



# COMPONENT SPECIFICATION

TITLE **Calibrated Leak Assembly**

APPROVALS:	DATE	REV	DCN NO	BY	CHK	DCC	DATE
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CHECKED: M. Lubinski	12/19/97						
APPROVED:							
DCC RELEASE:							

## DESCRIPTION

The Calibrated Leak Assembly (illustrated schematically in Fig. 1) will be used in conjunction with a high-sensitivity mass spectrometer/residual gas analyzer (RGA) attached to an ultra-high-vacuum (UHV) system to establish response calibration (using H<sub>2</sub> and N<sub>2</sub>), mass scale (using Krypton) and gas cracking patterns for a variety of gas species relevant to the application. There is provision for adding a presently unspecified gas by filling the bottle labeled “TBD” in Fig. 1 (it is initially filled with O<sub>2</sub>).

After the assembly is connected to an all-metal valve on the RGA system, the manifold is baked out at 250 °C while being pumped with an auxiliary turbo pump. All parts exposed to the vacuum envelope on the UHV side of the calibrated leak orifices must reach the bake temperature during this operation, and all of the valves indicated in Fig. 1 are open during this bake. During normal operation, the baked and clean manifold is exposed to the RGA through the all-metal valve on that assembly. The liquid nitrogen trap is filled to trap residual water vapor from the gas sources. Redundant valves at each leak accommodate valve failures which would otherwise require time-consuming disassembly and rebake. The assembly will be moved among multiple RGA systems and must operate satisfactorily in an uncontrolled (outdoors) environment.

## REQUIREMENTS

**Design and Packaging:** The assembly shall be constructed from the highest quality UHV components with only Conflat™-type flanges, metal seals and bakeable components. All components shall be cleaned and prebaked in accordance with best UHV practices prior to assembly. The assembly shall include heating sources for baking all parts on the UHV side of the leak orifices, including the valve bodies, LN<sub>2</sub> trap and flexible connection hoses, at up to 250 °C. The design shall permit convenient operation of all valves using one or more torque wrenches (valve operation is not required during bakeout). The assembly shall use only unlubricated, silver plated stainless steel fasteners for the UHV connections. The assembly shall be rugged and portable, with casters so it can be easily transported by one person. It shall be freestanding (there are no workbenches available) and weather-resistant (see ambient conditions below). It shall be able to reach to the RGA test input and auxiliary turbo pump inlet, each about 42 inches above the ground.

**External leaks:** The assembly shall be demonstrated to be free of leaks to the ambient atmosphere greater than 2×10<sup>-10</sup> torr-l/s (He)



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- Calibrated leaks:** All calibrated leaks shall be Vacuum Technology Inc. Lifetime™ CL-7 and CL-8 series with leak rates as indicated in Fig.1. The leak labeled “**TBD**” in Fig. 1 shall be purchased as an O<sub>2</sub> leak with the MFV metal-sealed fill valve special option.
- Liquid nitrogen trap:** Innotech LNB-22 series with 63 mm Conflat flanges
- Cold cathode gauge head:** Balzers IKR-060 with 40 mm ID Conflat flange (gauge head only; electronics and cables are already available)
- Heating provisions:** Shall heat the UHV portions of the assembly uniformly  $\pm 20$  °C at 250 °C.
- Heating controller:** Bakeout temperature shall be adjustable from ambient temperature to 250 °C.
- Bake out compatibility:** All surfaces of the volume exposed to the RGA vacuum shall be bakeable to 250 °C
- Output flange (to RGA):** 16 mm Conflat (the mating flange on the RGA system is rotatable)
- Flange to Auxiliary Turbo:** 63 mm ISO-K
- Power available:** 115VAC 1 $\phi$  (for heating sources)
- Ambient conditions:** Operating temperature range: -20 °C (-4 °F) to +43 °C (110 °F)  
Relative humidity: 0 to 100% (must work outdoors, with only direct rain shelter)








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### LEGEND:

-  ALL METAL UHV VALVE
-  COLD CATHODE GAUGE HEAD
-  CALIBRATED GAS LEAK
-  CONFLAT FLANGE (OR EQUAL)
-  LIQUID NITROGEN TRAP

