Alpine Surge Vessels

Address: 272 Bath Street Glasgow G2 4JR Cell: +44 (0) 776348 8809: Land: +44 (0) 1369 760423:
Email: john@afcvalves.co.uk: Web: www.afcvalves.co.uk

AFC SURGE CONTROL VESSELS

Alpine Surge Control Vessels

Alpine Flow Control UK Limited (AFC) have since its inception and before, had a major involvement in reducing water hammer reduction occurrences. Over the years products have been chosen to this end, and particularly with its core products being Automatic Control valves, it has put AFC in a position to offer all the traditional products to solve most hydraulic and Water hammer problems. AFC have a close relationship with Variant Air Valves SA who manufacture a very wide and innovative range of Air valves. They have an Applications Engineering department who specialize in Air valve sizing and placement with their advanced software. They also run the Surge 2020 software program and have a close working relationship with Prof. Srinivasa who is one of the developers of this software. It can be said with confidence that this is one of the most advanced Surge Software packages in the world and in fact used by numerous South African Engineers and Universities. Because of the numerous projects done by the Variant Engineering department, one can rest assured that the ultimate solution will be optimized. AFC offers the following product solutions for Water Hammer reduction.

Surge Tanks of both the Bladder and Compressor type.

Air valves The Variant air valves, which have the best Non-Slam closing characteristic of any available as it has been properly verified by the Water Hammer software. In the South African market most of the available products have been proven to close too late and have little effect as Non-slam closing valves.

Control Valves The Alpine ACV Control valve has proven itself as one of the most robust control valves and very suitable for African conditions. We offer various options of Surge Relief valve including Surge Anticipating, Gas Loaded Diaphragm and Power failure Relief with UPS Back-up.

Check Valves AFC has a wide range of check valves in its portfolio including the most popular Nozzle check for anti water hammer fast closing with lowest pressure drop. Also for larger applications on Raw water and sewage, a range of Tilting Disc check valves with counterweight and Hydraulic dampers are available.

Overall, AFC is in a position to offer complete and optimized solutions for any Water Pumping, Distribution and storage.

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Surge Vessels

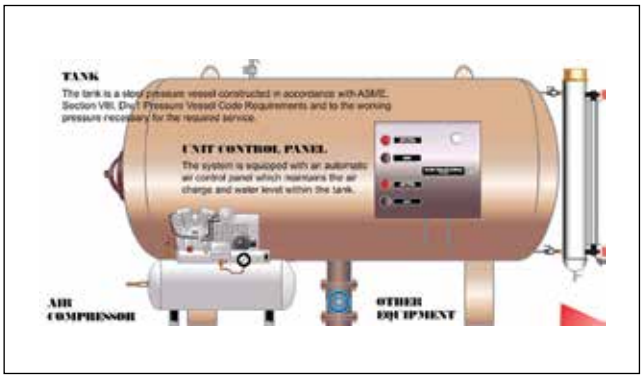
The rest of this catalogue shows the various options available and best practices. AFC have chosen to partner with H & H from Portugal, who have been in this industry for 40 years. Since 2015 a large number of H&H tanks have been supplied and commissioned by AFC.

Surge vessels are available in two broad categories ie Bladder Surge Vessels and Compressor Surge vessels

Bladder Surge Vessels

No dissolution of air into water - Liquid and gas are separated by a bladder

- Butyl rubber bladder approved for drinking water
- No electricity required - No permanent regulation system
- Self-regulation system – No need for complex controls – cuts operating costs
- Portable compressor will be sufficient to maintain pre-charge pressure in case of necessity
- No corrosion of vessel interior as water is NOT in contact with the vessel.
- Flexible selection of location for the vessel
- Reliable Hydro-pneumatic solution
- Low maintenance



Compressor Vessels

Dissolution of air into water

- Dissolved air will show up elsewhere in the system
- Prone to corrosion due to air-water interface
- Complicated System of Controls which must all function

n Compressor
n Measuring equipment
n Alarm systems
n Control panel
n Air receiver

- Highly restricted location
- Need for electricity
- Backup generator
- Constant maintenance
- Oil injection to ensure compressor efficiency - contact with drinkable water.

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Company

Henriques & Henriques, S.A., which was set up in 1980, is part of the Henriques SGPS group and specializes in the production and marketing of metallic tanks, intended for storing liquid fuels, LPG and compressed air, as well as surges vessels and filters for water treatment.
Our high-tech production lines and highly qualified staff, enable our company to provide an effective and professional response to all of our commitments.

Competitiveness, rigor and quality, are the principles that we, as an organization, have long supported. Therefore, we are very pleased to learn that we are highly recognized by our customers, from both domestic and foreign markets. We distinguish ourselves by establishing and maintaining a relationship of proximity with our customers. Our goal is to establish satisfactory and long-lasting business relations.

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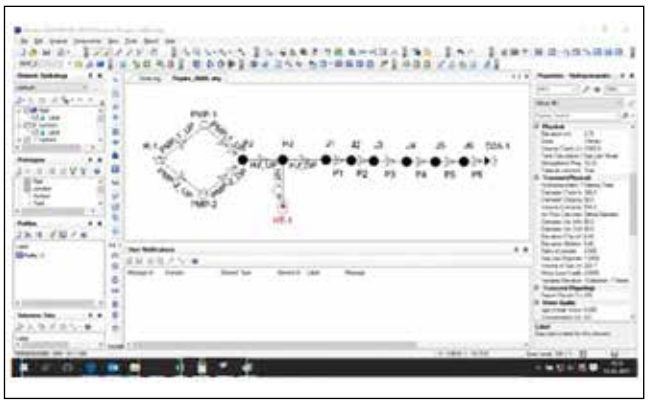
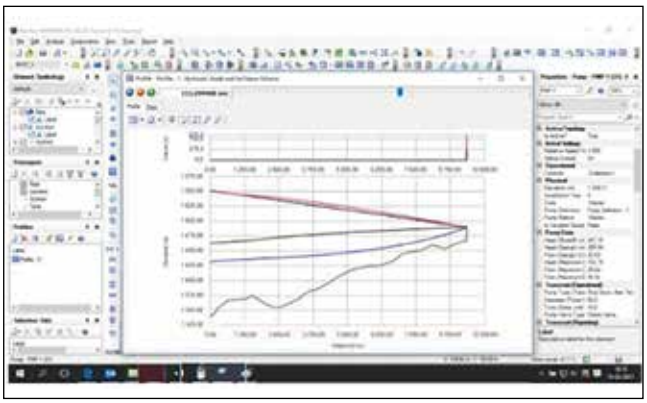
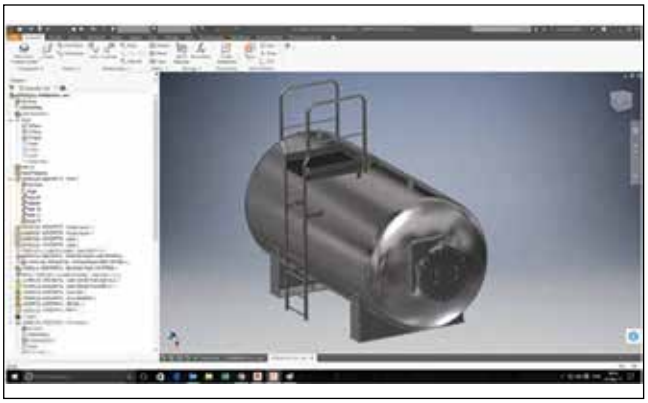
Studies/Engineering/Design

In the domain of hydraulics, we dispose of teams specialized in the study of the water hammer, capable of supporting our customers in the dimensioning of the most suitable tank for the required protection.
We use the Hammer VBi software, created by Bentley, which allows us to respond to the needs of our customers.





