

OTTO®

MILITARY & AEROSPACE



CONTROLS SOLUTIONS



847.428.7171 | www.otto-controls.com

OTTO Controls designs and manufactures operator controls solutions in the U.S. for some of the most demanding applications around the world.

Precision controls for the military and aerospace market include 3,500+ military-qualified switches for equipment running on land, air and sea, as well as flight grips for military and commercial aircraft.

Custom product design and engineering services meet customers' unique specifications.

OTTO's world-class laboratory rigorously tests products with endurance cycling and by simulating severe and adverse operating environments.

Certified FAA Part 145 repair station

ISO 9001, ISO 14001 and AS9100 registered

A2LA accredited to ISO/IEC 17025

TL 9000, TS 16949 and QS 9000 compliant

Miniature Toggles
pages 19–20



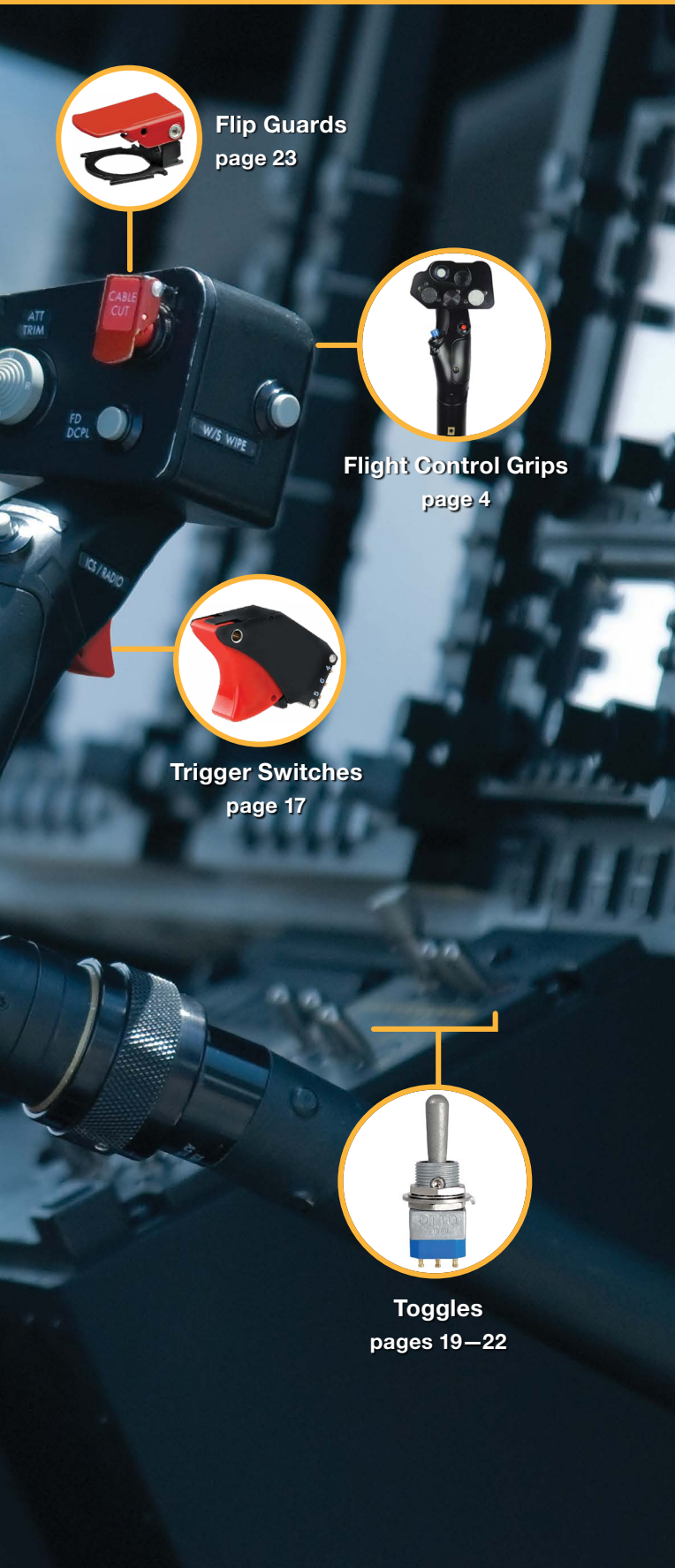
Trim Switches
page 24–28



Pushbuttons
page 14–16



Transducers
page 30–31



Flip Guards
page 23



Flight Control Grips
page 4



Trigger Switches
page 17



Toggles
pages 19–22

GRIPS & JOYSTICKS

- Military & Aerospace Control Grips 4
- Cyclic & Collective Grips..... 6
- Flight Control & Throttle Control Grips..... 8
- Finger & Mini Joysticks 9

