



Consolite Technology Specification Sheet

Part No: CTL-T061

Part name: NVIS Filter, Class A, White LED

The filter uses a dichroic coating on a clear glass substrate to achieve the NVIS Radiance requirements of MIL-STD-3009 (Class A and B) when used in combination with a high output white LED such as a Luxeon emitter. The material can be supplied in either 1mm or 2mm thickness.

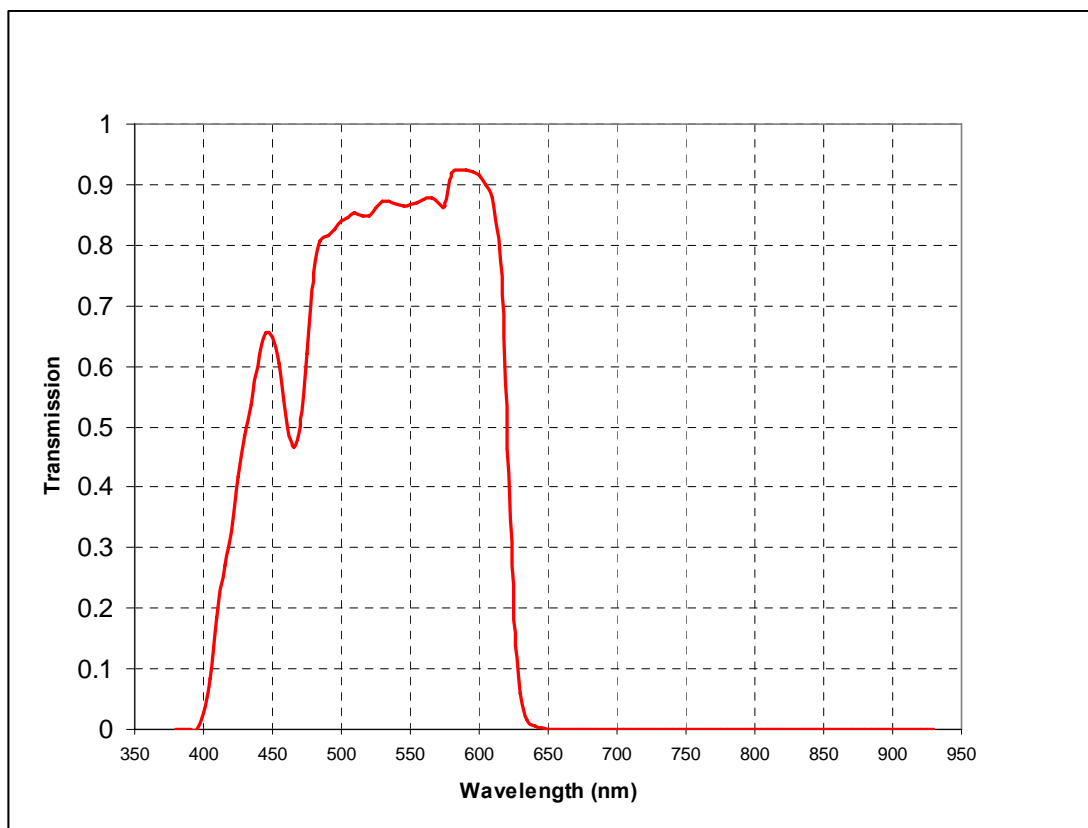
The coating is designed to provide optimal transmission and colour retention for the LED output.

Performance figures are quoted for a typical LED, and exact figures may vary.

1. TYPICAL PERFORMANCE

NVIS Radiance		Chromaticity		Photopic transmission
NR _A @ 0.1fL	NR _B @ 0.1fL	u'	v'	
7.6E-10	3.2E-11	.182	.497	83%

2. SPECTRAL TRANSMISSION





3. ENVIRONMENTAL TEST SPECIFICATIONS

The coating type has been successfully tested according to the following specifications.

3.1 Abrasion Resistance

Test No.	Relevant Specifications	Definition	Criteria for conformity
1.1	MIL-C-675A para. 4.6.11. MIL-C-675C para. 4.5.10. MIL-C-48497A para. 4.5.5.1.	Using an eraser (conforming to MIL-E-12397B) loaded to 1Kg rub the surface in straight line strokes approximately 18mm long for 20 cycles (i.e. 40 strokes.)	No visible imperfections such as blemishes, scratches or pinholes.

