LiCONiC
INSTRUMENTS

Operating Manual

for

Liconic Kiwi Stores

KIWI STORE
DF, ULT

Important Notice

The Information contained in this document is subject to change without notice.

Information provided by LiCONiC AG is believed to be accurate and reliable. However, the user is responsible for the proper and correct use of the product. No license is granted by acquisition of the product for any patent or patent rights of LiCONiC. If the user does not follow the instructions given in this manual, LiCONiC does not take any responsibility for injuries or damages caused by the LiCONiC product.

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Before operating the instrument, the user must read and understand this manual.

Installation and Servicing

Installation, servicing and reinstallation of the instrument shall only be performed by System Integrators and / or service personnel authorized by LiCONiC AG.

LiCONiC regularly offers Operator Training Courses. We highly recommend the attendance of such a course prior to working with a LiCONiC Instrument.

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Introduction

1. About the Product and its Manual

1.1 Intended Use

The LiCONiC Kiwi Store is intended for storage, identification and transfer of Microplates and Tubes. It is to be applied exclusively in the research field. The LiCONiC Kiwi Store is intended to work as a stand alone unit or an element in an automated system.

1.2 Unintended Use

Due to its open architecture, the LiCONiC Kiwi Store is NOT intended for regulated clinical and diagnostic applications (IvD Directive).

Read the safety instructions in this Manual carefully.

1.3 Product Identification

The Type Plate is located at the rear of the LiCONiC STC
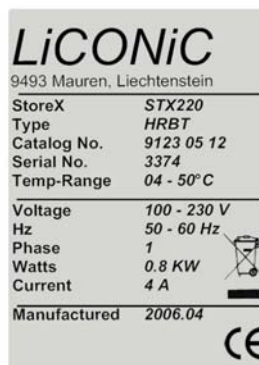
For future reference, please read the instrument Serial No. on the rear of your instrument and write it in the provided space.

1.4 Scope of Delivery

- Basic Unit, consisting of a Plate Handling, a Gate and the storage chamber
- Cooling unit for storage chamber
- Interface Unit, consisting of the a Handling, a Gate, the Tube Handling and the storage chamber
- Product Documents
- Cables
- User Software and Drivers
- Stackers (as specified)
- Transfer Station (as specified)
- Redundant Cooling (only if ordered)
- LN2 Backup (only if ordered, does not include DEWAR)

1.5 General

The LiCONiC Kiwi Store is a complete product for end users. But it can also be delivered to professional System Integrators who take responsibility for safe installation and documentation of the entire system.

In case of Integration, do not operate until it has been established that the system, into which the LiCONiC KIWI STRORE has been incorporated is in compliance with all local safety regulations.

1.6 Definitions

Operator:	Any person who uses the equipment for its intended purpose.
System Integrator:	Authorized person or company responsible for integration, installation, initial start up and overall safety of the system.
Authorized Engineer	Authorized person responsible for installation, initial start up.
	Person who carries out service and maintenance tasks and is therefore contacted in the case of any problems with the system.

1.7 Target User Group

The Kiwi Store has been conceived for applications in the research field.

Instrument operation requires a trained user.

1.8 Importance of the Safety Instructions

This chapter contains general information assuring safe operation of the instrument. More specific instructions in regard to safety are given throughout this manual, at the respective points where observation is most important.

Make sure that all Safety Instructions in this publication are strictly followed.

1.9   Labels

Throughout this publication, Warning Notices are to be interpreted as follows:

WARNING !
Indicates the possibility of severe personal injury, loss of life or equipment damage if instructions are not followed.

CAUTION !
Indicates the possibility of severe equipment damage if instructions are not followed.

NOTE !
Gives helpful information about the equipment.

DANGER !
May be harmful to your eyes.

1.10   Safety - Basics

1.10.1   General Operating Hazards

Carefully observe the following precautions:

1.10.2   Mechanical Hazards

Keep the housing and safety panels closed and never reach into the instrument work space when the unit is in operating mode.

1.10.3   Electrical Hazards

Keep the housing and safety panels closed. Before opening any of the panels disconnect the power supply to avoid electrical shock.

1.10.4   Chemical, Biological and Radioactive Hazards

All samples and test-kit components must be considered as potentially hazardous agents. Therefore, a potential risk may arise from the liquids being handled, such as infectious biological samples, toxic or corrosive chemicals, or radioactive substances. Strictly apply appropriate safety precautions according to local, state and federal regulations.

Prior to any first time application, test runs should be made with a neutral liquid to allow optimization of all liquid handling parameters.

Handling and disposing of waste has to be in accordance with all local, state and federal environmental, health and safety laws and regulations.

Prior to executing any maintenance task on the instrument or sending it, or parts of it for repair, the instrument or the parts have to be thoroughly decontaminated.

1.10.5 Extreme Temperature Hazards

All surfaces inside the storage chambers, interface and some parts of the refrigeration may be considered as potentially dangerous if touched without sufficient protective clothing. All components externally to the chamber are protected and are not able to be touched. Only if protective covers are removed components with extreme cold or heat may be touchable.

Inside the chamber temperatures below zero degree Celsius are present. Contact to any surfaces with bear skin should be avoided. Protective clothing has to be worn when manual operations are performed inside the chamber.

1.10.6 Suffocation Hazard

When entering the service are of the Storage chamber a potential risk of suffocation is present. A maximum of 15 minutes is given to stay in the service are without a respirator. When entered the service area a O2 monitor has to be worn under any circumstances. The monitor has to provide at least an adjustable O2 low limit and an acoustic alert when O2 level is to low.

It is not allowed to work inside the system alone. A second person has to be outside surveying the work inside and to be in permanent contact with a radio with the person inside.

1.11 General Safety Regulations

1.11.1 Legal Requirements

Please consult the Manufacturer's Declaration, delivered with each unit by LiCONiC AG, listing all applied directives and standards.

In Europe, the System Integrator must provide a Conformity Declaration upon final installation of the entire system.

1.11.2 General Inspection and Maintenance Duties

Only an authorized Engineer shall carry out inspection, maintenance and repair tasks.

1.11.3 Spare Parts to be used

Only original LiCONiC Spare Parts may be used. If other parts are used during the normal warranty period, the manufacturer's guarantee may be invalidated.

1.11.4 Modifications

Modifications shall only be carried out by an authorized Engineer. LiCONiC AG will not accept responsibility for any claim resulting from unauthorized modification or alteration.

General

2. The Kiwi Store Family

2.1 Kiwi Store

The Kiwi Store Series is the most compact Storage with Integrated Handling that covers tube and plate storage needs at –20°C and –80°C. The Kiwi Store Series offers dry climate storage.

The modular mechanical design in combination with extremely simple commands eases the integration of a Kiwi Store into any environment. A growing number of accessories are available for the Kiwi Store Series.

2.2 Kiwi Store Features

All Kiwi Store units have compact dimensions. The Kiwi Store has a user front door which allows comfortable and easy access for manual operation. The internal glass door allows visual inspection of the content and operation of the system without disturbing the internal climate. Removable stackers make the use of the Kiwi Store even simpler and more efficient. Stackers are available for all common plate types.
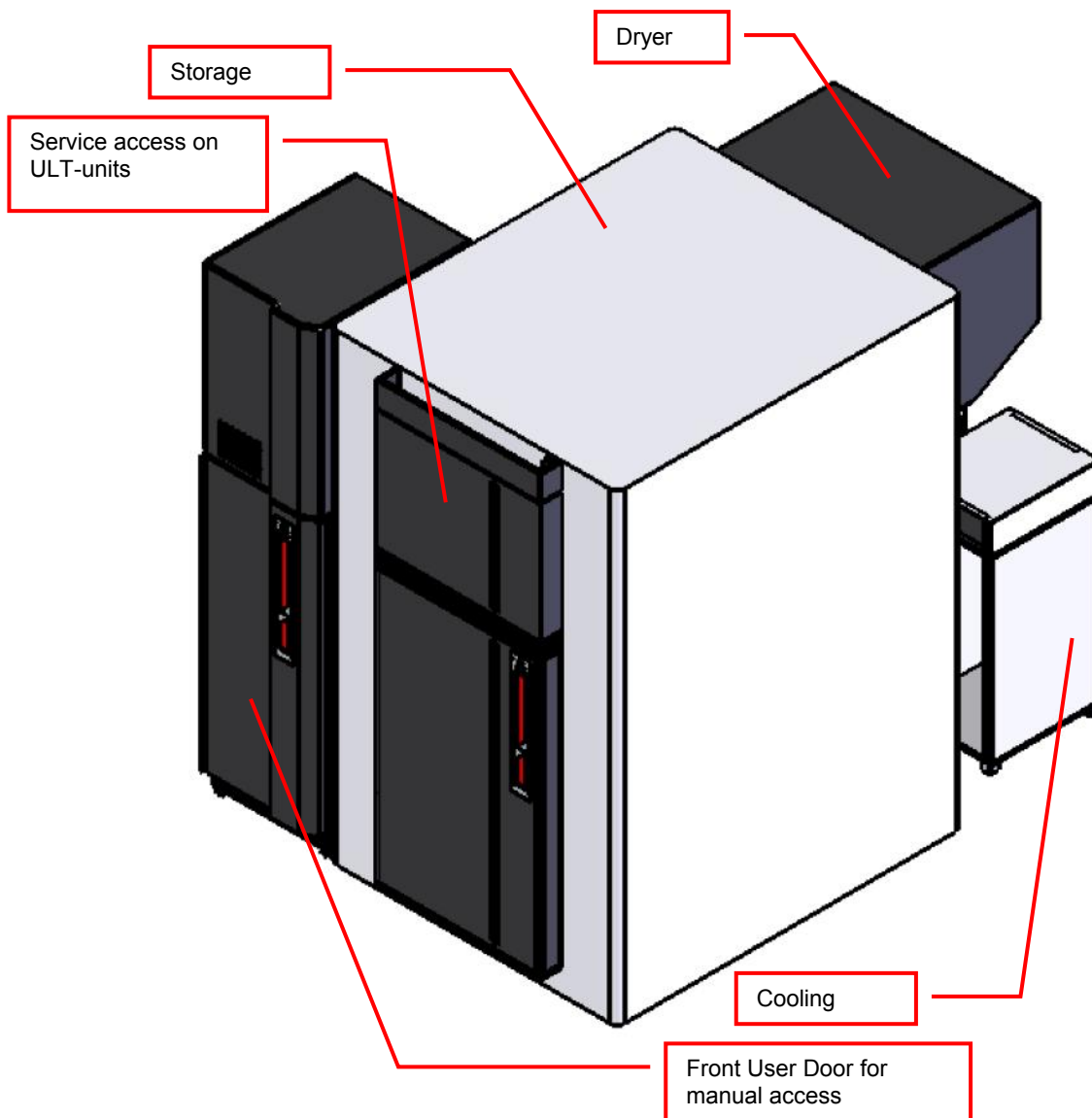
2.3 Kiwi Store Configuration and Capacity Overview

The Family of Kiwi Store is structured by their capacity in Microtiter plates (MTP) and their climate.

The Kiwi Stores are Stand Alone units with the possibility to be integrated into a robotic Platform. The height of transfer position of the units is ~1000mm above ground.

Capacity, given in MTP

Kiwi Store 1'000	1'000 MTP
Kiwi Store 3k0	3'000 MTP
Kiwi Store 3k5	3'500 MTP
Kiwi Store 5k	5'000 MTP
Kiwi Store 7k5	7'500 MTP
Kiwi Store 10k	10'000 MTP
Kiwi Store 12k5	12'500 MTP

These capacitys are an excerpt of the most commonly requested sizes. Further Storage sizes are available on request. All Kiwi Store can handle and store all types of plates and racks with SBS standard format. The corresponding capacity is only depending of the height of the racks.

Dimensions:

STT1000 Kiwi Store:
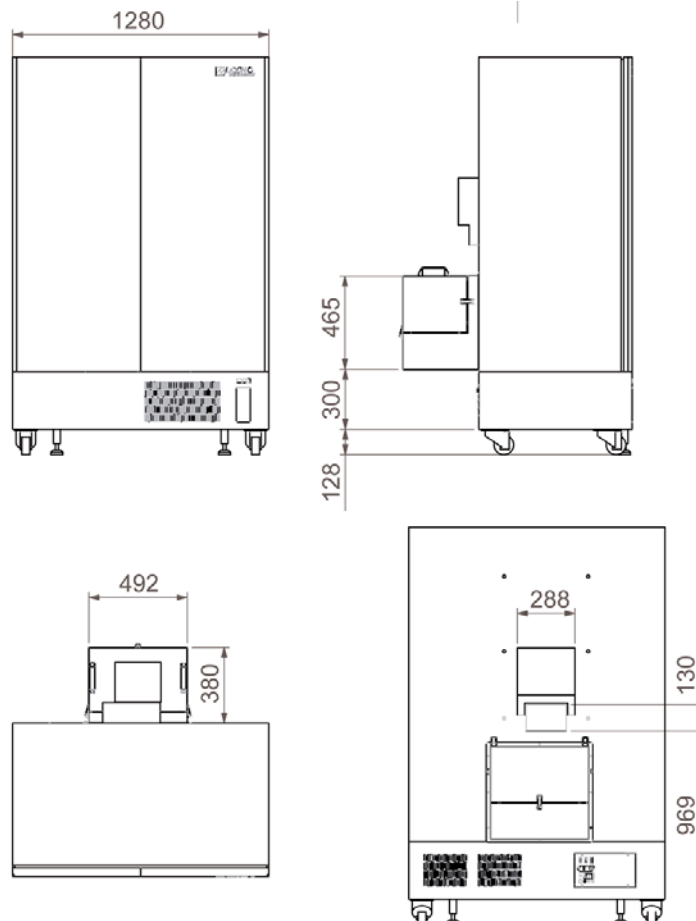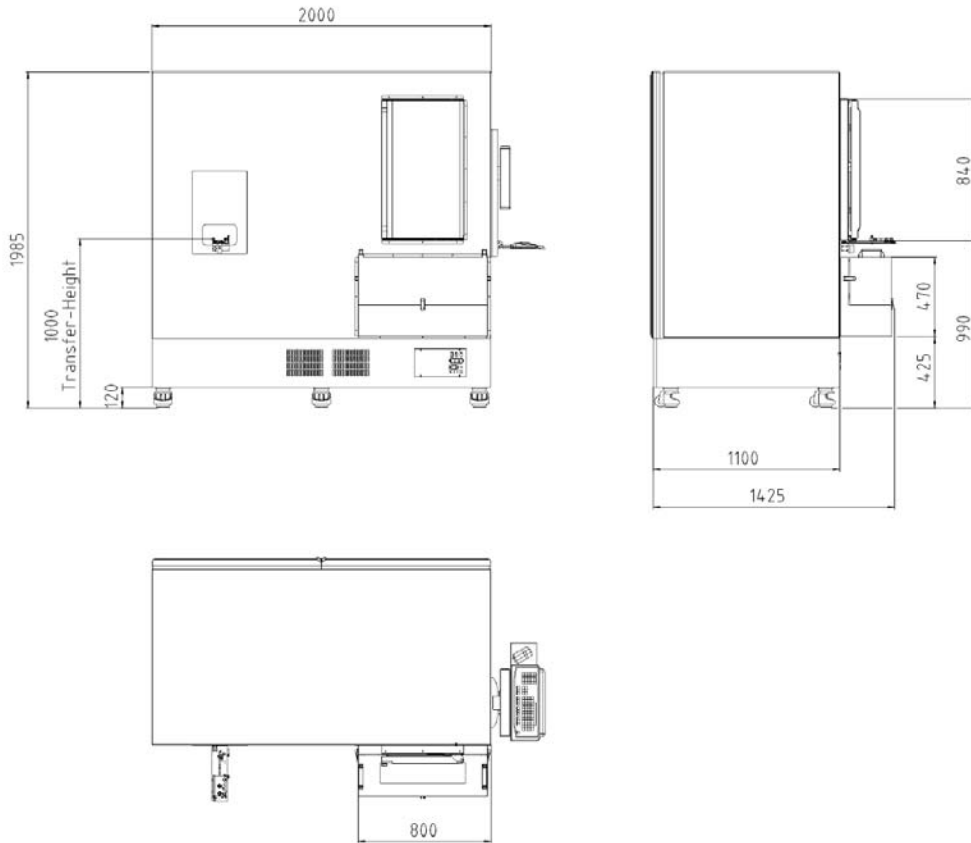
STT3k0 Kiwi Store

STC3k5 ULT Kiwi Store

3130

1120   370
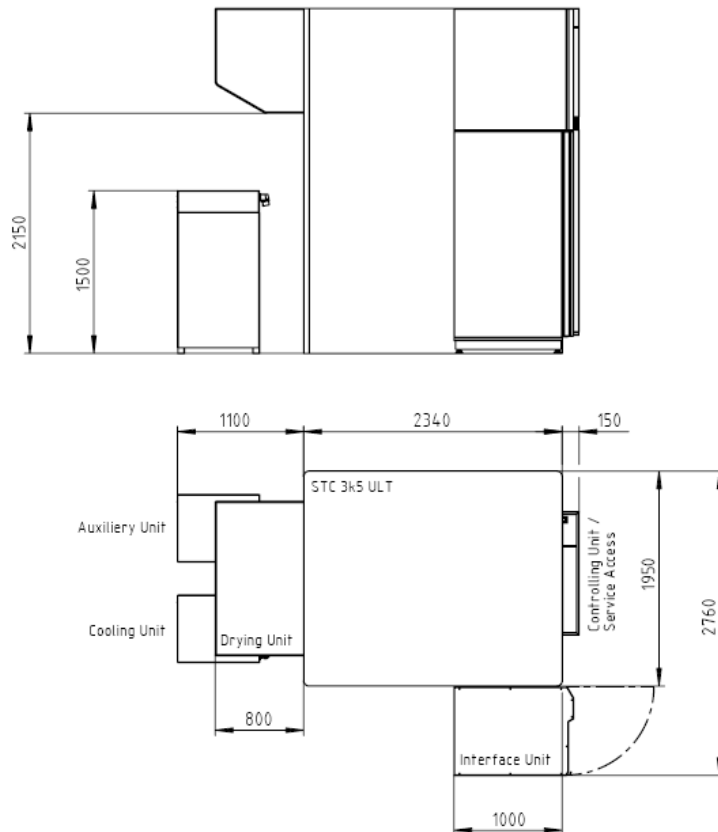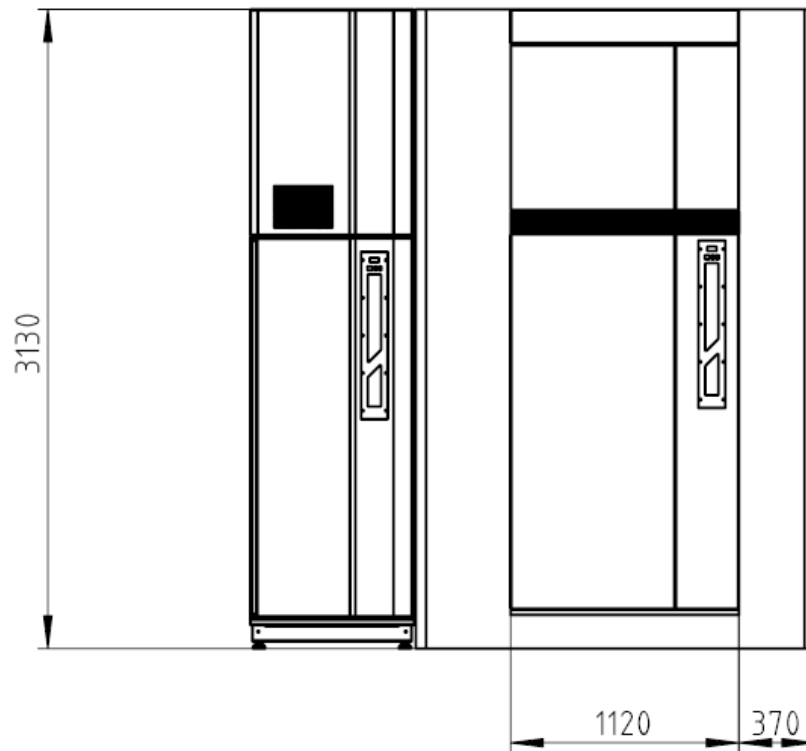
For further systems dimensions please contact LiCONiC AG. These Dimensions are examples and are not binding.

Options

3.   Kiwi Store Configurations

3.1   Kiwi Store STT 1000 and STT3k0 (DF)

These Kiwi Store units are intended for small laboratory use and movable solution. They are manufactured in the Stand Alone (SA) configuration, known from our standard StoreX Incubator Series. The transfer position is at a height of a typical work bench (~1000mm). These units can therefore be placed next to a robotic instrument.

The instrument's controls and climate generator are located below the incubation chamber. They are mounted on casters and may therefore easily be moved.

The picture below shows a Kiwi Store STT1000.
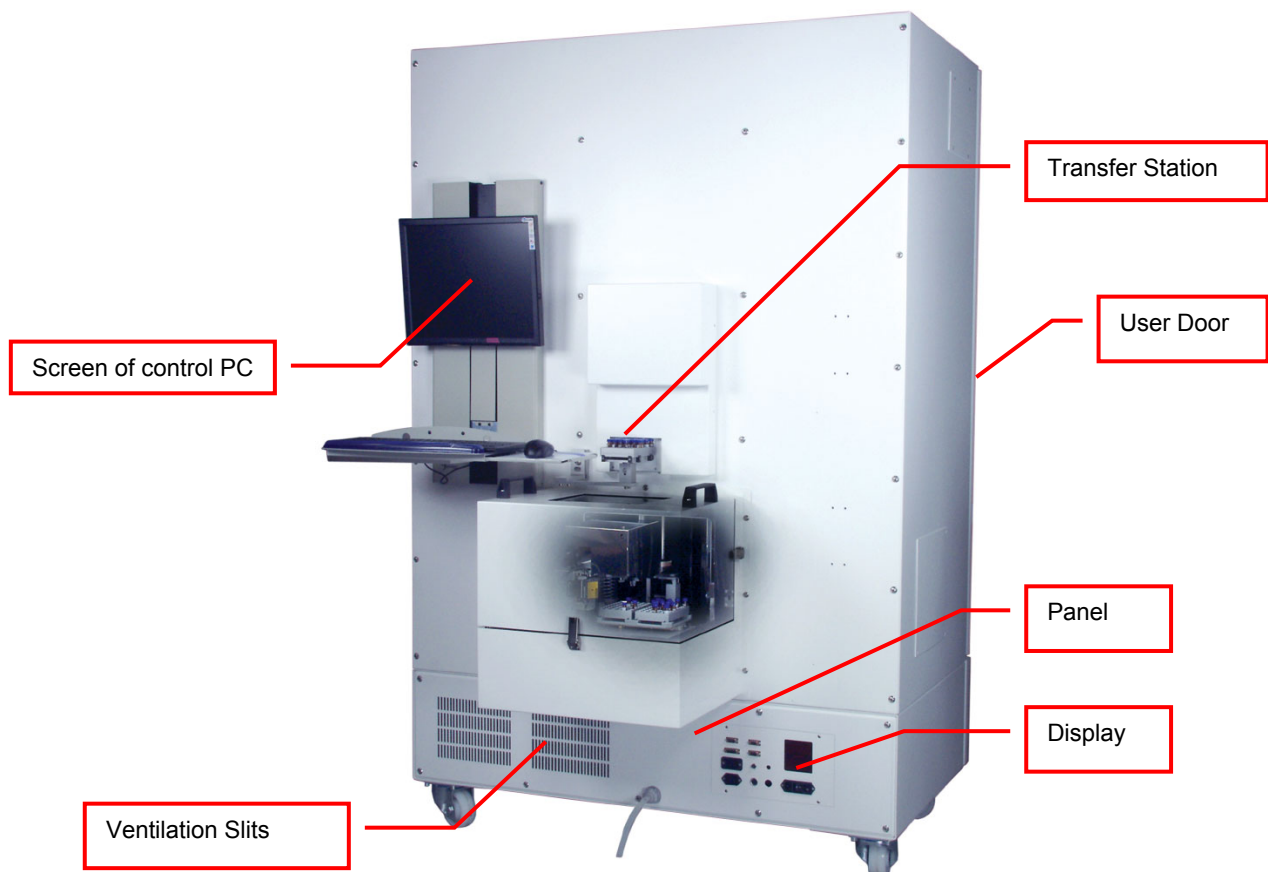
3.2   Kiwi Store STC DF

These Kiwi Store units are intended for larger storage needs. These Systems are mentioned to be fix installed. Still the possibility of robotic integration is given. The transfer position is at approximately at the height of a typical work bench (~1000mm). Therefore a robotic instrument can be placed next to the system.

The interface controls and climate generator are located inside the interface unit. The controls of the storage are located inside the front panel of the storage chamber. The cooling unit is placed next to the chamber. Due to their size they are not mentioned to be moved around.

The picture below shows a Kiwi Store DF.
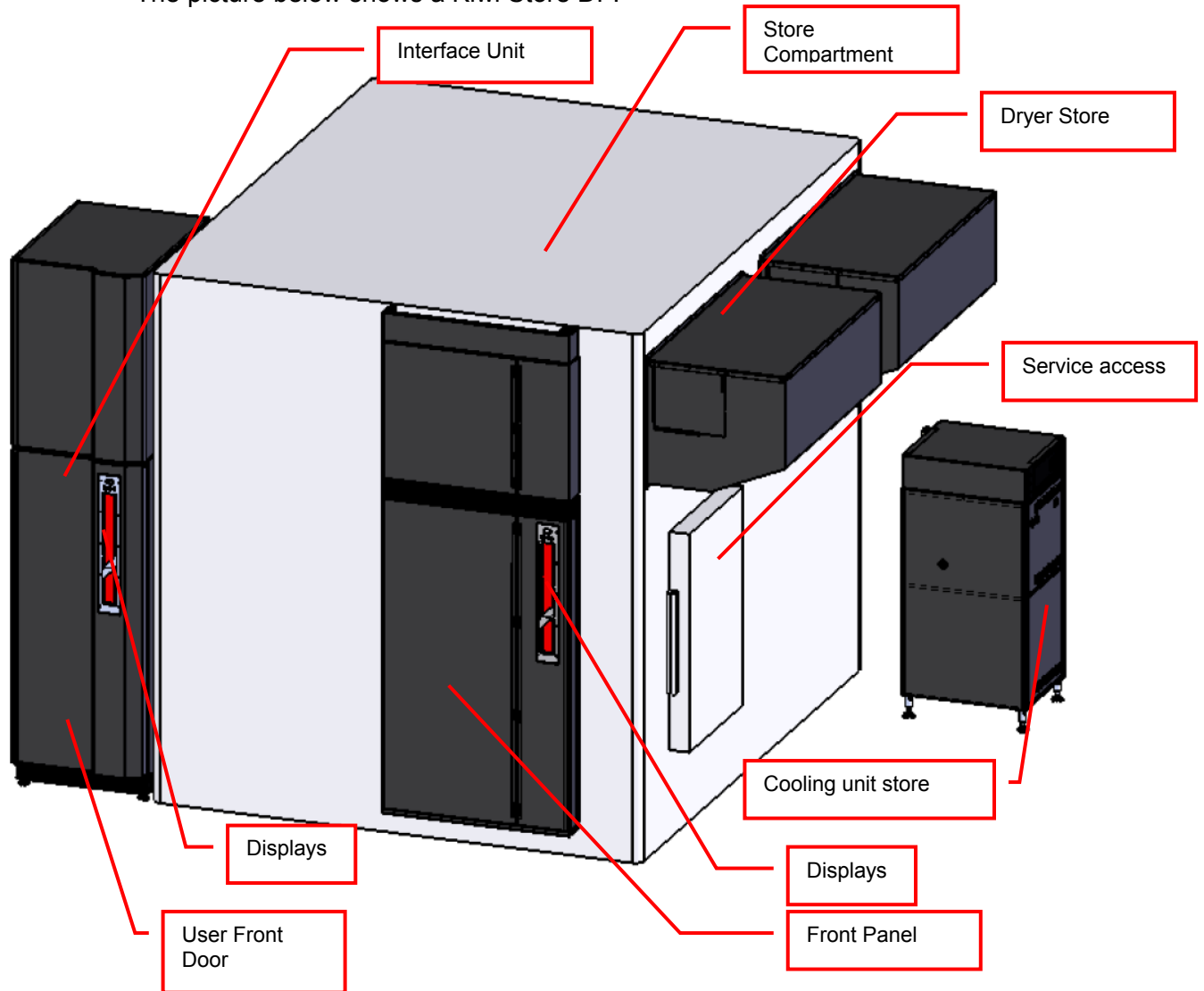
3.3   Kiwi Store STC ULT

These Kiwi Store units are intended for biobanking storage needs. These Systems are mentioned to be fix installed. Still the possibility of robotic integration is given. The transfer position is at the height of a typical work bench (~1000mm). Therefore a robotic instrument can be placed next to the system.

The interface controls and climate generator are located inside the interface unit. The controls of the storage are located inside the front panel of the storage chamber. The cooling unit is placed next to the chamber. Due to their size they are not mentioned to be moved around.

The picture below shows a Kiwi Store ULT.
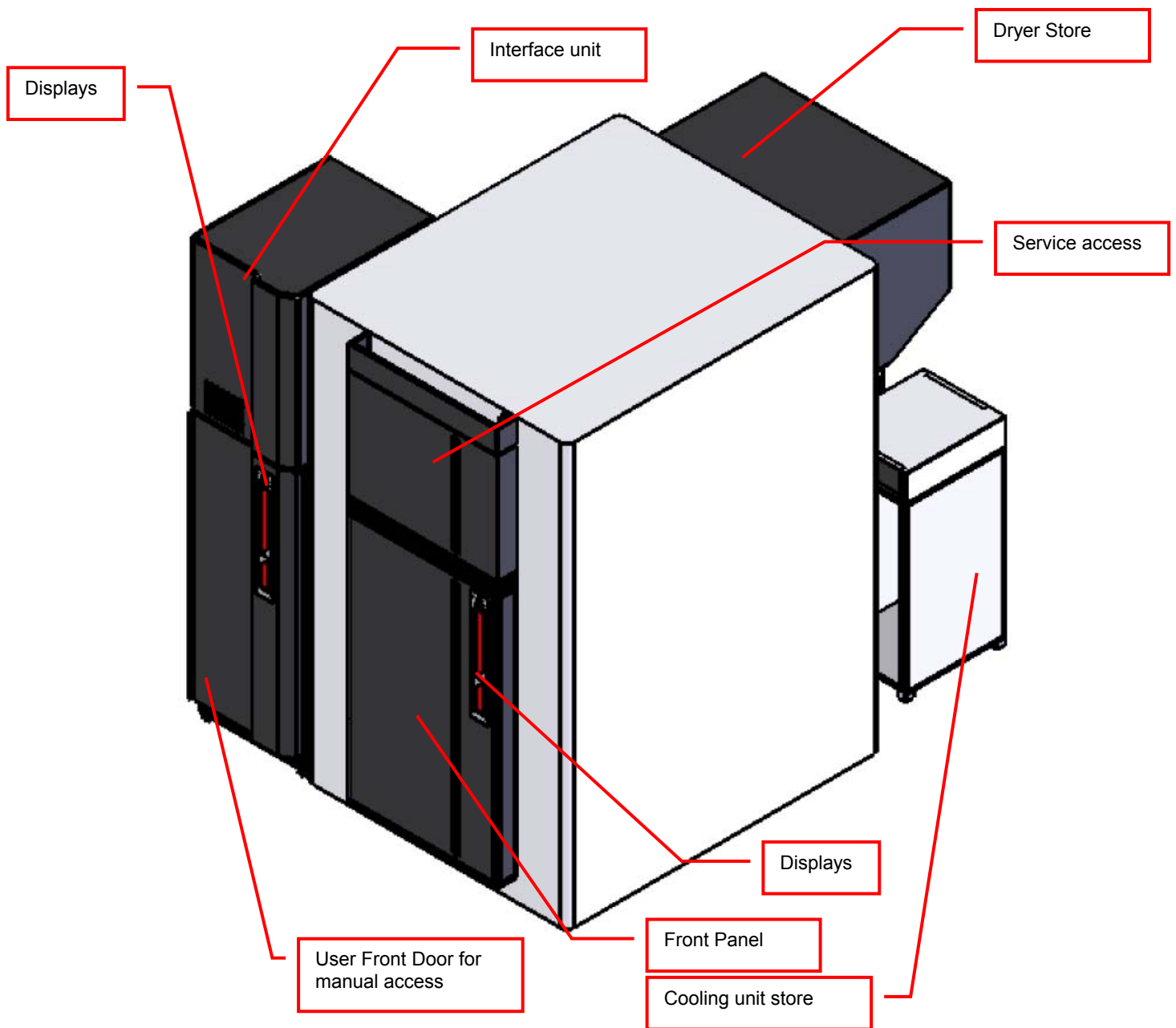
4. Climate of LiCONiC Kiwi Stores

4.1 Overview

Name	Temperature	Humidity
DF Deep Freezer	-20..00°C	02..45%RH
ULT Ultra low temperature	-80°C	n.a.

The KîWi DF Stores are designated for the use as compound storage, whereas the ULT version is mainly for Biobanking use.

4.2 Cooling

Within all units the air is actively dried by forcing the air through an evaporator. This allows cooling and actively drying the air. Since the evaporator gets covered with ice after a certain time these units have an automatic defrost function. The collected water will be exhausted trough a drain.

4.3 Temperature

All units are equipped with an Temperature-Sensor. This allows displaying the temperature inside the storage chamber. A very high quality sensor is used for this purpose. Quality and accuracy of the sensor is maintained by the Swiss Federal Office of Metrology and the Swiss Accreditation Service (see specification in next chapter).

Due to the limited temperature range this sensor is used in the ULT storage systems to monitor and control the climate in the service area. To monitor all other temperature, such as parameters of cooling and storage chamber temperature, thermocouple are used.

4.4 Humidity

All units are equipped with an RH-Sensor. This allows displaying the humidity inside the storage chamber. A very high quality sensor is used for this purpose. Quality and accuracy of the sensor is maintained by the Swiss Federal Office of Metrology and the Swiss Accreditation Service.
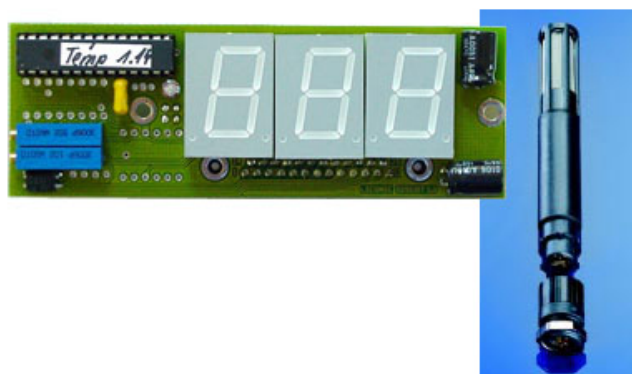
The Humidity sensors used in the Kiwi Store series are suitable for extremely high humidity as well as for extreme dryness. They incorporate a humidity and a temperature sensor allowing a relative humidity (RH) readout.

Specifications

Measuring Range	0..100	% RH
Accuracy@23°C	±1.5	% RH
	±1.3	°K Temp.
Resolution	12	Bit / 0.02%
	12	Bit / 0.1°C
Sensor	PT100	Temperature
	C94	Humidity
Adjustment	-	E2-PROM

5. Backup solutions for Kiwi Stores

5.1 Overview

Name	Temperature	Principle
Auxiliary Refrigeration DF	-20..00°C	2nd Refrigeration unit
Auxiliary Refrigeration ULT	-80°C	2nd Refrigeration unit
CO2 Backup	-20°C	Evaporator for CO2
LN2 Backup	-80°C	Evaporator for LN2

The Kiwi Store auxiliary refrigeration units mainly cover the case of a failure of the main cooling unit whereas the gas backup solutions are made to cover power outages.

