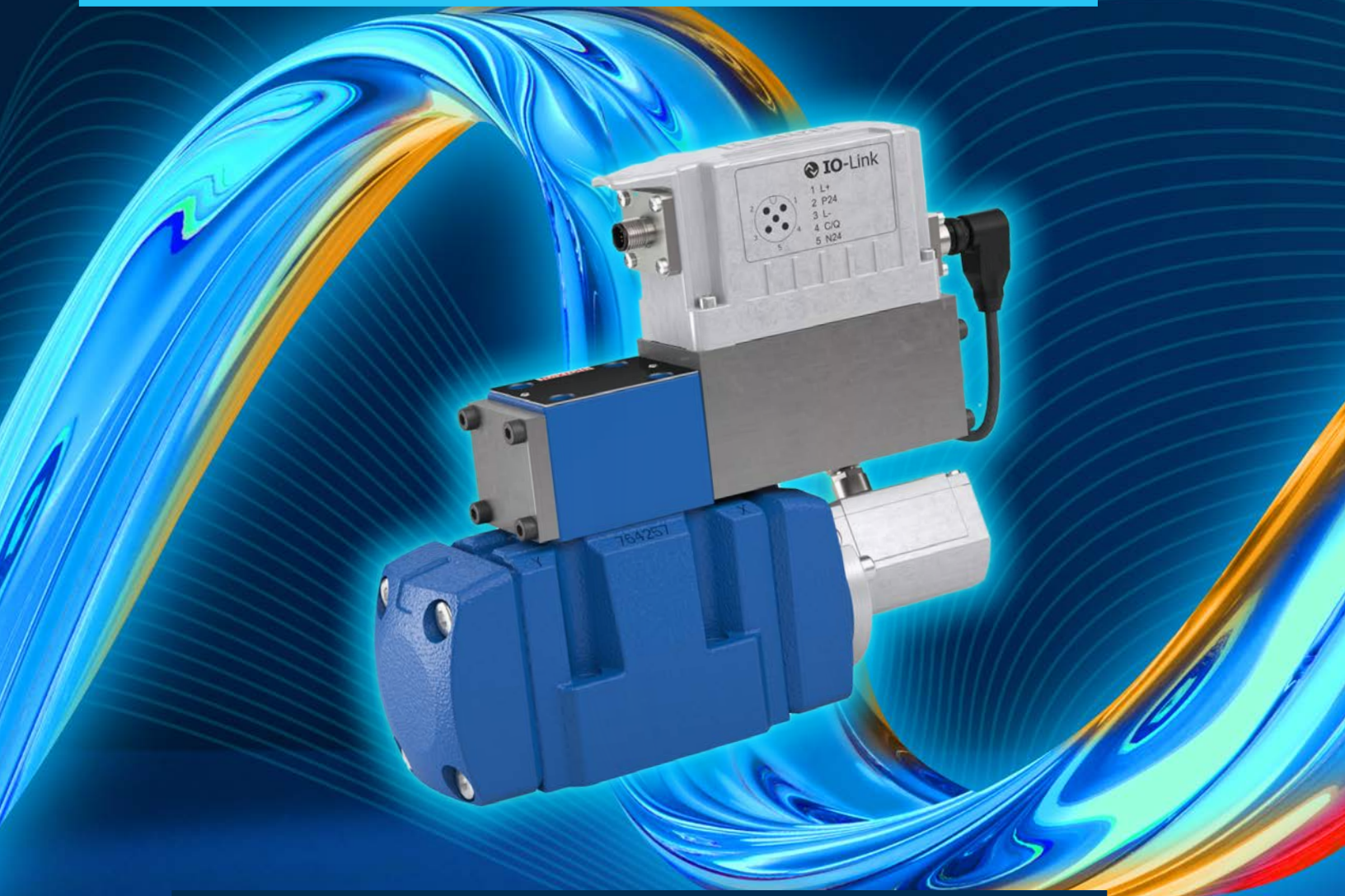
WHITEPAPER

The Best of Both Worlds



How Smart Valves Bridge the Gap Between Strength and Precision

In demanding industrial applications, operators have historically faced a trade-off: Choose powerful, durable hydraulic valves or opt for precise, electronically controlled ones. This whitepaper explores how modern pilot-operated valves with integrated electronics eliminate this compromise, delivering both robust performance and digital intelligence in a single package.

