

Self-pressurizing storage tanks

TP 35 – TP 60 – TP 100

User's manual





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Cryopal
Parc Gustave Eiffel
8 Avenue Gutenberg
CS 10172 Bussy Saint Georges
F - 77607 Marne la Vallée Cedex 3
Tel: +33 (0)1.64.76.15.00
Fax: +33 (0)1.64.76.16.99
E-mail: maintenance.cryopal@airliquide.com
Web: <http://www.cryopal.com>

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1. About this manual

1.1 Purpose of the manual

This manual refers specifically to cryogenic storage tanks in the TP range, i.e. self-pressurizing tanks intended for storing and transporting liquid nitrogen.

1.2 Who this manual is for

This manual is for any professional who wishes to use a cryogenic container in the TP line.

1.3 Structure of the manual

For ease of consultation, the structure of this manual follows the steps normally taken by the user, as described below:

<i>Topic</i>	<i>Page</i>
Overview of the <i>TP</i> tank	12
Assembly (parts and options)	20
Use	22
Maintenance	26
Technical specifications	3434

1.4 How to use this manual

The instructions in this manual are in the same sequence as those followed by the users of the product (section 1.3).

1.5 Skimming the manual

Given the specific nature of the cryogenic products and storage tanks, we would advise against skimming through this manual. We strongly recommend reading the chapters thoroughly in the order given.

1.6 The included document

The accompanying document contains:










- This manual in electronic *pdf* format.
- Manuals issued by Cryopal.
Note: you will need to have the software known as *Acrobat Reader* installed on your computer to be able to read or print from this pdf manual in pdf format.

1.7 Trade names cited

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2. Safety

2.1 Symbols used

Symbol	Meaning
	Important information about using the equipment. Failure to follow the instructions given for this point does not result in danger for the user.
	Warning: General danger. In this manual, failure to observe or implement the instructions preceded by this symbol may cause bodily harm, or may damage the equipment and installations.
	Name and address of manufacturer.
	Mandatory: Protect your hands using appropriate personal protection equipment.
	Warning: Low temperature.
	Product reference
	Date of manufacturing
	Capacity in liters
	Batch number

To maintain perfect operating conditions and ensure that the equipment is used safely, you must follow the instructions and take note of the symbols given in this manual. The tank has been designed for use with liquid nitrogen only.

When the device cannot be used in conditions of total safety, the equipment should be withdrawn from

service and protected against accidental usage. Full safety cannot be guaranteed in the following cases:

- The equipment is visibly damaged.
- The equipment no longer works (applies particularly to accessories).
- After prolonged storage in unsuitable conditions.
- After severe damage sustained during transit.

2.2 Operator safety

2.2.1 General safety precautions

Only personnel who have fully read this manual and the safety recommendations (see NH78380) are authorized to handle and use the apparatus described in this document.

Like every other system, your apparatus may be subject to a mechanical failure. The manufacturer cannot be held liable for any production losses subsequent to defective operation of the kind described above, even during the warranty period.

If the cryogenic tank appears to have an operating fault when used under normal conditions, only properly trained and qualified personnel are permitted to service it. The user must not be permitted to attempt repairs as this could present a risk to that person's health and/or safety.

The equipment described in this manual is designed exclusively for use by qualified personnel. Maintenance operations should only be carried out by qualified and authorized personnel. To ensure the safe and correct use of the device during service and maintenance, it is essential that all personnel observe standard safety procedures.

2.2.2 Safe use of liquid nitrogen

The temperature of liquid nitrogen is -196 °C. As a result:



You must never touch objects which have been in contact with liquid nitrogen with your bare hands. Always wear special gloves and visors when handling liquid nitrogen



Liquid nitrogen used in storage freezing chambers evaporates into the air; 1 litre of liquid nitrogen releases around 700 litres of nitrogen in the gaseous state. Nitrogen is an inert, non-toxic gas, but displaces oxygen when released into the atmosphere. Once the atmospheric oxygen content falls below 19% there is a risk for humans.

Any room or place where liquid nitrogen containers are kept must always be completely ventilated and, at least, equipped with an oxygen detector; it should not be used for other purposes than those defined by your integrator. All personnel should be informed of the risks associated with the use of nitrogen.

The storage tank is designed for use with liquid nitrogen only.

When in new condition, the tank must always be transported empty, in its original packaging and in compliance with current national and international regulations. Never stack storage tanks on top of each other.

According to the ADR directive on transporting dangerous goods by road, in order to avoid falling under the TPED directive, TP tanks must be transported without being under pressure (at atmospheric pressure) and with their neck open.

The tank may be moved across short distances (using the dolly base) with its head installed, with the tank not being under pressure (i.e. at atmospheric pressure).

If the tank is moved without the head, the control head can be reinstalled in the tank once full. This installation phase must be conducted with caution

(operator equipped with all required cryogenic personal protection equipment: gloves, apron, visor, etc.) in order to avoid any liquid nitrogen splashing.

The neck of the tank must never be hermetically sealed. Use the stopper provided.

The tank must always be kept vertical.

2.3 Precautions in the event of operating faults

If you suspect that the integrity of the equipment has been compromised (for example as a result of damage sustained during transit or during use), it should be withdrawn from service. Make sure that the withdrawn equipment cannot be accidentally used by others. The defective equipment should be handed over to authorized technicians for inspection.

2.4 Important Safety Elements (ISE)

These ISE are:

- Design rules for the EC Medical directives.
- Technical documentation (maintenance instructions and services),
- Components integral to the products (valves, solenoid valves, electronic equipment such as control and traceability electronics, overflow prevention and degassing devices, sensors and interfaces for remote monitoring (by an automation controller etc.), the cover contact); these elements are not necessarily present on the product.
- Obligatory safety recommendations or advice (the wearing of personal protection equipment when using our products, instructions for the use of equipment etc.).

During filling and transfer operations, ensure that equipment and procedures that ensure safety are used (hose, vacuum valve).

2.5 Destruction of the unit

In order to protect the environment the equipment (the tank and its peripheral equipment) must be disposed of via the proper channels.



3. Components supplied

The product is delivered complete with:

Ref.	Designation	Qty
1.	Insulating stopper.	1
2.	A <i>ATP</i> container (see table of capacities on page 34).	1
3.	Document containing this manual in pdf format.	1



Figure 3-1: The delivered parts.



4. General

4.1 Guide to components

This illustration shows the main parts, both included ones and options that make up a storage tank in the *TP* product line. These are described in greater detail in the following paragraphs and pages. The tanks will be used in an appropriate environment.



Figure 4-1: General view of the parts of a type *TP* storage tank.

