Cryotherm

Operating Manual

APOLLO® 200 - (with chassis)

APOLLO® 350 - (with chassis)

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Appendix: name plate
Certificate/Declaration of Conformity
List of pressure device and equipment

1 Introduction

The APOLLO® Vessel 200/350 is a vacuum super insulated pressure vessel made of corrosion-resistant stainless steel. for storing nitrogen (cryogenic liquid nitrogen).

The APOLLO® Vessel acc. to Directive for Pressure Devices 97/23/EG Category II

1.1 Symbols in the Manual

This sign points out to dangerous situations resulting in possible

- injury to persons
- damage to the environment
- damage to devices

This sign refers to

- recommendations
- explanations
- supplements

1.2 Principle

The APOLLO® Vessel may only be operated according to this operating manual.

1.3 Delivery

Immediately after receipt of the vessel, the delivery has to be examined with regard to

- completeness
- damage

In case of any shipping damage, contact

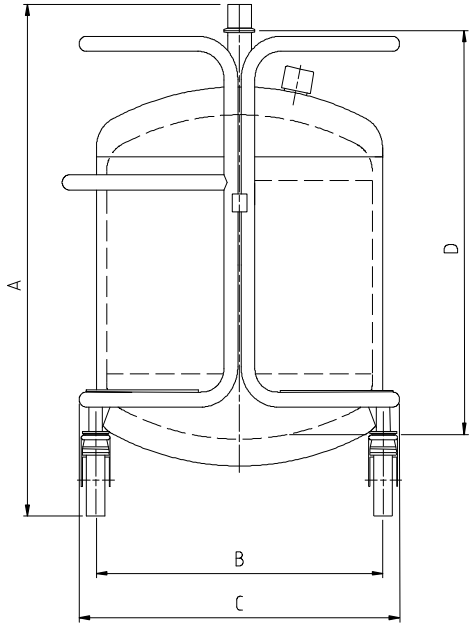
- the shipping insurance
- the shipping company
- the supplier

2 Vessel

2.1 Main Components

- Coaxial arrangement of the pressure vessel in the outer vessel with neck suspension and vacuum super insulation
- Pressure build-up device arranged in the vacuum room
- Level indicator
- Safety valve
- Pressure gauge
- Dismountable siphon, Type **EK®**
- Chassis

2.2 Specifications of the Vessel

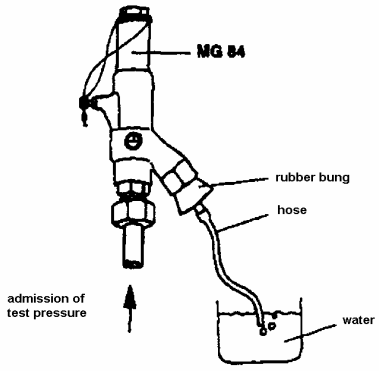


Manufacturer:		**Cryotherm GmbH & Co. KG**	
Type		**APOLLO® 200**	**APOLLO® 350**
Total height, mm	A	1170	1650
Outside diameter, mm	B	700	700
Total width, mm	C	800	800
Immersion depth, mm	D	910	1350
Neck diameter, mm		50	50
Geometrical capacity, l		198,5	348
Static rate of evaporation, %/d		0,6	0,5
Operating pressure, bar		2	2

2.3 Specifications of the Safety Valve

Type	MG 84
Blow-off pressure	2 bar
Article no.	79255323

2.4 Examination of Safety Valve MG 84



Examination

Seat tightness and set pressure of the safety valve may only be examined by means of the bubble method outlined below. Contamination and corrosion of the valve mechanics are thus avoided. The set pressure is indicated on the type plate of the safety valve.

1. Admission of the Test Pressure
For the admission of the test pressure a suitable testing device has to be used. With safety valves which shall not be dismantled, the feeding pipe from the pressure room of the vessel has to be locked.
Do not carry out examinations with oxygen or combustible as well as corrosive gases.

2. Examination of Seat Tightness
Increase the test pressure to 90 % of the set pressure. The valve has to remain tight, i.e. that no bubbles may produce.

3. Examination of Set Pressure
Slowly increase the test pressure to 100 %. The set pressure will be indicated by a clearly increased number of bubbles.

Full-flow safety valves do open abruptly! Possibly set pressure and opening pressure are identical.

4. Examination of Opening Pressure
Remove rubber bungs and slowly increase the test pressure. The opening pressure may exceed the set pressure by up to 5 %. The full flow can mostly be realized as stress-relieving bang

2.5 Assembly of Safety Valve MG 84

For the pre-assembly of the progressive ring, the hardened pre-assembly muff is recommended as follows: Type MG 84 VOMO 12 L, manufacturer: Ermeto.

Possible Material Combinations

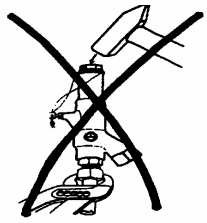
Pipe	Progressive ring	Cone MG 84	Pre-assembly with VOMO 12 L
austenitic steel	1.4571 (non-magnetic)	Brass austenitic steel	absolutely necessary

For further notes, refer to

EO Ermeto – Mounting Instructions 401 0-T2 / D,

The use of lubricants facilitates proper assembly. However, no lubricating spray may be used, but only those lubricants that are permitted for oxygen.

