Infusion pumps are medical devices that deliver fluids, such as nutrients and medications, into a patient’s body in controlled amounts. They are commonly used in hospital intensive care units and wards, but smaller portable infusion pumps are now being used to treat patients at home. These devices offer significant advantages over manual administration of fluids, including the ability to deliver fluids in very small volumes, and the ability to deliver fluids at precisely programmed rates or automated intervals.

There are many types of infusion pumps, including large volume, patient-controlled analgesia (PCA), syringe, enteral and insulin pumps. Some are designed mainly for stationary use at a patient’s bedside. Others, called ambulatory infusion pumps, are designed to be portable or wearable.

**BACKGROUND**

**SOLUTIONS**

Honeywell sensor and switch solutions are designed to enhance the performance and reliability of infusion pumps, monitor the delivery of fluids, medicines and nutrients to the patient and ensure the safe administration of the treatment to the patient (See Figure 1).

**SOLUTIONS FOR INFUSION PUMP APPLICATIONS**

- Force Sensors
- Pressure Sensors – Board Mount
- Magnetic Position Sensor ICs
- Basic and AML Switches
- Subminiature Load Cells
- Barcode Scan Engines & Software
FORCE SENSORS

*MicroForce FMA Series; FSA, FSG, FSS Series; TBF Series; 1865 Series*

**Functions/Actions**

- Monitor the delivery of fluids, medicines or nutrients to the patient
- Detect blockages and determine when the bag containing fluids or nutrients needs to be changed

Honeywell force sensors (see Table 1) are typically used within infusion pumps to monitor and control the delivery of fluids, medicines or nutrients to patients. They are used in a non-invasive manner and require no disinfection or sterilization before reuse.

**TABLE 1. FORCE SENSORS FEATURES**

<table>
<thead>
<tr>
<th>MICROFORCE FMA SERIES</th>
<th>TBF SERIES</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Amplified and temperature compensated</td>
<td>• Unamplified and temperature compensated</td>
</tr>
<tr>
<td>• Small form factor: 5 mm x 5 mm [0.20 in x 0.20 in]</td>
<td>• Analogue (mV) output</td>
</tr>
<tr>
<td>• Digital output (I²C/SPI) simplifies new designs</td>
<td>• Liquid media compatibility</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>FSA, FSG, FSS SERIES</strong></td>
<td>1865 SERIES</td>
</tr>
<tr>
<td>• Wide variety of force ranges</td>
<td>• Unamplified and temperature compensated</td>
</tr>
<tr>
<td>• Analogue or digital (I²C/SPI) output</td>
<td>• Analogue (mV) output</td>
</tr>
<tr>
<td>• Large coupling area simplifies integration within application</td>
<td>• Liquid media compatibility</td>
</tr>
</tbody>
</table>
**PRESSURE SENSORS – BOARD MOUNT**

*Basic ABP/ABP2 Series; MicroPressure MPR Series*

**Function/Action**
- Positioned in non-invasive location if peristaltic pump is used to control pressure to the pneumatic pincher rollers

Honeywell’s board mount pressure sensors (see Table 2) can be used to monitor and control the peristaltic pump. Board mount pressure sensors provide high performance with low drift over time. The small form-factor, low-power consumption supports smaller portable designs and the digital simplifies the design of new equipment.

Honeywell board mount pressure sensors are extensively used within medical equipment due to high levels of accuracy, sensitivity and reliability.

