# Sensata Technologies

SENSOR AND CONTROL SOLUTIONS FOR DIVERSIFIED APPLICATIONS

We take pride in knowing that our technologies improve safety, efficiency and comfort for millions of people every day

For more than 100 years, Sensata has provided a wide range of customized, sensor-rich solutions that address complex engineering requirements to help customers solve difficult challenges in many industries. Sensata's solutions help make products safer, cleaner, more efficient and connected.

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## Sensata solutions for thermal management, including motor and overheat protection, are reliable, cost-effective, and help ensure safety

Diversified applications like large and small household appliances, medical equipment, automotive and railway must perform high quality precision tasks while operating safely to prevent potential hazards or injuries. The market is very competitive, and any quality or safety issues generating product recalls will cause a waste of time and resources, financial losses and damage to the brand reputation of the manufacturers.

Sensata solutions for thermal management, motor and overheat protection are reliable, costeffective and help ensure safety. Sensata partners closely with its customers right from the design-concept to ensure a safe and reliable solution. All Sensata products are of exceptional quality and are designed and tested to meet the highest standards. Sensata's team of engineers have the experience and expertise to innovate and problem-solve no matter what the sensor challenges are.

Together with you, we enable a safer, cleaner, more connected and more comfortable world.



## Why Sensata

Sensata's teams have a deep knowledge and understanding of a broad range of industrial applications and offer advice and support to help customers select the right product for their applications. All Sensata's products are of exceptional quality. Sensata takes pride in the flexibility it drive in its operations to customize products on a global scale.



Industry-specific knowledge and proprietary technology in mission critical and hard-to-do applications



Partnership mindset and flexible technology building blocks configured for customized solutions



Cost-effective manufacturing model with concentrated manufacturing operations across the globe



Strong teamwork to deliver fast responses to customers, with deep understanding of product design cycles and launch execution

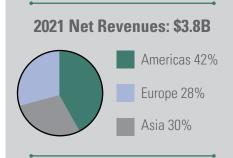
## What Our Customers Say

#### **Global Industrial Washing Machines Manufacturer:**

As an industrial washing machine manufacturer, we develop products which are different from the conventional washing machine used in a household. Our clients are hotels and cleaning companies. Therefore our machines need to withstand a constant operation, accommodating huge quantities of laundry.

We need highly reliable, robust and safe components that help our machines operate efficiently and safely all the time. Sensata is one of our preferred suppliers and we managed to build a true partnership along the way, based on trust and mutual understanding. We fully rely on their engineering capabilities and their level of support and engineering knowledge is truly one of their assets.

## **Fast Facts**



47,000+ different products manufactured

**1.1B** devices shipped each year, each highly engineered

21,000+ employees worldwide

**13** countries with business centers and manufacturing sites

## **Solution Overview**

Application		Pressure Sensors and Switches	Temperature Sensors and Thermal Cut-Outs	Position Sensors and Encoders	Motor Protectors	Solid State Relays	Circuit Breakers	Operator Controls
Professional Food Equipment	Beverage Dispensing Machines	٠	•	٠	•	•		
	Espresso Machines	•	•		•	•		
	Professional Kitchen Appliances	•	•	•	•	•		
Major Appliances	Washing Machines		•		•			
	Dishwashers		•		•			
	Dryers		•		•			
	Refrigerators		•		•			
Medium and Small Appliances	Vacuum Cleaners		•		•			
	Blenders		•		•			
Appnanooo	Hair Dryers		•		•			
Railway	Railway	•	•	•	•	•	•	
Automotive	Automotive Electric Systems		•		•		•	
Military Equipment	Military Vehicles Electric Systems		•		•		•	
Medical Application	CT/MRI							٠

