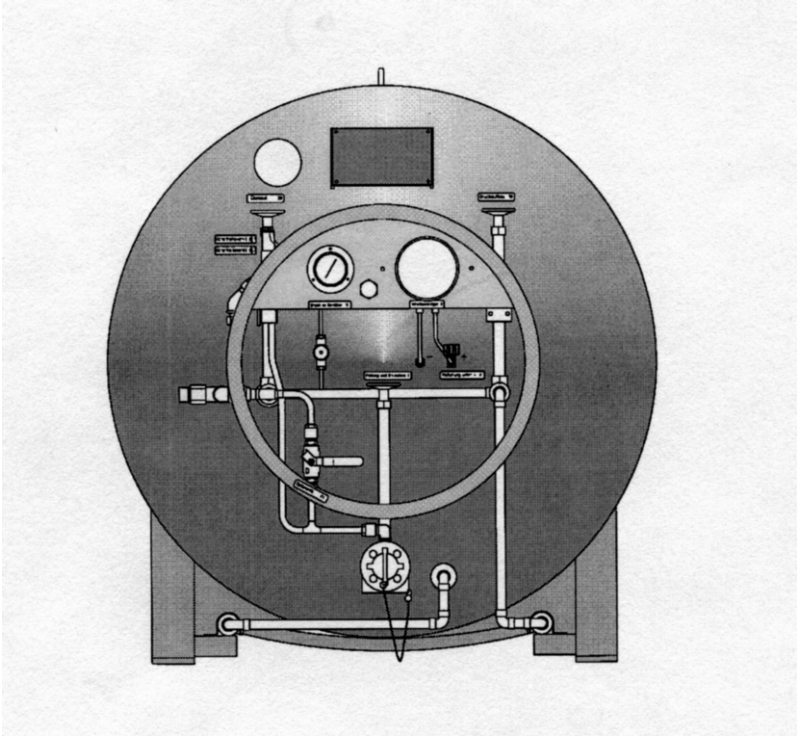
Cryotherm

Operating Manual

MERKUR® 500 K Transport Vessel

MERKUR® 1000 K Transport Vessel



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1 Introduction

The MERKUR® – 500/1000K is a vacuum super insulated Cryo–Vessel for cryogenic liquid nitrogen, oxygen and argon, for road transportation.
The production and examination take place in accordance with Guideline 99/36/EC, with PI – mark
The MERKUR® is used as Cryo–Vessel in transport vehicles e. g. for the supply of liquid nitrogen or of medical oxygen.

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 MERKUR® 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

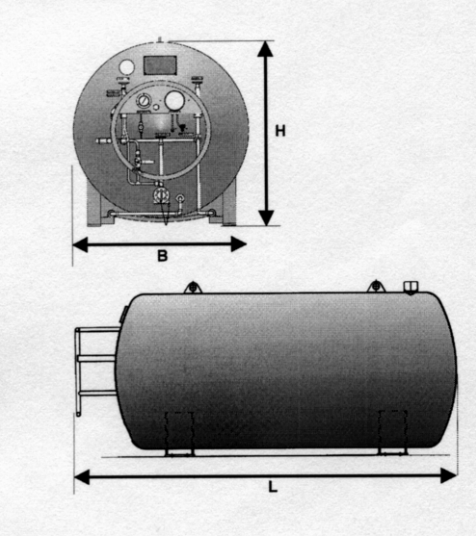
- the shipping insurance
- the shipping company
- the supplier

2 Vessel

2.1 Main Components

- coaxial arrangement of the pressure cryo - vessel in the outer vessel
- vacuum super insulation
- Positive pressure relief and seal-off valve
- pressure build-up evaporator
- fittings guard ring
- fittings equipment with shut-off valves and safety valves
- manometer, level indicator

2.2 Specifications of the Vessel

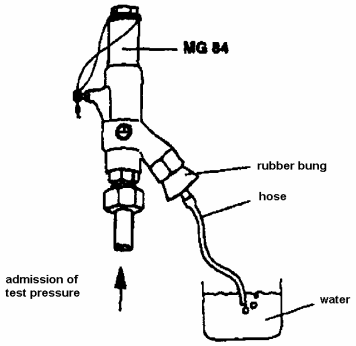


Type		Merkur® 500 K	Merkur® 1000 K	
Length	L	1640	2165	mm
Width	B	950	1050	mm
Height	H	1073	1173	mm
Geometrical volume		512	995	l
Empty weight		430 kg	566	kg
Static rate of evaporation (N_2)		1,7	1,2	%/d
Maximum operating pressure		6	6	bar