4.2 Function

Cryogenic containers in the *TP* range are self-pressurizing aluminium storage tanks for storing and withdrawing liquid nitrogen at low pressures. A float-type level indicator enables the amount of available liquid to be checked. The removable control head is fitted with a pressure gauge and two safety valves.

4.3 Principle

The storage tank contains liquid nitrogen. It is pressurised by means of an exchanger (9) [regulating valve (7) and shutoff valve (8)] located between the walls. This exchanger vaporises liquid gas and thus ensures that the tank is pressurised. The pressure can be read off the pressure gauge (1). Two safety valves (2) calibrated to 0.5 bars protect the tank. It is filled via the connector (3) and valve (4) assembly.

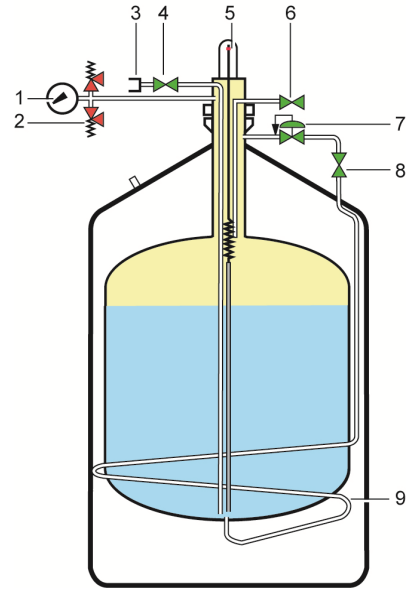


Figure 4-2: Principle.

Ref.	Designation
1.	Internal pressure gauge.
2.	Safety valves.
3.	Connector (filling/withdrawing)
4.	Filling and withdrawing valve.
5.	Mechanical level indicator.
6.	Venting /overflow valve.
7.	Internal pressure regulating valve.
8.	Pressure-building valve.
9.	Pressure-building coil.



5. Description

This section describes the two main parts, i.e. the storage tank and the control head.

5.1 Storage tank

The self-pressurizing aluminium storage tank enables liquid nitrogen to be stored and withdrawn. It consists of the following parts:

- A tank (6) consisting of two aluminium alloy enclosures connected by a collar of composite materials. It is thermally insulated by means of a vacuum between the two annular spaces and several layers of insulation on the internal container. The exterior of the tank is coated with polyurethane paint for a good finish and durability.
- A flange head DN50 (3), onto which the control head is fastened (see next section).
- Two handles (5).
- A vacuum valve (7) which also acts to keep the annular spaces safe.
- A controller (2) intended to control the tank's once the installed control head and the pressure-building valve (1) have been opened. The basic setting is 0.5 bar.
- A pressure-building heating coil (4).
- An insulating, enclosing stopper (8) that limits nitrogen loss. This stopper must be placed on the flange whenever the control head is not fitted on the tank.



The neck of the tank must never be hermetically sealed.

- Two self-adhesive labels carrying warnings and product identification.

Refer to:

- On page 12 for details of how these components operate.
- On page 34 for the technical specifications of the various models.

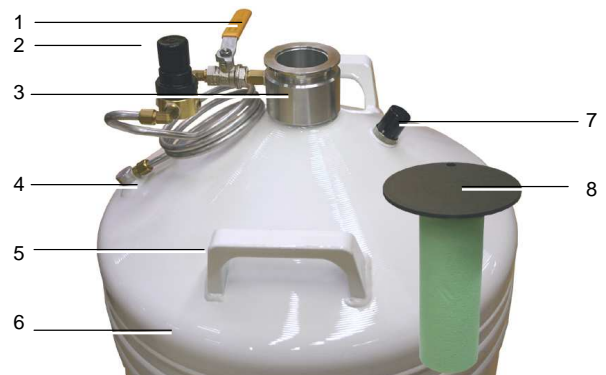


Figure 5-1: Overview of the tank

Ref.	Function
1.	Pressure-building valve.
2.	Controller.
3.	Head flange, nom. dia. 50 mm
4.	Heating coil.
5.	Handle
6.	Tank.
7.	Annular space safety device.
8.	Stopper.

5.2 The control head

The control head can provide a quick check of the amount of available liquid in the tank. It includes the following withdrawal, level reading and safety devices:

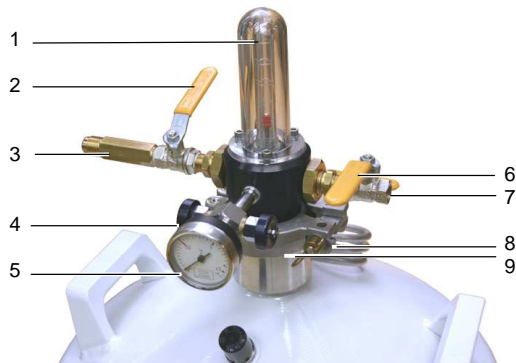


Figure 5-2: Overview of the control head.

Ref.	Function
1.	Mechanical level indicator.
2.	Filling / withdrawing valve.
3.	Filling/utilisation connector.
4.	0.5 bar valves.
5.	Pressure gauge (internal pressure).
6.	Venting /overflow valve.
7.	Venting connector
8.	Quick-release clamping ring
9.	Leak proof seal.

- A floating level indicator (1). The coloured part shows the percentage of liquid nitrogen remaining.
- A filling valve (2) and its connector (3) for connecting to the supply tank connector or to the supply line via a suitable flexible transfer line. This valve (2) and its connector (3) are also used for withdrawal (drawing liquid nitrogen off into another vessel for use).
- Two safety valves calibrated to 0.5 bar (4), protecting the tank from any excess internal pressure .
- A pointing pressure gauge (5) indicating the tank's internal pressure in bars (kPa). A red mark at 0.5 bars shows the maximum service pressure of the TP.
- A venting and overflow valve (6) and its connector (7).
- A quick-release clamping rings (8) to fit the control head on the storage tank flange.
- A seal (9) that prevents any leakage between the

control head and the storage tank flange.

Refer to:

- On page 12 for details of how these components operate.
- En On page 35 for the technical specifications.

5.3 Main accessories

These accessories are not supplied with the standard version and must be ordered separately.

5.3.1 Dolly base

This base (1) can be firmly clamped to the tank and enables it to be moved inside a building, making it easier to negotiate uneven floors. It has five castors, two of which have brakes.



Figure 5-3: Container mounted on the dolly base.

5.3.2 Hand rail

This removable metal accessory (1) makes it easy to move the tank and also protects the control head. The handrail (1) fastens on to two lugs mounted on the tank handles.



Figure 5-4: View of the handrail mounted on a tank.

