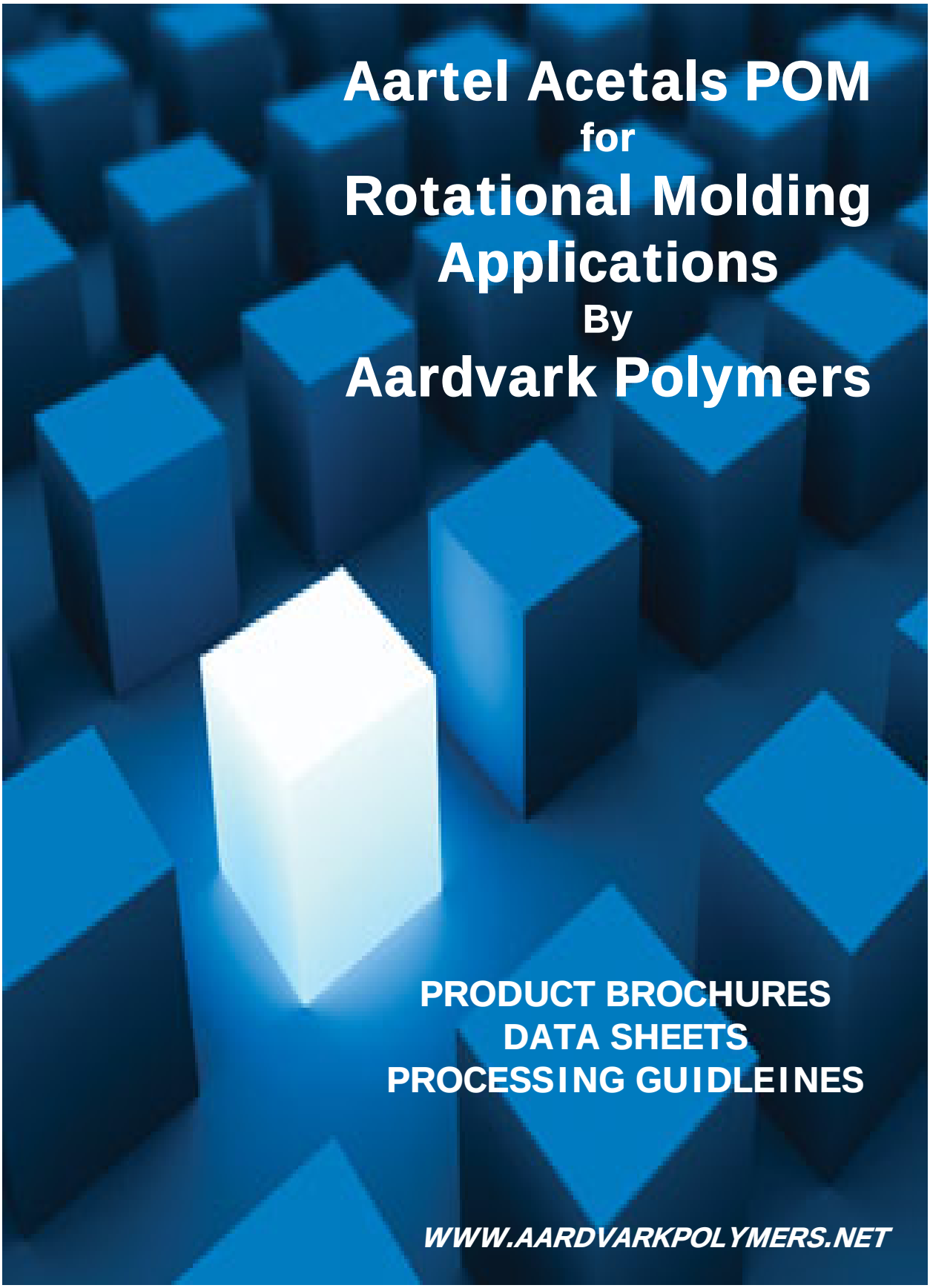
Aartel Acetals POM
for
Rotational Molding
Applications
By
Aardvark Polymers
PRODUCT BROCHURES
DATA SHEETS
PROCESSING GUIDLEINES
WWW.AARDVARKPOLYMERS.NET

Aartel® 800 Acetal

Polyoxymethylene (POM)
Rotational Molding Resin

VER. 11.10

Photo courtesy of Dutchland Plastics Corp.

