Limit Switches

AGENDA

- Limit Switches Production Overview
- Standards Overview
- Limit switches part and code creation
- Materials, cable inlets, connections
- Contact blocks features
- Label information
- How to read a diagram
- Head-casing combinations, head adjustments
- Switches for special applications: low temperature limit switches
- Prewired series overview
- Connection types and code creation
- Halogen free and dynamic cables
- Foot switches overview

Key Information

Over 12.000 available standard items.
Large number of available customizations.

Three involved production lines.
Designed and assembled in factory.
Assistance in references, product selection and technical questions.

International Sales:
Europe, Africa, America, China, Southern Asia, Australia.

Product Category:
30mm EN50047 switches, 40mm EN50041 switches, multiple cable entries switches, Pre-wired switches with cable or connectors, Special applications switches

2014/35/EU

Low Voltage Directive

EN 60947-1

Low Voltage Switchgear and Controlgear

Part 1 – General rules

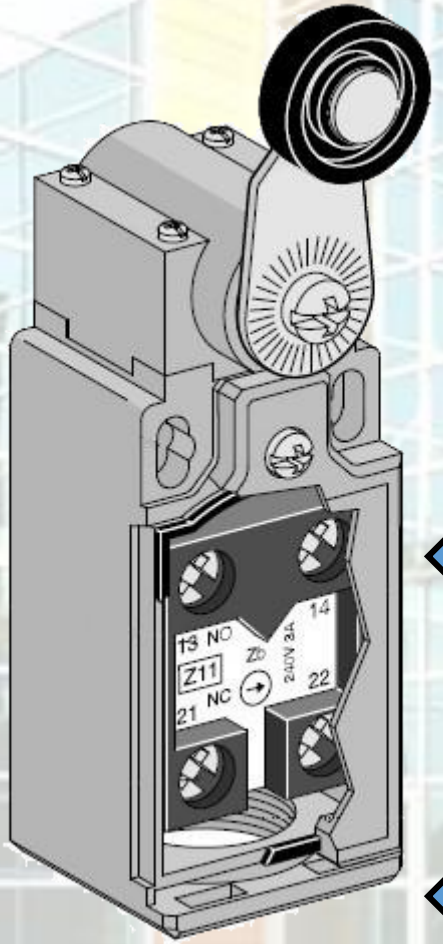
EN 60947-5-1

Low Voltage Switchgear and Controlgear

Part 5-1 – Control Switching Devices and Switching elements

Operating Head

Casing

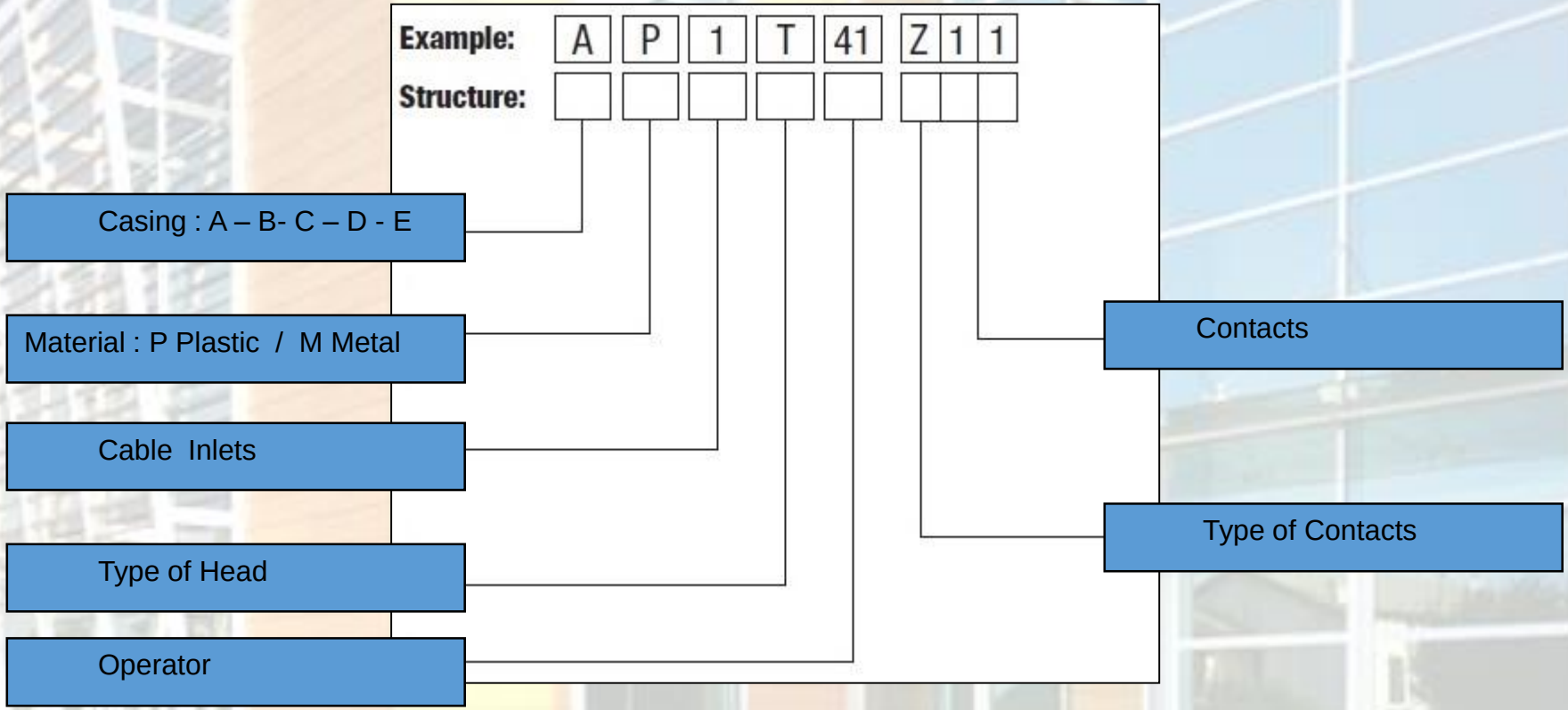


Actuator

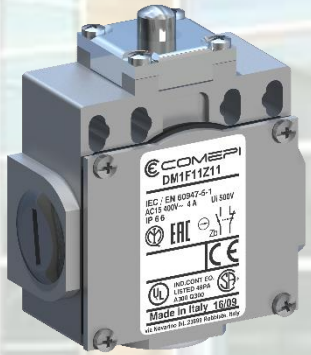
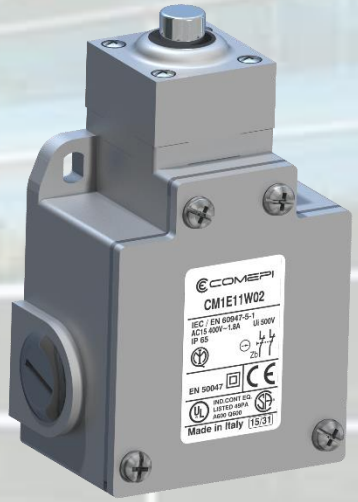
Contact block

Cable inlet

Limit switches code construction



Casing type

	A type – 30mm EN 50047	B type – 40mm EN 50041	D type – 50mm	C type – 60mm
Plastic Series	IP65 	IP65 	IP65 	
Metal Series	IP66 	IP66 	IP66 	IP66 

Cable inlet type

AP/AM/BP/BM
1 cable inlet

DP
2 cable inlets

DM/CM
3 cable inlets

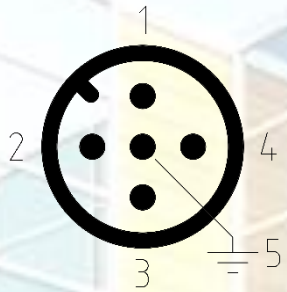
1 → PG13.5
2 → ½”NPT
3 → PG11
4 → M16x1.5
5 → M20x1.5

BP-BM-CM → Only PG13.5 – ½”NPT – M20x1.5

Cable inlet type – M12 connectors

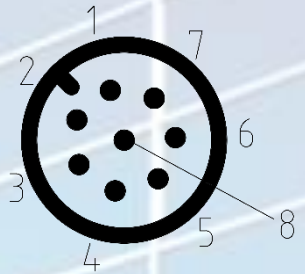
4 poles connector

Plastic limit switches with two contacts



5 poles connector

Metal limit switches with two contacts

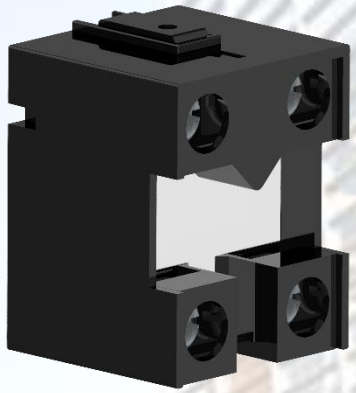


8 poles connector

Limit switches with three contacts

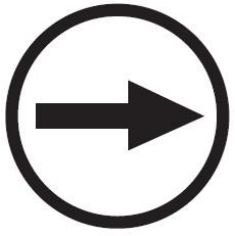
Part Number

AP1T10Z11M



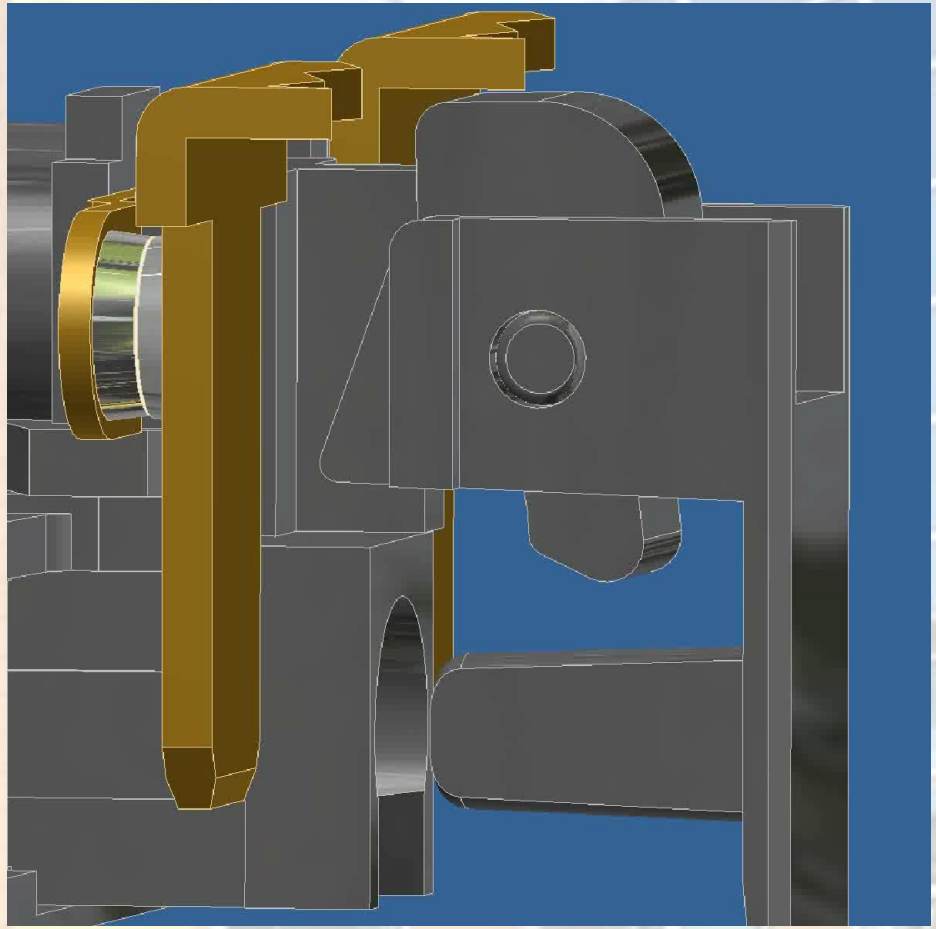
Positive opening operation according to EN 60947-5-1 on normally closed contacts

