Chipsmall Limited consists of a professional team with an average of over 10 year of expertise in the distribution of electronic components. Based in Hongkong, we have already established firm and mutual-benefit business relationships with customers from,Europe,America and south Asia,supplying obsolete and hard-to-find components to meet their specific needs.

With the principle of “Quality Parts,Customers Priority,Honest Operation,and Considerate Service”,our business mainly focus on the distribution of electronic components. Line cards we deal with include Microchip,ALPS,ROHM,Xilinx,Pulse,ON,Everlight and Freescale. Main products comprise IC,Modules,Potentiometer,IC Socket,Relay,Connector.Our parts cover such applications as commercial,industrial, and automotives areas.

We are looking forward to setting up business relationship with you and hope to provide you with the best service and solution. Let us make a better world for our industry!

Contact us

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Sensors and Controls

SOLUTIONS GUIDE

BOURNS®

Reliable Electronic Solutions

Index

Introduction

The Bourns Mission

Our goal is to satisfy customers on a global basis while achieving sound growth with technological products of innovative design, superior quality and exceptional value. We commit ourselves to excellence, to the continuous improvement of our people, technologies, systems, products and services, to industry leadership and to the highest level of integrity.

Bourns Corporate

Bourns, Inc. has been providing reliable and innovative solutions to the electronics industry for over 50 years. With manufacturing facilities and customer support teams located throughout the world, Bourns is uniquely positioned to serve the industrial, automotive, telecommunications, audio/visual, aerospace and other electronic industries. Most importantly, Bourns is firmly committed to quality, service and innovation.

Sensors and Controls Headquarters

The Sensors and Controls Division is headquartered in Riverside, California. Since introducing its precision control line in 1970, Sensors and Controls now manufactures an extensive range of products. The product lines include Precision Controls, Panel Controls, Commercial Controls, Encoders, Turns Counting Dials, and a wide array of Custom Solutions for use in the industrial, medical, professional audio, consumer electronics and automotive industries.

BCLM production facility

Bourns Corporate headquarters in Riverside, California

World-Class Manufacturing

The majority of Sensors and Controls products are manufactured at the Bourns facility, Bourns de Mexico-CLM (BCLM), located in Tijuana, Mexico. The 58,000 square foot facility employs over 500 people and has been recognized with various quality awards from Ford and Motorola among others. The facility is ISO/QS certified since 1997 and has certified several employees through the six-sigma “Black Belt” program. With the implementation of the Bourns Production System, many of the employees are now involved in Kaizen events to further improve production efficiencies and reduce cost.

BCLM production line

Our core competencies in plastic injection molding and thick film printing combined with world class manufacturing facilities have contributed to the success of Sensors and Controls over the years. Market research feeds the continuous development of new models to meet the changing application needs and state-of-the-art performance requirements of the electronics industry. Continuing advances in materials-research and processing techniques have enabled Bourns to provide innovative product solutions to a growing customer base on a continuous basis.

Introduction

Quick Response Center

The "heart" of the Bourns Sensors and Controls operation located in Tijuana, Mexico, is the Quick Response Center (QRC). The QRC employs a technical base of engineers, technicians, and production personnel to process all customer inquiries and sample requests. Producing samples with modified features for application specific requirements in a relatively short time is the main focus of the QRC. By utilizing the sustaining engineering and fabrication departments, the QRC can modify parts produced to customer specifications and coordinate sample fabrication in production areas to insure the utmost quality and reliability. This process reduces cycle time and decreases response time to the customer. The QRC's mission is quick response to the design needs of our customers.

BCLM Quick Response Center Team

Design Center

Using state-of-the-art design software and applying practical solutions to complex applications, Sensors and Controls Design Engineers develop and design products for the changing needs of the electronics industry. Working side by side with the Quick Response Center (QRC), the engineering team reviews feasibility of customer requirements,

Riverside Engineering Design Center

documents all new and modified designs on existing products, and coordinates prototype fabrication with the manufacturing facility. Our engineers work closely with customers to design cost effective and reliable solutions. Whatever your product needs may be, Sensors and Controls engineers can support your requirements.

Introduction

Reliability Test Facility

Once our engineering team has developed a product design, the Reliability Test Facility takes a major role to insure performance standards. The lab is equipped with specialized test equipment designed to run for thousands of hours, providing environmental, electrical and mechanical testing of potentiometers and encoders. Humidity, salt spray, rotational cycling, and exposure to high and low temperature extremes are just a few of the specialized tests performed on our products. In addition to testing finished products, our lab is set up to test individual piece parts, such as printed elements and windings, for endurance. The Reliability Assurance Test Program (RATP), which has a six-sigma quality goal, is evidence of our commitment to quality.

Riverside Reliability Test Facility

Commitment to Quality

Quality is the foundation of our products, starting with the acceptance of the customer drawing. Quality is continually being measured each and every time a Bourns®product is being put to use in every customer application. The Sensors and Controls Division has adopted the Six-Sigma Quality Program as the foundation of our business practice. Quality goes far beyond perfect parts, beyond quality control, to understanding zero-defects and how dependability affects our customer's customer. We are QS9000 certified and committed to consistent product reliability, assuring the highest yield of dependable, high performance products.

