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Norhof LN2 dispensing system

#485 Nitrogen dispensing system (liquid supply)

User manual

RoHS COMPLIANT

CE

February 2025

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INTRODUCTION

GENERAL DESCRIPTION

The Norhof #485 system is a cryogenic dispensing system in which Liquid Nitrogen is transferred from the Dewar to the desired application.

In the Norhof #485 the liquid Nitrogen is stored in pressure less cryogenic Dewars. When transfer is required, a small overpressure is generated by a microprocessor controlled heater element inside the cryogen, and liquid flows out of the system like water from a tap, without spilling, noise and vibrations.

INTENDED USE

The dispensing systems are designed for use in laboratories. Liquid Nitrogen (LN2) is transferred from a storage Dewar by a static pump and delivered through a fill line to the receiver vessel.

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1. GUIDE LINES FOR THE USE OF ALUMINUM CRYOGENIC DEWARS

1.1 GENERAL

- The aluminum dewar as supplied with the cooling system has a fiberglass/epoxy neck and is insulated with multilayered superinsulation under vacuum.

- These lightweight and highly efficient dewars are designed to withstand the most severe working conditions. However certain precautions should be taken to protect personnel using these dewars and to increase the life of your dewar.

1.2 PRECAUTIONS DURING USE

- always transport and store the vessel in an upright position on an even and level floor, also when the Dewar is empty or out of use. When using a transport trolley, only use the original trolley from Norhof.
- avoid tilting the dewar, even to withdraw LN2. When not using your Dewar, the cryogen will evaporate by itself. If you absolutely want to empty it, do it outdoors and pour on earth or gravel. Remember that most materials become brittle when cooled to very low temperatures.
- when handling the dewar, do not drop it and avoid impacts when placing the dewar on the ground
- either the pump or the separate plug must be on top of the dewar at all times. No compliance will increase the boil off of the dewar and can lead to ice plug forming in the neck
- the dewar must be filled by inserting in the neck either a flexible hose or a hand withdrawal pipe connected to a storage vessel. In the case of an installation using a transfer line and if the transfer line is warm, the flexible hose should be inserted into the neck only after appearance of the liquid at the end of the flexible hose
- when filling a warm dewar, pour liquid slowly to avoid any liquid being propelled out due to rapid vaporization of the liquid inside the dewar. Fill the dewar to approximately 50% of the total volume and allow cooling down some hours before topping up. Thermal stability will be reached only after 48hours
- during filling, it is important to avoid spillage of LN2 onto the top of the dewar. If any spillage occurs, check during 24 hours that there are no traces of frosting left before re-using the dewar

1.3 CHECKING THE DEWAR

- if traces of frosting appear on the outer vessel or if the outer vessel is completely frosted over, this shows that the vacuum in the interspace has been damaged or broken and that the LN2 is evaporating very quickly. Contact us for all necessary instructions. No repairs should be done by yourself on the dewar.

1.4 PRECAUTIONS WHEN HANDLING LIQUID NITROGEN/ARGON

- The cryogen stored in your dewar has a boiling point of below -186°C and has a very high refrigeration capacity. Strict regulations must be applied to handle this fluid.
- contact with LN2 may cause cryogenic burns
- the liquid must be handled, particularly during filling in such a way that splashing is prevented
- when handling LN2, protect your eyes with glasses, your hands with proper gloves and your body with clothes that completely cover your arms and legs
- in the event of LN2 burns, proceed as for a burn. In all cases call a doctor
- Do not rub the skin burns. Gradually bring the affected parts up to normal temperature by placing them against another warm part of the body
- Gaseous nitrogen produced by evaporation of LN2, is odorless and invisible. A concentration of gaseous Nitrogen or Argon in a closed room or in a poorly ventilated place may cause asphyxiation by lowering the oxygen. Always use and store your dewars in a well-ventilated place.

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2 UNPACKING

- **Dewar:** The Dewar has a closing plug, which is needed when filling the dewar. During transport of the dewar (empty or filled), this plug should be ON the dewar for safety, and to prevent entering too much water (ice) into the dewar. So keep the plug on a place that it could be taken when the dewar needs to be filled.

