MicroCircuit Laboratories

Hermetic Package Cover Seal Technology

Seam Weld | Seam AuSn | Projection Weld

Develop | Prototype | Support



JEDEC iMAPS AIM photonics ASM INTERNATIONAL

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Low Temperature Hermetic Cover Seal

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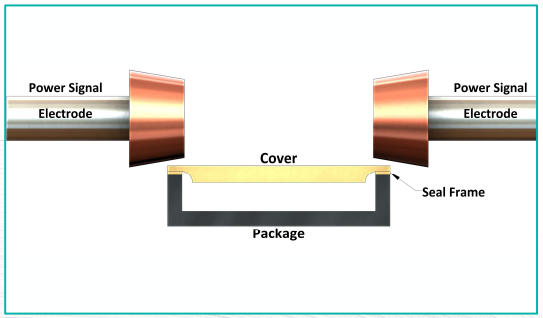
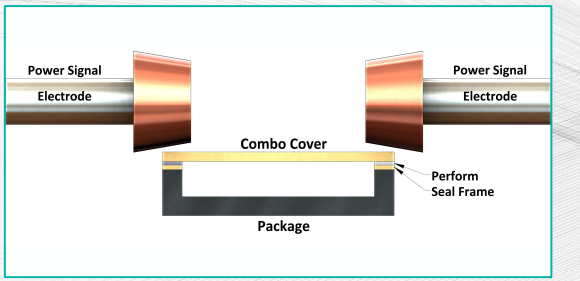
Why Hermetic?
Precisely Controlled Internal Head Space

- < Temperature than Polymer Cure Temperature
- Pre-Seal Vacuum Bake to Remove Moisture
- Class 1 Particles and 0.1 PPM H_2O and O_2 Inert Atmosphere



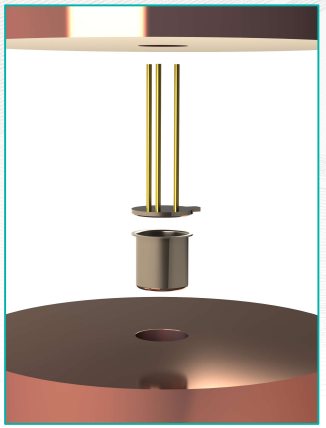
Seam Weld, Seam AuSn and Projection Weld Cover Sealing

- Rapid, Localized Heat with Little Thermal Impact



MCL Services

- Problem Resolution
- New Product Development
- Complete Hermetic Cover Seal Processing includes Tooling
- Development of A5 Gross and Fine Leak Testing per MIL-STD-883 TM 1014



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Seam Weld

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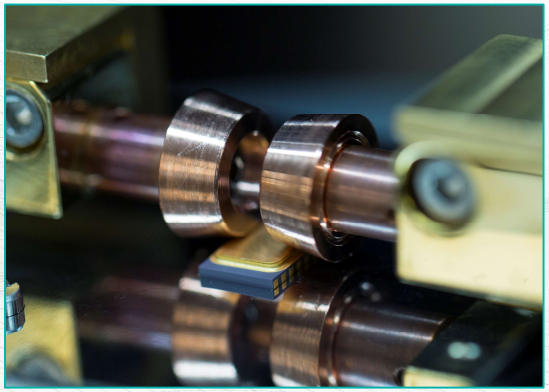
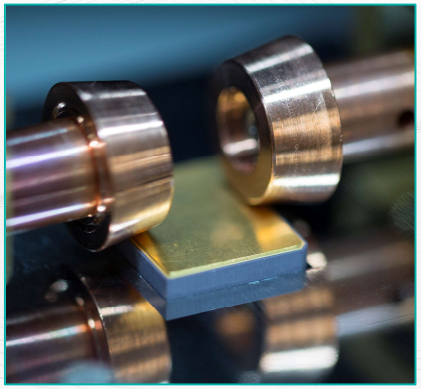
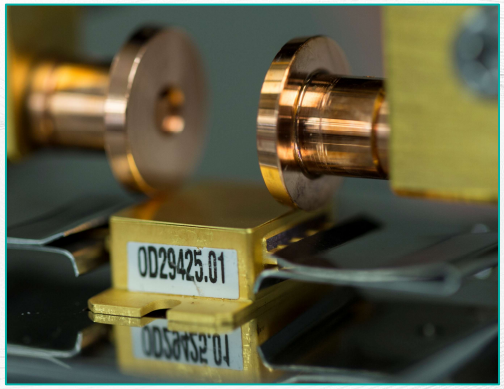
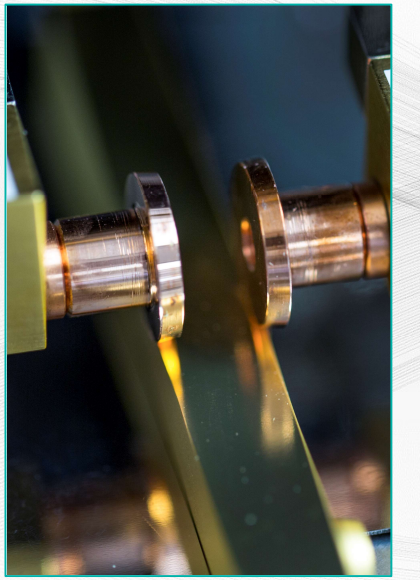
Largest Configurations of Hermetic Packages and Feedthroughs