2.3 Specifications of the Safety valve

Type	MG 84	
Blow-off pressure	6.0	bar

2.4 Examination of the 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 the Safety Valve

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

Possible Material Combinations
MG 84

Pipe	Progressive Ring	Cone MG 88	Pre-assembly with VOMO 12 L
austenitic steel	1.4571 (non-magnetic)	brass austenitic steel	absolutely necessary

For further notes, refer to

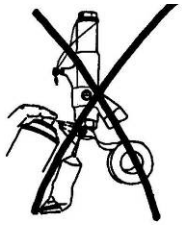
EO Ermeto – Mounting Instructions 401 0-T2 / D,

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

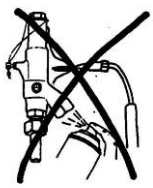
2.6 Wrong Installation / Operating Errors

The following agents, tools and procedures are prohibited:

- pliers
- striking tools

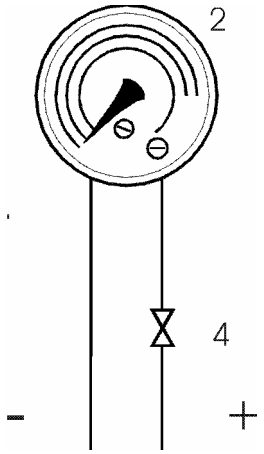


- lubricating spray
- sealant
- hemp
- adhesive sealing compound



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

2.7 Level Indicator



Structure of the Level Indicator

Item	**Designation**
2	Level Indicator Media 04 PN 40
4	Valve "instrument leads below"

Determination of the Vessel Level

- by reading the scale of the level indicator in litres under consideration of the gas type.

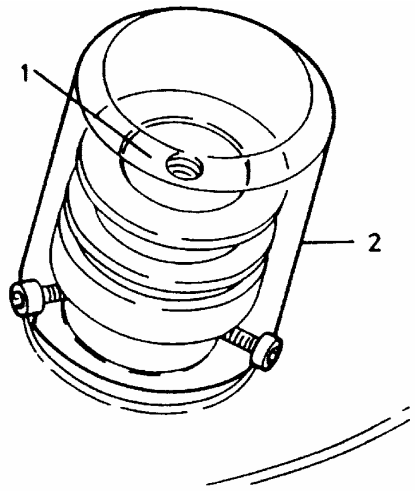
Note !

- Valve 4 opened.

Prior to the disassembly of the level indicator

- Close Shut-off Valve 4.

2.8 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.

2.9 Spare Parts / Accessories

Item	Designation	Subject number
1	Shut-off valve DN15PN40 Type test approval mark: 84GB53 No. 1, 10, 30	79244832
2	Level Indicator Media 04PN40 No. 2 Merkur 1000 Merkur 500	 79411936 79420658
3	Shut-off valve No. 4	78211424
4	Pressure indicator 0-10 bar Red mark at 6 bar No. 5	78210805
5	Safety Valve Type MG 84 Set pressure 6 bar, No. 6	79250337
6	Purge valve, ball valve 3/8" PN64 No. 41	0346570
7	Seals for filling and withdrawal coupling Seal Ø 40 made of copper Seal Ø 29 made of PTFE Seal Ø 28 made of PTFE	 0321130 0329353 0329352
8	Adhesive label of operating instructions Adhesive label of flow pattern	794.20119 79420118
9	ADR/RID – Labelling	
	Cryogenic liquid nitrogen	78400571
	Cryogenic liquid oxygen	0356987
	Cryogenic liquid argon	0356972
	GGVS adhesive label No. 2	0358193
	GGVS adhesive label No. 5	0358197
	GGVS adhesive label ↑↑ No.11	0356199

3 Safety

3.1 How to handle intensely cooled liquid Gases

Caution, when handling intensely cooled liquid gases!

Observe the following documents and procedures:

- Accident leaflet for road transportation ADR/GGVS, Class 2 "intensely cooled liquefied gases: suffocating“
- Accident leaflet for road transportation ADR/GGVS, Class 2 "intensely cooled liquefied gases: oxidizing"
- Operation of pressure cryo - vessels (TRG 280)
- Regulation for the Prevention of Accidents „gases“ BGV B 6 (VBG61), "oxygen" VBG 62
- ADR/RID
- 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 vessel.
- 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 against 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 vessel.
- Protect safety valves against splash water and lees.
- Wear gloves and safety glasses.
- Loosen the screwings only in unpressurized condition.

