Wire and Cable
Heat-shrink Tubing
Non-shrink Tubing
Braided Sleeving
Screening Braids
Moulded Parts
Terminals and Splices
Wire and Cable Markers
Accessories
Connectors
Backshells
Bonding Leads
Metal Braids

Relays and Contactors
Switches and Grips
Adhesives and Tapes
Application Equipment
Added Value Services
Relays and Contactors

INTRODUCTION

High-Performance Power Management Designed for Reliable Operation in Extremes of Temperature, Shock, Vibration and Altitude

The following pages provide an overview of our relays and contactors range. Products include hermetically sealed MIL Qualified, Electro-mechanical relays such as T05; Half Crystal can 1A to 10A; Mid Range relays 5A to 50A and Time Delay Relays, as well as a high current and high voltage range of relays and contactors, up to 1000 amps and 70kV voltage isolation.

Many of our relays are specifically designed for operation in extremes of temperature, shock, vibration and altitude being qualified to numerous standards:

Military
Specifications such as M39016; M28776; M83536; M6106; M83726; M28750 and associated DSCC drawings.

Aerospace
Specifications such as Airbus ASNE and NSA relays and relay sockets, Boeing BACC, MIL Spec, M83536, M6106, M83726, M12883.

Brands
Agastat, TE, Kilovac, Hartman, Deutsch, CII, Leach, Babcock, Teledyne, Kissling, Finder and many others.

This section of the catalogue is a brief overview of what is available, for more information please contact us.
## Relays and Contactors

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Miniature Low Signal Relays

Miniature low signal relays are designed to perform under the most demanding environmental conditions in military, aerospace and commercial applications. Stocked signal relays are rated at 1 Amp, all ratings available in a variety of packaging sizes, mounting configurations and termination options. Standard and sensitive coils are available with optional diode suppression.

Features & Benefits

- Miniature hermetically sealed relays
- Non latching
- Through-hole and gull-wing surface mount terminals
- High frequency models capable of switching up through 6 GHz
- Excellent isolation, insertion loss
- Shock and vibration resistant
- MIL-PRF-39016 and MIL-PRF-28776 qualification products available
- Low level, to 1 Amp switching

T05 CAN MINIATURE – SPDT and DPDT

A series of ultra miniature relays constructed in a transistor style case, providing superior performance and established reliability patterns. This series is available in a variety of sensitivities, contact configurations and hybrid versions to provide a most versatile element to the circuit designer.

MINI GRID (.100) – DPDT

Ideally suited to the needs of Instrumentation, data acquisition, process control, telecommunications and general purpose requirements. These models are specifically designed for high quality and reliability with versatile switching capabilities and contact forms.

<table>
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<th>Qualification</th>
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<tr>
<td>MIL-PRF-39016/9, /15 &amp; /20</td>
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<tr>
<td>MIL-PRF-28776/5</td>
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<table>
<thead>
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</tbody>
</table>

Includes surface mount versions
The MW Series relays are noted for their improved signal repeatability and RF switching capabilities up to the 6 GHz microwave range in a hermetically sealed, sub-miniature package. Excellent signal isolation, stable insertion loss and low VSWR are provided.

Standard versions are available for applications ranging from wireless communications to precision high-speed test equipment. High performance versions are available for even more demanding environments and conditions.

These relays provide microwave frequency switching in a hermetically sealed, sub-miniature package. Both standard and high performance models are offered in 3GHz, 4GHz and 6GHz types. Nominal standard coil power is 367-500mW (model dependent) and 169-250mW for sensitive coils.

**Features & Benefits**

- Mechanical life expectancy of 10m cycles.
- Standard high performance models are available in 3 GHz, 4 GHz & 6 GHz Types.
- Standard models (MW3, MW4 and MW6) perform in temperature range from -55ºC to +85ºC plus withstand 10G vibration and 30G shock.
- High performance models (MW3HP, MW4HP and MW6HP) offer extended temperature ratings of -65ºC to +125ºC whilst providing 30G vibration and up to 100G shock environmental ratings.
- All are available with either standard or sensitive DC coils. Nominal coil power is 367-500mW (model dependent) for standard coils and 169-250mW for sensitive coils.
- Signal isolation is 18dB @ 6 GHz (MW6/MW6HP, 18dB @ 4 GHz (MW4/MW4HP) and 22dB @ 3GHz (MW3/MW3HP).
- Insertion loss is 0.38dB for MW6/MW6HP; 0.27dB for MW4/MW4HP and 0.36dB for MW3/MW3HP.

<table>
<thead>
<tr>
<th>Qualification</th>
<th>3 GHz, 1 Amp or less</th>
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<tbody>
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<tr>
<td>6 GHz, 1 Amp or less</td>
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</table>

HF Microwave Series - DPDT

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<th>Qualification</th>
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<tbody>
<tr>
<td>3 GHz, 1 Amp or less</td>
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<tr>
<td>4 GHz, 1 Amp or less</td>
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<tr>
<td>6 GHz, 1 Amp or less</td>
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</tbody>
</table>
Stocked signal relays are rated at 2 Amp, up to 10 Amp versions, all available in a variety of packaging sizes, mounting configurations and termination options. Available in both latching and non-latching designs. Standard, bifilar and sensitive coils are available with optional diode suppression.

Key Features & Benefits
- Hermetically sealed relays
- Latching, non-latching designs and coaxial types.
- Plain case, mounting brackets or studs.
- Straight pins or solder hooks.
- Excellent isolation, insertion loss and VSWR.
- Shock and vibration resistant.
- Qualified to M5757, M39016, M27245, M27247.
- 2 to 10 Amp ratings.
- 1, 2 and 4 pole versions.

Full and Half Size
Available in a variety of packaging sizes, mounting configurations and termination options. There are both latching and non-latching designs. Standard, bifilar and sensitive coils are available with optional diode suppression.

Fifth Size
The .150 Grid-space relay, saves space in electronic packaging, with low profile designs at only 8.12mm high. The pin spacing allows you to insert the relay with no intermediate pin spreaders as well as meeting applicable military specifications. Fifth size relays offer internal diode for coil transient suppression and transistor driven models are available.

Magnetic Latching
Versions of crystal can relays.

Radio Frequency
Available as half and full size crystal can relays, supplied with coaxial leads.

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<thead>
<tr>
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<th>Qualification</th>
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<td>MIL-PRF-39016/40</td>
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<table>
<thead>
<tr>
<th>Fifth Size</th>
<th>Qualification</th>
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<tbody>
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<table>
<thead>
<tr>
<th>Latching</th>
<th>Qualification</th>
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<td>MIL-PRF-39016/45</td>
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<tr>
<td>MIL-PRF-39016</td>
<td></td>
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<tr>
<td>MIL-PRF-39016/32</td>
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<table>
<thead>
<tr>
<th>Radio Frequency</th>
<th>Description</th>
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</thead>
<tbody>
<tr>
<td>80 watts full size</td>
<td></td>
</tr>
<tr>
<td>80 watts half size</td>
<td></td>
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</tbody>
</table>
Mid Range relays offer critical size and weight savings in aircraft applications by providing efficient power switching in a compact package. Relays vary in size from the compact 5 amp package up to a 50 amp version in a 25mm³ enclosure.

The balanced force design with permanent magnet drive, provides the benefit of consistently high contact pressure, reduced bounce and less arcing leading to extended contact life. A variety of coil options are available which allow for AC or DC control. Terminal styles include socket pins, solder pins and solder hooks. Each series comes with a variety of mounting options.

### Key Features & Benefits
- Balanced force design with permanent magnet drive.
- 5 to 50 Amp ratings, within 25mm³ package.
- 1 to 6 pole versions.
- Terminal styles include socket pins, solder pins and solder hooks.
- Hermetically sealed and welded construction.
- Shock and vibration resistant.
- M83536 and M6106 qualified products.

