

C_{2h}^1
 $P12/m1$

No. 10

 $P2/m$

 UNIQUE AXIS b
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 o 1

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

[2] $P1m1$ (6)	1; 4
[2] $P121$ (3)	1; 2
[2] $P\bar{1}$ (2)	1; 3

II Maximal klassengleiche subgroups

• Enlarged unit cell

[2] $\mathbf{b}' = 2\mathbf{b}$			
$P12_1/m1$ (11)	$\langle 3; 2 + (0, 1, 0) \rangle$	$\mathbf{a}, 2\mathbf{b}, \mathbf{c}$	
$P12_1/m1$ (11)	$\langle (2; 3) + (0, 1, 0) \rangle$	$\mathbf{a}, 2\mathbf{b}, \mathbf{c}$	0, 1/2, 0
$P12/m1$ (10)	$\langle 2; 3 \rangle$	$\mathbf{a}, 2\mathbf{b}, \mathbf{c}$	
$P12/m1$ (10)	$\langle 2; 3 + (0, 1, 0) \rangle$	$\mathbf{a}, 2\mathbf{b}, \mathbf{c}$	0, 1/2, 0
[2] $\mathbf{c}' = 2\mathbf{c}$			
$P12/c1$ (13)	$\langle 3; 2 + (0, 0, 1) \rangle$	$\mathbf{a}, \mathbf{b}, 2\mathbf{c}$	
$P12/c1$ (13)	$\langle 2; 3 + (0, 0, 1) \rangle$	$\mathbf{a}, \mathbf{b}, 2\mathbf{c}$	0, 0, 1/2
$P12/m1$ (10)	$\langle 2; 3 \rangle$	$\mathbf{a}, \mathbf{b}, 2\mathbf{c}$	
$P12/m1$ (10)	$\langle (2; 3) + (0, 0, 1) \rangle$	$\mathbf{a}, \mathbf{b}, 2\mathbf{c}$	0, 0, 1/2
[2] $\mathbf{a}' = 2\mathbf{a}$			
$P12/a1$ (13, $P12/c1$)	$\langle 3; 2 + (1, 0, 0) \rangle$	$-2\mathbf{a} - \mathbf{c}, \mathbf{b}, 2\mathbf{a}$	
$P12/a1$ (13, $P12/c1$)	$\langle 2; 3 + (1, 0, 0) \rangle$	$-2\mathbf{a} - \mathbf{c}, \mathbf{b}, 2\mathbf{a}$	1/2, 0, 0
$P12/m1$ (10)	$\langle 2; 3 \rangle$	$2\mathbf{a}, \mathbf{b}, \mathbf{c}$	
$P12/m1$ (10)	$\langle (2; 3) + (1, 0, 0) \rangle$	$2\mathbf{a}, \mathbf{b}, \mathbf{c}$	1/2, 0, 0
[2] $\mathbf{a}' = 2\mathbf{a}, \mathbf{c}' = 2\mathbf{c}$			
$B12/e1$ (13, $P12/c1$)	$\langle 3; 2 + (0, 0, 1) \rangle$	$\mathbf{a} - \mathbf{c}, \mathbf{b}, 2\mathbf{c}$	
$B12/e1$ (13, $P12/c1$)	$\langle 2; 3 + (0, 0, 1) \rangle$	$\mathbf{a} - \mathbf{c}, \mathbf{b}, 2\mathbf{c}$	0, 0, 1/2
$B12/m1$ (10, $P12/m1$)	$\langle 2; 3 \rangle$	$\mathbf{a} - \mathbf{c}, \mathbf{b}, 2\mathbf{c}$	
$B12/m1$ (10, $P12/m1$)	$\langle (2; 3) + (0, 0, 1) \rangle$	$\mathbf{a} - \mathbf{c}, \mathbf{b}, 2\mathbf{c}$	0, 0, 1/2
[2] $\mathbf{a}' = 2\mathbf{a}, \mathbf{b}' = 2\mathbf{b}$			
$C12/m1$ (12)	$\langle 2; 3 \rangle$	$2\mathbf{a}, 2\mathbf{b}, \mathbf{c}$	
$C12/m1$ (12)	$\langle 2; 3 + (0, 1, 0) \rangle$	$2\mathbf{a}, 2\mathbf{b}, \mathbf{c}$	0, 1/2, 0
