D_{2h}^{1} $P2/m2/m2/m$ No. 47 $Pmmm$

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 *d* 1	(1) x,y,z	(2) $\bar{x},\bar{y},z$	(3) $\bar{x},y,\bar{z}$	(4) $x,\bar{y},\bar{z}$	
	(5) $\bar{x},\bar{y},\bar{z}$	(6) $x,y,\bar{z}$	(7) $x,\bar{y},z$	(8) $\bar{x},y,z$	

I Maximal *translationengleiche* subgroups

[2] *Pmm*2 (25)	1; 2; 7; 8		
[2] *Pm*2*m* (25, *Pmm*2)	1; 3; 6; 8	**c**, **a**, **b**	
[2] *P*2*mm* (25, *Pmm*2)	1; 4; 6; 7	**b**, **c**, **a**	
[2] *P*222 (16)	1; 2; 3; 4		
[2] *P*112/*m* (10)	1; 2; 5; 6		
[2] *P*12/*m*1 (10)	1; 3; 5; 7		
[2] *P*2/*m*11 (10, *P*12/*m*1)	1; 4; 5; 8	**c**, **a**, **b**	

II Maximal *klassengleiche* subgroups

- **Enlarged unit cell**

[2] $\mathbf{a}' = 2\mathbf{a}$			
Pmma (51)	$\langle 3;\ 5;\ 2+(1,0,0)\rangle$	$2\mathbf{a}, \mathbf{b}, \mathbf{c}$	
Pmma (51)	$\langle 2;\ (3;\ 5)+(1,0,0)\rangle$	$2\mathbf{a}, \mathbf{b}, \mathbf{c}$	$1/2,0,0$
Pmam (51, *Pmma*)	$\langle 2;\ 5;\ 3+(1,0,0)\rangle$	$2\mathbf{a}, -\mathbf{c}, \mathbf{b}$	
Pmam (51, *Pmma*)	$\langle 3;\ (2;\ 5)+(1,0,0)\rangle$	$2\mathbf{a}, -\mathbf{c}, \mathbf{b}$	$1/2,0,0$
Pmaa (49, *Pccm*)	$\langle 5;\ (2;\ 3)+(1,0,0)\rangle$	$\mathbf{b}, \mathbf{c}, 2\mathbf{a}$	
Pmaa (49, *Pccm*)	$\langle 2;\ 3;\ 5+(1,0,0)\rangle$	$\mathbf{b}, \mathbf{c}, 2\mathbf{a}$	$1/2,0,0$
Pmmm (47)	$\langle 2;\ 3;\ 5\rangle$	$2\mathbf{a}, \mathbf{b}, \mathbf{c}$	
Pmmm (47)	$\langle (2;\ 3;\ 5)+(1,0,0)\rangle$	$2\mathbf{a}, \mathbf{b}, \mathbf{c}$	$1/2,0,0$
[2] $\mathbf{b}' = 2\mathbf{b}$			
Pbmm (51, *Pmma*)	$\langle 2;\ 5;\ 3+(0,1,0)\rangle$	$2\mathbf{b}, \mathbf{c}, \mathbf{a}$	
Pbmm (51, *Pmma*)	$\langle (2;\ 3;\ 5)+(0,1,0)\rangle$	$2\mathbf{b}, \mathbf{c}, \mathbf{a}$	$0,1/2,0$
Pmmb (51, *Pmma*)	$\langle 5;\ (2;\ 3)+(0,1,0)\rangle$	$-2\mathbf{b}, \mathbf{a}, \mathbf{c}$	
Pmmb (51, *Pmma*)	$\langle 2;\ (3;\ 5)+(0,1,0)\rangle$	$-2\mathbf{b}, \mathbf{a}, \mathbf{c}$	$0,1/2,0$
Pbmb (49, *Pccm*)	$\langle 3;\ 5;\ 2+(0,1,0)\rangle$	$\mathbf{c}, \mathbf{a}, 2\mathbf{b}$	
Pbmb (49, *Pccm*)	$\langle 2;\ 3;\ 5+(0,1,0)\rangle$	$\mathbf{c}, \mathbf{a}, 2\mathbf{b}$	$0,1/2,0$
Pmmm (47)	$\langle 2;\ 3;\ 5\rangle$	$\mathbf{a}, 2\mathbf{b}, \mathbf{c}$	
Pmmm (47)	$\langle 3;\ (2;\ 5)+(0,1,0)\rangle$	$\mathbf{a}, 2\mathbf{b}, \mathbf{c}$	$0,1/2,0$
[2] $\mathbf{c}' = 2\mathbf{c}$			
Pcmm (51, *Pmma*)	$\langle 3;\ 5;\ 2+(0,0,1)\rangle$	$2\mathbf{c}, \mathbf{b}, -\mathbf{a}$	
