

Expansion limit for expansion for tubes.

Tube expansion can be compared to the cold rolling of steel sheets.

The tube to be expanded can also be equated with an endless steel sheet which, during the rolling process, has been lengthened or enlarged to a point when the external diameter of the tube equals the diameter of the tube sheet hole. This first stage is called 'metal to metal contact'.

Note that the expansion at this stage is not yet leakproof.

Further rolling is necessary to increase the expansion and reach the point when the material is deformed. This creates tension because of the compression between the tube and the tube sheet.

A leakproof expansion is assured if the pressure tension is greater than the service pressure, which arises from the heating, the lengthening and finally the tension of the medium.

The difference of expansion between the 'contact' and the final expansion is called 'expansion limit'

This 'expansion limit' must never cause a rupture in the cohesion of the molecules of the tube material by an exaggerated deformation of the material.

If this were the case the tube material could become damaged – it could crack or break – and this would create the danger of explosions etc. when the tube comes under high pressure.

It could then happen that, though the tests had turned out positive, the tube will prove useless after a few days in service.

Example :

Tube dimension: 30 x 3 mm

Tube sheet hole :	30,4 mm
less 2x3mm tube wall thickness :	6,0 mm
theor. internal dia. of the tube at 'metal to metal contact':	24,4 mm
plus expansion limit i.e. 20% of the tube wall thickness :	+ 0,6 mm
theor. i/d of tube after having reached the expansion limit :	25,0 mm

Recommended expansion ranges:

Metal to metal contact: about 3 - 5% of tube wall thickness

Expansion limit: about 15 - 20% of tube wall thickness