



Sensing and Control

Pressure and Thermal Product Portfolio Overview

Honeywell

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Pressure and Thermal Product Portfolio



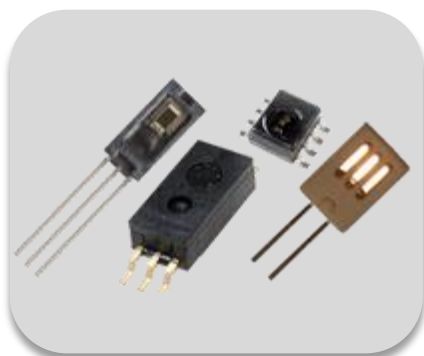
Heavy Duty Pressure Sensors and Transducers



Board Mount Pressure Sensors



Temperature Sensors and Thermostats



Humidity Sensors



Airflow Sensors



Force Sensors



Value Added Capabilities



Heavy Duty Pressure Sensors and Transducers

Heavy Duty Pressure Sensors



13 mm Series



19 mm Series

Heavy Duty Pressure Transducers



PX2 Series



MLH Series



SPT Series



Heavy Duty Pressure Sensors



13 mm Series



19 mm Series

Heavy Duty Pressure Sensors are small, allowing them to be used on their own in tight packages or as the building block for a complete transducer. The 13 mm Series and the 19 mm Series were developed for potential use in pressure applications that involve measurement of hostile media in harsh environments compatible with 316 stainless steel, a type of steel that increases corrosion resistance, improves resistance to pitting from chloride ion solutions, and provides increased strength at high temperatures.

Heavy Duty Pressure Sensors – 13 mm Series

Features

- Rugged, isolated stainless steel package
- Reliable semiconductor technology
- Calibrated and temperature compensated
- Weld-ring collar and special back support ring
- Voltage or current supply options
- Absolute and sealed gage pressures
- 500 psi to 5000 psi

Benefits

- High pressure applications involving measurement of hostile media in harsh environments
- This design has proven to be highly reliable, stable and accurate
- Enhanced life cycle capability as well as further package integration in OEM applications



Heavy Duty Pressure Sensors – 19 mm Series

Features

- Small-sized, rugged, isolated stainless steel package
- Variety of pressure connections
- Reliable semiconductor technology
- Calibrated and temperature compensated
- Vacuum compatible, isolated sensors
- Constant voltage or current source
- Vacuum compatible, isolated sensors
- 3 psi to 500 psi

Benefits

- Useable with harsh media
- Usable in a wide range of OEM equipment
- Uncompensated version for use in applications using specialized circuit designs



Heavy Duty Pressure Sensors – Potential Applications

- Industrial controls
- Process control systems
- Hydraulic controls
- Tank pressure
- Pressure transmitters or calibrators
- Industrial automation and flow control (19 mm Series)

Heavy Duty Pressure Transducers



PX2 Series



MLH Series



SPT Series

Heavy Duty Pressure Transducers are complete amplified and compensated pressure measurement solutions. With a choice of ports, connectors, outputs and pressure ranges, the PX2 Series, MLH Series and SPT Series transducers can be configured to meet the needs of the application. They are engineered to be resistant to a wide variety of media for use in a variety of environments.

Heavy Duty Pressure Transducers – PX2 Series

Features

- Designed for configurability
- Industry-leading Total Error Band of $\pm 2\%$ over compensated temperature range of -40°C to 125°C [-40°F to 257°F]
- Energy efficient
- Good EMC protection
- Absolute or sealed gage pressure
- 7 bar to 34 bar [100 psi to 500 psi] pressure ranges

Benefits

- Allows customers the ability to configure devices to meet specific application needs as well as quick product sample availability
- Compatibility with a wide variety of media, wide temperature range, up to IP69K sealing, and CE compliance allow for use in tough environments
- Available output transfer functions offer a 3.3 V ratiometric output with a <7 ms turn on time enabling use when energy efficiency is a key requirement
- Broad compensated temperature range allows customers to design the same transducer into a broad set of applications



Heavy Duty Pressure Transducers – MLH Series

Features

- Application Specific Integrated Circuit (ASIC) technology with a media isolated, metal diaphragm design
- All metal wetted parts
- 50 psi to 8,000 psi pressure ranges
- Deliver $\pm 0.25\%$ full scale accuracy Best Fit Straight Line (BFSL) and as low as 2% total error over a temperature range of $-40\text{ }^{\circ}\text{C}$ to $125\text{ }^{\circ}\text{C}$ [$-40\text{ }^{\circ}\text{F}$ to $257\text{ }^{\circ}\text{F}$]
- Input reverse voltage protection
- Less than 2 ms response time
- Rated IP65 or better
- Exceeds CE heavy industrial EMC
- Amplified and temperature compensated
- Calibration for special pressure ranges
- Six standard output options

Benefits

- Use in wide variety of fluid applications, including harsh media
- Accurate, high speed measurement
- Stable and creep free
- May be used in areas of high RFI/EMI
- Enhanced reliability and user flexibility



Heavy Duty Pressure Transducers – SPT Series

Features

- Stainless steel pressure sensors are designed for harsh media applications
- Reliable semiconductor technology
- Calibrated and temperature compensated
- NEMA 4 design
- Small size
- Absolute, gage, sealed gage, vacuum gage pressures
- 0 psi to 3 psi, 0 psi to 5000 psi
- Three styles of output
- Rugged 316L stainless steel wetted parts

Benefits

- Manufactured from stainless steel which provides effective protection against most harsh environment
- Variety of pressure connections allows use in wide range of OEM equipment



Heavy Duty Pressure Transducers – Potential Applications

PX2 Series

- System pressure
- Air compressors
- HVAC
- Rooftop chillers
- Compressor rack rooms
- Refrigerant recovery systems
- Compressor inlet and outlet pressure
- Filter pressure drop
- Cooling water inlet and outlet pressure
- Compressor oil pressure
- Fluid power, flow and level
- Factory automation
- Pneumatics
- Injection molding knock-out valves
- Pumps and valves
- Packaging/laminating equipment
- Sprayers, industrial lasers
- Foam dispensing

PX2 Series

- Solar energy
- Emissions monitoring
- Light hydraulics
- Brake and engine oil pressure

MLH Series

- Compressors
- Refrigeration and HVAC/R
- General industrial and hydraulics
- Multiple transportation applications
- Medical and diagnostics

SPT Series

- Industrial automation and flow control
- Pressure instrumentation
- Hydraulic systems
- Process control automation, flow control, and pressure instrumentation

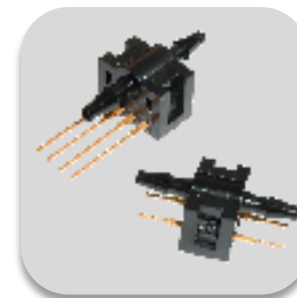
Board Mount Pressure Sensors



**Ultra-Low Pressure
(<1 psi)**



**Low Pressure
(1 psi to 15 psi)
to Mid Pressure
(15 psi to 250 psi)**



**Low Pressure
(1 psi to 100 psi)
Flow-Through**

Honeywell's sensing element design consists of four piezoresistors galvanized with a thin, chemically etched silicon diaphragm. A pressure change will flex the mechanism, causing a strain in the diaphragm and the buried resistors. The resistor values will change in proportion to the stress applied, which produces an electrical output.