5.3.3 Flexible transfer lines

5.3.3.1 Type 130/130

This flexible transfer line (or hose), which vary in length, is intended to fill the *TP* from a supply tank or vacuum line. There is a screw-on connector at both ends. One end is connected to the source valve outlet and the other to the connector (Figure 5-2) on the *TP* storage tank.

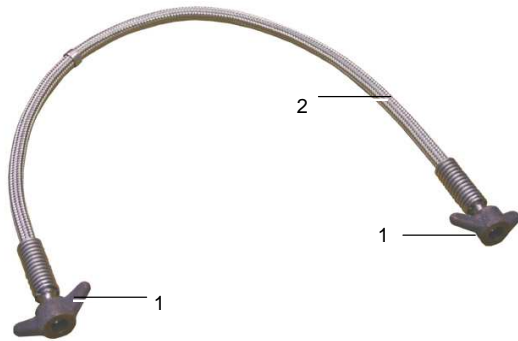


Figure 5-5: View of the 130/130 transfer line.

Ref.	Function
1.	Screw-on connector.
2.	Flexible line.



Cryopal flexible lines comply with the EN12434 standard.

It is essential to ensure that a safety valve calibrated to 15 bar maximum is inserted at one end of the flexible line (on condition that the operating pressure of the line is greater than or equal to 15 bar gauge pressure).

As a reminder, using any accessories (hoses, fittings etc.) that do not comply with the requirements set forth by *voids the manufacturer's liability and warranty*. We therefore ask you to check that any flexible lines or connectors used (other than those supplied by Cryopal) are approved and certified for an operating pressure of 15 bar (gauge bar).

5.3.3.2 Type 130 TC

This hose (1), which is 0.80 m in length, is intended for transferring between a *TP* tank and a *TR* tank or a different one. There is a screw-on connector (4) at one end for connection to the withdrawal valve outlet. A 10 mm diameter rigid tube (3) with a protective handle (2) is attached to the other end.

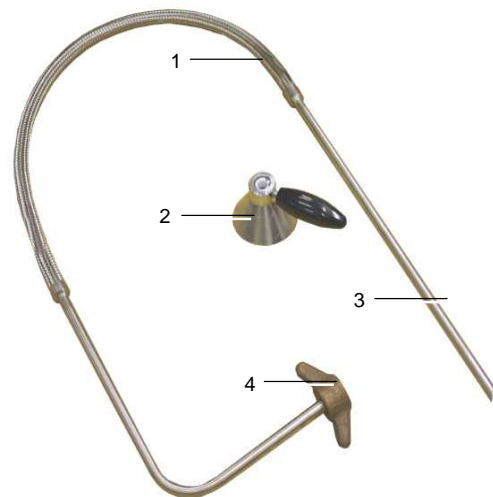


Figure 5-6: View of the 130 TC transfer line.

Ref.	Function
1.	Flexible pipe.
2.	Handle.
3.	10 mm diameter rigid tube.
4.	Screw-on connector.



6. Unpacking and installation

6.1 Unpacking

For your own safety you must observe the safety rules and use suitable tools for unpacking and personal protection equipment.

At least two able people are needed to unpack the assembly.

- Check the condition of the packaging on delivery.
- Unpack the equipment as close as possible to its place of use to avoid having to move it any great distance.
- Cut the straps and remove the lid.
- Remove the tank.

6.2 Installation

The customer is responsible for ensuring that the premises comply with current regulations and safety standards and with the following recommendations.



The maximum pressure of liquid nitrogen supply must be below 3 bars (1.5 bars recommended). Using a higher pressure may damage the equipment.

The volume of liquid nitrogen available is determined by the quantity of liquid present between the minimum level and the maximum filling level in the supplying tank.

Before connecting the flexible filling line to the supplying tank or the liquid nitrogen supply it is important to purge the lines with dry nitrogen in order to remove any trace of moisture.

6.3 Installation checklist

Action	Yes, done	No, not done
Check the general condition of the apparatus.	<input type="checkbox"/>	<input type="checkbox"/>
Are the users trained?	<input type="checkbox"/>	<input type="checkbox"/>
Does the room satisfy safety regulations and standards in force?	<input type="checkbox"/>	<input type="checkbox"/>
Are the dimensions of the room (in particular the clear ceiling height after opening the lid) suitable for installation of the medical apparatus?	<input type="checkbox"/>	<input type="checkbox"/>
Is access to the room limited to persons entitled to enter it?	<input type="checkbox"/>	<input type="checkbox"/>
Are safety instructions and risks related to liquid nitrogen posted?	<input type="checkbox"/>	<input type="checkbox"/>
Are instructions available / accessible close to it?	<input type="checkbox"/>	<input type="checkbox"/>
Is personal protection equipment available / accessible in the room?	<input type="checkbox"/>	<input type="checkbox"/>
Is the room equipped with a permanent ventilation system suitable for the size of the room?	<input type="checkbox"/>	<input type="checkbox"/>
Is the room equipped with an oxygen content checking system (display outside the room)?	<input type="checkbox"/>	<input type="checkbox"/>
Are safe distances observed (at least 0.5 m	<input type="checkbox"/>	<input type="checkbox"/>

<i>Action</i>	<i>Yes, done</i>	<i>No, not done</i>
around the apparatus)?		
Is the liquid nitrogen supply pressure lower than 3 bars?	<input type="checkbox"/>	<input type="checkbox"/>
Has the medical apparatus been blown through (to eliminate all traces of moisture)?	<input type="checkbox"/>	<input type="checkbox"/>



7. Installing the components

This section describes how to add various peripheral devices (control head, castor base) to the storage tank.

7.1 Control head

Proceed as follows:



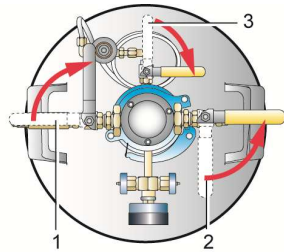
The control head can be installed in the full tank. This installation phase must be conducted with caution (trained operator, equipped with all required cryogenic personal protection equipment: gloves, apron, visor, etc.) in order to avoid any liquid nitrogen splashing.

1. Before starting, blow dry air or nitrogen through the lines and the valves to remove any moisture.



This is an essential precaution to avoid the risks of ice forming in the lines and the safety accessories and blocking them or preventing them from working.

2. Open the vent valve (2).
Close the filling/withdrawal valve (1).
Close the pressure-building valve (3).



You must ensure that these two valves are closed before doing anything else.

3. Fit the metal seal (5) over the flange of the tank.
The length of the control head means that you must be aware of equipment above you when installing it (see below).

4. Introduce the bottom of the control head (4) into the tank, taking care not to knock the neck of the inner vessel.
5. Position the clamping ring (6) and secure the assembly.



