opening remark

The two fundamental static design criteria for metal hoses described in DIN EN ISO 10380 are the bursting pressure and the permanent elongation under pressure (where PT = 1.5 x PS). These criteria define the strength of metal hose, braiding, fitting and jointing method.

The standard specifies that the service life be tested on the basis of load cycles for a few important installation types by way of example. For hose assemblies of diameters up to DN 100, an average life of 10,000 load cycles applies to installation in a vertical U-bend, with a minimum service life of 8,000 load cycles (with unlubricated braiding).

The principal factors affecting service life are:

- operating pressure
- operating temperature
- installation situation (shape and radius, among other things)
- correct storage, handling and assembly
- corrosion resistance to the piped medium and external influences such as sea water
- dynamic stresses caused by movement, vibration or pressure pulses, among other things
- flow conditions (depending on the properties and flow rate of the medium)

Service life issues usually relate to braided hose assemblies. A variety of failure mechanisms are associated with these. The system for connecting the metal hose to the fitting and friction effects between hose and braiding also play a significant role in this. However, it is still only possible to estimate these effects very approximately using calculation methods.

Wherever there is a risk of injury to persons or excessive damage to equipment or other property through failure of a hose, the manufacturer must be informed before the order is placed.

In these cases, it is necessary to verify the service life through empirical methods or a combination of empirical and calculation methods. We have the necessary facilities and methods to do this. Please contact us if this is the case.

Metal hoses for use in vehicles are as a matter of principle subject to particular quality standards and must be separately specified in consultation with us.

Dynamic reduction factors

Historically, we have taken account of the effects of dynamic stresses by applying reduction factors to the pressure dimensioning.

The change of test conditions stipulated by DIN EN ISO 10380 (load cycle tests at the rated pressure) can mean that a reduction is necessary as a result of the movements covered by the tests.

The rated pressures given in the tables that are defined in DIN EN ISO 10380 also apply to applications for the absorption of movement, heat expansion and vibration provided the design guidelines stated in Section 7 – Design/Calculation/Installation are observed for the respective application.

Where unusual mechanical stresses such as pressure pulses, jerky movements or heavy vibration / resonant vibration are expected in operation, assemblies must be individually designed in consultation with us.

Pressure reduction factors in the event of increased operating temperature

Pressure reduction factors in the event of increased operating temperature
As already mentioned, the pressure data given in this manual are nominal pressures that, as described in the definition, relate to a temperature of 20° C.

The effect of operating temperature is a decisive factor for the design pressure of the assembly.

The fall in pressure resistance of the used materials must be taken into account in the design. Reduction factors for the most important materials are given in the table on page 245.

Further material characteristics can be found in Appendix A.

For the design of assemblies, you should always take the lowest value for the material of the hose and braiding for your calculation.

This notwithstanding, the maximum permissible operating temperature specified for soldered joints (300° C) or any sealing materials used must not be exceeded.

pressure-proof, absolutely leakproof

Before shipment
As a matter of principle, all corrugated hose assemblies are subjected to a pressure and leak test before they are sent out.

The respective cold pressure at 20° C is calculated on the basis of the operating pressure PS, operating temperature TS and the ruling temperature reduction factors.

Hose assemblies not falling within the scope of the Pressure Equipment Directive are then tested at a test pressure of PT = 1.3 x cold pressure. Where the PED applies, the test pressure is defined in accordance with its rules.

Depending on the level of the test pressure and the nominal diameter, a combined pressure/leak test using nitrogen under water or a two-stage test – hydraulic pressure test with water followed by a leak test at reduced test pressure (N2 under water) is carried out.

If the customer does not give any data regarding medium and operating conditions, hose assemblies without braiding are subjected to a leak test with PT = 0.5 bar N2/air, braided hose assemblies to a pressure/leak test with PT = 10 bar nitrogen under water.

Further tests such as the helium leak test can be agreed in individual cases.