

# General Specifications

## Electrical Capacity (Resistive Load)

**Logic Level (gold):** 0.4VA maximum @ 28V AC/DC maximum (Applicable Range 0.1mA ~ 0.1A @ 20mV ~ 28V)

## Other Ratings

**Contact Resistance:** 20 milliohms maximum  
**Insulation Resistance:** 1,000 megohms minimum @ 500V DC  
**Dielectric Strength:** 1,000V AC minimum between contacts for 1 minute minimum;  
1,500V AC minimum between contacts and case for 1 minute minimum  
**Mechanical Life:** 50,000 operations minimum  
**Electrical Life:** 50,000 operations minimum  
**Angle of Throw:**  $25^{\circ} \pm 4^{\circ}$

## Materials & Finishes

**Toggle:** Brass with chrome plating  
**Bushing:** Brass with nickel plating  
**Frame:** Stainless steel  
**Case:** Diallyl phthalate resin (UL94V-0)  
**Movable Contactor:** Phosphor bronze with gold plating  
**Movable Contacts:** Copper with gold plating  
**Stationary Contacts:** Copper or brass with gold plating  
**Terminals:** Copper or brass with gold plating

## Environmental Data

**Operating Temperature Range:**  $-30^{\circ}\text{C}$  through  $+85^{\circ}\text{C}$  ( $-22^{\circ}\text{F}$  through  $+185^{\circ}\text{F}$ )  
**Humidity:** 90 ~ 95% humidity for 96 hours @  $40^{\circ}\text{C}$  ( $104^{\circ}\text{F}$ )  
**Vibration:** 10 ~ 55Hz with peak-to-peak amplitude of 1.5mm traversing the frequency range & returning in 1 minute; 3 right angled directions for 2 hours  
**Shock:** 50G ( $490\text{m/s}^2$ ) acceleration (tested in 6 right angled directions, with 5 shocks in each direction)  
**Sealing:** Splashproof bushing, which has o-rings inside and outside the bushing, meets IP67 of IEC60529 Standards

## Installation

**Mounting Torque:** 0.7Nm (6 lb•in)

## Processing

**Soldering:** Manual Soldering:  $390^{\circ}$  maximum for 4 seconds maximum; 2 cycles  
Note: Lever must be in OFF (center) position while soldering.  
**Cleaning:** These devices are not process sealed. Hand clean locally using alcohol based solution.

## Standards & Certifications

**Flammability Standards:** UL94V-0 for case  
**UL:** File No. E44145 - Recognized only when ordered with marking on switch.  
Add "/U" or "/CUL" before dash in part number to order UL recognized switch.  
All models recognized at 0.4VA maximum @ 28V DC maximum.

# Distinctive Characteristics

Knurled toggle accentuated with textured pattern, facilitating firm nonslip grip.

Inner o-ring and external rubber washer seal the switch to achieve IP67 of IEC60529 Standards (dust tight and water protected for temporary immersion).

Locking lever prevents accidental actuation.

Antirootation design, standard on noncylindrical levers, mates toggle and bushing; bottom of toggle has two flatted sides which fit into a complementary opening inside bushing.

Antijamming design protects contacts from damage due to excessive downward force on actuator.

High torque bushing construction prevents rotation or separation from frame during installation.

Molded diallyl phthalate case meets flammability standards for UL94V-0.

Increased insulation resistance and dielectric strength due to prominent external insulating barriers.

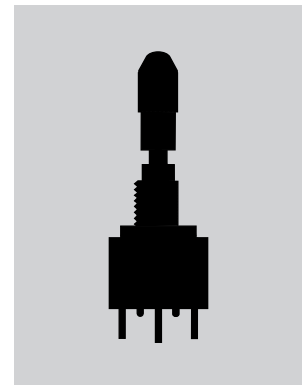
Interlocked actuator block, lever, and interior guide prevent switch failure due to biased lever movement.

Clinching of frame to case well above base and terminals provides 1,500V dielectric strength.

Epoxy sealed solder lug terminals prevent entry of solder flux and other contaminants.

The knurled cap is compatible with other M Series locking levers. Contact NKK for additional details.








