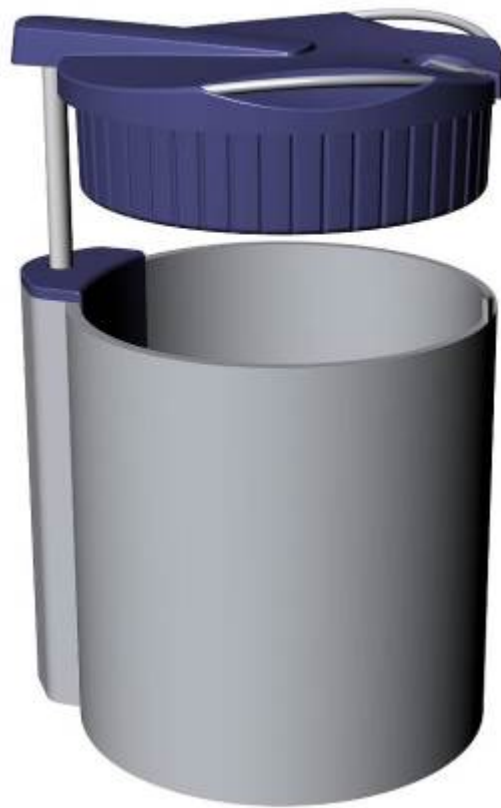


Operating Manual

BIOSAFE® 120 / 220 / 420 MDß



Service – Hotline:

+49 (0) 2741-95 85 75

Contents
Seite

1 Introduction	1
1.1 Symbols in the Manual	1
1.2 Principle	2
1.3 Delivery	2
2 Component Overview	3
3 Cryogenic Storage Vessels	
CHRONOS®120/220/420	4
3.1 Specifications of the Vessels CHRONOS® 120/220/420	4
3.2 Structure of the Vessel	6
3.2.1 Combined Positive Pressure Relief and Seal-off Device	6
3.2.2 Castors / Transport possibilities CHRONOS® 120	7
3.2.3 Castors / Transport possibilities CHRONOS® 220/420	8
3.2.4 Cover CHRONOS® 120	9
3.2.5 Cover / Elevating Mechanism CHRONOS® 220/420	10
3.2.6 Storage Shelf / Storage Frame	12
3.2.7 Connection for Level Control Unit and Vessel Control System BIOSAFE – CONTROL® ß	12
3.2.8 Fill Connection	13
4 Level Control Unit and Vessel Control System BIOSAFE-CONTROL® ß	14
4.1 Functions	14
4.2 Operating Elements	23
4.3 Assembly / Commissioning	24
4.4 Normal Operation	24
5 Safety	26
5.1 Safety advices	26
5.2 How to handle liquid Nitrogen	26
5.3 General Safety Instructions	26
5.4 Proper Use according to the Regulations	26
5.1 Safety Safety advices "Handling with cryogenic liquefied gases" Source: IGV Germany	27
5.2 Note Road Transportation	31
5.3 Labelling	32
6 Transport and Assembly	33
6.1 General Transport	33
6.2 Assembly	34
7 Operation	35
7.1 Installation / Assembly	35
7.1.1 Assembly of the Fill Line	35
7.1.2 Assembly of BIOSAFE-CONTROL® ß	36
7.1.3 Connection of the liquid Nitrogen Supply	36
7.2 Initial Commissioning	37
7.3 Normal Operation	38
7.4 Storing and Taking-out of Samples	40
7.5 Putting out of Operation / Cleaning	41

8	Accessories	42
8.1.1	Sorting System CHRONOS® 120	42
8.1.2	Sorting System CHRONOS® 220	45
8.1.3	Sorting system CHRONOS® 420	48
9	Maintenance / Repair	52
9.1	Scope of Maintenance	52
9.2	Declaration of Decontamination	54
9.3	Spare Parts	55
10	Faults	56
10.1	General	57
10.2	Possible Faults CHRONOS®	58
11	Warranty	60

1 Introduction

BIOSAFE® 120/220/420 MDB is a medical device of Class II a according to Directive 93/42/EEG of the Council of 14 June 1993 for medical devices.

With the medical device **BIOSAFE® 120/220/420 MDB** for example the following cell and tissue samples are long-term stored by using liquid nitrogen (LIN) as cryogenic agent at temperatures below -130° C for the return into the human being:

- sperm, ovum
- ancestral cells, bone marrow
- blood components, e. g. erythrocytes
- heart valves
- skin, bones, teeth
as well as e. g.
- samples for the DNA – analysis in gene technology

The preconditions for this are

- that the samples are tightly packed in packaging suitable for liquid nitrogen temperatures.
- that the samples were deep-frozen correctly.
- That the medical device **BIOSAFE® 120/220/420 MDB** is operated properly according to the regulations.

1.1 Symbols in the Manual



Informs of dangerous situations resulting in possible

- Personal injuries
- Environmental damage
- Machinery damage



Voltage hazard



Indicates

- Advices
- Exemplifications
- Supplements



Warning of Squeezing Danger

1.2 Principle

The medical device BIOSAFE® 120/220/420 MDß may only be operated according to this operating manual.

Before commissioning, it is absolutely necessary to read the operating manual completely.

The BIOSAFE® 120/220/420 MDß may only be operated by trained and instructed personnel.

1.3 Delivery

Immediately after receipt of the unit, check delivery with regard to

- completeness
- damage



In case of transport damage, inform

- transport insurance
- transport company
- supplier

2 Component Overview

The medical device **BIOSAFE® 120/220/420 MDB** consists of two components:

- Level control unit and vessel control system **BIOSAFE – CONTROL® B**, with level probe, temperature probe, evaluation software for PC and holding device at **CHRONOS® 120/220/420**
- Cryogenic Storage Vessel **CHRONOS® 120/220/420** with designer cover with vacuum insulated panel, solenoid valve, cover switch and safety intermediate piece under a cover, insulated decanting hose

Optional component:

- „I / O Box“ for connecting external alarms, main shut-off valve, analogue output for temperature documentation

Accessories:

Sale by:

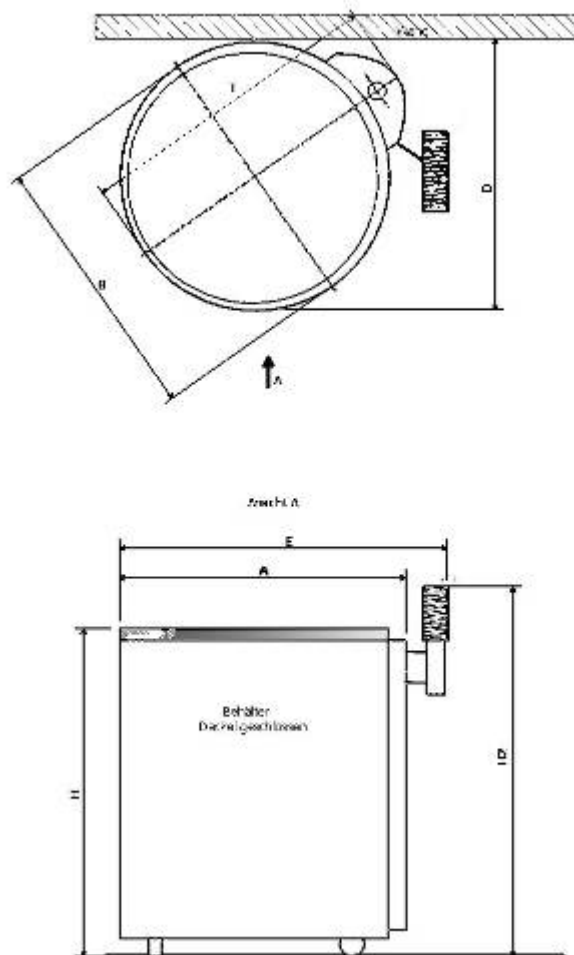
Cryotherm GmbH & Co. KG

- aluminum sorting system

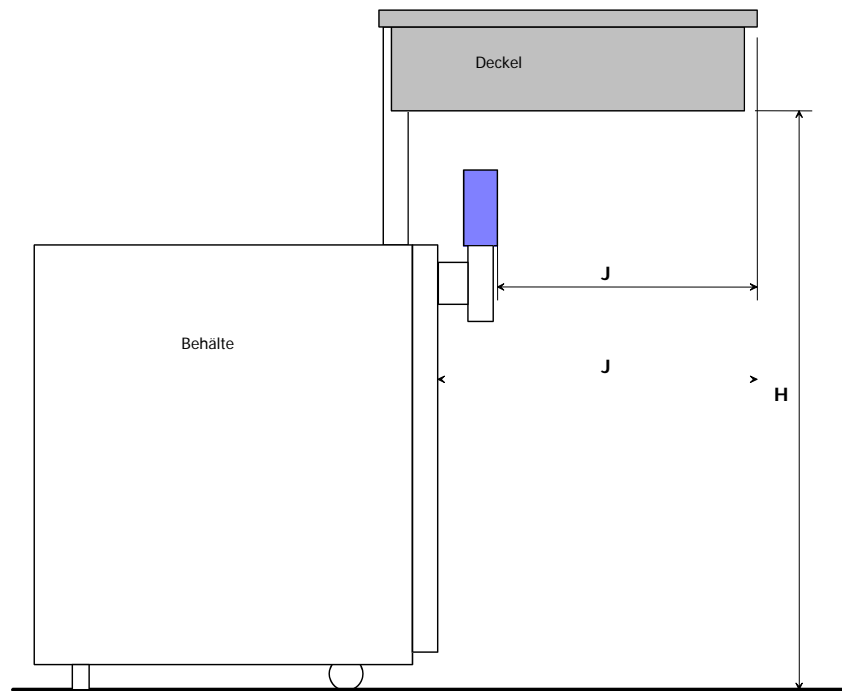
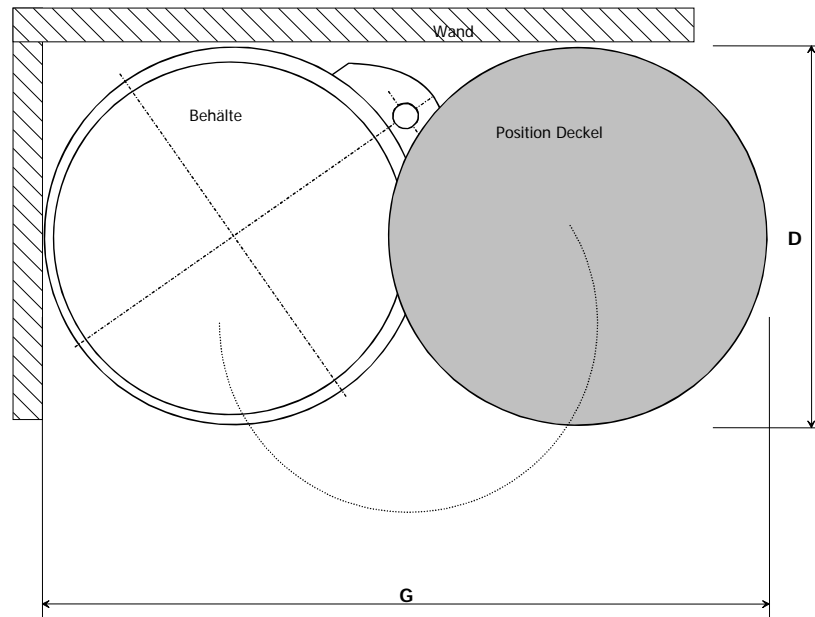
No medical device

3 Cryogenic Storage Vessels CHRONOS®120/220/420

3.1 Specifications of the Vessels CHRONOS® 120/220/420



		CHRONOS® 120	CHRONOS® 220	CHRONOS® 420
1.	Width B	56 cm	72 cm	90 cm
2.	Depth T	70 cm	85 cm	103 cm
3.	Total height of Vessel H (cover closed)	112 cm	120 cm	119 cm
4.	Assembly width A	80 cm	80 cm	96 cm
5.	Assembly depth D	80 cm	75 cm	95 cm
6.	Assembly width BIOSAFE-CONTROL® β	80 cm	95 cm	110 cm
7.	Height with BIOSAFE-CONTROL® β	125 cm	125 cm	125 cm

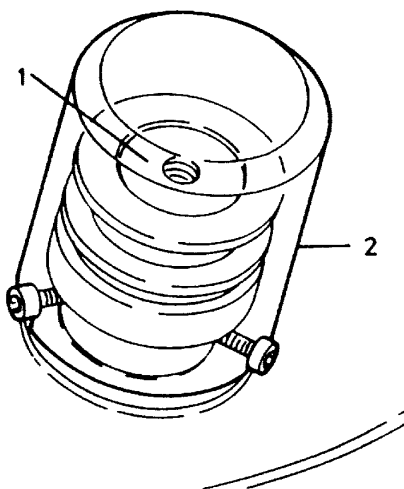


		CHRONOS® 220	CHRONOS® 420
8.	Vessel height, cover opened H1	107 cm	107 cm
9.	Space required: Depth F	91 cm	116 cm
10.	Space required: Width G	141 cm	175 cm
11.	Space required: Distance J	42 cm	62 cm
12.	Space required: Distance J1	55 cm	75 cm
13.	Space required: Height H3	137 cm	137 cm
14.	Space required: Height H4	168 cm	168 cm

	CHRONOS® 120	CHRONOS® 220	CHRONOS® 420	
Total geometrical capacity	151	251	415	l
Geometrical capacity below the storage shelf (LIN reserve)	21	35	57	l
Geometrical capacity above the storage shelf (cubic capacity)	130	216	358	l
1decimetre filling height corresponds to	21	35	57	l
Operating overpressure	0	0	0	bar
Empty weight	100	175	225	kg
Outside diameter	560	710	900	mm
Inside diameter	514	664	854	mm
Storage height	625	625	625	mm
Operating height (upper edge of the vessel with open cover)	1045	1070	1070	mm
Total height	1150	1180	1190	mm
Roller diameter		80	80	Mm
Static rate of evaporation (measured with gas phase storage)	2,3 3,5	2,0 5,0	1,5 ≈6,2	%/d l/d
Holding time (LIN Reserve)	4,5	5	8	d

3.2 Structure of the Vessel

3.2.1 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.

