

[CLICK TO VIEW](#)

[Table of Contents 2](#)

[List of Tables & Charts 3](#)

[Study Overview 4](#)

[Sample Text, Table & Chart 5](#)

[Sample Profile, Table & Forecast 6](#)

[Order Form 7](#)

[About Freedonia, Custom Research, Related Studies, Corporate Use License 8](#)

# Sensors

---

US Industry Study with Forecasts to **2010 & 2015**

---

Study #2053 | May 2006 | \$4200 | 335 pages

---

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



**The Freedonia Group**

767 Beta Drive

Cleveland, OH • 44143-2326 • USA

Toll Free US Tel: 800.927.5900 or +1 440.684.9600

Fax: +1 440.646.0484

E-mail: [info@freedoniagroup.com](mailto:info@freedoniagroup.com)

## Table of Contents

### EXECUTIVE SUMMARY

### MACROECONOMIC ENVIRONMENT

General .....	4
Economic Environment.....	5
Cyclical Trends.....	5
Long Term Trends.....	8
Personal Income & Expenditure Patterns..	10
Fixed Investment .....	12
Manufacturing Outlook.....	15
Electrical & Electronic Sector Outlook.....	18
Market Volatility .....	21
Pricing Patterns .....	23
International Environment.....	25
World Supply & Demand .....	26
Trends in US Foreign Trade .....	29
Imports.....	30
Exports .....	32

### TECHNOLOGY

General .....	35
Sensor Technology .....	36
Electrical & Magnetic.....	38
Photoelectric & Optoelectronic.....	40
Mechanical .....	42
Sonic & Ultrasonic .....	44
Other .....	45
Solid-State.....	46
Advanced Technological Concepts.....	47
Micro-Electromechanical Systems (MEMS).....	48
Smart Sensors & Smart Dust.....	50
Nanotechnology.....	52
Electronic Noses & Tongues .....	54
Telematics .....	56

### PRODUCTS

General .....	60
Process Variable Sensors.....	64
Pressure Sensors .....	67
Differential & Gauge .....	68
Vacuum & Absolute .....	69
Temperature Sensors.....	69
Thermocouples .....	72
Thermistors.....	73
RTDs .....	74
Other .....	75
Flow & Level Sensors .....	75
Ultrasonic & Electromagnetic .....	77
Mass Flow .....	78

Differential Pressure .....	79
Other/Advanced.....	79
Other Process Variable Sensors .....	80
Physical Property Sensors .....	82
Speed Sensors .....	85
Motion Sensors .....	88
Other Physical Property Sensors.....	92
Proximity & Positioning Sensors .....	94
Electrical Property Sensors .....	98
Chemical Property Sensors .....	100
Imaging Sensors .....	104
Other Sensors & Transducers .....	108

### MARKETS

General .....	111
Motor Vehicles.....	114
Motor Vehicle Sector Outlook .....	115
Automotive Electronics Demand .....	117
Motor Vehicle Sensor Market .....	121
Demand by Sensor Type .....	126
Demand by Motor Vehicle System ..	127
Industrial .....	141
Process Manufacturing Outlook.....	142
Process Control Sensor Market.....	145
Machinery & Equipment Outlook.....	147
Machinery & Equipment Sensor Market.....	149
Military/Aerospace .....	151
Military/Aerospace Sector Outlook .....	152
Military/Aerospace Sensor Market .....	155
Consumer Electrical & Electronic Products.....	159
Consumer Electrical & Electronic Sensor Market.....	161
Household Appliances.....	162
Consumer Electrical/Electronics.....	164
Electronic Security .....	166
Electronic Security Outlook.....	167
Electronic Security Sensor Market .....	169
Medical .....	172
Health Care Sector Outlook.....	173
Medical Sensor Market .....	176
Information Technology .....	178
Information Technology Outlook.....	179
Information Technology Sensor Market.....	181
Other Markets.....	183

### INDUSTRY STRUCTURE

General .....	187
Industry Composition .....	188
Market Share & Leading Producers .....	192