3.3 Use according to the Regulations

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

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

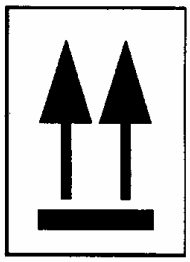
3.4 Labelling

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

Intensely cooled liquid Gases
suffocating, Class 2 Figure and Group 3A
oxidizing, Class 2 Figure and Group 3O

Figure and Group	Number, Labelling, Designation of the Medium
3 A	1951 argon, intensely cooled, liquid
3 A	1977 nitrogen, intensely cooled, liquid
3 O	1073 oxygen, intensely cooled, liquid

Caution marks



No. 2
Non-combustible and non-toxic gas;

No. 5
Medium having an inflammable effect;
(oxygen)

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

3.5 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.

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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.

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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

3.6 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.

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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.

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End of document.
Number of pages :4

3.7 Accident Leaflet suffocating Gases

ACCIDENT LEAFLET FOR ROAD TRANSPORTATION
ADR/GGVS Class 2
INTENSELY COOLED 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 vessel 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

3.8 Safety Data Sheet "Oxygen (refrigerated)"

AIR LIQUIDE

Safety Data Sheet

Product :	Oxygen (refrigerated)	Page :1/5
MSDS Nr : 097B_AL	Version : 1.01	Date : 31/07/2002

1 IDENTIFICATION OF THE SUBSTANCE/PREPARATION AND OF THE COMPANY

MSDS Nr	097B_AL
Product name	Oxygen (refrigerated)
Chemical formula	O2
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	07782-44-7
EEC Nr (from EINECS)	231-956-9

3 HAZARDS IDENTIFICATION

Hazards identification	Refrigerated liquefied gas. Contact with product may cause cold burns or frostbite.
	Oxidant. Strongly supports combustion. May react violently with combustible materials.

4 FIRST AID MEASURES

Inhalation	Continuous inhalation of concentrations higher than 75% may cause nausea, dizziness, respiratory difficulty and convulsion.
	Remove victim to uncontaminated area.
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	Supports combustion.
	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	None.

6 ACCIDENTAL RELEASE MEASURES

Personal precautions	Evacuate area. Ensure adequate air ventilation. Eliminate ignition sources. Use protective clothing.
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. Keep area evacuated and free from ignition sources until any spilled liquid has evaporated. (Ground free from frost).

7 HANDLING AND STORAGE

Handling and storage	Use no oil or grease. Open valve slowly to avoid pressure shock. Segregate from flammable gases and other flammable materials in store. 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. Keep away from ignition sources (including static discharges). Refer to supplier's container handling instructions. Keep container below 50°C in a well ventilated place.

8 EXPOSURE CONTROLS/PERSONAL PROTECTION

Personal protection	Do not smoke while handling product. Ensure adequate ventilation. Protect eyes, face and skin from liquid splashes. Avoid oxygen rich (>21%) atmospheres.

Safety Data Sheet

9 PHYSICAL AND CHEMICAL PROPERTIES

Molecular weight	32
Melting point	-219 °C
Boiling point	-183 °C
Critical temperature	-118 °C
Relative density, gas	1.1 (air=1)
Relative density, liquid	1.1 (water=1)
Vapour Pressure 20°C	Not applicable.
Solubility mg/l water	39 mg/l
Appearance/Colour	Bluish liquid
Odour	No odour warning properties.
Autoignition temperature	Not applicable
Flammability range	Oxidiser.
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

May react violently with combustible materials

May react violently with reducing agents.

Violently oxidises organic material.

Liquid spillages can cause embrittlement of structural materials.

Risk of explosion if spilt on organic structural materials (eg wood or asphalt).

11 TOXICOLOGICAL INFORMATION

General: No toxicological effects from this product.

12 ECOLOGICAL INFORMATION

General: Can cause frost damage to vegetation.

13 DISPOSAL CONSIDERATIONS

General

To atmosphere in a well ventilated place.

Do not discharge into any place where its accumulation could be dangerous.

Contact supplier if guidance is required.

Safety Data Sheet

14 TRANSPORT INFORMATION

Proper shipping name	Oxygen, refrigerated liquid
UN Nr	1073
Class/Div	2.2
Subsidiary risk	5.1
ADR/RID Classification code	2, 3°O
ADR/RID Hazard Nr	225
Labelling ADR	Label 05: fire intensifying risk. 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.

15 REGULATORY INFORMATION

Number in Annex I of Dir 67/548	008-001-00-8.
EC Classification	O;R8
-Symbols	O: Oxidising
-Risk phrases	R8 Contact with combustible material may cause fire.
-Safety phrases	S17 Keep away from combustible material.

16 OTHER INFORMATION

May cause frostbite.

Ensure all national/local regulations are observed.

Ensure operators understand the hazard of oxygen enrichment.

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.