3.2.2 Castors / Transport possibilities CHRONOS® 120

As an option, the cryogenic storage vessel **CHRONOS®** can be equipped with a roller base. This roller base features 4 casters, 2 of which are equipped with locking levers.

Transport with roller base



It is absolutely necessary to carry out transport over uneven grounds and stairs with 2 persons.

Transport with fork lifter

The **CHRONOS® 120** Vessel can be transported with a fork lifter.

Special fork lifter pockets are not provided. Therefore, it is absolutely necessary to secure the vessel with conventional means during the transport with a fork lifter.



Danger of tumbling down during unsecured transport.

It is absolutely necessary to secure the vessel at the fork lifter with suitable means (tightening straps) before transport.

3.2.3 Castors / Transport possibilities CHRONOS® 220/420



The cryogenic storage vessel **CHRONOS® 220** is equipped with 2 fixed castors without locking levers in the rear area and two adjusting feet in the front area. Thus, it is ensured that the vessel is stable in operating condition and cannot be moved without special devices

For the transport of Vessel **CHRONOS® 220/420**, two possibilities are given:

- by means of the additional transport device (article no. 78202830)
- by means of a fork lifter

Transport with transport device

The transport device (article no. 78202830) is intended for transporting vessels over small or middle distances (mainly inside buildings) and for shunting inside the laboratory.

The transport device is a frame with handle, two castors and a hemispherical journal placed in the lower area.

At the vessel bottom (in the front area), there exists the corresponding accommodation for hemispherical journals of the transport device (marked with a green arrow label).

By means of the transport device, the vessel is slightly lifted in front, is thus placed on four castors and can be moved.



Danger: trapping of the fingers

By means of the transport device, hindrances up to a height / depth / width of 20 mm (e. g. steps) can be overcome.



Danger: Due to the weight of the vessel, the handle of the transport device can hit back. Do not let go of the transport device during transport.

Transport with fork lifter

The **CHRONOS® 220/420** Vessel can be transported with a fork lifter.

Special fork lifter pockets are not provided. Therefore, it is absolutely necessary to secure the vessel with conventional means during the transport with a fork lifter.



Danger of tumbling down during unsecured transport.



It is absolutely necessary to secure the vessel at the fork lifter with suitable means (tightening straps) before transport.



Adjustable feet (CHRONOS 220/420)

The feet at CHRONOS 220/420 can be adjusted in height. For this, loosen the upper lock nut first and then adjust the foot with the lower nut in height or depth. Subsequently, tighten the upper lock nut again.



CAUTION

Do not unscrew the foot completely!

3.2.4 Cover CHRONOS® 120

The vessel is equipped with a detachable cover. The cover reduces the penetration of humidity and minimizes the penetration of additional heat into the vessel. A lock is integrated in the cover. Thus, the access to the contents of the vessel is limited.



Danger at the lock: trapping of the fingers

For handling the cover, two cover handles are provided.



The handles of the vessel are exclusively intended for operating the cover and must not be used for any other purposes.

Opening of the vessel cover

First of all, unlock the lock for opening the vessel. After that, the cover has to be lifted.



Should any frost formation be apparent at the cover, remove it with open cover!

Closing the vessel cover

For closing the vessel cover, put the cover on the vessel again. Shut the lock after closing.



Danger at the lock: trapping of the fingers

3.2.5 Cover / Elevating Mechanism CHRONOS® 220/420



The vessel is equipped with a liftable - slewable cover. The cover reduces the penetration of humidity and minimizes the penetration of additional heat into the vessel. A lock is integrated in the cover. Thus, the access to the contents of the vessel is limited



Danger at the lock: trapping of the fingers

For handling the cover, two cover handles are provided.



The handles of the vessel are exclusively intended for operating the cover and must not be used for any other purposes.

Cover opening mechanism

The cover opening mechanism serves for facilitating the opening and closing of the cover. The cover opening mechanism consists of a lifting mechanism with integrated gas pressure spring.

The pressure inside the gas pressure spring is adjusted in such a way that the cover cannot leave the vessel completely itself. This pressure ensures the perfect function of the cover opening mechanism



The pressure inside the gas pressure spring has to be examined during the annual maintenance and readjusted, if necessary.

Opening of the vessel cover

First of all, unlock the lock for opening the vessel. After that, the cover has to be lifted upwards to the limit stop and subsequently swivelled aside. In tilt-out condition the cover is blocked and protected against falling down.



After opening, block the cover by tilting-out aside.



Possible frost formation at the cover edge can possibly result in the fact that the cover does not move upwards itself after opening the lock handle.

For opening, loosen the cover at the handles with lateral movements and moderate pulling upwards.



Should any frost formation be apparent at the cover, remove it with open cover!

Closing the vessel cover

For closing the vessel cover, swing back the cover first, so that the cover is located above the vessel. At the same time, the blocking is loosened. After that, carefully lower the cover. Shut the lock after closing.



Danger at the lock: trapping of the fingers

**EMERGENCY - PROCEDURE**

In case that the lifting mechanism is obviously blocked with closed or opened cover, carry out the following emergency - procedure after consulting the CRYOTHERM – SERVICE (Hotline: 02741 – 95 85 75):

Opening: Loosen 4 fastening screws between cover and lifting mechanism. The cover can then be lifted with 2 persons.

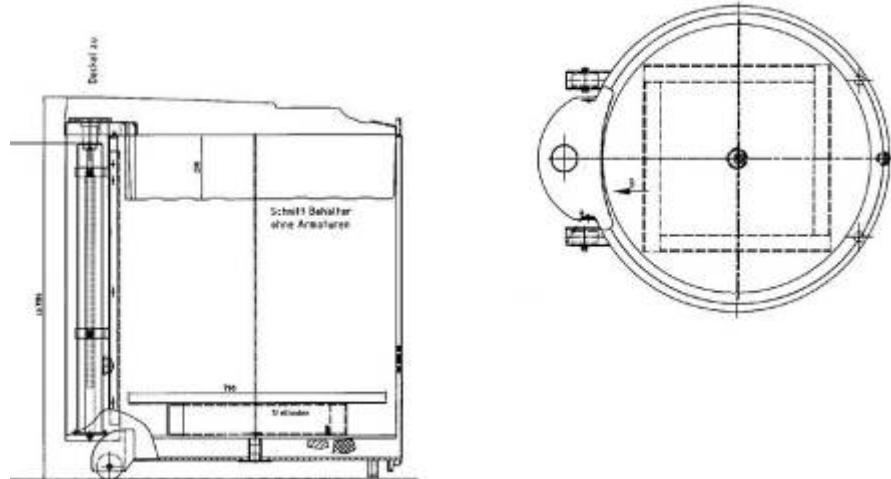
Closing: Loosen the cover as described and insert into the vessel as much as possible in slightly turned position.

3.2.6 Storage Shelf / Storage Frame

The storage shelf is a storage level loosely inserted into the vessel and is located on a storage frame made of aluminum.

Picture:

CHRONOS® 220/420



3.2.7 Connection for Level Control Unit and Vessel Control System BIOSAFE – CONTROL® ß



Right picture:

The level probe of BIOSAFE-CONTROL® ß is inserted into the splash guard pipe (center) provided for this.

Left picture:

Between the LIN fill line (left) and the splash guards pipe (right) for the level probe, there exists the instrument leads for the temperature probe of the BIOSAFE-CONTROL® ß

3.2.8 Fill Connection

The fill connection is a detachable 3/8" screwed pipe. At this connection, the decanting of the LIN supply is connected.

The fill pipe ends inside the vessel below the cover insulation and is slightly bevelled. It prevents the splashing of the level probe or of the sorting system.

4 Level Control Unit and Vessel Control System BIOSAFE-CONTROL® β

4.1 Functions

Languages

- The device display readings and the PC software can be set to **German** or **English**. Combinations are possible, too, i. e. German display and English PC software or German PC software and English display.

Level control

- The level of the liquid nitrogen inside the storage vessel is kept between minimum and maximum.
- If the level falls below minimum, a solenoid valve is triggered and liquid nitrogen continues flowing into the storage vessel.
- A delayed reaction between 0 and 999 minutes can be selected for the magnetic valve **(1)**. This delay cannot be set for "Filling after Min. Alarm" and "Manual Filling".
- The filling procedure is stopped as soon as the level reaches the maximum level.
- If the level falls below the minimum alarm level or exceeds the maximum alarm level, a visual and acoustic alarm is triggered. In addition, an alarm output is connected..
- The level and the operating states are displayed both at the device and at the PC.
- Delay times for triggering an alarm can be set both at the device and via PC.
- All alarms can only be activated or deactivated via a service menu in the PC software **(1)**. This menu can only be accessed by service personnel. At the time of delivery ex works all alarms are activated.
- With opened cover, automatic refilling is suppressed. Manual refilling (e. g. for unfogging) is possible.
- The distances between the sensors of the level probe (standard design) are as follows:

Minimum alarm to minimum:	3 cm
Minimum to maximum:	4 cm
Maximum to maximum alarm:	3 cm
- Alternatively there is a level control probe spaced at 2 cm/2cm/2cm. If required, please contact the manufacturer or service.
- In order to set the requested level in the storage vessel, the vessel probe has to be inserted more or less deeply into the instrument leads provided for this.

Temperature - Control

- The temperature inside the storage vessel is controlled, displayed (at the device and the PC) and logged.
- If an adjustable limiting value for the storage temperature is exceeded longer than the period of time selected for this, an alarm is recorded, displayed and triggered.
- The values for the storage temperature are stored every 15 minutes.
- If the temperature is above the limit, the log rate for the temperature values is increased from 1 reading every 15 minutes to 1 reading per minute. Thus the progression up to exceeding the limiting temperature is displayed with a higher resolution and is thus more accurately traceable.
- A graphic evaluation of the temperature course can be carried out via PC.
- Delay times for triggering an alarm and the maximum allowable storage temperature can be set both at the device and via PC
- Display range: -200 °C to +50 °C

Cover control

- The opening condition of vessel cover is determined by means of a cover switch.
- The opening of the cover is registered and indicated.
- If an adjustable period of time is exceeded for cover opening, an alarm is triggered.

**Note:**

Vessels without a cover switch must be bridged.



Display/Indication

- The display language can be set to German or English.
- On the display are indicated;:
 - storage temperature
 - level (between minimum and maximum)
 - messages (operating state, information, alarm messages)
- In addition, the
 - vessel no. (= ID) (1 to 32)
 - date and time (prevailing)
 - date and time of an occurred alarm message and
- information on:
 - data connection to the Master („M“)
 - automatic refilling is triggered („F“)
 - device is switched „inactive“ („ i “)

are indicated.

- With alarm messages, the background lighting of the display flashes.

Acoustic and visual alarm

- With alarm messages, the background lighting of the display flashes.
- On the display, the prevailing alarm is indicated in plain text.
- In addition to the visual alarm message, an acoustic warning takes place.

Horn off	<ul style="list-style-type: none"> Switches-off the acoustic alarm (no recurrence, but a new alarm triggers the horn again)
Acknowledge alarm	<ul style="list-style-type: none"> Acknowledges the alarm / switches-off the horn / resets the alarm relay If an alarm condition does no longer exist, the alarm message is erased from the display (goes to normal operation) If an alarm condition still exists, the alarm message is also still indicated / horn and alarm relay are reset for 30 minutes and return after this period of time

- All alarms can be activated and deactivated via a service menu in the PC software **(1)**. This menu is only accessible by service personnel. When delivered ex works all alarms are activated.

Data storage

- Each device stores data about:
 - storage temperature
 - operating states (solenoid valve / open cover)
 - alarm messages
- If the system is online, the data is directly transmitted to the PC
- Approx. 3 days before the data storage fills up, a message is displayed. Once the data storage is full, the alarm "Memory full" is triggered and the oldest data in the device memory will be overwritten.



Note:

The user can activate and deactivate the alarm "Memory full" on the device.

When resetting this alarm, an existing alarm "Memory full" is reset.

If data are not to be saved or no PC is connected, this alarm should always be deactivated!

When the alarm "Memory full" is deactivated, the data will still be saved but once the data storage is full the oldest data will be overwritten without previous warning.

The data can be viewed and edited (graphics, lists, printouts) even when the alarm is deactivated.

