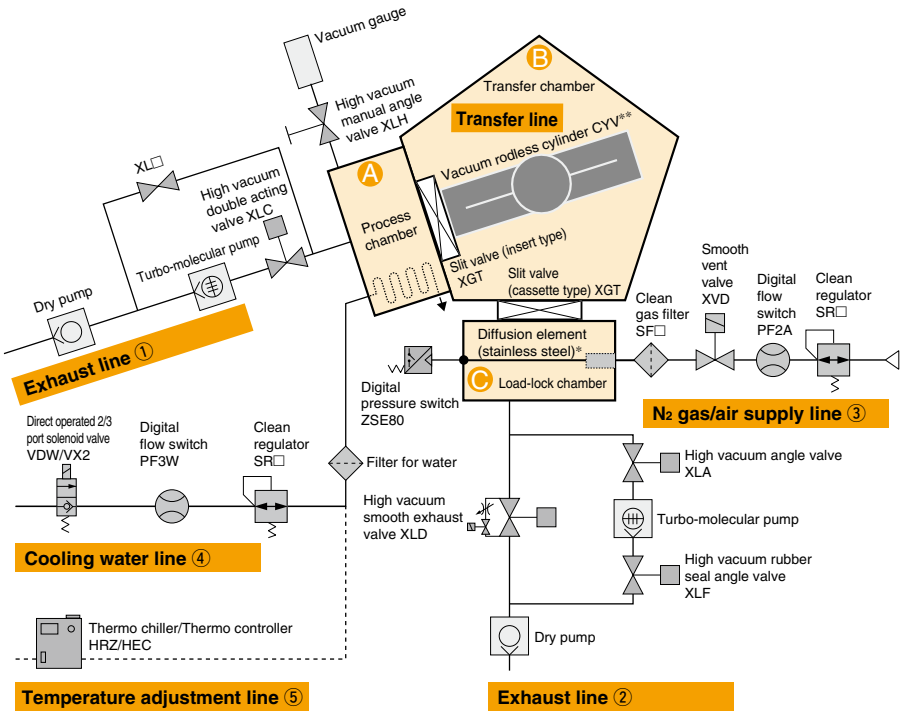
# System Configuration/Role of Each Line and Component

**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 non-leakage, clean specifications, and corrosion resistance.**

## System Configuration (Typical Application)




* Available upon request.
** The installation example for CYV given above, is an image only, and does not satisfy all the conditions for usage.

### 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.

# Role of Each Line and Component

## 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.

## $N_2$ gas/air supply line ③

When a wafer is introduced to the load-lock chamber C, the chamber has to temporarily restore atmospheric pressure. $N_2$ 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 $N_2$ 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.

## Cooling water/Temperature control line ④⑤

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.

## Slit valve/Transfer

In each chamber, vacuum and atmosphere are divided by a slit valve (XGT). Wafer transfer inside a chamber is enabled by the use of a vacuum cylinder (CYV).