Bourns' successful commitment to quality is evident from the awards that the company has been received over the years. Some of the most recent awards include:

- *2002 – Invensys Bronze Supplier Award*
- *2002 – Tektronix Preferred Supplier Award*
- *2000 – Lucent APL Gold Award*
- *2000 – TTI Supplier Excellence Award*

Introduction

Technical Support

Trained sales representatives, account managers and distributor sales engineers are located conveniently around the world. Our Field Application Engineers (FAEs) are also strategically located to assist with technical support and to provide an interface between customer inquiries and our production facility. Our technical support team can provide you with solutions appropriately selected and precisely manufactured to satisfy your requirements for performance, cost and availability.

Customer Service

Bourns' distributor network is the most extensive in the industry. Our three Bourns Customer Service Centers located in the US, Europe and Asia, as well as our extensive distributor network, are dedicated to serve you on any aspect and demand. With 100 % on-time delivery and world-class service as core business objectives, we ensure direct support for customers in all countries and market segments. At Sensors and Controls Division, we strive to build good business relationships with our customers.

In every aspect from innovative designs to on-time delivery, Bourns Sensors and Controls is the first choice in the industry for reliable and cost-effective potentiometers, encoders and custom solutions.

POTENTIOMETERS

Potentiometers

Selecting a Potentiometer

The Sensors and Controls Division has a potentiometer to fit many of your applications. Whether you need a precision control with millions of rotational life cycles or a commercial potentiometer that fits in a hand-held radio, we have a product selection that is second to none. No other manufacturer offers a broader selection of potentiometers than Bourns Sensors and Controls.

Types of potentiometers in the Sensors and Controls product line include:

- *Multiturn Precision*
- *Single-Turn Precision*
- *Panel Control*
- *Commercial Grade*

Precision Potentiometers are used to provide an accurate electrical output signal corresponding to a mechanical position input, where accuracy, reliability and long life are important. These devices are generally designed for high reliability, long life in continuous service, high accuracy and operation in demanding environments.

Panel Control Potentiometers are used where the frequency of adjustment is high and front panel accessibility is required. These industrial grade devices are designed for long rotational life with emphasis on good adjustability.

Commercial Potentiometers are used in consumer applications as lower cost alternatives to industrial grade panel controls. These devices are designed for moderate rotational life with emphasis on low cost.

In selecting a potentiometer for your application, the most important characteristics to consider are the type of element (cermet, conductive plastic, carbon, wirewound and Hybritron®) and expected cycle life of the product.

Cermet Element Technology

Cermet elements are available in a wide range of resistance values and tapers. They offer essentially infinite resolution and excellent stability in the most severe environmental conditions. Static and dynamic noise (CRV) performance is good, although conductive plastic is better. The temperature coefficient of cermet elements is better than conductive plastic or carbon type elements, though not as good as wirewound elements. Linearity is good but can be improved in accuracy by utilizing laser-trimming technology. Frequency response of cermet materials is very good. The practical application range extends well beyond 100 MHz.

Conductive Plastic Element Technology

Conductive plastic thick film ink is similar to cermet, but has a smoother surface. This characteristic offers several operational advantages over cermet. Dynamic noise characteristics (CRV or output smoothness) and rotational life are measurably improved and resolution is essentially infinite. Conductive plastic elements are generally available in a wide range of resistance values and tapers. Moisture resistance, temperature coefficient, power dissipation and wiper current capacity for conductive plastic elements are not as good as cermet elements.

Carbon Element Technology

Carbon elements offer the most cost-effective technology. A carbon-based resistive ink is screened or sprayed onto a phenolic or FR4 substrate. Resistance ranges are limited, beginning with 1 kΩ and going as high as 1 MΩ. Potentiometers using this element technology are typically for commercial type applications, with rotational life in the 10,000 to 15,000 cycles range.

Potentiometers

Wirewound Element Technology

Wirewound elements offer good stability, excellent linearity, low noise, high power capabilities and good operational life. Wirewound elements offer a wide range of resistance values up to 500 kΩ. One primary limitation of wirewound elements is the finite resolution steps, which result from the wiper moving from turn to turn perpendicular to the coil of wire. (These steps are distinct, sudden, repeatable changes in output.) Resolution improves as resistance values increase due to the manufacturing processes whereby smaller diameter wire and a higher number of turns are utilized. For applications that may be sensitive to such discrete steps, care should be taken to select an element with resolution fine enough to avoid difficulty.

The coil of resistance wire used to fabricate a wirewound element exhibits an inductive reactance that increases proportionately with the frequency. This effect is most noticeable in the lower total resistance elements where the inductive reactance can be larger than the resistance, even at frequencies as low as 20 kHz. The performance of wirewound elements is also affected by inherent capacitance. Capacitance exists from turn to turn and also between the winding and the mandrel. The effects of capacitance are most significant in the higher total resistance elements.

Hybritron®Element Technology

This element is a wirewound element with a conductive plastic coating. It exhibits the temperature coefficient and resistance stability similar to a pure wirewound element. In addition, it displays the long operational life, essentially infinite resolution and low noise characteristics of the pure conductive plastic elements. The combination of the two provides the major benefits of both types of elements. This element is not recommended in applications requiring high wiper currents.

