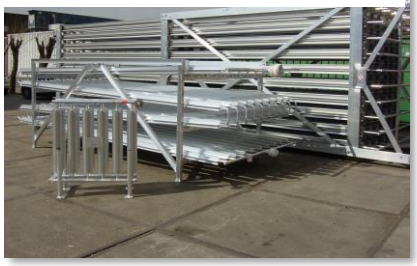
User Manual ambient vaporizers

Type CNLP – all aluminium

Type CNFA – fan assisted

Type PB – all aluminium



Type CNHP & CNLP AISI – stainless steel lined

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1. Foreword

This pressure equipment has been designed and manufactured in accordance with the latest technical developments and complies with the applicable European Directive. The design has been assessed by Lloyd's Register B.V. according to the Pressure Equipment Directive 2014/68/EU and it has been established that the essential safety requirements have been met, hence, this equipment is CE-marked.

If agreed in the contract, the ambient cryogenic vaporizer (all aluminum only) also complies with the requirements of Materials and articles intended to come into contact with food according to the EC regulations; 1935/2004/EU and 2023/2006/EU.

The manufacturer shall not be held responsible for unsafe situations, accidents and damages as a result of:

- Ignoring warnings or regulations as indicated on the equipment or prescribed in the user manual.
- Lack of maintenance.
- Use for applications other than described in this user manual.
- Modifications to the equipment by third party and/or the use of other than prescribed replacement parts.

This user manual contains useful directions for use, maintenance and trouble shooting, these directions must be respected and followed up.

2. Introduction

The vaporizer is designed to vaporize liquefied industrial gases and subsequently bring its temperature to an acceptable level for further processing, depending on the specific application.

Warning:

- The equipment is designed for open air conditions and may only be put into use free standing, exposed to natural climatic conditions.
- The equipment shall be installed out of reach of unauthorised persons.
- Operation and maintenance of the equipment must be executed by authorised personnel only.

For design data of the equipment we refer to the chapter “technical specifications” and for maintenance information, see the chapter “maintenance”.

3. Technical specifications

All low pressure vaporizers are designed to:

Design code : EN 13445
Design temperature : -196 / +60 °C
Design pressure : 40 bar

Nominal capacity mentioned on the drawing is based on:
- Oxygen service @ > 12 barg (LP) and > 220 barg (HP)
- Ambient air temperature of +4°C
- Relative humidity of 75%
- Minimum wind speed of 1 m/s
- Gas outlet temperature of 20°C below ambient after 8 hours full continuous service
- Start with completely defrosted vaporizer

To reach capacity for other gasses, following conversion factors apply on this nominal capacity:

- Nitrogen : 1.1
- Argon : 1.3
- Natural gas : 0.7

For this nominal capacity, external connections, dimensions and other information about specific vaporizers we refer to the relevant drawing in the annex concerned.

The drawings show the connections, flanges or couplings that are standard for the particular vaporizers, on request however connections can be modified to customer's requirements.

Nameplate data:

Type	:	
Serial Number	:	
Design Code	: EN13445 ed. 2016	
PS	: 0 - 40	Bar
PT	: 57,2	Bar
TS	: -196 / +60	˚C
Volume	:	L
Empty Weight	:	kg
Date Tested	:	

CE 0343

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4. Safety

4.1 Exposure to cold temperatures

Cryogenic fluids can cause serious damage to your skin that is similar to a skin burn.

When a cryogenic fluid is spilled on a surface, it immediately covers a bigger area and therefore cools a large area. The vapors of the spilled cryogenic fluid are extremely cold and can also cause serious damage to your skin.

Cryogenic fluids can also cause serious damage to delicate tissues like eyes, when exposed to the vapors of it.

Never touch uninsulated pipes, vessels or other material containing cryogenic fluids, the extremely cold material may stick to your skin and tear the flesh when you attempt to withdraw it. Also never touch non-metallic materials these also can cause serious damage to your skin when touching it. Beside the hazards of frost bite and flesh sticking to cold materials, objects that are soft and pliable at room temperature, such as rubber or plastic, will become hard and brittle and can then easily fracture.

Carbon steel also becomes brittle at low temperatures and may easily fracture when stressed.

4.2 Liquid to gas expansion

One volume of Cryogenic fluid, at one atmosphere, vaporizes to hundreds volumes of gas at 20°C and one atmosphere. Cryogenic fluids cannot be indefinitely maintained as a liquid even in well-insulated containers. Any liquid or even cold vapor trapped between valves has potential to cause an excessive pressure build up to the point of violent rupture of container or piping, hence the use of reliable pressure relief devices is mandatory.

4.3 Safety Data Sheet (SDS)

Personnel should be thoroughly familiar with the safety and the material properties if they must be in the area where cryogenic fluids are used. The applicable safety data sheets of the specific cryogenic fluid must be available and checked to develop safe work procedures.

4.4 Safety valves

Warning!

