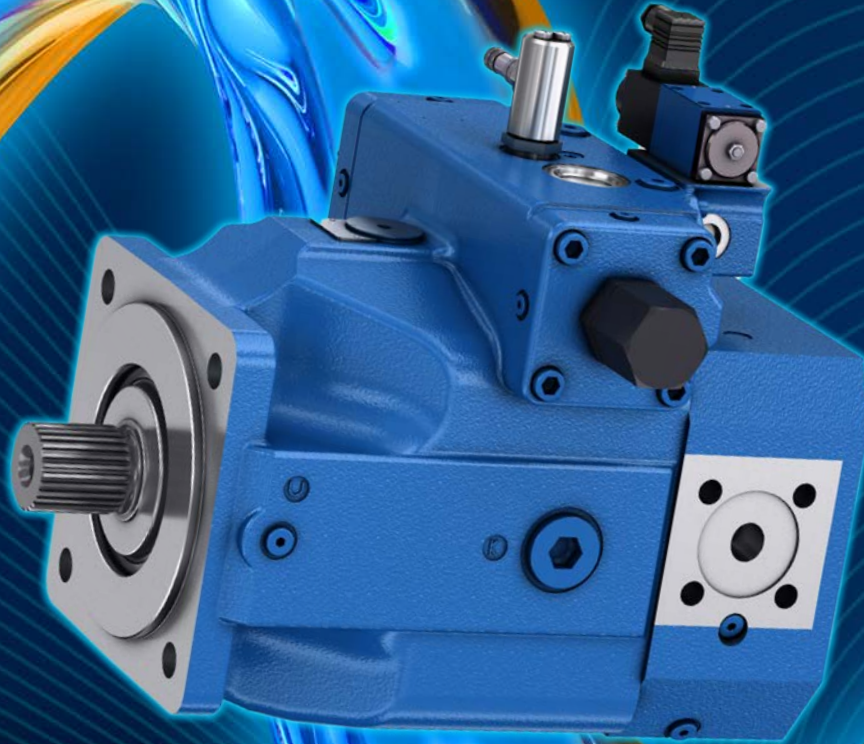


Evolving the Standard



How the A4VBO Architecture Delivers Reliable High-Pressure Performance

An examination of the design principles behind the A4VBO, a robust evolution of the proven A4VSO for modern open-circuit applications up to 450 bar nominal pressure.

In the world of high-pressure hydraulics, the Bosch Rexroth A4VSO axial piston pump established a benchmark for reliability. However, as industrial and mobile applications push for greater power density and higher operating pressures, a need has emerged for a component that builds upon this trusted foundation. The A4VBO series is the answer. This whitepaper details the engineering philosophy of the A4VBO, which leverages the proven swashplate design of the A4VSO while incorporating key optimizations for robust operation at nominal pressures of 450 bar and maximum pressures of 500 bar. We will explore its high-pressure design, modular control options, and the integration of digital electronics that make it a premier choice for modern, demanding open-circuit systems.

THE PRINCIPLE OF EVOLUTION, NOT REVOLUTION

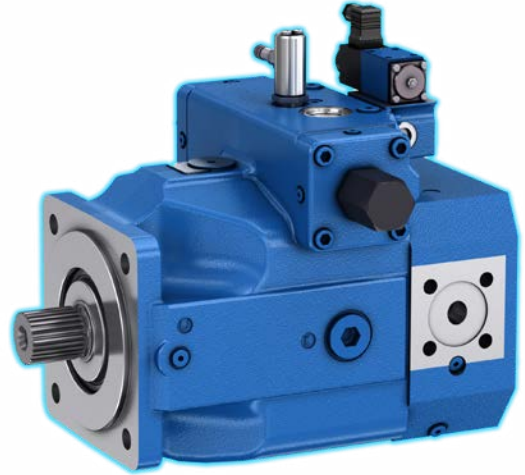
The design philosophy of the A4VBO is rooted in leveraging proven technology. By starting with the field-validated A4VSO architecture, the A4VBO inherits decades of real-world operational data and a fundamental design known for its robustness. Key areas of evolution include:

