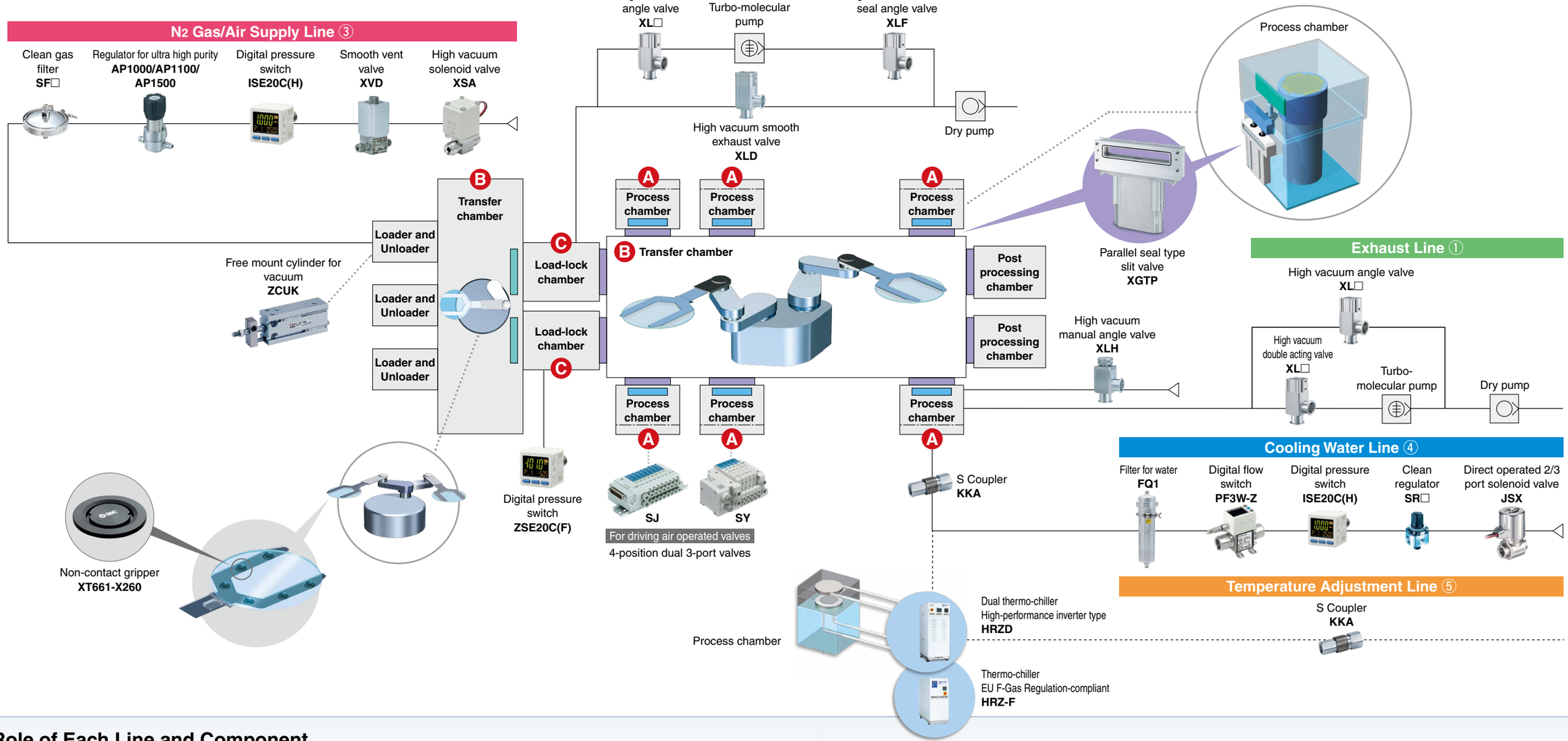
System Configuration/Role of Each Line and Component

In semiconductor manufacturing processes, etching equipment, sputtering equipment, ion implantation equipment, and CVD equipment generally process wafers and LCD's in a vacuum chamber. The peripheral equipment used to exhaust (vacuum) air from and supply atmospheric pressure to the vacuum chamber, such as valves, regulators, pressure switches, cylinders and gate valves should meet conditions such as nonleakage, clean specifications, and corrosion resistance.

System Configuration (Typical Application)



Role of Each Line and Component

Vacuum Chamber

The system consists of a **load lock chamber** C which introduces a wafer from the clean room into the chamber, a **transfer chamber** B which receives a wafer and moves it in and out, and a **process chamber** A in which the wafer is processed. Each chamber is exhausted with a vacuum pump in order to maintain a vacuum pressure.

Slit Valve/Transfer

In each chamber, vacuum and atmosphere are divided by a slit valve (XGT).

N2 Gas/Air Supply Line ③

When a wafer is introduced to the load-lock chamber C, the chamber has to temporarily restore atmospheric pressure. N2 or clean air is supplied for this purpose. The gas introduced to the chamber must have a high degree of cleanliness.
For fluid contact parts, stainless steel fittings are generally used. Non-leakage specification VCR® or Swagelok fittings® are adopted wherever possible. The smooth vent valve XVD is used to change the flow rate of N2 or clean air, which is supplied slowly at the initial stage after opening and, on achieving a certain pressure, is switched to the main valve for a full supply to prevent particle turbulence.
At the entrance of the chamber, the flow is rectified with a clean gas filter (with 100% filtration efficiency of 0.01 μm particles) and a stainless steel diffusion element inside the chamber.

Exhaust Lines

The exhaust line can be divided into the process chamber **exhaust line** ① and the transfer chamber and load-lock chamber **exhaust line** ②. **Exhaust line** ① has a high vacuum manual angle valve (XLH) between a dry vacuum pump and a turbo-molecular pump and a high vacuum angle valve (XLC) between a turbo-molecular pump and the process chamber. When these valves are closed, vacuum is maintained in the process chamber and maintenance can be performed on the pumps. Also, the process gas (reaction gas) can be introduced to the process chamber by closing the high pressure angular valve.
Exhaust line ② is used to evacuate the transfer chamber and the load-lock chamber. The load-lock chamber is restored to atmospheric pressure temporarily while a wafer is introduced. After introduction of the wafer, air is exhausted with a dry vacuum pump. When the pressure is reduced to a certain point, the turbo-molecular pump is used for exhaust. A by-pass circuit is provided with a high-vacuum smooth exhaust valve (XLD) and a high-vacuum angle valve (XLA/XLF). The smooth vent valve XVD is used to supply air slowly at the initial stage after opening and, on achieving a certain pressure, to switch to the main valve for a full supply to prevent particle turbulence.

Cooling Water Line ④

Temperature Adjustment Line ⑤

In order to optimize wafer processing and deposit removal, the temperature in each chamber (especially the process chamber) is precisely controlled.
The cooling water line can be used with devices such as the 2 port solenoid valves for water (VDW/VX2), flow switch (PF3W), clean regulator (SRH), and pressure switch (ISE80).
Thermo-chillers and thermo-controllers are used to cool and maintain the chamber temperatures.