

标准漏孔介绍 Leak Standards



美国雷科(LACO)-标准漏孔行业领导者

产品

进口高性能TianTest™氮质谱检漏仪|AURA™气密性(空气)检漏仪：全球唯一，整机2年质保
NIST标准漏孔：业界领先微通道技术|多种气体|全漏率|有源|无源|指定压力&指定漏率
标准化真空腔体、真空箱、真空测试盒、真空炉及定制
产品检漏、真空系统、检漏系统方案设计与定制
真空耗材：原装进口维修包|轴承|真空泵油|离子源|各种受控PARTS

维修

美国雷科LACO授权维修中心，电路级、单板级维修、质谱室维修
进口氮质谱检漏仪维修：雷科LACO|普发|阿尔卡特|莱宝|英孚康|安捷伦瓦里安
进口真空干泵、油泵维修：普发|阿尔卡特|爱德华|莱宝|安捷伦瓦里安|EBARA|希赫

服务

氮质谱检漏仪与真空泵租赁
专业检漏服务，承接各种管路、腔体、复杂工件、复杂环境的检漏工程

电话(D):+86 21 58220307 | 传真(F):+86 21 61927502 | 手机(M):+86 13601764364

xie.fangping@realmeter.cn

网站Website <http://www.realmeter.cn>



标准漏孔

提供美国国家标准与技术研究院可跟踪A2LA证书

NIST
National Institute of
Standards and Technology
U.S. Department of Commerce



各种气体|各种漏率|各种接口|有源（带气室）|无源（开放式）|工业集成|仪器校准|漏率模拟|流量控制
业界领先的微通道技术：温度修正0.1%/°C，45Mpa高压支持，一种材料全漏率支持，抗摔，抗堵塞
可制定精确漏率（如 1.30×10^{-9} mbar.L/s）|或同时指定压力和精确漏率（如35Mpa下 1.00×10^{-5} mbar.L/s）



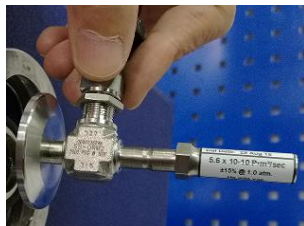
外置漏孔



普发Adixen内置漏孔
ASM142/310/340等



INFICON/Leybold
内置漏孔



开放式-常压喷气漏孔



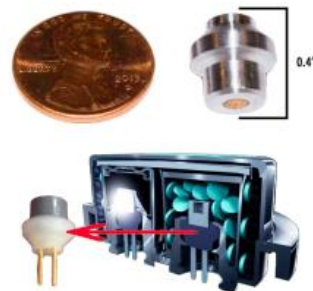
开放式-高压(35Mpa)漏孔



开放式-带电磁阀漏孔



双气室漏孔
用于冷媒、SF6等



模拟漏孔-气体发生器



泄漏仿真件



标准漏孔应用场景

提供美国国家标准与技术研究院可跟踪A2LA证书

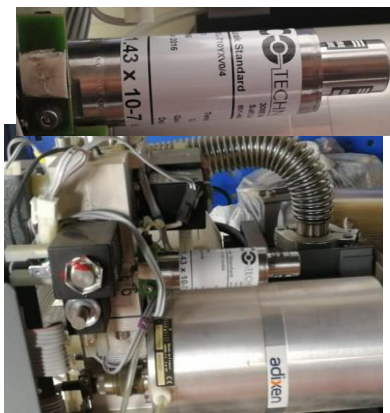
NIST
National Institute of
Standards and Technology
U.S. Department of Commerce



检漏仪外置校准
所有检漏仪...



检漏仪内置校准
Inficon, Adixen,
Leybold, Varian...



测漏系统校准
泄漏模拟与仿真



残存气体分析仪器
校准, 流量控制



吸枪校准
所有气体类型



雷科LACO标准漏孔优势

✚ 独特优势:

- ✓ 通道型漏率范围E-1~E-10 mbar.L/s, 具抗摔、温飘小,响应快、不易堵塞等特点
- ✓ 高压支持, 带气室漏孔支持1800PSI (122bar), 开放式漏孔支持450bar。
- ✓ 可指定精确漏率 (如 1.30×10^{-9} mbar.L/s, 根据客户需求可精确到百分位)
- ✓ 可同时指定压力和漏率 (如35Mpa下 1.00×10^{-5} mbar.L/s), 真实模拟标准工件
- ✓ 支持各种气体种类、各种漏率
- ✓ 开放式 (外接气源)、普通式 (自带气瓶)、冷媒 (双罐)、模拟、仿真标准漏件

✚ 所有标准漏产品出厂NIST Traceable A2LA Certificate

✚ 提供定制化服务, 如指定气体类型和配比、入口压力、出口压力、气室大小、阀门类型、接头类型等, 增加校准点个数和校准点范围 (开放式或带充气阀)。

业界领先的漏孔制作技术：微通道

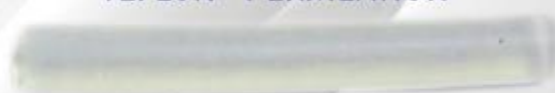
GLASS PERMEATION



LACO MICRO TUBE CAPILLARY (MTC)



