

# TE Connectivity (TE)

## Sensor Solutions Overview

EVERY CONNECTION COUNTS



**OUR PURPOSE**

**WE CREATE A  
SAFER, SUSTAINABLE,  
PRODUCTIVE AND  
CONNECTED FUTURE.**



**ADVANCING THE  
FUTURE OF  
TRANSPORTATION**



**MAKING  
FACTORIES & HOMES  
SMARTER**



**ENABLING GLOBAL  
COMMUNICATION  
NETWORKS**



**REVOLUTIONIZING  
MEDICAL TECHNOLOGY**



**CONNECTING  
THE WORLD**

**220B**

PRODUCTS MANUFACTURED ANNUALLY

**\$1.8B**

**COMMUNICATIONS**  
Appliances, Data & Devices

**\$14B**  
FY18 SALES

**\$3.9B**

**INDUSTRIAL**  
Industrial, Aerospace,  
Defense & Marine,  
Medical, Energy

**\$8.3B**

**TRANSPORTATION**  
Automotive, Industrial &  
Commercial Transportation, Sensors,  
Application  
Tooling





# GLOBAL PRESENCE

PARTNERING WITH CUSTOMERS IN

**140** COUNTRIES

FY18 SALES  
BY REGION



	MANUFACTURING SITES	EMPLOYEES
AMERICAS	38	25,000
EMEA	44	30,000
APAC	22	25,000



# A World Leader in Connectivity



## 75+ YEARS LEADING IN CONNECTIVITY

AMP  
DEUTSCH  
Intercontec

Creganna Medical  
Entrelec  
Raychem

## TRACK RECORD OF RELIABILITY

# 87%

of FY18 sales in Harsh  
Environment Applications

## UNMATCHED RANGE OF SENSORS

Fluid Properties  
Photo Optic  
Position  
Temperature

Humidity  
Piezo Film  
Pressure  
Vibration/Force

# Leading in Innovation



**15K+**

**PATENTS**  
granted or pending

**\$680M+**

**INVESTED** in Engineering,  
Research & Development

**8K+**

**ENGINEERS**  
globally

**20%**

of sales from new  
products

All figures from FY18



# Creating Value for Our Customers



**THE TE OPERATING ADVANTAGE  
(TEOA) PROVIDES VALUE TO  
CUSTOMERS BY OPTIMIZING:**



**QUALITY**



**SERVICE**



**DELIVERY**



**CUSTOMER  
SUPPORT**

# Living Our Purpose and Values



GREENHOUSE  
GAS EMISSIONS  
FY17 VS FY10



WATER USAGE  
FY17 VS FY10



\$4.75M

GLOBAL CHARITABLE  
GIVING FY17

26,000

GLOBAL EMPLOYEE  
VOLUNTEER HOURS FY17

\$3.6B

LOCAL ECONOMIC IMPACT FROM  
SUPPLY CHAIN FY17





# Unleashing Our Global Talent



We are committed to a safe, diverse and inclusive work environment where creativity, collaboration and innovation flourish.

## THE WALL STREET JOURNAL.

MANAGEMENT TOP  
250 - THE BEST  
MANAGED PUBLIC  
COMPANIES



HRC BEST PLACES  
TO WORK FOR  
LGBTQ EQUALITY IN  
US AND MEXICO

## OUR CORE VALUES

INTEGRITY  
ACCOUNTABILITY  
TEAMWORK  
INNOVATION

# Sensing & Connecting Data, Power, Signal...

## INTEGRATED SOLUTIONS

### Markets

Automotive  
Aerospace & Defense  
Medical  
Appliances  
Industrial Transportation  
Oil & Gas  
Industrial  
Consumer Devices

### Providing Unique Benefits

Cost Efficiencies  
Smarter Technologies  
Compact Footprints  
Better Systems

### Product Attributes

Innovative Design  
High-quality  
Real-time Intelligence  
Advanced Analytics  
Rugged & Reliable