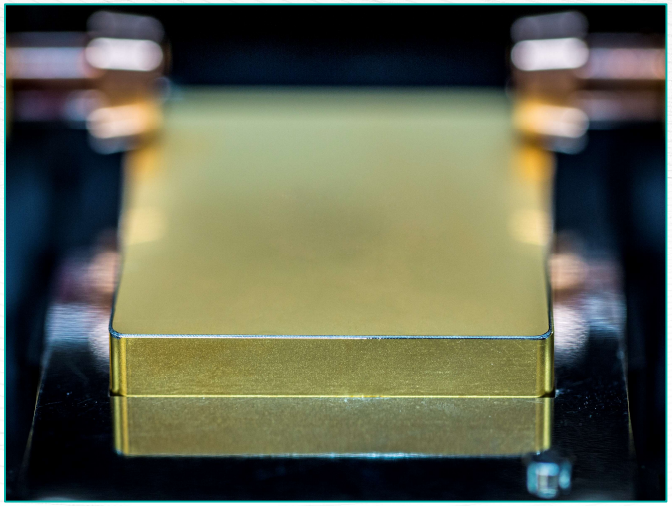
- 2 mm x 2 mm Chip Carriers to 40 mm x 190 mm Modules
- Packages and Covers with multiple feedthroughs











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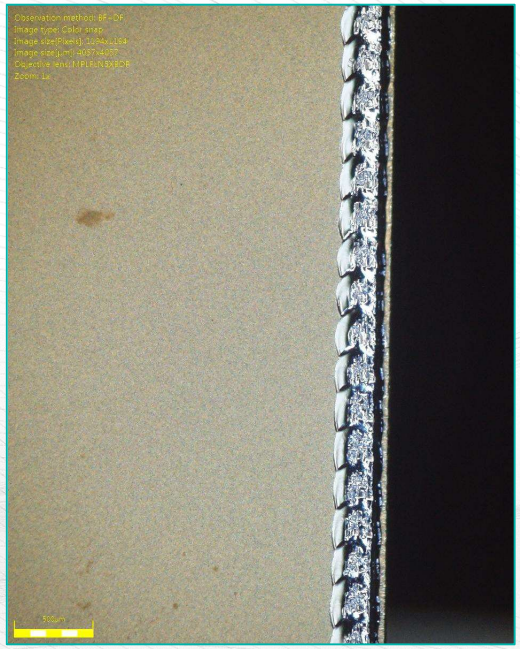
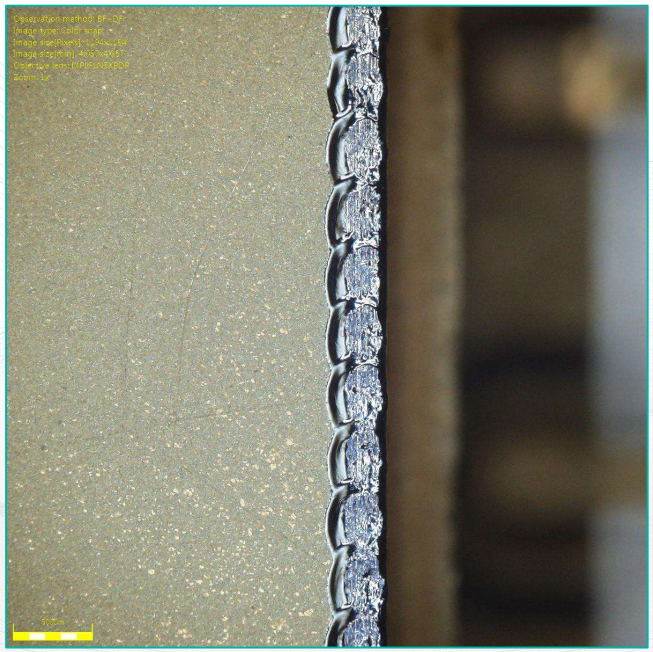
Seam Weld

Customized Seam Seals

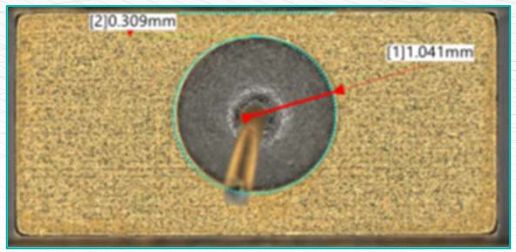


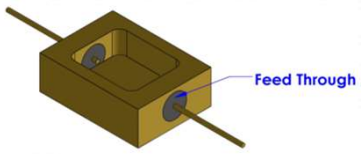
A12 — Standard Seal
Au/Electrolytic Ni Plate Stack