ELECTROMECHANICAL SWITCHES

- Subminiature Basic Switches..... 10
- Subminiature & Miniature Basic Switches 11
- Sealed Limit Switches 12
- Sealed, Subminiature Limit Switches 13
- Pushbuttons per MIL-PRF-8805/3 14
- Pushbuttons per MIL-PRF-8805/110 15
- Pushbuttons 16
- Trigger Switches..... 17
- Slide Switches 18
- T1 Miniature Toggles..... 19
- T3 Miniature Toggles..... 20
- T9 Toggles 21
- TE Miniature Toggles 22
- Toggle Guards & Flip Guards 23
- 2-Way Mini Trim Switches 24
- 3-Way & 4-Way Mini Trim Switches 25
- 4-Way & 5-Way Mini Trim Switches 26
- 8-Way Mini Trim Switches 27
- Tactile & Split Trim Switches 28
- Large Trim Switches 29
- Transducers..... 30

MILITARY & AEROSPACE CONTROL GRIPS

G2 Flight Control Grips

- Offered as a standard part, ready to use right out of the box
- Three versions: left- or right-handed with hand rest, and right-handed without a hand rest
- Grips have thin-wall, investment cast aluminum construction for high strength and low weight
- Modular construction
- Incorporates switch access panel for easy repair and maintenance



G2 Commander Grips

- Standard design eliminates tooling charges
- Thin-wall, investment cast aluminum construction
- Available as a fixed grip or mounted on an OTTO Hall effect joystick
- Various mounting and termination options
- Nine standard faceplate configurations with a combination of the following, or customize a grip with thousands of other OTTO switches:
 - T3 toggles
 - T4 or T5 trim switches
 - P4, P7 and P9 pushbuttons
 - Hall effect controls
 - K1 rockers
 - Split trim switches
 - J2 transducers
 - Flip guards
- Operator presence and trigger options
- USB output option
- Tested to withstand 265 lb. load
- Grip sealed to IP68S (subject to change based on switch choice)



G2 Commander Grip

G3 Dual Grip Remotes

- Ergonomic, lightweight, game-style grip
- Standard USB interface
- HTL or HTLT finger joysticks and P7 or P9 pushbuttons
- Switches sealed to IP68S and have excellent EMI/RFI immunity
- Excellent proportional control
- RoHS compliant



G3 Dual Grip Remote with
HTLT4 Finger Joysticks shown on p. 9





Collective Grip with Thumbwheel Switch and NVG Compatible Backlighting



Collective Grip Head

Cyclic & Collective Grips

- Grips have thin-wall, investment cast aluminum construction for high strength & 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 colors and style options available
- Transducer and electromechanical trim switch options



Cyclic Grips with Custom Switch Guards





Cyclic Grip



Exploded view of OTTO's modular design Cyclic Grip



FLIGHT CONTROL & THROTTLE CONTROL GRIPS



Cobra Style Grip



B8 Style Grip

Military Flight Control Grips

- Standard and custom configurations can be populated with MIL-qualified switches
- B8 and Cobra style grips made in accordance with MIL-DTL-25561
- Most ergonomic grip of its type on the market
- Non-reflecting, non-hygroscopic, rugged, injection molded grip
- Choice of terminal styles—from integral connectors to wire harnesses
- Threaded disconnect or tube mounting



Throttle Grips

Throttle Control Grips

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



HTLT Finger Joysticks

- One/two axis gated or 360°
- Nine button styles—two have pushbuttons
- Electronics sealed to IP68S
- Mechanical seal dusttight or watertight to IP68S
- 3.3V SPI, PWM, or single or redundant analog output
- Up to 3 million cycle mechanical life
- Tested for harsh environments



HTLT with Pushbutton



HTLT with Control Stick

JHT Miniature Joysticks

- Single or omni-directional gating
- Optional pushbuttons
- CANbus, SPI, PWM, or single or redundant analog output
- Z-Axis model rotates up to 60°
- Electronics sealed to IP68S
- Up to 5 million operational cycles



