

Aero 1

Vent check valves

2018

Instruction and maintenance manual.

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1. INTRODUCTION

1.1 The Problem

All liquid filled tanks onboard ships must be vented during filling or discharging. This to prevent excessive pressure or vacuum from building up in the tank, which would cause structural damage.

Previously normal service-tanks was vented using goosenecks. The gooseneck was normally a 180° bend, offering no protection for the tanks to seawater ingress. This protection is important, as ingress of seawater to the tanks can cause severe problems. If a vessel is damaged and tilts, the vent pipes might come under water, and it is then important that there is a valve that closes, otherwise this might lead to an uncontrollable flow into the tanks.

1.2 The Solution

In 1966 the international Loadline Convention stated that this problem had to be addressed. An automatic closing device was the solution. Many types of vent check valves evolved. The valves on the market today, are mainly using the same principle. It is a construction with a float inside which rises through buoyancy, to close before seawater reaches the vent out/inlet in case seawater comes into the vent check valve. This is described in more detail later in the document¹.

The classification societies followed and demanded these devices fitted to the vent pipes. Rules, regulations and type approvals came into force, and now most classification societies (DNV, GL, LR, BV, ABS, RINA etc.) demand that these devices should be type approved.

Briefly one can say that the operation and the different parameters of a valve are now more clearly defined, and the most vital aspects are addressed.

¹ Aero 1.



2. Rules and Regulations

2.1 General requirements.

When it is required to have an air pipe closing device, this should be permanently fixed. The device must also be type approved and automatically:

Prevent the free entry of water into the tanks.

Allow the passage of air or liquid to prevent excessive pressure or vacuum coming into the tank.

2.2 Design

Air pipe closing devices shall withstand both ambient and working conditions up to an inclination of $\pm 40^\circ$ without failure or damage.

Air pipe closing devices shall allow inspection of the closure and the inside of the casing as well as for changing the seals.

In air pipe closing devices with floater, suitable guides are to be provided to ensure unobstructed operation under all working conditions.

Efficient seating arrangements are to be provided for the closure.

Air pipe closing devices are to be self-draining.

The area through an air pipe closing device shall be at least equal to the area of the inlet.

The maximum allowable tolerances for wall thickness of ball floats should not exceed $\pm 10\%$ of the nominal thickness.

2.3 Materials

Air pipe closing devices are to be of approved metallic materials adequately protected against corrosion

Closures and seats made of non-metallic materials are to be compatible with the media carried in the tank and seawater at temperatures between -25°C and 85°C .

Testing, marking and calculations are described later in this document.



3. Selection of valve

3.1 Size

The capacity of the vent system shall be large enough to withstand the pressure in an overflow situation. We often recommend that the vent pipe shall have a cross sectional area that is 1.25 times as big as the filling pipe. Rules say that the free area in the valve shall be larger or equal to the vent pipe. Our valves are designed to fulfil this criterion.

3.2 Type

To determine the type of valve required you need to know where it is to be mounted, and the tank content that is to be vented.

3.3 Different types.

There are two main types of valves. There is one for mounting through superstructures² and one for mounting on deck³.

The valves for mounting through superstructures has an overflow pipe where the tank is vented, and a connection to the ships side.

The valves for mounting on deck does not have an overflow pipe, but a cover or screen to stop the direct access of flying water.

3.4 Flame screen

There is some difference in the requirements from the classification companies, and the customers often have different needs.

- Flame screen is mainly required in tanks that contains a flammable medium.
- Bug- and rat screen is mainly required in fresh water tanks.
- Bug- and rat screen are often used in tropical waters.

A valve with screen will have extra resistance that will influence the flow characteristics.

² See Aero 1.2 and 1.6

³ See Aero 1.1, 1.3 and 1.4



4. Aero

4.1 General information

The International Association of Classification Societies (IACS) has recently decided that more stringent demands are to be put on equipment for venting maritime tanks containing ballast, lubrication oil, fuel, fresh water etc.

There are three points in particular; IACS would like to put focus on.

- Flow characteristics
- Tightness in closed mode
- Float sensitivity

There has always been a degree of uncertainty regarding the flow-characteristics of the vent check valves. The knowledge of these characteristics is vital when one designs the vent piping system. The design must tolerate overflow through the vent pipe system.

Tightness has always been a key factor regarding to vent check valves, this was the original factor that made them mandatory. It is agreed that a certain leakage in the closing process must be tolerated, but it is a demand that when the valve is closed it should allow no leakage. The ball float that were used originally, was difficult to get smooth enough, at a realistic price. Therefore, we have developed a floater with a flat, smooth plastic surface that works optimal as a closing device.

The float has been tested in many ways to make sure that they will be able to withstand the harshest treatment. Again, our float design is favourable as a flat compact disc can tolerate the treatment better than hollow balls.

Apart from mentioned qualities:

- Aerodynamic design
- Thorough documentation available
- Solid steel construction
- Maintenance free
- Type approved by major classification societies
- Knowledgeable service network

4.2 Details and drawings

4.2.1 Aero 1 series



This is the Aero 1 series from John Gjerde AS.

The Aero product range has been in the market for 40 years. This valve is used to ventilate all tanks onboard ships, except cargo tanks on oil or chemical tankers.

