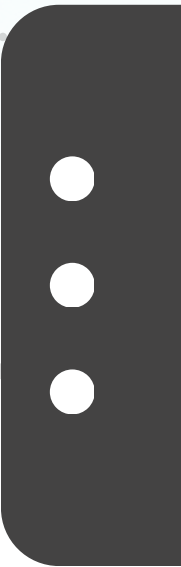
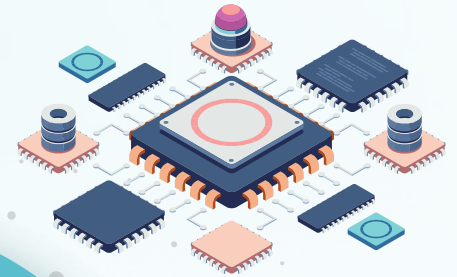
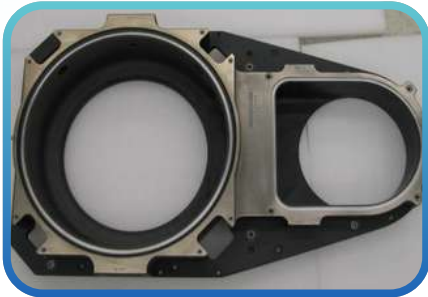




A Company of Japan Material Group

ALDON TECHNOLOGIES SERVICES PTE LTD

Anodization Technology



Aldon Proprietary Information



A Company of Japan Material Group

ALDON TECHNOLOGIES SERVICES PTE LTD

Anodization

- Tank Capacity :
2.0m(L)x1.0m(W)x1.8m(H)
- Fully automated anodizing line for consistent and reliable process
- Capable of performing sealed Sulphuricanodize and Oxalic anodize

