



SamplePro Tube

- Sample Preparation Robot
User Manual
Version 004



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Contents

1	About This Manual	7
1.1	Policy Statement	7
1.2	Symbols and Conventions	7
1.3	Font and Format Conventions	9
2	Introduction	11
2.1	Intended Use.....	11
2.2	Installation and Initial Commissioning.....	11
2.3	Concept.....	11
2.4	Limitations of Liability	12
2.5	Warranty Terms	12
2.6	Customer Service	12
3	Safety	13
3.1	General	13
3.2	System Owner's Responsibility.....	13
3.3	Personnel Requirements	14
3.3.1	Qualifications	14
3.3.2	Unauthorized Persons	15
3.3.3	Instruction	15
3.4	Personal Protective Equipment.....	15
3.5	Description of the Installed Safety Devices.....	16
3.5.1	Location of the Emergency Stop Button	16
3.5.2	Location of the Robot System ON/OFF Switch.....	16
3.6	Basic Dangers.....	17
3.6.1	General Workplace Dangers.....	17
3.7	Environmental Protection.....	25
3.8	Signage.....	26
3.9	Emergency Shutdown.....	26
4	Transport, Packaging and Storage	27
4.1	Symbols on the Packaging	27
4.2	Inspection at Delivery.....	28
4.3	Receiving the Product.....	28
4.3.1	Unpacking	29
4.4	Packaging	29
4.5	Storage	30
4.6	Returning the Robotic System	30
4.6.1	Robot and Part Shipping Precautions.....	30
4.6.2	Preparing the Robot System for Transport	31
4.6.3	Packing the Robot System for Transport	31
4.6.3.1	Packing the Arm.....	31
4.6.3.2	Packing the Tool Arm.....	32
4.6.3.3	Packing the Deck Tray and Frame	33

5	Technical Data	39
5.1	General	39
5.2	Electrical	40
5.3	Operating Conditions	40
5.4	Rating Plate Robot	41
5.5	Motion Speed	42
5.6	Electrical and Communication	42
5.7	Safety and Security	42
5.8	Physical Properties	42
5.8.1	Precision	42
5.9	Computer and Software Requirements	43
5.9.1	Recommended Options	43
5.9.2	Material Chemical Resistance	43
6	Design and Function	45
6.1	Overview	45
6.2	Brief Description	45
6.3	System Description	45
6.4	Description of The SamplePro Tube Robotic System	45
6.4.1	The Robot Back Panel	46
6.4.2	The SamplePro Tube LED Status Light	46
6.4.3	The Door Lock	46
6.5	SamplePro Control Main Display	46
6.5.1	General Naming Conventions	48
6.5.2	Panning, Zooming, Context Information	50
6.5.3	Menu and Button Navigation Overview	51
6.5.4	The Deck Tray View Tab	54
6.5.5	The SPE-TT View Tab	55
6.5.6	The Sample Positions Tab	56
6.5.7	The Tasks Tab	56
6.5.8	The System Tab	57
7	Operation Overview	59
7.1	General Operating Guidelines	59
7.1.1	Switching On the Device	60
7.1.2	Switching Off the Device	60
8	Operation	61
8.1	General Operating Guidelines	61
8.1.1	Switching On the Device	62
8.1.2	Switching Off the Device	62
8.2	Filling the Robot with Containers	63
8.2.1	Source Sample Input	63
8.2.2	NMR Tubes Input - 7" Tubes	64
8.2.3	NMR Tubes Input - SampleJet Tubes	65
8.2.4	NMR Tubes – MATCH Tubes	66
8.3	Preparing a Sample Manually	66
8.4	The Sample Position and Tasks Tab	74
8.5	The Menu	75

8.6	Tasks Recover System	76
8.7	Method Settings	77
8.8	Viewing the Activity History	78
8.9	Exporting a Device Report	78
8.10	Saving and Opening a Session	79
8.11	Exchanging Containers	79
8.12	Barcode Labels	80
8.13	Optional Temperature Controlled Deck Tray	82
8.13.1	About Temperature Controlled Deck Trays	82
8.13.2	Usage and Connection	83
8.14	Optional Shaker	84
8.14.1	About Shaker	84
8.14.2	Usage and Connection	85
9	Maintenance	87
9.1	Cleaning	89
9.1.1	Cleaning the Pipetting and Tool Arm Z-Racks	89
9.1.2	Cleaning the Outside of the SamplePro Tube and Units	89
9.1.2.1	After Cleaning	89
9.1.2.2	Other Cleaning Operations	89
9.1.3	Cleaning the Robot Barcode Reader	90
9.2	Preventative Maintenance	90
9.2.1	Daily Maintenance	90
9.2.2	Weekly Maintenance	91
9.3	Washable Tips and DT Adapters	91
10	Replacement of Parts	95
10.1	User Replaceable Parts	95
10.2	Returning the Unit for Repair	103
11	Dismantling and Disposal	105
11.1	Dismantling	105
11.2	Disposal Europe	105
11.3	Disposal USA and Other Countries	106
12	Contact	107
	List of Figures	109
	List of Tables	111
	Index	113

1 About This Manual

This manual enables safe and efficient handling of the device.

This manual is an integral part of the device, and must be kept in close proximity to the device where it is permanently accessible to personnel. In addition, instructions concerning labor protection laws, operator regulations tools and supplies must be available and adhered to.

Before starting any work, personnel must read the manual thoroughly and understand its contents. Compliance with all specified safety and operating instructions, as well as local work safety regulations, are vital to ensure safe operation.

The figures shown in this manual are designed to be general and informative and may not represent the specific Bruker model, component or software/firmware version you are working with. Options and accessories may or may not be illustrated in each figure.

1.1 Policy Statement

It is the policy of Bruker to improve products as new techniques and components become available. Bruker reserves the right to change specifications at any time.

Every effort has been made to avoid errors in text and figure presentation in this publication. In order to produce useful and appropriate documentation, we welcome your comments on this publication. Support engineers are advised to regularly check with Bruker for updated information.

Bruker is committed to providing customers with inventive, high quality products and services that are environmentally sound.

1.2 Symbols and Conventions

Safety instructions in this manual and labels of devices are marked with symbols. .

The safety instructions are introduced using indicative words which express the extent of the hazard.

In order to avoid accidents, personal injury or damage to property, always observe safety instructions and proceed with care.

DANGER



DANGER indicates a hazardous situation which, if not avoided, will result in death or serious injury.

This is the consequence of not following the warning.

1. This is the safety condition.
 - ▶ This is the safety instruction.

WARNING



WARNING indicates a hazardous situation, which, if not avoided, could result in death or serious injury.

This is the consequence of not following the warning.

1. This is the safety condition.
 - ▶ This is the safety instruction.

CAUTION



CAUTION indicates a hazardous situation, which, if not avoided, may result in minor or moderate injury or severe material or property damage.

This is the consequence of not following the warning.

1. This is the safety condition.
 - ▶ This is the safety instruction.

NOTICE

NOTICE indicates a property damage message.

This is the consequence of not following the notice.

1. This is a safety condition.
 - ▶ This is a safety instruction.

SAFETY INSTRUCTIONS

SAFETY INSTRUCTIONS are used for control flow and shutdowns in the event of an error or emergency.

This is the consequence of not following the safety instructions.

1. This is a safety condition.
 - ▶ This is a safety instruction.



This symbol highlights useful tips and recommendations as well as information designed to ensure efficient and smooth operation.

1.3 Font and Format Conventions

Type of Information	Font	Examples
Shell Command, Commands, “All what you can enter”	Arial bold	Type or enter fromjdx zg
Button, Tab, Pane and Menu Names “All what you can click”	Arial bold, initial letters capitalized	Use the Export To File button. Click OK . Click Processing...
Windows, Dialog Windows, Pop-up Windows Names	Arial, initial letters capitalized	The Stacked Plot Edit dialog will be displayed.
Path, File, Dataset and Experiment Names Data Path Variables Table Column Names Field Names (within Dialog Windows)	Arial Italics	<i>\$tshome/exp/stan/nmr/</i> <i>lists</i> <i>expno, procno,</i>
Parameters	Arial in Capital Letters	VCLIST
Program Code Pulse and AU Program Names Macros Functions Arguments Variables	Courier	go=2 au_zgte edmac CalcExpTime() XAU(prog, arg) disk2, user2
AU Macro	Courier in Capital Letters	REX PNO

Table 1.1: Font and Format Conventions

2 Introduction

The SamplePro Tube is a modular preparation robot suited for several Bruker NMR applications using a single sample handler base. The applications cover transfers/preparations from well plates and Cryo vial racks to a variety of NMR tubes and racks.

A complete list of container types supported by SamplePro Tube can be found in the chapter [User Replaceable Parts \[▶ 95\]](#).

2.1 Intended Use

The SamplePro Tube preparation robot has been designed and constructed solely for the intended use described here.

The device must only be used for the transfer/preparation of NMR samples in the specially designed preparation robot system and containers as described in this manual.

Intended use also includes compliance with all specifications in this manual.

Any use which exceeds or differs from the intended use shall be considered improper use.

No claims of any kind for damage will be entertained if such claims result from improper use.

2.2 Installation and Initial Commissioning



Installation, initial commissioning, retrofitting, repairs, adjustments or dismantling of the device must only be carried out by Bruker Service or personnel authorized by Bruker. Damage due to servicing that is not authorized by Bruker is not covered by your warranty.

2.3 Concept

The SamplePro Tube consists of a laboratory robot with various lab ware (racks for vials, NMR tubes, etc.) controlled by the Bruker Software *SamplePro Control*.

The system provides a Bruker standard interface, through which the robot can be controlled with external Software (for example *SampleTrack* or *EXCEL*).

The SamplePro Tube exists in two versions, the **SamplePro Tube S** (Standard Size) and **SamplePro Tube L** (Large Size).

The large model is two deck tray slots wider, i.e. it can hold a maximum of 5 deck trays and has a total capacity of 20 (5x4) well plate formatted containers (instead of 3 deck trays and a capacity of 12(3x4) for the Standard model).

The differences are described in the chapter [Technical Data \[▶ 39\]](#). In the text the term *SamplePro Tube* is used to describe the general functionality where no principle difference between the two models exists. For most pictures and examples the **SamplePro Tube S** model is used.

Refer to [Design and Function \[▶ 45\]](#) for a complete description of the design and function of SamplePro Tube.



Figure 2.1: The SamplePro Tube S System

2.4 Limitations of Liability

All specifications and instructions in this manual have been compiled taking account of applicable standards and regulations, the current state of technology and the experience and insights we have gained over the years.

The manufacturer accepts no liability for damage due to:

- Failure to observe this manual.
- Improper use.
- Deployment of untrained personnel.
- Unauthorized modifications.
- Technical modifications.
- Use of unauthorized spare parts.

The actual scope of supply may differ from the explanations and depictions in this manual in the case of special designs, take-up of additional ordering options, or as a result of the latest technical modifications.

The undertakings agreed in the supply contract, as well as the manufacturer's Terms and Conditions and Terms of Delivery, and the legal regulations applicable at the time of the conclusion of the contract shall apply.

2.5 Warranty Terms

The warranty terms are included in the manufacturer's Terms and Conditions.

2.6 Customer Service

Our customer service division is available to provide technical information. See [Contact \[107 \]](#) for contact details.

In addition, our employees are always interested in acquiring new information and experience gained from practical application; such information and experience may help improve our products.

3 Safety

This section provides an overview of all the main safety aspects involved in ensuring optimal personnel protection and safe and smooth operation.

Non-compliance with the action guidelines and safety instructions contained in this manual may result in serious hazards.

3.1 General

Before you start any repair inside of the device, be aware of the high 230/115V voltages. Even if these voltages are protected by security features to avoid any physical contact, it is still possible that the voltage sources can be unintentionally touched with a tool, object, etc.

Therefore, always check if you really need the power supply to be switched on during your work. Otherwise turn the device off and disconnect the power cable from the wall socket to the device. Safeguard that no one is able to re-power the system without your approval.

3.2 System Owner's Responsibility

System Owner

The term *system owner* refers to the person who operates the device for trade or commercial purposes, or who surrenders the device to a third party for use/application, and who bears the legal product liability for protecting the user, the personnel or third parties during the operation.

System Owner's Obligations

The device is used in the industrial sector, universities and research laboratories. The system owner of the device must therefore comply with statutory occupational safety requirements.

In addition to the safety instructions in this manual, the safety, accident prevention and environmental protection regulations governing the operating area of the device must be observed.

In this regard, the following requirements should be particularly observed:

- The system owner must obtain information about the applicable occupational safety regulations, and - in the context of a risk assessment - must determine any additional dangers resulting from the specific working conditions at the usage location of the device. The system owner must then implement this information in a set of operating instructions governing operation of the device.
- During the complete operating time of the device, the system owner must assess whether the operating instructions issued comply with the current status of regulations, and must update the operating instructions if necessary.
- The system owner must clearly lay down and specify responsibilities with respect to installation, operation, troubleshooting, maintenance and cleaning.
- The system owner must ensure that all personnel dealing with the device have read and understood this manual. In addition, the system owner must provide personnel with training and hazards information at regular intervals.
- The system owner must provide the personnel with the necessary protective equipment.

- The system owner must warrant that the device is operated by trained and authorized personnel as well as all other work, such as transportation, mounting, start-up, the installation, maintenance, cleaning, service, repair and shutdown, that is carried out on the device.
- All personnel who work with, or in the close proximity of the device, need to be informed of all safety issues and emergency procedures as outlined in this user manual.
- The system owner must document the information about all safety issues and emergency procedures in a laboratory SOP (Standard Operating Procedure). Routine briefings and briefings for new personnel must take place.
- The system owner must ensure that new personnel are supervised by experienced personnel. It is highly recommended to implement a company training program for new personnel on all aspects of product safety and operation.
- The system owner must ensure that personnel are regularly informed of the potential hazards within the laboratory. This is all personnel that work in the area, but in particular laboratory personnel and external personnel such as cleaning and service personnel.
- The system owner is responsible for taking measures to avoid inherent risks in the handling of dangerous substances, preventing industrial disease, and providing medical first aid in emergencies.
- The system owner is responsible for providing facilities according to the local regulations for the prevention of industrial accidents and generally accepted safety regulations according to the rules of occupational medicine.
- All substances needed for operating and cleaning the device samples, solvents, cleaning agents, gases, etc. have to be handled with care and disposed of appropriately. All hints and warnings on storage containers must be read and adhered to.
- The system owner must ensure that the work area is sufficiently illuminated to avoid reading errors and faulty operation.
- The system owner must ensure that the laboratory is equipped with an oxygen warning device, in case the device is operated with nitrogen.

Furthermore, the system owner is responsible for ensuring that the device is always in a technically faultless condition. Therefore, the following applies:

- The system owner must ensure that the maintenance intervals described in this manual are observed.
- The system owner must ensure that all (electrical, mechanical, etc.) safety devices are regularly checked to ensure full safety functionality and completeness.

3.3 Personnel Requirements



Only trained Bruker personnel are allowed to install, mount, retrofit, repair, adjust and dismantle the unit!

3.3.1 Qualifications

This manual specifies the personnel qualifications required for the different areas of work, listed below:

Laboratory Personnel

Laboratory personnel are health care professionals, technicians, and assistants staffing a research or health care facility where specimens are grown, tested, or evaluated and the results of such measures are recorded. Laboratory personnel are able to carry out assigned work and to recognize and prevent possible dangers self-reliant due to their professional training, knowledge and experience as well as profound knowledge of applicable regulations.

The workforce must only consist of persons who can be expected to carry out their work reliably. Persons with impaired reactions due to, for example, the consumption of drugs, alcohol, or medication are prohibited from carrying out work on the device.

When selecting personnel, the age-related and occupation-related regulations governing the usage location must be observed.

3.3.2 Unauthorized Persons

 **WARNING**



Risk to life for unauthorized personnel due to hazards in the danger and working zone!

Unauthorized personnel who do not meet the requirements described in this manual will not be familiar with the dangers in the working zone. Therefore, unauthorized persons face the risk of serious injury or death.

- ▶ Unauthorized persons must be kept away from the danger and working zone.
- ▶ If in doubt, address the persons in question and ask them to leave the danger and working zone.
- ▶ Cease work while unauthorized persons are in the danger and working zone.

3.3.3 Instruction

Personnel must receive regular instruction from the owner. The instruction must be documented to facilitate improved verification.

Date	Name	Type of Instruction	Instruction Provided By	Signature

3.4 Personal Protective Equipment

Personal protective equipment is used to protect the personnel from dangers which could affect their safety or health while working.

Personnel must wear personal protective equipment while carrying out the different operations at and with the device.

This equipment will be defined by the head of the laboratory. Always comply with the instructions governing personal protective equipment posted in the work area.

3.5 Description of the Installed Safety Devices

3.5.1 Location of the Emergency Stop Button

Pressing the emergency stop button triggers an emergency stop. After the emergency stop button has been pressed, it must be unlocked by rotating it in order to enable a restart. A restart of the software is also required to guarantee proper device operation.

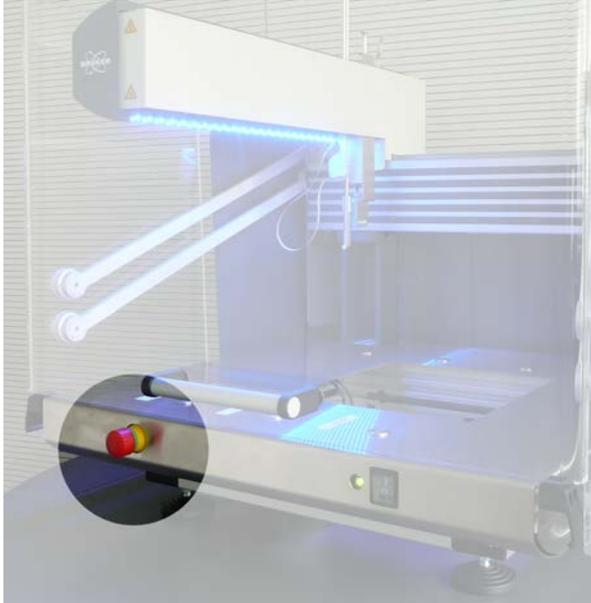


Figure 3.1: Location of the Emergency Stop Button

3.5.2 Location of the Robot System ON/OFF Switch

The robot system ON/OFF switch is located on the right front side of the deck tray:

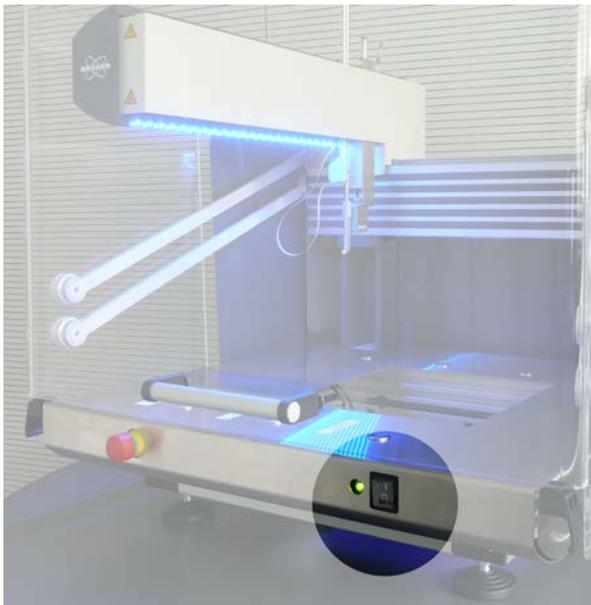


Figure 3.2: The Robot System ON/OFF Switch



A restart of the software is also required to guarantee proper device operation.

3.6 Basic Dangers

The following section specifies residual risks which may result from using the device and have been established by means of a risk assessment.

In order to minimize health hazards and avoid dangerous situations, follow the safety instructions specified here as well as in the following chapters of this manual.

3.6.1 General Workplace Dangers

CAUTION



Accident hazard from breaking or spilled samples!

Samples may break or be spilled due to improper adjustment or cap loss. This may result in personal injury or equipment contamination.

- ▶ Follow the mounting, installation and adjustment instructions in the manual.
- ▶ Confirm the correct installation at the customer site through use of acceptance protocol.
- ▶ Standard operating procedures for sample preparation and usage must be implemented.

CAUTION



Accident hazard from contact with hot or cold surfaces on the unit!

Contact with the hot or cold surfaces of the unit may result in serious burns.

- ▶ Do not touch cassette parts of cooled or heated units.
- ▶ Do not use damaged units.
- ▶ After removing any part of the unit, let it cool or thaw before coming in contact.

WARNING

Danger of injury from needles!

Contact with sharp pipetting needles during service and maintenance or while loading and unloading samples may cause personal injury.

- ▶ Avoid contact with the needle.
- ▶ If possible remove the needle from the device prior to any service.
- ▶ The front door is locked during an application run, so that the user can not access the work area.
- ▶ User-access to work area of the robot is not allowed during application run. While the door is opened, the application is automatically paused.
- ▶ An emergency stop button in front of the instrument allows the interruption of any unwanted/unexpected/potential dangerous movements at any time.
- ▶ In service mode the LED status light is yellow. Attention: in this mode the safety switch of the front door is not in use. This mode is only allowed for trained personal. If working with the front door, the highest care should be observed. While the robot is performing a task in the Service Mode, it is forbidden to perform any action inside the instrument hood.
- ▶ Pipetting needles are sharp and may cause injuries. Be careful while working inside the working area of the robot.
- ▶ During Service/Maintenance tasks the instrument must be shut down.
- ▶ Move the needle to a position where it does not disturb, do not work close to the needle tip.



NOTICE

Material damage hazard due to improper restart.

Device deadlock may occur as a result of restarting the unit when an equipment failure has occurred.

