

# Quick Start Sheet

## TruStability™ Silicon Pressure Sensors: HSC and SSC Series

NEW PRODUCT LAUNCH

**NOT FOR END CUSTOMER USE**

[Find the HSC, SSC Series on Sensing and Control's Web site](#)



### INTRODUCTION

Honeywell is pleased to introduce its TruStability™ Silicon Pressure Sensors comprised of:

**HSC (High Accuracy Silicon Ceramic) Series:** Industry-leading  $\pm 1\%$  total error band specification, compensated across a  $0\text{ }^{\circ}\text{C}$  to  $50\text{ }^{\circ}\text{C}$  [ $32\text{ }^{\circ}\text{F}$  to  $122\text{ }^{\circ}\text{F}$ ] temperature range.

**SSC (Standard Silicon Ceramic) Series:**  $\pm 2\%$  total error band specification, compensated across a wider  $-20\text{ }^{\circ}\text{C}$  to  $85\text{ }^{\circ}\text{C}$  [ $-4\text{ }^{\circ}\text{F}$  to  $185\text{ }^{\circ}\text{F}$ ] temperature range.

The HSC Series and SSC Series offer different accuracies and compensated temperature ranges that address specific segment needs. **These devices offer customers three key benefits not found in competitive silicon pressure sensors:**

- 1. Stability:** These sensors are the most stable silicon pressure sensors available.
- 2. Accuracy:** They are designed to provide an extremely tight accuracy specification.
- 3. Flexibility:** Their modular and flexible design offer customers a variety of package styles and options, all with the same industry-leading performance specifications.

### BACKGROUND

These sensors 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. Industry-leading stability helps prevent drift over time or from temperature extremes.

Their footprint is very small in comparison to most pressure sensors, including the current Honeywell portfolio. Despite their small size, they are temperature compensated and calibrated to provide an amplified signal, typically allowing the customer to remove the components associated with signal conditioning from the printed circuit board (PCB) to increase space and reduce costs often associated with those components (e.g., acquisition, inventory, assembly). This integrated capability often eliminates problems that could occur from having multiple signal conditioning components across the PCB.

### VALUE PROPOSITIONS

**Stability:** Industry-leading stability that often eliminates the need for calibration after board mount, and periodically over time.

**Accuracy:** Calibrated to optimize accuracy.

**Application flexibility:** Multiple packaging, mounting, power, and signal options combine with customized calibration capabilities to increase application flexibility.

**Small size:** Occupies less area on the PCB, typically allowing for easier placement on crowded boards, or in small devices.

**Repeatability:** Provides excellent repeatability, high accuracy and reliability under many demanding conditions.

**Efficient:** Allows pressure monitoring within the specified range so that the appropriate adjustments can be made.



SIP design



SMT design

**Sensitive:** Meets specified pressure level requirements, providing enhanced sensitivity and accuracy over the range.

### STRATEGIC PORTFOLIO ANALYSIS

The HSC and SSC Series' SMT mounting capability, small form factor, and stability fill a previous gap in the Honeywell portfolio. These sensors allow Honeywell to address many new applications with existing customers, and attract new customers who may require flexible, high performance pressure sensing.

### POTENTIAL APPLICATIONS

Industrial	Medical
Barometry	Airflow monitors
Flow calibrators	Anesthesia machines
Gas chromatography	Blood analysis machines
Gas flow instrumentation	Gas chromatography
HVAC	Gas flow instrumentation
Life sciences	Kidney dialysis machines
Pneumatic controls	Oxygen concentrators
	Pneumatic controls
	Respiratory machines
	Sleep apnea equipment
	Ventilators

### FEATURES

Feature	HSC	SSC
Output options	ratiometric analog output or digital I <sup>2</sup> C or SPI compatible digital output	
Total error band	$\pm 1.0\%$ of full scale span maximum	$\pm 2.0\%$ of full scale span maximum
Compensated temp range	precision ASIC conditioning/temp compensated	
	$0\text{ to }50\text{ }^{\circ}\text{C}$ [ $32\text{ to }122\text{ }^{\circ}\text{F}$ ]	$-20\text{ to }85\text{ }^{\circ}\text{C}$ [ $-4\text{ to }185\text{ }^{\circ}\text{F}$ ]
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 or SMT	
RoHS-compliant	yes	

### BENEFITS

- Digital ASIC output in either I<sup>2</sup>C or SPI protocols from digital sensors accelerates performance through reduced conversion requirements and the convenience of direct interface to microprocessors or microcontrollers
- On-board signal conditioning typically allows for the removal of signal conditioning components from the PCB
- Custom calibration ranges, combined with digital output options, provide support for many unique applications

### COMPETITIVE OVERVIEW

Key competitors include: Fujikura, SMI, All Sensors and Freescale

- HSC vs. Fujikura XFPM:** HSC offers better accuracy, a low voltage supply option, lower power consumption, digital output options, a faster response time and more package options
- HSC vs. SMI 5822/5872:** HSC offers a low voltage supply option, lower power consumption, broader pressure range and types, an additional SPI digital output option, a faster response time, and more package and port options

# TruStability™ Silicon Pressure Sensors: HSC and SSC Series

- **SSC vs. Fujikura X3PM:** SSC offers better accuracy, low voltage supply option, lower power consumption, less null offset, more pressure types, digital output options, wider temp ranges, faster response time, more package options
- **SSC vs. SMI 5852 Series:** SSC offers better accuracy, low voltage supply option, lower power consumption, more pressure types/ranges, SPI digital output option, faster response time, more package/port options
- **SSC vs. All Sensor 4v-mini:** SSC offers better accuracy, low voltage supply option, lower power consumption, more pressure types/ranges, digital output options, wider temp ranges, more package/port options.
- **SSC vs. Freescale MPX5:** SSC offers better accuracy, low voltage supply option, lower power consumption, more pressure types and ranges, digital output options, wider temp ranges, more package options

See [Competitive Cross Reference](#). Available on Rep/AD Resource Portal. To access, click on Sales Tools>New Products 2009.

## POTENTIAL SELLING CYCLE

Industrial applications: 4 -5 months; medical: 12-18 months

## TRAINING AND CUSTOMER VISITS

Available from: Product Director [Lee Burtelson](#), Product Manager [AJ Smith](#) and Applications Engineer [Martin Murray](#)

## SAMPLES

Available now through Product Management; contact [AJ Smith](#)

## PRODUCT AVAILABILITY

Most listings will be available through iCOM July 13, 2009. There may be a minimum quantity required to set up a new listing.

