

Series 18

Characteristics

The compact 8mm Series 18 is especially suited for:

- Flush design
- Raised design
- PCB (with adaptor)

Functions

The Series 18 incorporates the following functions:

- Indicator
- Pushbutton
- Illuminated pushbutton

Market segments

The EAO Series 18 is especially suited for applications in the segments:

- Audio and video
- Laboratory and measuring equipment

Please refer to the EAO website to obtain detailed information regarding this series www.products.eao.com
Configure a product to your exact needs and request a quotation.



Overview**Flush design**

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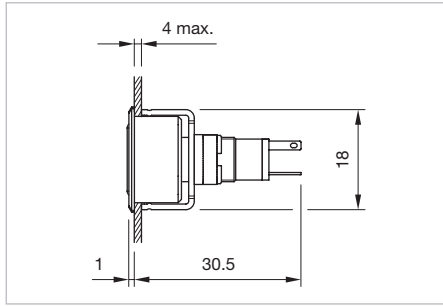
23

18 Flush design

Indicator, IP 40



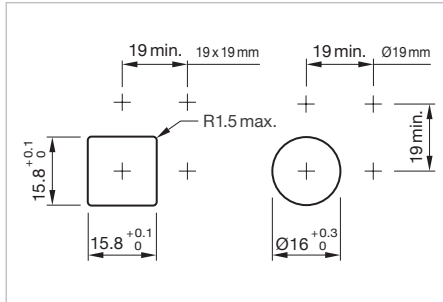
Product can differ from the current configuration.



Dimensions [mm]

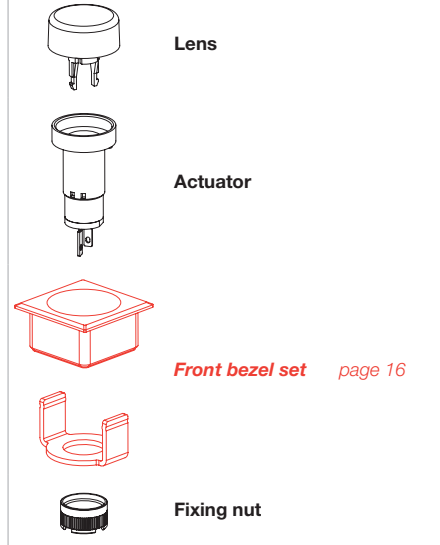
Additional Information

- For front dimensions 19 x 19 mm or Ø 19mm
- Luminosity and wave length variations caused by LED manufacturing processes may cause slight differences regarding the illumination
- The series resistance for LEDs need to be determined and integrated by customers.




Mounting cut-outs [mm]


Equipment consisting of (schematic overview)



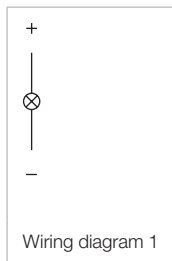
Each Part Number listed below includes all the black components shown in the 3D-drawing.

To obtain a complete unit, please select the red components from the pages shown.

LED colour	Forward voltage typ.	Operating voltage	Operation current	Lens	Terminal	Part No.	Component layout	Wiring diagram	Weight
	Indicator actuator								
red	2.0 VDC @ 20 mA	customer-specific	10 mA	Plastic red translucent	Solder	18-080.0052L	1	1	0.002 kg
white	3.0 VDC @ 20 mA	customer-specific	10 mA	Plastic yellow translucent	Solder	18-080.0054L	1	1	0.002 kg
green	3.2 VDC @ 20 mA	customer-specific	2 mA	Plastic green translucent	Solder	18-080.0055L	1	1	0.002 kg
		12 VDC ±10 %	10 mA	Plastic red translucent	Solder	18-081.0052L	1	1	0.002 kg
		24 VDC ±10 %	10 mA	Plastic red translucent	Solder	18-082.0052L	1	1	0.002 kg
			10 mA	Plastic yellow translucent	Solder	18-082.0054L	1	1	0.002 kg
			2 mA	Plastic green translucent	Solder	18-082.0055L	1	1	0.002 kg

LED colour	Forward voltage typ.	Operating voltage	Operation current	Lens	Terminal	Part No.	Component layout	Wiring diagram	Weight
 <p>Indicator actuator</p>									
red	2.0 VDC @ 20 mA	customer-specific	10 mA	Plastic red translucent	Solder	18-060.0052L	1	1	0.002 kg
white	3.0 VDC @ 20 mA	customer-specific	10 mA	Plastic yellow translucent	Solder	18-060.0054L	1	1	0.002 kg
green	3.2 VDC @ 20 mA	customer-specific	2 mA	Plastic green translucent	Solder	18-060.0055L	1	1	0.002 kg
		12 VDC ±10 %	10 mA	Plastic red translucent	Solder	18-061.0052L	1	1	0.002 kg
			10 mA	Plastic yellow translucent	Solder	18-061.0054L	1	1	0.002 kg
			2 mA	Plastic green translucent	Solder	18-061.0055L	1	1	0.002 kg
		24 VDC ±10 %	10 mA	Plastic red translucent	Solder	18-062.0052L	1	1	0.002 kg
			10 mA	Plastic yellow translucent	Solder	18-062.0054L	1	1	0.002 kg
			2 mA	Plastic green translucent	Solder	18-062.0055L	1	1	0.002 kg

