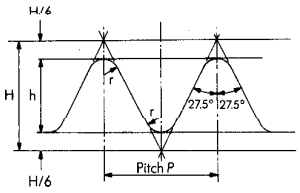
**Basic Whitworth Form**




H = 0.960 491 P
h = 0.640 327 P
r = 0.137 329 P

*Fig. 4.01*

**Basic form of taper pipe thread**

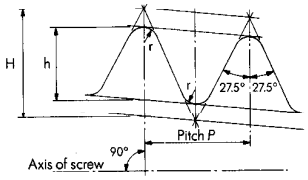



*Fig. 4.02*

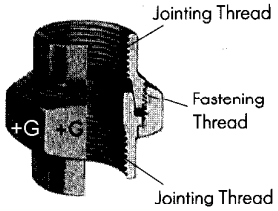



*Fig. 4.03*

*The George Fischer Union, showing both jointing and fastening threads.*

# Types & Designation

Over generations many different types of screw threads have been developed for particular applicatons, which include fastening components, power transmission and materials handling.

In the nineteenth century, most factories that needed a fastener would devise their own system. Clearly this resulted in all sorts of compatibility problems. The English mechanical engineer and inventor, Sir Joseph Whitworth (1803-1887) devised a standardised threading system in 1841 to tackle these difficulties. The Whitworth thread form is based on a 55 degree thread angle and rounded roots and crests. See *Fig. 4.01*.

The Whitworth thread form was selected for use as a connecting thread for pipes, which was made self sealing by cutting at least one of the threads on a taper. This became known as the British Standard Pipe thread (BSP Taper or BSP Parallel thread). The Whitworth thread is now used internationally as a standard thread for jointing low carbon steel pipes. See *Fig. 4.02.*

Pipe threads can be divided into two types:

a) **Jointing threads** - which are pipe threads for joints made pressure tight by sealing on the threads and are taper external and parallel or taper internal threads. The sealing effect is improved by using an appropriate jointing compound (see page 4.13 ). These threads are standardised in ISO 7-1 and the new BS EN 10226-1, which will supersede BS 21:1985.

b) **Fastening threads** - are pipe threads where pressure tight joints are not made on the threads. Both threads are parallel and sealing is effected by compression of a soft material onto the external thread, or a flat gasket. These threads standardised in ISO 228-1 and BS 2779:1986. (BS EN 10227-1 is being prepared and will supersed BS2779).

George Fischer malleable iron pipe fittings are produced with **jointing** threads, taper external and parallel internal. For special applications, a parallel **fastening** thread is required. See *Figure 4.03* of a **+GF+** union which uses the two types of thread.

### Pipe Thread Designation

The size designation of a pipe thread is derived from ISO 7. See page 3.08 for pipe size designation.

Before a revision of BS21 in 1973 an internal pipe thread that was specified , for example , by '1 1/2" BSP. Pl ' may now simply be referred to as 'Rp1 1/2'.

Similarly, a taper thread which was designated by '1 1/2 BSP. Tr EXT ' is now designated by R 1 1/2.

The method of designating the different types of pipe thread is detailed below using thread size 1 1/2" as an example.

**Jointing** thread to ISO 7-1, BS EN 10226-1

| | | |
|---|---|---|
| Internal thread (right-hand) | parallel | Rp 1 1/2 |
| External thread (right-hand) | taper | R 1 1/2 |

