EAO Product Information

Series 22

eao

Index

Series 22

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General Notes

The illuminated pushbuttons, keylock switches, mushroom pushbuttons with momentary or maintained action and indicators are primarily noteworthy for their degree of protection IP 65 of the front (i.e. dust and splash-proof). Their robust, compact design, mounting by one man, their screw and plug-in terminals proof against inadvertent contact, and their large surface area for engraving and illumination are other quality features.
The switching element is a double-break snap-action system, the current being carried by a through-contact bar.
The dimensions of the front bezel are 24 x 36 mm. For indicators and illuminated pushbuttons you can choose the design of the front to suit your requirements from two front bezels which clip on in different ways. The front bezel of keylock switches and mushroom pushbuttons is fixed (type 02-965.0).

Mounting

Mounting by one man from the front. The switch, pushed into the square opening in the panel from the front, can be fixed with two clamping elements (tighten screws with max. 25 Ncm).

Lenses

The flat lenses, made of polymethyl methacrylate, are obtainable in various colours, as well as transparent or translucent.

Marking

For engravings, hot stamping and film inserts, see under “Marking” on page 253.

Illumination

Perfect illumination of the different coloured lenses is assured by midget-grooved incandescent lamps T 1 3/4 (6-60 V).
For supply voltages above 60V, it is necessary to use a voltage reduction element (external series resistor, capacitor or transformer).
Multi-LED midget-grooved lamps T 1 3/4 (6, 12, 24, 48 V) are available in the colours white, red, yellow and green.

Position Indication

When a switch with maintained action is actuated, the lens remains in the depressed position mechanically. The state of the switch is apparent at all times from the position of the lens.

Keylock switches

Standard lock (Index D).
1 Standard number 311. If the lock number is not specified, we will supply No. 311. An additional 134 special locks (Index X) are available on request. By ordering special locks for lockable compartment systems pease not on your order suitable for lockable compartment systems. Master keys for locks No. 311-445 may be ordered by quoting No. 31-989.300. Two keys are supplied with each keylock switch. Spare keys for DOM standard locks may be ordered by quoting No. 31-989 (please state the lock number).

Number structure

22-XXX.0XX

- Type of terminals
- Contact material (1 = silver)
- Switch variant

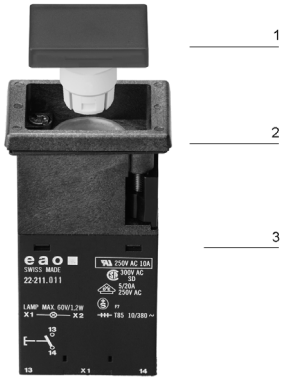
22-9XX.X	Lens
02-9XX.X	Front bezel
Example:	-Illuminated pushbutton with screw terminals, momentary action; 1 normally open contact 22-211.011
	-Lens, red, translucent 22-901.2
	-Front bezel, black 02-967.0

Specimen order

Indicator	
- indicator, plug-in terminal	22-040.004
Recommended accessories	
- lens, plastic red	22-903.2
- front bezel flat, grey	02-965.8
- LED, 1 chip, 24 VDC	10-2312.3139

All dimensions in mm.
We reserve the right to modify technical data.

illuminated-/pushbutton



1 lens
2 front bezel
3 switch housing

indicator

lens page 243
front bezel flat page 243
front bezel raised on all sides page 243
filament lamp page 244
LED page 245

	connection method	24 x 36 mm Typ-Nr.	circuit drawing	technical drawing	mounting dimensions	
indicator	PT	**22-040.004**	1	1	1	0,019
	ST	**22-040.001**	1	1	1	0,022

connection method : screw terminal = ST, plug-in terminal = PT
circuit drawings from page 249, technical drawings from page 248, mounting dimensions from page 249

