























## Illuminated pushbutton actuator



### Essential Accessories:

-  Front bezel flush page 10
-  Lens plastic page 10
-  Single-LED page 12

	Front protection	Switching system	Contacts	Switching action	Terminals	□ 24 x 36 mm Typ-Nr.	Mounting dimensions	Technical drawing	Circuit drawing	
<b>Illuminated pushbutton actuator</b>	IP 65	SA	1 NC	MA	PT 6.3	<b>22-222.014</b>	1	3	3	0.032
					ST	<b>22-222.011</b>	1	3	3	0.037
				M	PT 6.3	<b>22-212.014</b>	1	3	8	0.032
					ST	<b>22-212.011</b>	1	3	8	0.037
			1 NC + 1 NO	MA	PT 6.3	<b>22-225.014</b>	1	3	5	0.034
					ST	<b>22-225.011</b>	1	3	5	0.044
				M	PT 6.3	<b>22-215.014</b>	1	3	10	0.034
					ST	<b>22-215.011</b>	1	3	10	0.044
			1 NO	MA	PT 6.3	<b>22-221.014</b>	1	3	4	0.032
					ST	<b>22-221.011</b>	1	3	4	0.037
				M	PT 6.3	<b>22-211.014</b>	1	3	9	0.032
					ST	<b>22-211.011</b>	1	3	9	0.037
			2 NC	MA	PT 6.3	<b>22-224.014</b>	1	3	2	0.034
					ST	<b>22-224.011</b>	1	3	2	0.044
				M	PT 6.3	<b>22-214.014</b>	1	3	7	0.034
					ST	<b>22-214.011</b>	1	3	7	0.044
			2 NO	MA	PT 6.3	<b>22-223.014</b>	1	3	6	0.044
					ST	<b>22-223.011</b>	1	3	6	0.044
				M	PT 6.3	<b>22-213.014</b>	1	3	11	0.034
					ST	<b>22-213.011</b>	1	3	11	0.044

Switching system: SA = Snap-action switching element

Contacts: NC = Normally closed, NO = Normally open

Switching action: MA = Maintained action, M = Momentary action



Terminals: PT 6.3 = Plug-in terminal 6.3 mm, ST = Screw terminal


Mounting dimensions from page 17, Technical drawing from page 17, Circuit drawing from page 19

## Mushroom-head pushbutton actuator



### Essential Accessories:

-  Front bezel flush page 10
-  Mushroom-head cap page 10

	Switching system	Contacts	Switching action	Terminals	□ 24 x 36 mm Typ-Nr.	Mounting dimensions			
						Technical drawing	Circuit drawing		
<b>Mushroom-head pushbutton actuator</b>	SA	1 NC	MA	PT 6.3	<b>22-222.014</b>	1	4	3	0.032
				ST	<b>22-222.011</b>	1	4	3	0.037
			M	PT 6.3	<b>22-212.014</b>	1	4	8	0.032
				ST	<b>22-212.011</b>	1	4	8	0.037
		1 NC + 1 NO	MA	PT 6.3	<b>22-225.014</b>	1	4	5	0.034
				ST	<b>22-225.011</b>	1	4	5	0.044
			M	PT 6.3	<b>22-215.014</b>	1	4	10	0.034
				ST	<b>22-215.011</b>	1	4	10	0.044
		1 NO	MA	PT 6.3	<b>22-221.014</b>	1	4	4	0.032
				ST	<b>22-221.011</b>	1	4	4	0.037
			M	PT 6.3	<b>22-211.014</b>	1	4	9	0.032
				ST	<b>22-211.011</b>	1	4	9	0.037
		2 NC	MA	PT 6.3	<b>22-224.014</b>	1	4	2	0.034
				ST	<b>22-224.011</b>	1	4	2	0.044
			M	PT 6.3	<b>22-214.014</b>	1	4	7	0.034
				ST	<b>22-214.011</b>	1	4	7	0.044
		2 NO	MA	PT 6.3	<b>22-223.014</b>	1	4	6	0.044
				ST	<b>22-223.011</b>	1	4	6	0.044
			M	PT 6.3	<b>22-213.014</b>	1	4	11	0.034
				ST	<b>22-213.011</b>	1	4	11	0.044

