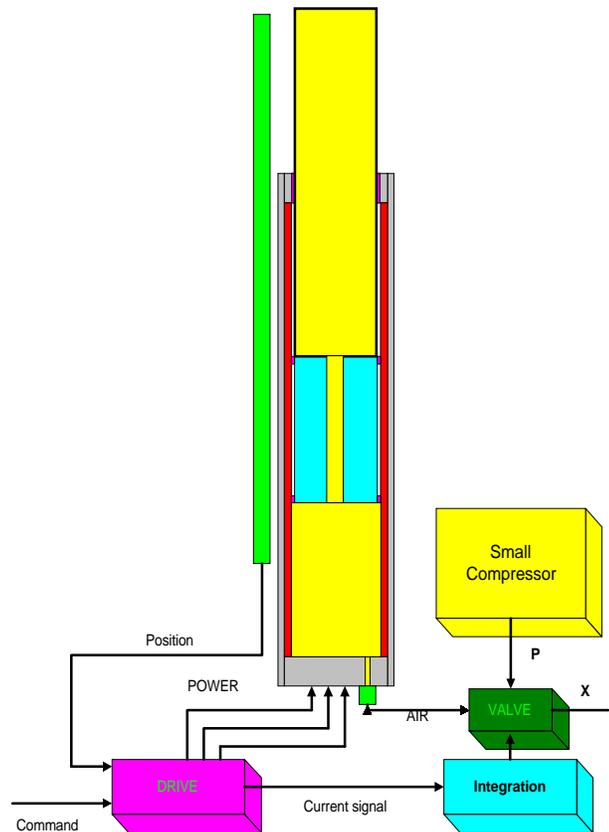


Notes on the use of electromagnetic rams in Elevators



The elevator system consists of a long ram with a hollow thrust tube, fixed to a permanent magnet armature that moves within a polished liner that acts as a bearing surface. The liner is surrounded by a series of copper coils that are connected to form three control phases and the unit is sealed by a ring that bears upon the outer polished surface of the thrust tube where it leaves the stator cylinder. A safety brake clamp ring can also be fitted at this point

The armature consists of a stack of magnet rings and polepieces that project a strong magnetic field outwards through the electrical coils; the magnetic flux returning via the steel outer tube that completes the assembly. There are no external electric or magnetic fields.

The deadload of the cabin and its payload is supported by gas (air) within the ram, at a pressure of approximately 3 bar (40-50psig). The exact value of this pressure is automatically adjusted from time to time by a small valve system and a standby compressor. The air pressure is controlled according to a simple algorithm that monitors and integrates the value of the current supplied by the ram drive unit, thus compensating automatically for temperature changes, leaks, load changes and elevator parking arrangements. Air is not consumed during elevator motion.

Advantages of linear electromagnetic elevators

- **Silent, all electronic** system
- Small wall-mounted power unit and controller
- No Hydraulics
- No mess, no cooling, no pumps or high-pressure pipes
- Simple, wide-tolerance, robust mechanical design
- Inherent self-monitoring of system characteristics
- Very low maintenance requirement

- **Zero-jerk operation.**
- Absolutely smooth acceleration and braking control at no extra cost
- Regenerative braking returns power to the electrical system
- Self-contained and fully-automatic counterbalancing
- Inherent instantaneous sensing of passenger load
- High power efficiency through patented design features
- Efficiency increases with speed
- Speeds to at least 5m/sec
- Extreme positioning accuracy, independent of load or velocity
- No mechanical backlash – force is created at the point of load

- **Three inherent and superimposed safety features:-**
 1. Under power fail conditions the internal gas spring prevents collapse to ground level. The spring pressure may be arranged to decay slowly under emergency conditions, if required
 2. The motor acts as a very powerful dynamo brake and the terminal descent velocity under worst case conditions is only a fraction of a metre/second *Worst case is assumed to be total loss of power and simultaneous immediate and total loss of gas counterbalance pressure when the elevator is fully loaded*
 3. A fail-safe clamp ring device can be added to lock the thrust tube at any point