As far as engineering and design are concerned, we comply with several international codes (PDSSOO, CODAP, ASME VIII-Div.1, En13445), regarding the mechanical dimensioning of the tanks.



We can produce tanks up to 120m^3 nevertheless, we can examine the possibility of producing tanks with larger capacities, depending on each situation.

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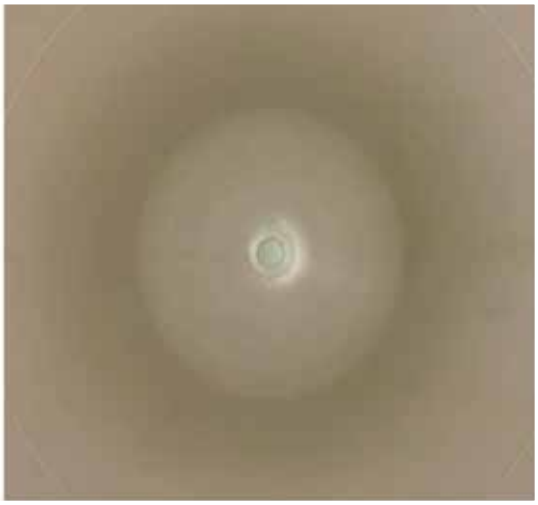
Production

As far as production is concerned, our company manufactures equipment with a standard thicknesses comprised between 5mm and 30mm. Nevertheless, we can manufacture equipment with larger thicknesses. The most commonly used materials are S275JR, S355JR, P265GH, P295GH, P355GH, SA516-Gr.60 and SA516-Gr.70 for carbon steels, and RISI 304/304L and RISI 316/316L for stainless steels.
Depending on the size of the equipment, we can manufacture tanks up to 150 Bar.





We have qualified professionals to conduct and interpret non destructive tests, in particular regarding penetrating liquids and x-rays.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Information required for performing the water hammer analysis

The following information is required in order to perform the water hammer analysis:
- Pipe profile
- Pipe inner diameter
- Pipe thickness
- Pipe material
- Total flow
- Information about the pumps (power, rotation speed,...)
- Water type (waste water, raw water, drinkable water, ...)

In case the pipe profile is not available, the following information is required:
- Pipe total length
- Pipe beginning and end heights
- Pipe heights and distances of the high and low points in relation to the pumping station.

Note: If the pipe's profile is not available, the calculation of the surge vessel is merely indicative.

Pre-load pressure

The pre-load pressure must ALWAYS be lower than the pipe's current pressure, where the connection with the tank is concerned.
When the dimensioning of the tank is carried out by us, the exact pre-load value can be provided.
Should this not be the case, that pressure can be determined by using the following approximated formula :

(((HMT + 1 Bar) /3) - 1 Bar)

When the pre-load pressure exceeds 4 Bar, we suggest that it should be phased in, through percentage steps, in such a way as to ensure that there is no risk of damage to the membrane.
Once the pre-charge has been applied to the tank, it is possible to check if the system is working properly.
When the pump stops, if the detected minimum pressure is higher than the pre-load value and if the maximum pressure is lower than the tank's service pressure, then the pre-load value is correct.

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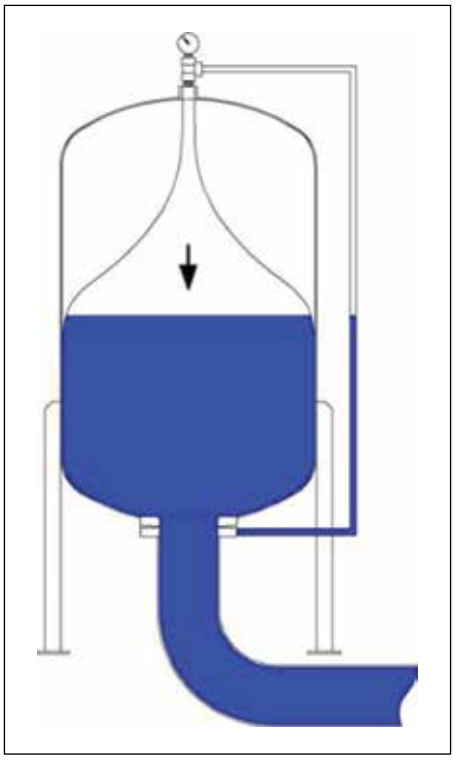
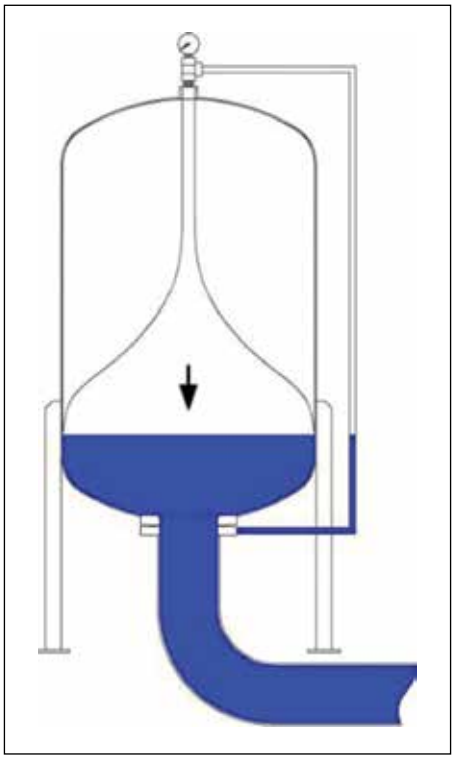
Operation of a surge vessel equipped with bladder

In this type of tank, the water is stored inside of the membrane. This prevents direct contact with the steel used in the tank (although it comes prepared with an appropriate coating which makes it suitable to be in contact with water).
This type of tank has the advantage of having a separation between water and air, which results in a longer running time without having to replace the air since it is not diluted in the water.

1. Once the pumps stop, a pressure reduction in the pipe will occur. The surge vessel will then send water back into the pipe.



2. The tank continues to supply water to the pipe.



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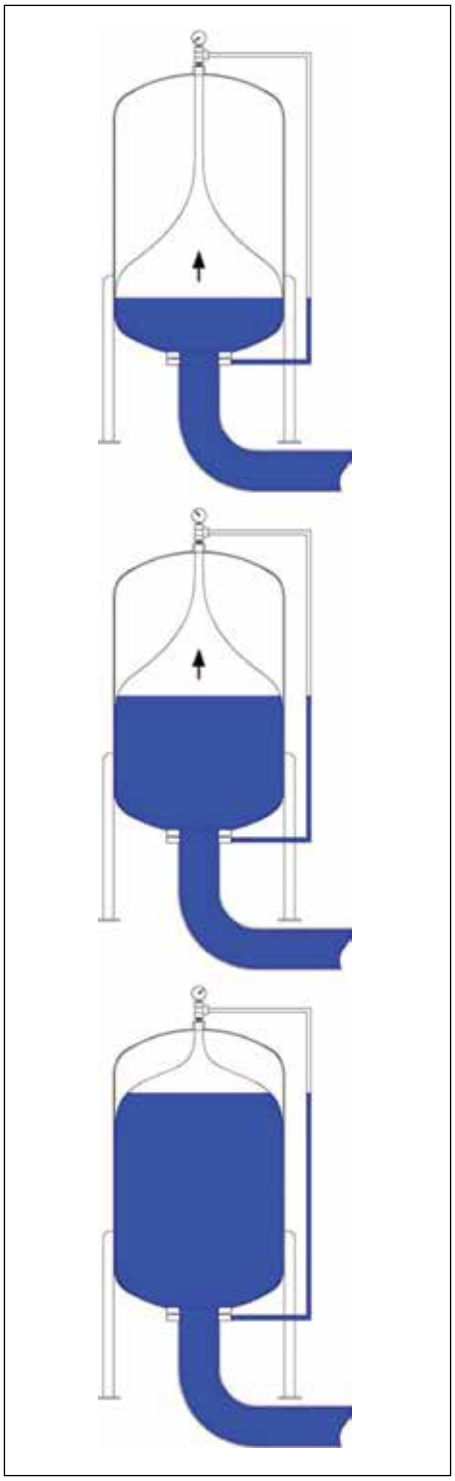
Operation of a surge vessel equipped with bladder

In this type of tank, the water is stored inside of the membrane. This prevents direct contact with the steel used in the tank (although it comes prepared with an appropriate coating which makes it suitable to be in contact with water).
This type of tank has the advantage of having a separation between water and air, which results in a longer running time without having to replace the air since it is not diluted in the water.

