PRODUCT TRAINING MODULE

TruStability™ Silicon Pressure Sensors

Stable. Accurate. Flexible.

Honeywell

February 2010

Summary Of What You'll Learn

- **Why they are called *TruStability*™**
- **Accuracy levels**
- **How they are used**
- **Features and benefits**
- **Package styles**
- **Competitive advantages**
- **Key specifications**
- **Potential applications**
- **Resources**

Product Portfolio

Why They Are Called *TruStability*™

- **Honeywell's TruStability™ Silicon Pressure Sensors are the most stable silicon pressure sensors available in the industry today**
- **Industry-leading stability helps prevent drift over time or from temperature and humidity extremes**
  - Often eliminates the customer's need to calibrate after mounting to the printed circuit board (PCB)
  - Eliminates the need for the end-user to calibrate the device
- **Honeywell Sensing and Control introduced this new platform of products in July 2009**

Accuracy Levels and Series

- **TruStability™ Silicon Pressure Sensors are available in two types of accuracy—high and standard—in two product Series:**
  - HSC (High Accuracy Silicon Ceramic) Series:
    - Industry-leading ± 1% total error band specification
    - Compensated across a 0 °C to 50 °C [32 °F to 122 °F] temperature range
  - SSC (Standard Silicon Ceramic) Series:
    - ± 2% total error band specification
    - Compensated across a wider -20 °C to 85 °C [-4 °F to 185 °F] temperature range

Two levels of accuracy; two product Series.

How TruStability™ Sensors Are Used

- **TruStability™ Silicon Pressure Sensors are PCB mounted sensors designed for the medical and industrial segments**
- **They measure gage, differential and absolute pressure**
- **They are intended for use with non-corrosive, non-ionic working fluids such as air and dry gases**
- **They are designed to provide digital correction of sensor offset, sensitivity, temperature coefficients and non-linearity**

The sensor to choose for many medical and industrial uses.

Features and Benefits

1. **Offer different total error bands and compensated temperature ranges that address segment needs**
2. **No calibration after solder**
3. **Reduced or no calibration in end product**
4. **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**
5. **On-board signal conditioning typically allows for removal of signal conditioning components from the PCB**

Numerous features, benefits and possibilities.

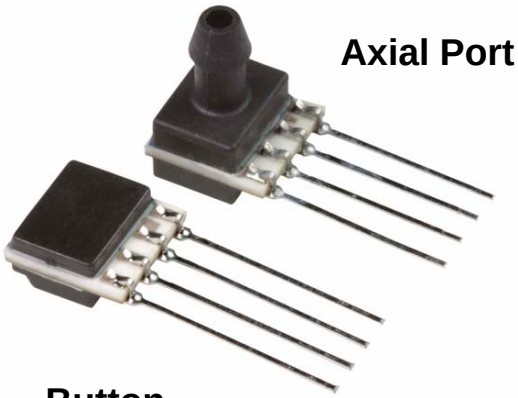
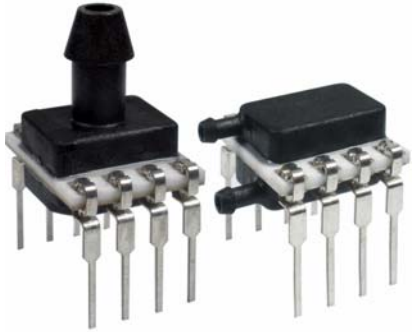
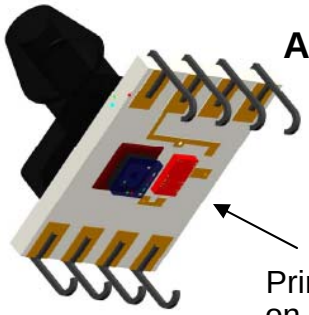
Features and Benefits

6. **Custom calibration ranges, combined with digital output options, provide support for many applications**
7. **Small footprint when compared to most silicon pressure sensors in the industry**
   - Despite their small size, they are temperature compensated and calibrated to provide an amplified signal, typically allowing the customer to remove components associated with signal conditioning from the PCB to increase space and reduce costs often associated with those components (e.g., acquisition, inventory, assembly)
   - Integrated capability often eliminates problems that could occur from having multiple signal conditioning components across the PCB

Customization and small footprint increase flexibility of use.