- The number of all sets of data transferred from the devices to the PC is displayed after the start of the programme under “No. of Data Records”.
- The data transfer from the device to the PC is shown on a progress bar.
- At regular intervals backup files of the PC software’s current database are created. The backup intervals and the backup directory can be set by the user.
- The user can also freely select the database directory for the current database. Thus the PC software features **network connectivity!**

Collective filling

For all devices with which the function „collective filling“ is active, it applies that all devices start the refill process as soon as one of the connected devices has started a refill process.

This accelerates for example the cooling of a LIN transfer line and minimizes cooling losses.

active/inactive

The devices can be switched „active“ and „inactive“. If a device is switched inactive, it keeps all its vessel-specific properties, like e. g. level control and temperature control!

Values and alarms are still indicated on the display of the device.

- Alarms from this device are no longer transferred.
- Central functions such as “Collective filling” or “Main Shutoff Valve” can no longer be used.
- The device works as a standalone system.

Parameters

Parameter and vessel information can be set on the device and in the PC software for each vessel individually.

Alarm output for external alarm

- Each device is equipped with an output (potential-free change-over contact).
- An external alarm system can be connected to this alarm connection

Redundant minimum alarm and maximum alarm control

- Regardless of software and the microprocessor, the condition „minimum alarm“ and „maximum alarm“ is controlled via a separate hardware.
- Also with troubles with software and microprocessor, an alarm is switched and displayed (flashing display and horn) when falling below the level „minimum alarm“ and exceeding the level „maximum alarm“

**Note:**

A hardware alarm is only displayed by faster flashing of the display and an increased alarm-sound-interval. No alarm message is displayed.

The display is still set to “normal operation”.

Re-cooling [1]

- The Re-cooling function is available via a service menu in the PC software. This service menu can only be accessed by service personnel.
- When the adjustable “Start temperature for Re-cooling” is exceeded, the vessel is filled to “Max.”, thus lowering the storage temperature.
- Border conditions: Fill level below “Max.” and lid closed
- Filling due to exceeding the “Start temperature for Re-cooling” does not trigger “Collective filling”.
- Factory setting: Function is deactivated.

Data Output

- Via the PC software data can be output in various formats:
 - Temperatures as a text file (CSV files, editable in Excel)
 - Temperatures, events and graphics as PDF files
 - Temperatures, events and graphics as printouts directly from the printer
 - Vessel and parameter settings as a PDF file

Software Versions / Downward Compatibility

- There is an older PC software version and firmware version (device software) than the one described in this manual. Compatibility between the two versions is guaranteed!

**Note**

Devices using the older device software can be upgraded through the service!

- During the system start the master scans the device for the oldest device software version in the system. The functions and commands used throughout the system are based on this version (lowest common denominator)
- The functions of the individual devices are not affected by this system version. The PC software functions are available to a limited extent only.

[1]**Important notice:**

The menu items “Settings/System Service” and “Settings/Vessel Parameters/Service” are accessible by Cryotherm personnel only.

Any changes may only be carried out by Cryotherm service personnel or personnel trained by Cryotherm!

Cryotherm does not accept any responsibility for changes made to these menus by the user.

- Via the „I/O box“ external signals (switching states) to the device or messages (switching states / analogue values) from the device can be transmitted to external systems.

I The „I / O box“ features the following inputs and outputs in detail:

No.	Output	Function	Functional Description
1	Voltage signal: 0 – 10 V DC	Analogue output for temperature signal	The storage temperature (-200°C to +50°C) is output as analogue voltage signal at this output. -200°C...0°C 1V.....9V Bruch 0,5V Kurzschluss 9,5V 0°C +50°C 9V
2	Digital input (make contact)	External alarm	If this input is closed, an alarm message „external alarm“ occurs at BIOSAFE-CONTROL® β The main valve closes and the relay „collective alarm“ switches. With this, e. g. the alarm output of an oxygen deficiency control can be connected.
3	Digital input (make contact)	External acknowledgement	With this, an alarm message can be acknowledged externally.
4	Digital input (make contact)	Collective filling	With this, the function „collective filling“ can be activated via an external switch.
5	Change-over contact (250 V AC / 5 A ; constant current 2 A)	Main valve	With this, a central main valve can be switched. Two operating modes are available.
6	Like No. 5	Fault	If a fault occurs (probe short circuit, probe break) at the BIOSAFE-CONTROL® β, this change-over contact switches („fault“).
7	Like No. 5	Maximum alarm	If the level inside the vessel is above the maximum alarm probe, this change-over contact switches („maximum alarm“).
8	Like No. 5	Excess temperature	If the storage temperature is above the limiting temperature, this change-over contact switches („excess temperature“).
9	Like No. 5	Collective alarm	The collective alarm is sort of a master alarm. If one of the up to 32 devices gives an alarm message, this change-over contact („collective alarm“) switches.
10	Like No. 5	Filling	Switches parallelly to the solenoid valve.
11	Like No. 5	Minimum alarm	If the level inside the vessel is below the minimum alarm probe, this change-over contact switches („minimum alarm“).
12	Like No. 5	Reserve 1	See table below
13	Like No. 5	Reserve 2	See table below

An alarm or event can be assigned to each of the two reserve relays.





The settings can only be changed via a PC software menu which is only accessible to service personnel!

Reserve 1 and Reserve 2

Alarm:	Events:
• No Event (Default)	• No Event (Default)
• Minimum Alarm	• Vessel is Activ
• Maximum Alarm	• Lid is Open
• Excess Temperature	• Magnetic Valve Activated
• Max. Lid Opening Time Exceeded	• Temperature out of Category Temp.
• Filling Time Exceeded	• Temperature Limit
• Filling Interval Exceeded	• Temperature Sensor Broken
• Communication Error	• Filling-Level probe Broken
• T – Sensor Error	• Memory Almost Full
• F- Probe-Head Error	
• Memory Full	
• External Alarm	

4.2 Operating Elements



Key button/ operating element	Function
Esc	<ul style="list-style-type: none"> Menu upwards (overriding menu) Goes to overriding menu without taking-over the values Terminates the selection Goes to password polling, if the key is pressed for more than 5 seconds
▲	<ul style="list-style-type: none"> Menu items up Values larger
▼	<ul style="list-style-type: none"> Menu items down Values smaller
Input acknowledge- ment (Return)	<ul style="list-style-type: none"> Menu downwards (submenu) Takes-over the values / settings and goes to overriding menu
M MANUAL FILL	<ul style="list-style-type: none"> Solenoid valves opens as long as the key button is being pressed (e.g. for „unfogging“) Function is inactive, if „max. alarm“ exists Function is inactive, if the level probe is defective
A AUTO FILL	<ul style="list-style-type: none"> Starts automatic refilling Function is suppressed, as long as the cover is opened
 SIGNAL OFF	<ul style="list-style-type: none"> Switches-off the acoustic alarm (no recurrence, but new alarm triggers horn again)
 ALARM QUIT	<ul style="list-style-type: none"> Acknowledges the alarm / switches-off the horn / resets alarm relay If the alarm condition no longer exists, the alarm message is erased in the display (goes to normal operation) If the alarm condition remains, the alarm message is continuously indicated / horn and alarm relays are reset for 30 minutes and return after this time

4.3 Assembly / Commissioning



For this, see separate operating manual BIOSAFE-CONTROL® β

4.4 Normal Operation



In normal operation, **BIOSAFE-CONTROL® β** controls the LIN level inside the storage vessel automatically between minimum and maximum!

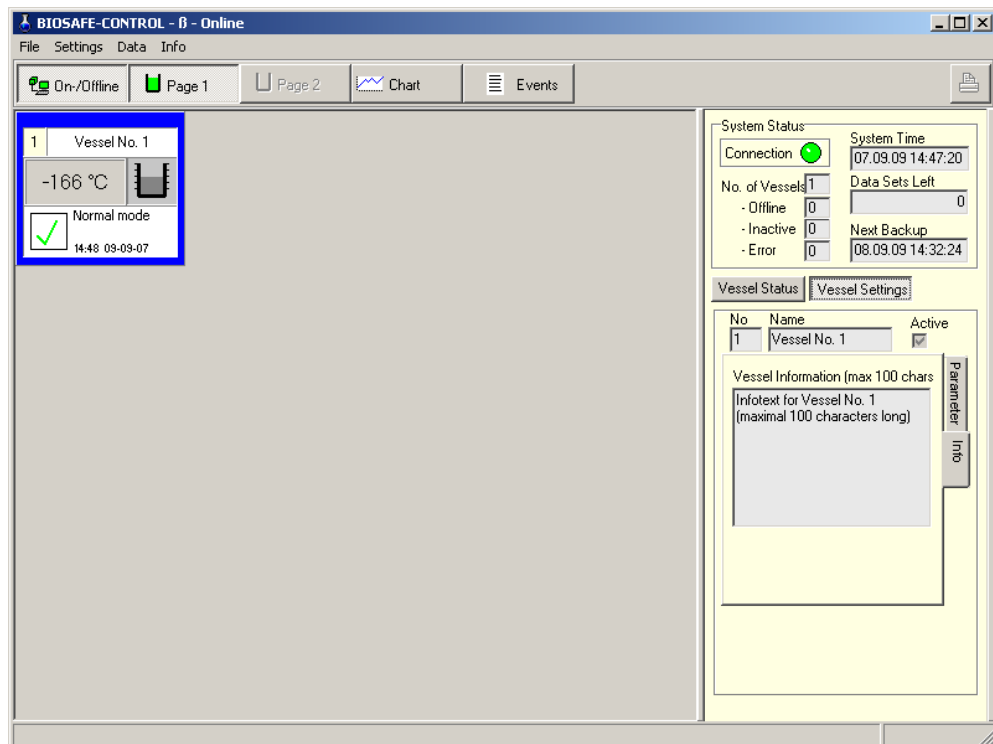


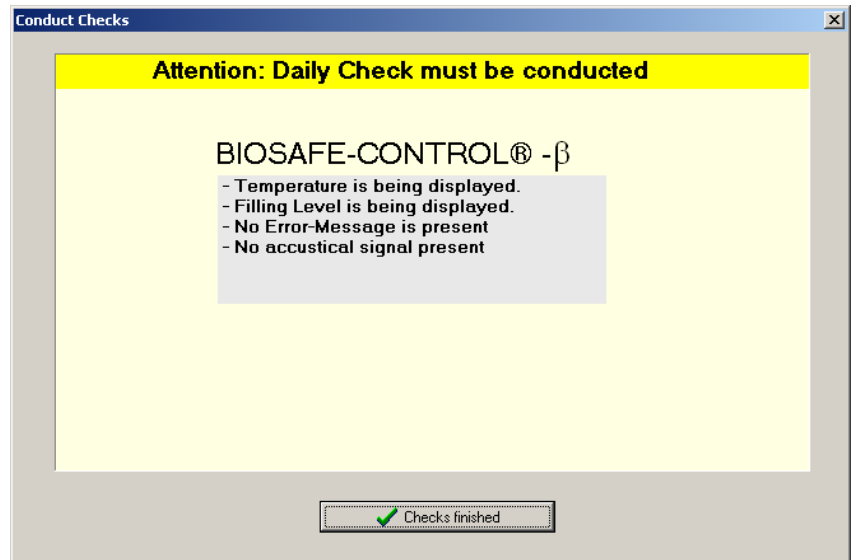
At the display of BIOSAFE-CONTROL® β, this display can be seen.

In normal operation, the following conditions are given:

- Temperature is displayed
- Level is displayed
- No error message on the display
- No acoustic signal

The following display can be seen at the PC in normal operation:



Examination per Working Day

Daily and generally after starting the computer programme, the user is requested to subject the system to a visual examination. By this, a visual examination shall be carried out independently from the computer.

5 Safety

5.1 Safety advices

Cryotherm GmbH & Co. KG recommend that the user request an EU – Safety data sheet for liquid nitrogen at his gas supplier

5.2 How to handle liquid Nitrogen



**Caution when handling liquid nitrogen!
Observe the following documents and procedures:**

- Safety advices „Handling with cryogenic liquefied gases ”
- Information for the road transportation
- When setting up in rooms, ensure good ventilation (TRB 610)
- Operation may only be carried out by persons instructed correspondingly (TRB 700)
- Regulation for the Prevention of Accidents
Regulation by the Central Office for Safety and Health
BGR 500 Chapter 2.33 (former BGV B 6)
- Occupational Safety Regulations

5.3 General Safety Instructions



For safe operation:

- Do not carry out any mechanical and thermal work at the vessel (loss of vacuum).
- Do not overcharge the tank.
- Wear gloves and safety glasses.

5.4 Proper Use according to the Regulations

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

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

5.1 Safety Safety advices

“Handling with cryogenic liquefied gases”

Source: IGV Germany

Publication series: Safe handling of industrial gases

SAFETY NOTES

Safe handling of cryogenically liquefied gases



1. Preliminary remarks

These safety notes are recommendations based on practical experience for the safe handling of cryogenically liquefied gases. These safety notes complement binding safety regulations, they do not replace them.

A gas or a liquid is in an ultra-cold (or cryogenic) state, when its temperature is considerably below -50°C . The table lists some gases that are frequently handled in a cryogenic state.

Before handling cryogenically liquefied gases, it is crucial to carry out a hazard assessment of the work area and/or the equipment.