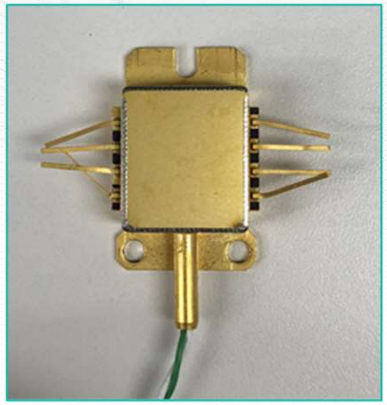


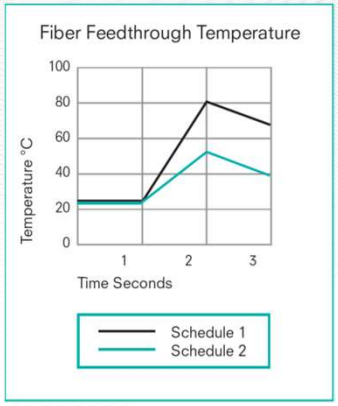
A7 — Multiple Feedthrough Seal
Au/Electrolytic Ni Plate Stack

A16 — Non-Standard Materials & Plating Stacks









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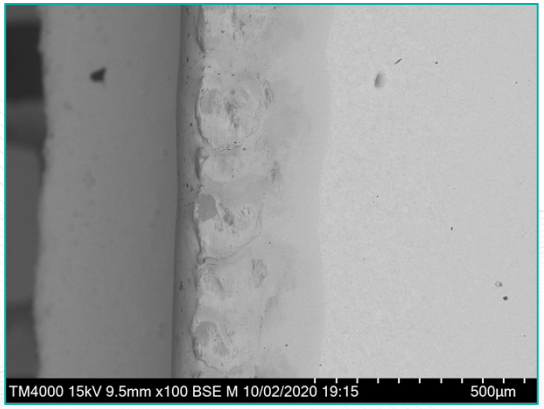
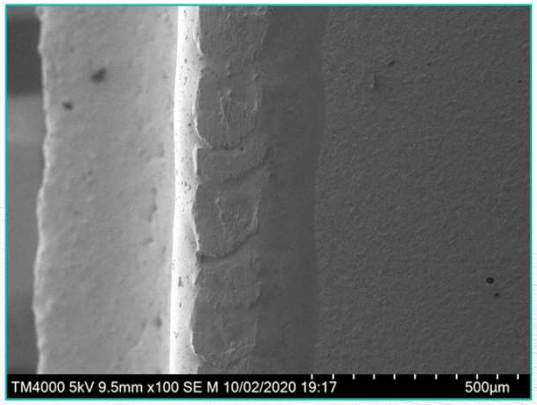
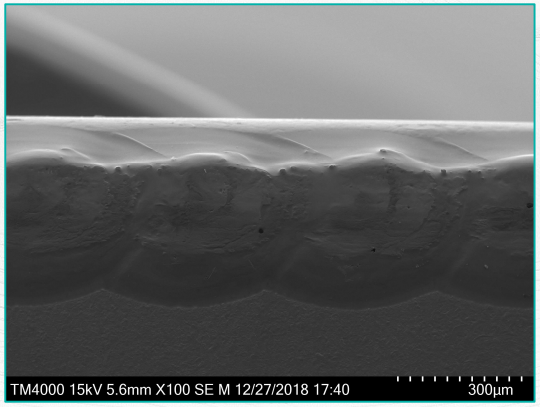
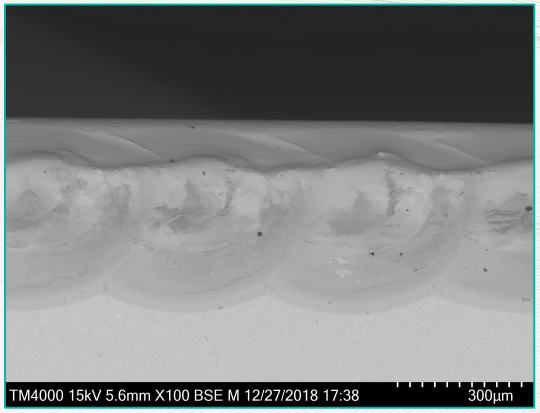
Seam Weld

