

Tetragonal

6. SCANNING TABLES

Laue class $D_{4h} - 4/mmm$ No. 135 $P4_2/mbc$

$$\mathcal{G} = P_m^{4_2 \frac{2}{m} \frac{2}{c}} \quad D_{4h}^{13}$$

Orientation orbit (hkl)	Conventional basis of the scanning group $\mathbf{a}' \quad \mathbf{b}' \quad \mathbf{d}$	Scanning group \mathcal{H}	Linear orbit $s\mathbf{d}$	Sectional layer group $\mathcal{L}(s\mathbf{d})$
(001)	$\mathbf{a} \quad \mathbf{b} \quad \mathbf{c}$	$P4_2/mbc$	$[0\mathbf{d}, \frac{1}{2}\mathbf{d}]$ $[\frac{1}{4}\mathbf{d}, \frac{3}{4}\mathbf{d}]$ $[\pm s\mathbf{d}, (\pm s + \frac{1}{2})\mathbf{d}]$	$pbam$ L44 $p\bar{4}b2$ L60 $pba2$ L25
(100)	$\mathbf{b} \quad \mathbf{c} \quad \mathbf{a}$	$Pcma$	$[0\mathbf{d}, \frac{1}{2}\mathbf{d}]$	$p12/m1$ L14
(010)	$-\mathbf{a} \quad \mathbf{c} \quad \mathbf{b}$		$[\frac{1}{4}\mathbf{d}, \frac{3}{4}\mathbf{d}]$ $[\pm s\mathbf{d}, (\pm s + \frac{1}{2})\mathbf{d}]$	$p2_1ma$ L28 $p1m1$ L11
(110)	$(-\mathbf{a}+\mathbf{b}) \quad \mathbf{c} \quad (\mathbf{a}+\mathbf{b})$	$Bbmb$	$[0\mathbf{d}, \frac{1}{2}\mathbf{d}]$	$pbnm$ L42
(1 $\bar{1}$ 0)	$(\mathbf{a}+\mathbf{b}) \quad \mathbf{c} \quad (\mathbf{a}-\mathbf{b})$		$[(\mathbf{a}' + \mathbf{d})/4]$ $[\frac{1}{4}\mathbf{d}, \frac{3}{4}\mathbf{d}]$ $[\pm s\mathbf{d}, (\pm s + \frac{1}{2})\mathbf{d}]$	$pbmb$ ($\mathbf{a}'/4$) L38 $pbm2$ $[(\mathbf{a}' + \mathbf{b}')/4]$ L24

No. 136 $P4_2/mnm$

$$\mathcal{G} = P_m^{4_2 \frac{2}{n} \frac{2}{m}} \quad D_{4h}^{14}$$

Orientation orbit (hkl)	Conventional basis of the scanning group $\mathbf{a}' \quad \mathbf{b}' \quad \mathbf{d}$	Scanning group \mathcal{H}	Linear orbit $s\mathbf{d}$	Sectional layer group $\mathcal{L}(s\mathbf{d})$
(001)	$\mathbf{a} \quad \mathbf{b} \quad \mathbf{c}$	$P4_2/mnm$	$[0\mathbf{d}, \frac{1}{2}\mathbf{d}]$ $[\frac{1}{4}\mathbf{d}, \frac{3}{4}\mathbf{d}]$ $[\pm s\mathbf{d}, (\pm s + \frac{1}{2})\mathbf{d}]$	$\widehat{c}mmm$ L47 $p\bar{4}2_1m$ ($\mathbf{a}/2$ or $\mathbf{b}/2$) L58 $\widehat{c}mm2$ L26
(100)	$\mathbf{b} \quad \mathbf{c} \quad \mathbf{a}$	$Pnmn$	$[0\mathbf{d}, \frac{1}{2}\mathbf{d}]$	$p12/m1$ L14
(010)	$-\mathbf{a} \quad \mathbf{c} \quad \mathbf{b}$		$[\frac{1}{4}\mathbf{d}, \frac{3}{4}\mathbf{d}]$ $[\pm s\mathbf{d}, (\pm s + \frac{1}{2})\mathbf{d}]$	$p2_1mn$ L32 $p1m1$ L11
(110)	$(-\mathbf{a}+\mathbf{b}) \quad \mathbf{c} \quad (\mathbf{a}+\mathbf{b})$	$Bmmm$	$[0\mathbf{d}, \frac{1}{2}\mathbf{d}]$	$pmmm$ L37
(1 $\bar{1}$ 0)	$(\mathbf{a}+\mathbf{b}) \quad \mathbf{c} \quad (\mathbf{a}-\mathbf{b})$		$[\frac{1}{4}\mathbf{d}, \frac{3}{4}\mathbf{d}]$ $[\pm s\mathbf{d}, (\pm s + \frac{1}{2})\mathbf{d}]$	$pmma$ ($\mathbf{a}'/4$) L41 $pmm2$ L23