Research & Product Development.....	194
Manufacturing .....	196
Marketing & Distribution .....	199
Financial Issues & Requirements.....	203
Mergers, Acquisitions & Industry Restructuring .....	205

### COMPANY PROFILES

Agilent Technologies .....	212
Airpax Corporation .....	213
AMETEK Incorporated .....	215
Analog Devices .....	220
Ashcroft Holdings .....	222
Autoliv Incorporated .....	224
Avago Technologies .....	226
Banner Engineering .....	227
Bosch (Robert) GmbH .....	230
Cherry Corporation .....	233
Danaher Corporation.....	234
Delphi Corporation .....	240
Dresser Incorporated .....	244
Eaton Corporation .....	245
Emerson Electric .....	247
Ford Motor .....	251
Freescale Semiconductor .....	253
General Electric .....	254
Goodrich Corporation.....	257
Heraeus Holding .....	261
Honeywell International.....	263
Invensys plc.....	271
Johnson Controls .....	273
Measurement Specialties .....	275
Motorola Incorporated .....	279
NGK Spark Plug.....	281
Northrop Grumman .....	282
OMRON Corporation .....	285
PerkinElmer Incorporated .....	288
Raytheon Company.....	290
Rockwell Automation .....	292
Rockwell Collins.....	294
Royal Philips Electronics .....	296
Schneider Electric .....	298
Sensata Technologies.....	302
Siemens AG .....	304
Stoneridge Incorporated.....	311
Texas Instruments .....	312
TRW Automotive .....	313
TT electronics.....	316
Tyco International.....	318
Vishay Intertechnology .....	321
Visteon Corporation.....	323
Other Sensor Companies.....	325

## List of Tables & Charts

### EXECUTIVE SUMMARY

1 Summary Table .....3

### MACROECONOMIC ENVIRONMENT

1 Macroeconomic Environment .....8  
 2 Consumer Income & Spending.... 12  
 3 Fixed Investment by Type ..... 15  
 4 Manufacturers' Shipments  
 by Industry ..... 18  
 5 Electrical & Electronic  
 Equipment Shipments ..... 20  
 6 Sensor Market Volatility ..... 22  
 Cht Sensor Market Volatility,  
 1996-2005 ..... 22  
 Cht Sensor Pricing Patterns ..... 25  
 7 World Sensor Demand  
 by Region ..... 29  
 8 US Foreign Trade in Sensors ..... 30  
 Cht US Sensor Imports  
 by Source, 2005 ..... 32  
 Cht US Sensor Exports by  
 Destination, 2005 ..... 34

### TECHNOLOGY

1 Sensor Demand by Technology ... 37  
 Cht Sensor Demand by  
 Technology, 2005 ..... 37  
 2 Micro-Electromechanical  
 Systems Demand ..... 50

### PRODUCTS

1 Sensor Supply & Demand ..... 63  
 Cht Sensor Demand by Type ..... 64  
 2 Process Variable Sensor  
 Demand by Type ..... 66  
 Cht Process Variable Sensor  
 Demand by Type, 2005 ..... 66  
 3 Pressure Sensor Demand ..... 68  
 4 Temperature Sensor Demand ..... 72  
 5 Flow & Level Sensor Demand ..... 77  
 6 Other Process Variable  
 Sensor Demand ..... 82  
 7 Physical Property Sensor  
 Demand by Type ..... 84  
 Cht Physical Property Sensor  
 Demand by Type, 2005 ..... 84

8 Speed Sensor Demand ..... 88  
 9 Motion Sensor Demand ..... 91  
 10 Other Physical Property  
 Sensor Demand ..... 93  
 11 Proximity & Positioning  
 Sensor Demand by Type ..... 97  
 12 Electrical Property Sensor  
 Demand by Type ..... 100  
 13 Chemical Property Sensor  
 Demand by Type & Analyte ... 104  
 14 Imaging Sensor Demand  
 by Type ..... 108  
 15 Other Sensor Demand ..... 110

