CONNECTED

MAGAZINE

WINTER 2026

CONNECTORS ON THE FRONT LINE

BACKSTAGE AT THE VIENNA OPERA

OPTIMA D SERIES:
MISSION ACCOMPLISHED

LEMO

22

IN THIS MAGAZINE

I M P R E S S U M

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INNOVATION WHERE FAILURE IS NOT AN OPTION

In today's rapidly transforming world, innovation stands at the forefront of ensuring safety, agility, and responsiveness. As global dynamics continue to evolve, we are witnessing increasing demand across the defence and security sectors, driven by national priorities and renewed focus on safeguarding both domestic and international interests.

This edition of our magazine examines how our technologies and solutions empower these objectives. Across defence and security applications—as well as in medical technology, broadcasting, test and measurement, and many other fields—we remain steadfast in our commitment to delivering performance and reliability where failure is not an option. From operational fields to the Austrian Parliament, from world-class performance venues to intensive care units, we provide technology that makes a critical difference.

Our feature on the defence and security sector highlights not only the growing demand but also the responsibility we bear as trusted partners and solution providers. Together with our customers and collaborators, we are advancing technologies that help protect lives, strengthen peace and security, and uphold the highest international and ethical standards.

We are also proud to introduce the OPTIMA D Series—a compact, miniature Push-Pull connector designed to perform in the most demanding defence, aerospace, and rugged electronics environments.

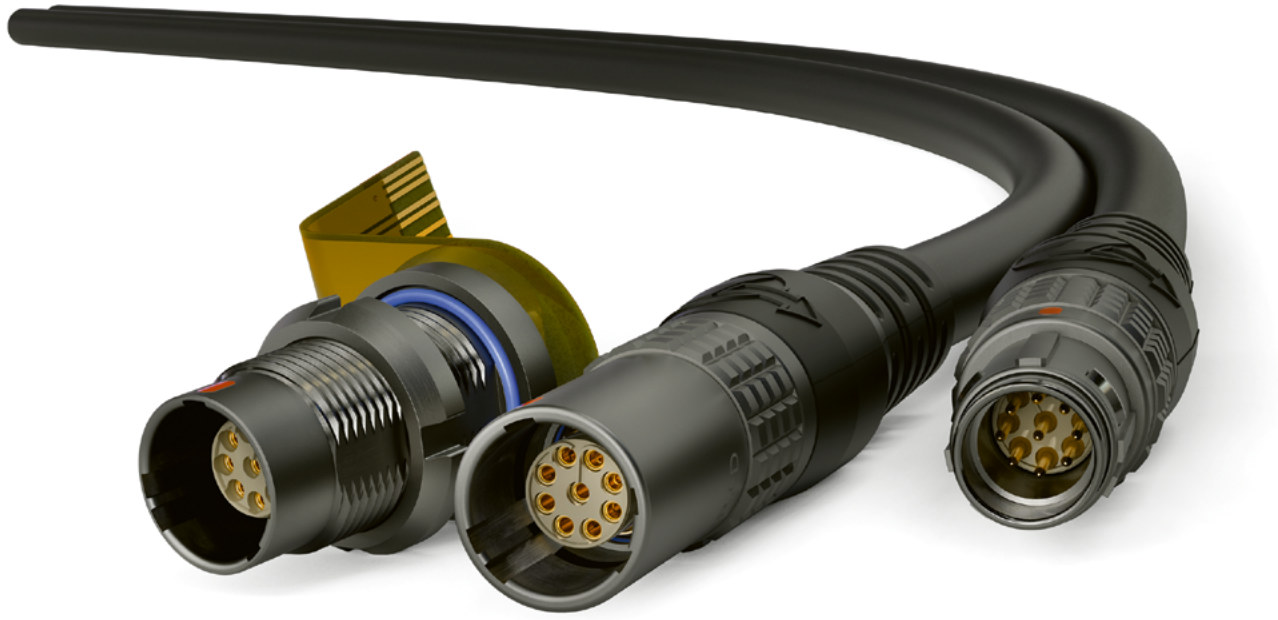
Finally, I extend my sincere appreciation to our teams, customers, and partners who continue to innovate and evolve with purpose. Together, we are shaping a more secure, intelligent, and resilient future.

Thank you for your continued trust and engagement. I hope this issue provides insight, inspiration, and a deeper understanding of how we are driving progress where it matters most.
Warm regards,

Farhad Kashani
CEO LEMO

LEMO OPTIMA D SERIES: MISSION ACCOMPLISHED

LEMO's brand new OPTIMA D Series is a compact and miniature, Push-Pull connector engineered for the toughest defence, aerospace, and rugged electronics environments. Built for demanding applications, it delivers secure connections where failure simply isn't an option.



In the dead silence of a pre-dawn mission, there is no room for hesitation. A young soldier adjusts his gear in the dark, trusting every component to perform. No room for error, no second chances. The smallest connector can mean the difference between mission success and failure.

Miles above, a drone hovers over the battlefield, its sensors feeding mission-critical data through complex electronics engineered to operate in the harshest conditions.

In such moments, failure is not an option. When the stakes are this high, the smallest design details matter. Flawless connections may directly impact the safety of those in the theatre of operations.

That is where LEMO's new Optima D Series delivers.

Smaller. Stronger. Ready for Anything

With an optimised overmoulding design, the D Series is up to 25% shorter than comparable LEMO connectors—perfect for space-constrained applications like wearable soldier systems, UAV platforms, and embedded aerospace electronics.

Secure by Design

At the heart of the D Series is a patented new Push-Pull latching mechanism, designed for effortless use and reliable connectivity—even in blind-mate conditions. For rapid disconnection under stress, a break-away latching option is available.

Tested to MIL-STD-810H, the D Series withstands harsh environments, extreme vibration, and physical impact. Its low-profile, non-reflective, corrosion-resistant finish makes it ideal for stealth applications and dense system integration.

Reliable connectivity for modern defence

In today's rapidly evolving geopolitical landscape, modern defence and security solutions demand uncompromising reliability and performance. As global threats become more complex and defence strategies more sophisticated, the need for cutting-edge, fail-safe technologies is greater than ever.

LEMO is a global leader in high-performance connector solutions, trusted by leading defence contractors and system integrators across the world. With over 75 years of engineering excellence, our connectors are built to perform in the most demanding conditions – where failure is not an option.

Our interconnect solutions combine compactness, durability, and precision, delivering mission-critical performance

MAIN BENEFITS

Compact & miniature: Save weight & space. Optimised for worn soldier applications.

Extremely robust and reliable: Designed for rugged field operations with a durability of 5'000 mating cycles.

Protect signals: EMI/RFI shielding ensures uninterrupted communications.

Trusted for defence: Fully compliant with military standard MIL-STD.

Watertight and dustproof for superior protection in all conditions.

THE RISE OF RUGGED, HIGH-SPEED CONNECTORS IN SECURITY AND DEFENCE APPLICATIONS

The security and defence sectors have undergone rapid transformation over the past two decades, driven by technological advancements, emerging threats, and the increasing need for real-time data transmission.

From network-centric warfare and artificial intelligence-driven surveillance to autonomous vehicles and advanced cyber defence systems, the industry is more reliant than ever on secure, high-speed connectivity. These innovations demand rugged, ultra-reliable, and ever-faster interconnect solutions that can withstand the harshest environments while ensuring seamless data transfer.

The Need for Speed: The Role of High-Speed Data Transmission

Modern security and defence applications generate vast amounts of data that must be processed and transmitted in real time. High speed and low latency data transmission via military electrical connectors is essential for mission-critical decision-making and secure communications. Situational awareness and video monitoring are typical applications where the consequences of unreliability are literally life or death scenarios. Military vehicles, advanced radar systems, electronic warfare (EW), and unmanned systems require connectors that support ultra-high bandwidth while maintaining signal integrity.