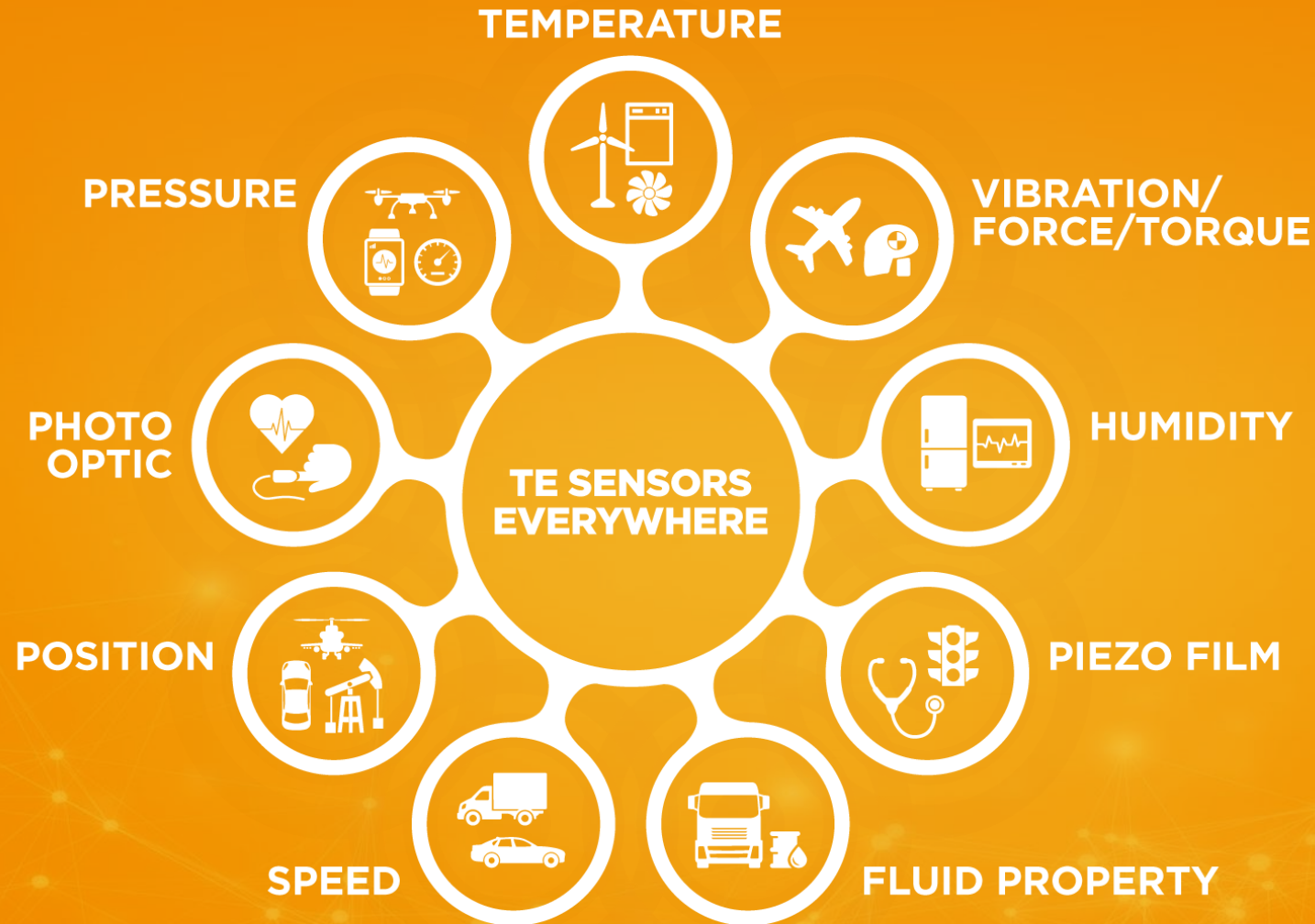
# Sensors Are Making Business Better



- Streamlined data provides better business intelligence
- Size, weight, cost reductions enable broader uses in more applications
- Integrated functionalities for smarter sensing with less infrastructure
- Resistance to harsh environments for reliable, accurate monitoring

# A World Leader in Sensors

TE HAS AN UNMATCHED RANGE OF SENSOR TECHNOLOGIES





# Sensing Global Innovation



- Leverage data, power, and signal across digital ecosystems
- Shared data improves intelligence
- Smarter cities, safer transport and healthier lifestyles



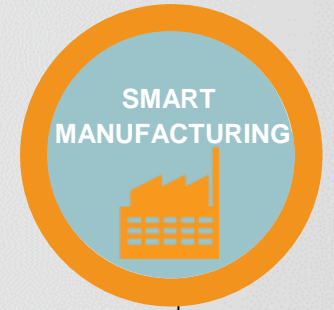
- Advancing levels of safety from the ocean floor to our daily lives and even into space
- Increasing reliability across life critical industries
- Continued operation in harsh environments



- Improved levels of productivity and economy through advanced analytics
- Real-time intelligence for smarter decisions
- New business models anticipate customer needs



- Efficient operations reduce carbon footprints from vehicles and factories
- Consumer cost savings through home energy management systems (HEMS)
- Streamlined utility consumption for improved resource management



- Increased business process efficiency
- Limit downtime of equipment
- Self-monitoring of control systems



# Industries & Solutions

INNOVATIVE SENSOR SOLUTIONS THAT HELP CUSTOMERS  
TRANSFORM CONCEPTS INTO SMART, CONNECTED CREATIONS



AEROSPACE  
& DEFENCE



APPLIANCES



AUTOMATION  
& CONTROL



AUTOMOTIVE



DATA & DEVICES



INDUSTRIAL



INDUSTRIAL &  
COMMERCIAL  
TRANSPORTATION



INTELLIGENT  
BUILDINGS



MEDICAL



OIL & GAS



TEST &  
MEASUREMENT



# Sensors Global Footprint

UNMATCHED RESOURCES  
CLOSE TO OUR CUSTOMERS



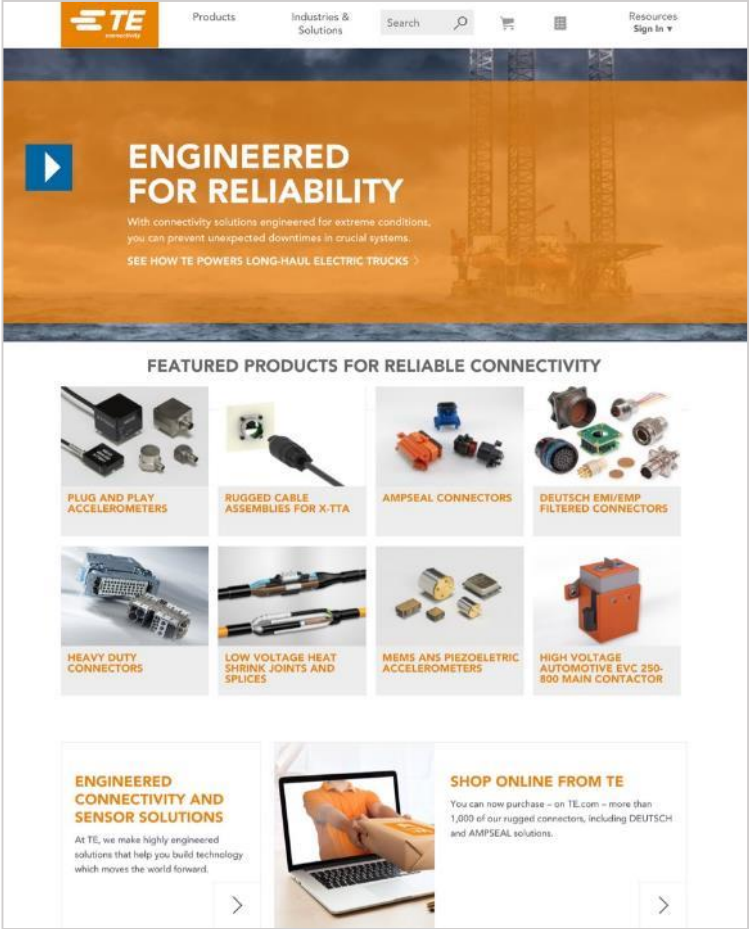
4,100+  
SENSORS  
EMPLOYEES  
WORLDWIDE

# Connect with Us

Learn more  
[www.te.com](http://www.te.com)