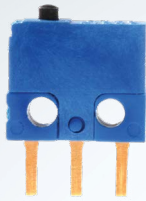
JHT Miniature Z-Axis Joystick



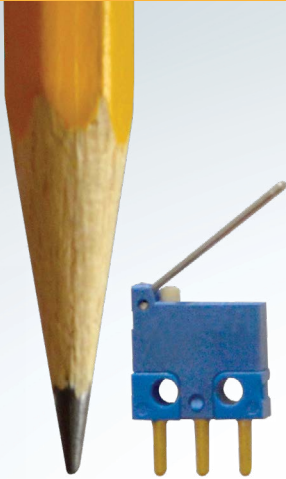
JHT Miniature Joystick with Pushbutton

Hall Effect Technology





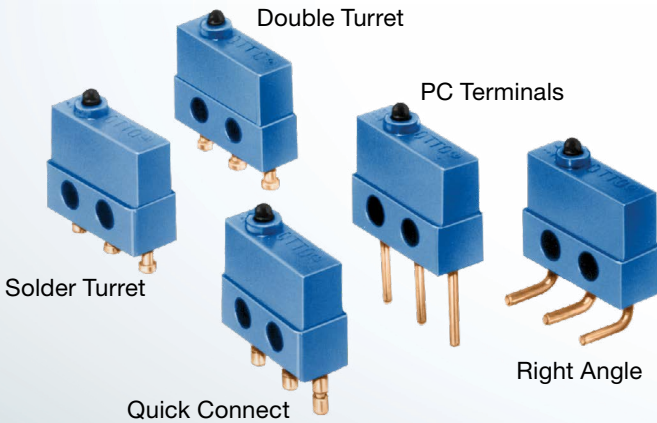
B1 with PC Pins



B1-5 with Long Straight Lever

B1 and B1-5 Basic Switches

- Ultra-compact:
only 0.300" w x 0.255" h x 0.100" thick
- B1-5 Series has up to 1 million cycle life and integral lever
- Logic level switching capability
- Designed in accordance with MIL-PRF-8805/94
- Commercial and military grade available
- Choice of solder or PC pin terminals
- Precision operating points
- RoHS compliant



B2 Subminiature Basic Switches

B2 Basic Switches

- 0.156" & 0.200" wide models
- Up to 7 amps switching
- Sensitive movement differentials
- B2D Series available for low dead break applications
- Eight terminal styles or wire leads
- Qualified under MIL-PRF-8805/4, MIL-PRF-8805/106 and MIL-PRF-8805/109
- Commercial and military grade available
- UL recognized
- RoHS compliant

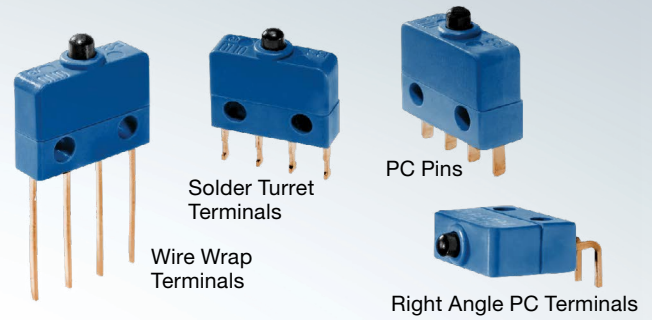


SUBMINIATURE & MINIATURE BASIC SWITCHES

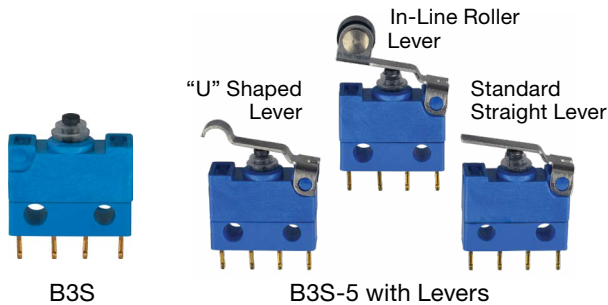
ELECTROMECHANICAL SWITCHES

B3 Subminiature Basic Switches

- Up to 8 amps switching capability
- Double-break circuit, snap-action, momentary switches
- Less than 25mΩ initial contact resistance
- 0.200" wide model meets MIL-PRF-8805/76
- 0.156" wide model meets MIL-PRF-88505/101
- Commercial and military grade available
- UL recognized
- RoHS compliant