### MARKETS

1 Sensor Demand by Market ..... 113  
 Cht Sensor Demand by  
 Market, 2005 ..... 114  
 2 Motor Vehicle Outlook ..... 117  
 3 OEM Automotive  
 Electronics Market ..... 121  
 4 Motor Vehicle Sensor Market  
 by Type & System ..... 125  
 Cht Average Number of Sensors  
 per Vehicle ..... 126  
 Cht Motor Vehicle Sensor  
 Demand by Type ..... 127  
 Cht Motor Vehicle Sensor  
 Demand by System ..... 129  
 5 Selected Sensors in  
 Motor Vehicles by  
 System & Sensor Type ..... 130  
 6 Motor Vehicle Engine &  
 Drivetrain Sensor Market ..... 133  
 7 Motor Vehicle Emissions  
 Control Sensor Market ..... 136  
 8 Motor Vehicle Safety & Security  
 System Sensor Market ..... 139  
 9 Other Motor Vehicle System  
 Sensor Market ..... 141  
 10 Industrial Sensor Market ..... 142  
 11 Process Manufacturers'  
 Shipments ..... 145  
 12 Process Control  
 Sensor Market ..... 147  
 13 Industrial Machinery  
 Shipments ..... 149

14 Machinery & Equipment  
 Sensor Market ..... 151  
 15 Aerospace Shipments &  
 Defense Expenditures ..... 155  
 16 Military/Aerospace  
 Sensor Market ..... 159  
 17 Consumer Electrical/Electronic  
 Product Shipments ..... 160  
 18 Consumer Electrical &  
 Electronic Sensor Market ..... 161  
 19 Household Appliance  
 Sensor Market ..... 164  
 20 Consumer Electronics  
 Sensor Market ..... 166  
 21 Electronic Security  
 Product Shipments ..... 169  
 22 Electronic Security  
 Sensor Market ..... 172  
 23 National Health Expenditures .. 176  
 24 Medical Sensor Market ..... 178  
 25 Information Technology  
 Equipment Shipments ..... 180  
 26 Information Technology  
 Sensor Market ..... 183  
 27 Other Sensor Markets ..... 186

### INDUSTRY STRUCTURE

1 Leading Sensor  
 Manufacturers, 2005 ..... 190  
 Cht US Sensor Market Share  
 by Company, 2005 ..... 193  
 2 Research & Development  
 Spending Patterns: Selected  
 Sensor Manufacturers,  
 2003-2005 ..... 196  
 3 Capital Spending Patterns:  
 Selected Sensor  
 Manufacturers, 2003-2005 .... 198  
 4 Selected Cooperative  
 Agreements ..... 201  
 5 Composite Financial Ratios,  
 2003-2005: Selected Sensor  
 Manufacturers ..... 205  
 6 Selected Acquisitions  
 & Divestitures ..... 207

*The fastest growth will occur in sensors based on advanced technologies and those sensors used in automotive safety and security, medical equipment, military equipment and other dynamic applications.*

