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Integrating intelligence



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Low Emission Zones

With low and even zero emission zones now in force across Europe, what are the lessons learned and challenges ahead?

Connecting VRUs

As connected vehicle technology becomes more useful, the next challenge is to bring vulnerable road users into the ecosystem

Smarter studs

Madrid's A-2 highway now uses inductive LED road studs to manage its dynamic BUS-VAO lane, combining mechanical durability with real-time monitoring

Words | **Fernando Afonso, engineer & CEO, Sernis**

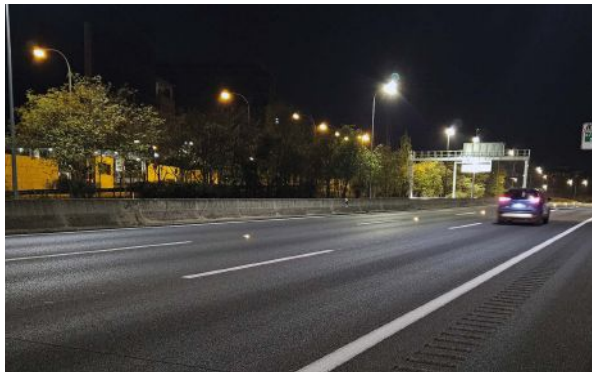
Madrid's new BUS-VAO lane on the A-2 highway is fully operational, prioritising buses, motorcycles, and vehicles with at least two occupants. Designed to reduce congestion on one of the city's busiest entry routes, this dynamic lane relies on intelligent traffic management rather than permanent barriers, requiring both robust and responsive road marking solutions.

At the core of this project is Sernis's SR-45C-IPW, an inductive LED road stud engineered for high-traffic urban environments. The distributor responsible for installation confirmed that these road studs were chosen for "their technical and mechanical performance" and that the model offers "greater operational advantages compared to others available on the market." This validation highlights the SR-45C-IPW's suitability for complex infrastructure projects.

Technical capabilities and high-traffic performance

The A-2 corridor handles approximately 120,000 vehicles per day, demanding a solution capable of withstanding extreme mechanical stress while enabling continuous operational monitoring. The SR-45C-IPW delivers this with IP68/IK10 protection against water, dust, and impacts; load resistance up to 120 tons, ensuring mechanical reliability; inductive power transfer, eliminating physical wiring between the base and light module, and compatibility with intelligent traffic controllers for real-time adjustment of brightness and signalling logic.

Sernis's distributor emphasised that a key challenge was "implementing a system capable of monitoring the status of the road studs and transmitting this information in real time to Madrid's DGT Control Center," highlighting the combination of technical robustness and operational oversight. Furthermore, the distributor added, "Sernis's



Above & below: **The Sernis SR-45C-IPW is an inductive road stud that makes installation easier through its 'Plug & Light' concept**

support – through continuous technical advice and commercial assistance – was decisive in ensuring the project was executed with all the guarantees required by the project owner."

Functionality and visual signalling

SR-45C-IPW road studs have no physical wiring between base and light module, ensuring easier and faster maintenance. They illuminate to signal the BUS-VAO lane during active periods, complementing variable signage. Amber illumination is used as the default when the lane is active, in compliance with Article 144 of the Spanish General Traffic Regulations. Green illumination is applied in boarding zones to indicate authorised access, even if not formally regulated, a criterion defined by the DGT based on previous installations.

When the BUS-VAO lane is inactive, the road studs remain off, ensuring clear and context-sensitive signalling.

Installation, maintenance, and operational efficiency

The A-2 project required night-time maintenance in highly restricted windows. Here, the 'Plug & Light' modular design and O-ring sealing

system proved decisive. The distributor confirmed: "This solution allowed the electronic part of the road stud to be replaced quickly and easily, without the need for new drilling, grooves, or cabling. Traditional systems would have required replacing the entire road stud along with the cable network."

This approach reduces traffic disruption, ensures compliance with operational schedules, and significantly lowers long-term maintenance costs.

Collaboration and scalability

Close collaboration between Sernis and the distributor was essential. From the outset, Sernis provided technical guidance and commercial support to integrate a substantial amount of road studs efficiently. As the distributor noted: "Sernis proposed and developed this solution in time to be incorporated into the revised project, demonstrating innovation and adaptability."

Looking ahead, the SR-45C-IPW is fully scalable. "In upcoming BUS-VAO lane projects at a national level, this solution will be highly regarded and is fully transferable to international contexts as well," the distributor added.

