



# Installation Instructions for the Honeywell Force Sensors FSA Series Compensated/Amplified

**32311097**  
Issue B

**Table 1. Operating Specifications**

Characteristic	Analog			Digital			Unit
							
	Min.	Typ.	Max.	Min.	Typ.	Max.	
Supply voltage ( $V_{supply}$ ): <sup>1,2,3</sup> 3.3 Vdc 5.0 Vdc	3.0 4.75	3.3 5.0	3.6 5.25	3.0 4.75	3.3 5.0	3.6 5.25	Vdc
Supply current: 3.3 Vdc 5.0 Vdc	— —	2.0 2.6	— —	— —	2.8 3.9	3.9 4.6	mA
Power input	13			20			mW
Operating temperature range <sup>4</sup>	0 [32]	—	70 [158]	0 [32]	—	70 [158]	°C [°F]
Compensated temperature range <sup>5</sup>	5 [41]	—	50 [122]	5 [41]	—	50 [122]	°C [°F]
Storage temperature range	-40 [-40]	—	85 [185]	-40 [-40]	—	85 [185]	°C [°F]
Startup time (power up to data ready)	—	—	5	—	—	3	ms
Response time	—	1	—	—	0.42	0.84	ms
Clipping limit: upper lower	— 2.5	— —	97.5 —	— —	— —	— —	% $V_{supply}$
SPI/I <sup>2</sup> C voltage level: low high	— —	— —	— —	— 80	— —	20 —	% $V_{supply}$
Pull up on SDA/MISO, SCL/SCLK, SS	—	—	—	1	—	—	kOhm
Accuracy <sup>6</sup>	—	—	±3	—	—	±3	%FSS <sup>7</sup> BFSL
Total Error Band <sup>8</sup>	—	—	±5	—	—	±5	%FSS
Output resolution	—	—	—	12	—	—	bits
Long term stability <sup>9</sup>	—	±1.3	—	—	±1.3	—	%FSS

<sup>1</sup>Sensors are either 3.3 Vdc or 5.0 Vdc based on the catalog listing selected.

<sup>2</sup>Ratiometricity of the sensor (the ability of the device output to scale to the supply voltage) is achieved within the specified operating voltage.

<sup>3</sup>The sensor is not reverse polarity protected. Incorrect application of supply voltage or ground to the wrong pin may cause electrical failure.

<sup>4</sup>Operating temperature range: The temperature range over which the sensor will produce an output proportional to force.

<sup>5</sup>Compensated temperature range: The temperature range over which the sensor will produce an output proportional to force within the specified performance limits.

<sup>6</sup>Accuracy: The maximum deviation in output from a Best Fit Straight Line (BFSL) fitted to the output measured over the force range at 25°C [77°F]. Includes all errors due to force non-linearity, force hysteresis, and non-repeatability.

<sup>7</sup>Full Scale Span (FSS): The algebraic difference between the output voltage at full scale force and the output at zero force.

<sup>8</sup>Total Error Band (TEB): Combined error from calibration, accuracy and temperature effects over the compensated temperature range at 5.0 V from 15 %FSS to 95 %FSS.

<sup>9</sup>Long-term stability after 1000 hr of operation at 25°C [77°F].

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**Table 2. Environmental Specifications**

Characteristic	Parameter
Humidity	0% to 95% RH, non-condensing
Vibration	MIL-STD-202, Method 214, Condition 1E (16.9 G)
Shock	MIL-STD-202, Method 213, Condition F (1500 G)
Life <sup>1</sup>	1 million full scale force cycles minimum

<sup>1</sup>Life may vary depending on specific application in which the sensor is utilized.

**Table 3. Materials<sup>1</sup>**

Component	Material
Covers	high temperature polyamide
Plunger	stainless steel 316
Substrate	alumina, ceramic
Adhesives	epoxy, silicone
Electronic components	ceramic silicon, glass, solder

<sup>1</sup>Contact Honeywell customer service for detailed material information.

**Table 4. Absolute Maximum Specifications**

Characteristic	Min.	Max.	Unit
Supply voltage	-0.3	6.0	Vdc
Voltage on any pin	-0.3	$V_{\text{supply}} + 0.3$	V
Digital interface clock frequency:			
SPI	50	800	kHz
I <sup>2</sup> C	100	400	
ESD susceptibility (human body model)	2	–	kV
Storage temperature range	-40 [-40]	85 [185]	°C [°F]
Overforce limit	–	6804 [15]	g [lb]
Minimum operating voltage	2.8 Vdc		
Lead soldering time and temperature	4 s max. at 220°C [428°F]		