#### Mid range 5 to 50 Amps

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<th>Qualification</th>
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<td>MIL-PRF-83536/9 and /10</td>
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<td>other MIL-PRF-6106</td>
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#### Latching Type

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<td>MIL-PRF-83536: 2PDT, 5A</td>
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<tr>
<td>MIL-PRF-83536: 2PDT, 10-15A*</td>
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<tr>
<td>MIL-PRF-83536: 4PDT, 10-15A*</td>
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<tr>
<td>MIL-PRF-83536: 3PDT, 25A</td>
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<tr>
<td>MIL-PRF-83536: 4PDT, 12A</td>
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<td>MIL-PRF-6106: 1PDT, 25A</td>
</tr>
<tr>
<td>MIL-PRF-6106: 3PDT, 25A</td>
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</tbody>
</table>

*Also available in track mount versions
Time Delay
M83726 and other

M83726 series time delay relays are available for delay on operate, or delay on release operation and can be supplied as fixed or resistor adjustable types. These products consist of solid state timing circuits controlling two Form C (DPDT) output contacts rated 10 amps. The internal timing circuit uses R/C controlled oscillator with a programmable digital pulse counter, gating a semiconductor switch to operate the relay. Timing is independent of whether the controlling voltage is a ramp or step function. For adjustable models the user specifies a one decade range in seconds, this range is programmed internally at the time of manufacture.

Key Features & Benefits

- Welded hermetically sealed enclosure occupies about 16.4cm³
- Meets or exceeds electrostatic discharge Mil-STD-1686 Class Non-Sensitive

M83726
Includes delay on operate, fixed and adjustable; delay-on-release, fixed, adjustable and interval timers with relay or solid state outputs. Contact ratings range from 2 to 10A, with MIL qualification on 10A versions. Also available are MIL approved sub-miniature digital timing modules.

Sensing Relays
Our range also includes AC & DC voltage sensors and AC frequency and phase sensors. All are hermetically sealed, with a variety of mounting options and relay contact outputs.

Electro-Pneumatic Timing Relays
Relays feature high repeat accuracy over voltage and temperature extremes. Hermetically sealed designed for high shock and vibration applications, offering instant recycling with easy linear adjustment. The series features an exclusive dial head adjustment, no needle valves, with delay ranges from milliseconds to 60 minutes.

M83726

<table>
<thead>
<tr>
<th>Qualification</th>
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<tr>
<td>MIL-PRF-83726, 10A</td>
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<tr>
<td>MIL-PRF-83726, SS</td>
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<tr>
<td>MIL-PRF-83726/13, SS</td>
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<tr>
<td>MIL-PRF-83726, Series interval and SS</td>
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Sensing

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<td>AC Voltage sensor, relay output</td>
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<tr>
<td>MIL-PRF-83726, Phase sensor</td>
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<tr>
<td>DC Voltage sensor</td>
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Electro-Pneumatic

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<tr>
<td>Industrial Standard</td>
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<tr>
<td>Nuclear qualified</td>
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</table>
High Voltage AC and DC Contactors

Up to 500 Amps
These contactors offer continuous current ratings up to 500 amps at 900 Volts DC, in a very compact package. Available hermetically or environmentally sealed, with a variety of electrical configurations, power ratings, voltage ratings and mounting styles to make your electrical system more reliable and capable.

Key Features & Benefits
• Suitable for electric drive vehicles, aerospace, military and industrial applications.
• Small lightweight, hermetically sealed units
• Variety of contact arrangements available.
• Latching and non-latching types
• Wide range of mounting and termination styles
• One or two pole, with normally open or normally closed contacts

High Performance Electric Vehicle -
Designed and built in accordance with AS9100.

Electric Vehicle Contactors - Lightweight models designed and built in accordance with AIAG QS9000.

Commercial Aerospace - Designed and built in accordance with AIAG QS9000.

Military Aerospace & Marine - Designed and built in accordance with AIAG QS9000.

Please note that multiple configurations and AC versions are also available

Lightweight Contactors up to 1750 Amps
These hermetically sealed enclosures are available for the most severe environmental conditions or altitudes above 50,000 feet. Designed to meet the applicable requirements of M6106 and/or specific customer requirements.

<table>
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<td>MIL-PRF-6106, 200A</td>
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<td>MIL-PRF-6106, 400A</td>
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<tr>
<td>MIL-PRF-6106, 500A</td>
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<tr>
<td>MIL-PRF-6106, 1000A</td>
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Lightweight up to 1750 Amps

<table>
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<tr>
<th>Qualification</th>
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<tbody>
<tr>
<td>100 to 500 Amps, 12-900 Vdc</td>
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<tr>
<td>200 Amps, 480Vac or 48 Vdc</td>
</tr>
<tr>
<td>60 Amps, 600 Vac, 3 Form A</td>
</tr>
<tr>
<td>600Vdc SPST-NO Form X</td>
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</tbody>
</table>
Products include both AC and DC versions, with output ratings up to 25A. AC relays rated at 2A, 10A & 25A feature zero voltage turn on for reduced EMI. DC relays are offered with ratings up to 2A in several miniature hermetically sealed package configurations, some with optional isolated status lines and/or short circuit protection.

**Key Features & Benefits**
- Qualified to DSCC Drawing 86031, 88062, 89116, 90091 as appropriate.
- Qualified to MIL-PRF-28750/5, /6, /7, /9 & /10
- TTL & CMOS compatible input.
- Optically coupled all solid state.
- Buffered/current limited input for direct drive from CMOS or TTL logic.
- Replacements for Teledyne M92F and M93F series.

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<th>Solid State</th>
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<tr>
<td>2A, DSCC Drwg 86031</td>
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<td>2A, DSCC Drwg 88062</td>
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<td>2A, DSCC Drwg 89116</td>
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<td>2A, DSCC Drwg 90091</td>
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<tr>
<td>MIL-PRF- 28750</td>
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</tbody>
</table>
General high performance relays, for industrial applications such as Plug-in/PCB and high current motorsport high voltage applications.

**Mass Transit**
Includes relays suitable for Air conditioning; Door control systems; Train light control; Signal control; Control board; and Traffic management applications.

Relays used for rolling stock are subject to increasingly higher technical demands, such as the need for wider operating ranges; higher resistance to shock and vibration; operation over a wider range of temperature and humidity and above all, the fire resistance properties of the relay’s constituent parts.

The relays and their sockets and accessories are manufactured using specific insulating materials, which satisfy the requirements of fire protection prescribed by the standard UNI CEI 11170-3 for risk levels LR1 to LR4.

- Conformity to reaction fire test to ISO 11925-2
- Smoke class F2 according to NF F 16-101 (calculated from opacity according to NF X 10-702-2 + NF X 10-702-1 and from Toxicity according to NF X 70-100-1 + NF X 70-100-2).

The resistance against random vibrations and shock of the relays, their sockets and accessories is in compliance with EN61373 standard for Category 1, Class B products. Their resistance to temperature and humidity is in compliance with the prescription of EN 50155 standard, TX class.

**Industrial and Motorsport**
Includes an overview of Plug-in / PCB relays and relay interface modules, plus coil indication and EMC suppression modules.
Relay sockets for commercial, military, airborne, ground and shipboard equipment, are manufactured to MIL-DTL-12883 specifications, plus specialised requirements. Supplied in a broad range of military standard and special configurations plus styles for 2 to 25 amp operations. Featuring state of the art ultrasonically bonded interfaces between the dielectric components, which eliminate air paths and provide protection against moisture and degradation.

The product line offers – Low Profile, Extended Height, Micro Miniature, Board Mount, Track Mount and Solder Termination relay socket options.

Low profile sockets are provided in all military configurations and are configured to minimize size and weight. These accept the MIL-C-39029/92 contact family.

Extended height sockets are configured to accept the longer MIL-C-39029/5 contact, which is standard on many cylindrical connectors and other avionic interconnect systems and allow contact standardization.

