CODED SWITCH TYPE 07ML

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MAIN FEATURES

MULTI LAYER OR ON-OFF FUNCTION

> Multi layer coded switch (up to 2 layers)
> High/low torque function "on/off"
> BCD, Hex or Gray coding 2 to 16 positions
> Shorting
> Switching torque per layer up to 3.5 Ncm
> For rugged environments
> Gold plated contacts
> THT (reflow version on request)
> Optional IP68 front panel sealing (up to 5 bar)
> Operating temperature range: -40 to +85°C
> Various options and customizations

Pb ELV (2000/53/EC)
RoHS (2002/95/EC)

TYPE 07ML
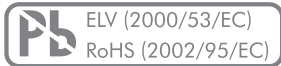
PRODUCT VARIETY

- BCD, Hex or Gray coding
- Multi layer (up to 2 layers)
- Switching torque per layer
    - BCD: 1.5, 2.2 or 3.5 Ncm
    - Hex or Gray: 1.5, 3.2 or 3.5 Ncm
- With or without high/low torque function "on/off"
- With End-Stop or endless rotating
- Number of positions
- Shaft length
- Front panel sealing IP60 or IP68
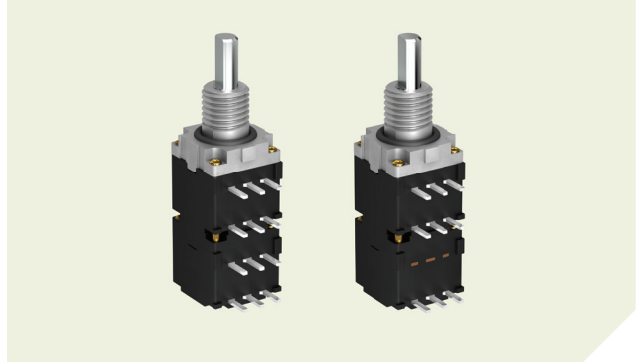
POSSIBLE CUSTOMIZATIONS

- Additional layers
- Non-shorting
- Shaft dimension and shape
- Bushing style
- IP sealing
- Switching torque
- 4 (5) positions selector switch

TYPICAL APPLICATIONS

- Frequency and channel selection for two way radios
- Target aiming devices
- Aircraft transponders
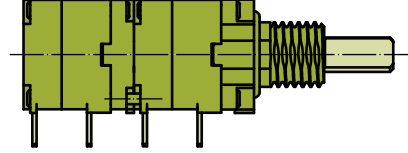- Medical equipment
- Industrial automation

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[1] PREFERENCE TYPES SELECTION CHART

[1] For other types/opions, see type key.
[2] Torque force 5.0 Ncm will appear only during the ON-OFF-actuation.

WITH ON-OFF FUNCTION
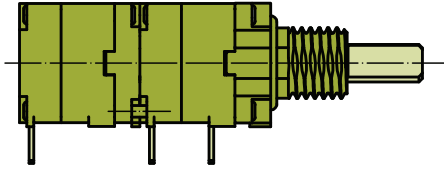
WITHOUT ON-OFF FUNCTION

STANDARD SHAFT LENGTH, IP68; HEX NUT SUPPLIED, SHORTING

CODING	POSITIONS/ INDEXING ANGLES	ON-OFF FUNCTION	TORQUE PER LAYER	TYPE
BCD	10 (0-9) / 36°	With	Layer 1: 3.5 Ncm [2]Layer 2: 5.0 Ncm	07ML-330A-13D0
		Without	Layer 1: 3.5 Ncm Layer 2: 3.5 Ncm	07ML-330S-13DD
BCD compl.	10 (0-9) / 36°	With	Layer 1: 3.5 Ncm [2]Layer 2: 5.0 Ncm	07ML-430S-13D0
		Without	Layer 1: 3.5 Ncm Layer 2: 3.5 Ncm	07ML-430S-13DD
Hex	16 (0-F) / 22.5°	With	Layer 1: 3.5 Ncm [2]Layer 2: 5.0 Ncm	07ML-530S-13D0
		Without	Layer 1: 3.5 Ncm Layer 2: 3.5 Ncm	07ML-530S-13DD
Hex compl.	16 (0-F) / 22.5°	With	Layer 1: 3.5 Ncm [2]Layer 2: 5.0 Ncm	07ML-630S-13D0
		Without	Layer 1: 3.5 Ncm Layer 2: 3.5 Ncm	07ML-630S-13DD
Gray	16 (0-F) / 22.5°	With	Layer 1: 3.5 Ncm [2]Layer 2: 5.0 Ncm	07ML-730S-13D0
		Without	Layer 1: 3.5 Ncm Layer 2: 3.5 Ncm	07ML-730S-13DD

