OPERATING LIMITS

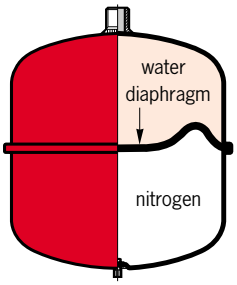
Static head up to:	**40 m CE**
Temperature range:	**– 10° to + 110°C**
Operating pressure:	**4 and 10 bar**
Test pressure:	**25 bar***

** according to models, see table.*

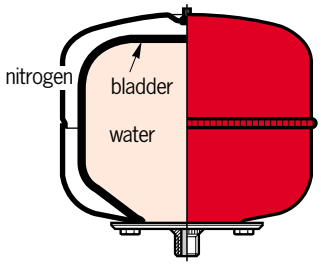
VESSELS

DIAPHRAGM OR BLADDER TANKS

For expansion and pressure boosting applications



Principle of the diaphragm vessel.



Principle of the bladder vessel.

APPLICATIONS

EXPANSION
For maintaining the pressurization of systems subject to temperature variations by compensation of water expansions.
– For central heating, cooling and air-conditioning systems.

PRESSURE BOOSTING
• **Direct pressure boosting:**
A small vessel maintains the pressure in the installation when no delivery is required and protects the pressure controller against pressure variations and water expansion.

• **Conventional pressure boosting:**
A large vessel with a large useful water reserve covers the low deliveries required by the installation.

• **STAINLESS STEEL** secondary water version, used **when water quality is imperative**

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VESSELS

BENEFITS

- **Closed vessels removing any risk of evaporation and frost.**
- **Diaphragm in natural rubber, food processing grade, easily interchangeable.**
- **Eliminates the need for expensive air replacement systems.**
- **Speedy, easy installation.**
- **No maintenance.**
- **Large useful water reserve avoiding starting the pump too often in pressure boosting configuration.**
- **Vessels approved by the W.R.C. (Water Research Center) and conform to standard DIN 4807.**

DESIGN

Horizontal or vertical closed vessel.

EPDM or Butyl bladder. Butyl bladder, moulded in a single piece and secured inside the tank in one or two points according to capacities.

The bladder or diaphragm ensures total separation between water and air. It is protected by a strainer at the water inlet.

The vessel enveloppe is coated (inside and outside) with an anti-corrosion paint.

Inflating valve, standard car type, protected by a cap.

Vessels with 2 to 24 litres' capacity are mounted directly on the piping; other models are to be placed on the ground.

Vessels are factory tested or submitted to Mines Administration testing.

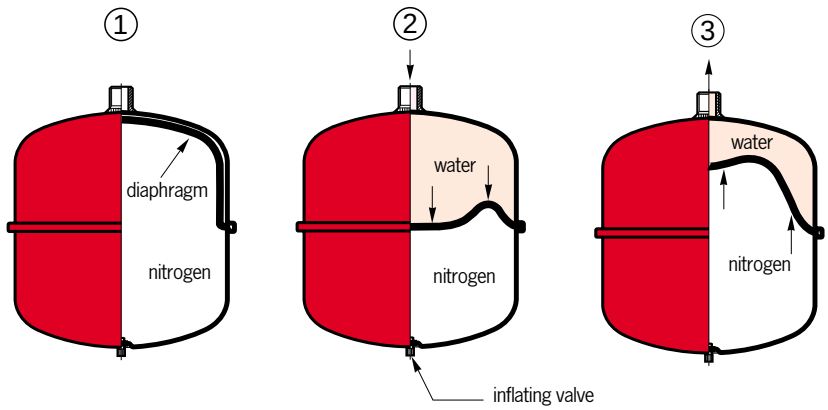
THEORETICAL INSTALLATION VOLUME

Conversion of kW into litres:

heating body	for 1 kW	for installations
Convectors and steel radiators	7 litres	
Cast iron radiators	10 litres	≤ 581 th/hr
Hot plates	8,5 litres	
Any heating body	7 litres	> 581 th/hr

1 th/hr = 1000 kcal = 1.163 kW.

EXPANSION: OPERATING PRINCIPLE



Before the increase in temperature, the pressure inside the vessel balances the installation static pressure. The nitrogen fills the whole vessel volume. The diaphragm remains stuck against the wall.

During the increase in temperature, the water volume in the system increases under the effect of expansion and compresses the diaphragm. The nitrogen volume decreases and the pressure in the installation increases. After the increase in temperature, the final pressure nears the calibration pressure of the safety valve.

