



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}): ^{1,2,3} 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 ⁴	0 [32]	—	70 [158]	0 [32]	—	70 [158]	°C [°F]
Compensated temperature range ⁵	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 ² C voltage level: low high	— —	— —	— —	— 80	— —	20 —	% V_{supply}
Pull up on SDA/MISO, SCL/SCLK, SS	—	—	—	1	—	—	kOhm
Accuracy ⁶	—	—	±3	—	—	±3	%FSS ⁷ BFSL
Total Error Band ⁸	—	—	±5	—	—	±5	%FSS
Output resolution	—	—	—	12	—	—	bits
Long term stability ⁹	—	±1.3	—	—	±1.3	—	%FSS

¹Sensors are either 3.3 Vdc or 5.0 Vdc based on the catalog listing selected.

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

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

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

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

⁶Accuracy: 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.

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

⁸Total 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.

⁹Long-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 ¹	1 million full scale force cycles minimum

¹Life may vary depending on specific application in which the sensor is utilized.

Table 3. Materials¹

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

¹Contact 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 ² 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]		

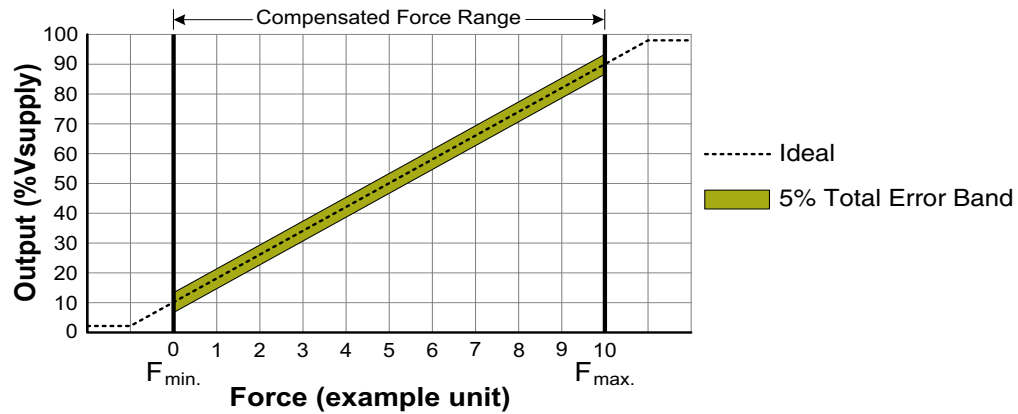
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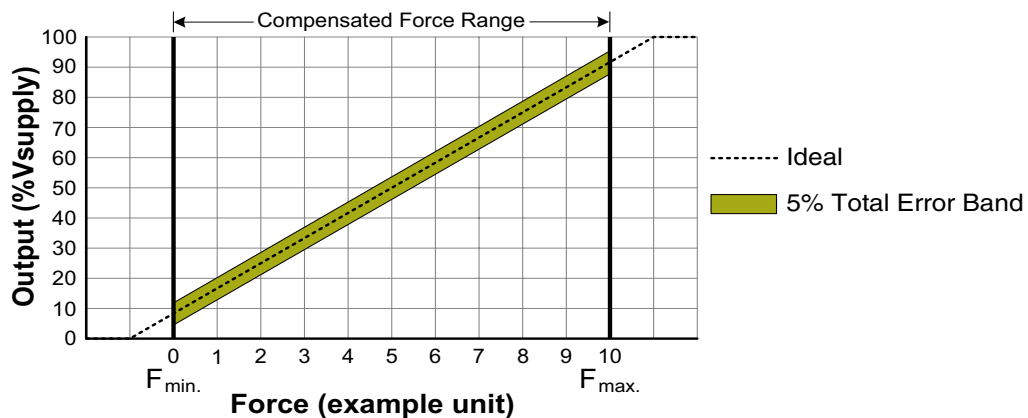
Figure 2. Transfer Function Limits¹

