

SPM50 Sampling Pump Module

The sampling pump module is used to draw gas samples into the sampling tube and deliver them to the specified meter. The design and parameters of the module have been adapted to work with SENSOTRON meters, for example the FCM41 fast gas concentration meter, Figure 1. However, the module can also be used with other meters.



Figure 1 Sampling pump module SPM50

The pump control system ensures a constant flow rate of gas samples regardless of the flow resistance of the sampling lines, absolute pressure and gas temperature. The set flow value is given as the value of the volumetric flow rate for standard conditions, absolute pressure of 1013 hPa and temperature of 0 °C. When operating in conditions different from standard conditions, the value of the volumetric flow rate is calculated for the current values of temperature and absolute pressure of the gas. In fact, the module control algorithm maintains

a constant mass flow rate. The flow value can be changed from 5 to 7.5 SmL/s.

The Hagen–Poiseuille law was used to measure the flow. This solution allows for obtaining a linear relationship between the gas flow and the measurement signal used to control the flow, which in turn ensures the maintenance of good flow stability parameters throughout the entire regulation range. In the SPM50 module, the flow of gas samples is forced by a miniature diaphragm pump powered by DC voltage.

Due to the operating principle of the diaphragm suction pump used in the SPM50 module, the gas flow generated by it is characterized by fluctuations. To eliminate these fluctuations, an appropriate damper is used in the system. Figure 2 shows the recommended method of connecting the priming pump module with the meter. Connecting the SPM50 module after the meter minimizes the impact of the remaining flow fluctuations that are not eliminated by the damper.

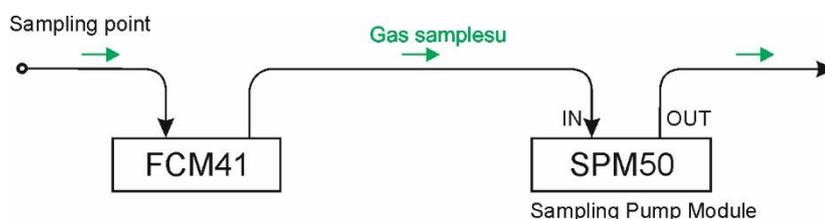


Figure 2 Connection diagram of the SPM50 module with the fast concentration meter FCM41.

Software.

The gas sample flow rate is set by the user using computer software. The software communicates with the module via the ZigBee SPM504 wireless transmission module connected to the computer via a universal USB serial link. The software can communicate using one SPM504 communication module with several SPM50 modules. The control panels of several modules can be displayed simultaneously on the monitor screen. The module control panel, Figure 3, allows you to turn the pump on/off, set the required flow rate as well as view the measured values of the generated flow, temperature and absolute gas pressure. The value of the volumetric flow rate is presented on the screen as SmL/s and SL/h. The panel also displays the mass flow rate expressed in kg/s. Turning the pump on and off is also possible using the button on the front panel of the module, Figure 1.

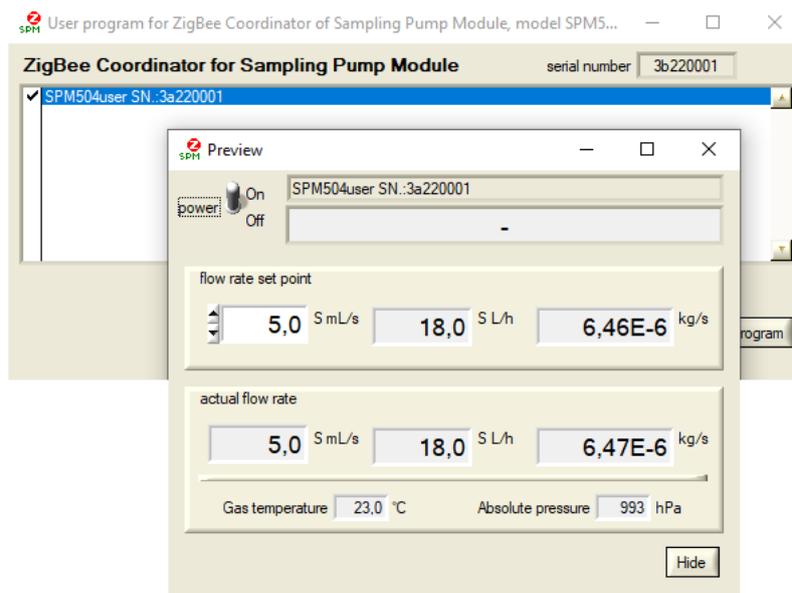


Figure 3 View of the control panel.

Technical parameters

Volume flow rate – 5 ÷ 7,5 S mL/s (dla T=273K, pabs = 1013,24 hPa)
 Maximum pressure drop – 100hPa (for 5 SmL/s)
 Flow rate measuring principle – Hagen–Poiseuille law
 Time constant of response – 10 s (for a step change in flow conditions)

Communication method – wireless ZigBee, USB
 Power supply – 220-230 AC / 50 Hz