

## Orthorhombic

## 6. SCANNING TABLES

Laue class  $D_{2h} - mmm$ No. 54  $Pcca$  $D_{2h}^8$ 

$$\mathcal{G} = P \begin{matrix} 2_1 & 2_1 & 2_1 \\ c & c & a \end{matrix}$$

| Orientation orbit<br>( <i>hkl</i> ) | Conventional basis<br>of the scanning group<br><b>a'</b> <b>b'</b> <b>d</b> | Scanning group<br>$\mathcal{H}$ | Linear orbit<br><b>sd</b>   | Sectional layer group<br>$\mathcal{L}(\mathbf{sd})$          |                   |
|-------------------------------------|---|---------------------------------|---|--|-------------------|
| (001)                               | <b>a</b> <b>b</b> <b>c</b>  | $Pcca$                          | $[0\mathbf{d}, \frac{1}{2}\mathbf{d}]$<br>$[\frac{1}{4}\mathbf{d}, \frac{3}{4}\mathbf{d}]$<br>$[\pm\mathbf{sd}, (\pm s + \frac{1}{2})\mathbf{d}]$ | $p112/a$<br>$p2_122 (\mathbf{a}/4)$<br>$p112 (\mathbf{a}/4)$ | L07<br>L20<br>L03 |
| (100)                               | <b>b</b> <b>c</b> <b>a</b>  | $Pbcb$                          | $[0\mathbf{d}, \frac{1}{2}\mathbf{d}]$<br>$[\frac{1}{4}\mathbf{d}, \frac{3}{4}\mathbf{d}]$<br>$[\pm\mathbf{sd}, (\pm s + \frac{1}{2})\mathbf{d}]$ | $p2/b11$<br>$pb2b$<br>$pb11$                                 | L16<br>L30<br>L12 |
| (010)                               | <b>c</b> <b>a</b> <b>b</b>  | $Pbaa$                          | $0\mathbf{d}, \frac{1}{2}\mathbf{d}$<br>$[\mathbf{sd}, -\mathbf{sd}]$   | $pbaa$<br>$pba2 (\mathbf{a}'/4)$                             | L43<br>L25        |

No. 55  $Pbam$  $D_{2h}^9$ 

$$\mathcal{G} = P \begin{matrix} 2_1 & 2_1 & 2_1 \\ b & a & m \end{matrix}$$

| Orientation orbit<br>( <i>hkl</i> ) | Conventional basis<br>of the scanning group<br><b>a'</b> <b>b'</b> <b>d</b> | Scanning group<br>$\mathcal{H}$ | Linear orbit<br><b>sd</b>   | Sectional layer group<br>$\mathcal{L}(\mathbf{sd})$ |                   |
|-------------------------------------|---|---------------------------------|---|---|-------------------|
| (001)                               | <b>a</b> <b>b</b> <b>c</b>  | $Pbam$                          | $0\mathbf{d}, \frac{1}{2}\mathbf{d}$<br>$[\mathbf{sd}, -\mathbf{sd}]$   | $pbam$<br>$pba2$                                    | L44<br>L25        |
| (100)                               | <b>b</b> <b>c</b> <b>a</b>  | $Pcma$                          | $[0\mathbf{d}, \frac{1}{2}\mathbf{d}]$<br>$[\frac{1}{4}\mathbf{d}, \frac{3}{4}\mathbf{d}]$<br>$[\pm\mathbf{sd}, (\pm s + \frac{1}{2})\mathbf{d}]$ | $p12/m1$<br>$p2_1ma$<br>$p1m1$                      | L14<br>L28<br>L11 |
| (010)                               | <b>c</b> <b>a</b> <b>b</b>  | $Pmcb$                          | $[0\mathbf{d}, \frac{1}{2}\mathbf{d}]$<br>$[\frac{1}{4}\mathbf{d}, \frac{3}{4}\mathbf{d}]$<br>$[\pm\mathbf{sd}, (\pm s + \frac{1}{2})\mathbf{d}]$ | $p2/m11$<br>$pm2_1b$<br>$pm11$                      | L14<br>L28<br>L11 |