Package Styles

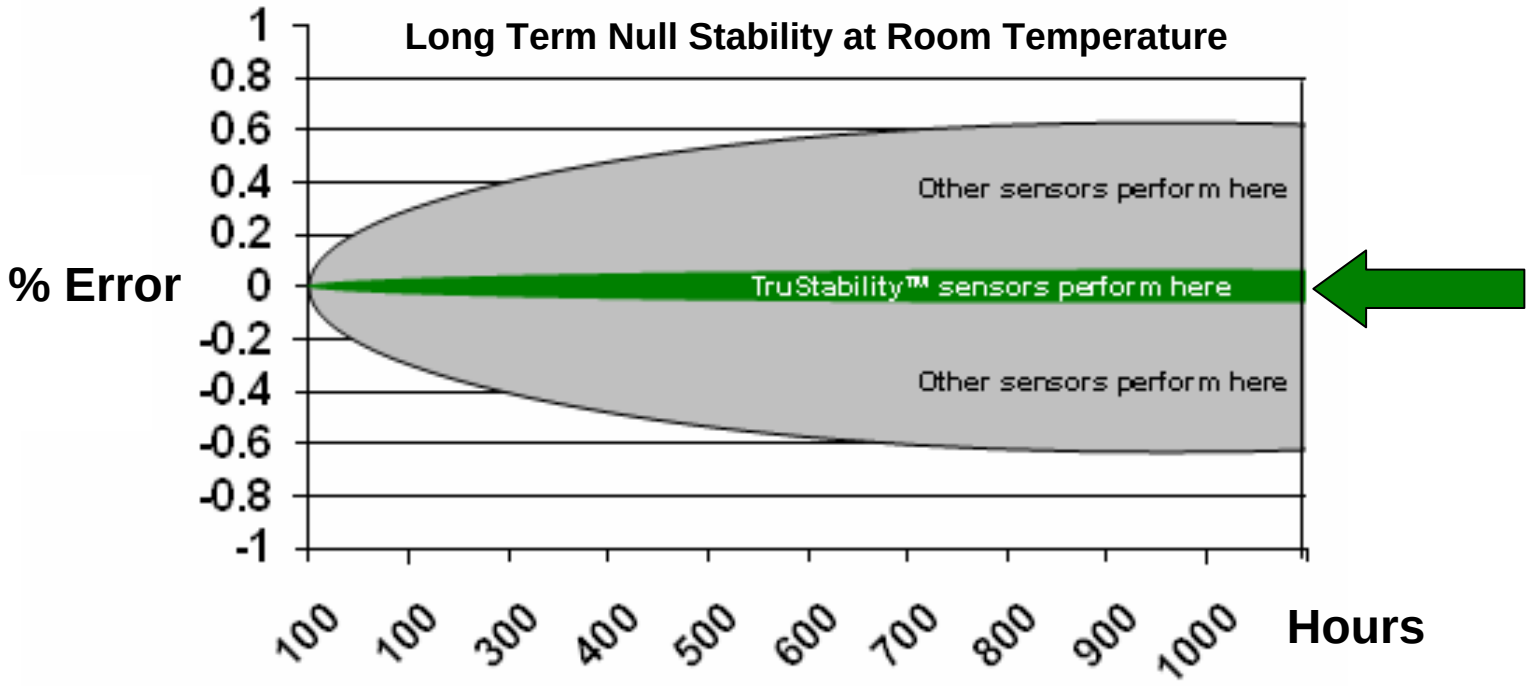
- **TruStability™ Silicon Pressure Sensors are available in either SIP, DIP or SMT packaging**

SIP	DIP	SMT
 Axial Port Button		 Axial Port Primary pressure port on back side of sense die protects critical components  Dual Radial

Honeywell offers porting and mounting versions.

