

MSG No. 223.106 $Pm'\bar{3}'n$ [Type III, cubic]

* 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	{2 ₁₀₀ 0}	$\begin{bmatrix} 1 & 0 & 0 & 0 \\ 0 & -1 & 0 & 0 \\ 0 & 0 & -1 & 0 \end{bmatrix}$	1	1
3	{2 ₀₁₀ 0}	$\begin{bmatrix} -1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & -1 & 0 \end{bmatrix}$	1	1
4	{2 ₀₀₁ 0}	$\begin{bmatrix} -1 & 0 & 0 & 0 \\ 0 & -1 & 0 & 0 \\ 0 & 0 & 1 & 0 \end{bmatrix}$	1	1
5	{3 ⁺ ₁₁₁ 0}	$\begin{bmatrix} 0 & 0 & 1 & 0 \\ 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 \end{bmatrix}$	1	1
6	{3 ⁻ ₁₁₁ 0}	$\begin{bmatrix} 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 0 \\ 1 & 0 & 0 & 0 \end{bmatrix}$	1	1
7	{3 ⁻ ₁₋₁₋₁ 0}	$\begin{bmatrix} 0 & -1 & 0 & 0 \\ 0 & 0 & 1 & 0 \\ -1 & 0 & 0 & 0 \end{bmatrix}$	1	1
8	{3 ⁺ ₁₋₁₋₁ 0}	$\begin{bmatrix} 0 & 0 & -1 & 0 \\ -1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 \end{bmatrix}$	1	1
9	{3 ⁻ ₋₁₁₋₁ 0}	$\begin{bmatrix} 0 & -1 & 0 & 0 \\ 0 & 0 & -1 & 0 \\ 1 & 0 & 0 & 0 \end{bmatrix}$	1	1
10	{3 ⁺ ₋₁₁₋₁ 0}	$\begin{bmatrix} 0 & 0 & 1 & 0 \\ -1 & 0 & 0 & 0 \\ 0 & -1 & 0 & 0 \end{bmatrix}$	1	1
11	{3 ⁻ ₋₁₋₁₁ 0}	$\begin{bmatrix} 0 & 1 & 0 & 0 \\ 0 & 0 & -1 & 0 \\ -1 & 0 & 0 & 0 \end{bmatrix}$	1	1
12	{3 ⁺ ₋₁₋₁₁ 0}	$\begin{bmatrix} 0 & 0 & -1 & 0 \\ 1 & 0 & 0 & 0 \\ 0 & -1 & 0 & 0 \end{bmatrix}$	1	1
13	{-4 ⁺ ₁₀₀ $\frac{1}{2}\frac{1}{2}\frac{1}{2}$ }	$\begin{bmatrix} -1 & 0 & 0 & \frac{1}{2} \\ 0 & 0 & 1 & \frac{1}{2} \\ 0 & -1 & 0 & \frac{1}{2} \end{bmatrix}$	-1	1

continued ...

