JOHN GJERDE™

Specialists in maritime tank venting technique

Aero 1

Vent check valves

2018

Instruction and maintenance manual.

Version: 24.08.2018

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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 180º 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 document[1].

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 ∓ 40º 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 +/- 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 -25ºC and 85ºC.

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 were 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 superstructures[2] and one for mounting on deck[3].

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.

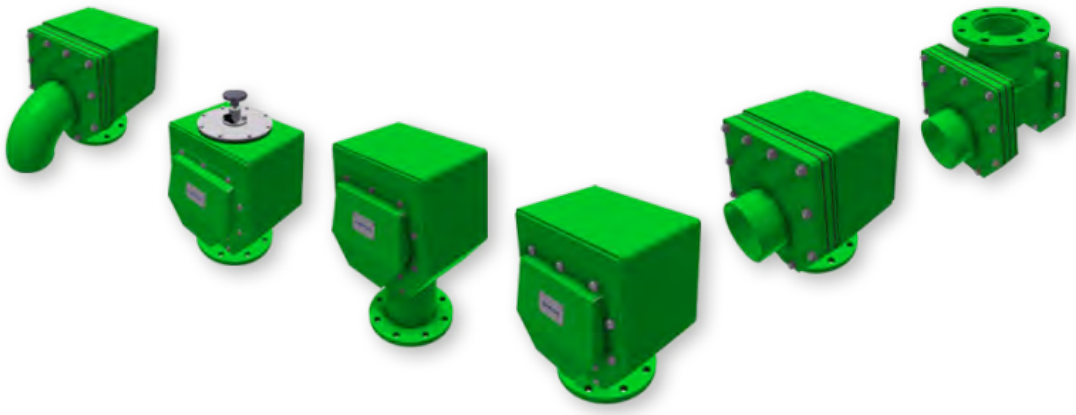
The float has been tested in many ways to make sure that they will be able to withstand the harshest treatment. Again, our float design is favourable as a flat compact disc can tolerate the treatment better than hollow balls.

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.

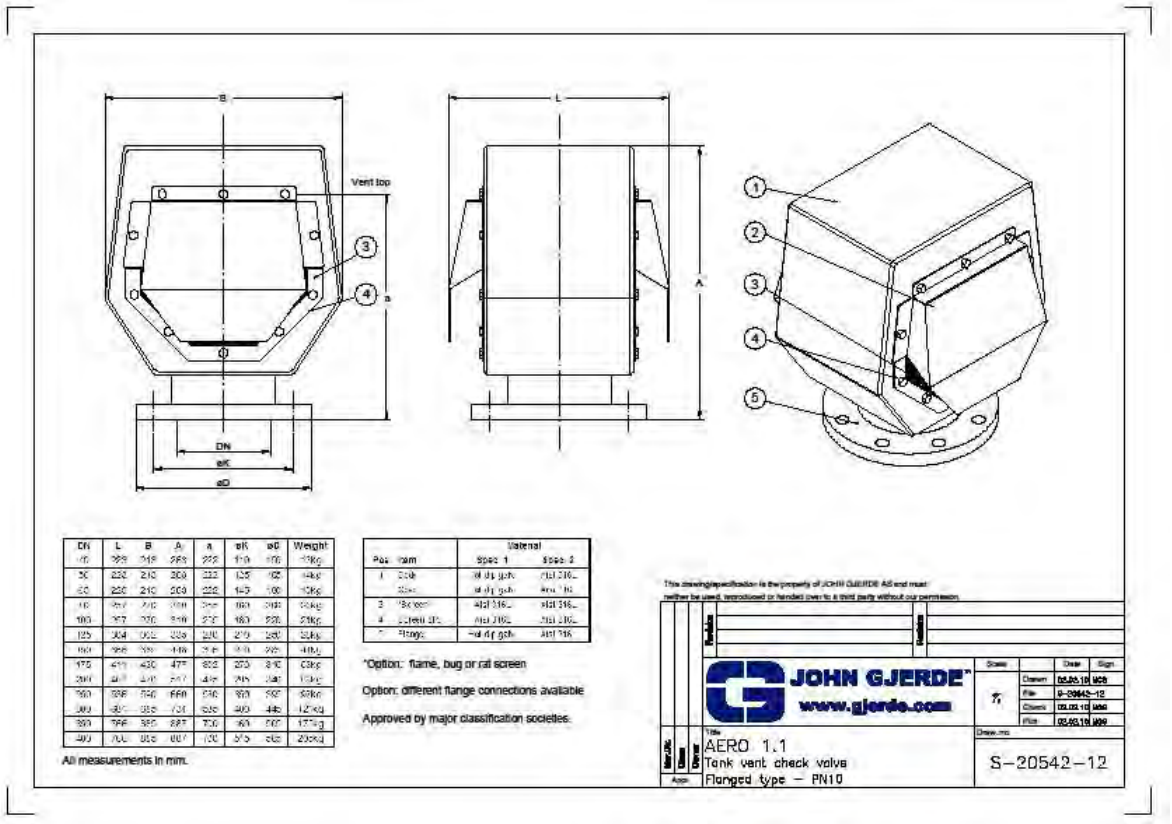
The Aero product range has been in the market for 40 years. This valve is used to ventilate all tanks onboard ships, except cargo tanks on oil or chemical tankers.

