## Description



The microswitches of MK series have been designed to add new features to traditional and tested microswitches by Pizzato Elettrica.
The absolute new feature of this series is the enhanced and state-of-the-art trigger mechanism, whose design features are of higher quality in comparison to other solutions available on the market.
Thanks to the double and redundant execution, the electrical contact of the new microswitch has been designed with a technology providing increased reliability, and is able to carry out switching operations with positive opening. Inside the housing of the new microswitch it is possibile to insert gaskets to protect the mechanism against fine dusts or liquids up to the protection degree IP65. Conductor fixing terminals are more practical, allowing for cables of different diameters to be fixed or the choice of different bends for the Faston contacts.

## Contact reliability

In the following table a typical contact structure for a microswitch normally used in the industry (type A ) is shown compared with the innovative solution implemented by Pizzato Elettrica in the MK series microswitches: mobile contact with single interruption and double contacts (type B). As you can see from the table below, in the latter contact structure (type B) the contact resistance (R) is only half in comparison to the mobile contact with single interruption (type A), and presents a very low failure probability (fe) as well.
With a failure probability of $x$ for a single switching operation, the failure probability for type $A$ is $f e=x$, for type $B$ fe $\cong x^{2}$. This means that if the probability of a switching failure is $x$ in a given situation, e.g., $1 \times 10^{-4}$, ( 1 switching failure in 10,000 ), the result is as follows:

- for type A one failed commutation every 10,000.
- for type B one failed commutation every 100,000,000.



## Extended temperature range



The new MK series includes versions with extended temperature range available upon request. Compared to the standard MK microswitches with temperature ranges from $+85 \mathrm{C}^{\circ}$ to $-25 \mathrm{C}^{\circ}$, these special versions are suitable for environments with temperature ranges from $+85 \mathrm{C}^{\circ}$ to $-40^{\circ} \mathrm{C}$. They can therefore be installed inside cold stores, sterilizers or other equipment with very low ambient temperature. The special materials used to produce these versions retain their characteristics even under these conditions, thereby expanding the installation possibilities.

Microswitches for safety applications


All microswitches showing the symbol $\Theta$ besides the product code are with positive opening and therefore suitable for safety applications. These microswitches are provided with a rigid connection between the plunger and the NC contacts, which are forcibly actuated by a internal sturdy safety lever.
The positive opening has been designed in compliance with the standard EN 60947-5-1, Annex K. Therefore, these microswitches are suitable for safety applications.

## Protection degree IP65

By installing microswitches MK ••2••• with terminal covers VF MKC•22 or terminal covers VF MKC•23, a microswitch fully protected against water and dust is obtained. Thanks to their special oil resistant rubber gaskets the protection degree IP65 is provided. For applications in very dirty environments there are also versions with integrated double gasket for the plunger (internal + external). e.g. MK $\bullet \bullet 2 \bullet 12$ or MK $\bullet \bullet 2 \bullet 13$.


## Clamping screw plates for cables of different diameters (MK V•)



The clamping screw plates are provided with a particular "roofing tile" structure and are loosely coupled to the clamping screw. The design causes connection wires of different diameter to be pulled towards the screw when tightening the screw (see figure), preventing the wires from escaping towards the outside.

## Terminal covers with side-by-side strain relief cable gland

The new terminal covers are provided with strain relief cable gland and protection degree up to IP65. These are snapon terminal covers and have reduced dimensions contained in the profile of the microswitch so that these can be installed on microswitches fixed side by side as well.


## Actuators with variable orientation



Thanks to the patented lateral fixing
 system, the roller of the microswitches MK $\bullet \bullet \bullet 15$ and MK $\bullet \bullet 17$ can be now rotated in $90^{\circ}$ steps.
The lateral fixing allows to disconnect the actuator from the switch body even when the actuator is already fixed to the support bracket. The flexibility of the product also allows for products to be unified in the warehouse for applications that require castors both in the longitudinal or transverse direction.