Switching system: SA = Snap-action switching element

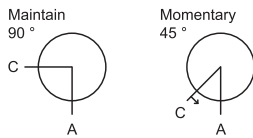
Contacts: NC = Normally closed, NO = Normally open

Switching action: MA = Maintained action, M = Momentary action

Terminals: PT 6.3 = Plug-in terminal 6.3 mm, ST = Screw terminal

Mounting dimensions from page 17, Technical drawing from page 17, Circuit drawing from page 19

## Keylock switch 2 positions



	Front protection	Switching system	Contacts	Switching action	Terminals	Key remove	□ 24 x 36 mm Typ-Nr.	Mounting dimensions	Technical drawing	Circuit drawing		
<b>Keylock switch 2 positions</b> Position A : Basic position Position C : Maintained action Standard lock 311 Front : Plastic black	IP 65	SA	1 NC + 1 NO	MA	PT 6.3	A	<b>22-335.114D</b>	1	5	16	0.046	
						C	<b>22-335.314D</b>	1	5	16	0.046	
						C + A	<b>22-335.514D</b>	1	5	16	0.046	
					ST	A	<b>22-335.111D</b>	1	5	16	0.051	
						C	<b>22-335.311D</b>	1	5	16	0.051	
						C + A	<b>22-335.511D</b>	1	5	16	0.051	
				1 NO	MA	PT 6.3	A	<b>22-331.114D</b>	1	5	15	0.046
							C	<b>22-331.314D</b>	1	5	15	0.044
							C + A	<b>22-331.514D</b>	1	5	15	0.040
			ST		A	<b>22-331.111D</b>	1	5	15	0.051		
					C	<b>22-331.311D</b>	1	5	15	0.044		
					C + A	<b>22-331.511D</b>	1	5	15	0.044		
			2 NO	MA	PT 6.3	A	<b>22-333.114D</b>	1	5	17	0.046	
						C	<b>22-333.314D</b>	1	5	17	0.046	
						C + A	<b>22-333.514D</b>	1	5	17	0.046	
ST	A	<b>22-333.111D</b>			1	5	17	0.051				
	C	<b>22-333.311D</b>			1	5	17	0.051				
	C + A	<b>22-333.511D</b>			1	5	17	0.051				
Position A : Basic position Position C : Momentary action Standard lock 311 Front : Plastic black	IP 65	SA		1 NC + 1 NO	M	PT 6.3	A	<b>22-355.114D</b>	1	5	13	0.046
						ST	A	<b>22-355.111D</b>	1	5	13	0.051
					1 NO	M	PT 6.3	A	<b>22-351.114D</b>	1	5	12
			ST	A			<b>22-351.111D</b>	1	5	12	0.051	
			2 NO	M		PT 6.3	A	<b>22-353.114D</b>	1	5	14	0.046
					ST	A	<b>22-353.111D</b>	1	5	14	0.051	

Other lock numbers on request

Switching system: SA = Snap-action switching element

Contacts: NC = Normally closed, NO = Normally open


Switching action: MA = Maintained action, M = Momentary action

Terminals: PT 6.3 = Plug-in terminal 6.3 mm, ST = Screw terminal

Mounting dimensions from page 17, Technical drawing from page 17, Circuit drawing from page 19

## Front


### Lens plastic

	Lens	⌀ 24 x 36 mm Typ-Nr.	 kg
<b>Lens plastic illuminative</b>	blue transparent	<b>22-903.6</b>	0.003
	colourless transparent	<b>22-903.7</b>	0.003
	green transparent	<b>22-903.5</b>	0.003
	orange transparent	<b>22-903.3</b>	0.003
	red transparent	<b>22-903.2</b>	0.003
	smoked transparent	<b>22-903.1</b>	0.003
	yellow transparent	<b>22-903.4</b>	0.003
illuminative (not recommended for film insert)	colourless transparent	<b>22-905.7</b>	0.003
	green transparent	<b>22-905.5</b>	0.003
	red transparent	<b>22-905.2</b>	0.003
	yellow transparent	<b>22-905.4</b>	0.003
illuminative (not recommended for film insert, bright LED's are visible)	blue translucent	<b>22-901.6</b>	0.003
	green translucent	<b>22-901.5</b>	0.003
	orange translucent	<b>22-901.3</b>	0.003
	red translucent	<b>22-901.2</b>	0.003
	white translucent	<b>22-901.9</b>	0.003
	yellow translucent	<b>22-901.4</b>	0.003
non-illuminative	black opaque	<b>22-901.0</b>	0.003
	grey opaque	<b>22-901.8</b>	0.003