$C12/m1$ (12)	$\langle (2; 3) + (1, 0, 0) \rangle$	$2\mathbf{a}, 2\mathbf{b}, \mathbf{c}$	1/2, 0, 0
$C12/m1$ (12)	$\langle 2 + (1, 0, 0); 3 + (1, 1, 0) \rangle$	$2\mathbf{a}, 2\mathbf{b}, \mathbf{c}$	1/2, 1/2, 0
[2] $\mathbf{b}' = 2\mathbf{b}, \mathbf{c}' = 2\mathbf{c}$			
$A12/m1$ (12, $C12/m1$)	$\langle 2; 3 \rangle$	$2\mathbf{c}, 2\mathbf{b}, -\mathbf{a} - 2\mathbf{c}$	
$A12/m1$ (12, $C12/m1$)	$\langle (2; 3) + (0, 0, 1) \rangle$	$2\mathbf{c}, 2\mathbf{b}, -\mathbf{a} - 2\mathbf{c}$	0, 0, 1/2
$A12/m1$ (12, $C12/m1$)	$\langle 2; 3 + (0, 1, 0) \rangle$	$2\mathbf{c}, 2\mathbf{b}, -\mathbf{a} - 2\mathbf{c}$	0, 1/2, 0
$A12/m1$ (12, $C12/m1$)	$\langle 2 + (0, 0, 1); 3 + (0, 1, 1) \rangle$	$2\mathbf{c}, 2\mathbf{b}, -\mathbf{a} - 2\mathbf{c}$	0, 1/2, 1/2
[2] $\mathbf{a}' = 2\mathbf{a}, \mathbf{b}' = 2\mathbf{b}, \mathbf{c}' = 2\mathbf{c}$			
$F12/m1$ (12, $C12/m1$)	$\langle 2; 3 \rangle$	$2\mathbf{a}, 2\mathbf{b}, -\mathbf{a} + \mathbf{c}$	
$F12/m1$ (12, $C12/m1$)	$\langle 2; 3 + (0, 1, 0) \rangle$	$2\mathbf{a}, 2\mathbf{b}, -\mathbf{a} + \mathbf{c}$	0, 1/2, 0
$F12/m1$ (12, $C12/m1$)	$\langle (2; 3) + (1, 0, 0) \rangle$	$2\mathbf{a}, 2\mathbf{b}, -\mathbf{a} + \mathbf{c}$	1/2, 0, 0
$F12/m1$ (12, $C12/m1$)	$\langle 2 + (1, 0, 0); 3 + (1, 1, 0) \rangle$	$2\mathbf{a}, 2\mathbf{b}, -\mathbf{a} + \mathbf{c}$	1/2, 1/2, 0
[3] $\mathbf{b}' = 3\mathbf{b}$			
$P12/m1$ (10)	$\langle 2; 3 \rangle$	$\mathbf{a}, 3\mathbf{b}, \mathbf{c}$	
$P12/m1$ (10)	$\langle 2; 3 + (0, 2, 0) \rangle$	$\mathbf{a}, 3\mathbf{b}, \mathbf{c}$	0, 1, 0
$P12/m1$ (10)	$\langle 2; 3 + (0, 4, 0) \rangle$	$\mathbf{a}, 3\mathbf{b}, \mathbf{c}$	0, 2, 0
[3] $\mathbf{c}' = 3\mathbf{c}$			
$P12/m1$ (10)	$\langle 2; 3 \rangle$	$\mathbf{a}, \mathbf{b}, 3\mathbf{c}$	
$P12/m1$ (10)	$\langle (2; 3) + (0, 0, 2) \rangle$	$\mathbf{a}, \mathbf{b}, 3\mathbf{c}$	0, 0, 1
$P12/m1$ (10)	$\langle (2; 3) + (0, 0, 4) \rangle$	$\mathbf{a}, \mathbf{b}, 3\mathbf{c}$	0, 0, 2
[3] $\mathbf{a}' = \mathbf{a} - \mathbf{c}, \mathbf{c}' = 3\mathbf{c}$			
$P12/m1$ (10)	$\langle 2; 3 \rangle$	$\mathbf{a} - \mathbf{c}, \mathbf{b}, 3\mathbf{c}$	
$P12/m1$ (10)	$\langle (2; 3) + (0, 0, 2) \rangle$	$\mathbf{a} - \mathbf{c}, \mathbf{b}, 3\mathbf{c}$	0, 0, 1
$P12/m1$ (10)	$\langle (2; 3) + (0, 0, 4) \rangle$	$\mathbf{a} - \mathbf{c}, \mathbf{b}, 3\mathbf{c}$	0, 0, 2