## **Functional Solutions**

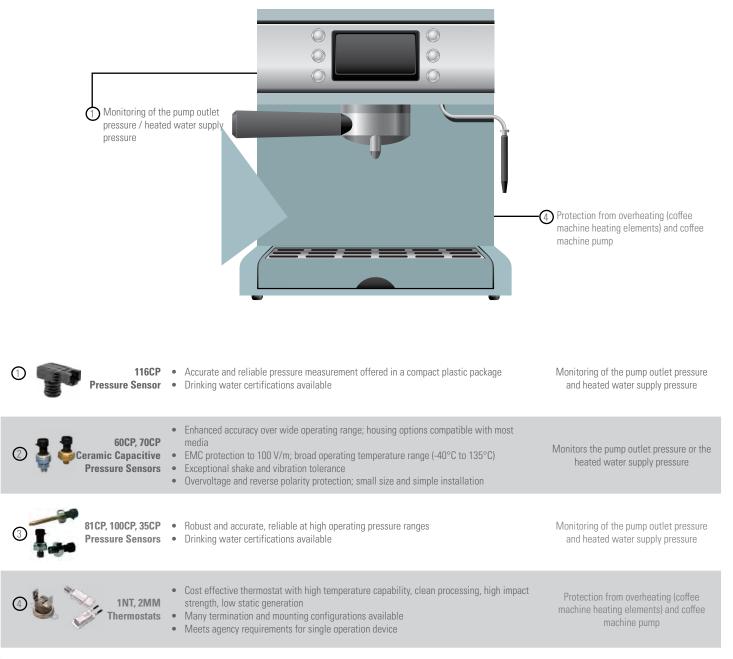
Pressure Sensors and Switches	Temperature Sensors and Thermal Cut-Outs	Position Sensors and Encoders		
Sensata offers a broad portfolio of pressure products based on a variety of proven technologies, from pressure sensors that offer ranges from 1 inch $H_2O$ to 10,000psi or vacuum up to 700bar, to our highly reliable pressure switches with a wide range from $0 - 2000$ psi or $0 - 140$ bar.	Sensata's comprehensive range of thermal solutions can meet many electrical protection needs. Its portfolio is easily configurable and includes rugged industrial thermostat switches and temperture sensors, with a wide range of form factors and connection options.	Sensata's comprehensive position sensor line includes incremental and absolute encoders, hall effect sensors, rotary and linear potentiometers as well as inclinometers and draw wire solutions for a broad variety of applications within many industrial markets.		
Motor Protectors and Circuit Breakers	Solid State Relays	Operator Controls		
These products, including magnetic hydraulic circuit breakers, ground fault circuit interrupters, power switches and fuses, accurately protect against fault conditions and provide power distribution and control. They have an innovative design and proven performance.	Sensata's Crydom brand is a market leader with the widest range of off-the-shelf solid state relays and contactors, as well as custom- designed solid state switching solutions for professional ovens, vending machines, deep fat fryers, coffee machines and more.	Sensata designs and manufactures advanced operator controls and integrated systems with embedded diagnostics meeting strict product safety standards in medical, material handling and mobile elevating work platforms that simplify operation, increase reliability, and improve		

#### **Commercial Espresso Machines**

Water pressure measurement in professional coffee machines is required in the boiler and brewing loops. Pressure instruments must be accurate, able to withstand the temperatures and stresses generated by cleaning processes and have specialized wetted parts, certified for drinking water and food applications, as the use of pressure instrumentation is an essential part of safe food production.

To guarantee constant espresso quality the brew pressure (pump outlet pressure) must be stable. To ensure this espresso machine manufacturers install an over pressure valve (OPV) at the pump outlet side. An OPV can be adjusted with a screwdriver and is not always accessible without dismantling the machine. As manufacturers are constantly improving their technology and considering easy-to-use consumer requirements, modern coffee machines allow regulation of the brew pressure with a single button, which is easily accessible from outside the machine. In this case, an OPV is being substituted by a proportional valve and a pressure transducer, installed behind the valve.

