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general catalogue

About UNIGB

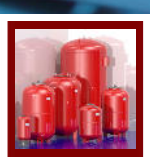
Technicians and innovators, makers and craftsmen: we are UNIGB, leading water tanks and expansion vessel for water systems and booster sets manufacturing company. With a team strong of decades long experience in the field we present ourselves as Your reliable partner and we offer quality standards hardly attainable by our competitors; indeed, we apply the most strict criteria on the production and control. Our belief is: quality, no compromise.

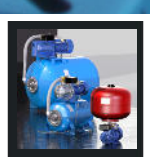
UNIGB has its roots in Italy, where there is our European office, the technical office and distribution center for the European market. Our production facility is located in Russia where has its home our office for the local market.

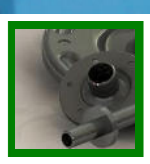
With such strong background and the CE certification, we now have begun to propose our products in the European market.

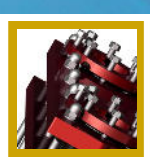
Unigb srl,
Giorgio Benettolo

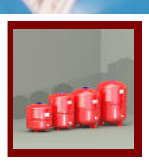
Uffici ed impianto produttivo, Kromj regione Orel Russia











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WATER TANKS: operation explanation

Pressurized water tank with membrane together with the pump and control system (pressure switch, flow switch and the like) make the water boosting set. Such apparatus enables for the effective distribution to the utilizing points of the drinking water, allowing the control of the flow pressure. It is essential whenever the pressure needed to guarantee the right flow rate at the highest or furthest points of the distribution system is not met. The water tank with membrane allows to obtain a pressurized water reservoir enough to prevent the discontinuous pump operation limiting the on-off cycles: water is drawn directly out of the vessel and the pump intervenes only when the system pressure is less than the minimum pressure requested, thus restoring the reservoir.

There are two kinds of tanks: with and without membrane; the latter employs an indirect compression of air (or nitrogen) by the same water pumped into the tank, or a direct gas compression when using a compressor or tank pre-charge if membrane equipped vessel.

indirect compression

We can highlight three distinct phases in the evolution of operation:

A) p_{atm}, V_a

B) p_2, V_2

C) p_1, V_1

A) Empty water tank. Total volume V_a is filled with gas with p_{atm} atmospheric pressure except the bottom portion where the tank is connected to the system.

B) Water tank at the minimum working pressure:In such case we can say the system is at one point of equilibrium (water and gas) at p_2 pressure with air compressed to the V_2.

C) Water tank under the maximum working pressure: The system has reached the maximum pressure equilibrium point at p_1 and the gas is at the maximum compression being segregated to the volume V_1.

For the majority of installations there is usually a pressure at: $p_1 = p_2 + ½$ bar. Triggered by the pressure switch the pump boosts the pressure p_2 and it switches off once reached the pressure p_1. Pressure p_2 value is equal to the sum of the losses of the circuit , of the additional pressure needed for the taps and utilities at the most remote points of the system (usually the highest point of installation). The value of p_1 (in accordance to the project) defines the characteristics of resistance of the reservoir. The difference between the pressure $p_1$and the pressiure p_2 is proportional to the volume of the water tank. It can be computed as the minimum pressure p_2 of air present with a water volume that can be expressed as V_a - V_2.

direct compression

In such case, the minimum working pressure is reached without the need to pump water inside the tank. There are membrane-less tanks, in which a compressor provides directly air at the minimum pressure p_2, to the system, or tanks with membrane, in which an air cushion distinct by the elastic wall of the membrane is tuned at the pre charge pressure p_2.

Using the membrane water tank involves several advantages:

- Energy saving: there is no compressor.
- Avoids corrosion of the tank thanks to the membrane which parts water and tank walls and air, prolonging the operating lifetime of the device.
- Water is protected and confined by the membrane, avoiding unwanted side effects of the mixing with air.
- Easy maintenance, changing of the membrane and inspection of the vessel.
- Membrane is moreover a dumper, so it counteracts the water hammer head effect and absorbs changes of the fluid pressures.
- Minor footprint (volume is reduced by V_a - V_2)

p_2, V_2

p_1, V_1

The tank is installed tuning the pre-charge pressure of roughly 0.2 bar less the pump-on pressure p_2.

Pre-charge pressure has to be considered of the tank without water: if it were more than the pump-on pressure, system operation would be faulty.

Let C_u stand for draw down volume coefficient, a tool introduced to formulate the tank capacity.

To express such value for the tank let it be a isothermal compression of the air enclosed by the walls of the tank and the membrane. This hypothesis is legitimate in as such the process taking place can be treated with as a quasistatic process and the metal walls can be considered as diathermal. Therefore, dealing with absolute pressures, **pV** = costant. It has to be remembered that pre-charge pressure needs to be tuned with respect to the control device of the pump (usually the pressure switch), at a pressure slightly less than the minimum pressure; it is suggested to set $p_{precharge} = p_2$ - 0.2 bar. this is requiered to guarantee the correct start of the pump when needed by the system.

