Application Note

Measurement of pressure in a medical ventilator

Overview

Patients with respiratory failure often require assistance from a ventilator, which helps move air in and out of the lungs.
When the patient's air tube leaks, the ventilator cannot measure the pressure build up and flow rate. The ventilator needs to warn of these leakages, and also needs an accurate and reliable pressure sensor.
During the development, manufacturing, inspection and calibration of ventilators, pressure values are strictly measured and controlled to ensure correct performance.
The application is a test methodology that ensures that pressure sensors give accurate measurements of the patient's breathing.
It also guarantees that the pressure valves are operating correctly for switching the intake and exhalation, while also maintaining the measurement environment over a long period.

The background

The application ensures that pressure sensors are measuring the value accurately and that pressure valves are operating at the proper pressure and timing. It needs to measure the pressure values quickly and accurately, and to maintain the measurement environment for a long period.
The measurement device used in the application must check the pressure loss that occurs between the supply pressure and the pressure sensor. It must ensure the sensor is accurately measuring the switching timing to guarantee proper valve operation when switching between exhalation and inspiration.
It must also check the pressure level when valves are opened or closed and periodically calibrate several measurement devices to maintain the performance of the equipment.

The solution

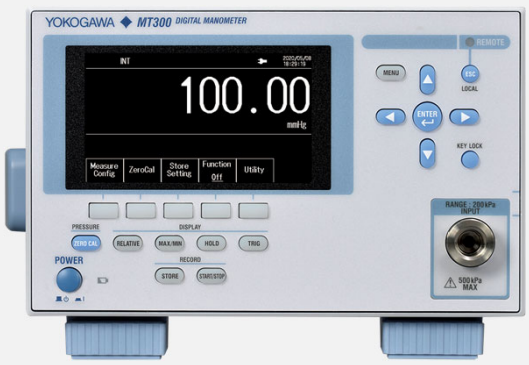
The Yokogawa MT300 Digital Manometer meets the needs of the application because of its high accuracy and ability to take rapid measurements. The measurement sensor and valve built into the device is highly accurate to ensure faithful capture of the signal from the patient.

The device achieves this accuracy through Yokogawa's proprietary silicon based resonant sensor. The sensor has excellent characteristics that allow it to meet the needs of the application and achieve the accurate measurements required, such as stability, reproducibility, sensitivity, and temperature characteristics.

Yokogawa's MT300-G03 (200 kPa gauge model) is the best model for this application. One of its main advantages is that it displays the same units of mmHg and mmH_2O used in medical equipment, meaning the values can be read and compared directly.

The device has a measurement accuracy of 0.01%, making the MT300 suitable for the range of tasks needed - verifying device performance and small pressure losses in the equipment, and for conducting tests both during product development and during inspection stages on the production line.

This model also has a high enough sampling rate to capture respiration as a standard function. In addition, by selecting the high-speed measurement mode, the MT300 can capture not only the open-close pressure value of the valve but also sudden pressure changes during opening and closing.



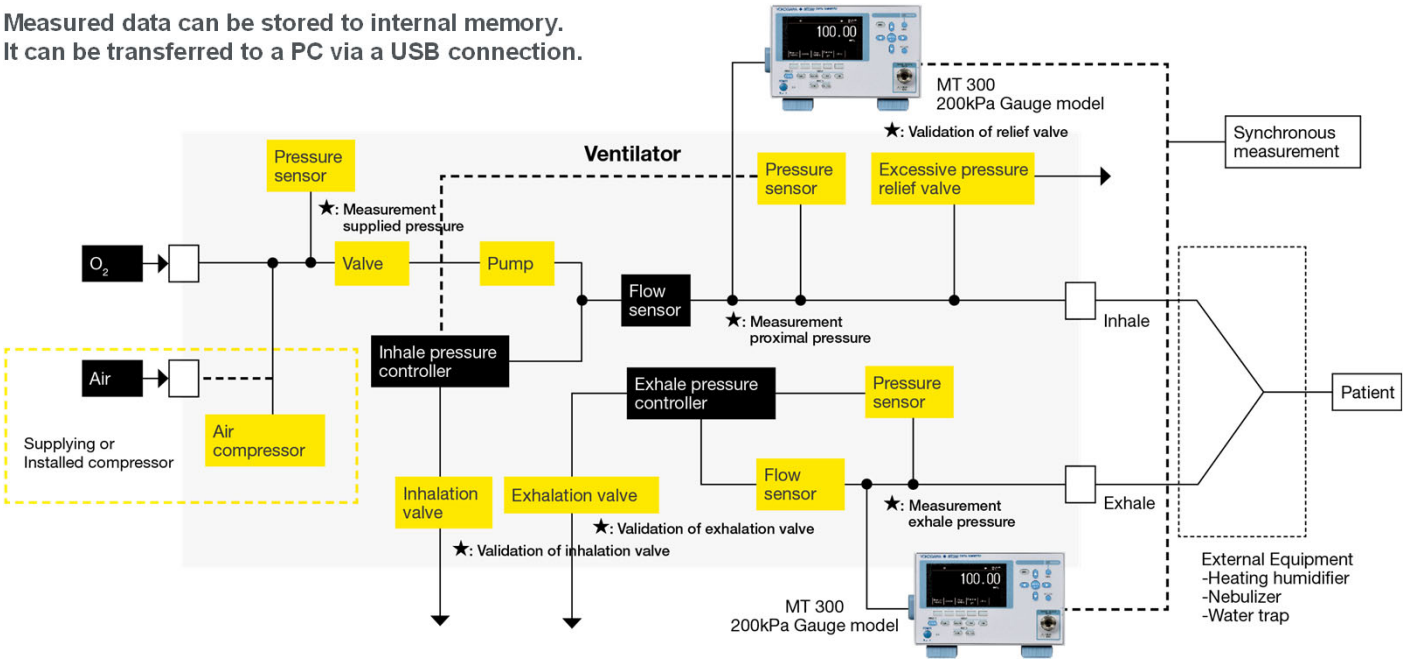
Because the synchronous measurement function can measure the inhale pressure and exhale pressure in synchronization, it is an effective way of checking how the pressure changes at the time of switching.

Battery operation also allows measurements anywhere, without the need for AC power.

This model has a high allowable input pressure and can be used for various purposes. The D/A output makes it easy to output data to a recorder or other instrument.
These abilities ensure the MT300 can provide the high accuracy, high resolution, and high stability pressure measurement system that customers need. Overall, the device will improve measurement quality and work efficiency.

Measurement setup

Measured data can be stored to internal memory.
It can be transferred to a PC via a USB connection.



About the MT300

The MT300 Digital Manometer is ideal for the needs of testing medical ventilators, as it offers both high accuracy and long-term stability - the relative accuracy of pressure measurement is 0.01 %, while the device offers a guaranteed accuracy for a period of 12 months.

As well as accuracy, the MT300 also has a range of functions that make it suitable for the application. A color dot matrix LCD displays measurement data and analysis with high resolution and high visibility.

This display, combined with high speed measurement, and synchronous measurement functions make the MT300 suitable for high precision measurement, while its leak test, scaling, and statistical processing functions promote efficient working.

For more information about the MT300 Digital Manometer, go to: **tmi.yokogawa.com**

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