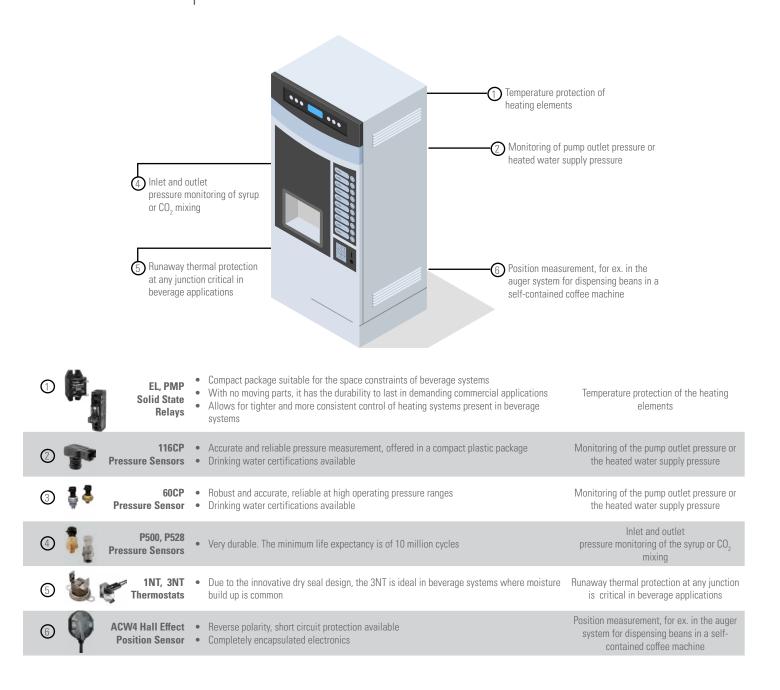
Pressure transducers from Sensata can be used to monitor brewing pressure: either in the cold-water piping, where the sensor is connected to the pump outlet, or in hot water piping, behind the boiler.



#### **Commercial Beverage Systems**

Sensata's solutions range from the sensors that monitor system temperature to the relays that can withstand the high quantity of switching needed for commercial activity. Consumers' tastes in beverages have grown more eclectic over the years. Restaurants and cafes are expected to have the variety necessary to satisfy many different beverage desires. Furthermore, the prevalence of self-service beverage systems has increased as well. Through automation, restaurants must provide complex drinks to the customer in a consistent fashion. Versatility and automation are not the only factors. Size is also critical. Bar and kitchen space is at a premium and operators expect their beverage machine to accomplish more in the same or smaller footprint. Durability is a major concern as well. Beverage systems must withstand the wear and tear of constant commercial usage.

The trends in beverage systems are leading to an increased need for better and more efficient sensors and electronics. Sensata provides many components that make complex beverage systems possible and efficient. Our solutions range from sensors that monitor the temperature of systems to relays that can perform the high quantity of switching needed for commercial activity.