When the boiler is shut down, the water in the system cools down and the installation pressure decreases. The water contained in the vessel returns to the system to restore the pressure and the water volume.

In cooling and air-conditioning installations:
- when the system cools down, the water volume decreases; the expansion vessel returns the water to the system to maintain the pressure.
- upon shutdown, the water at ambient temperature expands, the increased volume of water enters the vessel and compresses the diaphragm.

BASIS FOR COMPUTATION

HOT WATER SYSTEM

1 - Expansion volume:

$$V\,exp = Vt \times (Cm - Cr)$$

where:

Vt : total installation volume

Cm : Expansion coefficient at average operating temperature, i.e.:

$$\frac{T°\ \text{boiler outlet} + T°\ \text{return}}{2}$$

Cr : Expansion coefficient at filling temperature (10 ° to 12 °C)

2 - Total vessel volume:

$$V = \frac{Vt \times (Cm - Cr)}{1 - \frac{P1}{P2}}$$

where:

P1 : effective inflating pression corresponding to the static head + 1 bar*

P2 : valve cracking pressure + 1 bar*

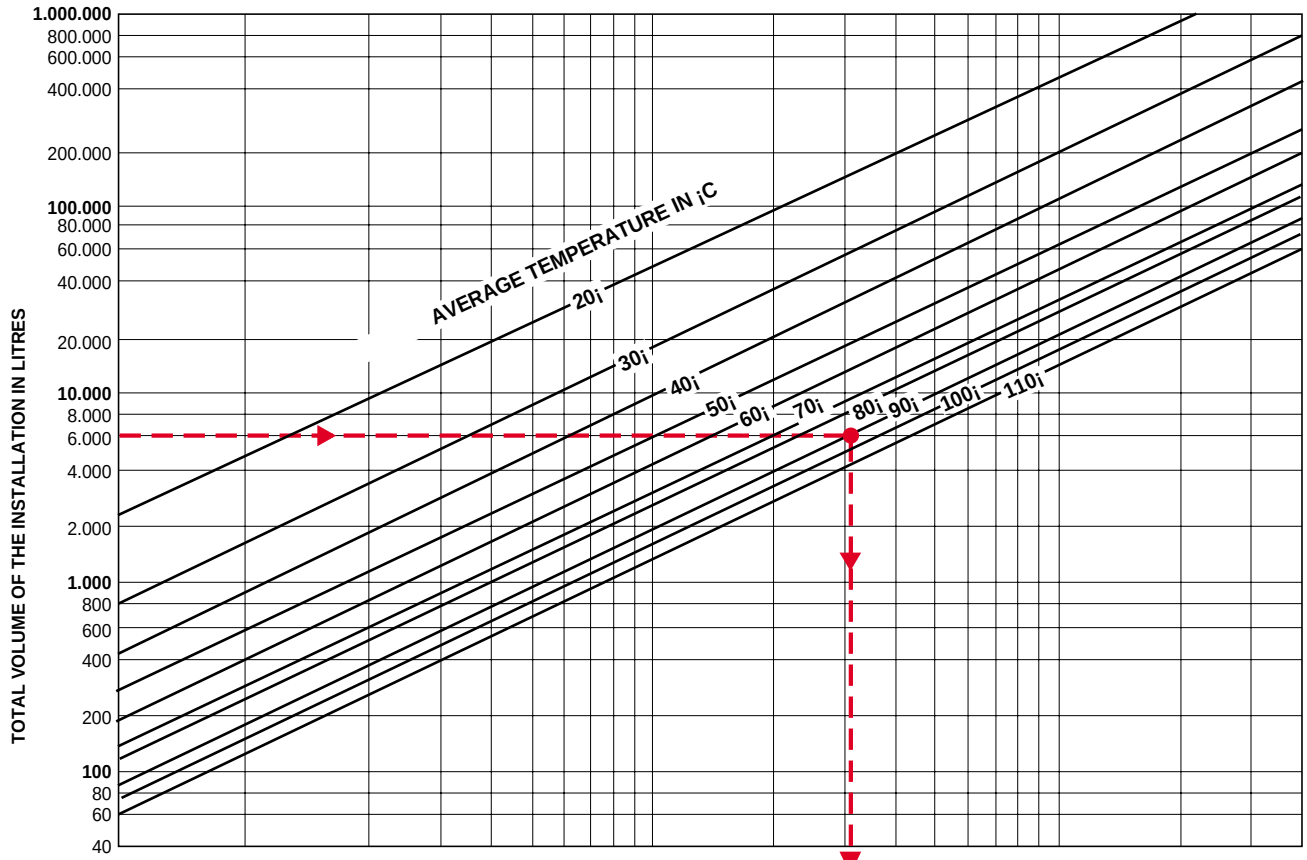
* Corresponding to the atmospheric pressure.