No elastic parts between actuator and contacts

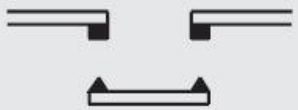
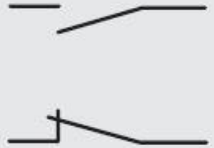
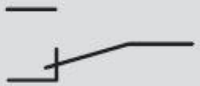
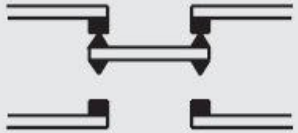
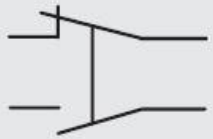
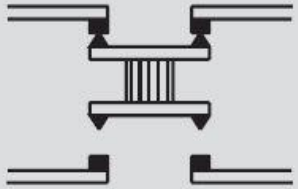
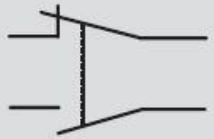


All the switches with positive opening operations are identified by this symbol printed on the cover

Positive opening operation → How it works?

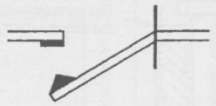
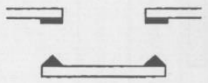
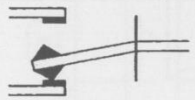
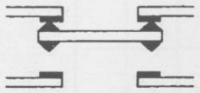
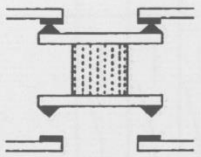


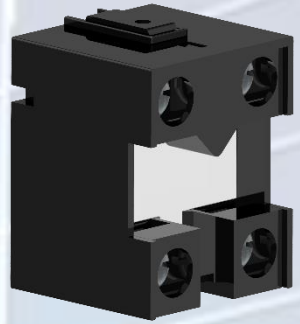
Contact block → contact form

Design	Figure	Symbol	Description
X Y			Double interruption contact element with two terminals
C			Change-over contact element with single interruption and three terminals
Za			Change-over contact element with double interruption and four terminals. **The contacts have identical polarity**
Zb			Change-over contact element with double interruption and four terminals. **Mobile contacts are electrically separated**

Contact block → contact form

Fig. 4 Examples of contact elements (schematic sketches) Esempi di elementi di contatto (figure schematiche)

Fig. N. Figure No	Figura *Figure*	Simboli *Symbols*	Forma *Form*	Descrizione *Description*
4a)		Nota 1 Note 1	A	Elemento di contatto a singola interruzione con due morsetti *Single gap contact element with two terminals*
		Nota 1 Note 1	B	
4b)		Nota 1 Note 1	X	Elemento di contatto a doppia interruzione con due morsetti *Double gap contact element with two terminals*
		Nota 1 Note 1	Y	
4c)		Nota 1 Note 1	C	Elemento di contatto in scambio a semplice interruzione con tre morsetti *Change-over, single gap contact element with three terminals*
4d)			Za	Elemento di contatto in scambio a doppia interruzione con quattro morsetti **Nota:** I contatti hanno la stessa polarità *Change-over, double gap, contact element with four terminals* ***Note:** The contacts are of the same polarity*
4e)			Zb	Elemento di contatto in scambio a doppia interruzione con quattro morsetti (I due contatti mobili sono elettricamente separati) *Change-over, double gap, contact element with four terminals. (The two moving contacts are electrically separated)*



X & Y – Double interrupted

Slow action NO or NC contacts

W02 – W20 – X12 – X21 – W30 – W03

Zb – Double interrupted and separated

1NO + 1NC or snap action

Z11 – X11 – Y11 – Z02

Contact block → contact form

Electrically separated contacts

Symbol "**+**" between contact designs (e.g. X+X, Za+Za, X+X+Y, etc.) indicates the combinations of simple contact blocks **electrically separated** between each other.

The **electrically separated contacts allow** the application of different voltages on the contacts and the connection of loads on different polarities (figure 1).

Prescriptions and restrictions for Za contacts

Electrical loads must be connected to the same phase or polarity. The contacts **are not** electrically separated, connection of different voltages between the NC contact and the NO contact is not allowed (fig. 2 and 3).

Also, as prescribed by the standard EN 60947-5-1 paragraph K.7.1.4.6.1, if Za contacts with positive opening for safety applications are used, the following restrictions have to be adopted:

" If the control accessory has shifting contacts components with design C or Za, **you have to use only one contact component** (closure or cutoff). In case of shifting contact with design Zb, both contacts may be used..."

Zb design contact

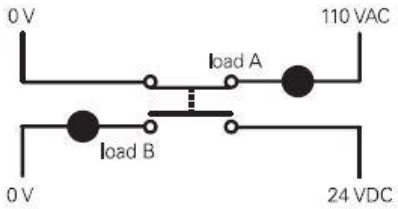


figure 1: **correct**

Za design contact

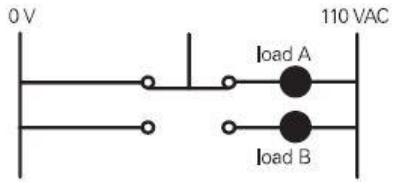


figure 2: **correct**

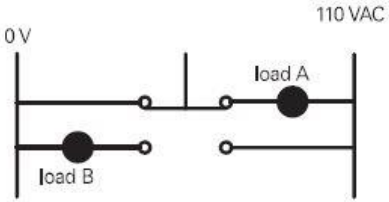


figure 3: **incorrect**

Utilization categories according to EN 60947-5-1

Tab 1 **Utilization categories for switching elements** — **Categorie di utilizzazione per elementi di manovra**

Tipo di corrente *Kind of current*	Categoria *Category*	Applicazioni tipiche *Typical applications*
Corrente alternata *Alternating current*	AC-12	Comando di carichi resistivi e carichi a stato solido con isolamento ottenuto con optoisolatori *Control of resistive loads and solid state loads with isolation by optocouplers*
	AC-13	Comando di carichi a stato solido con trasformatore di isolamento *Control of solid state loads with transformer isolation*
	AC-14	Comando di piccoli carichi elettromagnetici (≤ 72 VA) *Control of small electromagnetic loads (≤ 72 VA)*
	AC-15	Comando di carichi elettromagnetici (> 72 VA) *Control of electromagnetic loads (> 72 VA)*
Corrente continua *Direct current*	DC-12	Comando di carichi resistivi e carichi a stato solido con isolamento ottenuto con optoisolatori *Control of resistive loads and solid state loads with isolation by optocouplers*
	DC-13	Comando di elettromagneti *Control of electromagnets*
	DC-14	Comando di carichi elettromagnetici aventi resistori economizzatori nel circuito *Control of electromagnetic loads having economy resistors in circuit*

AC-15

Control of electromagnetic loads (>72VA)

Tabella_*Table* 4a

Categoria di utilizzazione *Utilization category*	Chiusura[2] *Make*[2]			Interruzione[2] *Break*[2]			Tempo minimo di passaggio della corrente *Minimum on-time*
	I/I_e	U/U_e		I/I_e	U/U_e		
AC			cos φ			cos φ	Cicli *Cycles* (a_at 50 Hz o_or 60 Hz)
AC-12	1	1	0,9	1	1	0,9	2
AC-13	2	1	0,65	1	1	0,65	2[3]
AC-14	6	1	0,3	1	1	0,3	2[3]
AC-15	10	1	0,3	1	1	0,3	2[3]
DC			$T_{0.95}$ ms			$T_{0.95}$ ms	Tempo_*Time* ms
DC-12	1	1	1	1	1	1	25
DC-13	1	1	6 × P[6]	1	1	6 × P[6]	$T_{0.95}$
DC-14	10	1	15	1	1	15	25[3]

I_e Corrente nominale di impiego
U_e Tensione nominale di impiego
$P = U_e \times I_e$ Potenza assorbita a regime in W

I Corrente da stabilire o interrompere
U Tensione prima della chiusura
$T_{0.95}$ Tempo per raggiungere il 95% della corrente a regime in millisecondi

I_e *Rated operational current*
U_e *rated operational voltage*
$P = U_e \times I_e$ *Steady-state power consumption in W*

I *Current to be made or broken*
U *Voltage before make*
$T_{0.95}$ *Time to reach 95% of the steady-state current*

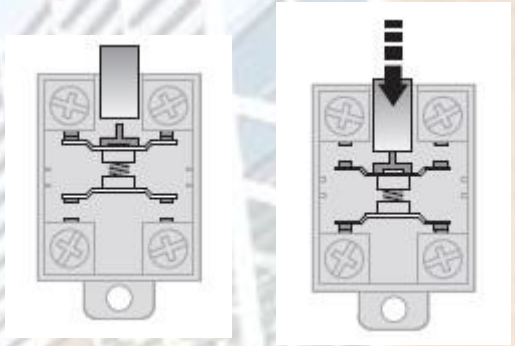
Tabella_*Table* 4b

Sequenza, numero e frequenza delle operazioni
Sequence, number and rate of operations

Ordine[7] *Order*[7]	Numero *Number*	Frequenza al minuto *Rate per minute*
1	50[4]	6
2	10	rapidamente[5] *rapidly*[5]
3	990	60
4	5000	6

