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Switch Application Guide

TTI, Inc., – A Berkshire Hathaway Company



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The Specialist in Electronic Component Distribution



One of the largest Autostore systems in Europe

Why Choose TTI?

Founded in 1971, TTI has steadily grown to become a world leading specialist distributor of electronic components. The company was founded on the premise that passive component purchasing could be made more efficient by offering product specialization, customer-driven service and proprietary supply chain solutions.

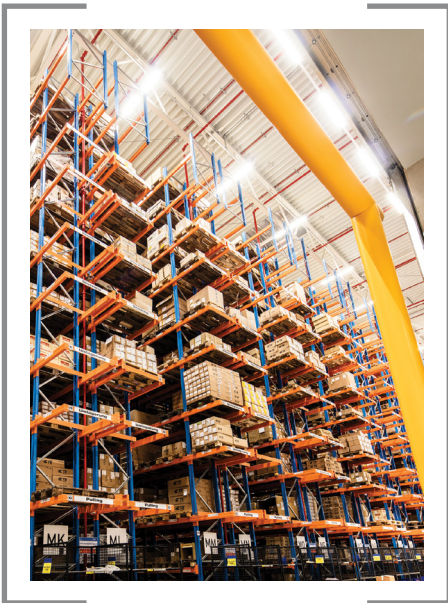
Global Distribution Centres

Our European headquarters is located just outside of Munich, Germany in Maisach-Gernlinden. In total, we have 35,000m² of dedicated warehouse space and local sales and technical support in over 40 locations across Europe. TTI has more than 120,000m² of automated warehousing in North America, Europe and Asia. All are linked into a global warehouse management system that provides superior customer service and overall business efficiencies. Wherever you are in the world, TTI can support you.

Year after year, customers rate our inventory availability, on-time delivery and accuracy among the very best in the industry – contact us today to find out what a true specialist has to offer.

Quality and Reliability

TTI's global warehouses are all ISO-registered and have received certification to the ISO 9001 and ISO 14001 Standards. TTI Europe is also certified to EN9120/EN9100, IECQ-CECC and ISO/IEC 27001 Standards. Additionally, our European sales branches are ISO 9001 certified. TTI has one global documentation system that ensures that every TTI branch and warehouse in the world follows the same processes.



Local Sales and Technical Support in over 40 locations across EMEA

Global Distribution Centres

120,000m²

of automated warehousing in North America, Europe and Asia

European HQ, Munich

35,000m²

of dedicated warehouse space





Finding the Right Switch for your Design

From harsh environment sealed toggles to customized joystick designs to miniature pcb mount tact switches – if your application calls for a switch, TTI is committed

to providing the support and has the breadth of inventory that you need.

Our engineers welcome the opportunity to work with you to help develop your switch solutions to meet your individual needs.

To view TTI's full line of switches, go to www.ttieurope.com/switches

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Switches Line Card

Switches	ALPS	APEM/IDEC	Amphenol/Piher	Bourns	C&K	Honeywell	Littelfuse	Omron	Panasonic Industry	Schurter	Standex Meder	TDK Electronic	TE Connectivity
ATEX						■							
Counters / Hour Meters					■	■			■				
DIP	■	■			■			■					■
DIP Coded Rotary		■		■	■			■					■
Emergency Stop/Safety		■				■							
Encoder	■			■		■		■	■				
Fader/Potentiometer	■		■	■					■				
Limit - Heavy Duty						■							
Standard - Standard						■		■					
Joystick	■	■											
Keylock / Switchlock		■			■	■	■						■
Microswitch/Snap Action	■	■			■	■		■	■				■
Mil / Aero / Space Grade Level		■			■	■							
Miniature Detection	■				■			■	■				
Navigation Switches	■	■			■								
Off-Road -Special Purpose		■					■						
Piezo switch		■								■		■	
Pushbutton	■	■			■	■		■	■	■			■
Pushwheel / Thumbwheel		■			■			■	■				■
Reed							■				■		
Rocker		■			■	■	■	■		■			■
Rotary	■				■			■		■			■
Slide	■	■			■			■					■
Tactile	■	■		■	■			■	■				■
Toggle / Paddle		■			■	■							■



Industrial Automation/ Robotics

APEM / IDEC 07

Honeywell 09

TE Connectivity 10



APEM



A new range of switches for industrial control applications

Manufactured by IDEC, the LB/LBW range includes pushbutton switches, pilot lights, selector, buzzers and key switches in an ergonomic, modern and complementary design. Available in 22mm (LBW), 18mm (LB flush) and 16mm (Ø16 LB) and a large selection of customization possibilities.



With over 50 years of experience, the newest IDEC offering of 22, 18 and 16mm industrial switches, all include the latest technologies and design with the UL, CSA, TUV and CCC recognition.

A complete range of compact switches

LB and LBW series includes several HMI products to cover all aspects of light industrial applications (industrial automation, precision machining, machine tool).

A complete control panel can be created using pushbutton switches, pilot lights, selector switches, key switches and buzzers from the LB & LBW series. Each function is available in several bushing sizes and with different terminals while maintaining a low profile under the panel.

LBW and LB's flush models includes a below panel thickness of 34.9mm and 27.9mm for the LB Ø16mm series. Due to customisation options including colour and materials, over 25,000 PNs are available.

A modern product range complementary to the CW series

The new LB/LBW series is ideally suited to complement IDEC's CW products recently launched by APEM. The series offers a total of 4 bushing sizes (18mm, 22mm, 26mm, 28mm) while maintaining a consistent appearance.

The LB/LBW products offer several types of terminals (quick terminals or solder lugs, PCB) and are ideal in applications where design is important.



Industrial Automation/ Robotics

APEM



New Series of Emergency Stop Switches

APEM is proud to include 9 new emergency stop switches in their e-stop series, with the inclusion of the IDEC brand into its product portfolio. This new series includes the XA, X6, XN1E/5E, XN4E, EU2B, FB1W, XW, HW and YW, expanding the product line to more than twice its size.



With IDEC's patents of 3rd generation safety technology, the new emergency stop switches provide optimal safety by conforming to international approvals: UL, TUV, ATEX, CE, and CCC.

An exceptional range

The 9 new series of emergency stop switches include a very wide range of options:

- 3 plunger diameters (30, 40 and 60mm)
- 3 plunger colours (yellow, red and grey)
- Illuminated versions available
- 16, 22 and 30mm panel cut-outs
- Several methods of connection
- 4 types of reset functions: twist, pull, both (when required) or key
- Reduced size (greater flexibility in the number of contacts, from 1 to 4, NO or NC)

3rd generation safety level achieved with IDEC patents

Because user safety is vital, IDEC has developed two patented technologies that go beyond today's most stringent standards. By reversing the position of the spring, the contact's relaxed state corresponds to its safety position (when contacts are open, the machine is at a standstill). The spring does not

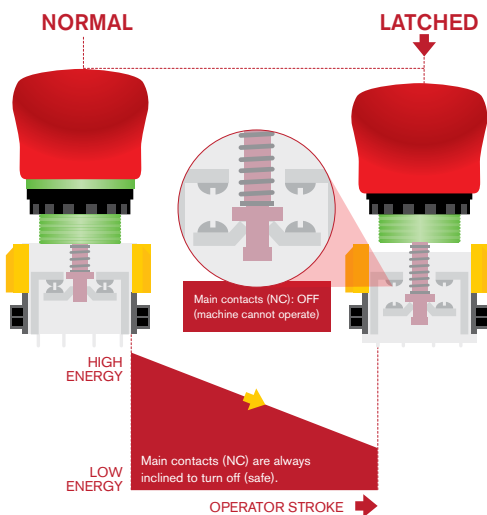
undergo any load once the plunger has been pressed down and as a result, all risks of malfunction are very significantly reduced, especially when the push-button has been damaged.