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No.	tag	matrix (polar)	det	TR
14	$\{-4_{100}^- \frac{1}{2}\frac{1}{2}\frac{1}{2}\}$	$\begin{bmatrix} -1 & 0 & 0 & \frac{1}{2} \\ 0 & 0 & -1 & \frac{1}{2} \\ 0 & 1 & 0 & \frac{1}{2} \end{bmatrix}$	-1	1
15	$\{-4_{010}^+ \frac{1}{2}\frac{1}{2}\frac{1}{2}\}$	$\begin{bmatrix} 0 & 0 & -1 & \frac{1}{2} \\ 0 & -1 & 0 & \frac{1}{2} \\ 1 & 0 & 0 & \frac{1}{2} \end{bmatrix}$	-1	1
16	$\{-4_{010}^- \frac{1}{2}\frac{1}{2}\frac{1}{2}\}$	$\begin{bmatrix} 0 & 0 & 1 & \frac{1}{2} \\ 0 & -1 & 0 & \frac{1}{2} \\ -1 & 0 & 0 & \frac{1}{2} \end{bmatrix}$	-1	1
17	$\{-4_{001}^+ \frac{1}{2}\frac{1}{2}\frac{1}{2}\}$	$\begin{bmatrix} 0 & 1 & 0 & \frac{1}{2} \\ -1 & 0 & 0 & \frac{1}{2} \\ 0 & 0 & -1 & \frac{1}{2} \end{bmatrix}$	-1	1
18	$\{-4_{001}^- \frac{1}{2}\frac{1}{2}\frac{1}{2}\}$	$\begin{bmatrix} 0 & -1 & 0 & \frac{1}{2} \\ 1 & 0 & 0 & \frac{1}{2} \\ 0 & 0 & -1 & \frac{1}{2} \end{bmatrix}$	-1	1
19	$\{m_{110} \frac{1}{2}\frac{1}{2}\frac{1}{2}\}$	$\begin{bmatrix} 0 & -1 & 0 & \frac{1}{2} \\ -1 & 0 & 0 & \frac{1}{2} \\ 0 & 0 & 1 & \frac{1}{2} \end{bmatrix}$	-1	1
20	$\{m_{1-10} \frac{1}{2}\frac{1}{2}\frac{1}{2}\}$	$\begin{bmatrix} 0 & 1 & 0 & \frac{1}{2} \\ 1 & 0 & 0 & \frac{1}{2} \\ 0 & 0 & 1 & \frac{1}{2} \end{bmatrix}$	-1	1
21	$\{m_{011} \frac{1}{2}\frac{1}{2}\frac{1}{2}\}$	$\begin{bmatrix} 1 & 0 & 0 & \frac{1}{2} \\ 0 & 0 & -1 & \frac{1}{2} \\ 0 & -1 & 0 & \frac{1}{2} \end{bmatrix}$	-1	1
22	$\{m_{01-1} \frac{1}{2}\frac{1}{2}\frac{1}{2}\}$	$\begin{bmatrix} 1 & 0 & 0 & \frac{1}{2} \\ 0 & 0 & 1 & \frac{1}{2} \\ 0 & 1 & 0 & \frac{1}{2} \end{bmatrix}$	-1	1
23	$\{m_{101} \frac{1}{2}\frac{1}{2}\frac{1}{2}\}$	$\begin{bmatrix} 0 & 0 & -1 & \frac{1}{2} \\ 0 & 1 & 0 & \frac{1}{2} \\ -1 & 0 & 0 & \frac{1}{2} \end{bmatrix}$	-1	1
24	$\{m_{-101} \frac{1}{2}\frac{1}{2}\frac{1}{2}\}$	$\begin{bmatrix} 0 & 0 & 1 & \frac{1}{2} \\ 0 & 1 & 0 & \frac{1}{2} \\ 1 & 0 & 0 & \frac{1}{2} \end{bmatrix}$	-1	1
25	$\{4_{100}^+ \frac{1}{2}\frac{1}{2}\frac{1}{2}\}'$	$\begin{bmatrix} 1 & 0 & 0 & \frac{1}{2} \\ 0 & 0 & -1 & \frac{1}{2} \\ 0 & 1 & 0 & \frac{1}{2} \end{bmatrix}$	1	-1
26	$\{4_{100}^- \frac{1}{2}\frac{1}{2}\frac{1}{2}\}'$	$\begin{bmatrix} 1 & 0 & 0 & \frac{1}{2} \\ 0 & 0 & 1 & \frac{1}{2} \\ 0 & -1 & 0 & \frac{1}{2} \end{bmatrix}$	1	-1
27	$\{4_{010}^+ \frac{1}{2}\frac{1}{2}\frac{1}{2}\}'$	$\begin{bmatrix} 0 & 0 & 1 & \frac{1}{2} \\ 0 & 1 & 0 & \frac{1}{2} \\ -1 & 0 & 0 & \frac{1}{2} \end{bmatrix}$	1	-1

continued ...