- ▶ When an error has occurred, do not try to restart the unit until the cause of the error has been corrected.
- ▶ Only trained personnel should carry out maintenance work.

DANGER

Accident and/or material damage hazard from sample breakage.

Contact with hazardous substances contained in sample containers that break may result in a life threatening situation or material damage. The contents of sample containers are the responsibility of the laboratory supervisor. The laboratory supervisor is responsible for:

- ▶ Defining disinfectant and cleaning procedures.
- ▶ Establishing and enforcing the use of protective clothing (gloves, eye protection, mask etc.).
- ▶ Preparing laboratory instructions for handling this type of accident.
- ▶ Preparing an emergency plan.
- ▶ Enforcing standard sample handling procedures, e.g. removing all samples from the sample containers and using sample containers with dummy contents before maintenance work etc.
- ▶ Training laboratory personnel.



 **WARNING****Fire and Shock Hazard**

Incorrect installation or use of the power supply may result in a fire or shock hazard.

- ▶ Use only the provided power supply.
- ▶ The power supply must be plugged into an outlet which has a protective ground connection.
- ▶ Ensure that the power cord is disconnected before removing any covers.

 **CAUTION****Accident and material damage hazard from broken glass containers!**

The following may lead to injury and material damage:

- Usage of improper containers.
- Improper positioning of containers.
- Too frequent reuse of containers.
- Incorrect cleaning after breakage of glass container.
 - ▶ Use only the specified containers to avoid damage of glassware.
 - ▶ Use only new containers.
 - ▶ After breakage of glass containers immediately remove all particles from the robot.
 - ▶ Check the robot regularly for particles of glass especially prior to any service/ maintenance work.
 - ▶ After insertion of containers or racks in the work area of the robot, ensure that the containers are correctly positioned and complete inserted in their slots.

NOTICE**Loss of measurement time due to unprepared samples**

A hardware, software, or firmware error may lead to loss of measurement.

- ▶ Appropriate maintenance of the device is recommended to provide highest reliability.

 **CAUTION**
Accident and material damage hazard from contamination with toxic or biological samples/liquids or vapors during usage!

During usage contamination from toxic or biological liquids or vapors from the following may result in personal injury or equipment damage:

- Spillage due to incorrectly made liquid connections.
 - Breakage of containers for samples, additives or system liquid.
 - Overflow of the waste bottle.
 - Usage of toxic or biological liquids.
 - Insufficient or inappropriate cleaning of the robot.
 - Spillage when filling additive or system liquid reservoir.
 - Potential robot dispensing sample to position without container.
 - Potential robot overfilling container with too high amount of liquid.
 - Tilting over of solvent reservoirs.
- 
- ▶ For installation, calibration and acceptance test use only non- or low toxic and non-volatile samples and additive are used. System liquid is non-toxic.
 - ▶ Check liquid level in waste bottle regularly. Place bottle in tube which can hold the complete volume in case the bottle breaks.
 - ▶ Fill containers on the work deck only with the approximately required amount of chemicals.
 - ▶ Wear proper safety equipment (goggles, gloves and lab coat) when working with the robot.
 - ▶ Remove all containers for maintenance tasks.
 - ▶ For service on-site the laboratory administrator is responsible for safeguard the use of solvents that may have influence on health.
 - ▶ Prior to any service/repair of the instrument the customer has to perform cleaning and decontamination of the system and has to sign that the task was performed.
 - ▶ A venting system appropriate to the samples/liquids used in the robot must be installed.
 - ▶ A fume hood that is suitable for the shape of the robot is available from BRUKER as an option.
 - ▶ Never fill additive containers on the work deck of the robot.
 - ▶ Only qualified staff which are trained to operate the robot, and to handle samples and chemicals used for the sample preparation, are allowed to use the robot.
 - ▶ The barcode reader identifies containers prior to usage. Empty positions of individually labeled containers are not accessed by the robot and cannot dispense liquids.
 - ▶ When the down holder physically detects that non-identifiable containers or vials are not located in a rack the procedure will automatically stop. Liquids are not dispensed.
 - ▶ The use of closed septum for additives and sample containers is possible, whereby the tilting over of septum does not lead to spillage.

 **CAUTION****Accident and material damage hazard from during service and installation!**

During service and installation contamination from toxic or biological liquids or vapors may occur as a result of the following:

- 
- Spillage due to incorrectly made liquid connections.
 - Breakage of containers for samples, additives or system liquid.
 - Overflow of the waste bottle.
 - Usage of toxic or biological liquids.
 - Insufficient or inappropriate cleaning of the robot.
 - ▶ For installation, calibration and acceptance tests use only non- or low toxic and non-volatile samples and additives. The system liquid is non-toxic.
 - ▶ Check liquid level in the waste bottle regularly. Place the bottle in a vessel which can hold the complete volume in case the bottle breaks.
 - ▶ Fill the containers on the work deck only with the approximately required amount of chemicals.
 - ▶ Wear proper safety equipment (goggles, gloves and lab coat) when working with the robot.
 - ▶ Remove all containers for maintenance tasks.
 - ▶ During on-site service the laboratory administrator is responsible for safeguarding the use of solvents that may have influence on health.

NOTICE**Material damage hazard due to liquid leakage!**

The default needle position is over the wash station. In case of pump/valve leakage, liquid leaks onto the wash station and drips into the waste. Leakage only occurs when the pump is running. In standby mode leakage leads to back-flow of liquid into the solvent reservoir, or to the needle tip, through intrusion of air from the leakage.

- ▶ Containers with system solvent or waste bottles must not be placed on the deck of the robot.
- ▶ Containers must be placed in a vessel which can hold the complete content of the container.
- ▶ Position the system solvent and the waste bottles at the same level or below the surface where the robot is located.

NOTICE

Material damage of electronic parts due to leakage from solvent reservoirs.

When filling additive or system liquid reservoirs, leakage can occur through:

- Breakage of containers for samples, additives or system liquid.
- Tilting over of solvent reservoirs.
- Overflow of the waste bottle or by spillage.
 - ▶ Containers with system solvent and waste bottle must not be placed on the deck of the robot.
 - ▶ Containers must be placed in a vessel which can hold the complete content of the container.
 - ▶ The use of closed septum additive and sample containers is possible, whereas tilting over does not lead to spillage.
 - ▶ Check the liquid level in the waste bottle regularly. Place the bottle in a vessel which can hold the complete volume in case the bottle breaks.
 - ▶ The filling of additive containers must not be carried out on the work deck of the robot.

WARNING

Biological, chemical hazard!

Infection, contamination, or other health endangerment as a result of contact with biological or chemical substances, e.g. from broken samples.



- ▶ Clean the device before maintenance work and/or returning to Bruker for repair.
- ▶ Prepare a list of materials in which the device came into contact with or measured.
- ▶ A signed confirmation of correctly carrying out cleaning/disinfection is required from the customer. Without this confirmation the parts delivered for repair will be rejected and returned to the customer.

WARNING

Chemical Hazards

Incorrect use of chemicals used in and near the device may result in injury or property damage.



- ▶ Learn about the chemicals which will be used in and near the device, and observe the necessary precautions.
- ▶ Always use appropriate personal protective equipment, including protective eyewear.

WARNING

Danger of injury from improper operation!

Improper operation can result in serious injury and significant damage to property.



- ▶ Carry out all operating steps in accordance with the specifications and instructions in this manual.
- ▶ Before starting work, ensure that
 - All covers and safety devices are installed and functioning properly.
 - No persons are in the danger zone.
- ▶ Never disable or bypass safety devices during operation.

⚠ CAUTION**Accident and material damage hazard from moving robot parts.**

When the actual robot configuration does not correspond to the software configuration, e.g. when the wrong needles or container are used, or when the robot is defective, then material damage and/or personal injury may occur due to the robot colliding with items in the work area.



- ▶ When the down holder, needle or XY motors detect an unexpected obstruction, the process is interrupted and the instrument is stopped to prevent further damage.
- ▶ The access to the work area is protected by the front door. Each time an access to the work area is detected and the front door is closed a barcode reading is automatically started.
- ▶ For items with unknown, unavailable or unreadable barcodes, the maximum geometry is assumed to avoid collision.
- ▶ Only trained users should be allowed to use the device.

NOTICE**Degradation of Cooled Samples Caused by Malfunction of the Cooling Unit!**

Measurement errors can occur due to a malfunction or breakdown of the cooling unit.

- ▶ Use an additional UPS to keep the cooling unit operating during a power loss.
- ▶ Use redundant temperature sensors.



To avoid NMR measurement interference, place the robot far enough from the magnet based on the magnet and console specifications. Carry out reference measurements at regular intervals to detect possible interferences.

⚠ WARNING**Risk of severe hand injury.**

When accessing the work area of the robot, robot movement may cause personal injury.



- ▶ When the down holder, pick-up adapter, needle or XY motors detect an unexpected obstruction, the process is interrupted and the device is stopped to prevent further damage.
- ▶ Access to the work area is protected by the front door. Each time the front door is closed the barcode reading is automatically started.
- ▶ If the safety door cannot be opened, stop the automation using the control software.
- ▶ Do not reach over the safety door to access the work area.

WARNING

Warning: Danger to life, accident or material damage due to flammable liquids or vapors

Contact with flammable liquids or vapors may result in a life threatening situation or material damage.



- ▶ No open flames or smoking allowed. Ensure countermeasures to avoid spark-formation by electrostatic discharge.
- ▶ Proper venting of the workspace must be ensured.
- ▶ For usage of flammable liquids the volume of the system solvent and waste reservoir must not exceed 1 liter.
- ▶ The system solvent reservoir and additive reservoirs should only be filled with the amount of liquid required for the daily work.
- ▶ The waste bottle must be emptied daily.
- ▶ All reservoirs must be marked with the appropriate warning labels for the solvents

SAFETY INSTRUCTIONS

The SamplePro Tube Liquid Handler is designed for the use with the following solvents (in deuterated and/or non deuterated form) and mixtures thereof:

- ▶ Acetone (Propanon).
- ▶ Acetonitrile (Methylcyanid).
- ▶ Dimethyl sulfoxide (DMSO).
- ▶ Methanol.
- ▶ Trichloromethane (Chloroform).
- ▶ Water, also in mixtures with salt, buffer, acid or bases.
- ▶ If used with other solvents, the user is responsible for the implementation of any additional safety measures.



Reference measurements should be made at regular intervals to help detect possible vibration and/or electromagnetic interference.

NOTICE

Material damage hazard software error

Samples or the unit may be damaged due to a software error causing malfunction of the control system. Users may also be shocked by abrupt malfunction or unexpected system start.

- ▶ Sample containers with dummy contents must be used during installation and service.
- ▶ Personal should be alerted to unexpected malfunctions.



To avoid mix-up of the contents in sample containers, standard laboratory operating procedures must be followed.

3.7 Environmental Protection

NOTICE

Danger to the environment from incorrect handling of pollutants!

Incorrect handling of pollutants, particularly incorrect waste disposal, may cause serious damage to the environment.

- ▶ Always observe local environmental regulations regarding handling and disposal of pollutants.
- ▶ Take the appropriate actions immediately if pollutants escape accidentally into the environment. If in doubt, inform the responsible municipal authorities about the damage and ask about the appropriate actions to be taken.

The following pollutants are used:

Nitrogen gas	Nitrogen gas may cause suffocation at high concentrations. Disposal of the empty gas cylinders must be performed by a specialist disposal company.
Helium inert gas	Helium inert gas may cause suffocation at high concentrations. Disposal of the empty gas cylinders must be performed by a specialist disposal company.
Coolants	When released, coolants develop decomposition products which are hazardous to the environment. Maximum care and caution are required when handling coolants. Always observe the safety data sheet issued by the manufacturer. Ensure that personnel handling coolants are regularly informed about potential dangers and are instructed in the safe handling of coolants.
Cleaning liquids	Cleaning liquids incorporating solvents contain toxic sub-stances. They must not be allowed to escape into the environment. Disposal must be carried out by a specialist disposal company.

3.8 Signage

The following symbols and information signs can be found in the work area. They refer to their immediate surroundings.



The identification and placement of warning labels are included in the manual. The laboratory supervisor is responsible for ensuring that all the warning labels are maintained in their proper place any time that the device is used.

Electrical Voltage



Only qualified electricians are permitted to work in a work room marked by this sign. Unauthorized persons must not enter the workplaces thus marked and must not open the marked cabinet.

Danger Spot



Warning indicating a danger spot in work rooms.
The warning label may be ordered using Bruker Part Number 67470.

3.9 Emergency Shutdown

In dangerous situations, it is vital to stop moving components as quickly as possible and to switch off the power supply. In an emergency proceed as follows:

1. Immediately disconnect the system from the mains power source and secure the power cables to prevent re-connection.
2. Notify a doctor and the fire brigade when the severity of the emergency warrants this.
3. Notify those responsible for the area of use.
4. Keep access routes clear for emergency service vehicles.
5. If warranted by the gravity of the emergency, notify the responsible authorities.
6. Delegate specialist personnel to rectify the fault.
7. Before the restart, check the device and ensure that all safety devices are installed and fully functional.

4 Transport, Packaging and Storage



Installation, initial commissioning, retrofitting, repairs, adjustments or dismantling of the device must only be carried out by Bruker Service or personnel authorized by Bruker. Damage due to servicing that is not authorized by Bruker is not covered by your warranty.

4.1 Symbols on the Packaging

The following symbols are affixed to the packaging material. Always observe the symbols during transport and handling.

Top		The arrow tips on the sign mark the top of the package. They must always point upwards; otherwise the content may be damaged.
Fragile		Marks packages with fragile or sensitive contents. Handle the package with care; do not allow the package to fall and do not allow it to be impacted.
Protect Against Moisture		Protect packages against moisture and keep dry.
Attach Here		Lifting gear (lifting chain, lifting strap) must only be attached to points bearing this symbol.
Center of Gravity		Marks the center of gravity of packages. Note the location of the center of gravity when lifting and transporting.
Weight, Attached Load		Indicates the weight of packages. Handle the marked package in accordance with its weight.
Permitted Stacking Load		Indicates packages which are partially stackable. Do not exceed the maximum load-bearing capacity specified on the symbol in order to avoid damaging or destroying the content.

Do not Damage Air-tight Packaging		<p>The packaging is air-tight. Damage to the barrier layer may render the contents unusable.</p> <p>Do not pierce.</p> <p>Do not use sharp objects to open.</p>
Component Sensitive to Electrostatic Charge		<p>The packaging contains components which are sensitive to an electrostatic charge.</p> <p>Only allow packaging to be opened by trained personnel.</p> <p>Establish potential equalisation before opening.</p>
Protect from Heat		<p>Protect packages against heat and direct sunlight.</p>
Protect from Heat and Radioactive Sources		<p>Protect packages against heat, direct sunlight and radioactive sources.</p>

Table 4.1: Symbols on the Packaging

4.2 Inspection at Delivery

Upon receipt, immediately inspect the delivery for completeness and transport damage.

Proceed as follows in the event of externally apparent transport damage:

- Do not accept the delivery, or only accept it subject to reservation.
- Note the extent of the damage on the transport documentation or the shipper's delivery note.
- Initiate complaint procedures.



Note:

Issue a complaint in respect to each defect immediately following detection. Damage compensation claims can only be asserted within the applicable complaint deadlines.

4.3 Receiving the Product

Upon receiving the device the „AS002 Shipping / Installation Report Form“ enclosed with the product must be completed and returned to Bruker within two weeks after delivery.

When the system is installed past the two week deadline, the report should be filled out and returned to Bruker twice as follows:

- Immediately after the shipment is received.
- Immediately after the installation.

4.3.1 Unpacking

CAUTION

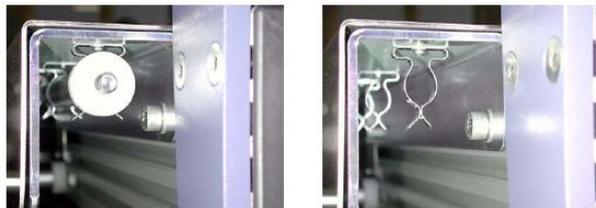


Risk of personal injury from lifting heavy objects.

The unit is very heavy and may lead to injury when lifting.

- ▶ Before transporting the device, remove all items which are placed on the deck.
- ▶ At least four people should lift the device.
- ▶ Carry the device with the specially designed handles.
- ▶ Keep your back straight and bend the knees, never bend the back.
- ▶ Use a hoist if available.

It is very important to move and carry the robot using the specially designed handles. They are mounted into the slot nuts located in the aluminum frame profile. For optimum comfort while carrying, the position of the handles can be adjusted. After use, the handles can be stowed under the deck.



1. Inspect the packaging for any damage that may have occurred during shipping. Check the shock indicators attached to the crate.
 - ▶ If any shock indicators are red, broken or missing, or if the shipment is damaged, please file a claim with the transport carrier immediately and contact Bruker for advice.
2. Remove the plastic straps and lift off the cardboard box.
3. Unpack all items in the shipping container and check against the packing list.
 - ▶ If the items received do not match the packing list, or if any items are missing, immediately contact the transport carrier and Bruker for advice.
4. All device parts were thoroughly inspected and tested before the unit was shipped. Carefully inspect the device and its accessories for any physical damage sustained in transit.
 - ▶ If any damage is found file a claim with the transport carrier immediately and contact Bruker.

4.4 Packaging

About Packaging

The individual packages are packaged in accordance with anticipated transport conditions. Only environmentally friendly materials have been used in the packaging.

The packaging is intended to protect the individual components from transport damage, corrosion and other damage prior to assembly. Therefore do not destroy the packaging and only remove it shortly before assembly.

Handling Packaging Materials

Dispose of packaging material in accordance with the relevant applicable legal requirements and local regulations.

4.5 Storage

Storage of the Packages

Store the packages under the following conditions:

- Do not store outdoors.
- Store in dry and dust-free conditions.
- Do not expose to aggressive media.
- Protect against direct sunlight.
- Avoid mechanical shocks.
- Storage temperature: 15 to 35 °C.
- Relative humidity: max. 60%.
- If stored for longer than 3 months, regularly check the general condition of all parts and the packaging. If necessary, top-up or replace preservatives.



Note:

Under certain circumstances, storage instructions may be affixed to packages which expand the requirements specified here. Comply with these accordingly.

4.6 Returning the Robotic System

Before delivery to the customer Bruker thoroughly checks all parts according to the order received and ensures that they are packed properly. Whenever a device or parts of a device need to be returned to the factory, the same precautions should be taken.

Bruker recommends keeping the packaging material in case of later shipment (at least the foam block used to stabilize the arms and ideally the wooden pallet). If the original packing is not available, contact Bruker to order a replacement.

4.6.1 Robot and Part Shipping Precautions

Before returning a device or parts to Bruker, the following actions must be completed:

1. Contact Bruker support to get a „Return Material Agreement (RMA) number“. This number must be entered on all correspondence.
2. If defective parts are returned, specify from which device (type and SN) they come from.
3. Indicate the circumstance of the problem, i.e. error code reported by software.
4. Complete the RMA document provided during service training (please contact Bruker support if you need a copy).
5. Summarize what service action and time was necessary to identify and to fix the problem. Write down your actions.
6. Clean and decontaminate parts and device as described in Cleaning and Disposal.
7. Complete the *Certificate of Decontamination*. This document is available from Bruker upon request. The completed certificate must be sent with the parts.

4.6.2 Preparing the Robot System for Transport

Dismounting

1. Remove all unfixed modules, accessories, including racks.
2. Remove the needle.

4.6.3 Packing the Robot System for Transport

For packing the device Bruker recommends the use of the original foam blocks and box. Contact your supplier to order a replacement set if the originals are not available.



The device and accessories mentioned below are general and may not be relevant to your specific equipment. However, make sure your device is packed in a comparable way.

4.6.3.1 Packing the Arm

1. Slide the liquid level detector assemblies to the center area of the arm.
2. Stabilize the Z-racks by wrapping PE flat film around the Z-Modules and arm as shown in the following figure. Do not wrap too tightly, and this may cause tension on the liquid level detector assemblies!



Figure 4.1: Placing Foam Parts to protect Z-module & Y-Arm

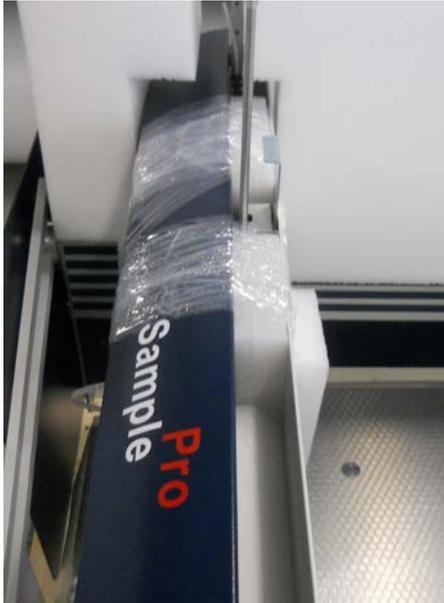


Figure 4.2: Wrapping Foam Parts

4.6.3.2 Packing the Tool Arm

1. Slide the tool module to the center area of the tool arm.
2. Fasten the module (e.g. handler) with an adequate foam block and attach it to the arm housing with PE flat film.
3. Stabilize the tool module by wrapping PE flat film around the tool module. Do not wrap too tightly, as this may cause tension on the module!



Figure 4.3: Wrapping Z-Modules

4.6.3.3 Packing the Deck Tray and Frame

CAUTION

Risk of personal injury from lifting heavy objects.

The unit is very heavy and may lead to injury when lifting.

- ▶ Before transporting the device, remove all items which are placed on the deck.
- ▶ At least four people should lift the device.
- ▶ Carry the device with the specially designed handles.
- ▶ Keep your back straight and bend the knees, never bend the back.
- ▶ Use a hoist if available.