Data:

- p_2 (relative) minimum working pressure
- p_1 (relative) maximum working pressure
- $p_{precharge}$ (relative) pre-charge pressure
- p_b barometric pressure at the installation point of the tank
- V_{tot} Tank nominal volume
- V_{dd} draw down volume

$$p \cdot V = constant \Longrightarrow V_{dd} = \frac{p_1 - p_2}{p_1 + p_b} \cdot \frac{p_{percharge} + p_b}{p_2 + p_b} \cdot V_{tot}$$

It can be highlighted the coefficient: $$C_u = \frac{p_1 - p_2}{p_1 + p_b} \cdot \frac{p_{precharge} + p_b}{p_2 + p_b}$$

The coefficient C_u is reported with the following table in relation to the most common values of the relative pressures, setting p_b to 1 bar, and the draw down volume for the system of our range of tanks:

$p_{precharge}$ (relative) bar	0.8	0.8	1.8	1.8	1.8	1.8	2.8	2.8	2.8	3.8	3.8
p_2 minimum (relative) bar	1	1	2	2	2	2	3	3	3	4	4
p_1 maximum (relative)bar	2	3	3	3.5	4	5	4	4.5	5	6	8
C_u draw down coefficient	0.30	0.45	0.23	0.31	0.37	0.47	0.19	0.26	0.32	0.27	0.43
V_{tot} Water tankvolume L	V_{dd} Draw down volume (Water available) L										
8	2.40	3.60	1.87	2.49	2.99	3.73	1.52	2.07	2.53	2.19	3.41
12	3.60	5.40	2.80	3.73	4.48	5.60	2.28	3.11	3.80	3.29	5.12
20	6.00	9.00	4.67	6.22	7.47	9.33	3.80	5.18	6.33	5.49	8.53
24	7.20	10.80	5.60	7.47	8.96	11.20	4.56	6.22	7.60	6.58	10.24
50	15.00	22.50	11.67	15.56	18.67	23.33	9.50	12.95	15.83	13.71	21.33
80	24.00	36.00	18.67	24.89	29.87	37.33	15.20	20.73	25.33	21.94	34.13
100	30.00	45.00	23.33	31.11	37.33	46.67	19.00	25.91	31.67	27.43	42.67
150	45.00	67.50	35.00	46.67	56.00	70.00	28.50	38.86	47.50	41.14	64.00
200	60.00	90.00	46.67	62.22	74.67	93.33	38.00	51.82	63.33	54.86	85.33
300	90.00	135.00	70.00	93.33	112.00	140.00	57.00	77.73	95.00	82.29	128.00
500	150.00	225.00	116.67	155.56	186.67	233.33	95.00	129.55	158.33	137.14	213.33
750	225.00	337.50	175.00	233.33	280.00	350.00	142.50	194.32	237.50	205.71	320.00
1000	300.00	450.00	233.33	311.11	373.33	466.67	190.00	259.09	316.67	274.29	426.67
1500	450.00	675.00	350.00	466.67	560.00	700.00	285.00	388.64	475.00	411.43	640.00
2000	600.00	900.00	466.67	622.22	746.67	933.33	380.00	518.18	633.33	548.57	853.33

WATER TANKS: choosing the right size - needed water reservoir

Draw down of the system: needed water reservoir

To perform the correct choice of the water tank, the system designer has to identify the needed water reservoir which mitigates the on-off cycles of the pump, satisfying the effective water delivery to the drawing points of the system (remembering the least advantaged ones). Defined the entity of such parameter the draw down volume (matching the needed water reservoir) can be selected to rightly meet the working pressures of the system; the tank needed nominal volume value is therefore set.

An empirical relation to ease the preliminary design is proposed, given:

- **p_2** (relative) minimum working pressure
- **p_1** (relative) maximum working pressure
- **P** pump electric power
- **Q_{max}** maximum flow rate requested by the system

The relation is:

$R = Q_{max} \cdot K$

In the following table the correction coefficient **K** can be found to match the water reservoir **R** needed by the system.

P (kW)	1	2	3	4	5	6	8	10
K (min)	0,25	0,33	0,42	0,50	0,58	0,66	0,83	1,00

Setting **$R = V_{dd}$** the right water tank for the working pressure of the system can be deduced with the help of the previous table.

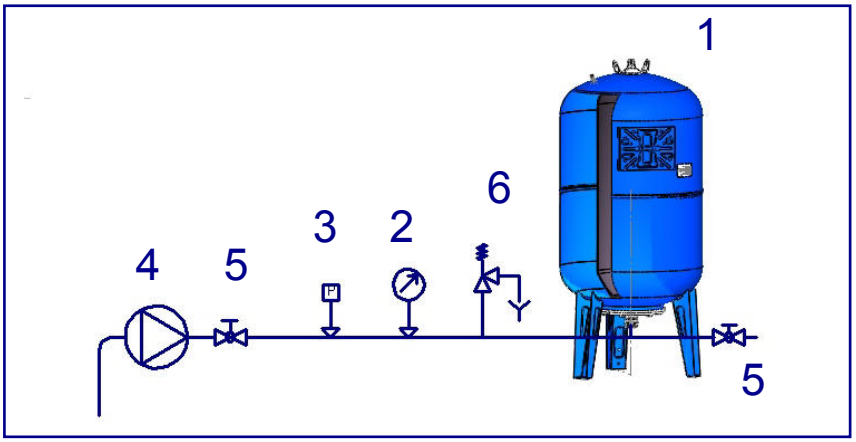
Calculation example

- p_2 = 1 bar; (relative) minimum set pressure of the pressure switch
- p_1 = 3 bar; (relative) maximum set pressure of the pressure switch
- Q_{max} = 105 l/min; maximum system flow rate (litres per minute)
- P = 2 kW; pump power

K coefficient can be detected with the given table in accordance with the power, in numbers **K** = 0.33; Needed reservoir of the tank becomes **R** = 105 · 0.33 = 34.65 L .