DC-13

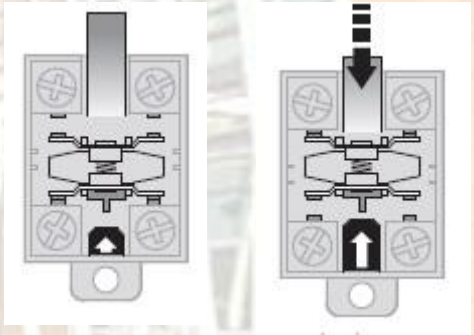
Control of electromagnets



SLOW ACTION

Contacts move at the same speed as the actuator

Suggested in case of low current or fast movement of the actuator



SNAP ACTION

Contacts move independently from the actuator speed

Suggested in case of high current or slow movement of the actuator

Z11

Contact Type

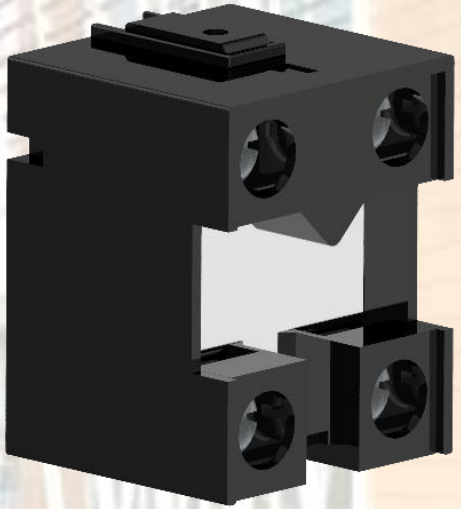
Z = Snap action contacts
X = Non overlapping slow action contacts
Y = Overlapping slow action contacts
W = Simultaneous slow action contacts
J = Directional contacts

Number of NO contacts

Number of NC contacts

Two contacts

Z11 / X11 / Y11 = 1NO+1NC
Z02 / W02 / J02 = 2NC
W20 = 2NO



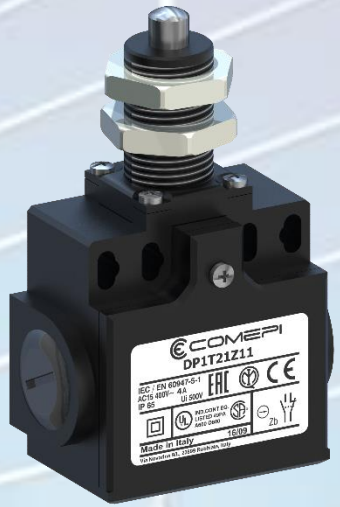
Three contacts

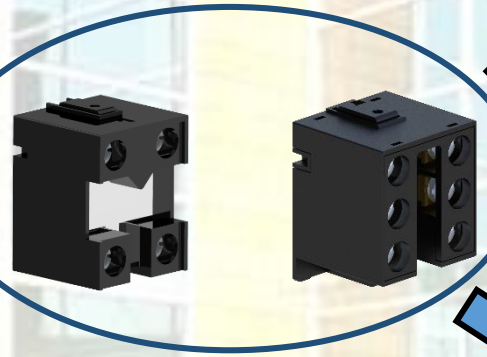
X12P / X12 = 1NO + 2NC
X21P / X21 = 2NO + 1NC
W03P / W03 / J03 = 3NC
W30 = 3NO

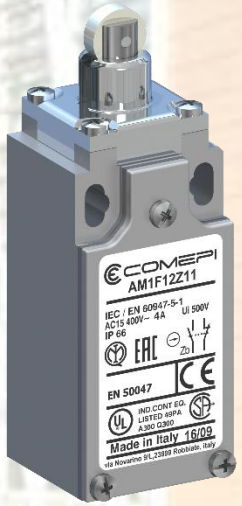
Contact block type – Small series

AP

DP

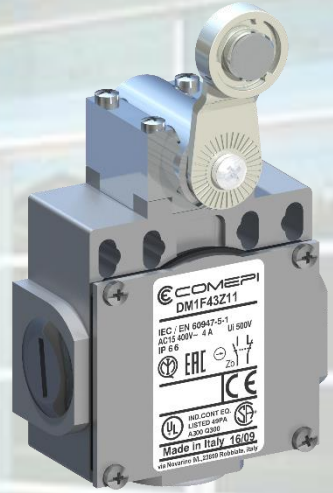






AM

DM

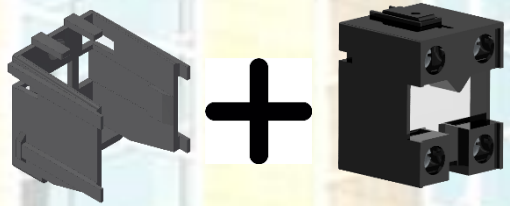


Replacement 2poles contact block for large series:

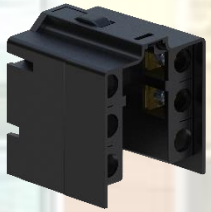
Add "G" at the beginning of contact block name

