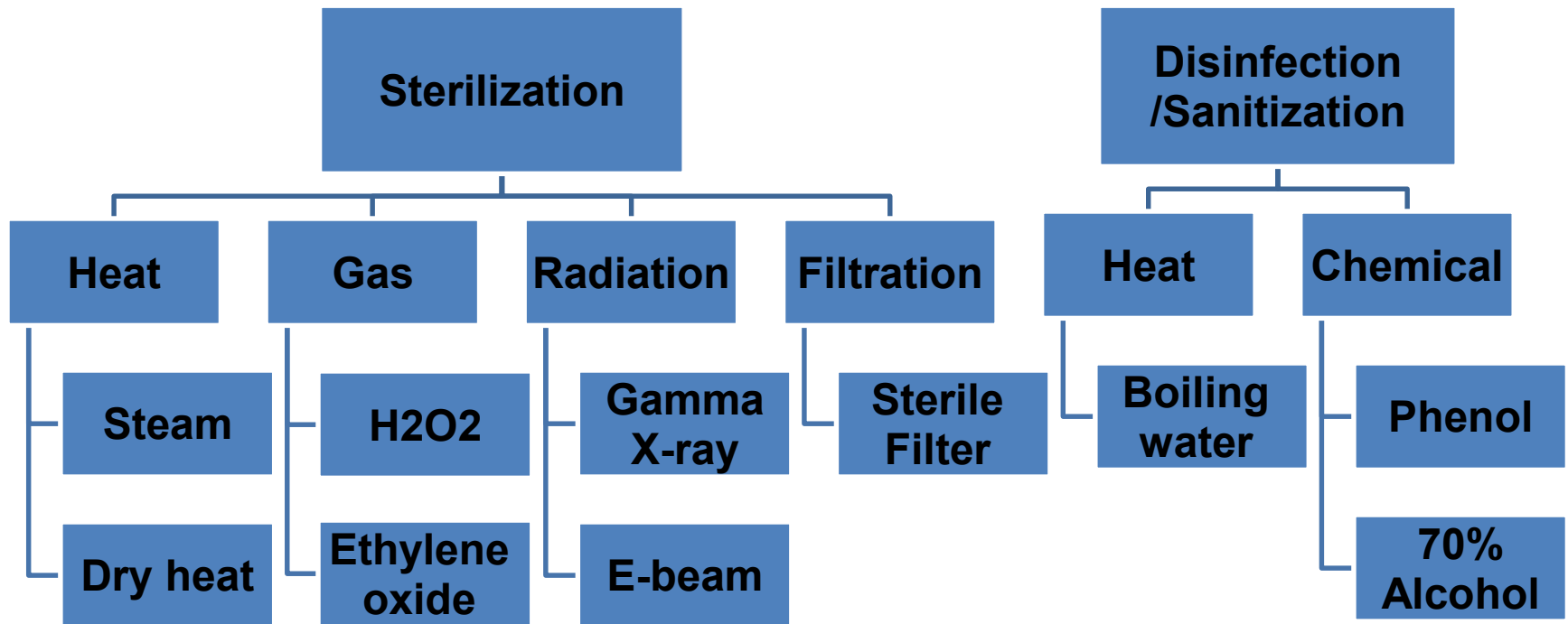


Autoclave or Steam sterilizer

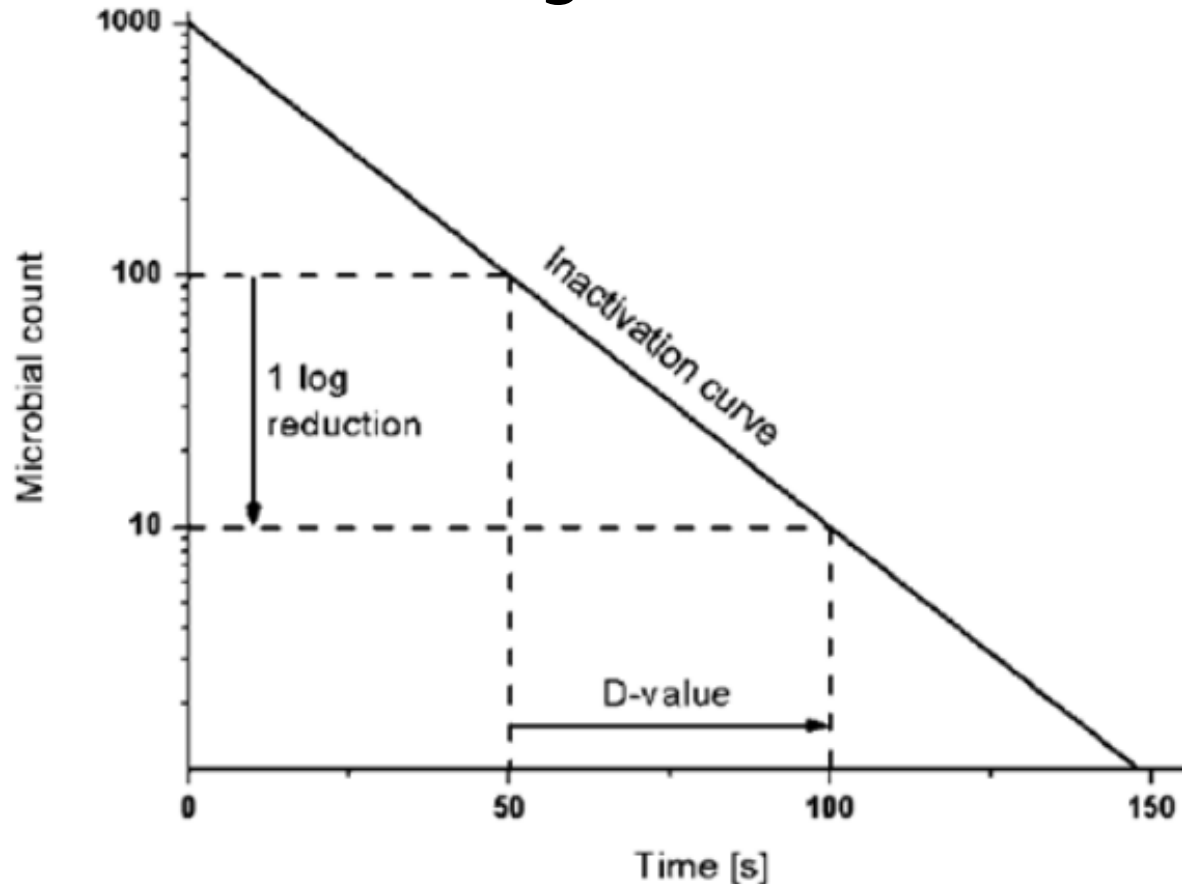


Methods of Removing Germs



D-value

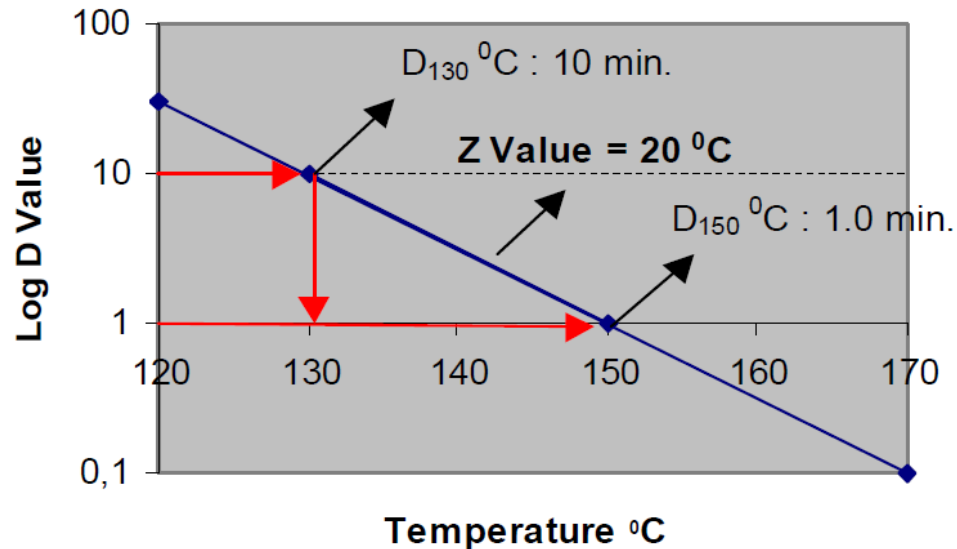
- Decimal reduction time
 - Time required for one log (or 90%) reduction



Z-Value

- Definition
 - D-value 가 10분의 1로 줄어드는 온도 변화량
 - 예) 130°C D value 10, 150°C D value 1, Z value 20.
- 보통 Dry Heat 20 °C, Steam 10 °C.

Assesment of Z Value



SAL(Sterility Assurance Level)

- Probability of a non-sterile unit
- Indicated as a level of Log reduction
