Honeywell | Medical

Sensors and Switches in Oxygen Concentrators

An Application Note

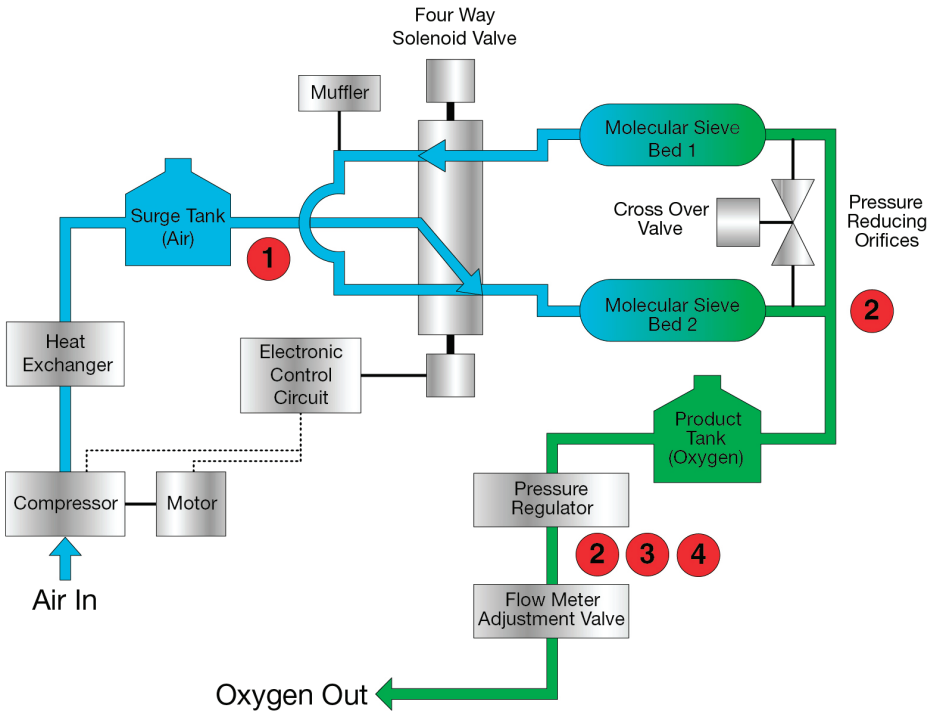
Background

An oxygen concentrator reduces the amount of nitrogen in the air, increasing the oxygen level delivered to the patient. Oxygen concentrators are often used with patients, such as those with lung disease, who have difficulty absorbing oxygen into the bloodstream.

Solutions

Honeywell manufactures many products that may be used in oxygen concentrators. They are designed to help control pressure and airflow, track machine usage, and act as a high pressure warning. (See Figure 1.)

Figure 1. Potential Honeywell Products Used in Oxygen Concentrator Applications



1. **Pressure Transducers - Heavy Duty**
   MLH Series
2. **Pressure Sensors - Board Mount**
   Low pressure: TruStability™ HSC Series, SSC Series, TSC Series, NSC Series; Basic ABP Series, TBP Series, NPB Series

   Ultra-low pressure: TruStability™ HSC Series, SSC Series, NSC Series
3. **Airflow Sensors**
   AWM90000 Series (AWM92100V)
4. **Pressure Switches**
   5000 Series

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Pressure Sensors and Transducers

Honeywell offers a variety of board mount pressure sensors that may be used to detect when the patient begins to inhale so that oxygen can then be delivered efficiently and effectively. Not only does this enhance system response time, it also minimizes wasting oxygen when the patient isn't inhaling, allowing the oxygen concentrator to be smaller and to operate more efficiently. Smaller equipment size also means lower power consumption, as well as greater portability. (See Table 1.)

Honeywell also offers heavy duty pressure transducers that sense pressure from the surge tank, providing feedback to the compressor which allows the compressor to maintain the appropriate pressure level. (See Table 2.)

Customer Benefits: Stable, sensitive, accurate, reliable, cost effective, efficient.