For example: GZ11

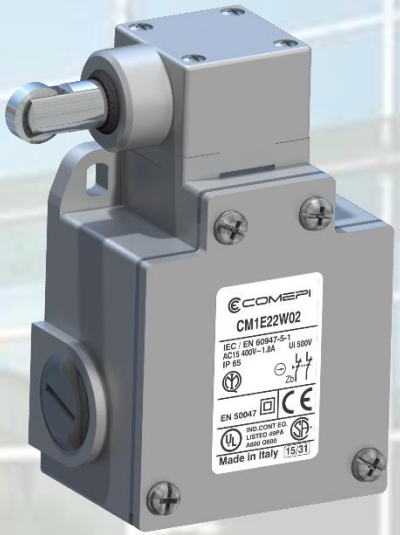
BP



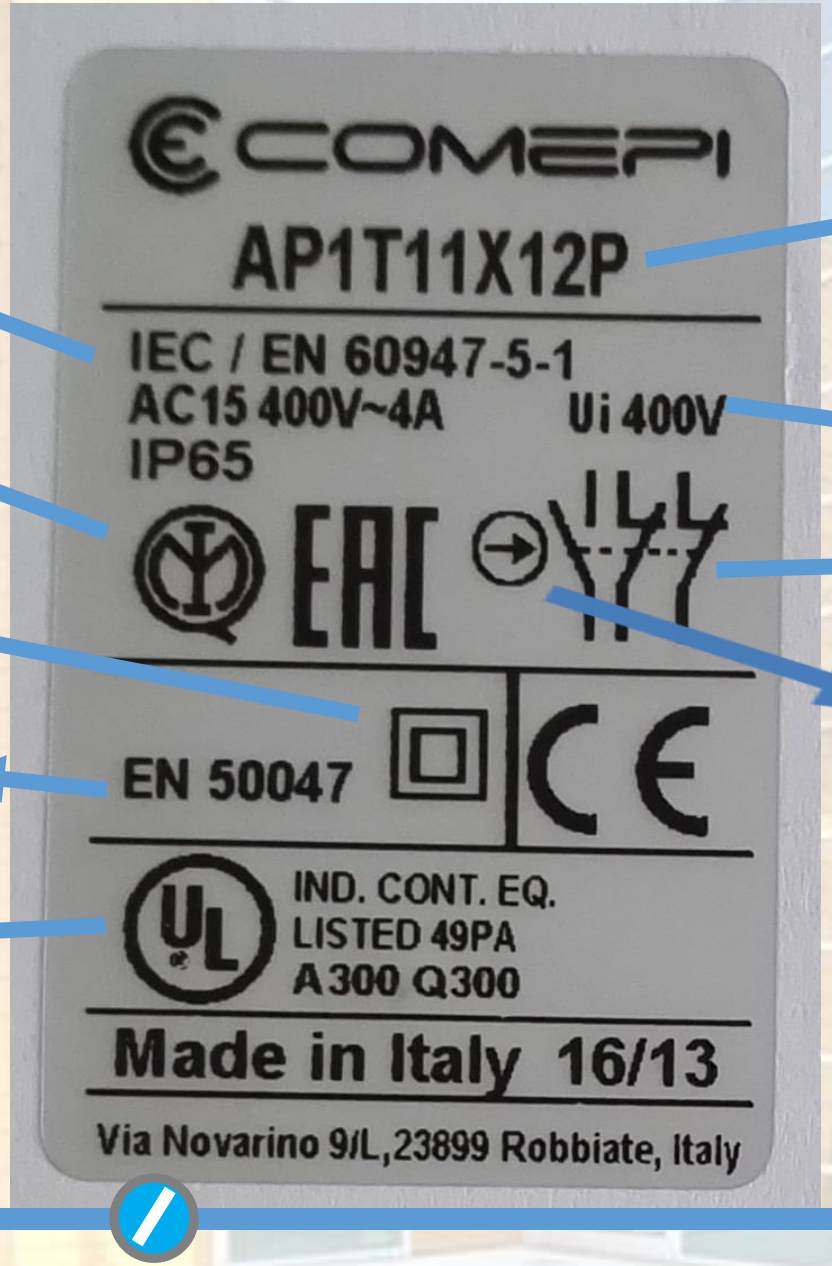
BM



CM



How to read a label



Standards
Electrical ratings
IP degree

Approvals

Double insulation

Dimensional standard

UL Approval

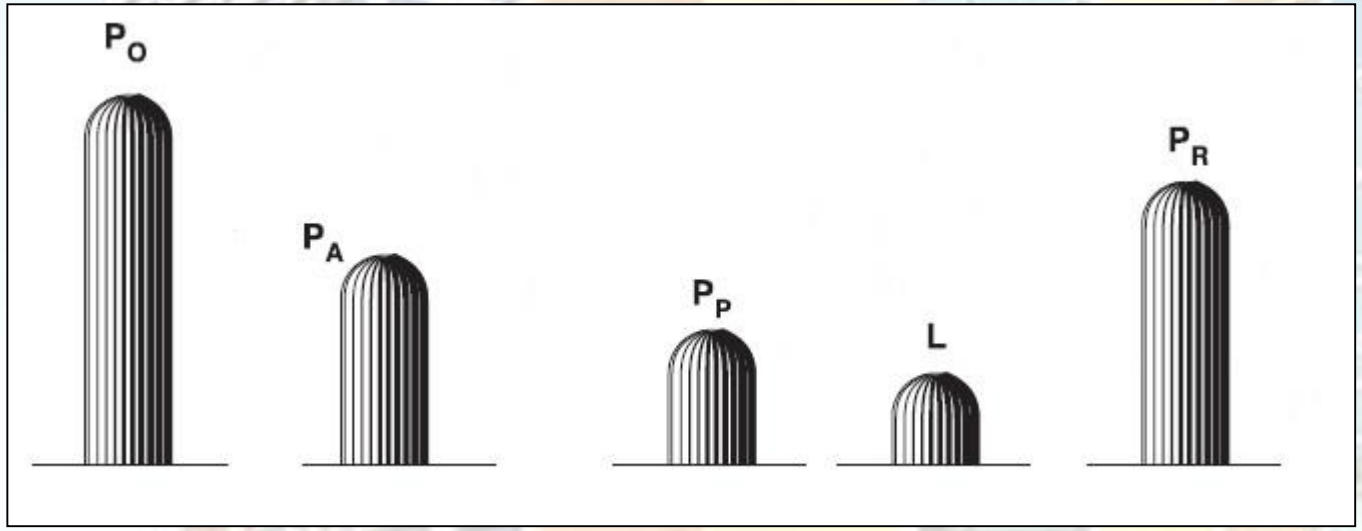
CODE

Insulation voltage

Contact block

Positive opening operation

Travel and operating diagram



Free Position

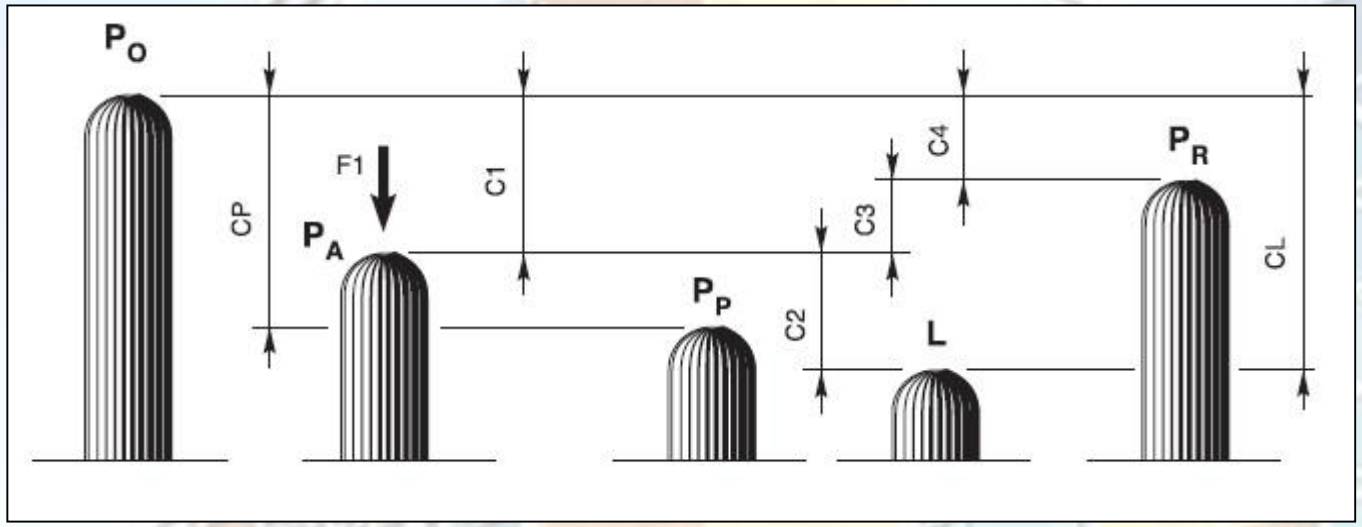
Operating Position

Positive Opening Position

Max. Travel Position

Release Position

Travel and operating diagram



Free Position

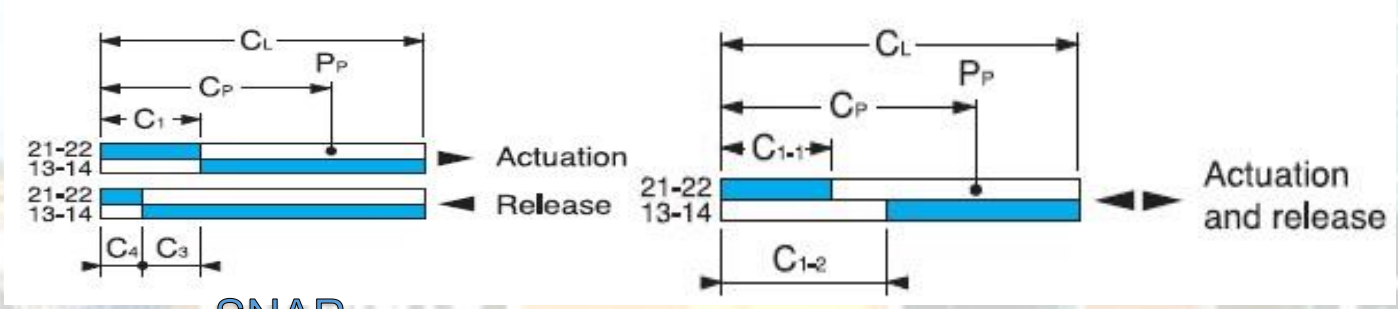
Operating Position

Positive Opening Position

Max. Travel Position

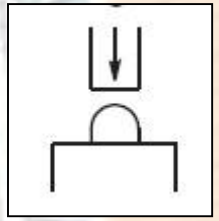
Release Position

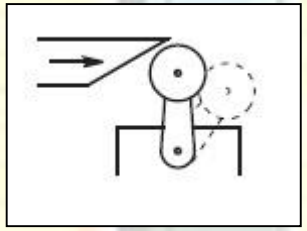
C_1 Pre-Travel
C_P Positive Open.
C_2 Over-Travel
C_L Max. Travel
C_3 Differential Tr.
C_4 Release Travel

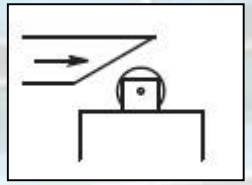


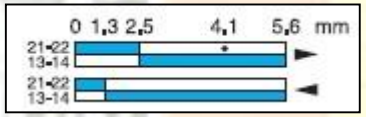
SNAP ACTION

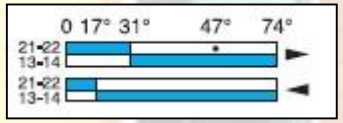
SLOW ACTION

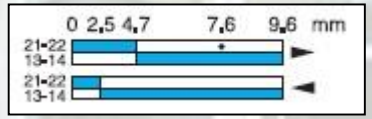












In mm
(Cam Travel)

In degrees
(Lever Rotation)

In mm
(Cam Travel)

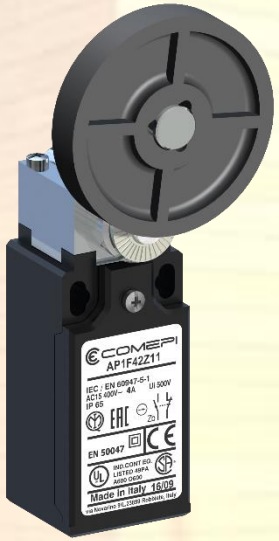
In mm
(Cam Travel)

Head and casing material – Small series

Plastic head
Plastic body
AP_T series
DP_T series

Metal head
Metal body
AM_F series
DM_F series

Metal head
Plastic body
AP_F series
DP_F series



Plastic head
Metal body
AM_T series
DM_T series

Head and casing material – Large series

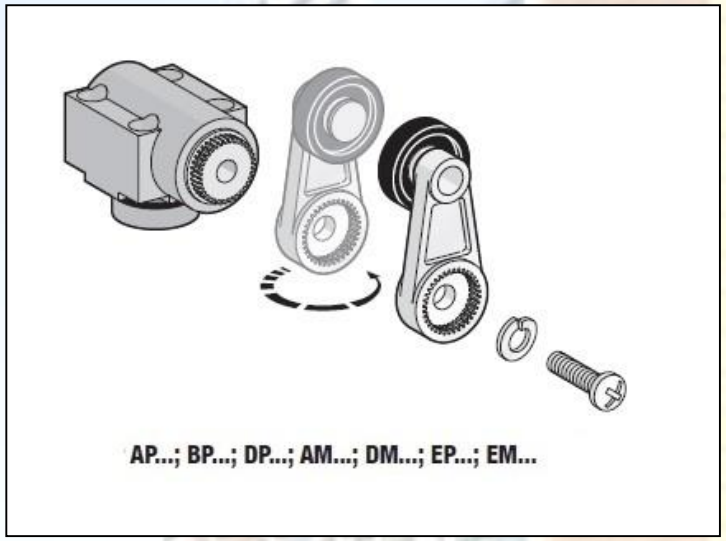
Plastic head
Plastic body
BP_H series

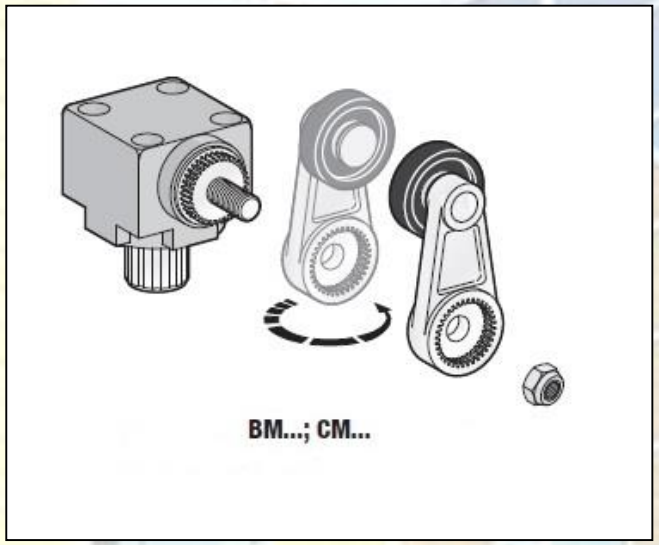
Painted aluminium head
Painted aluminium body
BM_E series
CM_E series

Metal head
Painted aluminium body
BM_M series
CM_M series

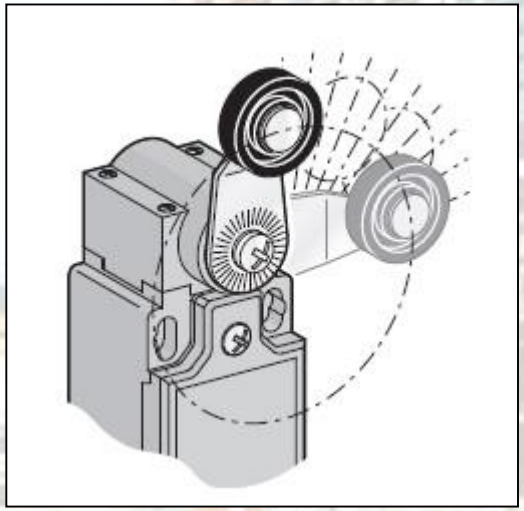
Plastic head
Painted aluminium body
BM_P series
CM_P series