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No.	tag	matrix (polar)	det	TR
28	$\{4_{010}' \frac{1}{2} \frac{1}{2} \frac{1}{2}\}$	$\begin{bmatrix} 0 & 0 & -1 & \frac{1}{2} \\ 0 & 1 & 0 & \frac{1}{2} \\ 1 & 0 & 0 & \frac{1}{2} \end{bmatrix}$	1	-1
29	$\{4_{001}' \frac{1}{2} \frac{1}{2} \frac{1}{2}\}$	$\begin{bmatrix} 0 & -1 & 0 & \frac{1}{2} \\ 1 & 0 & 0 & \frac{1}{2} \\ 0 & 0 & 1 & \frac{1}{2} \end{bmatrix}$	1	-1
30	$\{4_{001}' \frac{1}{2} \frac{1}{2} \frac{1}{2}\}$	$\begin{bmatrix} 0 & 1 & 0 & \frac{1}{2} \\ -1 & 0 & 0 & \frac{1}{2} \\ 0 & 0 & 1 & \frac{1}{2} \end{bmatrix}$	1	-1
31	$\{2_{110}' \frac{1}{2} \frac{1}{2} \frac{1}{2}\}$	$\begin{bmatrix} 0 & 1 & 0 & \frac{1}{2} \\ 1 & 0 & 0 & \frac{1}{2} \\ 0 & 0 & -1 & \frac{1}{2} \end{bmatrix}$	1	-1
32	$\{2_{1-10}' \frac{1}{2} \frac{1}{2} \frac{1}{2}\}$	$\begin{bmatrix} 0 & -1 & 0 & \frac{1}{2} \\ -1 & 0 & 0 & \frac{1}{2} \\ 0 & 0 & -1 & \frac{1}{2} \end{bmatrix}$	1	-1
33	$\{2_{011}' \frac{1}{2} \frac{1}{2} \frac{1}{2}\}$	$\begin{bmatrix} -1 & 0 & 0 & \frac{1}{2} \\ 0 & 0 & 1 & \frac{1}{2} \\ 0 & 1 & 0 & \frac{1}{2} \end{bmatrix}$	1	-1
34	$\{2_{01-1}' \frac{1}{2} \frac{1}{2} \frac{1}{2}\}$	$\begin{bmatrix} -1 & 0 & 0 & \frac{1}{2} \\ 0 & 0 & -1 & \frac{1}{2} \\ 0 & -1 & 0 & \frac{1}{2} \end{bmatrix}$	1	-1
35	$\{2_{101}' \frac{1}{2} \frac{1}{2} \frac{1}{2}\}$	$\begin{bmatrix} 0 & 0 & 1 & \frac{1}{2} \\ 0 & -1 & 0 & \frac{1}{2} \\ 1 & 0 & 0 & \frac{1}{2} \end{bmatrix}$	1	-1
36	$\{2_{-101}' \frac{1}{2} \frac{1}{2} \frac{1}{2}\}$	$\begin{bmatrix} 0 & 0 & -1 & \frac{1}{2} \\ 0 & -1 & 0 & \frac{1}{2} \\ -1 & 0 & 0 & \frac{1}{2} \end{bmatrix}$	1	-1
37	$\{-1' 0\}$	$\begin{bmatrix} -1 & 0 & 0 & 0 \\ 0 & -1 & 0 & 0 \\ 0 & 0 & -1 & 0 \end{bmatrix}$	-1	-1
38	$\{\text{m}_{100}' 0\}$	$\begin{bmatrix} -1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 0 \end{bmatrix}$	-1	-1
39	$\{\text{m}_{010}' 0\}$	$\begin{bmatrix} 1 & 0 & 0 & 0 \\ 0 & -1 & 0 & 0 \\ 0 & 0 & 1 & 0 \end{bmatrix}$	-1	-1
40	$\{\text{m}_{001}' 0\}$	$\begin{bmatrix} 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & -1 & 0 \end{bmatrix}$	-1	-1
41	$\{-3_{111}' 0\}$	$\begin{bmatrix} 0 & 0 & -1 & 0 \\ -1 & 0 & 0 & 0 \\ 0 & -1 & 0 & 0 \end{bmatrix}$	-1	-1

continued ...

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No.	tag	matrix (polar)	det	TR
42	$\{-3^-_{111}' 0\}$	$\begin{bmatrix} 0 & -1 & 0 & 0 \\ 0 & 0 & -1 & 0 \\ -1 & 0 & 0 & 0 \end{bmatrix}$	-1	-1
43	$\{-3^-_{1-1-1}' 0\}$	$\begin{bmatrix} 0 & 1 & 0 & 0 \\ 0 & 0 & -1 & 0 \\ 1 & 0 & 0 & 0 \end{bmatrix}$	-1	-1
44	$\{-3^+_{1-1-1}' 0\}$	$\begin{bmatrix} 0 & 0 & 1 & 0 \\ 1 & 0 & 0 & 0 \\ 0 & -1 & 0 & 0 \end{bmatrix}$	-1	-1
45	$\{-3^-_{-11-1}' 0\}$	$\begin{bmatrix} 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 0 \\ -1 & 0 & 0 & 0 \end{bmatrix}$	-1	-1
46	$\{-3^+_{-11-1}' 0\}$	$\begin{bmatrix} 0 & 0 & -1 & 0 \\ 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 \end{bmatrix}$	-1	-1
47	$\{-3^-_{-1-11}' 0\}$	$\begin{bmatrix} 0 & -1 & 0 & 0 \\ 0 & 0 & 1 & 0 \\ 1 & 0 & 0 & 0 \end{bmatrix}$	-1	-1
48	$\{-3^+_{-1-11}' 0\}$	$\begin{bmatrix} 0 & 0 & 1 & 0 \\ -1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 \end{bmatrix}$	-1	-1