




SamplePro Tube

- Sample Changer
Service Manual
Version 003



Copyright © by Bruker Corporation

All rights reserved. No part of this publication may be reproduced, stored in a retrieval system, or transmitted, in any form, or by any means without the prior consent of the publisher. Product names used are trademarks or registered trademarks of their respective holders.

This manual was written by

NMR Development Department

© November 18, 2014 Bruker Corporation

P/N: Z33092

DWG: Z4D12075

For further technical assistance for this product, please do not hesitate to contact your nearest BRUKER dealer or contact us directly at:

Bruker Corporation

Am Silberstreifen

76287 Rheinstetten

Germany

Phone: +49 721 5161 0

FAX: +49 721 5171 01

E-mail: nmr-support@bruker.de

Internet: www.bruker.com

Contents

1	About This Manual	9
1.1	This Manual	9
1.2	Policy Statement	9
1.3	Symbols and Conventions	9
1.4	Font and Format Conventions	11
2	Introduction	13
2.1	Concept.....	13
2.2	Before you begin.....	13
2.3	Minimum Qualifications for Service Personnel	14
2.4	The Bruker Service	14
2.5	Transport to Manufacturer	14
3	Safety	15
3.1	Intended Use.....	15
3.2	Owner's Responsibility.....	15
3.3	Personnel Requirements	16
3.3.1	Qualifications	16
3.3.2	Unauthorized Persons	17
3.3.3	Instruction	17
3.4	Personal Protective Equipment.....	17
3.5	Description of the Installed Safety Devices.....	18
3.5.1	Location of the Emergency Stop Button	18
3.5.2	Location of the Robot System ON/OFF Switch.....	18
3.6	Basic Dangers.....	19
3.6.1	General Workplace Dangers.....	19
3.7	Environmental Protection.....	22
3.8	Signage.....	22
3.8.1	Warning Signs.....	22
4	Description of the Robotic System Main Parts	25
4.1	The Deck Tray	25
4.2	The Frame	25
4.3	Barcode Reader.....	26
4.4	Safety Door	26
4.5	Safety Door Lock	26
5	Tool List	27
5.1	Required for SamplePro Tube	27
5.2	Required Tools that Can be Ordered from Sias.....	27
5.3	Optional.....	28
6	Installation	29
6.1	Before You Begin.....	29
6.1.1	Site Planning.....	29
6.2	Installation Procedure Overview	29

6.3	Installation Requirements	30
6.4	Receiving the Product.....	30
6.4.1	Unpacking.....	30
6.5	Connecting the Power Cable	31
6.6	Optional Cooling Racks	31
6.6.1	About Cooling Racks	31
6.6.2	Installation.....	32
6.6.3	Usage and Connection	34
7	System Configuration	37
7.1	Overview	37
7.2	Configuring the Device Settings.....	37
7.2.1	Initial Settings.....	38
7.2.1.1	Robot Settings	39
7.2.1.2	Robot Teaching.....	40
7.2.1.3	Standard Device User.....	41
7.2.1.4	Methods	42
7.3	Backing up the Settings Configuration.....	43
7.4	Importing, Exporting and Restoring Device Settings	43
7.5	The Robot Device Manager.....	44
8	Verification and Calibration.....	45
8.1	Pre-Test Checklist.....	45
8.2	Robotic System Teaching	45
8.2.1	Teaching the Robot Tip Alignment.....	46
8.2.2	Checking the Robot Tip Alignment	48
8.2.3	Checking the Labware Position	50
8.2.4	Teaching the Rack Offset at Pin Point	52
8.2.5	Teaching the Barcode Reader Position	54
8.2.6	Teaching the Barcode Offset of 7 Inch Tubes	56
8.2.7	Getting Barcodes of All 7 Inch Tubes	58
8.3	Teaching with Sias Alignment Tool.....	58
8.3.1	Introduction	58
8.3.2	Installation	59
8.3.2.1	Standardized Installation Procedure	59
8.3.2.2	Customized Installation Procedure	59
8.3.3	Verification and Alignment	59
8.3.3.1	Measure X-Ranges and Y-Ranges	62
8.3.3.2	Set Reference/Scaling Point	62
8.3.3.3	Set Z-Offsets	65
8.3.3.4	Saving the Default.Robot.XML	66
9	Operation Overview.....	69
9.1	Safety.....	69
9.1.1	Emergency Shutdown.....	74
9.2	General Operating, Service and Repair Guidelines.....	74
9.2.1	Switching On the Device.....	77
9.2.2	Switching Off the Device.....	77
10	Service - Minor Corrective Actions.....	79

10.1	Introduction	79
10.2	Securing Screws	80
10.2.1	Securing Gear Screws	80
10.3	Mains Fuse (Input)	81
10.4	Output Fuses	81
10.5	CAN-Bus and Extensions (loop)	82
10.6	Deck	82
10.7	Arm Housing	83
10.7.1	Arm Cover	83
10.7.2	Side and Front Cover Plate	85
10.7.3	Rear Cover Plate	86
10.8	X-Axis Components	86
10.8.1	MCB X-Motor Board	86
10.8.2	X-Gear	87
10.8.3	X-Motor	89
10.9	CAN Connector Board	91
10.10	Device X-Rail	92
10.10.1	X-Belt	92
10.10.2	X-Spacers	92
10.10.3	Caterpillar Drive Chain	92
10.10.4	CAN-Bus Wiring	93
10.10.5	Safety Door	93
10.11	Y-Axis Components	94
10.11.1	YZ-Board	94
10.11.2	Y-Motor Assembly (spring-loaded Y-motor support)	96
10.11.3	Y-Motor (spring-loaded Y-motor support)	97
10.11.4	Spring-Loaded Y-Motor Support	98
10.11.5	YZ-Module	100
10.12	Z-Axis Components	100
10.12.1	YZ-Board	100
10.12.2	Z-Motor Assembly	101
10.12.3	Z-Motor	103
10.13	Arm Alignment Check	104
10.14	Washable Tips and DT Adapters	105
10.15	Downholder	107
10.16	Barcode Reader	107
10.17	Door Lock Actor	107
10.18	Door Open Sensor	108
11	Service - Major Corrective Actions	111
11.1	Replacing the Power Supply Unit	112
11.2	Adjusting the X-Belt Tension	113
11.2.1	Mechanical Principle of the X-Drive	114
11.2.2	Checking the Tension of the X-Belt	114
11.2.3	Adjusting the Tension of the X-Belt	116
11.3	Exchanging Boards and Motors	118
11.3.1	Introduction	118
11.3.1.1	Exchanging Controller Boards	118

11.3.2	Replacing the X-Board.....	118
11.3.3	Replacing the X-Motor	119
11.3.4	Replacing the YZ-Module	121
11.3.5	Replacing the YZ-Board.....	122
11.3.6	Replacing the Y-Motor (with fixed support).....	123
11.3.7	Replacing the Y-Motor (with spring-loaded support).....	124
11.3.8	Replacing the Z-Motor	125
11.3.8.1	Z-Motor Check	126
11.3.8.2	Coil Resistance Check.....	127
11.4	Arm Alignment	128
11.4.1	Arm Adjustment	129
11.4.2	Arm Assembly and Testing	129
12	Troubleshooting	131
12.1	Error Reporting Checklist.....	131
12.2	History Files and Log Files.....	131
12.2.1	History files	132
12.2.2	Robot System Sub-device Log Files.....	132
12.3	Error Information Dialogs	133
12.3.1	Initialization Warning Dialog	133
12.3.2	Standard Error Dialog at Run Time.....	133
12.3.3	Robot System Sub-device Error Window.....	134
12.4	Start Problems Due to Virus Scanner Setup.....	136
12.5	Firmware	136
12.5.1	Validating Firmware Parameters.....	136
12.5.1.1	Correct Configuration (display)	137
12.5.1.2	Incorrect Configuration (Display)	138
12.5.2	Firmware and Parameters	139
12.5.2.1	Firmware Download	139
12.5.2.2	Firmware Parameter Setup.....	139
12.5.3	Troubleshooting Corrupted Firmware Configuration.....	140
12.5.3.1	Configuration Conflict after Module Identification	140
12.5.4	Procedure to Restore a Correct FW Parameter Configuration	142
12.5.4.1	Software Procedure	142
12.5.4.2	Emergency Procedure	143
12.5.5	Communication Error While Reading X-Util FW Parameters.....	143
12.6	Y- and Z-Motor and Controller Board.....	145
12.6.1	Motor does not Initialize	145
12.6.2	Motor Moves in Negative Direction with Positive Values	146
12.6.3	Motor Check.....	146
12.6.4	Z-motor Shakes When Sensing for Liquid	146
12.6.5	Controller Board Check.....	147
12.6.5.1	Controller Board Troubleshooting.....	147
12.7	USB / CAN-Bus.....	148
12.7.1	Communication Problems Linked to USB Devices	148
12.7.2	Mixup of USB CAN Adapters	149
13	Container Types, Labware and Bruker Part Numbers	151

14 Spare Parts	157
15 Electrical Data	159
15.1 Robotic System PCB Pinout	159
15.1.1 MCB X-Motor Board V2.11	159
15.1.2 MCB BB1 V2.0	159
15.1.3 MCB BB2 V2.0	160
16 Preventive Maintenance	161
17 Transport, Packaging and Storage	163
17.1 Symbols on the Packaging	163
17.2 Inspection at Delivery.....	164
17.3 Packaging	164
17.4 Storage	165
17.5 Returning the Robotic System	165
17.5.1 Robot and Part Shipping Precautions.....	165
17.5.2 Preparing the Robot System for Transport	166
17.5.3 Packing the Robot System for Transport	166
17.5.3.1 Packing the Arm.....	166
17.5.3.2 Packing the Tool Arm.....	167
17.5.3.3 Packing the Deck Tray and Frame	168
18 Safety and Repair Declaration Form	173
19 Cleaning and Disposal	175
19.1 Cleaning.....	175
19.2 Environmental Protection.....	175
19.3 Decommissioning, Recycling and Disposal of the Robotic System.....	176
20 Technical Data	177
20.1 General	177
20.2 Electrical	178
20.3 Operating Conditions	178
20.4 Rating Plate Robot.....	179
21 Specifications	181
21.1 Motion Speed.....	181
21.2 Electrical and Communication	181
21.3 Safety and Security.....	181
21.4 Physical Properties	182
21.4.1 Precision	182
21.5 Computer and Software Requirements.....	182
21.5.1 Recommended Options	182
21.5.2 Material Chemical Resistance	182
22 Contact	185
List of Figures	187
List of Tables	191
Index	193

1 About This Manual

This manual is intended to be a reference guide for operators and service technicians. It provides detailed information about the user level maintenance and service, as well as overall use of the Bruker device.

