Industrial Automation Catalog Section - U906

Switches & Pilot Devices

A8 Series Miniature Switches & Pilot Devices

Switches & Pilot Devices

idec

Selection Guide

A8 Series Miniature Switches and Pilot Devices Ø 21/64" (8mm)

Series Model	AL8	AB8
Appearance		
See Page	*A-13*	*A-13*
Operator Type	Illuminated Pushbuttons: • Momentary • Maintained • Pilot Lights	Non-Illuminated Pushbuttons: • Momentary • Maintained
Lens Shape and Size	Round: Ø 0.351 (9mm) Square: ❑ 0.351 (9mm) Rectangular: 0.351 x 0.468 (9 x 12mm)	
Light Source	LED	—
Lens/Button Colors	Amber, Green, Red, White, Yellow	Black, Blue, Green, Red, White, Yellow
Contact Configuration	SPDT (Gold-Clad Silver Contact)	
Contact Ratings	120V AC/1A, 24V DC/1A, (Resistive), Minimum applicable load reference value: 5V AC/DC, 1mA	
Electrical Life (at full rated load)	Momentary: 100,000 operations minimum Maintained: 50,000 operations minimum	
Mechanical Life	Momentary: 200,000 operations minimum Maintained: 100,000 operations minimum	
Degree of Protection	Enclosed/Dustproof: IP40	
Termination	Solder Tab Terminal	
Approvals	UL Recognized File No. E55996	CSA Certified File No. LR21451

1. LED lamps require an external current limiting resistor.
2. Available as assembled units only (replacement lamps available).

General Information

Information About LED Lamps

Light-emitting diodes (LEDs) are P–N junction semiconductors with mechanisms called "junction electro-luminescence." Application of direct current results in radiation or emission of a monochromatic light.

Different semiconductor materials produce different wavelengths of light as shown below:

Specifications			
	Green	Gallium Phosphide (GaP)	5600 Å
	Yellow	Gallium Arsenide Phosphide (GaAsP)	5800 Å
	Amber	Gallium Arsenide Phosphide (GaAsP)	6300 Å
	Red	Gallium Arsenide Phosphide (GaAsP)	6600Å
	Infrared	Gallium Arsenide (GaAs)	9000 Å

Advantages of Using LEDs

- **LEDs are used when heat generated by incandescent lamps would damage nearby equipment or interfere with a precision process. This is particularly advantageous when multiple lights are grouped.**
- **LEDs can operate at low temperatures which would cause incandescent lamps to fail, since glass cracks during rapid cooling.**
- **LEDs consume 50 times less power than incandescent lamps, thereby reducing energy consumption.**
- **LEDs last 500 times longer than incandescent lamps. LEDs average a million hours (114 years) while incandescent lamps average 2000 hours.**
- **LEDs do not generally "blow out" unless subjected to a severe overvoltage. They exhibit a half-life type dimishment in brightness over time. After 50,000 hours (6 years) of use, IDEC LEDs will retain approximately half of their original intensity.**
- **IDEC's SUPERBRIGHT LEDs have high visibility.**
- **LEDs require little or no maintenance because of long life and high reliability.**

IDEC Recommendations

For optimum results, especially when using switches and pilot lights in operating environments which are conducive to overheating, use IDEC LED illuminated units. Transformers are available for use with incandescent illuminated units, which operate at lower voltages to avoid overheating.

When IDEC's L-120L lamp is used, make sure ambient temperatures do not exceed 30˚C (86˚F). If a lamp from another supplier is used, it should be rated for less than 1.8 watts (15mA at 120V AC), with ambient temperatures as stated above.

Information About Incandescent Lamps

Filament-type incandescent lamps operate within the following parameters.

Light output and life expectancy depend on operating voltage. Light output varies to the 3rd or 4th power of the voltage. Life expectancy varies inversely to the 12th power of voltage. In other words, over-voltage of 5% reduces life expectancy by 50%. Under-voltage of 5% doubles life expectancy at the price of light output efficiency.