7.2 Removing the control head

Proceed as follows:

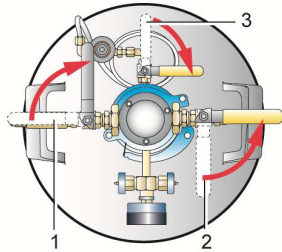


Check that there is no liquid nitrogen in the tank and it has been dried with dry air.

1. Open the vent valve (2); Close the filling/withdrawal valve (1). Close the pressure-building valve (3).



Ensure that the vent valve (2) is open before doing anything else.



2. Unclip and remove the clamping ring (5).



3. Lift the control head (4) out of the tank and place it on a suitable support.
Mind the height when removing the head. Do not knock the control head against the inner wall of the tank. Do not lose the metal seal between the control head and the neck of the tank.
4. Remove the seal from the tank flange.
5. Put a stopper into the neck to keep moisture from entering the tank.

8. Use

This section introduces the use of the assembled tank during transport, handling, filling (by gravity or from a supply tank) and withdrawal (using the liquid nitrogen).

8.1 Storage precautions



Before installing the equipment or using it for the first time, it is essential to refer to the safety instructions on page 6.



The storage tank must always be kept sheltered from exposure to the elements, with its control head or stopper fitted.

8.2 Moving



The tank may be moved across short distances (using the dolly base) with its head installed, with the tank not being under pressure (i.e. at atmospheric pressure).

If the tank is moved without the head, the control head can be reinstalled in the tank once full. This installation phase must be conducted with caution (operator equipped with all required cryogenic personal protection equipment: gloves, apron, visor, etc.) in order to avoid any liquid nitrogen splashing.

8.3 Handling

To keep the rate of loss low and keep the tank serviceable for as long as possible, we strongly recommend that you:

- Avoid severe impacts.
- Keep tanks upright at all times.
- Only move a tank inside the same laboratory (see section 8.2).

- If possible, use the optional dolly base.
- Move the tank with the neck open.
- Use the tank in a fixed location.

8.4 Filling the tank

The tank is filled from a low-pressure supplying tank or a transfer line using type 130/130 or other flexible filling lines:



For any operation with a liquefied gas you must wear protective gloves and goggles.

Mandatory: Protect your hands using appropriate personal protection equipment.



The gas transferred is at a very low temperature.



A safety valve calibrated to 15 bar max must be fitted at one end of the flexible line.

When filling the tank, make sure that neither personnel nor equipment are in the area facing the vent valve (1, diagram on next page) or the filling valve (2).

Filling must always be done by a qualified person in constant attendance.

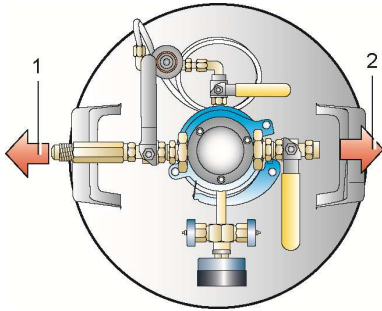


Figure 8-1: No person standing here during filling.

To fill the tank, proceed as follows:



Refer to the safety notes in section 8.4, on page 22.

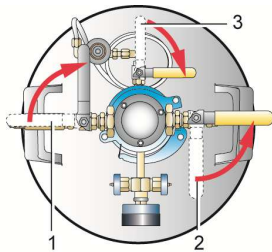
The tank must never be left unattended during the filling stage.

The pressure of the supply tank or the filling line must not exceed 3 bars.



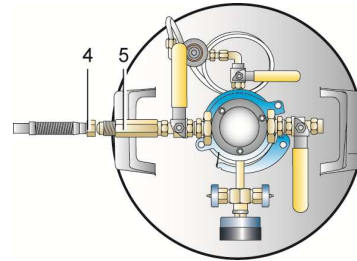
Pressure as read on the gauge **does not** need to be monitored.

1. Before starting, blow dry air or nitrogen through the lines and the valves to remove any moisture.
2. Open the vent valve (2). Close the filling/withdrawal valve (1). Close the pressure-building valve (3).



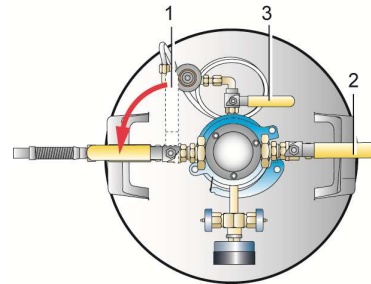
This enables you to check that the tank is no longer pressurized. If the tank were still pressurized (a jet of gas would appear), there would be a danger of cryogenic burns.

3. Fit the filling valve's connector (5) onto the supply line by means of a transfer hose (130 TC or 130/130) (4).



To limit filling time, it is important to use the shortest possible transfer line (1.1 or 1.5 m).

4. Open the TP filling valve (1). Check that the pressure-building valve (3) is closed. Check that the vent valve (2) is open.



5. Open the line or supply tank's valve **slightly** (to allow a low flow).

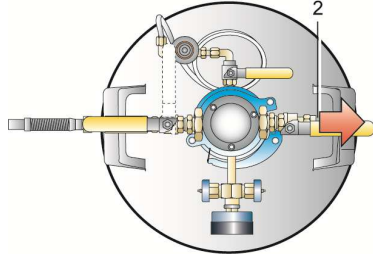


If the tank is not cold (new tank, or tank has not been used recently) you must open the withdrawal valve of the supplying tank very gently so as not to send too much liquid nitrogen into the tank. This precaution will prevent excessive pressure in the tank being filled.

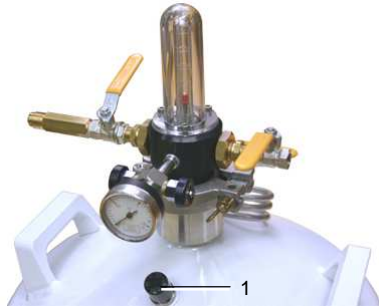
6. Now open the line (or supply tank) valve **gradually** to speed up the filling operation.
Opening the withdrawal valve of the supplying tank gradually prevents the pressure in the vessel being filled from rising too suddenly.

- As soon as liquid starts to issue from the vent valve (2), stop filling by closing the line (or supply tank) valve. For details of this operation, refer to the instruction manual for the supply tanks.

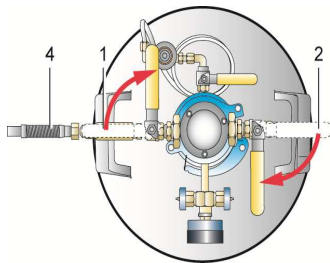
Maximum level is reached.