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 accident prevention 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 This Manual

1.2 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.

1.3 Symbols and Conventions

Safety instructions in this manual 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.

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.

1.4 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 Bruker Trademarks Table Column Names Field Names (within Dialog Windows)	Arial Italics	<i>\$tshome/exp/stan/nmr/</i> <i>lists</i> <i>expno, procno,</i> <i>IconNMR™,</i> <i>TopSpin™,</i> <i>XWIN-NMR™</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 [Container Types, Labware and Bruker Part Numbers \[▶ 151\]](#).

2.1 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 changer 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 \[▶ 177\]](#). 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 for a complete description of the design and function of SamplePro Tube.

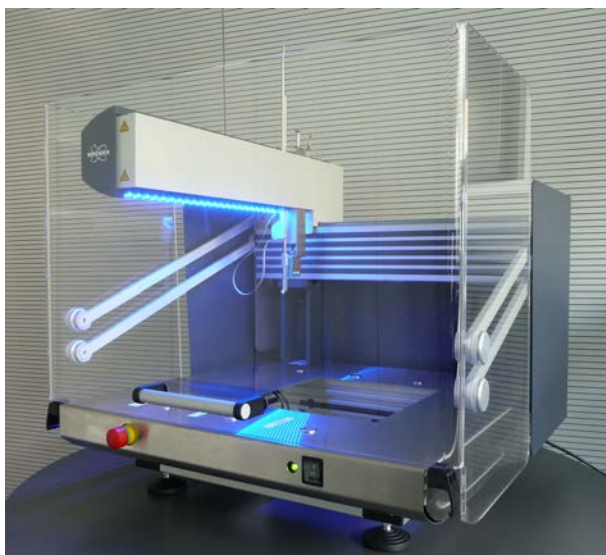


Figure 2.1: The SamplePro Tube S System

2.2 Before you begin

This service manual contains information and safety information that are necessary for the installation and service of the SamplePro Tube.

All maintenance and repairs are to be accomplished using the information in this manual. At the same time references over general maintenance and care from the User Manual are also to be followed.

Consider all safety references!

Information for ordering spare parts is available in the spare parts section for from the Bruker Service Center (see [Contact ▶ 185](#)).

2.3 Minimum Qualifications for Service Personnel

Type of Task	Personnel	Training and Experience
Transportation	No special requirements.	No special.
Installation	Bruker certified personnel only.	Technically skilled, with a good knowledge of the application field.
Routine Use	Appropriately certified and experienced personnel, familiar with use of computers and automation in general	Laboratory technicians or equivalent. Training is usually done in-house. Familiar with Microsoft® Windows® environment.
Daily Maintenance		
Setup and optimization of program	Bruker certified personnel only.	Experienced laboratory technician. High degree of knowledge of the relevant application field.
Preventive Maintenance	Bruker certified personnel only.	Technically skilled with a basic understanding of the application.
Servicing	Bruker certified personnel only.	Background and experience in electronics/mechanics with computer knowledge.

Table 2.1: Overview Installation and Operation Requirements for Personnel

2.4 The Bruker Service

See [Contact ▶ 185](#).

2.5 Transport to Manufacturer

When the SamplePro Tube must be returned to the manufacturer for a major repair, use the original packaging for transportation.

See [Returning the Robotic System ▶ 165](#).

Include a good description of the problem.

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 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.

3.2 Owner's Responsibility

Owner

The term „owner“ refers to the person who themselves operates the unit for trade or commercial purposes, or who surrenders the unit 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.

Owner's Obligations

The device is used in the industrial sector, universities and research laboratories. The 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 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 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 owner must assess whether the operating instructions issued comply with the current status of regulations, and must update the operating instructions if necessary.
- The owner must clearly lay down and specify responsibilities with respect to installation, operation, troubleshooting, maintenance and cleaning.
- The owner must ensure that all personnel dealing with the device have read and understood this manual. In addition, the owner must provide personnel with training and hazards information at regular intervals.
- The owner must provide the personnel with the necessary protective equipment.

- The 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 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 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 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 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 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 owner must ensure that the work area is sufficiently illuminated to avoid reading errors and faulty operation.
- The owner must ensure that the laboratory is equipped with an oxygen warning device, in case the device is operated with nitrogen.

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

- The owner must ensure that the maintenance intervals described in this manual are observed.
- The owner must ensure that all safety devices are regularly checked to ensure full functionality and completeness.

3.3 Personnel Requirements

3.3.1 Qualifications



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

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

Laboratory Personnel

Laboratory personnel are 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.

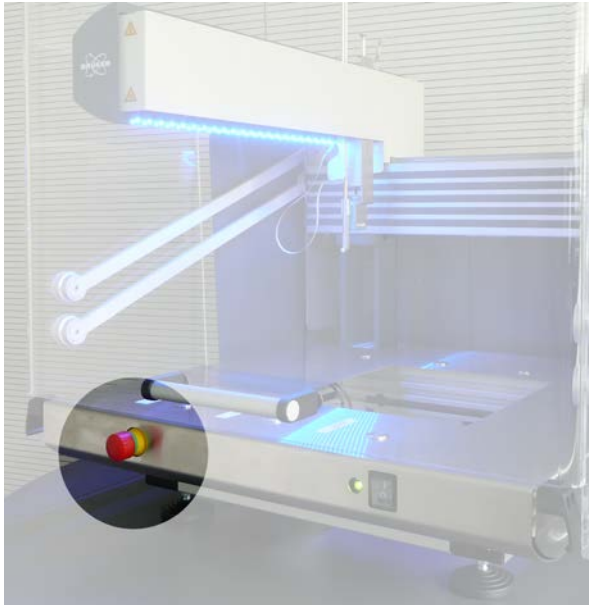


Figure 3.1: Location of the Emergency Stop Button

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:

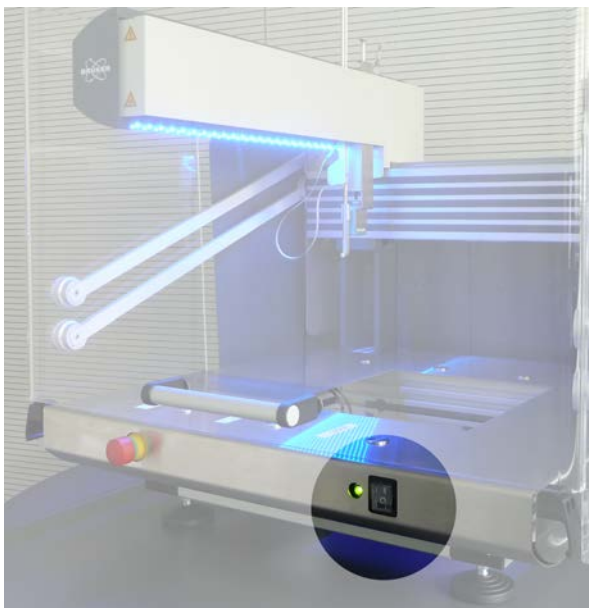


Figure 3.2: The Robot System ON/OFF Switch



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 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.

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.

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.

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

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 LiquidHandler is designed for the usage 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 other/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 an 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

CAUTION

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 the instructions below 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.



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 substances. They must not be allowed to escape into the environment. Disposal must be carried out by a specialist disposal company.

3.8 Signage

3.8.1 Warning Signs



Warning indicating a danger zone in work rooms.



Warning indicating a biological hazard.



Warning indicating severe hand injury.



Warning indicating heat or hot surface.

4 Description of the Robotic System Main Parts

The robotic system consists of the following parts:

[The Deck Tray \[▶ 25\]](#)

[The Frame \[▶ 25\]](#)

[Barcode Reader \[▶ 26\]](#)

[Safety Door \[▶ 26\]](#)

[Safety Door Lock \[▶ 26\]](#)

4.1 The Deck Tray

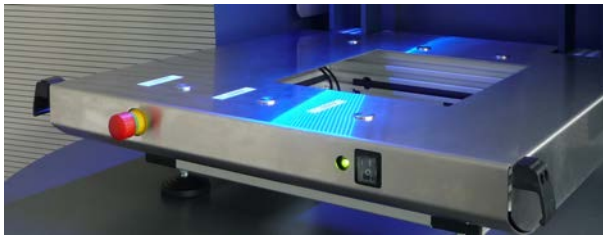


Figure 4.1: Deck Tray Layout

4.2 The Frame

The frame supports the deck and provides a base for the X-rail.

The X-rail supports the Y-arm. The Y-arm is mounted on the X-rail located at the back of the device frame and moves in the X-direction (left and right). High precision DC motors with encoders drive all the module movements of the robot.

