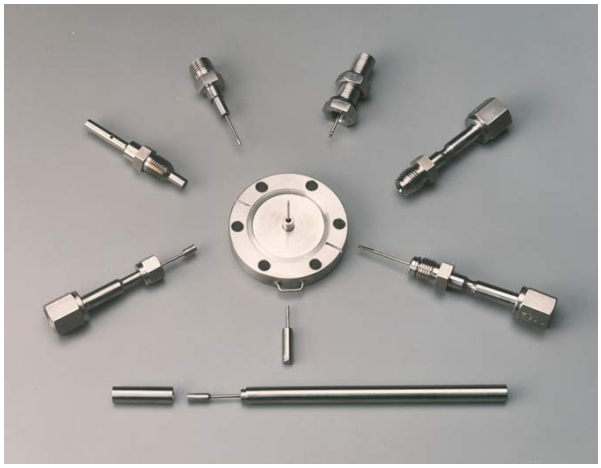
CALIBRATED LEAK STANDARDS FOR ALL GASES

CLO "Open-Style" Capillary Leaks

The CLO Model "OPEN-STYLE" (No Reservoir) CAPILLARY CALIBRATED LEAKS FOR ALL GASES

VTI's CLO model calibrated gas leaks have a stainless steel capillary that has been precision crimped to provide an accurate flow-rate restriction for any gas. These "open-style" or "in-line" leaks do not have a reservoir of gas but, instead, use an external gas source. Under pressure, gas flows through the capillary restriction into the system or part being tested. This yields a precise, known flow rate based on the inlet and outlet pressures.

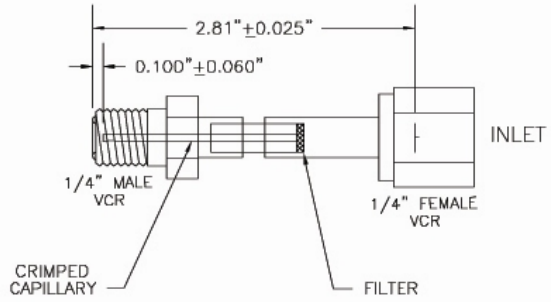


The CLO leaks are available welded into a tube and welded into many different inlet and outlet attachment fittings. In addition, these capillary leaks can be built into an actual or simulated test part that can then periodically be put through a regular test cycle to validate and calibrate the entire leak test system. This is the only way to be sure that the total test procedure is finding the leaks that lead to product failure. A separate brochure provides additional information.

These open-style leaks can be calibrated at one inlet pressure (your test pressure) to obtain a single specified leak rate. Alternatively, they can be calibrated at several inlet pressures, usually three, to obtain different leak rates and the ability to vary the rate within a range (usually 10x) of values using the calibration curve of pressure vs. leak rate provided.

Choosing the CLO Calibrator

- **CAN BE CALIBRATED WITH ANY GAS: or mix.**
- **UNBREAKABLE: all stainless steel, all welded.**
- **WIDE LEAK-RATE CHOICE: can be used for large leak rate applications.**
- **SINGLE OR ADJUSTABLE LEAK RATES: can be calibrated or one or multiple pressures/rates.**
- **STABLE: low temperature coefficient of 0.2% per ^{o}C.**
- **CAN BE BUILT INTO A PRODUCTION TEST PART: to simulate a defect with a specific leak rate.**
- **BAKEABLE FOR UHV USE: using all metal fittings.**
- **MEETS ISO REQUIREMENTS: NIST-traceable, A2LA-accredited Calibration Certification.**



Open Style Crimped Capillary Leak with 1/4" Female and Male Fittings (Standard Design)

Typical CLO assembly. This example part would have the part number:
CLO-X-3C-HE-4FVCR-4MVCR
(X= Leak Rate Range)

VTI's Calibration Laboratory is Accredited by the American Association for Laboratory Accreditation.

As the major manufacturer of Calibrated Leaks for all gases, all leak rates, and all makes of leak detectors, VTI supplies them worldwide to users, distributors, and other manufacturers. These Accu-Flow™ Leak Standards are recognized internationally for their superior quality construction and calibration.

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ORDERING INFORMATION

For an order or quotation for a CLO Leak, please provide the Part Number, confirm the Inlet Fitting for connection to your gas source line, and confirm the Outlet Fitting for connection to the test system or part. It is also necessary to specify the Gas, the Inlet Pressure from your gas line, and the Outlet Pressure (usually vacuum or 1 atmosphere), all as used in your test and to be used for the calibration. Any dimensional requirements should also be noted.