SPECIFICATIONS

MECHANICAL DATA

Resolution:	BCD: 10 positions max. (36° indexing) Hex or Gray: 16 positions max. (22.5° indexing)
Switching mode:	Shorting
End-stops can be set:	BCD: From position 0 to 9 Hex or Gray: From position 0 to F
Layers:	2 layers
Switching torque (new condition) per layer:	BCD: 1.5, 2.2 or 3.5 Ncm (+/- 25%) Hex or Gray: 1.5, 3.2 or 3.5 Ncm (+/- 25%) Caution: Torque force depends on the quantity of layers and torque force of each layer. (Example: Layer1=3.5 Ncm, Layer2=3.5 Ncm. Total torque force of the switch=7 Ncm)
High/low torque function "on/off":	5.0 Ncm (+/- 25%)
Rotational life:	10'000 cycles min.
End-Stop strength:	BCD: 45 Ncm min. Hex or Gray: 35 Ncm min.
Fastening torque of nut:	100 Ncm max.

ELECTRICAL DATA

Coding/output:	BCD, BCD complementary, Hex, Hex complementary or Gray (shorting)
Contact resistance (new conditiion):	50 mΩ max.
Insulation resistance (new condition):	1 GΩ min. @ 500 VDC
Max. switching/breaking capacity:	5 VA
Switching current:	0.2 A (resistive load) max.
Switching voltage:	42 V (resistive load) max.
Dielectric withstanding voltage:	500 VDC during 60 seconds (pins to pins, pins to housing)

MATERIAL DATA

Shaft:	Stainless steel
Housing:	Zinc diecast, fiber enforced high performance plastic
Nut:	Brass
Contact system:	CuBe alloy, AuCo plated (hard gold)
Soldering leads:	CuBe alloy, tin plated
O-rings:	NBR (nitrile), 70 shore

ENVIRONMENTAL DATA

Operating/storage temperature range:	–40 to +85°C max.
IP sealing:	IP60, optional IP68 (2 bar, 1 h) shaft/front panel sealing (up to 5bar, 4 h on request) Washable (sealed contact system)
Vibration:	10 G$_{rms}$ max. @ 10 to 2000 Hz
Flammability:	UL94-HB

SOLDERING CONDITIONS

Hand soldering:	280°C max. during 2 sec max.
Wave soldering:	280°C max. peak temperature during 2 sec max.

PACKAGING QUANTITY

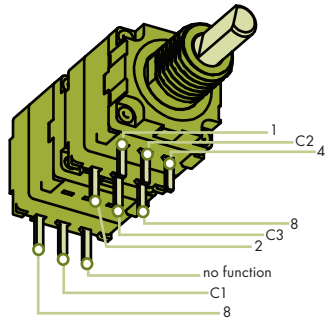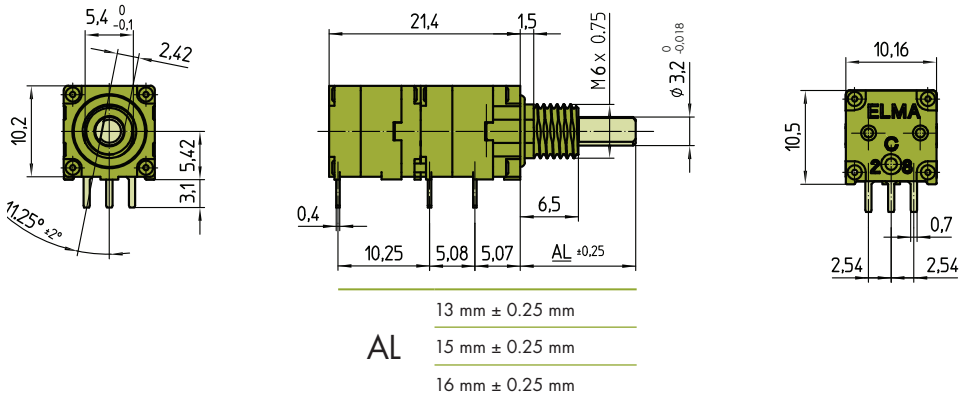|	
[1] Standard tray:	50 pcs. or 200 pcs.
Antistatic tray:	100 pcs.

