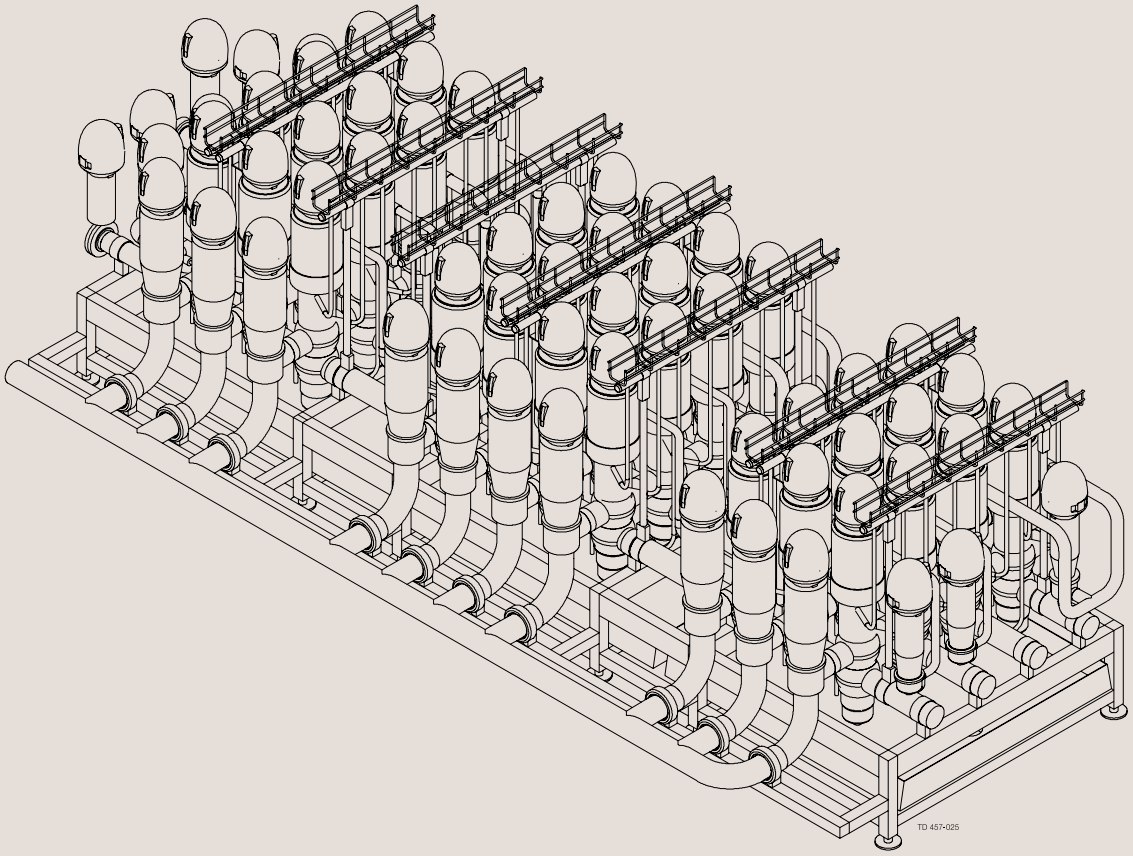
Guidelines for installation of valve clusters and other types of installations



ESE00040EN1 2004-05

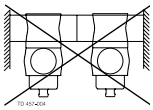
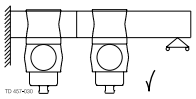
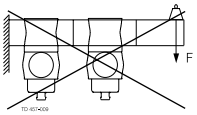
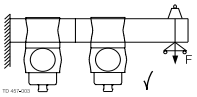
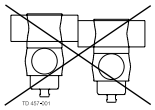
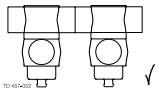
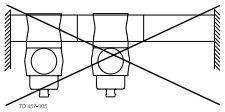
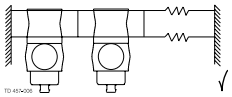
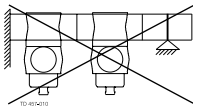
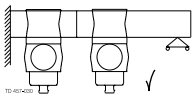
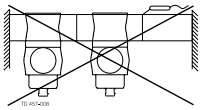
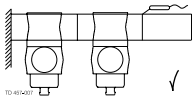
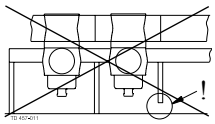
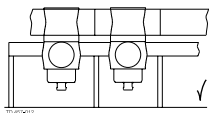
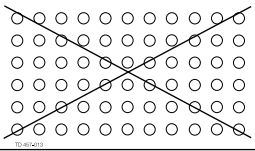
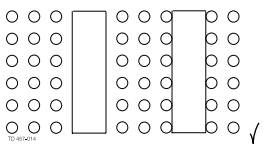
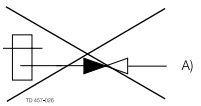
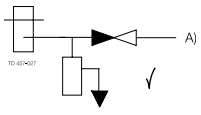
The information contained herein is correct at the time of issue but may be subject to change without prior notice.

