



Pressure Measurement Solutions

# HVAC AND REFRIGERATION SYSTEMS

# ABOUT KAVLICO PRESSURE SENSORS

For more than 50 years Kavlico Pressure Sensors has been a leading expert in designing, developing, and manufacturing a broad range of precision, pressure, pressure and temperature, fluid level and specialty sensors.

Focused on premium products, and adapting innovative technologies to meet customer needs, Kavlico Pressure Sensors is the reliable solutions provider for the harshest and most demanding applications across the globe.

Kavlico Pressure Sensors is a brand of Sensata Technologies.

## Sensata Technologies

Our highly engineered devices satisfy the world's coving need for safety, energy efficiency, and a clean environment. These are devices that improve safety, efficiency and comfort for millions of people every day and are used in automotive, appliance, aircraft, industrial, military, heavy vehicle, heating, air conditioning, data, telecommunications, recreational vehicle and marine applications.

Until 2006, we were called Texas Instruments Sensors & Controls. Today we are the world's leading supplier of sensors and controls across a broad range of markets and applications.

[www.sensata.com](http://www.sensata.com)



## Your Pressure Sensing Partner in HVAC and Refrigeration Systems

With over two decades of high-volume experience and millions of devices installed worldwide, Kavlico Pressure Sensors' low-range differential pressure (DP) transducers provide performance levels unparalleled in the Building Automation Industry. With applications ranging from HVAC (heating, ventilation, and air conditioning) to Refrigeration Systems and Chillers up to VAV (variable air volume), Kavlico pressure sensors provide a distinct advantage.

By offering several different pressure sensing technologies, Kavlico can provide solutions for an abundance of applications.

Understanding the challenges faced by the design engineers to meet modern technology requirements for HVAC/R systems, along with variable air volume applications (VAV) and refrigeration equipment, this is critical to Kavlico's success.

With inherent long term stability and accuracy, Kavlico's rugged line of pressure sensors can be configured to meet unique applications by having a wide variety of housings, pressure ports, electrical connections, along with voltage, milliamp and digital output options to choose from.



## Pressure Measurement in Variable Air Volume Systems

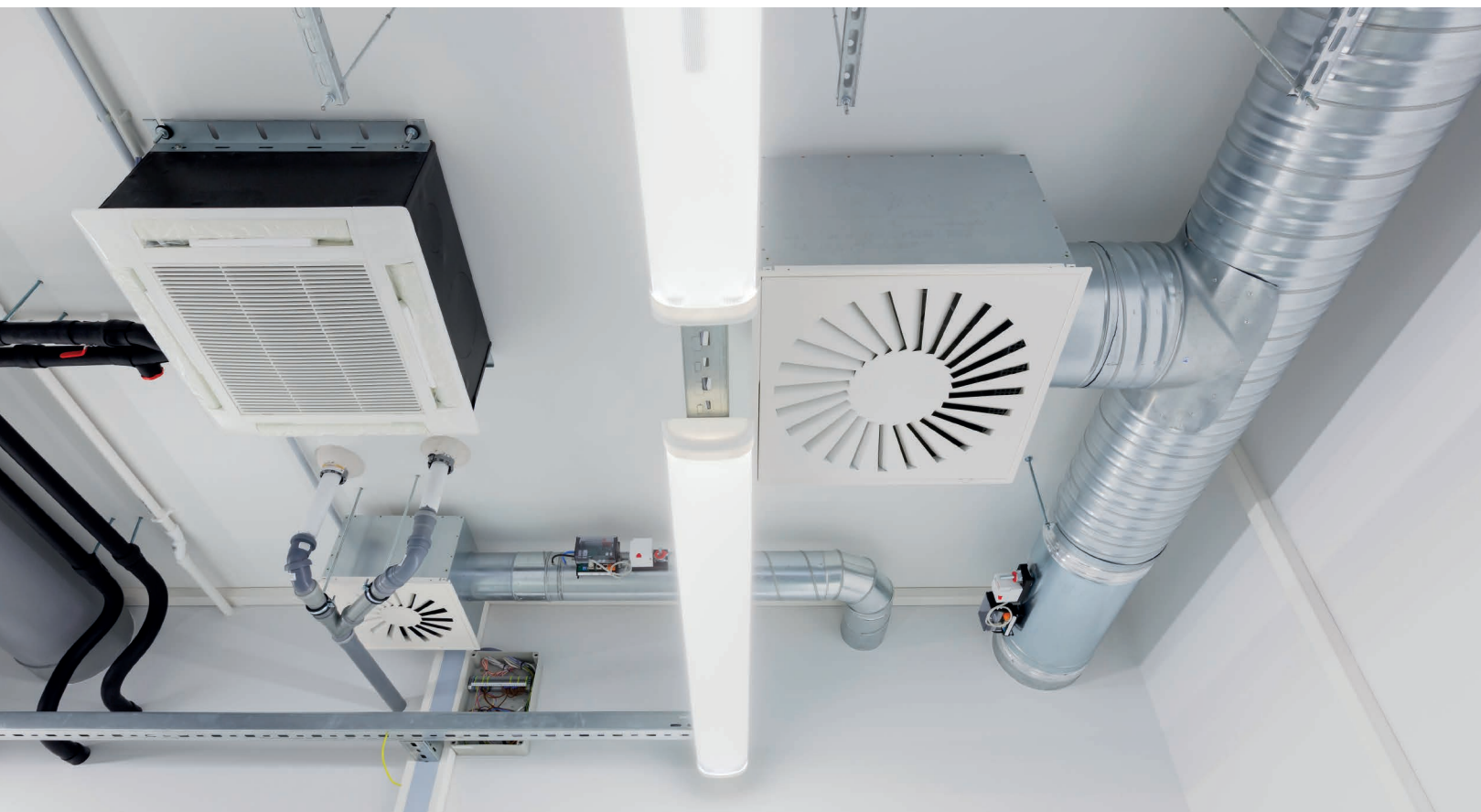
There are three types of VAV boxes: traditional, with reheat and fan-powered VAV.

