

$C_2^2$  $P12_11$ 

No. 4

 $P2_1$ UNIQUE AXIS  $b$ Generators selected (1);  $t(1,0,0)$ ;  $t(0,1,0)$ ;  $t(0,0,1)$ ; (2)

General position

Multiplicity,  
Wyckoff letter,  
Site symmetry

Coordinates

2  $a$  1(1)  $x,y,z$  (2)  $\bar{x},y+\frac{1}{2},\bar{z}$ I Maximal *translationengleiche* subgroups[2]  $P1$  (1) 1II Maximal *klassengleiche* subgroups

## • Enlarged unit cell

[2] $c' = 2c$			
$P12_11$ (4)	$\langle 2 \rangle$	$a, b, 2c$	
$P12_11$ (4)	$\langle 2 + (0,0,1) \rangle$	$a, b, 2c$	0,0,1/2
[2] $a' = 2a$			
$P12_11$ (4)	$\langle 2 \rangle$	$2a, b, c$	
$P12_11$ (4)	$\langle 2 + (1,0,0) \rangle$	$2a, b, c$	1/2,0,0
[2] $a' = 2a, c' = 2c$			
$B12_11$ (4, $P12_11$ )	$\langle 2 \rangle$	$a - c, b, 2c$	
$B12_11$ (4, $P12_11$ )	$\langle 2 + (0,0,1) \rangle$	$a - c, b, 2c$	0,0,1/2
[3] $b' = 3b$			
$P12_11$ (4)	$\langle 2 + (0,1,0) \rangle$	$a, 3b, c$	
[3] $c' = 3c$			
$P12_11$ (4)	$\langle 2 \rangle$	$a, b, 3c$	
$P12_11$ (4)	$\langle 2 + (0,0,2) \rangle$	$a, b, 3c$	0,0,1
$P12_11$ (4)	$\langle 2 + (0,0,4) \rangle$	$a, b, 3c$	0,0,2
[3] $a' = a - c, c' = 3c$			
$P12_11$ (4)	$\langle 2 \rangle$	$a - c, b, 3c$	
$P12_11$ (4)	$\langle 2 + (0,0,2) \rangle$	$a - c, b, 3c$	0,0,1
$P12_11$ (4)	$\langle 2 + (0,0,4) \rangle$	$a - c, b, 3c$	0,0,2
[3] $a' = a - 2c, c' = 3c$			
$P12_11$ (4)	$\langle 2 \rangle$	$a - 2c, b, 3c$	
$P12_11$ (4)	$\langle 2 + (0,0,2) \rangle$	$a - 2c, b, 3c$	0,0,1
$P12_11$ (4)	$\langle 2 + (0,0,4) \rangle$	$a - 2c, b, 3c$	0,0,2
[3] $a' = 3a$			
$P12_11$ (4)	$\langle 2 \rangle$	$3a, b, c$	
$P12_11$ (4)	$\langle 2 + (2,0,0) \rangle$	$3a, b, c$	1,0,0
$P12_11$ (4)	$\langle 2 + (4,0,0) \rangle$	$3a, b, c$	2,0,0

## • Series of maximal isomorphic subgroups

[ $p$ ] $b' = pb$			
$P12_11$ (4)	$\langle 2 + (0, \frac{p}{2} - \frac{1}{2}, 0) \rangle$	$a, pb, c$	
	prime $p > 2$		
	no conjugate subgroups		
[ $p$ ] $a' = a - qc, c' = pc$			
$P12_11$ (4)	$\langle 2 + (0,0,2u) \rangle$	$a - qc, b, pc$	0,0, $u$
	prime $p > 2$ ; $0 \leq q < p$ ; $0 \leq u < p$		
	$p$ conjugate subgroups for each pair of $q$ and $p$		
[ $p$ ] $a' = pa$			
$P12_11$ (4)	$\langle 2 + (2u,0,0) \rangle$	$pa, b, c$	$u,0,0$
	prime $p > 2$ ; $0 \leq u < p$		
	$p$ conjugate subgroups		

