Cryotherm

Operating Manual

SATURN®50, SATURN®100 SATURN®150

SATURN® 200, SATURN® 300

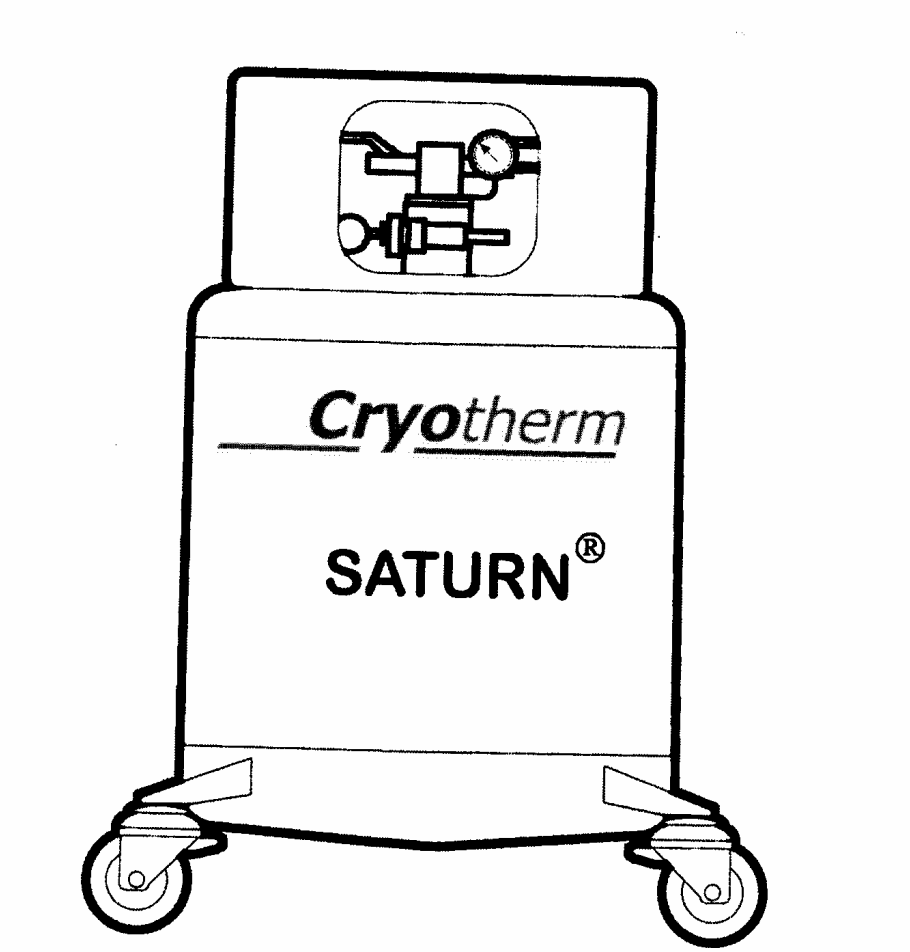


Table of contents **Seite**

1 Introduction

The **SATURN® - Vessel** is a super insulated Cryo-Vessel for cryogenic liquid nitrogen and argon, for road and rail transportation.

The production and examination take place in accordance with Guideline 99/36/EC, with PI – mark.

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 SATURN®- Vessel may only be operated according to the 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

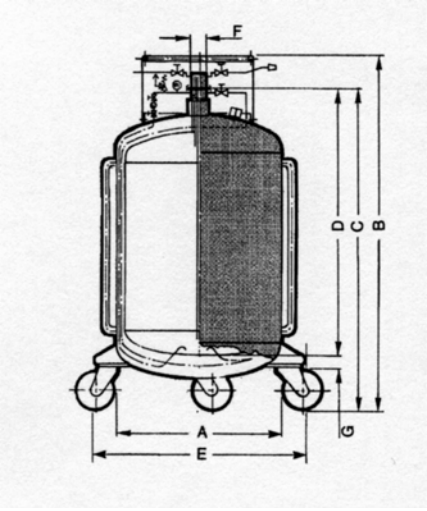
- the shipping insurance
- the shipping company
- the supplier

2 Vessel

2.1 Main Components

- Coaxial arrangement of the Cryo vessel in the outer vessel
- Vacuum – super insulation
- Positive pressure relief an seal-off device
- Pressure build – up, evaporator
- Fittings protection ring
- Fittings equipment with shut-off valves and safety valves
- Pressure gauge, level indicator
- castors

2.2 Specifications of the vessel



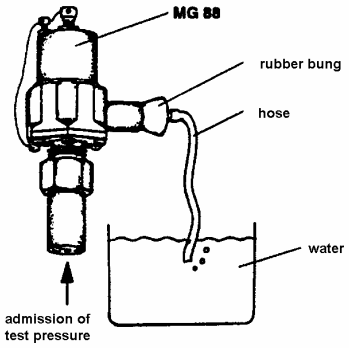
Type		SATURN® 50	SATURN® 100	SATURN® 150	
Geometrical capacity		53	105	152	l
Operating overpressure	l	3,0	3,0	3,0	bar
Weight	empty	65	80	114	kg
Weight (LIN)	full	107	161	231	kg
Outside diameter	A	500	500	550	mm
Total height	B	935	1270	1370	mm
Height to small flange	C	777	1110	1210	mm
Immersion depth	D	592	930	1045	mm
Total width	E	550	550	600	mm
Clear neck diameter	F	50	50	50	mm
Roller diameter	G	125	125	125	mm
Small flange DN		50	50	50	mm
Connection for re-pumping valve		25	25	40	mm
Static rate of evaporation		2,4	1,5	1,2	%/d
Maximum withdrawal rate		22	26	29	l/min
Article no.		794.03451	794.03452	79403453	

