Microswitches MK Series

General purpose microswitches for heavier duty applications

- High precision snap action mechanism
- 16A 250V AC resistive rating (I_{th})
- Wide range of actuator styles
- Screw terminals with self lifting plate
- 10 million mechanical operation cycles
- Protection degree IP20, IP40 or IP65
- Versions with positive opening
- Mechanically interchangeable with previous products (see cross reference section)

Options & Ordering Codes

MK V 1 1 D 40 G

Terminals type

screw terminals with self-lifting plate	V

Contact block

1NO+1NC, snap action	1

Max protection degree

IP40 (with protection)	1
IP65 (with protection)	2

Actuation type

direct action	D

Actuator (see following pages)

01	with pin
02	with pin
03	with small push button
..	.....

Contacts type

	silver contacts (standard)
G	silver contacts gold plated 1 µm

Attention! The feasibility of a code number does not mean the effective availability of a product. Please contact our sales office. There are other options possible, if you can not see the option you require please contact IMO.

WITH PLUNGER DIRECT ACTION

D01 D02 D03 D04 D05 D06 D08

D09 D10 D12 external rubber gasket D13 external rubber gasket D15 D17 D18 D19

WITH LEVER DIRECT ACTION

D30 D31 D32 D35 D37 D40 D42

D45 D46 D47 D53 D59 D49

Microswitches MK Series

Introduction

The MK series of microswitches has been developed with added features to replace the existing MV range.
The main features of the new range have been kept the same as the existing MV range to allow for interchangeability. However, extra features have increased the application field where these switches can be used.

The innovative feature of this series is the tripping device which has evolved with the use of modern technology, allowing added features that offer a higher number of solutions when compared with similar devices currently present in the market.

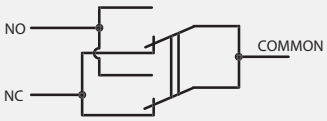
The contacts of the new MK range have a higher reliability factor which has been achieved with the use of double contacts and with the possibility of use where positive opening of the contact is required.

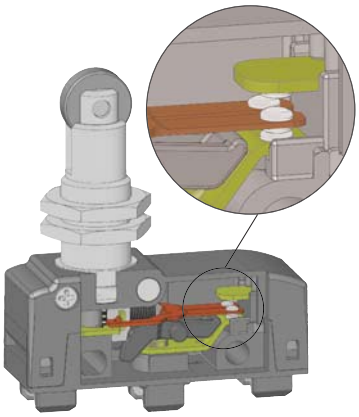
The housing has been designed so a gasket can be added as an option in order to seal the device against fine dust or liquids up to IP65.

The terminals are more practical and allow for connection of a wider range of cable diameters. There are also options available with Fast-On terminals, with the choice of three different terminal exit angles

Contact block reliability

In the following table we refer to the typical microswitch contact structure (type A) normally used in the industry, compared with the innovative solution that IMO Precision Controls uses in new MK series microswitches: movable contact with single interruption and double contacts (type B). As you can see from the table below, this last structure (type B) offers half of the contact resistance (R) than the simple mobile contact (type A) and a lower probability of failure (fe).
In fact, defined x the probability of a commutation failure of a single interruption, it results that in the type A the failure probability fe=x, in the type B the probability fe= x^2.This means that if in a certain situation the failure probability x is equal, for instance, to 1 x 10^{-4} (1 failed interruption every 10.000), we will have:
- in type A one failed commutation every 10.000
- in type B one failed commutation every 100.000.000

Type	Figure	Description	Contact resistance R	Probability of failure fe
A Common microswitch		Contacts with single interruption	R=Rc	fe=x
B IMO microswitch MK series		Contacts with single interruption and double contacts	R=Rc/2	fe $\cong x^2$

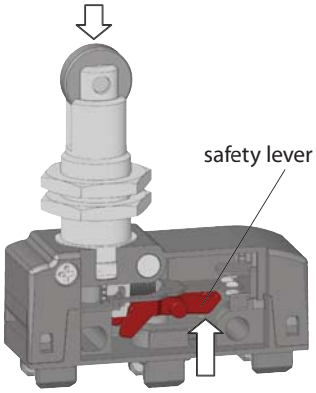


Extended temperature range

-40°C

On request the new MK series are also available with an extended temperature range. Where the IMO standard MK microswitches have a temperature range of -25°C +85°C to , these special versions can be used in places where the ambient temperature changes from -40°C to +85°C leading to possible installation inside cold stores, sterilizers or other equipment using very low ambient temperatures. Special materials have been used to realize these versions and these allow the specifications and features to remain unchanged under these conditions, thereby widening the installation possibilities.

