



# OTTO<sup>®</sup>

Expect Excellence.

JOYSTICKS  
HALL TECHNOLOGY  
GRIPS  
SWITCHES

SHORT FORM  
CATALOG



For a complete overview of OTTO products visit [www.ottoexcellence.com](http://www.ottoexcellence.com)

For over 45 years OTTO has built a reputation for innovative engineering capabilities and adherence to the highest quality standards. Our switches and controls perform every day in some of the toughest applications in the world, from Military Ground Support Grips, Throttle Quadrant and Control Grips for fixed-wing aircraft to Helicopter Cyclic & Collective Grips. OTTO houses a complete MIL-I-45208, as well as ISO 17025 (A2LA), on-site test lab facility with environmental, mechanical, electrical and audio test capabilities. Registration to ISO 9001:2000, AS9100b and FAA Part 145 Repair Station. Our experience and know-how in the design and manufacturing of precision switches and grips has made us a supplier to all flight control manufacturers. With an emphasis on sealed-switch technology and custom electromechanical switch design and development, OTTO has a solution to meet the most demanding applications.

## Features:

### MILITARY GROUND SUPPORT GRIPS

- Custom-machined heads available to fit standard handle
- Back lighting options
- Custom head can be outfitted with a variety of OTTO switches

### FLIGHT CONTROL GRIPS

- B8 and Cobra style controls are made in accordance with MIL-DTL-25561
- Most ergonomic version on the market
- Non-reflecting, non-hygroscopic, rugged injection molded grip
- Choice of termination styles—from integral connectors to wire harnesses
- Threaded disconnect or tube mounting
- Can be populated with mil-qualified switches, standard or custom configurations

### THROTTLE CONTROL GRIPS

- Control for fixed-wing aircraft
- Custom toggle and rocker switches can be used to meet high cycle requirements



Cyclic Grip

B8 Style  
GripMilitary Ground  
Support GripCobra Style  
GripThrottle  
Grips

Collective Grip

# G2 AEROSPACE AND MILITARY CONTROL GRIPS

### HELICOPTER CYCLIC & COLLECTIVE GRIPS

- Controls have thin-wall, investment cast aluminum construction for high strength and low weight
- Modular construction
- Custom heads and switch mounting plates can be fabricated to fit standard handles
- Available with switch access panel for easy repair and maintenance
- A variety of button color and style options available
- Transducer and electromechanical trim switch options



## COMMERCIAL GRIPS

The G3 Universal Grips can be customized for top-of-the-line machines requiring high switch content or to provide only basic control functions on lower tier units. The OTTO G3 Universal Grips have a modular design and were developed for use with OTTO's standard Pushbuttons, Rockers, Toggles, Hall Effect switches and the JH Hall Effect Joystick. Both the G3-0100 Small Universal Grip and the G3-0101 Medium Universal Grip are easily customized with multiple switch configurations—quickly and without any tooling charges.

**Features:**

- Modular design eliminates the need for tooling charges
- Compatible with the OTTO Hall Effect JH Series Joystick
- Small and medium sizes available
- Accommodates a full line of Pushbutton, Rocker, Toggle, HP Hall Effect and HPL Proportional Output series of switches
- Various mounting and termination options available



Small Universal Grips shown with Pushbutton and Rocker Switches

Medium Universal Grip shown with Pushbutton and Rocker Switches



Custom Terminations Available

Custom Mounting Adapters Available

OTTO serves Agriculture, Off-Highway, Material Handling and Specialized Industrial Equipment markets. If your application cannot be met with one of our standard grips, OTTO can help design and build a truly custom made solution, utilizing state of the art 3-D solid modeling work stations. Our grips can be manufactured with an almost unlimited variety of switches, custom termination and custom mounting options. OTTO is a vertically integrated facility offering SLS & SLA compatible outputs for rapid prototyping; in-house precision machining; progressive die stamping; injection, insert and compression molding; cable and over-molding assembly capabilities. All OTTO products are manufactured under an ISO 9001:2000 approved quality system, ensuring the greatest value, quality and the highest performance for our customers.



