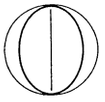
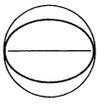
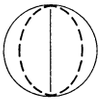
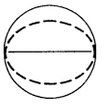
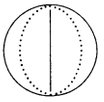
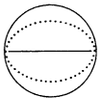
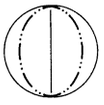
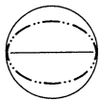
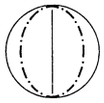
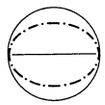
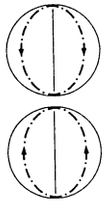
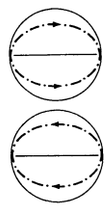
1.4.3. Symmetry planes inclined to the plane of projection (in cubic space groups of classes $\bar{4}3m$ and $m\bar{3}m$ only)

Symmetry plane	Graphical symbol* for planes normal to [011] and $[01\bar{1}]$	Graphical symbol* for planes normal to [101] and $[10\bar{1}]$	Glide vector in units of lattice translation vectors for planes normal to [011] and $[01\bar{1}]$	Glide vector in units of lattice translation vectors for planes normal to [101] and $[10\bar{1}]$	Printed symbol
Reflection plane, mirror plane			None	None	*m*
'Axial' glide plane			$\frac{1}{2}$ lattice vector along [100]	$\frac{1}{2}$ lattice vector along [010]	*a* or *b*
'Axial' glide plane			$\frac{1}{2}$ lattice vector along $[01\bar{1}]$ or along [011]	$\frac{1}{2}$ lattice vector along $[10\bar{1}]$ or along [101]	
'Double' glide plane† [in space groups $I\bar{4}3m$ (217) and $Im\bar{3}m$ (229) only]			*Two* glide vectors: $\frac{1}{2}$ along [100] *and* $\frac{1}{2}$ along $[01\bar{1}]$ or $\frac{1}{2}$ along [011]	*Two* glide vectors: $\frac{1}{2}$ along [010] *and* $\frac{1}{2}$ along $[10\bar{1}]$ or $\frac{1}{2}$ along [101]	*e*
'Diagonal' glide plane			*One* glide vector: $\frac{1}{2}$ along $[11\bar{1}]$ or along [111]‡	*One* glide vector: $\frac{1}{2}$ along $[11\bar{1}]$ or along [111]‡	*n*
'Diamond' glide plane¶ (pair of planes; in centred cells only)			$\frac{1}{2}$ along $[1\bar{1}1]$ or along [111]§ $\frac{1}{2}$ along $[\bar{1}\bar{1}1]$ or along $[\bar{1}11]$§	$\frac{1}{2}$ along $[\bar{1}11]$ or along [111]§ $\frac{1}{2}$ along $[\bar{1}\bar{1}1]$ or along $[1\bar{1}1]$§	*d*

* The symbols represent orthographic projections. In the cubic space-group diagrams, complete orthographic projections of the symmetry elements around high-symmetry points, such as $0,0,0$; $\frac{1}{2},0,0$; $\frac{1}{4},\frac{1}{4},0$, are given as 'inserts'.

† For further explanations of the 'double' glide plane *e* see Note (iv) below and Note (x) in Section 1.3.2.

‡ In the space groups $F\bar{4}3m$ (216), $Fm\bar{3}m$ (225) and $Fd\bar{3}m$ (227), the shortest lattice translation vectors in the glide directions are $\mathbf{t}(1,\frac{1}{2},\frac{\bar{1}}{2})$ or $\mathbf{t}(1,\frac{1}{2},\frac{1}{2})$ and $\mathbf{t}(\frac{1}{2},1,\frac{\bar{1}}{2})$ or $\mathbf{t}(\frac{1}{2},1,\frac{1}{2})$, respectively.

§ The glide vector is half of a centring vector, *i.e.* one quarter of the diagonal of the conventional body-centred cell in space groups $I\bar{4}3d$ (220) and $Ia\bar{3}d$ (230).

¶ See footnote § to Section 1.3.1.

1.4.4. Notes on graphical symbols of symmetry planes

(i) The *graphical* symbols and their explanations (columns 2 and 3) are independent of the projection direction and the labelling of the basis vectors. They are, therefore, applicable to any projection diagram of a space group. The *printed* symbols of *glide planes* (column 4), however, may change with a change of the basis vectors, as shown by the following example.

In the rhombohedral space groups $R3c$ (161) and $R\bar{3}c$ (167), the dotted line refers to a *c* glide when described with 'hexagonal axes' and projected along [001]; for a description with 'rhombohedral axes' and projection along [111], the same dotted glide plane would be called *n*. The dash-dotted *n* glide in the hexagonal description becomes an *a*, *b* or *c* glide in the rhombohedral description; *cf.* footnote † to Section 1.3.1.

(ii) The graphical symbols for glide planes in column 2 are not only used for the glide planes defined in Chapter 1.3, but also for the further glide planes *g* which are mentioned in Section 1.3.2 (Note x) and listed in Table 4.3.2.1; they are explained in Sections 2.2.9 and 11.1.2.

(iii) In monoclinic space groups, the 'parallel' glide vector of a glide plane may be along a lattice translation vector which is inclined to the projection plane.

(iv) In 1992, the International Union of Crystallography introduced the 'double' glide plane *e* and the graphical symbol ··–··– for *e* glide planes oriented 'normal' and 'inclined' to the plane of projection (de Wolff *et al.,* 1992); for details of *e* glide planes see Chapter 1.3. Note that the graphical symbol ⇣⇢ for *e* glide planes oriented 'parallel' to the projection plane has already been used in *IT* (1935) and *IT* (1952).

references