

## INDUSTRIAL APPLICATIONS

## Application Note

# Electronic Sensors and MICRO SWITCH™ Switches in Industrial Air Compressors

### BACKGROUND

Air compressors provide pressurized air to a variety of machine and other tools. They are often used in manufacturing, construction, chemical production, pneumatic power tools, oil and gas, food and beverage, and medical equipment applications. At a very basic level, an air compressor processes air from the outside to supply the tank(s) with air. Once the compressed air reaches a certain pressure point, the air compressor turns itself off. (See Figure 1.)

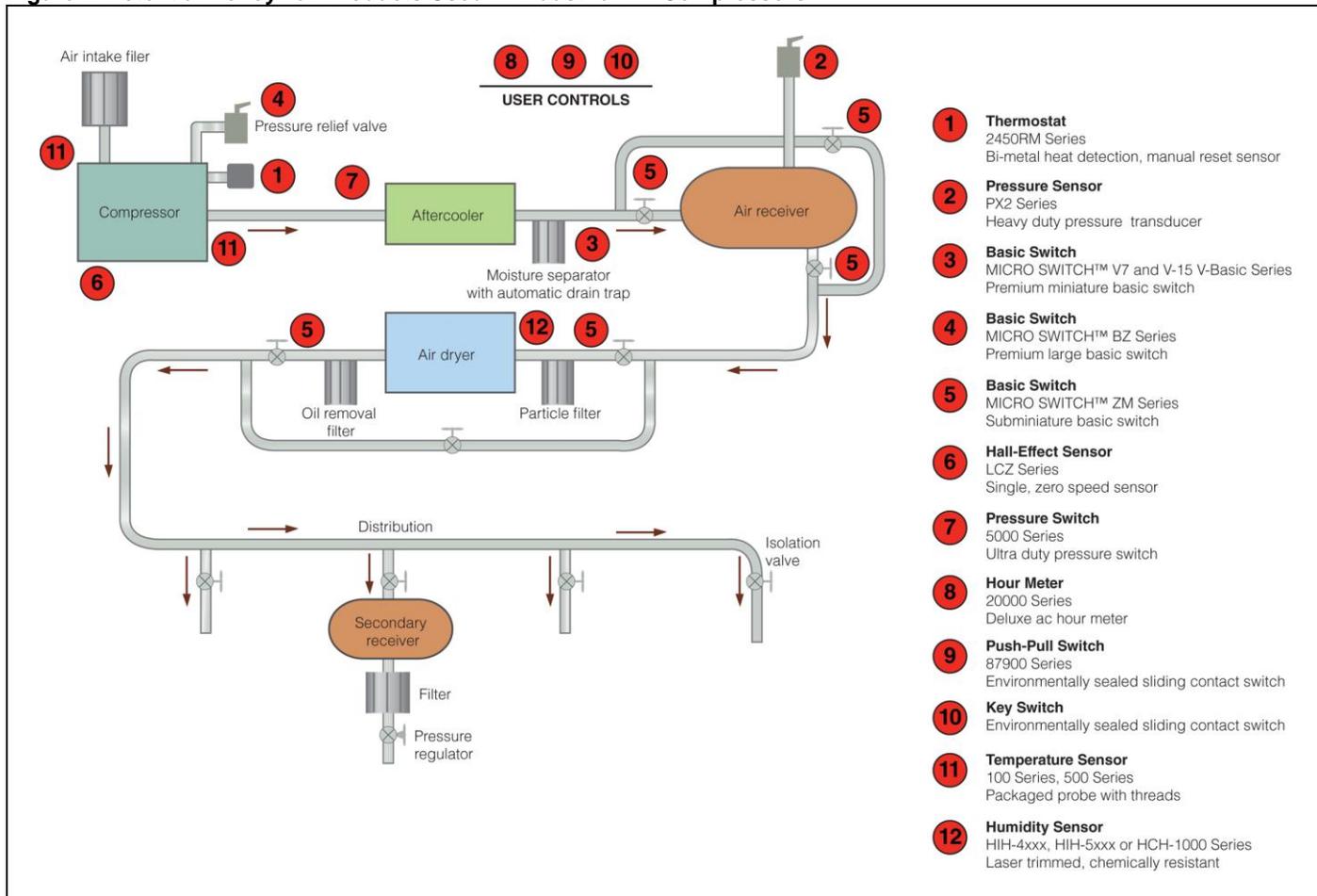
### SOLUTIONS

Honeywell manufactures many electronic sensors and switches that may be used in industrial air compressors. They are designed to deliver system control, fluid level indication, temperature regulation, along with protection from overheating and starting/stopping the compressor. (See Figure 2.)

