

Acvatix magnetic control valves for multifunctional heating appliance test bench

Magnetic control valves type MXG461 from Siemens' Building Technologies Division ensure trouble-free operation of a novel multifunctional test bench for heating appliances. The test bench was developed by Omega Technology GmbH in close cooperation with Viessmann Werke GmbH & Co. KG, one of the largest boiler manufacturers, and affords considerably shorter market introduction times for heating appliances.

The development of heating appliances is typically associated with considerable effort and expense. Especially costly and time-consuming is the testing of functions, performance, capacities and strain since each type of heating appliance and each capacity range requires its own test bench.

These costly processes can be significantly shortened by a new type of multifunctional test bench developed jointly by Omega Technology GmbH and Viessmann Werke GmbH & Co. KG. The mobile power supply equipment for external load simulation of heating appliances covers a broad range of capacities and ensures fast and accurate control of test sequences with predefined temperatures and/or volumetric flows.

The high level of flexibility of the new test bench is made possible by the extra-ordinary versatility, precision and fast action of the Acvatix MXG461 magnetic control valves supplied by Siemens' Building Technologies Division. These valves are designed to acquire temper-atures and volumetric flows within tight tolerance bands. Also, they enable the valve characteristic to be changed from linear to equal-percentage, and vice versa – an important prerequisite for matching the test bench to the entire output range of heating appliances. This ensures accurate measuring results, especially under extreme load conditions (load close to zero or close to 100 percent).

Another benefit offered by the control concept based on the MXG461 magnetic control valves is the fact that valves of different size can be installed in parallel, controlled by a single DC 0...10 V

signal converter. This way, the test bench can be used for wider heating capacity ranges reaching from a few watts to several hundred kilowatts. This means that a single test bench on the basis of MXG461 control valves is capable of handling a wide range of heating appliances in short-term or fatigue tests. As a result, cost-intensive product development and market introduction times of heating appliances (gas- and oil-fired appliances plus heat pumps) are considerably shortened.

Omega Technology test bench in detail

The test bench by Omega Technology and Viessmann Werke was developed for testing gas- and oil-fired heating appliances plus heat pumps in a broad range of capacities. The major distinctive feature from conventional test benches is the short time it takes for a measured value to reach its new level after entering a new parameter. Among other things, the test bench is thus capable of making measurements with preset parameters (different volumetric flows, different flow and return temperatures, constant inlet temperature and volumetric flow while changing the appliance's output) and of decoupling pressure and temperature of the appliance from the cooling water supply. Furthermore, the test bench is suited for critical operating states and extreme operating modes plus defined temperature differentials between flow and return.

Thanks to the use of process control, all test procedures can be reproduced and repeated. These functions and features offered make the test bench suited for both short-term and fatigue tests.

Function of magnetic control valves

The operating principle of modulating magnetic control valves is simple: Modulating voltage is applied to a coil which pushes the metal core inside against a spring, positioning it in accordance with the applied voltage. This ensures very fast and accurate control, practically with no wear and tear. In comparison with electro-motoric or electrohydraulic actuators, magnetic actuators produce relatively small positioning forces. For this reason, magnetic control valves are equipped with a pressure compensation system, where the pressure upstream of and downstream from the valve acts in opposite directions on two surfaces of equal size. Pressure and counter-pressure are compensated, independent of whether the valve is open or closed. Thanks to this technical feature, the magnetic positioning force and thus the energy required are kept very low. A major design feature of the range of Acvatix magnetic control valves from Siemens is the flexible valve plug that allows the valve to open smoothly with no inlet jump – in contrast to conventional valves.

This offers a stroke resolution of 1:1000 and thus the control of individual drops of water. The next moment, any volumetric flow between 0 and 100 percent can be controlled while maintaining positioning times below 2 seconds with no oscillations. Also, the general tendency toward

oversizing valves does not pose a problem: Due to their design, magnetic control valves also offer excellent control performance in the low load range, especially since there is no inlet jump.

CAPTIONS

Abb1_Sole-Wasser Prüfstand.jpg

Test bench for brine-to-water heat pumps with capacities up to 32 kW (Source: Omega Technology)

Abb2_WP_Magnetventil26.jpg

Two magnetic control valves type MXG461 connected in parallel ensure fast and accurate control of preset parameters (Source: Omega Technology)

Abb_K1_Temperaturverlauf.jpg

Progression of temperature when controlling to a setpoint. A quick response of the control valves makes it possible to simulate different operating states within short periods of time.

Abb_K2_BT_Magnet_control_valve_key_components_EN.jpg

Key components of a magnetic control valve (Source: Siemens)

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