The Danfoss composite pipe are manufactured in such a way that the aluminium layer prevents the pipe from going back to its original form. This makes it easy to install.

**Performance over time**
A minimum performance over a time of 50 years has to be proved for the Danfoss composite pipes.

**Tension under temperature in N/mm²**

![Graph showing tension under temperature in N/mm²](image)

**Corrosion free quality**
Since the inner synthetic pipe is virtually smooth, water cannot affect it. The resulting minimal pipe friction means there is very little loss of pressure. Corrosion and deposits are a thing of the past. Consequently, the hydraulic performance is still in accordance with the original specifications after many years. Any flow murmur or noises resulting from a circulation pump are reduced to a minimum due to the characteristics of the pipe material.

The synthetic outer layer allows the Danfoss composite pipe to be laid straight into screed without any extra protection.

**Minimum linear expansion**
Because of the firm bonding of the synthetic layers with the aluminium, the linear expansion is determined by the expansion coefficient of the aluminium and is therefore similar to the expansion of a metal pipe, i.e. only 1/7 of that of a pure synthetic pipe.

**Thickness of the aluminium**
The aluminium in the Danfoss composite pipe makes it 100 % impervious to air and therefore even better than for the requirements of DIN 4726.

**Frost resistance**
The composite pipe can be installed at minus temperatures, but it is not recommended to go under -10 °C. Freezing of the filled pipe must be avoided since unacceptable higher inner pressure causes damage to the composite pipe.
Danfoss composite pipes with anti-freeze
The following combinations of anti-freeze and anti-corrosion with water can be used for the Danfoss System (pipe and connectors):

- Antifrogen N by Clariant GmbH
- Antifrogen L by Clariant GmbH
- Tyfocor by TYFOROP Chemie GmbH
- Tyfocor L by TYFOROP Chemie GmbH
- Tyfocor LS by TYFOROP Chemie GmbH

It is important that the proportion of water to Anti-freeze and anti-corrosion should be a minimum of 25 % Vol and a maximum of 80 % Vol since otherwise there is a danger of corrosion in some metallic areas. Installations that have been temporarily filled with anti-freeze and anti-corrosion must be emptied and cleaned several times with water in order to remove any residual product.

UV-protection
Inside buildings there is no need to take extra precaution against UV radiation. The grey outer synthetic layer of the composite pipe is not sensitive to indirect UV radiation inside buildings. However, the Danfoss composite pipe has to be protected from direct sunlight and UV radiation. Completed installations must be covered or protected in another way from UV radiation (e.g. enclosed in protective pipe).

Pipe work in floor construction
Other services
Pipe work and other service installations in floor constructions should be planned without crossings. The layout of these pipes must be parallel to walls wherever possible.

If the requirements of DIN 18 560-2 “Screed in Building Work, Screed and Heated Screed on Insulation (Floating Screed)” are adhered to installations can be continued through thresholds into other rooms. When planning, priority should be given to heating and domestic water pipe work over electrical cables and conduits. This must also be considered during co-ordination and actual installation. If pipes or conduits have to be crossed, this usually requires the raising of the floor, a fact that has to be included in the planning.

Careful planning will avoid height issues and associated problems. Differences in height of pipes or conduits can be overcome by installing levelling layers as long as the maximum compressive strength of the insulation is not exceeded (cf. DIN 18 560). Within a floor construction, pipes should be laid without connections or, if necessary, should be joined with the appropriate couplings. Please note that in some countries connections in the floor construction is not allowed. When laying pipes, it is important to avoid damage occurring through either expansion or shrinkage.

### Application

<table>
<thead>
<tr>
<th>Description</th>
<th>Width / distance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Channel width for parallel installed service pipes incl. pipe insulation</td>
<td>≤ 30 cm</td>
</tr>
<tr>
<td>Width between service channels (when pipes are closely laid)</td>
<td>≥ 20 cm</td>
</tr>
<tr>
<td>Distance of services channel from wall, incl. insulation as support for screed in rooms, not in hallways</td>
<td>≥ 50 cm</td>
</tr>
<tr>
<td>Distance of services channels incl. insulation as support for screed in hallways</td>
<td>≥ 20 cm</td>
</tr>
</tbody>
</table>

Danfoss press system
Apart from being easy and economical to fit, the Danfoss press system has other advantages: the outer sleeve of the press fitting is made of high quality stainless steel and has small holes allowing for a visual inspection to see that the pipe has been pressed home. The fitted outer stainless steel sleeve also offers protection from mechanical damage on the inner O-Ring seal. After fitting, the connection can tolerate bending without leaks being caused due to the stable pipe sleeve.