Conclusion

The A-2 BUS-VAO lane demonstrates how intelligent road studs can enhance urban traffic management. By combining operational reliability, minimal maintenance, and context-sensitive signalling, the SR-45C-IPW meets the challenges of one of Madrid's busiest corridors. Validation from the installation partner underscores its technical superiority and suitability for future intelligent mobility projects both in Spain and internationally. ■

This article is part of the SERNIS internationalisation project (identified as COMPETE2030-FEDER-01440000 Incentive System to the Internationalization of SMEs according to Portugal 2030) and is co-funded by the European Structural and Investment Funds (ESIF) from European Union, framed in the Norte 2030.



SERNIS



FLEXIBLE BY DESIGN SAFE BY PURPOSE

Flexible bollards guide traffic and protect pedestrians, without rigid consequences.

People-First Road Safety

Not all road safety barriers need to be hard to be effective. Flexible bollards are engineered to protect people first, bending under impact to mitigate injury severity while clearly defining spaces for vehicles, cyclists, and pedestrians. Designed for cities that prioritize human safety over rigidity, they combine engineering strength with the resilience and empathy of human design. With its illuminated top, the SR-CITY-BALI-TSL-R (pictured) clearly marks pedestrian zones and cycle paths, shining a light on safer urban spaces.

Ideal For



Guiding modern mobility

A new flexible luminous bollard combines LED guidance with impact-resistant design, offering cities a solar-powered alternative to dangerous rigid posts while protecting cyclists, pedestrians, and reducing long-term maintenance costs

Words | **Fernando Afonso, engineer & CEO, Sernis**

Urban areas are under growing pressure to balance safety, sustainability, and functionality. Pedestrians, cyclists, and motorists increasingly share the same spaces, and city planners must ensure that environments are both safe and cost-effective. In response to these needs, Sernis has developed a new solution: SR-CITY-BALI-TSL-R, a flexible luminous bollard designed to guide, protect, and illuminate, while offering a safer and more sustainable alternative to rigid metal posts.

Guiding light in urban spaces

Sernis has been a reference in road studs and flexible bollards for more than a decade, consistently exploring how technology can enhance road and urban safety. SR-CITY-BALI-TSL-R combines two of the company's key areas of expertise: impact-resistant bollards and LED technology. The result is a product that not only withstands collisions and returns to shape but also provides orientation through integrated lighting.

The illumination is subtle but effective. Instead of competing with streetlights, the LED top light acts as a complementary marker, guiding users in areas where clarity and visibility are most needed. Sidewalks, cycle paths, pedestrian crossings, and low-speed traffic areas are typical environments where this bollard can be effective. In these contexts, the presence of both a physical barrier and a visual reference help to reduce uncertainty, improving the safety of vulnerable users.

Unlike rigid posts that can cause severe injuries, flexible bollards bend on impact, reducing accident risk. Tests show that while collisions with rigid posts throw riders forward and lift the bike, flexible bollards allow bikes to roll over smoothly, keeping the rider in control and proving their superior safety.

Efficiency and durability

Energy efficiency is a defining feature. SR-CITY-BALI-TSL-R can be powered by



solar energy, keeping operational costs low and reducing dependency on the electrical grid. When necessary, it can also be connected to electricity, offering municipalities deployment flexibility. Smart brightness management and over-temperature protection add further efficiency and reliability, ensuring long-term performance with minimal maintenance.

Durability has also been a priority. With UV protection, IK10 impact resistance and IP68 waterproofing, the bollards are engineered for demanding outdoor use. The inclusion of 3M reflective tape reinforces visibility even when the LED light is not active, safeguarding safety standards.

Above: The SR-CITY-BALI-TSL-R is a flexible bollard with a solar light on top

Crucially, this durability does not come at the expense of safety. Rigid posts may resist impact, but they transmit that force directly to the cyclist, pedestrian, or vehicle involved. Flexible bollards, by contrast, absorb and dissipate the energy, drastically reducing harm. With the growing popularity of e-bikes, cargo bikes, and scooters, the risk of severe accidents with rigid objects is increasing, making flexible alternatives a practical and future-proof choice.

A practical response to urban mobility

For decision makers, these features translate into tangible advantages: reduced replacement costs thanks to the bollard's memory effect, little to no maintenance thanks to solar charging and LED longevity and improved public perception of safety in pedestrian and cyclist zones. Most importantly, they replace dangerous rigid posts with a safer alternative that protects vulnerable road users without compromising durability or visibility.

By merging Sernis's experience in flexible bollards and LED technology, the company has developed a solution that goes beyond simple delineation. The SR-CITY-BALI-TSL-R is about guiding people, improving visibility, and creating safer, more sustainable public spaces.

As urban mobility evolves, products like SR-CITY-BALI-TSL-R demonstrate how targeted innovation can address the daily challenges of modern cities. More than simple markers, they act as protective tools that help replace outdated rigid infrastructures with safer, smarter and more energy-conscious alternatives. ■

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