WATER EXPANSION COEFFICIENTS

temperature °C	coefficient	temperature °C	coefficient
10°	0.0004	75°	0.0256
20°	0.0018	80°	0.0288
30°	0.0044	85°	0.0322
40°	0.0079	90°	0.0357
50°	0.0119	95°	0.0394
55°	0.0143	100°	0.0431
60°	0.0169	105°	0.0472
65°	0.0196	110°	0.0513
70°	0.0225		

Note: volumes of still cold water submitted to expansion require a food-processing grade expansion system.

APPLICATION: EXPANSION



3 bar	5m	6	8	12	18	24	35	50	80	100	150	200	250	300	500	750	1000	1500	2000	3000	4000	
3	10		8	12	18	24	35	50	80	100	150	200	250	300	500	750	1000	1500	2000	3000	4000	
3	15			12	18	24	35	50	80	100	150	200	250	300	500	750	1000	1500	2000	3000	4000	
4	20			12	18	24	35	50	80	100	150	200	250	300	500	750	1000	1500	2000	3000	4000	
4.5	25				24		50		100		150	200		300	500	750	1000	1500	2000	3000	4000	
5	30				24		50		100		150	200		300	500	750	1000	1500	2000	3000	4000	
5.5	35				24		50		100		150	200		300	500	750	1000	1500	2000	3000	4000	
6 bar	40m			24		50		100		150		200		300	500	750	1000	1500	2000	3000	4000	

Operating pressure
4/7 bar
10/15 bar

Static heads in m

Valve cracking pressures in bar (or valve calibration).

NOTE: Above 500 litres, use multiples or add vessels.
For expansion of secondary water systems, hot or cold, use of food-processing grade vessels is mandatory.
These vessels also ensure the safety of systems filled with water and 30% glycol.

VESSELS

APPLICATION: CONVENTIONAL PRESSURE BOOSTING

PRESSURES IN BAR		VESSEL VOLUME IN LITRES												
Pe	Pd	8	18	24	50	60	100	200	300	500	750	1000	1500	2000
1.5	2.5	2.2	4.9	6.5	13.6	16.3	27.1	54	81	136	204	271	407	543
1.5	3	2.9	6.4	8.6	17.8	21.4	35.6	71	107	178	267	356	534	713
2	3	1.9	4.3	5.7	11.9	14.3	23.8	48	71	119	178	238	356	475
2	3.5	2.5	5.7	7.6	15.8	19.0	31.7	63	95	158	238	317	475	633
2.5	3.5	1.7	3.8	5.1	10.6	12.7	21.1	42	63	106	158	211	317	422
2.5	4	2.3	5.1	6.8	14.3	17.1	28.5	57	86	143	214	285	428	570
3	4	1.5	3.4	4.6	9.5	11.4	19.0	38	57	95	143	190	285	380
3	4.5	2.1	4.7	6.2	13.0	15.5	25.9	52	78	130	194	259	389	518
3	5	2.5	5.7	7.6	15.8	19.0	31.7	63	95	158	238	317	475	633
3.5	4.5	1.4	3.1	4.1	8.6	10.4	17.3	35	52	86	130	173	259	345
3.5	5	1.9	4.3	5.7	11.9	14.3	23.8	48	71	119	178	238	356	475
3.5	5.5	2.3	5.3	7.0	14.6	17.5	29.2	58	88	146	219	292	438	585
4	5	1.3	2.9	3.8	7.9	9.5	15.8	32	48	79	119	158	238	317
4	5.5	1.8	3.9	5.3	11.0	13.2	21.9	44	66	110	164	219	329	428
4	6	2.2	4.9	6.5	13.6	16.3	27.1	54	81	136	204	271	407	543
4.5	5.5	1.2	2.6	3.5	7.3	8.8	14.6	29	44	73	110	146	219	292
5	7	1.9	4.3	5.7	11.9	14.3	23.8	48	71	119	178	238	356	475
5	8	2.5	5.7	7.6	15.8	19.0	31.7	63	95	158	238	317	475	633
6	9	2.3	5.1	6.8	14.3	17.1	28.5	57	86	143	214	285	428	570
7	10	2.1	4.7	6.2	13.0	15.5	25.9	52	78	130	194	259	389	518
8	11	1.9	4.3	5.7	11.9	14.3	23.8	48	71	119	178	238	356	475
10	14	2.0	4.6	6.1	12.7	15.2	25.3	51	76	127	190	253	380	507
12	16	1.8	4.0	5.4	11.2	13.4	22.4	45	67	112	168	224	335	447

Triggering pressure (Pd)

Cut-in pressure (Pe)

NOTE
Vessel capacity is determined according to the pump delivery, cut-in and triggering pressures, and the number of start-ups per hour.