illuminated-/pushbutton

lens page 243
front bezel flat page 243
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	switching system	contacts	switching action	connection method	24 x 36 mm Typ-Nr.	circuit drawing	technical drawing	mounting dimensions	kg
illuminated-/pushbutton	SA	1 NO	M	PT	**22-211.014**	2	2	1	0,032
				ST	**22-211.011**	2	2	1	0,037
			MA	PT	**22-221.014**	7	2	1	0,032
				ST	**22-221.011**	7	2	1	0,037
		1 NC	M	PT	**22-212.014**	3	2	1	0,032
				ST	**22-212.011**	3	2	1	0,037
			MA	PT	**22-222.014**	8	2	1	0,032
				ST	**22-222.011**	8	2	1	0,037
		1 NC + 1 NO	M	PT	**22-215.014**	6	2	1	0,034
				ST	**22-215.011**	6	2	1	0,044
			MA	PT	**22-225.014**	11	2	1	0,034
				ST	**22-225.011**	11	2	1	0,044
		2 NO	M	PT	**22-213.014**	4	2	1	0,034
				ST	**22-213.011**	4	2	1	0,044
			MA	PT	**22-223.014**	9	2	1	0,044
				ST	**22-223.011**	9	2	1	0,044
		2 NC	M	PT	**22-214.014**	5	2	1	0,034
				ST	**22-214.011**	5	2	1	0,044
			MA	PT	**22-224.014**	10	2	1	0,034
				ST	**22-224.011**	10	2	1	0,044

switching system : snap-action switching element = SA
contacts : 1 normally open = 1 NO, 1 normally closed = 1 NC, normally open = NO, normally closed = NC
switching action : momentary action = M, maintained action = MA
connection method : screw terminal = ST, plug-in terminal = PT
circuit drawings from page 249, technical drawings from page 248, mounting dimensions from page 249

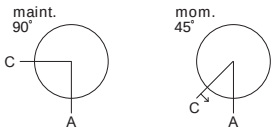
pushbutton with mushroom-head cap

mushroom-head cap page 243
front bezel flat page 243

	switching system	contacts	switching action	connection method	24 x 36 mm Typ-Nr.	circuit drawing	technical drawing	mounting dimensions	
pushbutton with mushroom-head cap	SA	1 NO	M	PT	**22-211.014**	2	3	1	0,032
				ST	**22-211.011**	2	3	1	0,037
			MA	PT	**22-221.014**	7	3	1	0,032
				ST	**22-221.011**	7	3	1	0,037
		1 NC	M	PT	**22-212.014**	3	3	1	0,032
				ST	**22-212.011**	3	3	1	0,037
			MA	PT	**22-222.014**	8	3	1	0,032
				ST	**22-222.011**	8	3	1	0,037
		1 NC + 1 NO	M	PT	**22-215.014**	6	3	1	0,034
				ST	**22-215.011**	6	3	1	0,044
			MA	PT	**22-225.014**	11	3	1	0,034
				ST	**22-225.011**	11	3	1	0,044
		2 NO	M	PT	**22-213.014**	4	3	1	0,034
				ST	**22-213.011**	4	3	1	0,044
			MA	PT	**22-223.014**	9	3	1	0,044
				ST	**22-223.011**	9	3	1	0,044
		2 NC	M	PT	**22-214.014**	5	3	1	0,034
				ST	**22-214.011**	5	3	1	0,044
			MA	PT	**22-224.014**	10	3	1	0,034
				ST	**22-224.011**	10	3	1	0,044

switching system : snap-action switching element = SA
contacts : 1 normally open = 1 NO, 1 normally closed = 1 NC, normally open = NO, normally closed = NC
switching action : momentary action = M, maintained action = MA
connection method : screw terminal = ST, plug-in terminal = PT
circuit drawings from page 249, technical drawings from page 248, mounting dimensions from page 249

keylock switch 2 positions



	switching system	contacts	switching action	connection method	key removable in	24 x 36 mm Typ-Nr.	circuit drawing	technical drawing	mounting dimensions	kg
keylock switch 2 positions	SA	1 NO	M	PT	A	**22-351.114D**	15	4	1	0,046
				ST	A	**22-351.111D**	15	4	1	0,051
			MA	PT	A	**22-331.114D**	12	4	1	0,046
					A+C	**22-331.514D**	12	4	1	0,040
					C	**22-331.314D**	12	4	1	0,044
				ST	A	**22-331.111D**	12	4	1	0,051
					A+C	**22-331.511D**	12	4	1	0,044
					C	**22-331.311D**	12	4	1	0,044
		1 NC + 1 NO	M	PT	A	**22-355.114D**	17	4	1	0,046
				ST	A	**22-355.111D**	17	4	1	0,051
			MA	PT	A	**22-335.114D**	14	4	1	0,046
					A+C	**22-335.514D**	14	4	1	0,046
					C	**22-335.314D**	14	4	1	0,046
				ST	A	**22-335.111D**	14	4	1	0,051
					A+C	**22-335.511D**	14	4	1	0,051
					C	**22-335.311D**	14	4	1	0,051
		2 NO	M	PT	A	**22-353.114D**	16	4	1	0,046
				ST	A	**22-353.111D**	16	4	1	0,051
			MA	PT	A	**22-333.114D**	13	4	1	0,046
					A+C	**22-333.514D**	13	4	1	0,046
					C	**22-333.314D**	13	4	1	0,046
				ST	A	**22-333.111D**	13	4	1	0,051
					A+C	**22-333.511D**	13	4	1	0,051
					C	**22-333.311D**	13	4	1	0,051