Microswitches for safety applications



All microswitches that have ⊕ beside the part number are with a positive opening mechanism therefore suitable for safety applications.

These microswitches are provided with a rigid connection between the actuating plunger and the NC contacts, which means these are opened by force through a strong/sturdy internal safety lever.

The positive opening is in conformity with the IEC 60947-5-1 standard and as such these microswitches are suitable for installation in protection application.

Microswitches MK Series

Protection degree IP20

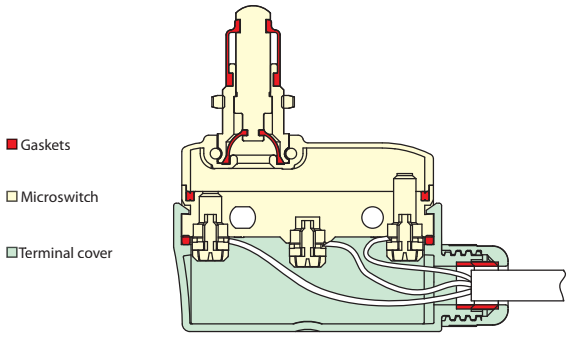
By installing microswitches type MKV11xxx with terminal cover VFC01 it is possible to obtain a microswitch that is IP20.

Protection degree IP40

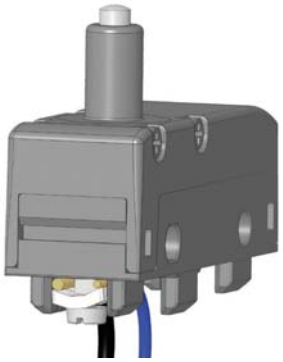
By installing microswitch types MKV11xxx with terminal cover VFC02 it is possible to obtain a microswitch that is IP40.

Protection degree IP65

By installing microswitch types MKV12xxx (not stocked) with terminal covers VFMKCV22 or VFMKCV23 it is possible to obtain a microswitch that is dustproof and waterproof and hence achieve IP65.



Clamping screw terminal for different size cable

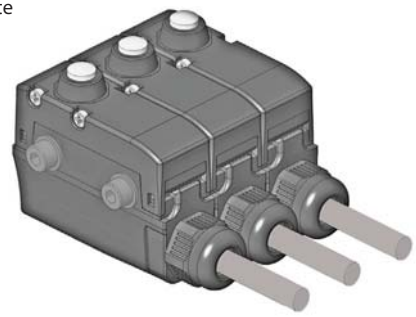


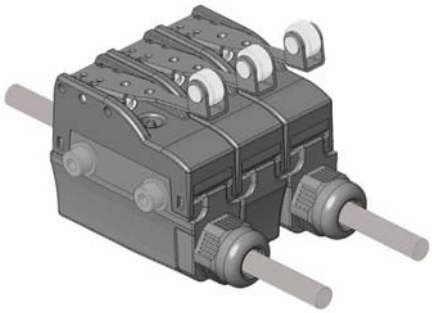
The clamping mechanism of the MK microswitches has been designed to allow for connection of different diameter cables. The clamping plate is designed in such a way to force the cable towards the screw hence achieving the most robust termination possible for all cable sizes within its specification.

Terminal covers with cable gland entry

Terminal covers can be supplied that incorporate a trap cable gland to achieve a protection level up to IP65.

These terminal covers are snap-in assembled and when used they will increase the size of the microswitch. The use of these covers can also be extended to installations where a number of microswitches are clamped together.





Rotating actuators

The microswitches have been designed to allow the user to rotate the actuator head (roller plunger types only) by 90° steps and this is possible by removing the holding screws, rotating the head and then refitting the screws back.