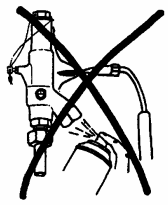
2.6 Wrong Installation / Operating Errors



The following agents, tools and procedures are prohibited:

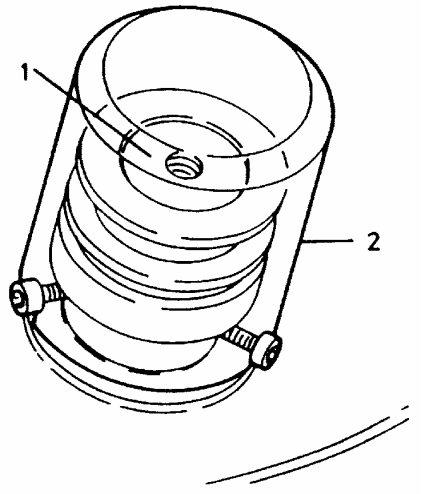
- pliers
- striking tools

- lubricating spray
- sealant
- hemp
- adhesive sealing compound



- open flame
- splash water
- vapour
- leak indicating spray
- lees

2.7 Combined Positive Pressure Relief and Seal-off Device



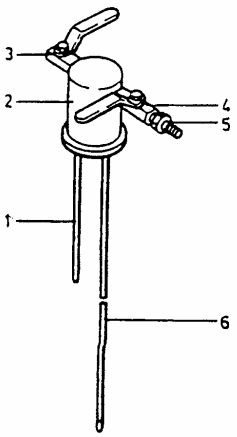
Caution! The positive pressure relief and seal-off device protects the vacuum room from overpressure. Re-evacuation may only be carried out by

- manufacturer's skilled staff

The protective cover (2) intercepts the valve insert (1), when there is overpressure existing in the vacuum room.

- Do not remove the protective cover (2).
- Protect the valve from heat as well as cooling, as brittleness results in the loss of the operating vacuum.

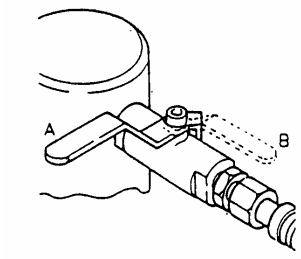
2.8 Siphon with Small Flange Connection Type EK



Structure of the Siphon

Item	**Description**
1	Waste gas/overflow line
2	Basic body with small flange connection DN 50
3	Waste gas/overflow valve G 1/2"
4	Filling/withdrawal valve G 3/8"
5	Connection screwing (double nipple ring R 3/8" - 3/4-16 UNF) for flexible transfer hose
6	Filling/withdrawal line

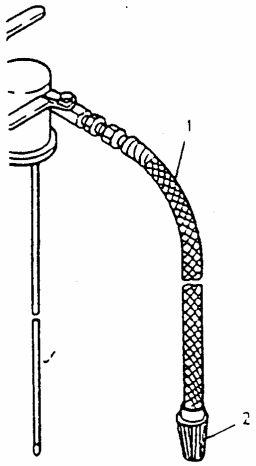
The siphon serves for the filling and withdrawal of liquid nitrogen.
Special designs (e.g. single / triple withdrawal) are available on request.



Ball Valve Positions:

A - closed
B - open

2.9 Transfer Hose



Structure of the Standard Transfer Hose

Item	**Description**
1	Flexible corrugated hose with a corrosion-resistant stainless steel braiding
2	Phase separator for ensuring the splash-free transfer of liquid nitrogen

Exchange damaged hose

Protect transfer hose from

- bending when in a cold condition
- being twisted
- being pulled
- buckling
- impacts

2.10 Level Indicator

Structure of the Level Indicator

Determination of the Vessel Filling Level

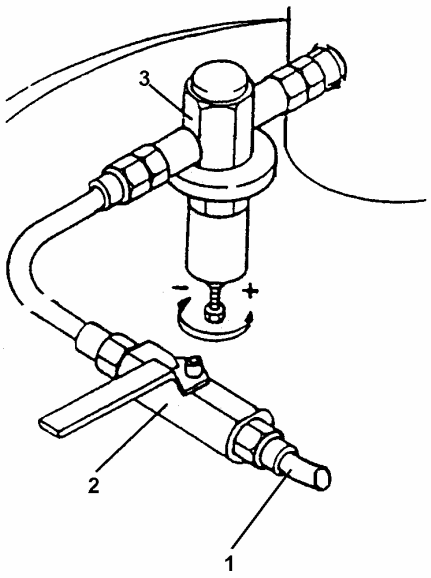
- by reading the scale of the level indicator
- by determining the filling level by means of a dip rod and comparing with the filling level curve
- the black area marks 25% of residual contents

Prior to the disassembly of the level indicator:

- relieve pressure from the vessel
- close the shut-off valve (2)

2.11 Pressure Build-up Control System

Automatic Pressure Build-up Control System (Option)
As spare part if the vessel already in use (does not belong to the basic equipment)



Item	Description	Article no.
1	Pressure build-up line	
2	Pressure build-up valve	0346570
3	Pressure build-up control valve	0366006

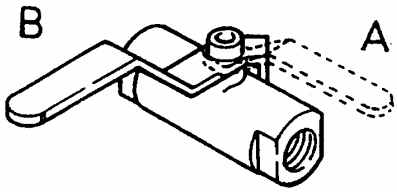
The automatic pressure build-up valve controls the pressure in the vessel.

It is recommended with continuous withdrawal operation.

Close the pressure build-up valve (2) prior to filling, relieving pressure or transporting.

Pressure Build-up Control

- Switch on by opening the pressure build-up valve (2), Position A.
- Switch off by closing the pressure build-up valve (2), Position B.



