



Success Stories for Potential Medical Applications

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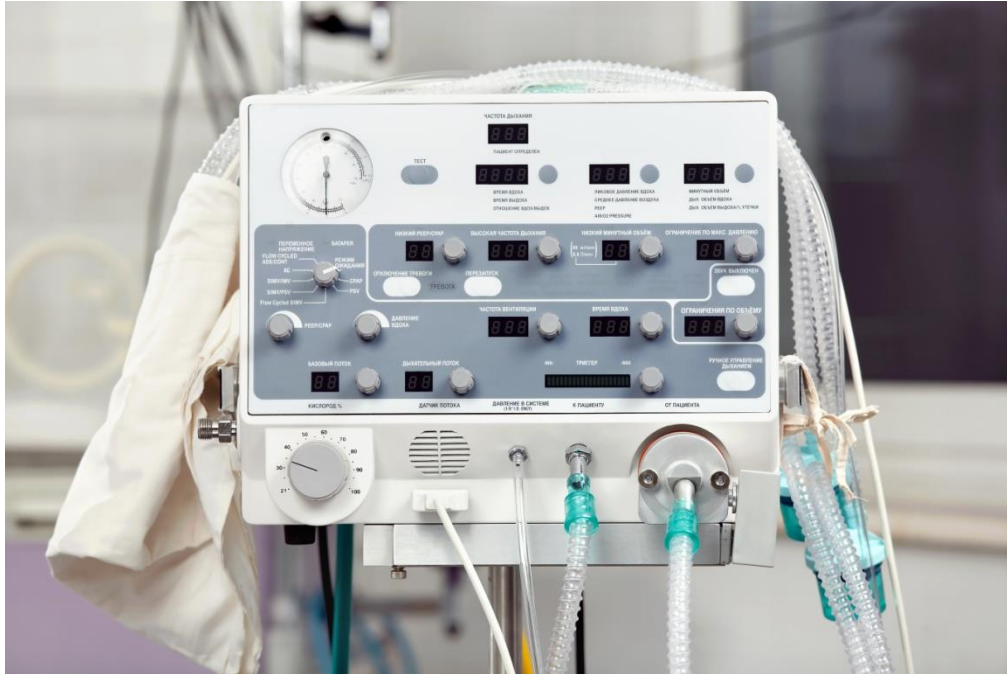
Honeywell

Success Story: TruStability[®] Pressure Sensors for Ventilators

Customer	Ventilator company	Honeywell (HON) Product	TruStability [®] Ultra-Low Pressure Board Mount Pressure Sensors
Location	North America	Task That HON Product Performs in This Application	Pressure sensor to detect changes in the patient's breathing
Vertical / Sub-Vertical	Medical / Respiratory	Size of Win	\$870K over 5 years
Application	Ventilator breathing detection	Sales Person(s), Organization	Tricia Lee, Honeywell

Describe the application	<ul style="list-style-type: none"> In a ventilator, it is important to be able to determine when the patient is inhaling versus exhaling. The device should work with the patient, not against them. To gauge that the ventilator is not pushing air into the patient when the patient is trying to exhale, a pressure sensor is used to detect small pressure changes that signal the patient is ready to exhale.
What were the key requirements driving sensor selection?	<ul style="list-style-type: none"> The sensor must be able to accurately measure pressure below 1 in H₂O and be stable over time.
Describe the Honeywell solution and benefits. What alternatives were evaluated?	<ul style="list-style-type: none"> The customer had tried pressure sensors from two different competitors. The Honeywell TruStability[®] ULP sensor outperformed the competitors in accuracy and stability. The TruStability[®] ULP was truly a “door opener” and once the sensor was tested by the customer, no other competitive sensors were evaluated.
Other factors that contributed to winning this opportunity?	<ul style="list-style-type: none"> The Sales team clearly understood the customer's application and the importance of accuracy and stability for the ventilator. The customer tends to leverage sub-systems across multiple platforms, so additional NBO's are anticipated on other platforms.

Success Story: TruStability[®] Pressure Sensors for Ventilators



- Higher performance ventilators use pressure sensors to determine when the patient transitions from inhalation to exhalation.
- The ventilator responds by working with the patient's natural breathing cadence.
- The Honeywell TruStability[®] ULP pressure sensor has industry leading accuracy and stability, making it suitable choice for this application.



Success Story: ULP TruStability® Board Mount Pressure Sensor for New Spirometer Design

Customer	Spirometer manufacturer	Honeywell (HON) Product	TruStability® Pressure Sensor, HSC and SSC Series; Honeywell HumidIcon™ Digital Humidity/Temperature Sensor, HIH6130 Series
Location	EMEA - Northern	Task That HON Product Performs in This Application	Measuring airflow using differential pressure in pressurized tube and measuring humidity
Vertical / Sub-Vertical	Medical / Respiratory	Size of Win	\$1.3M over 5 years
Application	Flow and pressure detection for lung function testing	Sales Person(s), Organization	Risto Rennie, Honeywell

Describe the application	<ul style="list-style-type: none"> Measuring lung function through lung volume taken from the patient's exhalation. Flow is measured using a proprietary flow transducer (tube) which creates a differential pressure which is, in turn, measured by a differential pressure sensor – the flow can vary from 10ml to 20l/s.
What were the key requirements driving sensor selection?	<ul style="list-style-type: none"> The accuracy of the spirometer measurement is affected by temperature, humidity and barometric pressure. The customer wanted to have the data measured and automatically entered in the system for calculation of results. Results are affected by very small effects, e.g., noise, linearity vs. position, the effect of light on the sensor, and stability of null over 30 second period. The customer was concerned with variations down to ±0.1Pa.
Describe the Honeywell solution and benefits. What alternatives were evaluated?	<ul style="list-style-type: none"> High stability and accuracy of the TruStability® pressure sensor: the customer's main concern was null drift over 30 s period of measurement time, shifts and drifts that occur during the turn on and warm-up of the sensor, and the sensor's sensitivity to mechanical and thermal influence. In addition, the customer wanted to upgrade to a 12 mbar for 8 mbar. GE NPA integrated sensor was also evaluated, as well as the incumbent, AllSensors. A key benefit was the very good performance of the TruStability® pressure sensor during testing: stability, drift, calibration, etc.
Other factors that contributed to winning this opportunity?	<ul style="list-style-type: none"> Exceptional execution on NBO from the Sales team; excellent cooperation between Sales, application support, and engineering; samples delivered in good time; samples performed well in test. Risto Rennie identified the customer proactively and orchestrated multiple successful visits to the customer with the right internal experts and generated access to the decision-makers.

Success Story: TruStability® ULP Board Mount Pressure Sensor for New Spirometer Design



HSC Series
Pressure Sensor



SSC Series
Pressure Sensor



HIH6130
Digital Humidity/
Temperature Sensor

- In a spirometer, the disposable tube converts the flow to a differential pressure.
- This pressure is measured by the Honeywell TruStability® pressure sensor.
- The measured differential pressure is converted to an equivalent flow rate which is integrated to determine the total flow.