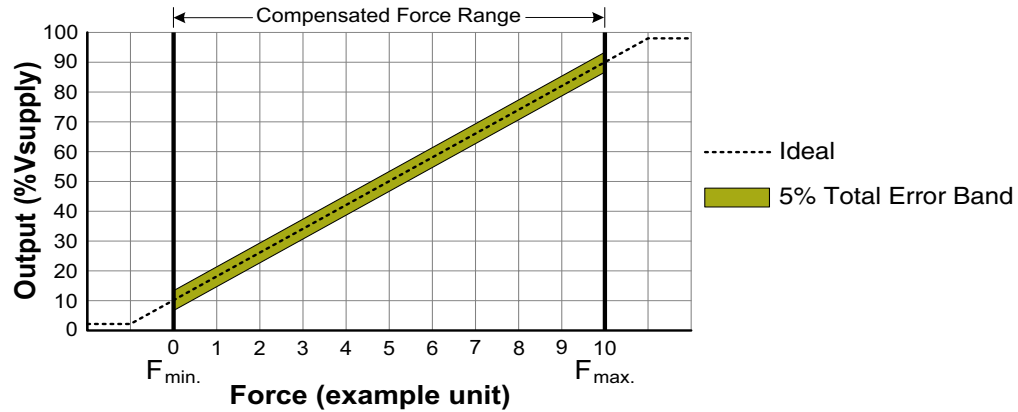
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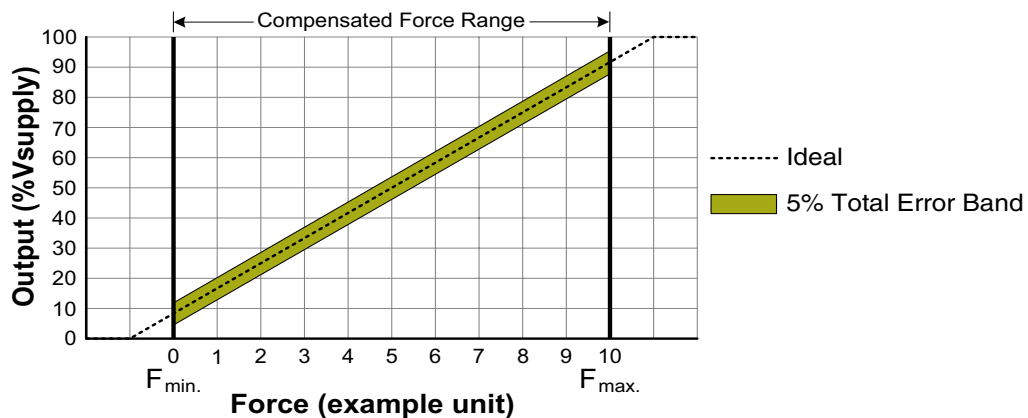
Figure 2. Transfer Function Limits<sup>1</sup>

### Analog Version



$$\text{Output (V)} = \frac{0.8 \times V_{\text{supply}}}{\text{Force range}} \times (\text{Force}_{\text{applied}}) + 0.10 \times V_{\text{supply}}$$

### Digital Version



$$\text{Output (\% of } 2^{14} \text{ counts)} = \frac{80\%}{\text{Force range}} \times (\text{Force}_{\text{applied}}) + 10\%$$

<sup>1</sup>Transfer Function "A" is shown. See Figure 1 for other available transfer function options.