No. 137 $P4_2/nmc$

$$\mathcal{G} = P_n^{4_2 \frac{2}{m} \frac{2}{c}} \quad \text{origin 1} \quad D_{4h}^{15}$$

Orientation orbit (hkl)	Conventional basis of the scanning group $\mathbf{a}' \quad \mathbf{b}' \quad \mathbf{d}$	Scanning group \mathcal{H}	Linear orbit $s\mathbf{d}$	Sectional layer group $\mathcal{L}(s\mathbf{d})$
(001)	$\mathbf{a} \quad \mathbf{b} \quad \mathbf{c}$	$P4_2/nmc$ (origin 1)	$[0\mathbf{d}, \frac{1}{2}\mathbf{d}]$ $[\frac{1}{4}\mathbf{d}, \frac{3}{4}\mathbf{d}]$ $[\pm s\mathbf{d}, (\pm s + \frac{1}{2})\mathbf{d}]$	$p\bar{4}m2$ L59 $pmmn$ $[(\mathbf{a}+\mathbf{b})/4]$ L46 $pmm2$ L23
(100)	$\mathbf{b} \quad \mathbf{c} \quad \mathbf{a}$	$Pmnm$	$[0\mathbf{d}, \frac{1}{2}\mathbf{d}]$	$pm2m$ ($\mathbf{b}'/4$) L27
(010)	$-\mathbf{a} \quad \mathbf{c} \quad \mathbf{b}$ $(\mathbf{b}'/4)$	(origin 1)	$[\frac{1}{4}\mathbf{d}, \frac{3}{4}\mathbf{d}]$ $[\pm s\mathbf{d}, (\pm s + \frac{1}{2})\mathbf{d}]$	$p2_1/m11$ $[(\mathbf{a}'+\mathbf{b}')/4]$ L15 $pm11$ ($\mathbf{b}'/4$) L11
(110)	$(-\mathbf{a}+\mathbf{b}) \quad \mathbf{c} \quad (\mathbf{a}+\mathbf{b})$	$Bbcb$ (or. 1)	$[0\mathbf{d}, \frac{1}{2}\mathbf{d}]$	$pban$ $[(\mathbf{a}'+\mathbf{b}')/4]$ L39
(1 $\bar{1}$ 0)	$(\mathbf{a}+\mathbf{b}) \quad \mathbf{c} \quad (\mathbf{a}-\mathbf{b})$	or $Bbcb$ (or. 2) $[(\mathbf{a}'+\mathbf{b}')/4]$	$[\frac{1}{4}\mathbf{d}, \frac{3}{4}\mathbf{d}]$ $[\pm s\mathbf{d}, (\pm s + \frac{1}{2})\mathbf{d}]$	$pbab$ ($\mathbf{b}'/4$) L43 $pba2$ L25