1.1 Important information

Unsafe practices and other important information are emphasized in this manual.

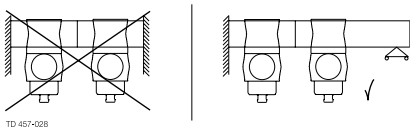
This documnet is to be read as a guideline when making clusters and other types of installations.

If in doubt, please contact Alfa Laval for advise.

1) Installation free from stress		
2) No load on the valve bodies		
3) Avoid misalignment		
4) Compensate for thermal expansion		
5) Choice of supports allowing thermal expansion		
6) Allow for welding shrinkage		
7) All legs of frames must touch the floor		
8) Be aware of service access		
9) Avoid Block filled pipes A = water/Product		

Step 1
Avoid stress on the pipe system when installing the valve cluster.
Secure free end from expansion.

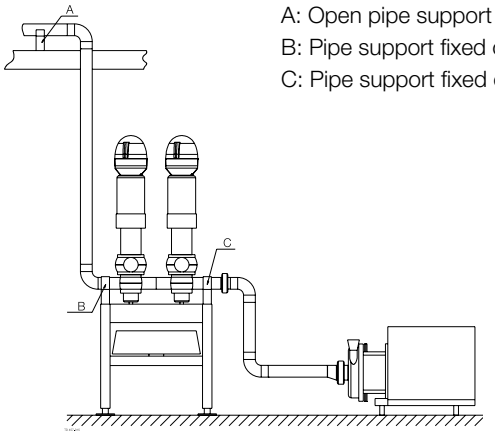
Stress can come from load, misalignment or thermal expansion and can be induced both vertically and horizontally.



Step 2
It is important that no load is applied directly to the valve bodies.

In installations with more levels the upper pipe must rest in an open support on the upper bridge allowing thermal expansion to move upwards.

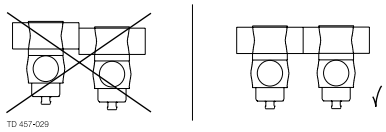
The lower pipe must be supported as to avoid the load tension from the vertical pipe causing stress.



A: Open pipe support
B: Pipe support fixed or loose
C: Pipe support fixed or loose

Step 3
Apart from being properly supported, the area on which the valves rest must be straight and even to allow for thermal movement.

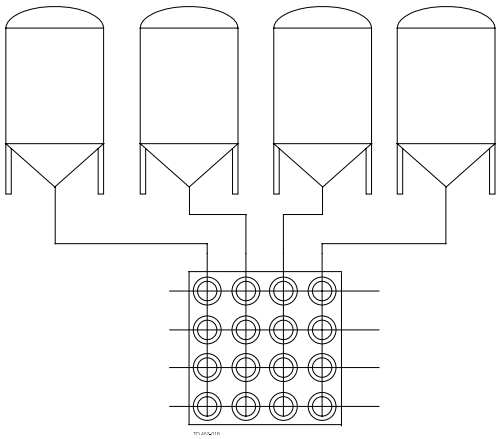
The load from the cluster may not cause deflection of the frame. Pipe supports must be placed in intervals avoiding deflection.



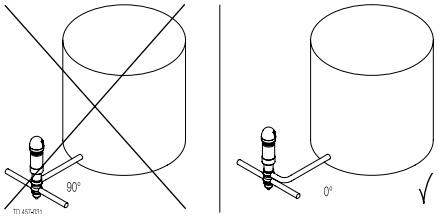
Step 4
It is important to compensate for thermal expansion as this can lead to malfunction of valves.