Sockets are available with either fixed or loose mounting studs. Studs and hardware supplied with standard QPL-listed sockets are cold rolled steel. Stainless steel is available as an alternative to specify stainless steel an “S” is added to both the QPL number and the catalogue number.

Relay sockets can be top or bottom mounted.

Relay-to-socket positive polarization is provided by specific contact configurations and/or polarizing pins, in accordance with MIL spec requirements.
Please contact our technical support team for those relays that are no longer readily available, as we can supply bespoke DSCC approved relays or contactors to suit your requirements.

We offer a complete portfolio of electro-mechanical relays, standard time delay relays, voltage, current, phase, frequency sensors and power monitors to customer’s exact requirements, whether for a new application or a legacy system.

Where a standard product does not meet your requirement, in many cases, we can offer custom, fit, form, functional units.

Many are designed to meet or exceed MIL-STD-202, MIL-STD-704 etc and/or are listed on the Qualified Products List (QPL), or have been tested to the requirements of MIL-PRF-24021, MIL-F-26301, MIL-R-5757, MIL-PRF-6106, MIL-PRF-83726 and MIL-V-81995.

Should you have a special enquiry please contact us.
Wire and Cable
Heat-shrink Tubing
Non-shrink Tubing
Braided Sleeving
Screening Braids
Moulded Parts
Terminals and Splices
Wire and Cable Markers
Accessories
Connectors
Backshells
Bonding Leads
Metal Braids
Relays and Contactors

**Switches and Grips**

Adhesives and Tapes
Application Equipment
Added Value Services
Switches and Grips

INTRODUCTION

Overview

Extended Life-cycle and Reliable Performance

We offer an extensive range of precision switches and operator controls commonly used throughout some of the toughest environments and applications. Typical markets and industries include Defence, Aerospace, Marine, Industrial Equipment, Motorsport, Medical, Communication and Process Control.

The product range covers an array of mechanical, hall effect, sealed and illuminated high performance switching technologies, in a variety of styles including pushbutton, toggle, rocker, slide and rotary.

Custom Illuminated Panels

Supplementary to the range of performance switches and grips outlined in this section, we can also offer a broad range of specialist lighted switches and scratch resistant illuminated panels designed and approved for use in aircraft cockpits and ground defence equipment. For more information on these products and services please contact us or see our website.
Basic Switches  page 438
B1 Series  Ultra Small Subminiature
B2 Series  Subminiature
B3 Series  Double Break Subminiature
B5 Series  Double Break Miniature
B5-7 Series  Double Break Miniature, Two Pole

Pushbutton Switches  page 440
LP Series  LED Lighted
P Series  MIL spec and Commercial
FG and HDW Series  Flip Guard and Hardware accessories

Trim Switches  page 446
MT, SPT and T Series  Mini, Split and Large trim switches

Toggle Switches  page 448
T1 Series  MIL-PRF 83731
T3 Series  MS27717, 18, 19, 20, 21
T7 Series  IP68S
T9 Series  MS24523, 24 and MS24658, 59
TE Series  MS24655, 56 and MS90310, 11
TG Series  Toggle guards, MS25224

Rocker Switches  page 450
K1, K2, K3, K4 and K5 Series  MIL and Commercial
U2 Series  Extreme environment
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Other Types  page 451
R2 Rotary, SL Slide, J2 Transducer and U2 Trigger

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G2 Series  Aerospace and Military controls
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Hall Effect Switches and Overview  page 456
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HPL and HPW  Linear Pushbutton and Paddles
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Limit Switches  page 461
P6 and P6-3 type  Sealed MIL-PRF-8805
Switches and Grips

B1 to B2-5 Basic Switches
Product Range Overview
Miniature and Subminiature

B1/B1-5 Series Description
Ultra small subminiature in size, designed to reliably switch low level signals as well as up to 2 amps switching capacity for a minimum of 25,000 cycles. Mechanical life expectancy is in excess of one million cycles. The terminals are available as a double turret solder style, or 0.508mm x 0.635mm PC pins.
The B1 series is also available with integral lever actuators as B1-5 series.

- Ultra-compact: Only 7.62mm width x 6.48mm height x 2.54mm thick
- 1 million cycle life, B1-5 Series
- Low level logic switching capability
- In accordance with MIL-PRF-8805/94
- Available in Military & Commercial grades
- Choice of solder or PC moulded-in terminals

B2/B2-5 Series Description
Can be specified for military or commercial use at cost savings. Offering a choice of turret, quick connect and three lengths of printed circuit board style terminal are available for both the 3.96mm and 5.08mm wide models.
Conforms to and are qualified under MIL-PRF-8805/4, MIL-PRF-8805/106 (high temp -55°C to 205°C) and MIL-PRF-9905/109.

- Choice of 3.96mm & 5.08mm wide models
- Up to 7 amps switching
- Sensitive movement differentials
- Low operating forces
- Choice of 8 terminal styles or wire leads
- Long operating life
- Qualified under MIL-PRF-8805/4, MIL-PRF-8805/106 & MIL-PRF-8805/109
- UL recognized & CSA certified

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# B3 Series Description

Designed to switch at least one million mechanical cycles, the B3 surpasses the requirements of the military in these categories: contact resistance less than 25mΩ, contact bounce and overall cycle life. Gold plated contacts are available for non-military applications. UL recognized and CSA certified models available.

- Low level switching capability
- Qualified under MIL-PRF-8805/76 & /101
- Choice of widths 3.96mm and 5.08mm
- Available in Commercial & Military grades
- UL Recognized & CSA Certified

# B5 Series Description

Miniature in size and feature up to 10 amps switching capability of 100,000 cycles. Mechanical life is one million cycles. The moulded housing is rugged and structurally stable. The terminals are sealed against solder flux entering the switch and are bright acid tin plated for excellent solder-ability.

- High contact pressure
- Constructed under MIL-PRF-8805/7
- Available in Military & Commercial grades
- Choice of 4 terminal styles or wire leads
- UL recognized & CSA certified
- B5-21141 qualified to MS27217-1

# B5-7 Series Description

Two switches in one case! The B5-7 series basic switches are miniature in size but feature up to 10 amps switching capability of 100,000 cycles. The moulded housing is rugged and structurally stable. The terminals are sealed against solder flux entering the switch and are bright acid tin plate brass for excellent solder-ability. B5-71 has end terminals; B5-72 has front terminals.

- Double pole, 4-circuit
- Simultaneity of both poles within .004”
- Accordance with MIL-PRF-8805
- Available in Military & Commercial grades
- Choice of end & front terminals

## All models are RoHS, WEEE and Reach compliant

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<table>
<thead>
<tr>
<th>Series</th>
<th>Feature</th>
<th>Max Rating</th>
<th>Mechanical Life</th>
<th>Approvals</th>
<th>Circuitry</th>
</tr>
</thead>
<tbody>
<tr>
<td>B1</td>
<td>Ultra Small Subminiature</td>
<td>2A</td>
<td>100,000</td>
<td>n/a</td>
<td>SPST, SPDT</td>
</tr>
<tr>
<td>B1-5</td>
<td>Ultra Small Subminiature, with Integral Levers</td>
<td>2A</td>
<td>1,000,000</td>
<td>n/a</td>
<td>SPST, SPDT</td>
</tr>
<tr>
<td>B2</td>
<td>Subminiature</td>
<td>7A</td>
<td>50,000 - 250,000 (varies by part)</td>
<td>UL (E61705), CSA (LR43865), DSCC (QPL8805)</td>
<td>SPST, SPDT</td>
</tr>
<tr>
<td>B2-5</td>
<td>Subminiature with Integral Levers</td>
<td>7A</td>
<td>100,000</td>
<td>UL (E61705), CSA (LR43865), DSCC (QPL8805)</td>
<td>SPST, SPDT</td>
</tr>
<tr>
<td>B3</td>
<td>Double Break Subminiature</td>
<td>8A</td>
<td>1,000,000</td>
<td>UL (E61705), CSA (LR43865), DSCC (QPL8805)</td>
<td>SPST-DB, SPDT-DB</td>
</tr>
<tr>
<td>B5</td>
<td>Double Break Miniature</td>
<td>10A</td>
<td>1,000,000</td>
<td>UL (E61705), CSA (LR43865), DSCC (QPL8805)</td>
<td>SPST-DB, SPDT-DB</td>
</tr>
<tr>
<td>B5-7</td>
<td>Double Break Miniature, Two Pole</td>
<td>10A</td>
<td>100,000</td>
<td>UL (E61705), CSA (LR43865), DSCC (QPL8805)</td>
<td>DPDT-DB</td>
</tr>
</tbody>
</table>

Please contact us for individual part numbers and specifications or see our website for information.
Switches and Grips

LP3 and LP5 Push-Button
Selection Chart and Range Overview
Illuminated Performance Switches

A diverse and comprehensive range of illuminated pushbutton switches, that are both rugged and aesthetically pleasing.