No. 56  $Pccn$  $D_{2h}^{10}$ 

$$\mathcal{G} = P \begin{matrix} 2_1 & 2_1 & 2_1 \\ c & c & n \end{matrix}$$

| Orientation orbit<br>( <i>hkl</i> ) | Conventional basis<br>of the scanning group<br><b>a'</b> <b>b'</b> <b>d</b> | Scanning group<br>$\mathcal{H}$ | Linear orbit<br><b>sd</b>   | Sectional layer group<br>$\mathcal{L}(\mathbf{sd})$  |                   |
|-------------------------------------|---|---------------------------------|---|--|-------------------|
| (001)                               | <b>a</b> <b>b</b> <b>c</b>  | $Pccn$                          | $[0\mathbf{d}, \frac{1}{2}\mathbf{d}]$<br>$[\frac{1}{4}\mathbf{d}, \frac{3}{4}\mathbf{d}]$<br>$[\pm\mathbf{sd}, (\pm s + \frac{1}{2})\mathbf{d}]$ | $p112/n$<br>$p2_12_12 [(\mathbf{a} + \mathbf{b})/4]$<br>$p112 [(\mathbf{a} + \mathbf{b})/4]$ | L07<br>L21<br>L03 |
| (100)                               | <b>b</b> <b>c</b> <b>a</b>  | $Pbnb$                          | $[0\mathbf{d}, \frac{1}{2}\mathbf{d}]$<br>$[\frac{1}{4}\mathbf{d}, \frac{3}{4}\mathbf{d}]$<br>$[\pm\mathbf{sd}, (\pm s + \frac{1}{2})\mathbf{d}]$ | $p2_1/b11$<br>$pb2b (\mathbf{a}'/4)$<br>$pb11 (\mathbf{a}'/4)$                               | L17<br>L30<br>L12 |
| (010)                               | <b>c</b> <b>a</b> <b>b</b>  | $Pnaa$                          | $[0\mathbf{d}, \frac{1}{2}\mathbf{d}]$<br>$[\frac{1}{4}\mathbf{d}, \frac{3}{4}\mathbf{d}]$<br>$[\pm\mathbf{sd}, (\pm s + \frac{1}{2})\mathbf{d}]$ | $p12_1/a1$<br>$p2aa (\mathbf{b}'/4)$<br>$p1a1 (\mathbf{b}'/4)$                               | L17<br>L30<br>L12 |

Auxiliary tables for Laue class  $D_{2h} - mmm$ Centring types  $P$  and  $I$ 

| Orientation orbit<br>( $hkl$ ) | Conventional basis<br>of the scanning group |                             |                              | Auxiliary basis<br>of the scanning group |                    |                    |
|--------------------------------|---|-----------------------------|------------------------------|--|--------------------|--------------------|
|                                | $\mathbf{a}'$                               | $\mathbf{b}'$               | $\mathbf{d}$                 | $\hat{\mathbf{a}}$                       | $\hat{\mathbf{b}}$ | $\hat{\mathbf{c}}$ |
| ( $mn0$ )                      | $\mathbf{c}$                                | $n\mathbf{a} - m\mathbf{b}$ | $p\mathbf{a} + q\mathbf{b}$  | $\mathbf{a}$                             | $\mathbf{b}$       | $\mathbf{c}$       |
| ( $\bar{m}n0$ )                | $\mathbf{c}$                                | $n\mathbf{a} + m\mathbf{b}$ | $-p\mathbf{a} + q\mathbf{b}$ |  |                    |                    |
| ( $0mn$ )                      | $\mathbf{a}$                                | $n\mathbf{b} - m\mathbf{c}$ | $p\mathbf{b} + q\mathbf{c}$  | $\mathbf{b}$                             | $\mathbf{c}$       | $\mathbf{a}$       |
| ( $0\bar{m}n$ )                | $\mathbf{a}$                                | $n\mathbf{b} + m\mathbf{c}$ | $-p\mathbf{b} + q\mathbf{c}$ |  |                    |                    |
| ( $n0m$ )                      | $\mathbf{b}$                                | $nc - ma$                   | $pc + qa$                    | $\mathbf{c}$                             | $\mathbf{a}$       | $\mathbf{b}$       |
| ( $n0\bar{m}$ )                | $\mathbf{b}$                                | $nc + ma$                   | $-pc + qa$                   |  |                    |                    |