B3 Subminiature Basic Switches



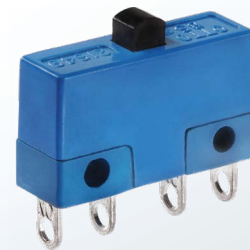
B3S and B3S-5 Sealed Subminiature Basic Switches

B3S and B3S-5 Sealed Subminiature Basic Switches

- Sealed to IP68S
- Double-break circuit, snap-action, momentary switches
- 0.200" width
- Integral lever actuators on B3S-5; lever actuators available on B3S
- RoHS compliant

B5 Miniature Basic Switches

- Up to 10 amps switching capability
- High contact pressure
- Precision operating points
- Button accepts actuation directly from cam
- Constructed in accordance with MIL-PRF-8805/7
- Commercial and military grade available
- UL recognized
- B5-21141 qualified to MS27217-1
- RoHS compliant



B5 Miniature Basic Switch





P6 with Roller Plunger



P6 with Pin Plunger Radial Leads



P6 with Custom Paint



P6 with Roller Plunger Axial Leads



P6 with Pin Plunger Axial Leads

P6 Sealed Limit Switches

- Products available per MIL-PRF-8805/39/40/43/100
- One-piece housing
- Sealed at plunger with O-rings
- Sealed at base with a glass seal
- EMI reduction construction
- Choice of pin or roller plunger
- Option of pin or radial leads
- Choice of integral connector, axial or radial leads



Modified Military Styles



SEALED, SUBMINIATURE LIMIT SWITCHES

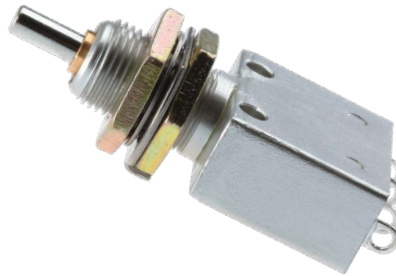
ELECTROMECHANICAL
SWITCHES

P6-3 Sealed, Subminiature Limit Switches

- Compact design
- Watertight to MIL-PRF-8805
- Four actuator styles
- Single or double pole
- Wire lead and solder terminal styles
- Up to 10 amps switching capability
- High contact pressure
- Precision operating points



P6-3 with Roller Lever
Double Pole



P6-3 with Over-Travel Plunger
Single Pole



P6-3 with Plunger
Single Pole



P6-3 with Lever
Single Pole





Style P1-1



Style P1-2



Style P1-3
Push Pull Version



Style P1-3



Style P1-5



Style P1-6



Style P1-7



Style P1-8

P1 Pushbuttons

- Mechanical life exceeds MIL-PRF-8805
- Sealed to MIL-PRF-8805 Design 3
- Button sealed with patented “rolling sleeve” principle
- Contact area sealed at button and terminals
- Less than 25mΩ initial contact resistance
- Ideal for low level switching as well as up to 10 amp resistive
- Positive tactile feedback
- Variety of mounting styles
- Engraved buttons and bezels available
- UL recognized
- RoHS compliant



P7 Subminiature Pushbuttons

- Low level switching capability
- Less than 25mΩ initial contact resistance
- High contact pressure
- Six circuit variations
- Positive tactile feedback
- Variety of mounting styles
- Square button option with case style A
- Qualified to MIL-PRF-8805/110
- Moistureproof and dusttight to IP64 and MIL-PRF-8805 Design 2 or Watertight to IP68S and MIL-PRF-8805 Design 3
- RoHS compliant



Style P7-1



Style P7-2



Style P7-3



Style P7-3



Style P7-5



Style P7-5



Style P7-5



Style P7-6



Style P7-7



Style P7-8



Style P7-A



Style P7-A



Style P7-A



Style P7-A





PE Military Pushbuttons
per MIL-PRF-8805/96

PE Pushbuttons

- Per MIL-PRF-8805/96
- Momentary snap-action
- Sealed or unsealed
- Compact, space-saving design
- Black or red button colors
- Clear or black case colors
- RoHS compliant



PE2 Military Pushbuttons
per MIL-PRF-8805/99

PE2 Pushbuttons

- Per MIL-PRF-8805/99
- Momentary snap-action
- Black, white or red button colors
- Splashproof
- RoHS compliant



Trigger Switches

- Two-step trigger
- Actuating force of 2.25 lbs. to make the first pole
- Additional force of 6.5 lbs. passing through a detent to actuate the second pole
- Rated 7 amps resistive @ 28VDC
- Electrical life up to 50,000 cycles
- RoHS compliant



U2-016 Trigger Switch

Military qualified to M8805/111-01, has a width of 0.641" +/- 0.016".



