

SG No. 228 O_h^8 $Fd\bar{3}c$ [cubic]

* generator : $\{2_{001}| \frac{1}{4} \frac{3}{4} \frac{1}{2}\}$, $\{2_{010}| \frac{3}{4} \frac{1}{2} \frac{1}{4}\}$, $\{3_{111}^+| 0\}$, $\{2_{110}| \frac{3}{4} \frac{1}{4} 0\}$, $\{-1| 0\}$

* symmetry operation $+ [0, 0, 0]$, $+ [0, \frac{1}{2}, \frac{1}{2}]$, $+ [\frac{1}{2}, 0, \frac{1}{2}]$, $+ [\frac{1}{2}, \frac{1}{2}, 0]$

Table 1: Symmetry operations for 3d polar vector.

No.	tag	matrix (polar)	det
1	$\{1 0\}$	$\begin{bmatrix} 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 0 \end{bmatrix}$	1
2	$\{2_{001} \frac{1}{4} \frac{3}{4} \frac{1}{2}\}$	$\begin{bmatrix} -1 & 0 & 0 & \frac{1}{4} \\ 0 & -1 & 0 & \frac{3}{4} \\ 0 & 0 & 1 & \frac{1}{2} \end{bmatrix}$	1
3	$\{2_{010} \frac{3}{4} \frac{1}{2} \frac{1}{4}\}$	$\begin{bmatrix} -1 & 0 & 0 & \frac{3}{4} \\ 0 & 1 & 0 & \frac{1}{2} \\ 0 & 0 & -1 & \frac{1}{4} \end{bmatrix}$	1
4	$\{2_{100} \frac{1}{2} \frac{1}{4} \frac{3}{4}\}$	$\begin{bmatrix} 1 & 0 & 0 & \frac{1}{2} \\ 0 & -1 & 0 & \frac{1}{4} \\ 0 & 0 & -1 & \frac{3}{4} \end{bmatrix}$	1
5	$\{3_{111}^+ 0\}$	$\begin{bmatrix} 0 & 0 & 1 & 0 \\ 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 \end{bmatrix}$	1
6	$\{3_{-11-1}^+ \frac{1}{2} \frac{1}{4} \frac{3}{4}\}$	$\begin{bmatrix} 0 & 0 & 1 & \frac{1}{2} \\ -1 & 0 & 0 & \frac{1}{4} \\ 0 & -1 & 0 & \frac{3}{4} \end{bmatrix}$	1
7	$\{3_{1-1-1}^+ \frac{1}{4} \frac{3}{4} \frac{1}{2}\}$	$\begin{bmatrix} 0 & 0 & -1 & \frac{1}{4} \\ -1 & 0 & 0 & \frac{3}{4} \\ 0 & 1 & 0 & \frac{1}{2} \end{bmatrix}$	1
8	$\{3_{-1-11}^+ \frac{3}{4} \frac{1}{2} \frac{1}{4}\}$	$\begin{bmatrix} 0 & 0 & -1 & \frac{3}{4} \\ 1 & 0 & 0 & \frac{1}{2} \\ 0 & -1 & 0 & \frac{1}{4} \end{bmatrix}$	1
9	$\{3_{111}^- 0\}$	$\begin{bmatrix} 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 0 \\ 1 & 0 & 0 & 0 \end{bmatrix}$	1
10	$\{3_{1-1-1}^- \frac{3}{4} \frac{1}{2} \frac{1}{4}\}$	$\begin{bmatrix} 0 & -1 & 0 & \frac{3}{4} \\ 0 & 0 & 1 & \frac{1}{2} \\ -1 & 0 & 0 & \frac{1}{4} \end{bmatrix}$	1
11	$\{3_{-1-11}^- \frac{1}{2} \frac{1}{4} \frac{3}{4}\}$	$\begin{bmatrix} 0 & 1 & 0 & \frac{1}{2} \\ 0 & 0 & -1 & \frac{1}{4} \\ -1 & 0 & 0 & \frac{3}{4} \end{bmatrix}$	1
12	$\{3_{-11-1}^- \frac{1}{4} \frac{3}{4} \frac{1}{2}\}$	$\begin{bmatrix} 0 & -1 & 0 & \frac{1}{4} \\ 0 & 0 & -1 & \frac{3}{4} \\ 1 & 0 & 0 & \frac{1}{2} \end{bmatrix}$	1
13	$\{2_{110} \frac{3}{4} \frac{1}{4} 0\}$	$\begin{bmatrix} 0 & 1 & 0 & \frac{3}{4} \\ 1 & 0 & 0 & \frac{1}{4} \\ 0 & 0 & -1 & 0 \end{bmatrix}$	1