Mechanical Cycle Life

Mechanical cycle life is the ability of a potentiometer to withstand a specified number of cycles under specific operating conditions, while remaining within allowable specifications. A mechanical cycle consists of wiper traverse from one limit of travel to the other limit, and back. The performance is determined by the type of resistive element and wiper used in the construction of the potentiometer.

Precision Potentiometers are generally capable of mechanical cycle life in the range of 300,000 to 25,000,000 shaft revolutions.

Panel Control Potentiometers are generally capable of mechanical cycle life in the range of 25,000 to 100,000 full cycles.

Commercial Potentiometers are generally capable of mechanical cycle life in the range of 10,000 to 25,000 full cycles.

The actual mechanical cycle life or rotational life will heavily depend on the environmental and electrical stresses imposed on the unit during its life.

Additional information on performance characteristics and applications is contained in the “Application Notes” section of this guide.

Potentiometers

Modification Capabilities and Value-Added Solutions

The strength of Bourns Sensors and Controls product line lies in the customized or modified potentiometers to suit your application. A wide range of "value-added" potentiometer enhancements is also available to provide you with cost-effective solutions. We appreciate the opportunity to explore your application and provide potentiometers modified to meet your exact needs.

Bourns' capabilities to develop custom potentiometer solutions and modifications include the following:

Terminal Configurations
Terminals can be customized.

Hardware
Most products are shipped with one hex nut and one lock washer, with other configurations available on request.

Bushing and Servo Mount
Bushings can be modified to add a flat, provide special thread pitch, or even custom lengths. Servo mount versions can be substituted on many bushing mount models.

Seal
Many models are sealed for board processing. Some models can be sealed to IP65 specifications.

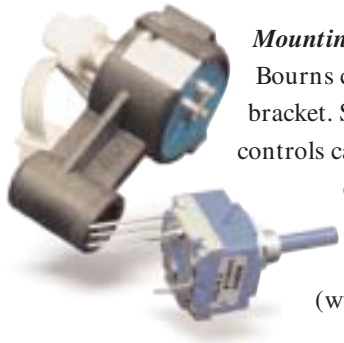
Special Test Requirements
Bourns has the capability to provide extensive reliability testing as required. We can accommodate most special test needs along with test documentation and/or certification with each shipment as requested.

Cable Harness or Lead Wires
For ease of connection to your application, we can supply a custom fit cable harness or lead wires with a mating connector.

Marking
Standard marking includes the Bourns part number and date code. We can mark additional information, such as customer name and part number, or any other designations.

Special Packaging
Bourns will provide custom packaging to meet your production or storage needs.

Customized Shaft Options
In all shaft diameters, Bourns can modify the length of the shaft, add a flat with special shaft orientation, add holes or notches, or even press on a gear as a value-added option.



Mounting Brackets
Bourns can develop a customized bracket. Servo mount precision controls can use motor mount cleats or precision synchro mounting clamps by Pic Design. (www.pic-design.com)

Some additional customizing features ***solely applicable to potentiometers:***

Switches
Rotary switches are available as a standard feature on many panel control models. Push switches can be added to meet your specific needs.

Potentiometers

Special Tapers
We can provide custom tapers on our non-wirewound panel controls and precision potentiometers.

Front and Rear Ball Bearings
Bourns offers additional ball bearing configurations not listed in our data sheets to accommodate unique applications with heavy shaft side load. This option is typically used with our 65xx and 66xx single-turn precision controls.

Independent Linearity
Our wirewound and single-turn precision potentiometers can be ordered with special linearity from 0.1 % to 2.0 %.

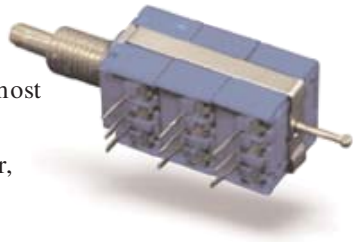
Temperature Ratings
Bourns offers special potentiometer configurations made to withstand temperature extremes.

Center Tap
We can add a fourth terminal (center tap) for measuring current or voltage.

High Torque
Running torque variations available in 2 to 8 oz-in for a smooth, heavy feel.

Dual Wipers
Our precision controls 65xx and 66xx models can be produced with dual resistive tracks and dual wipers.

Rear Shaft Extension
This option is available on many models, and is most popular on a multiturn wirewound potentiometer, but is available on panel control models as well.



Mechanical & Electrical Angles
We can provide custom mechanical and electrical angles. Electrical angles are typically smaller than their corresponding mechanical angles.

Multi-Section Potentiometers
This feature is available on many panel control and precision potentiometer models. These devices can be configured with one shaft to control multiple ganged potentiometers, or a dual concentric shaft for individual adjustment.

