

**KGW-ISOTHERM**



Germany  
76185 Karlsruhe  
Gablonzer Strasse 6  
Tel. 0049 / 721 / 95897-0  
Fax. 0049 / 721 / 95897-77  
E-Mail: [info@kgw-isotherm.de](mailto:info@kgw-isotherm.de)  
Internet: [www.kgw-isotherm.de\(com\)](http://www.kgw-isotherm.de(com))

## Information and Operating Instructions for Dewar Vessels Type 30/4 up to 35 C or CAL



**Type C**



**Type CAL**

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# 1 Structure of a Dewar vessel Type 30/4 up to 35 C or CAL

## 1.1 Description

The container comprises two parts:

- a) The inner container made of borosilicate glass 3.3 for the storage of LN<sub>2</sub>, CO<sub>2</sub> or other coolants or liquids ranging from +150°C to -196°C
- b) The protective outer cover made of blue coated metal or aluminum with a handle and lid.

## 1.2 Inner glass container with technical data

The inner container is made of borosilicate glass 3.3 in accordance with DIN/ISO 3585 (DURAN).

The glass has the following characteristics:

Chemical characteristics	Water resistance: in accordance with DIN - ISO 719 (98°C) Water resistance: in accordance with DIN-ISO 720 (121°C) Acid resistance: in accordance with DIN - ISO 1776 Alkali resistance: in accordance with ISO 695 - A2
Optical characteristics	Spectral range: 310 - 200 nm in which the absorption is negligible.
Physical characteristics	Linear coefficient of expansion: $3.3 \times 10^{-6} \text{ 1/K (at 20-300°C)}$ Density: $2.23 \text{ g/cm}^3$ Specific heat capacity: 910 J/kg K Transformation temperature: 525 °C

Permissible operating conditions for the inner glass container with no lid

Dewar temperature range	- 196 to + 150 °C
Pressure range	Pressure-less

**Standard Dewar vessels are not suitable for using with liquid and gaseous helium.**

## Standards and guidelines

The standard glass Dewar vessels, manufactured by KGW-ISOTHERM, are produced in compliance with the "Pressure Equipment Directive," Directive 97/23 EC (N4 with Annex 1) and in accordance with DIN EN ISO 16496 "Equipment with Vacuum Insulation."

### 1.3.1 The blue coated metal protective cover Type C

The outer blue coated metal cover is purely a protective cover that protects the inner glass container from mechanical influences.

### 1.3.2 The Aluminum protective cover Type CAL

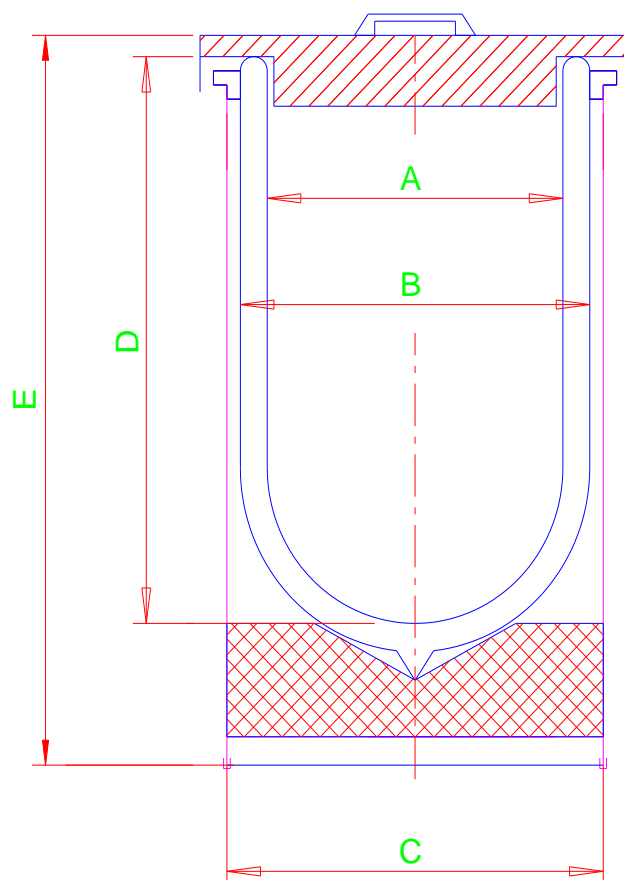
The outer Aluminum cover is purely a protective cover that protects the inner glass container from mechanical influences.