Competitive Advantages – 1

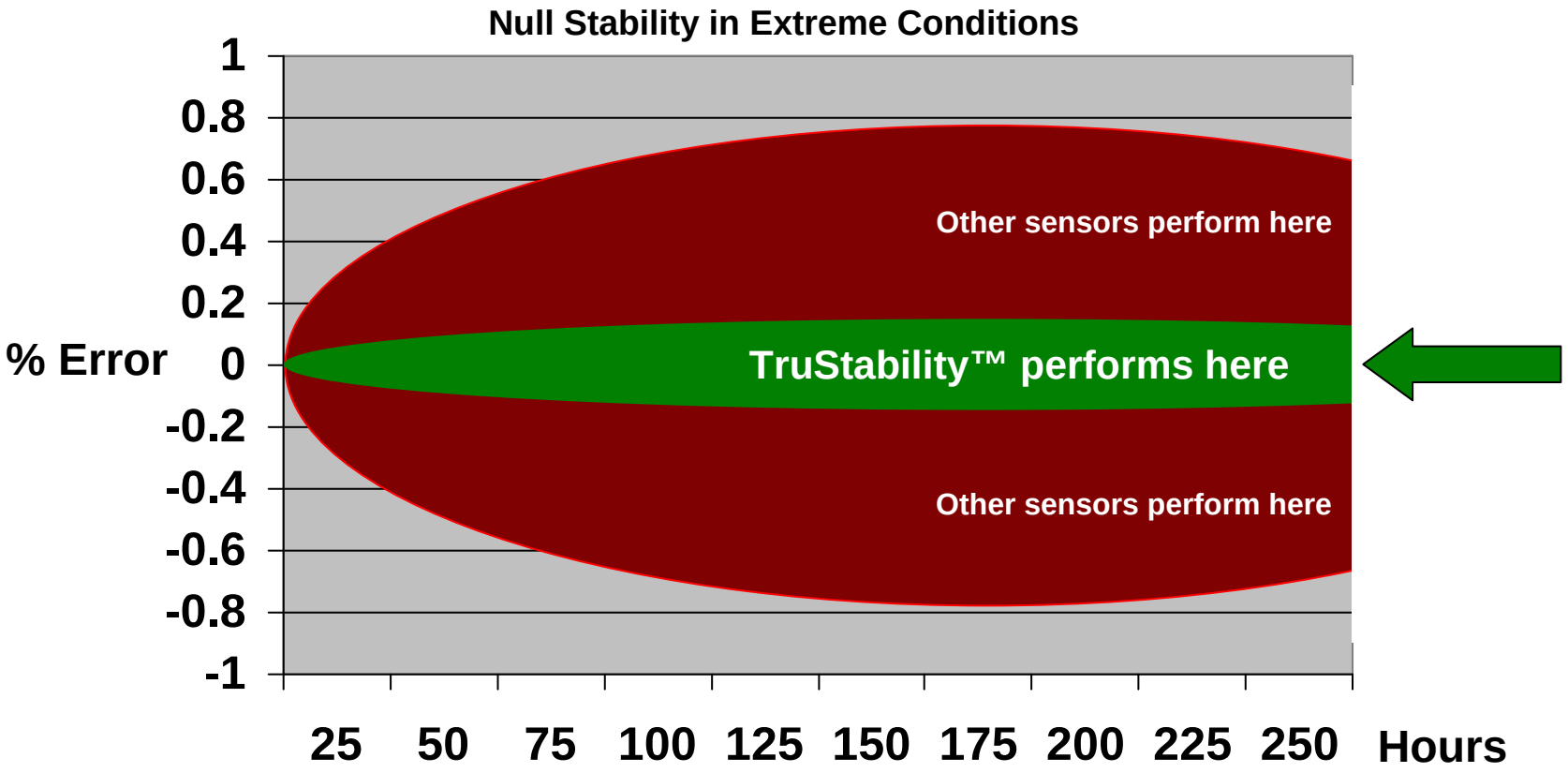
- **TruStability™ sensors offer five competitive advantages:**
  1. **Help prevent drift over time to assure proper operation**



Room temperature 20 °C [68 °F] ±5 °C, supply voltage 5V

Help prevent drift over time at room temperature.

Stability in Extreme Conditions



Extreme conditions: 85 °C [185 °F], 85% RH, supply voltage 5.5 V

Help prevent drift over time, even in extreme conditions.

Competitive Advantages – 2

2. Exceptional accuracy, which is a result of:

- Leading-edge technology
- Precise manufacturing processes
- Temperature compensation and calibration
- **TruStability™ Silicon Pressure Sensors are available in two levels of accuracy:**
  - High accuracy HSC Series:
    ± 1% total error band
  - Standard accuracy SSC Series:
    ± 2% total error band

HSC Series' accuracy is better than most competitive products.