"Soft Touch" Grips and Joysticks

## HEAVY EQUIPMENT & MATERIAL HANDLING GRIPS

- Rugged injection molded grip can be outfitted with a variety of OTTO switches
- Ergonomic design for extended use
- Custom designs
- Left or right hand orientation available



Palm Grip

## TRACTOR GRIPS

- Rugged thermoplastic
- Can be outfitted with a variety of OTTO switches



Tractor Grip

## AGRICULTURAL GRIPS

- Powder-coat, cast aluminum grip and steel mounting bracket
- Space-saving four-way toggle switches
- Can be outfitted with a variety of OTTO switches



Agricultural Grip

## 9 MILLION LIFE CYCLE

The HJFC Hall Effect Foot Pedal is built to perform under the worst possible conditions. The unique design places Hall sensors and electronics behind a solid plastic diaphragm that separates the top and bottom halves of the front pedal, sealing the electronics in an IP68S rated enclosure. The bottom half of the pedal utilizes the same proven non-contacting analog output Hall technology used in the OTTO Joystick and is available in J1939 and CANopen protocols. The CAN interface provides 8 analog input channels, 13 digital input channels, 2 digital output channels and I/O extension for up to 40 digital input channels and 8 analog input channels by means of I<sup>2</sup>C interface. It will withstand operating temperature extremes of -40°C to +85°C, is sealed to IP68S immersion requirements and passes electromagnetic and radio frequency interference (EMI/RFI) immunity testing to 100 volts per meter.

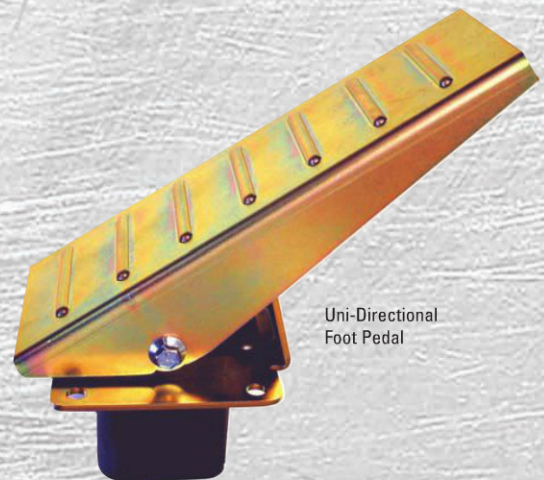
The HJFC Foot Pedal provides a life expectancy of over 9 million cycles. The pedal's pivot point is also sealed against large debris. Customer specified features such as pre-travel (dead band) and over-travel, along with a minimum and maximum output, are programmable. The sensor programming is completed in automated fixtures during assembly ensuring tight output tolerances. The HJFC Hall Foot Pedal offers a higher cycle and seal rating than any other foot pedal on the market.

### Features:

- Outstanding EMI/RFI immunity
- Heavy gauge, corrosion resistant metal
- Proven non-contacting analog output Hall technology
- Life expectancy of over 9 million cycles
- Hall sensors and electronics behind a solid plastic diaphragm that separates the top and bottom halves of the foot pedal
- Electronics are sealed to IP68S
- Pedal pivot point sealed against large debris
- Programmable pre-travel (dead band) and over-travel, along with minimum and maximum output
- Sensor programming is completed in automated fixtures during assembly, ensuring tight output tolerances
- Reverse polarity protection available



Bi-Directional  
Foot Pedal



Uni-Directional  
Foot Pedal

## OPERATES 10 MILLION CYCLES, CONTACTLESS HALL EFFECT TECHNOLOGY

Designated the HP7 series, these momentary pushbutton switches utilize Hall Effect sensor technology for long life, contactless switching with 10 million operations. Available in dusttight and moistureproof sealed configurations, these switches can also be watertight sealed to IP68S. The stylish dome-shaped pushbuttons are available in a choice of nine colors.

