SG No. 196 T^2 $F23$ [cubic]

* plus set: $+[0,\,0,\,0]$, $+\left[0,\,\frac{1}{2},\,\frac{1}{2}\right]$, $+\left[\frac{1}{2},\,0,\,\frac{1}{2}\right]$, $+\left[\frac{1}{2},\,\frac{1}{2},\,0\right]$
* Wyckoff site: `4a`, site symmetry: `23.`

Table 1: Wyckoff bond: `12a@4a`

No.	vector	center	mapping
1	$[X,\,0,\,0]$	$[0,\,0,\,0]$	`[1,-2,-3,4]`
2	$[0,\,X,\,0]$	$[0,\,0,\,0]$	`[5,-6,-7,8]`
3	$[0,\,0,\,X]$	$[0,\,0,\,0]$	`[9,-10,-11,12]`

Table 2: Wyckoff bond: `16b@4a`

No.	vector	center	mapping
1	$[X,\,X,\,X]$	$[0,\,0,\,0]$	`[1,5,9]`
2	$[-X,\,-X,\,X]$	$[0,\,0,\,0]$	`[2,7,12]`
3	$[-X,\,X,\,-X]$	$[0,\,0,\,0]$	`[3,8,10]`
4	$[X,\,-X,\,-X]$	$[0,\,0,\,0]$	`[4,6,11]`

Table 3: Wyckoff bond: `24c@4a`

No.	vector	center	mapping
1	$[X,\,Y,\,0]$	$[0,\,0,\,0]$	`[1,-2]`
2	$[-X,\,Y,\,0]$	$[0,\,0,\,0]$	`[3,-4]`
3	$[0,\,X,\,Y]$	$[0,\,0,\,0]$	`[5,-6]`
4	$[0,\,-X,\,Y]$	$[0,\,0,\,0]$	`[7,-8]`
5	$[Y,\,0,\,X]$	$[0,\,0,\,0]$	`[9,-10]`
6	$[Y,\,0,\,-X]$	$[0,\,0,\,0]$	`[11,-12]`

Table 4: Wyckoff bond: `48d@4a`

No.	vector	center	mapping
1	$[X,\,Y,\,Z]$	$[0,\,0,\,0]$	`[1]`
2	$[-X,\,-Y,\,Z]$	$[0,\,0,\,0]$	`[2]`
3	$[-X,\,Y,\,-Z]$	$[0,\,0,\,0]$	`[3]`
4	$[X,\,-Y,\,-Z]$	$[0,\,0,\,0]$	`[4]`
5	$[Z,\,X,\,Y]$	$[0,\,0,\,0]$	`[5]`
6	$[Z,\,-X,\,-Y]$	$[0,\,0,\,0]$	`[6]`
7	$[-Z,\,-X,\,Y]$	$[0,\,0,\,0]$	`[7]`
8	$[-Z,\,X,\,-Y]$	$[0,\,0,\,0]$	`[8]`
9	$[Y,\,Z,\,X]$	$[0,\,0,\,0]$	`[9]`
10	$[-Y,\,Z,\,-X]$	$[0,\,0,\,0]$	`[10]`

continued ...

Table 4

No.	vector	center	mapping
11	$[Y, -Z, -X]$	[0, 0, 0]	`[11]`
12	$[-Y, -Z, X]$	[0, 0, 0]	`[12]`

* Wyckoff site: `4b`, site symmetry: `23.`

Table 5: Wyckoff bond: `12a@4b`

No.	vector	center	mapping
1	$[X, 0, 0]$	$\left[\frac{1}{2}, \frac{1}{2}, \frac{1}{2}\right]$	`[1,-2,-3,4]`
2	$[0, X, 0]$	$\left[\frac{1}{2}, \frac{1}{2}, \frac{1}{2}\right]$	`[5,-6,-7,8]`
3	$[0, 0, X]$	$\left[\frac{1}{2}, \frac{1}{2}, \frac{1}{2}\right]$	`[9,-10,-11,12]`