Draw down volume table, at the given pressures in the column, it can be highlighted the value closest to R (rounding), V_{dd} = 36 L; which matches with the tank with V_{tot} = 80 L.

Installation diagram



1 - Unigb pressurized water tank
2 - Pressure gauge
3- Pressure switch
4 - Pump
5 - Valve
6 - Safety valve

Vertical pressurized water tanks: they allow minimum footprint and assure the correct operation employing the most reliable membrane configuration.

CODE	VOLUME l	PRESSURE bar	SIZE D	SIZE H	CONNECION	FOOTPRINT. m^3	CERTIFICATION
500100	50	10	382	770	1”	0.120	CE o.n.0948
800100	80	10	450	851	1”	0.170	CE o.n.0948
101100	100	10	450	950	1”	0.240	CE o.n.0948
151100	150	10	580	1010	1” 1/2	0.315	
201100	200	10	580	1200	1” 1/2	0.390	
301100	300	10	580	1540	1” 1/2	0.600	
501100	500	10	780	1550	1” 1/2	1.300	
751100	750	10	780	1940	1” 1/2	1.400	
102100	1000	10	930	1970	2”	1.900	
152100	1500	10	1150	1900	2”	2.600	
202100	2000	10	1280	2230	2”	3.700	

Horizontal pressurized water tanks: stocked with anchoring plate, they allow the direct installation of the pump on top of the tank.

CODE	VOLUME l	PRESSURE bar	SIZE D	SIZE H	CONNECTION	FOOTPRINT. m^3	CERTIFICATION
500101	50	10	430	615	1”	0.100	CE o.n.0948
800101	80	10	500	680	1”	0.160	CE o.n.0948
101101	100	10	500	780	1”	0.200	CE o.n.0948
201101	200	10	580	1000	1” 1/2	0.320	
301101	300	10	580	1300	1” 1/2	0.480	

In line pressurized water tanks: they provide support-free direct install on the piping line.

CODE	VOLUME l	PRESSURE bar	SIZE D	SIZE H	CONNECTION	FOOTPRINT m^3	CERTIFICATION
080100	8	8	210	330	1”	0.016	CE
120100	12	8	210	392	1”	0.027	CE
200100	20	10	250	492	1”	0.042	CE
200101	20	10	275	492	1”	0.042	CE
240100	24	8	360	335	1”	0.042	CE

AUTOCLAVE À MEMBRANA: anti waterhammer

System overpressures

In the preliminary design of a system it is usually supposed as constant both the working conditions and some of the characteristic parameters, like pressures, flow rates etc. During normal operation of hydraulic systems there is instead a periodic variation of flow rates (in connection with use and utilities). This not stationary mode of the fluid in the piping has implications: closing of the various valves, as the turn-on of the pumping system, add a variable component of pressure to the water. This triggers a pressure wave front that run through the pipes; such condition appears with noise and dilation of the pipes. There is a limit value of the rate speed, such as when a valve closes above said limit speed, over which there can be structural risks for the piping. Such limit speeds become lower and lower as the material used for the pipes: usually PVC piping or plastic-wise alike suffer more of such tensions compared to the metal ones.

This phenomenon is called water hammer.

To mitigate this ian expansion vessel has to be installed on the points in the system in which the waterhammer happens, as a dynamic dumper accepting the peak of additional pressure. To have a rough design idea to choose the volume of the vessel the following table can be used, whenever the system designer has not already caluclated a more precise value for the system.

Q_{ref} ref flow rate[m^3 / h]	0.9	1.5	3.0	7.0	12.0	19.0	27.0	37.0
speed [m/s]	1.12	1.19	1.38	1.48	1.47	1.50	1.58	1.62
diameter	½"	¾"	1"	1"½	2"	2"½	3"	3"½
p_{max} absolute pressure [bar]	**C_{lin}** minimum capacity per unit length requested (L/m)							
5	0.0457	0.0568	0.1271	0.3077	0.5087	0.8162	1.447	1.5793
6	0.0200	0.0248	0.0557	0.1348	0.2229	0.3576	0.5015	0.6920
7	0.0120	0.0149	0.0335	0.0811	0.1342	0.2153	0.3019	0.4166
8	0.0084	0.0104	0.0234	0.0568	0.0939	0.1507	0.2113	0.2916
9	0.0064	0.0080	0.0179	0.0433	0.0717	0.1150	0.1613	0.2226
10	0.0052	0.0064	0.0144	0.0350	0.0578	0.0928	0.1302	0.1796
11	0.0043	0.0054	0.0121	0.0293	0.0485	0.0778	0.1091	0.1506
12	0.0037	0.0046	0.0104	0.0253	0.0418	0.0671	0.0941	0.1298
13	0.0033	0.0041	0.0092	0.0222	0.0368	0.0590	0.0828	0.1141
14	0.0029	0.0036	0.0082	0.0199	0.0329	0.0528	0.0710	0.1022
15	0.0026	0.0033	0.0074	0.0180	0.0298	0.0479	0.0671	0.0926