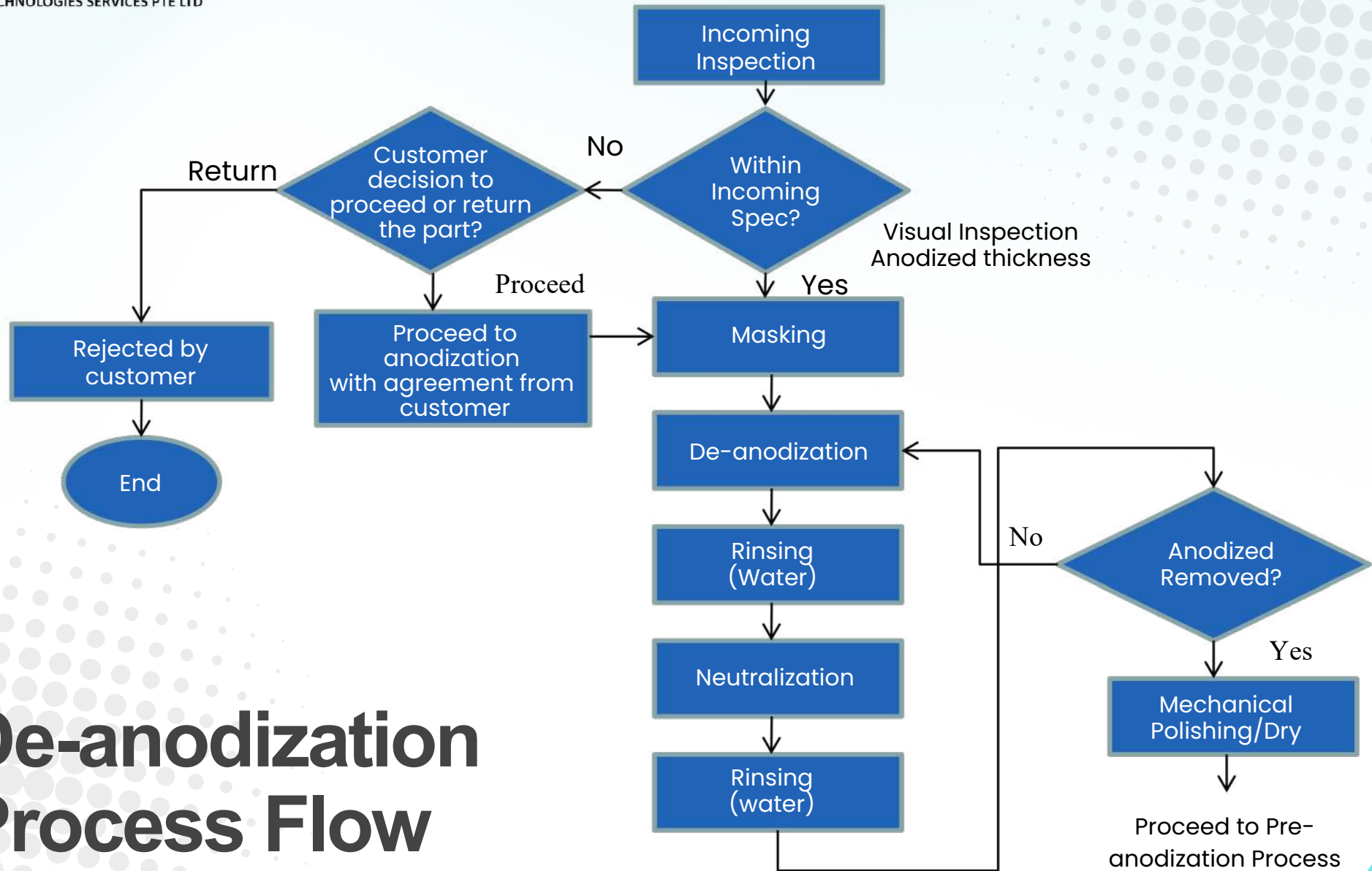
Aldon Proprietary Information





A Company of Japan Material Group

ALDON TECHNOLOGIES SERVICES PTE LTD



De-anodization Process Flow

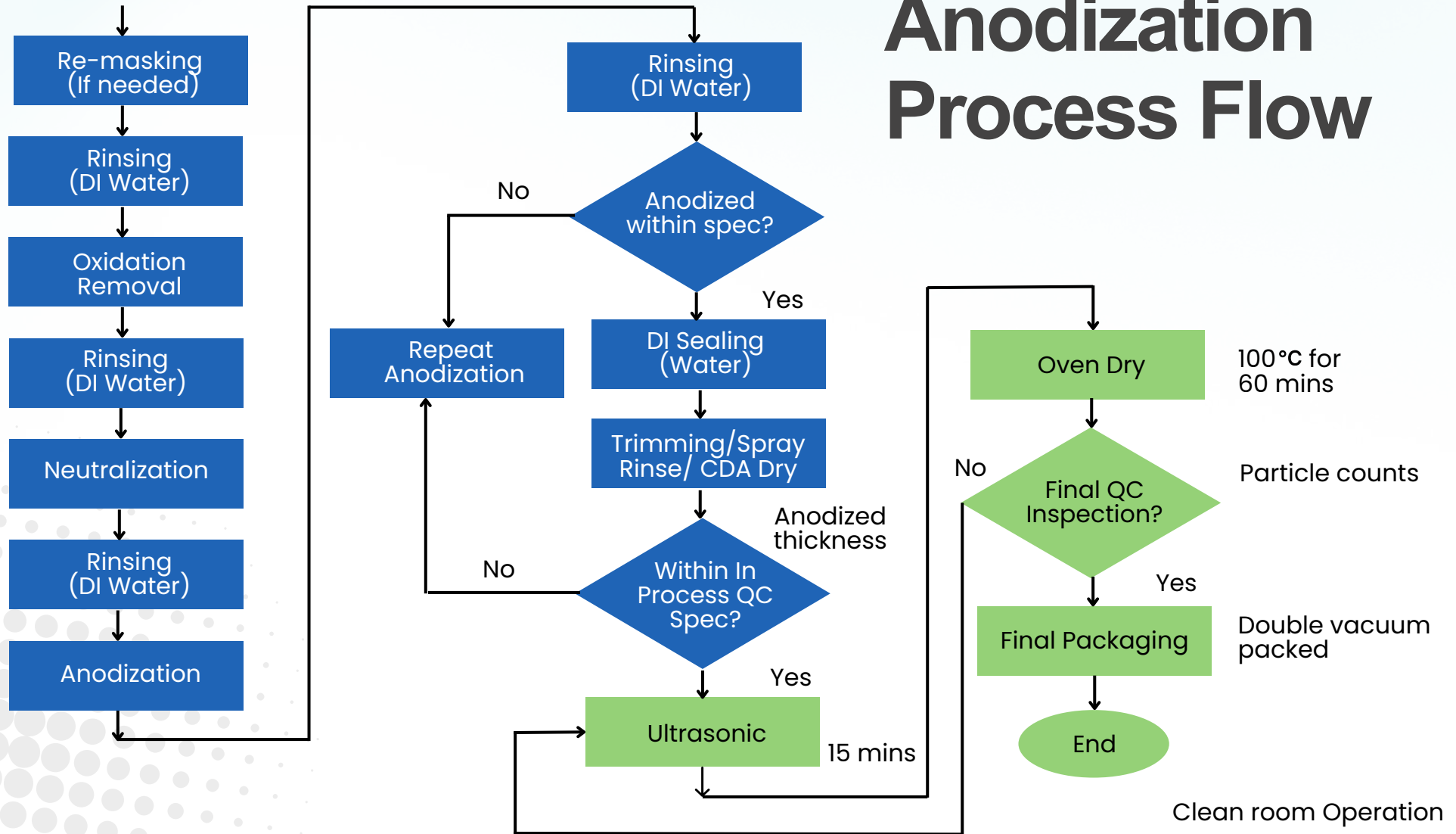
Aldon Proprietary Information



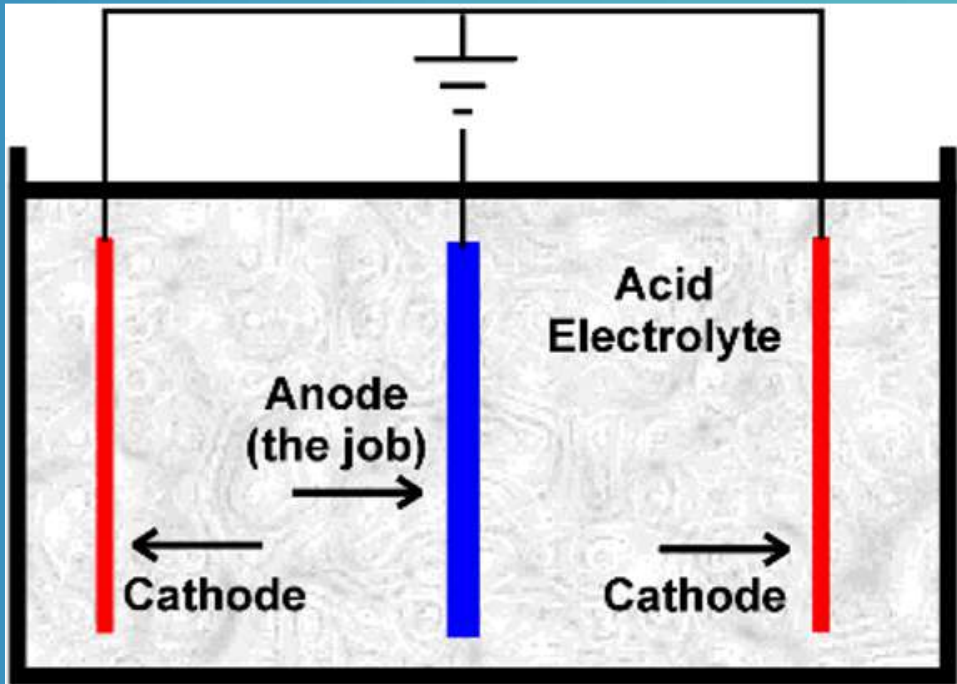
A Company of Japan Material Group

ALDON TECHNOLOGIES SERVICES PTE LTD

Anodization Process Flow



Anodization Process



- Anodizing is achieved by immersing the aluminum workpiece into an electrolytic bath and with passing through an electric current.
- A cathode is mounted to the inside of the anodizing tank.
- The aluminium workpiece acts as an anode.
- The current releases hydrogen at the cathode (the negative electrode) and oxygen at the surface of the aluminium anode, creating a build-up of aluminium oxide



A Company of Japan Material Group

ALDON TECHNOLOGIES SERVICES PTE LTD

Anodization Process

- Oxygen from the electrolysis of water reacts with surface aluminum.
- $2\text{H}_2\text{O}_2 + \text{Electrons} \rightarrow \text{O}_2 + 2\text{H}_2$
- $4\text{Al (Aluminium)} + 3\text{O}_2 \text{ (Oxygen)} \rightarrow 2\text{Al}_2\text{O}_3$
Aluminium Oxide
- As Al atoms are extracted from the surface of Al workpiece, pore-like pits are formed.
- The surfaces of these pits are very reactive due to the availability of electrons for bonding.
- The in-processing forming Al_2O_3 with electrons, bonds with metal surface to form a stable structure.