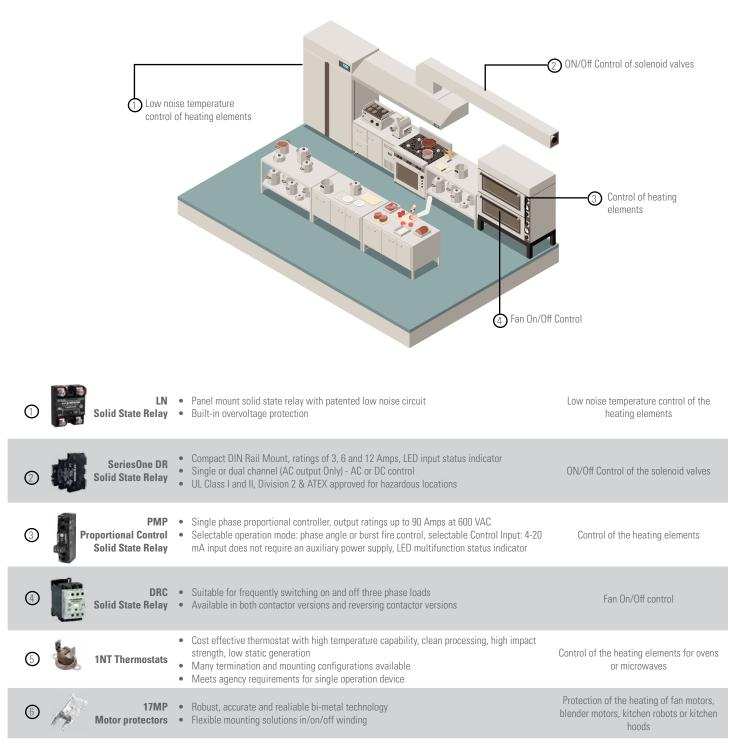


#### **Professional Kitchen Appliances**

Today's successful restaurants and cafes rely upon the latest machinery for cooking, warming and beverage preparation. This includes mixers, convection ovens, combi steamers, deep fat fryers, dough divider rounders, food warming cabinets, coffee machines, etc. This demand has increased the use of highly accurate digital control technology that ensures compliance with related standards, such as low EMC (Electromagnetic Compatibility) directives for commercial and household use.

Sensata offers a broad range of solid state relays and contactors that are perfectly suited for use in the food equipment industry.

Solid state relays are well suited for use with digital control signals due to their low input current and higher switching speed, which is required to maintain proper temperature control.



#### **Dishwashers, Washing Machines and Dryers**

Sensata's motor protectors can be located outside the winding, providing the motor **manufacturer extra flexibility** during the manufacturing process.

Washing machines are an indispensable appliance of any home today and people cannot imagine their daily life without one. Therefore, washing machines must work properly and operate safely, no matter how many washing cycles are needed over time. Dryers are also a useful addition especially in urban areas where space can be limited.

However, they can also be dangerous, and the hazards can be numerous, so ensuring the safety functions of washers is very important. Features aside, water appliances may leak, and heating elements can overheat and catch fire, so the motor and overheating protection are extremely important.