To use the table we can think of the follwing scenarios, known the length L of the piping:

•known flowrate and diameter of the pipes, we can identify **C_{lin}** ; threfore, the needed capacity becomes: $C_{tot} = C_{lin} \cdot L$. Then, we can calculate the volume considering the ratio of the squares of the flowrates, rounding to the closest next volume: $V_{requise} = C_{tot} \cdot \left(\frac{Q}{Q_{ref}}\right)^2$

•Given the pressure of the system and the diameter of the pipes, we can proceed as said to select the coefficient **C_{lin}**, multilied by the length and rounding we can mark the value of the needed vessel:

$$V_{requise} = C_{lin} \cdot L$$

Acting as an expansion vessel funtcion-wise, the drinking water expansion vessel is coupled to the accumulator on the drinking water system. It is installed just after the cold water intake.

Drinking water expansion vessel for hot water handles the thermal expansion of the fluid held by the accumulator. It is good practice in designing the water system not to give back to the network worked water, thus it is mandatory to install a check valve. Without the expansion vessel, if it were installed a safety valve dripping and bleeding would occur; moreover, the pipework would be stressed non-stop by not expected by design pressures, leading to damaging and cracking of the delivery system.

Choosing the right drinking water expansion vessel

Assumed known the volume of water needed by the users (given project datum): such is the volume of water subjected to expansion. Taking into account the expansion coefficient of the fluid, we can calculate, in accordance with the system pressures, the needed volume of the expansion vessel for the system.

Please refer to the expansion vessel pages for more specific technical info; to have an approximate value, for the most common cases, the volume of the accumulator can be the reference. If the range of changing temperature is of 80°C and ordinary system pressures:

$$V_{vessel} = 10\% \cdot V_{accumulator}$$

This cautionary approximation has to be used if no more specific information is known about the parameters driving the design of the plant.

technical specifications

CODE	VOLUME l	PRESSURE (max) bar	SIZE D	SIZE H	CONNECTION	FOOTPRINT m^3	CERTIFICATION
080003	8	5	210	330	3/4"	0.016	exonéré CE
120003	12	5	210	392	3/4"	0.027	CE
180003	18	5	250	492	3/4"	0.042	CE
200003	20	5	250	492	3/4"	0.042	CE
240003	24	5	360	335	3/4"	0.042	CE

EXPANSION VESSELS: operation expanation

The expansion vessel for heating water systems has two specific functions: from the hydraulic point of view it allows to define a reference pressure for the systems, thermically it welcomes the volume change of the working fluid, usually water thus not compressible, occurring as a result of the thermal expansion of the fluid itself.

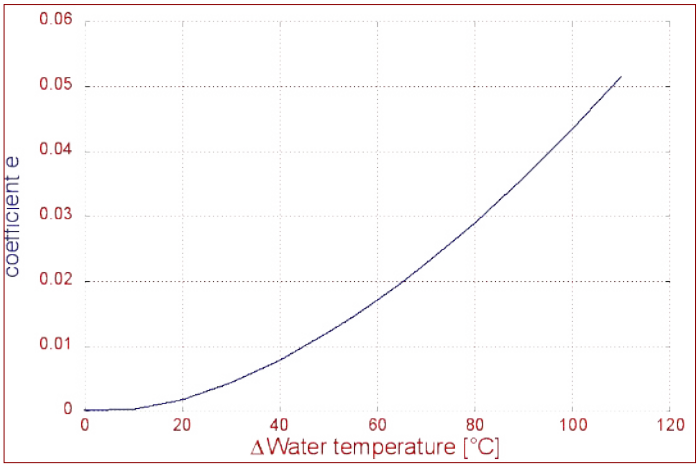
There are three kinds of expansion vessels:

• **Open tank**: the water is meeting the external environment without shielding. Such kind is historically the first type of solution implemented;such vessels were usually installed on the roof space. Common weaknesses rose from the promiscuous state of water with air: indeed the atmospheric oxygen dissolving in the water can induce corrosion related problems on the pipe work, undermining the soundness of the metal pieces of the system and releasing particles in the fluid which could clog the piping. it requires regular draining of the system and air in solution with water increase noisiness and heat loss. Evaporation of the water make it required to cyclically restore the water in the system. Special care must be taken to prevent water losses which could overflow out of the tank..

• **Closed vessel without membrane:** closed type of tank in which there is air (or inert gas) and water without any parting mean. It is self-pressurized. Limits of this kind of vessel are similarly linked at the shared environment between air and water: Typical aspect of such tank can be akin the previous kind of vessel. Moreover, the self-pressurized vessel the air or gas share in the tank grows progressively thinner as air goes in solution with water, making it necessary to regularly restore the pre-charge pressure.

• **Membrane expansion vessel:** this device, evolution and improvement of the former, requires an elastic wall shielding water from air made of rubber (bag-shaped or diaphragm-shaped). The drawbacks of the other two types are prevented. Moreover, it make it possible to optimize the available volume of use: tuned pre-charged according to operation allows to minimized the water volume at installation. It is of easier setting up and maintenance compared to the former kinds.