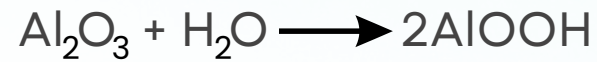
A Company of Japan Material Group

ALDON TECHNOLOGIES SERVICES PTE LTD

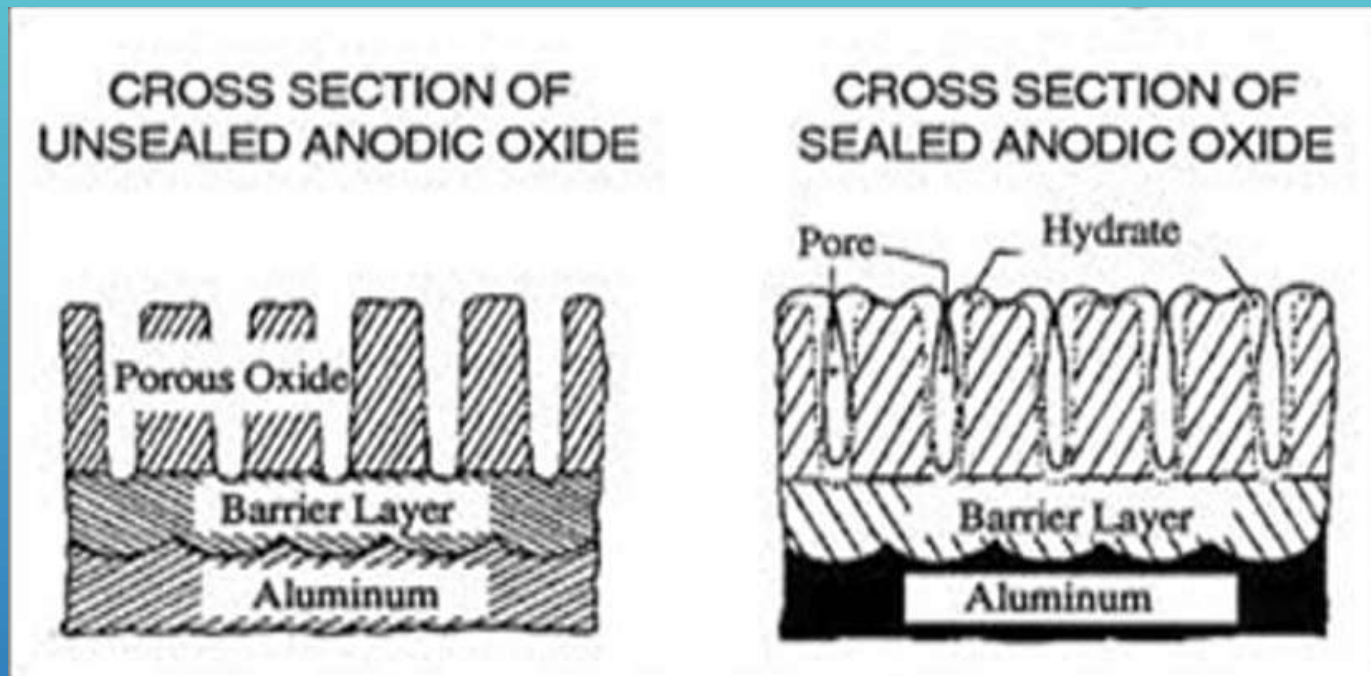
DI Sealing

- In hot DI sealing, the part is immersed into hot DI water (Spec: 95-105°C)
- The anodized coating (Aluminum oxide, Al_2O_3) are made up of small pores.
- Hot DI sealing converts the aluminum oxide in the pores to hydrated aluminum oxide (Boehmite) which is a larger molecule and fills up the pore with hydrated aluminum oxide.
- Hot DI water seal is often used for which low particle contamination is important.