The Next Generation of Roto Resins
by Aardvark Polymers

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Acetal ~ POM

Polyoxymethylene, (POM) commonly referred to as acetal or polyacetal is a highly crystalline engineering polymer with elevated mechanical and thermal properties coupled with a high degree of chemical resistance.

Since its introduction over 50 years ago, acetal has met the requirements of millions of demanding applications in the injection molding and extrusion markets. Acetal materials comprise an estimated 30% of the global fabrication markets for engineering materials. Acetal is one of the first choices in engineering resins when it comes to metal replacement.

Some of the benefits that make acetal so popular are:

- High strength to weight ratio
- Low coefficient of friction
- Wear and scratch resistance
- High impact strength
- Chemical resistance to fuels and hydrocarbons
- Exacting dimensional stability
- Low moisture vapor transmission rate
- Moderately priced

Aartel® acetals have been designed and developed for rotational molding applications that require expanded physical and thermal capabilities beyond the standard polymers employed by rotational molders.

Aartel® acetals are manufactured with prime virgin resins supplied by the world's leading manufacturers of acetals. Aartel® acetals are stabilized acetals engineered with high performance characteristics and modified for toughness and impact resistance.

Aartel® acetals offer excellent resistance to fuels and hydrocarbons. Unfilled Aartel® acetals meet or exceed all current CARB requirements with an enviable fuel permeation rate of 1.2g-mm/m²/day. *Additional information is available upon request in a PDF file of Plastics and Aggressive Auto Fuels—a 5000 Hour Study of Seven Plastics and Nine Fuel Blends.*

Aartel® acetals may be repeatedly sterilized by steam or ETO and offer dimensional stability in moist environments at elevated temperatures. Aartel® acetals are excellent materials for secondary machining and finishing operations. Aartel® acetals may be printed, plated, sawn, milled, drilled, tapped, and machined with both conventional and CNC equipment. Aartel® acetals may be bonded, welded, and joined with conventional acetal fabrication techniques.

Aartel® 800 POM

Rotational Molding Resin

Aartel 800 POM is our general purpose formulation for rotational molding applications. Aartel 800 offers exceptional heat capacity, high resistance to aggressive chemical environments, and superior strength to weight ratios. Aartel 800 POM is processor friendly and may be molded with conventional equipment and tooling without modifications. Aartel 800 POM does not require nitrogen or inert gasses for processing.

Aartel 800 POM is a very strong structural material. Applications include cooling system reservoirs, high temperature hydraulic tanks, HVAC ducting, solar water collectors, marine components, and a wide array of automotive products.

Aartel 800 POM is available in natural, white, and may be dry colored to suit. Aartel 800 POM is available in 35 mesh/500 micron powder in 25kg/55lb. bags and in gaylord containers.

Aardvark Knows Acetal

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Aardvark Polymers
Aartel® 800 POM - Acetal Polyoxymethylene

Typical Properties
from injection molded specimens

Properties	Value	Notes
Physical		
Density, g/cc	1.41	
Water Absorption, %	0.22	
Moisture Absorption at Equilibrium, %	0.8	
Linear Mold Shrinkage, cm/cm	0.022	
Linear Mold Shrinkage, Transverse, cm/cm	0.018	
Mechanical		
Hardness, Rockwell M	80	
Tensile Strength, Yield, MPa	61	
Elongation at Break, %	40	
Flexural Modulus, GPa	2.6	
Flexural Yield Strength, MPa	90	
Compressive Yield Strength, MPa	110	10% Deflection; ASTM D695
Fatigue Strength, MPa	21	10E+7 Cycles; ASTM D671
Shear Strength, MPa	53	
Izod Impact, Notched, J/cm	0.5	ASTM D256
Izod Impact, Notched, Low Temp, J/cm	0.4	-29°C; ASTM D256ASTM
Tensile Impact Strength, kJ/m²	130	
Thermal		
Maximum Service Temperature, Air, °C	110	Deflection temperature at 1.8
Deflection Temperature at 0.46 MPa (66 psi), °C	158	
Deflection Temperature at 1.8 MPa (264 psi), °C	110	
Flammability, UL94	HB	

MSDS Available upon request
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High Performance Polymers
Product, Process, Market, and Business Development

AARTEL® 1600 POM
THERMOPLASTIC RESIN

ENHANCED ACETAL COMPOUND (POLYOXYMETHYLENE)
ENGINEERED FOR LOW PERMEATION APPLICATIONS

Product and properties brochure v11.5

by Aardvark Polymers

FOR APPLICATIONS IN:

INJECTION MOLDING
EXTRUSION PROCESSES
COMPRESSION MOLDING
ROTATIONAL MOLDING
BLOW MOLDING
FABRICATION
SELECTIVE LASER SINTERING

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Acetal ~ POM

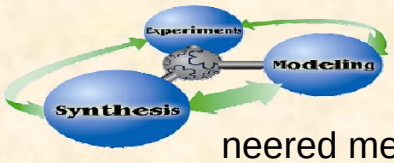
Polyoxymethylene, (POM) commonly referred to as acetal or polyacetal, is a highly crystalline engineering polymer with elevated mechanical and thermal properties coupled with a high degree of chemical resistance.