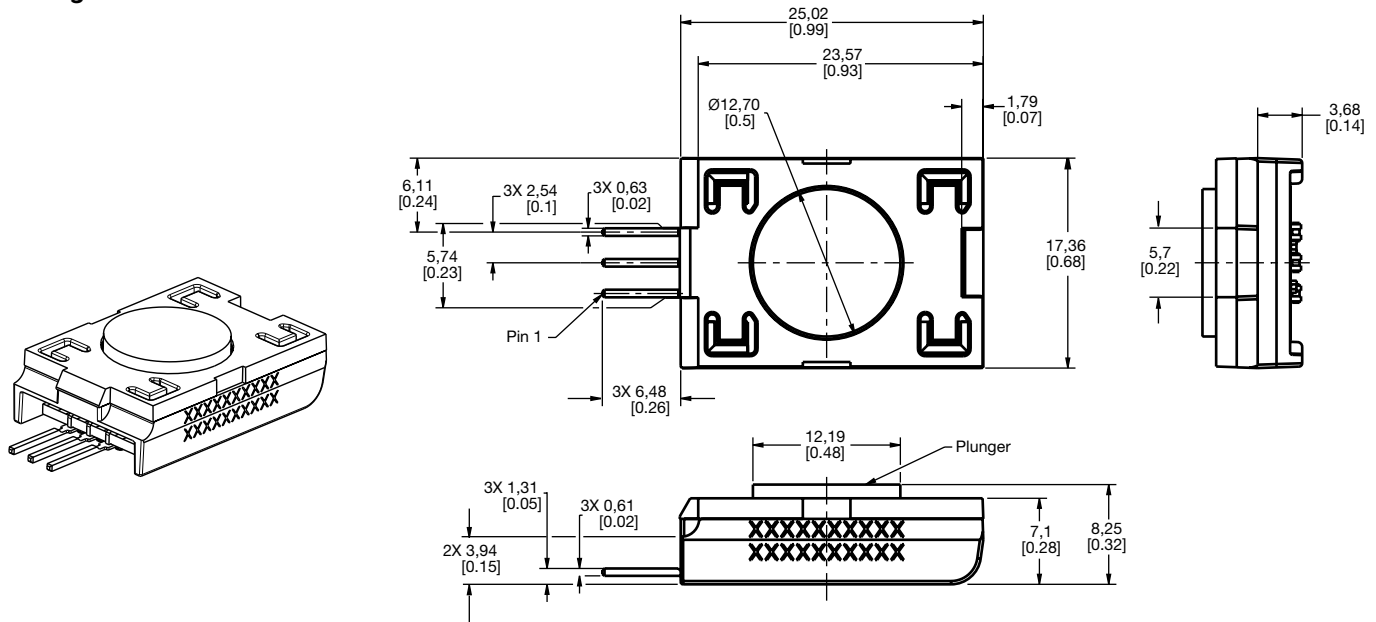
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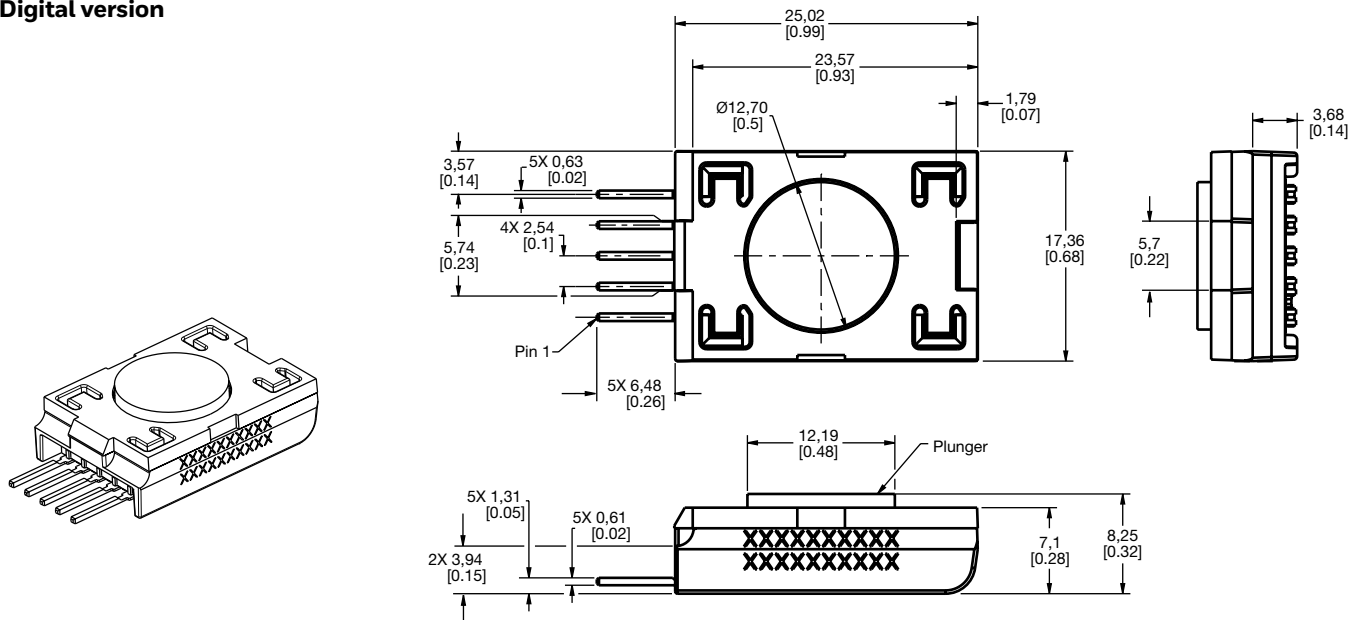
Figure 2. Mounting Dimensions (For reference only: mm/in.)

### Analog version



Function	Pin 1	Pin 2	Pin 3
analog	$V_{supply}$	Vout	GND

### Digital version



Function	Pin 1	Pin 2	Pin 3	Pin 4	Pin 5
SPI	GND	$V_{supply}$	SS	MISO	SCLK
I <sup>2</sup> C	GND	$V_{supply}$	N/C	SDA	SCL

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## **▲ 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.**

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### **Honeywell Sensing and Internet of Things**

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