- Sterile
 - minimum SAL 10^{-6} or 6 Log reduction
 - 1/1,000,000 은 멸균되지 않는 확률
 - Most sterilizing processes go beyond that
 - Called overkill($> =$ SAL 12)

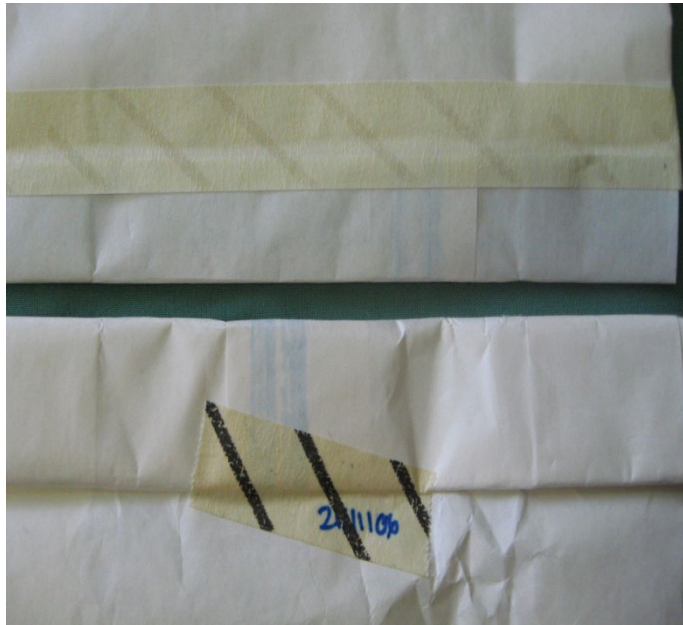
F0, LETHALITY RATE

- F0: Index of Steam Sterilization
 - 121°C에서 유지한 시간(min)으로 환산
 - 1 min at 121°C is F0 of 1
- $F0 = \Delta t \times \text{Lethality Rate}$
- Δt : Cycle time
- Lethality Rate : $10^{((T-121)/Z)}$
- T : Actual Cycle temperature
- Tb : Base Temperature(121°C)
- Z : Microbial Death Rate Constant(10°C)