3. Now that the depression stage is completed, the motion shall reverse. The tank will absorb the water in the pipe.

4. The water flows into the reservoir, consequently reducing the air volume and therefore increasing the pressure in the tank.

5. The tank continues to be filled until its motion is reversed.



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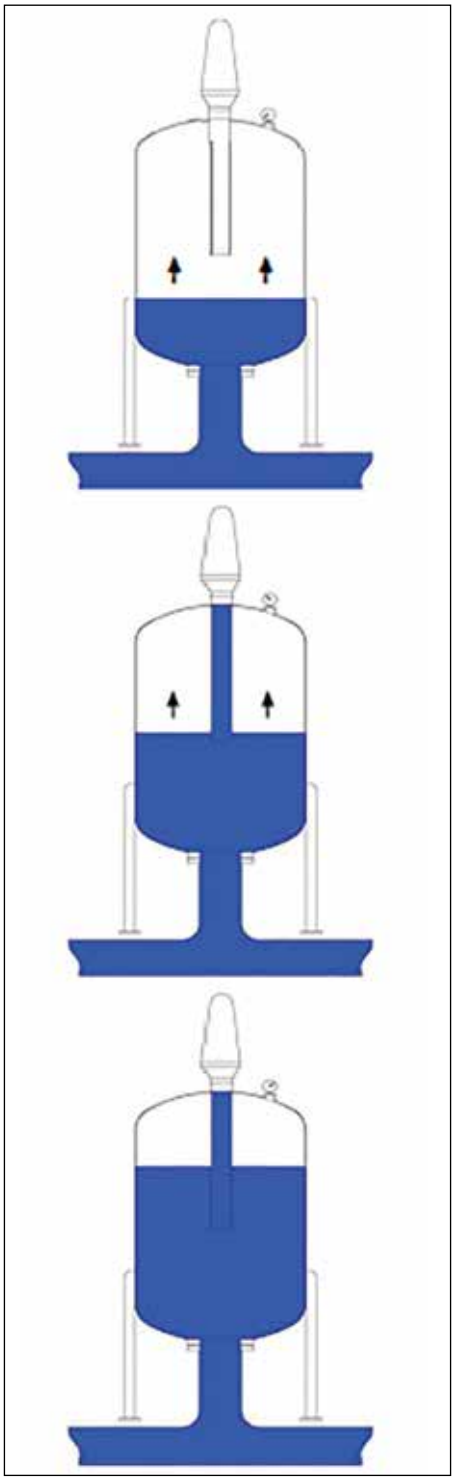
Operation of a surge vessel equipped with air valve

1. When the pump starts, once the pipe is free of air, water begins to flow into the pump and starts compressing the air that will come out through the air release vent.

2. The difference of the current pressure will make the water rise through the pipe, closing the air release vent. At this point, the tank is completely tight and the air starts being compressed. (Volume of the compression chamber).

3. Since the pressure (with the pumps in motion) increases, the air inside the tank is compressed more and more until the system achieves its balance.



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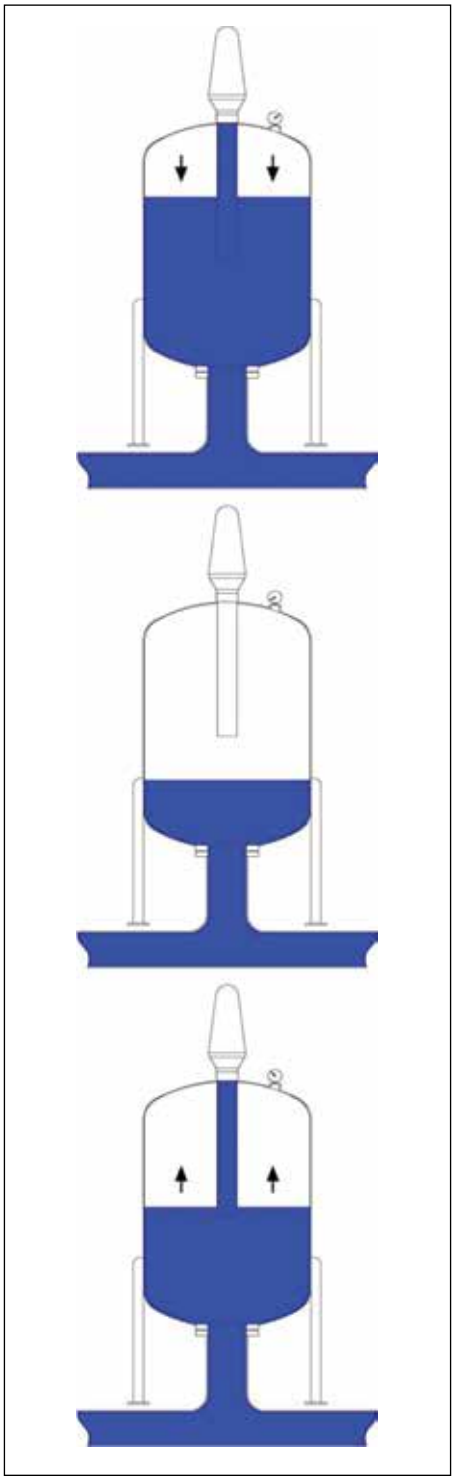
Operation of a surge vessel equipped with air valve

4. When the pumps stops, the pressure inside the pipe starts decreasing. Consequently, the pressure inside the tank is higher, thus allowing the water to start to flow into the pipe in order to compensate for the lack of water inside the pipe.

5. Once the total amount of water inside the compression chamber flows into the pipe, air begins to flow into the tank. This allows to compensate for the air that is diluted during its operation and to replenish the necessary air for a new cushioning.

6. Once the motion is reversed, the water goes back into the tank, thus closing the air release vent to create once again the compression volume and to repeat the cycle.
NOTE: Air renewal is mandatory for the proper operation of this system.



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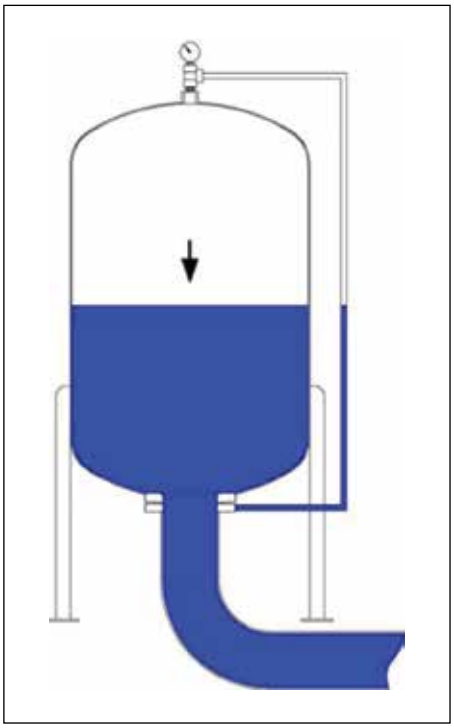
Operation of a surge vessel equipped with a compressor

In this type of reservoir, the water is stored in direct contact with the steel of the tank, which is dully prepared so that it can be in contact with water.
Since this type of reservoir does not have a separation between water and air, the air needs to be replenished due to the fact that it becomes diluted in water over time. Therefore, it has a compressor which is programmed to supply air, whenever needed.