By using the safe brake action technology, the emergency stop is put in its safety position (contacts open) whenever the "On" button is not properly positioned, has been damaged or is detached. In this position, any risks resulting from poor installation or damage are completely avoided. This technology is especially useful in emergency stop switches that are in highly prominent positions or which have a detachable contact block and are more liable to be accidentally damaged. Several of the new emergency stop switches are fitted with these innovations, including the XA, X6, XN1E/5E, XN4E, and XW.

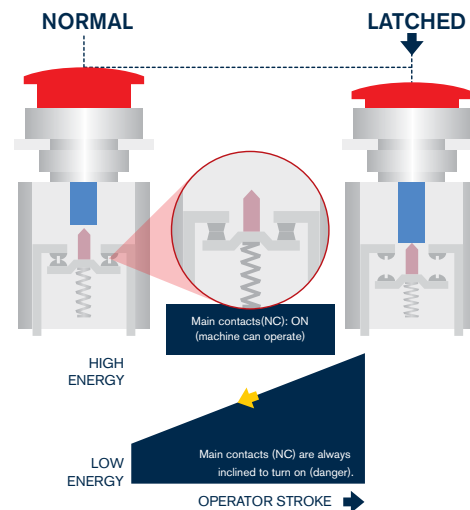
Optional innovations for even more safety

On the XN4E series, padlock eyelets are provided so that emergency stop switches can be locked in their safety position and machines cannot be re-started whilst in use by other operators. Several padlocks can be fitted at the same time, therefore allowing several operators to work safely on different areas of the installation at the same time, without fear that one can restart the machine before the others have finished and removed their padlocks.

3rd generation EStop "reversed energy structure"



Common E-Stops



Honeywell

Honeywell

Snap Action Micro Switches

With decades of engineering excellence in the design of snap action switches, Honeywell offer a range of product to meet market demands.

No matter if you require a simple or precision on/off detection, or an electromechanical interface for pressure monitoring or to support a manual operator interface, there are options to serve numerous applications.

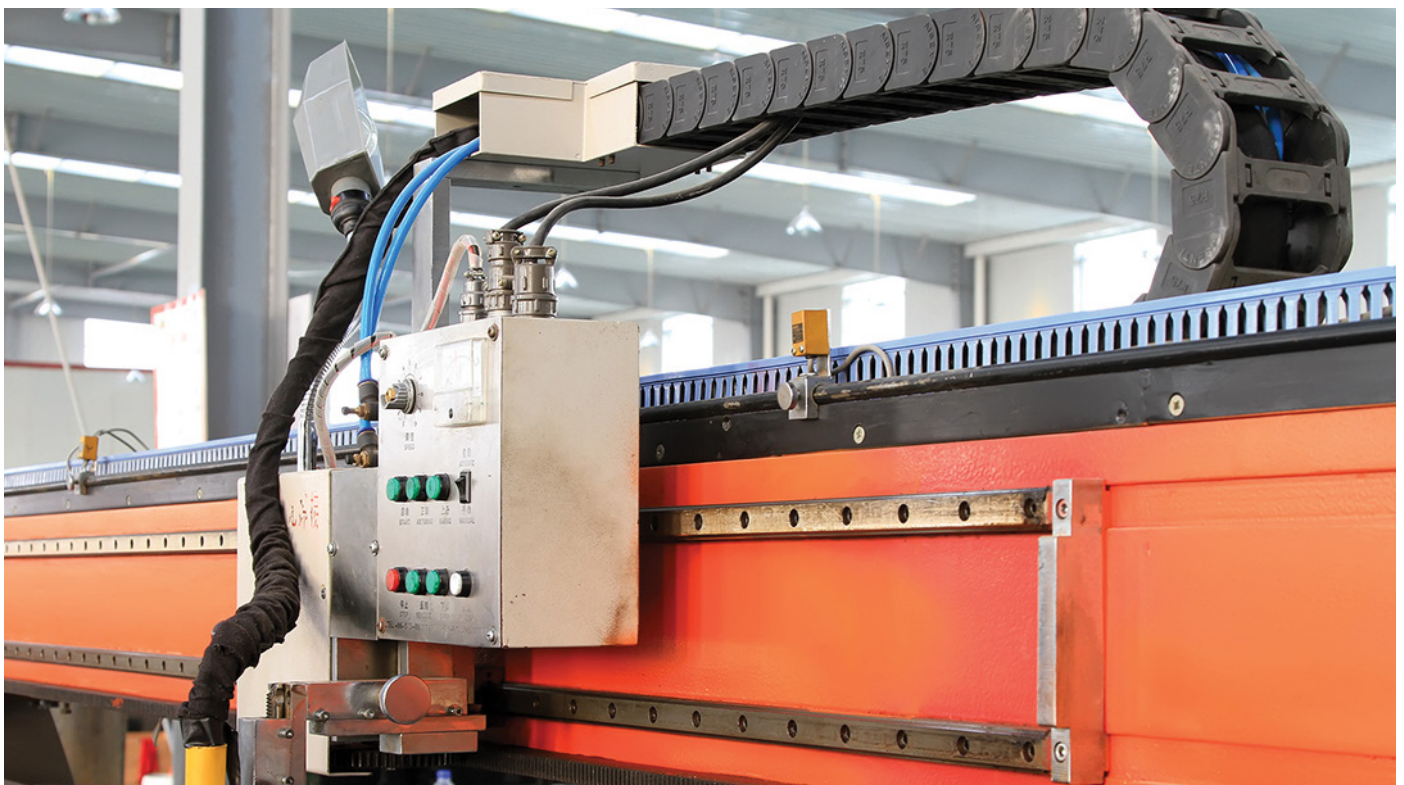
Potential uses include valves, manually operated devices, vending machines, water heaters, appliances, and industrial controls.

Series Specific Options

- High load current
- Variety of thermoplastic housing options
- Numerous actuator and termination styles
- ATEX/IECEx approved range

Features

- Max 26A Load
- Up to 20 million mechanical cycles
- IP67 sealed
- MIL-PRF-8805 listings



TE Connectivity



ALCOSWITCH PB – IP68 Series Sub Miniature Push Buttons

Compact and capable switches. Designed for demanding indoor and outdoor control applications



TE connectivity's PB push button switch portfolio is a stylish solution where simplicity and weather resilience are of prime importance. These switches are a cost-effective solution for wet and dusty environments such as food processing facilities or outside plant. Their attractive design makes them also a consideration for other pushbutton requirements.

TE connectivity's PB switch range is IP68 rated. This means that they are tested at a depth of one meter of water for 60 minutes. Although not an everyday requirement, it gives reassurance for most applications. This environmental protection combined with its ease of use and easy installation makes them ideal for a broad variety of control applications.