### Mushroom-head cap

use Front bezel flush

	Mushroom had cap	⌀ 24 x 36 mm Typ-Nr.	 kg
<b>Mushroom-head cap non-illuminative</b>	Plastic black opaque	<b>22-930.0</b>	0.006
	Plastic green opaque	<b>22-930.5</b>	0.006
	Plastic red opaque	<b>22-930.2</b>	0.006
	Plastic yellow opaque	<b>22-930.4</b>	0.006




### Front bezel flush

	Front bezel	⌀ 24 x 36 mm Typ-Nr.	 kg
<b>Front bezel flush</b>	Plastic black	<b>02-965.0</b>	0.001



### Front bezel raised

Lens only removable with lens remover 98-969

	Front bezel	⌀ 24 x 36 mm Typ-Nr.	 kg
<b>Front bezel raised</b>	Plastic black	<b>02-967.0</b>	0.001





## Protective cover

use Front bezel flush



		□ 24 x 36 mm Typ-Nr.	Technical drawing		
<b>Protective cover</b> hinged, transparent, with means for sealing		<b>22-925</b>	1	0.004	

Technical drawing from page 17



## Blind plug

		□ 24 x 36 mm Typ-Nr.		
<b>Blind plug</b> Mounting hole size 16 mm dia.	Blind plug Plastic black	<b>22-949.0</b>		0.005

## Master key

		Typ-Nr.		
<b>Master key</b> Lock numbers 311 ... 445 (DOM)		<b>31-989.300</b>		0.006


## Spare key

		Typ-Nr.		
<b>Spare key</b> Key lock switch, standard lock 311 (DOM)		<b>31-989.311</b>		0.006

Other lock numbers on request


## Illumination

## Filament lamp

	Socket	Operating voltage/-current	Typ-Nr.	
Filament lamp	T1 3/4 MG	12 VAC/DC, 75 mA	<b>10-1309.1309</b>	0.001
		14 VAC/DC, 80 mA	<b>10-1310.1319</b>	0.001
		18 VAC/DC, 40 mA	<b>10-1311.1249</b>	0.001
		24 VAC/DC, 35 mA	<b>10-1312.1229</b>	0.001
		28 VAC/DC, 30 mA	<b>10-1313.1209</b>	0.001
		28 VAC/DC, 40 mA	<b>10-1313.1249</b>	0.001
		36 VAC/DC, 20 mA	<b>10-1316.1179</b>	0.001
		36 VAC/DC, 30 mA	<b>10-1316.1209</b>	0.001
		48 VAC/DC, 20 mA	<b>10-1319.1179</b>	0.001
		48 VAC/DC, 25 mA	<b>10-1319.1199</b>	0.001
		6 VAC/DC, 120 mA	<b>10-1306.1349</b>	0.001
		6.3 VAC/DC, 200 mA	<b>10-1307.1369</b>	0.001