Case and bezel are precision-machined aluminum alloy, available with either a black or clear coat anodized finish. Three case and button styles are offered in raised dome, flush dome and exposed dome styles. PC pins or wire leads are standard, with value-added connectors available to specification.

This rugged switch is designed to withstand harsh environments while being subjected to high rates of actuation. Applications that require repeated "jogging" and other continuous operations from positioning switches are prime applications for the HP7 Hall Effect switch. Examples can be found in Material Handling equipment such as loaders, lift trucks, bucket and shovel and other applications where positioning of the load is critical.

### Features:

- 10 million cycles
- Hall Effect sensor technology for long life
- Moistureproof and dusttight to IP64 or watertight to IP68S
- Stylish dome-shaped buttons in nine colors
- Momentary action
- Choice of termination styles
- Mechanical detent available for tactile feedback



## PROVIDES 10 MILLION LINEAR OUTPUT CYCLES USING CONTACTLESS HALL EFFECT TECHNOLOGY

The HPL series is a revolutionary switch utilizing Hall Effect technology to provide the user an output proportional to the travel of the button. The HPL delivers 10 million cycles. This rugged switch is ideal for applications where a simple on/off control is insufficient and a linear output is desired. Using the HPL, an operator can control the motion of a device as well as the speed of the movement. The HPL switch is an excellent control device for valves and variable speed drives, and can be used in Industrial Control, Heavy Equipment and Material Handling applications.

The HPL is offered as a stand-alone switch and in a dual HPL rocker assembly. As with all OTTO switches, a wide variety of case, button styles and colors are offered, along with various termination styles. OTTO can also provide custom configurations as well as the HPL switches installed in a control grip.

### Features:

- Programmable outputs of 0.5V to 4.5V
- 10 million cycles
- Hall Effect for reliable contactless switching
- Watertight per IP68S available
- Front or behind panel mounting
- Choice of termination styles
- Rocker version available



HPL-4 15/32"  
Thread Rear Mount  
with Wire Leads



HPL-R Hall Effect Rocker



U2 Hall Effect Rocker



# LINEAR HALL EFFECT 2 & 4-WAY TOGGLE

The HTL series provides all of the performance of a full size, dual axis joystick in a miniature package that can be mounted in control handles, armrests and panels. The Hall Effect sensors are protected against EMI/RFI interference up to 100 volts per meter. Programmable sensors with built-in temperature compensation ensure consistent and repeatable operation. The HTL series provides excellent operator control, and a wide variety of output configurations for different applications. They are dusttight to IP64 and watertight to IP68S.

