



Winter Division

Technical Data
Kilfrost DF Plus

SAE Type I Fluid

Winter Season 2016/17

1. Material description

Kilfrost DF Plus is a low foaming propylene glycol based Type I de-icing fluid which conforms to all of the technical requirements of the Society of Automotive Engineers Aerospace Material Specification SAE AMS 1424/1 for Type I and ISO11075 for Aircraft Deicing/Anti-icing Fluids. The new SAE slash sheet designation for de-icing fluids classifies according to base fluid - Kilfrost DF Plus is a conventional glycol-based fluid, conforming with the AMS 1424/1 specification. Therefore, it does not contain any alkali organic salts e.g. formates/acetates. Materials compatibility testing demonstrates the product conforms to the requirements set out in AMS1424/1.

2. Physical properties

	Typical values
Appearance	Clear orange fluid, free from suspended matter
Flash point (°C)	Not below 100
Specific gravity (20°C)	1.045 ± 0.015
pH (20°C)	9.0 ± 0.5
Refractive index (20°C)	1.4190 ± 0.0015
Surface tension (20°C) (dynes/cm)	39
Freezing Point (°C)	
100%	Does not freeze
69% (v/v)	-42.0
60% (v/v)	-30.2
50% (v/v)	-21.5

3. Fluid stability

3.1 Storage stability

DF Plus has a shelf life of 3 years in original sealed containers. Refer to certificate of conformity for further information. Stability tests under both thermal and cold storage conditions showed no significant change in pH, RI, viscosity or appearance. Thermal storage stability tests are carried out using neat fluid at 80°C for 30 days. The fluid remained homogenous at all times, WSET testing confirms aged fluids meet the minimum requirements for anti-icing performance.

3.2 Hard water stability

DF Plus diluted 1:1 in standard hard water does not show any significant changes in pH or appearance with no evidence of insoluble deposit seen. Hard water stability tests are carried out on fluid diluted 50% at 95°C for 30 days.

3.3 Foam stability

0°C for 15mins

-10°C for 15mins

Foam coverage <1% (est.)

Foam coverage <5% (est.)

4. Performance properties

4.1 Aerodynamic performance – high speed BLDT ramp	69% (a)	50% (a)
Acceptable temperature range °C	Above -32	Above -11.5
LOUT for a high take off speed jet aircraft -32°C for a 69% dilution		
4.2 Aerodynamic performance – low speed BLDT ramp	69% (a)	50% (a)
Acceptable temperature range °C	Above -25.5	Above -19
LOUT for low take off speed aircraft -25.5°C for a 69% dilution		
4.3 Anti-icing performance	69% (a)	50% (a)
WSET (mins) (b)	6	5
HHET (mins) (c)	40	32

(a) Dilutions volume / volume – ASTM D1193 type IV water

(b) 5g/dm²/h @ -5°C

(c) Precipitation rate 1.2g/dm²/hr @ -5 °C

5. Environmental data

BOD (a)	0.59 kg O ₂ /kg fluid
COD (a)	1.39 kg O ₂ /kg fluid
BOD/COD (Biodegradability)	0.42
Aquatic toxicity	
EC50 (Daphnia magna)	3,000mg/l (b)
LC50 (Pimephales promelas)	6,250mg/l (c)
Trace contaminants	
Sulphur	35ppm
Halogens	< 25ppm
Phosphate (P as P ₂ O ₅)	238ppm
Nitrate (as NO ₃)	< 20ppm
Lead (Pb)	<1ppm
Chromium (Cr)	< 1ppm
Cadmium (Cd)	< 1ppm
Mercury (Hg)	< 1ppm

(a) APHA STD methods

(b) OECD 202, 48hr

(c) OECD 203, 96hr

6. Operational limits

pH (20°C)	7.0 – 10.0 (neat) min 6.0 (dilute)
Refractive index (20°C)	1.4175 – 1.4205

**Refractive Index and Freezing Point Chart
Kilfrost DF Plus and DF Plus (80)**

Conc. (% v/v)	RI (20°C)	Freezing Point (°C)	Conc. (% v/v)	RI (20°C)	Freezing Point (°C)	Conc. (% v/v)	RI (20°C)	Freezing Point (°C)
10%	1.342	-2.7	41%	1.371	-15.3	72%	1.399	-48.5
11%	1.343	-3.0	42%	1.372	-15.8	73%	1.400	-51.0
12%	1.344	-3.3	43%	1.373	-16.5	74%	1.400	-54.0
13%	1.345	-3.6	44%	1.374	-17.1	75%	1.401	-57.5
14%	1.346	-3.9	45%	1.375	-17.7	76%	1.402	Does not freeze
15%	1.347	-4.2	46%	1.376	-18.4	77%	1.403	
16%	1.348	-4.5	47%	1.377	-19.1	78%	1.404	
17%	1.349	-4.8	48%	1.378	-19.7	79%	1.404	
18%	1.350	-5.2	49%	1.379	-20.5	80%	1.405	
19%	1.351	-5.5	50%	1.380	-21.5	81%	1.406	
20%	1.352	-5.8	51%	1.381	-22.0	82%	1.407	
21%	1.353	-6.1	52%	1.382	-22.7	83%	1.407	
22%	1.354	-6.5	53%	1.382	-23.6	84%	1.408	
23%	1.355	-6.9	54%	1.383	-24.4	85%	1.409	
24%	1.355	-7.3	55%	1.384	-25.3	86%	1.410	
25%	1.356	-7.7	56%	1.385	-26.2	87%	1.410	
26%	1.357	-8.1	57%	1.386	-27.1	88%	1.411	
27%	1.358	-8.5	58%	1.387	-28.1	89%	1.412	
28%	1.359	-8.8	59%	1.388	-29.1	90%	1.413	
29%	1.360	-9.2	60%	1.389	-30.2	91%	1.413	
30%	1.361	-9.8	61%	1.390	-31.2	92%	1.414	
31%	1.362	-10.1	62%	1.391	-32.2	93%	1.414	
32%	1.363	-10.5	63%	1.391	-33.5	94%	1.415	
33%	1.364	-11.0	64%	1.392	-34.7	95%	1.416	
34%	1.365	-11.5	65%	1.393	-36.2	96%	1.416	
35%	1.366	-12.0	66%	1.394	-37.5	97%	1.417	
36%	1.367	-12.5	67%	1.395	-38.7	98%	1.418	
37%	1.368	-13.0	68%	1.396	-40.7	99%	1.418	
38%	1.368	-13.5	69%	1.396	-42.0	100%	1.419	
39%	1.369	-14.0	70%	1.397	-44.0			
40%	1.370	-14.8	71%	1.398	-46.0			

Note: Refractive indices in the range 1.4175 to 1.4205 are acceptable for neat type I fluids.

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