Competitive Advantages – 3

3. Numerous implementation options

- Surface mount, DIP, or SIP packages
- 3.3 or 5 V power supplies
- Analog or digital output using SPI or 1^2C protocols
- Absolute, gage, or differential pressure
- Pressure ranges up to 150 psi
- Multiple port types and orientations

More than 500,000 different combinations.

Competitive Advantages – 4

4. Can help reduce your production costs

- Sensing element and packaging reduce effects of production stresses to eliminate drift
- Delivered calibrated and signal conditioned, eliminating need for external components and manufacturing steps

Can significantly reduce manufacturing costs.

Competitive Advantages – 5

5. Can eliminate your end-user's need to recalibrate

- Frequent recalibration isn't necessary
- Simplifies your design and makes it easier to use

Simplifies design; easier to use.

Key Specifications

Features	HSC Series High Accuracy	SSC Series Standard Accuracy
Output options	ratiometric analog output or digital I^2C or SPI compatible output	
Total error band	± 1.0% of full scale span maximum	± 2.0% of full scale span maximum
Compensated temperature range	precision ASIC conditioning/temperature compensated	
	0 to 50 °C [32 to 122 °F]	-20 to 85 °C [-4 to 185 °F]
Pressure types	absolute, differential, gage, compound	
Pressure ranges	1 psi to 150 psi [60 mbar to 10 bar]	
Standard calibration units	psi, mbar, bar, kPa	
Supply voltage	3.3 Vdc or 5.0 Vdc	
Mounting	lead through SIP, DIP or SMT	
RoHS compliant	yes	yes

Numerous implementation options.

Potential Medical Applications

- **May be used in medical and industrial applications**
- **Potential medical applications include:**
  - Airflow monitors
  - Anesthesia machines
  - Blood analysis machines
  - Gas chromatography
  - Infusion pumps
  - Kidney dialysis machines
  - Oxygen concentrators
  - Life science devices
  - Sleep apnea equipment
  - Ventilators





Potential Industrial Applications

- **Potential industrial applications include:**
  - Barometry
  - Flow calibrators
  - Gas flow instrumentation
  - HVAC
  - Pneumatic controls




Important Things to Remember

1. **Their long-term stability is the best in the industry.**
2. **They can help you reduce your production costs.**
3. **They can eliminate the need to recalibrate for you and your end-user.**

Long-term stability. Reduce production costs. Eliminate recalibration.

Resources

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Summary of Resources

- **Value to customers**
- **Catalog listings**
- **Nomenclature guides**
- **Active listings cross-reference**
- **Product samples**
- **Training**
- **Online resources**
- **Customer Service**

TruStability™ Sensors – Value To Our Customers

For (customer)	**SEGMENTS:** Industrial and medical **POTENTIAL APPLICATIONS:** Barometry, flow calibrators, gas chromatography, gas flow instrumentation, HVAC, life sciences, pneumatic controls, airflow monitors, anesthesia/ blood analysis/kidney dialysis/ respiratory/sleep apnea/ventilation machines, pneumatic controls
… that need	digital correction of sensor offset, sensitivity, temperature coefficients and non-linearity with industry-leading stability that helps prevent drift over time or from temperature extremes
… Honeywell's	**Silicon Pressure Sensors** HSC Series, SSC Series

BENEFITS		***HONEYWELL DELIVERS…***	*Competitive differentiation*
• Often eliminates need for calibration after board mount, and periodically, over time	**Stable**	• Industry-leading stability	★
• Provides optimal accuracy	**Accurate**	• Calibrated	★
• Increases application flexibility	**Flexible**	• Multiple packaging, mounting, power and signal options, combined with customized calibration capabilities	★
• Typically allows for easier placement on crowded boards, or in small devices	**Small**	• Occupies less area on the printed circuit board	★
• Repeatable, accurate and reliable, even under many demanding conditions	**Repeatable**	• Provides excellent repeatability, high accuracy and reliability	★
• Allows adjustments to be made	**Flexible**	• Allows pressure monitoring within a specified range	
• Provides enhanced sensitivity and accuracy over the range	**Sensitive, Accurate**	• Meets specified pressure level requirements	