Microswitches MK Series

Main data

- Polymer housing
- High reliability contacts
- Protection degree IP20, IP40 or IP65
- 4 terminal types available
- 47 actuators available
- Versions with positive opening ⊖
- Silver contacts gold plated versions
- Terminal covers with wire trap cable gland
- Mechanically interchangeable with previous products (see cross reference section)

Markings and quality marks:

CE c UL us

Technical data

Housing
Made of glass-reinforced polymer, self-extinguishing, shock-proof thermoplastic resin.

Protection degree:
IP20 (with protection VF C01 - VF C03)
IP40 (with protection VF MKC • 1• - VF C02)
IP65 (with protection VF MKC • 22 - VF MKC • 23)
according to EN 60529

General data

Ambient temperature:	from -25°C to +85°C (-40°C option)
Max operating frequency:	3600 operations cycles [1]/hour
Mechanical endurance:	10 million operations cycles [1]
Driving torque for installation:	see pages 6/1-6/10

(1) One operation cycle means two movements, one to close and one to open contacts, as foreseen by EN 60947-5-1 standard.

Cross section of the conductors (flexible copper wire)

MK series :	min.	1 x 0,34 mm [2]	(1 x AWG 22)
	max	2 x 1,5 mm [2]	(2 x AWG 16)

In conformity with standards:
IEC 60947-5-1, EN 60947-5-1, IEC 60529, EN 60529.
Approvals:
UL 508

In conformity with requirements requested by:
Low Voltage Directive 2006/95/EC, Machinery Directive 2006/42/EC and Electromagnetic Compatibility 2004/108/EC.
Positive contact opening in conformity with standards:
IEC 60947-5-1, EN 60947-5-1, EN 60947-5-1, VDE 0660-206.

Installation for safety applications:
Use only switches marked with the symbol ⊖.The safety circuit must always be connected with the NC contacts (normally closed contacts) as stated in the standard EN 60947-5-1, encl. K, par. 2.The switch must be actuated by a travel length that is at least up to the positive opening travel (POT) value of which is lister near the code article.The switch must be actuated at least with the positive opening force (POT), value of which is listed near the code article.

Electrical data

Thermal current (Ith):	16 A
Rated insulation voltage (Ui):	250 Vac 300 Vdc
Conditional shot circuit current:	1000 A according to EN 60947-5-1
Protection against short circuits:	fuse 10 A 500 V type gG
Pollution degree:	3
Dielectric strength	2000 Vac/min.

Utilization categories

Alternate current: AC15 (50 ... 60 Hz)

Ue (V)	250	120
Ie (A)	6	6

Direct current: DC13

Ue (V)	24	125	250
Ie (A)	5	0,6	0,3

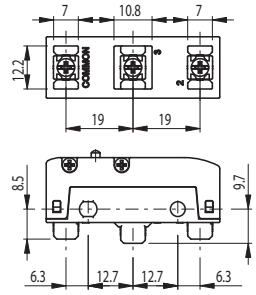
Data type approved by UL

Utilization categories	Q300 (69 VA, 125-250 Vdc)
	A300 (720 VA, 120-300 Vac)

In conformity with standard: UL 508

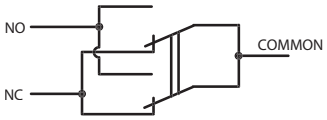
Microswitches MK Series

Terminals outline dimension



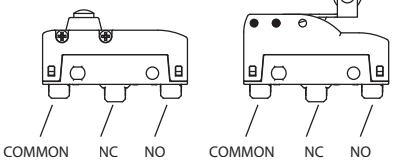
Screw terminals V with plate

Wire diagram

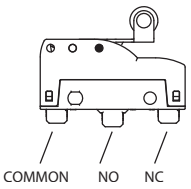


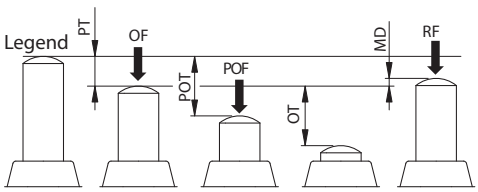
Contacts with single interruption and double contacts

With direct and back direct action (F, D)