Make sure not to overfill the tank during manual filling so as to avoid rupturing the vacuum in the inner wall (liquid nitrogen coming in contact with the pump check valve - 1).



- Close the filling/withdrawal valve (1). Withdraw the flexible line from the TP and the line (or supply tank) valve (4). Close the vent valve (2) as soon as air no longer exits from it.



8.5 Withdrawal

Withdrawal consists in transferring the liquid nitrogen that is in the storage tank to a container, for example a tank in the TR product line. This is done with a

flexible withdrawal line attached to the withdrawal valve. No additional equipment is needed.

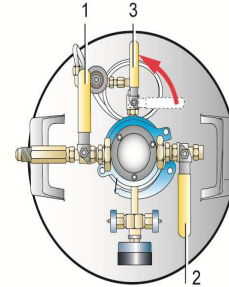
Proceed as follows:



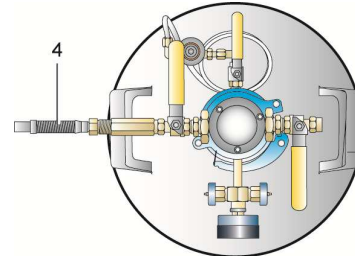
Refer to the safety notes in section 8.4, on page 22.

The tank must never be left unattended during the withdrawal stage.

- Check that the vent valve (2) is closed. Check that the filling/withdrawal valve (1) is closed. Open the pressure-building valve (3).



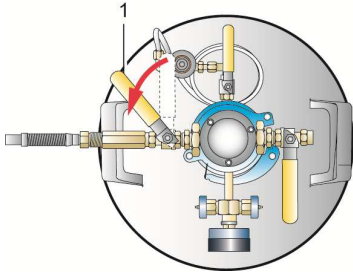
- Fit the withdrawal hose (130/130 or 130/TC – see page 16) onto the withdrawal tap (4).



- Place a container at the other end of the flexible withdrawal line.



4. While holding the hose, **gradually** open the withdrawal valve (1) in order to start withdrawing while controlling the flow.



Beware of possible splashes of nitrogen.

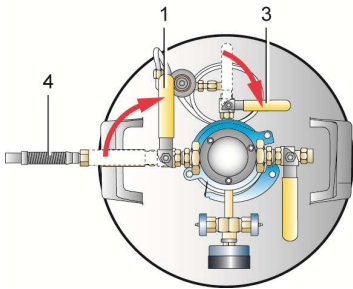


The pressure reading on the pressure gauge must be 0.5 bars or lower.



The top of the control head may become covered in frost during use. This is perfectly normal.

5. When withdrawal is completed, close the withdrawal valve (1). If you do not intend to withdraw more nitrogen in the immediate future, close the pressure-building valve (3). Remove the hose (4).



9. Maintenance

This section summarizes the procedures for inspecting and changing the components of the control head. It also describes calibration of the pressure gauge.

9.1 Operating incidents

9.1.1 Wrong level shown

Causes	Corrective action
Level regulating ring in wrong position.	Adjust the level gauge (see section 9.4, on page 29).
Damaged spring.	Change the control head assembly (see section 7.1, on page 20).

9.1.2 Valves operate at a pressure lower than 0.5 bar

Causes	Corrective action
Pressure gauge out of order	Check that the pressure gauge is operating properly (see section 9.3.1, on page 27). Replace it if necessary (see section 9.5.1, on page 30).
Valve out of order	Replace the valve (see section 9.5.1, on page 30).
Foreign body present on the valve seat obstructing the seal	<p>If the foreign body is ice, warm the valve with a jet of nitrogen or dry air until it disappears.</p> <p>If the body is of a different kind, carefully open the flap and blow nitrogen or dry air onto the seat of the valve then closed the flap (see <field/>, 1). This operation may require the valve to be dismantled (see section 9.5.1, on page 30).</p>



Figure 9-1: Blowing out the valve's seat.

9.1.3 Valves constantly operate at a high flow rate

Causes	Corrective action
Pressure-building valve open	Close the pressure-building valve. This valve must always be kept closed unless liquid is about to be withdrawn.
Pressure-building valve leaking	Replace the pressure-building valve (see section 9.5.2, on page 31).
Poor quality vacuum, causing a lot of liquid to evaporate	Contact your local <i>Cryopal</i> representative.

9.1.4 Abnormally high evaporation rate under standard temperature and pressure

Causes	Corrective action
Pressure-building circuit leaking	Locate the leak (see section 9.3.4, on page 29). Make the fitting leak-proof again (see section 9.5, page 30) or contact your local <i>Cryopal</i> representative.
Poor quality vacuum	Contact your local <i>Cryopal</i> representative.

9.1.5 Uncontrolled service pressure

Causes	Corrective action
Pressure controller out of adjustment.	Adjust the controller's service pressure. Adjust the operating pressure on the controller by lifting the red locking ring of the controller and turning the knurled knob clockwise to increase the internal pressure in the tank or anticlockwise to reduce it. Note that there is a long period of inertia, lasting about a minute, between the adjustment and a change in the pressure gauge reading.

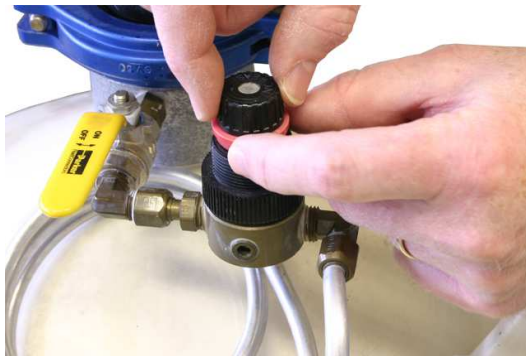


Figure 9-2: Red locking ring on the controller.

9.2 Preventive maintenance

Inspection of the components	Frequency (*)
Pressure gauge	Annual
Valves	Annual
Level indicator	Annual
Airtight seal	Annual
Leaks	Annual

(*)The frequencies shown are guideline intervals and should be adjusted by the user according to the use made of the tank.

9.3 Inspections

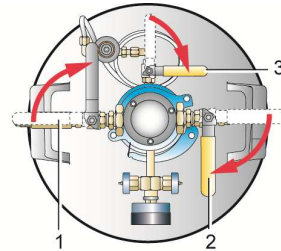
9.3.1 Inspecting the pressure gauge

The equipment needed is as follows:

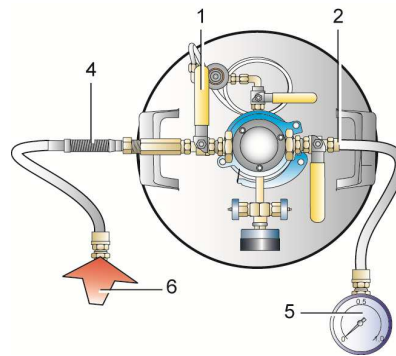
- A calibrated manometer to be used as a reference.
- A flexible line.