**The traditional VAV box** consists of a box with an integral damper and is controlled by thermostat. This is the most basic type of VAV box.

**A VAV with reheat** also is built the same as the traditional VAV, but it contains an electric coil designed to reheat the air when the damper reaches a predetermined position. This feature allows heating in the specific zone instead of having to heat the whole building.

**The fan-powered VAV** is built the same as the traditional, but it also contains a fan which is triggered when the area reaches optimal temperature or the damper is 50% closed, providing additional air circulation when there is less demand for conditioned air.

The **Kavlico P992/P993 and P1J/P1K** measure the air flow pressure reading with an analog output that would be linear to pressure. With an automation system, this allows energy efficiencies along with building environmental comfort control.



## Kavlico Pressure Sensor Products for VAV Systems

### P992 - Silicon Capacitive Pressure Sensor



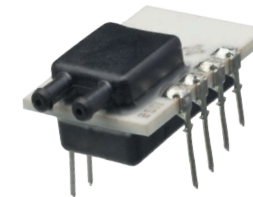
Pressure Ranges	1, 1.5, 2, 5, 10, ±1, ±2, and ±5 inches of H <sub>2</sub> O Differential
Electrical Connection	PCB Mount; 3 Foot PCB (Compatible with Kavlico P892); 2 Foot PCB with lead wires (Compatible with Kavlico P592/P593/P792)
Pressure Connection	1/8" diameter tube fitting with barb for 3/16 ID tubing
Housing Material	PET, 30% glass
Output Voltage	0.25 to 4.0 VDC

### P993 - Silicon Capacitive Pressure Sensor



Pressure Ranges	1, 1.5, 2, 5, 10, ±1, ±2, and ±5 inches of H <sub>2</sub> O Differential
Electrical Connection	3 solderable pins, tin plated
Pressure Connection	1/8" diameter tube fitting with barb for 3/16 ID tubing
Housing Material	PET, 30% glass
Output Voltage	0.25 to 4.0 VDC

### P1J & P1K - Piezo-resistive Pressure Sensors



Pressure Ranges	1, 1.5, 2, 5, 10, ±1, ±2, and ±5 inches of H <sub>2</sub> O Differential
Electrical Connection	PCB solderable pin
Pressure Connection	1/8" diameter tube fitting with barb for 3/16" ID tubing
Housing Material	PPS and Ceramic
Output Types	I <sup>2</sup> C and SPI or 0.25 - 4.0 VDC

## Pressure Measurement in HVAC/R Systems and Chillers

HVAC is the technology incorporated for indoor and vehicular environmental temperature comfort control systems. The HVAC system design is a sub-discipline of mechanical engineering, based on the principles of thermodynamics, fluid mechanics, and heat transfer.