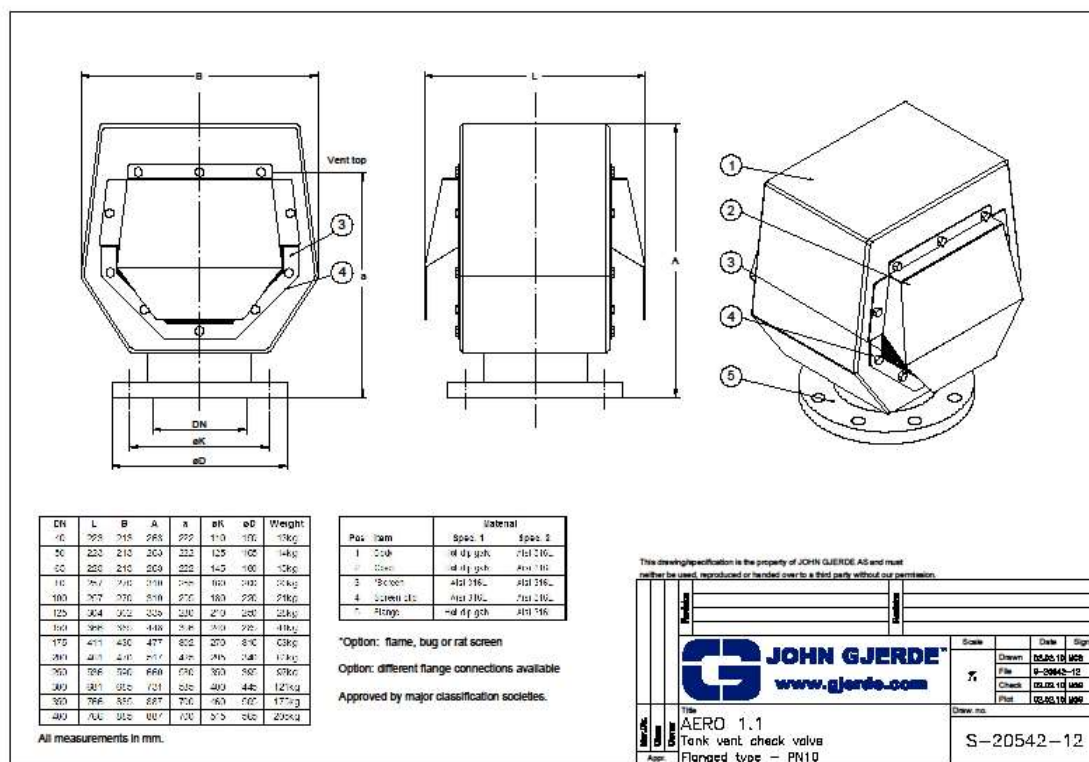
The Aero 1 series consists of six valves, all with the same basic design and same basic operating principle:

- All valves have the flat float principle, ensuring low leakage.
- Sturdy design to withstand severe conditions.
- Protection against corrosion, both on the in- and outside.
- High performance. Technical data available.
- Materials: Duplex, super duplex, stainless steel 316L, carbon steel

When the valve is in "venting mode", the float is resting on its support and the vent is open. This allows free airflow in and out of the tank. If external water rises and reaches the inner chamber of the valve, the float will be lifted and come to rest against the float gasket. The float gasket is designed to ensure 'no leakage when closed' to the tank. This means that the tank is secured against contamination from seawater penetration.



4.2.2 Aero 1.1



Description:

This is the valve that is the most commonly used on ships. There are three different connection possibilities, flanged, threaded and with a weld but. It is a valve for on deck mounting. The valve is to be mounted with the vent opening (a), at least 760 mm above deck level for safety reasons (class requirement).

