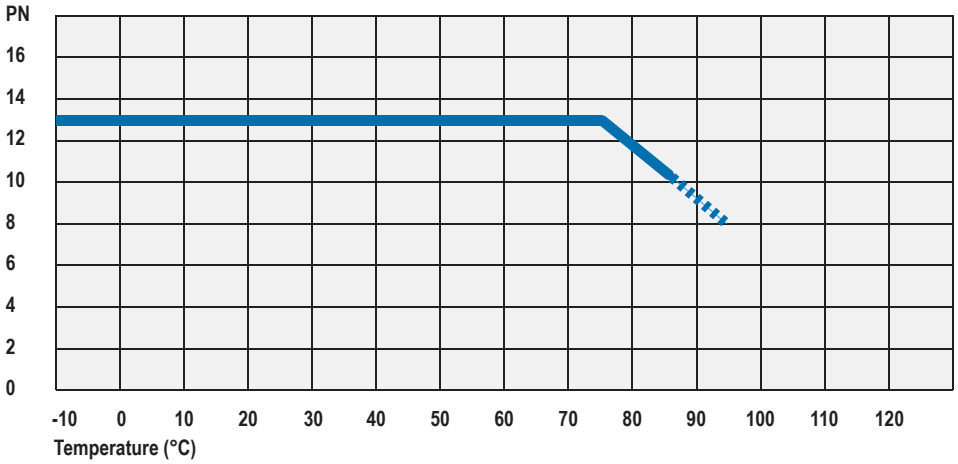
RATIO BETWEEN PRESSURE AND TEMPERATURE

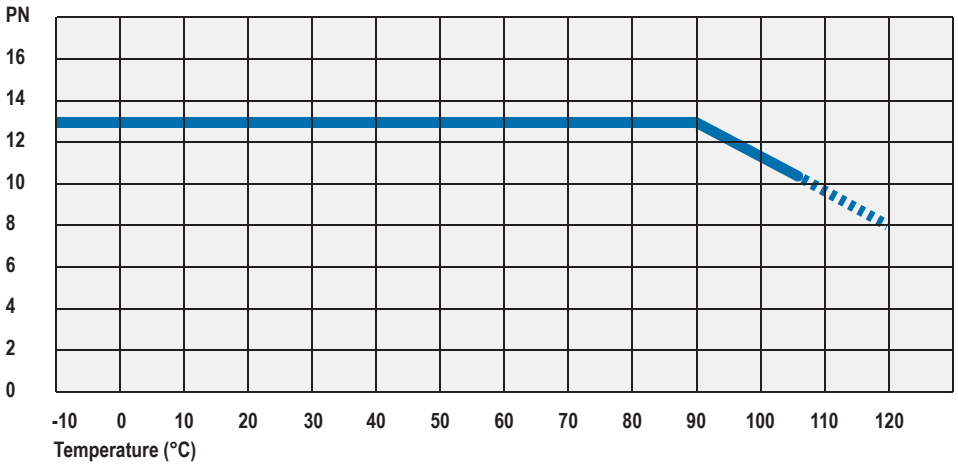
The indication Pn 13 means that AIRCOM Quick Line products may be used up to a maximum pressure of 13 bar.

If the temperature rises the nominal service pressure lowers according the curves showed in the following graphs:

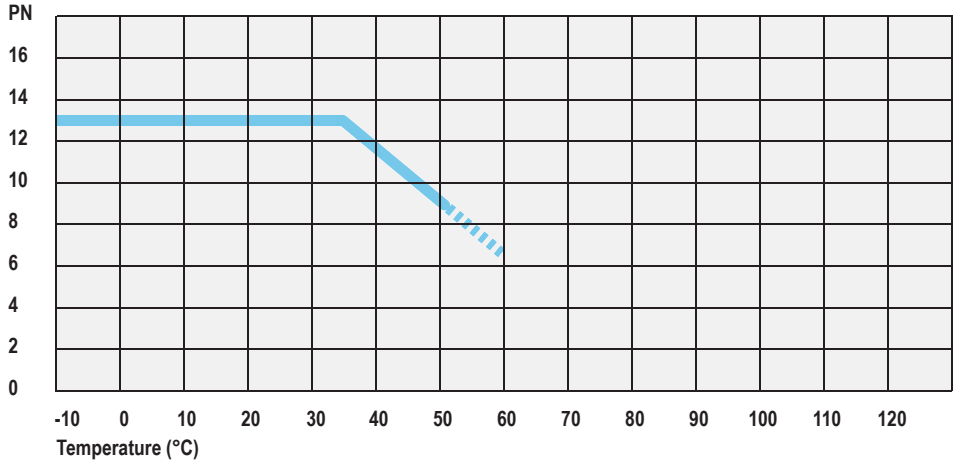
RATIO BETWEEN PRESSURE AND TEMPERATURE WITH ALUMINUM "QUICK" PIPE AND PA QUICK LINE FITTINGS