1. Mount the four handles to the SamplePro frame. Lift the Device on the wooden pallette.
2. Attach the bag containing the system liquid filters on the pallet.
3. Remove the handles and pack them in bubble wrap. Stow them in the accessory card box.

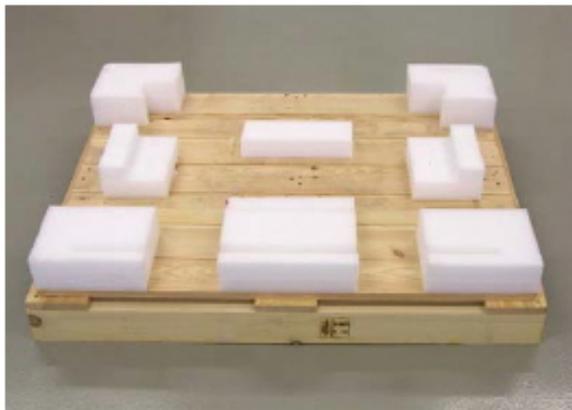


Figure 4.4: Wooden pallet

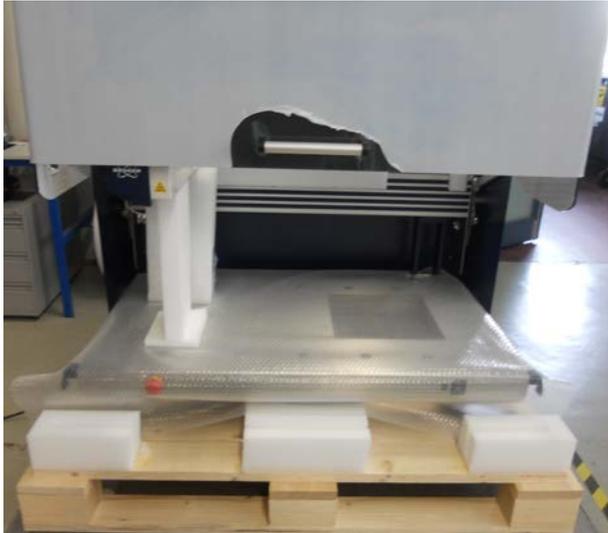


Figure 4.5: Device on the wooden pallet

4. Stabilize the arm with a foam block put over the X-rail. Fasten the block with adhesive tape around the X-rail.
5. Cover the deck with bubble wrap. Protect the edges of the deck with cardboard, then fix the device by screwing the four metal hooks to the pallet. The hook must grip tightly around the leg adjusting screw.
6. Support the arms with foam blocks.



Figure 4.6: Stabilizing the arms and the X-rail with a foam block



Figure 4.7: Fixing unit on pallet (left side).

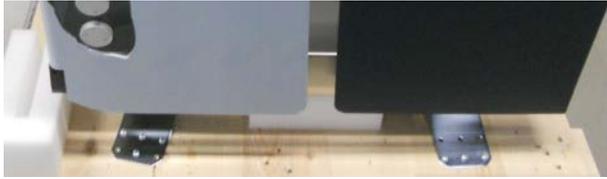


Figure 4.8: Fixing unit on pallet (right side)

7. Pack all accessories in a box. Make sure every item is adequately protected.
8. Put the accessories box on the deck between the arms and fasten it to the pallet with two straps.



Figure 4.9: Packing accessories

9. Wrap the safety door in bubble wrap. Lift safety door a bit and place a spacer foam underneath and lower the safety door. The sides of the safety door must not touch the black vibration reducing pieces on the left and right side.



Figure 4.10: Protect front shield with a spacer foam

10. Cover the device with a card box and fasten it with plastic strapping. Protect the edges with strap guards.



Figure 4.11: Place and fix the accessory box on the deck

11. If the device was shipped in a wooden box, then screw the wooden side panels to the pallet and to each other. Use minimum 5 screws per side. Finally place the top lid to the side walls and fix it with screws.



Figure 4.12: Cover the device with bubble foil.

11. Attach Shockwatch® indicators to the top of two opposite sidewalls. Make sure they are white, which means that they are still intact.



Figure 4.13: Attaching Shockwatch® indicators

12. Make sure all necessary documents are provided and required forms are completely filled in.

5 Technical Data

5.1 General

IP Rating

IP protection code (IEC 60529): **IP 20**

Part Numbers

Part Number	Description
1826206	SAMPLEPRO TUBE ROBOT 100 hereafter referred to as <i>SamplePro Tube L</i>
1813721	SAMPLEPRO TUBE ROBOT 60 hereafter referred to as <i>SamplePro Tube S</i>

Table 5.1: Part Numbers

Weight

Data	Value	Unit
SamplePro Tube S	75	kg
SamplePro Tube L	90	kg

Table 5.2: Weight

Dimensions

Data	Height	Width	Depth	Unit
SamplePro Tube S	875	745	789	mm
SamplePro Tube L	875	1050	788	mm

Table 5.3: Dimensions

Noise Level SamplePro Tube L and SamplePro Tube S

Data	Value	Unit
The highest measured workstation accepted value, with consideration of a standard deviation of 1.5 dB from the measurement inaccuracy.	71.5	dB(A)
The highest value 1 meter from the vicinity of the neighboring workstation.	69.5	dB(A)

Table 5.4: Noise Level SamplePro Tube L and SamplePro Tube S

Height

The SamplePro Tube system can be operated in a height up to maximum 2000 m.

Sample Usage

A complete list of container types supported by SamplePro Tube can be found in the chapter [User Replaceable Parts \[▶ 95\]](#).

5.2 Electrical

System

System	Value	Unit
Voltage (automatic voltage regulation)	100 - 240	Volts
Maximum Power Consumption	550	Watts
Maximum Power Output @ 24V	450	Watts
Frequency	50/60	Hz

Table 5.5: Electrical Connection Values SamplePro Tube S and L

Components

Components	Value	Unit
Robot SamplePro Tube L and S	100 ¹⁾	Watts
Temperature Controlled Deck Tray °4C	120 ¹⁾	Watts
Incubator 101 for 1 MTP positions. From room temperature up to 37°C	14 ¹⁾	Watts
Shaker 103	12 ¹⁾	Watts
Xantus Pump Calibration Tool XPCT	24 ¹⁾	Watts
Additional BC Reader E0380 ICR803-B0201	2 ¹⁾	Watts
Temperature Controlled Deck Tray -16°C	150 ²⁾	Watts

Table 5.6: Maximum Power Consumption SamplePro Tube S and L

¹⁾ supplied by build in power supply (included in above listed 450W)

²⁾ Supplied by separate power supply

5.3 Operating Conditions

Environment SamplePro Tube L and SamplePro Tube S

Data	Value	Unit
Temperature range	5 to 40	°C
Relative humidity at 30 °C, maximum, non-condensing	10-85	%

Table 5.7: Operating Environment SamplePro Tube L and SamplePro Tube S

For the appropriate temperature see also the Bruker site planning guides on the BASH CD (Bruker Advanced Service Handbook):

Manual	Bruker Part Number
Site Planning for AVANCE Systems 300-700 MHz (UM)	Z31276
Site Planning for AVANCE Systems 750 -950 MHz (UM)	Z31686

Table 5.8: Bruker Site Planning Guides

5.4 Rating Plate Robot



Figure 5.1: Rating Plate SamplePro Tube S



Figure 5.2: Rating Plate SamplePro Tube L

The rating label is positioned in the back-left corner of the frame.



Figure 5.3: Rating Plate Position

5.5 Motion Speed

Feature		Speed	Ramp
Tool arm	X-motion	750 mm/sec	1000 mm/sec ²
	Y-motion	300 mm/sec	1500 mm/sec ²
	Z-motion	350 mm/sec	500 mm/sec ²

5.6 Electrical and Communication

Feature	Specification
Power	Self regulating power supply. 110–240 VAC nominal, 50/60 Hz, 500 VA
Mains fuses	Located at the rear of the device. 2x F10 A / 250 V (P and N), for devices with dual output PSU
Output fuses	Located at the rear of the device (below the CAN-bus extension). CAN-bus loop: F3.15 A / 250 V Arm and high power output: F10 A / 250 V Values depend on the power supply configuration. Please refer to the appropriate label.
Interface	CAN-bus.
Uninterruptible power supply	600 VA is recommended.

Table 5.9: Electrical and Communication

5.7 Safety and Security

Feature	Specification
Safety	Operator safety is ensured by the safety door or an optional cover. The SamplePro Tube robot is designed for EN IEC 61010-1 compliance and bears the CE mark.
Security	Sophisticated software combined with real time bar code tracking can eliminate sample tracking errors. Processes and actions are monitored and logged.
Uninterruptible power supply	Refer to Electrical and Communication [▶ 42].

5.8 Physical Properties

5.8.1 Precision

Device	Positional Accuracy
Object Detector	+/-0.2 mm (Y, Z); +/-0.5 mm (X);
Handler	+/-0.2 mm (Y, Z); +/-0.5 mm (X);

5.9 Computer and Software Requirements

Device	Requirement	
	Minimal	Recommended
Processor	Intel dual core	Intel dual/quad core
Operating system	Windows 7 (32/64 Bit)	Windows 7 (32/64 Bit)
RAM	4 GB	8 GB
Free disk space	1 GB	10 GB
Display	17" color screen (monitor resolution 1024 x 768).	
Mouse	optical (recommended)	
Drives	DVD-ROM	
Ports	USB (current 500 mA)	

5.9.1 Recommended Options

Device
Uninterruptible power supply 600 VA (sine wave).
Additional software: WinZip, MS Excel®. MS Excel® installation on the control computer is mandatory to submit orders to the SamplePro Control software from EXCEL®.

5.9.2 Material Chemical Resistance

The following table lists material compatibility for the SamplePro Tube robot with specific chemicals. The source of compatibility data is material producers and was not cross tested by Sias.



The SamplePro Tube robot was developed for use with following liquids only. We strongly recommend extensive testing prior to using the systems with other liquids.

Key EX= excellent GO= good PO= poor NR= not resistant		Aqua eous Sol	Met han ol	Eth an ol	Aceton itrile	Chloro form	DM SO	Oth er
Components	Material							
System liquid container	Container	EX	EX	EX	---	---	---	
	Reservoir HDPE	EX	EX	EX	PO	PO	PO	
System liquid filter P/ N: 120020	Sintered, SS	EX	EX	EX	EX	EX	EX	
System liquid filter P/ N: 100706	PEEK mesh, SS	EX	EX	EX	NR	NR	GO	
Pump tubing	FEP	EX	EX	EX	EX	EX	EX	

Technical Data

Key EX= excellent GO= good PO= poor NR= not resistant		Aqua eous Sol	Met han ol	Eth an ol	Aceton itrile	Chloro form	DM SO	Oth er
Components	Material							
Annular gear pump	ARCAP	EX	EX	EX	---	---	EX	Acid NR parti cles >10 µm
	SS 316L	EX	EX	EX	EX	EX	EX	
	Tungsten Carbide	EX	EX	EX	---	---	---	
	Fluorocarbo n resin	EX	EX	EX	---	---	EX	
	Teflon®	EX	EX	EX	EX	EX	EX	
Motorized valve	Body: PCTFE	EX	EX	EX	EX	PO	EX	
	Fittings: PP	EX	EX	EX	NR	EX	EX	
Valve tubing	FEP	EX	EX	EX	EX	EX	EX	
Micro-valve * except cap	ETFE (Tefzel)	EX	EX	EX	EX	GO	GO *	
Tip tubing	PTFE	EX	EX	EX	EX	EX	EX	
SS tip	SS	EX	EX	EX	EX	EX	EX	
	Teflon®	EX	EX	EX	EX	EX	EX	
DT tip	PP	EX	EX	EX	PO	NR	EX	
Worktable	High quality SS	EX	EX	EX	EX	EX	EX	
DT drop station	SS	EX	EX	EX	EX	EX	EX	
	POM/ACL	EX	GO	GO	---	---	---	
Racks	HDPE	EX	EX	EX	PO	PO	PO	

6 Design and Function

6.1 Overview

The principal components of the SamplePro Tube system are the SamplePro Robotic System and supported sample containers. Details of the robotic system will be presented in this chapter.

6.2 Brief Description

The SamplePro Tube is a modular preparation robot suited for several Bruker NMR applications using a single sample handler base. The applications cover transfers/preparations from well plates and Cryo vial racks to a variety of NMR tubes and racks.

A complete list of container types supported by SamplePro Tube can be found in the chapter [User Replaceable Parts \[95\]](#).

6.3 System Description

The SamplePro Tube consists of a laboratory robot with various lab ware (racks for vials, NMR tubes, etc.) controlled by the Bruker Software *SamplePro Control*.

The system provides a Bruker standard interface, through which the changer can be controlled with external Software (for example *SampleTrack* or *EXCEL*).

6.4 Description of The SamplePro Tube Robotic System

The SamplePro Robotic System consists of the following parts:

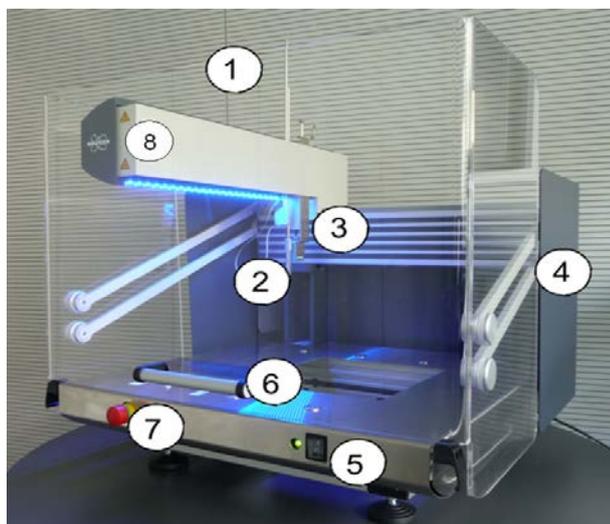


Figure 6.1: The SamplePro Tube S Robotic System

1.	Safety door.	5.	ON/OFF Switch
2.	Needle with down-holder.	6.	Deck tray
3.	Barcode reader.	7.	Emergency stop button
4.	Safety door locker.	8.	Warning Label Position

6.4.1 The Robot Back Panel

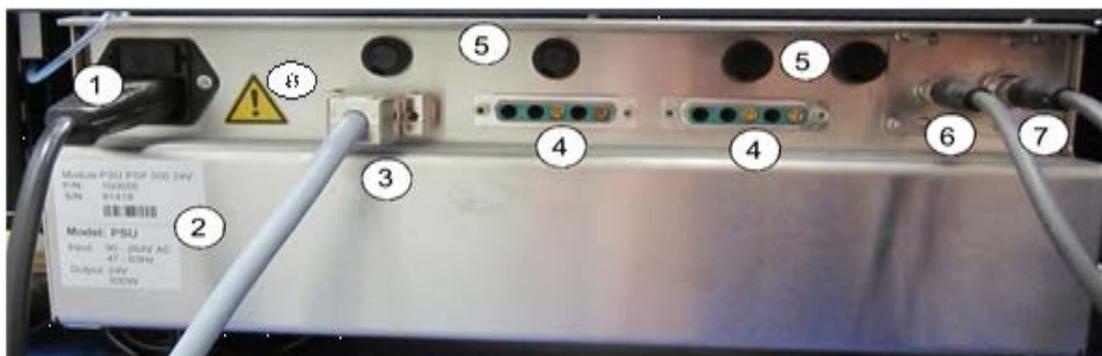


Figure 6.2: The Robotic System Back Panel

1.	Power supply and main fuse.	5.	Output fuses.
2.	Rating plates.	6.	CAN System
3.	CAN interface to PC.	7.	CAN System
4.	Supply for external temperature units	8.	Warning Label Position

6.4.2 The SamplePro Tube LED Status Light

The LED status light is integrated in the robotic system.

The LED light utilizes different colors, whereas each light symbolizes a different system status:

- **Blue:** A user interaction is required.
- **White:** The system is initializing or running tasks.
- **Green:** The SamplePro robotic system is ready and waiting for requests.
- **Red:** A SamplePro Tube device error has occurred. Further tasks cannot be performed.
- **Yellow:** The system is running in service mode.

6.4.3 The Door Lock

The SamplePro Tube robotic system provides a door lock for safety.

The door locks when

- tasks are performed.
- barcodes of all containers are scanned.
- the arm moves.
- the system is cleaned, purged or recovered.

6.5 SamplePro Control Main Display

The instrument control software to operate the SamplePro Tube is the BRUKER software *SamplePro Control*. The main window displays a menu, a top panel, 5 tabs and a graphical panel for each tab visualizing the robot state.

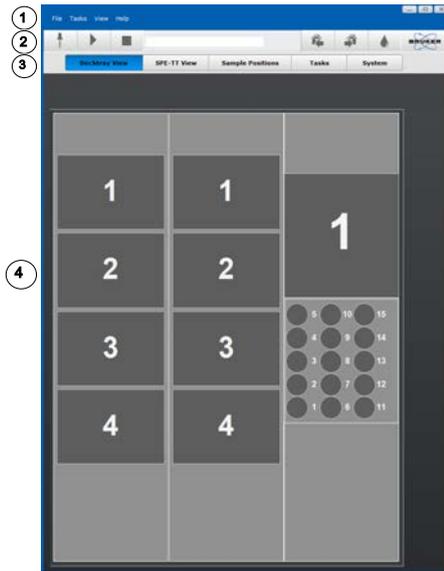


Figure 6.3: SamplePro Tube Main Display

1.	Menu Area	3.	Tabs Area
2.	Top Panel Area	4.	Graphical view for each tab

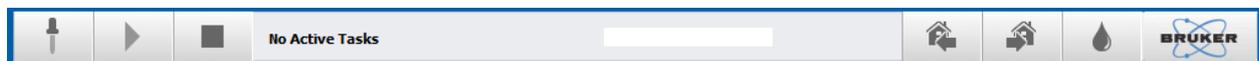
The Menu Area

The SamplePro Tube menu provides navigation to the key software components. Refer to the [Menu and Button Navigation Overview \[51\]](#) for more information.

The Top Panel Area

The top panel consists of:

- The **Prepare Samples** button.
- The **Start Automation** button.
- The **Stop Automation** button.
- A progress bar, showing information about the remaining time for the current task.
- The **Move Arm to Home Position** button.
- The **Move Arm to Right Position** button.
- The **Clean System** button.



Refer to the [Menu and Button Navigation Overview \[51\]](#) for more information.

The Tabs Area

The five tabs in the tabs area provide an overview of the deck tray, SPE cartridges, sample positions, tasks and system:

- [The Deck Tray View Tab \[54\]](#)
- [The SPE-TT View Tab \[55\]](#)
- [The Sample Positions Tab \[56\]](#)
- [The Tasks Tab \[56\]](#)

- [The System Tab \[57\]](#)

6.5.1 General Naming Conventions

The Deck Tray or Worktable

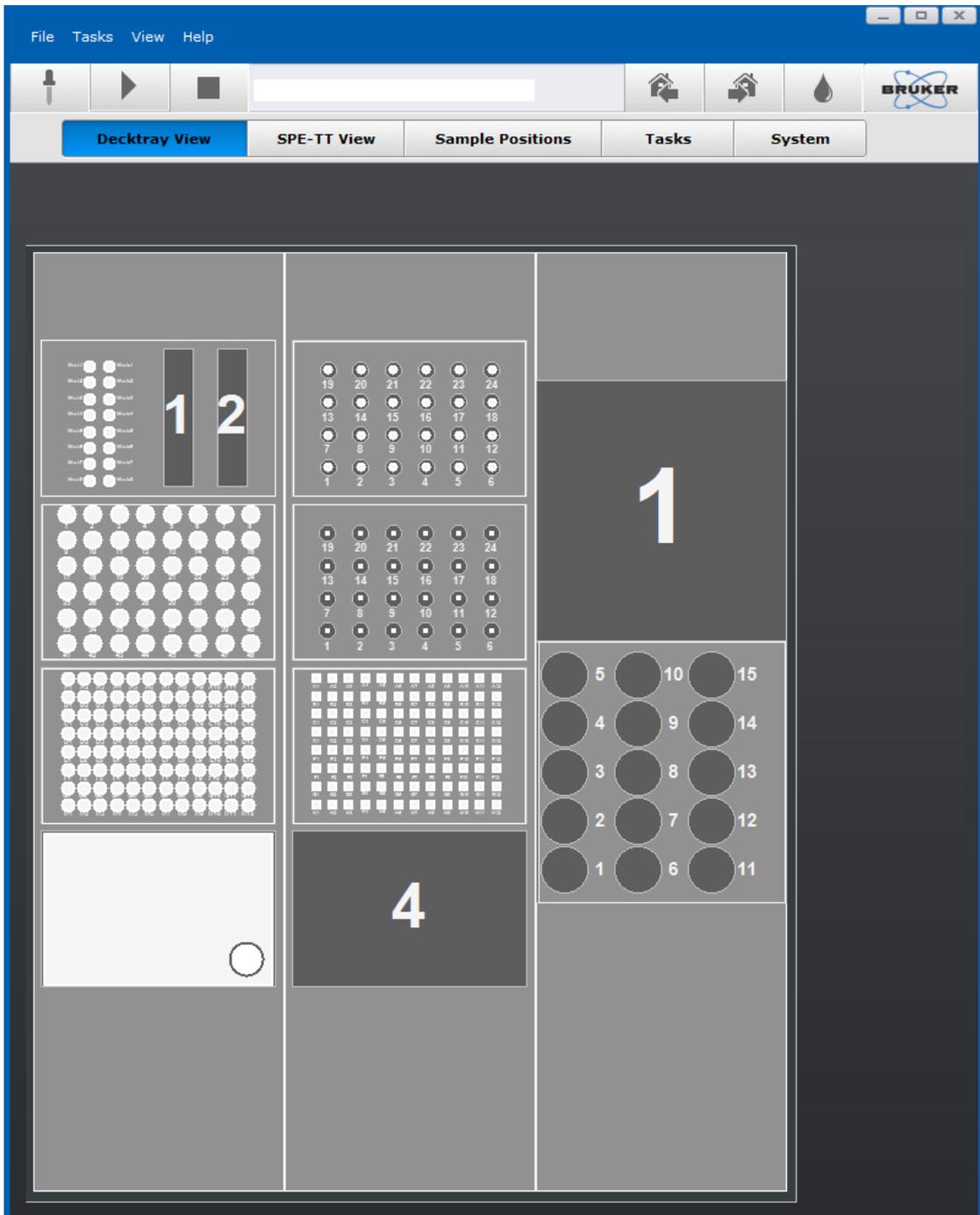
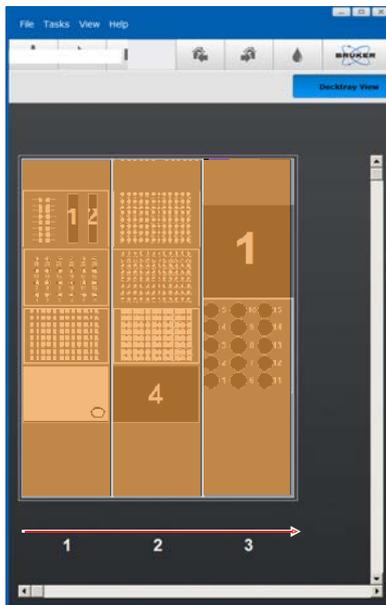


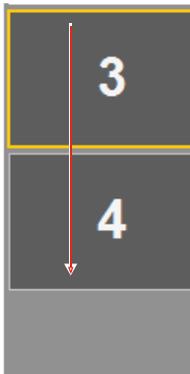
Figure 6.4: The Deck Tray View

Worktable Naming Conventions

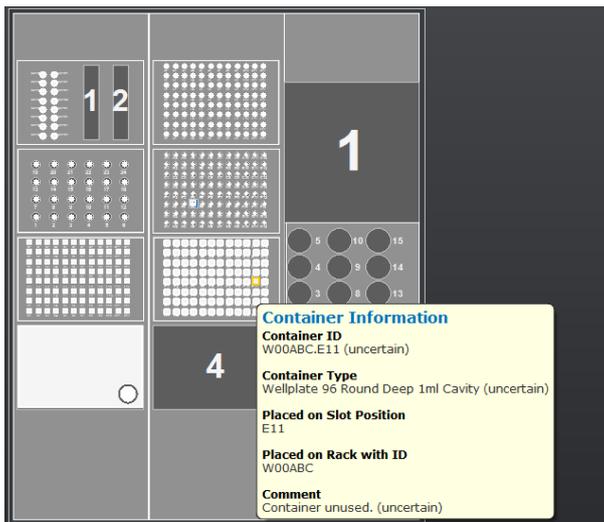
- The worktable has 3 *worktable positions* from left to right or 3 *deck tray slots*.



