CHEMICAL PROPERTIES

CHEMICAL RESISTANCE

		Filaflex® 70A, 82A and 95A	
Code	**Tested**	**23 °C**	**60 °C**
0. Water	Tap Water	Years	Years
	Sea Water	Years	Years
1. Wake Acids, Carbonic Acids	3 % Acetic Acid	Years	Months
	3 % Lactic Acid	Years	Months
	3 % Boric Acid	Years	Months
	3 % Phenolic Solution	Years	Months
		However, tensile strength only 50 % due to swelling.	
	The action of 3 % solutions of formic acid, propionic acid, butyric acid, lauric acid, oleic acid, stearic acid etc., will be comparable.		
2. Chelating Carbon Acids	3 % Citric Acid	Years	Months
3. Weak Mineral Acids	3 % Sodium Bisulphate Solution	Years	Months
	3 % Phosphoric Acid	Years	Months
4. Strong Mineral Acids	3 % Hydrochloric Acid	Years	Months
	The action of 3 % sulphuric acid will be similar.		
5. Battery Acid	Battery Acid	Years	Months
6. Oxidizing Mineral Acids	3 % Nitric Acid	Days	Hours
7. Oxidizing Solutions, pH-value around 7	Hydrogen Peroxide 35 %	Months	
	Sodium Nitrate, 3 %	Years	Months
	Sodium Hypochlorite= Bleach	Months	Weeks
	(Javelle Water), 3 %	Years	Months
	Bleach (Javelle Water), 0.5 %	Years	Months
8. Reducing Solutions	Sodium Sulphite, 3 %	Years	Months
9. Alkaline Solutions	Saturated Calcium Hydroxide (Slaked Lime)	Years	Months
	3 % Soda Solution	Years	Months
	3 % Soda Lye (Caustic Soda)	Years	Months
	3 % Triethanolamine Solution	Years	Months
10. Basic Solutions	3 % Urea Solution	Years	Months
	3 % Ammonium Solution	Years	Months
	3 % Ammonium Chloride Solution	Years	Months

		Reduced tensile strength due to swelling	
11. Adblue	Adblue	Months / Yea	Months
12. Alcohols	Methanol	Months	
	Ethanol	Years	
	Iso-Propanol	Years	
13. FAM Test Fluids acc. to DIN 51604*	Test Fluid C	Years	
	Test Fluid B	Years Strong swelling	
	Test Fluid C	Years Strong swelling	
14. ASTM-Oils acc. to ASTM D 471-06**	IRM 901	Years	Months
	IRM 902	Years	Months
	IRM 903	Years	Months
15. Miscellaneous	Anti-freeze (Glysantine/Water 1/1.5)	Years	Months
	Silicone Fluid (Dimethyl Polysiloxane)	Years	Months
	Brake Fluid	Hours	Hours
	Ethyl Acetate	Months Reduced tensile strength due to swelling	
	Volume swelling:	70 %	
16. Solvents	No degradation of Filaflex® products occurs, however, according to the solvent class a variable degree of swelling and consequent reduction in tensile strength (after evaporation of the solvents, the tensile strength recovers approx. its original value). Methanol should be considered more as a chemical reagent than as a solvent. TPU is soluble in some solvents. As test procedure, 5A test rods (DIN EN ISO 527-2) were immersed in the solvent for three weeks at 23° C, and tested for tensile strength and residual swell 15 minutes after withdrawal. The values of volume swelling and reduction of tensile strength are rounded values.		

Code	**Tested**	**Filaflex® 70A, 82A and 95A** **%** Swelling	 **%** Reduction of Tensile strengh
16.1. Aliphatic Hydrocarbons	Pentan	10	20
	Cyclohexan	22	10
	Isooctan	7.5	none
	Filaflex® grades behave similarly in other aliphatic and cyclo-aliphatic hydrocarbons such as methane, ethane, propane, butane, hexane, octane, petroleum ether, paraffin oil, diesel oil and kerosine (although additives can present problems).		
16.2. Aromatic Hydrocarbons	Toluene	65	50
	Other aromatic hydrocarbons such as benzene and xylene have a similar affect.		

16.3. Aliphatic Esters	Ethyl Acetate	70	75
	Other short-chained esters such as butyl acetate and amyi acetate have a similar affect.		
16.4. Aliphatic Ketones	Methyl Ethyl Ketone	130	90
	Other short-chained aliphatic ketones such as acetone and methyl isobutyl ketone = MIBK have a similar affect.		
16.5. Aliphatic Halogenated Hydrocarbons, 1 C-atom	Methylene Chloride	190	95
	Chloroform		practically dissolved
			45
	Tetrachloroethylene	75	54
2 C-atoms and higher	Trichloroethane		
	Other aliphatic halogenated hydrocarbons with 2 C-atoms and higher have a similar affect.		
16.6. Aromatic Halogenated Hydrocarbons	Chlorobenzene	110	60
	Other aromatic halogenated hydrocarbons have a similar affect.		
16.7. ASTM-Oils acc. to ASTM D 471-06**	IRM 901 at 100 °C 500 h	1	6
	1000 h	1	14
	IRM 902 at 100 °C 500 h	9	4
	1000 h	10	5
	IRM 903 at 100 °C 500 h	18	8
	1000 h	20	30
16.8. Agents Dissolving TPU	Tetrahydrofurane		dissolved
	Dimethyl Formamide (DMF)		dissolved
	Dimethyl Acetamide		dissolved
	N-Methyl Pyrrolidone (NMP)		dissolved
	Dimethyl Sulphoxide (DMSO)		dissolved
	Pyridine		dissolved
17. Alcohols and Fuels	Methanol	28	60
	Ethanol	33	64
	Iso-Propanol	30	50
	Benzyl Alcohol	not measurable	partly dissolved
			poor resistance
	Ethylene Glycol	4	15
	Glycerine	none	none
FAM Test Fluids acc. to DIN 51 604*	Test Fluid A	67	60
	Test Fluid B	68	74
	Test Fluid C	43	70
Diesel Fuel	Diesel Fuel	11	none
Biodiesel Fuel RME at 60°C	Biodiesel Fuel	27	21
Fuel Types ASTM D 471	Fuel A = Iso-Octane	7.5	none
	Fuel B = Iso-Octane Toluene 70 % / 30 %	25	36
	Fuel C = Iso-Octane Toluene 50 % / 50 %	38	44

Fuel D = Iso-Octane Toluene 60 % / 40 %	31	44

* **DIN 51 604, 03.1984**, is the standard, etablished by FAM to assess the resistance of plastic materials to automotive fuels.

** The **IRM** reference oils are mineral oils with different paraffin and aromatics contents. The formerly used ASTM oils 1, 2 and 3 were replaced by the IRM oils 1, 2 and 3 owing to health risks, and are no longer available. The IRM oils 1, 2 and 3 are very similar in terms of their characteristics, but not identical.

(**FAM** = Fachausschuß Mineral- und Brennstoffnormung-Professional committee for standardization of fuel stuffs).

(**ASTM** = American Society for Testing and Materials).

Test fluid A consists of:
50.0 % by volume toluene
30.0 % by volume iso-octane
15.0 % by volume di-isobutylene
5.0 % by volume ethanol

Test fluid B consists of:
42.0 % by volume toluene
25.5 % by volume iso-octane
13.0 % by volume di-isobutylene
15.0 % by volume methanol
4.0 % by volume ethanol
0.5 % by volume water

Test fluid C consists of:
20.0 % by volume toluene
12.0 % by volume iso-octane
6.0 % by volume di-isobutylene
58.0 % by volume methanol
2.0 % by volume ethanol
2.0 % by volume water