Water thermal expansion



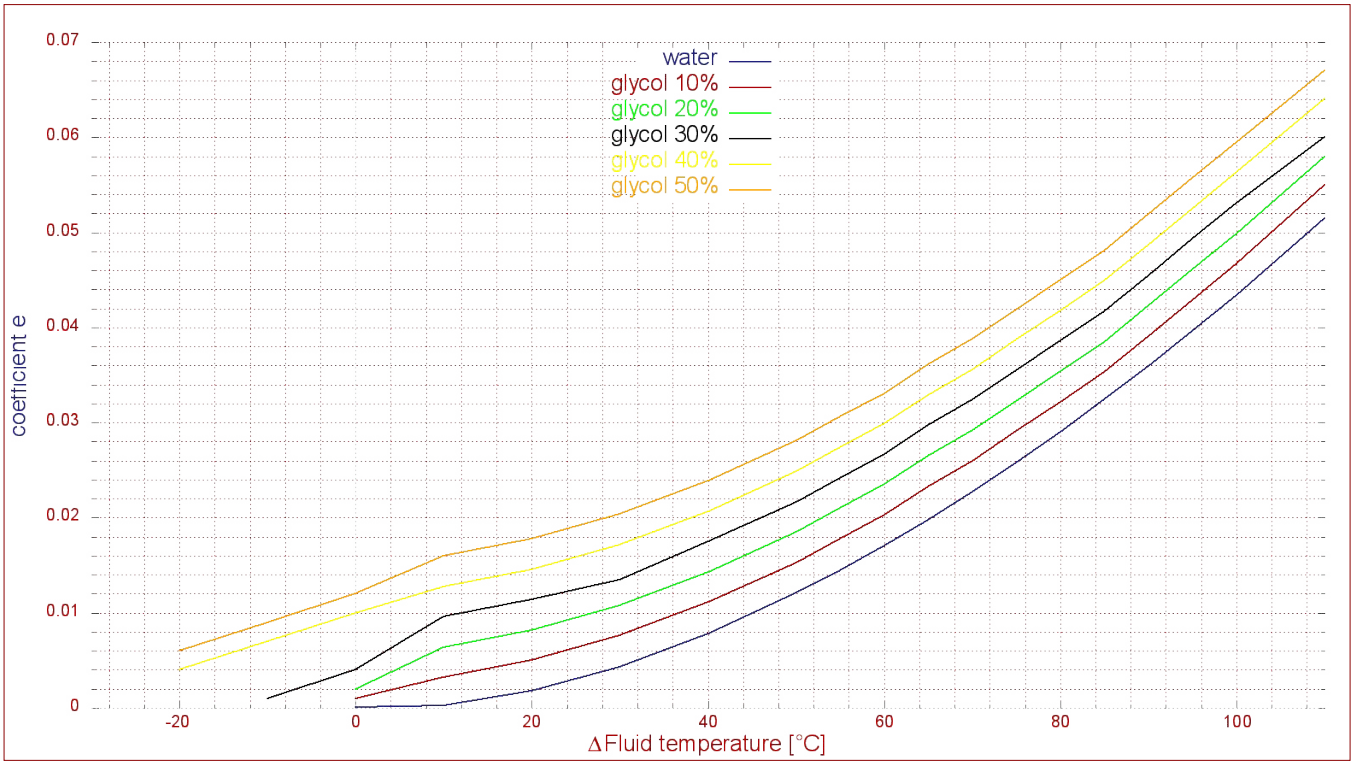
ΔT differenza temperatura acqua [°C]	coefficiente e
0	0.00013
10	0.00027
20	0.00177
30	0.00435
40	0.00782
50	0.01210
55	0.01450
60	0.01710
65	0.01980
70	0.02270
75	0.02580
80	0.02900
85	0.03240
90	0.03590
95	0.03960
100	0.04340
110	0.05150

Thermal Expansion coefficient (see table) describes the variation of specific volume of the workign fluid (water usually) with the change of temeperature, as stated: $e = f(T_{maximum}; T_{minimum}) = f(\Delta T)$

Change in temperature is with respect to a 10 °C initial temperature .

Therefore, if we consider ten litres of water undergoing a change in temperature of 80 °C corresponding to an expansion coefficient of e = 0.029, (see table), we can compute the amount of operating fluid volume increase as a consequence of the rising of the temperature: the total volume of 10.29 litres is found. Expansion vessel holds 0.29 litres of additional volume related to the heated fluid.

For many application (such as solar systems) it is employed as thermodynamic fluid a mixture of water and glycol (antifreeze sustance). Such implies a variation of the thermal expansion coefficient with the different percentage of antifreeze substance. With the following there are highlighted le values for some of these mixes:



With the increase of the percentage of glycol in the mix the same temperature difference is related to a bigger thermal coefficient.

Choosing the expansion vessel for heating systems

To set the correct volume of use for the expansion vessel let us rightly consider an isothermal quasi-static transformation. We focus on the air (or inert gas) cushion existing between the metal walls of the vessel and the membrane. In absolute pressures it must be **pV** = costant.