- The slots in the deck tray are enumerated from rear to front depending on the type of deck tray. Numbers of the slots are visible in the GUI when the slots are empty.



Container Information



When a *Deck tray Slot Position* is filled with a container the following context information is provided:

- Container ID
- Container Type
- Slot Position
- Rack ID
- Comment

6.5.2 Panning, Zooming, Context Information

Zooming in and out

Use the mouse wheel to zoom in and out.

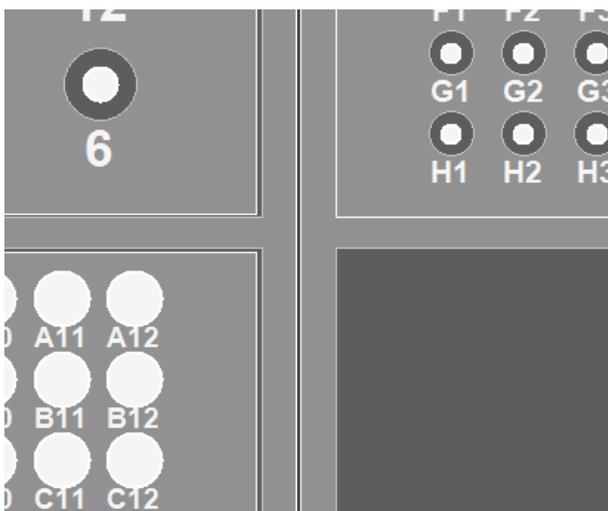


Figure 6.5: Zoom

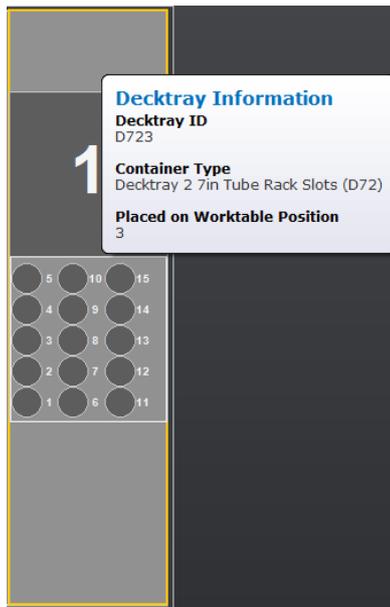
Panning

Click the right mouse button to pan the view.

Context information

Depending on the mouse position the selected area is highlighted yellow and context information is displayed.

- Example: Deck tray Information (Deck tray ID, Container Type and Worktable Position)



6.5.3 Menu and Button Navigation Overview

The Main Menu

File		
	Show Device Web Page	Used to open the device service Web Page (for Bruker Service personnel only!)
	Export Task List	Used to save the task data as CSV file.
	Export Device Report	Used to export a file containing device information(part number, serial number, etc.), device statistics (total runtime minutes, etc.) and other helpful information for diagnostic. This data should be sent to Bruker when problems occur.
	Load Session	Used to load a previously saved session.
	Save Session	Used to save the current session to disk for later use.
	Service And Settings	Used to open the service window (for Bruker service personnel only)
	Exit	Used to exit the program.
Tasks		
	Prepare Samples	Used to setup the preparation tasks.

	Clean System	Used to clean the needle and tubes.
	Purge System	Clean and refill the complete liquid path.
	Stop Shaker	Used to stop the shaker during execution of BRUKER Shaker ON method.
	Recover System	The system returns to the home position followed by a Clean System task.
	Move Arm to Home Position	Used to move the arm to the home position. This feature makes it easier to exchange containers on the right side.
	Move Arm to Right Position	Used to move the arm to the right position. This feature makes it easier to exchange containers on the left side.
	Search Containers	Used to map current deck trays and containers.
	Pause Automation	Used to finish the current task and pauses the execution of queued tasks.
	Stop Automation	Used to stop the current task and stops the execution of queued tasks.
View		
	Show Activity History	Opens a new window showing the activity history.
Help		
	Show BRUKER Home Page	Used to open the Bruker internet homepage.
	SamplePro Tube Quick Start - Installation	Illustrates major steps of SamplePro tube installation.
	SamplePro Tube Quick Start – Interactive Preparation	A initial guide of how to perform preparation of NMR samples in an interactive mode using the GUI of SamplePro Control software.
	SamplePro Tube Quick Start - Excel based Preparation	Quick Start Guide for the workflow setup in Excel as input for SamplePro Control and IconNMR, preferably for a large number of preparations.
	SamplePro Tube Quick Start – Sample Track based Preparation	A guide of how to perform preparation of NMR samples controlled from SampleTrack. It is recommended for automatic treatment of large number of samples which run with standardized preparation methods and subsequent NMR and/or LC-MS analysis.
	SamplePro Tube Quick Start – Coolings Decktrays	Describes the usage of Cooling Decktrays for temperature control (cooling and heating) of source samples, prepared samples or additive.
	SamplePro Tube Quick Start – SPE-TT	Step-by-step guide of how to transfer SPE cartridges in an interactive mode. HyStar software must be previously installed.
	SamplePro Tube Quick Start – Shaker	Describes the usage of a Shaker within SamplePro Tube, for example, to mix liquids, dissolve solid samples or remove gas from liquids.
	SamplePro Tube Quick Start – Details	Details about container, barcodes, method parameters, Sample Track Super Methods and troubleshooting.
	SamplePro Tube User Manual	This manual

	SamplePro Tube – Usage of Bar Codes	Details about how to position Bruker Standard Barcode labels on the SamplePro Tube and its items used in the deck.
	SamplePro Tube SitePlan	Contains information for Site planning for the installation of a SamplePro Tube Liquid Handler.
	MS Excel Sheet to control SamplePro Tube	Used to open an Excel template.
	Show Info	Used to display the product version and copyright.

The Main Button Bar

The main button bars in the top panel area provides quick access to the most popular commands:



The Prepare Samples Button

Purpose: Used to setup preparation tasks.



The Start Automation Button

Purpose: Used to start the automation. This option will be grayed out when the automation is already running.



The Stop Automation Button

Purpose: Used to stop the automation. This option will be grayed out when the automation is already stopped.



The Move Arm to Home Position Button

Purpose: Used to move the arm to the home position. This feature makes it easier to exchange containers on the right side.



The Move Arm to Right Position Button

Purpose: Used to move the arm to the right position. This feature makes it easier to exchange containers on the left side.



The Clean System Button

Purpose: Used to clean the needle and tubes.

6.5.4 The Deck Tray View Tab

The **Deck tray View** tab displays the three deck trays, which have positions to place other containers, as well as the current status of the inserted vials.

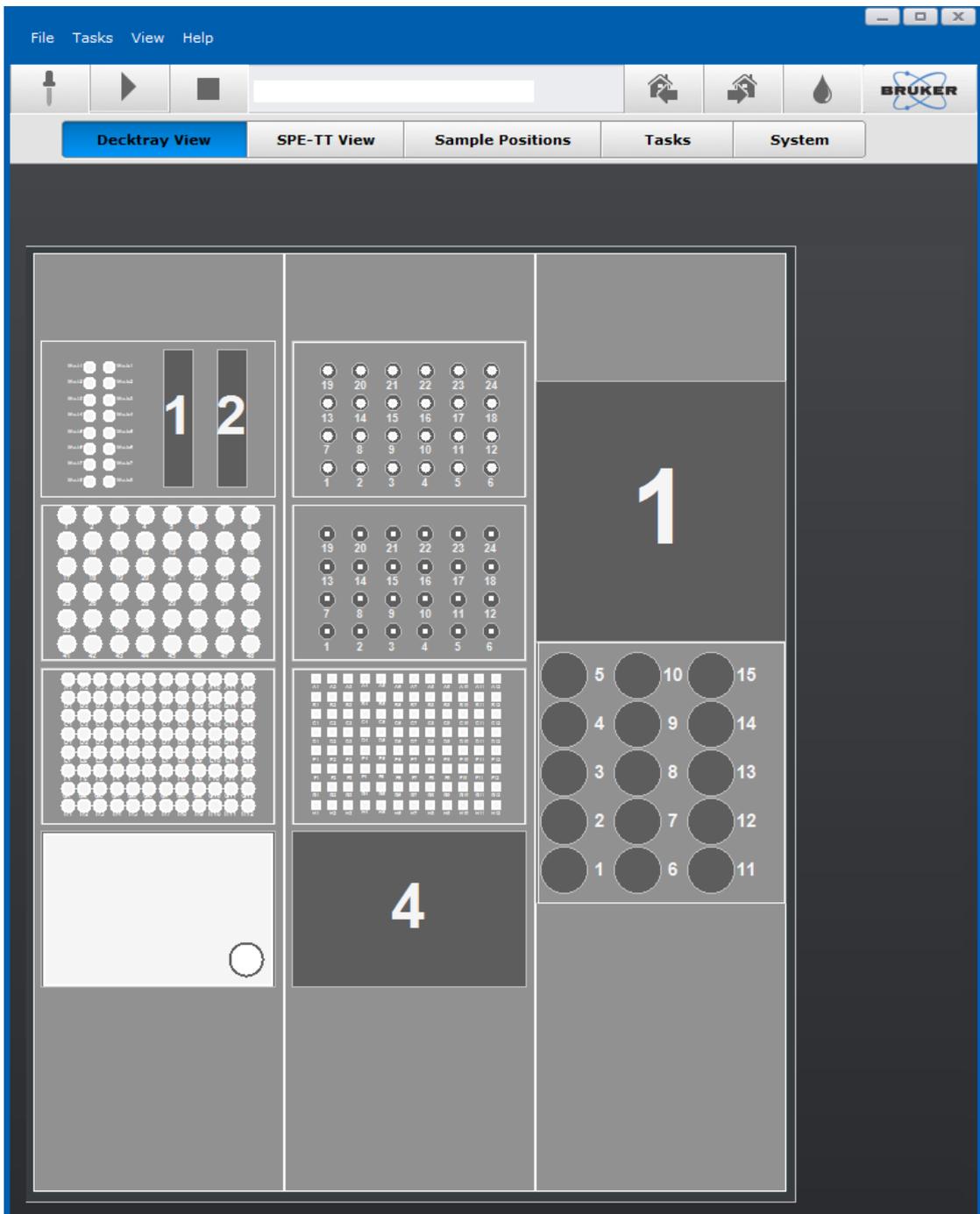
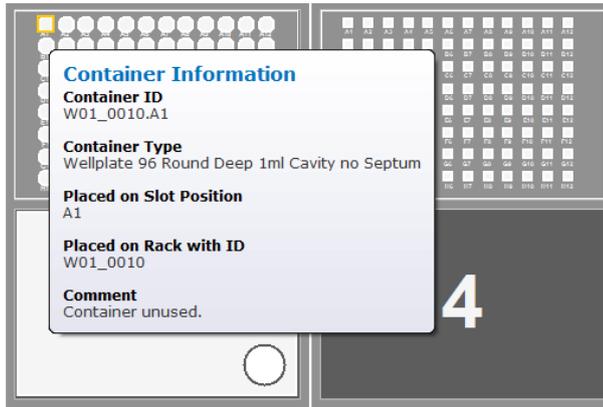


Figure 6.6: The Deck Tray View tab

When the mouse is moved over a container position, the corresponding container information is displayed:



6.5.5 The SPE-TT View Tab

The **SPE-TT View** tab displays the status of the cartridges. The information about the cartridges is stored in files and in the registry and is updated by HyStar. The color coding corresponds to the same scheme used in the HyStar status display.

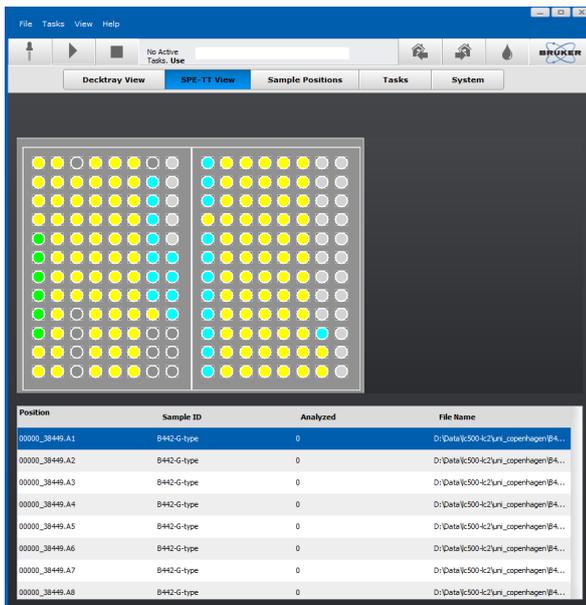


Figure 6.7: The SPE-TT View tab

6.5.6 The Sample Positions Tab

The **Sample Positions** tab provides information on the status of the measurement orders.

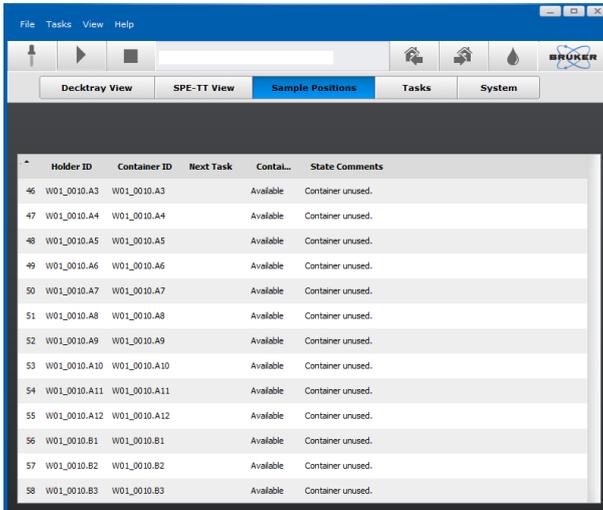
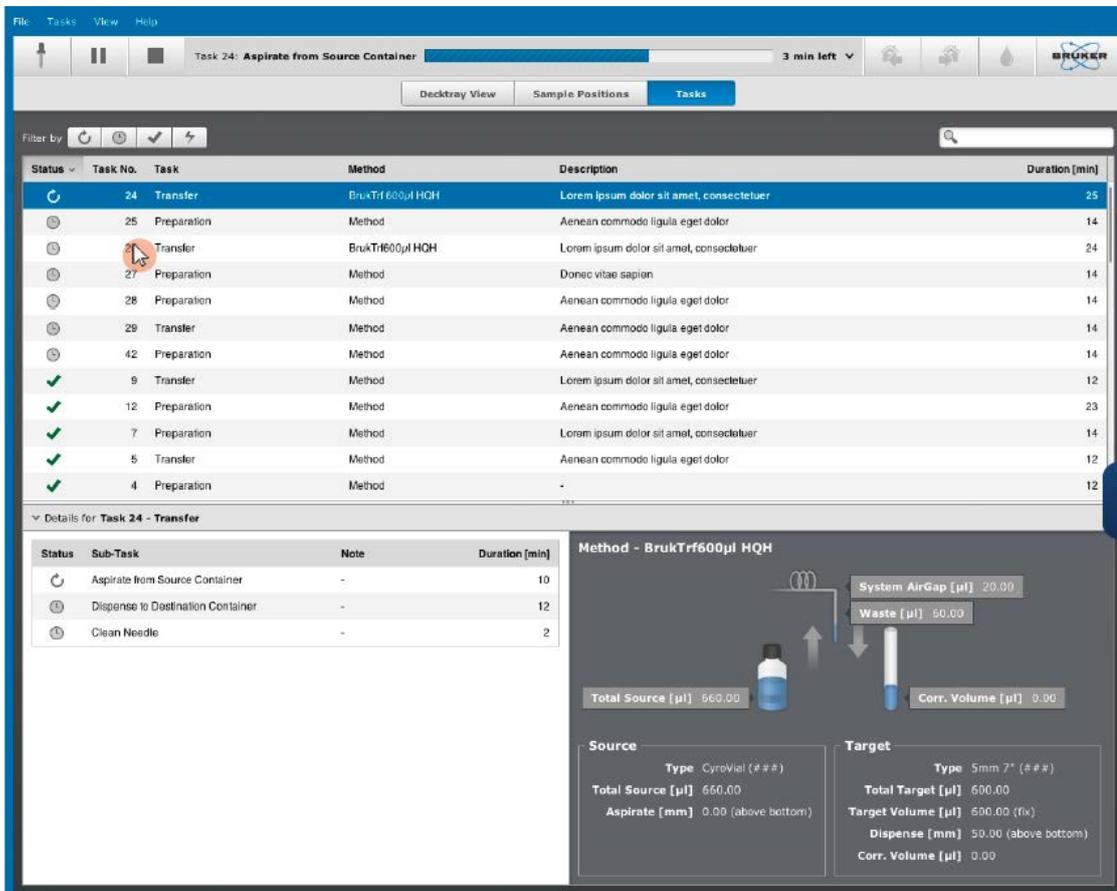


Figure 6.8: The Sample Positions Tab

6.5.7 The Tasks Tab

The **Tasks** tab displays the tasks in list form. Clicking on a task shows the task details in the panels below.



Task State

The list can be filtered based on the preparation status:

- Running - The task is currently running.
- Committed - The task is ready to be run.
- Finished - The task is completed.
- Finished with Error - The task is completed, but an error has occurred.



6.5.8 The System Tab

The **System** tab displays the current robot action status.

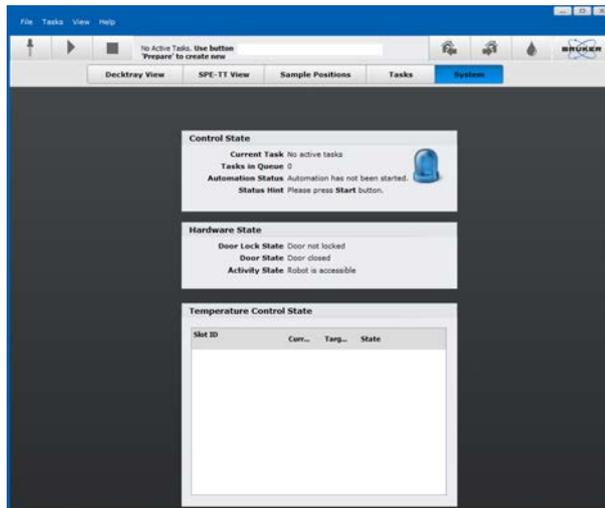


Figure 6.9: The **System** tab

7 Operation Overview

7.1 General Operating Guidelines

Safety Relevant Parts

Safety relevant parts, such as the cover, status light and barcode reader must not be deactivated or removed. The cover of the robot uses a door switch to detect if the cover is open. Removing of the cover will have the same effect as leaving the cover open: The robot will not work.