Table 6: Wyckoff bond: `16b@4b`

No.	vector	center	mapping
1	$[X, X, X]$	$\left[\frac{1}{2}, \frac{1}{2}, \frac{1}{2}\right]$	`[1,5,9]`
2	$[-X, -X, X]$	$\left[\frac{1}{2}, \frac{1}{2}, \frac{1}{2}\right]$	`[2,7,12]`
3	$[-X, X, -X]$	$\left[\frac{1}{2}, \frac{1}{2}, \frac{1}{2}\right]$	`[3,8,10]`
4	$[X, -X, -X]$	$\left[\frac{1}{2}, \frac{1}{2}, \frac{1}{2}\right]$	`[4,6,11]`

Table 7: Wyckoff bond: `24c@4b`

No.	vector	center	mapping
1	$[X, Y, 0]$	$\left[\frac{1}{2}, \frac{1}{2}, \frac{1}{2}\right]$	`[1,-2]`
2	$[-X, Y, 0]$	$\left[\frac{1}{2}, \frac{1}{2}, \frac{1}{2}\right]$	`[3,-4]`
3	$[0, X, Y]$	$\left[\frac{1}{2}, \frac{1}{2}, \frac{1}{2}\right]$	`[5,-6]`
4	$[0, -X, Y]$	$\left[\frac{1}{2}, \frac{1}{2}, \frac{1}{2}\right]$	`[7,-8]`
5	$[Y, 0, X]$	$\left[\frac{1}{2}, \frac{1}{2}, \frac{1}{2}\right]$	`[9,-10]`
6	$[Y, 0, -X]$	$\left[\frac{1}{2}, \frac{1}{2}, \frac{1}{2}\right]$	`[11,-12]`

Table 8: Wyckoff bond: `48d@4b`

No.	vector	center	mapping
1	$[X, Y, Z]$	$\left[\frac{1}{2}, \frac{1}{2}, \frac{1}{2}\right]$	`[1]`
2	$[-X, -Y, Z]$	$\left[\frac{1}{2}, \frac{1}{2}, \frac{1}{2}\right]$	`[2]`
3	$[-X, Y, -Z]$	$\left[\frac{1}{2}, \frac{1}{2}, \frac{1}{2}\right]$	`[3]`
4	$[X, -Y, -Z]$	$\left[\frac{1}{2}, \frac{1}{2}, \frac{1}{2}\right]$	`[4]`
5	$[Z, X, Y]$	$\left[\frac{1}{2}, \frac{1}{2}, \frac{1}{2}\right]$	`[5]`

continued ...

Table 8

No.	vector	center	mapping
6	$[Z, -X, -Y]$	$\left[\frac{1}{2}, \frac{1}{2}, \frac{1}{2}\right]$	`[6]`
7	$[-Z, -X, Y]$	$\left[\frac{1}{2}, \frac{1}{2}, \frac{1}{2}\right]$	`[7]`
8	$[-Z, X, -Y]$	$\left[\frac{1}{2}, \frac{1}{2}, \frac{1}{2}\right]$	`[8]`
9	$[Y, Z, X]$	$\left[\frac{1}{2}, \frac{1}{2}, \frac{1}{2}\right]$	`[9]`
10	$[-Y, Z, -X]$	$\left[\frac{1}{2}, \frac{1}{2}, \frac{1}{2}\right]$	`[10]`
11	$[Y, -Z, -X]$	$\left[\frac{1}{2}, \frac{1}{2}, \frac{1}{2}\right]$	`[11]`
12	$[-Y, -Z, X]$	$\left[\frac{1}{2}, \frac{1}{2}, \frac{1}{2}\right]$	`[12]`

* Wyckoff site: `4c`, site symmetry: `23.`

Table 9: Wyckoff bond: `12a@4c`

No.	vector	center	mapping
1	$[X, 0, 0]$	$\left[\frac{1}{4}, \frac{1}{4}, \frac{1}{4}\right]$	`[1,-2,-3,4]`
2	$[0, X, 0]$	$\left[\frac{1}{4}, \frac{1}{4}, \frac{1}{4}\right]$	`[5,-6,-7,8]`
3	$[0, 0, X]$	$\left[\frac{1}{4}, \frac{1}{4}, \frac{1}{4}\right]$	`[9,-10,-11,12]`