Considerations in design and selection of HVAC systems include performance, efficiencies, maintenance, and product life cycle along with environmental impact.

HVAC is important in the design of medium to large industrial and office buildings. These conditions are regulated with respect to temperature and humidity, along with using fresh air from the outdoors to meet health and safety regulations. In modern buildings today, the design, installation and control systems of these functions are integrated into one or more HVAC systems. Many refrigerant options are available.

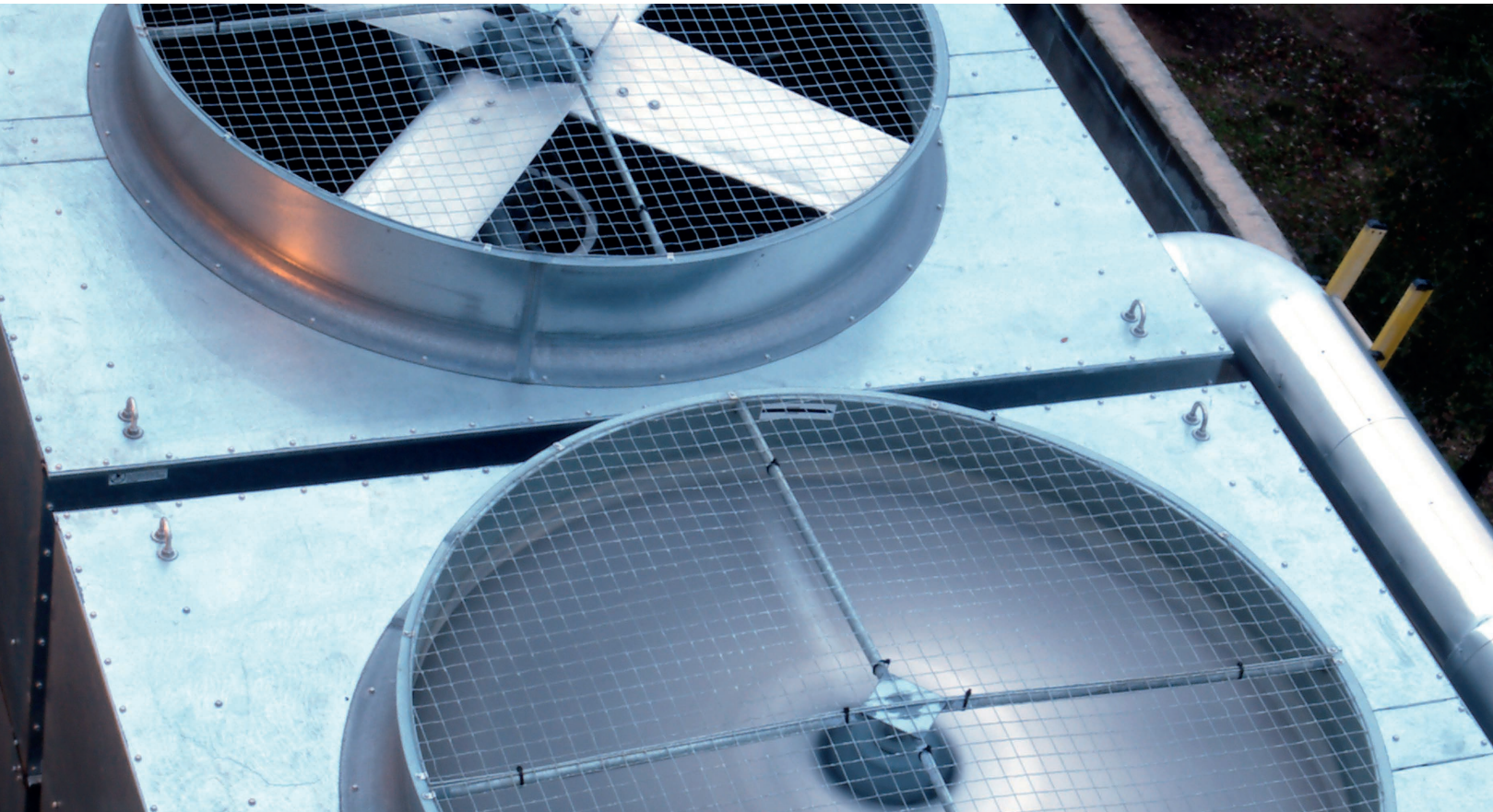
The application of cooling temperature requirements and refrigerant's cooling characteristics need to be matched to the HVAC/R system components along with parameters of the operating temperatures and pressures desired.

