4.3. SYMBOLS FOR SPACE GROUPS

Table 4.3.2.1. *Index of symbols for space groups for various settings and cells*

TRICLINIC SYSTEM

No. of space group	Schoenflies symbol	Hermann–Mauguin symbol for all settings of the same unit cell
1	C_1^1	$P1$
2	C_i^1	$P\bar{1}$

MONOCLINIC SYSTEM

No. of space group	Schoenflies symbol	Standard short Hermann–Mauguin symbol	Extended Hermann–Mauguin symbols for various settings and cell choices						Unique axis b Unique axis c Unique axis a
			a$\underline{\mathbf{b}}$c	**c$\bar{\mathbf{b}}$a**	**ab$\underline{\mathbf{c}}$**	**ba$\bar{\mathbf{c}}$**	**$\underline{\mathbf{a}}$bc**	**$\bar{\mathbf{a}}$cb**	
3	C_2^1	$P2$	$P121$	$P121$	$P112$	$P112$	$P211$	$P211$	
4	C_2^2	$P2_1$	$P12_11$	$P12_11$	$P112_1$	$P112_1$	$P2_111$	$P2_111$	
5	C_2^3	$C2$	$C121$	$A121$	$A112$	$B112$	$B211$	$C211$	Cell choice 1
			$A121$	$C121$	$B112$	$A112$	$C211$	$B211$	Cell choice 2
			$I121$	$I121$	$I112$	$I112$	$I211$	$I211$	Cell choice 3
6	C_s^1	Pm	$P1m1$	$P1m1$	$P11m$	$P11m$	$Pm11$	$Pm11$	
7	C_s^2	Pc	$P1c1$	$P1a1$	$P11a$	$P11b$	$Pb11$	$Pc11$	Cell choice 1
			$P1n1$	$P1n1$	$P11n$	$P11n$	$Pn11$	$Pn11$	Cell choice 2
			$P1a1$	$P1c1$	$P11b$	$P11a$	$Pc11$	$Pb11$	Cell choice 3
8	C_s^3	Cm	$C1m1$	$A1m1$	$A11m$	$B11m$	$Bm11$	$Cm11$	Cell choice 1
			$A1m1$	$C1m1$	$B11m$	$A11m$	$Cm11$	$Bm11$	Cell choice 2
			$I1m1$	$I1m1$	$I11m$	$I11m$	$Im11$	$Im11$	Cell choice 3
9	C_s^4	Cc	$C1c1$	$A1a1$	$A11a$	$B11b$	$Bb11$	$Cc11$	Cell choice 1
			$A1n1$	$C1n1$	$B11n$	$A11n$	$Cn11$	$Bn11$	Cell choice 2
			$I1a1$	$I1c1$	$I11b$	$I11a$	$Ic11$	$Ib11$	Cell choice 3
10	C_{2h}^1	$P2/m$	$P1\frac{2}{m}1$	$P1\frac{2}{m}1$	$P11\frac{2}{m}$	$P11\frac{2}{m}$	$P\frac{2}{m}11$	$P\frac{2}{m}11$	
11	C_{2h}^2	$P2_1/m$	$P1\frac{2_1}{m}1$	$P1\frac{2_1}{m}1$	$P11\frac{2_1}{m}$	$P11\frac{2_1}{m}$	$P\frac{2_1}{m}11$	$P\frac{2_1}{m}11$	
12	C_{2h}^3	$C2/m$	$C1\frac{2}{m}1$	$A1\frac{2}{m}1$	$A11\frac{2}{m}$	$B11\frac{2}{m}$	$B\frac{2}{m}11$	$C\frac{2}{m}11$	Cell choice 1
			$\frac{2_1}{a}$	$\frac{2_1}{c}$	$\frac{2_1}{b}$	$\frac{2_1}{a}$	$\frac{2_1}{c}$	$\frac{2_1}{b}$	
			$A1\frac{2}{m}1$	$C1\frac{2}{m}1$	$B11\frac{2}{m}$	$A11\frac{2}{m}$	$C\frac{2}{m}11$	$B\frac{2}{m}11$	Cell choice 2
			$\frac{2_1}{c}$	$\frac{2_1}{a}$	$\frac{2_1}{a}$	$\frac{2_1}{b}$	$\frac{2_1}{b}$	$\frac{2_1}{c}$	
			$I1\frac{2}{m}1$	$I1\frac{2}{m}1$	$I11\frac{2}{m}$	$I11\frac{2}{m}$	$I\frac{2}{m}11$	$I\frac{2}{m}11$	Cell choice 3
			$\frac{2_1}{n}$	$\frac{2_1}{n}$	$\frac{2_1}{n}$	$\frac{2_1}{n}$	$\frac{2_1}{n}$	$\frac{2_1}{n}$	
13	C_{2h}^4	$P2/c$	$P1\frac{2}{c}1$	$P1\frac{2}{a}1$	$P11\frac{2}{a}$	$P11\frac{2}{b}$	$P\frac{2}{b}11$	$P\frac{2}{c}11$	Cell choice 1
			$P1\frac{2}{n}1$	$P1\frac{2}{n}1$	$P11\frac{2}{n}$	$P11\frac{2}{n}$	$P\frac{2}{n}11$	$P\frac{2}{n}11$	Cell choice 2
			$P1\frac{2}{a}1$	$P1\frac{2}{c}1$	$P11\frac{2}{b}$	$P11\frac{2}{a}$	$P\frac{2}{c}11$	$P\frac{2}{b}11$	Cell choice 3

Table 4.3.2.1. *Index of symbols for space groups for various settings and cells* (*cont.*)

MONOCLINIC SYSTEM (*cont.*)