## ORDERING INFORMATION

These are the initial iterations that are available. Please refer to the "Nomenclature and Order Guide" in the product sheet for all possible product configurations.

Catalog Listing	Description
HSCMRNN001BGAA5	High Accuracy ASC, SMT, Radial single port, 1 Bar gage, 5.0 V, Analog output
HSCMRNN001BG2A5	High Accuracy ASC, SMT, Radial single port, 1 Bar gage, 5.0 V, Digital I <sup>2</sup> C output
HSCMRNN001PG2A3	High Accuracy ASC, SMT, Radial single port, 1 PSI gage, 3.3 V, Digital I <sup>2</sup> C output
SSCSANN001BGAA5	Standard Accuracy ASC, SIP, Axial single port, 1 Bar gage, 5.0 V, Analog output
SSCSANN001PGAA5	Standard Accuracy ASC, SIP, Axial single port, 1 PSI gage, 5.0 V, Analog output

## SEARCH ENGINE KEY WORDS

Pressure sensor, plastic silicon, temperature compensated, temperature calibrated, digital output, analog output, stability, accuracy, flexibility, silicon ceramic, barometry, flow calibrators, gas chromatography, gas flow instrumentation, HVAC, life sciences, pneumatic controls, airflow monitors, anesthesia machines, blood analysis machines, gas flow instrumentation, kidney dialysis machines, oxygen concentrators, pneumatic controls, respiratory machines, sleep apnea equipment, ventilators

## ADDITIONAL MATERIALS AND LINKS

- Products sheets: [HSC Series 1 psi to 150 psi, SIP, analog output](#); [HSC Series 60 mbar to 10 bar, SIP, analog output](#); [HSC Series 1 psi to 150 psi, SIP, digital output](#); [HSC Series 60 mbar to 10 bar, SIP, digital output](#); [HSC Series 1 psi to 150 psi, SMT, analog output](#); [HSC Series 60 mbar to 10 bar, SMT, analog output](#); [HSC Series 1 psi to 150 psi, SMT, digital output](#); [HSC Series 60 mbar to 10 bar, SMT, digital output](#); [SSC Series 1 psi to 150 psi, SIP, analog output](#); [SSC Series 60 mbar to 10 bar, SIP, digital output](#); [SSC Series 1 psi to 150 psi, SMT, analog output](#); [SSC Series 60 mbar to 10 bar, SMT, analog output](#); [SSC Series 1 psi to 150 psi, SMT, digital output](#); [SSC Series 60 mbar to 10 bar, SMT, digital output](#)
- Installation instructions: [HSC, SSC Series SIP, analog output](#); [HSC, SSC Series SIP, digital output](#); [HSC, SSC Series SMT, analog output](#); [HSC, SSC Series SMT, digital output](#)
- [Silicon Pressure Sensors Line Guide](#)
- [Competitive Cross Reference](#)
- [Sales Resource: Product Overview](#)
- [Value Propositions](#)

### WARNING

#### MISUSE OF DOCUMENTATION

- The information presented in this product sheet 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.**

### 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.

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## 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.

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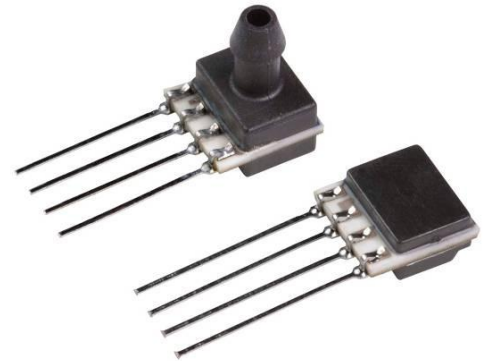
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## TruStability™ Silicon Pressure Sensors: HSC Series – High Accuracy

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±1 % Total Error Band, Analog  
Output, SIP, 1 psi to 150 psi



### DESCRIPTION

The TruStability™ High Accuracy Silicon Ceramic (HSC) Series is a piezoresistive silicon pressure sensor offering a ratiometric analog output for reading pressure over the specified full scale pressure span and temperature range.

The HSC Series is fully calibrated and temperature compensated for sensor offset, sensitivity, temperature effects, and non-linearity using an on-board Application Specific Integrated Circuit (ASIC). Calibrated output values for pressure are updated at approximately 1 kHz.

The HSC Series is calibrated over the temperature range of 0 °C to 50 °C [32 °F to 122 °F]. The sensor is characterized for operation from a single power supply of either 3.3 Vdc or 5.0 Vdc.

These sensors measure absolute, differential, and gage pressures. The absolute versions have an internal vacuum reference and an output value proportional to absolute pressure. Differential versions allow application of pressure to either side of the sensing diaphragm. Gage and compound versions are referenced to atmospheric pressure and provide an output proportional to pressure variations from atmosphere.

The HSC Series sensors are intended for use with non-corrosive, non-ionic working fluids such as air and dry gases. They are designed and manufactured according to standards in ISO 9001.

### FEATURES

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- Industry-leading long-term stability
- Extremely tight accuracy of ±0.25 % FSS BFSL\*
- Total error band of ±1 % full scale span maximum
- Modular and flexible design offer customers a variety of package styles and options, all with the same industry-leading performance specifications
- Miniature 10 mm x 10 mm (0.39 in x 0.39 in) package
- Low operating voltage
- Extremely low power consumption
- Ratiometric 12-bit analog output
- Precision ASIC conditioning and temperature compensated over 0 °C to 50 °C (32 °F to 122 °F) temperature range
- RoHS compliant
- Virtually insensitive to mounting orientation
- Internal diagnostic functions increase system reliability
- Also available with I<sup>2</sup>C and SPI digital output, and in SMT and DIP packages
- Absolute, differential, gage and compound types
- Pressure ranges from 1 psi to 150 psi (60 mbar to 10 bar)
- Custom calibration available
- Various pressure port options