5.2 Auxiliary Refrigeration DF

All Kiwi Store DF units can be equipped with an auxiliary refrigeration. There are two different solutions for the STT and the STC units.

5.2.1 Auxiliary Refrigeration Kiwi Store STT 1000

Because of the small footprint of the STT1000 units and therefore the reduced space for additional cooling units an external solution was developed.

The redundant refrigeration unit is placed at the side of the system. Through two openings the cooling circulation is driven. On the hole at the bottom the air is sucked in, forced through an evaporator and afterwards exhausted into the chamber. On its way through the evaporator the air is cooled and dried.

5.2.2 Auxiliary Refrigeration Kiwi Store STT 3k0 DF

Because of the bigger footprint compared to the STT1000 units an internal solution for an additional cooling unit is available.

The redundant refrigeration unit is placed next to the main cooling unit underneath the chamber. To provide complete redundancy the auxiliary cooling is equipped with its own refrigerator and circulation fan. It has therefore the same cooling power as the main cooling and can maintain the climate in case of the main cooling failing. Furthermore the auxiliary cooling is able to maintain the climate even if the main PLC controlling of the climate is failing.

5.2.3 Redundant Refrigeration Kiwi Store STC DF

The Kiwi Store STC have a refrigeration unit placed at the side of the system. Therefore easily an additional refrigeration unit can be placed next to the main refrigeration.

To provide the complete redundancy a second evaporator is installed inside of the storage chamber. The auxiliary refrigeration is equal to the main refrigeration and therefore can provide the same cooling performance as the main unit.

5.3 Auxiliary Refrigeration ULT

As for the bigger DF units the ULT auxiliary refrigeration solution is realized with a second refrigeration unit. The main unit is running all the time to maintain the temperature. The auxiliary refrigeration takes over during failure of the main cooling unit or to assist the main unit during cool down. The auxiliary cooling unit is equipped with its own control an monitoring PLC and is therefore completely independent of the main control.

5.4 CO2 Backup cooling

The CO2 Backup solution is for the use in DF systems to maintain the temperature during power failure. The CO2 bottle is connected to a controlled inlet to the chamber injecting CO2 to maintain cold.

This option includes the tubing and the control. This backup solution is fully monitored to ensure the temperature to stay at –20°C. Also an exhaust is part of this option.

If the CO2 backup cooling is coming into action large amounts of CO2 are released through the options exhaust. Therefore the exhaust needs to be lead out of the building to not endanger personnel working in the area of the system.

WARNING !
➢ Inert gases are asphyxiates and will displace oxygen to produce localized oxygen deficient atmospheres
➢ Inert gases are odorless, colorless and tasteless
➢ Inert gases give no warning and may cause death in few seconds
➢ The Exhaust of the CO2 backup cooling option needs to be lead out of the building otherwise danger of suffocation is immanent
➢ In their liquid state inert gases are extremely cold fluids which can cause serious burns when in contact with the skin
➢ A cryogenic spill often gives a low lying cloud of vapor that creeps along the ground

5.5 LN2 Backup cooling

The LN2 Backup solution is for the use in ULT systems to maintain the temperature during power failure. The LN2 Dewar is connected to an additional evaporator specially designed for cooling use with LN2.

This option includes the evaporator, the tubing and the control, the Dewar is not included. The size of the Dewar is defined by the desired backup time and the

desired refill interval. This backup solution is fully monitored to ensure the temperature is maintained. Also an exhaust is part of this option.

If the LN2 backup cooling is coming into action large amounts of N2-Gas are released through the options exhaust. Therefore the exhaust needs to be lead out of the building to not endanger personnel working in the area of the system.

WARNING !
➢ Inert gases are asphyxiates and will displace oxygen to produce localized oxygen deficient atmospheres
➢ Inert gases are odorless, colorless and tasteless
➢ Inert gases give no warning and may cause death in few seconds
➢ The Exhaust of the LN2 backup cooling option needs to be lead out of the building otherwise danger of suffocation is immanent
➢ In their liquid state inert gases are extremely cold fluids which can cause serious burns when in contact with the skin
➢ A cryogenic spill often gives a low lying cloud of vapor that creeps along the ground

6. Identification

6.1 Barcode reader

A Bar Code Reader is installed on the Lift Assembly. It allows the reading of Bar Codes on plates stored in the stackers. Bar Codes have to be printed on the shorter side of the plates and have to face outwards to the KIWI STORE Lift Assembly.

6.1.1 Supported Barcode Types

The optional Barcode reader recognizes the following barcode types.

- CODE128   max. digits   : 74; 148 (Start character C)
- CODE39   max. digits   : 74
- NW-7/Codabar   max. digits   : 74
- UPC/EAN   max. digits   : 74
- GS1-128 (EAN-128)   max. digits   : 74
- GS1 DataBar (RSS)   max. digits   : 74
- ITF   max. digits   : 74
- Industrial 2of5   max. digits   : 74
- Standard 2of5   max. digits   : 74
- COOP 2of5   max. digits   : 74
- CODE93   max. digits   : 74

6.1.2 Barcode Specifications

- Light Source: Semiconductor Laser
- Wavelength: 660nm
- Output: 1.0mW
- Class: Class II (JIS C6802)
  IEC /EN 60825-1 A2:2001
- Reading Bar Width: min. 0.1 mm
- Ambient Light: Sunlight 10'000 lx
- Incandescent Lamp: 6'000 lx
- UL Applicable standards   UL508, UL60950-1
- UL File No.   E207185, E167973
- UL category   NRAQ/NRAQ7, NWGQ2/NWGQ8

6.2 2D Code single tube reader

A 2D code reader can be installed on the Liconic TubePicker and TubeBoxer. It allows the reading of 2D Codes on single Tubes. To read the 2D code every tube has to be individually accessed.

6.2.1 Supported 2D code Types

The optional 2D code reader recognizes the following 2D code types.

- Data Matrix
- QR Code
- Maxicode
- Aztec
- Microglyph
- Royal Mail
- Japan Post
- Planet

6.2.2   2D code reader Specifications

- OPTICAL FEATURES: WVGA (752 x 480) CMOS Sensor with Global Shutter
- FRAME RATE: 60 frame/s
- READING WINDOW: Direct or 90°
- READING ANGLES: Max. Pitch: ± 35°; Tilt: 0-360°

6.3   2D Code rack scanner

A 2D code rack scanner can be integrated into the Liconic software. It allows the reading of 2D Codes of a whole rack at once. To read the 2D code the rack needs to be placed manually on to the reader at the outside of the system.

6.3.1   Supported 2D code Types

The optional 2D code reader recognizes the following 2D code types.

- DataMatrix

6.3.2   2D code scanner Specifications

- Scanning Device: Customized flatbed scanner
- Compatible rack vendors
  - Thermo Matrix
  - Thermo Abgene
  - Thermo Nunc
  - Remp
  - Micronic
  - FluidX
  - …. And all other 2D coded tubes
- Compatible rack sizes: 384, 96, 48, 24
- Export data to Excel, text, XML, rack images
- Database connectivity: SQL Server, Oracle, MySQL, Postgres, HSQL and others [v1.23+]
- Fast Scanning — 5 seconds per rack
- Displays damaged/missing tubes
- One-click scan for any size or brand of tube
- Simple installer — no dongles required
- Multiple scanners/multiple configurations
- 110/220 v automatically selected
- Fully integratable into robotics platforms

Accessories

7.   Transfer Stations

The following transfer stations are an excerpt of all available transfer stations. Due to special design of some of the storage units not all transfer stations are available for each unit. Please contact LiCONiC for detailed information on compatibility and special hand off requirements.

7.1   Standard Transfer Station

A variety of transfer stations are available. The transfer station is accessed by the KIWI STORE handler as well as any external robot. The transfer stations allow most grippers access to the plate. All transfer stations are equipped with alignment pins to realign the plates in both horizontal directions. The alignment works for the handling as well as for any external robotic transportation system.
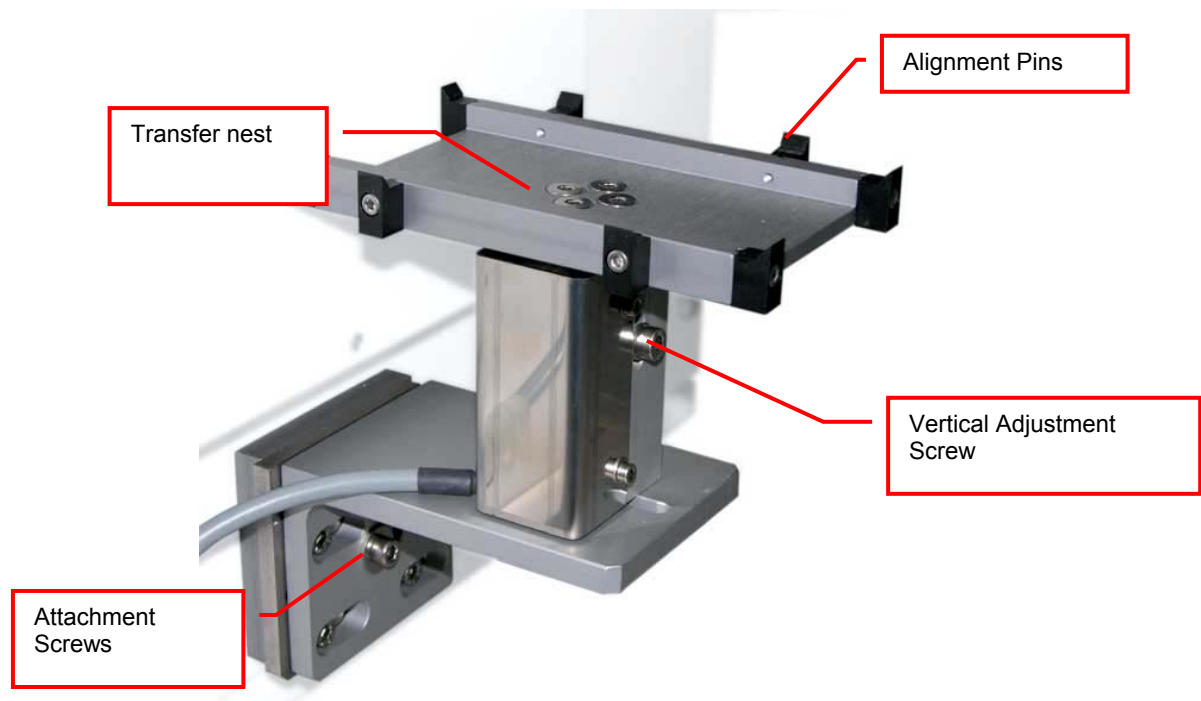
The transfer station can be easily adjusted. The transfer plate can be adjusted horizontally and vertically. Rotation of the transfer plate can also be adjusted.

The presence of a plate on the transfer station can be checked via the plate sensor.

Plate Sensor

Transfer Station
Attachment Kit
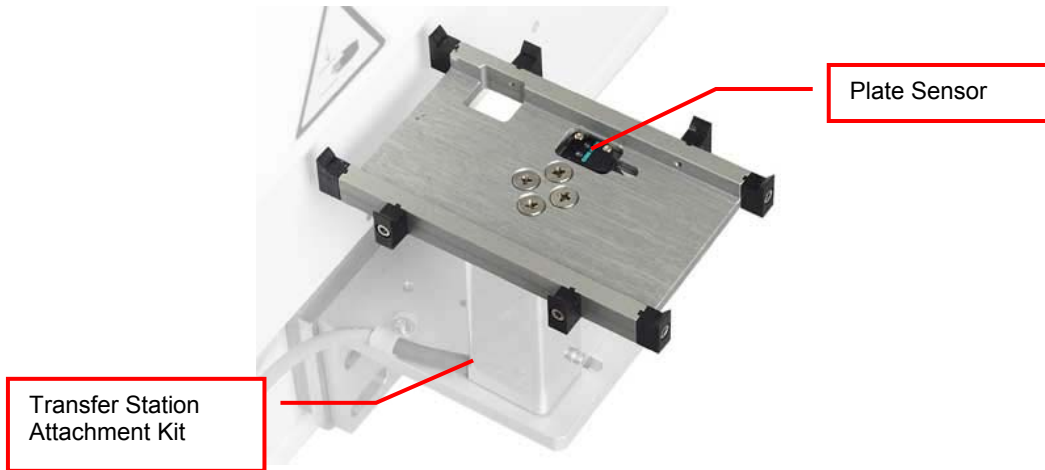
7.2   Standard Transfer nest

There are Transfer nests available for applications where the transfer position is mechanically attached to the external system. Transfer Plates have alignment features. Transfer nests are manufactured in aluminum with an anodized surface finish.

Alignment
Pins
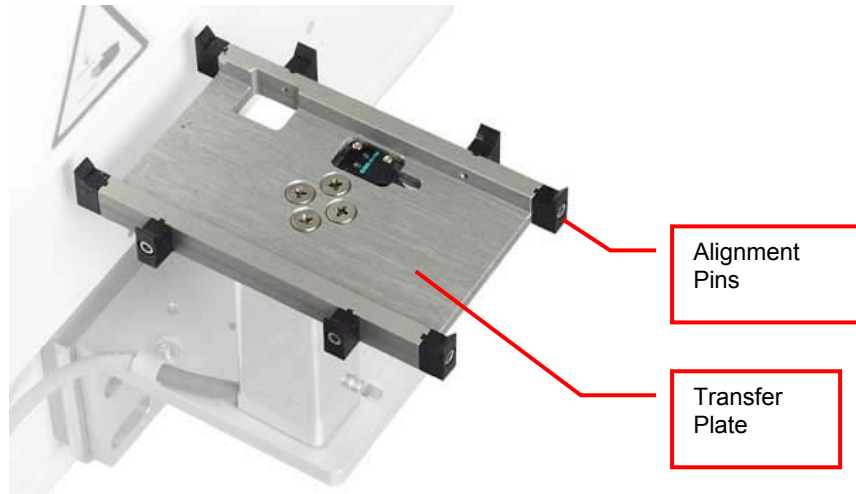
Transfer
Plate

7.3   Transfer nest Sensor

A sensitive optical sensor is integrated into the Transfer Stations. The Transfer nest Sensor will detect all commonly used plates. Transparent, opaque, white or black plates are detected. The miniaturized design of the sensor helps to keep the Transfer Station flat. The Transfer Plate Sensor is connected to the system. The sensor status can be requested through the handling communication port.

Sensor
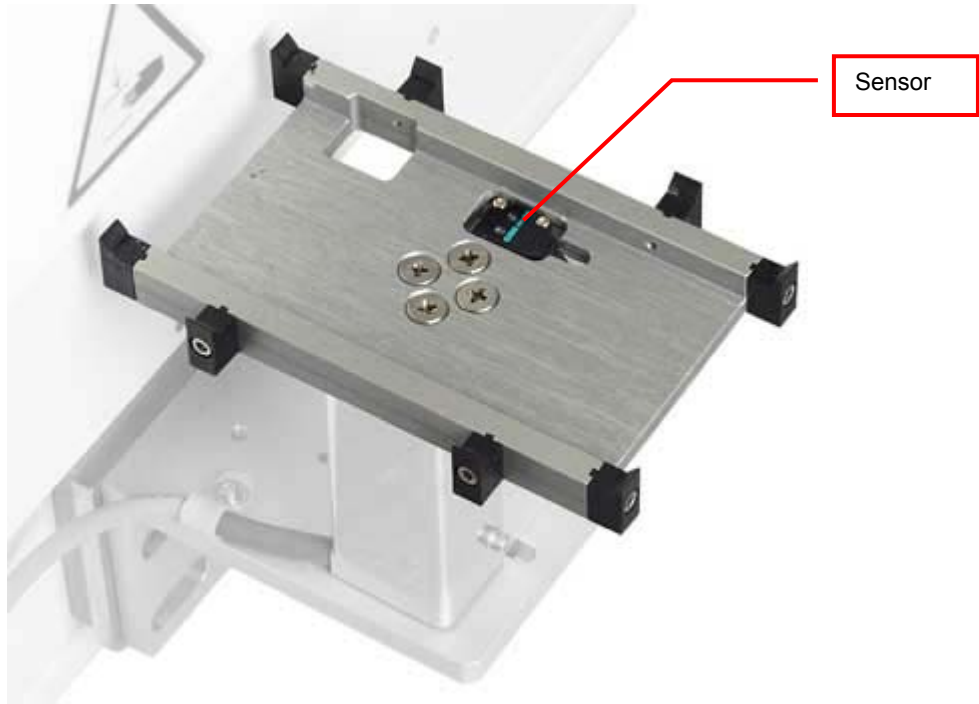
7.4 Active Plate Alignment

For applications requiring extremely high alignment accuracy there is an Active Plate Alignment available. The Active Plate Alignment is attached to the Transfer nest. Every time a plate is accessed by the external system, the Active Plate Alignment is selected. The alignment takes approximately one second. The alignment accuracy is accurate to more than 0.1 mm.

The Active Plate Alignment is controlled by the external system. The access is performed through the handler communication port.

7.5 Turn Station

The KIWI STORE handler transports plates along their longer axis. Many systems require the plate to be presented at a rotation of 90 degrees. The Turn Station will rotate each plate before and after the access by the KIWI STORE interface handler.

Transfer Station
Rotation Drive
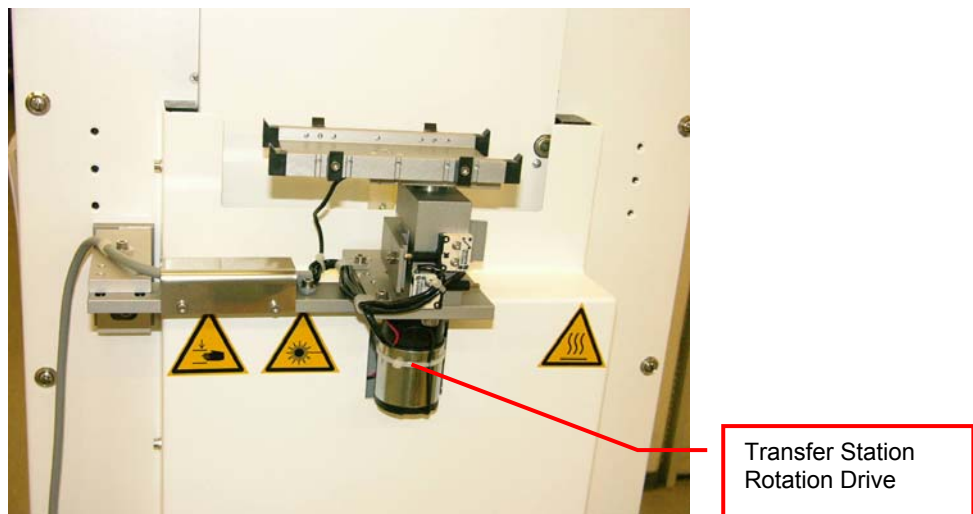
Rotation is controlled by the KIWI STORE system. No additional external software is required.

7.6 Swap Station

The Swap station has two transfer plates mounted on a rotation (swap-) drive. The swap drive rotates the two transfer plates by 180 degrees. The swap station acts as a plate buffer as well as a plate extension shuttle. The distance of the actual transfer position is increased by 145 mm.

The swap station is controlled by the attached robotic system. The KIWI STORE system monitors possible conflicts with the handler and the Swap Station.

The swap station has two integrated plate sensors. Both sensor statuses can be requested individually.

Swap Drive
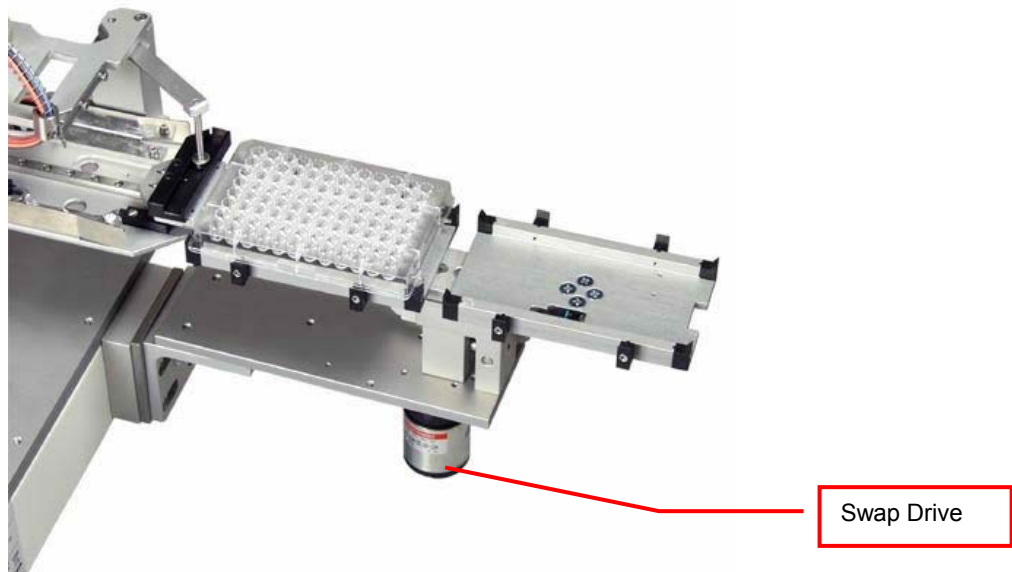
7.7 Slide Station

When the distance of the transfer location to the KIWI STORE is not sufficient, it may be extended by the Slide Station. The Slide Station has a linearly displaceable Transfer Plate. The travel path of the Transfer Plate can be ordered as necessary.

Slide Drive
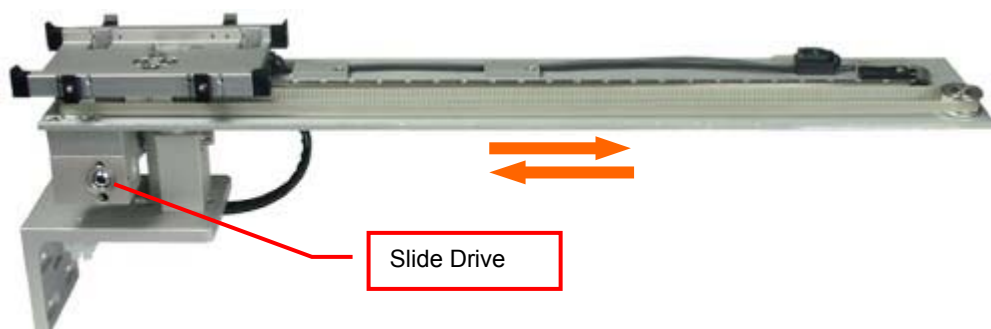
The movements of the Shuttle Station are controlled by the KIWI STORE system. Each time a plate is accessed by the KIWI STORE handling, the Transfer Plate is moved towards the unit. After access by the KIWI STORE the Plate Shuttle is extended towards the external system.

7.8 Shuttle Station

The function of the shuttle-station is for the elimination of "inter transfer module", space constants, and complications of adding robotic arms for distances of 170-1000 mm. The source plates can be transferred from one work area to another with precision accuracy. This delivery system can be used for multiple functions and work-station designs.
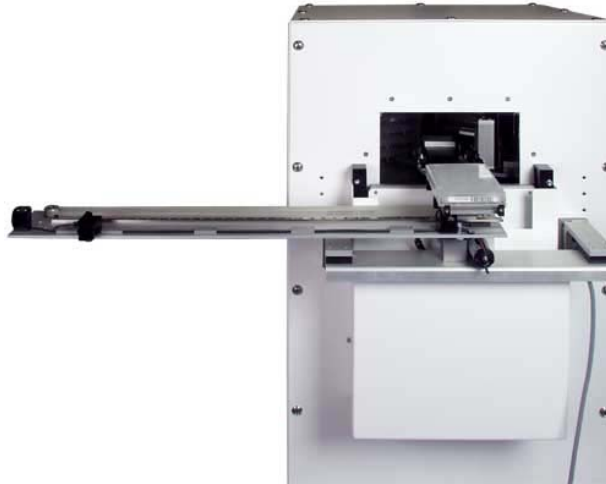
The belt driven system ensures smooth transfer and accuracy of delivery. The shuttle station is normally in far off Position, when Handler loads or unloads a Plate to the Station the station goes to the load Position.

7.9 Shuttle Turn Station

The function of the shuttle turn station is similar to the shuttle station. The difference of these two transfer stations is the 90° turn performed at the outer position of the transfer station.

The belt driven system ensures smooth transfer and accuracy of delivery. The shuttle turn station is normally in far off Position, when Handler loads or unloads a Plate to the Station the station goes to the load Position.

7.10 Step Stations

All active transfer station are available as step stations. Equipped with a stepper motor drive the transfer station can access intermediate positions. The positions are adjusted via the standard handling communication.

On a slide station per example various stop position can be defined. One for delidding, the next for buffer filling and the last for aliquoting.

8. Kiwi Store Cassettes

The total cassette capacity depends on the unit size. An example list of the number of cassettes for some predefined units are given in the table below.

Instrument	Configuration	Number of Cassettes
Kiwi Store STT 1000	SA	20
Kiwi Store STT 3k0	SA	60
Kiwi Store STC 3k5	System	60
Kiwi Store STC 5k	System	100
Kiwi Store STC 7k5	System	140
Kiwi Store STC 10k	System	210
Kiwi Store STC 12k	System	224
Kiwi Store STC 12k5	System	240

The cassettes are configured depending on the used kinds of tubes and plates. The cassettes can be modified to hold various plate or tube rack types. To maximize the capacity of a system the use of cassettes according to the type of the plate or rack is recommended. The table below lists some examples of tube rack types with its corresponding cassette types. Further types are available.

Cassette	Levels		
	Kiwi Store STT 1000	Kiwi Store STT 3k0	Kiwi Store STC
MTP (Microtiter Plates) / REMP384	54	50	54
REMP96-300 / Micronic 0.5 ml	44	39	44
Abgene 0.3ml / Matrix 0.5 ml	41	36	41
Abgene 0.65ml	31	27	31
Abgene Twist-Lock 0.5ml	29	26	29
Matrix 0.75ml	28	25	28
DWP (Deepwell Plates) / REMP96-900	25	22	25
Matrix 1.4ml	23	20	23
Abgene 1.2ml	22	19	22

The Kiwi Store can handle almost every plate or tube racks in SBS formate currently available on the market. For optimum performance LiCONiC offers a variety of cassettes.

Cassette

Microtiter Plate

Nanotiter Plate

Deep Well Plate
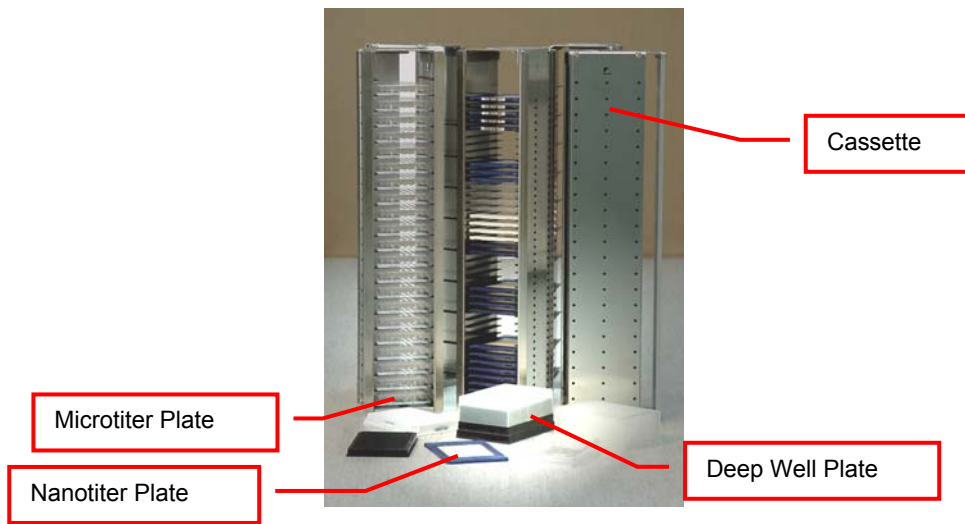
Installation

9. KiWi Store STT installation

The STT series is an out of the box system, needing only minor on site installation. Therefore this system might be installed by authorized integrators or distributors.

10. KiWi Store STC installation

The installation of the KiWi Store STC series is only performed by Liconic personnel and in rare cases thoroughly trained representatives. These systems need major on site installation and adjustments. In this manual only preparations necessary to be done by the customer are described.

10.1 Customer installation guide

10.1.1 Complete System Overview

3D-View
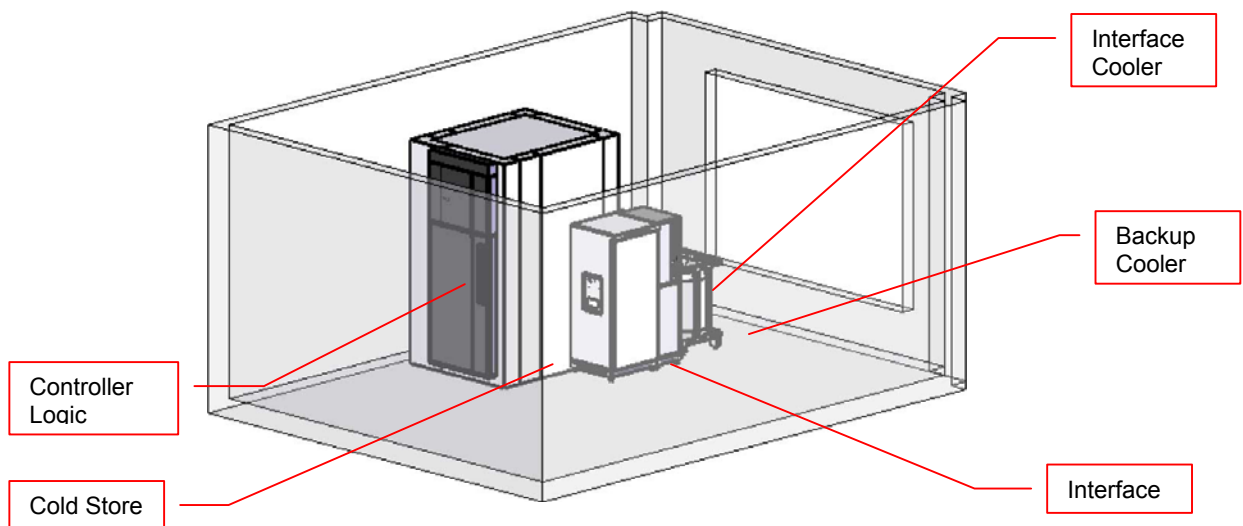
Top view

Panel Locations

3.4 Electrical Connection Interface

3.2 Electrical Connection Store

2.4 gass cooling inlet and exhaust

LN2 Backup

Store

Interface Store

Auxiliary Cooling

Main Cooling

3.3 Electrical Connection Cooling unit

2.6 Cooling Water Connection
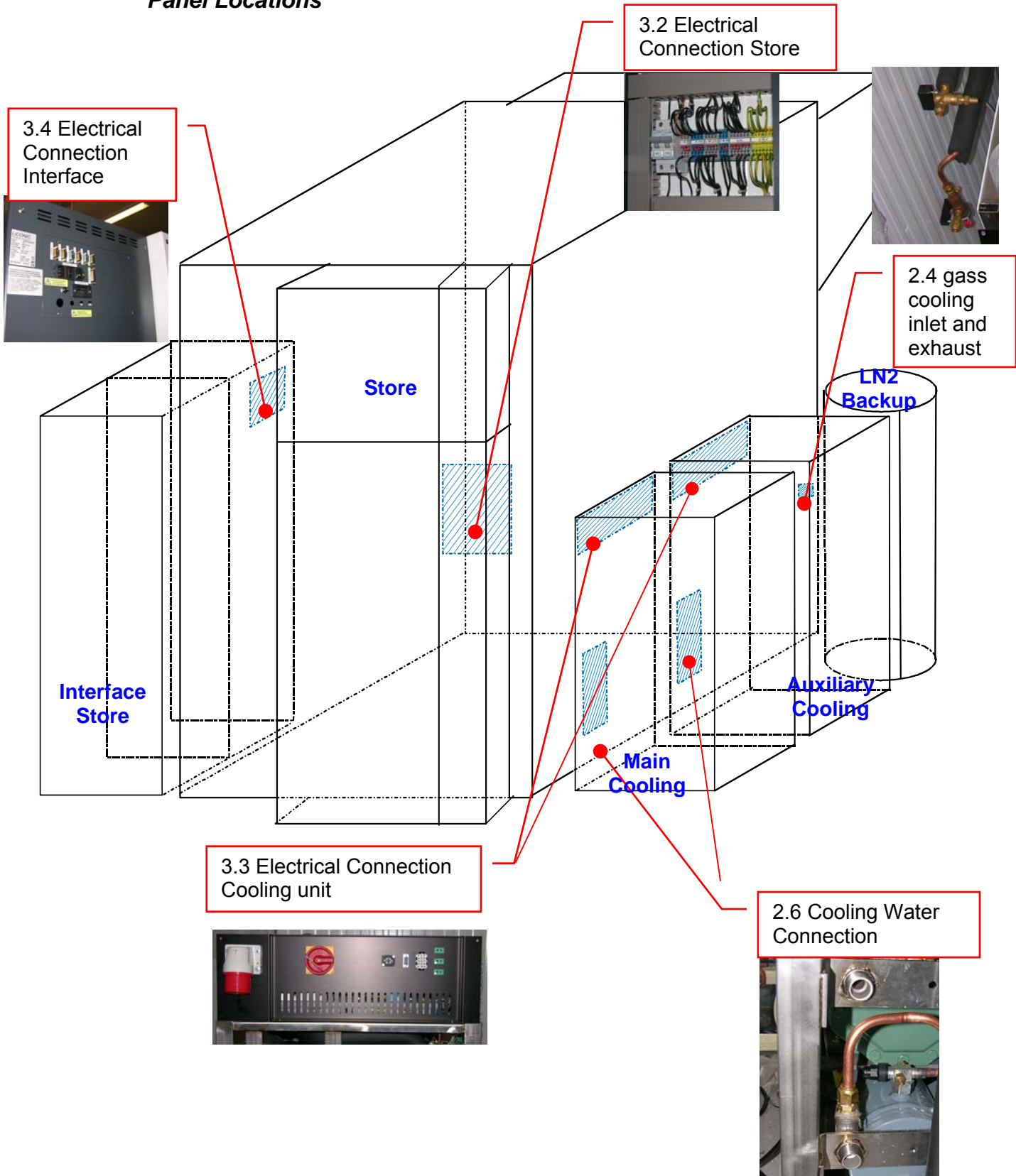
General Requirements

Requirement	Details
Ambient	Temperature: max. 22 °C Humidity: < 40%
Room height	3.5 m
Ground cooling	10W/m^2 (Cooling energy loss passed on to the ground)
Floor load	Recommended 1'000 kg/m^2 (for smaller load specifications please consult clearance recommendations with Liconic Applications team, case-by-case approval required)
Point load	250 kg
Heat dissipation	< 2kW
Flatness	+/- 1mm per 1m
Accessability	Room has to be accessible from 7am - 7pm for installation
Storage	A room has to be supplied to lock in all tools and material

