

## Design and Function

BERNSTEIN float switches are designed as contactless magnetic switches. They are used to control level in containers / tanks with non-flowing and / or flowing liquids such as water, oils, caustic solutions etc.

Float switches consist of a connection head, an immersion tube with one to four magnetic sensor elements and a float. Versions with straight or elbow immersion tube are available.

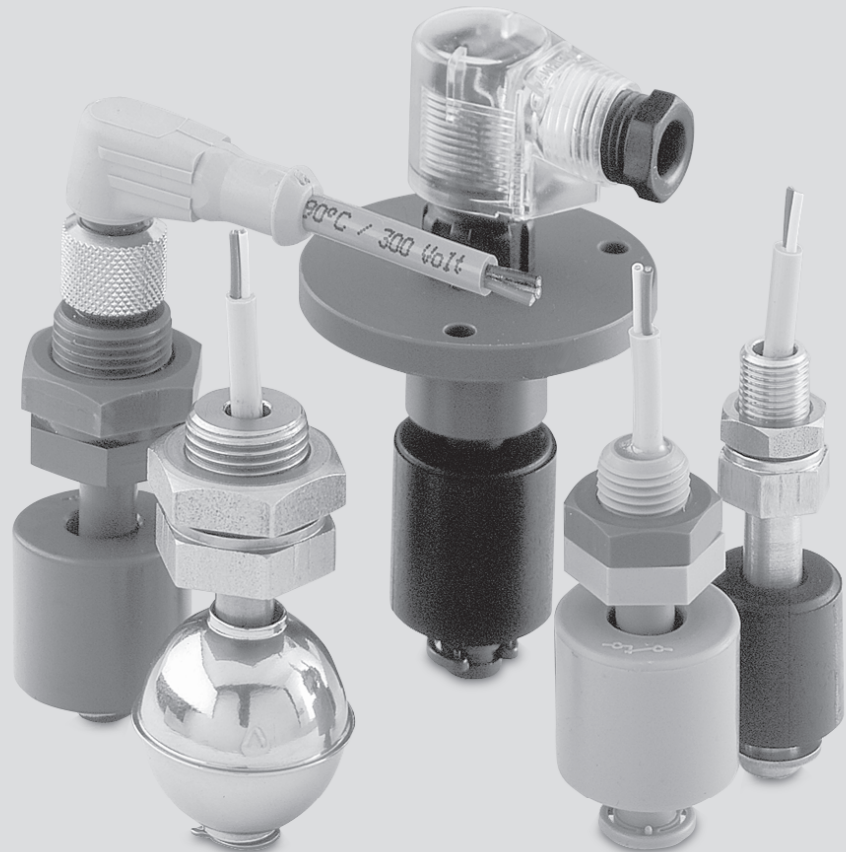
Rising or falling liquid levels carry the float equipped with a ring magnet into the detection zone of a magnetic sensor element, where the magnetic field of the float is evaluated and a switching pulse generated.

The range of BERNSTEIN float switches extends from miniature float switches through to heavy-duty, pressure-proof versions.

The combination options between various enclosure materials, floats and connection heads make it possible to create the optimum configuration for virtually any application.

Based on a comprehensive modular system of adjustable float switches, the product range offers an enormous problem solution potential. It allows the user to adjust the required switching points to individual applications, thus creating a customised product ideally adaptable to specific operating conditions.

BERNSTEIN additionally offers many other specific solutions that cannot all be illustrated in one catalogue. For more demanding applications it is therefore recommended to contact BERNSTEIN using a fax enquiry / Order form at the end of this section.



BERNSTEIN miniature float switches

To ensure smooth running operating processes, in many devices and industrial systems it is necessary to monitor product level in the most confined spaces.

