

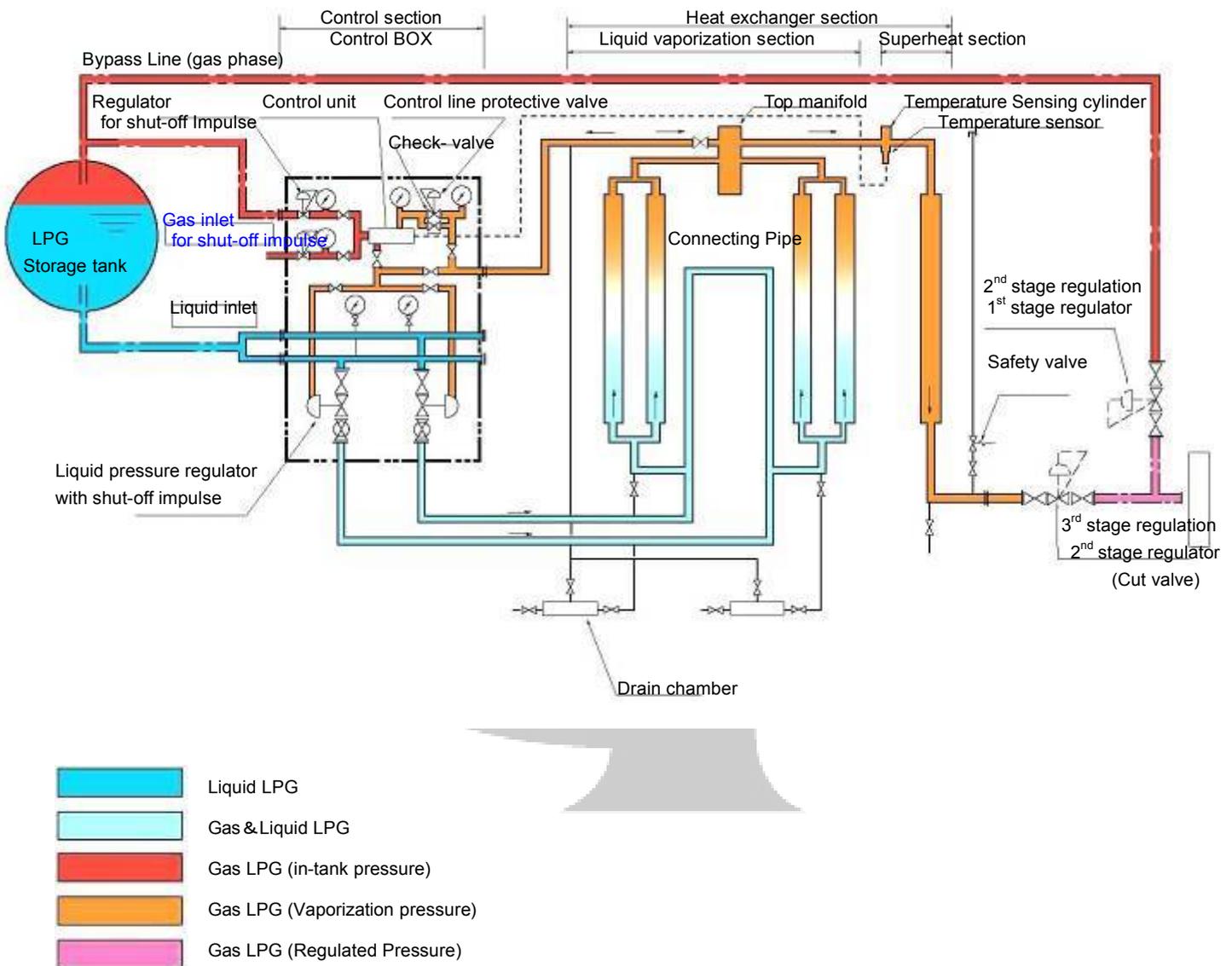
# SR-W Outline

ITO f System Corp. 3/30/2012- Re

The SR series are vaporizers which vaporize liquid LP gas by using atmospheric temperature as the heat source. Liquid LP Gas which flows in fin tubes of this product absorbs the atmospheric temperature and the liquid which is vaporized then turns to vapor LP gas.

Here is the flow chart of the SR-W. At first, the liquid enters liquid regulators (which incorporate a shut-off function) in the control box and the liquid and gas mixture moves into the fin tubes to vaporize. This product consists of 2 main sections, the control box (control section) and fin blocks (the heat exchanging section).

## Operation Flow Chart



## 1. Control Box

In the control box, there are two liquid regulators with shut-off impulse line pressure gauges, and various valves.

This product employs the liquid decompression method. Before the liquid enters into the fin tube section it is decompressed by a liquid regulator in order to further decrease the temperature, the liquid turns to a liquid & gas mixture. Since the liquid temperature reduces, we can create more of a temperature difference between the atmosphere and the liquid. This difference enables the SR to vaporize the liquid more effectively.