Safety Data Sheet

Product :	Oxygen (refrigerated)	Page :5/5
MSDS Nr : 097B_AL	Version : 1.01	Date : 31/07/2002

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 :5

3.9 Accident Leaflet oxidizing Gases

ACCIDENT LEAFLET FOR ROAD TRANSPORT
ADR/GGVS Class 2
INTENSELY COOLED LIQUEFIED GASES: oxidizing

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

HAZARDS
Heating results in pressure increase – danger of bursting.
Increased fire hazard. Combustible materials (e. g. clothing) contaminated with the product can easily ignite. Reacts with fats, oil or combustible substances under evolution of heat. Fire and explosion hazard.
For dinitrogen monoxide N_2O, the following applies additionally: gas has a dazing effect.
For liquefied or intensely cooled liquefied gases under pressure, the following applies additionally:
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.

PROTECTIVE EQUIPMENT
Safety glasses, protective gloves or face protection, protective shoes

EMERGENCY MEASURES: IMMEDIATELY NOTIFY FIRE BRIGADE AND POLICE
Stop the motor.
Keep away ignition sources (e. g. no open fire) and do not smoke.
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.

FIRE:
In case of fire conditions, cool the vessel 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

4 Transportation and Assembly

4.1 General Transportation

Transportation of the vessel

- Observe safety instructions
- Avoid impacts and strong shocks

Transportation in filled condition

- Close Valves 1 (filling valve), 10 (pressure raising), 30 (overflow), 41 (purge valve)
- Maximum value at Manometer 5 (pressure inside the vessel) must be 3 bar before the red mark, otherwise relieve pressure: open Valve 30 (overflow), until the working pressure at Manometer 5 (pressure inside the vessel) is achieved.
- Mount sealing cap on 8 (filling and withdrawal coupling)

Observe national and international regulations in the case of transport on the road.

5 Operation

5.1 Initial Commissioning

The vessel can be commissioned immediately after delivery.

Observe safety instructions

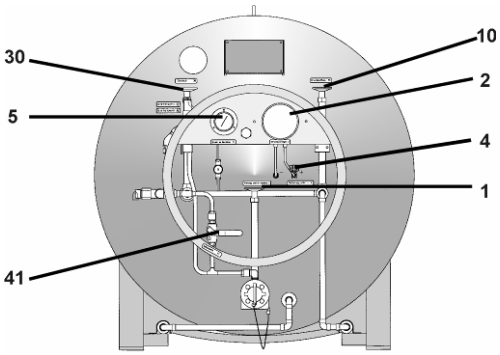
Note !

- When cooling down the hot vessel to operating temperature, increased boil-offs do occur.

5.2 Filling of the Vessel

Caution !

- Observe safety instructions.
- Use filling pipe with safety valve and pressure relief.
- Wear gloves and safety glasses.
- Protect the vessel against damage.



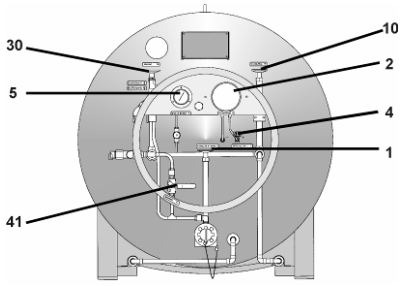
Filling:

- Attach transfer hose between the MERKUR® - Transport Vessel and the withdrawal Vessel.
- Open Valve 1 (filling valve) an Valve 30 (over flow).
- Increase pressure at the withdrawal Vessel, so that it will be higher than the MERKUR® Transport Vessel pressure and open the withdrawal valve.
- **Stop filling, when:**
  - the pointer at Level Indicator 2 will be reaching the red area.
  - the pressure at Manometer 5 (pressure inside the vessel) rises to 2 bar below the red mark.
  - liquid pours out of Valve 30 (overflow)
- Close Valves 1 (filling valve) and 30 (overflow).
- Close the withdrawal valve at the withdrawal Vessel. Relieve and disconnect the transfer hose.

Note !

- Open Valve 30 (overflow) 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.

5.3 Pressure Build-up



Pressure Build-up

- Slowly open Valve 10 (pressure build-up) until the working pressure at Manometer 5 (pressure inside the vessel) is achieved.

Note !

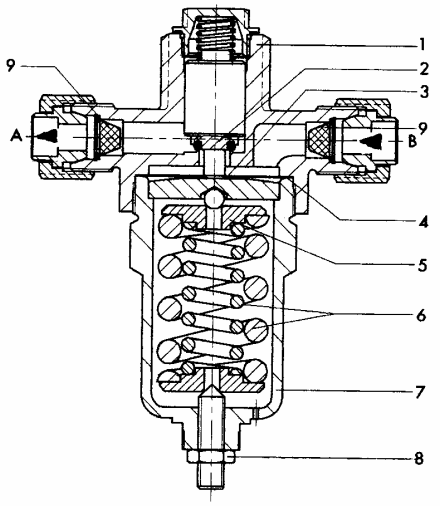
- Depending on the filling ratio, operating overpressure and type of gas, the pressure build-up needs varying time, until the desired working pressure is achieved.
- Adjust the working pressure only as high as required in order to avoid an undue heating of the medium.
- Avoid blowing-off of the safety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

5.4 Pressure Relief

Observe safety instructions !