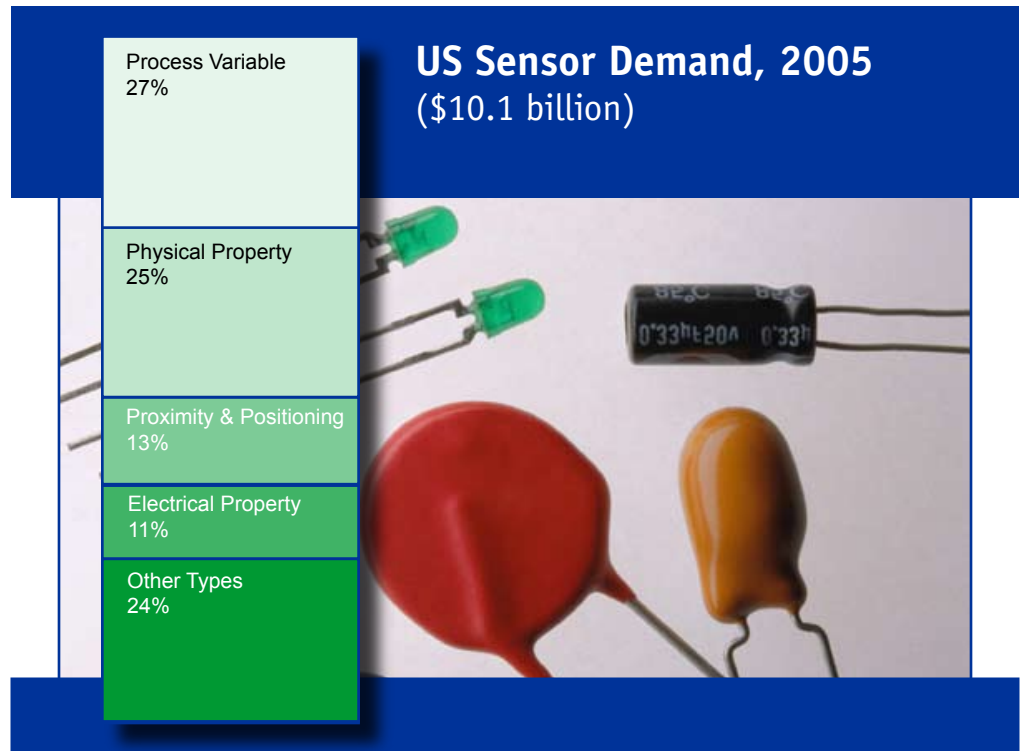
## US sensor market to top \$12 billion in 2010

US demand for sensor products (sensors, transducers and associated housings) is projected to increase 3.7 percent annually to \$12.1 billion in 2010, which represents a noticeable improvement from the 2000 to 2005 period. The improved outlook for many sensor-containing products (e.g., motor vehicles, aerospace equipment, industrial machinery and electronics) will support gains in sensor demand.

The fastest growth will occur in sensors based on more advanced, sophisticated technologies and those sensors likely to be used in dynamic applications such as automotive safety and security systems, medical equipment, military and aerospace equipment, and information technology.

### Proximity/positioning, optical, CMOS sensors among best prospects

Products such as advanced proximity and positioning sensors, optical chemical sensors, complementary metal-oxide semiconductor (CMOS) and thermal imaging sensors hold especially good prospects through the end of the decade. Demand for certain types of physical property sensors, particularly those utilizing advanced technologies -- such as



speed sensors based on micro-electro-mechanical systems (MEMS) technology -- is also expected to advance at well above the pace of the overall market.

Furthermore, economic recovery will support gains in many of the more mature applications such as process control, industrial machinery and conventional automotive sensors. This will stimulate demand for sensors measuring process variables (temperature, pressure, flow, etc.), electrical properties (e.g., current, voltage) and physical properties (motion, speed, load and force, etc.), as well as conventional proximity/positioning sensors.

### Imaging sensors to see fastest annual gains

Imaging sensors will see the fastest demand growth of any major sensor product category through 2010, rising 6.2 percent annually. Moreover, value gains understate the unit growth that will be achieved in the face of relentless price declines. Imaging sensors are integral components of numerous high-growth electronic products including cellular phones, digital cameras, electronic toys and games, and the like. As a result, worldwide demand for these sensors has grown dramatically over the past several years.