3.2 Adhesion

Test No.	Relevant Specifications	Definition	Criteria for conformity
2.1	MIL-M-13508C para. 4.4.6. MIL-C-675C para. 4.5.12. MIL-C-48497A para. 4.5.3.1.	Press cellulose tape 0.5" wide (conforming to L-T-90, Type 1, Class A) against and over the edges of the coated surface and remove slowly. (At an angle approximately normal to the surface.)	No coating removal.

3.3 Humidity

Test No.	Relevant Specifications	Definition	Criteria for conformity
3.1	MIL-M-13508C para. 4.4.7. MIL-C-675A para. 4.6.9. MIL-C-675C para. 3.8.2. MIL-C-48497A para. 4.5.3.2.	The coated witness piece shall be exposed for a period of 24 hours in a thermostatically controlled humidity chamber having a relative humidity of between 95 & 100% at 49°C ± 2°C (120°F ± 4°F). The witness piece shall be removed from the chamber and dried with lens tissue or selyvt cloth.	No evidence of corrosion or pitting.
3.2	MIL-STD-810 Method 507 Procedure 1	A coating witness piece shall be orientated vertically to avoid condensation from dripping on the test item. It shall be mounted to prevent water from accumulating at the bottom of the witness piece. Testing shall be conducted for a 10 day period, with no water condensation on the sample. The cycle and humidity parameters are to be set as per specification.	No evidence of corrosion or pitting.

3.4 Temperature Limits

Test No.	Relevant Specifications	Definition	Criteria for conformity
4.1	MIL-C-48497A para. 4.5.4.1.	Expose to temperatures of -26°C and +72°C for 2 hours at each temperature and return to ambient. The rate of change is to be less than 2°C per minute. The sample is then to be tested to the adhesion requirements of test 2.1.	No visible signs of deterioration.

3.5 Solubility

Test No.	Relevant Specifications	Definition	Criteria for conformity
5.1	MIL-C-675A para. 4.6.8. MIL-C-675C para. 4.5.7. MIL-C-48497A para 4.5.5.2.	Immerse the coated sample for a period of 24 hours in a solution of water and Sodium Chloride. The mixture shall be 37g of salt in 1 litre of de-ionised water (6oz/UK gallon) at room temperature.	No visible coating imperfections.



5.2	MIL-C-48497A para. 4.5.4.2.	Immerse the coated sample in sequence in Trichloroethylene, Acetone and Ethyl Alcohol (10 minutes in each.) Upon removal from each solution, the solvent shall be allowed to evaporate to dryness without wiping or forced drying before proceeding to the next solution. Upon removal from the Alcohol solution and after drying, any resultant stains on the coated surface shall be removed by wiping the coating to a clean, stain free condition with an Alcohol moistened tissue or selvyt cloth.	No visible coating imperfections.
5.3	MIL-C-48497A para. 4.5.5.3.	Immerse the coated sample for a period of 24 hours in de-ionised water at room temperature. Upon removal the sample shall be dried with lens tissue or selvyt cloth.	No visible coating imperfections.

3.6 Salt Spray

Test No.	Relevant Specifications	Definition	Criteria for conformity
6.1	ASTM-B-117	The witness pieces shall be exposed to a salt spray environment in a controlled chamber with the relevant settings as per ASTM-B-117. The length of exposure is to be determined by the documentation of the item under test.	No visible signs of corrosion.

The filter will additionally meet the specification requirements whilst experiencing the following environmental conditions. The filter will be designed to meet the full extremes of the conditions stated below.

3.7 Temperature

-40°C to 90°C

3.8 Solar Radiation

Equipment materials exposed to direct sunlight will not deteriorate or degrade through the effects of ultra violet light to affect maintainability, performance or significantly affect reliability.

3.9 Contamination Resistance

The effects of contamination by any of the fluids listed in Table 1 below will not cause deterioration of materials such as to affect the equipment reliability or performance, nor will it result in corrosion or damage to painted surfaces.

Where contamination is likely to cause corrosion, a suitable anti-corrosion treatment will be applied to the material.

3.10 Fungus Resistance

Materials that are not nutrients for fungi will be used. Where this is not practicable, a suitable fungicidal agent or other means will be used to protect materials.

