

# PRODUCTS AND SERVICES

2023



# SENSOR INTELLIGENCE

# ABOUT HITEC

Today's HITEC Sensor Developments brings together three companies and a half century of experience providing custom sensors for aerospace, automotive, medical, energy, industrial and other vital applications.

Our sensors have been instrumental to space exploration, from orbiting the earth to landing on Mars. They measure airframe stresses, sense electric actuator forces, and provide data for health and usage monitoring systems on modern aircraft. They help automotive designers create safer, better-performing vehicles. They're found in a wide range of medical devices that improve diagnosis and enable better outcomes, including infusion pumps, catheters, surgical robot, laboratory analyzers and much more.

HITEC specializes in providing innovative, customized sensor solutions to our customers' most demanding technical challenges. This brochure will highlight our capabilities and provide examples of some applications in which our sensor technology has been deployed. Contact us to find out how we can help you.



## COMPANY HISTORY

**1971**

HITEC Corporation was established

**1970's**

Engineering custom sensors for the Space Shuttle's RS-25 liquid-fuel main

**1976**

Sensor Developments, Inc. was formed

**1980's-90's**

National Aero-Space Plane

**1990's**

We began to vastly increase our service to the medical device industry

**Early 2000's**

HITEC were instrumental in the development and manufacture of Pratt & Whitney engines for the Joint Strike Fighter program

**2009**

Aero Sense Technologies founded

**2012**

HITEC Sensor Solutions & Sensor Developments, Inc. join forces more than 35 years later

**2018**

Aero Sense became part of HITEC Sensor Developments





## INTO THE FUTURE

Today's HITEC is advancing the future of aerospace, medical, energy, and many other industries, with a half-century of experience developing, manufacturing, and supporting custom sensors for virtually any application. We have ISO 9001 Certified, AS9100 Registered, and A2LA Accredited facilities in multiple locations in the U.S. and overseas to meet the most stringent quality requirements. And we have the know-how to take on the most challenging projects.

But our success is built on more than know-how. It's about trusted and enduring relationships. As we look back over our long history and forward to each new accomplishment, it's the trusted, enduring relationships that make it all possible.

We know that when we collaborate with our customers as partners, when we understand and meet their exact needs, when we're always at their service for design, implementation, and support needs – that's when we win together.

## BENEFITS OF WORKING WITH HITEC SENSORS

- Over 50 years' experience in sensor design and strain gauge installation
- A breadth of application knowledge across diverse industry sectors
- Global network of manufacturing sites, sales and technical support
- Customer-focused engineering specialized in customizing solutions to fit your requirements
- Experienced field services team for on-site work anywhere in the world
- Certified and accredited facilities and processes
- Ongoing calibration and repair service available

## WORKING WITH HITEC

### 1<sup>st</sup> contact

hitecsensors.com

sales@hitecsensors.com

+1 (978) 742 9032

Via our extensive global network of Manufacturer's Representatives

### Discuss Application Requirements

We review your project requirements, including technical specifications, timing and budget

### Propose Solution

It could be a standard product, a modification to an existing solution, or a completely new and custom design

### Evaluation and Testing

We build prototypes for your qualification testing, then refine the design based upon feedback or changes to the project scope of work until you are completely satisfied

### Production

Once a solution has been adopted, we support production needs, from PPAP, pilot, and ramp-up through full volume production, from one-offs to 100k+ pieces per year

### Aftercare

Our services extend beyond production with flexible delivery and scheduling options, to annual recalibration and full repair services when needed





## AUTOMOTIVE & TRANSPORTATION

A committed, experienced automotive partner.

HITEC has a proud, 50-year legacy of supplying strain gauge-based sensors to a diverse customer base within the automotive and transportation industries. Our expertise includes specialized sensors for application-specific testing, general-purpose force and torque sensors for structural and performance testing, sensors used for monitoring and control of assembly processes, strain gauge bonding services for stress and strain measurements (including high-temperature sensors), and OEM sensors.

- Steering effort torque sensors
- Window pinch force sensors
- Brake pedal force sensors
- Drive shaft/half shaft torque measurement with rotor telemetry
- High-temperature strain gauging of vehicle exhaust systems for durability testing
- Dynamometer torque sensors
- Force gauges for the measurement of resistance spot weld clamp loads

## RACE CAR

HITEC has years of experience instrumenting components for the race car industry. Sensors used in the racing industry provide important data on how the car behaves, helping race engineers and drivers optimize the performance of their car. These sensors must be small and light, yet withstand the harsh temperature and vibration conditions encountered on the race car.

- Push/pull rods can be gauged for weight transfer analysis to lower the likelihood of a crash
- Sway bars can be gauged for weight shift reaction to turns and straightaways
- The gear shifter can be gauged to measure gear shift forces
- Custom load cells can be applied as an alternative to the screw jack/top hat for measuring coil springs. The original screw jack, helix and coil springs are retained, and the load cell does not interfere with coil spring changes or other suspension adjustments normally made at the track. Capacities and dimensions can be customized to your specific measurement needs

### Reliability in Higher Temperatures

Changes in the sensitivity of the strain gauge and the elasticity modulus of a transducer's temperature will result in an output span shift. HITEC provides a specially selected, modulus-compensated strain gauge to reduce this effect to an agreed-upon level. An unloaded suspension component will exhibit some output as it is heated, even with no load applied. This is due to a variation in the matching of the strain gauge circuit to the transducer material. We add temperature compensation to the strain gauge bridge to reduce this effect, requiring two calibration runs.

### Amplifiers

For increased accuracy and repeatability, installation of a strain gauge amplifier is added as an option to work with your data-acquisition system. Amplifiers have a high-level output, such as 0–5 Volts, and the gain can be adjusted to maximize sensitivity.

## MEDICAL

HITEC provides extremely sensitive strain gauge-based sensors for medical equipment, incorporating a choice of foil and semiconductor technology. Both types have wide application in the medical environment, from precisely measuring larger forces in equipment such as patient tables and imaging systems to the tiny forces involved in the most delicate medical procedures.

In particular, our sensors based on semiconductor strain gauges provide exceptional resolution at the thin and small sizes needed for endoscopic tools, catheters, suture devices, infusion pumps, surgical staplers, and more. We also provide wireless sensors for use in a wide range of applications, such as measuring torque in the rotational components of surgical robots, CT scanners and other medical devices.