The component layouts you will find from page 20

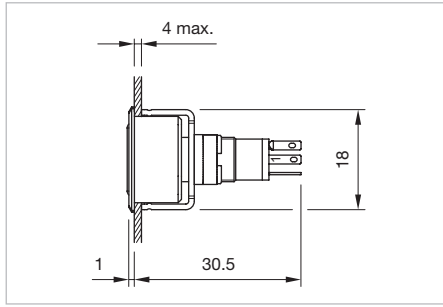


18 Flush design

Pushbutton, IP 40



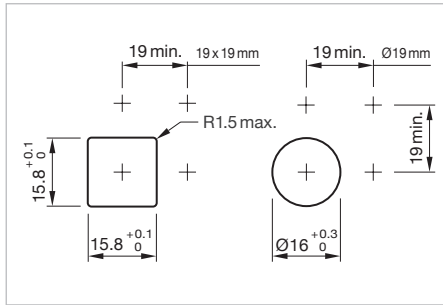
Product can differ from the current configuration.



Dimensions [mm]

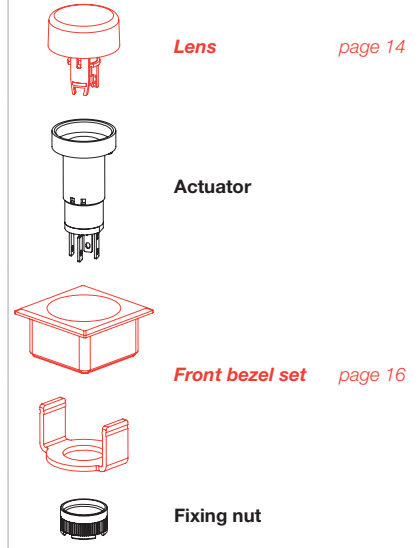
Additional Information

- For front dimensions 19 x 19 mm or Ø 19mm
- +/- terminals are not connected





Mounting cut-outs [mm]

Equipment consisting of (schematic overview)

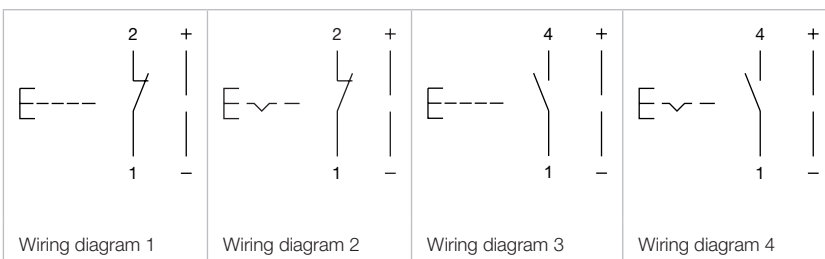


Each Part Number listed below includes all the black components shown in the 3D-drawing.

To obtain a complete unit, please select the red components from the pages shown.

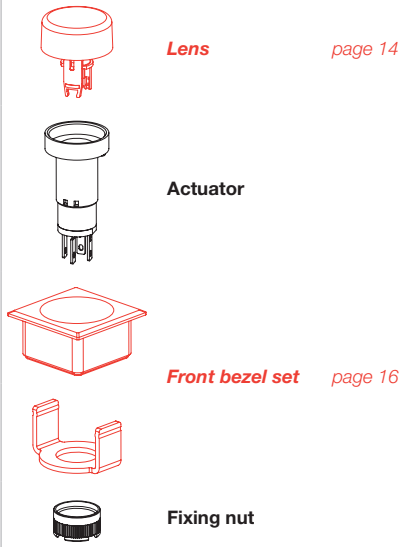
Switching system	Contacts	Switching action	Terminal	Part No.	Component layout	Wiring diagram	Weight
 <p>Pushbutton actuator</p>	1 NC	B	Solder	18-188.035	2	1	0.002 kg
		C	Solder	18-288.035	2	2	0.002 kg
	1 NO	B	Solder	18-187.035	2	3	0.002 kg
		C	Solder	18-287.035	2	4	0.002 kg
 <p>Pushbutton actuator</p>	1 NC	B	Solder	18-168.035	2	1	0.002 kg
		C	Solder	18-268.035	2	2	0.002 kg
	1 NO	B	Solder	18-167.035	2	3	0.002 kg
		C	Solder	18-267.035	2	4	0.002 kg

Contacts: NC = Normally closed, NO = Normally open
 Switching action: B = Momentary, C = Maintain
 The component layouts you will find from page 20



