



PRES•VAC

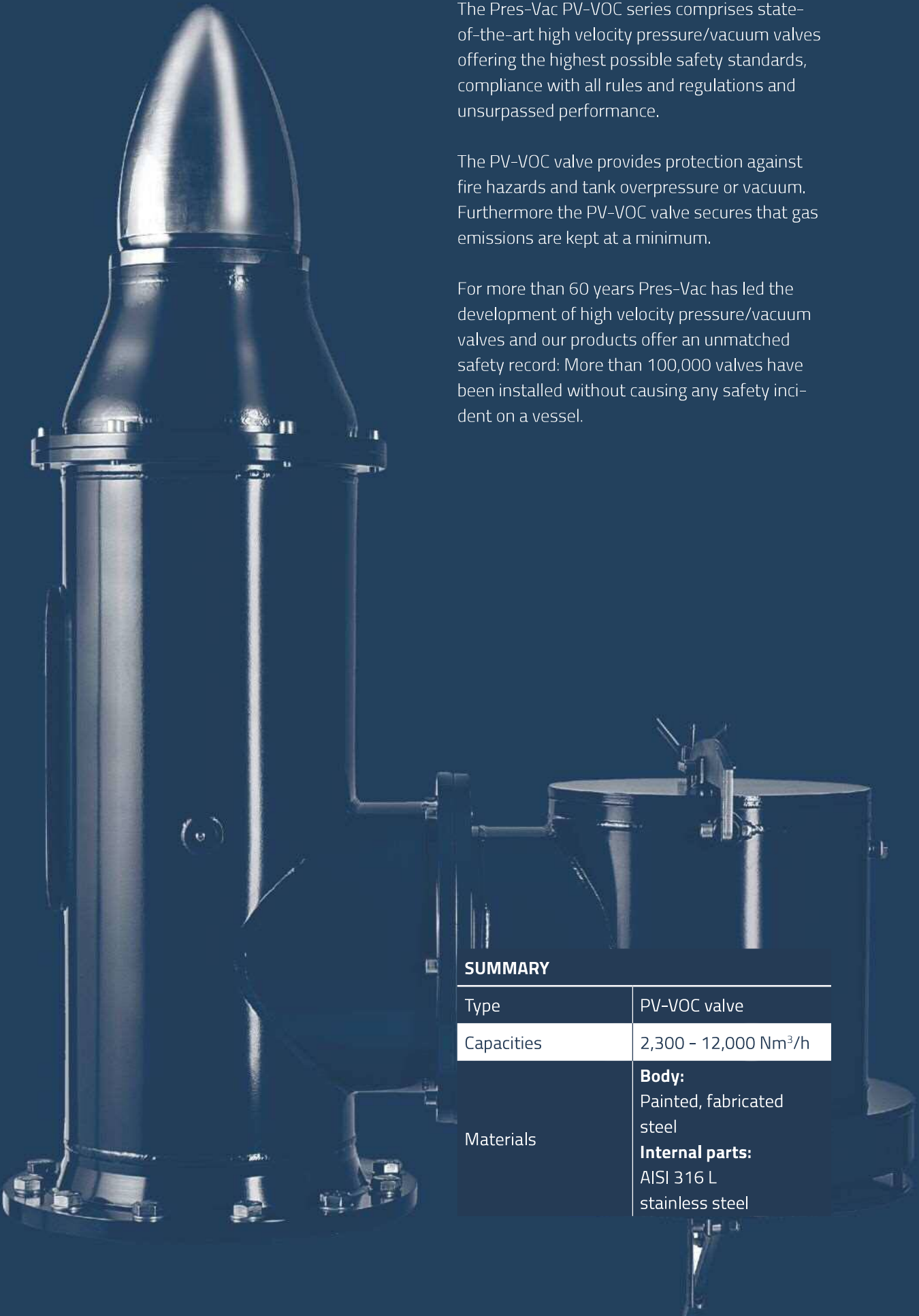
PV-VOC SERIES

High velocity pressure/vacuum valves



G&O MARITIME GROUP

MARINE LIFE WITHOUT FOOTPRINTS



The Pres-Vac PV-VOC series comprises state-of-the-art high velocity pressure/vacuum valves offering the highest possible safety standards, compliance with all rules and regulations and unsurpassed performance.

