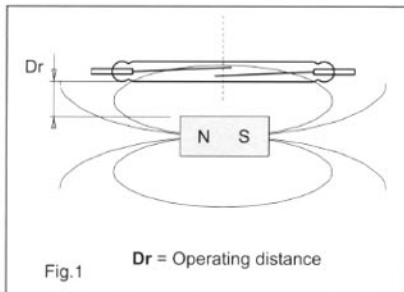


The operating principle of magnetic sensors is based on reed contacts, which consist of two low reluctance ferromagnetic reeds enclosed in glass bulbs containing inert gas. The reciprocal attraction of both reeds in presence of magnetic field, due to magnetic induction, establishes an electrical contact (fig. 1).



Magnetic sensors make use of reed contacts operated by means of an external magnetic field, generated by a permanent magnet (**magnetic unit**). A wide range of reed contacts is available with different features in terms of dimensions (standard or miniature), type (NO, NC, Change-over), electrical and mechanical properties, covering a huge variety of applications in the industrial field.

The **normally open** (NO) reed contact is open at the rest while it closes as the magnet is approaching.

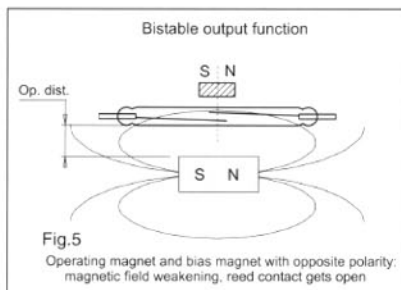
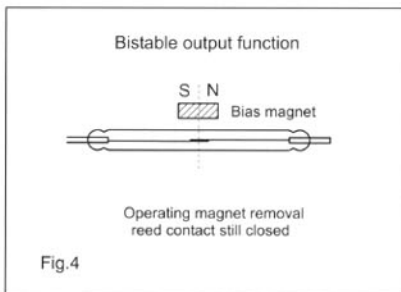
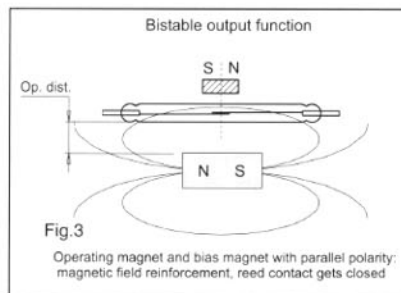
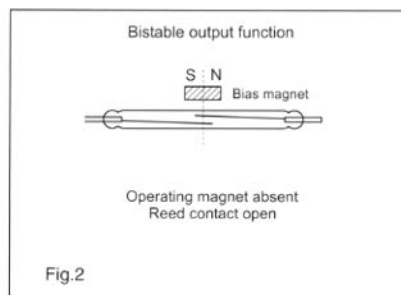
If the function is **normally closed** (NC), the contact is kept closed through a bias magnet placed near the glass bulb; the approach of the operating magnet, of reverse polarity, causes the magnetic field cancellation and then the contact opening.

It occurs to take account of the minimum distance that should exist between the bulb and the magnetic unit: its decrease causes the contact closing. This minimum distance depends on used reed form and on the operating magnetic unit.

In **Change-over** models, the NO and NC functions take place in the same glass bulb; thereby, when the operating magnet approaches or moves away, the contact position is changed from open to close condition and vice versa.

In **bistable** (B) function an internal magnet pre-polarizes the contact reed, without succeeding in closing it. By the approach of the magnet with same polarity the magnetic field is intensified, causing the contact to get closed, that lasts even when the operating magnet moves away from the influence area.

The contact opens again only once the magnet approaches with opposite polarity to the steady maintenance field (fig. 2, 3, 4 and 5).



The **bistable** function can be carried out also with Change-over contacts, giving the Change-over / bistable function.

Compared to mechanical contacts, the use of reed contacts is featured by the following advantages:

- contact protection against dust and dampness, thanks to the hermetic sealing;
- easy operation;
- high switching frequency (up to 300 Hz);
- long contact life ($10^7 + 10^8$ operations);
- absence of maintenance and small dimensions;
- shock resistance with accelerations up to 50 times the gravity acceleration;
- vibration resistance with accelerations up to 35 times the gravity acceleration.

Considering low voltage and current values, the operating life of a magnetic switch depends on the contact mechanical features, while for higher voltage and current values the operating life depends mainly on the load characteristics: therefore it is necessary to provide an external protection on the switch output.

Rectangular proximity sensors

Housed in a plastic case, considering the reed contact and the case shape and dimensions, the rectangular magnetic sensors can be divided as follows:



- **Standard series**

They make use of standard reed contacts.

- **Standard series with faston connection**

Housed in a fibre-glass plastic case.

- **Miniature series**

Characterized by small dimensions, they use reed contacts of miniature type.