\* Full Scale Span Best Fit Straight Line

# TruStability™ Silicon Pressure Sensors: HSC Series—High Accuracy

## POTENTIAL APPLICATIONS

- |   |  |
|---|--|
| <ul style="list-style-type: none"> <li>• <b>Medical:</b> <ul style="list-style-type: none"> <li>- Airflow monitors</li> <li>- Anesthesia machines</li> <li>- Blood analysis machines</li> <li>- Gas chromatography</li> <li>- Gas flow instrumentation</li> <li>- Kidney dialysis machines</li> <li>- Oxygen concentrators</li> <li>- Pneumatic controls</li> <li>- Respiratory machines</li> <li>- Sleep apnea equipment</li> <li>- Ventilators</li> </ul> </li> </ul> | <ul style="list-style-type: none"> <li>• <b>Industrial:</b> <ul style="list-style-type: none"> <li>- Barometry</li> <li>- Flow calibrators</li> <li>- Gas chromatography</li> <li>- Gas flow instrumentation</li> <li>- HVAC</li> <li>- Life sciences</li> <li>- Pneumatic controls</li> </ul> </li> </ul> |
|---|--|

**Table 1. Absolute Maximum Ratings<sup>1</sup>**

Parameter	Min.	Max.	Unit
Supply voltage ( $V_{\text{supply}}$ )	-0.3	6.0	V
Voltage on any pin	-0.3	$V_{\text{supply}} + 0.3$	V
ESD susceptibility (human body model)	3	-	kV
Storage temperature	-40 [-40]	85 [185]	° C [° F]
Lead temperature (2 s to 4 s)	-	250 [482]	° C [° F]

**Table 2. Operating Specifications**

Parameter	Min.	Typ.	Max.	Unit
Supply voltage ( $V_{\text{supply}}$ ) <sup>2</sup>				
3.3 V	3.0	3.3 <sup>3</sup>	3.3	Vdc
5.0 V	4.75	5.0 <sup>3</sup>	5.25	
<i>Sensors are either 3.3 or 5.0 V based on model selected</i>				
Supply current				
3.3 V supply	-	1.6	2.1	mA
5.0 V supply	-	2	3	
Compensated temperature range <sup>4</sup>	0 [32]	-	50 [122]	° C [° F]
Operating temperature range <sup>5</sup>	-20 [-4]	-	85 [185]	° C [° F]
Startup time (power up to data ready)	-	-	5	ms
Response time	-	1	-	ms
Upper output clipping limit	-	-	97.5	% $V_{\text{supply}}$
Lower output clipping limit	2.5	-	-	% $V_{\text{supply}}$
Accuracy <sup>6</sup>	-	-	±0.25	%FSS BFLS
Total error band <sup>7</sup>	-	-	±1	%FSS <sup>8</sup>
Output resolution	12	-	-	bits

**Table 3. Environmental Specifications**

Parameter	Characteristic
Humidity	0 % to 95 % RH, non-condensing
Vibration	MIL-STD-202F, Curve AK (20.7 g random)
Shock	MIL-STD-202F, Method 213B, Condition F
Life <sup>9</sup>	1 million cycles minimum

## ±1 % Total Error Band, SIP, Analog Output, 1 psi to 150 psi

**Table 4. Wetted Materials<sup>10</sup>**

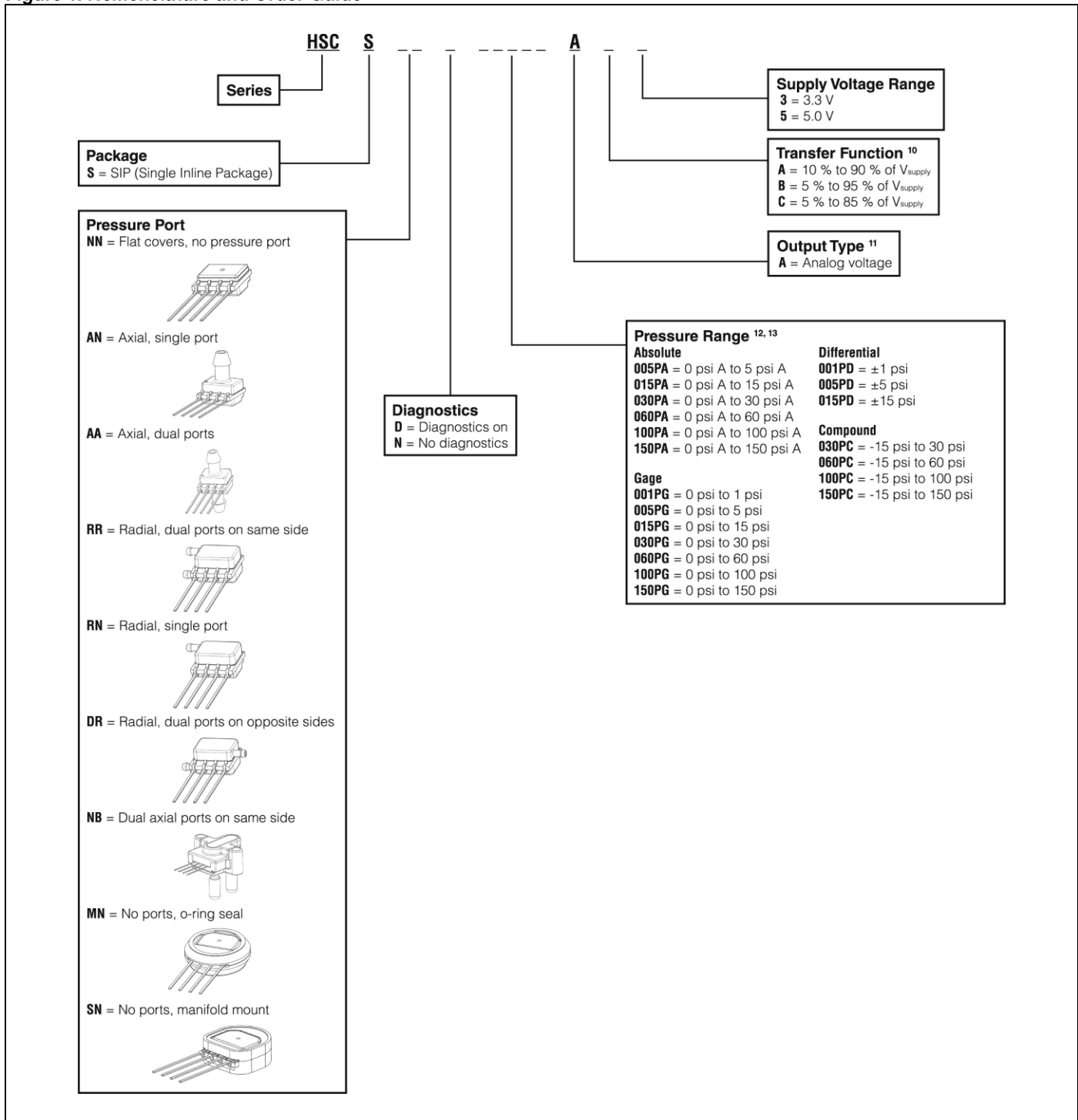
Parameter	Port 1 (Pressure Port)	Port 2 (Reference Port)
Covers	high temperature polyamide	high temperature polyamide
Substrate	alumina ceramic	alumina ceramic
Adhesives	epoxy, RTV	epoxy, RTV
Electronic components	ceramic, glass, solder, silicon	silicon, glass, gold, solder