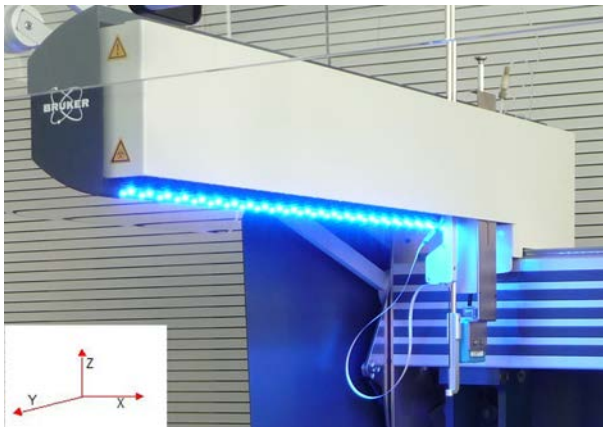


Figure 4.2: The X-Rail

Y-Arm

The Y-arm provides the down holder, a needle device and the barcode reader.

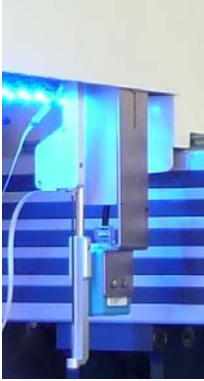


Figure 4.3: Y-Arm with Down Holder, Needle Device and Barcode Reader.

4.3 Barcode Reader

The barcode reader is used to read the ID barcode and the type barcode of the container.

4.4 Safety Door

WARNING



Severe hand injury.

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

- ▶ If the safety door cannot be opened, stop the automation using the control software (IconNMR).
- ▶ Do not reach over the safety door to access the work area.

The safety door provides operator safety when the robot is in operation. There are four possible status for the safety door:

OPEN: The safety door is open.

CLOSED: The safety door is closed.

LOCKED: The safety door is locked.

UNLOCKED: The safety door is unlocked.

4.5 Safety Door Lock

The SamplePro robotic system provides a door lock for safety.

The door locks when:

- The door is closed and the barcode scanner scans for barcodes. After the scan the door is automatically unlocked.

The door remains unlocked when:

- The robot is not active.

5 Tool List

5.1 Required for SamplePro Tube

- Ratchet tool + extension
- Torx bit # 6 to # 25
- Torx screwdriver # 6 and 8.
- Allen bit # 2,3,4,5,and 8
- Pozidrive screwdriver # 1
- Phillips # 1
- Slotted screwdriver # 2
- Open wrench 5.5 mm (Z-gear play adjustment)
- Space gauge set 0.01 mm - 0.5 mm
- Set square
- Spirit level
- 20 cm metal precision ruler
- Adjustable spring loaded scale (2.5 kg)
- Glue Loctite 222
- Glue Loctite 243 (X-Motor gear screw)
- Transparent tape
- White insulating tape
- Sharp blade or tubing cutter
- Multi-meter
- Marker
- Safety door screw tool
- Nylon tie raps
- Solvent to clean threads

5.2 Required Tools that Can be Ordered from Sias

Sias AG
Etzelstrasse 30
CH-8634 Hombrechtikon
Switzerland

www.sias.biz

- Special hexagonal socket wrench # 6 thin walls (Sias reference # 150008)
- Sias screw set (Sias reference # 150000)
- Sias Handler Gripper oil (Sias reference # M0266)
- Rubber pad (Sias reference # M0488)

5.3 Optional

- Wise wrench
- Slotted screwdriver # 1
- Adjustable parallel wrench
- Wire cutting pliers
- Pocket lamp
- Caliper
- Pliers

6 Installation

6.1 Before You Begin

Before beginning the installation verify that the Site Planning considerations described in the section below have been met.

1. Read and understand the chapter Safety Information.

6.1.1 Site Planning

The SamplePro Tube with a total weight between 75 - 90 kg should be placed on a sturdy workbench at least 80 cm high. This prevents that the user has access to the robot from the top. It should not be located near a heat source or exposed to direct sunlight. The device must be close to an AC power outlet. The electrical supply for the equipment should be voltage regulated, properly grounded, and surge protected.

The site planning guidelines for the Bruker spectrometer must also be observed.

NOTICE

Install the device on a solid table that can hold weight up to 130-150kg. The table must be at least 80 cm high. The height prevents user access over the closed front door.

User access to the work area is only allowed from the front side of the device.

Ensure that the device is correctly positioned and cannot move when operation starts.

SAFETY INSTRUCTIONS

Difficulties in fully disconnecting unit from mains supply

The unit is only completely separated from the mains power when the mains connector plug is removed.

- ▶ The mains connector must be easily accessible at all times.

6.2 Installation Procedure Overview

The installation must be carried out in accordance with the specifications and instructions in this manual.

Installation Procedure

The installation procedure consists of the following major steps:

1. Robot System Installation.
2. Entering the system settings in the SamplePro Tube application software (see [Configuring the Device Settings \[▶ 37\]](#)).

3. Perform the robotic system teaching (see [Robotic System Teaching \[▶ 45\]](#)).
4. Perform the robot system device test (see [Teaching with Sias Alignment Tool \[▶ 58\]](#)).
5. Save the settings as described in [Importing, Exporting and Restoring Device Settings \[▶ 43\]](#).

6.3 Installation Requirements

- A separate host computer (PC) for installation and operation.
- An Uninterruptible Power Supply (UPS) is highly recommended.

The PC or UPS can be ordered with the device from Bruker as an option.

6.4 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.

6.4.1 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.

6.5 Connecting the Power Cable

Connect the power cable to the mains socket located at the rear of the device, under the deck on the left hand side of the power supply.

6.6 Optional Cooling Racks

6.6.1 About Cooling Racks

A Cooling Rack allows the cooling of source samples, prepared samples or additives while they are located in the SamplePro Tube.

- Temperature ranges from ambient temperature to approx. 4°C are available.
- A Cooling Rack (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 Cooling Rack occupies one deck tray slot in the instrument, i.e. the space for 4 standard MTP containers or 30 7" tubes.
- Up to two cooling racks 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 Cooling Racks is optional. Once they are installed the user can connect/disconnect the Cooling racks from the instrument within a few minutes.

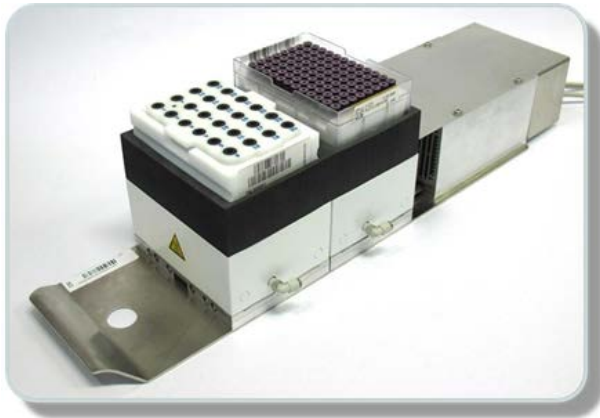
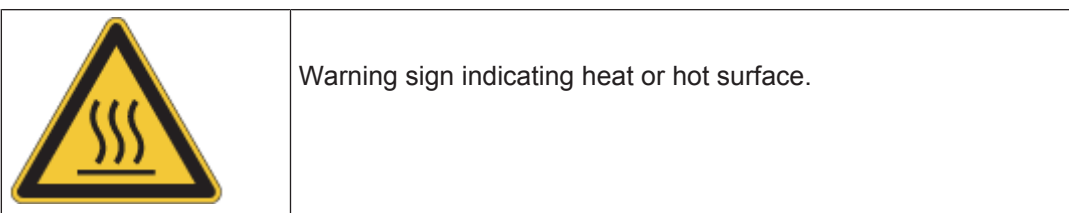
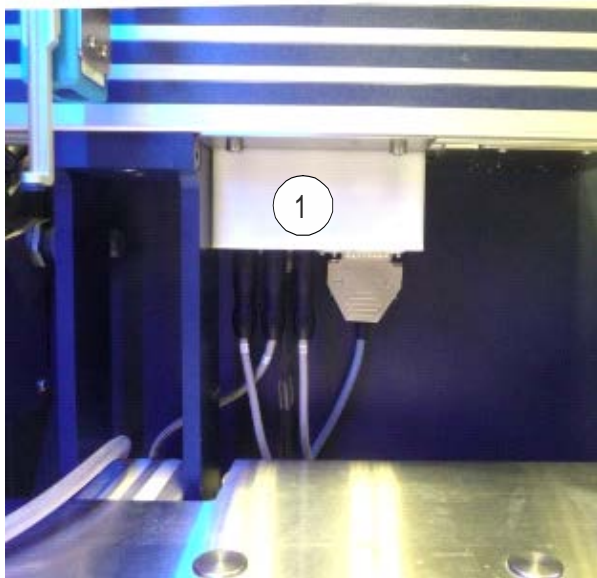


Figure 6.1: Cooling Rack



6.6.2 Installation

- Close the software SamplePro Control and power off the instrument SamplePro Tube.
- Mount the connection Box for the Cooling Rack below the X-Rail of the instrument (1)



- Remove the right CAN cable from the SamplePro Tube and connect it to the I/O Box (2).



- Use the supplied CAN cable and connect the I/O Box to the now free port (3).



- Connect the supplied 24V cable to connect I/O Box to a free 24V power supply of the SamplePro Tube (4).



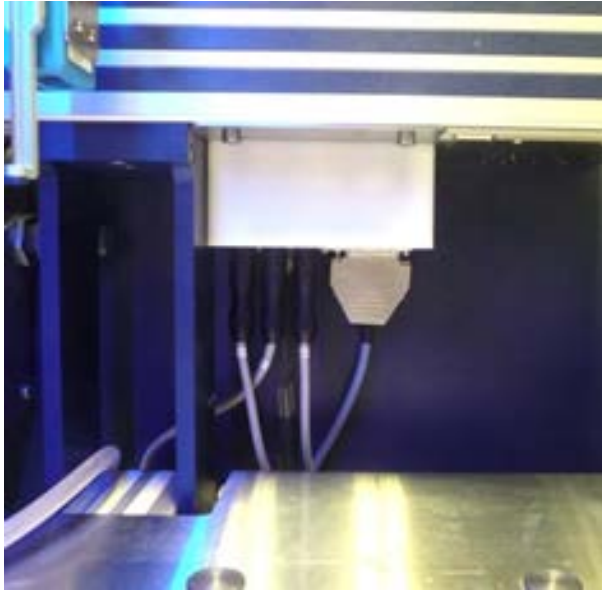
- Place the Cooling Rack in the deck of the SamplePro Tube, preferably on the rightmost position (slot 3 or 5)
- The data cables to the Cooling Rack are labeled with 1, 2 and FAN. Connect them to the accordingly labeled ports of the Control box



- Power the Samplepro Tube on and start the software.
- Set the desired temperature.