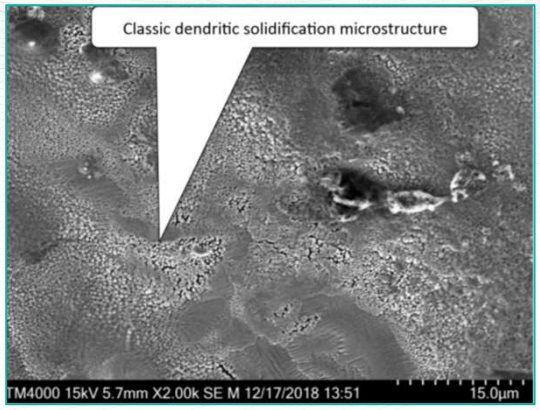
High Performance Cover Joining











SEM Photographs from MicroCircuit Laboratories

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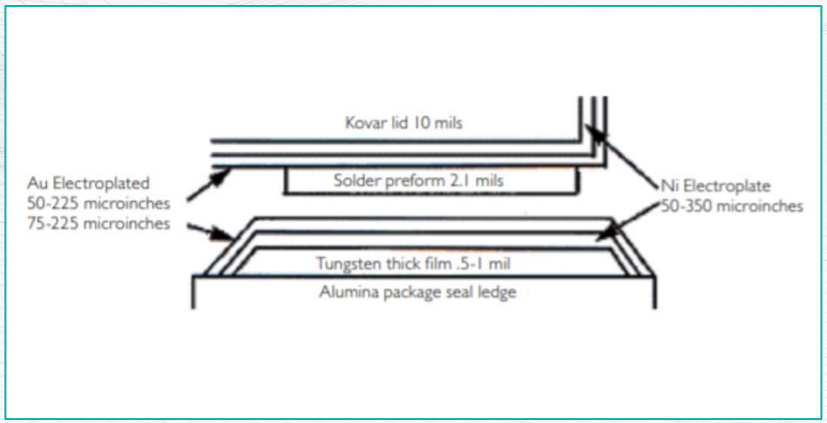
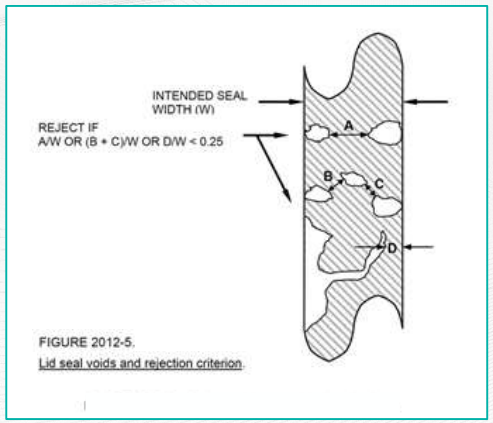
Seam 80Au20Sn

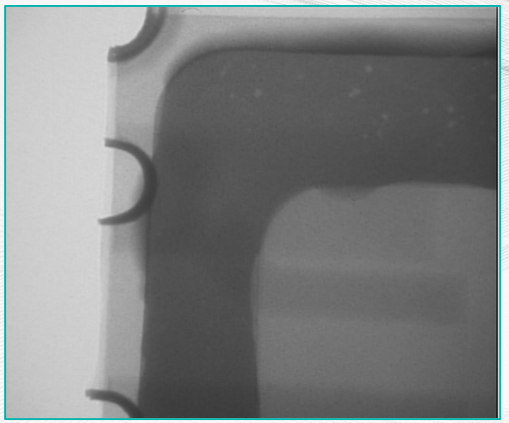
MIL-STD 883 TM 2012.9 3.10.2.2 e Lid Seal Voids and Rejection Criteria

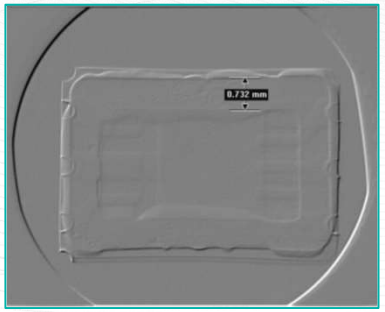
JEDEC Meeting Columbus, Ohio | September 14, 2017

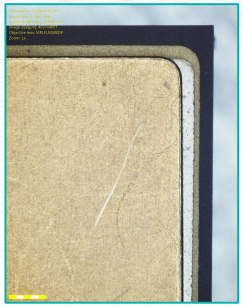
The current standard defines the “design seal width” per Test Method 2012 is interpreted to be the area where the lid overlaps both the solder preform and the seal ring, i.e. the area under the lid that is in contact with solder and the seal ring interface. The portion of the seal ring outside the lid is not included in today’s definition.

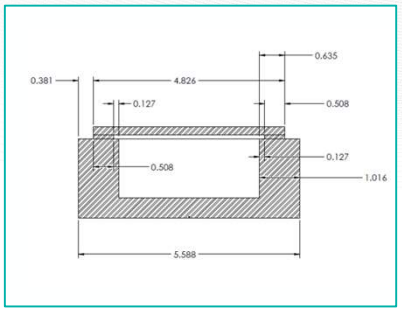












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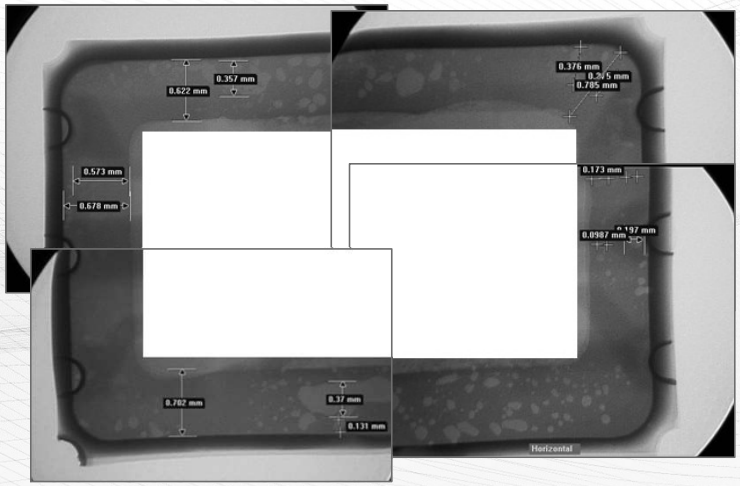
Seam 80Au20Sn