Ultra-Low Pressure (<1 psi)



**TruStability®
HSC Series**



**TruStability®
SSC Series**

Sensing element design consists of four piezoresistors galvanized with a thin, chemically etched silicon diaphragm that produces a proportional electrical output.

Ultra-Low Pressure Board Mount Pressure Sensors – TruStability[®] HSC Series, SSC Series

Features

- Industry-leading long-term stability and accuracy
- Extremely low power consumption
- Low operating voltage
- Miniature 10 mm x 10 mm [0.39 in x 0.39 in] package
- High working pressure ranges above 135 in H₂O (1034 mbar)

Benefits

- Industry-leading long-term stability minimizes system calibration needs and maximizes system performance
- Industry-leading accuracy reduces software needed to correct system inaccuracies, minimizing system design time, supporting system accuracy and warranty requirements, and helping to optimize system uptime
- Numerous package styles, ports, and options, simplify integration into the device manufacturer's application



Ultra-Low Pressure Board Mount Pressure Sensors – Applications

- VAV (Variable Air Volume) control
- Static duct pressure
- Clogged HVAC (Heating, Ventilation, Air Conditioning) filter detection
- HVAC transmitters
- Indoor air quality
- Ventilators
- Anesthesia machines
- Spirometers
- Nebulizers
- Hospital room air pressure

Low Pressure (1 psi to 15 psi) to Mid Pressure (15 psi to 250 psi)



24PC Series



26PC Series



**TruStability®
HSC Series**



**TruStability®
SSC Series**



**TruStability®
NSC Series**



**Basic NBP
Series**

Utilizes a specialized piezoresistive micro-machined sensing element which allows part interchangeability, and enhanced performance, reliability, and accuracy.

Low Pressure to Mid Pressure Board Mount Pressure Sensors – 24PC Series

Features

- True wet/wet differential sensing
- Miniature package
- Operable after exposure to frozen conditions
- Choice of termination for gage sensors
- DIP and SMT packages

Benefits

- Piezoresistive sensing technology designed to provide inherently stable outputs over sensing range
- Variety of gage pressure port configurations for quick and easy modification
- Reduces sensitivity shift over temperature



Low Pressure to Mid Pressure Board Mount Pressure Sensors – 26PC Series

Features

- Calibrated and temperature compensated
- True wet/wet differential sensing
- Miniature size
- Flow path with minimal dead space
- Operable after exposure to frozen conditions
- Choice of termination for gage sensors
- SIP and DIP packages

Benefits

- Piezoresistive sensing technology designed to provide part interchangeability and enhanced performance, reliability and accuracy
- Factory-calibrated sensors designed to provide pressure sensing performance with enhanced precision and reliability in a miniature package
- Variety of gage pressure port configurations designed to provide quick and easy modification



Low Pressure to Mid Pressure Board Mount Pressure Sensors – TruStability[®] HSC/SSC/NSC Series

Features

- Industry-leading long-term stability and accuracy
- Extremely low power consumption
- Low operating voltage
- Miniature 10 mm x 10 mm [0.39 in x 0.39 in] package

Benefits

- Industry-leading long-term stability minimizes system calibration needs and maximizes system performance
- Industry-leading accuracy reduces software needed to correct system inaccuracies, minimizing system design time, supporting system accuracy and warranty requirements, and helping to optimize system uptime
- Numerous package styles, ports, and options, simplify integration into the device manufacturer's application



Low Pressure to Mid Pressure Board Mount Pressure Sensors – Basic NBP Series

Features

- Small Size (as small as 7 mm x 7 mm [0.276 in x 0.276 in])
- Cost-effective
- Durable
- Wide operating temperature range -40 °C to 125 °C [-40 °F to 257 °F]
- ISO 9001 compliance
- Numerous package styles, pressure ranges, housings, gel coating, and porting options
- Robust
- Reflow mounting J-STD-020D, MSL 1 and rapid stabilization after reflow soldering
- Six Sigma standards design

Benefits

- Occupies less space on the PCB
- Allows for easy placement on crowded PCBs or in small devices
- Simplifies integration into the device manufacturer's application
- Allows calibration immediately after mounting



Low Pressure to Mid Pressure Board Mount Pressure Sensors – Applications

24PC and 26PC Series

- Measures vacuum or positive pressure in potential environmental, industrial instrumentation applications medical instrumentation applications

TruStability® HSC/SSC

- Ventilators
- Anesthesia machines
- Spirometers
- Nebulizers
- Hospital room air pressure
- VAV (Variable Air Volume) control
- Static duct pressure
- clogged HVAC (Heating, Ventilation, and Air Conditioning) filter detection
- HVAC transmitters indoor air quality

TruStability® HSC/SSC Series

- Airflow monitors
- Barometry
- Medical Airflow monitors
- Anesthesia machines
- Blood analysis machines
- Kidney dialysis machines
- Oxygen concentrators
- Pneumatic controls
- Respiratory machines
- Sleep apnea equipment
- Flow calibrators
- Gas chromatography
- Gas flow instrumentation
- HVAC
- Life sciences
- Pneumatic controls

Low Pressure to Mid Pressure Board Mount Pressure Sensors – Applications

TruStability® NSC Series

- Valves
- Pumps
- Actuators
- HVAC transmitters
- Automated pneumatic assembly equipment
- Pneumatic operator control systems
- Industrial or hospital gas supply
- Oxygen concentrators
- Barometry
- Blood analysis
- Gas chromatography
- Analytical instrument sampling systems
- Nebulizers
- Spirometers
- Patient monitoring
- Therapeutic hospital beds

Basic NBP Series

- Hospital beds
- Oxygen concentrators
- wound therapy
- Blood pressure monitoring
- HVAC transmitters
- Air movement control
- environmental control
- level indicators,
- leak detection
- industrial
- Controls
- pneumatic controls, and other
- commercial applications

Low Pressure (1 psi to 100 psi) Flow-Through Board Mount Pressure Sensors



**24PC
Flow-Through
Series**



**26PC
Flow-Through
Series**

Features a sensing technology that utilizes a specialized piezoresistive micro-machined sensing element.