Note: LH is added to designate left-hand thread, Rp 1 1/2 -LH

*Fig. 4.04*

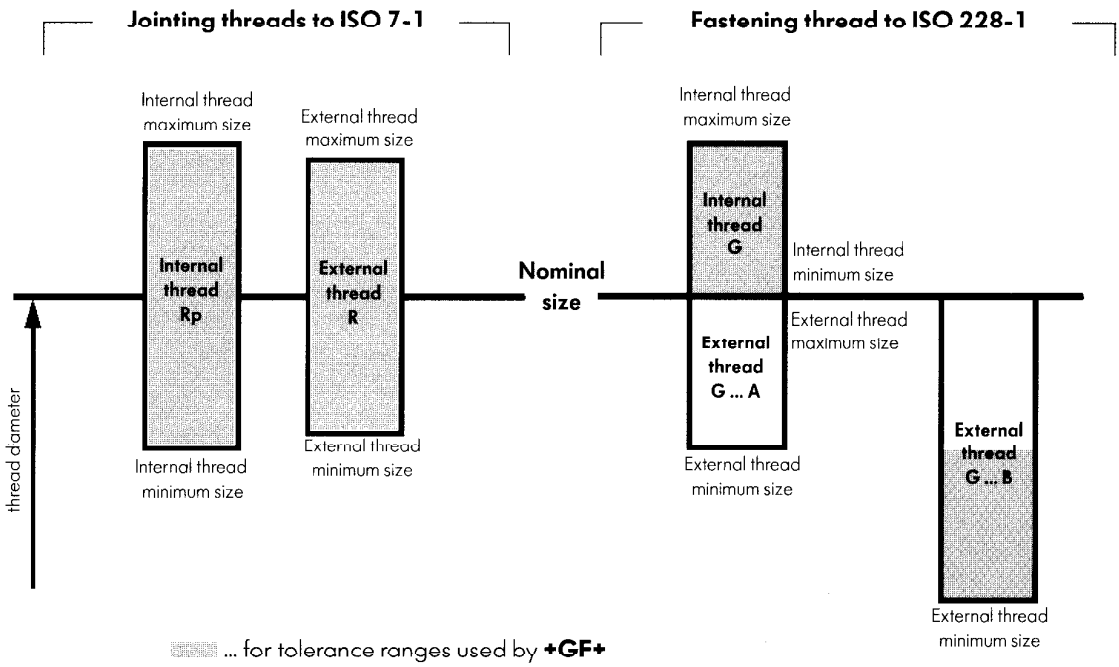
**Fastening** Thread to ISO 228-1, BS 2779 (BS EN 10227-1)

| | | |
|---|---|---|
| Internal thread (right-hand) | parallel | G 1 1/2 |
| External thread (right-hand) Tolerance class A | parallel | C 1 1/2 A |
| External thread (right-hand) Tolerance class B | parallel | G 1 1/2 B |

Note: LH is added to designate left-hand thread, G 1 1/2- LH

*Fig. 4.05*

# Comparison of Jointing and Fastening Thread Tolerances




... for tolerance ranges used by **+GF+**

*Fig. 4.06*

## Combination of Jointing and Fastening Threads

If a parallel external pipe thread, G (fastening thread to ISO 228-1), is screwed together with a parallel internal pipe thread Rp, (jointing thread to ISO 7-1), special consideration is required since this combination may not assemble together and does not necessarily lead to a pressure tight joint. (see ISO 228-1 section 3 and/or BS21:1985 Table 6).

4

# Design and Function of Jointing Threads

Thread shape, dimensions, tolerances and designations per thread size are specified in ISO 7-1(CEN 10226).