Permissible operating conditions for the protective cover with lid

Operating temperature of the protective cover: 0 to + 80 °C

Operating temperature of the lid: -196 to + 60 °C

## 1.4 Dimensions and consumption data of cylindrical Dewar vessels Type 30/4 up to 35 C or CAL



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## Technical Data

Type		max. content approx. [ L ]	A mm	B mm	C mm	D mm	E mm
30/4 C	(30/4 CAL)	4	158	183	210	250	340
30/7 C	(30/7 CAL)	7	158	183	210	400	490
30 C	(30 CAL)	7	200	230	250	275	385
31 C	(31 CAL)	10	200	230	250	350	475
32 C	(32 CAL)	14	200	230	250	500	610
33 C	(33 CAL)	21	250	280	300	480	615
34 C	(34 CAL)	28	250	280	300	620	750
35 C	(35 CAL)	40	280	330	355	650	780

Type		max. content approx. [ L ]	weight approx. [ kg ]	evaporation rate CO2 approx. [ kg / d ]
30/4 C	(30/4 CAL)	4	5	0,45
30/7 C	(30/7 CAL)	7	6	0,4
30 C	(30 CAL)	7	6	0,45
31 C	(31 CAL)	10	8	0,4
32 C	(32 CAL)	14	9	0,4
33 C	(33 CAL)	21	14	0,6
34 C	(34 CAL)	28	16	0,6
35 C	(35 CAL)	40	23	0,9

Type	Art.No.	Type	Art.No.
30 / 4 C	1248	30/4 CAL	1258
30 / 7 C	1249	30/7 CAL	1259
30 C	1241	30 CAL	1251
31 C	1242	31 CAL	1252
32 C	1243	32 CAL	1253
33 C	1244	33 CAL	1254
34 C	1245	34 CAL	1255
35 C	1246	35 CAL	1256

## 2 Set up Instructions

### 2.1 Safety precautions when setting up the container.

Before setting up or first using the container, read through and apply the safety regulations listed in point 7.

The following important points in particular should be noted:

- a) **Wear appropriate protective equipment.**
- b) **Nitrogen or dry ice is neither toxic nor flammable but can lead to a lack of oxygen in closed rooms.**

It is therefore recommended that containers filled with liquid gas (especially when the liquefied gas is decanted into another container) are only used in an area with sufficient ventilation.

Always seal containers with the loose fitting lid.

**It is important to make sure that with the employment by gassing materials such as CO<sub>2</sub> or LN<sub>2</sub> a degassing hole is drilled into the lid, so that no positive pressure can form in containers.**

Always place the container securely. Avoid carrying the vessels by hand when transporting them via stairways as stairways always present a trip hazard and therefore coolant solutions could escape should you stumble. Therefore, always use a lift for safety reasons.

Always carry the container using the handle and avoid the container swinging when transporting it as LN<sub>2</sub> could spurt out as a result.

### 3. Operating Instructions

#### 3.1 Transport

The cylindrical Dewar vessels should only be used for in-house transportation. There is no ADR approval for road transportation.

Wear protective gloves, goggles and clothing if necessary when transporting the vessels. Furthermore, the internal in-house safety information or guidelines of the Employers' Liability Insurance Association should be observed.