U2-082 Trigger Switch

Military qualified to M8805/111-03, has a width of 0.641" +/- 0.016".



U2-025 Trigger Switch

Military qualified to M8805/111-04, has a width of 0.762" +/- 0.025".



U2-084 Low Level Trigger Switch

Military qualified to M8805/111-06, has a width of 0.762". Rated 1 amps resistive @ 28VDC.





SL Slide Switch with Flush Button

SL Slide Switches

- Single & double pole, double throw switch configuration
- Logic-level rating available with gold plate contacts and terminals
- 3-position center OFF with momentary or maintained switch action in any combination
- Dusttight to MIL-PRF-8805 Design 2
- Raised and flush button contours available
- Numerous button color choices
- FAA/PMA available (contact factory)
- RoHS compliant



SL Slide Switches with Raised Button



T1 Sealed Toggle Switches

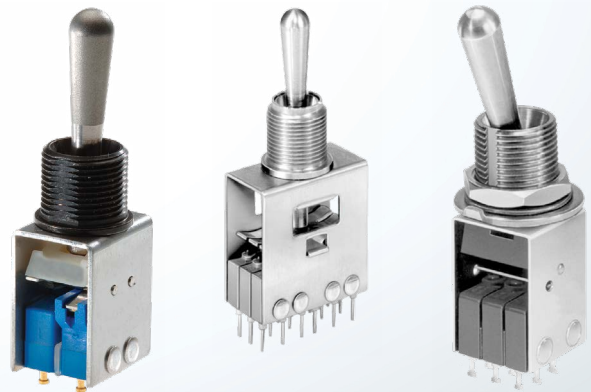
- Panel sealed per MIL-PRF-83731
- 2-position with 2, 3, 4 or 8 pole styles
- 3-position with 4 or 8 pole styles
- Several lever lock options
- Custom handles available
- IWTS terminal option



T1 Sealed Toggle Switches

T1 Unsealed Toggle Switches

- Unsealed toggle switches featuring B2 and B3 basic switches
- 2 and 3-position available
- Available up to 8 pole
- Lever lock styles available per MIL-PRF-8805/4



T1 Unsealed Toggle Switches





T3-1
with
bat handle



T3-2
with short bat
handle,
1/4-40 bushing,
single pole



T3-2
with short bat
handle,
1/4-40 bushing,
double pole



T3-3
with bat handle
with lockout



T3-4
with
convex button



T3-5
with
concave button



T3-6
with smaller bat
handle w/lockout



T3-7
with
rocker button



T3-8
with small
paddle bat
handle



T3-9
with large
paddle bat
handle



T3-A
with knurled
lockout handle

T3 Miniature Toggle Switches

- Per MS277XX (16, 17, 18, 19, 20, 21)
- Shorter behind panel depth
- Superior wiping action helps keep contacts clean
- Positive tactile response prevents operating errors
- Weighs up to 25% less than competitive products
- More contact/plating choices
- Highly reliable, simpler design, fewer parts
- Black matte finish available (contact factory)
- RoHS compliant
- Commercial and military grade available



T9 Toggle Switches

- Per MIL-DTL-3950
- Commercial and military grade available
- Commercial version is sealed per IP68S
- Lever lockout option available
- Maintained & momentary toggle action
- 2 or 3-position
- Optional panel seal
- RoHS compliant
- Black matte finish available (contact factory)
- Single or double pole
- Rated to -65°C



