Ventilator Equipment

Application Note

Industry: Medical
Application: Ventilator

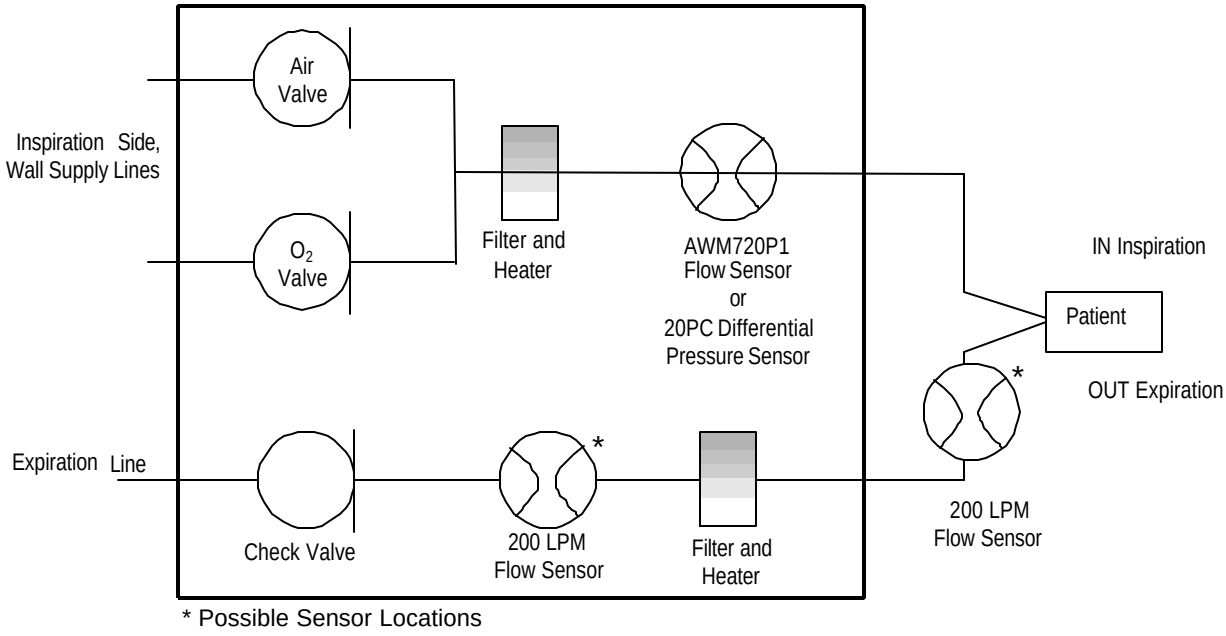

Figure 1. Ventilator application using Honeywell's 200 LPM airflow sensors

Background

Ventilation is the process through which oxygen and carbon dioxide are exchanged between the lungs and the air. For those who cannot breathe without assistance, a ventilating machine supports or manages this process.

According to FDA regulation 21CFR868.5895, a continuous ventilator (or respirator) is a device intended to mechanically control or assist patient breathing by delivering a predetermined percentage of oxygen in a gas form.

Application

Figure 1 illustrates a typical ventilator application. High pressure gases enter the ventilator and pass through an adjusting valve. The adjusting valve ensures that oxygen and the fresh air supply are combined in appropriate proportions. This mixture passes through a main flow bacterial filter. Next, the oxygen and the fresh air mixture travel through a flow sensor that measures the inspiratory gas flow.

Finally, the ventilator flow sensor sends an output signal to a signal conditioner or an analog digital converter interface that relays the signal to a microprocessor. The microprocessor compares the gas flow measurement to the preset inspiratory volume. If the actual gas flow does not match the preset inspiratory volumes, a stepper motor opens or closes the gas check valves to adjust flow delivery.

The patient exhales oxygen and carbon dioxide that returns to the respirator or passes through an open exhalation line. At this point, there are several possible exhalation sensor, filter and heater configurations. In Figure 1, the patient's exhaled gases pass through a gas flow sensor mounted between the patient and the filter heater assembly. This sensor is optional depending on the application requirements. Next, the patient's gas expiration travels through a heater and filter that removes large particles and condensation. The expiration then travels through a flow sensor that measures gas flow.

As in the inspiration cycle, the ventilator flow sensor sends an output signal to a signal conditioner or an analog digital converter interface that relays the signal to a microprocessor. In this instance, the microprocessor compares the gas flow measurement to the preset expiratory volumes. If actual gas flow exceeds or does not meet preset expiratory volumes, a stepper motor opens or closes the check valve.

Honeywell's Solutions to Customer's Needs

Ventilator Gas Flow Sensing

Ventilators must accurately maintain and regulate gas flow so that the patient inhales and exhales with minimal exertion. To measure ventilator gas flow, Honeywell recommends the 200 standard liter per minute (SLPM) airflow sensor.

Honeywell's airflow sensors meet the requirement for multiple gas compatibility, high stability, low hysteresis, high accuracy and repeatability, and fast response time.

Figure 1 illustrates one system for measuring the gas flow and the placement of Honeywell's 200 LPM airflow sensors in a ventilator application detailed in the *Application* section.

Honeywell offers another flow measurement solution that is also found in ventilator applications. In this specific design, a 20PC differential pressure sensor with P1 and P2 ports interfaced across an inline restrictor, such as a screen mesh, measures the pressure drop in ventilation applications.

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While we provide application assistance personally, through our literature and the Honeywell web site, it is up to the customer to determine the suitability of the product in the application.

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