

## Introduction

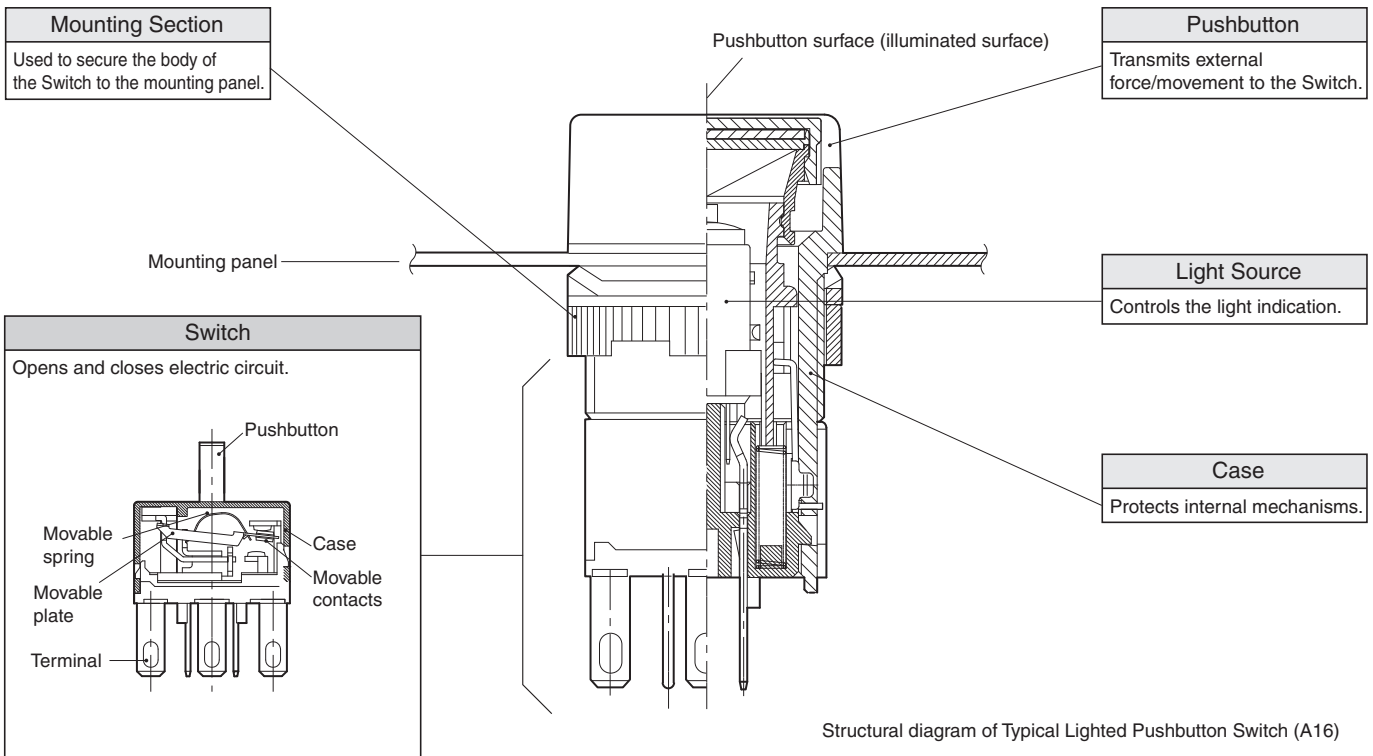
### What Is a Pushbutton Switch?

A Pushbutton Switch is a switch designed so that its contacts are opened and closed by depressing and releasing a pushbutton on the Switch in the direction of its axis.



### Classifications and Structures

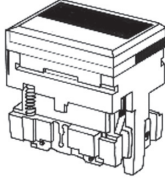
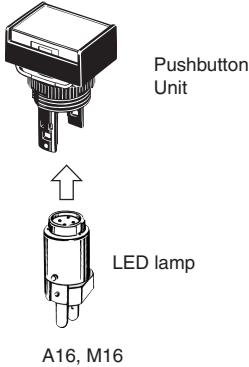
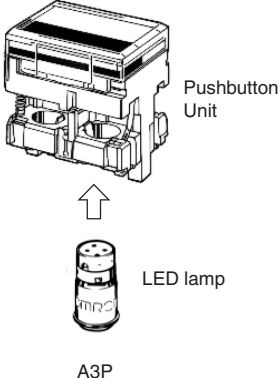
Pushbutton Switches come in two categories: lighted and non-lighted. The structure of a typical Lighted Pushbutton Switch is shown below. Broadly speaking, Lighted Pushbutton Switches are made up of the 5 sections shown below. Non-lighted Pushbutton Switches are made up of 4 sections, the 5 sections shown below less the light source.