Pcmm (51, *Pmma*)	$\langle (2;\ 3;\ 5)+(0,0,1)\rangle$	$2\mathbf{c}, \mathbf{b}, -\mathbf{a}$	$0,0,1/2$
Pmcm (51, *Pmma*)	$\langle 5;\ (2;\ 3)+(0,0,1)\rangle$	$2\mathbf{c}, \mathbf{a}, \mathbf{b}$	
Pmcm (51, *Pmma*)	$\langle 3;\ (2;\ 5)+(0,0,1)\rangle$	$2\mathbf{c}, \mathbf{a}, \mathbf{b}$	$0,0,1/2$
Pccm (49)	$\langle 2;\ 5;\ 3+(0,0,1)\rangle$	$\mathbf{a}, \mathbf{b}, 2\mathbf{c}$	
Pccm (49)	$\langle 2;\ 3;\ 5+(0,0,1)\rangle$	$\mathbf{a}, \mathbf{b}, 2\mathbf{c}$	$0,0,1/2$
Pmmm (47)	$\langle 2;\ 3;\ 5\rangle$	$\mathbf{a}, \mathbf{b}, 2\mathbf{c}$	
Pmmm (47)	$\langle 2;\ (3;\ 5)+(0,0,1)\rangle$	$\mathbf{a}, \mathbf{b}, 2\mathbf{c}$	$0,0,1/2$
[2] $\mathbf{b}' = 2\mathbf{b},\ \mathbf{c}' = 2\mathbf{c}$			
Aemm (67, *Cmme*)	$\langle 3;\ 5;\ 2+(0,0,1)\rangle$	$2\mathbf{b}, 2\mathbf{c}, \mathbf{a}$	
Aemm (67, *Cmme*)	$\langle (2;\ 3;\ 5)+(0,0,1)\rangle$	$2\mathbf{b}, 2\mathbf{c}, \mathbf{a}$	$0,0,1/2$
Aemm (67, *Cmme*)	$\langle 2;\ 5;\ 3+(0,0,1)\rangle$	$2\mathbf{b}, 2\mathbf{c}, \mathbf{a}$	$0,1/2,1/2$
Aemm (67, *Cmme*)	$\langle 2;\ 3;\ 5+(0,0,1)\rangle$	$2\mathbf{b}, 2\mathbf{c}, \mathbf{a}$	$0,1/2,0$
Ammm (65, *Cmmm*)	$\langle 2;\ 3;\ 5\rangle$	$2\mathbf{b}, 2\mathbf{c}, \mathbf{a}$	
Ammm (65, *Cmmm*)	$\langle 2;\ (3;\ 5)+(0,0,1)\rangle$	$2\mathbf{b}, 2\mathbf{c}, \mathbf{a}$	$0,0,1/2$
Ammm (65, *Cmmm*)	$\langle 5;\ (2;\ 3)+(0,0,1)\rangle$	$2\mathbf{b}, 2\mathbf{c}, \mathbf{a}$	$0,1/2,1/2$
Ammm (65, *Cmmm*)	$\langle 3;\ (2;\ 5)+(0,0,1)\rangle$	$2\mathbf{b}, 2\mathbf{c}, \mathbf{a}$	$0,1/2,0$
[2] $\mathbf{a}' = 2\mathbf{a},\ \mathbf{c}' = 2\mathbf{c}$			
Bmem (67, *Cmme*)	$\langle 2;\ 5;\ 3+(1,0,0)\rangle$	$2\mathbf{c}, 2\mathbf{a}, \mathbf{b}$	
Bmem (67, *Cmme*)	$\langle 3;\ (2;\ 5)+(1,0,0)\rangle$	$2\mathbf{c}, 2\mathbf{a}, \mathbf{b}$	$1/2,0,0$
Bmem (67, *Cmme*)	$\langle 5;\ (2;\ 3)+(1,0,0)\rangle$	$2\mathbf{c}, 2\mathbf{a}, \mathbf{b}$	$1/2,0,1/2$
Bmem (67, *Cmme*)	$\langle 2;\ 3;\ 5+(1,0,0)\rangle$	$2\mathbf{c}, 2\mathbf{a}, \mathbf{b}$	$0,0,1/2$
Bmmm (65, *Cmmm*)	$\langle 2;\ 3;\ 5\rangle$	$2\mathbf{c}, 2\mathbf{a}, \mathbf{b}$	
Bmmm (65, *Cmmm*)	$\langle (2;\ 3;\ 5)+(1,0,0)\rangle$	$2\mathbf{c}, 2\mathbf{a}, \mathbf{b}$	$1/2,0,0$
Bmmm (65, *Cmmm*)	$\langle 3;\ 5;\ 2+(1,0,0)\rangle$	$2\mathbf{c}, 2\mathbf{a}, \mathbf{b}$	$1/2,0,1/2$
Bmmm (65, *Cmmm*)	$\langle 2;\ (3;\ 5)+(1,0,0)\rangle$	$2\mathbf{c}, 2\mathbf{a}, \mathbf{b}$	$0,0,1/2$