- This pressure equipment is delivered without a safety relieve valve. The user must provide for a safety relieve valve in the installation with sufficient capacity in order to protect the vaporizer against overpressure. The set pressure of the safety relieve valve shall not exceed the maximum working pressure of the vaporizer.

- The safety relieve valve must be mounted in such way that the outlet port of the valve is pointing in a safe direction, away from personnel.

4.5 Personal Protective Equipment (PPE)

Use all required protective equipment. Loose fitting gloves of impermeable material should be worn when handling anything that comes into contact with cold liquids and vapor or whenever the possibility of exposure to cryogenic fluid spill exists.

customer personnel, under normal circumstances, should not be exposed to the hazards of cold temperatures).

Warning!

- Don’t touch the equipment’s surface. Low temperature!

4.6 Safety measures for the user

The use of personal protective aids as prescribed or commonly used in the surroundings in which the equipment is placed, and in accordance with the local labour requirements, is mandatory.

4.6.1 Safety measures for maintenance and repair

Warning!

- Check the presence of safety precautions and act in accordance.
- Make sure the pressure is off.
- Make sure the surface temperature of the equipment is above 0 °C.
- Use personal protective aids.
- Use indications “out of order” .
- Make sure no liquid gases are left in the equipment before opening the connections.
- Make sure the gases left in the vaporizer cannot cause a fire hazard when opening the connections.
- Make sure life conditions are respected, use forced ventilation if necessary, and check for the gas contents in the ambient air before entering the neighbourhood. Danger of asphyxiation.

4.6.2 General safety precautions

The following precautions are not related to any specific procedures and do not appear repeatedly in this publication. Personnel must understand and apply these precautions during all phases of operation and maintenance of this equipment. Specific precautions will be included in the text for certain potentially hazardous operations in the form of WARNING statements. Some of the warnings appear in the text of this publication but are presented here for emphasis.

- Only qualified personnel should be authorized to operate and perform maintenance on this equipment and it's components. Unauthorized personnel must be kept away from the unit when operating, servicing or performing maintenance due to possible low and high surface temperatures.

- Personnel operating and performing maintenance on this equipment should wear suitable protective clothing and equipment which complies with the local labor requirements.

- Overall good safety practices should be adhered to at all times when starting up, operating, shutdown, and maintenance of this equipment. It is the equipment owner's operator's responsibility to establish good safety practices, personnel training and enforce observance of safety practices.

- Personnel should not operate the unit unless they are thoroughly familiar with the equipment manual, all unit operating controls and functions. Reading the equipment manual does not qualify any individual to operate this equipment.

- Ensure pressure in piping connected to the unit has been bled to zero (0) pressure before attempting to disconnect any component.

- Equipment used during lifting and moving the unit must be of sufficient rating to handle the weights involved.

- Use of compressed air can create an environment of propelled foreign particles. Air pressure should be reduced to less than 3 Bar(g) and used with effective chip guarding and personal protective equipment. Never apply direct compressed air to the body or other personnel.

- Keep hands, hair, clothing jewelry, rags and tools away from moving parts when the unit is in operation.

- Do not attempt to operate equipment with obstructed visibility. This includes before sunrise and after sunset unless suitable lighting provisions are available.

- Before starting the unit ensure that all operating controls are in the proper position (e.g. off, on ,neutral).

- Keep working areas clean and clear of obstructions, hand tools and other objects when operating the unit.

- Ensure all components are secured before transporting the unit to another location.

Warning!:

- Check the presence of safety precautions and act accordingly.
- Do not touch the equipment's surface because of possibly low/hot surface temperature
- Make sure that the pressure is relieved.
- Use personal protective aids and make sure the surface temperature of the equipment is above 0°C.!
- Use indications "out of order"

5. Description of the pressure equipment

Ambient air vaporizers are relatively uncomplicated devices, used for vaporizing liquid gases. They are used in many applications in a broad range throughout industry. As they have no moving parts and as they make use of the free available heat contained in atmosphere as energy-source for vaporization, they are extremely reliable and cost saving.
The principle of operation is simple, liquid gases are passed through a number of interconnected tubes in various series and parallel paths.

For Low Pressure vaporizers:

The tubes themselves are part of an aluminum extrusion that has several fins emanating from the center. These fins provide a large surface area upon which the “ambient weather conditions” impinge and provide energy for vaporization. Our different types of vaporizers are all build up from the same components: (fin)tubes, caps, tee's, reducers and flange connections. Each component has been calculated in conformance with EN 13445 / max. working pressure 40 Bar.

Cryonorm can supply a number of types of vaporizers, each type suitable for a specific application and capacity in normal cubic meters of gas per hour.
In addition to natural draught ambient air vaporizers we also have forced draught (fan assisted) vaporizers in our scope of supply.

6. Installation

6.1 General safety precautions

Warning!:

- This pressure equipment is delivered without a safety relieve valve. The user must provide a safety relieve valve in the installation with sufficient capacity to protect the vaporizer against overpressure. The maximum set pressure of the safety relieve valve may not exceed the maximum working pressure of the vaporizer.
- Use certified hoisting equipment for lifting only.
- Foundation should have provisions for drainage and must be resistant to low temperatures.