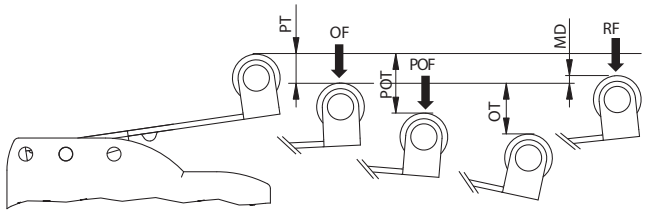
With inverted action (R)





MD differential travel
PT pretravel
OF operating force

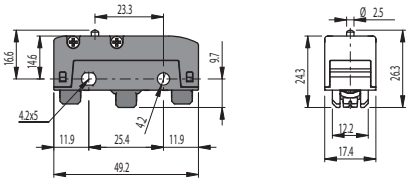
OT over-travel
POT positive opening travel
MD movement differential



OF operating force
RF releasing force

POF positive opening force

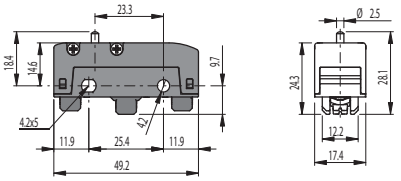
Microswitches with direct action 10 pcs packs



MK V11D01 1NO+1NC

PT 0,5 mm
OT 1,5 mm
MD 0,05 mm

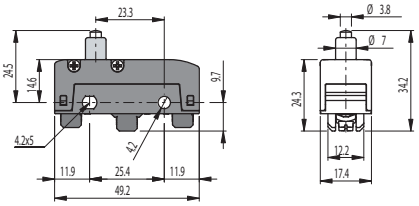
OF 4 N
RF 3 N



MK V11D02 1NO+1NC

PT 0,5 mm
OT 2 mm
MD 0,05 mm

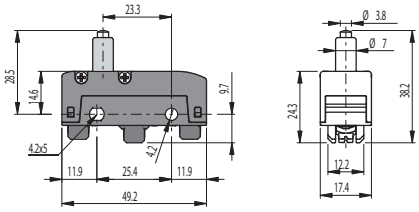
OF 4 N
RF 3 N



MK V11D03 1NO+1NC

PT 0,5 mm
OT 2 mm
MD 0,05 mm

OF 4 N
RF 3 N

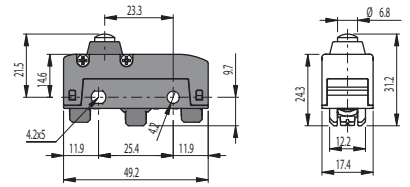


MK V11D04 1NO+1NC

PT 0,5 mm
OT 2 mm
MD 0,05 mm

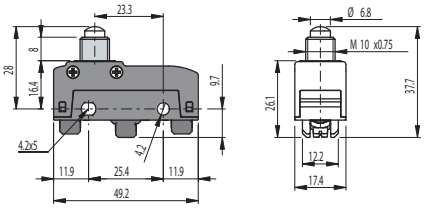
OF 4 N
RF 3 N

Microswitches MK Series



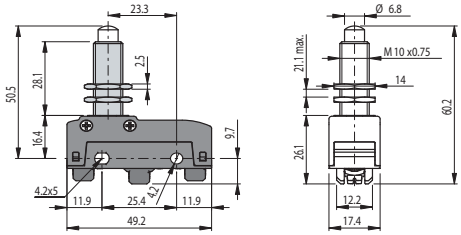
MK V11D05 ⊖ 1NO+1NC

PT	0,5 mm	OF	4 N
OT	2 mm	RF	3 N
MD	0,05 mm	POF	20 N
POT	2,2 mm		



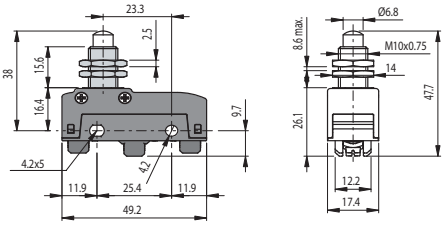
MK V11D06 ⊖ 1NO+1NC

PT	0,5 mm	OF	4 N
OT	3 mm	RF	3 N
MD	0,05 mm	POF	20 N