**Notes:**

1. Absolute maximum ratings are the extreme limits the device will withstand without damage.
2. Ratiometricity of the sensor (the ability of the device to scale to the supply voltage) is achieved within the specified operating voltage for each option. Other custom supply voltages are available, please contact Honeywell Customer Service.
3. The sensor is not reverse polarity protected. Incorrect application of supply voltage or ground to the wrong pin may cause electrical failure.
4. The compensated temperature range is the temperature range over which the sensor will produce an output proportional to pressure within the specified performance limits.
5. The operating temperature range is the temperature range over which the sensor will produce an output proportional to pressure but may not remain within the specified performance limits.
6. Accuracy: The maximum deviation in output from a Best Fit Straight Line (BFSL) fitted to the output measured over the pressure range at 25 °C [77 °F]. Includes all errors due to pressure non-linearity, pressure hysteresis, and non-repeatability.
7. Total Error Band: The maximum deviation from the ideal transfer function over the entire compensated temperature and pressure range. Includes all errors due to offset, full scale span, pressure non-linearity, pressure hysteresis, repeatability, thermal effect on offset, thermal effect on span, and thermal hysteresis.
8. Full Scale Span (FSS) is the algebraic difference between the output signal measured at the maximum ( $P_{max}$ ) and minimum ( $P_{min}$ ) limits of the pressure range. (See Figure 1 for ranges).
9. Life may vary depending on specific application in which sensor is utilized.
10. Contact Honeywell Customer Service for detailed material information.

# TruStability™ Silicon Pressure Sensors: HSC Series—High Accuracy

Figure 1. Nomenclature and Order Guide



**Notes:**

11. The transfer function limits define the output of the sensor at a given pressure input. By specifying  $P_{min}$  and  $P_{max}$ , the output at  $P_{min}$  and  $P_{max}$  the complete transfer function of the sensor is defined. See Figure 2 for a graphical representation of the transfer function. Other transfer functions are available. Contact Honeywell Customer Service for more information.
12. Digital outputs (SPI and I<sup>2</sup>C) are also available. Contact Honeywell Customer Service for more information.
13. Custom pressure ranges are available. Contact Honeywell Customer Service for more information.
14. See Table 5 for an explanation of sensor types.

±1 % Total Error Band, SIP, Analog Output, 1 psi to 150 psi

Figure 2. Transfer Functions and Limits

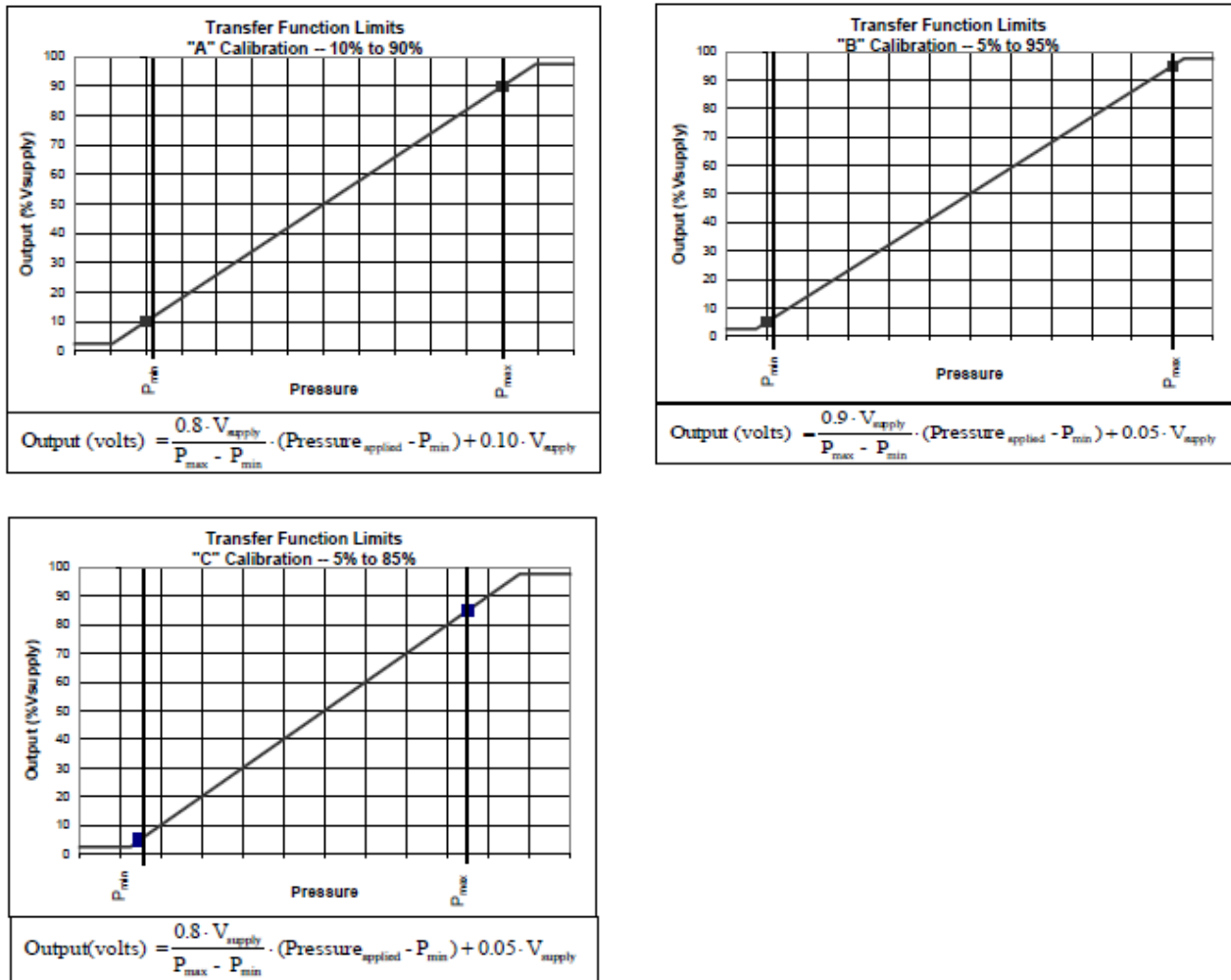
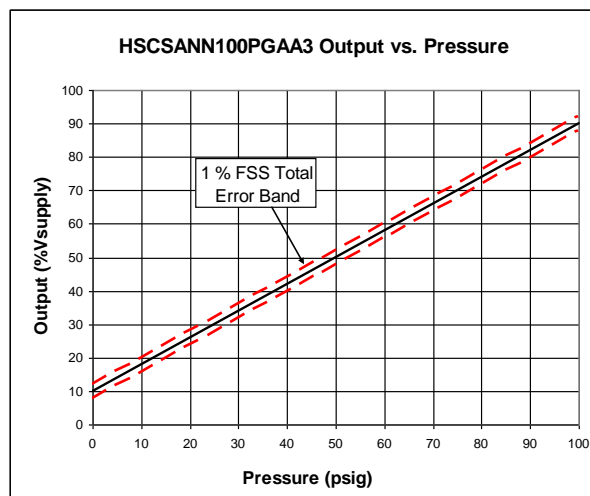