No. of space group	Schoenflies symbol	Standard short Hermann–Mauguin symbol	Extended Hermann–Mauguin symbols for various settings and cell choices						Unique axis b Unique axis c Unique axis a
			a$\underline{\mathbf{b}}$**c**	**c**$\bar{\underline{\mathbf{b}}}$**a**	**ab**$\underline{\mathbf{c}}$	**ba**$\bar{\underline{\mathbf{c}}}$	$\underline{\mathbf{a}}$**bc**	$\bar{\underline{\mathbf{a}}}$**cb**	
14	C_{2h}^5	$P2_1/c$	$P1\frac{2_1}{c}1$	$P1\frac{2_1}{a}1$	$P11\frac{2_1}{a}$	$P11\frac{2_1}{b}$	$P\frac{2_1}{b}11$	$P\frac{2_1}{c}11$	Cell choice 1
			$P1\frac{2_1}{n}1$	$P1\frac{2_1}{n}1$	$P11\frac{2_1}{n}$	$P11\frac{2_1}{n}$	$P\frac{2_1}{n}11$	$P\frac{2_1}{n}11$	Cell choice 2
			$P1\frac{2_1}{a}1$	$P1\frac{2_1}{c}1$	$P11\frac{2_1}{b}$	$P11\frac{2_1}{a}$	$P\frac{2_1}{c}11$	$P\frac{2_1}{b}11$	Cell choice 3
15	C_{2h}^6	$C2/c$	$C1\frac{2}{c}1$	$A1\frac{2}{a}1$	$A11\frac{2}{a}$	$B11\frac{2}{b}$	$B\frac{2}{b}11$	$C\frac{2}{c}11$	Cell choice 1
			$\frac{2_1}{n}$	$\frac{2_1}{n}$	$\frac{2_1}{n}$	$\frac{2_1}{n}$	$\frac{2_1}{n}$	$\frac{2_1}{n}$	
			$A1\frac{2}{n}1$	$C1\frac{2}{n}1$	$B11\frac{2}{n}$	$A11\frac{2}{n}$	$C\frac{2}{n}11$	$B\frac{2}{n}11$	Cell choice 2
			$\frac{2_1}{a}$	$\frac{2_1}{c}$	$\frac{2_1}{b}$	$\frac{2_1}{a}$	$\frac{2_1}{c}$	$\frac{2_1}{b}$	
			$I1\frac{2}{a}1$	$I1\frac{2}{c}1$	$I11\frac{2}{b}$	$I11\frac{2}{a}$	$I\frac{2}{c}11$	$I\frac{2}{b}11$	Cell choice 3
			$\frac{2_1}{c}$	$\frac{2_1}{a}$	$\frac{2_1}{a}$	$\frac{2_1}{b}$	$\frac{2_1}{b}$	$\frac{2_1}{c}$	

ORTHORHOMBIC SYSTEM

No. of space group	Schoenflies symbol	Standard full Hermann–Mauguin symbol **abc**	Extended Hermann–Mauguin symbols for the six settings of the same unit cell					
			abc (standard)	**ba**$\bar{\mathbf{c}}$	**cab**	$\bar{\mathbf{c}}$**ba**	**bca**	**ac**$\bar{\mathbf{b}}$
16	D_2^1	$P222$	$P222$	$P222$	$P222$	$P222$	$P222$	$P222$
17	D_2^2	$P222_1$	$P222_1$	$P222_1$	$P2_122$	$P2_122$	$P22_12$	$P22_12$
18	D_2^3	$P2_12_12$	$P2_12_12$	$P2_12_12$	$P22_12_1$	$P22_12_1$	$P2_122_1$	$P2_122_1$
19	D_2^4	$P2_12_12_1$	$P2_12_12_1$	$P2_12_12_1$	$P2_12_12_1$	$P2_12_12_1$	$P2_12_12_1$	$P2_12_12_1$
20	D_2^5	$C222_1$	$C222_1$ $2_12_12_1$	$C222_1$ $2_12_12_1$	$A2_122$ $2_12_12_1$	$A2_122$ $2_12_12_1$	$B22_12$ $2_12_12_1$	$B22_12$ $2_12_12_1$
21	D_2^6	$C222$	$C222$ 2_12_12	$C222$ 2_12_12	$A222$ 22_12_1	$A222$ 22_12_1	$B222$ 2_122_1	$B222$ 2_122_1
22	D_2^7	$F222$	$F222$ 2_12_12 22_12_1 2_122_1	$F222$ 2_12_12 2_122_1 22_12_1	$F222$ 22_12_1 2_122_1 2_12_12	$F222$ 22_12_1 2_12_12 2_122_1	$F222$ 2_122_1 2_12_12 22_12_1	$F222$ 2_122_1 22_12_1 2_12_12
23	D_2^8	$I222$	$I222$ $2_12_12_1$	$I222$ $2_12_12_1$	$I222$ $2_12_12_1$	$I222$ $2_12_12_1$	$I222$ $2_12_12_1$	$I222$ $2_12_12_1$
24	D_2^9	$I2_12_12_1$	$I2_12_12_1$ 222	$I2_12_12_1$ 222	$I2_12_12_1$ 222	$I2_12_12_1$ 222	$I2_12_12_1$ 222	$I2_12_12_1$ 222
25	C_{2v}^1	$Pmm2$	$Pmm2$	$Pmm2$	$P2mm$	$P2mm$	$Pm2m$	$Pm2m$
26	C_{2v}^2	$Pmc2_1$	$Pmc2_1$	$Pcm2_1$	$P2_1ma$	$P2_1am$	$Pb2_1m$	$Pm2_1b$
27	C_{2v}^3	$Pcc2$	$Pcc2$	$Pcc2$	$P2aa$	$P2aa$	$Pb2b$	$Pb2b$
28	C_{2v}^4	$Pma2$	$Pma2$	$Pbm2$	$P2mb$	$P2cm$	$Pc2m$	$Pm2a$
29	C_{2v}^5	$Pca2_1$	$Pca2_1$	$Pbc2_1$	$P2_1ab$	$P2_1ca$	$Pc2_1b$	$Pb2_1a$
30	C_{2v}^6	$Pnc2$	$Pnc2$	$Pcn2$	$P2na$	$P2an$	$Pb2n$	$Pn2b$
31	C_{2v}^7	$Pmn2_1$	$Pmn2_1$	$Pnm2_1$	$P2_1mn$	$P2_1nm$	$Pn2_1m$	$Pm2_1n$
32	C_{2v}^8	$Pba2$	$Pba2$	$Pba2$	$P2cb$	$P2cb$	$Pc2a$	$Pc2a$
33	C_{2v}^9	$Pna2_1$	$Pna2_1$	$Pbn2_1$	$P2_1nb$	$P2_1cn$	$Pc2_1n$	$Pn2_1a$
34	C_{2v}^{10}	$Pnn2$	$Pnn2$	$Pnn2$	$P2nn$	$P2nn$	$Pn2n$	$Pn2n$