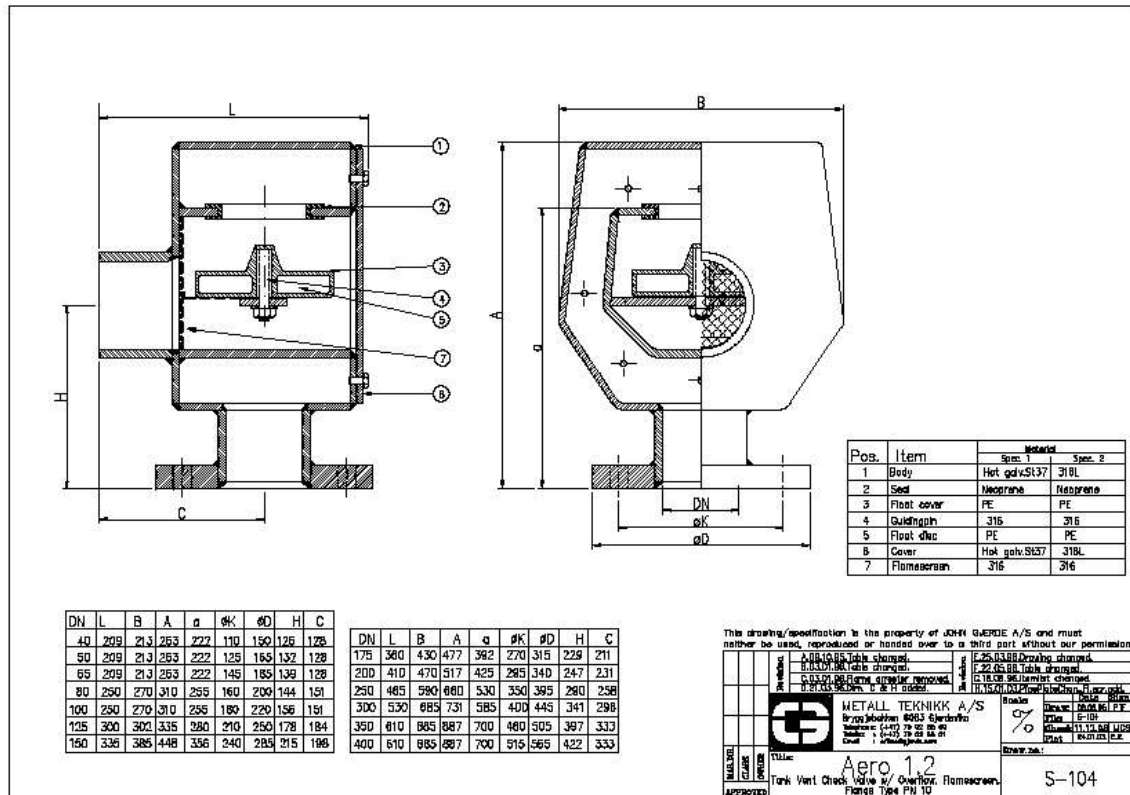
Usage:

This valve is used to ventilate all tanks onboard ships; ballast tanks, fresh water tanks, lubrication oil tanks and fuel tanks. However, it is not used to ventilate cargo tanks on oil or chemical tankers. (These use PV valves)

Merits:

- Determined flow characteristics
- Low leakage performance
- Low cost
- Short production times.

4.2.3 Aero 1.2



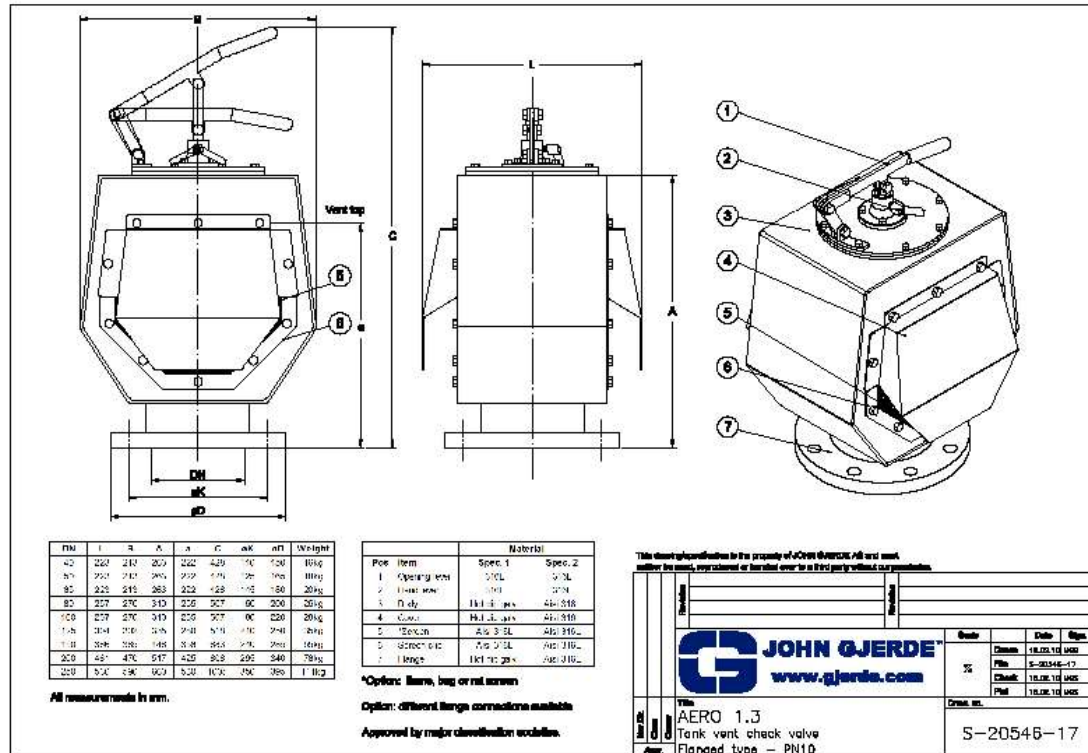
Description: This is a valve for mounting through superstructures. The rules say that this valve should be mounted at least 2300 mm (a) above sea level for safety reasons.

Usage: The valve is used where it would be uneconomical/impractical to pull the vent line all the way to deck level. It is equipped with an outlet pipe directing the flow and a flanged end on the outlet for easy mounting. The inlet-outlet measurement can be modified to customer specifications. This allows for easy mounting and provides versatility in the design process.