Clearance Requirements

10.1.2   Refrigeration

Refrigeration Elements Overview

Cold Store
–80°C/ -20°C

Main Cooler
400 VAC

Aux. Cooler
400 VAC

Backup Cooler
LN2 Dewar 2 /
CO2 Cylinder 2

Backup Cooler
LN2 Dewar 1 /
CO2 Cylinder 1

Electrical Refrigeration Principles ULT

Water Cooler Inlet

Water Cooler Outlet

1 stage Condenser

1st Stage R404a

2nd Stage R508b

Backup Cooler LN2 Dewar 1

Electrical Refrigeration Principles DF

COMPRESSOR INLET

COMPRESSOR OUTLET

1 COMPRESSOR

SUCTION LINE

DISCHARGE LINE

2 CONDENSER

Water Cooling

Water Cooler Inlet

Coolant R404a

LIQUID LINE

Water Cooler Outlet

WARM RETURN AIR IN

EVAPORATOR BLOWER

COOL SUPPLY AIR OUT

EVAPORATOR **4**

METERING DEVICE **3**

REFRIGERANT FLOW

DRIER

Cold Water Cooler

External water

Cold water in typ. ~14°C

Room AC

STC cooler unit

STC Cold water return typ. ~30°C

Liconic STC Store

Connections Cooler to Cold Store

Back plane cold store

Auxiliary Cooler

LN2 Inlet

Main Cooler

LN2 Exhaust

Connections Main Cooler

Connections Dryer

Power In Main Cooler

Main Cooler

Cold store

Power In aux. Cooler

Aux. Cooler

Connections auxiliary cooler
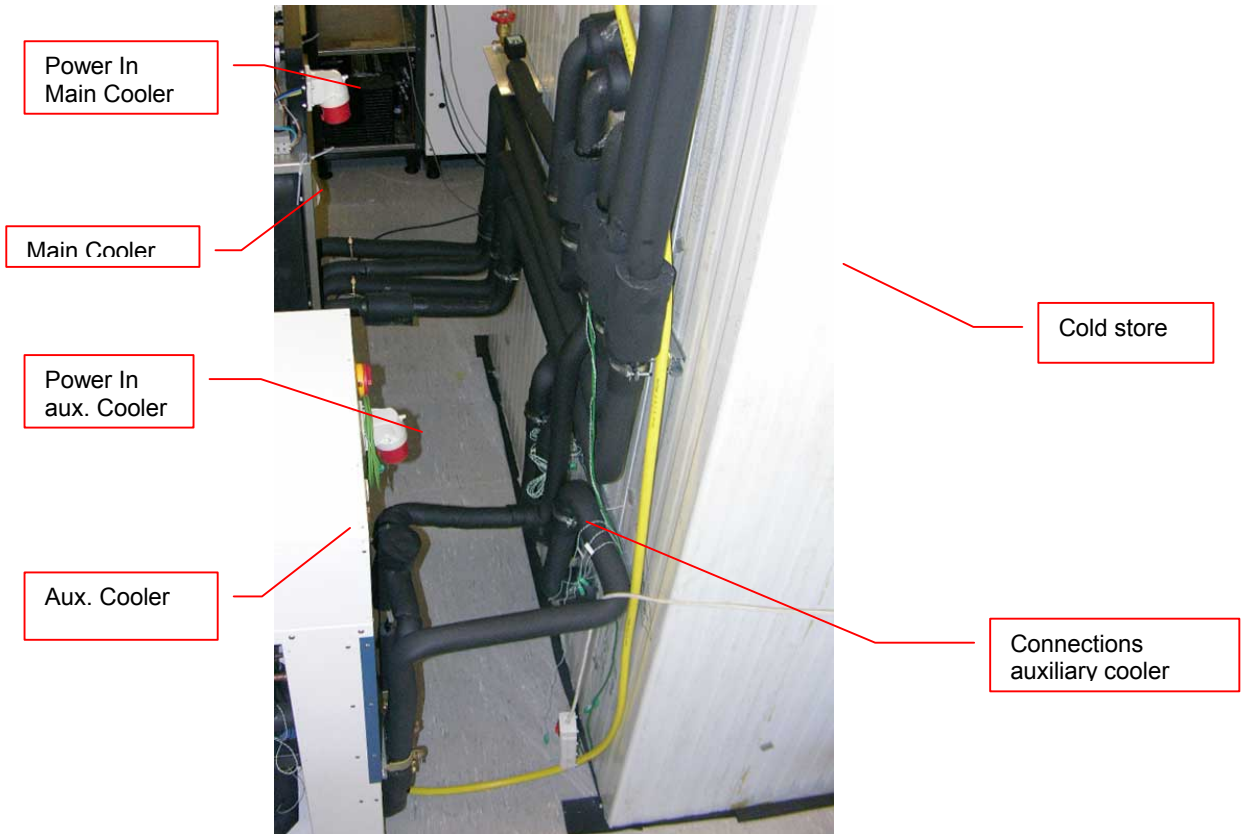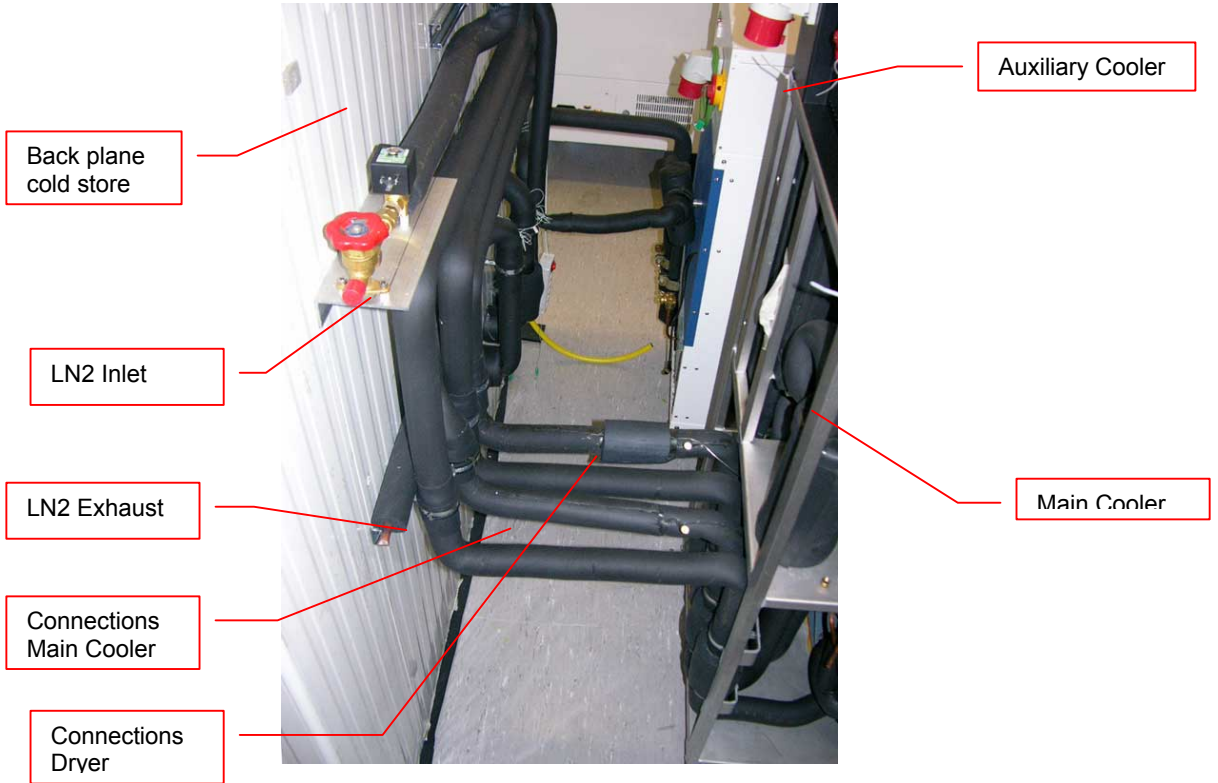
Typical Water Cooler Integration

Cooling water return line

Cooling water inlet

Water shut-off valve

Cooling Water Connection

Refrigeration cooling water IN ¾"

Refrigeration cooling water OUT ¾"

206

213

130
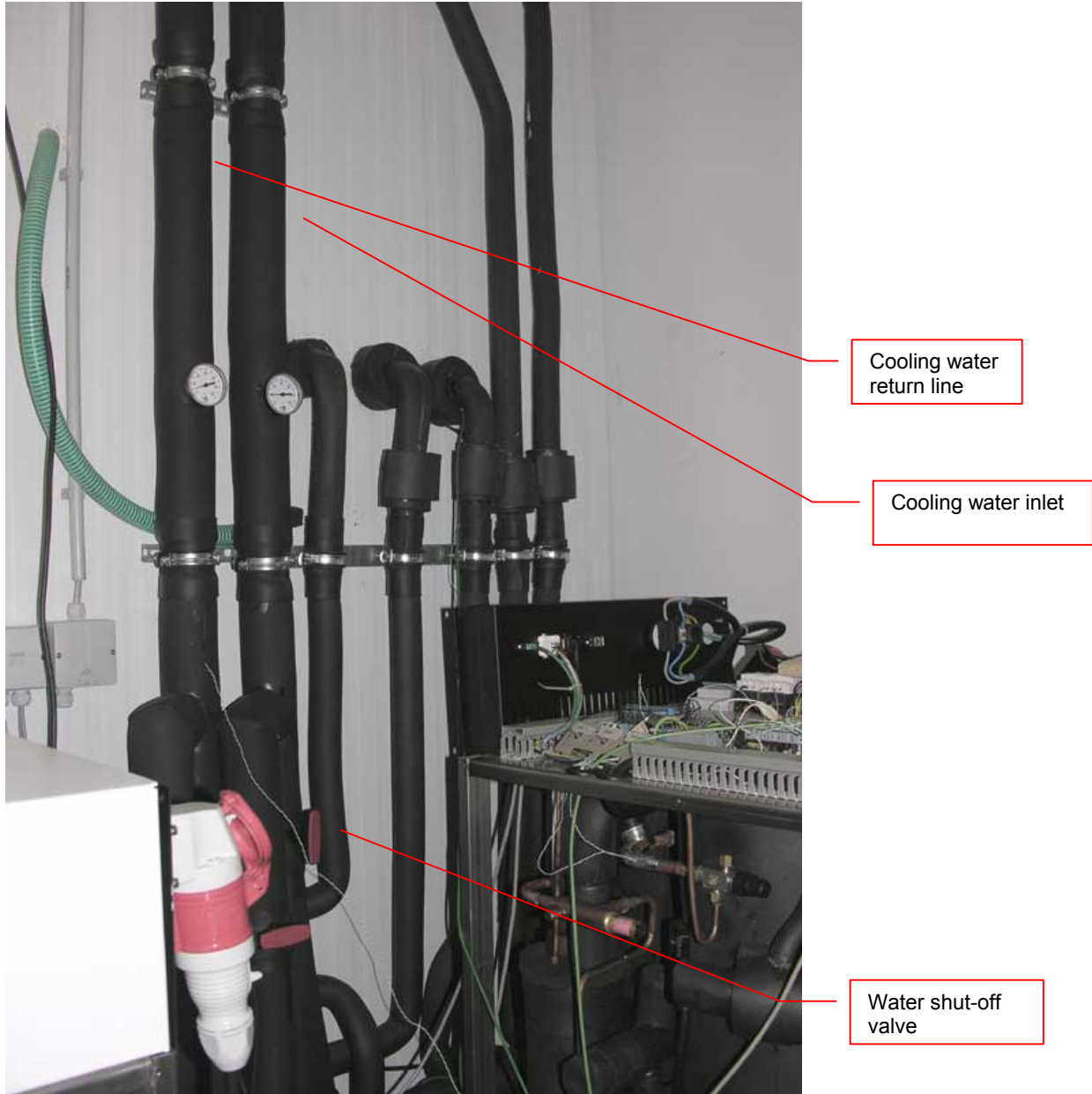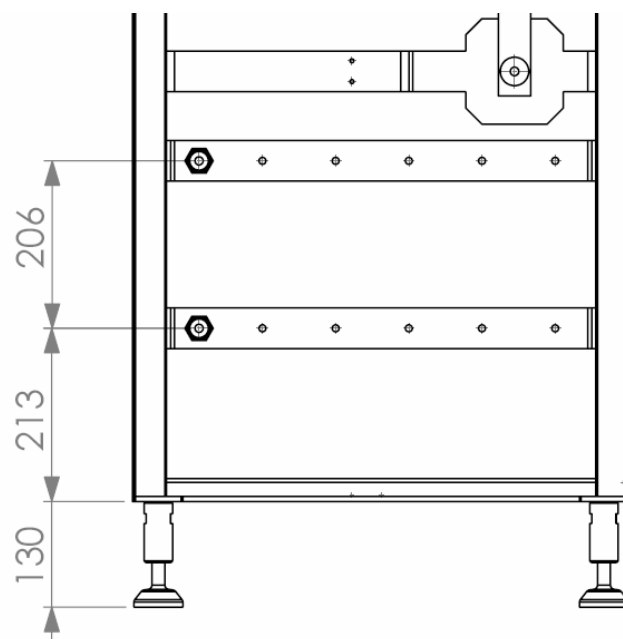
Requirements Cooling Water

Requirement	Details
Cooling	Media: Water Water quality: Tap water quality, clear Suspended solids: None Conductivity: 50-600 uS/cm Hardness: < 8° dH PH: 7.8 CO2 aggressive: None Iron: < 0.3 mg/L Manganese: < 0.05 mg/L Sulfate: < 250 mg/L Chloride: < 250 mg/L COD: < 40 mg/L Bacteria: < 1000 CFU/ml Pressure Difference: 2.5 bar (p.e.: IN 5 bar; OUT 2.5 bar) Max. Inlet Pressure: 10 bar Temperature: IN 5 .. 18 °C Flow: typ. 3-5 l/min @14°C Temperature Return: 35°C Connection fittings: 3/4" male Individual connections for main and redundant cooling Mixture of Water with glycol are possible.
Redundant Cooling	A backup water cooling is recommended. Experience showed the vitality of the water cooling. If the water cooling is facing an error both main and redundant cooling units are inhibited to work. Therefore the installation of a redundant water cooling system is recommended.
Drain	Peripheral Unit and Storage Dryer may perform regular defrost cycles. Peripheral Unit and Storage Dryer are equipped with a drain tube leading the gathered water out of them. Solution to remove the water may be foreseen. In the most simple case an evaporation pan could be used. (Water would evaporate into the room over time) More sophisticated solution would be to provide a drain to guide the water out of the room.

LN2 Backup Connections

Auxiliary Cooler

Back plane cold store

LN2 Inlet

Main Cooler

LN2 Exhaust
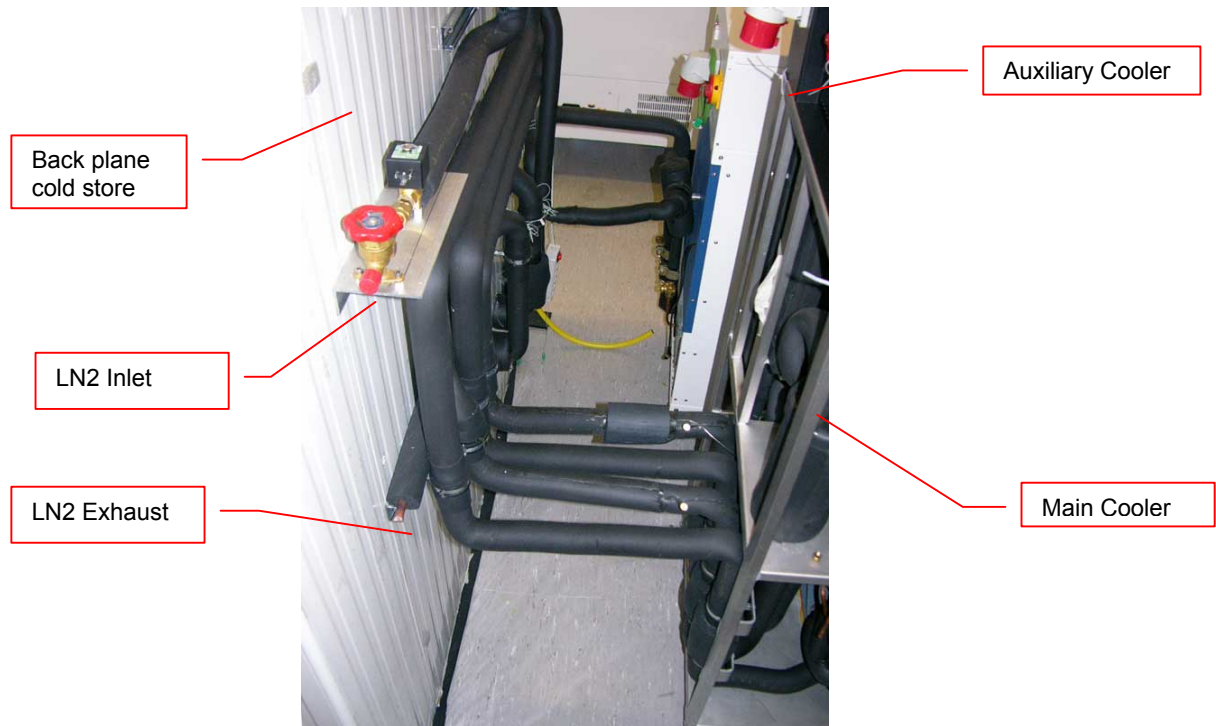
LN2 Requirements

Requirement	Details
Media	LN2
Refill intervall	Depending on DEWAR-Volume With respect to the Leak rate the DEWAR has to be refilled to maintain the minimum desired backup time. Specifications based on Cryotherm Apollo 350: 24 h Back up = Consumption: 209 - 298 L Refill: about every 28 - 80 days (recommended once a month)
Cooling time	Depending on DEWAR-Volume Specifications based on Cryotherm Apollo 350: 100% filled: typically 28 - 40 h 50% filled: typically 14 - 20 h
LN2 Consumption	7-10 kg/h = 8.7 - 12.4 L/h
Leak rate	Depending on DEWAR Specification based on Cryotherm Apollo 350: 0.5% / Day
Supply Pressure	1.5 bar
N2-Exhauste	Exhaust is necessary. In case of use of backup cooling N2 will be released into the environment The Exhaust has to be guided out of the building.

10.1.3   Electrics

Overview

Power 400VAC
main cooler

Power 400VAC
auxiliary cooler

Power 230VAC
Store

Power 230VAC
Interface unit
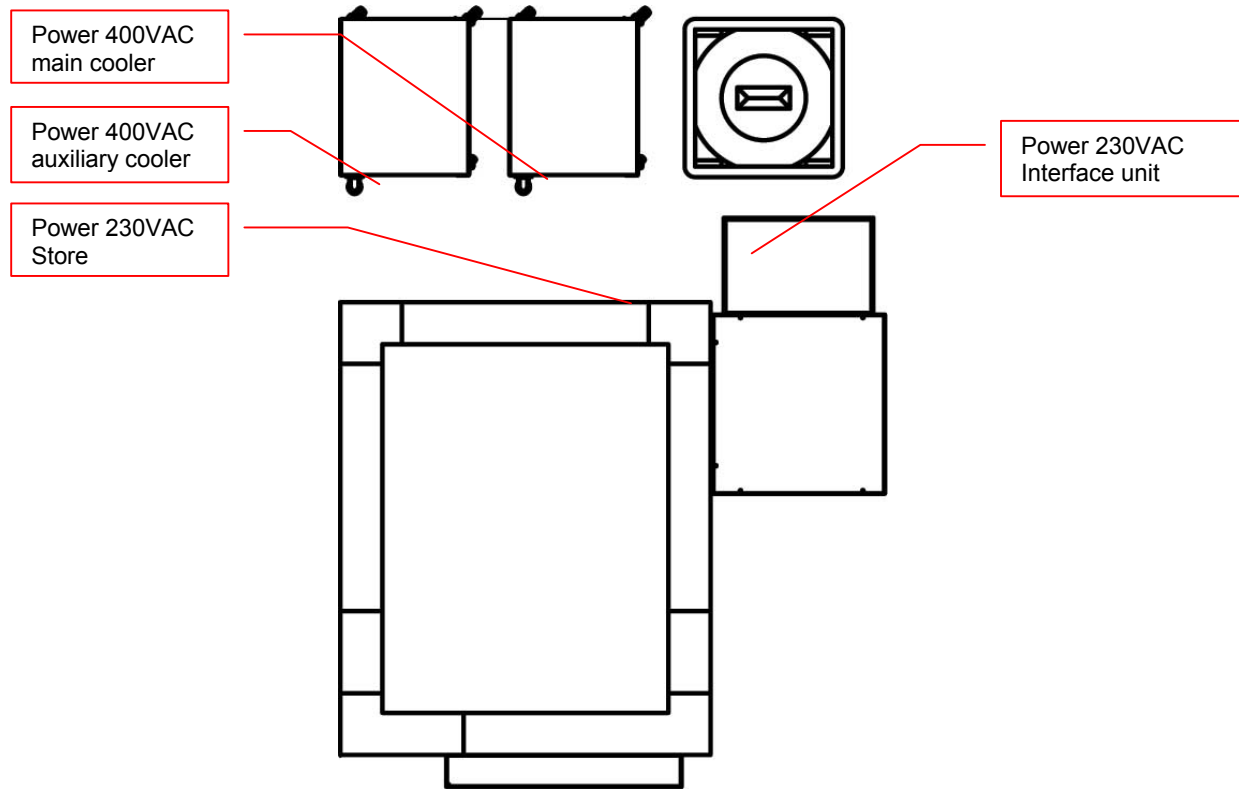
Electrical Connections Store
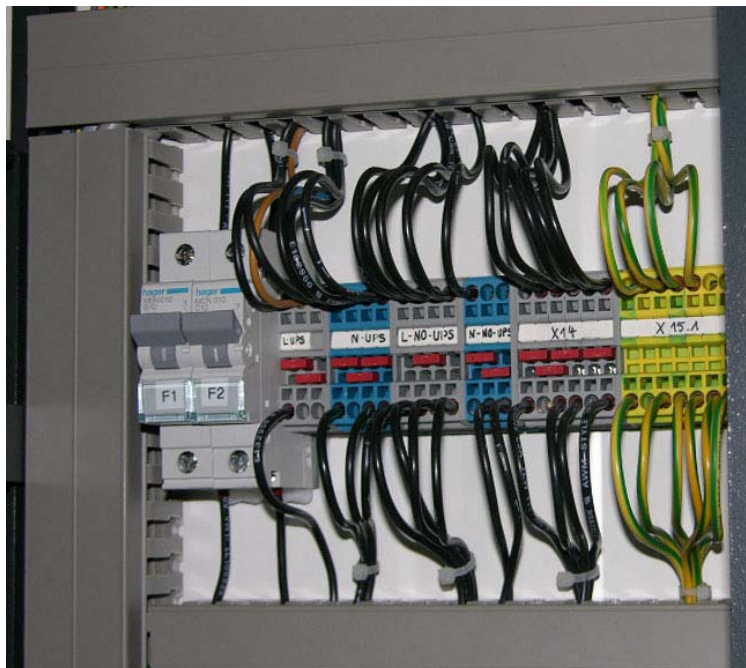
Electrical Connections Cooling units

Communication

Power 400VAC cooler

Main Power switch

IEC 60309
3P+N+PE 400V / 16A

¾"

612

68

60

198

807

1226

206

130
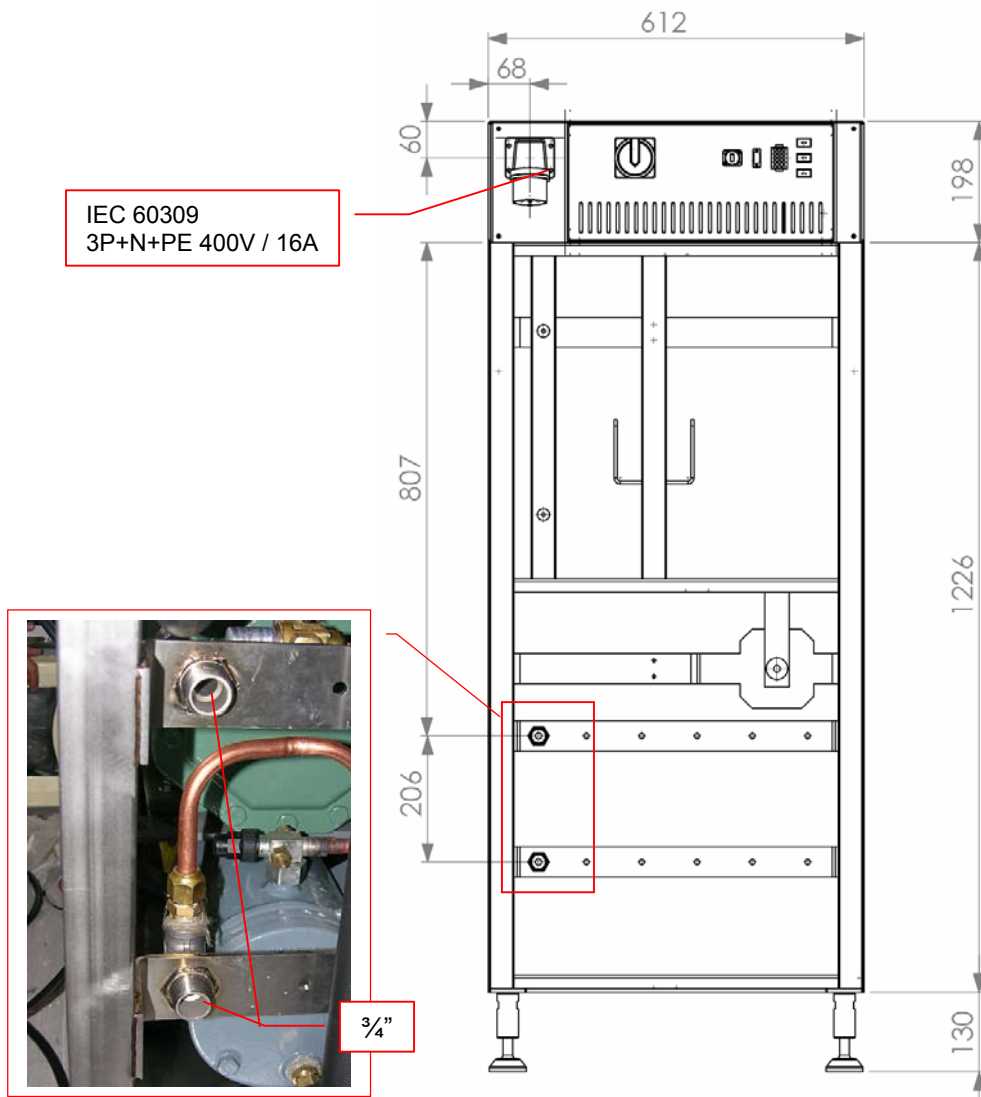
Electrical Connections Interface

Interface unit comm.
Ports Handling /
BCR / Tube Picker /
2D-BCR

Interface unit low Power
230VAC (handling)

Interface unit 230VAC
high power (climate)
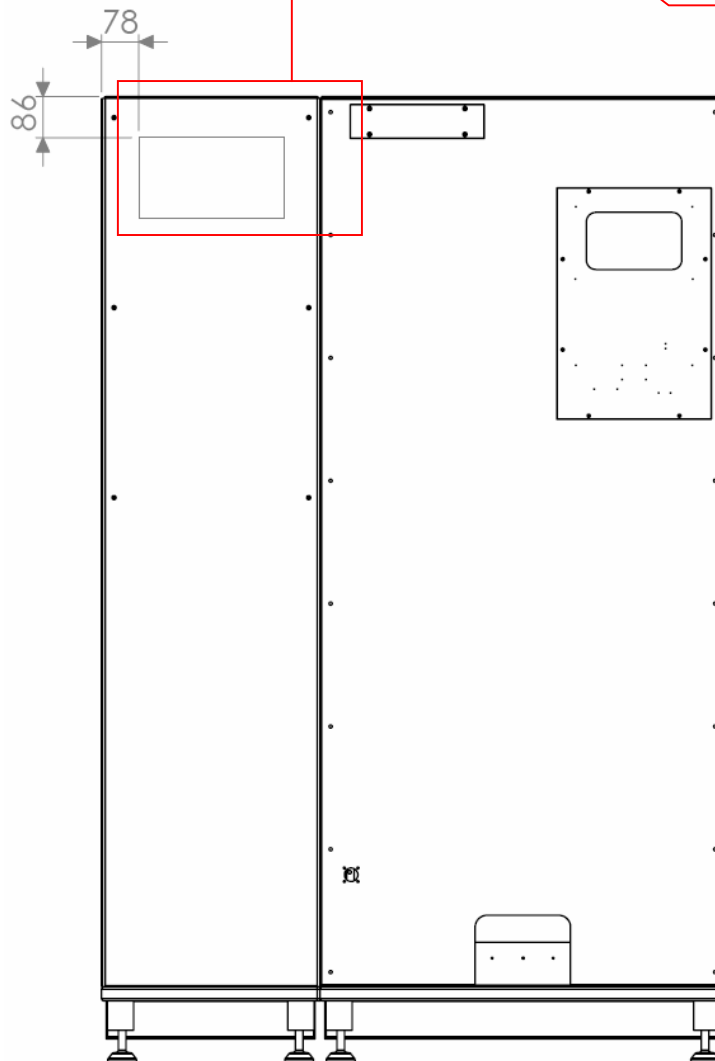
Requirements

Requirement	Details
Supply Refrigeration Store	380V / 50Hz 3 Phases Fuse: 16A Connector: CEE Type 611, 16A 5-Pol: 3xL, N, G (IEC 60309) Phase sequence: clock wise
Supply Redundant Refrigeration Store (optional)	380V / 50Hz 3 Phases Fuse: 16A Connector: CEE Type 611, 16A 5-Pol: 3xL, N, G (IEC 60309) Phase sequence: clock wise
Power consumption Refrigeration	Typically: Current: 8 - 10 A Voltage: 380V / 50Hz 3 Phases Power: 2.5 - 6 kW
Supply Logic Control Unit Store	230V / 50Hz UPS protection Fuse: 10A Connector: Type C14, 10A 3-Pol: L, N, G
Supply Dryer Store	230V / 50Hz Fuse: 10A Connector: Type C14, 10A 3-Pol: L, N, G
Supply Interface Unit Logic	230V / 50Hz UPS protection Fuse: 10A Connector: Type C14, 10A 3-Pol: L, N, G
Supply Interface Unit Climate	230V / 50Hz Fuse: 16A Connector: Type C20, 16A 3-Pol: L, N, G
Power consumption Logic Control Unit Store	Typically: Voltage: 230V / 50Hz Power: < 1 kW
Power consumption Dryer Store	Typically: Voltage: 230V / 50Hz Power: < 2.5 kW
Power consumption Logic Control Unit Interface	Typically: Voltage: 230V / 50Hz Power: < 1 kW
Power consumption Climate Unit Interface	Typically: Voltage: 230V / 50Hz Power: < 2 kW

10.2   Gassing Installation

10.2.1   Kiwi Store Gassing and Backup Options

The Kiwi Store series supports a wide selection of gassing and backup options. Typical properties of some commonly used options are described next. There are other gassing options available. Note that each gassing and backup option is linked to specific risks and hazards. It is important to be fully informed about any specific application before installing the instrument or even running any application.

10.2.2   Safety Information

General

Commonly used in research medicine are inert gases like: Nitrogen, Argon, Helium and Carbon Dioxide. Inert gases are used mainly to create and maintain inert atmospheres for an application or process. The above gases, which generally don't react with other materials, displace oxygen in order to maintain an inert, contaminant free atmosphere.

In their liquid form these gases are very cold, (the boiling point of liquid nitrogen is -196° C) . Such cold liquids are known as cryogenic liquids, (from the Greek, kryos meaning frost and gene meaning producing). The liquid gases therefore can be used as backup cooling option in case of power failure.

Major hazards

There are some major hazards associated with these gases

WARNING !
- ➢ Inert gases are asphyxiates and will displace oxygen to produce localized oxygen deficient atmospheres
- ➢ Inert gases are odorless, colorless and tasteless
- ➢ Inert gases give no warning and may cause death in few seconds

Oxygen is the only gas, which supports life. The normal concentration in the air that we breathe is approximately 21%. If the oxygen concentration in air diminishes or, (what amounts to the same) if the concentration of inert gases increases, a situation is rapidly reached where the hazards of asphyxia become very great.

The danger occurs as soon as the oxygen levels are lower than 16%. Inert gases are odorless, colorless and tasteless and are therefore a great deal more dangerous than other gases such as chlorine, ammonia, or hydrogen sulfide, which can be detected by their odor, at very low concentrations. The asphyxiating effect of inert gases occurs without any preceding physiological signals which could alert the victim. It takes place very rapidly: just a few dozen seconds with very low oxygen content. Stated clearly "you do not notice that you are passing out!"

The danger from the inert gases such as nitrogen, argon, helium, etc cannot be stressed enough!! . Especially in this case of Asphyxia as there are no warning signs. People also vary considerably in their reactions to oxygen deficiency.

> **WARNING !**
> ➢ In their liquid state inert gases are extremely cold fluids which can cause serious burns when in contact with the skin
> ➢ A cryogenic spill often gives a low lying cloud of vapor that creeps along the ground

When a cryogenic liquid is released into the atmosphere, it evaporates and forms a dense cloud. As it is very cold it is heavy and hangs close to the ground. So it will flow into any low lying areas, such as drains or pits. Therefore the first warning of a cryogenic spill is often given by the presence of a low lying cloud of vapor that creeps along the ground. These clouds can be dangerous, as their temperature or composition will be unknown. Visibility within the cloud is very low with the possibility of falling, perhaps into contact with the cryogenic liquid. If the cloud is nitrogen or argon then it is very likely that the cloud does not contain sufficient oxygen to support life. In this case unconsciousness could be immediate and death could follow.

> **CAUTION !**
> ➢ When you see a cryogenic spill or a large vapor cloud notify qualified personnel immediately
> ➢ Shut off the source of liquid, by a REMOTELY controlled valve
> ➢ Do not enter a vapor cloud caused by vaporizing cryogenic liquid
> ➢ DO NOT SMOKE!

When you see a cryogenic spill or a large vapor cloud notify qualified personnel immediately. Call the Fire Department in the case of a large liquid oxygen spill. Have them stand by until the spillage is dispersed.

If possible shut off the source of liquid, by a *remotely* controlled valve if one is fitted. Do not expose yourself to the hazard, such as high oxygen, combustible or asphyxiating atmospheres or cryogenic liquid. Do not allow liquid oxygen to enter drains or sewers. If so advised, shut down any air conditioning or ventilating systems that may draw vapor or gas from the spill into other locations.

If it is essential to enter a cloud caused by nitrogen or argon (note: never enter one that could be rich in oxygen), then wear a self contained breathing apparatus provided you are trained and qualified to do so. A stand-by person, also wearing breathing apparatus must keep you under surveillance. If the release is oxygen, then your clothes could be saturated making them extremely flammable. If you suspect that you have been contaminated with oxygen do not go near any source of ignition for no less than 15 minutes. Ventilate your clothing; change if possible. A fire may occur at any time in the oxygen cloud, should it come into contact with highly combustible material.

General Safety Instructions

When working with inert gases prevent contact of liquid gas, cold vapors, or "snow" with exposed skin. Prevent entrapment of liquid in closed systems. Use only in well ventilated areas. Compressed gas cylinders contain gaseous and liquid gas at extremely high pressure and should be handled with care. Use a pressure-reducing regulator when connecting to lower pressure piping systems. Secure cylinders when in use. Never use direct flame to heat a compressed gas cylinder. Use a check valve to prevent backflow into a storage container. Avoid dragging, rolling, or sliding the cylinders, even for a short distance. Use a suitable hand truck. For additional handling recommendations on compressed gas cylinders, consult the Compressed Gas Association Pamphlet P-1.