The PV-VOC valve provides protection against fire hazards and tank overpressure or vacuum. Furthermore the PV-VOC valve secures that gas emissions are kept at a minimum.

For more than 60 years Pres-Vac has led the development of high velocity pressure/vacuum valves and our products offer an unmatched safety record: More than 100,000 valves have been installed without causing any safety incident on a vessel.

SUMMARY

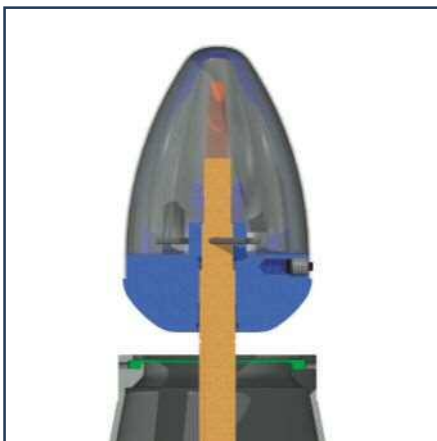
Type	PV-VOC valve
Capacities	2,300 - 12,000 Nm ³ /h
Materials	Body: Painted, fabricated steel Internal parts: AISI 316 L stainless steel

MAIN FUNCTIONS AND FEATURES

Safety

- The PV-VOC valve is designed, tested and manufactured to provide maximum safety for crew, cargo and vessel.
- The pressure unit has been designed to ensure that the efflux velocity is always above the required minimum of 30 m/s and typically between 60-100 m/s.
- The cone of the pressure unit has been optimized to secure vertical vapour dispersing, which combined with the high efflux velocity ensures, that gas is safely led away from deck.
- The PV-VOC valve has been extensively fire tested at the world's leading test laboratory in Germany. Tests include endurance burn testing and flash-back testing in accordance with all relevant rules.
- The resilient seal provides protection against leakage and reduces emissions to virtually zero.

Pres-Vac is ISO 9001 certified to ensure consistency of the high quality products that Pres-Vac is known for.



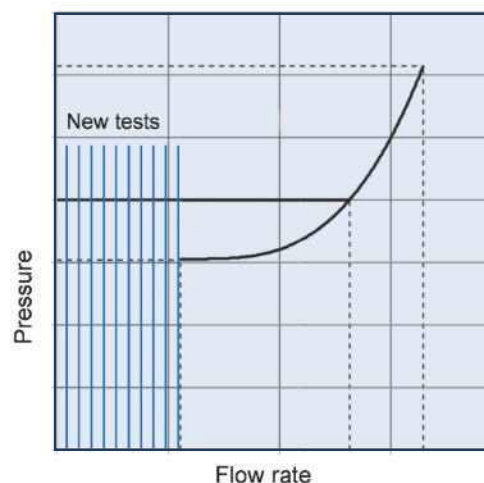
Vertical vapor dispersing and high efflux velocity.

Compliance with rules and regulations

- The PV-VOC valve is designed, tested and manufactured to be in compliance with all existing and foreseen international regulations.
- In 2013 the European Commission adopted EN ISO 16852:2010 as a new standard for testing of flame arrestors to be installed on-board marine vessels. As the first P/V valve on the market, The PV-VOC valve has been designed, tested and approved to comply with this new standard.

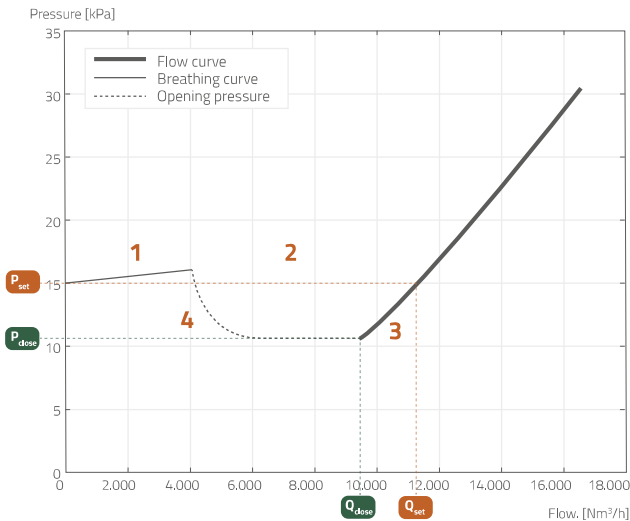


Flashback testing at low flow rates in accordance with EN ISO 16852:2010. The flashback tests shall be performed on pipe lengths equal to or longer than the pipe length, on which the valves are to be installed. This is mandatory according to EN ISO 16852:2010.