Arithmetic class  $222P$ 

| Serial No.      | 16      | 17                 | 18                 | 19                 |
|-----------------|---------|--------------------|--------------------|--------------------|
| Group type      | $D_2^1$ | $D_2^2$            | $D_2^3$            | $D_2^4$            |
| Group           | $P222$  | $P222_1$           | $P2_12_12$         | $P2_12_12_1$       |
| ( $mn0$ )       | $P112$  | $P112_1$           | $P112$             | $P112_1$           |
| ( $\bar{m}n0$ ) |         |                    |                    | ( $\mathbf{a}/4$ ) |
| ( $0mn$ )       |         | $P112$             | $P112_1$           | $P112_1$           |
| ( $0\bar{m}n$ ) |         |                    | ( $\mathbf{b}/4$ ) | ( $\mathbf{b}/4$ ) |
| ( $n0m$ )       |         | $P112$             | $P112_1$           | $P112_1$           |
| ( $n0\bar{m}$ ) |         | ( $\mathbf{c}/4$ ) | ( $\mathbf{a}/4$ ) | ( $\mathbf{c}/4$ ) |

Arithmetic class  $mm2P$ 

| Serial No.      | 25         | 26         | 27         | 28                 | 29                 | 30                 | 31         | 32                 | 33                 | 34                 |                    |
|-----------------|------------|------------|------------|--------------------|--------------------|--------------------|------------|--------------------|--------------------|--------------------|--------------------|
| Group type      | $C_{2v}^1$ | $C_{2v}^2$ | $C_{2v}^3$ | $C_{2v}^4$         | $C_{2v}^5$         | $C_{2v}^6$         | $C_{2v}^7$ | $C_{2v}^8$         | $C_{2v}^9$         | $C_{2v}^{10}$      |                    |
| Group           | $Pmm2$     | $Pmc2_1$   | $Pcc2$     | $Pma2$             | $Pca2_1$           | $Pnc2$             | $Pmn2_1$   | $Pba2$             | $Pna2_1$           | $Pnn2$             |                    |
| ( $mn0$ )       | $P11m$     | $P112_1$   | $P112$     | $P112$             | $P112_1$           | $P112$             | $P112_1$   | $P112$             | $P112_1$           | $P112$             |                    |
| ( $\bar{m}n0$ ) |            |            |            |                    |                    |                    |            | ( $\mathbf{a}/4$ ) |                    |                    |                    |
| ( $0mn$ )       |            | $P11m$     | $P11m$     | $P11b$             | $P11m$             | $P11b$             | $P11n$     | $P11m$             | $P11a$             | $P11n$             | $P11n$             |
| ( $0\bar{m}n$ ) |            |            |            | ( $\mathbf{a}/4$ ) | ( $\mathbf{a}/4$ ) |                    |            |                    | ( $\mathbf{a}/4$ ) | ( $\mathbf{a}/4$ ) | ( $\mathbf{a}/4$ ) |
| ( $n0m$ )       |            | $P11a$     | $P11a$     | $P11b$             | $P11b$             | $P11a$             | $P11n$     | $P11b$             | $P11b$             | $P11n$             |                    |
| ( $n0\bar{m}$ ) |            |            |            |                    |                    | ( $\mathbf{b}/4$ ) |            | ( $\mathbf{b}/4$ ) | ( $\mathbf{b}/4$ ) | ( $\mathbf{b}/4$ ) |                    |