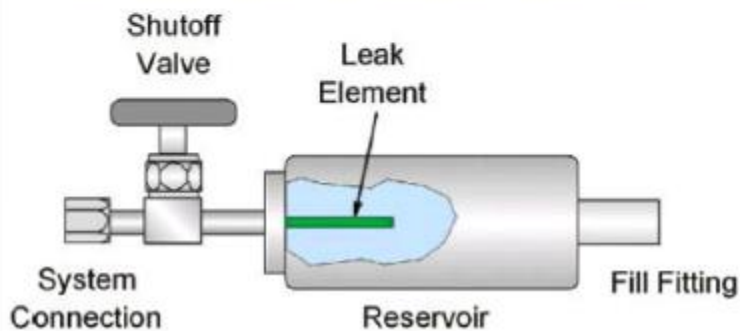
TEFLON® PERMEATION



METAL CRIMPED CAPILLARY



CUTAWAY VIEW OF LEAK STANDARD



LACO的微通道技术就是一种特殊材料制作的均匀的细细管子，接近遵循气体流导定律，制作难度极大。

LACO微通道材质还可以支持高达45Mpa的高压力而不会形变，有着很好的稳定性。

针对用户的特许要求，如指定的压力、漏率等，根据流导定律，可以选择不同管径、长度的漏孔用以制作标准漏孔。

漏孔制作技术比较：微通道vs其他

制作技术	支持气体	适用漏率 (Mbar.L/S)	温度补偿	抗堵塞	真空响应	稳定性	抗摔
玻璃渗透	氦气	$10^{-7} \sim 10^{-12}$	4%/°C	不堵塞	一般	优秀	差
特富龙渗透	氦气	$10^{-4} \sim 10^{-8}$	2%/°C	不堵塞	一般	一般	差
金属压扁 Metal Crimped	所有气体	$10^{-1} \sim 10^{-6}$	0.2%/°C	经常堵塞	即时	很差	优秀
LACO微通道 Micro-Tube Capillary	所有气体	$10^{-1} \sim 10^{-10}$	0.1%/°C	很少堵塞	即时	优秀	优秀

LACO专有的微通道技术(MTC)在克服其他技术的缺点的同时，综合了其他技术的优点！

雷科标准漏孔范围值



Calibration Certificate Number: 1530.01

ACCREDITED LABORATORY
ISO/IEC 17025:2005



Certificate Number: 1212-244-1

氦气: 2×10^{-10} - 5×10^{-2} mbarL/sec 入真空
其他气体: 3×10^{-9} - 5×10^{-2} mbarL/sec 入真空
所有气体: 5×10^{-6} - 8.0 mbarL/sec 入大气

方式	漏率范围(mbar.L/s)	不确定度(±)	说明
气流入真空 (<50 mbar)	$5 \times 10^{-6} \sim 1 \times 10^{-2}$	5.0%	对比法（质谱分析），氦气
	$1 \times 10^{-8} \sim 1 \times 10^{-6}$	6.6%	
	$1 \times 10^{-9} \sim 1 \times 10^{-8}$	14%	
	$2 \times 10^{-10} \sim 1 \times 10^{-9}$	21%	
	$1 \times 10^{-6} \sim 0.1$	2.2%	常压、体积变化法，总压力 技术，适用所有气体
	$3 \times 10^{-6} \sim 1 \times 10^{-6}$	4.6%	
气流入大气	$1 \times 10^{-5} \sim 10$	3.4%	常压、体积变化法，总压力 技术，适用所有气体
	$5 \times 10^{-6} \sim 1 \times 10^{-5}$	11%	
	$5 \times 10^{-6} \sim 1 \times 10^{-2}$	1.1%	干活塞流计量法-所有气体

支持高压力（一）

雷科漏孔高支持：

开放式漏孔(外置气源)：45Mpa=450公斤

带气室漏孔：1800PSI=12.2Mpa=122公斤(取决于运输和气瓶)

➤ 高压力=更高精度，更长使用寿命

同等条件下（同等体积，同等时间），更小的压力相对变化值，对应更高的精度和更长的使用寿命

- ✓ 如10公斤压力对应年泄漏量10%，雷科的120公斤压力漏孔年泄漏量<1%，意味着雷科的高压力漏孔几年之内漏率变化很小，精确性更高！
- ✓ 即使是外接气源漏孔，较高的压力优势也意味着即使调压有一定偏差，相对压力变化较小，漏率值更精确。



高压支持优势：①极大提高漏率稳定性，②使用寿命，③真实模拟工况

支持高压力（二）

➤ 可调漏率漏孔制作刻度更均匀，精度更高

由于雷科采用微通道技术，接近流导计算公司，如制作5E-4到5E-6漏孔，如5X10-4对应1500PSIG，则：

$$5E-5 \text{ 对应漏率理论值} = \frac{1500}{\sqrt{10}} = 474 \text{ PSIG}$$

$$5E-6 \text{ 对应漏率理论值} = \frac{1500}{\sqrt{100}} = 150 \text{ PSIG}$$

采用金属压扁技术，还不能支持高压力，如制作5E-4到5E-6漏孔，如5X10-4对应500PSIG，则：

$$5E-5 \text{ 对应漏率理论值} = 500/10 = 50 \text{ PSIG}$$

$$5E-6 \text{ 对应漏率理论值} = 500/100 = 5 \text{ PSIG}$$

很显然，难以找到一个压力计来对应金属压扁式漏孔的压力。而且对于小压力，任何微小的调压误差对漏率造成的偏差很大。

可调漏孔-刻度均匀，精度高

标定点 序号	X=漏率 (单位: 10- 8mbarL/s	Y=压力 (单位: 10PSIG)	Z=X/Y ²
1	491	46	0.232041588
2	772	57	0.237611573
3	1010	67	0.224994431
4	1230	74	0.224616508
5	1520	82	0.226055919
6	1730	88	0.22339876
7	2060	96	0.223524306
8	2310	109	0.194428078
9	4140	139	0.214274623
10	4540	148	0.207268079