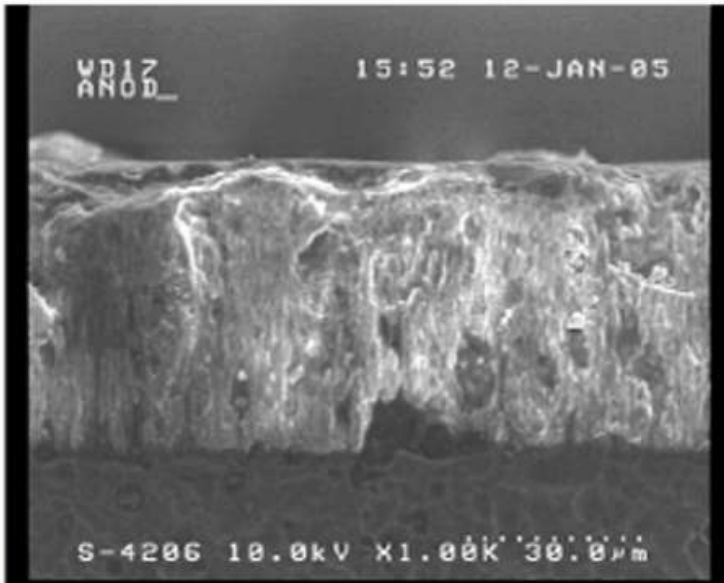
DI Sealing



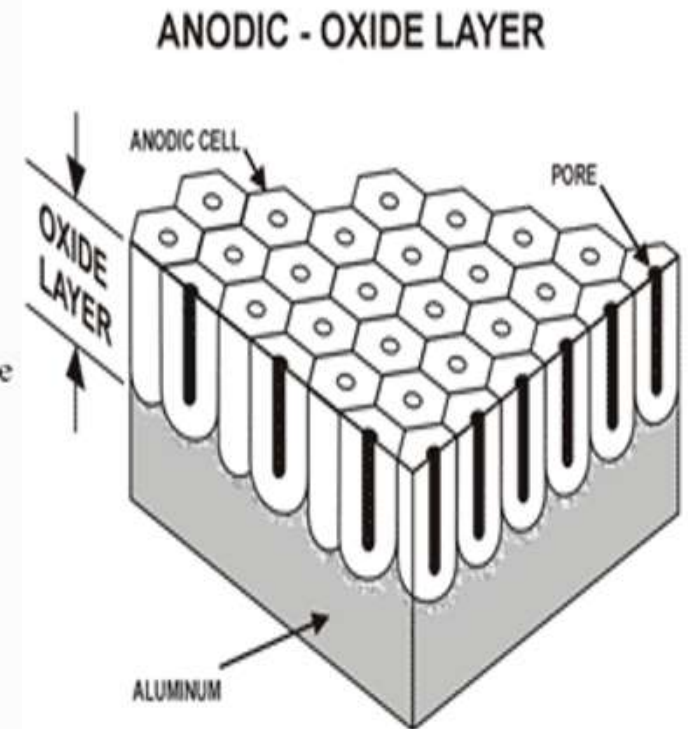
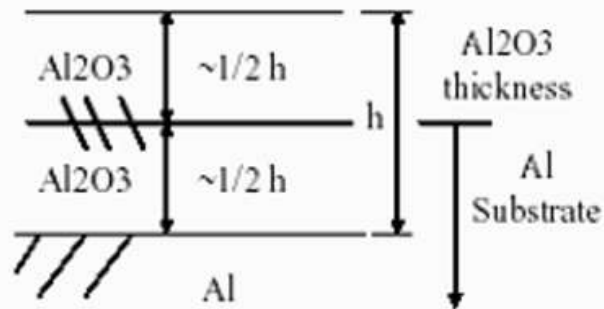
- Below depicts DI water sealing of anodic oxide coating.



Microstructure of Anodization Layer



SEM





A Company of Japan Material Group

ALDON TECHNOLOGIES SERVICES PTE LTD

Anodization Properties

**Insulation
Resistance**

**Particle
Control**

**Wear
Resistance**

**Temperature
Resistance**

**Corrosion
Resistance**

**Aesthetic
Effect**



A Company of Japan Material Group
ALDON TECHNOLOGIES SERVICES PTE LTD

Anodization General Specifications

TYPICAL ANODIZATION SPEC. FOR SEMI-CONDUCTOR APPLICATION						
Type	Process Temp	Electrolyte	Film Thickness mm	Breakdown Voltage	Colour	Application in Process Kits
2	15-20 °C	Sulphuric Acid	0.005-0.01	>300VDC	Light Grey	• CVD Shower Head • Cooling Plate • Hi Temp Isolation Sheet Shield
3.1 Hardcoat	-5-0 °C	Sulphuric Acid	0.05-0.01	>1,000VDC	Almost Black	• Electrode • Clamp Ring • Chamber Liner • Upper Chamber • General Application
3.2 Hardcoat	15-20 °C	Oxalic Acid	0.02-0.03	>1,000VDC	Yellowish Grey	• GDP • Susceptor • Chamber Liner



A Company of Japan Material Group

ALDON TECHNOLOGIES SERVICES PTE LTD

Anodization Technology Applications

**Semi-
conductor &
Flat Panel (LCD)
improvement**

Aviation Parts

**Clean-Energy
(Solar)**

**Oil/Gas and
Petro-chemical
repair**

**Repair and
Overhaul**

**Coating to
Customer's
Requirements**



A Company of Japan Material Group
ALDON TECHNOLOGIES SERVICES PTE LTD

ATS Recommendations

- Majority of the parts fall in anodization thickness range of 50-60um
- Able to withstand breakdown voltage of 1000 VDC.

