SOLENOIDS : GENERAL TECHNICAL INFORMATION

1. WHAT IS A SOLENOID ?

A solenoid is an electromagnetic system made of a magnetic core, a coil and a magnetic frame permitting to guide the magnetic field and to mount the solenoid in the mechanism in which it will be used.

2. COMPONENTS OF A SOLENOID :

A. THE COIL :

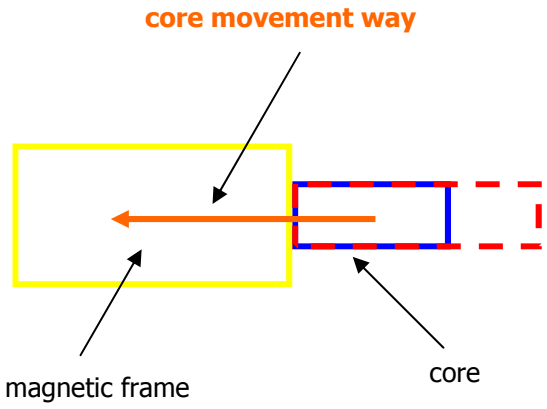
In a solenoid, the coil permits to generate a magnetic field.

B. THE CORE :

The solenoid's core permits to guide the magnetic field lines created by the electric current of the coil. Usually realised in cut steel, this part of the solenoid is the one used to push or pull (according to the type) the part of the mechanism in which the solenoid is incorporated. The core is located inside the coil which generates the magnetic field.

C. THE FRAME :

The magnetic frame of a solenoid is the frame in which the coil is incorporated. It has two uses : magnetic and mechanical. It permits to close the magnetic field lines created by the coil. For that reason, the frame, as the core, made of a magnetic material. It also permits to fix the solenoid in the mechanism in which it will be used.



3. OPERATING PRINCIPLE OF A SOLENOID :

When powering the solenoid, the coil will create a magnetic field. Guided by the frame and the core, this field will create another magnetic field in the airgap located between the core and the bottom of core, this having for effect to move the core and to plate it at the bottom of the frame.

4. THE FORCE OF A SOLENOID :

The force of a solenoid depends of the current intensity passing inside the coil. It is thus possible to increase the force of a solenoid while sending a more important electric intensity in the coil.

But this force also depends on two other parameters : the magnetic properties of the material used for the core and the frame and the position of the core in the frame.

The force of a solenoid is not constant : it is much more important when the core is plated at the bottom of core. When the core is far from the bottom of core, the force of the solenoid decreases very quickly accordint to the distance to the bottom of core. This can be explained by a phenomenon of dispersion of the magnetic field between the core and the bottom of core. However, it is possible to get an important and precise influence on this decrease of the force according to the position of the core.

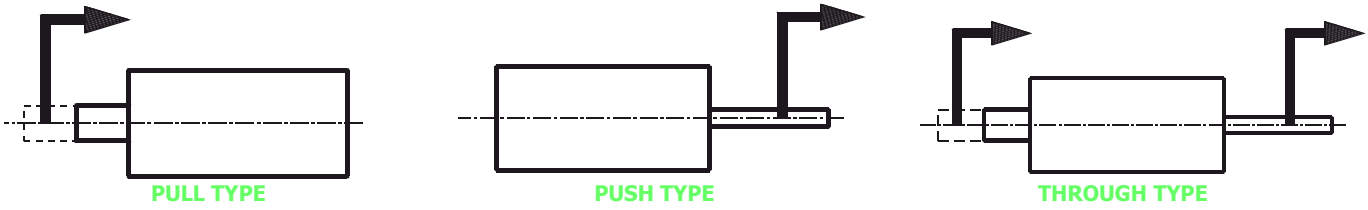
5. REACTION TIME OF A SOLENOID :

A solenoid has a reaction time of less than one second. As this reaction time depends on the coil characteristics and the solenoid's dimensions, it is thus can be decreased down to some milliseconds.

SOLENOIDS : SIGNIFICATION OF THE TERMS USED IN OUR CATALOGUE

1. PRINCIPLE :

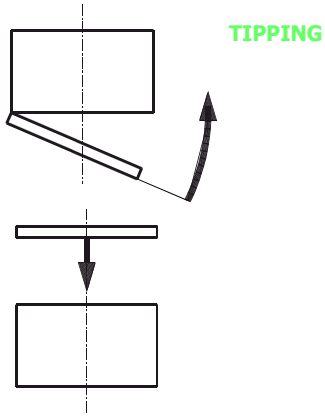
Linear : the movement is rectilinear, following a stroke corresponding to the distance travelled in mm from the starting position until the limit position of the mobile part of the solenoid.



PULL TYPE PUSH TYPE THROUGH TYPE

an internal or external return spring can be proposed. In the case of a monostable solenoid with permanent magnet, the end of stroke position is assured by a permanent magnet.

Clapper or actuator (shank on clapper) : the movement is tipping following a stroke measured at the centre of the core. The return is assured by an internal spring.



TIPPING

Hold magnet : permits to hold a metallic part by magnetic locking.

2. POWER SUPPLY :

The admissible variation of the standard voltage is +5%/-10% (according to NFC 79.300) but a specific tolerance can be studied for you.

3. DUTY CYCLE (Fm) :

This is the ratio of the ON times to the total duration of the cycle.

$$Fm\ (\%) = \frac{\text{ON times}}{\text{ON times + rest times}} \times 100$$

Our standard duty cycles are : 100%, 40%, 25%, 15% & 5%.

4. OPERATING LIFE :

The operating life depends on external stresses (load, stroke, damping, mounting position). In most cases, we can assure an operating life of one million operations.

5. AMBIANT TEMPERATURE :

- 5 to + 35°C (according to NFC 79.300).
the maximum heating of our solenoids is 80°C under nominal voltage when mounted on a poor heat conducting bracket. If the ambiant temperature is over 35°C, the power, hence the holding force, have to be reduced.

6. THERMAL LIMITS :

Our solenoids are built of materials of class E isolation, i.e. with an upper temperature limit of 120°C. For specific uses, we can realise products with materials of class F isolation, i.e. an upper temperature limit of 155°C.

7. DIELECTRIC TEST VOLTAGE OR PROTECTION DEGREE :

According to NFC 79.300.