



## *Bladder Surge Tanks*

### *Bladder Surge Tanks Introduction*

#### *Pressure transients (Surges)*

Pressure transient is a phenomenon which can be described as waves propagated in both positive and negative magnitude. These transients are caused by rapid change in flow velocity accompanied by a change in pressure. Rapid change in flow velocity may be caused by events such as pipe bursts, sudden changes in demand, sudden pump start-ups and shut-offs, opening and closing of fire hydrants, quick closing and opening of in-line isolating valves, flushing and draining operations, fire flow, feed tank draining, and other similar events.

Control of pressure transients should be one of the main concerns of the hydraulic engineer during the process of system design. Pressure transients can cause cracks and unseen small breaks in buried pipelines, pipe fittings and accessories and also can cause severe pipe ruptures and pipe bursts.

#### *Bladder Surge Vessel*

A Bladder Surge Vessel is a surge control device installed with a butyl rubber bladder. A pre-charge pressure is calculated to give the required elasticity to push the water into the system following a pump trip. As there is no contact between the compressed air and the water, there is no dissolution. Thus, there is no requirement for a permanent regulation system including compressors, etc. Once the vessel has been commissioned and the correct pre-charge has been introduced, the vessel will operate automatically, emptying when called upon and refilling with the return waves until naturally reaching its steady state balance.



## Bladder Vessel Concept

The vessels can be installed either horizontally or vertically.

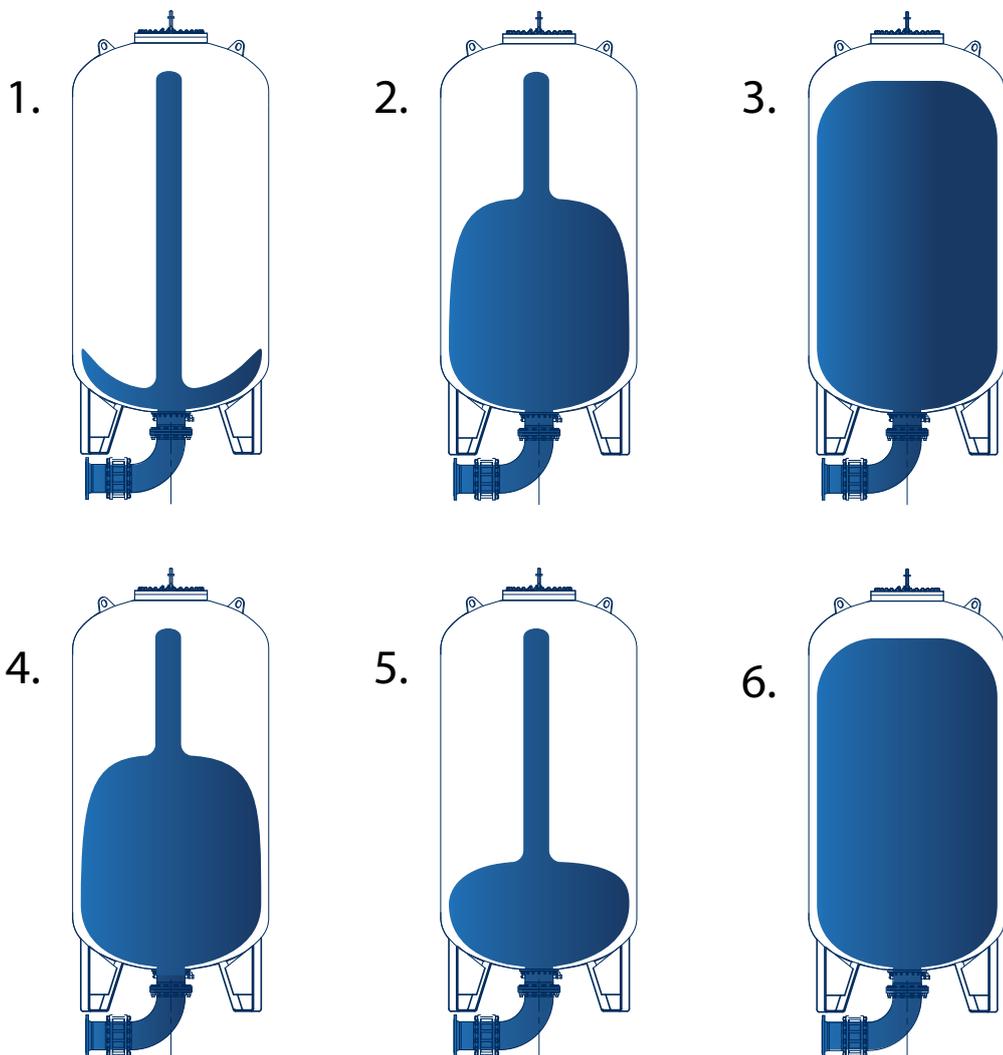
The vessels are treated internally with food quality epoxy paint for corrosion protection and externally according to client specification.