continued ...

Table 1

No.	tag	matrix (polar)	det
14	$\{2_{1-10} \frac{1}{2}\frac{1}{2}\frac{1}{2}\}$	$\begin{bmatrix} 0 & -1 & 0 & \frac{1}{2} \\ -1 & 0 & 0 & \frac{1}{2} \\ 0 & 0 & -1 & \frac{1}{2} \end{bmatrix}$	1
15	$\{4_{001}^- \frac{1}{4}0\frac{3}{4}\}$	$\begin{bmatrix} 0 & 1 & 0 & \frac{1}{4} \\ -1 & 0 & 0 & 0 \\ 0 & 0 & 1 & \frac{3}{4} \end{bmatrix}$	1
16	$\{4_{001}^+ 0\frac{3}{4}\frac{1}{4}\}$	$\begin{bmatrix} 0 & -1 & 0 & 0 \\ 1 & 0 & 0 & \frac{3}{4} \\ 0 & 0 & 1 & \frac{1}{4} \end{bmatrix}$	1
17	$\{4_{-100}^- \frac{3}{4}\frac{1}{4}0\}$	$\begin{bmatrix} 1 & 0 & 0 & \frac{3}{4} \\ 0 & 0 & 1 & \frac{1}{4} \\ 0 & -1 & 0 & 0 \end{bmatrix}$	1
18	$\{2_{011} 0\frac{3}{4}\frac{1}{4}\}$	$\begin{bmatrix} -1 & 0 & 0 & 0 \\ 0 & 0 & 1 & \frac{3}{4} \\ 0 & 1 & 0 & \frac{1}{4} \end{bmatrix}$	1
19	$\{2_{01-1} \frac{1}{2}\frac{1}{2}\frac{1}{2}\}$	$\begin{bmatrix} -1 & 0 & 0 & \frac{1}{2} \\ 0 & 0 & -1 & \frac{1}{2} \\ 0 & -1 & 0 & \frac{1}{2} \end{bmatrix}$	1
20	$\{4_{100}^+ \frac{1}{4}0\frac{3}{4}\}$	$\begin{bmatrix} 1 & 0 & 0 & \frac{1}{4} \\ 0 & 0 & -1 & 0 \\ 0 & 1 & 0 & \frac{3}{4} \end{bmatrix}$	1
21	$\{4_{010}^+ \frac{3}{4}\frac{1}{4}0\}$	$\begin{bmatrix} 0 & 0 & 1 & \frac{3}{4} \\ 0 & 1 & 0 & \frac{1}{4} \\ -1 & 0 & 0 & 0 \end{bmatrix}$	1
22	$\{2_{101} \frac{1}{4}0\frac{3}{4}\}$	$\begin{bmatrix} 0 & 0 & 1 & \frac{1}{4} \\ 0 & -1 & 0 & 0 \\ 1 & 0 & 0 & \frac{3}{4} \end{bmatrix}$	1
23	$\{4_{010}^- 0\frac{3}{4}\frac{1}{4}\}$	$\begin{bmatrix} 0 & 0 & -1 & 0 \\ 0 & 1 & 0 & \frac{3}{4} \\ 1 & 0 & 0 & \frac{1}{4} \end{bmatrix}$	1
24	$\{2_{-101} \frac{1}{2}\frac{1}{2}\frac{1}{2}\}$	$\begin{bmatrix} 0 & 0 & -1 & \frac{1}{2} \\ 0 & -1 & 0 & \frac{1}{2} \\ -1 & 0 & 0 & \frac{1}{2} \end{bmatrix}$	1
25	$\{-1 0\}$	$\begin{bmatrix} -1 & 0 & 0 & 0 \\ 0 & -1 & 0 & 0 \\ 0 & 0 & -1 & 0 \end{bmatrix}$	-1
26	$\{\text{m}_{001} \frac{3}{4}\frac{1}{4}\frac{1}{2}\}$	$\begin{bmatrix} 1 & 0 & 0 & \frac{3}{4} \\ 0 & 1 & 0 & \frac{1}{4} \\ 0 & 0 & -1 & \frac{1}{2} \end{bmatrix}$	-1
27	$\{\text{m}_{010} \frac{1}{4}\frac{1}{2}\frac{3}{4}\}$	$\begin{bmatrix} 1 & 0 & 0 & \frac{1}{4} \\ 0 & -1 & 0 & \frac{1}{2} \\ 0 & 0 & 1 & \frac{3}{4} \end{bmatrix}$	-1

