

\* symmetry operation

Table 1: Symmetry operations for 3d polar vector.

| No. | tag  | matrix (polar)   | det | TR |
|-----|--|--|-----|----|
| 1   | $\{1 0\}$  | $\begin{bmatrix} 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 0 \end{bmatrix}$                                | 1   | 1  |
| 2   | $\{2_{001} 00\frac{1}{2}\}$                      | $\begin{bmatrix} -1 & 0 & 0 & 0 \\ 0 & -1 & 0 & 0 \\ 0 & 0 & 1 & \frac{1}{2} \end{bmatrix}$                    | 1   | 1  |
| 3   | $\{m_{100} 0\}$                                  | $\begin{bmatrix} -1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 0 \end{bmatrix}$                               | -1  | 1  |
| 4   | $\{m_{010} 00\frac{1}{2}\}$                      | $\begin{bmatrix} 1 & 0 & 0 & 0 \\ 0 & -1 & 0 & 0 \\ 0 & 0 & 1 & \frac{1}{2} \end{bmatrix}$                     | -1  | 1  |
| 5   | $\{1' \frac{1}{2}\frac{1}{2}\frac{1}{2}\}$       | $\begin{bmatrix} 1 & 0 & 0 & \frac{1}{2} \\ 0 & 1 & 0 & \frac{1}{2} \\ 0 & 0 & 1 & \frac{1}{2} \end{bmatrix}$  | 1   | -1 |
| 6   | $\{2_{001}' \frac{1}{2}\frac{1}{2}0\}$           | $\begin{bmatrix} -1 & 0 & 0 & \frac{1}{2} \\ 0 & -1 & 0 & \frac{1}{2} \\ 0 & 0 & 1 & 0 \end{bmatrix}$          | 1   | -1 |
| 7   | $\{m_{100}' \frac{1}{2}\frac{1}{2}\frac{1}{2}\}$ | $\begin{bmatrix} -1 & 0 & 0 & \frac{1}{2} \\ 0 & 1 & 0 & \frac{1}{2} \\ 0 & 0 & 1 & \frac{1}{2} \end{bmatrix}$ | -1  | -1 |
| 8   | $\{m_{010}' \frac{1}{2}\frac{1}{2}0\}$           | $\begin{bmatrix} 1 & 0 & 0 & \frac{1}{2} \\ 0 & -1 & 0 & \frac{1}{2} \\ 0 & 0 & 1 & 0 \end{bmatrix}$           | -1  | -1 |