Adjustments



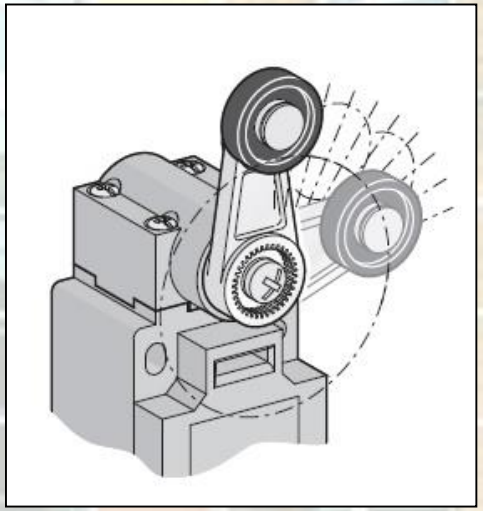


Reverse lever

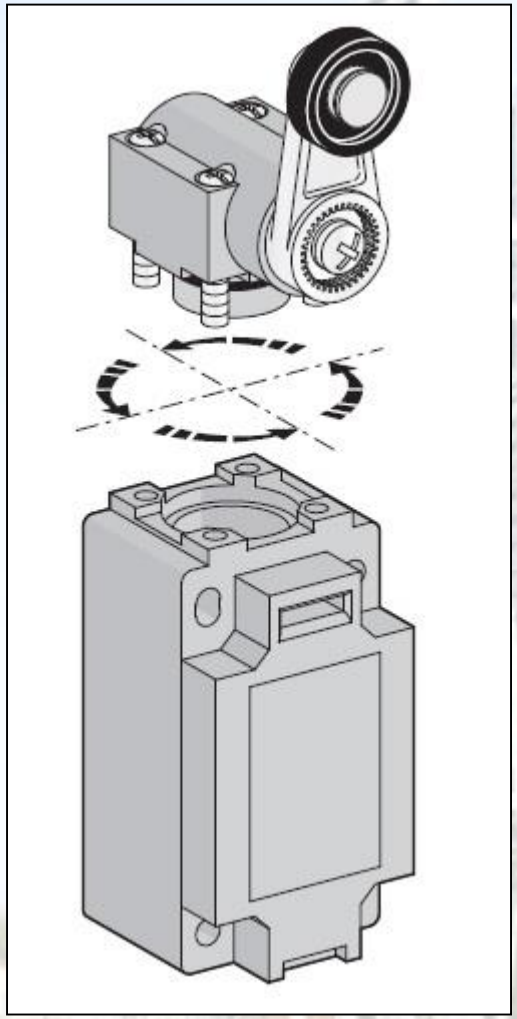


AP-AM-DP-DM-EP-EM
10x10° adjustments

BP-BM-CM
9x9° adjustments



Starting angle



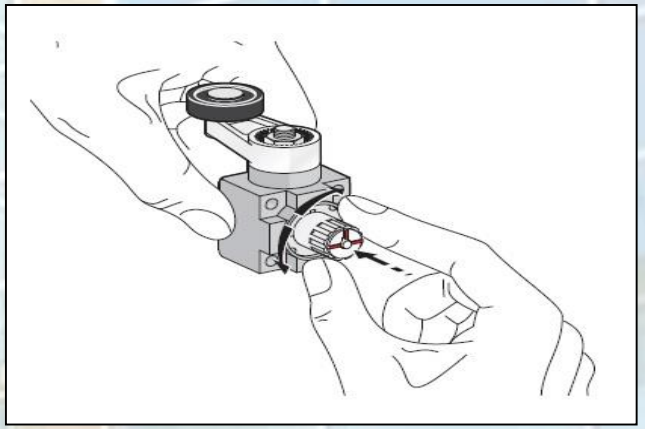
Head orientation

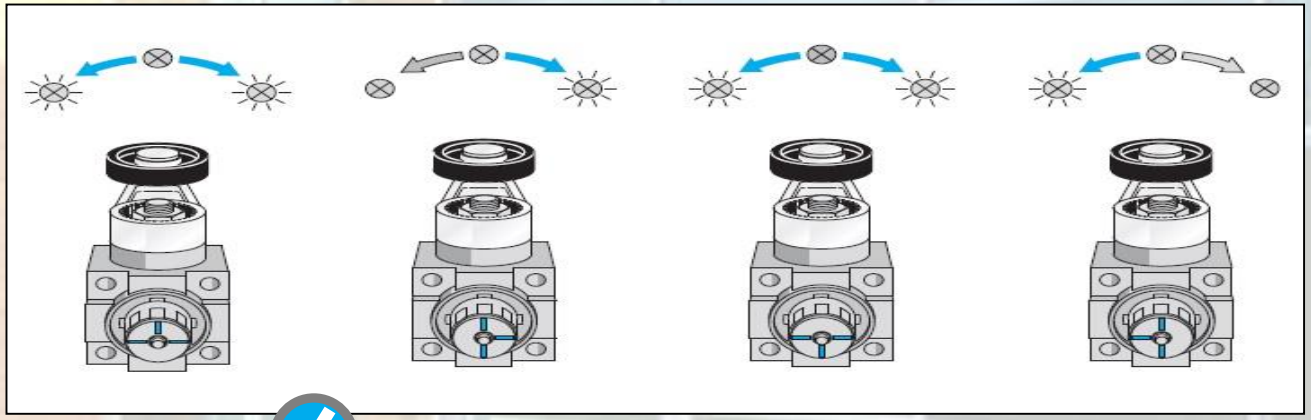
Every 90° for all the switches

Except EP & EM series (only 180°)

Operating mode selection

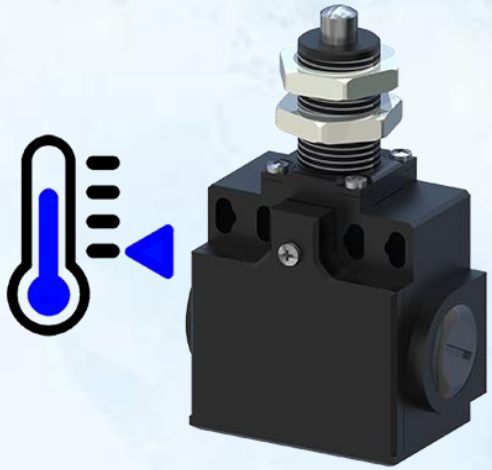
For BM – BP – CM series





Low temperature limit switches

-40°C



Extended low temperature limit down to -40°C with the same mechanical performances

Available for all the devices from the main limit switches series AP-DP-BP-AM-DM-BM-CM

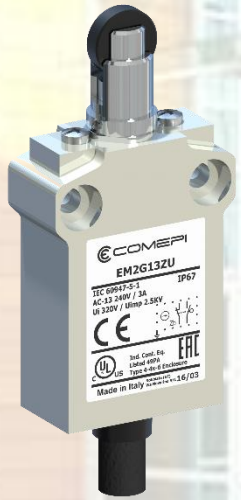
Reference Part Number: add the digits «40» after the actuator code.
For example AP1T10Z11 become AP1T1040Z11

EP series
Plastic body

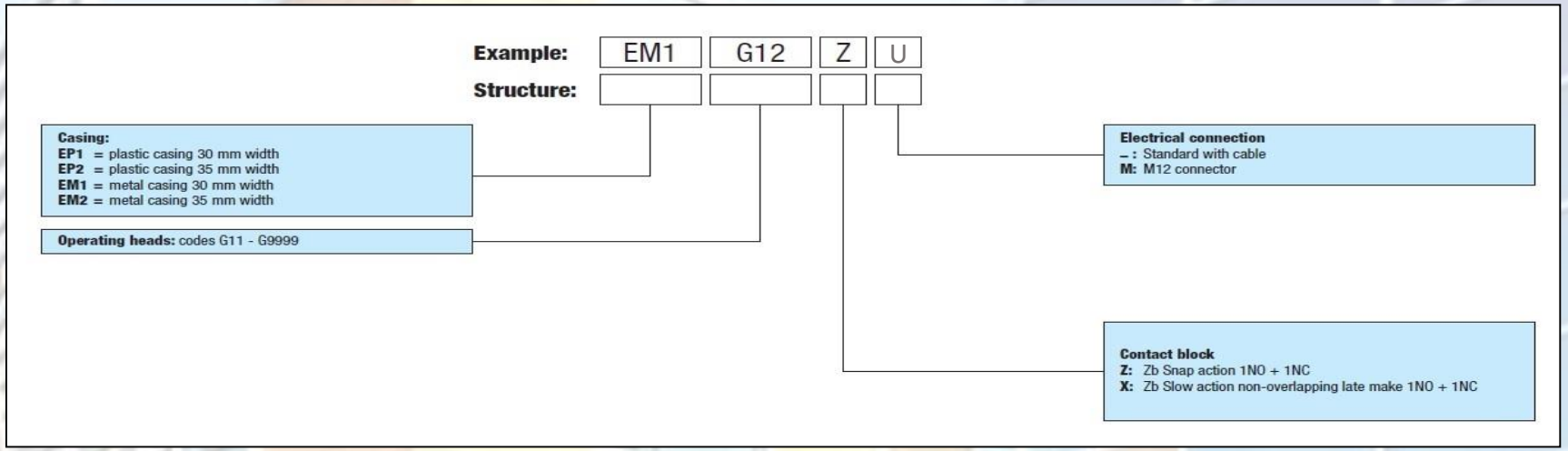
EM series
Metal body

EP1 – EM1
30mm width

EP2 – EM2
35mm width



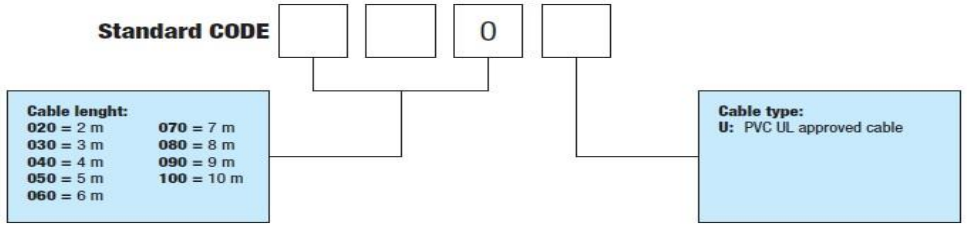
Miniaturized
Prewired
IP67



Electrical connection:

Standard: 1 m. PVC cable 4 x 0,75 mm² (EP... series)
1 m. PVC cable 5 x 0,75 mm² (EM... series)

On request: All EP.../EM... limit switches can be supplied with different cable types and lenghts according to the following ordering details

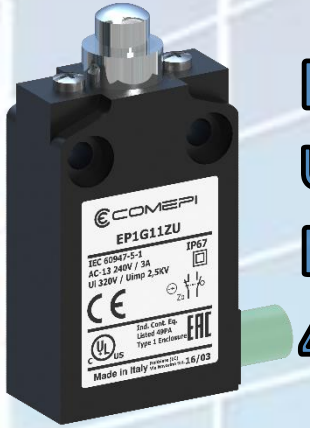


Examples

EM1G11Z030: 30 mm. width limit switch - plain plunger - snap action contact block - 3 m. standard cable.
EM1G11ZU: 30 mm. limit switch - plain plunger - snap action contact block - 1 m. UL cable.
EM1G11Z040U: 30 mm. width limit switch - plain plunger - snap action contact block - 4 m. UL cable.