Proceed as follows:

1. Close the vent valve (2). Close the filling/withdrawal valve (1). Close the pressure-building valve (3).

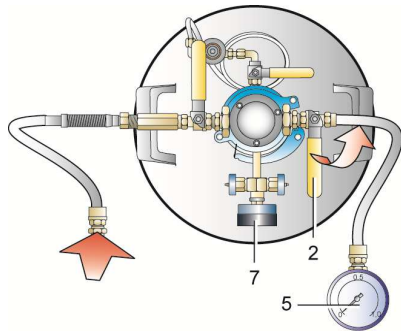


2. Connect the calibrated manometer (5) to the vent connection (2) with a flexible line.
3. Connect a pressure source (oil-free dry air) (6) that can be varied between 0 and 0.5 bar to the fill connector (4).
4. Open the withdrawal valve (1) **gradually** in order to increase pressure in the tank to a given value.



Do not increase pressure past the normal tolerated pressure (see technical specifications on page 34).

5. Open the vent valve (2) and compare the readings on the two pressure gauges (5 and 7). You can measure a number of different points between 0 and 0.5 bars.

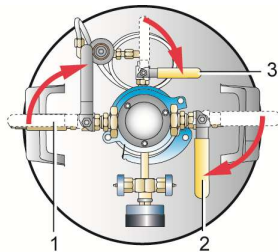


- If the difference between the readings is greater than 0.1 bar, we recommend replacing the pressure gauge (7) (see section 9.5.1, on page 30).

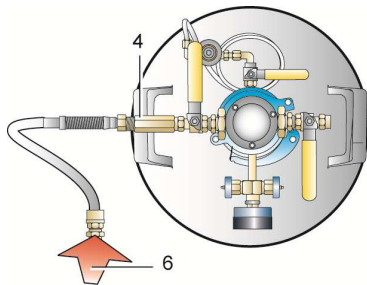
9.3.2 Inspecting the valves

No tools are necessary if the pressure gauge has been inspected as described in section 9.3.1, page 27. Proceed as follows:

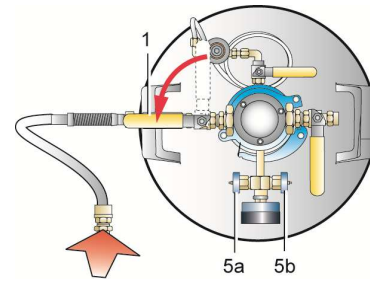
- Close the vent valve (2). Close the filling/withdrawal valve (1). Close the pressure-building valve (3).



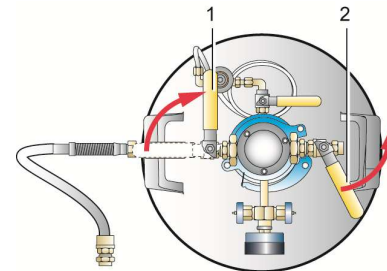
- Connect a pressure source (oil-free dry air) (6) that can be varied between 0 and 0.5 bar to the fill connector (4).



- Open the fill valve (1) and note the pressure readings when the valves (5a and 5b) are opened. If the pressure is not between 0.45 and 0.5 bar, replace the valve.

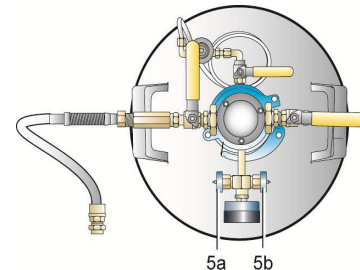


- Lower the pressure in the tank slowly. To do so, close the fill valve (1) and gradually open the vent valve (2).



Make sure that nobody is in the path of the jet of air issuing from the vent valve (2).

- Note the pressure readings when the valves (5a and 5b) are opened. Change the valve if the pressure is not below 0.45 bars.



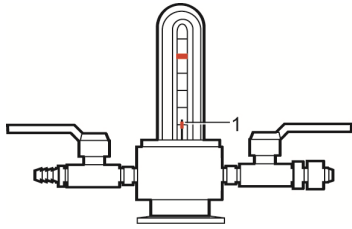
9.3.3 Checking the level indicator

No tools are necessary if the pressure gauge has been inspected as described in section 9.3.1, page 27. Proceed as follows:

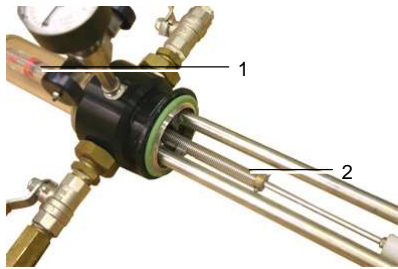


The control head must be in a vertical position during all these movements.

- With the head still mounted on the empty tank, check that the red mark (1) is on the bottom line of the level indicator. If the mark is not at zero, you must adjust the zero (see § 9.4.1, on page 29).



2. Remove the control head. Refer to section 7.2, on page 21.
3. Once the assembly has warmed up to room temperature, check that the stem (2) slides smoothly along the indicator (1).
By grasping the float and sliding the stem between the very bottom line and the very top line of the indicator.
If it catches on anything, replace the assembly.



Adjusting the level indicator is covered in section 9.4, on page 29.

9.3.4 Inspecting for leaks

This must be checked every year. The required tools are as follows:

- A mixture of soap and water in a beaker.
- A brush.

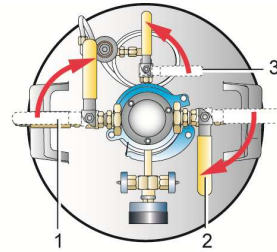
Proceed as follows:



The control head is mounted on a tank and the tank is considered to be full of liquid nitrogen.

1. Check that the vent valve (2) and the filling/withdrawal valve (1) are closed.

Open the pressure-building valve (3) and wait for the tank's pressure to rise to 0.5 bars.



2. Using the brush, dab soapy water over the various connections. If bubbles appear, this indicates a leak. If a leak is observed, renew the seal on the connection concerned.

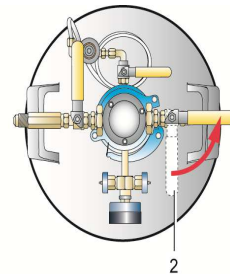
9.4 Adjusting the level indicator

This becomes necessary after the equipment has been roughly handled or following successive fitting and removal of the control head.