2. General information on cryogenically liquefied gases

The chemical properties of gases in a cryogenically liquefied state are in principle the same as in the “warm” state. In the ultra-cold state the physical property “cryogenic” is added. This additional property results in special characteristics that require particular attention when handling cryogenically liquefied gases, such as:

- **Contact:** direct contact with cryogenic liquids can cause severe frostbite and/or cold burns. Particularly the eyes can be damaged by accidental splashes.
- **Embrittlement:** materials (e.g. most plastics, machinery steel) become brittle at cryogenic temperatures.

The most important protective measures must be described in the operating instructions and must be observed.

3. Precautionary measures

The precautionary measures described in this paragraph apply to all cryogenically liquefied gases.

They must be applied in conjunction with the precautionary measures described in the Safety Data Sheets for Gases and other applicable security notes, as for example in the security notes regarding **oxygen deficiency**, **oxygen enrichment**, etc.



3.1 Personal protective equipment

If worn continually, personal protective equipment protects from contact with cryogenic gases, liquids or system parts so that any harm to the user's health is virtually impossible.

Clothing should be clean, dry and made of natural fibres. Clothing should be loose-fitting so that it can be taken off quickly and easily when it has come into contact with the cryogenic gas or the liquid. Arms and legs should be covered entirely. There should be no open pockets, turned-up trouser legs or rolled-up sleeves.

Physical properties of some cryogenic gases

Gas	oxygen	nitrogen	argon	hydrogen	helium	LNG	carbon dioxide
Chem. symbol	O ₂	N ₂	Ar	H ₂	He	CH ₄	CO ₂
Boiling temperature at 1013 mbar [$^{\circ}\text{C}$]	-183	-196	-186	-253	-269	-161	-78.5 *)
Density of the liquid at 1013 mbar [kg/l]	1.142	0.808	1.4	0.071	0.125	0.42	1.178 **)
Density of the gas at 15 $^{\circ}\text{C}$, 1013 mbar [kg/m ³]	1.34	1.17	1.67	0.084	0.167	0.72	1.85
Relative density compared to air at 15 $^{\circ}\text{C}$, 1013 mbar	1.09	0.95	1.36	0.0685	0.136	0.55	1.5
Volume of gas [l] derived from 1 l of liquid	853	691	839	845	749	587	832

*) Sublimation temperature

**) at 5.18 bar



When handling cold components and when the user has to be prepared for splashes, **protective gloves** with good insulation properties made of dry material that is not brittle (as for example leather or Kevlar®) must be worn. The gloves should be loose-fitting so that they can be taken off quickly and easily when a cryogenic liquid has entered the gloves. Cuffs should be made in such a way that they prevent easy ingress of liquids.

In situations where splashing cryogenic liquid might reach the eyes, **face protection** must be worn, e.g. when cryogenic liquid is transfused, pipelines are connected or de-connected or when parts are immersed into the cryogenic liquid. Goggles offer only incomplete protection.

When handling cryogenic liquids, **shoes** in good repair with treaded soles must be worn. When handling combustible cryogenic gases or liquids (e.g. liquid hydrogen, liquid natural gas, LNG) shoes with conductive ("antistatic") soles must be worn. All protective footwear manufactured according to EN 345 comply with these requirements but only if they still have the original soles. High boots are not advisable as they cannot be taken off quickly enough.



Respiratory protective equipment might be necessary when the oxygen in the air is displaced by evaporated cryogenic gases. See also safety notes on **oxygen deficiency**.

3.2 Special requirements when handling cryogenically liquefied gases

Cryogenically liquefied gases are generally in a boiling state at atmospheric pressure. When **transfusing** gases into vessels that still have ambient temperature, the boiling initially increases considerably. In the course of this process, the cryogenically liquefied gases may easily splash in conjunction with the evaporating cryogenic gas. For this reason, face and hands must be protected. The same applies to the **immersion** of objects with ambient temperature (or warmer) into cryogenically liquefied gases.

Once the vessels or objects have reached the temperature of the cryogenically liquefied gas, evaporation decreases but the cryogenically liquefied gas remains in a **boiling state**. The heat intake causes the cryogenic gas to leak continuously from the vessel if it is open (e.g. in the case of a dewar). If the vessel is closed, the pressure will rise. The better the insulation of the vessel the slower the **pressure** increase will be.

One litre of cryogenically liquefied gas produces considerable amounts of gas (see table, row 6). Therefore, places where cryogenically liquefied gases in open vessels are handled must be provided with technical **ventilation** equipment that can at least safely divert the developing gas. Sufficient ventilation prevents the oxygen content of the air from changing substantially.



Oxygen enrichment of the air of (normally) 21 percent/Volume to more than approx. 23 percent/Vol. increases the **fire hazard** considerably. Cryogenically liquefied oxygen must therefore not be stored in open vessels.

Although it is true that the cryogenic gases listed in the table do not lead to poisoning as they are non-toxic, these gases (except oxygen) could displace the oxygen in the air which can lead to **asphyxiation** if the oxygen is below 15 percent/Vol.

It should be noted that even low concentrations of carbon dioxide in the air can lead to considerable **breathing disorders**. CO₂-concentrations of around 8 percent/Vol. and above are lethal within seconds.



Further information in this respect can be found in the safety notes: **Oxygen deficiency** and/or **oxygen enrichment**.

Staying in an environment that is supercooled by cryogenic gases can **reduce the body temperature** but breathing in this supercooled air can furthermore lead to lung activity disorders.

When cryogenic gases are mixed in the air, the cooling down of the air can lead to the development of fogs because the **air humidity** condenses. If large amounts of cryogenically liquefied gases are discharged, the developing fog can be so extensive that **visibility is reduced** to an extent hindering orientation. Please note that even outside the fog bank the composition of the air can change considerably.



At the boiling temperature indicated, all gases listed in the table are considerably heavier than air. In places where large amounts of cryogenically liquefied gases could be released, all drains must be provided with a liquid seal, there must be no open cellar windows or any other **open access to lower rooms**, conduits etc. as the heavy gases could accumulate there. In such areas there could be a particularly high asphyxiation and/or fire hazard. **Inert gases** (such as nitrogen, argon, helium, CO₂) do not present a fire hazard. These gases can even be used to extinguish fires.

A fire or explosion hazard can arise from leaking combustible cryogenically liquefied gases (such as liquid hydrogen, LNG) because they will evaporate and thus form an explosive mixture in combination with air. For this reason, effective natural or artificial ventilation is generally necessary. Although not combustible itself, oxygen enhances combustion considerably. Materials considered un-combustible or flame-retardant under atmospheric conditions, may be combustible in oxygen-enriched air – even more so in pure **oxygen**. Once they are ignited, they burn extremely strongly, developing considerable heat. Materials combustible in air (such as oil, tarmac, plastics, ...) react with explosive force in combination with oxygen-enriched air and in pure oxygen. Therefore, contact with such materials must be avoided. Also see safety notes on **oxygen enrichment**



All cryogenic gases with a temperature below the boiling point of oxygen (see table, row 2) can, when handled, lead to a condensation of oxygen in the air and thus to local oxygen enrichment. See safety notes on **oxygen enrichment**.

Only materials that do not **brittle** in the cold may come into contact with cryogenically liquefied gases. Materials suitable for the low temperatures of these gases are for example copper, austenitic steel and some aluminium alloys.

Among plastics, PTFE is suitable under certain conditions. Which materials are suitable in each case should be clarified with the gas supplier.



If cryogenically liquefied gases can be trapped between two valves, **pressure release systems** with a sufficiently large diameter must be provided.

These liquids will evaporate even with the best insulation.

Any gas developing that way must be discharged in order to avoid pipes bursting

Before cryogenically liquefied gases enter devices, vessels, pipelines, fittings, etc., these must be completely dry. Otherwise, the cryogenically liquefied gases would cause the **humidity** to freeze and this in turn can lead to malfunctions (e.g. of safety valves, pressure gauges, ...).



Attention should be paid to the fact that any material shrinks when exposed to low temperatures. The extent of **shrinkage** depends on the material and on the temperature drop. When different materials shrink to a different extent, parts such as screwed flanges or similar connections may leak or break.

4. Transport

In particular when transporting cryogenically liquefied gases the precautionary measures described previously must be complied with. When a transport vessel filled with liquid nitrogen topples in a closed vehicle without ventilation, large amounts of gaseous nitrogen are suddenly released, displacing the aerial oxygen in the vehicle. Apart from that, the condensed air humidity (fog formation) leads to reduced vision inside the vehicle. As a result, both securing the load and ventilation have high priority when transporting cryogenically liquefied gases in vehicles.

5. Environmental protection

All the gases listed in the table (except hydrogen and LNG) are – in different concentrations – to be found in the air. When relatively small amounts (a few litres) of cryogenically liquefied gases evaporate into the atmosphere, this does not stress nor modify the environment for an extended period of time.

When cryogenically liquefied gases are spilled accidentally, this does not lead to a contamination of the ground, because cryogenically liquefied gases evaporate quickly, thus seeping into the soil to a low extent. Temporary freezing of the soil does not result in permanent damage to the soil.



6. Concluding remarks

Cryogenically liquefied gases can only be handled safely, when users have knowledge of the specific properties of these gases and use them sensibly. Misuse of cryogenic gases can cause harm such as frostbite, while the appropriate use of these gases is beneficial in cryosurgery. In other words: Cryogenically liquefied gases have neither good nor bad properties. What matters is that their properties are used correctly. Your gas supplier will tell you how.

IGV

This publication corresponds to the state of technical knowledge at the time of publication. It is the users' own responsibility to check the applicability in their particular case and the topicality of the information at hand. IGV and those who were involved in the preparation of the present publication do not assume any liability.

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IGV – Safety advice:

The original is in German language

Translations into other languages may be carried out by a qualified translation company

5.2 Note
Road Transportation**INFORMATION FOR ROAD TRANSPORTATION**
CRYOGENIC LIQUEFIED GASES: suffocating

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

HAZARDS

Heating results in pressure increase – danger of bursting.
Gas is having a suffocating effect without any observable
symptoms.

The leaked liquid is very cold and evaporates rapidly.
Liquid causes heavy injuries through frostbite on skin and
eyes.

Together with humid air, it generates fog.

Gas is heavier than air and spreads on the ground.

PROTECTIVE EQUIPMENT

Safety glasses, protective gloves or face protection, protective
shoes

**EMERGENCY MEASURES: IMMEDIATELY NOTIFY FIRE
BRIGADE AND POLICE**

Stop the motor.

Secure the road and warn other road users.

Keep unauthorized persons away from the danger zone.

Stay on wind side.

LEAKAGE LOSSES

If possible, remove leakage losses.

Consult an expert.

Have leaked liquid evaporated.

Warn everyone - danger of suffocating existing in sewerage,
cellars and pits.

FIRE:

In case of fire conditions, cool the 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.

5.3 Labelling

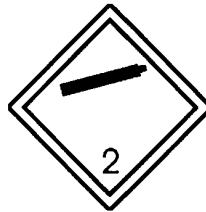
The vessels have to be labelled according to the regulations for hazardous goods for the respective employment.

Cryogenic liquefied Gases

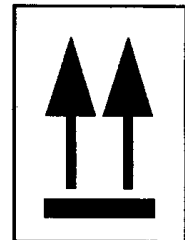
suffocating, Class 2 Figure and Group 3A

Figure and Group	Number, Labelling, Designation of the Medium
3A	1977 nitrogen, cryogenic liquid


Caution Marks



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



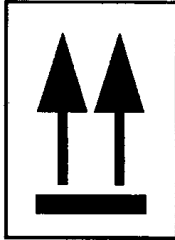
No. 11
This side up;
This label has to
be attached with
the arrow heads
pointing upwards.

 Achtung attention	max. Befülldruck 2 bar max. filling pressure 2 bar
---	---

Attention: max. filling pressure 2 bar

6 Transport and Assembly

6.1 General Transport



Transport of the Vessel

- Observe safety instructions
- Keep upright, max. tilting angle of 10°
- Lift and set down carefully.
- Avoid impacts and strong shocks.
- Transport the vessel only with closed cover.

CHRONOS® 120

For the transport of Vessel **CHRONOS® 120**, two possibilities are given:

- by means of an additional roller base (article no. 78202845)
- by means of a fork lifter

Transport with roller base

The roller base (article no. 78202845) is intended for transporting vessels on small or middle distances (mainly inside buildings) and for shunting inside the laboratory.



Transport should always be carried out by 2 persons!



Danger: trapping of the fingers

CHRONOS® 220/420

For the transport of Vessel **CHRONOS® 220/420**, two possibilities are given:

- by means of the additional transport device (article no. 78202830)
- by means of a fork lifter

Transport with transport device

The transport device (article no. 78202830) is intended for transporting vessels on small or middle distances (mainly inside buildings) and for shunting inside the laboratory.

By means of the transport device, the vessel is slightly lifted in front, is thus placed on four castors and can be moved.



Danger: trapping of the fingers



Danger: Due to the weight of the vessel, the handle of the transport device can hit back. Do not let go of the transport device during transport.



During internal and road transportation with vehicles, protect the vessel from tumbling down, shifting and damage (by stowing / lashing).

6.2 Assembly



Assembly of the Vessel

- Observe safety instructions.
- Ensure good ventilation.
- Consider place of operation.
- Actuate the locking levers of the castors.
- Only operate the vessel under "normal" room conditions (about 20°C, relative humidity about 65%); with larger deviations there exists the danger of frost formation.
- Pay attention to even ground.
- Do not expose the vessel to direct airflow (e.g. fans of technical systems) (danger of frost formation)



The feet with CHRONOS 220/420 can be adjusted in height.