CAUTION !
➢ Wear loose fitting gloves of impermeable material such as leather when working with cold liquid, solid, or vapor
➢ Safety glasses are recommended when handling high-pressure cylinders and in areas where vapors are discharged

Set-up gas cylinder in a well ventilated area. Keep cylinder away from sources of heat. Storage should not be in heavy traffic areas to prevent accidental knocking over or damage from passing or falling objects. Valve caps should remain on cylinders not connected for use. Segregate full and empty cylinders. Storage areas should be free of combustible material. Avoid exposure to areas where salt or other corrosive chemicals are present. Install carbon dioxide cylinders with the valve end up. See Compressed Gas Association Pamphlet P-1 for additional recommendations.

10.2.3   Installation Safety Recommendations

Preventive Measures

The very first preventive measure is to inform all persons who handle or who use inert gases:

- Of the hazard represented by the refraction of oxygen in atmosphere
- Of the preventive means to be employed in handling the gases
- Of procedures to be observed should an accident occur

This information and training should be systematically and periodically reviewed in order to maintain an awareness with regard to these hazards. In particular, training in rescue work is fundamental since quickly improvised rescue, without the respect of a strict procedure, often proves to be ineffective, if not catastrophic (the rescue worker lacking foresight becomes a second victim). An annual program of training and rescue drills is recommended.

Ventilation

Depending on the existing ventilation, amount of gas used and size of room where the unit is installed and operated, ventilation may be required. A local exhaust may be useful at the point of sources of possible gas vapors. Where low lying areas are not naturally ventilated vents should be situated to avoid higher than normal concentration. Hazards to be considered in confined spaces are:

- Limited access and exits
- Increased likelihood of gas accumulation through leaks
- Increased asphyxiation risk
- Fire and explosion hazard

To be considered as confined spaces are the inside rooms of a building, laboratory rooms, machine pits, culverts, basement trenches for piping. When working in confined spaces, it is advisable that operators and other personnel are fully aware of the hazards of oxygen deficiency and adopt the following practices:

- A fully documented permit to work system
- Personal and fixed oxygen analyzers
- Self contained breathing apparatus available for use and all personnel fully trained in its use
- Personnel harnesses and ropes
- Operation of the "buddy system"
- A system of fresh air ventilation and fume extraction

In the case of permanent presence of personnel in a room where there are risks of oxygen depletion mixture, ventilation must be maintained with at least 30mJ per hour per person. The volume of air introduced per hour must not be less than twice the enclosed space in question. Ventilation should never be carried out with pure oxygen, but solely with air.

Testing of Oxygen or Gas Content

At present, various types of oxygen analyzers are available, which are often simple and reliable to operate. Such a monitor should at least have

- A readout of the actual gas concentration
- A settable alarm threshold value
- An alarm output with an acoustic and optical alarm connected
- An error output that shows malfunction of the monitor

Ideally the monitor should be placed so that it can be read inside, as well as from outside, the room which has gas present. The selection of the type of apparatus depends on the nature of the work in the place to be monitored (temperature, multiple detectors, portable equipment, etc). The picture below shows such a monitor for CO_2.

Testing the oxygen content is desirable, although attention must be drawn to the fact that an analyzer alone is not absolute protection. Such equipment can always malfunction, unexpectedly be out of adjustment or detectors can be improperly positioned. Testing of oxygen content should therefore only be considered as an aid to the detection of a lack of oxygen.

Work Permit

For certain types of work, safety instructions and a special work procedure must be set up in the form of a work permit

Personnel Protection

Depending on the type of work to be performed, and the layout of the premises, the decision to provide additional protection for personnel may be taken on the initiative of the person in charge. Such additional protection may involve:

- The use of notices warning against the presence of a hazard
- The placing of a person on watch outside the work area
- The use of personal atmosphere monitors
- The organization of an alarm system for rapid intervention in case of an emergency
- The wearing of a harness so that the worker can be easily and rapidly taken out of an enclosed space in the case of an emergency. Preferably this harness is connected to a hoist to facilitate removing the victim. It is very difficult for one man to lift up another in the absence of a hoist.
- The wearing of an autonomous breathing mask, to the exclusion of all cartridge masks, which are ineffective in a case of lack of oxygen.
- The wearing of protective goggles and gloves when handling liquid nitrogen to avoid burns
- The wearing of all other means of protection, such as safety shoes, helmet, etc., depending on the circumstances
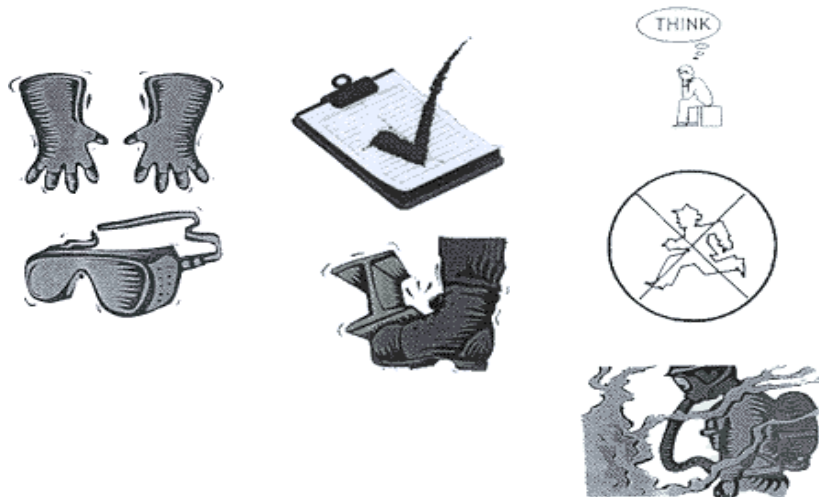
Considering the hazards mentioned above, it is essential to provide all those who handle or use inert gases with all the information and training necessary regarding safety instructions, means of prevention and procedures to be followed to avoid accidents, as well as rescue procedures to be implemented in the event of an accident.

10.2.4   Gassing System Installation

On installations preferably choose pressurized cylinders rather then gas wall outlets. The use of cylinders will limit the amount of gas being spilled in case of fatal failure. Whenever a wall outlet installation is chosen, make sure that there is a remote shut off valve installed outside the room where the gas is used.

Place the cylinder in an easily accessible and visible place next to the system. Remember that the cylinder will have to be replaced or refilled routinely. As the operator will have to check the cylinder routinely it should be clearly visible to all personnel during routine work.

The room should provide a glass door or a window that will allow a good view of the instrument and gas connection from outside the room. Often major defects can easily be detected by visible vapor clouds or icy tubes without the risk of entering a contaminated room.

Before installation make sure that the maximum specified inlet pressure is never exceeded. Always install a main shut-off valve that will cut gas flow as close to the source as possible. Secure cylinder when in use.

WARNING!
- Gas cylinders are under extremely high pressure that must be reduced for use with a StoreX incubator
- Use a pressure-reducing regulator when connecting to lower pressure piping system
- Never exceed maximum specified inlet pressure
- Never connect a Kiwi gassing inlet directly to a pressurized cylinder or wall outlet

Use a two stage pressure regulator with indicating valves. The high pressure gauge should have an indicating range of 0 to ~200 bar (0..3000 psi) to monitor the pressure or the gas source. For CO2 a scale of 0..100 bar (0..2000psi) is sufficient. The low pressure gauge should have an indicating range of 0..4 bar (0..60 psi) and will monitor the input pressure to the Kiwi Store. A flow meter is recommend since it will show correct operation of the system.

Cylinder Pressure Gauge — Main Shut-off Valve ! — High Pressure Gas Cylinder — High Pressure Adjustment Screw — Low Pressure pipe — High Pressure Regulator — Gas Flow Meter — Gas Outlet Adjustment Valve — Low Pressure Regulator — Low Pressure Gauge
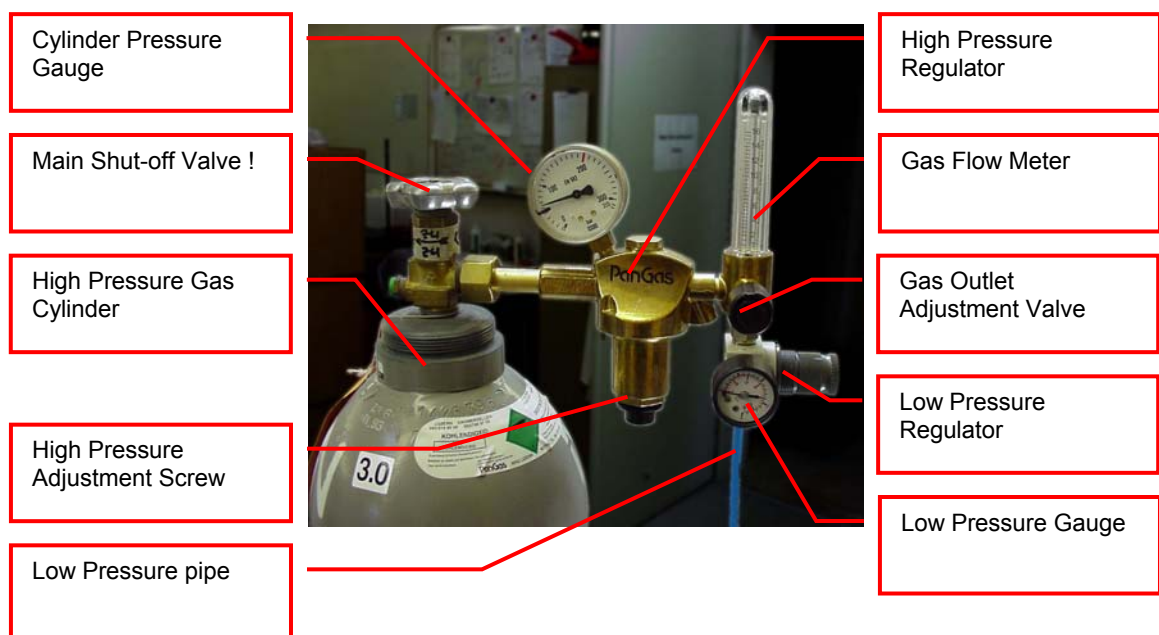
Two-stage pressure regulators are available from gas suppliers or laboratory accessories suppliers. The picture above shows an example of an installation. There is a wide variety of different models available. Your equipment may look different.

The gas inlet of the Kiwi Store is located on the back of the instrument. Attach the low pressure hose securely to the fitting. Always use the security nut. Never operate the unit without the security nut being tightly fit.
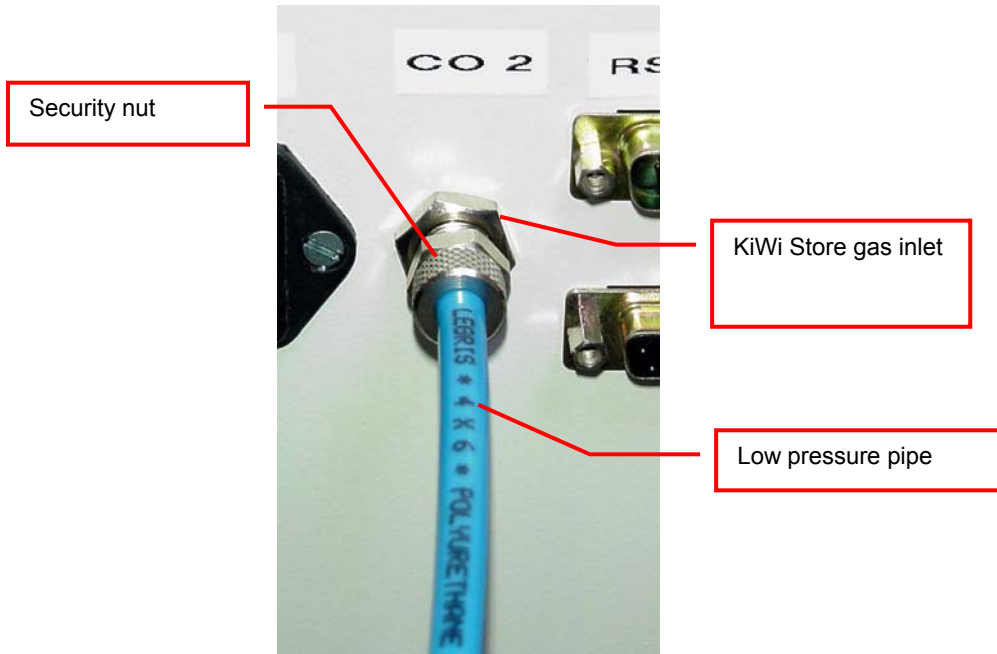
Use 4x6mm PUR, PVC, Neoprene or Nylon tube for the low pressure connection or in case of liquid nitrogen backup option a cryogenic safety tubing. Do not use Silicon or natural rubber tubing. Make the low pressure tube long enough to allow a minimum of movement of the gas cylinder for cleaning and maintenance work. For longer length of tubing, copper or other metal tubing should be considered. Foresee flexible tubing next to the instrument.

Be prepared for the following gas consumption values. These values may vary significantly over time since they depend on the instruments use.

10.2.5 Specific Advice for CO2 Carbon Dioxide

Principals of Operation

CO2 is mainly used as backup cooling for the KIWI DF STORES. CO2 allows to maintain the temperature at –20°C.

WARNING !
➢ Improper use of CO2 or improper installation of the CO2 operated equipment may cause death
➢ Read CO2 safety information and installation instructions (See CO2 Installation) carefully. If you are not familiar with the handling of CO2 and / or safety precautions contact trained personnel.

Properties of Carbon Dioxide

Carbon dioxide is colorless and odorless as gas or liquid. It is stored In containers under its own vapor pressure. If the pressure is suddenly relieved, the liquid rapidly cools as it evaporates and sublimes, forming dry ice at -78.5°C (-109.3°F)

Boiling Point @ 1 atm	-78.5°C, -109.3°F
Freezing Point @ 1 atm	-56.6°C, 76.0°F
Vapor Pressure @ 20°C	56.5 atm, 831 psi
Solubility in Water @ 20°C, 1 atm	87.8% vol.
Specific Gravity (air =1) @ 20°C, 1 atm	1.53

Health Hazard Data of Carbon Dioxide

Carbon dioxide is a minor but important constituent of the atmosphere, averaging about 0.03% or 300 ppm by volume. At higher concentrations it affects the respiratory rate. Additional symptoms are described below.

WARNING !

➢ THRESHOLD LIMIT VALUE TLV = 5'000 ppm

➢ TLV-STEL (Short Term Exposure Limit) = 15'000 ppm   (=1.5% vol.)

Carbon dioxide does not support life and may produce immediately hazardous atmospheres. At a concentration in excess of 1.5%, carbon dioxide may produce hyperventilation, headaches, visual disturbances, tremor, loss of consciousness and death. Symptoms of exposure In the concentration ranges of 1.5-5% may be highly variable, but typical symptoms of carbon dioxide intoxication include the following:

CO2 Concentration	Symptoms
3-6%	Headaches, dyspnea, perspiration, breathing increases to approximately four times normal rate, symptoms of intoxication become evident, and slight choking may be felt.
6-10%	Headache, dyspnea, perspiration, tremors, visual disturbance, characteristic sharp odor noticeable, very labored breathing and ringing in the ears, judgment may be impaired, followed within minutes by loss of consciousness.
Over 10%	Unconsciousness occurs more rapidly above 10% level. Prolonged exposure to high concentrations may eventually result in death from asphyxiation.

If the concentration of carbon dioxide exceeds 10%, unconsciousness can occur without warning, preventing self-rescue. At much higher concentrations, carbon dioxide displaces the oxygen in air below levels necessary to support life.

Persons suffering from the toxic effect of carbon dioxide should be moved to areas with normal atmosphere. Self contained breathing apparatus may be necessary to prevent toxic exposure or asphyxiation of rescue workers. Assisted respiration and supplemental oxygen should be given if the victim is not breathing. Frozen tissues should be flooded or soaked with tepid water (105-115F; 41-46C). Do not use hot water. Cryogenic burns which result in blistering or deeper tissue freezing should be seen promptly by a physician.

10.2.6   Specific Advice for N2 Nitrogen

Properties of Nitrogen

Nitrogen is colorless, odorless and tasteless, as gas or liquid. It is nontoxic and non-flammable at atmospheric temperatures and pressures. A specific gravity of 0.9669 makes nitrogen slightly lighter than air. Nitrogen is mainly found in the atmosphere, where it accounts for 78.1% by volume of the air we breath. It is stored In containers under its own vapor pressure.

Boiling Point @ 1 atm	-195.8°C (-320.4°F)
Freezing Point @ 1 atm	-209.9°C (-345.8°F)
Vapor Pressure @ 20°C	150 atm
Solubility in Water @ 0°C, 1 atm	2.3% vol.
Specific Gravity (air =1) @ 20°C, 1 atm	0.97

Health Hazard Data of Nitrogen

Nitrogen is inert and does not sustain life. Nitrogen is nontoxic, but may cause suffocation by displacing the oxygen in air.

Oxygen Concentration	Symptoms
21 - 14% (<19.5%) Oxygen	Increasing pulse rate, tiredness, dizziness, drowsiness, excess salivation, diminished mental alertness
14 - 11% Oxygen	Muscular coordination slightly disturbed, intellectual performance becomes difficult, breathing and pulse rate increased
11 – 8% Oxygen	Possibility of headaches, nausea and vomiting, collapse or loss of consciousness.
< 6% Oxygen:	Unconsciousness occurs without warning and so quickly that the individuals cannot help or protect themselves. Convulsive movements, possible respiratory collapse and death or brain damage

On sudden pressure release, liquid nitrogen rapidly cools as it evaporates and sublimes, forming dry ice at extremely cold temperatures of –196°C (-320°F) at atmospheric pressure. This can cause **severe frost bite**.

WARNING !
➢ Nitrogen may cause suffocation by displacing the oxygen in air. Ensure levels of *at least 19.5% Oxygen*
➢ On evaporation Nitrogen forms dry ice at *extremely cold* temperatures of –196°C (-320°F)

Nitrogen may cause mild skin irritation, moderate eye irritation and possible gastric distress. Cause of chronic illness is not known.

On vaporization Nitrogen expands by a factor of 700; one liter of liquid nitrogen becomes 0.7 cubic meter (24.6 cubic feet) of nitrogen gas. This can cause the **explosion** of a sealed container, or it can displace oxygen in the room and cause **suffocation without warning**. Nitrogen can also become oxygen enriched and cause ordinarily noncombustible materials to burn rapidly.

In case of an accident evacuate all personnel from the affected area. Persons suffering from lack of oxygen should be removed to fresh air. If victim is not breathing, use trained personnel to administer a supplemental oxygen supply and

artificial respiration to support vital functions. If breathing is difficult, administer oxygen. Victim and rescuers must seek immediate medical attention.

Ventilate area and attempt to shut off the release of gas by tightening the main valve. If it is not possible to stop the release of gas, allow the gas to be released there. If leaking from cylinder or its valve, contact your supplier. Monitor area for a minimum of 19.5% oxygen content before allowing re-entry by personnel.

In case of frostbite, restore tissue to normal body temperature, 37°C (98.6°F), followed by protection of the injured tissue from further damage and infection. Immediately place the frostbitten part in warm water (not to exceed 40°C) or wrap affected parts gently in blankets. Under no circumstances should the water be over 44°C (112°F), nor should the frozen part be rubbed either before or after re-warming. Remove or loosen clothing that may constrict blood circulation to the frozen area. In case of massive exposure, remove clothing while showering the area with warm water. Encourage victim to gently exercise the affected part while being warmed. Call a physician. The patient should neither smoke, nor drink alcohol.

10.2.7 Principles of Operation of Gassing Options

Continuous Flow System

The Continuous Flow System is the simplest implementation of the gassing option. The use of this solution is limited to low-accuracy applications where the incubation chamber has to be filled with a specific gas or where a gas inside the chamber has to be displaced. In some applications pre-mixed gas may be used. The gas flow is adjusted to a value that generates the specified atmosphere. This value is determined experimentally by the user. In most cases the low costs of this solution will quickly be compensated by the costs caused by the excessive gas consumption and / or additional safety requirements needed in conjunction with this solution.

A pressure limiter and a flow limiter protect the system from inlet pressure fluctuations and make it relatively insensitive to the amount of input pressure. This solution is adequate for very low demanding applications and for non toxic gases. Note that a significant amount of gas may be emitted to the instrument's environment.
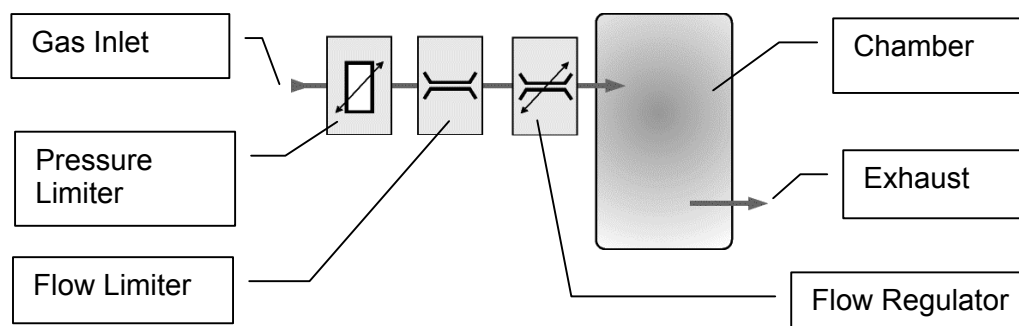
An exhaust channels the surplus amount of gas to a defined point. The exhaust is usually connected to the slightly under-pressurized exhaust system of the building. The flow regulator is combined with a visual flow indicator and a scale calibrated in l/min.

Open Loop System

The Open Loop System uses a more intelligent system that limits gas flow to the actual required amount. This solution is suitable for mid-accuracy applications where the incubation chamber has to be filled with a specific gas or where a gas has to displaced. In applications where a certain concentration has to be maintained pre-mixed gases may be used. The advantage of this solution over the continuous flow solution is its lower gas consumption while still maintaining low costs.

The picture below explains the functioning of this system. At the gas inlet a pressure limiter and a flow limiter protect the system from inlet pressure fluctuations. This also makes the system relatively insensitive to the amount of input pressure.

Flow Regulator	Chamber
Gas Inlet	
Pressure Limiter	
Flow Limiter	
Exhaust	
Main CPU	01010001110
Glass Door Switch	Gate Switch
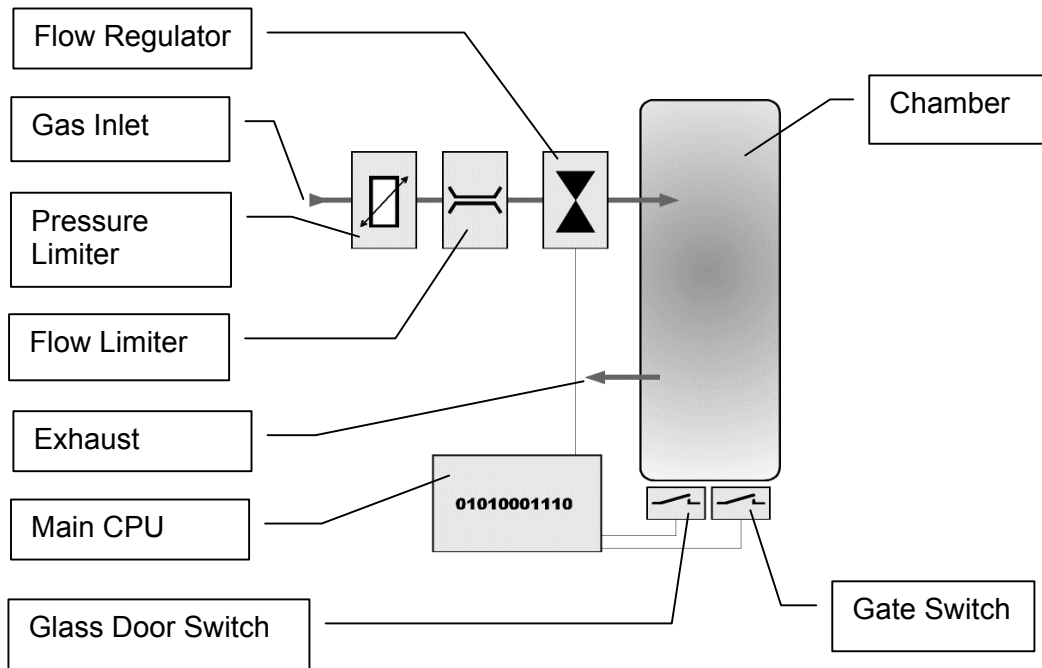
The actual gas flow is controlled by a solenoid. The solenoid is controlled by the main CPU. By sensing both, glass door switch and Gate switch, the CPU knows when there is a user access or when the Gate is opened and reacts accordingly. In fact the CPU holds three values that represent the gas needed to add. The standby value maintains the gas concentration when there is no access and compensates for minor leakages of the incubation chamber. The Gate Access Value compensates the gas loss caused by a Gate access while the User Access Constant allows recovery after opening the glass door. The CPU internally calculates the actual amount of gas needed in a specific situation. Since this system limits the gas consumption to a fairly low level the exhaust does not have to be connected in most cases.

Closed Loop System

The Closed Loop System is the most advanced system that gives a very high level of accuracy and maximum flexibility. The gas consumption is limited to the actual required amount. This solution is suitable for high-accuracy applications where the incubation chamber has to be filled with specific gas concentrations that may even vary with time. In addition this solution provides an external and remotely readable readout of the actual gas concentration inside the incubation chamber. Gas concentration can be set or altered remotely.

Right at the inlet a pressure limiter protects the successive components against overpressure, up to ~10 bar. The pressure limiter also makes the gassing option relatively insensitive to the amount of inlet pressure. A flow limiter also limits the gas flow to ~10 l/min. A solenoid controls the gas flow to the incubation chamber in accordance with the gas concentration inside the chamber.

A second tubing system measures the gas concentration inside the incubation chamber. A pump removes a small amount of gas from the incubation chamber and feeds it to the gas sensor. A particle filter protects the pump and sensor from contamination.
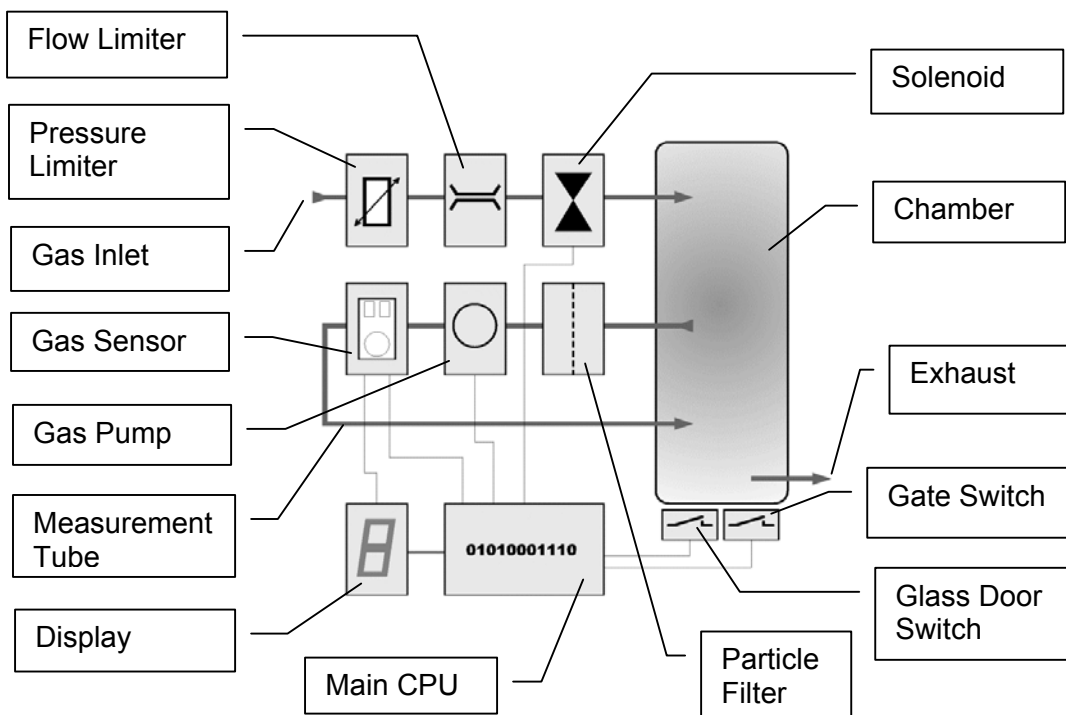
The main CPU monitors the opening of the incubation chamber preventing unwanted gas flow to the surrounding environment. The solenoid is therefore only opened when the glass door is shut and the Gate has not been opened over an excessive period of time.

10.2.8   Integrated Gassing Safety Features

There are a number of safety mechanisms implemented in the system application that protect the user from unwanted exposure to gases. Even in the case of failure or operation errors these mechanisms can ensure safe shut-off of the gas inlet. The optimum arrangement should be selected according to the level of accuracy, danger and specified settling time. The level of safety depends on the type of gassing option.

The continuous flow system has a minimal of safety functions. The exhaust limits gas leaking into the surrounding environment. A slight under pressure on the exhaust will also lower uncontrolled gas flow into the surrounding environment. The safety elements of the continuous flow system simply limit the gas flow and protect against overpressure to some extent. This system may not be used in an higher risk environment.

A significantly higher standard of safety is provided by the open loop. system. In addition to the basic flow and pressure protection, the gas flow is controlled by the system. This results in a significantly higher level of safety and in a reduction of gas consumption.
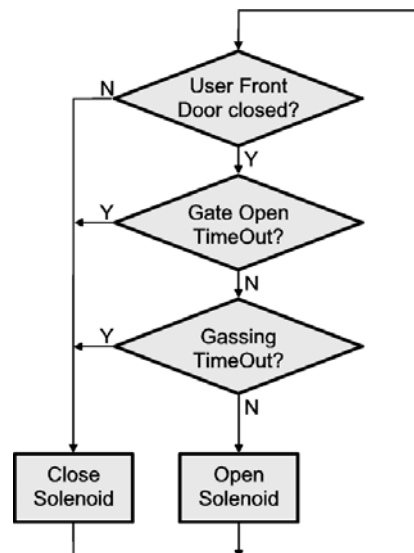
The above flowchart lists the steps that are implemented to avoid unwanted gas emissions. As a first step the gas is always shut-off when the glass door is open. This will eliminate the risk of large amounts of gas exiting when the user door is opened. The same applies to the Gate. However, because of its smaller size some gas flow is allowed even when the Gate is open. A Gate timeout is implemented cutting gas flow when the Gate has been opened for an excessive period of time. An additional general safety step is the gassing timeout. A gassing timeout will occur when the solenoid is opened over a limited period of time.

An even greater level of safety can be achieved by the closed loopsystem. By actually measuring and displaying the gas concentration possible errors or malfunctions can be detected by the system. If the specified gas concentration is not reached within a certain time limit the gas flow is shut-off and a error flag is set. A display will inform the operator as to the correct operation of the system.
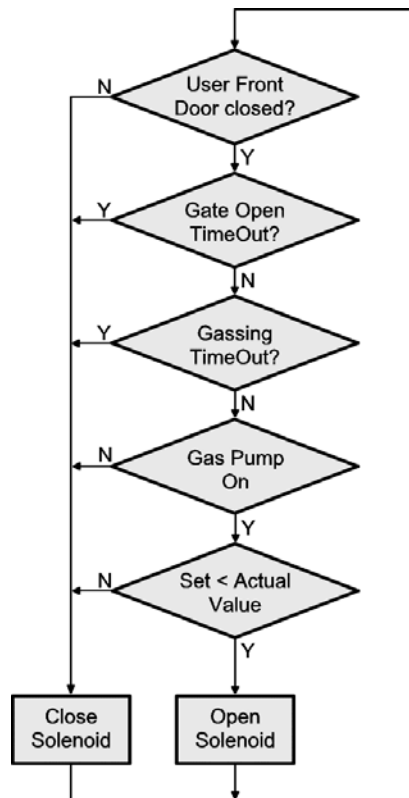
The option of remote access to the gas concentration allows a simple tracing of the gas concentration over long periods of time.

The safety features are summarized in a table given below.

Feature	Comment	F[1]	O[2]	C[3]
Pressure Limiter	Limits internal pressure to some extent	+	+	+
Gas Flow Limiter	Limits maximum flow avoiding full gas flow	+	+	+
Exhaust	Channels exhaust gas	+	+	-[4]
Gas Switch	Turns gas flow on and off	-	+	+
Door Monitoring	Cuts gas flow when door opens	-	+	+
Gate Monitoring	Cuts gas flow when Gate is open over a certain period of time	-	+	+
Gas Flow Timeout	Cuts gas when a continuous gas flow occurs over a long period of time	-	+	+
Gas Flow Lookup	Controls gas flow according to system status	-	+	+
Gas Control	Controls gas flow according to measured gas concentration values	-	-	+
Gas Measuring	Gas sensor measures actual gas concentration	-	-	+
Gas Display	Gas concentration is displayed to user	-	-	+
Gas Transmission	Remote gas concentration readout	-	-	+

WARNING!

> Because of the high safety standards maintained within the Kiwi the highest risk of failure or unwanted gas emission lies in the external installations

[1] Continuous Flow System
[2] Open Loop System
[3] Closed Loop System
[4] Available on request

10.2.9   Backup Refrigeration installation

On installations preferably choose pressurized liquid gas storage cylinders rather then wall outlets. The use of cylinders will limit the amount of gas being spilled in case of fatal failure. Whenever a wall outlet installation is chosen, make sure that there is a remote shut off valve installed outside the room where the liquid is used.

Place the cylinder in an easily accessible and visible place next to the system. Remember that the cylinder will have to be replaced or refilled routinely. As the operator will have to check the cylinder routinely it should be clearly visible to all personnel during routine work.

The room should provide a glass door or a window that will allow a good view of the instrument and gas connection from outside the room. Often major defects can easily be detected by visible vapor clouds or icy tubes without the risk of entering a contaminated room. If this is not possible a oxygen level meter with a remote alarm needs to be installed creating a acoustic and optical alarm in case of low oxygen level.

Before installation make sure that the maximum specified inlet pressure is never exceeded. Always install a main shut-off valve that will cut gas flow as close to the source as possible. Secure cylinder when in use.

⚠	**WARNING!** ➢ Never operate a damaged liquid gas cylinder ➢ Special pressure-reducing regulator may be required to operate a liquid gas backup. ➢ Never exceed maximum specified cylinder pressure ➢ Always ensure tight fit of all connections.