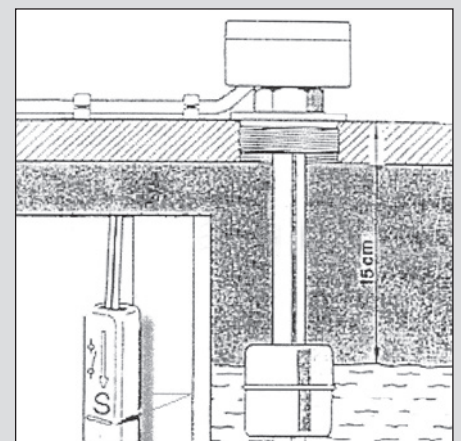
These miniature float switches have been specially developed for small tanks / reservoirs as used in the automotive industry, drinks vending machines, air conditioning systems etc.

The NC / NO contact switching function in many miniature switches can be selected by simply turning the float by 180°.

This type of miniature float switch is also available with individual lengths of immersion tube.

BERNSTEIN adjustable float switches

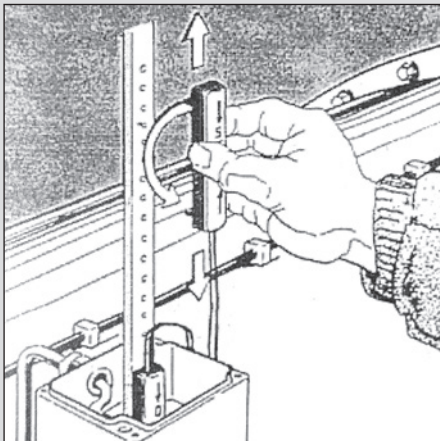
Up to four encapsulated magnetic sensor elements can be placed in any position at 10 mm intervals in the immersion tube of BERNSTEIN adjustable float switches.



Thanks to their extremely user-friendly design, each of these universally used devices can replace several conventional switches.

Instead of keeping a large assortment of different switches in stock, the user requires only one single device.

The NC or NO contact switching function can be easily adapted to specific operating conditions.



All versions are available as standard in four lengths (250, 500, 750 and 1000 mm). Other lengths are possible on request.



#### BERNSTEIN standard float switches

For over 25 years it has been hard to imagine fluid level regulation, control and monitoring systems without BERNSTEIN standard float switches. In addition to being used to simply provide a signal when a liquid level drops below or exceeds a defined value, they also ideally serve as signal generators in automatically operating filling systems.

With a wide range of different floats, enclosure materials and connection heads to choose from, the optimum float switch can be configured for virtually any application. Lengths of up to 2 m are possible. Versions are available with an elbow immersion tube in the connection head or even with a specially developed switching device.

## Terminology and Basic Theory

### Connection cable

Temperature resistant up to +70 °C, special versions up to +150 °C also available. Switches with cables come in the standard length of 1 m, other lengths are also possible on request.

### Radian (γ)

The radian is the length measured from the contact surface of the connection head to the neutral phase of the vertical immersion tube.

### Chemical resistance

See "Chemical Resistance" table (Page 133).

### Pressure

Up to 25 bar depending on type of float.

### Disruptive breakdown voltage

Each float switch undergoes a high voltage test in accordance with DIN VDE 0160.

### Maximum making current

From 0.5 A – 5 A depending on type of sensor used.

### Immersion depth (h1)

Designates how far the float is immersed in the medium. This parameter is dependent on the density of the liquid as well as the size and weight of the float. The values listed in the catalogue refer to a density of 1.

### End length (e)

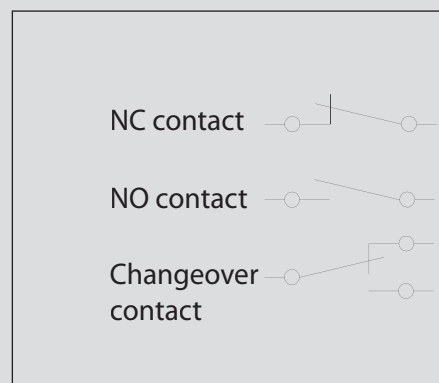
From 36 mm to 50 mm depending on the type of float.

### Electrical service life

To maintain a long service life of the float switches, it is important to ensure the maximum supply voltages and switching currents are not exceeded.

### Spark quenching

On request, all BERNSTEIN float switches can be equipped with protection circuitry which prevents wear caused by switching sparks when switching inductive or capacitive loads (please refer to protective circuitry for reed contacts).



