

**Industry**

**Building Technologies**

For the trade press

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### **Modulating magnetic control valves for demanding heating and cooling applications**

**Excellent control performance is one of the key requirements in the heating, ventilation and air conditioning field. Short positioning times and high stroke resolution are desirable not only from the point of view of enhanced comfort. They also help save energy, especially in the refrigeration field or with HVAC applications in the industrial sector. In addition, magnetic valves meet requirements that could hardly be satisfied by conventional controlling elements. Siemens has launched a new line of magnetic control valves with valve bodies made entirely of stainless steel, especially for use in the industrial sector.**

Present trends in the heating, ventilation and air conditioning (HVAC) field lead to ever higher control performance in almost all types of plant. This is particularly obvious in the refrigeration field and with HVAC applications in the industrial sector. Here, it is not only a question of enhanced comfort like for instance quick room climate adjustments, or the instant supply of hot water for large shower facilities. Efforts are more and more concentrated on minimized energy usage, but fighting legionella viruses in various types of plant, and especially HVAC requirements in connection with industrial production processes and testing procedures demand the highest levels of control performance including accuracy in the region of a few thousandth of a degree Kelvin. For this reason, the very fast and highly accurate Acvatix modulating magnetic valves from Siemens are used increasingly in connection with control systems for semiconductor production

processes, in the pharmaceutical, chemical and food industry, as well as on engine test rigs, in clean rooms, and on HVAC applications under difficult environmental conditions.

Modulating magnetic control valves for the HVAC field are marketed exclusively by Siemens. They are based on decades of experience, and the range has been continuously improved and extended over the years. Key features are:

- Non-contact magnetic actuators operating on AC 24 V (DC 0...10 V, DC 2...10 V, 4...20 mA) afford hermetically sealed hydraulic circuits and offer many years of maintenance-free operation
- Positioning time of 2 seconds over the entire stroke
- Great stroke resolution of 1:1000 – with no inlet jump
- Two-port valves and three-port mixing valves
- Pressure-compensated valves for high differential pressures
- Extensive product range for a host of different applications from refrigeration at - 40 °C to HVAC plant at + 180 °C

### **Broad application area in the HVAC field**

Some of the most demanding control tasks in the HVAC field are supply air temperature and humidity control as well as DHW temperature control in systems with greatly varying demand like for instance in sport facilities and hotels. Other types of plant considered difficult from the control point of view are district heating schemes – be it low-temperature community heating or high-pressure hot water or steam systems. With all these applications, the control loop's complexity is very high. It is characterized by quick load changes, the trend towards plate heat exchangers with high output ratings, or varying temperature differentials and pressure conditions in the winter as against those during intermediate seasons or in the summer.

### **Refrigerant valves with modulating magnetic actuators**

The production of refrigeration is very expensive and the energy savings achieved with accurate output or superheat control thanks to advanced controlling elements offer short payback times of only a few months. The two- and three-port valves of the refrigeration range from Siemens cover all applications found in medium-size refrigeration systems. Here, the non-contact drive technology of the actuators takes full effect since it affords the installation of hermetically sealed hydraulic circuits, thus preventing refrigerant from

escaping, also offering savings and security. The range of refrigerant valves also includes a version for ammonia which, in terms of life expectancy, environmental compatibility and security, satisfies very demanding requirements.

### **Constant temperatures in clean rooms and complex processes**

The quality and performance of the magnetic control technology also proves its worth in clean room installations and production facilities for electronic memory chips. For example, a supplier of production technology for the semiconductor industry wanted a more accurate temperature level in the production facility that would enable him to increase the diameter of the wafers from 200 to 300 mm. Thanks to the installation of magnetic control valves in a semiconductor lithography plant, the temperature at the core could be maintained within  $\pm 0.001$  Kelvin. According to the project leader, the use of magnetic control valves was one key factor why the wafers' surface area could be doubled, also leading to considerably lower production costs.

### **New version with valve body made of stainless steel**

The valve bodies of the entire range of DN15, 20, 25, 32 and 50 valves are made of stainless steel (chromium-nickel steel). For this reason, the valves are suited specifically for applications requiring stainless components and piping, e.g. in aggressive environments or in the pharmaceutical, chemical or food industry. In these sectors, fully desalinated water (totally pure water, deionized water) is increasingly used, aimed at preventing the formation of lime and silting-up and, therefore, minimizing plant malfunctioning and costly downtimes. Stainless steel valves are also suited for this kind of aggressive media.

**((Box))**

### **The range of Acvatix magnetic control valves from Siemens**

The working principle of modulating magnetic control valves is simple: A modulating voltage is applied to a coil which pushes the metal core inside the coil against a spring, positioning it according to the magnitude of the applied voltage. This approach makes possible very fast and accurate control adjustments – practically with no wear and tear. Since magnetic actuators only produce relatively small positioning forces in comparison

with electromotoric or electrohydraulic actuators, they make use of a pressure compensation system. Upstream of and downstream from the valve, the compressive forces act on two surfaces of identical size in opposite directions, which means that pressure and counterpressure are compensated, irrespective of the valve's position (open or closed). Thanks to this technical feature, the magnetic positioning force and energy consumption are kept at a very low level.

An important design detail of the magnetic control valves from Siemens is their flexible valve plug, which enables the valve to open without inlet jump – this jump being a characteristic feature of conventional control valves. Thanks to a stroke resolution of 1:1000, the valves practically offer drop-by-drop control and, the next moment, full volume control between 0 and 100 percent, if required, with no hunting.

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