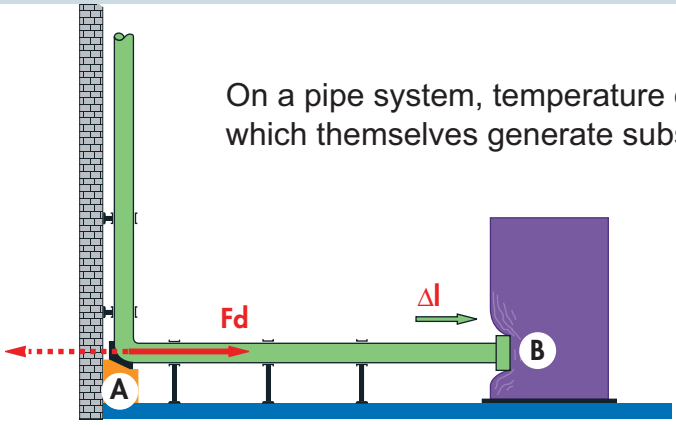
# EFFECTS DUE TO TEMPERATURE VARIATIONS




On a pipe system, temperature differences cause big dimensional variations on the pipes which themselves generate substantial reaction forces

*The expansion joint DILATOFLEX® compensates these effects.*

## DIMENSIONAL VARIATIONS

of the pipe systems are proportional to :

**- material's dilation coefficient**
**- pipe's length**
**- temperature difference**

$$\Delta L = \frac{k \times L \times \Delta\theta^\circ}{100}$$

| | |
|---|---|
| $\Delta L$ | = length variation in mm |
| $k$ | = material's dilation coefficient |
| $L$ | = pipe's length in meter (m) |
| $\Delta\theta^\circ$ | = temperature difference in °C |

| Pipe material | Coefficient k |
|---|---|
| Steel | 1.2 |
| Stainless steel | 1.65 |
| Aluminium and alloys | 2.2 up to 2.4 |
| Copper | 1.7 |
| Plastics | varying |

*For instance:*
*Steel pipe diameter 300mm*
*Thickness 8mm, length 10m*
*Temperature difference 40°C*

**ΔL = 4,8mm or 0,048%**

## FORCES GENERATED

by dimensional variations
due to temperature differences
are significant

$$F_d = \alpha \times E \times S \times \Delta\theta^\circ$$

| | |
|---|---|
| $F_d$ | = generated force (thrust) in daN |
| $\alpha$ | = material's coefficient of lineal expansion |
| $E$ | = material's modulus of elasticity |
| $S$ | = material's section in mm² |
| $\Delta\theta^\circ$ | = Temperature difference in °C |

*For instance:*
*Steel pipe diameter 300mm*
*Thickness 8mm, length 10m*
*Temperature difference by 40°C.*
*with*
*$\alpha = 120.10^{-7}$; E= 21000 daN/mm²*

**Fd = 75962 daN or 76 Tons**

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anvis GROUP
**anvis France Decize S.A.S.**
**Sales Office for Industry Sector** - 2 rue du Pont Colbert - 78000 VERSAILLES - France
**Tel.: +33 (0)1 30 97 41 41 - Fax: +33 (0)1 30 97 41 01 - Web: www.dilatoflex.com**