Tactical Communication Systems: High-speed connectors enable secure, real-time voice, video, and data transmission for battlefield and law enforcement applications.

ISR (Intelligence, Surveillance, and Reconnaissance): Cutting-edge sensors and high-resolution imaging demand ultra-fast circular military connectors capable of handling industry standard protocols such as SPE MultiGBaseT1 (2.5 Gbps), USB 3.2(10 Gbps) and Ethernet Cat 6A (10 GBps).

Cybersecurity and Electronic Warfare: Real-time signal processing and data encryption require secure data that is immune to

penetation from hostile actors. Fibre optic systems are a growth area in negating this threat.

Ruggedisation: A Non-Negotiable Requirement

The extreme environments in which security and defence systems operate make ruggedisation a top priority for military grade connectors. Many applications are deployed on **portable devices**, in **high-vibration environments**, or in **harsh conditions** such as battlefields, aircraft, naval vessels, and industrial sites. High-speed connectors must endure:

- **Extreme Temperatures:** Military and aerospace applications often require connectors that perform reliably in temperature ranges from -55°C to +200°C.
- **Shock and Vibration Resistance:** Whether mounted on a fast-moving vehicle, aircraft, or soldier-worn system, connectors must maintain a secure connection despite constant movement and impact.
- **Lightweight and Low Profile:** Modern defence applications prioritise compact, lightweight solutions that maintain stealth while delivering high performance.
- **Sealing and Environmental Protection**: Exposure to dust, water, and corrosive environments necessitates IP68-rated connectors that remain operational in the most challenging conditions.
- **EMI/RFI performance:** Ever increasing threats to data security include cyber warfare and hacking. High levels of screening are critical, and methods of termination and material selection are vital to ensuring that signal integrity is guaranteed.

Standards: MIL-STD Military Spec Connector vs. EIA

When it comes to security and defence applications, interconnect solutions must adhere to rigorous industry standards. Two widely recognised standards are MIL-STD (Military Standard) and EIA (Electronic Industries Alliance). While both establish performance and durability criteria, they serve different purposes:

- **MIL-STD (Military Standard):** Developed by the U.S. Department of Defence, MIL-STD outlines requirements for military spec connectors used in military applications. These standards focus on extreme durability, environmental resistance, and electromagnetic shielding to ensure performance in combat and rugged conditions.
- **EIA (Electronic Industries Alliance):** EIA standards are industry-driven and widely adopted in commercial and industrial applications. They emphasise interoperability, high-speed data transmission, and cost-effectiveness while still ensuring high reliability.

LEMO: Meeting the Challenge with Cutting-Edge Interconnect Solutions

As the demand for high-speed, lightweight, rugged military connectors grows, **LEMO** has established itself as a leader in precision interconnect solutions tailored for security and defence applications. LEMO's high-performance connectors are engineered to withstand the harshest operational environments while delivering seamless, ultra-reliable data transmission.

M Series: Designed for automotive, UAV and defence applications, the M Series offers high-density, rugged connectors with superior EMI shielding and environmental sealing.

F Series: A trusted solution for mission-critical operations, providing high-vibration resistance and enhanced performance to extreme conditions.

New D Series: Rugged miniature circular connector allowing high-speed data transmission, featuring IP68 sealing for reliable performance in the most demanding environments.

By integrating innovative materials, cutting-edge shielding technologies, and high-density configurations, **LEMO** ensures that security and defence forces can rely on robust, high-speed connectivity in any operational scenario.

INNOVATIONS DRIVING THE FUTURE OF HIGH-SPEED CIRCULAR CONNECTORS

1 Miniaturisation: With space and weight constraints in modern defence applications, miniature circular connectors are becoming more compact while maintaining performance.

2 Hybrid Connectors: Capability of containing power and data in the same circular push pull connector is a major advantage in ensuring maximum utilisation of the space available.

3 Fibre Optic Connectivity: High-speed, interference-free fibre optic solutions are increasingly replacing traditional copper-based connectors in critical applications.

4 High-Density Interconnects: The growing need for multi-signal transmission within limited space is driving the development of high-density, multi-contact connectors.

The Road Ahead :

As security and defence technologies continue to evolve, the demand for rugged, high-speed connectors will only intensify. The future battlefield will be defined by interconnected systems, autonomous platforms, and AI-driven decision-making—all requiring reliable, high-performance interconnect solutions. LEMO remains at the forefront of these advancements, ensuring that the military connectors market and security forces are equipped with the most reliable, innovative connectivity solutions available.

In an era where speed, security, and durability are paramount, the next generation of high-speed, rugged connectors will serve as the backbone of mission-critical operations, ensuring that military and security forces can operate with confidence in any environment.

AN EYE ON YOUR PATIENT

IDMED, a small MedTech company based in Marseille, France, develops and markets innovative medical devices for anaesthesia and intensive care. Used worldwide in operating theatres and intensive care units, their products rely on LEMO solutions for safe and secure connections.

In an intensive care unit of a Marseille hospital, a young patient lies motionless in her bed, her unconscious body connected to an intricate web of blinking and beeping medical devices. Oxygen tubes snake through the air, the rhythmic whirring of pumps underscoring the intensity of the environment. A nurse enters swiftly, positioning a sophisticated, small, portable scanner over the patient's wristband barcode, then over each eye, meticulously examining the information displayed on the touchscreen. She then quickly checks the other monitoring screens, and, noting that all readings are stable, she quietly exits the ward.

As the saying goes, "the eyes are the windows to the soul," and medical science has shown that they are also a reflection of the brain. It is truly remarkable to observe the reactions of the pupil to light or other stimuli.

In the past, a simple penlight sending a flash of light into the eye and relying on the doctor's or nurse's subjective visual evaluation was used to determine the patient's state of consciousness.

The technology used by the nurse's compact device above relies on pupillometry to measure pupil size and reactivity, known as the pupillary light reflex. The compact device, called NeuroLight, enables quick and non-invasive assessment and diagnosis of the neurological function of critical ICU patients, such as those with head injuries or who have had a stroke.

We talked to Frédéric Bernert, president and co-founder of IDMED about their story, products and vision.

Nestled among the lush vegetation of olive groves and cypresses just outside Marseilles in the South of France, IDMED was founded on the day of the Beijing Olympic Games opening ceremony, on 08.08.08.

The two founders and friends, Frédéric Bernert and Thierry Bagnol, met at their previous company specialized in the field of ENT research. While studying patients with balance problems, they used to film the eye movements to detect various pathologies. It was back then that an anaesthesiologist mentioned that the pupil diameter also varies in reaction to pain. The two young engineers decided to use this idea to create

▲ *NeuroLight enables quick and non-invasive assessment and diagnosis.*

their own company and harness the potential of pupillometry, for creating revolutionary devices.

The first product they launched was the NeuroLight, followed by the AlgiScan, a truly revolutionary innovation in anaesthesia.

Excessive analgesia can lead to undesirable effects such as hypotension, prolonged recovery times, nausea and vomiting, and morphine-related hyperalgesia. It is therefore important to be able to assess the level of analgesia objectively, tailored to each individual patient.

The pupil is the most sensitive marker of nociception in unconscious patients. The AlgiScan delivers the Pupillary Pain Index (PPI), a score that reflects the patients' level of analgesia. The PPI is calculated from pupillary dilation during increasing electric stimulation. A higher PPI score indicates higher sensitivity to pain and lower analgesia whereas a PPI score close to 1 indicates high analgesia.

Finally, IDMED's third product line focuses on monitoring neuromuscular blockade during anaesthesia or Train-of-Four (TOF) monitoring (4 consecutive electrical stimuli are applied along the nerve pathway, and the muscle's response is measured to assess which stimuli are

▲ *TOFscan monitors neuromuscular blocade during anaesthesia.*

blocked and which are successfully delivered) and acceleromyography. The technology assesses muscle responses to stimulation, providing valuable insights into the level of muscular relaxation. The user-friendly TOFscan stimulates nerves near the wrist, causing a thumb movement that is measured by an accelerometer. TOFscan has been IDMED's most successful product, and it is also distributed worldwide by prominent German MedTech company Dräger.