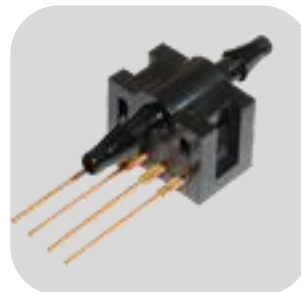
Low Pressure Flow-Through Board Mount Pressure Sensors – 24PC Flow-Through Series

Features

- Miniature package
- Media flow-through port
- Operable after exposure to frozen conditions
- Choice of termination for gage sensors
- 1,78 mm [0.070 in] diameter or 5,0 mm [0.200 in] diameter flow path with minimal dead space

Benefits

- Gage pressure sensing performance in miniature package with enhanced reliability
- Sensing technology designed to use specialized piezoresistive micro-machined sensing element
- Low power, non-amplified, non-compensated Wheatstone bridge circuit design often provides inherently stable mV outputs
- 2 mA constant current excitation significantly reduces sensitivity shift over temperature



Low Pressure Flow-Through Board Mount Pressure Sensors – 26PC Flow-Through Series

Features

- Miniature package
- Media flow-through port
- Operable after exposure to frozen conditions
- Choice of termination for gage sensors

Benefits

- Gage pressure sensing performance in miniature package with enhanced reliability
- Sensing technology designed to use specialized piezoresistive micro-machined sensing element
- Low power, non-amplified, non-compensated Wheatstone bridge circuit design often provides inherently stable mV outputs
- 2 mA constant current excitation significantly reduces sensitivity shift over temperature



Low Pressure to Mid Pressure Board Mount Pressure Sensors – Applications

- Measures vacuum or positive pressure in environmental applications
- Measures vacuum or positive pressure in medical applications

Value Added Products – Potential Applications

Packaging – Combined Sensors

- Respiratory device: Implement a differential pressure and airflow sensor into a single package, easing integration
- Weather balloon: Combine a thermistor and barometric pressure sensor in a package on a PCB, providing temperature data and altitude

Packaging – Customer Interface

- Medical pump: Encapsulate a force sensor in a package, easing implementation and maintenance

Non-Standard Terminations

- Airflow transmitter: Facilitate manufacturing by mounting an airflow sensor on a PCB with a cable/connector harness

Thermal Management Solutions

- Combine thermistors, temp probes, heaters, thermostats, and humidity sensors mechanically (or with basic controls) in a sub-system for managing thermal attributes

Temperature Sensors and Thermostats



**Discrete RTD
Sensors**



**Discrete and
Packaged
RTD Sensors**



**Packaged
Temperature
Probes**



**Precision
Thermostats**



**Commercial
Thermostats**



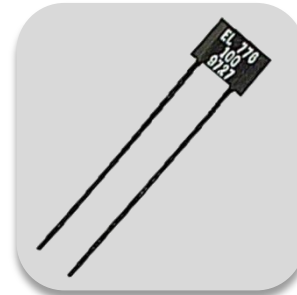
Discrete RTD Sensors



**HEL-705/707/711/
712/716/717
Series**



**HEL-775
Series**



**HEL-777/776
Series**



700 Series

Silicon-based thin film RTDs laser trimmed for accuracy and interchangeability.
Offer stable, fast linear outputs.
Accurate and interchangeable without recalibration.

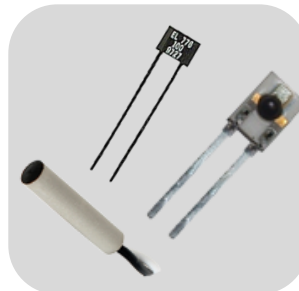
Discrete RTD Sensors – HEL Series

Features

- Linear resistance vs. temperature
- Accurate and interchangeable
- Enhanced stability
- Teflon lead wires
- Wide temperature range
- Ceramic case material
- Multiple sizes

Benefits

- Fully assembled and ready to use without need for fragile splices to extension leads
- Fast linear output
- Ceramic SIP package with solderable leads provides strong connections for wires or printed circuits



Discrete RTD Sensors – 700 Series

Features

- Linear resistance vs temperature
- Enhanced accuracy
- Interchangeable
- Enhanced stability
- Enhanced time response
- Wide temperature range
- RoHS compliant
- Radial chip or surface mount
- Cost effective

Benefits

- Economical
- Miniature temperature sensors available in two sizes each of leaded and surface mount configurations
- Surface mount in industry standard 0805 and 1206 packages; 100 Ohm and 1000 Ohm base resistance in both 3850 ppm/K and 3750 ppm/K temperature coefficients (385 and 375 alphas)
- Tolerances meet DIN class A, DIN class B and DIN class 2B industry standards
- Wide temperature range covers most potential applications



Discrete RTD Sensors – Potential Applications

HEL-705/707/711/ 712/716/717 Series

- HVAC
- Electronic assemblies
- Process control

HEL-775 Series

- PCBs
- Lower temperature probes
- Lower temperature HVAC
- Lower temperature electronic assemblies
- Lower temperature process control

HEL-777/776 Series

- PCBs
- Temperature probes
- HVAC
- Electronic assemblies
- Process control

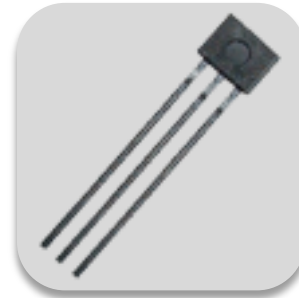
700 Series

- HVAC
- Electronic assemblies
- Process control
- Appliances
- Automotive
- Instrumentation HVAC
- Electronic assemblies
- Process control

Discrete and Packaged RTD Sensors



HRTS Series



TD Series

Silicon-based thin film RTDs laser trimmed
for accuracy and interchangeability.
Offer stable, fast linear outputs.
Accurate and interchangeable.

Discrete and Packaged RTD Sensors – HRTS Series

Features

- Linear resistance vs. temperature
- Resistance interchangeable
- Accurate
- Fast
- Laser trimmed
- Wide temperature range
- Ceramic case

Benefits

- Fully assembled and ready to use without need for fragile splices to extension leads
- Wide temperature range covers most potential applications
- Eliminates next level assembly for moderate volume customers



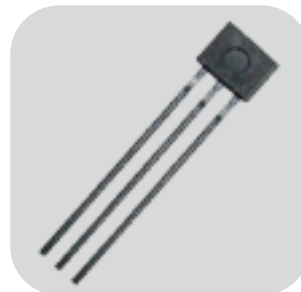
Discrete and Packaged RTD Sensors – TD Series

Features

- Linear resistance vs. temperature
- Interchangeable without recalibration
- Thin film
- Laser trimmed
- Long term stability
- Air or liquid temperature sensing
- Cost effective

Benefits

- Provide 8 Ohm/°C sensitivity with inherently near linear output
- Completely interchangeable without sensor-to-sensor recalibration
- Silicon chip sensing element with proven thin film processing reliability
- Individually laser trimmed
- TD4A environmentally sealed liquid temperature sensors with teflon leads
- TD5A miniature temperature sensors used where space is at a premium
- Three hole solderable SIP package



Discrete and Packaged RTD Sensors – Applications

- HVAC
- Electronic assemblies
- Process control applications
- Semi conductors

Packaged Temperature Probes



R300 Series



500 Series



ES110 Series



ES120 Series



6655 Series

Compact, lightweight. Operate with enhanced sensitivity, reliability, and stability under diverse conditions of shock, vibration, humidity, and corrosion. Variety of custom packages available for air, liquid, and solid temperature sensing applications.

