saving solution

The Conet network was developed and launched in 1981 in response to a need from plant operators who wished to bring field data back to control rooms, or a supervisor's office, without the need for installing expensive cabling.

The only solutions that existed at the time were very expensive and beyond the reach of smaller operators. This is why, one of the most important features of Conet is its ability to operate on low cost cabling which, in many instances, is already available as a free pair in an existing multi-core or telephone cable. Furthermore, it is a true token passing, peer-to-peer network with high system redundancy, low latency and a ten kilometre transmission distance.

These aren't features you would typically think of when you essentially repurpose existing infrastructure to create a new, high-performance industrial network. But then again, it's more profitable for most suppliers to sell you a new network.





Maximum flexibility for radiation monitoring

Omniflex's Maxiflex RTU range provides the nuclear industry with a cost-effective front end data acquisition system for radiation protection instruments. It comes equipped with RSS232/485 ports and can interface to all third party alpha, beta and gamma monitors, including Ultra, Mirion, John Caut and Berthold devices.

The network interface capabilities include ethernet, radio, gsm, fibre, satellite, copper communications and Conet and has a wide range of hot swappable I/O modules, including digital, high accuracy analogue, HART, TC/mV, RTD and high speed pulse modules (RS422 interface to the legacy Harwell 3230 and 3280 Alpha Beta monitors).



A fully scalable system that can serve small, medium or large applications



Maxiflex systems are ideal for applications where you have a central marshalling point that is wired to multiple radiation monitors spread across multiple locations. This is a common sight in a large nuclear facility where monitors have been in place for years and connected using direct wiring.

You can connect Maxiflex at the marshalling point to all of the devices, creating a central gateway point of interconnected networks to collect all the data.

The Maxiflex system can be as large as you need it to be and the amount of I/O available is unlimited because all you need to do is increase the number of modules in the system to add more I/O. This makes it a fully scalable system that can serve small, medium or large applications and provide unlimited networking of third-party hardware and dissimilar networks.

An alarming situation

Alarm annunciators are panel-based alarms that are hard-wired directly into relevant processes by a series of cables.

In the event of system failure, the relevant window on the panel lights up and the alarm emits a sound, immediately giving operators the necessary information to act quickly. Many alarm annunciators in use today were installed decades ago and do not meet the current IEC 61508 safety integrity levels (SIL).

Many sites rely on control systems teeming with complex visualisations to warn operators of imminent danger. This can be overwhelming for operators and sometimes counterproductive. In the event of imminent danger, it is vital that the safety systems alert operators quickly and efficiently so they can respond appropriately.

Operator response times are an important part of the SIL-rating, making it vital that alarms maximise, rather than impede, the operator's ability to respond and act quickly. Physical alarm annunciators must be kept up to date and must only display the safety, health and environmental alarms that plant operators must respond to.



Updating your alarms

Plant managers looking to update their alarm annunciators should bear in mind two key considerations.

Hardwiring

Firstly, you must ensure that they are directly hardwired into the process.

The importance of this cannot be overstated. Digital alarms that are displayed in lists on the control screen are at the mercy of network outages. If the network goes down, so do all the alarms.

If they are directly hardwired, and you lose one wire, you only lose one alarm.



Annunciators

The second point to consider is that the annunciators must have a panel of windows permanently dedicated to specific processes.

This enhances operator familiarity and increases their awareness when the panel sounds an alarm.





Door warning alarms

Omniflex also supplies door warning alarms for the UK's nuclear industry. The Omni2 door warning alarm is a compact, wall-mounted visual alarm annunciator designed for radiation and airborne contaminant warnings and has been designed to meet the requirements of SIL-2 safety systems as defined in IEC61508. It serves as a safeguard against personnel inadvertently entering plant areas where abnormal radiological and other hazardous conditions are present.

Operators should position the Omni2 on the wall adjacent to the entrance of an environmentally segregated area and connect it to the local radiation monitors. If airborne contamination or high radiation conditions are present in the area, a bright flashing visual is displayed, warning local operators of the hazard and deterring entry to the contaminated area.

The Omni2 features full dual redundant design for each of the two alarms, solid state logic and visual display, providing a highly reliable alarm system, meeting or exceeding the functional safety requirements of these critical applications.

Slave alarm units

Generally, workers in a nuclear facility always know the condition of the area where they are working at a given moment, however they do not always know the status of adjacent areas. This is why slave alarm units play a vital role in maintaining safety levels. For example, if you are in a cleanroom with a contaminated area next to it, local slave alarms, which are connected to the monitors in the adjacent section, will alert you that the room is not safe to enter and you can stay safely in the cleanroom.

Omniflex supplies the Omni2S slave alarm unit for the UK's nuclear industry. Unlike the door warning sign that is equipped with inscriptions, the Omni2S instead features a simple red and green beacon that directly matches the condition of the connected radiation monitors. If airborne contamination or high radiation conditions are detected, a flashing LED beacon provides visual warning of the hazard is displayed, to deter entry to the area. The sounder tone can be selected to indicate type of contamination.

Once an alarm has occurred, the Red LED beacon light will continue to flash, and the audible alert will continue to sound until muted by the pushbutton. The alarm warning turns off and the mute pushbutton resets if the alarm condition returns to normal. The internal audible warning will give a warning of a dangerous condition, even if the display is out of sight of the personnel.



Remotely monitoring all local alarms, door warning alarms and slave alarms is best practice in nuclear facilities because, if a central control room can have access to all the real-time on-site alarm information, it promotes better decision making without relying on people physically checking the alarms in contaminated areas.

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Industry approved

When Sellafield Ltd. needed to upgrade its on-site alarm annunciators to SIL standards, in accordance with the requirements of the Nuclear Installations Inspectorate, it turned to Omniflex for help. The Omni 8/16 range of alarm annunciators is the world's first range of alarm annunciators substantiated by EMPHASIS for use in SIL applications in the nuclear industry.

Omniflex has over 55 years of experience specialising in instrumentation, remote monitoring and safety-critical alarm systems, and is now the standard approved supplier of SIL-rated alarm annunciators for the UK's nuclear industry.

In the nuclear industry, where saving money and improving safety don't often go hand-in-hand, Omniflex is bringing the two together.

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range of alarm
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Omniflex's nuclear industry capabilities

Omniflex's full list of capabilities for the nuclear industry includes radiological surveillance and protection, SIL-rated alarm systems, door warning signs and slave alarms, which we have covered in this whitepaper.

It also includes sequence of event monitoring systems, PLC control systems, temperature monitoring systems, SIL-rated signal conditioning products, glove box alarm systems, secondary fire reporting and site signalling systems and cathodic protection systems, which are not covered here.

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To find out more, head to our website and read more of our technical whitepapers, covering topics such as cathodic protection and wireless telemetry systems.