



IGA Database

Organizing IGA Data to See Trends

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With contributions from:

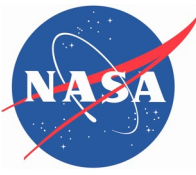
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Acronyms

- CA – Construction Analysis
- DPA – Destructive Physical Analysis
- DUT – Device Under Test
- EEEE – Electrical, Electronic, Electromechanical, and Electro-optical
- EVAL – Evaluation
- EXTVIS – External Visual
- FA – Failure Analysis
- FC – Fluorocarbon
- GSFC – Goddard Space Flight Center
- IGA – Internal Gas Analysis
- NASA – National Aeronautics and Space Administration
- NEPP – NASA Electronics Parts and Packaging
- OCR – Optical Character Recognition
- PPM – Parts Per Million
- PN – Part Number



Internal Gas Analysis overview

- Other names: Residual Gas Analysis/ Internal Vapor Analysis/ MIL-STD-883, method 1018 / MIL-STD-750, method 1018
- Internal Gas Analysis (IGA) is a destructive process used to quantitatively measure the gaseous atmosphere inside hermetic packages.
 - Device Under Test (DUT) is milled to create an opening for the gases to be extracted, which are then analyzed through mass spectrometry.

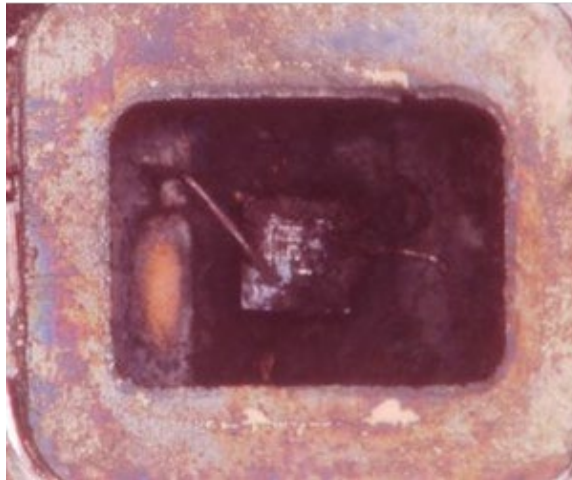
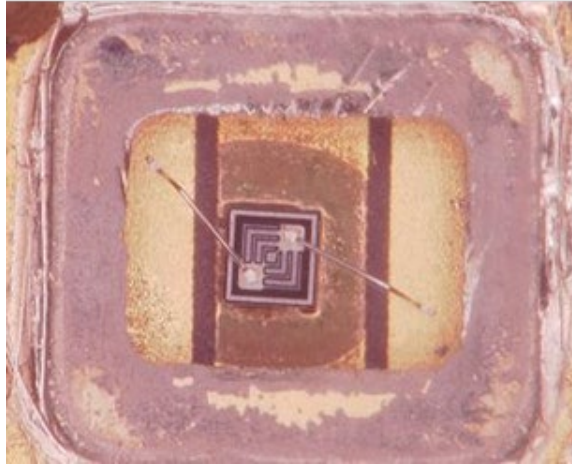
MIL-STD-883-1
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METHOD 1018.10

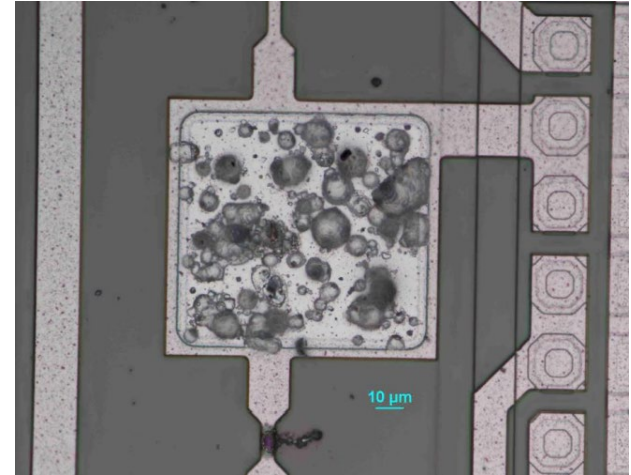
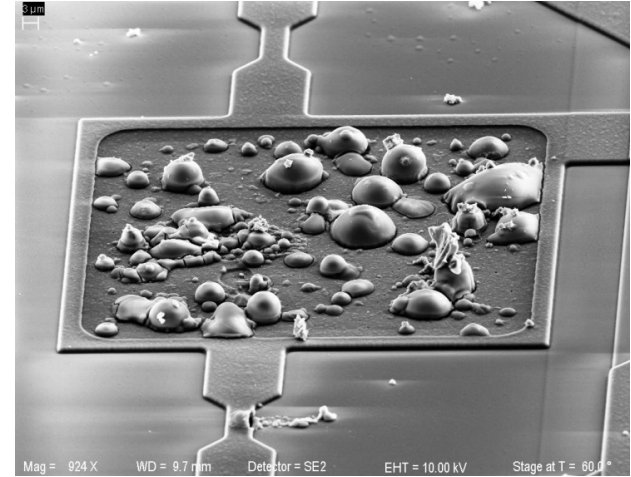
INTERNAL GAS ANALYSIS