Changing the Operating Pressure

- Turning the regulating screw (3) in clockwise direction causes the pressure to increase.
- Turning the regulating screw (3) in counter clockwise direction causes the pressure to decrease.

Automatic Pressure Build-up Control Valve Mode of Operation:

- The pressure build-up control valve (3) will open when the pressure in the tank drops.
- The liquid nitrogen is introduced into the pressure build-up line (1) at the vessel bottom, it evaporates and is returned to the tank.
- The pressure in the tank rises to the adjusted operating pressure.
- The pressure build-up control valve (3) closes.

2.12 Spare Parts / Accessories

Item	Designation	Subject number	Subject number
0	**Vessel complete**	**APOLLO® 200 with chassis** 78202748	**APOLLO® 350 with chassis** 78202749
1	Lettering APOLLO	79406948	79406948
2	Cryotherm logo	79406985	79406985
4	Level indicator Cryotherm - WIKA	78202757	78202757
5	Ball valve 3/8"	0346570	0346570
6	EK-siphon complete	78202754	78202755
7	Safety valve MG 84	79255323	79255323
8	Pressure gauge 0-4,0 bar	78212373	78212373
9	Castor without locking lever ∅ 160 mm	78211697/1	78211697/1
10	Castor with locking lever	78211698/1	78211698/1
12	Double nipple R 3/8"-3/4-16 UNF	0793576	0793576
13	Transfer hose 1,5 m	79229957	79229957
14	Straining ring, DN 50	0792277	0792277
15	Centering ring, DN 50	0321303	0321303
16	Phase separator G 3/4"	0794146	0794146
17	Safety glasses	0794189	0794189
18	Transport stopper DN 50	78202417	78202417
19	Protective insulating leather gloves	0794111	0794111
20	Rating plate (adhesive film)	78201521	78201521
22	Operating manual	78211689	78211689
23	GGVS / ADR - Labelling		
24	Cryogenic liquid nitrogen	78400571	78400571
25	GGVS adhesive label. 2	0358193	0358193
26	GGVS adhesive label ↑↑ no.11	0356199	0356199
27	Chassis	78202758	78202759
28	Pressure regulator	0366006	0366006

3 Safety

3.1 How to handle liquid Nitrogen

Caution when handling liquid nitrogen!
Observe the following documents and procedures:

- Leaflet „How to handle nitrogen“
- Safety data sheet: “Nitrogen refrigerated”
- Accident leaflet "cryogenic liquefied gases: suffocating“
- When setting up in rooms, ensure good ventilation (TRB 610)
- Operation may only be carried out by persons instructed correspondingly (TRB 700)
- Regulation for the Prevention of Accidents „gases“ BGV B 6 (VBG61)
- Regulation for Pressure Devices

3.2 General Safety Instructions

For safe operation:

- Additional aggregates for filling/withdrawal have to be adjusted to the operating conditions of the tank.
- Test the tightness and function of the fittings at regular intervals.
- Use original spare parts.
- Employ suitable tools.
- Do not operate valves abruptly or jerkily.
- Protect lockable rooms from exceeding of the maximum operating overpressure by means of a safety valve.
- Have adjustment, maintenance and repair work done only by authorized skilled personnel.
- Do not carry out any mechanical and thermal work at the vessel (loss of vacuum).
- Do not transfuse contents with foreign gas.
- Do not overcharge the tank.
- Protect safety valves from splash water and lees.
- Wear gloves and safety glasses.
- Loosen the screwings only in unpressurized condition.

3.3 Proper Use according to the Regulations

Company Cryotherm GmbH & Co. KG does not assume any liability, if the tank is changed or adapted without approval given by the manufacturer.

Company Cryotherm GmbH & Co. KG does not assume any liability, if the tank is not properly used according to the regulations.

3.4 Safety Data Sheet "Nitrogen refrigerated"

AIR LIQUIDE

Safety Data Sheet

Product :	Nitrogen (refrigerated)	Page :1/4
MSDS Nr : 089B_AL	Version : 1.01	Date : 31/07/2002

1 IDENTIFICATION OF THE SUBSTANCE/PREPARATION AND OF THE COMPANY

MSDS Nr	089B_AL
Product name	Nitrogen (refrigerated)
Chemical formula	N2
Company identification	see heading and/or footer
	see paragraph 16 "OTHER INFORMATION"
Emergency phone numbers	see heading and/or footer
	see paragraph 16 "OTHER INFORMATION"

2 COMPOSITION/INFORMATION ON INGREDIENTS

Substance/Preparation	Substance.
Components/Impurities	Contains no other components or impurities which will influence the classification of the product.
CAS Nr	07727-37-9
EEC Nr (from EINECS)	231-783-9

3 HAZARDS IDENTIFICATION

Hazards identification	Refrigerated liquefied gas. Contact with product may cause cold burns or frostbite. In high concentrations may cause asphyxiation.

4 FIRST AID MEASURES

Inhalation	In high concentrations may cause asphyxiation. Symptoms may include loss of mobility/consciousness. Victim may not be aware of asphyxiation. Remove victim to uncontaminated area wearing self contained breathing apparatus. Keep victim warm and rested. Call a doctor. Apply artificial respiration if breathing stopped.
Skin/eye contact	Immediately flush eyes thoroughly with water for at least 15 minutes. In case of frostbite spray with water for at least 15 minutes. Apply a sterile dressing. Obtain medical assistance
Ingestion	Ingestion is not considered a potential route of exposure.