6.2 Installation manual

6.2.1 Unloading of the vaporizer from truck

- Lift the vaporizer from the truck in full accordance with the lifting drawings.
- Small vaporizers are not equipped with lifting lugs because of the low weight. Lifting can be done with polyester woven lifting slings.

Warning!:

- Do not lift the vaporizer with a forklift truck under the aluminum fintubes, which would inevitably lead to serious damage!

6.2.2 Erection of the vaporizer

- Lift and erect the vaporizer in full accordance with the lifting drawings.

Warning!:

- Watch balance of vaporizer carefully, keep strained lifting wires vertical in laterally displacing the hoisting point; when nearing the vertical strive for 4 strained wires before final tilt in vertical position, and this now perfectly controlled.

- Remark:

An unrestricted exposure to natural atmospheric air circulation is vital for ambient air heated vaporizers in order to perform to standards. Therefore do not place vaporizers near a wall or building, in a closed-in courtyard, etc. Place vaporizers as spacious and open / windy as possible.

6.2.3 Fixation to foundation

- Now vaporizer hangs in crane and is positioned to the flat concrete foundation.
- Make sure the vaporizer will stand on a sound platform and can not fall over.

  Remark:
  Please pay attention to orientation (flange positions).

- To fix vaporizer to foundation drill holes in concrete through holes in footplates. For size of anchor bolts see remark on general arrangement drawing.

  Remark:
  Carefully follow up anchor bolt supplier's instructions.

- Once the vaporizer is in position and fixed, in- and outlet piping can be placed. See drawing for in- and outlet flanges.
- Connect piping to counter flange or coupling (brazing connection for brass counter flange or coupling, welded connection for stainless steel counter flange).
- Make sure that the flange connections are mounted in a way that no forces are exercised on the vaporizer. To this end pipe supports should be placed, also coping with low temperature induced contraction of piping to and from vaporizer.
- Assemble connections, make sure that PTFE-seal is placed correctly.

  Remark:
  The design calculations do not include for nozzle loads induced by external piping. Contraction of piping is likely to occur due to cryogenic temperatures, "Flexibles" are recommended.

- Check for leakages by pressurising the system.

  Warning!:

  - Always make sure that all necessary safety precautions for personnel have been taken into account.

6.2.4 Fan assisted vaporizers

- Connect wiring of the fans according to electric diagram, specific site application and national standards.
- Check the fan for correct direction of rotation, the airflow through vaporizer is to be downwards.
- When wiring is completed and checked and, in- and outlet flanges are connected with in- and outlet-piping, the vaporizer is ready for use. Start fan and open valves in inlet and outlet conduits, liquid gas will now enter the ambient vaporizer and will be vaporised and heated.

  Remark:
  For fan assisted vaporizers air intake through the gratings at four sides at the top of the vaporizer is an important factor for a good performance of this type. A periodical check for possible obstructions is recommended.

  Without additional noise reduction devices, the noise level at 1m above floor level and 1 meter distance is likely to exceed 95 dB in fan assisted units.

7. Operation, use

When inlet - and outlet flanges are connected with in- and outlet piping, the vaporizer is ready for use. Open valves, liquid gas will now enter the ambient vaporizer and gas will be vaporised and heated.

As the temperature of the liquid gas is lower than 0 °C, humidity in the air will condense on the aluminium vaporizer and this will start to ice up. Depending on time of operation and the required gas temperature at the outlet, vaporizer should be switched of periodically for a complete de-frost.

Remark:

At ambient temperatures of ≤ 0 °C, defrosting will not take place without external heating. Use for instance a steam cleaner when inevitable.

Warning!:

- Always make sure that defrosting with external heating aid will only take place after the vaporizer has been put off-line and given time for a natural heating-up to ambient temperature.

8. Maintenance

- Check seals on in- and outlet flange periodically.
- Check complete vaporizer on possible leakage periodically.
- For fan maintenance follow specific fan supplier's instructions and directions.

9. Malfunction, repair

Completely iced up vaporizers will not perform to expectation.
In order to perform to satisfaction the vaporizer will have to be switched of periodically for de-frost, depending on time of operation and the required gas temperature at outlet.
At ambient temperatures of ≤ 0 °C, defrosting will not take place without external heating. See chapter 7.

Warning!:

- Always make sure that defrosting with external heating aid will only take place after the vaporizer has been put off-line and given time for a natural heating-up to ambient temperature.

In case of any repair the user must make sure that the repair is performed in accordance with regulations as set out in the PED 2014/68/EU.

10. Annexes

1. EU Declaration of Conformity CRYONORM

2. GA Drawings

3. Installation, Operating and Maintenance Instruction for Fan & EU Declaration of Conformity Fan (for fan assisted vaporizers only)