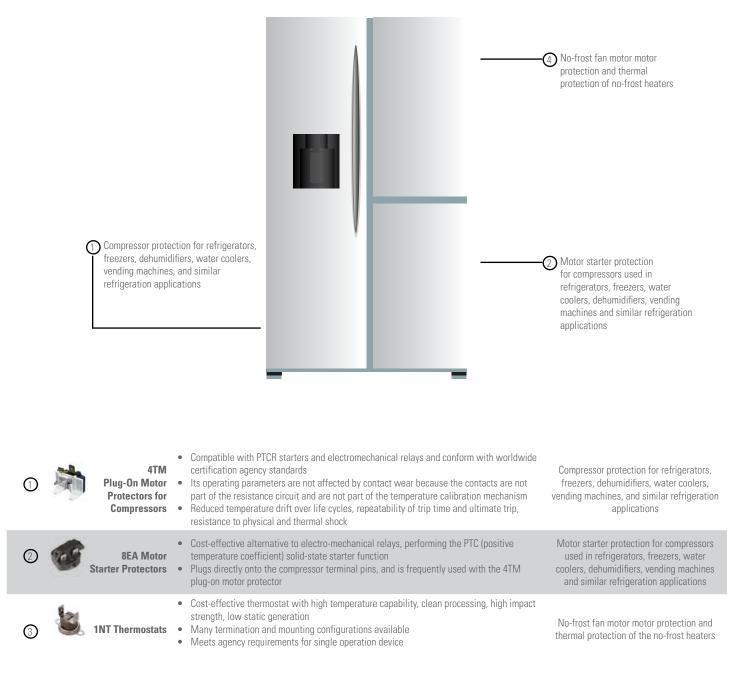


1NT Thermostats	<ul> <li>Cost effective thermostat with high temperature capability, clean processing, high impact strength, low static generation</li> <li>Many termination and mounting configurations available</li> <li>Meets agency requirements for single operation device</li> </ul>	Protection of the heating elements
15AM Motor protector / Thermal cut-out	<ul> <li>Robust, accurate and realiable bi-metal technology</li> <li>Flexible mounting solutions in/on/off winding</li> <li>Operates as an incorporated thermal sensitive protector of the electric motor of the washing machine</li> </ul>	Locked rotor and motor overload protection.
7AM (3) Lighting, Electrical, Thermal, Battery, Motor Protector	<ul> <li>Delivers maximum protection in the smallest package at a competitive price</li> <li>Optimum snap-acting open and reset characteristics necessary to achieve consistent performance over the required life cycle</li> </ul>	Overload and overheating motor and pump protection
SMP     Motor protector	<ul> <li>Motor protector for 120 and 250 Vac applications to operate in wide temperatures and current ranges</li> <li>Provides consistent performance characteristics and excellent reliability</li> <li>The certification as a thermal cut-out device combined with its unique current sensitivity, positions the 3MP as an advanced and cost effective solution to protect toroidal transformers</li> </ul>	3MP features permit to move the motor protector location outside the winding, providing the motor manufacturer extra flexibility during the manufacturing process.
(5) Motor protector	<ul> <li>Motor protector for 120 and 250 Vac applications to operate in wide temperature and current ranges</li> <li>Provides consistent performance characteristics and excellent reliability</li> </ul>	Overload and overheating motor and pump protection
6 Motor protector	<ul> <li>Robust, accurate and reliable bi-metal technology</li> <li>Flexible mounting solutions in/on/off winding</li> </ul>	Overload and overheating motor and pump protection

#### Refrigerators

Refrigerators must be safe against fire due to motor overheating. Internal temperature sensors or thermal switches are installed to perform an automatic power shut off in the case of a fire. These thermal switches must be reliable and work in a timely fashion to avoid any potential fire hazard.

Sensata's motor protectors provide overload protection in commercial motors which function in destructive or corrosive environments.



#### **Vacuum Cleaners**

Sensata's 7AM motor protectors deliver the maximum protection of the motor and of the pump, in the smallest package at a competitive price. People trust their vacuum cleaners to clean their homes and rarely give these products more than a second of thought. Unfortunately, vacuum cleaners are electronic components that can malfunction.

Therefore, vacuum cleaners need robust and safe motor protectors and circuit breakers in order to prevent any short circuit in the power cord. A short circuit could lead to a fire and may cause injuries to the person operating the vacuum. Damages to brand reputation can be overwhelming for manufacturers.



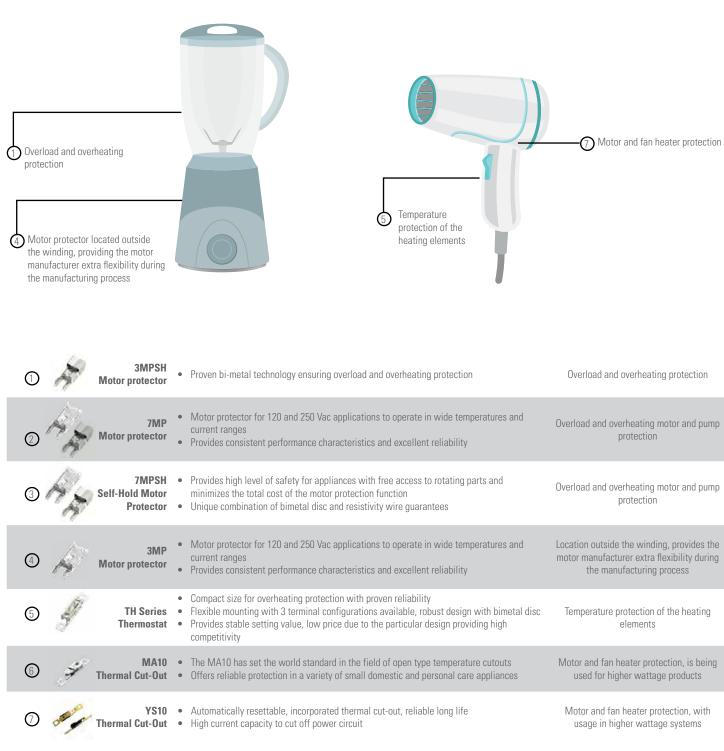
#### **Small Appliances**

Small appliances like blenders or hair dryers can overheat when left plugged into the electrical connection. This poses a potential fire hazard, even when the appliance is switched off.