### Operations

Operation	Explanation
Momentary operation	The pushbutton returns to its original position after it is released.
Alternate operation	The first time the pushbutton is pressed, an internal lock mechanism holds it in the same position. The next time it is pressed, the lock is released and the pushbutton returns to its original position.
Push-pull operation	When the pushbutton is pressed, an internal lock mechanism holds it in the same position. The pushbutton is returned to its original position when the pushbutton is pulled to release the lock.
Push-lock, turn-reset operation	When the pushbutton is pressed, an internal lock mechanism holds it in the same position. The pushbutton is returned to its original position when the pushbutton is twisted to release the lock.

## Explanation of Terms

Term	Explanation	
Chameleon lighting	Full-screen lighting in one of 3 colors: red, green, or orange. (Orange is produced by simultaneous illumination of red and green.)	
Simultaneity	This term is used for switches that have more than one contact circuit. It indicates the difference in time or position between the contacts when all the contacts of the switch are opened or closed in one operation.	
LED lighting	<ul style="list-style-type: none"> <li>· LED-lighted models are lit with an LED installed in the base of the Pushbutton Unit.</li> <li>· The LED is mounted internally; it cannot be removed.</li> </ul> 	
LED-lamp lighting	<ul style="list-style-type: none"> <li>· LED lamp-lighted models are lit with an LED chip.</li> <li>· The Lamp (i.e., the LED lamp) and the Pushbutton Unit can be separated.</li> </ul> <div style="display: flex; justify-content: space-around; align-items: center;"> <div style="text-align: center;">  <p>A16, M16</p> </div> <div style="text-align: center;">  <p>A3P</p> </div> </div>	
Voltage Reduction Unit	For 16-dia. A16 (M16) models and 22-dia. A22 (M22) models	The Voltage Reduction Unit has a smoothing circuit and resistor, and lights the 24-VAC/VDC LED lamp by applying 110 (or 220) VAC/VDC directly to the Lamp terminals.
Matrix mounting	Mounting several Switches in vertical and/or horizontal lines.	
Horizontal side-by-side mounting	Mounting Switches side-by-side with the long side of the Switch (rectangular models) horizontal.	
Vertical side-by-side mounting	Mounting Switches side-by-side with the long side of the Switch (rectangular models) vertical.	

Sensors

Switches

Safety Components

Relays

Control Components

Automation Systems

Motion / Drives

Energy Conservation Support / Environment Measure Equipment

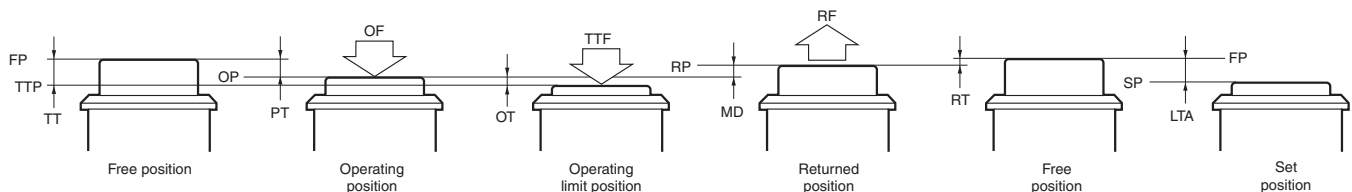
Power Supplies / In Addition

Others

Common

## Terms Related to Operating Characteristics

Classification	Term	Abbreviation	Unit	Definition
Force (torque)	Operating Force (torque)	OF	N, N·m	The force (or torque) that must be applied to the pushbutton to move it from the free position to the operating position.
	Releasing Force (torque)	RF	N, N·m	The force (or torque) that must be applied to the pushbutton to move it from the operating limit position back to the returned position.
	Total Travel Force (torque)	TTF	N, N·m	The force (or torque) on the pushbutton when it reaches the stopper.
Position	Free Position	FP	mm, (°)	The position (or angle) of the pushbutton when there is no external force applied to it.
	Operating Position	OP	mm, (°)	The position (or angle) of the pushbutton when the movable contact changes from the free position state to the operating position state due to an external force.
	Release Position	RP	mm, (°)	The position (or angle) of the pushbutton when the movable contact changes from the operating position state to the free position state due to the reduction of external force.
	Total Travel Position	TTP	mm, (°)	The position (or angle) of the pushbutton when it reaches the stopper.
	Set Position	SP	mm, (°)	The position of an alternate operation pushbutton when it is in the self-holding state, or the position (or angle) of a selector switch when it is in the self-holding state.
Travel	Pretravel	PT	mm, (°)	The distance (or angle) through which the pushbutton moves in going from the free position to the operating position.
	Overtravel	OT	mm, (°)	The distance (or angle) through which the pushbutton moves in going from the operating position to the operating limit position.
	Movement Differential	MD	mm, (°)	The distance (or angle) through which the pushbutton moves in going from the operating position back to the returned position.
	Total Travel	TT	mm, (°)	The distance (or angle) through which the pushbutton moves in going from the free position to the operating limit position.
	Releasing Travel	RT	mm, (°)	The distance (or angle) through which the pushbutton moves in going from the returned position to the free position.
	Lock Travel Alternate	LTA	mm, (°)	The distance (or angle) through which the pushbutton moves in going from the free position to the set position.