Inrush current (initial current through the filament) has an adverse effect on life expectancy. Cold resistance (room temperature) will have a more detrimental effect than hot resistance to inrush current. Life expectancy of incandescent lamps can be maximized by reducing occurrences of cold resistance to inrush current.

Continued intermittent flashing will significantly reduce life expectancy. When using an incandescent lamp with a tungsten filament, flashing will not reduce life expectancy as long as light output does not exceed that of steady burning.

When an incandescent lamp must withstand shock and vibration, use low voltage/high amperage (5–6V/60–120mA) lamps. These lamps have a short, thick filament with a high resonant frequency.

Provide cooling by using a heat sink, particularly when multiple incandescent lamps are grouped or when air circulation is limited. Make sure ambient temperatures do not exceed 100˚C (212˚F) for maximum life of incandescent lamps.

A

Comparison: LED vs. Incandescent Lamps

		Superbright LEDs	*Incandescent*
Characteristics	**Heat Dissipation**	Very Low	High
	Life Expectancy	Very Long	Short
	Reliability	Very High	Low
	Mechanical Strength	Not Susceptible	Susceptible to Shock/Vibration
	Maintenance Required	Negligible	Frequent
	Operation at Low Temps.	Possible	Not Possible
	Inrush Current	Negligible	Very Large
	Voltage Effects on Life	Insignificant	Significant
	Brightness	Slightly Less	Slightly More

Ordering Information

1. IDEC offers assembled and sub-assembled switches and pilot lights for your convenience. In some cases there is a cost difference, with sub-assembled units costing slightly less. Since assembled units are custom made to your order, a couple of days for assembly is added to delivery . To minimize delivery or inventory requirements, it is recommended that switches and pilot lights be ordered as sub-components.
2. When ordering pilot lights or illuminated pushbuttons, make sure to specify the color code in place of the asterisk in the part number, (LED or incandescent lamp included). Spare lamps can be ordered and are listed with sub-assembly components.
3. Accessories, such as locking ring wrench, lens removal tool, and lamp holder, are available to make installation and assembly easier. IDEC recommends using these accessories and is not responsible for damage as a result of using the wrong tool.
4. Marking plates are available for switches and pilot lights which feature a flat lens. Printed mylar (not included) can also be inserted under lens for labeling purposes.
5. Nameplates are available for TW, 7/8" (22mm), HW 7/8" (22mm),and TWTD series, Ø1–13/64" (30mm). For prompt delivery, order standard legends. Custom engraving is also offered for an additional charge.

Installation and Operation

1. Use the appropriate lamp holder to remove or install LED or incandescent lamps. Using pliers will damage the lamp.
2. When mounting switches and pilot lights into a panel, use locking ring wrench.Using pliers or tightening excessively will damage the locking ring.
3. A series, 21/64" (8mm), can be mounted on a panel 0.019" (0.5mm) to 0.236" (6mm) thick.
4. LW 7/8" (22mm), TW, 7/8" (22mm), and TWTD series, Ø1–13/64" (30mm), feature an adjustment ring for mounting on a panel 0.038" (1mm) to 0.236" (6mm) thick. Using a nameplate or an anti-rotation ring adds 0.031" (0.8mm) to the panel thickness.
5. When applicable, solder terminals within 20W/5sec or 260˚/3sec without exerting external force to the terminals. Use a non-corrosive resin liquid flux.
6. The operating voltage for LED units represents a complete DC value. When using a pulsing voltage, such a full-wave rectification, keeppeak currents within the forward current I_f. Peak currents exceeding I_f may shorten the life of the LED lamp.
7. To avoid a short circuit, never connect NO and NC contacts to different voltages or power sources.
8. Optimum performance of TW and TWTD illuminated pushbuttons, selector switches, and pilot lights is obtained with IDEC LED and incandescent lamps.
9. For maximum life of incandescent lamps (approximately 2000 hours), use within the rated operating voltage. If it is necessary to use a higher voltage, keeping ambient temperature below 30˚C (86˚F)will help prolong the life of an incandescent lamp.