Table 4.3.2.1. *Index of symbols for space groups for various settings and cells* (*cont.*)

ORTHORHOMBIC SYSTEM (*cont.*)

No. of space group	Schoenflies symbol	Standard full Hermann–Mauguin symbol **abc**	Extended Hermann–Mauguin symbols for the six settings of the same unit cell					
			abc (standard)	**ba$\bar{c}$**	**cab**	**$\bar{c}$ba**	**bca**	**a$\bar{c}$b**
35	C_{2v}^{11}	*Cmm*2	*Cmm*2 *ba*2	*Cmm*2 *ba*2	*A*2*mm* 2*cb*	*A*2*mm* 2*cb*	*Bm*2*m* *c*2*a*	*Bm*2*m* *c*2*a*
36	C_{2v}^{12}	*Cmc*2$_1$	*Cmc*2$_1$ *bn*2$_1$	*Ccm*2$_1$ *na*2$_1$	*A*2$_1$*ma* 2$_1$*cn*	*A*2$_1$*am* 2$_1$*nb*	*Bb*2$_1$*m* *n*2$_1$*a*	*Bm*2$_1$*b* *c*2$_1$*n*
37	C_{2v}^{13}	*Ccc*2	*Ccc*2 *nn*2	*Ccc*2 *nn*2	*A*2*aa* 2*nn*	*A*2*aa* 2*nn*	*Bb*2*b* *n*2*n*	*Bb*2*b* *n*2*n*
38	C_{2v}^{14}	*Amm*2	*Amm*2 *nc*2$_1$	*Bmm*2 *cn*2$_1$	*B*2*mm* 2$_1$*na*	*C*2*mm* 2$_1$*an*	*Cm*2*m* *b*2$_1$*n*	*Am*2*m* *n*2$_1$*b*
39*	C_{2v}^{15}	*Aem*2	*Aem*2 *ec*2$_1$	*Bme*2 *ce*2$_1$	*B*2*em* 2$_1$*ea*	*C*2*me* 2$_1$*ae*	*Cm*2*e* *b*2$_1$*e*	*Ae*2*m* *e*2$_1$*b*
40	C_{2v}^{16}	*Ama*2	*Ama*2 *nn*2$_1$	*Bbm*2 *nn*2$_1$	*B*2*mb* 2$_1$*nn*	*C*2*cm* 2$_1$*nn*	*Cc*2*m* *n*2$_1$*n*	*Am*2*a* *n*2$_1$*n*
41*	C_{2v}^{17}	*Aea*2	*Aea*2 *en*2$_1$	*Bbe*2 *ne*2$_1$	*B*2*eb* 2$_1$*en*	*C*2*ce* 2$_1$*ne*	*Cc*2*e* *n*2$_1$*e*	*Ae*2*a* *e*2$_1$*n*
42	C_{2v}^{18}	*Fmm*2	*Fmm*2 *ba*2 *nc*2$_1$ *cn*2$_1$	*Fmm*2 *ba*2 *cn*2$_1$ *nc*2$_1$	*F*2*mm* 2*cb* 2$_1$*na* 2$_1$*an*	*F*2*mm* 2*cb* 2$_1$*an* 2$_1$*na*	*Fm*2*m* *c*2*a* *b*2$_1$*n* *n*2$_1$*b*	*Fm*2*m* *c*2*a* *n*2$_1$*b* *b*2$_1$*n*
43	C_{2v}^{19}	*Fdd*2	*Fdd*2 *dd*2$_1$	*Fdd*2 *dd*2$_1$	*F*2*dd* 2$_1$*dd*	*F*2*dd* 2$_1$*dd*	*Fd*2*d* *d*2$_1$*d*	*Fd*2*d* *d*2$_1$*d*
44	C_{2v}^{20}	*Imm*2	*Imm*2 *nn*2$_1$	*Imm*2 *nn*2$_1$	*I*2*mm* 2$_1$*nn*	*I*2*mm* 2$_1$*nn*	*Im*2*m* *n*2$_1$*n*	*Im*2*m* *n*2$_1$*n*
45	C_{2v}^{21}	*Iba*2	*Iba*2 *cc*2$_1$	*Iba*2 *cc*2$_1$	*I*2*cb* 2$_1$*aa*	*I*2*cb* 2$_1$*aa*	*Ic*2*a* *b*2$_1$*b*	*Ic*2*a* *b*2$_1$*b*
46	C_{2v}^{22}	*Ima*2	*Ima*2 *nc*2$_1$	*Ibm*2 *cn*2$_1$	*I*2*mb* 2$_1$*na*	*I*2*cm* 2$_1$*an*	*Ic*2*m* *b*2$_1$*n*	*Im*2*a* *n*2$_1$*b*
47	D_{2h}^{1}	$P\frac{2}{m}\frac{2}{m}\frac{2}{m}$	*Pmmm*	*Pmmm*	*Pmmm*	*Pmmm*	*Pmmm*	*Pmmm*
48	D_{2h}^{2}	$P\frac{2}{n}\frac{2}{n}\frac{2}{n}$	*Pnnn*	*Pnnn*	*Pnnn*	*Pnnn*	*Pnnn*	*Pnnn*
49	D_{2h}^{3}	$P\frac{2}{c}\frac{2}{c}\frac{2}{m}$	*Pccm*	*Pccm*	*Pmaa*	*Pmaa*	*Pbmb*	*Pbmb*
50	D_{2h}^{4}	$P\frac{2}{b}\frac{2}{a}\frac{2}{n}$	*Pban*	*Pban*	*Pncb*	*Pncb*	*Pcna*	*Pcna*
51	D_{2h}^{5}	$P\frac{2_1}{m}\frac{2}{m}\frac{2}{a}$	*Pmma*	*Pmmb*	*Pbmm*	*Pcmm*	*Pmcm*	*Pmam*
52	D_{2h}^{6}	$P\frac{2}{n}\frac{2_1}{n}\frac{2}{a}$	*Pnna*	*Pnnb*	*Pbnn*	*Pcnn*	*Pncn*	*Pnan*
53	D_{2h}^{7}	$P\frac{2}{m}\frac{2}{n}\frac{2_1}{a}$	*Pmna*	*Pnmb*	*Pbmn*	*Pcnm*	*Pncm*	*Pman*
54	D_{2h}^{8}	$P\frac{2_1}{c}\frac{2}{c}\frac{2}{a}$	*Pcca*	*Pccb*	*Pbaa*	*Pcaa*	*Pbcb*	*Pbab*
55	D_{2h}^{9}	$P\frac{2_1}{b}\frac{2_1}{a}\frac{2}{m}$	*Pbam*	*Pbam*	*Pmcb*	*Pmcb*	*Pcma*	*Pcma*
56	D_{2h}^{10}	$P\frac{2_1}{c}\frac{2_1}{c}\frac{2}{n}$	*Pccn*	*Pccn*	*Pnaa*	*Pnaa*	*Pbnb*	*Pbnb*
57	D_{2h}^{11}	$P\frac{2}{b}\frac{2_1}{c}\frac{2_1}{m}$	*Pbcm*	*Pcam*	*Pmca*	*Pmab*	*Pbma*	*Pcmb*
58	D_{2h}^{12}	$P\frac{2_1}{n}\frac{2_1}{n}\frac{2}{m}$	*Pnnm*	*Pnnm*	*Pmnn*	*Pmnn*	*Pnmn*	*Pnmn*
59	D_{2h}^{13}	$P\frac{2_1}{m}\frac{2_1}{m}\frac{2}{n}$	*Pmmn*	*Pmmn*	*Pnmm*	*Pnmm*	*Pmnm*	*Pmnm*
60	D_{2h}^{14}	$P\frac{2_1}{b}\frac{2}{c}\frac{2_1}{n}$	*Pbcn*	*Pcan*	*Pnca*	*Pnab*	*Pbna*	*Pcnb*
61	D_{2h}^{15}	$P\frac{2_1}{b}\frac{2_1}{c}\frac{2_1}{a}$	*Pbca*	*Pcab*	*Pbca*	*Pcab*	*Pbca*	*Pcab*