- Recommended limit to refurbishment: 3 times (subject to customer)
- Recommended minimum part thickness for processing: 1mm



A Company of Japan Material Group
ALDON TECHNOLOGIES SERVICES PTE LTD

ATS Quality Management

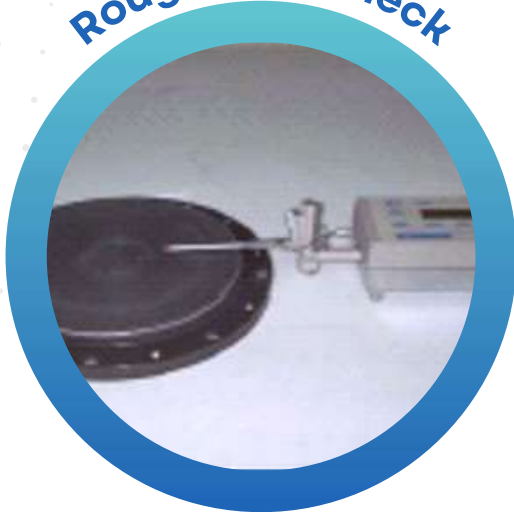
Coating Thickness Meter



Breakdown Voltage



Roughness Check



Clean-room Assembly



Vacuum Packing



Aldon Proprietary Information



A Company of Japan Material Group
ALDON TECHNOLOGIES SERVICES PTE LTD

Incoming QC Inspection Report

A Company of Aldon Group			Incoming Inspection Report Anodize & Y2O3 Coating			Ref No: JOA1802282-02A 									
Part No.		0041-12166		Serial No.		300911N-1310-0030		Customer				Module		AMAT Parts	
Name		Wall Liner		EGP No.		2018028278		Date In (yyyymmdd)		20181001		Date Out (yyyymmdd)			
Check Point	Anodizing Thk (μm)	Y2O3 Thk (μm)	Pictures & illustrations:												
Spec	Ref only	Ref only													
1															
2															
3															
4															
5															
6															
7															
8															
9															
10															
11															
12															
13															
14															
15															
Min.															
Max.															
Avg.															
Notes:															
Insp. Result		ACCEPT													
Inspected by		Li Ting													
Reviewed by		ADAM													
Y0041-12166-s300911N-1310-0030-d20181001-JOA1802282-02A															

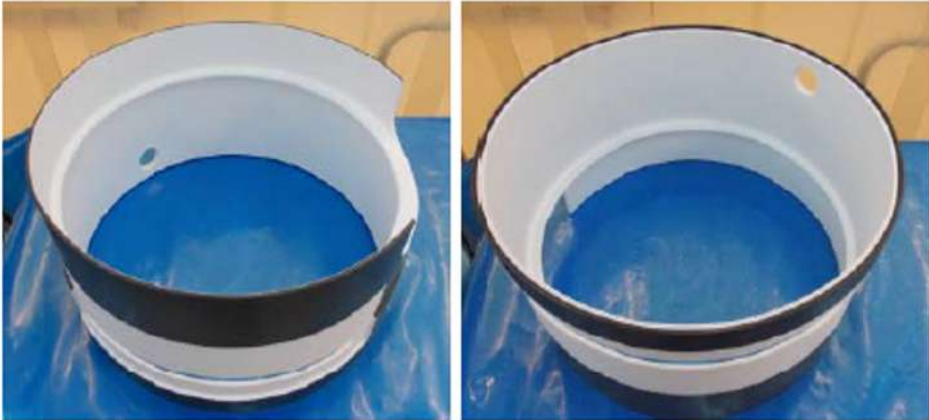
Visual Inspection	
	Scratches
	Dents
	Cracks
	Chips / Peel off
X	Stains
X	Anodized coating damage
	No Abnormalities Found



A Company of Japan Material Group

ALDON TECHNOLOGIES SERVICES PTE LTD

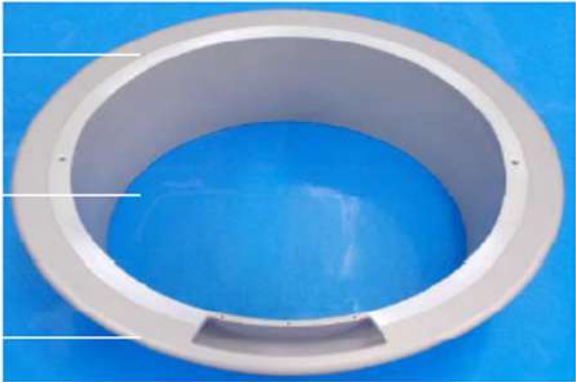
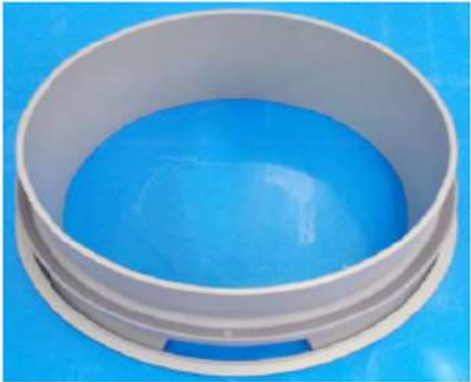
Final QC Inspection Report