As they are available in 5 different cap colours, i.e. black, red, yellow, green and blue, cabinet designers are able to create intuitive panels. Combine this with the illuminated 'flat cap' multi-colour LED options and you have almost endless possibilities. As LEDs are largely impervious to mechanical shock or vibration and radiate little heat, these switches are an excellent option for most industrial environments.

To aid installation speed, the need for soldering can be avoided by using versions with 500 flying leads.

Key Features

- IP68 Rated (1 meter of water, 60 minutes)
- Normally open and normally closed versions available
- For rapid installation
- Various cap options and colours
- LED illuminated flat cap versions
- A choice of LED colours

Benefits

- Compact form factor enables high panel density
- Choice of terminations enables flexible and rapid installation (solder lugs, through hole pins and several flying lead options)
- Various coloured caps for increased recognition of functions
- Several LED colours available to indicate service state
- LED illumination technology for long-term reliability
- Low weight but strong for mobile applications

Applications

- Industrial equipment
- Instrumentation
- Communication equipment
- Control equipment
- Outside plant





Outdoor/ Harsh Environment

APEM 12
TE Connectivity 13



APEM



Q-Series

New range of RGB-LED-indicators



APEM's new range of RGB LED indicators shine brilliant and bright to provide high quality illumination for attractive, functional and innovative designs.

RGB is versatile and all purpose for a variety of applications and available in 10, 14, 16, 19 and 22mm cut-outs and features in both flush and prominent bezels.

What's new?

By mixing the three primary colours red, green and blue empower and unlock the product giving you multiple colours such as cyan, magenta, yellow and white and with flexible controller configuration fine tune your colour option with infinite options.

Guide your way with the Q-Series

RGB LED indicators from APEM are truly the lights to follow so give your product a voice and reveal countless new applications whilst boosting and enriching your product design.

Features & Benefits

- Bright chrome, black or satin grey bezel finish
- Prominent and flush bezel styles
- Voltage: 2 VDC – 220 VAC
- Terminals: 2.8 x 0.8 solder lug/fastons, pins or 200mm long wires
- IP67 sealing option (EN 60529)
- Supplied with fixing nut and spring washer
- Special 'Night Vision' range

Applications

- Process controls
- Professional electrical appliances
- Communications, radar
- Civil engineering vehicles, trucks, diggers, crane
- Automotive
- Aftermarket
- HVAC, energy management
- Lifts
- Machine tools



TE Connectivity



ALCOSWITCH AV Anti-Vandal Switches

Stainless Steel Anti-Vandal switches. Designed for harsh and outdoor applications



TE connectivity's AV Anti-Vandal switch portfolio is an aesthetic solution for applications where ruggedness and weather resilience are of prime importance. These switches are a cost-effective solution for challenging environments such as publicly accessible elevators or any other form of activating and controlling devices that are in a harsh environment.

TE connectivity's Anti-Vandal switch range is a popular solution for many environments. Its stylish design, ease of use, installation friendliness and environmental protection makes them ideal for a broad application area including public spaces as well as plant and machinery.

The version with ring or power icon negates the need for separate engraved designation strips. The LED illuminated versions also negate the need for separate indication devices. As these switches deploy solid state LEDs, they lend themselves extremely well in environments where vibration may occur. The multi-colour LED versions can indicate multiple states. To simplify installation, the LEDs do not require external resistors.

If mechanical actuation is a concern, the AV Series is also available as Capacitive and Piezo versions.

Features & Benefits

- Large pushbutton actuators for ease of use
- Single and multi-colour LED illuminated versions, including RGB are available for clear and distinct indication
- Available with pushbutton symbols, including spot, ring, and power logo for intuitive use
- Strong antivandal proof solution through full metal body design and rear jam nut
- Mechanical versions available with flying lead for solderless installation, capacitive and Piezo with flying lead only
- Mechanical versions support high contact ratings of 2A @ 36VDC (16mm) and 3A @ 250VAC (19, 22, 25mm)
- Single and dual pole with latching or momentary operation for full flexibility
- Life expectancy of up to 50 million cycles for the capacitive and inductive versions
- RoHS & REACH compliant and Pb free
- UL (E46765) for AV19, AV22 series
- Large operating temperature window
- Choice of copper with silver or copper with gold plating terminals
- Corrosion resistant materials (stainless steel and aluminium, depending on model)
- IP67 and IP68 rated, depending on model

Applications

- Industrial equipment
- Elevators/escalators
- Instrumentation
- Communication equipment
- Control equipment
- Bath and pool accessories
- Automotive electronics
- Strict access control systems.
- Shipping equipment
- Medical equipment
- Horticulture





Smart Buildings & Appliances

Alps Alpine 15

C&K 16

Omron 18

Panasonic Industry 20

Alps Alpine



SPGA series

With the expansion of IoT, the needs for various wireless sensors, detection of condition and input switches are increasing. Not every surrounding offers the possibility to implement wiring, and batteries involve frequent maintenance and are considered to be non-eco-friendly.



The SPGA Series Energy Harvester is a compact power-generating device employing electromagnetic induction to generate power with each push or release. Combined with external low-power wireless technology, the device can function as a switch. It can be installed away from a main board, for example, in places where connection to a power source, or battery replacement, is difficult, and is ideal particularly for frequently operated equipment.

Features & Benefits

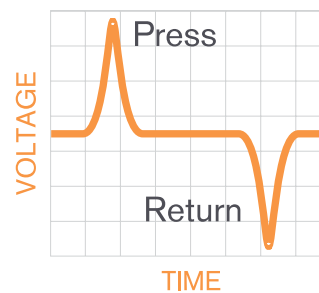
- **Long life:** more than 1,000,000 operations
- **Power generation:** Generates more than 170µJ w/ each action (press or return)
- **No wiring necessary:** easy to add to existing facility, easy layout change, flexibility in design
- **Eco-friendly:** No battery is needed
- Soft, comfortable function feeling
- Low noise

Applications

- Remote-control for ceiling light, outdoor light, gate open/close etc.
- Open/close operation detection of door/locker
- Report support such as emergency call button

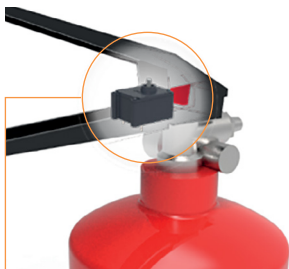
Specifications	
Power generation amount	>170µ (every action)
Stroke	3.3mm
Operation force	7.5N max.
Operating life	>1,000,000 operations

Operating sample (electromotive force)



Usage examples

Report support (such as Emergency call button)



Notice of fire extinguisher use

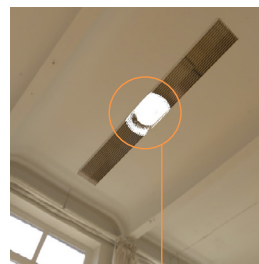


Emergency call button

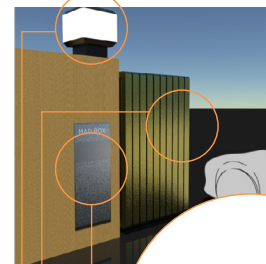


Fire extinguisher chest

One key remote controller and open/close detection



Ceiling light
Outdoor light
Mailbox and delivery locker
Gate



C&K

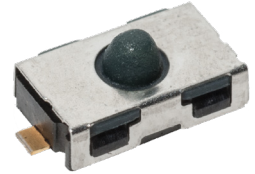


ATS Series (Anti-tamper switch)

Developed for use in next-generation communicating devices including smart meters, alarms and point of sales terminals, ATS switches deliver a cost-effective solution for applications that require reliable detection against opening or hacking of devices. In a wireless device, the biggest problem is energy management – especially when the source cannot be replaced or recharged, ATS Series was specifically designed to address these requirements, minimising energy consumption to the maximum with Ultra Low Current and Normally Closed contact.