24x7 Live Chat





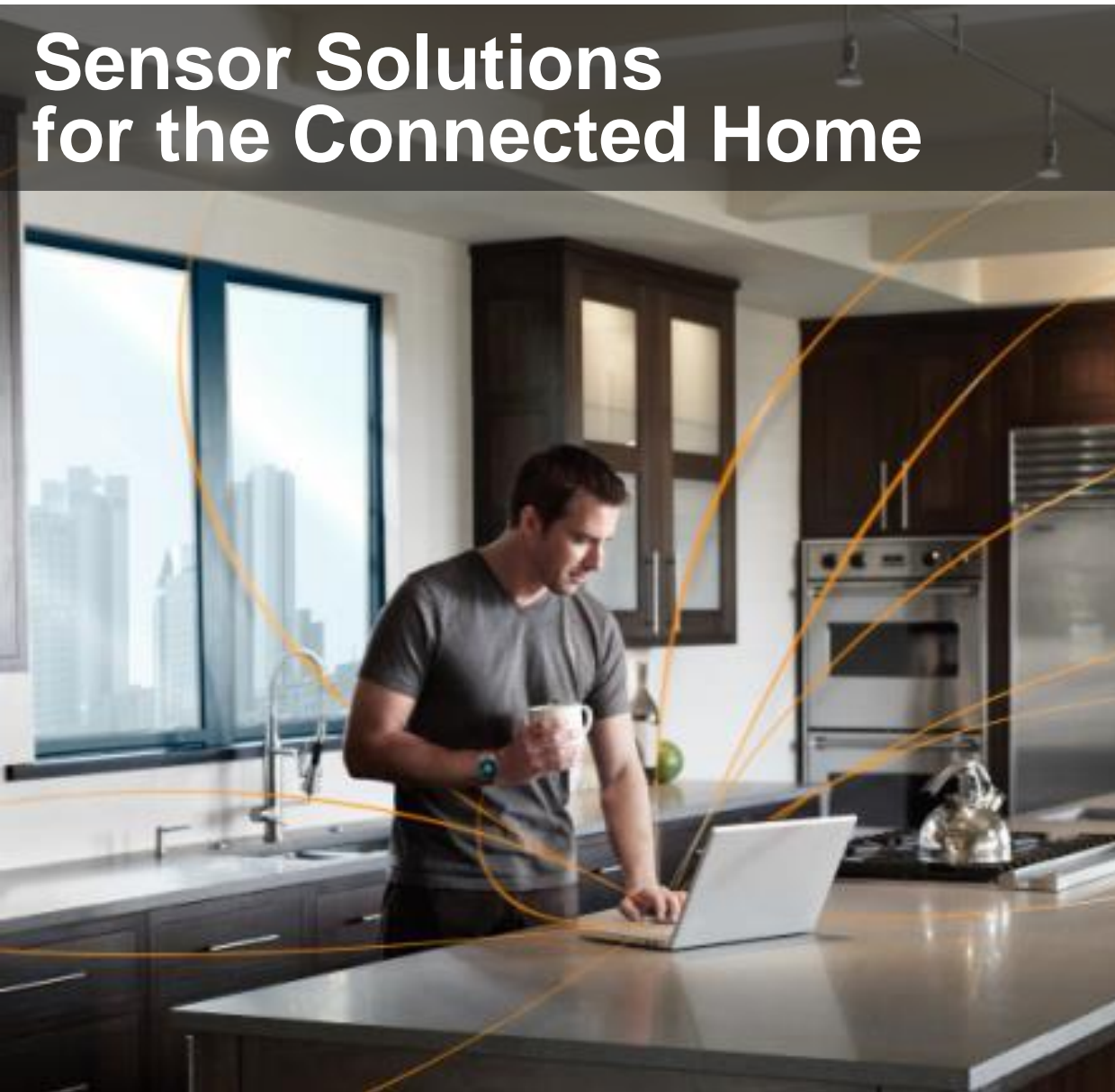
# SMARTER SOLUTIONS START WITH TE SENSORS

[www.TE.com](http://www.TE.com)

# EVERY CONNECTION COUNTS



# Sensors Markets and Applications Appendix



# Sensor Solutions for the Connected Home

## Humidity, Pressure & Temperature

Environmental Sensing, Equipment & Controls



## Position

Magneto Resistive Sensors, Environmental, Actuators & Control Sensing



## Flow

Reed Switch & Magnet, Equipment Sensing



## Pressure

Board Level Sensors, Environmental, Equipment & Control Sensing



## Force

Load Cell, Equipment Sensing



## Temperature

NTC Thermistor, Digital Temp. Sensors, Environmental, Equipment & Control Sensing