I Minimal *translationengleiche* supergroups[2]  $P12_1/m1$  (11); [2]  $P12_1/c1$  (14); [2]  $P222_1$  (17); [2]  $P2_12_12$  (18); [2]  $P2_12_12_1$  (19); [2]  $C222_1$  (20); [2]  $Pmc2_1$  (26); [2]  $Pca2_1$  (29); [2]  $Pmn2_1$  (31); [2]  $Pna2_1$  (33); [2]  $Cmc2_1$  (36); [2]  $P4_1$  (76); [2]  $P4_3$  (78); [3]  $P6_1$  (169); [3]  $P6_5$  (170); [3]  $P6_3$  (173)II Minimal non-isomorphic *klassengleiche* supergroups

## • Additional centring translations

[2]  $C121$  (5); [2]  $A121$  (5,  $C121$ ); [2]  $I121$  (5,  $C121$ )

## • Decreased unit cell

[2]  $b' = \frac{1}{2}b$   $P121$  (3)

UNIQUE AXIS  $c$

Generators selected (1);  $t(1,0,0)$ ;  $t(0,1,0)$ ;  $t(0,0,1)$ ; (2)

General position

Multiplicity,  
Wyckoff letter,  
Site symmetry

Coordinates

2  $a$  1

(1)  $x,y,z$  (2)  $\bar{x},\bar{y},z + \frac{1}{2}$

I Maximal translationengleiche subgroups

[2]  $P1$  (1) 1

II Maximal klassengleiche subgroups

• Enlarged unit cell

[2] $\mathbf{a}' = 2\mathbf{a}$			
$P112_1$ (4)	$\langle 2 \rangle$	$2\mathbf{a}, \mathbf{b}, \mathbf{c}$	
$P112_1$ (4)	$\langle 2 + (1,0,0) \rangle$	$2\mathbf{a}, \mathbf{b}, \mathbf{c}$	$1/2, 0, 0$
[2] $\mathbf{b}' = 2\mathbf{b}$			
$P112_1$ (4)	$\langle 2 \rangle$	$\mathbf{a}, 2\mathbf{b}, \mathbf{c}$	
$P112_1$ (4)	$\langle 2 + (0,1,0) \rangle$	$\mathbf{a}, 2\mathbf{b}, \mathbf{c}$	$0, 1/2, 0$
[2] $\mathbf{a}' = 2\mathbf{a}, \mathbf{b}' = 2\mathbf{b}$			
$C112_1$ (4, $P112_1$ )	$\langle 2 \rangle$	$2\mathbf{a}, -\mathbf{a} + \mathbf{b}, \mathbf{c}$	
$C112_1$ (4, $P112_1$ )	$\langle 2 + (1,0,0) \rangle$	$2\mathbf{a}, -\mathbf{a} + \mathbf{b}, \mathbf{c}$	$1/2, 0, 0$
[3] $\mathbf{c}' = 3\mathbf{c}$			
$P112_1$ (4)	$\langle 2 + (0,0,1) \rangle$	$\mathbf{a}, \mathbf{b}, 3\mathbf{c}$	
[3] $\mathbf{a}' = 3\mathbf{a}$			
$P112_1$ (4)	$\langle 2 \rangle$	$3\mathbf{a}, \mathbf{b}, \mathbf{c}$	
$P112_1$ (4)	$\langle 2 + (2,0,0) \rangle$	$3\mathbf{a}, \mathbf{b}, \mathbf{c}$	$1, 0, 0$
$P112_1$ (4)	$\langle 2 + (4,0,0) \rangle$	$3\mathbf{a}, \mathbf{b}, \mathbf{c}$	$2, 0, 0$
[3] $\mathbf{a}' = 3\mathbf{a}, \mathbf{b}' = -\mathbf{a} + \mathbf{b}$			
$P112_1$ (4)	$\langle 2 \rangle$	$3\mathbf{a}, -\mathbf{a} + \mathbf{b}, \mathbf{c}$	
$P112_1$ (4)	$\langle 2 + (2,0,0) \rangle$	$3\mathbf{a}, -\mathbf{a} + \mathbf{b}, \mathbf{c}$	$1, 0, 0$
$P112_1$ (4)	$\langle 2 + (4,0,0) \rangle$	$3\mathbf{a}, -\mathbf{a} + \mathbf{b}, \mathbf{c}$	$2, 0, 0$
[3] $\mathbf{a}' = 3\mathbf{a}, \mathbf{b}' = -2\mathbf{a} + \mathbf{b}$			
$P112_1$ (4)	$\langle 2 \rangle$	$3\mathbf{a}, -2\mathbf{a} + \mathbf{b}, \mathbf{c}$	
$P112_1$ (4)	$\langle 2 + (2,0,0) \rangle$	$3\mathbf{a}, -2\mathbf{a} + \mathbf{b}, \mathbf{c}$	$1, 0, 0$
$P112_1$ (4)	$\langle 2 + (4,0,0) \rangle$	$3\mathbf{a}, -2\mathbf{a} + \mathbf{b}, \mathbf{c}$	$2, 0, 0$
[3] $\mathbf{b}' = 3\mathbf{b}$			
$P112_1$ (4)	$\langle 2 \rangle$	$\mathbf{a}, 3\mathbf{b}, \mathbf{c}$	
$P112_1$ (4)	$\langle 2 + (0,2,0) \rangle$	$\mathbf{a}, 3\mathbf{b}, \mathbf{c}$	$0, 1, 0$
$P112_1$ (4)	$\langle 2 + (0,4,0) \rangle$	$\mathbf{a}, 3\mathbf{b}, \mathbf{c}$	$0, 2, 0$