The bearings in the blender blades assembly can become seized from liquid and food seeping through, causing the motor to work harder than it should, and either overheat or burn out. Dull blades from blending large amounts of ice or other hard foods can also cause stress on the motor, sometimes resulting in a burning smell. Brushes and seals wear down over time when the blender is heavily used and allow liquid to get into the motor.

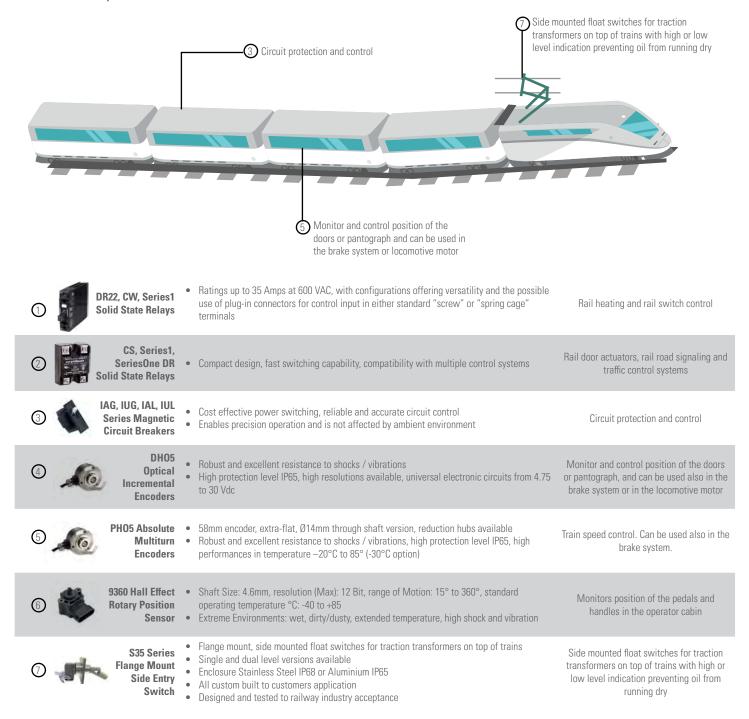
Sensata motor protectors ensure that the motor of these applications will not overload, protecting it from burning or electrical smells.

Sensata's solutions protect against start winding overheating and other conditions which generate high main winding currents.



#### Railway

Sensata's circuit protectors are designed using the latest in sensitive hydraulic magnetic technology. Ambient temperature does not affect their operation. Sensata's magnetic circuit protectors provide cost effective power switching, reliable circuit protection and accurate circuit control. Designed using the latest in sensitive hydraulic magnetic technology, ambient temperature does not affect the operation, making the range suitable for many rail applications and environments, wherever precision operation is required.