RATIO BETWEEN PRESSURE AND TEMPERATURE WITH ALUMINUM "QUICK" PIPE AND ALUMINIUM QUICK LINE FITTINGS



RATIO BETWEEN PRESSURE AND TEMPERATURE WITH "CLASSIC" PIPE



N.B.: (in graphs pressures are espressed in bars and temperatures in °C)

LINEAR THERMAL EXPANSION/CONTRACTION

All materials change their dimensions according to temperature variations; usually plastic materials are liable to higher variations than metals.

Considering the installation temperature as a reference:

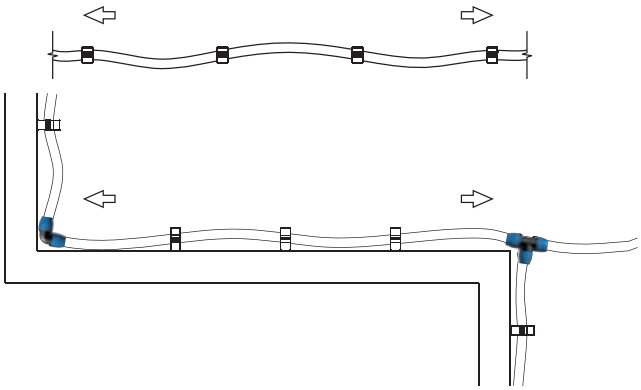
- they expand when temperature rises,
- they contract when temperature decrease.

The main general consequences of expansions and contractions are:

EXPANSION EFFECTS

Buckling of a pipeline segment included between two fixed points .

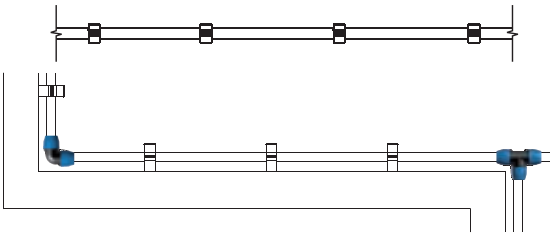
Compression of brackets, machines connections and/or other equipments which form fixed ponts with risk of stressing and breaking them.



NEUTRAL CONDITION

The are no visible bucklings due to expansion/contraction.

This condition mostly occurs during the installation, provided that the room temperature is not subject to excessive variations.



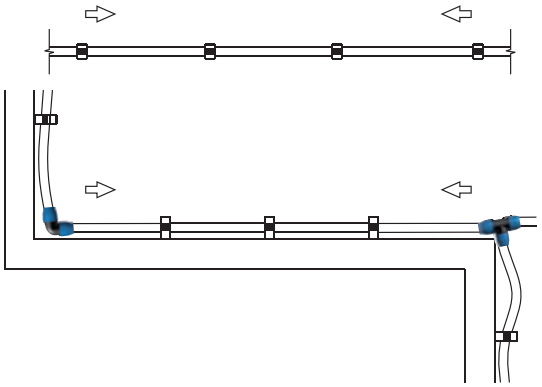
CONTRACTION EFFECTS

Pipelines traction of a segment included between two fixed points.

Traction of thebrackets, machines connections and /or other equipments which form fixed ponts with risk of stressing and breaking them.

In order to avoid that compression/traction effects may cause heavy damages to the plant (in addition to aesthetic defects), it is necessary to observe the following rules to allow free sliding of pipes and to compensate pipe's expansion/contraction:

- support and bracket the pipeline in order to allow pipeline free sliding between two fixed points;
- insert a compensator between two fixed points if they are positioned at a distance which may cause sensible contractions/expansions.



