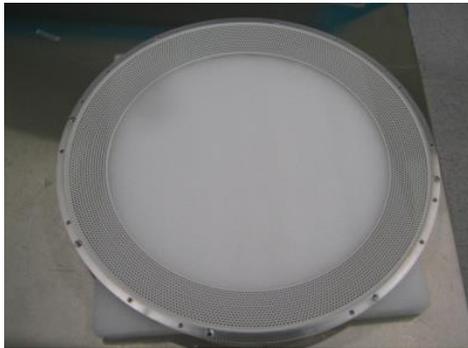




ALDON TECHNOLOGIES SERVICES PTE LTD



Y_2O_3 Plasma Coating



Aldon Proprietary Information



ALDON TECHNOLOGIES SERVICES PTE LTD

Introduction

ALDON is proud to present our Y_2O_3 plasma coating capability and service to our customers. Our continuous drive is to satisfy above and beyond our customers' needs with our excellent quality and undisputed services and full adaptability to meet all requirement. Our Y_2O_3 plasma coating service is an example of how we constantly strive to bring value added technology and develop integrated products and service solutions to improve customer's yield and throughput.



Aldon Proprietary Information

What is Plasma Spray Coating

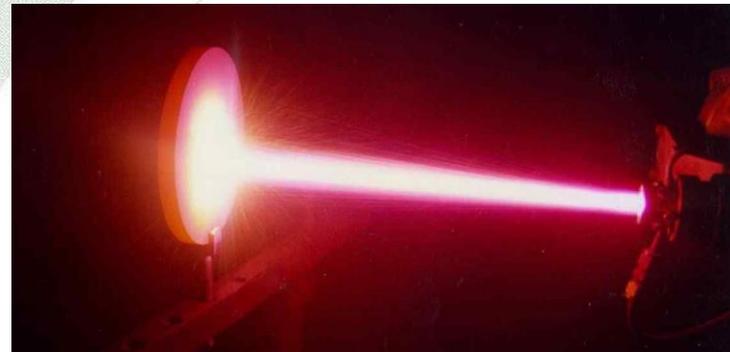
Plasma Spray Coating – A process in which a heat source transforms metallic or non-metallic materials into a spray of molten or semi-molten particles that are deposited onto metal substrates.

ALDON Plasma Spray

- Capable of spraying Aluminium, Tungsten Carbide, Al₂O₃, Y₂O₃ etc coating material. Working dimensions 2.0m (L) x 1.5m (W) for automated process.
- Automated robotic arm spraying to ensure consistent and reliable process.



Automated Robotic Arm



Plasma Coating Spraying Illustration

Yttrium Oxide (Y_2O_3)

Below is additional information of Y_2O_3 material:

Yttrium oxide, also known as yttria, is Y_2O_3 . It is an air-stable, white solid substance. Yttrium oxide, commonly used as starting material for both materials science as well as inorganic compounds.

Purity : 99.95% - 99.99%

Molar mass: 225.81 g/mol

Density: 5.01 g/cm³

Melting point: 2,425 °C

Boiling point: 4,300 °C



Advantages Of ALDON Plasma Spray (Y_2O_3 Coating)

- Better particle control in etch chamber.
- Electrical insulation more superior than to just anodization.
- Higher deposition rate which results in lesser heat and stress applied to the metal parts which will not cause any damages to the parts.
- More superior hardness which improves MTBC and recycle time.
- Higher grade and more superior quality of material used.
- Better bonding strength which will not result to crack, peeling and flaking problem.
- Cost savings. Recoat is cheaper than buying new parts.
- Localization of services will shorten the leadtime, our best support will be provided, and cost savings will be passed on to customers.
- Environment friendly.



ALDON TECHNOLOGIES SERVICES PTE LTD

Plasma Spray Specification

- Specs ensures proper coverage of surface; too thick will result in easy peeling.
- Thickness requirement monitoring in-placed during coating and outgoing QA inspection.
- Custom Spray available according to Customer Requirements

Challenges / Limitations

- Manual spraying is adopted for hard to reach areas.
- As this is a line of sight process, there is limitation in coating deep and small diameter holes, parts with tight spaces.
- Parts must be handled with care to avoid coating chip off due to struck by hard objects.