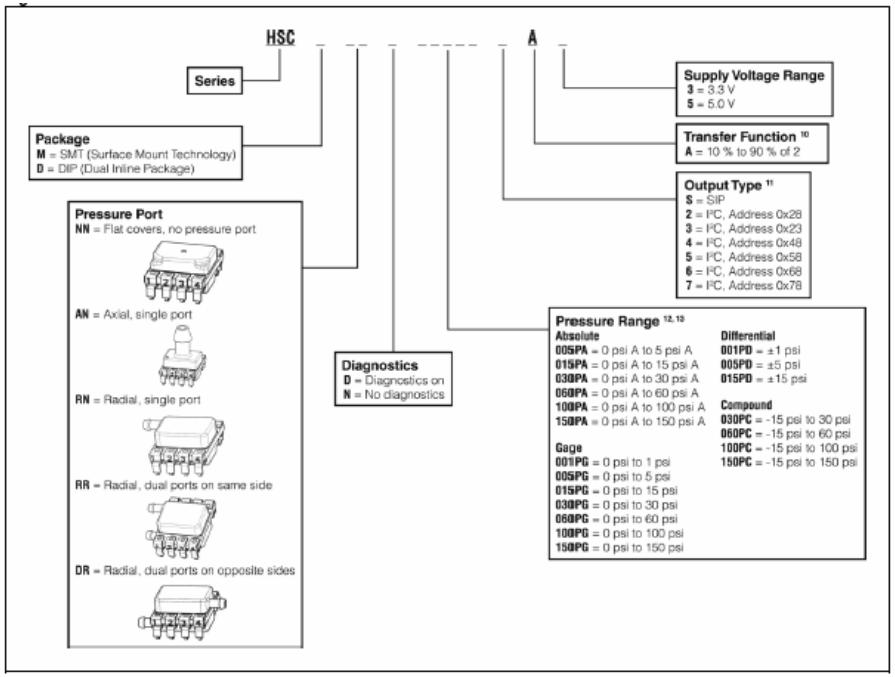
Catalog Listings

- **Five catalog listings available on Honeywell's website**
  - HSCMRNN001BGAA5: High Accuracy TruStability, SMT, Radial single port, 1 Bar gage, 5.0V, Analog output
  - HSCMRNN001BG2A5: High Accuracy TruStability, SMT, Radial single port, 1 Bar gage, 5.0V, Digital I^2C output
  - HSCMRNN001PG2A3: High Accuracy TruStability, SMT, Radial single port, 1 PSI gage, 3.3V, Digital I^2C output
  - SSCSANN001BGAA5: Standard Accuracy TruStability, SIP, Axial single port, 1 Bar gage, 5.0V, Analog output
  - SSCSANN001PGAA5: Standard Accuracy TruStability, SIP, Axial single port, 1 PSI gage, 5.0V, Analog output
- **Honeywell has thousands of configurations to meet your design needs**

Over 500,000 configurations possible.

Nomenclature Guides

- **Use the Nomenclature Guide located in the Data Sheet to configure your sensor including:**
  - Series
  - Package type
  - Pressure port
  - Diagnostics
  - Supply voltage
  - Transfer function
  - Output type
  - Pressure range
- HSC, High Accuracy, SIP, Analog
- HSC, High Accuracy, SMT/DIP, Digital
- SSC, Standard Accuracy, SIP, Digital
- SSC, Standard Accuracy, SMT/DIP



Active Listings Cross-Reference

- **Download a cross-reference that lists TruStability™ active listings and key specifications including:**
  - **Accuracy**
  - **Reference and media side pressure ports**
  - **Pressure range, units and reference**
  - **Output type**
  - **Transfer function**
  - **Supply voltage**
  - **Total error band**
  - **Wiring**
  - **Options**
- **Click here**