Potentiometers

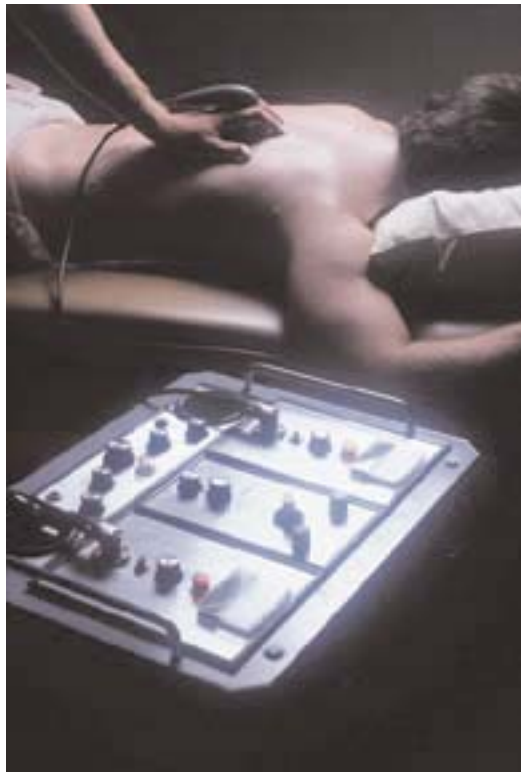
Array of Applications

Bourns®potentiometers can be found in a broad array of applications and functions. For over 50 years, Bourns has provided technical leadership in the potentiometer market. Our engineering and design expertise have provided customers solutions to applications in the following areas:

Transportation
A fast growing marketplace, manufacturers are taking advantage of long life precision potentiometers used as position feedback sensors in rugged transportation systems.

- *Aircraft Systems*
- *Rocket Guidance Systems*
- *Agriculture & Construction Equipment*
- *Traffic Control Systems*
- *Training & Simulation Equipment*
- *Locomotive Braking Systems*
- *Forklifts*
- *Joystick Controls*
- *Automotive Comfort Controls*
- *Motorized Golf Carts*

Medical
State-of-the-art medical equipment requires a reliable electronic solution that will withstand the use and abuse of daily wear. Bourns® potentiometers, used as human interface controls, or sensors in non-critical life support applications are designed to outlast the equipment life.



- *Dental Equipment*
- *Electric Wheelchairs*
- *Analytical & Diagnostic Equipment*
- *Hospital Bed Controls*
- *Positioning Controls for X-Ray*

Potentiometers

Industrial Controls

Bourns®precision potentiometers have played a key role in industrial control systems for many years. Dependable and accurate, Bourns®potentiometers should be your first choice for your most robust and

demanding applications.

- *HVAC Equipment*
- *Illumination and Theater Controls*
- *Meteorological Equipment*
- *Oil Exploration & Refinery Equipment*
- *Manufacturing Control Systems*
- *Machine Tool/Presses/Vision Systems*
- *Robots/Robotic Equipment*
- *Dispensing Process Equipment*
- *Controls for Printing Presses*
- *Food Processing Equipment*
- *Automatic Doors/Gates*
- *Automated Warehouse Equipment*
- *Speed/Adjustment Controls*

Professional Audio

As a leader serving the professional audio market, Bourns®controls are used for volume, balance, and

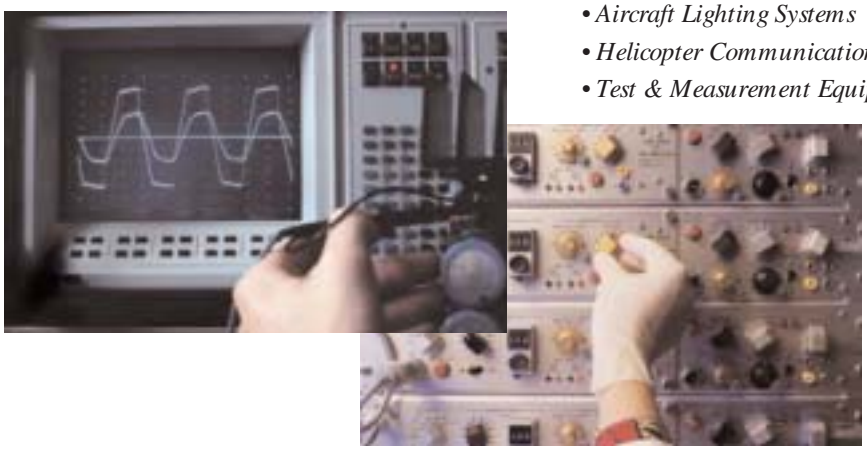
tone controls in professional audio equipment today.

- *Studio Recording Equipment*
- *Mixing Consoles*
- *Broadcast Equipment*
- *Keyboards*
- *Amplifiers*
- *Commercial Audio Sound Systems*

Instrumentation

On a panel in selector mode, or inside the cabinet as a sensor, Bourns'®potentiometers are an excellent choice for all types of instrumentation.

- *Oscilloscopes*
- *X-Y Plotters*
- *Fluid Level Sensors*
- *Aircraft Lighting Systems*
- *Helicopter Communication Systems*
- *Test & Measurement Equipment*



Potentiometers

Commercial Appliances

Bourns has developed many controls for the expanding electronic appliance industry. We can modify any of our potentiometers to meet these robust commercial applications.