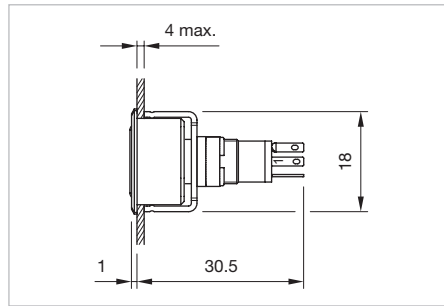
Illuminated pushbutton, IP 40

Equipment consisting of (schematic overview)

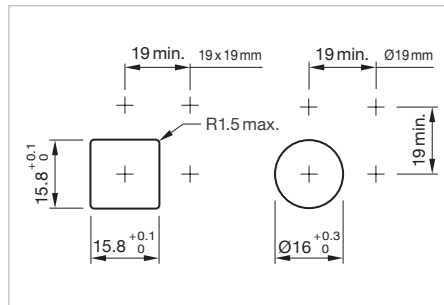


Each Part Number listed below includes all the black components shown in the 3D-drawing.

To obtain a complete unit, please select the red components from the pages shown.



Dimensions [mm]



Mounting cut-outs [mm]



Product can differ from the current configuration.

Additional Information

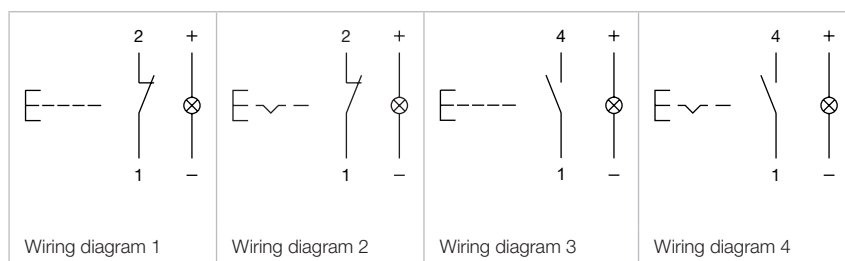
- For front dimensions 19 x 19 mm or Ø 19mm

Switching system	Contacts	Switching action	Terminal	Part No.	Compo- nent layout	Wiring diagram	Weight
<h3>Illuminated pushbutton actuator</h3>							
Snap-action switching element	1 NC	B	Solder	18-188.035	2	1	0.002 kg
		C	Solder	18-288.035	2	2	0.002 kg
	1 NO	B	Solder	18-187.035	2	3	0.002 kg
		C	Solder	18-287.035	2	4	0.002 kg
<h3>Illuminated pushbutton actuator</h3>							
Snap-action switching element	1 NC	B	Solder	18-168.035	2	1	0.002 kg
		C	Solder	18-268.035	2	2	0.002 kg
	1 NO	B	Solder	18-167.035	2	3	0.002 kg
		C	Solder	18-267.035	2	4	0.002 kg

Contacts: NC = Normally closed, NO = Normally open

Switching action: B = Momentary, C = Maintain

The component layouts you will find from page 20

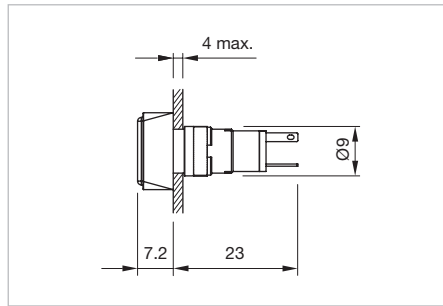


18 Raised design

Indicator, IP 40

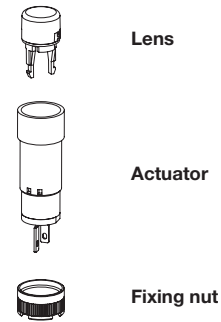


Product can differ from the current configuration.



Dimensions [mm]

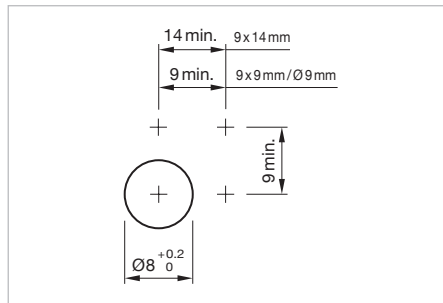
Equipment consisting of (schematic overview)





Each Part Number listed below includes all the black components shown in the 3D-drawing.


Additional Information

- Luminosity and wave length variations caused by LED manufacturing processes may cause slight differences regarding the illumination
- The series resistance for LEDs need to be determined and integrated by customers.