With a staff of about forty, IDMED's engineers design and develop the interface and software of the devices in-house. They have their own compliance and regulatory affairs specialists, ensuring that products are compliant with medical regulations in most countries. In addition, IDMED is proud to control 90% of added value through local suppliers and to assemble all end-products in-house.

LEMO & IDMED

Given its world-class reputation in the medical field, LEMO was the natural choice for equipping IDMED's devices from the very beginning. Frédéric Bernert emphasizes the strong, trusting partnership with LEMO. During the COVID crisis, when demand surged to save lives, LEMO France prioritized, ensuring continuous delivery of REDEL connectors and Northwire Biocompatic cables to its longtime customer. "What we appreciate above all is consistent quality. We've never ever encountered any issues with non-compliance from LEMO throughout our successful cooperation."

IDMED's customers include both local and global hospitals and clinics (mainly operating theatres and intensive care units). *"One of our major customers is Grenoble Hospital, at the foot of the French Alps, overloaded with patients suffering from head and brain injuries during the skiing season."*

What sets IDMED apart from its competitors is its close cooperation with hospitals, anaesthesiologists and neurologists. Frédéric Bernert emphasizes the importance of fieldwork and on-site hospital observations to identify new ideas and address medical challenges in direct partnership with customers.

In addition, IDMED stands out with its cost-effective, user-friendly and portable devices. The company's small size enables greater agility, faster response times, and a shorter project timeline, while reducing administrative overhead.

Another key advantage is the company's commitment to sustainability: IDMED avoids waste by offering reusable sensors and accessories, which can last for at least two years, rather than relying on disposable components. Safeguarding the environment is firmly anchored in the company's philosophy. Recycling, limited transport, reusable components and a customer service that *"repairs what is repairable"*, in addition to the company's own ecological footprint, housed in a modern ecofriendly building.

When asked about IDMED's vision for the future, Frédéric Bernert readily claims:

"We are committed to continued innovation in the field of medical anaesthesia and intensive care and to develop, in the field of brain monitoring, the potential of pupillometry, etched in our DNA." ■

WIRED FOR DEMOCRACY – INSIDE AUSTRIA'S HI-TECH PARLIAMENT

Under the watchful gaze of Pallas Athena, neoclassical columns recall Ancient Greek ideals and Habsburg grandeur. However, Austria's Parliament stands not merely as an impressive historic marble monument but as a stage for modern democracy.

Built in 1883, the Austrian Parliament has recently been completely refurbished after careful planning and construction, balancing heritage conservation with modern demand for transparency, sustainability and functionality.

After a six-year renovation, completed in 2023, the political headquarters of Austria has become a stage for modern governance and democratic transparency. Behind the solemn statues and historic façade, today's politicians navigate the complex and challenging contemporary landscape, shaped by coalition politics, neutrality, an uncertain geopolitical climate and a rapidly evolving Europe.

What stands out straight away to visitors is how the newly renovated building seems to break down the barrier between elected officials and the people they represent.

With transparent glass walls, open galleries, public spaces, modern visitor centres and digital broadcasting, the new design reshapes the institution into a modern Agora, a space where citizens are not just represented, but welcome to participate.

Central to the transformation was the implementation of a comprehensive digital broadcast infrastructure: over 1,500km new cabling supports high-resolution, multi-angle video streaming of almost all parliamentary activity, including plenary sessions, committee meetings and press conferences.

Both the Parliament's own broadcast and security system and those equipped for Austrian Television and other television stations have been fitted with LEMO 3K.93C HDTV connectors.

We interviewed **Thomas Tauscher**, in charge of the Parliament's Media & Security Technology.

The Austrian Parliament's plenary meeting room. ▲

What is your role and the scope of your work at the Austrian Parliament?

Thomas Tauscher: *I am responsible for media technology at the Austrian Parliament, overseeing the planning, implementation, and ongoing operation of audiovisual systems.*

What were the main drivers behind the decision to modernize the Parliament's broadcast and security system?

The main reasons for the modernization were technological advancements, the public's growing expectations for transparency, and the need for a future-proof system that meets current standards for quality, security, and accessibility.

What are the most significant technical improvements made to the system (HD, 4K, IP-based broadcasting)?

The entire system was transitioned to IP-based broadcasting. We now use 4K-capable cameras, high-performance video encoders, and software-driven control rooms. This has enabled flexible workflows and significantly enhanced audio and video quality.

What were the challenges of integrating modern technology into a historical building?

The biggest challenge was integrating modern technology into a heritage-protected building. We had to work discreetly and reversibly to preserve historical integrity while ensuring full functionality.

How has the modernization changed the way sessions are filmed and broadcast? Are new cameras or control systems being used?

The use of PTZ (pan-tilt-zoom) cameras and automated control workflows has made session broadcasting more efficient and flexible. Manual camera operation has largely been replaced with preset and automated control systems.

Which platforms can citizens now use to watch live or archived sessions and how has the user experience improved?

Citizens can now watch live or on-demand sessions via the Parliament's website, social media channels, and streaming platforms. Navigation has become more intuitive, and accessible formats are also available.

How do you ensure the reliability of the live broadcast, especially during high-profile or emergency sessions?

We rely on redundancy concepts with backup systems for power, network, and recording. The entire system is monitored around the clock to ensure immediate response in case of any disruption.

What security measures are in place to protect against tampering, disruptions or cyberattacks targeting the broadcast system?

Our systems are protected by segmented networks, access controls, encrypted transmissions, and regular penetration testing.

▲ *Classical marble colonnades meet modern technology.*

In what ways do you think this modernization supports political transparency, democracy and citizen participation?

The modernization significantly supports democratic transparency by making political processes visible and accessible. Citizens can stay informed and follow discussions anytime and from anywhere.

Would you like to share any other information?

It's also worth mentioning the close collaboration with preservation authorities and architects during planning, as well as comprehensive training programs for staff to ensure long-term system operation and support.

▲ *The Fountain of Pallas-Athena and the Parliament's neoclassical building recall Ancient Greek ideals.*

What are LEMO connectors used for?

We use LEMO connectors primarily for camera, audio, and control signal transmission. They are known for their high reliability, precision engineering, and suitability for professional broadcast environments.

What is your experience with LEMO connectors?

So far, we have had a very positive experience and have not encountered any operational issues. ■

▲ *LEMO 3K.93C broadcast connectors ensure perfect transparency.*

LEMO MAGIC BACKSTAGE AT THE VIENNA OPERA

Step behind the scenes at the iconic Vienna Staatsoper and discover how LEMO connectors contribute to the show. Gain expert insights through our interview with the chief sound engineer as he shares the challenges of live performance in a world-class historical venue.

As twilight settles over Vienna, the curtain rises on Mozart's beloved opera *The Magic Flute*. When the Queen of the Night unleashes the piercing opening notes of her famous *"rage aria"*, over 2,000 pairs of eyes and ears are spellbound, drawn to the vibrant stage of the Vienna State Opera. Her dazzling coloratura soars effortlessly, carried with crystalline clarity through the Staatsoper's masterfully tuned sound system.