- Close Valve 10 (pressure build-up).
- Open Valve 30 (overflow), until the working pressure at Manometer 5 (pressure inside the vessel) is achieved. Subsequently, close Valve 30.

5.5 Pressure Build-up with Pressure Build-up Control Valve 24 (Option)



1 Valve housing
2 Taper
3 Set membrane
4 Sealing washer
5 Spring plate
6 Springs
7 Housing lower part
8 Set-point adjuster with counter nut
9 dirt pan

Picture: Pressure Build-up Control Valve 24 (Option)

Pressure build-up

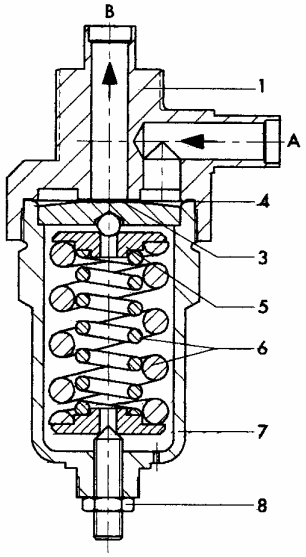
1. Slowly open Valve 10 (pressure raising).
2. Screw-in the regulating screw at 8 (pressure build-up control valve), until the working pressure at Manometer 5 (pressure inside the vessel) is achieved.
3. The Pressure Build-up Control Valve 24 is closed above the blow-down pressure.

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 is 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 pressure build-up evaporator (Cu-gilled pipe) is operational.

Adjust the blow-down pressure of the pressure build-up control valve (24) to at most 0.3 bar below the opening pressure of the gas control valve (25) Option).

5.6 Pressure Control with Gas Control Valve 25 (Option)



Picture: Gas Control Valve 25 (Option)

Observe safety instructions!

For pressure relief close Valve 10 (pressure build-up) and open Valve 30 (overflow) until the working pressure at Manometer 5 (pressure inside the vessel) is achieved.
The overpressure of the vessel is limited upwards over the adjustable Gas Control Valve 25.

- Adjust the desired maximum pressure at Gas Control Valve 25 (at least 0.5 bar above the set pressure of the pressure build-up control valve)
- Screw-in Regulating Screw 8 for pressure increase.
- Unscrew Regulating Screw 8 for pressure decrease.

Caution: Adjust the blowing-off pressure of the gas control valve to at least 0.3 bar above the blow-down pressure of pressure build-up control valve (option).

5.7 Withdrawal

Withdrawal of Liquid

- Connect the transfer hose to the filling coupling.
- Open valve (filling and withdrawal).
- Close Valve 1 after withdrawal of liquid.

Observe safety instructions !

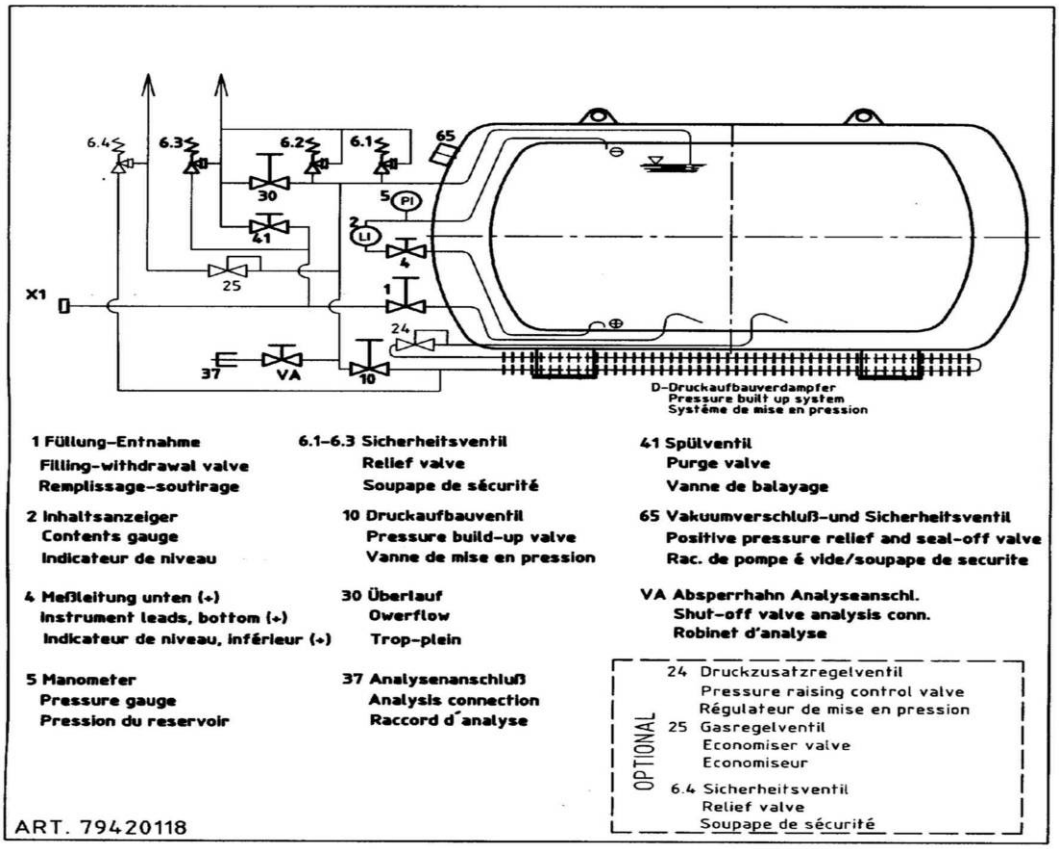
Note !