1. PURPOSE. The purpose of this test method is to quantitatively measure the gas atmosphere inside a metal or ceramic hermetically-sealed device using mass spectrometry methods. Gases inside hermetically sealed devices can impact device long term reliability. Of particular interest is the measurement of the primary sealing gases (or lack thereof), the moisture content, the presence of bombing gases that are indicative of non-hermeticity (e.g. helium), oxygen to argon ratio indicative of room air ~ 20 to 1 (\pm 10 percent), dissimilar concentration of internally sealed gases (e.g. nitrogen, helium) than originally sealed in the device package, the presence of leak test fluid (i.e. fluorocarbon, helium, air), and all other gases to determine if the device meets the specified moisture, hermeticity and other criteria. Also of interest is the measurement of all the other gases since they reflect upon the quality of the sealing process and provide information about the long term chemical stability of the atmosphere inside the device. This test is destructive. The presence of leak test fluorocarbon vapor in the IGA is an indication of failure to meet leak test requirements of Test Method 1014 of this test method standard.

Example of corrosion in hermetic part cavity due to presence of prohibited gases/moisture.



Package cavity of known good part (top), and part with corrosion due to loss of hermiticity (bottom)

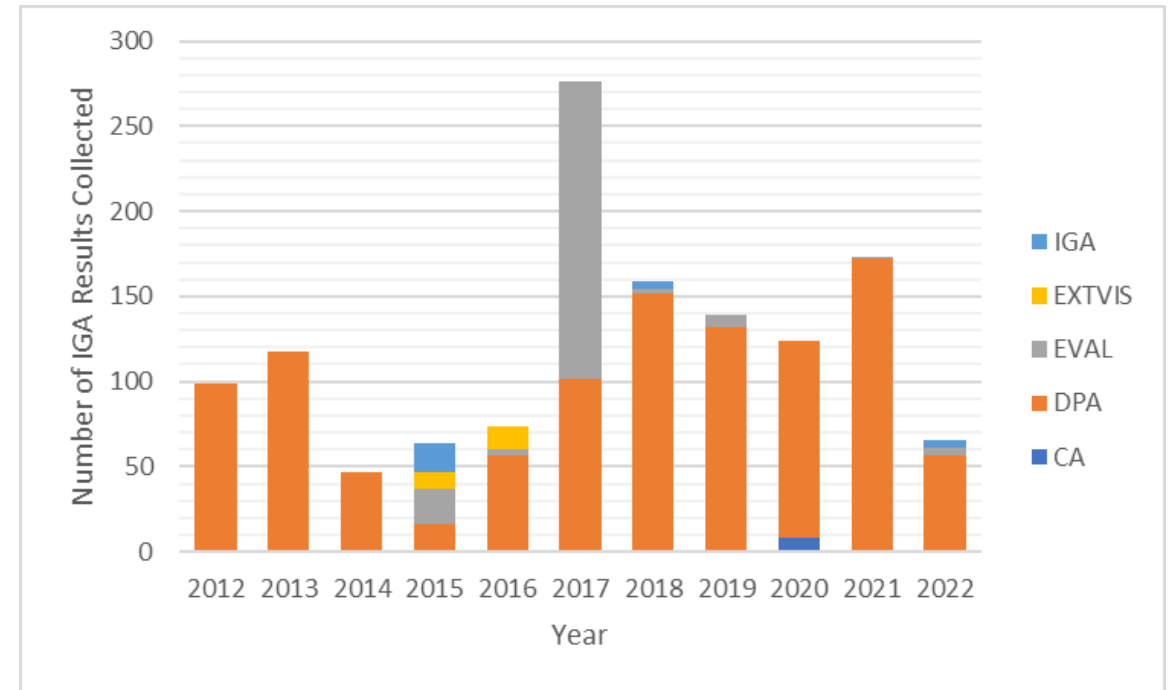


Aluminum pad corrosion in a hermetic device due to moisture ingress



Parts Analysis Lab (PAL)

