

SG No. 109     $C_{4v}^{11}$      $I4_1md$     [ tetragonal ]

\* generator :  $\{2_{001}| \frac{1}{2} \frac{1}{2} \frac{1}{2}\}$ ,  $\{4_{001}^+| 0 \frac{1}{2} \frac{1}{4}\}$ ,  $\{m_{010}| 0\}$

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

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	$\{m_{010}  0\}$	$\begin{bmatrix} 1 & 0 & 0 & 0 \\ 0 & -1 & 0 & 0 \\ 0 & 0 & 1 & 0 \end{bmatrix}$	-1
6	$\{m_{100}  \frac{1}{2} \frac{1}{2} \frac{1}{2}\}$	$\begin{bmatrix} -1 & 0 & 0 & \frac{1}{2} \\ 0 & 1 & 0 & \frac{1}{2} \\ 0 & 0 & 1 & \frac{1}{2} \end{bmatrix}$	-1
7	$\{m_{110}  0 \frac{1}{2} \frac{1}{4}\}$	$\begin{bmatrix} 0 & -1 & 0 & 0 \\ -1 & 0 & 0 & \frac{1}{2} \\ 0 & 0 & 1 & \frac{1}{4} \end{bmatrix}$	-1
8	$\{m_{1-10}  \frac{1}{2} 0 \frac{3}{4}\}$	$\begin{bmatrix} 0 & 1 & 0 & \frac{1}{2} \\ 1 & 0 & 0 & 0 \\ 0 & 0 & 1 & \frac{3}{4} \end{bmatrix}$	-1