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 ensures '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



DN	L	B	A	a	øK	øD	Weight
50	232	210	309	222	125	165	4kg
65	256	210	309	222	145	185	5kg
80	267	210	309	222	160	200	6kg
100	267	230	309	222	180	220	6kg
125	304	265	329	240	210	250	8kg
150	356	320	448	240	240	285	11kg
175	411	430	477	402	270	315	13kg
200	411	430	477	402	295	340	15kg
250	596	640	669	540	350	405	30kg
300	596	640	701	535	400	445	42kg
350	796	880	887	700	460	505	77kg
400	796	880	887	700	515	565	89kg

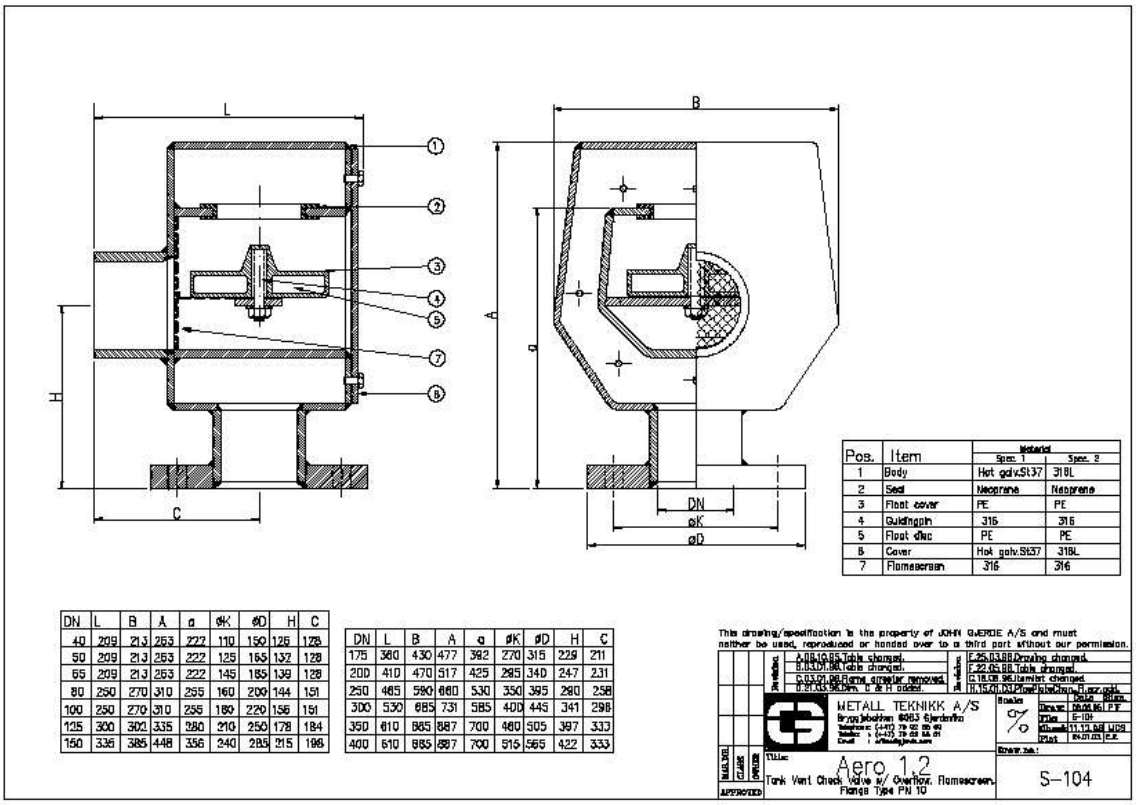
Pos	Item	Material Spec. 1	Spec. 2
1	Body	St st cast grade	AISI 316L
2	Cover	St st cast grade	AISI 316L
3	Screen*	AISI 316L	AISI 316L
4	Screen ring	AISI 316L	AISI 316L
5	Flange	Hot dip galv.	AISI 316

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



Pos.	Item	Material Spec. 1	Spec. 2
1	Body	Hot galv.St37	316L
2	Seal	Neoprene	Neoprene
3	Float cover	PE	PE
4	Guidingpin	316	316
5	Float disc	PE	PE
8	Cover	Hot galv.St37	316L
7	Flamescreen	316	316

