fischertechnik® e-m3

Pushbutton & Switch

for Experiments with the fischertechnik Expansion Kit

Elektro-Mechanik e-m1

Elektro-Mechanik e-m2

Licht-Elektronik l-e1

Licht-Elektronik l-e2

®

Order No. 30073

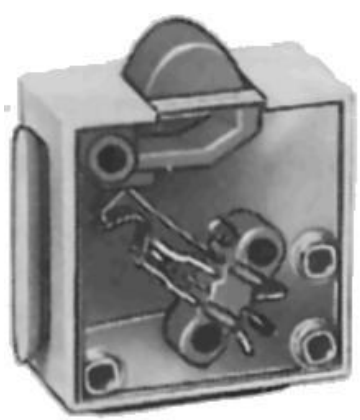
1. Technical Data

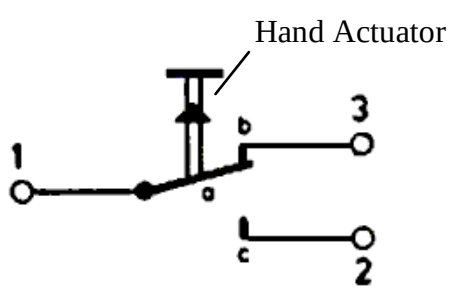
The special add-on kit e-m3 contains:

	Part. No.
1 Change-over contact, one pole, with spring contact	31332
1 Polarity Reversal Switch, with spring contacts	31331
1 Cable with green plugs, 40 cm	31353
1 Cable with green plugs, 20 cm	31346
1 Cable with red plugs, 40 cm	31350
1 Cable with red plugs, 20 cm	31349

2. The fischertechnik micro-switch

This is a "micro-switch" with a "changeover contact set". It can also be called a "momentary pushbutton" or a "snap-action switch".





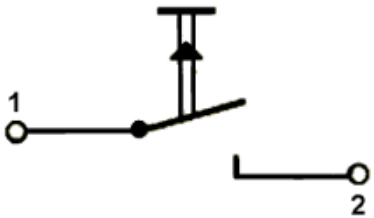
Circuit Diagram

The circuit diagram shows the movable switch element "a" which connects socket 1 either to socket 2 or socket 3. The horizontal thick bar in the circuit diagram is the symbol for the red button, which is generally referred to as an "actuator" or "plunger". This button can, of course, also be operated by an eccentric disc (cam) or by a lever.

The 2 parallel lines connecting the switching element and the actuator symbolize the mechanical connection between the actuator and the switching element.

If the actuator is pressed, the switching element "breaks" from contact "b" and "makes" with contact "c". If the actuator is released, the switching element, likewise, returns to its original position. A "reset spring" is therefore installed. This spring is the feature of all "push buttons".

The fischertechnik micro-switch works as an "on-button" when only connections 1 and 2 are used. Instead of "on-button" one also says "make-button".



Circuit Diagram for "on-button"

Such a contact set consisting of a fixed contact and a movable contact is called a "normally open" (NO) contact.

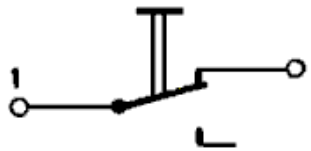
The fischertechnik micro-switch, on the other hand, acts as an "off-button" or "break-button" when only the connections 1 and 3 are used.

Circuit Diagram for "off-button"

This contact set is generally referred to as a "normally closed" (NC) contact because, when the actuator is not operated (= pushbutton at rest), there is a conductive connection between the two terminals.

3. The fischertechnik polarity switch

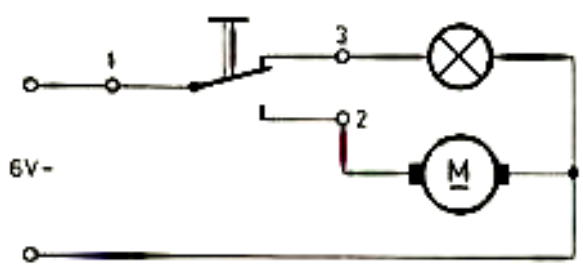
While the pushbutton has only one rest position, a switch has at least 2 such positions.



Circuit Diagram of a simple "on-off-switch"

Hence there is no reset spring shown in the circuit diagram. After the switch has been actuated, the contact remains "disconnected" until the switch is actuated in the opposite direction.

A "changeover switch" has 2 fixed contacts in addition to the movable switching element.

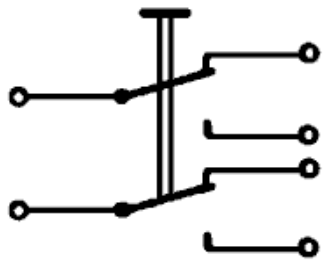


Circuit Diagram of a Single-Pole-Double-Throw (SPDT) switch

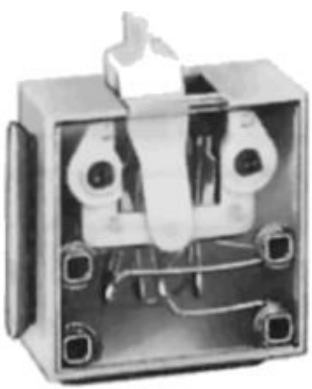
Depending on the position of the switch, the lamp or the motor will be active in our example.