Actual Size



### SWITCH PART NUMBER & DESCRIPTION

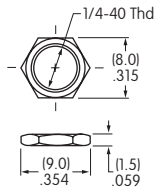
Part Number	Switch Description	Toggle & Bushing
<b>M2013LL3G01-K</b>	Logic Level (Gold): 0.4VA max @ 28V AC/DC max (Applicable Range 0.1mA ~ 0.1A @ 20mV ~ 28V) Single Pole Double Throw ON OFF ON Solder Lug Terminals	.681" (17.3mm) Locking Lever 1/4-40 .291" (7.4mm) Threaded Bushing with D Flat 3 Position Locking Mechanism AT513H Hex Nut & AT516 O-ring

POLE & CIRCUIT

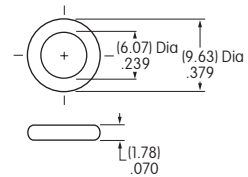
Pole	Model	Toggle Position			Connected Terminals			Throw & Schematics
		Down	Center	Up	Down	Center	Up	
SP	M2013	 ON	 OFF	 ON	 2-3	 OPEN	 2-1	Note: Terminal numbers are not actually on the switch.  SPDT 

STANDARD HARDWARE

AT513H Hex Nut  
Brass with Nickel Plating



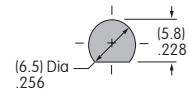
AT516 O-ring  
Nitrile Butadiene Rubber



PANEL CUTOUT

For 1/4-40 .291" (7.4mm)  
Threaded Splashproof Bushing with D Flat

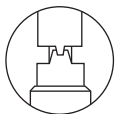
Maximum Panel Thickness with Standard Hardware:  
.047" (1.2mm)



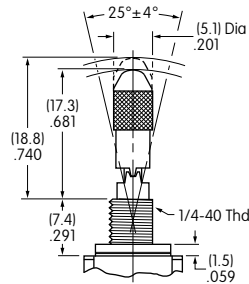
LOCKING MECHANISM

Locking Mechanism

ON-OFF-ON

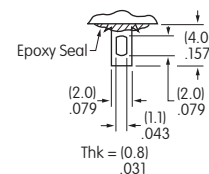


3 Positions Lock



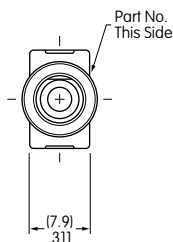
TERMINALS

Solder Lug

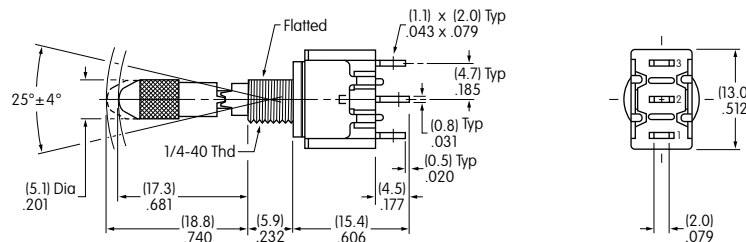


TYPICAL SWITCH DIMENSIONS

Solder Lug



Single Pole



M2013LL3G01-K

### APPLICATION CONSIDERATIONS

*The Knurled Locking Lever is designed as a panel seal switch, and not to be used under water.*

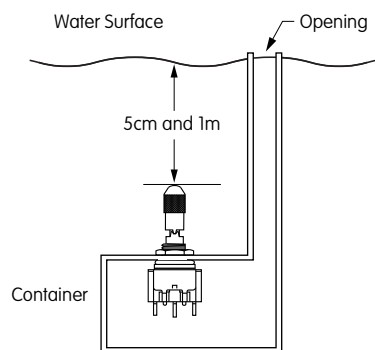
#### Material Properties

The inner o-ring and external rubber washer are made of nitrile butadiene rubber, which excels in durability and oil and chemical resistance. Its performance is less durable with lower weather and ozone resistant characteristics.

Evaluate the products in regard to your application and intended environment with these properties in mind.

#### Waterproof Test Conditions

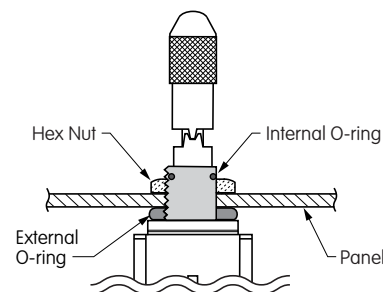
Waterproofing is measured by submersing the switch five centimeters from the water surface (see illustration), and opening and closing 50 times at a frequency of 50 – 60 times per minute. The switch is then submersed one meter from the surface and left in this position for 30 minutes.



Repeat opening and closing same as previous test. The resulting insulation resistance and voltage capacity are both within the rated values, and water has not entered inside the switch or installation panel.

#### Panel Installation

For panel installation, the hex nut is installed above the panel. The external o-ring mounts below the panel.



#### Applications

- Construction Equipment
- Transportation
- Industrial Control Equipment
- Medical Equipment
- Machine Tooling
- Marine Equipment