Figure 3. Completed Catalog Listing Example

HSCSANN100PGAA3: SIP, AN ports, no diagnostics, 100 psi gage sensor, 10 % to 90 % calibration at 3.3 V.



# TruStability™ Silicon Pressure Sensors: HSC Series—High Accuracy

**Table 5. Sensor Types**

Pressure Type	Description
Absolute	Output is proportional to the difference between applied pressure and a built-in reference to vacuum. $P_{min}$ is set at absolute zero pressure (full vacuum).
Compound	Output is proportional to the difference between applied pressure and atmospheric (ambient) pressure. $P_{min}$ is set at -15 PSI G, referenced to atmospheric pressure.
Differential	Output is proportional to the difference between the pressures applied to each port. (Port1 – Port2) 50% point of transfer function set at Port1 = Port2.
Gage	Output is proportional to the difference between applied pressure and atmospheric (ambient) pressure. $P_{min}$ is set at atmospheric pressure.

**Table 6. Pressure Range Specifications**

Pressure Range Order Code	Pressure Range		Over-pressure <sup>14</sup>	Burst Pressure <sup>15</sup>	Common Mode Pressure <sup>16</sup>	Long-term Stability (1000 hr, 25 °C [77 °F])
	$P_{min}$	$P_{max}$				
<b>Absolute</b>						
005AP	0 psi A	5 psi A	30 psi A	40 psi A	NA	±0.35 %
015AP	0 psi A	15 psi A	30 psi A	60 psi A	NA	±0.25 %
030AP	0 psi A	30 psi A	60 psi A	120 psi A	NA	±0.25 %
060AP	0 psi A	60 psi A	120 psi A	240 psi A	NA	±0.25 %
100AP	0 psi A	100 psi A	250 psi A	250 psi A	NA	±0.25 %
150AP	0 psi A	150 psi A	250 psi A	250 psi A	NA	±0.25 %
<b>Differential</b>						
001PD	-1 psi	1 psi	10 psi	10 psi	150 psi	±0.35 %
005PD	-5 psi	5 psi	30 psi	40 psi	150 psi	±0.35 %
015PD	-15 psi	15 psi	30 psi	60 psi	150 psi	±0.35 %
<b>Gage</b>						
001PG	0 psi	1 psi	10 psi	10 psi	150 psi	±0.35 %
005PG	0 psi	5 psi	30 psi	40 psi	150 psi	±0.35 %
015PG	0 psi	15 psi	30 psi	60 psi	150 psi	±0.35 %
030PG	0 psi	30 psi	60 psi	120 psi	150 psi	±0.35 %
060PG	0 psi	60 psi	120 psi	240 psi	150 psi	±0.35 %
100PG	0 psi	100 psi	250 psi	250 psi	250 psi	±0.35 %
150PG	0 psi	150 psi	250 psi	250 psi	250 psi	±0.25 %
<b>Compound</b>						
030PC	-15 psi	30 psi	60 psi	120 psi	150 psi	±0.25 %
060PC	-15 psi	60 psi	120 psi	240 psi	150 psi	±0.25 %
100PC	-15 psi	100 psi	250 psi	250 psi	250 psi	±0.25 %
150PC	-15 psi	150 psi	250 psi	250 psi	250 psi	±0.25 %

**Notes:**

- Overpressure: The maximum pressure which may safely be applied to the product for it to remain in specification once pressure is returned to the operating pressure range. Exposure to higher pressures may cause permanent damage to the product. Unless otherwise specified this applies to all available pressure ports at any temperature with the operating temperature range.
- Burst pressure: The maximum pressure that may be applied to any port of the product without causing escape of pressure media. Product should not be expected to function after exposure to any pressure beyond the burst pressure.
- Common mode pressure: The maximum pressure that can be applied simultaneously to both ports of a differential pressure sensor without causing changes in specified performance.