Type		SATURN® 200	SATURN® 300	
Geometrical capacity		195	313	l
Operating overpress-sure	l	3,0	3,0	bar
Weight	Empty	132	180	kg
Weight (LIN)	full	283	420	kg
Outside diameter	A	700	700	mm
Total height	B	1250	1610	mm
Height to small flange	C	1095	1450	mm
Immersion depth	D	885	1240	mm
Total width	E	750	750	mm
Clear neck diameter	F	50	50	mm
Roller diameter	G	160	160	mm
Small flange DN		50	50	mm
Connection for re-pumping valve		40	40	mm
Static rate of evapo-ration		0,8	0,7	%/d
Maximum withdrawal rate		32	34	l/min
Article no.		794.03454	794.03455	

2.3 Specification of the Safety Valve

Type	Mg 84	
Blow-off pressure	3,0	bar

2.4 Examination of Safety Valve

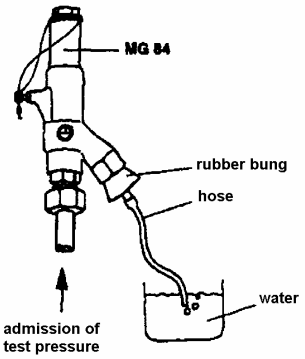


Examination

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 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

For the pre-assembly of the progressive ring, the hardened pre-assembly muff is recommended as follows: for MG 88 Type VOMO 10 L and for MG 84 VOMO 12 L, manufacture: Ermeto.

Possible Material Combinations

MG 88

Pipe	Progressive ring	Cone MG 88	Pre-assembly with VOMO 10 L
austenitic steel	1.4571 (non-magnetic)	brass	absolutely necessary

Possible Material Combinations

MG 84

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

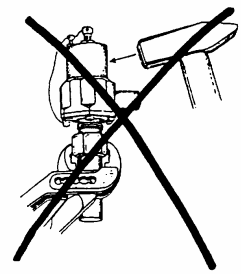
For further notes, refer to

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

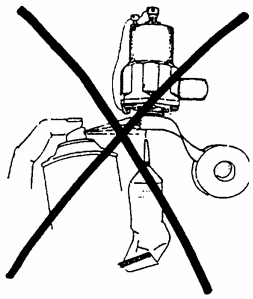
The use of lubricants facilitates proper assembly. However, no lubricating spray may be used, but only those lubricants that are permitted for oxygen.

2.6 Wrong Installation / Operating Errors

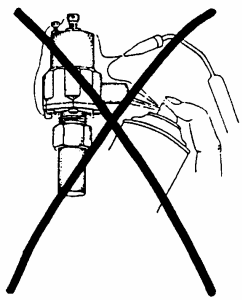
The following agents, tools and procedures are prohibited:



- pliers
- striking tools

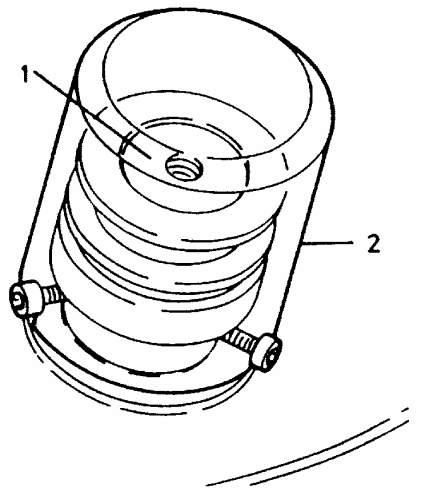


- lubricating spray
- sealant
- hemp
- adhesive sealing compound



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

2.7 Combined Positive Pressure Relief and Seal-off Device



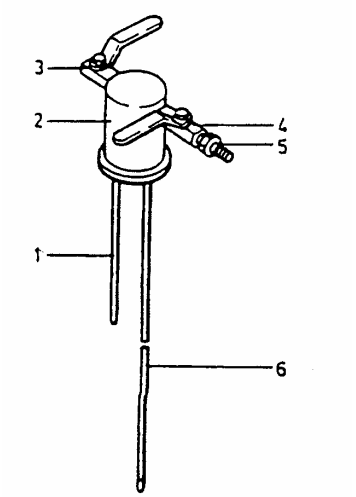
Caution! The positive pressure relief and seal-off device protects the vacuum room from overpressure. Re-evacuation may only be carried out by

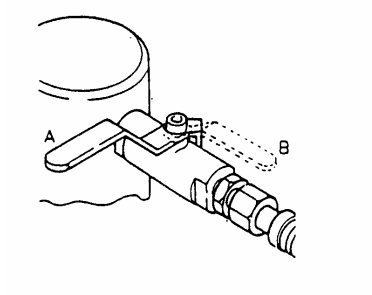
- manufacturer's skilled staff

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 3/8”
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

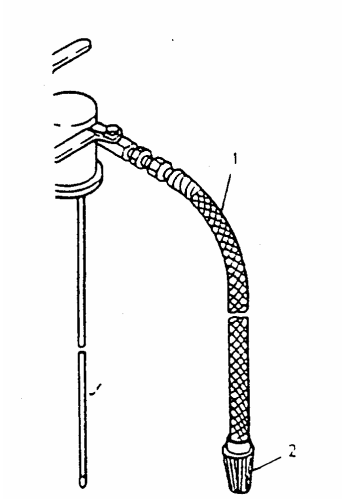
The siphon serves for the filling and withdrawal of liquid nitrogen.