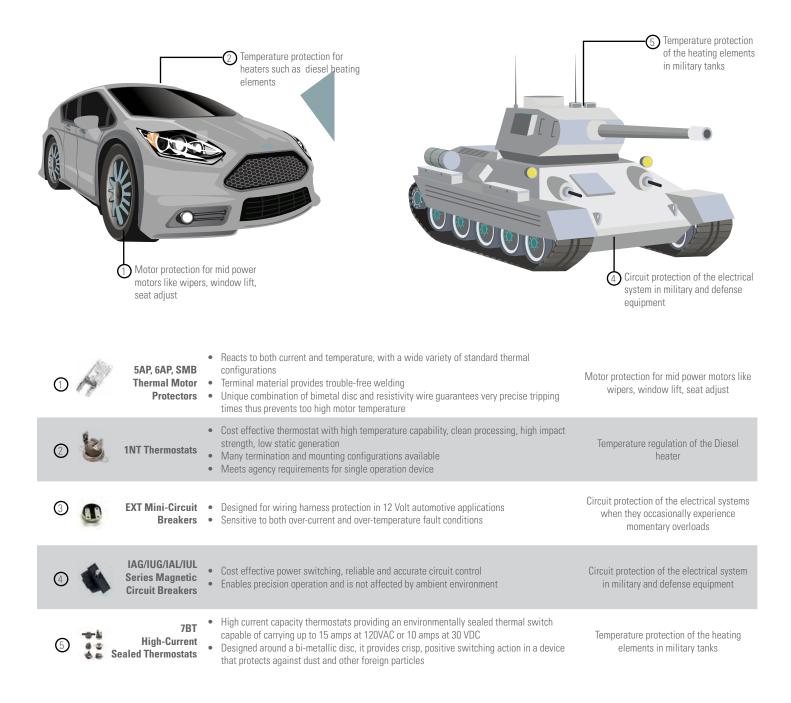


#### **Vehicles Electric Circuits**

Thermal automotive circuit breakers are devices used to break the flow of current in automotive circuits in order to protect them against a fault such an overcurrent or short circuit. The thermal aspect of this type of circuit breaker allows for smaller over-currents over a longer period of time, but will quickly trip the circuit for larger over-currents. This is useful in the case of motors as there will be a small overcurrent each time the engine is switched on for a short length of time, which should not trip the circuit.

Thermal automotive circuit breakers from Sensata protect electrical networks in most types of vehicles, including cars, vans, buses, boats but also military and defense vehicles or any other types of transportation equipment.

Sensata's thermal automotive circuit breakers protect electrical networks in most types of vehicles including cars, vans, buses, boats, and military and defense vehicles.

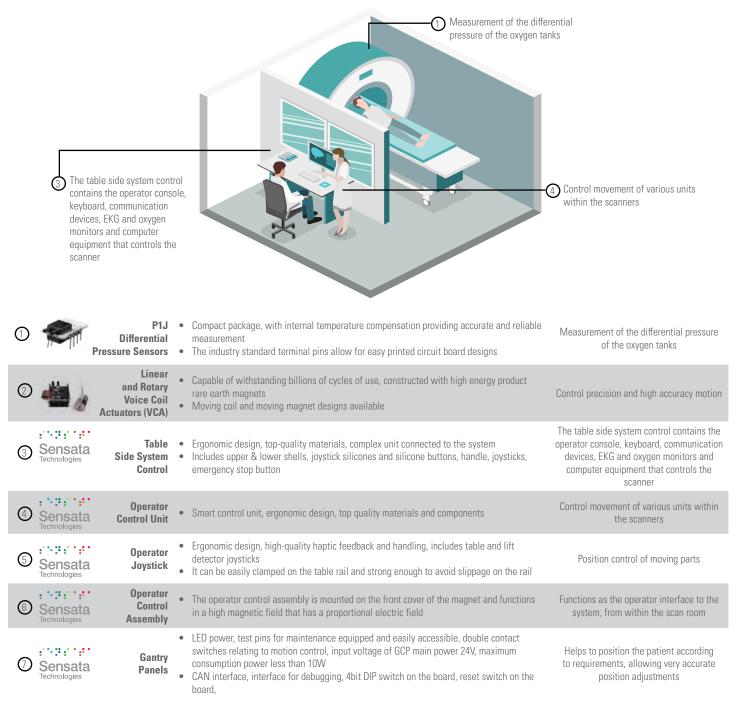


#### Magnetic Resonance Imaging (MRI) and Computer Tomography (CT) Scanners

Sensata can develop custom and exclusive operator control solutions for computer tomographic and magnetic resonance imaging scanners, ensuring knowledge property transfer and allowing medical OEMs to focus on the creation of more innovation. Our medical product offering and experienced application engineers help medical equipment designers in finding the right sensing solution for a variety of medical applications, including ventilators, oxygen concentrators, patient monitoring systems, laboratory, vascular equipment, and more. Our sensors for medical applications are reliable, accurate, robust, and have a long life cycle.

Besides these sensing solutions, Sensata can develop also custom and exclusive operator control solutions for computer tomographic and magnetic resonance imaging scanners, ensuring knowledge property transfer. We partner with you right from the design stage and our deep engineering knowledge of the applications, as well

as our partnership approach, will contribute to develop top quality, ergonomic and high-class design control solutions for your unique end equipment.



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