Our expertise for medical sensors is backed by more than 50 years of experience. Custom engineering and manufacturing is our specialty, enabling us to understand and serve the needs of medical equipment manufacturers like no other provider can. And we deliver

highly customized solutions in high volumes – manufactured, installed, and serviced either in the U.S.A. or overseas to achieve optimum pricing and delivery for any application.

Our sensor solutions help surgeons work smarter and with greater precision. They help diagnosticians see clearly. They help enable minimally invasive surgeries that lead to faster and more complete recovery. They help patients be more comfortable, mobile, and healthy. We can't imagine a more vital role to play. We're proud to offer the highest-quality sensors, purpose-customized for the demanding needs of medical equipment suppliers in virtually every healthcare field.

### Medical-Specific Expertise and Engineering

Our sensors based on foil strain-gauge technology have a long, proven history in medical applications. To support continuing progress in areas such as minimally invasive surgery and surgical robotics, we also offer customized sensors that incorporate semiconductor technology to achieve up to 150 times greater resolution and 10 times greater overload protection.

Temperature compensation and isolation from noise and vibration provide the reliable, no-creep accuracy needed for the most sensitive medical procedures. Hermetic sealing and the ability to withstand extreme temperatures ensure long-term reliability through hundreds of autoclave cycles.

With sensors capable of measuring forces through all six axes, and measurement capacities as low as 50 mg, our sensors deliver the precision needed for practically any medical application – from precisely guiding a surgeon's hand to decoding the DNA of a genetic disorder or a virulent pathogen.

HITEC's highly customized sensors are engineered with deep understanding of the medical equipment industry and what it requires in terms of function, quality, regulatory certification and support.

### Applications include:

- MRI and CT scan machines
- Mammography
- Surgical robotics
- Occlusion sensors for infusion pumps
- Surgical catheters
- Force sensing for surgical instruments
- Surgical staplers and suture devices
- Weight tables
- Force feedback for prosthetic limbs
- And many more

There are off-the-shelf sensors, but our greatest strength is in customizing solutions to your exacting technical requirements. Contact your HITEC sales representative to discuss your needs.





## INDUSTRIAL

The industrial market is broadly categorized as applications involving automation, manufacturing, or process control. HITEC has been supporting the industrial market for a half-century with custom sensors and instrumentation services. Examples of HITEC intelligent engineered solutions for the industrial market include:

- Custom OEM torque sensors for assembly tools
- Pallet truck steering sensor
- Off-highway vehicle tilt sensor
- Load pins for cranes
- Weighing systems
- Agricultural equipment
- Steel mills and aluminum processing plants
- Injection molding machines
- Robotics
- And more

## APPLICATIONS INCLUDE

### Torque Measurements in the Paper Mill Industry

Torque bridges using transducer-class strain gauges are installed on the inner diameter of specialized tools for monitoring levels during the pulping process in a paper mill. The installation area is hermetically sealed for environmental protection including moisture. These level indicators provide production efficiency during manufacturing.

### Cement Shrinkage Measurements

Encapsulated strain gauges are applied to a hollow sleeve with the capacity to survive in a high PSI alkaline water mix for recording data as the cement dries.

### Weld Robot Check Systems

One of the major contributors to the quality of a spot weld is clamping force. This clamping force is typically audited by a technician, making periodic measurements of the weld force using a hand-held instrument. However, since the robot's motions and cycles are programmable, it is possible to specify a "check cycle" at regular intervals. As part of their programming, weld robots periodically move the weld tips into a tip dresser that grinds them into the optimum shape. Once this process is complete, the weld robot can be instructed to move to a check station, where it momentarily clamps down on a sensor that measures clamping force. The weld robot check station has memory on board that can hold thousands of measurements.

### Motion Sensors in Municipal Wastewater

Managers and operators of municipal wastewater treatment plants appreciate moving-cavity pumps for handling sewage because they have no valves and can handle most of the solids appearing in sewage. The Mark II is, by definition, a rotary-speed-sensor. Because almost all electric motors are speed-sensitive to torque, the Mark II can also operate effectively as a torque sensor. As rags, paper and debris build up around the shaft, slowing the flow of liquid, the friction between the shaft and the rubber stator increases. This increased load causes a reduction in pump shaft speed. The Mark II can detect a speed change as small as 1 rpm and, with a circuit provided for alarm/shutdown, can power down the pump long before stator burnout.





## AEROSPACE

HITEC designs and manufactures state-of-the-art force, moment, and torque sensors for civil and military aviation as well as governmental and private spaceflight programs. Our custom solutions are optimized to meet the uniquely specialized requirements of the aerospace industry, delivering on our uncompromising standards of performance, quality, and reliability.

Our custom sensor designs are found on well-known flight platforms including the Airbus A220 and A350, Gulfstream G500 and G600, Embraer E170/190, and are soon to be installed on the Block 2 version of the Boeing CH-47F. They provide precise, repeatable measurement for airframe structural analysis and fatigue testing, electric actuation systems, health, and usage monitoring systems (HUMS), advanced cockpit controls, and many other applications.

Over the course of our 50+ year history, we have developed an exceptional range of sensor capabilities, gaining a unique insight into the aerospace industry's demands for sensor functionality, space and weight-saving, ease of integration, reliability in extreme conditions, and meeting certification requirements. While we also provide the industry with general-purpose sensors, our greatest contribution is our ability to customize sensors to the rigorous specifications of the most vital aerospace applications.

### Expertise and Engineering for Safer, More Capable Aircraft

As the aerospace industry makes increasing use of electric actuation, data-based monitoring, and standardized controls systems, HITEC is the ideal partner for sensors that are available today and engineered for the long-term future.