6.6.3 Usage and Connection

- Close the software SamplePro Control and power off the instrument SamplePro Tube.
- Place the Cooling Rack in the deck of the SamplePro Tube, preferably on the rightmost position (slot 3 or 5).
- The **Connection Box** for the Cooling Rack 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 Cooling Rack 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.

7 System Configuration

7.1 Overview

The Service and Settings area is used for the system configuration and is intended for trained Bruker service personnel only!

WARNING



Danger of injury if personnel are insufficiently qualified.

If unqualified personnel perform work in the software service area, hazards may arise which can cause serious injury and substantial damage to the robot.

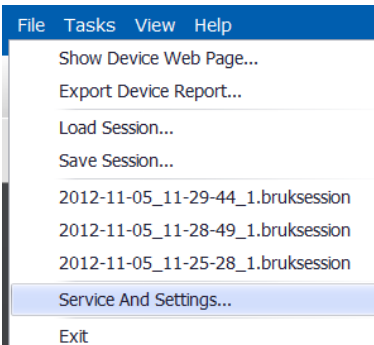
- ▶ All work must be carried out by qualified personnel.
- ▶ Unqualified personnel must not be given the service password.

The Service and Settings area menu of the application software is made of the following components:

Menu Option	Submenu Option	Description
Device Settings	Robot Settings	Used to set the robot configuration, set the target values for nitrogen, air flow and cooling rack temperature, and to select barcode identification.
	Robot Teaching	Used to check and teach the pickup adapter, object sensor and the barcode reader.
	Standard Device User	Used to select the user level.
	Methods	Used for the maintenance of methods.

7.2 Configuring the Device Settings

Select **File - Service and Settings** from the application software menu.



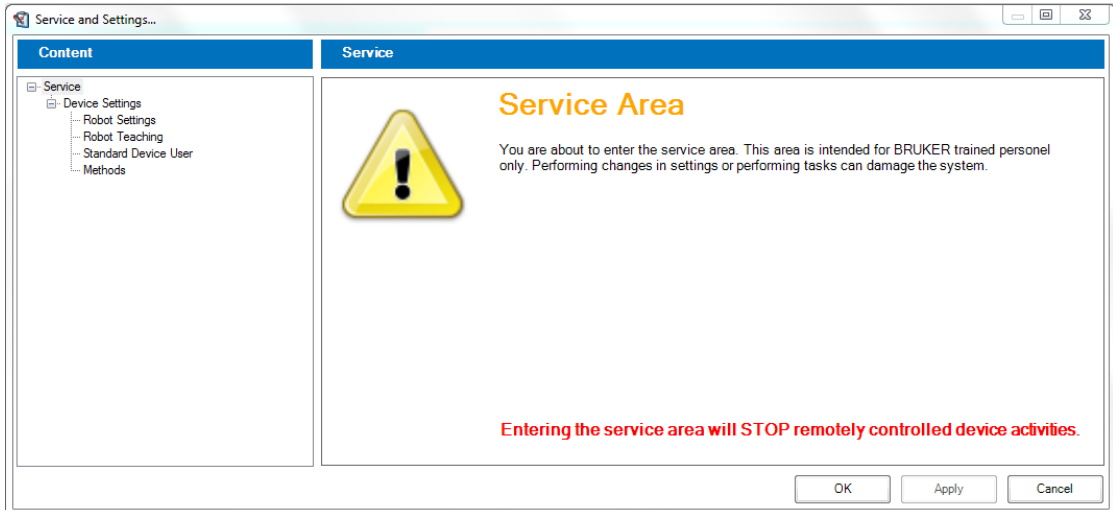


Figure 7.1: Entering the Service Area

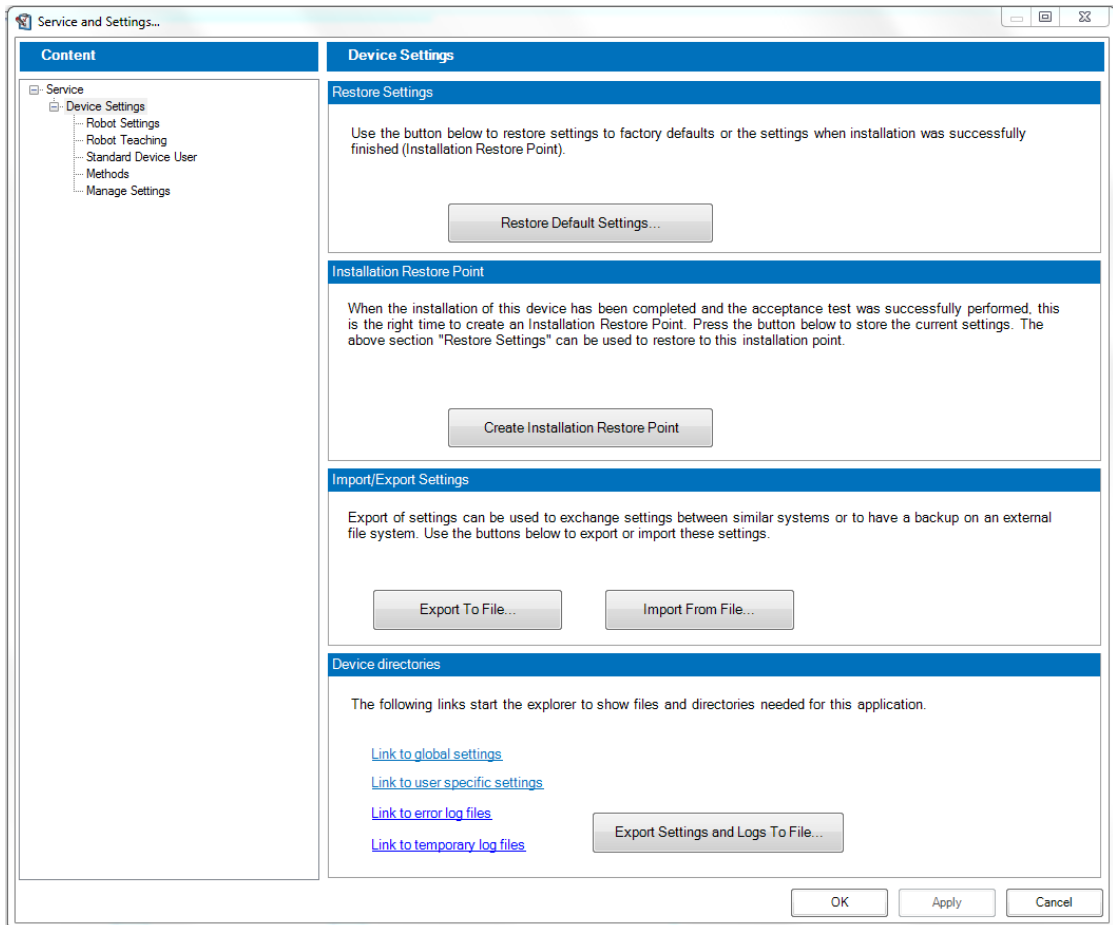


Figure 7.2: Service and Settings Window

7.2.1 Initial Settings

After the device has been installed as described in Installation, the software must be configured as described in this section.

The initial device settings must be set in the following sequential order:

"Robot Settings" [▶ 39]

"Robot Teaching" [▶ 40]

"Standard Device User" [▶ 41]

Methods

7.2.1.1 Robot Settings

Import SIAS Configuration File

A new Sias Instrument is delivered from Sias with a CD "NELSON" containing the Device Configuration file with the name of the current serial number and the extension ".Robot.XML" (e.g. "1234.Robot.xml" for the instrument with serial number "1234").

This software is using the Device Configuration file "Bruker 60cm.Robot.xml" and one time the button "Import SIAS Configuration File" must be pressed to import instrument specific adjustment data from the SIAS CD into the Bruker device configuration file.