## Humidity

Component Module, Environmental, Equipment & Controls Sensing



## Vibration

Piezo Electric Film, Environmental & Actuator Sensing







# Sensor Solutions for Automotive

**Humidity, Pressure & Temperature**

Humidity Air Intake Monitoring, Nox Emissions Management



**Mass Air Flow**

Mass Air Flow



**Fluid Property**

Electronic Oil/Temp Level Sensor, Self Cal' Capacitive Fluid Level Sensor



**Position**

Low Oil Level Switch & Magnetic Reed Switch



**Fluid Property**

Engine Oil Condition Viscosity, Density, Dielectric Constant



**Pressure**

High Pressure Common Rail, Exhaust Manifold, Fuel Pressure & Microfused Sensor



**Fluid Property**

Fuel Identification & Quality Biodiesel Concentration & Cor



**Temperature**

Engine Oil, Nickel RTD Sensor



**Fluid Property**

Coolant Fluid Level Solid State Switch & Level Sensor



**Speed**

Turbocharger Control & Diagno Gear Position an



# Sensor Solutions for Automotive



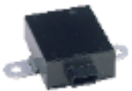
## Humidity

Air Intake Monitoring



## Position

Tilt / Anti-Theft



## Humidity

Anti-Fogging/HVACR



## Position

MR Brake Pedal



## Humidity

Seat Heating/Cooling



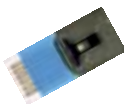
## Temperature

Nickel RTD  
Engine Oil



## Mass Air Flow

Mass Air Flow

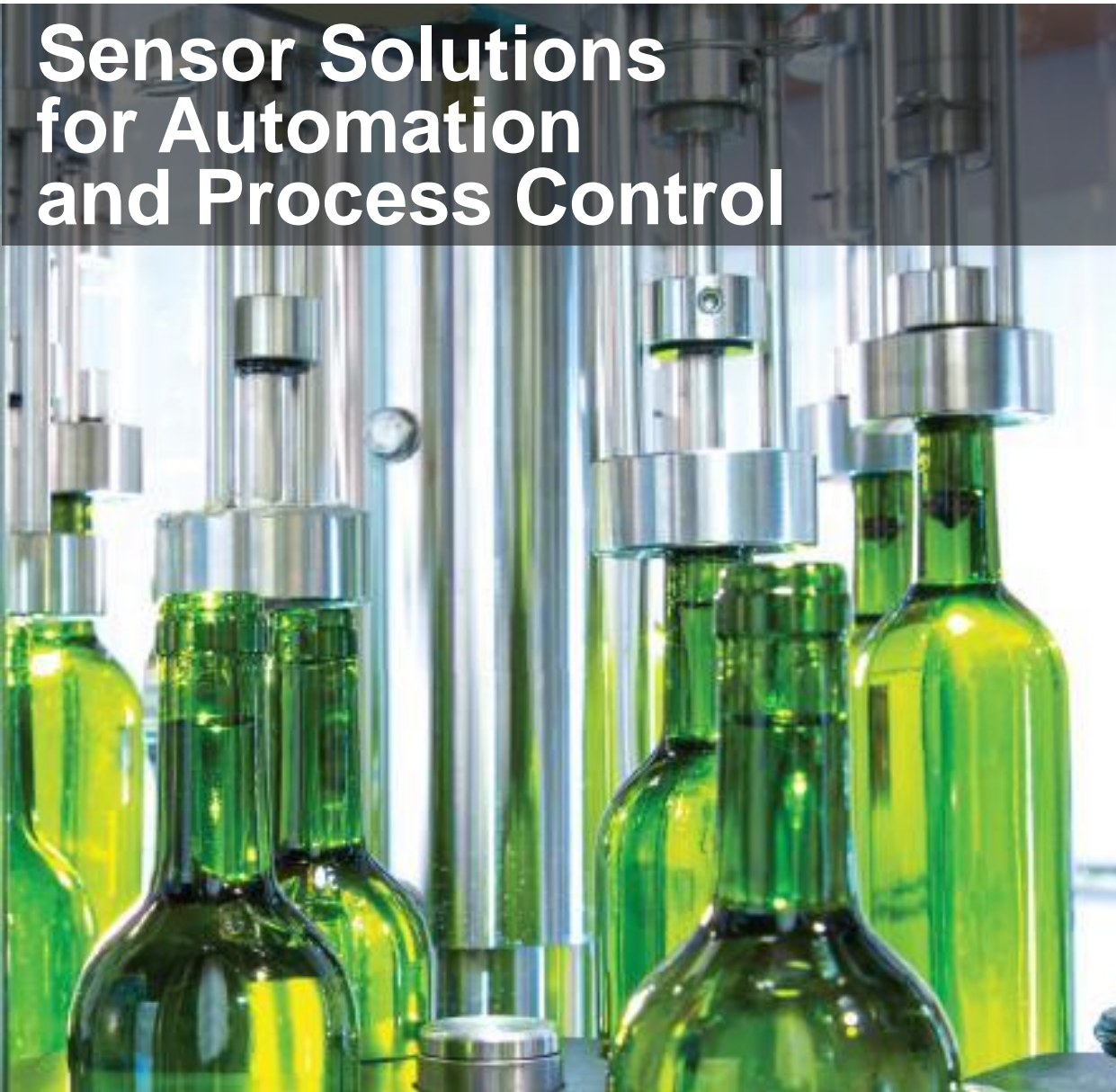


## Temperature

Seat Temperature







# Sensor Solutions for Automation and Process Control

**Fluid Property**  
Fluid Property



**Position**  
String  
Potentiometer



**Force**  
Load Cell



**Pressure**  
Transducer



**Position**  
Gagehead



**Temperature**  
Thermocouple  
RTD



**Position**  
Inclinometer



**Ultrasonic**  
Fluid Level



**Position**  
Linear  
Potentiometer



**Vibration**  
Accelerometer



**Position**  
Rotary



**Speed**  
Measurement,  
Control and Protection





# Sensor Solutions for Power Generation

**Position**  
Bearing Monitoring



**Temperature**  
Surface



**Position**  
Gas Valve  
Control



**Temperature**  
Stator Monitoring



**Position**  
Valve  
Radiation



**Vibration**  
Accelerometer  
Predictive Maintenance



**Temperature**  
Bearing  
Monitoring



**Speed**  
Speed  
Measurement,  
Control and Protection







# Sensor Solutions for Wearables

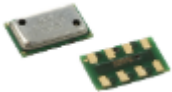
**Pressure**  
Altitude  
Measurement



**Piezo Film**  
Heart Rate &  
Body Motion



**Pressure**  
Elevation  
Monitoring



**Piezo Film**  
Heart Rate &  
Respiration



**Pressure,  
Temperature,  
Humidity**  
Altitude Measurement



**Temperature**  
Personal Comfort



# Sensor Solutions for Medical



## Force

Infusion Pump  
Microfused Load  
Cells Used to Detect  
Presence &/or Rate of Flow,  
Occlusion, Presence of Needle



## Pressure

Blood Pressure  
Cuff, Silicon Mems  
Pressure Sensor in Cuff



## Force

Bone Drill Microfused  
Load Cell Monitors  
the Force Pushing  
on the Drill Bit, Robotic Surgery  
Torque Measurement



## Pressure

Silicon MEMS,  
Pressure Media  
Isolated, Dialysate Pressure, Home  
&/or Hospital Dialysis



## Position

Cable Extension  
Position or MR  
Contact Less Position,  
Monitor Position and Motion of the  
Robotic Arm Sections, Position and  
Motion of the End Effectors



## Pressure

Disposable Blood  
Pressure, MEMS  
Pressure Sensor, Invasive  
Blood Pressure, Bladder,  
Intra uterine Pressure Monitoring



## Photo Optic

Photo-Optic  
Sensors Used To  
Measure Blood Oxygen  
Saturation (SpO<sub>2</sub>) & Pulse



## Temperature

Skin Temperature,  
Surface Probe for  
Continuous Patient Monitoring,  
Catheter Thermocouple Wire  
Measure Head Temperature During  
Various Medical Ablation Procedures



## Piezo Film

Heart Pacemaker,  
Home Electronic Stethoscope, Sensor  
Monitors Body Activity



## Ultrasonic

Detect Bubbles or  
Medication Levels  
During Infusion







# Sensor Solutions for Appliances

**Force**  
Load Imbalance



**Piezo Film**  
Vibration Sensi



**Humidity**  
Air Conditioner



**Temperature**  
Microwave Oven



**Humidity**  
Dishwasher  
Anti-System



**Temperature**  
Oven



**Humidity**  
Dryer



**Temperature**  
Refrigerator



**Humidity**  
Energy  
Management



**Temperature**  
Refrigerator





# Sensor Solutions for Wind Turbines

**Fluid Level**  
Gearbox Oil



**Temperature**  
Bearings



**Fluid Property**  
Gearbox Oil



**Temperature**  
Stator Winding



**Piezo Film**  
Energy Harvesting



**Vibration**  
Accelerometer  
Gearbox Monitoring



**Position**  
Prop Feathering



**Vibration**  
Accelerometer  
Tower Sway



**Position**  
Tower Leveling



**Vibration**  
Accelerometer  
Turbine Shroud



**Pressure**  
Blade Dynamics



**Speed**  
Pole Bands,  
Diagnostic  
Outputs  
Over-Speed Protection







# Sensor Solutions for Helicopters

## Position

LVDT  
Flight Control Actuators



## Vibration

Accelerometer  
Comfort



## Position

LVDT  
Targeting System  
Lens Focusing



## Vibration

Accelerometer  
Flight Test



## Position

LVDT/RVDT  
Cockpit Controls



## Vibration

Accelerometer  
HUMS



## Pressure

Turbine Exhaust



## Vibration

Accelerometer  
Safety (Impact)



## Torque

Contactless Rotor



## Speed

Rotor speed



# Sensor Solutions for Aircraft



**Fluid Property**  
Hydraulic Oil Fuel



**Pressure**  
Differential  
Cabin Air



**Force**  
Horizontal  
Stabilizer Load



**Pressure**  
On Board Insert Gas  
Generation System (OBIGGS)



**Humidity**  
Cabin



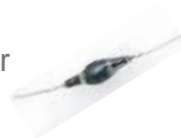
**Temperature**  
RTD  
Fuel Temp Anti-Icing