Lowest Void Cover Seal

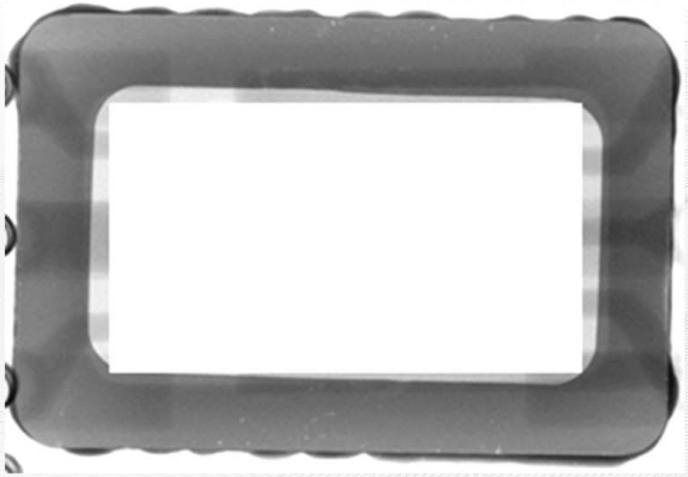
Before MCL



Leak Rate

1.2E-9 atm-cm^3/sec **air**

MCL Seal



Leak Rate

7E-10 atm-cm3/sec **air**

Hermetic Projection Weld of TO Packages

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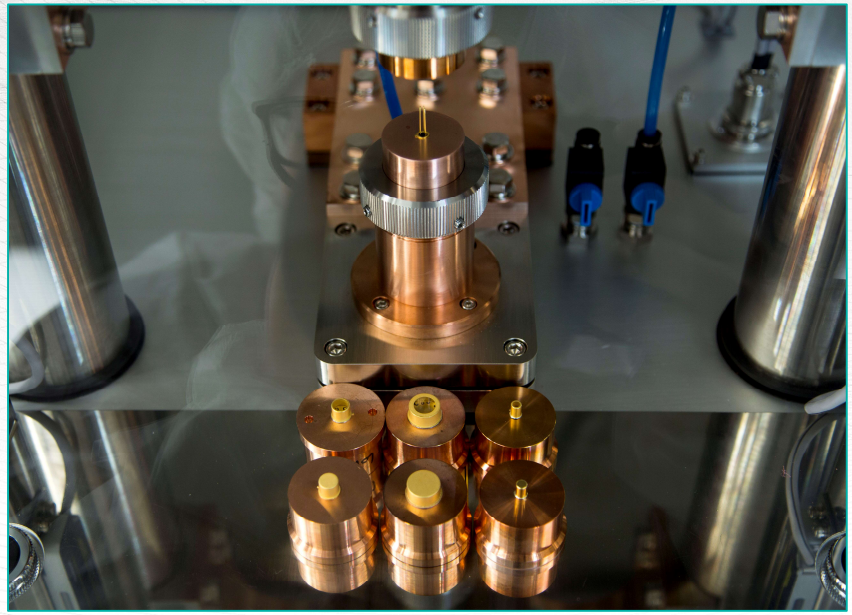
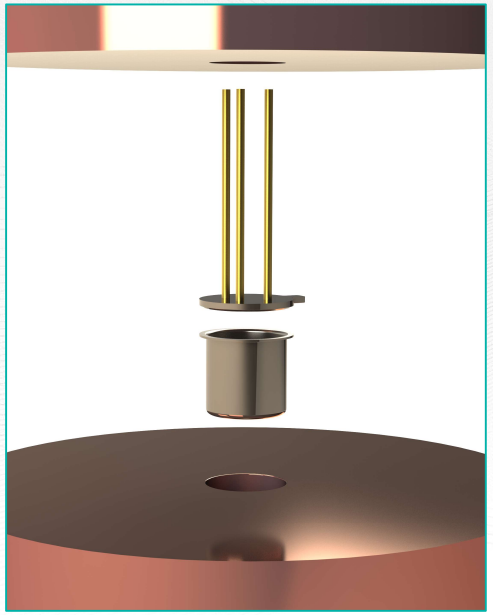
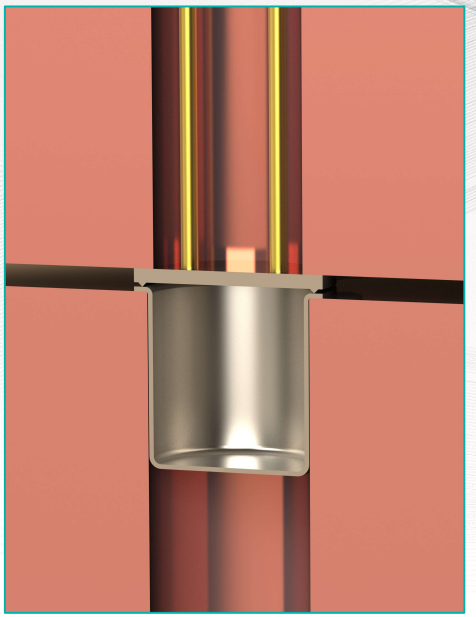
Molecular Leak Rates for TO Packages