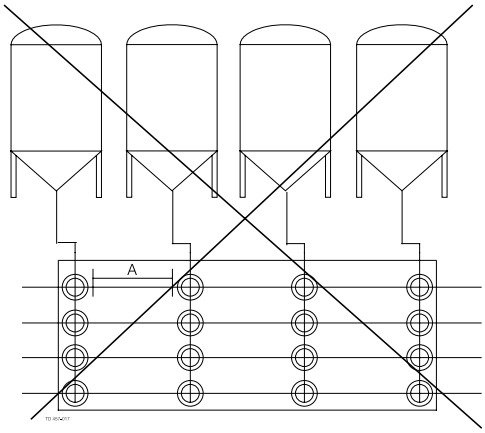
Pipes should be kept as short as possible as long pipes present a potential risk of problems with thermal expansion.

The wide temperature range in the parallel lines in a cluster causes an uneven heat expansion from line to line. Therefore the cluster should be designed as compact as possible.



Step 4, cont.
Distance pipes should be avoided in the cluster lines as this increases the pipe length and with the combination of hot and cold pipes the heat expansions can cause tremendous forces on the individual valve body.





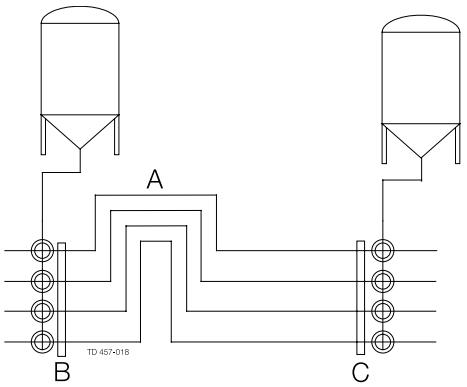
Thermal expansion in straight stainless steel tubes

Temp. rise, °C	5	10	15	20	25	30	35	40	45	50	55	60
Thermal expansion in mm per 10 m	0.9	1.7	2.6	3.4	4.3	5.1	6.0	6.8	7.7	8.5	9.4	10.2

Temp. rise, °C	65	70	75	80	85	90	95	100	105	110	115	120
Thermal expansion in mm per 10 m	11.1	11.9	12.8	13.6	14.5	15.3	16.2	17.0	17.9	18.7	19.6	20.4

If long pipes cannot be avoided, compensation must be introduced. U-bends are the simplest and most cost effective way to break the pipes into short lengths. These will absorb the thermal expansion.

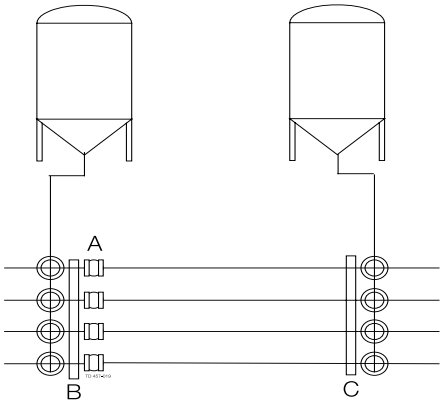
A: Compensation by U-bends
B: Fixed support
C: Fixed support



If space does not allow this, compensators can be inserted as shown below. For number and dimensions, please refer to supplier documentation.

The thermal expansion must be allowed unhindered movement, but from pre-decided points in the system. These points are called fixed points. A fix point holds the pipes in position regardless of temperature. The thermal expansion is allowed to move away from the fix point into a more flexible area (compensation).

A: Compensation by rubber bellows compensators
B: Fix point (ridgid)
C: Fix point (ridgid)

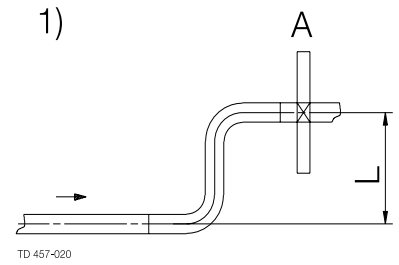


Step 4, cont.

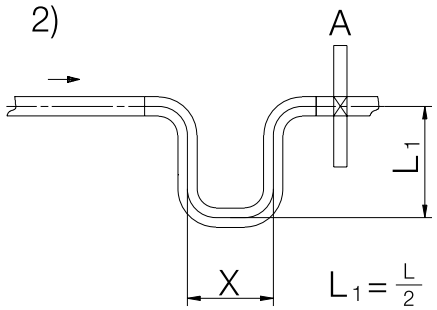
Please be aware that some compensator types need specially designed fix points. Please refer to manuals for specific compensators.

Compensation achieved by bends.