**TABLE 2. PRESSURE SENSORS – BOARD MOUNT FEATURES**

**BASIC ABP/ABP2 SERIES**
- Pressure range 5 mbar to 25 bar
- Measures absolute, gage and differential
- Amplified and temperature compensated
- Analogue or digital (I²C/SPI) output
- Supports liquids and dry gases

**MICROPRESSURE MPR SERIES**
- Pressure range 60 mbar to 2.5 bar
- Measures absolute and gage
- Amplified and temperature compensated
- Digital (I²C/SPI) output (24-bits)

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**MAGNETIC POSITION SENSOR ICS**

Hall-Effect: SS490; SS360NT, SS360ST, SS460S; Micropower SL353; or Magnetoresistive: Nanopower Series

**Function/Action**
- Monitor placement of tube in pump cavity to ensure proper orientation along with pump motor speed control

Hall-effect position sensor ICs (see Table 3) are designed to provide reliable, accurate output for smooth motor control that reduces noise and vibration in the machine’s motor assembly and improves its efficiency.

The high reliability reduces repair and maintenance costs, and its small size simplifies new designs. A thermally-balanced integrated circuit provides consistent operation over the full temperature range.

**TABLE 3. MAGNETIC POSITION SENSORS FEATURES**

**SS490**
- Quad Hall-effect design
- Unipolar, bipolar or latching
- Optimized slope compensation
- Wide temperature range

**SS360/SS460**
- Fast response time
- High sensitivity
- Latching magnetics

**MICROPOWER SL353**
- Energy efficient
- Non-chopper stabilized design
- Omnipolar sensing, activates with either magnetic pole

**NANOPOWER SERIES**
- High sensitivity
- Ultra-low power consumption
- Omnipolar sensing, activates with either magnetic pole
BASIC AND AML PUSHBUTTON SWITCHES

V15W, ZD, ZW Series, AML Series

Function/Action
- Used as on/off operator controls, as well as detection for covers, panels and doors

Honeywell MICRO SWITCH basic switches (see Table 4) can be used as on/off operator controls. Micro Switch basic switches can also be used as presence/detection for covers, panels and doors acting as a fail-safe to prevent switching the machine when doors/panels are ajar. Several series are sealed to protect against fluids.

MICRO SWITCH AML Series are available as pushbuttons, key switches and rockers/paddles. They are often used in medical equipment as off/on operator controls on the external face of the equipment.

LOAD CELLS – SUBMINIATURE

Models 31 and 11

Function/Action
- Monitor the weight of the IV bag to determine the volume of fluid remaining

Honeywell’s subminiature load cells (see Table 5) are designed to fit into systems with limited space or tight clearances. Constructed of rugged stainless steel for precise measurements and excellent long term stability and reliability. These load cells are designed to eliminate or reduce to a minimum the effect of off-axis loads.

TABLE 5. SUBMINIATURE LOAD CELLS FEATURES

MODEL 31 AND 11
- Accuracies of 0.25 % to 0.80 % full scale
- Offers load ranges from 150 g up to 1,000 lb
- Miniature and subminiature size
- mV/V output
- Stainless steel
- Single/double diaphragm construction

BARCODE SCAN ENGINES & SOFTWARE

N670X & N660X, SwiftDecoder™

Function/Action
- Ensure the right treatment is administered to the right patient by reading the barcodes on the IV bag and on the patient wrist band

Honeywell barcode scan engines, modules and decoding software (see Table 6) are used in medical applications to help improve patient safety and enhance operational effectiveness. Integrating Honeywell barcode reading OEM solutions supports automated, more accurate and faster tracking of patient and caregiver IDs, ensuring the right medication, treatment and equipment match the right patient, and tracking and validating sample IDs and associated information in the work flow.

TABLE 6. SCAN ENGINES AND SOFTWARE FEATURES

N670X, N660X SERIES SCAN ENGINES
- Small form-factor
- Wider operational temperature range
- Available with SR or HD optics
- Parallel or MIPI interface
- Low power consumption

SWIFTDECODER™ SOFTWARE
- Faster barcode scanning
- High accuracy and repeatability
- Reads damaged/poor quality barcodes
- Omni-directional
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 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 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.

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USA/Canada +302 613 4491
Latin America +1 305 805 8188
Europe +44 1344 238258
Japan +81 (0) 3-6730-7152
Singapore +65 6355 2828
Greater China +86 4006396841