DN	L	B	A	a	øK	øD	H	C
40	209	213	263	222	110	150	126	128
50	209	213	263	222	125	165	132	128
65	209	213	263	222	145	185	139	128
80	250	270	310	255	160	200	144	151
100	250	270	310	256	180	220	156	151
125	300	302	335	280	210	250	178	184
150	336	385	448	356	240	285	215	198

DN	L	B	A	a	øK	øD	H	C
175	360	430	477	362	270	315	229	211
200	410	470	517	425	295	340	247	231
250	465	590	680	530	350	395	280	258
300	530	685	731	585	400	445	341	298
350	610	885	887	700	460	505	397	333
400	610	885	887	700	515	565	422	333

METALL TEKNIKK A/S
Brynsbakken 6063 Sjørdalfo

Aero 1.2
Tank Vent Check Valve w/ Overflow, Flamescreen.
Flange Type PN 10

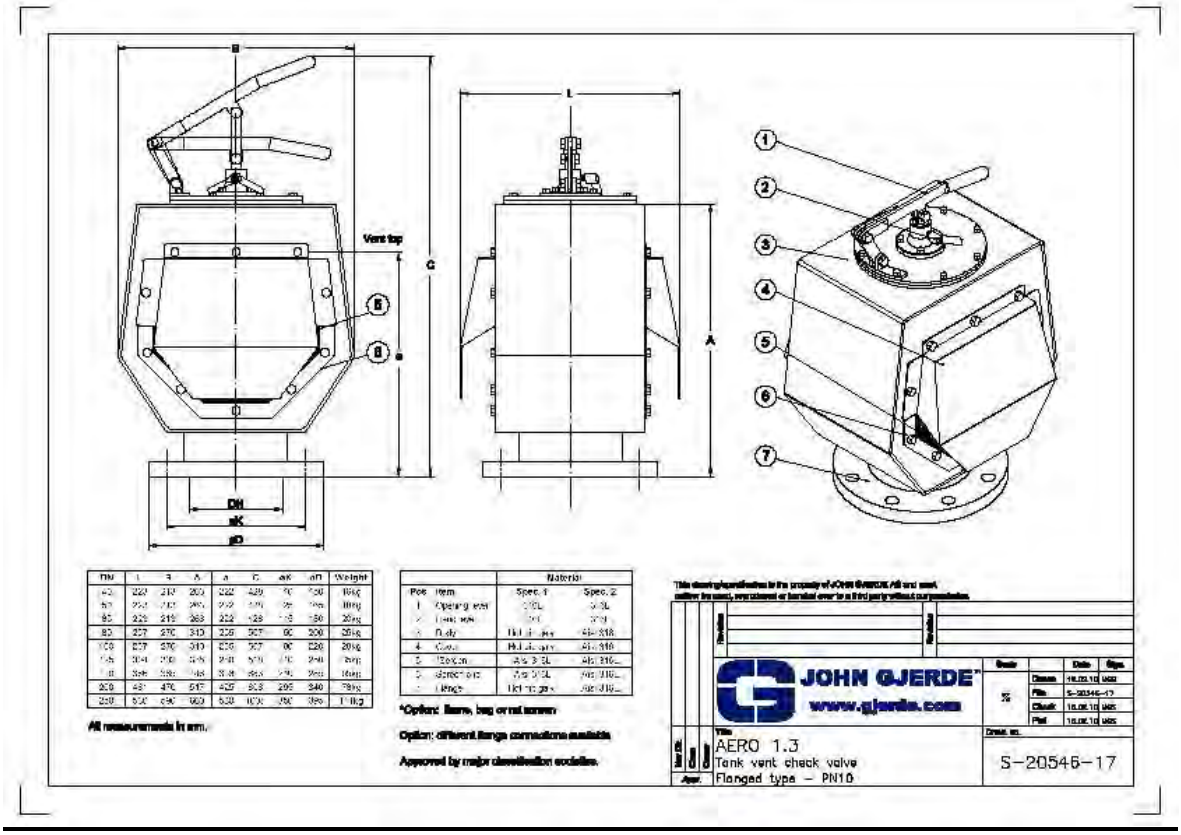
S-104

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 were 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