## Terminal Symbols

Symbol	Meaning
COM	Common terminal
NC	Normally closed terminal
NO	Normally open terminal

## Contact Form

Name	Contact form
Double-throw	
Normally closed	
Normally opened	
Double-break	

Terms Related to IEC60947 and IEC60950

No.	Term	Explanation																																			
1	Rated operating voltage (Ue)	VAC: 120, 240, 380, 480, 500, 600 VDC: 125, 250, 440, 500, 600																																			
2	Rated operating current (Ie)	Specified by the manufacturer on consideration of rated operating voltage (Ue), rated frequency, rated energizing time, area of application, and type of enclosure protection.																																			
3	Rated insulation voltage (Ui)	<ul style="list-style-type: none"> <li>· Determined by creepage distance and the dielectric strength.</li> <li>· The maximum Ue value must not exceed the maximum Ui value.</li> <li>· If there is no Ui value specified, the maximum Ue value is taken as the Ui value.</li> </ul>																																			
4	Pollution degree	<ol style="list-style-type: none"> <li>1. Either no pollutants are present, or only dried, non-conductive pollutants are present (e.g., clean rooms).</li> <li>2. Basically, only non-conductive pollutants are present, or only transient conductivity occurs due to condensation (indoor locations, such as offices).</li> <li>3. Conductive pollutants are present, or non-conductive pollutants are present in locations where condensation is expected (e.g., factories).</li> <li>4. Conductivity due to impurities is a constant possibility, or conductivity is caused by conductive dust, rain, or snow (e.g., outdoor locations).</li> </ol>																																			
5	Electric shock protection class	<p>Class I: These devices require grounding. Electric shock is prevented by basic insulation and charged parts that would be subject to dangerously high voltages if the insulation was damaged, are grounded.</p> <p>Class II: Electric shocks are prevented by double insulation or enforced insulation.</p> <p>Class III: No countermeasures against electric shocks are required because the electric circuits in use operate in a low-enough voltage range.</p>																																			
6	PTI	<p>Proof tracking index.</p> <p>Specified CTI values (comparative tracking indices): Materials satisfying the 175, 250, 300, 375, and 500 levels are denoted as PTI-175, PTI-250, PTI-300, PTI-375, and PTI-500 respectively.</p>																																			
7	IP	<p>IP- [1] [2] (IEC60529) Meaning of first number-Degree of protection against solid materials and people (See below.) Meaning of second number-Degree of protection against water (See below.)</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th rowspan="2">No.</th> <th colspan="2">Meaning of first number</th> <th>Meaning of second number</th> </tr> <tr> <th>Degree of protection against solid materials</th> <th>Degree of protection for people</th> <th>Degree of protection against water</th> </tr> </thead> <tbody> <tr> <td>0</td> <td>No protection</td> <td>No protection</td> <td>No protection</td> </tr> <tr> <td>1</td> <td>No penetration by any solid object with a diameter of 50 mm or more.</td> <td>Cannot be touched with the palm of your hand.</td> <td>Protects against vertical drops of water.</td> </tr> <tr> <td>2</td> <td>No penetration by any solid object with a diameter of 12.5 mm or more.</td> <td>Cannot be touch with fingers.</td> <td>Protects against drops of water approaching at a maximum angle of 15° to the vertical.</td> </tr> <tr> <td>3</td> <td>No penetration by any solid object with a diameter of 2.5 mm or more.</td> <td>Same as at left.</td> <td>Protects against sprinkled water.</td> </tr> <tr> <td>4</td> <td>No penetration by any solid object with a diameter of 1.0 mm or more.</td> <td>Same as at left.</td> <td>Protects against water spray.</td> </tr> <tr> <td>5</td> <td>Protection against dust</td> <td>No penetration by any object with a diameter of 1.0 mm or more.</td> <td>Protects against water jet spray.</td> </tr> <tr> <td>6</td> <td>Dustproof</td> <td>No penetration by any object with a diameter of 1.0 mm or more.</td> <td>Protects against high-pressure water jet spray.</td> </tr> </tbody> </table>	No.	Meaning of first number		Meaning of second number	Degree of protection against solid materials	Degree of protection for people	Degree of protection against water	0	No protection	No protection	No protection	1	No penetration by any solid object with a diameter of 50 mm or more.	Cannot be touched with the palm of your hand.	Protects against vertical drops of water.	2	No penetration by any solid object with a diameter of 12.5 mm or more.	Cannot be touch with fingers.	Protects against drops of water approaching at a maximum angle of 15° to the vertical.	3	No penetration by any solid object with a diameter of 2.5 mm or more.	Same as at left.	Protects against sprinkled water.	4	No penetration by any solid object with a diameter of 1.0 mm or more.	Same as at left.	Protects against water spray.	5	Protection against dust	No penetration by any object with a diameter of 1.0 mm or more.	Protects against water jet spray.	6	Dustproof	No penetration by any object with a diameter of 1.0 mm or more.	Protects against high-pressure water jet spray.
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