LACO TECHNOLOGIES
3085 West Directors Row
Salt Lake City, UT 84104
801-486-1004 • lacotech.com

Calibrated Leak Standard

Mod No: CM5C1.7-61161VG/4/5P	Temp: 23.5°C
Ser No: 11329	Temp Coef: 0.1%/°C
Cal No: 637902	Cal Gas: 5%H ₂ /95%N ₂
Cal Date: 22 Apr 2016	Gas Press: 1500 Psig
	Depl Rate: 0.1%/year

Leak Rate (mbarL/sec) **1.67 x 10⁻⁶ ±3.8% into vac**

氮氢漏孔

1.67E-6 @1500PSIG

泄漏: 2.0%/年

1000cc



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Calibrated Leak Standard

Mod No: CM5C1.7-61161VG/4/5P Temp: 23.5°C
Ser No: 11329 Temp Coef: 0.1%/°C
Cal No: 637902 Cal Gas: 5%H₂/95%N₂
Cal Date: 22 Apr 2016 Gas Press: 1500 Psig
Depl Rate: 0.1%/year

Leak Rate (mbarL/sec) **1.67 x 10⁻⁶ ±3.8% into vac**

5.00E-4 @1510PSIG
泄漏: 1.6%/年
1000cc

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Salt Lake City, UT 84104
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Calibrated Leak Standard

Mod No: CM51L-51121V0/4	Temp: 22.6°C
Ser No: 12119	Temp Coef: 0.1%/°C
Cal No: 660694	Cal Gas: Helium
Cal Date: 8 Sep 2016	Gas Press: 1200 Psig
	Depl Rate: 1.6%/year

Leak Rate (mbarL/sec) $1.25 \times 10^{-5} \pm 5.5\%$ into vac

1.25E-5 @1200PSIG
泄漏: 1.6%/年
300cc



PowerPoint interface showing a slide titled '无标题幻灯片' (Untitled Slide) with a list of items 1 through 10. The interface includes a menu bar with '文件' (File), '开始' (Home), and '插入' (Insert), and a sidebar with icons for various functions like '剪贴板' (Clipboard), '复制' (Copy), '粘贴' (Paste), '格式刷' (Format Painter), '新建' (New), '幻灯片放映' (Slide Show), '窗口' (Window), and '帮助' (Help).

Right sidebar of the PowerPoint interface showing a list of items 1 through 10. The interface includes a menu bar with '文件' (File), '开始' (Home), and '插入' (Insert), and a sidebar with icons for various functions like '剪贴板' (Clipboard), '复制' (Copy), '粘贴' (Paste), '格式刷' (Format Painter), '新建' (New), '幻灯片放映' (Slide Show), '窗口' (Window), and '帮助' (Help).



4.74E-5@1200PSIG
泄漏: 4.4%/年
300cc

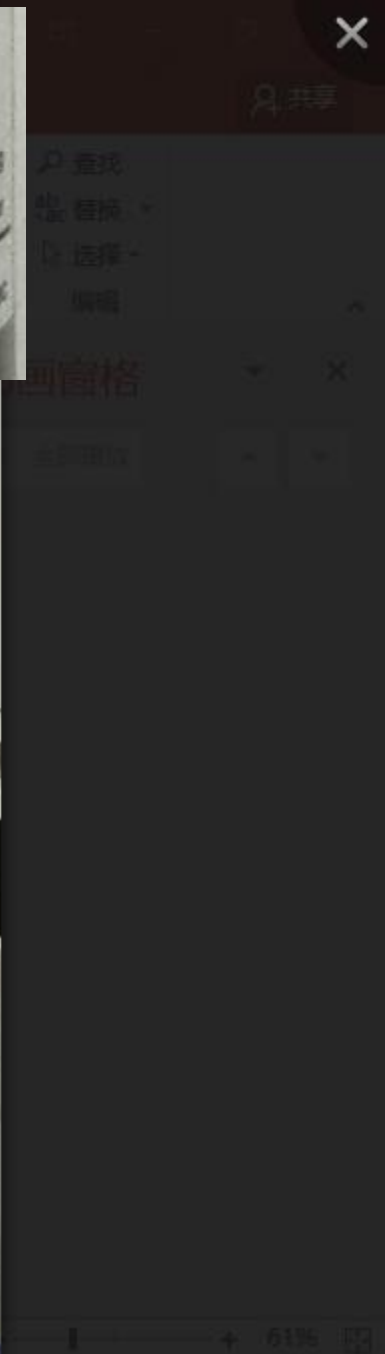
Calibrated Leak Standard	
Mod No: CM51M-51121V0/4	Temp: 22.6°C
Ser No: 12118	Temp Coef: 0.1%/°C
Cal No: 660683	Cal Gas: Helium
Cal Date: 8 Sep 2016	Gas Press: 1600 Psig
	Depl Rate: 4.4%/year
Leak Rate (mbarL/sec)	4.74 x 10⁻⁵ ±5.5% into vac





