

Operating Manual

**ALU 7 - ALU 10 - ALU 20 - ALU 26
ALU 35 - ALU 60 - ALU 100**



KGW - ISOTHERM

Gablonzer Straße 6

76185 Karlsruhe

Germany

Tel: 0049 / 721 95897-0

Fax: 0049 / 721 95897-77

Internet: www.kgw-isotherm.com

e-mail: info@kgw-isotherm.de



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Separate Attachment: General Safety Regulations

1 Design of a Functioning Container

1.1 Description

The container consists of two components:

- * Upright container for storing LN2
- * Siphon head for transferring LN2, consisting of an LN2 valve and a vent valve, a manometer and an overpressure valve

1.2 Container

The container consists of two shells made of aluminum alloy that are connected by a neck made of a fibreglass-epoxy compound material. A high vacuum between the two shells and multilayer insulation (superinsulation foil) guarantee thermal insulation in the vacuum space.

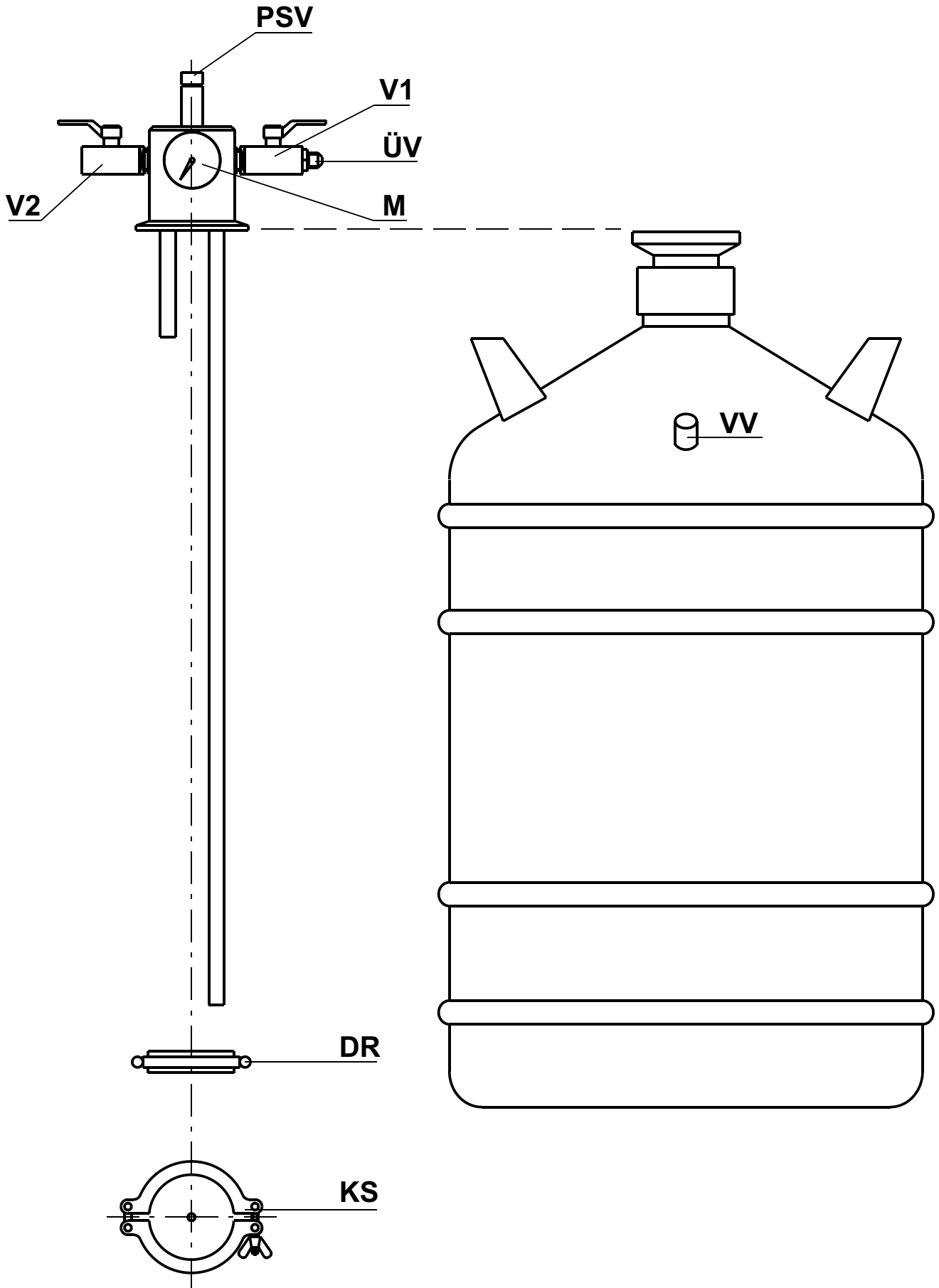
Two handles and an NW 50 flange for attaching the siphon head with a clamp are located on the upper part of the container.