5 FIRE FIGHTING MEASURES

Specific hazards	Exposure to fire may cause containers to rupture/explode. Non flammable
Hazardous combustion products	None
Suitable extinguishing media	All known extinguishants can be used.

Safety Data Sheet

Specific methods	If possible, stop flow of product. Move away from the container and cool with water from a protected position. If leaking do not spray water onto container. Water surrounding area (from protected position) to contain fire.
Special protective equipment for fire fighters	In confined space use self-contained breathing apparatus.

6 ACCIDENTAL RELEASE MEASURES

Personal precautions	Evacuate area. Use protective clothing. Wear self-contained breathing apparatus when entering area unless atmosphere is proved to be safe. Ensure adequate air ventilation.
Environmental precautions	Try to stop release. Prevent from entering sewers, basements and workpits, or any place where its accumulation can be dangerous.
Clean up methods	Ventilate area.

7 HANDLING AND STORAGE

Handling and storage	Suck back of water into the container must be prevented. Do not allow backfeed into the container. Use only properly specified equipment which is suitable for this product, its supply pressure and temperature. Contact your gas supplier if in doubt. Refer to supplier's container handling instructions. Keep container below 50°C in a well ventilated place.

8 EXPOSURE CONTROLS/PERSONAL PROTECTION

Personal protection	Ensure adequate ventilation. Protect eyes, face and skin from liquid splashes.

9 PHYSICAL AND CHEMICAL PROPERTIES

Molecular weight	28
Melting point	-210 °C
Boiling point	-196 °C
Critical temperature	-147 °C
Relative density, gas	0.97 (air=1)
Relative density, liquid	0.8 (water=1)

Safety Data Sheet

Vapour Pressure 20°C	Not applicable.
Solubility mg/l water	20 mg/l
Appearance/Colour	Colourless liquid
Odour	No odour warning properties.
Other data	Gas/vapour heavier than air. May accumulate in confined spaces, particularly at or below ground level.

10 STABILITY AND REACTIVITY

Stability and reactivity	Stable under normal conditions. Liquid spillages can cause embrittlement of structural materials.

11 TOXICOLOGICAL INFORMATION

General	No known toxicological effects from this product.

12 ECOLOGICAL INFORMATION

General	Can cause frost damage to vegetation.

13 DISPOSAL CONSIDERATIONS

General	Do not discharge into any place where its accumulation could be dangerous. Contact supplier if guidance is required.

14 TRANSPORT INFORMATION

Proper shipping name	Nitrogen, refrigerated liquid
UN Nr	1977
Class/Div	2.2
ADR/RID Classification code	2, 3°A
ADR/RID Hazard Nr	22
Labelling ADR	Label 2: non flammable non toxic gas
Other transport information	Avoid transport on vehicles where the load space is not separated from the driver's compartment. Ensure vehicle driver is aware of the potential hazards of the load and knows what to do in the event of an accident or an emergency. Before transporting product containers ensure that they are firmly secured and: - there is adequate ventilation. - compliance with applicable regulations.

Safety Data Sheet

15 REGULATORY INFORMATION

Number in Annex I of Dir 67/548	Not included in Annex I.
EC Classification	Not classified as dangerous preparation.
EC Labelling (Symbols, R&S phrases)	No EC labelling required.

16 OTHER INFORMATION

May cause frostbite.

Asphyxiant in high concentrations.

Keep container in well ventilated place.

Do not breathe the gas.

Ensure all national/local regulations are observed.

The hazard of asphyxiation is often overlooked and must be stressed during operator training.

Before using this product in any new process or experiment, a thorough material compatibility and safety study should be carried out.

Details given in this document are believed to be correct at the time of going to press. Whilst proper care has been taken in the preparation of this document, no liability for injury or damage resulting from its use can be accepted.

This Safety Data Sheet has been established in accordance with the applicable European Directives and applies to all countries that have translated the Directives in their national laws.

This MSDS is for information purposes only and is subject to change without notice. [Prior to purchase of products, please contact your local Air Liquide office for a complete MSDS (with Manufacturer's name and emergency phone number).]

End of document.
Number of pages :4

3.5 Accident Leaflet „suffocating Gases"

ACCIDENT LEAFLET FOR ROAD TRANSPORTATION
CRYOGENIC LIQUEFIED GASES: suffocating

non-toxic, non-caustic, non-inflammable, non-oxidizing – designation of the medium is indicated on the next page

HAZARDS

Heating results in pressure increase – danger of bursting.
Gas is having a suffocating effect without any observable symptoms.
The leaked liquid is very cold and evaporates rapidly.
Liquid causes heavy injuries through frostbite on skin and eyes.
Together with humid air, it generates fog.
Gas is heavier than air and spreads on the ground.

PROTECTIVE EQUIPMENT

Safety glasses, protective gloves or face protection, protective shoes

EMERGENCY MEASURES: IMMEDIATELY NOTIFY FIRE BRIGADE AND POLICE

Stop the motor.
Secure the road and warn other road users.
Keep unauthorized persons away from the danger zone.
Stay on wind side.

LEAKAGE LOSSES
If possible, remove leakage losses.
Consult an expert.
Have leaked liquid evaporated.
Warn everyone - danger of suffocating existing in sewerage, cellars and pits.

FIRE:

In case of fire conditions, cool the tank by means of a water spray jet.

FIRST AID:
Thaw frozen garments and remove them carefully.
Medical aid is required in case of frostbite symptoms.

ONLY VALID FOR ROAD TRANSPORTATION Dez 96

3.6 Labelling

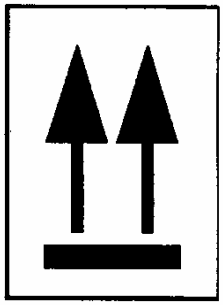
The tanks have to labelled according to the ADR.