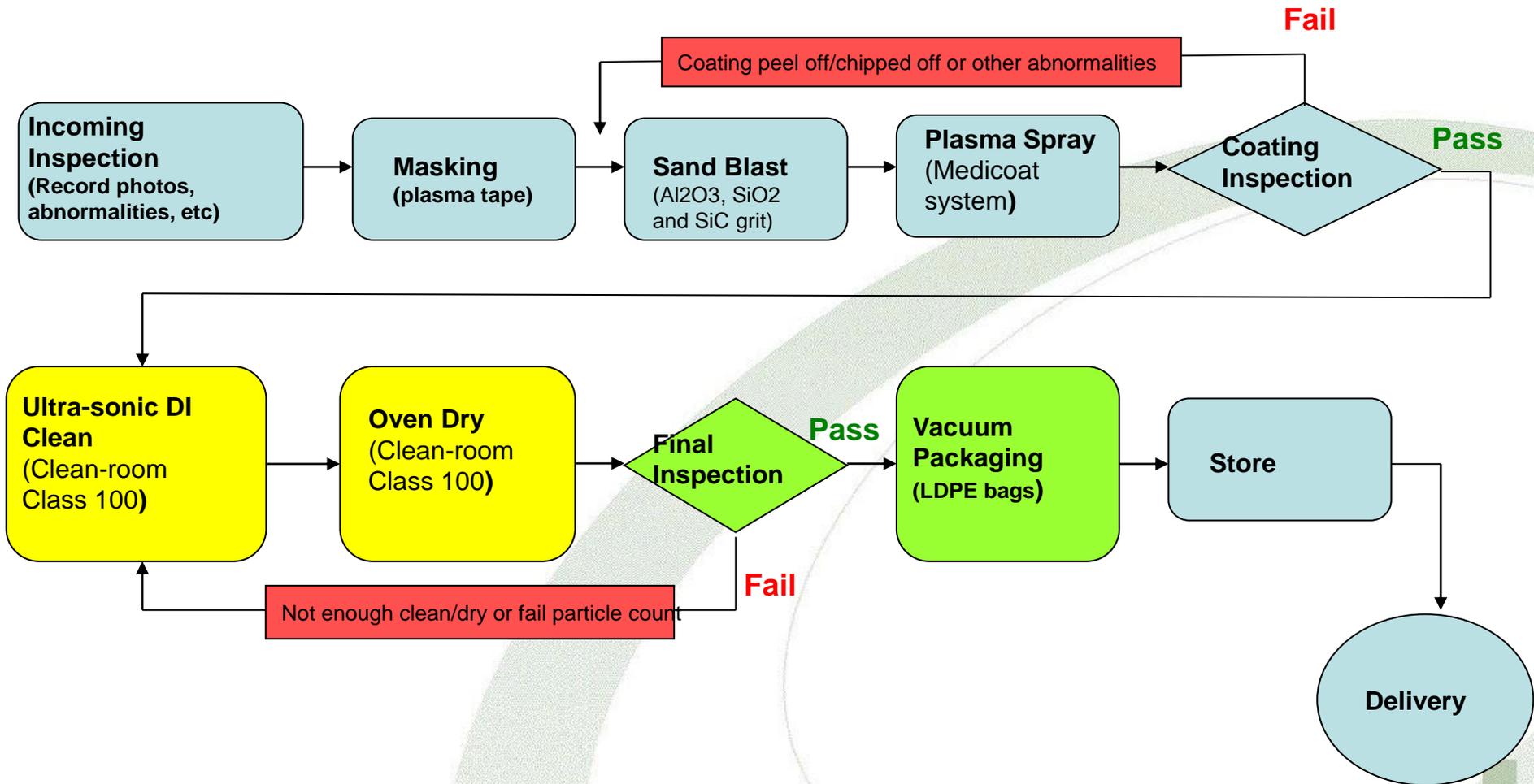


Aldon Proprietary Information



Plasma Spray Coating Process Flow

ALDON TECHNOLOGIES SERVICES PTE LTD



Aldon Proprietary Information

After acceptance of Incoming inspection:

- 1) General Clean & drying
- 2) Masking for removal of Coating
- 3) Old coat is removed by blasting
- 4) Part is inspected for proper removal & masking is in place
- 5) Touch up masking if needed
- 6) Place & secure part on Turn-Table in Plasma Chamber
- 7) Set robot program for each specific part
- 8) Plasma coating commence with set recipe (distance, Pressure, angle and powder feed rate)
- 9) Inspection and Cleaning
- 10) Final Inspection & Delivery





