

## Application Note

### Basic Force Sensors, TBF Series, Compensated/Unamplified 1 bar to 10 bar | 100 kPa to 1 MPa | 15 psi to 150 psi Millivolt Analog Output

#### Background

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Honeywell's TBF Series Force Sensors are small flush diaphragm pressure sensors designed for customers who require a simple device for applications where media compatibility and low trapped volume are important. The TBF Series has a precisely controlled diaphragm height, making these products useful in applications where force is applied by a flexible membrane to the sensor, such as infusion pumps. The sensor is internally unamplified, providing infinite resolution and allowing customers to do their own amplification in order to make use of the maximum resolution of the bare sensor output, leveraging any algorithm needed for the application. The sensor is internally temperature compensated and calibrated.

#### Solutions

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##### POTENTIAL MEDICAL APPLICATIONS

###### Infusion/Syringe Pumps and Ambulatory Infusion Pumps

- **Description:** An external infusion/syringe pump is a medical device used to deliver medication or fluids to a patient intravenously in a controlled manner, typically for stationary use at a patient's bedside. Others, called ambulatory infusion pumps, are designed to be portable or wearable to give the patient a greater degree of freedom and to enable patients to receive medication in their homes. The infusion pump's syringe drivers use spring- or gas-powered mechanisms that provide a relatively constant force to the plunger, creating a constant pressure for medication and fluid delivery.
- **Function in application:** May be used as an occlusion detector to ensure there isn't a blockage in the pump's tube that delivers the medication or fluid to the patient. If the tube becomes blocked, the sensor alerts the patient, nurse, or doctor via an audible alarm that the therapy isn't being delivered.
- **Benefits:**
  - **Accurate:** Assures the patient that the medication/fluid being delivered, as set by the physician and operated correctly by the patient, is accurate.
  - **Easy to design in:** Small package size is smaller than most board mount force sensors, simplifying placement on the printed circuit board (PCB).
  - **Easy to use:** The force sensor is external to the tubing (media isolated), minimizing the need for the tubing to be sterilized or re-sterilized after each use.

- **Enhances the patient's therapy and safety:** Informs the operator when the medication/fluid reservoir is empty, or whether a clot has formed in the catheter.
- **Energy efficient:** Low power reduces power consumption, helping to extend battery life and reduce energy costs, which is beneficial in battery-operated devices such as ambulatory infusion pumps.
- **Enhances patient safety:** The force sensor's sensitivity enables early detection of occlusion of the tubing, enhancing patient safety.
- **Stable:** Ability to detect occlusion accurately over time assures the patient that the readings are accurate.
- **Temperature compensation:** Allows for accurate measurements in changing environments.

For more information about Honeywell's sensors that may potentially be used in infusion pumps, [see our application note](#).

###### Kidney Dialysis

- **Description:** Kidney dialysis machine treatments replace some kidney functions by removing waste and fluid from the bloodstream via diffusion and osmosis of solutes and fluid across a semi-permeable dialysis membrane. Blood in one compartment is pumped along one side of the membrane while a dialysate (a crystalloid solution that acts as a sponge for impurities) is pumped along the other side, in a separate compartment, in the opposite direction. Ultra filtration occurs by increasing the hydrostatic pressure across the membrane by applying a negative pressure to the dialysate compartment of the dialyzer. This pressure gradient causes water and dissolved solutes to move from the blood to the dialysate. The cleansed blood returns via the circuit back to the body.
- **Function in application:** May be used to detect the presence or absence of a fresh dialysate cartridge before the dialysis machine can be used. May be used to monitor the flexible tubing pressure of the dialysate to detect whether the pressure exceeds a specified level. May be used to monitor the weight of the dialysate to detect whether there is a sufficient amount of dialysate in the fresh dialysate cartridge.

# Application Note


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• Benefits:

- Accurate: Assures the operator that the dialysate tubing pressure readings and dialysate weight readings are accurate.
- Easy to design in: Small package size is smaller than most board mount force sensors, simplifying PCB placement.
- Energy efficient: Low power reduces power consumption, helping to extend battery life and reduce energy costs.
- Sensitive: Enhanced sensitivity to force changes enables early detection of occlusion of the flexible tubing, enhancing patient safety.

- Stable: Ability to detect occlusion accurately over time assures the operator of accurate dialysate readings.
- Temperature compensation: Allows for accurate measurements in changing environments.

For more information about Honeywell's sensors that may potentially be used in kidney dialysis machines, [see our application note](#).

TBF Series	Features
	<ul style="list-style-type: none"><li>• Cost-effective with many options</li><li>• Compensated/unamplified</li><li>• Durable</li><li>• Tight accuracy [<math>\pm 0.15</math> %FSS]</li><li>• Wide operating temperature range (0 °C to 50 °C [32 °F to 122 °F])</li><li>• Low power consumption</li><li>• Not sensitive to mounting orientation</li><li>• Small package size [7 mm x 7 mm x 3,89 mm]</li><li>• Stable offset voltage</li><li>• RoHS2 compliance</li></ul>

### Find out more

To learn more about Honeywell Sensing and Productivity Solutions' 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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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.

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008303-1-EN IL50  
January 2016  
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