## Sample Text & Charts

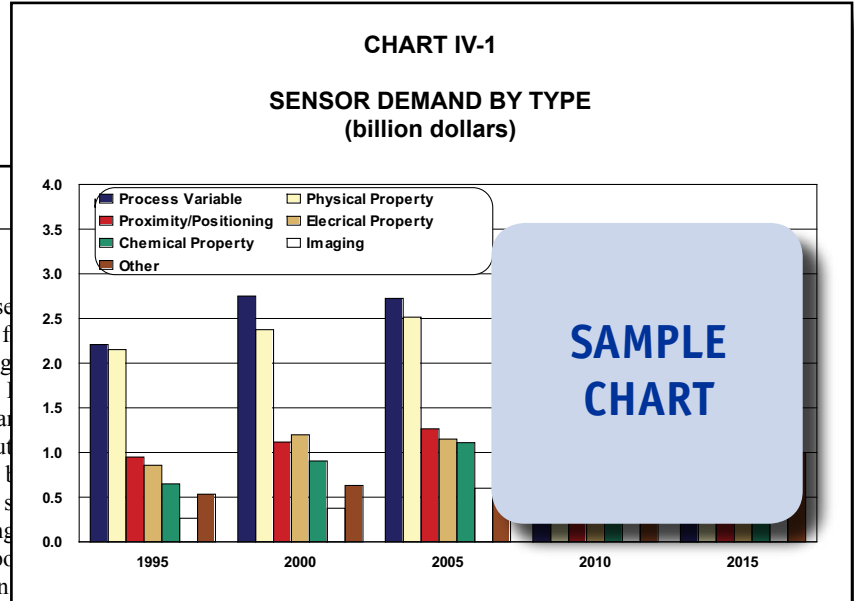
### PRODUCTS

#### Speed Sensors

The market for speed sensors is projected to increase annually to \$1.5 billion by 2015, at the average pace for physical properties. The fastest rates of growth will be in any of the product segments. Demand will be extended by speed sensor technology, in both automotive and industrial applications, and continued market support by speed sensor technology, in both automotive and industrial applications, supporting this will be increasingly favorable cyclical dynamics in more conventional speed sensor applications such as industrial machinery control and aircraft engine. In addition, automotive applications offer other opportunities for advanced-generation speed sensors, such as those used in navigation systems (primarily in light trucks, sport utility vehicles and higher line passenger cars) and vehicle dynamic control systems (mostly for higher priced cars and light trucks). Although penetration is still increasing modestly, airbags -- one of the early drivers of MEMS-based speed sensor demand -- now represent a fairly mature market for speed sensors.

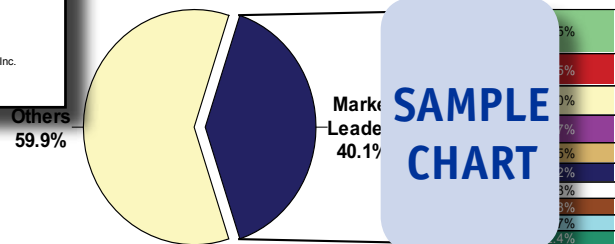
Speed sensors detect and measure the speed of a specified object in motion, and convert these readings into signals able to be transmitted to some type of control device that can, if necessary, take a predetermined responsive action. Among the most basic types of speed sensors is the accelerometer, which refers generically to any device that measures the acceleration of a body in motion and translates the measure into an electrical quantity. Conventional accelerometers are of basically two types of physical construction -- capacitive and piezoelectric. In capacitive types, the application of acceleration results in a change in the proximity between two electrodes, one moving and the other stationary; this creates a change in capacitance, which can be measured and expressed as an electrical quantity. Piezoelectric accelerometers, as the name indicates, utilize piezoelectric materials (polycrystalline ceramics featuring a

SAMPLE  
TEXT



SAMPLE  
CHART

**CHART VI-1**  
**SENSOR MARKET SHARE BY COMPANY, 2005**  
 (\$10.1 billion)



SAMPLE  
CHART

## Sample Profile, Table & Forecast

**TABLE V-7**  
**MOTOR VEHICLE EMISSIONS CONTROL SENSOR MARKET**  
 (million dollars)

Item	1995	2000	2005	2010	2015
Motor Vehicle Sensor Market	2314				
% emissions control	21.6				
Emissions Control Sensor Market	500				
Chemical Property	371				
Process Variable	27				
Proximity/Positioning	102				

**SAMPLE  
TABLE**

### COMPANY PROFILES

#### Dresser Incorporated

15455 Dallas Parkway, Suite 1100  
 Addison, TX 75001  
 972-361-9800  
 http://www.dresser.com

Revenues: \$1.2 billion  
 US Revenues: \$1.2 billion  
 Employment: 10,000

**SAMPLE PROFILE**

Key Products: oxygen sensor and detonation sensor modules for engine control applications

Dresser Incorporated is a manufacturer of equipment for the global energy infrastructure and oilfield industries. The Company operates through three segments: Flow Control, Measurement Systems, and Compression and Power Systems. Dresser is 88.5-percent owned by First Reserve Corporation (Greenwich, Connecticut) and Odyssey Investment Partners LLC (New York, New York), private equity firms with numerous holdings in the energy industry. In September 2004, the Company announced its intention to launch an initial public offering; however, as of March 2006 that plan was still pending.