- PAL provides EEEE parts testing services at NASA GSFC
 - Destructive physical analysis (DPA), failure analysis (FA), incoming test and inspection, screening, qualifications, flight lot acceptance testing, etc.
 - Routinely collect IGA data through testing at outside labs

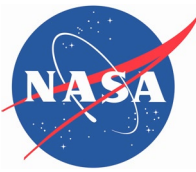


Breakdown of IGA results collected by job type and year



Motivation for the project

- MIL STD failure criteria for IGA
 - 5,000 ppm moisture
 - 10,000 ppm oxygen
 - 50 ppm fluorocarbon
- Pass/fail criteria can be insufficient
 - Analysts need to interpret the IGA results to get a holistic picture
 - Need for historical IGA data as a comparison to interpret results
- Currently, all IGA data are embedded in reports (pdf/word format)
 - No intuitive way to compare multiple IGA results
 - Analysts need to scour reports manually

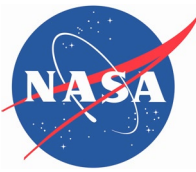


Historical IGA data as a comparison tool for making informed decisions

Scenario: MIL-PRF-38534 Hybrid

- A recent DPA showed fluorocarbon (FC) levels exceeding 50 ppm failure threshold.
 - Normally an indication that parts allowed ingress of leak test fluid during gross leak testing for hermiticity.
- Analyst manually extracted IGA data from past GSFC reports showing a pattern of fluorocarbon levels above 50 ppm for similar part types from this manufacturer.
 - This was not noted as a failure in past reports.
 - Elevated levels of fluorocarbon became a failure criteria relatively recently.
- Manufacturer identified a specific manufacturing step independent of gross leak testing fluid that produces elevated FC levels.
 - Project accepted part for use.

GASSES ANALYZED	(1%=10,000ppm)	(optional)	P/F
	Vol %	LIMIT in %	
1. Hydrogen	0.0000		
2. Helium (3)	0.0000		
3. Helium (4)	7.1321		
4. CH3	0.0554		
5. Water	0.0740	0.5000	PASS
6. Neon (20)	0.0000		
7. Neon (22)	0.0000		
8. Nitrogen	90.3458		
9. Carbon Monoxide	0.0000		
10. Oxygen	0.0447	1.0000	PASS
11. Argon	0.0001		
12. Carbon Dioxide	2.3098		
13. Tot. HC and Org.	0.0348		
14. Fluorocarbons	0.0028	0.0050	PASS
15. NH3	0.0006		
16. Krypton	0.0000		
17. Xenon	0.0000		



Requirements for an IGA database

- Create an interactive IGA database.
 - Easy input of IGA data received from test house.
 - Uploading raw data file from test labs.
 - Manual entering-in of IGA data, if needed.
 - Allow comparison of all historical IGA data for a Manufacturer and/or PN.
 - Highlight anomalies for each gas reading.

	B	C	E	H	I	Q	R	S	T	U	V	W	X	Y	Z	AA
1	TYPE	SN	PARTNO	MFR	PARTTYPE	HYDROG	HELIUM3	HELIUM4	METHANE	WATER	NEON20	NEON22	NITROGEN	CARBONMONO	OXYGEN	ARGON
2	DPA	6	1 A	Microcircuit	148			94,500		80			885,000			238
3	DPA	154	1 A	Microcircuit	175			94,600		55			889,000			239
4	DPA	126	1 A	Microcircuit				85,270		109			873,646			75
5	DPA	72	2 A	Microcircuit				93,111		389			878,308			25
6	DPA	22	2 A	Microcircuit				99,995		322			888,408			24
7	DPA	20	1 A	Microcircuit				99,824		593			887,740			19
8	DPA	44	1 A	Microcircuit				98,461		506			886,507		163	31
9	DPA	35	1 A	Microcircuit		13		95,001		489			886,521			34
10	DPA	50	1 A	Microcircuit		11		91,762		492			889,721			34
11	DPA	12	1 A	Microcircuit		81		109,378		78			870,132			106
12	DPA	6	2 A	Microcircuit				42,534		6,111			811,030		122,769	5,518