If excessive voltage is applied (over 50V), the lamp may blow and the lens holder may pop out.

A8 Series — Miniature Switches and Pilot Devices: 21/64" (8mm)

Key features of the 21/64" (8mm) A8 series Switches and Pilot Devices include:

- **21/64" (8mm) round mounting hole**
- **Compact Design Saves Space**
- **Bright and Vivid Illumination**
- **Choice of Shapes and Functions**
- **Gold Clad SIlver Contacts for reliable low level switching**
- **Snap action contacts**
- **IP40 (Dustproof) Construction**

UL Recognized
File No. E55996

CSA Certified
File No. LR21451

Specifications

LED Lamp Life	50,000 hours approximately (reduced to half of original intensity)
Contact Configuration	SPDT
Maximum Voltage	250V AC/DC
Thermal Current	3A
Contact Material	Silver
Terminal Style	Solder Tab Terminal
Operating Temperature	–25° to +55°C (no freezing)
Operating Humidity	45 to 85% RH
Contact Resistance	50mΩ maximum (initial value)
Insulation Resistance	100MΩ minimum (500V DC megger)
Vibration Resistance	10 to 55Hz, amplitude 1.5mm p-p
Shock Resistance	Damage limits: 500m/sec^2 (approx. 50G) Operating extremes: 200m/sec^2 (approx. 20G)
Electrical Life	100,000 operations minimum
Mechanical Life	Maintained: 100,000 (1200 operations/hour) Momentary: 200,000 minimum
Degree of Protection	IP40 Enclosed/Dustproof
Soldering Temperature	20W/5 seconds or 260°C/3 seconds
Dielectric Strength	Switch Unit: 2,000V AC, 1 min. between live/dead part and terminals of different poles; 1,000V AC, 1 minute between terminals of the same pole; 1,500V AC, 1 minute between contact and lamp terminals. Illumination Unit: 2,000V AC, 1 min. between live part/ground

Contact Ratings

Operating Voltage		**24V**	**120V**	**240V**
AC 50/60Hz	Resistive	—	1.0A	0.5A
	Inductive	—	0.7A	0.5A
DC	Resistive	1.0A	0.2A	—
	Inductive	0.7A	0.1A	—

1. *AC Inductive Load, PF = 0.6 – 0.7; DC Inductive Load, L/R = 7.*
2. *Minimum applicable load (reference value) is 5V AC/DC 1mA (applicable range is subject to the operating conditions and load).*

AB8 Non-Illuminated Pushbuttons (Assembled)

A

Part Numbers: Non-Illuminated Pushbuttons

Style	Contact	Part Numbers	
		Momentary	Maintained
Round 	SPDT	AB8M-M1-①	AB8M-A1-①
Square 	SPDT	AB8Q-M1-①	AB8Q-A1-①
Rectangular 	SPDT	AB8H-M1-①	AB8H-A1-①

1. *In place of ①, specify button color code from the table below.*
2. *For accessories, see page A-16.*
3. *For dimensions, see page A-17.*
4. *AB8 pushbuttons available as assembled units only (no replacement buttons available)*

① Button Color Code

Color	Code
Black	B
Green	G
Red	R
Blue	S
White	W
Yellow	Y

AL8 Illuminated Pushbuttons and Pilot Lights (Assembled)

Part Numbers: LED Illuminated Pushbuttons and Pilot Lights

Style	Contact	Pushbutton Part Number		Pilot Light Part Number
		Momentary	Maintained	
Round 	SPDT	AL8M-M11-②	AL8M-A11-②	AL8M-P1-②
Square 	SPDT	AL8Q-M11-②	AL8Q-A11-②	AL8Q-P1-②
Rectangular 	SPDT	AL8H-M11-②	AL8H-A11-②	AL8H-P1-②

