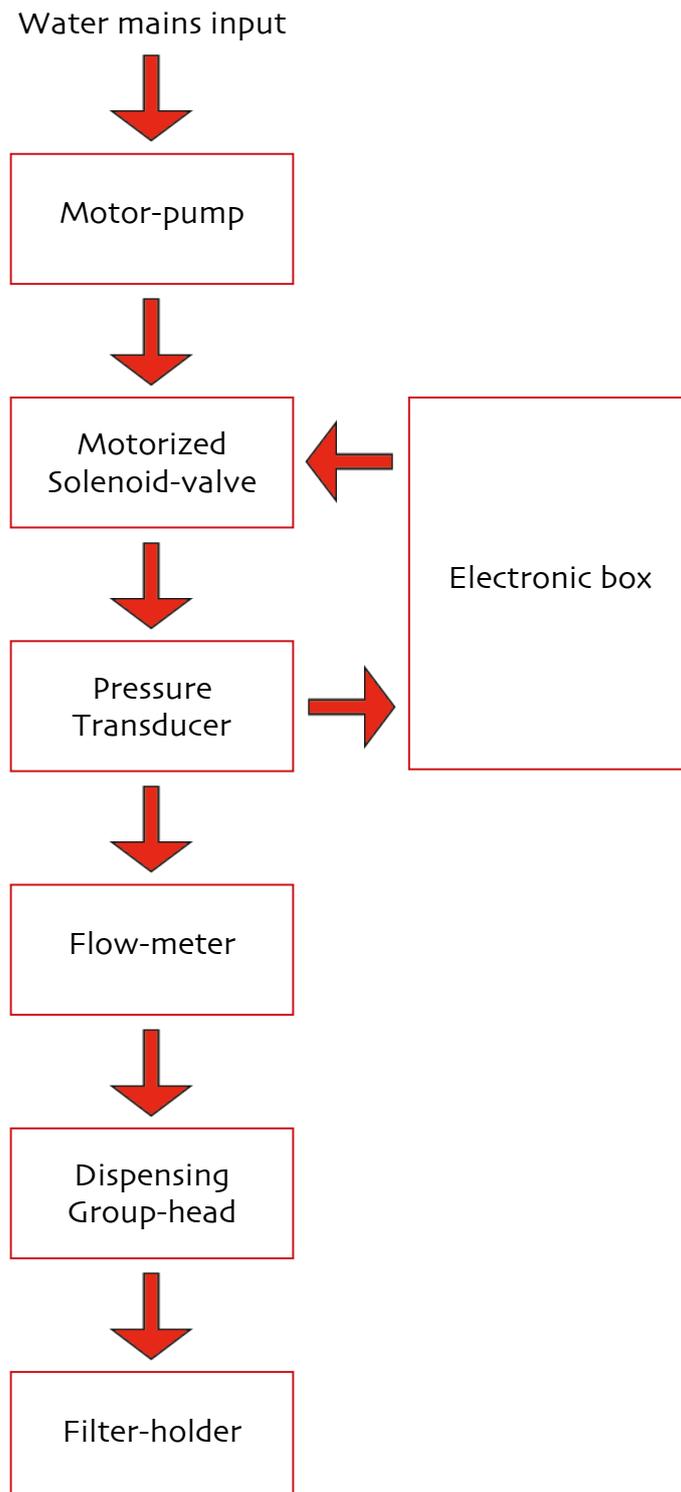


PRESSURE PROFILES



Control of variable pressure profiles using a motorized solenoid-valve. Following a block diagram of the hydraulic and electric circuit blocks realized to control the water pressure in output from the group.



The motor pump is calibrated to a pressure of 10 bar to have a wider range of work on the pressure, the pressure of the water input ideal for the functioning is approximately 3 bar. We connected in series to the motor-pump the motorized solenoid-valve, orienting it with 2 input and 1 output because this is the configuration that allows it to work properly.

The motorized solenoid- valve doesn't work in pressure but in **water flow**, it means that the internal orifice change very rapidly switching to a frequency of about 100 Hz following the pressure requested by us through the software. The variation of pressure through the water flow is possible thanks to the fact that we work on an open circuit (in dispensing step), we can't say the same in the case of a closed circuit because the detected pressure is not given by the flow rate but by the thrust input. The motorized solenoid-valve is directly controlled by electronic box, which collects the data read by the pressure transducer creating what is called a feedback error to system. The transducer therefore has the function of reading the pressure in output from the solenoid-valve and communicate it to the electronic box, which will compare the reading with the data that we inserted and perform any necessary adjustment to get as close as possible to the desired pressure. The circuit has been connected in input to the flow-meter.

For system tests we connected a pressure gauge not held back on the group's pre-infusion chamber to verify the correct pressure modulation by the solenoid-valve. All tests were carried out by recreating a real situation, using therefore double and single filter-holders and varying the grinding to have feedback on all possible variables.

COMPONENTS FOR PRESSURE CONTROL:

1. Motorized Solenoid-valve ODE
2. Pressure Transducer ODE
3. Electronic box Concerto
4. Motorized Solenoid-valve interface module with electronic box

STRUCTURAL CONSIDERATIONS:

Considering that the motorized solenoid-valve has a maximum orifice opening of 1.2 mm and considering that the same solenoid-valve control the water flow it is possible to mount a standard Gigger of the same rating if you want to have a bigger quantity of water coming out from the group. The lowest possible pressure coming out from the group is currently 2 bars, but we're working on ways to be able to bring it to zero to have the chance to expand the range of the system's working pressure. The maximum pressure that you will have will be the one who was calibrated the motor-pump in the circuit entrance, and so 10 bar.

The motorized solenoid-valve is controlled through the PID parameters (KP, KI, KD), not editable by the user, through which you can control the speed variation and precision of pressure. The solenoid-valve operating pressure goes from 0 to 10 bar maximum. During our tests we checked that it's fundamental the coffee grinding, if the grind is too coarse the motorized solenoid-valve will modify the pressure very quickly but you will have difficulty to reach the maximum output pressure, by contrast with a very fine grind the pressure modify will be lower but with more precise modulation. Plays a very important role also the force that you use to press the coffee into the filter-holder.

CONCLUSIONS:

Once you find the right balance between all these variables, the system will work perfectly and the user will have the chance to create the own personal pressure profile for each type of coffee blend and get the best coffee extraction.