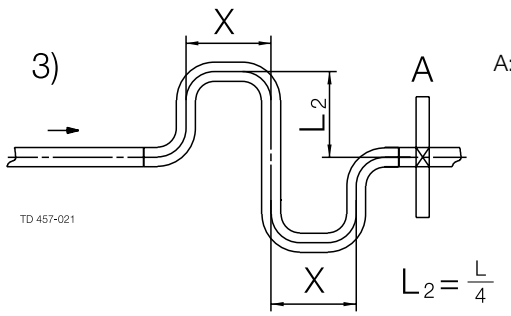
These bends vary in shape depending on available space and demand.



A: Fixed support



A: Fixed support



A: Fixed support

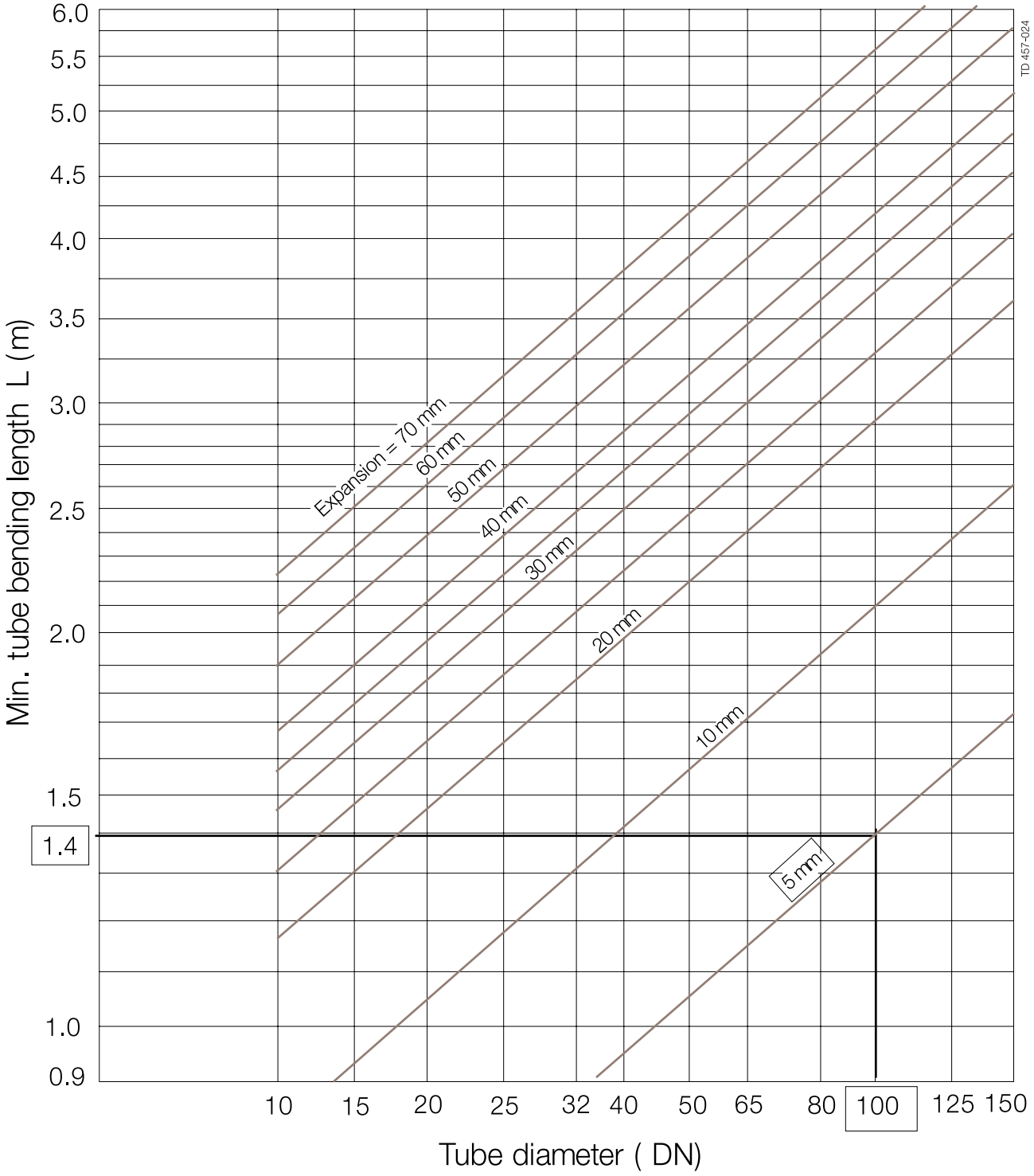
"L" (or L1 or L2 respectively" should be min. 3 x D.
"X" should be min. 6 x D, however it is recommended to make "L" (or L1 or L2 respectively) longer than "X".