[3] $\mathbf{a}' = \mathbf{a} - 2\mathbf{c}, \mathbf{c}' = 3\mathbf{c}$			
$\left\{ \begin{array}{l} P12/m1 (10) \\ P12/m1 (10) \\ P12/m1 (10) \end{array} \right.$	$\langle 2; 3 \rangle$ $\langle (2; 3) + (0, 0, 2) \rangle$ $\langle (2; 3) + (0, 0, 4) \rangle$	$\mathbf{a} - 2\mathbf{c}, \mathbf{b}, 3\mathbf{c}$ $\mathbf{a} - 2\mathbf{c}, \mathbf{b}, 3\mathbf{c}$ $\mathbf{a} - 2\mathbf{c}, \mathbf{b}, 3\mathbf{c}$	$0, 0, 1$ $0, 0, 2$
[3] $\mathbf{a}' = 3\mathbf{a}$			
$\left\{ \begin{array}{l} P12/m1 (10) \\ P12/m1 (10) \\ P12/m1 (10) \end{array} \right.$	$\langle 2; 3 \rangle$ $\langle (2; 3) + (2, 0, 0) \rangle$ $\langle (2; 3) + (4, 0, 0) \rangle$	$3\mathbf{a}, \mathbf{b}, \mathbf{c}$ $3\mathbf{a}, \mathbf{b}, \mathbf{c}$ $3\mathbf{a}, \mathbf{b}, \mathbf{c}$	$1, 0, 0$ $2, 0, 0$
• Series of maximal isomorphic subgroups			
[p] $\mathbf{b}' = p\mathbf{b}$			
$P12/m1 (10)$	$\langle 2; 3 + (0, 2u, 0) \rangle$ prime $p > 2; 0 \leq u < p$ p conjugate subgroups	$\mathbf{a}, p\mathbf{b}, \mathbf{c}$	$0, u, 0$
[p] $\mathbf{a}' = \mathbf{a} - q\mathbf{c}, \mathbf{c}' = p\mathbf{c}$			
$P12/m1 (10)$	$\langle (2; 3) + (0, 0, 2u) \rangle$ prime $p > 2; 0 \leq q < p; 0 \leq u < p$ p conjugate subgroups for each pair of q and p	$\mathbf{a} - q\mathbf{c}, \mathbf{b}, p\mathbf{c}$	$0, 0, u$
[p] $\mathbf{a}' = p\mathbf{a}$			
$P12/m1 (10)$	$\langle (2; 3) + (2u, 0, 0) \rangle$ prime $p > 2; 0 \leq u < p$ p conjugate subgroups	$p\mathbf{a}, \mathbf{b}, \mathbf{c}$	$u, 0, 0$

I Minimal translationengleiche supergroups

[2] $Pmmm$ (47); [2] $Pccm$ (49); [2] $Pmma$ (51); [2] $Pmna$ (53); [2] $Pbam$ (55); [2] $Pnmm$ (58); [2] $Cmmm$ (65); [2] $Cccm$ (66);
[2] $P4/m$ (83); [2] $P4_2/m$ (84); [3] $P6/m$ (175)

II Minimal non-isomorphic klassengleiche supergroups

• Additional centring translations

[2] $C12/m1$ (12); [2] $A12/m1$ (12, $C12/m1$); [2] $I12/m1$ (12, $C12/m1$)

• Decreased unit cell

none

UNIQUE AXIS *c*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 *o* 1(1) *x, y, z* (2) \bar{x}, \bar{y}, z (3) $\bar{x}, \bar{y}, \bar{z}$ (4) *x, y, \bar{z}*I Maximal *translationengleiche* subgroups

[2] <i>P11m</i> (6)	1; 4
[2] <i>P112</i> (3)	1; 2
[2] <i>P</i> $\bar{1}$ (2)	1; 3