In addition, for CLO's to be used at one Leak Rate, please state the specific Leak Rate requested (at the specified Inlet and Outlet Pressure) and your preferred leak-rate units. Also, the Manufacturing Variance ("Tolerance") that you can allow on that Leak Rate should be specified as +/- 40% (the normal allowance), or as +/- 15% (the "Special-Range Variance"), for which there is an additional cost and an "-SR" added to the part number. An example specification is $2.0x10^{-5}$ atm-cc/sec +/- 40%. In all cases, the leak rate provided will be as close as we can make it to your specified rate, and the actual rate, as calibrated, will be recorded on the Calibration Tag and the Certifications.

CLO Leaks can also be calibrated at multiple pressures to provide a range of adjustable leak rates, for example covering values from 1 to $9x10^{-5}$ atm-cc/sec using three pressures from 15 to 200 psig. VTI provides a curve of Leak Rate vs. Pressure based on the calibrations. This allows the leak rate to be changed by changing the inlet pressure and allows exact leak rates to be selected without the limitation of the manufacturing variance. For these adjustable-rate CLO's, the Leak Rate Range requested and your available Inlet Pressure Range, as well as your Outlet Pressure, should also be specified. VTI can advise on the leak-rate range achievable based on your available pressure range.

PART NUMBER BUILD-UP

The CLO Part Numbers are constructed as follows:

CLO-X-NA-BB-YYYY-ZZZZ

where **X** = the code for the Leak Rate Range required.
where **N** = the code for the number of calibration points.
Where **A** = calibration method *(C for He, P for other gases)*
where **BB** = the code for the Gas to be used,
where **YYYY** = the code for the INLET fitting required,
and **ZZZZ** = the code for the OUTLET fitting required.

EXAMPLE GASES AVAILABLE

Please contact us with other gas requirements.
Helium (HE), Argon (AR), Nitrogen (N2), Hydrogen (H2), Carbon Dioxide (CO2), Oxygen (O2), Air (AIR), Methane (CH4), Sulphur Hexafluoride (SF6), Refrigerants ("R"#), Xenon (XE), Deuterium (D2), Mixed gases (MIX).

EXAMPLE FITTINGS AVAILABLE

Please contact us for other fitting requirements.

Code:	Description:
4FVCR	*¼" Female VCR*
4MVCR	*¼" Male VCR*
MCFF	*1.33" OD Mini Conflat Flange*
2CFF	*2.75" OD Conflat Flange*
1/4T	*¼" OD Tube*
KF16	*¾" OD ISO Flange*
KF25	*1" OD ISO Flange*
KF40	*1.5" OD ISO Flange*
4MPT	*¼" Male Normal Pipe Thread*

LEAK RATE RANGES AVAILABLE and EXAMPLE PART NUMBERS

Leak Rate Ranges Available for the CLO ***Specify a value in the range for 1 cal point or range to be covered by 3 cal points.***	***Leak Range Code (X)***	***Cal P'ts & Type Code (NA)***	***Gas Code (BB)***	***Inlet Fitting Code (YYYY)***	***Outlet Fitting Code (ZZZZ)***	***Example Part Number***
1.0 to $9.9x10^{-1}$ atm-cc/sec	1	1C	HE	4FVCR	4MVCR	CLO-1-1C-HE-4FVCR-4MVCR
1.0 to $9.9x10^{-2}$ atm-cc/sec	2	1P	AR	4MVCR	MCFF	CLO-2-1P-AR-4MVCR-MCFF
1.0 to $9.9x10^{-3}$ atm-cc/sec	3	3P	SF6	KF25	KF40	CLO-3-3P-SF6-KF25-KF40
1.0 to $9.9x10^{-4}$ atm-cc/sec	4	1P	AIR	4FVCR	4MVCR	CLO-5-1P-AIR-4FVCR-4MVCR
1.0 to $9.9x10^{-5}$ atm-cc/sec	5	1P	XE	MCFF	2CFF	CLO-5-1P-XE-MCFF-2CFF
$5x10^{-5}$ to $5x10^{-6}$ atm-cc/sec	5/6	3P	H2	1/4T	2CFF	CLO-5/6-3P-H2-1/4T-2CFF
1.0 to $9.9x10^{-6}$ atm-cc/sec	6	3C	HE	4MPT	4MPT	CLO-6-3C-HE-4MPT-4MPT

Note: Larger and smaller flow rates are possible. However, with leaks smaller than 10^{-6} atm-cc/sec plugging of the capillary is possible unless a source of pure gas is provided.

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