



9

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### Series 99

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## General Notes

The series 99 contains indicators and illuminated pushbuttons with maintained and momentary action with one or two contacts which may be either normally open or normally closed or a combination of the two. The illuminated pushbuttons are equipped with the low-level switching system.

The series 99 PCB keylock switch with a spacing of 19.05 mm completes the existing range of indicators and illuminated pushbuttons. The PCB keylock switch is available with two and three positions, with maintained action, and with either one or two normally open contacts as well as with one normally open and one normally closed one.

## Mounting

The illuminated pushbuttons of series 99 can be soldered to a printed circuit board. The contact layout conforms to the module of 2.54 mm (1/10"). A centering pin ensures dimensionally exact mounting in rows or blocks.

With an M 1.2 screw the pushbuttons can also be fixed to a printed circuit board. (This screw must be ordered separately.) The pushbuttons can be joined together easily with a coupling piece to form rows or blocks.

The layout of the PCB keylock switch conforms to the module of 2.54 mm (1/10").

Two centering pins ensure a dimensionally exact mounting. The contact layout corresponds to that of series 99 switches.

## Rules for cleaning soldered PC boards

In many cases the boards are cleaned following mechanical soldering. In this case it is essential to prevent the cleaning fluid containing dirt, grease and flux from entering the switch.

## Lenses

The lens consists of a bezel, a marking plate and a transparent lens plate, which may be either flat or concave.

## Marking

For engraving, hot stamping and film inserts, see under "Markings" on page 546.

## Illumination

Illumination of the different coloured lenses is by lamps bipin T 1 long-life (6-36 V) or LED bipin T 1.

## 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 switch

standard lock (Index D)

10 different locks with standard nos. 311-320. If the lock number is not specified, we supply no. 311. Additional 125 locks, no. 321 - 445, are available on request. Master keys for locks no. 311 - 445 may be

*All dimensions in mm.*

*We reserve the right to modify technical data.*

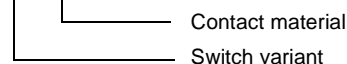
ordered by quoting no. 31-989.300.

Two keys are supplied with each keylock switch.

Spare keys for standard DOM locks may be ordered by quoting no. 31-989 (please state the lock number).

## Number structure

99-XXX.8X7



99-9XX.X

Lens

99-9XX.X

Other accessories

Example:

-Illuminated pushbutton, single, with momentary action; gold contact; soldering terminals  
99-455.837

-Lens, complete, flat  
99-901.9

## Specimen order

### Indicator single

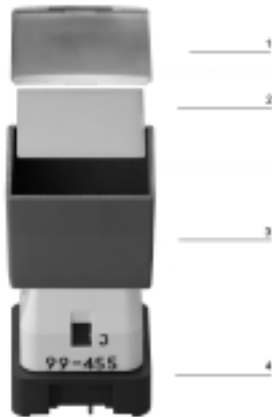
- indicator single 99-050.807

### Recommended accessories:

- lens single complete, flat 99-901.9

- LED, 1 chip, yellow 10-2602.3174C

## illuminated-/pushbutton








- 1 lens plate
- 2 marking plate
- 3 lens bezel
- 4 switching element

## indicator single



### recommended accessories:

-  lens single complete → 537
-  lens plate single → 537
-  marking plate single → 537
-  lens bezel single → 537
-  incandescent lamp → 539; LED → 540

	connection method	18.6 x 18.6 mm part no.	circuit drawing	technical drawing	mounting dimension	components layout	
<b>indicator single</b>	P	<b>99-050.807</b>	1	1	1	1	0,006

connection method: P = PCB terminal




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## indicator double



### recommended accessories:

-  lens plate double → 538
-  marking plate double → 538
-  incandescent lamp → 539; LED → 540

	connection method	18.6 x 37.8 mm part no.	circuit drawing	technical drawing	mounting dimension	components layout	
<b>indicator double</b>	P	<b>99-052.807</b>	2	2	1	2	0,011

connection method: P = PCB terminal




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## indicator triple



### recommended accessories:

-  lens plate triple → 538
-  marking plate triple → 538
-  incandescent lamp → 539; LED → 540

indicator triple	connection method	 18.6 x 56.9 mm part no.	circuit drawing	technical drawing	mounting dimension	components layout	
indicator triple	P	<b>99-053.807</b>	3	3	1	3	0,017

connection method: P = PCB terminal






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## illuminated/-pushbutton single