Figure 1. Industrial Air Compressors



Figure 2. Potential Honeywell Products Used in Industrial Air Compressors



# Electronic Sensors and MICRO SWITCH™ Switches in Industrial Air Compressors

## Thermostats

**2450RM Series bi-metal heat detection with manual reset sensor:** In industrial air compressors, thermostats are used in the system control box as an over-temperature switch to help prevent the system from overheating.

Honeywell's commercial and precision snap-action thermostats include automatic and manual reset options, phenolic or ceramic housings and a variety of mounting brackets and terminal options. Each thermostat's design is configured from a base unit, and can be customized for temperature tolerance and mechanical configurations. (See Table 1).

## Pressure Sensors

**PX2 Series heavy duty pressure transducer:** This line of highly configurable pressure transducers uses piezoresistive sensing technology with ASIC (Application Specific Integrated Circuit) signal conditioning in a stainless steel housing that is compatible with a variety of harsh media.

The PX2 Series is fully calibrated and compensated for transducer offset, sensitivity, temperature effects and non-linearity using an on-board ASIC. This provides a Total Error Band of  $\pm 2\%$  over the operation temperature range of  $-40\text{ }^{\circ}\text{C}$  to  $125\text{ }^{\circ}\text{C}$  [ $-40\text{ }^{\circ}\text{F}$  to  $257\text{ }^{\circ}\text{F}$ ]. The wide operating temperature range, up to IP69K protection, and CE compliance allow compatibility for reliable performance in tough environments.

These transducers measure absolute or sealed gage pressure. The absolute versions have an internal vacuum reference and an output value proportional to absolute pressure. The sealed gage versions have an internal pressure reference of one atmosphere at sea level. (See Table 2.)

## MICRO SWITCH™ Basic Switches

**MICRO SWITCH™ BZ, V7, V15, and ZM basic switches:** Basic switches have several applications in industrial air compressors. They can be used as the float switch at the drain trap after the aftercooler (V7, V15, ZM, ZW) or used as pressure switches by the compressor relief valves and by each filter to measure back pressure (BZ, V7, V15, ZM).

Accepted as the world-wide standard "large basic" switch, MICRO SWITCH™ BZ Series switches are used for simple or precision on/off application needs.

With world-wide package size acceptance and designed to withstand 100K operations at full load, MICRO SWITCH™ V7 Series basic switches are used for simple or precision on/off, end of limit, presence/absence, and manual operator interface application needs.

MICRO SWITCH™ V15 Series snap-action basic switch is designed for applications requiring greater than or equal to 100 g of operating force and electrical ratings ranging from 16 A to 22 A.

MICRO SWITCH™ ZM Series subminiature basic switches are combine small size and light weight with ample electrical capacity, low cost, and long life, and are suitable for precision ON/OFF applications. (See Table 3).

**Table 1. Thermostats in Industrial Air Compressor Applications**

2450RM Series, Bi-metal Heat Detection With Manual Reset Sensor	Features and Benefits
	<ul style="list-style-type: none"> <li>• Cost effective</li> <li>• Rivet sleeve construction</li> <li>• Wide variety of mounting brackets and terminals</li> <li>• Small size allows enhanced response to temperature changes</li> </ul>

**Table 2. Pressure Sensors in Industrial Air Compressor Applications**

PX2 Series Heavy Duty Pressure Transducer	Features and Benefits
	<ul style="list-style-type: none"> <li>• Designed for configurability and Six Sigma standards</li> <li>• Industry leading Total Error Band (TEB)</li> <li>• Durable and cost effective</li> <li>• Broad compensated temperature range</li> <li>• Good EMC protection</li> <li>• Global support</li> <li>• Application expertise</li> </ul>

# Electronic Sensors and MICRO SWITCH™ Switches in Industrial Air Compressors

**Table 3. MICRO SWITCH™ Basic Switches in Industrial Air Compressor Applications**

MICRO SWITCH™ BZ Premium Large Basic switch	MICRO SWITCH™ V7 Premium V-basic Switch	MICRO SWITCH™ V15 Standard V-basic Switch	MICRO SWITCH™ ZM Subminiature Basic Switch
			
Features and Benefits			
<ul style="list-style-type: none"> <li>• Low operating force and differential travel</li> <li>• Long mechanical life up to 20,000,000 cycles at 95% survival</li> <li>• Current rating ranges from 15 A to 25 A</li> <li>• Choice of actuation, termination, and operating characteristics</li> </ul>	<ul style="list-style-type: none"> <li>• Best suited for higher cost-of-failure applications</li> <li>• Designed for 100K operations at a full load or 10M for mechanical life</li> <li>• World-wide package size acceptance</li> <li>• Current rating ranges from 0.1 A to 25 A</li> <li>• UL/CSA and ENEC approvals</li> </ul>	<ul style="list-style-type: none"> <li>• Best suited for lower cost-of-failure applications</li> <li>• Designed from 10K to 50K operations at a full load or 5M for mechanical life</li> <li>• World-wide package size acceptance</li> <li>• Current rating ranges of 10 A and 26 A</li> <li>• UL/CSA, cUL, ENEC, and CQC approvals</li> </ul>	<ul style="list-style-type: none"> <li>• Choice of low energy or power duty electrical ratings (gold-plated or silver contacts)</li> <li>• Choice of 0.1 A, 5 A or 10.1 A ratings</li> <li>• Choice of actuation, termination, and operating characteristics</li> <li>• Polyamide (nylon) housing material</li> </ul>