Main focus has to be on:

1. Length of thermal expansion to be compensated for (same direction as the arrows above). The thermal expansion can be found in the table "Thermal expansion in straight stainless steel tubes" or can be calculated using the following formula: **Thermal expansion = Increase in temp x 17 x 10^{-6} x length of actual pipe between fix points.**

2. L is the length necessary to obtain the generated thermal expansion without harming the pipe work and can be found in the curve next page.

Pressure drop/capacity diagram



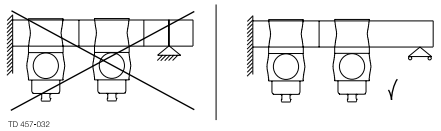
Example:
Tube DN100, expansion = 5.1mm ~ 5mm ⇒ L = 1.4m

Step 5

Supports for thermal expansion

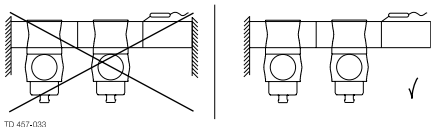
Use mainly loose pipe supports and place those in the direction of the longest pipe only (thermal direction). If supports are needed in the other direction (in order to eliminate loads from surrounding equipment), make these as supports which can slide on the frame.

Ensure that the surrounding plant is prepared to absorb the thermal expanion from the cluster. In the example shown in step 2 on of the two supports shown on the valve cluster should be fixed and the other should be loose. If this valve cluster would have been longer but with the same surroundings it is recommended to make a row of fixed supports in the centre of the cluster and the other ones loose.



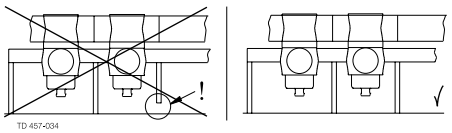
Step 6

Be aware of welding shrinkage.



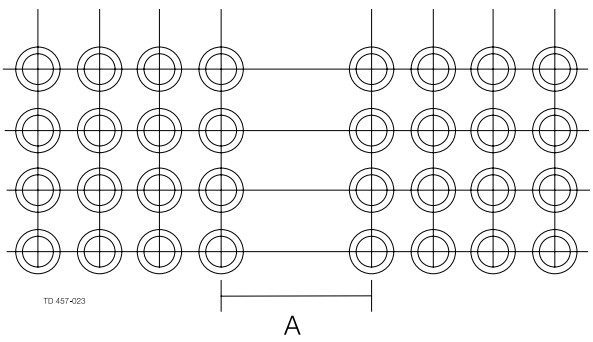
Step 7

All legs must touch the floor at all times and the lock nuts must be tightened. This is to avoid possible deformation of valve cluster due to deflection caused by the frame not being properly supported.



Step 8

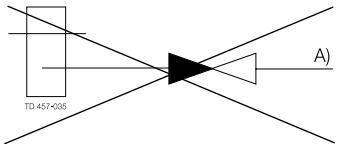
In large valve clusters service access after max. every 4th row is recommended. The service access ways should be max. 500 mm wide.

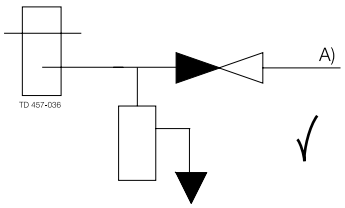


A: Service access

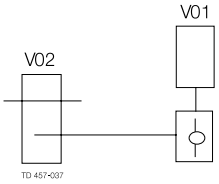
Step 9
When constructing a pipe system keep in mind that liquid cannot be compressed.

Therefore blocking the pipes should be avoided as constriction of liquid can cause malfunction of the valves.
Likewise increasing hydraulic pressure as a result of rise in temperature combined with block filled pipe can cause problems when not allowed for in design.

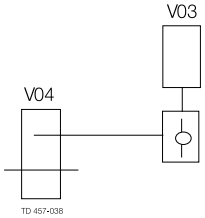




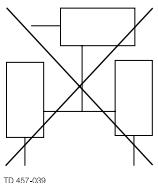
A = Water/product

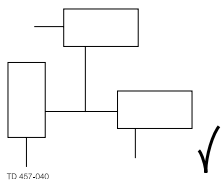


Open V01 before V02
Close V02 before V01



Open V03 before V04
Close V04 before V03





How to contact Alfa Laval
Contact details for all countries are continually updated on our website. Please visit www.alfalaval.com to access the information direct.