Merits:

- Determined flow characteristics
- Low cost
- Design and production opens for customer influence

4.2.4 Aero 1.3



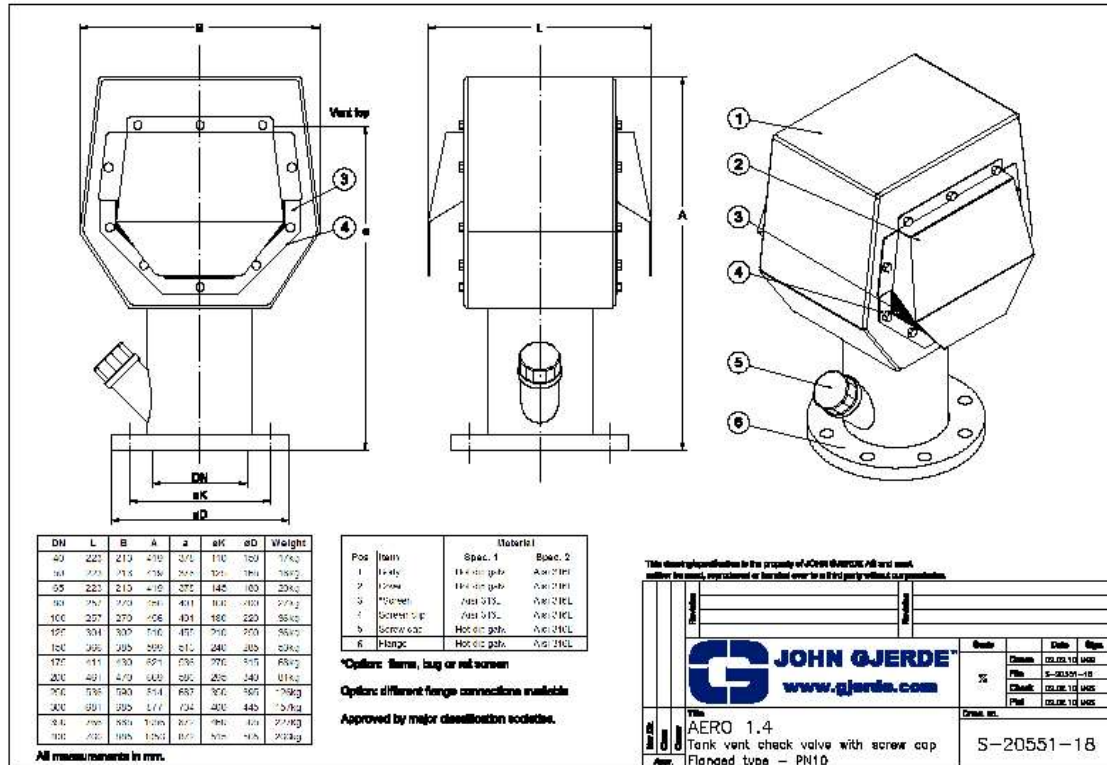
Description: Like Aero 1.1, with manual closing. Used to vent dry cargo holds.

Usage: Manual closing is useful where the least amount of water penetration is highly undesirable. In case of harsh weather or high sea there might be a need for manual closing of the valve to stop any water penetration. In case of a fire there might be a need to shut down the supply of fresh air, conversely to reduce the escape of flame quenching gasses if these are used.

Merits:

- Both manual and automatic closing.
- Sturdy design, will withstand rough treatment.
- Minimal maintenance
- Quick closing type.
- Full closing operation.

4.2.5 Aero 1.4



Description: Valve for on deck mounting with a branch pipe. This pipe can be used for sounding, sampling etc.

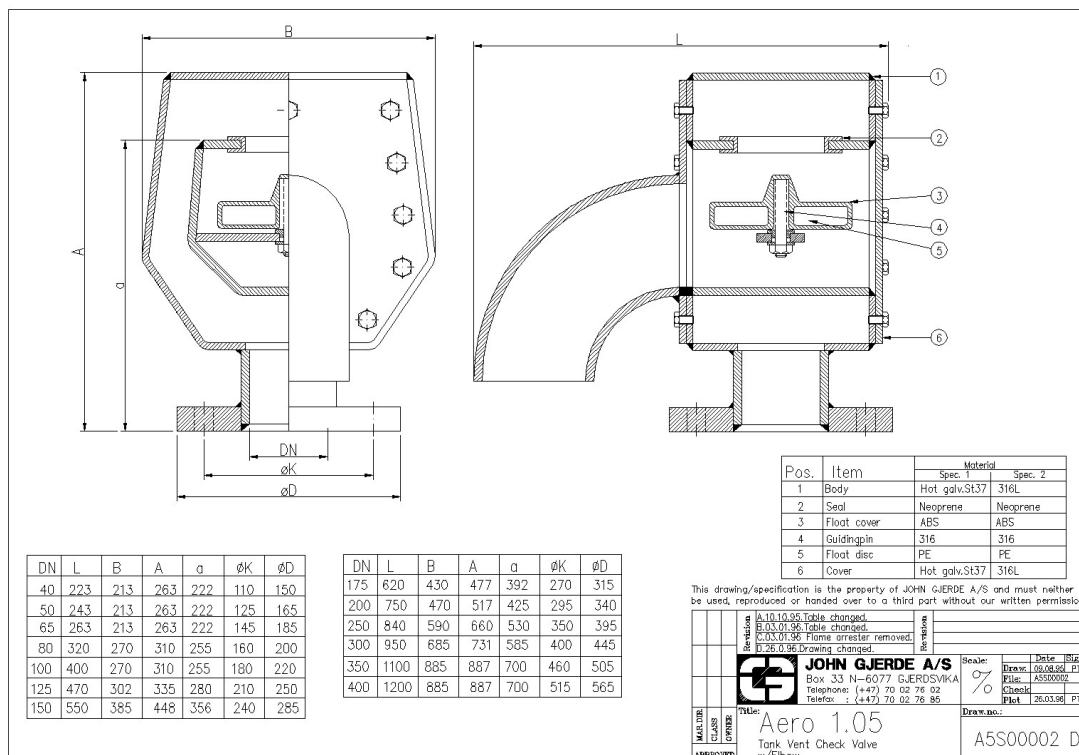
Usage: All tanks have vent lines. Some tanks also have sounding lines. In these circumstances there are two separate lines to the tanks. The idea is that instead of having separate lines for venting and sounding, one can use the vent line also for the sounding purpose.