Consolidating historical IGA data

- IGA only accepted from certified labs that conduct IGA to MIL-STD-883 and MIL-STD-750 specification
 - Parts analysis lab generally works with multiple labs and they each present data in different ways
 - Some measurements were in percentages, some in PPM, some report more gases than others
- Consolidating data from various sources
 - Some test labs provided the tabulated IGA data from NASA GSFC projects
 - Rest of the IGA data extracted from NASA GSFC Parts Analysis Lab reports
 - Optical Character Recognition (OCR) to extract the meaningful data in an excel format





A look at the IGA database in its current form

NEPP FY23 IGA Test Data Compilation

Parts 1 - 200 of 1,347

Code 562 Parts Lab Detail				IGA Test Result Detail																					
Lab	Job	Type	PartNo	MFR	Part Type	Nitrogen	Oxygen	Argon	CO2	H2O	Hydrogen	Methane	Ammonia	Helium	fluorocar	unk	Methanol	Benzene	Neon20	Neon22	CO	HC+Orgs	Krypton	Xenon	sum
IGALAB1	J12316	DA	PN001	MFR001	Microcircuit, Monolithic	98.0128	0.0049	0.0027	1.7393	0.0021	0.2038	0.0090	0.0083	0.0009	0.0027				0.0000	0.0000	0.0000	0.0126	0.0002	0.0006	99.9999
IGALAB1	J12320	DA	PN002	MFR002	Microcircuit, Hybrid	92.5232	0.0064	0.0222	0.7046	0.4101	0.0000	5.0591	0.2194	0.0007	0.0151				0.0000	0.0000	0.0000	1.0393	0.0000	0.0000	100.0001
IGALAB1	J12321	DA	PN003	MFR002	Microcircuit, Hybrid	96.3722	0.0250	0.0000	0.2553	0.3366	0.0000	2.2513	0.1123	0.0118	0.0068				0.0000	0.0000	0.0000	0.6286	0.0000	0.0000	99.9999
IGALAB1	J12390	DA	PN004	MFR003	Microcircuit, Hybrid	84.4640	0.0577	0.0028	1.9863	0.0189	0.0000	0.1532	0.0046	12.2973	0.0019				0.0000	0.0000	0.0000	0.0133	0.0000	0.0000	100.0000
IGALAB1	J12413	DA	PN005	MFR003	Microcircuit, Hybrid	82.4210	0.0362	0.0008	1.3692	0.0470	0.0000	0.1126	0.0000	15.9887	0.0062				0.0000	0.0000	0.0000	0.0160	0.0023	0.0000	100.0000
IGALAB1	J12414	DA	PN006	MFR003	Microcircuit, Hybrid	83.4647	0.0477	0.0022	0.8507	0.0485	0.0000	0.0981	0.0002	15.4789	0.0016				0.0000	0.0000	0.0000	0.0074	0.0000	0.0000	100.0000
IGALAB1	J12415	DA	PN007	MFR003	Microcircuit, Hybrid	82.3959	0.1108	0.0000	0.7303	0.1181	0.0000	0.1873	0.0000	16.4236	0.0070				0.0000	0.0000	0.0000	0.0269	0.0000	0.0000	99.9999
IGALAB1	J12419	DA	PN008	MFR004	Microcircuit, Monolithic	79.8794	18.7025	0.9449	0.1850	0.2722	0.0000	0.0046	0.0005	0.0008	0.0019				0.0000	0.0000	0.0000	0.0019	0.0000	0.0064	100.0001
IGALAB1	J12420	DA	PN009	MFR004	Microcircuit, Monolithic	99.9565	0.0055	0.0114	0.0080	0.0119	0.0000	0.0027	0.0024	0.0009	0.0002				0.0000	0.0000	0.0000	0.0006	0.0000	0.0000	100.0001