Supplied connection for liquid gas backup is a ½" SAE male (outside thread). For liquid gas cylinder such as Cryogenic cylinders, standard connection hose are available.
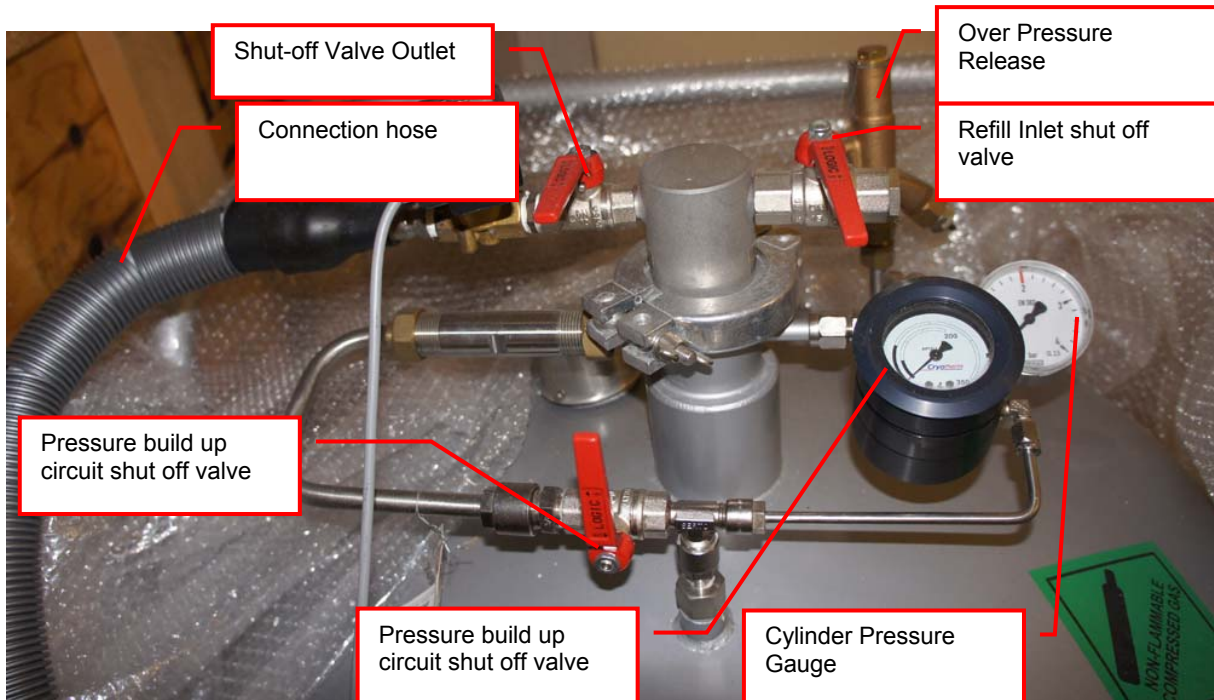
10.2.10 Specific Advice for LN2 Liquid Nitrogen

Properties of Nitrogen

Nitrogen is colorless, odorless and tasteless, as gas or liquid. It is nontoxic and non-flammable at atmospheric temperatures and pressures. A specific gravity of 0.9669 makes nitrogen slightly lighter than air. Nitrogen is mainly found in the atmosphere, where it accounts for 78.1% by volume of the air we breath. It is stored In containers under its own vapor pressure.

Boiling Point @ 1 atm	-195.8°C (-320.4°F)
Freezing Point @ 1 atm	-209.9°C (-345.8°F)
Vapor Pressure @ 20°C	150 atm
Solubility in Water @ 0°C, 1 atm	2.3% vol.
Specific Gravity (air =1) @ 20°C, 1 atm	0.97

Health Hazard Data of Nitrogen

Nitrogen is inert and does not sustain life. Nitrogen is nontoxic, but may cause suffocation by displacing the oxygen in air.

Oxygen Concentration	Symptoms
21 - 14% (<19.5%) Oxygen	Increasing pulse rate, tiredness, dizziness, drowsiness, excess salivation, diminished mental alertness
14 - 11% Oxygen	Muscular coordination slightly disturbed, intellectual performance becomes difficult, breathing and pulse rate increased
11 – 8% Oxygen	Possibility of headaches, nausea and vomiting, collapse or loss of consciousness.
< 6% Oxygen:	Unconsciousness occurs without warning and so quickly that the individuals cannot help or protect themselves. Convulsive movements, possible respiratory collapse and death or brain damage

Spills of liquid Nitrogen have extremely cold temperatures of –196°C (-320°F) at atmospheric pressure. This can cause **severe frost bite**.

⚠️	**WARNING !**
	➢ Nitrogen may cause suffocation by displacing the oxygen in air. Ensure levels of *at least 19.5% Oxygen*
	➢ Liquid Nitrogen has *extremely cold* temperatures of –196°C (-320°F)

Contact with liquid Nitrogen may cause skin frost burns and severe eye damages.

On vaporization Nitrogen expands by a factor of 700; one liter of liquid nitrogen becomes 0.7 cubic meter (24.6 cubic feet) of nitrogen gas. This can cause the **explosion** of a sealed container, or it can displace oxygen in the room and cause **suffocation without warning**. Nitrogen can also become oxygen enriched and cause ordinarily noncombustible materials to burn rapidly.

In case of an accident evacuate all personnel from the affected area. Persons suffering from lack of oxygen should be removed to fresh air. If victim is not breathing, use trained personnel to administer a supplemental oxygen supply and

artificial respiration to support vital functions. If breathing is difficult, administer oxygen. Victim and rescuers must seek immediate medical attention.

Ventilate area and attempt to shut off the release of gas by tightening the main valve. If it is not possible to stop the release of gas, allow the gas to be released there. If leaking from cylinder or its valve, contact your supplier. Monitor area for a minimum of 19.5% oxygen content before allowing re-entry by personnel.

In case of frostbite, restore tissue to normal body temperature, 37°C (98.6°F), followed by protection of the injured tissue from further damage and infection. Immediately place the frostbitten part in warm water (not to exceed 40°C) or wrap affected parts gently in blankets. Under no circumstances should the water be over 44°C (112°F), nor should the frozen part be rubbed either before or after re-warming. Remove or loosen clothing that may constrict blood circulation to the frozen area. In case of massive exposure, remove clothing while showering the area with warm water. Encourage victim to gently exercise the affected part while being warmed. Call a physician. The patient should neither smoke, nor drink alcohol.

10.2.11 Refill LN2 Liquid Nitrogen cylinder

When ever working with liquid Nitrogen use of personal safety equipment is required. Thermal gloves and protective glasses have to be worn at least.

Refill interval of LN2 cylinder is depending on the required minimum backup time and the available LN2 cylinder volume. All cryogenic cylinder have a certain leakage rate which will define the time after which the minimum filling level of the tank is reached. The filling level is shown by a gauge mounted next to the connection points on the cylinder. The actual design may vary depending on cylinder manufacturer.

Before disconnecting the connection hose close the pressure builder valve, the shut off valve on the cylinder and the shut off valve on the connection point on the actual storage chamber. Use two suitable spanner to loosen the connection on the chamber (or on the cylinder depending on refill procedure). Usually the cylinder is then moved to a refill station and refilled with LN2. Depending on cylinder manufacturer the process may vary. Please refer to the manufacturers cylinder manual for further details.

To reconnect the cylinder with the system, proceed in the reverse way to the disconnecting procedure. Connect back the hose. Open the main shut off valve on the cylinder, open the shut off valve on the storage chamber and open the valve on the pressure builder. The pressure builder valve has to stay opened in order to ensure proper operation of the LN2 backup option.

WARNING!
- ➢ Wear personnel protection when disconnecting, refilling and reconnecting LN2 cylinder.
- ➢ Ensure the shut off valves are closed when disconnecting the cylinder.
- ➢ Refer to cylinder manufacture manual for exact refill procedure

CAUTION !
- ➢ Shut off valve of pressure builder has to stay open as long as the cylinder is connected to the storage.

10.2.12 Refill LCO2 Liquid CO2

The refill procedure of the CO_2 backup cooling is a relatively simple process as it only needs to be performed if the CO_2 cylinder is empty. As the CO_2 cylinder has no loss over time it has no regular refill interval.

When replacing a cylinder, make sure the shut off valve on the CO_2 cylinder and on the unit are closed. Use a spanner to disconnect the pressure regulator from the bottle. Put the new bottle in place and reconnect the pressure regulator. Open the shut off valve of the cylinder and of the storage.

⚠	**WARNING!** ➢ Ensure the shut off valves are closed when disconnecting the cylinder.

Manual Operation

11. Power-On System

The instruments power is activated by the main switch. The instrument is turned on by pressing the power switch located at the front of the instrument. After power-on the climate portion of the instrument is activated automatically. An alarm will sound. If the green light of the power switch does not turn on, check the main switch at the back of the instrument or the fuse in the mains supply.
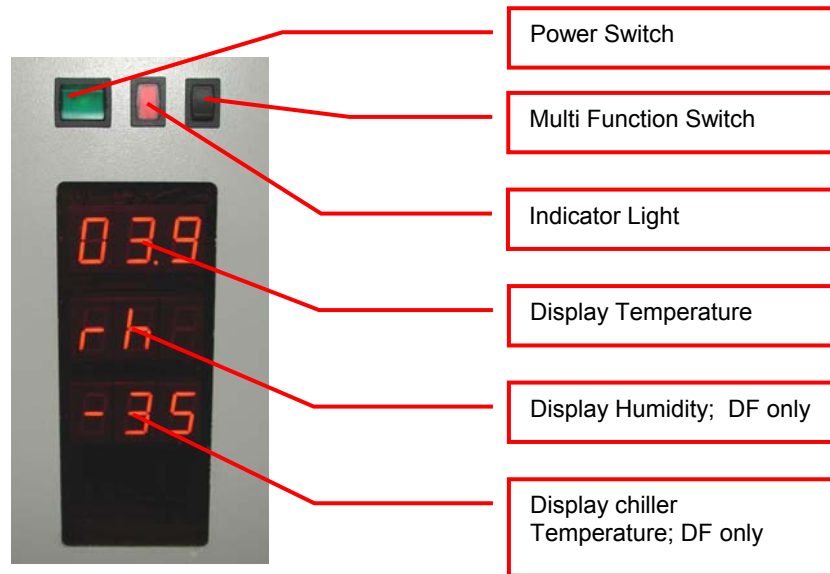
The alarm indicates that the handling is not activated. In order to activate the handling, the black multi function switch has to be pressed (Interface and STT only). The multi function switch will cause the handling to initialize. Take note the gate - if opened- is closed after pressing the multi function switch. Pressing the multi function switch is equal to sending an external activate command through the software.

It is normal for some condensation to occur during warm-up. This condensation will disappear once the internal climate is stabilized. The settling time may take several hours.

The temperature inside the climate chamber is displayed on the temperature display. The temperature display may not be used to set temperature. The operating temperature can only be set through the communication port.

Toggle Multi Function Switch	Function	Description
Toggle (< 1sec) (after power on)	Initialize	Unit initializes (Interface and STT only)
Toggle (< 1sec) (Unit initialized)	Carousel turns one position further	Carousel turns to the next cassette position. (Interface and STT1000 only)
Hold (Unit initialized)	Carousel turns	Carousel turns till switch is released (Interface and STT1000 only)
Hold in case of Alert (10sec)	Acknowledge Alert	Check system for cause of Alert

12. Doors

12.1 front door

The front door opens on the left side of the instrument and should be kept closed at all times. A magnetic seal keeps the front door closed. When access is necessary it should be for as short as possible periods.

In order to avoid condensation and to allow an even temperature distribution inside the instrument, the front door is heated. Note: Leaving the front door open for extended periods will influence the instruments temperature.

Pull left edge of front door

front Shield

front door
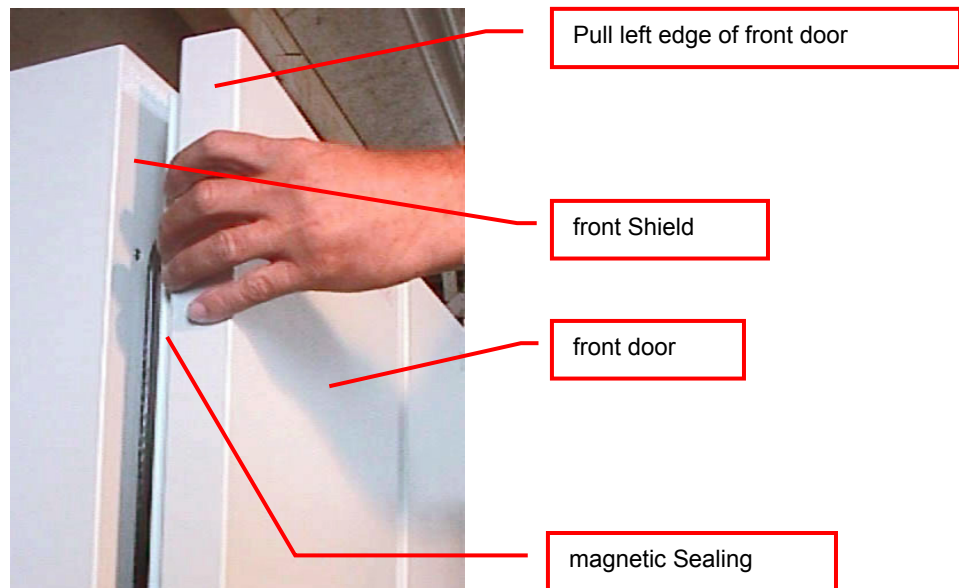
magnetic Sealing

The front door is opened by pulling on the left edge or on the handlebar and may be opened to an angle of almost 180 degrees.

Regularly inspect sealing performance of the front door. The magnetic seal must keep the front door firmly closed over its whole surface. When the front door is out of alignment with the front shield it must be re-aligned by an authorized person. Note that gaps between the magnetic seal and front shield will cause undesired air exchange and therefore condensation and will degrade the temperature distribution.

CAUTION !
➢ Use left edge of front door or the door handle to open front door
➢ Keep front door closed when it is not being accessed
➢ Keep front door access to a minimum
➢ magnetic seal must firmly close front door
➢ Keep magnetic seal clean

WARNING !

➢ It is dangerous to leave the front door open over long periods of time.

➢ Avoid excessive condensation on the glass door

12.2 Glass door

Behind the front door is the glass door which allows inspection of the stored samples and observation of the functioning of the handler while keeping the climate stable.

The glass door may be opened on its left side but should be kept closed at all times. When access is necessary, the glass door should only be opened for as short as possible. A glass door access will dramatically influence climate inside the instrument. Humidity is extremely sensitive to these accesses.

The glass door is sealed by an inner seal. The inner sealing completely isolates the climate inside the climate chamber from the ambient climate. Gas exchange between the climate chamber and the exterior is practically eliminated.

Glass door Sealing

Glass door Lock
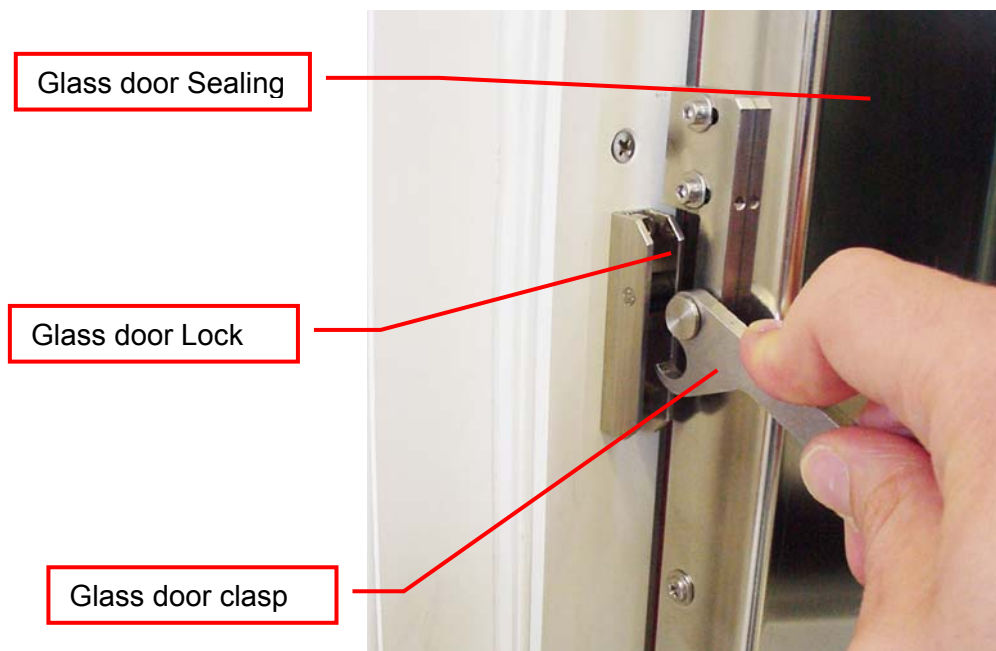
Glass door clasp

When a glass door access exceeds a certain time period an alarm will sound. This alarm will also prevent the glass door from being left open unintentionally. The alarm may be stopped by closing the glass door.

CAUTION !
- Pull the clasp to open glass door
- Keep glass door closed all the time during critical processes. Opening the glass door will dramatically change climate in climate chamber.
- Keep accesses to a minimum
- Regularly inspect glass door seal
- Glass door lock must firmly close the glass door
- Keep inner seal clean

You may press the multi function switch to activate the carrousel. When the desired carrousel position is in front of the door you may open the glass door. Alternatively simply open the glass door and spin the carrousel manually. The power to the carrousel drive is switched off when the glass door is opened.

When you open the glass door during a remote access, the beeper will inform you about the conflict. In this case you should close the glass door again an wait until the remote access is finished or paused the remote accesses.

12.3   The Robot Gate

The robot gate is located on the side of the Interface unit or on the user side of the unit. Through the robot gate the storage samples are transported by the handler. The robot gate has the same sealing system as the front door. Because of the frequent accessing through the gate, special care must be taken with the sealing performance of the gate.

The gate may make spontaneous movements. External commands, manual interaction and internal protection time-out functions may cause the gate to close. Special care must be taken that the gate cannot be accessed during operation.

WARNING !
> Remote Accesses have priority over manual accesses
> No remote access should be initiated during a manual access

The Gate movement is speed and force controlled. However, the high demands on the sealing capability of the gate require certain minimum forces, therefore there is a risk of injury. Never put hands into the gate opening when the instrument is active.

WARNING !
> The gate cannot be opened manually. Do not apply force to the gate.

Gate

Gate
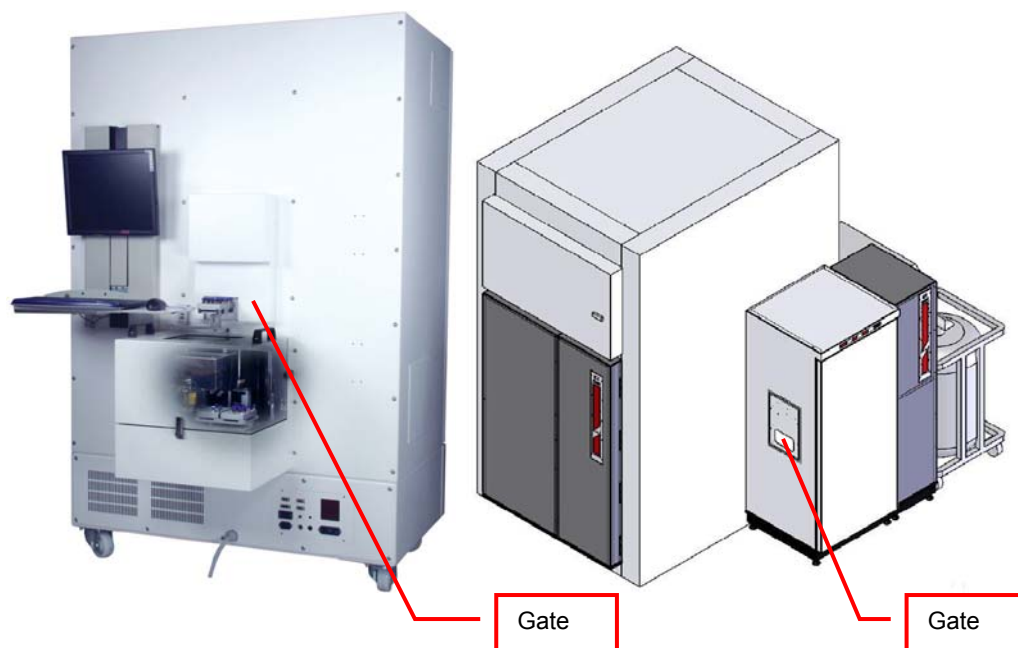
13.　Cassettes

Cassettes allow simple and comfortable loading and unloading of storage samples and can be prepared outside the climate chamber. Once prepared, the samples can be quickly transferred into the climate chamber of the Kiwi unit.

There is a wide variety of cassette types available. Make sure that you work with the proper cassette size that matches the type of plates you are using.

CAUTION !
- ➢ Do not add, bend or remove support rails.
- ➢ If cassettes with different pitch height are used within the same system, make sure a prior removed cassette is put back in exactly the same position. Failures being generated like that, will in destinations not found or crashes.
- ➢ Only a trained System Integrator may alter the instrument configuration and reset the lift accordingly.

The cassettes are open at their front for loading.

Cassette Side Wall

Plastic Rail

Plate (MTP)
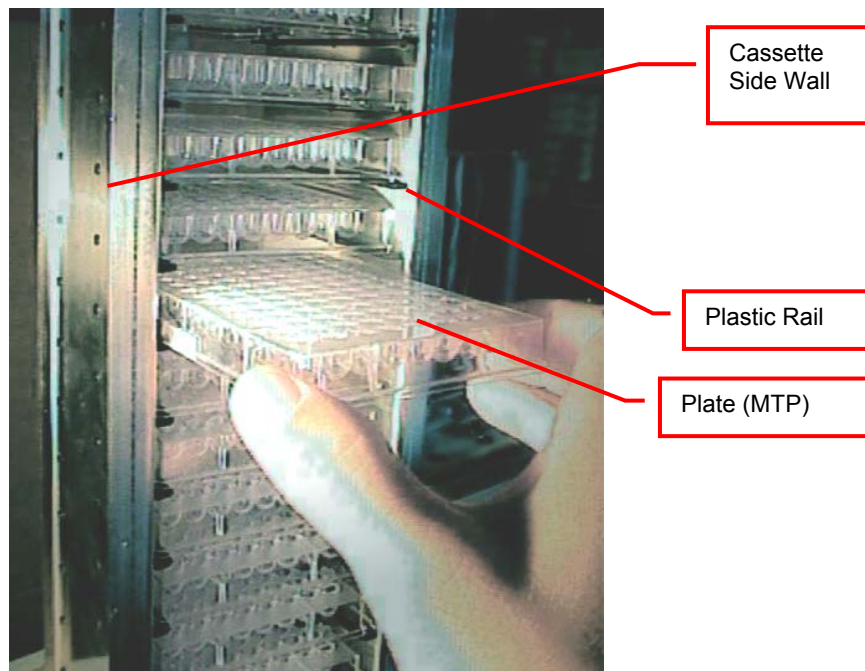
To put a plate into the cassette, choose the level and slide the plate along the rails towards the back of the cassette. Slightly lift the front of the plate to avoid excessive wear of the retaining nozzles at the front end of the rails. When the plates are loaded make sure that they are all pushed towards the back of the cassette. Plates that jut out may cause collision with the handler and may result in damage to the handler.

Cassettes must be treated with great care. They are aligned within 1mm when leaving the factory. Misaligned cassettes must be returned for re-alignment. Misaligned, tilted or bent cassettes may cause handling failures. Special care must be taken when cassettes are fully loaded with plates.

The carousel must be kept clean as particles may cause the cassette to tilt. Do not place cassettes on the floor as they may pick-up dust etc. Always store cassettes inside the climate chamber or on clean surfaces.

Use the cassette handle for transport of the cassettes. When lifting the cassette by its handle it will tilt backward slightly in order to prevent plates from shifting to the front.

Cassette Handle
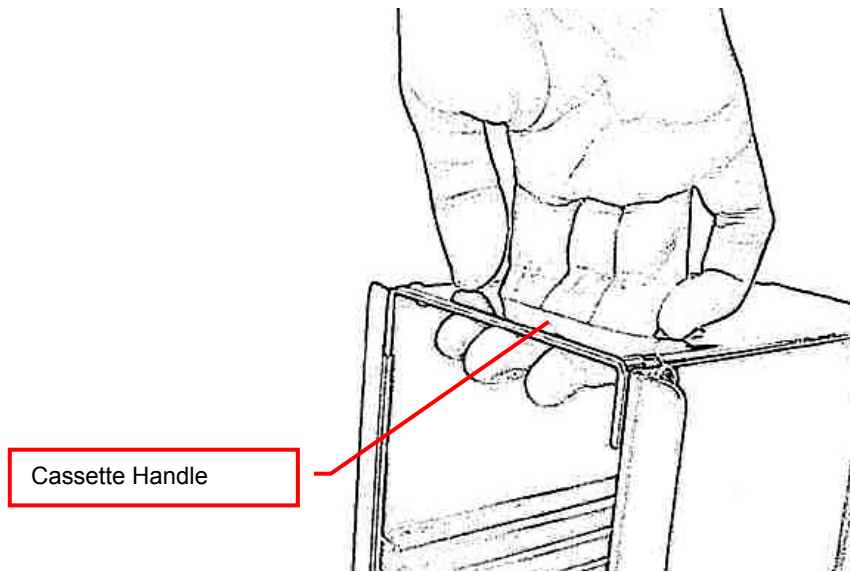
Never apply force to the cassettes. Do not drop a cassette as mechanical shock will misalign it. Never lift a cassette by its side walls. This may bend the side walls of the cassette. Bent side walls cause the plates to block when being loaded or unloaded.

Cassette Side Wall
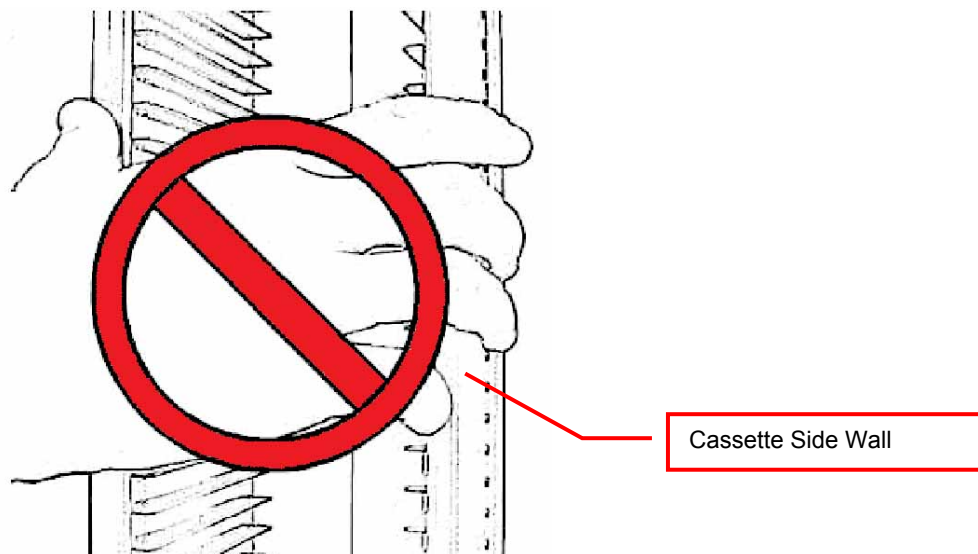
In the rare event of a blockage with the extended shovel in the cassette, the shovel must be carefully pushed backwards until it can move freely. Then the cassette can be removed.

Cassette Handle

Cassette

Cassette Back
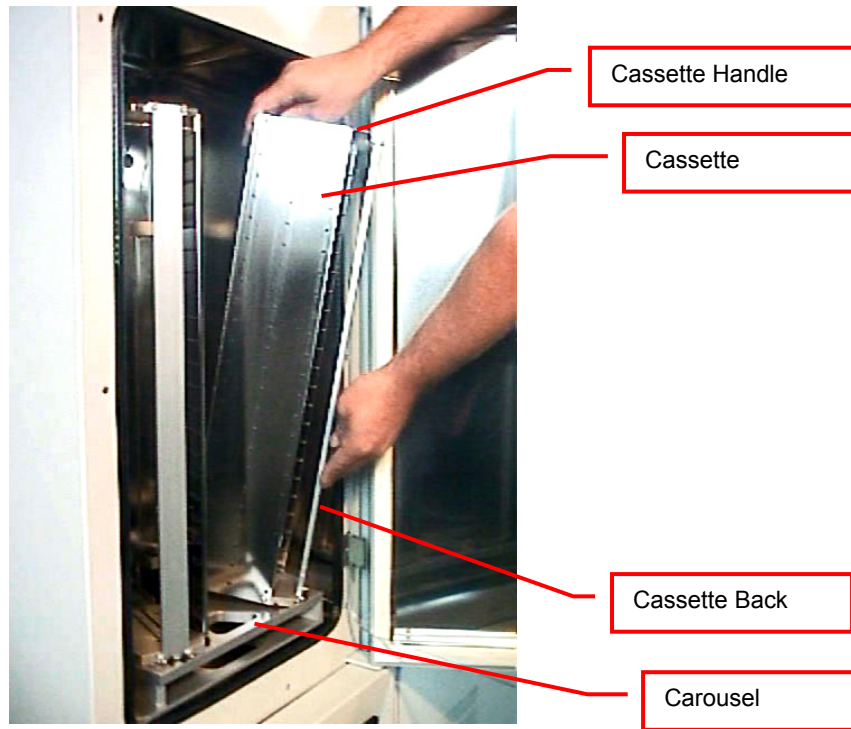
Carousel

The cassettes are secured by alignment rails to the carousel. The cassettes may be tilted slightly backwards (towards the front opening) for removal. In order to load a cassette align the back of the stacker base plate to the cassette alignment rail. Push the cassette forward until it stands vertically. The cassette should now stand firmly on the cassette plate. There should be no movement.

Carousel

Cassette Base Plate

Cassette Alignment Rail
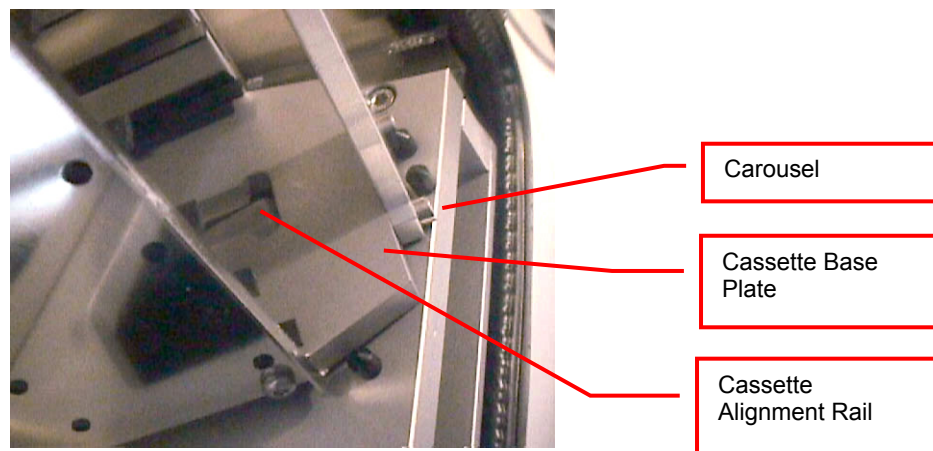
To remove a cassette pull the stacker handle slightly backwards, tilting it, then lift the cassette until it loosens from the cassette alignment rail. Use both hands for this operation. Never use force.

CAUTION !
➢ Make sure that ALL plates are pushed to the back of the cassette. Plates jutting out the front side of the cassette may cause collision with the handler shovel.
➢ Lift cassettes by their cassette handles only
➢ Do not drop cassettes. Misaligned cassettes can cause handling errors
➢ Do not autoclave cassettes with plastic rails. Use disinfecting solution for sterilization. All stainless steel cassettes may be autoclaved.
➢ Keep cassette plate clean. Particles may tilt cassettes

14. Barcode Reader

14.1 1D Reader for racks and plates

The Barcode reader for plate/rack identification is mounted onto the handling mechanism.

The Barcodes must be placed on the shorter side of the plates and must face towards the open side of the cassette. The barcodes should be parallel to the plate's lower edge. The barcode label should be centered both vertically and horizontally. On higher plates (e.g. deep well plates) place the barcode further down. Preferably barcode labels should be at the same height independent of the plate height. Barcode reading reliability is improved when the barcode is not covered by the plate's lid.

	WARNING !
	➢ Laser Class 2. Laser light - do not look into the beam.
	DANGER !
	➢ May be harmful to your eyes.

Use barcode testing device to verify barcode quality. Quality Class A, B or C are required. Identification of Class D is not guaranteed. For sufficient print quality use barcodes printed by thermal transfer or photographic methods. The barcode label surface should be mat and clean. Do not use yellowed, dirty or damaged barcodes

14.2 2D Reader for tubes

The 2D Reader for tube identification is mounted on the tube handling mechanism.

The 2D codes must be placed on the bottom of the tube. The 2D reader operates on a camera based principle. Therefore it needs lighting by short flashes to take pictures. These flashes may be a potential trigger for people with photosensitive epilepsy.

	WARNING !
	➢ A few people may experience epileptic seizures when viewing flashing lights or patterns. Avoid watching the 2D code reading for longer time.

Use barcode testing device to verify barcode quality. The code label surface should to be mat and clean. Do not use dirty or damaged barcodes.

14.3   1D Reader for tubes

The 1D Reader for tube identification is an optional feature. It can be mounted on the tube handling mechanism.

The Barcodes must be wrapped around the tube. The bars have to be oriented horizontally and be present all way round the tube. The barcodes should be parallel to the tube bottom. The barcode label should be centered vertically.

⚠	WARNING ! ➢ Laser Class 2. Laser light - do not look into the beam.
⚠	DANGER ! ➢ May be harmful to your eyes.

Use barcode testing device to verify barcode quality. Quality Class A, B or C are required. Identification of Class D is not guaranteed. For sufficient print quality use barcodes printed by thermal transfer or photographic methods. The barcode label surface should be mat and clean. Do not use yellowed, dirty or damaged barcodes

15. Cooling unit operation

15.1 Switch on cooling STT1000

On the STT1000 the cooling is switched on wit the main power switch of the device. Therefore no special actions have to be take to switch on the cooling.

15.2 Switch on cooling STT3k0

The STT3k0 has a main power switch for the cooling unit. This power switch needs to be put into the ON position. All cable should be connected before power on the cooling. After power on the auxiliary cooling immediately starts. As soon as the main unit is switched on (green switch) the main cooling will take over.

15.3 Switch on cooling STC DF

The cooling unit should stay switched on all the time. All cables should be connected before start up.

To switch on the cooling unit the main power switch needs to be turned into the position stating ON. The cooling unit will immediately start on the auxiliary cooling as the handling is not switched on. As soon as the STC handling (and therefore the PLC controlling the climate) is switched on the main cooling will take over.