**Table 7. Pinout for All Port Styles**

Output Type	Pin 1	Pin 2	Pin 3	Pin 4
Analog	NC	$V_{supply}$	Output	ground

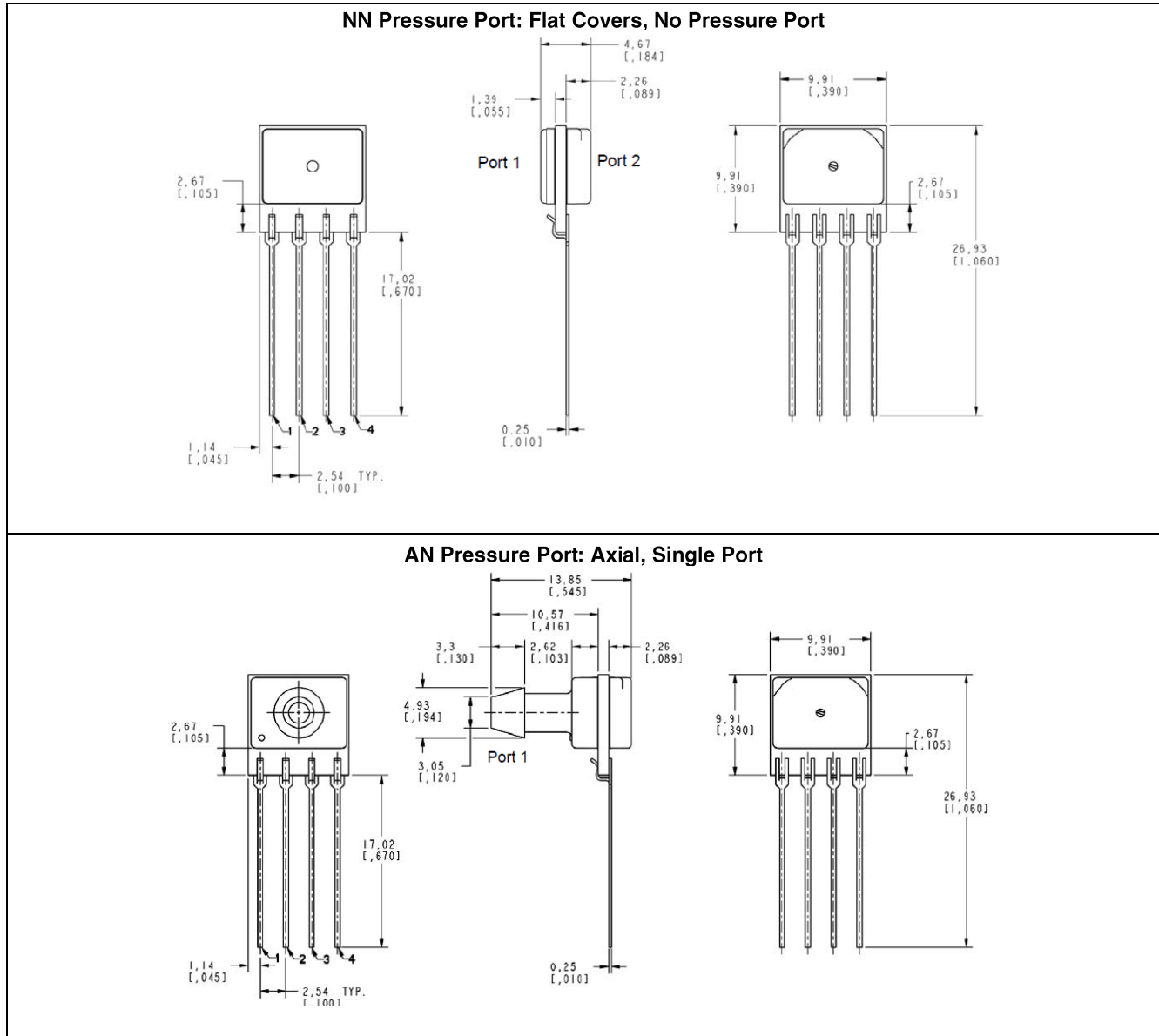


$\pm 1\%$  Total Error Band, SIP, Analog Output, 1 psi to 150 psi

**Figure 4. Package Dimensional Drawings**

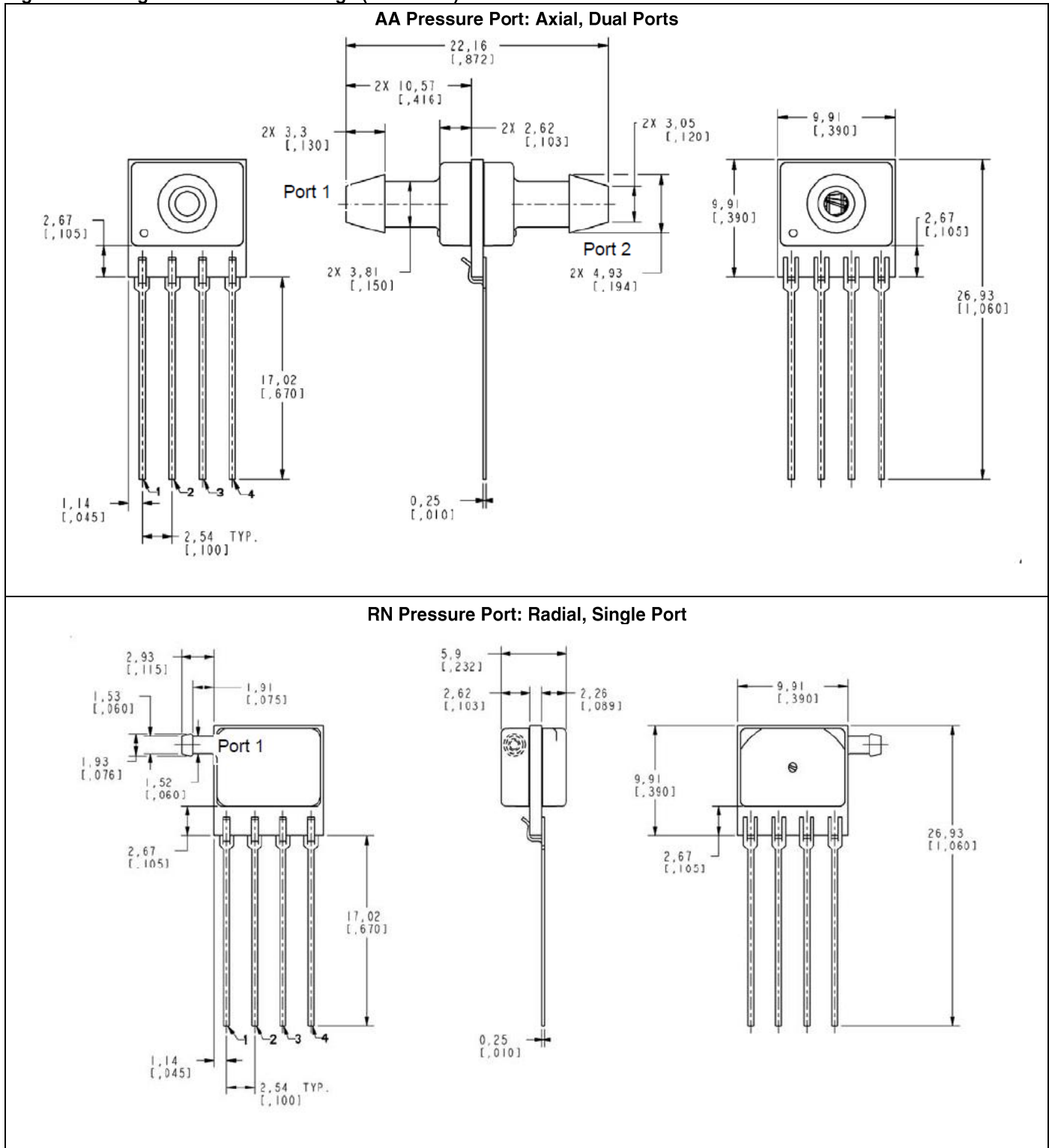
(For reference only: mm [in])