The door lock must be tested in periodical intervals:

- After powering on the device check that the door SENSOR is working:
 - Open the door and in the menu click **Task/Search Containers**. An error message must be displayed:



- Check that the door LOCK is working: Close the door and in the menu click **Task/Search Containers**.
 - Try to open the door. It must not be possible to open the door.

User Mode, Super User Mode

While working in *user mode* the user can only perform tasks that have been validated.

While working in *super user mode* trained laboratory admins can customize robot functions.

Warning Labels

Warning labels must be inspected regularly by the operator of the laboratory and replaced if missing or damaged.

The laboratory administrator is responsible for placing the bio hazard label when bio samples are used.

NMR Measurement

The laboratory supervisor should define procedures regarding access to the unit and/or the 5 Gauss area around the magnet.

Sample Mix-up

The laboratory supervisor should define through an SOP who should be allowed to load or unload samples from containers, and when. The operator should work carefully and optimally, using container ID barcodes.

The positioning for containers in a Rack (Vials, SampleJet Tubes) which are not individually identified by a barcode (but only by their position) must be carefully done. Exchange/replacement of vials in a rack or change of the position is not allowed.

When used vials must be removed the rack must receive a new barcode and all vials in the rack must be assigned again. The software remembers and can detect containers in a rack that were already used. The software allows the propagation of prepared destination container IDs into external software (for example SampleTrack or EXCEL) for further usage of this information. Barcode types used for container identification is compatible with barcode readers used in NMR spectrometers so that the propagation of the destination container ID is possible without any physical new labelling.

ID Barcode

When the container ID barcode is dirty it should be cleaned according to established instruction or the barcode may be incorrectly read.

Contamination of Samples

Reusing containers may result in contamination of a new NMR sample from the old substance. Clean reusable containers in accordance to established GLP and SOP standards.

Redundant Temperature Sensor

A redundant temperature sensor is not available for this product. If laboratory environments require this, the laboratory is responsible for this feature.

7.1.1 Switching On the Device

1. Press the **Power** button on the host computer.
2. Press the **Power** button on the robot.

7.1.2 Switching Off the Device

When the robot is not operated for a longer period of time, it must be cleaned, see the chapter [Maintenance \[▶ 87\]](#).

1. Shut down the host computer.
2. Turn off the robot.

8 Operation

The workflow for the SamplePro Tube preparation robot can be setup in three ways:

- Manually, see [Preparing a Sample Manually \[66\]](#).
- Using a Microsoft Excel sheet.
- Using the SampleTrack program.



Information on setting up samples with SampleTrack is not part of this manual, please refer to the SampleTrack User Manual for information on this workflow.

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1. Shut down the host computer.
2. Turn off the robot.

8.2 Filling the Robot with Containers

8.2.1 Source Sample Input

If the samples are supplied in Cryo- or Auto sampler Vials

- Use a suitable rack and ensure that it carries a correct and unique barcode. All Racks located in the deck must carry a unique, i.e. different Rack ID.
 - RVC... for Cryo Vials or
 - RVA... for Auto sampler vials
- Fill the samples into **empty positions** of the rack. If the rack is full, use a new rack or remove all previous samples and attach a new barcode.
- For each sample vial note the Rack ID (1) and position (2).



If the samples are supplied in well plates:

- Attach a new Barcode to the well plates.
Well plate, Samples and barcode typically remain linked.
Use a new barcode for each well plate.
- Keep the information available which sample is located in which well.

Place the racks or well plates

- into any slot of a D03, D04 or temperature controlled deck tray on the deck of the SamplePro Tube.
- Align the barcode on the **left** side.
- Press the containers into the **rear left** corner of the slot.

8.2.2 NMR Tubes Input - 7" Tubes

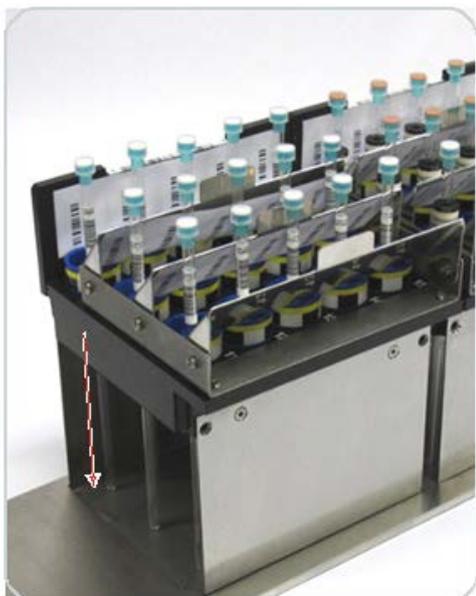
To prepare the tubes

- Label them with a unique 1D barcodes (4 or 6 digits)
- Preferably close the tubes with Septum caps.
 - Septum Caps are available from BRUKER as
 - 1811642 100 Pieces/Pack rubber
 - 1811641 100 Pieces/Pack (pre-slit silicon)

SAFETY INSTRUCTIONS

Do NOT use closed caps!
Use only 5mm tubes (3mm are not supported)!

- Slide the tubes into Spinners.
- Place the spinner into the Rack and push the tube down to the bottom.
 - By this it is adjusted to 20mm insertion depth.
 - For reliable barcode reading check that the interruption of the barcode does not point towards the mirror.



- Check that the mirror is dust & fingerprint free and place it on the 4 metal bolts on the rack
 - If necessary clean it with a lint free soft tissue.
- Place the rack into the 7" deck-tray of the SamplePro Tube.
- Tubes are ready for filling.

SAFETY INSTRUCTIONS

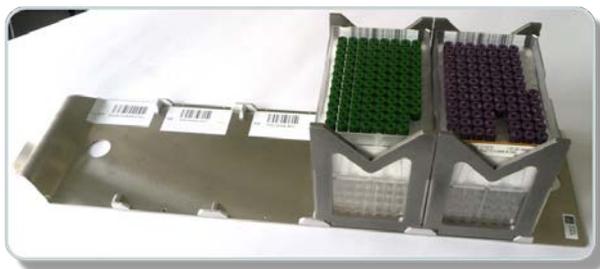
Standard methods require a long needle (198mm) for handling of 7" tubes.

8.2.3 NMR Tubes Input - SampleJet Tubes

- Use a *SampleJet* tube block with **one** tube diameter.
- Remove the cover from the blocks and attach a suitable barcode label
 - For 3mm tubes use: RJF...
 - For 5mm tubes use: RJI...
 - Use a unique ID for each block, if all tubes are filled use a new block, do not replace individual tubes.



- Place the block in a *SampleJet* deck tray (DJ4) on the deck.



- It is recommended to check the correct positioning:
 - Click **File|Service And Settings** and **Service|Device Settings|Robot Teaching**.
 - Click **Check Labware Position**.
 - Select the SampleJet tube that will be used from the container list.
 - Reject the 5mm Z offset test.
 - Select **Move XY** and check that the needle is correctly placed over the tube.
 - Click **Check Object with Downholder**.
 - The object must be detected correctly.
 - See also *SamplePro Tube Quick Start - Installation.pdf*.
- The tube is ready for filling

SAFETY INSTRUCTIONS

Never place SampleJet tube blocks on the deck with a long (198mm) needle!!!

8.2.4 NMR Tubes – MATCH Tubes

- Use one or more MATCH tube blocks of the required diameter.
- The blocks must carry unique barcodes, but the labels can be used multiple times.
- Fill the tube block with a sufficient number of MATCH tubes.
- Close the tube block with a cover.
- Place the tube block into any position of a standard deck tray (D03, D04 or cooling DC2).
- The tubes are ready for filling.

SAFETY INSTRUCTIONS

Never place MATCH tube blocks on the deck with a long (198mm) needle!!!

8.3 Preparing a Sample Manually



Note that only containers with recognized barcode can be used as Source/Target or Additive. When a barcode is unreadable during the initialization a question mark is displayed on the decktray slot.

Starting a Preparation

To start a preparation

- click the **Prepare Samples** button  in the **Decktray View** tab.

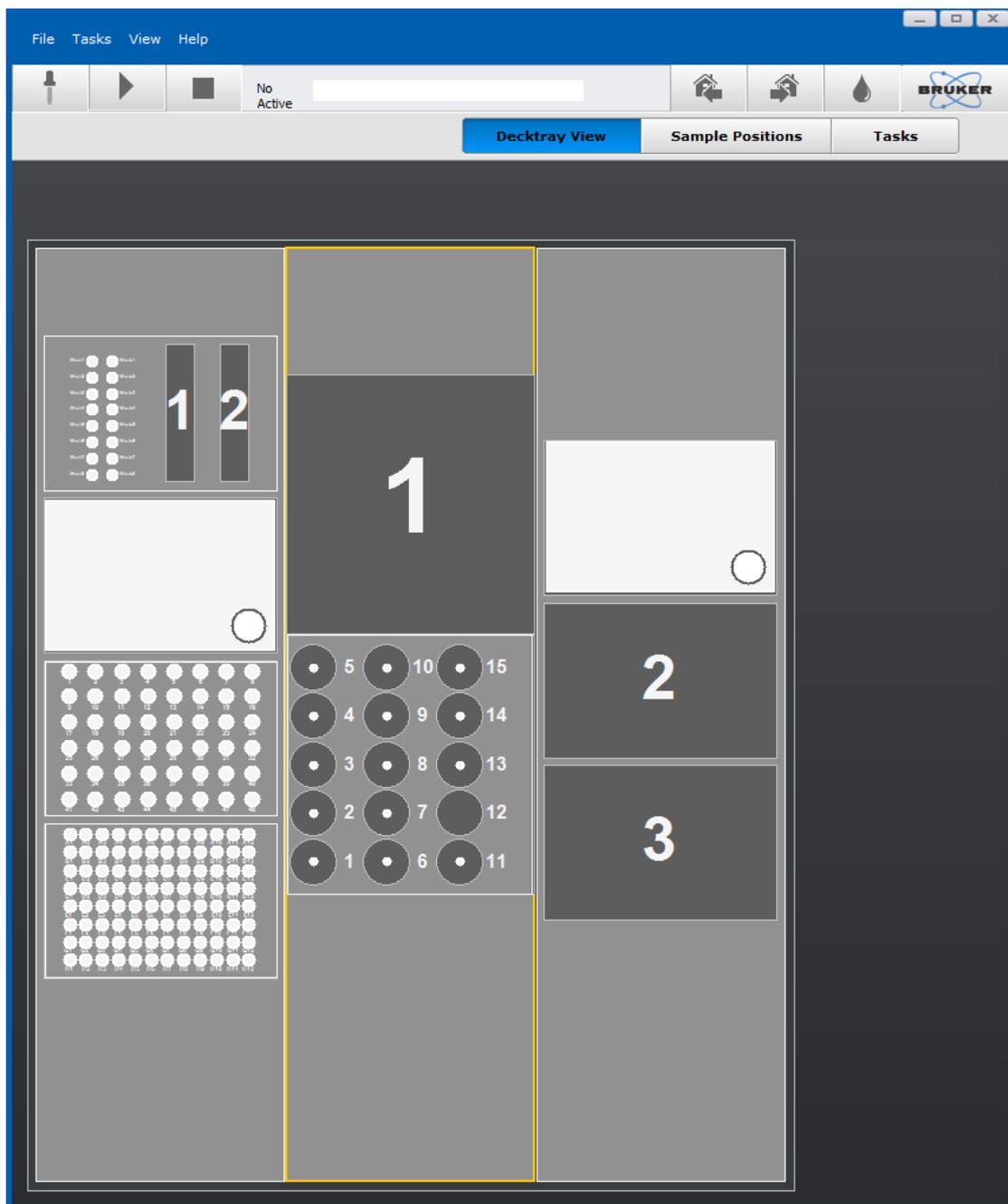


Figure 8.1: The Decktray View tab

The Prepare Samples view is displayed.

Step 1 - Method Selection

- Click the **Arrow Down** button in the Method Selection field and select a method.

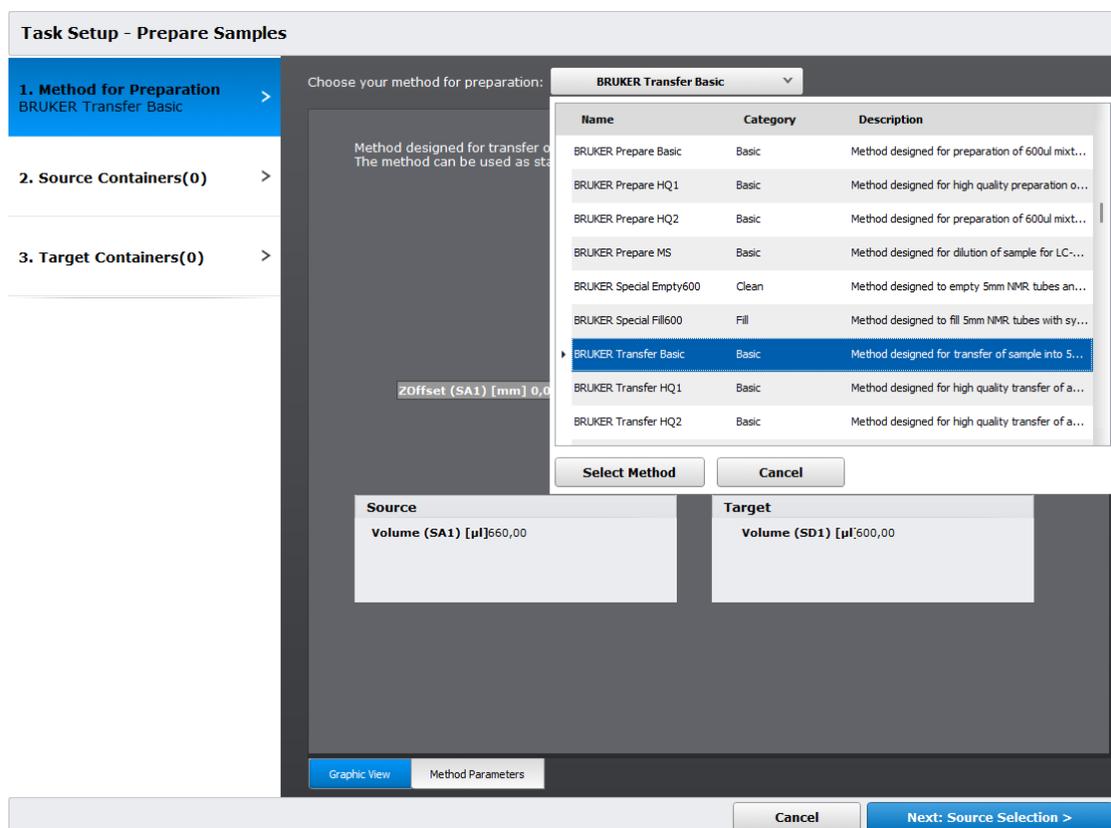


Figure 8.2: Method Selection in the Prepare Samples view.

The parameters are displayed graphical and with text. In the **Method Parameters** tab in the bottom line the parameters are displayed as text.



More information about the parameter is displayed in the bottom area when a parameter is selected.



Some of the parameters can be modified in the **Method Parameters** tab. The kind of modification depends from the method itself and modifications here will not be saved.

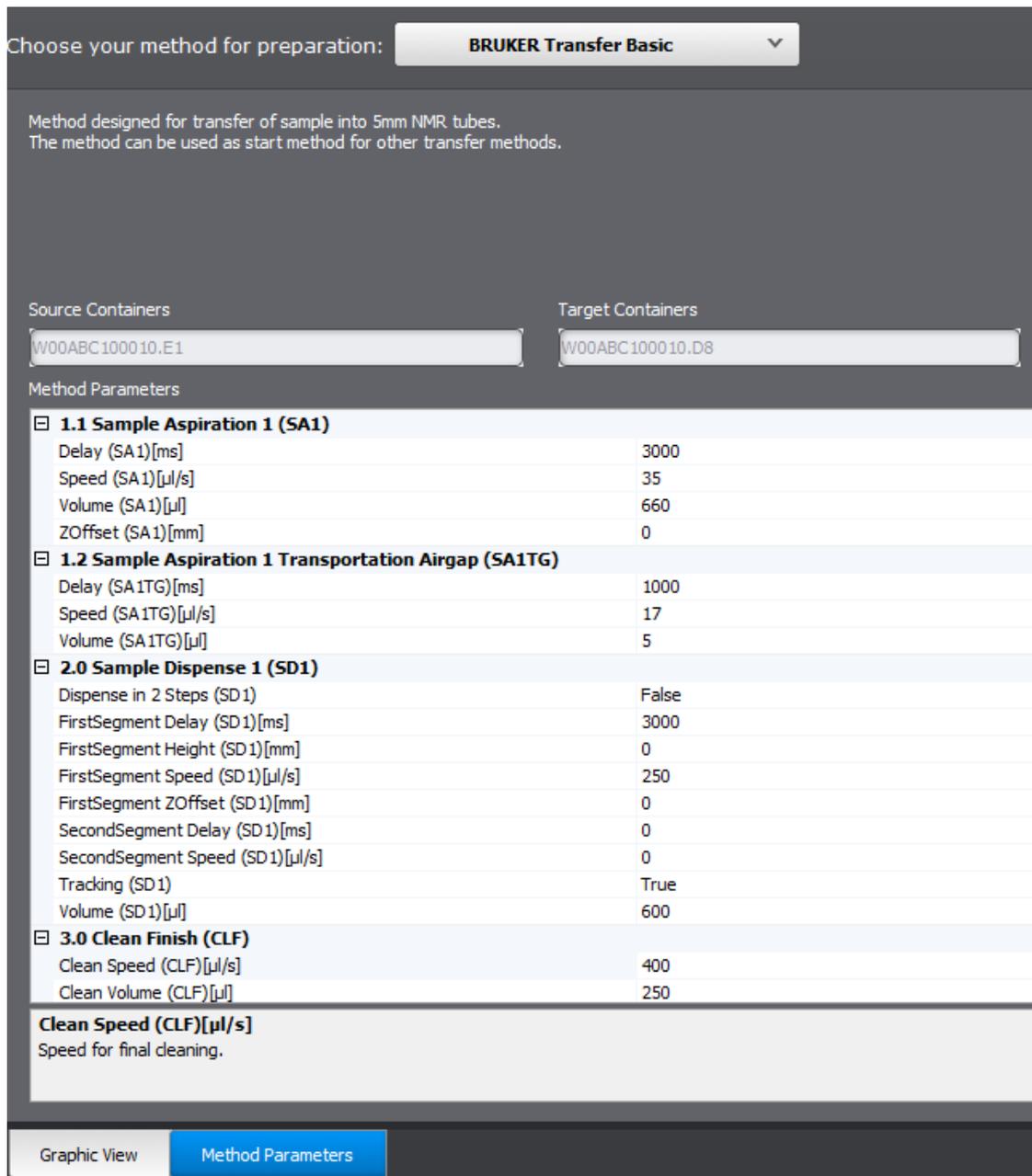


Figure 8.3: Method parameters

The selected method is shown in the left part of the window as text.

1. Method for Preparation
BRUKER Transfer Basic

2. Source Containers(0)

3. Target Containers(0)

Step 2 - Source Selection

In the bottom line

- click **Next: Source Selection**.

The Source Container view is displayed.

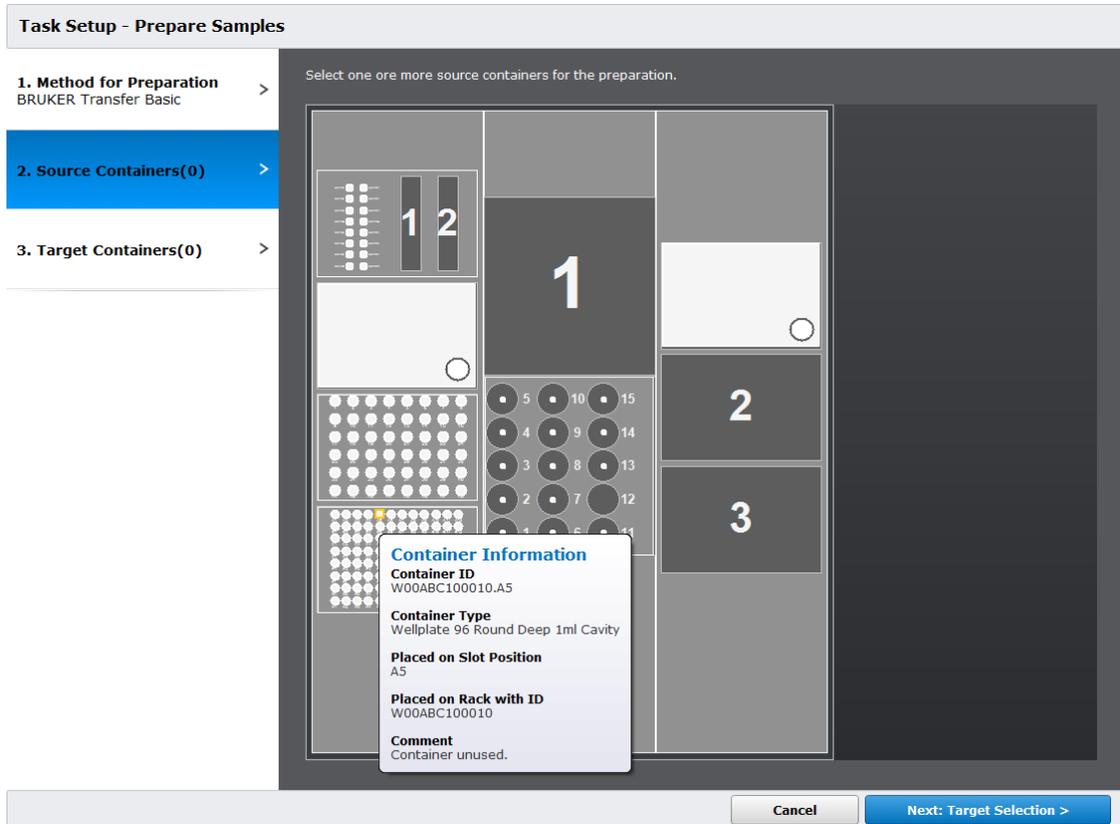
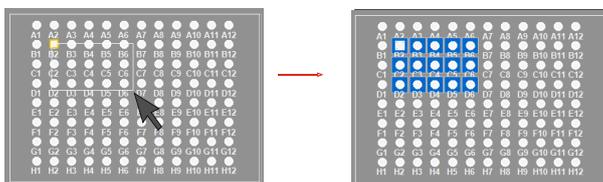


Figure 8.4: The Source Container view

Mouse Selection

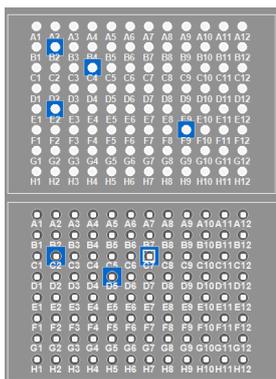
The selection with the mouse can be done in three ways

- Select the sources with the left mouse using the rubber band.