1. Once the pumps stop, a pressure reduction in the pipe will occur. The surge vessel will then send water back into the pipe.



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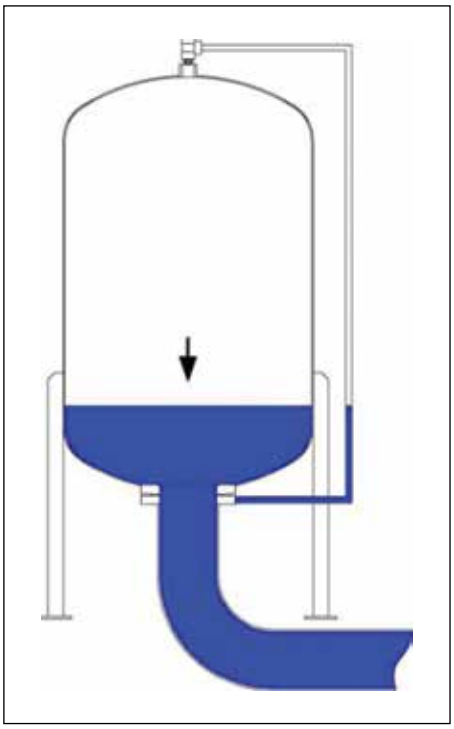

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Operation of a surge vessel equipped with a compressor

3. Now that the depression stage is completed, the motion shall reverse. The tank will absorb the water in the pipe.

4. The water flows into the reservoir, consequently reducing the air volume and therefore increasing the pressure in the tank.

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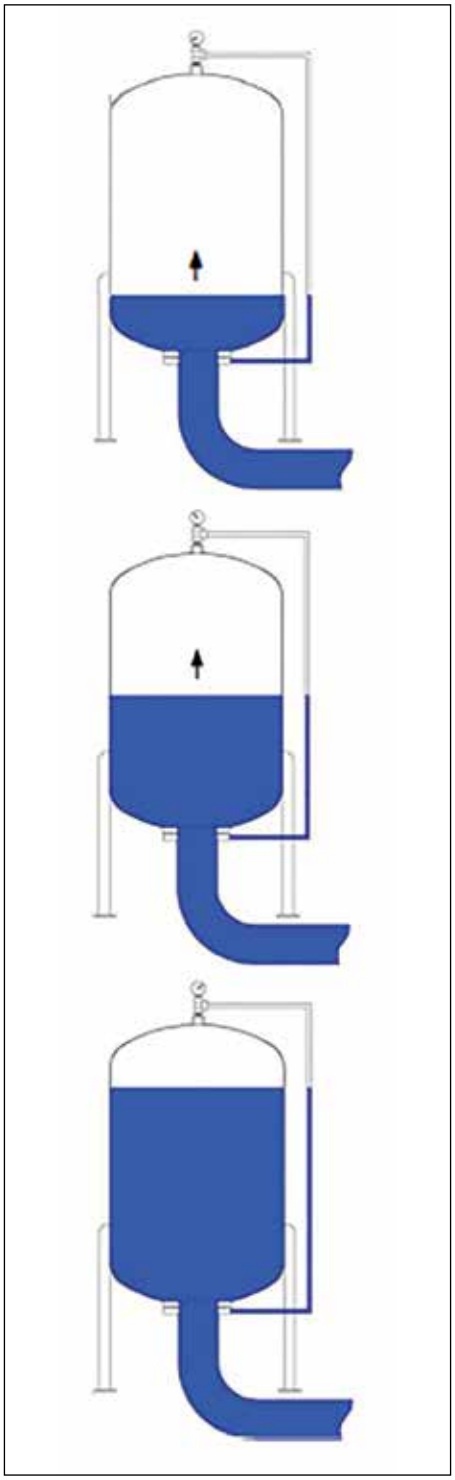

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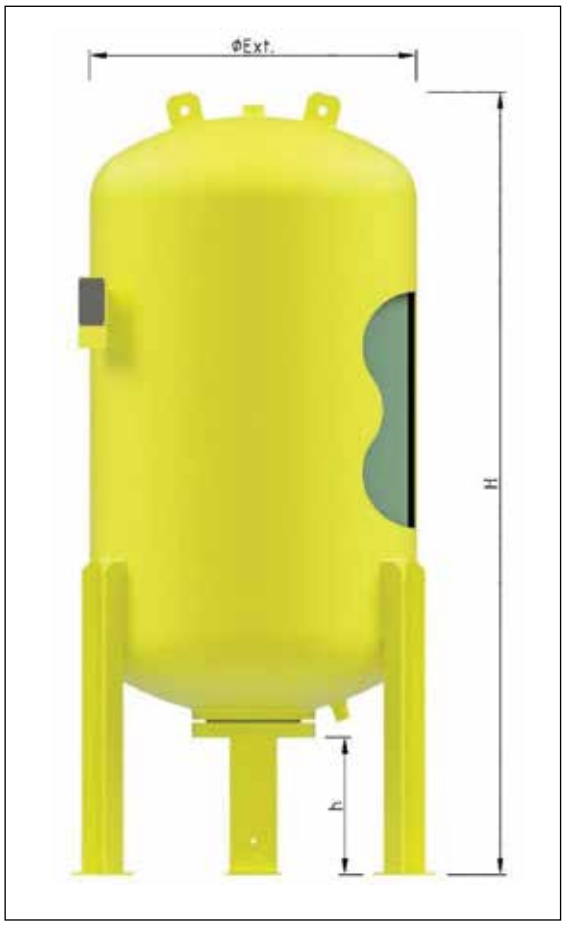
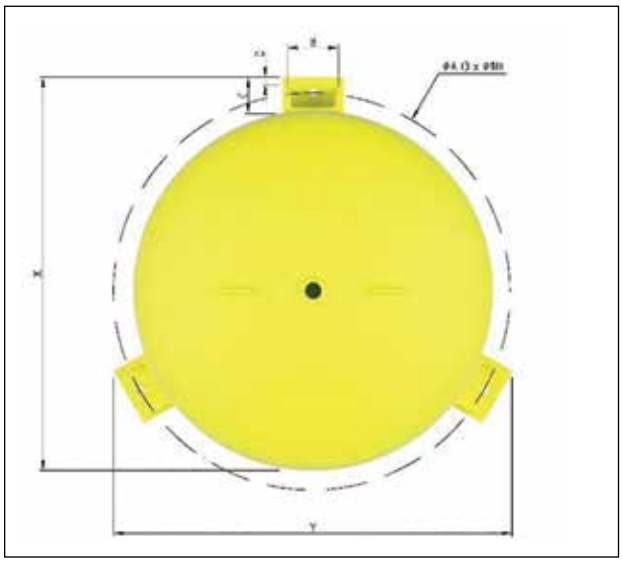
Surge Vessel - 100 L to 2000 L
Vertical





	100 L	150 L	200 L	300 L	500 L	750 L	1000 L	1500 L	2000 L
Ø EXT. (mm)	620	620	620	700	800	900	950	1100	1100
A (mm)	690	690	690	780	880	990	1040	1210	1210
B (mm)	120	120	120	140	140	160	160	200	220
C (mm)	105	105	105	110	110	115	115	125	130
D (mm)	40	40	40	40	40	40	40	40	40
h (mm)	405	405	405	405	405	405	4105	405	405
H (mm)	1100	1250	1420	1600	1850	2100	2300	2540	3080
X (mm)	695	695	695	780	880	985	1035	1195	1195
Y (mm)	727	727	727	815	901	1007	1050	1217	1217
Dn (max)	80	100	100	150	150	150	200	200	200
Weight 10 bar	70	80	91	130	170	225	290	370	540
Weight 16 bar	78	88	100	145	186	247	326	480	595
Weight 10 bar	90	100	115	165	215	285	375	550	680

- Dn (max) - Inlet/outlet maximum standard diameter. Further measures upon request.
- The table can be changed without prior notice.