### Contact function

### Performance diagram

The performance diagram shows the switching capacity as a function of the switching current (please refer to Page 67).

### Miniature float switches

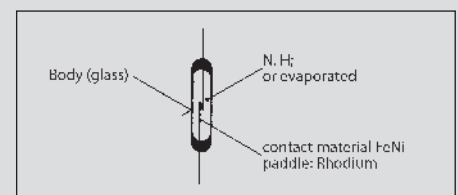
Favourable design and compact dimensions allow these float switches to be used in smallest containers.

### Mechanical wear

Thanks to the contactless operating principle, mechanical wear is not an issue.

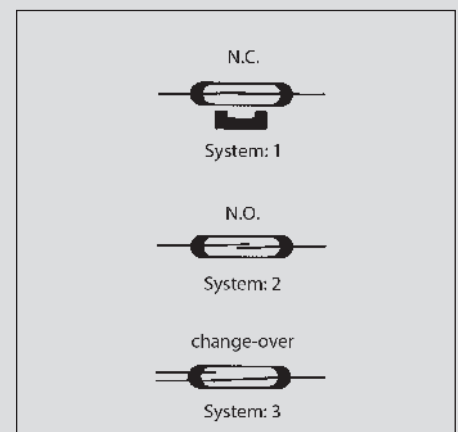
### Reed contact

A reed contact is a magnetically or electromagnetically operated switch. The pair of ferromagnetic contact studs are housed in a hermetically sealed glass tube filled with inert gas. Under the influence of a magnetic field, the contact paddles assume opposing polarity (north and south pole) and close when a sufficient force is applied. This procedure can be repeated millions of times even at extremely short time intervals.



Design of a reed contact

BERNSTEIN float switches are equipped with barium ferrite magnets that are located in the float. Opening and closing of the contact studs is determined by the magnet in the float correspondingly approaching or moving away. The delivery range includes normally-closed contacts, normally-open contacts and changeover contacts.



Versions of reed contacts

**Switching distances (o/m/u)**

The switching distances are defined with

- ⌘ o = Top
- ⌘ m = Middle
- ⌘ u = Bottom

(please refer to Float Switch Enquiry and Order form on Page 134).

**Switch length (x)**

This is the length from the connection head up to the lower end of the tube.  
x (max.) = 2000 mm

**Maximum switching power**

3 VA – 250 VA depending on type of reed contact (please refer to Page 130).

**Immersion tube**

Available in PVC, MS63, stainless 1.4571.