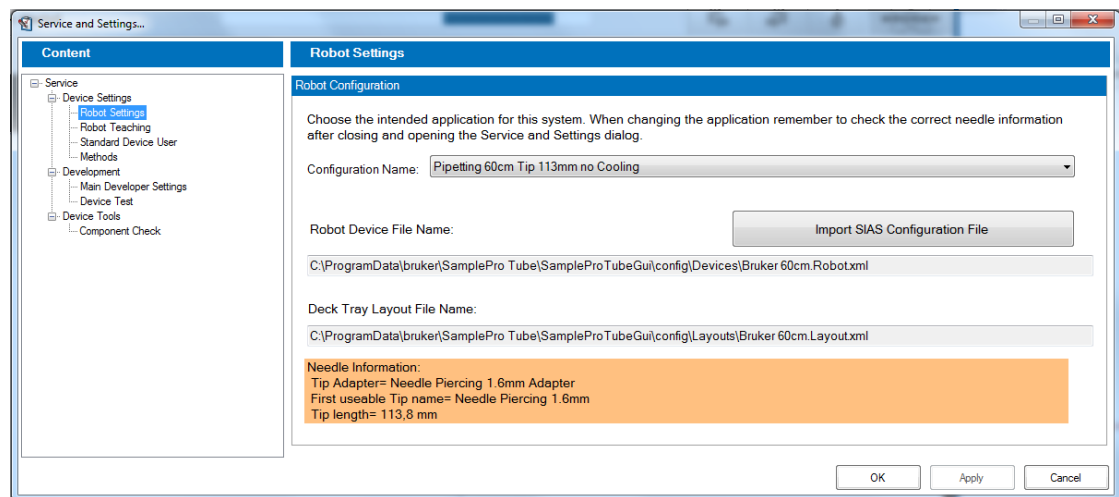
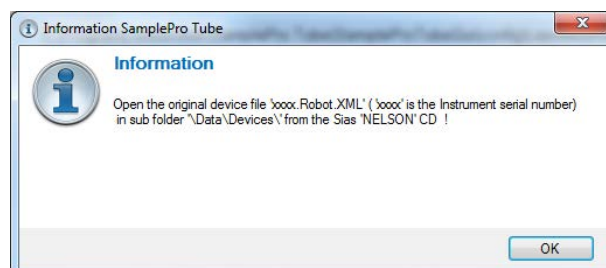
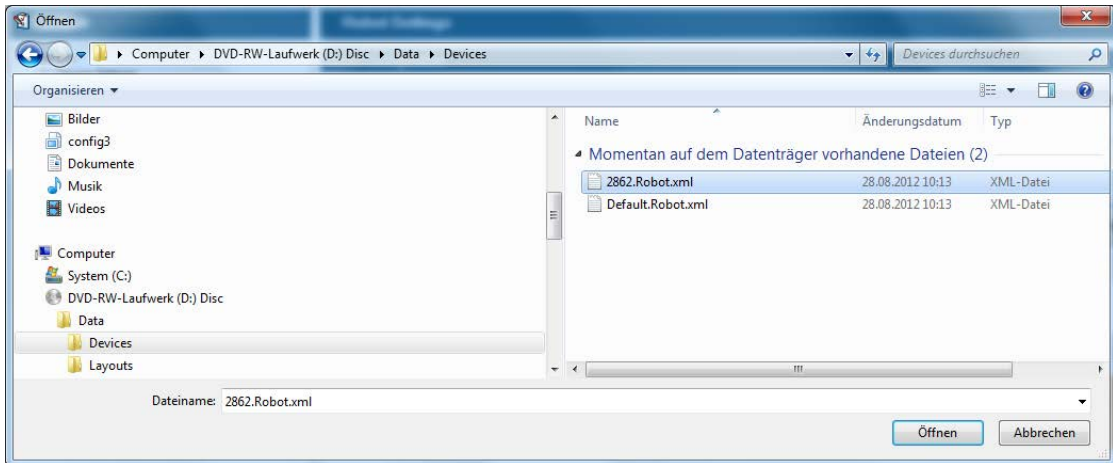


Figure 7.3: Robot Settings

After pressing the button the SIAS file with the extension *.Robot.XML* must be selected from the current CD drive.





The Device Configuration file *Bruker 60cm.Robot.xml* for this application will be saved automatically.

Select the intended Application for this system

Currently two different applications are available with a Septum Piercing Needle of 130mm or 200mm.



After mounting the 200mm Needle before starting the Application: check manually the height of all containers in the layout if the top of the containers are below the bottom of the needle!

Choose the intended application configuration name for this system. When changing the application remember to check the correct needle information in the settings after closing and opening the Service and Settings dialog.

A different application selection can be saved using the **OK** or **Apply** button of the dialog.

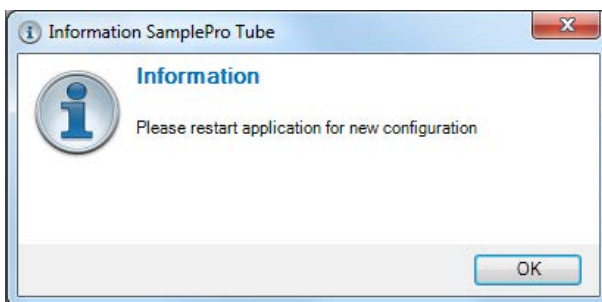


Figure 7.4: Information: Restart Application

7.2.1.2 Robot Teaching

This section is used to check and teach the main robot positions.

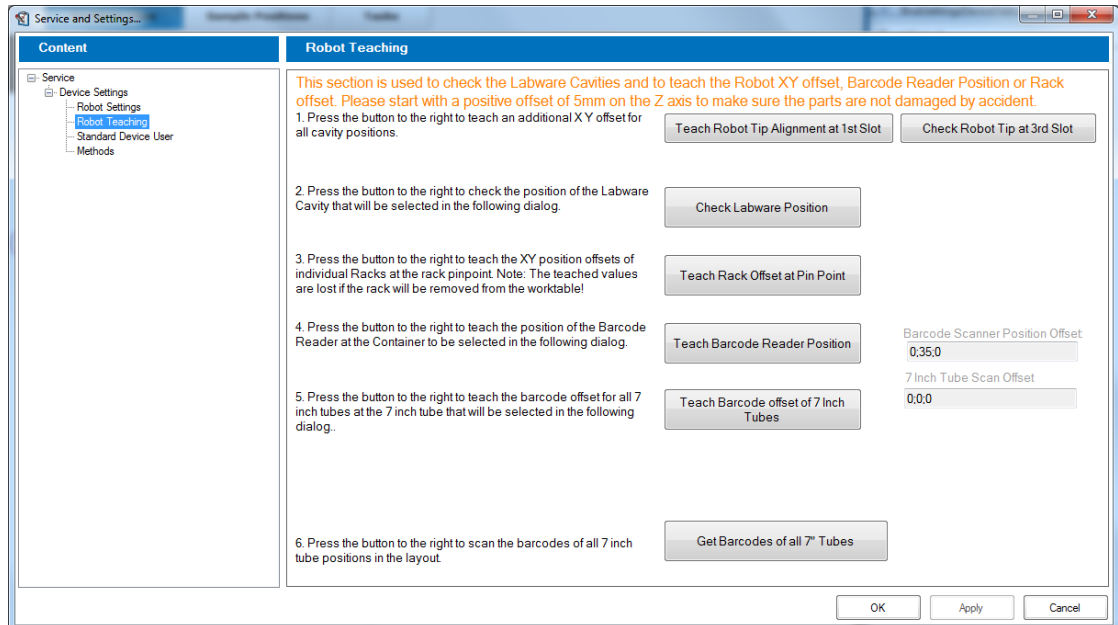


Figure 7.5: Robot Teaching

Perform the tasks in the order listed here:

1. Teach the Robot Tip Alignment at 1st slot” to teach an XY offset for all cavity positions,
 - see [Teaching the Robot Tip Alignment \[46\]](#).
 - Check the Robot Tip at 3rd slot” to check the XY offset for all cavity positions.
 - see [Checking the Robot Tip Alignment \[48\]](#).
2. Perform [Checking the Labware Position \[50\]](#) to check the position of the selected Labware Cavity.
3. Perform [Teaching the Rack Offset at Pin Point \[52\]](#) to teach the XY position offsets of individual Racks at the rack pinpoint.
4. Perform [Teaching the Barcode Reader Position \[54\]](#) to teach the position offset between the needle and the Barcode Reader.
5. Perform [Teaching the Barcode Offset of 7 Inch Tubes \[56\]](#) to teach the barcode offset for all 7 inch tubes at the selected 7 inch tube.
6. Perform [Getting Barcodes of All 7 Inch Tubes \[58\]](#) to check the Barcode Reader XY offset values .



The teaching values are lost if the rack will be removed from the worktable!

See also

- 📖 [Robotic System Teaching \[45\]](#)

7.2.1.3 Standard Device User

Select the access mode **Service** when the service settings pages should be available after restarting the program.

Select the access mode **Guest** when the service settings pages should not be available after restarting the program.

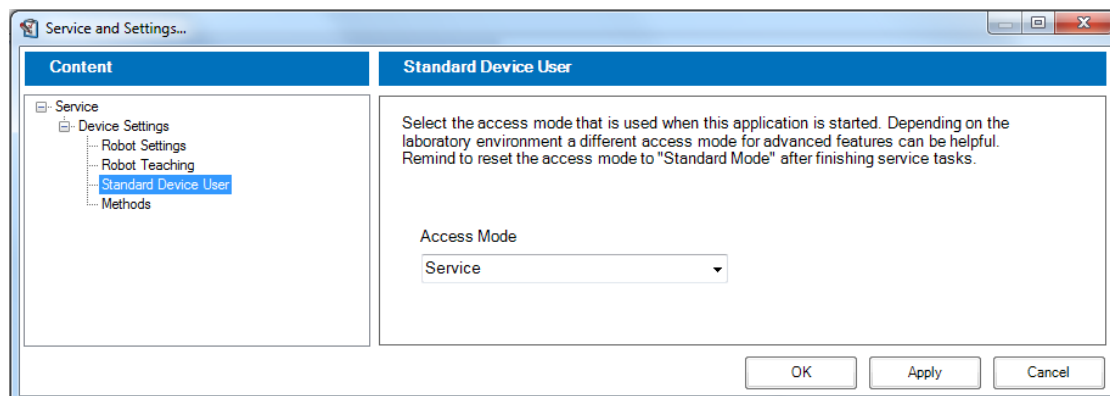


Figure 7.6: Standard Device User

7.2.1.4 Methods

The first version of *SamplePro Control* is delivered with the following pre-defined methods:

BRUKER Transfer Basic

Method designed for transfer of sample into 5mm NMR tubes. The method can be used as start method for other transfer methods.

With the defined standard parameters a volume variation <1% and contamination with system solvent <2.9% is reached.

BRUKER Transfer HQ1

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

With the defined standard parameters highest reproducibility (volume variation is <0.5%) and lowest contamination with system solvent (<0.3%) is reached also the lowest contamination with the before prepared sample is <0.1% A waste volume of 150% is used.

BRUKER Transfer HQ2

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

With the defined standard parameters highest reproducibility (volume variation is <0.5%) and lowest contamination with system solvent (<0.8%) is reached also the lowest variation of pH value (variability of chemical shift of tataric acid) is <0.5Hz A waste volume of 50% is used.