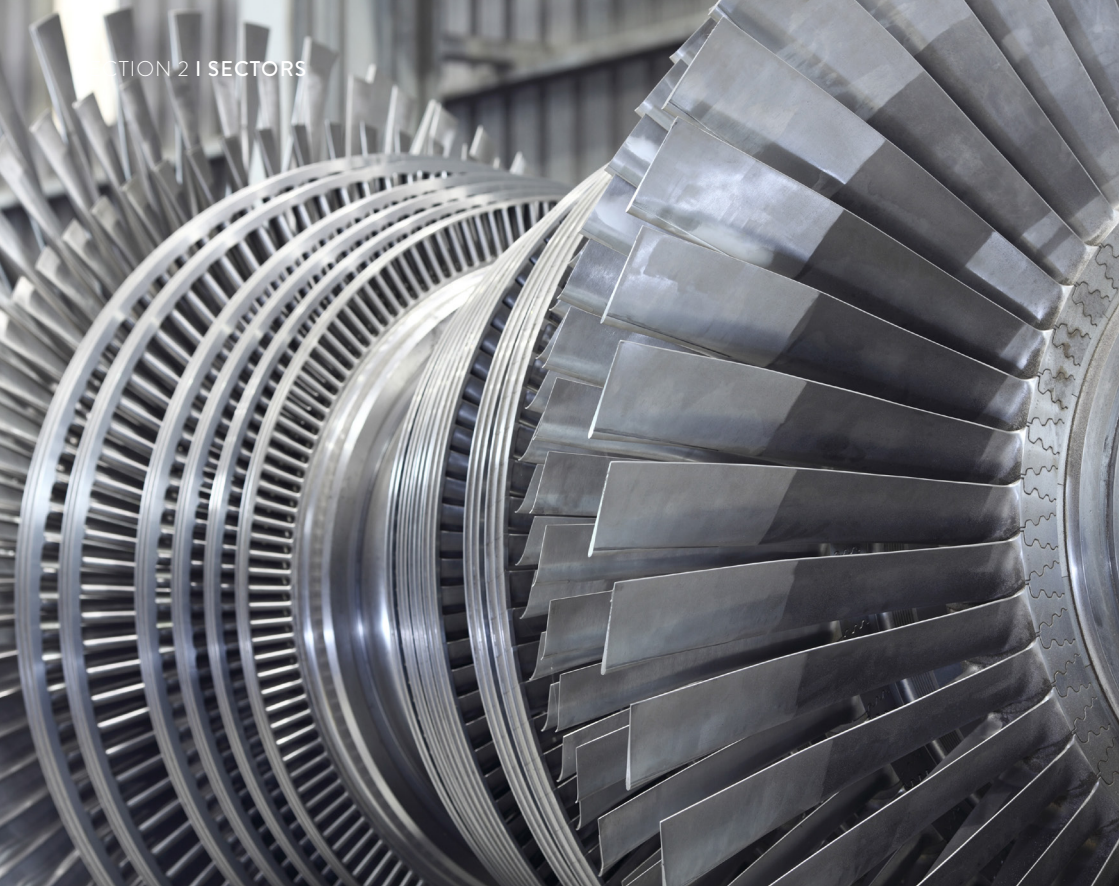
Our experts work in direct collaboration with yours. For example, we can work with your engineers to customize best-fit sensors for your aircraft. We can come to your site to install strain gauges throughout your airframe, with all data routed to a single point for analysis. We understand certification requirements and can help you meet them for individual sensors and integrated assemblies.

And we are not just a supplier. We're a partner, committed to your long-term success wherever you design, build, and fly your aircraft. It's a level of commitment proven in well over 6 million flight hours to date, with tens of thousands of sensors in the air around the world.

### Applications include:

- Electrical actuators for braking and other systems
- HUMS force sensing
- Flight controls
- Cockpit controls
- Airframe fatigue test and measurement
- Control surface load detection
- Secondary load-path structures
- And many more

You'll find off-the-shelf sensors in this brochure, but our greatest strength is in customizing solutions to your exacting technical requirements. Contact your HITEC sales representative to discuss your needs.



## ENERGY

Energy production is a critical driver of the world's economy. HITEC is leading the way with measurement technologies used across the energy segment. HITEC has extensive experience in the oilfield, providing custom solutions for down-hole drilling measurements with the survivability and accuracy that the industry demands.

We also provide high-temperature strain gauging installations for gas-turbine applications that set the standard for the industry. Installation methods include ceramic cement and Rokide™ flame spray. Our technology and processes allow strain gauges to operate at temperatures in excess of 2000°F.

## APPLICATIONS INCLUDE

### Turbomachinery

HITEC Sensor Developments has over 50 years of experience in the turbomachinery field. We perform instrumentation services in our facility or at the customer site. We work directly with the customer to analyze the placement of the gauges and ensure highly accurate data.

### EDM and Rokide™ Flame Spray on Turbine Engine Blades

Wire electrical discharge machining (EDM), an industrial cutting process, is performed on lead wire holes and egress slots on power-generating turbine engine blades for installation of thermocouples and high-temperature strain gauges. A Rokide™ flame spray, one of the best methods of attaching strain gauges in extreme environments, is used to guarantee sensor survivability. Static and dynamic sensors for gas turbine components measure stress, strain, and vibration. HITEC's extreme environment instrumentation expertise allows for accurate performance in a maximum temperature of 2012°F.

### Strain Gauge Instrumentation for Full-Scale Static Load Measurement

Strain gauges are used on wind turbine blades for full-scale static load measurement, design validation, and fatigue testing for cycle loading and certification requirements. Strain gauge instrumentation services can be provided on location or here at our facility.

### Rokide™ Application for Strain Gauges on Turbine Engine Fuel Spray Nozzles

120 Ohm free-filament strain gauges are installed using a high-temperature Rokide™ application on the turbine engine fuel spray nozzle. The strain gauges are installed onto the inlet fitting assembly prior to the braze cycle to provide for dynamic strain data and testing. After the assembly braze cycle, strain gauges are installed on the flange and outer stem at operating temperatures of 1350°F.

### Oil & Gas

HITEC specializes in instrumenting drill rods, enabling the customer to measure while drilling (MWD). Providing drilling engineers with real-time MWD information is particularly important in today's directional drilling operations, as various inputs are required to maximize drilling efficiency. Typical of the environment, shock can approach 100 G's and HITEC sensors are designed and manufactured to survive these extreme environmental conditions with accuracies close to 0.5%.



# PRODUCTS

## CUSTOM DESIGNED FORCE SENSORS & ELECTRONICS

### Industrial Load Cells

Load cells are strain gauge-based transducers used for quick, precise measurement of weight, load, overload or tension conditions.