The measure of these variations is given by the linear expansion coefficient **d**

for AIRCOM QUICK LINE with aluminum pipe this coefficient is 0,023 mm/m/°C

that means 0,023 mm. per meter per °C degree

Please find hereunder the comparison between the linear thermal expansion/contractions coefficients for some materials of frequent use:

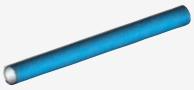
Steel	12,8 x 10^{-6} m/m °C
Copper	16,5 x 10^{-6} m/m °C
Aluminum (Alloys)	**23 x 10^{-6} m/m °C**
uPVC CLASSIC - FREEZE	**75 x 10^{-6} m/m °C**
ABS	101 x 10^{-6} m/m °C
PVDF	120 x 10^{-6} m/m °C
PP	150 x 10^{-6} m/m °C
PE	200 x 10^{-6} m/m °C

The design and execution of a plant must consider this phenomenon which is calculated through the following formula:

$\Delta L = d \times L \times \Delta T$

where: **d** = linear expansion coefficient
L = pipeline length
ΔT = temperature difference in °C degrees
ΔL = length difference (expansion or contraction)

Example: installation temperature 10°C; pipeline length 20 m; service temperature 35°C
ΔT = 35 - 10 = 25°C
ΔL= 0,023 x20 x 25 = **11,5 mm**



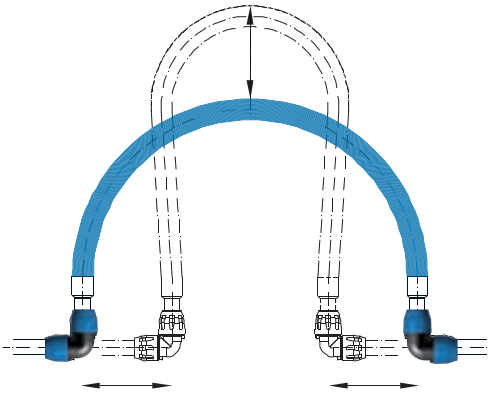
QLTUAL (Aircom Aluminium Plpe) CONTRACTION/EXPANSION "ΔL" relating to pipeline length "L" and to temperature difference"ΔT"

L (m)	ΔT=10°C	ΔT=15°C	ΔT=20°C	ΔT=25°C	ΔT=30°C	ΔT=35°C	ΔT=40°C
	ΔL (mm)	ΔL (mm)	ΔL (mm)	ΔL (mm)	ΔL (mm)	ΔL (mm)	ΔL (mm)
30	6,9	10,35	13,8	17,25	20,7	34,15	27,6
40	9,2	13,8	18,4	23	27,6	32,2	36,8
50	11,5	17,25	23	28,75	34,5	40,25	46
60	13,8	20,7	27,6	34,5	41,4	48,3	55,2
70	16,1	24,15	32,2	40,25	48,3	56,35	64,4
80	18,4	27,6	36,8	46	55,2	64,4	73,6
90	20,7	31,05	41,4	51,75	62,1	72,45	82,8
100	23	34,5	46	57,5	69	80,5	92

EXPANSION/CONTRACTION COMPENSATION

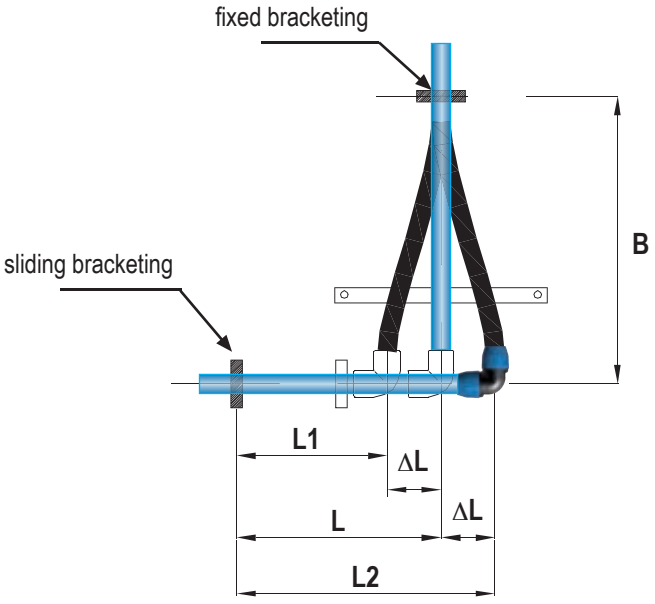
Among the most efficient compensation methods we suggest you the "LIRA" (lyre) (or OMEGA) or "DIRECTION CHANGE".

Lira and Direction Change are obtained with elbows and pipes; as they are perfectly homogeneous with the plant, of easy installation and economic, we think they represent the best remedy to expansions/contractions if the are no obstacles to their use.



LIRA

Diameter (mm)	Hose length (m)
20	0,79
25	0,80
32	0,96
40	1,20
50	1,40
63	1,60



DIRECTION CHANGE

L: piepeline length at the installation

L1: length with minimum temperature

L2: length with maximum temperature

ΔL: length difference due to ΔT

B: length of the arms of the Lira or of the direction change