(Other package combinations are possible, please contact Honeywell Customer Service.)



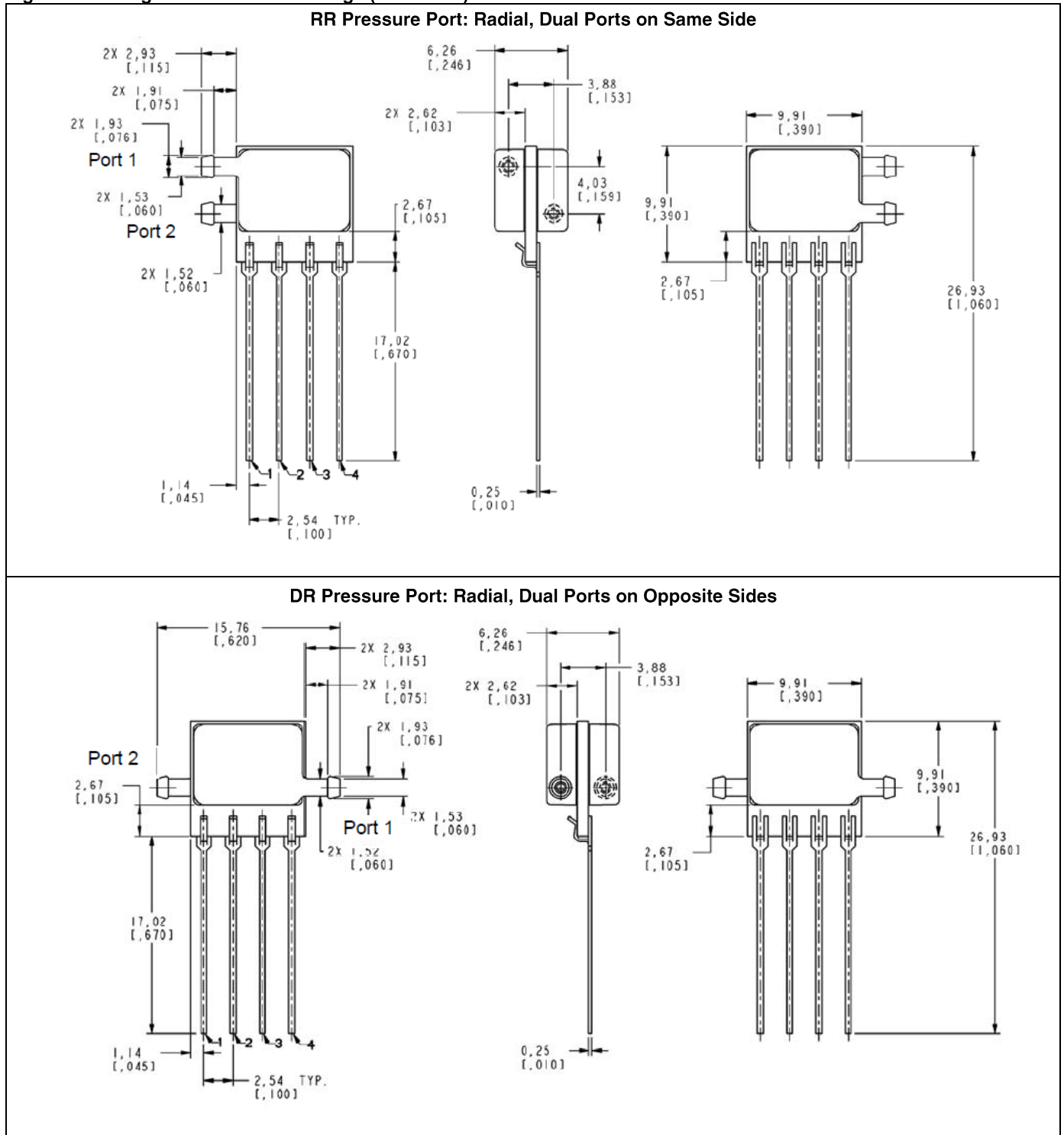
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Figure 4. Package Dimensional Drawings (continued)