## Single-LED


	Socket	Light colour	Operating voltage/-current	Typ-Nr.	
Single-LED	T1 3/4 MG	blue	12 VAC/DC, 7/14 mA	<b>10-2J09.1066</b>	0.002
			24 VAC/DC, 7/14 mA	<b>10-2J12.1066</b>	0.002
			28 VAC/DC, 7/14 mA	<b>10-2J13.1066</b>	0.002
			48 VAC/DC, 4/8 mA	<b>10-2J19.1046</b>	0.002
			6 VDC, 15 mA	<b>10-2J06.3146</b>	0.002
		green	12 VAC/DC, 4/7 mA	<b>10-2J09.1065</b>	0.002
			24 VAC/DC, 4/7 mA	<b>10-2J12.1065</b>	0.002
			28 VAC/DC, 4/7 mA	<b>10-2J13.1065</b>	0.002
			48 VAC/DC, 2/4 mA	<b>10-2J19.1045</b>	0.002
			6 VDC, 7 mA	<b>10-2J06.3145</b>	0.002
		red	12 VAC/DC, 7/14 mA	<b>10-2J09.1062</b>	0.002
			24 VAC/DC, 7/14 mA	<b>10-2J12.1062</b>	0.002
			28 VAC/DC, 7/14 mA	<b>10-2J13.1062</b>	0.002
			48 VAC/DC, 4/8 mA	<b>10-2J19.1042</b>	0.002
			6 VDC, 15 mA	<b>10-2J06.3142</b>	0.002
		white diffuse	12 VAC/DC, 7/14 mA	<b>10-2J09.1069</b>	0.002
			24 VAC/DC, 7/14 mA	<b>10-2J12.1069</b>	0.002
			28 VAC/DC, 7/14 mA	<b>10-2J13.1069</b>	0.002
			48 VAC/DC, 4/8 mA	<b>10-2J19.1049</b>	0.002
			6 VDC, 15 mA	<b>10-2J06.3149</b>	0.002
		yellow	12 VAC/DC, 7/14 mA	<b>10-2J09.1064</b>	0.002
			24 VAC/DC, 7/14 mA	<b>10-2J12.1064</b>	0.002
			28 VAC/DC, 7/14 mA	<b>10-2J13.1064</b>	0.002
			48 VAC/DC, 4/8 mA	<b>10-2J19.1044</b>	0.002
			6 VDC, 15 mA	<b>10-2J06.3144</b>	0.002



Note:  
AC operation through halve-wave rectifier possible, slight flickering can occur.

## Series resistor

for lamp voltage reduction


	Operating voltage	Typ-Nr.	
<b>Series resistor</b> 10 kΩ, for filament lamp 48 VAC, 25 mA	230/240 V	<b>02-904.7</b>	0.003
2.7 kΩ, for filament lamp 48 VAC, 25 mA	110 V	<b>02-904.0</b>	0.003
3.3 kΩ, for filament lamp 48 VAC, 25 mA	125 V	<b>02-904.1</b>	0.003
4.7 kΩ, for filament lamp 48 VAC, 25 mA	145 V	<b>02-904.3</b>	0.003



Please keep to the country specific security rules.

## Terminal plate empty


for fitting with series resistors

	Typ-Nr.	
<b>Terminal plate empty</b> 10 spaces 125 x 60 x 15 mm	<b>02-912.2</b>	0.045
15 spaces 187.5 x 60 x 15 mm	<b>02-912.3</b>	0.090
20 spaces 250 x 60 x 15 mm	<b>02-912.4</b>	0.095
5 spaces 62.5 x 60 x 15 mm	<b>02-912.1</b>	0.025




## Assembling

### Lens remover

	Typ-Nr.	
<b>Lens remover</b> for flush front bezel	<b>02-905</b>	0.011
for raised front bezel	<b>98-968</b>	0.004



### Lamp remover

	Typ-Nr.	
<b>Lamp remover</b>	<b>61-9740.0</b>	0.003




CAUTION

A switching process might be released when replacing the lamp/LED !

### Dismantling tool

for dismantling the lens from the holder

	Typ-Nr.	
<b>Dismantling tool</b>	<b>22-938</b>	0.030



## Actuator with snap-action switching element

### Switching system

Self-cleaning, double-break, snap-action switching system (with contact gap 2 x 1.5 mm).  
Max. 2 normally closed or 2 normally open contacts, or one of each.