continued ...

Table 1

No.	tag	matrix (polar)	det
28	$\{\mathbf{m}_{100} \frac{1}{2}\frac{3}{4}\frac{1}{4}\}$	$\begin{bmatrix} -1 & 0 & 0 & \frac{1}{2} \\ 0 & 1 & 0 & \frac{3}{4} \\ 0 & 0 & 1 & \frac{1}{4} \end{bmatrix}$	-1
29	$\{-3^+_{111} 0\}$	$\begin{bmatrix} 0 & 0 & -1 & 0 \\ -1 & 0 & 0 & 0 \\ 0 & -1 & 0 & 0 \end{bmatrix}$	-1
30	$\{-3^+_{-11-1} \frac{1}{2}\frac{3}{4}\frac{1}{4}\}$	$\begin{bmatrix} 0 & 0 & -1 & \frac{1}{2} \\ 1 & 0 & 0 & \frac{3}{4} \\ 0 & 1 & 0 & \frac{1}{4} \end{bmatrix}$	-1
31	$\{-3^+_{1-1-1} \frac{3}{4}\frac{1}{4}\frac{1}{2}\}$	$\begin{bmatrix} 0 & 0 & 1 & \frac{3}{4} \\ 1 & 0 & 0 & \frac{1}{4} \\ 0 & -1 & 0 & \frac{1}{2} \end{bmatrix}$	-1
32	$\{-3^+_{-1-11} \frac{1}{4}\frac{1}{2}\frac{3}{4}\}$	$\begin{bmatrix} 0 & 0 & 1 & \frac{1}{4} \\ -1 & 0 & 0 & \frac{1}{2} \\ 0 & 1 & 0 & \frac{3}{4} \end{bmatrix}$	-1
33	$\{-3^-_{111} 0\}$	$\begin{bmatrix} 0 & -1 & 0 & 0 \\ 0 & 0 & -1 & 0 \\ -1 & 0 & 0 & 0 \end{bmatrix}$	-1
34	$\{-3^-_{1-1-1} \frac{1}{4}\frac{1}{2}\frac{3}{4}\}$	$\begin{bmatrix} 0 & 1 & 0 & \frac{1}{4} \\ 0 & 0 & -1 & \frac{1}{2} \\ 1 & 0 & 0 & \frac{3}{4} \end{bmatrix}$	-1
35	$\{-3^-_{-1-11} \frac{1}{2}\frac{3}{4}\frac{1}{4}\}$	$\begin{bmatrix} 0 & -1 & 0 & \frac{1}{2} \\ 0 & 0 & 1 & \frac{3}{4} \\ 1 & 0 & 0 & \frac{1}{4} \end{bmatrix}$	-1
36	$\{-3^-_{-11-1} \frac{3}{4}\frac{1}{4}\frac{1}{2}\}$	$\begin{bmatrix} 0 & 1 & 0 & \frac{3}{4} \\ 0 & 0 & 1 & \frac{1}{4} \\ -1 & 0 & 0 & \frac{1}{2} \end{bmatrix}$	-1
37	$\{\mathbf{m}_{110} \frac{1}{4}\frac{3}{4}0\}$	$\begin{bmatrix} 0 & -1 & 0 & \frac{1}{4} \\ -1 & 0 & 0 & \frac{3}{4} \\ 0 & 0 & 1 & 0 \end{bmatrix}$	-1
38	$\{\mathbf{m}_{1-10} \frac{1}{2}\frac{1}{2}\frac{1}{2}\}$	$\begin{bmatrix} 0 & 1 & 0 & \frac{1}{2} \\ 1 & 0 & 0 & \frac{1}{2} \\ 0 & 0 & 1 & \frac{1}{2} \end{bmatrix}$	-1
39	$\{-4^-_{001} \frac{3}{4}0\frac{1}{4}\}$	$\begin{bmatrix} 0 & -1 & 0 & \frac{3}{4} \\ 1 & 0 & 0 & 0 \\ 0 & 0 & -1 & \frac{1}{4} \end{bmatrix}$	-1
40	$\{-4^+_{001} 0\frac{1}{4}\frac{3}{4}\}$	$\begin{bmatrix} 0 & 1 & 0 & 0 \\ -1 & 0 & 0 & \frac{1}{4} \\ 0 & 0 & -1 & \frac{3}{4} \end{bmatrix}$	-1
41	$\{-4^-_{100} \frac{1}{4}\frac{3}{4}0\}$	$\begin{bmatrix} -1 & 0 & 0 & \frac{1}{4} \\ 0 & 0 & -1 & \frac{3}{4} \\ 0 & 1 & 0 & 0 \end{bmatrix}$	-1

