DURAKOOL®

A Solid State Group Brand

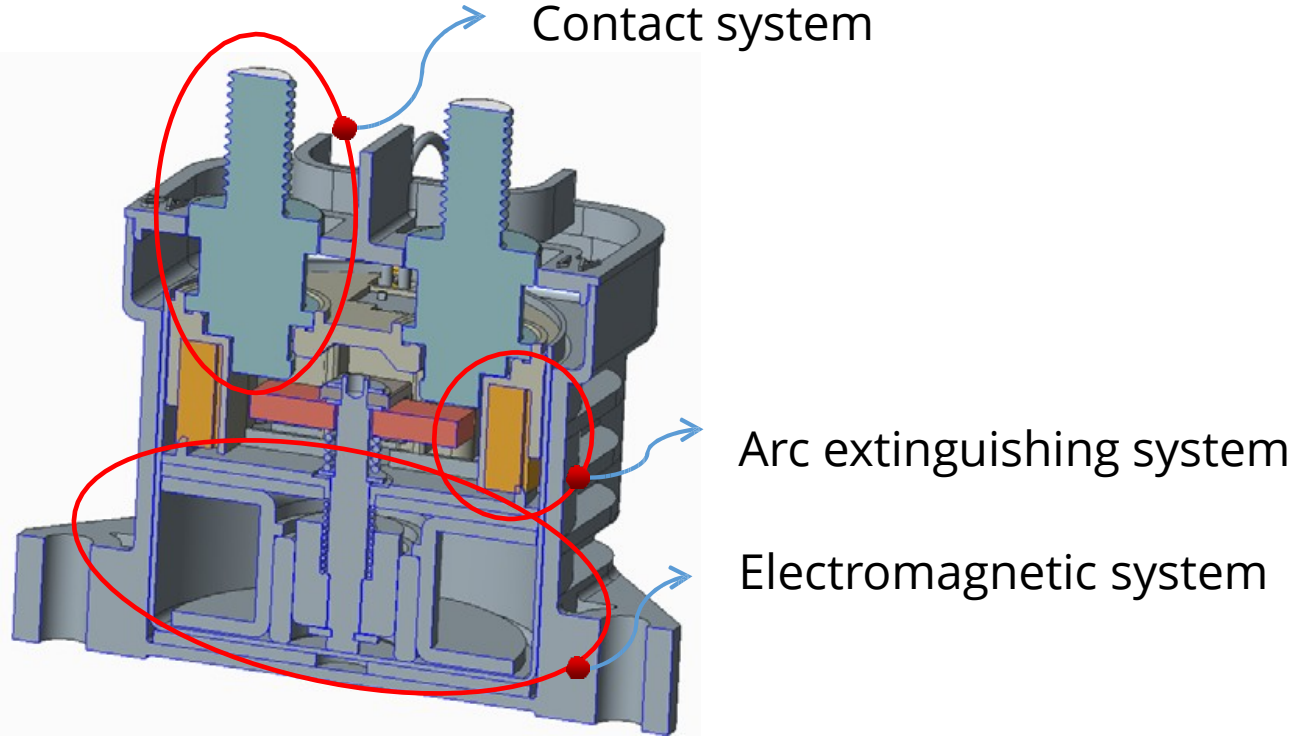
Switching Polarised & Non-Polarised DC Contactors