**Table 4. Speed Sensors in Industrial Air Compressor Applications**

LCZ Series Hall-effect Single Zero Speed Sensor	Features and Benefits
	<ul style="list-style-type: none"> <li>• Available in several diameters and lengths for application flexibility</li> <li>• Stainless steel package is simple to install and adjust, and does not require rotational orientation</li> <li>• Small size allows application flexibility</li> <li>• Cost effective</li> <li>• Low power consumption allows energy efficiency</li> <li>• Durable</li> </ul>

## Speed Sensors

LCZ Series Hall-effect, single zero speed sensor: In industrial air compressors, speed sensors are used to monitor the speeds of the motor and the compressor.

Honeywell's Hall-effect speed sensors use multiple technologies to detect a change in magnetic field to create an electronic signal for control system interface. These technologies offer the ability to detect speed, direction, or position of a moving ferrous metal or magnetic target. Sensing is accomplished without contacting the target, and there are no moving parts. This eliminates mechanical wear of the sensor or target. (See Table 4).

## Pressure Switches

5000 Series ultra-duty pressure switch: Honeywell pressure switches are used to monitor oil pressure in order to minimize air compressor motor damage.

5000 Series pressure switches sense a change in the pressure, opening, or closing an electrical circuit when the designated set point is reached. Honeywell designers have the engineering expertise to modify existing parts or create an original component per a customer's specifications. (See Table 5).

# Electronic Sensors and MICRO SWITCH™ Switches in Industrial Air Compressors

**Table 5. Pressure Switches in Industrial Air Compressor Applications**

5000 Series Ultra-Duty Pressure Switch	Features and Benefits
	<ul style="list-style-type: none"> <li>• Consistent, reliable performance in most harsh machine environments</li> <li>• Tested to 1 million on/off cycles for long life and durability</li> <li>• High repeatability and consistent performance</li> <li>• Factory set, capable of field adjustment</li> <li>• Direct acting blade - gold-plated contacts and no dead band</li> <li>• Kapton diaphragm for compatibility with a variety of fluids</li> </ul>

**Table 6. Hour Meters in Industrial Air Compressor Applications**

20000 Series Deluxe ac Hour Meter	85000 Series dc Hour Meter
	
Features and Benefits	
<ul style="list-style-type: none"> <li>• Rugged housing and sealing minimizes equipment downtime in most harsh environments</li> <li>• High resistance to vibration minimizes costly repairs</li> <li>• Accurate tracking and recording for maintaining equipment</li> <li>• CE and/or UL certifications</li> <li>• Wide voltage range and custom graphics available</li> </ul>	

**Table 7. Push-Pull Switches in Industrial Air Compressor Applications**

Push-Pull Switches Environmentally Sealed Sliding Contact Switch	Features and Benefits
	<ul style="list-style-type: none"> <li>• Quick, reliable power shut-off with heavy/precious metal contacts and sliding contact action design</li> <li>• Highly visible safety measure available with custom button colors</li> </ul>

## Hour Meters

20000 Series (ac) and 85000 Series (dc) hour meters: Used to track equipment use in many harsh factory or construction environments. Honeywell hour meters may also be used in compressors to maintain the equipment at required intervals.

Honeywell 20000 Series are accurate and reliable hour meters passing 100% function and timing accuracy tests before shipping. All parts are in process inspected and benefit from an uncommon design – integrating motor and frame into one substructure.

With its highly reliable drive mechanism, the Honeywell Hobbs 85000 Series features an odometer gear train and accurate quartz crystal timing to provide enhanced performance. An

improved odometer gear train, plus snap-together chassis fits into a shock-proof sealed case. (See Table 6).

## Push-Pull Switches

Push-Pull environmentally sealed, sliding contact switch:

Enable quick power shut-off to pneumatic tools in dc-powered air compressors.

Honeywell push-pull switch is a robust, environmentally sealed, sliding contact switch incorporating two circuits with multiple combinations. The sliding contacts provide positive contact closure and opening when the switch knob is operated. Dual o-ring design protects the contact chamber by isolating it from any moisture or any other contaminant. (See Table 7).