**Maximum switching voltage**

100 V – 250 V depending on type of reed contact (please refer to Page 130).

**Switching point**

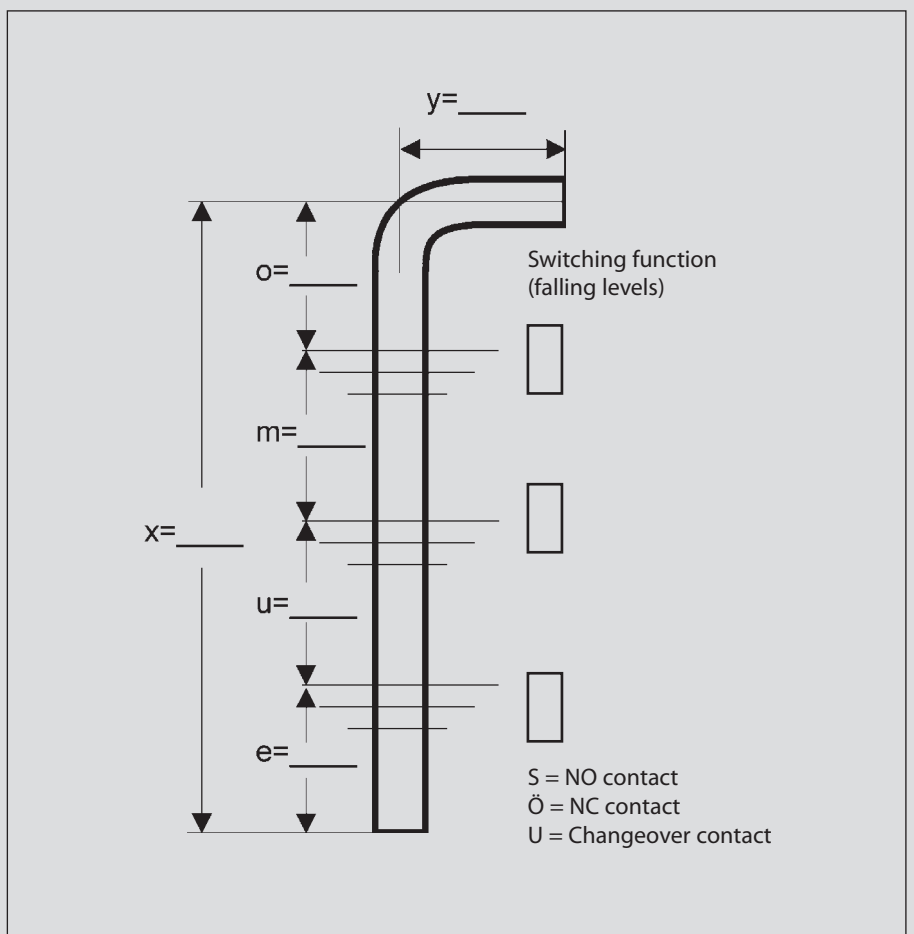
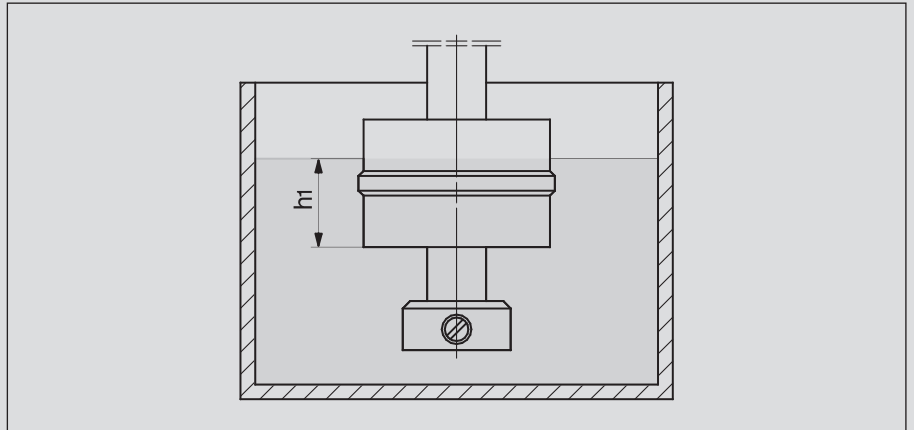
The float magnet initiates a switching signal by magnetising the contact studs of the reed contact. Three switching points per switch are possible (more on request).

**Switching path**

This corresponds to the path, on which the contact remains active while the float is moving in the same direction.

**Protection classes**

Corresponding to their ID code, the switches are dustproof and waterproof in accordance with IP 65 or IP 67 (EN 60529, IEC 529).



# Float Switches

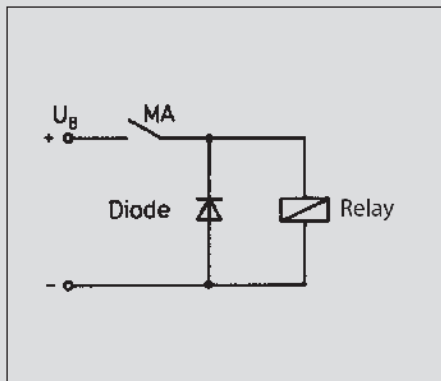
## Guidelines for reed contact protection

The values for current, voltage and power specified in the catalogue apply only to purely resistive loads. Very often, however, these loads are exposed to inductive or capacitive components. In these cases it is advisable to protect the reed contacts against voltage and current peaks. Whilst it is not possible to recommend a safe contact protection concept that applies to all load ranges (each individual case will require its own evaluation), we would like to present general guidelines on how reed contacts may be connected to different loads in order to avoid premature failure.