6.02E-6@1088PSIG
泄漏: 1.7%/年
150cc

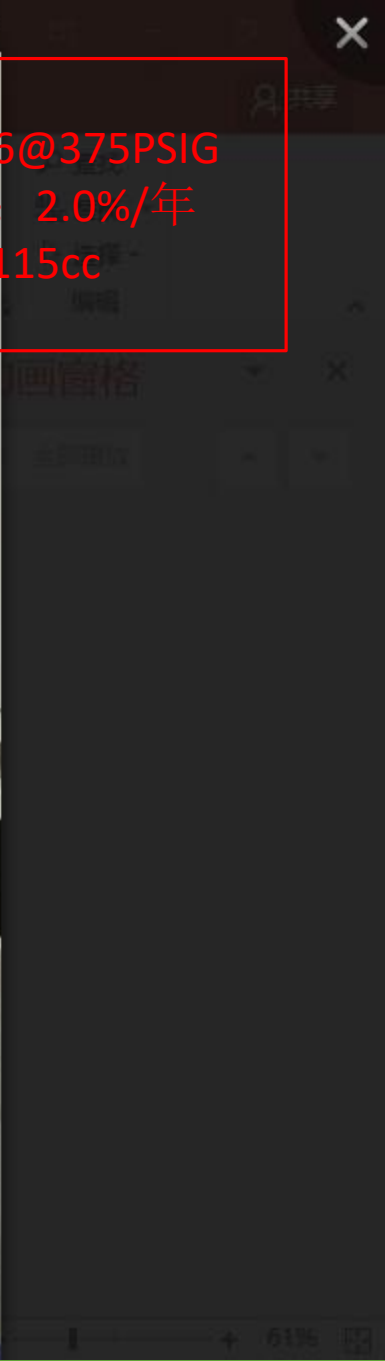
0-61141V0/4
Temp: 22.5°C
Temp Coef: 0.1%/°C
Cal Gas: Helium
Gas Press: 1088 Psig
Depl Rate: 1.7%/year
6.02 x 10-6 ±8.0% into vac



Mod No: CM51L-61111V0/4 Temp: 23.5°C
Ser No: 11332 Temp Coef: 0.1%/°C
Cal No: 637572 Cal Gas: Helium
Cal Date: 20 Apr 2016 Gas Press: 375 Psig
Depl Rate: 2.0%/year

Leak Rate (mbarL/sec) **1.96 x 10⁻⁶** ±8.0% into vac

1.96E-6@375PSIG
泄漏: 2.0%/年
115cc



Mod No: CM51L-81111V0/4 Temp: 23.5°C
Ser No: 11453 Temp Coef: 0.1%/°C
Cal No: 637726 Cal Gas: Helium
Cal Date: 21 Apr 2016 Gas Press: 69 Psig
Depl Rate: 0.1%/year

Leak Rate (Imbar/Lsec) **3.00 x 10⁻⁸ ±8.0% into vac**

3.00E-8@69PSIG
泄漏: 0.1%/年
115cc



Mod No: CM51L-101111V0/6

Temp: 22.3°C

Ser No: 12036

Temp Coef: 0.1%/°C

Cal No: 667361

Cal Gas: Helium

Cal Date: 18 Aug 2016

Gas Press: 25 Psia

Depl Rate: <0.1%/year

Leak Rate
(P·m³/sec) **2.25 x 10-10 ±8.0% into vac**

2.25E-9@69PSIG
泄漏: 0.1%/年
115cc





2.86E-10@6PSIA
泄漏: <0.1%/年
115cc

LACO TECHNOLOGIES
Calibrated Leak Standard
Model: CMTL-0101004
Serial No: 15119
Cal Date: 8 Sep 2018
Temp: 20.0°C
Temp Coef: 8.1%/°C
Gas: Helium
Gas Purity: 999.999%
Gas Pressure: 1000 Psig
Dead Volume: 1.0 Liter
Leak Rate: 1.25×10^{-5} ±5.0% std. vac.
1.25E-05

LACO TECHNOLOGIES
Calibrated Leak Standard
Model: CMTL-0101004
Serial No: 15118
Cal Date: 8 Sep 2018
Temp: 20.0°C
Temp Coef: 8.1%/°C
Gas: Helium
Gas Purity: 999.999%
Gas Pressure: 1000 Psig
Dead Volume: 1.0 Liter
Leak Rate: 4.74×10^{-5} ±5.0% std. vac.
4.74E-05

LACO TECHNOLOGIES
Calibrated Leak Standard
Model: CMTL-0101004
Serial No: 15117
Cal Date: 8 Sep 2018
Temp: 20.0°C
Temp Coef: 8.1%/°C
Gas: Helium
Gas Purity: 999.999%
Gas Pressure: 1000 Psig
Dead Volume: 1.0 Liter
Leak Rate: 6.02×10^{-6} ±5.0% std. vac.
6.02E-06