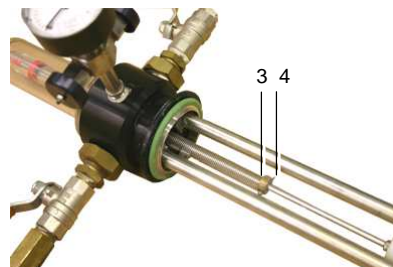
9.4.1 Adjusting the zero mark

This procedure consists of making the red ring on the stem coincide with the zero marker engraved on the transparent cap. Proceed as follows:

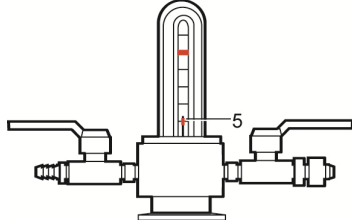
1. Open the vent valve (1) to release any pressure.



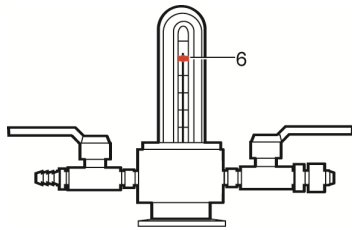
2. Remove the control head (§ 7.2, page 21) and wait for it to warm up.
3. Using a 2 mm hexagon key, unscrew the hex socket grub screw (4) so that the ring (3) slides up and down the stem.



- Place the ring (3) at the correct height and tighten the grub screw (4) again to immobilise the ring. Thus the more the spring is stretched (ring displaced towards the float) the higher the red mark rises (5).



The correct height is reached when the top end of the end mark is at the very last line on the indicator (6) with the control head vertical.



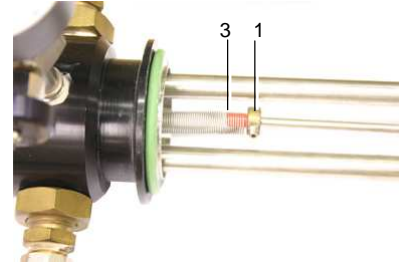
9.4.2 Adjusting the position of the red ring on the stem

This procedure consists in positioning the red ring on the stem. The red ring may have slipped along the stem (1 in the above figure). Its normal position is a few millimetres from the stem. Proceed as follows:

- Undo the grub screw to release the ring (1) from the stem (2).



- Slide the ring (1) until the red marker (3) is accessible and reposition the marker by sliding it along the stem.



- Adjust the ring as shown in section 9.4.1.



If the above actions do not allow the level to be adjusted, the spring must have been damaged by bad handling. In this case, the control head assembly must be replaced.

9.5 Changing components

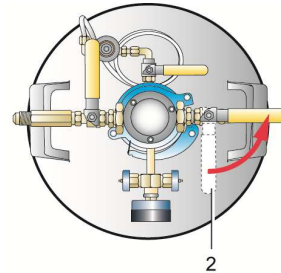


Before replacing any components the tank must be emptied and brought to room temperature.

9.5.1 Changing the gauge-and-valves assembly

Proceed as follows:

- Open the vent valve (1) to release any pressure.



- Withdraw the pressure gauge and safety valve assembly, taking care not to unscrew any other parts of the control head and carefully clean the internal screw threads so that all traces of joint filler are removed.



3. Apply PTFE tape or joint filler (silicone etc.) to the threads of the replacement part, taking care not to obstruct the orifices.

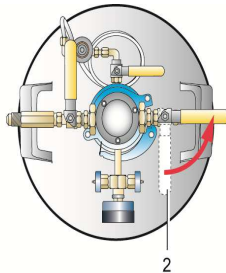


4. Screw the part in, keeping tight control so as not to damage the threads.
5. Test for leaks (see § 9.3.4, on page 29).

9.5.2 Changing valves

Proceed as follows:

1. Open the vent valve (1) to release any pressure.



2. Remove the control head (§ 7.2, page 21) and wait for it to warm up.
3. Mount the swivelling screw fitting and the nitrogen connector or the grooved end piece onto the new valve.
4. Check the assembly for leaks as described in section 9.3.4, on page 29.
5. Secure these connectors firmly to the valve so that they do not become unscrewed when the flexible transfer line is fitted and removed.
6. Screw the above premounted assembly onto the control head.
7. Once the assembly is facing in the desired direction, secure it in place by using the lock nut (1) to lock it against the control head.



8. Test for leaks as described in section 9.3.4, on page 29.

9.6 Interview frequency

This section is for skilled and qualified persons who are authorized to carry out maintenance work. Maintenance is necessary to ensure that the equipment remains in normal operating condition. The person who uses the equipment is responsible for this. The tools used for maintenance operations must be non-abrasive and should have no sharp edges or points that could damage the surfaces.

Operation	Frequency
Defrost the control head Remove the ice that forms on the control head with e.g. a hairdryer. Be careful with the plastic parts (stopper, fairing etc). The ice and/or water must be recovered so that they do not fall on the equipment.	Every 2 weeks
Cleaning the outside of the tank <i>Important note: cleaning is limited to the outer parts of the device. The use of acetone, solvents or any other highly flammable chemicals or liquid-containing chlorine products is prohibited.</i> Wipe the plastic parts with a dry rag and, if necessary, with a slightly moist non-abrasive sponge (do not use abrasive powder) or with impregnated wipes. Ordinary domestic cleaning products (slightly abrasive creams containing ammonia) applied with a sponge will be acceptable for the tank and the stainless steel parts. Afterwards, rinse with a damp rag, then wipe and leave to dry.	Every 5 weeks

(*)The frequencies shown are guideline intervals and should be adjusted by the user according to the use made of the equipment.