Since its introduction over 50 years ago, acetal has met the requirements of millions of demanding applications in the injection molding and extrusion markets. Acetal materials comprise an estimated 30% of the global fabrication markets for engineering materials. Acetal is one of the first choices in engineering resins when it comes to metal replacement.

Some of the benefits that make acetal so popular are:

- High strength to weight ratio
- Low coefficient of friction
- Wear and scratch resistance
- High temperature capacities
- Chemical resistance to fuels and hydrocarbons
- Exacting dimensional stability
- Low moisture vapor transmission rate
- Moderately priced

Aartel ® 1600 POM



Aartel 1600 is a unique thermoplastic compound developed for today's emerging technology markets that require enhanced barrier properties coupled with engineered mechanical properties and resistance to aggressive chemical environments.

Aartel 1600 is a custom compound of thermoplastic elastomers, polyacetal, PTUF impact modifiers, and compatibilizers. Aartel 1600 provides the enviable permeation rates and chemical resistance characteristics of polyacetal coupled with the elasticity and elongation characteristics of an elastomer, and complimented with an impact resistance only available with exceptional modifiers.

Aartel 1600 offers a high strength to weight ratio, a natural lubricity, scratch and wear resistance, and a permeation ratio that will meet or exceed all current CARB and EPA standards for fuel emissions.

Aartel 1600 maintains excellent properties for exposure to aggressive chemical environments, even at elevated temperatures. Aartel 1600 is exceptionally resistant to fuels, oils, solvents, and hydrocarbons.

Aartel 1600 is custom formulated to be processed by injection molding, extrusion processes, compression molding, rotational molding, blowmolding, fabrication, and selective laser sintering.

Aartel 1600 POM mechanical properties:

Aartel 1600 offers a unique combination of mechanical properties not usually found in acetal materials.

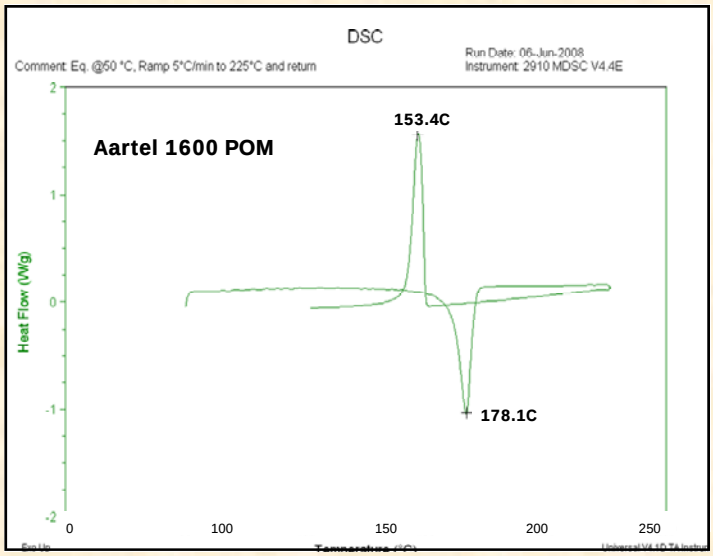
Aartel 1600 provides a slightly reduced specific gravity compared to commercial acetal formulations.

The elongation factor of Aartel 1600 is 3 times that of conventional acetal materials.

The impact resistance of Aartel 1600 has been dramatically increased to be as much as 20 times greater than that of standard acetal materials.

A typical properties Data Sheet is provided on the next page for more information on Aartel1600 .

Aartel 1600 POM thermal characteristics:



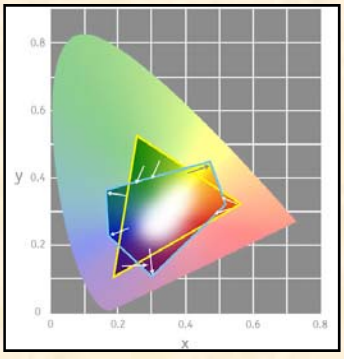
Aartel 1600 maintains very stable and definitive heat and crystallization profiles allowing processors to maximize processing parameters in their operations.