ALDON TECHNOLOGIES SERVICES PTE LTD

QC Coating Inspection Illustration



QC Coating Roughness Measurement



QC Coating Thickness Measurement



Aldon Proprietary Information

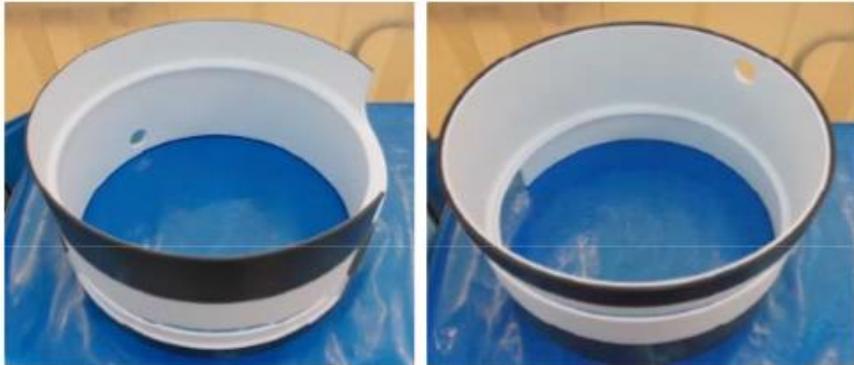
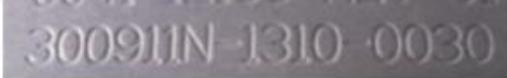
ALDON TECHNOLOGIES SERVICES PTE LTD

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



QC Inspection Reports

ALDON TECHNOLOGIES SERVICES PTE LTD

ATS A Company of Aldon Group		Final Inspection Report Y2O3 Coating				Ref No:	JOA1802282-02A		
									
Part No.	0041-12166		Serial No.	300911N-1310-0030		Customer			
Name	Wall Liner		EGP No.	2018028278		Date In (yyyymmdd)	20181001	Date Out (yyyymmdd)	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/cm ² @>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



Plasma Spray Coating Quality Management

ALDON TECHNOLOGIES SERVICES PTE LTD



Singapore Test Services Pte Ltd
Main Office:
249 Jalan Boon Lay, Singapore 619523
Tel: (65) 6000 7271 / (65) 6000 7202
Fax: (65) 6281 2817
Website: www.sts.com.sg
E-mail: sts@stsg.com.sg
(Reg. No. 19094219C)

Branch Office:
Block 4210 Ang Mo Kio Avenue 5
TECHPLACE 1 425-11 & 42-43-42
Singapore 630223
Tel: (65) 6084 2807 Fax: (65) 6084 2888

Report No: 03019-0318-00921-MEME
Date of Report: 15 March 2018

Page 1 of 1

Client's Reference: POP1800107

Report Title: Bond Strength Testing

Client Details: Aldon Technologies Services Pte Ltd
20 Loyang Lane
Singapore 508919

Attn: Ms Chai Yim

Sample Description: Three (03) pairs of ERP: SV-TT Specimens for Bond Strength Test
(3 Coated with Y203 Coating & 3 uncoated bond caps) labeled as in table 1.

Test Standard: ASTM C633-13 "Standard Test Method for Adhesion or Cohesion Strength of Thermal Spray Coatings"

Test Equipment: Universal Testing Machine, MTS / SINTECH 454G
Speed Rate : 1mm per minute

Date of Receipt: 13 March 2018

Date of Test: 14 March 2018

Location of Test: 249 Jalan Boon Lay, Singapore 619523

Results of Testing:

Table 1: Bond Strength Test Results

Sample Reference	Coated with Y203 Coating			
	Sample 1	Sample 2	Sample 3	
Bonded Area	in ²	0.764	0.767	0.764
Maximum Load	lbf	6329	5386	4605
Bond Strength	psi	8284	7022	6023
	MPa	57.14	48.43	41.57
Failure Mode	Failure at Coating & Glass/Coating Interface			

Results Reported By:

Tin Soon Long
Reporting Officer

Report Approved By:

Tin Chao Kheng
Supervisor
Materials Engineering Division

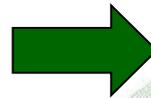
This report is issued in accordance with ITS Terms and Conditions, which are applicable here. A copy of which is readily available at www.sts.com.sg
The report shall not be reproduced except in full, unless written approval is sought from the issuing laboratory.



