Screw threads

General representation

The methods shown in Figure 1.42 are recommended for right-hand or left-hand representation of screw threads. The diameter (DIA) of a thread is the nominal size of the thread, for example for a 12 mm thread (M12, see p. 28), DIA = 12 mm.

Threads on assembly and special threads

Figure 1.43(a) illustrates the method of representing two threads in assembly. Figure 1.43(b) shows the assembly of two members by a stud mounted in one of them. Special threads are usually represented by a scrap sectional view illustrating the form of the thread, as shown in Figure 1.43(c).

![Diagram of screw threads and assembly methods](image)

Fig. 1.42 Methods of representing screw threads

Fig. 1.43 Methods of representing assembled and special threads
Dimensioning full and runout threads
When full and runout threads have to be distinguished, the methods of dimensioning shown in Figure 1.44 are recommended. Where there is no design requirement, the runout threads need not be dimensioned.

Dimensioning metric threads in holes
Figure 1.45 (below) shows various methods used to dimension threaded holes. The diameter of the thread is always preceded by the capital letter M, which indicates metric threads.

The coarse thread series is dimensioned simply by the letter M followed by a numeral, for example M12. However, fine threads should show the pitch of the thread as well, for example M12 × 1.25. The term 6H contained in the thread dimensions of Figure 1.45(b), (c) and (d) refers to the grade of tolerance to be used in the manufacture of these threaded holes. This tolerance combined with a similar tolerance on the mating screw provides a certain 'fit' when the screw is assembled into the threaded hole. The system used for threaded 'fits' is the same as that used for plain shaft and hole 'fits' described on page 54.

If it is not important, the runout threads need not be dimensioned. However, in blind holes it is often important to have fully formed threads for a certain depth, and dimensioning must be provided to control this.
The Australian metric thread profile

Figure 1.46 shows the profile of the internal and external metric threads, which are suitable for single point screw cutting at maximum material condition according to AS 1721:1985. If the rounded projection is not used, a flat should be ground on the appropriate tool to the values of \( W_n \) and \( W_s \) and the corners will round off as the tool wears.

![Diagram of Australian metric thread profile](image)

Fig. 1.46 Profile of the Australian metric thread

The ISO metric thread

Figure 1.47 shows the profile of the ISO metric thread, together with proportions of the various defined parts of the thread.

![Diagram of ISO metric thread profile](image)

Fig. 1.47 Basic profile and proportions of the ISO metric thread
Graphical comparison of metric thread series
ISO metric threads are of two kinds: coarse and fine thread. A graphical comparison of these two series is shown in Figure 1.48.

Tapping size and clearance holes for ISO metric threads
Tapping sizes and clearance holes for metric threads are shown in Table 1.9 (page 32). In this table column 1 represents first and second choices of thread diameters. The sizes listed under second choice should be used only when it is not possible to use sizes in the first choice column.

The pitches listed in column 2 are compared on the graph in Figure 1.48. These pitches, together with the corresponding first and second choice diameters of column 1, are those combinations which have been recommended by the ISO as a selected ‘coarse’ and ‘fine’ series for screws, bolts, nuts and other threaded fasteners commonly used in most general engineering applications. Column 3 is the tapping size for the coarse and fine series. These values represent approximately 83 per cent full depth of thread, and can be calculated simply by the formula:

\[
tapping \text{ drill size} = \text{outside diameter} - \text{pitch} - 3.3 = 4 - 0.7
\]

Sometimes the drill size has to be rounded off to the next largest stock drill size; this can be obtained from Table 1.10 (page 33).

Column 4 of Table 1.9 gives tapping sizes for coarse threads in mild steel only; these will give approximately 71 per cent of the full depth of thread. In most general engineering applications this depth of thread is sufficient and desirable for the following reasons:

1. Tapping 83 per cent depth of thread necessitates about three times more power than tapping 71 per cent depth of thread.
2. The possibility of tap breakage is greater as the depth of thread increases.
3. The 83 per cent depth of thread has approximately 5 per cent more strength than the 71 per cent depth of thread.
4. The amount of metal removed from a 71 per cent depth of thread is much less than that removed for 83 per cent depth of thread.

There are cases when a deeper thread is necessary, for example on machines and in situations where movement in the mating threads is to be kept to a minimum.

Column 5 of Table 1.9 gives three classes of clearance holes recommended for the various sizes of metric threads.