The selected positions are colored in blue.

- or select the first position with the mouse, press the **Shift** button and select the last position with the mouse.
- or use the **CTRL** button to select or deselect several container and / or positions.



Use the **CTRL** button to select or deselect several source container.

The selected sources are shown in the left part of the window as text.

1. Method for Preparation

BRUKER Transfer Basic

2. Source Containers(10)

W00ABC100010.A1-A5,
W00ABC100010.B1-B5

3. Target Containers(0)

Step 3 – Target Selection

In the bottom line

- click **Next: Target Selection**.

The Prepare Samples view is displayed.

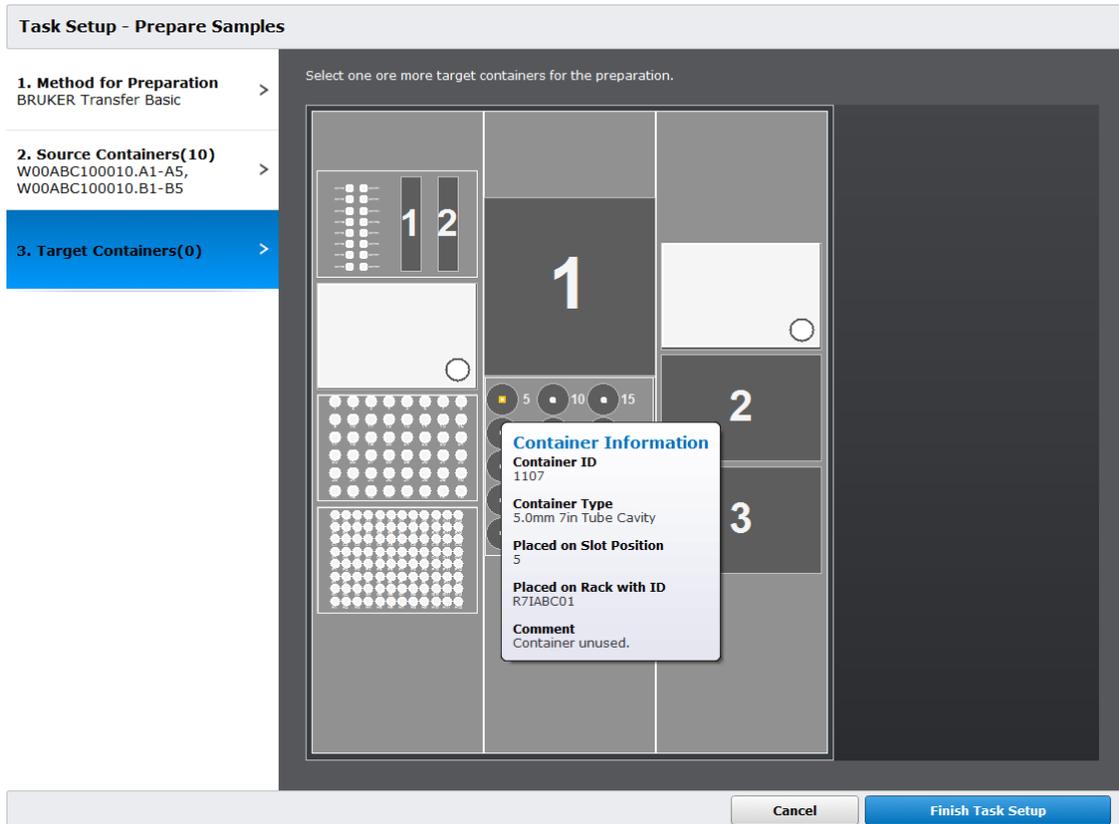
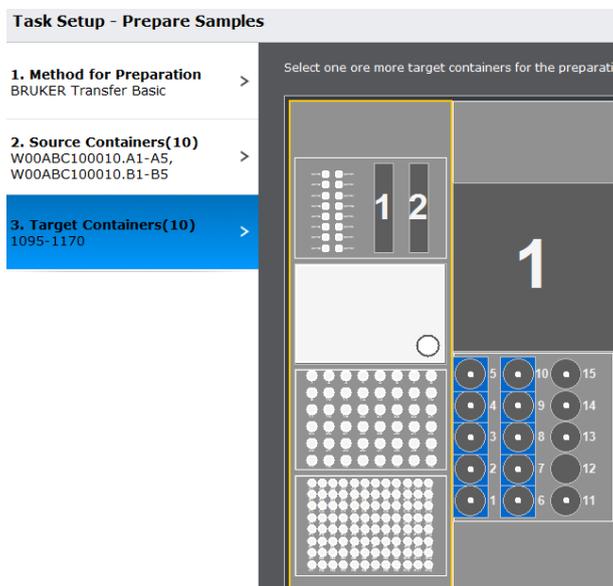


Figure 8.5: Prepare Samples view

- Select with the mouse one or more target containers for the preparation.



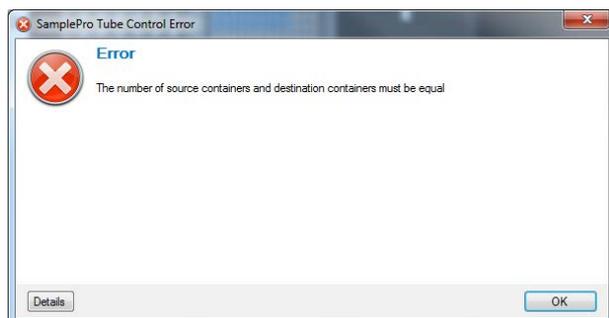
Use **CTRL** to select target containers at any location.

In the bottom line

- click **Finish Task Setup**.



The number of source and target container must be equal. When the number of source and target container is different an error message is displayed:

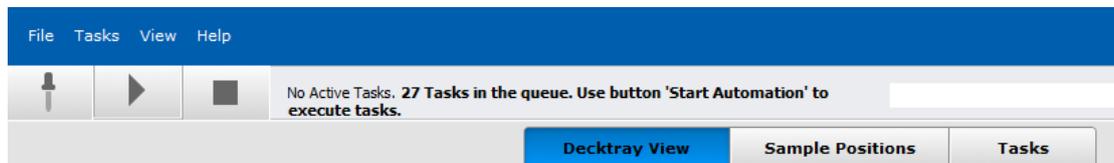


Correct the number of destinations, it must be equal with the number of the source containers.

2. Source Containers(10)
RVCABC100001.1-5,
RVCABC100001.9-13

3. Target Containers(5)
W00ABC100010.A1-A5

Each source needs one destination and is assigned to the destination in ascending logic order of the destination container and not in the order as it was selected.



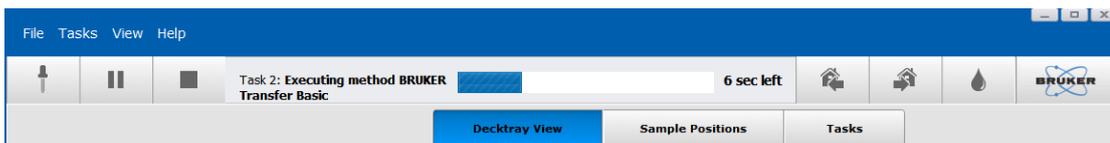
Step 4 – Starting /Pausing /Stopping the Automated Preparation

Click the **Start Automation** button

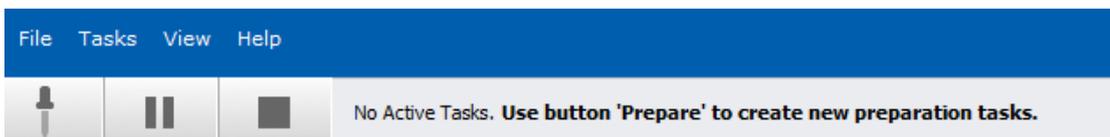
To pause the automated preparation use the **Pause** button

To stop the automated preparation click the **Stop** button

After starting the automation the info bar displays information about the running task.



When the preparation has finished the **Decktray View** info bar displays the message: *No Active Tasks*.



8.4 The Sample Position and Tasks Tab

The Sample Positions Tab

The Sample Positions tab provides information about Slot ID, Container ID, Next Task, Container State and State Comments.

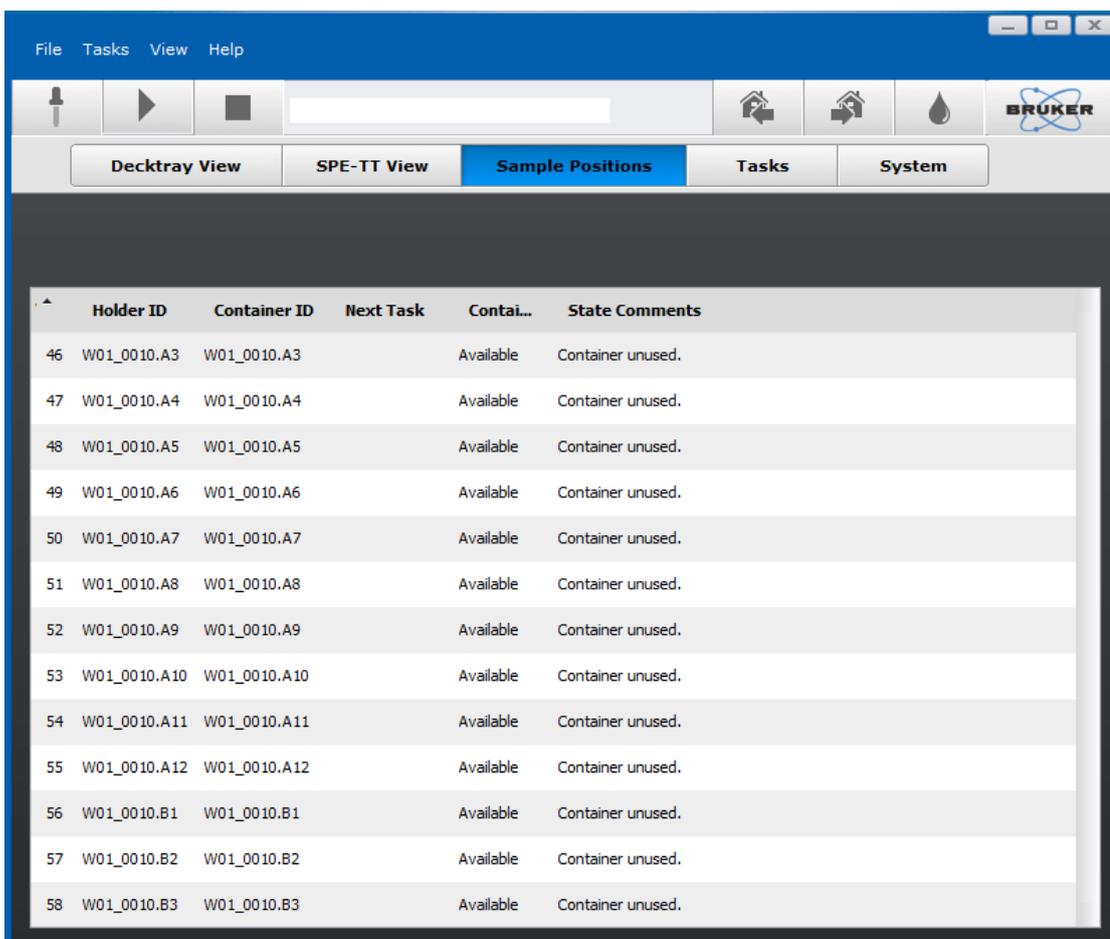


Figure 8.6: The Sample Positions tab

The Tasks Tab

The single tasks and their status are displayed in the **Tasks** tab.

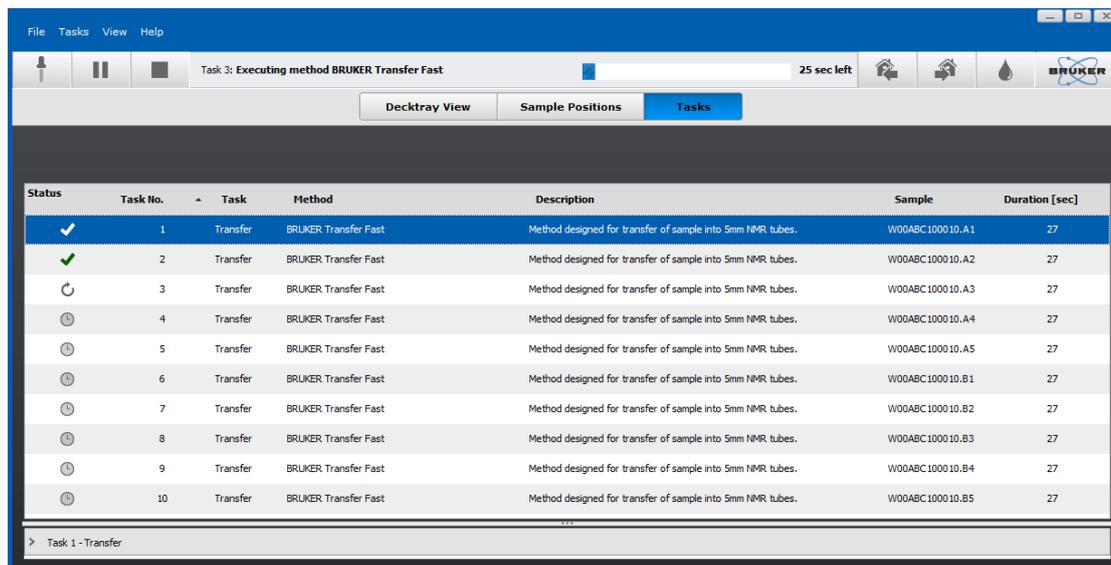


Figure 8.7: The Tasks tab

The Preparation Status in the Task Tab

Successfully executed tasks

Task in process

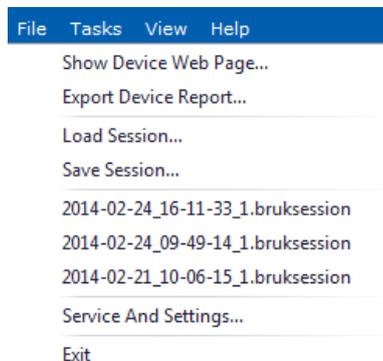
Submitted and waiting

8.5 The Menu

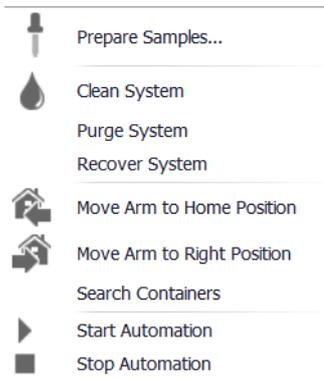
File|Show Device Web Page

Select **File|Show Device Web Page...**

A web page is displayed for administration.



Tasks|Prepare Samples



This menu item has the same function as the **Prepare Samples** button in the icon bar.



The assistant for manual setup is displayed.

Tasks|Clean System

Use this task to clean the needle.

Tasks|Purge System

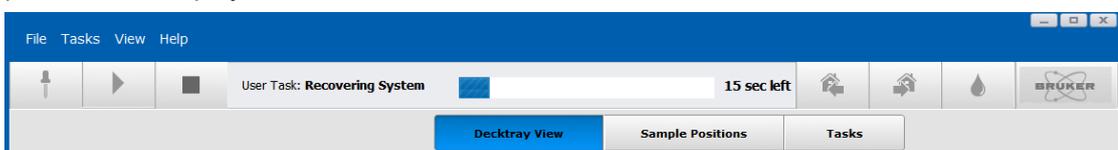
Use this task to clean and refill the complete liquid path.

8.6 Tasks|Recover System

When a system error has occurred e.g. due to accidental needle movement and contact a system error is raised as shown in the next figure.



Click **Continue**: The system starts an automatic recover. This includes initialization of XYZ axis by a homing of the robot, search container to detect the layout and a clean system. This procedure is displayed in the info line:



For a manual recover click **Tasks|Recover System** in the Menu.

8.7 Method Settings

SamplePro Control is delivered with the following pre-defined methods:

BRUKER Prepare Basic

Method designed for preparation of 600µl mixture of sample with Additive in destination NMR tubes. Start method for other preparations.

BRUKER Prepare MS

Method designed for dilution of sample for LC-MS analysis into a wellplate.

BRUKER Shake 1min

Switches the Shaker ON and waits until the Shake Time is over to continue with other tasks.

BRUKER Shaker OFF

Switches the Shaker OFF immediately.

BRUKER Shaker ON

Shaker switches ON and SamplePro Tube immediately continues with parallel tasks.

BRUKER SPE-TT

Method that requests the elution of Cartridge contents from LC-SPE software HyStar and collects the content into a container in the worktable of SamplePro Tube and mixes the eluted liquid.

BRUKER Special Empty600

Method designed to empty 5mm NMR tubes and to discard the content into the waste.

BRUKER Special Fill600

Method designed to fill 5mm NMR tubes with system liquid.

BRUKER Transfer Basic

Method designed for transfer of sample into 5mm NMR tubes.

BRUKER Transfer Basic 1.7mm

Method designed for transfer of sample into 1.7mm NMR tubes.

8.8 Viewing the Activity History

The *SamplePro Control* program offers an activity history that can be used, for example, by the laboratory manager to monitor user activities or troubleshooting.

To watch the activity history in the menu

- Click **View|Show Activity History**.



A new report window will open displaying all available activity history files. Each history file is date and time stamped and includes the activity and activity type:

The screenshot shows the 'Activity History' window. It has a dropdown menu for 'Available activity histories' set to 'Since application start (last 200 entries)' and a checkbox for 'Stay on last entry' which is checked. The main area contains a table with the following data:

Symbc	Activity	Activity Type	Date Started	Date Finished	Execution Time
	Security Cover Opened	Action	24.02.2014 16:11:30		
	Search Containers: Searching for containers finished	Action	24.02.2014 16:11:38	24.02.2014 16:11:46	00:00:08
	Application has been started successfully.	Information	24.02.2014 16:11:38	24.02.2014 16:11:38	00:00:00
	Setup Prepare Samples: Finished	Action	24.02.2014 16:11:50	24.02.2014 16:29:31	00:17:41
	Clean System: System Cleaned	Action	24.02.2014 16:47:45	24.02.2014 16:47:48	00:00:03
	Purge System: System Purged	Action	24.02.2014 16:47:54	24.02.2014 16:47:57	00:00:03
	Clean System: System Cleaned	Action	24.02.2014 16:48:21	24.02.2014 16:48:24	00:00:03
	Stop Automation: Automation Stopped	Action	24.02.2014 16:48:42	24.02.2014 16:48:42	00:00:00
	Start Automation: Automation Started	Action	24.02.2014 16:48:46	24.02.2014 16:48:46	00:00:00
	Pause Automation: Automation Paused	Action	24.02.2014 16:48:55	24.02.2014 16:48:55	00:00:00

Figure 8.8: The Activity History Window

8.9 Exporting a Device Report

The device report is a file containing device identification information (part number, serial number, etc.), device statistics (total runtime minutes, etc.) and other helpful information for diagnostic. This data should be sent to Bruker when problems occur.

- Select **File|Export Device Report**



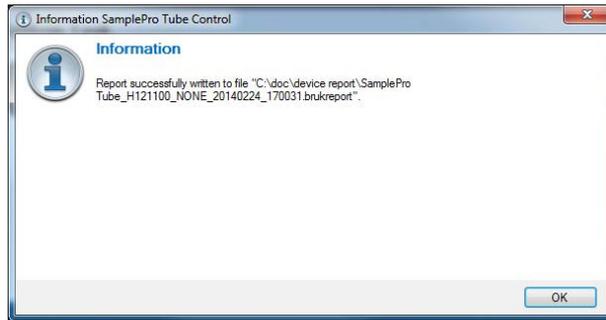


Figure 8.9: Exporting a Device Report

The file can be sent to the Bruker service, see [Contact \[▶ 107\]](#).

8.10 Saving and Opening a Session

Saving a Current Session

To save the current session to disk for later use press **File -> Save Session** and select a directory to save the file.

Automatic Saving

Session information is automatically stored by the system. i.e. even after closing the software without saving a session it is possible to recover the status from the automatically saved file.

Opening a Saved Session

To load a session that has been previously saved, press **File -> Open Session** and select the file from the directory where the file was saved.

Press **Start Automation** to actualize the desktop view.

The last three sessions can also be opened directly from the File menu, they are automatically saved by *SamplePro Control*.