Success Story: TruStability® Board Mount Pressure Sensor in Breath Alcohol Testing Device

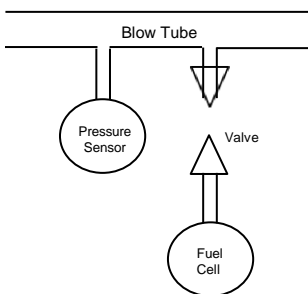
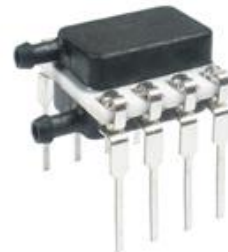
Customer	Manufacturer of SpO2 cells and analyzers, as well as specialized breathalyzers for police and safety applications	Honeywell (HON) Product	TruStability® Board Mount Pressure Sensor, HSCMRRN016MGAA3
Location	Germany	Task That HON Product Performs in This Application	Measures pressure in the tube where breath flows to determine pressure and volume of breath
Vertical / Sub-Vertical	Medical / Respiratory	Size of Win	\$375K over 5 years
Application	Differential pressure for gas volume and pressure measurement	Sales Person(s), Organization	Helmut Kinzel, Honeywell Olaf Seelbach, Honeywell

Describe the application	<ul style="list-style-type: none"> • Electric pressure sensors in the tube are used to determine pressure of the exhaled breath to make sure that a “deep lung” sample is measured and not just mouth alcohol; also used to determine the volume of breath.
What were the key requirements driving sensor selection?	<ul style="list-style-type: none"> • The accuracy of the analysis is dependent on the fact that deep lung air needs to be sampled in sufficient quantity. • Accuracy and calibration are extremely important for a device used in the field as a handheld device. Additionally important are the possibility of drift and the need for re-calibration that causes downtime. • The sensor needed to be integrated in an electric circuit board.
Describe the Honeywell solution and benefits. What alternatives were evaluated?	<ul style="list-style-type: none"> • High stability and accuracy of the TruStability® pressure sensor made it an excellent fit for the application—the sensor provides little drift or need for re-calibration. • The customer used Freescale/Motorola on their older models, but is said to have had performance issues with the Freescale sensor. • The customer selected the Honeywell sensor because of our long-term engagement on new business development, as well as the relationship-building with the customer on all levels. • Honeywell’s sample delivery and application support was extremely responsive. Multiple part numbers were considered and the best fit was sent to the customer for testing, which produced very good results.
Other factors that contributed to winning this opportunity?	<ul style="list-style-type: none"> • Working together as ‘One Honeywell’

Success Story: TruStability® Board Mount Pressure Sensor in Breath Alcohol Testing Device



Example of the EnviteC, a Honeywell Breathalyzer



The flow through the blow tube is monitored by the pressure sensor. When it is within the desired range, the valve is opened and a sample of the breath is analyzed.

- Alcohol is not metabolized upon absorption and thus arrives with the bloodstream in the lungs, where some alcohol crosses over into the alveoli and is exhaled in a fixed proportion of breath alcohol to blood alcohol (BAC) of 2,100:1.
- Independent of which principle is used to titrate the alcohol concentration in the breath, each device has a mouthpiece, a tube through which the suspect blows air, and a sample chamber where the air goes.
- Electronic measuring devices have been developed to measure breath alcohol concentration using a fuel cell gas sensor that is specific to alcohol molecules, where air flows past one side of the fuel cell and the platinum oxidizes any alcohol molecules in the air to produce acetic acid, protons, and electrons, which can be measured as electric current.

Success Story: Next Gen Hall-effect Sensors for Syringe Infusion Pumps

Customer	Infusion pump manufacturer	Honeywell (HON) Product	SS351AT Omnipolar Hall-effect
Location	Latin America	Task That HON Product Performs in This Application	Syringe size and cabinet door detection
Vertical / Sub-Vertical	Medical / Infusion pumps	Size of Win	\$125K over 5 years
Application	Syringe size and cabinet door detection	Sales Person(s), Organization	Karina Cezar, Honeywell

Describe the application	<ul style="list-style-type: none"> • Various sizes of syringes can be used in a syringe pump. The algorithms used for accurate fluid delivery require knowing the syringe size. The customer uses a lever to contact the syringe and the location of the lever correlates to the syringe size. Four SS351AT Omnipolar Hall IC's are used to detect the lever position. • One additional sensor is used to detect the system door opening/closing.
What were the key requirements driving sensor selection?	<ul style="list-style-type: none"> • Unipolar sensing was needed. The customer was currently using a competitive part and needed a sensor that met the required specifications.
Describe the Honeywell solution and benefits. What alternatives were evaluated?	<ul style="list-style-type: none"> • Honeywell's SS351AT is an Omnipolar sensor. This sensor works like a unipolar sensor with the additional benefit of working with either pole of the magnet. This means that during the manufacturing process, the customer would not need to identify the poles of the magnet, thereby increasing quality and saving time and money. • In addition, the sensor performed better in the application than the incumbent sensor.
Other factors that contributed to winning this opportunity?	<ul style="list-style-type: none"> • The incumbent sensor had poor delivery performance. • Honeywell had a great relationship with the customer due to other business (force sensors) with the customer.

Success Story: Next Gen Hall-effect Sensors for Syringe Infusion Pumps



- Four SS351AT Series Omnipolar Hall-effect Sensors are used to determine the syringe size by determining the position of a lever against the syringe body.

Success Story: Optical Position Detection in Diagnostics

Customer	Diagnostic equipment manufacturer	Honeywell (HON) Product	Optical – Infrared Reflective Sensor HOA1406-003
Location	North America	Task That HON Product Performs in This Application	Detect position of sample carrier rack
Vertical / Sub-Vertical	Medical / Diagnostics	Size of Win	\$474M over 5 years
Application	Position detection in cellular analysis (using flow cytometry)	Sales Person(s), Organization	CBC Electronics Thomas Ledbetter, Honeywell

Describe the application	<ul style="list-style-type: none"> Diagnostic equipment that can test multiple samples have some mechanism for loading the samples. In this device a carrier rack is used to load multiple test tubes, then the rack and test tubes are moved into the system so that the sample can be drawn into the machine. In order to know the position of the carrier rack, an optical sensor is used.
What were the key requirements driving sensor selection?	<ul style="list-style-type: none"> The customer desired a reflective sensor and chose the Honeywell HOA1406. The customer needed to have the emitter and detector in a single sensor and reflect the infrared light off the carrier rack.
Describe the Honeywell solution and benefits. What alternatives were evaluated?	<ul style="list-style-type: none"> The customer was using a similar reflective infrared sensor from a competitor. The competitor's sensor, while having the same specifications as the Honeywell sensor, had sensitivity drift over time which was causing a false reading from the background reflection. The customer was seeing high failure rates in the field. The Honeywell solution was a physical drop-in replacement for the competitor's part and when tested by the customer, the Honeywell device was deemed superior because it reliably met the stated specification. Any company can state they meet their specifications, but Honeywell is rigorous in testing and verifying that its parts will perform as stated.
Other factors that contributed to winning this opportunity?	<ul style="list-style-type: none"> This opportunity was identified during a customer meeting. The customer asked if Honeywell could offer suggestions to replace the incumbent part. During the meeting, a message was sent to Product Management and before the meeting was over, the team provided Honeywell part numbers and samples were provided within 3 days. This rapid response and the performance of the Honeywell product led to a quick win.

Success Story: Optical Position Detection in Diagnostics



- Samples are loaded into a moving rack.
- As the samples and rack move into the machine, an optical sensor determines when the rack is in the correct location.
- Optical sensors are commonly used in diagnostic equipment due to the high number of moving parts that require position detection.