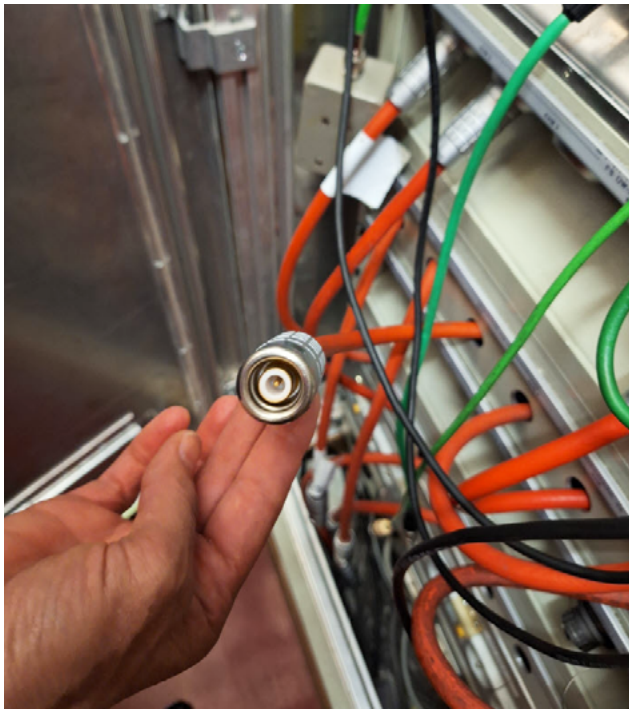
Backstage, unseen by the enraptured audience, lies a delicate cobweb of cables and connectors - an intricate, silent network binding microphone to loudspeaker, performer to listener.

We had the rare privilege of stepping behind the scenes at the Vienna State Opera House. Under the guidance of the head of the audio-video technical department, Athanasios Rovakis, we wandered through the labyrinthine backstage - a realm few ever glimpse.

There, amid the towering fly systems, we encountered the unsung heroes behind every performance, the silent sentinels, LEMO connectors. Discreet and unpretentious, they lie hidden in the shadows, yet they play a crucial role in sound quality: LEMO 4S.304 connecting microphones and loudspeakers all over backstage. Some have stood steadfast for almost thirty years, faithfully transmitting each note and each whisper of music without falter.

Others, more recent, 4E.675 triaxial and 3K.93C SMPTE, bridge the world beyond - the Austrian Television's OB vans linked to the heart of the stage.

▼ *Triaxial connectors link to the outside world.*



▲ *FFA.4S LEMO connectors.*

Since their first installation, decades ago, they have functioned without flaw, night after night, ensuring hundreds of performances every season, unseen but essential - never once betraying their role and the confidence placed in them.

The iconic Vienna State Opera opened on 25th May, 1869. A blend of Gothic and Renaissance elements, with some details even influenced by Emperor Franz Joseph himself, the building faced some criticism at the time. One columnist even described it as *"heavy and sinking into the ground as an elephant in digestion"*.

The now world-famous Staatsoper, cherished by the people of Vienna, offers 1709 seats and 435 standing places. Each season, around 350 performances of over 60 different operas and ballets take place on the main stage and in the state rooms, alongside over 800 guided tours and other events. In total, around 900,000 people visit the opera house each season.

After our exclusive tour of the building and backstage, just before the public began to fill the premises for the evening performance, Athanasios Rovakis kindly agreed to an interview. A seasoned professional, he has brought his technical expertise, precision and passion to every live performance at the Wiener Staatsoper for over 12 years.

▼ *LEMO S Series have connected microphones and loudspeakers backstage for over 30 years.*

How has the technology and acoustics evolved since you joined the Wiener Staatsoper?

During this period, we have seen significant advancements in sound technology, particularly in the areas of wireless systems and network-based audio solutions.

What is your primary role as chief sound & video engineer at such a prestigious venue?

I serve as the head of the Audio and Video department, overseeing all technical aspects related to audio and video for the performances. This includes managing personnel, maintaining and continuously improving our technical capabilities, and designing the sound setup for new productions. Put simply, it is my responsibility to ensure that every performance sounds perfect. From rehearsals to final curtain, sound quality is paramount.

What is a typical workday like for you?

A typical day involves rehearsals in the morning or an evening performance. On some days we handle both.

How big is the team you are responsible for?

I lead a team of 13 professionals in the Audio and Video department.

Are there any acoustical features or unique elements in the Staatsoper that help shape its world-famous sound?

Yes, the geometry of the hall, the materials used, acoustic reflectors and the layout of the boxes all contribute to the unique sound. Notably, the orchestra pit is very open and deep, which plays a key role in shaping the sound experience.

How does the building's respectable age impact the integration of modern sound systems with its historic architecture?

The Staatsoper being a protected historic building, all technological upgrades must be carefully integrated to respect the existing architecture.

What specific challenges do you face in maintaining or enhancing the sound quality?

One of the challenges is ensuring that any change to the sound system is compatible with all 60 productions in our repertoire.

What type of sound equipment do you use, and how do you decide on the best setup for each event?

We use a wide range of equipment. The selection for each production is made after thorough testing, ensuring that it meets the specific needs of the performance.

▲ *The magnificent marble staircase of the Vienna Opera.*

Are there any cutting-edge sound or video technologies you have recently integrated that have significantly improved the opera and ballet experience?

Yes, over the past 10 years, we have upgraded to a modern digital mixing console, installed wireless systems, high-quality modern loudspeakers and a powerful video projector.

In addition to real-time streaming on various platforms, performances are often broadcast by the Austrian Television. Can you tell us about your cooperation?

We have enjoyed a longstanding trustful cooperation with the Austrian Television. Our colleagues there are highly skilled and professional, with whom we have an excellent relationship developed over many years.

What are the most common challenges you face when preparing for an event?

The most unpredictable link in the chain is always the human factor. We must deal with tight setup and rehearsal schedules, as well as last-minute changes. Flexibility and problem-solving are essential.

With 350 performances of over 60 different operas and ballets each season, how do you handle such an impressive schedule?

We rely on a well-trained and experienced team, as well as robust and reliable technology.

How do you work with conductors, musicians and singers to achieve the desired sound for each show?

We work very closely with them during rehearsals, always striving for a trustworthy working relationship. Afterwards, we conduct intensive analyses using PFL (pre-fade listen) recordings to refine the sound.

Have you ever had technical issues during a performance and how do you handle these situations in such a high-pressure environment?

Yes, of course – these are live performances, and technical issues can happen. There is no given solution when something goes wrong during a live show, but we work hard to minimise such situations. We have spare parts, backup equipment and standby personnel ready, so we can react quickly when needed.

How do you ensure that all the connectors, cables and connections are securely and reliably set up for each performance?

We conduct a complete system check before every performance.

Can you tell us about your experience with LEMO connectors?
LEMO connectors, used for the microphones and loudspeakers, have proven to be incredibly reliable for decades. ■

Building photo credits: © Wiener Staatsoper / Michael Pöhn

VOIDSENSE – ENHANCING RELIABILITY IN RAILWAY TRACK MONITORING

Maintaining railway tracks is essential for ensuring safe and efficient train operations. A significant challenge in this area, particularly with tracks using ballast substrates, is a phenomenon known as "Voiding." Voiding occurs when ballast migrates away from critical areas beneath sleepers or crossings, resulting in voids that undermine track support. This can lead to excessive vertical movement of track components, causing cracks and eventual failure due to constant flexing under the weight of passing trains. UK company RailSense developed a solution using LEMO connectors.

Traditional methods for measuring dynamic vertical deflection, such as the Dansometer and Voidmeter, have been in use since the 1930s. These manual devices require a track worker to physically measure deflections—a process that is not only labour-intensive but also exposes workers to hazardous environments. Furthermore, these devices are not well-suited to measuring deflections at complex track features such as crossings.

Development of VoidSense

Recognising the limitations of manual Voidmeters, Network Rail developed a specification for a more advanced, battery-powered electronic device capable of providing remote data collection without manual intervention. RailSense responded to this challenge by developing VoidSense, a device that meets the specified requirements and has gained Network Rail approval. The VoidSense system is now being deployed across the UK and internationally, offering a flexible solution that can be easily installed, removed, and redeployed as needed. Crucially, VoidSense can be used on crossings, addressing a significant gap in the capabilities of traditional devices.