1.3 Siphon Head

The siphon head consists of the following:

- * Manometer (M)
- * 0.5 bar safety valve (PSV)
- * Transfer valve (V1)
- * Vent valve (V2)
- * Quick release clamp (KS)
- * O-ring with centering ring (DR)
- * Screw adapter (ÜV)

1.4 Diagram of the Container with Transfer Siphon



1.5 Specifications

Technical dates								
Typ ALU		7	10	20	26	35	60	100
Best.-Nr.		2515	2516	2517	2518	2519	2521	2522
Capacity	(l)	7	12	21	26	34	60	99
Operating overpressure	(bar)	0,5	0,5	0,5	0,5	0,5	0,5	0,5
Weight empty	(kg)	6	7,5	11	13,5	16	21,5	29,5
Weight full	(kg)	12	17,5	28,5	34,5	43	70	110
Overall height	(mm)	480	584	605	670	655	870	986
Diameter	(mm)	308	308	388	388	468	468	510
Evaporation rate static	L / Tag)	0,2	0,2	0,18	0,2	0,24	0,4	0,55
Static holding time (days)		36	67	119	130	140	150	180
Roller base				2640	2640	2641	2641	2642
All rights reserved for technical changes								

Daily evaporation and static holding time were determined at 20°C, 1013 mbar, container stationary, lid closed and without transfer siphon. These are nominal values that may change depending on the age and use of the container.

2 Setup Instructions

2.1 Precautions for Setting Up the Container

You must read the attached Safety Regulations prior to setting up the container or using it for the first time. Please pay particular attention to the following important items:

Nitrogen and argon are neither toxic nor flammable, but they may cause an oxygen deficiency in closed spaces.

For that reason, we recommend that you use containers holding liquefied gas (especially if liquefied gas is being transferred to an open container) in a room with sufficient ventilation.

Always have either the siphon head or the plug inserted in the container.

Store it protected from weather damage.

2.2 Mounting the Siphon Head

The siphon head is mounted on the LN2 container as follows:

- A) Open vent valve V2 and close transfer valve V1 (these steps are especially important if the container holds liquid nitrogen).**
- B) Put the centering ring with O-ring (DR) on flange DN 50 of the LN2 container.**
- C) Place the siphon head on the centering ring, making sure not to bump against the neck of the inside container and that the siphon head sits in the center of the sealing ring.**
- D) Attach the quick release clamp (KS) and connect the siphon head to the container.**

Warning:

Before assembling the siphon head, remove any traces of moisture by blowing out the tubes and valves with nitrogen or dry air. This precaution is absolutely necessary so as to prevent any risk of ice forming in the tubing or in the safety equipment, which might be plugged by the ice and consequently cause operating failures.

3. Operating Instructions

3.1 Transportation

LN2 containers may be transported only as open, depressurized containers, i.e., without transfer siphon (with the necktube core), if they are filled with LN2.

The pressure inside the container must be equivalent to the atmospheric pressure. To achieve this, remove the siphon head and put on the plug. This will reduce leakage and prevent moisture from entering.

3.2 Handling

The containers have been designed to be resistant to minor blows that cannot be avoided during handling. However, to minimize leakage and to ensure a long service life of the container, we strongly recommend the following:

Avoid major blows.

Always keep the containers in an upright position.

Transport the containers only within the laboratories (do not use them as containers for mechanically robust transports).

To make it easier to transport the containers in the laboratory, we can provide a mobile roller base as an accessory (see chapter 6). This detachable roller base is connected tightly to the container with a quick release clamp. The container with the roller base can be lifted to transport it across small uneven areas (steps, sidewalks etc.).