On sealed models, a silicone boot operating on a patented “rolling sleeve” principle, protects the contact area against contamination at the button area. This boot provides long life and smooth operation over a wide temperature range. Sealed terminals protect the contact area from hostile environments and solder flux on both sealed and unsealed models.

<table>
<thead>
<tr>
<th>Series</th>
<th>Feature</th>
<th>Max Rating</th>
<th>Seal Rating</th>
<th>Approvals</th>
<th>Circuitry</th>
</tr>
</thead>
<tbody>
<tr>
<td>LP3</td>
<td>LED Lighted</td>
<td>5A</td>
<td>Unsealed or IP64 or IP68S</td>
<td>UL (E61705)</td>
<td>SPST-DB, SPDT-DB</td>
</tr>
<tr>
<td>LP5</td>
<td>LED Lighted</td>
<td>5A</td>
<td>Unsealed, IP64 or IP68S</td>
<td>UL (E61705)</td>
<td>SPST, SPDT</td>
</tr>
<tr>
<td>LP5-V</td>
<td>LED Lighted, Vandal Resistant</td>
<td>5A</td>
<td>IP64 or IP68S</td>
<td>UL1500 Ignition Protected</td>
<td>SPST, SPDT</td>
</tr>
<tr>
<td>LP7-D</td>
<td>LED Lighted, Ruggedised</td>
<td>5A</td>
<td>IP64 or IP68S</td>
<td>n/a</td>
<td>SPST-DB, SPDT-DB</td>
</tr>
<tr>
<td>LP9</td>
<td>LED Lighted</td>
<td>5A</td>
<td>IP68S</td>
<td>UL (E61705)</td>
<td>SPST-DB, SPDT-DB</td>
</tr>
<tr>
<td>LPL</td>
<td>Indicator Light</td>
<td>n/a</td>
<td>Unsealed or IP64 or IP68S</td>
<td>n/a</td>
<td>n/a</td>
</tr>
</tbody>
</table>

**LP3 Description**
Momentary action, commercial switch, with the added benefit of reliable LED illumination. Designed for use in off-highway, material handling, industrial controls, marine and demanding commercial applications.

Choose from the standard mounting styles and electrical ratings, or contact us for custom configurations. Available with 5/8” or 15/32” threaded or press fit.

**LP5 Description**
Alternate action, LED illuminated and sealed, available as front mount or raised dome. The LP5 offers the same rugged, sealed construction as the proven P5 series with the added benefit of reliable LED illumination. Designed for use in off-highway, material handling, industrial controls, marine and other demanding applications. Available with 5/8” or 15/32” threaded or press fit mounting.
Switches and Grips
LP5 to LPL Push-Button
Product Range Overview
Illuminated Performance Switches

**LP5-V Description**
Alternate action, LED illuminated ring with metal case and button. Designed to provide attractive, lighted position indication for applications in harsh environments, where security and reliability are paramount.

Features both aluminum and stainless steel cases watertight to IP68S. Momentary action is available in the LP3-V series. Available with 5/8” or 3/4” threaded mounting.

**LP7-D Description**
Momentary action, designed for use in panels, control grips, computers, instruments, heavy equipment and other demanding applications where attractive, highly ruggedised pushbutton switches are required.

Versions include round and square, flush dome and raised dome. The switch series features short behind panel depth. Available with 15/32” threaded mounting.

These pages are a brief overview of what is available in this comprehensive product range, with only a selection illustrated here. All products are RoHS/WEEE/Reach compliant.

Numerous designs include single point, ring or full illumination.

For more information on both standard and custom products available please take a look at our website or contact us for additional information.

**LP9 Description**
Momentary action, offering a positive tactile feedback, signalling the operator when the switch is operated with the added benefit of reliable LED illumination, point or full illumination.

The LP9 series offers four button versions; flush and raised profile with either a glossy or matte finish. Providing a short behind panel depth. Available with 15/32” threaded mounting.

**LPL Description**
The LPL Indicator Light series offers an excellent means of indicating the activity of a circuit by providing a visual on/off indication of process conditions. Ideally suited as part of a panel mounted indicator for control panels, instrumentation and front panel fault indicators. Offering anodized aluminum alloy cases with seal options of moisture proof and dust tight to IP64 or watertight to IP68S.
P Series Push-Button
Selection Chart and Range Overview
Performance Switches

A diverse and comprehensive range of pushbutton switches, rugged and aesthetically pleasing. Designs available include illuminated, vandal resistant, dome, shrouded and many more, that are often used in Defence, Aerospace, Off-Road Equipment, Material Handling, Medical, Marine, Industrial and Process Control. Sealed models such as the P1 operate on the patented “rolling sleeve” principle, providing longer life and smoother operation over a wide temperature range. The inherent wiping action breaks welds and wipes the contacts clean on each operation.