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

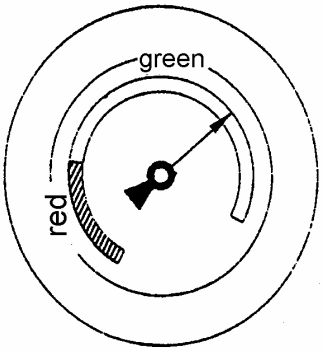
Item	**Description**
1	Flexible corrugated hose with a corrosion-resistant stainless steel braiding
2	Phase separator for ensuring the splash-free transfer of liquid nitrogen

Exchange damaged hose

Protect transfer hose from

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

2.10 Level Indicator



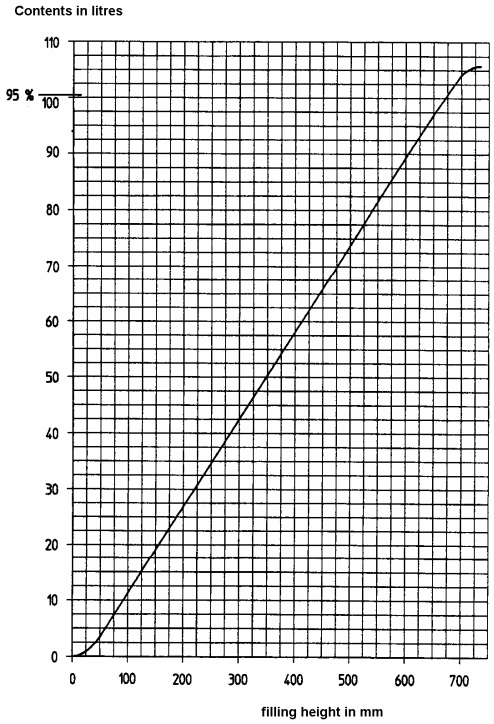
Structure of the Level Indicator

Item	Description
1	Level Indicator

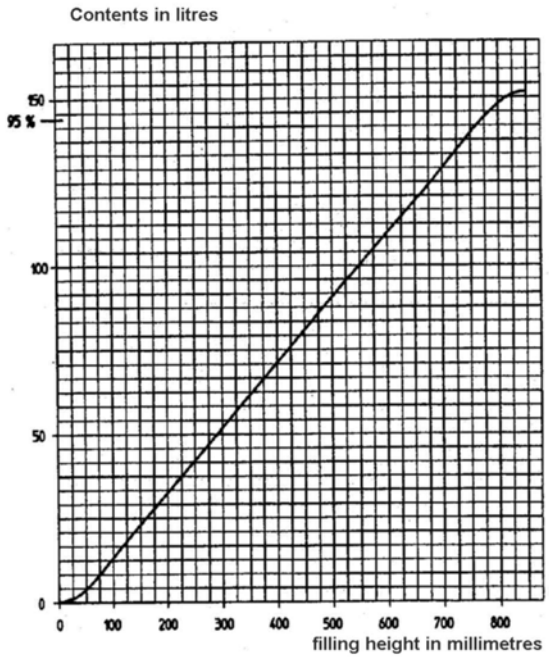
Determination of the Vessel Filling Level

- 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

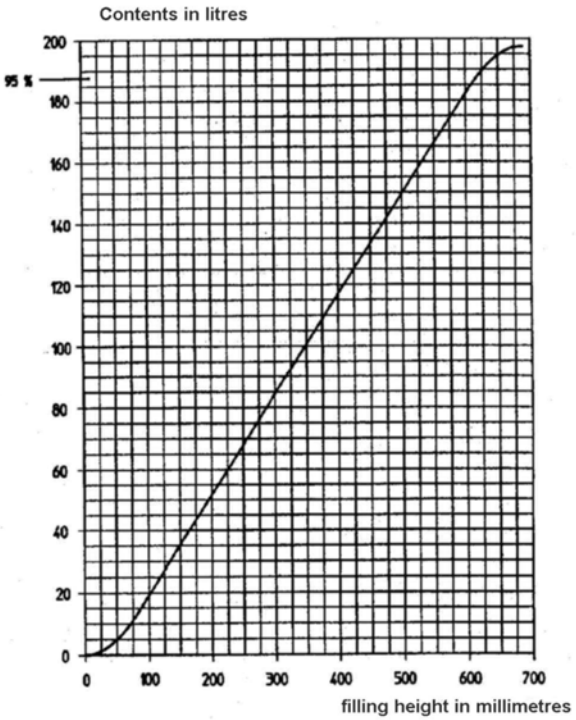
Filling Level Curve SATURN® 100:



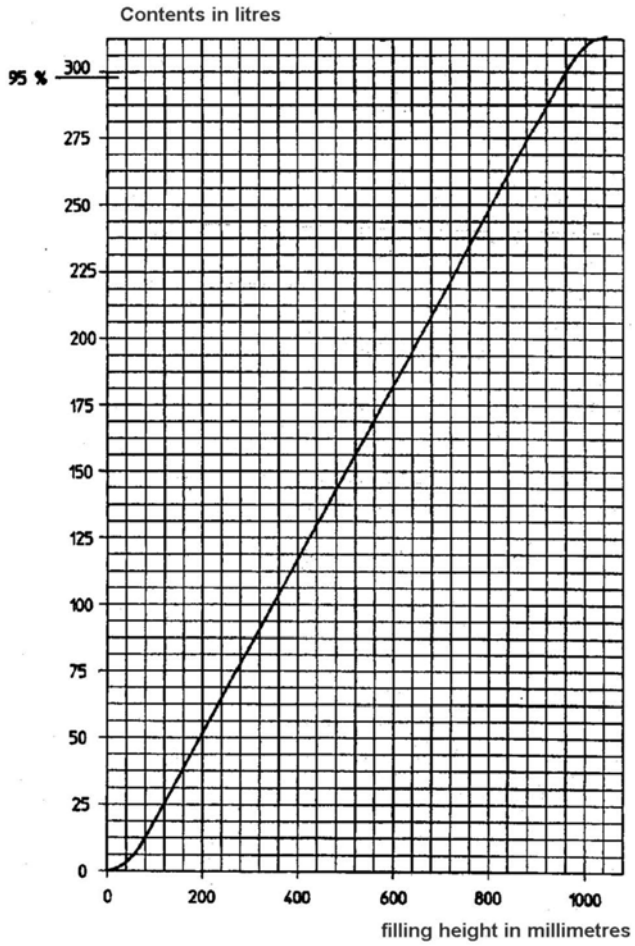
Filling Level Curve SATURN® 150:



Filling Level Curve SATURN® 200:



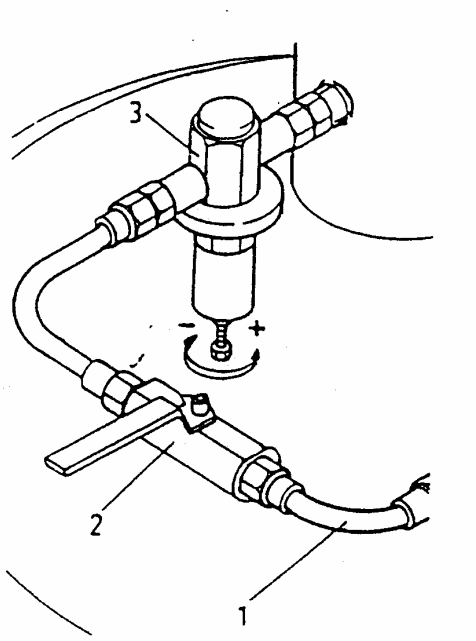
Filling Level Curve SATURN® 300:

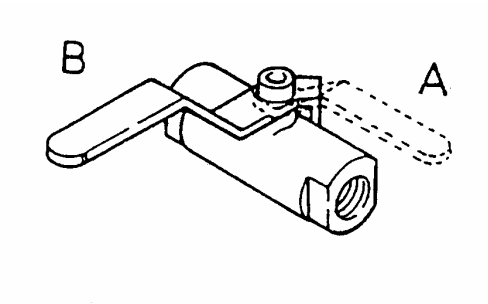


Prior to the disassembly of the level indicator:

- relieve pressure from the vessel

2.11 Pressure Build-up Control valve





Automatic pressure Build-up Control System (Option)

Item	Description
1	Pressure build-up line
2	Pressure build-up valve
3	Pressure build-up control valve

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.

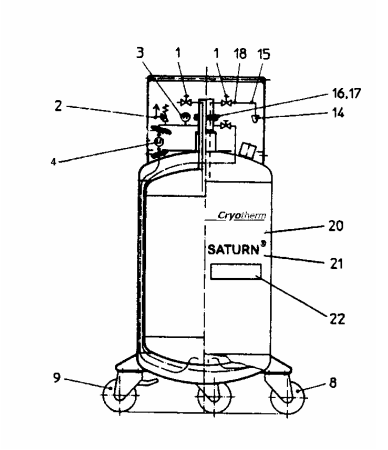
Changing the Operating Pressure

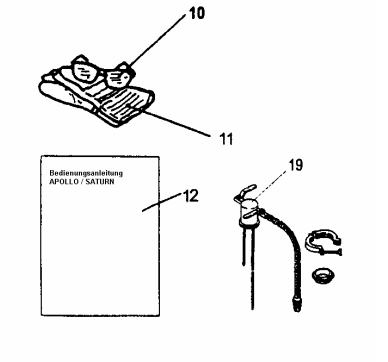
- Turning the regulating screw (3) in clockwise direction causes the pressure to increase.
- Turning the regulating screw (3) in counter clockwise direction causes the pressure to decrease.

Automatic Pressure Build-up Control Valve Mode of Operation:

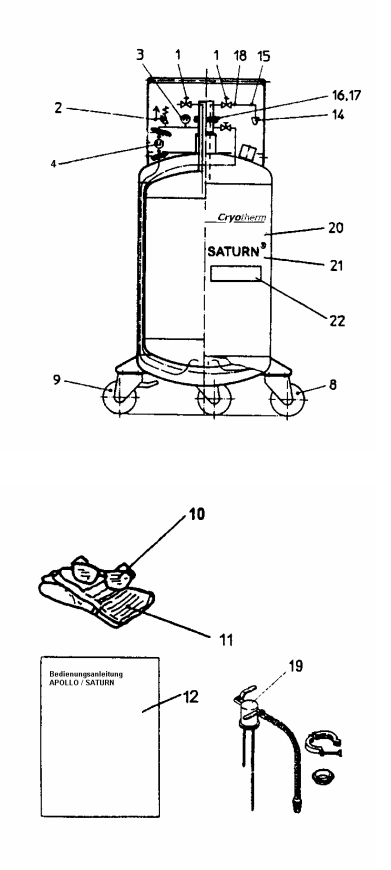
- The pressure build-up control valve (3) will open when the pressure in the tank drops.
- The liquid nitrogen is introduced into the pressure build-up line (1) at the vessel bottom, it evaporates and is returned to the tank.
- The pressure in the tank rises to the adjusted operating
- The pressure build-up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