10. Technical specifications

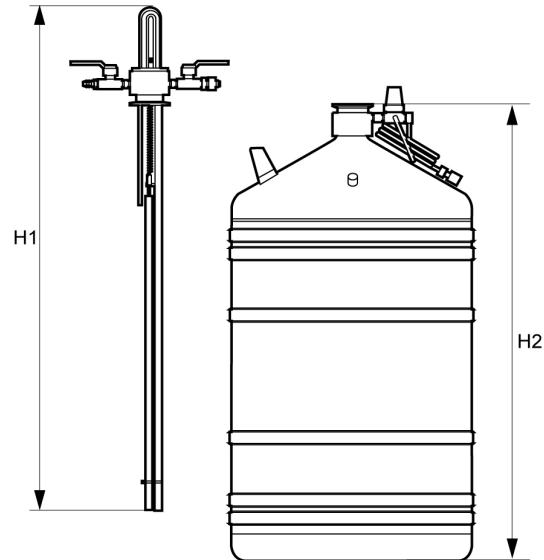
10.1 Tank

	Unit	TP 35	TP 60	TP 100
Total capacity	Litres	35	60	99
Working capacity	Litres	35	60	98
Maximum working gauge pressure	Bar	0,5	0,5	0,5
Static duration of use	Days	35	60	75
Weight when empty, without control head	kg	17,6	24	31
Weight when empty, with control head	kg	19,8	26,4	33,5
Weight when full of nitrogen, with control head	kg	48	74,5	113,5
Daily rate of evaporation				
With insulating stopper	Litres/day	0,7	0,7	0,7
With control head	Litres/day	1	1	1,3
Time required for pressure to build up (1)				
Tank ½ full	min & sec	3 min 50	4 min	5 min
Tank ¼ full		8 min	8 min	10 min
Delivery rate (2)	l/min	2,4	3,5	5,2
Ambient temperature (3)	°C	20	20	20
Storage temperature	°C	<50	<50	<50
Dimensions (H1 and H2)	mm	853/668	1080/896	1213/1029
Total internal height	mm	580	815	945
External diameter	mm	468	468	510

(1) from 0 to 0.5 bar, pressure-building open

(2) maximum at P = 0.5 bar (3) operating temperature when sheltered from direct sunlight

Figure 10-1:
Dimensions (in
mm).



10.2 Control head

Feature	Principal characteristics
Nitrogen level:	Measured by a mechanical level indicator (float)
Nitrogen pressure	Pressure gauge (graduated from 0 to 1.6 bar)
Controller	Integral
Safety	2 valves calibrated to 0.5 bar
Manual valves	Filling / withdrawal Vent / overflow

11. Spare parts and accessories

11.1 Tank

<i>Item</i>	<i>Product references</i>
Pressure-building valve	ACC-TP-6
Controller 0.07 - 0.7 bar	ACC-TP-5

11.2 Control head

<i>Item</i>	<i>Product references</i>
Full control head for TP35	ACC-ALU-6
Full control head for TP60	ACC-ALU-10
Full control head for TP100	ACC-ALU-11
Withdrawal valve / vent valve	ACC-TP-7
Pressure gauge	ACC-TP-23
0.5 bar valve	ACC-TP-18
Centring ring, 50 mm nom. dia. with seal	ACC-ALU-14
Seal for centring ring	ACC-ALU-16
Liquid nitrogen end piece	ACC-TP-16
Level protection cover	ACC-TP-10
Level indicator	ACC-TP-11
Level spring for TP35	ACC-TP-12
Level spring for TP60	ACC-TP-13
Level spring for TP100	ACC-TP-14
Seal for level indicator	ACC-TP-4

11.3 Accessories

<i>Item</i>	<i>Product references</i>
Elbow with anti-splash device	ACC-TP-17
Anti-splash device	ACC-ALU-12
Two-valve TP withdrawal assembly	ACC-TP-21
Rod	
TC withdrawal rod - FLEX DN10 180/180 NL	ACC-FLTC-1
TC withdrawal rod + Anti-splash device 180/180 NL	ACC-FLTC-2
Hand rail	
Hand rail for TP35 , TP60 and TP100	ACC-ALU-21
Hoses	
130TC Flexible line for nitrogen, nom. dia. 10 mm, 800 mm long	ACC- FL180TCNL-08
130-130 Flexible line for nitrogen, nom. dia. 10 mm, 1100 mm long	ACC- FL180180NL-11
600-130 Flexible line for nitrogen, nom. dia. 16 mm, 1500 mm long	ACC- FL630TCNL-15
600-130 Flexible line for nitrogen, nom. dia. 16 mm, 2200 mm long	ACC- FL630180NL-22
Insulating stopper	
Insulating stopper	ACC-TP-19
Adjustable dolly base	
Standard adjustable dolly base	ACC-ALU-29
Non-magnetic adjustable dolly base	ACC-ALU-31
Lock kit (3 units)	ACC-ALU-32

12. Warranty and limit of liability

12.1 Warranty

The warranty period takes effect on the date of issue of the equipment delivery note and has a duration of one year.

Goods are delivered at the vendor's risk if delivered by a carrier appointed by Cryopal. In other cases delivery is at the buyer's risk.

The vendor guarantees the equipment against all design faults and defects of manufacture and construction affecting the storage tanks.

The seller's guarantee is strictly limited, at the seller's discretion, to repairing or replacing the parts which it acknowledges as defective and to its labour expenses other than transport and packing charges.

Replaced defective parts become the property of the vendor.

The repair, modification or replacement of parts during the guarantee period does not extend the duration of the guarantee.

To qualify for the guarantee, the user must submit a claim to the vendor within 15 days of its receipt of the equipment, accompanied by the delivery note.

The required repairs, modifications or replacements due to normal wear and tear, deteriorations or accidents from faulty operation, insufficient supervision or maintenance, negligence, overloads, a use not conforming to the utilization regulations, as well as shocks, drops, or degradations due to bad weather are not covered by the guarantee (see the operating instructions).

This guarantee is immediately invalidated in the event of the replacement or repair of original parts by persons not duly authorized by Cryopal.

Within the limits imposed by applicable legislation, it is expressly agreed that the guarantee awarded in this article is the only guarantee implicitly, explicitly or lawfully granted by the vendor with regard to the materials sold, and that, except where stated to the contrary in writing, the buyer renounces entitlement to any legal action which the buyer (or its employees, affiliate companies, successors or concession holders) might take against the vendor, its employees,

affiliate companies, successors or concession holders, in connection with the materials sold; this provision includes without limitation actions concerning personal injury, damage to goods not covered by the agreement, indirect or immaterial losses or damage and particularly loss of use or of profit, loss of cryogenic liquid or of products in storage etc. Within the limits imposed by applicable legislation, the buyer undertakes to compensate the vendor, its employees, affiliate companies, successors and concession holders, for all claims, complaints, demands, court orders, convictions or liabilities of any nature, as well as all costs and expenses incurred by or imposed on the vendor in connection with the materials sold.

Replacement parts must be used in the conditions of service originally defined by the vendor. In particular, safety devices sold as replacement parts must be installed as replacements for the original safety devices in conditions of service (pressure, temperature, gas, valve diameter etc.) identical to the original.

Application of this guarantee takes place in accordance with the vendor's general terms and conditions of sale.

12.2 Limit of liability

Neither *Cryopal*, nor any related company, may under any circumstances be held liable for any damages, included but not limited to damages for loss of manufacture, interruption of manufacture, loss of information, defect in the indicator or its accessories, bodily harm, loss of time, financial or material losses, or for any consequences whether indirect or subsequent to a failure occurring in the course of use, or inability to use the product, even in a situation where Cryopal had been made aware of such damages.



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