Table 1. Low And Ultra-Low Board Mount Pressure Sensors

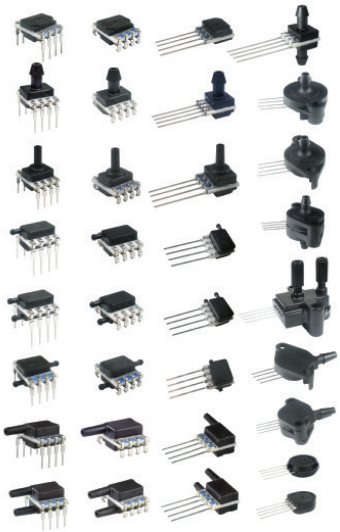
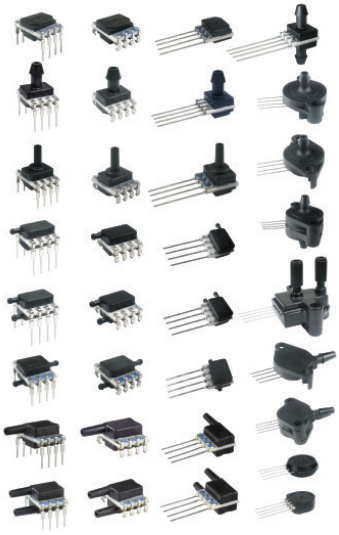
TRUSTABILITY™ HSC SERIES, SSC SERIES	FEATURES
	• Proprietary Honeywell technology combines high sensitivity with high overpressure and burst pressure while providing industry leading stability, performance factors difficult to achieve in the same product • Industry-leading accuracy: ±0.25 %FSS BFSL • Wide pressure range: ±1.6 mbar to ±10 bar | ±160 Pa to ±1 MPa | ±0.5 inH_2O to ±150 psi • Miniature package size • Extremely low power consumption • Temperature compensation and calibration provide an amplified signal • Digital ASIC output in either I^2C or SPI protocols from digital sensors accelerates performance through reduced conversion requirements and the convenience of direct interface to microprocessors and microcontrollers • Multiple packaging, mounting, power and signal options and customized calibration capabilities increase flexibility • REACH and RoHS compliant
TRUSTABILITY™ TSC SERIES AND NSC SERIES	**FEATURES**
	• Compensated, unamplified (TSC Series) • Uncompensated, unamplified (NSC Series) • Pressure range: – TSC Series: ±60 mbar to ±10 bar | ±6 kPa to ±1 MPa | ±1 psi to ±150 psi – NSC Series: ±2.5 mbar to ±10 bar | ±250 Pa to ±1 MPa | ±1 inH_2O to ±150 psi • Millivolt analog output • Industry-leading long-term stability • Industry-leading accuracy: ±0.15 %FSS BFSL • Modular, flexible design with numerous package styles, pressure ports • Insensitive to mounting orientation • Miniature package size: 10 mm x 10 mm [0.39 in x 0.39 in] • Excellent repeatability, high accuracy and reliability under many demanding conditions • Supports LEAN manufacturing • Operating supply voltage as low as 1.5 Vdc • Absolute, differential and gage types • RoHS and ISO9001 compliance

Table 1. Low And Ultra-Low Board Mount Pressure Sensors (Cont.)

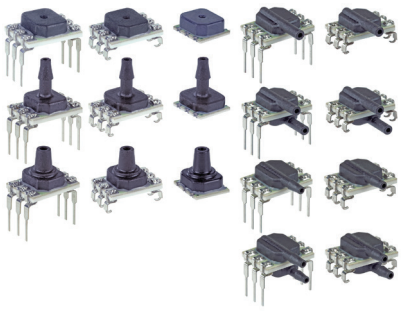
BASIC ABP SERIES	FEATURES
	• Compensated, amplified • Industry-leading long-term stability: ±0.25 %FSS • Industry-leading accuracy: ±0.25 %FSS BFSL • Industry-leading flexibility • Total Error Band: ±1.5 %FSS • Wide pressure range: 60 mbar to 10 bar | 6 kPa to 1 MPa | 1 psi to 150 psi • High burst pressures • Energy efficient • Ratiometric analog; I^2C- or SPI compatible 14-bit digital output (min. 12-bit sensor resolution) • As small as 8 mm x 7 mm • REACH and RoHS compliant
BASIC NBP SERIES	**FEATURES**
	• Uncompensated, unamplified • Pressure range: 60 mbar to 10 bar | 1 psi to 150 psi • Millivolt analog output • Small package size, as small as 7 mm x 7 mm [0.276 in x 0.276 in] • Cost effective • Durable • Wide operating temperature range: -40°C to 125°C [-40°F to 257°F] • Numerous package styles, pressure ranges, housings, porting and media compatibility (non-gel coating or gel coating) options • Reflow mounting J-STD-020D, MSL 1 and rapid stabilization after reflow soldering allow calibration immediately after mounting • ISO 9001 compliance
BASIC TBP SERIES	**FEATURES**
	• Compensated, unamplified • Millivolt analog output • Pressure range: 60 mbar to 10 bar | 6 kPa to 1 MPa | 1 psi to 150 psi • Cost-effective • Small package size: 7 mm x 7 mm [0.276 in x 0.276 in] • Wide operating temperature range: -40°C to 125°C [-40°F to 257°F] • Many package styles, pressure ranges, porting and media compatibility options (no gel coating and silicone gel coating) • ROHS AND ISO 9001 compliance