Table 10: Wyckoff bond: `16b@4c`

No.	vector	center	mapping
1	$[X, X, X]$	$\left[\frac{1}{4}, \frac{1}{4}, \frac{1}{4}\right]$	`[1,5,9]`
2	$[-X, -X, X]$	$\left[\frac{1}{4}, \frac{1}{4}, \frac{1}{4}\right]$	`[2,7,12]`
3	$[-X, X, -X]$	$\left[\frac{1}{4}, \frac{1}{4}, \frac{1}{4}\right]$	`[3,8,10]`
4	$[X, -X, -X]$	$\left[\frac{1}{4}, \frac{1}{4}, \frac{1}{4}\right]$	`[4,6,11]`

Table 11: Wyckoff bond: `24c@4c`

No.	vector	center	mapping
1	$[X, Y, 0]$	$\left[\frac{1}{4}, \frac{1}{4}, \frac{1}{4}\right]$	`[1,-2]`
2	$[-X, Y, 0]$	$\left[\frac{1}{4}, \frac{1}{4}, \frac{1}{4}\right]$	`[3,-4]`
3	$[0, X, Y]$	$\left[\frac{1}{4}, \frac{1}{4}, \frac{1}{4}\right]$	`[5,-6]`
4	$[0, -X, Y]$	$\left[\frac{1}{4}, \frac{1}{4}, \frac{1}{4}\right]$	`[7,-8]`
5	$[Y, 0, X]$	$\left[\frac{1}{4}, \frac{1}{4}, \frac{1}{4}\right]$	`[9,-10]`
6	$[Y, 0, -X]$	$\left[\frac{1}{4}, \frac{1}{4}, \frac{1}{4}\right]$	`[11,-12]`

Table 12: Wyckoff bond: `48d@4c`

No.	vector	center	mapping
1	$[X, Y, Z]$	$\left[\frac{1}{4}, \frac{1}{4}, \frac{1}{4}\right]$	`[1]`
2	$[-X, -Y, Z]$	$\left[\frac{1}{4}, \frac{1}{4}, \frac{1}{4}\right]$	`[2]`
3	$[-X, Y, -Z]$	$\left[\frac{1}{4}, \frac{1}{4}, \frac{1}{4}\right]$	`[3]`
4	$[X, -Y, -Z]$	$\left[\frac{1}{4}, \frac{1}{4}, \frac{1}{4}\right]$	`[4]`
5	$[Z, X, Y]$	$\left[\frac{1}{4}, \frac{1}{4}, \frac{1}{4}\right]$	`[5]`
6	$[Z, -X, -Y]$	$\left[\frac{1}{4}, \frac{1}{4}, \frac{1}{4}\right]$	`[6]`
7	$[-Z, -X, Y]$	$\left[\frac{1}{4}, \frac{1}{4}, \frac{1}{4}\right]$	`[7]`
8	$[-Z, X, -Y]$	$\left[\frac{1}{4}, \frac{1}{4}, \frac{1}{4}\right]$	`[8]`
9	$[Y, Z, X]$	$\left[\frac{1}{4}, \frac{1}{4}, \frac{1}{4}\right]$	`[9]`
10	$[-Y, Z, -X]$	$\left[\frac{1}{4}, \frac{1}{4}, \frac{1}{4}\right]$	`[10]`
11	$[Y, -Z, -X]$	$\left[\frac{1}{4}, \frac{1}{4}, \frac{1}{4}\right]$	`[11]`
12	$[-Y, -Z, X]$	$\left[\frac{1}{4}, \frac{1}{4}, \frac{1}{4}\right]$	`[12]`

* Wyckoff site: `4d`, site symmetry: `23.`

Table 13: Wyckoff bond: `12a@4d`

No.	vector	center	mapping
1	$[X, 0, 0]$	$\left[\frac{3}{4}, \frac{3}{4}, \frac{3}{4}\right]$	`[1,-2,-3,4]`
2	$[0, X, 0]$	$\left[\frac{3}{4}, \frac{3}{4}, \frac{3}{4}\right]$	`[5,-6,-7,8]`
3	$[0, 0, X]$	$\left[\frac{3}{4}, \frac{3}{4}, \frac{3}{4}\right]$	`[9,-10,-11,12]`