- **Pump:** The pump is packed in plastic. Unpack it . On top of the pump is an orange knob (safety valve) that needs be mounted firmly on the pump, so that it closes the pump airtight.

- **Power Supply :** The transformer supplied can be used with an input voltage of 100-240 Volts at 50/60Hz. Please mount a suitable power plug.

- **Trolley**: (optional, if ordered) The trolley is already mounted.

- **Floorstand**: (optional, if ordered) Mount the tube to the baseplate with the bolt supplied. Put the stand on the floor and step on it. This will align the 5 feet with the floor.

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3 PREPARATION FOR 1ST TIME OPERATION

3.1 remove clamp and remove pump from the dewar

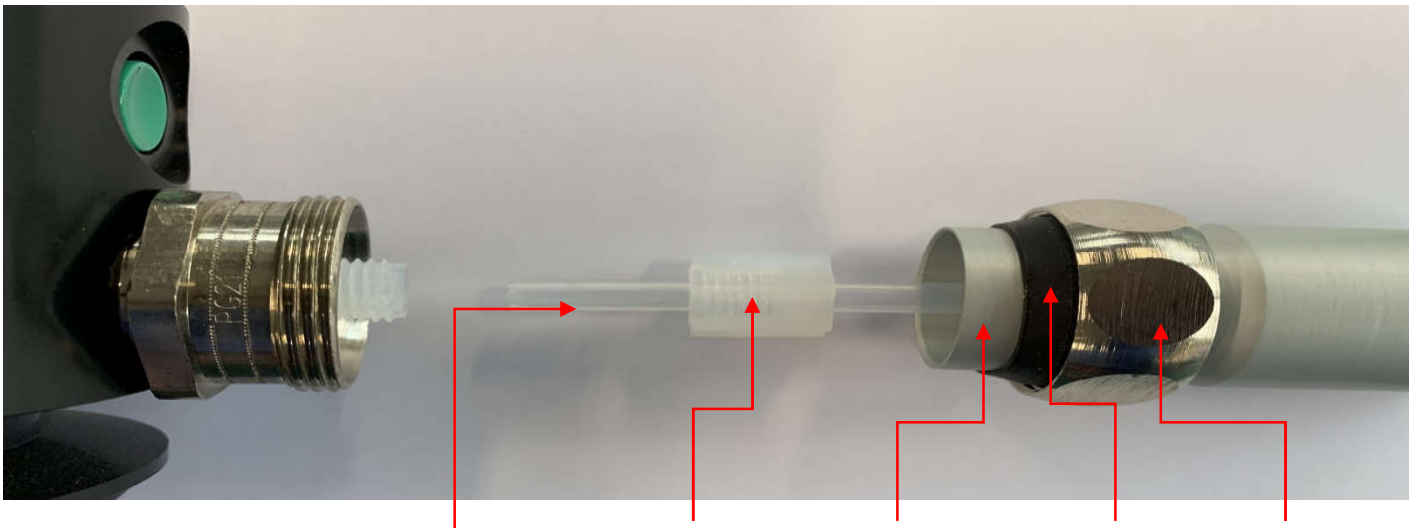
3.2 "park" pump in floorstand or lay it on a table

3.3 fill the storage Dewar for max 90%, no LN2 in the neck , so minimal 18 cm free
allow Dewar to cool down. A 'fresh' filled dewar will degas for more that 12 hours, which is not a big problem. You may use it in this stage, but during this cooling down of the dewar the detecting of the liquid level which is in the pump can not be very accurate. The level as shown on the computer screen in the monitor program, may vary. However, the detection of the warning in the pump for 'too low level' is NOT depending of this. It is a separate sensor, which is NOT influenced by the degassing of a 'fresh' filled dewar.