3.3 Connections

The screw adapter (ÜV) attached to transfer valve V1 allows different accessories, e.g., a transfer hose or a transfer tube, to be connected to the LN2 container.

The thread of the screw adapter (ÜV) is a 3/4" / 16 UNF.

3.4 Filling and Transferring

Always wear protective gloves and goggles when handling liquefied gases.

3.4 Filling

The LN2 container is filled either with a

- a) filling hose introduced into the neck of the container or a
- b) filling flange with a filling hose (2606 and 2607).

3.4.1 Filling Using a Filling Hose on an Open Container

- a) Make sure that the container is depressurized and that vent valve V2 on the siphon head is open.
- b) Remove the quick release clamp (KS).
- c) Carefully remove the siphon head.
- d) Insert the filling hose and let the liquid nitrogen flow into the container up to the desired filling level.
(Maximum level: lower end of the neck.)
Make sure that liquid nitrogen cannot get on to the vacuum valve (VV); if necessary, cover the vacuum valve.
- e) After filling the container with LN2, put on and connect the siphon head and quick release clamp carefully and slowly as described in chapter 2.2.

Do not forget to first open valve V2 and to close valve V1.

The amount of introduced liquid can be checked by weighing the container. One litre of liquid nitrogen weighs approx. 0.808 kg under atmospheric pressure. The maximum filling level has been reached if in case of

ALU 7	= approx. 5.6 kg
ALU 10	= approx. 8 kg
ALU 20	= approx. 16 kg
ALU 26	= approx. 21 kg
ALU 35	= approx. 28 kg
ALU 60	= approx. 47 kg
ALU 100	= approx. 78 kg

has been transferred.

3.4.2 Filling Using a Level Control Unit

The siphon head is attached to the container. Make sure that the container is depressurized. If this is not the case:

- a) Open vent valve V2 and slowly release the excess pressure.
- b) Open the quick release clamp (KS) and remove the siphon head from the container.
- c) Put on the level filling head and secure it with the quick release clamp (KS). There is no need to use the centering ring with the O-ring.
- d) Feed the level probe into the level filling head and secure it. Connect the filling hose (2607) to the level filling head.
- e) Slowly push the LN2 reservoir tank with the transfer siphon and the Ln2 magnetic valve to the container to be filled and secure it.

WARNING: The pressure in the reservoir tank should not exceed 1.3 bar.

- f) Connect the filling hose (2607) to the LN2 magnetic valve.
- g) Connect the LN2 magnetic valve and the min/max probes with the level control unit.
- h) Turn on the level control unit; the filling process will start.

