

Technical Overview

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Pressure and Flow on Demand – Proven 100,000 Times Over



Never has the efficient use of energy been as important as today in view of exploding costs. Modern hydraulic systems combine efficient energy savings with high dynamics and decentralized intelligence. Electrohydraulic closed-loop control systems of the Rexroth SY(H)DFEx family, on the basis of variable displacement axial piston pumps, control pressure, displacement, and output without throttling losses in the power branch. These system solutions feature extremely short adjustment times with high and reliable repeatability. Depending on the individual machine concept, the user can select external or internal control electronics, or analog signal transmission or signal transmission via CAN bus.

In plastics processing machines, they already became an integral part of modern hydraulic drive systems: This year Rexroth will celebrate the 100,000th SY(H)DFEx sold. The proven combination of Rexroth variable displacement axial piston pumps of swashplate design, series A10VSO and A4VSO, with innovative control electronics guarantees short cycle times and reliable, high repeatability in injection molding machines. This technology is, however,

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continuously winning new customers for machines outside the plastics and rubber processing industry, for example in presses or test rigs. Rexroth has developed consistent electronics of various characteristics, which meet a wide variety of requirement profiles and ensure process reliability.

Rexroth developed and patented the basic principles in the 1980s. The modern characteristics are based on the tried-and-tested axial piston pump types A4VSO and A10VSO of swashplate design. An electrically controlled proportional valve adjusts the position of the swashplate by means of an actuating piston in a closed control loop. The displaced flow is proportional to the position of the swashplate. A pressure transducer that is connected to the control electronics constantly senses the system pressure, which is processed in the closed pressure control loop of the electronics so that the pump output pressure can be steplessly varied. A power control is an available option.

Increased hydraulic efficiency

In contrast to p/Q systems, which are still widely used and based on the delta- p , the operating principle of SY(H)DFEx is characterized by the absence of throttling losses in the power branch. This results in a significant increase in the hydraulic efficiency of the overall system and a higher energy efficiency ratio; hence lower costs. Another decisive factor for the machine manufacturer is high

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dynamics in order to reduce the adjustment times and finally, the process movement to a minimum.

Analog or digital: what do you like?

For this control, the user can select from various features of a consistent electronic concept and cover various focal points of his application:

- SYDFE1 with external closed-loop control electronics,
- SYDFEE as analog, integrated version,
- SYDFEC as integrated digital closed-loop control electronics with field bus controlling via CAN bus

In the case of SYDFE1, the external controller card VT 5041-2X processes all the required signals. This Euro-format card operates as an analog amplifier and is provided as a standard with one command value input each for pressure and swivel angle and optionally with an input for the power command value. A pressure transducer acquires the actual pressure value and a position transducer on the pump receives the actual swivel angle. The control electronics process the two actual values and uses them to precisely correct the system variables of pressure, swivel angle, or power. The output signal of the minimum value generator becomes the command value and closes the control loop. The control electronics change the piston position and, therefore, the swivel angle in relation

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to the command value. This variant is ideal when the ambient conditions for the hydraulic power unit are particularly harsh. In this case, the electronics are optimally protected in the control cabinet.

Apart from this external solution for control cabinet installation, Rexroth utilizes rugged processors for integration into closed-loop control electronics of the axial piston pump. These ready-to-connect system solutions support both analog signal transmission and interfacing with digital communication.

The operating principle is the same. The integrated analog electronics SYDFEE senses the swivel angle via a rotary angle sensor based on a Hall sensor. The pressure transducer can be mounted onto the pump or the optional pre-load valve with direct connection to the control electronics. Alternatively, an external pressure transducer can be connected at any position within the hydraulic systems by means of a central plug. The control electronics is fitted with one analog command value input each for pressure and swivel angle, which are connected via the central plug. The user can adjust the optional power limitation by means of an internal potentiometer. A position transducer with integrated electronics on the pump determines the actual swivel angle value and signals it back to the on-board electronics.

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Ready-to-connect solutions reduce cabling effort

As ready-to-connect system solutions, internal electronics simplify commissioning and significantly reduce the cabling effort. This is even more valuable for the field bus-capable control of type SYDFEC. The digital open and closed-loop control electronics with CAN interface, which is integrated in the proportional valve, assumes the complete functions for pressure and flow control. The control electronics receives its command values for pressure, swivel angle, and power limit via the CAN bus. The user can select from analog, digital, or hybrid signal transmission and, therefore, can adjust the control electronics to his individual automation concept.

Via the CAN bus, the user can change controller parameters from the machine control during operation and also conveniently call up diagnosis messages. In this way, Rexroth integrates the pressure and flow control as intelligent actuator seamlessly into decentralized automation structures.

Strong basis due to optimized axial piston pumps

Apart from the progress achieved in the field of electrohydraulics, Rexroth is continually improving the basic components—in this case, axial piston pumps. Rexroth has recently optimized the new series 32 of the medium-pressure pump type A10VSO, which is designed for operating pressures of up to 280 bar, in

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terms of noise reduction and efficiency to achieve further energy savings. This improvement was accomplished by implementing an optimized changeover feature in the new series. An important side effect—this also reduces pressure pulsation in the system. In applications in which the distance between power unit and machine is greater, the optional pre-compression volume PCV significantly decreases pulsation. And less pulsation primarily means less structure-borne noise; hence, a reduction in the noise emission.

Moreover, thanks to the new universal drive of series 32, the developers significantly simplified the optional combination of various pumps: with the A10VSO, the hydraulic specialist relocates the variance from the pump to the relatively favorably priced mounting and through-drive elements.

The Rexroth SY(H)DFEx offers a consistent electronic concept with various characteristics for a wide range of sizes and pressures. Unlike other controls, the DFE operates without throttling losses in the power branch. The controller family covers sizes 18 to 355 and the complete pressure range up to 350 bar in conjunction with Rexroth standard valves. The user can freely choose external or internal electronics and adapt the signal transmission to his architecture. When CAN bus is used, numerous diagnostic options increase the availability.

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