MAIN FUNCTIONS AND FEATURES

Performance



The patented PV-VOC pressure/vacuum valve is designed to optimize the VOC performance. Using fluid dynamic simulation software in connection with testing, we have achieved a performance that benefits all stages in the operation of an oil tanker. This includes filling, topping, breathing or VOC savings in accordance with the VOC management procedure required by IMO/MSC/Circ.680.

Performance in 4 phases:

1. The breathing phase

When the vessel is in voyage and the only influences on the pressure in the cargo tank are the thermal variation and the movements of the ships, the valve will be in the breathing phase. The breather performance will ensure that the pressure is kept on top of the cargo avoiding any unnecessary emission of VOC. The valve performance is characterised by the ability to open and close at the same pressure level. This performance is kept until approximately 50% of the total flow capacity is reached. Then the valve will enter the fully open phase.

2. The fully open phase

The valve will enter the fully open phase, when the vessel is loading and the full flow capacity is required. The pressure unit will open up fully and ensure, that the pressure is maintained at the opening setting level. The design of the valve ensures a steady, non-oscillating behaviour keeping a constant pressure in the venting system, until the loading has finished. The valve will then enter the closing phase.

3. The closing phase

When the cargo tank is getting close to full, the loading rate will decrease and the valve will enter the closing phase. The valve will start closing, still keeping a sufficient pressure on the cargo. The closing phase will be performed while ensuring that the blow down will be as small as possible. The valve will still be open in this phase, but the performance will stop the evaporation of the cargo.

4. Topping off phase

When the cargo tank is almost full (closing towards 98%) the topping of the tank will result in a significant decrease of the loading rate in order to avoid the cargo from creating a sudden overpressure. This will force the valve into the final closing phase. In this phase, the valve will close at the same pressure as it opened, thus preserving the VOC in the cargo tank in compliance with the IMO/MSC/Circ. 680.

Effective relief of tank pressure

The PV-VOC valve provides effective control and management of the tank pressure. If pressure exceeds the specified opening setting, the valve will open immediately and relieve the excess pressure. Similarly, if pressure during discharging gets below the specified opening pressure, the valve will open and relieve the vacuum.

MAIN FUNCTIONS AND FEATURES

The PV-VOC valve has an advanced flow control design to manage tank pressure:

- The tank pressure valve is controlled by a combination of magnet and weight forces to secure that the valve does not create a pressure surge during opening.
- A patented combination of a booster plate and pressure control ring secures that the valve has a soft opening and closing phase ensuring efficient operations also at low flow rates.

Configured to your requirements

Pres-Vac P/V valves are individually configured to suit your specific requirements:

- 5 different sizes of pressure units combined with 5 different sizes of vacuum units
- Variable flange sizes
- All flange standards available and any customized version
- Options include integrated gas freeing cover, coating, heating, low pressure setting
- Two different product versions

Low noise level

The PV-VOC valve is designed to minimise noise during operations. By optimising the nozzle design, the noise level of the PV-VOC valve has been reduced by 10-15 dB compared to other designs. In many applications hearing protection will not be required.



Noise reduced design



30% fewer parts

Operations and maintenance made simple

The PV-VOC valve has been designed to simplify operation and maintenance. Daily operations by the crew are made simple by the following features:

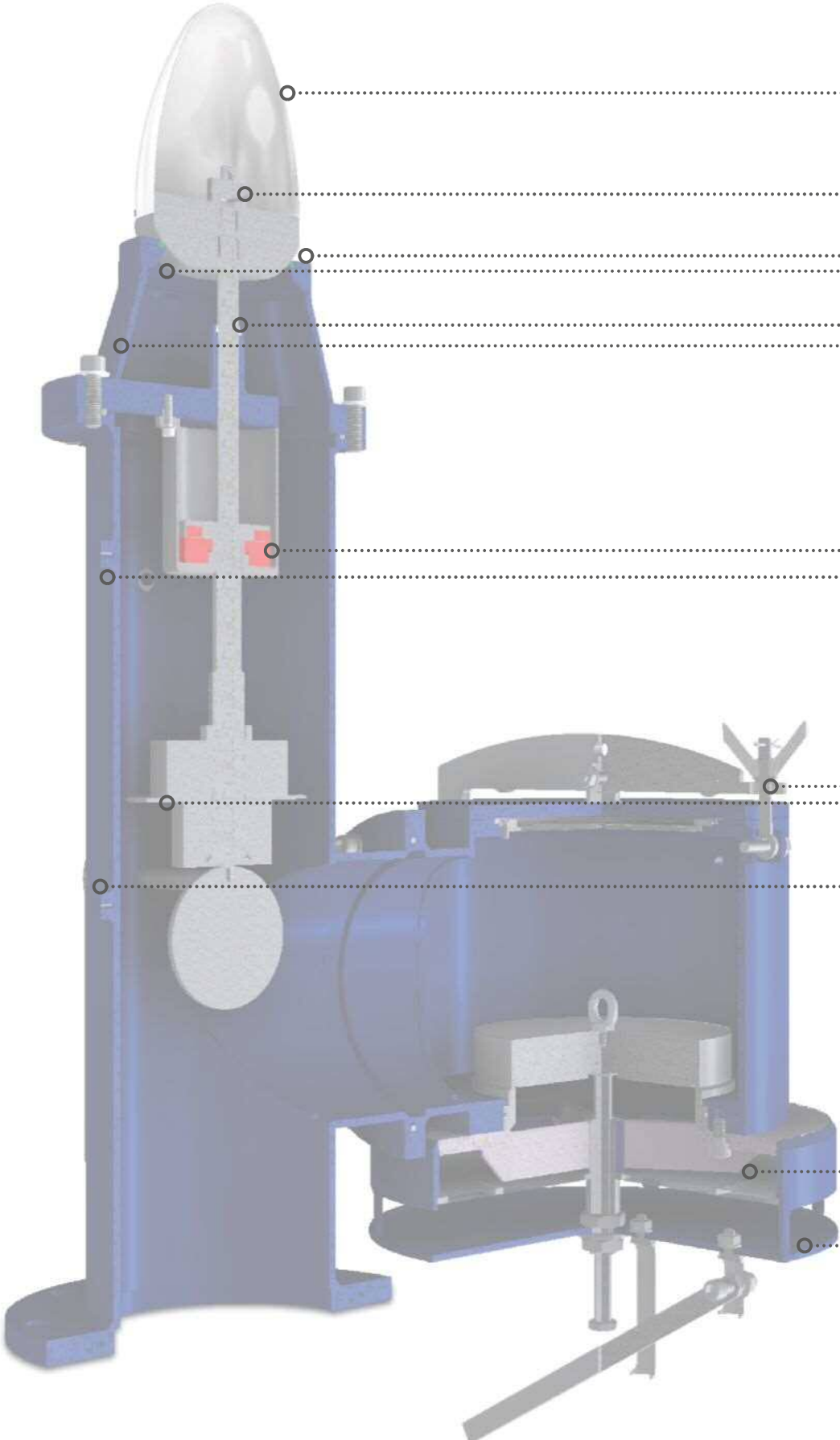
- New two-way operating full stroke check lift
- Visual inspection of all moving parts
- Dirt indicator/cleaning port
- Hinged type gas freeing cover

Additional features

The PV-VOC valve has been made easier to maintain as follows:

- The number of parts has been reduced by 30% and the valve is very simple to disassemble and maintain.
- The weight of the valve has been significantly reduced.
- Check lift can be maintained without disassembly of valve.
- Easy calibration of setting after overhaul.
- Regular maintenance can easily be performed by on-board crew.
- Replaceable vacuum flame arrestor, gas freeing flame screens and integrated resilient seal.

DESIGN





Optimised nozzle design

Reduces noise and provides high gas dispersion.

Setting calibration

Easy calibration of setting after overhaul.

Integrated resilient seal

Zero leakage with replaceable resilient seal.

Visual inspection of disc/seat

Simple inspection for maintenance.

Full open mark

Indicates when the valve is 100% open.

Fabricated steel body and stainless steel internals

Rigid exterior and chemically resistant interior.

Enclosed magnet

The enclosed Neodymium permanent magnets provide the highest magnet force and temperature resistance per m³. The design is therefore compact, durable and temperature resistance.

Dirt Indicator/cleaning port

Easy check for valve fouling.

Hinged type gas freeing cover

Ensures quick and safe gas freeing operation.

Booster plate

Part of the advanced flow management system.