• Series of maximal isomorphic subgroups

[ $p$ ] $\mathbf{c}' = p\mathbf{c}$			
$P112_1$ (4)	$\langle 2 + (0,0, \frac{p}{2} - \frac{1}{2}) \rangle$ prime $p > 2$ no conjugate subgroups	$\mathbf{a}, \mathbf{b}, p\mathbf{c}$	
[ $p$ ] $\mathbf{a}' = p\mathbf{a}, \mathbf{b}' = -q\mathbf{a} + \mathbf{b}$			
$P112_1$ (4)	$\langle 2 + (2u,0,0) \rangle$ prime $p > 2$ ; $0 \leq q < p$ ; $0 \leq u < p$ $p$ conjugate subgroups for each pair of $q$ and $p$	$p\mathbf{a}, -q\mathbf{a} + \mathbf{b}, \mathbf{c}$	$u, 0, 0$
[ $p$ ] $\mathbf{b}' = p\mathbf{b}$			
$P112_1$ (4)	$\langle 2 + (0,2u,0) \rangle$ 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]  $P112_1/m$  (11); [2]  $P112_1/a$  (14); [2]  $P222_1$  (17); [2]  $P2_12_12$  (18); [2]  $P2_12_12_1$  (19); [2]  $C222_1$  (20); [2]  $Pmc2_1$  (26); [2]  $Pca2_1$  (29); [2]  $Pmn2_1$  (31); [2]  $Pna2_1$  (33); [2]  $Cmc2_1$  (36); [2]  $P4_1$  (76); [2]  $P4_3$  (78); [3]  $P6_1$  (169); [3]  $P6_5$  (170); [3]  $P6_3$  (173)

II Minimal non-isomorphic klassengleiche supergroups

• Additional centring translations

[2]  $A112$  (5); [2]  $B112$  (5,  $A112$ ); [2]  $I112$  (5,  $A112$ )

• Decreased unit cell

[2]  $\mathbf{c}' = \frac{1}{2}\mathbf{c}$   $P112$  (3)