II Maximal *klassengleiche* subgroups

• Enlarged unit cell

[2] c' = 2c			
<i>P112</i> ₁ / <i>m</i> (11)	$\langle 3; 2 + (0, 0, 1) \rangle$	a, b, 2c	
<i>P112</i> ₁ / <i>m</i> (11)	$\langle (2; 3) + (0, 0, 1) \rangle$	a, b, 2c	0, 0, 1/2
<i>P112/m</i> (10)	$\langle 2; 3 \rangle$	a, b, 2c	
<i>P112/m</i> (10)	$\langle 2; 3 + (0, 0, 1) \rangle$	a, b, 2c	0, 0, 1/2
[2] a' = 2a			
<i>P112/a</i> (13)	$\langle 3; 2 + (1, 0, 0) \rangle$	2a, b, c	
<i>P112/a</i> (13)	$\langle 2; 3 + (1, 0, 0) \rangle$	2a, b, c	1/2, 0, 0
<i>P112/m</i> (10)	$\langle 2; 3 \rangle$	2a, b, c	
<i>P112/m</i> (10)	$\langle (2; 3) + (1, 0, 0) \rangle$	2a, b, c	1/2, 0, 0
[2] b' = 2b			
<i>P112/b</i> (13, <i>P112/a</i>)	$\langle 3; 2 + (0, 1, 0) \rangle$	2b, -a - 2b, c	
<i>P112/b</i> (13, <i>P112/a</i>)	$\langle 2; 3 + (0, 1, 0) \rangle$	2b, -a - 2b, c	0, 1/2, 0
<i>P112/m</i> (10)	$\langle 2; 3 \rangle$	a, 2b, c	
<i>P112/m</i> (10)	$\langle (2; 3) + (0, 1, 0) \rangle$	a, 2b, c	0, 1/2, 0
[2] a' = 2a, b' = 2b			
<i>C112/e</i> (13, <i>P112/a</i>)	$\langle 3; 2 + (1, 0, 0) \rangle$	2a, -a + b, c	
<i>C112/e</i> (13, <i>P112/a</i>)	$\langle 2; 3 + (1, 0, 0) \rangle$	2a, -a + b, c	1/2, 0, 0
<i>C112/m</i> (10, <i>P112/m</i>)	$\langle 2; 3 \rangle$	2a, -a + b, c	
<i>C112/m</i> (10, <i>P112/m</i>)	$\langle (2; 3) + (1, 0, 0) \rangle$	2a, -a + b, c	1/2, 0, 0
[2] b' = 2b, c' = 2c			
<i>A112/m</i> (12)	$\langle 2; 3 \rangle$	a, 2b, 2c	
<i>A112/m</i> (12)	$\langle 2; 3 + (0, 0, 1) \rangle$	a, 2b, 2c	0, 0, 1/2
<i>A112/m</i> (12)	$\langle (2; 3) + (0, 1, 0) \rangle$	a, 2b, 2c	0, 1/2, 0
<i>A112/m</i> (12)	$\langle 2 + (0, 1, 0); 3 + (0, 1, 1) \rangle$	a, 2b, 2c	0, 1/2, 1/2
[2] a' = 2a, c' = 2c			
<i>B112/m</i> (12, <i>A112/m</i>)	$\langle 2; 3 \rangle$	-2a - b, 2a, 2c	
<i>B112/m</i> (12, <i>A112/m</i>)	$\langle (2; 3) + (1, 0, 0) \rangle$	-2a - b, 2a, 2c	1/2, 0, 0
<i>B112/m</i> (12, <i>A112/m</i>)	$\langle 2; 3 + (0, 0, 1) \rangle$	-2a - b, 2a, 2c	0, 0, 1/2
<i>B112/m</i> (12, <i>A112/m</i>)	$\langle 2 + (1, 0, 0); 3 + (1, 0, 1) \rangle$	-2a - b, 2a, 2c	1/2, 0, 1/2
[2] a' = 2a, b' = 2b, c' = 2c			
<i>F112/m</i> (12, <i>A112/m</i>)	$\langle 2; 3 \rangle$	a - b, 2b, 2c	
<i>F112/m</i> (12, <i>A112/m</i>)	$\langle 2; 3 + (0, 0, 1) \rangle$	a - b, 2b, 2c	0, 0, 1/2
<i>F112/m</i> (12, <i>A112/m</i>)	$\langle (2; 3) + (0, 1, 0) \rangle$	a - b, 2b, 2c	0, 1/2, 0
<i>F112/m</i> (12, <i>A112/m</i>)	$\langle 2 + (0, 1, 0); 3 + (0, 1, 1) \rangle$	a - b, 2b, 2c	0, 1/2, 1/2
[3] c' = 3c			
<i>P112/m</i> (10)	$\langle 2; 3 \rangle$	a, b, 3c	
<i>P112/m</i> (10)	$\langle 2; 3 + (0, 0, 2) \rangle$	a, b, 3c	0, 0, 1
<i>P112/m</i> (10)	$\langle 2; 3 + (0, 0, 4) \rangle$	a, b, 3c	0, 0, 2
[3] a' = 3a			
<i>P112/m</i> (10)	$\langle 2; 3 \rangle$	3a, b, c	
<i>P112/m</i> (10)	$\langle (2; 3) + (2, 0, 0) \rangle$	3a, b, c	1, 0, 0
<i>P112/m</i> (10)	$\langle (2; 3) + (4, 0, 0) \rangle$	3a, b, c	2, 0, 0
[3] a' = 3a, b' = -a + b			
<i>P112/m</i> (10)	$\langle 2; 3 \rangle$	3a, -a + b, c	
<i>P112/m</i> (10)	$\langle (2; 3) + (2, 0, 0) \rangle$	3a, -a + b, c	1, 0, 0
<i>P112/m</i> (10)	$\langle (2; 3) + (4, 0, 0) \rangle$	3a, -a + b, c	2, 0, 0