IGALAB1	J12421	DA	PN010	MFR004	Microcircuit, Monolithic	81.4917	17.0294	0.9608	0.1442	0.3502	0.0000	0.0042	0.0017	0.0000	0.0034				0.0000	0.0000	0.0000	0.0032	0.0019	0.0094	100.0001
IGALAB1	J12422	DA	PN011	MFR004	Microcircuit, Monolithic	90.1958	7.9482	0.5654	0.1763	1.0296	0.0000	0.0029	0.0034	0.0074	0.0042				0.0000	0.0032	0.0000	0.0074	0.0084	0.0457	99.9999
IGALAB1	J12439	DA	PN012	MFR004	Microcircuit, Monolithic	78.2766	19.5632	1.0622	0.1825	0.9006	0.0000	0.0041	0.0000	0.0033	0.0007				0.0000	0.0000	0.0000	0.0019	0.0003	0.0046	100.0000
IGALAB1	J12439	DA	PN012	MFR004	Microcircuit, Monolithic	79.4464	19.1682	0.9213	0.1330	0.3261	0.0000	0.0036	0.0000	0.0002	0.0000				0.0000	0.0000	0.0000	0.0011	0.0000	0.0000	99.9999
IGALAB1	J12467	DA	PN013	MFR005	Microcircuit, Hybrid	71.0363	0.4790	0.0512	0.0319	0.0669	0.0000	0.0048	0.0003	28.3266	0.0003				0.0000	0.0000	0.0000	0.0029	0.0000	0.0000	100.0002
IGALAB1	J12486	DA	PN014	MFR004	Microcircuit, Monolithic, PEM	79.0181	19.6683	0.9038	0.1416	0.2627	0.0000	0.0030	0.0000	0.0004	0.0004				0.0000	0.0000	0.0000	0.0019	0.0000	0.0000	100.0002
IGALAB1	J12491	DA	PN015	MFR006	Diode, Optical, Light Emitting D	99.6958	0.0084	0.0035	0.0120	0.0919	0.1767	0.0018	0.0000	0.0095	0.0001				0.0000	0.0000	0.0000	0.0005	0.0000	0.0000	100.0002
IGALAB1	J12492	DA	PN016	MFR006	Diode, Optical, Light Emitting D	99.7362	0.0077	0.0022	0.0081	0.0745	0.1596	0.0017	0.0000	0.0096	0.0000				0.0000	0.0000	0.0000	0.0004	0.0000	0.0000	100.0000
IGALAB1	J12506	DA	PN017	MFR007	Microcircuit, Monolithic	97.4598	0.0285	0.0001	0.0942	0.0967	2.3107	0.0046	0.0012	0.0003	0.0003				0.0000	0.0000	0.0000	0.0036	0.0000	0.0000	100.0000
IGALAB1	J12506	DA	PN017	MFR007	Microcircuit, Monolithic	98.1135	0.0224	0.0005	0.0602	0.0927	1.7031	0.0034	0.0010	0.0004	0.0002				0.0000	0.0000	0.0000	0.0025	0.0000	0.0000	99.9999
IGALAB1	J12506	DA	PN017	MFR007	Microcircuit, Monolithic	96.9168	0.0157	0.0001	0.0935	0.1090	2.8546	0.0046	0.0015	0.0006	0.0002				0.0000	0.0000	0.0000	0.0036	0.0000	0.0000	100.0002
IGALAB1	J12548	DA	PN018	MFR008	Microcircuit, Hybrid	86.6845	0.0011	0.0208	0.0046	0.0057	0.0000	0.0016	0.0007	13.2808	0.0000				0.0000	0.0000	0.0000	0.0003	0.0000	0.0000	100.0001
IGALAB1	J12548	DA	PN018	MFR008	Microcircuit, Hybrid	86.8190	0.0013	0.0215	0.0042	0.0065	0.0000	0.0016	0.0003	13.1452	0.0000				0.0000	0.0000	0.0000	0.0004	0.0000	0.0000	100.0000
IGALAB1	J12549	DA	PN019	MFR005	Microcircuit, Hybrid	82.3951	0.8872	0.0543	0.0377	0.0331	0.2803	0.0035	0.0000	16.2973	0.0013				0.0000	0.0000	0.0000	0.0083	0.0000	0.0000	100.0001