### recommended accessories:

-  lens single complete → 537
-  lens plate single → 537
-  marking plate single → 537
-  lens bezel single → 537
-  incandescent lamp → 539; LED → 540

illuminated/-pushbutton single	switching system	contacts	switching action	point of pressure	connection method						
						18.6 x 18.6 mm part no.	circuit drawing	technical drawing	mounting dimension	components layout	
illuminated/-pushbutton single	LL	1NC	main	with	P	<b>99-482.837</b>	4	1	1	1	0,008
				without	P	<b>99-487.837</b>	4	1	1	1	0,008
			mom	with	P	<b>99-452.837</b>	8	1	1	1	0,008
				without	P	<b>99-457.837</b>	8	1	1	1	0,008
		1NC + 1NO	main	with	P	<b>99-483.837</b>	6	1	1	1	0,008
				without	P	<b>99-488.837</b>	6	1	1	1	0,008
			mom	with	P	<b>99-453.837</b>	10	1	1	1	0,008
				without	P	<b>99-458.837</b>	10	1	1	1	0,008
		1NO	main	with	P	<b>99-480.837</b>	5	1	1	1	0,008
				without	P	<b>99-485.837</b>	5	1	1	1	0,008
			mom	with	P	<b>99-450.837</b>	9	1	1	1	0,008
				without	P	<b>99-455.837</b>	9	1	1	1	0,008
		2NO	main	with	P	<b>99-481.837</b>	7	1	1	1	0,008
				without	P	<b>99-486.837</b>	7	1	1	1	0,008
			mom	with	P	<b>99-451.837</b>	11	1	1	1	0,008
				without	P	<b>99-456.837</b>	11	1	1	1	0,008

switching system: LL = Low Level switching element

switching action: main = maintained action, mom = momentary action

connection method: P = PCB terminal

contacts: NC = normally closed, NO = normally open




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## illuminated-/pushbutton double



### recommended accessories:

-  lens plate double → 538
-  marking plate double → 538
-  incandescent lamp → 539; LED → 540

	switching system	contacts	switching action	connection method	18.6 x 37.8 mm part no.	circuit drawing	technical drawing	mounting dimension	components layout	
<b>illuminated-/pushbutton double</b>	LL	1NC + 1NO	main	P	<b>99-418.837</b>	12	2	1	2	0,013
			mom	P	<b>99-408.837</b>	14	2	1	2	0,013
		2NO	main	P	<b>99-416.837</b>	13	2	1	2	0,013
			mom	P	<b>99-406.837</b>	15	2	1	2	0,013

switching system: LL = Low Level switching element

switching action: main = maintained action, mom = momentary action

connection method: P = PCB terminal

contacts: NC = normally closed, NO = normally open




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## illuminated-/pushbutton triple



### recommended accessories:

-  lens plate triple → 538
-  marking plate triple → 538
-  incandescent lamp → 539; LED → 540

	switching system	contacts	switching action	connection method	18.6 x 56.9 mm part no.	circuit drawing	technical drawing	mounting dimension	components layout	
<b>illuminated-/pushbutton triple</b>	LL	1NC + 1NO	main	P	<b>99-448.837</b>	16	3	1	3	0,019
			mom	P	<b>99-438.837</b>	18	3	1	3	0,019
		2NO	main	P	<b>99-446.837</b>	17	3	1	3	0,019
			mom	P	<b>99-436.837</b>	19	3	1	3	0,019

switching system: LL = Low Level switching element

switching action: main = maintained action, mom = momentary action

connection method: P = PCB terminal

contacts: NC = normally closed, NO = normally open

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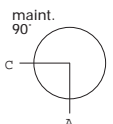