### Miniature Sensors

Miniature and low-profile force sensors in a wide range of form factors and capacities that are ideally suited for a broad range of applications where space is limited.

### Torque Sensors

A variety of sensors that measure rotational force.

### Multi-Axis Sensors

Used for demanding applications that require simultaneous measurement of multiple forces data.

### Custom Force Sensors

Designed for customer specific applications and in accordance with technical performance requirements.





## INDUSTRIAL LOAD CELLS


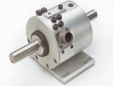










Industrial Load Cells	Rod End Force	Pancake Force Sensor	Threaded Rod Load Cell	High Overload Protected Load Cell	Hollow Pancake Load Cell	Hollow Pancake Load Cell	Load Pin	Flange Type Load Cell
Image								
Model number	10144	10174	10188 & 10190	10164	10043	10019	SP	FTLC
<b>Specifications</b>								
Capacities Available (lbs)	1K – 20K	300 – 100,000	2K – 50K	5 – 100	5,000 – 165,000	5 – 165K	5,000 – 200,000 N	1,000 – 10,000 N
Overload (of F.S.)	150%	150%	150%		150%	150%	150%	150%
Non-Linearity (of F.S.)	0.10%	0.25%	0.10%	0.10%	0.25%	0.25%	± 0.5% FS nominal	± 0.25% of RO max.
Hysteresis (of F.S.)	0.10%	0.25%	0.10%	0.10%	0.25%	0.25%	± 0.5% FS nominal	± 0.25% of RO max.
Zero Offset (of F.S.)	1%	1%	1%	1%	1%	1%	±1% FS max	± 2% of RO max
Operating Temperature Range	-65 to +250 °F	-65 to +250 °F	-65 to +250 °F	-65 to +250 °F	-65 to +250 °F	-65 to +250 °F	-20°C to +70°C	-20°C to +80°C
Excitation (Vdc)	20	20	20	20	20	20	5V, 10V	5-15V
Output	2.0 mV/V nominal	2.0 mV/V nominal	2.0 mV/V nominal	2.0 mV/V nominal	1.5 mV/V	1.0 mV/V	1 mV/V ±3%	1mV/V nominal
Material Construction	Alloy steel	Alloy steel	Alloy steel	Aluminum	Alloy steel	Aluminum	Stainless steel	Stainless steel
Accuracy (%)	0.5%	0.05%	0.5%	0.05%	0.05%	0.05%	1%	0.50%
Environmental Protection	IP64	IP65	IP64	IP65	IP65	IP65	IP67	IP65
TEDS enabled	Optional		Optional				✓	✓
In-line electronics optional	✓		✓				✓	✓
<b>Used for applications such as...</b>								
Agricultural	✓						✓	
Automation	✓	✓	✓	✓		✓		✓
Automotive	✓		✓		✓	✓		
Batch weighing		✓		✓				
Bolt fastening		✓		✓	✓	✓		
Civil engineering	✓	✓	✓	✓			✓	
Crane/lifting		✓		✓			✓	
End-of-line test equipment		✓		✓				
General test & measurement	✓	✓	✓	✓				✓
Industrial	✓	✓	✓	✓	✓	✓	✓	
Machine monitoring & control	✓	✓	✓	✓	✓	✓		✓
Manufacturing	✓	✓	✓	✓				✓
Marine							✓	✓
Medical		✓		✓	✓	✓		
Offshore							✓	
Packaging & assembly machinery	✓	✓	✓	✓	✓	✓	✓	
Assembly process equipment		✓		✓	✓	✓	✓	
Robotic	✓		✓					✓

For full range see website

## MINIATURE SENSORS

Miniature Sensors	Button Load Cell	Threaded Load Button	Load Washer	Subminiature S-Beam Load Cell	High Temperature Miniature S-Beam Load Cell	In-Line Load Cell	Compact Low Profile Load Cell	Clamping Force Load Cell	Press Force Load Cell	LCHA Circular	Strain Sensor (strain transducer)
Image											
Model Number	ALBM	CTLB	ALW	SMSBLC	HTSB	AIRC1	CLP	CFLC	PFLC	LCHA	
Specifications											
Capacities Available	1 – 10,000 lb	2 – 10,000 lb	5 – 2,000 lb	1 – 100 lb	50 – 250 lb	50 – 10000 N	200 – 5000 N	15,000 – 160,000 N	2,000 – 100,000 N	1 – 10 kg	0 – 500 µm/m
Maximum Load	150% of full scale	150% of full scale	150% of full scale	200% of full scale	150% of full scale	150% of full scale	150% of full scale	150% of full scale	200% of full scale	150% of full scale	1500 µm/m
Accuracy (%)	from 0.05%	0.8%	1.0%	0.20%	0.08%	0.5-1%	0.20%	2%	from 0.05%	0.20%	1%
Operating Temperature Range	-20°C to +80°C	-20°C to +80°C	-60°F to +200°F	-60°F to +200°F	-65°F to +320°F	-20°C to +80°C	-40°C to +85°C	-20°C to +80°C	-40°C to +70°C	-40°F to +200°F	-20°C to +70°C
Environmental Protection	IP64 (IP67-68 on request)	IP64	IP64	IP40	IP40	IP64	IP68	IP65	IP60	IP40	IP65
Excitation	7V (max)	7V (max)	7V (max)	10V (max)	10V (max)	7V (max)	12-24 VDC	10V (max)	2-12V	10V (max)	2-15V
Output	2mV/V	1 or 1.5mV/V	0.2-2mV/V	2mV/V	3mV/V	2mV/V	1-9V or 4-20mA	1mV/V	1mV/V	1mV/V	1.5mV/V
Material Construction	Stainless steel, Aluminium	Stainless steel, Aluminium	Stainless steel	Stainless steel, Aluminium	Aluminium	Stainless steel	Stainless steel	Stainless steel	Stainless steel	Aluminium	Stainless steel
TEDS enabled	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
In-line electronics optional	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Used for Applications such as...											
Agricultural	✓										
Automation	✓	✓	✓	✓	✓	✓	✓				
Automotive	✓	✓	✓	✓	✓	✓	✓				
Batch weighing	✓										
Bolt fastening			✓								
Civil engineering			✓				✓		✓		
Crane/lifting											✓
End-of-line test equipment			✓								
General test & measurement	✓	✓	✓	✓	✓	✓	✓	✓			
Industrial	✓	✓	✓				✓	✓	✓		✓
Machine monitoring & control	✓	✓	✓	✓	✓	✓	✓		✓	✓	
Manufacturing	✓	✓	✓	✓	✓	✓	✓			✓	✓
Marine											
Medical	✓	✓		✓							
Offshore				✓	✓						
Packaging & assembly machinery	✓	✓				✓	✓			✓	
Assembly process equipment								✓	✓		
Robotic	✓	✓		✓		✓	✓				