Content of a Session

A session contains information about the

- layout (containers in the worktable)
- the task list, i.e. executed as well as still scheduled or paused tasks
- container status.

8.11 Exchanging Containers

To add, remove, or exchange a container on the SamplePro Tube deck tray:

1. Press **Stop Automation** when a task is running.
2. Open the Sample Pro Tube door.
3. Exchange the containers as required. **Note:** To provide easier access use the **Move Arm to Home Position** or **Move Arm to Right Position** buttons or menu options to move the magnet gripper to the other side of the deck tray.
4. Close the SamplePro Tube door.

5. Press **Start Automation** to rescan the desktop.

8.12 Barcode Labels

Superscript Serial Numbers for Identifying

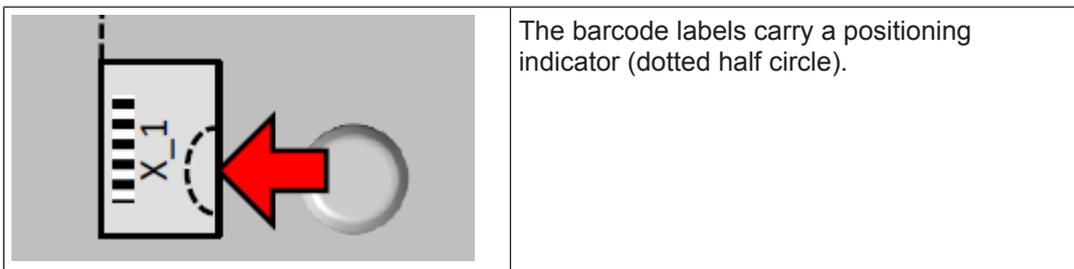


Due to the relative low number of decktrays used in one robot and the limited space for the barcode the serial number is limited to one digit.

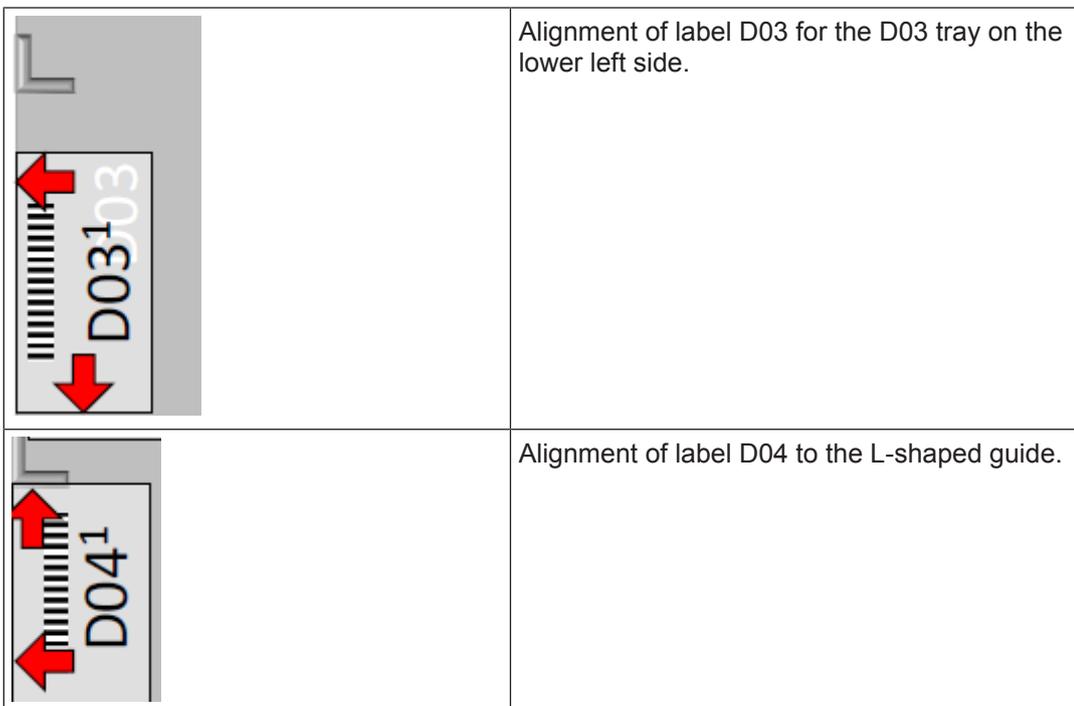
To improve the readability of information the serial number is printed as superscript. When several trays are in use they are identified and labeled with a serial number as superscript. Example: D03¹, D03², D03³,...

Barcodes on the Deck

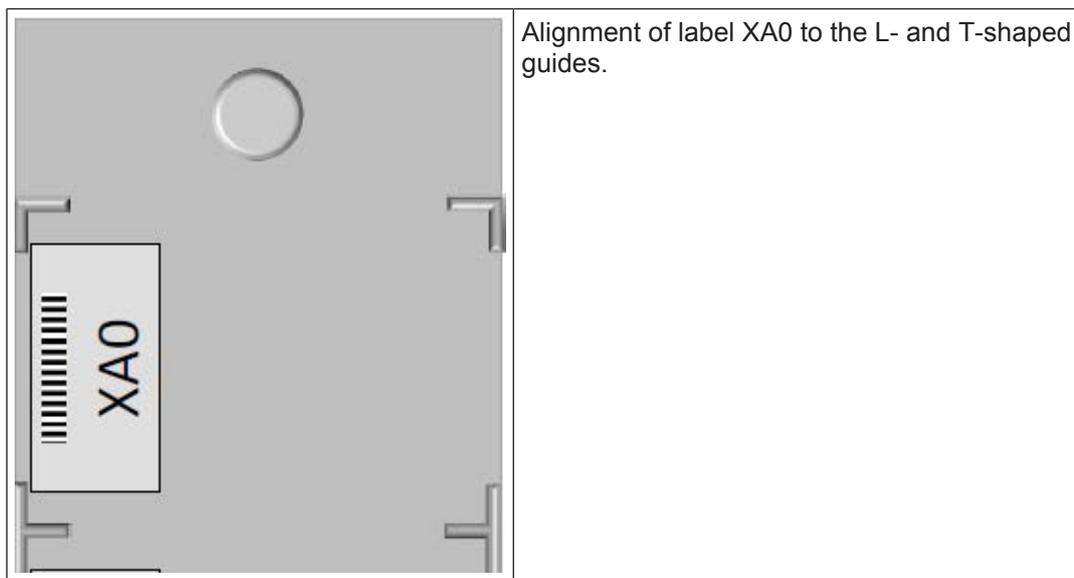
Use the labels to identify the deck tray slots from left to right as X₁, X₂, ...



Barcodes on D03, D04, XA0 Deck Trays

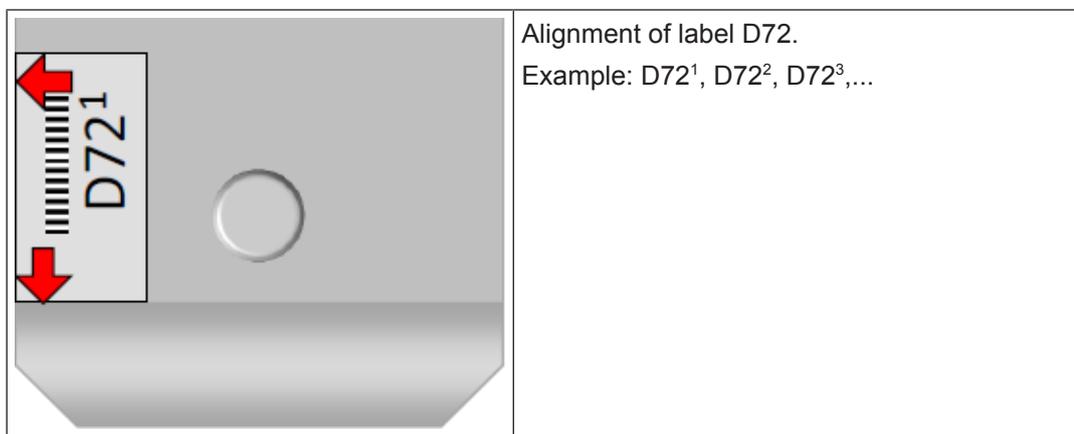


Labels for Empty Slots



Empty slots is labeled as follows:
XA0, XB0, XC0, XD0.

Barcodes on D72 Deck Trays



8.13 Optional Temperature Controlled Deck Tray

8.13.1 About Temperature Controlled Deck Trays

A temperature controlled deck tray allows the cooling of source samples, prepared samples or additives while they are located in the SamplePro Tube.

- Temperature ranges from approx. 4°C to 40°C are available.
- A temperature controlled deck tray (type DC2) has two slots for MTP sized containers.
 - Containers that can be used in such slots are: MATCH tubes Blocks (RMF, RMI), Racks for vials (RVC, RVA), Well plates (W00, W10), Solvent reservoirs (C12, C16), SampleJet tube blocks with adapter (RJF, RJI).



If the SamplePro is equipped with a long needle (198mm - as required for the preparation of 7" tubes) the usability is limited to containers with ~45mm height, i.e. well plates (W00, W10), vial racks (RVC, RVA) and the 225ml solvent reservoir (C12).

- One temperature controlled deck tray occupies one deck tray slot in the instrument, i.e. the space for 4 standard MTP containers or 30 7" tubes.
- Up to two temperature controlled deck trays can be used simultaneously in a SamplePro Tube S/L so that a total of 4 MTP positions can be cooled.
- Power supply and data interfaces of the standard instruments are already prepared; retrofit in the field is possible.
- The usage of the temperature controlled deck tray is optional. Once they are installed the user can connect/disconnect the temperature controlled deck trays from the instrument within a few minutes.

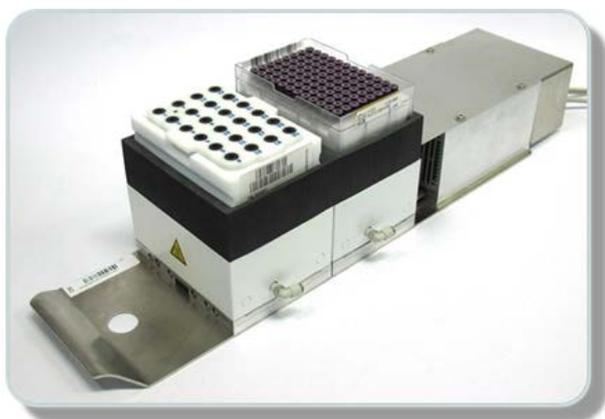


Figure 8.10: Temperature Controlled Deck Tray



Warning sign indicating heat or hot surface.

8.13.2 Usage and Connection

- Close the software SamplePro Control and power off the instrument SamplePro Tube.
- Place the temperature controlled deck tray in the deck of the SamplePro Tube, preferably on the rightmost position (slot 3 or 5).
- The **Connection Box** for the temperature controlled deck tray is mounted below the X-Rail of the instrument.



- The power supply and CAN cables were connected during the installation and remain connected.
- The data cables to the temperature controlled deck tray are labeled with 1, 2 and FAN. Connect them to the accordingly labeled ports of the Control box.



- Power the SamplePro Tube on and start the software.
- Set the desired temperature.
- The two cooling positions will be recognized by SamplePro Control automatically after reading the barcode.

8.14 Optional Shaker

8.14.1 About Shaker

A Shaker can be used in the SamplePro Tube to mix liquids, dissolve solid samples or remove gas from liquids. It is under full software control so the “shaking” can be programmed like other Preparation tasks.

The Shaker holds items of standard MTP format under maximum weight of 500g. Usable containers are:

- All well plates (shallow, square and deep).
- Vial racks (Eppendorf, Autosampler-, Cryo- and 4ml vials).
- Solvent reservoir C12 type.



Figure 8.11: Shaker



NMR tubes (SampleJet, MATCH and 7inch) are not compatible.

8.14.2 Usage and Connection

- Close the SamplePro Control software and power off the robot.
- Check for the correct label in the deck tray (DS4/DS1- not D04!).
 - DS4 = Shaker in **front** slot 4
 - DS1 = Shaker in **rear** slot 1
- Open the CAN loop and reconnect the cables.



- Start SamplePro Control software.
- Perform barcode scanning.
- Assign the position of **Shaker_72** to the Deck tray and Slot.

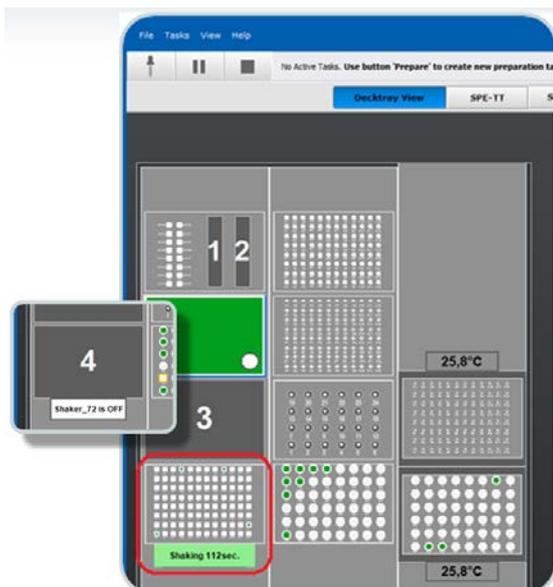


- In the Deck Tray View check the Shaker position.



If the position is wrong, you must change the barcode. Incorrect assignment can lead to severe damage of the needle or instrument!

- Any item placed in the Shaker are used and shown with their standard ID and Type. The barcode reader **cannot** detect the Shaker because it is hidden below the containers.
- The offset (different height) is automatically respected by the software, i.e. you can use all standard methods without modification.
- The Shaking time can be visualized in the layout.



The following predefined methods are installed together with *SamplePro Control* version 1.2.

BRUKER Shake 1min

- Switches Shaker ON for 60 seconds.
- After Shake time is over, switches the Shaker OFF.
- Continues with the subsequent tasks.

BRUKER Shaker ON

- Switches Shaker ON for a determined period of time.
- Immediately proceeds with the next task, as soon as, the container in the Shaker is not used.
- If all tasks are finished, before Shake time is over, the SamplePro Tube will unlock the door and allow access to the worktable, even if the shaker is still running.
- Switches Shaker OFF after Shake Time.

BRUKER Shaker OFF

- Switches the Shaker OFF *immediately*.

The workflow with a Shaker:

- During set up of tasks select one of those methods.
- Change the parameters, if necessary.

The software will not request Source or Destination container.

- Setup subsequent tasks for containers.
- Start the automation.

9 Maintenance

Service and Repair

Prior to any service/repair of the instrument the customer

- Must provide a list of all known substances that were in contact with the robot.
- Must perform a proper cleaning of the system according to the used samples and chemicals.
- Has to sign that the cleaning/decontamination was performed.

Devices or parts of devices will not be repaired if they are obviously contaminated, nor at Bruker neither at customer site.

Devices without a decontamination confirmation will not be accepted for repair.

Devices that have not been accepted for repair will be returned at customers cost and expense.

Needle Safety Instructions

If possible remove the needle from the instrument prior to any service work. If service with mounted needle is required

- Avoid contact with the sharp needle tip.
- Move the needle away from the required service position.

Before accessing the worktable the needle is parked in the rear left corner. The software allows positioning of the needle at alternate position (rear RIGHT corner), if work close to the rear left corner needs to be done. The down holder moves to the bottom position and covers the sharp needle end in a park position.

WARNING

Danger of injury from needles!

Contact with sharp pipetting needles during service and maintenance or while loading and unloading samples may cause personal injury.

- ▶ Avoid contact with the needle.
- ▶ If possible remove the needle from the device prior to any service.
- ▶ Move the needle away from the required service position. See also Installation in the Service Manual.



WARNING

Risk of severe hand injury.

When accessing the work area of the robot, robot movement may cause personal injury.



- ▶ When the down holder, pick-up adapter, needle or XY motors detect an unexpected obstruction, the process is interrupted and the device is stopped to prevent further damage.
- ▶ Access to the work area is protected by the front door. Each time the front door is closed the barcode reading is automatically started.
- ▶ If the safety door cannot be opened, stop the automation using the control software.
- ▶ Do not reach over the safety door to access the work area.

WARNING

Electrical hazard from electrical shock

A life threatening shock may result when the door to the housing is open during operation.



- ▶ Disconnect the device from the electrical power supply before opening the device for maintenance. Use a voltmeter to verify that the device is not under power!
- ▶ Be sure that the power supply cannot be reconnected without notice.
- ▶ The housing must be closed during operation.
- ▶ Ensure that all warning labels are in place.
- ▶ Only trained personnel should carry out maintenance.

WARNING

Risk of damage to persons and property due to unreadable signs and labels.

Signs and labels with advice may become unreadable. Thus:



- ▶ Maintain signs and labels in a readable state.
- ▶ Replace damaged or unreadable signs and labels immediately. New signs and labels can be ordered from Bruker Service.

NOTICE

Material damage hazard due to improper maintenance

Device deadlock may occur as a result of failures due to a lack of proper maintenance.

- ▶ Maintenance intervals must be properly followed.
- ▶ Use appropriate tools to avoid damaging parts or modules.
- ▶ Only trained personnel should carry out maintenance work.

9.1 Cleaning

For cleaning and decontamination of the instrument (e.g. deck, tips, decktrays, racks) use a 70% ethanol solution.

For cleaning and decontamination of system liquid related parts (e.g. SL container, reservoir, filter, wash station, waste tubing) use either 0.05% ProClin 950® solution or 0.001% sodium azide solution. Use lint free tissues only.

9.1.1 Cleaning the Pipetting and Tool Arm Z-Racks

The following parts should be cleaned on a 6 monthly basis (more frequently if the unit is in constant use).

There is a risk of injury, infection and contamination from parts to be cleaned, which could contain toxic and/or infected material. Appropriate protective clothing, gloves, and glasses are required for this step!

Use a lint free tissue to clean the sensors. Move the Z-rack manually slowly up and down several times to check for smooth movement.

- Never apply alcohol, alcohol solutions, or lubricant to the toothed rack or sleeve bearings, as they may expand and block Z-movement.

9.1.2 Cleaning the Outside of the SamplePro Tube and Units

Clean the outside of the SamplePro Tube chassis and units with a soft, lint-free cloth dampened in water.

- Do not use any detergent or other cleaning solvents.
- Only use water or neutral cleaning fluids.
- Usage of volatile cleaners like thinner or benzine may damage the surface of the unit.

9.1.2.1 After Cleaning

Wait until the unit is completely dry before you reconnect the line plug.

9.1.2.2 Other Cleaning Operations

For all other cleaning operations contact your authorized service station for advice and support. It may be necessary to send in the probe for a cleaning service, if cleaning of the probe becomes necessary due to excessive background signal. No special precautions have been taken in standard BRUKER probes to avoid contamination from a broken rotor. BRUKER accepts no responsibility for any damage which may occur when samples are used containing radioactive or other hazardous materials.

In case of an accident with toxic, radioactive, explosive or biologically active substances, the probe and associated equipment must be cleaned in such a way that there is no longer any danger in any form, especially for all uninformed personnel. If a probe has to be cleaned of all remains of a substance for safety reasons, contact your authorized service station for advice and support, as there is no standard cleaning procedure that is applicable for all probe types. Note that in serious cases it may be necessary for the customer to properly dispose of the probe and replace it with a new one.

9.1.3 Cleaning the Robot Barcode Reader

Clean the robot barcode reader once a year with warm water and a damp lint-free cotton cloth or towel.



Excessive dust or dirt at the lens surface of the optics reduces the optics recognition performance. Keep these surfaces clean.

9.2 Preventative Maintenance

The SamplePro Tube robotic system is designed with a minimum amount of maintenance by the user. However, to preserve the accuracy and reliability of the instrument, the following Preventive Maintenance (PM) procedures must be performed on a regular basis according to the maintenance schedules given below.

Maintenance Log

A log sheet should be used for verification of maintenance. Whenever preventive maintenance actions are performed the corresponding form should be completed. It is important to maintain this record, as repairs necessitated by misuse; abuse or negligence is not covered under the warranty or service contract.

9.2.1 Daily Maintenance

Daily maintenance is performed by the operator at the end of each day or after 8 hours of operation, and takes a few minutes.

Flush the system

- Flushing the liquid system is crucial to prevent the growth of microorganisms or the build-up of crystals or precipitates from reagents, which might affect assay precision and accuracy. It is also essential to flush the liquid system at the end of each shift. A flush is automatically performed and requested at the beginning and end of every assay run and extension of the routine flush cycle is optional. A flush can also be initiated by using the appropriate icon.
- The system liquid should not contain chemicals susceptible to crystallization! If such a liquid has been aspirated through the pump and valves, extend the flush process with distilled or de-ionized water.
- If the instrument is not to be used for several hours, leave the system filled with the distilled or de-ionized water. Other solutions may form precipitates, which can considerably shorten the life of the pump and liquid system components and affect the precision and accuracy of the instrument.

Clean the deck

- Remove racks from the worktable. Carefully clean the worktable first with warm water and then with 70% ethanol solution, using a lint free tissue.

Clean the end of the tip(s)

- Gently wipe the end of the tip(s) with a 70% ethanol solution impregnated lint free tissue to remove any accumulated serum or reagent. Replace the tip if the coating has been scratched or damaged.

Replace the system liquid

- Empty the system liquid container and the system liquid reservoir, rinse thoroughly and refill with distilled or de-ionized water.

Decontaminate the waste station

- Decontaminate the wash station by pouring 0.05% ProClin 950® solution over the wash cups and leave in contact for 3–5 minutes. Rinse thoroughly with distilled or de-ionized water.