Table 4.3.2.1. *Index of symbols for space groups for various settings and cells* (*cont.*)

ORTHORHOMBIC SYSTEM (*cont.*)

No. of space group	Schoenflies symbol	Standard full Hermann–Mauguin symbol **abc**	Extended Hermann–Mauguin symbols for the six settings of the same unit cell					
			abc (standard)	**ba$\bar{c}$**	**cab**	**$\bar{c}$ba**	**bca**	**a$\bar{c}$b**
62	D_{2h}^{16}	$P\frac{2_1}{n}\frac{2_1}{m}\frac{2_1}{a}$	*Pnma*	*Pmnb*	*Pbnm*	*Pcmn*	*Pmcn*	*Pnam*
63	D_{2h}^{17}	$C\frac{2}{m}\frac{2}{c}\frac{2_1}{m}$	*Cmcm* *bnn*	*Ccmm* *nan*	*Amma* *ncn*	*Amam* *nnb*	*Bbmm* *nna*	*Bmmb* *cnn*
64*†	D_{2h}^{18}	$C\frac{2}{m}\frac{2}{c}\frac{2_1}{e}$	*Cmce* *bne*	*Ccme* *nae*	*Aema* *ecn*	*Aeam* *enb*	*Bbem* *nea*	*Bmeb* *cen*
65	D_{2h}^{19}	$C\frac{2}{m}\frac{2}{m}\frac{2}{m}$	*Cmmm* *ban*	*Cmmm* *ban*	*Ammm* *ncb*	*Ammm* *ncb*	*Bmmm* *cna*	*Bmmm* *cna*
66	D_{2h}^{20}	$C\frac{2}{c}\frac{2}{c}\frac{2}{m}$	*Cccm* *nnn*	*Cccm* *nnn*	*Amaa* *nnn*	*Amaa* *nnn*	*Bbmb* *nnn*	*Bbmb* *nnn*
67*†	D_{2h}^{21}	$C\frac{2}{m}\frac{2}{m}\frac{2}{e}$	*Cmme* *bae*	*Cmme* *bae*	*Aemm* *ecb*	*Aemm* *ecb*	*Bmem* *cea*	*Bmem* *cea*
68*	D_{2h}^{22}	$C\frac{2}{c}\frac{2}{c}\frac{2}{e}$	*Ccce* *nne*	*Ccce* *nne*	*Aeaa* *enn*	*Aeaa* *enn*	*Bbeb* *nen*	*Bbeb* *nen*
69	D_{2h}^{23}	$F\frac{2}{m}\frac{2}{m}\frac{2}{m}$	*Fmmm* *ban* *ncb* *cna*	*Fmmm* *ban* *cna* *ncb*	*Fmmm* *ncb* *cna* *ban*	*Fmmm* *ncb* *ban* *cna*	*Fmmm* *cna* *ban* *ncb*	*Fmmm* *cna* *ncb* *ban*
70	D_{2h}^{24}	$F\frac{2}{d}\frac{2}{d}\frac{2}{d}$	*Fddd*	*Fddd*	*Fddd*	*Fddd*	*Fddd*	*Fddd*
71	D_{2h}^{25}	$I\frac{2}{m}\frac{2}{m}\frac{2}{m}$	*I mmm* *nnn*	*I mmm* *nnn*	*I mmm* *nnn*	*I mmm* *nnn*	*I mmm* *nnn*	*I mmm* *nnn*
72	D_{2h}^{26}	$I\frac{2}{b}\frac{2}{a}\frac{2}{m}$	*I bam* *ccn*	*I bam* *ccn*	*I mcb* *naa*	*I mcb* *naa*	*I cma* *bnb*	*I cma* *bnb*
73	D_{2h}^{27}	$I\frac{2_1}{b}\frac{2_1}{c}\frac{2_1}{a}$	*I bca* *cab*	*I cab* *bca*	*I bca* *cab*	*I cab* *bca*	*I bca* *cab*	*I cab* *bca*
74†	D_{2h}^{28}	$I\frac{2_1}{m}\frac{2_1}{m}\frac{2_1}{a}$	*I mma* *nnb*	*I mmb* *nna*	*I bmm* *cnn*	*I cmm* *bnn*	*I mcm* *nan*	*I mam* *ncn*

* For the five space groups *Aem*2 (39), *Aea*2 (41), *Cmce* (64), *Cmme* (67) and *Ccce* (68), the 'new' space-group symbols, containing the symbol '*e*' for the 'double' glide plane, are given for all settings. These symbols were first introduced in the Fourth Edition of this volume (*IT* 1995); *cf. Foreword to the Fourth Edition.* For further explanations, see Section 1.3.2, Note (x) and the space-group diagrams.