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## keylock switch 2 positions



recommended accessories:

	switching system	contacts	switching action	connection method	key removable in	 18.8 x 18.8 mm part no.	circuit drawing	technical drawing	mounting dimension	components layout	
<b>keylock switch 2 positions</b> pos. A: basic position pos. C: maintained action standard lock 311, other lock numbers on request	LL	1NC + 1NO	main	P	A	<b>99-213.837D</b>	21	4	2	1	0,017
					A+C	<b>99-253.837D</b>	21	4	2	1	0,017
					C	<b>99-233.837D</b>	21	4	2	1	0,017
	1NO	main	P	A	<b>99-210.837D</b>	20	4	2	1	0,017	
				A+C	<b>99-250.837D</b>	20	4	2	1	0,017	
				C	<b>99-230.837D</b>	20	4	2	1	0,017	
	2NO	main	P	A	<b>99-211.837D</b>	22	4	2	1	0,017	
				A+C	<b>99-251.837D</b>	22	4	2	1	0,017	
				C	<b>99-231.837D</b>	22	4	2	1	0,017	

switching system: LL = Low Level switching element

switching action: main = maintained action

connection method: P = PCB terminal

contacts: NC = normally closed, NO = normally open

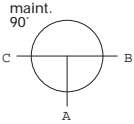
[description see page 529](#)

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## keylock switch 3 positions



recommended accessories:

	switching system	contacts	switching action	connection method	key removable in	18.8 x 18.8 mm part no.	circuit drawing	technical drawing	mounting dimension	components layout	
 <p><b>keylock switch 3 positions</b>                      pos. A: basic position                      pos. B: maintained position                      pos. C: maintained position                      standard lock 311,                      other lock numbers on request</p>	LL	2NO	main-0-main	P	A	<b>99-311.837D</b>	23	4	2	1	0,017
					A+B	<b>99-341.837D</b>	23	4	2	1	0,017
					A+B+C	<b>99-371.837D</b>	23	4	2	1	0,017
					A+C	<b>99-351.837D</b>	23	4	2	1	0,017
					B	<b>99-321.837D</b>	23	4	2	1	0,017
					B+C	<b>99-361.837D</b>	23	4	2	1	0,017
					C	<b>99-331.837D</b>	23	4	2	1	0,017

switching system: LL = Low Level switching element

connection method: P = PCB terminal

contacts: NC = normally closed, NO = normally open

switching action: main = maintained action, 0 = basic position



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## at front

### lens single complete



for single pushbutton

	shape	lens plate	colour	∅ 18.6 x 18.6 mm part no.		
<b>lens single complete</b> plastic	concave	transparent	clear	<b>99-902.9</b>	0,002	
	flat	transparent	clear	<b>99-901.9</b>	0,002	

marking see page 546

### lens plate single



for single pushbutton

	shape	lens plate	colour	∅ 18.6 x 18.6 mm part no.		
<b>lens plate single</b> plastic	concave	opaque	grey	<b>99-924.8</b>	0,001	
		transparent	clear	<b>99-922.7</b>	0,001	
		transparent matt	clear	<b>99-928.7</b>	0,001	
	convex	transparent	clear	<b>99-929.7A</b>	0,001	
	convex with recess	transparent	clear	<b>99-928.7A</b>	0,001	
	flat	transparent	clear	<b>99-921.7</b>	0,001	
		transparent matt	clear	<b>99-927.7</b>	0,001	

marking see page 546



### marking plate single

for lens single

	marking plate	colour	∅ 18.6 x 18.6 mm part no.		
<b>marking plate single</b> can be engraved or hot stamped for LED	translucent	black	<b>99-908.0</b>	0,001	
		white	<b>99-908.9</b>	0,001	
	translucent	beige	<b>99-918.A</b>	0,001	

### lens bezel single

for single pushbutton

	construction	colour	part no.		
<b>lens bezel single</b>	rounded	grey	<b>99-920.82</b>	0,001	
		with edges	beige	<b>99-920.9B</b>	
	black	<b>99-920.0</b>	0,001		
	brown	<b>99-920.9C</b>	0,001		
	grey	<b>99-920.8</b>	0,001		
	white	<b>99-920.9A</b>	0,001		