2.12 Spare Parts/Accessories





Item	Designation	Subject number	Subject number	Subject number
		SATURN® 50 79403451	SATURN® 100 79403452	SATURN® 150 79403453
1	Ball valve 3/8"	0346570	0346570	0346570
2	Safety valve 3,0 bar	79408204	79408204	79408204
3	Pressure gauge 0-4 bar	0640556	0640556	0640556
4	WIKA Level Indicator	79245055	79245055	79245055
8	Castors without locking lever	0793655	0793655	0793655
9	Castors with locking lever	0793656	0793656	0793656
10	Safety glasses	0794189	0794189	0794189
11	Protective insulating leather gloves	0794111	0794111	0794111
12	Operating manual	79406873	79406873	79406873
13	Operating instructions (adhesive film)	79406614	79406614	79406614
16	centering ring DN 50 incl. 0- ring	0321303	0321303	0321303
17	Straining ring DN 50	0792277	0792277	0792277
18	Double nippel R3/8" UNF	0793576	0793576	0793576
19	EK-Siphon complete	79408303	79408303	79408304
20	Cryotherm logo	77031446	77031446	77031446
21	Lettering SATURN®	79406982	79406982	79406982
22	GGVS / ADR – Labelling			
	Cryogenic liquid nitro-gen	78400571	78400571	78400571
	Cryogenic liquid argon	0356972	0356972	0356972
	GGVS adhesive label no. 2	0358193	0358193	0358193
	GGVS adhesive label ↑↑ Nr.11	0356199	0356199	0356199



Item	Designation	Subject number	Subject number
		SATURN® 200 79403454	SATURN® 300 79403455
1	Ball valve 3/8"	0346570	0346570
2	Safety valve 3,0 bar	79408204	79408204
3	Pressure gauge 0-4 bar	0640556	0640556
4	WIKA Level Indicator	79245055	79245055
8	Castors without locking lever	0793652	0793652
9	Castors with locking lever	0793651	0793651
10	Safety glasses	0794189	0794189
11	Protective insulating leather gloves	0794111	0794111
12	Operating manual	79406873	79406873
13	Operating instructions (adhesive film)	79406614	79406614
16	Centering ring DN 50 incl. 0- ring	0321303	0321303
17	Straining ring DN 50	0792277	0792277
18	Double nippel R3/8" UNF	0793576	0793576
19	EK-Siphon complete	79408305	79408306
20	Cryotherm logo	77031446	77031446
21	Lettering SATURN®	79406983	79406983
22	GGVS / ADR – Labelling		
	Cryogenic liquid nitro-gen	78400571	78400571
	Cryogenic liquid argon	0356972	0356972
	GGVS adhesive label no. 2	0358193	0358193
	GGVS adhesive label ↑↑ Nr.11	0356199	0356199

3 Safety

3.1 How to handle liquid Nitrogen

Caution, when handling intensely cooled liquid gases!

Observe the following documents and procedures:

- Leaflet:
  ”How to handle nitrogen”
  “How to handle argon”
  -Accident leaflet for road transportation ADR/RID Class 2 "intensely cooled liquefied gases: suffocating“
- Operation of Pressure gas Vessels (TRG 280)
- 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)
- ADR/RID/ICAO
- EN 1251-3

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.
- Keep fittings free from oil and fat due to danger of explosion with oxygen.
- 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 Labelling

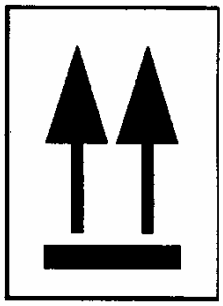
The tanks have to labelled according to the regulations for hazardous goods for the respective employment.

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-combustible and non-toxic gas;



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

3.5 Notes
"Notes on the use of nitrogen"

Notes

Notes on the use of nitrogen

Nitrogen is a ***non-toxic,*** colourless gas that has no odour, is not combustible, has an inertizing effect and is lighter than air
(specific gravity, gas/air = 0.967 at 1 bar and 15 °C).

Special care must be taken when using nitrogen in enclosed spaces (inside vessels, conduits, mines etc.) as nitrogen reduces or dispels the oxygen content of the air.In such cases, nitrogen can cause suffocation without warning.

Good air flow and ventilation are required where the containers are installed in rooms. Vessels and other enclosed spaces where shortage of oxygen can be expected may only be entered with a special written permit subject to the implementation of prescribed safety precautions. See also UVV 1 "General regulations" para 47 and MGI safety instructions "Entering shafts and mines flooded with cryogenic liquid nitrogen" (N 125).
The discharge points of blowoff and expansion lines should be arranged so that the nitrogen that is discharged cannot pose a hazard to persons or property.

When using cryogenic liquid nitrogen, the following additional instructions must be followed:

The risk of suffocation can exist even in the vicinity of container openings and when leaning over containers.
Evaporating cold nitrogen is initially heavier than air and can collect near the floor or in rooms positioned at a lower level.
Because of the lower boiling temperature of nitrogen, the oxygen in the ambient air can condense. In this way, undesirable concentrations of oxygen can occur in open liquid nitrogen containers.
Oxygen concentrations can also form on the outer wall of non-insulated containers which are filled with liquid nitrogen.
For the same reason, metallic cryogenic components (e.g. pipework) that are in contact with the ambient air must be insulated with non-combustible materials only. *)
Those sections of transfer lines for liquid nitrogen that are fitted with shutoff valves must be protected by safety valves or bursting plates to prevent the maximum permissible operating pressure from being exceeded.
When selecting materials for cryogenic applilcations, do not forget to take into account the cold embrittlement of organic materials (e.g. plastic or rubber) and certain types of steel.
Take care to avoid contact with the skin when handling liquid nitrogen on account of the freezing risk. Industrial footwear, gloves and goggles that provide all-round protection must be worn.
In the event of injuries caused by the cryogenic liquid, thaw immediately with water and summon medical aid.
Ensure that all employees concerned with the use of nitrogen are fully informed about the risks involved.