# Electronic Sensors and MICRO SWITCH™ Switches in Industrial Air Compressors

**Table 8. Key Switches in Industrial Air Compressor Applications**

Key Switches Environmentally Sealed Sliding Contact Switch	Features and Benefits
	<ul style="list-style-type: none"> <li>• Consistent, reliable operation in harsh environments and high vibration</li> <li>• Highly dependable performance allows access only to authorized personnel</li> <li>• 4-position design available for diesel applications</li> <li>• UL certification</li> <li>• Integral connector or screw terminations</li> <li>• Environmentally sealed</li> </ul>

**Table 9. Temperature Sensors in Industrial Air Compressor Applications**

100 Series Packaged Probe with Threads	500 Series Package Probe with Threads
	
Features and Benefits	
<ul style="list-style-type: none"> <li>• Customized packaging allows for greater application flexibility</li> <li>• Wide variety of packages, R-T curves, termination styles, and housing materials reduces the cost of the total solution</li> <li>• Reliable and stable output over many demanding environmental conditions promotes maximum system life and uptime</li> <li>• Enhanced accuracy and response time allows for tight system monitoring of coolant and compressor temperature for optimal system performance and uptime</li> <li>• Excellent interchangeability reduces or eliminates calibration in the customer's manufacturing process</li> </ul>	

## Key Switches

Environmentally sealed, sliding contact key switch: In industrial air compressors, key switches track equipment usage to allow only authorized individuals to turn on and/or off the machine.

Honeywell sliding contact key switch uses o-rings to help keep dirt and moisture out of the contact chamber and prolong the life of the switch. Two-, three-, and four-position key switch options available. (See Table 8).

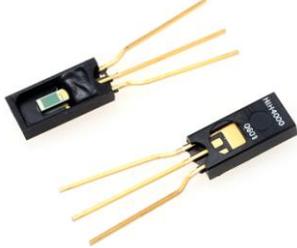
## Temperature Sensors

100 Series and 500 Series packaged probes with threads: Often used for coolant, compressor air inlet, and discharge air temperature. They may also be used to measure the air compressor's motor temperature.

Honeywell's temperature sensors are designed to maximize component and product performance with enhanced reliability, repeatability, precision, and responsiveness. A wide selection of housings, resistance, and terminal options allow application flexibility. (See Table 9).

# Electronic Sensors and MICRO SWITCH™ Switches in Industrial Air Compressors

**Table 10. Humidity Sensors in Industrial Air Compressor Applications**

HIH-4XXX Series laser trimmed, chemically resistant humidity sensor	HIH-5XXX Series laser trimmed, chemically resistant humidity sensor	HCH-1000 Series laser trimmed, chemically resistant humidity sensor
		
Features and Benefits		
<ul style="list-style-type: none"> <li>• Enhanced accuracy and response time helps prevent water from getting in the compressed air line</li> <li>• Reliable and stable output over many demanding environmental conditions helps to prolong maximum system life</li> <li>• Excellent interchangeability reduces or eliminates calibration in the customer's manufacturing process</li> <li>• Small, space-saving housing profile allows for application flexibility</li> <li>• Low current draw allows for use in low-current-drain, battery-operated systems</li> <li>• Surface mount device (SMD) packaging on tape and reel allows for use in automated, high-volume, lower-cost pick and place manufacturing</li> <li>• Multi-layer construction and hydrophobic filter provide resistance to condensation and contaminants</li> </ul>		

## Humidity Sensors

HIH-4XXX, HIH-5XXX, and HCH-1000 laser-trimmed, chemically resistant humidity sensors: In industrial air compressors, humidity sensors allow for tight system control of humidity and dew point.

Honeywell's humidity sensors are designed to provide enhanced sensitivity, response time, stability, and reliability. Sensor construction consists of a planar capacitor with a second polymer layer to protect against dirt, dust, oils, and other hazards. These sensors are laser trimmed for stable, low drift performance and offer accuracy of  $\pm 3\%$ .

The HCH-1000 Series humidity sensor is a capacitive polymer sensor that converts humidity value into capacitance, which can be measured electronically. A cased version, for dust protection, and an uncased version are available.

The HIH-4XXX and HIH-5XXX Series Humidity Sensors are designed specifically for high volume OEM (Original Equipment Manufacturer) users. Direct input to a controller or other device is made possible by this sensor's near linear voltage output. With a typical current draw of only 200  $\mu\text{A}$ , the HIH-5030/5031 Series is ideally suited for many low drain, battery operated systems. Tight sensor interchangeability reduces or eliminates OEM production calibration costs. (See Table 10).

# Electronic Sensors and MICRO SWITCH™ Switches in Industrial Air Compressors

## WARRANTY/REMEDY

Honeywell warrants goods of its manufacture as being free of defective materials and faulty workmanship. 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 it 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.**

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