Success Story: Subminiature Basic Switch in Diagnostics

Customer	Diagnostic equipment manufacturer	Honeywell (HON) Product	Subminiature Basic Switch, ZM Series (X-205832-ZM)
Location	North America	Task That HON Product Performs in This Application	Detect position of sample vial
Vertical / Sub-Vertical	Medical / Diagnostics	Size of Win	\$247M over 5 years
Application	Position detection of a sample vial in cellular analysis (using flow cytometry)	Sales Person(s), Organization	CBC Electronics Thomas Ledbetter, Honeywell

Describe the application	<ul style="list-style-type: none"> Diagnostic equipment may be designed to run many samples automatically. However, if an emergency test is required, the equipment needs a method to allow for interrupting the broader testing to be able to run a new, single sample. The equipment features the ability to load a single sample vial; the ZM Series is used to detect the presence of a sample.
What were the key requirements driving sensor selection?	<ul style="list-style-type: none"> The customer had quality issues with their existing supplier and desired a direct replacement part. The form factor needed to be similar and the switch needed to be more robust than the incumbent switch.
Describe the Honeywell solution and benefits. What alternatives were evaluated?	<ul style="list-style-type: none"> The competitor's switch had a removable lever which was breaking in the application. The Honeywell switch had a lever that was molded into the switch and could not be removed. The customer did extensive testing on the Honeywell switch and was not able to cause a failure. The customer paid Honeywell tooling fees to allow the switch to be a direct replacement (hence the X-listing number).
Other factors that contributed to winning this opportunity?	<ul style="list-style-type: none"> The incumbent was not willing to work with the customer to provide a more robust design. Honeywell's ability to provide a direct replacement part was a key factor in this win.

Success Story: Subminiature Basic Switch in Diagnostics



- The equipment has a means for allowing an individual sample to be manually loaded for emergency or high-priority tests.
- When manually loading a vial, the ZM Series switch is used to detect the presence of the vial.
- The reliability of the switch is critical. Sometimes test results are needed immediately and system downtime is not acceptable.

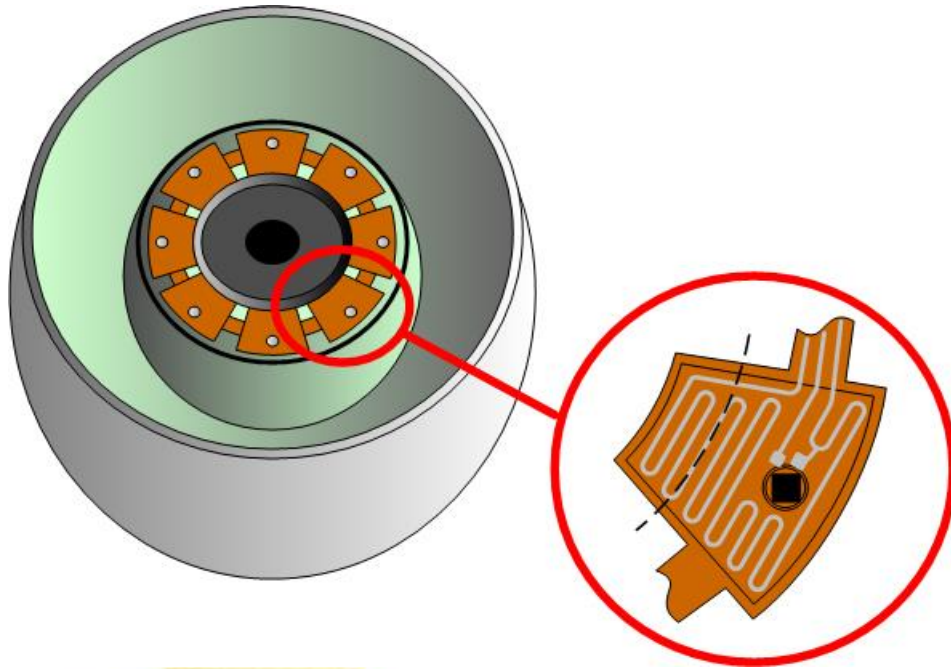


Success Story: 360° Flexible Heater for Centrifuge Used in Fully Automated Blood Analyzer

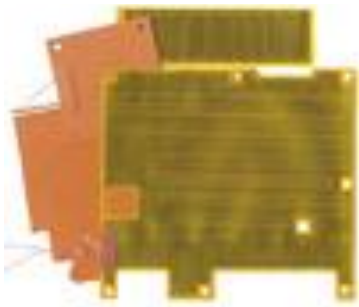
Customer	Start-up company that produces novel equipment for blood analysis equipment for laboratories and blood banks	Honeywell (HON) Product	Flexible Heaters: A3400-3244-002 and A3400-3242-002
Location	Switzerland	Task That HON Product Performs in This Application	360° flexible heater used to maintain blood temperature
Vertical / Sub-Vertical	Medical / Diagnostics & analytical equipment	Size of Win	\$1.5M over 6 years
Application	Centrifuge for separating blood into its components for analysis and transfusion	Sales Person(s), Organization	Ymatron

Describe the application	<ul style="list-style-type: none"> • During the analysis of whole blood (e.g., for blood group serology) the blood needs to be split up into its components: platelets (thrombocytes), plasma, red blood cells, and white blood cells. This is done using a centrifuge. • Any handling of blood for analysis and transfusion requires the blood to remain at body temperature. • The customer wanted the heater elements for the blood incorporated into the centrifuge elements in a fully automated blood analysis machine, where a machine contains between 8 and 16 centrifuges. The company plans to produce 3 versions of the system: a 16 centrifuge, an 8 centrifuge, and a 4 centrifuge version of their system.
What were the key requirements driving sensor selection?	<ul style="list-style-type: none"> • Provide 5 watts of heat output from a 5 volt supply in the form of an Arc to allow the customer to heat 3 blood samples to body temperature. The heaters also include a PT1000 RTD to provide temperature measurement for each heat zone.
Describe the Honeywell solution and benefits. What alternatives were evaluated?	<ul style="list-style-type: none"> • A customized flexible heater was engineered to fit the customer's application and requirements. • Honeywell suggested an alternative solution to the existing flexible heaters supplied (single heat foil 5 per centrifuge) which was limiting the full utilization of the carousel on each test cycle. The new solution increases yield and efficiency. • Minco was also asked to provide a solution and bid, which in the end they couldn't. Alternatively, the customer would have had to stay with an existing solution of a single heat foil.
Other factors that contributed to winning this opportunity?	<ul style="list-style-type: none"> • The project had challenges including some samples that did not perform properly. The Sales team continued to work with the customer and reached a great outcome. • This is a great example of good cooperation between the rep company, Ymatron, who originated the opportunity and provided application support and engineering, which produced a novel solution to a complex problem.

Success Story: 360° Flex Heater for Centrifuge Used in Fully Automated Blood Analyzer



- The customer's system can handle 18 samples per centrifuge. If only a single heater is used, the customer is limited to heating either multiples of 3 samples or has to leave open spaces in the carousel.
- We suggested a dual heater providing the option of a 2-1 split in the heater in order to heat any number of samples from 1 to 18 and fully utilize the carousel on each test cycle, which was ultimately chosen.
- We have worked closely with the customer to develop the concepts for a single 6x heater foil assembly, which will improve the manufacturability of the customer's system.