Table 14: Wyckoff bond: `16b@4d`

No.	vector	center	mapping
1	$[X, X, X]$	$\left[\frac{3}{4}, \frac{3}{4}, \frac{3}{4}\right]$	`[1,5,9]`
2	$[-X, -X, X]$	$\left[\frac{3}{4}, \frac{3}{4}, \frac{3}{4}\right]$	`[2,7,12]`
3	$[-X, X, -X]$	$\left[\frac{3}{4}, \frac{3}{4}, \frac{3}{4}\right]$	`[3,8,10]`
4	$[X, -X, -X]$	$\left[\frac{3}{4}, \frac{3}{4}, \frac{3}{4}\right]$	`[4,6,11]`

Table 15: Wyckoff bond: `24c@4d`

No.	vector	center	mapping
1	$[X, Y, 0]$	$\left[\frac{3}{4}, \frac{3}{4}, \frac{3}{4}\right]$	`[1,-2]`
2	$[-X, Y, 0]$	$\left[\frac{3}{4}, \frac{3}{4}, \frac{3}{4}\right]$	`[3,-4]`
3	$[0, X, Y]$	$\left[\frac{3}{4}, \frac{3}{4}, \frac{3}{4}\right]$	`[5,-6]`
4	$[0, -X, Y]$	$\left[\frac{3}{4}, \frac{3}{4}, \frac{3}{4}\right]$	`[7,-8]`
5	$[Y, 0, X]$	$\left[\frac{3}{4}, \frac{3}{4}, \frac{3}{4}\right]$	`[9,-10]`
6	$[Y, 0, -X]$	$\left[\frac{3}{4}, \frac{3}{4}, \frac{3}{4}\right]$	`[11,-12]`

Table 16: Wyckoff bond: `48d@4d`

No.	vector	center	mapping
1	$[X, Y, Z]$	$[\frac{3}{4}, \frac{3}{4}, \frac{3}{4}]$	`[1]`
2	$[-X, -Y, Z]$	$[\frac{3}{4}, \frac{3}{4}, \frac{3}{4}]$	`[2]`
3	$[-X, Y, -Z]$	$[\frac{3}{4}, \frac{3}{4}, \frac{3}{4}]$	`[3]`
4	$[X, -Y, -Z]$	$[\frac{3}{4}, \frac{3}{4}, \frac{3}{4}]$	`[4]`
5	$[Z, X, Y]$	$[\frac{3}{4}, \frac{3}{4}, \frac{3}{4}]$	`[5]`
6	$[Z, -X, -Y]$	$[\frac{3}{4}, \frac{3}{4}, \frac{3}{4}]$	`[6]`
7	$[-Z, -X, Y]$	$[\frac{3}{4}, \frac{3}{4}, \frac{3}{4}]$	`[7]`
8	$[-Z, X, -Y]$	$[\frac{3}{4}, \frac{3}{4}, \frac{3}{4}]$	`[8]`
9	$[Y, Z, X]$	$[\frac{3}{4}, \frac{3}{4}, \frac{3}{4}]$	`[9]`
10	$[-Y, Z, -X]$	$[\frac{3}{4}, \frac{3}{4}, \frac{3}{4}]$	`[10]`
11	$[Y, -Z, -X]$	$[\frac{3}{4}, \frac{3}{4}, \frac{3}{4}]$	`[11]`
12	$[-Y, -Z, X]$	$[\frac{3}{4}, \frac{3}{4}, \frac{3}{4}]$	`[12]`

* Wyckoff site: `16e`, site symmetry: `.3.`

Table 17: Wyckoff bond: `16a@16e`

No.	vector	center	mapping
1	$[X, X, X]$	$[x, x, x]$	`[1,5,9]`
2	$[-X, -X, X]$	$[-x, -x, x]$	`[2,7,12]`
3	$[-X, X, -X]$	$[-x, x, -x]$	`[3,8,10]`
4	$[X, -X, -X]$	$[x, -x, -x]$	`[4,6,11]`