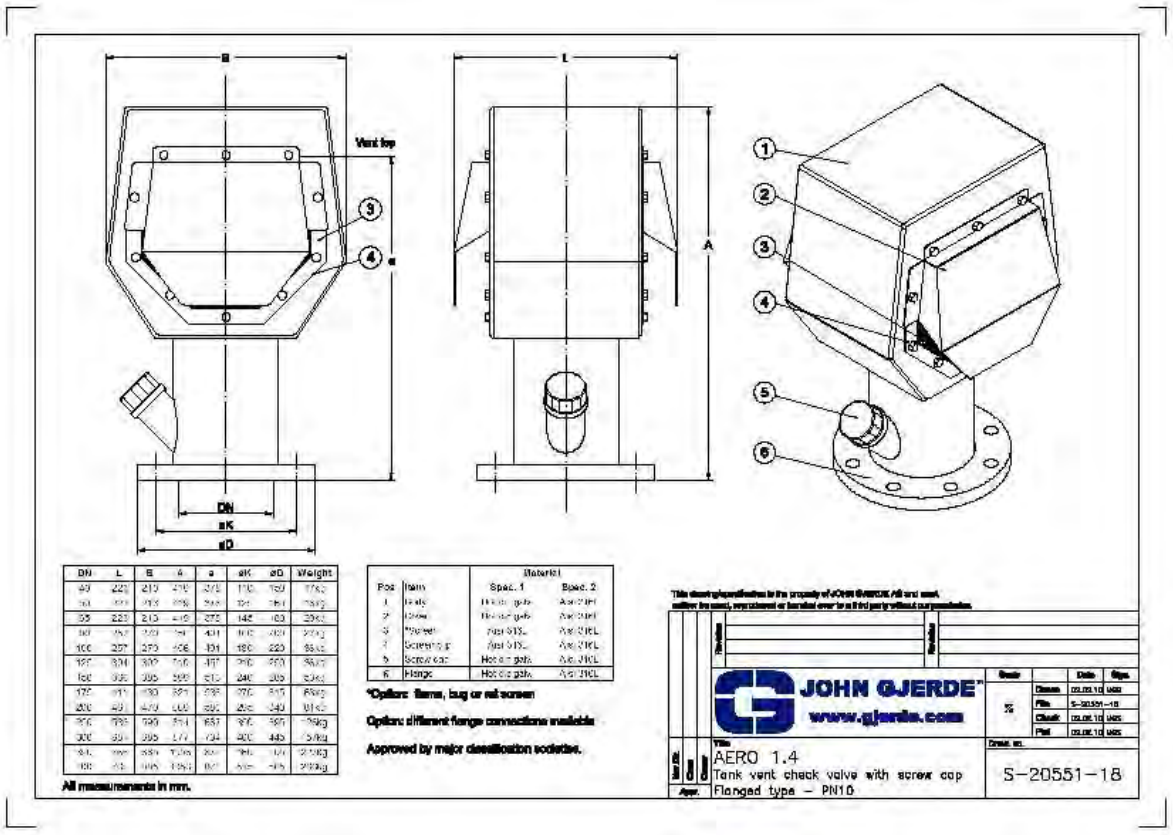


Description: Like Aero 1.1, with manual closing. Used to vent dry cargo holds.

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



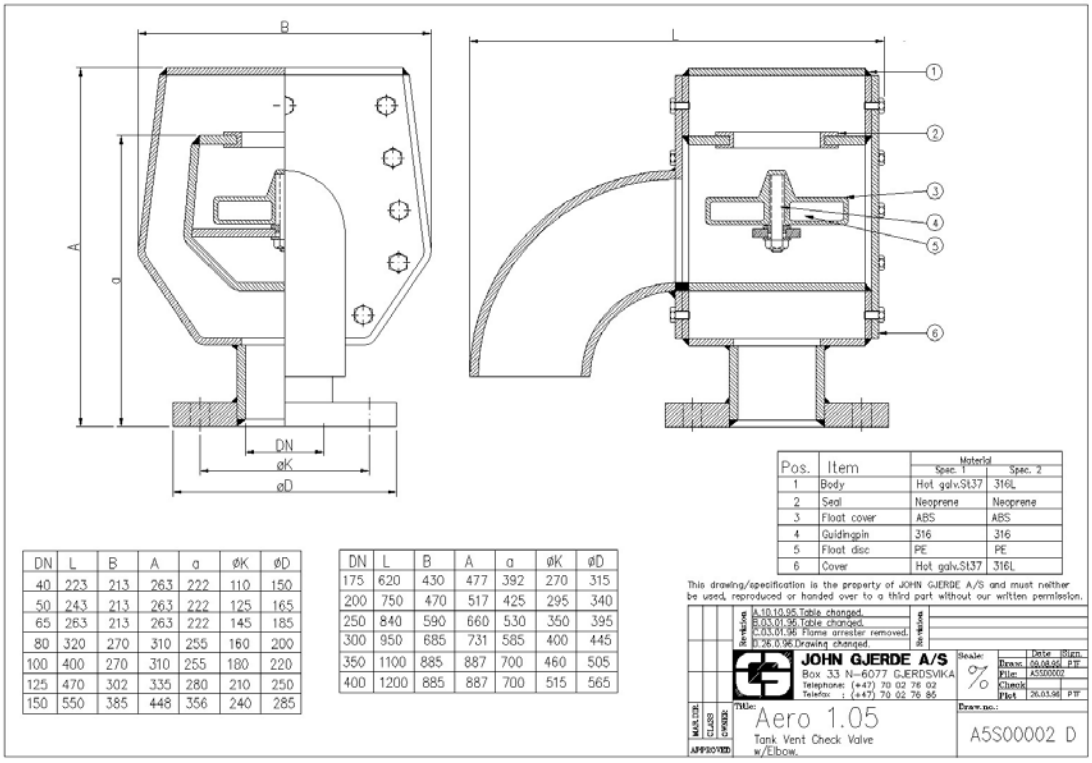
Description: Valve for on deck mounting with a branch pipe. This pipe can be used for sounding, sampling etc.