switching system : snap-action switching element = SA
contacts : 1 normally open = 1 NO, normally open = NO, normally closed = NC
switching action : maintained action = MA, momentary action = M
connection method : screw terminal = ST, plug-in terminal = PT
circuit drawings from page 249, technical drawings from page 248, mounting dimensions from page 249

at front

lens

	shape	lens/support	colour	24 x 36 mm Typ-Nr.	kg
lens of plastic	flat	transparent/translucent	blue	**22-903.6**	0,003
			yellow	**22-903.4**	0,003
			green	**22-903.5**	0,003
			clear	**22-903.7**	0,003
			orange	**22-903.3**	0,003
			smoked	**22-903.1**	0,003
			red	**22-903.2**	0,003
of plastic (not for film insert and illumination)	flat	opaque/translucent	grey	**22-901.8**	0,003
			black	**22-901.0**	0,003
of plastic (not for film insert and LED)	flat	translucent/translucent	blue	**22-901.6**	0,003
			yellow	**22-901.4**	0,003
			green	**22-901.5**	0,003
			orange	**22-901.3**	0,003
			red	**22-901.2**	0,003
			white	**22-901.9**	0,003
of plastic (not recommended for film insert)	flat	transparent/transparent	yellow	**22-905.4**	0,003
			green	**22-905.5**	0,003
			clear	**22-905.7**	0,003
			red	**22-905.2**	0,003

mushroom-head cap

use flat front bezel

	mushroom	colour	22 x 35 mm Typ-Nr.	kg
mushroom-head cap (not for illumination)	opaque	yellow	**22-930.4**	0,006
		green	**22-930.5**	0,006
		red	**22-930.2**	0,006
		black	**22-930.0**	0,006

front bezel flat

	material	colour	24 x 36 mm Typ-Nr.	kg
front bezel flat actuator	plastic	black	**02-965.0**	0,001

front bezel raised on all sides

	material	colour	24 x 36 mm Typ-Nr.	kg
front bezel raised on all sides lens only removable with lens remover 98-969	plastic	black	**02-967.0**	0,001

protective cover

use flat front bezel

	24 x 36 mm Typ-Nr.	technical drawing	kg
protective cover hinged, transparent, with means for sealing	**22-925**	5	0,004

technical drawings from page 248

blind plug

	colour	24 x 36 mm Typ-Nr.	kg
blind plug	black	**22-949.0**	0,005

spare key

	part no.	kg
spare key for standard lock 311, other lock numbers on request	**31-989.311**	0,006

master key

	part no.	kg
master key for lock numbers 311-445	**31-989.300**	0,006

for illumination

filament lamp

	voltage/current	part no.	kg
filament lamp base T 1 3/4 MG	6 VAC/VDC/125 mA	**10-1306.1349**	0,001
	6.3 VAC/VDC/200 mA	**10-1307.1369**	0,001
	12 VAC/VDC/75 mA	**10-1309.1309**	0,001
	14 VAC/VDC/80 mA	**10-1310.1319**	0,001
	18 VAC/VDC/40 mA	**10-1311.1249**	0,001
	24 VAC/VDC/35 mA	**10-1312.1229**	0,001
	28 VAC/VDC/30 mA	**10-1313.1209**	0,001
	28 VAC/VDC/40 mA	**10-1313.1249**	0,001
	36 VAC/VDC/20 mA	**10-1316.1179**	0,001
	36 VAC/VDC/30 mA	**10-1316.1209**	0,001
	48 VAC/VDC/20 mA	**10-1319.1179**	0,001
	48 VAC/VDC/25 mA	**10-1319.1199**	0,001
	60 VAC/VDC/20 mA	**10-1320.1179**	0,001