Check lift

- a. Two-way full stroke check lift
- b. Can be maintained without disassembly of valve.
- c. Complete check lift systems can be replaced without disassembly of the valve.

IIB flame screen in vacuum valve

Replaceable as a wear part.

Mechanical protection of flame screen

Protects the vacuum valve from external impacts, such as wave sloshing.

CUSTOM CONFIGURATION AND OPTIONS

Specific requirements

The PV-VOC valve is always configured to meet the specific requirement of every single customer.

Different vessel designs need different venting requirements for pressure and vacuum valves. Furthermore, vessel designs tend to use different piping arrangement and consequently require different flange sizes and flange standards.

The pressure and vacuum unit of the valve can be delivered in five different sizes. The pressure and vacuum units can be freely combined to deliver the combination most suitable for your vessel. All the combinations can be delivered in different flange sizes and with all flange standards.

Furthermore, Pres-Vac offers a broad range of options for the PV-VOC valve:

- integrated gas freeing cover
- heated versions
- low and high pressure setting
- custom coating

Custom solutions and special requirements can be delivered upon request.

Option: Integrated gas freeing cover

The gas freeing cover is installed as an integrated version on top of the vacuum valve. It can easily be operated without using tools.

The design ensures that the cover releases the maximum amount of vapour that the size of the piping allows.



Easily operated gas freeing cover

CUSTOM CONFIGURATION AND OPTIONS

Option: electric, steam or thermal Heating

The pressure unit and the vacuum unit can be equipped with heating device. This prevents ice accretion*, which will result in malfunction. The heating will also prevent certain cargoes with a high pour point from crystallising, as the temperature can be kept at a suitable level.

* Ice Accretion occurs when waves or heavy rain is present with surface temperatures at or below freezing. A layer of ice will accumulate and prevent the valve from functioning properly.



Option: Custom coating

As a standard the PV-VOC valve is delivered with the following Hempel paint:

- 2 x HEMPADUR 45141 (2 x 100 mic thickness)
- 1x HEMPATHANE 55210 (1 x 50 mic thickness) Red 5063 outer color.

However it is possible to deliver the PV-VOC valve in any color.

RAL 1001	RAL 1002	RAL 1003
RAL 1012	RAL 1013	RAL 1014
RAL 1020	RAL 1021	RAL 1022
RAL 1034	RAL 1040	RAL 1051
RAL 1014	RAL 1011	RAL 1012
RAL 1009	RAL 1007	RAL 1008
RAL 1016	RAL 1017	RAL 1018
RAL 1023	RAL 1024	RAL 1024
RAL 1005	RAL 1007	RAL 1002
RAL 1009	RAL 1010	RAL 1011
RAL 1010	RAL 1019	RAL 1020
RAL 1001	RAL 1002	RAL 1003
RAL 1009	RAL 1010	RAL 1011
RAL 1017	RAL 1018	RAL 1019
RAL 1020	RAL 1021	RAL 1022
RAL 1001	RAL 1001	RAL 1002
RAL 1009	RAL 1010	RAL 1011
RAL 1009	RAL 1010	RAL 1011
RAL 1009	RAL 1010	RAL 1011

THE ULTIMATE VERSION

PV-VOC ULTIMATE

You should choose a **PV-VOC Ultimate**, if you are particular concerned about leakage protection, loss of inert gas, disc/seat and flame screen maintenance costs.

The PV-VOC Ultimate delivers all the features of the PV-VOC Superior and three additional safety and maintenance features:

- Seat with integrated resilient seal.
 - The integrated resilient seal provides ultimate leakage protection and also reduces wearing of disc and seat.
- Flame screens in AISI 316 L stainless steel.
 - To reduce wearing from high corrosive cargoes and to extend maintenance intervals, flame screens are delivered in AISI 316 L stainless steel.

Resilient seal

- Elimination of leakage
- Reduction of wear and tear
- Easy replacement
- Made of an advanced, non-flammable material.
- Suitable for chemical and oil products



With resilient seal



Without resilient seal

CUSTOMER BENEFITS

Maximum safety for crew, vessel and cargo

- High vertical gas dispersion
- Low noise
- Extensively tested by independent test laboratory
- Integrated leakage protection (Ultimate version)

Compliance with all current and foreseen regulations

- No risk of non-compliance
- Complies with the latest European standard for fire testing

Designed to your needs

- The valves can be optimized to effectively meet your venting requirements.