[1] The packaging size depends on shipment quantity. If the shipment quantity is
< 200 pcs. then standard tray 50 pcs.
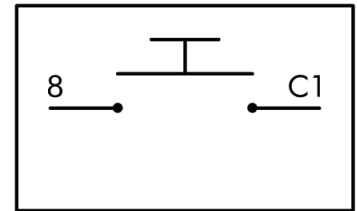≥ 200 pcs. then standard tray 200 pcs.

CODED SWITCH TYPE 07ML

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DRAWINGS

Tolerances unless otherwise specified DIN ISO 2768-1 (m)

SWITCH DESIGN

WITH ON-OFF FUNCTION

5,4 $^{0}_{-0,1}$
2,42
10,2
5,42
3,1
11,25° ±2°

21,4   1,5
M 6 x 0,75
$\varnothing$ 3,2 $^{0}_{-0,018}$
0,4
10,25   5,08   5,07   AL ±0,25
6,5

AL
13 mm ± 0.25 mm
15 mm ± 0.25 mm
16 mm ± 0.25 mm

10,16
10,5
ELMA
C
2 8
2,54   0,7   2,54

1
C2
4
8
C3
2
no function
C1
8

ON-OFF FUNCTION

8   C1

WITHOUT ON-OFF FUNCTION, ONLY SECOND LAYER

5,4 $^{0}_{-0,1}$
2,42
10,2
5,42
3,1
11,25° ±2°

21,4   1,5
M 6 x 0,75
$\varnothing$ 3,2 $^{0}_{-0,018}$
0,4
5,08   5,17   5,08   5,07   AL ±0,25
6,5

AL
13 mm ± 0.25 mm
15 mm ± 0.25 mm
16 mm ± 0.25 mm

10,16
10,5
ELMA
C
2 8
2,54   0,7   2,54

1
C2
4
8
C3
2
4
C4
1
2
C5
8

CODED SWITCH TYPE 07ML

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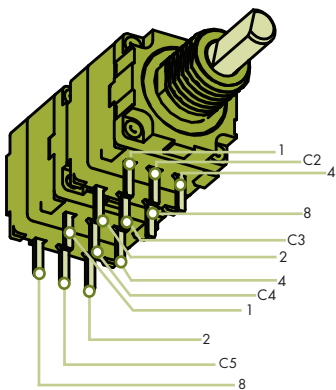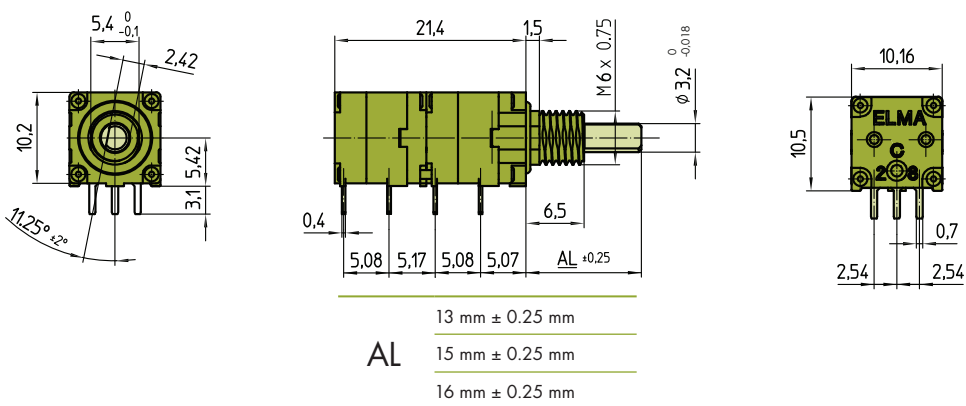
DRAWINGS