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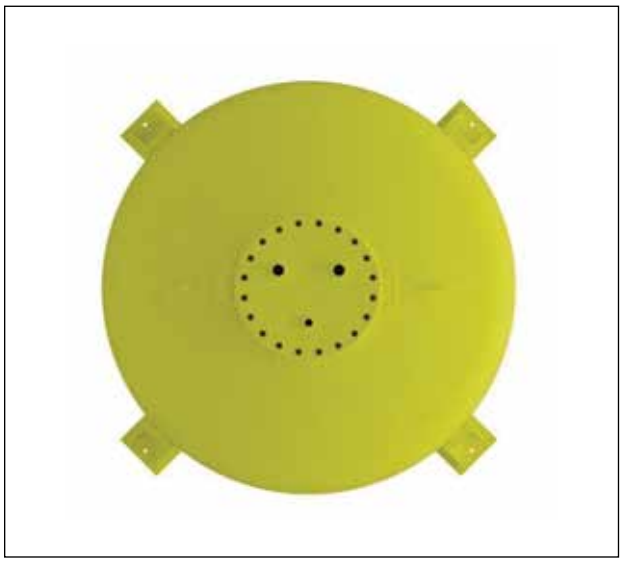
Surge Vessel - 3000 L to 25000 L
Vertical



	3000 L	4000 L	5000 L	6000 L	7000 L	8000 L	9000 L	10000 L	12000 L	15000 L	18000 L	20000 L	25000 L
Ø EXT. (mm)	1100	1273	1600	1600	1600	1600	1600	1900	1900	1900	2150	2150	2150
h (mm)	405	405	405	405	405	405	4105	405	405	405	405	405	405
H (mm)	4070	4075	3480	3980	4480	4980	5480	4580	5300	6000	6070	6625	8000

- This table can be changed without prior notice.

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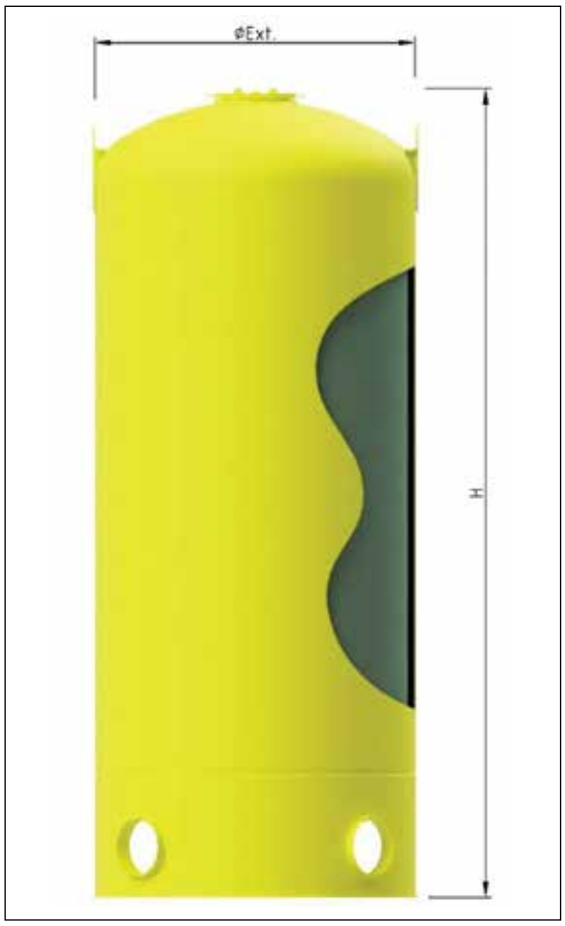
Surge Vessel - 300a00 L to 120000 L
Vertical



	30000 L	35000 L	40000 L	45000 L	50000 L	60000 L	70000 L	80000 L	90000 L	100000 L	120000 L
Ø EXT. (mm)	2385	2385	2385	2450	2450	2864	3000	3340	3450	3450	3450
h (mm)	7870	8990	10110	10720	11780	10576	11200	10480	11000	12070	14210

- Regarding bladder tanks, please refer to the horizontal format.
- This table can be changed without prior notice.

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Visual Level Equipment

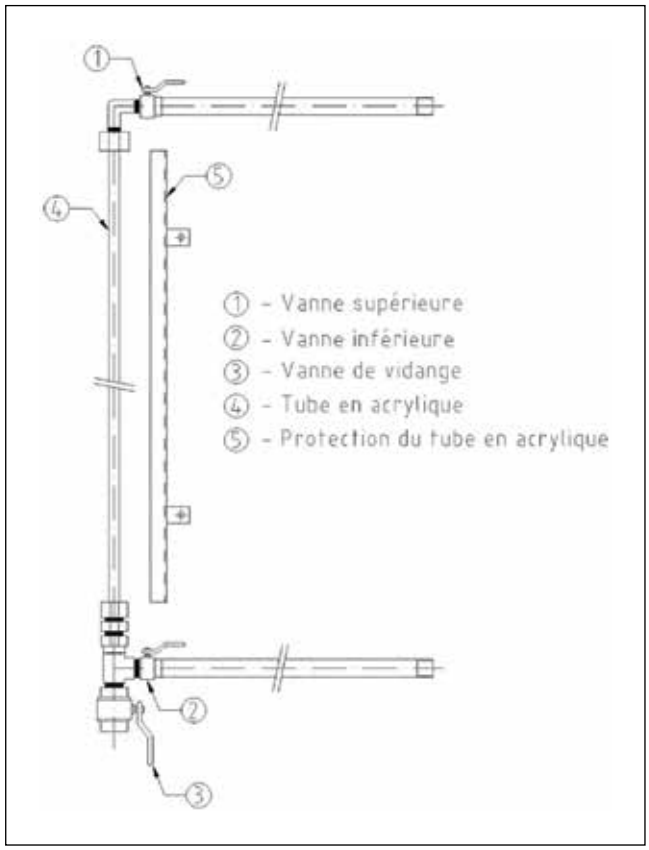
Installation Instructions

- Install the level protection **[5].**
- Place the different accessories in order to connect the tank to the upper arm of level.
- Install the upper valve **[1].**
- Place the different accessories in order to connect the tank to the lower arm of level **[3].**
- Install the lower valve **[2].**
- Place the joints and the clamping nuts in the tube **[4].**
- Place the acrylic tube **[4]** slightly apart from the two arms of the level. The tube **[4]** should enter at least 1 cm into the curve and the tee.
- Slide the joints and the tightening the nuts until achieve a good seal.
- Align with accuracy the two valves of the level and the tube **[4].**
- Perform the pre-charge to control the tightness and place the tank in service.

Commissioning

- The tank, in which is installed the level equipment, is in service but the pumps are stopped. Which means that has a certain amount of water and air to the static pressure.
- Slowly open the lower valve of the level indicator **[2]** (liquid zone of the tank), allowing the entry of water into the tube. In this step, it is important that the water level doesn't get too close to the top of the tube **[4]**, so that, if it is necessary, the valve **[2]** should be closed, preventing the further rise of water.
- Slowly open the upper valve of the level indicator **[1]** (gaseous zone of the tank) allowing the air intake and the water level lowering in the tube **[4]**.
- With both valves open **[1]** and **[2]**, the water level should stabalise when the static level was achieved.
- Put a mark at this level, close the valves **[1]** and **[2]** and drain the acrylic tube **[4]** through the purge valve **[3]**.
- At a certain pressure always corresponds the same water level within the tank.
- Check the level periodically.

