



BORYGO PLANE I

**SAE TYPE I
AIRCRAFT DEICING FLUID**

TECHNICAL DATA SHEET

**(SAE AMS 1424 L)
FLUID APPROVED BY THE FAA & TRANSPORT CANADA**

BORYSZEW S.A. ODDZIAŁ BORYSZEW ERG W SOCHACZEWIE

Product Description

Borygo Plane I is a technically advanced type I aircraft deicing fluid based on mono propylene glycol and contains a corrosion inhibitor system.

The glycol content is not less than 80 %.

Borygo Plane I is a clear fluid, homogeneous, uniform in color, free from skins, lumps and foreign materials. It appears orange in color.

Physical Properties

Property	SAE AMS 1424 L requirement	Borygo Plane I Typical Value
Chemical Composition	80 % aqueous propylene glycol solution containing surfactants, a corrosion inhibitor system, buffers and anti-foaming agents	
Appearance	Clear and homogeneous fluid, uniform in color, free from skins, lumps and foreign materials	
Color	Orange	
Flash Point	Not lower than 100 °C (ASTM D93 or ASTM D3278)	Conforms (No flash to 100 °C)
Specific Gravity	Initial qualification value $\pm 0,015$ (ASTM D891 or ASTM D4052)	1,051 @ 15,6 °C (@ 60 °F)
Refractive Index	Initial qualification value $\pm 0,0015$ (ASTM D1747)	1,4200 @ 20 °C
pH	Initial qualification value $\pm 0,5$ (ASTM E70)	8,5

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Surface Tension	Initial qualification value ± 10 %	32,1 dynes/cm
Freezing Point	Initial qualification value ± 3 °C (ASTM D1177)	- 21 °C @ 50 % dilution

Summary of Freezing Point Temperatures (dilution by volume)

Dilution (by volume)	Freezing Point
10 %	- 2 °C
20 %	- 5 °C
30 %	- 9 °C
40 %	- 14 °C
50 %	- 21 °C
60 %	- 30 °C
70 %	- 42 °C
80 %	- 46 °C
90 %	- 46 °C
100 % (undiluted)	- 47 °C

Property	SAE AMS 1424 L requirement	Borygo Plane I Typical Value
Foam Stability	No foam @ - 10 °C No foam @ 0 °C	
Viscosity	Initial qualification value ± 5 % @ + 20, 0, - 10, and - 20 °C (ASTM D445)	See page 4

Summary of Viscosity values using Brookfield Model DV-II+ viscometer ($\pm 5\%$)

Spindle	Speed (RPM)	Temp (°C)	Viscosity (cps)
LV1	6,0	20	20
LV1	12,0		18
LV1	30,0		22
LV1	6,0	0	48
LV1	12,0		48
LV1	30,0		45
LV1	6,0	- 10	80
LV1	12,0		104
LV1	30,0		80
LV1	6,0	- 20	186
LV1	12,0		240
LV1	30,0		187

Fluid Stability

Property	SAE AMS 1424 L requirement	Borygo Plane I Typical Value
Thermal Stability	<p>ph $\leq 1,0$ Refractive index @ 20 °C < 0,0020 WSET time ≥ 3 min No deposits No color change (AS5901 - WSET only)</p>	<p>Conforms (- 0,7) Conforms (0,0001) Conforms (≥ 3 min) Conforms Conforms</p>
Hard Water Stability	<p>ph $\leq 1,0$ Refractive index @ 20 °C < 0,0020 WSET time ≥ 3 min No deposits No color change (AS5901 - WSET only)</p>	<p>Conforms (- 0,4) Conforms (0,0002) Conforms (≥ 3 min) Conforms Conforms</p>

Aerodynamic Performance

Lowest Operational Use Temperature (LOUT):

High Ramp	Above - 30 °C (75/25 dilution by volume) Above - 20 °C (50/50 dilution by volume)
Low Ramp	Above - 25 °C (75/25 dilution by volume) Above - 19 °C (50/50 dilution by volume)

Anti-icing Performance

WSET:	6 min 39 s ± 10 s	(75/25 dilution)
	4 min 08 s ± 26 s	(50/50 dilution)
HHET:	46 min 56 s ± 2 min	(75/25 dilution)
	30 min 53 s ± 3 min 17 s	(50/50 dilution)

Effect on Aircraft Materials

Property	SAE AMS 1424 L requirement	Borygo Plane I Typical Value
Sandwich Corrosion	Corrosion no worse than control panels using ASTM D1193, Type IV water (ASTM F1110)	Conforms (see below)

Summary of Sandwich Corrosion Test Results

	2024-T3 Bare Anodized	2024-T3 Alclad	7075-T6 Bare Anodized	7075-T6 Alclad
As Received	1	1	1	1
Diluted (1:1 v/v)	1	1	1	1
CONTROL	1	1	1	1

Property	SAE AMS 1424 L requirement	Borygo Plane I Typical Value
Total Immersion Corrosion	Shall neither show evidence of corrosion of panels nor cause a weight change of any test panel greater than allowed (ASTM F483)	Conforms (see below)