Features

- Normally closed function
- IP54 sealed
- Reliable long time compression
- Long travel
- Ultra low current



Applications

- Anti-tamper devices
- Heat cost meter
- Gas meter
- Smart meters in general
- Alarm systems
- Energy monitor

HDT (Micro Mini Surface Mount Detect Switch)

Designers of compact devices with high functionality requirements need switches that have a low profile and low actuation force. That's where the HDT Series of micro mini surface mount detect switches from C&K come in. They're designed to be quality, long-lasting switches that only allow a maximum actuation force of 35g – and are available with either top or side actuation, making it easy to incorporate the switch into your device design.

Features

- Low actuation force, 35 grams max
- Pick and place compatible
- Design allows top or side actuation



Applications

- Anti-tamper devices
- Heat cost meter
- Gas meter
- Smart meters in general
- Alarm

Switch solutions for metering applications

Application		Display activation and control				Tamper protection			Sim card	
										
Switches		KSC3	KSC7	KSE	PTS641	KSU	SDS	ZMA	CCM03	CCM04
	Smart electricity meters		■	■	■	■	■	■	■	■
	Smart gas meters	■	■	■	■	■	■	■	■	■
	Energy monitors	■	■	■	■					
	Heat cost meters			■	■		■	■		

C&K



KSC series (Sealed Tact Switch)

KSC Tactile family is composed by 14 different series that offers important customisation options to meet most application requirements. The KSC Series is more than a product series with defined characteristics, it is a system where configurations can be combined to deliver a complete switch solution. Actuators, domes, and housings can be mixed in order to obtain the right dimension, haptics and resistance to meet environmental requirements. By offering the right mix, the KSC Series can match specific customer requirements in terms of haptics and durability.

Features

- IP67
- Long life up to 5M Cycles
- Wide range of forces from 1N up to 6N
- Silver and gold contacts
- Different actuator material

Applications

- Coffee machine
- Vacuum robot
- Refrigerator
- Dryer and washer
- Internet doorbell
- Hubs and voice assistants



KMR (Micro Mini Surface Mount Detect Switch)

The KMR Series tactile switch offers 5 series featuring robust, compact switches with a wide range of forces from 1.20N up to 4N designed to help engineers working on consumer, automotive, industrial and medical products. Depending on the series, they are either IP40 or IP67 sealed with a soft or hard actuator and feature a ground pin option. The ULC versions present an Ultra Low Current feature that is particularly needed in some applications. The KMR series is perfect for new, innovative designs which have to be sturdy enough to survive both regular use – and regular exposure to elements.

Features

- Soft and hard actuator available
- Ultra low current capabilities
- Up to 300K life cycles
- IP40 and IP67
- Silver and Gold contacts available
- Up to 4N actuation force

Applications

- Hubs and voice assistants
- Smart plugs and outlets
- Coffee maker
- Speakers and sound bar
- AR/VR headsets



Switch solutions for home appliance and smart home applications

Application		Display activation and control									
											
Switches		KSC	KMR	KMT0	KSR	PTS645	LCS	ZMS	HDT	DS	
	Robot vacuum	■			■	■		■	■	■	
	Washer / dryer	■				■	■			■	
	Smart TV		■		■	■					
	AR/VR headsets	■	■	■	■						

Omron

OMRON

Switch solutions for Home Safety & Security

With over seventy years' of experience Omron is one of the most trusted names in the market when it comes to providing quality switches for Home safety and security.

D2FD Series

Dust-Proof Ultra Sub-miniature Basic Switch

Features & Benefits

- Sealing by using rubber packing means the switch can be used in dust-proof environments meeting IEC IP6X requirements
- Switch rating of 2 A at 125 VAC possible with a single-leaf movable spring
- Models for micro loads are also available 0.1A loads for micro-voltage and micro-current
- Solder and PCB terminals are available.
- RoHS Compliant



D3SK Series

Ultra Small Detector Switch

One of the smallest detection switches in the market with high precision operation.

Features & Benefits

- This ultra small 3.0 x 3.5 x 09mm (W x D x H) with ultra low profile is ideal for applications with limited space for example, door handles
- The unique mechanism enables high contact reliability and high precision operation
- It's long stroke improves easy installation
- The contact and lever can be varied making it ideal for a variety of open/close detection applications

Applications

- Smart lock
- Window shutter motors
- Security sensors
- Fire alarms and security panels
- Security cameras



Omron

Switch solutions for Indoor Air Conditioning Units

As the global temperatures rise, more air conditioning units are being installed as a standard feature in new build homes across Europe and the market for portable air conditioners is increasing. Omron have a comprehensive range of switches used in air-conditioning units.

Air Conditioning Panel

For open-close status Omron's D3M – sub-miniature basic switches or D2HW – sealed ultra sub-miniature basic switch or miniature door switches like the D3DC range are ideal for this application.

Air Conditioning Reset Button

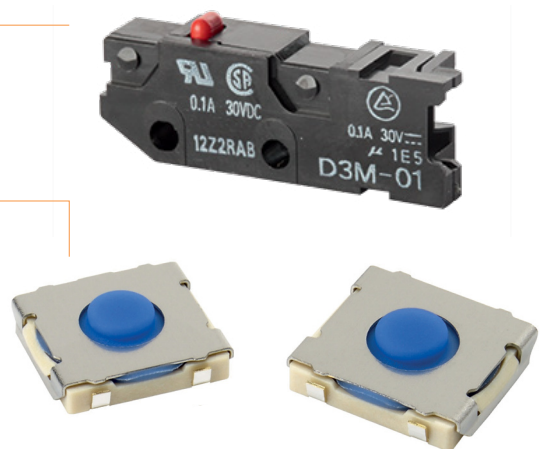
Each air-conditioning unit has a reset button to reset the unit to its default mode, Omron's B3FS series tact switches can be used. They provide a sharp audible click, are highly durable and have an option for projected plungers as well.

Louver Position

The air conditioners louver angle and direction position needs to be detected through an air pressure switch, this can be achieved using the SS Series – Sub-miniature basic switch, a best selling MicroSwitch with a variety of models available with two split springs this ensure a high stability and durability of 30,000,000 operations.

Filter Cleaning Mechanism

Switches are used to detect the filter status, damper switching, check for cover open or closed and if the cartridge is installed in correct position. In this environment Sealed Ultra Sub miniature basic switches are used. The D2HW smallest sealed snap action switch has a very long stroke and is ideal for reliable on/off action required for these applications.



Panasonic Industry

Panasonic
INDUSTRY

A “smart home” can be defined as a residence equipped with computing and information technology which anticipates and responds to the needs of the occupants, working to promote their comfort, convenience, security and entertainment through the management of technology within the home and connections to the world beyond.

Connectivity introduces both opportunities and risks – especially in terms of security – challenging you to consider a growing list of requirements. Robustness and reliability remain key in all home automation solutions along with cost-effectiveness. Panasonic Industry’s expertise, paired with its portfolio of high-quality Switch components for home automation technology, can help you achieve great success with your designs!