LETHALITY RATE

Time (min)	Temperature (°C)	Lethality Rate min. at 121 °C
5	100	0,0080
6	103	0,0160
7	106	0,0320
8	109	0,0630
9	112	0,1260
10	115	0,2510
11	118	0,5010
12	121	1,0000
13	121	1,0000
14	121	1,0000
15	118	0,5010
16	115	0,2510
17	112	0,1260
18	109	0,0630
19	106	0,0320
20	103	0,0160
21	100	0,0080

Chemical/Physical indicators



Autoclave tape



Physical indicator

Top: Untreated
Bottom : Treated

Biological indicators

Organism	D-Value
<i>Geobacillus stearothermophilus</i> (most common)	1 - 2.8
<i>Bacillus coagulans</i>	0.3
<i>Clostridium sporogenes</i>	0.8 – 1.4
<i>Bacillus atrophaeus</i>	0.5



Spore
Suspensions

Validation

- IQ
 - URS와 설치의 적합성확인
 - Sensor calibration
- OQ/PQ
 - 계측기의 상태확인
 - 작동성 확인, Alarm test
 - Temperature Distribution
 - Heat Penetration
 - Biological Indicator test
 - AIR REMOVAL TEST(Bowie-Dick)
 - LEAK RATE TEST



Sterilization condition

- Common cycles:
 - 121°C for 15 minutes
 - 134°C for 3 minutes
 - Lower temperature takes longer time
 - 115°C for 40 minute

TEMPERATURE	TIME (MIN)
132°–134°C	3–4 minutes ^a
121°C	8–30 minutes ^a
115°C	35–45 minutes
111°C	80–180 minutes

^a Unwrapped items have been shown to be sterile at short times. Wrapped items and load sizes may require longer times for adequate heating and a sterility assurance level of 10⁻⁶, or shorter times depending upon bioburden, product mix, processing, and characteristics of the product. Significantly higher time and temperature is required for inactivation of prions (e.g., 134°C for longer than 1 hour).