**Position**  
Anti-Stall Valve  
Regional Jets



**Temperature**  
Heated Thermistor  
Fuel Mgt.  
Hydr. Fluid Temp.



**Position**  
LVDT  
Thrust Reverser



**Temperature**  
Thermistor  
Cabin Temp



**Position**  
LVDT/Potentiometer  
Flight Ctrl Actuator &  
EHSV Nose-Wheel Steering  
Position Hydr. Fluid Level







# Sensor Solutions for Commercial Vehicles

## Fluid Level

Single/Multipoint  
Measurements  
Coolant and Lubricant level



## Pressure

Low to Very High  
Pressure Measurements  
Fuel, Lubricants, Coolant, Gases  
and Hydraulic Fluids



## Fluid Level

Continuous Measurement  
Transmission Oil Level



## Linear Position

Continuous Measurement  
Short to Long Stroke Booms



## Fluid Property

Multiple Physical  
Property Measurements  
Fuel, Lubricant and Hydraulic Fluid  
Quality



## Linear Position

High Accuracy  
Measurements  
Hydraulic Spool Valves



## Fluid Level

Single/Multipoint  
Measurements  
Fuel Level



## Angular Position

Single and Multi-Axis  
Measurements  
Vehicle Inclinometer



## QLS

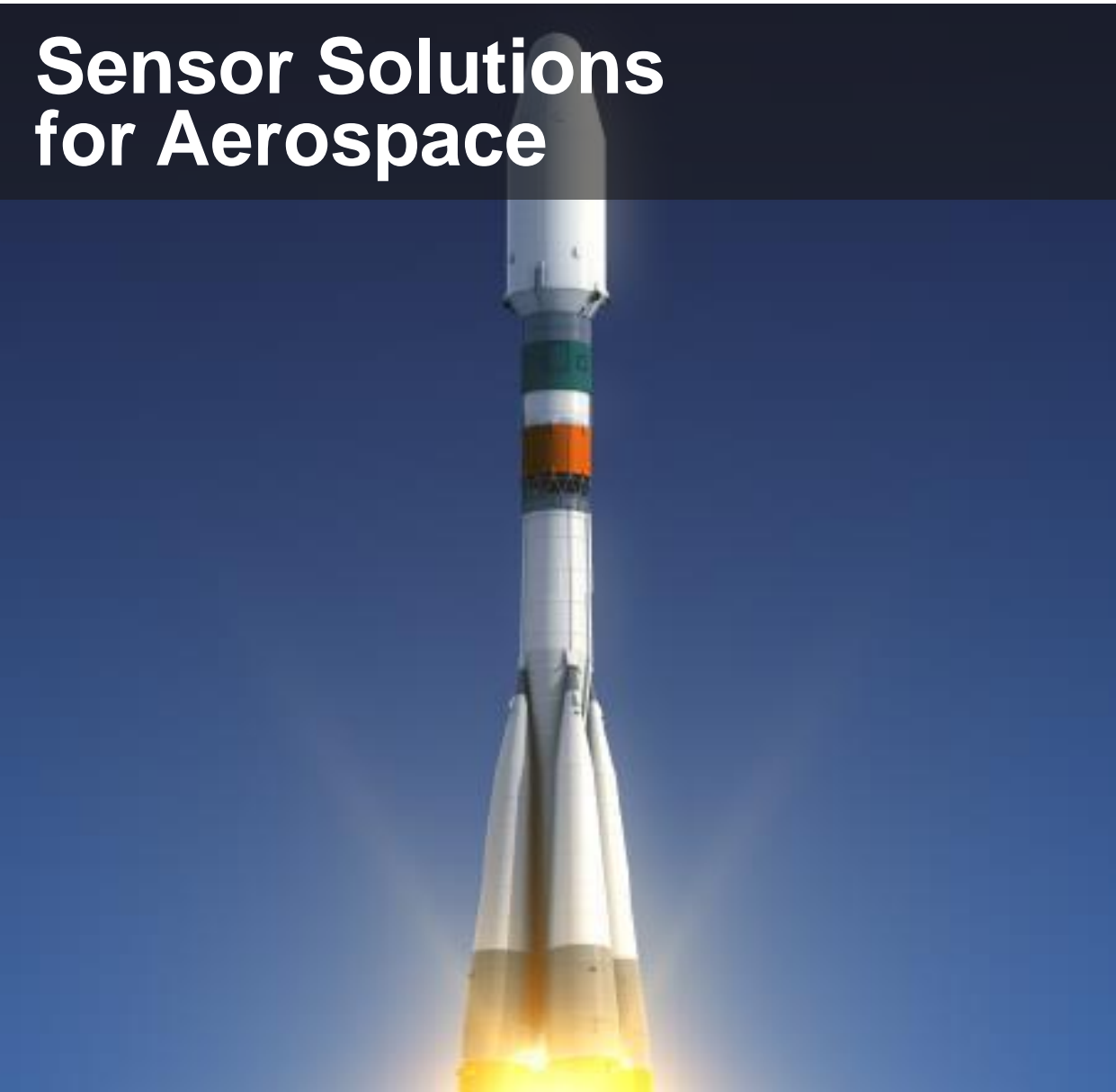
Fluid Property and  
Liquid Level  
Density and  
Multi-Point Measurements  
DEF Concentration and Level