DRILLING DIAGRAMS

WITH ON-OFF FUNCTION

Commons (C2, C3) must be connected together on the PCB

View from switch mounting side of the PCB

View from soldering side of the switch
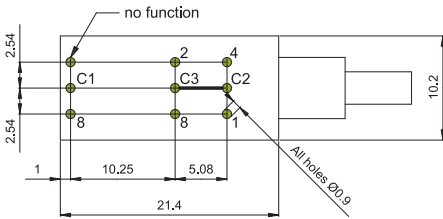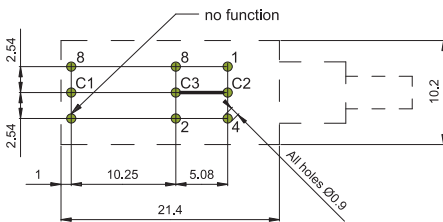
WITHOUT ON-OFF FUNCTION, ONLY SECOND LAYER

Commons (C2 + C3, C4 + C5) must be connected together on the PCB
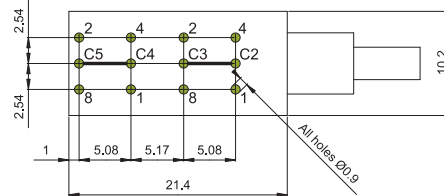
View from switch mounting side of the PCB
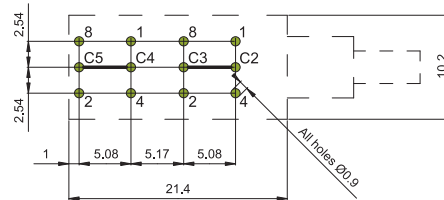
View from soldering side of the switch

FRONT PANEL CUT OUT

$5,4^{+0,03}_{+0,105}$

$6^{+0,03}_{+0,105}$

NUT

HEX NUT

M6 x 0,75

2.5

9
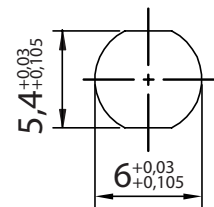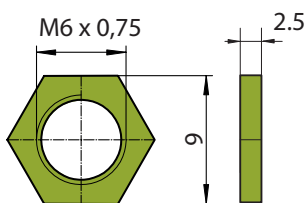
Spare part
Order number (50 pcs. bag)
- Brass: 4424-22

SLOTTED NUT

M6 x 0,75

Ø 8,5

1,3

1

2
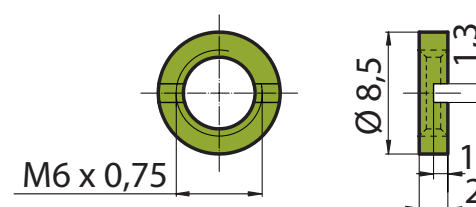
Order number (50 pcs. bag)
- Brass: 4424-28
- Stainless steel (cross slot): 4424-31

TYPE KEY

| 07ML | – | _ _ _ _ – _ _ _ _ |

CODING

3 BCD (max. 10 pos.)
4 BCD compl. (max. 10 pos.)
5 Hex
6 Hex compl.
7 Gray

(Explanation: see chapter technical explanation at the end of the catalog)

BUSHING; IP SEALING; NUT

10 Threaded ; IP60 ; Hex-Nut
20 Threaded ; IP60 ; Slotted-Nut
30 Threaded ; IP68 ; Hex-Nut
40 Threaded ; IP68 ; Slotted-Nut
50 Threaded ; IP60 ; Without Nut
60 Threaded ; IP68 ; Without Nut