Excellent operational performance

- The combination of weight and magnetic force protects against pressure surges and secures high closing pressure.
- Leakage protection ensures maximum safety, minimises loss of inert gas and cargo vapour.

Low maintenance costs

- Modular design of the valve makes replacement of wear parts and spare parts simple.
- Lifetime availability of spare parts and global network of service centres.

Emission Reduction

- Breather functionality

DIMENSIONS OF VACUUM UNIT

Inlet diameter mm

150, 180, 215, 248, 315

DIMENSIONS OF PRESSURE UNIT in mm

Seat size	DN	H1	H
106	≥ 125	943.0	782.0
122	≥ 150	987.0	796.0
150	≥ 200	1142.0	922.3
174	≥ 250	1309.0	1038.0
204	≥ 300	1439.0	1167.0

GAS GROUP

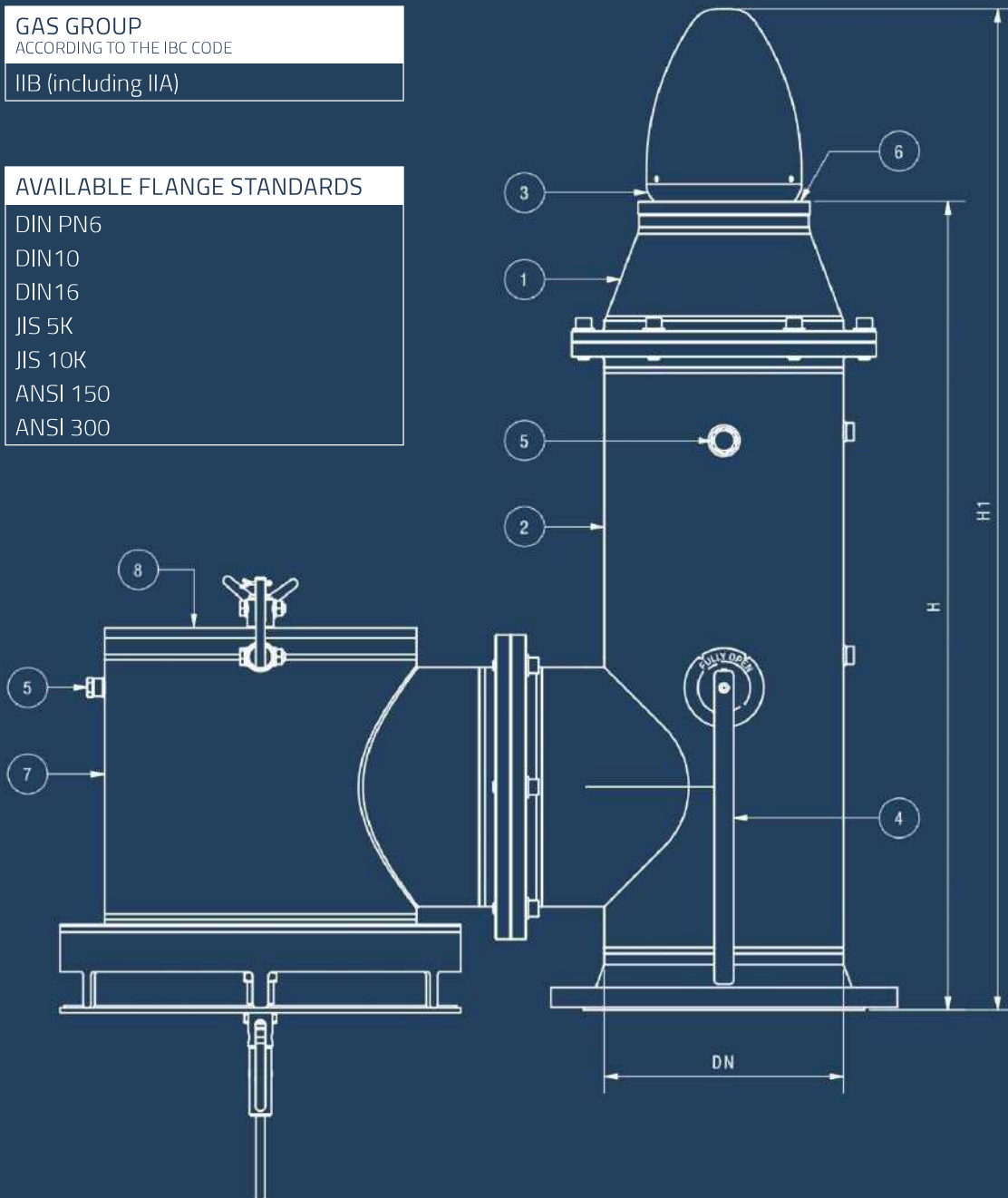
ACCORDING TO THE IBC CODE

IIB (including IIA)