ATTENTION:
IF THE TANK IS A SURGE VESSEL WITH BLADDER, DURING THE OPERATION OF PUMPS, THE VALVES [1] AND [2] MUST BE CLOSED TO NOT DAMAGE THE BLADDER.



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Magnetic Level Equipment

Operation

The magnetic security level is used to inform in real time the level of the water/liquid in the tank when it is in operation.

The system can be controlled automatically via sensors placed along the vertical body of the magnetic level indicator. The most common applications are for control, monitoring, regulation, activation of alarms, pump control, solenoid valve control as well as other different types of equipment without human intervention and with remote control.

In this specific case, the magnetic security level allows to remotely monitoring the bladder pressurized tanks, particularly in case of lack of water or air.

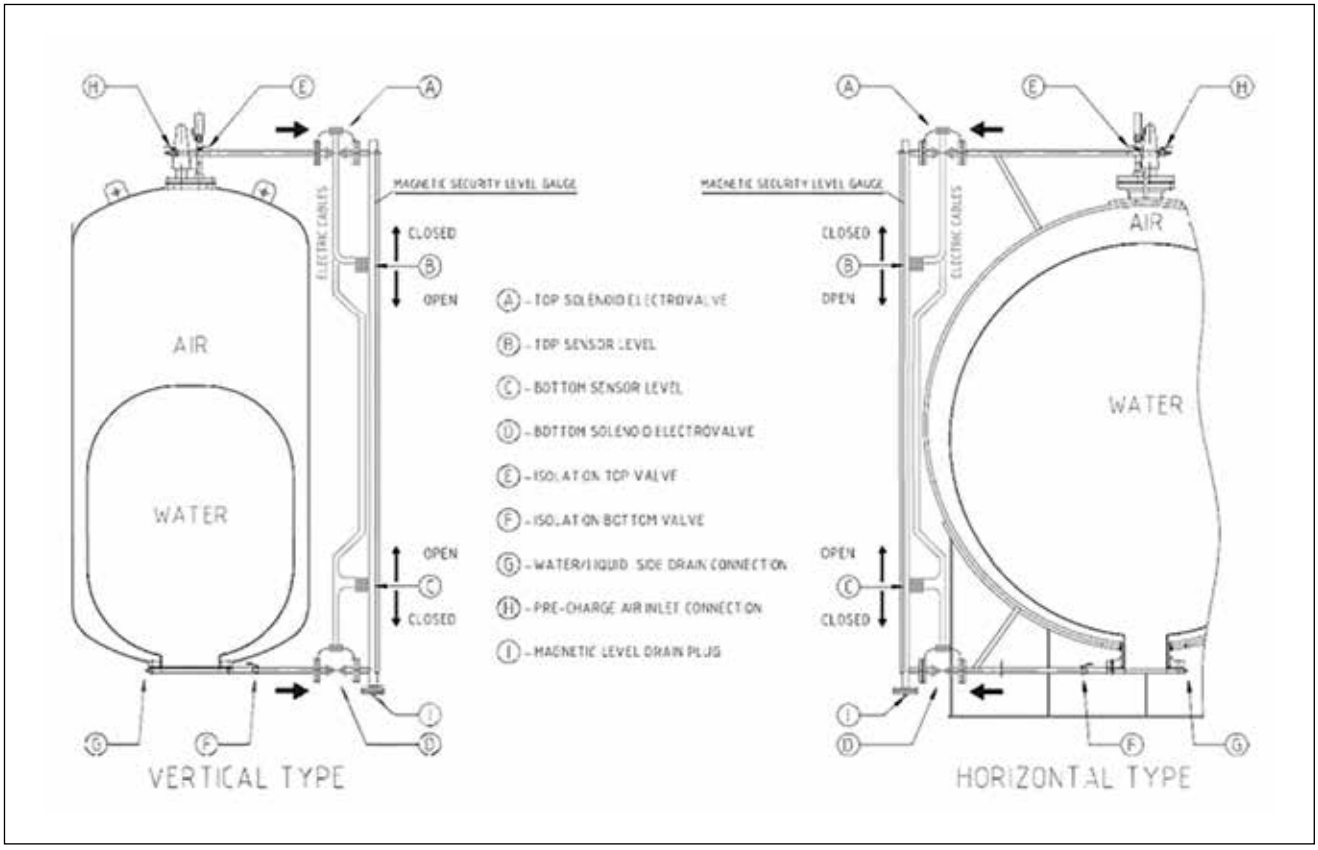
In case of a sudden pressure drop or lack of water, the sensor (C), placed at the bottom of the magnetic level, will provide information to the solenoid valve (D) to close, in order to prevent the tank air escape into pipeline (network) and into the bladder.

In the case of a sudden pressure increase or a lack of air, the sensor (8), placed on top of the magnetic level indicator, gives information to the solenoid valve (A) to close in order to prevent water from entering in the gaseous zone of the tank.

As an option, other sensors can be added to emit alarms to deactivate, stopping the pumps, etc., being unlimited the number of vertical sensors.

Regarding the alarm monitors are required other sensors.

Each level sensor works with a relay, in which the type and characteristics should be established in relation to the power of the equipment concerned.



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Magnetic Level Equipment

Components
All flanges, pipes, check valves, level indicators are in stainless steel. In the models of standard magnetic level indicators there are two check valves and two solenoid valves in stainless steel which ate normally **closed**.

Normally these devices have two level sensors connected with solenoid valves.
As an option, by customer request, it is possible to provide additional sensors to monitor alarms and level transmitter with 4/20 mA at the exit in order to transmit an analog signal in relation ta the water level.

Superior safety device comprising of a solenoid valve and a check valve.

Inferior safety device comprising of a solenoid valve and a check valve.

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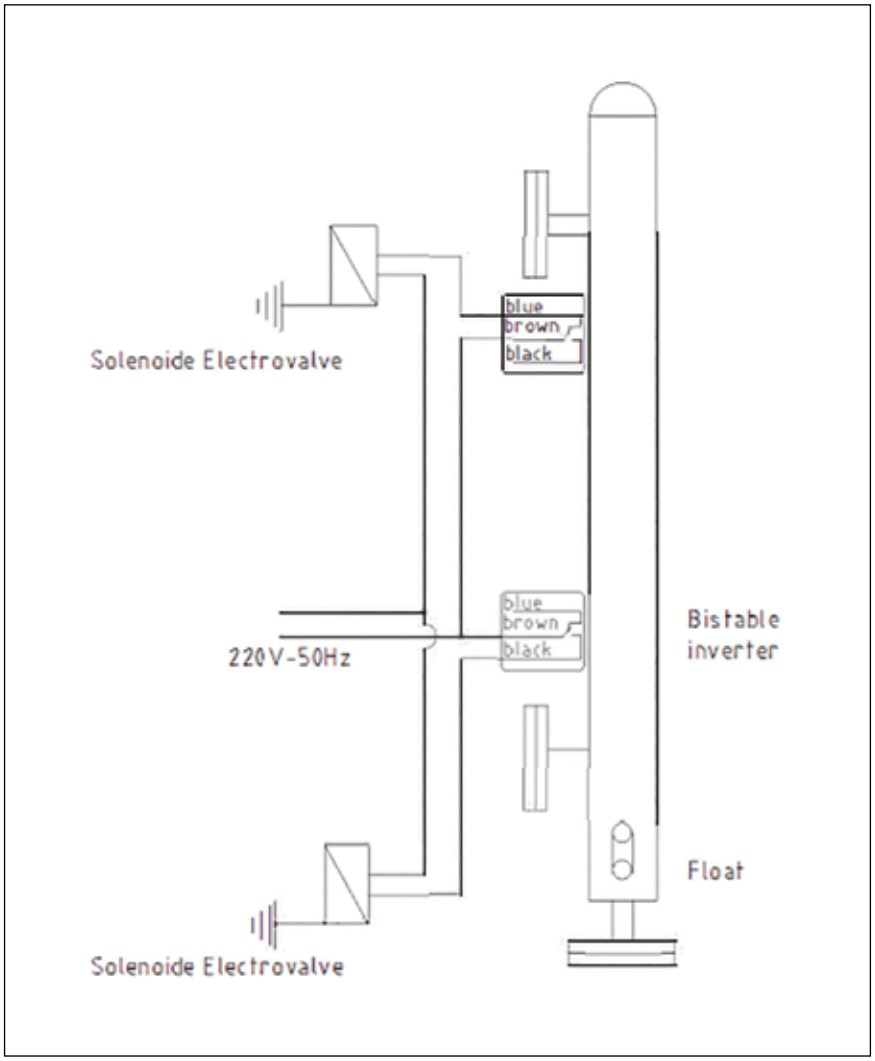
Magnetic Level Equipment