† For space groups *Cmca* (64), *Cmma* (67) and *Imma* (74), the first lines of the extended symbols, as tabulated here, correspond with the symbols for the six settings in the diagrams of these space groups (Part 7). An alternative formulation which corresponds with the coordinate triplets is given in Section 4.3.3.

TETRAGONAL SYSTEM

No. of space group	Schoenflies symbol	Hermann–Mauguin symbols for standard cell *P* or *I*		Multiple cell *C* or *F*	
		Short	Extended	Short	Extended
75	C_4^1	$P4$		$C4$	
76	C_4^2	$P4_1$		$C4_1$	
77	C_4^3	$P4_2$		$C4_2$	
78	C_4^4	$P4_3$		$C4_3$	
79	C_4^5	$I\,4$	$I4$ 4_2	$F4$	$F4$ 4_2
80	C_4^6	$I\,4_1$	$I4_1$ 4_3	$F4_1$	$F4_1$ 4_3
81	S_4^1	$P\bar{4}$		$C\bar{4}$	
82	S_4^2	$I\bar{4}$		$F\bar{4}$	

No. of space group	Schoenflies symbol	Hermann–Mauguin symbols for standard cell *P* or *I*		Multiple cell *C* or *F*	
		Short	Extended	Short	Extended
83	C_{4h}^1	$P4/m$		$C4/m$	$C4_2/m$ n
84	C_{4h}^2	$P4_2/m$		$C4_2/m$	$C4_2/m$ n
85	C_{4h}^3	$P4/n$		$C4/a$	$C4/a$ b
86	C_{4h}^4	$P4_2/n$		$C4_2/a$	$C4_2/a$ b
87	C_{4h}^5	$I\,4/m$	$I4/m$ $4_2/n$	$F4/m$	$F4/m$ $4_2/a$
88	C_{4h}^6	$I\,4_1/a$	$I4_1/a$ $4_3/b$	$F4_1/d$	$F4_1/d$ $4_3/d$

Table 4.3.2.1. *Index of symbols for space groups for various settings and cells* (*cont.*)

TETRAGONAL SYSTEM (*cont.*)

No. of space group	Schoenflies symbol	Hermann–Mauguin symbols for standard cell P or I		Multiple cell C or F	
		Short	Extended	Short	Extended
89	D_4^1	$P422$	$P422$ 2_1	$C422$	$C422$ 2_1
90	D_4^2	$P42_12$	$P42_12$ 2_1	$C422_1$	$C422_1$ 2_1
91	D_4^3	$P4_122$	$P4_122$ 2_1	$C4_122$	$C4_122$ 2_1
92	D_4^4	$P4_12_12$	$P4_12_12$ 2_1	$C4_122_1$	$C4_122_1$ 2_1
93	D_4^5	$P4_222$	$P4_222$ 2_1	$C4_222$	$C4_222$ 2_1
94	D_4^6	$P4_22_12$	$P4_22_12$ 2_1	$C4_222_1$	$C4_222_1$ 2_1
95	D_4^7	$P4_322$	$P4_322$ 2_1	$C4_322$	$C4_322$ 2_1
96	D_4^8	$P4_32_12$	$P4_32_12$ 2_1	$C4_322_1$	$C4_322_1$ 2_1
97	D_4^9	$I422$	$I422$ $4_22_12_1$	$F422$	$F422$ $4_22_12_1$
98	D_4^{10}	$I4_122$	$I4_122$ $4_32_12_1$	$F4_122$	$F4_122$ $4_32_12_1$
99	C_{4v}^1	$P4mm$	$P4mm$ g	$C4mm$	$C4mm$ b
100	C_{4v}^2	$P4bm$	$P4bm$ g	$C4mg_1$	$C4mg_1$ b
101	C_{4v}^3	$P4_2cm$	$P4_2cm$ g	$C4_2mc$	$C4_2mc$ b
102	C_{4v}^4	$P4_2nm$	$P4_2nm$ g	$C4_2mg_2$	$C4_2mg_2$ b
103	C_{4v}^5	$P4cc$	$P4cc$ n	$C4cc$	$C4cc$ n
104	C_{4v}^6	$P4nc$	$P4nc$ n	$C4cg_2$	$C4cg_2$ n
105	C_{4v}^7	$P4_2mc$	$P4_2mc$ n	$C4_2cm$	$C4_2cm$ n
106	C_{4v}^8	$P4_2bc$	$P4_2bc$ n	$C4_2cg_1$	$C4_2cg_1$ n
107	C_{4v}^9	$I4mm$	$I4mm$ 4_2ne	$F4mm$	$F4mm$ 4_2eg_2
108	C_{4v}^{10}	$I4cm$	$I4ce$ 4_2bm	$F4mc$	$F4ec$ 4_2mg_1
109	C_{4v}^{11}	$I4_1md$	$I4_1md$ 4_1nd	$F4_1dm$	$F4_1dm$ 4_3dg_2
110	C_{4v}^{12}	$I4_1cd$	$I4_1cd$ 4_3bd	$F4_1dc$	$F4_1dc$ 4_3dg_1
111	D_{2d}^1	$P\bar{4}2m$	$P\bar{4}2m$ g	$C\bar{4}m2$	$C\bar{4}m2$ b
112	D_{2d}^2	$P\bar{4}2c$	$P\bar{4}2c$ n	$C\bar{4}c2$	$C\bar{4}c2$ n
113	D_{2d}^3	$P\bar{4}2_1m$	$P\bar{4}2_1m$ g	$C\bar{4}m2_1$	$C\bar{4}m2_1$ b
114	D_{2d}^4	$P\bar{4}2_1c$	$P\bar{4}2_1c$ n	$C\bar{4}c2_1$	$C\bar{4}c2_1$ n
115	D_{2d}^5	$P\bar{4}m2$	$P\bar{4}m2$ 2_1	$C\bar{4}2m$	$C\bar{4}2m$ 2_1
116	D_{2d}^6	$P\bar{4}c2$	$P\bar{4}c2$ 2_1	$C\bar{4}2c$	$C\bar{4}2c$ 2_1
117	D_{2d}^7	$P\bar{4}b2$	$P\bar{4}b2$ 2_1	$C\bar{4}2g_1$	$C\bar{4}2g_1$ 2_1
118	D_{2d}^8	$P\bar{4}n2$	$P\bar{4}n2$ 2_1	$C\bar{4}2g_2$	$C\bar{4}2g_2$ 2_1