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

Cmme (67)	$\langle 3;\ 5;\ 2+(1,0,0)\rangle$	$2\mathbf{a}, 2\mathbf{b}, \mathbf{c}$	$1/2, 1/2, 0$
Cmme (67)	$\langle 2;\ (3;\ 5)+(1,0,0)\rangle$	$2\mathbf{a}, 2\mathbf{b}, \mathbf{c}$	$0, 1/2, 0$
Cmme (67)	$\langle 5;\ (2;\ 3)+(1,0,0)\rangle$	$2\mathbf{a}, 2\mathbf{b}, \mathbf{c}$	
Cmme (67)	$\langle 2;\ 3;\ 5+(1,0,0)\rangle$	$2\mathbf{a}, 2\mathbf{b}, \mathbf{c}$	$1/2, 0, 0$
Cmmm (65)	$\langle 2;\ 3;\ 5\rangle$	$2\mathbf{a}, 2\mathbf{b}, \mathbf{c}$	
Cmmm (65)	$\langle (2;\ 3;\ 5)+(1,0,0)\rangle$	$2\mathbf{a}, 2\mathbf{b}, \mathbf{c}$	$1/2, 0, 0$
Cmmm (65)	$\langle 2;\ 5;\ 3+(1,0,0)\rangle$	$2\mathbf{a}, 2\mathbf{b}, \mathbf{c}$	$1/2, 1/2, 0$
Cmmm (65)	$\langle 3;\ (2;\ 5)+(1,0,0)\rangle$	$2\mathbf{a}, 2\mathbf{b}, \mathbf{c}$	$0, 1/2, 0$