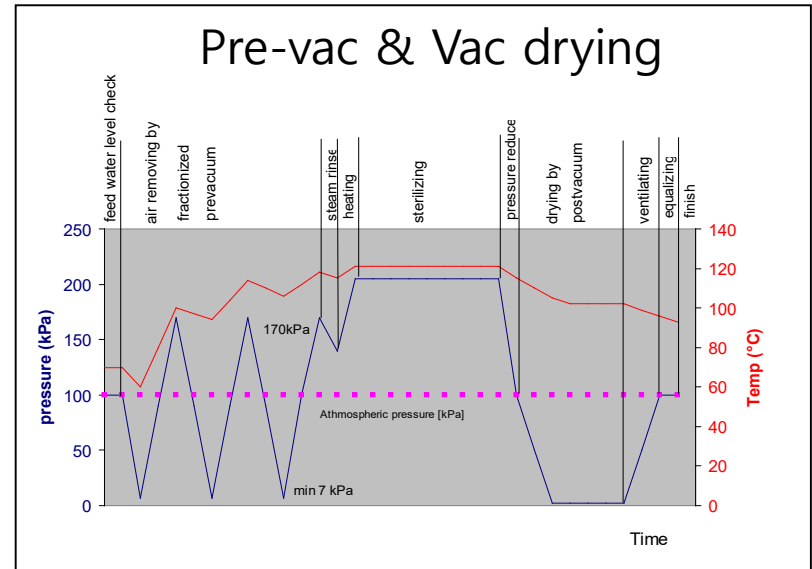
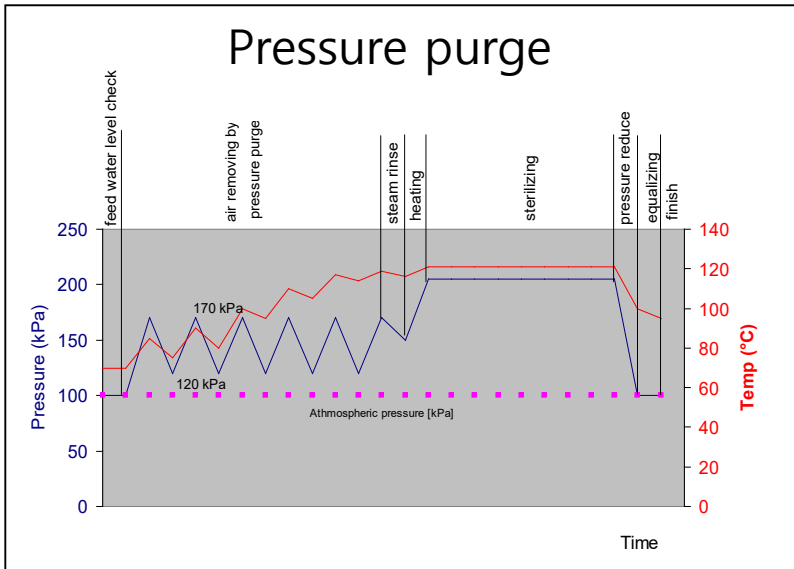
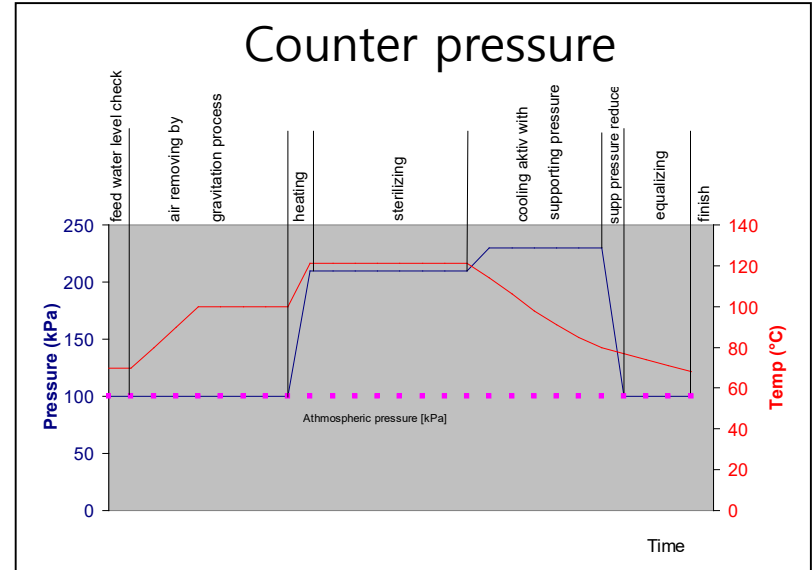
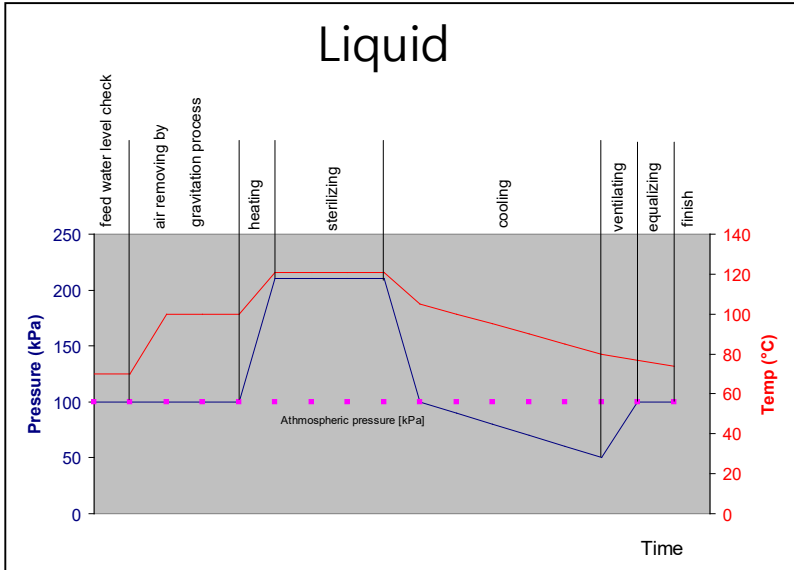
Item for sterilization

- Glassware
- Plastic tubes and pipette tips
- Solutions and water
- Fabrics/Clothes
- Animal food and bedding
- Waste