TETRAGONAL SYSTEM (*cont.*)

No. of space group	Schoenflies symbol	Hermann–Mauguin symbols for standard cell P or I		Multiple cell C or F	
		Short	Extended	Short	Extended
119	D_{2d}^9	$I\bar{4}m2$	$I\bar{4}m2$ $n2_1$	$F\bar{4}2m$	$F\bar{4}2m$ 2_1g_2
120	D_{2d}^{10}	$I\bar{4}c2$	$I\bar{4}c2$ $b2_1$	$F\bar{4}2c$	$F\bar{4}2c$ 2_1n
121	D_{2d}^{11}	$I\bar{4}2m$	$I\bar{4}2m$ 2_1e	$F\bar{4}m2$	$F\bar{4}m2$ $e2_1$
122	D_{2d}^{12}	$I\bar{4}2d$	$I\bar{4}2d$ 2_1d	$F\bar{4}d2$	$F\bar{4}d2$ $d2_1$
123	D_{4h}^1	$P4/mmm$	$P4/m\ 2/m\ 2/m$ $2_1/g$	$C4/mmm$	$C4/mmm$ nb
124	D_{4h}^2	$P4/mcc$	$P4/m\ 2/c\ \ 2/c$ $2_1/n$	$C4/mcc$	$C4/mcc$ nn
125	D_{4h}^3	$P4/nbm$	$P4/n\ 2/b\ \ 2/m$ $2_1/g$	$C4/amg_1$	$C4/amg_1$ bb
126	D_{4h}^4	$P4/nnc$	$P4/n\ 2/n\ \ 2/c$ $2_1/n$	$C4/acg_2$	$C4/acg_2$ bn
127	D_{4h}^5	$P4/mbm$	$P4/m\ 2_1/b\ 2/m$ $2_1/g$	$C4/mmg_1$	$C4/mmg_1$ nb
128	D_{4h}^6	$P4/mnc$	$P4/m\ 2_1/n\ \ 2/c$ $2_1/n$	$C4/mcg_2$	$C4/mcg_2$ nn
129	D_{4h}^7	$P4/nmm$	$P4/n\ 2_1/m\ \ 2/m$ $2_1/g$	$C4/amm$	$C4amm$ bb
130	D_{4h}^8	$P4/ncc$	$P4/n\ 2_1/c\ \ 2/c$ $2_1/n$	$C4/acc$	$C4/acc$ bn
131	D_{4h}^9	$P4_2/mmc$	$P4_2/m2/m\ 2/c$ $2_1/n$	$C4_2/mcm$	$C4_2/mcm$ nn
132	D_{4h}^{10}	$P4_2/mcm$	$P4_2/m2/c\ 2/m$ $2_1/g$	$C4_2/mmc$	$C4_2/mmc$ nb
133	D_{4h}^{11}	$P4_2/nbc$	$P4_2/n2/b\ 2/c$ $2_1/n$	$C4_2/acg_1$	$C4_2/acg_1$ bn
134	D_{4h}^{12}	$P4_2/nnm$	$P4_2/n2/n\ 2/m$ $2_1/g$	$C4_2/amg_2$	$C4_2/amg_2$ bb
135	D_{4h}^{13}	$P4_2/mbc$	$P4_2/m2_1/b\ 2/c$ $2_1/n$	$C4_2/mcg_1$	$C4_2/mcg_1$ nn
136	D_{4h}^{14}	$P4_2/mnm$	$P4_2/m2_1/n\ 2/m$ $2_1/g$	$C4_2/mmg_2$	$C4_2/mmg_2$ nb
137	D_{4h}^{15}	$P4_2/nmc$	$P4_2/n\ 2_1/m\ 2/c$ $2_1/n$	$C4_2/acm$	$C4_2/acm$ bn
138	D_{4h}^{16}	$P4_2/ncm$	$P4_2/n\ 2_1/c\ 2/m$ $2_1/g$	$C4_2/amc$	$C4_2/amc$ bb
139	D_{4h}^{17}	$I4/mmm$	$I4/m\ \ 2/m\ \ 2/m$ $4_2/n\ 2_1/n\ 2_1/e$	$F4/mmm$	$F4/mmm$ $4_2/aeg_2$
140	D_{4h}^{18}	$I4/mcm$	$I4/m\ \ 2/c\ \ 2/e$ $4_2/n\ 2_1/b\ 2_1/m$	$F4/mmc$	$F4/mec$ $4_2/amg_1$
141	D_{4h}^{19}	$I4_1/amd$	$I4_1/a\ 2/m\ 2/d$ $4_3/b\ 2_1/n\ 2_1/d$	$F4_1/ddm$	$F4_1/ddm$ $4_3/ddg_2$
142	D_{4h}^{20}	$I4_1/acd$	$I4_1/a\ \ 2/c\ \ 2/d$ $4_3/b\ 2_1/b\ 2_1/d$	$F4_1/ddc$	$F4_1/ddc$ $4_3/ddg_1$

Note: The glide planes g, g_1 and g_2 have the glide components $g(\frac{1}{2}, \frac{1}{2}, 0)$, $g_1(\frac{1}{4}, \frac{1}{4}, 0)$ and $g_2(\frac{1}{4}, \frac{1}{4}, \frac{1}{2})$. For the glide plane symbol 'e', see the *Foreword to the Fourth Edition* (*IT* 1995) and Section 1.3.2, Note (x).