### Terms relating to Pipe Threads

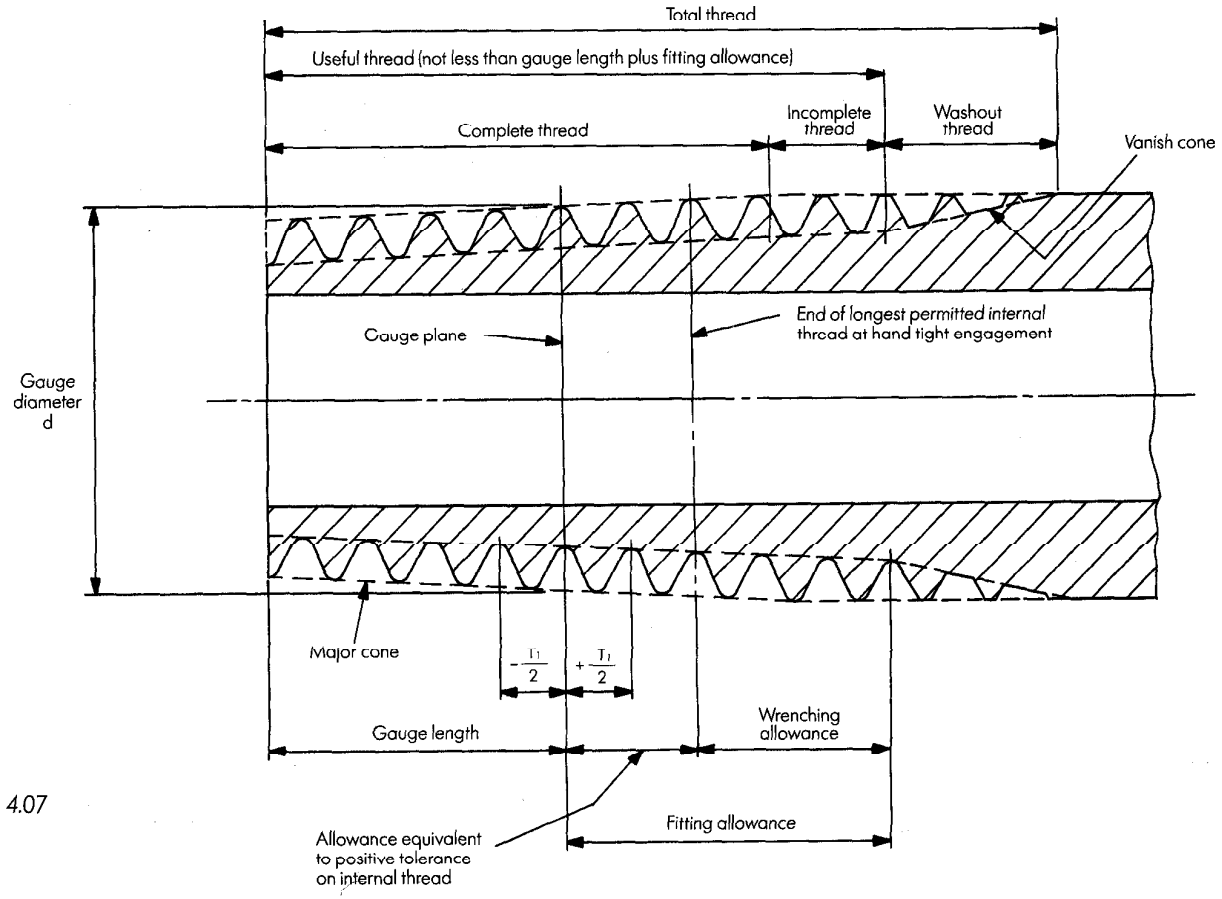



*Fig. 4.07*

### Taper External Threads, R

The taper has a combined ratio 1:16. The most important parts of the thread are :

- **Gauge Length** is the length along the axis from the gauge plane to the end of the thread. This will vary within a tolerance. The design dimensions ensure that assemby with the internal thread is always possible, even when the internal thread is at the minimum diameter.
- **Fitting Allowance** is the length of useful thread required to provide for assembly with an internal thread. Even when the internal thread is at the maximum diameter, there is still sufficient allowance for tightening or wrenching the joint.
- **Wrenching Allowance** is the length of useful thread which is provided to allow tightening or wrenching of the components, beyond the hand tight position, in order to achieve a pressure tight joint.
- **Washout Thread** is the part of the thread which is not fully formed at the root. This section is not useful thread and does not contribute to the effectiveness of the joint.

### Internal Threads, Rp or Rc

The length and design of the internal thread must be such to allow the external thread to be screwed in sufficiently to achieve adequate compression and sealing in the threads, even when the external thread is at the maximum permitted length.