### Material

#### Lens

Polymethylmethacrylate PMMA, as per UL 94 HB, Polycarbonate (PC), as per UL 94 V0

#### Front bezel

Polyphenylenoxide (PPO)

#### Material of contact

Hard silver

#### Actuator housing

Polyamide (PA), Polytherimide (PEI)

### Mechanical characteristics

#### Terminals

Screw terminal (with self-lifting clip):  
Max. wire cross-section 2 x 2.5 mm<sup>2</sup>  
Max. wire cross-section of stranded cable 2 x 1.5 mm<sup>2</sup>

Plug-in terminal 6.3 x 0.8 mm

#### Actuating force

with 1 switching element 3.6 N ±0.3 N  
with 2 switching elements 6.8 N ±0.3 N

#### Actuating travel

5.5 mm ±0.2 mm

#### Travel

3 mm

#### Rebound time

≤3 ms

#### Mechanical lifetime

Illuminated pushbutton 1 million operations  
Keylock switch 40 000 operations

### Electrical characteristics

#### Contact resistance

Starting value ≤50 mΩ, as per IEC 60512-2-4

#### Isolation resistance

≥100M Ω between all contacts at 100 VDC, as per IEC 60512-2-10

#### Switch rating

Power rating  
min. 12 VAC, 50 mA  
max. 400 VAC, 10 A

Switch rating AC (cosφ 0,7), service category AC-11

Voltage	125 VAC	250 VAC	380 VAC
Current	8 A	5 A	3 A
Operations	≥100 000		

Switch rating DC (inductive) L:R = 30 ms, service categorie DC-11

Voltage	24 V	60 V	110 V	220 V
Current	6 A	1.5 A	0.4 A	0.2 A
Operations	≥100 000			

#### Electric strength

2500 VAC, 50 Hz, 1 min. between all terminals and earth, as per IEC 60512-2-11.

### Environmental conditions

#### Storage temperature

-40 °C ... +95 °C

#### Service temperature

-25 °C ... +85 °C

#### Protection degree

Terminal/case IP 20  
Front IP 65 as per IEC 60529

#### Shock resistance

50 g for 11 ms, as per IEC 60512-4-3

#### Vibration resistance

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

### Approvals

#### Approbations

CB (IEC 61058)  
CSA  
ENEC (EN 61058)  
UL  
VDE

#### Declaration of conformity

CE



## Suppressor circuits

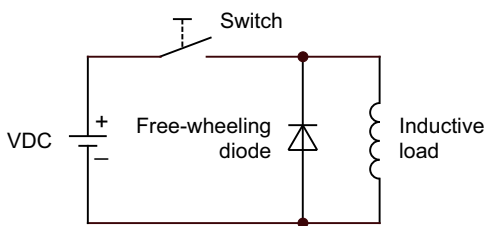
When switching inductive loads such as relays, DC motors, and DC solenoids, it is always important to absorb surges (e.g. with a diode) to protect the contacts. When these inductive loads are switched off, a counter emf can severely damage switch contacts and greatly shorten lifetime.

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. 12 VDC) see Fig. 2.

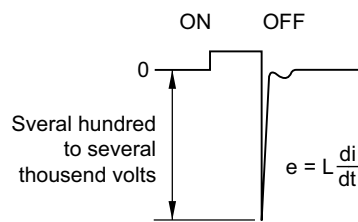
The free-wheeling diode should be chosen so that the reverse breakdown voltage is greater than the voltage driving the inductive load. The DC blocking voltage ( $V_R$ ) of the free-wheeling diode can be found in the datasheet of a diode. The forward current should be equal or greater than the maximum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



## General notes

### 1. Engraving

In addition to the most commonly used world languages, in DIN 1451-3 close spacing, other typefaces are available as Scandinavian, Slavic, Greek, Russian and Polish.

Red, blue and black lenses are filled with white colour. Other colour lenses are filled in black. Standard height of letters is 3 mm. If the height is not specified, we will supply 3 mm engraved letters.

### 2. Hot stamping

For larger series it is worth considering markings by means of hot stamping. We will be pleased to advise you.

For letters and figures, typefaces with 2.5 mm, 3 mm and 4 mm are available.

### 3. Film inserts

Instead of using engraving the lenses can be fitted with transparent film inserts, as an alternative. For this purpose, though, it is advisable to use transparent lenses.

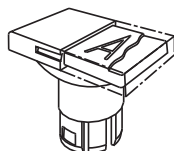
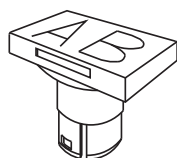
In the case of use of a smoke-black lens the fitted film becomes readable only if the lamp is on.

The film thickness is 0.2 mm.