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



DN	L	B	A	a	øK	øD
40	223	213	263	222	110	150
50	243	213	263	222	125	165
65	263	213	263	222	145	185
80	320	270	310	255	160	200
100	400	270	310	255	180	220
125	470	302	335	280	210	250
150	550	385	448	356	240	285

DN	L	B	A	a	øK	øD
175	620	430	477	392	270	315
200	750	470	517	425	295	340
250	840	590	660	530	350	395
300	950	685	731	585	400	445
350	1100	885	887	700	460	505
400	1200	885	887	700	515	565

Pos.	Item	Material Spec. 1	Spec. 2
1	Body	Hot galv.St37	316L
2	Seal	Neoprene	Neoprene
3	Float cover	ABS	ABS
4	Guidingpin	316	316
5	Float disc	PE	PE
6	Cover	Hot galv.St37	316L

Revisions: A.10.10.95 Table changed. B.03.01.96 Table changed. C.03.01.96 Flame arrester removed. D.26.0.96 Drawing changed.

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Scale: %
Date / Sign.
Draw. 09.08.95 PTF
File: A5S00002
Check
Plot 26.03.96 PTF

MAT. SPEC. CLASS OWNERS APPROVED

Title: Aero 1.05
Tank Vent Check Valve w/Elbow.

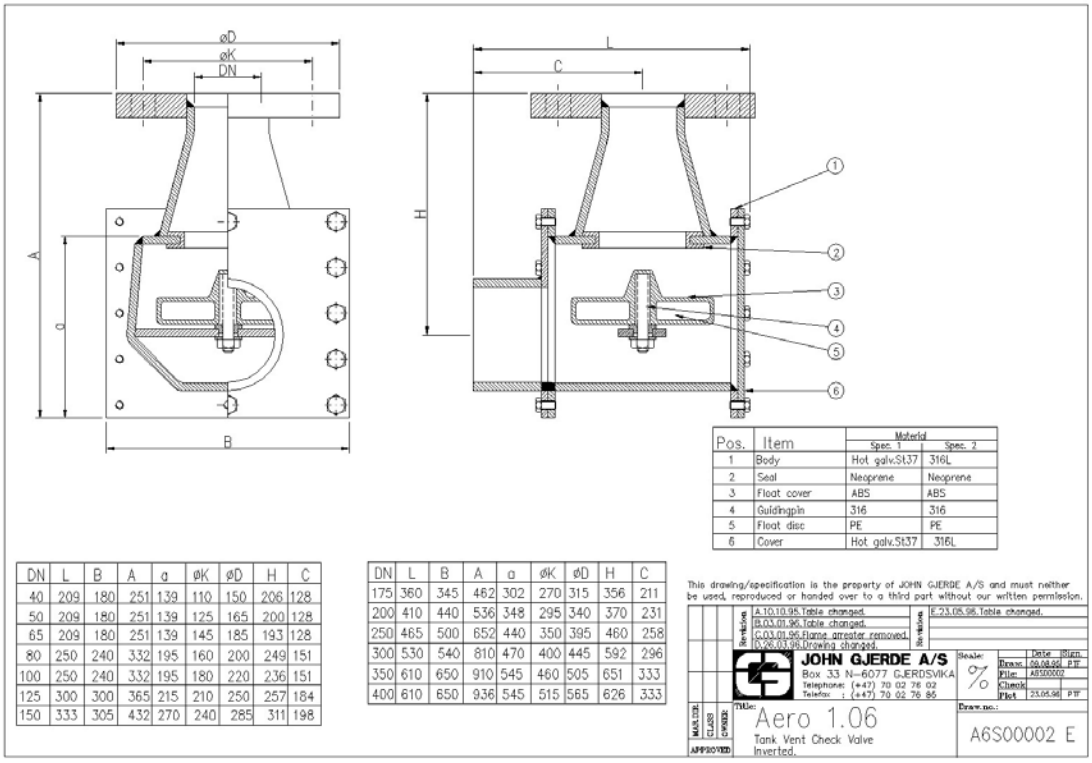
Draw.no.: A5S00002 D

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



Pos.	Item	Material Spec. 1	Material Spec. 2
1	Body	Hot galv.St.37	316L
2	Seal	Neoprene	Neoprene
3	Float cover	ABS	ABS
4	Guidingpin	316	316
5	Float disc	PE	PE
6	Cover	Hot galv.St.37	316L