## MK V12D40-GR16T6

| Terminal type |  |
| :--- | :--- |
| V | screw with self-lifting plate |
| H | vertical faston |
| F | Faston, $45^{\circ}$ bend to the right |
| G | Faston, $45^{\circ}$ bend to the left <br> (on request) |
|  |  |
| Contact block |  |
| $\mathbf{1}$ | 1NO+1NC, snap action, change-over |
| $\mathbf{2}$ | 1NO, snap action (on request) |
| $\mathbf{3}$ | 1NC, snap action (on request) |


| Maximum protection degree |  |
| :---: | :--- |
| $\mathbf{1}$ | IP40 (with terminal cover) |
| $\mathbf{2}$ | IP65 (with terminal cover) |
|  |  |
| Type of actuation |  |
| D | direct actuation |
| R | inverted actuation |
| F | direct actuation at the back |


| Ambient temperature |  |
| :--- | :--- |
|  | $-25^{\circ} \mathrm{C} \ldots+85^{\circ} \mathrm{C}$ (standard) |
| T6 | $-40^{\circ} \mathrm{C} \ldots+85^{\circ} \mathrm{C}$ |

## Rollers

standard roller
metal roller $\varnothing 9.5 \times 4 \mathrm{~mm}$
(for actuators $40,42,45,46,47,53,59$ only)
large plastic roller $\varnothing 9.8 \times 8.4 \mathrm{~mm}$
(for actuators 40, 42, 45, 53 only)

## Contact type

silver contacts (standard)
G silver contacts, $1 \mu \mathrm{~m}$ gold coating

| Actuator |  |
| :--- | :--- |
| $\mathbf{0 1}$ | pin |
| $\mathbf{0 2}$ | pin |
| $\mathbf{0 3}$ | narrow plunger |
| .. | ............... |



## Main features

- Technopolymer housing
- High reliability contacts
- Protection degree up to IP65
- 4 terminal types available
- 52 actuators available
- Versions with positive opening $\Theta$
- Versions with gold-plated silver contacts
- Terminal covers with strain relief cable gland


## Quality marks:

## C (© (1) : (1): © © ER

| IMQ approval: |  |
| :--- | :--- |
| CA02.05772 |  |
| CL approval: | E131787 |
| CCC approval: | 2013010305604291 |
| EAC approval: | RU C-IT.УT03.B.00035/19 |

## Technical data

Housing
Housing made of glass fibre reinforced technopolymer, self-extinguishing and shock-proof.
Protection degree acc. to EN 60529:
IP00 without terminal cover
IP20 (with terminal covers VF C01, VF C03)
IP40 (with terminal covers VF MKC•1• , VF C02)
IP65 (with terminal covers VF MKC•22 +
MK V•2••• or VF MKC• $23+$ MK H•2•••)

## General data

Ambient temperature:
$-25^{\circ} \mathrm{C} \ldots+85^{\circ} \mathrm{C}$ (standard)
$-40^{\circ} \mathrm{C} \ldots+85^{\circ} \mathrm{C}$ (T6 option)
Max. actuation frequency:
3600 operating cycles/hour
Mechanical endurance:
10 million operating cycles
Safety parameter $\mathrm{B}_{100}$ :
20,000,000 for NC contacts
Tightening torques for installation:
see page 233

## Conductor cross section (flexible copper strands)

MK series: $\quad \min .1 \times 0.34 \mathrm{~mm}^{2}(1 \times$ AWG 22)
max. $2 \times 1.5 \mathrm{~mm}^{2} \quad(2 \times$ AWG 16)

Wire stripping length (x):
MK V••••• articles (screw connection):


## In compliance with standards:

IEC 60947-5-1, EN 60947-5-1, IEC 60529, EN 60529, EN 60947-1, IEC 60947-1, EN 50581.
Approvals:
UL 508, CSA 22.2 No.14, EN 60947-1, EN 60947-5-1.

Compliance with the requirements of:
Low Voltage Directive 2014/35/EU, EMC Directive 2014/30/EU,
RoHS Directive 2011/65/EU.
Positive contact opening in conformity with standards:
IEC 60947-5-1, EN 60947-5-1.