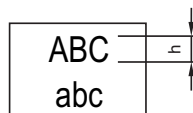
**Important :** Consider pushbutton mounting orientation before specifying engraving characters !

All dimensions in mm

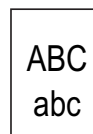
Film insert max. size	Height of letters h	Number of lines	Number of (target value) capital letters per line	Number of (target value) small letters per line	Image
14.3 x 22.4	3	4	11	13	B1
			7 - 8	8 - 9	B2
	4	2	7	9	B1
			4	5	B2
	5	2	5 - 6	6 - 7	B1
			3	3 - 4	B2
	6	1	5	6	B1
			2	3	B2
	8	1	3	4	B1
			2	2	B2



B1

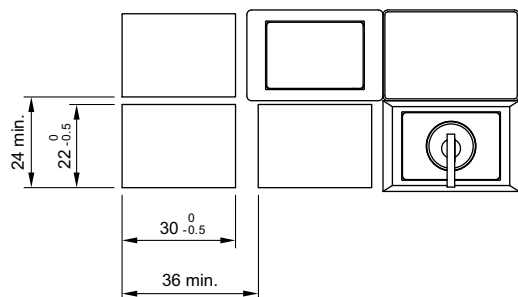


B2



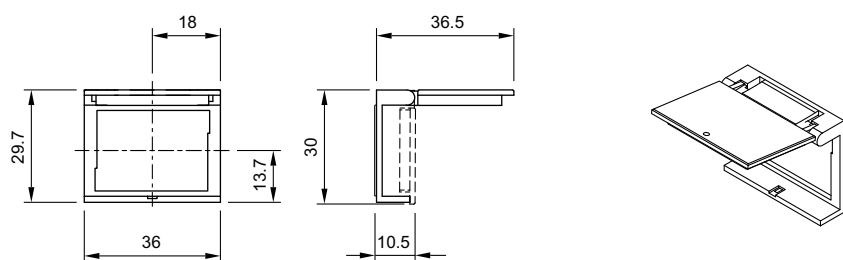
## Mounting dimensions

1 Indicator actuator page 6 | Illuminated pushbutton actuator page 7 | Mushroom-head pushbutton actuator page 8 | Keylock switch 2 positions page 9