Merits: This solution saves space, lead to less work and will in the end be a lot cheaper, and more compact than the alternative.

Only one deck penetration required, were traditionally two would be used.



4.2.6 Aero 1.5



Description: Vent check valve with directed overflow. This valve is like Aero 1.2, but instead of a straight pipe at the end, this valve has an elbow or a pipe with a customer defined direction/length.

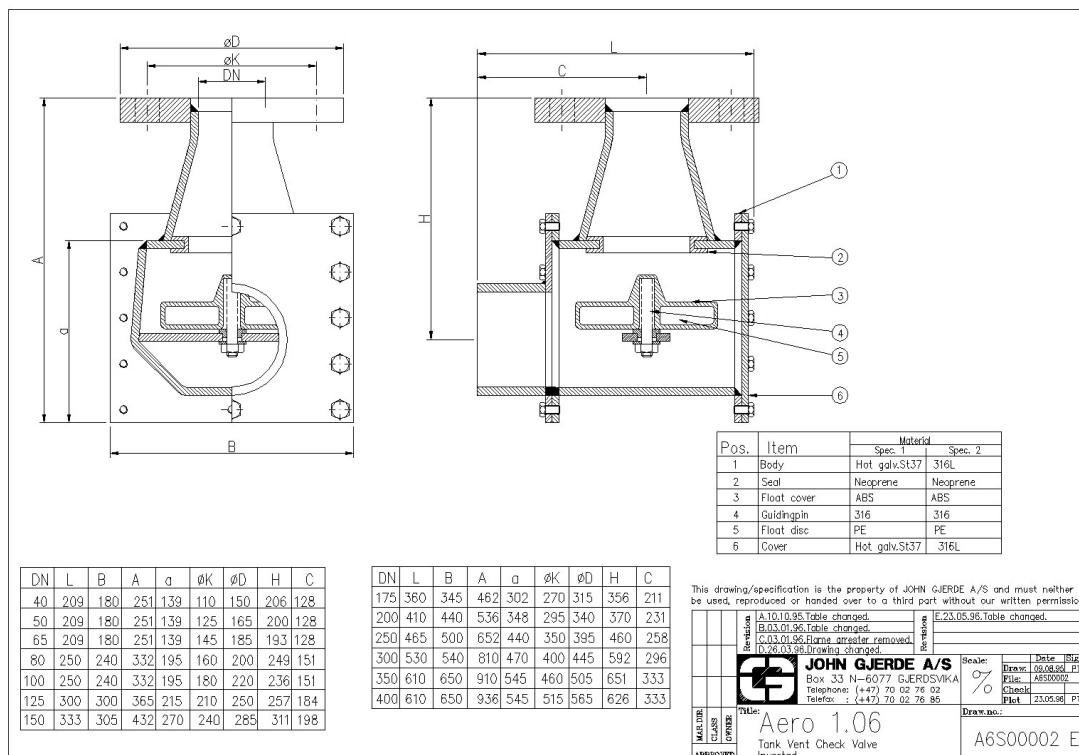
Usage: This is useful when you cannot mount the valve at straight angles to the vent exit. It is also useful when you are venting to a specified destination like a buffer tank. This is an advantage if the harbour authorities are restrictive about pollution.

Merits:

- Known flow characteristics
- Design opens for customer's specifications
- Low cost compared to alternative



4.2.7 Aero 1.6



Description: Vent check valve for venting through superstructures, inverted mounting.

Usage: On certain ships there is a requirement for valves to be mounted inverted. If the vent line is pulled up to the minimum height, the line can come back down again and through the ships side. The valve also offers an extra safety, as a leakage would have to rise to the top of the pipe before entering the tank.