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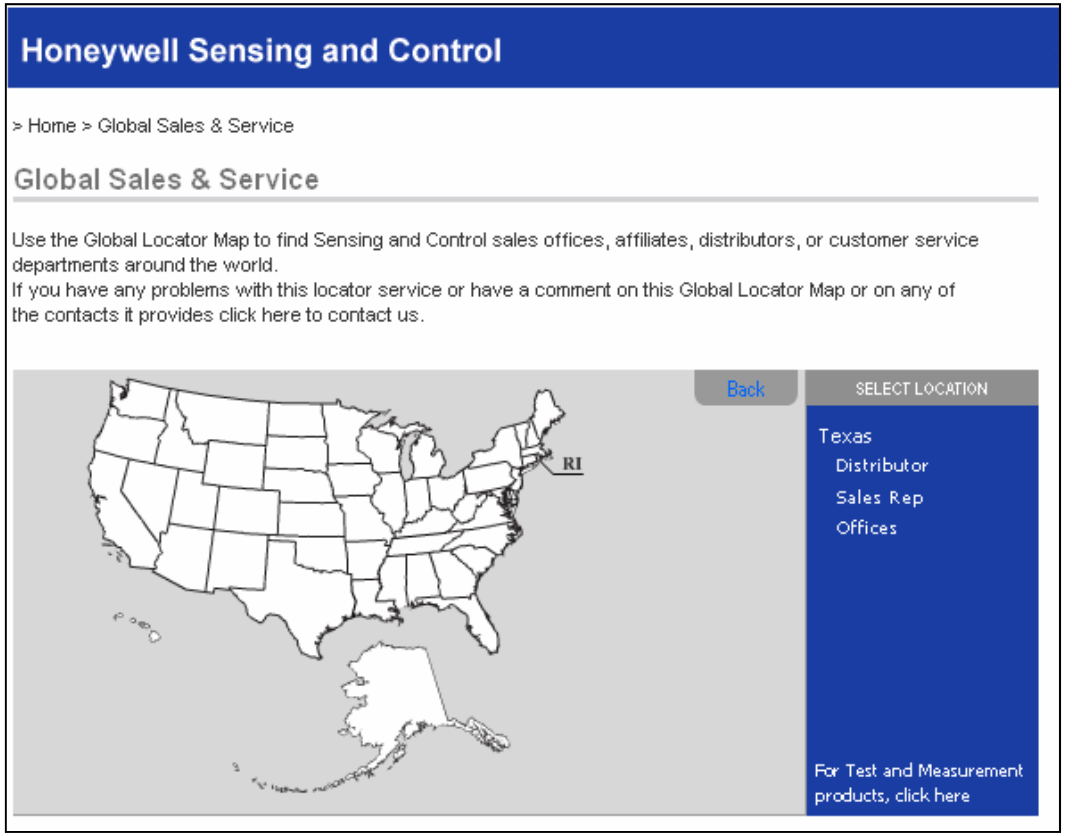
Catalog Listing (updated: 01/26/10)	Accuracy	Wiring	Media Side Pressure Po	Reference Side Pressure Po	Options	Pressure Ran	Pressure Uni	Pressure Referen	Output Type	Transfer Functio	Supply Voltag	Total Error Ban	Accuracy %
HSCDAND015PDSA3	High	DIP	Axial Port	No Port	Diagnostics	15	PSI	Differential	SPI	10 to 90% Vdd	3.3 V	± 1%	± 0.25%
HSCDANN001BGAA3	High	DIP	Axial Port	No Port	No Diagnostics	1	Bar	Gauge	Amplified	10 to 90% Vdd	3.3 V	± 1%	± 0.25%
HSCDANN001PGSA5	High	DIP	Axial Port	No Port	No Diagnostics	1	PSI	Gauge	SPI	10 to 90% Vdd	5 V	± 1%	± 0.25%
HSCDANN005PGSA3	High	DIP	Axial Port	No Port	No Diagnostics	5	PSI	Gauge	SPI	10 to 90% Vdd	3.3 V	± 1%	± 0.25%
HSCDANN015PAAA5	High	DIP	Axial Port	No Port	No Diagnostics	15	PSI	Absolute	Amplified	10 to 90% Vdd	5 V	± 1%	± 0.25%
HSCDANN150PG2A5	High	DIP	Axial Port	No Port	No Diagnostics	150	PSI	Gauge	I2C, Address 0x28	10 to 90% Vdd	5 V	± 1%	± 0.25%
HSCDANN150PG7A5	High	DIP	Axial Port	No Port	No Diagnostics	150	PSI	Gauge	I2C, Address 0x78	10 to 90% Vdd	5 V	± 1%	± 0.25%
HSCDDRD001PD2A3	High	DIP	Radial Port - Opposite	Radial Port	Diagnostics	1	PSI	Differential	I2C, Address 0x28	10 to 90% Vdd	3.3 V	± 1%	± 0.25%
HSCMAND1.6BGSA3	High	SMT	Axial Port	No Port	Diagnostics	1.6	Bar	Gauge	SPI	10 to 90% Vdd	3.3 V	± 1%	± 0.25%
HSCMRNN001BG2A5	High	SMT	Radial Port	No Port	No Diagnostics	1	Bar	Gauge	I2C, Address 0x28	10 to 90% Vdd	5 V	± 1%	± 0.25%
HSCMRNN001BGAA5	High	SMT	Radial Port	No Port	No Diagnostics	1	Bar	Gauge	Amplified	10 to 90% Vdd	5 V	± 1%	± 0.25%
HSCMRNN001PG2A3	High	SMT	Radial Port	No Port	No Diagnostics	1	PSI	Gauge	I2C, Address 0x28	10 to 90% Vdd	3.3 V	± 1%	± 0.25%
HSCMRNN1.6BASA3	High	SMT	Radial Port	No Port	No Diagnostics	1.6	Bar	Absolute	SPI	10 to 90% Vdd	3.3 V	± 1%	± 0.25%
HSCMRNN1.6BGSA3	High	SMT	Radial Port	No Port	No Diagnostics	1.6	Bar	Gauge	SPI	10 to 90% Vdd	3.3 V	± 1%	± 0.25%
HSCMRRD001PDAA3	High	SMT	Radial Port	Radial Port	Diagnostics	1	PSI	Differential	Amplified	10 to 90% Vdd	3.3 V	± 1%	± 0.25%
HSCMRRN001PD2A3	High	SMT	Radial Port	No Port	No Diagnostics	1	PSI	Differential	I2C, Address 0x28	10 to 90% Vdd	3.3 V	± 1%	± 0.25%
HSCMRRN001PDAA5	High	SMT	Radial Port	Radial Port	No Diagnostics	1	PSI	Differential	Amplified	10 to 90% Vdd	5 V	± 1%	± 0.25%
