



## Industrial Laminate Chemical Resistance

G-10 FR-4 Epoxy, G-3 Phenolic, G-9 Melamine, G-11 Epoxy, Phenolic L & Phenolic C

SOLVENTS (C-168/23)		FR-4 GLASS EPOXY	G-3 GLASS PHENOLIC	G-9 GLASS MELAMINE	G-11 GLASS EPOXY	L LINEN PHENOLIC	C CANVAS PHENOLIC
Acetone	Visual	G	G	E	G	E	F
	+/- thickness %	7.04	0.9	1.14	5.92	0.47	3.71
	+/- width %	0.09	0.07	0.02	0	0	0.26
<b>Recommend</b>		caution	ok	good	caution	good	caution
Methyl Alcohol	Visual	G	E	E	E	E	E
	+/- thickness %	2.91	-1.14	0	3.7	1.09	2.78
	+/- width %	0.07	0.05	0.01	0.1	0	0.33
<b>Recommend</b>		caution	good	excellent	caution	ok	caution
Unleaded Gasoline	Visual	E	E	E	E	E	E
	+/- thickness %	0.08	0.09	0.07	0.08	0.08	0.25
	+/- width %	0.05	0.1	0.04	0	0	0.08
<b>Recommend</b>		excellent	excellent	excellent	excellent	excellent	good
Toluene	Visual	E	E	E	E	E	E
	+/- thickness %	0.72	0.36	0.07	0.41	0	0.25
	+/- width %	0.05	0.12	0.06	0	0	0.17
<b>Recommend</b>		ok	good	excellent	good	excellent	good
TCIE	Visual	E	E	E	E	E	E
	+/- thickness %	2.44	0.09	0.43	2.51	0.08	0.5
	+/- width %	0.16	0.08	0.01	0.05	0	0.1
<b>Recommend</b>		caution	excellent	good	caution	excellent	good
ATF (#220)	Visual	E	E	E	G	E	E
	+/- thickness %	-0.39	-0.63	0	0.24	0.31	0
	+/- width %	0	0	0	0	0	0
<b>Recommend</b>		good	good	excellent	good	good	excellent

### Key to abbreviations:

#### Visual

E = excellent  
F = fair  
G = good  
N/D = no data  
X = bad

#### Recommendation

excellent = excellent for that application  
good = good resistance to chemical  
ok = may be used, minor changes in width and/or thickness <10%  
caution = use caution because of thickness increase in chemical  
N/R = not recommended for use in this chemical

**Notes Regarding Solvent Testing:** The materials on these pages have been tested in various media to determine the chemical resistance of these materials. All laminate materials were measured in thickness (.062") and width (1.00").

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ACIDS/BASES (E-24/38)		FR-4 GLASS EPOXY	G-3 GLASS PHENOLIC	G-9 GLASS MELAMINE	G-11 GLASS EPOXY	L LINEN PHENOLIC	C CANVAS PHENOLIC
<b>Acetic 10%</b>	Visual	E	E	E	E	E	E
	+/- thickness %	0.63	0.55	0	0.016	1.33	1.81
	+/- width %	0.35	0.05	0	-0.1	0.15	0.71
<b>Recommend</b>		ok	good	excellent	good	ok	ok
<b>Hydrochloric Acid 10%</b>	Visual	E	E	G	E	G	F
	+/- thickness %	0.16	0.09	2.9	0.16	1.01	1.57
	+/- width %	0.1	0.1	0.2	0	0.2	0.29
<b>Recommend</b>		good	excellent	caution	good	ok	good
<b>HNO<sub>3</sub> 5%</b>	Visual	E	E	G	E	E	E
	+/- thickness %	0.24	0.54	1.1	0	1.42	2.43
	+/- width %	0.05	0.25	0.05	0.1	0.3	0.25
<b>Recommend</b>		good	ok	ok	excellent	ok	caution
<b>H<sub>3</sub>PO<sub>4</sub> 25%</b>	Visual	E	E	E	E	E	E
	+/- thickness %	0.39	0.91	0.07	0.08	0.63	1.55
	+/- width %	0	0.69	0	0	0	0.2
<b>Recommend</b>		good	ok	excellent	excellent	ok	ok
<b>NH<sub>4</sub>OH 1N</b>	Visual	E	E	E	E	E	E
	+/- thickness %	0.08	0.18	0	0	0.86	2.59
	+/- width %	0	0.05	0.05	0.05	0.2	0.54
<b>Recommend</b>		excellent	good	excellent	excellent	ok	caution
<b>NaOH 1N</b>	Visual	E	NA	E	E	F	X
	+/- thickness %	0.08	0	0.22	0	4.03	12.61
	+/- width %	0	0	0.05	0.05	0.3	20.3
<b>Recommend</b>		excellent	excellent	good	excellent	caution	NR

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Acetic Acid 10%	Visual	E	E	E	E	E	E
	+/- thickness %	0	0.99	0.07	0.48	2.43	2.76
	+/- width %	0.34	0.27	0.01	0	0.41	0.46
<b>Recommend</b>		good	ok	excellent	good	caution	caution
HCl 10%	Visual	E	E	F	E	E	F
	+/- thickness %	0	0.98	4.4	0.24	2.21	2.32
	+/- width %	0.05	0.07	0	0.05	0.45	0.17
<b>Recommend</b>		excellent	ok	caution	ok	caution	caution
H <sub>3</sub> PO <sub>4</sub> 25%	Visual	E	E	E	E	E	E
	+/- thickness %	0.31	0.81	0.58	0	1.09	1.55
	+/- width %	-0.12	-0.26	0.13	0	0.2	0.41
<b>Recommend</b>		good	ok	ok	excellent	ok	ok
H <sub>2</sub> SO <sub>4</sub> 25%	Visual	E	E	G	F	E	E
	+/- thickness %	0.08	0.99	1.83	0	1.66	2.23
	+/- width %	0.06	0.15	0.63	0	0.3	0.18
<b>Recommend</b>		excellent	ok	ok	excellent	ok	caution
HNO <sub>3</sub> 5%	Visual	E	E	G	E	E	E
	+/- thickness %	0.31	0.72	1.85	0	2.03	3.81
	+/- width %	0.06	0.25	0.11	0.05	0.4	0.72
<b>Recommend</b>		good	ok	ok	excellent	ok	caution
BASES (C-168/23)		FR4 GLASS EPOXY	G-3 GLASS PHENOLIC	G-9 GLASS MELAMINE	G-11 GLASS EPOXY	L LINEN PHENOLIC	C CANVAS PHENOLIC
KOH 1N	Visual	E	X	E	G	F	X
	+/- thickness %	0.7	3.28	0.85	0.4	6.52	14.32
	+/- width %	0.08	0.26	0.08	0	0.61	1.33
<b>Recommend</b>		ok	caution	ok	good	caution	NR
NH <sub>4</sub> OH 1N	Visual	E	G	E	E	E	E
	+/- thickness %	1.1	0.72	0.51	0.08	2.44	3.91
	+/- width %	0.01	0.43	0.05	0	0.4	0.62
<b>Recommend</b>		ok	ok	good	excellent	caution	caution
NAOH 1N	Visual	E	F	E	E	F	F
	+/- thickness %	0.4	0.81	0.15	0	12.92	5.85
	+/- width %	0.09	0.16	0.09	0	0.91	0.56
<b>Recommend</b>		good	ok	good	excellent	NR	caution

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