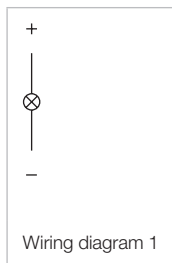


Mounting cut-outs [mm]

LED colour	Forward voltage typ.	Operating voltage	Operation current	Lens	Terminal	Part No.	Component layout	Wiring diagram	Weight
 <p>Indicator actuator, Front dimension 9 x 9 mm</p>									
red	2.0 VDC @ 20 mA	customer-specific	10 mA	Plastic red translucent	Solder	18-050.0052L	1	1	0.002 kg
white	3.0 VDC @ 20 mA	customer-specific	10 mA	Plastic yellow translucent	Solder	18-050.0054L	1	1	0.002 kg
green	3.2 VDC @ 20 mA	customer-specific	2 mA	Plastic green translucent	Solder	18-050.0055L	1	1	0.002 kg
		12 VDC ±10 %	10 mA	Plastic red translucent	Solder	18-051.0052L	1	1	0.002 kg
			10 mA	Plastic yellow translucent	Solder	18-051.0054L	1	1	0.002 kg
			2 mA	Plastic green translucent	Solder	18-051.0055L	1	1	0.002 kg
		24 VDC ±10 %	10 mA	Plastic red translucent	Solder	18-052.0052L	1	1	0.002 kg
			10 mA	Plastic yellow translucent	Solder	18-052.0054L	1	1	0.002 kg
			2 mA	Plastic green translucent	Solder	18-052.0055L	1	1	0.002 kg
 <p>Indicator actuator, Front dimension 9 x 14 mm</p>									
red	2.0 VDC @ 20 mA	customer-specific	10 mA	Plastic red translucent	Solder	18-040.0052L	1	1	0.002 kg
white	3.0 VDC @ 20 mA	customer-specific	10 mA	Plastic yellow translucent	Solder	18-040.0054L	1	1	0.002 kg
green	3.2 VDC @ 20 mA	customer-specific	2 mA	Plastic green translucent	Solder	18-040.0055L	1	1	0.002 kg
		12 VDC ±10 %	10 mA	Plastic red translucent	Solder	18-041.0052L	1	1	0.002 kg
			10 mA	Plastic yellow translucent	Solder	18-041.0054L	1	1	0.002 kg
		24 VDC ±10 %	10 mA	Plastic red translucent	Solder	18-042.0052L	1	1	0.002 kg
			10 mA	Plastic yellow translucent	Solder	18-042.0054L	1	1	0.002 kg
			2 mA	Plastic green translucent	Solder	18-042.0055L	1	1	0.002 kg

LED colour	Forward voltage typ.	Operating voltage	Operation current	Lens	Terminal	Part No.	Component layout	Wiring diagram	Weight
 <p>Indicator actuator, Front dimension Ø 9 mm</p>									
red	2.0 VDC @ 20 mA	customer-specific	10 mA	Plastic red translucent	Solder	18-030.0052L	1	1	0.002 kg
white	3.0 VDC @ 20 mA	customer-specific	10 mA	Plastic yellow translucent	Solder	18-030.0054L	1	1	0.002 kg
green	3.2 VDC @ 20 mA	customer-specific	2 mA	Plastic green translucent	Solder	18-030.0055L	1	1	0.002 kg
		12 VDC ±10 %	10 mA	Plastic red translucent	Solder	18-031.0052L	1	1	0.002 kg
			10 mA	Plastic yellow translucent	Solder	18-031.0054L	1	1	0.002 kg
			2 mA	Plastic green translucent	Solder	18-031.0055L	1	1	0.002 kg
		24 VDC ±10 %	10 mA	Plastic red translucent	Solder	18-032.0052L	1	1	0.002 kg
			10 mA	Plastic yellow translucent	Solder	18-032.0054L	1	1	0.002 kg
			2 mA	Plastic green translucent	Solder	18-032.0055L	1	1	0.002 kg

The component layouts you will find from page 20

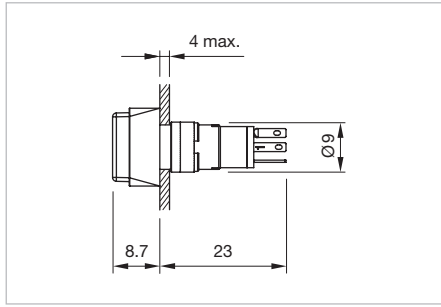


18 Raised design

Pushbutton, IP 40



Product can differ from the current configuration.



Dimensions [mm]

Equipment consisting of (schematic overview)



Lens

page 14



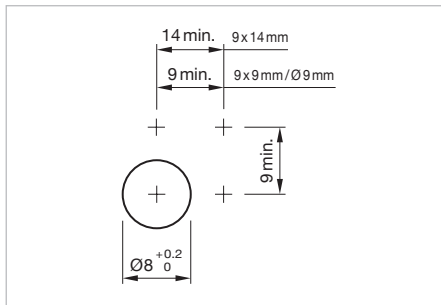
Actuator



Fixing nut

Additional Information




- +/- terminals are not connected



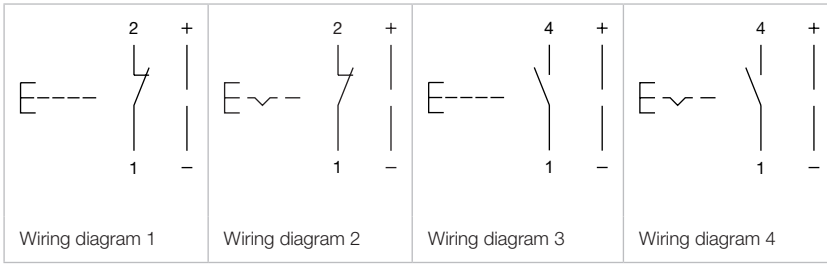
Mounting cut-outs [mm]

Each Part Number listed below includes all the black components shown in the 3D-drawing.