Table 4.3.2.1. *Index of symbols for space groups for various settings and cells* (*cont.*)

TRIGONAL SYSTEM

No. of space group	Schoenflies symbol	Hermann-Mauguin symbols for standard cell P or R			Triple cell H
		Short	Full	Extended	
143	C_3^1	$P3$			$H3$
144	C_3^2	$P3_1$			$H3_1$
145	C_3^3	$P3_2$			$H3_2$
146	C_3^4	$R3$		$R3$ $3_{1,2}$	
147	C_{3i}^1	$P\bar{3}$			$H\bar{3}$
148	C_{3i}^2	$R\bar{3}$		$R\bar{3}$ $3_{1,2}$	
149	D_3^1	$P312$		$P312$ 2_1	$H321$
150	D_3^2	$P321$		$P321$ 2_1	$H312$
151	D_3^3	$P3_112$		$P3_112$ 2_1	$H3_121$
152	D_3^4	$P3_121$		$P3_121$ 2_1	$H3_112$
153	D_3^5	$P3_212$		$P3_212$ 2_1	$H3_221$
154	D_3^6	$P3_221$		$P3_221$ 2_1	$H3_212$
155	D_3^7	$R32$		$R3\ 2$ $3_{1,2}2_1$	
156	C_{3v}^1	$P3m1$		$P3m1$ b	$H31m$
157	C_{3v}^2	$P31m$		$P31m$ a	$H3m1$
158	C_{3v}^3	$P3c1$		$P3c1$ n	$H31c$
159	C_{3v}^4	$P31c$		$P31c$ n	$H3c1$
160	C_{3v}^5	$R3m$		$R3\ m$ $3_{1,2}b$	
161	C_{3v}^6	$R3c$		$R3\ c$ $3_{1,2}n$	
162	D_{3d}^1	$P\bar{3}1m$	$P\bar{3}12/m$	$P\bar{3}12/m$ $2_1/a$	$H\bar{3}m1$
163	D_{3d}^2	$P\bar{3}1c$	$P\bar{3}12/c$	$P\bar{3}12/c$ $2_1/n$	$H\bar{3}c1$
164	D_{3d}^3	$P\bar{3}m1$	$P\bar{3}2/m1$	$P\bar{3}2/m1$ $2_1/b$	$H\bar{3}1m$
165	D_{3d}^4	$P\bar{3}c1$	$P\bar{3}2/c1$	$P\bar{3}2/c1$ $2_1/n$	$H\bar{3}1c$
166	D_{3d}^5	$R\bar{3}m$	$R\bar{3}2/m$	$R\bar{3}\ 2/m$ $3_{1,2}2_1/b$	
167	D_{3d}^6	$R\bar{3}c$	$R\bar{3}2/c$	$R\bar{3}\ 2/c$ $3_{1,2}2_1/n$	

HEXAGONAL SYSTEM

No. of space group	Schoenflies symbol	Hermann–Mauguin symbols for standard cell P			Triple cell H
		Short	Full	Extended	
168	C_6^1	$P6$			$H6$
169	C_6^2	$P6_1$			$H6_1$
170	C_6^3	$P6_5$			$H6_5$
171	C_6^4	$P6_2$			$H6_2$
172	C_6^5	$P6_4$			$H6_4$
173	C_6^6	$P6_3$			$H6_3$
174	C_{3h}^1	$P\bar{6}$			$H\bar{6}$
175	C_{6h}^1	$P6/m$			$H6/m$
176	C_{6h}^2	$P6_3/m$			$H6_3/m$
177	D_6^1	$P622$		$P62\ 2$ 2_12_1	$H622$
178	D_6^2	$P6_122$		$P6_12\ 2$ 2_12_1	$H6_122$
179	D_6^3	$P6_522$		$P6_52\ 2$ 2_12_1	$H6_522$
180	D_6^4	$P6_222$		$P6_22\ 2$ 2_12_1	$H6_222$
181	D_6^5	$P6_422$		$P6_42\ 2$ 2_12_1	$H6_422$
182	D_6^6	$P6_322$		$P6_32\ 2$ 2_12_1	$H6_322$
183	C_{6v}^1	$P6mm$		$P6mm$ ba	$H6mm$
184	C_{6v}^2	$P6cc$		$P6cc$ nn	$H6cc$
185	C_{6v}^3	$P6_3cm$		$P6_3cm$ na	$H6_3mc$
186	C_{6v}^4	$P6_3mc$		$P6_3mc$ bn	$H6_3cm$
187	D_{3h}^1	$P\bar{6}m2$		$P\bar{6}m2$ $b2_1$	$H\bar{6}2m$
188	D_{3h}^2	$P\bar{6}c2$		$P\bar{6}c2$ $n2_1$	$H\bar{6}2c$
189	D_{3h}^3	$P\bar{6}2m$		$P\bar{6}2m$ 2_1a	$H\bar{6}m2$
190	D_{3h}^4	$P\bar{6}2c$		$P\bar{6}2\ c$ 2_1n	$H\bar{6}c2$
191	D_{6h}^1	$P6/mmm$	$P6/m2/m2/m$	$P6/m\ 2/m\ 2/m$ $2_1/b\ 2_1/a$	$H6/mmm$
192	D_{6h}^2	$P6/mcc$	$P6/m2/c2/c$	$P6/m\ 2/c\ 2/c$ $2_1/n\ 2_1/n$	$H6/mcc$
193	D_{6h}^3	$P6_3/mcm$	$P6_3/m2/c2/m$	$P6_3/m\ 2/c\ 2/m$ $2_1/b\ 2_1/a$	$H6_3/mmc$
194	D_{6h}^4	$P6_3/mmc$	$P6_3/m2/m2/c$	$P6_3/m\ 2/m\ 2/c$ $2_1/b\ 2_1/n$	$H6_3/mcm$

Example: $B\ 2/b\ 11$ (15, unique axis a)
$2_1/n$

The t subgroups of index [2] (type **I**) are $B211(C2)$; $Bb11(Cc)$; $B\bar{1}(P\bar{1})$.

The k subgroups of index [2] (type **IIa**) are $P2/b11(P2/c)$: $P2_1/b11(P2_1/c)$; $P2/n11(P2/c)$; $P2_1/n11(P2_1/c)$.

Some subgroups of index [4] (not maximal) are $P211(P2)$; $P2_111(P2_1)$; $Pb11(Pc)$; $Pn11(Pc)$; $P\bar{1}$; $B1(P1)$.

