

## Force Sensors, FSA Series Compensated/Amplified

### An Application Note

#### Background

The FSA Series are piezoresistive-based force sensors offering a ratiometric analog or digital output for reading force over the specified full scale force span and temperature range. They are fully calibrated and temperature compensated for sensor offset, sensitivity, temperature effects, and nonlinearity using an on-board Application Specific Integrated Circuit (ASIC). Direct mechanical coupling allows for easy interface with the sensor, coupling with tubing, membrane or a plunger, providing repeatable performance and a reliable mechanical interface to the application. The package also provides excellent corrosion resistance and isolation to external package stress. All products are designed and manufactured according to ISO 9001 standards. (See Table 1.)

#### Solutions


Honeywell's FSA Series are a modular range of force sensors designed for potential use in certain medical and industrial applications to measure fluid pressure through the customer-supplied disposable tubing. Potential applications include:

- Medical: Ambulatory non-invasive pump pressure, infusion pumps, kidney dialysis machines, occlusion detection
- Industrial: Load and compression sensing

#### Customer Benefits

- Overforce (6804 g [15 lb]): Provides adequate overforce protection which reduces field life warranty failures and extends sensor life in the application.
- Accuracy and resolution: The digital output provides an output range better calibrated to system needs.
- Linearity: Improves system performance allowing operation with lower preloads.
- Precise sensor height:
  - The plunger interface can directly couple to customers' tubing, reducing the amount of their interface work.
  - The product's mechanical plunger works with a very sensitive gel-coupled sense die that can detect very small forces.
  - The durable plunger interface and good overforce allow customers to place the sensor directly into their applications.
- Total Error Band ( $\pm 5\%$  FSS): Clear and meaningful measurement that provides the sensor's true performance over a compensated range thereby improving system accuracy.
- Diagnostics functionality: Detects most internal failures. The sensor should never have a randomly drifting output in its normal active range.

Table 1. FSA Series

FSA SERIES	FEATURES
	<ul style="list-style-type: none"> <li>• Wide variety of force ranges:                     <ul style="list-style-type: none"> <li>- Newton (N): 5, 7.5, 10, 15, 20, 25</li> <li>- pound (lb): 1, 1.5, 2, 3, 5</li> <li>- gram (g): 500, 750</li> <li>- kilogram (kg): 1, 2</li> </ul> </li> <li>• Total Error Band: <math>\pm 5\%</math> FSS</li> <li>• Accuracy: <math>\pm 3\%</math> FSS</li> <li>• Ratiometric analog or SPI- or I2C-compatible digital output</li> <li>• Fully calibrated and temperature compensated over a temperature range of 5°C to 50°C [41°F to 122°F]</li> <li>• Overforce: 6804 g [15 lb]</li> <li>• Supply voltage: 3.3 Vdc typ. or 5.0 Vdc typ.</li> <li>• Low power consumption: 13 mW (analog) or 20 mW (digital)</li> <li>• Excellent part-to-part repeatability</li> <li>• Enhanced reliability</li> <li>• Stable interface plunger</li> <li>• Internal diagnostic functions available</li> <li>• REACH and RoHS compliant</li> </ul>

## **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.**

While Honeywell may provide application assistance personally, through our literature and the Honeywell web site, it is buyer's sole responsibility 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 writing. However, Honeywell assumes no responsibility for its use.

## **For more information**

To learn more about Honeywell's sensing and switching products, call 1.800.537.6945, visit [sensing.honeywell.com](http://sensing.honeywell.com), or e-mail inquiries to [info.sc@honeywell.com](mailto:info.sc@honeywell.com)

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