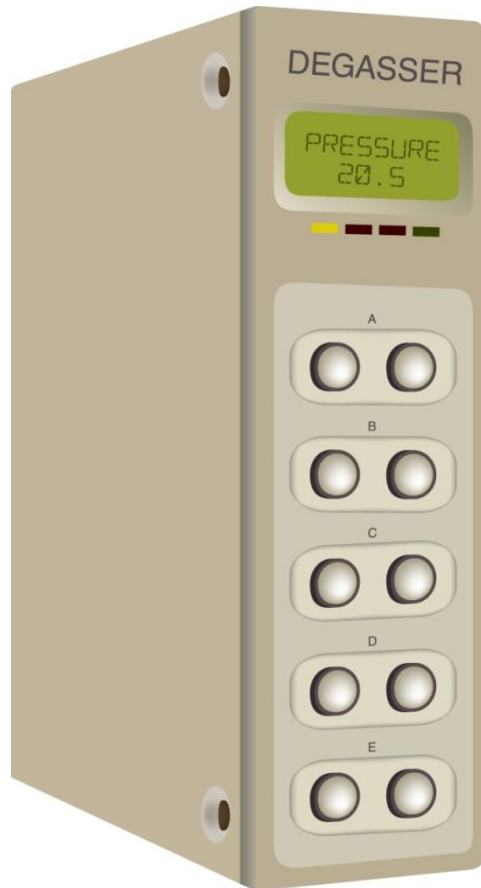
A3400 Series
Flexible Heater

Success Story: 24PC Board Mount Pressure Sensor for Degasser

Customer	Supplier to diagnostic companies	Honeywell (HON) Product	24PC Board Mount Pressure Sensor, 24PCCFA6A
Location	Japan	Task That HON Product Performs in This Application	Liquid media compatibility / absolute pressure
Vertical / Sub-vertical	Medical / Diagnostics	Size of Win	\$500K total revenue over 5 years
Application	Measurement with correct sample loops by degasser (remove air bubble)	Sales Person(s), Organization	Tetsuo Shinno, Honeywell

Describe the application	<ul style="list-style-type: none"> In medical blood or chemical analyzers, there is a need to ensure air bubbles are removed from the system to avoid incorrect readings. A degasser can be used to remove air bubbles. After air bubbles are removed, the analyzer can measure the sample correctly. The operating principle of the device is to use a membrane/vacuum technique.
What were the key requirements driving sensor selection?	<ul style="list-style-type: none"> The customer needed a sensor that was compatible with liquid as sometimes the liquid sample could reach the pressure sensor. They needed an absolute type pressure sensor and wanted to put the sensor on their circuit board.
Describe the Honeywell solution and benefits. What alternatives were evaluated?	<ul style="list-style-type: none"> The Honeywell 24PC pressure sensor with its wet-wet media compatibility, small size, and board mount options fit the customer's need. In the past, the customer bought a Honeywell sensor in small volumes, but they selected Fujikura as their major sensor supplier. When Honeywell visited this customer with Krone, Honeywell's Authorized Distributor for the Medical Vertical in Japan, they found that the Fujikura sensor did not work well in liquid media. The customer was having quality problems. The Honeywell 24PC was introduced to the customer because of its wet-wet media compatibility feature.
Other factors that contributed to winning this opportunity?	<ul style="list-style-type: none"> The distributor maintained a relationship with the customer even when they were buying low quantities. This relationship simplified the ability to meet with the customer to present the 24PC's features. The Sales team was able to determine that the customer was having issues with Fujikura and used the 24PC to meet their needs.

Success Story: 24PC Board Mount Pressure Sensor for Degasser



- Application: Pressure sensor used in membrane/vacuum degasser
- Honeywell product: 24PCCFA6A
- Annual potential: US \$100K annual
- Program life: 5 years
- Key success factors:
 - Possibility of wet media
 - Easy PCB mounting
 - Track records
 - Technical support
 - Competitive price

Success Story: 26PC Flow Thru Board Mount Pressure Sensor for Chemical Analyzer

Customer	Analytical equipment company	Honeywell (HON) Product	26PC Flow Thru Board Mount Pressure Sensor, 26PCDFG6G
Location	China	Task That HON Product Performs in This Application	Flow thru pressure / acidic liquid media
Vertical / Sub-vertical	Medical / Diagnostic & analytical equipment	Size of Win	\$220K total revenue over 6 years
Application	Pressure change in acidic liquid solution	Sales Person(s), Organization	Perry Lam, Honeywell

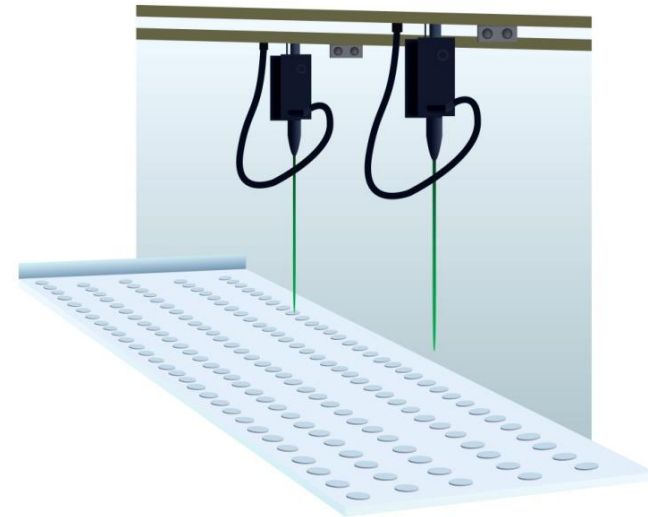
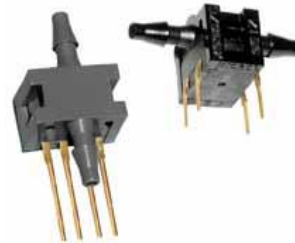
Describe the application	<ul style="list-style-type: none"> The product is an auto Opto-chemical Immune Analyzer. This analyzer can conduct tests on up to 144 samples with 15 reagents. Honeywell's board mount pressure sensor performs pressure measurement in one pipe needle which is a liquid/acidic solution media.
What were the key requirements driving sensor selection?	<ul style="list-style-type: none"> The key need was to measure pressure of the liquid and be able to withstand various liquid media including some acidic media.
Describe the Honeywell solution and benefits. What alternatives were evaluated?	<ul style="list-style-type: none"> Honeywell's 26PC Flow Thru Board Mount Pressure Sensor can function well in liquid media, especially in some acidic media. Moreover, Honeywell's 26PC Flow Thru Board Mount Pressure Sensor can measure the pressure range without extra connections. It is easy for the customer to wash out the system without worrying about the sensor. This is a typical application for flow thru pressure in a chemical analyzer, which we can extend to other chemical analyzer customers. The customer did not have any good alternatives as no other supplier offers a wet-wet pressure sensor like the 26PC.
Other factors that contributed to winning this opportunity?	<ul style="list-style-type: none"> Honeywell has been in contact with the customer since 2008 when they first tried to develop the automatic chemical analyzer. We learned from the customer that they will use a broad range of sensors in the chemical analyzer application. Honeywell was able to quickly provide a sample in the early stage of their design work that helped to foster a good relationship with the customer. FAE support and sample kits were very important in order to demonstrate the solution to the customer.

Success Story: 26PC Flow Thru Board Mount Pressure Sensor for Chemical Analyzer

- Application: Measure pressure in the sample tube
- Honeywell product: 26PCDFG6G
- Annual potential : US\$37K
- Program life: 6 years
- Key success factors:
 - Product features
 - Quick sample
 - Technical support
 - Possibility of wet media



Example of one type of chemical analyzer.
Chemistry analyzers are available
in many sizes and styles.



