2018High-pressure Gas Handling
Safety Training Workshop

April 13and 17, 2018

Centralized Gas Piping System

Overview of Centralized Gas Piping System

In the university, hydrogen (H_2), oxygen (O_2), and nitrogen (N_2) gases are supplied by a centralized gas piping system to prevent disasters caused by high-pressure gas.

The pressure inside the pipe is ≤1 MPa (10 kgf/cm^2) throughout the system, which does not fall under high-pressure gas; however, the system should be handled in accordance with criteria for the use of high-pressure gas.

Gas Supply for the Centralized Gas Piping System

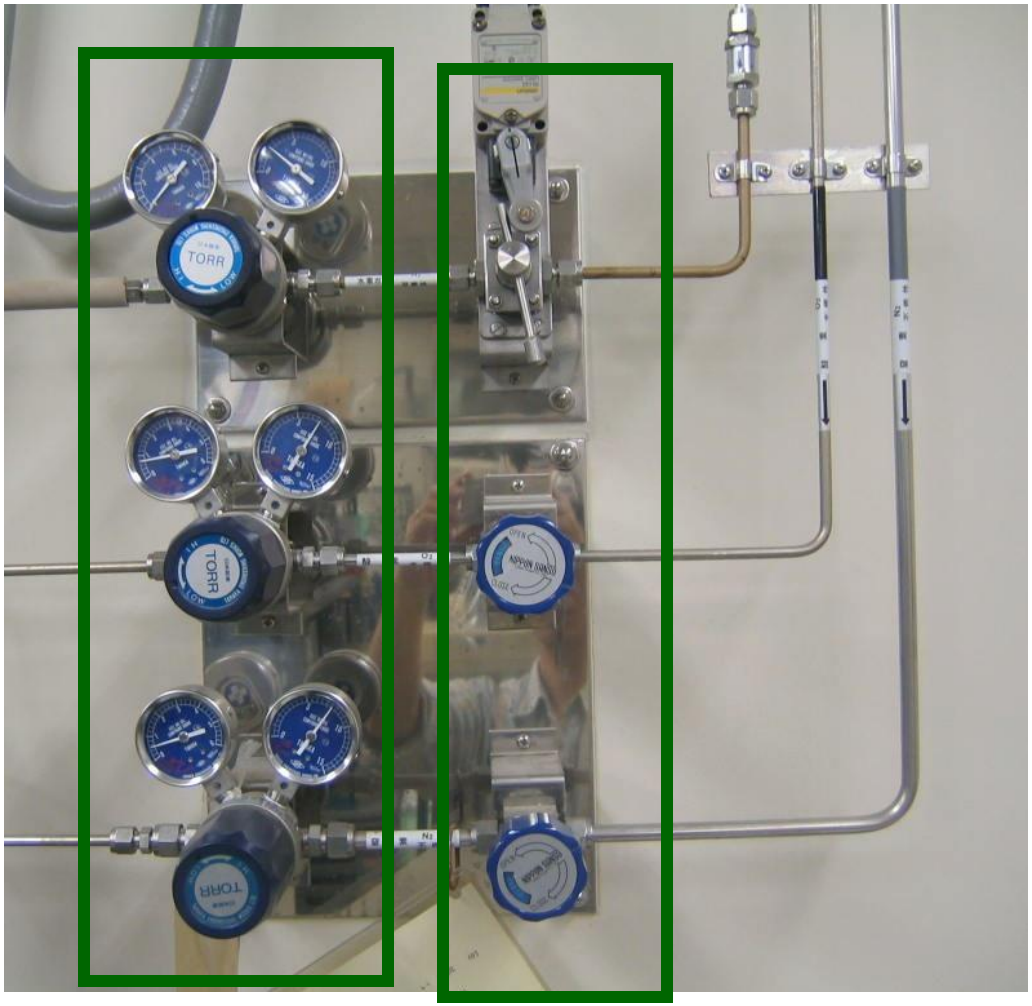
H_2 and O_2 gases are supplied by several high-pressure cylinders located in the cylinder storage room. N_2 gas is supplied in liquid nitrogen Dewars. All gases are kept at the pressure of 1 MPa (10 kgf/cm^2) or less and supplied to each laboratory.

Centralized Piping Valves in the Laboratory

H_2

O_2

N_2



Secondary valve

Primary valve (H_2 pipe is equipped with a sensor)

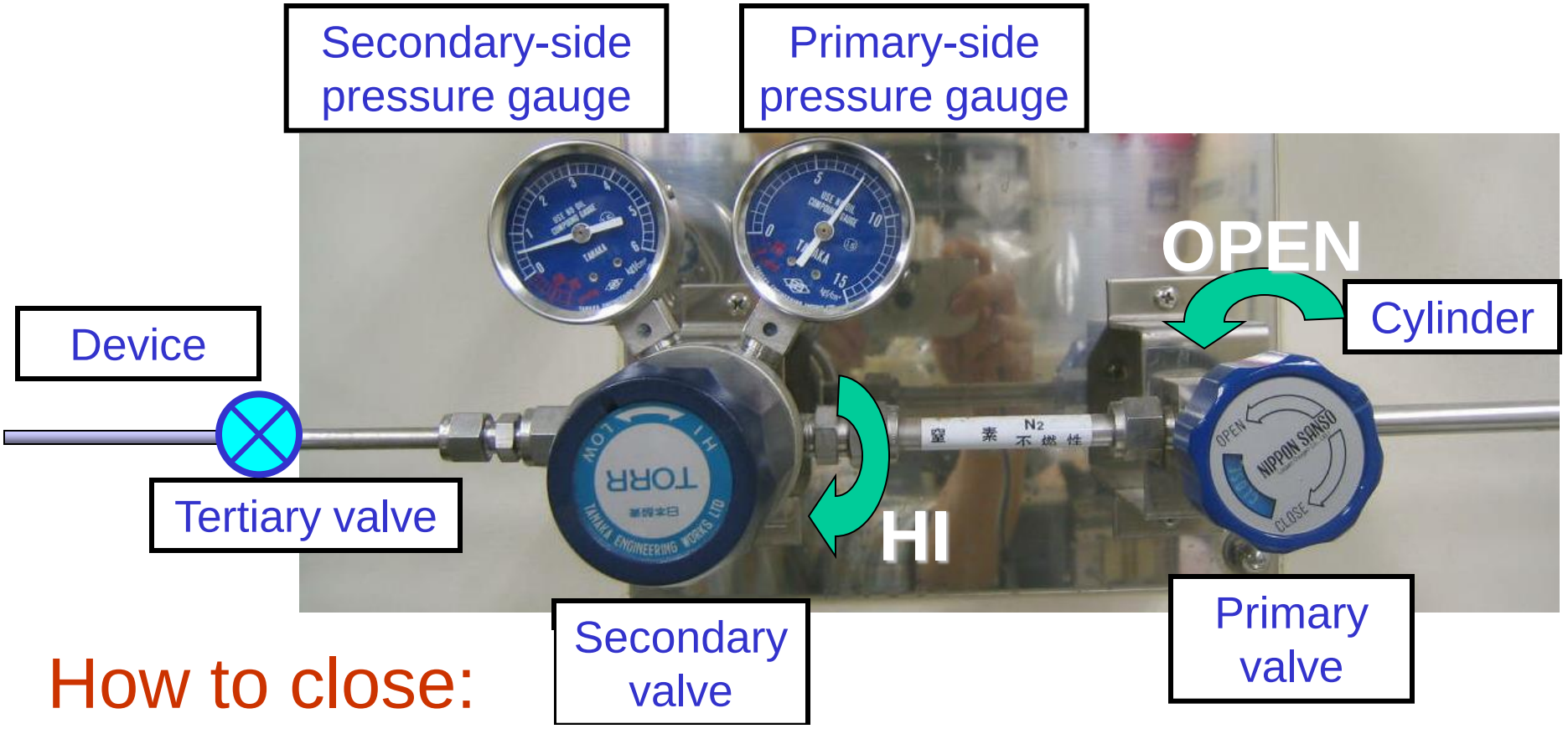
H_2 Gas Sensor for Centralized Gas Piping System

H_2 gas sensor

Ceiling gas detector

Notification light on the side of the door

How to Use Gas from Centralized Gas Piping System



How to close:

(1) Close primary valve.