No. 142 $I4_1/acd$

$$\mathcal{G} = I\frac{4}{a}\frac{1}{c}\frac{2}{d}$$

 D_{4h}^{20}

Orientation orbit (hkl)	Conventional basis of the scanning group $\mathbf{a}' \quad \mathbf{b}' \quad \mathbf{d}$	Scanning group \mathcal{H}	Linear orbit $s\mathbf{d}$	Sectional layer group $\mathcal{L}(s\mathbf{d})$
(001)	$\mathbf{a} \quad \mathbf{b} \quad \mathbf{c}$	$I4_1/acd$ (origin 2)	$[0\mathbf{d}, \frac{1}{2}\mathbf{d};$ $\frac{1}{4}\mathbf{d}, \frac{3}{4}\mathbf{d}]$ $[\frac{1}{8}\mathbf{d}, \frac{5}{8}\mathbf{d};$ $\frac{3}{8}\mathbf{d}, \frac{7}{8}\mathbf{d}]$ $[\pm s\mathbf{d}, (\pm s + \frac{1}{4})\mathbf{d},$ $(\pm s + \frac{1}{2})\mathbf{d}, (\pm s + \frac{3}{4})\mathbf{d}]$	$pbab$ L43 $pbaa [(\mathbf{a} + \mathbf{b})/4]$ L43 $p\bar{4}b2 (3\mathbf{b}/4)$ L60 $p\bar{4}b2 (\mathbf{b}/4)$ L60 $pba2 (\mathbf{b}/4)$ L25
(100)	$\mathbf{b} \quad \mathbf{c} \quad \mathbf{a}$	$Ibca$	$[0\mathbf{d}, \frac{1}{2}\mathbf{d}]$ $[\frac{1}{4}\mathbf{d}, \frac{3}{4}\mathbf{d}]$ $[\pm s\mathbf{d}, (\pm s + \frac{1}{2})\mathbf{d}]$	$pbab$ L43 $pbaa [(\mathbf{a}' + \mathbf{b}')/4]$ L43 $pba2 (\mathbf{b}'/4)$ L25
(010)	$-\mathbf{a} \quad \mathbf{c} \quad \mathbf{b}$	$Ibca$ [($\mathbf{a}' + \mathbf{b}' + \mathbf{d}$)/4]	$[0\mathbf{d}, \frac{1}{2}\mathbf{d}]$ $[\frac{1}{4}\mathbf{d}, \frac{3}{4}\mathbf{d}]$ $[\pm s\mathbf{d}, (\pm s + \frac{1}{2})\mathbf{d}]$	$pbaa$ L43 $pbab [(\mathbf{a}' + \mathbf{b}')/4]$ L43 $pba2 (\mathbf{a}'/4)$ L25
(110)	$(-\mathbf{a} + \mathbf{b}) \quad \mathbf{c} \quad (\mathbf{a} + \mathbf{b})$	$Fddd$ (or. 1) [$3(\mathbf{a}' + \mathbf{b}' + \mathbf{d})/8$] or $Fddd$ (or. 2)	$[0\mathbf{d}, \frac{1}{2}\mathbf{d};$ $\frac{1}{4}\mathbf{d}, \frac{3}{4}\mathbf{d}]$ $[\frac{1}{8}\mathbf{d}, \frac{5}{8}\mathbf{d};$ $\frac{3}{8}\mathbf{d}, \frac{7}{8}\mathbf{d}]$ $[\pm s\mathbf{d}, (\pm s + \frac{1}{4})\mathbf{d},$ $(\pm s + \frac{1}{2})\mathbf{d}, (\pm s + \frac{3}{4})\mathbf{d}]$	$\hat{p}112/b$ L16 $\hat{p}112/a (\mathbf{a}'/4 \text{ or } \mathbf{b}'/4)$ L16 $c222 [(\mathbf{a}' + \mathbf{b}')/8]$ L22 $c222 [3(\mathbf{a}' + \mathbf{b}')/8]$ L22
(1 $\bar{1}0$)	$(\mathbf{a} + \mathbf{b}) \quad \mathbf{c} \quad (\mathbf{a} - \mathbf{b})$	$Fddd$ (or. 1) [($\mathbf{a}' + \mathbf{b}' + 3\mathbf{d}$)/8] or $Fddd$ (or. 2) [($\mathbf{a}' + \mathbf{b}'$)/4]	$[0\mathbf{d}, \frac{1}{2}\mathbf{d};$ $\frac{1}{4}\mathbf{d}, \frac{3}{4}\mathbf{d}]$ $[\frac{1}{8}\mathbf{d}, \frac{5}{8}\mathbf{d};$ $\frac{3}{8}\mathbf{d}, \frac{7}{8}\mathbf{d}]$ $[\pm s\mathbf{d}, (\pm s + \frac{1}{4})\mathbf{d},$ $(\pm s + \frac{1}{2})\mathbf{d}, (\pm s + \frac{3}{4})\mathbf{d}]$	$\hat{p}112 [(\mathbf{a}' + \mathbf{b}')/8]$ L03