Cryogenic liquefied Gases
suffocating, Class 2 Figure and Group 3A

Figure and Group	Number, Labelling, Designation of the Medium
3A	1977 nitrogen, cryogenic liquid 1951 argon, cryogenic liquid

Caution Marks

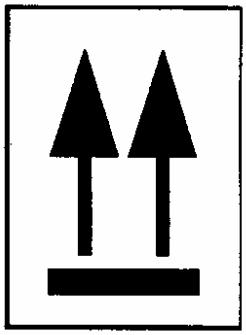
No. 2
Non-flammable and non-toxic gases;



No. 11
This side up;
This label has to be attached with the arrow heads pointing upwards.

4 Transportation and Assembly

4.1 General Transportation



Transportation of the Vessel

- Observe safety instructions.
- Keep upright.
- Lift and set down carefully.
- Avoid impacts and strong shocks

Transportation in filled condition

- The vessel must be in excellent condition.
- The vessel must be in unpressurized condition with loosely fitted transport stopper.
- The EK Siphon has to be dismantled.
- Use 2 person for transport over inclines, pitches and steps

Observe the national regulations during internal and road transportation with vehicles. At the same time, protect the vessel from tumbling down, shifting and damage (by stowing / lashing).

4.2 Assembly

Assembly of the Vessel

- Observe safety instructions.
- Ensure good ventilation.
- Consider place of operation
- Fix castors by means of the locking levers.

5 Operation

5.1 Initial Commissioning

The vessel can be commissioned immediately after delivery.

Caution !

- Observe safety instructions.
- Use filling line with safety valve and pressure relief.
- Wear gloves and safety glasses.
- Protect the vessel from rolling away, tumbling down and damage.

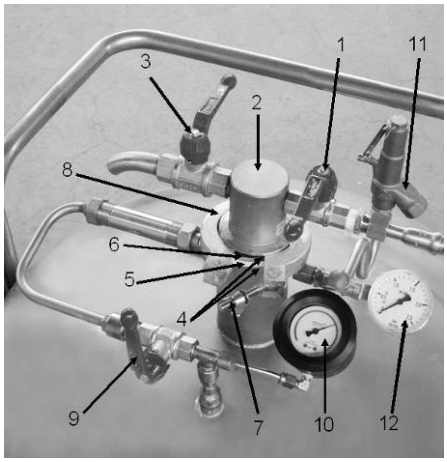
Note !

- When cooling down the hot vessel to operating temperature, increased evaporation losses do occur.

5.2 Assembly and Disassembly of the EK Siphon

In principle, operate the vessel exclusively by means of the EK Siphon (2).

When opening the waste gas/overflow valve (3), make sure that it is not directed towards any persons or devices; cryogenic gas will cause burns and brittleness.



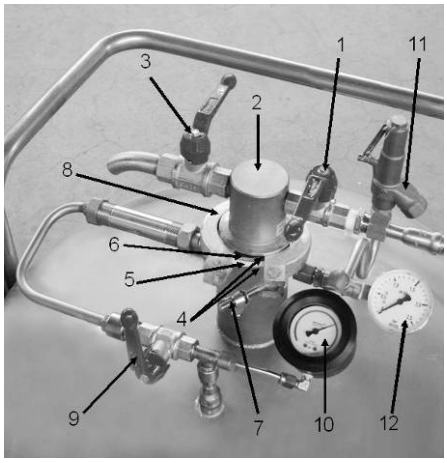
Note !

- Due to operation, open valves will get covered by ice during the pressure build-up, waste gas/overflow and filling/withdrawal.
- Closed valves will thaw eventually.
- Lasting frost formation indicates leakage.

Assembly of the EK Siphon

1. Clean and remove ice from the sealing surfaces (4), centering ring (5) and O-ring (6) **and replace if damaged**.
2. Place the centering ring (5) with O-ring (6) on the flange.
3. Close the filling/withdrawal valve (1) at the EK Siphon, before insert into the vessel neck.
4. Open the waste gas/overflow valve (3) for avoiding pressure increase.
5. Insert the EK Siphon (2) vertically into the neck.
6. Place the straining ring (8) and tighten the wing screw (7).
7. Close the waste gas/overflow valve (3).

Liquid nitrogen may escape from the waste gas/overflow valve (3) when the EK Siphon is immersed.



Disassembly of the EK Siphon

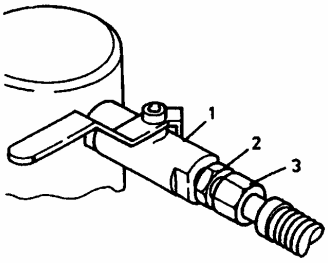
Danger of Accidents!
Dismantle the EK Siphon only with unpressurized vessel.

1. Close the pressure build-up valve (9).
2. Close the filling/withdrawal valve (1).
3. Detach the connected withdrawal line from the EK Siphon.
4. Open the waste gas/overflow (3) valve for relieving the pressure of the vessel.
5. Loosen the wing screw (7) and remove the straining ring (8) from the unpressurized tank.
6. Remove the EK Siphon (2) by pulling it out carefully from the top and deposit it carefully.
7. Loosely insert the transport stopper.

5.3 Assembly of the Transfer Hose

Note

- Avoid any heavy mechanical strain.
- Do not carry out any assembly and disassembly while the vessel is cold.