Given system data, be the pressures relative:

- $\mathbf{p}_{min}$ [bar] minimum system pressure
- $\mathbf{p}_{max}$ [bar] maximum system pressure; it is also the safety pressure of the heating system safety valve
- $\mathbf{p}_{st}$ [bar] hydrostatic pressure (remember the geodetic pressure in computing such value) at which the expansion vessel is installed: it is $\mathbf{p}_{st} = \rho g H$ where H stands for the height of the installation point, ρg is the specific weight of the thermodynamic fluid.
- $\mathbf{p}_{precarica}$ [bar] pressure at which the gas within the expansion vessel is subjected; usually it is suggested to set such value according with $\mathbf{p}_{precarica} = \mathbf{p}_{min} + 0.2$ bar.
- $\mathbf{V}_{impianto}$ [litres] amount of water held by the system, here assuming at the initial temperature of 10°C
- $\mathbf{V}_{esp}$ [litres] change in volume of the water due to heating (to the maximum temperature by design) acting on the operating fluid.
- $\mathbf{V}_{tot}$ [litres] total nominal volume of the expansion vessel.
- **e** coefficient of expansion (also known as thermal expansion) of the operating fluid.

N.B. : absolute pressures can be obtain as $\mathbf{p}_{assoluta} = \mathbf{p}_{relativa} + \mathbf{p}_{barometrica}$

The two states to consider are: empty vessel in which all the container volume is filled by the gas at the pre-charge pressure and full vessel in which there is a residual volume taken by the gas at the maximum pressure. According with the given assumptions we can express, recalling that $\mathbf{p}_{precharge} > \mathbf{p}_{min}$:

$$p \cdot V = costant \Longrightarrow V_{utile} = \frac{p_{max} - p_{min}}{p_{max} + p_b} \cdot V_{tot}$$

We can compute the coefficient of use $\mathbf{C}_u$ that allows to get, given the maximum and minimum pressure of the plant, the value of the volume of use for the expansion of the water,, $\mathbf{V}_{utile}$. If pre-charge pressur eis lower than the minimum pressure there is an added negative effect on the volume of the tank: a portion of the volume will be filled by the fluid at the minimum working operation pressure. To avoid such situation the $\mathbf{p}_{min}$ must be correctly calculated taking into account the height (thus the geodetic share of the hydrostatic pressure) at the installation point: most commonly $\mathbf{p}_{min} = \mathbf{p}_{st}$

Coefficient of use $\mathbf{C}_u$:

$$C_u = \begin{cases} \frac{p_{max} - p_{precarge}}{p_{max} + p_b} & \text{se } p_{precarge} \geq p_{min} \\ \frac{p_{max} - p_{precarge}}{p_{max} + p_b} \cdot \frac{p_{precarica} + p_b}{p_{min} + p_b} & \text{se } p_{precarge} < p_{min} \end{cases}$$

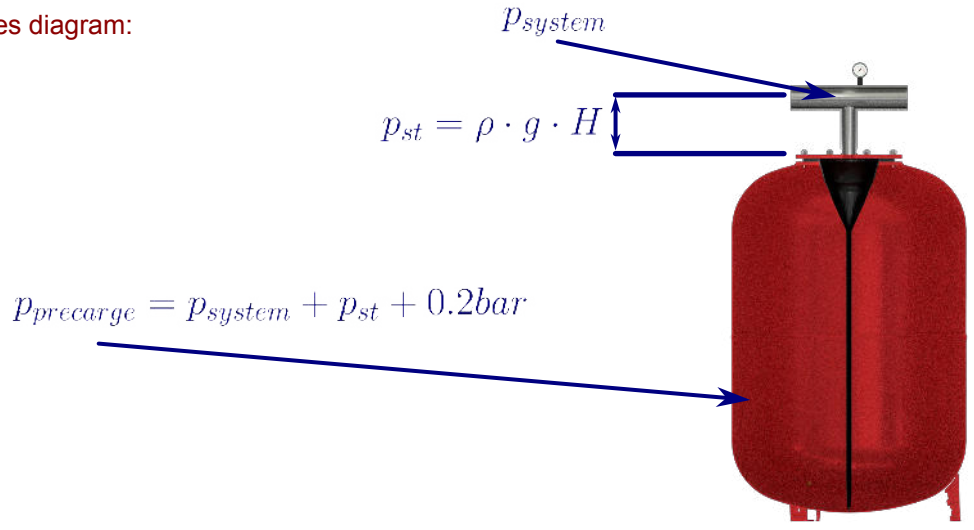
Said coefficient helps to obtain the volume of use starting from the value of the total nominal volume of the vessel, that is:: $V_{utile} = C_u \cdot V_{tot}$

Volume of use can be imposed to be equal the found expansion volume for the heating system: $\mathbf{V}_{utile} = \mathbf{V}_{esp}$. This value is calculated known the volume of the operating fluid; counting not only the piping, boiler, accessory devicese such as radiators and the likes but also a safety margin of 15% Given the maximum and minimum temperatures the thermal coefficient of the operating fluid can be found. (here the table associated will be used). It will be the system designer's task to make the correct calculation. Expansion volume can be easily estimated with:

$$V_{esp} = e \cdot V_{system} \Longleftrightarrow V_{utile}$$

Comparing these the right expansion vessel can be chosen.

