# SG No. 110   $C_{4v}^{12}$   $I4_1cd$   [ tetragonal ]

* generator : $\{2_{001}|\frac{1}{2}\frac{1}{2}\frac{1}{2}\}$, $\{4_{001}^+|0\frac{1}{2}\frac{1}{4}\}$, $\{m_{010}|00\frac{1}{2}\}$
* symmetry operation   $+[0, 0, 0]$,   $+\left[\frac{1}{2}, \frac{1}{2}, \frac{1}{2}\right]$

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 | $\{2_{001}\|\frac{1}{2}\frac{1}{2}\frac{1}{2}\}$ | $\begin{bmatrix} -1 & 0 & 0 & \frac{1}{2} \\ 0 & -1 & 0 & \frac{1}{2} \\ 0 & 0 & 1 & \frac{1}{2} \end{bmatrix}$ | 1 |
| 3 | $\{4_{001}^+\|0\frac{1}{2}\frac{1}{4}\}$ | $\begin{bmatrix} 0 & -1 & 0 & 0 \\ 1 & 0 & 0 & \frac{1}{2} \\ 0 & 0 & 1 & \frac{1}{4} \end{bmatrix}$ | 1 |
| 4 | $\{4_{001}^-\|\frac{1}{2}0\frac{3}{4}\}$ | $\begin{bmatrix} 0 & 1 & 0 & \frac{1}{2} \\ -1 & 0 & 0 & 0 \\ 0 & 0 & 1 & \frac{3}{4} \end{bmatrix}$ | 1 |
| 5 | $\{m_{010}\|00\frac{1}{2}\}$ | $\begin{bmatrix} 1 & 0 & 0 & 0 \\ 0 & -1 & 0 & 0 \\ 0 & 0 & 1 & \frac{1}{2} \end{bmatrix}$ | $-1$ |
| 6 | $\{m_{100}\|\frac{1}{2}\frac{1}{2}0\}$ | $\begin{bmatrix} -1 & 0 & 0 & \frac{1}{2} \\ 0 & 1 & 0 & \frac{1}{2} \\ 0 & 0 & 1 & 0 \end{bmatrix}$ | $-1$ |
| 7 | $\{m_{110}\|0\frac{1}{2}\frac{3}{4}\}$ | $\begin{bmatrix} 0 & -1 & 0 & 0 \\ -1 & 0 & 0 & \frac{1}{2} \\ 0 & 0 & 1 & \frac{3}{4} \end{bmatrix}$ | $-1$ |
| 8 | $\{m_{1-10}\|\frac{1}{2}0\frac{1}{4}\}$ | $\begin{bmatrix} 0 & 1 & 0 & \frac{1}{2} \\ 1 & 0 & 0 & 0 \\ 0 & 0 & 1 & \frac{1}{4} \end{bmatrix}$ | $-1$ |