## lens plate double

for pushbutton double

	shape	lens plate	colour	⌀ 18.6 x 37.8 mm part no.	 0,001	
<b>lens plate double plastic</b>	concave	transparent	clear	<b>99-962.7</b>	0,001	
		transparent matt	clear	<b>99-974.7</b>	0,001	
	flat	transparent	clear	<b>99-961.7</b>	0,001	
		transparent matt	clear	<b>99-973.7</b>	0,001	

marking see page 546

## marking plate double

for lens double

	marking plate	colour	⌀ 18.6 x 37.8 mm part no.	 0,001	
<b>marking plate double</b> can be engraved or hot stamped	translucent	black	<b>99-963.0</b>	0,001	
		white	<b>99-963.9</b>	0,001	

## lens plate triple

for pushbutton triple

	shape	lens plate	colour	⌀ 18.6 x 56.9 mm part no.	 0,002	
<b>lens plate triple plastic</b>	concave	transparent	clear	<b>99-967.7</b>	0,002	
		transparent matt	clear	<b>99-979.7</b>	0,002	
	flat	transparent	clear	<b>99-966.7</b>	0,002	
		transparent matt	clear	<b>99-978.7</b>	0,002	

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## marking plate triple

for pushbutton triple

	marking plate	colour	⌀ 18.6 x 56.9 mm part no.	 0,001	
<b>marking plate triple</b> can be engraved or hot stamped	translucent	black	<b>99-968.0</b>	0,001	
		white	<b>99-968.9</b>	0,001	



## colour foil single

for lens single

	colour	⌀ 18.6 x 18.6 mm part no.	 1,001	
<b>colour foil single</b>	blue	<b>99-909.6</b>	1,001	
	green	<b>99-909.5</b>	1,001	
	orange	<b>99-909.3</b>	1,001	
	red	<b>99-909.2</b>	1,001	
	yellow	<b>99-909.4</b>	1,001	



## colour foil double

for lens double



	colour	18.6 x 37.8 mm part no.		
<b>colour foil double</b>	blue	<b>99-964.6</b>	0,001	
	green	<b>99-964.5</b>	0,001	
	red	<b>99-964.2</b>	0,001	
	yellow	<b>99-964.4</b>	0,001	

## colour foil triple



for lens triple

	colour	18.6 x 56.9 mm part no.		
<b>colour foil triple</b>	blue	<b>99-969.6</b>	0,001	
	green	<b>99-969.5</b>	0,001	
	red	<b>99-969.2</b>	0,001	
	yellow	<b>99-969.4</b>	0,001	

## blind plug

	height	colour	19 x 19 mm part no.		
<b>blind plug</b>	16 mm	grey	<b>99-948.81</b>	0,003	
	17.5 mm	grey	<b>99-948.82</b>	0,003	
	19 mm	grey	<b>99-948.83</b>	0,004	

## spare key

	part no.		
<b>spare key</b> for standard lock 311, other lock numbers on request	<b>31-989.311</b>	0,006	

[description see page 529](#)

## for illumination



### incandescent lamp

up to pushbutton order 1, 2 or 3 pcs.

	voltage/current	part no.		
<b>incandescent lamp</b> base T 1 Bi-Pin	6 AC/DC/70mA	<b>10-1606.1309 (19-903.00)</b>	0,001	
	12 AC/DC/25 mA	<b>10-1609.1199 (19-903.10)</b>	0,001	
	24 AC/DC/20 mA	<b>10-1612.1179 (19-903.30)</b>	0,001	
	28 AC/DC/24 mA	<b>10-1613.1189 (11-903.4)</b>	0,001	
	36 AC/DC/20 mA	<b>10-1616.1179 (11-903.5)</b>	0,001	

## LED

up to pushbutton order 1, 2 or 3 pcs.

