

TABLE 1 Chemical components of 7075-T6 Al alloy (wt. %)

Material	Si	Fe	Cu	Mn	Mg	Cr	Zn	Ti	Al
Al 7075-	≤0.40	≤0.50	1.2~2.	≤0.30	2.1~2.	0.18~0.28	5.1~6.	≤0.20	Bal
T6			0		9		1		

TABLE 2 Biaxial loading ratio and the corresponding load ($R=0$)

λ	0	0.5	1	1.5	2
P_x (kN)	0	4	8	12	16
P_y (kN)	8	8	8	8	8

TABLE 3 The material properties of 7075-T6 Al alloy sheet

Material	E (GPa)	ν	ΔK_{th} (MPa·m ^{1/2})	K_{IC} (MPa·m ^{1/2})
Al 7075-	71.7	0.33	1.3007	25
T6				

TABLE 4 Initial crack deviation angle with respect to diagonal

λ	without residual stress	with residual stress-front 1	with residual stress-front 2
0	57.8° (clockwise)	26.1° (clockwise)	18.9° (clockwise)
0.5	38.9° (clockwise)	3.2° (counter-clockwise)	9.4° (counter-clockwise)
1	0°	24.3° (counter-clockwise)	27.2° (counter-clockwise)
1.5	27.8° (counter-clockwise)	35.1° (counter-clockwise)	36.5° (counter-clockwise)

2	38.9° (counter-clockwise)	41.1° (counter-clockwise)	43.4° (counter-clockwise)
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TABLE 5 Residual stress effects on K_I and K_{II} at initial crack tip (MPa·m^{1/2})

λ	0	0.5	1	1.5	2
K_I -1	1.15↗2.33	1.73↗2.77	2.31↗3.21	2.88↗3.65	3.46↗4.09
K_I -2	1.15↗2.51	1.73↗2.94	2.31↗3.38	2.88↗3.82	3.46↗4.26
K_{II} -1	1.63↘0.61	0.82↘0.08	0↗0.77	0.82↗1.45	1.63↗2.14
K_{II} -2	1.63↘0.44	0.82↘0.24	0↗0.93	0.82↗1.62	1.63↗2.30

TABLE 6 SIF components (K_I^{load} , K_{II}^{load} , K_I^{res} and K_{II}^{res}) on both sides for different biaxial loading ratios (MPa·m^{1/2})

λ	0	0.5	1	1.5	2
K_I^{load} -1	1.25~18.82	1.69~22.94	2.13~17.01	2.57~21.86	3.01~19.40
K_I^{load} -2	1.26~19.56	1.68~24.51	2.14~16.91	2.57~19.82	3.01~20.66
K_{II}^{load} -1	1.51~2.68	0.83~2.62	0.14~0.51	-0.54~0.25	-1.23~0.15
K_{II}^{load} -2	-1.51~2.21	-2.68~-0.83	-0.55~0.33	-0.29~0.54	-0.30~1.23
K_I^{res} -1	0.39~1.08	0.88~5.63	1.08~5.94	1.08~5.86	1.08~5.92
K_I^{res} -2	0.75~1.28	0.55~5.29	0.42~5.74	1.25~5.87	1.25~5.84
K_{II}^{res} -1	-2.71~-0.91	-2.37~-0.91	-0.91~-0.14	-0.91~-0.04	-0.91~0.06
K_{II}^{res} -2	1.07~2.23	1.07~2.62	-0.50~1.07	0.08~1.07	-0.01~1.07