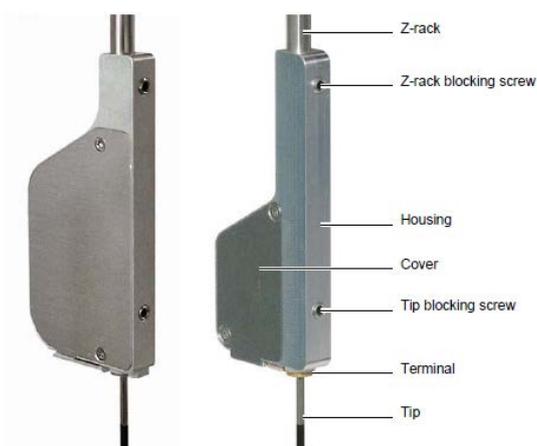
Empty the waste container

- Check and empty the waste container regularly.

9.2.2 Weekly Maintenance

Weekly maintenance is performed by the operator once a week, in addition to the daily maintenance.

- Perform daily maintenance schedule.
- Backup DB and DATA subdirectories.
- Check status of the tip(s) for scratches.
- Wash and rinse the waste container with decontaminant.
- Wash the system liquid reservoir and the system liquid container with decontaminant, then rinse thoroughly with distilled or de-ionized water before refill.
- Check position of the waste tubing (waste must be sloped down freely to the waste container as straight as possible). The end of the tube must not go deeper than the bottleneck inside the waste container.
- Clean or if necessary replace the system liquid filter(s) regularly.

9.3 Washable Tips and DT Adapters**Required tools**

- Allen wrench 2 mm.
- Piece of a rubber liner or "Parafilm®".

Installation



The installation procedure for tips and DT adapters are the same. To simplify the following step-by-step action, only tips are mentioned.

Use a piece of rubber liner or "Parafilm[®]" to get a better grip while removing and installing the tubing!

1. Ensure that the instrument is switched off and the power cable is unplugged.
2. Remove the tip blocking screw of the liquid level detector assembly.
3. Move the pipetting tubing downwards until you can grip its end.
4. Ensure that the tappet at the end of the tip points in the correct direction (depends on the version of the liquid level detector). Then firmly push the top of the tip into the end of the pipetting tubing.
5. Move the tip upwards until the tappet fits into the recess on the liquid level detector terminal.
6. Tighten the screw.
7. Check that all tips are on the same level after initialization.

Removal



The installation procedure for tips and DT adapters are the same. To simplify the following step-by-step action, only tips are mentioned.

Use a piece of rubber liner or "Parafilm[®]" to get a better grip while removing and installing the tubing!

1. Start X-Util.
2. Initialize the PipPump module.
3. Pick 20000 to flush back the system liquid (to avoid system liquid dripping while removing the tip).
4. Switch the instrument off and unplug the power cable.
5. Cover the deck underneath the tips with absorptive tissues before removing any tips.
6. Slide the liquid level detector assemblies apart and lift to their uppermost positions.
7. Loosen the tip blocking screw of the liquid level detector assembly.
8. Pull the tip carefully down and disconnect the tubing by using a piece of a rubber liner or "Parafilm[®]" to get a better grip. Rotating the tip while pulling down eases the disconnection of the tubing.
9. To prevent the tip blocking screw from falling out turn the screw in until it aligns with the edge of the liquid level detector housing.



The POM part at the end of tips and DT adapters has either a groove or a small indentation (to fix the tip/DT adapter with the tip blocking screw) but only tips and DT adapters with a groove are compatible with LQS.

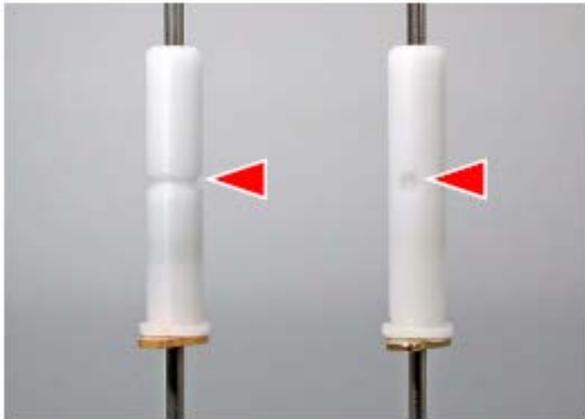


Figure 9.1: Tip Fixture Characteristic



Figure 9.2: LLD Tip Mounting and LQS Tip Mounting

10 Replacement of Parts

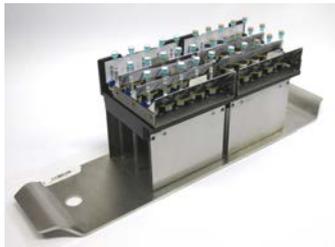


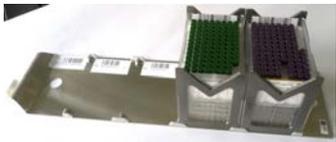
Only trained Bruker personnel are allowed to install, mount, retrofit, repair, adjust and dismantle the unit!

10.1 User Replaceable Parts

Short Name	Description	Container Type	Figure	Bruker Part Number
Deck tray 3 Slots	Deck tray with 3 well plate formatted slots	D03	-	
Deck tray 4 Slots	Deck tray with 4 well plate formatted slots	D04		AH0384-01
Wash Station Standard	Wash station with 8 shallow wash positions	DW0		
Wash Station Bruker Special A	Wash station with shallow and 2 deep wash positions	DW2		
Cooling device with 1 slot	Temperature controlled deck tray from +4°C to 40°C with 1 slot	DC1	-	

Replacement of Parts

Short Name	Description	Container Type	Figure	Bruker Part Number
Cooling device with 2 slots	Temperature controlled deck tray from +4°C to 40°C with 2 slots	DC2		
Deck tray Shaker Slot 1	Deck tray with 4 well plate formatted slots for Shaker on position 1	DS1	-	
Deck tray Shaker Slot 4	Deck tray with 4 well plate formatted slots for Shaker on position 4	DS4	-	
Deck tray 7" tubes	Deck tray for 7" NMR tubes with 2 rack slots	D72		AH0380-50
Rack 15 x 5mm 7" tubes	Rack for 7" tubes with 15 slots for 5mm NMR tubes	R71		H130350
5mm 7"Tube	5mm 7" NMR tube	TI, NI		H100

Short Name	Description	Container Type	Figure	Bruker Part Number
Rack 48 x 7" tubes	Rack for 7" tubes with 48 slots for 5mm NMR tubes	B7I		
Deck tray Sample Jet	Deck tray with 4 well plate formatted slots for Sample Jet racks	DJ4		
Rack 96 x 1.0 mm SJ tubes	1.0mm Sample Jet tube block with 96 slots. No data matrix code.	RJA		
1.0mm Sample Jet Tube	1.0mm Sample Jet NMR tube	JA		
Rack 96 x 1.7 mm SJ tubes	1.7mm Sample Jet tube block with 96 slots. No data matrix code.	RJC		
1.7mm Sample Jet Tube	1.7mm Sample Jet NMR tube	JC		
Rack 96 x 3.0 mm SJ tubes	3.0mm Sample Jet tube block with 96 slots. No data matrix code.	RJF		AH00193
3.0mm Sample Jet Tube	3.0mm Sample Jet NMR tube	JF		
Rack 96 x 5.0 mm SJ tubes	5.0mm Sample Jet tube block	RJI		AH0184

Replacement of Parts

Short Name	Description	Container Type	Figure	Bruker Part Number	
	with 96 slots. No data matrix code.				
5.0mm Sample Jet Tube	5.0mm Sample Jet NMR tube	J1			
Rack 24 x1.7mm Match Tubes	1.7mm Match tube block with 24 slots	RMC			
1.7mm Match Tube	1.7mm Match tube	MC			
Rack 24 x2.0mm Match Tubes	2.0mm Match tube block with 24 slots	RMD			
2.0mm Match Tube	2.0mm Match tube	MD			
Rack 24 x2.5mm Match Tubes	2.5mm Match tube block with 24 slots	RME			
2.5mm Match Tube	2.5mm Match tube	ME			
Rack 24 x3.0mm Match Tubes	3.0mm Match tube block with 24 slots	RMF			
3.0mm Match Tube	3.0mm Match tube	MF			AH1160-30
Rack 24 x4.0mm Match Tubes	4.0mm Match tube block with 24 slots	RMG			
4.0mm Match Tube	4.0mm Match tube	MG			
Rack 24 x5.0mm Match Tubes	5.0mm Match tube block with 24 slots	RMI			
5.0mm Match Tube	5.0mm Match tube	MI			AH1160-50
Well plate 96 Round Deep	Well plate 96 round deep 1 ml	W00			68964
Well plate 96 Round Deep NO Septum	Well plate 96 round deep 1 ml without septum	W01			

Short Name	Description	Container Type	Figure	Bruker Part Number
Well plate 96 Round Shallow	Well plate 96 round shallow 1 ml	W10		
Well plate 96 Round Shallow NO Septum	Well plate 96 round shallow 1 ml without septum	W11		
Well plate 96 Square Deep	Well plate 96 square deep 2ml	W20		
Well plate 96 Square Deep NO Septum	Well plate 96 square deep 2ml without septum	W21		
Well plate 384 Shallow	Well plate 384 Shallow	W50 <i>Note: 384 wellplate must be used with heightener, shown in the picture below the wellplate.</i>		
Well plate Square 24x 10ml	Well plate square 24x 10ml	WL1		
Well plate Square 24x 10ml NO Septum	Well plate square 24x 10ml without septum	WL3		
Well plate Square 24x 25ml	Well plate square 24x 25ml	WL2		
Well plate Square 24x 25ml NO Septum	Well plate square 24x 25ml without septum	WL4		

Replacement of Parts

Short Name	Description	Container Type	Figure	Bruker Part Number
Rack 48x1.8ml Cryovials	Cryovial rack with 48 slots	RVC		H146401
1.8ml Cryovial	Cryovial with 1.8ml content, septum closed	VC		1811150 +1811151
Rack 48x2ml Autosampler Vials	Autosampler vial rack with 48 slots	RVA		
2.0ml Autosampler Vial	Autosampler vial with 2.0ml content	VA		
Rack 24x4ml Standard Vials	Standard vial rack with 24 slots	RV4		
4.0ml Standard Vial	Standard vial with 4.0 ml content	V4		
225ml glass vessel NO Septum	Small glass reservoir with 225 ml content without septum. Fits directly into well plate format	C02		
225ml glass vessel	Small glass reservoir with 225 ml content, septum closed. Fits	C12		AH0383-02

Short Name	Description	Container Type	Figure	Bruker Part Number
	directly into well plate format			
600ml glass vessel NO Septum	Large glass reservoir with 600ml content without septum. Fits directly into well plate format.	C06		1824336
600ml glass vessel	Large glass reservoir with 600ml content, septum closed. Fits directly into well plate format.	C16		
Eppendorf rack	Rack for Eppendorf tubes with 21 slots	RE2		

Table 10.1: Trays and Slots

Various Items

Bruker Part Number	Description	Details
1811642	NMR Septum Cap 5mm 100St. kpl	Septum Cap for 5mm Tubes. Cap+Septum mounted. Pack with 100 pieces
H100	SAMPLE TUBE 5MM 7" 507-PP-7" ROYAL IMP.	Standard 7" tubes. Basic equipment for testing.
H138145	SIAS 500ML BOTTLE FRAME	Frame for (84755, C15) solvent reservoir to fit into MTP position of SamplePro Tube robot.
H130350	SIAS 7" RACK KPL	Complete Block for 15x 7" Tubes. Block, Mirror.
1813715	SIAS CAN BUS DONGLE	Converter from USB at PC to CAN connection at robot

Bruker Part Number	Description	Details
1813717	SIAS DECKTRAY 2x15x7" (D72)	Bruker deck tray with 2 handles, 5mm thickness and cut out. For 7" tube blocks with 15 positions.
1813719	SIAS DECKTRAY 4MTP ALIGNMENT	Alignment deck tray with 4 MTP positions
1825101	SIAS NEEDLE 1.5X198MM	198mm pipetting needle with threaded connector. Required for preparation in 5mm 7" tubes.
1825102	SIAS NEEDLE 1.5x128mm	Pipetting needle with threaded connector. For preparation in 3.0 - 5.0mm SampleJet and MATCH tubes.
H140008W1-00	SOFT SAMPLEPRO CONTROL CD WIN 1.0	DVD with Software and Utilities for SamplePro Tube
H140008W1-10	SOFT SAMPLEPRO CONTROL CD WIN 1.1	DVD with Software and Utilities for SamplePro Tube
H140008W1-20	SOFT SAMPLEPRO CONTROL CD WIN 1.2	DVD with Software and Utilities for SamplePro Tube
Z5293	SPINNER SB PLA (POM) 10MM	10mm Spinner for MATCH accessory
Z42516	SPINNER SB PLA (POM) 5+2,5	5mm standard spinner as initial equipment in 7" package
84761	VERBR LABORFLASCHE 500ML GL45	500ml Solvent reservoir as waste and system liquid container
68964	VERBR WELLPLATE 96 1.2ML 40MM	Ritter well plate with round cavities.
85675	VERBR WELLPLATE 96 COVER 1.2ML 10ST	Cover for Ritter Well plate
1806845	ACCBL SCREW CAP BOTTLE 125ML	Caps for 225ml solvent reservoir
86696	ACCVL SEPTUM RUBBER RED BOTTLE 125ML	Septa for 225ml solvent reservoir
H130334	SIAS 7" RACK SPINNER 20mm	deck tray for 2 7" Tube blocks, deck tray only, no Blocks. For adjustment of 20mm Depth BIV#

Table 10.2: Bruker Part Numbers

10.2 Returning the Unit for Repair

If the Bruker Hotline diagnoses an instrument failure that requires a part to be returned for repair, please follow the procedure listed here:

1. Contact your local Bruker office to start the repair process (see Contact). Repair is always handled by your local Bruker office. Their reply will contain all necessary information for the subsequent repair process steps.
2. They will provide you with details on the shipping address, and also in most cases a “Return Merchandise Authorization” number (RMA number) that allows references to the repair case. Always refer to this RMA number in case of questions.
3. Send the defective part to the local Bruker office and include the following documents:
 - RMA sheet (if RMA number was assigned).
 - Signed Equipment Clearance Form. The Equipment Clearance Form will be sent to you as part of step 1 (see above) with information about the returned part (part number, serial number, your contact details) already filled in.
4. Attach the relevant papers to the *outside* of the packaging, for instance in a transparent polybag.



The unit should be returned using the original container and packing assembly. If this packaging is no longer available, contact your local Bruker office for further instructions.

11 Dismantling and Disposal

Following the end of its operational life, the device must be dismantled and disposed of in accordance with the environmental regulations.



Installation, initial commissioning, retrofitting, repairs, adjustments or dismantling of the device must only be carried out by Bruker Service or personnel authorized by Bruker. Damage due to servicing that is not authorized by Bruker is not covered by your warranty.

11.1 Dismantling

Before starting dismantling:

1. Shut down the device and secure to prevent restarting.
2. Disconnect the power supply from the device; discharge stored residual energy.
3. Remove consumables, auxiliary materials and other processing materials and dispose of in accordance with the environmental regulations.
4. Clean assemblies and parts properly and dismantle in compliance with applicable local occupational safety and environmental protection regulations.

11.2 Disposal Europe

Environmental information for laboratory and industrial customers within the EU (European Union)



This laboratory product is developed and marketed for Business-to-Business (B2B), so does not fall under article 6 clause 3 of the German Act ElectroG. To meet the demands of the European Directive 2012/19/EU WEEE 2 (Waste of Electrical and Electronic Equipment) and the national Equipment Safety Act, electrical and electronic equipment that is marked with this symbol directly on or with the equipment and/or its packaging must not be disposed of together with unsorted municipal waste or at local municipal waste collecting points. The symbol indicates that the equipment should be disposed of separately from regular industrial/ domestic waste.

Correct disposal and recycling will help prevent potential negative consequences for the environment and risk to personal health. It is your responsibility to dispose of this equipment using only legally prescribed methods of disposal and at collection points defined by government or local authorities in your area.

The WEEE register number can be found on the product label of the equipment. If you need further information on the disposal of equipment or collection and recovery programs available, contact your local Bruker BioSpin sales representative. Local authorities or professional waste management companies may also provide information on specific waste disposal services available in your area.

Disposal - End of Life (EoL) information: the common procedure as defined in the sales contract with Bruker BioSpin

After the lifespan of an electrical and electronic product, Bruker BioSpin takes responsibility for final disassembly and correct disposal in accordance with the European directive 2012/19/EU WEEE 2.

Bruker BioSpin offers to take back the equipment (only for deliveries after 23.03.2006) after termination of use at the customer site upon request by the customer. This request must be affirmed when the equipment is ordered from Bruker BioSpin. Additional costs for dismantling and transport service will apply!

Only 100% pre-decontaminated equipment can and will be accepted by Bruker BioSpin. A release document for decontamination can be inquired from your nearest Bruker BioSpin contact site, also to be used when repairs, going back to Bruker sites, are requested.

In compliance with WEEE II directive: **2012/19/EU**

11.3 Disposal USA and Other Countries

Disposal of these materials may be regulated due to environmental considerations. For disposal or recycling information, please contact our local office or your local authorities, or in the U.S.A., contact the Electronics Industry Alliance web site at www.eiae.org.

12 Contact

Manufacturer

Bruker BioSpin GmbH
Silberstreifen 4
D-76287 Rheinstetten
Germany
<http://www.bruker.com>

WEEE DE43181702

NMR Hotlines

Contact our NMR service centers.

Bruker BioSpin NMR provides dedicated hotlines and service centers, so that our specialists can respond as quickly as possible to all your service requests, applications questions, software or technical needs.

Please select the NMR service center or hotline you wish to contact from our list available at:

<https://www.bruker.com/service/information-communication/helpdesk.html>

Phone: +49 721-5161-6155

E-mail: nmr-support@bruker.com

List of Figures

Figure 2.1:	The SamplePro Tube S System	12
Figure 3.1:	Location of the Emergency Stop Button	16
Figure 3.2:	The Robot System ON/OFF Switch.....	16
Figure 4.1:	Placing Foam Parts to protect Z-module & Y-Arm.....	31
Figure 4.2:	Wrapping Foam Parts	32
Figure 4.3:	Wrapping Z-Modules	32
Figure 4.4:	Wooden pallet.....	33
Figure 4.5:	Device on the wooden pallet.....	34
Figure 4.6:	Stabilizing the arms and the X-rail with a foam block	34
Figure 4.7:	Fixing unit on palette (left side).....	34
Figure 4.8:	Fixing unit on palette (right side).....	35
Figure 4.9:	Packing accessories	35
Figure 4.10:	Protect front shield with a spacer foam.....	35
Figure 4.11:	Place and fix the accessory box on the deck.....	36
Figure 4.12:	Cover the device with bubble foil.	36
Figure 4.13:	Attaching Shockwatch® indicators	37
Figure 5.1:	Rating Plate SamplePro Tube S.....	41
Figure 5.2:	Rating Plate SamplePro Tube L	41
Figure 5.3:	Rating Plate Position	41
Figure 6.1:	The SamplePro Tube S Robotic System	45
Figure 6.2:	The Robotic System Back Panel	46
Figure 6.3:	SamplePro Tube Main Display	47
Figure 6.4:	The Deck Tray View	48
Figure 6.5:	Zoom.....	50
Figure 6.6:	The Deck Tray View tab	54
Figure 6.7:	The SPE-TT View tab	55
Figure 6.8:	The Sample Positions Tab.....	56
Figure 6.9:	The System tab.....	57
Figure 8.1:	The Decktray View tab.....	67
Figure 8.2:	Method Selection in the Prepare Samples view.	68
Figure 8.3:	Method parameters.....	69
Figure 8.4:	The Source Container view	70
Figure 8.5:	Prepare Samples view	72
Figure 8.6:	The Sample Positions tab.....	74
Figure 8.7:	The Tasks tab	75
Figure 8.8:	The Activity History Window	78
Figure 8.9:	Exporting a Device Report.....	79
Figure 8.10:	Temperature Controlled Deck Tray	82
Figure 8.11:	Shaker	84

List of Figures

Figure 9.1:	Tip Fixture Characteristic.....	93
Figure 9.2:	LLD Tip Mounting and LQS Tip Mounting	93

List of Tables

Table 1.1: Font and Format Conventions	9
Table 4.1: Symbols on the Packaging	27
Table 5.1: Part Numbers.....	39
Table 5.2: Weight	39
Table 5.3: Dimensions	39
Table 5.4: Noise Level SamplePro Tube L and SamplePro Tube S.....	39
Table 5.5: Electrical Connection Values SamplePro Tube S and L.....	40
Table 5.6: Maximum Power Consumption SamplePro Tube S and L	40
Table 5.7: Operating Environment SamplePro Tube L and SamplePro Tube S	40
Table 5.8: Bruker Site Planning Guides.....	41
Table 5.9: Electrical and Communication	42
Table 10.1: Trays and Slots	95
Table 10.2: Bruker Part Numbers	101

Index

A

Accidents 89

B

Barcodes 60, 62

C

Cleaning and decontamination 89

Components 45

Contamination 89

Customer service 12

D

Dangerous situations 26

Door lock 46

E

Emergency Shutdown 26

L

Laboratory personnel 15

LED 46

liability 12

M

Main Menu 51

O

Object Sensor Z-racks 89

P

Personal protective equipment 15

Personnel qualifications 14

Product liability 13

R

Restart 26

Risk assessment 13

Robotic System

 Components 45

S

Sample Positions 56

Shipping

 Inspection 29

 Shock indicators 29

Site Planning 41

SOP 14

Standard Operating Procedure 14

Symbols and Conventions

 Font and Format 9

 Safety 7

T

Terms and Conditions 12

Terms of Delivery 12

The Main Button Bar 53

U

Untrained personnel 12

W

warranty 12





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