Packaged Temperature Probes – R300 Series

Features

- Passive, resistive temperature device (RTD), high temperature probe
- Robust, stainless steel closed-tip design
- Working temperature range: -40 °C to 275 °C [-40 °F to 527 °F]; continuous, excursion to 300 °C [572 °F] for 10 min. max.
- Enhanced response, reliability, and accuracy

Benefits

- Enhances reliability in aggressive environments while still providing excellent response time
- Can operate under diverse conditions of shock, vibration, humidity and corrosion



Packaged Temperature Probes – 500 Series

Features

- Air/gas, surface, immersion and liquid level temperature measurement
- Wide operating temperature range with NTC type output thermistor
- Enhanced sensitivity, reliability, and accuracy
- Small package size and easy to install
- Enhanced stability/low drift
- RTD linear output available

Benefits

- Wide operating temperature range of -60 °C to 300 °C [-76 °F to 572 °F] provides application flexibility
- Available in a wide variety of housing styles and materials, R-T (Resistance-Temperature) curves, mounting methods, mechanical interface, electrical interface and connector types to meet most applications



Packaged Temperature Probes – ES110/120 Series

Features

- Air/gas sensing (ES110 Series) or Immersion sensing (ES120 series)
- NTC (Negative Temperature Coefficient) or KTY (silicon-based positive temperature coefficient) type outputs
- Enhanced sensitivity, accuracy, and reliability
- Robust packaging
- Fast response times over a wide operating temperature range of -40 °C to 150 °C [-40 °F to 302 °F]

Benefits

- Vibration and shock resistance
- Operates in harsh environments



Packaged Temperature Probes – 6655 Series

Features

- Air/surface temperature sensing
- NTC (Negative Temperature Coefficient) thermistor output
- Low, compact profile
- Tight interchangeability
- Enhanced accuracy and response time

Benefits

- NTC thermistor output allow the customer greater flexibility in temperature monitoring and control
- Tight interchangeability eliminates or reduces customer need for calibration
- Wide operating temperature range of -20 °C to 110 °C [-4 °F to 230 °F] allows application flexibility
- A variety of mounting brackets provides mounting flexibility



Packaged Temperature Probes – Applications

R300 Series

- Exhaust gas temperature sensing systems on heavy duty, truck, agriculture and construction vehicle engines including:
- In-line fluid temperature sensing
- Cylinder head temperature sensing
- High temperature industrial or commercial applications including bulk refrigeration, domestic heating and controls, hot tub and pool temperature controls, industrial ovens up to 300 °C [572 °F]
- Industrial applications such HVAC or refrigeration compressor equipment

ES110/ES120 Series

- Transportation: engine coolant, oil temperature, air intake, fuel and engine block sensing
- Industrial: compressor, duct, hydraulic oil temperature sensing

500 Series

- Industrial: HVAC, refrigeration, office automation, air compressors, industrial ovens and ranges, hydraulic systems, processing and packaging, power generation
- Transportation: heavy duty or sport vehicle engine oil, air inlet, fuel, coolant or surface temperature sensing
- Aviation: engine bleed air or environmental control systems
- Weather stations

6655 Series

- Water heaters and boilers
- Industrial ovens and ranges
- Copier diffuser rollers
- HVAC compressor or duct temperature sensing

Precision Thermostats



3000 Custom Packaged Series



3100 Hermetic Series



3100 UL-Approved Hermetic Series



3106 Low Level Hermetic Series



3150 Low Silhouette Hermetic Series



3153 Low Silhouette Hermetic Series



3156 Low Level Silhouette Hermetic Series



3200 Aerospace Series

Thermostats can provide either temperature control or over-temperature protection by breaking electrical contact when a specified temperature is reached. Hermetic/non-hermetic devices are available. Enhanced reliability versions meet stringent requirements of military/aerospace industries for dielectric strength, moisture, resistance, vibration, and shock.

Precision Thermostats – Applications

3000 Custom Packaged Series

- Military
- Vehicle fire suppression
- Vehicle engine fan control

3100/3100 UL Approved/3106 Low Level Hermetic Series

- Computers
- Medical electronics
- Power supplies
- Industrial controls
- Infotech
- Test equipment

3153 Low Silhouette Hermetic Series

- Military and commercial aircraft applications

3150 Low Silhouette/3156 Low Level Silhouette Hermetic Series

- Industrial
- Food service
- Telecom
- Infotech
- Medical

3200 Aerospace Series

- Aerospace
- Rocket thrusters
- Satellites:
 - Directional thrusters, battery recharging, environmental control, propellant lines, heaters, inertial guidance systems, gimbals, solar panel monitoring, gyros, avionics

Commercial Thermostats



2450A Series



**2450CM/
2450CMG Series**



**2450HR/2450R/
2450RG Series**



**2450HRG
Series**



2450RC Series



2455R Series



**2455RA
Series**



**2455RVB
Series**



**2455RC
Series**



**2455RG/2455RM
Series**

Thermostats can provide either temperature control or over-temperature protection by breaking electrical contact when a specified temperature is reached. Honeywell offers 12,7 mm [0.5 in] commercial snap-action thermostats which include automatic and manual reset options, phenolic or ceramic housings and a wide variety of mounting brackets and terminal options.

Commercial Thermostats – Applications

2450A Series

- Office copy machines and computers
- HVAC equipment
- Aircraft/aerospace
- Radar or medical equipment
- Electronic control systems
- Fire alarms and smoke/heat detectors

2450CM/2450R/2455R Series

- High current HVAC, appliances, hot water heaters. office automation
- High current heat/smoke detectors (2450R/2455R Series)

2450CMG Series

- Low voltage HVAC, appliances, hot water heaters, and office automation
- Water heater/boiler/flame rollout control

2450HR Series

- HVAC
- Major appliances
- Automotive

Commercial Thermostats – Applications

2450RG Series

- Low voltage tabletop appliance

2450HRG/2455RG Series

- Low voltage HVAC, major appliances, automotive, heat/smoke detectors, and copy machines

2450RC Series

- High current HVAC, power supplies, decorative fireplaces, glue guns
- Sleep apnea machines
- Incubator