<table>
<thead>
<tr>
<th>Series</th>
<th>Feature</th>
<th>Max Rating</th>
<th>Seal Rating</th>
<th>Approvals</th>
<th>Circuitry</th>
</tr>
</thead>
<tbody>
<tr>
<td>P1</td>
<td>Mil Grade</td>
<td>10A</td>
<td>MIL-PRF-8805 Design 2, 3 or IP68S</td>
<td>UL (E61705)</td>
<td>SPDT-DB, SPST-DB</td>
</tr>
<tr>
<td>P2</td>
<td>Commercial</td>
<td>5A</td>
<td>MIL-PRF-8805 Design 2, 3 or IP68S</td>
<td>n/a</td>
<td>DPST, DPDT</td>
</tr>
<tr>
<td>P3</td>
<td>Commercial</td>
<td>10A</td>
<td>IP64 or IP68S &amp; IP69K (Except push- pull)</td>
<td>UL (E61705), CSA (LR43865)</td>
<td>SPDT-DB, SPST-DB</td>
</tr>
<tr>
<td>P3-D</td>
<td>Dome Shape</td>
<td>10A</td>
<td>IP64 or IP68S &amp; IP69K</td>
<td>UL (E61705)</td>
<td>SPDT-DB, SPST-DB</td>
</tr>
<tr>
<td>P4</td>
<td>1-4 Poles, Custom Pushbutton</td>
<td>8A</td>
<td>IP64 or IP68S</td>
<td>n/a</td>
<td>1 to 4 Poles</td>
</tr>
<tr>
<td>P5</td>
<td>Alternate Action</td>
<td>10A</td>
<td>IP64 &amp; MIL-PRF-8805 Design 2, or IP68S</td>
<td>UL (E61705)</td>
<td>SPST, SPDT</td>
</tr>
<tr>
<td>P5-D</td>
<td>Dome Shape P5, Ruggedised</td>
<td>10A</td>
<td>IP64 &amp; MIL-PRF-8805 Design 2, or IP68S</td>
<td>UL (E61705)</td>
<td>SPST, SPDT</td>
</tr>
<tr>
<td>P7</td>
<td>Subminiature, Mil Grade</td>
<td>5A</td>
<td>IP64 &amp; MIL-PRF-8805 Design 2 or IP68S &amp; MIL-PRF-8805 Design 3</td>
<td>UL (E61705), CSA (LR43865)</td>
<td>SPDT-DB, SPDT-DB</td>
</tr>
<tr>
<td>P7-D</td>
<td>Dome Shape</td>
<td>5A</td>
<td>IP64 &amp; MIL-PRF-8805 or IP68S</td>
<td>UL (E61705),</td>
<td>SPDT-DB, SPDT-DB</td>
</tr>
<tr>
<td>P8</td>
<td>Shorter Behind Panel Depth</td>
<td>10A</td>
<td>IP64 or IP68S</td>
<td>UL (E61705), CSA (LR43865)</td>
<td>SPDT-DB, SPDT-DB</td>
</tr>
<tr>
<td>P9</td>
<td>Dome Shape</td>
<td>5A</td>
<td>IP64 or IP68S &amp; IP69K</td>
<td>UL (E61705), CSA (LR43865)</td>
<td>SPDT-DB, SPDT-DB</td>
</tr>
<tr>
<td>P9C</td>
<td>Low Level, Lower Cost</td>
<td>100mA @1-32VDC</td>
<td>IP68S</td>
<td>n/a</td>
<td>SPDT-DB</td>
</tr>
<tr>
<td>P9M</td>
<td>Latching</td>
<td>4A @ 12VDC</td>
<td>IP68S</td>
<td>n/a</td>
<td>SPDT-DB</td>
</tr>
<tr>
<td>PE</td>
<td>Mil Grade</td>
<td>5A</td>
<td>Unsealed or MIL-PRF-5505 Design 2</td>
<td>n/a</td>
<td>SPDT-DB</td>
</tr>
</tbody>
</table>
**P1 Description**
Offers a mechanical life well beyond the 50,000 cycles MIL-PRF-8805. The double break switching mechanism has an incredibly fast transfer time, reducing arcing and increasing contact life. For use in panel boards, control grips, instruments and where sealed pushbutton switches are required.
Available with 5/8” and 15/32” threaded case or press fit mounting.

**P2 Description**
Three position, offering two steps of momentary switch action plus “rest” (or “off”). Each detent operates an independent set of SPDT contacts in a watertight and dust tight package.
Designed for applications in the high performance commercial market such as the control of two-speed motors.
Available with 5/8” threaded case or press fit mounting.

**P3 and P3-D Description**
A commercial version of the P1 Push button switch, with either momentary or push-pull action. Offering vastly improved life under extreme conditions found in some industrial environments. Available with 5/8” or 15/32” threaded or press fit mounting.
Also available in domed style as P3-D.
Available with 5/8” and 15/32” threaded case or press fit mounting. P3-D only 5/8” threaded.

**P4 Description**
Auxiliary actuators designed for use with B2 and B3 Basic Switches, bushing mount.
Moisture proof at the front panel. Choice of one and two pole configurations and select from a variety of six bezel/bushing mount case styles in clear (silver) or black anodized aluminum.
Buttons are available in nine colours. Basic switches are per MIL-PRF-8805/101.
Switches and Grips

P5 and P8 Push-Button
Selection Chart and Range Overview
Performance Switches

**P5, P5-D and P5-V Description**
Alternate Action switches match the P1, P3 and P8 momentary action models for mixed function. Anodised aluminium alloy case. Design panels with both alternate and momentary action switches with uniform panel appearance. P5 requires less behind the panel space than the P1 and P3 momentary versions. Available with 5/8” (both) or 15/32” (P5 only) threaded or press fit.

**P7 Description**
These subminiature switches embrace today’s technology requirements by allowing for a large number of switches to fit within a faceplate. Anodised aluminium alloy case. Numerous mounting styles, including a swaged bushing for installation in aircraft flight control and hand grips and similar applications. Available with 1/4” or 15/32” threaded or press fit mounting.

**P7-D Description**
Ruggedised, subminiature momentary switch with contoured sealed dome style pushbutton. Two design versions are offered; flush dome and raised dome button profile. Anodised aluminium alloy case. One million operations at 1 amp resistive, 50,000 at full rated load of 5 amps resistive or 3 amps inductive. Available with 15/32” threaded mounting.

**P8 and P8-V Description**
Momentary action subminiature switch, with push-pull option. P8 series switches offer vastly improved electrical and mechanical life under extreme conditions found in most military and industrial environments. Case is anodised aluminium. P8-V is the vandal resistant version, stainless steel case option. Available with 5/8”, 15/32” or 1/2” threaded or press fit mounting.
**P9 and P9-M Description**
The P9 Dome series feature a contoured dome style and share similar size and characteristics to the P7 series. Major differences are plastic housing construction and the availability of a shorting bar contact arrangement. P9-M is the latching maintained version. Available with 15/32” threaded thermoplastic case or snap-in mounting.

**P9C Description**
Competitively priced, the P9C pushbutton is a low-level only momentary, normally open, IP68S sealed switch with a dome style pushbutton and a 3 million cycle life. Flush dome and raised dome button profiles are available in either gloss or matte finish. Available with 15/32” threaded case and features short behind panel depth.

**PE and PE2 Description**
Operating temperature -55°C to +85°C PE pushbuttons per MIL-PRF8805/96, with momentary snap-action. Available with black or red button colours and clear or black case colours. PE2 pushbuttons per MIL-PRF8805/99 with momentary snap-action. Available with black, white or red button colours. Available with 1/4” (PE) or 15/32” (PE2) threaded aluminium alloy case mounting.

**FG Flip Guard and HDW Hardware**
The FG Flip Guard assembly offers a maintained or momentary actuation for pushbutton switches with a 15/32” (12mm) threaded bushing. Supplied with or without flats to prevent rotation during assembly. The HDW accessories range includes shrouds, panel seals, push button and toggle boots and more.
A diverse and comprehensive range of trim switches, available in both military and commercial grades, both rugged and aesthetically pleasing. Available with multiple button designs and colours.