3.4 lower the pump slowly into the Dewar, in a way that the liquid does not splashes too much.
WARNING:
- the pump is at ambient temperature and when the "hot" protection pipe hits the liquid, a fair amount of "clouds" are generated
- also liquid might escape through the Teflon coupling, so don't stand in front of it

3.5 keep lowering the pump until it rests on the dewar.
- put the clamp in place.
- make sure the pump + clamp is placed properly to make an airtight seal. Do not use tools! Hand tight is fine (after all the system works with only millibars of overpressure)

3.6 mount the fill hose to the pump



For a clear instruction how to Leak Free install the Cryo hose, please check our Norhof YouTube instruction Video at:
https://youtu.be/xy8xilgeiJY?si=epIJ_bDJgx2Qbslk

SCAN ME

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- Loosen the big nut on the outlet, and put in on the metal protection tube of the fill hose. Loosen the Teflon (plastic) nut 2 turns. Push the Teflon (plastic) fill hose in the nut. Tighten the Teflon nut 2 turns, and gently pull on the fill hose until the groove clicks in the nut. This is easy to feel. Now tighten the nut by hand as tight as possible. Then use a spanner to give the nut one full turn. DO NOT TIGHTEN IT TOO MUCH. It is plastic, and can break if tightened too much.
- Move the insulation on the filling hose so, that the metal protection tube fits into the pump's outlet. Tighten the big nut so that the protection tube is fixed. Tighten by hand only.
- The fill hose is standard ab. 1,60 meter. It can be cut shorter for your application. The shorter the fill hose is, the faster the liquid will start to flow. Only make sure that the fill hose is long enough to make it possible to remove the pump from the dewar while the fill hose is still connected (for refilling the dewar)
- Slip the phase separator over the other end of the fill hose, over the inner tube, if you want a free falling LN2 supply. Do the installation when the tube is at room temperature. The phase separator is not mandatory for operation. It is just something that you might want to use.

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4 Operation of the pump

SLEEP mode:
When the pump is connected to the power, 9 beeps sounds, and the pump will begin in SLEEP mode (yellow LED flashing slowly every 5 seconds)
When the pump is started for the first time, the LN2 level in the Dewar is unknown to the pump. During SLEEP (when all is OFF) the pump measures the pressure in the bottom of the Dewar and after some seconds, when this measurement is stable, the level is determined. **Before the level is detected it is not possible to start the pump.**

PUMPING mode:
When the green button is pushed, the pump switches ON, the pump will go into PUMPING mode. (Yellow LED activated)
When starting pumping, the pump starts to build up pressure and first some cold gas will come out of the supply tube. After approximately one minute the gas will change to a liquid flow of 1 liter per minute.
Pushing the green button during pump operation will stop the liquid flow after a small delay and the pump will return to SLEEP mode.

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5 Alarm list

Almost empty alarm:
Warning LED ON + double beep every 30 seconds = less than 4 Liter LN2 left
- This is measured with a sensor 4 cm from the bottom of the dewar.

Other alarms:
When warning LED flashes, the number of beeps indicate the problem:
beeps
1 pump is not cold (empty?)
- this is measured with a sensor close to the bottom of the dewar
2 dewar level sensor not OK
- empty or almost empty internal sensor is broken?
3 pump flow sensor not OK
- internal TMB sensor is broken?
4 no pressure building (leak?)
- pump not airtight on dewar, or orange overpressure valve is not tight

10 exhaust blocked (frozen?)
- flow tube inside the pump is frozen, or fill tube on application is frozen
11 pressure measuring tube frozen
- internal pressure measuring tube is frozen or has water inside (refer to chapter 6)
12 pumping was too long
- pumping time has reached the adjusted time for pumping too long alarm

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6 Warming up and drying the pump

Notice: when cleaning the pump, <u>always remove the pump from mains</u> during cleaning procedure

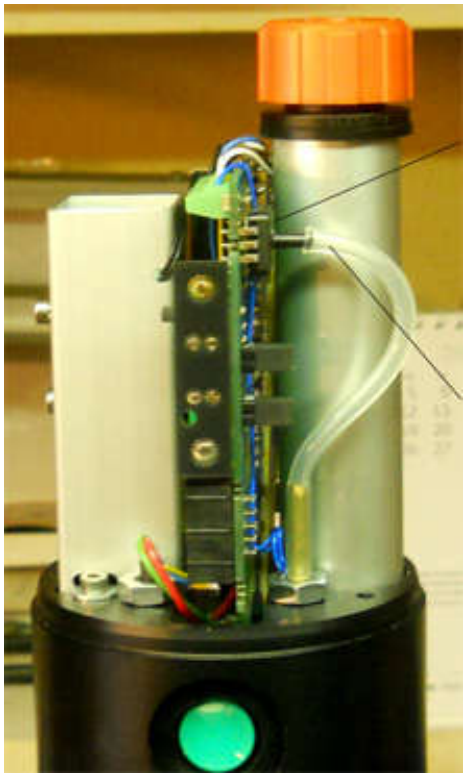
If you have the feeling that the risepipe or the pressure measuring tube is frozen, you need to warm the pump up to room temperature, and maybe dry the rise pipe and measuring tube.
Please put the pump in its floorstand, or lay the pump on a table and wait for all ice and condense water has disappeared. You may help a little by warming it with a electrical hairdryer. But be careful. The protection pipe, around the heater and rise pipe, is made of PVC, and will deform at temperatures above 70 C.