Providing Switching Solutions

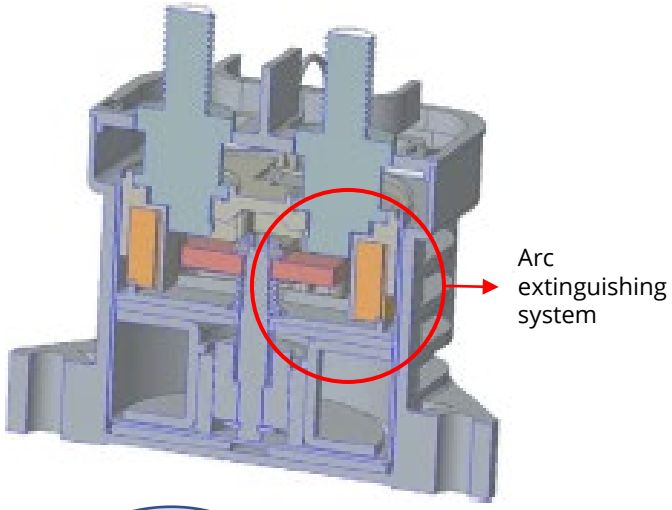
DC Contactor Structure and working principle

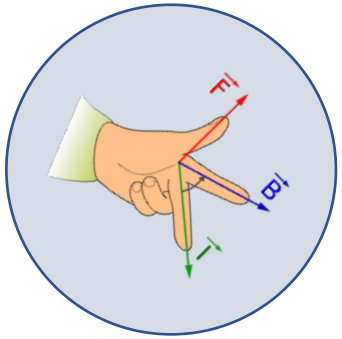
DC contactors consist of three parts:

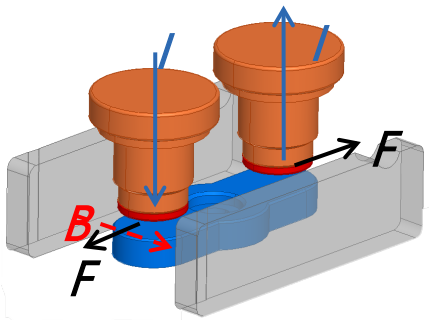
An electromagnetic system, a contact systems and an arc extinguishing system



Arc extinguishing system







I = Current direction, B = Magnet field,
F = direction of movement (of the arc)

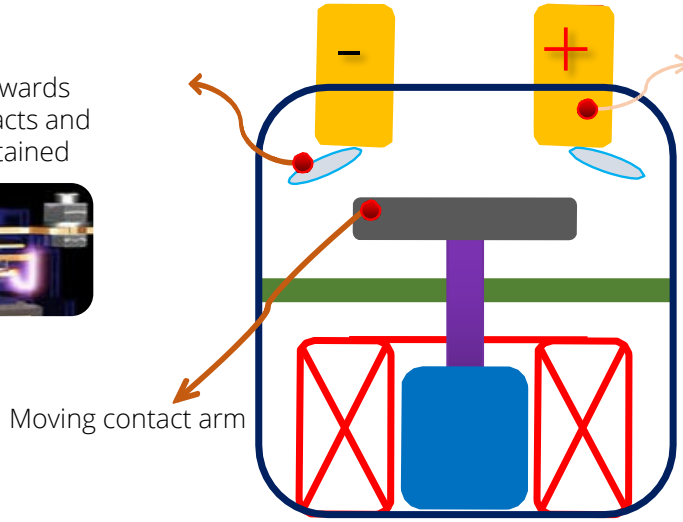
Consists of permanent magnets and inert gases.

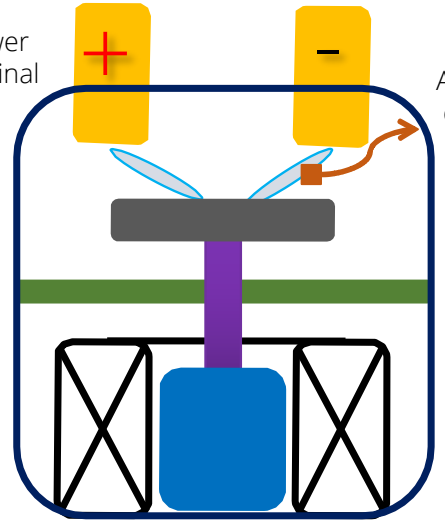
The arc generated between the moving contacts, as the DC contactor is disconnected, is a high-temperature ion current, formed by gas ionisation. Using the principle of Fleming's Left-hand Rule, the charged particles are deflected in the magnetic field. The magnetic field formed by the permanent magnet is "pulled" to achieve the effect of permanent magnet arc extinguishing (Arc "Blow-out").