Connector Challenges

VoidSense uses a linear sensor which is clamped to the body of the device, and this connects to the device via a short length of screened cable and a connector, which was initially an M12-type industrial connector, but these were fiddly, difficult to confirm a positive connection and potentially open to manufacturing issues with screw terminal connections.

Possible Solutions

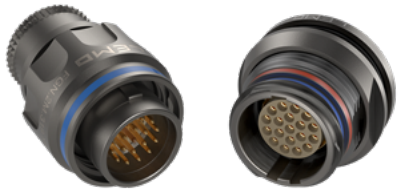
Several connector options from different manufacturers were considered; however, RailSense ultimately chose the LEMO M Series with Arctic grip, which provided a much more positive connection.

Nigel Dean, Senior Electronics Design Engineer BEng(hons), MIET, MPWI at RailSense, commented:

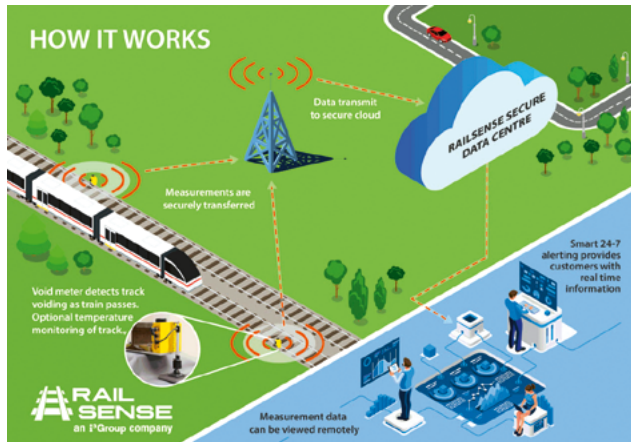
"LEMO very helpfully publish full specifications for their connectors, which many of their competitors do not. This made it easier for us to verify suitability for various applications. We now specify the LEMO M Series for our VoidSense sensor connector and have been delighted with the results. Our customers appreciate them as well and have commented on how secure the connection is."

Benefits and Measurable Outcomes

The key benefit of the LEMO M Series connector is its exceptional reliability in the challenging conditions of railway track monitoring. This connector offers a rugged ratchet coupling, combining a lightweight, compact design with high vibration resistance and an IP68-rated screw-locking mechanism. This reliability is fundamental to the success of the VoidSense system, ensuring a stable connection between the sensor and the electronics unit.



▲ *M Series - Rugged Ratchet coupling*



Nigel Dean commented:

"A common remark we hear is, 'LEMO connectors are so expensive.' My response to that is simple: if you want the best, you have to pay for it. When you consider the cost of implementing an unscheduled line block on a major rail route due to product failure, you realise there's no choice but to use the best components available, and there's no doubt that LEMO fits into this category.

▼ *VoidSense provides real-time void detection and track temperature monitoring.*

▲ *RailSense: flexible, real-time monitoring for the assets that keep networks moving.*

WORKING WITH LEMO

RailSense's experience working with LEMO has been very positive.

Nigel Dean commented:

"We contacted LEMO with our requirements, and their technical team suggested the M Series as a suitable replacement for our existing connector. Following successful trials, we are now fitting the LEMO connector to all our production builds. We have regular meetings with our LEMO sales contact, who has been very supportive, particularly when we needed to procure larger quantities." RailSense's experience with LEMO underscores the value of high-quality components in critical applications. As VoidSense deployment expands, the collaboration with LEMO will continue to ensure the product's reliability and ongoing success. ■

KUWAIT'S STADIUM UPGRADE SHINES AT THE ARABIAN GULF CUP

The 26th edition of the Arabian Gulf Cup, known as Khaleeji Zain 26, took place in Kuwait from 21st December 2024 to 4th January 2025, bringing together the eight members of the Arab Gulf Cup Football Federation. To accommodate the high-profile event, Kuwaiti stadiums underwent significant upgrades, with a new permanent broadcast network infrastructure provided by local system integrator Smart Engineering and LEMO Middle East.

The Khaleeji Zain 26 was a tournament filled with memorable moments that went beyond the football pitch, showcasing the rich cultural tapestry and unity of the Gulf nations. Its breathtaking opening ceremony, captivating an audience of 42,500 spectators, featured mesmerising music, special effects, and choreography, including dazzling fireworks and an impressive drone display. The action-packed two-week football competition concluded with Bahrain's victory over Oman following an emotional rollercoaster of a final.

Tasked with ensuring seamless coverage of all three stadiums hosting the matches and the ceremonies, LEMO faced the formidable challenge of completing the necessary upgrades within a tight four-week timeframe. To accomplish this monumental task, LEMO Middle East teamed up with local system integrator Smart Engineering.

They installed and integrated cutting-edge broadcast network infrastructure, which included 3,500 infrastructure connectors, 140,000 metres of SMPTE Hybrid Fibre Optic, LEMO Audio and OPTOKON Multicore Fibre Optic cables, as well as 100 LEMO camera cable assemblies of various lengths.

Smart Engineering and LEMO worked tirelessly around the clock to ensure the project was completed on time, delivering a flawless solution for the tournament's extensive coverage.

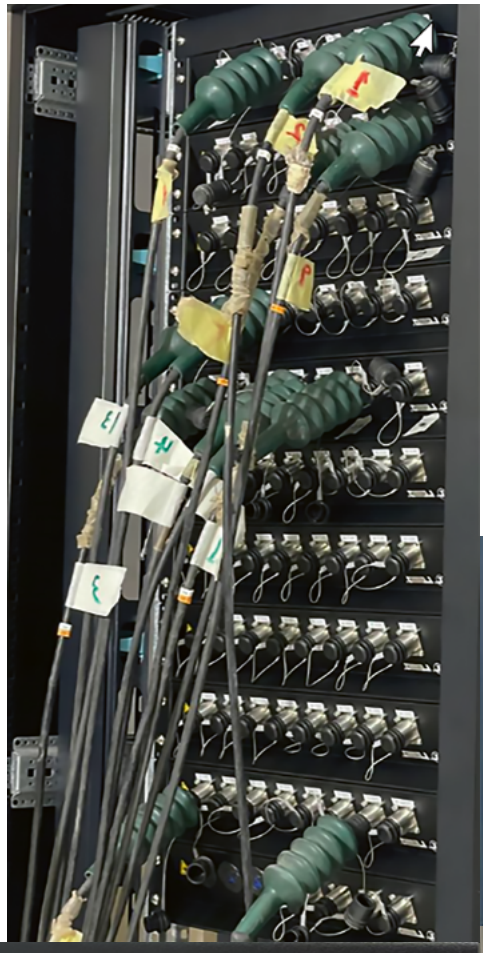
We have interviewed Mina Adel L Tadrous, co-founder and Executive Manager of Smart Engineering Co. about this special mission and his LEMO experience.

Can you give a short presentation of Smart Engineering?

Mina Adel L Tadrous Smart Engineering Co., established in 2007, is a leading provider of integrated solutions in Kuwait. Our company specialises in offering a broad range of innovative products and services, including infrastructure broadcasting, security systems, lighting solutions, networking, and solar energy systems. With a reputation for excellence, Smart Engineering Co. serves diverse industries, from small commercial offices to large-scale projects such as the Jaber Al-Ahmed International Stadium. The company proudly employs 8 qualified engineers and 25 skilled technicians.

Can you explain your role as a system integrator for major sports events and what your responsibilities entail?

My role focuses on overseeing and managing the integration of complex systems required for major sports events. This includes coordinating technical teams, ensuring seamless operation of broadcasting, LED screens, security systems, and other essential infrastructure while meeting tight deadlines and adhering to high standards.



How do you manage the complexity of such major events?

Managing complexity requires careful planning, team collaboration, and the use of advanced technologies. By breaking tasks down into smaller milestones, ensuring real-time communication, and proactively identifying risks, we can manage the pressures of large-scale events with precision and efficiency.