IGALAB1	J12549	DA	PN019	MFR005	Microcircuit, Hybrid	80.5474	7.1190	0.3295	0.0493	0.0844	0.2176	0.0054	0.0000	11.6407	0.0010				0.0000	0.0000	0.0000	0.0057	0.0000	0.0000	100.0000
IGALAB1	J12550	DA	PN020	MFR005	Microcircuit, Hybrid	81.8931	0.0050	0.0188	0.0307	0.0261	0.3745	0.0054	0.0002	17.6395	0.0010				0.0000	0.0000	0.0000	0.0057	0.0000	0.0000	100.0000
IGALAB1	J12550	DA	PN020	MFR005	Microcircuit, Hybrid	82.0466	0.0049	0.0178	0.0365	0.0336	0.4621	0.0054	0.0001	17.3878	0.0007				0.0000	0.0000	0.0000	0.0045	0.0000	0.0000	100.0000
IGALAB1	J12550	DA	PN020	MFR005	Microcircuit, Hybrid	81.0070	5.8369	0.2667	0.0530	0.0841	0.2651	0.0078	0.0000	12.4537	0.0048				0.0000	0.0000	0.0000	0.0208	0.0000	0.0000	99.9999
IGALAB1	J12551	DA	PN014	MFR004	Microcircuit, Monolithic, PEM	80.0982	18.2948	0.8919	0.1616	0.5486	0.0000	0.0032	0.0000	0.0001	0.0002				0.0000	0.0000	0.0000	0.0014	0.0000	0.0000	100.0000
IGALAB1	J12551	DA	PN014	MFR004	Microcircuit, Monolithic, PEM	79.7308	18.8085	0.9108	0.1666	0.3779	0.0000	0.0034	0.0000	0.0001	0.0001				0.0000	0.0000	0.0000	0.0015	0.0000	0.0000	99.9997
IGALAB1	J12552	DA	PN008	MFR004	Microcircuit, Monolithic	79.6563	18.9438	0.9050	0.1743	0.3138	0.0000	0.0053	0.0000	0.0001	0.0001				0.0000	0.0000	0.0000	0.0013	0.0000	0.0000	100.0000
IGALAB1	J12553	DA	PN021	MFR005	Microcircuit, Hybrid	78.1905	0.0029	0.0177	0.0300	0.0509	0.0538	0.0087	0.0000	21.6439	0.0000				0.0000	0.0000	0.0000	0.0016	0.0000	0.0000	100.0000
IGALAB1	J12553	DA	PN021	MFR005	Microcircuit, Hybrid	78.2242	0.0039	0.0172	0.0299	0.0546	0.0297	0.0091	0.0000	21.6298	0.0001				0.0000	0.0000	0.0000	0.0017	0.0000	0.0000	100.0002
IGALAB1	J13011	DA	PN022	MFR003	Microcircuit, Hybrid	86.1427	0.0135	0.0118	2.2589	0.0189	0.0000	0.0607	0.0000	11.4742	0.0016				0.0000	0.0000	0.0000	0.0175	0.0000	0.0000	99.9998
IGALAB1	J13012	DA	PN023	MFR003	Microcircuit, Hybrid	89.9135	0.0154	7.0131	2.9751	0.0133	0.0000	0.0595	0.0000	0.0000	0.0007				0.0000	0.0000	0.0000	0.0093	0.0000	0.0000	99.9999
IGALAB1	J13013	DA	PN024	MFR003	Microcircuit, Hybrid	88.0498	0.0184	0.0000	2.8570	0.0113	0.0000	0.0893	0.0006	8.9560	0.0025				0.0000	0.0000	0.0000	0.0151	0.0000	0.0000	100.0000
IGALAB1	J13014	DA	PN025	MFR003	Microcircuit, Hybrid	90.3558	0.0218	7.4535	2.0328	0.0124	0.0000	0.1053	0.0000	0.0001	0.0015				0.0000	0.0000	0.0000	0.0168	0.0000	0.0000	100.0000
IGALAB1	J13015	DA	PN026	MFR009	Oscillator, Crystal, Quartz (XD)	89.7164	0.0041	0.0071	0.0690	0.0243	0.0000	0.0123	0.0018	10.1500	0.0004				0.0000	0.0000	0.0000	0.0146	0.0000	0.0000	100.0000