BRUKER Prepare Basic

Method designed for preparation of 600ul mixture of sample with Additive (90:10) in 5mm NMR tubes.

The mixture is performed directly in the destination tube. The method can be used as start method for other preparations.

BRUKER Prepare MS

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

Non-deuterated MS additive is used and the mixing is done in the target container.

BRUKER Special Fill600

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

BRUKER Special Empty600

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

Other methods may also be in development by Bruker, contact your local Bruker representative for more information.

7.3 Backing up the Settings Configuration

Before making any setting changes and after making the changes, always use the **Export To File** button to back up the settings. The exported settings can be restored at any time using the **Import From File** button (see ["Import/Export Settings" on page 79 \[▶ 43\]](#)).

7.4 Importing, Exporting and Restoring Device Settings

In the device settings area, it is possible to export, import or restore the device settings. The device configuration files can be found in the following directories:

C:\ProgramData\bruker\SamplePro Tube\SampleProTubeGui\config

C:\Users\AppData\Local\bruker\SamplePro Tube\SampleProTubeGui\config

C:\ProgramData\bruker\SamplePro Tube\SampleProTubeGui\logs

C:\Users\AppData\Local\Temp\bruker\SamplePro Tube\SampleProGui\logs

Restore Settings

The **Restore Default Settings** button is used when the system is already installed to either:

Restore the factory defaults.

Restore the installation settings, that were saved with the **Create Installation Restore Point** button.

Installation Restore Point

When the installation of the device is complete and the acceptance test was successfully performed, an installation restore point should be established.

To do this, press the **Create Installation Restore Point** button.

Import/Export Settings

The Import/Export Settings buttons can be used to exchange settings between similar systems or to have a backup of an external file system.

After a successful installation, or before testing or changing the device settings, the settings should be stored using the **Export To File** button.

The settings that were saved can be restored using the **Import From File** button.

If necessary, the zipped export file can also be sent to Bruker for troubleshooting purposes.

See the sections [Troubleshooting \[▶ 131\]](#) and [History Files and Log Files \[▶ 131\]](#) for more information.

7.5 The Robot Device Manager

The robot device manager settings are used only by the program developers and therefore are not explained in this manual.

8 Verification and Calibration

8.1 Pre-Test Checklist

The installation must be completed as described in the chapter Installation.

The system must be configured as described in the chapter [System Configuration](#) [▶ 37].

The parallelism of the arm alignment must be checked as described in the chapter [Teaching with Sias Alignment Tool](#) [▶ 58].

8.2 Robotic System Teaching

This section is used to check and teach the main robot positions.

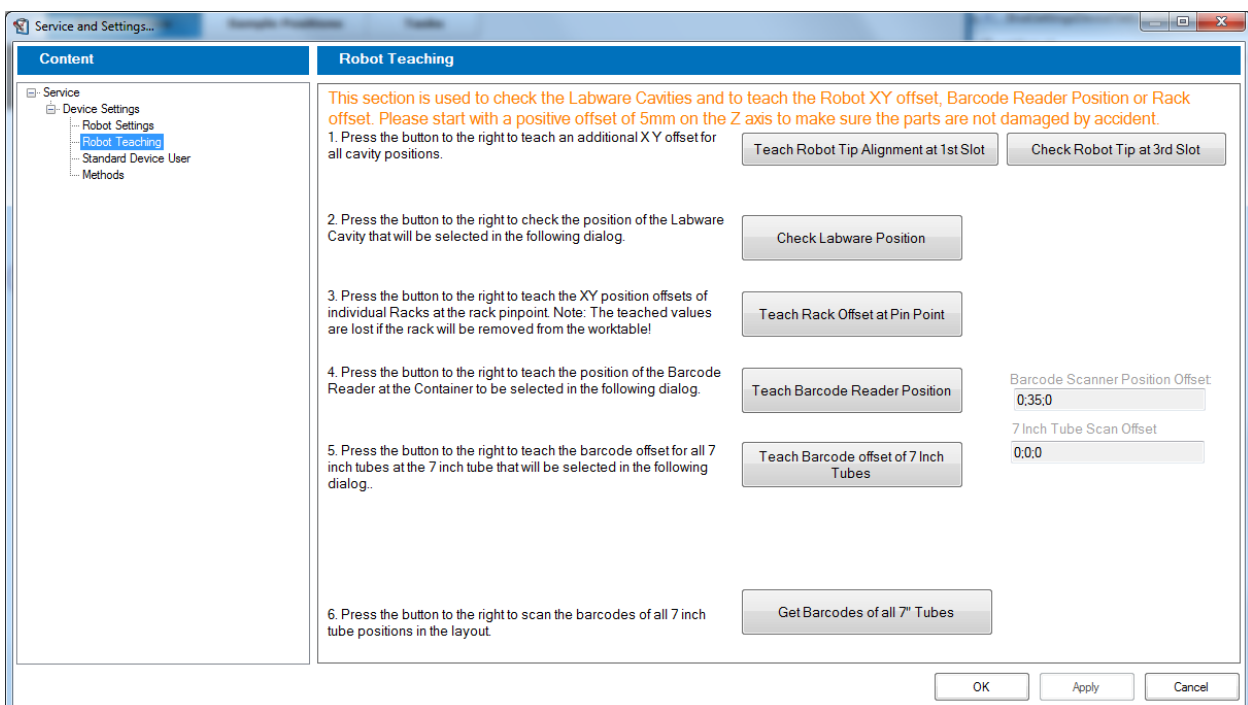


Figure 8.1: Robot Teaching Main Window

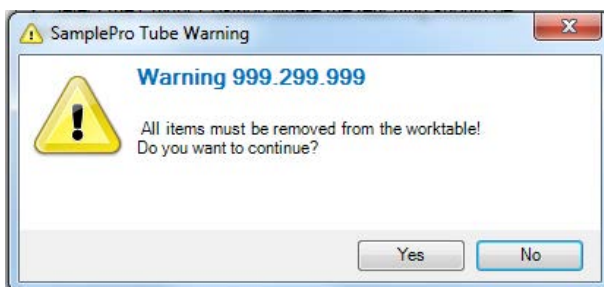
The basic steps to teach the robot are as follows, refer to the links for details on each step:

1. Teach an XY offset for all cavity positions - see [Teaching the Robot Tip Alignment](#) [▶ 46].
2. Check the XY offset for all cavity positions - see [Checking the Robot Tip Alignment](#) [▶ 48]).
3. Check the position of the selected Labware cavity - see [Checking the Labware Position](#) [▶ 50].
4. Teach the XY position offsets of individual racks at the rack pinpoint - see [Teaching the Rack Offset at Pin Point](#) [▶ 52].

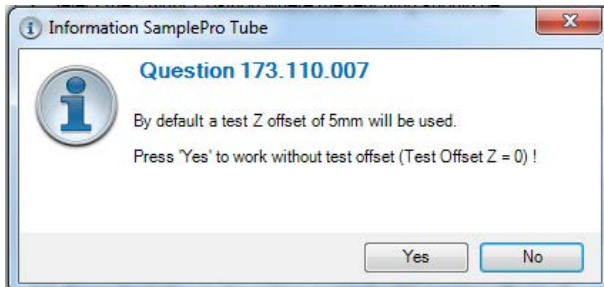
5. Teach the position offset between the needle and the barcode reader, see [Teaching the Barcode Reader Position](#) [▶ 54].
6. Teach the barcode offset for all 7 inch tubes at the selected 7 inch tube - see - [Teaching the Barcode Offset of 7 Inch Tubes](#) [▶ 56].
7. Check the barcode reader XY offset values, see [Getting Barcodes of All 7 Inch Tubes](#) [▶ 58].

8.2.1 Teaching the Robot Tip Alignment

1. Press the **Teach Robot Tip Alignment at 1st slot** in the main teaching dialog.
 - ▶ The following window will appear:



2. Remove all objects from the work table and place the empty teaching decktray in the first slot of the work table. Press **Yes** to continue.
 - ▶ The following window will appear:



3. When no mechanical changes have been done since the last check you can answer with **Yes**.
4. When the needle or software has been changed since the last check answer with **No** to begin the teaching with a safer 5 mm test offset.
 - ▶ The teaching dialog will then open.