What are the key systems and technologies you are responsible for?

We specialize in broadcasting systems, LED screen technology, security frameworks, and networking solutions. These systems are the backbone of ensuring seamless live coverage and event management.

▲ *3K.93C broadcast connectors.*

◀ *In record time, LEMO Middle East installed 3,500 connectors, 140,000m SMPTE fibre optic cables and 100 camera-connector assemblies*

▲ *The breathtaking opening ceremony captivating 42,000 spectators.*

How early do you begin preparing for the technical setup and what is the process leading up to the event?

Preparation begins at least six months in advance. We start by collaborating with event organizers to understand their technical requirements, followed by detailed site surveys, system design, equipment procurement, and testing. As the event approaches, we conduct rehearsals and contingency planning to ensure full readiness.

What were the technical and environmental local challenges you faced while setting up the Kuwaiti stadiums?

Challenges included adapting systems to extreme heat conditions, managing power supply stability, and ensuring compatibility with local infrastructure. Coordination with multiple stakeholders added to the complexity.

How do you prepare for unexpected technical failures, especially when millions are watching?

We prepare by conducting thorough system testing, implementing redundancies in critical systems, and having a team of on-site experts ready to respond instantly. Additionally, we deploy backup equipment and follow strict maintenance protocols.

Can you share any specific anecdote where you had to troubleshoot an issue before or during the event?

During one event, we encountered an unexpected broadcasting server failure just hours before going live. Our team quickly identified the issue and replaced the faulty component, ensuring uninterrupted coverage for the audience. Another memorable moment was managing to install a complex LED screen system in record time due to last-minute changes from the event organizers. It required exceptional teamwork and technical expertise under immense pressure.

How many cameras are there in each stadium?

Broadcast operators typically set up up to 30 cameras of various types. The exact number may vary depending on the type of football event and the number of operators authorized to broadcast it.

Do you know how many people participated in shooting the images and broadcasting them towards the rest of the world?

Approximately 50–70 skilled professionals, including camera operators, technicians, and broadcasting experts, work together to ensure flawless coverage.

Do you have any statistics about the audience?

Our broadcasts reached millions globally, with significant viewership from the Middle East, Asia, and Europe.

Are there any sustainable initiatives you've integrated into the system design? For example, energy saving technologies?

Yes, we've integrated energy-efficient LED displays and implemented smart power management systems to reduce energy consumption and promote sustainability.

COOPERATION WITH LEMO

Since when have you been working with LEMO?

We have been working with LEMO for just one year, and the experience has been exceptional.

Why did you choose LEMO Group solutions?

LEMO offers high-quality and reliable interconnect solutions that meet the demanding standards of large-scale events.

How about LEMO NORTHWIRE cables?

NORTHWIRE cables have proven to be durable and highly efficient, complementing our systems perfectly.

Did the choice of a complete LEMO interconnect solution also make your work easier?

Yes, absolutely. LEMO's integrated solution streamlined our operations, reduced installation time, and enhanced system reliability.

Do you work with LEMO for maintenance as well?

Yes, we collaborate with LEMO for maintenance to ensure our systems continue performing at the highest level.

Can you tell us about your LEMO experience?

LEMO has been a reliable partner, offering excellent customer support and world-class products. Their solutions have significantly contributed to the success of our projects.

Do you have other major projects in view? Will you partner with LEMO again?

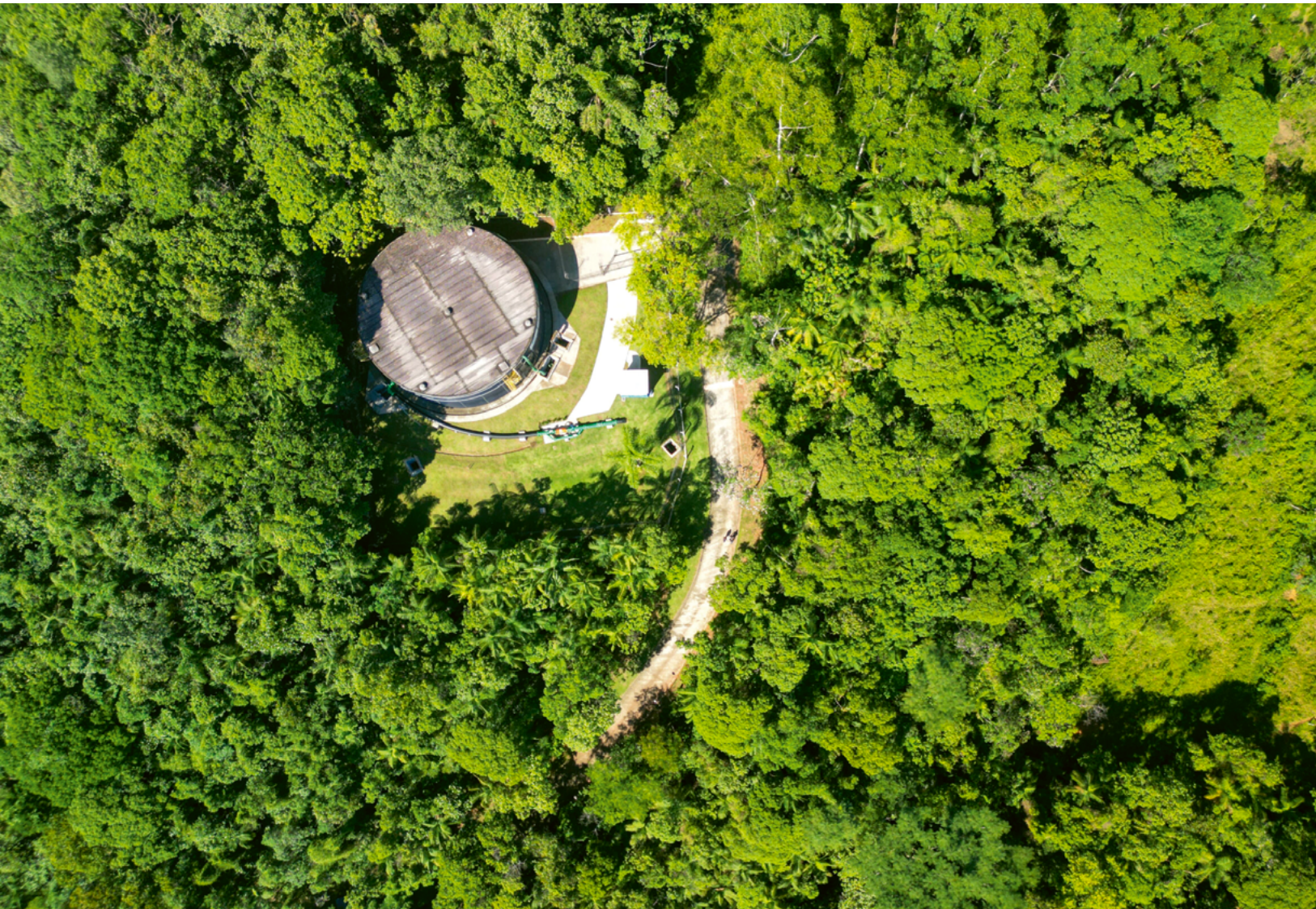
Yes, we are working on Fahaheel Club and the Asian Handball Event. We look forward to partnering with LEMO again for these exciting ventures.

LEMO has been a leader in interconnect solutions for the broadcast industry for several decades. It is the creator of the 3K.93C Series, adopted as a global standard for HDTV television. Today, the Group's solutions equip most TV studios in the world as well as major entertainment and sports infrastructures.

Additionally, the Kuwaiti stadium upgrade is a testament to LEMO Middle East's commitment to enhancing the sports broadcasting landscape in the region. ■

ECOFRIENDLY AMPHIBIOUS PUMPS

Brazilian pump pioneer HIGRA delivers unique amphibious pumping solutions offering high efficiency and robustness with low environmental impact.