POT	2,2 mm		



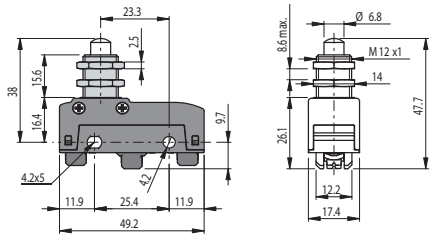
MK V11D08 ⊖ 1NO+1NC

PT	0,5 mm	OF	4 N
OT	5,5 mm	RF	3 N
MD	0,05 mm	POF	20 N
POT	2,2 mm		



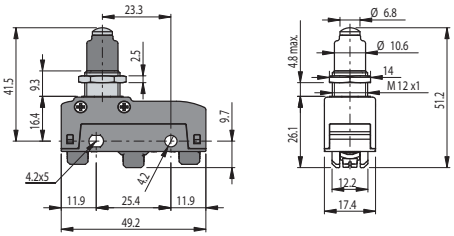
MK V11D09 ⊖ 1NO+1NC

PT	0,5 mm	OF	4 N
OT	5,5 mm	RF	3 N
MD	0,05 mm	POF	20 N
POT	2,2 mm		



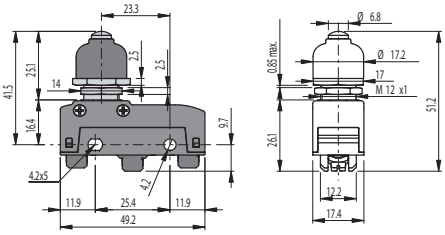
MK V11D10 ⊖ 1NO+1NC

PT	0,5 mm	OF	4 N
OT	5,5 mm	RF	3 N
MD	0,05 mm	POF	20 N
POT	2,2 mm		



MK V11D12 ⊖ 1NO+1NC

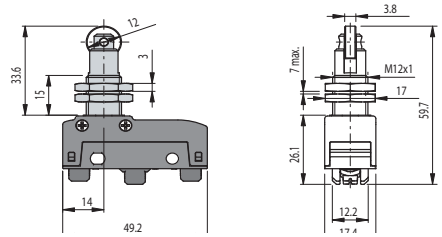
PT	0,5 mm	OF	4,5 N
OT	5,5 mm	RF	3 N .
MD	0,05 mm	POF	20 N
POT	2,2 mm		



MK V11D13 ⊖ 1NO+1NC

PT	0,6 mm	OF	6 N .
OT	5,4 mm	RF	4 N
MD	0,05 mm	POF	20 N
POT	2,2 mm		

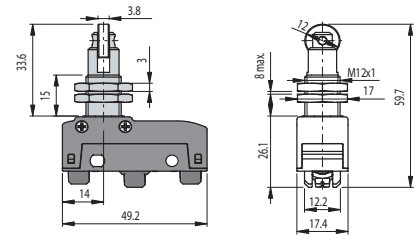
Fixed only by threaded head



MK V11D15 ⊖ 1NO+1NC

PT	0,5 mm	OF	4 N
OT	5,5 mm	RF	3 N .
MD	0,05 mm	POF	20 N
POT	2,2 mm		

Fixed only by threaded head



MK V11D17 ⊖ 1NO+1NC

PT	0,5 mm	OF	4 N
OC	5,5 mm	RF	3 N
MD	0,05 mm	POF	20 N
POT	2,2 mm		

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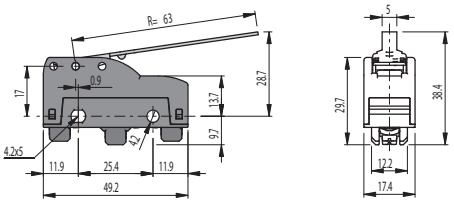
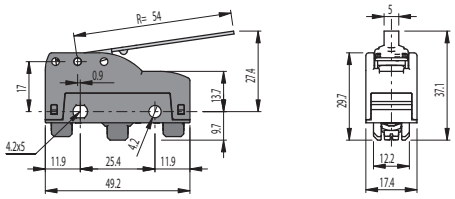
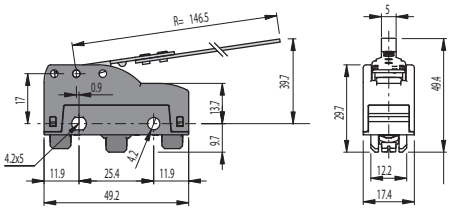