Merits:

- Versatile
- Low leakage
- Low cost
- Small dimensions



5. Installation

5.1 Installation instructions

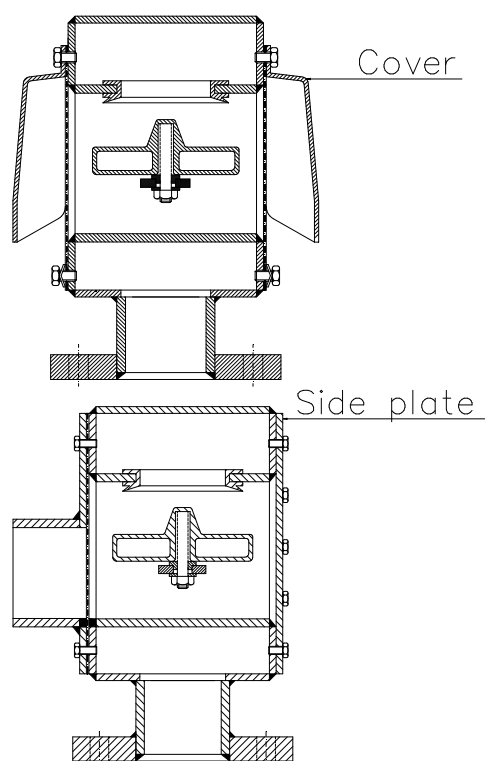
Each tank vent check valve, type Aero1, is supplied fully assembled and tested, with no further work required to render the unit operative. Installation is accomplished by bolting the flange of each unit to its corresponding tank vent pipe mating flange.

5.2 Maintenance

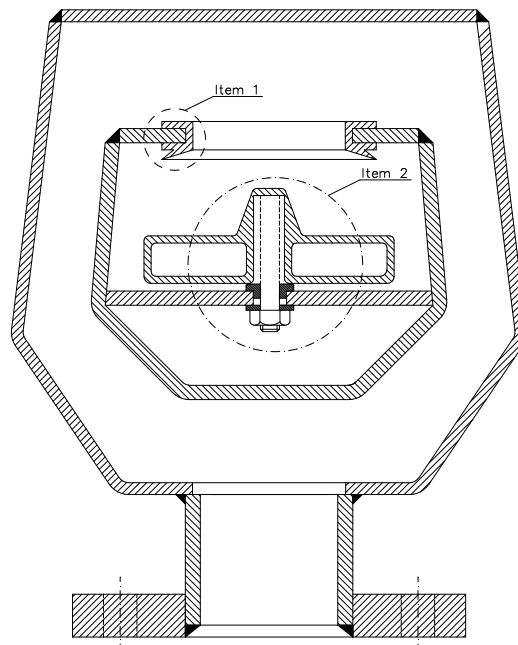
How often cleaning and inspection of Aero 1 is necessary, depends on the purity of the liquid flowing in the piping system. However, we recommend cleaning and inspecting Aero 1, at least once a year.

Cleaning and inspection of Aero 1 have to be carried out according to the following procedure:

1. Remove the side covers (or side plates).



2. If the tank vent check valve is fitted with a protective flame screen, then disassemble this from the valve.



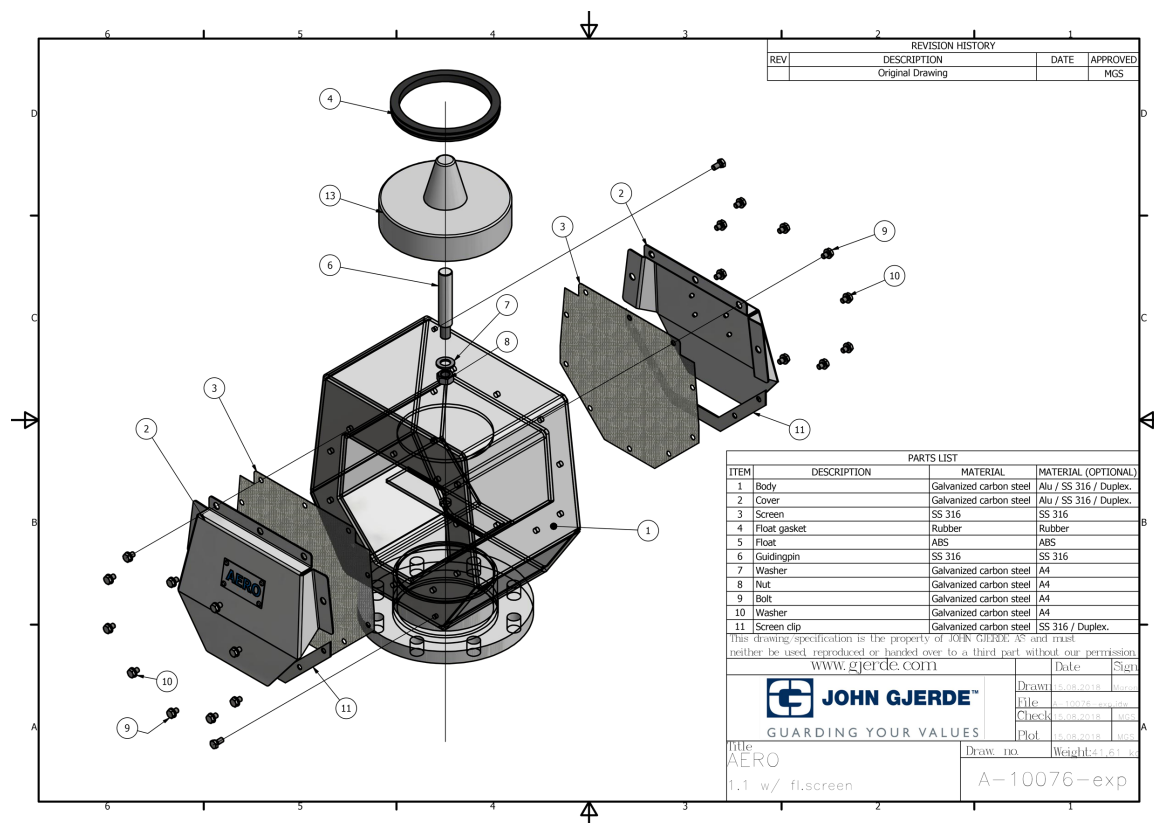
3. Loosen nut holding guiding pin.
4. Remove guiding pin and float.
5. Check the float gasket
6. Clean all parts, using oil-based solvent and a brush.
7. If any parts are damaged, then please make a note of the part and the dimension of the valve.
8. We have spares in stock and can deliver these when ordered. Any part in the valve must be replaced by a genuine spare part from John Gjerde As, to ensure proper valve function.