Installation instructions

1. Install the upper isolation valve (E) in the connection;
2. Install the upper tube;
3. Fix the upper tube to the arm;
4. Assemble the upper solenoid valve (A) respecting the direction of the arrow on the check valve (always in the direction of level indicator);
5. Install the lower isolation valve (F) in the connection;
6. Install the lower tube;
7. Fix the lower tube to the arm;
8. Assemble the lower solenoid valve (D) respecting the direction of the arrow on the check valve (always in the direction of level indicator);
9. Fix the switches of the level sensor (8) and (C) to the tube of the level indicator;
10. Adjust the level sensor switch (8) and (C) in the tube (fix the switch at a minimum distance of 200mm from the, superior and inferior, level tube connections);
11. Install the level indicator tube;
12. Connect the level sensor switch (8) and (C) through the solenoids valves (see electric scheme);
13. The power supply should be in accordance with the voltage of the provided material;
14. Perform the pre-charge of the tank (with air or nitrogen) through the opening of the water/liquid drain purge (G);
15. Open the upper valve (E) to pressurize with air;
16. Check with soapy water, if all connections are tight. If there are leaks, they must to be repaired and the process has to be restarted from the beginning (close the, superior and inferior, isolation valves (E) and (F) and open the purge (I) that exists at the bottom of the level indicator for draining it);
17. Fill the tank, through the gradual opening of the isolation valve between the tank and the network, until it reaches the static pressure;
    Beware of the level sensor commissioning:
    * Turn off the electric current of the lower solenoid valve (D);
    * Slightly open the lower isolation valve (F) for some water enter to the inside of the level indicator;
    * Ensure that the float is above the lower level sensor (C) and then close the lower isolation valve (F);
    * Reconnect the lower solenoid valve (D) and continue in point 18;
18. Open the lower valve (F) of the level indicator to check the water level in the magnetic level indicator on the static pressure;
19. Confirm again that there are no leaks in the, static and dynamic, pressures.

Magnetic Level Equipment

Wiring Diagram



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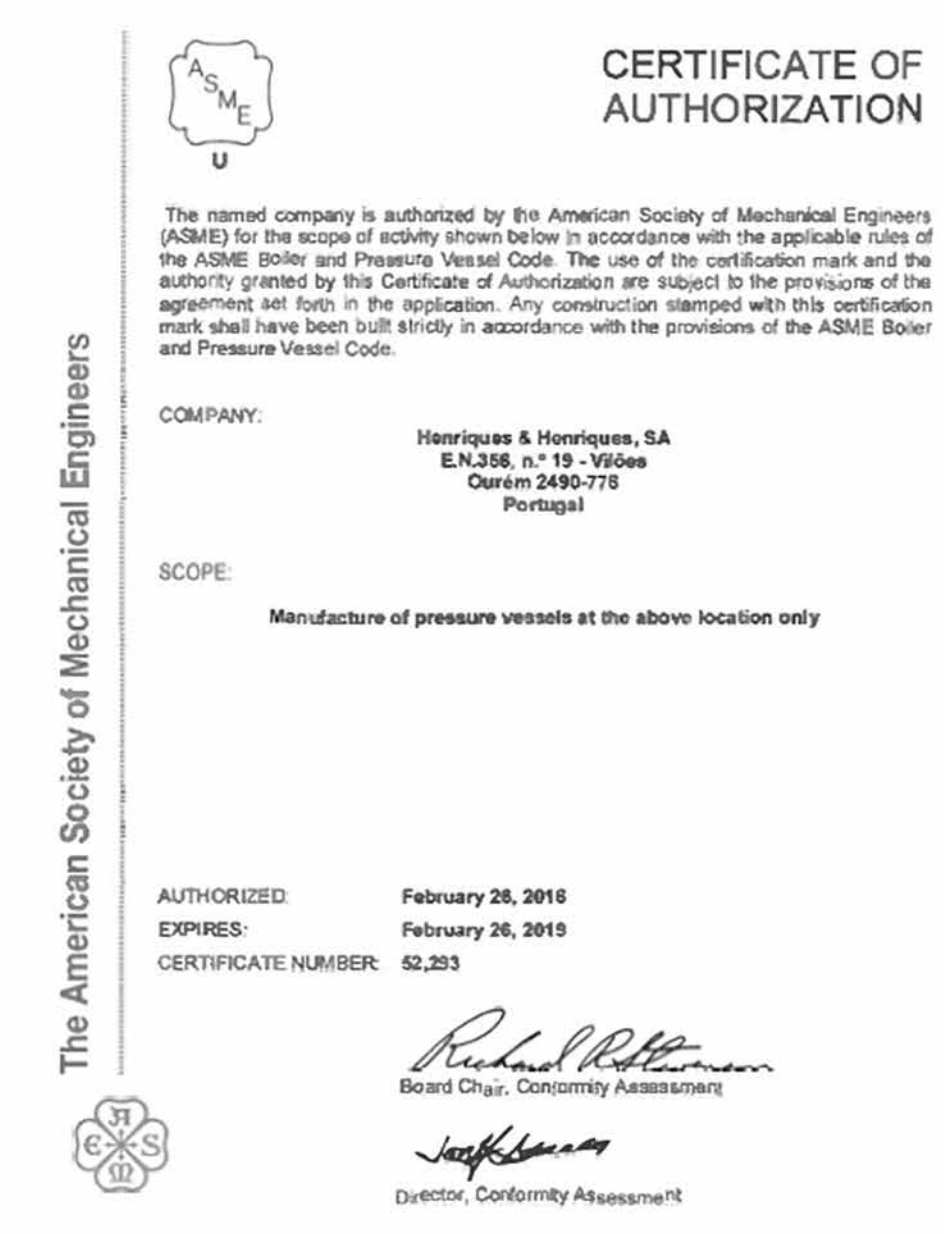
AFC SURGE CONTROL VESSELS

U-STAMP Certification



The American Society of Mechanical Engineers

U

CERTIFICATE OF AUTHORIZATION

The named company is authorized by the American Society of Mechanical Engineers (ASME) for the scope of activity shown below in accordance with the applicable rules of the ASME Boiler and Pressure Vessel Code. The use of the certification mark and the authority granted by this Certificate of Authorization are subject to the provisions of the agreement set forth in the application. Any construction stamped with this certification mark shall have been built strictly in accordance with the provisions of the ASME Boiler and Pressure Vessel Code.