ALL COMPONENTS  
INSIDE DASHED LINES  
TO BE BAKED TO  
250 °C WITH INTEGRAL  
HEATING SOURCES

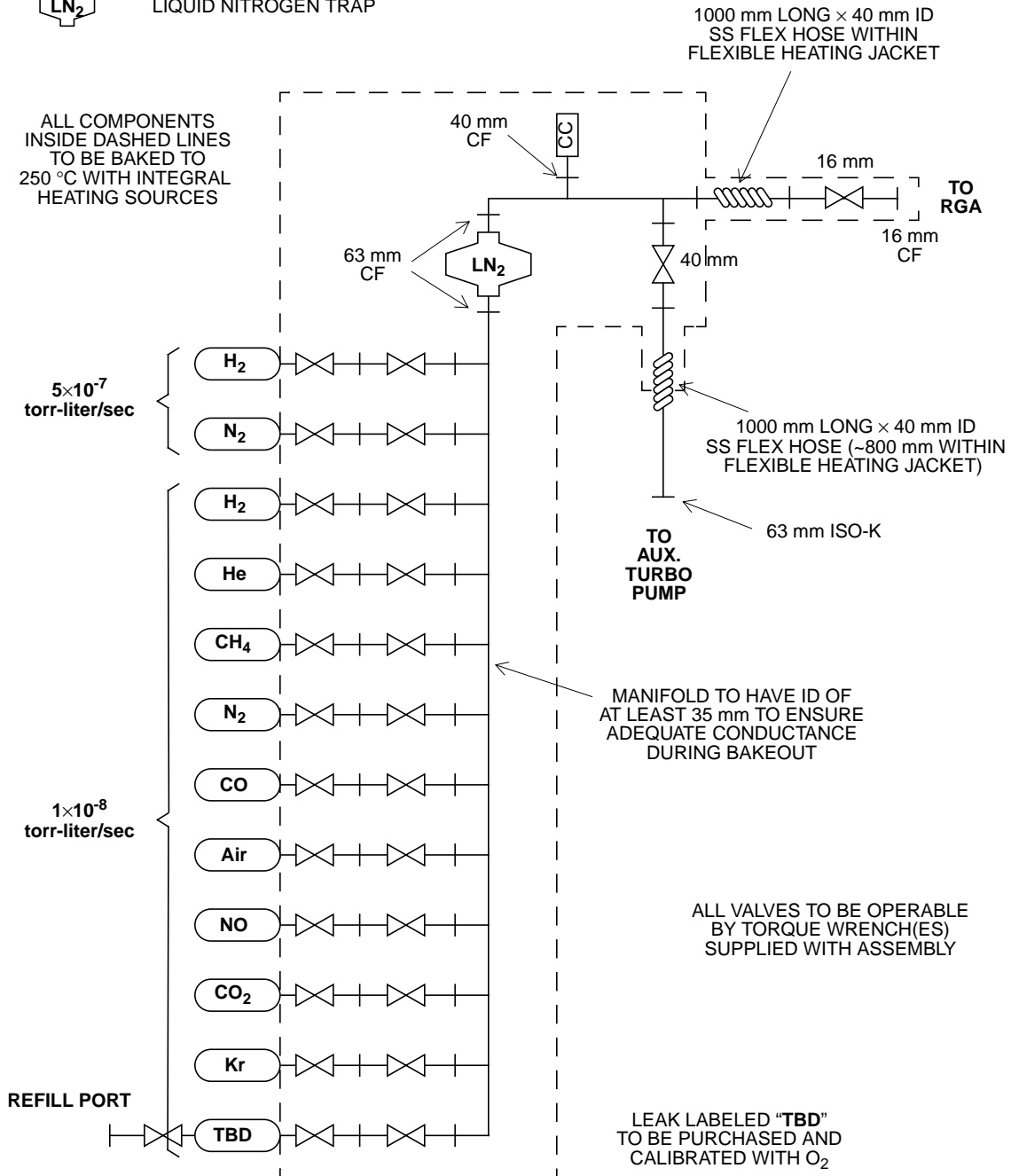


Figure 1: Calibrated Leak Assembly Vacuum Circuit Schematic (not a mechanical layout)