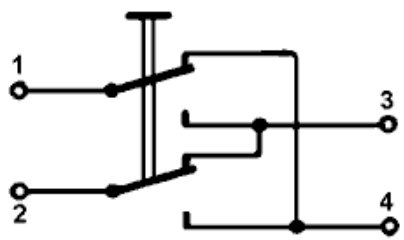
The fischertechnik polarity switch contains 2 such changeover contacts, which are mechanically connected to one another. Of course, this mechanical connection consists of insulating material. Each contact set could thus be used in another circuit. Therefore, it is called a "2-pole" change-over switch.

Circuit Diagram of a Double-Pole-Double-Throw (DPDT) switch



Such a "2-pole" change-over switch is often used as a "pole reversing switch" for reversing the direction of rotation of DC motors. The fischertechnik switch has already been wired in this configuration at the factory.





Circuit Diagram of polarity switch

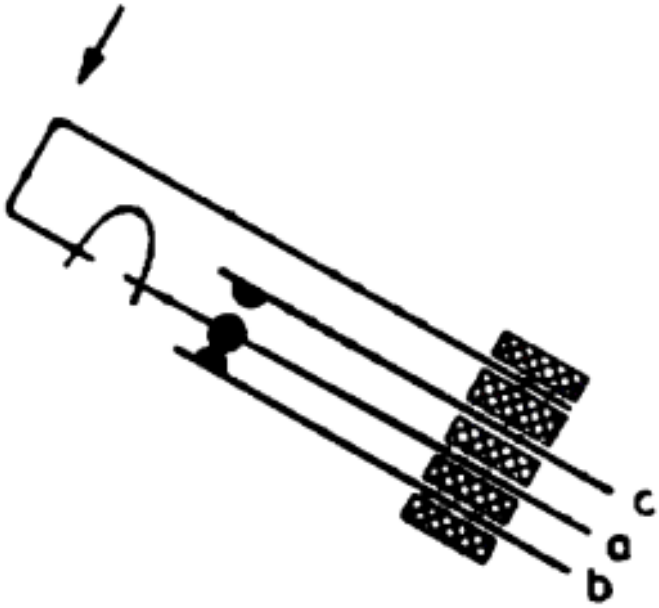
In the depicted position, contact 1 is connected to 4 and 2 to 3. If the operating lever is moved to the other switching position, 1 is connected to 3 and 2 by 4. If the positive and negative poles of a power source are connected to 1 and 2, and a DC motor is connected to 3 and 4, it will turn to the right in the one position of the switch and to the left in the other.

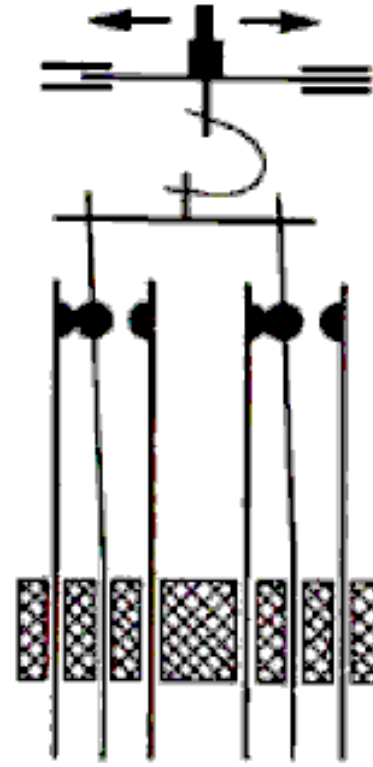
Of course, this pole reversing switch can also be used as a single pole switch. There are many combinations. Think about how many it could be.

4. Equipment with "spring contacts"

If the actuator is pushed slowly, the center contact "a" jumps suddenly from the contact "b" to the contact "c" at a certain position of the activating lever. This rapid rebounding is achieved by the fitting of a suitably shaped flat metal spring. This type of switch operation is called "snap-action".

With this trick, the wear and tear of the contact surfaces is greatly reduced due to "burn-out" (= sparking formation when the contact is opened), which means that the life of the contacts increases considerably.





The danger with pushbuttons or switches that are not equipped with spring contacts is that low contact pressure and an insufficiently wide contact gap can cause increased wear and lead to "burn-out". The chance of "burn-out" increases if the switch without spring contacts is not operated manually, but slowly by means of a cam or lever, which is particularly the case with slow-running machines. The "micro-switch" has therefore been designed for these types of applications.

Translated by: Peter King,
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with the assistance of Google.

Fischer-Werke · 7241 Tumlingen
Made in Germany · Ref. No. 29 · 5/70/5