Aartel 1600 offers a DTUL @ 0.45MPa/66psi of 124°C/255°F making it an ideal choice for moderate to elevated temperature applications.

Aartel 1600 maintains exacting dimensional stability in wet environments at elevated temperatures and may be steam autoclaved for sterilization.

Aartel 1600 POM chemical resistance and barrier properties

Aartel 1600 has been specifically designed and developed to be competitive in the emerging markets for the storage, transport, and handling of automotive fuel system applications. Aartel 1600 offers exceptional chemical resistance and barrier capabilities at increased temperatures and pressures over extended periods of time



Aartel 1600 offers low permeation factors for a wide range of industrial gasses including compressed hydrogen and natural gas, oxygen, nitrogen, carbon dioxide, toluene, gasoline, freon, and ethyl /alcohol and ethyl /water solutions.

Aartel 1600 has passed saturation and permeation testing for the storage of compressed hydrogen at 700BAR/10,000psi. Aartel 1600 offers an enviable CARB rating of 1.2grs/m^2-24hrs.

Aartel 1600 maintains the high level of chemical resistance in a wide range of aggressive environments. Please request a copy of our Aartel Chemical Resistance brochure for further information.

AARDVARK POLYMERS

AARTEL 1600 POM

ACETAL RESIN

Typical Properties
from injection molded specimens

Aartec 1600 is an acetal alloy formulated for enhanced impact reistance and elongation.
Aartec 1600 maintains the high degree of chemical reistance and low fuel permeation rates of unfilled acetals.
Aartec 1600 is available in natural white and may be colored to suit.
Aartec 1600 is an excellent choice for fuel tanks, hydraulic resevoirs, brake and fuel system components.
Aartec 1600 may be processed by extrusion, injection, compression, blow,and rotational molding processes and selective laser sintering.
Aartec 1600 should be predried for 4 hours at 80C prior to processing.

Properties	Value	Test
Physical		
Density, g/cc	1.34	ISO 1183
Water Absorption, %	0.44	ASTM D570
Moisture Absorption at Equilibrium, %	0.35	ASTM D570
Water Absorption at Saturation, %	0.9	ASTM D570
Linear Mold Shrinkage, cm/cm	0.014	ISO 294-4
Linear Mold Shrinkage, Transverse, cm/cm	0.015	ISO 294-4
Melt Flow, g/10 min	2.3	ISO 1133
Mechanical		
Hardness, Rockwell R	105	ISO 2039/2
Tensile Strength, Yield, MPa	45	ASTM D638
Elongation at Break, %	100	ISO 527
Elongation at Break, %	150	ASTM D638
Elongation at Yield, %	30	ISO 527
Tensile Modulus, GPa	1.3	ASTM D638
Flexural Modulus, GPa	1.13	ASTM D790
Flexural Yield Strength, MPa	34	ASTM D732
Shear Strength, MPa	34	ASTM D732
Izod Impact, Notched (ISO), kJ/m²	90	ISO 1801A
Izod Impact, Unnotched, J/cm	NB	ASTM D256
Izod Impact, Notched, Low Temp (ISO), kJ/m²	20	ISO 1801A
Izod Impact, Unnotched @ -40°C, J/cm	2.5	ASTM D256
Charpy Impact Unnotched, J/cm²	NB	ISO 179/IEU
Charpy Impact, Notched, Low Temp, J/cm²	2	ISO 179/IEA
Charpy Impact, Unnotched Low Temp, J/cm²	NB	ISO 179/IEU
Charpy Impact, Notched, J/cm²	9	ISO 179/IEA
Tensile Impact Strength, kJ/m²	1580	ASTM D1822
Tensile Creep Modulus, 1 hour, MPa	1350	ISO 899
Tensile Creep Modulus, 1000 hours, MPa	550	ISO 899
Thermal		
CTE, linear 20°C Transverse to Flow, µm/m-°C	140	ISO 11359-1/2
Melting Point, °C	178	ASTM D3418
Deflection Temperature at 0.46 MPa (66 psi), °C	124	ASTM D648
Deflection Temperature at 1.8 MPa (264 psi), °C	70	ASTM D648
Flammability, UL94	HB	UL94
Oxygen Index, %	21	ISO 4589-1/2

MSDS Available upon request.
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Aartel® Acetals

Homopolymers ~ Copolymers

The Next Generation of Roto Resins

Processing Guidelines

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Aartel acetals (POM) are uniquely designed and formulated for rotational molding applications. Aartel POM materials may be processed with conventional tooling on all commercial rotational molding machines.