Assembly of the Transfer Hose

1. Screw the union nut (3) onto the connecting screwing (2) of the filling/withdrawal valve (1).
2. Tighten the union nut (3) by means of an open-jawed wrench (SW24); in doing so retain the hexagon (2) with a wrench (SW 22).

5.4 Filling of the Vessel

Caution !

- Observe safety instructions.
- Use filling line with safety valve and pressure relief.
- Wear gloves and safety glasses.
- Protect the vessel from rolling away, tumbling down and damage.

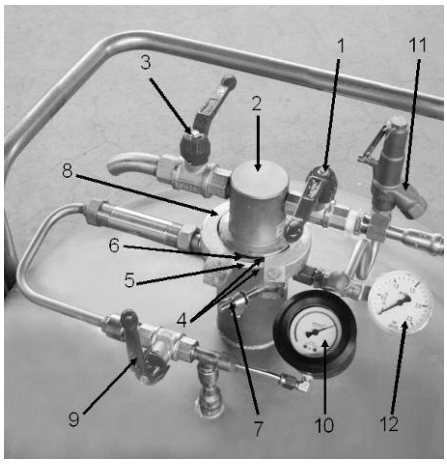
Note !

- Additional aggregates for filling and withdrawal have to be adapted to the operating conditions of the vessel.
- Filling has to take place outside or in a sufficient ventilated room

Risk of suffocation

Filling

1. Mount the EK Siphon.
2. Connect the filling line from the tank to the filling/withdrawal valve (1).
3. Open the waste gas/overflow valve (3) for causing pressure relief.
4. Open the filling/withdrawal valve (1) at the EK Siphon.
5. Open the tank valve for filling the vessel.
6. Observe level indicator (10)
7. Close the tank valve when liquid nitrogen escapes from the waste gas/overflow valve (3).



Caution!
Risk of skin burns

After completion of filling:

Waste Gas/Overflow Valve (3) to leave open.

1. Close the filling/withdrawal valve (1) at the EK Siphon.
2. Relief pressure from the filling line (2).
3. Loosen the filling line (2).
4. Dismantle the EK Siphon.
5. Move the tank (with the transport stopper loosely inserted) to its destination.
6. Remove the transport stopper.
7. Mount the EK Siphon (2).

Risk of skin burns by escaping nitrogen

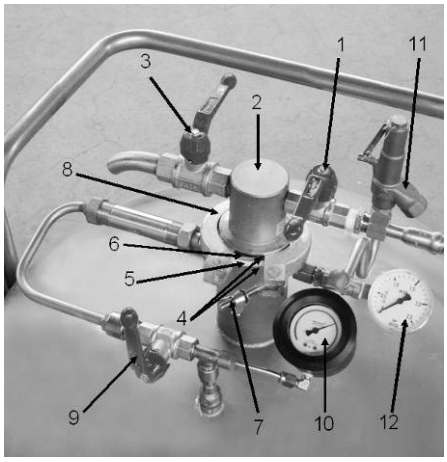
<u>Filling without EK-Siphon in open condition</u>

Alternatively to the procedure described above the vessel may be filled by a hose with phase separator in open condition. The filling has to be stopped prior the liquid level reaches the neck tube.

1. Depressurise and unmount the EK-siphon (2).
2. Let liquid inflow trough the neck tube in open condition.
3. Stop filling procedure prior liquid level reach the neck tube (liquid level gauge 5% under max-indicator).
4. Mount the EK siphon. (Fill-/Withdrawal valve (1) as well as waste gas/overflow valve (3) closed).
5. Open waste gas/overflow valve (3) overfilled liquid will escape.

Caution!
Risk of skin burns by escaping nitrogen

5.5 Withdrawal of liquid Nitrogen



Withdrawal

1. Move the vessel to the place of withdrawal.
2. Mount the EK Siphon (2).
3. Mount the delivered transfer hose or a relevant filling line.
4. Open the filling/withdrawal valve (1) in order to withdraw liquid
   nitrogen.
5. Adjust the desired withdrawal pressure and open the pressure build-up valve (9) for this purpose.

Caution !

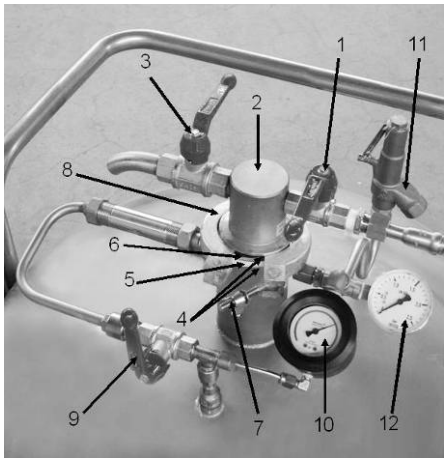
- Observe safety instructions.
- Wear gloves and safety glasses.
- Protect the vessel from rolling away, tumbling down and damage.

5.6 Pressure Build-up

The operating pressure in the vessel allows for withdrawing the liquid gas.

Vessel name		Apollo® 200 / 350
maximum operating pressure		2,0 bar

The safety valve (11) limits the maximum operating pressure. Should the pressure in the tank not be sufficient for the withdrawal operation, it can be increased by opening the pressure build-up valve (9).



Prior to pressure build-up:

- Check the EK Siphon (2) for tight seat.
- Adjust the operating pressure only as high as required.

Pressure Build-up

1. Close the waste gas/overflow valve (3).
2. Close the filling/withdrawal valve (1).
3. Slowly open the pressure build-up valve (9).
4. Watch the pressure gauge (12).
5. Close pressure build-up valve (9) when the desired pressure is reached.