	number of chips	voltage/current	colour	part no.		
<b>LED</b> base T 1 Bi-Pin	1 chip	2,2 VDC/20 mA	green	<b>10-2602.3175C (19-943.05)</b>	0,001	
			red	<b>10-2602.3172C (19-943.02)</b>	0,001	
			yellow	<b>10-2602.3174C (19-943.04)</b>	0,001	
			white	<b>10-2603.3179C</b>	0,001	
	4 chips	28 VDC/12 mA	green	<b>10-4613.3105B (11-968.35)</b>	0,001	
			orange	<b>10-4613.3103B (11-968.33)</b>	0,001	
			red	<b>10-4613.3102B (11-968.32)</b>	0,001	
			yellow	<b>10-4613.3104B (11-968.34)</b>	0,001	


## assembling

### coupling section



for mounting pushbuttons in rows or blocks

	part no.		
<b>coupling section</b> grey	<b>99-910</b>	0,001	

### fixing screw

	part no.		
<b>fixing screw</b> M 1.2 x 5 mm (DIN)	<b>99-990</b>	0,001	

### lamp remover

	part no.		
<b>lamp remover</b>	<b>11-906</b>	0,003	

## Low Level switching element

### switching system

This low-level switching system was designed for switching low powers in electronic circuits. The switching system assures reliable switching of loads.

Single-break momentary contact, as normally open or normally closed with 4 independent points of contact.

Special features are the long life, extremely short rebound time and stable contact resistance.

Contact combinations: 1 normally open contact, 2 normally open contacts, 1 normally closed/1 normally open contact, 1 normally closed contact

### material

#### material of contacts

gold-plated

#### switching element

polycarbonate PC

### mechanical characteristics

#### ambient air temperature

-25°C to +55°C

for indicators and illuminated pushbuttons mounted as a block, make sure the heat can escape freely (as per DIN IEC 68-)

#### mechanical life

illuminated pushbuttons	5 million operations
PCB keylock switches	50000 operations

#### rebound time

typ.  $\leq 100 \mu\text{s}$

#### resistance to shock

(single impacts, semi-sinusoidal)  
15 g for 11 ms as per IEC 68-2-27

#### storage temperature

-40°C to +85°C  
(as per DIN IEC 68-)

### electrical characteristics

#### electric strength

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

#### insulation resistance

$10^{12} \Omega$  between contacts at 100 VDC, as per IEC 512-2, test 3a

#### volume resistance

starting value (initial)  $\leq 50 \text{ m}\Omega$  as per IEC 512-2, test 2b

## actuator

### material

#### lens bezel

polycarbonate PC, heat-resistant

#### lens plate

polymethylmethacrylate PMMA, heat-resistant

### mechanical characteristics

#### actuating force

pushbuttons with tactile point:	$2.0 \pm 0.3 \text{ N}$
pushbuttons without tactile point:	$1.3 \pm 0.4 \text{ N}$

#### actuating torque

4.7-6.0 Ncm (measured at the key)

#### ambient air temperature

-25°C to +55°C

for indicators and illuminated pushbuttons mounted as a block, make sure the heat can escape freely (as per DIN IEC 68-)

#### angle of rotation for print keylock switch

keylock switch with 2 positions: 90°  
keylock switch with 3 positions: 2 x 90°

#### degree of protection

front as per IEC 529:  
IP 40, PCB keylock switch, illuminated pushbutton

#### mechanical life

illuminated pushbuttons	5 million operations
PCB keylock switches	50000 operations

#### storage temperature

-40°C to +85°C

(as per DIN IEC 68-)

#### travel

lead distance NC contact:  $1.1 \pm 0.2 \text{ mm}$ ;  
lead distance NO contact:  $2.1 \pm 0.2 \text{ mm}$ ;  
total distance:  $3.6 \pm 0.2 \text{ mm}$