- Kovar Header with Standard Au over Ni Plate
    - Large Area Glass Feedthroughs
    - Tooled Sizes: TO-18; TO-5; TO-8







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MCL Leal Testing

Automatic Gross and Fine Leak Testing

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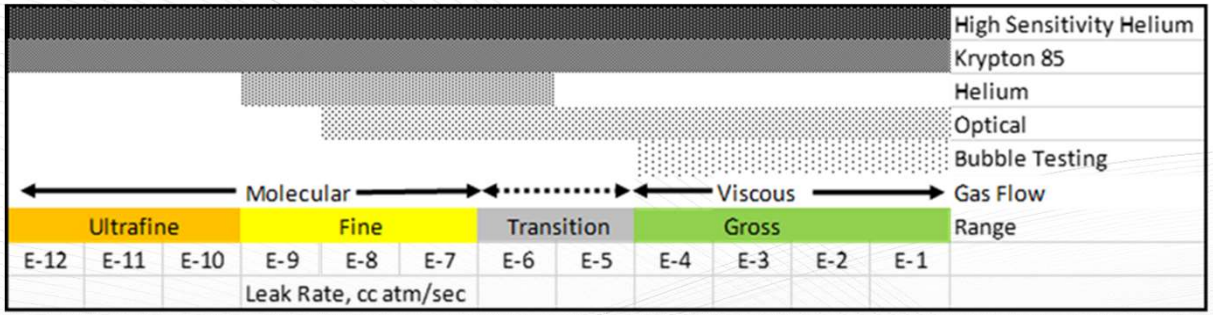
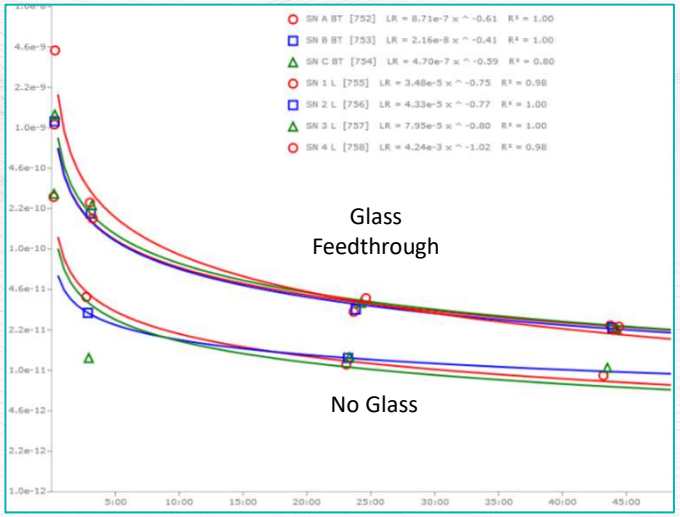
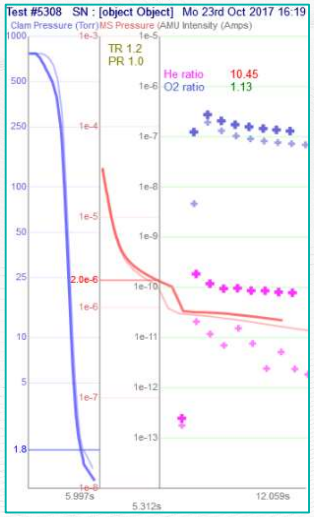
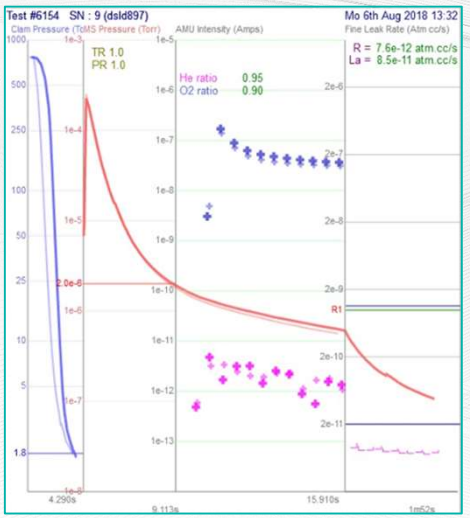