## Installation for safety applications:

Use only microswitches marked with the symbol $\Theta$ next to the product code. Always connect the safety circuit to the NC contacts (normally closed contacts) as required by EN ISO 14119, paragraph 5.4 for specific interlock applications and EN ISO 13849-2 tables D3 (well-tried components) and D. 8 (failure exclusions) for safety applications in general. Actuate the switch at least up to the positive opening travel (CAP) reported next to the article code. Actuate the switch at least with the positive opening force (FAP) reported next to the article code.
§ If not expressly indicated in this chapter, for correct installation and utilization of all articles see the instructions given on pages 223 to 236.

| Electrical data |  | Utilization category |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: |
| Thermal current ( $I_{\text {th }}$ ): | 16 A | Alternating current: AC15 (50 ... 60 Hz ) |  |  |  |
| Rated insulation voltage ( $\mathrm{U}_{\mathrm{i}}$ ): | 250 Vac 300 Vdc |  |  |  |  |
| Rated impulse withstand voltage ( $\mathrm{U}_{\text {imp }}$ ): | 4 kV | $\begin{aligned} & \text { Ue (V) } \\ & \text { le (A) } \end{aligned}$ |  | $\begin{aligned} & 250 \\ & 5 \end{aligned}$ |  |
| Conditional short circuit current: | 1000 A acc. to EN 60947-5-1 | Direct current: DC13 |  |  |  |
| Protection against short circuits: | type gG fuse 16 A 250 V | Ue (V) | 24 | 125 | 250 |
| Pollution degree: | 3 | le (A) | 4 | 0.6 | 0.3 |
| Dielectric strength | $2000 \mathrm{Vac} / \mathrm{min}$. | (A) |  |  |  |

Features approved by IMO
Rated insulation voltage $\left(U_{i}\right)$ :
Conventional free air thermal current $\left(I_{t+1}\right)$ :
Protection against short circuits:
Rated impulse withstand voltage ( $U_{i m p}$ )
Conditional short circuit current:
Protection degree of the housing:
Terminals: screw terminals / faston
Pollution degree:
Utilization category:
Operating voltage (Ue):
Operating current (le):
Forms of the contact element: $X ; Y ; C$
Positive opening of contacts on contact blocks: 1, 3
In compliance with standards: EN 60947-1, EN 60947-5-1, fundamental requirements of the Low Voltage Directive 2014/35/EU.
Please contact our technical department for the list of approved products.

Features approved by UL
Electrical Ratings: $\quad$ Q300 pilot duty ( $69 \mathrm{VA}, 125-250 \mathrm{~V} \mathrm{dc}$ )
A300 pilot duty ( $720 \mathrm{VA}, 120-300 \mathrm{~V} \mathrm{ac}$ )

Please contact our technical department for the list of approved products.

## Circuit diagram



Mobile contact with single interruption and double contacts

With direct actuation and direct actuation at the back (F, D)



With inverted actuation (R)


## Actuation forces and travels




FS Trigger force
FAP positive opening force

## Microswitches with direct actuation

|  |  |  |  |  |  |  |  |  |  | $+2.5$ <br> $\stackrel{\square}{\sim}$ |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| MK V11D01 | $1 \mathrm{NO}+1 \mathrm{NC}$ | $\begin{aligned} & \text { PC } \\ & \text { OC } \\ & C D \end{aligned}$ | 0.5 mm 1.5 mm 0.05 mm | $\begin{aligned} & \hline \text { FS } \\ & \text { FR } \end{aligned}$ | $\begin{aligned} & 4 \mathrm{~N} \\ & 3 \mathrm{~N} \end{aligned}$ | MK V11D02 | 1NO+1NC | $\begin{aligned} & 0.5 \mathrm{~mm} \\ & 2 \mathrm{~mm} \\ & 0.05 \mathrm{~mm} \end{aligned}$ | $\begin{aligned} & \hline \text { FS } \\ & \text { FR } \end{aligned}$ | $\begin{aligned} & 4 \mathrm{~N} \\ & 3 \mathrm{~N} \end{aligned}$ |
| Maximum and minimum speed see page 233 - type 1 |  |  |  |  |  | Maximum and minimum speed see page 233 - type |  |  |  |  |