7 Operation



The BIOSAFE[®] 120/220/420 MDB may only be operated by trained personnel !

7.1 Installation / Assembly



The BIOSAFE[®] 120/220/420 MDB may only be installed and commissioned (initial commissioning) by Cryotherm Service staff or by personnel trained by the Cryotherm Service staff.

7.1.1 Assembly of the Fill Line



The fill line consists of:

1. Decanting hose DN10 , 1.5 metres, normally insulated
2. 90° – screwing

Proceed as follows during assembly:

The fill line is fastened to its 90° elbow union with the union nut of the fill connection.

7.1.2 Assembly of BIOSAFE-CONTROL® ß



For this, see separate operating manual BIOSAFE-CONTROL® ß

7.1.3 Connection of the liquid Nitrogen Supply

For the liquid nitrogen supply, the following requirements apply:

- Supply pressure: 0.5 – 2.0 bar
- Liquid nitrogen has to be available as much as possible directly at the connection of the connection line.



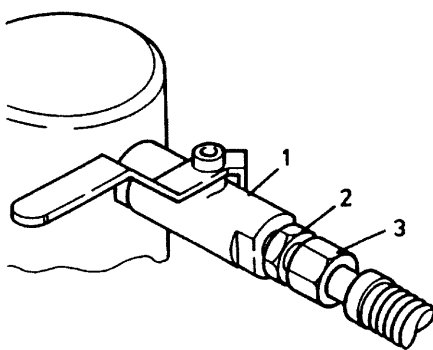
When connecting and exchanging the LIN – vessel, wear gloves and safety glasses.



Cooled connection lines (fill lines) may never be separated from the vessel or the supply line. Penetrating humidity can result in the freezing-in of the solenoid valve!

When connecting the fill line to the vessel or the supply line, please observe as follows:

- After connecting the fill line, open the ball valve for the LIN-withdrawal at the vessel or the supply line to a minimum.
- By repeated pressing of the switch "filling" to "man.", rinse the fill line. Only then open the ball valve completely.



Connecting the connection line (fill line):

- Screw the union nut (3) on the connection screwing (2) of the fill / withdrawal valve (1).
- Tighten the union nut (3) with spanner. At the same time, counter hold with the spanner at the hexagon (2) of the connection screwing.



Retighten the union nut in cold condition.

7.2 Initial Commissioning

Observe safety instructions !



**Caution !
Supply voltage**



Caution when handling liquid nitrogen

- Connect the connecting line.
- Establish the filling pressure of liquid nitrogen supply.
- Open the ball valve to the connecting line.
- Check the connecting line for tightness.



Adjust the requested filling height by means of the level probe of BIOSAFE-CONTROL® β. For this, see separate operating manuals of BIOSAFE-CONTROL® β



The initial filling of the vessel has to be carried out with open cover!



For operating BIOSAFE-CONTROL® β, see separate operating instructions of BIOSAFE-CONTROL® β

7.3 Normal Operation



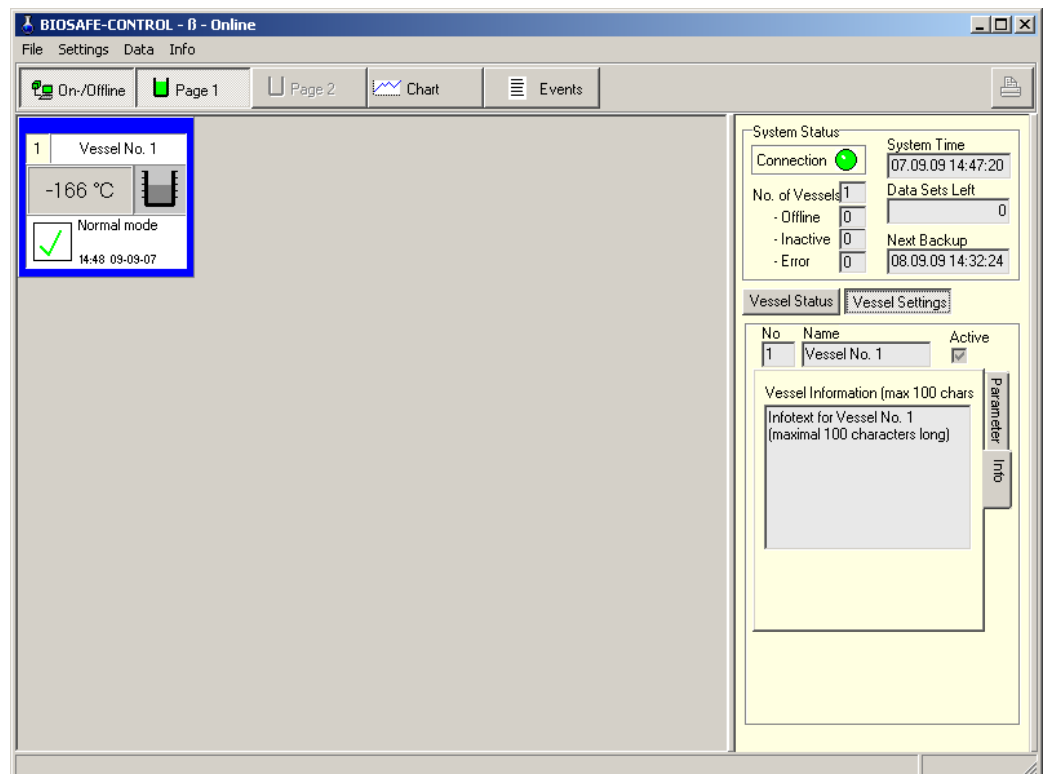
In normal operation, **BIOSAFE-CONTROL® β** controls the LIN level inside the storage vessel automatically between minimum and maximum!

At the display of BIOSAFE-CONTROL® β, this display can be seen.

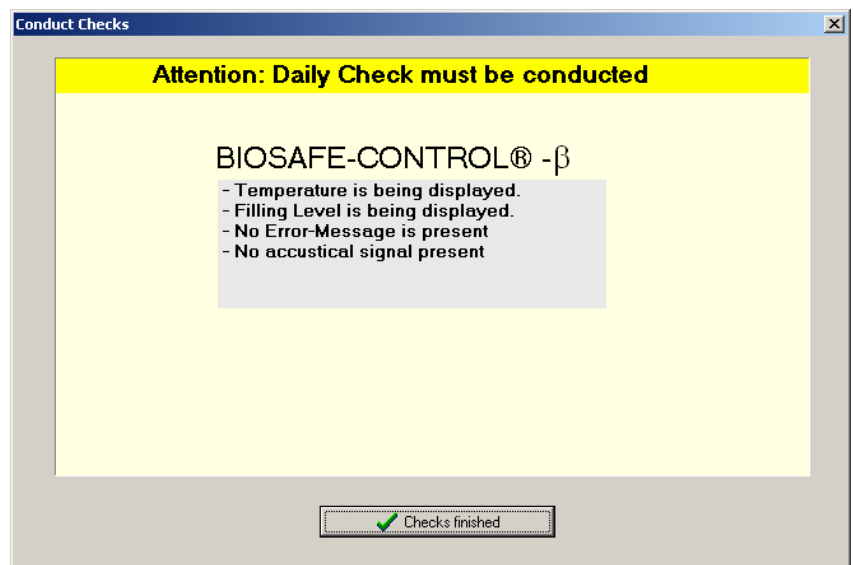
In normal operation, the following conditions are given:

- Temperature is displayed
- Level is displayed
- No error message on the display
- No acoustic signal

The following display can be seen at the PC in normal operation:



Examination per Working Day



Daily and generally after starting the computer programme, the user is requested to subject the system to a visual examination. By this, a visual examination shall be carried out independently from the computer.

7.4 Storing and Taking-out of Samples

The **CHRONOS®** Vessels should be open only for a short period of time. Prior to storing and taking-out, determine the position of the sample inside the vessel.



Caution!

- Observe the safety instructions.
- Observe the requirements of the sorting system.
- Wear gloves and safety glasses.
- The level is changed by the storing and taking-out of the towers. Due to this, the automatic level control can refill liquid nitrogen. There exists the danger of splashes.
- The wrapping of the samples can be very brittle in intensely cooled condition. Caution when handling.

Storing



Always store only one tower or a similar sample vessel at once in the vessel (penetration of additional heat into the vessel).

- Prior to storing, determine a free position for the sample inside the vessel.
- Slowly open the cover. That limits nebulosity and improves the view on the sorting system.
- Pull out the free tower and put it down on the other towers.
- Store the marked sample in the free position determined before.
- Put back the tower to its original place inside the **CHRONOS®** Vessel.
- Close the cover.

Taking-out

- Prior to taking-out, determine the position of the sample inside the container.
- Slowly open the cover. That limits nebulosity and improves the view on the sorting system.
- Pull out the tower with the desired sample and put it down on the other towers.
- Take out the sample.
- Examine the marking of the sample.
- Put back the tower to its original place inside the **CHRONOS®** Vessel.
- Close the cover.

7.5 Putting out of Operation / Cleaning

When putting out of operation,

- empty the vessel completely.

When the vessel has reached room temperature,



**Remove the storage shelf and storage frame.
Dry the vessel after putting out of operation.**



Carefully dry the gap between inner vessel wall and inner vessel bottom!

Incomplete drying can result in a damage of the vessel !
(freezing-out of condensation water / corrosion)!

- Clean the sample room, storage shelf and storage frame.

When cleaning the vessel, please observe as follows:

- No temperatures exceeding 80°C.
- Use only detergents compatible with plastics at the cover. If necessary, test compatibility first.
- Use only detergents compatible with stainless steel at the vessel.
- Decontaminate the vessel.



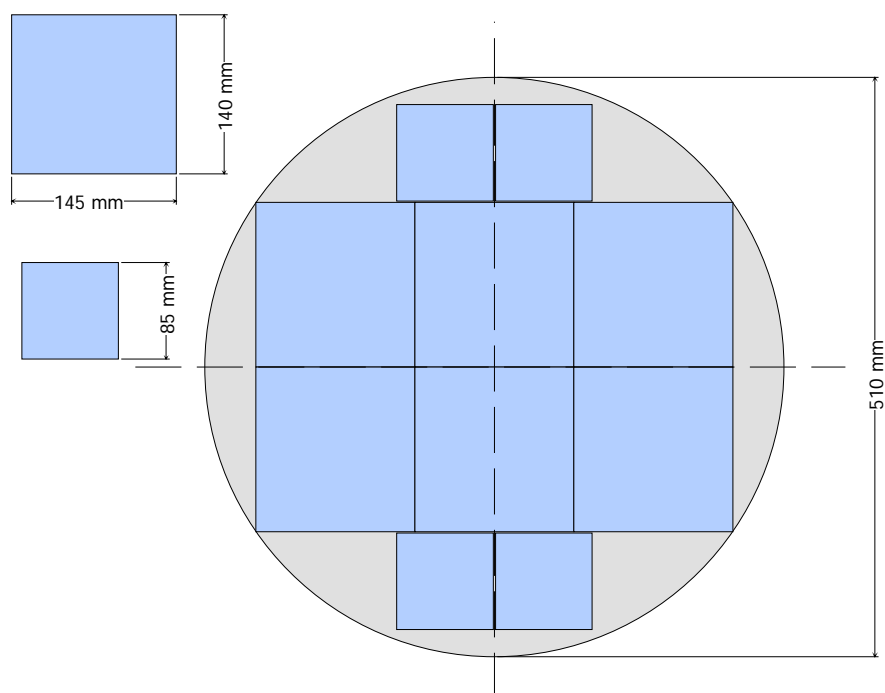
The positive pressure relief and seal-off valve contains an O-ring made of buna N. If necessary, avoid contact with the detergent.



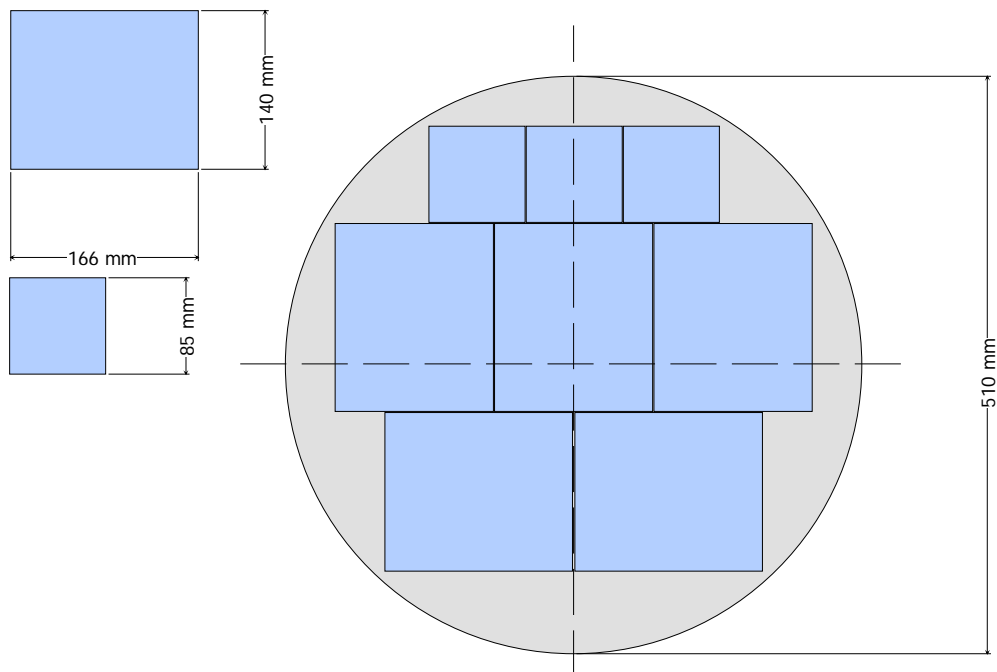
When returning the vessel to the manufacturer, make sure to enclose the filled-in declaration of decontamination.