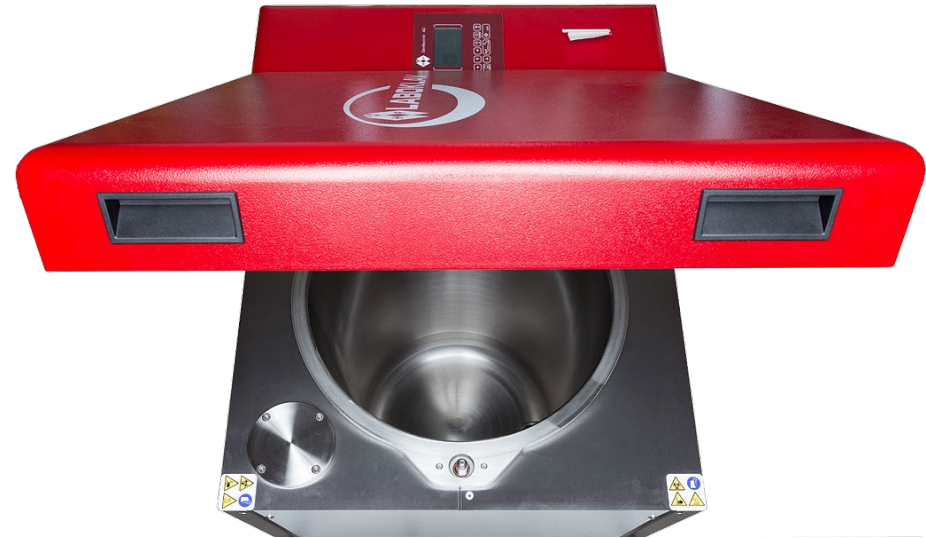
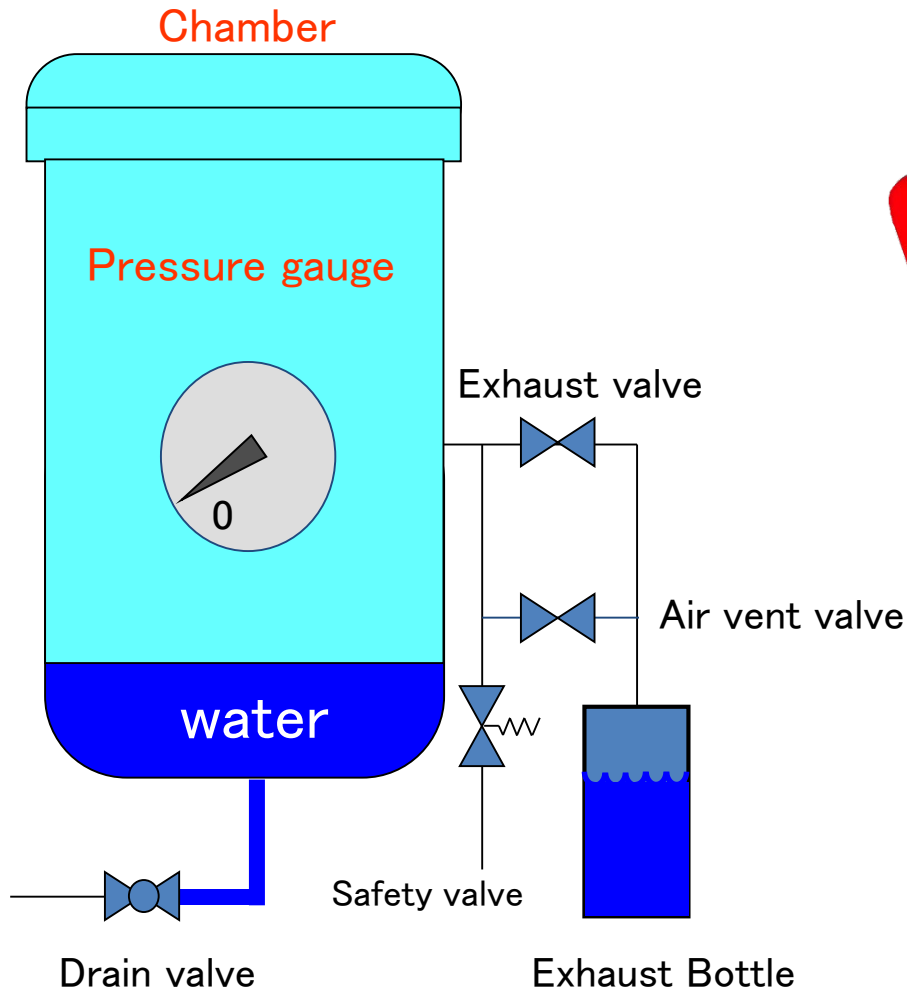
Process of cycle

- Pressure purge or Pre-vacuum period
 - air is withdrawn from device
- Sterilizing period
 - steam is introduced under pressure to specific temperatures & times.
- Cooling or Post-vacuum
 - Cooling by air or water
 - steam is withdrawn to dry autoclave