Aldon Proprietary Information

Coating Quality Acceptance Criteria

Tensile Bond Strength Analysis



Highlights of analysis:

- Average tensile bond strength of 49.04 MPa was achieved. This is higher than the 10.5 MPa achieved by Standard Part.

EDX

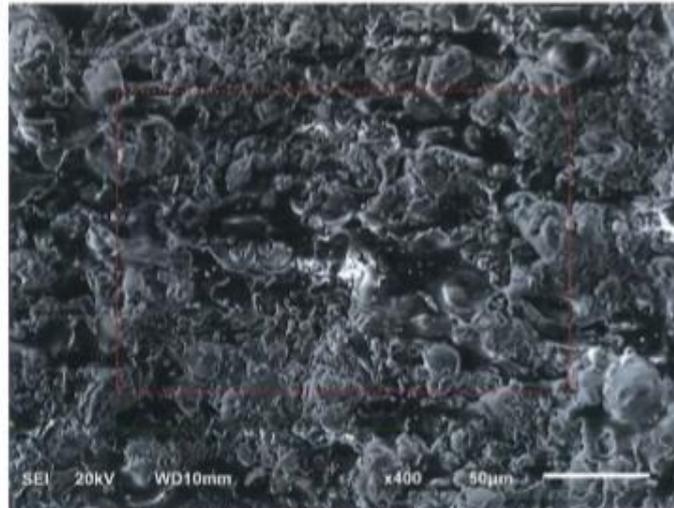


Figure 2a: Typical SEM image of test coupon '5', 400X

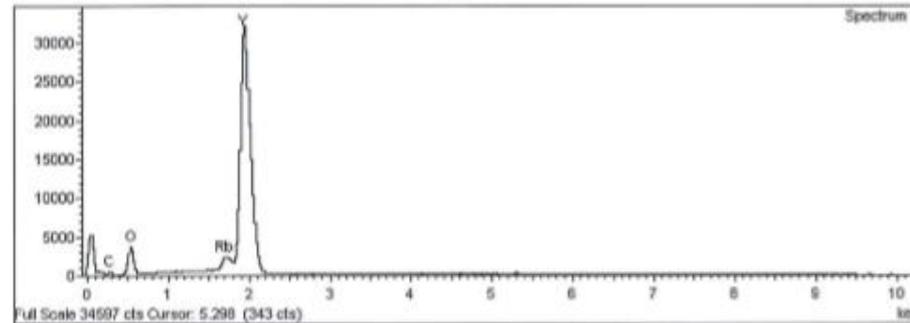


Figure 2b: Typical EDX spectrum of test coupon '5'

Table 2: Elements percentage breakdown for test coupon '5'

Element	Y	O ^a	Rb
Wt %	72.6	25.8	1.6

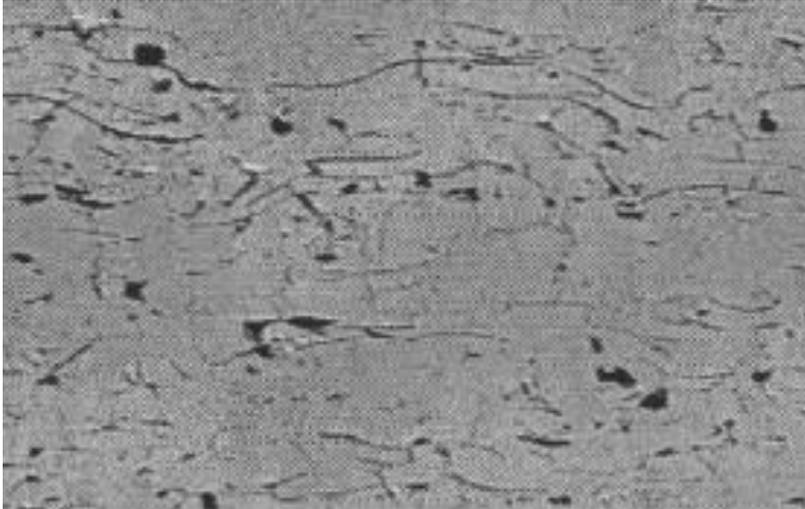
^a Semi-quantitative result for Oxygen was included as per client's request.