**Mini Trims** - Typically press fit into grips or panels and multiple sealing levels available.

**Split Trim** - Two action toggles with detent. Each two way switch can operate independently or simultaneously.

**Large Trim** - Original larger trim switches please contact us for details.

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**Trim Switches**

**Selection Chart and Range Overview**

**Performance Switches**

<table>
<thead>
<tr>
<th>Series</th>
<th>Feature</th>
<th>Actuation</th>
<th>Max Rating</th>
<th>Seal Rating</th>
<th>Circuitry</th>
</tr>
</thead>
<tbody>
<tr>
<td>MT T1</td>
<td>2 Way, centre pushbutton option</td>
<td>Momentary</td>
<td>10mA @ 5VDC</td>
<td>IP64, IP68S, MIL-PRF-8805 Design 3</td>
<td>SPST (x2)</td>
</tr>
<tr>
<td>MT T1-T</td>
<td>2 Way, tactile feedback</td>
<td>Momentary/Maintained</td>
<td>10mA @ 30VDC</td>
<td>Water resistant per MIL-STD-810F, 506.4</td>
<td>SPST (x2)</td>
</tr>
<tr>
<td>MT T4</td>
<td>4 Way</td>
<td>Momentary</td>
<td>10mA @ 5VDC</td>
<td>IP64, IP68S, MIL-PRF-8805 Design 3</td>
<td>SPST (x4)</td>
</tr>
<tr>
<td>MT T4-T</td>
<td>4 Way, tactile feedback</td>
<td>Momentary with tactile feel</td>
<td>2A @ 28VDC</td>
<td>Water resistant per MIL-STD-810F, 506.4</td>
<td>SPST (x4)</td>
</tr>
<tr>
<td>MT T5</td>
<td>4 Way, centre pushbutton</td>
<td>Momentary, lenient option</td>
<td>10mA @ 5VDC</td>
<td>IP64, IP68S, MIL-PRF-8805 Design 3</td>
<td>SPST (x5)</td>
</tr>
<tr>
<td>MT T8</td>
<td>8 Way</td>
<td>Momentary</td>
<td>10mA @ 5VDC</td>
<td>IP64, IP68S, MIL-PRF-8805 Design 3</td>
<td>SPST (x8)</td>
</tr>
<tr>
<td>MT T8-T</td>
<td>8 Way, tactile feedback</td>
<td>Momentary with tactile feel</td>
<td>2A @ 28VDC</td>
<td>Water resistant per MIL-STD-810F, 506.4</td>
<td>SPST (x8)</td>
</tr>
<tr>
<td>SPT</td>
<td>Two 2 Way trim switches</td>
<td>Momentary with tactile feel</td>
<td>0.6mA @ 15VDC</td>
<td>Water resistant per MIL-STD-810F, 506.4</td>
<td>Two SPST (x2)</td>
</tr>
<tr>
<td>T2</td>
<td>2 Way, centre pushbutton option</td>
<td>Momentary with tactile feel</td>
<td>10A @ 28VDC</td>
<td>MIL-PRF-8805 Design 2, resilient Design 4</td>
<td>SPST, DPST Double break x3</td>
</tr>
<tr>
<td>T4</td>
<td>4 Way</td>
<td>Momentary with tactile feel</td>
<td>5A @ 30VDC</td>
<td>MIL-PRF-8805 Design 2, resilient Design 4</td>
<td>SPST (x4) multi pole option</td>
</tr>
<tr>
<td>T5</td>
<td>4 Way, plus centre pushbutton</td>
<td>Centre maintained</td>
<td>2A @ 28VDC</td>
<td>MIL-PRF-8805 Design 2</td>
<td>SPST (x5) multi pole option</td>
</tr>
</tbody>
</table>
**MT T1 and MT T1-T Description**
The T1 Mini Trim is a single pole, double throw, centre off, momentary contact (self return to centre off) switch.

The T1-T Mini Trim is a latching, single pole, single throw, centre off momentary/maintained action contact switch.

Press fit Ø15.2mm or 11/16” threaded case mounting options, as with other MT switches.

**MT T4, MT T4-T and MT T5 Description**
The T4 Mini Trim is a single pole, 4 throw, centre off, momentary contact (self return to centre off). T4-T Tactile switches remain a favourite due to the positive detent indicates circuit transfer to the operator.

The T5 Mini Trim is a single pole, 5 throw centre off momentary contact (self return to centre off), centre pushbutton switch.

**MT T8 and MT T8-T Description**
The T8 Mini Trim is a single pole, 8 throw, centre off momentary contact (self return to centre off switch). T8-T Tactile switches remain a favourite due to the positive detent indicates circuit transfer to the operator.

Ideal for grip applications in aircraft, ground forces vehicles and off-road equipment.

**SPT Description**
Uses 2 single-pole-single-throw momentary toggles with detent providing a positive click action. Each two-way switch can operate independently or simultaneously. Available in both commercial and military grades and are most ideal for applications in aircraft, but can also be used in medical, unmanned vehicle, construction and agricultural equipment.
Switches and Grips

Toggle Switches
Selection Chart and Range Overview
Performance Switches

T1 Series - Panel sealed and unsealed toggle switches to MIL-PRF-83731.

T3 Series - Miniature toggles are rugged, highly reliable switches with snap-action switch.

T7 Series - High performance switch, entirely sealed to withstand direct water spray.

T9 Series - Suitable for applications in Off-Highway, Aerospace, Commercial & Industrial equipment (MS24523, 24 and MS24658, 59).

TE Series - All metal components are corrosion resistant and exceed requirements of MS25224.

<table>
<thead>
<tr>
<th>Series</th>
<th>Feature</th>
<th>Actuation</th>
<th>Max Rating</th>
<th>Seal Rating</th>
<th>Circuitry</th>
</tr>
</thead>
<tbody>
<tr>
<td>T1</td>
<td>2 or 3 position, 1 to 8 poles, lever lock option</td>
<td>Momentary, Maintained</td>
<td>8A</td>
<td>MIL-PRF-83731</td>
<td>Multi-Pole B2, B3 Basics</td>
</tr>
<tr>
<td>T3</td>
<td>Snap action, Lever lock option</td>
<td>Momentary, Maintained</td>
<td>5A</td>
<td>MIL-PRF-83731 15/32&quot; Threaded only</td>
<td>SPST, DPST</td>
</tr>
<tr>
<td>T7</td>
<td>Lower cost sealed</td>
<td>Momentary, Maintained</td>
<td>16A</td>
<td>IP68S or IP69K</td>
<td>SPST, SPDT, DPST, DPDT</td>
</tr>
<tr>
<td>T9</td>
<td>High performance lever lock option</td>
<td>Momentary, Maintained</td>
<td>20A</td>
<td>IP68S or MIL-DTL-3950</td>
<td>SPST, SPDT, DPST, DPDT</td>
</tr>
<tr>
<td>TE</td>
<td>Snap Action, Non-Teasable</td>
<td>Momentary, Maintained</td>
<td>5A</td>
<td>MIL-DTL-8834</td>
<td>SPST, DPST</td>
</tr>
<tr>
<td>TG</td>
<td>Toggle guards to fit standard size toggles such as the T9, prohibiting accidental actuation. They meet requirements of MIL-DTL-7703, MS25224-1/-3 and MS27752-1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

T1 Description MIL-PRF-83731
Available as panel sealed per MIL-PRF-83731 in various configurations and actuator designs. Also available as unsealed toggle featuring B2 and B3 basic switches.

Mounting is via 15/32”, 7/16” or 11/16” threaded collar.

TG Toggle Guards
Offered for 2 and 3 position switches with 15/32-32 threaded bushings with slotted or flat keyways. All models feature spring loaded covers that lock in either the open or closed positions. Moulded plastic cover available in multiple colour choices.

MS approved and QPL’d choices
Switches and Grips

Toggle Switches
Product Range Overview
Performance Switches

T3 Description MIL-PRF-83731
These miniature toggles are rugged, highly reliable switches offering positive detent action for safe switching operation. Featuring a snap-action switch mechanism.

Choose sealed one or two pole circuitry, 15/32” sealed or 1/4” unsealed bushing construction, momentary and/or maintained.

In addition to the single turret solder terminal specified in MIL-DTL-83731, we also offer two different lengths of pins for printed circuit soldering.

T9 Description MIL-DTL-3950
This MIL qualified high performance switch is a logical choice for use in environments where sealing and resistance to shock and vibration are required. Particularly suitable for applications in military, off-highway, aviation, commercial and industrial equipment.

Available in single and double pole configurations with a lever lockout option. Circuitry configurations include two or three positions with many combinations of OFF-ON in momentary and maintained action including ON-ON-ON.

T7 Description IP68S or IP9K
Rugged, high performance sealed switches designed for use under severe conditions found in heavy equipment, industrial control, marine and appliance applications. Offered in single and double pole designs.

In conjunction with the snap-action switch mechanism, the T7 offers non-teasible contact transfer.

Offers numerous actuator stalk or thumb designs. Available with 15/32” threaded mounting.

TE Description MIL-DTL-8834
A snap-action, non-teasible, positive make and break, panel mount toggle switch. The non-teasible mechanism assures that the switch will actuate and not “hang up” even when actuated very slowly. All metal components are corrosion resistant and designed to exceed all military requirements.