The key switch has to be in automatic position (see Picture 1).
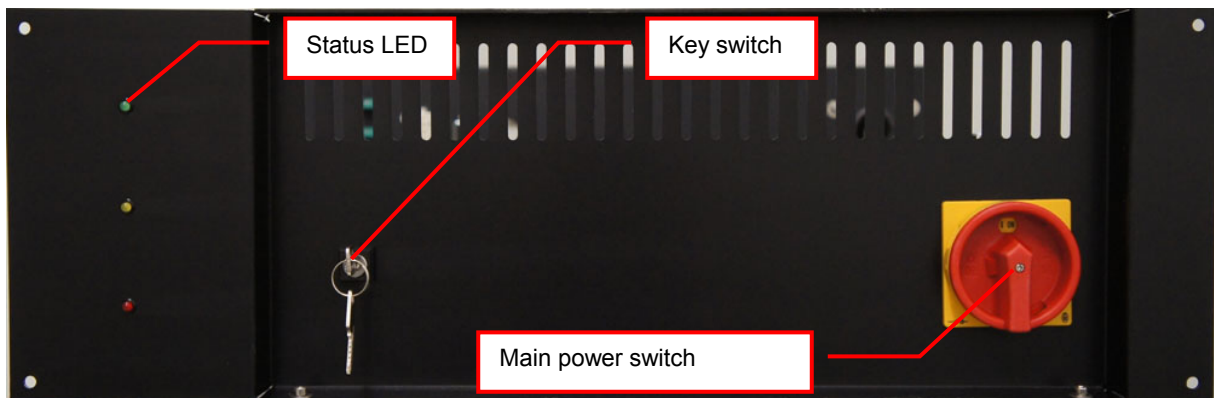
Picture 1: Cooling unit front view
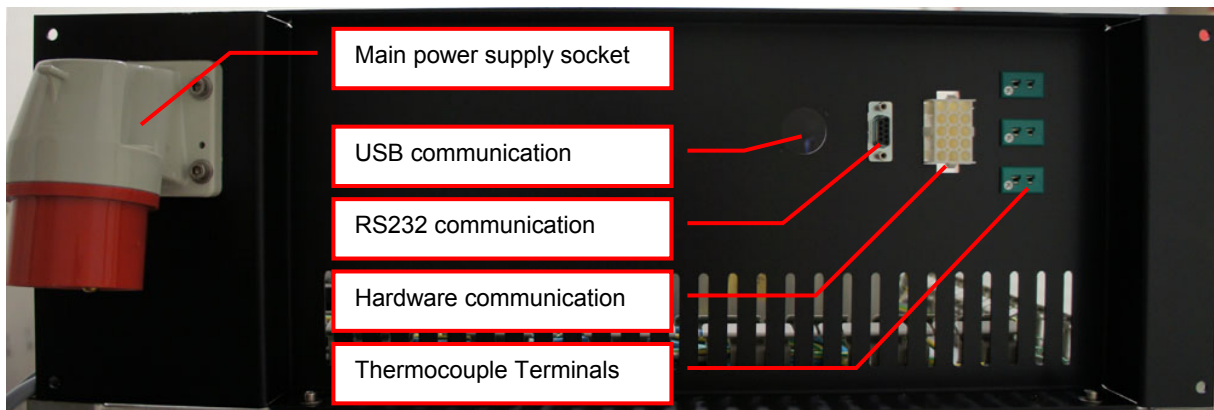
Picture 2: Cooling unit back view

Status LED	Status	Description
Green	1st Cooling stage operating	All conditions are fulfilled to run first cooling stage
Yellow	2nd cooling stage operating	All conditions are fulfilled to run the second cooling stage
Red	ERROR	One condition is fulfilled to trigger an error.

CAUTION !
  ➢ Do not disconnect any cables, except a LiCONiC engineer did advise to do so.
  ➢ All cooling units have to be permanently switched on.
  ➢ The key switch has to stay in automatic position.
  ➢ Ensure normal conditions (p.e.: Power and Water) before switch on the cooling units.

15.4   Switch on cooling STC ULT

The cooling units should stay switched on all the time. Initial power up of cooling should be performed with switched off handling of store. All cables should be connected before start up.

To switch on the cooling unit the main power switch needs to be turned into the position stating ON. The key switch has to be in automatic position (see Picture 3). This has to be performed on both cooling units main and auxiliary.
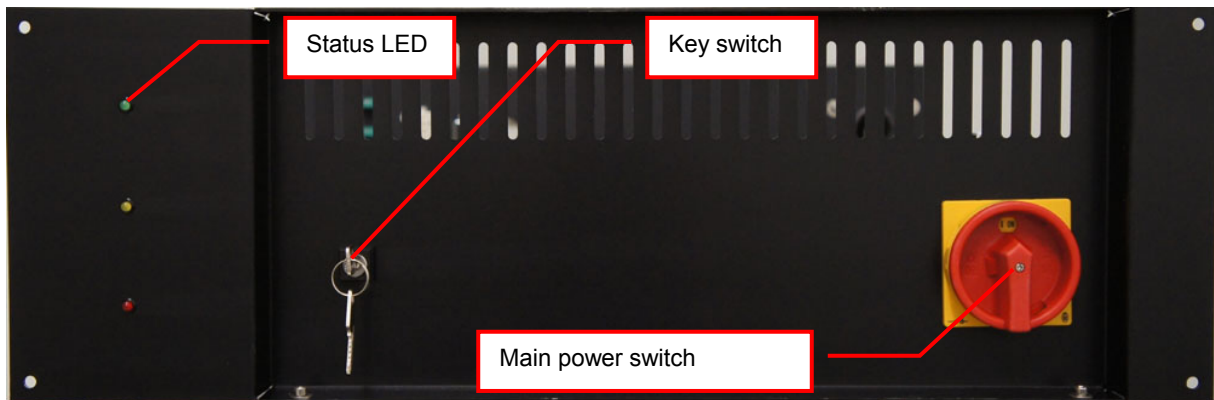
Picture 3: Cooling unit front view

The first cooling stage of the cooling unit will immediately start to operate. The green status LED therefore indicates all conditions fulfilled to run first stage. After a certain time the second cooling stage will kick in. The yellow status LED therefore indicates all conditions to operate the second stage are fulfilled.
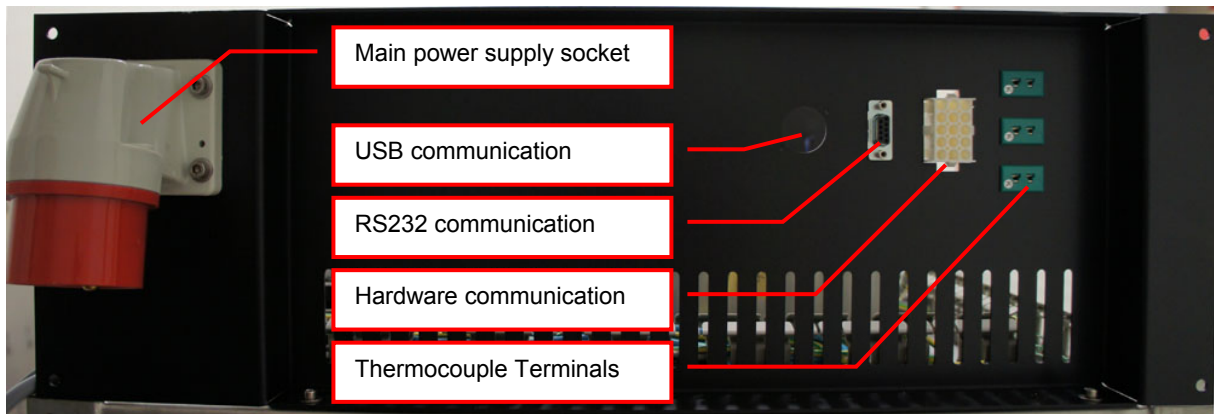
Picture 4: Cooling unit back view

In case of an error the red status LED will be lit. If the error conditions are resolved check the section "Recovery after backup activation" for the procedure to return in to normal operation.

Status LED	Status	Description
Green	1st Cooling stage operating	All conditions are fulfilled to run first cooling stage
Yellow	2nd cooling stage operating	All conditions are fulfilled to run the second cooling stage
Red	ERROR	One condition is fulfilled to trigger an error.

CAUTION !
  - ➢ Do not disconnect any cables, except a LiCONiC engineer did advise to do so.
  - ➢ All cooling units have to be permanently switched on.
  - ➢ The key switch has to stay in automatic position, for normal operation.
  - ➢ Ensure normal conditions (p.e.: Power and Water) before switch on the cooling units.

15.5   Recovery after Backup activation

In the case the backup cascade was activated and the system is running on one oft the backup options a recovery might be necessary. The recovery procedure should only be performed after normal conditions for main cooling are restored.

CAUTION !
  - ➢ Ensure normal conditions being restored to operate the main cooling
  - ➢ Ask for assistance from a LiCONiC engineer in case of insecurity about normal conditions and performing the recovery procedure.
  - ➢ Observe cooling after recovery. Contact immediately a LiCONiC engineer in case of repeated stop of cooling after recovery.
  - ➢

15.5.1   Procedure

STC ULT System running on auxiliary cooling

o Ensure normal operation conditions being restored. Optimal reset point would be system returned to target operation Temperature.

o Toggle the key switch of main cooling (move key switch out of normal position and back again)

o Auxiliary cooling should stop now and the red alarm light of main cooling should switch off

STC DF System running on auxiliary cooling

o Ensure normal operation conditions being restored. Optimal reset point would be system returned to target operation Temperature.

o The Error Flag 1506 has to be manually set back with "RS 1506" sent through the service terminal.

STT system running on auxiliary cooling

o Ensure normal operation conditions being restored. Optimal reset point would be system returned to target operation Temperature.

o The Error Flag 1506 has to be manually set back with "RS 1506" sent through the service terminal.

STC ULT system running on gas backup

o Ensure normal operation conditions being restored. Power and Water for electric cooling units available.

o Toggle the key switch of aux and main cooling (move key switch out of normal position and back again)

o Either Main only or both cooling units will operated. When Target operation Temperature of the Storage is reached toggle the key switch of the main cooling again.

STC DF system running on gas backup

o Ensure normal operation conditions being restored. Power and Water for electric cooling units available.

o As soon as normal operation conditions are restored the gas backup should stop operation an electric cooling unit takes over.

STT system running on gas backup

o Ensure normal operation conditions being restored. Power and Water for the system is available.

o As soon as normal operation conditions are restored the gas backup should stop operation an electric cooling unit takes over.

16. Climate Settings

16.1 Temperature Settings

System Temperature is pre set. Temperature should only be changed by a qualified system administrator or LiCONiC engineer.

16.2 Humidity Settings

Humidity is kept as low as possible and is not adjustable.

17. Alert System

The KIWI STORE has a combined acoustic / visual alert system. An alert occurs when one or more abnormal statuses occur or when interaction is required. When the system is operating properly there is no alert. The various alerts are distinguished by the alert signal duration and the pause between the signals.

17.1 STC Alerts

The storage area of the bigger KIWI STORES does not allow manual access, therefore the following alerts are defined:

Signal / Pause (time in seconds)	Alert	Comment, Action
∞	Main Power Fail	Main Power input fail on STC Handling Power supply. System operates on built in battery.
0.1 / 2.4	No Initialization	StoreX not initialized. Press Multi Function Switch for initialization.

17.2 Interface Alerts

The interface unit does allow manual access. Therefore additional alerts are defined:

Signal / Pause (time in seconds)	Alert	Comment, Action
0.1 / 2.4	No Initialization	StoreX not initialized. Press Multi Function Switch for initialization.
0.1 / 0.3	Gate Timeout	Check Handling position. Press Multi Function Switch to close Gate.
0.2 / 0.4	Glass Door Timeout	Close Glass Door or press Multi Function Switch to cancel alert status.
0.5 / 0.5	Access collision	Occurs when Glass Door is opened and shovel is extracted. This alarm indicates high risk of damage to the handler. Do not rotate carrousel. Check shovel position before moving cassettes. Use extreme caution as shovel may be trapped in a cassette.
0.1 / 0.1	System Busy Access	Glass Door is opened during a remote access. Close Glass Door and wait for remote access to be finished.

17.3   STT Alerts

The STT KIWI STORES are the out of the box storages. Therefore manual access is possible to the storage area. Therefore the alerts are the same as for the above mentioned Interface:

Signal / Pause (time in seconds)	Alert	Comment, Action
0.1 / 2.4	No Initialization	StoreX not initialized. Press Multi Function Switch for initialization.
0.1 / 0.3	Gate Timeout	Check Handling position. Press Multi Function Switch to close Gate.
0.2 / 0.4	Glass Door Timeout	Close Glass Door or press Multi Function Switch to cancel alert status.
0.5 / 0.5	Access collision	Occurs when Glass Door is opened and shovel is extracted. This alarm indicates high risk of damage to the handler. Do not rotate carrousel. Check shovel position before moving cassettes. Use extreme caution as shovel may be trapped in a cassette.
0.1 / 0.1	System Busy Access	Glass Door is opened during a remote access. Close Glass Door and wait for remote access to be finished.

18.   Routine Safety Checks

Carefully read all safety instructions before operating the instrument. Be sure that you fully understand their content. Although the KIWI STORE is intended to be operated as a remote controlled system, there still are some manual interactions required for operation. Apart from these operations there are also some very important safety checks the operator should be familiar with.

The operator should regularly read the display readings and check whether they match the desired values. Readings like *"0.00"* or *"9.99"*, readings that are far out, instable or that differ over long periods of time could indicate a malfunction of the instrument or could be caused by faulty settings of the system.

The electrical cables should be routinely inspected for wear, defects or contusion. There should be no mechanical tension on any cable. Broken connectors should be replaced immediately. All electrical installations should be kept clean and well protected from water and humidity.

The same applies to cables and gas tubing. They should be free of mechanical tension and should show no signs of wear or contusion. Sharp bends should be avoided under all circumstances. All fittings should be secured. Missing security nuts must be reinstalled immediately. Any broken pneumatics parts must also be replaced immediately.

The mechanical appearance of the instrument should be clean and "straight". All movements should be smooth and precise. Watch out for unusual noises as these may indicate misalignments or mechanical wear.

Seals should close the chamber firmly. Check seals by placing a piece of paper between the seal and door. When trying to pull on the paper, there should be an even resistance. Check the seal on the glass door, gate and front door.

Condensation, mainly on the front glass door, presents a possible severe danger as it may lead to water flowing into the electrical parts of the instrument. When cooling, excessive condensation on the glass door will occur when the front door is open over a long period of time. Furthermore it may also indicate a faulty heater or high environmental humidity.

Icing on a gassing tube or on a pressurized gas cylinder indicates excessive gas flow and therefore severe danger. Once icing has been observed leave the room immediately and call for help. Do not try to locate the source of the problem or try to fix it. The room may already be contaminated.

	WARNING !
⚠	➢ Icing on the gas cylinder or other parts of the gassing system indicate excessive gas flow.
	➢ In the case of such icing leave the room immediately and call for help
	➢ Do not try to locate the source of the problem or try to fix it

Software

19.   Sample Management Software

19.1   Order File

The order file is used to retrieve specific samples from the storage system. Two types of order files can be used to execute order jobs. The first type is the simple order file containing only 1D or 2D codes or ID's of tubes/racks to be retrieved. The second type is more complex, allowing more functionally. Refer to the following chapter for a detailed description of the files.

19.1.1   Simple order file

In case of the simple order file, the file is a simple list of 1D barcodes for plate orders only. For tube orders 2D barcodes/Sample ID's, or a mixture of both can be used. These files can be passed onto the system as CSV (Comma Separated Values) file or as a TXT-File using the web interfaces LoadJobList -page. They can be populated manually by a user or exported from MS Excel© or a database. Picture 5 below shows an example of a simple order file for tube picking.

```
JobList.csv - Notepad

File  Edit  Format  View  Help

1450236575
1450236574
1450236573
1450236572
1450236571
1450236570
1450236569
1450236568
1450236567
1450236566
1450236565
1450236564
1450236563
```
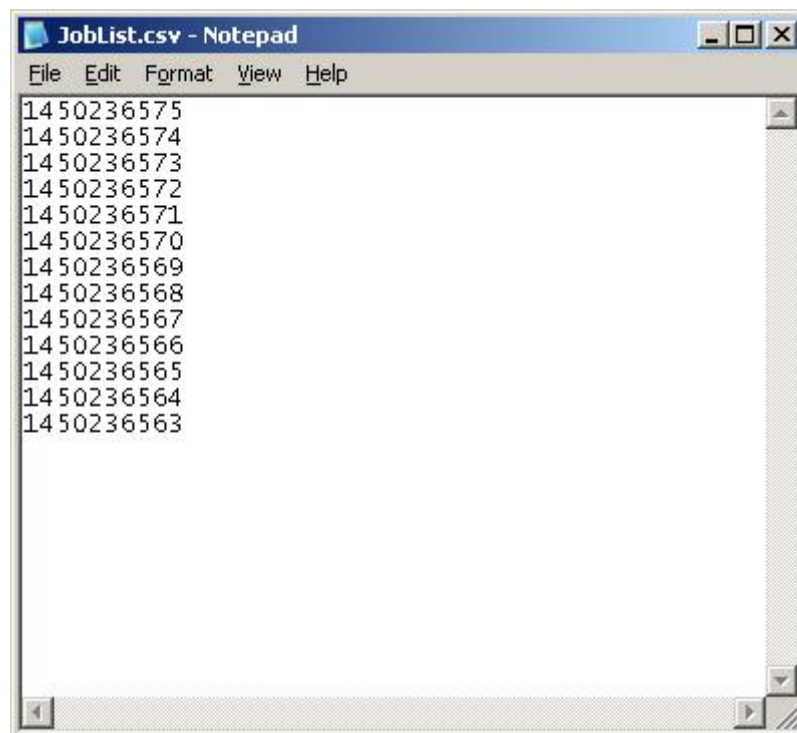
Picture 5: Sample order file

19.1.2 Complex order file

In case of the complex order file, the file consists of a parameter list. This file can be passed onto the system as a CSV (Comma Separated Values) file or as a TXT-File. The file can be populated manually by a user or exported from Excel© or a database too. Picture 6 below shows an example of a complex order file.


```
PLATE00195014,,D,09,PLATE00187891,A,01
PLATE00195314,,D,09,PLATE00187891,B,01
PLATE00195614,,D,09,PLATE00187891,C,01
PLATE00195914,,D,09,PLATE00187891,D,01
PLATE00197114,,D,09,PLATE00187891,E,01
PLATE00193414,,D,09,PLATE00187891,F,01
PLATE00193414,3528473647,,,PLATE00187891,G,01
PLATE00193414,3528473648,,,PLATE00187891,H,01
```
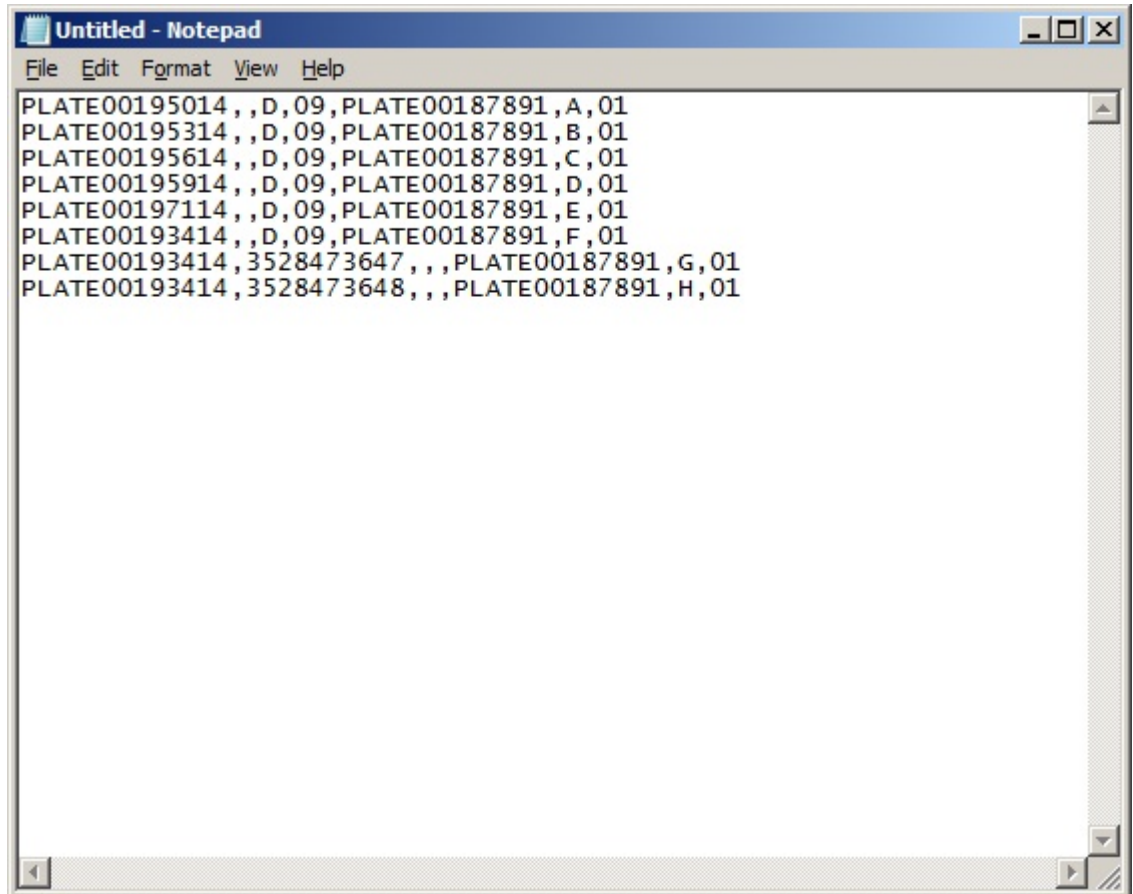
Picture 6: Complex order file

A parameter line consists of the following items:

Barcode(1D) or explicit name of the source rack,

Barcode(2D) or explicit name of the tube to be picked,

Row of the picked tube on the source rack,

Column of the picked tube on the source rack,

Barcode(1D), explicit name or generic name ("Rack_1,"…) of the target rack,

Row of the picked tube on the target rack,

Column of the picked tube on the target rack

19.2   Web-Interface

The Web-Interface supplies an easy to use and intuitive GUI. There are two different GUI's depending whether you would like to place an order from a remote computer, or if you would like to retrieve/store your samples.

In the following chapters a description of the different GUI's is given with instructions how to use them.

To access the unit on the remote or local GUI an authorization is requested (Picture 7: User Identification). Access management and user rights will be discussed further on in the PlateExplorer section.
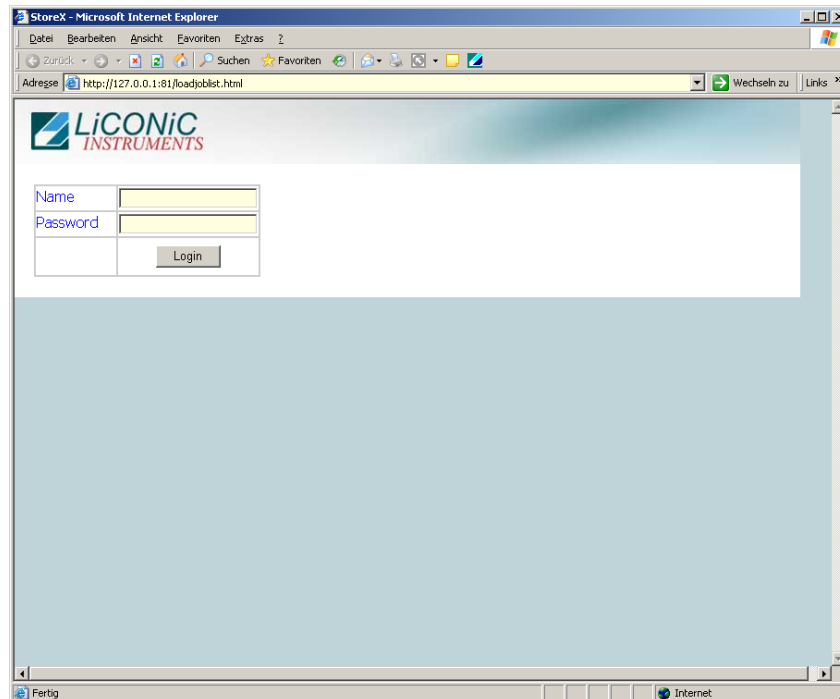
Picture 7: User Identification

19.2.1 Remote Web Access

Placing an order is most likely performed from a remote computer. In order to do so the user needs to open the browser, type in the name of the Kiwi-PC following loadjoblist.html (example: http://MyKiwiPc/loadjoblist.html") and to log in. To then send an order to the system the "Search" button has to be pressed to select the desired file. This will open up a dialogue box to search your local computer for an order file. Select the desired order and click open. The file path will be displayed next to the "Search" button. With pressing the "Send File" the order is passed to the system.
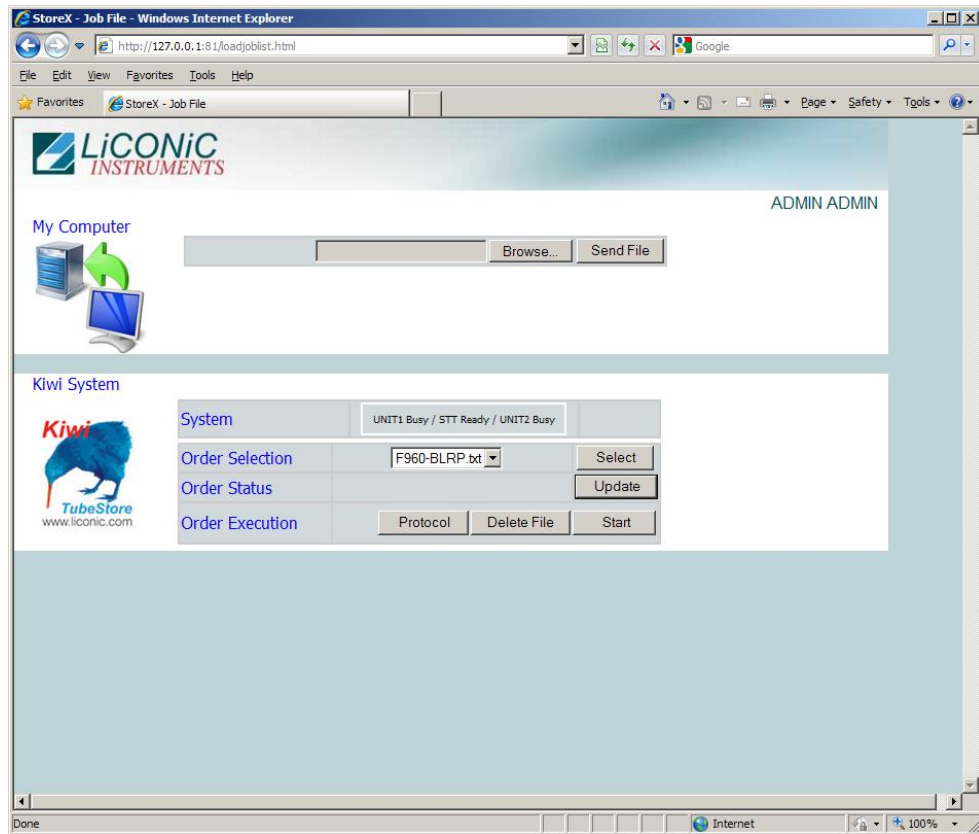
Picture 8: Remote order placement

To start the order, the required file needs to be selected from the drop down menu and the button "Select" needs to get pressed. This being done, the "Start" button will start the processing of the order. When the order is started it will be displayed as shown in Picture 8 including the approximate time till the order is finished. The user now can make use of the "Update" button in order to see the current status of the job. Additionally in this screen selected jobs can be deleted by pressing the "Delete" -button.

Since the system is a multi user system, other users are able to submit orders at the same time. If this happens, the submitted order will be placed in a queue ready for processing once the current order is complete. The processing follows the "First come first serve" principle. This is dependant on the priority of the order assigned. When accessing to the unit one can always check the current status of the orders. Pressing the "Update" button the GUI will refresh the display and show the most recent information. The progress of the order selected in the "Select Job" area will be shown. The bar shows a relation between the amount of lines in the jobfile and the ones already being processed.
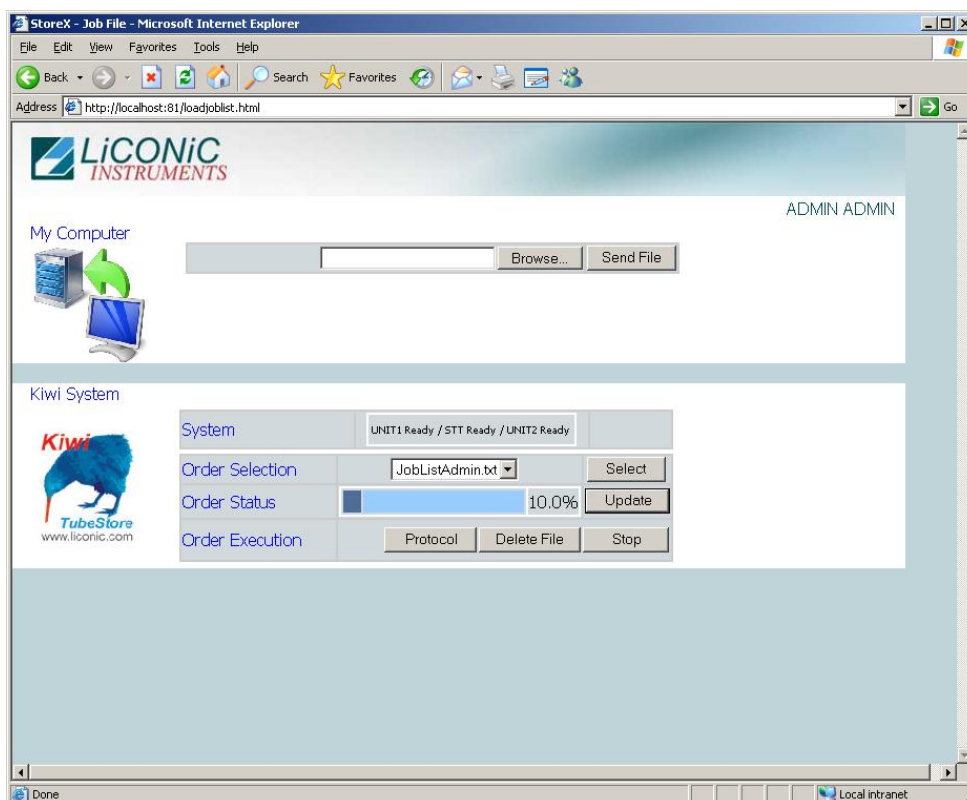
Picture 9: Order selection for status display

19.2.2   Local Web Access

The local Web-Interface is only usable when the user is in front of the unit. The two main functions are Plate import and Plate export.

Plate Import

When loading a new Plate the user first needs to generate an XML content file. On the Import/Export Interface in the section "Plate Content" one then needs to press "Browse", to choose the desired file and then press "Load". By then the system imports the file data including the plate's 1D-code. When pressing "Import", the plate gets moved into the storage device using 1D –barcode authentication (See Picture 10).
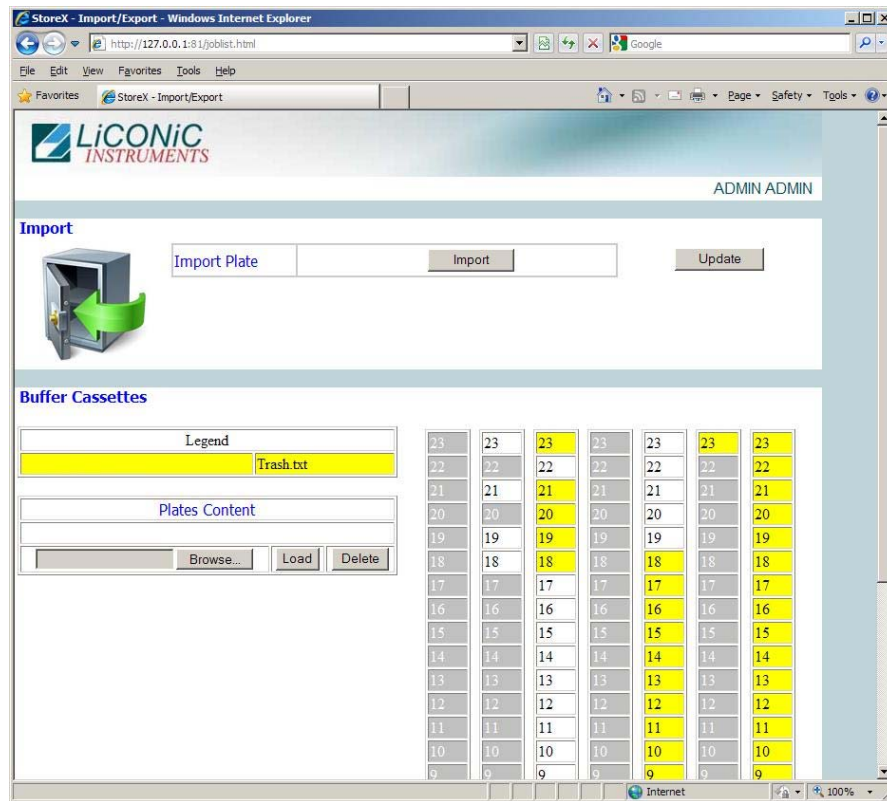
Picture 10: Local plate/rack import/export screen

Plate Export

Plates can be exported when finished orders are complete. In general by then the plates are stored in the bigger store compartment of the Kiwi-device. In order to move them into the interface compartment, one needs to figure out the name of the job and choose either "one plate" or "all plates" from the table on the bottom of the Import/Exports web interface. Having done so, pressing the "Export" button will start the move of the plates into the interface. To finally move them out, using the transfer station, one needs to identify the plates of the job being done by either the name or the color to be compare to the table on the left (see Picture 10).To move a plate out, it needs to get clicked once and then the user needs to choose "Unload" from the Right-Click-Menu of the plate. Depending on the system configuration the plates have to be requested one by one (only one transfer station available) or can be stored into an I/O-buffer. If the system is built with an I/O buffer (for bigger systems this is mostly the Interface unit) the whole order can be exported to the buffer, providing the job's amount of plates is smaller or of the same size as the buffer.

19.3   PlateExplorer

The PlateExplorer is the more sophisticated administrational access possibility to the Storage system. It allows the manager and the user access to it. Therefore the PlateExplorer hast two different access levels in general.

The PlateExplorer is a network based application and can run therefore on a remote computer over the network. Before using the application every user has to log on. (Picture 11) The application will automatically log off a user after a certain idle time, (this time can be adjusted).
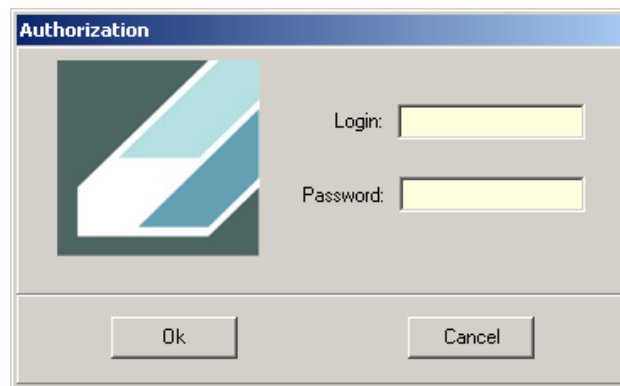
Picture 11: The PlateExplorer's login window

19.3.1   General Functionalities

In this chapter the functionality accessible to the administrator and the normal user are described. There is only one difference between user and administrator. Whilst the user has only access to the assigned area, the administrator has access to the full store. Therefore the difference will not be mentioned in this part of the manual anymore.