In order to verify the water level in the vessel, it is normally equipped with a level indicator as well as a manometer to verify the initial pre-charge pressure.

If it is hydraulically required, the vessel is equipped with a non return valve or an incorporated bypass in order to reduce the over pressure by consuming the energy of the flow reversal.

## Operation

1. Initially, the pre-charge pressure must be adjusted to the value resulting from the hydraulic analysis (pre-charge can be either compressed air or nitrogen). At this stage, the bladder contains no volume at all.
2. When the gate valve is opened, the water will enter the vessel under static conditions and begin to compress the gas (static pressure is always higher than pre-charge pressure).
3. The water entering the vessel will further compress the pre-charged gas until a balance between the liquid and the compressed gas is reached.
4. Immediately after a pump trip, the pressure in the line will start to decrease and the elastic energy in the vessel will cause the discharge of water from the vessel into the line. This prevents dangerously low pressure along the pipe.
5. As the pressure may become very low, the flow will reverse. Water will then enter into the vessel via a reduced diameter (drilled non return valve or bypass) if hydraulically required. Several oscillations may occur before static state is reached.
6. When the pump restarts, the vessel will continue to fill until dynamic steady state is reached and it is then once again prepared for the next pump trip.



# Large vessel - 3000 to 35,000 L

Large vessel with food quality butyl bladder.

## PAINT

Internal. Epoxy paint without solvents, colour white, thickness 100 microns.

External. Polyurethane lacquer colour orange and anti corrosion polyurethane finishing, thickness 50 microns.

## BLADDER

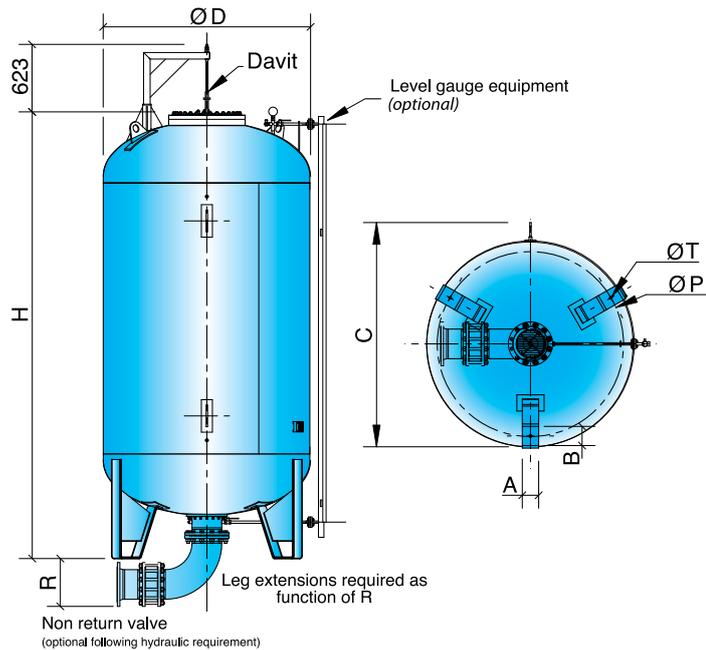
Interchangeable food quality butyl.

## WARRANTY

Not including parts subject to wear and tear and subject to use under normal conditions.

## PACKING

Craddles.



Capacity L	Ø D	H	No. of legs	P	T	A (mm)	B (mm)	C (mm)	Davit
3000	1200	3800	3	1050	26	150	125	1370	No
4000	1200	4100	3	1050	26	150	125	1370	No
5000	1500	3500	3	1300	26	150	178	1670	No
6000	1500	4300	3	1300	26	150	178	1670	No
7000	1500	4800	3	1300	26	150	178	1670	No
8000	1500	5300	3	1300	26	150	178	1670	No
9000	1500	5800	3	1300	26	150	178	1670	No
10000	1900	4900	4	1700	26	150	178	2070	Yes
10000	2100	3800	4	1800	26	150	276	2270	Yes
12000	1900	5600	4	1700	26	150	178	2070	Yes
12000	2100	4400	4	1800	26	150	276	2270	Yes
15000	1900	6300	4	1700	26	150	178	2070	Yes
15000	2100	5300	4	1800	26	150	276	2270	Yes
18000	1900	7800	4	1700	26	300	300	2070	Yes
18000	2100	6100	4	1800	26	300	300	2270	Yes
20000	1900	8600	4	1700	26	300	300	2070	Yes
20000	2100	6700	4	1800	26	300	300	2270	Yes
25000	1900	10400	4	1700	26	300	300	2070	Yes
25000	2100	8200	4	1800	26	300	300	2270	Yes
25000	2500	6000	4	2000	26	500	500	2670	Yes
30000	2100	9700	4	1800	26	300	300	2270	Yes
30000	2500	7200	4	2000	26	500	500	2670	Yes
35000	3000	6100	4	2550	26	500	500	3170	Yes

Contact us for upper capacities. The dimensions shown are indicative and can be modified without warning.