continued ...

Table 1

No.	tag	matrix (polar)	det
42	$\{m_{011} 0\frac{1}{4}\frac{3}{4}\}$	$\begin{bmatrix} 1 & 0 & 0 & 0 \\ 0 & 0 & -1 & \frac{1}{4} \\ 0 & -1 & 0 & \frac{3}{4} \end{bmatrix}$	-1
43	$\{m_{01-1} \frac{1}{2}\frac{1}{2}\frac{1}{2}\}$	$\begin{bmatrix} 1 & 0 & 0 & \frac{1}{2} \\ 0 & 0 & 1 & \frac{1}{2} \\ 0 & 1 & 0 & \frac{1}{2} \end{bmatrix}$	-1
44	$\{-4^+_{100} \frac{3}{4}0\frac{1}{4}\}$	$\begin{bmatrix} -1 & 0 & 0 & \frac{3}{4} \\ 0 & 0 & 1 & 0 \\ 0 & -1 & 0 & \frac{1}{4} \end{bmatrix}$	-1
45	$\{-4^+_{010} \frac{1}{4}\frac{3}{4}0\}$	$\begin{bmatrix} 0 & 0 & -1 & \frac{1}{4} \\ 0 & -1 & 0 & \frac{3}{4} \\ 1 & 0 & 0 & 0 \end{bmatrix}$	-1
46	$\{m_{101} \frac{3}{4}0\frac{1}{4}\}$	$\begin{bmatrix} 0 & 0 & -1 & \frac{3}{4} \\ 0 & 1 & 0 & 0 \\ -1 & 0 & 0 & \frac{1}{4} \end{bmatrix}$	-1
47	$\{-4^-_{010} 0\frac{1}{4}\frac{3}{4}\}$	$\begin{bmatrix} 0 & 0 & 1 & 0 \\ 0 & -1 & 0 & \frac{1}{4} \\ -1 & 0 & 0 & \frac{3}{4} \end{bmatrix}$	-1
48	$\{m_{-101} \frac{1}{2}\frac{1}{2}\frac{1}{2}\}$	$\begin{bmatrix} 0 & 0 & 1 & \frac{1}{2} \\ 0 & 1 & 0 & \frac{1}{2} \\ 1 & 0 & 0 & \frac{1}{2} \end{bmatrix}$	-1