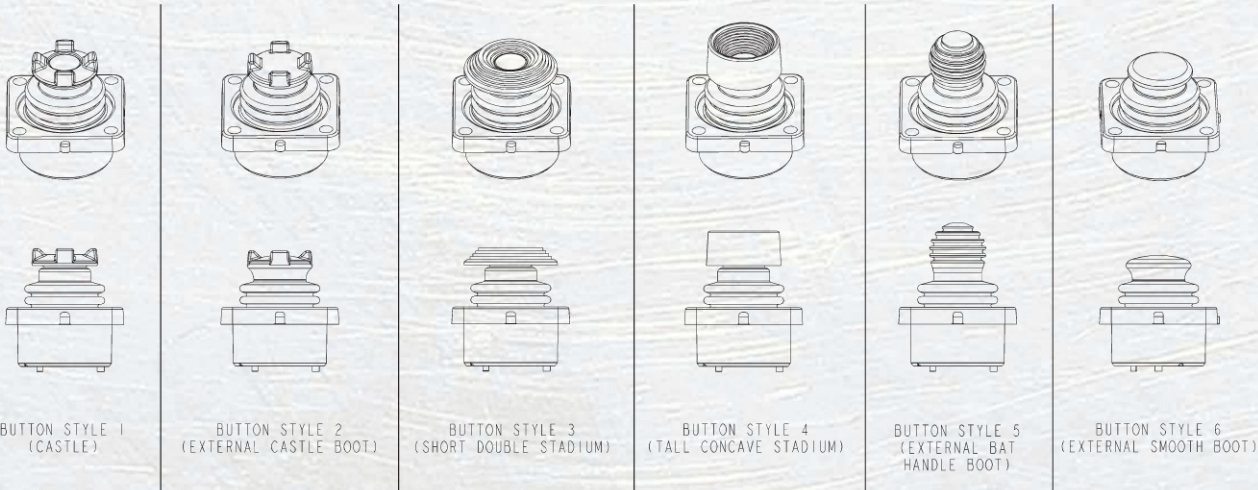


HTL4 with External Bat  
Handle Boot with Wire Leads

**Features:**

- Designed for grip, armrest and panel mounting
- Proven contactless Hall technology
- Redundant outputs available
- 1 million cycles
- Electronics watertight to IP68S
- Outstanding EMI/RFI immunity
- Available gated and ungated
- Variety of button styles
- HTL2 single axis
- HTL4 dual axis

## BUTTON STYLE CONFIGURATION



## 3 MILLION CYCLE ROTATIONAL LIFE USING HALL EFFECT CONTACTLESS TECHNOLOGY

The Hall Effect Proportional Output Thumbwheel, HTW switch, is available with eight output options. The HTW offers a self-centering, single axis thumbwheel actuator that provides linear change in voltage output in either direction from the center. Options include increasing or decreasing voltage output from the center position to the full travel position in either direction, and single or dual (redundant) outputs in either direction. The HTW offers Rocker switch style mounting and provides a 3 million cycle rotational life. The electronics are sealed to IP68S and have excellent EMI/RFI immunity. The HTWM offers a much shorter behind panel depth with the same features of the HTW. Its smaller size and robust quality make this ideal for use in grip, armrest and panel applications.

### Features:

- Eight output options
- Self-centering single axis actuator
- Rocker switch style mounting
- 3 million cycle rotational life
- Electronics sealed to IP68S
- EMI/RFI immunity
- HTW friction and detent options available



HTWM Paddle Wheel

HTWM Knurled Wheel



HTW Paddle Wheel

HTW Knurled Wheel

## COMMUNICATION PROTOCOLS

### J1939, CANopen COMMUNICATION PROTOCOLS AVAILABLE

OTTO is an industry leader in the integration of J1939 and CANopen serial bus communications in Off-Highway operator controls. OTTO has extensive experience implementing CAN operating systems in conjunction with the latest generation of operator controls, replacing traditional electromechanical and hydraulic systems with solid state, digital and analog electrohydraulic control systems. OTTO's product line of electromechanical switches, digital Hall Effect switches, analog Hall Effect rockers, thumbwheels, pushbuttons and mini-joysticks, mated to our full size Hall Effect joysticks and control handles, provide a CAN-based integrated solution for any application. J1939 offers an industry standard set of defined codes for consistent system integration.

The OTTO J1939 joystick will work in systems running with 250 Kbit/s processing a message approximately every 10 ms. J1939 can be configured into a minimum of 3 variations (50, 51, 52 are the default addresses). An external resistor change at the connector pins allows multiple OTTO joysticks to be used on the same bus. Additional joystick addresses can be added by assigning a unique identification during configuration.

CANopen provides a greater degree of flexibility in defining device IDs and can be remotely configured. CANopen will work in systems running with 125 Kbit/s (default), receiving and processing a message approximately every 10 ms. CANopen can also be configured to run with other system baud rates.