DN	L	B	A	a	øK	øD	H	C
40	209	180	251	139	110	150	206	128
50	209	180	251	139	125	165	200	128
65	209	180	251	139	145	185	193	128
80	250	240	332	195	160	200	249	151
100	250	240	332	195	180	220	236	151
125	300	300	365	215	210	250	257	184
150	333	305	432	270	240	285	311	198

DN	L	B	A	a	øK	øD	H	C
175	360	345	462	302	270	315	356	211
200	410	440	536	348	295	340	370	231
250	465	500	652	440	350	395	460	258
300	530	540	810	470	400	445	592	296
350	610	650	910	545	460	505	651	333
400	610	650	936	545	515	565	626	333

Revisions: A.10.10.95.Table changed. B.03.01.96.Table changed. C.03.01.96.Flame arrester removed. D.26.03.96.Drawing changed. E.23.05.96.Table changed.

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Scale: %
Date (Sign.)
Draw. 06.08.96 PTF
File: A6S00002
Check
Plot 23.05.96 PTF

MAIN.CON. CLASS OWNER APPROVED

Title: Aero 1.06
Tank Vent Check Valve Inverted.

Draw.no.: A6S00002 E

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

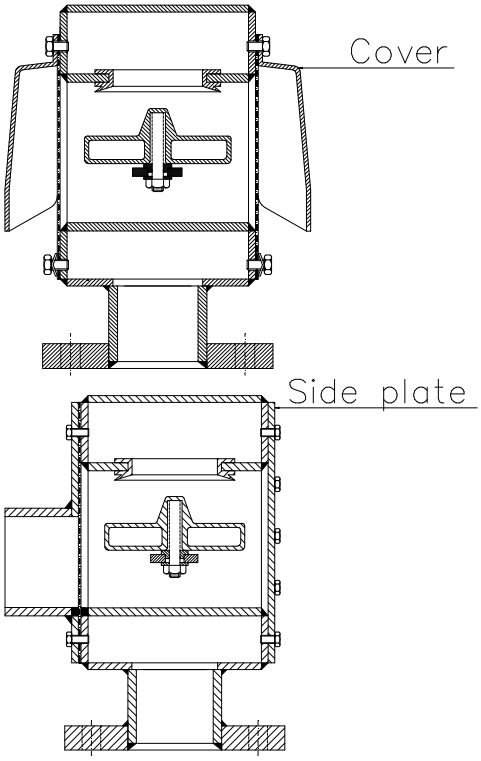
Each tank vent check valve, type Aero1, is supplied fully assembled and tested, with no further work required to render the unit operative. Installation is accomplished by bolting the flange of each unit to its corresponding tank vent pipe mating flange.

5.2 Maintenance

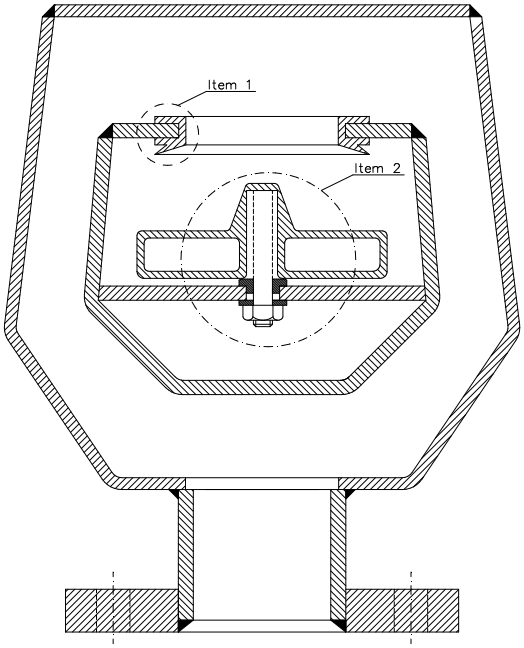
How often cleaning and inspection of Aero 1 is necessary, depends on the purity of the liquid flowing in the piping system. However, we recommend cleaning and inspecting Aero 1, at least once a year.

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.