LACO TECHNOLOGIES
Calibrated Leak Standard
Model: CMTL-0101004
Serial No: 15116
Cal Date: 8 Sep 2018
Temp: 20.0°C
Temp Coef: 8.1%/°C
Gas: Helium
Gas Purity: 999.999%
Gas Pressure: 1000 Psig
Dead Volume: 1.0 Liter
Leak Rate: 1.96×10^{-6} ±5.0% std. vac.
1.96E-06

LACO TECHNOLOGIES
Calibrated Leak Standard
Model: CMTL-0101004
Serial No: 15115
Cal Date: 8 Sep 2018
Temp: 20.0°C
Temp Coef: 8.1%/°C
Gas: Helium
Gas Purity: 999.999%
Gas Pressure: 1000 Psig
Dead Volume: 1.0 Liter
Leak Rate: 3.00×10^{-8} ±5.0% std. vac.
3.00E-08

LACO TECHNOLOGIES
Calibrated Leak Standard
Model: CMTL-0101004
Serial No: 15114
Cal Date: 8 Sep 2018
Temp: 20.0°C
Temp Coef: 8.1%/°C
Gas: Helium
Gas Purity: 999.999%
Gas Pressure: 1000 Psig
Dead Volume: 1.0 Liter
Leak Rate: 2.25×10^{-10} ±5.0% std. vac.
2.25E-10

LACO TECHNOLOGIES
Calibrated Leak Standard
Model: CMTL-0101004
Serial No: 15113
Cal Date: 8 Sep 2018
Temp: 20.0°C
Temp Coef: 8.1%/°C
Gas: Helium
Gas Purity: 999.999%
Gas Pressure: 1000 Psig
Dead Volume: 1.0 Liter
Leak Rate: 2.86×10^{-10} ±5.0% std. vac.
2.86E-10

Certificate of Calibration
Calibration Number 700835

Calibration Date: 6 Jan 2017



Prepared for:
Real Meter Instruments (Shanghai) Co., Ltd.
Jianhao Rd 99-401, Zhoupu Town, Pudong New Distr
Shanghai, China 201316

Item Identification
Item/Type: Leak Standard
Model Number: CM5C7.0-5204DAG/4/10-G/5P
Serial Number: 12768

Calibration Data

Calibration Gas: 5% Hydrogen / 95% Nitrogen

Condition	Leak Rate (mbarL/sec into atmosphere)	Uncertainty† (±% of Leak Rate)	Pressure (Psig)	Temperature (°C)
New	7.35 x 10 ⁻⁵	3.4	158	23.8

†Expanded uncertainty, 95% confidence interval, coverage factor, k=2

Environmental Conditions/Effects

The leak rate of this item increases/decreases at a factor of -0.6%/°C deviation from the calibration temperature(s) listed above. Relative humidity has negligible effect on the performance of this item. Barometric pressure during this calibration was 1.00 atm.; effect of barometric pressure on the performance of this item is detailed in the attached addendum.

Traceability and Conformance

All calibration procedures, equipment maintenance, and training of technicians are in accordance to LACO Quality Manual QM-100, which meets the requirements of ISO/IEC 17025 and ANSI/NCSL Z540-1-1994. All reference standards used in this calibration (see table at right) are traceable to the National Institute of Standards and Technology (NIST). This calibration was performed according to procedure number LSP-106, a volume change method.

Reference Standards

Measurement Parameter	Serial Number	Expires
Pressure	016557653	Jul 20, 2017
Temperature	25551345	Jul 13, 2018
Volume	111600	Jul 11, 2021

Leak Standard Stability

The leak rate of this leak standard depletes at an estimated 2.5%/week. This and all leak standards are sensitive to moisture, oils, and particles; proper use and storage is important for preventing contamination and maintaining leak rate stability. This certificate does not guarantee this item to be in tolerance at the end of the calibration interval.

Calibration Technician: *Rod Empey*
Rod Empey

Quality Control: *Rick Asper*
Rick Asper

The calibration data reported above applies only to the item referenced in this certificate.
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氢气标准漏孔

7.35E-5@158PSIG

充气

温度修正: -0.6%/°C



Calibrated Leak Standard

Mod No: CM5G3.0-91040VP/4
Ser No: 11452
Cal No: 630784
Cal Date: 5 May 2016

Leak Rate (mbarL/sec) 3.05×10^{-9}

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Temp: 23.5°C
Temp Coef: 0.1%/°C
Cal Gas: Xenon
Gas Press: 26.0 Psia
Depl Rate: <0.1%/year

$3.05 \times 10^{-9} \pm 6.1\%$ into vac

氙气标准漏孔
 $3.05E-9@26PSIA$
泄漏: 0.1%/年
150cc

Certificate of Calibration

Calibration Number 701077



Calibration Date: 9 Jan 2017

Prepared for
Real Meter Instruments (Shanghai) Co., Ltd.
Jianhao Rd 99-401, Zhoupu Town, Pudong New Distr
Shanghai, China 201316

Item Identification
Item/Type: Leak Standard
Model Number: CM5J7.5-230CCA0/3/2-M
Serial Number: 12827

Calibration Data

Calibration Gas: Methane

Condition	Leak Rate (scc/m into atmosphere)	Uncertainty† (±% of Leak Rate)	Pressure (MPa G)	Temperature (°C)
New	6.95 x 10 ⁻²	10	2.0	23.2
	4.99 x 10 ⁻²	10	1.7	23.3
	2.22 x 10 ⁻²	10	1.1	23.4

†Expanded uncertainty, 95% confidence interval, coverage factor, k=2.