A chiller is a machine that removes heat from a liquid via a vapor-compression or absorption refrigeration cycle. This liquid can then be circulated through a heat exchanger to cool air or equipment as required. As a necessary byproduct, refrigeration creates waste heat that must be exhausted to ambient or, for greater efficiency, recovered for heating purposes.

Considerations in design and selection of chillers include performance, efficiency, maintenance, and product life cycle environmental impact.

A vapor-compression chiller uses a refrigerant internally as its working fluid. Many refrigerant options are available. The application cooling temperature requirements and refrigerant's cooling characteristics need to be matched. Important parameters to consider are the operating temperatures and pressures.

In both, the HVAC/R and Chillers applications, the **Kavlico P500, P528, PTE5000 and P1A** will allow a voltage output which is linear to the pressure. By measuring the pressures, this will allow for better system control, increased energy efficiencies, and building comfort.



## Kavlico Pressure Sensor Products for HVAC & R and Chillers

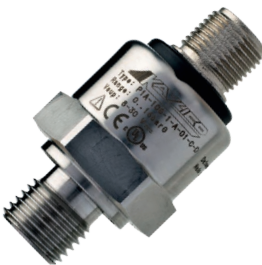
### PTE5000 / PTA5000 - Thin Film Pressure Sensor



Pressure Ranges	0 to 6 ... 0 to 600 Bar, 0 to 100 ... 0 to 10.000 PSI
Electrical Connection	DIN 175301-803 A, M12/4p, GDS307, Packard Metri Pack 150
Pressure Connection	7/16"-20 UNF-2B (female) SAE J1926/1 (modified) w/ 45° cone and Schrader (for pressure range 006 - 060) 7/16"-20 UNF-2A (male) SAE J1926/2 (modified) w/ 45° cone G1/4A DIN 3852-E G1/4A DIN 3852-A
Housing Material	Stainless steel 1.4301
Output Types	4-20 mA, 0-10V, 0-5V, 0.5 to 4.5V
Ingress Protection	IP 67



### P1A - Ceramic Capacitive Pressure Sensor



Pressure Ranges	0 to 0.25 ... 0 to 16 bar G and -1 to 1 bar G, 0 to 5 ... 0 to 200 PSI G 0 to 1.6... 0 to 16 bar A, 0 to 20 ... 0 to 200 PSI A
Electrical Connection	DIN 175301-803 A, M12/4p, Packard Metri Pack 150
Pressure Connection	G1/4A DIN 3852-A 7/16"-20 UNF-2A (male) SAE J1926/2 (modified) w/ 45° cone Further options available
Housing Material	Stainless steel 1.4301
Output Types	4-20 mA, 0-10V, 0-5V, 0.5 to 4.5V
Ingress Protection	IP 67



### P528 - Ceramic Capacitive Pressure Sensor



Pressure Ranges	0 to 6 ... 0 to 70 Bar, 0 to 100 ... 0 to 1000 PSI
Electrical Connection	Packard Metri Pack 150
Pressure Connection	1/4 SAE Female Flare w/ Schrader deflator (7/16 - 20 UNF-2B internal threads) 7/16 - 20 UNF-2A Per SAE J513f (external threads) and other
Housing Material	Brass and stainless steel
Output Voltage	0.5 to 4.5 Vdc
Ingress Protection	IP 67



### P500 - Ceramic Capacitive Pressure Sensor



Pressure Ranges	0 to 1 ... 0 to 70 Bar, 0 to 15 ... 0 to 1000 PSI
Electrical Connection	Packard Metri Pack 150
Pressure Connection	1/4-18 NPT (external), 1/8-27 NPT (external) For more options consult datasheet
Housing Material	Brass and stainless steel
Output Voltage	0.5 to 4.5 Vdc
Ingress Protection	IP 67