# TORQUE SENSORS

Torque Sensors	Rotary Shaft Slip Ring Torque Sensor	Rotary Shaft Torque Sensor	Rotary Shaft Digital Non-Contact Torque Sensor	IRT Dynamometer Torque Sensor	Pulley Torque Sensor	Rotary Socket Slip Ring Torque Sensor	Motor Flange C Face Mount Reaction Torque Sensor	Motor Mount Reaction Torque Sensor	SAE Flange Reaction Torque Sensor	Flange to Flange Reaction Torque Sensor	Keyed Shaft Reaction Torque Sensor	Socket Reaction Torque Sensor
Image												
Model number	01324	01100	01424	90415	01286	01325	01291	01302	01298	01165-01171	01091-01092	01190
<b>Specifications</b>												
Capacities Available	0.35 – 2300 Nm	100 – 20,000 in-lbs	3.125 – 100,000 in-lbs	880 – 220,000 in-lbs	120 in-lbs	50 – 2,400 in-lbs	500 in-lbs	1200 in-lbs	1400 in-lbs	50 – 200,000 in-lbs	100 – 10,000 in-lbs	25 – 84,000 in-lbs
Overload (%)	150%	150%	150%	150%	150%	150%	150%	150%	150%	150%	150%	150%
Non-Linearity (%)	0.10%	0.10%	0.10%	0.10%	0.10%	0.10%	0.10%	0.10%	0.10%	0.10%	0.10%	0.10%
Hysteresis (%)	0.10%	0.10%	0.10%	0.10%	0.10%	0.10%	0.10%	0.10%	0.10%	0.10%	0.10%	0.10%
Zero Balance (%)	1.00%	1.00%	1.00%	1.00%	1.00%	1.00%	1.00%	1.00%	1.00%	1.00%	1.00%	1.00%
Operating Temperature Range	-40 to +185 °F	-65 to +250 °F	-40 to +185 °F	-20 to +85 °C	-40 to +185 °F	-40 to +185 °F	-65 to +250 °F	-65 to +250 °F	-65 to +250 °F	-65 to +250 °F	-65 to +250 °F	-65 to +250 °F
Excitation	20 VDC	20 VDC	12 – 15 VDC	12 VDC	20 VDC	20 VDC	20 VDC	20 VDC	20 VDC	20 VDC	20 VDC	20 VDC
Output	2.0 mV/V	2.0 mV/V	+/- 5 VDC	Varies	2.0 mV/V	1.5 – 3.0 mV/V	2.0 mV/V	2.0 mV/V	2.0 mV/V	2.0 mV/V	2.0 mV/V	2.0 mV/V
Shaft Speed (RPM)	5,000	6,000	10,000	15000	5,000	5,000	N/A	N/A	N/A	N/A	N/A	N/A
<b>Used for Applications such as...</b>												
Agricultural	✓	✓		✓	✓					✓	✓	
Automation	✓	✓	✓	✓	✓		✓	✓	✓	✓	✓	
Automotive	✓	✓	✓	✓	✓					✓	✓	
Batch weighing												
Bolt fastening						✓						✓
Civil engineering												
Crane/lifting					✓							
End-of-line test equipment	✓	✓	✓	✓	✓		✓	✓	✓	✓	✓	
General test & measurement	✓	✓		✓	✓					✓	✓	
Industrial	✓	✓		✓	✓					✓	✓	
Machine monitoring & control	✓	✓		✓	✓		✓	✓	✓	✓	✓	
Manufacturing												
Marine												
Medical												
Offshore												
Packaging & assembly machinery	✓	✓		✓	✓					✓	✓	
Assembly process equipment												
Robotic	✓	✓	✓	✓	✓					✓	✓	



# MULTI-AXIS SENSORS

Multi-Axis Sensors are used for demanding applications that require simultaneous measurement of multiple forces, such as aerospace flight controls, surgical or manufacturing robotics, and automotive component or materials testing machines. Crosstalk between channels is a design challenge that must be taken into consideration.

HITEC has a half-century of experience designing and building multi-axis sensors. Many products that started as custom designs have become industry standards. Today we continue to provide innovative solutions to challenging customer applications.

## TECHNOLOGIES/FEATURES

- Multi-axis measurements
- Fatigue rated
- Cross-talk compensation
- Extraneous load capabilities
- Elimination of off-axis loading effects
- Custom flanges and mounting
- Compact sizes

## TYPICAL APPLICATIONS

- Flight Controls
- Rolling Resistance
- Braking Force
- Skid-Steer

Typical Products	Model Numbers
	11048
Torque Thrust Load Cell	11042 11010
Braking Force Load Cell	30003
Lateral Force Load Cell	20009
Rolling Resistance Load Cell	50012
Skid Steer Tri-Axial Load Cell	70060
Platform Load Cell	70048
Compact Platform Load Cell	70058
See website for full specifications	

Contact HITEC to discuss your custom project/s  
[custom@hitecsensors.com](mailto:custom@hitecsensors.com)





## SPECIALTY TEST & MEASUREMENT

HITEC Sensors has been serving the needs of the vehicle test and measurement market for 50 years.

These application-specific sensors are used in design validation, manufacturing and quality control to ensure passenger safety and improve vehicle performance. Each one is designed to solve a problem or address a technical requirement. Providing custom solutions for customer applications is what HITEC does best.