Blocked exhaust:

After all condense water is disappeared, it could be possible to see if there is an ice block in the rise pipe. The most obvious place is high in the risepipe, almost at the pumphead. So this may not be easy to see.
You may blow with dry air from the fill line into the pump, to blow the last water downwards out of the rise pipe. Of course the air should flow freely through this when the ice block is removed.

Frozen pressure measuring tube:

Second place of freezing is the pressure measuring tube. (red tube of 3,3 mm for pumps from before 2011, or transparent tube for pumps after 2011)
At the bottom, next to the heater, there is a set of two small resistors mounted in this pressure tube. These resistors evaporate LN2 during pumping, to make sure this pressure tube is fully filled with N2 gas all the time.
If the pump is out of the LN2, condense water may occur here, which will turn into ice when the pump is replaced in the LN2 before it was dried. If done many times, some ice may appear here, and even some water can go upwards in this tube. To make really sure that all water is out, you may careful blow with dry air from above trough this tube. Here for, the silicon tube in the pumphead could be removed from the pressure sensor on the PCB. Then you can blow in the silicone tube downwards through this pressure tube. Watch if any water comes out, and blow until there is no water left.



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7 Declaration of Conformity

EU DECLARATION OF CONFORMITY

This Declaration of Conformity is issued under the sole responsibility of the manufacturer

MANUFACTURER

Company name:	Norhof B.V.
Full address:	Galileilaan 33U
Postal code:	6716 BP
Place:	Ede
Country:	The Netherlands

DESCRIPTION AND IDENTIFICATION OF THE EQUIPMENT

Generic name:	LN2 Microdosing Systems
Function:	Transfer of liquid nitrogen
Model:	Serie #400 Manual LN2 dosing systems
	Serie #600 Automatic LN2 microdosing systems
	Serie #800 Automatic N2 gasstream systems
	Serie #900 Advanced Automatic LN2 microdosing systems
	Liquid Nitrogen storage Dewars
Serial number:	400-XXXX-XX-XX-XX-XX
	600-XXXX-XX-XX-XX-XX
	800-XXXX-XX-XX-XX-XX
	900-XXXX-XX-XX-XX-XX
Year in which the CE marking was affixed:	17

COMPLIANCE

The manufacturer declares that the above mentioned equipment fulfills all relevant provisions of

EMC Directive 2014/30/EU
Low Voltage Directive 2014/35/EU
RoHS Directive 2015/863/EU

In conjunction with the following harmonised standards and where appropriate other technical standards and specifications

EN ISO 12100:2010; EN ISO 23208:2019; EN 61010-1: 2010/A1:2019; EN 61000-6-1:2019

Signed for and on behalf of Norhof BV

Place:	Ede The Netherlands	Name: Function:	Mr. D. den Hartog General Manager
Date:	21-9-21	Signature:	

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8 P.E.D. 99/36/EC compatibility

According to P.E.D. 99/36/EC (Pressure European Directive) for pressurized vessels, systems which are working with a pressure of 0.5 Bar and higher are affected by this directive, and are not allowed in a laboratory. The Norhof system can produce maximum 300 mBar, and therefor this directive does not apply for this system.

9 Country of Origin

All the Norhof LN2 dispensers and pump models #400, #600, #800 and #900 are manufactured in the Netherlands.

10 RoHS compliance

RoHS COMPLIANT

This product does not contain any of the restricted substances referred to in Article 4(1) of the RoHS Directive at concentrations in excess of those permitted under the RoHS Directive EC directive 2015/863/EU

- Original instructions -
Norhof B.V., Ede 2025