LED

	number of chips	voltage/current	colour	part no.	kg
LED base MG T 1 3/4	1 chip	24 VDC/14 mA	white	**10-2312.3139**	0,001
		28 VDC/14 mA	white	**10-2313.3139**	0,001
	6 chips	6 VDC/45 mA	yellow	**10-5306.3254**	0,001
			green	**10-5306.3255**	0,001
			red	**10-5306.3252**	0,001
		12 VDC/30 mA	yellow	**10-5309.3204**	0,001
			green	**10-5309.3205**	0,001
			red	**10-5309.3202**	0,001
		24 VAC/DC/12.5 mA	yellow	**10-5312.1114**	0,001
			green	**10-5312.1115**	0,001
			red	**10-5312.1112**	0,001
		24 VDC/14 mA	yellow	**10-5312.3134**	0,001
			green	**10-5312.3135**	0,001
			red	**10-5312.3132**	0,001
		28 VAC/DC/12.5 mA	yellow	**10-5313.1114**	0,001
			green	**10-5313.1115**	0,001
			red	**10-5313.1112**	0,001
		28 VDC/14 mA	yellow	**10-5313.3134**	0,001
			green	**10-5313.3135**	0,001
			red	**10-5313.3132**	0,001
		48 VDC/12 mA	yellow	**10-5319.3104**	0,001
			green	**10-5319.3105**	0,001
			red	**10-5319.3102**	0,001
	8 chips	6 VDC/48 mA	yellow	**10-6306.3264**	0,001
			green	**10-6306.3265**	0,001
			red	**10-6306.3262**	0,001
		12 VDC/24 mA	yellow	**10-6309.3184**	0,001
			green	**10-6309.3185**	0,001
			red	**10-6309.3182**	0,001
		24 VDC/12 mA	yellow	**10-6312.3104**	0,001
			green	**10-6312.3105**	0,001
			red	**10-6312.3102**	0,001
		28 VDC/12 mA	yellow	**10-6313.3104**	0,001
			green	**10-6313.3105**	0,001
			red	**10-6313.3102**	0,001

Note:
For optimal illumination we strongly recommend using our new single-chip LEDs.

For new designs, only the new single-chip LEDs should be chosen. They can be found on page 669.

capacitor

for lamp voltage reduction

	value	part no.	kg
capacitor use with 60 VAC/20 mA, 50 Hz lamp voltage	230 VAC/0.27 µF	**02-917.0**	0,004

Please keep to the country specific security rules.

series resistor

for lamp voltage reduction

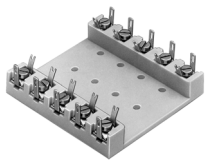
	value	part no.	kg
series resistor use with 60 VAC/20 mA lamp rating	110 V/2.7 kΩ	**02-904.0**	0,003
	125 V/3.3 kΩ	**02-904.1**	0,003
	145 V/4.7 kΩ	**02-904.3**	0,003
	230-240 V/10 kΩ	**02-904.7**	0,003

Please keep to the country specific security rules.

terminal plate empty

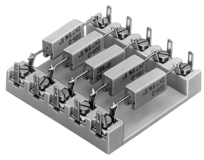
for fitting with series resistors and capacitors

	no. of spaces	part no.	kg
terminal plate empty	5 spaces	**02-912.1**	0,025
	10 spaces	**02-912.2**	0,045
	15 spaces	**02-912.3**	0,090
	20 spaces	**02-912.4**	0,095



terminal plate with capacitor

	value	no. of components	part no.	kg
terminal plate with capacitor use with 60 VAC/20 mA lamp rating	0.27 µF/230 VAC/60 VAC	5 spaces	**02-914.10**	0,045
		10 spaces	**02-914.20**	0,090
		15 spaces	**02-914.30**	0,135
		20 spaces	**02-914.40**	0,180



Please keep to the country specific security rules.

assembling

lens remover

	use	part no.	kg
lens remover	Standard	**02-905**	0,011
	for front bezel 4-full face raised	**98-968**	0,004

lamp remover

	part no.	kg
lamp remover CAUTION A switching process might be released when replacing the lamp!	**02-906**	0,002