## Speed

Rotary Measurements  
Engine, Axle and Turbo  
Speed





# Sensor Solutions for Aerospace

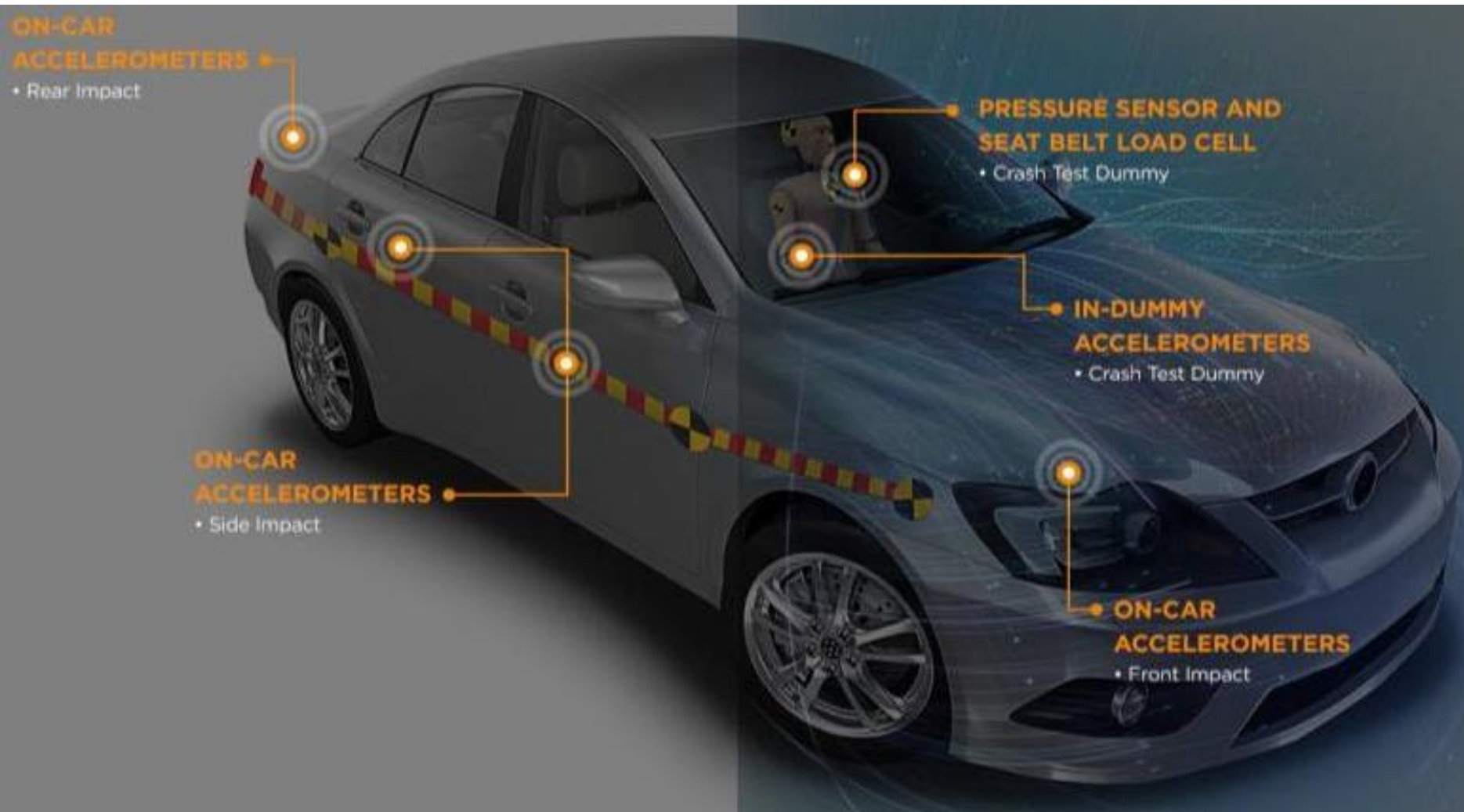
<b>Pressure</b> Miniature		<b>Position</b> Valve Actuator	
<b>Position</b> Hall Effect		<b>Temperature</b> NTC Thermistor	
<b>Position</b> LVDT		<b>Vibration</b> MEMS Accelerometer	
<b>Position</b> Potentiometer		<b>Vibration</b> Triaxial Accelerometer	
<b>Position</b> Resolver			