Pressures diagram:



Volume V_{utile} table

The following volume of use table $\mathbf{V}_{utile}$. is shown. Mind to choos the V_{tot} of the tank rounding respect the table value. Maximum pressure for the system is limited by the pressure value of the safety valve, most commonly it is $\mathbf{p}_{max}$ = 3 bar (relative). Other common values for maximum pressure are shown. Pre-charge pressure is the minimum pressure added of 0.2 bar relative. Minimum pressure is also bond to the maximum height of the plant.

$\mathbf{p}_{précharge}$ (relative) bar	0.5	1	1.5	2	2.5	1	1.5	1.5	2	2	2.5
$\mathbf{p}_{max}$ (relativa) bar	3	3	3	3	3	4	4	4.5	4.5	5	5.5
$\mathbf{C}_u$ coefficient of use	0.625	0.500	0.375	0.25	0.125	0.600	0.500	0.545	0.455	0.500	0.417
$\mathbf{V}_{tot}$ Volume nominale Expansion vessel L	$\mathbf{V}_{utile}$ Volume utile L										
5	3.13	2.50	1.88	1.25	0.63	3.00	2.50	2.73	2.27	2.50	2.08
8	5.00	4.00	3.00	2.00	1.00	4.80	4.00	4.36	3.64	4.00	3.33
12	7.50	6.00	4.50	3.00	1.50	7.20	6.00	6.55	5.45	6.00	5.00
18	11.25	9.00	6.75	4.50	2.25	10.80	9.00	9.82	8.18	9.00	7.50
25	15.63	12.50	9.38	6.25	3.13	15.00	12.50	13.64	11.36	12.50	10.42
35	21.88	17.50	13.13	8.75	4.38	21.00	17.50	19.09	15.91	17.50	14.58
50	31.25	25.00	18.75	12.50	6.25	30.00	25.00	27.27	22.73	25.00	20.83
80	50.00	40.00	30.00	20.00	10.00	48.00	40.00	43.64	36.36	40.00	33.33
100	62.50	50.00	37.50	25.00	12.50	60.00	50.00	54.55	45.45	50.00	41.67
150	93.75	75.00	56.25	37.50	18.75	90.00	75.00	81.82	68.18	75.00	62.50
200	125.00	100.00	75.00	50.00	25.00	120.00	100.00	109.09	90.91	100.00	83.33
250	156.25	125.00	93.75	62.50	31.25	150.00	125.00	136.36	113.64	125.00	104.17
300	187.50	150.00	112.50	75.00	37.50	180.00	150.00	163.64	136.36	150.00	125.00
400	250.00	200.00	150.00	100.00	50.00	240.00	200.00	218.18	181.82	200.00	166.67
500	312.50	250.00	187.50	125.00	62.50	300.00	250.00	272.73	227.27	250.00	208.33
600	375.00	300.00	225.00	150.00	75.00	360.00	300.00	327.27	272.73	300.00	250.00
700	437.50	350.00	262.50	175.00	87.50	420.00	350.00	381.82	318.18	350.00	291.67

Cooling system expansion vessel application

Cooling or chilling systems use an hydraulic system to provide to the utlilties cool working fluid from chilling unit and back. Thus, the underling concepts are sound for these applications too, accounting that the minimum and maximum pressures must be related to the right temperature. Please take good care in choosing the working fluid: below 4 ° C, it is good use to employ glycol-water mixes or antifreeze.

The system is as a matter of fact installed at the highest temperature, thus the installation pressure is the maximum system pressure.

EXPANSION VESSEL: technical data

Expansion vessel with membrane for in-line application: compact and easy to install.

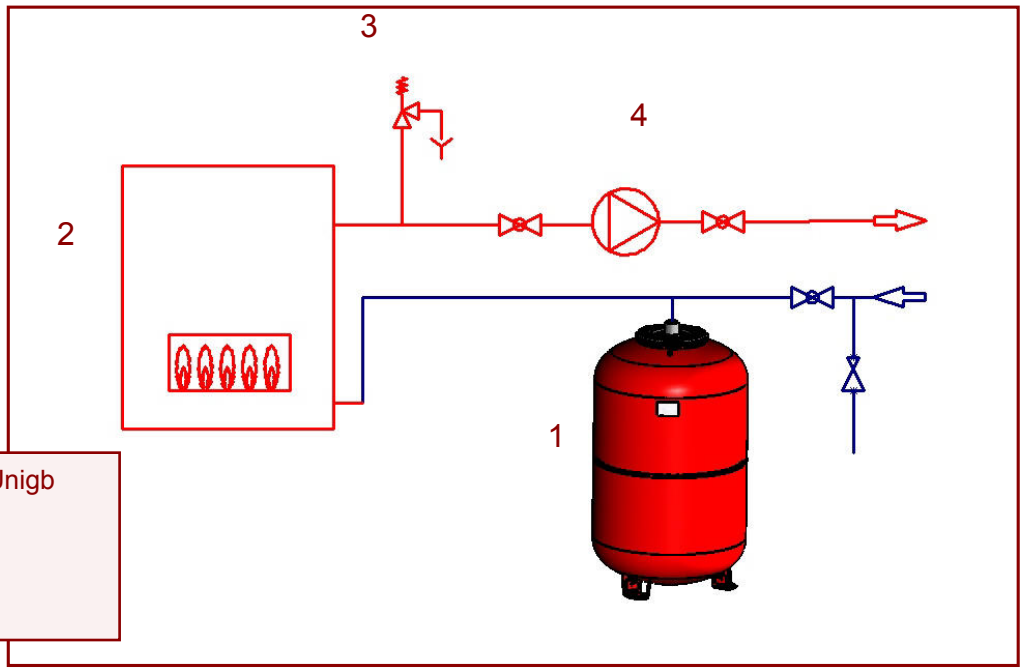
CODE	VOLUME l	PRESSURE (max) bar	SIZE D	SIZE H	CONNECTION	FOOTPRINT m^3	CERTIFICATIION
050002	5	5	210	290	3/4"	0.012	not needed CE
080002	8	5	210	330	3/4"	0.016	not needed CE
120002	12	5	210	392	3/4"	0.027	CE
180000	18	5	250	492	3/4"	0.042	CE
240000	24	5	360	335	3/4"	0.042	CE