### TECHNOLOGIES/FEATURES

- Peak force tracking
- Real time measurement
- Auto-ID and self-calibration
- Air bag compatible
- Integrated electronics
- Specialized mounting
- Inclinometer
- Telemetry
- Adapter plates
- Brackets
- Ease of installation

### TYPICAL APPLICATIONS

- Pinch force
- Torque and angle
- Torque, speed, temperature
- Multi-axis
- Compliance with Federal safety standards
- Drift pull
- Steering effort
- Brake pedal force

Typical Products	Variant	Model Numbers
Weld Force Gage		90061
Window Pinch Force Systems	Hands-free Pinch Force Sensor	10293
	Hand Held Pinch Force Sensor	90250
	Power Sliding Door Assembly	90411
Steering Effort Sensors	<b>Air Bag</b> Compatible Steering Effort Sensor	01184
	<b>Non-Air Bag</b> Compatible Steering Effort Sensor	01027
	In-line Steering Effort Sensor	01227
Drift Pull Sensor		90408
Pedal Force		10118
Shift Knob		50006
Wheel Sensor		90360
See website for full specifications		

Contact HITEC to discuss your custom project/s  
[custom@hitecsensors.com](mailto:custom@hitecsensors.com)



# INSTRUMENTS & DATA ACQUISITION

HITEC offers portable instrumentation and signal conditioning modules for use with load cells, torque sensors, and all other strain gauge-based transducers. Our easy-to-use instruments are great for use in the field or on the production floor, and our signal conditioning modules allow for convenient integration of a sensor into your control system. HITEC provides full technical support for our products so you can be comfortable specifying them for your application.

Let us know how you would like us to support you;  
we are here to help you succeed [info@hitecsensors.com](mailto:info@hitecsensors.com)



	Portable Digital Indicator	PMAC 3000	Peak Track Instrument	USB Sensor Link	Signal Conditioner	4–20mA Bridge Amplifier	Bridge Amplifier
Model Number	A-6357-00	90424	90323	90386	90131	90416	90376
Excitation (VDC)	2.5 VDC	5 VDC	2.5 VDC	5 V	4 to 15 VDC	4.1 VDC	3 VDC
Input Range (mV/V)	+/- 5 mV/V	+/- 4.5 mV/V	+/- 6.0 mV/V	4.5 mV/V (+/- 10V)	2.7mV/V to 62mV/V	0.05mV/V to 2.0mV/V	0.1mV/V to 1000mV/V
Output	+/- 2.0 V analog output	Selectable analog outputs	None	8 bits of TTL compatible by-directional	+/-10V (4 – 20 mA available)	4 – 20mA or 12 +/-8mA (factory set)	+/-5V or +/-10Vdc (factory set)
Operating Temperature Range	0 to +40 °C	-20 to +60 °C	-18 to +48 °C	0 to +70 °C	0 to +70 °C	-40 to +185 °F	-40 to +185 °F
Power	AA battery or USB powered	Lithium ion battery powered	9V battery powered	115 VAC/12 VDC	115 VAC	15 – 24 VDC	5 – 15 VDC
Notes	<ul style="list-style-type: none"> <li>Strain gauge transducer inputs</li> <li>24-bit, 1kHz A/D</li> <li>TEDS enabled</li> </ul>	<ul style="list-style-type: none"> <li>Auto-ID sensor enabled</li> <li>24-bit resolution</li> <li>10kHz sampling rate</li> <li>Strain gauge transducer inputs</li> <li>Optional encoder input</li> <li>120ohms min bridge impedance</li> </ul>	<ul style="list-style-type: none"> <li>Auto-ID sensor enabled</li> <li>Strain gauge transducer inputs</li> <li>60Hz sampling rate</li> <li>350ohms min bridge impedance</li> </ul>	<ul style="list-style-type: none"> <li>USB 2.0 compatible</li> <li>16 bits, 4 pole 400Hz low pass filter, 5 VDC exc.</li> <li>2,000 strain/analog/ position samples per sec</li> <li>Bi-polar</li> <li>5.3W x 5.1D x 1.5H</li> <li>350ohms min bridge impedance</li> </ul>	<ul style="list-style-type: none"> <li>-5V to +2V output offset tare</li> <li>2 kHz, 2 pole Bessel filter</li> <li>3.75" L x 2.0" W x 3.0" H</li> <li>18 oz. (150 grams)</li> </ul>	<ul style="list-style-type: none"> <li>1kHz low pass filter</li> <li>350ohms minimum bridge impedance</li> <li>&lt; 40mA Quiescent current</li> </ul>	<ul style="list-style-type: none"> <li>350ohms minimum bridge impedance</li> <li>&lt; 15mA Quiescent current</li> <li>1kHz low pass filter</li> </ul>
	See website for full specifications	See website for full specifications	See website for full specifications	See website for full specifications	See website for full specifications	See website for full specifications	See website for full specifications





## SERVICES & SUPPORT

HITEC Sensors is uniquely equipped for designing and manufacturing custom transducers, installing strain gauges and tackling force sensor calibration and repair requirements. How can we support your requirements?

Our technical experts combine over 50 years of experience in the industry, with an unsurpassed reputation for service.

## QUALITY

A2LA has accredited our facility in Chelmsford, MA for technical competence in the field of calibration. Our laboratory is accredited in accordance with the recognized International Standard ISO/IEC 17025:2017 General requirements for the competence of testing and calibration laboratories. This laboratory also meets the requirements of ANSI/NCSLI Z540-1-1994 and any additional program requirements in the field of calibration. This accreditation demonstrates technical competence for a defined scope and the operation of a laboratory quality management system (refer to joint ISO-ILAC-IAF Communiqué dated 8 January 2009).

A2LA

ISO  
9001:2015

AS9100D

Certificates available on our website

## CUSTOM TRANSDUCER DESIGN & MANUFACTURING

A transducer, or sensor, is an effective means of sensing and quantifying a physical characteristic – such as force, load, torque, pressure or displacement – and converting it to an electrical signal to be used for test and measurement or feedback control systems. A strain gauge-based transducer is one of the most accurate ways to measure force, an effective way to add sensing capabilities to just about any component or system, and can be integrated into an assembly during any stage of the product life cycle.

HITEC has been designing and building custom force sensors for all kinds of applications for 50 years. We have the experience and expertise to provide custom products that meet the exact requirements of your application, so that you're not limited to using off-the-shelf products.