LED remover

	part no.	kg
LED remover CAUTION A switching process might be released when replacing the LED!	**51-996**	0,024

dismantling tool

	part no.	kg
dismantling tool for dismantling the lens off the holder	**22-938**	0,030

actuator with snap-action switching element

switching system

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
polymetylmethacrylat PMMA, polycarbonate PC

front bezel
polyphenylenoxide PPO

material of contacts
hard silver

actuator case
polyamide PA, polytherimide PEI

mechanical characteristics

connection method
screw terminal (with self-lifting clip):
max. wire cross-section: 2 x 2.5 mm&
max. wire cross-section of stranded cable: 2 x 1.5 mm&

plug-in terminal 6.3 x 0.8 mm

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

actuating travel
5.5 ± 0.2 mm

storage temperature
-40°C to + 95°C
(as per DIN IEC 68-)

mechanical life
as per IEC 163-1
illuminated pushbuttons: 2 million operations
keylock switch: 40.000 operations

rebound time
<= 3 ms

travel
3 mm

resistance to shock
50 g for 11 ms as per IEC 512-4-3

degree of protection
terminal/case: IP 20
front as per IEC 529: IP 65

resistance to vibration
(sinusoidal)
10 g at 10-2000 Hz, amplitude 0.75 mm as per IEC 512-4-4

ambient air temperature
-25°C to + 85°C
(as per DIN IEC 68-)

electrical characteristics

contact resistance
starting value <= 50 mΩ as per IEC 512-2-4

insulation resistance
>= 100M Ω between all contacts at 100 VDC as per IEC 512-2-10

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

switch rating AC, cos ϕ 0.7 as per AC 11 (IEC 337):

voltage	125 V	250 V	380 V
current	8 A	5 A	3 A
operations		> 100.000	

switch rating DC (inductive), L:R=30 ms as per DC 11 (IEC 337):

voltage	24 V	60 V	110 V	220 V
current	6 A	1.5 A	0.4 A	0.2 A
operations		> 100.000		

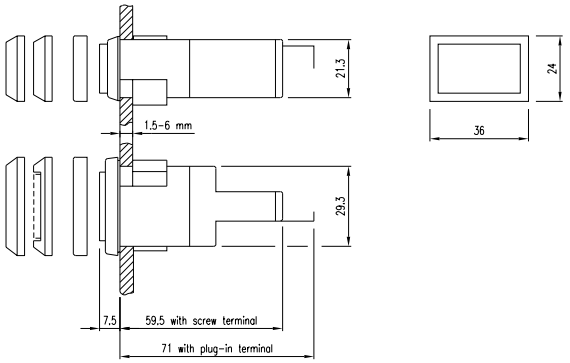
electric strength
2500 VAC, 50 Hz, 1 min. between all terminals and earth, as per IC 512-2-11.

approvals

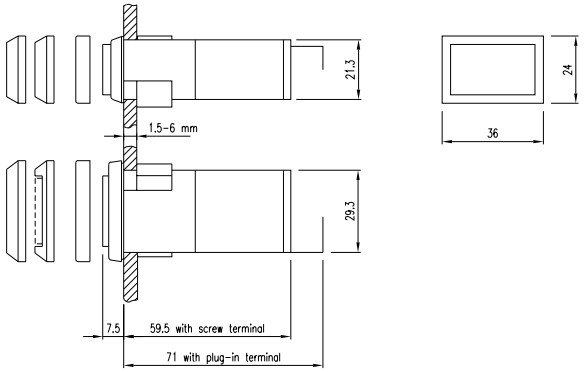
approvals
- CSA 300 VAC
- CE (declaration of conformity)
- UL
- CB
- ENEC