To obtain a complete unit, please select the red components from the pages shown.

Switching system	Contacts	Switching action	Terminal	Part No.	Component layout	Wiring diagram	Weight
 <p>Pushbutton actuator, Front dimension 9 x 9 mm</p>							
Snap-action switching element	1 NC	B	Solder	18-158.035	2	1	0.002 kg
		C	Solder	18-258.035	2	2	0.002 kg
	1 NO	B	Solder	18-157.035	2	3	0.002 kg
		C	Solder	18-257.035	2	4	0.002 kg
 <p>Pushbutton actuator, Front dimension 9 x 14 mm</p>							
Snap-action switching element	1 NC	B	Solder	18-148.035	2	1	0.002 kg
		C	Solder	18-248.035	2	2	0.002 kg
	1 NO	B	Solder	18-147.035	2	3	0.002 kg
		C	Solder	18-247.035	2	4	0.002 kg
 <p>Pushbutton actuator, Front dimension Ø 9 mm</p>							
Snap-action switching element	1 NC	B	Solder	18-138.035	2	1	0.002 kg
		C	Solder	18-238.035	2	2	0.002 kg
	1 NO	B	Solder	18-137.035	2	3	0.002 kg
		C	Solder	18-237.035	2	4	0.002 kg

Contacts: NC = Normally closed, NO = Normally open
 Switching action: B = Momentary, C = Maintain
 The component layouts you will find from page 20

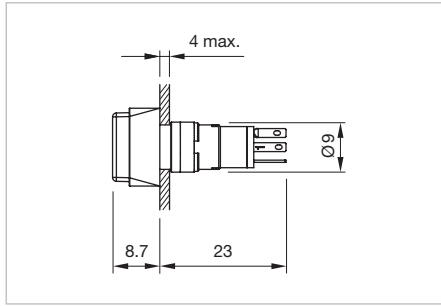


18 Raised design

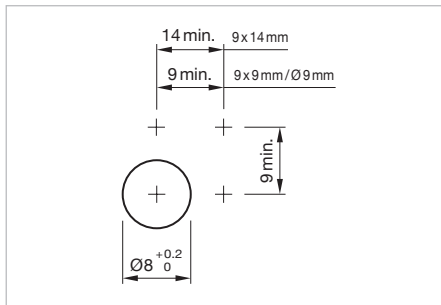
Illuminated pushbutton, IP 40



Product can differ from the current configuration.



Dimensions [mm]



Mounting cut-outs [mm]

Equipment consisting of (schematic overview)



Lens

page 14






Actuator



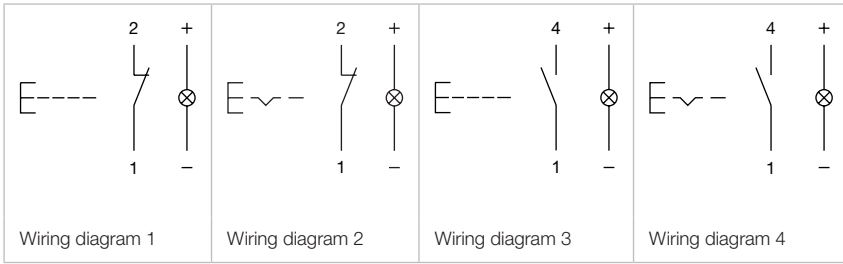
Fixing nut

Each Part Number listed below includes all the black components shown in the 3D-drawing.



To obtain a complete unit, please select the red components from the pages shown.

Switching system	Contacts	Switching action	Terminal	Part No.	Component layout	Wiring diagram	Weight
 <p>Illuminated pushbutton actuator, Front dimension 9 x 9 mm</p>							
Snap-action switching element	1 NC	B	Solder	18-158.035	2	1	0.002 kg
		C	Solder	18-258.035	2	2	0.002 kg
	1 NO	B	Solder	18-157.035	2	3	0.002 kg
		C	Solder	18-257.035	2	4	0.002 kg
 <p>Illuminated pushbutton actuator, Front dimension 9 x 14 mm</p>							
Snap-action switching element	1 NC	B	Solder	18-148.035	2	1	0.002 kg
		C	Solder	18-248.035	2	2	0.002 kg
	1 NO	B	Solder	18-147.035	2	3	0.002 kg
		C	Solder	18-247.035	2	4	0.002 kg
 <p>Illuminated pushbutton actuator, Front dimension Ø 9 mm</p>							
Snap-action switching element	1 NC	B	Solder	18-138.035	2	1	0.002 kg
		C	Solder	18-238.035	2	2	0.002 kg
	1 NO	B	Solder	18-137.035	2	3	0.002 kg
		C	Solder	18-237.035	2	4	0.002 kg

Contacts: NC = Normally closed, NO = Normally open
 Switching action: B = Momentary, C = Maintain
 The component layouts you will find from page 20