8 Accessories

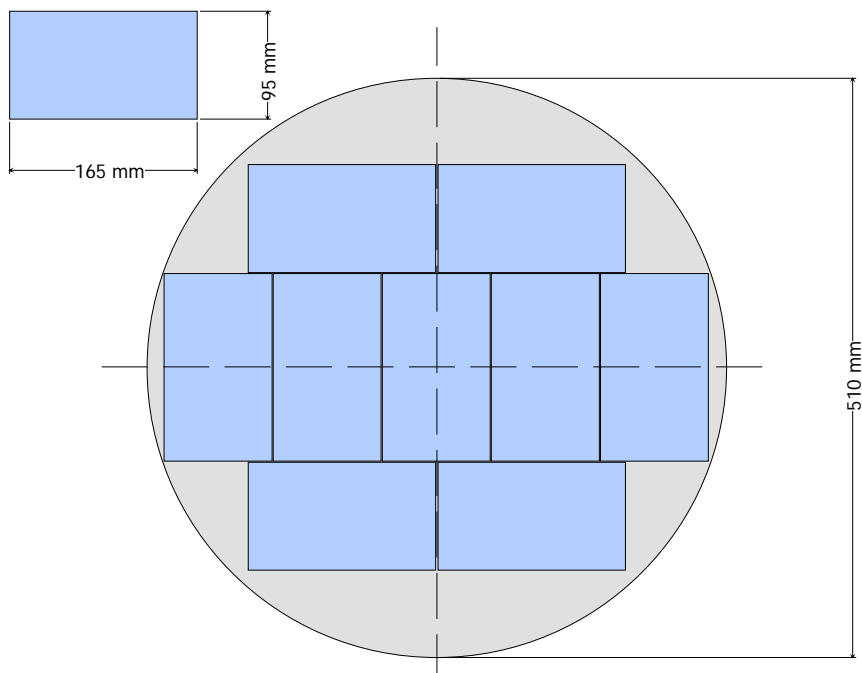
8.1.1 Sorting System CHRONOS® 120



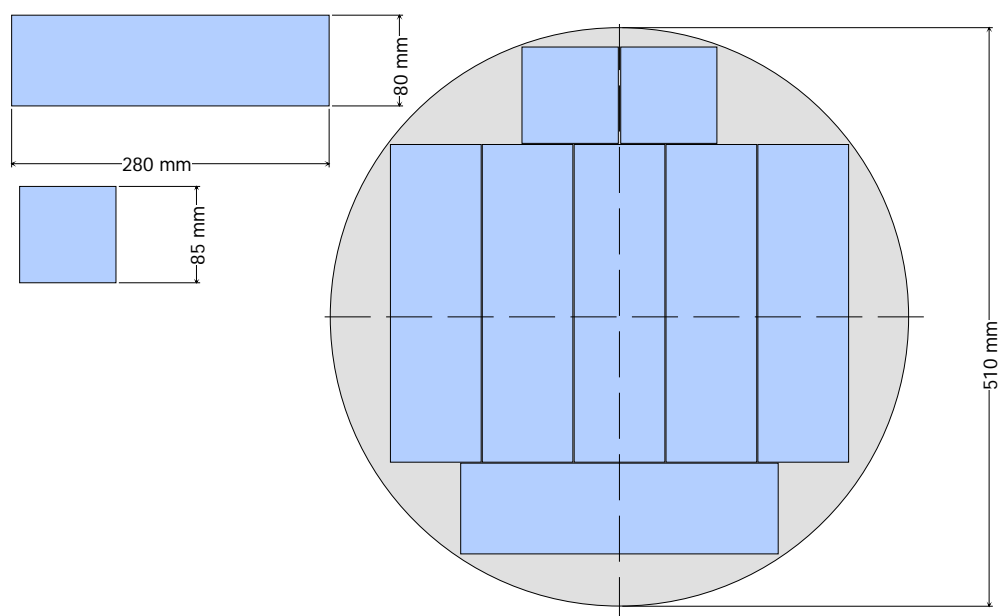
CHRONOS® 120,
Towers 78202833 and 78202834 (140x145 mm)
Towers 78202835, 78202836 (85x85 mm)



CHRONOS® 120,
Towers 78202837 and 78202838 (140x166 mm),
Towers 78202835 and 78202836 (85x85 mm)



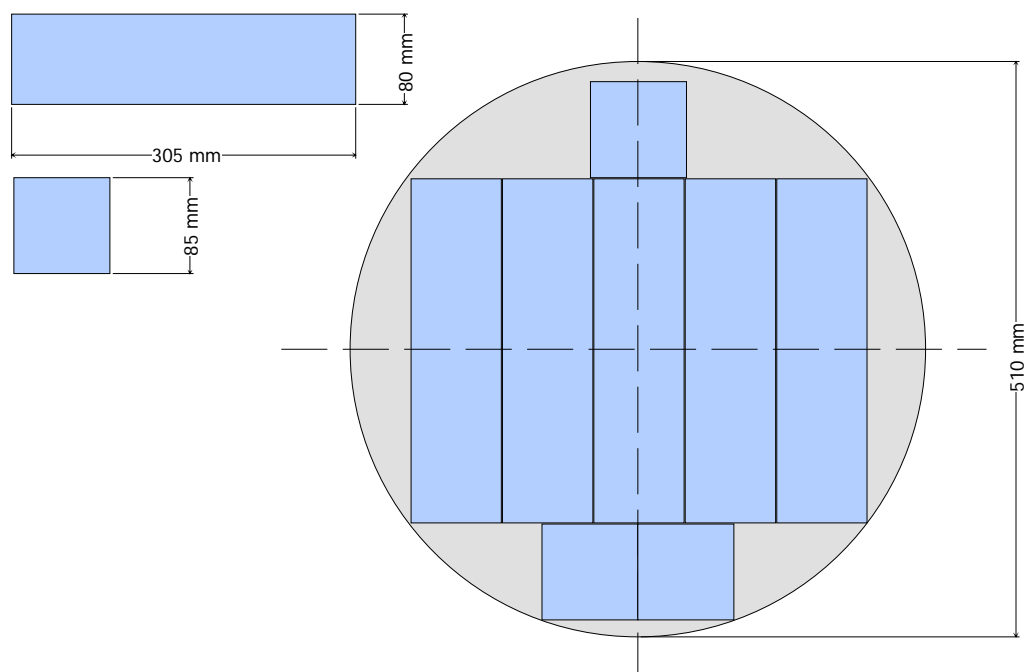
CHRONOS® 120
Towers 77031511 (95 x 165 mm)



CHRONOS® 120

Towers 78202831 (80 x 280 mm)

Towers 78202835, 78202836 (85x85 mm)

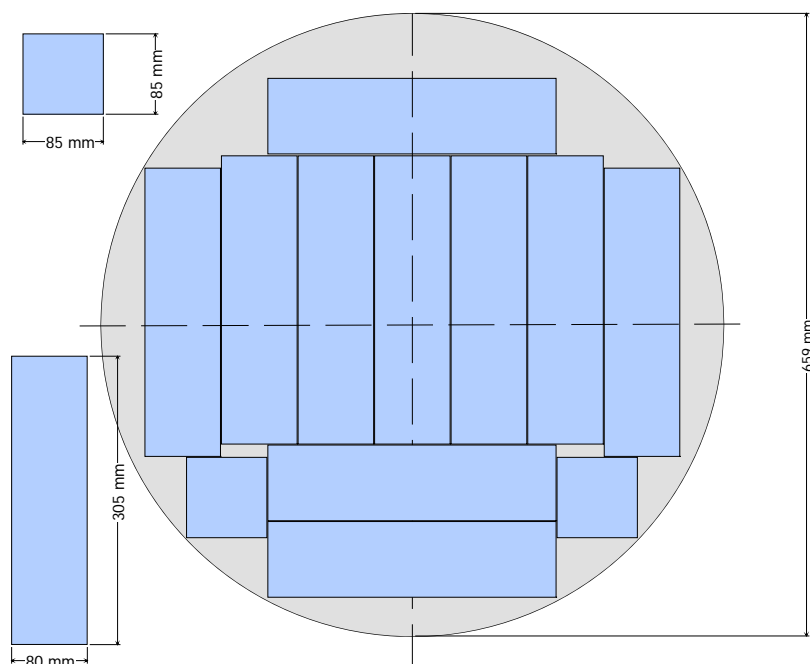


CHRONOS® 120,

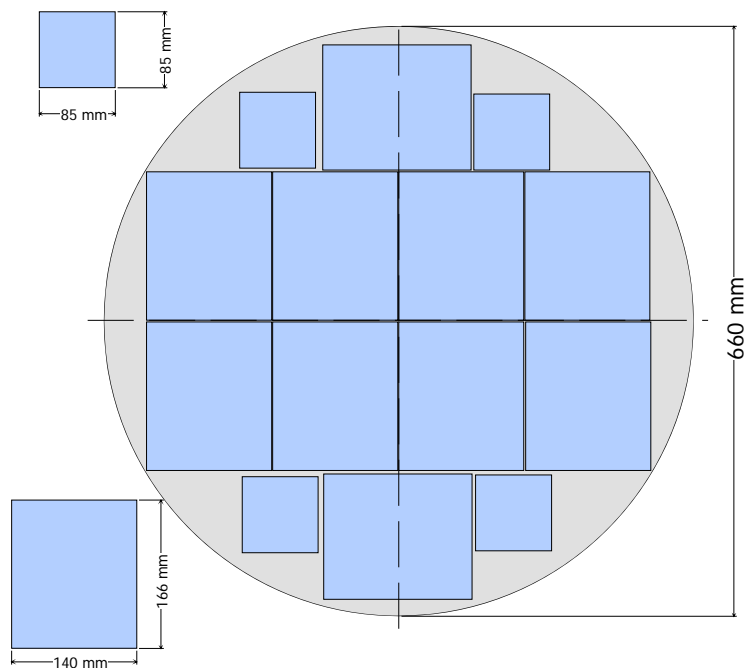
Towers 78202832 (80 x 305 mm)

Towers 78202835, 78202836 (85x85 mm)

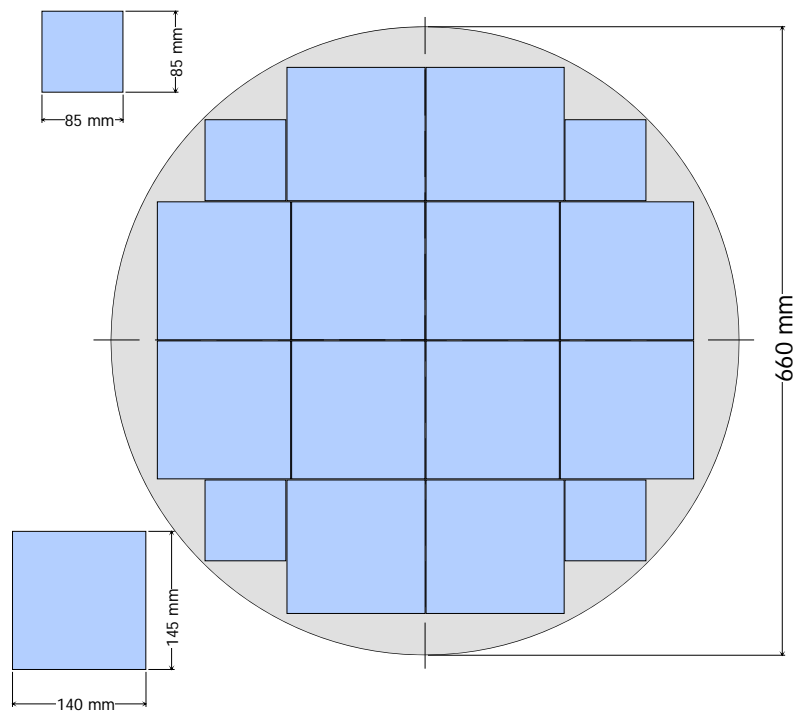
8.1.2 Sorting System CHRONOS® 220



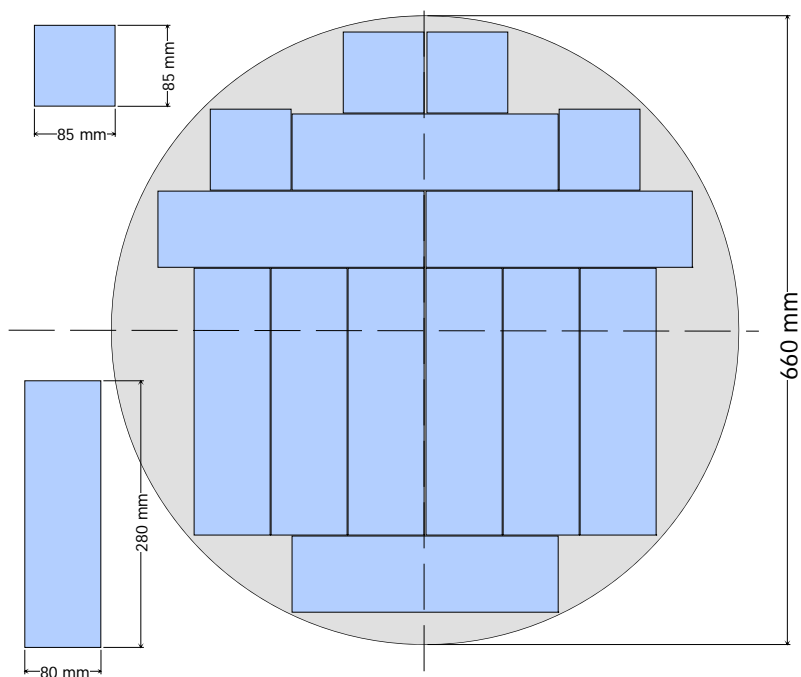
CHRONOS® 220
Towers 78202832 (80 x 305 mm)
and 78202835, 78202836 (85x85 mm)