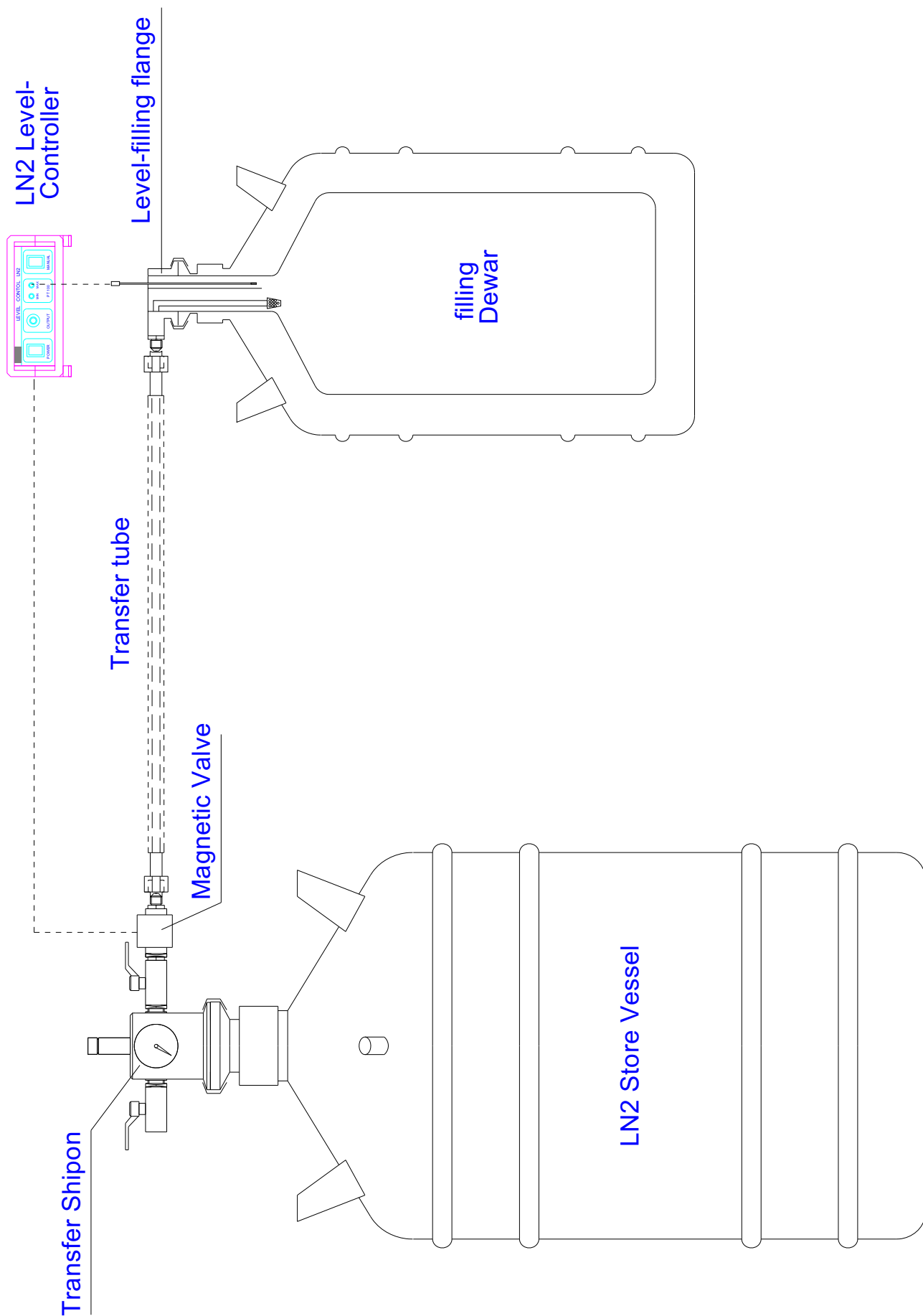
Fill the container automatically under supervision only.

The LN2 magnetic valve is open during the filling process. As soon as the LN2 level in the container being filled has reached the maximum probe of the level control unit, this unit closes the magnetic valve and stops the filling process.

Once the maximum filling level has been reached in the container and the level control unit has closed the magnetic valve, the container can be disconnected from the reservoir tank.

- a) After the filling process is completed, remove the transfer hose from the full container and disconnect the level probe from the level control unit.
- b) Open the quick release clamp (KS) and remove the level filling head from the container.
- c) Close transfer valve V1 on the siphon head and open vent valve V2.
- d) Place the siphon head with the centering ring on the container flange and secure it with the quick release clamp.
- e) Connect a transfer tube or hose and wait until the container has reached its service pressure.

Diagram of a filling with a LN2 level controller



3.4.3 Filling Using a Filling Flange

The siphon head and the filling flange are attached to the container. Make sure that the container is depressurized. If this is not the case:

