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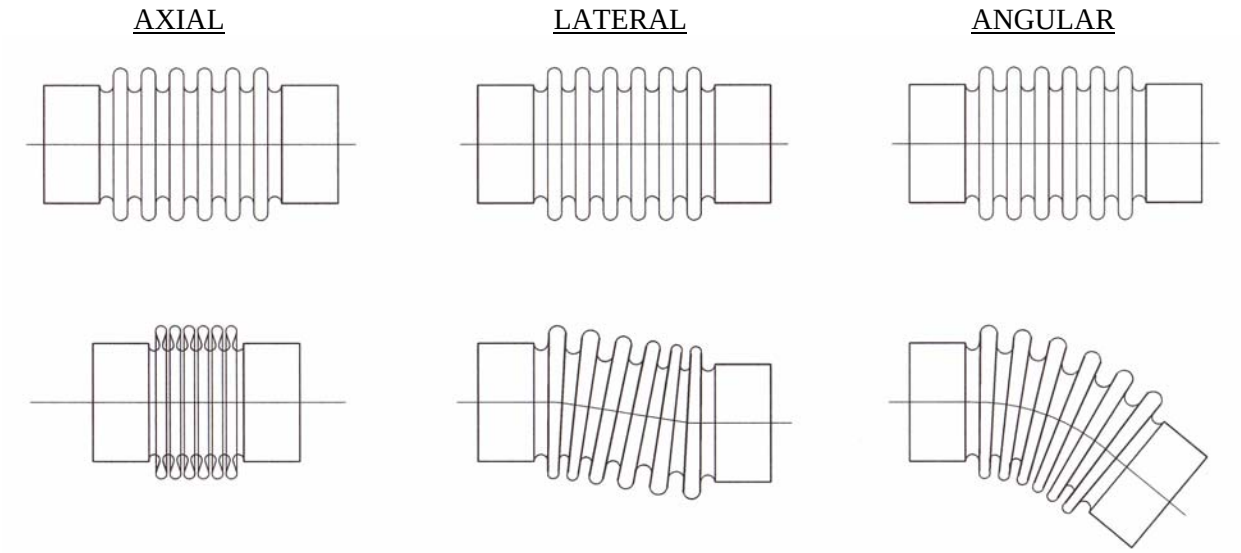
DISMANTLING JOINTS

FEATURES AND PARTICULARS

Expansion joints are flexible elements composed in the foundamental part, from multiply bellow in stainless steel, that allows to absorb axial, angular and lateral movements, but it can to be used also like anti-vibrations with engines, pumps or other machines.



Normally these expansion joints are used with pipeline where because of the variations of temperature, expand, provoking (if done not compensate for note) of the disruptions either of the deformations to the same pipelines or to the rigid parts to are connected.
Bellow's composition (number of plies and thickness) is different and it depend from design pressare "PN" (pressure at 20 degC); one bellow PN 2,5 it will have except plies of PN 10 and/or plies with inferior thicknesspare.
Bellows building with multi-ply method, guarantee simultaneously:

- High pressare resistance, because all bellow's plies workint to contain it.
- High flexibility, thanks to the reduced thickness of the individual ply.

To corrected project of expansion joint type, is very important to know exactly, following working conditions:

- Fluid conveyed
- Max working pressure
- Max working temperature
- Required movements
- Axial binds and anchor points
- Other adding forces on expansion joint

Only in this manner is possibile to guarantee a long working life to expansion joint, eliminating following effects:

- Local instability (corrugation's instability).
- Axial instability (column's instability).

PRESSURE AND TEMPERATURE

Expansion joints were planned considering the temperature environment (20°C). In fact the variations of temperature, like all know, is in a position to alter the features of the materials, and also the expansion joints, being in stainless steel, decrease their resistance to the pressure all' to increase some temperature, according to the corrective factor "KP"; the same thing is valid for the movements that is able compensate for corrective factor "KC" (you see table to page 4 valid for stainless steel 321).
Into following table you can see others necessary values to calculate previous mentioned corrective factors:

- E (elasticity module to EJMA ed. '93 Tab. 2 Sez. C).
- Sa (bellow's acceptable stresses to ASME B31.1 Tab. A-3 Ed. '92).

We write following the formulas to calcolate two previous mentioned corrective factors, used elasticità module "E" and bellow's acceptable stresses "Sa":

KP = Sah / Sac

Sah = Acceptable stress with working temperature (Te) measured in MPa (Mega Pascal).
Sac = Acceptable stress with environment temperature (20°C) measured in MPa (Mega Pascal).