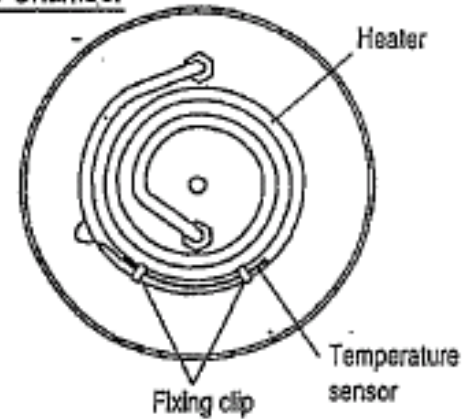
Cycles



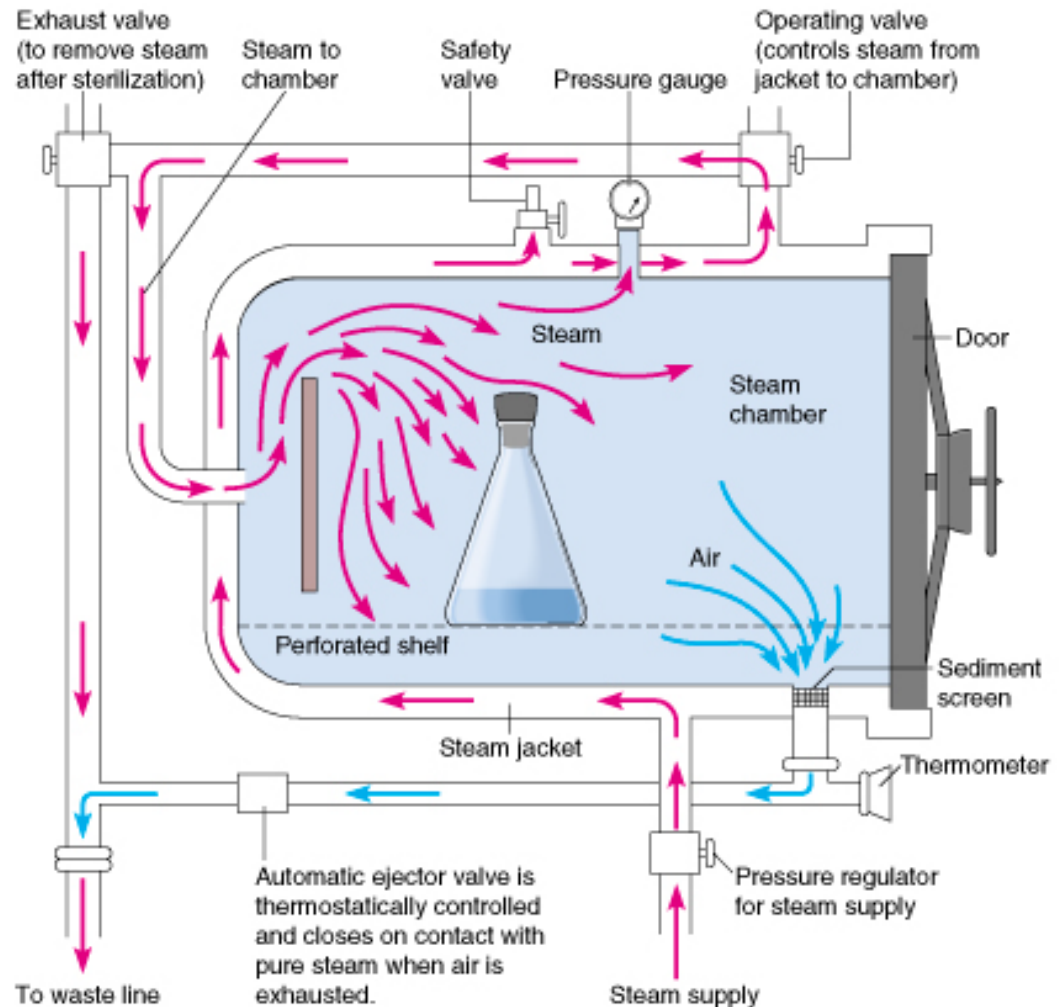
Heating coil / element



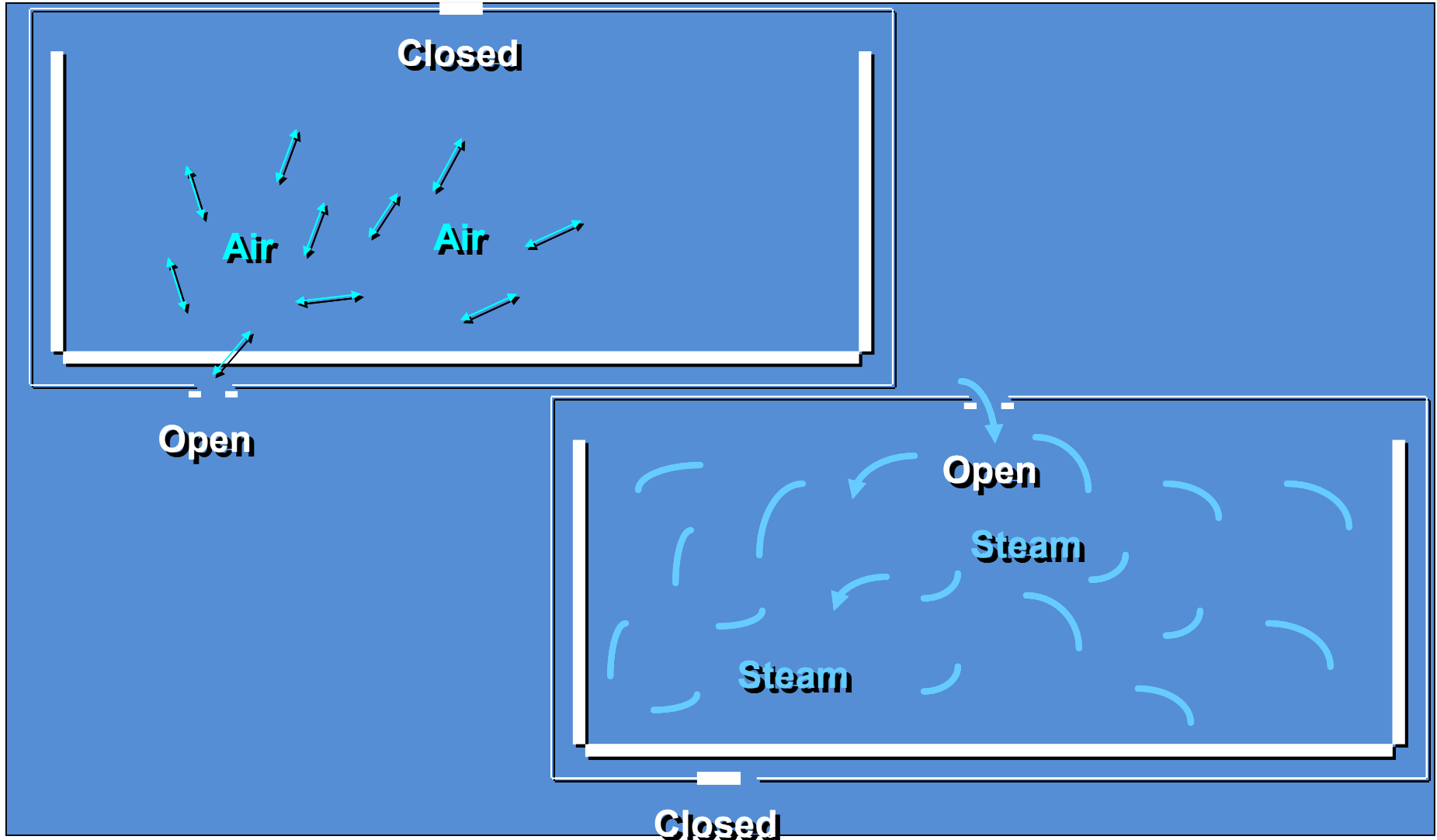
Inside the Chamber



Steam generator



Vacuum Assisted



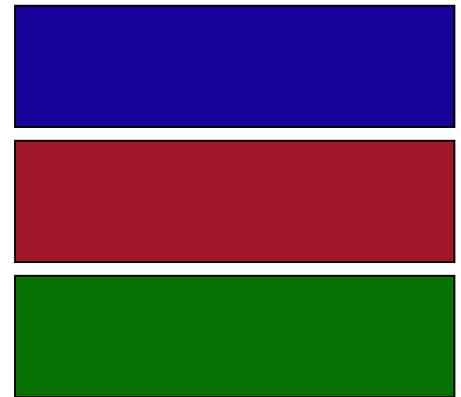
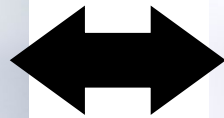
Autoclave 국산 실험실용

- 와이비랩(국산)
 - Swing hinge open, Heating coil
 - Controller
 - Simple switch: 온도, 시간 세팅
 - Recorder: Paper type
 - Touch screen
 - Programming
 - » Pressure purge 등 조건 적용가능.
 - Recording
 - » 기본메모리 저장. SD card, USB.
 - » Paper type 추가 가능
 - BMS connection