ATS A Company of Alden Group		Final Inspection Report Anodize & Y2O3 Coating			Ref No: JOA1802282-02A	
Part No.	0041-12166	Serial No.	300911N-1310-0030	Customer	[Redacted]	
Name	Wall Liner	EGP No.	2018028278	Date In (yyyymmdd)	20181001	Date Out (yyyymmdd)
					20181001	20181008
Check Point	Anodizing Thk. (μm)	Y2O3 Thk (μm)	Pictures & illustrations:			
Spec	Ref only	200 / ± 30				
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						
11						
12						
13						
14						
15						
Min.						
Max.						
Avg.						
Surface Roughness (Ra 3.5 - 5.5 μm)			Notes:			
Surface Particle <5 cnt/cm² @ >0.3μm						
Insp. Result	ACCEPT					
Inspected by	Li Ting					
Reviewed by	ADAM					
						
Y0041-12166-s300911N-1310-0030-d20181001-JOA1802282-02A						

Visual Inspection	
	Scratches
	Dents
	Cracks
	Chips
	Stains
	Anodized coating damage
X	No Abnormalities Found

Aldon Proprietary Information

Final QC Inspection Report

 A Company of Alden Group		Final Inspection Report Anodized Coating			Ref No:		JOA1900003-01	
								
Part No.	0040-02609	Serial No.	119423-038	Customer			Module	Super E
Name	CATHODE LINER	GP No.	PMT-18-12-5600	Date In (yyyymmdd)	20190102	Date Out (yyyymmdd)	20190103	
Check Point Spec	Pictures & illustrations:							
	  							
Min.								
Max.								
Avg.								
Surface Roughness (Ra >50 μ-inch)								
Surface Particle <5 cnt/cm² @>0.3μm								
Insp. Result	ACCEPT							
Inspected by	Li Ting							
Reviewed by	ADAM							
		Notes:						
		Visual Inspection						
		Scratches						
		Dents						
		Chips/Peel off						
		Stains						
		Anodized coating damage						
		X	No Abnormalities Found					
								
A0040-02609-s119423-038-d20190102-JOA1900003-01								



A Company of Japan Material Group
ALDON TECHNOLOGIES SERVICES PTE LTD

Typical Parts Lists (Brand New or Refurbishment)

**TEL Tools
Chamber Parts**

**LAM Tools
Chamber Parts**

**AMAT Tools
Chamber Parts**

**AMEC Tools
Chamber Parts**

**LCD TEL Etcher
Chamber Wall
Parts**

**Ability to tailor
made and
anodize
according to
customer's
requirements**



A Company of Japan Material Group
ALDON TECHNOLOGIES SERVICES PTE LTD

ATS Quality Management

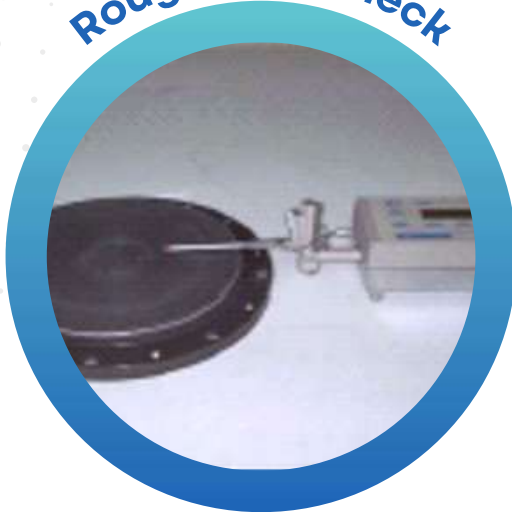
Coating Thickness Meter



Breakdown Voltage



Roughness Check



Clean-room Assembly



Vacuum Packing



Aldon Proprietary Information

Some Parts List – Anodization Parts (Sulphuric Anodization)

AMAT DPS

Item	Picture	Module	OEM P/N	Description	Tools	Material
1		ETCH	0040-02544	DPS UPPER CHAMBER	DPS	Metal, Aluminum
2		ETCH	0021-01421	Chamber,upper, DPS	DPS-Metal	Metal, Aluminum
3		ETCH	0040-52662	DPS UPPER CHAMBER	DPS	Metal, Aluminum



A Company of Japan Material Group
ALDON TECHNOLOGIES SERVICES PTE LTD

Some Parts List – Anodization Parts (Sulphuric Anodization)