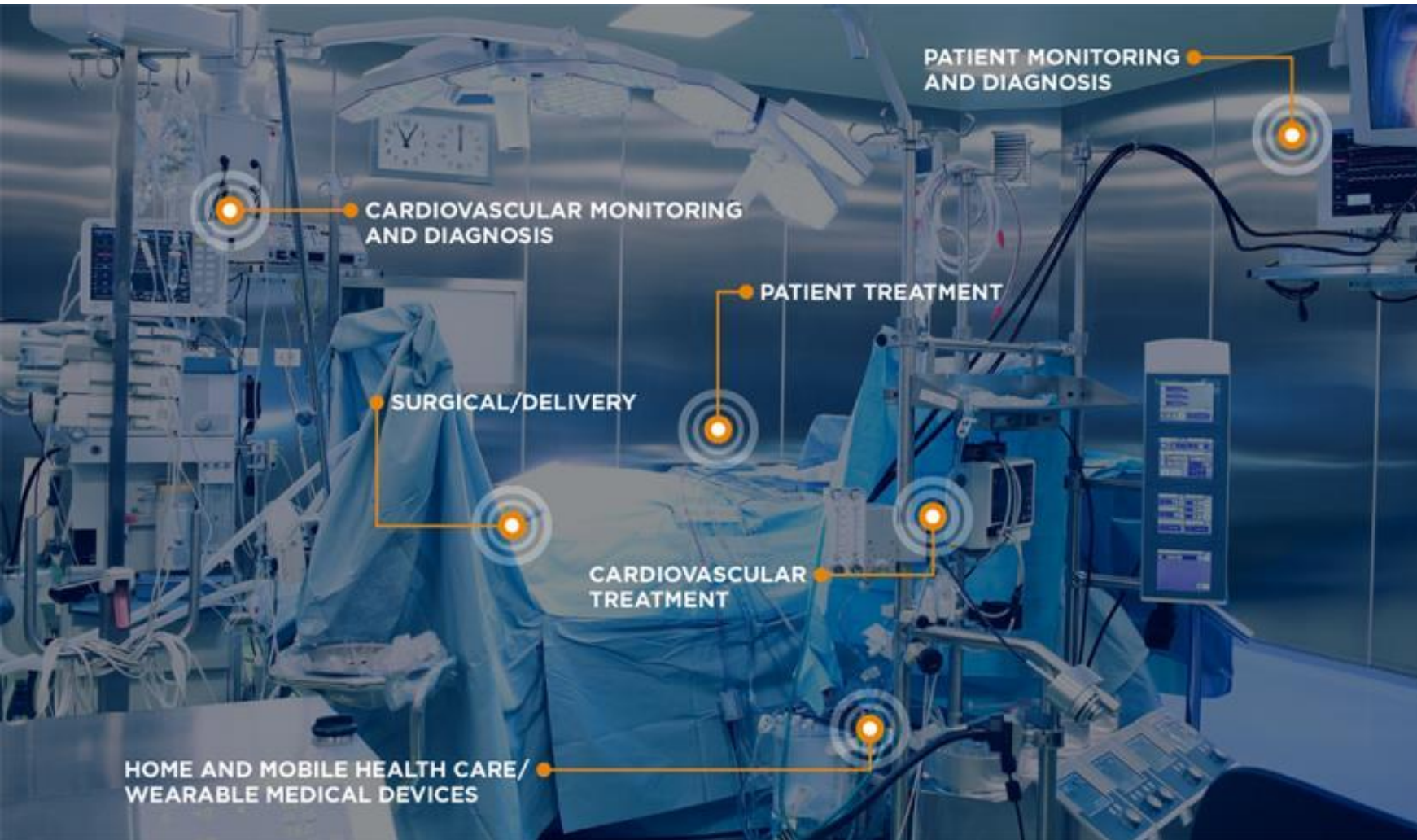


# Crash Test Accelerometer Solutions

## TEST & MEASUREMENT

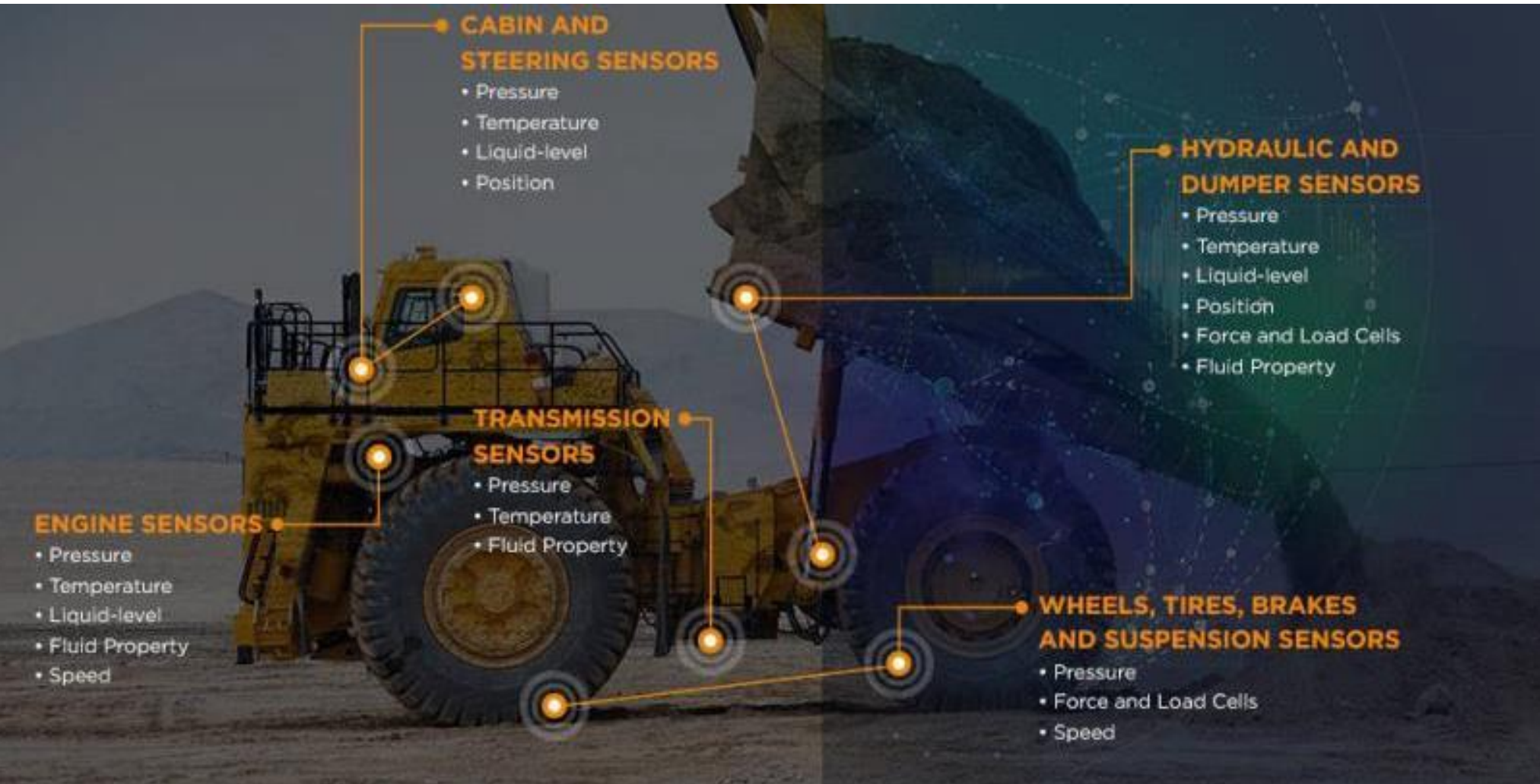


# Medical Sensor Applications

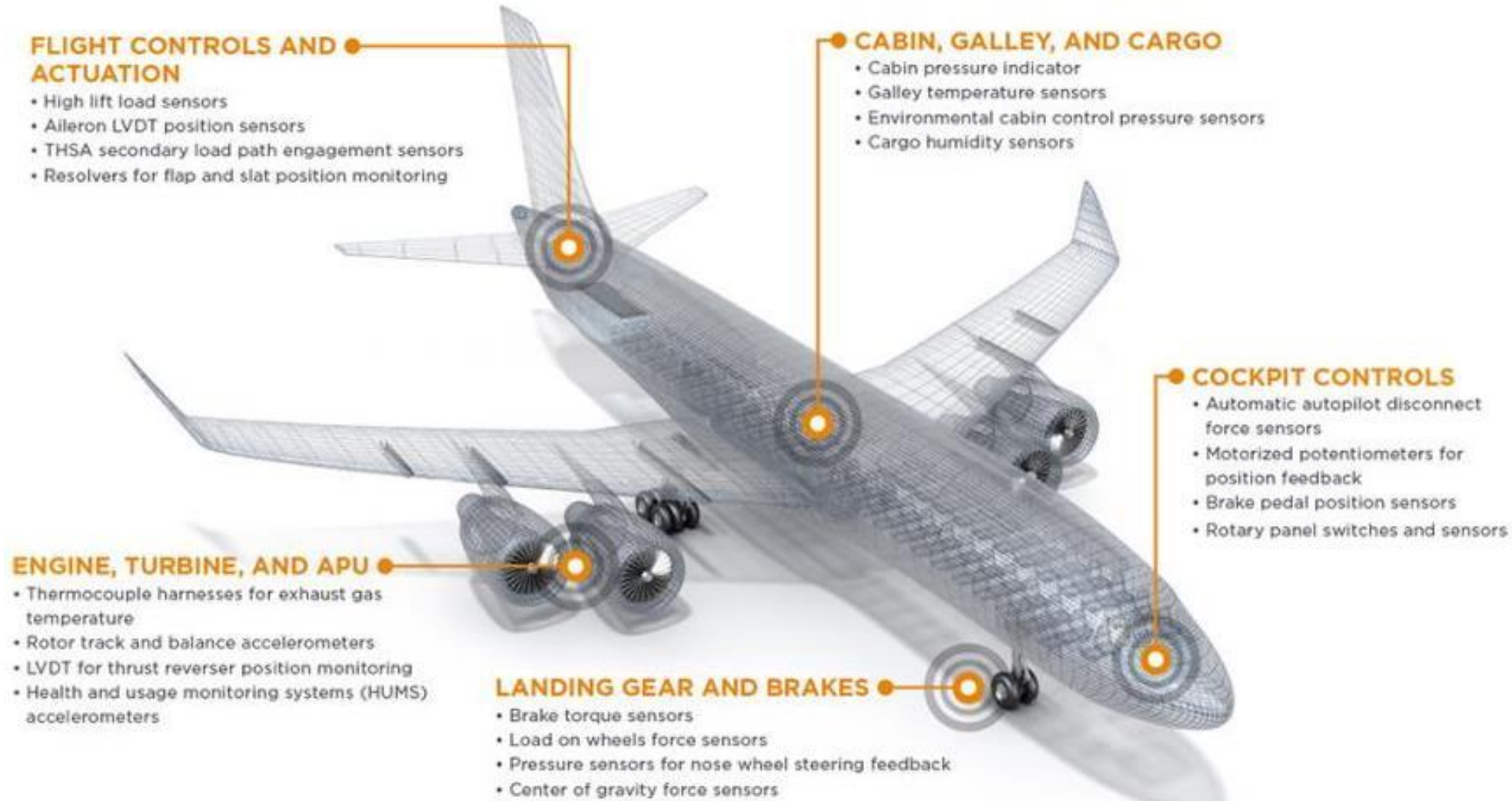




# Off-Road Vehicle Sensor Solutions

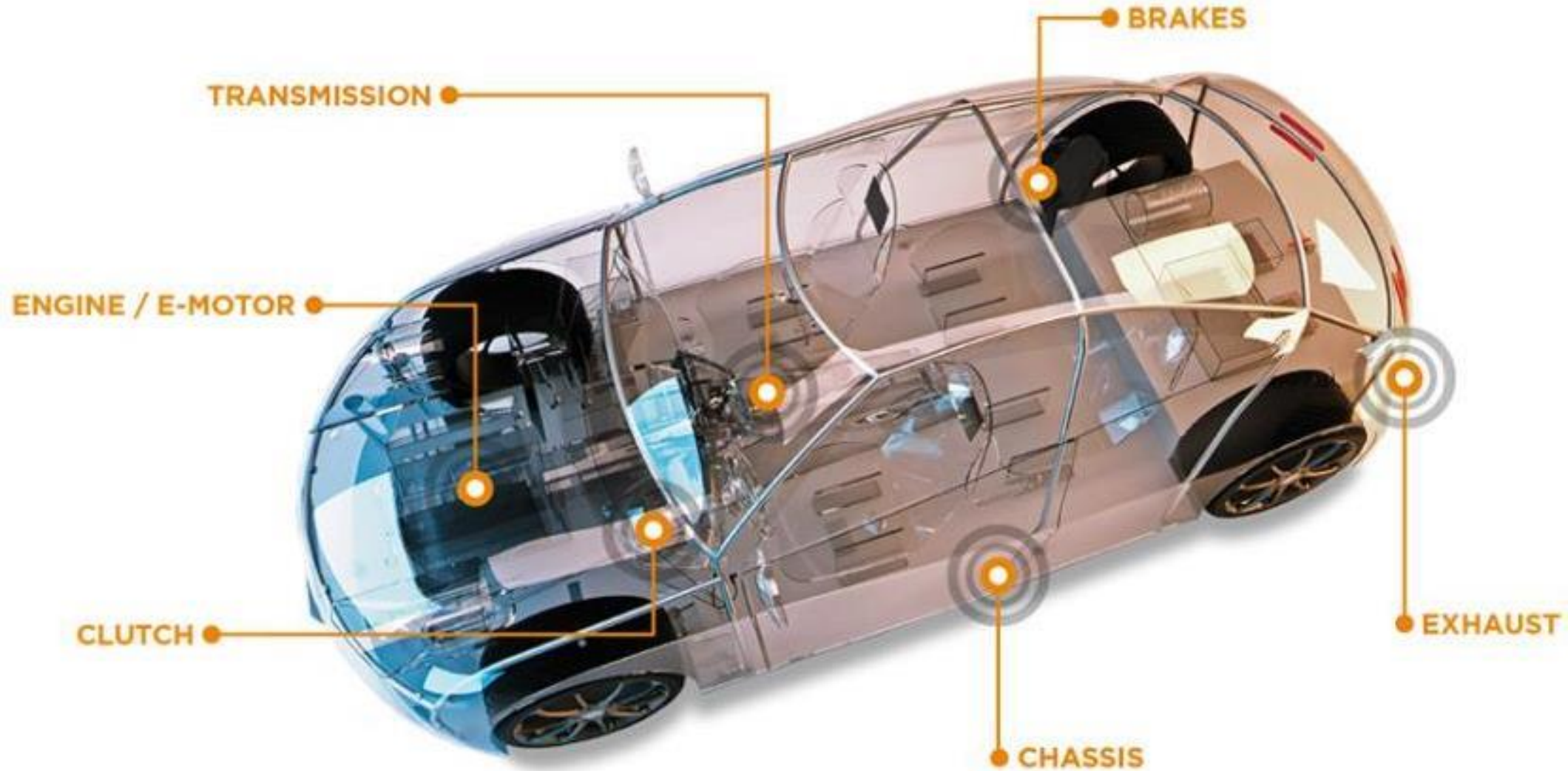


# Aerospace Sensor Applications





# Automotive Sensor Applications





# What is Driving the CONNECTED CAR Trend?

## **SAFETY**

**94%**

of crashes are caused  
by human error.

## **ENVIRONMENT**

Auto industry working to  
reduce greenhouse gas  
emissions by **2020**

## **LIFESTYLE**

Consumers look to their  
cars to stay connected.



# Sensors & Markets

	Aerospace & Defense	Appliances / HVACR	Automotive	Consumer Devices	Industrial Equipment	Intelligent Buildings	Medical	Oil & Gas	Test & Measurement	Commercial Trucking
Digital Component		•	•	•	•	•	•			
Flow		•	•	•	•	•	•			•
Fluid Property	•		•	•	•					•
Force	•	•		•	•		•		•	•
Humidity	•	•	•	•	•	•	•		•	•
Liquid Level	•	•		•	•	•	•			•
Photo Optic							•			
Piezo Film	•	•			•	•	•			•
Position	•	•	•	•	•	•	•	•	•	•
Pressure	•	•	•	•	•	•	•	•	•	•
Rate & Inertial	•				•				•	
Scanners & Systems									•	
Speed	•		•		•			•	•	•
Temperature	•	•	•	•	•	•	•	•	•	•
Torque					•				•	