# Series Variations

## Exhaust Line

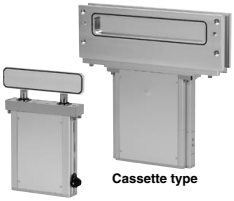
| Description | Model | Shaft seal system<br>Valve type | Flange size | Material |
|---|---|---|---|---|
| **Aluminum<br>High Vacuum Angle Valve**<br>● High fluorine resistance<br>● Minimal outgassing<br>● Minimal contamination from heavy metals<br>  <br>P.1109 | **XLA**<br>XLAV (With solenoid valves) | Bellows seal<br>Single acting (N.C.) | 16, 25, 40, 50, 63, 80<br>(KF [NW]/K [DN] Note 1)) | Body: Aluminum alloy<br>Bellows: Stainless steel 316L |
| | **XLC**<br>XLCV (With solenoid valves) | Bellows seal<br>Double acting | | |
| | **XLF**<br>XLFV (With solenoid valves) | O-ring seal<br>Single acting (N.C.) | 16, 25, 40, 50, 63<br>80, 100, 160<br>(KF [NW]/K [DN] Note 1)) | Body: Aluminum alloy<br>Main part: Stainless steel, FKM Note 3) |
| | **XLG**<br>XLGV (With solenoid valves) | O-ring seal<br>Double acting | 16, 25, 40, 50, 63<br>80, 100 Note 2), 160 Note 2)<br>(KF [NW]/K [DN] Note 1)) | Body: Aluminum alloy<br>Main part: Stainless steel, FKM Note 3) |
| | **XLD**<br>XLDV (With solenoid valves) | Bellows/<br>O-ring seal<br>2-Step Control | 25, 40, 50, 63, 80<br>(KF [NW]/K [DN] Note 1)) | Body: Aluminum alloy<br>Bellows: Stainless steel 316L |
| | **XLH** | Manual | 16, 25, 40, 50<br>(K [NW]) | |
| | **XLS** | Single acting (N.C.) | 16, 25<br>(KF [NW]) | Body: Aluminum alloy<br>Main part: Stainless steel, PFA, FKM Note 3) |
| **Aluminum One-touch Connection and Release High Vacuum Angle Valve**<br>● One-touch connection and release (No tools are required.)<br>  <br>P.1163 | **XLAQ** | Bellows seal<br>Single acting (N.C.) | 16, 25, 40, 50<br>(KF [NW]) | Body: Aluminum alloy<br>Bellows: Stainless steel 316L |
| | **XLDQ** | Bellows/<br>O-ring seal<br>2-Step Control | 40, 50<br>(KF [NW]) | |
| **Stainless Steel<br>High Vacuum Angle Valve**<br>● A precision casting, unified composition prevents accumulation of gas.<br>● Series XM is interchangeable with the series XL, aluminum high vacuum angle valve.<br>  <br>P.1175 | **XMA** | Bellows seal<br>Single acting (N.C.) | 16, 25, 40, 50, 63, 80<br>(KF [NW]/K [DN] Note 1)/CF Note 4)) | Body: SCS13<br>(equivalent to stainless steel 304)<br>Bellows: Stainless steel 316L |
| | **XMC** | Bellows seal<br>Double acting | | |
| | **XMD** | Bellows/<br>O-ring seal<br>2-Step Control | 25, 40, 50, 63, 80<br>(KF [NW]/K [DN] Note 1)/CF Note 4)) | |
| | **XMH** | Manual | 16, 25, 40, 50<br>(KF [NW]/CF Note 4)) | |
| **Stainless Steel<br>High Vacuum In-line Valve**<br>● Combination with the angle valve allows space saving.<br>  <br>P.1175 | **XYA** | Bellows seal<br>Single acting (N.C.) | 25, 40, 50, 63, 80<br>(KF [NW]/K [DN] Note 1)) | |
| | **XYC** | Bellows seal<br>Double acting | | |
| | **XYD** | Bellows/<br>O-ring seal<br>2-Step Control | 25, 40, 50, 63, 80<br>(KF [NW]/K [DN] Note 1)) | |
| | **XYH** | Manual | 25, 40, 50<br>(KF [NW]) | |

Note 1) Applicable to flange sizes over 63.
Note 2) Made to order. Solenoid valves are not available.
Note 3) Standard seal
Note 4) Only applicable to flange sizes 16, 40, and 63.

## $N_2$ Gas/Air Supply Line

| Description | Model | Fitting size | Material |
|---|---|---|---|
| **Smooth Vent Valve**<br>● Valve / needle valve integrated construction – requires only 1/4 the piping space of previous models.<br>● Particulates significantly reduced through the use of a metal diaphragm in the sheet portion<br>● Flow of both initial air supply and main air supply can be adjusted.<br>  <br>P.1206 | **XVD** | 1/4<br>(For VCR®/Swagelok®) | Body: Stainless steel<br>Main part: Stainless steel, FKM (seal material) |

## Slit Valve

| Description | Model | Opening window size Height x width (mm) | Applicable wafer size | Number of axis | Material |
|---|---|---|---|---|---|
| **Slit Valve**<br>● This product is suitable for the partition valve between the load lock chamber and the transfer chamber or between the transfer chamber and the process chamber in semiconductor equipment or other equipment.<br>  <br>Cassette type<br>Non-Cassette type<br>P.1211 | **XGT22** | 32 x 222 | 200 mm | Two axes bellows | Body: A5052<br>Gate: A6063<br>Bellows: AM350<br>Seal Material: FKM, Kalrez 4079 |
| | | 46 x 236 | | | |
| | **XGT31** | 50 x 336 | 300 mm | One axis bellows | |

## Transfer Line

| Description | Model | Bore size (mm) | Port size | Material |
|---|---|---|---|---|
| **Rodless Cylinder for Vacuum**<br>● Air cylinder for transfer in vacuum environments (1.3 x $10^{-4}$ Pa)<br>  <br>P.1219 | **CYV** | 15 | 5/16-24UNF | Body: Aluminum allow<br>Linear: Stainless steel<br>O-ring: Fluororubber |
| | | 32 | 7/16-20UNF | |