Success Story: 26PC Series for Alcohol Breath Testing Device

Customer	Alcohol breath testing device manufacturer	Honeywell (HON) Product	26PC Series Board Mount Pressure Sensor – 26PC01SMT
Location	Australia	Task That HON Product Performs in This Application	Reliable and accurate direct air pressure measurement / sensing
Vertical / Sub-Vertical	Medical / Instrumentation	Size of Win	\$79.8K for 3 years
Application	Hand-held alcohol breath testing device / analyzer	Sales Person(s), Organization	Ronaldo Banatin, Honeywell

Describe the application	<ul style="list-style-type: none"> The alcohol breath tester is used for estimating blood alcohol content (BAC). The device does not directly measure blood alcohol content or concentration, which requires the analysis of a blood sample. Instead, it estimates BAC indirectly by measuring the amount of alcohol in one's breath.
What were the key requirements driving sensor selection?	<ul style="list-style-type: none"> The customer needed a compact, low-cost sensor that provided reliable pressure sensing. As the end product is a hand-held device, the pressure sensing application required a sensor that was small and easy to install. It also needed to be durable, reliable, and accurate. Honeywell's product met and exceeded the customer's specifications, providing gage, vacuum gage, differential gage, and wet/wet differential sensing in one package. Temperature compensation was also required as the device could be used in a wide range of environmental temperatures.
Describe the Honeywell solution and benefits. What alternatives were evaluated?	<ul style="list-style-type: none"> As Honeywell's product was capable of being used with other surface mount technology components on the printed circuit board, it helped to lower the customer's installation costs, eliminated secondary operations, and provided durability and reliability. Due to a pressure sensor's sensitivity to temperature, it may give false readings if not adjusted or recalibrated to account for ambient or surrounding air temperatures. The temperature compensation feature Honeywell's device offered was an important factor to achieve correct and accurate readings.
Other factors that contributed to winning this opportunity?	<ul style="list-style-type: none"> The opportunity started through Honeywell's local AD who was an existing supplier and had a good relationship with the customer. Through teaming and support, the 26PC Series was proposed to the customer. Reputable Honeywell brand.

Success Story: 26PC Series for Alcohol Breath Testing Device



- A pressure sensor is used so that a complete air sample is obtained from a full, deep lung exhalation. A shallow exhalation can negatively affect the accuracy of the device.
- The moisture in the air requires that the sensor be resistant to moisture.



Success Story: Magneto-resistive Sensor IC for Hospital Bed

Customer	Hospital bed manufacturer	Honeywell (HON) Product	SS552MT Magneto-resistive (MR) Sensor IC
Location	North America	Task That HON Product Performs in This Application	Signals position of hospital bed safety rails to prevent patient falls
Vertical / Sub-Vertical	Medical / Hospital hardware	Size of Win	\$165,000 over 5 years
Application	Hospital bed rail position sensing	Sales Person(s), Organization	Allied Enterprises Denny Brown, Honeywell

Describe the application	<ul style="list-style-type: none"> The side rails of higher-end hospital beds are designed to be lowered to facilitate easier access to the bed and allow the patient to get on/off the bed more easily. In order to know if the side rails are up or down, a sensor is needed to verify the position of the side rail. An alarm will be triggered if the bed rails are lowered, signaling the need for a nurse to provide assistance to the patient.
What were the key requirements driving sensor selection?	<ul style="list-style-type: none"> The sensor needed to be reliable for 1 million cycles (10 years). Tolerances of the bed rail required a ½ inch working range for the sensor. The sensor needed to be waterproof or packaged into a waterproof enclosure.
Describe the Honeywell solution and benefits. What alternatives were evaluated?	<p>The customer evaluated electromechanical switches, reed switches, Hall-effect, and Honeywell's MR sensor ICs.</p> <ul style="list-style-type: none"> The reed switch and Hall-effect sensors did not have the sensitivity needed to handle the ½ inch gap as effectively as an MR sensor. MR sensors can be 10x as sensitive as Hall-effect or reed switches. The electromechanical switch was larger than desired for this application. The SS552MT MR sensor was the best solution. It offered non-contact sensing with a > 1 million cycle life. It was designed into the side rail of the bed and protected within the plastic rail housing. The sensor works regardless of the magnet's polarity. The solid state technology exceeded expectations for electrical life, reliability, and shock and vibration over that of a previously used electromechanical solution. Honeywell was the only company to offer the customer this solution.
Other factors that contributed to winning this opportunity?	<ul style="list-style-type: none"> A variety of non-product factors supported this win including team work, technical support, samples, and Honeywell's reputation as an established global company. This opportunity was identified through early involvement with the customer's engineering team to review program requirements.

Success Story: Magnetostrictive Sensor IC for Hospital Bed



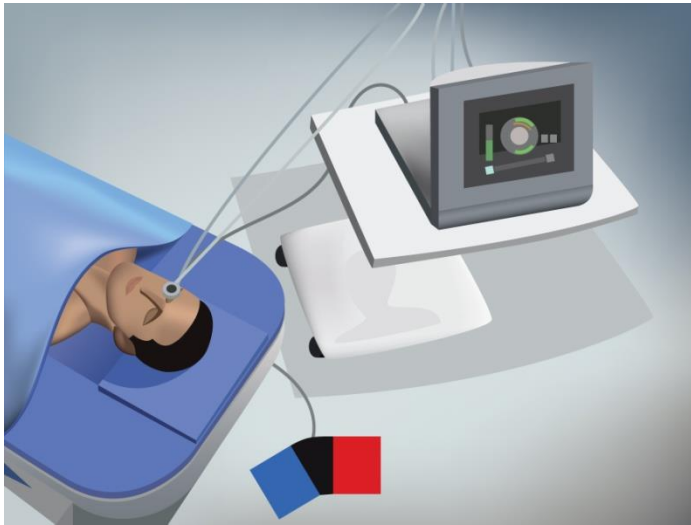
- One SS552MT sensor is used for each bedside rail (4 per bed) as the rail is pivoted up to prevent patient falls or down to allow patient egress.
- The unauthorized movement of the bedside rail activates an alarm in the nurse's station, signaling the need for assistance.

Success Story: TruStability® Pressure & Honeywell Zephyr™ Airflow in Ophthalmology Device for Refractory Glaucoma

Customer	Manufacturer of glaucoma treatment device	Honeywell (HON) Product	TruStability® Board Mount Pressure Sensor, HSC Series; Honeywell Zephyr™ Airflow Sensor, HAFBSS200C4AX5
Location	France	Task That HON Product Performs in This Application	Pressure sensor controls vacuum to maintain position of the eyeball; airflow sensor creates an alarm in case of leakage
Vertical / Sub-Vertical	Medical / Surgical instruments ophthalmology	Size of Win	\$237K over 6 years
Application	Flow detection for leakage control; vacuum pressure for device position	Sales Person(s), Organization	Veronique Chavanon, Honeywell

Describe the application	<ul style="list-style-type: none"> Refractory glaucoma is a form of glaucoma that is resistant to normal treatment, such as eye drops or drugs. Glaucoma describes a number of conditions in which the optical nerve is damaged due to a rise in intraocular pressure. In the novel treatment device of this manufacturer, the part of the eye that produces the fluid in the eye and thus causes the high pressure is targeted with high frequency ultrasound to cause lesions and decrease fluid production.
What were the key requirements driving sensor selection?	<ul style="list-style-type: none"> The eyeball needs to be maintained precisely and comfortably during the medical exam by maintaining an accurate and repeatable vacuum; system redundancy is required to precisely control the vacuum. Fast feedback and alarm that interrupts therapy in case of vacuum leakage detection on the eyeball position. The sensor needs to be small to simplify integration into a compact machine.
Describe the Honeywell solution and benefits. What alternatives were evaluated?	<ul style="list-style-type: none"> Analog and digital output in the same small package caters to the redundancy needs of the application. The ability to calibrate Honeywell's HSC Series to measure the desired vacuum value on the full scale was a real key feature. Honeywell entered the project at an early stage when the customer was starting clinical tests of proof of concept. After a first approach with new ASDX samples, Honeywell converted the customer to the TruStability® pressure sensor. The airflow measurement was a second step of the customer's design to provide safety during treatment. Excellent support and responsiveness was provided throughout the project phases.
Other factors that contributed to winning this opportunity?	<ul style="list-style-type: none"> Exceptional execution on NBO from Sales team and excellent cooperation between Sales, application support, and engineering in the way the project was conducted. Responsiveness to customer's questions, excellent support with samples, and technical answers to securing position during design-in. The lead was generated during the COMPAMED trade show in 2008.