Prior to November 2005, Dresser was primarily involved in the US sensors industry through the Dresser Instruments division (Stratford, Connecticut), which had been part of the Flow Control segment. This division, which had annual sales of approximately \$115 million, had manufactured a range of pressure and temperature transducers, gauges, transmitters, switches and other devices used in a wide variety of applications and industries. These products had been marketed by

**“Safety & Security:** Sensor demand in motor vehicle safety and security systems will increase 8.2 percent annually to nearly \$1.2 billion in 2010. This represents not only the fastest gain for any motor vehicle application, but the best opportunity for sensor manufacturers. Growth will be greatest in new safety and security products, with sensors used in airbag systems experiencing strong but moderating growth, as new applications such as side and curtain airbags are installed on more vehicles, and as new actuation technologies are...”

--Section V, pg. 136

ONLINE: www.freedoniagroup.com

MAIL: Print out and complete the order form and send to The Freedonia Group (see address at the bottom of this form)

PHONE: Call toll free, 800.927.5900 (US) or + 1 440.684.9600

FAX: + 1 440.646.0484 (US)

EMAIL: info@freedoniagroup.com

Free Handling & Shipping

There is NO charge for handling or UPS shipping in the US. Expect delivery in 3 to 5 business days. Outside the US, Freedonia provides free airmail service. Express delivery is available at cost.

Orders Outside of the US

Checks must be made payable in US funds, drawn against a US bank and mailed directly to The Freedonia Group. For wire transfers please contact our customer service department at info@freedoniagroup.com. Credit cards accepted.

Credit Card Orders

For convenience, Freedonia accepts American Express, MasterCard or Visa. Credit card purchases must include account number, expiration date and authorized signature.

Save 15%

If you order three (3) different titles at the same time, you can receive a 15% discount. If your order is accompanied by a check or wire transfer, you may take a 5% cash discount (discounts do not apply to Corporate Use Licenses).

Corporate Use License

Now every decision maker in your organization can act on the key intelligence found in all Freedonia studies. For an additional \$2300, companies receive unlimited use of an electronic version (PDF) of the study. Place it on your intranet, e-mail it to coworkers around the world, or print it as many times as you like,

Click here to learn more about the Corporate Use License

ORDER FORM

F-WEB.2053

Sensors..... \$4200

Corporate Use License (add to study price) \* + \$2300

Additional Print Copies @ \$500 each \*

Total (including selected option) \$

Enclosed is my check (5% discount) drawn on a US bank and payable to The Freedonia Group, Inc., in US funds (Ohio residents add 7.75% sales tax)

Bill my company American Express MasterCard Visa

Credit Card # grid

Expiration MM YY grid

Signature

Name

Title

Company

Division

Street (No PO Box please)

City/State/Zip

Country

Phone Fax

Email

\* Please check appropriate option and sign below to order an electronic version of the study.

Corporate Use License Agreement

The above captioned study may be stored on the company's intranet or shared directory, available to company employees. Copies of the study may be made, but the undersigned represents that distribution of the study will be limited to employees of the company.

Signature

Individual Use License Agreement

The undersigned hereby represents that the above captioned study will be used by only individual(s) who are employees of the company and that the study will not be loaded on a network for multiple users. In the event that usage of the study changes, the Company will promptly notify Freedonia of such change and will pay to Freedonia the appropriate fee based on Freedonia's standard fee schedule then in effect. Note: Entire company corporate use license, add \$2300; one additional user, add \$500; two additional users, add \$1000; three additional users, add \$1500.