Drag&Drop

The *Drag&Drop* functionality of the PlateExplorer makes this GUI very simple to use. Plates and Racks can be moved within the store by simply left-clicking them, keeping the mouse button held and release it over the desired location.
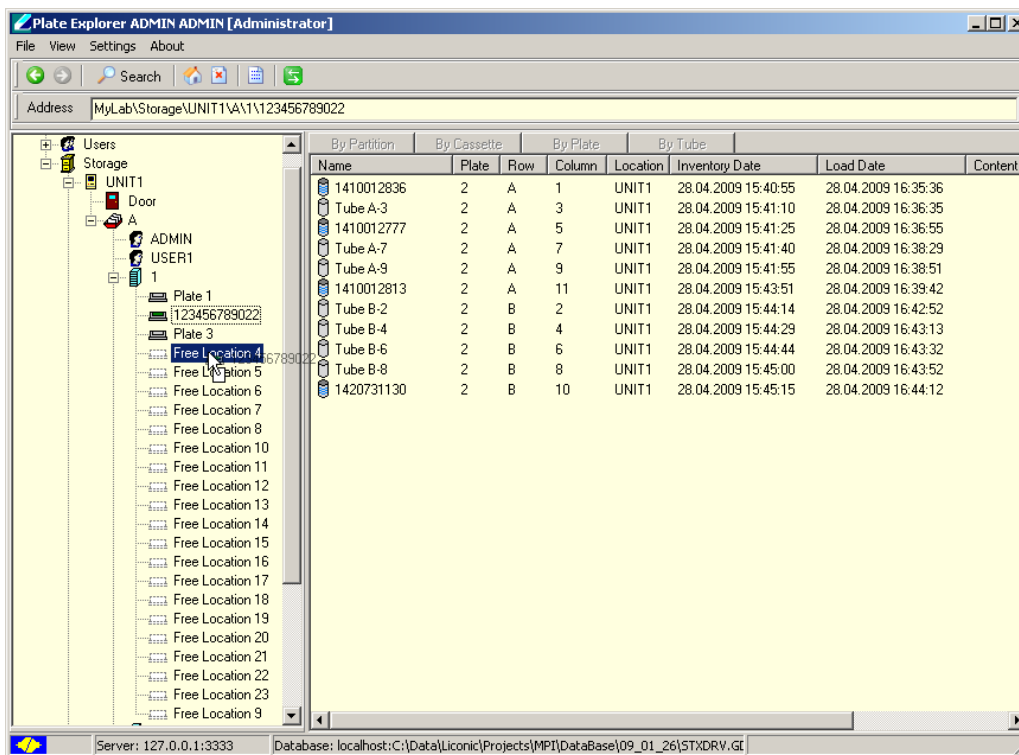
Picture 12: Drag&Drop a plate

To manually move a tube, the tube racks first have to be moved to the Picker/Boxer. In the "Location" view (selected in the menu bar "View") of the picker/boxer the tubes can conveniently be localized. For a single tube the easiest way to move it, is to Drag&Drop (hold CTRL in parallel) it.
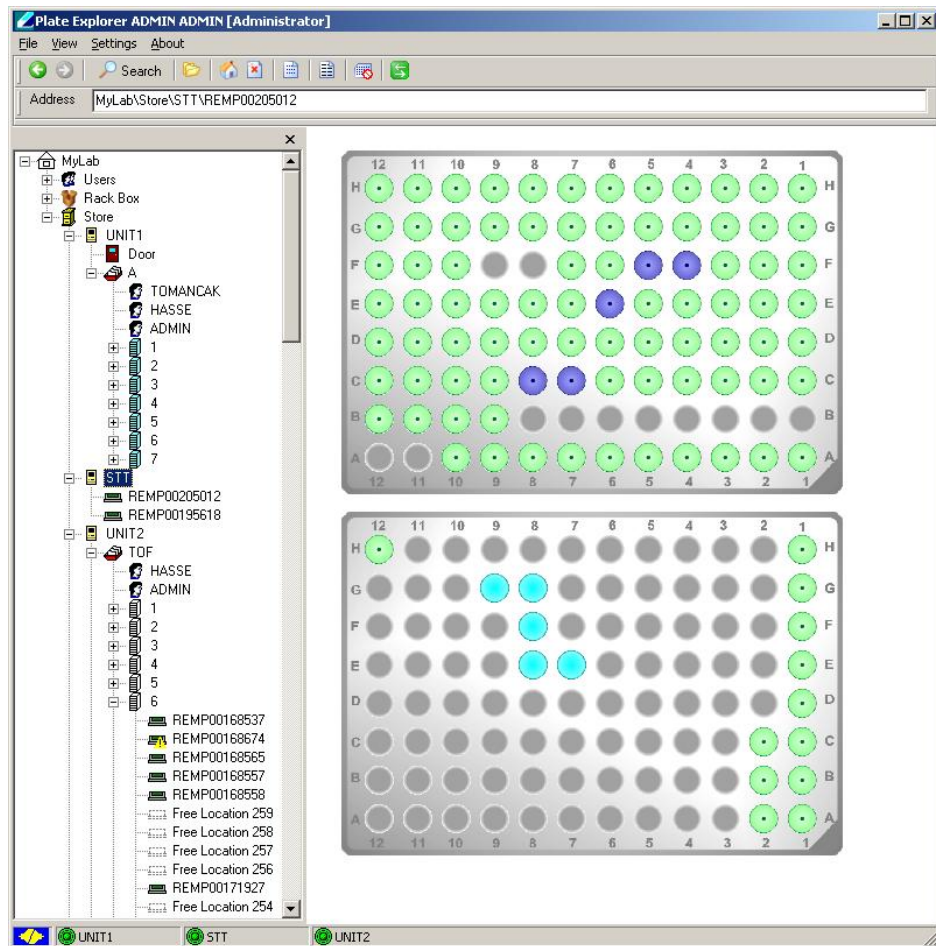
Picture 13: Copy&Paste a tube

Copy&Paste

If more than one tube is to be moved, the Copy&Paste -method is more convenient (see Picture 13). To use this functionality one can click on different tubes on the source side holding the CTRL-button in parallel, then right-click one and choose "Copy". Afterwards one can choose the target locations the same way and insert the tubes by right-clicking again and choosing "Paste".

19.3.2   Layout of the PlateExplorer

The main window of the PlateExplorer is subdivided into the Menu bar, a quick usage button bar, the contents tree on the left and the detailed information view on the right (see Picture 14).
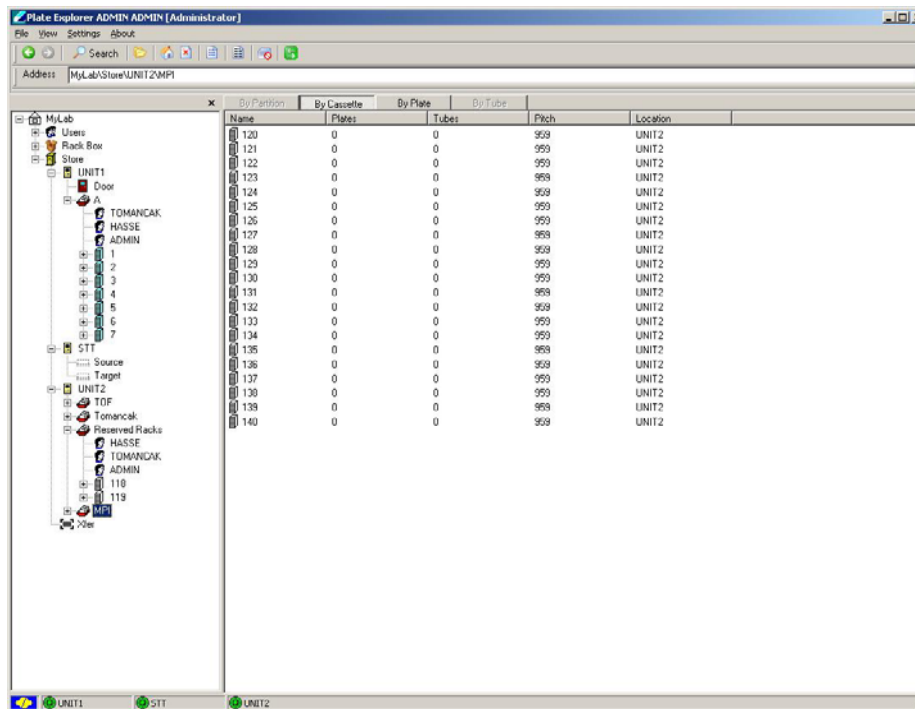
Picture 14: Main screen of the PlateExplorer

The Menu Bar

The menu bar of the PlateExplorer covers four main entries.

The "*File*"-menu item offers the user to "Exit" the program.

The "*View*" options enable the user to define the way to look at the items being displayed in the PlateExplorer's Detail View on the right. The user can choose between a "List" mode, "Small icons", "Symbols" a "Detailed View" and a so-called "Location View". The last is mostly used to better visualize tube movement when plates are on the picker/boxer.

The "*Settings*" come with the ability to change the details on the "Connection" (Here the IP address/name and the port of the computer running the STXGui.exe have to be set), the Logout Delay can be set ("Security" – "Logout Delay"), the "*Database*" of the PlateExplorer can be assigned in the belonging entry and global "View" settings for the software can be set ("Show history", "Sort Levels", "Tool bar" and "Status bar").

The "*About*" window will show information on the running PlateExplorer software.

The Icon Bar

The icon bar of the PlateExplorer shows different buttons that will be explained here.

The *navigation arrow* buttons on the left enable the user to do steps forward and backwards in the navigations being made.

The *search button* calls the search function. With the search function (Button with the magnifying glass) the content of the store can be searched. The search is also available in the right-click menus. Using it in that way, the user can decide about the level within the tree structure the search will take part in and exclude the rest (click open the tree up to the level you want to search, right-click there and choose it from the menu). In Picture 15 and Picture 16 examples are shown.
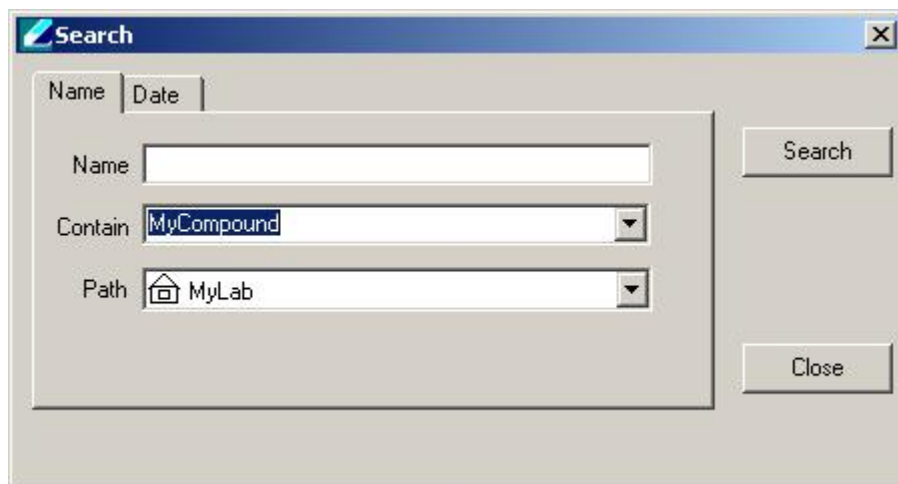
Picture 15: Search for Sample ID or Barcode
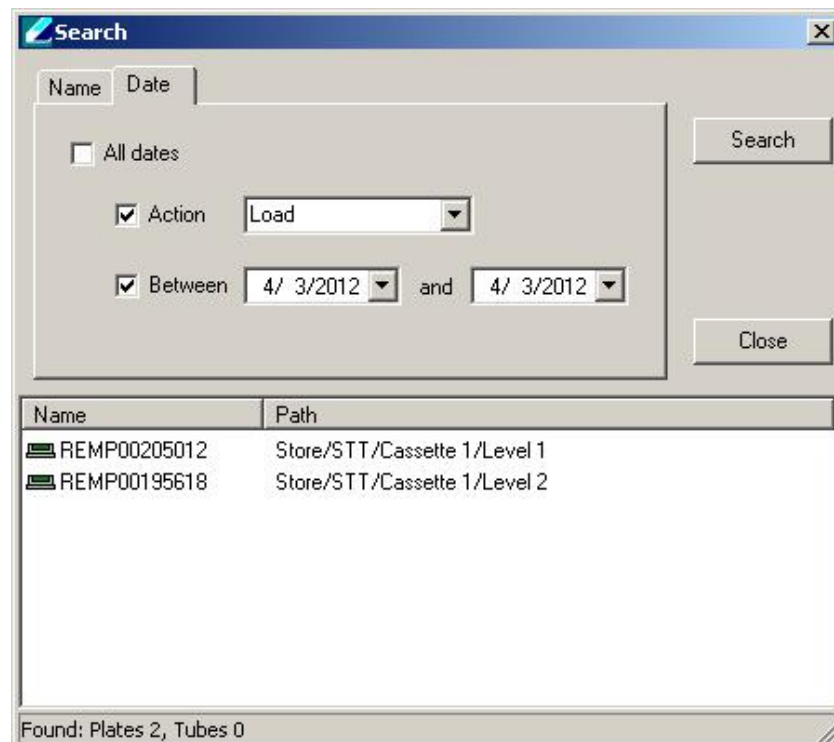
Picture 16: Search by date with results

The generated search results can be used to create an order file as described in section 1.1. This can be done by holding CTRL and clicking onto the desired items. Right-clicking then will offer the user "Save as a Job File" (see Picture 17). This can be processed via the Web-Interface afterwards.
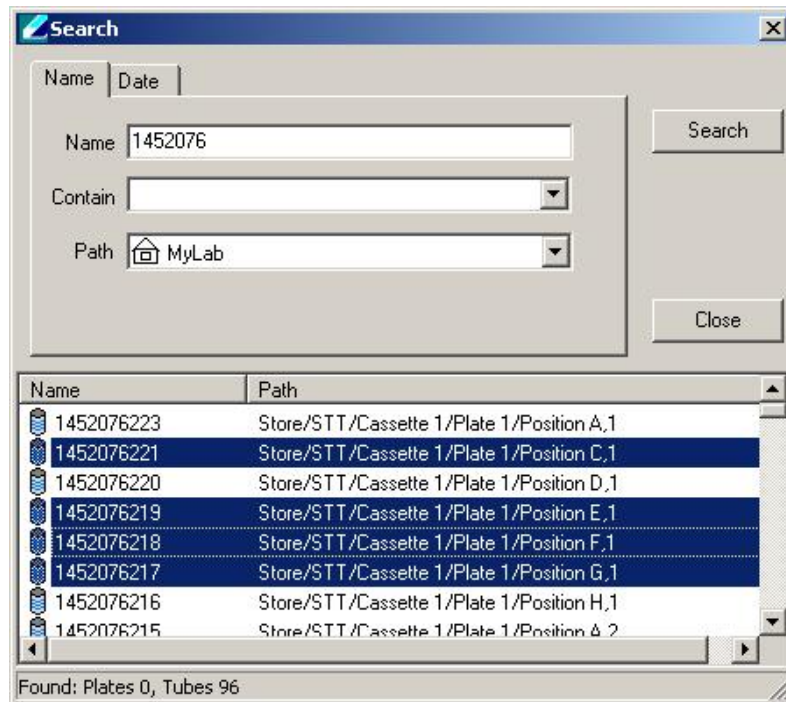
Picture 17: Create an order from search results

The *folder* button enables or disables the tree view on the left.

The *home symbol* button actualizes both detail windows (tree view and detailed view on the right) and closes the tree in the tree view on the left.

The button with the *cross symbol* is used to disconnect from the system.

The *dotted sheet* button will show the jobfile history, means pick jobs of the past and current ones. Further it integrates error statistics.

The *lined sheet* button is used to show current Import and Export options. The "Import" tab shows the actually loaded import files and enables the user to delete them by using the "Delete" button. The "Export" tab shows jobs that have been processed and are ready to export. Those can be deleted the same way too.

The *plate with stop* button raises a search interface that enables the user to look for tube racks with certain amounts of usage times for locations within the rack. This functionality is commonly used to figure out, which racks are old enough to substitute them and thus make sure, that boxed tubes are not falling through it when being used with it.

The *green arrows* button is used to log the current user out of the system.

The Address Bar

The address bar of the PlateExplorer shows the user the current location the PlateExplorer is within the tree hierarchy in a path form.

The Tree Window

The tree window of the PlateExplorer shows the user the current location the PlateExplorer is within the tree hierarchy. Here registered users and rack types as well as the physical (sub units, picker and Xfer station) and logical (partitions) structure within the LiCONiC storage device and its belonging access rights (users within the tree) are visualized.

"Users" shows all users being registered for within the database for web and application access.

The "Rack Box" is a visualization of rack types that are registered within the device. Those can be dragged and dropped onto the transfer station to start an import of a rack into the system via the PlateExplorer software. The user will then be asked where the rack will be loaded and what its content is.

The "Store" symbol finally is the actual Kiwi device visualization. It is subdivided into further units (mostly Unit1 [Storage -80°C area], STT [Picker/Boxer] and Unit2 [Interface -20°C area]) and the transfer station. The subunits themselves show their *door status* (if installed) and the *partitions* being installed by the user. The *picker/boxer* only will show its two positions for the source and the target rack.

Within the partitions, which can be seen as logical sub-divisions of the Kiwi, one can see the so called cassettes, vertical hanging shelves within the unit. Their single positions, called levels, form the lowest hierarchy level.

When being filled with a rack they can have different states. If the graphics label is *grey*, it means that no tubes are in there. If a *green* label appears, the system shows that the rack is either partially or completely filled. Is the rack *crossed out with a red line*, the system has no 1D-barcode assigned to it.

An *exclamation mark* shows that the plate is assigned to an export job and not accessible to retrieve tubes from it. The question mark marks that the systems auto inventory is enabled and the plate hasn't been inventoried yet. Grayed and crossed out levels showing the level being blocked for security reasons. This level is not accessible to store plates into it.

Picture 18: Rack symbols in the Tree View

The Detail Information Screen

The detail information screen on the right of the PlateExplorer shows the user all properties of the item selected within the tree view on the left. It supports Drag&Drop and its functionality can mostly be accessed with the help of the right-click action menus. Those will be explained within part 1.3.4 of this manual.

19.3.3 Setting up the Plate Explorer

The Administrator access level of PlateExplorer is intended to manage and administer the store. It allows the management of user rights, storage and troubleshooting. The initial values for the Login per default are "ADMIN" with "test". Please change that as soon as you have access to the software.

Setting up the Database- and Driver Connection

In order to get the PlateExplorer working with an existing firebird database and a running STXGui.exe –driver, the user needs to fill out two forms within the PlateExplorer. The first is located under "Settings" and "Database". Here the settings to connect to the belonging database have to be made. As server type the user can choose between "Local" and "Remote". If "Remote" is chosen, the user needs to type in the IP address or name of the server. In both cases the database-file including the path needs to get chosen.
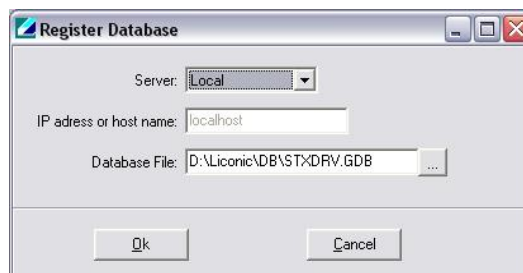
Picture 19: Database Connection Settings

When the database is chosen, the user can connect to the running driver of the actual machine. In order to do so, click "Settings" in the menu bar and choose "Connection". Then type in the name or IP address of the STXGui.exe –driver server and the belonging port (default 3333).
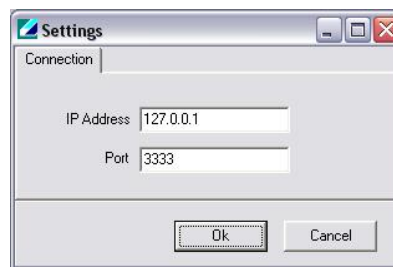
Picture 20: Driver Connection Settings

After this has been done, the PlateExplorer should be able to connect and should offer to initialize the sub units.

User Management and Alarm notification

The Administrator mode allows the creation, modification and deletion of users and their rights. In the picture below (Picture 21) the "User Manager" is shown. All users accessing to the system have to be created with this tool, even users accessing only through the Web-Access. The initial user data for accessing the User manager are the user "SYSDBA" with the password "masterkey".

To access the tool, please mark "Users" and right-click and select "User Properties". After logging in twice, press the "New User" button to create a new user. A new line will be shown on the right hand side and the dialogue boxes on the left will get editable. Now a login name, password, the users name and mail details have to be assigned. Additionally the Administrator here needs to assign the partitions the user is allowed to work with. The partitions are storage areas within the unit. A user can have access to only one or multiple areas. Details how to create partitions will be given further on.

After all information is entered, the "Save" button has to be pressed to finally store the user and their details.

To edit a user the desired user is selected from the list on the right and the "Edit" button pressed. The fields on the left side will get editable. Change the information and press the "Save" button to store the changes made. When finished, press "Close" to close the user manager.
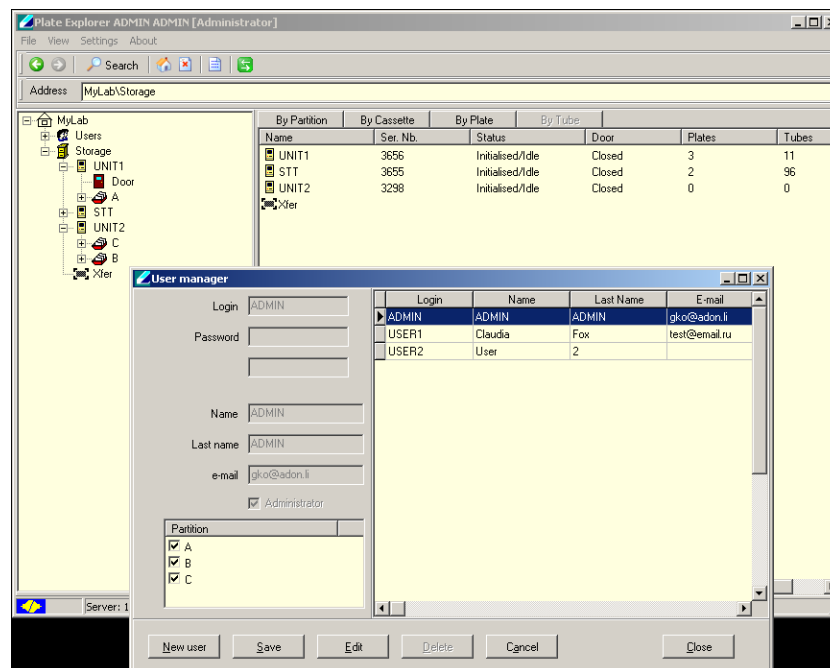
Picture 21: User Management

In order to set up a desired alarm notification, one needs to know that everyone who is marked as Administrator in this manager will get all error notifications under his or her given email address. Additionally the submitting users will get the alarms concerning their jobs.

Partitioning

Depending on the use of the system different partitions can be created. Partitions are virtual subdivisions and can be used to split the storage capacity for different uses, user groups or experiments. To launch the partition tool mark the storage unit with a left click, the right click the storage unit and select "Partition" in the menu. (Picture 22)
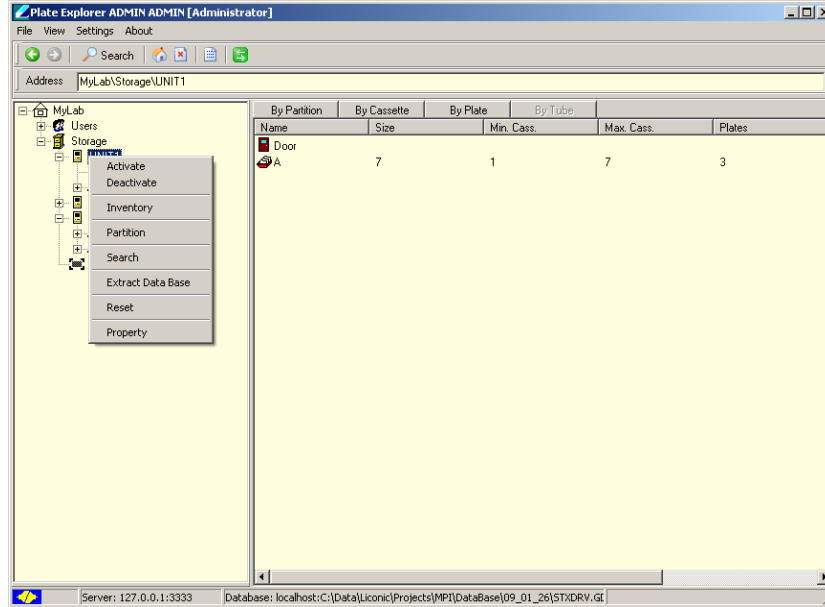
Picture 22: Accessing partition tool

The "Partition Master" will be started. A new partition can be created if free space is available, (white area on the top). Right click into the white area and select "New". A dialogue box appears where the size of the partition can be entered.

Existing partitions can easily be manipulated by moving the mouse over the border of the partition to be changed. Hold down the left mouse button and move the mouse to the right to increase the size, move to the left to decrease the size.
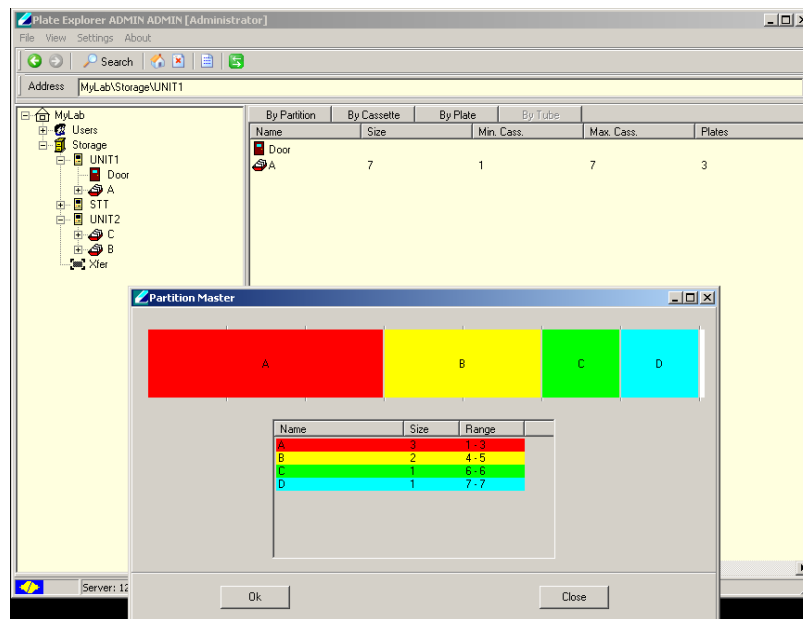
Picture 23: Creating / Modifying Partitions

19.3.4 Right-Click Action Menus in the Tree View

The right-click action menus are the most powerful tool within the PlateExplorer. They cover most of the commands and their content is depending on where they get activated.

Right-Click a "Device"

On the device level, the right-click menu offers the user to either "Search" within the device and its subunits or to show the devices "Properties" concerning storage capacity.
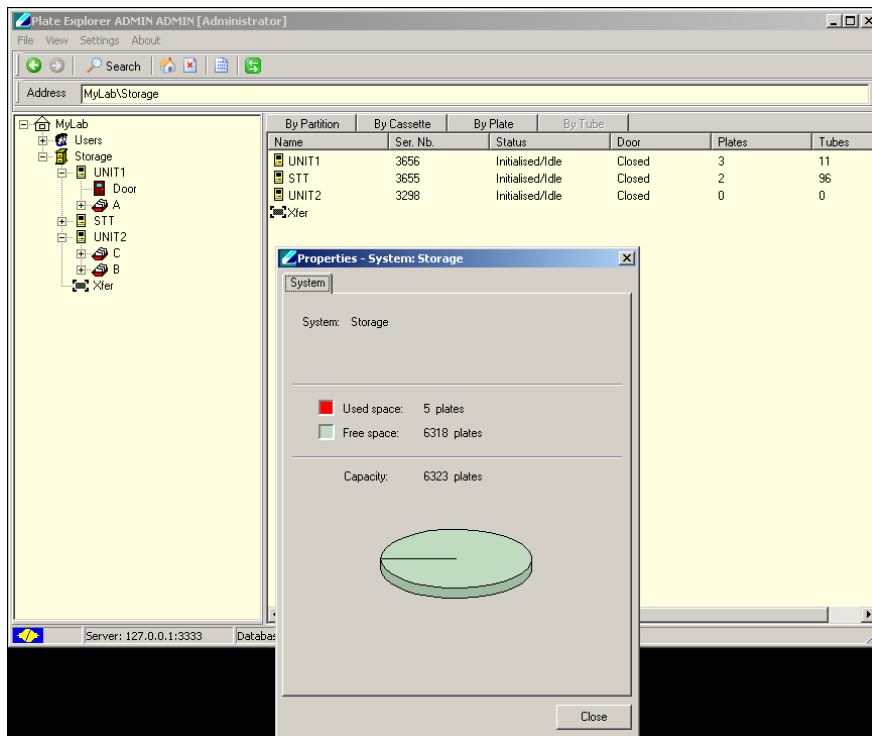
Picture 24: Device properties

Right-Click a "Unit"

When right-clicking a unit, a sub menu with seven items appears.

"Activate" and "Deactivate" open and close the communication with the clicked unit. If an error appeared before activation is pressed, the unit will reset and initialize. If no error happened before, it will only initialize.

"Partition" most likely will be used very seldom and is explained in this manual under 1.3.3 "Initializing the PlateExplorer", sub item "Partitioning".

"Search" will activate the search, described in chapter 1.3.2 "Layout of the PlateExplorer" in a way that only the clicked unit is searched.

"Extract database" will extract all relevant data from the database for this unit. A dialogue will be displayed that enables the user to create a file within a desired location.

"Reset" will simply reset the unit.

"Properties" is divided into several tabs. The tab Device shows the graphics with capacity used within the unit. Hardware deals with the settings for the COM-port of the unit, its firmware and its current status. Service enables the user to unload

a rack (current rack on the shovel to the Xfer station), using the belonging named button or to place a plate within the unit. The parameters (positions) are set in the belonging sub units of the functions. Additionally climate settings can be made here, possibly using the integrated alarm function by enabling it and setting a timeout value, for how long the unit is allowed to be out of the given boundaries.
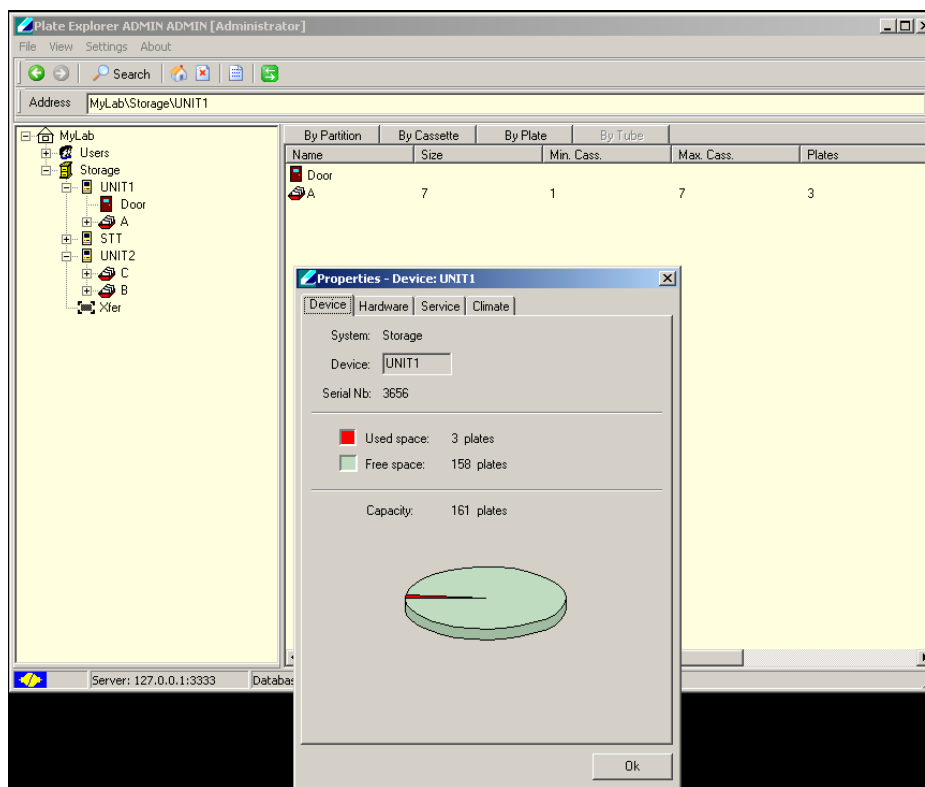
Picture 25: Unit properties

Right-Click a "Partition"

When right-clicking a partition, a sub menu with several options appears.

"Inventory" starts a 1D barcode inventory on the clicked partition.

"Search" opens the search interface, described earlier in 1.3.2 for only the partition selected.

"Unreadable vials" gives the user the opportunity to find not barcoded vials within the partition and create an unload-file from this list in order to check their codes.

"Extract database" will extract all relevant data from the database for this unit. A dialogue will be displayed that enables the user to create a file within a desired location.

"Properties" lets the user set some general properties and see the usage graph of the chosen partition.

Right-Click a "Cassette"

When right-clicking a cassette, there are two options to choose from:

"Search" opens the search interface, described earlier in 1.3.2 for only the cassette chosen.

"Properties" will show the usage graph of the clicked cassette and a check box to block the complete cassette for administrative reasons.

Right-Click a "Level"

When right-clicking a level, several options will appear:

"Copy" and "Paste" will enable the user to move plates within the system as described in 1.3.1. under "Using Drag&Drop and Copy&Paste".

"Load" and "Unload" are direct access commands and will, when activated, immediately load a plate on the transfer station onto this level or unload the existing one onto the transfer station.

"Check Presence" and "Check Barcode" do what their names say. "Check Presence" will check the presence of a rack/plate on that level. "Check Barcode" will check the barcode of an existing plate or, if not identified yet, also check the presence of a plate on that level beforehand.

"Extract database" will extract all relevant data from the database for this unit. A dialogue will be displayed that enables the user to create a file within a desired location.

The "Properties" of a rack in a level lets under the tab "Plate" the user set the PlateID and see location information of the chosen Level. Under "Tubes" one can change the preset tube type and load content from an XML file. Additionally one can look at the history of the rack, the level and the content on the third tab.

If a level is clicked without a plate or rack being stored in it, the Properties only show the levels plate history and enable the user to close the level for administrative reasons.
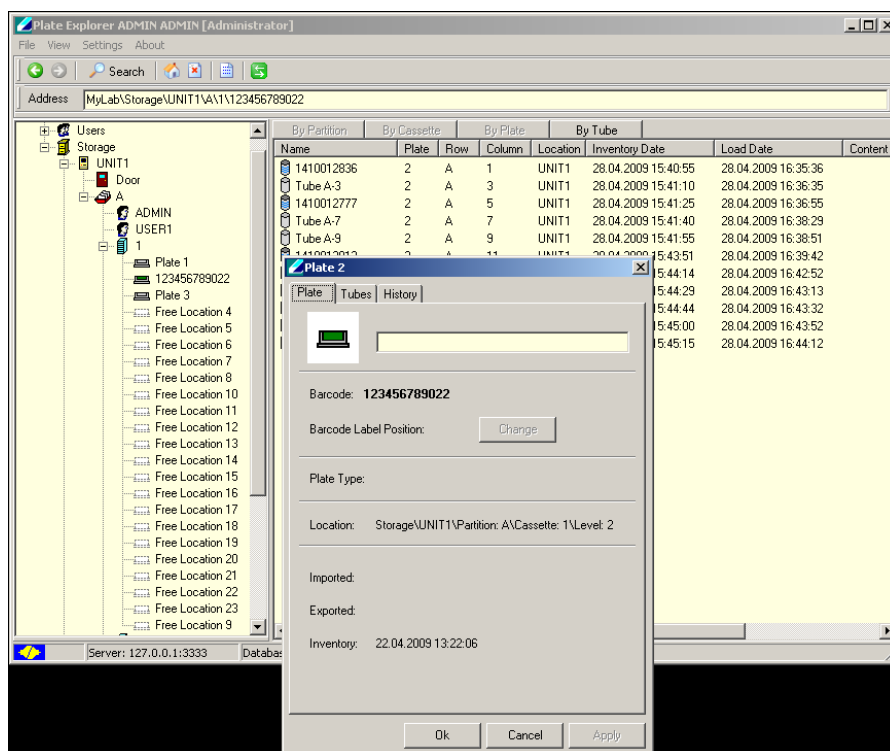
Picture 26: Plate/rack properties

19.3.5 Right-Click Action Menus in the Detail Information Screen

In the detailed information screen on the right, right-click menus are mostly the same as described for the tree view on the left. Additionally there are two extensions.

"Open in new window" opens the clicked item in a new window in order to be able to handle the shown items a bit more handy.