He Sorption Characteristics



Gross Leaker



Fine Leak Rate

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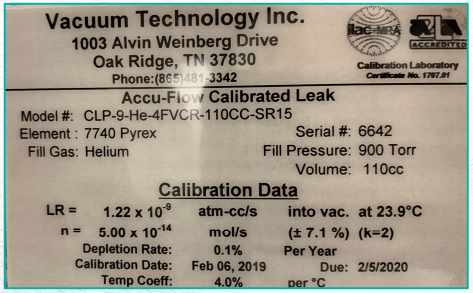
MCL Leak Testing

A5 Combined He/O_2 Dry Gross Leak & He Fine Leak

- Quadrupole Mass Spectrometer with Low/High Standards
- Howl Mann Flexible Method Enables Flexible He Soak Termination



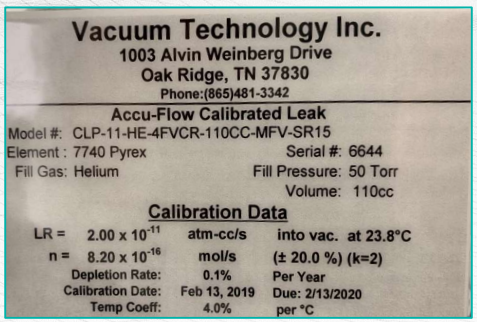
Vacuum Technology Inc.
1003 Alvin Weinberg Drive
Oak Ridge, TN 37830
Phone:(865)481-3342

Accu-Flow Calibrated Leak

Model #: CLP-9-He-4FVCR-110CC-SR15
Element : 7740 Pyrex
Fill Gas: Helium
Serial #: 6642
Fill Pressure: 900 Torr
Volume: 110cc

Calibration Data

LR =	1.22×10^{-9}	atm-cc/s	into vac. at 23.9°C
n =	5.00×10^{-14}	mol/s	(± 7.1 %) (k=2)
Depletion Rate:	0.1%	Per Year	
Calibration Date:	Feb 06, 2019	Due:	2/5/2020
Temp Coeff:	4.0%	per °C	



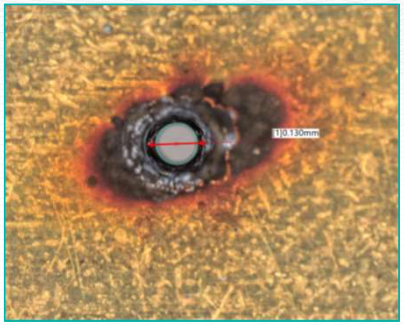
Vacuum Technology Inc.
1003 Alvin Weinberg Drive
Oak Ridge, TN 37830
Phone:(865)481-3342

Accu-Flow Calibrated Leak

Model #: CLP-11-HE-4FVCR-110CC-MFV-SR15
Element : 7740 Pyrex
Fill Gas: Helium
Serial #: 6644
Fill Pressure: 50 Torr
Volume: 110cc

Calibration Data

LR =	2.00×10^{-11}	atm-cc/s	into vac. at 23.8°C
n =	8.20×10^{-16}	mol/s	(± 20.0 %) (k=2)
Depletion Rate:	0.1%	Per Year	
Calibration Date:	Feb 13, 2019	Due:	2/13/2020
Temp Coeff:	4.0%	per °C	



Laser Drill Hole >0.127 mm

Test O2 or He > 3X Background to Validate Gross Leak Test


Helium Leak Testing

Large Area Glass Feedthroughs

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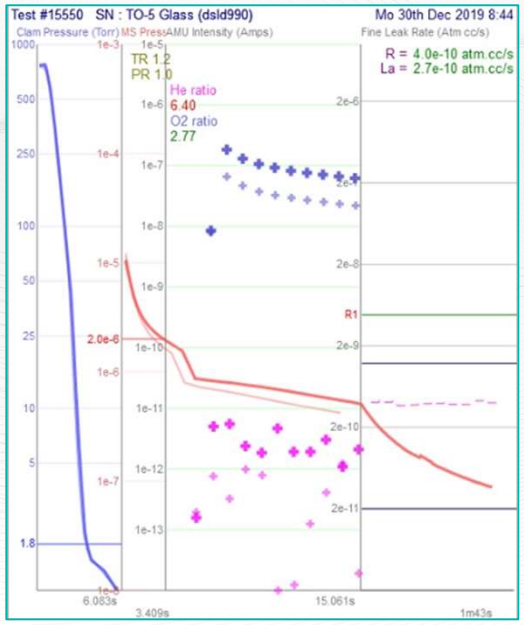
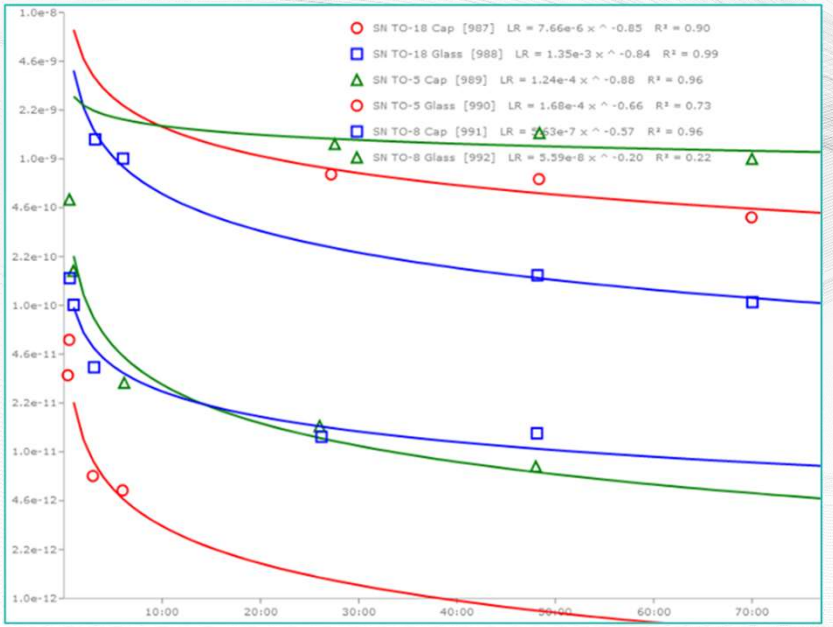
- TO-5 Double Sided Glass Window
- (No Package for Testing) Double Side Glass with 83.72 mm^2 surface area
- Gross and Fine Leak Rates within 24 Hour of He bomb Termination