ASQ Mini – NEW – smallest size in IP67!

ASQ Mini for tight spaces and harsh environments



Features & Benefits

- Small Size: 8mm × 8mm / Depth of only 5mm
- Contact pressure is not dependent on the operation stroke
- Over travel of up to 2.2mm
- Highly effective sealing for resistance against adverse environments (IP67)
- Silent operation with sliding contacts

Applications

- Vacuum cleaners
- Washing machines
- Air conditioners
- Electronic locking system
- Access systems



Panasonic Industry



EVPA Series – Short Stroke

As one of the industry's smallest size solution for Light Touch Switches (outer dimensions 3.5mm x 2.9mm, height 1.7mm), the EVPA Series offers a wide variety of available operating forces up to 5.0N.



Features & Benefits

- Common size of 3.5mm x 2.9mm
- Travel 0.15mm
- Excellent light-touch operation feeling
- Long operating life
- 1.0N: 1 million cycles or more
- 1.6N, 2.4N, 3.5N, 5.0N: 100K cycles or more
- Reflow soldering available
- 100k – 1 mil Life Cycles with a variety of push forces 1.0N, 1.6N, 2.4N, 3.5N and 5.0N

Applications

- Smart meter
- Intercom
- Dishwasher
- Vacuum cleaner
- Automatic coffee maker
- Led lighting (DC drive)
- Wall switch

EVPA Series – Long Stroke

Panasonic Industry EVPA Series is a “rubber dome type” with the advantage of its 6.0mm x 6.1mm (square) x 5mm size with only 2 terminals.



This SMD Light Touch Switch convinces due to its dust proof structure with a silent superior snap and extra soft feeling thanks to rubber dome feature. The high quality integration of a metal leaf spring convinces users with its steady and low contact resistance.

Features & Benefits

- Common size of 6.0mm square x 5.0mm (with push plate)
- Travel 1.0mm or 1.3mm
- Excellent solderability with 2 terminals
- Reflow soldering available
- Excellent light-touch operation feeling
- Usage temperature range: -40°C – +90°C

Applications

- Smart meter
- Intercom
- Washing machine
- Vacuum cleaner
- Automatic coffee maker
- Led lighting (DC drive)
- Wall switch
- Dishwasher



Automotive & Autonomous Vehicles

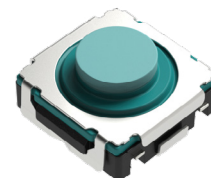
Alps Alpine 23
C&K 24

Alps Alpine



SKST series

Automobiles contain all kinds of switches that contribute to vehicle comfort and safety. Typical examples are controls for HVAC and audio & navigation systems located in the centre console and controls for side mirrors and hands-free calls located in the steering wheel.



Besides compatibility with the tough conditions of the vehicle cabin environment, these switches need to produce a premium operating sound and feel consistent with the image each automaker is trying to convey. In electric vehicles, where there is no engine noise, there is also a need to preserve the quietness of the cabin.

Quiet operation and excellent operating feel are therefore important factors in the development of comfortable cabin environments.

Alps Alpine SKST series realises both quiet operation and an excellent operating feel responding to these market needs for many years. Adding to the variety Alps Alpine is now offering new versions with higher operating force (7N + 10N).

Features & Benefits

- High operation force meets the automotive market needs and help to prevent malfunction
- Rubber stem helps to provide pre-stroke and over-stroke for excellent operability
- Good & clear click feeling based on tactile feedback characteristic
- Operation sound is small compared with the conventional model kind
- Reliable contact: reliable and stable contact realised by 3-dimple dome

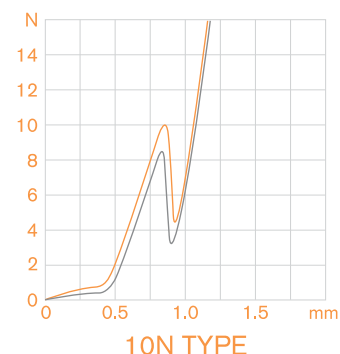
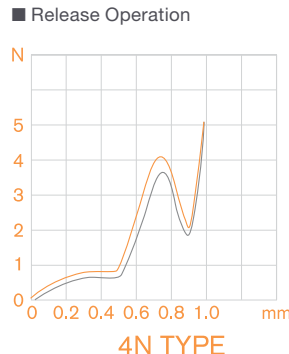
Applications

- HVAC, car audio & navigation
- Steering switch

Specifications			
Dimension	8.5mm x 8.5mm		
Height	3.95mm		
Operation force	4N	7N	10N
Operating life	500K	200K	100K
Top colour	Green	Yellow	Blue
Travel	0.9mm		
Maximum rating	16V DC 50mA		
Initial contact resistance	100mΩ max.		

Force vs Travel

- Push Operation
- Release Operation



Automotive & Autonomous Vehicles

Alps Alpine



SPVQ8 series

Today many systems have to diagnose safety by themselves in order to avoid human injury and malfunction. This SPVQ8 series water-proof detector switch is used in a variety of applications in cars and autonomous vehicles.



In these applications, there is a need for reliable long time usage due to tough environment conditions. As autonomous vehicles take control of more operations by themselves reducing human operation, there is a greater need for self diagnostics. ALPS Alpine SPVQ8 series realises both high reliability and is easy to mount for the given automotive applications.

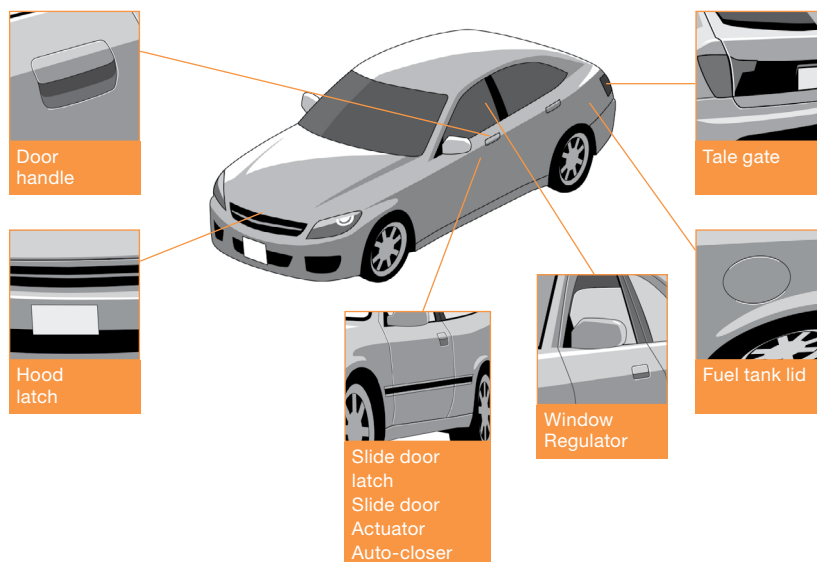
Features & Benefits

- **Reliable contact:** self-cleaning function by wiping, double-sided sliding mechanism and Alps Alpine original grease protection
- **Compact size:** world's smallest size
- **Dust/water protection:** main body has dustproof and waterproof structure which conforms to IP67
- **Easy handling in mounting:** soldering type, solder-less terminal type (press fit connection), with wire harness type

Applications

- Window regulator
- Door handle
- Tail gate
- Fuel tank lid
- Slide door latch, slide door actuator, auto-closer
- Hood latch

Automotive usage examples



Specifications		
Force		1±0.5 N
Max rating / min rating		0.1A 12V DC / 50µA 5V DC
(Rated load) Operating life (no load / with load)	(1) Standard type	300,000 cycles
	(2) Long Life type	1,000,000 cycles
Contact resistance		500mΩ max.