Environmental Conditions/Effects

The leak rate of this item increases/decreases at a factor of -0.6%/°C deviation from the calibration temperature(s) listed above. Relative humidity has negligible effect on the performance of this item. Barometric pressure during this calibration was 1.00 atm; effect of barometric pressure on the performance of this item is detailed in the attached addendum.

Traceability and Conformance

All calibration procedures, equipment maintenance, and training of technicians are in accordance to LACO Quality Manual QM-100, which meets the requirements of ISO/IEC 17025 and ANSI/NCSL Z540-1-1994. All reference standards used in this calibration (see table at right) are traceable to the National Institute of Standards and Technology (NIST). This calibration was performed according to procedure number LSP-106, a volume change method.

Reference Standards

Measurement Parameter	Serial Number	Expires
Pressure	016557653	Jul 20, 2017
Temperature	25551345	Jul 13, 2018
Volume	111600	Jul 11, 2021

Leak Standard Stability

The leak rate of this leak standard depletes at an estimated . This and all leak standards are sensitive to moisture, oils, and particles; proper use and storage is important for preventing contamination and maintaining leak rate stability. This certificate does not guarantee this item to be in tolerance at the end of the calibration interval.

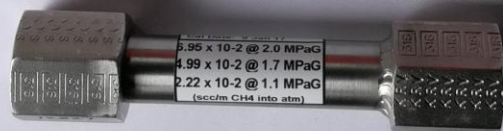
Calibration Technician:

Rick Asper

Quality Control:

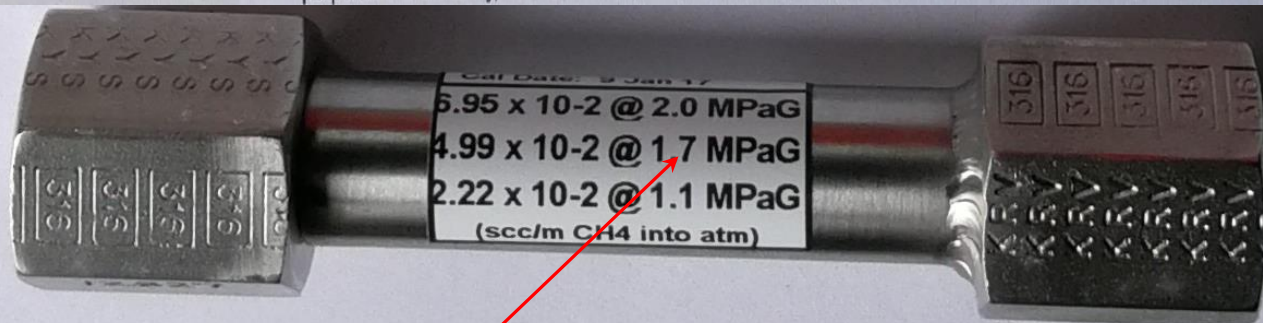
Ron Brown

The calibration data reported above applies only to the item referenced in this certificate. This document shall not be reproduced except in full without written approval from Laco Technologies.



Condition	Leak Rate (scc/m into atmosphere)	Uncertainty† (±% of Leak Rate)	Pressure (MPa G)	Temperature (°C)
New	6.95 x 10 ⁻²	10	2.0	23.2
	4.99 x 10 ⁻²	10	1.7	23.3
	2.22 x 10 ⁻²	10	1.1	23.4

†Expanded uncertainty, 95% confidence interval, coverage factor, k=2.



甲烷CH4标准漏孔
3个校准点: 7, 5, 2x10⁻²sccm

支持各种气体类型

支持所有气体类型或混合气体（非腐蚀）

Helium (He)氦气	R-12 R制冷剂	Krypton (Kr)氪气
Air空气	R-22制冷剂	R-404a制冷剂
Argon (Ar)氩气	Hydrogen (H2)氢气	R-290制冷剂
Nitrogen (N2)氮气	Deuterium (D2)氘气	R-407c制冷剂
CO2二氧化碳	SF6六氟化硫	R-410制冷剂
N2O二氧化氮	Neon (Ne)氖气	NH3氨
Helium 3 Isotope同位素 氦-3	Xenon (Xe)氙气	Halon 1301三氟一溴甲 烷
CO一氧化碳	R-134a制冷剂	
Oxygen氧	Methane (CH4)甲烷	

支持定制任意接口

如您需要的接头未在上述列出，请与我们联系定制

Inlet入口类型（开放式，连接外部气源）：

0 = No Inlet Connection

A = 1/8" FNPT

B = 1/8" MNPT

C = 1/4" FNPT

D = 1/4" MNPT

E = 1/4" Male VCR

F = 1/4" Swagelock

J = NW 16 Flange

K = NW 25 Flange

L = NW 40 Flange

N = 1.33" Mini Con-Flat (CF) Flange

S = Push-in, 1/4"