Plasma Spray Coating Quality Management

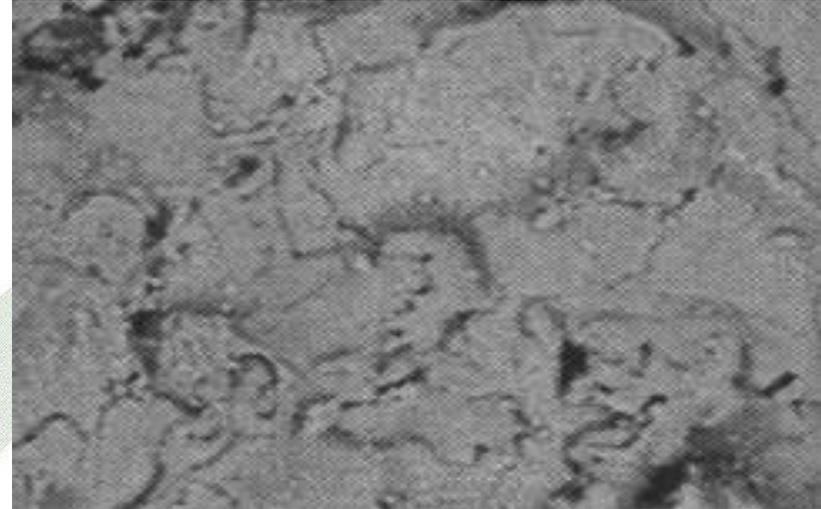
ALDON TECHNOLOGIES SERVICES PTE LTD

Porosity



Porosity good = with small gaps

Surface melt



Surface melt good = even surface melts



Aldon Proprietary Information



ALDON TECHNOLOGIES SERVICES PTE LTD

ATS Quality Management



Coating Thickness Meter



Breakdown Voltage



Roughness Check



Clean-room Assembly



Vacuum Packing



Aldon Proprietary Information



ALDON TECHNOLOGIES SERVICES PTE LTD

ISO 9001 Certificate



Aldon Proprietary Information



ALDON TECHNOLOGIES SERVICES PTE LTD

Advantages Of Y2O3 Coating

Advantages Of Y2O3 coating by ATS Plasma Spray

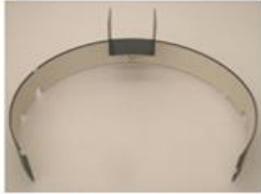
- Higher grade and superior quality of material is used. Our coating EDX confirmed there is no contaminants within the powder material and coating processes.
- Good plasma resistance coating can improve the part lifetime. Some customers feedback that their part lifetime has been increased 2x.
- Higher bonding strength improve coating quality with less peeling problem. We have some
- Cases of peeling issue which is-related to part handling by customer.
- Localization of services improve customer response time.



Aldon Proprietary Information



ALDON TECHNOLOGIES SERVICES PTE LTD

S/N	OEM Part#	Description	Material	Photo
1	715-027638-814/824	Top Chamber (Kiyo 45)	Al Partially Coated Y ₂ O ₃	
2	715-042721-810	Hi Flow Liner (Kiyo 45)	Al Partially Coated Y ₂ O ₃	
3	714-045743-809	Outer Liner (Kiyo 45)	Al Partially Coated Y ₂ O ₃	
4	715-045710-807	Liner Door (Kiyo 45)	Al Partially Coated Y ₂ O ₃	
5	715-801021-838	Upper Chamber	Al Partially Coated Y ₂ O ₃	
6	715-801916-808	GDP	Al Partially Coated Y ₂ O ₃	



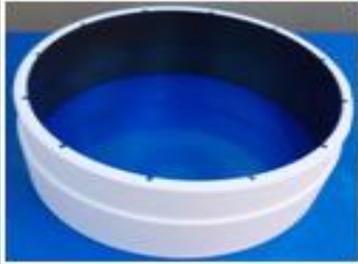
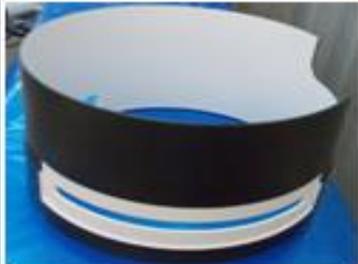
Aldon Proprietary Information

ALDON TECHNOLOGIES SERVICES PTE LTD

S/N	OEM Part#	Description	Material	Photo
1	715-027638-822	CX Top Chamber	Al Partially Coated Y_2O_3	
2	715-042721-866	CX Hi Flow Liner	Al Partially Coated Y_2O_3	
3	714-045743-809	CX Outer Liner	Al Partially Coated Y_2O_3	
4	715-045710-807	CX Liner Door	Al Partially Coated Y_2O_3	