Auxiliary tables for Laue class $D_{4h} - 4/mmm$ Centring type P

Orientation orbit (hkl)	Conventional basis of the scanning group $\mathbf{a}' \quad \mathbf{b}' \quad \mathbf{d}$	Auxiliary basis of the scanning group $\hat{\mathbf{a}} \quad \hat{\mathbf{b}} \quad \hat{\mathbf{c}}$
($m n 0$)	\mathbf{c} $n\mathbf{a} - m\mathbf{b}$ $p\mathbf{a} + q\mathbf{b}$	$\mathbf{a} \quad \mathbf{b} \quad \mathbf{c}$
($\bar{n} m 0$)	\mathbf{c} $m\mathbf{a} + n\mathbf{b}$ $-q\mathbf{a} + p\mathbf{b}$	
($\bar{m} \bar{n} 0$)	\mathbf{c} $n\mathbf{a} + m\mathbf{b}$ $-p\mathbf{a} + q\mathbf{b}$	
($n m 0$)	\mathbf{c} $m\mathbf{a} - n\mathbf{b}$ $q\mathbf{a} + p\mathbf{b}$	
($0 m n$)	\mathbf{a} $n\mathbf{b} - m\mathbf{c}$ $p\mathbf{b} + q\mathbf{c}$	$\mathbf{b} \quad \mathbf{c} \quad \mathbf{a}$
($0 \bar{m} \bar{n}$)	\mathbf{a} $n\mathbf{b} + m\mathbf{c}$ $-p\mathbf{b} + q\mathbf{c}$	
($m 0 n$)	\mathbf{b} $m\mathbf{c} - n\mathbf{a}$ $q\mathbf{c} + p\mathbf{a}$	$\mathbf{c} \quad \mathbf{a} \quad \mathbf{b}$
($m 0 \bar{n}$)	\mathbf{b} $m\mathbf{c} + n\mathbf{a}$ $-q\mathbf{c} + p\mathbf{a}$	
($h h l$)	$\mathbf{a} - \mathbf{b}$ $n(\mathbf{a} + \mathbf{b}) - m\mathbf{c}$ $p(\mathbf{a} + \mathbf{b}) + q\mathbf{c}$	$\mathbf{a} + \mathbf{b} \quad \mathbf{c} \quad \mathbf{a} - \mathbf{b}$
($\bar{h} h l$)	$\mathbf{a} - \mathbf{b}$ $n(\mathbf{a} + \mathbf{b}) + m\mathbf{c}$ $-p(\mathbf{a} + \mathbf{b}) + q\mathbf{c}$	
($h \bar{h} l$)	$\mathbf{a} + \mathbf{b}$ $n(\mathbf{b} - \mathbf{a}) - m\mathbf{c}$ $p(\mathbf{b} - \mathbf{a}) + q\mathbf{c}$	$\mathbf{b} - \mathbf{a} \quad \mathbf{c} \quad \mathbf{a} + \mathbf{b}$
($\bar{h} \bar{h} l$)	$\mathbf{a} + \mathbf{b}$ $n(\mathbf{b} - \mathbf{a}) + m\mathbf{c}$ $-p(\mathbf{b} - \mathbf{a}) + q\mathbf{c}$	
l odd $\Rightarrow n = l, m = 2h; l$ even $\Rightarrow n = l/2, m = h$		

Arithmetic class $4/mmmP$ (cont.)

Serial No. Group type Group	135 D_{4h}^{13} $P4_2/mbc$	136 D_{4h}^{14} $P4_2/mnm$	137 D_{4h}^{15} $P4_2/nmc$		138 D_{4h}^{16} $P4_2/ncm$	
			Origin 1	Origin 2	Origin 1	Origin 2
	(mn0) ($\bar{n}m0$) ($\bar{m}n0$) (nm0)	$P112/m$	$P112/m$	$P112/n$	$P112/n$ ($\mathbf{a} + \mathbf{b} + \mathbf{c}$)/4	$P112/n$
(0mn) (0 $\bar{m}n$) (m0n) (m0 \bar{n})	$P112_1/a$	$P112_1/n$	$P112_1/m$ ($\mathbf{a} + \mathbf{b} + \mathbf{c}$)/4	$P112_1/m$	$P112_1/b$ ($\mathbf{a} + \mathbf{b} + \mathbf{c}$)/4	$P112_1/b$
$(\bar{h}hl)$ $(\bar{h}\bar{h}l)$ $(h\bar{h}l)$ $(\bar{h}hl)$	$B112/b$ ($\mathbf{a}/2$ or $\mathbf{b}/2$)	$B112/m$	$B112/b$ ($\mathbf{a} - \mathbf{b} + \mathbf{c}$)/4	$B112/b$	$B112/m$ ($\mathbf{a} - \mathbf{b} + \mathbf{c}$)/4	$B112/m$
			$B112/b$ ($\mathbf{a} + \mathbf{b} + \mathbf{c}$)/4	$B112/b$ ($\mathbf{a}/2$ or $\mathbf{b}/2$)	$B112/m$ ($\mathbf{a} + \mathbf{b} + \mathbf{c}$)/4	$B112/m$ ($\mathbf{a}/2$ or $\mathbf{b}/2$)