- **Strengthened Rotary Group:** The core components, including the cylinder block, pistons, and slipper pads, are engineered with materials and geometries optimized for the increased mechanical and hydraulic stresses of 450-bar operation.
- **Optimized Swashplate and Bearings:** The swashplate design, central to flow generation, and its associated bearings are designed to handle higher continuous loads, ensuring stability and a very long service life.
- **Modular Design Heritage:** The A4VBO retains the modularity of its predecessor, allowing for a wide range of control devices—from simple power controllers to advanced digital systems—to be fitted to the same core pump.

ENGINEERING FOR THE 450-BAR ENVIRONMENT

Operating at 450 bar (6525 psi) is a significant engineering challenge. The A4VBO addresses this through several key features identified in the datasheets (RE 92122, RE 92088):

- **High Power Density:** A crucial metric for modern machine design. The A4VBO's ability to deliver substantial power from a compact size (e.g., size 450 delivering 810 l/min) allows designers to achieve performance targets within tight space and weight constraints.
- **Through-Drive Capability:** The A4VBO's robust design supports through-drives, allowing for the creation of multi-pump combinations without needing separate motor pump groups. This simplifies circuit design, reduces components, and lowers installation costs in complex machinery.
- **Optimized Bearing and Case Flushing:** High pressure generates heat. The A4VBO design incorporates internal and external bearing flushing options to ensure optimal lubrication and thermal management of the drive shaft bearings, directly contributing to a longer service life under continuous load.



THE DIGITAL CONTROL OPTION: FROM BRUTE FORCE TO PRECISION INSTRUMENT

While the A4VBO is a hydraulic powerhouse, its true potential is unlocked with digital electronic controls like the HS5 series (RE 92076). This option transforms the pump from a simple flow source into an intelligent, responsive system component.

- **HS5 Digital Electro-hydraulic Control:** This system utilizes a proportional valve with electrical feedback for the swivel angle. Combined with pressure transducers, it enables a suite of advanced functions:
 - **Electric Pressure Control:** Precisely maintain system pressure according to a digital command signal, allowing for dynamic load profiles.
 - **Electric Displacement (Flow) Control:** Accurately command the pump's output flow, essential for applications requiring variable speed control.
 - **Torque Limitation:** By processing both pressure and displacement data, the controller can calculate and limit the input torque, protecting the prime mover (e.g., diesel engine or electric motor) from overload.
- **On-Board Electronics (OBE) with HS5E:** The HS5E variant integrates the digital controller (OBE) directly onto the pump. This simplifies wiring, reduces cabinet space, and brings the control intelligence closer to the point of action, enabling faster response times and providing a clean, modern integration path via industry-standard fieldbuses.

APPLICATION PROFILE: WHERE THE A4VBO EXCELS

The combination of a robust, high-pressure design and advanced control options makes the A4VBO ideal for a specific class of applications:

- **Industrial Presses:** For large-scale forming, stamping, and forging where high, sustained, and controllable pressure is the primary requirement.
- **Marine and Offshore:** Leveraging its high power density and reliability for various marine applications in demanding environments including heavy lifting operations and diesel injection for large engines.
- **Heavy Construction & Mining Equipment:** Providing the primary hydraulic power for large excavators, drills, and material handlers that require both power and durability.
- **High-Performance Test Rigs:** Where its precise control over pressure and flow is critical for simulating loads and validating other components.

The A4VBO is more than just a high-pressure pump; it is the strategic evolution of an industry standard. By reinforcing the proven A4VSO design for the rigors of 450-bar operation and integrating options for advanced digital control, Bosch Rexroth has created a component that offers unmatched power, reliability, and intelligence. For designers of next-generation high-pressure open-circuit systems, the A4VBO provides a trusted, powerful, and future-proof foundation for success.

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