

$D_4^1$ 

P422

No. 89

P422

Generators selected (1);  $t(1,0,0)$ ;  $t(0,1,0)$ ;  $t(0,0,1)$ ; (2); (3); (5)

## General position

Multiplicity,  
Wyckoff letter,  
Site symmetry

## Coordinates

8  $p$  1(1)  $x, y, z$  (2)  $\bar{x}, \bar{y}, z$  (3)  $\bar{y}, x, z$  (4)  $y, \bar{x}, z$   
(5)  $\bar{x}, y, \bar{z}$  (6)  $x, \bar{y}, \bar{z}$  (7)  $y, x, \bar{z}$  (8)  $\bar{y}, \bar{x}, \bar{z}$ I Maximal *translationengleiche* subgroups

[2] P411 (75, P4)	1; 2; 3; 4	
[2] P212 (21, C222)	1; 2; 7; 8	$\mathbf{a} - \mathbf{b}, \mathbf{a} + \mathbf{b}, \mathbf{c}$
[2] P221 (16, P222)	1; 2; 5; 6	

II Maximal *klassengleiche* subgroups

## • Enlarged unit cell

[2]  $\mathbf{c}' = 2\mathbf{c}$ 

P4 <sub>2</sub> 22 (93)	$\langle 2; 5; 3 + (0,0,1) \rangle$	$\mathbf{a}, \mathbf{b}, 2\mathbf{c}$	
P4 <sub>2</sub> 22 (93)	$\langle 2; (3; 5) + (0,0,1) \rangle$	$\mathbf{a}, \mathbf{b}, 2\mathbf{c}$	0, 0, 1/2
P422 (89)	$\langle 2; 3; 5 \rangle$	$\mathbf{a}, \mathbf{b}, 2\mathbf{c}$	
P422 (89)	$\langle 2; 3; 5 + (0,0,1) \rangle$	$\mathbf{a}, \mathbf{b}, 2\mathbf{c}$	0, 0, 1/2

[2]  $\mathbf{a}' = 2\mathbf{a}, \mathbf{b}' = 2\mathbf{b}$ 

C422 <sub>1</sub> (90, P42 <sub>1</sub> 2)	$\langle 2; 3; 5 + (1,0,0) \rangle$	$\mathbf{a} - \mathbf{b}, \mathbf{a} + \mathbf{b}, \mathbf{c}$	1/2, 1/2, 0
C422 <sub>1</sub> (90, P42 <sub>1</sub> 2)	$\langle 2; 5; 3 + (1,0,0) \rangle$	$\mathbf{a} - \mathbf{b}, \mathbf{a} + \mathbf{b}, \mathbf{c}$	
C422 (89, P422)	$\langle 2; 3; 5 \rangle$	$\mathbf{a} - \mathbf{b}, \mathbf{a} + \mathbf{b}, \mathbf{c}$	
C422 (89, P422)	$\langle 2 + (1,1,0); (3; 5) + (1,0,0) \rangle$	$\mathbf{a} - \mathbf{b}, \mathbf{a} + \mathbf{b}, \mathbf{c}$	1/2, 1/2, 0

[2]  $\mathbf{a}' = 2\mathbf{a}, \mathbf{b}' = 2\mathbf{b}, \mathbf{c}' = 2\mathbf{c}$ 

F422 (97, I422)	$\langle 2; 3; 5 \rangle$	$\mathbf{a} - \mathbf{b}, \mathbf{a} + \mathbf{b}, 2\mathbf{c}$	
F422 (97, I422)	$\langle 2; 3; 5 + (0,0,1) \rangle$	$\mathbf{a} - \mathbf{b}, \mathbf{a} + \mathbf{b}, 2\mathbf{c}$	0, 0, 1/2
F422 (97, I422)	$\langle 2; (3; 5) + (1,0,0) \rangle$	$\mathbf{a} - \mathbf{b}, \mathbf{a} + \mathbf{b}, 2\mathbf{c}$	1/2, 1/2, 0
F422 (97, I422)	$\langle 2; 5; 3 + (1,0,0) \rangle$	$\mathbf{a} - \mathbf{b}, \mathbf{a} + \mathbf{b}, 2\mathbf{c}$	1/2, 1/2, 1/2

[3]  $\mathbf{c}' = 3\mathbf{c}$ 

P422 (89)	$\langle 2; 3; 5 \rangle$	$\mathbf{a}, \mathbf{b}, 3\mathbf{c}$	
P422 (89)	$\langle 2; 3; 5 + (0,0,2) \rangle$	$\mathbf{a}, \mathbf{b}, 3\mathbf{c}$	0, 0, 1
P422 (89)	$\langle 2; 3; 5 + (0,0,4) \rangle$	$\mathbf{a}, \mathbf{b}, 3\mathbf{c}$	0, 0, 2

## • Series of maximal isomorphic subgroups

[ $p$ ]  $\mathbf{c}' = p\mathbf{c}$ 

P422 (89)	$\langle 2; 3; 5 + (0,0,2u) \rangle$ prime $p > 2$ ; $0 \leq u < p$ $p$ conjugate subgroups	$\mathbf{a}, \mathbf{b}, p\mathbf{c}$	0, 0, $u$
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[ $p^2$ ]  $\mathbf{a}' = p\mathbf{a}, \mathbf{b}' = p\mathbf{b}$ 

P422 (89)	$\langle 2 + (2u, 2v, 0); 3 + (u + v, -u + v, 0); 5 + (2u, 0, 0) \rangle$ prime $p > 2$ ; $0 \leq u < p$ ; $0 \leq v < p$ $p^2$ conjugate subgroups	$p\mathbf{a}, p\mathbf{b}, \mathbf{c}$	$u, v, 0$
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I Minimal *translationengleiche* supergroups[2] P4/*mmm* (123); [2] P4/*mcc* (124); [2] P4/*nbm* (125); [2] P4/*nnc* (126); [3] P432 (207)II Minimal non-isomorphic *klassengleiche* supergroups

## • Additional centring translations

[2] I422 (97)

## • Decreased unit cell

none