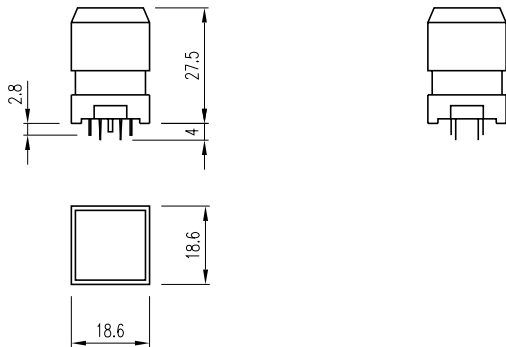
### electrical characteristics

#### electrostatic breakdown value

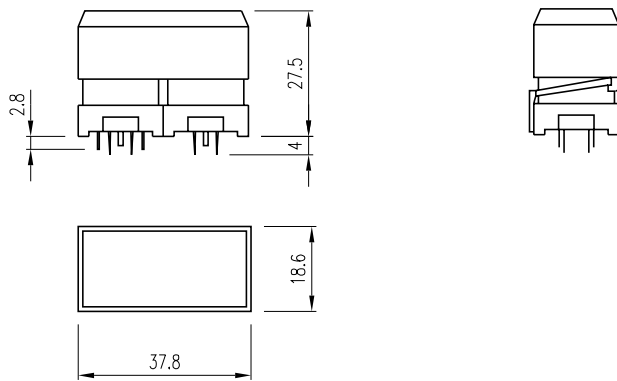
10 kV as per IEC 65 (Co) 28.

## technical drawing

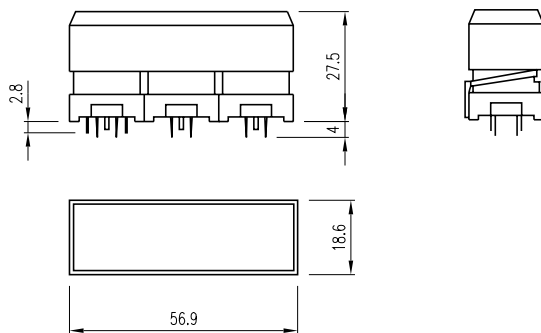
### 1 indicator single, illuminated-/pushbutton single page 531, 533