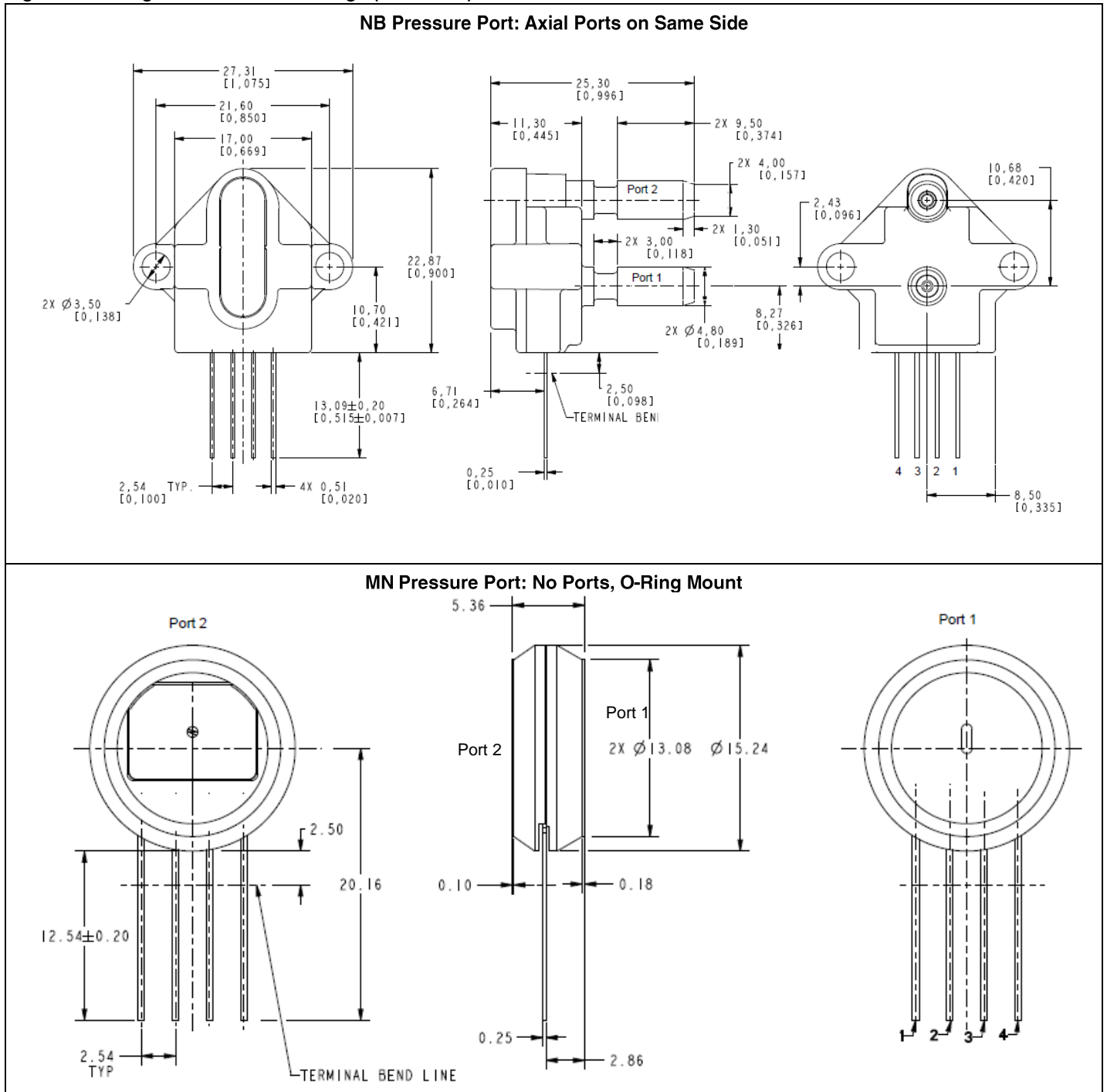
$\pm 1\%$  Total Error Band, SIP, Analog Output, 1 psi to 150 psi

Figure 4. Package Dimensional Drawings (continued)



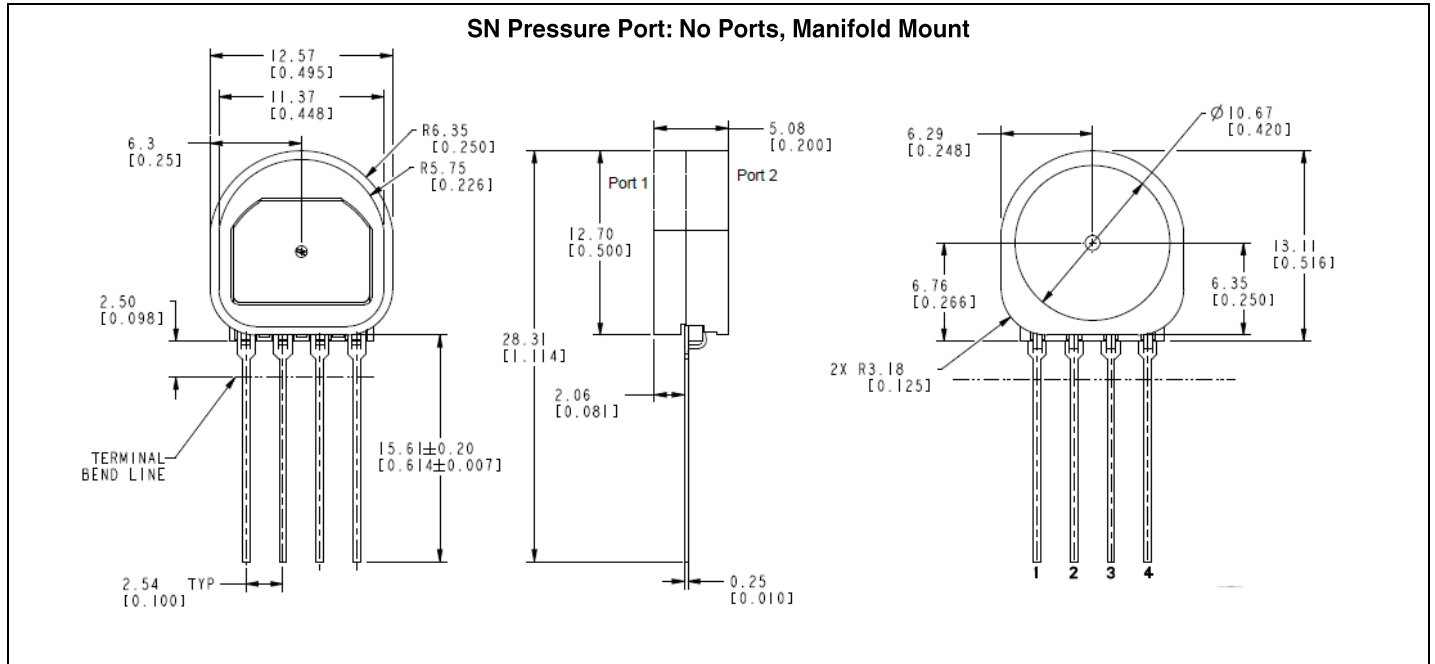
# TruStability™ Silicon Pressure Sensors: HSC Series—High Accuracy

Figure 4. Package Dimensional Drawings (continued)



±1 % Total Error Band, SIP, Analog Output, 1 psi to 150 psi

Figure 4. Package Dimensional Drawings (continued)



## **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.

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Sensing and Control

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