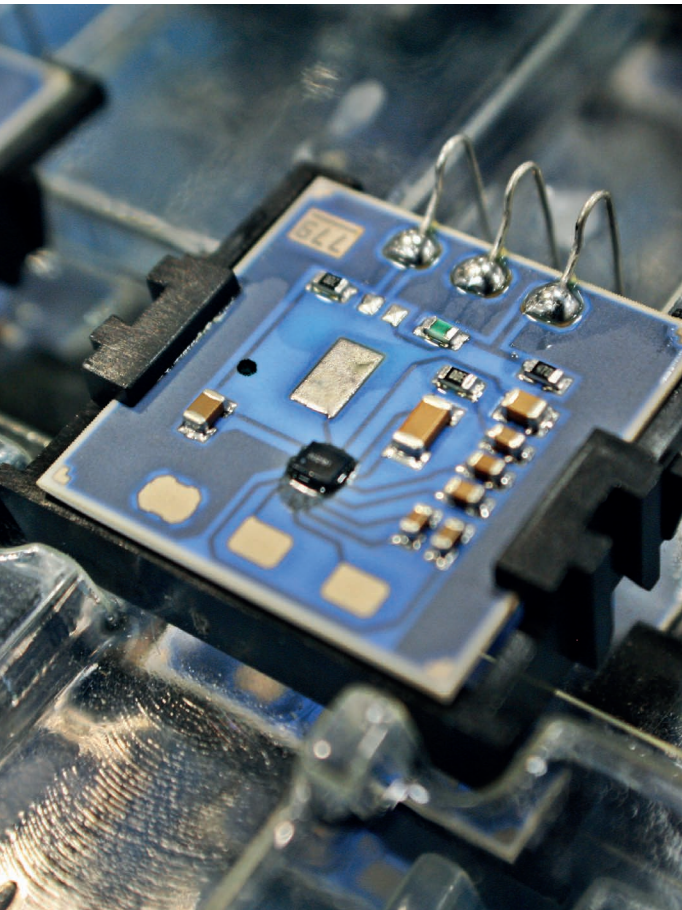


### Pressure Sensors with Overmolded Cable Connection



Pressure Ranges	0 to 1 ... 0 to 70 Bar, 0 to 15 ... 0 to 1000 PSI
Electrical Connection	Customized overmolded cable connection
Pressure Connection	Customized tube mount port
Housing Material	Brass
Output Voltage	0.5 to 4.5 Vdc
Ingress Protection	IP 67





## Committed to Innovation

Kavlico Pressure Sensors offers state-of-the-art pressure sensing and signal treatment technologies innovatively packaged to fit the highest quality requirements in the harshest environments.

Designing and developing pressure sensors for mission critical applications is our focus and specialty.

Our strength lies in our ability to apply one of Kavlico's innovative sensing technologies to meet an application specific requirement and provide perfect package expertise to adapt to customer specifications.

Kavlico offers multiple pressure sensing technologies: Ceramic Capacitive, Silicon Micro-Machined Capacitive (MEMS), Silicon Piezoresistive (PRT), and Thin Film (TiON), with an extensive network of development and support functions to design, develop, validate and manufacture pressure sensors for the most demanding applications.

## Customization Capabilities

Kavlico's customization team is a dedicated and highly qualified engineering team, adapting our pressure sensors to meet customer specific requirements.

Extended by the latest testing and analyses capabilities, Kavlico Pressure Sensors' adaptation team is offering exclusive designs tailored for unique applications.

Kavlico Pressure Sensors - The right sensor for your application!