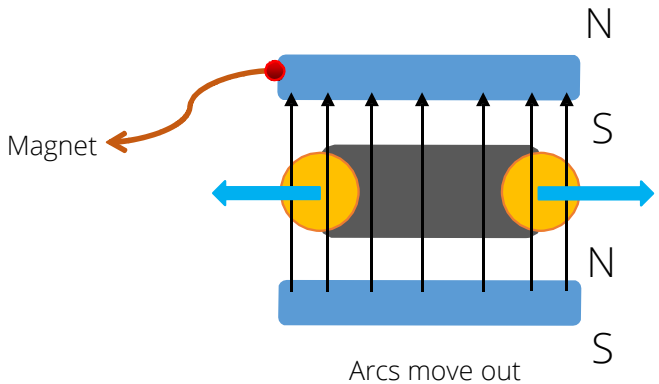
Although other gases can be used, the DEVR series uses Nitrogen (N) in the arc chamber. Since there are three strong bonding orbitals in the N molecule, the bond energy is particularly large: (942kJ/mol). It's a highly symmetrical non-polar molecule, which therefore has great stability and is not easily ionised when the DC contactor is disconnected, thereby effectively suppressing the generation of an electric arc between the contacts as they open.

Polarised contactors - Magnet effect depending on direction of current flow

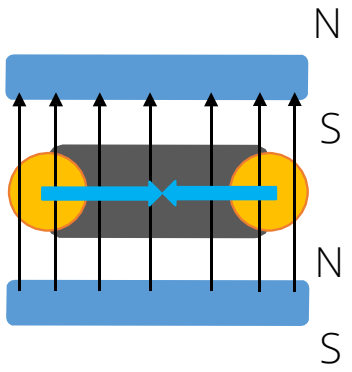
Arcs move outwards away from contacts and cannot be sustained







Arcs move out away from contacts



Arcs move inwards

In the left drawing, you can see how the arcs are pushed away from the moving contacts.

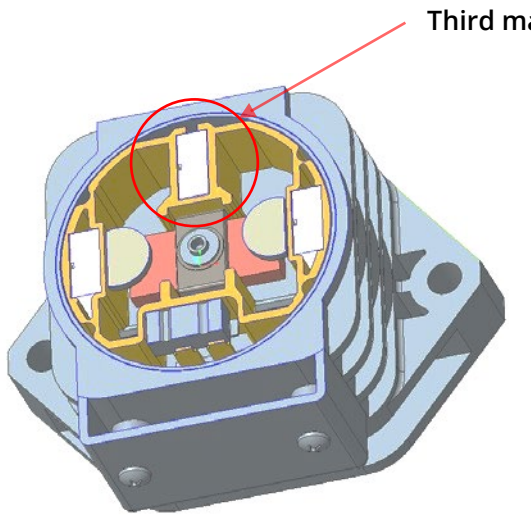
However, if we are breaking a current flowing in the opposite direction (right drawing), the magnet effect is in the opposite direction. This means we are not gaining any arc length.

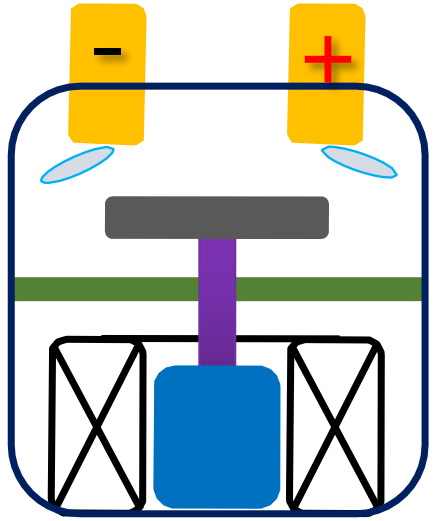
This is the reason why, for polarised contactors and relays, current breaking capacity is optimised for one current flow direction only.