② Lens/LED Color Code

Color	Code
Amber	A
Green	G
Red	R
White	W
Yellow	Y

1. *In place of ②, specify lens color code from table on the right.*
2. *A replaceable LED lamp is included with the operator.*
3. *Because the LED lamp does not contain an internal current limiting resistor, an external resistor must be added. For recommended values, see table below.*
4. *For accessories, see page A-16.*
5. *For dimensions, see page A-17.*
6. *Available as assembled units only (no replacement lenses available).*

Part Numbers: Replacement LEDs

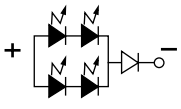
Lens Color	LED Lamp	Part Number
Amber	Amber	LAD-SA
Green	Green	LAD-SG
Red	Red	LAD-SR
White	Yellow*	LAD-SY
Yellow	Yellow	LAD-SY

** White units use a white lens and a yellow LED.*

LED Voltage and Current Limiting Resistor

Voltage	External Resistor
5V DC	150Ω, 1/2W
6V DC	200Ω, 1/2W
12V DC	510Ω, 3/4W
24V DC	1.1kΩ, 3/4W

LED Lamp Ratings

LED Specifications	LED Lamp	Forward Current I_f	Forward Voltage (Nominal) V_f	Reverse Voltage V_r	Operating Voltage and External Current Limiting Resistor (Recommended Value)	Equivalent Circuit
	Amber	20mA	2.2V	4V	5V DC: 150Ω, 1/2w	
	Green	20mA	2.1V	4V	6V DC: 200Ω, 1/2w	
	Red	20mA	1.7V	4V	12V DC: 510Ω, 3/4w	
	Yellow	20mA	2.2V	4V	24V DC: 1.1kΩ, 3/4w	

When LED lamps are used at voltages other than those stated above, external resistor value, R, is determined by the following formula:
$R = (\text{Operating Voltage} - V_f) / I_f$

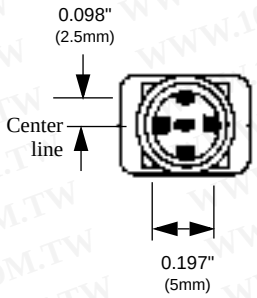
A

Accessories — A8 Series: 21/64" (8mm)

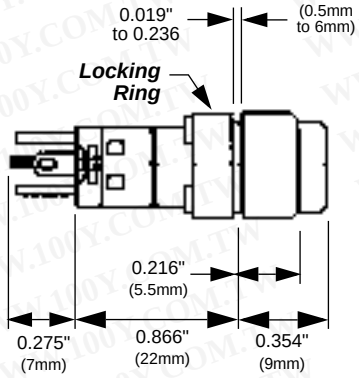
Appearance	Description	Used With	Part Number
Locking Ring Wrench 	Made of metal. Used for tightening plastic locking ring during installation. Tightening torque should not exceed 3kgf-cm	All units	MT-004
Lens Removal Tool 	Made of metal. Used for removing lens or button from the housing	Illuminated pushbuttons and pilot lights	MT-101
Lamp Holder Tool 	Made of rubber. Used for removing and replacing LED lamps in illuminated units	Illuminated pushbuttons and pilot lights	OR-66
Switch Guard 	Used to avoid operating the pushbutton inadvertently. Cover flips open 90°. Provides IP40 protection	Round & square units	AL-K8
		Rectangular units	AL-KH8
Terminal Cover 	Made of translucent nylon. Fits over and shields the terminals	All units	AL-V8
Adaptor Socket 	Plug-on adaptor with solder terminals, allows easy control unit replacment.	All units	AL-C8
	Plug-on adaptor with PCB terminals, allows easy control unit replacment.		AL-C8V
Mounting Hole Plug 	Made of rubber. Fills unused mounting holes to provide IP65 protection	Extra panel cutouts	AL-B8
LED Replacements 	LED lamp is included in every illuminated control unit. Replacement lamp is ordered separately. External current limiting resistor required.	Illuminated units and pilot lights	LAD-SR (red)
			LAD-SG (green)
			LAD-SA (amber)
			LAD-SY (yellow)