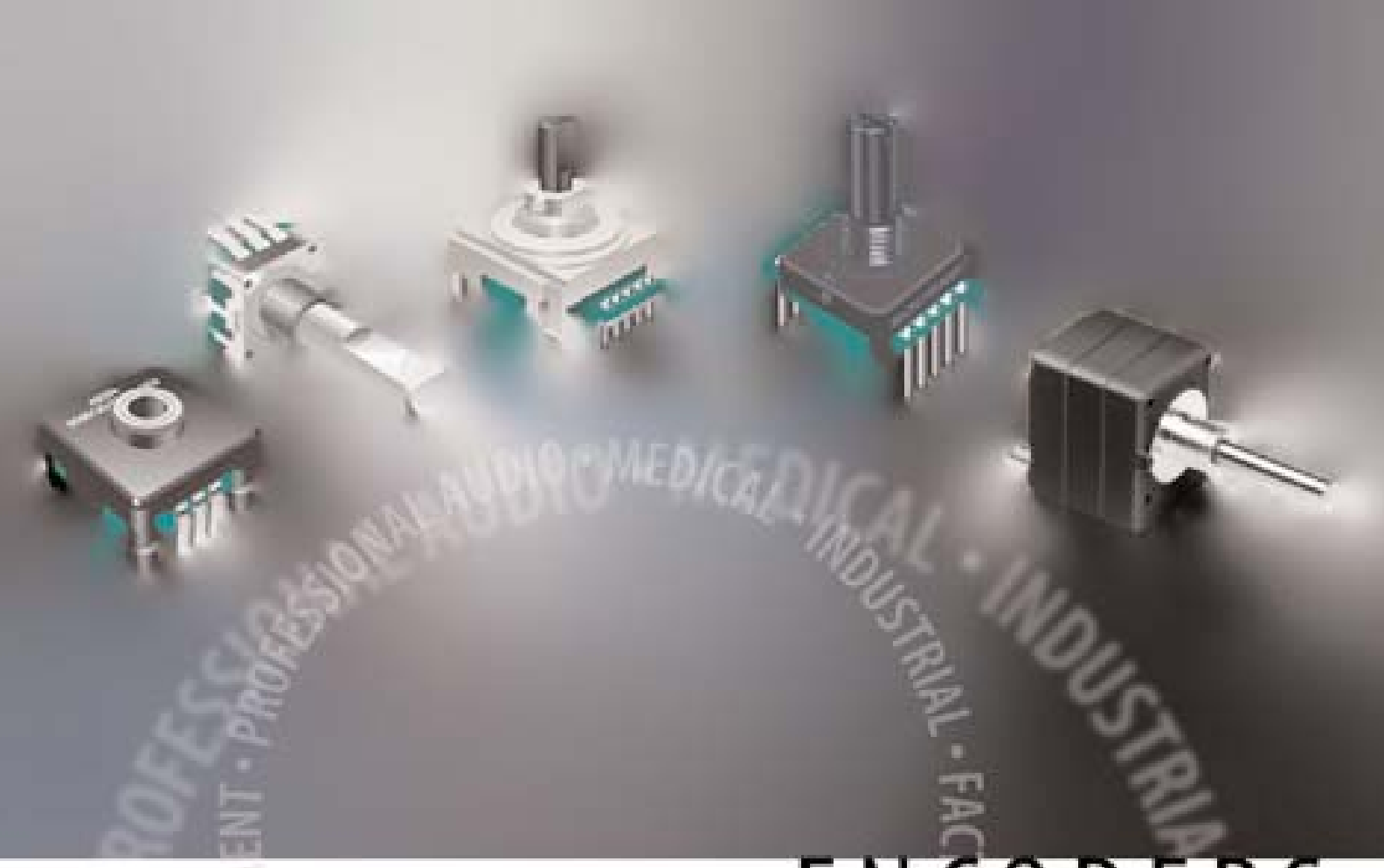
- *Laundry*
- *Refrigeration*
- *Oven Ranges*
- *Hand Mixers*
- *Food Processors*

Consumer Electronics

Bourns®potentiometers continue to get smaller as the demand for portable equipment increases. Take a look at all the models we have to offer for this growing consumer electronics industry.

- *Computer Speakers*
- *Car Audio*
- *Dictation Equipment*
- *Film Development Processors*
- *Graphic Applications & Simulation*
- *Joy Sticks*

To assist you in making the right potentiometer selection for your application, please refer to the sections in this guide entitled “Application Notes” and “Product Selection Guides.” These sections provide a side-by-side comparison of specifications for each model along with technical data for each model. Additional technical information can be found in the “Data Sheets” and “Glossary of Terms” sections.


PROFESSIONAL AUDIO • MEDICAL • INDUSTRIAL • FACTORY AUTOMATION • TELECOM • TEST & MEASUREMENT

ENCODERS

Encoders

Selecting an Encoder

With Sensors and Controls offering more than 10 different models of encoders, we have one to fit your applications needs. Providing the industry with both contacting and non-contacting encoders, Bourns is recognized worldwide for supplying standard and custom encoder solutions and providing excellent technical support.

An encoder is a rotary or linear device that detects or senses a change in position resulting in a digital signal output. These devices are also known as Incremental Encoders, Digital Panel Controls, Bit Switches, Gray Code Switches and Digital Switches. Rotary encoders are physically similar in appearance to a potentiometer. However, the electrical function of an encoder is different than a potentiometer. Encoders are used in applications from car radios to automatic door openers as position sensing digital switches. Some of the functions that the Bourns®encoders can be used for are:

- *Identifying direction of rotation*
- *Detecting angular position*
- *Up/down counting*
- *Sensing speed of rotation*
- *Pulse generation*
- *Switching*

An advantage of using encoders over potentiometers in a digital circuit is that the signal produced by an encoder eliminates the analog-to-digital (A/D) conversion process. This approach can reduce memory overhead, wiring and wiring interconnects, and can provide greater MPU program speed.