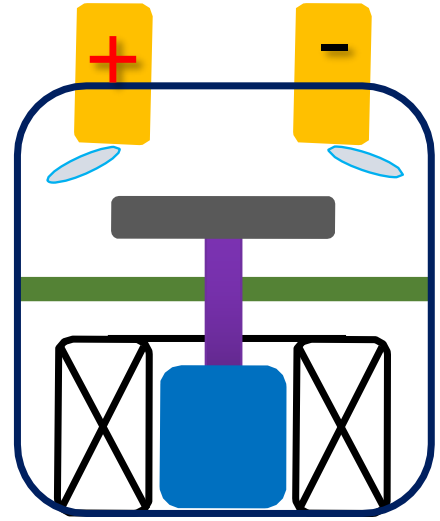
If we intend to use a polarised contactor in the reverse direction, its breaking capacity is reduced, as a general rule, by 30 – 50%

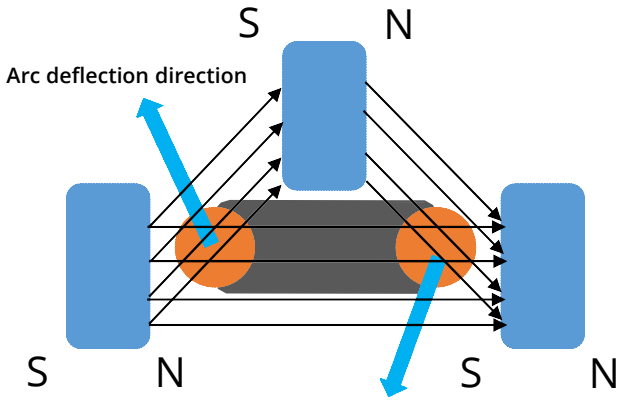
NB: Polarity has no effect through closed contacts, it only matters when the contacts open under load (or bounce when closing under load).

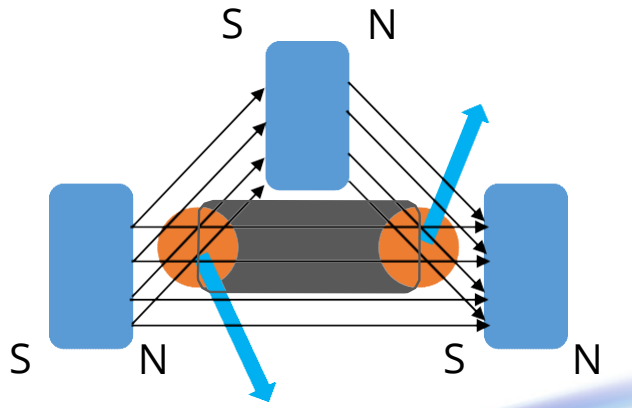
Non-polarised contactors









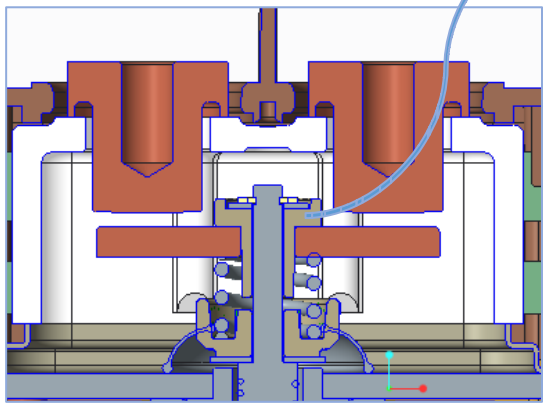


Non polarised contactors use a third magnet to move the arc away. This is why non polarised contactors are a little more expensive.