[3] $\mathbf{a}' = 3\mathbf{a}, \mathbf{b}' = -2\mathbf{a} + \mathbf{b}$			
$\left\{ \begin{array}{l} P112/m (10) \\ P112/m (10) \\ P112/m (10) \end{array} \right.$	$\langle 2; 3 \rangle$ $\langle (2; 3) + (2, 0, 0) \rangle$ $\langle (2; 3) + (4, 0, 0) \rangle$	$3\mathbf{a}, -2\mathbf{a} + \mathbf{b}, \mathbf{c}$ $3\mathbf{a}, -2\mathbf{a} + \mathbf{b}, \mathbf{c}$ $3\mathbf{a}, -2\mathbf{a} + \mathbf{b}, \mathbf{c}$	$1, 0, 0$ $2, 0, 0$
[3] $\mathbf{b}' = 3\mathbf{b}$			
$\left\{ \begin{array}{l} P112/m (10) \\ P112/m (10) \\ P112/m (10) \end{array} \right.$	$\langle 2; 3 \rangle$ $\langle (2; 3) + (0, 2, 0) \rangle$ $\langle (2; 3) + (0, 4, 0) \rangle$	$\mathbf{a}, 3\mathbf{b}, \mathbf{c}$ $\mathbf{a}, 3\mathbf{b}, \mathbf{c}$ $\mathbf{a}, 3\mathbf{b}, \mathbf{c}$	$0, 1, 0$ $0, 2, 0$
• Series of maximal isomorphic subgroups			
[p] $\mathbf{c}' = p\mathbf{c}$			
$P112/m (10)$	$\langle 2; 3 + (0, 0, 2u) \rangle$ prime $p > 2; 0 \leq u < p$ p conjugate subgroups	$\mathbf{a}, \mathbf{b}, p\mathbf{c}$	$0, 0, u$
[p] $\mathbf{a}' = p\mathbf{a}, \mathbf{b}' = -q\mathbf{a} + \mathbf{b}$			
$P112/m (10)$	$\langle (2; 3) + (2u, 0, 0) \rangle$ prime $p > 2; 0 \leq q < p; 0 \leq u < p$ p conjugate subgroups for each pair of q and p	$p\mathbf{a}, -q\mathbf{a} + \mathbf{b}, \mathbf{c}$	$u, 0, 0$
[p] $\mathbf{b}' = p\mathbf{b}$			
$P112/m (10)$	$\langle (2; 3) + (0, 2u, 0) \rangle$ prime $p > 2; 0 \leq u < p$ p conjugate subgroups	$\mathbf{a}, p\mathbf{b}, \mathbf{c}$	$0, u, 0$

I Minimal translationengleiche supergroups

[2] $Pmmm$ (47); [2] $Pccm$ (49); [2] $Pmma$ (51); [2] $Pmna$ (53); [2] $Pbam$ (55); [2] $Pnmm$ (58); [2] $Cmmm$ (65); [2] $Cccm$ (66); [2] $P4/m$ (83); [2] $P4_2/m$ (84); [3] $P6/m$ (175)

II Minimal non-isomorphic klassengleiche supergroups

• Additional centring translations

[2] $A112/m$ (12); [2] $B112/m$ (12, $A112/m$); [2] $I112/m$ (12, $A112/m$)

• Decreased unit cell

none