Table 18: Wyckoff bond: `48b@16e`

No.	vector	center	mapping
1	$[X, Y, Z]$	$[x, x, x]$	`[1]`
2	$[-X, -Y, Z]$	$[-x, -x, x]$	`[2]`
3	$[-X, Y, -Z]$	$[-x, x, -x]$	`[3]`
4	$[X, -Y, -Z]$	$[x, -x, -x]$	`[4]`
5	$[Z, X, Y]$	$[x, x, x]$	`[5]`
6	$[Z, -X, -Y]$	$[x, -x, -x]$	`[6]`
7	$[-Z, -X, Y]$	$[-x, -x, x]$	`[7]`
8	$[-Z, X, -Y]$	$[-x, x, -x]$	`[8]`
9	$[Y, Z, X]$	$[x, x, x]$	`[9]`
10	$[-Y, Z, -X]$	$[-x, x, -x]$	`[10]`
11	$[Y, -Z, -X]$	$[x, -x, -x]$	`[11]`
12	$[-Y, -Z, X]$	$[-x, -x, x]$	`[12]`

* Wyckoff site: `24f`, site symmetry: `2..`

Table 19: Wyckoff bond: `24a@24f`

No.	vector	center	mapping
1	$[0,\ X,\ Y]$	$[x,\ 0,\ 0]$	`[1,-4]`
2	$[0,\ -X,\ Y]$	$[-x,\ 0,\ 0]$	`[2,-3]`
3	$[Y,\ 0,\ X]$	$[0,\ x,\ 0]$	`[5,-8]`
4	$[Y,\ 0,\ -X]$	$[0,\ -x,\ 0]$	`[6,-7]`
5	$[X,\ Y,\ 0]$	$[0,\ 0,\ x]$	`[9,-12]`
6	$[-X,\ Y,\ 0]$	$[0,\ 0,\ -x]$	`[10,-11]`

Table 20: Wyckoff bond: `24b@24f`

No.	vector	center	mapping
1	$[X,\ 0,\ 0]$	$[x,\ 0,\ 0]$	`[1,4]`
2	$[-X,\ 0,\ 0]$	$[-x,\ 0,\ 0]$	`[2,3]`
3	$[0,\ X,\ 0]$	$[0,\ x,\ 0]$	`[5,8]`
4	$[0,\ -X,\ 0]$	$[0,\ -x,\ 0]$	`[6,7]`
5	$[0,\ 0,\ X]$	$[0,\ 0,\ x]$	`[9,12]`
6	$[0,\ 0,\ -X]$	$[0,\ 0,\ -x]$	`[10,11]`

Table 21: Wyckoff bond: `48c@24f`

No.	vector	center	mapping
1	$[X,\ Y,\ Z]$	$[x,\ 0,\ 0]$	`[1]`
2	$[-X,\ -Y,\ Z]$	$[-x,\ 0,\ 0]$	`[2]`
3	$[-X,\ Y,\ -Z]$	$[-x,\ 0,\ 0]$	`[3]`
4	$[X,\ -Y,\ -Z]$	$[x,\ 0,\ 0]$	`[4]`
5	$[Z,\ X,\ Y]$	$[0,\ x,\ 0]$	`[5]`
6	$[Z,\ -X,\ -Y]$	$[0,\ -x,\ 0]$	`[6]`
7	$[-Z,\ -X,\ Y]$	$[0,\ -x,\ 0]$	`[7]`
8	$[-Z,\ X,\ -Y]$	$[0,\ x,\ 0]$	`[8]`
9	$[Y,\ Z,\ X]$	$[0,\ 0,\ x]$	`[9]`
10	$[-Y,\ Z,\ -X]$	$[0,\ 0,\ -x]$	`[10]`
11	$[Y,\ -Z,\ -X]$	$[0,\ 0,\ -x]$	`[11]`
12	$[-Y,\ -Z,\ X]$	$[0,\ 0,\ x]$	`[12]`

* Wyckoff site: `24g`, site symmetry: `2..`

Table 22: Wyckoff bond: `24a@24g`

No.	vector	center	mapping
1	$[0,\ X,\ Y]$	$\left[x,\ \frac{1}{4},\ \frac{1}{4}\right]$	`[1,-4]`

continued ...