C&K



SSW Series (SMT Subminiature Detect Switches)

The SSW Detect Switch has many attributes that will be of great value for automobile industry applications, such as Electric Parking Brakes (EPB) and x-by-wire, which each require functional safety in accordance with the ISO 26262 automotive standard, as well as any other applications where low-level signals are used. This next generation double-pole double-throw (DPDT) device will enable customers to improve functional safety in their electronic designs. It is defined by several key features – including built-in redundancy, self-failure detection and lack of bi-stability with controlled switching time.

Features

- SMT
- IP67
- Redundant contacts
- Change over time <15ms
- Top and side actuation

Applications

- Automotive, ASIL related applications (electronic parking brake, by-wire functions)
- Safety applications



SAM (Micro Mini Surface Mount Detect Switch)

The SAM series switch is valuable for applications such as seat adjustment systems for automotive, off-road vehicles and avionics along with industrial controls and motorized healthcare devices that require a specific ergonomic feel. The SAM series switch enables manufacturers to reduce the necessary hardware to power the functionality of the device being controlled by eliminating the need for relay switches. This switch is defined by its seamless integration, direct motor management based on SPDT (single pole, double throw) contacts, and flexible mechanical characteristics including travel, shaft shape and dimensions.

Features





- Multi-directional switches, 2-way & 4-way
- Actuation force 5.3N or 6N
- Footprint 20.7x18.0mm (2-way) & 26.2x26.2mm (4-way)
- Momentary action – SPDT

Applications

- Automotive
- Industrial
- Avionics
- Joystick switch
- Alarm



Switch solutions for automotive applications

Application	Interior controls				Access management			Powertrain	
Switches	KSC2	KSC4	KSC8	KSA	KSC DCT	KMR	KSC XA	K12S	KSC V2
 Middle Console		■	■	■	■	■	■		■
 Steering Wheel & Column Switches	■		■	■		■	■		■
 Handles	■	■			■		■		
 Gear Shifters		■					■	■	■



Material Handling & Agricultural Machinery

APEM 27

C&K 29

Honeywell 30

APEM



12000 Series toggle switches

Robust and reliable HMI components are key to guaranteed Operator Safety



Material handling equipment can be subjected to dust, water, shock and vibrations. APEM's products from design to quality, focus on strength and safety to meet and exceed customers' expectations

The 12000 Series Toggle Switches for example are specially manufactured for material handling applications. This toggle series has 1, 2, 3 and 4 pole configurations available with silver, gold-plated silver or solid gold rivet contacts. There are several front panel sealing options available including bright chrome, satin chrome or matt black finish options. This series is CECC approved and conforms to MIL specifications.

Features

- **Approvals:** CECC 96201-005, CECC 96201-008, meeting the requirements of MIL standard (MIL 3950)
- Robust switches for high specification environments
- Toggle action on 2-position models giving smooth mechanical operation
- Plastic material with high insulation resistance
- Several front panel sealing options
- Several locking lever options
- Bright chrome, satin chrome or matt black finish
- **Operating temperature:** -40°C to +85°C (-40°F to 185°F)

Applications

- MEWPs (mobile elevating work platforms – including scissor lifts and telescopic boom lift)
- Forklifts
- Telehandlers
- Cranes
- AGV (Automated guided vehicles)
- Front loaders
- Remote control
- Belly box

Electrical specifications

- **Max. current/voltage rating with resistive load:**
 - silver contacts (A-AD2-X780): 4 A 30 VDC
 - gold contacts (D): 100 mA 30 VDC
- **Minimum load:** AD2-X780-D contacts: 10mA 50mV, 10µA 5Vmin.
- **Initial contact resistance:** 10mΩ max.
- **Insulation resistance:** 1.000mΩ min. at 500 VDC
- **Dielectric strength:**
 - 1,000 Vrms 50Hz min. between terminals
 - 2,000 Vrms 50Hz min. between poles and between terminals and frame
- **Contact bounce:** 2ms max.



APEM



Enable Switch

Also known as “Dead-man” or “3-position safety” switches, enabling switches allow the operator to work safely on a machine without disabling operation. The use of an enabling switch stops the device in the event of a catastrophic failure or unforeseen problem.

Dealing with every type of behaviour

In hazardous situations, every second counts and whichever way the worker reacts, the enabling switch gives the fastest stop signal, compared to the use of regular Emergency stops.

Our products are recommended for cobotics (collaborative robots), robotics, the building trade, industry, remote controlled apparatus, hoisting equipment, etc. in adjustment, apprenticeship, transition-process, breakdown and repair situations.

IDEC teams have contributed to developing international safety standards, especially for the IEC 60947-5-8(2008) norm, and, benefitting from all firm’s experience in the field, the HE*B, HE2G, and HE1G-L series are perfectly compatible with the highest safety and performance requirements.

A product adapted to human behaviour

IDEC safety solutions have been designed for adapting themselves to the different types of reaction a user may have in the face of danger and emergencies.

If some users let go of their control grips, others tend to clench them tightly. This is why dead-man safety switches have been developed with three possible positions:

- **Position 1:** no contact, the machine doesn’t run
- **Position 2:** light pressure maintained by the user, the machine runs.
- **Position 3:** heavy pressure, a “stop” signal is sent and the machine stops running.

Applications

- Belly boxes for construction vehicles and AGVs
- Teaching pendants for robots and cobots
- Remote controls for cranes





C&K



APB series (Backlit Pushbutton Switches)

APB series is equipped with laser-etched symbols to the backlit caps and it's available with LED's in either blue or white high brightness, the backlit caps provide a highly visible indication that the switch has been activated or turned on. Additionally, since the LEDs are independent of the switching mechanism, customers can control the LED to indicate whether the switch is in the up (on) or down (off) position, and can even control the level of brightness. Ideal for joystick modules and control panels used in off-road transportation and construction equipment controls, in addition to a variety of other harsh industrial applications. The rugged, backlit APB Series switches feature an extended operating life of up to 1,000,000 cycles.

Features

- IP67
- Long life up to 1M Cycles
- Threaded or snap-in mounting
- 9 standard caps symbols
- Easy symbol customisation

Applications

- Grip and joystick switches
- Lift platform and hand control functions
- Cab and cabin switches



K12S (Illuminated Harsh Environment)

The K12S Series key switches now include a version sealed to IP67 standards for use in outdoor applications such as automotive door locks, trunk openers, motorbike handles and other environments likely to encounter harsh conditions. An IP40 version of the switch is available for less demanding environments. The entire line of K12S Series key switches feature gold-plated, self-cleaning contacts with low contact resistance (<100mΩ), 100N overload resistance and life cycles of 1,000,000. The switches' low PCB-mounted profile makes them ideal for mechatronics design engineers to integrate into complex sub-assemblies requiring precise control for joysticks, remote controls, vehicle cabins and forklift/crane controls. In the DPST configuration, the K12S Series meets safety requirements for demanding applications in medical, military, avionics or industrial equipment.