5.3 Spare parts

Classification societies have no specific demands for spare parts for vent check valves. We do however recommend a full set of spares according to the following key:

| No of valves | Set of spares |
|--------------|---------------|
| 1-5 | 1 |
| 6-10 | 2 |
| 11-15 | 3 |

We have spare parts in stock. to process an order we need the dimension, type of valve and the spare name.



Spare parts for Aero 1.1 - 1.6 & Mud Partnumberlist

Backplate
Gasket

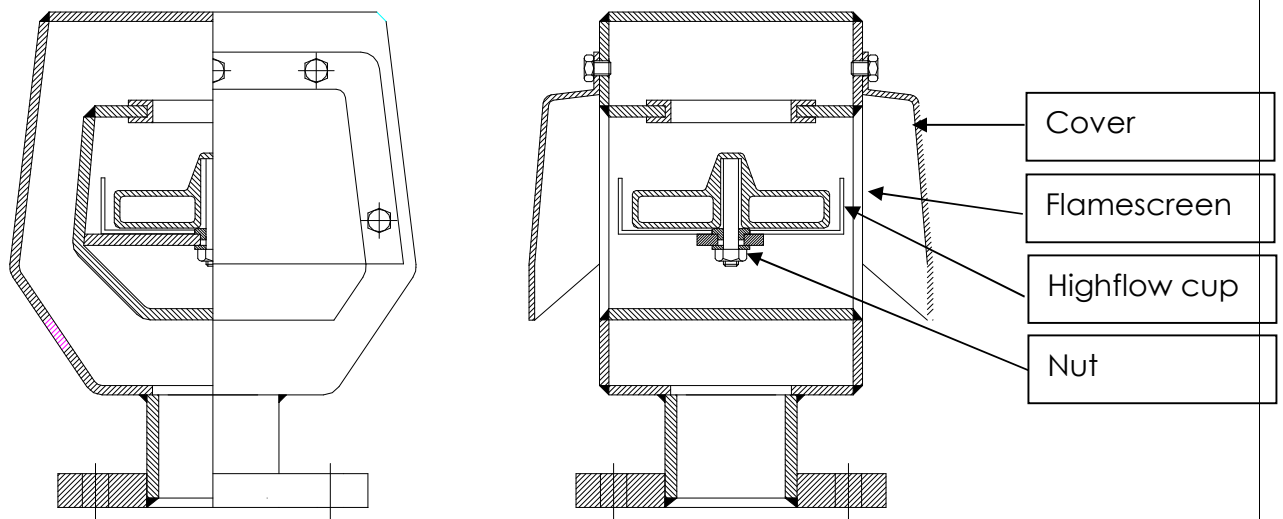
| DN | Float | Gasket | High Flow Cup | Fl.screen set | Guiding Pin | Cover ST37 | 1.2 & 1.6 |
|----------|-------|--------|---------------|---------------|-------------|------------|-----------|
| 40/50/65 | 10579 | 10702 | 12482 | 11845 | 10846 | 10392 | 13123 |
| 80/100 | 10580 | 10587 | 12261 | 11846 | 11279 | 10393 | 13124 |
| 125 | 10581 | 10588 | 12484 | 11847 | 10847 | 10394 | 13125 |
| 150 | 10582 | 10589 | 11645 | 11848 | 10848 | 10395 | 13126 |
| 200 | 10583 | 10591 | 11608 | 11850 | 10849 | 10397 | 13127 |
| 250 | 10584 | 10592 | 11838 | 11851 | 10850 | 10398 | 13128 |
| 300 | 10585 | 10593 | 11839 | 11852 | 10851 | 10399 | 13129 |
| 350 | 10586 | 10594 | 11840 | 11853 | 10852 | 10400 | 13130 |
| 400 | 12053 | 10594 | 11576 | 11853 | 10852 | 10400 | 13130 |



5.4 Mounting High Flow cup in Tank Vent

The High Flow Cup for the Aero 1 series tank vent check valves is a result of us continuously testing our valves to improve the flowcapacity. When the return flow (air into the tank) is high, due to severe conditions, this could cause the float to be sucked up and thereby close the ventline.