XX Ask for customized solution

ADJUSTABLE END-STOP; POSSIBLE POSITION TRAVEL

0 Without (endless rotating)
S [1] Standard; BCD:10 pos. , Hex/Gray: 16 pos.
E 0-E ; 15 pos.
D 0-D ; 14 pos.
C 0-C ; 13 pos.
B 0-B ; 12 pos.
A 0-A ; 11 pos.
9 0-9 ; 10 pos.
8 0-8 ; 9 pos.
7 0-7 ; 8 pos.
6 0-6 ; 7 pos.
5 0-5 ; 6 pos.
4 0-4 ; 5 pos.
3 0-3 ; 4 pos.
2 0-2 ; 3 pos.
1 0-1 ; 2 pos.

[1] End-stop between pos. 0-F (Hex/Gray) and pos. 0-9 (BCD)

PACKAGING

- [1] Standard tray (50/200 pcs.)
A Antistatic tray (100 pcs.)

[1] Standard tray:
The packaging size depends on shipment quantity.
If the shipment quantity is
< 200 pcs. then standard tray 50 pcs.
≥ 200 pcs. then standard tray 200 pcs.

LAYER 2: TORQUE AT LAYER 2

0 [1] 5.0 Ncm (ON-OFF function)
B [2] 1.5 Ncm (Gray/Hex/BCD)
C [2] 3.2 Ncm (Gray/Hex); 2.2 Ncm (BCD)
D [2] 3.5 Ncm (Gray/Hex/BCD)

X Ask for customized solution

Caution:
[1] During the ON-OFF-actuation (position 0 to 1) the torque-force will be increased!
[2] Additional layer increases the torque-force according to the chosen torque-force!

LAYER 1: TORQUE AT LAYER 1

B 1.5 Ncm (Gray/Hex/BCD)
C 3.2 Ncm (Gray/Hex); 2.2 Ncm (BCD)
D 3.5 Ncm (Gray/Hex/BCD)

X Ask for customized solution

D-SHAFT LENGTH (AL)

13 Standard, 13 mm length
15 Standard, 15 mm length
16 Standard, 16 mm length

(shaft dimension and shape see drawing)

XX Ask for customized solution

GENERAL SWITCH TERMS

POSITION

A position is a mechanical detent of a switch actuation.

DETENT

A detent is a positioning device to mechanically stop the rotation of a switch. This can be achieved for instance with a spring-operated ball and an opponent chamfer.

POLE

A pole is capable of conducting a single electrical signal. Each layer is equivalent to one pole (1 layer = 1 pole). The number of poles indicates the number of electrical signals/circuits which are controlled by the switch.
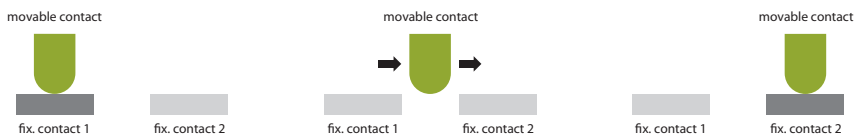
WAFER, DECK OR LAYER

Here, a wafer is a construction of a fixed and a movable disk. One wafer consists of the necessary contacts for one pole.

INDEXING ANGLE

An indexing angle is the number of degrees between each consecutive position.
For example: 12 positions of a total of 360 degrees results in a 30 degrees indexing angle.