The process starts with an in-depth discussion with our Applications Engineering team, so that we fully understand what you are trying to accomplish. Working together and using the most advanced modeling software, we'll come up with a design that clearly meets all required performance characteristics. After review and approval, we'll build prototypes for further qualification testing.

Once you're completely satisfied, we'll release the design to OEM production. HITEC supports manufacturing of custom products at all levels, from one-offs to annual production quantities of over 100,000.

- Custom OEM Sensors
- Customization of Standard Products
- Industry Specific Sensors

## THE WHOLE PACKAGE THAT WE CAN OFFER

Complete design and manufacturing of all components including component flexure, custom electrical PC boards, chip-based amplifiers, telemetry systems, and all miscellaneous components such as housings, flexible circuits, cables, cable strain relief, and connectors for a turnkey transducer assembly.

- A staff of engineers with years of experience in custom-designed transducers
- Complete mechanical and electrical design capabilities
- FEA analysis for stress pattern prediction
- A wide variety of strain gauge types including resistive, high output and semiconductor strain gauges
- Temperature compensation per specification
- Environmental protection and PC board conformal coating
- Force calibration in tension and compression
- Torque calibration
- A wide variety of outputs, including analog and digital signals of your choice
- Higher-level assembly with transducer integration capabilities
- US-based and offshore manufacturing options
- ISO 9001-2008 quality management
- AS9100 certification



# STRAIN GAUGE INSTALLATION SERVICES

Get quality and reliable results by outsourcing your next strain gauge installation to HITEC Sensor Developments.

We call it transducerizing your component. Applying strain gauge technology directly to your component or system allows you to measure static and dynamic forces and loads without adding an external sensor. Strain gauges are frequently used in mechanical engineering R&D projects to directly measure stresses generated by use.

HITEC has the experience and expertise for precision strain gauge application on a wide variety of customer-supplied components. Application can be performed in-house or on location.

Let us know how you would like us to support you;  
we are here to help you succeed [info@hitecsensors.com](mailto:info@hitecsensors.com)



## BENEFITS OF PARTNERING WITH HITEC

### HITEC provides:

- A half century of strain gauge technology experience
- A skilled team of application engineers and technicians
- State-of-the-art techniques for applications on a wide variety of surfaces
- The highest-quality gauge wire and environmental coating, suitable for strain measurements from cryogenic to 1,800°F
- Relationships with the industry's top strain gauge, wire, coating, connector, instrumentation, signal conditioning, telemetry and data acquisition manufacturers
- Quality and quick-turn installations to meet the most aggressive strain testing schedules
- On-site machine shop and calibration capabilities



## ELEVATED TEMPERATURES & EXTREME ENVIRONMENTS

Strain measurements in extreme environments can often be a difficult task. Working directly with your engineering staff, drawing upon a half century of direct industry experience, HITEC provides specialized instrumentation expertise for static and dynamic measurements in extreme environments that include severe temperatures, presence of fluids, high or low pressures, and vibrations.

Strategic strain gauge placement with the appropriate protective coating provides the ability to accurately measure strain in various locations. We help customers achieve their goals of identifying operational safety parameters that include stress limits, deflection limits and high cycle fatigue.

### HITEC's instrumentation capabilities include:

- Strain gauge application: foil, free-filament, semiconductor and weldable gauges
- Ceramic cement and Rokide™ Flame Spray for elevated temperatures
- Temperature sensor application (thermocouples, RTD sensors)
- Pressure sensors
- Rake and probe assembly
- Bearing thrust, shaft torque and force sensors
- Rotating machinery expertise
- Leading-edge airfoil sensors
- Accelerometers
- Slip ring and telemetry system integration

Our sensor installations are proven to survive countless hours of rigorous testing. Our technicians experienced in extreme environments can perform sensor installations that incorporate Rokide™ Flame Spray and other protective measures, with wire routing and splicing on-site.



## CALIBRATION & REPAIR SERVICE

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Satisfy your force sensor calibration and repair requirements.

HITEC offers two full-service calibration laboratories, with our Chelmsford, Massachusetts, facility accredited by A2LA to the ISO 17025 standard. All HITEC transducers are shipped with a NIST Traceable Calibration certificate.

HITEC is well positioned to satisfy your force sensor calibration and repair requirements, regardless of manufacturer. Our services include transducer repair ranging from simple wiring repairs to complete sensor remanufacturing, with reliable service and rapid turnaround. Feel free to contact us for an estimate and a return authorization.

- Force calibrations to 300,000 pounds
- Torque calibrations to 250,000 pound-inches
- Calibrations performed using a combination of NIST traceable force standards and certified dead weights
- Sensor and instrument system calibrations available upon request
- 12 Month Warranty on all repair services

Let us know how you would like us to support you;  
we are here to help you succeed [info@hitecsensors.com](mailto:info@hitecsensors.com)





# CALIBRATION LABORATORY

Our in-house calibration laboratory is accredited to the ISO 17025 standard. Each strain gauged based transducer produced or repaired by can be fully certified to these exacting calibration standards if our customers require it.

Our service department is committed to providing the highest quality repair, remanufacturing, and recalibration of strain gauge based transducers at competitive prices with quick, reliable turnaround times. HITEC's extensive repair capabilities range from simple wiring repairs to complex re-gaging of a customer's sensor.

- Force calibrations to: 300,000 lbs
- Torque calibrations to: 250,000 in-lbs
- We use a combination of NIST Traceable Force Standards and NIST Traceable dead weights to perform calibrations

## FEATURES

- ISO 17025 certified calibration laboratory
- Complete repair and remanufacturing of strain gauge based sensors
- Sensor and instrument system calibrations available
- NIST traceable force and torque calibrations in customer specified engineering units
- Recalibration notices mailed to customer
- One year limited service warranty



## DO YOU HAVE A TRANSDUCER THAT ISN'T WORKING PROPERLY OR IS IN NEED OF REFURBISHING?

At HITEC Sensor Developments, our repair department is committed to providing the highest-quality troubleshooting, repair, remanufacturing and calibration of strain gauge transducers from any manufacturer. Our extensive repair capabilities range from simple wiring repairs to complete regauging of your sensor.