TO-5 Glass Cap at 70 Hours





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Seam Weld & Seam AuSn Deliverables

0 Gross Leakers & Lowest Leak Rates *Guaranteed!*

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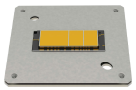
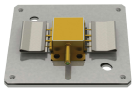
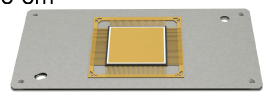
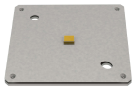
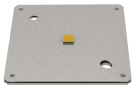
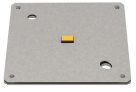
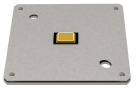
Test Limits for All Fine Leak Methods MIL-STD-883 Method 1014, August 2016		
Internal Free Volume of Package (cm^3)	L Failure Criteria atm-cm^3/sec (air) Hybrid Class H and Monolithic Classes B, S, Q and V	L Failure Criteria atm-cm^3/sec (air) Hybrid K Class only
≤ 0.05 > 0.05 – ≤ 0.4 > 0.4	5×10^{-8} 1×10^{-7} 1×10^{-6}	1×10^{-9} 5×10^{-9} 1×10^{-8}

	Space Seal	MCL Seal
0.42 cm^3 	1E-8 atm-cm^3/sec **Air**	2E-10 atm-cm^3/sec **Air**
0.58 cm^3 	1E-8 atm-cm^3/sec **Air**	4.4E-10 atm-cm^3/sec **Air**
0.68 cm^3 	1E-8 atm-cm^3/sec **Air**	2E-10 atm-cm^3/sec **Air**
6.48 cm^3 	1E-8 atm-cm^3/sec **Air**	1.6E-9 atm-cm^3/sec **Air**
0.05 cm^3 	1E-9 atm-cm^3/sec **Air**	4.4E-10 atm-cm^3/sec **Air**

		Space Seal	MCL Seal
0.0002 cm^3 	80Au20Sn	1E-9 atm-cm^3/sec **Air**	1E-10 atm-cm^3/sec **Air**
0.005 cm^3 	80Au20Sn	1E-9 atm-cm^3/sec **Air**	1E-10 atm-cm^3/sec **Air**
0.008 cm^3 	80Au20Sn	1E-9 atm-cm^3/sec **Air**	1E-10 atm-cm^3/sec **Air**
0.02 cm^3 		1E-9 atm-cm^3/sec **Air**	1E-10 atm-cm^3/sec **Air**
0.05 cm^3 		1E-9 atm-cm^3/sec **Air**	4.8E-10 atm-cm^3/sec **Air**

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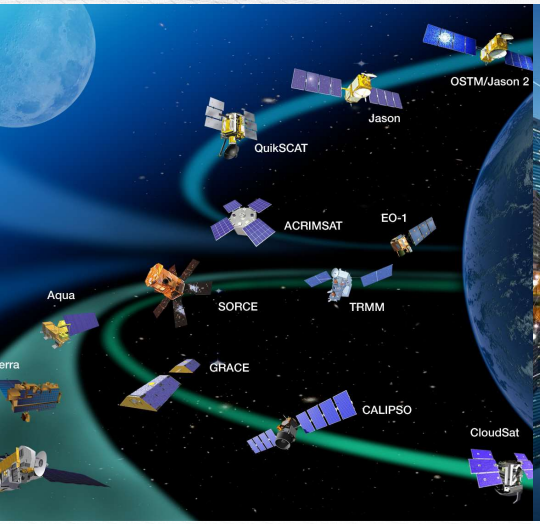
Success is when Customers are delighted!





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