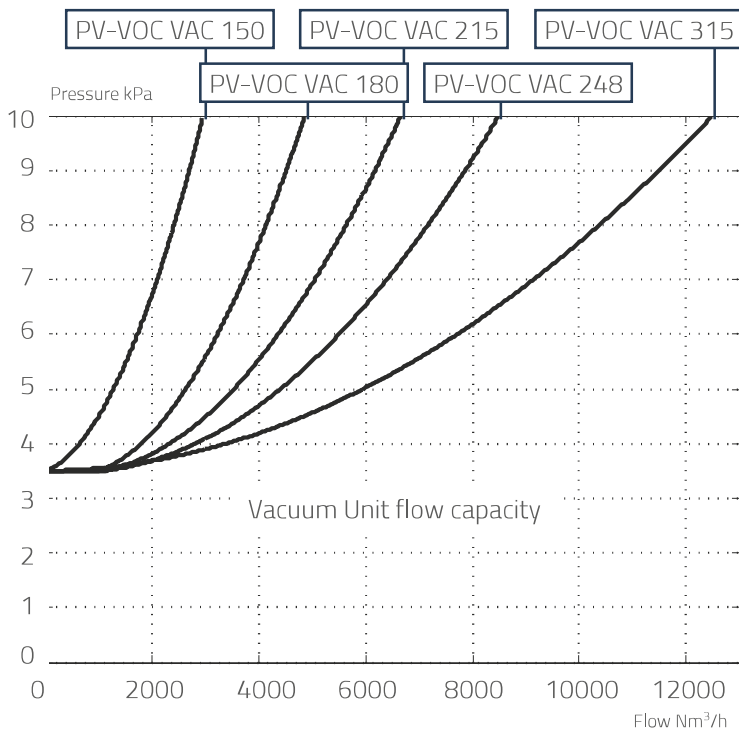
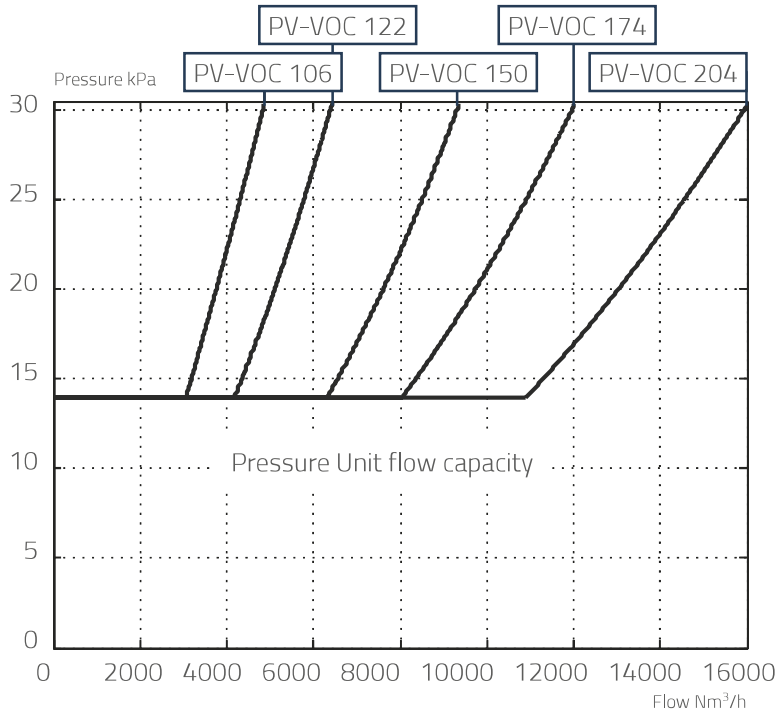
AVAILABLE FLANGE STANDARDS