Important Characteristics

In selecting an encoder for your application, the most important characteristics to consider are the type of technology, type of output signal, speed of rotation, expected cycle life and switching capability of the product. There are two basic technology classifications of encoders: contacting (mechanical) and non-contacting. Your application will dictate the type of technology that will be best suited for your design.

Contacting Technology

Contacting encoders have two major components in their construction: the coded element and a contacting sensor or wiper. Movement of the wiper over a coded element emulates a mechanical switching action, producing a digital output signal. This type of technology offers the most cost-effective solution for your application. However, resolution and rotational life are limitations of contacting designs. Bourns offers a variety of contacting encoder models suited for low cost applications.

Non-Contacting Technology

Non-contacting encoders can be constructed from four different types of technologies: optical, inductive, capacitive and magnetic. Optical encoders contain three major components in their construction: a light source, a code disk, and a detector. Resolution and life are much higher than the contacting technology. Optical encoders can be used in both static and dynamic applications. This type of encoder offers a midrange priced solution for your application. Magnetic encoders contain three major components in their construction: a coil, a magnet, and a sensor. Magnetic encoders can operate in very high-speed and high temperature applications. However, resolution is limited for an equivalent sized optical encoder package. This type of encoder is used in dynamic applications only and is a high priced component. Bourns offers optical encoders suitable for your applications.

Encoders

Types of Output Signals

There are two basic types of encoder output signals: incremental and absolute. The incremental signal consists of two phase-shifted, square-wave signals. The phase shift is required for recognition of the direction of rotation. The absolute signal, also known as Gray Code, consists of discreet coded binary values and may be from 4 to 16 bits wide. In application, absolute encoders are required if a particular setting must be recognized and available after a power down of the system. All other applications can use an incremental encoder.

Speed of Rotation

Contacting encoders have a higher sensitivity to speed of rotation or revolutions per minute (RPM). On the other hand, non-contacting encoder can be rotated at high speeds. contacting encoders begin to skip counts when the shaft is rotated in excess of 100 RPM, while non-contacting encoders fitted with ball bearings can be rotated at speeds up to 3000 RPM.

Rotational Life

Contacting encoders have a limited rotational life due to wear on mechanical contact components used to create the signal output. In general, contacting encoders have a rotational life below 100,000 cycles. On the other hand, non-contacting encoders can endure rotational life in excess of 1,000,000 cycles. Non-contacting encoders are theoretically limited by the wear in bearing surface of the bushing or ball bearings holding the shaft in place. Typical cycle life expectancy is 10 million without ball bearings and 200 million with ball bearings.

Switching Capability

Encoders are frequently used in swit applications where each discreet bin number in the output signal is recognized as a specific instruction or setting for the digital system. In such cases, the system must recognize the position of the encode after power down of the system. For those applications, encoders such as Bourns® Model EA Absolute Contacting Encoder (ACE™) are the perfect solution. Incremental contacting encoders can also be used in such applications. However, the designer must make additional software and hardware provisions for retaining the encoder position in a non-volatile memory.

Another frequently used option available in many encoder models is the momentary push switch. This type of switch is typically used to drive menu selection in a digital display. Bourns offers the model EP and PEC series encoders with momentary push switch options to suit your application.

Additional information on performance characteristics and applications is contained in the "Application Notes" section of this guide.

Encoders

Modification Capabilities and Value-Added Solutions

The Sensors and Controls Division has continued to expand its encoder product offering with a wide variety of models to meet your application needs, including both absolute and incremental quadrature output codes. A wide range of "value-added" potentiometer enhancements is also available to provide you with cost-effective solutions. We would like the opportunity to provide a custom solution to meet your application and design needs.

Bourns' capabilities to develop custom encoder solutions and modifications include the following:

Cable Harness/Lead Wires
For ease of connection to your application, we can supply a custom fit cable harness or lead wires. We can even supply it with a mating connector.

Detents
On some models, the detent count can be doubled or quadrupled per electrical output cycle.

Custom Output
In addition to our standard electrical output (PPR), custom outputs signals can be developed to meet special application needs.

Seal
Some models are sealed for board processing. Some models can be sealed to IP65 specifications.

Torque
On some models, rotational torque can be increased for a smooth, heavier feel.

Special Packaging
Bourns can provide custom packaging to meet your production or storage needs.

Terminal Configurations
Terminals can be formed to meet your application needs.

Hardware
Most products are shipped with one hex nut and one lock washer, but other configurations are available upon request.

Marking
Standard marking includes the Bourns part number and date code. We can mark additional information, such as customer name and part number, or any other designations.

Mechanical Stops
All encoders are continuous turn, but stops can be added to limit mechanical travel.

Mounting Brackets
Bourns can develop a customized bracket to meet your needs. Servo mount precision controls can use motor mount cleats or precision synchro mounting clamps by Pic Design. (www.pic-design.com)

Special Test Requirements
We have the capability to provide extensive reliability testing as required. We can accommodate most special test needs along with test documentation and/or certification with each shipment as requested.