HSCMRNN060MGSA3	High	SMT	Radial Port	Radial Port	No Diagnostics	60	milliBar	Gauge	SPI	10 to 90% Vdd	3.3 V	± 1%	± 0.25%
HSCSAAN001PGAA5	High	SIP	Axial Port	No Port	No Diagnostics	1	PSI	Gauge	Amplified	10 to 90% Vdd	5 V	± 1%	± 0.25%
HSCSANN001PGAA5	High	SIP	Axial Port	No Port	No Diagnostics	1	PSI	Gauge	Amplified	10 to 90% Vdd	5 V	± 1%	± 0.25%
HSCSANN100PA2A5	High	SIP	Axial Port	No Port	No Diagnostics	100	PSI	Absolute	I2C, Address 0x28	10 to 90% Vdd	5 V	± 1%	± 0.25%
HSCSANN100PA4A5	High	SIP	Axial Port	No Port	No Diagnostics	100	PSI	Absolute	I2C, Address 0x48	10 to 90% Vdd	5 V	± 1%	± 0.25%
HSCSANN150PA2A5	High	SIP	Axial Port	No Port	No Diagnostics	150	PSI	Absolute	I2C, Address 0x28	10 to 90% Vdd	5 V	± 1%	± 0.25%
HSCSANN150PA4A5	High	SIP	Axial Port	No Port	No Diagnostics	150	PSI	Absolute	I2C, Address 0x48	10 to 90% Vdd	5 V	± 1%	± 0.25%
HSCSANN150PG2A3	High	SIP	Axial Port	No Port	No Diagnostics	150	PSI	Gauge	I2C, Address 0x28	10 to 90% Vdd	3.3 V	± 1%	± 0.25%
HSCSMNN001PDAA3	High	SIP	O-Ring Seal	No Port	No Diagnostics	1	PSI	Differential	Amplified	10 to 90% Vdd	3.3 V	± 1%	± 0.25%
HSCSSNN001PD2A3	High	SIP	Manifold Mount	No Port	No Diagnostics	1	PSI	Differential	I2C, Address 0x28	10 to 90% Vdd	3.3 V	± 1%	± 0.25%
SSCDANN001PGAA5	Standard	DIP	Axial Port	No Port	No Diagnostics	1	PSI	Gauge	Amplified	10 to 90% Vdd	5 V	± 2%	± 0.25%
SSCDANN005PGAA5	Standard	DIP	Axial Port	No Port	No Diagnostics	5	PSI	Gauge	Amplified	10 to 90% Vdd	5 V	± 2%	± 0.25%
SSCDANN015PAAA5	Standard	DIP	Axial Port	No Port	No Diagnostics	15	PSI	Absolute	Amplified	10 to 90% Vdd	5 V	± 2%	± 0.25%
SSCDANN015PAAB5	Standard	DIP	Axial Port	No Port	No Diagnostics	15	PSI	Absolute	Amplified	5 to 95% Vdd	5 V	± 2%	± 0.25%
SSCDANN015PGAA5	Standard	DIP	Axial Port	No Port	No Diagnostics	15	PSI	Gauge	Amplified	10 to 90% Vdd	5 V	± 2%	± 0.25%
SSCDANN030PAAA5	Standard	DIP	Axial Port	No Port	No Diagnostics	30	PSI	Absolute	Amplified	10 to 90% Vdd	5 V	± 2%	± 0.25%
SSCDANN030PAAB5	Standard	DIP	Axial Port	No Port	No Diagnostics	30	PSI	Absolute	Amplified	5 to 95% Vdd	5 V	± 2%	± 0.25%
SSCDANN060PAAA5	Standard	DIP	Axial Port	No Port	No Diagnostics	60	PSI	Absolute	Amplified	10 to 90% Vdd	5 V	± 2%	± 0.25%
SSCDANN060PGAA5	Standard	DIP	Axial Port	No Port	No Diagnostics	60	PSI	Gauge	Amplified	10 to 90% Vdd	5 V	± 2%	± 0.25%
SSCDANN100PAAB5	Standard	DIP	Axial Port	No Port	No Diagnostics	100	PSI	Absolute	Amplified	5 to 95% Vdd	5 V	± 2%	± 0.25%