Success Story: TruStability® Pressure & Honeywell Zephyr™ Airflow in Ophthalmology Device for Refractory Glaucoma



TruStability®



Honeywell
Zephyr™

- Glaucoma refers to a group of conditions in which the optic nerve suffers a characteristic form of damage at the back of the eye which is often associated with a raised level of intraocular pressure. Glaucoma is found in about 2% of the population over the age of 40 and is much less frequent in children. Without treatment, vision loss usually gets worse over months or years.
- The innovative device from this manufacturer uses High Intensity Focused Ultrasound (HIFU) waves generated by a disposable probe that sits on the eyeball of the patient and has a circular transducer for treating the entire circumference. The waves are so fine that they easily penetrate the tissue, leaving it intact, and reach the capillary bodies that produce the liquid in the eye, causing the intraocular pressure to rise.
- The pressure sensor controls the positioning of the device on the eyeball; the airflow sensor is used to create alarms in case of leakage.

Success Story: HIH-4000-001 as Part of an Air Probe for Neonatal Incubator

Customer	Global conglomerate with a large healthcare and energy division	Honeywell (HON) Product	HIH-4000-001
Location	EMEA	Task That HON Product Performs in This Application	Monitors and controls the humidity level within the neonatal incubator to allow for fine regulation
Vertical / Sub-Vertical	Medical / Respiratory / Anesthesia	Size of Win	\$105K over 5 years
Application	Humidity measurement for air probe to measure air quality and humidity	Sales Person(s), Organization	Nordic Howard Tilling, Honeywell

Describe the application	<ul style="list-style-type: none"> • In the first days of an infant's life, the daily evaporative loss from premature neonates can reach up to 20% of body mass. Such loss can be reduced by increasing the air humidity inside the incubator. • It is crucial to avoid too much humidity in the incubator to 1) prevent fogging, 2) prevent the collection of water pockets that are difficult to remove, and 3) eliminate an environment that is conducive to the development of germs. • A humidity sensor is used to monitor and allow fine tuning of the humidity conditions inside the incubator.
What were the key requirements driving sensor selection?	<ul style="list-style-type: none"> • Analog output to fit to control system and the plug and play nature of the HIH-4000 (e.g., apply 5 volts and receive a linear output). • Packaging style fitting the probe. • Sensor performance at test, and the reputation of brand/manufacturer.
Describe the Honeywell solution and benefits. What alternatives were evaluated?	<ul style="list-style-type: none"> • The HIH-4000-001 product was ideal due to its analog output, linear output, package style, ease of use, and there was no need for the customer to modify the required for analog output. Also of importance were the fast availability of samples, its performance on test, the excellent sales and application support, and competitive pricing. • Alternatives the customer considered were Honeywell's HIH-5030/31 and sensors from Sensirion and GE Sensors.
Other factors that contributed to winning this opportunity?	<ul style="list-style-type: none"> • Sales and application support with joint customer visits to help rectify a technical issue that arose about light influencing the sensor • The ability to offer alternative solutions.

Success Story: HIH-4000-001 as Part of an Air Probe for Neonatal Incubator



- It is important to know how much water the infant needs so that the loss of fluid via the skin can be replaced as completely as possible.
- In some cases, the air dampness in the incubator is increased to minimize fluid loss via the skin and exhalation.
- This, however, can cause water vapor to condense on the walls of the incubator, which may reduce visibility through the incubator door or lead to condensation within the incubator, which may be difficult to remove.
- As heat and dampness can provide an optimal environment for the development of germs, in regions of the world that have high levels of humidity in the air (such as EMEA), problems can arise during operation and cleaning.
- Humidity sensors can be used to monitor and control the humidity levels within the incubator.

Source:
http://www.gehealthcare.com/us/en/education/infant_care/products/infantcare.html

Success Story: Humidity / Temperature Sensors for CO2 Incubator

Customer	Cleanroom / laboratory equipment manufacturer	Honeywell (HON) Product	HIH-4000-004 humidity sensor; 2455R-01000077 thermostat
Location	Singapore	Task That HON Product Performs in This Application	Humidity and temperature sensing
Vertical / Sub-Vertical	Semi-con / Medical / Analytical	Size of Win	\$70K total revenue over 3-4 years
Application	Lab refrigeration unit / CO2 incubators	Sales Person(s), Organization	Kelvin Tan, Honeywell

Describe the application	<ul style="list-style-type: none"> • Honeywell's HIH Series humidity sensors and 2455 Series thermostats are used in biological safety cabinets, lab refrigeration, and CO2 incubators to detect and sense the humidity and temperature of the chamber within the respective equipment. • This customer is a leader in the development of controlled environment, laboratory, and cleanroom equipment solutions.
What were the key requirements driving sensor selection?	<ul style="list-style-type: none"> • Medical / analytical is a focus area for Honeywell. This opportunity was discovered through a medical trade show. Honeywell's Sales team learned of the design project and asked relevant questions about the customer's requirements and the types of solutions they were looking for to overcome certain technical challenges they were facing.
Describe the Honeywell solution and benefits. What alternatives were evaluated?	<ul style="list-style-type: none"> • Given that the product would be used in cleanroom / lab environment, the customer needed a high quality, durable, reliable, and effective solution. The humidity sensor and thermostat solutions provided a simple yet effective way of detecting the humidity and temperature levels that the customer was looking for. • The customer evaluated three competitive sensor companies. The competitive designs did not provide a reliable output after the customer evaluated the sensors through their temperature / humidity cycle testing. • The customer valued being able to choose from Honeywell's broad portfolio of temperature and humidity sensors.
Other factors that contributed to winning this opportunity?	<ul style="list-style-type: none"> • Strong teamwork • Identified the customer's needs and understood their product roadmap • Worked closely with the customer during the design-in stage and provided consistent feedback • Differentiated Honeywell from the competition with superior technical and pre- and post-sales support

Success Story: Humidity / Temperature Sensors for CO2 Incubator



- The CO2 incubator requires an accurate and stable humidity and temperature reading through multiple cycles.
- The Honeywell humidity / temperature sensor provided leading accuracy and stability compared to other sensor providers.