Section of Danfoss press fitting
The hand press tool must be offered around the fitting. The fitting finds its own position within the tool. When in place, start the pressing.
**Handbook Danfoss composite pipe**

**Danfoss screw fitting**
Tightening of the compression nut presses the pipe sleeve to the fixed olive on the Danfoss pipe. The connection can be disconnected. The pipe sleeve remains pressed to the pipe.

*Section of Danfoss screw fitting*

**Exterior corrosion protection of Danfoss fittings**
Danfoss fittings must always be protected against outer corrosion from direct contact with corrosive substances (e.g. chloric air from swimming pools, cleaning agents, disinfectants) and from contact with building materials (e.g. cement, screed, plaster, gypsum, etc.). Before applying corrosion protection, the mandatory pressure test has to be carried out. The corrosion protection must be resistant to water vapour diffusion, ageing and heat influences. Closed-cell insulation or pipe insulation with cut and butt-ends carefully sealed may be used. Care must be taken to avoid moisture being trapped under the corrosion protection. Protective sleeves containing chloride, ammoniac, sulphate and nitrite must not be used as protection. Felt is a permissible protection.

### Press tools

**Important maintenance notes**
Press tools like any tools succumb to normal wear and tear.
Danfoss press tools therefore should be checked at least once a year. Only regularly checked press tools guarantee a perfect pressing.
It is advisable to follow the handbook and maintenance instructions.

**Recommendation:**
Always clean/check press tools before starting the work.

| 1. Optical checks of press tool and inserts. |
| 2. Remove dirt or rust from surface. |

Regular checks (at least every 4 weeks):

| 1. Oil Inserts on movable parts. |
| 2. Lightly oil complete inserts. |

### General notes on installation

**Calculated heat flow density**
The pipe ends of all sizes must be bevelled with a bevelling tool, i.e. a 2 mm deep bevel is cut into the end of the pipe. The bevel is necessary so that, when pressing and screwing, the O-ring is not damaged. The pipes are easily bent by hand and cut to size with a pipe cutter.

The pipe dispensing wheel makes installation easy and it is possible for one person to roll out and install the pipe.

### Pipe bending

**Manual pipe bending**
It is easy and quick for one person to install the Danfoss composite pipe. The thickness of the aluminium makes it possible to easily bend the pipe.
The pipe should be held at a distance of approx. 40 cm and then be bent to the required radius. Kinks should be avoided.

**Bending with internal bending spring**
The pipe is first bevelled. The internal pipe bending spring is then inserted to leave just a small bit showing. It is important not to bend so hard that the spirals of the bender begin to show on the outside of the PE-sleeve.

**Bending with external bending spring**
The external bending spring is pushed over the pipe up to the bending point. After carrying out the bending the spring is removed.
### Minimum bending radius with bending springs [mm]

<table>
<thead>
<tr>
<th>Pipe dimension [mm]</th>
<th>Manual pipe bender radius [mm]</th>
<th>Internal pipe bending spring radius [mm]</th>
<th>External bending spring radius [mm]</th>
</tr>
</thead>
<tbody>
<tr>
<td>16</td>
<td>80 (5 x Od)</td>
<td>64 (4 x Od)</td>
<td>64 (4 x Od)</td>
</tr>
<tr>
<td>20</td>
<td>100 (5 x Od)</td>
<td>80 (4 x Od)</td>
<td>80 (4 x Od)</td>
</tr>
</tbody>
</table>

$Od$ = Outside diameter

### Pressure loss diagram

![Pressure loss diagram](chart.png)

**Water temperature 60 °C**

**Mass flow kg/h**

**Pressure loss kPa/m**

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