 - » RS232, RS485, 0~20mA. Ethernet(옵션)
 - Capacity
 - 45, 60, 80, 100, 150 L



Autoclave 독일 실험실용

- SHP steriltechnik(제조사). Laboklav(모델명)
 - Steam generator / Heating element
 - Hot stone 방식: 물과 heating element 가 분리됨.
 - 용량: 2~10kW
 - EZ to handle
 - 전기만 연결하여 사용가능: Laboklav 25, 55, ECO80
 - Position: Horizontal or Vertical
 - Color: Blue, Red, Green



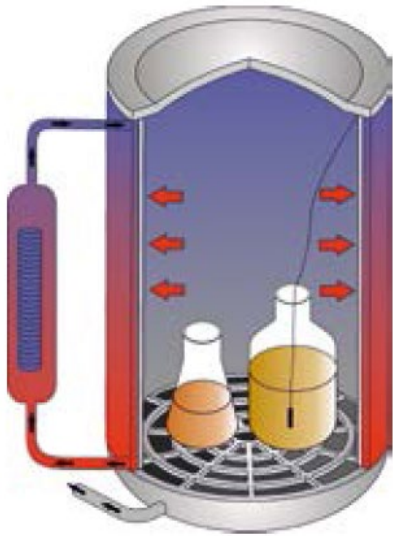
Autoclave 독일 실험실용

- Safety
 - 2 stage motorized closing system
 - Thermo lock: 설정온도 이하에서만 열림
 - Reference sensor is standard
 - Exhaust filter option: BSL 2 이상