*) Exceptions are possible, e.g. the use of braided metal (Armaflex) hoses provided joints and couplings are air-tight.

8045 gesp. A2-4E-2'pm

3.6 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

3.7 Safety Data Sheet "Argon refrigerated"

AIR LIQUIDE

Safety Data Sheet

Product :	**Argon (refrigerated)**	Page :1/4
MSDS Nr : 003B_AL	Version : 1.01	Date : 31/07/2002

1 IDENTIFICATION OF THE SUBSTANCE/PREPARATION AND OF THE COMPANY

MSDS Nr	003B_AL
Product name	Argon (refrigerated)
Chemical formula	Ar
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	07440-37-1
EEC Nr (from EINECS)	231-147-0

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	40
Melting point	-189 °C
Boiling point	-186 °C
Critical temperature	-122 °C
Relative density, gas	1.38 (air=1)
Relative density, liquid	1.4 (water=1)

Safety Data Sheet

Vapour Pressure 20°C	Not applicable.
Solubility mg/l water	67 mg/l
Appearance/Colour	Colourless liquid
Odour	No odour warning properties.
Flammability range	Non flammable.
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	Argon, refrigerated liquid.
UN Nr	1951
Class/Div	2.2
ADR/RID Classification code	2, 3°A
ADR/RID Hazard Nr	220
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:

Safety Data Sheet

- there is adequate ventilation.
- compliance with applicable regulations.

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

Asphyxiant in high concentrations.

Keep container in well ventilated place.

Do not breathe the gas.

May cause frostbite.

Wear suitable protective clothing.

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.

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End of document.
Number of pages :4

3.8 Accident Leaflet "suffocating Gases"

ACCIDENT LEAFLET FOR ROAD TRANSPORTATION
ADR/GGVS Class 2
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:

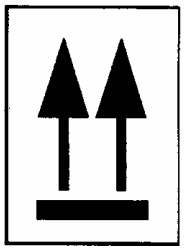
In case of fire conditions, cool the tank by means of a water spray jet.

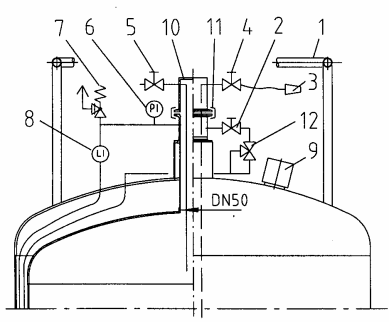
FIRST AID:
Thaw frozen garments and remove them carefully.
Medical aid is required in case of frostbite symptoms.

ONLY VALID FOR ROAD TRANSPORTATION Dez

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

- Open waste gas/overflow valve 4 and close filling-/ withdrawal valve 4, pressure build-up 2 and Valve 12
- Maximum value at pressure gauge (pressure inside the vessel) 1 bar, otherwise relieve pressure: open valve 5 (waste gas/overflow) until the working pressure at pressure gauge 6

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

5 Operation

5.1 Initial Commissioning

The vessel can be commissioned immediately after delivery.

Caution!

- Observe Safety Instructions

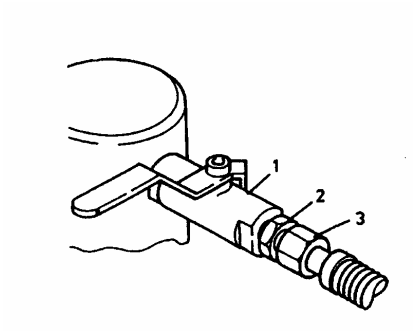
Note !

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

5.2 Assembly of the Transfer Hose

Note!

- Avoid any heavy mechanical strain
- Do not carry out any



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; in doing so retain the hexagon (2) with a wrench.
3. If necessary, tighten the union nut (3) in cold condition.

5.3 Filling of the Vessel

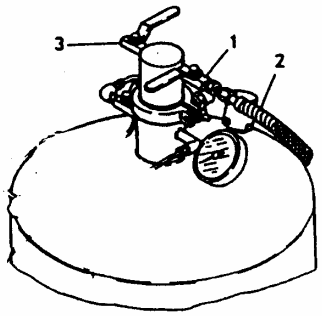
Caution !

- 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.
- The pressure of the LIN filling source must not be more than 3 bar

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

- Attach filling hose 2 between withdrawal tank and filling/withdrawal valve 1.
- Open waste-/overflow valve 1
- Open filling-/withdrawal valve 1
- Stop filling, when: Liquid pours out of waste gas / overflow valve 3
- Close filling-/withdrawal 1
- Close withdrawal valve at the withdrawal vessel.
- Relieve and disconnect the transfusing hose.

Note !

- Open waste./overflow valve 3 for pressure relief.
- Adjust the working pressure only as high as required, in order to avoid an undue heating of the medium.
- Avoid blowing-off of the safety valves. Relieve pressure, if required.

5.4 Withdrawal

Withdrawal of liquid

- Attach transfer hose with phase separator at valve 1.
- Open filling-/withdrawal valve 1.
- Close valve 1 after withdrawal of liquid

Observe safety instructions !