Parts 1 - 200 of 1,347

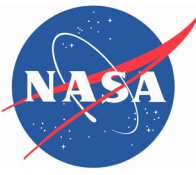
- Aggregate of 10+ years of IGA data from GSFC
- More than 1300 IGA results currently available and growing.



Conditional formatting and filters

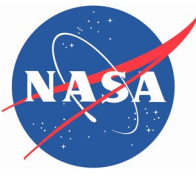
- Filterable by:
 - Manufacturer and Part number
 - IGA test lab, Job number, test type
 - Relevant information used by the Parts Analysis Lab

NEPP FY23 IGA Test Data Compilation																									
Code 562 Parts Lab Detail						IGA Test Result Detail																			
Lab	Job	Type	PartNo	MFR	Part Type	Nitrogen	Oxygen	Argon	CO2	H2O	Hydrogen	Methane	Ammonia	Helium	fluorcarb	unk	Methanol	Benzene	Neon20	Neon22	CO	HC+Orgs	Krypton	Xenon	sum
IGALAB1	J12390	DPA	PN004	MFR003	Microcircuit, Hybrid	84.4640	0.0577	0.0028	1.9863	0.0189	0.0000	0.1532	0.0046	13.2973	0.0019				0.0000	0.0000	0.0000	0.0133	0.0000	0.0000	100.0000
IGALAB1	J12413	DPA	PN005	MFR003	Microcircuit, Hybrid	82.4210	0.0362	0.0008	1.3692	0.0470	0.0000	0.1126	0.0000	15.9887	0.0062				0.0000	0.0000	0.0000	0.0160	0.0023	0.0000	100.0000
IGALAB1	J12414	DPA	PN006	MFR003	Microcircuit, Hybrid	83.4647	0.0477	0.0022	0.8507	0.0485	0.0000	0.0981	0.0002	15.4789	0.0016				0.0000	0.0000	0.0000	0.0074	0.0000	0.0000	100.0000
IGALAB1	J12415	DPA	PN007	MFR003	Microcircuit, Hybrid	82.3959	0.1108	0.0000	0.7303	0.1181	0.0000	0.1873	0.0000	16.4236	0.0070				0.0000	0.0000	0.0000	0.0269	0.0000	0.0000	99.9999
IGALAB1	J13011	DPA	PN022	MFR003	Microcircuit, Hybrid	86.1427	0.0135	0.0118	2.2589	0.0189	0.0000	0.0607	0.0000	11.4742	0.0016				0.0000	0.0000	0.0000	0.0175	0.0000	0.0000	99.9998
IGALAB1	J13012	DPA	PN023	MFR003	Microcircuit, Hybrid	89.9135	0.0154	7.0131	2.9751	0.0133	0.0000	0.0595	0.0000	0.0000	0.0007				0.0000	0.0000	0.0000	0.0093	0.0000	0.0000	99.9999
IGALAB1	J13013	DPA	PN024	MFR003	Microcircuit, Hybrid	88.0498	0.0184	0.0000	2.8570	0.0113	0.0000	0.0893	0.0006	8.9560	0.0025				0.0000	0.0000	0.0000	0.0151	0.0000	0.0000	100.0000
IGALAB1	J13014	DPA	PN025	MFR003	Microcircuit, Hybrid	90.3558	0.0218	7.4935	2.0328	0.0124	0.0000	0.1053	0.0000	0.0001	0.0015				0.0000	0.0000	0.0000	0.0168	0.0000	0.0000	100.0000
IGALAB1	J13016	DPA	PN027	MFR003	Microcircuit, Hybrid	87.0441	0.0095	0.0058	2.2671	0.0063	0.0000	0.1016	0.0014	10.5542	0.0005				0.0000	0.0000	0.0000	0.0096	0.0000	0.0000	100.0001
IGALAB1	J13021	DPA	PN028	MFR003	Microcircuit, Hybrid	88.4092	3.0285	0.2126	2.0332	0.2069	0.0000	0.0937	0.0000	5.9526	0.0526				0.0000	0.0000	0.0000	0.0107	0.0000	0.0000	100.0000
IGALAB1	J13022	DPA	PN029	MFR003	Microcircuit, Hybrid	91.3667	0.0162	6.7684	1.7517	0.0087	0.0000	0.0802	0.0002	0.0000	0.0003				0.0000	0.0000	0.0000	0.0076	0.0000	0.0000	100.0000
IGALAB1	J13092	DPA	PN033	MFR003	Microcircuit, Hybrid	84.1290	0.0123	0.0285	3.7306	0.0099	0.0000	0.1090	0.0007	11.9647	0.0012				0.0000	0.0000	0.0000	0.0140	0.0000	0.0000	99.9999
IGALAB1	J13097	DPA	PN035	MFR003	Microcircuit, Hybrid	83.2324	0.0221	0.0008	2.1571	0.0253	0.0000	0.0867	0.0001	14.4308	0.0043				0.0000	0.0000	0.0000	0.0404	0.0000	0.0000	100.0000
IGALAB1	J14256	DPA	PN185	MFR003	Microcircuit, Hybrid	91.1583	0.0199	0.0000	1.9731	0.0162	0.0000	0.0219	0.0002	6.7730	0.0040				0.0000	0.0000	0.0000	0.0335	0.0000	0.0000	100.0001
						86.6105	0.2450	1.5357	2.0695	0.0401	0.0000	0.0971	0.0006	9.3782	0.0061	null	null	null	0.0000	0.0000	0.0000	0.0170	0.0002	0.0000	100.0000