T9
Single Pole with
Lockout Lever



T9
Single Pole with
Black Lockout Lever



T9
Single Pole



T9
Double Pole



T9
Double Pole



T9
Double Pole with
Lockout Lever





TE 1/4-40 Bushing Style



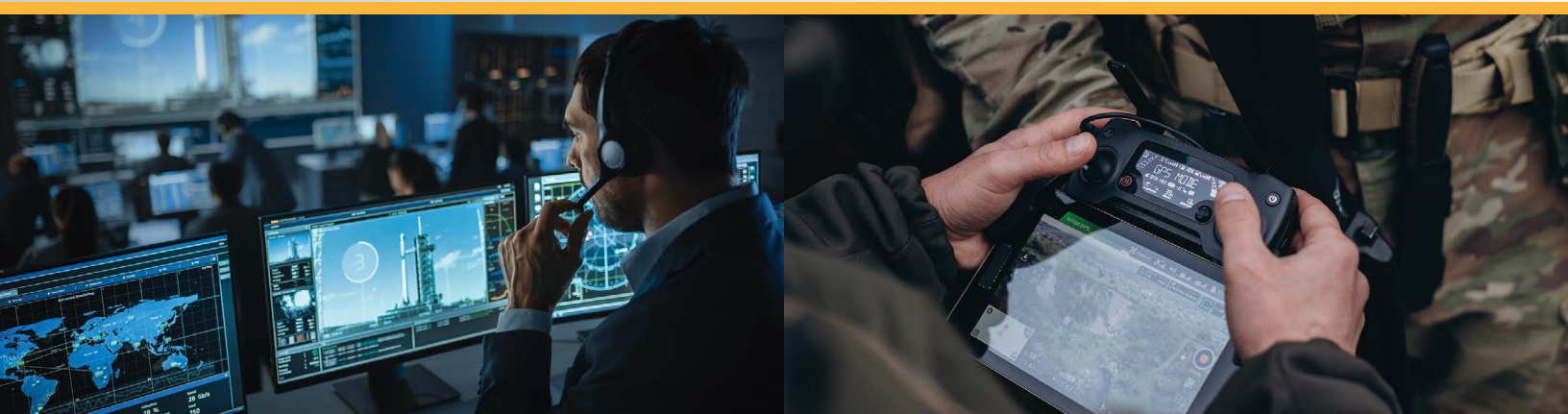
TE with 15/32" Bushing



TE with Black Finish

TE Toggle Switches

- Panel-mount switch with positive action mechanism
- Momentary and maintained action
- Single- and double-pole configurations
- Silicone seal protects contact area from contaminants
- All metal components are corrosion resistant
- Sealed per MIL-DTL-8834
- MIL qualified: MS90310-211/221/231/271/311
MS90311-211/221/231/271/311
MS24655-211/221/231/271/311
MS24656-211/221/231/271/311/
331/341/351
- RoHS compliant
- Black matte finish available (contact factory)



TG Toggle Guards

- MS approved & QPL'd choices
- Offered for 2 and 3-position switches with 15/32-32 threaded bushings and slotted or flat keyways
- Spring loaded covers
- Easily installed from the front panel
- Optional panel seal provided with each switch
- Molded plastic cover with multiple color choices
- Bracket: Black painted steel (contact factory)



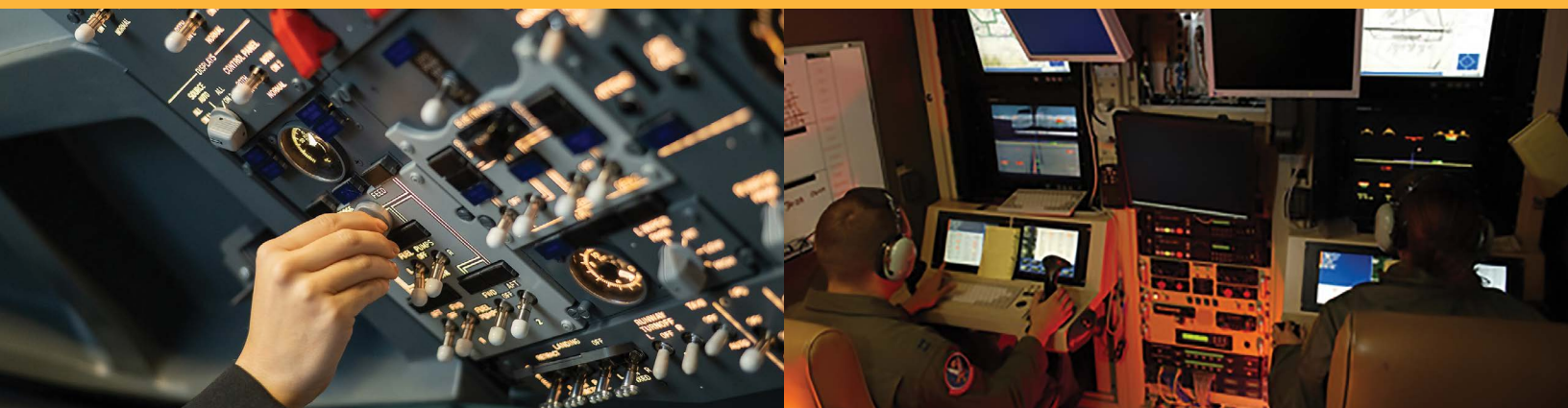
Toggle Guards

Flip Guards

- Maintained or momentary actuation for pushbutton switches with a 15/32" threaded bushing
- Spring loaded cover
- Easily installed from the front panel
- Optional D-flat or mounting tabs option to prevent any rotation during assembly