- 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.

5.8 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



Kurzbetriebsanleitung MERKUR®
Short Operating Instructions MERKUR®

1. Befüllen
Filling

1.1 Betriebsanleitung des Entnahmetanks zum Entleeren beachten
Observe the operating instructions of the withdrawal Vessel for draining-off.

1.2 Füllleitung vom Entnahmetank an die Tankanschlussklaue X1 anschließen.
Connect the filling pipe from the withdrawal Vessel to Vessel Connection Claw X1.

1.3 Kugelhahn 41 öffnen und Füllleitung vom Entnahmetank her spülen.
Open Ball Valve 41 and rinse the filling pipe from the direction of the withdrawal Vessel.

1.4 Kugelhahn 41 schließen.
Close Ball Valve 41.

1.5 Ventil 1 (Füllung-Entnahme) und Ventil 30 (Überlauf) öffnen.
Open Valve 1 (filling – withdrawal) and Valve 30 (overflow).

1.6 Füllvorgang sofort beenden, wenn
- Druckanzeige sich der roten Marke am Manometer 5 nähert.
-Flüssigkeit aus Ventil 30 (Überlauf) austritt
Immediately stop filling, when
- the pressure indicator approaches the red mark at Manometer 5.
- liquid pours out of Valve 30 (overflow).

1.7 Ventil 1 (Füllung-Entnahme) bzw. Ventil 27 schließen
Close Valve 1 (filling – withdrawal)

1.8 Kugelhahn 41 (Spülventil) öffnen.
Open Ball Valve 41 (purge valve).

1.9 Ventil 30 (Überlauf) schließen.
Close Valve 30 (overflow).

1.10 Füllleitung abnehmen.
Detach filling pipe.

1.11 Kugelhahn 41 (Spülventil) schließen.
Close Ball Valve 41 (purge valve).

3. Druckentlastung
Pressure Relief

3.1 Ventil 10 (Druckaufbau) schließen.
Close Valve 10 (pressure build-up).

3.2 Ventil 30 (Überlauf) öffnen
Druckregelung über Gasventil, 25 (optional)
Open Valve 30 (overflow).
Pressure control over Gas Valve 25 (optional)

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Cryotherm

2. Entnahme
Withdrawal

2.1 Betriebsanleitung des zu befüllenden Druckbehälters beachten.
Observe the operating instructions of the pressure vessel to be filled.

2.2 Umfüllschlauch an Tankanschlussklaue X1 anschließen.
Connect the transfer hose to vessel connection Claw X1.

2.3 Ventil 30 (Überlauf), Kugelhahn 41(Spülventil) geschlossen halten.
Keep Valve 30 (overflow), Ball Valve 41 (purge valve) closed.

2.4 Ventil 10 (Druckaufbau) öffnen.
Open Valve 10 (pressure build-up).

2.5 Ventil 1 (Füllung-Entnahme) leicht öffnen und Umfüllschlauch spülen, danach am zu befüllenden Behälter anschließen.
Slightly open Valve 1 (filling – withdrawal) and rinse the transfer hose. Subsequently, connect it to the vessel to be filled.

2.6 Ventil 1 (Füllung-Entnahme) öffnen.
Open Valve 1 (filling – withdrawal).

2.7 Nach der Flüssigentnahme Ventil 1 (Füllung-Entnahme) und 10 (Druckaufbau) schließen.
After the withdrawal of liquid, close Valves 1 (filling – withdrawal) and 10 (pressure build-up).