2455RA Series

- Low voltage fire alarm, smoke detectors, and security devices

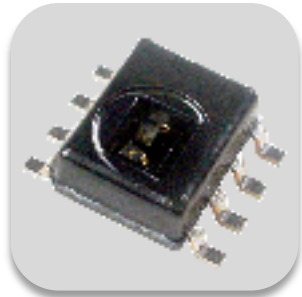
2455RVB Series

- High current automotive and industrial equipment

2455RM/2455RC Series

- High current HVAC, power supply, and office automation

Humidity Sensors



**Honeywell
Humidicon™
HIH6130/6131
Series**



**HIH-4000
Series**



**HIH-
4010/4020/4021
Series**



**HIH-
4030/4031
Series**



**HIH-
5030/5031
Series**



**HCH-1000
Series**

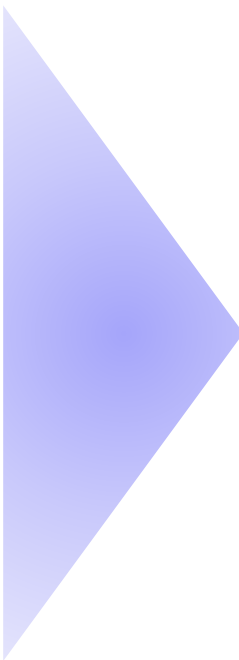
Configured with integrated circuitry to provide on-chip signal conditioning, Honeywell humidity sensors ensure linear voltage output versus RH. Laser trimmed for stable, low-drift performance, they are packaged in chemically resistant packaging to accommodate many harsh environments.



Humidity Sensors – Honeywell HumidCon™ HIH6130/6131 Series

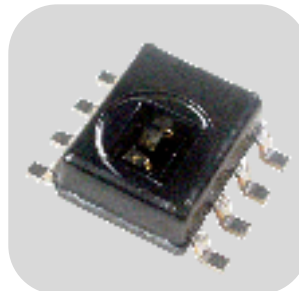
Features

- Industry-leading Total Error Band
- Industry-leading long term stability (1.2 %RH over five years)
- Industry-leading reliability
- Lowest total cost solution
- True, temperature-compensated digital I2C output
- Energy efficient (low supply voltage and low power consumption)
- Low supply voltage
- Ultra-small package has combined humidity and temperature sensor
- Wide operating temperature range of -25 °C to 85 °C [-13 °F to 185 °F]



Benefits

- Industry-leading Total Error Band (± 5 %RH): eliminates individually testing and calibrating every sensor, which can increase their manufacturing time and process; supports system accuracy and warranty requirements; helps to optimize system uptime; provides excellent sensor interchangeability
- Industry-leading long term stability (1.2 %RH over five years) helps support system uptime by eliminating the need to service or replace the sensor during its application life; eliminates the need to regularly recalibrate the sensor in their application, which can be inconvenient and costly



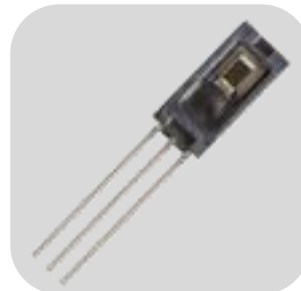
Humidity Sensors – HIH-4000/4010/4020/4021/4030/4031 Series

Features

- Near linear voltage output vs %RH
- Accurate, fast response
- Accuracy of ± 3.5 %RH
- Voltage supply of 4 Vdc to 5.8 Vdc
- Laser trimmed interchangeability
- Low power design
- Stable, low drift performance

Benefits

- Instrumentation-quality sensing performance
- Multilayer construction designed to provide excellent resistance to wetting, dust, dirt, oils and common environmental chemicals
- Laser trimmed for stable, low drift performance (optional)
- Factory calibration data provides individually matched downstream electronics and accuracy
- Available covered/uncovered and filtered/unfiltered for application flexibility



Humidity Sensors – HIH-5030/5031 Series

Features

- Voltage output
- Near linear voltage output vs %RH
- Operates at 2.7 Vdc to 5.5 Vdc
- Accurate, fast response
- Molded thermoset plastic housing
- Designed to be chemically resistant
- Accuracy of ± 3 %RH
- Stable, low drift performance
- Chemically resistant

Benefits

- Operates down to 2.7 Vdc, often ideal in battery-powered systems where the supply is a nominal 3 Vdc
- Instrumentation-quality sensing performance in a competitively priced, solderable surface mount device
- Multilayer construction designed to provide enhanced resistance to wetting, dust, dirt, oils, and common environmental chemicals
- Low current draw often ideal in most low drain, battery operated systems
- Tight sensor interchangeability reduces or eliminates OEM production calibration costs
- Available covered, filtered/unfiltered for application flexibility



Humidity Sensors – HCH-1000 Series

Features

- Capacitance output
- Polyimide sensing material
- Semiconductor fabrication technology
- Glass wafer substrate
- Low hysteresis, long-term stability
- Enhanced and accurate response time
- Reduced temperature dependence
- Uses glass wafer as substrate
- Enhanced sensitivity and accuracy provides fast response
- Low hysteresis and long-term stability

Benefits

- Polyimide sensing material designed to reduce temperature dependence and enhances resistance against contamination
- Top grid electrode/ polyimide layer, bottom electrode structure more sensitive than standard structure
- Cased version designed to protect against dust
- Cost-effective performance
- Enhanced sensitivity and accuracy provides fast response



Humidity Sensors – Applications

Honeywell HumidIcon™ HIH6130/6131 Series

- HVAC/R (air conditioning/air movement systems, enthalpy sensing, thermostats, humidifiers/dehumidifiers, and humidistats)
- Air compressors
- Weather stations
- Telecom cabinets
- Respiratory therapy (sleep apnea machines and ventilators)
- Incubators/microenvironments

HIH-4000/4010/4020/4021/ 4030/4031 Series

- HVAC/R equipment
- Drying
- Metrology
- Battery-powered systems
- Medical equipment
- OEM assemblies

HIH-5030/5031 and HCH-1000 Series

- Air compressors
- Battery-powered systems
- Drying equipment
- HVAC (air conditioning, air movement, thermostats, humidifiers, de-humidifiers, humidistats, enthalpy sensing)
- OEM assemblies
- Office automation equipment
- Process equipment
- Refrigeration (includes bulk and transport systems)
- Telecommunications cabinets
- Weather stations and meteorology equipment
- Hospital air compressors
- Infant incubators
- Microenvironments
- Sleep apnea equipment
- Treadmill stress monitoring equipment

Airflow Sensors



**Honeywell
Zephyr™ HAF
Series**

All airflow sensors operate on heat transfer - flow and differential pressure. Silicon chip design is created from thin-film, thermally isolated bridge structure, containing both heater and temperature sensing elements. This provides rapid response to the air or gas flow and amount and direction, delivering a proportional output voltage. Contains thin-film thermally isolated bridge with heater and temperature sensing elements. The bridge promotes sensitivity and fast response to flow.