DIN PN6
DIN10
DIN16
JIS 5K
JIS 10K
ANSI 150
ANSI 300

ITEM	DESCRIPTION	MATERIAL
1	Upper valve house	ST37 steel / AISI 316 L stainless steel
2	Valve house	ST37 steel
3	Pressure disc	SAF 2205
4	Full stroke check lift	AISI 316 L stainless steel
5	Flushing port/ cleaning indicator	AISI 316 L stainless steel
6	Resilient seal	Advanced rubber
7	Vacuum house	ST37 steel
8	Gas freeing cover	ST37 steel



SPECIFICATIONS



SAFETY AND COMPLIANCE

International marine business regulations

The marine sector is regulated by IMO, local government rules and regulations stipulated by leading classification societies. The PV-VOC valve is subjected to severe tests in order to meet these market demands for high quality and safety.



PV-VOC complies with all design and test requirements of:

- IMO MSC/Circ. 677 as amended by IMO MSC/Circ.1009 and IMO MSC.1/Circ. 1324
- EN ISO 16852:2010
- ISO 15364:2007,
- EN 12874:2001
- ISO 15364:2000
- ISO 28300/API 2000

Class authorities and quality assurance

The offered equipment is approved by our notified body, all major classification societies, European inland regulations and Russian river specification.

Pres-Vac Engineering is quality controlled by FORCE and certified in accordance with ISO 9001:2008. Details are available upon request.

In addition the equipment complies with ATEX for onshore based plants and offshore applications like FPSO including compliance with NORSOK. Approval certificates are included in scope of supply and test and material certificates are available against cost; However, they must be specified in the project specification.

The P/V valves suitability for a given application is to be decided by the buyer on basis of the Product Review Document containing a description of the valve in accordance with the requirement of ISO 15364:2007.

Regulatory updates

The equipment is guaranteed to comply with all mandatory and known future rules and regula-

tions applicable to the vessel in question. IMO MEPC.2/Circ. 19 (December 17th , 2013) Latest provisional categorization of liquid substances amending chapter 17 of the IBC Code.

SOLAS Reg. II-1/3-12 Noise Code (July 1st , 2014) Mandatory measurement during sea trial and noise level limits.

MED 9th amendment: New flame testing (December 4th , 2014) Implementing new flame test requirements by adoption of EN ISO 16852. Requiring additional testing at low flow rates, closing the safety hazard gap in the current flame testing.

Patents and product reliability

The offered equipment is patented and guaranteed free of third party claims against yard and/or owner. The offered P/V valves are covered by US patent. The offered equipment is fully covered by product liability worldwide in respect of manufacturing and engineering.

SERVICE AND MAINTENANCE

Network of service repair centres

Pres-Vac has arranged a Service and Repair Centre network. These centres have the technical skills and marine experience to repair Pres-Vac equipment.

Our Service Repair Centres are conveniently located around the world in order to provide you with rapid access to spare parts and qualified service repair engineers.

The number of Service Repair Centres is steadily growing and new locations will appear in the near future.

Service and Repair Centre skills

Our service engineers have been trained and certified to overhaul Pres-Vac products according to our specifications.

Quick supply of spare parts and kits

All Service Repair Centres have spare part kits for Pres-Vac products in stock ensuring supply of most parts within 48 hours.

To supplement the ordering of parts, Pres-Vac has developed a series of Maintenance Kits that enable the crew to carry inexpensive parts on board to cover the most common repairs.

For further information regarding service, spare parts and maintenance, please contact us via email: aftersales@pres-vac.com or tel: +45 48174055





About Pres-Vac Engineering

For over 60 years, Pres-Vac Engineering has been supplying pressure/vacuum valves and venting equipment to the tanker shipping industry.

Today, we are the worlds' leading supplier of high-velocity pressure/vacuum valves and around 50% of all tanker vessels world-wide use Pres-Vac equipment.

We work with shipyards, naval architects and other partners on all continents. We have a network of highly professional, experienced agents and distributors in all major ship owning and ship building countries.



PART OF G&O MARITIME GROUP ■

Pres-Vac Engineering A/S | Svanevang 3-5 | DK-3450 Allerød | T: (+45) 4817 4055 | W: www.pres-vac.com
G&O Maritime Group | Solvang 22 | DK-3450 Allerød | T: (+45) 4817 4055 | W: www.gomaritimegroup.com

G&O Maritime Group provide value, safety and reliability to the global maritime industry through green, innovative quality solutions.