Ultrasonic					•		•		•	
Vibration	•	•			•				•	•
Water Level					•				•	



# The Best in Engineering For Over 70 Years

1940-1950

Revolutionary solderless method to attach electrical terminals to wire

**AMP**

Material science and heat-shrink tubing

**Raychem**

1999-2010

Tyco International brings together 88 companies, including AMP & Raychem

**tyco** Electronics

Tyco Electronics separates from TI to form independently listed company

**Tyco Electronics**

Repositions for growth and rebrands

**TE**  
connectivity

2011-2015

Acquired DEUTSCH, establishing TE as a leader in harsh environment connectivity

**DEUTSCH**

Acquired Measurement Specialties establishing TE as a global leader providing sensor solutions

**measurement**  
SPECIALTIES

**wema**

**celesco**

**AST**

**MACRO SENSORS**  
A Division of Mersen & Schenck Technologies Inc.

Acquired AdvancedCath **advancedcath**

Divests Broadband Networks- further focusing portfolio on harsh environments

TODAY

Acquired Jaquet Technology Group, establishing TE as the partner-of-choice in the auto and CT space for sensors

**JAUQUET**  
TECHNOLOGY GROUP

Acquired Creganna Medical

**CREGANNA**  
MEDICAL



# Sensor Brand Legacy



# Connected Manufacturing