Table 2. Heavy Duty Presssure Transducers

MLH SERIES	FEATURES
	• Media isolated transducer (stainless steel wetted surfaces) designed for compatibility with many corrosive fluids and gases • Threaded pressure port designed for simplified installation in customer manifold • Optional weldable interface designed to support a hermetic interface • Temperature-compensated electrical output • Amplified and non-amplified options

Airflow Sensors

The AWM90000 Series is designed to detect ultra-low flow levels at 0.1 cm^3. This enhanced sensitivity may be used to detect when the patient exhales and when the system should reduce airflow, easing exhalation and improving patient comfort.

Honeywell's airflow sensors deliver a low pressure drop (down to 0.2 cmH_2O at 200 SLPM), leading to lower flow resistance and improved patient comfort. (See Table 3.)

Customer Benefits: Improves patient comfort, eases patient breathing, quiet, portable, reliable

Table 3. Airflow Sensors

AWM90000 SERIES (AWM92100V)	FEATURES
	• Sensitivity to low flows (0.1 SCCM to 200 SLPM) • Analog output • Bi-directional sensing • Low differential pressure sensing • Low power consumption • Actual mass airflow sensing • Enhanced response time • Precision silicon micromachining • Cost effective

Pressure Switches

Honeywell's 5000 Series is often located on the output of the oxygen concentrator's pressure regulator and acts as a high pressure warning, alerting the user by activating an indicator light if the pressure exceeds a specified limit. In some cases, it may also shut down the motor.

Honeywell's pressure switch products are reliable and highly accurate. (See Table 4.)

Customer Benefits: Accurate, reliable, extended life, one-stop-shopping.

Table 4. Pressure Switches

5000 SERIES	FEATURES
	• Enhanced response time of 5 ms or less • Stands up to many extended duty applications • Factory set, capable of field adjustment • Direct acting blade, gold-plated contacts • No dead band • Kapton diaphragm for compatibility with a variety of media • Variety of electrical connections and terminations available • Optional rubber boot

Warranty/Remedy

Honeywell warrants goods of its manufacture as being free of defective materials and faulty workmanship during the applicable warranty period. Honeywell's standard product warranty applies unless agreed to otherwise by Honeywell in writing; please refer to your order acknowledgement or consult your local sales office for specific warranty details. If warranted goods are returned to Honeywell during the period of coverage, Honeywell will repair or replace, at its option, without charge those items that Honeywell, in its sole discretion, finds defective. **The foregoing is buyer's sole remedy and is in lieu of all other warranties, expressed or implied, including those of merchantability and fitness for a particular purpose. In no event shall Honeywell be liable for consequential, special, or indirect damages.**

While Honeywell may provide application assistance personally, through our literature and the Honeywell web site, it is buyer's sole responsibility to determine the suitability of the product in the application.

Specifications may change without notice. The information we supply is believed to be accurate and reliable as of this writing. However, Honeywell assumes no responsibility for its use.

For more information

To learn more about Honeywell's sensing and switching products, call 1.800.537.6945, visit sensing.honeywell.com, or e-mail inquiries to info.sc@honeywell.com

Honeywell Sensing and Internet of Things
9680 Old Bailes Road
Fort Mill, SC 29707
www.honeywell.com

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