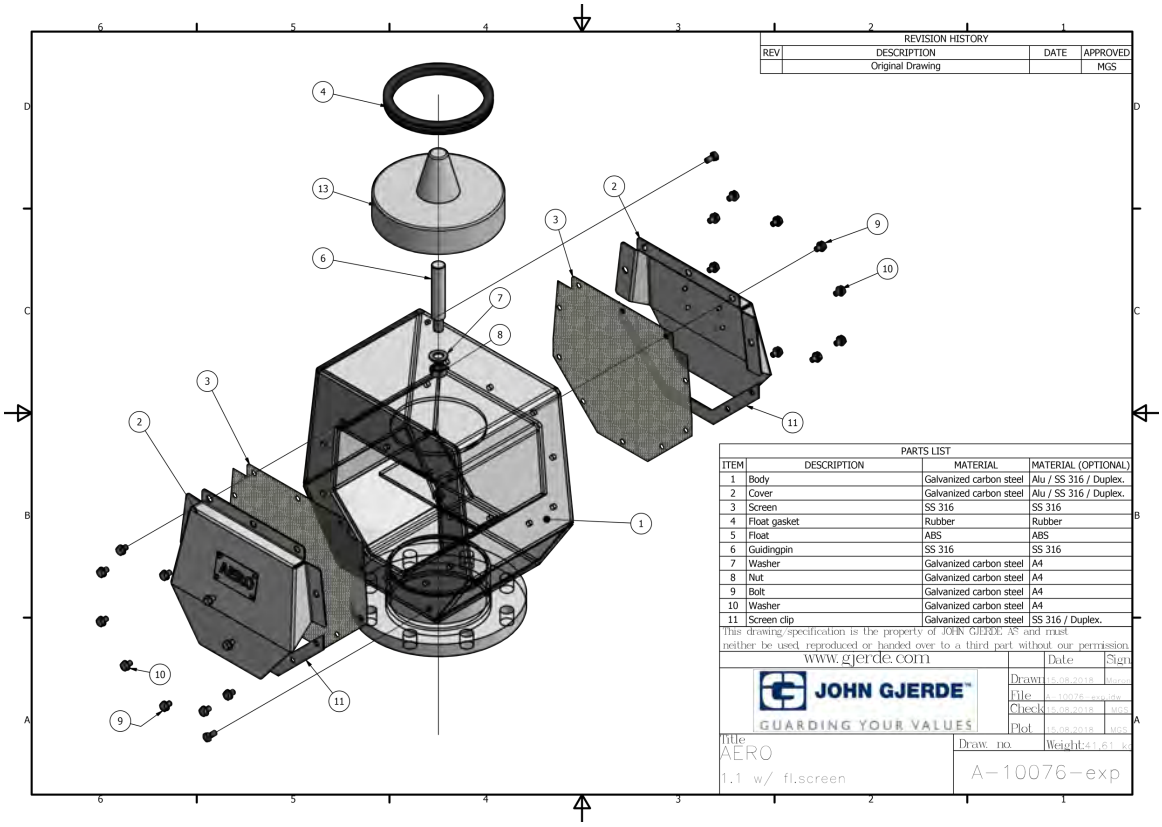
3. Loosen nut holding guiding pin.
4. Remove guiding pin and float.
5. Check the float gasket
6. Clean all parts, using oil-based solvent and a brush.
7. If any parts are damaged, then please make a note of the part and the dimension of the valve.
8. We have spares in stock and can deliver these when 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.



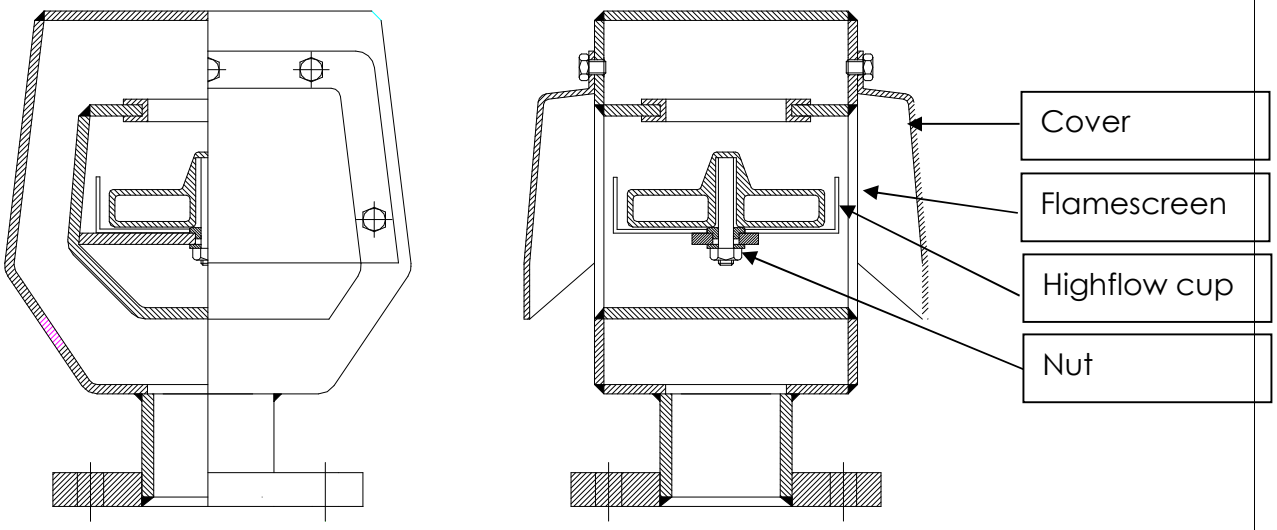
Spare parts for Aero 1.1 - 1.6 & Mud
Partnumberlist