Lens without LED flush design

Dimension	Lens	Part No.	Weight
 <p>Lens without LED flush design</p>			
13.8 x 13.8 mm	Plastic black opaque	18-982.0	0.001 kg
	Plastic red translucent	18-982.2	0.001 kg
	Plastic yellow translucent	18-982.4	0.001 kg
	Plastic green translucent	18-982.5	0.001 kg
	Plastic grey opaque	18-982.8	0.001 kg
	Plastic white translucent	18-982.9	0.001 kg
 <p>Lens without LED flush design</p>			
Ø 13.8 mm	Plastic black opaque	18-962.0	0.001 kg
	Plastic red translucent	18-962.2	0.001 kg
	Plastic yellow translucent	18-962.4	0.001 kg
	Plastic green translucent	18-962.5	0.001 kg
	Plastic grey opaque	18-962.8	0.001 kg
	Plastic white translucent	18-962.9	0.001 kg




Lens with LED flush design

Additional Information

- Luminosity and wave length variations caused by LED manufacturing processes may cause slight differences regarding the illumination

Dimension	Lens	Part No.	Weight
 <p>Lens with LED flush design</p>			
13.8 x 13.8 mm	Plastic red translucent	18-981.2L	0.001 kg
	Plastic yellow translucent	18-981.4L	0.001 kg
	Plastic green translucent	18-981.5L	0.001 kg
 <p>Lens with LED flush design</p>			
Ø 13.8 mm	Plastic red translucent	18-961.2L	0.001 kg
	Plastic yellow translucent	18-961.4L	0.001 kg
	Plastic green translucent	18-961.5L	0.001 kg

Lens without LED raised design




Dimension	Lens	Part No.	Weight
 <p>Lens without LED raised design</p>			
7.5 x 7.5 mm	Plastic black opaque	18-952.0	0.001 kg
	Plastic red translucent	18-952.2	0.001 kg
	Plastic yellow translucent	18-952.4	0.001 kg
	Plastic green translucent	18-952.5	0.001 kg
	Plastic grey opaque	18-952.8	0.001 kg
	Plastic white translucent	18-952.9	0.001 kg
 <p>Lens without LED raised design</p>			
7.5 x 12.5 mm	Plastic black opaque	18-942.0	0.001 kg
	Plastic red translucent	18-942.2	0.001 kg
	Plastic yellow translucent	18-942.4	0.001 kg
	Plastic green translucent	18-942.5	0.001 kg
	Plastic grey opaque	18-942.8	0.001 kg
	Plastic white translucent	18-942.9	0.001 kg
 <p>Lens without LED raised design</p>			
Ø 7.5 mm	Plastic black opaque	18-932.0	0.001 kg
	Plastic red translucent	18-932.2	0.001 kg
	Plastic yellow translucent	18-932.4	0.001 kg
	Plastic green translucent	18-932.5	0.001 kg
	Plastic grey opaque	18-932.8	0.001 kg
	Plastic white translucent	18-932.9	0.001 kg

18 Accessories


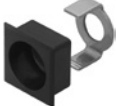

Lens with LED raised design

Additional Information

- Without built-in series resistor, typical forward voltage 2.2 VDC @ 20 mA
- Luminosity and wave length variations caused by LED manufacturing processes may cause slight differences regarding the illumination

Dimension	Lens	Part No.	Weight
 Lens with LED raised design			
7.5 x 7.5 mm	Plastic red translucent	18-951.2L	0.001 kg
	Plastic yellow translucent	18-951.4L	0.001 kg
	Plastic green translucent	18-951.5L	0.001 kg
 Lens with LED raised design			
7.5 x 12.5 mm	Plastic red translucent	18-941.2L	0.001 kg
	Plastic yellow translucent	18-941.4L	0.001 kg
	Plastic green translucent	18-941.5L	0.001 kg
 Lens with LED raised design			
Ø 7.5 mm	Plastic red translucent	18-931.2L	0.001 kg
	Plastic yellow translucent	18-931.4L	0.001 kg
	Plastic green translucent	18-931.5L	0.001 kg



Front bezel set

Product attribute	Mounting cut-out	Front bezel	Part No.	Weight
 Front bezel set, flush design, Front dimension 19 x 19 mm				
for square lens	15.8 x 15.8 mm	Plastic black	18-920.1	0.006 kg
 Front bezel set, flush design, Front dimension 19 x 19 mm				
for round lens	15.8 x 15.8 mm	Plastic black	18-920.2	0.006 kg
 Front bezel set, flush design, Front dimension Ø 19 mm				
for round lens	Ø 16 mm	Plastic black	18-920.3	0.006 kg

Blind plug

Additional Information

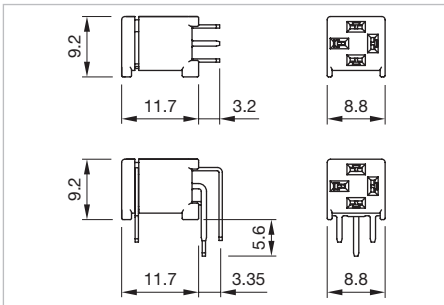
- The dimensions of the mounting cut-outs are shown in the product details