EP1G11ZU
UL Cable
PVC-PVC
4xAWG18

EP1G11ZUP
UL Dynamic Cable
PUR-PVC
4xAWG18

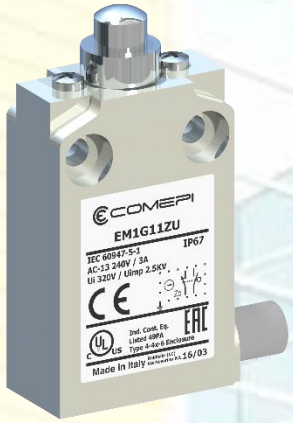


EP1G11ZHF
UL Halogen free cable
PUR-TPE
4xAWG18

EP1G11ZM
M12 connector
Male
4 poles

EP1G11ZAMP
AMP connector
Male
4 poles

EM1G11ZU
UL Cable
PVC-PVC
5xAWG18



EM1G11ZUP
UL Dynamic Cable
PUR-PVC
5xAWG18

EM1G11ZHF
UL Halogen free cable
PUR-TPE
5xAWG18

EM1G11ZM
M12 connector
Male
5 poles

EM1G11ZAMP
AMP connector
Male
4 poles

EM1G11ZUP

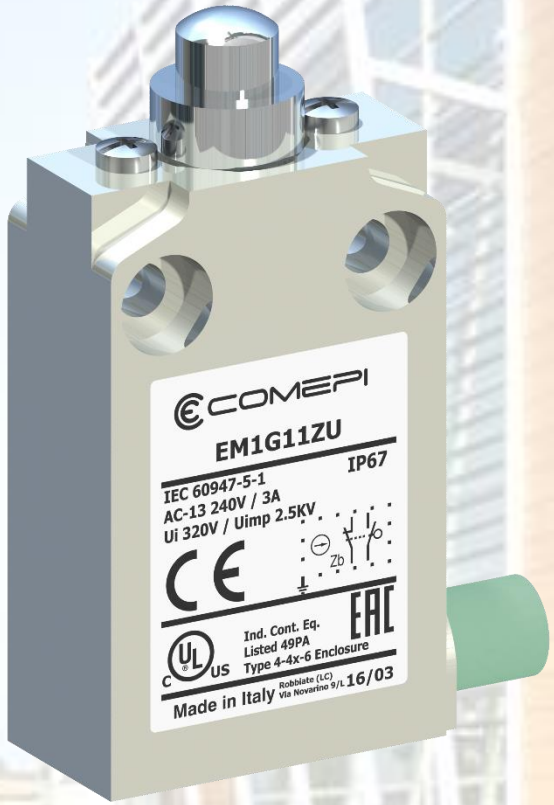
Grey color

More flexible

More resistance in harsh environment

PUR-PVC

4/5xAWG18



EM1G11ZHF

Green color

Without halogens

Less fumes or toxic gases released in case of fire

More resistance in harsh environment

PUR-TPE

4/5xAWG18

EP1G11Z020U

Different cable lengths on request, from 1 to 10 meters

010 → 1mt

020 → 2mt

030 → 3mt

…

100 → 10mt

Different cable exit orientation on request

EP1G11Z020UC

Empty → Standard right exit

C → Central exit