HIH-4000 Series



2455R Series

Success Story: 26PC Board Mount Pressure Sensor for Lung Capacity Meter

Customer	Hand-held lung capacity meter	Honeywell (HON) Product	26PC Board Mount Pressure Sensor, 26PCAFA6D
Location	China	Task That HON Product Performs in This Application	Differential pressure to measure airflow
Vertical / Sub-Vertical	Medical / Rehab Fitness	Size of Win	\$90K annual
Application	Measure lung capacity	Sales Person(s), Organization	Beijing link-trend company

Describe the application	<ul style="list-style-type: none"> The customer makes a device to measure lung capacity for fitness analysis. They use pressure sensors to measure the exhaled breath and thereby calculate the lung capacity.
What were the key requirements driving sensor selection?	<ul style="list-style-type: none"> Since exhaled breath is moist, the pressure sensor must be able to perform in a very humid environment.
Describe the Honeywell solution and benefits. What alternatives were evaluated?	<ul style="list-style-type: none"> The customer had been using GE NOVA (1210) pressure sensors, but the customer had some of their lung capacity meters returned from their customers due to GE NOVA pressure sensor failures. Honeywell provided the customer with 26PCAFA6D samples, and the product allegedly performed very well. The ability of Honeywell's 26PC sensor to perform in the presence of wet media has great value to the customer. In addition, the 26PC's temperature compensation made the customer's circuit design easier.
Other factors that contributed to winning this opportunity?	

Success Story: 26PC Board Mount Pressure Sensor for Lung Capacity Meter



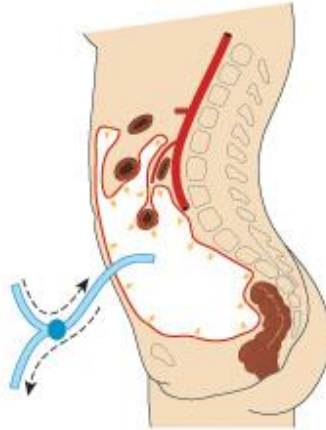
- Application: Measure lung capacity
- Honeywell product: 26PCAFA6D; additionally, the customer decided to use Honeywell as their main sensor supplier
- Annual potential: US\$90K annual
- Program life: 5 years
- Key success factors
 - Possibility of wet media
 - Technical support
 - Price
 - Track record

Success Story: Value-Added Thermal Management Assembly for Dialysis

Customer	Dialysis equipment manufacturer	Honeywell (HON) Product	Combined heating, temperature sensing/control and value-added mounting / tray
Location	North America	Task That HON Product Performs in This Application	Precise heating/control of dialysate fluid to body temperature
Vertical / Sub-Vertical	Medical / Dialysis	Size of Win	USD \$8M
Application	Peritoneal Dialysis	Sales Person(s), Organization	Meridian Tricia Lee, Honeywell

Describe the application	<ul style="list-style-type: none"> • A leading supplier of a medical peritoneal dialysis equipment for home use needed a thermal management assembly that combined heating, temperature sensing / control, and a value-add mounting / tray. It required precise heating/control of dialysate fluid to body temperature with UL Class II compliance for safe use in places with no electrical ground.
What were the key requirements driving product selection?	<ul style="list-style-type: none"> • Compliance to new IEC60601-001 / UL Class II standard -- to be safe for use in residences where no electrical ground is present. • Customized from similar and previous model thermal management assembly. • Aggressive heating profile with tight temperature sensor accuracy.
Describe the Honeywell solution and benefits. What alternatives were evaluated?	<ul style="list-style-type: none"> • Honeywell offered a complete turnkey assembly and one that was customized from the previous model s to optimize product development cycle and testing time. <ul style="list-style-type: none"> • Double insulation and larger heater area with robust dielectric withstanding capability for UL Class II compliance (unlike previous model). • More aggressive heating/time profile supports patient therapy goal. • Tight thermistor accuracy insures fluid temp control within comfortable body temp range. • Chemical compatibility, robust sealing and construction support userability requirements.
Other factors that contributed to winning this opportunity?	<ul style="list-style-type: none"> • Total value-added capability and service o deliver a complete thermal management assembly . • Customer relationship and collaboration. • Dedicated technical support and program management.

Success Story: Value-Added Thermal Management Assembly for Dialysis



- Peritoneal dialysis is typically done at home using a portable machine.
- Through a catheter inserted into the belly, a cleansing dialysate fluid is pumped in, absorbs wastes, and extra fluid that is filtered through the peritoneal membrane, before it drains out.
- Quickly warming dialysate fluid to body temp and holding it precisely at that temperature is important for patient comfort and safety.
- Medical devices like this used in the home need to be compliant to IEC60601-001.



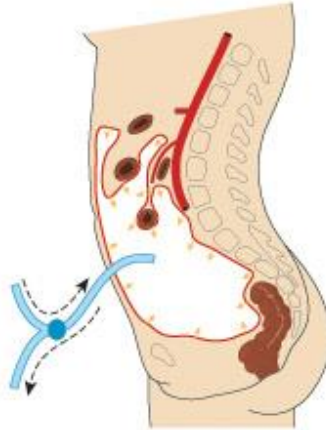
Value-Added Thermal Management Assembly
(top and underside view)

Success Story: Value-Added Force Sensor Assembly for Dialysis

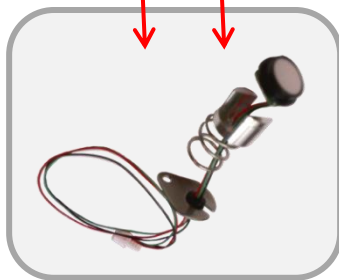
Customer	Dialysis equipment manufacturer	Honeywell (HON) Product	Force sensor with value-added mounting and termination
Location	North America	Task That HON Product Performs in This Application	Non-invasive flow sensing
Vertical / Sub-Vertical	Medical / Dialysis	Size of Win	USD \$2.4M
Application	Peritoneal Dialysis	Sales Person(s), Organization	Meridian Tricia Lee, Honeywell

Describe the application	<ul style="list-style-type: none"> • A leading supplier of a medical peritoneal dialysis equipment for home use needed a redundant and more reliable dialysate fluid flow sensing solution with custom mounting and termination.
What were the key requirements driving product selection?	<ul style="list-style-type: none"> • Use 1865-series customized force sensor as in current/previous models. • Eliminate external subcontractor operation for adding mounting hardware and connector. • Improve overall assembly reliability and ease of assembly into machine. • Aggressive product launch deadline.
Describe the Honeywell solution and benefits. What alternatives were evaluated?	<ul style="list-style-type: none"> • Customer was working with an external subcontractor to modify Honeywell's force sensor assembly by cutting the lead wires, removing the connector, then adding custom mounting hardware before attaching a new gold-crimp style connector. • The connector used by the subcontractor made assembly to the small pcb in the machine more difficult and time consuming – Honeywell was able to offer a more ergonomic solution. • Honeywell was able to offer the entire value-added assembly – simplifying the customer's chain, manufacturing, and installation with a more reliable and easy-to-assemble solution.
Other factors that contributed to winning this opportunity?	<ul style="list-style-type: none"> • Good recognition of value-added capability. • Customer relationship and collaboration. • Dedicated technical support and program management. • Rapid execution to customer timeline.

Success Story: Value-Added Force Sensor Assembly for Dialysis



- Peritoneal dialysis is typically done at home using a portable machine.
- Through a catheter inserted into the belly, a cleansing dialysate fluid is pumped in, absorbs wastes and extra fluid that is filtered through the peritoneal membrane, before it drains out.
- Redundant and non-invasive fluid flow detection to help monitor dialysate fluid pumping and fill rates is essential to patient comfort and safety.