BASIS FOR COMPUTATION

Determine the vessel volume according to the cut-in pressure (Pe), triggering pressure (Pd) and useful water reserve.

Compute the useful water reserve using the following general formula:

$$RU = 16.5 \times \frac{Q}{n}$$

where:
Q : average delivery of a pump l/min.
n : max. number of start-ups per hour (11 to 15).

Example:
Q = 9 m^3/hr, i.e. 150 l/min.
n = 11 start-ups/hour max.
Pe = 2 bar.
Pd = 3.5 bar.
Useful water reserve (RU):

$$RU = 16.5 \times \frac{150}{11} = 225 \text{ litres}$$

In the table opposite, look for the vessel volume corresponding to a useful water reserve of 225 litres (or the nearest value), according to pressures Pe and Pd.

Vessel volume:
- 750 litres

Actual useful water reserve:
- 238 litres

Remark:
Choose the biggest difference between Pe and Pd, which allows to reduce the vessel volume for a same useful water reserve.

PRESSURE BOOSTING

0.16 l

GALVANIZED VESSELS

The use of these vessels is subject to very strict hygiene rules,
CONSULT US
BEFORE USE.

- 100 to 2000 l - 4/7 bar.
- Dimensions available upon request.

DIMENSIONS

FIG. 1
for connection onto piping

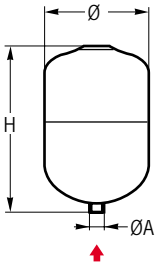


FIG. 2

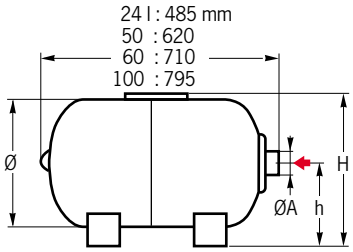
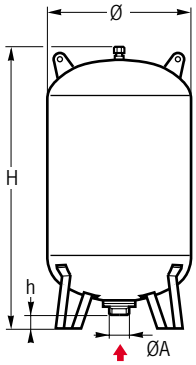


FIG. 3



All 12/18-bar and 10/15-bar vessels are tested and stamped by the Mines Administration.

CAPACITY litres	ORDER REFERENCE	FIG.	WITH BLADDER	Ø mm	H mm	h mm	ØA	MASS kg	PRESSURE (in bar) operating	test
12 S.S.	**066300**	1	●	220	390	–	G 1"	3.2	4	12
20 S.S.	**066301**	1	●	270	420	–	G 1"	3.5	4	12
8	**066304**	1	●	220	310	–	G ¾"	2.5	4	12
18	**066305**	1	●	260	370	–	G ¾"	3.5	4	12
24	**066306**	1	●	260	485	–	G ¾"	5.5	4	12
24	**066309**	2	●	260	285	134	G 1"	5.5	4	12
50	**066310**	2	●	380	410	189	G 1"	11.5	4	12
60	**4019423**	2	●	380	410	189	G 1"	14	4	12
100	**066311**	2	●	460	490	229	G 1"	19.5	4	12
50	**066307**	3	●	380	715	170	G 1"	10.5	4	12
100	**066308**	3	●	460	880	200	G 1"	20	4	12
200	**020845**	3	●	630	1020	200	G 1½"	37	4	7
300	**020846**	3	●	630	1375	200	G 1½"	46	4	7
500	**020847**	3	●	630	2025	200	G 1½"	63	4	7
50	**019103**	3	●	400	400	170	G 1"	22	10	15
100	**020848**	3	●	630	760	200	G 1½"	40	10	15
200	**020849**	3	●	630	1095	200	G 1½"	60	10	15
300	**018736**	3	●	630	1435	200	G 1½"	85	10	15
500	**018737**	3	●	630	2065	200	G 1½"	130	10	15
750	**020850**	3	●	850	1900	200	G 1½"	210	10	15
1000	**020851**	3	●	850	2310	200	G 1½"	245	10	15
1500	**020852**	3	●	1000	2470	200	G 1½"	350	10	15
2000	**020853**	3	●	1000	3130	200	G 1½"	460	10	15
ANTI-HAMMER VESSELS*										
0,16	**066302**	1	●	85	110	–	G ¼"	0.3	15	25
VESSELS SPECIFIC TO PRESSURE BOOSTERS										
8	**020938**	1	●	200	308	–	G ¾"	2.5	8	12
24	**064615**	1	●	250	560	–	G 1"	7	12	18

Operating temperature –10 °C to +110°C max. (60°C for anti-hammer vessels).
* Also exist in 5-litre capacity.