A year ago, in April 2024, southern Brazil, particularly the State of Rio Grande do Sul, experienced devastating floods due to torrential rain that lasted several days. Considered as the worst natural disaster in the region's history, the 420-mm downpour caused 180 fatalities and widespread destruction, including landslides and a dam collapse. Cities were devastated, entire neighborhoods went under water, thousands of people became homeless.

HIGRA contributed directly to the flood relief, supplying, free of charge, five large pumps. Each with a capacity of 3,300 liters of liquid per second, the pumps were used to remove the water from flooded cities, ejecting the water into the rivers and drastically reducing the time required to dry the affected areas.

The company was founded 25 years ago in Southern Brazil, by industrial hydraulic engineer Silvino Geremia, with the concept of producing high efficiency, robust and low environmental impact pumping solutions. "HIGRA" stands for Hydrotechnical Geremia, the brand carrying the founder's family name. Today, HIGRA employs 110 people spread across Brazil and is represented in 14 countries by partners and distributors in Latin America, Europe, Africa and Oceania. HIGRA serves about 200 active customers worldwide, generating a turnover of around 100 million BRL.

We interviewed **Lucas Bordigon**, electrical engineer about the company and its solutions.

How do your pumps work and what makes them unique?

Our amphibious pumps have a unique design which enables them to work both submerged and out of water, in any position or installation, even in extremely harsh environments like open pit mines. Pumped fluid is admitted by a flanged axial suction, passing through a centrifugal impeller where its entire volume moves alongside a submersible electric motor, ensuring excellent thermal exchange and noise absorption.

What other products do you offer?

With the same proven versatility and robustness as the pumps, our turbogenerators present closely the same structure, the main difference is the electric device, a generator instead of a motor and a turbine instead of an impeller. They are suitable for harnessing hydraulic potential for hydroelectric generation and renewable energy. Their electric power generator is submersible and directly water-cooled, resulting in excellent thermal and efficiency conditions.

Our aerators and mixers for effluent treatment are designed to fulfill the aeration market's needs. The use of a submersible motor offers advantages such as low noise level, excellent oxygenation, and a wide mixture zone, saving significant energy compared to conventional equipment.

▲ *HIGRA pumps contributing to flood disaster relief.*

▲ *Irrigation system in Australia.*

▲ *Water collection.*

Water pumps and turbines have existed for over a century in hydroelectricity. In what ways are your solutions innovative?

Amphibiousness is the main innovative feature in HIGRA technology. The same equipment operating submerged or out of water is interesting in several aspects.

In addition to ensuring excellent thermal exchange and low noise emissions, it is a characteristic that makes the product extremely versatile. For example, if the equipment is working in a raw water pump station and it becomes flooded, there is no problem at all. In a hydro power plant project for example, there is no need any more for a major civil structure to accommodate conventional dry generators. This does not only reduce the overall costs but also environmental damage.

You are active in some very polluting markets (irrigation, industry, mining...), but the environment is central to your DNA. In what way your solutions contribute to preserving the environment?

By developing innovative and disruptive technologies for moving fluids, we seek to recover or save energy wasted throughout the water cycle. Sustainability and robustness walk side by side in every HIGRA product. Our pumps and turbogenerators are designed to achieve efficiencies up to 90%, directly impacting energy consumption and gas emissions and generate clean energy. The unique design delivers high hydropower efficiency, robustness, low noise emission and versatility due to easy and simple installation and intervention.

The amphibious technology is lubricated using water, so it doesn't use lubricants, oils, or greases, providing an oil-free solution.

HIGRA technology enables to reduce environmental damage. The ease and simplicity of installation and handling require minimum investment in infrastructure, significantly reducing the environmental impact and the total cost of civil works.

Moreover, our products are built with 100% recyclable materials.

Who are your customers?

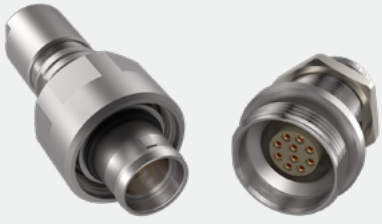
Most of our customers are from the segments of hydropower plants, mining and steel industry, water and sewage treatment, irrigation and agriculture.

Have you received innovation or tech awards?

FENASAN is the biggest sanitation and environment event in Latin America and HIGRA has already received several Technological Innovation Awards for Amphibious pump design and for the UCHA concept (UCHA means Compact Amphibious Hydrogeneration Power Plant).

What makes you especially proud of your company today?

Contributing to a better future by preserving the environment, manufacturing and promoting innovative equipment with reduced environmental impact and generating clean energy.



ABOUT HIGRA AND LEMO

Pumps and turbogenerators can be equipped with several sensors for condition monitoring. Since early 2023, HIGRA has been using W Series LEMO solutions, enabling quick and easy connections inside the equipment. Most importantly, they ensure perfectly watertight connections up to 30 bars in harsh environments, which is exactly what HIGRA was looking for.

SPANISH TV'S UHD UPGRADE REACHES OLYMPIC HEIGHTS

Picture a roaring stadium teeming with tens of thousands of fervent supporters, swaying with the highs and lows of a decisive football match. Two proud nations competing for Olympic glory and millions of viewers around the globe eager to be part of the show.

Tucked away on the edge of the heaving stadium, an unnoticeable lorry parks quietly. Step inside, and you will be transported into a cockpit buzzing with people and technology, tightly lined with flickering screens, noisy intercoms, monitors, the director giving rapid instructions such as "Camera 2 ready, take camera 2..." to ensure that every moment of the event outside is captured, mixed and broadcast in real time.

This is the world of an OB van, where cutting-edge technology meets split-second decision-making, where space is optimized for equipment, not comfort, and live television is delivered to millions in real time with the precision of a Swiss watch.

RTVE (the Spanish public broadcasting corporation responsible for national television and radio services in Spain) had been working hard in a fast-paced technological triathlon to complete the upgrade of the entire SD territorial infrastructure to ultra-high definition. It also aimed to have a mobile unit capable of producing content in the UHD standard. Everything had to be ready in time for the Paris Olympic Games.

The technical and operational staff, along with the engineering team at RTVE, and their suppliers and integrators, worked hard to deliver the 2024 Olympics in high definition, broadcasting free-to-air across Spain via DTT (digital terrestrial television) from Paris.

The coverage of the Paris Games was to be the premiere of the new UHD mobile RTVE unit as well. It was decided to implement the system using the 12G-SDI* video standard with specific coaxial cable and a new family of 75 Ohm connectors. LEMO's 1S.275 S Series product range, this first Push-Pull 12G-SDI connector, offered the required connection, with a cable retention force of 250 N and a fast and reliable Push-Pull latching system. The small connector diameter enabled patch-panels with a high connection density, essential for the compact and crowded OB van.

IBERLEMO, LEMO's Spanish subsidiary supplied infrastructure, including dedicated UHD cables, 126 patch-panels, connectors, patch cords and bridges for the new OBV, all designed to operate in a native 12G-SDI environment at 12Gbit/s, compliant with the SMPTE 2082-1 standard, featuring 360° EMI shielding and excellent return loss performance. The new OB van was ready for the big game!

We interviewed **Francisco Jose Collado**, Deputy Director of Engineering Studios and OB Vans at RTVE.

Can you tell us a few words about RTVE's past and present?

Franscisco Jose Collado: In the past, RTVE have been working in PAL and SDI technology, in the last few years we have been working in HD resolution, and we are changing to UHD resolution. The future, for us, is in UHD, HDR and IP 2110.

What were the main drivers behind RTVE's decision to renew its entire broadcast infrastructure in 2024?

Mainly the possibility of producing natively in UHD and, to continue developing IP 2110 installations, adopting this cutting-edge technology as the basis for future installations.