2.8 Kugelhahn 41 (Spülventil) öffnen.
Open Ball Valve 41 (purge valve).

2.9 Umfüllschlauch abnehmen.
Detach the transfer hose.

2.10 Kugelhahn 41 (Spülventil) schließen.
Close Ball Valve 41 (purge valve).

4. Veränderung des Arbeitsdruckes
Alteration of the operating pressure

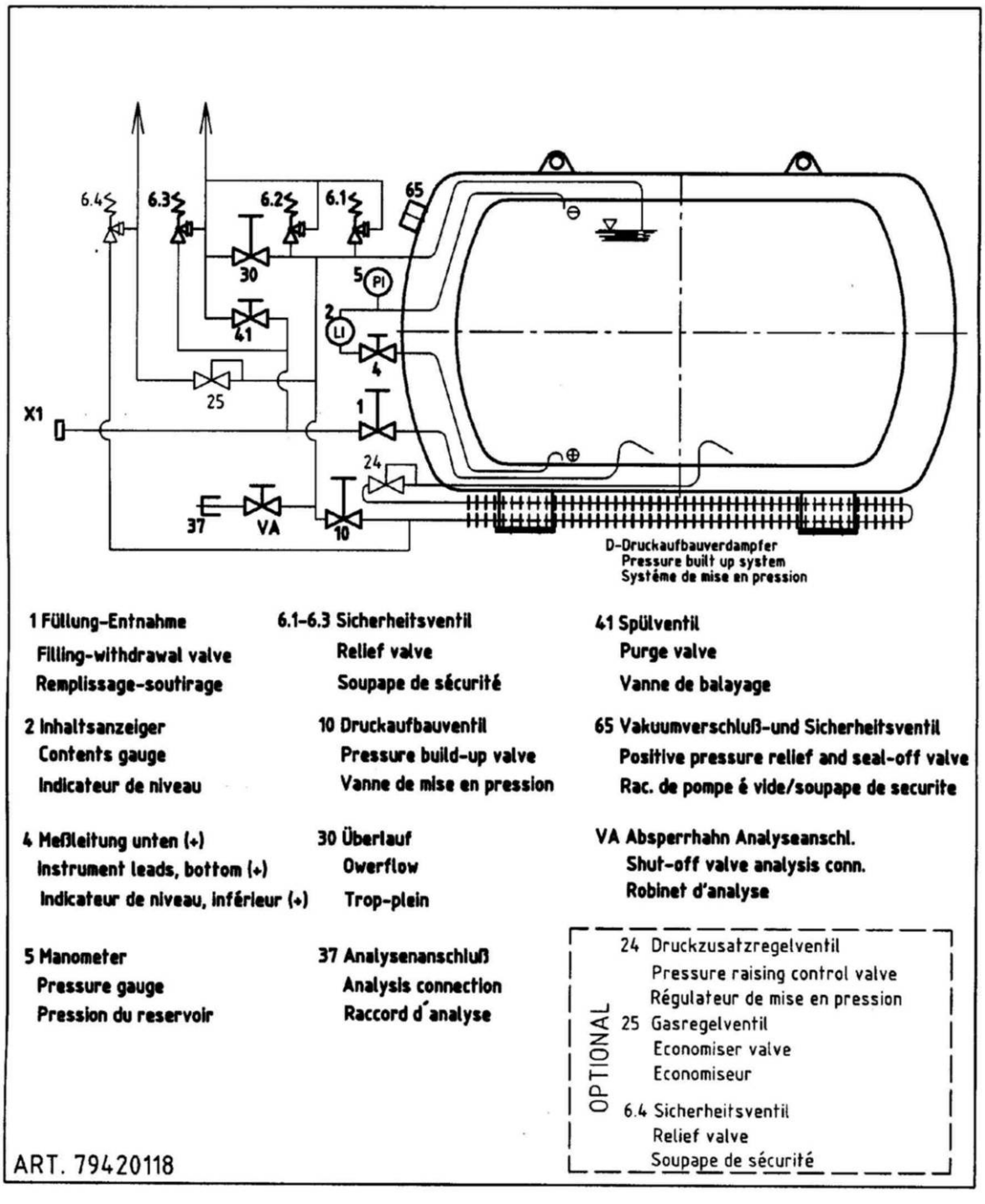
4.1 Ventil 10 (Druckaufbau) öffnen bis der gewünschte Arbeitsdruck (Einstellung Druckregelventil, 24) am Manometer 5 angezeigt wird.
Open Valve 10 (pressure build-up) until the desired operating pressure (adjustment of Pressure Control Valve 24) is indicated on Manometer 5.

