

$P4$

No. 75

 $P4$
 C_4^1
Generators selected (1); $t(1,0,0)$; $t(0,1,0)$; $t(0,0,1)$; (2); (3)

General position

 Multiplicity,
 Wyckoff letter,
 Site symmetry

Coordinates

 4 d 1

 (1) x, y, z (2) \bar{x}, \bar{y}, z (3) \bar{y}, x, z (4) y, \bar{x}, z
I Maximal translationengleiche subgroups

 [2] $P2$ (3, $P112$) 1; 2

II Maximal klassengleiche subgroups

 • **Enlarged unit cell**

 [2] $c' = 2c$
 $P4_2$ (77) $\langle 2; 3 + (0, 0, 1) \rangle$
 $\mathbf{a}, \mathbf{b}, 2\mathbf{c}$
 $P4$ (75) $\langle 2; 3 \rangle$
 $\mathbf{a}, \mathbf{b}, 2\mathbf{c}$

 [2] $\mathbf{a}' = 2\mathbf{a}, \mathbf{b}' = 2\mathbf{b}$
 $C4$ (75, $P4$) $\langle 2; 3 \rangle$
 $\mathbf{a} - \mathbf{b}, \mathbf{a} + \mathbf{b}, \mathbf{c}$
 $C4$ (75, $P4$) $\langle 2 + (1, 1, 0); 3 + (1, 0, 0) \rangle$
 $\mathbf{a} - \mathbf{b}, \mathbf{a} + \mathbf{b}, \mathbf{c}$
 $1/2, 1/2, 0$

 [2] $\mathbf{a}' = 2\mathbf{a}, \mathbf{b}' = 2\mathbf{b}, \mathbf{c}' = 2\mathbf{c}$
 $F4$ (79, $I4$) $\langle 2; 3 \rangle$
 $\mathbf{a} - \mathbf{b}, \mathbf{a} + \mathbf{b}, 2\mathbf{c}$
 $F4$ (79, $I4$) $\langle 2; 3 + (0, 0, 1) \rangle$
 $\mathbf{a} - \mathbf{b}, \mathbf{a} + \mathbf{b}, 2\mathbf{c}$
 $1/2, 1/2, 0$

 [3] $\mathbf{c}' = 3\mathbf{c}$
 $P4$ (75) $\langle 2; 3 \rangle$
 $\mathbf{a}, \mathbf{b}, 3\mathbf{c}$

 • **Series of maximal isomorphic subgroups**

 [p] $\mathbf{c}' = p\mathbf{c}$
 $P4$ (75) $\langle 2; 3 \rangle$
 $\mathbf{a}, \mathbf{b}, p\mathbf{c}$
 $p > 1$

no conjugate subgroups

 [p^2] $\mathbf{a}' = p\mathbf{a}, \mathbf{b}' = p\mathbf{b}$
 $P4$ (75) $\langle 2 + (2u, 2v, 0); 3 + (u + v, -u + v, 0) \rangle$
 $p\mathbf{a}, p\mathbf{b}, \mathbf{c}$
 $u, v, 0$
 $p > 2; 0 \leq u < p; 0 \leq v < p$
 p^2 conjugate subgroups for prime $p \equiv 3 \pmod{4}$

 [$p = q^2 + r^2$] $\mathbf{a}' = q\mathbf{a} - r\mathbf{b}, \mathbf{b}' = r\mathbf{a} + q\mathbf{b}$
 $P4$ (75) $\langle 2 + (2u, 0, 0); 3 + (u, -u, 0) \rangle$
 $q\mathbf{a} - r\mathbf{b}, r\mathbf{a} + q\mathbf{b}, \mathbf{c}$
 $u, 0, 0$
 $q > 0; r > 0; p > 4; 0 \leq u < p$
 p conjugate subgroups for prime $p \equiv 1 \pmod{4}$
I Minimal translationengleiche supergroups

 [2] $P4/m$ (83); [2] $P4/n$ (85); [2] $P422$ (89); [2] $P42_12$ (90); [2] $P4mm$ (99); [2] $P4bm$ (100); [2] $P4cc$ (103); [2] $P4nc$ (104)

II Minimal non-isomorphic klassengleiche supergroups

 • **Additional centring translations**

 [2] $I4$ (79)

 • **Decreased unit cell**

none