Obviously for calculate correct expansion joints property, its design pressur "PN" it have to be grater or like at equivalent pressure at 20 degC "Pc", calculated from working pressure "Pe" (at working temperature "Te") and corrective factor "KP" rate (corresponding at working temperature "Te").

PN >= Pc = Pe / KP

Pc = Equivalent pressure at 20 degC measured in bar.
Pe = Working pressure at working temperature (Te) measured in bar.

Same for the acceptable movements:

KC = (Sah / Sac) x (Ec / Eh)

Eh = Elasticity module at working temperature (Te) measured in MPa (Mega Pascal).
Ec = Elasticity module at environment temperature (20 deg°C) measured in MPa (Mega Pascal).

For calculate correct expansion joints property, its designed movement "CN" it have to be greater or like to equivalent movement at 20 degC "Cc", calcolate from working movement "Ce" (at working temperature "Te") and corrective factor "KC" rate (corresponding at working temperature "Te").

CN >= Cc = Ce / KC

Cc = Equivalent movement at 20 degC measured in millimeters.
Pe = Working movement at working temperature (Te) measured in millimeters.

PRESSURE AND MOVEMENT CORRECTIVE FACTORS FOR STAINLESS STEEL 321

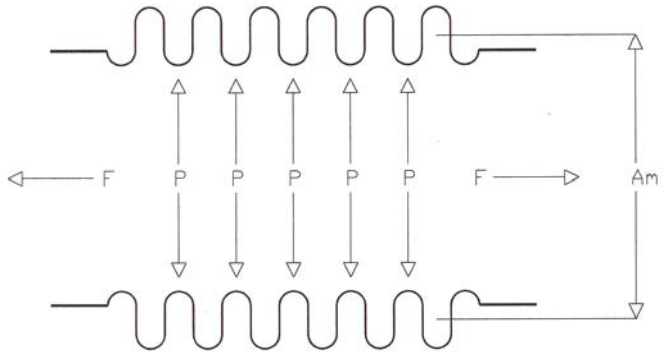
TEMPERATURE		ELASTICITY MODULE "E"	ACCEPTABLE STRESS "Sa"	CORRECTIVE FACTORS	
Deg C	Deg F	EJMA (ED. '93) Tab.2, Sez. C [N/mm^2] [MPa]	ASME B31.1 Tab.A-3, (Ed. '92) [N/mm^2] [MPa]	Pressure "KP"	Movement "KC"
20	68	195.179	129,62	1,000	1,000
40	104	193.859	128,82	0,994	1,001
60	140	192.523	121,62	0,938	0,951
80	176	191.186	114,43	0,883	0,901
100	212	189.799	108,22	0,835	0,859
120	248	188.310	104,00	0,802	0,832
140	284	186.820	99,78	0,770	0,804
160	320	185.469	96,11	0,741	0,780
180	356	184.228	92,89	0,717	0,759
200	392	182.987	89,66	0,692	0,738
220	428	181.360	87,20	0,673	0,724
240	464	179.622	84,97	0,656	0,712
260	500	177.885	82,74	0,638	0,700
280	536	176.644	81,25	0,627	0,693
300	572	175.403	79,76	0,615	0,685
320	608	174.162	78,38	0,605	0,678
340	644	172.921	77,39	0,597	0,674
360	680	171.680	76,39	0,589	0,670
380	716	170.218	75,62	0,583	0,669
400	752	168.480	75,13	0,580	0,671
420	788	166.743	74,63	0,576	0,674
440	824	165.171	74,13	0,572	0,676
460	860	163.682	73,64	0,568	0,677
480	896	162.192	73,14	0,564	0,679
500	932	160.482	73,08	0,564	0,686
520	968	158.745	72,59	0,560	0,689
540	1004	157.008	71,04	0,548	0,681
560	1040	155.270	65,09	0,502	0,631
580	1076	153.533	55,19	0,426	0,541
600	1112	151.630	44,43	0,343	0,441
620	1148	149.396	35,00	0,270	0,353
640	1184	147.162	27,91	0,215	0,286
660	1220	144.790	22,06	0,170	0,229
680	1256	142.308	17,18	0,133	0,182
700	1292	139.826	12,71	0,098	0,137
720	1328	137.344	9,40	0,073	0,103
740	1364	134.862	7,01	0,054	0,078
760	1400	132.379	5,52	0,043	0,063
780	1436	129.649	4,03	0,031	0,047
800	1472	126.919	2,84	0,022	0,034
820	1508	124.188	1,85	0,014	0,022

BELLOW'S REACTION FORCES

During the expansion joints installation, it is necessary always it hold account of the forces that develop themselves to its inside because of the pressare. The more mattering of these forces, that it is cause often of disruptions or deformations considered unjustified, is without doubt the Back Push.
This force that stretches out to extend the bellow, if done not clash from adequate anchor points or binds, is bred from the pressure that works on the waves it of the bellows, trying of "to flatten them" and causing in this manner a push, directed by the center verse the two ends of the bellow.
See follow for calculate this back push:

F = p x Am

p = Pressure (bar).
Am = Effective surface (bellow middle diameter) (cmq).