4.3.3. Orthorhombic system

4.3.3.1. *Historical note and arrangement of the tables*

The synoptic table of *IT* (1935) contained space-group symbols for the six orthorhombic 'settings', corresponding to the six permutations of the basis vectors **a**, **b**, **c**. In *IT* (1952), left-handed systems like **c̄ba** were changed to right-handed systems by reversing the orientation of the c axis, as in **cba**. Note that reversal

Table 4.3.2.1. *Index of symbols for space groups for various settings and cells* (*cont.*)

CUBIC SYSTEM

No. of space group	Schoenflies symbol	Hermann–Mauguin symbols		
		Short	Full	Extended†
195	T^1	$P23$		
196	T^2	$F23$		$F23$ 2 2_1 2_1
197	T^3	$I23$		$I23$ 2_1
198	T^4	$P2_13$		
199	T^5	$I2_13$		$I2_13$ 2
200	T_h^1	$Pm\bar{3}$	$P2/m\bar{3}$	
201	T_h^2	$Pn\bar{3}$	$P2/n\bar{3}$	
202	T_h^3	$Fm\bar{3}$	$F2/m\bar{3}$	$F2/m\bar{3}$ $2/n$ $2_1/e$ $2_1/e$
203	T_h^4	$Fd\bar{3}$	$F2/d\bar{3}$	$F2/d\bar{3}$ $2/d$ $2_1/d$ $2_1/d$
204	T_h^5	$Im\bar{3}$	$I2/m\bar{3}$	$I2/m\bar{3}$ $2_1/n$
205	T_h^6	$Pa\bar{3}$	$P2_1/a\bar{3}$	
206	T_h^7	$Ia\bar{3}$	$I2_1/a\bar{3}$	$I2_1/a\bar{3}$ $2/b$
207	O^1	$P432$		$P4\ 32$ 2_1
208	O^2	$P4_232$		$P4_232$ 2_1
209	O^3	$F432$		$F4\ 32$ $4\ 2$ 4_22_1 4_22_1
210	O^4	$F4_132$		$F4_132$ $4_1\ 2$ $4_3\ 2_1$ $4_3\ 2_1$
211	O^5	$I432$		$I4\ 32$ $4_2\ 2_1$
212	O^6	$P4_332$		$P4_3\ 32$ 2_1
213	O^7	$P4_132$		$P4_132$ 2_1
214	O^8	$I4_132$		$I4_132$ $4_3\ 2_1$

CUBIC SYSTEM (*cont.*)

No. of space group	Schoenflies symbol	Hermann–Mauguin symbols		
		Short	Full	Extended†
215	T_d^1	$P\bar{4}3m$		$P\bar{4}3m$ g
216	T_d^2	$F\bar{4}3m$		$F\bar{4}3m$ g g_2 g_2
217	T_d^3	$I\bar{4}3m$		$I\bar{4}3m$ e
218	T_d^4	$P\bar{4}3n$		$P\bar{4}3n$ c
219	T_d^5	$F\bar{4}3c$		$F\bar{4}3n$ c g_1 g_1
220	T_d^6	$I\bar{4}3d$		$I\bar{4}3d$ d
221	O_h^1	$Pm\bar{3}m$	$P4/m\bar{3}2/m$	$P4/m\bar{3}2/m$ $2_1/g$
222	O_h^2	$Pn\bar{3}n$	$P4/n\bar{3}2/n$	$P4/n\bar{3}2/n$ $2_1/c$
223	O_h^3	$Pm\bar{3}n$	$P4_2/m\bar{3}2/n$	$P4_2/m\bar{3}2/n$ $2_1/c$
224	O_h^4	$Pn\bar{3}m$	$P4_2/n\bar{3}2/m$	$P4_2/n\bar{3}2/m$ $2_1/g$
225	O_h^5	$Fm\bar{3}m$	$F4/m\bar{3}2/m$	$F4/m\ \bar{3}2/m$ $4/n\quad 2/g$ $4_2/e\quad 2_1/g_2$ $4_2/e\quad 2_1/g_2$
226	O_h^6	$Fm\bar{3}c$	$F4/m\bar{3}2/c$	$F4/m\bar{3}2/n$ $4/n\quad 2/c$ $4_2/e\ 2_1/g_1$ $4_2/e\ 2_1/g_1$
227	O_h^7	$Fd\bar{3}m$	$F4_1/d\bar{3}2/m$	$F4_1/d\bar{3}2/m$ $4_1/d\ 2/g$ $4_3/d\ 2_1/g_2$ $4_3/d\ 2_1/g_2$
228	O_h^8	$Fd\bar{3}c$	$F4_1/d\bar{3}2/c$	$F4_1/d\bar{3}2/n$ $4_1/d\ 2/c$ $4_3/d\ 2_1/g_1$ $4_3/d\ 2_1/g_1$
229	O_h^9	$Im\bar{3}m$	$I4/m\bar{3}2/m$	$I4/m\bar{3}2/m$ $4_2/n\ 2_1/e$
230	O_h^{10}	$Ia\bar{3}d$	$I4_1/a\bar{3}2/d$	$I4_1/a\bar{3}2/d$ $4_3/b\ 2_1/d$

† Axes 3_1 and 3_2 parallel to axes 3 are not indicated in the extended symbols: *cf.* Chapter 4.1. For the glide-plane symbol '*e*', see the *Foreword to the Fourth Edition* (*IT* 1995) and Section 1.3.2, Note (x).
Note: The glide planes g, g_1 and g_2 have the glide components $g(\frac{1}{2},\frac{1}{2},0)$, $g_1(\frac{1}{4},\frac{1}{4},0)$ and $g_2(\frac{1}{4},\frac{1}{4},\frac{1}{2})$.

of two axes does not change the handedness of a coordinate system, so that the settings $\bar{\mathbf{c}}\mathbf{ba}$, $\mathbf{c}\bar{\mathbf{b}}\mathbf{a}$, $\mathbf{cb}\bar{\mathbf{a}}$ and $\bar{\mathbf{c}}\bar{\mathbf{b}}\bar{\mathbf{a}}$ are equivalent in this respect. The tabulation thus deals with the $6 \times 4 = 24$ possible right-handed settings. For further details see Section 2.2.6.4.

An important innovation of *IT* (1952) was the introduction of extended symbols for the centred groups *A*, *B*, *C*, *I*, *F*. These symbols are systematically developed in Table 4.3.2.1. Settings which permute the two axes **a** and **b** are listed side by side so that the two *C* settings appear together, followed by the two *A* and the two *B* settings.

In crystal classes *mm*2 and 222, the last symmetry element is the product of the first two and thus is not independent. It was omitted in