Dimension	Mounting cut-out	Material	Colour	Part No.	Weight
 Blind plug					
9 x 9 mm	Ø 8 mm	Plastic	black	19-948.0	0.001 kg
 Blind plug					
Ø 9 mm	Ø 8 mm	Plastic	black	19-949.0	0.001 kg



18 Accessories

Rear side

PCB plug-in base




Dimensions [mm]

pins	Terminal	Part No.	Component layout	Weight
 <p>PCB plug-in base</p>				
axial	PCB	18-945	3	0.001 kg
 <p>PCB plug-in base</p>				
right-angled	PCB	18-946	4	0.001 kg

The component layouts you will find from page 20

Mounting


Lens remover

Part No.	Weight
 <p>Lens remover</p>	
18-910	0.002 kg

Mounting tool

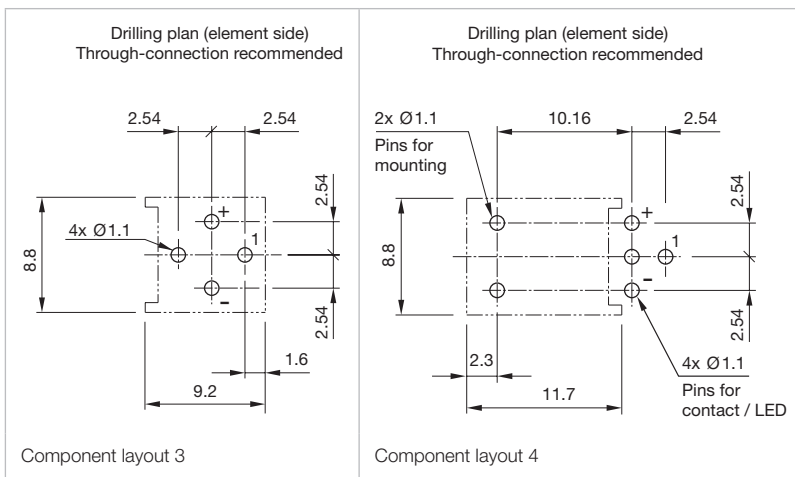
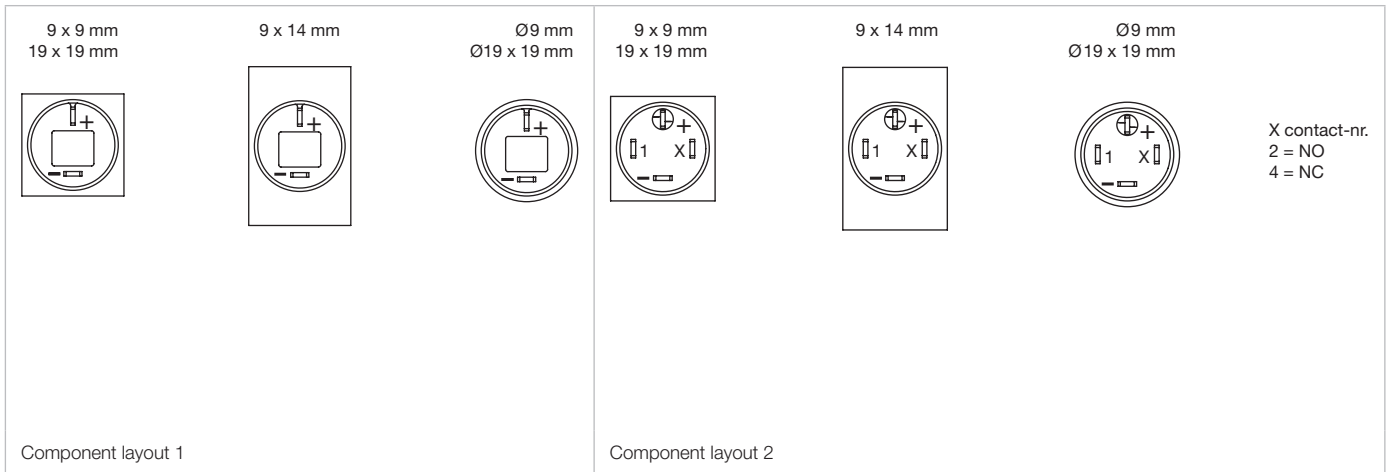
Additional Information

- For fixing nut long Part No. 19-991

Part No.	Weight
 <p>Mounting tool</p>	
19-905	0.011 kg

18 Drawings

Drawings



Actuator with snap-action switching element
Switching system

The snap-action switching system was designed for switching low powers in electronic circuits.
Single-break snap-action contact.

