What is a reed switch?

Operation

All GEMS switches work on a combined reed switch/permanent magnet basis.

What is a reed switch?

A basic magnetic reed switch consists of a pair of low resistance, ferromatic, slender flattened reeds, hermetically sealed into a glass tube with a controlled atmosphere in cantilever fashion so that the ends align and overlap - but with a small air gap.

Since the reeds are ferromagnetic, the extreme ends will assume opposite magnetic polarity when brought into the influence of a magnetic field. When the magnetic flux density is sufficient, the attraction forces of the opposing magnetic poles overcome the reed stiffness causing them to flex toward each other and make contact. This operation can be repeated millions of times at extremely high speeds.

Operating the magnetic reed switch

Magnetic reed switches are actuated by the presence of a magnetic field with sufficient flux. This can be accomplished by either bringing a permanent magnet close to the switch or by energizing an electromagnetic coil which is mounted around or near the switch. Built-in to a GEMS switch the reed switch is actuated by a permanent magnet which is either moved parallel to the reed switch or by a pivoting movement.

Reed switch characteristics

- Reliability - the rhodium contacts are hermetically sealed in a glass tube and are therefore, dust, corrosion, oxidation and tamper proof.
- Service life - in excess of 1 million operations at maximum rating can be achieved providing the contact rating and contact protection is observed.
- Vibration and shock resistance - all these switches have good shock and vibration resistance. Please ask for further details.
- Temperature range - the normal operating temperature range is -20 °C to +250 °C. Higher temperatures may change the molecular structure of the contacts and thereby influence the switching function. Higher temperature reed switches are available as an option.
- Switching time - although not as fast as electronic switches, they are considerably faster than conventional switches, which makes them ideally suited to applications where high switching speeds are vital. Typically change over is 0.6 to 2 ms.

Contact protection

High inrush currents, as well as inductive and capacitive load, can considerably reduce the service life of a reed switch and under extreme circumstances result in a destruction of the contacts. Therefore, the following guidelines are to help the user to install protection circuits corresponding to the various types of loads to avoid a premature failure.

Inductive loads

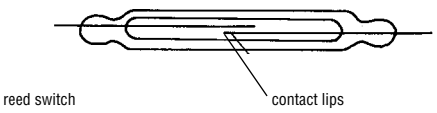
It is relatively easy to provide a contact protection for direct current circuits. An inverse diode is connected in parallel to the load, the polarity being in such a way that the diode blocks when normal operating voltage is supplied. When the circuit is interrupted, the voltage peak in reverse direction is shorted and the formation of an arc between the circuits is avoided (fig.1). Contact protection by a diode is not feasable for alternating current circuits. However, it is recommended that an arc attenuator be provided, which usually consists of a resistance-capacitance element which is connected in parallel to the reed contact (fig. 2). Component values may be derived from Fig. 4 below (example 1).

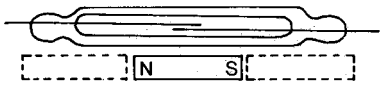
Capacitive loads and lamp loads

Inrush currents of up to 15 times the nominal current can occur with inductive loads, especially with lamp loads. In the worst case, inductive loads can cause welding or destruction of the reed switch contacts. Therefore, a protection resistor should be connected in series to the reed switch to limit the current, when switching capacitative loads, filament lamps and other circuits via long cables (fig. 3).
The contact protection diagram below may serve as a guideline (example 2).

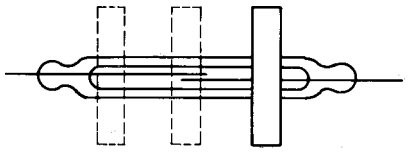
Contact protection diagram (fig.4)
Example no. 1: I = 0.1 A
U = 220 V
Put a ruler on the graph at the values above and you will find the approximate values for the capacitor C and the resistor R. This results in the following:
C = 0.001 µF
R = 340 Ohm

Example no. 2: max. permissible inrush current pulse:
I = 0.5 A
U = 200 V
Put a ruler on the graph at the values above and you will find the approximate values for the minimum resistor R min. This results in the following:
R_{min} = 400 Ohm