L → Left exit

EP2G11Z020UC

Empty → Standard central exit

R → Right exit

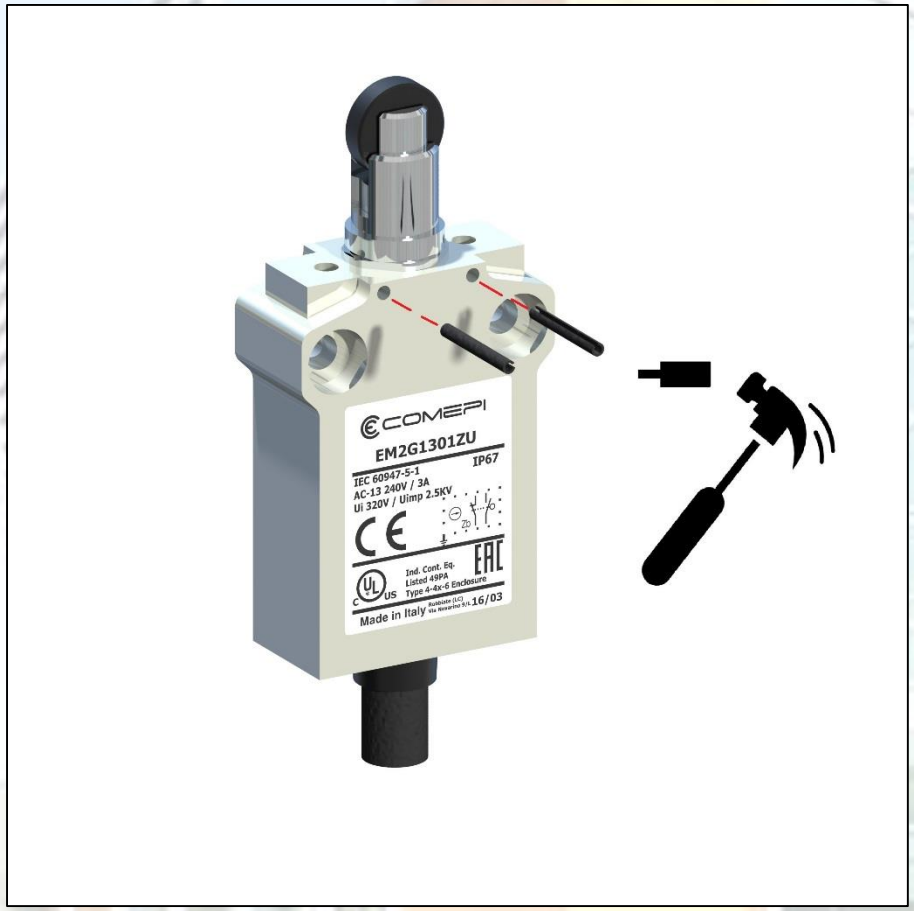
L → Left exit

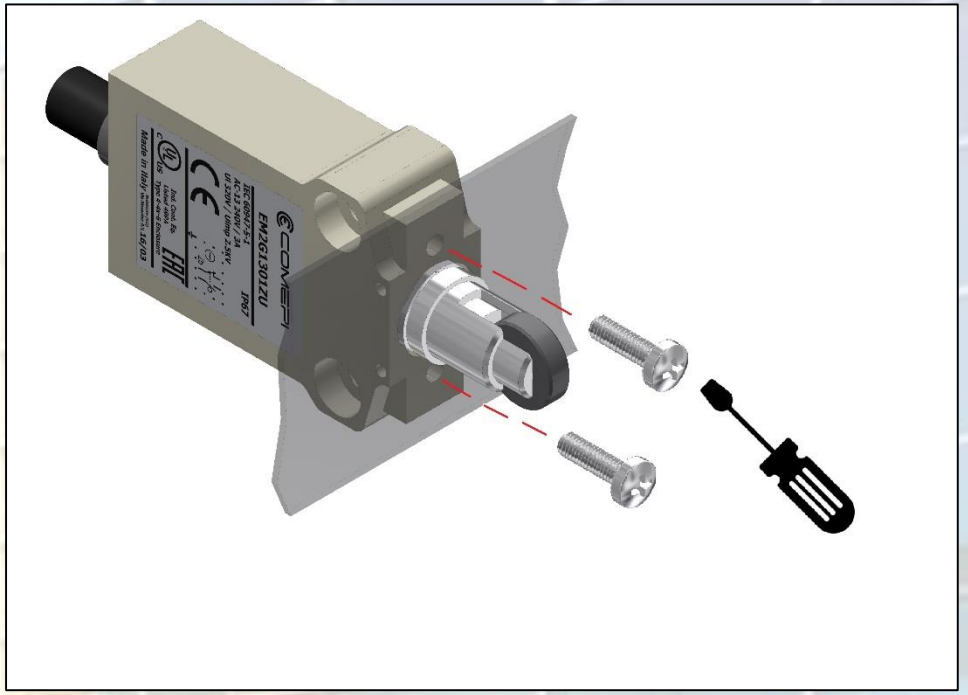
EP1G11ZU

1NO + 1NC Snap action contact block

EP1G11XU

1NO + 1NC Slow action contact block

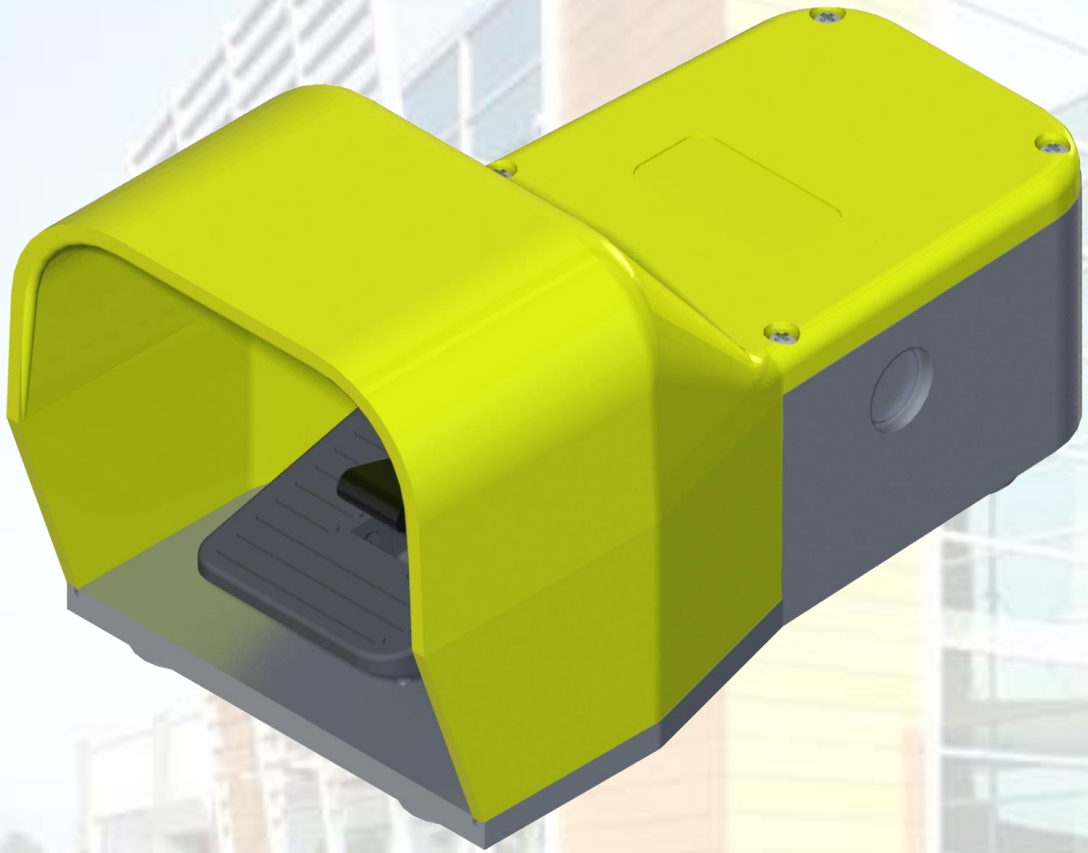




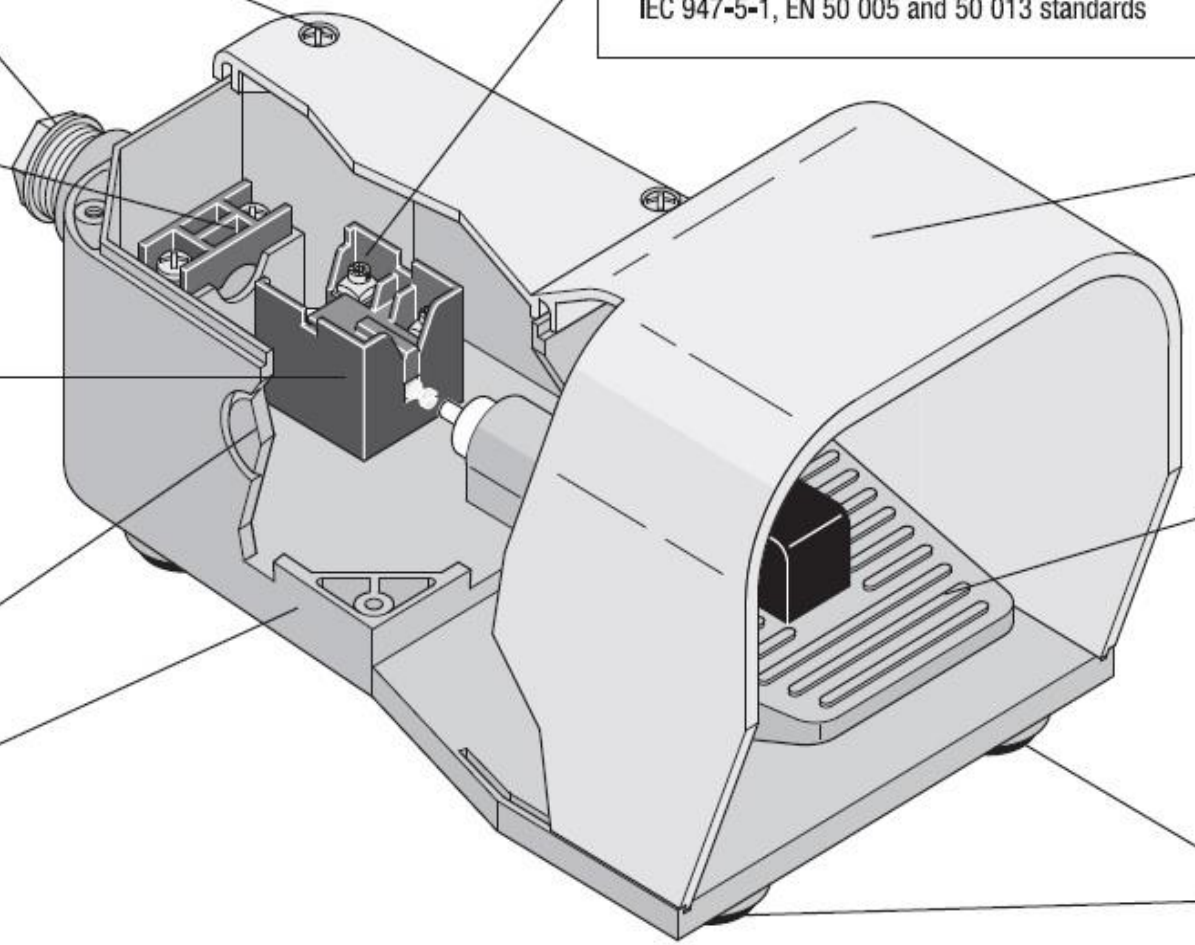
EM2G1301ZU

Head fixed by elastic pins

Foot Switches



Foot Switches



4 stainless steel 18/8. Philips no. 2 screws.

Cable inlet with Pg 16 or M20 cable gland.

Cable clamp

Block(s) of two contacts:
- one block: 1 N.O. + 1 N.C.
- two blocks: 2 N.O. + 2 N.C.
- Positive opening operation.
- Zb shape:
  the contacts are electrically separated.

1 pre-pressed Pg16 knockout on each side.

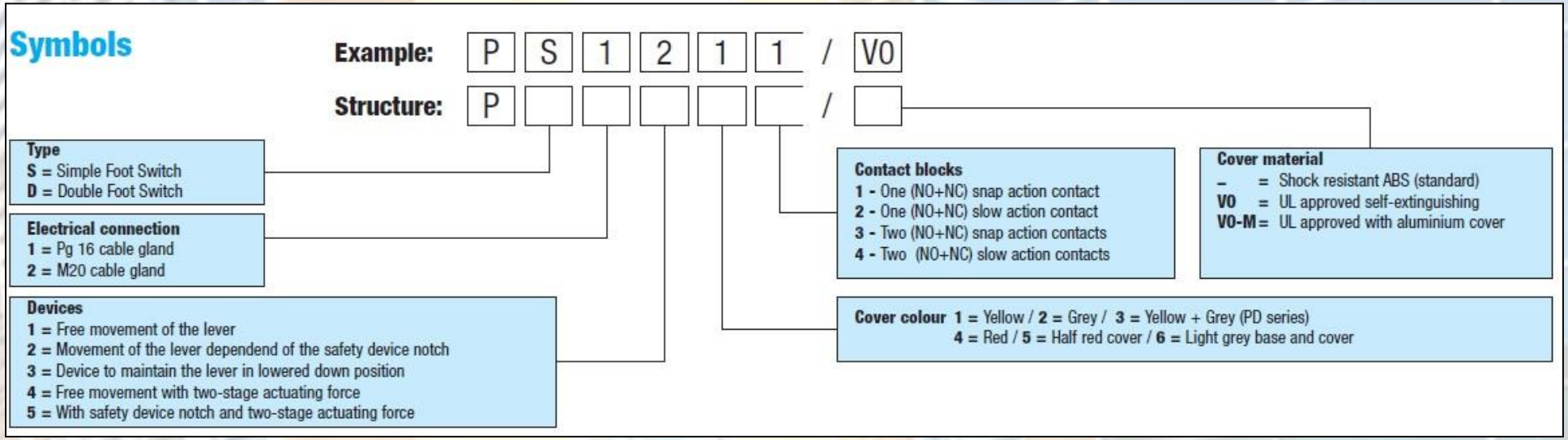
Base

Connecting terminals
- M 3.5 (+, –) Philips no. 1 screw
- Screw head with captive cable clamp.
- Markings conform with IEC 947-1, IEC 947-5-1, EN 50 005 and 50 013 standards