## Committed to Premium Quality

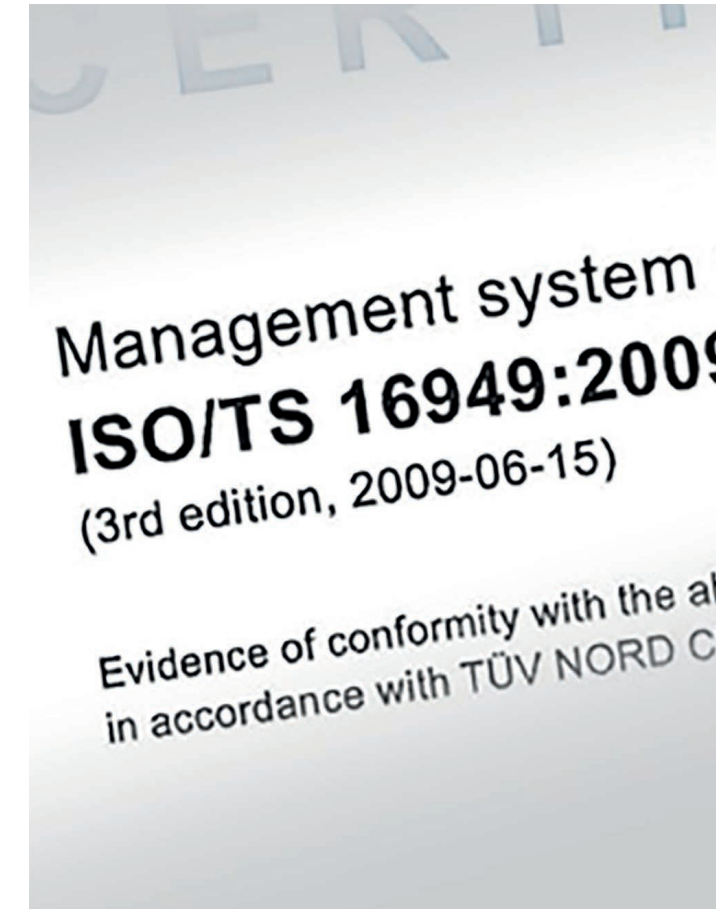
**Customer Commitment** – To continuously improve our products and services beyond the expectations of our customers. To provide cost-effective solutions to their applications. To always listen.

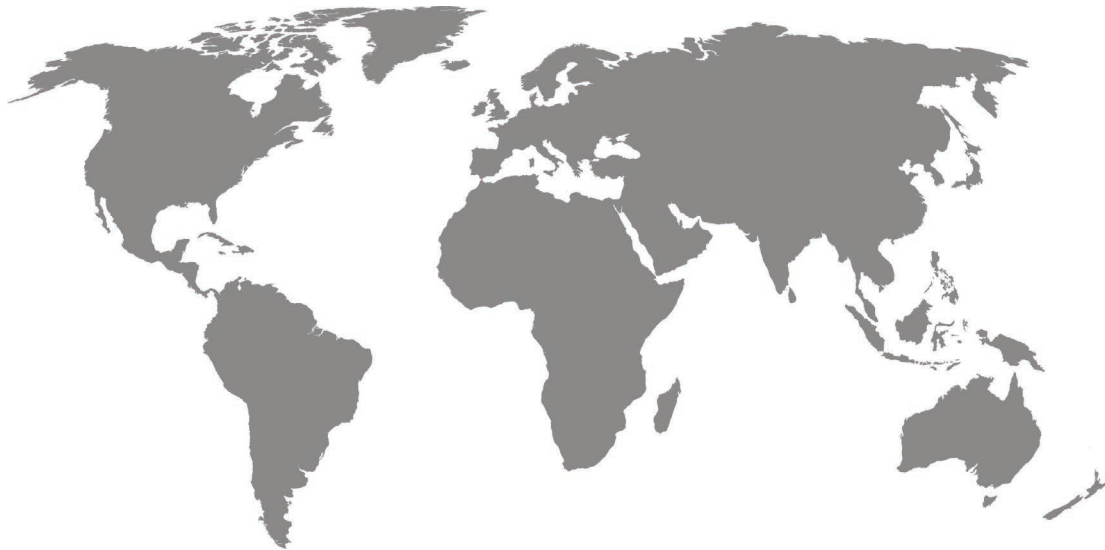
**Process Integrity** – To maintain manufacturing systems and processes which produce consistently flawless products and to continuously improve the systems of manufacturing. To prevent defects and eliminate waste through the application of statistical process control (SPC), FMEA's, control plans, and other statistical techniques.

**Supplier Covenant** – To develop mutually beneficial partnerships with our suppliers that demand nothing less than the same commitment to the pursuit of excellence that we demand of ourselves. To see each supplier as an extension of Kavlico Pressure Sensors.

We recognize that each employee plays a vital role in bringing these three principles to life. The development and empowerment of each employee in a team environment is necessary to ensure Kavlico's continued prosperity.

Kavlico Pressure Sensors is certified according to ISO/TS 16949, ISO 9001, ISO 14001 and OHSAS 18001. Furthermore many of our standard products are compliant to CE, UL and RoHs marks.





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## Your local sales contact: