

❖ Air Leak Tester Functions

Master Chamber

Easily adjustable standard master that offers long-term reliability

■ Overview

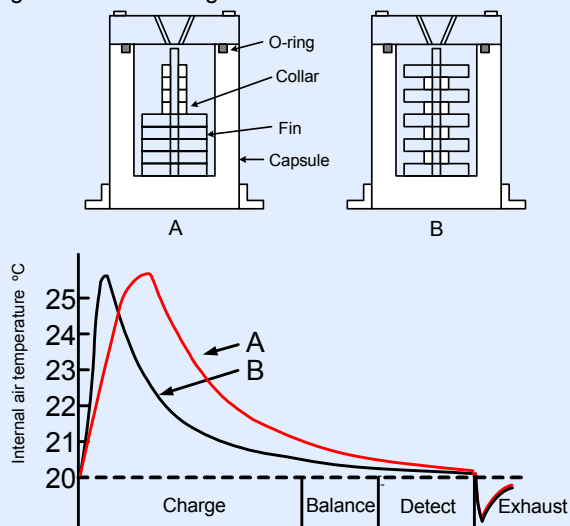
There are problems with using a non-leaking part as a master. Not only does the sealing deteriorate with age, a non-leaking part cannot be used as a master for variable volumes and multi-part testing. The Cosmo Master Chamber was designed as a standard master to solve these problems.

• Role of the master

When a test pressure is applied to a part, adiabatic compression causes the temperature to rise sharply. This temperature change causes errors in microscopic leak measurements. On a differential pressure leak tester, pressure drifts caused by changes in the part temperature are offset by the master, thereby eliminating these errors.

• Master chamber principle and structure

The master chamber is equipped with adjustable fins. Changing the number of fins and the respective intervals adjusts the ratio between volume and surface area in order to fit the temperature characteristics of the parts. In the figure below, master chambers A and B each have a different surface area. Because their thermal stabilities are different, they exhibit different pressure changes during the DETECT stage.



• Role of the master used during mastering

Designed to reduce the process time, the mastering technique measures and compensates the differential pressure errors caused by adiabatic compression beforehand. In many cases, this function eliminates the need to use the master for error correction.

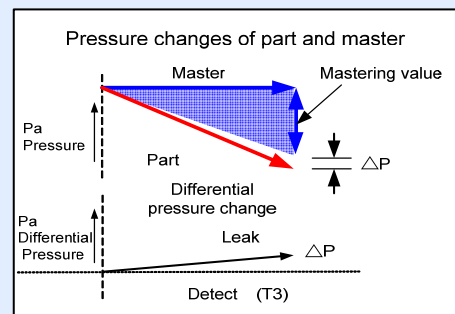
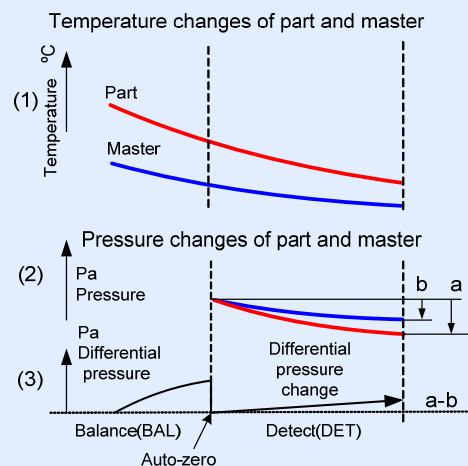
• Key factors of mastering: temperature stability and repeatability of the master

In order to obtain accurate measurements, the mastering process requires a highly repeatable master that can be used as a comparison reference. Because it is equipped with adjustable fins, the master chamber provides higher repeatability than a master created from a part. As a result, there are fewer measurement variations.