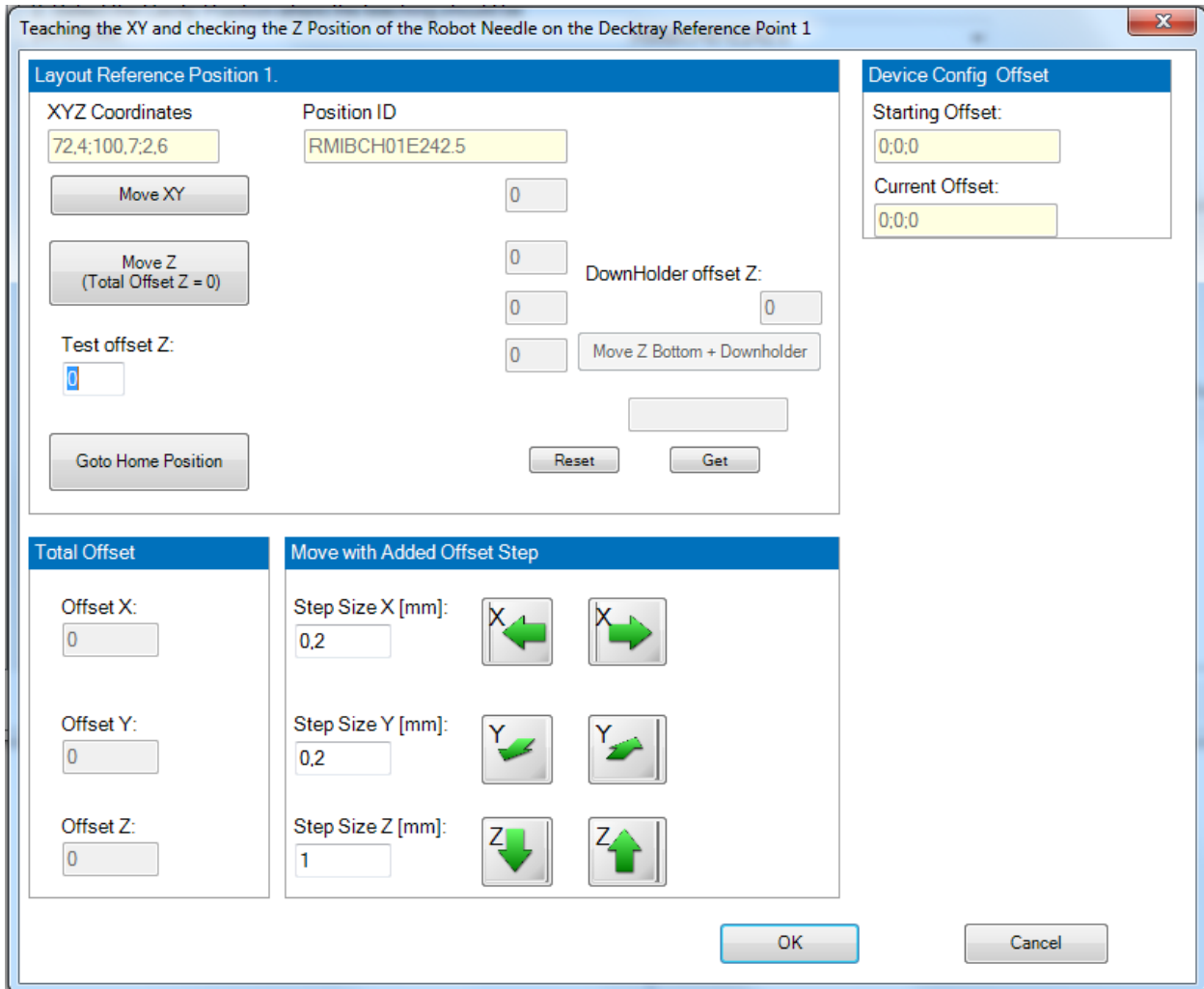


Figure 8.2: Robot Teaching Alignment 1

5. Press the **Move XY** button to move to the XY position with the needle up in the home position.
6. Press the **Move Z** button to move the needle down to the base Z position of the cavity.
7. Define the value of the step size for small movements of X, Y, or Z axis in the edit fields "Step Size ...". When you selected a test offset Z of 5 mm in response to Question 173.110.007, carefully decrease the step size (e.g. 1 mm or 0.2 mm) in the Offset Z to avoid breaking the needle.



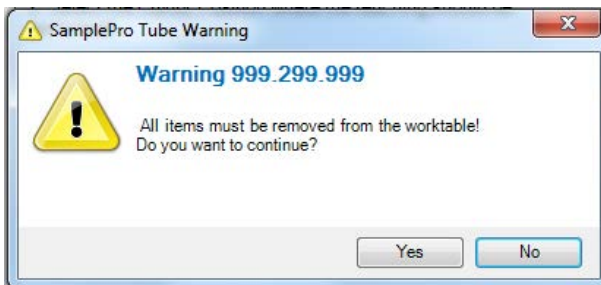
If you are not sure what the decimal delimiter of your operating system ('.' or ';') is, do not check this with a "Z Down" movement, as this may damage of the needle. Use "Z Up" to check it using a step size of e.g. 0.5 mm and watch if the real movement is 5 mm or 0.5 mm.

8. Check if the position of the top of the needle is in the range of 0.2 mm to 0.6 mm over the decktray.
 - When the needle is not within this range you may need to teach the Z-axis alignment - see [Teaching with Sias Alignment Tool \[58\]](#).
9. Check the position of the needle compared with the **rear** mark (reference point) on the teaching decktray.
10. When the position is correct press the **OK** button.

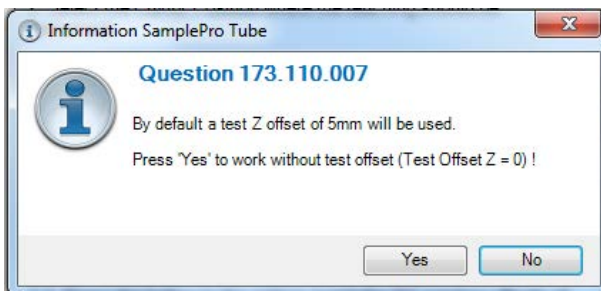
11. When the position is not correct, set the step size to appropriate values (e.g. 0.2 mm), then use the arrows to the right of the step size to move the needle of the cross position on the teaching decktray. When the correct position is achieved press the **OK** button.
12. Press the **Goto Home Position** button.

8.2.2 Checking the Robot Tip Alignment

1. Press the **Check Robot Tip at 3rd Slot** button in the main teaching dialog.
 - The following window will appear:



2. Remove all objects from the work table and place the empty teaching decktray in the 3rd slot of the worktable! Press **Yes** to continue.
 - The following window will appear:



3. When no mechanical changes have been done since the last check you can answer with **Yes**.
 4. When the needle or software has been changed since the last check answer with **No** to begin the check with a safer 5 mm test offset.
- ⇒ The **Checking the XYZ Position of the Robot Needle** dialog will then open.

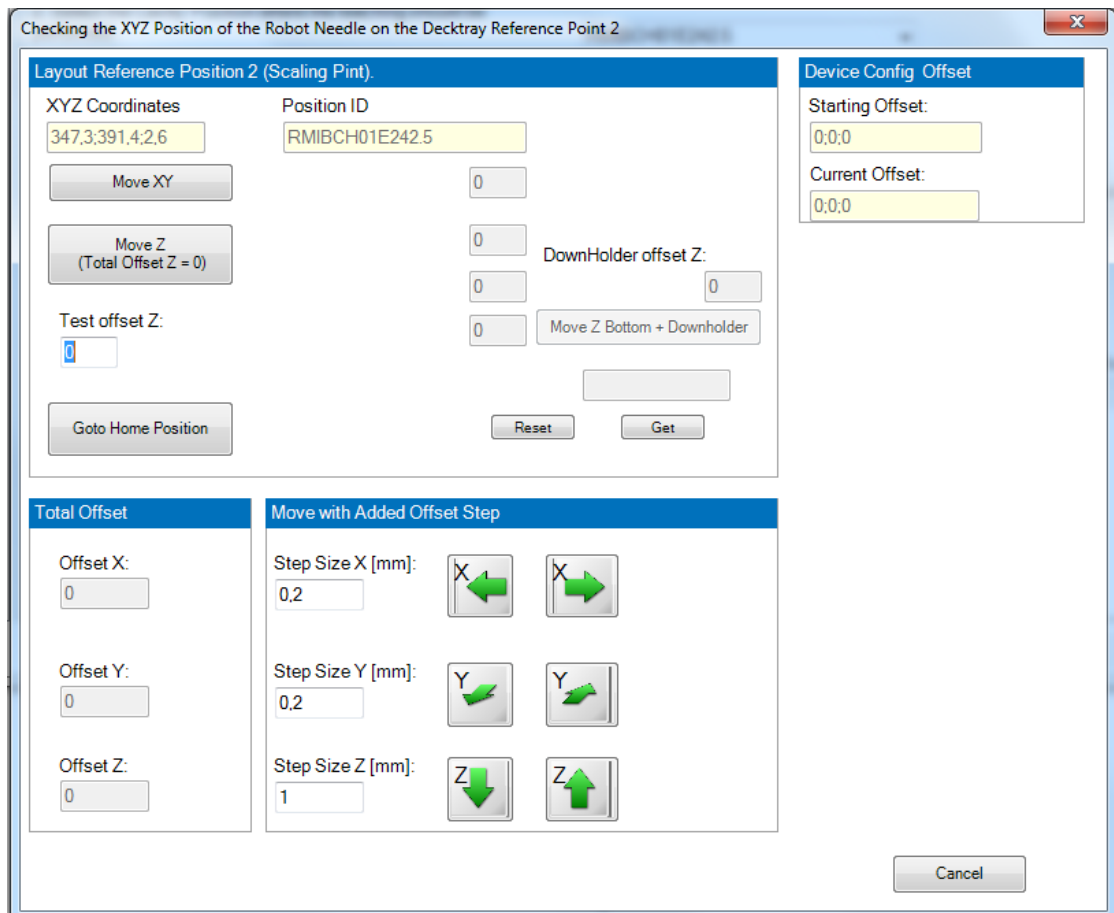


Figure 8.3: Checking the XYZ Position of the Robot Needle

1. Press the **Move XY** button to move to the XY position with the needle up in the home position.
2. Press the **Move Z** button to move the needle down to the base Z position of the cavity.
3. Define the value of the step size for small movements of X, Y, or Z axis in the edit fields "Step Size ...". When you selected a test offset Z of 5 mm in response to Question 173.110.007, carefully decrease the step size (e.g. 1 mm or 0.2 mm) in the Offset Z to avoid breaking the needle.

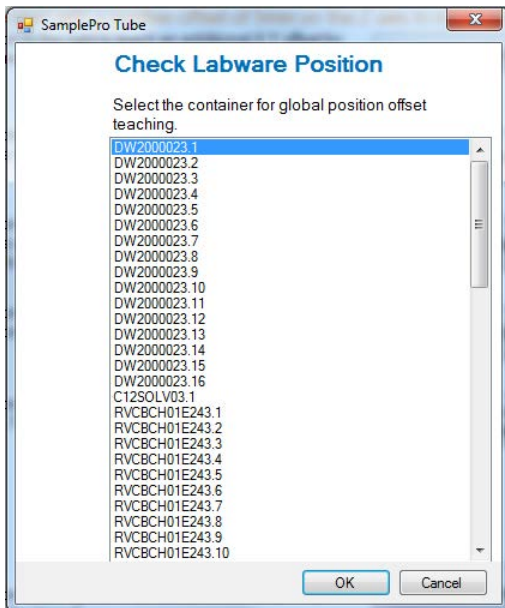


If you are not sure what the decimal delimiter of your operating system ('.' or ',') is, do not check this with a "Z Down" movement, as this may damage of the needle. Use "Z Up" to check it using a step size of e.g. 0.5 mm and watch if the real movement is 5 mm or 0.5 mm.