Arithmetic classes  $222I$ ,  $mm2I$  and  $mmmI$ 

| Serial No.      | 23                 | 24                 | 44            | 45            | 46            | 71            | 72                 | 73   | 74            |  |          |
|-----------------|--------------------|--------------------|---------------|---------------|---------------|---------------|--------------------|--|---------------|--|----------|
| Group type      | $D_2^8$            | $D_{2v}^9$         | $C_{2v}^{20}$ | $C_{2v}^{21}$ | $C_{2v}^{22}$ | $D_{2h}^{25}$ | $D_{2h}^{26}$      | $D_{2h}^{27}$                                | $D_{2h}^{28}$ |  |          |
| Group           | $I222$             | $I2_12_12_1$       | $Imm2$        | $Iba2$        | $Ima2$        | $Immm$        | $Ibam$             | $Ibca$                                       | $Imma$        |  |          |
| ( $mn0$ )       | $I112$             | $I112$             | $I112$        | $I112$        | $I112$        | $I112/m$      | $I112/m$           | $I112/b$                                     | $I112/b$      |  |          |
| ( $\bar{m}n0$ ) |                    | ( $\mathbf{b}/4$ ) |               |               |               |               |                    |  |               |  |          |
| ( $0mn$ )       |                    | $I112$             | $I11m$        | $I11b$        | $I11m$        |               |                    |  | $I112/b$      |  | $I112/m$ |
| ( $0\bar{m}n$ ) |                    | ( $\mathbf{c}/4$ ) |               |               |               |               | ( $\mathbf{a}/4$ ) |  |               |  |          |
| ( $n0m$ )       | $I112$             |                    | $I11a$        | $I11b$        |               | $I112/a$      |                    | $I112/m$                                     |               |  |          |
| ( $n0\bar{m}$ ) | ( $\mathbf{a}/4$ ) |                    |               |               |               |               |                    | ( $\mathbf{a} + \mathbf{b} + \mathbf{c}/4$ ) |               |  |          |

Arithmetic class  $mmmP$

| Serial No.<br>Group type<br>Group | 47<br>$D_{2h}^1$<br>$Pmmm$ | 48<br>$D_{2h}^2$<br>$Pnmm$                         |          | 49<br>$D_{2h}^3$<br>$Pccm$ | 50<br>$D_{2h}^4$<br>$Pban$              |          |
|-----------------------------------|----------------------------|--|----------|----------------------------|---|----------|
|                                   |                            | Origin 1   | Origin 2 |                            | Origin 1                                | Origin 2 |
| $(mn0)$<br>$(\bar{m}n0)$          | $P112/m$                   | $P112/n$<br>[[ <b>a</b> + <b>b</b> + <b>c</b> ]/4] | $P112/n$ | $P112/m$                   | $P112/n$<br>[[ <b>a</b> + <b>b</b> ]/4] | $P112/n$ |
| $(0mn)$<br>$(0\bar{m}n)$          |                            |  |          | $P112/b$                   | $P112/a$<br>[[ <b>a</b> + <b>b</b> ]/4] | $P112/a$ |
| $(n0m)$<br>$(n0\bar{m})$          |                            |  |          | $P112/a$                   | $P112/b$<br>[[ <b>a</b> + <b>b</b> ]/4] | $P112/b$ |

| Serial No.<br>Group type<br>Group | 51<br>$D_{2h}^5$<br>$Pmma$ | 52<br>$D_{2h}^6$<br>$Pnna$ | 53<br>$D_{2h}^7$<br>$Pmna$ | 54<br>$D_{2h}^8$<br>$Pcca$ | 55<br>$D_{2h}^9$<br>$Pbam$ | 56<br>$D_{2h}^{10}$<br>$Pccn$ |
|-----------------------------------|----------------------------|----------------------------|----------------------------|----------------------------|----------------------------|-------------------------------|
| $(mn0)$<br>$(\bar{m}n0)$          | $P112/a$                   | $P112/a$                   | $P112_1/a$                 | $P112/a$                   | $P112/m$                   | $P112/n$                      |
| $(0mn)$<br>$(0\bar{m}n)$          | $P112_1/m$                 | $P112/n$                   | $P112/m$                   | $P112_1/b$                 | $P112_1/a$                 | $P112_1/b$                    |
| $(n0m)$<br>$(n0\bar{m})$          | $P112/m$                   | $P112_1/n$                 | $P112/n$                   | $P112/a$                   | $P112_1/b$                 | $P112_1/a$                    |