Features





- Illuminated 6 colours
- IP67
- Up to 1M life cycles
- Wide range of circuit option
- Double stroke option with 6/12
- Up to 9N actuation force

Applications

- Handles/trunks
- Gear shifters
- Grip/joystick switches
- Forklift/crane controls



Switch solutions for material handling applications

Application	Display activation and control						Detection		
									
Switches	AP	NP	PNP	KSC	KSA	ED/EDM	PVA	ZMS	LCS
 Multi-function joystick buttons	■	■	■						
 Instrument panels (outdoor exposure)	■	■	■						
 Interior controls (mirror, door, windows)				■	■	■	■		
 Seat belt latch verification								■	■

Material Handling & Agricultural Machinery

Honeywell



Limit – NGC Series

Honeywell limit switches offer superior flexibility and performance

The NGC series limit switch is Honeywell's most recent addition to the mid tier switch portfolio. It's more rugged, well sealed package allows for use in most challenging indoor or outdoor environments. The small compact housing is often ideal for applications with space limitations. The configurable platform offers plastic or metal housing options, SPDT or DPDT circuitry, a variety of head and actuator styles and the option of a factory sealed cable or connector. Honeywell's large portfolio of limit switches offers many options for position detection, which can enable the OEM to standardize on a single supplier.

- Configurable platform

Applications

- Scissor/boom lifts
- Packaging equipment
- Machine tools
- Off road equipment
- Agriculture equipment
- Rail doors
- Vehicle lifts



Key Features/Benefits

- SPDT and DPDT circuitry options allow more design flexibility
- Two times the shock (50G) and vibration (10g) ratings of competitive devices allows for use in harsh environments with enhanced reliability and repeatability
- Broader current capacity (10A) allows for use in a wider set of applications
- Enhanced mechanical life (10 million cycles) allows for longer life
- IP67 Sealing allows for use in harsh indoor and outdoor applications
- UL, CE, cUL and CCC approvals allow for global use



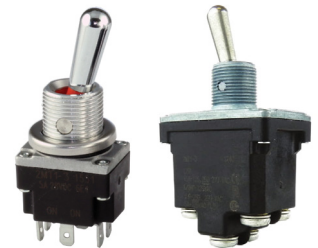


Honeywell

Honeywell

Toggle Switches – NT and MT Series Sealed Toggles

Meeting the need for a rugged, cost-effective, panel mounted, IP rated toggle switches.



Honeywell MICRO SWITCH™ NT Series and MT Series miniature toggle switches meet the need for a rugged, cost-effective toggle switch.

Quality construction features include a seal between the toggle lever and bushing, and between the cover and case.

These switches are suitable for applications in many demanding outdoor environments, where the panels are subjected to vibration from equipment, temperature extremes, dust, splashing water, and/or hose directed water.

They are capable of withstanding exposure to heavy accumulations of early morning dew that may condense on the control panel in cabs of vehicles left outdoors overnight.

Features

NT Series

- NEMA 3, 3R, 4, 13 and IP67/68 environmental sealing for demanding applications
- UL recognised, CSA certified, and CE certified for global use
- Three popular styles of termination: 6–32 screws, solder lugs with 3.0mm [0.12in] diameter hole, or 6.35mm [0.2in] quick connect terminals
- Larger standard metal or plastic levers are well suited for gloved-hand operation
- Optional “Easy Start” threaded bushing enables quick alignment of the mounting nut to minimise any cross threading
- The panel stand-off with O-ring feature available on some listings eliminates the need for behind-the-panel hardware, provides a uniform panel height, and a panel-to-cover seal
- Many configuration options

MT Series

- Miniature behind-panel size (case) enables overall control box or panel use
- IEC 60529-2001, IP67, IP68 (except terminal parts) sealing for harsh-duty applications
- Up to 60,000 electrical life that enhances the use time
- Available with 8 circuitry options
- 2 or 3 position maintained and momentary action to meet circuit and actuator requirements
- UL recognised, CE certified for global use

Applications

- Machine control applications in harsh environments, where heads up operation is required or where controls are subject to weather, splashed or sprayed water, dust and dirt
- Concrete pumping
- Cranes
- Material handling
- Boom trucks
- Remote controls
- Platform lifts
- Road construction equipment
- Agricultural equipment



APEM



New IX series

A compact pushbutton



APEM's popular I series range of pushbuttons is now evolving with the new IX series, designed to meet demanding markets.

The IX series combines the high qualities of the IP and IA series with a backlit switch and 12 mm diameter compact bushing and flexible elastomer membrane actuator.

Ultra waterproof

The IX series features a flexible elastomer membrane actuator, with no space between the actuator and bushing, guaranteeing an IP69K panel sealing.

This provides excellent resistance to frost, sand and other contaminants. The ultra-thin design has a great ergonomic advantage with a tight matrix mounting.

Highly customisable

The IX series pushbutton offers a large selection of customisation.

Choose from 9 different actuator colours, illuminated markings with 5 different LED colours and several different marking symbols.

Illumination can also be limited to just the symbol, or the entire membrane actuator.

Features

- Pushbutton for harsh environment
- Illuminated or non-illuminated
- Compact (12mm bushing)
- Tactile effect
- Sealing: IP67, IP69K
- Marking on request

General specification

- Panel thickness: 1.5 to 6mm
- Total travel: 2mm (.078) \pm 0.3mm
- Typical operating force: 7N \pm 2N
- Low level/mech. life: 1,000,000 cycles
- Torque: 0.5Nm (0.6 Nm max.) applied to nut
- Soldering: 320°C (608°F) max. for 3 sec.

Environmental specifications

- Operating and storage temperature: -40°C to +85°C (-40°F to +185°F)
- Front panel sealing: IP67 according to IEC 60529, IP69K according to DIN 40050-9
- Shock resistance: 100 g according to IEC 512-4, test 6c
- Salt spray: IEC 512-6, test 11f

Applications

- 'Play-station' type controllers for bomb disposal
- Unmanned Vehicle and Drone Controllers
- Fixed grips for weapon control and military communication



Honeywell

Honeywell

Toggle Switches – TL Series Military-Grade Toggles

Qualified to MIL-DTL-3950 specifications for sealed toggle switches.



The robust design of the TL Series toggle is well-suited for many military, aerospace and other demanding applications where reliability is essential.

These applications include environments where the panels are subjected to mechanical shock, vibration and temperature extremes as well as environments with dust, splashing or hose-directed water.

TL Series toggle switches offer a variety of circuitry and pole options to easily integrate into many applications. A long history in military and aerospace applications has shown the TL Series toggle provides reliable performance with long operating life under the toughest conditions.

Features

- MIL-DTL-3950 qualified
- Environmental sealing enables switches to withstand many demanding indoor and outdoor applications
- 1-, 2-, and 4-pole options for a variety of circuitry requirements
- 2- and 3-position, maintained and momentary toggle action to meet circuit and actuator requirements
- UL recognized, CSA certified and CE approved for global use
- Optional Locking Levers
- Engineered step-design case provides added space between terminals to prevent shorting
- Available with a choice of silver alloy or gold-plated contacts to handle a variety of electrical load requirements

Applications

- Applications requiring MIL-DTL-3950 qualification or any application requiring a sealed toggle with a higher tolerance to vibration than conventional commercial grade toggles
- Military and commercial Aircraft and Helicopters
- Aviation ground support equipment
- Military land vehicles





Medical & Healthcare



APEM 36
Panasonic Industry 37
TDK 38

APEM



PBA series

The PBA series including models with dia. 16, 19 or 22mm bushing. Sealed to IP68 or IP69K, easy to clean metal surface, long life (50 million cycles), ring illumination, custom configurations.