ALDON TECHNOLOGIES SERVICES PTE LTD

S/N	OEM Part#	Description	Material	Photo
1	0021-27883	Slit Door	Al Partially Coated Y ₂ O ₃	
2	0021-34196	Cathode Liner	Al Partially Coated Y ₂ O ₃	
3	0040-99548	Chamber Liner Left	Al Partially Coated Y ₂ O ₃	
4	0040-99549	Chamber Liner Right	Al Partially Coated Y ₂ O ₃	



Aldon Proprietary Information

ALDON TECHNOLOGIES SERVICES PTE LTD

ITEM	OEM Part#	DESCRIPTION	MATERIAL	Photos
1	1D10-315183-15	SHIELD DEPO 85-M4 (Y2-Y) (DRM2)	Al Inner coated Y2O3	
2	1D10-315182-12	DEPO SHIELD WINDOW (YC-2) (DRM2)	Al partial coated Y2O3	
3	1D10-102848-13	PLATE BAFFLE M-9 (Y2-Y) (DRM2)	Al partial coated Y2O3	
4	1D10-204418-12	BELLOWS COVER A-2 (Y2-Y) (DRM2)	Al partial coated Y2O3	
5	1D10-204338-13	UPPER ELECTRODE P-V2 (DRM2)	Al partial coated Y2O3	

ALDON TECHNOLOGIES SERVICES PTE LTD

S / N	OEM Part#	Description	Material	Photo
1	3D10-302734-12	WINDOW, DEPO Y-AL, SE	Al Partially Coated Y ₂ O ₃	
2	3D10-101152-13	SHUTTER BTM TYPE Y-AL SE	Al Partially Coated Y ₂ O ₃	
3	3D10-100844-11	RING BTM SHIELD Y-AL SE	Al Partially Coated Y ₂ O ₃	
4	3D10-201706-21	SPACER GAP50 Y-AL SE	Al Partially Coated Y ₂ O ₃	
5	3D10-100845-11	<u>Exhuast</u> Plate Y-AL, SE	Al Partially Coated Y ₂ O ₃	
6	3D10-101195-11	Depo Shield D3.0P0.8 P35, 6Y-A	Al Partially Coated Y ₂ O ₃	
7	3D10-202405-13	INSULATOR LOWER T32-R6-BL-NC	Ceramic Partially Coated Y ₂ O ₃	



Typical Inspection Report

ALDON TECHNOLOGIES SERVICES PTE LTD

ATS A Company of Aldon Group		Final Inspection Report Anodize & Y2O3-Coating				Ref No: DO-113509-10		
Part No.	3D10-101152-12	Serial No.	42016UR-15212	Customer	[Redacted]		Module	TEL SCCM
Name	SHUTTER		[Redacted]	[Redacted]	Date In (yyyymmdd)	20110725	Date Out (yyyymmdd)	20110909
Check Point	Anodizing Thk. (µm)	Ra on anodize surface (µm)	Y2O3 Thk (µm)	Pictures & illustrations: 				
Spec	55 ± 5 µm	0.5-3.0 µm	150 ± 30 µm					
1								
2								
3								
4								
5								
6								
7								
10								
11								
12								
13								
14								
15								
Min.								
Max.								
Avg.								
Result								
Y2O3 Surface Roughness (Ra 3.5 - 5.5 µm)	[Redacted]	Notes: Y2O3 Surface roughness measured on test coupon. the part is re-anodized and re-coated.						
Surface Particle <5 ont/cc @ >=0.3µm	[Redacted]							
Insp. Result	ACCEPT							
Inspected by	Li Ting							
Reviewed by	Kyaw San Win							
Visual Inspection <input type="checkbox"/> Dents <input type="checkbox"/> HA damage <input type="checkbox"/> Chips <input type="checkbox"/> Stains <input type="checkbox"/> Scratches <input checked="" type="checkbox"/> No Abnormalities Found								
 *Y3D10-101152-12-42016UR-15212-d20110725-DO-113509-10*								



Aldon Proprietary Information



ALDON TECHNOLOGIES SERVICES PTE LTD

Typical Parts Lists (Brand New or Refurbishment)

Typical Parts List

- 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 Y_2O_3 plasma coated according to customer's requirements



Aldon Proprietary Information