# Large vessel - 3000 to 70,000 L

Large vessel with food quality butyl bladder.

## PAINT

Internal. Epoxy paint without solvents, colour white, thickness 100 microns.  
External. Polyurethane lacquer colour orange and anti corrosion polyurethane finishing, thickness 50 microns.

## BLADDER

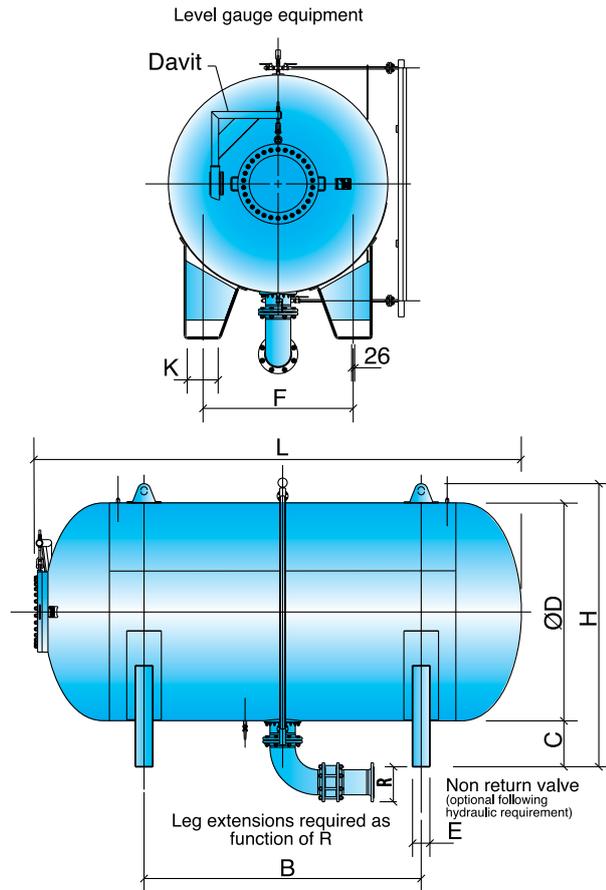
Interchangeable food quality butyl.

## WARRANTY

Not including parts subject to wear and tear and subject to use under normal conditions.

## PACKING

Craddles.



Capacity L	Ø D	L	H	B (mm)	E (mm)	F (mm)	K (mm)	C (mm)	Davit
3000	1200	3010	1770	1600	150	900	167	400	No
4000	1200	3800	1770	2400	150	900	167	400	No
5000	1500	3170	2070	1700	150	1200	158	400	No
6000	1500	4024	2070	2200	150	1200	158	400	No
7000	1500	4480	2070	2500	150	1200	158	400	No
8000	1500	4970	2070	3200	150	1200	158	400	No
9000	1500	5470	2070	3700	150	1200	158	400	No
10000	1900	4240	2470	2200	150	1300	268	400	Yes
10000	2100	3550	2670	1600	300	1600	328	400	Yes
12000	1900	4800	2470	3000	150	1300	268	400	Yes
12000	2100	4150	2670	2200	300	1600	328	400	Yes
15000	1900	5920	2470	3700	150	1300	268	400	Yes
15000	2100	4940	2670	3000	300	1600	328	400	Yes
18000	1900	7200	2470	5200	150	1300	268	400	Yes
18000	2100	6540	2670	3900	300	1600	328	400	Yes
20000	1900	7740	2470	5500	150	1300	268	400	Yes
20000	2100	6340	2670	4400	300	1600	328	400	Yes
25000	2100	7800	2670	5500	300	1600	328	400	Yes
25000	2500	5560	3300	3150	500	1900	500	590	Yes
30000	2100	9400	2670	5700	300	1600	300	400	Yes
30000	2500	6840	3300	4200	500	1900	500	590	Yes
35000	2500	7960	3300	5400	500	1900	500	590	Yes
35000	3000	5830	3800	3000	500	1900	500	590	Yes
40000	3000	6430	3800	3600	500	1900	500	590	Yes
50000	3000	7830	3800	5000	500	1900	500	590	Yes
60000	3000	9330	3800	6000	500	1900	500	590	Yes
70000	3000	10830	3800	7500	500	1900	500	590	Yes

Contact us for upper capacities. The dimensions shown are indicative and can be modified without warning.