This environmentally sealed switch is available in single and double pole configurations with 15/32 or 1/4-40 bushings. The TE series is ideal in applications for dry circuit, low level and power switching applications.
Switches and Grips

Rocker Switches
Selection Chart and Range Overview
Performance Switches

1 Designed to comply with standards established for Appliances, Marine (ignition protection) and Off-Road Vehicles. Mounting is simple and quick. The snap-in design supports a variety of panel thicknesses. Choose LED, incandescent or neon illumination. Legends can be printed onto a button or lens, or laser etched and back-lit. Custom colours are also available. All switches have a seal rating of IP68S and IP69K. All products are RoHS/WEEE/Reeek compliant.

K1 and K2 Description 16A
Rugged, high performance sealed switches designed for use under severe conditions found in marine, appliance, heavy equipment and industrial control applications.
Available with rocker or paddle style switches.
Approved to UL (1054), CSA (LR43865), DEMKO (97-01807), (UL1500) and Ignition protected.

- K1 - SPST, SPDT
- K2 - SPST, SPDT, DPST, DPDT

K3 Description 20A
Attractive and rugged, snap-in rocker for wet and dusty environments.

- SPST, SPDT, DPST, DPDT, SPTT

K4 Description 16A
Entry level, Snap-in toggle for wet and dusty environments.

- SPST, SPDT, DPST, DPDT

K5 Description 20A
Attractive style and rugged construction, snap-in rocker for wet and dusty environments.

- SPST, SPDT, DPST, DPDT, SPTT

U2 Description 10A
The U2-277 and U2-278 rocker switches are designed to run a minimum of one million mechanical cycles and withstand extreme environmental conditions.

- Electrical life >100,000 cycles
- Mechanical life >1,000,000 cycles
**Other Types Switches**

**Product Range Overview**

**Performance Switches**

**R2 Series - Rotary Switches**

Excellent replacement for rocker switches as they offer improved visual position indication, additional lighting options and different styling opportunities on front panels. Benefiting from being sealed to IP68S, with various illumination options snap-in action in a 1.475” x 0.875” industry standard rocker switch panel opening.

**SL Series - Slide Switches**

Three position centre ‘OFF’, with momentary or maintained action available in any combination. Supplied in both commercial and military grades, dust-tight to MIL-PRF-8805 Design 2. Button styles include raised or flush contours.

- FAA/PMA versions available
- 100,000 cycle mechanical & electrical life
- RoHS/WEEE/Recall compliant
- Choice of button colour

**J2 Series Transducer**

These are strain gauge based designs, force transducer switches. They provide analogue 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.

Various custom designed U2 and U7 type pendant designs are also available, please contact us for details.

**U2 Series Trigger Switches**

A selection of Single-step and Two-Step trigger switches are also available, including qualified to M8805/111-1 and -04. Please contact us for specific details and brackets available.

**U7 Series - Pendant Switches**

The rugged, high performance range of pendant switches is designed for use under severe conditions found in medical, appliance, heavy equipment and industrial control applications. Standard and custom designs are possible, please contact us for details.

All products on these pages are RoHS/WEEE/Recall compliant.

www.is-rayfast.com
Switches and Grips

A comprehensive range of aerospace and military control grips are available. These G2 grips perform every day in some of the toughest applications from military ground vehicles, throttle quadrant and control grips for fixed wing aircraft, to helicopter cyclic collective grips. With the manufacturer being registered to ISO 9001:2008, AS9100C and FAA Part 145 Repair Station.

Military Ground Support Grips
• Custom machined heads available to fit standard handles
• Back lighting options
• Custom head can be outfitted with a variety of standard switches

Flight Control Grips
• B8 & Cobra style grips are made in accordance with MIL-DTL-25561
• Non-reflecting, non-hygroscopic, rugged injection moulded grip
• Choice of termination styles - from integral connectors to wire harnesses
• Threaded interface or tube mounting
• Can be populated with MIL qualified switches, standard or custom configurations

Throttle Control Grips
• Control for fixed-wing aircraft
• Custom toggle & rocker switches can be used to meet high cycle requirements

Helicopter Cyclic & Collective Grips
• Grips have thin-wall, investment cast aluminium construction for high strength and low weight
• Modular construction
• Custom heads & switch mounting plates can be fabricated to fit standard handles
• A variety of button colours & style options available
• Transducer & electro-mechanical trim switch options

For more information on this extensive range, or for assistance with your specific requirements, please contact us.
Cast from aluminum alloy, the G2 Commander Grip is a rugged industrial control grip suitable for demanding applications. The standard G2 Commander Grip offers nine different faceplate configurations that include pushbutton, toggle, transducer, split trim and Hall effect switches. Thousands of custom faceplate configurations are possible. The grip body has 10 possible switch location options.

The G2 Commander Grip is suitable for use in military, aerospace and industrial applications, and is the ideal solution where durability and dependability are required.

- Standard design eliminates the need for tooling charges
- Available as a fixed grip or can be mounted on a JH or JHM series Hall effect joystick
- Various mounting & termination options available
- Nine standard faceplate configurations that include T3, T4 and T5 toggle switches, P4, P7 and P9 pushbutton switches, K1 rocker switches, SPT split trim switches, J2 transducer switches, FG flip guards, and HTWM, HTL and HTLT Hall effect switches
- Thousands of custom faceplate configurations possible that can accommodate virtually all OTTO pushbutton, rocker, toggle, trim, transducer and thumb wheel switches
- Operator presence and trigger options
- USB output option
- Tested to withstand a 265 lb. load
- Grip sealed to IP68S (subject to change based on switch choice)

For more information on the multiple options available please contact us to discuss your requirements further.
Switches and Grips

G3 Universal Grips
Selection Chart and Overview
Performance Switches

The G3 Universal Grips can be customised for top-of-the-line machines requiring high switch content, or to provide only basic control function on lower tier units. The G3 Universal Grips have a modular design and were developed for use with our standard pushbuttons, rockers, toggles, Hall effect switches and the JH and JHM series Hall effect joystick.

Available in both Small and Medium size, they are easily customised with multiple switch configurations, quickly and without tooling charges. Some of the markets for the G3 Universal Grip include Industrial, Medical, Off-Highway and Transportation.

- Modular Design eliminates the need for tooling charges
- Compatible with the JH and JHM series Hall Effect Joysticks
- Small & Medium sizes available
- Accommodates a full line of Pushbutton, Rocker, Toggle, HP Hall Effect & HPL Proportional Output series of switches
- Various mounting & termination styles available
- Includes mounting adaptor with boot ring

For more information on the multiple options available please contact us to discuss your requirements further.
Switches and Grips

G3 Dual and Commercial Grips
Rugged Modular Design
Performance Switches

G3 Dual Grip
The G3 dual grip remote is a durable, lightweight, two-handed game style grip. Its ergonomic design allows for comfortable extended use and its moulded body eliminates the need for tooling charges. The G3 dual grip remote accommodates our standard HTL and P7 series switches, with your choice of button styles and colors. The G3 Dual Grip Remote is designed for unmanned vehicles, robotics, and can be used for military applications.

- Standard USB interface
- Readily available options include HTL series and P7/P9 switches
- Lightweight, ergonomic design for comfortable use
- Excellent proportional control
- Switches sealed to IP68S
- Switches have excellent EMI/RFI immunity
- Custom configurations are available, please contact us.

G3 Commercial Grips
The G3 range of commercial grips have been designed to serve the agriculture, off-highway, material handling and specialised industrial equipment markets.