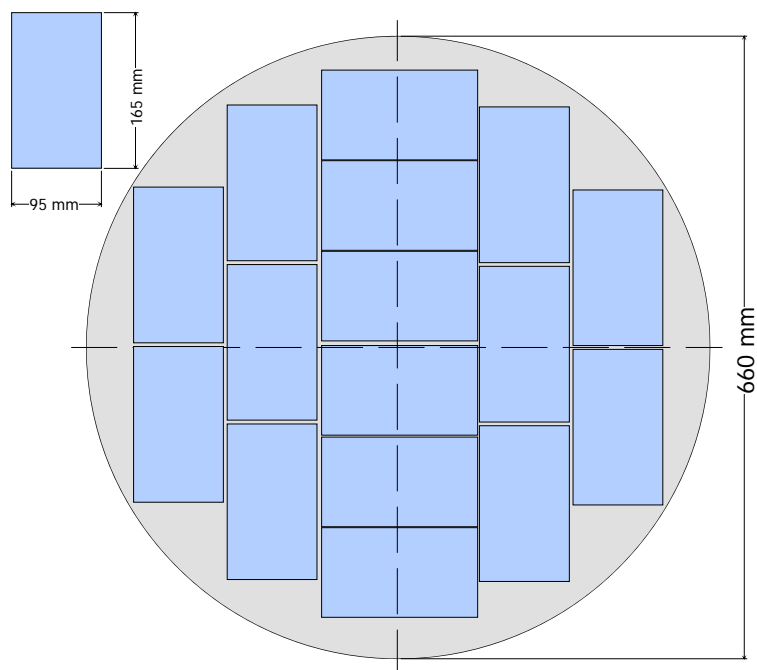
CHRONOS® 220
Towers 78202837, 78202838 (140x166 mm),
and 78202835, 78202836 (85x85 mm)



CHRONOS® 220
Towers 78202833 and 78202834 (140x145 mm),
and 78202835, 78202836 (85x85 mm)

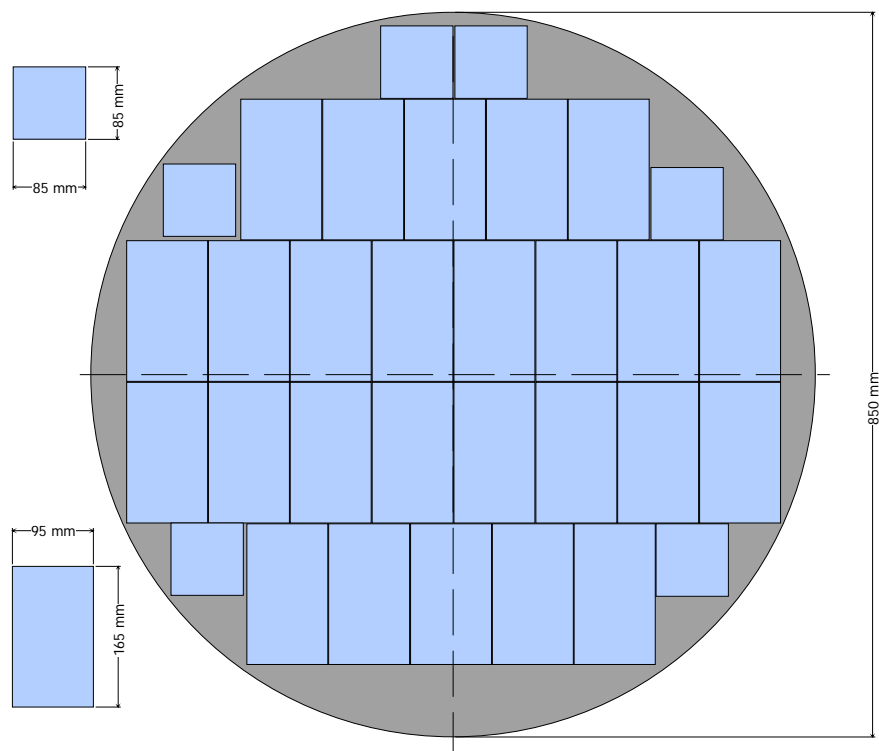


CHRONOS® 220
Towers 78202831 (80 x 280 mm)
and 78202835, 78202836 (85x85 mm)

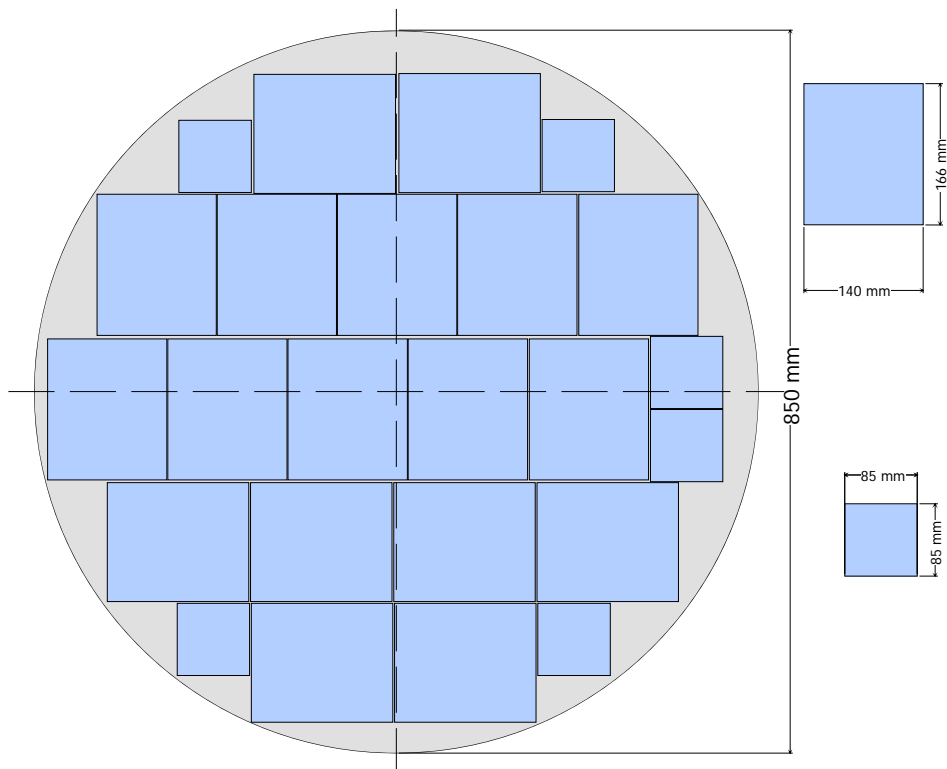


CHRONOS® 220
Towers 77031511 (95 x 165 mm)

8.1.3 Sorting system CHRONOS® 420

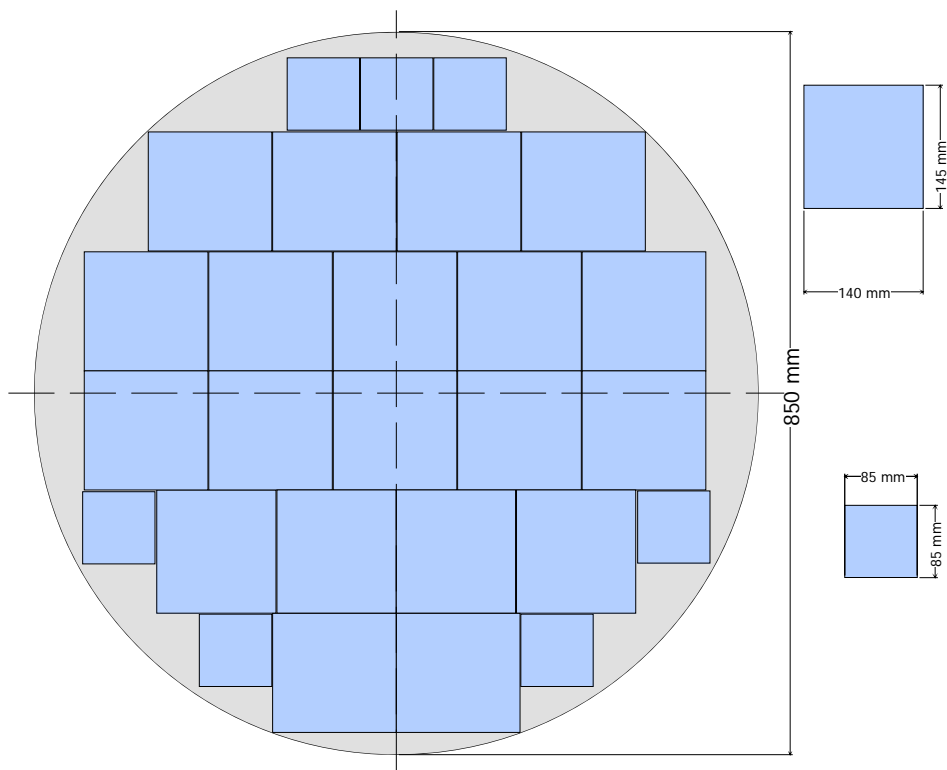


CHRONOS® 420
Towers 77031511 (95x165 mm)
and 78202835, 78202836 (85 x 85 mm)



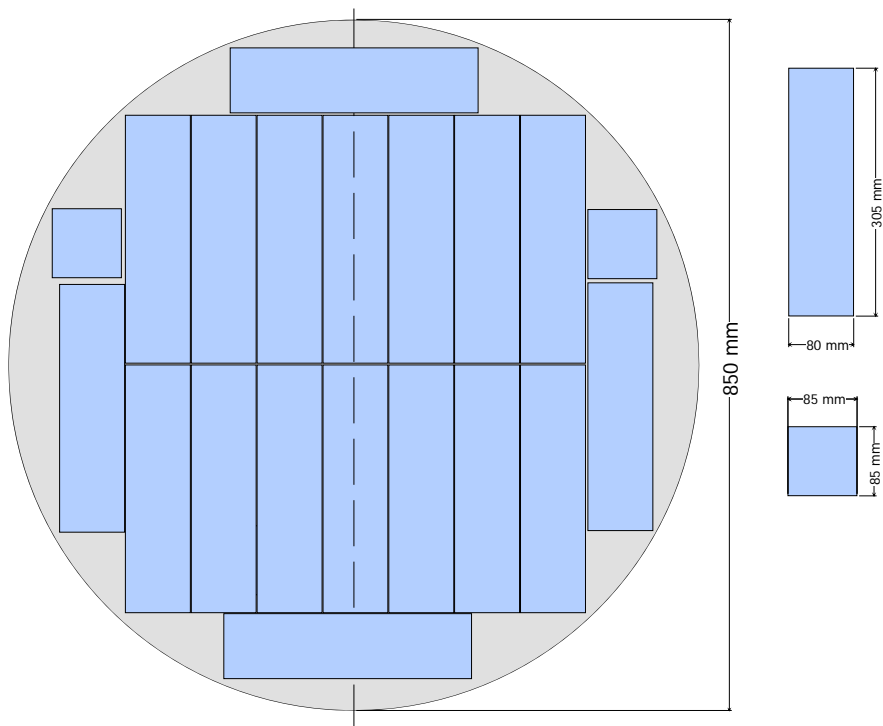
CHRONOS® 420

Towers 78202837, 78202838 (140x166 mm),
and 78202835, 78202836 (85x85 mm)

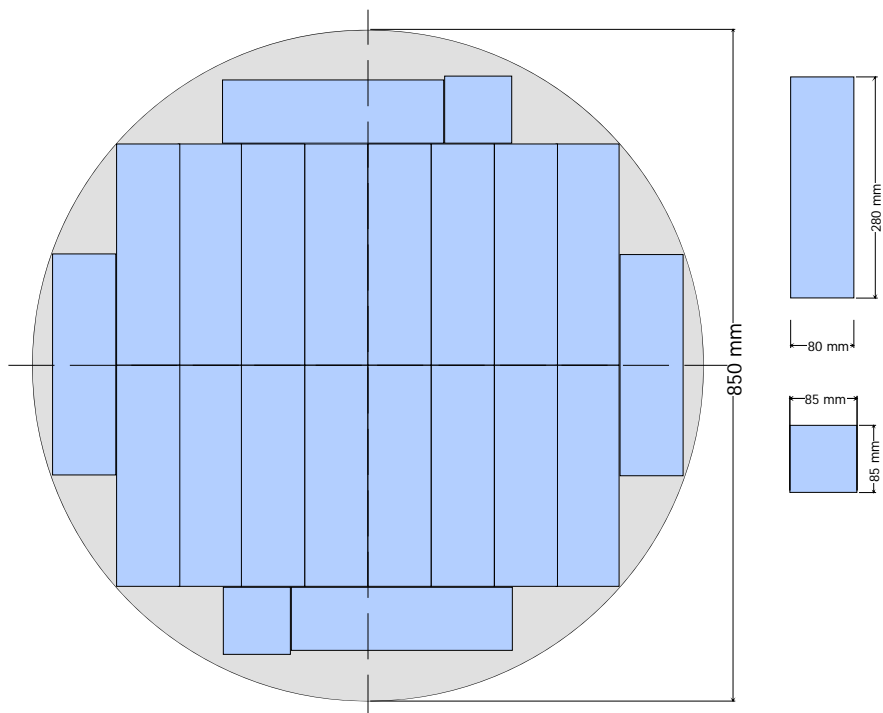


CHRONOS® 420

Towers 78202833, 78202834 (140x145 mm),
and 78202835, 78202836 (85x85 mm)



CHRONOS® 420
Towers 78202832 (80 x 305 mm)
and 78202835, 78202836 (85x85 mm)



CHRONOS® 420
Towers 78202831 (80 x 280 mm)
and 78202835, 78202836 (85x85 mm)

Requirements:

Good thermoconducting material (e. g. aluminum) for producing a constant temperature distribution inside the vessel. For this, a complete insertion of the vessel according to the sketch is absolutely necessary.