Vertical expansion vessel with membrane: small footprint and highest reliability allowing the correct operation thanks to the bag shaped membrane.

CODE	VOLUME l	PRESSURE (max) bar	SIZE D	SIZE H	CONNECTION	FOOTPRINT m^3	CERTIFICATION
500000	50	6	380	770	1"	0.095	CE o.n. 0948
800000	80	6	450	851	1"	0.145	CE o.n. 0948
101000	100	6	450	950	1"	0.160	CE o.n. 0948
151000	150	6	580	750	1" 1/2	0.260	
201000	200	6	580	1200	1" 1/2	0.380	
251000	250	6	580	1200	1" 1/2	0.420	
301000	300	6	580	1390	1" 1/2	0.500	
401000	400	6	750	1080	1" 1/2	0.600	
501000	500	6	750	1300	1" 1/2	1.000	
601000	600	6	800	1340	1" 1/2	1.250	
701000	700	6	800	1580	1" 1/2	1.500	

Expansion vessel with diaphragm membrane: small footprint with a specially designed diaphragm membrane.

CODE	VOLUME l	PRESSURE (max) bar	SIZE D	SIZE H	CONNECTION	FOOTPRINT m^3	CERTIFICATION
350001	35	5	380	392	3/4"	0.072	CE o.n. 0948
500001	50	5	380	485	3/4"	0.095	CE o.n. 0948
800001	80	5	450	692	3/4"	0.145	CE o.n. 0948
101001	100	5	450	763	3/4"	0.160	CE o.n. 0948



1 – Expansion vessel Unigb
2 – boiler
3 – Safety valve
4 – Circulator Pump

Numeric sizing example

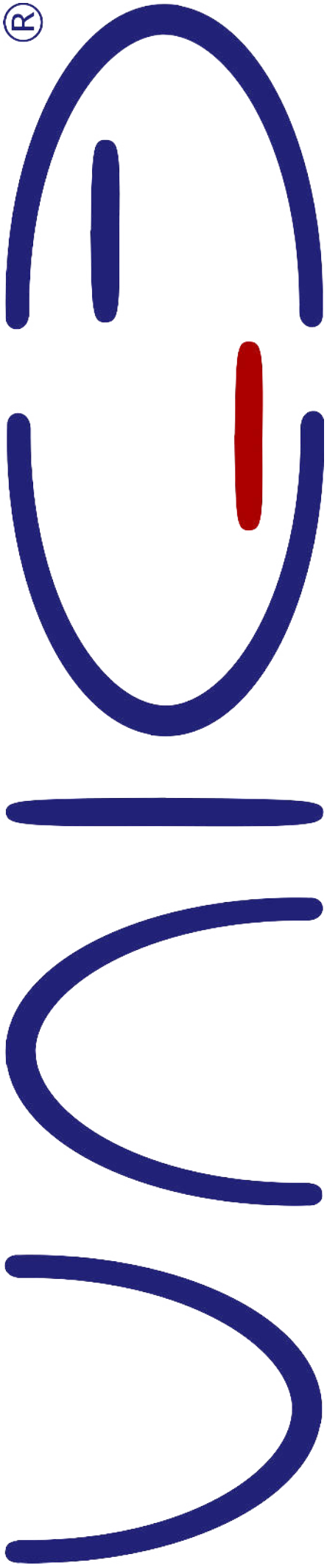
Given the value for a plant:

- $\mathbf{V}_{system}$ = 400 L,volume of water used in the plant at the installation temperature $\mathbf{T}_1$.
- $\mathbf{T}_1$ = 10°C, water installation temperature (when system not in use).
- $\mathbf{T}_2$ = 90°C, working point temperature for the water when system is in operation (maximum fluid temperature).
- **e** = f(ΔT) = 0.029, coefficient of expansion (from graph with ΔT = 90 -10 = 80°C).
- $\mathbf{p}_{max}$ = 3bar, relative pressure of the safety valve.
- $\mathbf{p}_{precarica}$ = 1bar, relative pressure of the expansion vessel pre-charge.

The need of the plant can be found with:

$$V_{esp} = e \cdot V_{system} = 11.6L \approx 12L$$

Verifying with the table of the volume of use the nominal corresponding volume: the column with the assumed pressure values for the system gives the volume of use to be chosen 12.50 L (the closest to the expansion volume computed) that is for this example of a tank that holds a nominal volume of $\mathbf{V}_{tot}$ = 25 L.



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