#### Features:

- Standard configuration for both J1939 and CANopen is 3 analog input channels and 12 digital input channels with 2 digital output channels
- CAN power accommodates 9-32VDC power supply
- I/O extension for up to 40 digital inputs and 8 analog inputs by I<sup>2</sup>C interface
- Both J1939 and CANopen versions include a failure monitoring feature
- Tested to 100V/M with less than 2.5% full scale change in output
- EMI/RFI per ISO 11898 89/336 ECC
- Operating temperature -40°C to +85°C
- Storage temperature -65°C to +105°C
- All designs are RoHS compliant
- PWM available



HJFC Foot Pedal with CANbus Interface



HJST Soft Touch Grip with CANbus Interface

## 2 & 4-WAY HALL EFFECT TECHNOLOGY JOYSTICK

The JH Series Joystick is designed around the rugged mechanism of a traditional 2 & 4-way hydraulic joystick, but utilizes non-contacting Hall technology for increased life and more dependable performance in the field. This combination provides performance and features never before available in an electronic joystick. The JH series uses OTTO's field-proven dual magnet configuration found in OTTO's HPL linear output Hall Effect switches. Programmable sensors with built-in magnetic temperature compensation logic ensure consistent and repeatable operation. The JH series is designed for maximum flexibility in features. A wide variety of input and output configurations are available to satisfy different applications. The modular electronic package can be configured for both standard and custom I/O requirements including CANbus protocols.

### Features:

- Adapts to a wide variety of shaft styles
- 15 million cycles
- 300 lb. static load strength
- IP68S submersible rating
- Operational angles from 16° to 25°
- EMI/RFI shielding up to 100V/M
- Factory programmable pre-travel and over-travel
- Analog, CANbus and custom output options available
- Redundant outputs available
- Dual axis joystick with Z axis option, reverse voltage protection -5.0V max
- Fail safe and neutral indicator available
- Single axis available



JHM



HJG3 with  
Universal Grip



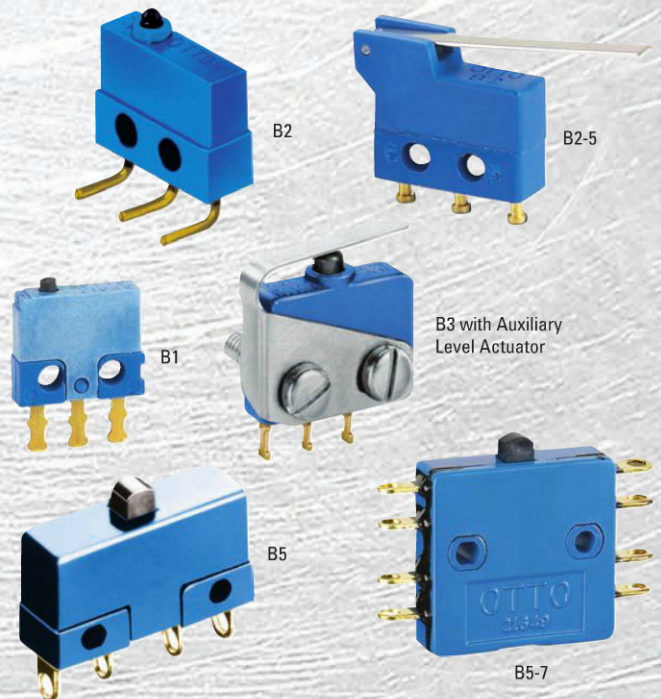
HJG3 with  
Palm Grip

## BASIC SWITCHES

For use in spaces where cam or other limit actuators are used, subminiature switches are designed and qualified to meet military specifications. A variety of custom configured actuators for pushbutton, toggle and lever actuations are available.

### Features:

- Military per M8805 and Commercial Grades
- Miniature and subminiature sizes available
- Low level to 10A
- Highly repeatable operation
- UL/CSA approvals
- Mechanical life up to 1 million cycles



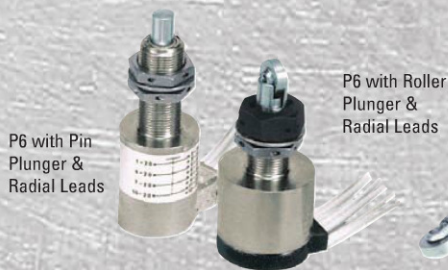
## LIMIT SWITCHES

These switches are sealed against corrosive atmospheres. A one piece stainless steel housing provides true environment-free sealing to comply with M8805/39, M8805/40, M8805/43 and M8805/100. Most case parts are grounded for EMI reduction.