Outlet出口接头类型：

NW 16 Flange

NW 25 Flange

NW 40 Flange

VCR4 Male

1/4" Swagelock

1/8" FNPT

1/4" MNPT

10-32 Male with O-ring

1/8" MNPT

1/4" FNPT

Universal Sniffer Probe Adaptor（通用吸枪接口）

2.75" Con-Flat (CF) Flange

1.33" Mini Con-Flat (CF) Flange

Straight Thread, M8 Bolt Male

支持同时指定压力和漏率

- 适用于所有漏孔，包括带气瓶漏孔，开放式漏孔，如：
 1. 外接气源（开放式），压力为35Mpa下入真空漏率为 1×10^{-6} Mbar.L/S
 2. 自带气瓶，压力10bar下入大气漏率为 5×10^{-5} mbar.L/s
 3. 常压下（喷气漏孔）入真空漏率为 5×10^{-9} mbar.L/s
- 可精确指定漏率区间
 1. 如要求漏率范围落在【1.01， 1.05】 $\times 10^{-6}$ mbar.L/s

同时指定漏率和压力，可以精确的模拟真实的工况，制作标准泄露件，用来校准检漏系统。

支持同时指定压力和漏率 (1)



支持同时指定压力和漏率（2）



名 称	测量范围	不确定度/ 准确度等级	证书编号	证书有效期至 (YYYY-MM-DD)
真空漏孔校准 装置	$(1.0 \times 10^{-10} \sim 5.0 \times 10^{-5})$ $\text{Pa} \cdot \text{m}^3/\text{s}$	7.6%~1.6% ($k=2$)	[2015]国量标计 证字第 292 号	2019-12-20
校准漏孔	$10^{-10} \text{Pa} \cdot \text{m}^3/\text{s}$	15% ($k=2$)	RGvc2016-1198	2017-09-13



第 2 页 共 3 页

Serial Number: 11333



0.252 scc/m
±3.4% @ 2 MPa
Air into atm

Uncertainty† (±% of Leak Rate)	Pressure (MPa)	Temperature (°C)
3.4	2	23.6

Leakage interval coverage factor: k=2



标准漏孔分类



图：带气室漏孔



图：无源标准漏孔（开放式）

冷媒漏孔-双气瓶



吸枪校准漏孔



Sniffer标准漏孔（带1000cc气室）
支持所有气体



可充气Sniffer标准漏孔（115cc气室）
支持所有气体



SF6/卤素/冷媒检漏仪专用Sniffer标准漏孔
双气室设计，可调压

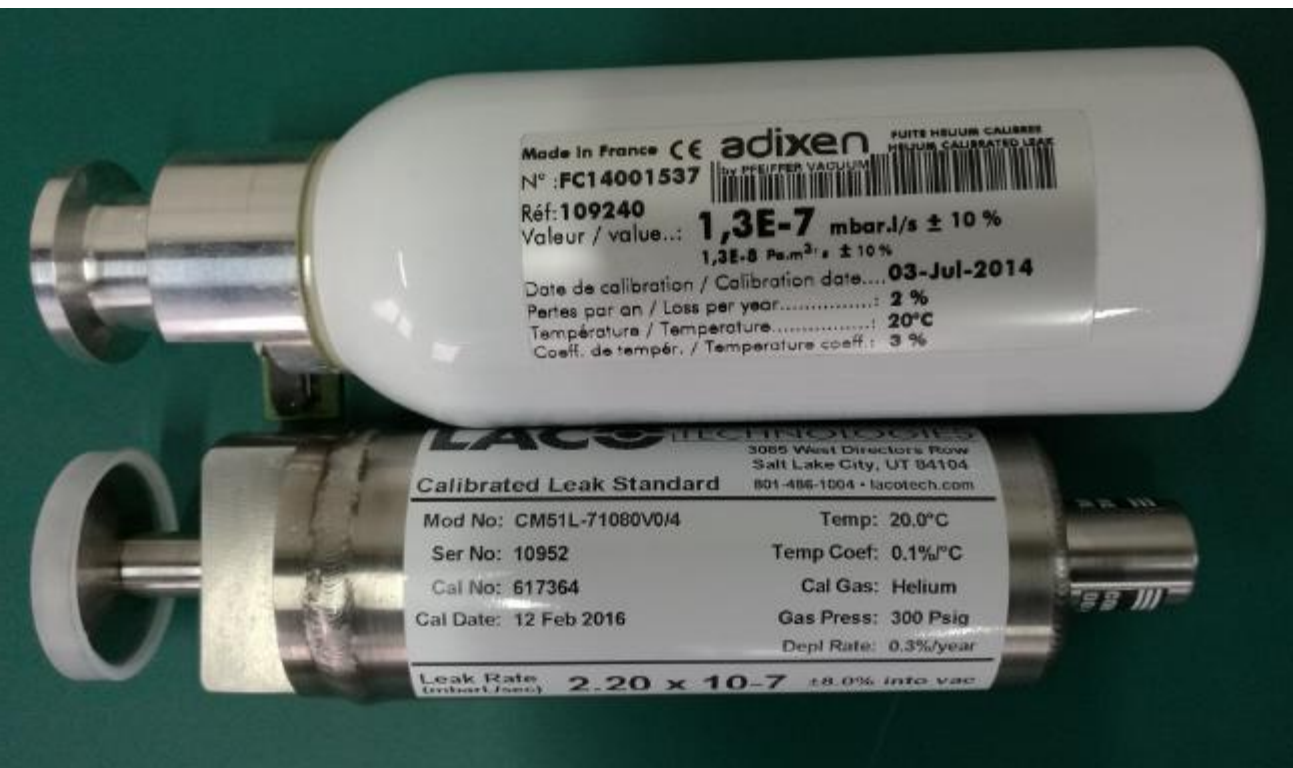


Sniffer标准漏孔，开放式
支持所有气体



Sniffer标准漏孔，开放式
支持所有气体

检漏仪内置漏孔



标准漏孔的应用

仪器校准

- 氦质谱检漏仪/质谱分析仪/冷媒检漏仪
- 吸枪式检漏仪/空气检漏仪/真空规等...