### 2 indicator double, illuminated-/pushbutton double page 531, 534

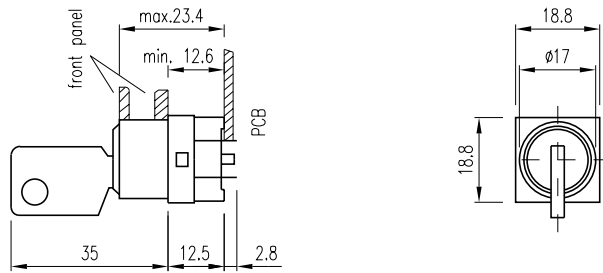


### 3 indicator triple, illuminated-/pushbutton triple page 532, 534



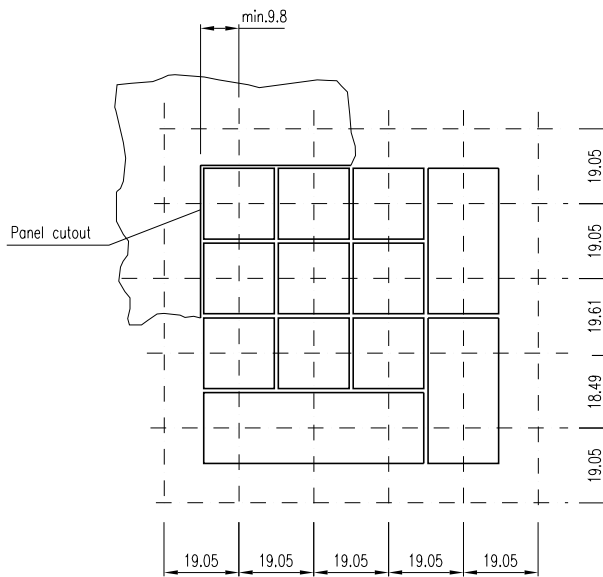


**4 keylock switch 2 positions, keylock switch 3 positions**  
page 535, 536

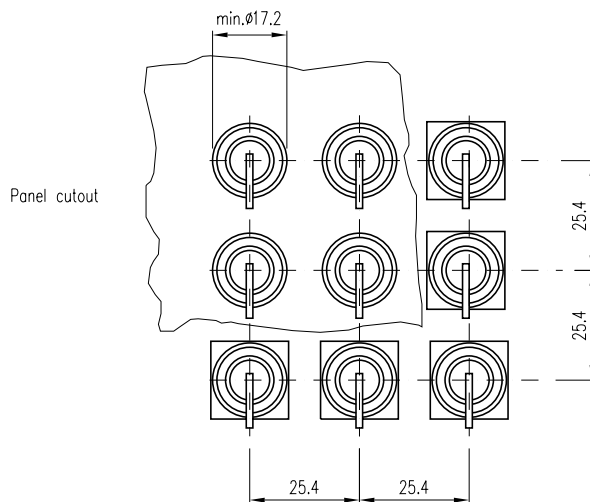


## mounting dimension

**1 indicator single, indicator double, indicator triple, illuminated/-pushbutton single, illuminated/-pushbutton double, illuminated/-pushbutton triple**  
page 531, 532, 533, 534



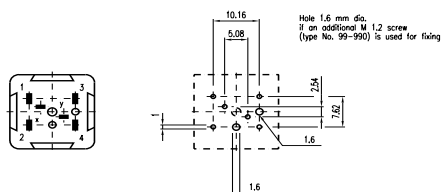
**2 keylock switch 2 positions, keylock switch 3 positions**  
page 535, 536



## components layouts

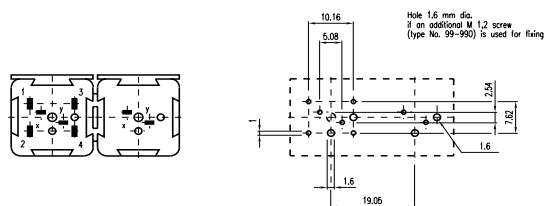
### 1 indicator single, illuminated-/pushbutton single, keylock switch 2 positions, keylock switch 3 positions

page 531, 533, 535, 536



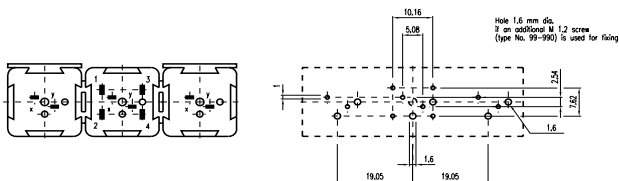
### 2 indicator double, illuminated-/pushbutton double

page 531, 534



### 3 indicator triple, illuminated-/pushbutton triple

page 532, 534



	circuit drawing
1	
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	circuit drawing
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22	
23	

## 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

Unless requested otherwise by the customer, the lettering on white and black marking plates will be in black and white.

### 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.

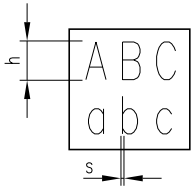
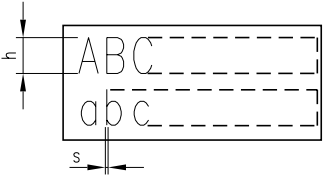
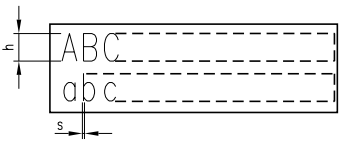
## 3. Film inserts

Instead of being engraved, the lenses can have a film inserted, possibly backed by a colour foil, placed between the lens plate and the marking plate.

### Film dimensions

for single button: 16 x 16 mm  
for double button: 16 x 34,7 mm  
for triple button: 16 x 53,8 mm

### Film thickness 0,2 mm

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	Number of lines	Number of letters per line	Number of letters per line
h	s		(caps)	(small)		(caps)	(small)		(caps)	(small)
2,5	0,4	4	7	8	4	19	20	4	30	32
3	0,4	3	6	7	3	16	18	3	25	28
4	0,5	2	4	5	2	11	13	2	18	20
5	0,5	2	3	4	2	9	10	2	14	16
6	0,6	1	3	4	1	7	8	1	12	13
8	0,6	1	2	3	1	5	6	1	9	10