Table 22

No.	vector	center	mapping
2	$[0, -X, Y]$	$\left[-x, \frac{3}{4}, \frac{1}{4}\right]$	[2,-3]
3	$[Y, 0, X]$	$\left[\frac{1}{4}, x, \frac{1}{4}\right]$	[5,-8]
4	$[Y, 0, -X]$	$\left[\frac{1}{4}, -x, \frac{3}{4}\right]$	[6,-7]
5	$[X, Y, 0]$	$\left[\frac{1}{4}, \frac{1}{4}, x\right]$	[9,-12]
6	$[-X, Y, 0]$	$\left[\frac{3}{4}, \frac{1}{4}, -x\right]$	[10,-11]

Table 23: Wyckoff bond: 24b@24g

No.	vector	center	mapping
1	$[X, 0, 0]$	$\left[x, \frac{1}{4}, \frac{1}{4}\right]$	[1,4]
2	$[-X, 0, 0]$	$\left[-x, \frac{3}{4}, \frac{1}{4}\right]$	[2,3]
3	$[0, X, 0]$	$\left[\frac{1}{4}, x, \frac{1}{4}\right]$	[5,8]
4	$[0, -X, 0]$	$\left[\frac{1}{4}, -x, \frac{3}{4}\right]$	[6,7]
5	$[0, 0, X]$	$\left[\frac{1}{4}, \frac{1}{4}, x\right]$	[9,12]
6	$[0, 0, -X]$	$\left[\frac{3}{4}, \frac{1}{4}, -x\right]$	[10,11]

Table 24: Wyckoff bond: 48c@24g

No.	vector	center	mapping
1	$[X, Y, Z]$	$\left[x, \frac{1}{4}, \frac{1}{4}\right]$	[1]
2	$[-X, -Y, Z]$	$\left[-x, \frac{3}{4}, \frac{1}{4}\right]$	[2]
3	$[-X, Y, -Z]$	$\left[-x, \frac{3}{4}, \frac{1}{4}\right]$	[3]
4	$[X, -Y, -Z]$	$\left[x, \frac{1}{4}, \frac{1}{4}\right]$	[4]
5	$[Z, X, Y]$	$\left[\frac{1}{4}, x, \frac{1}{4}\right]$	[5]
6	$[Z, -X, -Y]$	$\left[\frac{1}{4}, -x, \frac{3}{4}\right]$	[6]
7	$[-Z, -X, Y]$	$\left[\frac{1}{4}, -x, \frac{3}{4}\right]$	[7]
8	$[-Z, X, -Y]$	$\left[\frac{1}{4}, x, \frac{1}{4}\right]$	[8]
9	$[Y, Z, X]$	$\left[\frac{1}{4}, \frac{1}{4}, x\right]$	[9]
10	$[-Y, Z, -X]$	$\left[\frac{3}{4}, \frac{1}{4}, -x\right]$	[10]
11	$[Y, -Z, -X]$	$\left[\frac{3}{4}, \frac{1}{4}, -x\right]$	[11]
12	$[-Y, -Z, X]$	$\left[\frac{1}{4}, \frac{1}{4}, x\right]$	[12]

* Wyckoff site: 48h, site symmetry: 1

Table 25: Wyckoff bond: 48a@48h

No.	vector	center	mapping
1	$[X, Y, Z]$	$[x, y, z]$	[1]
2	$[-X, -Y, Z]$	$[-x, -y, z]$	[2]
3	$[-X, Y, -Z]$	$[-x, y, -z]$	[3]

continued ...

Table 25

No.	vector	center	mapping
4	$[X, -Y, -Z]$	$[x, -y, -z]$	[4]
5	$[Z, X, Y]$	$[z, x, y]$	[5]
6	$[Z, -X, -Y]$	$[z, -x, -y]$	[6]
7	$[-Z, -X, Y]$	$[-z, -x, y]$	[7]
8	$[-Z, X, -Y]$	$[-z, x, -y]$	[8]
9	$[Y, Z, X]$	$[y, z, x]$	[9]
10	$[-Y, Z, -X]$	$[-y, z, -x]$	[10]
11	$[Y, -Z, -X]$	$[y, -z, -x]$	[11]
12	$[-Y, -Z, X]$	$[-y, -z, x]$	[12]