### Features:

- Choice of Pin Plunger, Roller Plunger or Lever
- Electrical life up to 50,000 cycles at full load
- Low level up to 10A
- Special designs available

### P6-3 Series



## PUSHBUTTON SWITCHES

OTTO offers the most diverse line of pushbutton switches in the industry—all sealed, rugged and aesthetically pleasing. We have created designs that are commonly used in Military, Aerospace, Off Road Equipment, Material Handling, Medical, Marine, Industrial and Process Control.

The OTTO pushbutton series consists of illuminated switches (LP3, LP5, LP9) and non-illuminated switches (P1, P3, P4, P5, P7, P8, P9, PE, PE2). They have military approvals M8805/96, M8805/99, M8805/110 and MS25089 – 1 thru 5.

OTTO's pushbutton switches have been proven as reliable solutions for countless applications for almost a half century. The **P1** series operates on our patented "rolling sleeve," providing longer life and smoother operation over a wide temperature range. The **P3 & P5 Dome** series offer all seal options and a variety of mounting and housing styles. Our **P7** series is a sealed subminiature snap action switch with a variety of mounting styles to best match your application. The **P8** series makes and breaks every time. OTTO's wiping action breaks welds and wipes contacts clean. The **P9** is a sealed dome pushbutton that withstands extreme shock and vibration. The **Vandal Resistant** series offers the same quality and precision tactile feedback found in the standard P8 series with a variety of case, mounting and terminal styles—ideal for door access security systems, public transit systems, emergency phones, and more.

Custom versions of pushbutton switches are available. Let our specialists design a solution tailored to your specific application.

### Features:

- Military and commercial grades
- Dusttight to IP64 and watertight to IP68S options
- 2V to 24V LED Illuminated
- Vandal resistant stainless steel case options
- Momentary and alternate action
- Subminiature
- Variety of dome case styles
- Shorter behind panel depth styles
- Up to 1 million cycle mechanical life
- Press-fit, snap-in and threaded mounting options



# PUSHBUTTON SWITCHES

**P SERIES**  
PUSHBUTTON  
SWITCHES

## ILLUMINATED SWITCHES



## NON-ILLUMINATED SWITCHES



Specifications Subject To Change Without Notice

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## ROCKER SWITCHES

These rockers are designed to comply with standards established for Appliance, Marine (ignition protection) and Off-Road Vehicles. Mounting is simple and quick. The snap-in design supports a variety of panel thicknesses. Existing applications are easily upgraded to sealed functionality, IP68S. Choose LED, incandescent or neon illumination. Legends can be printed onto a button or lens or laser etched and backlit. Custom colors available.

### Features:

- Sealed to IP68S
- Low level up to 20A
- Single and double pole circuits
- UL/CSA/CE recognized
- Mating connectors available on selected styles



## ROTARY SWITCHES

Used in Heavy Equipment, Marine, Process Control and Instrumentation markets, the **R2** rotary switch is an excellent replacement for rocker switches. They offer improved visual position indication, additional lighting options and different styling opportunities on front panels. R2 switches are sealed and lighted and snap into a 1.45 x 0.830" industry standard rocker switch panel opening. The **R5** series is a 1/2" traditional rotary switch available in commercial and military grade with four angles of throw. The **RM** series is a multi deck switch with up to 12 decks and 6 poles per deck. The **RK** rotary key lock switch offers three angles of throw and a variety of finish options.

### Features:

- Single deck, multi deck, keylock and lighted versions
- Commercial and MIL-S-3786/20 military grade available
- 36°, 45°, 60° and 90° angles of throw
- Snap-in panel mounting available on some models
- Choice of termination styles





## SL SLIDE SWITCHES

The SL Slide switch is a reliable switch with a mechanical life of 100,000 cycles. Offered in both single and double pole, double throw configurations and low level ratings. Three-position center off with momentary or maintained switch action is available in any combination.