Comparisons of multiple IGA results can be made quickly on one interface

PartNo	MFR	Part Type	Nitrogen	Oxygen	Argon	CO2	H2O	Hydrogen	Methane	Ammonia	Helium	fluorocarb
×	MFR003	×										
PN004	MFR003	Microcircuit, Hybrid	84.4640	0.0577	0.0028	1.9863	0.0189	0.0000	0.1532	0.0046	13.2973	0.0019
PN005	MFR003	Microcircuit, Hybrid	82.4210	0.0362	0.0008	1.3692	0.0470	0.0000	0.1126	0.0000	15.9887	0.0062
PN006	MFR003	Microcircuit, Hybrid	83.4647	0.0477	0.0022	0.8507	0.0485	0.0000	0.0981	0.0002	15.4789	0.0016
PN007	MFR003	Microcircuit, Hybrid	82.3959	0.1108	0.0000	0.7303	0.1181	0.0000	0.1873	0.0000	16.4236	0.0070
PN022	MFR003	Microcircuit, Hybrid	86.1427	0.0135	0.0118	2.2589	0.0189	0.0000	0.0607	0.0000	11.4742	0.0016
PN023	MFR003	Microcircuit, Hybrid	89.9135	0.0154	7.0131	2.9751	0.0133	0.0000	0.0595	0.0000	0.0000	0.0007
PN024	MFR003	Microcircuit, Hybrid	88.0498	0.0184	0.0000	2.8570	0.0113	0.0000	0.0893	0.0006	8.9560	0.0025
PN025	MFR003	Microcircuit, Hybrid	90.3558	0.0218	7.4535	2.0328	0.0124	0.0000	0.1053	0.0000	0.0001	0.0015
PN027	MFR003	Microcircuit, Hybrid	87.0441	0.0095	0.0058	2.2671	0.0063	0.0000	0.1016	0.0014	10.5542	0.0005
PN028	MFR003	Microcircuit, Hybrid	88.4092	3.0285	0.2126	2.0332	0.2069	0.0000	0.0937	0.0000	5.9526	0.0526
PN029	MFR003	Microcircuit, Hybrid	91.3667	0.0162	6.7684	1.7517	0.0087	0.0000	0.0802	0.0002	0.0000	0.0003
PN033	MFR003	Microcircuit, Hybrid	84.1290	0.0123	0.0285	3.7306	0.0099	0.0000	0.1090	0.0007	11.9647	0.0012
PN035	MFR003	Microcircuit, Hybrid	83.2324	0.0221	0.0008	2.1571	0.0253	0.0000	0.0867	0.0001	14.4308	0.0043
PN185	MFR003	Microcircuit, Hybrid	91.1583	0.0199	0.0000	1.9731	0.0162	0.0000	0.0219	0.0002	6.7730	0.0040



Concluding remarks

- Successfully developed an Internal Gas Analysis database
 - Analysts can efficiently access data from multiple reports, saving time and effort.
 - Instantly compares IGA data across various reports, allowing to identify patterns and anomalies and aiding in decision making for projects.
- Future improvements to the database
 - Improve input of new data from different test labs
 - Add Oxygen: Argon ratio
 - Indicative of room air ingress into part
 - Allow additional sorting and color options
- Database will be accessible to all NASA centers
 - We invite and encourage you to contribute your IGA data to the database.
 - Please contact our team to learn how to get access.
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