Heavy Equipment & Material Handling Grips
- Rugged injection moulded grip can be outfitted with a variety of our switches
- Ergonomic design for extended use
- Custom designs
- Left or right hand orientation available
- Comfortable Soft Touch Grip available

Tractor Grips
- Rugged thermoplastic
- Can be outfitted with a variety of our switches

Agricultural Grips
- Powder-coat, cast aluminum grip and steel mounting bracket
- Can be outfitted with a variety of our switches

Soft Touch Grips
Palm Grips
Tractor Grips
The ergonomically designed Contour Grip reduces muscle strain allowing for extended use with minimal fatigue and is available in both left-handed and right-handed versions.
Hall Effect Overview
Communication Protocols
USB, CANOPEN® and J1939

Ultra Reliable
Proportional Output
Extremely Long Life Cycles
Available, in the MILLIONS

Hall Effect switches from an industry leader in the integration of J1939 and CANopen® serial bus communications in on and off-highway operator controls. Having 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 analogue electro-hydraulic control systems. Their product line of electro-mechanical switches, Hall effect devices, push buttons and mini joysticks mated to our 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 J1939 Joystick will work in systems running with 250Kbit/sec processing a message approximately every 10ms. J1939 can be configured into three variations (50, 51, 52 are the default addresses). An external resistor change at the connector pins allows multiple 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® can also be configured to run with other system baud rates.

Features:
- Standard configuration for both is three analogue input channels & 12 digital input channels with two digital output channels
- CAN power accommodates a 9–32VDC power supply
- I/O extension for up to 40 digital inputs, eight analogue inputs & multiple digital outputs by I²C interface
- Both J1939 & CANopen® versions include a failure monitoring feature
- EMI/RFI per ISO 11898 89/336 ECC, tested to 100V/M
- Operating temperature -40°C to +85°C
- Storage temperature -65°C to +105°C
- All designs are RoHS and WEEE compliant
Hall Effect
Product Range Overview
Performance Switches

HFNR
Hall Effect Forward/Neutral/Reverse Rocker
Compact, robust and reliable, ideal for grip or panel mount applications. This 3-position switch provides operator comfort by reducing the movement required to change direction or switch gears. Back lighting provides enhanced visibility; making them easy to see in poor lighting or night-time operation.

The electronics are sealed to IP68S, the switch has excellent EMI/RFI immunity and a mechanical life of three million cycles.

HJFC
Hall Effect Foot Pedal
Built to perform under the worst possible conditions. The unique design places Hall effect 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 utilises the same proven contact-less analog output Hall effect technology used in our joysticks and is available in J1939 and CANopen(R) formats.

Provides a life of nine million cycles. Customer specified features such as pre-travel and over-travel, along with a minimum and maximum output and are programmable.

HP7 and HP7C
Hall Effect Pushbutton Switches
These momentary pushbutton switches utilise Hall effect sensor technology for long life contactless switching, with 10 million cycles. Available in dust tight and moisture proof sealed configurations, these switches can also be watertight sealed to IP68S.

Available in three case and button styles and offered in raised dome, flush dome and exposed dome styles. PC pins or wire leads are standard.

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 are prime applications for the HP7 Hall Effect Switch.
Switches and Grips

Hall Effect
Product Range Overview
Performance Switches

HPL
Hall Effect Linear Output Pushbuttons
Utilises Hall Effect technology to provide the user an output proportional to the travel of the button. The HPL delivers up to 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 ideal control device for valves and variable speed drives and can be used in industrial control, construction, 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 and button styles and colors are offered, along with various termination styles and two levels of sealing. OTTO can provide custom configurations as well as provide the HPL switches installed in a control grip.

HPW
Hall Effect Single Axis Paddle
The HPW series is available with 14 output options, offers a self-centering single axis actuator that provides linear change in voltage output in either direction from centre. Options include increasing or decreasing voltage output in either direction (from center position to the full travel position) with single or dual outputs in either direction. The HPW series without detent provides a five million cycle, full forward to full back life and with detent (available with HPW-3) provides a two million cycle full forward to full back life. Electronics are sealed to IP68S, while offering outstanding EMI/RFI immunity.

- Designed for grip, armrest and panel mounting
- 14 output options available
- Self-centering, single axis actuator
- Up to 5 million mechanical life
- Electronics sealed to IP68S
- Optional soft touch coating available
Switches and Grips

Hall Effect
Product Range Overview
Performance Switches

HTL
Linear Hall Effect Finger Joystick
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 immune to electromagnetic and radio frequency interference up to 100V/M. The HTL series has excellent tactile feel for improved operator control and is available with either dust tight or IP68S watertight seal. A wide variety of output configurations are available to satisfy different applications.

HTLT
Finger Joystick with Pushbutton Option
The HTLT Series miniature Hall effect joystick is a proportional linear output finger joystick with a pushbutton option. The HTLT features 6 different button styles, multiple output configurations and 3 mounting options including top mount with threaded housing. Gating options include omni directional square on axis guided feel, gated single axis return to center, gated dual axis return to center and omni directional round smooth feel. The HTLT offers excellent tactile feedback and is available with a mechanical seal of either dust tight or watertight per IP68S. All electronics are sealed to IP68S.

HTW and HTWE
Proportional Output Thumbwheel
HTW is a spring-return-to-center, single axis thumbwheel with an actuator that provides linear change in voltage output in either direction from the center. Whereas the HTWE offers return-to-end alternative. Available with eight output options, including increasing and decreasing voltage output from the center position to the full travel position and single or dual (redundant) outputs. A durable switch providing three million cycle rotational life, sealed to IP68S and excellent EMI /RFI immunity. Both HTW and HTWE are also available with short behind panel depth versions.
JH
Hall Effect Joysticks

The JH Series Joystick is designed around the rugged mechanism of a traditional 4-way hydraulic joystick, but it utilises contactless Hall effect 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 a field proven dual magnet configuration found in our HPL Linear Output Hall Effect switches. The Hall effect sensors are fully protected against electromagnetic and radio frequency interference (EMI and RFI) up to 100V/M.

JHM
Hall Effect Medium Joystick

The JHM series Medium Hall Effect Joystick is a full function operator control in a package that will fit in an armrest or on a panel. It utilises patented Hall effect technology for unmatched life and reliability. Electronics are sealed and it has an operational life of ten million cycles in all directions. Additional options include CANopen® and CAN J1939 versions, multiple analog and digital auxiliary control outputs, redundant sensors and a variety of output configurations, along with a variety of grip and switch options.

JHT and JHT-Z
Hall Effect Miniature Joystick

The JHT miniature series Hall Effect joystick’s compact design and robust construction is the ideal solution where space is limited and precision control is required. Ideal applications include: robotics, construction equipment, hydraulic controls, medical and surgery equipment, security and surveillance video cameras. The JHT has been tested to five million cycles with no degradation of electrical performance or boot wear. Electronics are sealed to IP68S and the EMI/RFI withstand are per SAE J1113 specifications.

Also available with 60° rotational movement of the actuator top, as a JHT-Z.
Sealed Limit Switches
Overview - Sealed Against Immersion and Corrosive Atmosphere

P6 Limit Switches
Sealed against immersion and corrosive atmospheres. These switches are designed for rugged duty both mechanically and electrically. A one-piece stainless steel or nickel plated brass housing, sealed at the plunger with an O-ring seal and at the base with a glass-to-metal header option provides true environment-free sealing to comply with MIL-PRF-8805/39, MIL-PRF-8805/40, MIL-PRF-8805/43, MIL-PRF-8805/100 and MIL-PRF-8805/104. Most case parts are grounded for EMI reduction.

The P6 series is available with roller plunger styles for cam or slide actuation and pin plunger for in-line actuation. Please contact us for additional design options.

P6 series features the B2, B3 or B5 series snap-action basic switch. High contact pressure and unique contact design provides low contact resistance for low level switching as well as full rated service.

- Complies with MIL-PRF-8805 sealing
- 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
- Choice of axial or radial leads

P6-3 Subminiature
These subminiature sealed limit switches are contained in a rugged aluminum housing with choice of lever, roller or plunger. Featuring the B5 series basic switch, the P6-3 series is able to switch up to 10 amps. The high contact pressure and superior wiping action of the design also makes the P6-3 series an excellent choice when switching logic level loads.

Sealing against water and other liquids is per MIL-PRF-8805. Wire leaded models feature potted leads. The solder terminals are epoxy sealed.

Please contact us for additional details on this range of limit switches and modifications available.