Supplied in both commercial and military grades, dusttight to MIL-PRF 8805 Design 2. Button styles include raised or flush contours.

### Features:

- Single and double pole, double throw switch configurations
- Low level up to 5A
- 100,000 cycle mechanical life
- Raised and flush button contours available
- FAA/PMA versions available



## SPECIALTY SWITCHES

Specialty switches provide you with a flexible, cost efficient solution for your application needs. They are customized to your specifications or OTTO can develop a design to meet your needs. Your new switch will complete a qualification test plan and acceptance test procedure to ensure it meets all specifications.



P8-7 with  
Custom Button



FNR Switch



Trigger Switch



Pendant Switch

## TOGGLE AND TRIM SWITCHES

**T3 Series** miniature toggles are rugged, highly reliable switches with snap-action switch mechanism and toggle actuator design for non-teasible contact transfer.

**T7 Series** is a high performance switch, entirely sealed to withstand direct water spray and submersion, even during operation. Designed to meet submersion specification level IP68S.

**T9 Toggle Switch** is qualified to MIL-DTL-3950. Environmentally sealed, the T9 is particularly suitable for applications in Off-Highway, Aviation, Commercial and Industrial Equipment.

**TE Series** is qualified to MIL-DTL-8834, snap-action, non-teasible, positive make and break, panel mount toggle switch. All metal components are corrosion resistant and designed to exceed military requirements.

**TG Series Toggle Guards** fit standard size toggles, prohibiting actuation (On or Off) without first flipping up the safety switch cover. They meet the requirements of MIL-DTL-7703, MS25224-1/-3 and MS27752-1.

**Mini Trims** (T1, T4, T4-T, T5, T8) are toggle switches available in 2 to 4-way, plus pushbutton and 8-way versions. They are supplied in both Military and Commercial grades. Tactile feedback and a variety of button styles are just a few of the many options available. Mini Trims are typically press fit into grips or panels and are available with multiple sealing levels to fit all applications.

**Large Trim Switches** (T2, T4, T5) provide 2, 4 & 5-way momentary toggle action with operating positions every 90 degrees, with a center pushbutton. Dusttight and moistureproof with fully watertight IP68S option.

**K4 Switch** is a snap-in toggle switch that is a rugged, high performance, totally sealed switch designed for use under severe conditions. Ideal for Marine, Appliance, Heavy Equipment and Industrial Control applications. The K4 switch can handle low level switching up to 16 amps. Mounting is simple, designed to fit industry standard panel openings for a quick drop in replacement.



## TRANSDUCER SWITCHES

OTTO's J2 transducers are strain gauge based, force transducer switches. They provide analog output proportional to the force applied to the button. Normally mounted in a grip and operated by a finger or thumb, common applications include flight control of aircraft, operating ground vehicles, target acquisition and air traffic management.

### Features:

- Enclosure dusttight to M8805 Design 2
- Null temp coefficient +/- 0.4% of full scale per degree C
- Hysteresis +/- 0.5% of full scale within one second after release
- Sensitivity temperature coefficient +/- 2% full scale per degree C
- Operating temperature range -55°C to +85°C



J2-S3  
Conical Hat



J2-S2  
Flat Button



J2-S1 Pushbutton



*Accreditations:*

ISO 17025 (A2LA) Accredited Laboratory

EASA Repair Station Certified

FAA Repair Station Certified

ISO 9001:2000/AS9100b Certified

RoHs Compliant

ISO 14000 Compliant

**OTTO**<sup>®</sup>  
Expect Excellence.

2 East Main Street • Carpentersville, IL 60110

Phone: 847.428.7171 • Fax: 847.428.1956

E-Mail: [info@ottoexcellence.com](mailto:info@ottoexcellence.com) • Internet: [ottoexcellence.com](http://ottoexcellence.com)

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