technical drawings

1 indicator
page 239



2 illuminated-/pushbutton
page 240



3 pushbutton with mushroom-head cap
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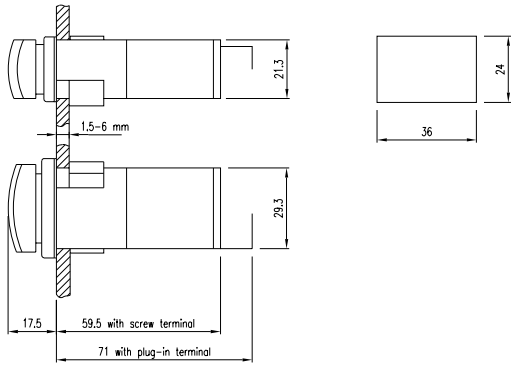
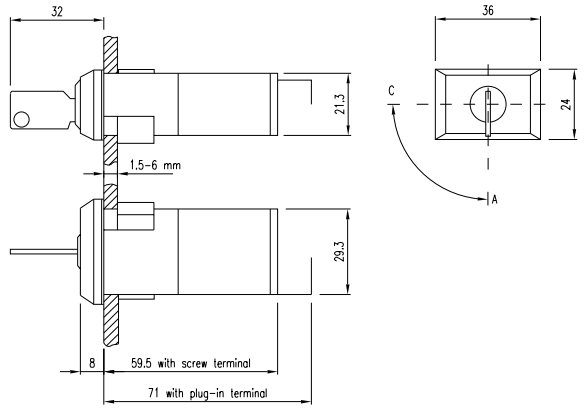


4 keylock switch 2 positions
page 242



5 protective cover
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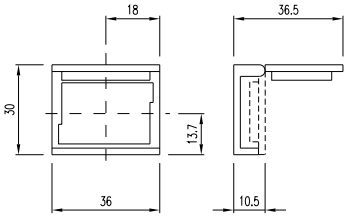
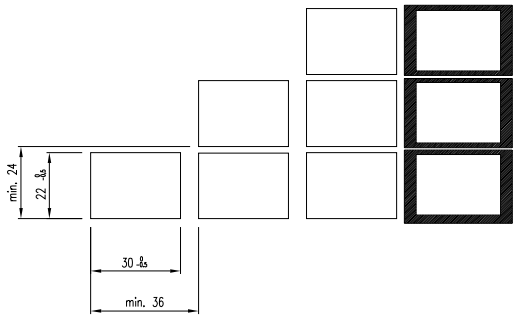


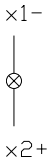
mounting dimensions

1 indicator, illuminated-/pushbutton, pushbutton with mushroom-head cap, keylock switch 2 positions
page 239, 240, 241, 242

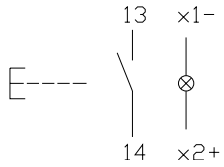


circuit drawings

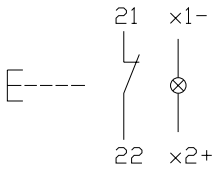
1 indicator
page 239



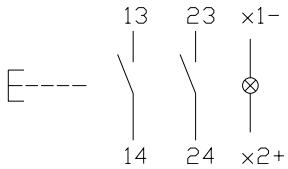
2 illuminated-/pushbutton, pushbutton with mushroom-head cap
page 240, 241



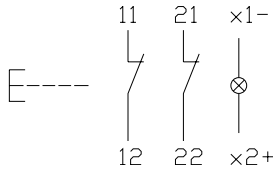
3 illuminated-/pushbutton, pushbutton with mushroom-head cap
page 240, 241



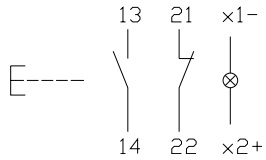
4 illuminated-/pushbutton, pushbutton with mushroom-head cap
page 240, 241



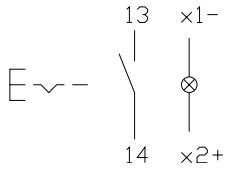
5 illuminated-/pushbutton, pushbutton with mushroom-head cap
page 240, 241



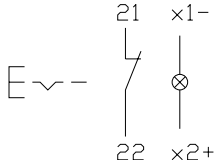
6 illuminated-/pushbutton, pushbutton with mushroom-head cap
page 240, 241



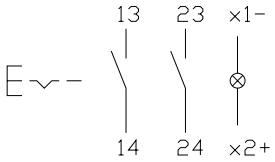
7 illuminated-/pushbutton, pushbutton with mushroom-head cap
page 240, 241



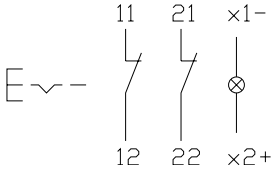
8 illuminated-/pushbutton, pushbutton with mushroom-head cap
page 240, 241