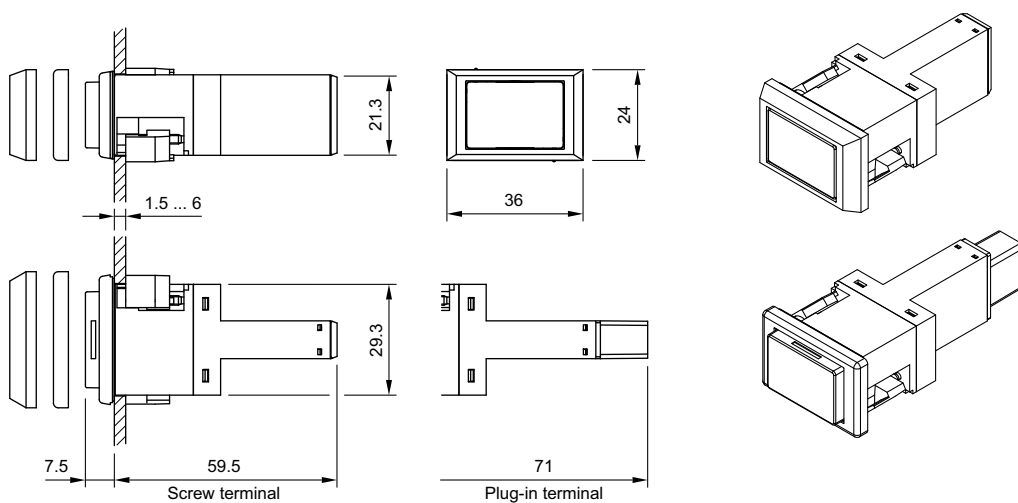


## Technical drawing

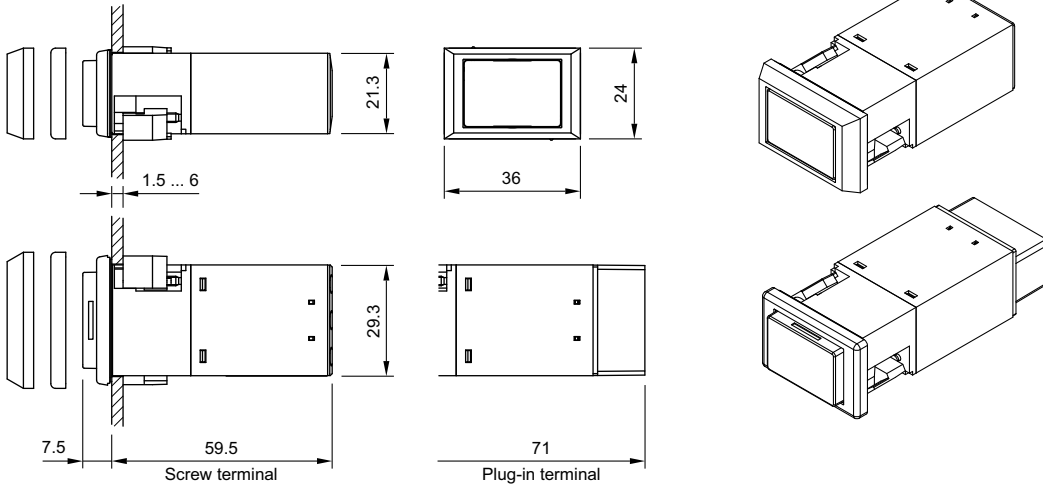
1 Protective cover page 11



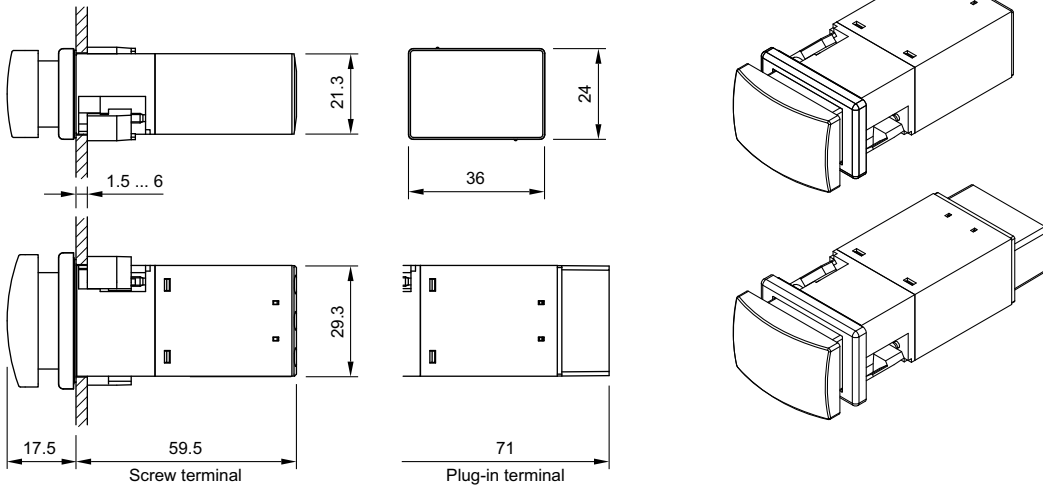
2 Indicator actuator page 6



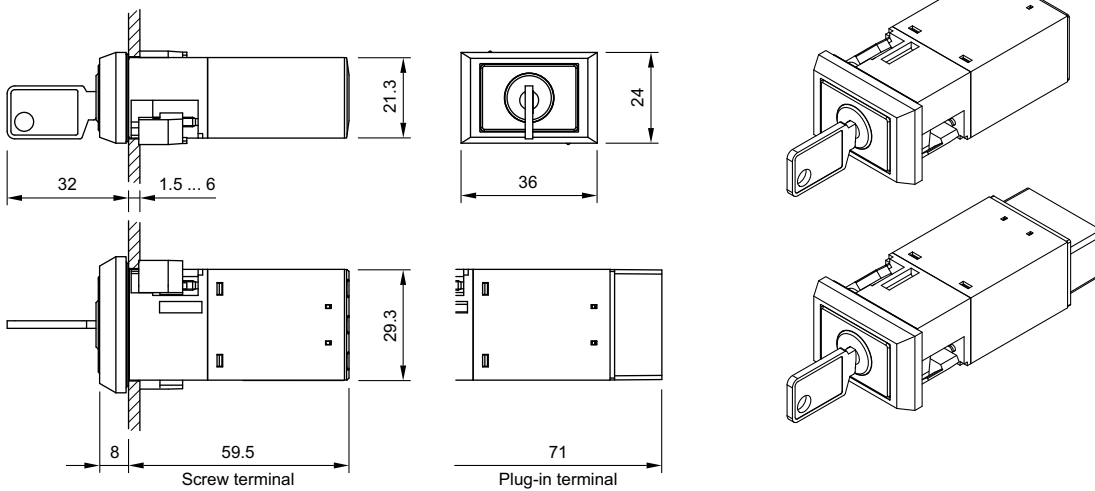
### 3 Illuminated pushbutton actuator page 7



### 4 Mushroom-head pushbutton actuator page 8



### 5 Keylock switch 2 positions page 9

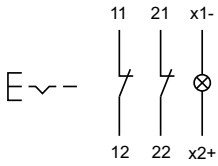


## Circuit drawing

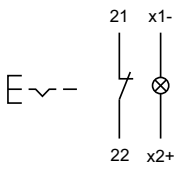
1 Indicator actuator page 6



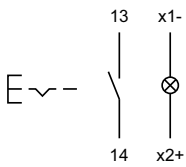
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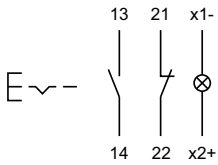
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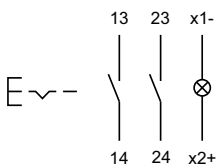
4 Illuminated pushbutton actuator page 7 | Mushroom-head pushbutton actuator page 8



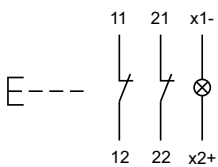
5 Illuminated pushbutton actuator page 7 | Mushroom-head pushbutton actuator page 8



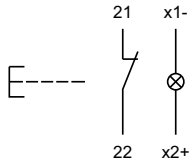