#### 3.2 Handling

The containers were designed in such a way that the glass insert is not damaged by minor knocks that cannot be avoided during handling. However, we strongly recommend the following in order to keep the LN<sub>2</sub> or CO<sub>2</sub> evaporation low and ensure that the glass container has a long service life:

- a) Avoid any hard knocks.
- b) Always transport the container in an upright position.
- c) Transport the container in such a way that any serious mechanical influences are avoided.

A mobile roller base or transport trolley can be used to make it easier to transport containers within a laboratory.

#### 3.3 Inspection before Use

**Before using a Dewar container, a complete inspection must be made for scratches, cracks, chips or other flaws. Containers with surface flaws that will be subjected to mechanical or thermal stresses cannot be used due to the threat of implosion.**

#### 3.4 Filling and emptying

Protective gloves, clothing and goggles should generally be worn when handling liquid gases.

### 3.4.1 Filling

LN2 containers are filled using the following:

A filling hose with a phase separator that is inserted into the container. Ensure that the filling pressure in the hose does not exceed 1.5 bars so that the hose is stable and secure in the neck of the container during the filling process. The hose should not damage the glass wall. Secure the hose if necessary.

When filling the container with CO<sub>2</sub> is to make sure that the CO<sub>2</sub> is brought carefully into the container. For Dewar vessel Type 33 up to 35 you have Line-bags to bring CO<sub>2</sub> carefully into the container.

**A surface damage of the glass is to be avoided.**

#### 3.4.2.1 Emptying the LN2 from Type 30/4 up to 31 C or CAL

Remove the lid from the container and raise the container using the handle of the protective shell. A gripping edge on the base of the protective shell can be used to tip the container so that it is possible to safely handle and decant the LN2 or another liquid.

#### 3.4.2.1 Emptying the CO<sub>2</sub>

Remove the lid from the container and take the dry ice carefully out of the container.

**Please carry protective gloves and safety goggles**

## 4. Maintenance

Vessels are largely maintenance-free.

Only the check, as described under point 3.3 should be done.

If protective casing is damaged (deformed), the glass Dewar must get removed from the protective casing and checked for scratches or other mechanical damages.



## **5. Checking the Evaporation Rate**

The evaporation rate of LN2 is checked by weighing the container with its liquid nitrogen content. This requires scales with a reading area that corresponds to the weight of the filled container and that provide sufficient accuracy when weighing.

**Procedure:**

**Seal the container with its lid.**

**Weigh the empty container (M1).**

**Fill the container with liquid nitrogen and wait 3 to 4 hours until the temperature of the container has stabilised. Then fill it completely.**

**Weigh the full container (M2).**

**Read off the weight every hour. Deduct the weight of the empty container (M1) from the weighing result and log the data. This generates a stream of data from which the average weight loss in grams per hour can be determined for the period of time measured. If this value is converted with the specific weight of LN2 at approx. 800 grams = 1 litre, this gives the average evaporation rate per hour.**

**Note:**

**The room must remain at a constant temperature of 20°C and the atmospheric pressure must be held at 1,013 mbar during the measuring interval so that the measurement can be reproduced. The condition and age of the container obviously have a significant effect on the evaporation rate.**

## 6 Spare Parts and Accessories

Type		Glass Refill	Art. No.
30/4 C	(30/4 CAL)	40	1231
30/7 C	(30/7 CAL)	41	1232
30 C	(30 CAL)	42	1233
31 C	(31 CAL)	43	1234
32 C	(32 CAL)	44	1235
33 C	(33 CAL)	45	1236
34 C	(34 CAL)	46	1237
35 C	(35 CAL)	47	1238