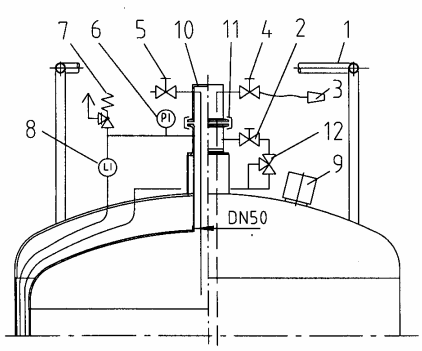
Note !

- Adjust working pressure only as high as required, in order to avoid an undue heating of the medium.
- Avoid blowing-off of the safety valves. Relieve pressure, if required.

5.5 Pressure Build-up (Pressure Raising Control)

Pressure Build-up

- Slowly open Pressure Build-up valve 2 until the working pressure will be achieved
- Adjust the pressure build up controller (option).The pressure build up controller is closed above the set pressure



Note !

- Screw-in the regulating screw for pressure increase.
- Unscrew regulating screw for pressure decrease.
- Depending on the filling ratio, operating overpressure and type of gas, the pressure build-up needs varying time, until the desired working pressure will be achieved.
- Adjust the working pressure only as high as required, in order to avoid an undue heating of the medium.
- Avoid blowing-off of the safety valves. Relieve pressure, if required.
- The icing of the vessel bottom is operational

5.6 Pressure Relief

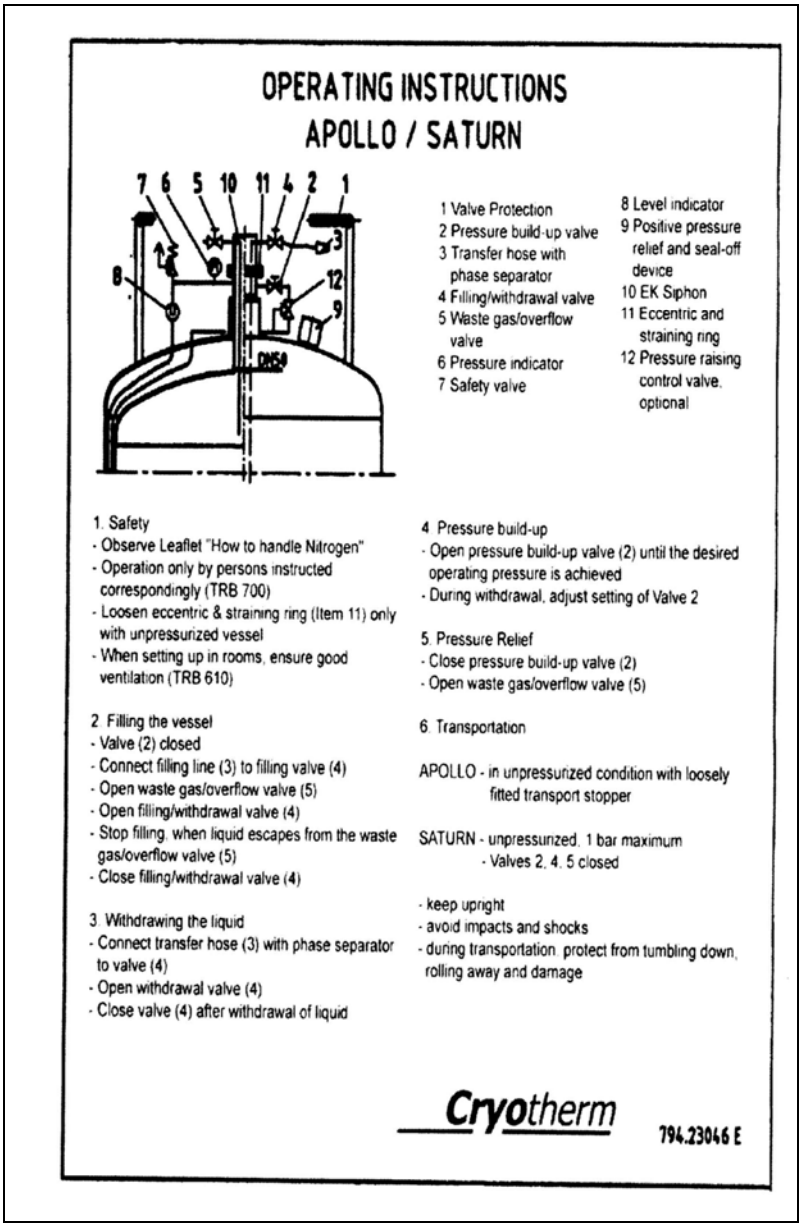
Observe safety instructions !

- Close Pressure build-up valve 2
- Open waste-/overflow valve 5

5.7 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.

5.8 Operating Instructions



OPERATING INSTRUCTIONS
APOLLO / SATURN

1 Valve Protection
2 Pressure build-up valve
3 Transfer hose with phase separator
4 Filling/withdrawal valve
5 Waste gas/overflow valve
6 Pressure indicator
7 Safety valve
8 Level indicator
9 Positive pressure relief and seal-off device
10 EK Siphon
11 Eccentric and straining ring
12 Pressure raising control valve, optional

1. Safety
- Observe Leaflet "How to handle Nitrogen"
- Operation only by persons instructed correspondingly (TRB 700)
- Loosen eccentric & straining ring (Item 11) only with unpressurized vessel
- When setting up in rooms, ensure good ventilation (TRB 610)

2. Filling the vessel
- Valve (2) closed
- Connect filling line (3) to filling valve (4)
- Open waste gas/overflow valve (5)
- Open filling/withdrawal valve (4)
- Stop filling, when liquid escapes from the waste gas/overflow valve (5)
- Close filling/withdrawal valve (4)