Value-Added
Force Sensor

Success Story: Value-Added Thermal Management Assembly for CPAP

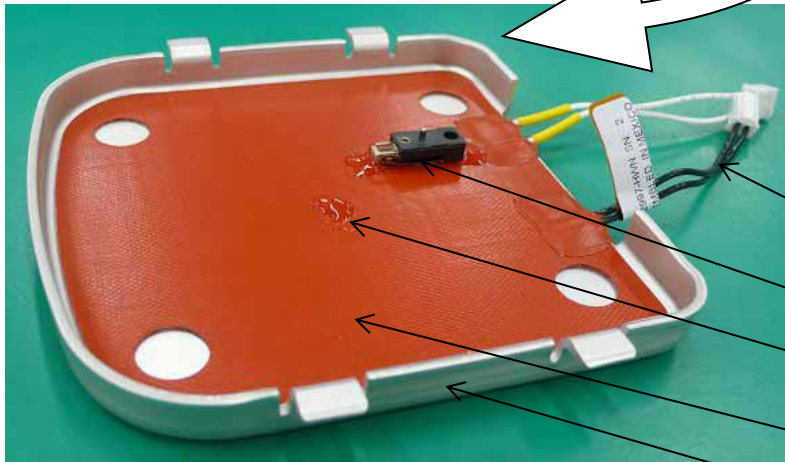
Customer	CPAP machine manufacturer	Honeywell (HON) Product	Combined heating, temperature sensing/control and value-added mounting / tray with custom wiring harness
Location	Japan	Task That HON Product Performs in This Application	Precise humidifier chamber heating/control to vaporize water
Vertical / Sub-Vertical	Medical / Respiratory	Size of Win	USD \$125K over 5 years
Application	Portable CPAP device	Sales Person(s), Organization	Tetsuo Shinno , Honeywell

Describe the application	<ul style="list-style-type: none"> • Compact CPAP for home use, for patients with sleep apnea. Customer needed a complete thermal management system of custom geometry that would vaporize water at the right temperature to allow for patient comfort during therapy.
What were the key requirements driving product selection?	<ul style="list-style-type: none"> • Must be a UL recognized component. • Must have accurate temperature sensing/control. • Uniform thermal distribution. • Over temperature turn off.
Describe the Honeywell solution and benefits. What alternatives were evaluated?	<ul style="list-style-type: none"> • Complete turnkey assembly which included a custom stamped anodized aluminum tray with heater vulcanization, and NTC thermistor control with in-line “over temperature” cut out resettable thermostat. • Custom wiring harnesses for the thermistor and heater assembly terminated with customer – preferred connectors. • Large heater surface area achieves more aggressive heating/time profile and supports patient therapy goal. • Tight thermistor accuracy insures fluid temp control within vaporization temperature without going to a boil.
Other factors that contributed to winning this opportunity?	<ul style="list-style-type: none"> • Total value-added capability and service to deliver a complete thermal management assembly. • Customer relationship and collaboration / good track record with pressure sensors previously. • Dedicated technical support and program management.

Success Story: Value-Added Thermal Management Assembly for CPAP



- CPAP (continuous positive airway pressure) is typically done at home using a portable machine.
- The device is designed for patients with obstructive sleep apnea. These patients often stop breathing while sleeping.
- The heated humidifier chamber warms water into a vapor and is delivered to the patient via an air pump.
- The pressurized moist warm air allows the patient to sleep comfortably without interruption.



Value-Added Thermal Management Assembly

- Custom wire harness assemblies
- Over temperature thermostat
- Tight tolerance NTC thermistor
- Silicone heater
- Custom formed tray assembly

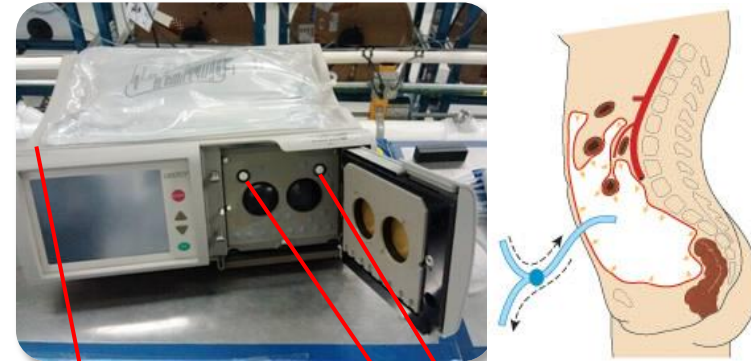
Success Story: Value Added Assemblies for Medical / Dialysis

Customer	Dialysis Machine Manufacturer	Honeywell (HON) Product	Value Added A3100 Series Thermal Management Assembly & Value Added 1865 Series Force Sensor Assembly
Location	North America	Task That HON Product Performs in This Application	Maintaining dialysate fluid temperature to body temperature; detecting fluid flow to patient
Vertical / Sub-Vertical	Medical	Size of Win	\$10.4M USD
Application	Precise heating to body temperature and control of dialysate fluid with UL class II compliance; non-invasive fluid/flow detection	Sales Person(s), Organization	Meridian Technical Sales Tricia Lee, Honeywell

Describe the application	<ul style="list-style-type: none"> • Home peritoneal dialysis machine allows patient to warm, dispense, and drain dialysate at home without technician's aid. • Honeywell products help heat and maintain dialysate at body temperature. They also keep proper fluid flow rate during therapy.
What were the key requirements driving sensor selection?	<ul style="list-style-type: none"> • Value Added Thermal Management Assembly: Precise, uniform heating of custom-geometry heating tray surface to maintain dialysate at body temperature. • On-board precision thermistors and thermostats for temperature monitoring and control. <ul style="list-style-type: none"> • Multiple thermistors for tray and fluid bag temperature monitoring allows system to properly control heater on/off time. • Thermostats used to cut power to the heater if the temperature increases beyond the customer-specified limit. • IEC 60601-1 3rd edition compliance for safe use in places with no electrical ground. • One source for supplying the entire assembly and manufacture, including tray and mounting bracket with on-board heating, temperature monitoring, and control. • Value Added Force Sensor: Precise, non-invasive measurement of dialysate fluid/flow. • Simplify supply chain to eliminate subcontractor operations and improve sensor's connection to customer's PCB.
Describe the Honeywell solution and benefits. What alternatives were evaluated?	<ul style="list-style-type: none"> • See above for the thermal management assembly description and benefits. • Value Added Force Sensor: Custom-packaged sensor ideal for use in low pressure/non-invasive applications. • Customer was previously buying Honeywell's sensor with lead wire and connector, then having subcontractor cut off connector, add custom bracket, spring, grommet, and mounting plate before reattaching connector. • Honeywell provided fully warranted, value-added mounting hardware and termination; thereby, eliminating both the customers' subcontractor and the added cost and reliability risk implications. • We engineered a different connector to make it easier to mount the sensor to the customer's crowded PCB.
Other factors that contributed to winning this opportunity?	<ul style="list-style-type: none"> • Good relationship. Incumbent supplier of thermal management and force sensing on previous model. • Excellent collaboration with the customer and weekly NPI engineering meetings. • Rapid execution to customer timelines and good identification of value.

Success Story: Value Added Assemblies for Medical / Dialysis

- **Peritoneal dialysis machine for home use**
 - Thermal management assembly - \$8 M
 - Combined heating, temperature sensing/control, and value-add mounting/tray
 - Precise heating/control of dialysate fluid to body temperature with UL Class II compliance for safe use in places with no electrical ground
 - Force sensor mounting and termination - \$2.4 M
 - Non-invasive dialysate fluid/flow detection using force sensor with value-added termination and mounting components
 - Simplified customer supply chain, manufacturing, and installation
 - Winning attributes
 - Customer collaboration
 - Good identification of value
 - Rapid execution to customer timeline



Value-Added Thermal Management Assembly
(top and underside view)