Cover

Pedal

4 skidproof pads

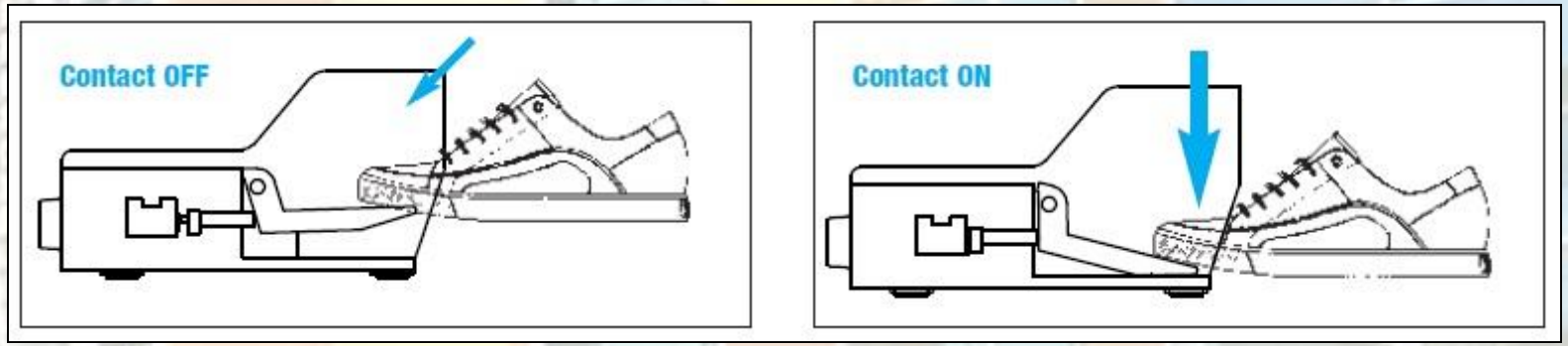


5 different type of movement

3 different cover materials

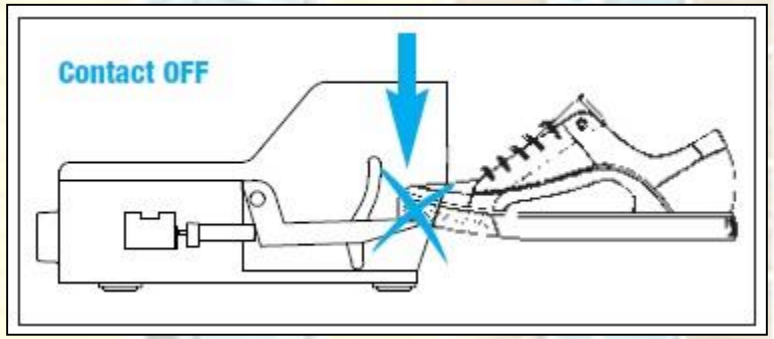
Over than 400 available devices

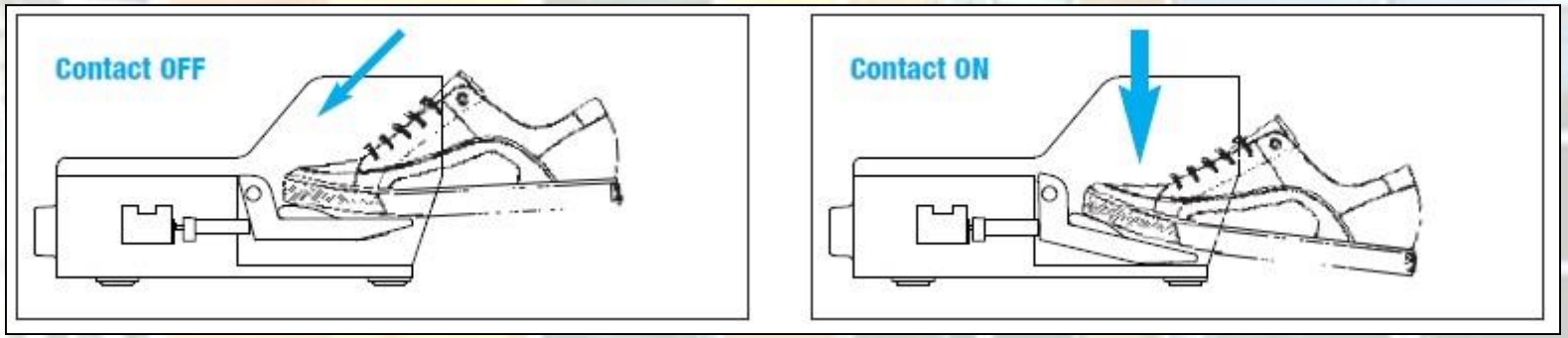
PS•1 → Free movement of the lever



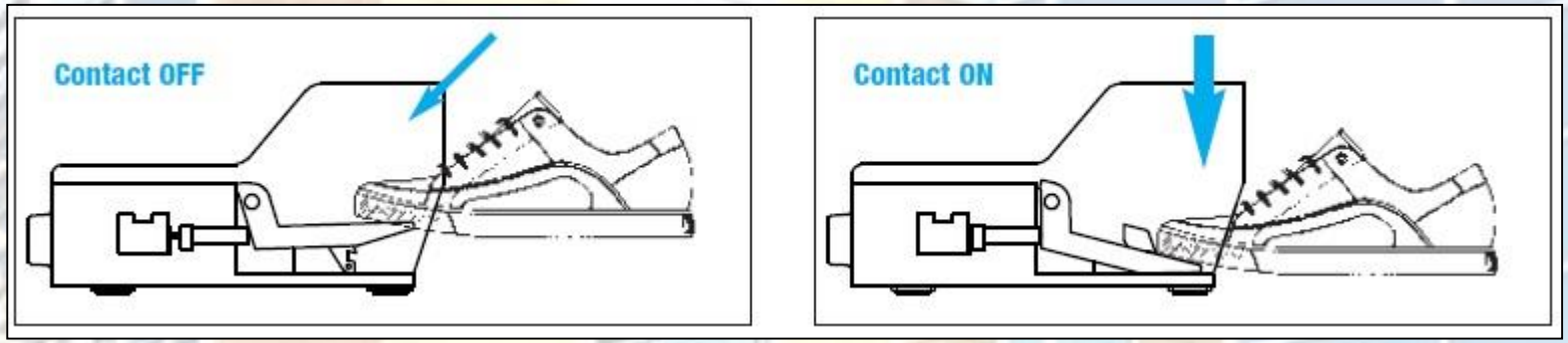
PS•2 → Movement of the lever dependent From the safety notch device

Useful to prevent accidental actuations

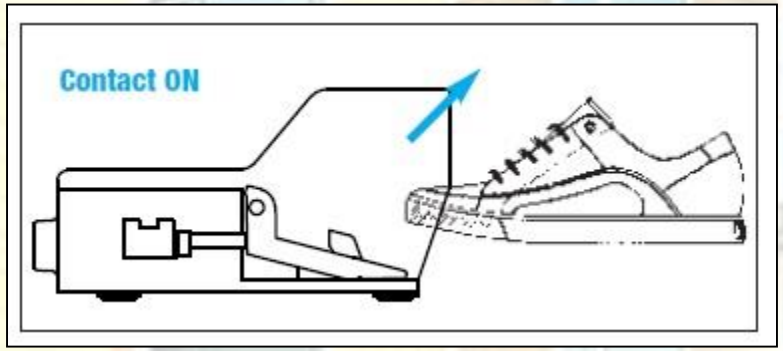


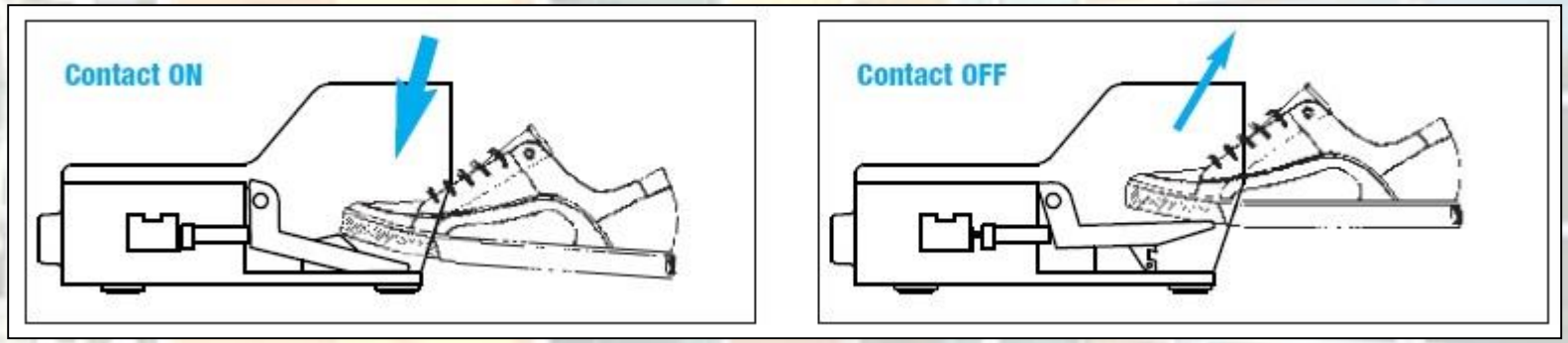


PS•3 → Device to maintain the lever in lower position

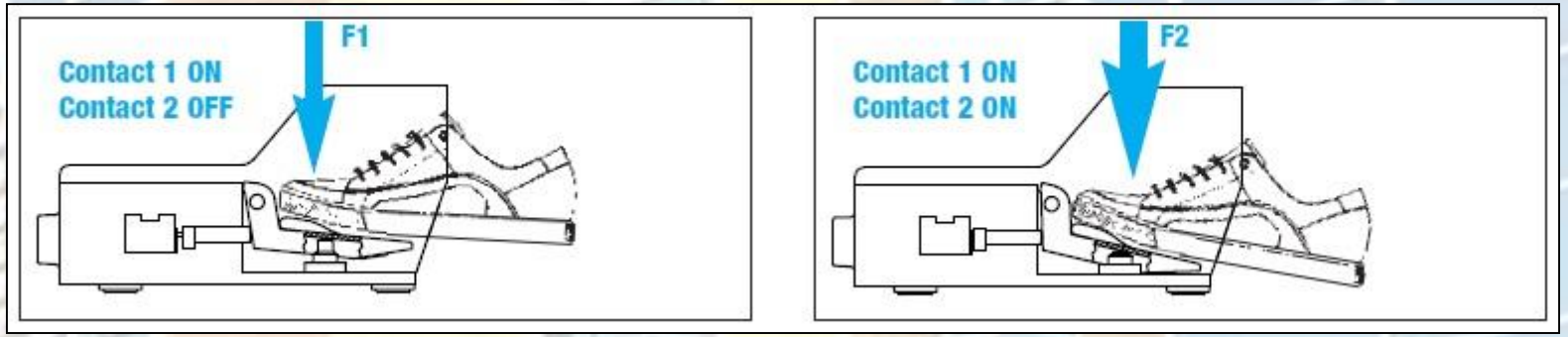


The lever remains locked





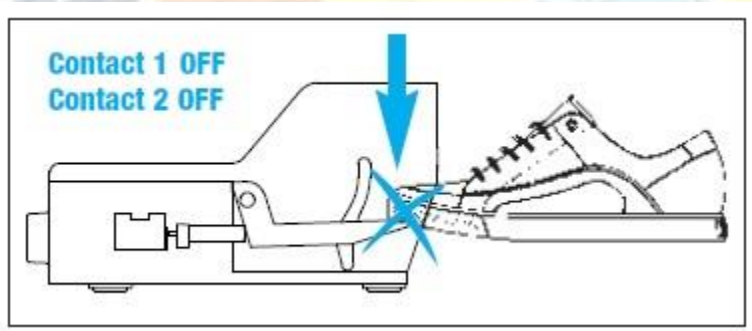
PS•4 → Two stage actuating lever

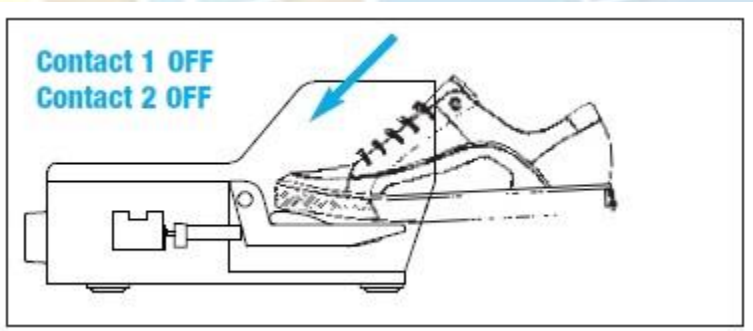


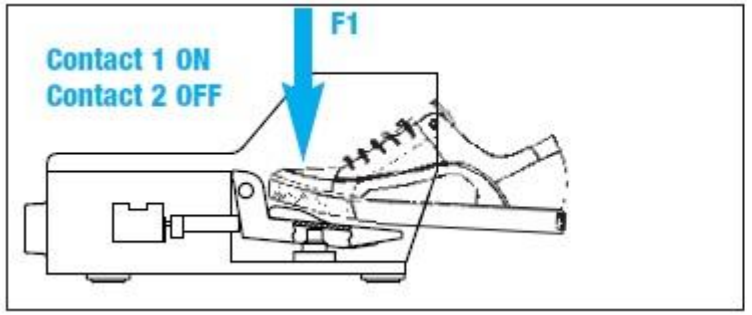
A first force F1 will actuate the first contact block

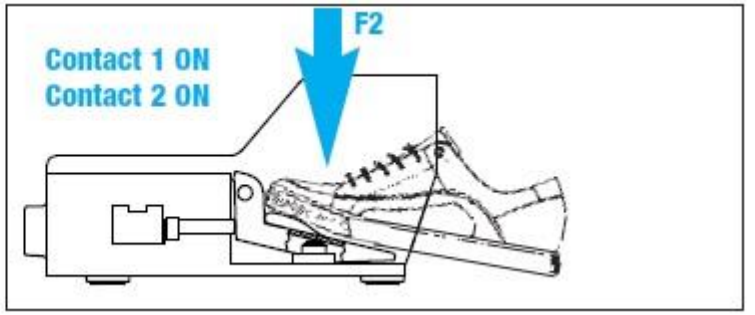
A second force F2 will actuate also the second contact block

PS•5 → Two stage actuating lever
With safety device notch









Thanks
for your attention!