■ Advantages of using the master chamber

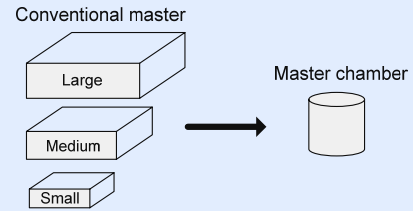
- Allows custom adjustment to fit the thermal change characteristics of parts.
- Small size reduces the amount of space needed for installation
- More cost effective than creating a master from a part
- O-ring protects the sealing, providing superior air tightness and long-term reliability.
- Zero change in volume allows for highly repeatable measurements
- Can be used during mastering as a standard reference for multi-part testing, thereby eliminating the need to change the master.



Used during mastering for higher precision and multi-part testing

Advantages of using master chamber during mastering

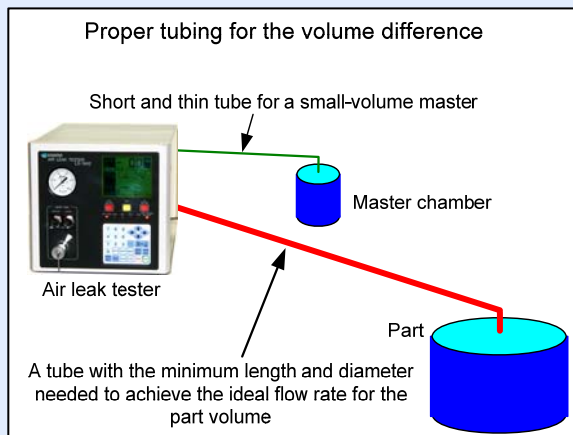
- Reduces testing time and provides for more accurate detection
 - Fewer adjustment processes during start-up and maintenance
 - Can be used for multi-part testing. No need to change the master.
- A standard master chamber is available for parts with different internal volumes.



Selecting a master chamber for use during mastering

Large-volume parts

The dedicated MC-F02A Master Chamber (small volume) can be used for large and small volume parts. However, if the process time is considerably shorter than conventional methods, you may obtain an excessively large mastering value. In this case, the MC-500B/1000B master chamber can be used to offset a set amount of drift error, allowing you to obtain an appropriate mastering value.



Non-zero volume for the master.

Closing the master port causes the master volume to drop considerably, resulting in a slight decrease in sensitivity. This is caused by a rise in the equivalent internal volume of the part. The higher the test pressure, the greater the effect on the sensitivity.* Though the minimum leak detection requirements vary, it is important for the master to maintain an appropriate volume.

*Refer to the Cosmo calculation sheet "Calculation Formula of Equivalent Inner Volume" for details.

Small-volume parts

A master chamber is not always required for small-volume parts. A metal or plastic tube can be used to close and seal the opening. Note, however, that pressure can deform a plastic tube, resulting in a small volume change. The effect increases as the overall volume decreases. If possible, use a short, thin tube made of a non-deformable material as the small-volume master. For the part, select a rigid tube with a diameter sufficiently large enough to achieve the required flow rate for the volume.

High test pressure

Repeatedly pressurizing and depressurizing the master in short cycles can cause heat to accumulate gradually. In this case, you can use a copper pipe as a thermally stable master. Make sure to avoid the effects of ambient temperature fluctuations caused by airflows or winds.

Different master chamber models

Model	Internal Volume Adjustment Range	Maximum Operating Pressure
MC-F02A-100*1	69mL	700kPa
MC-F02A-200*1	120mL	700kPa
MC-50B	25 to 50mL	700kPa
MC-100B	50 to 100mL	700kPa
MC-200B	100 to 200mL	700kPa
MC-500B	231 to 500mL	700kPa
MC-1000B	527 to 1000mL	700kPa
MC-2000B	986 to 2000mL	700kPa

*1) Only intended for mastering. The fins cannot be used to perform adjustments.

Notes on where to install the master

- Avoid motor vibrations, heat, or other disturbances. Keep the master away from areas where it may be exposed to airflows, such as areas near doors and air conditioners. Shielding is an effective means for protecting the instrument from these elements.
- The ambient temperature near the floor varies greatly. Select a place free of temperature variations.
- If the mounting rack is exposed to large temperature variations, place a heat insulation cover over it to prevent direct heat transmission.