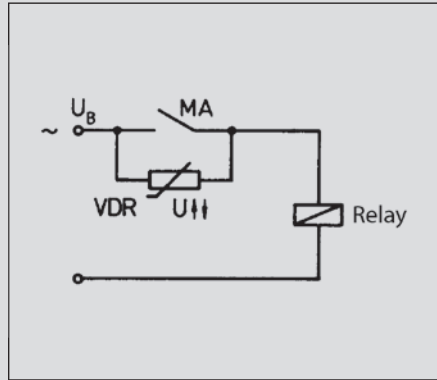
### 1. Inductive loads

In DC applications, contact protection is relatively easy to realise with the aid of a free-wheeling diode connected in parallel to the load. The diode polarity must be selected so that it blocks when normal operating voltage is applied but will short-circuit the voltage induced after the switch is opened (voltage peaks can significantly exceed the operating voltage).

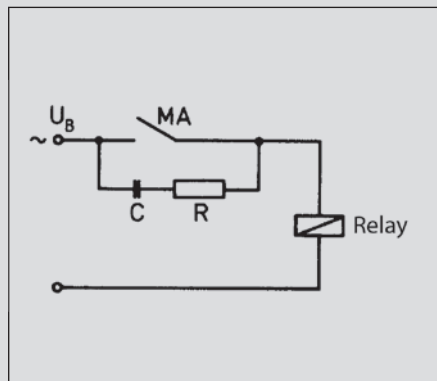
This can amount to a multiple of the operating voltage and initially cause a switching spark between the opening contact studs.



Suppression of voltage peaks with a free-wheeling diode



1) Voltage peaks induced by switching off inductive loads are suppressed by connecting a voltage-dependent resistor (VDR) in parallel to the reed contact.



2) In AC voltage applications effective protection is achieved with a combination of a resistor and a capacitor (RC element).

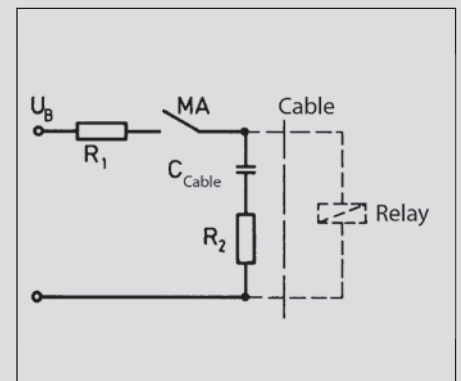
Generally, the RC element is connected in parallel to the contact and therefore in series to the load (vice versa is also possible).

### 2. Capacitive loads

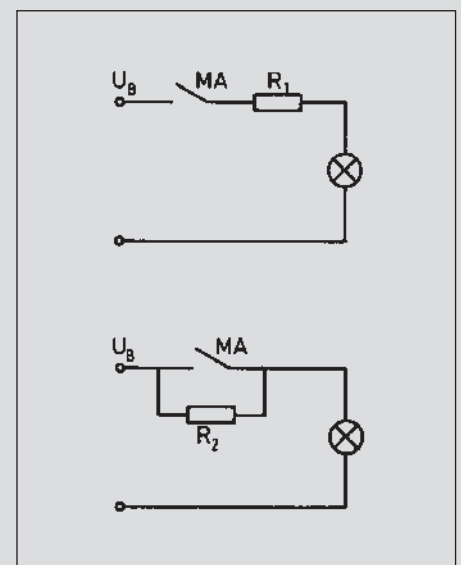
In contrast to inductive loads, an increase of making currents could occur in connection with capacitive loads and lamp loads that can damage and even weld contacts closed. When capacitors are switched (e.g. cable capacitance) a very high peak current occurs with its intensity depending on the capacitance and length of the cable leading to the switch.

A resistor connected in series to the contact will reduce this current. The size of the resistor is determined by the characteristics of the corresponding electric circuit. It should, however, be as large as possible to reduce the current to a permissible value, thus ensuring reliable contact protection.

Contact protection with resistors for limiting current:



1) Capacitive load



2) Lam load

Wiring diagram