For decades, the foundation of heavy industry has been the raw power of hydraulics. The ability to move immense loads reliably is non-negotiable. However, as machines become more complex and connected, the need for precision, flexibility, and data integration has grown. Simply being strong is no longer enough.

WHY INTEGRATED SAFETY MATTERS

Machine builders often had to choose a side:

- **Traditional Robust Valves:** Offered unmatched durability and power but lacked the fine control and feedback needed for complex, automated cycles. Adjustments were often manual and imprecise.
- **Early Servo/Proportional Valves:** Provided high precision but could be sensitive to harsh industrial environments, contamination, and vibration, sometimes sacrificing long-term reliability.

This created a gap where applications needed both strength and intelligence, forcing engineers to build complex external control systems to try and bridge the two worlds.

THE INTEGRATED ELECTRONICS (OBE) SOLUTION

The 4WRLE series represents the next step in valve evolution, where the “brain” is built directly onto the “muscle.” By integrating Onboard Electronics (OBE) with a field-proven, pilot-operated directional valve, we create a single, powerful, and intelligent component.

The integrated design delivers:

- **High-Quality Mechanics:** The core of the valve is a robust cast housing and a high-quality pilot valve, engineered for millions of cycles in tough conditions.
- **Onboard Intelligence:** The OBE constantly compares the operator’s command signal with the main spool’s actual position, making micro-adjustments in real-time to ensure perfect accuracy.
- **Digital-Ready Interface:** With options like IO-Link, the valve is no longer just a hydraulic component; it’s a data node in a modern Industry 4.0 ecosystem, providing feedback and accepting digital commands.

WHAT THIS MEANS FOR MACHINE PERFORMANCE

This fusion of strength and intelligence solves real-world problems and unlocks new capabilities:

- **Precision Where It Counts**: In applications like injection molding or die casting, precise control over flow and pressure is critical for part quality. The 4WRLE’s high response and low hysteresis mean repeatable, accurate cycles, reducing scrap and improving consistency.
- **Flexibility on Demand:** A single 4WRLE valve can be used for position, velocity, and pressure control. This allows machine builders to simplify their hydraulic circuits, reduce the number of required components, and create more flexible, multi-functional machines.
- **Reliability You Can Trust:** The design includes built-in “fail-safe” positions. If power is lost or a fault is detected, the pilot and main spools automatically return to a safe, spring-centered position, preventing uncontrolled machine movement. This is reliability that is engineered, not assumed.

THE IO-LINK ADVANTAGE

The optional IO-Link interface transforms the valve from a simple actuator into a smart device. This single, standardized connection provides:

- **Simplified Wiring:** Rxeplaces complex analog wiring with a simple, universal M12 plug.
- **Advanced Diagnostics:** The valve can report its status, errors, and operating hours directly to the main control system.
- **Remote Parameterization:** Technicians can adjust valve settings remotely, reducing machine setup and changeover times.
- **Enhanced Safety:** Can be used as a shut-off element up to category 3, PL d according to EN 13849-1, adding another layer of functional safety.

The demand for smarter, more efficient, and more reliable machinery will only continue to grow. The era of choosing between hydraulic strength and electronic precision is over. Integrated valves like the 4WRLE prove that you can have the best of both worlds: the unyielding power of hydraulics, guided by the flawless precision of digital control.

Is it time to upgrade your machine’s performance? Contact a Bosch Rexroth specialist to learn how the 4WRLE can bring a new level of control and reliability to your application.

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