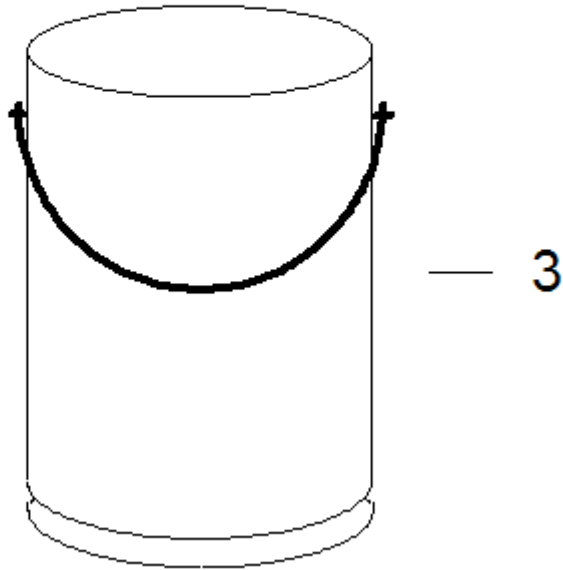
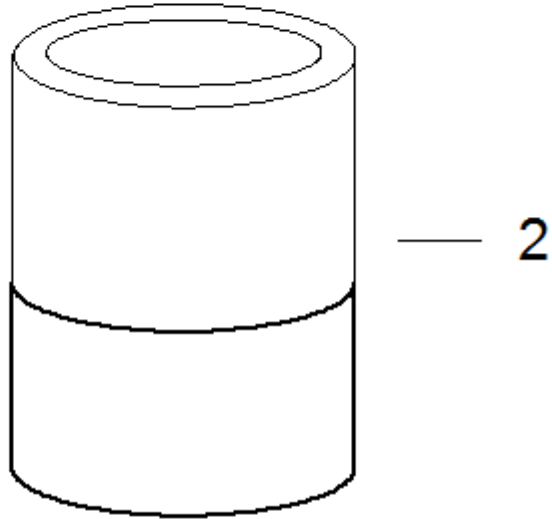
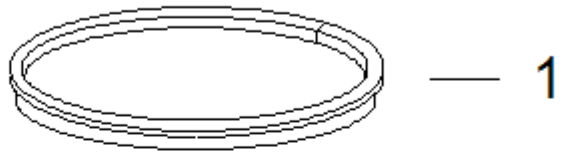
Type		Roller base Art. No.	Linen-bags for Type Art. No.	Insulating disc for Type Art. No.
30/4 C	(30/4 CAL)			
30/7 C	(30/7 CAL)			
30 C	(30 CAL)			
31 C	(31 CAL)		1632	1642
32 C	(32 CAL)		1633	1643
33 C	(33 CAL)	1268-33	1634	1644
34 C	(34 CAL)	1268-34	1635	1645
35 C	(35 CAL)	1268-35	1636	1646

Mounting instruction for large insulating Dewar vessels Types 30/4 up to 35

### Safety instructions

**When handling and working with Dewar containers, safety goggles / face protection and protection gloves must be worn!**

- 1) Before mounting the Dewar vessel with bottom cap (No. 2) into the already existing casing (No. 3), a complete inspection must be made for transport damages (scratches, cracks, chips or other flaws).
- 2) At first, put the Dewar vessel with bottom cap (No. 2) into the casing (No. 3).
- 3) The rim of the vessel (seal of glass vessel) must be about 5 to 8 mm above the casing, then.
- 4) The mounting rubber (No. 1) is now carefully pushed in between the top of casing and the Dewar vessel with the help of a mounting tool. To reduce the frictional resistance, please damp it with soap water, or a flushing agent.
- 5) Dry the vessel for about 10 hours by room temperature. After that period of time the vessel can be used again.



## 7 General Safety Regulations with LN2 and CO2

This document contains general safety instructions in general, when using with liquid nitrogen and dry ice.

The following instructions shall be respected while working with liquid nitrogen and dry ice. To minimise the risk of accident and their consequences a few precautions should be taken, particularly related to:

- Oxygen deficiency
- Cryogenic burns
- Risks of explosion
- Oxygen enrichment

Once the users have been informed of risks and environmental conditions, all of them must be able to use liquid nitrogen and dry ice in a safe way.