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



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

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

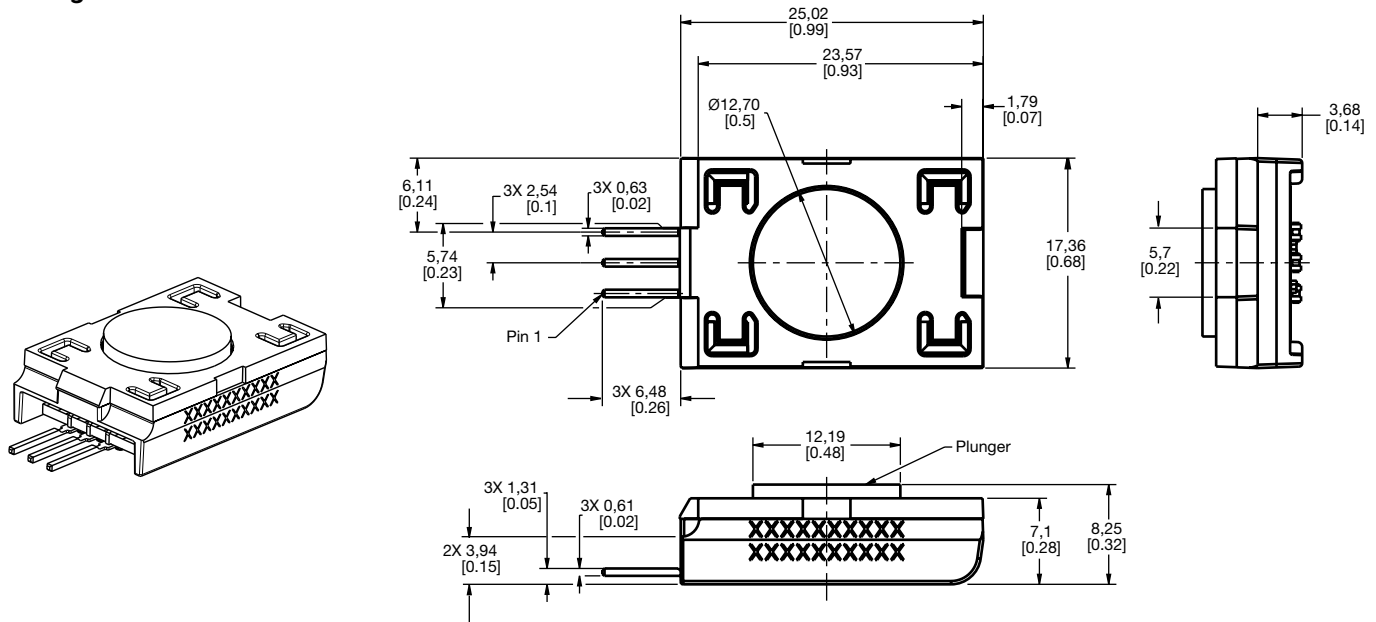
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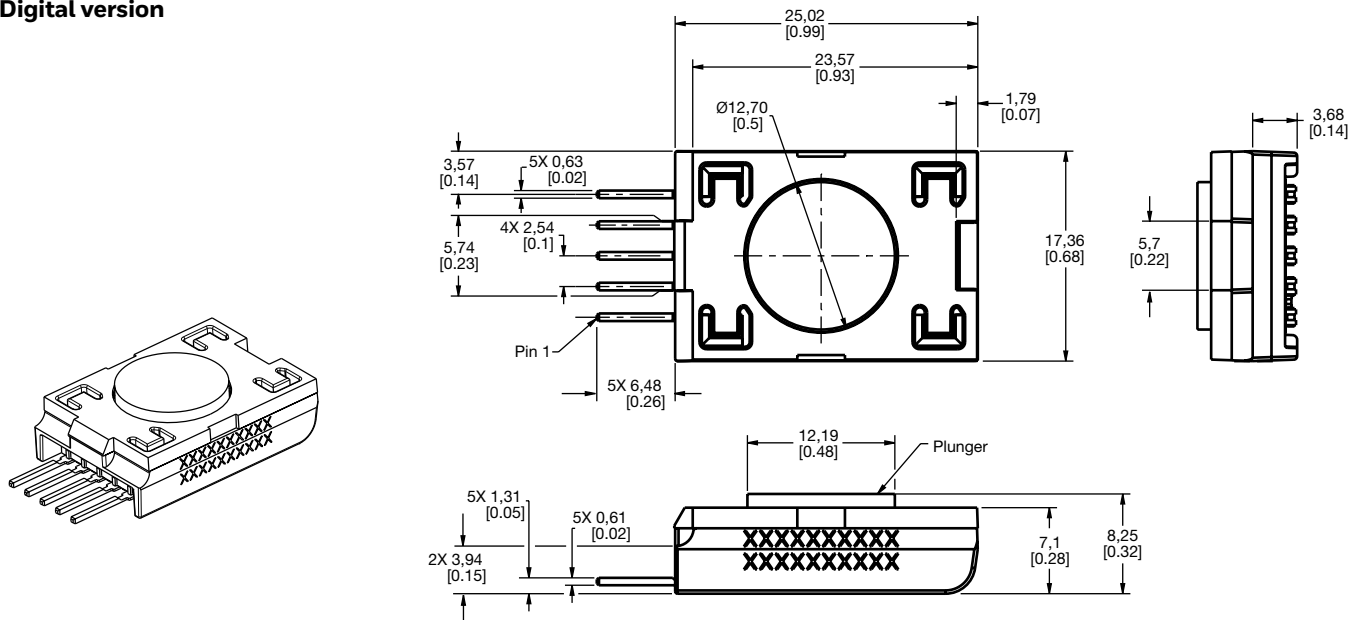
Figure 2. Mounting Dimensions (For reference only: mm/in.)

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 ² 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.

Warranty/Remedy

Honeywell warrants goods of its manufacture as being free of defective materials and faulty workmanship during the applicable warranty period. Honeywell's standard product warranty applies unless agreed to otherwise by Honeywell in writing; please refer to your order acknowledgment 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 that Honeywell, in its sole discretion, 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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