Flip Guards





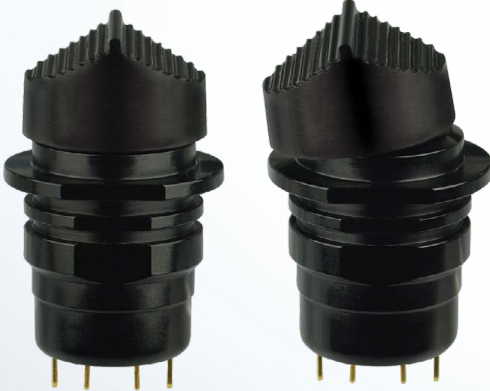
T1 2-Way with Jog Button



T1 2-Way with Rocker Button

T1 2-Way Mini Trim Switches

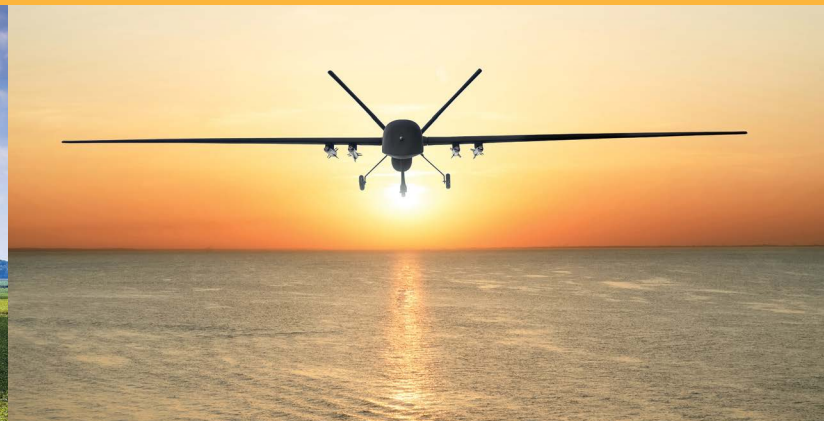
- Single pole, double throw, center off, momentary contact, 2-way
- Variety of button styles
- Standard and logic-level switching
- Dusttight to IP64 and watertight to IP68S, MIL Watertight Design 3
- Commercial and military grade available
- Press fit or threaded cases



T1-T Latching 2-Way Mini Trims

T1-T Latching 2-Way Mini Trim Switches

- Latching, single pole, single throw, center off
- 2-way momentary/maintained action with positive click
- 11/16" threaded case
- Four switch action/circuit options



T2 3-Way Mini Trims

- Single pole, three throw, center off, momentary contact (self return-to-center off)
- Numerous button styles
- Press fit into control grips or panel mounted using versions with a 11/16" threaded case
- Multiple sealing levels available to fit all applications
- Commercial and military grade available



T2 3-Way Mini Trim

T4 4-Way Mini Trims

- Variety of button styles
- Standard and low-level switching
- Dusttight to IP64 or watertight to IP68S
- Commercial and military grade available
- Press fit or threaded cases
- MIL options per M9419/2



T4 4-Way Tactile Mini Trims



4-WAY & 5-WAY MINI TRIM SWITCHES



T4-T 4-Way Tactile Mini Trims

T4-T 4-Way Tactile Mini Trims

- 4-way momentary action with positive click
- Sealed to IP64, IP68S or water resistant per MIL-STD-810F, method 506.4, procedure 3 (drip)
- Standard and low-level options with or without internal jumper
- Various button styles and colors
- Commercial and military grade available
- RoHS compliant



T5 4-Way Plus Center
Pushbutton Mini Trim

T5 with Stadium Button
and Pushbutton

T5 4-Way Plus Center Pushbutton Mini Trims

- 4-way plus center pushbutton
- Variety of button styles
- Standard and logic-level switching
- Dusttight to IP64 or watertight to IP68S or MIL-PRF-8805 Design 3
- Press fit or threaded cases
- Commercial and military grade available