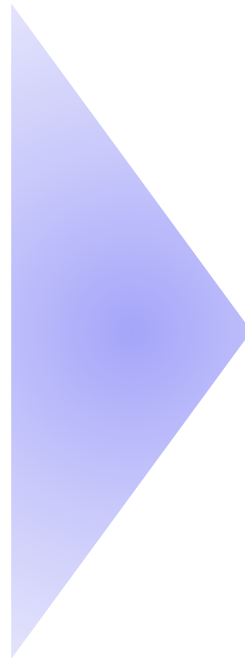
What is an Airflow Sensor?

- Airflow sensors are designed to measure mass flow of air and other non-corrosive gases based on the heat transfer principle
- The thermally isolated heater and temperature sensing elements help provide a fast response to air or gas flow
- Amplified versions provide an enhanced output signal and less external circuitry
- Unamplified versions allow additional external circuit options
- A variety of port styles provide flexibility of use within the application
- Contains advanced microstructure technology to provide a sensitive and fast response to flow, amount/direction of air or other gases

Airflow Sensors – Honeywell Zephyr™ HAF Series High Accuracy Series

Features

- Total error band as low as $\pm 2.25\%$ FSS
- Wide range of airflows from ± 50 SCCM to ± 750 SCCM
- Full calibration and temperature compensation
- High stability
- Low pressure drop
- Low 3.3 Vdc operating voltage option and low power consumption
- ASIC-based I2C digital output (digital version)
- Bidirectional flow sensing capability



Benefits

- Provide an analog or digital interface for reading airflow over the specified full-scale flow span and temperature range
- Total error band allows for very precise airflow measurement, often ideal for demanding applications with high accuracy requirements
- Detects presence or absence of airflow from ± 50 SCCM to ± 750 SCCM, increasing the options for integrating the sensor into the application; also has high sensitivity at very low flows
- Full calibration and temperature compensation typically allow the customer to remove additional components associated with signal conditioning from the PCB



Airflow Sensors – Applications

- Air-to-fuel ratio
- Analytical instrumentation: spectrometry, chromatography
- Anesthesia delivery machines
- Fuel cells
- Gas leak detection
- Gas meters
- Hospital diagnostics: spectrometry, gas chromatography
- HVAC filters
- Meteorology
- Nebulizers
- Oxygen concentrators
- Patient monitoring systems: respiratory monitoring
- Sleep apnea machines
- Spirometers
- VAV system on HVAC systems
- Ventilators
- Ventricular assist devices: heart pumps

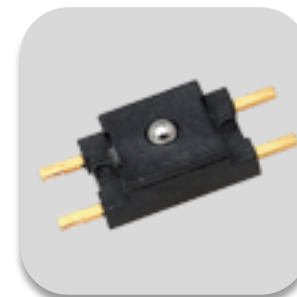
Force Sensors



1865 Series



**FS01/FS03
Series**



FSS Series

Force sensors measure the addition or backup of force—meaning, the resistance of silicon-implanted piezoresistors will increase when flexed under applied force. Each sensor concentrates force directly to the silicon-sensing element through a stainless steel plunger, with the amount of resistance changing in proportion to the amount of force applied. This change in circuit resistance results in a corresponding mV output level. Honeywell's force sensors also deliver built-in stability and flexibility, to provide enhanced performance in most applications.



Force Sensors – 1865 Series

Features

- Silicon pressure/force interface diaphragm
- Force measurement for infusion pump applications
- Pressure measurement for liquid media
- Medical-grade materials
- 8-pin DIP electrical connection
- Laser trimmed compensation
- Choice of voltage or constant current excitation

Benefits

- Silicon diaphragm provides long life
- Offers high resolution using its Wheatstone Bridge strain gauge design
- Enhanced performance force/pressure transducers specifically designed to address needs of potential medical and specialized OEM applications
- Reliable replacement for older force or load cell transducers
- Silicon rubber diaphragm allows sensor to be compatible with some potential liquid media applications
- Laser-trimmed compensation may be specified to operate with a constant current or voltage supply



Force Sensors – FS01/FS03 Series

Features

- High-level output range
- Temperature compensated
- Calibrated zero and span
- Zero noise
- 0 to 1.5 pound and 0 to 3.0 pound ranges
- High-level output range
- Calibrated zero and span

Benefits

- Piezoresistive-based force sensor for potential applications including medical infusion pumps, ambulatory noninvasive pump pressure, occlusion detection, and kidney dialysis machines
- High-level voltage output, calibrated, and temperature compensated sensors give accurate and stable output over temperature range
- Integrated circuit sensor element and laser-trimmed thick-film ceramic in a small plastic housing



Force Sensors – FSS Series

Features

- Precision force sensing
- Ratiometric output
- Maximum peak reflow temperature of 260 °C [500 °F]
- Reliability rated at 20 million MCTF at 25 °C [77 °F]
- Extremely low deflection (30 microns typ. at Full Scale)
- High ESD resistance 8 kV
- Optional terminal configurations



Benefits

- Piezoresistive sensing technology designed to provide precise, often reliable force sensing in a compact, commercial-grade package
- Wheatstone bridge circuit design provides inherently stable mV outputs over force range
- Sensor package design incorporates a patented modular construction: innovative elastomeric technology and engineered molded plastics results in load capacities of 4,500 g over force
- Stainless steel plunger provides enhanced mechanical stability and is adaptable to a variety of potential applications



Force Sensors – Potential Applications

1865 Series

- Infusion pumps
- Anesthesia monitors
- Non-corrosive, non-pressurized media-level sensors
- Ventilation systems
- Blood pressure equipment
- Syringe pumps
- Drug delivery systems

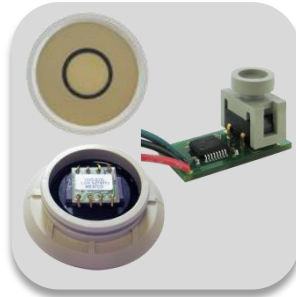
FS01/FS03 Series

- Medical infusion pumps
- Ambulatory noninvasive pump pressure
- Occlusion detection
- Kidney dialysis machines
- Load and compression sensing
- Variable tensions control

FSS Series

- Medical infusion pumps
- Ambulatory noninvasive pump pressure
- Occlusion detection
- Kidney dialysis machines
- Load and compression sensing
- Variable tensions control
- Robotic end-effectors
- Wire bonding equipment
- Infusion pumps
- Insulin pumps
- Syringe pumps
- Surgical instruments

Value Added Pressure and Thermal Products



**Pressure and Thermal
Management
Assemblies**



**Thermal
Management
Assemblies**

Value added products are a combination of robust Pressure and Thermal sensing platforms, other Honeywell products, capabilities, and technologies, provided together for customers in target vertical markets.