Signature

**OTHER STUDIES**

**Nanotechnology in Health Care**

US demand for nanotechnology medical products will grow 17.5% annually through 2011, driven by the critical need for new or improved therapies and diagnostics. The greatest short-term impact will be in cancer and central nervous system disorders, followed by orthopedic nanoimplants. This study analyzes the \$23.6 billion US nanotech medical product industry to 2011, 2016 and 2021 by material, product and application. The study also reviews product development activities and profiles major players.

#2168 ..... 02/2007..... \$4500

**Insulated Wire & Cable**

US demand for insulated wire and cable will grow 2.2% annually through 2010. Fiber optic cable will see the sharpest gains, followed by electronic wire and cable. Electronic equipment will be the fastest growing market as the communications and computer industries recover from their collapse early in the decade. This study analyzes the \$18.4 billion US insulated wire and cable industry to 2010 and 2015 by material, product and market. It also evaluates company market share and profiles major players.

#2093 ..... 09/2006..... \$4400

**Patient Monitoring Systems**

US demand for patient monitoring systems will grow 5.4% annually through 2010, bolstered by technological advances. Electrochemical blood glucose test strips, diabetic electrodes and sensors, and diabetic catheters will lead growth among accessories. Wireless multi-parameter monitors and stations will pace gains in equipment sales. This study analyzes the \$7 billion US patient monitoring system industry to 2010 and 2015 by product and market. It also evaluates market share and profiles leading competitors.

#2052 ..... 05/2006..... \$4300

**World Automotive Sensors**

The global market for OEM sensors in light vehicles will grow 7.4% annually through 2010. Gains will be driven by robust demand for new types (e.g., inertia, pressure, and position sensing; object and headway detection) in mature economies and by basic safety, drivetrain and emission control systems in emerging markets. This study analyzes the global market for OEM light vehicle sensors to 2010 and 2015 by product, world region and for 23 countries. It also evaluates market share and profiles key producers.

#2034 ..... 04/2006..... \$5200

**Chemical Sensors**

US chemical sensor demand will grow 7.4% annually through 2009. Biosensors will continue to dominate and drive gains followed by optical, ultrasound, conductometric, liquid crystal and other emerging sensor technologies. Fast growing markets include glucose tests, motor vehicles, air quality monitors and drug and alcohol detectors. This study analyzes the \$2.9 billion US chemical sensor industry to 2009 and 2014 by product, analyte and market. It also evaluates market share and profiles major producers.

#2005 ..... 12/2005..... \$4200

**About The Freedonia Group**

The Freedonia Group, Inc., is a leading international industry market research company that provides its clients with information and analysis needed to make informed strategic decisions for their businesses. Studies help clients identify business opportunities, develop strategies, make investment decisions and evaluate opportunities and threats. Freedonia research is designed to deliver unbiased views and reliable outlooks to assist clients in making the right decisions. Freedonia capitalizes on the resources of its proprietary in-house research team of experienced economists, professional analysts, industry researchers and editorial groups. Freedonia covers a diverse group of industries throughout the United States, the emerging China market, and other world markets. Industries analyzed by Freedonia include:

- Chemicals • Plastics • Life Sciences • Packaging • Building Materials • Security & Electronics • Industrial Components & Equipment • Automotive & Transportation Equipment • Household Goods • Energy/Power Equipment

[Click here to learn more about Freedonia](#)

**Freedonia Custom Research**

Freedonia Custom Research delivers the same high quality, thorough and unbiased assessment of an industry or market as an industry study. Since the research initiative is based upon a company's specific needs, companies harness Freedonia's research capabilities and resources to answer unique questions. When you leverage the results of a Freedonia Custom Research engagement, you are able to obtain important answers to specific questions and issues associated with: mergers and acquisitions, new product launches/development, geographic expansion, entry into new markets, strategic business planning, and investment and funding decisions.

Freedonia Custom Research is ideal for companies seeking to make a strategic difference in the status quo and focus on future business growth. Working side by side with clients, Freedonia's team is able to define a research project that is custom-tailored to answer specific questions and provide the basis from which a company can make informed business decisions.

[Click here to learn more about Custom Research](#)



[Click here for complete title list](#)



[Click here to visit freedoniagroup.com](http://www.freedoniagroup.com)