The equipment will therefore not be adversely affected when tested to MIL-STD-810D, Method 508.3.

Table 1: List of Contaminants

FLUID	NATO REF	EQUIVALENT NATIONAL SPECIFICATION				
		US	SP	UK	FRG	IT
1.Avtag/FS11	F.40	MIL-T-5624 (Grade JP4)	INTA 151314I	D.Eng RD 2454 Iss4	TL9130-006 Iss9	AER.M.C.141n
2.Avtur/FS11	F.34	MIL-T-83133 (Grade JP8)	INTA 15316a	D.Eng RD2453		AER.M.C.141d



				Iss5		
3.Hydraulic Fluid OM15	H515	MIL-H-5606E	INTA 157111a	DEF.STD 91-48/1	VTL9150-020 Iss2a	AER.M.O.261g
4.Hydraulic Fluid OX19	H537	MIL-H-83282		MIL-H- 82382		
5.Cabin Seal Com- pounds		MIL-S-8802	Z-16103	DTD 900/4590 DTD 900/4709		
6.Fire Extinguishant		Bromo-Chloro-Difluoro-Methane (BCF)			A3F ⁽¹⁾ BC Powder ⁽³⁾ Halon1301 ⁽⁵⁾ Halon1211 ⁽⁶⁾	Plurex ⁽²⁾ AFFF ⁽⁴⁾ Dry Powder
7.Engine and Gearbox Oil	0156	MIL-L-23699C		D.Eng RD 2499	DERD 24970X27	
8.De-Icing Fluid	S737	TT-I-735(a) Am2 Grade(b)	TT-I- 735(a)	BS 1595 Am1	TL6810-002 Iss2	AER.M.L.421d
9.De-Icing Fluid (Wind- screen)				DTD 900/4039		
10.De-Icing Fluid (Air- craft)	S1746			DTD 900/4907	TL5850-02/1	
11.De-Icing Fluid (Run- way)				Konsin, Urea	Frigantin (BASF) Hoechst 1678	UREA (Carba- rnide)
12.Sea Water		MIL-STD-810D, Method 509.1				
13.Heat Transfer Liquid			Monsanto Coolanol 25R	DTD 900/4931a	Monsanto Coolanol 25R	
14.Engine Corrosion Inhibition Fluid	0133	MIL-L-6081 (Grade 1010) Only accesso- ries and gear box				
15.Bacterial and Chemical Agents		N/A	N/A	N/A	N/A	TBD
16.Nuclear Decontami- nation Fluid				Water	A1 ⁽⁷⁾ A2 ⁽⁸⁾	PX24 (at 2%)
17.Chemical Decon- tamination Fluid ⁹				N/A	N/A	N/A
18.Aircraft Washing Agents				TS 10281 Foaming Liquid TS 10304 Cleaning Gel	T3 C1D METAKS VD 4123 REMIL L AIR TEC 19	AER.M.M.501c
19.Dry Penetrant: In- spection Fluid Ardrex (NDT)				DTD929: 1.Dye - 996-PA 2.Rem - 9PR551 3.Dev -9D6		
20.Corrosion Preventive Compound	C634			DEF STAN 68/10/2		
21.Aircraft Cleaning Compound				DTD 5507B		

⁽¹⁾ ASF (Lightwater)

⁽²⁾ Plurex U3 (at 6%)



- (3) BC-Powder (Natriumhydrogene-Carbonate)
- (4) AFFF (at 6%)
- (5) Bromo-Trifluoro-Methane (Halon 1301). Used in Aircraft fire suppression only
- (6) Bromo-Chloro-Difluoro-Methane (Halon 1211). Used in Aircraft fire suppression only.
- (7) A1: Arylalkylsulfonat (Alkylarylsulfonat) in hydrous solution, 0.5%
- (8) A2: Di-Natriumsalt of Ethylene Diamin-Tetra-Acetic-Acid in hydrous solution, 0.5%
- (9) Only Applicable to Equipment located on the outside of the aircraft.

4. ADDITIONAL INFORMATION

The coating materials used are both hard refractory oxides and therefore non flammable, with melting points in excess of 1500°C.

Neither material is radioactive.

With regard to toxicity, it is only as a dust in the coating material raw state that the materials are known to cause irritation through ingestion. This will not apply to a coated substrate.