Customized Shaft Options
In all shaft diameters, Bourns has the ability to modify the length of the shaft, add a flat with special shaft orientation, add holes or notches, or even press on a gear as a value-added option.

Encoders

Array of Applications

Bourns Sensors and Controls offers a wide range of encoder package options and performance characteristics unmatched by competitive devices. This extra measure of adaptability makes Bourns® encoders the optimum solution for a broad range of applications. Our engineering and design expertise used to resolve customer needs have led us to encoder applications in the following industries:

Professional and Consumer Audio
An industry leader serving the professional and consumer audio market, Bourns' contacting and optical encoders can be found in all types of audio applications. Old analog designs are being redesigned with to digital circuits with encoders replacing potentiometers.

- *Studio Recording Equipment*
- *Digital Mixing Consoles*
- *Digital Broadcast Equipment*
- *Professional Sound Systems*
- *Digital Amplifiers*
- *Digital Car Audio*

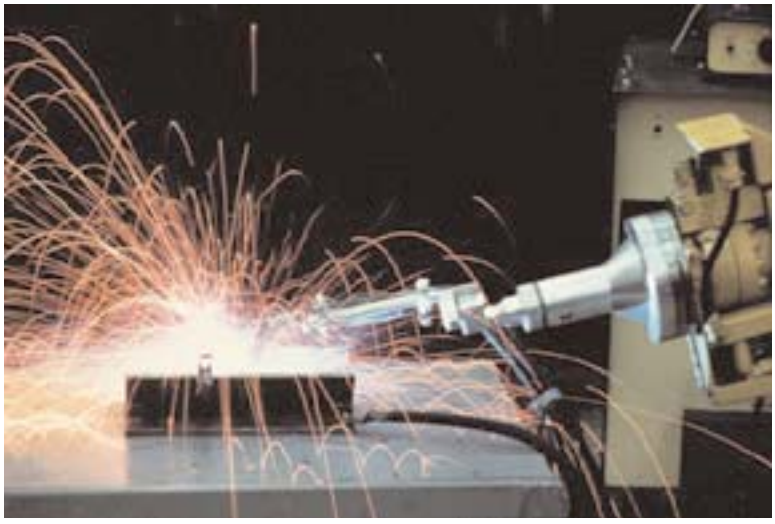
Test & Measurement Equipment
Used as input devices for all types of test and measurement equipment, contacting and optical encoders provide accurate adjustment controls insuring reliability and dependability in your end product.

- *Oscilloscopes*
- *Digital Analyzers*
- *Measurement Instruments*
- *Weather Instruments*
- *Medical Diagnostic Equipment*
- *Chart Recorders*
- *Digital Monitors*

Encoders

Industrial/Factory Automation

Optical Encoders are a rugged and durable solution for factory automation and industrial uses. With millions of life cycles, non-contacting technology enables these encoders to outlast the life of the equipment. Designed with outputs to 256 pulses per revolution, Bourns®optical encoders provide the highest resolution with the smallest package size in the industry.



- *Robotics*
- *Material Handling*
- *Forklift Trucks*
- *Machine Tools*
- *Automated Gates/Doors*
- *Fluid Measurement*

To assist you in making the right encoder selection for your application, please refer to the sections in this guide entitled “Application Notes” and “Product Selection Guides.” These sections provide a side-by-side comparison of specifications for each model along with technical data for each model. Additional technical information can be found in the “Data Sheets” and “Glossary of Terms” sections.

CUSTOM SOLUTIONS

Custom Solutions

Automotive Products

Many of the world's leading manufacturers have long known Bourns as a company that they can trust to deliver quality electronic parts on time and within target costs. With components and integrated solutions for many automotive applications, Bourns Sensors and Controls has a keen sense of automotive companies' needs. Our products deliver performance and reliability you can trust.

Bourns has been an integral part of many recent technological advances providing high-performance, low-cost, magnetic position sensors, and enhancements to positive temperature coefficient over-current protection devices.

At the Sensors and Controls Division, we understand that automotive manufacturers need complete solutions. To achieve an optimum blend of price and quality, we are structured to be one of the world's most vertically integrated suppliers. With our own prototype engineering labs and tool rooms, we are able to minimize the time to market. From simple substrates to complete assemblies, Bourns does it all. Our component offering is exceptionally broad-based.

Bourns automotive offerings include sensors, overcurrent protection devices, controls, and discrete components. The breadth of Bourns standard product offering is unmatched in the passive electronics industry. At the same time, our vertical integration, production capacity, and technical expertise gives us the ability to adapt quickly to just about any custom requirement. This unbeatable versatility continues to make Bourns a supplier of choice for many automotive manufacturers. Simply contact your local Bourns sales representative for assistance on your automotive needs.

Bourns Automotive Engineering Group has designed, prototyped, and manufactured customized automotive sensors for tier one and tier two automotive customers over the last 25 years. With everything from contacting type encoders for automobile radios, including the more recent use of new non-contacting magnetic technology in throttle position sensors and electronic throttle control applications, Bourns can provide you with the custom discreet and integrated solutions needed in today's changing automotive marketplace.