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

Fmmm (69)	$\langle 2;\ 3;\ 5\rangle$	$2\mathbf{a}, 2\mathbf{b}, 2\mathbf{c}$	
Fmmm (69)	$\langle (2;\ 3;\ 5)+(1,0,0)\rangle$	$2\mathbf{a}, 2\mathbf{b}, 2\mathbf{c}$	$1/2, 0, 0$
Fmmm (69)	$\langle 3;\ 5;\ 2+(1,0,0)\rangle$	$2\mathbf{a}, 2\mathbf{b}, 2\mathbf{c}$	$1/2, 0, 1/2$
Fmmm (69)	$\langle 2;\ (3;\ 5)+(1,0,0)\rangle$	$2\mathbf{a}, 2\mathbf{b}, 2\mathbf{c}$	$0, 0, 1/2$
Fmmm (69)	$\langle 2;\ 5;\ 3+(1,0,0)\rangle$	$2\mathbf{a}, 2\mathbf{b}, 2\mathbf{c}$	$1/2, 1/2, 0$
Fmmm (69)	$\langle 3;\ (2;\ 5)+(1,0,0)\rangle$	$2\mathbf{a}, 2\mathbf{b}, 2\mathbf{c}$	$0, 1/2, 0$
Fmmm (69)	$\langle 5;\ (2;\ 3)+(1,0,0)\rangle$	$2\mathbf{a}, 2\mathbf{b}, 2\mathbf{c}$	$0, 1/2, 1/2$
Fmmm (69)	$\langle 2;\ 3;\ 5+(1,0,0)\rangle$	$2\mathbf{a}, 2\mathbf{b}, 2\mathbf{c}$	$1/2, 1/2, 1/2$

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

Pmmm (47)	$\langle 2;\ 3;\ 5\rangle$	$3\mathbf{a}, \mathbf{b}, \mathbf{c}$	
Pmmm (47)	$\langle (2;\ 3;\ 5)+(2,0,0)\rangle$	$3\mathbf{a}, \mathbf{b}, \mathbf{c}$	$1, 0, 0$
Pmmm (47)	$\langle (2;\ 3;\ 5)+(4,0,0)\rangle$	$3\mathbf{a}, \mathbf{b}, \mathbf{c}$	$2, 0, 0$

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

Pmmm (47)	$\langle 2;\ 3;\ 5\rangle$	$\mathbf{a}, 3\mathbf{b}, \mathbf{c}$	
Pmmm (47)	$\langle 3;\ (2;\ 5)+(0,2,0)\rangle$	$\mathbf{a}, 3\mathbf{b}, \mathbf{c}$	$0, 1, 0$
Pmmm (47)	$\langle 3;\ (2;\ 5)+(0,4,0)\rangle$	$\mathbf{a}, 3\mathbf{b}, \mathbf{c}$	$0, 2, 0$

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

Pmmm (47)	$\langle 2;\ 3;\ 5\rangle$	$\mathbf{a}, \mathbf{b}, 3\mathbf{c}$	
Pmmm (47)	$\langle 2;\ (3;\ 5)+(0,0,2)\rangle$	$\mathbf{a}, \mathbf{b}, 3\mathbf{c}$	$0, 0, 1$
Pmmm (47)	$\langle 2;\ (3;\ 5)+(0,0,4)\rangle$	$\mathbf{a}, \mathbf{b}, 3\mathbf{c}$	$0, 0, 2$

- **Series of maximal isomorphic subgroups**

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

Pmmm (47)	$\langle (2;\ 3;\ 5)+(2u,0,0)\rangle$ $p > 2;\ 0 \le u < p$ p conjugate subgroups for the prime p	$p\mathbf{a}, \mathbf{b}, \mathbf{c}$	$u, 0, 0$

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

Pmmm (47)	$\langle 3;\ (2;\ 5)+(0,2u,0)\rangle$ $p > 2;\ 0 \le u < p$ p conjugate subgroups for the prime p	$\mathbf{a}, p\mathbf{b}, \mathbf{c}$	$0, u, 0$

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

Pmmm (47)	$\langle 2;\ (3;\ 5)+(0,0,2u)\rangle$ $p > 2;\ 0 \le u < p$ p conjugate subgroups for the prime p	$\mathbf{a}, \mathbf{b}, p\mathbf{c}$	$0, 0, u$

I Minimal *translationengleiche* supergroups

[2] $P4/mmm$ (123); [2] $P4_2/mmc$ (131); [3] $Pm\bar{3}$ (200)

II Minimal non-isomorphic *klassengleiche* supergroups

- **Additional centring translations**

[2] *Ammm* (65, *Cmmm*); [2] *Bmmm* (65, *Cmmm*); [2] *Cmmm* (65); [2] *Immm* (71)

- **Decreased unit cell** none