Centring type I

Orientation orbit (hkl)	Conventional basis of the scanning group			Auxiliary basis of the scanning group		
	\mathbf{a}'	\mathbf{b}'	\mathbf{d}	$\hat{\mathbf{a}}$	$\hat{\mathbf{b}}$	$\hat{\mathbf{c}}$
(mn0)	\mathbf{c}	$n\mathbf{a} - m\mathbf{b}$	$p\mathbf{a} + q\mathbf{b}$	\mathbf{a}	\mathbf{b}	\mathbf{c}
($\bar{n}m0$)	\mathbf{c}	$m\mathbf{a} + n\mathbf{b}$	$-q\mathbf{a} + p\mathbf{b}$			
($\bar{m}n0$)	\mathbf{c}	$n\mathbf{a} + m\mathbf{b}$	$-p\mathbf{a} + q\mathbf{b}$			
(nm0)	\mathbf{c}	$m\mathbf{a} - n\mathbf{b}$	$q\mathbf{a} + p\mathbf{b}$			
(0mn)	\mathbf{a}	$n\mathbf{b} - m\mathbf{c}$	$p\mathbf{b} + q\mathbf{c}$	\mathbf{b}	\mathbf{c}	\mathbf{a}
(0 $\bar{m}n$)	\mathbf{a}	$n\mathbf{b} + m\mathbf{c}$	$-p\mathbf{b} + q\mathbf{c}$			
(m0n)	\mathbf{b}	$m\mathbf{c} - n\mathbf{a}$	$q\mathbf{c} + p\mathbf{a}$	\mathbf{c}	\mathbf{a}	\mathbf{b}
(m0 \bar{n})	\mathbf{b}	$m\mathbf{c} + n\mathbf{a}$	$-q\mathbf{c} + p\mathbf{a}$			
($\bar{h}hl$)	$\mathbf{a} - \mathbf{b}$	$n\hat{\mathbf{a}} - m\mathbf{c}$	$p\hat{\mathbf{a}} + q\mathbf{c}$	$(\mathbf{a} + \mathbf{b} + \mathbf{c})/2$	\mathbf{c}	$\mathbf{a} - \mathbf{b}$
($\bar{h}\bar{h}l$)	$\mathbf{a} - \mathbf{b}$	$n\hat{\mathbf{a}} + m\mathbf{c}$	$-p\hat{\mathbf{a}} + q\mathbf{c}$			
($h\bar{h}l$)	$\mathbf{a} + \mathbf{b}$	$n\hat{\mathbf{a}} - m\mathbf{c}$	$p\hat{\mathbf{a}} + q\mathbf{c}$	$(\mathbf{b} - \mathbf{a} + \mathbf{c})/2$	\mathbf{c}	$\mathbf{a} + \mathbf{b}$
($\bar{h}hl$)	$\mathbf{a} + \mathbf{b}$	$n\hat{\mathbf{a}} + m\mathbf{c}$	$-p\hat{\mathbf{a}} + q\mathbf{c}$			
l odd $\Rightarrow n = 2l, m = 2h + l; l$ even $\Rightarrow n = l, m = h + l/2$						

Arithmetic classes $422I$ and $4mmI$

Serial No. Group type Group	97 D_4^9 $I422$	98 D_4^{10} $I4_122$	107 C_{4v}^9 $I4mm$	108 C_{4v}^{10} $I4cm$	109 C_{4v}^{11} $I4_1md$	110 C_{4v}^{12} $I4_1cd$
(mn0) ($\bar{n}m0$) ($\bar{m}n0$) (nm0)	$I112$	$I112$	$I112$	$I112$	$I112$	$I112$
(0mn)	$I112$	$I112$	$I11m$	$I11b$	$I11m$	$I11b$
(0 $\bar{m}n$)		$(\mathbf{b}/4 + \mathbf{c}/8)$				$I11a$
(m0n)	$I112$		$I11a$			
(m0 \bar{n})		$(\mathbf{a}/4 + 3\mathbf{c}/8)$				
($\bar{h}hl$)	$A112$	$A112$	$A11m$	$A11m$ ($\mathbf{a}/2$ or $\mathbf{b}/2$)	$A11n$ ($\mathbf{a} - \mathbf{b}$)/8	$A11n$ $3(\mathbf{a} - \mathbf{b})/8$
($\bar{h}\bar{h}l$)					$A11n$ $3(\mathbf{a} + \mathbf{b})/8$	$A11n$ ($\mathbf{a} + \mathbf{b}$)/8
($h\bar{h}l$)						