GILL
TECHNOLOGY

Spirocell

Ultrasonic Medical Gas Flow Meter

- High reliability, robust performance
- Bi-directional flows measured
- Requires no calibration by the user

Gill Instruments Ltd, the world leader in the design and production of ultrasonic meteorological anemometers, has now successfully applied the same technology to the demanding medical fields of anaesthesia and ventilation monitoring.

The Spirocell uses proven ultrasonic techniques to measure gas flow reliably and accurately with no moving parts. Compared with existing technology the Spirocell provides extended functionality, reduced lifetime costs and improved reliability. It can measure from extremely low flow rates up to its maximum with no change in its configuration. Together with its high sample rate this gives the speed of response and accuracy to produce detailed information on very small changes in the gas flow. Unlike other measurement devices the Spirocell retains its accuracy despite the presence of moisture and the rapid changes in temperature and humidity that are found in patient respiration. This robustness of operation also means that the user is not required to perform any calibration on the unit.

Along with these benefits the Spirocell is also easy to use. It is simple to install, has output via a serial link and requires no regular maintenance.

Safety is a key factor in the design of the Spirocell so the unit has extensive error checking and diagnostic routines to ensure that only reliable data is collected.

The ultrasonic sensors can be easily detached from the unit to allow sterilisation. The unit complies with all relevant US FDA recommendations.

Gill Instruments Ltd is very experienced in designing and manufacturing products to the highest standards and can provide expert support to allow easy integration into other systems.

SPECIFICATION

Flow accuracy	± 3%(1) (2)
Resolution	0.01 l/min
Flow rate	±0.2 to 150 l/min(3)
Sample rate	100Hz
Resistance to flow	<2cmH_2O @ 60 l/min(1)
Operating media	Air and all common anaesthetic gas mixtures(4)
Power	12V, 80 mA peak
Outputs	RS232 or Pulse frequency proportional to flow rate

(1) Measured in air
(2) Worst case accuracy is +/- 10% for the whole range of gases specified
(3) Standard anaesthesia flow housing. Higher flow rates possible with different housings
(4) Excluding heliox

FEATURES

- Lower lifetime running costs
- Highly accurate measurement of flow
- Suitable for all anaesthetic gases(4)
- Very low flow rates measured
- Robust construction
- Easily sterilised
- No calibration required by the user

The Gill product range is in continuous development and so specifications are subject to change without prior notice.

GILL TECHNOLOGY

Spirocell

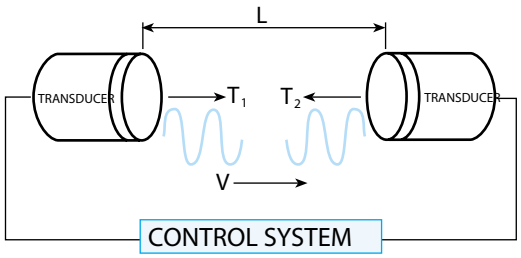
Ultrasonic Medical Gas Flow Meter

PRINCIPLE OF OPERATION

The Spirocell uses ultrasound to measure the velocity of gas travelling through the device. Bursts of ultrasound are transmitted upstream and downstream in the gas flow between the two sensors. The time of flight in both directions is measured and the distance between the sensors is known. Therefore, by using the equation opposite, the flow rate of the gas can be calculated. The tube in which the gas is flowing has a known cross sectional area, so for a given period of time the volume of the gas flow can also be measured.

The speed of sound in a gas is dependent on factors such as temperature, pressure, humidity and composition. As can be seen, by using the difference in the times of flight, the equation used to calculate the flow rate becomes independent of the speed of sound. This means the measurement is unaffected by changes in these factors. This makes the Spirocell simple to use and removes the need for any time consuming calibration procedures to correct for environmental changes.

BASIC TIME-OF-FLIGHT THEORY



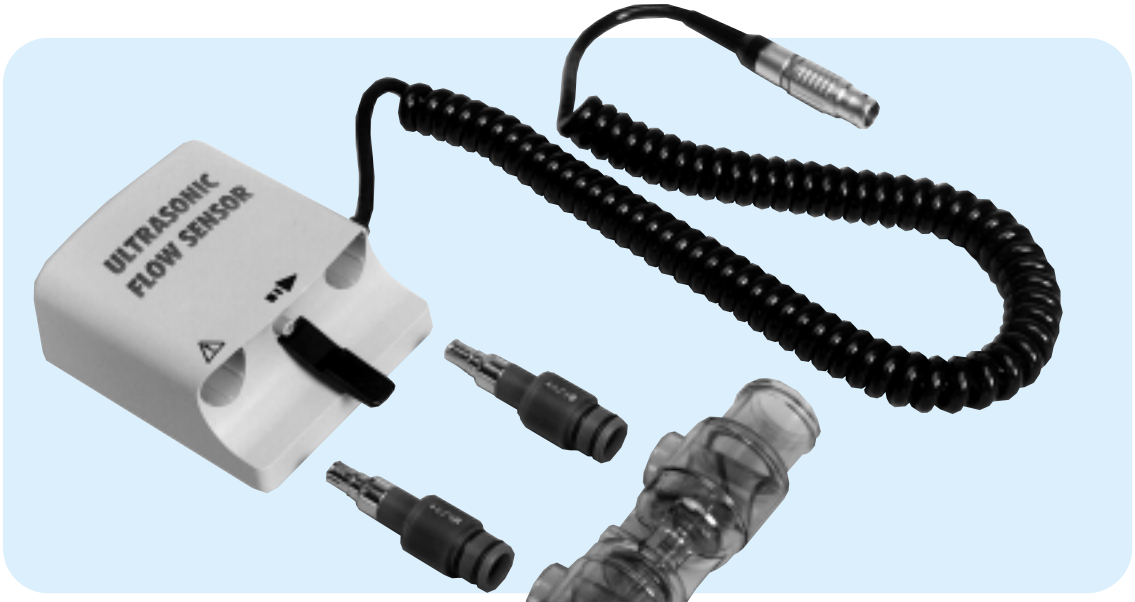
$$T_2 = \frac{L}{C - V} \quad \text{And} \quad T_1 = \frac{L}{C + V}$$

Therefore

$$V = \frac{L}{2}\left(\frac{1}{T_1} - \frac{1}{T_2}\right) \qquad C = \frac{L}{2}\left(\frac{1}{T_1} + \frac{1}{T_2}\right)$$

Key

- L = Distance between transducer faces
- C = Speed of Sound
- V = Velocity of gas flow
- T_1 = Transit time of Ultrasound
- T_2 = Transit time of Ultrasound



The Spirocell uses extensive self diagnostic routines which ensure a higher data integrity than any other technology. The results from these tests along with the flow data is output on the RS232 serial link. For example, if the unit fails any of its start up tests then no data will be transmitted and an error message will be sent. The Spirocell disassembles easily to allow the appropriate components to be sterilised. The unit is compatible with chemical and steam sterilisation for 15 to 30 min at 121˚C.

GILL TECHNOLOGY LIMITED

Solent House, Cannon Street, Lymington, Hampshire, S041 9BR, England.

Tel: +44 (0) 1590 613400 E-mail: gill@gilltechnology.com Web: www.gilltechnology.co.uk