The liquid regulators also play a further two roles in this system. They control the liquid flow by detecting gas pressure in the fin block - If the gas pressure in the fin blocks increase, they reduce the inlet liquid flow, and vice versa. Also, when the liquid is not vaporized and enters into the temperature sensing cylinder and chills the sensor inside, this sends a shut-off impulse to these regulators which then stops the liquid supply.

## 2. Fin Blocks

The Fin Block consists of 2 sections, the liquid vaporization section and the superheat section.

The liquid enters the liquid vaporization section at first and moves to the superheat section. The liquid is vaporized by absorbing atmospheric temperature in the liquid vaporization section and LPG vaporized in the liquid vaporization section gets warmed to atmospheric temperature in the superheat section.

When the liquid is not fully vaporized in the liquid vaporization section, it passes to the temperature sensing cylinder with temperature sensor. When this senses the low temperature of the liquid, the regulators in the control box shut down the liquid supply.

## 3. Double-Lines System

The SR-W has 2 lines in the control box and the liquid vaporization section. One line is the service side and the other the reserve side. We can select the appropriate side by adjustment of the handle of the liquid regulator in the control box.

At first, the liquid passes through the service side's regulator and the fin block in the liquid vaporization section. When the low-temperature liquid creates frost and ice on the service side's fin block and tubes due to long operation, this product's vaporizing ability becomes low and the remaining liquid amount in the service side block increases. When the liquid level in the service side's fin block rises up to around the position of half the fin length, the liquid will automatically flow away into another block via the connection pipe.

This double line system provides stable vaporizing ability for the SR-W and allows users to maintain the product without stopping the gas supply. Also, by switching the service side and the reserve side manually, we can remove frost and ice on the service side's fin block and tubes.

#### 4. Three SR-W Merits

##### 1) No-Running Cost

This vaporizer does not incur running costs since it uses atmospheric temperature, which is free, and does not use any heat source, such as electricity. Even if there is a power failure, this can continue to supply gas to users.

##### 2) Extremely Long Life

This product's body is made of aluminum alloy. This material is durable and does not rust. It is very easy to operate and maintain this product.

##### 3) Safe and Reliable Design

This product employs the double lines system, safety valve, and liquid carryover protection system. As we mentioned before, the double lines system provides stable and safe gas supply. In the liquid carryover protection system, when the liquid passes into the temperature sensing cylinder and built-in temperature sensor, the regulators in the control box stop the liquid flow. Also the safety valve relieves any abnormal pressure when the gas pressure in the fin blocks rises to 1.56MPa (15.6bar) or more.

**5. Ability**

**1) The principal of the SR vaporizer**

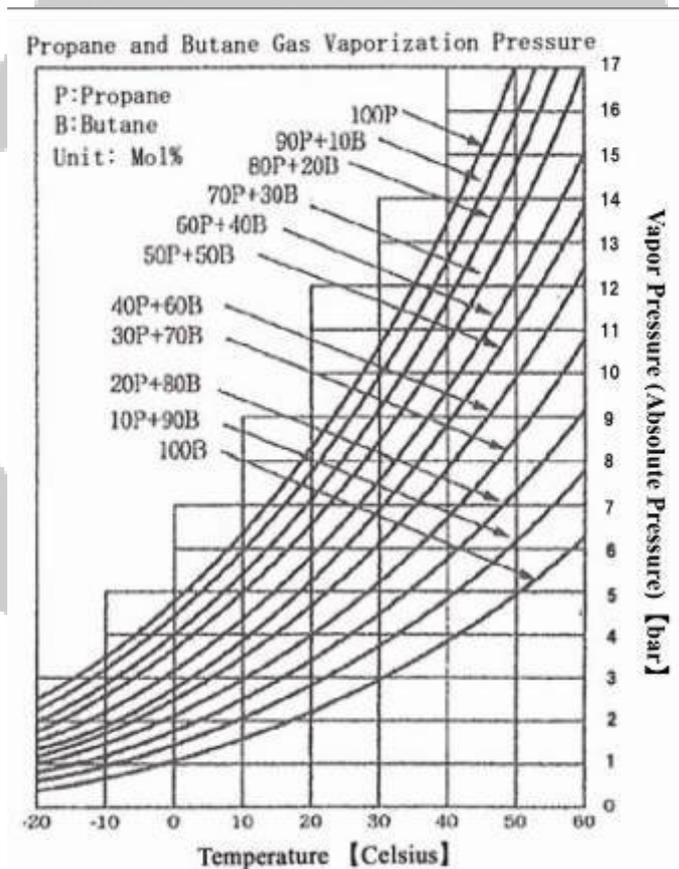
The SR needs a specific differential between the liquid temperature and atmospheric temperature.

As is widely known, the vaporization pressure of butane and propane is different. The more propane LP gas has, the easier the LP gas is vaporized this is because propane's boiling point is much lower (-42°C) than butanes(-0.5°C).