|  |  |  |  |
| :---: | :---: | :---: | :---: |
| MK V11D03 1NO+1NC PC 0.5 mm FS 4 N <br>   OC 2 mm FR 3 N | MK V11D04 | $1 \mathrm{NO}+1 \mathrm{NC}$ PC 0.5 mm <br>  OC 2 mm <br>  CD 0.05 mm | $\begin{array}{ll} \hline \text { FS } & 4 \mathrm{~N} \\ \text { FR } & 3 \mathrm{~N} \end{array}$ |
| Maximum and minimum speed see page 233 - type 1 | Maximum and minimum speed see page 233 - type 1 |  |  |
| All values in the drawings are in mm | Accessories See page 207 | $\rightarrow$ The 2D and 3D files are available at www.pizzato.com |  |













Terminal dimensions


Screw terminals $\mathbf{V}$ with plate


Note:The vertical faston term


Faston terminals $\mathbf{H}$, vertical




Faston terminals $\mathbf{F}$, right angle


Faston terminals G, left angle (upon request)

We recommend to bend the faston with an angle not higher than $45^{\circ}$ and to carry out this operation no more than 5 times.

Protective terminal covers
Packs of $\mathbf{1 0} \mathbf{p c s}$.


Protective terminal cover for screw terminals with strain relief cable gland and snap-in mounting. It allows to install mutiple switches side-by-side.

| Article | Description | Protection <br> degree |
| :---: | :--- | :---: |
| VF MKCV11 | Protective terminal cover without gasket for <br> multipolar cables $\varnothing 5 \ldots 7.5 \mathrm{~mm}$ | IP40 |
| VF MKCV12 | Protective terminal cover without gasket for <br> multipolar cables $\varnothing 4 \ldots 7.5 \mathrm{~mm}$ | IP40 |
| VF MKCV13 | Protective terminal cover without gasket for <br> multipolar cables $\varnothing 2 \ldots 5.5 \mathrm{~mm}$ | IP40 |
| VF MKCV22 | Protective terminal cover with gasket for <br> multipolar cables $\varnothing 4 \ldots 7.5 \mathrm{~mm}$ | IP65 |
| VF MKCV23 | Protective terminal cover with gasket for <br> multipolar cables $\varnothing 2 \ldots 5.5 \mathrm{~mm}$ | IP65 |

Protective terminal cover for vertical faston terminals with strain relief cable gland and snap-in mounting. It allows to install mutiple switches side-by-side.

| Article | Description | Protection <br> degree |
| :---: | :--- | :---: |
| VF MKCH11 | Protective terminal cover without gasket for <br> multipolar cables $\varnothing 5 \ldots 7.5 \mathrm{~mm}$ | $\mathrm{IP40}$ |
| VF MKCH12 | Protective terminal cover without gasket for <br> multipolar cables $\varnothing 4 \ldots 7.5 \mathrm{~mm}$ | $\mathrm{IP40}$ |
| VF MKCH13 | Protective terminal cover without gasket for <br> multipolar cables $\varnothing 2 \ldots 5.5 \mathrm{~mm}$ | IP40 |
| VF MKCH22 | Protective terminal cover with gasket for <br> multipolar cables $\varnothing 4 \ldots 7.5 \mathrm{~mm}$ | IP65 |
| VF MKCH23 | Protective terminal cover with gasket for <br> multipolar cables $\varnothing 2 \ldots 5.5 \mathrm{~mm}$ | IP65 |



| Article |  |
| :--- | :--- |
| VF C01 | Protective terminal cover for screw termi- <br> nals |
| IP20 |  |
| Description |  |

Article $\quad$ VF C03 | Protective terminal cover for screw termi- |
| :--- |
| nals, snap-in mounting. It allows to install |
| mutiple switches side-by-side | IP20

## Accessories

Packs of $\mathbf{1 0} \mathbf{p c s}$.