## 7 SAFETY INSTRUCTIONS

### 7.1 OXYGEN DEFICIENCY

The approximate composition of air by volume is as follows for its main components:

Oxygen O <sub>2</sub>	21 %
Nitrogen N <sub>2</sub>	78 %
Argon Ar	1 %

This gases are not toxic, but changes in their relative constituents, and particularly oxygen, have an effect on life and combustion processes. Therefore it is essential that the air we breathe should contain sufficient oxygen (> 19 %).

Our senses are incapable of detecting changes in the concentration of the constituents of air sufficiently quickly, since they are odourless and colourless.

#### 7.1.1 Dangers

The risk of suffocation is high due to normal evaporation of liquid nitrogen to nitrogen gas that displaces oxygen in the inhaled air. For example, under standard temperature and pressure conditions (20° C; 1013 mbar), 1 litre of liquid nitrogen evaporates to 680 litres of nitrogen gas and 1 Kg. dry ice evaporates to 550 litres gas . The critical limit of oxygen can be easily reached.

Oxygen deficiency is dangerous and can cause death from suffocation. The reaction of the organism to oxygen deficiency is different from one person to another. It is impossible to give any valid information in general about symptoms of a starting oxygen deficiency.

### **7.1.2 Causes**

To protect yourself from risks of oxygen deficiency pay attention to following points:

- usage of liquid or gaseous
- natural evaporation rate
- refilling
- defective vent pipes or exhaust pipes
- tipping over the vessel

This list is not complete.

### **7.1.3 Recommendation**

Proceed as follows to prevent the risks of oxygen deficiency:

- keep always the vessel in the vertical position
- close the vessel with an suitable lid
- do not put the vessel in bright sunshine or close to a heat source
- do not transport the vessel by car
- premises must always be well ventilated
- prevent strokes, avoid shocks and sudden movements
- wear always individual protective equipment (suitable gloves, safety goggles or protection visors and closed shoes)
- check the oxygen content continuously
- carry an oxygen meter
- train personnel

This list is not complete.

### **7.1.4 General behaviour to be followed in case of accident**

Proceed as follows:

- mark the environment to prevent secondary accidents
- take action quickly: the rescuer must have taken individual protective measures (independent breathing protection apparatus)
- move the victim(s) away as quickly as possible
- pay attention to internal first aid rules of your plant
- ventilate the room sufficiently
- find out the reason of accident

This list is not complete.

## **7.2 CRYOGENIC BURNS**

Liquid nitrogen (-196° C) and dry ice (-78,5° C) are extremely cold

### **7.2.1 Danger**

Cryogenic fluids or cooling solids can:

- cause burns on the human body
- make materials (metallic or plastic) brittle in case they are not suitable for low temperatures
- cause strong nebulosity, depending on the air humidity of premise

### **7.2.2 Causes**

There are two kinds of cryogenic burns:

#### **7.2.2.1 Burns by splashes**

It is important to protect yourself against the risk of splashes while using liquid nitrogen, especially when handling with samples. Splashes can cause cryogenic burns that can have serious consequences, especially when hitting eyes or face.

#### **7.2.2.2 Contact burns**

Contact between skin and cold materials causes frostbites or cryogenic burns. Never touch or grip the inner side of vessel or samples with a bare hand.

### **7.2.3 Recommendation**

Proceed as follows to prevent the risks of burns:

- prevent skin contact with cryogenic liquids
- never touch the cold walls of vessel, or un-insulated or frosted equipment
- wear individual protection equipment (suitable gloves, safety goggles or protective visors and closed shoes)
- always hold the vessel in the vertical position
- use only suitable equipment (metal or PTFE hose) for refilling the container
- train personnel

This list is not complete.

### **7.3 safety data sheets**

Pay attention to the notes and guidelines of the safety data sheets of your gas supplier to the gasses LN2 (liquid nitrogen) and CO2 (dry ice)