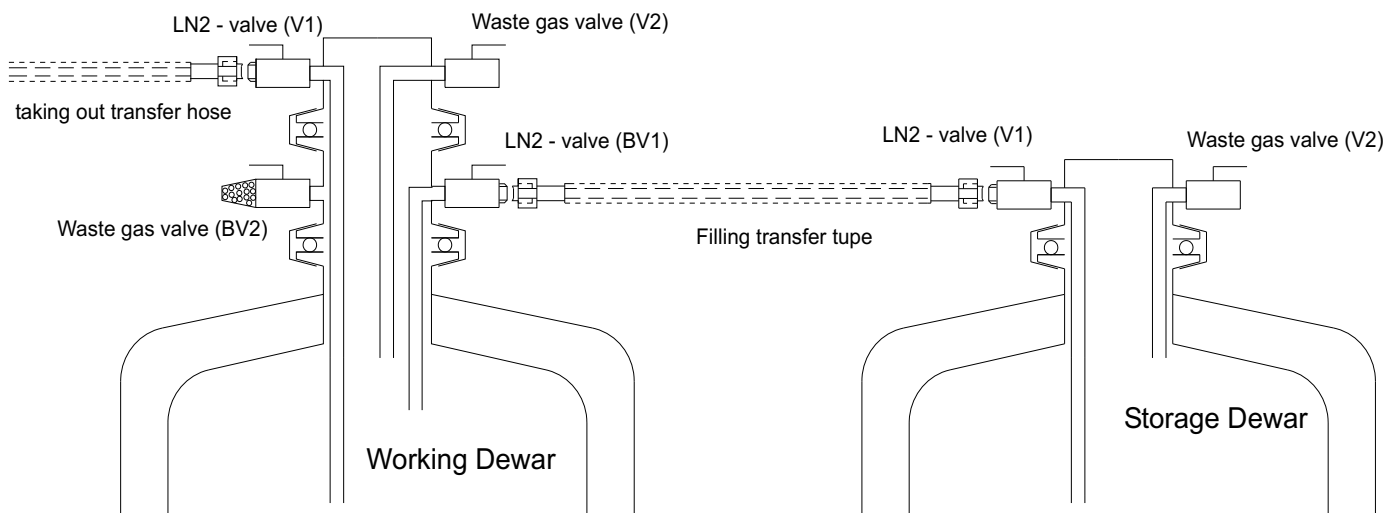
- A) Open vent valve V2 on the siphon head and slowly release the excess pressure.
- B) Open the vent valve (BV2) on the filling flange.
- C) Connect the filling hose (2607) to the screw adapter (ÜV) of the filling flange and open the LN2 filling valve (BV1).
- d) Slowly push the LN2 reservoir tank with the transfer siphon to the container to be filled and secure it.

WARNING: The pressure in the reservoir tank should not exceed 1.3 bar.

- E) Connect the filling hose (2607) to the screw adapter (ÜV) of the transfer siphon of the reservoir tank.
- F) Open the LN2 valve (V1) on the reservoir tank and fill the container. The pressure in the container may not exceed 0.4 bar during the filling process (see manometer on the transfer siphon).
- G) If LN2 appears in addition to N2 gas on the vent valve of the filling flange, the LN2 valve (V1) on the reservoir tank is closed immediately.

Fill LN2 into containers under supervision only.

- H) After the filling process is completed, remove the transfer hose from the full container and close the filling valve (BV1).
- I) Close the vent valve on the siphon head of the container (V2) and on the filling flange (BV2).
- J) Remove the reservoir tank and wait until the container has reached its service pressure.



4. LN2 Transfer

If the container is not connected to the transfer siphon yet, do the following:

- a) Place the LN2 transfer siphon on the container where the centering ring and the O-ring have already been placed. Secure it with the quick release clamp.**

Don't forget: Before placing the transfer siphon on the container, you first have to open vent valve V2 and close Ln2 transfer valve V1!

- b) Connect the transfer hose or tube to LN2 transfer valve V1.**
- c) Close vent valve V2.**
- d) Wait for the internal pressure to build up.**
- e) LN2 can be extracted after the internal pressure has been built up.**

Note:

Do not use the container unprotected outdoors during rain. The container and the transfer siphon must never come into contact with water while being used.

When mounting or removing tubes or hoses, you should always make sure that the tubes or hoses being attached to the LN2 transfer valve (V1) of the container are blown out first with N2 gas or dry air so that any moisture that may have collected in them is removed.

5 Maintenance

5.1 Inspecting the Valves and Fittings

The valves and fittings must be inspected regularly and after any operational incident.

Inspection frequency: at least once every year.

5.1.1 Checking the Manometer

Tools required: a manometer calibrated as a reference

Proceed as follows:

Close valves V1 and V2 of the transfer siphon.

Let the pressure in the container build to a certain value, e.g., 0.4 bar.

Connect a calibrated reference manometer to the V2 valve and open this valve.

The two manometers should read out the same value.

If the pressure readouts differ by more than 0.1 bar, the manometer should be replaced.

5.1.2 Checking the overpressure Valve

Tools required: none, provided the manometer was checked before

Proceed as follows:

Close valves V1 and V2.