Basically, the liquid is decompressed to 0.1MPa-0.12MPa (1bar-1.2bar, gauge pressure) on the supply side line for the standard model and when it reaches 0.12MPa(1.2bar, gauge pressure) the liquid passes into the fin blocks. Therefore, the vaporization pressure in a tank needs to be 0.15MPa (1.5 bar, gauge pressure) or more in order to operate the SR and keep nominal vaporization capability (to vaporize liquid LPG into SR).

Please check the chart below, "Propane and Butane Gas Vaporization Pressure".

We need atmospheric temperature, around 15°C or more in order to keep the LP gas 0.15MPa(1.5bar, gauge pressure) when we use LP gas with 90% butane(C<sub>4</sub>H<sub>10</sub>). Therefore, we need to follow the check list below.



## 2) Check List

Vaporizing Ability of SR-W is dependent on the following factors.

- ① Gas Composition( % of Propane and % of Butane)
- ② Lowest Temperature in year
- ③ Continuous Operating Time.
- ④ Supply Pressure
- ⑤ Environment temperature of Installation Site
- ⑥ Max. Amount of gas to be used per hour
- ⑦ How long peak (Max. gas consumption) hours does the user require ?

Here is the change of the SR-W ability by temperatures and continuous operating time.

### Vaporizing Ability Chart for Air Heating Vaporizer (Reference)

#### [Condition]

Composition of LP Gas: Propane (90% or more)

Atmospheric Temperature: - 5°C or more

Outlet Gas Temperature: -10°C or more

Vaporizing Pressure:0.1MPa(1bar)

Peak Hours of Gas Use: 5 hr

Unit: kg/h

| Model   | Continuous Operating Time(hr) | Atmospheric Temperature(°C) |     |     |     |
|---------|-------------------------------|-----------------------------|-----|-----|-----|
|         |                               | -10                         | -5  | 0   | 5   |
| SR-100W | 4                             | 70                          | 100 | 125 | 125 |
|         | 10                            | 35                          | 57  | 62  | 105 |
|         | Non-stop(all day long)        | 28                          | 40  | 50  | 68  |
| SR-150W | 4                             | 105                         | 150 | 187 | 187 |
|         | 10                            | 60                          | 85  | 106 | 142 |
|         | Non-stop(all day long)        | 42                          | 60  | 75  | 102 |
| SR-200W | 4                             | 140                         | 200 | 250 | 250 |
|         | 10                            | 79                          | 113 | 141 | 192 |
|         | Non-stop(all day long)        | 56                          | 80  | 100 | 136 |
| SR-300W | 4                             | 210                         | 300 | 375 | 375 |
|         | 10                            | 119                         | 170 | 212 | 289 |
|         | Continuous Operation          | 84                          | 120 | 150 | 204 |
| SR-400W | 4                             | 280                         | 400 | 500 | 500 |
|         | 10                            | 158                         | 227 | 283 | 386 |
|         | Non-stop(all day long)        | 112                         | 160 | 200 | 272 |
| SR-500W | 4                             | 350                         | 500 | 625 | 625 |
|         | 10                            | 198                         | 283 | 353 | 481 |
|         | Non-stop(all day long)        | 140                         | 200 | 250 | 340 |
| SR-600W | 4                             | 420                         | 600 | 750 | 750 |
|         | 10                            | 238                         | 340 | 425 | 578 |
|         | Non-stop(all day long)        | 168                         | 240 | 300 | 408 |
| SR-700W | 4                             | 490                         | 700 | 875 | 875 |

|          |                        |      |      |      |      |
|----------|------------------------|------|------|------|------|
|          | 10                     | 277  | 396  | 495  | 673  |
|          | Non-stop(all day long) | 196  | 280  | 350  | 476  |
| SR-800W  | 4                      | 560  | 800  | 1000 | 1000 |
|          | 10                     | 317  | 453  | 566  | 770  |
|          | Non-stop(all day long) | 224  | 320  | 400  | 544  |
| SR-1000W | 4                      | 700  | 1000 | 1250 | 1250 |
|          | 10                     | 396  | 566  | 707  | 962  |
|          | Non-stop(all day long) | 280  | 400  | 500  | 680  |
| SR-1500W | 4                      | 1050 | 1500 | 1500 | 1500 |
|          | 10                     | 595  | 850  | 1062 | 1445 |
|          | Non-stop(all day long) | 420  | 600  | 750  | 1020 |

\* The above capacities for 'all day long' are based on being around 1m/second of wind speed. When there is no wind, the ability of all day long operation is 60 to 80% .

\* Note

This document is based on SR-W sales in Japan.

We can design custom-made modes to satisfy overseas customers.

We can manufacture bigger sizes of SR-W which have more fins and capacity, we also produce a higher size of SR-W (reference SR-WL) which has fewer but taller fins and saves installation space.