COMPANY:

Henriques & Henriques, SA
E.N.356, n.º 19 - Vilões
Ourém 2490-776
Portugal

SCOPE:

Manufacture of pressure vessels at the above location only

AUTHORIZED: **February 26, 2016**
EXPIRES: **February 26, 2019**
CERTIFICATE NUMBER: **52,293**

Board Chair, Conformity Assessment

Director, Conformity Assessment

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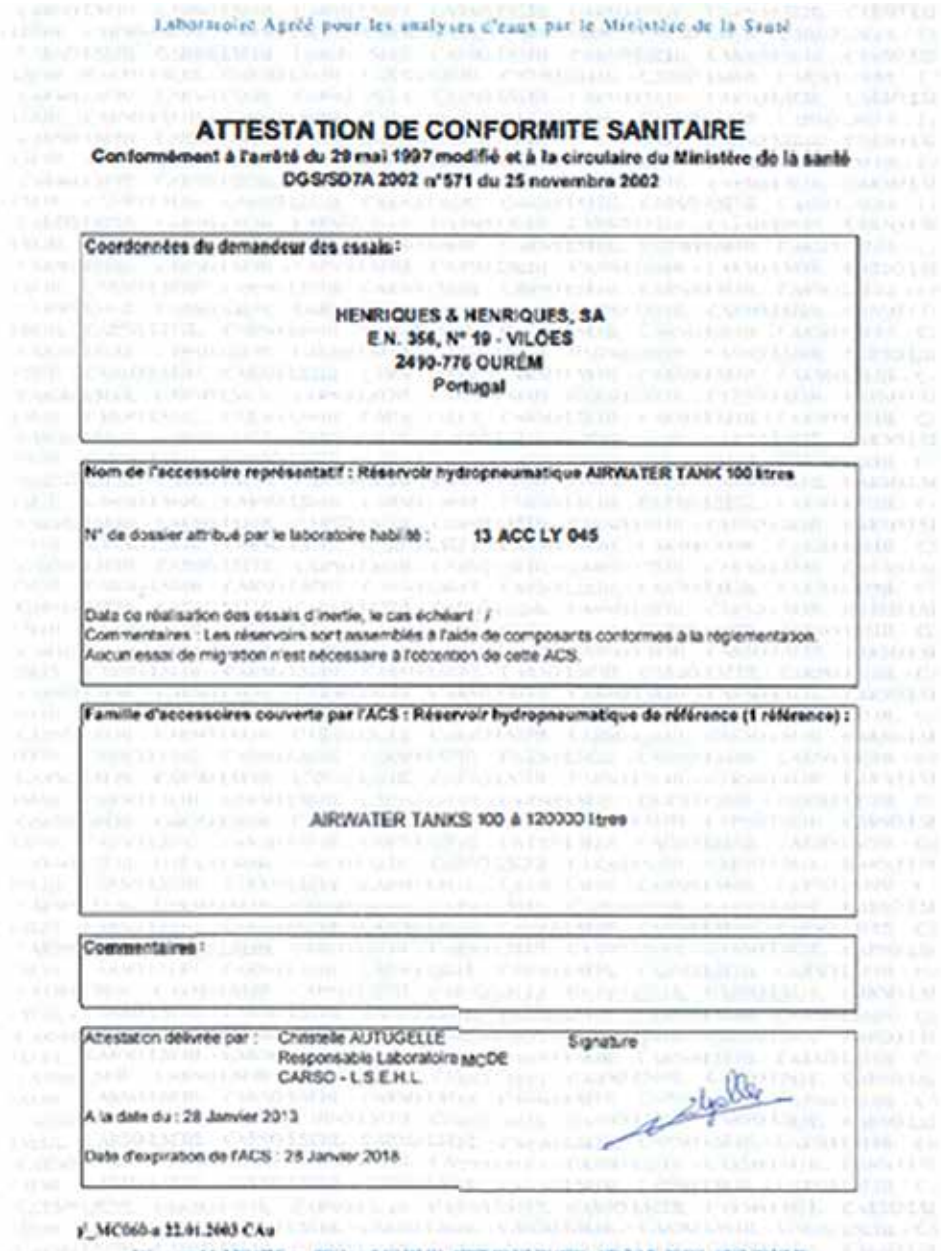
ACS Certification



Laboratoire Agréé pour les analyses d'eaux par le Ministère de la Santé

ATTESTATION DE CONFORMITE SANITAIRE

Conformément à l'arrêté du 29 mai 1997 modifié et à la circulaire du Ministère de la santé DGS/SD7A 2002 n°571 du 25 novembre 2002

Coordonnées du demandeur des essais :

HENRIQUES & HENRIQUES, SA
E.N. 356, N° 19 - VILÕES
2490-776 OURÉM
Portugal

Nom de l'accessoire représentatif : Réservoir hydropneumatique AIRWATER TANK 100 litres

N° de dossier attribué par le laboratoire habilité : **13 ACC LY 045**

Date de réalisation des essais d'inertie, le cas échéant : /
Commentaires : Les réservoirs sont assemblés à l'aide de composants conformes à la réglementation.
Aucun essai de migration n'est nécessaire à l'obtention de cette ACS.

Famille d'accessoires couverte par l'ACS : Réservoir hydropneumatique de référence (1 référence) :

AIRWATER TANKS 100 à 120000 litres

Commentaires :

Attestation délivrée par : Christelle AUTUGELLE — Responsable Laboratoire MCDE — CARSO - L.S.E.H.L.

Signature

A la date du : 28 Janvier 2013

Date d'expiration de l'ACS : 28 Janvier 2018

y:_MC060-a 22.01.2003 CAu

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ISO 9001 Certification

IQNet

THE INTERNATIONAL CERTIFICATION NETWORK

CERTIFICATE

IQNet and

APCER

hereby certify that the organization

HENRIQUES & HENRIQUES, S.A.

E.N. 356, 19 – Vilões
2490-776 OURÉM
PORTUGAL

for the following field of activities

Conception, manufacture and assembly of tanks for petrol liquids, water and chemical products and pressure vessels for air, liquid petrol gas-LPG, water and chemical products

has implemented and maintains a

Quality Management System

Which fulfils the requirements of the following standard

ISO 9001:2008

Issued on: 2016-11-17
Validity date: 2019-11-16

Registration Number: PT- 1994/CEP.215

IQNet

Michael Drechsel
President of IQNet

José Leitão
APCER CEO

apcer

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ISO 14001 Certification

IQNet

THE INTERNATIONAL CERTIFICATION NETWORK

CERTIFICATE

IQNet and

APCER

hereby certify that the organization

HENRIQUES & HENRIQUES, S.A.

E.N. 356, 19 - Vilões
2490-776 OURÉM - PORTUGAL

for the following field of activities

Conception, manufacture and assembly of tanks for petrol liquids, water and chemical products and pressure vessels for air, liquid petrol gas-LPG, water and chemical products

has implemented and maintains a

Environmental Management System

Which fulfils the requirements of the following standard

ISO 14001:2004

Issued on: 2015-10-27
Validity date: 2018-09-15

Registration Number: PT- 2012/AMB.0625

IQNet

Michael Drechsel
President of IQNet

José Leitão
APCER CEO

apcer

Any additional information concerning the scope of this certificate may be obtained by consulting APCER.

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ISO 18001 Certification

IQNet

THE INTERNATIONAL CERTIFICATION NETWORK

CERTIFICATE

IQNet and

APCER

hereby certify that the organization

HENRIQUES & HENRIQUES, S.A.

E.N. 356, 19 - Vilões
2490-776 OURÉM - PORTUGAL

for the following field of activities

Conception, manufacture and assembly oil tanks for petrol liquids, water and chemical products and pressure vessels for air, liquid petrol gas-LPG, water and chemical products

has implemented and maintains a

Occupational Health and Safety Management System

Which fulfils the requirements of the following standard

OHSAS 18001:2007

Issued on: 2015-10-27
Validity date: 2018-10-25

Registration Number: PT- 2012/SST.0342

IQNet

Michael Drechsel
President of IQNet

José Leitão
APCER CEO

apcer

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