Custom Solutions

Bourns core technologies can be tailored to fit any sensor application. These technologies include:

- *Thick Film Printing*
- *Long Life Resistive Ink Technology*
- *Non-Contacting Magnetic Technology*
- *Insert and Injection Molding*
- *CNC Machining*
- *Metal Fabrication*

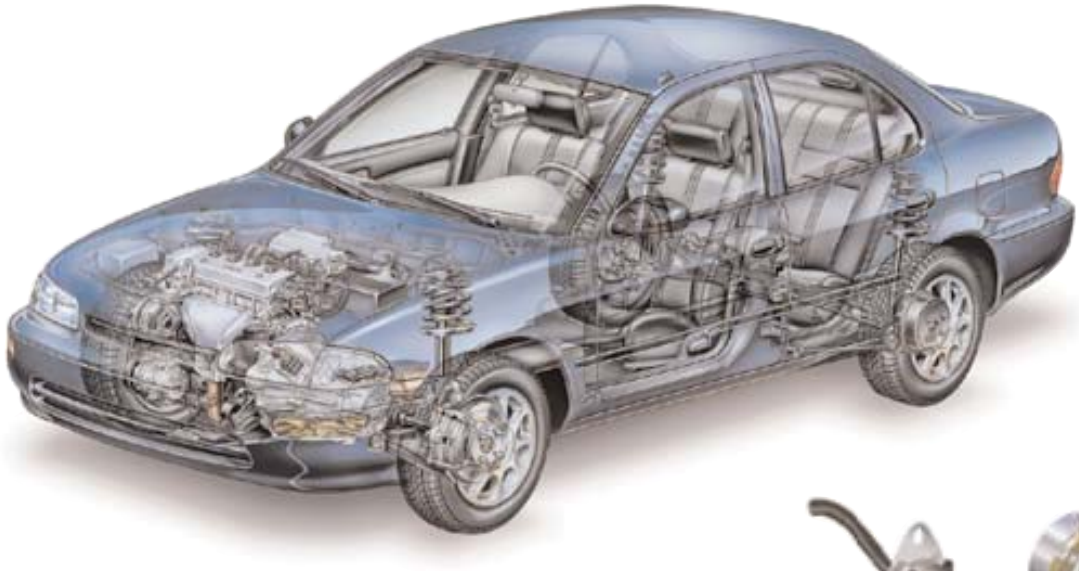
Bourns Automotive Engineering Group has been successful in developing the following types of components for the automotive industry:

- *Brake Wear Sensors*
- *Steering System Sensors*
- *Gear Position Sensors*
- *Single/Dual Output Non-Contacting Pedal Position Sensors*
- *Non-Contacting Linear and Rotary EGR Sensors*
- *Non-Contacting Rotary Throttle Position Sensors*
- *Electronic Transmission Sensors*
- *Suspension Position Sensors*
- *Memory Seat Controls*
- *Radio Controls*
- *HVAC*

Whatever your automotive sensor or control requirement may be, Bourns Automotive Engineering Group has the expertise to design, prototype, and manufacture it for you. Simply contact your local Bourns Sales Representative with details of your idea or design, and they will do the rest. Like millions before you, Bourns will be happy to provide you with the most Reliable Electronic Solutions the industry has to offer.

Custom Solutions

Custom Solutions for Automotive Applications



Dimming System
• 3310 Panel Control

Stability Systems
• Suspension Sensors
• Steering Sensors
• Brake Wear Sensors

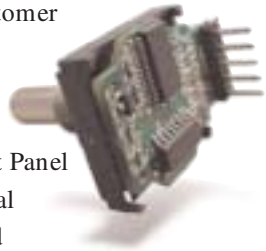
Cockpit Systems
• HVAC Controls
• Radio Controls
• Integrated Electronic Front Panel Solutions
• Infotainment Electronic Solutions

Engine Management Systems
• Throttle Position Sensors
• Pedal Position Sensors
• EGR Valve Position Sensors
• Transmission/Gear Position Sensors

Custom Solutions

Other Custom Products

The Sensors and Controls Division specializes in designing, developing and manufacturing custom components, utilizing both contacting and non-contacting technologies. From throttle position sensors for a unique automotive environment, to printed circuit boards custom fitted with Bourns®contacting encoders, we aid customers in developing their ideas into assembly ready solutions. Bourns can fully integrate passive and active components into an array of housing sizes to meet customer needs.



One example of a custom solution is the Bourns®Smart Panel Control. This device is a digital rotary control with embedded functionality facilitated by on-board electronics. The product may be programmed to accommodate a variety of different functions. Specifically, it can control several devices and all associated functions through one simple, intelligent interface.

Another Smart Panel Control configuration directly controls and powers a small DC motor for an automotive or industrial application. Variables such as speed, slew rate and control curve can be programmed into the on board electronics. The Smart Panel Control may also monitor all systems and under program control either notify the operator of the offending condition, or take direct action.

With Bourns' core manufacturing competencies in precision injection molding, metal fabrication, resistive ink development and high volume resistive ink printing, we can cost-effectively meet your application needs. Simply contact your local Bourns Sales Representative to start the process.

Diagram 1: The Bourns Advantage