4.2 Ventil 10 (Druckaufbau) schließen
Close Valve 10 (pressure build-up).

Hinweise
Note
- Alle Armaturen sind wegen EXPLOSIONSGEFAHR öl- und fettfrei zu halten.
- All fittings have to be kept free of oil and fat due to the DANGER OF EXPLOSION..
- Die Ventile sind nur langsam zu öffnen bzw. zu schließen.
- The valves are to be opened and closed only slowly.
- Der Arbeitsdruck soll nur so hoch wie erforderlich gefahren werden.
- The operating pressure is to be set only as high as necessary.
- Betriebsstörungen sind dem Lieferwerk zu melden.
- Any operational malfunctions are to reported to the supplier.

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

5.10 Flow Pattern



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 manometer 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 2.9 (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 P203 (8).** **Additional the safety valves have to be checked every 5 years by a competent according to EN 1251-3 body.**

8 Faults

8.1 General Faults

Immediately put the MERKUR® Transport Vessel **out of operation, in case that**

- the fittings are leaky.
- the safety valves blow off intensively.
- the rate of evaporation is too high.
- the outer vessel is thawed / iced-up, which indicates a 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.
	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.
Frost formation on the vessel		
• at the outer vessel	Vacuum loss	Examination / re-evacuation to be carried out by the manufacturer
Positive pressure relief and seal-off device 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 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.

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 fulfill the requirements of Directive 99/36/EC. The pressure device is marked with the depicted sign.

Π 0035

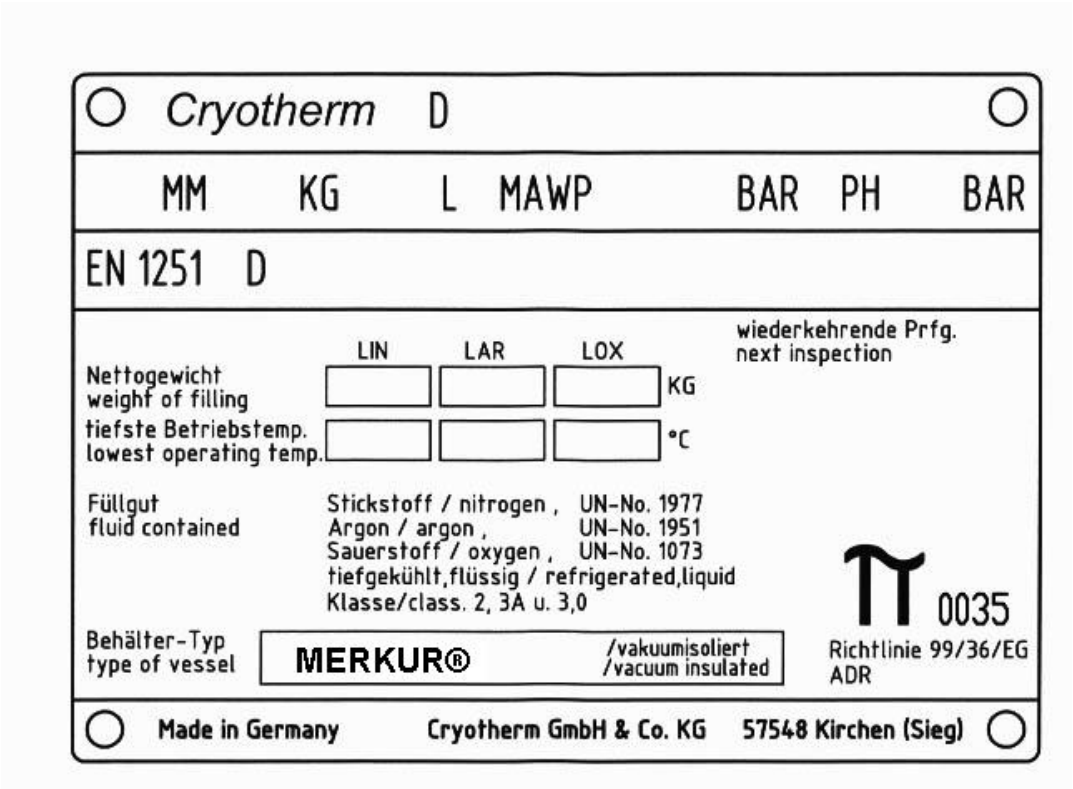
Examined according to Directive 99/36/EC, EN 1251
ADR/RID

Module: G

Category: III

Designation of the pressure device: **MERKUR® 500 - 1000**

Intended use: Vessel for transportation of cryogenic liquid nitrogen, oxygen and argon



DIN EN ISO 9001:2000

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