NON-SHORTING CONTACTS "BREAK BEFORE MAKE"

A non-shorting contact is also known as "break-before-make" and describes the switching action of a pole when switching to the next position. The switch will momentarily be interrupted while it changes for instance from position 1 to position 2 (see picture)

| movable contact | | movable contact | | movable contact | |
| fix. contact 1 | fix. contact 2 | fix. contact 1 | fix. contact 2 | fix. contact 1 | fix. contact 2 |

SHORTING CONTACTS "MAKE BEFORE BREAK"

A shorting contact is also known as "make-before-break" and describes the switching action of a pole when switching to the next position. The switch will momentarily short two contacts while it changes for instance from position 1 to position 2 (see picture).

| movable contact | | movable contact | | movable contact | |
| fix. contact 1 | fix. contact 2 | fix. contact 1 | fix. contact 2 | fix. contact 1 | fix. contact 2 |
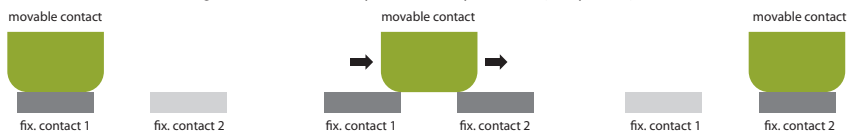
CYCLE

A cycle is one rotation through all positions and back to the start position. The rotational life of coded or selector switches are usually specified by cycles.

REVOLUTION

A revolution is a 360 degree rotation through all positions. The rotational life of encoded switches is usually specified by revolutions.

BENEFITS OF GOLD-PLATED CONTACTS

Gold-plated contacts should be used for longer rotational life, in corrosive environment or in case the switch will not be actuated for a long period of time.

TECHNICAL EXPLANATIONS

ELMA SWITCH TERMS

MECHANICAL CODED SWITCHES (BCD, HEX, GRAY)

A mechanical coded switch usually works with 4 bits (bit values 1,2,4,8). A common contact (C) shorts the circuit. With 4 bits it is possible to achieve 10 to 16 switch positions (depending on the used code, see picture below) with only 5 connection pins. It is a cost effective way to realize a rotary switch.
Coded switches need a microcontroller with corresponding software.

CODE TABLES

Legend: ■ On □ Off

BCD

	8	4	2	1
0	□	□	□	□
1	□	□	□	■
2	□	□	■	□
3	□	□	■	■
4	□	■	□	□
5	□	■	□	■
6	□	■	■	□
7	□	■	■	■
8	■	□	□	□
9	■	□	□	■

BCD Complementary

	8	4	2	1
0	■	■	■	■
1	■	■	■	□
2	■	■	□	■
3	■	■	□	□
4	■	□	■	■
5	■	□	■	□
6	■	□	□	■
7	■	□	□	□
8	□	■	■	■
9	□	■	■	□

Hex

	8	4	2	1
0	□	□	□	□
1	□	□	□	■
2	□	□	■	□
3	□	□	■	■
4	□	■	□	□
5	□	■	□	■
6	□	■	■	□
7	□	■	■	■
8	■	□	□	□
9	■	□	□	■
A	■	□	■	□
B	■	□	■	■
C	■	■	□	□
D	■	■	□	■
E	■	■	■	□
F	■	■	■	■

Hex Complementary

	8	4	2	1
0	■	■	■	■
1	■	■	■	□
2	■	■	□	■
3	■	■	□	□
4	■	□	■	■
5	■	□	■	□
6	■	□	□	■
7	■	□	□	□
8	□	■	■	■
9	□	■	■	□
A	□	■	□	■
B	□	■	□	□
C	□	□	■	■
D	□	□	■	□
E	□	□	□	■
F	□	□	□	□

Gray

	8	4	2	1
0	□	□	□	□
1	□	□	□	■
2	□	□	■	■
3	□	□	■	□
4	□	■	■	□
5	□	■	■	■
6	□	■	□	■
7	□	■	□	□
8	■	■	□	□
9	■	■	□	■
A	■	■	■	■
B	■	■	■	□
C	■	□	■	□
D	■	□	■	■
E	■	□	□	■
F	■	□	□	□

CONCENTRIC FUNCTION

A concentric rotary switch has two shafts (inner and outer) and logically two switching-functions packed in just one switch.

SWISS CLICK INDEXING SYSTEM™

The "Swiss click indexing system" is an Elma label, containing switches with a special indexing to ensure nearly consistent torque over life (see picture below). Switches with that feature are specially marked in the catalogue.

Torque — ELMA'S Swiss Click Indexing System™ — Typical Competitors — Life