DN	Float	Gasket	High Flow Cup	Fl.screen set	Guiding Pin	Cover ST37	Backplate Gasket 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

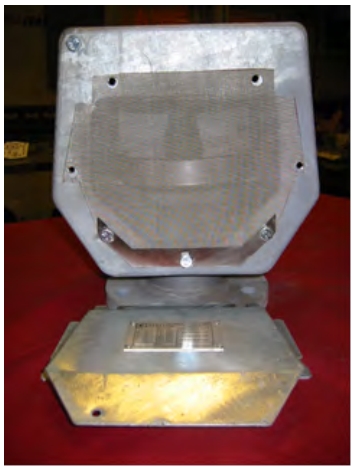
The High Flow Cup for the Aero 1 series tank vent check valves is a result of us contineously testing our valves to improve the flowcapacity. When the return flow (air into the tank) is high, due to severe conditions, this could cause the float to be sucked up and thereby close the ventline.

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 stabilzation tanks on board supply vessels.



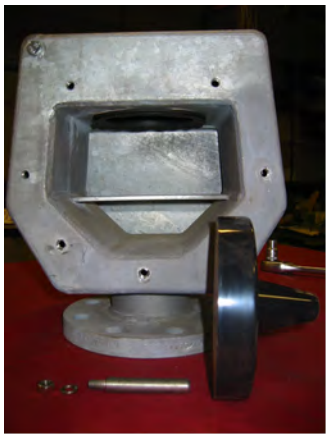
Maintenance / mounting instruction:

- Remove the cover by disassembling the bolts.



- Remove the flame screen if mounted.

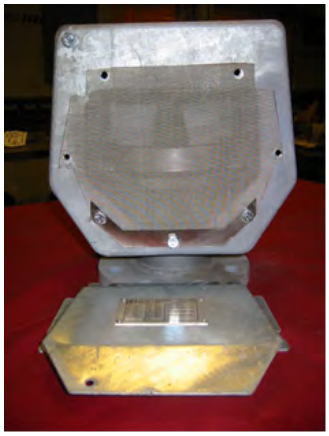
- Loosen nut and remove the guiding-pin and float.

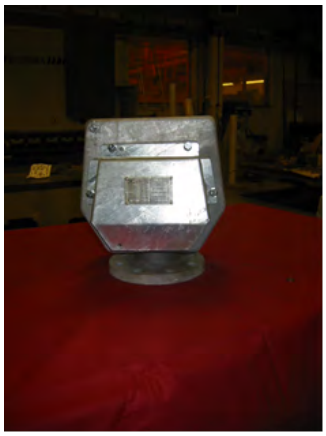


- Now place the "high flow cup" in position on the guiding-pin (over the thread side). Replace the float over the guiding-pin. **Do this outside the valve**.

- 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

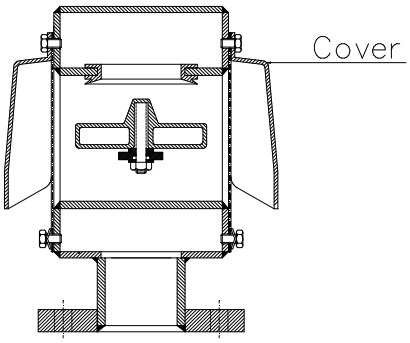


fig 1

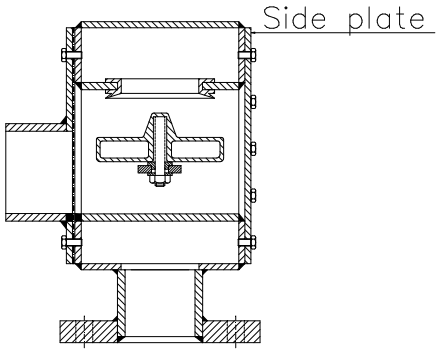


fig 2

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:

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Website : www.gjerde.com
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