FOREWORD

Process parameters may vary greatly depending upon equipment, part configuration, and tool design. Individual molders will determine what their situations demand.

The single largest consideration when comparing rotational molding processing of POM to that of PE is that the POM process window is narrowed. PE materials may be successfully processed with an oven temperature differential as great as 200°F. POM materials will require oven differentials of 50°F, or less. The actual oven temperatures required for POM processing may compliment PE oven temperatures allowing both materials to be processed simultaneously.

Aartel® acetal products should be completely cooled to ambient temperature before any secondary machining operations are performed. This will minimize any outgassing and assure the dimensional stability of the product before, during, and after finishing.

Aartel POM is offered in natural white color. If volume dictates, Aartel POM may be color compounded to exacting specifications. Aartel POM may be dry colored in a high speed blender often utilizing the same color concentrates as PE.

Caution:
Aartel POM materials are heat stabilized to prevent destabilization and degradation during processing. Excessive temperatures and residency periods may defeat the stabilizing properties resulting in reduced mechanical properties and possible outgassing.

GENERAL RECOMENDATIONS

Material storage:

Aartel POM resins are non-hygroscopic in nature and should be stored in a cool dry environment. Open containers may require surface drying before processing if exposed to high humidity environments.

Material preheating:

Preheating of Aartel POM materials may provide reductions up to 25% in the heat cycle. Aartel resins may be preheated for extended periods at temperatures of 175°F/80° C without degrading the materials.

Mold temperatures:

We suggest that mold temperatures be as consistent as possible in all areas of the tooling before processing. Whether aluminum tooling is cast or machined, molds frequently have varying temperature zones through thick and thin sections. With the narrowed process window required for POM resins, these variations in tooling temperatures should be minimized as much as possible for a successful process.

Our suggestion is that the tooling be soaked in a heated oven to an overall even temperature prior to the first cycle. Once this balance is achieved preheating for subsequent cycles is not required as the tooling temperature zones should remain fairly consistent from cycle to cycle.

For best results inserts should be preheated to the temperature of the aluminum tooling prior to processing. As the heat transfer rate of metal inserts may differ from the tooling temperature it is imperative that the differential of insert temperatures fall within the processing window of the resin.

Rotation:

Rotation speeds and ratios for POM is similar to that required for comparable melt flow formulations of polyethylene.

Cooling:

POM resins have very sharp crystallization points and care should be taken to provide equal cooling internally and externally on thick wall sections of molded products. Cooling is similar to PE processing. Water may be utilized as preferred but is not required. Internal air cooling, or pass through air, may be employed at 1/2 psi to enhance cooling and stability of the molded product but it is not required.

Inert atmospheres:

Nitrogen and other inert gasses are not required for processing Aartel POM materials.

Aartel 800 POM process guidelines

Aartel 800 POM is a processor friendly general purpose acetal formulated for rotational molding applications.

Aartel 800 POM does not normally require any mold release for processing. This may change due to the configuration of the molded product.

Aartel 800 POM should be processed with oven temperatures between 450°F/232°C and 500°F/260°C. The recommended starting temperature for Aartel 800 POM is 475° F/ 246°C The desired PIAT for Aartel 800 POM is approximately 340°F/170°C.

Example:
Aluminum tooling with 6.35mm/0.250” wall thickness.
Molded product with 3mm/.120” wall section.

Heat cycle with oven temperature of 475°F/246°C = 16 minutes
Cooling cycle = 14 minutes

Aartel 1600 POM process guidelines

Aartel 1600 POM is an enhanced compound of acetal with elastomers and impact modifiers and requires exceptions to normal POM processing.

For best results we recommend drying/preheating Aartel 1600 for a period of 3-4 hours prior to molding.

A generic mold release should be applied when molding with Aartel 1600 POM.

Aartel 1600 POM should be processed with oven temperatures between 525°F/274°C and 575°F/302°C. The recommended starting temperature for Aartel 1600 POM is 550°F/288°C. The desired PIAT for Aartel 1600 POM is 365°F/185°C.

Example:
Aluminum tooling with 6.35mm/0.250” wall thickness.
Molded product with 3mm/.120” wall section.

Heat cycle with oven temperature at 550°F/288°C = 16 minutes
Cooling cycle = 16 minutes

For more information contact

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