



User Manual CRYONORM vaporisers



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 B.V. according to the Pressure Equipment Directive 97/23/EC and it has been established that the essential safety requirements have been met, hence, this equipment is CE-marked.

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 usermanual.
- lack of maintenance.
- use for applications other than described in the usermanual.
- modifications to the equipment by third party and/or the use of other than prescribed replacement parts.

This usermanual contains useful directions for use, maintenance and trouble shooting. The directions shall have to be respected and followed up.

2. Introduction

The Vaporiser is designed to vaporise 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 is to be restricted to 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 vaporisers are designed to:

Design temperature : -196 / +50 °C
Design pressure : 40 bar

All high pressure vaporisers are designed to:

Design temperature : -196 / +50 °C
Design pressure : 420 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 vaporiser

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 vaporisers we refer to the relevant drawing in the annex concerned.

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

Name plate data

Type	:		
Capacity	:		
Serial No.	:		
Design temperature	:	-196/+50	°C
Volume	:		L
PS	:		Bar
PT	:		Bar
Date tested	:		
Welders Stamp	:		

CE 0038

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4. Safety

4.1 Safety valves:

Warning!

- This pressure equipment is delivered without safety valve. The user must provide for a safety valve in the installation with sufficient capacity in order to protect the vaporiser against overpressure. The set pressure of the safety valve shall not exceed the maximum working pressure of the vaporiser.
- The safety relief valve must be mounted in such a way that the outlet port of the valve is pointing in a safe direction, away from personnel.

4.2 Safety precautions

Because of the low operating temperature the pressure equipment has to be placed out of reach of unauthorised persons.

Warning!

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

4.2.1 Safety precautions 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.

4.2.2 Safety precautions 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 vaporiser can not 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 off asphyxiation.

5. Description of the pressure equipment

Ambient air vaporisers 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 vaporisers:

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 vaporisers are all build up from the same components: (fin)tubes, caps, tee's, reducers and flange connections. Each component has been calculated to conform to AD Merkblätter / max. working pressure 40 Bar.

For High pressure vaporisers:

Instead of aluminium tubes, high pressure vaporisers consist of stainless steel tubes which are fitted inside aluminium extruded tubes. These aluminium tubes have, like the low pressure fintubes, several fins emanating from the center which provide the large surface area.

The different types of High Pressure vaporisers are all build up from the same components: tubes, fintubes, tee's and couplings. Each pressure part has been calculated to conform to AD Merkblätter / max. working pressure 420 Bar.

For Stainless Steel Lined Low pressure vaporisers:

Like High pressure vaporisers, st. st. Lined Low pressure vaporisers consist of stainless steel tubes which are fitted in aluminium extruded fintubes.

Because of the pressure parts being all stainless steel, this type of vaporiser is suitable for use in the semiconductor industry where reducing to a minimum of the possibility of contamination of the gas product is required.

The different types of Stainless Steel Lined Low pressure vaporisers are all built up from the same components: tubes, stainless steel lined fintubes, tee's, flanges and couplings. Each pressure part suitable to conform to ASME VIII / max. working pressure 40 Bar or 100 Bar (depending on vaporizer model, see the relevant general arrangement drawing).

Cryonorm can supply a number of types of vaporisers, each type suitable for a specific application and capacity in normal cubic meters of gas per hour.

In addition to natural draught ambient air vaporisers we also have forced draught (fan assisted) vaporisers in our scope of supply.

6. Installation

6.1 General safety precautions

Warning

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

6.2 Installation manual

6.2.1 Unloading of vaporiser from truck

- Fasten chain (consisting of four parts) to each end of each upper leg (at the lifting lug topside of the vaporiser and the hole of footplate at the bottomside) and place the vaporisers next to the truck.
- Now loosen the chains from the two feet-ends and attach these to the other (lower) lifting lugs topside.
- Small vaporisers are not equipped with lifting lugs because of the low weight. Lifting can be done with polyester woven lifting slings.

Warning!

- Do not lift with forklift truck on the fintubes, which would inevitably lead to serious damage!

6.2.2 Erection of vaporisers

- Tighten chain slowly and start lifting using bottom footplates as centre of rotation.

Warning:

- Watch balance of vaporiser 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 vaporisers in order to perform to standards. Therefore do not place vaporisers near a wall or building, in a closed-in courtyard, etc. Place vaporisers as spacious and open / windy as possible.

6.2.3 Fixation to foundation

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

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

- To fix vaporiser 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 vaporiser 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 vaporiser. To this end pipe supports should be placed, also coping with low temperature induced contraction of piping to and from vaporiser.
- 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 vaporisers

- 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 vaporiser is to be downwards.
- When wiring is completed and checked and, in- and outlet flanges are connected with in- and outlet-piping, the vaporiser is ready for use. Start fan and open valves in inlet and outlet conduits, liquid gas will now enter the ambient vaporiser and will be vaporised and heated.

REMARK: For fan assisted vaporisers air intake through the gratings at four sides at the top of the vaporiser 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 dBa in fan assisted units.

7. Operation, use

When inlet - and outlet flanges are connected with in- and outlet piping, the vaporiser is ready for use. Open valves, liquid gas will now enter the ambient vaporiser 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 vaporiser and this will start to ice up. Depending on time of operation and the required gas temperature at the outlet, vaporiser 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 vaporiser 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 vaporiser on possible leakage periodically.
- For fan maintenance follow specific fan supplier's instructions and directions.

9. Malfunction, repair

Completely iced up vaporisers will not perform to expectation.

In order to perform to satisfaction the vaporiser 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 vaporiser 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 set out in the PED 97/23/EC.

10. Annexes

1. Declaration of conformity CRYONORM
2. Test certificate Vaporiser
3. Drawings
4. Installation, operating and Maintenance Instruction for Fan & EC declaration Fan (Fan Assisted vaporisers only)