**Contact us today for more details**



# CONVERSION TABLES

## TORQUE CONVERSION TABLE

BY	Pounds-inch	Pounds-foot	Ounce-inch	Gram-inch	Kilogram-centimeter	Kilogram-meter	Newton-meter
Pounds-inch	1	12	0.0625	0.0022	0.8681	86.81	8.8511
Pounds-foot	0.08334	1	0.0052	0.0002	0.0723	7.234	0.7375
Ounce-inch	16	192	1	0.0353	13.8858	1388.58	141.6
Gram-inch	453.52	5433.1	28.349	1	393.7	39.37	4014.6
Kilogram-centimeter	1.152	13.826	0.072	0.0025	1	100	10.197
Kilogram-meter	0.01152	0.138	0.0007	0.00002	0.01	1	0.10197
Newton-meter	0.1129	1.356	0.007	0.0002	0.0981	9.807	1

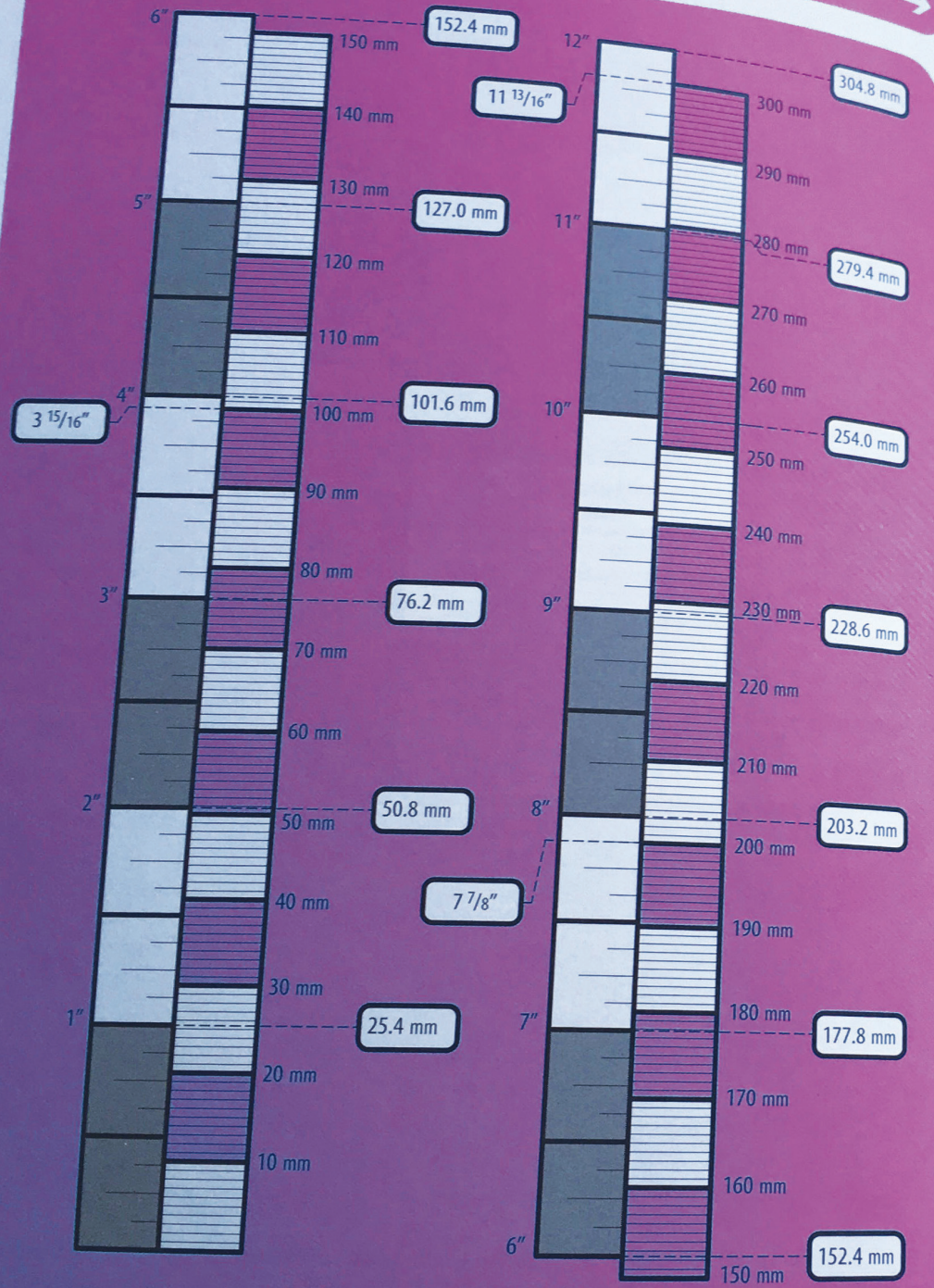
## FORCE & WEIGHT CONVERSION TABLE

BY	Pounds	Ounces	Grams	Kilograms	Newtons	Kilo-Newtons	Ton	Metric Tons
Pounds	1	0.0625	0.0022	2.2046	0.2248	224.8	2000	2205
Ounces	16	1	0.0353	35.242	3.5971	3597.1	32000	35240
Grams	453.59	28.349	1	1000	102.07	102070	908000	0.000001
Kilograms	0.45359	0.0284	0.001	1	0.10207	102.07	908	1000
Newtons	4.448	0.278	0.0098	9.797	1	1000	8896	9807
Kilo-Newtons	0.0044	0.0003	0	0.0098	0.001	1	8.896	9.807
Tons	0.0005	0	0	0.0011	0.0001	0.01124	1	1.103
Metric Tons	0.0005	0	0	0.0011	0.0001	0.102	0.9067	1

## METRIC CONVERSION

### Inches and Millimeters Scale (1:1)

### Feet and Meters Scale →



# REPRESENTATIVES

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We have representatives in the following countries.  
The most up-to-date information including contact details can be found on our website:

[hitecsensors.com/contact-us-locations](http://hitecsensors.com/contact-us-locations)

- |         |             |           |
|---------|-------------|-----------|
| BRAZIL  | ITALY       | SRI LANKA |
| CHINA   | JAPAN       | TAIWAN    |
| FRANCE  | KOREA       | USA       |
| GERMANY | MEXICO      |           |
| INDIA   | NETHERLANDS |           |

■ HITEC Locations      ● Representative Locations