3. Withdrawing the liquid
- Connect transfer hose (3) with phase separator to valve (4)
- Open withdrawal valve (4)
- Close valve (4) after withdrawal of liquid

4. Pressure build-up
- Open pressure build-up valve (2) until the desired operating pressure is achieved
- During withdrawal, adjust setting of Valve 2

5. Pressure Relief
- Close pressure build-up valve (2)
- Open waste gas/overflow valve (5)

6. Transportation

APOLLO - in unpressurized condition with loosely fitted transport stopper

SATURN - unpressurized, 1 bar maximum
- Valves 2, 4, 5 closed

- keep upright
- avoid impacts and shocks
- during transportation, protect from tumbling down, rolling away and damage

Cryotherm 794.23046 E

Note !
The operating instructions
- Are firmly attached to the outer vessel.

6 Wartung / Reparatur

- 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.
- Carry out vacuum work only at the manufacturer's works.
- Observe the instructions for handling, examination and assembly of the safety valves.
- Only use original spare parts according to Item 2.12 (accessories / spare parts).
- Have repair and maintenance work carried out only by skilled personnel
- Carry out recurrent examinations at the manufacturer`s works.

7 Recurrent examinations	**Time for examination every 10 years, according to ADR part 4, P 203 (7) and 8, examination part 6.2.1.6**

8 Faults

8.1 General Faults

Immediately put the SATURN® Cryo - Vessel **out of operation, in case that**

- the fittings are leaky.
- the safety valves do blow off intensively.
- the rate of evaporation is too high.
- the outer vessel is thawed / iced-up, which indicates loss of vacuum.

In case of gas 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 queries, please indicate

- type of vessel
- maker's number

year of construction

8.2 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 vessel.
	Pressure increase due to self-evaporation	Open waste gas overflow valve.
	Level indicator is defective.	Close shut-off valves of the level indicator, exchange level indicator.
Icing of the vessel		
• at the outer vessel	Vacuum loss	Examination / re-evacuation by the manufacturer
• at the bottom	Operational pressure build-up	-
Vacuum seal and safety valve released, vessel extremely iced-up	Vacuum loss / pressure within the vacuum room	Empty out the vessel / put it out of operation Examination / repair at the manufacturer's works

9 Warranty

Our warranty requires the 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.

10 Declaration of Conformity

Declaration of Conformity
According to Directive 99/36/EC

Manufacturer's name and address: Cryotherm GmbH & Co. KG
Euteneuen 4 57548 Kirchen (Sieg)

With this declaration we certify that the results of the examinations carried out at the pressure device mentioned below fulfil the requirements of Directive 99/36/EC. The pressure device is marked with the depicted sign.

Π 0035

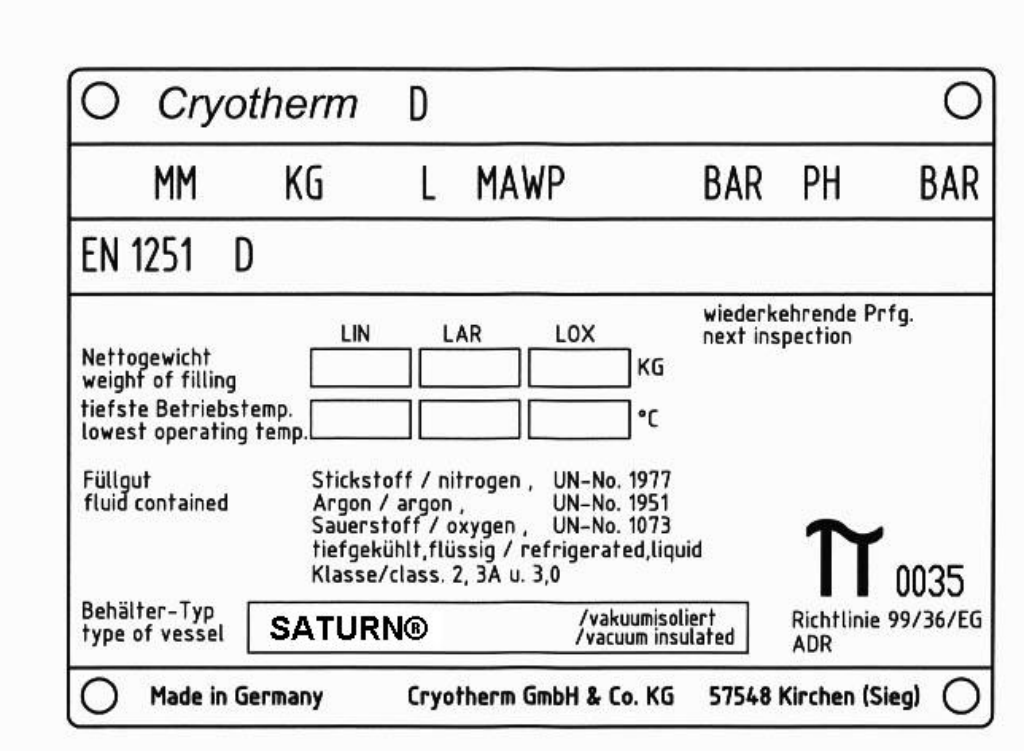
Examined according to Directive 99/36/EC
ADR/RID/EN 1251

Modul: G

Kategorie: 2

Designation of the pressure device:
SATURN® 50
SATURN® 100
SATURN® 150
SATURN® 200
SATURN® 300

Intended use: Vessel for storing cryogenic liquid nitrogen and argon



Cryotherm

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