Wait for the internal pressure to build up.

Note the pressure value at the time the overpressure valve (PSV) is opened.

If this pressure value is not between 0.45 and 0.55 bar, replace the valves.

Allow the pressure in the container to drop slowly by opening valve V2 bit by bit (make sure that nobody is standing in the axial direction of valve V2).

Note the pressure value that corresponds to the closing of the valves. If this value is less than 0.45 bar, replace the valve.

5.2 Leak Test

Connect an N₂ gas cylinder with a gas regulator to vent valve V2 and set the pressure to 0.4 bar. Close valve V1 and open valve V2 until the container is under a nitrogen gas pressure of 0.4 bar.

Prepare a soap water mixture in a cup or use a ready-to-use solution (leak detector spray).

Brush soap water on the individual connections with a brush. Bubbles are a sign that a leak exists.

Mark the leak and replace the leaking part.

5.3 Checking the Loss Evaporation Rate

The loss evaporation rate is checked by weighing the container holding the liquid nitrogen. You will need a scale with a reading range that corresponds to the weight of the container and that weighs with sufficient accuracy (i.e., where the weighing inaccuracy is insignificant compared to the differences between the actual weighings, see below).

Proceed as follows:

Put the plug on the container (the loss evaporation rate is checked under atmospheric pressure).

Weigh the empty container.

Fill the container with liquid nitrogen, e.g., 20 kg / LN 2 for the ALU 60.

Wait 3 to 4 days until the temperature of the container has stabilized.

Weigh the container: mass m₁.

After 24 hours, weigh the container again: mass m₂.

For a new container, the difference between the two weighings M₁ M₂ must equal the following:

650 g +/- 10 % for the ALU 100

570 g +/- 10 % for the ALU 60 and ALU 35

If the scale is not precise enough (e.g., if its readability is 100 grams), both weighings must be done in a timeframe that will render the measurement inaccuracy negligible with respect to the difference between M₁ and M₂.

Note:

To make the measurement significant, the room temperature must be at a constant 15°C, and the atmospheric pressure must consistently be 1013 mbar during the measuring interval. Obviously, the condition and age of the container will have a significant impact on the loss evaporation rate.

5.4 Replacing the Valves and Fittings

The container must be empty and warm (room temperature) whenever the valves and fittings are replaced.