AMAT DPS-II

Item	Picture	Module	OEM P/N	Description	Tools	Material
1		ETCH	0021-19030 0021-26274	SCREEN, PHM	DPS II	Metal, Aluminum
2		ETCH	0021-13430 0021-26273	CATHODE LINER	DPS II	Metal, Aluminum
3		ETCH	0040-46003 0040-81158	LOWER CHAMBER LINER, PHM	DPS II	Metal, Aluminum
4		ETCH	0040-43977 0040-81155	LOWER CHAMBER LINER	DPS II	Metal, Aluminum
5		ETCH	0040-41703 0040-81165	SLIT VALVE DOOR	DPS II	Metal, Aluminum
6		ETCH	0040-63668 0040-41703	SLIT VALVE DOOR	DPS II	Metal, Aluminum
7		ETCH	0040-81156	UPPER CHAMBER LINER	DPS II	Metal, Aluminum
8		ETCH	0020-13660	HOOP SHADOW RING, PHM	DPS II	Metal, Aluminum

Some Parts List – Anodization Parts (Oxalic Anodization)

AMAT e-MAX (200)

Item	Picture	Module	OEM P/N	Description	Tools	Material
1		ETCH	0040-50414	DOOR, SLIT VALVE, WAFFLE-LESS, 200MM E-M	200eMAX	Metal, Aluminum
2		ETCH	0021-14960	DOOR, SLIT VALVE, WAFFLE-LESS, 200MM E-M	200eMAX	Metal, Aluminum
3		ETCH	0040-34866	LINER, CATHODE, MAG RING, WAFFEL-LESS, D	200eMAX	Metal, Aluminum
4		ETCH	0040-34865	LINER, DGDP, CHAMBER, WAFFLE-LESS, 200MM	200eMAX	Metal, Aluminum



A Company of Japan Material Group
ALDON TECHNOLOGIES SERVICES PTE LTD

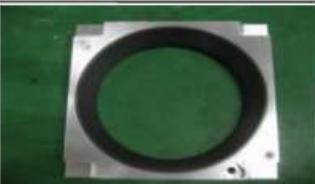
Some Parts List – Anodization Parts (Oxalic Anodization)

AMAT MxP & SUPER-e

Item	Picture	Module	OEM P/N	Description	Tools	Material
1		ETCH	0010-30057	ASSEMBLY, CATHODE LINER, MXP+	MxP+, Super E	Metal, Aluminum
2		ETCH	0021-10223	LINER, CHAMBER, CLAMP LID	MxP+, Super E	Metal, Aluminum
3		ETCH	0021-09104	LINER, CATHODE, ALIGNED, OXIDE ETCH	MxP+, Super E	Metal, Aluminum
4		ETCH	0040-33998	LINER, SLIT LINER DOOR	MxP+, Super E	Metal, Aluminum
5		ETCH	0020-19003	INSERT, SLIT VALVE SHO	MxP+, Super E	Metal, Aluminum
6		ETCH	0020-34694 0020-34695	LINER, CHAMBER LINER, CATHODE	MxP+, Super E	Metal, Aluminum

Some Parts List – Anodization Parts (Sulphuric Anodization)

LAM 2300

Item	Picture	Module	OEM P/N	Description	Tools	Material
1		ETCH	796-098655-002	GDP, TOP COVER	Lam2300	Metal, Aluminum
2		ETCH	796-098654-002	GDP, RING	Lam2300	Metal, Aluminum
3		ETCH	715-801916-008	Chamber Liner	Lam2300	Metal, Aluminum
4		ETCH	715-801916-008	GDP	Lam2300	Metal, Aluminum
5		ETCH	715-801021-838	Chamber Liner	Lam2300	Metal, Aluminum

Some Parts List – Anodization Parts (Sulphuric Anodization)

TEL DRM

Item	Picture	Module	OEM P/N	Description	Tools	Material
1		ETCH	1D10-101475-11	Baffle Plate	TEL DRM	Metal, Aluminum
2		ETCH	1D10-101551-11	Baffle Plate / IBM	TEL DRM	Metal, Aluminum
3		ETCH	1D10-303124-21	Shield Depo	TEL DRM	Metal, Aluminum



A Company of Japan Material Group
ALDON TECHNOLOGIES SERVICES PTE LTD

Some Parts List – Anodized with Y_2O_3 Parts

AMAT & LAM (300mm)

ITEM	OEM Part #	DESCRIPTION	MATERIAL	PHOTOS
1	0021-17015	CATHODE SLEEVE	Al, partial coated Y2O3	
2	0040-99548	CHAMBER LINER LEFT	Al, partial coated Y2O3	
3	0040-99549	CHAMBER LINER RIGHT	Al, partial coated Y2O3	
4	0021-27883	SLIT DOOR ASSY	Al, partial coated Y2O3	