泄漏模拟

- 工件泄漏模拟
- 泄漏仿真标准件

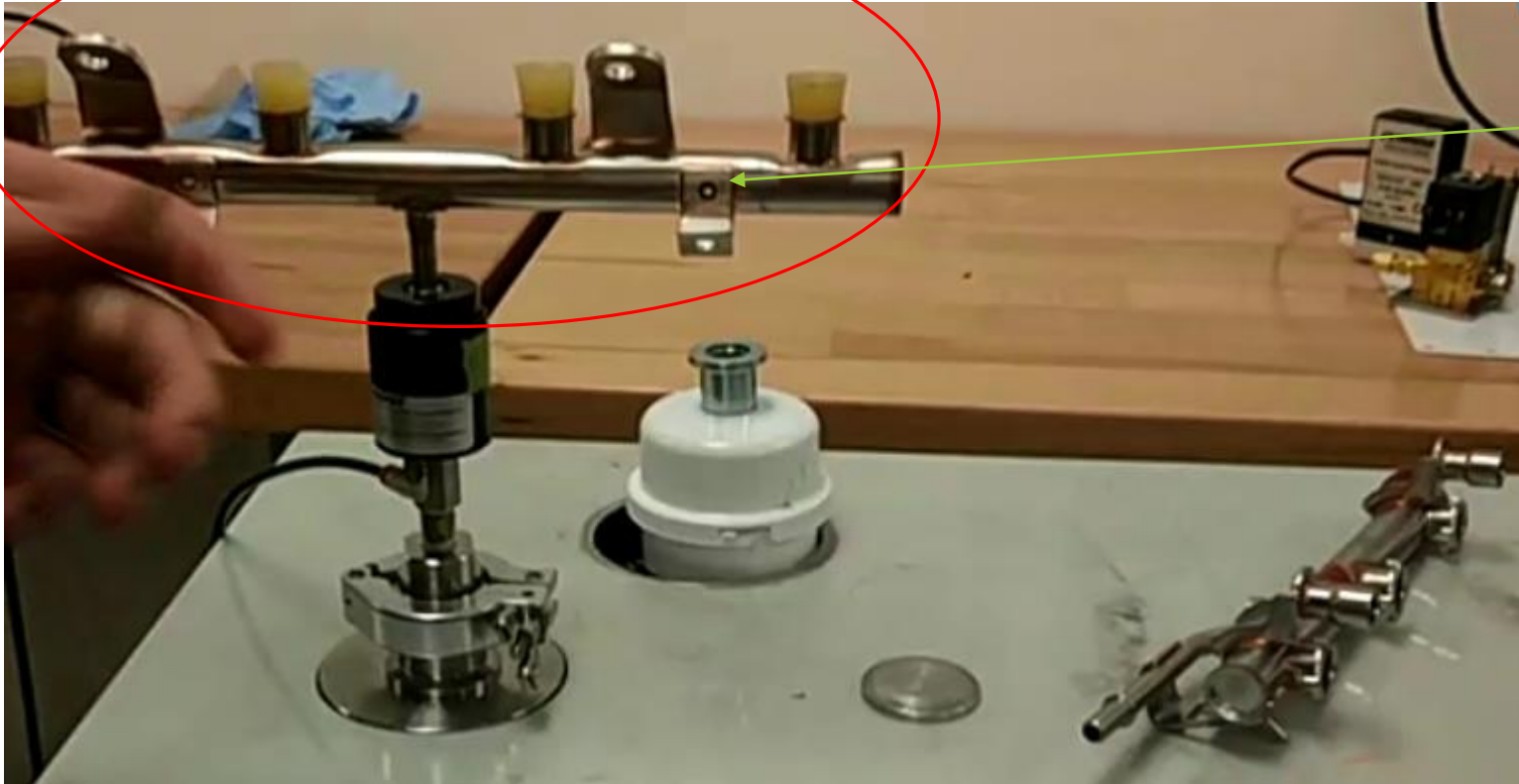


流量控制

- 可变泄露阀门
- 质量流控制器



泄漏仿真标准件-built-into-parts



用1个标准漏孔去模拟一个正式的工件，并不能完全反应测试的工况。

如真实工件是多个密封接触点，加注高压气体空间与标准漏孔也不一样，造成温度变化也不一样，这样会造成系统误差。

泄漏仿真标准件-built-into-parts



无源标准漏孔

漏率模拟并不符合实际的工况，会产生系统误差！

泄漏仿真工件就是把漏孔内置入标准的工件，再进行泄漏模拟。最大真实的模拟实际的工况。

LEAK STANDARD BUILT INTO AIRBAG INITIATOR BODY



0.4"

1.5×10^{-5} ATM.CC/SEC @ 5 PSIG HELIUM INTO VACUUM

AIRBAG INFLATOR BODY



AIRBAG INITIATOR

谢谢！