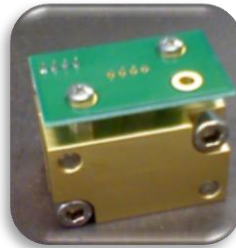
What are Value Added Products?

Integrating existing pressure and thermal products into higher level assemblies



Ventilator exhalation valve cover – custom heater assembly

Packaging pressure and thermal sensors to facilitate easiest customer implementation



Value Add TruStability® Pressure Sensor - control and monitoring PCB - manifold assembly for anesthesia vaporizer

Adding other proven Honeywell technologies to solve pressure and thermal customer needs

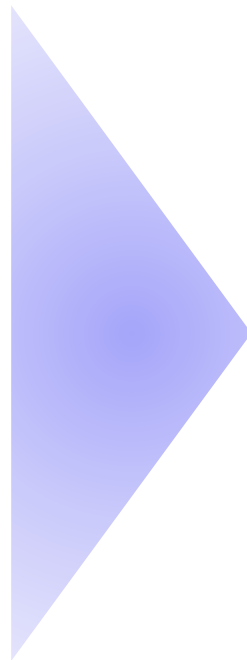


Value Add 1865 Series Force Sensor assembly with custom packaging

Value Added Pressure and Thermal Management Assemblies

Enablers

- Up front technical support to clearly understand customer's system and application issue
- Robust RFQ and pursuit model assessment for strategic, capability, financial fit and quick decision making
- Added value by tailoring solutions to specific application needs
- Responsive quoting and rapid prototyping processes
- Executing velocity product development assures built in quality, reliability and repeatability
- Build value added solutions on highly reliable, stable and accurate sensing platforms you can trust
- Best-in-class factory operations and customer care ensure a great customer experience



Benefits

- Improves time to market
 - Reduces production cycle time
 - Honeywell provides the sensor interface
 - Eases manufacturing
 - Plug & play assembly provided
 - Application and engineering support
 - Reduces customer design time
- Lowers total system costs
 - Reduces number of vendors
 - A single supplier who can provide what previously required many
 - Improves reliability
 - Reduces failure points
 - Honeywell provides a tested sub-assembly
 - Optimizes your product
 - Utilizes Six Sigma and lean processes
 - Simplifies qualification and manufacturing
 - Single part number for purchasing, manufacturing and tracking



Value Added – Initial Pressure & Thermal Targets

Target For Opportunities	Applicable Pressure & Thermal Products								
	BM P	Airflow	Force	Humidity	HD P	Thermist	HD Temp	T Stat.	Heater
Packaging - Combined Sensors	●	●	●	●	●	●	●	●	●
Packaging - Customer Interface	●	●	●	●	●	●	●	●	●
Non-Standard Terminations	●	●	●	●		●			
Thermal Management Solutions				●		●	●	●	●

● Target For NBO Generation

- Packaging – Combined Sensors:** Creating special packaging in order to combine multiple pressure and thermal sensors into a single part.
(All Pressure & Thermal Products)
- Packaging – Customer Interface:** Creating special packaging that facilitates implementation and interaction of a pressure or thermal sensor in the customer application.
(All Pressure & Thermal Products)
- Non-Standard Terminations:** Creating a special, non-standard electrical termination (e.g. adding wiring or connectors to existing leads) for a sensor.
(All Board Mounted Products)
- Thermal Management Solutions:** Combining multiple thermal sensing products into a physical (and sometimes functional) sub-assembly / sub-system.
(All Thermal Products)

Value Added Products – Potential Applications

Packaging – Combined Sensors

- Respiratory device: Implement a differential pressure and airflow sensor into a single package, easing integration
- Weather balloon: Combine a thermistor and barometric pressure sensor in a package on a PCB, providing temperature data and altitude

Packaging – Customer Interface

- Medical pump: Encapsulate a force sensor in a package, easing implementation and maintenance

Non-Standard Terminations

- Airflow transmitter: Facilitate manufacturing by mounting an airflow sensor on a PCB with a cable/connector harness

Thermal Management Solutions

- Combine thermistors, temperature probes, heaters, thermostats, and humidity sensors mechanically (or with basic controls) in a sub-system for managing thermal attributes