Dimensions — A8 Series: 21/64" (8mm)

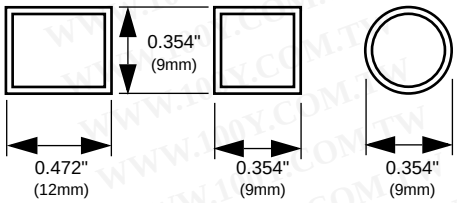
A△8 Pushbuttons



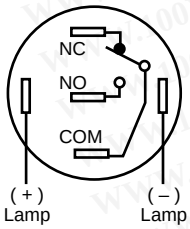
Panel Thickness



Rectangular Square Round

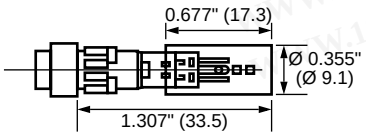


Terminal Arrangement (Bottom View)



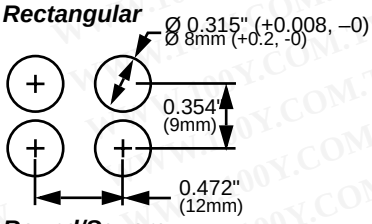
Terminal Cover

AL-V8, Ø 21/64" (8mm)

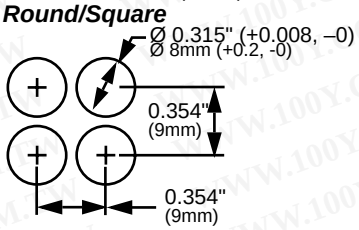


Panel Cut-Out (not drawn to scale)

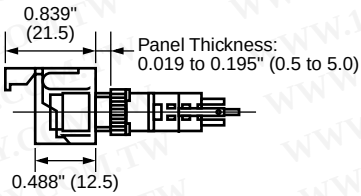
Rectangular



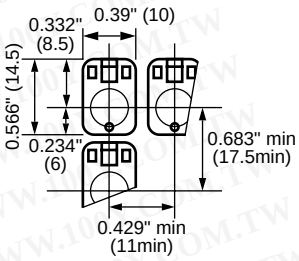
Round/Square



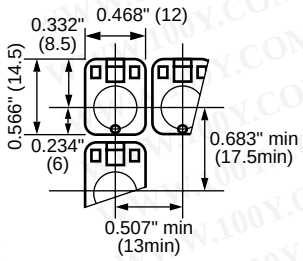
Switch Guard, Ø 21/64" (8mm)



AL-K8, Ø 21/64" (8mm) Round and Square

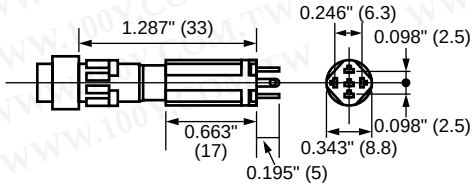


AL-KH8, Ø 21/64" (8mm) Rectangular

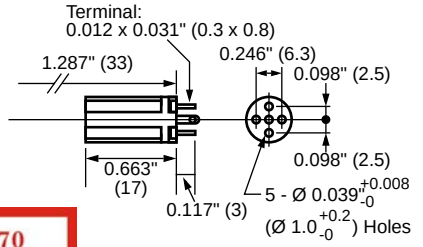


Terminal Sockets

AL-C8, Ø 21/64" (8mm), Solder



AL-C8V, Ø 21/64" (8mm), PCB



PC Board Drilling Layout
Bottom View