Material
Lens

Polymethylacrylate (PMMA), Polycarbonate (PC)

Material of contact

Gold contact on nickel plating

Actuator housing

Polyamide, colour black

Mechanical characteristics
Terminals

The terminals can be used as soldering terminals.
Max. wire diameter: $2 \times 0.5 \text{ mm}^2$
Max. wire cross-section of stranded cable $1 \times 0.75 \text{ mm}^2$
Wire cross-section of terminal $1.6 \times 0.4 \text{ mm}$

Tightening torque

for fixing nut max. 20 Ncm

Actuating force

1.4 N

Actuating travel

$2.2 \text{ mm} \pm 0.2 \text{ mm}$

Rebound time

$\leq 2.5 \text{ ms}$

Mechanical lifetime

Momentary action 2 million cycles of operation
Maintained action 1 million cycles of operation,
as per IEC 60512-5-9a

Electrical characteristics
Illumination

Operating voltage LED: 12 VDC $\pm 10\%$
24 VDC $\pm 10\%$
customer-specific *)

*) The series resistance for LEDs need to be determined and integrated by customers.

Operating current:	red	typ. 10 mA
	yellow	typ. 10 mA
	green	typ. 2 mA
	white	typ. 10 mA
	blue	typ. 10 mA

Contact resistance

$\leq 100 \text{ m}\Omega$ starting value (initial), as per IEC 60512-2-2b

Electrical life

$\geq 500\,000$ cycles of operation at 30 VDC, 100 mA, according to IEC 61058-1

Switch rating

min. $10 \mu\text{A}$ at $100 \mu\text{V}$
max. 100 mA at 42 VAC/VDC

Electric strength

500 VAC, 50 Hz, 1 min. between all terminals and earth,
as per IEC 60512-2-11

Environmental conditions
Storage temperature

$-40^\circ\text{C} \dots +80^\circ\text{C}$

Service temperature

$-25^\circ\text{C} \dots +65^\circ\text{C}$

Protection degree

IP 40 front side, as per IEC 60529

Shock resistance

(Single impacts, semi-sinusoidal)
50 g for 11 ms, as per IEC 60068-2-27

Vibration resistance

(sinusoidal) 10 g at 10–2000 Hz, amplitude 0.75 mm,
as per IEC 60512-4-4

EAO reserves the right to alter specifications without further notice.

18 Application guidelines

Suppressor circuits

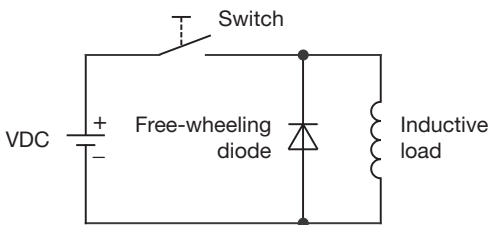
When switching inductive loads such as relays, DC motors, and DC solenoids, it is always important to absorb surges (e.g. with a diode) to protect the contacts. When these inductive loads are switched off, a counter emf can severely damage switch contacts and greatly shorten lifetime.

Fig. 1 shows an inductive load with a free-wheeling diode connected in parallel. This free-wheeling diode provides a path for the inductor current to flow when the current is interrupted by the switch. Without this free-wheeling diode, the voltage across the coil will be limited only by dielectric breakdown voltages of the circuit or parasitic elements of the coil. This voltage can be kilovolts in amplitude even when nominal circuit voltages are low (e.g. 12VDC) see Fig. 2.

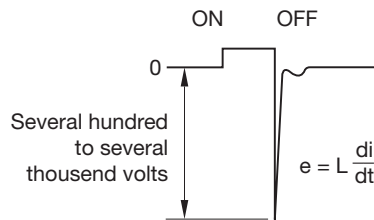
The free-wheeling diode should be chosen so that the reverse breakdown voltage is greater than the voltage driving the inductive load. The DC blocking voltage (VR) of the free-wheeling diode can be found in the datasheet of a diode. The forward current should be equal or greater than the maximum current flowing through the load.

To get an efficient protection, the free-wheeling diode must be connected as close as possible to the inductive load!

Switching with inductive load
Fig. 1



Counter EMF
over load without free-wheeling diode
Fig. 2



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18-030.0055L	9	18-287.035	7		
18-031.0052L	9	18-288.035	6		
18-031.0054L	9	18-288.035	7		
18-031.0055L	9	18-910	19		
18-032.0052L	9	18-920.1	16		
18-032.0054L	9	18-920.2	16		
18-032.0055L	9	18-920.3	16		
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18-040.0054L	8	18-931.4L	16		
18-040.0055L	8	18-931.5L	16		
18-041.0052L	8	18-932.0	15		
18-041.0054L	8	18-932.2	15		
18-041.0055L	8	18-932.4	15		
18-042.0052L	8	18-932.5	15		
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18-050.0052L	8	18-941.2L	16		
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18-050.0055L	8	18-941.5L	16		
18-051.0052L	8	18-942.0	15		
18-051.0054L	8	18-942.2	15		
18-052.0052L	8	18-942.4	15		
18-052.0054L	8	18-942.5	15		
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18-062.0052L	5	18-952.0	15		
18-062.0054L	5	18-952.2	15		
18-062.0055L	5	18-952.4	15		
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18-147.035	12	18-981.2L	14		
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18-157.035	10	18-982.0	14		
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