VESSELS

DIMENSIONS

EXPANSION

FIG. 1
for connection onto piping

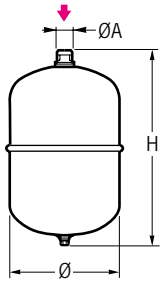


FIG. 2

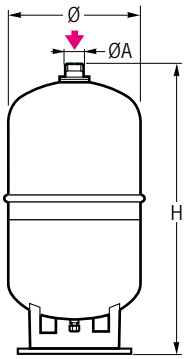
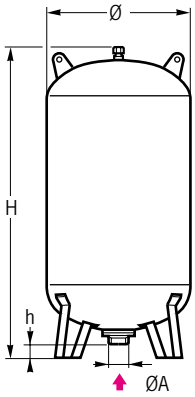


FIG. 3



Operating temperature –10 °C to +110 °C max.

CAPACITY litres	ORDER REFERENCE	FIG.	WITH DIAPHRAGM	WITH BLADDER	Ø mm	H mm	h mm	ØA	MASS kg	PRESSURE (in bar) operating	test
6	**066284**	1	●		245	248	–	G ¾"	2	4	7
8	**066285**	1	●		245	275	–	G ¾"	2.5	4	7
12	**066286**	1	●		285	320	–	G ¾"	3	4	7
18	**066287**	1	●		285	390	–	G ¾"	4	4	7
24	**066288**	1	●		325	420	–	G ¾"	5	4	7
35	**066289**	1	●		380	465	–	G 1"	7	4	7
50	**066290**	2	●		380	650	–	G 1"	10	4	7
80	**066291**	2	●		460	700	–	G 1"	12	4	7
100	**066292**	2	●		460	810	–	G 1"	16.5	4	7
150	**4000155**	2	●		510	970	–	G 1"	24	4	7
250	**4000156**	2	●		590	1230	–	G 1"	40	4	7
200	**020845**	3		●	630	1020	200	G 1½"	37	4	7
300	**020846**	3		●	630	1375	200	G 1½"	46	4	7
500	**020847**	3		●	630	2025	200	G 1½"	63	4	7
50	**019103**	3		●	400	400	170	G 1"	22	10	15
100	**020848**	3		●	630	760	200	G 1½"	40	10	15
200	**020849**	3		●	630	1095	200	G 1½"	60	10	15
300	**018736**	3		●	630	1435	200	G 1½"	85	10	15
500	**018737**	3		●	630	2065	200	G 1½"	130	10	15
750	**020850**	3		●	850	1900	200	G 1½"	210	10	15
1000	**020851**	3		●	850	2310	200	G 1½"	245	10	15
1500	**020852**	3		●	1000	2470	200	G 1½"	350	10	15
2000	**020853**	3		●	1000	3130	200	G 1½"	460	10	15

The 35-litre vessel is supplied with a bracket for wall mounting (with 2 holes Ø 11 - distance b/c 250 mm).

FEATURES

a) Installation

In expansion configuration, on boiler return line, before the circulating pump(s) if installed on the return line.
In pressure boosting configuration, on piping connected to the discharge collector.

Charge pressure.
(Check once a year.)

Charge pressure shall be slightly below:
– the system pressure (after venting), in expansion configuration;
– the cut-in pressure less approx. 0.2 bar, in pressure boosting configuration.

Max. charge limit.

– 3 bar for 4/7- and 4/12-bar vessel,
– 5 bar for 10/15-bar vessel.
Make sure the total pressure at vessel inlet is lower than the max. service pressure.

IMPORTANT

Safety valve compulsory on vessels tested by the Mines Administration.

b) Packaging

Vessels are pre-charged with nitrogen (1 or 1.5 bar) and delivered in a cardboard packing or a plastic bag, depending on models.
A plate stamped by the Mines Administration is affixed on 'Mines-tested' vessel front panel.

c) Maintenance

Standard bladder replacement.

RECOMMENDED...

... ACCESSORIES

- Safety valves with or without pressure gauge.
- Pressure gauge.
- Automatic air vent...

NOTE

For higher installation characteristics, see data sheets specific to expansion modules: EXPANSON.

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