Cross-reference tool provides detailed specifications.

Product Samples

- **Samples are available**
  - Contact an Authorized Honeywell Distributor or Sales Representative
    - Visit the Honeywell Sensing and Control website to locate an Authorized Distributor or Sales Representative in your area



Samples are available now.

Training

- **Training about Honeywell's TruStability™ Silicon Pressure Sensors is available from Honeywell's product management team:**
  - Product Manager: AJ Smith, andrew.smith5@honeywell.com, +1.763.954.6289
  - Applications Engineer: Martin Murray, martin.murray@honeywell.com, +1.815.235.5695

Contact our product marketing experts.

Online Resources

- TruStability™ New Product Webpage
- TruStability™ Video
- SPI Communication with Honeywell Digital Output Pressure Sensors
- I²C Communications with Honeywell Digital Output Pressure Sensors
- Sensors and Switches in Medical Applications Brochure
- Airflow, Force, Pressure Product Range Guide
- Silicon Pressure Sensors Line Guide
- Low Pressure Silicon Pressure Sensor Documentation

www.honeywell.com/sensing

About Honeywell Sensing and Control Products

- **For more information about Honeywell Sensing and Control products:**
  - Visit www.honeywell.com/sensing
  - Call our Customer Service team at +1-815-235-6847
  - Email inquiries to info.sc@honeywell.com

Warranties, Remedies, and Warnings

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Warnings and Remedies

⚠ WARNING

PERSONAL INJURY

DO NOT USE these products as safety or emergency stop devices or in any other application where failure of the product could result in personal injury.

Failure to comply with these instructions could result in death or serious injury.

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.**

While we provide application assistance personally, through our literature and the Honeywell web site, it is up to the customer 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 printing. However, we assume no responsibility for its use.

⚠ WARNING

MISUSE OF DOCUMENTATION

- The information presented in this document is for reference only. Do not use this document as a product installation guide.
- Complete installation, operation, and maintenance information is provided in the instructions supplied with each product.

Failure to comply with these instructions could result in death or serious injury.