8-WAY MINI TRIM SWITCHES

T8 8-Way Mini Trims

- Single pole, center off, 8-way, momentary contact
- Variety of button styles
- Standard and low-level switching
- Dusttight to IP64 or watertight to IP68S or MIL-PRF-8805 Design 3
- Press fit or threaded cases
- Commercial and military grade available



T8 with Bat Button

T8-T Tactile 8-Way Mini Trims

- Single pole, center off, 8-way momentary contact with tactile response
- Positive detent
- IP64 or IP68S options (panel seal)
- Commercial and military grade available
- Logic-level switching
- Variety of button styles and colors
- RoHS compliant



T8-T with Castle Button



T8-T with Hat Button



T8-T with Inverse Hat Button





TK with Molex® Connector



TK with Wire Leads

TK Tactile Mini Trims

- Two functions in one compact switch: toggle and pushbutton action
- Available in 2-way or 4-way and with or without center pushbutton (center off)
- Toggle lockout when pushbutton is actuated
- Pushbutton lockout in toggle mode
- Positive click action indicates actuation
- Panel sealed to IP64 or IP68S, or unsealed
- Wire leads or integral Molex® connector
- Logic level only
- RoHS compliant



Split Trim

Split Trims

- Tactile feedback
- 2-way momentary action of each switch
- Logic-level switching option
- Water resistant per MIL-STD-810F, method 506.4, procedure 3 (drip)
- Commercial and military grade available
- Various button colors and case styles
- RoHS compliant



T2 - Large Trim 2-Way Pushbuttons

- Two functions in one compact switch: toggle and pushbutton action
- Features toggle lockout when pushbutton mode is actuated
- Pushbutton lockout when in toggle mode
- Splashproof and dusttight seal



T2 Large Trim Switches

T4/T5 - Large Trim Switches

- 4-way momentary with center position maintained toggle action
- Dusttight
- Up to 100,000 life cycles
- Low level switching
- Variety of button styles and colors available
- Commercial and military grade available



T4 Large Trim Switches



T5 Large Trim Switches





J2-S1 Series



J2-S2 Series



J2-S3 Series



**J2 Short Travel Transducers,
Series S1, S2 and S3**

- In accordance with MIL-S-81619 and MIL-STD-810
- Infinite resolution
- 3.0 lbs. nominal actuation force
- Short (0.05 max) or long (.20 typ.) travel options
- Hysteresis: +/- 0.5% of full scale within 1 second after release
- Sensitivity temp coefficient +/- 0.2% full scale per degree Celsius
- -55°C to +85°C temperature range
- Exposure: dusttight MIL-PRF-8805 Design Symbol 2
- Wire leads 24 AWG, 12" MIL-W-16878/4
- Various button styles and colors
- Different output polarity
- Terminal and wired connections
- Half or full bridge and isolated gauges available (depending on series)



J2 Short Travel Transducers, Series S4

- Bottom mount
- Shorter behind panel
- Conical hat or flat button
- Full bridge circuit type
- Watertight to IP68S
- Up to 1 million cycle life



J2-S4 Series



J2-S5 Series

J2 Short Travel Transducers with Pushbutton, Series S5

- Built-in pushbutton
- Full bridge circuit type
- Flat button

J4 Hall Effect Transducers

- Cost-effective alternative to strain gauge technology
- Mini joystick function
- 5V DC input
- Magnetic shielding in case offers excellent external EMI protection
- Rugged construction



J4 Hall Effect Transducers

Hall Effect Technology



OTTO®

VERTICALLY INTEGRATED MANUFACTURING AND VALUE-ADDED CAPABILITIES

OTTO, a U.S. designer and manufacturer of precision switches and operator controls, was founded in 1961. Custom and standard controls solutions deliver high functionality and performance for demanding commercial, military and industrial applications around the world.

As a vertically integrated manufacturer, OTTO offers advanced, in-house capabilities, including injection molding, CNC machining, wire EDM, short-run tooling and high-speed, large-volume stamping. Strong mechanical, electrical and design engineering services are supported by full quality testing.

Customers can count on OTTO's value-added capabilities to manage every phase of their projects from conceptual design to finished product. Ask what we can build for you.



Far Part 145
Repair Station



EASA Part 145



ISO 14001:2015
ISO 9001:2015



AS9100:2016



A2LA
ISO/IEC 17025

Follow us on:



@OTTO.Controls

Corporate Headquarters
2 East Main Street
Carpentersville, IL 60110

847.428.7171
info@ottoexcellence.com
www.ottoexcellence.com

www.otto-controls.com