Value Added Thermal Management Assemblies



78000 Series



3100 Series



3200 Series



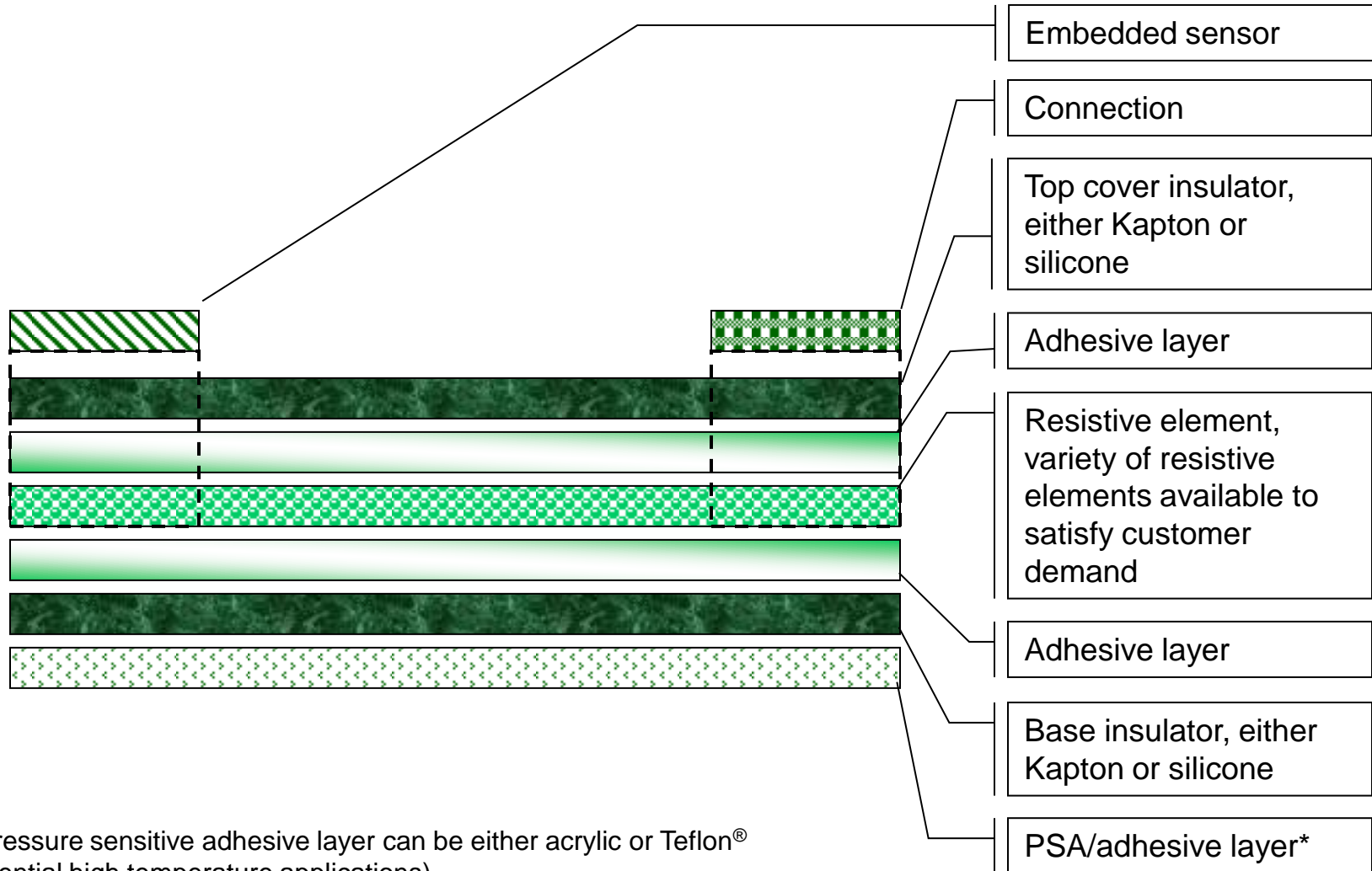
3400 Series

Honeywell's flexible heater product line meets multiple needs in many industries — from medical electronics to burgeoning global telecommunication segments. Each solution is designed to be bonded to other system parts or combined with Honeywell thermostats, thermistors, thermocouples, temperature sensors and thermal fuses to form custom-engineered heating systems.

What is a Thermal Management Assembly?

- Thermal Management Assemblies are resistive elements in various configurations to fit application needs that generate heat with induced electrical current
- Integration of thermal sensors, mounting interface and custom terminations are often provided as a complete thermal management assembly
- Resistive elements can be insulated with silicon, Kapton or polyester (transparent) material
- Watt density, max. temp., geometry, size, and agency approvals will vary depending on the material used
- Typical characteristics of the Honeywell thermal management assemblies:
 - Temperature range: -40 °C to 200 °C [- 40 °F to 392 °F]
 - Available heating zones: up to 40
 - Flexural radius: as low as 0.125 in. [3,175 mm]
 - Insulation resistance: up to 6,000 VAC
 - Temperature tolerance: ± 2.0 °C across heater surface
 - Visible light transfer (VLT): up to 95%
 - Regulatory approvals: UL, CSA

Typical Construction of a Thermal Management Assembly

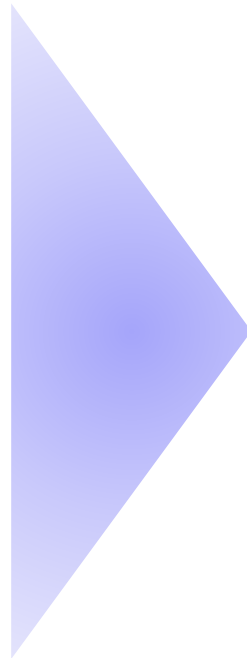


*PSA-pressure sensitive adhesive layer can be either acrylic or Teflon®
(for potential high temperature applications)

Value Added Thermal Management Assemblies – 78000 Series

Features

- Sputtered Indium Tin Oxide (ITO) on transparent polyester film
- Printed silver or carbon bus bars
- No wires in the viewing area
- Visible light transmission ranges between 80 % and 95 % (application dependent)
- Operating temperature range of -40 °C to 85 °C [-40 °F to 185 °F]
- Output up to 5 W/in² (application dependent)



Benefits

- Electrically-conductive transparent film eliminates need for resistance wires or traces and also accommodates potential EMI/RFI shielding applications
- Optical grade, thin-film polyester is designed to ensure clarity and optimum readability in extreme environments
- Transparent PSA permits light transmission up to 95% and allows heating element to be mounted in front of or behind LCD
- Low power consumption for use with battery or line power
- May be combined with other Honeywell thermal products to form custom thermal management assemblies



Value Added Thermal Management Assemblies – 3100 Series

Features

- Virtually any size and shape
- Standard designs UL and CSA approved
- Multi-strand resistance wires

Benefits

- Wire wound type heaters easily conform to many different mounting surface shapes
- Pressure sensitive adhesive (PSA), when used, can simplify installation in the customer's system
- May be combined with other Honeywell thermal products to form custom-thermal management assemblies



Value Added Thermal Management Assemblies – 3200 Series

Features

- Multiple heating zones/ watt densities or varying trace geometries
- Variety of geometries that can be vulcanized to flat surfaces
- Standard designs UL and CSA approved

Benefits

- Easily vulcanized to metal parts.
- Pressure Sensitive Adhesive (PSA), when used, can simplify the customer's installation
- May be combined with other Honeywell thermal products to form custom-thermal management assemblies
- Application flexibility and efficient heating



Value Added Thermal Management Assemblies – 3400 Series

Features

- Low out gassing
- Variety of geometries that can be vulcanized to flat surfaces
- High dielectric strength with minimum thickness
- Standard designs UL and CSA approved

Benefits

- Kapton is designed to provide thermal stability over a wide temperature range.
- Pressure sensitive adhesive (PSA), when used, can simplify customer's installation
- May be combined with other Honeywell thermal products to form custom-thermal management assemblies
- Used where thin profile and/or low material outgassing are important considerations



Pressure and Thermal Value Added Products – Potential Applications

- Infusion
- Anesthesia machines and ventilators
- Dialysis
- Diagnostics
- Hospital hardware
- Incubators
- HVAC
- Refrigeration
- Power generation
- Oil and gas
- Telecom

Pressure and Thermal Product Groups

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- **Value Added Pressure and Thermal Products**

- 78000 Series
- 3100 Series
- 3200 Series
- 3400 Series

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- **Heavy Duty Pressure Sensors and Transducers**

- 13 mm Series
- 19 mm Series
- PX2 Series
- MLH Series
- SPT Series

- **Temperature Sensors**

- Discrete RTD Sensors
- Discrete and Packaged RTD Sensors
- Packaged Temperature Probes
- Precision Thermostats
- Commercial Thermostats

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- **Board Mount Pressure**

- Ultra-Low Pressure Sensors
- Low Pressure to Mid Pressure Sensors
- Low Pressure Flow-Through Sensors

- **Humidity Sensors**

- HumidIcon™ HIH6130/6131 Series
- HIH-4000/4010/4020/4021/4030/4030/5030/5031 Series
- HCH-1000 Series

- **Airflow Sensors**

- Zephyr HAF Series

- **Force Sensors**

- 1865 Series
- FS01/FS03 Series
- FSS Series

About Honeywell Sensing and Control Products

- For more information about all of Honeywell Sensing and Control sensor and switch solutions, visit <http://sensing.honeywell.com>



<http://sensing.honeywell.com>

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