Continuous Withdrawal under constant Pressure

1. Slightly open the pressure build-up valve (9).
2. Close the pressure build-up valve (9) when the desired pressure is reached.
3. When starting with the withdrawal, watch the pressure drop at the pressure gauge (12).
4. Open the pressure build-up valve (9) is such a way that the desired pressure remains constant.

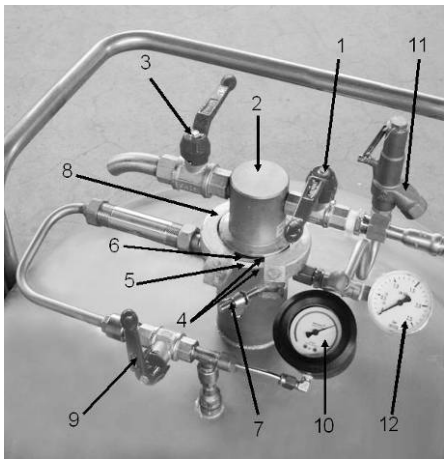
Note

- Avoid blowing-off of the safety valve (11).
- Frost formation on the vessel bottom is operational.

Close the pressure build-up valve (9) prior to finishing the withdrawal process.

A pressure control valve is recommended for continuous withdrawal. This item has to be indicated separately on the purchase order. Retrofitting is possible.

5.7 Pressure Relief



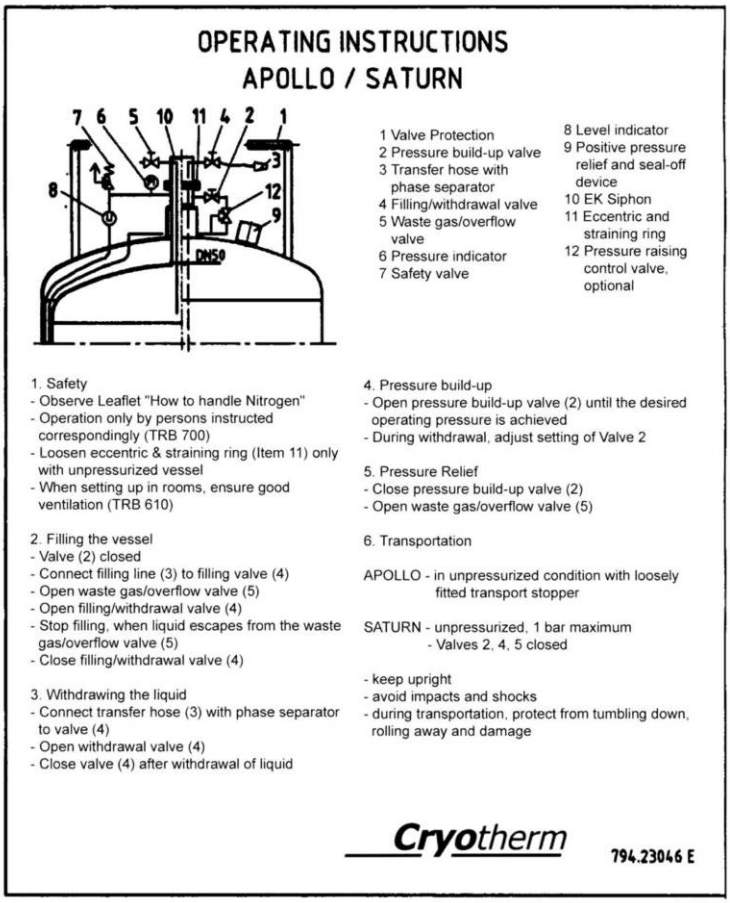
Open the waste gas/overflow valve (3), until the operating pressure will be achieved – observe pressure gauge
Subsequently, close the waste gas/overflow valve (3) again.

Do not direct the opening of the waste gas/overflow valve (3) towards any persons or devices, as cryogenic gas causes burns and brittleness.

5.8 Putting out of Operation

When putting the vessel out of operation, it has to be completely emptied out, warmed up and stored under slight gas overpressure, in order to avoid condensation of humidity.

5.9 Operating Instructions



Note !
The operating instructions

- are firmly attached to the outer vessel.

6 Maintenance / Repair

- With conventional use, the vessel does not require any special maintenance or attendance.
- Regular examinations with regard to operativeness and tightness of the fittings and screwings are recommended.
- Every two years, the safety valves have to examined with regard to function and set pressure. The pressure gauge indicates the set pressure.
- With conventional use, the vessel does not require any special maintenance or attendance.
- Regular examinations with regard to operativeness and tightness of the fittings and screwings are recommended.
- Every two years, the safety valves have to examined with regard to function and set pressure. The pressure gauge indicates the set pressure.

7 Faults

7.1 General Faults

Immediately put the vessel out of operation, in case that

- the fittings are leaky.
- the safety valve does blow off intensively.
- the rate of evaporation is too high.
- The outer cylinder is thawed / iced-up, which indicates loss of vacuum.

In case of nitrogen escaping,

- there exists the danger of suffocation.
- open windows and doors.
- leave closed rooms.

Vessels with vacuum loss are useless and have to be returned to the manufacturer for examination / repair.