Was this update part of a broader digital transformation strategy, or a response to specific challenges?

In this case, it responds to a specific need for UHD production, but is included in our future strategy.

How has the modernization impacted your workflows in production, post-production, and playout?

Having different systems interconnected, automating processes, and, above all, transferring information between all systems, greatly streamlines workflows and operations, making us more efficient.

What are the main improvements or capabilities introduced with the new infrastructure compared to the legacy system?

The improvements have included the flexibility of the new structures, allowing for the production of different programmes with diverse requirements using the same equipment, enabling dynamic and agile switching between them. This previously required considerable time to make the necessary changes.

What has been the overall budget for this infrastructure overhaul?

The budget for a medium-sized OB VAN, operating in 12G-SDI, includes bodywork, air conditioning, and audiovisual installation. The budget is estimated at around €4.5 million.

Why did RTVE choose 12G-SDI as the new standard for its OB vans, as opposed to transitioning directly to IP or NDI workflows?

It's not that 12G-SDI was chosen as the new standard. The decision was made to implement it in SDI instead of IP 2110, due to its compatibility with RTVE's other OB VANs, with a distributed SDI matrix, which allows for the interconnection of several OB VANs and the implementation of larger productions.

How does 12G-SDI benefit RTVE in terms of live production quality, latency, or operational efficiency?

12G-SDI in terms of quality offers UHD and HDR quality. In terms of operation, there are usually no differences with IP 2110, since both technologies are intended to be transparent for operators. However, for Technique and Maintenance, there are major changes, since with SDI the detection of incidents and signal tracking is much more agile, but in IP it is necessary to carry out maintenance by means of frame tracking and with IP techniques.

Were there any specific challenges in retrofitting or replacing the OB vans with 12G-SDI-compatible hardware?

SDI technology is well-known, and the challenges were more on the side of equipment configuration and operation, which was done using a Broadcast Controller.

How are signal integrity and cable length limitations being managed in the new 12G-SDI environment?

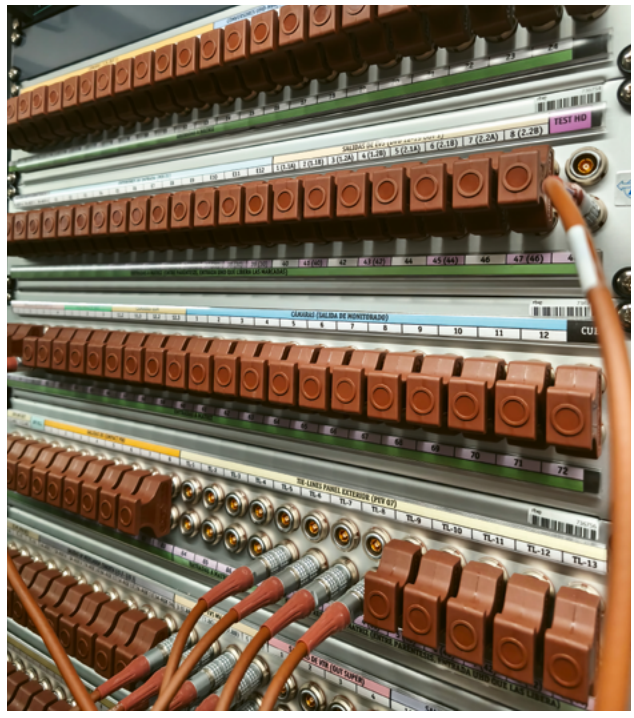
Obviously, distances for 12G signals in SDI are a limitation, more significant than in HD or 3G. But in OB VAN environments, this hasn't been a problem, as the unit's internal distances aren't very big. When considering longer distances, for outdoor use, the use of optical fibre is necessary to ensure signal quality.

What kind of ROI or qualitative benefits (e.g., viewer satisfaction, efficiency gains) does RTVE expect from this infrastructure renewal?

Primarily the image quality, without forgetting the improved sound quality, thanks to the use of immersive audio. Producing in Multichannel UHD-HDR provides an increase in quality, which viewers can receive through our 4K-UHD DTT broadcast channel.

How does this infrastructure renewal support RTVE's digital or multi-platform content distribution strategy?

We have interconnected the different production systems so that we serve content for the different platforms in a targeted manner. With future IP 2110 installations, we will improve this aspect and be able to work in a more personalized way.



▲ *12G-SDI is a high-performance video transmission standard used primarily in broadcasting to carry 4K and UHD video over a single coaxial cable. It allows for the transmission of 12 gigabits per second, enabling high-quality, high-resolution video with high frame rates. 12G-SDI is especially useful for professional environments where video signal transmission is critical, such as live events and broadcast studios.*

◀ *The first UHD OB Van.*

Were there any particular technologies or vendors that played a key role in the upgrade?

Leading manufacturers and suppliers in broadcast environments, with a great reputation and solvency, to achieve the high quality we always demand.

RTVE AND LEMO

LEMO supplied its new S series of Push-Pull 12G-SDI 75 Ohm connectors for refurbishing the first full UHD OB vans in Spain (126 patch panels with 1S.275 connectors, patch cords and bridges). Can you tell us about your LEMO experience?

We've practically always used LEMO interconnection systems. They provide us with a robust, reliable, and easy-to-use system. The new connectors, specifically for UHD, offer the necessary quality while maintaining the usual versatility and ease of operation.

Are there other LEMO connectors currently used by RTVE?

We are using virtually all types of LEMO connectors, for audio, AES, HD video, UHD video, with SMPTE camera cables, etc. ■

A MILESTONE OF EXCELLENCE IN THE IBERIAN REGION

This year marks a significant milestone for the LEMO Group: the 30th anniversary of IBERLEMO, our dedicated subsidiary serving the Iberian Peninsula. However, LEMO's presence in the region goes well beyond three decades.

This celebration is not only about an organisation – it is also a heartfelt tribute to the remarkable individual whose vision, leadership and dedication laid its very foundations.

For nearly four decades, Francesc Rosell had been at the very heart of LEMO's story in Spain and Portugal. His journey began in the 1980s, representing LEMO products through a distributor. In 1995, when the decision was taken to establish a direct presence in the region, Francesc was the natural choice to lead the way. With the founding of IBERLEMO in Barcelona, a new chapter was opened – one built on trust, service, and an unwavering commitment to quality.

Under Francesc's leadership, IBERLEMO grew from a fledgling operation to a LEMO Group subsidiary. He built a skilled and close-knit team, developed a state-of-the-art cable assembly workshop, and earned the respect of customers across a wide range of industries – from medical and broadcast to defence, test & measurement and industrial automation. Francesc was never simply a manager – he was a mentor, with a real passion for LEMO products, and, above all, a man who led with heart.

In 2022, Francesc entered a well-earned retirement, but his legacy is woven into the fabric of IBERLEMO – in its people, its values and its enduring commitment to excellence.

Now, as we proudly celebrate 30 years of IBERLEMO, we also look to the future with confidence. Enric Ventura, who worked closely alongside Francesc for many years, has taken over as General Manager since 2022. Under his leadership, IBERLEMO remains firmly committed to its mission: providing world-class interconnect solutions, backed by local expertise and a spirit of innovation.

▲ *IBERLEMO has recently moved to new modern premises.*

"For 30 years, IBERLEMO has embodied the values of precision, innovation, and service excellence that drive the LEMO Group forward," says Enric Ventura, General Manager of IBERLEMO. "We are proud of the strong partnerships we've built and look forward to continuing our journey alongside our customers and colleagues."

To all those who have been part of this story – our customers, and dedicated employees – we extend our heartfelt thanks. Your trust and cooperation have shaped what IBERLEMO is today.

This anniversary is both a moment of reflection and a renewed commitment – to serve, to innovate and to carry forward the spirit that Francesc Rosell has so beautifully instilled. ■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