5.4.1 Replacing the Manometer and the over pressure Valve

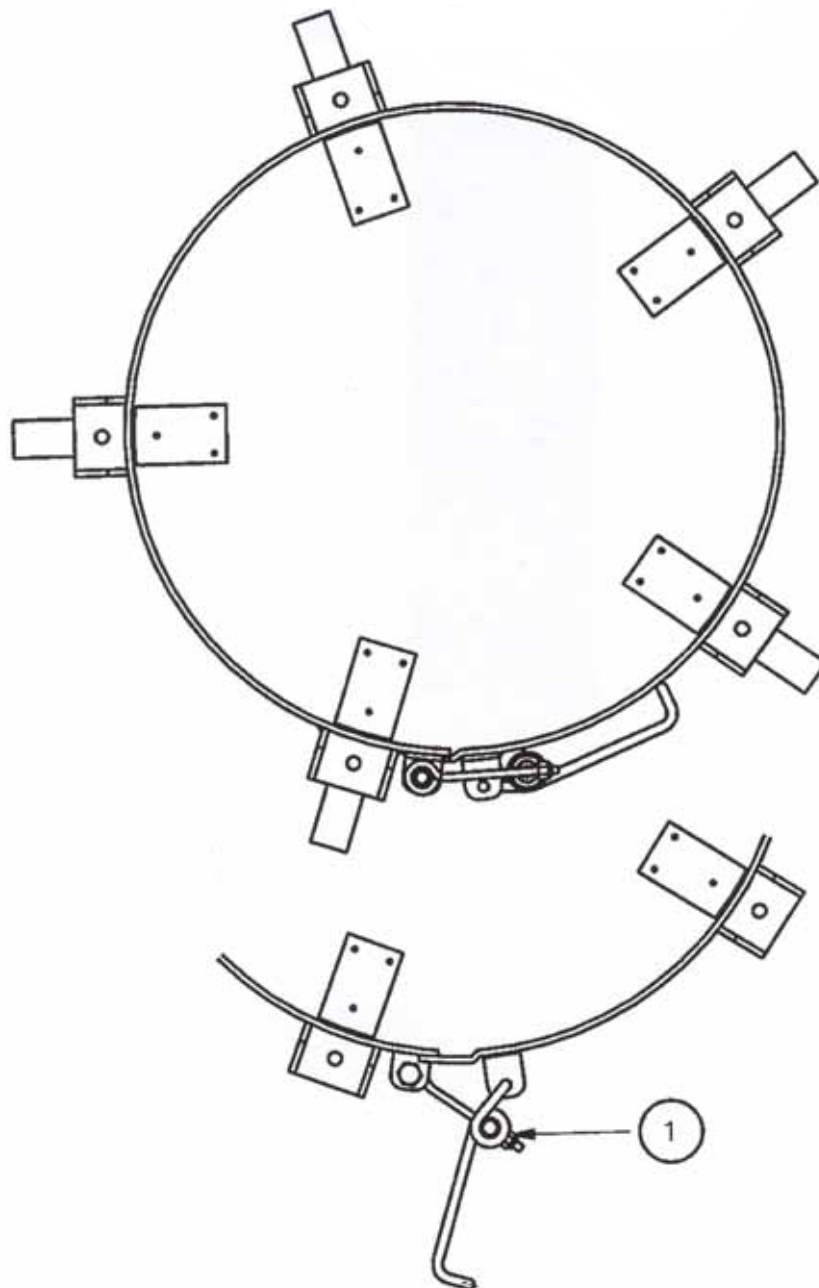
- A) Open vent valve V2 to release any pressure.**
- B) Remove the defective part, making sure not to loosen any other parts.**
- C) Thoroughly clean the female thread to remove all traces of the sealing compound.**
- D) Apply PTFE tape or sealing compound, making sure not to clog the openings on the spare part's threads.**
- E) Screw on the part without damaging the threads. Perform a leak test (see 5.2).**

5.4.2 Replacing the Valves

- A) Remove the vent valve or the LN2 transfer valve and thoroughly clean the female thread to remove all traces of the sealing compound.**
- B) Attach the screw adapter to the new vent valve or the LN2 transfer valve and mount it using PTFE tape or sealing compound.**
- C) Secure the mounted valves with lock nuts so that they will not become loose when the transfer hose is screwed on or off.**
- D) Place the siphon head with the new valves on the container and secure it with the quick release clamp. Put the container under pressure with N2 gas as described in section 5.2.**
- E) Perform a leak test (see 5.2).**

6. Roller Base

We can supply a roller base so that the containers can be transported in-house with greater ease. The roller base is a detachable accessory; it is attached to the container with a quick release clamp (1). When attached, the roller base is connected to the container so tightly that the container can be lifted with the roller Base.



7. Spare Parts and Accessories



Special transfer siphon

This modified EKI transfer siphon has a heating element; its purpose is to generate over pressure in the ALU container by electric evaporation.

Art. no. 2611-H



7.1 Spare Parts for EKI Transfer Siphon

DESCRIPTION	ARTICLE NUMBER
Transfer valve 3/8" female thread	2625
Vent valve 3/8" female thread	2625
Manometer 1/4" male thread	2626
Over pressure valve 0.5 bar	2621
Seal for centering ring DN 50	2619
Quick release clamp DN 50	2618
Neck tube core	2622

7.2 Accessories for Container and Transfer Siphon

DESCRIPTION	ARTICLE NUMBER
EKI transfer siphon 0.5 bar (specify container size)	2611
LN2 transfer hose 1.5 metres with PTFE inside tube and phase separator	2612
LN2 transfer hose 2 metres with PTFE inside tube and phase separator	2612 - S3
Transfer tube with phase separator	2613
Screw adapter	2615
Screw coupling, dia. = 8 mm	2614
Roller base for ALU 20 or ALU 26	2640
Roller base for ALU 35 or ALU 60	2641
Roller base for ALU 100	2642
Filling flange	2606
Filling hose	2607
LN2 level control unit "Level Control"	1301
Replacement probe Pt100	1302
Magnetic valve 24V for Ln2	1303
Level filling head	1306