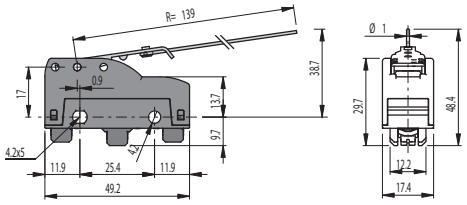
MKV11D30 1NO+1NC PT 9 mm OT 10 mm MD 1,1 mm OF 0,65 N RF 0,5 N



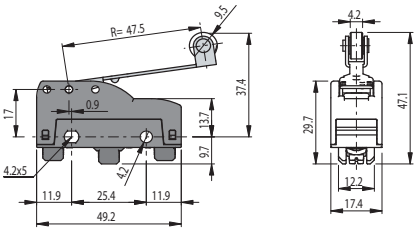
MKV11D32 1NO+1NC PT 7,7 mm OT 8,3 mm MD 0,9 mm OF 0,76 N RF 0,58 N



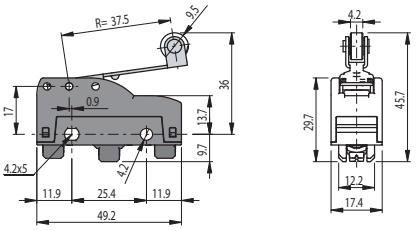
MKV11D35 1NO+1NC PT 19 mm OT 16,7 mm MD 2,5 mm OF 0,28 N RF 0,22 N



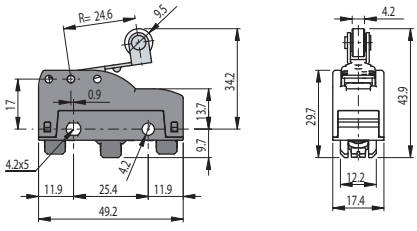
MKV11D37 1NO+1NC PT 19 mm OT 9,5 mm MD 2,3 mm OF 0,08 N RF 0,04 N



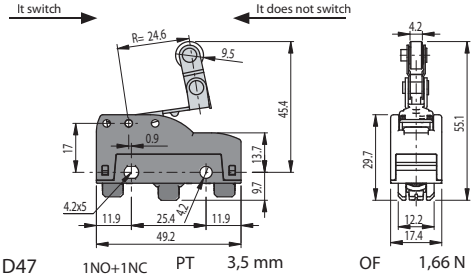
MKV11D40 1NO+1NC PT 6,7 mm OT 7,8 mm MD 0,8 mm OF 0,86 N RF 0,66 N



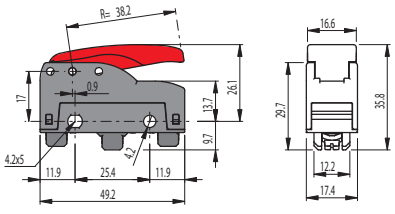
MKV11D42 1NO+1NC PT 5,3 mm OT 5,7 mm MD 0,6 mm OF 1,09 N RF 0,84 N



MKV11D45 1NO+1NC PT 3,5 mm OT 4,5 mm MD 0,4 mm OF 1,66 N RF 1,28 N



MKV11D47 1NO+1NC PT 3,5 mm OT 4 mm MD 0,4 mm OF 1,66 N 1,28 N



MKV11D49 1NO+1NC Hand operated

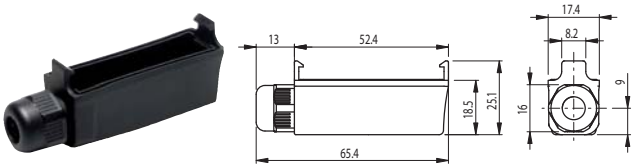
Cross reference (all new parts are stocked)