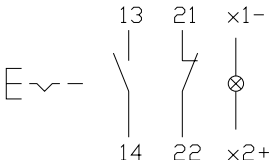
9 illuminated-/pushbutton, pushbutton with mushroom-head cap
page 240, 241



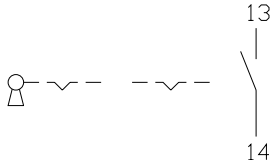
10 illuminated-/pushbutton, pushbutton with mushroom-head cap
page 240, 241



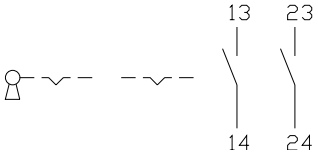
11 illuminated-/pushbutton, pushbutton with mushroom-head cap
page 240, 241



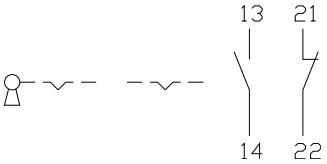
12 keylock switch 2 positions
page 242



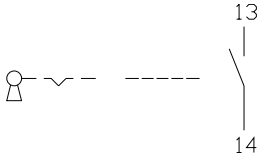
13 keylock switch 2 positions
page 242



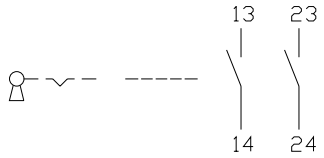
14 keylock switch 2 positions
page 242



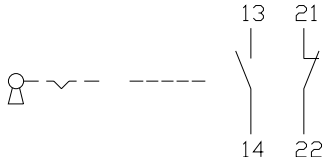
15 keylock switch 2 positions
page 242



16 keylock switch 2 positions
page 242



17 keylock switch 2 positions
page 242



1. Engraving

Typefaces

In addition to the most commonly used world languages (see DIN 1451) with close spacing, the following typefaces are available: Scandinavian, Slavian, Greek, Russian.

Coloured filling of engraving

Specify whether engraving should be on the diffuser, or on the lens.
Specify the infill colour, character height and the text or symbol orientation.

Symbols

A list of the symbols available can be supplied on request.

2. Hot stamping

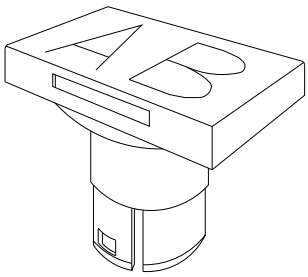
For large batches it is worth while to have the lettering produced by hot stamping.

Typefaces

For letters and figures, typefaces with 2,5 mm, 3 mm and 4 mm are available.

Symbols

A list of the symbols available can be supplied on request.



3. Film inserts

Instead of using engraving, the lenses can be fitted with transparent film inserts.
For this purpose, though, it is advisable to use transparent lenses.When a smoked lens is used, the lettering does not become visible until the lamp lights.

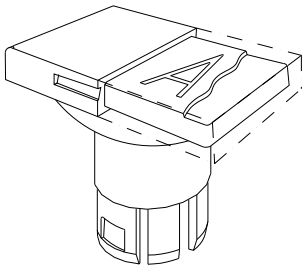
Film dimensions

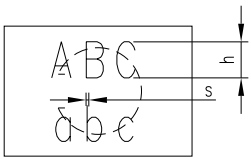
max. 22,4 x 14,3 mm

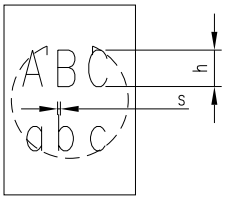
Film thickness 0,2 mm

Important!

Before engraving, check the position of the illuminated pushbuttons or indicator.







Height of letters mm	Thickness of letters mm	Number of lines	Number of letters per line	Number of letters per line	Number of lines	Number of letters per line	Number of letters per line
h	s		(caps)	(small)		(caps)	(small)
3	0,4	4	11	13	4	7-8	8-9
4	0,5	2	7	9	4	5	5-6
5	0,5	2	5-6	6-7	3	3-4	4
6	0,6	1	5	6	2	3	4
8	0,6	1	3	4	1	2	2

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