Additionally general tube "Properties", like an ID, the mater, the concentration of the sample in the tube and the level of filling can be entered here.
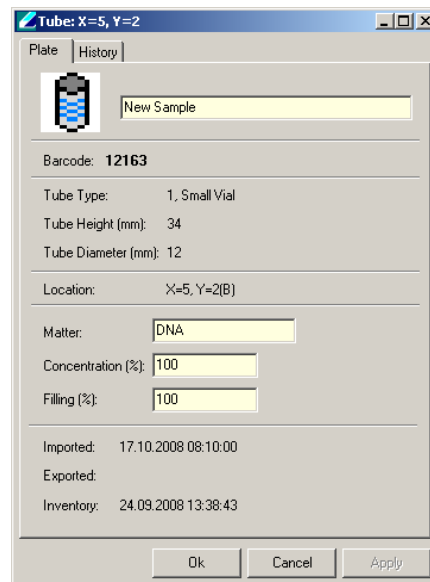
Picture 27: Tube properties

A simple history tracking is implemented for tubes as well as for plates and can be accessed via the sample properties. In the picture below, an example is shown.
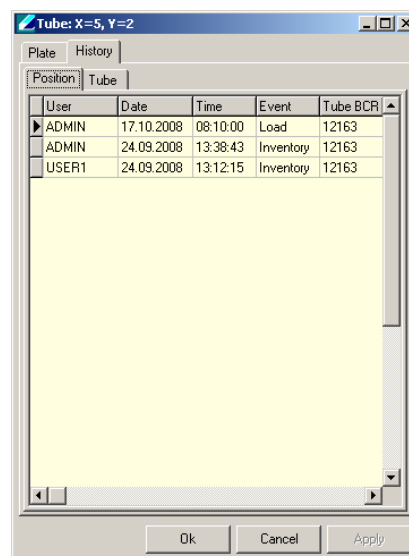
Picture 28: History

Having the occurrence of a plate being double in the system, the sub-tab "Content" in the history of the plate can be used to move the data from the old plate location to the new one. To do so, right-click the old plate and click "Select"

and then right-click the actual plate and click "Replace". All data will be moved from the "Select"-plate to the "Replace"-plate then.

19.3.6 Right-Click Action Menus on the Boxer/Picker

The right-click menu on the tube separation unit covers the following items:

"Copy" and "Paste" enable the user to manually move tubes from plate to plate on the device. "Check Presence" will work only depending on the model of the picker/boxer. If integrated, the function checks if a tube exists on the clicked location within the rack. If possible with the purchased model "Check Barcode" will take the tube and read the 2D-code of a tube.
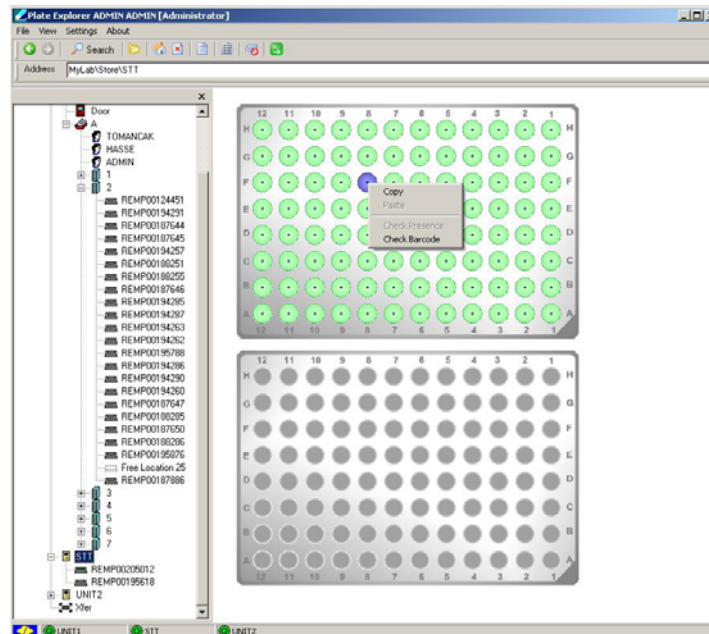
Picture 29: Right-click Menu of the Picker/Boxer

19.4   The Climate Explorer

Using the Climate Explorer enables the user to visualize the logged temperature data from the Kiwi devices database. The small tool consists of a menu bar, an area where one can choose the visualization options and the main graphics. The menu bar covers the following possibilities: File's "Exit" lets you exit the program. The Settings entry covers the choice of language; the databases path and the scale per unit (select the minimal and maximal value to be shown).

Picture 30: The Climae Explorers interface

The left part of the user interface controls the unit and the amount of time being displayed. First the user needs to choose the unit to be read out of the database. If current temperature is chosen, the graph will show a straight line on the level of the temperature being given in the device. Make sure that you have an adequate scale chosen in the settings menu. If day, month or history is chosen, the graph will show the progress of the temperature over the desired amount of time to be displayed. The show button actualizes the graphics.

20. Basic Configuration Files

All configuration files necessary are preset and delivered with the system. Modifications in the configuration files should only be performed after consultation of a Liconic applications specialist

CAUTION !
> ➢ Consult a Liconic specialist before changing the configuration files

The configuration files are present as ".LNI"-Files. The files can be opened and modified with a common text editor.

General Syntax:

```
//port=1234
```

Lines in a configuration file having a double slash (//) or an underscore (_) in front are ignored. They have no effect as they are commented.

20.1 Driver Configuration File: DriverConfig.Ini

The driver configuration file defines the parameters for the STXGui server. It is split in several sections which are described in the following parts.

20.1.1 Section: [TCP]

In this section the communication port and the communication log folder are set.

Syntax:

```
[TCP]

port=3333

LogFile=C:\STXTCPLog.log
```

Description:

Port: This Parameter defines the specific communication port set for all communication with the driver.

LogFile: A log file is created at the specified path to log all TCP communication to the driver.

20.1.2 Section: [WEB]

Setting for the web interfaces are made in this section.

Syntax:

```
[WEB]

port=81
```

Description:

Port: Web communication port to access the web
               interfaces.

20.1.3 Section: [XML]

Settings for the XML communication are located in this part
of the configuration file.

Syntax:

```
[XML]

port=3334
```

Description:

Port: Setting of the communication port for the XML
               exchange.

20.1.4 Section [paths]

In this section the paths for several logging functions,
system configuration and storage folders for optional
functions are set.

Syntax:

```
[paths]

StxMainFolder=D:\Liconic

CommunicationLogFolder=D:\Liconic\Log

LowLevelCommunicationLogFolder=D:\Liconic\LogLowLevel

PickBackJobFolder=D:\Liconic\PickBackJob

PickJobReportFolder=D:\Liconic\PickJobReport

XMLContent=D:\Liconic\XMLContent

XMLCommunicationLogFolder=D:\Liconic\XMLLog

ZiathTextContent=D:\ziath-csv

InXMLEventsFolder=D:\Liconic\Events\In

OutXMLEventsFolder=D:\Liconic\Events\Out

PickJobReportFolder=D:\Liconic\PickJobReport
```

Description:

STXMainFolder: Path to the main folder. In this folder
                        the software and the   system
                        configuration is located.

CommunicationLogFolder: In this folder the high level string
                        commands are logged which are sent
                        to the STXGui Server.

LowLevelCommunicationLogFolder: In this set folder the
                        low level communication
                        is logged, being sent
                        from the STXGui server to
                        the hardware.

PickBackJobFolder: In this set folder pick back job files,
                        being created by the LiCONiC software,
                        are stored.

XMLContent: In this set folder Upload-data for the
                        LiCONiC software can be placed. It is
                        read out if an inventory of the buffer
                        is started.

XMLCommunicationLogFolder: In this set folder the LiCONiC
                        drivers XML communication is
                        logged.

ZiathTextContent: If installed, this is the set folder
                        the driver is permanently looking for
                        Ziath import files.

InXMLEventsFolder: This folder is set as the input-folder
                        for a bridge between the LiCONiC
                        software and special LIMS adapters. For
                        further information using this special
                        solution, please contact your local
                        LiCONiC representative.

OutXMLEventsFolder: This folder is set as the output-folder
                        for a bridge between the LiCONiC
                        software and special LIMS adapters. For
                        further information using this special
                        solution, please contact your local
                        LiCONiC representative.

PickJobReportFolder: Set folder for where the results of
                        pickjobs can be accessed in a CSV-
                        format.

20.1.5 Section: [database]

In this section the storage location, the belonging network server and the embedded property of the database is stored.

Syntax:

[database]

server=localhost

path=D:\Liconic\DB\STXDRV.GDB

Embedded=0

Description:

Server:	Address of server where the database is located.
	– localhost: The database is located on the same computer as the actual driver controlling the system.
	– IP-Address: For a database located on a remote server an IP- address or alternatively a DNS or NetBIOS host name has to be given
path:	Path of the actual database file either on the PC the driver is running on (in case of localhost) or on the server (in case of a network configuration).
Embedded:	For systems with low storage capacity an embedded database is available with limited functionality. This can be enabled here.

20.1.6   Section: [Options]

In this section optional functions offered are enabled or disabled.

Syntax:

```
[Options]

ShowErrorMessages=0

DevicesLogFile=D:\Liconic\DevError.log

KeepHistory=1

SimulationMode=0

KeepEventsHistory=0

PickingTubesVerify=1

SortByAlley=0

MisingTubesProceed=1

MismatchPickBack=1

RackBCPickingTubesVerify=0

PickingTubesUnloadBack=1
```

Description:

ShowErrorMessages:	Switch on/off the message displaying function in case of an error.
DevicesLogFiles:	Path to the folder where errors of the devices are logged.
KeepHistory:	Enabling/Disabling history tracking
SimulationMode:	Enables/Disables the simulation mode of the STXGui server for software and communication development.
KeepEventsHistory:	Enabling/Disabling event tracking via the In-/ OutXMLEventsFolder.
PickingTubesVerify:	Enables/Disables the 2D-tube code verification during picking.
SortByAlley:	This parameter can be used for systems with double transfer stations in order to enable a sorting of the source racks by alley within the -80°C part of the STC devices.
MissingTubesProceed:	Enables/Disables proceeding of a pick job and updating the database in case of missing tubes (tubes not available for picking). If set to 0

<div style="text-align: right">

the system will stop and send an
error message via email.

</div>

MismatchPickBack: Enable/Disable tubes to be returned
                           to its original position in case of
                           mismatched 2D tube code reading
                           (only working in combination with a
                           TubePicker   and   enabled
                           RackPickingTubesVerify).

RackBCPickingTubesVerify: Enable/Disable 1D rack code
                           verification. The 1D rack code
                           is read prior to the transport
                           of the rack to be picked out of
                           or into.

PickingTubesUnloadBack: This option enables the user to
                           force the system to move racks being
                           taken from the device back to their
                           exact original position (cassettes,
                           level) within the devices.

20.1.7   Section: [Messages]

In this section parameters are defined for transmitting
messages from the system.

Syntax:

```
[Messages]

SendMessages=0

SMTPAddress=mail.srg.li

SMTPPort=25

From=XYZ@SRG.de
```

Description:

SendMessages: Enables/Disables   the   email   message
                 transmission.

SMTPAddress: Address of the SMTP server used to transmit
                 the messages.

SMTPPort: Communication port of the SMTP server.

From: Set name for the notification mail sender.

20.2   System Configuration File: System.Ini

In the main folder defined in the DriverConfig.lni the System.lni configuration file is found containing the combination of the individual units to a system.

20.2.1   Section: [System]

In this section the system identification and the displayed name (in the User interfaces) is set.

Syntax:

```
[System]

SystemName=Storage

SystemId=Storage
```

Description:

```
SystemName:   Definition of the display name of the system.

SystemId:     Definition of the system id used for commands
              addressed to the system as a whole.
```

20.2.2   Section: [Unit]

In this section the units the system consists of are defined.

Syntax:

```
[Unit]

Unit1=Store.lni

Unit2=Boxer.lni

Unit3=Interface.lni
```

Description:

```
UnitX:        Definition of configuration files belonging to
              the individual devices a system does consist
              of.  This  is  strongly  dependent  on  the
              specifics of the system.
```

21.   Unit Configuration File Types

21.1   Common Sections

This section is part of all unit configuration files.

21.1.1   Section: [Unit]

In this section the basic communication settings and parameter file settings are made.

Syntax:

```
[Unit]

UnitComPort=3

UnitBCRPort=4
```

Description:

```
UnitComPort: Here   the   Units   COM   port   for   general
             interaction with the device is set.

UnitBCRPort: Here the COM-port of the 1D barcode reader is
             set.
```

21.1.2   Section: [ParameterFile]

Here the name of the sub units parameter file is set.

Syntax:

```
[ParameterFile]

FileName=Param.txt
```

Description:

```
FileName:    Defines  the  filename  to  be  used  for  reading
             out DM parameters of this sub unit. In order
             to  change  those,  please  consult  a  LiCONiC
             representative.
```

21.2   STC Store configuration File: Store.Ini

This section describes the setting file of an STC unit.

21.2.1   Section: [Climate]

Here the climate type is set.

Syntax:

```
[Climate]

ClimateType=DF
```

Description:

```
FileName:     Defines the climate type of the sub unit. This
              option is not activated by LiCONiC yet.
```

21.2.2   Section: [Options]

Here options of the unit are set.

Syntax:

```
[Options]

XFerStation=0

Storage=1

SysStat=1
```

Description:

```
XFerStation: Defines   the   presence/absence   of   a   transfer
              station.

Storage:      This  is  the  attribute  that  assigns  the  device
              type to the belonging unit.

SysStat:      If  implemented  in  the  Firmware  and  set  to  1,
              this attribute enables the Administrator of the
              system to request a deeper level of information
              by an extended command result.
```

21.2.3   Section: [Option Configuration]

Here further options for the unit are set.

Syntax:

```
[Option Configuration]

Door=0

DoubleIntXFerStation=0

NeighbourPlate=0

UseFirstAlleyExchange=1
```

Description:

Door: Sets the presence/absence of a door in the belonging sub unit.

DoubleIntXFerStation: Sets the presence/absence of a double internal transfer station in the belonging sub unit.

NeighbourPlate: Enables the system to keep the current position after movements within the unit. This should only be switched on or off after talking back to a LiCONiC representative.

UseFirstAlleyExchange: This option enables the device to already open the gate, when the handling arrives in the alley of the internal transfer. **This is only possible if your device has the internal transfer station within the first alley**.

21.2.4   Section: [Option Configuration2]

Here a second parameter set for the unit is set.

Syntax:

```
[Option Configuration2]

BCR=1

Compatibility=6
```

Description:

BCR: The attribute sets the presence/absence of a 1D barcode reader in the belonging unit.

Compatibility: This attribute is set by LiCONiC representatives in order to set firmware version compatibility and should not be changed under all circumstances.

21.2.5 Section: [Sensor Configuration]

Here the configuration of the sensors is set.

Syntax:

```
[Sensor Configuration]

PlatePresenceSensor=1

pShovelSen=1

pxferSens1=0
```

Description:

PlatePresenceSensor: Parameter to switch on and off the usage of the plate presence sensor.

pShovelSen: Parameter to switch on and off the usage of the shovel sensor.

pxferSens1:   Parameter to switch on and off the usage of the plate presence sensor on internal double transfer stations.

21.2.6 Section: [Carousel Configuration]

Here the parameter for the integrated carousel is set.

Syntax:

```
[Carousel Configuration]

ManualAccessOffset=3
```

Description:

ManualAccessOffset: This is a special parameter for the StoreX systems in order to manipulate the position of cassettes for manual access. If you want to use that parameter please talk back a LiCONiC representative.

21.2.7   Section: [Climate Configuration]

Here the climates configuration settings are made.

Syntax:

```
[Climate Configuration]

Temperature=1

Humidity=1

MinTemperature=-90

MaxTemperature=-70

TimeOutTemperature=2

MinHumidity=21

MaxHumidity=90

TimeOutHumidity=3

TemperatureAlarm=1

HumidityAlarm=0
```

Description:

Temperature:	Activates/Deactivate the temperature control.
Humidity:	Activates the humidity control.
MinTemperature:	Sets the lower alarm value for the temperature.
MaxTemperature:	Sets the upper alarm value for the temperature.
TimeOutTemperature:	This value tells the maximum amount of time the set temperature can be out of the given limits.
MinHumidity:	Sets the lower alarm value for the humidity.
MaxHumidity:	Sets the upper alarm value for the humidity.
TimeOutHumidity:	This value tells the maximum amount of time the set humidity can be out of the given limits.
TemperatureAlarm:	Activates the Alarm messaging for the temperature monitoring.
HumidityAlarm:	Activates the Alarm messaging for the temperature monitoring.

21.2.8   Section: [Partitions]

In this section the settings for the partitions within the unit are made.

Syntax:

```
[Partitions]

B=1
```

Description:

```
This parameter is a special parameter used for specific
systems. If your system applies to having that and you want
to change it, please contact a LiCONiC representative.
```

21.2.9   Section: [CassettesConfiguration]

In this section the usage of a cassette configuration table is decided and pitch heights as well as amounts of levels are assigned to the cassettes.

Syntax:

```
[Cassette Configuration]

UseCassConfTable=0

1-140=44,1918
```

Description:

```
UseCassConfTable:  Activates  the  usage  of  the  cassette
configuration table being given in XXX. The lines below mark
the different configuration setting areas with their amounts
of levels and the assigned pitch height.
```

21.2.10   Section: [X-Tilt] – some old systems – liconic tech

In special systems this parameter section assigns X-tilt values to specific cassettes.

21.3   Interface Configuration File: Interface.Ini

This section shows the configuration options of a unit file for an STC interface unit.

21.3.1   Section: [Options]

In this section the usage of different options is set.

Syntax:

```
[Options]

XFerStation=1

DoubleDeck=0

Peripheral=1

Handshake=0

SysStat=0
```

Description:

XFerStation: Regulates the presence/absence of a transfer station for the unit.

DoubleDeck: This parameter regulates the presence/absence of a second cassette level in the unit.

Peripheral: Sets the attribute for the main device for the customer interaction.

Handshake: This technical parameter synchronizes steps within movements. It should only be changed by a LiCONiC representative.

SysStat: If implemented in the Firmware and set to 1, this attribute enables the Administrator of the system to request a deeper level of information by an extended command result.

21.3.2   Section: [Option Configuration]

In this section the usage of different options is set.

Syntax:

```
[Option Configuration]

Door=1

InventoryContent=0

CloseDoorAutoInventory=0
```

Description:

Door:	Defines the presence/absence of a door in the unit.
InventoryContent:	Enables a complete 2D-code check when a tube rack enters the system via the transfer station. This will only work in combination with the CloseDoorAutoInventory enabled.
CloseDoorAutoInventory:	Activates the automatic 1D-code inventory of the unit when the door gets closed.

21.3.3   Section: [Option Configuration2]

In this section the usage of different options is set.

Syntax:

```
[Option Configuration2]

BCR=1

Compatibility=6

LoadPlateBack=0
```

Description:

BCR:	The attribute sets the presence/absence of a 1D barcode reader in the belonging unit.
Compatibility:	This attribute is set by LiCONiC representatives in order to set firmware version compatibility and should not be changed under all circumstances.
LoadPlateBack:	This feature enables the system daleay of 2 minutes before a rack, when not being taken off the transfer station, is moved back into the system in order to protect its contents.

21.3.4   Section: [Sensor Configuration]

Here the configuration of the sensors is set.

Syntax:

```
[Sensor Configuration]

PlatePresenceSensor=1

pShovelSen=1

pxferSens1=1
```

Description:

PlatePresenceSensor: Parameter to switch on and off the usage of the plate presence sensor.

pShovelSen: Parameter to switch on and off the usage of the shovel sensor.

pxferSens1:   Parameter to switch on and off the usage of the plate presence sensor on internal double transfer stations.

21.3.5   Section: [Carousel Configuration]

Here the parameter for the integrated carousel is set.

Syntax:

```
[Carousel Configuration]

ManualAccessOffset=5
```

Description:

ManualAccessOffset: This is a special parameter for the StoreX systems in order to manipulate the position of cassettes for manual access. If you want to use that parameter please talk back a LiCONiC representative.

21.3.6   Section: [Climate Configuration]

Here the climates configuration settings are made.

Syntax:

```
[Climate Configuration]

Temperature=1

Humidity=1

MinTemperature=-90

MaxTemperature=-70

TimeOutTemperature=2

MinHumidity=21

MaxHumidity=90

TimeOutHumidity=3

TemperatureAlarm=1

HumidityAlarm=0
```

Description:

Temperature:	Activates/Deactivate the temperature control.
Humidity:	Activates the humidity control.
MinTemperature:	Sets the lower alarm value for the temperature.
MaxTemperature:	Sets the upper alarm value for the temperature.
TimeOutTemperature:	This value tells the maximum amount of time the set temperature can be out of the given limits.
MinHumidity:	Sets the lower alarm value for the humidity.
MaxHumidity:	Sets the upper alarm value for the humidity.
TimeOutHumidity:	This value tells the maximum amount of time the set humidity can be out of the given limits.
TemperatureAlarm:	Activates the Alarm messaging for the temperature monitoring.
HumidityAlarm:	Activates the Alarm messaging for the temperature monitoring.

21.3.7   Section:[Partitions]

In this section the settings for the partitions within the unit are made.

Syntax:

```
[Partitions]

B=1
```

Description:

```
This parameter is a special parameter used for specific
systems. If your system applies to having that and you want
to change it, please contact a LiCONiC representative.
```

21.3.8   Section: [CassettesConfiguration]

In this section the usage of a cassette configuration table is decided and pitch heights as well as amounts of levels are assigned to the cassettes.

Syntax:

```
[Cassette Configuration]

UseCassConfTable=0

1-140=44,1918
```

Description:

```
UseCassConfTable: Activates  the  usage  of  the  cassette
configuration table being given in XXX. The lines below mark
the different configuration setting areas with their amounts
of levels and the assigned pitch height.
```

21.4 TubeBoxer/Picker Configuration File: Boxer.Ini

This section shows the configuration options of a unit file for a tube boxing unit.

21.4.1 Section: [Options]

In this section the settings for the tube picking/boxing units are made.

Syntax:

```
[Options]

STT=1

STTTYPE=1

STTPOS=1

STTMaster=UNIT1

UpHead=0
```

Description:

STT:	This parameter enables/disables the picker/boxer for the whole system.
STTTYPE:	This parameter sets the type of tube separation unit. 1=boxer, 0=picker
STTPOS:	This paramteter describes the position of the picker within the interface (2nd cassette level).
STTMaster:	This parameter assigns the unit the picker/boxer is located in.
UpHead:	Enable this setting to take the boxer/picker head up (safe position) when plate is moved from/to the STT.

21.4.2 Section: [Option Configuration2]

Here further settings of the picker/boxer can be made.

Syntax:

```
[Option Configuration2]

BCR=1
```

Description:

BCR:	This setting enables/disables the 2D-reader on the picking unit.

21.4.3   Section: [TubesConfiguration]

This section contains the parameters of the tubes being used on the system.

Syntax:

```
[TubesConfiguration]

UseTubeHeight=0

Type 0=1620,12,8,0,0,0,0,0,0
```

Description:

```
UseTubeHeight:              Enables/Disables  the  usage  of  tube
                            types.
```

The lines below define the different tube types preset for the system. To extend the list, please contact a LiCONiC representative.

Trouble Shooting

22. Troubleshooting

The following chapter does give assistance to the customer to fix some errors which eventually could appear.

22.1 Basic Errors

The following table shows some basic errors of the Kiwi Stores which can be fixed by the customer. If the steps below aren't successful, please contact an authorized service person.

(STOP)	**CAUTION !** ➢ Never touch electrical connections as long the System is connected to the main power supply or one or more covers are removed.

Error	Cause	Action
Instrument does not power-up	Main Switch off	Turn Main Switch on
	circuit breaker or fuse in the power cabinet has tripped	Set back circuit breaker or replace fuses
	main inlet power source is not present	Check main inlet power source
System does not react on external commands	A fault in the electrical connectors/cables	Check RS232 connections
	Wrong communication settings	Check communication settings
	No communication to System	Check if software is running
	Internal error	Call service personnel
System does not cool down	Cooling unit does not turn on	Check main power switch on cooling unit
	Cooling unit break down	Call Service personnel
Cooling unit switches off shortly after it starts	Insufficient cooling media supply	Check cooling media supply
	Insufficient coolant within system	Check coolant level
		Call service personnel
Handling stops with error	Error did appear	Check general handling error procedure for further steps

22.2   Handling Errors

Some issues encountered while handling plates can be resolve by performing the procedures described in the following chapters. When performing this procedures, always carefully observe the moving of the robotics.

Should any mechanical resistance be observed while the robotics are moving, reset the system immediately and ask a trained engineer for assistance.

CAUTION !

- ➢ When initializing system after an error stop, check if handler does move freely. Reset the system if this is not the case and ask for assistance.
- ➢ If you do not feel secure about performing the following tasks, ask your local engineer for assistance.
- ➢ When changing DM6 with extended shovel, always be sure about the entered value as the handler will immediately move after sending the new value.

22.2.1 Gerneral

22.2.2 Plate stuck

```
                              ┌──────────────────────┐
                              │ Plate/Rack got stuck │
                              │      in cassette     │
                              └──────────┬───────────┘
                                         │
                              ┌──────────▼───────────┐
                              │  Enter service mode  │
                              │   WR DM123 63450     │
                              └──────────┬───────────┘
                                         │
                              ┌──────────▼───────────┐
                              │    Extend shovel     │
                              │      ST 1401         │
                              └──────────┬───────────┘
                                         │
┌──────────────┐   YES   ◇───────────────◇   NO   ┌──────────────────┐
│ Retract shovel│◄───────│  Shovel does   │──────►│ Manual intervention│
│   RS 1401     │        │   extend?      │       │  is neccessary     │
└──────┬────────┘        ◇───────────────◇        └─────────┬─────────┘
       │                                                    │
       │                                          ┌─────────▼─────────┐
       │                                          │  Ask your local   │
       │                                          │  engineer for     │
       │                                          │     support       │
       │                                          └───────────────────┘
  ◇────────────◇   NO   ┌──────────────────┐
  │ Shovel does │──────►│  Extend shovel   │◄──────────┐
  │  retract?   │       │     ST 1401      │           │
  ◇────────────◇        └────────┬─────────┘           │
       │ YES                     │                     │
       │                ┌────────▼─────────┐           │
┌──────▼────────┐       │ Read out current │           │
│ Leave service │       │     height       │           │
│ mode          │◄──────│    RD DM6        │           │
│ WR DM123 0    │       └────────┬─────────┘           │
└──────┬────────┘                │                     │
       │                ┌────────▼─────────┐           │
┌──────▼────────┐       │  Move handler    │           │
│ Performe a    │       │  Downwards       │           │
│ soft reset    │       │  WR DM6 xxxx     │           │
│ ST 1800       │       │ (xxxx=Value from │           │
└──────┬────────┘       │  above plus some │           │
       │                │ steps; max. +100)│           │
┌──────▼────────┐       └────────┬─────────┘           │
│ Use PlateExplorer│             │                     │
│ to set the plate │    ┌────────▼─────────┐           │
│ to an empty      │    │  Retract shovel  │           │
│ position         │    │     RS 1401      │           │
└──────┬───────────┘    └────────┬─────────┘           │
       │                         │                     │
┌──────▼────────┐         ◇──────────────◇  NO         │
│ Use PlateExplorer│       │ Shovel does  │────────────┘
│ to identify the  │       │  retract?    │
│ plate Check      │       ◇──────────────◇
│ Barcode          │  YES         │
└──────────────────┘◄─────────────┘
                ┌────────────────────┐
                │ Check if plate is  │
                │ removed from shovel │
                │     RD 1812        │
                │ Should retourn 0   │
                └─────────┬──────────┘
                          │
                ┌─────────▼──────────┐
                │ Leave service mode │
                │    WR DM123 0      │
                └─────────┬──────────┘
                          │
                ┌─────────▼──────────┐   ┌──────────────────┐   ┌──────────────────┐
                │ Performe a soft    │──►│ Use PlateExplorer │──►│ Try to proceed   │
                │ reset ST 1800      │   │ to identify the   │   │ with the process │
                └────────────────────┘   │ plate Check       │   └──────────────────┘
                                         │ Barcode           │
                                         └──────────────────┘
```

22.2.3   Plate not set

Technical Data

23. Technical Data

23.1 Mechanics

- Cassettes — Depending on configuration: minimum 20 storage cassettes
- Levels — Depending on used lab ware
- Position drives — Stepper Motor, bipolar, micro-stepping mode
- Shovel drive — DC-Motor
- Gate — Linear movement, heated
- Noise — <82dBA / 1m
- RAL Color — 9010

23.2 Electronics

23.2.1 Robotics

- Mains — 110 / 230VAC, 50/60Hz
- Power consumption Handling — Maximum: 1 kW, Typical: 400 – 600 W

23.2.2 Cooling Interface

- Mains — 208 / 230VAC, 50/60Hz
- Power consumption cooling — Maximum: 1 kW, Typical: 600 W

23.2.3 Cooling STC

- Mains — 3 phase 400 VAC, 50/60Hz
- Power consumption cooling — Maximum: 5 kW, Typical: 3 kW

23.2.4 Communication

- Handling communication — Communication via RS-232
  2=Controller RX, 3=Controller TX, 5=GND
  7,8 and 4,6 shortened
- Barcode Communication — Communication via RS-232
  Straight connected serial extension

23.3 Pneumatics

- Optional Gas Pressure — <4 bar

23.4

23.5   Water

- Water consumption   3-5 l/min
- Pressure Difference   2.5 bar (max 10 bar Inlet)
- Water Temperature   Inlet maximum: 18°C

  Outlet regulated: 35°C

23.6   Cooling

23.6.1   STT

- Principle   Single stage compressor, air cooled (water cooling optional)

- Working conditions   Typical: 22°C; ~45% rH

  max. Temperature: 26°C

- Type of refrigerant   R404a
- Refrigerant charge   1.5 kg

23.6.2   Interface

- Principle   Single stage compressor, air cooled (water cooling optional)

- Working conditions   Typical: 22°C; ~45% rH

  max. Temperature: 26°C

- Type of refrigerant   R404a
- Refrigerant charge   1.5 kg

23.6.3   STC DF

- Principle   Single stage compressor, water cooled
- Working conditions   Typical: 22°C; ~45% rH

  max. Temperature: 26°C

- Type of refrigerant   R404a
- Refrigerant charge   2.9 kg

23.6.4 STC ULT

- Principle   Two stage compressor, water cooled
- Working conditions   Typical: 22°C; ~45% rH

                                              max. Temperature: 26°C

- Type of refrigerant first stage   R404a
- Refrigerant charge first stage   2.9 kg
- Type of refrigerant second stage   R508
- Refrigerant charge second stage   2.2 kg

For detailed installation requirements refer to the section installation.

23.7 Overall Dimensions

System dimensions do depend on the configuration. Dimension for specific systems may be retrieved from LiCONiC according to the needs and room constraints.

23.8 Weights

System weights do depend on the configuration. Weights for specific systems may be retrieved from LiCONiC according to the needs and room constraints.

23.9 Ambient Ratings

Operating: Temperature: 22 °C
                      Relative humidity: 45% or below (non- condensing)

Storage: Temperature: 10 – 40°C
                     Relative humidity: 50% or below (non- condensing)

Safety Sheets
Safety guideline for the work in the service area of the LiCONiC STC-series

Works, that require the regulations:
maintenance(repair, maintenance, inspection), cleaning, hardware changes, disturbance removal

Behavior on the machine, that requires the regulations:
lean into the service area, get into / out of the service area, detention at the service area

Work on the device should only start following all given regulations in this document!

Potential danger	Protection mechanism
Contact with dangerous samples	• Additional to the usage of thermal protection clothing, please use Nitrile-gloves or gloves with comparable safety properties concerning dangerous materials • Check skin compatibility towards the used disposables
Lacking air condition / lack of oxygen (Measurement value <20,9%)	• For works within the area, a breathing mask is recommended (no Cartridge-mask, as this does not help). • Personal oxygen monitors have to be worn when entering the service area.
Burning skin by undercooling / freezing	• Generally only work in thermal protection clothing (thermally protect body, head and hands). Do not touch or pick up anything within the -80°C area without using tools. Never lean into the -80°C area under the isolation or step into it. Generally the work in the service area should be limited to 15 minutes time.
Violent pressure by mechanical parts	• Before entering the service area, switch off the device and put a sign, saying „Do not switch on device!" on it. After the work a reset and re-initialization is necessary. Attention: Neither the cooling nor the handling should be switched off longer than 30 minutes!
Advanced physical stress by the small sizes of the service area.	• Duration of the work within the area should be limited to 15 minutes.

Bodily harm by sharp edges or corners (e.g. air condition pipes)	• Overtired or for different reasons unconcentrated persons should not do maintenance work.
suffocation / burning by contact with LN2	• When LN2 has been introduced into the system and the DEWAR needs to be exchanged, wear protective clothing. • In case no exhaust leading the N2 gas out of the room, only enter the room wearing a breathing mask with oxygen supply. • During operation of LN2 backup, do not touch any piping showing frost without protective clothing.
Bodily harm while entering the area by slipping off or falling down	• Access should only be realized with the help of proper tools, like a ladder
Contamination of the user by destroyed samples or of the probes by the user (product safety and personnel safety)	• To avoid a contamination of or by the samples, no sharp or acute tools should be used within the service area.

General Rules:

1) DO NEVER WORK ALONE WITHIN THE DEVICE. ALWAYS ORGANIZE A SECOND PERSON AS SAFTEY GUARD ON THE OUTSIDE OF THE DEVICE THAT IS CONNECTED TO YOU VIA RADIO. FURTHER AN ADMINISTRATIVE PERSON MUST BE REACHABLE IN A SHORT TIME. BOTH MUST BE 100% PHYSICALLY FIT.

2) WHILE WORKING IN THE SERVICE AREA, ALWAYS SWITCH ON THE INTEGRATED LAMP. NEVER WORK IN THE DARK.

3) FOR ALL KINDS OF WORK, CARRY AN OXYGEN MEASUREMENT DEVICE WITH YOU, HAVING A DISPLAY FOR THE ACTUAL VALUE, AN ADJUSTABLE VALUE FOR THE LIMIT AND AN OPTICAL/ACCOUSTIC SIGNAL WHEN THIS LIMIT IS REACHED.

4) ENTERING THE OR WORKING WITHIN THE -80°C AREA OF THE DEVICE IS ALLOWED TO TRAINED LiCONiC PERSONNEL ONLY. THE USER SHOULD NOT WORK WITHIN THIS AREA OR EVEN ENTER IT. OBJECTS FALLEN DOWN OR THINGS TO BE ALIGNED WITHIN THIS AREA SHOULD ONLY BE PICKED UP OR MOVED WITH THE HELP OF PROPER TOOLS.

5) IF THERE ARE DOUBTS ABOUT THE FUNCTIONALITY OF THE DEVICE (FATIGUE, ABRASION OR BREAKING OF PARTS), THE USER SHOULD IMMEDIATELY ORDER A SERVICE BY LiCONiC AND THE USER SHOULD NOT ACCESS IT ANYMORE.

6) IN CASE OF A FIRE THE DEVICE MUST NOT BE ENTERED UNDER ALL CIRCUMSTANCES.

7) EVERY PERSON TAKING PART IN THE WORK ON THE DEVICE SHOULD BE INFORMED ABOUT THE SAFETY REGULATIONS BEFORE STARTING TO WORK. ONCE A YEAR AN ACTIVITY PLANNING SHOULD BE MADE WITH ALL PARTICIPATING PERSONS.