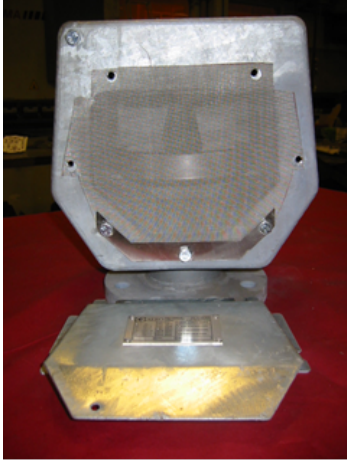
By mounting a High Flow Cup under the float the return flowcapacity is nearly doubled. The effect of this is safer and more noiseless operation. It will also protect the tank for structural damage due to the devices shutting of. This device is mostly mounted on the tank vent check valves for stabilization tanks on board supply vessels.





Maintenance / mounting instruction:

- Remove the cover by disassembling the bolts.



- Remove the flame screen if mounted.

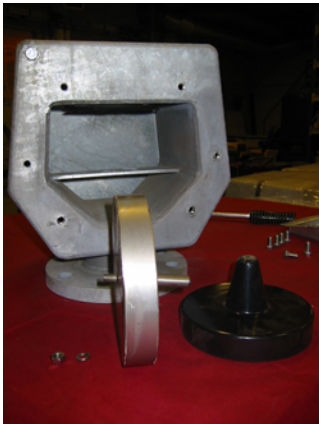


- Loosen nut and remove the guiding-pin and float.

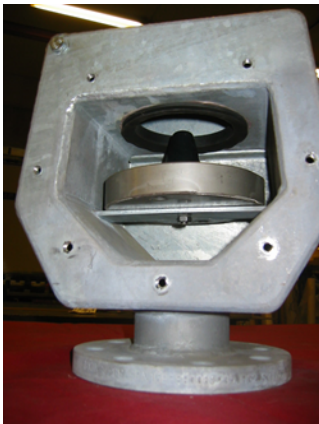




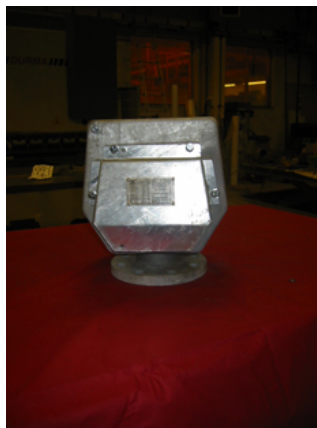
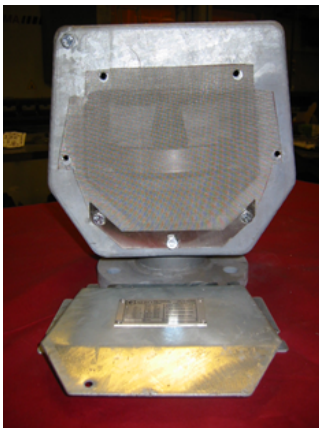
- Now place the “high flow cup” in position on the guiding-pin (over the thread side). Replace the float over the guiding-pin. **Do this outside the valve.**



- Careful place the mounted assembly in position and tighten the nut.



- Install flame screen (if necessary) and cover back in position.





5.5 Mounting Flame screen / bug screen / rat screen

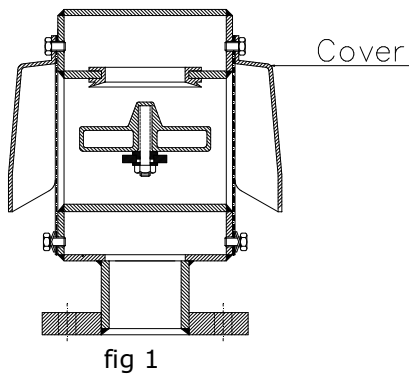


photo 1

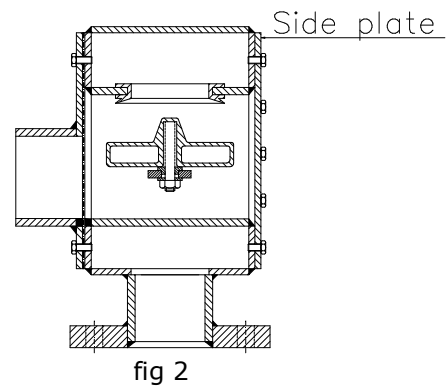


photo 2



photo 3



Maintenance / mounting instruction:

- First remove the covers by disassembling the bolts (fig 1 and 2)
- Put the flame/bug/rat screen over the vent opening (photo 1)
- Mount the flame screen-strip on the lower part of the vent opening (photo 2)
- Put the cover back on its place and tighten the bolts (photo 3)
- Do the same at the other side of the vent check valve.
- Check the flame/bug/rat screens for damage each 3 month and replace if necessary.



For more information you can contact your local agent or:

John Gjerde AS

Gjerdsvikvegen 313
N-6083 Gjerdsvika
Norway

Telephone : +47 7002 6500
Website : www.gjerde.com
E-mail : office@gjerde.com