The sorting system and the sample wrappings (e. g. bags or ampoules) have to match. A damage of the sample wrapping by the sorting system has to be excluded.



The position of each sample inside the vessel has to be clear and unmistakable by the sorting system and a corresponding labelling.



It has to be possible to fix the samples in their position. The falling-out of the sample and the floating-out from the holding device has to be avoided.



The sorting system has to be adjusted to the vessel in height (The cover may not stand on the sorting system).



The sample wrappings and the labelling material have to be suitable for the application in liquid nitrogen.



The sample wrappings have to reliably prevent the liquid nitrogen from penetrating and the escaping of the wrapping contents.



Avoid the outer contamination of the sample wrapping.

9 Maintenance / Repair

Examination and maintenance work at the **BIOSAFE**
® **120/220/420 MDß** has to be carried out at regular intervals.



Maintenance and repair work may only be carried out by trained and instructed skilled personal. Visual examinations and operational checks can be carried out by instructed users (operators).

Service Hotline

02741 - 95 85 75

9.1 Scope of Maintenance



Once a year, a maintenance has to be carried out. This maintenance may only be carried out by:

- Cryotherm service personnel
- Skilled personnel specially trained for this medical device by the manufacturer

CHRONOS®:

- visual examination (outer condition, stability)
- examination for undue frost formation
- examination of the castors
- examine the cover for damage (handles, insulation, outer condition)
- examine the pressure in the gas pressure spring of the cover opening mechanism
- visual examination (outer condition) of the LIN line
- clean the solenoid valve, check the function
- clean the LIN filter

BIOSAFE-CONTROL® ß:

Visual examination

- examination of outer condition
- fastening
- plug-in connections
- cables
- leadthroughs

Examination of all functions:

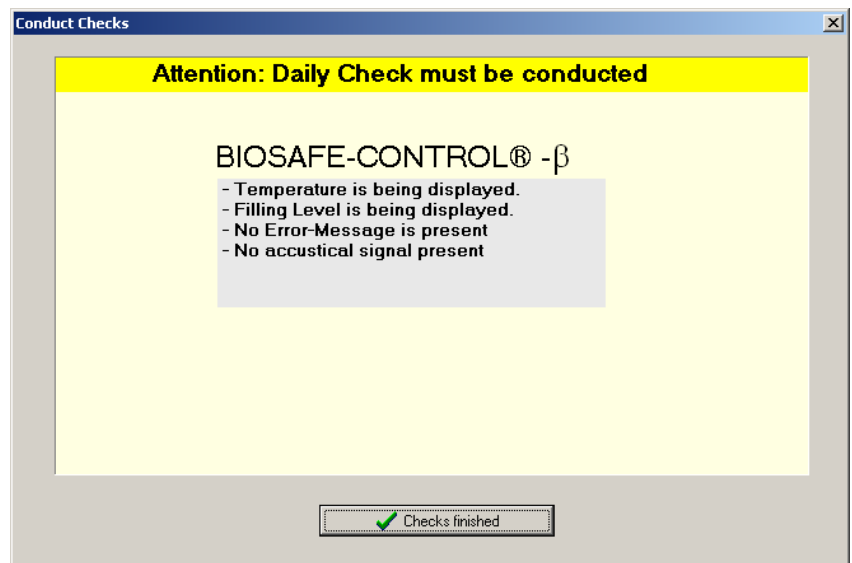
- temperature measurement
- displays
- switching functions automatic and manual filling
- alarm functions
- data transmission
- function of the software
- relay outputs alarm (I/O box, if required)
- examination of the set parameters
- examination of battery voltage, exchange if required
- examination of the electrical safety

We recommend to conclude a service contract with Cryotherm GmbH & Co. KG for the yearly maintenance !

Additionally to the yearly maintenance, the following examinations have to be carried out by the user weekly:

- visual examination of the vessel and the connecting line
- check all connections for tightness (visual examinations)
- check the function of the solenoid valve
- visual examination of the electrical connecting cables

In addition to the weekly examination, the following examinations have to be carried out at the BIOSAFE-CONTROL® β by the user per working day:



9.2 Declaration of Decontamination

In case of returning the **BIOSAFE® 120/220/420 MDß** (or parts), the declaration of decontamination must by all means be completed and enclosed.

Cryotherm

Certificate of Clearance / Decontamination

This clearance / decontamination certificate applies for cryogenic operating and (specimen) storage vessels. The observance of legal regulations and guidelines in the fields of health and environment protection obliges all companies to protect human beings and the environment from harmful impacts when handling hazardous substances. Therefore, this declaration is the precondition for a corresponding order. Irrespective of this, we reserve the right to accept the order.

Contractor:

Cryotherm GmbH & Co. KG Tel. (0049-27 41) 95 85-0
Euteneuen 4 Fax (0049- 27 41) 69 00
D-57548 Kirchen (Sieg)

Reason for order:

☐ Scrapping ☐ Return of rental vessel ☐ Maintenance/Inspection ☐ Repair ☐ Other

Fault

description:

.....

Vessel type:	Vessel no.:	Year of construction:

☐ Was application-specifically contaminated with harmful substances and **was decontaminated professionally.**

☐ Was **not** contaminated with **any harmful substances** (chemical, biological...)

Decontamination effected

Name, date, signature

Legal statement

We ensure that the information given in this declaration is true and complete and that the signatory is able to assess this. We are aware that we are liable for damage resulting from incomplete or incorrect information towards the contractor. We oblige ourselves to release the contractor from claims for damages of third parties. Furthermore, we are aware that, independent of this declaration, we are directly liable towards third parties to which the contractor's staff in particular belongs that is entrusted with the handling/repair of the product.

Phone : Fax : e-mail:

Name of the authorized person:
(in block letters)

Position: Company stamp:

Legal signature: Date :

A taking-over for repair/maintenance/scrapping of vessels or vessel parts is only effected if this declaration is correctly and completely filled-in and handed over by the operator.

Acceptance of the vessel through the contractor service technician, carrier)

Name, date, signature:

FM7.5-10CG e Rev. 0

9.3 Spare Parts

Spare Parts for CHRONOS® Vessels:

	Spare parts for CHRONOS®- Vessels:	CHRONOS® 120	CHRONOS® 220	CHRONOS® 420
1.	Cover for CHRONOS® 120/220/420	78202811	78202810	78202809
2.	Roller base	78202845		
3.	Castor with a diameter of Ø 80 mm without locking lever		77031491	77031491
4.	Mini blow-off valve	77031419	77031419	77031419
5.	Solenoid valve 3/8" DN5,6, 220V, 50Hz, 16,7 W, 7 bar	0346709	0346709	0346709
6.	Operating instructions BIOSAFE® 120/220/420 MDß	78203751	78203751	78203751
7.	Blind cap 1/4"	79404869	79404869	79404869
8.	Cryotherm logo	77031446	77031446	77031446
9.	Lettering BIOSAFE® MDß	77031598	77031598	77031598
10.	Rating plate BIOSAFE®MDß	79421988	79421988	79421988
	GGVS / ADR - labelling			
11.	GGVS adhesive label no. 2	0358193	0358193	0358193
12.	GGVS adhesive label ↑↑ no. 11	0356199	0356199	0356199
13.	Label liquid cryogenic nitrogen	78400571	78400571	78400571
14.	Operating manual BIOSAFE-CONTROL® ß	78203750	78203750	78203750

10 Faults



Faults at the level control unit and the vessel control system BIOSAFE - CONTROL® ß are visually indicated on the display and acoustically by a horn.

If the cause of the fault cannot be determined or removed, inform the manufacturer without delay.

Service - Hotline: +49 (0) 2741-95 85 75



The BIOSAFE® 120/220/420 MDß has a LIN reserve below the storage shelf. This reserve guarantees the requested storage temperature of $\leq -130^{\circ}\text{C}$ also with a minimum filling ratio (LIN – level in storage shelf height) for another

4.5 days	with BIOSAFE® 120 MDß
5 days	with BIOSAFE® 220 MDß
8 days	with BIOSAFE® 420 MDß

after occurrence of a fault in the liquid nitrogen supply.

This period of time only applies if the vessel is not opened during this time.

With higher filling ratio, this residual holding time is correspondingly higher (for this, also see the specifications of the vessel).

10.1 General



Immediately put the BIOSAFE[®] 120/220/420 MDß out of operation, in case that

- the rate of evaporation is too high.
- the outer vessel is thawed / iced-up, which indicates loss of vacuum (does not apply during and immediately after filling)
- **Rearrange the samples before putting out of operation!**



In case of nitrogen 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 any queries, please indicate

- type
- system no.
- year of construction

10.2 Possible Faults CHRONOS®

Fault	Cause	Trouble shooting
Level too low.	The supply of liquid nitrogen is defective. Fault at the level control unit and vessel control system BIOSAFE-CONTROL® β	Open the liquid nitrogen supply. Examine the level and the pressure of the store tank and the function of the valves. See separate operating manual of BIOSAFE-CONTROL® β
Level too high, liquid nitrogen overflows, the cover floats	Supply of liquid nitrogen defective Fault at the level control unit and vessel control system BIOSAFE-CONTROL® β	Close the supply of liquid nitrogen, check the function of the valves See separate operating manual of BIOSAFE-CONTROL® β
Frost formation on the vessel		
Upper vessel edge thawed	This is operational after refilling or cooling-in. Vessel is directly exposed to strong air-flow	dry up, if necessary avoid direct blowing against the vessel
Iced-up cover	This is operational after frequent opening	If necessary, remove the ice carefully
Outer vessel iced-up	Loss of vacuum The vessel is directly exposed to strong airflow.	Examination / Reevacuation by the manufacturer avoid direct blow-against of the vessel
Positive pressure relief and seal-off device actuated, vessel extremely iced-up	Loss of vacuum / pressure inside the vacuum room	Empty out the vessel / put it out of operation Examination / repair at the manufacturer's works


Fault	Cause	Trouble shooting
The cover cannot be opened.	Possible frost formation at the cover edge can possibly result in the fact that the cover cannot be opened.	For opening, loosen the cover with lateral movements and moderate pulling upwards at the handles.

11 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.

Cryotherm

Produktname product name		BIOSAFE® MD3
Typ type		
System-Nr. system-no.	SN	
Baujahr year of construction		
Artikelnummer article-no.	REF	

CE 0482
Klasse / class IIa 93/42/EWG

 Cryotherm GmbH & Co. KG
Euteneuen 4, 57548 Kirchen (Sieg) Made in Germany, RLP
www.cryotherm.de

Cryotherm

Typ type	CHRONOS®	
Herstell - Nr. fabr.no.		
Baujahr year of construction		
Leergewicht empty weight	kg	

	Innenbehälter inner vessel	Außenbehälter outer vessel
zul. Betriebsüberdruck working pressure	bar	-1 bar
tiefste Betriebstemp. working temperature	°C	-20°C
Fluid		
Inhalt volume	l	l

Made in Germany Cryotherm GmbH & Co. KG 57548 Kirchen (Sieg)

Cryotherm

IP41		
BIOSAFE-CONTROL® β		
Modell	Geräte Nr.	
230V	50/60Hz	43(86)VA

Cryotherm GmbH & Co. KG Euteneuen 4
Made in Germany 57548 Kirchen (Sieg)

Cryotherm

IP41		
I/O Box		
Modell	Geräte Nr.	
9V	---	300mA

Cryotherm GmbH & Co. KG Euteneuen 4
Made in Germany 57548 Kirchen (Sieg)

Cryotherm GmbH & Co. KG certified according to DIN EN 13485
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Cryotherm

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