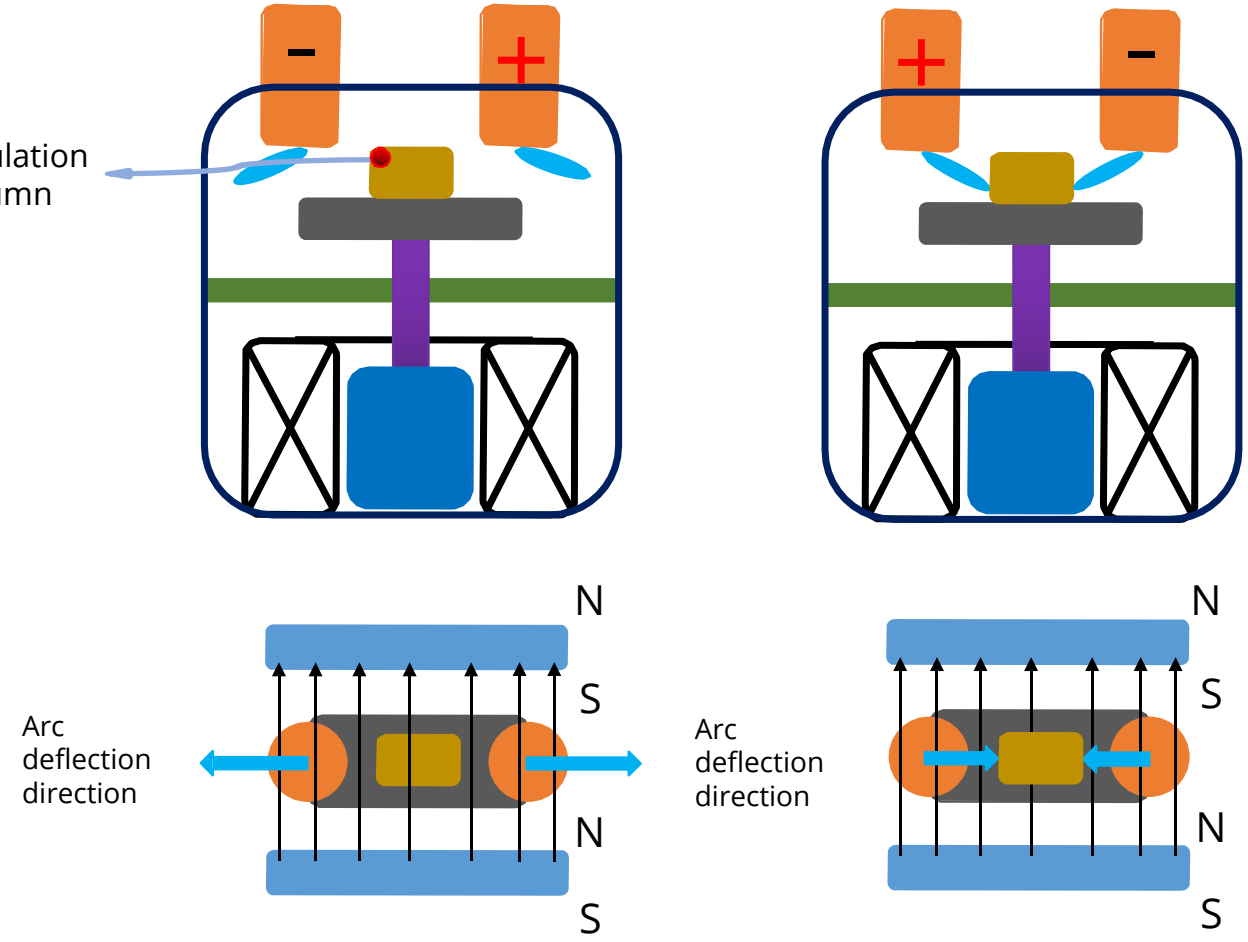
The breaking capacity is a bit lower than polarised contactors, because the arc is pushed away – but not in the optimal direction.

DURAKOOL DEVRs use a third magnet.

Non-polarised contactor using an insulator between contacts



Insulator blocks the arc



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For further information

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