- **Micro-miniature series**

Characterized by extremely small dimensions, they use reed contacts of miniature type.

Cylindrical proximity sensors

Cylindrical magnetic sensors are available in several configurations, thanks to the combination of different sensor bodies:



- **Plastic (threaded / not threaded)**

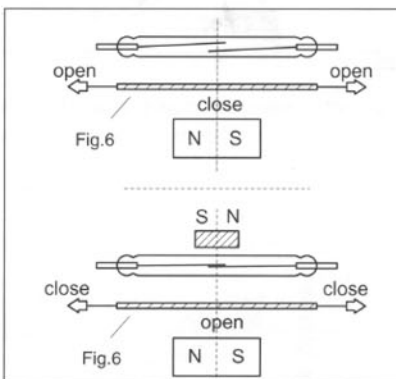
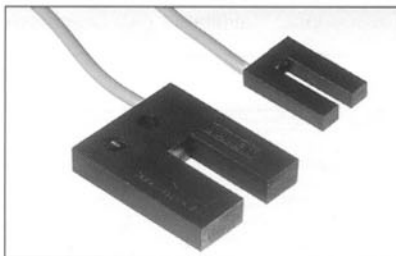
- **Stainless steel**

- **Brass / Nickel plated brass**

with case diameter from 6 to 16 mm and, moreover, with a large variety electrical features thanks to the wide offer of reed contacts.

Slot sensors

These switches are operated by a ferromagnetic vane which causes the shielding of a magnetic field generated by a permanent magnet (fig. 6). The available families (ISY, IM, I) differ from



the shape and dimensions of the case and from the type of the reed contact.

They offer a very high quality level of performance and safety. The reed contact and the permanent magnet are dipped in polyurethane resin, which makes them waterproof and dust resistant and protects against shock (50 g) and vibrations (35 g).

- **I series**

I models are housed in plastic case.

- **ISY series**

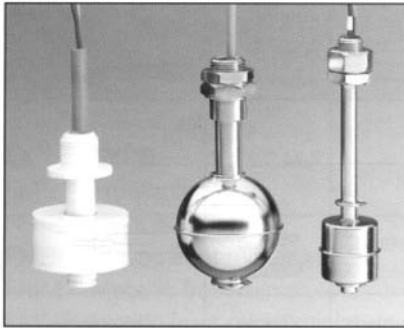
ISY models, which have plastic case, use miniature reed contacts.

- **IM series**

The vane operated IM models also have plastic case and use miniature reed contacts.

Level sensors

Magnetic level sensors include several families which are classified in terms of housing materials and external dimensions. Inside the float, a permanent magnet is placed operating one or more reed contacts dipped in resin. Level sensors available can be classified in:



- **ILM series:**
level metallic standard
- **ILC series:**
level upon request
- **ILSP series:**
level polypropylene standard
- **ILU series:**
level universal
- **ILMU series:**
level universal miniature
- **ILMP series:**
level polyethylene miniature
- **ILMPU series:**
level universal polyethylene miniature
- **ILMM series:**
level metallic miniature

Flux sensor

Designed for horizontal mounting, the flux sensor is a magnetic switch able to signal when the flux of a liquid gets higher or lower than a threshold value.



In this sensor a reed contact is operated by a float containing a permanent magnet. When the flux of the operating liquid pushes the float, the spring gets compressed and the magnet in the float causes the reed contact to switch. As the intensity of the flux decreases, the spring takes the float back to the rest position.

Such sensors find their use field in a large range of applications where the pressure of a liquid must be kept under control.

Explosive Environment sensors

This series of magnetic sensors is certified according to the ATEX Directive for use in potentially explosive atmosphere.



The series includes rectangular proximity sensors, cylindrical proximity sensors and level sensors.

Mounting supports

Only frontal proximity magnetic sensors with NO and Change-over output functions can be directly mounted on ferromagnetic supports. All other models must be placed on non-magnetic supports (plastic, brass, aluminium and so on), or they must be provided of appropriate non-magnetic spacers.

For sensors utilizing standard reed contacts, spacers must be more than 20 cm thick, while for sensors provided with miniature reed they must be more than 10 mm thick.

Side by side mounting

In order to avoid magnetic interferences, when mounting proximity magnetic sensors side by side it is necessary to keep a certain distance depending on the sensor type. For standard models, the distance between two contiguous sensors must be not less than 45 mm, when switching is carried out with CL.2, CL.11 or CL.31 magnetic units; operating with bigger magnetic units the distance must be increased. For miniature and micro-miniature models, the fixing screws of two contiguous sensors must be placed 30 mm far from each other, when switching is carried out with CL.1, CL.10 or CL.18 magnetic units; operating with bigger magnetic units this distance must be increased. The fixing torque of magnetic units must be in the range 250 , 400 gf_m.