Summary of Total Immersion Corrosion Test Results

Test Panel	Weight change allowed (mg/cm ² /24 hrs)	Weight change (mg/cm ² /24 hrs)	
		AS RECEIVED	DILUTE (1:1)
AMS 4037 Aluminum Alloy, Anodized as in AMS 2470	0,3	0,01	< 0,01
AMS 4041 Aluminum Alloy	0,3	< 0,01	< 0,01
AMS 4049 Aluminum Alloy	0,3	< 0,01	< 0,01
AMS 437 Magnesium Alloy, dichromate treated as in AMS 2475	0,2	+ 0,02	0,05
AMS 4911 Titanium Alloy	0,1	< 0,01	< 0,01
AMS 5045 Carbon Steel	0,8	0,01	+ 0,01

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Property	SAE AMS 1424 L requirement	Borygo Plane I Typical Value
Low Embrittling Cadmium Plate	Shall not show weight change greater than 0,3 mg/cm ² per 24 hours (ASTM F1111)	<p>Conforms</p> <ul style="list-style-type: none"> • < 0,01 mg/cm²/24 hrs (as received) • + 0,01 mg/cm²/24 hrs (dilute 1:1)
Stress Corrosion Resistance	Shall not cause cracks in AMS 4911, Ti alloy (ASTM F945 Method A)	<p>Conforms</p> <ul style="list-style-type: none"> • no cracking evident (as received) • no cracking evident (dilute)
Hydrogen Embrittlement:	Shall be non-embrittling (ASTM F519)	<p>Conforms</p> <ul style="list-style-type: none"> • No failures within 150 hours (as received) • No failures within 150 hours (dilute 1:1)
Effect on Transparent Plastics	Shall not craze, stain or discolor (ASTM F484)	<p>Conforms</p> <ul style="list-style-type: none"> • MIL-PRF-25690 (Type C) 4500 psi/8 hours no crazing, stains, or discoloration • MIL-P-833120 200 psi/30 min no crazing, stains, or discoloration

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Property	SAE AMS 1424 L requirement	Borygo Plane I Typical Value
Effect on Painted Surfaces	Shall not produce any streaking, discoloration or blistering of the paint film, shall not decrease paint film hardness by more than two pencil hardness numbers (ASTM F502)	Conforms <ul style="list-style-type: none"> • no streaks, discoloration, blistering / no decrease in film hardness (as received) • no streaks, discoloration, blistering / no decrease in film hardness (dilute 1:1)
Effect on Unpainted Surfaces	Shall neither produce streaking not leave stains (ASTM F502)	Conforms <ul style="list-style-type: none"> • no streaks not stains (as received) • no streaks not stains (dilute 1:1)
Runway Concrete Scaling Resistance	Runway concrete surface shall have a rating not greater than 1 for 50 freeze-thaw cycles (ASTM C672)	Conforms <ul style="list-style-type: none"> • rating after freeze-thaw cycles: 1

Environmental Information

Property	SAE AMS 1424 L requirement	Borygo Plane I Typical Value
BOD	Informational	<ul style="list-style-type: none"> • 5 day BOD < 0,01 O₂/kg concentrate (5 °C) • 28 day BOD < 0,01 O₂/kg concentrate (5 °C) • 5 day BOD 0,60 O₂/kg concentrate (20 °C) • 28 day BOD 0,62 O₂/kg concentrate (20 °C)
COD	Informational	1,44 kg O ₂ /kg fluid
Biodegradability	Informational	<ul style="list-style-type: none"> • 5 day BOD/COD < 0,01 / 1,44 = < 0,01 (5 °C) • 28 day BOD/COD < 0,01 / 1,44 = < 0,01 (5 °C) • 5 day BOD/COD 0,60 / 1,44 = 0,42 (20 °C) • 28 day BOD/COD 0,62 / 1,44 = 0,43 (20 °C)
Aquatic Toxicity	Informational	<p>LC₅₀: 16,250 mg/L (48 hour – Daphnia magna)</p> <p>LC₅₀: 32,500 mg/L (96 hour – Pimephales promelas)</p>

Summary of Trace Contaminants Results
(Method: ICP Inductive-Coupled Plasma Spectrometry
Detection Limit: 1 ppm)

	ppm	%
Sulfur	< 1	< 0,0001
Halogens	39	0,0039
Total phosphorus	2	0,0002
Nitrate (as NO ₃)	< 2	0,0002
Total kjeldahl nitrogen	245	0,0245
Lead (Pb)	< 1	< 0,0001
Chromium (Cr)	< 1	< 0,0001
Cadmium (Cd)	< 1	< 0,0001
Mercury (Hg)	< 1	< 0,0001

MANUFACTURER: Boryszew S.A. Oddział Boryszew ERG w Sochaczewie
BUSINESS CONTACT: +(48 46) 863 02 01
aerochemicals@boryszewerg.com.pl
ADRESS: 15 Sierpnia 106, 96-500 Sochaczew, Poland