(2) Close secondary valve.

(3) Close tertiary valve.

Let the space between the primary and secondary valves leak

How to Use Gas from Centralized Gas Piping System (for distribution)

How to open:

(1) Make sure the secondary and tertiary valves are closed.

(2) Slowly open the primary valve.

⇒ Primary-side pressure gauge should indicate the predetermined pressure (7-9 kgf/cm^2).

(3) While monitoring the secondary-side pressure gauge, slowly turn the secondary valve toward HI until the required pressure is reached (turning toward LOW decreases the pressure).

*Pressure should be 2/3 or less than the maximum pressure indicated on the secondary-side pressure gauge.

(4) Open the tertiary valve until the required flow rate is reached.

How to close:

(1) Close the primary valve.

(2) Close the secondary valve.

(3) Close the tertiary valve.

Let the space between the primary and secondary valves leak.

Safety Data Sheet for Each Gas

Oxygen

【Properties】

It is not a flammable gas but a combustion-enhancing gas that increases combustibility.“

【Notes】

a. Avoid open flames when using oxygen.

b. Do not use simultaneously with a flammable gas.

Nitrogen

【Notes】

a. Ensure good ventilation when using a large quantity.

b. To maintain high N_2 purity, make sure to close the pressure-reducing valve after use to prevent contamination.

Hydrogen

【Properties】

a. Highly flammable gas

b. Highly explosive when mixed with air or oxygen.

Air：4.1 - 74.2 (H_2%)

Oxygen：4.65 - 93.9 (H_2%)

【Notes】

a. Avoid open flames.

b. Because it tends to leak, precaution should be taken as it may ignite if released rapidly, even though there are no open flames.

Important Points When Using Gas from Centralized Gas Piping System

【1】Important points

a. Check basic handling (e.g., valve rotation direction).

b. **Conduct a thorough inspection at the end of each experiment or after a temporary absence.**

c. **Check for pipeline leakage beyond the secondary valve.**

d. Do not exceed the required pressure and flow rate.

【2】Contact the high-pressure gas safety management center when a large amount is to be used.

a. If you intend to use more than the usual amount or for a long period of time

b. Check flow rate with a flow meter installed along the corridor of each floor.

H_2 and O_2: 1 L/min or higher

N_2: 5 L/min or higher

【3】Use is prohibited during centralized gas piping system inspection.

Do not use gas from the centralized gas piping system during leakage test of the system, which takes place around the second week of August.

Standards for Use of Gas from Centralized Gas Piping System (1)

(1) Laboratories and facilities intending to use H_2, O_2, and N_2 gases from the centralized gas piping system must register the room number and gas type at the high-pressure gas safety management center prior to use, and follow the safety management instructions of the center. In addition, the center must be notified when use is to be discontinued.

(2) The primary-side valves and the pressure-reducing valves in the centralized gas piping system must not be remodeled or moved.

(3) H_2 gas from the centralized gas piping system must not be used in a room with open flames or without hydrogen sensors.

(4) When using gas from the centralized gas piping system, exercise adequate caution to prevent leakage (especially H_2 gas) and ensure good ventilation (especially N_2 gas).

Standards for Use of Gas from Centralized Piping System (2)

(5) When using gas from the centralized piping system, care should be taken not to lower gas purity on the primary side.

(6) The centralized piping system should be operated with primary-side valves and pressure-reducing valves; when not in use, these valves should be tightly closed.

(7) Be sure to contact the high-pressure gas safety management center in advance when you intend to use a large amount of gas in a short period.

⇒ Turn on the ventilation system!

(8) If you notice any failure or malfunction in the centralized gas piping system, immediately report the situation to the high-pressure gas safety management center or to an assigned high-pressure gas safety management committee member.