bar magnet parallel to the reed switch



ring magnet parallel to the reed switch

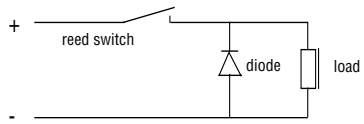


Fig. 1

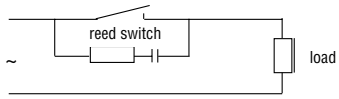


Fig. 2

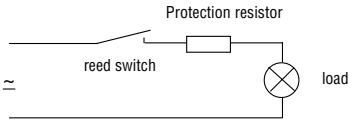


Fig.3

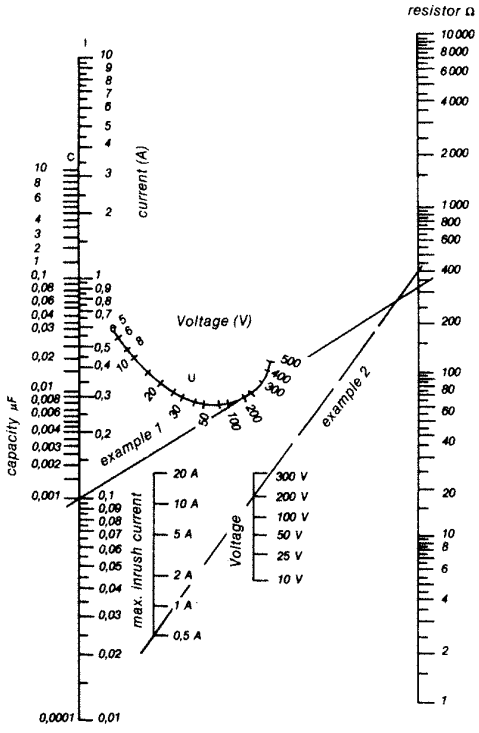


Fig. 4

Operating Principle of Gems Flow Switches

GEMS flow switches work according to the principle which is shown in the simplified diagrams on this page.

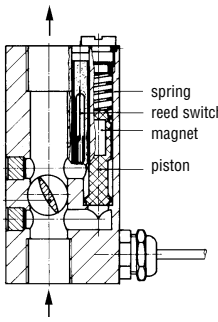
One can differentiate between two main operating principals:

1. A magnet-equipped piston or shuttle, displaced by the pressure differential (>350mb) from fluid flow, magnetically actuates a hermitically sealed reed switch within the unit.
2. Liquid flow deflects a paddle, which - with a pivoting cam - moves a magnet-equipped shuttle along the unit stem.

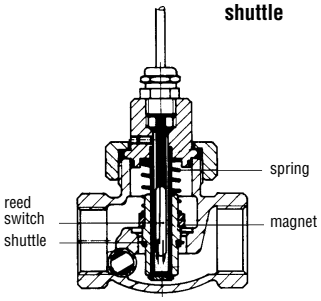
With both operating principles, if a pre-defined flow rate is achieved, a hermetically sealed reed switch is actuated by the magnetic field, resulting in the opening or closing of an electric circuit.

Operating principle

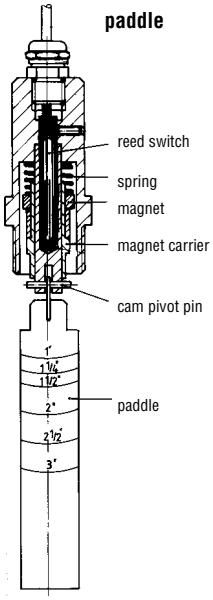
piston



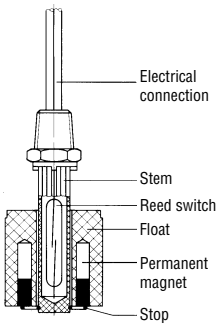
shuttle

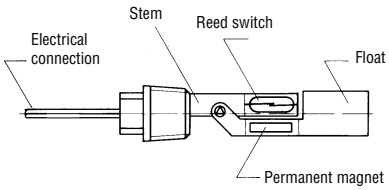


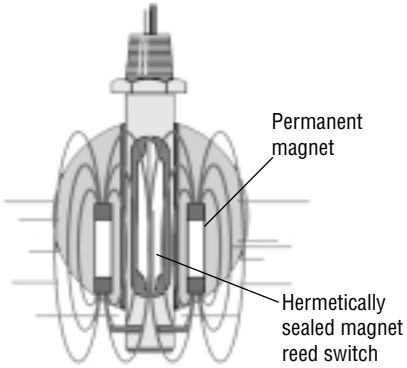
paddle



Operating Principle of Gems Level Switches







All GEMS level switches operate according to the schematic drawings.

A float equipped with one or more magnets moves up and down with the fluid level and actuates with its magnetic field a hermetically sealed reed switch embedded in the stem.

The switches can be provided as normally open normally closed or change-over contacts.

The advantage of this principle:

There is only one moving part - the float. This actuates the reed switch with its magnetic field without causing any wear. The reed switch itself is totally isolated from the media.

These advantages give the user safe, repeatable, accurate and high operational reliability with low maintenance over a long and trouble-free life.

Acceptance and Approvals

Various Civil, Military, Naval and Coast Guard approvals have been attained for special products. Some switches have been developed for applications in ships and have passed shock and vibration tests, seismic shock tests and other quality tests. Please ask for further details.

Contact Sales Office for detailed ordering information.

Approvals available on selected products:

RINA - Registro Italiano Navale (Italy)

Underwriters laboratories UL (USA)

Cenelec

Canadian Standards Association - CSA (Canada)

Germanischer Lloyd GL (Germany)

ISO 9001

Bureau Veritas BV (France)

American Bureau of Shipping

CE