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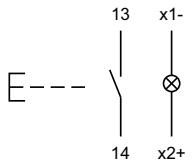
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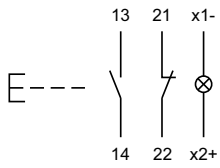
**8 Illuminated pushbutton actuator page 7 | Mushroom-head pushbutton actuator page 8**



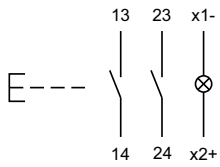
**9 Illuminated pushbutton actuator page 7 | Mushroom-head pushbutton actuator page 8**



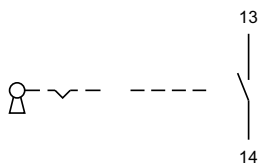
**10 Illuminated pushbutton actuator page 7 | Mushroom-head pushbutton actuator page 8**



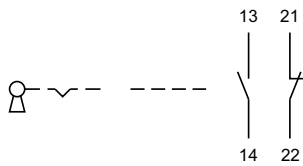
**11 Illuminated pushbutton actuator page 7 | Mushroom-head pushbutton actuator page 8**



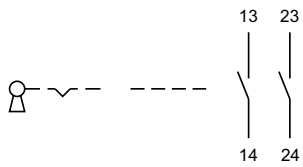
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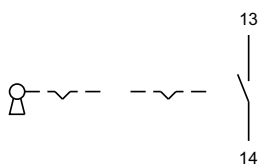
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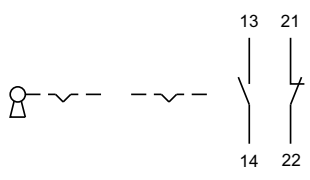
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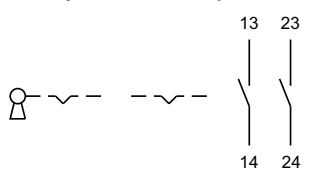
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