Advantages

APEM Piezo switches are based on a solid-state output allowing for a very long-life expectancy (more than 50 million cycles), ideal for demanding applications where reliability is most important. The flat actuation surface is completely closed, preventing the intrusion of liquids or other contaminants, perfect for surface cleaning required in the medical and food-processing industries. High performance sealing (IP68 and IP69K) is achieved due to the one-piece construction of the switch. No external power supply is required. The screw-machined metal housing construction and APEM's vertical integration allow for the manufacture of a variety of shapes.

Features & Benefits

- Sealed to IP68 or IP69K (switches mounted on panel)
- Easy to clean metal surface
- Long life (50 million cycles)
- Ring illumination

Materials

- Case: aluminium, anodized or stainless steel 316L
- Multi-wire leads section 0,22mm 2 length 300mm, twisted by pair
- Cable, length 300mm, section depending on switch model

- PC terminals: bronze, tin plated

Environmental specifications

- Sealing: IP68 per IEC 529, IP69K per DIN 40050-9 (switches mounted on panel)
- Vibration resistance: 10-500 Hz / 10 g per IEC 60068-2-6
- Operating temperature: -40°C to +75°C
- EMC compatibility according to EN 61058-1 for the whole range
- EMC compatibility according to EN 61000-4 & EN61000-6-2 for model 1A (code 002)

Electrical specifications

- Max. current/voltage rating:
 - Function A: standard 200mA 24 VAC/DC – option 1 A 24 VAC/DC
 - Function B: standard 100mA 24 VAC/DC
- Switch resistance ON: 10Ω max.
- Switch resistance OFF: 5MΩ min.
- LED consumption: Illuminated dot 10mA – illuminated ring 20mA (functions A-B-C)
- Power consumption for function 1: non-illuminated 10mA – illuminated 30mA



Panasonic Industry

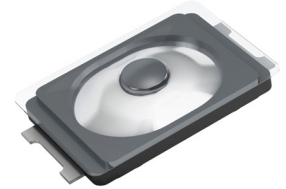


Wearable devices have become the hot commodity in today's tech landscape. From fitness to healthcare, wearable technology has changed the way consumers receive and send data across the world; opening the door for the wearable market to exponentially grow in the years to come.

Panasonic Industry's Light Touch Switches achieves excellent operability and tactile feedback by utilising a unique movable contact design technology, precision processing technology, and press working technology. This allows the switch to meet the need for space-saving design, contributing to making various devices smaller and thinner and improving the design flexibility of such devices.

Tactile Switch – EVPAW short Stroke / Top Push

EVPAW Series features a laser welded film construction, achieving an IP67 water and dust protection while protecting the actuator from peeling off. This unique construction adds mechanical advantages in its durability and tactile feel over competitive membrane based products.



Features & Benefits

- Small Size: 3.0mmx2.0mm, Height 0.6mm
- High operability equipped with an a common size of 3.0mm x 2.0mm actuator (push plate)
- IP67
- High robustness against dust / water by new technology
- Excellent tactile and acoustic feedback

Applications

- Wearable devices
 - Smart watch
 - Activity trackers

NEW EVPAK Series Light Touch Switches!

With a compact size of just W3.80 x H2.05 x H1.60mm, this side-operation switch is perfect for use in portable electronic equipment as an operation switch.



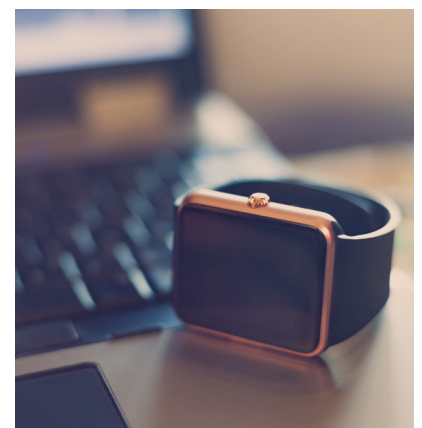
Featuring a laser-welded design with an IP67 rating, Panasonic Industry has been able to provide a high level of ingress protection while maintaining the sharp tactile feel necessary for enhanced user experience.

Features & Benefits

- Small Size 3.90 x 2.05 x 1.60mm
- Laser welded design
- IP67 rated
- Perfect for small applications
- Excellent ingress protection
- Withstands typical drop tests

Applications

- Glucose meters
- Hearing aids
- Control panels
- Wearable devices
 - Smart watch
 - Activity trackers

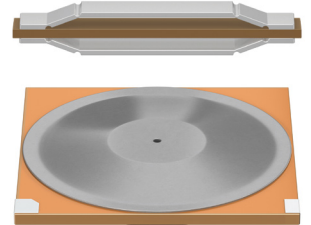


TDK



PowerHap™

PowerHap™ is a family of powerful actuators for active haptic feedback in a very compact design.



They are available in different sizes and designs and are therefore suitable for many medical applications from lightweight portable medical and wearable devices to medical apparatus.

The PowerHap™ piezo actuators are based on PZT piezo ceramics. Additional mechanical elements are used to amplify the feedback. In addition, PowerHap™ can be also used as a sensor that provides an output voltage on its terminals when external force is applied.

Features & Benefits

- Compact design
- Low insertion height down to 1.1mm
- Multilayer structure enables high acceleration $\geq 50g$ and high force $\geq 50N$
- Large displacement $\geq 280\mu m$
- Fast response time $< 1ms$
- Low power consumption
- Flexible and programmable waveforms
- Integrated sensor functionality
- Bipolar driving mode allows low operating voltage (e.g. $\pm 10V$)
- Qualified based on AEC-Q200

Applications

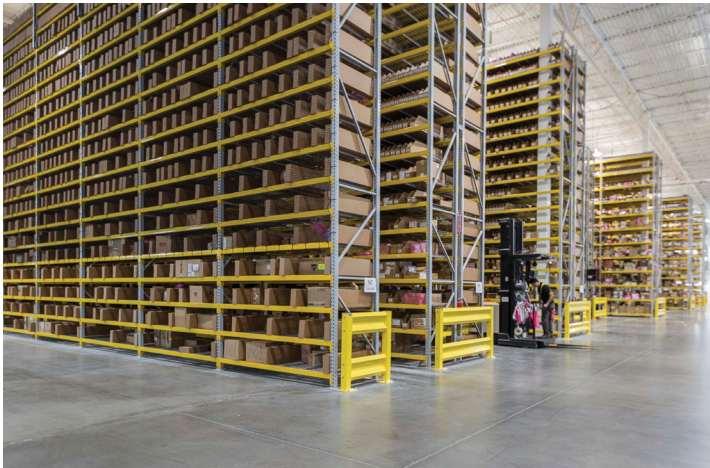
- Patient monitoring
- Diagnostic imaging systems
- Image analysis systems
- Small diagnostic equipment
 - Endoscope
 - Blood sugar level monitor
 - Blood pressure gauge
 - Dental drill
- Hearing aids





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