In case of any queries, please indicate

- type of vessel
- maker's number
- year of construction

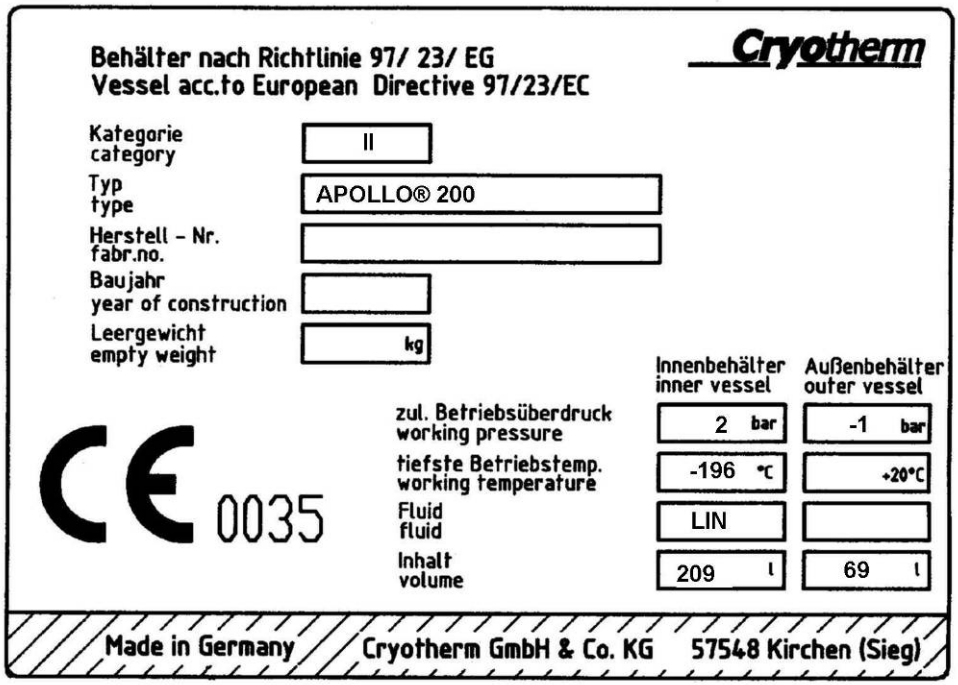
7.2 Possible Faults

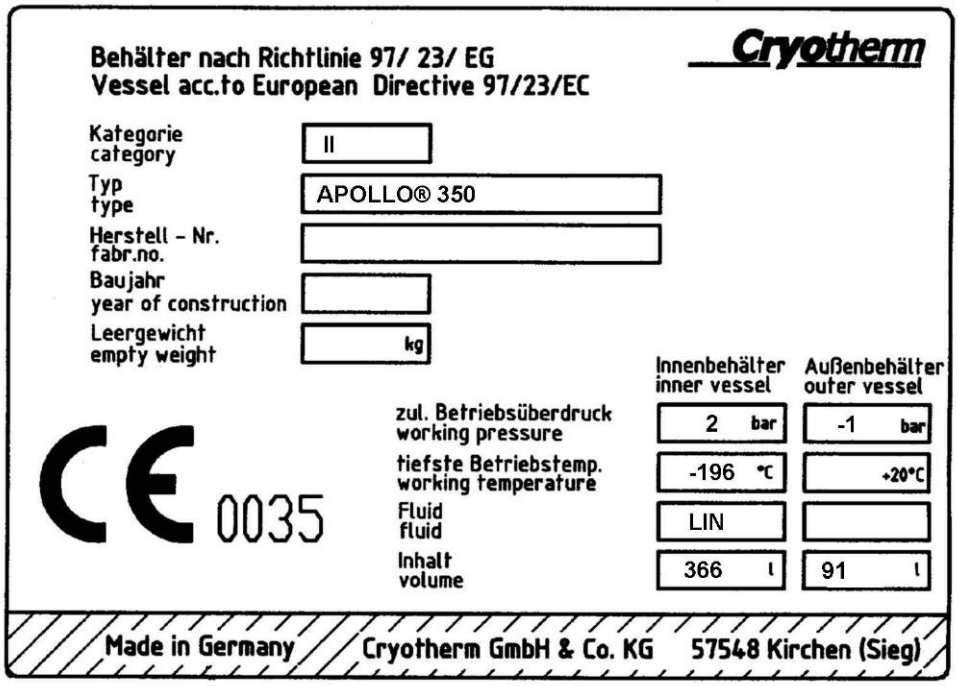
Fault	Cause	Trouble shooting
Iced-up valve	This is operational with opened valve.	-
	The valve is not closed completely.	Close the valve (it thaws).
	The valve is leaky.	Tighten the screwings / seat. If required, rinse / exchange the valve.
Safety valve blows off.	Pressure build-up valve is open.	Close pressure build-up valve.
	Pressure raising controller is too highly adjusted.	Lower adjust the opening pressure of the pressure raising controller.
	Filling pressure is too high.	Decrease the filling pressure of the withdrawal tank.
	Pressure build-up valve is open	Open waste gas overflow valve.
	Level indicator is defective.	Close shut-off valves of the level indicator, exchange level indicator.
Frost formation on the vessel		
• at the outer vessel	Vacuum loss	Examination / re-evacuation by the manufacturer
• at the bottom	Operational pressure build-up	-
Positive pressure relief and seal-off device released, vessel extremely iced-up	Vacuum loss within the vacuum room	Empty out the vessel / put it out of operation Examination / repair at the manufacturer's works

8 Warranty

Our warranty requires the proper use of the device according to the regulations. When exchanging parts, only original spare parts have to be used. Wear parts are not subject to warranty.

Extent and duration of our warranty comply with the regulation indicated in our terms of delivery.





TÜV CERT
DIN EN ISO 9001:2000

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