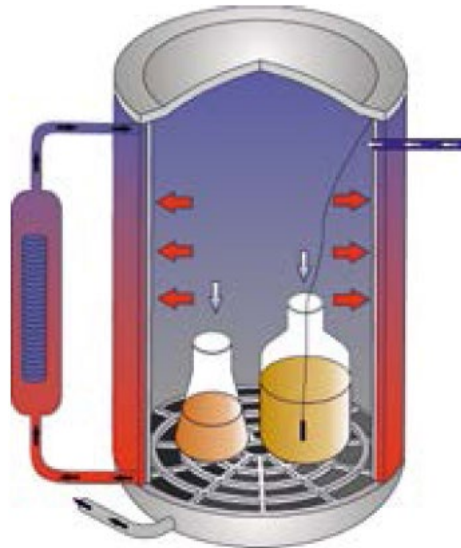


Autoclave 독일 실험실용

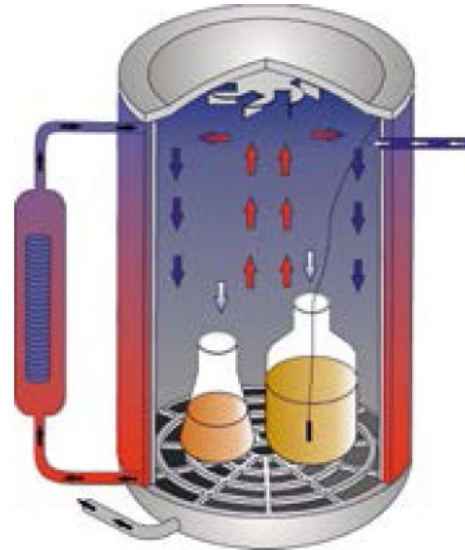
- Various option



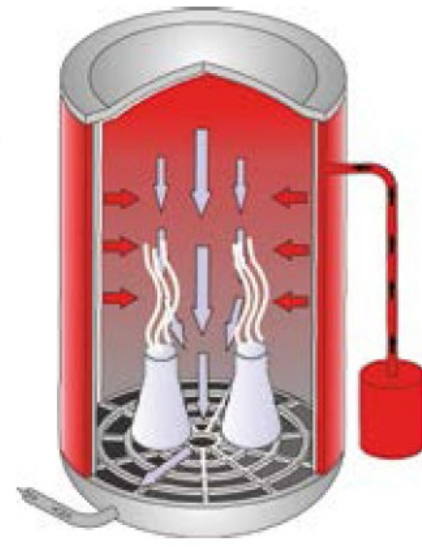
Fast cooling



Fast cooling
Counter pressure



Fast cooling
Counter pressure
Fan



Vacuum

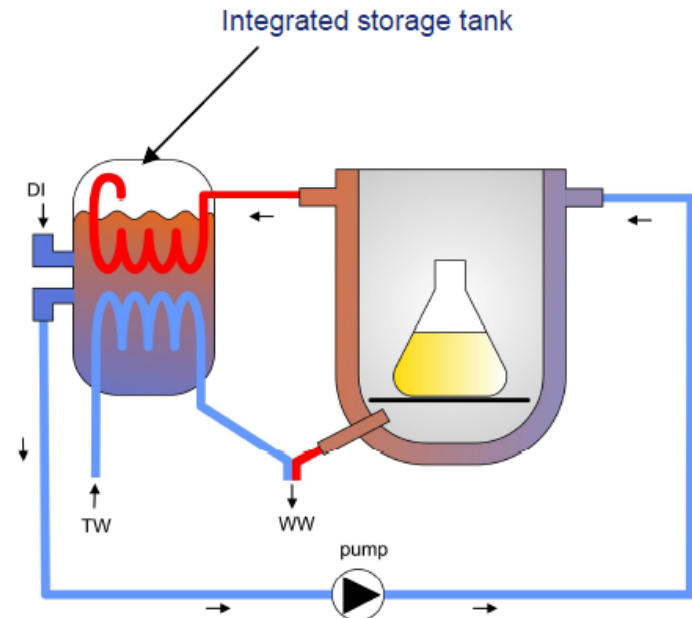
Autoclave 독일 실험실용

- Utility connections
 - Power: 220 / 380 V
 - Feed water: Manual / Automatic
 - Drain: Condensate collector / Pipe
 - Tap water: Rapid cooling, Vacuum
 - Compressed air: Compressor / Pipe



Autoclave 독일 실험실용

- Energy saving
 - Efficient steam generator
 - Feed water 사용량: 4~6L/회
 - Cooling
 - Energy saving method
 - 정제수를 버리지 않음.
 - 수도수로 열 교환



Legend:

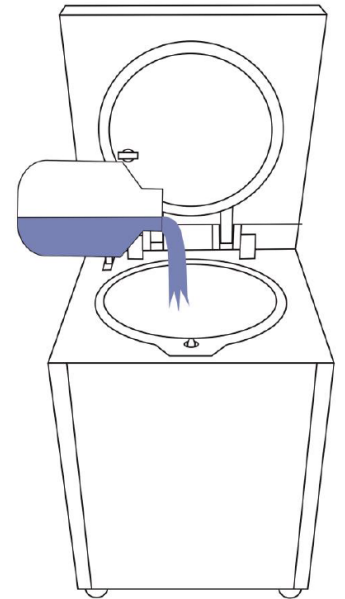
DI = de-ionized water

TW = tap water

WW = waste water (drainage)

Autoclave 독일 실험실용

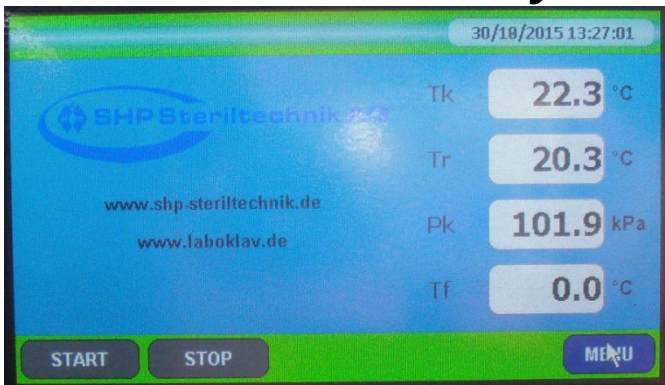
- Models of Laboklav
 - 25: 유리창. Compact size
 - ECO 80, 135: Heating element
 - 55~195: various options
 - Wastewater: 135L waste water treatment



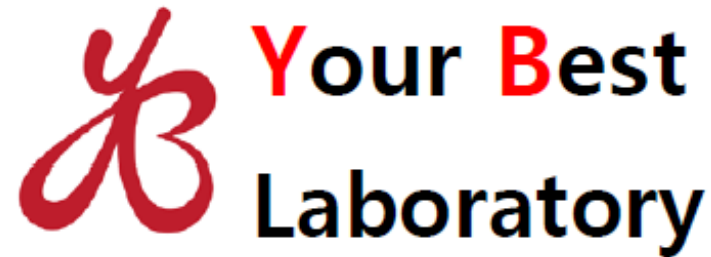
Autoclave 독일 실험실용

- Other options
 - Magnetic stirrer
 - Printer: dot-matrix type
 - Touch screen
 - Basket/Bucket
- Special programs
 - Glass test: USP 660, EP 3.2.1
 - Endless cycle: Material test

Magnetic stirrer for tabletop units



Contact



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