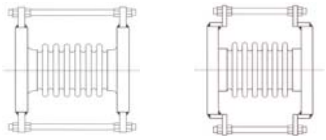
You consider that the presence of the back push, is cause of installation's problems, when in decisive areas of an installation, is not possible to realize anchor points supplementary to contain it. For this reason is possible to build expansion joints, that thanks to their special construction, can to contain autonomously this force, without to need of other anchor points.

EXPANSION JOINTS THAT THEY CONTAIN AUTONOMOUSLY BACK PUSH	EXPANSION JOINTS THAT THEY NOT CONTAIN AUTONOMOUSLY BACK PUSH
- Angular expansion joints - Gimbal expansion joints - Lateral expansion joints - Spherical lateral expansion joints - Dismantling joints with pressure bearing tie rods	- Assiale - Universale - Dismantling joints without pressure bearing tie rods

Another bellow's reaction force that it not depend to internal pressure, but from bellow's building features, is the named Spring rate.
This force is born from the resistance that the bellows offers to the deformation caused from the work that should develop (movement); Different types are:

- Axial spring rate (axial exp. joint) is axial force measured in Newton / millimeter (N/mm).
- Angular spring rate (angular exp. joint) is a torque measured in Newton meter / grado (Nm/grado).
- Lateral spring rate (lateral and universal exp. joint) is a transversal force perpendicular at movement measured in Newton / millimeter (N/mm).

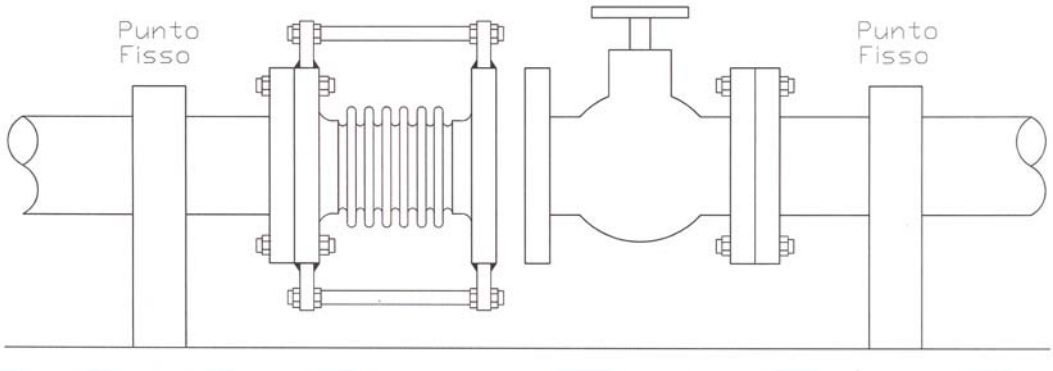
Is possible to calculate total bellow's reaction multiplying spring rate for movement request.



DISMANTLING JOINTS:

Dismantling joints are used for remove valves or other elements, when this operation is impossibile or very hard for flanges with step or other; in effect these joints, have -20 millimeters compression “dismantling movement”, that it agrees the removing of element, in easy and secure manner. This “dismantling movement” it is obtained working on the bolts of the appropriate dismantling tie rods, that they go however left slackened after installation, to agree the joint to absorb eventual motions of arrangement, yieldings of the ground, or small expansions.
Dismantling joints in the standard configuration, are supplied flanged and with only dismantling tie rods, but they cannot contain autonomously the back push; To obviate this problem is necessary to equip the dismantling joints (to request), with appropriate pressure bearing tie rods, that go to replace some of the bolts of fixing between the dismantling joint and element to remove.
Following they come restored two relevant illustrations to how much above described.
Dismantling joints types that is possible to supply are:
GS = Dismantling joint with only dismantling tie rods
GSC = Dismantling joint with inner sleeve and dismantling tie rods
GSF = Dismantling joint with dismantling tie rods and pressure bearing tie rods
GSCF = Dismantling joint with inner sleeve, dismantling tie rods and pressure bearing tie rods

DISMANTLING JOINT WITH ONLY DISMANTLING TIE RODS



DISMANTLING JOINT WITH DISMANTLING TIE RODS AND PRESSURE BEARING TIE RODS