| Serial No.<br>Group type<br>Group | 57<br>$D_{2h}^{11}$<br>$Pbcm$ | 58<br>$D_{2h}^{12}$<br>$Pnmm$ | 59<br>$D_{2h}^{13}$<br>$Pmnm$           |          | 60<br>$D_{2h}^{14}$<br>$Pbcn$ | 61<br>$D_{2h}^{15}$<br>$Pbca$ | 62<br>$D_{2h}^{16}$<br>$Pnma$ |            |   |            |            |            |
|-----------------------------------|-------------------------------|-------------------------------|---|----------|-------------------------------|-------------------------------|-------------------------------|------------|---|------------|------------|------------|
|                                   |                               |                               | Origin 1                                | Origin 2 |                               |                               |                               |            |   |            |            |            |
| $(mn0)$<br>$(\bar{m}n0)$          | $P112_1/m$                    | $P112/m$                      | $P112/n$<br>[[ <b>a</b> + <b>b</b> ]/4] | $P112/n$ | $P112_1/n$                    | $P112_1/a$                    | $P112_1/a$                    |            |   |            |            |            |
| $(0mn)$<br>$(0\bar{m}n)$          |                               |                               |   |          |                               |                               | $P112/a$                      | $P112_1/n$ | $P112_1/m$<br>[[ <b>a</b> + <b>b</b> ]/4] | $P112_1/m$ | $P112_1/a$ | $P112_1/n$ |
| $(n0m)$<br>$(n0\bar{m})$          |                               |                               |   |          |                               |                               | $P112_1/a$                    |            |   | $P112/a$   |            | $P112_1/m$ |

Centring type C

| Orientation orbit<br>( $hkl$ )   | Conventional basis of the scanning group<br><b>a'</b> <b>b'</b> <b>d</b> |   |  | Auxiliary basis of the scanning group<br>$\hat{\mathbf{a}}$ $\hat{\mathbf{b}}$ $\hat{\mathbf{c}}$ |                               |          |
|--|--|---|--|---|-------------------------------|----------|
| $(hk0)$  | <b>c</b>   | $n\hat{\mathbf{a}} - m\hat{\mathbf{b}}$ | $p\hat{\mathbf{a}} + q\hat{\mathbf{b}}$  | $(\mathbf{a} - \mathbf{b})/2$   | $(\mathbf{a} + \mathbf{b})/2$ | <b>c</b> |
| $(\bar{h}k0)$  | <b>c</b>   | $n\hat{\mathbf{a}} + m\hat{\mathbf{b}}$ | $-p\hat{\mathbf{a}} + q\hat{\mathbf{b}}$ |   |                               |          |
| $h$ even, $k$ odd or $h$ odd, $k$ even $\Rightarrow n = h + k, m = h - k$<br>$h, k$ odd $\Rightarrow n = (h + k)/2, m = (h - k)/2$ |  |   |  |   |                               |          |
| $(0mn)$  | <b>a</b>   | $nb - mc$                               | $pb + qc$                                | <b>b</b>  | <b>c</b>                      | <b>a</b> |
| $(0\bar{m}n)$  | <b>a</b>   | $nb + mc$                               | $-pb + qc$                               |   |                               |          |
| $(n0m)$  | <b>b</b>   | $nc - ma$                               | $pc + qa$                                | <b>c</b>  | <b>a</b>                      | <b>b</b> |
| $(n0\bar{m})$  | <b>b</b>   | $nc + ma$                               | $-pc + qa$                               |   |                               |          |