Old						New							
	N		mm				N			mm			
P/N	OF	RF	PT	OT	MD	P/N	OF	RF	POF	PT	OT	MD	PO
MV17	3.57	2.04	0.5	5.5	0.05	MKV11D17	4	3	20	No change	No change	No change	2.2
MV15	3.57	2.04	0.5	5.5	0.05	MKV11D15	4	3	20	No change	No change	No change	2.2
MV40	0.61	0.41	8	5	1	MKV11D40	0.86	0.66	N/A	6.7	7.8	0.8	N/A
MV10	3.57	2.04	0.5	5.5	0.05	MKV11D10	4	3	20	No change	No change	No change	2.2
MV35	0.33	0.27	20	15	4	MKV11D35	0.28	0.22	N/A	19	16.7	2.5	N/A
MV06	3.57	2.04	0.5	2	0.05	MKV11D06	4	3	20	No change	3	No change	2.2
MV45	1.12	0.71	3.5	2.5	0.6	MKV11D45	1.66	1.28	N/A	No change	4.5	0.4	N/A
MV05	3.57	2.04	0.5	1.5	0.05	MKV11D05	4	3	20	No change	2	No change	2.2
MV42	0.82	0.51	6	3	0.8	MKV11D42	1.09	0.84	N/A	5.3	5.7	0.6	N/A
MV01	3.57	2.04	0.5	0.2	0.05	MKV11D01	4	3	N/A	No change	1.5	No change	N/A
MV12	5.61	4.08	1	5	0.05	MKV11D12	4.5	3	20	0.5	5.5	No change	2.2
MV30	0.51	0.31	10	6	1.5	MKV11D30	0.65	0.5	N/A	9	1.1	No change	N/A
MV09	3.57	2.04	0.5	5.5	0.05	MKV11D09	4	3	20	No change	No change	No change	2.2
MV37	0.1	0.05	20	10	4	MKV11D37	0.08	0.04	N/A	19	9.5	2.3	N/A

OF= Operating Force (maximum)
RF= Releasing Force (minimum)
PT= Pre-travel (maximum)
OT= Over-travel
MD= Movement Differential
PO= Positive Opening
POF= Positive Opening Force
N/A= Not Applicable

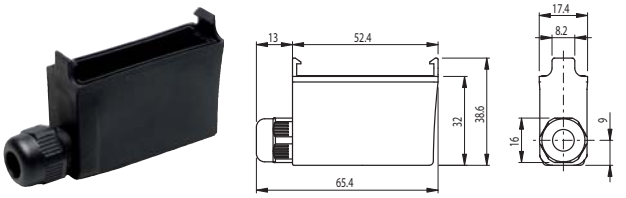
Microswitches MK Series

Protections Terminals Covers 10 pcs packs



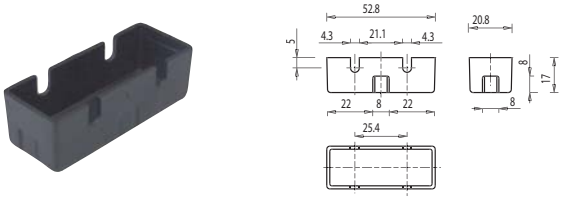
Protection terminal cover for screw terminals snap-in assembled and with wire trap cable gland. It allows the installation of more switches side by side.

Article	Description	Protection degree
VF MKCV12	Protection terminal cover without gasket for multipolar cables from Ø 4 to Ø 7,5 mm	IP40
VF MKCV22	Protection terminal cover with gasket for multipolar cables from Ø 4 to Ø 7,5 mm	IP65
VF MKCV23	Protection terminal cover with gasket for multipolar cables from Ø 2 to Ø 5 mm	IP65

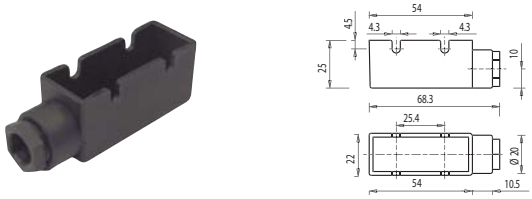


Protection terminal cover for vertical faston terminals snap-in assembled and with wire trap cable gland. It allows the installation of more switches side by side.

Article	Description	Protection degree
VF MKCH12	Protection terminal cover without gasket for multipolar cables from Ø 4 to Ø 7,5 mm	IP40



Article	Description	Protection degree
VF C01	Protection terminal cover for screw terminals	IP20



Article	Description	Protection degree
VF C02	Protection terminal cover for screw terminals with cable gland PG9 for multipolar cables from Ø 5 to Ø 7 mm	IP40