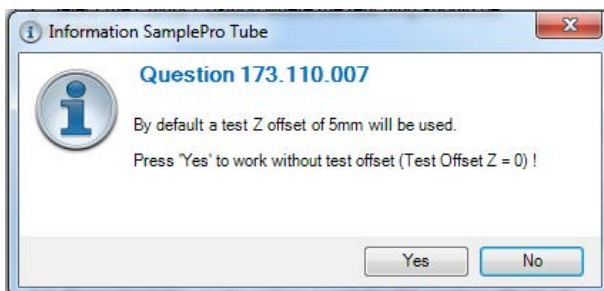
4. Check if the position of the top of the needle is in the range of 0.2 mm to 0.6 mm over the decktray.
 - When the needle is not within this range you may need to teach the Z-axis alignment - see [Teaching with Sias Alignment Tool \[58\]](#).
5. Check the position of the needle compared with the **rear** mark (reference point) on the teaching decktray.
6. When the position is correct press the **OK** button.
7. When the position is not correct, use the [Teaching with Sias Alignment Tool \[58\]](#) to teach the Z axis alignment.
8. Press the **Goto Home Position** button.

8.2.3 Checking the Labware Position

1. Press the **Check Labware Position** button in the main teaching dialog.
 - The following window will appear:



2. Select the cavity position where the teaching should be performed from the pull-down menu.
 - The following window will appear:



3. When no mechanical changes have been done since the last check you can answer with **Yes**.
 4. When the needle or software has been changed since the last check answer with **No** to begin the teaching with a safer 5 mm test offset.
- ⇒ The **Checking the XYZ Positions for the Selected Cavity** dialog will open, whereas the XYZ coordinates of the selected cavity will be displayed in the upper left corner:

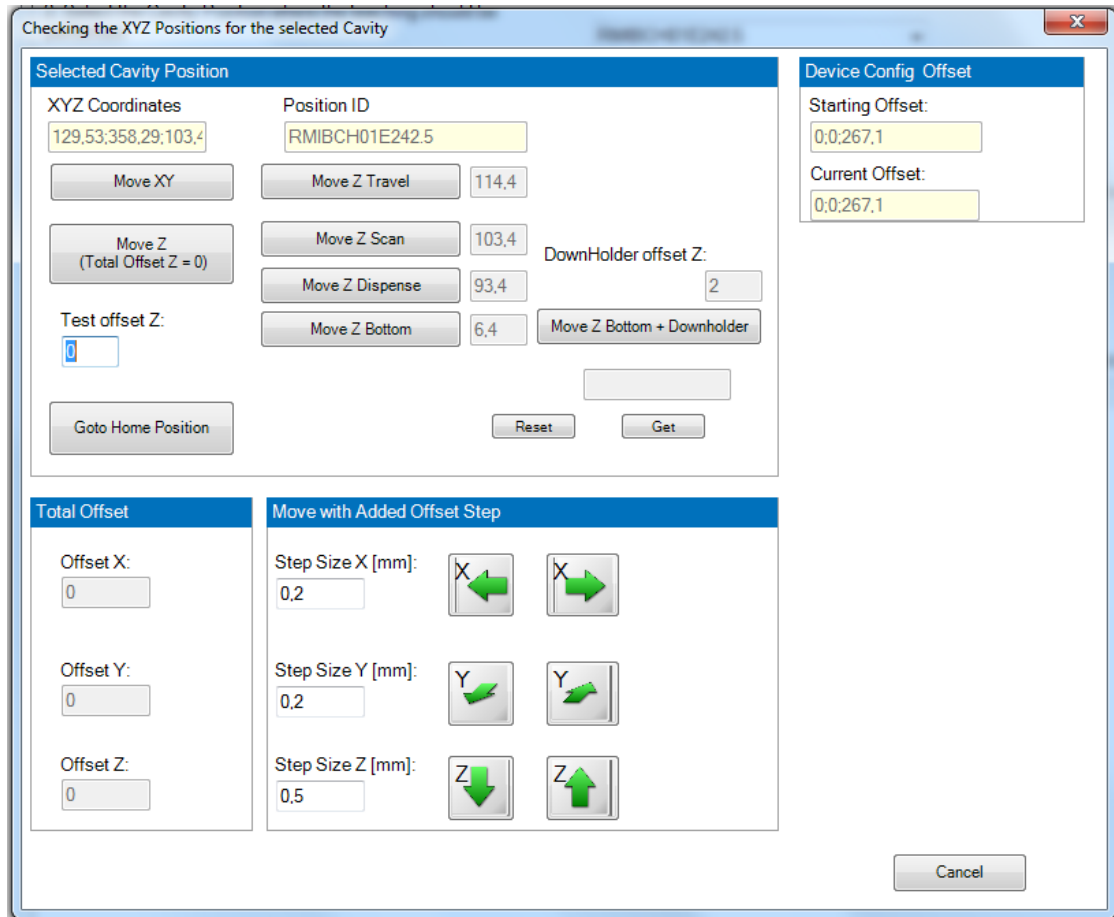


Figure 8.4: Checking the XYZ Positions for the Selected Cavity

1. Press the **Move XY** button to move to the XY position with the needle up in the home position.
2. Press the **Move Z** button to move the needle down to the base Z position of the cavity.
3. Define the value of the step size for small movements of X, Y, or Z axis in the edit fields "Step Size ...". When you selected a test offset Z of 5 mm in response to Question 173.110.007, carefully decrease the step size (e.g. 1 mm or 0.2 mm) in the Offset Z to avoid breaking the needle.



If you are not sure what the decimal delimiter of your operating system ('.' or ',') is, do not check this with a "Z Down" movement, as this may damage of the needle. Use "Z Up" to check it using a step size of e.g. 0.5 mm and watch if the real movement is 5 mm or 0.5 mm.

4. Use the **Move Z Travel** button and/ or the **Z Down arrow** button with the selected step size (e.g. 1 mm) to move the needle closer to the top of the cavity.
5. Check if the position of the top of the needle is in the center of the cavity.
6. When the needle can enter into the cavity without problems, check the other Z positions of the cavity using the **Move Z Scan**, **Move Z Dispense** and **Move Z Bottom** buttons. The positions that are used depend on the selected pipetting method used during pipetting (do not use these buttons if the cavity is closed with a septum!).
7. When the correct position can not be obtained, contact Bruker service.
8. When the selected cavity is closed with a septum, you can use the **Move Z Bottom + Downholder** button to check the correct needle and down holder position used during pipetting.

9. Press the **Goto Home Position** button.

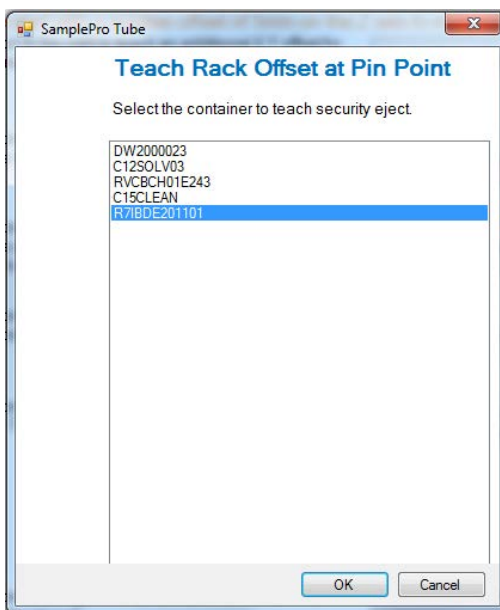
8.2.4 Teaching the Rack Offset at Pin Point



The teaching values are lost when the rack is removed from the worktable!

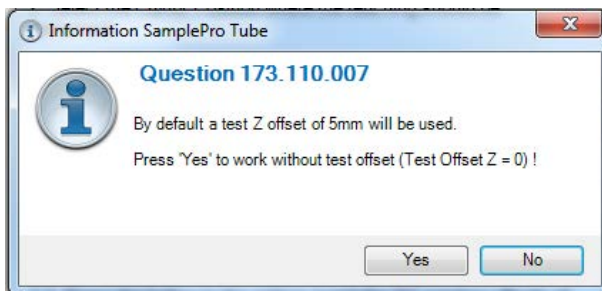
1. Press the **Teach Rack Offset at Pin Point** button in the main teaching dialog to teach the XY position offsets of individual racks at the rack pinpoint.

► The following window will appear:



2. Select the cavity position where the teaching should be performed from the pull-down menu.

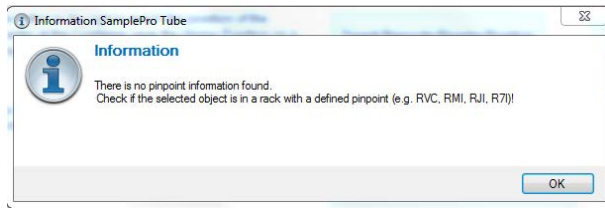
► The following window will appear:



3. When no mechanical changes have been done since the last check you can answer with **Yes**.

4. When the needle or software has been changed since the last check answer with **No** to begin the teaching with a safer 5 mm test offset.

► When pin point teaching, a cavity of a rack with a defined pin point (e.g. type 'RVC', 'RMI', 'RMF', 'RJ', 'RJF', 'R7I') must be selected, otherwise the following information will be displayed:



- The teaching dialog will appear with the XYZ coordinates of the selected rack pin point are displayed in the upper left corner:

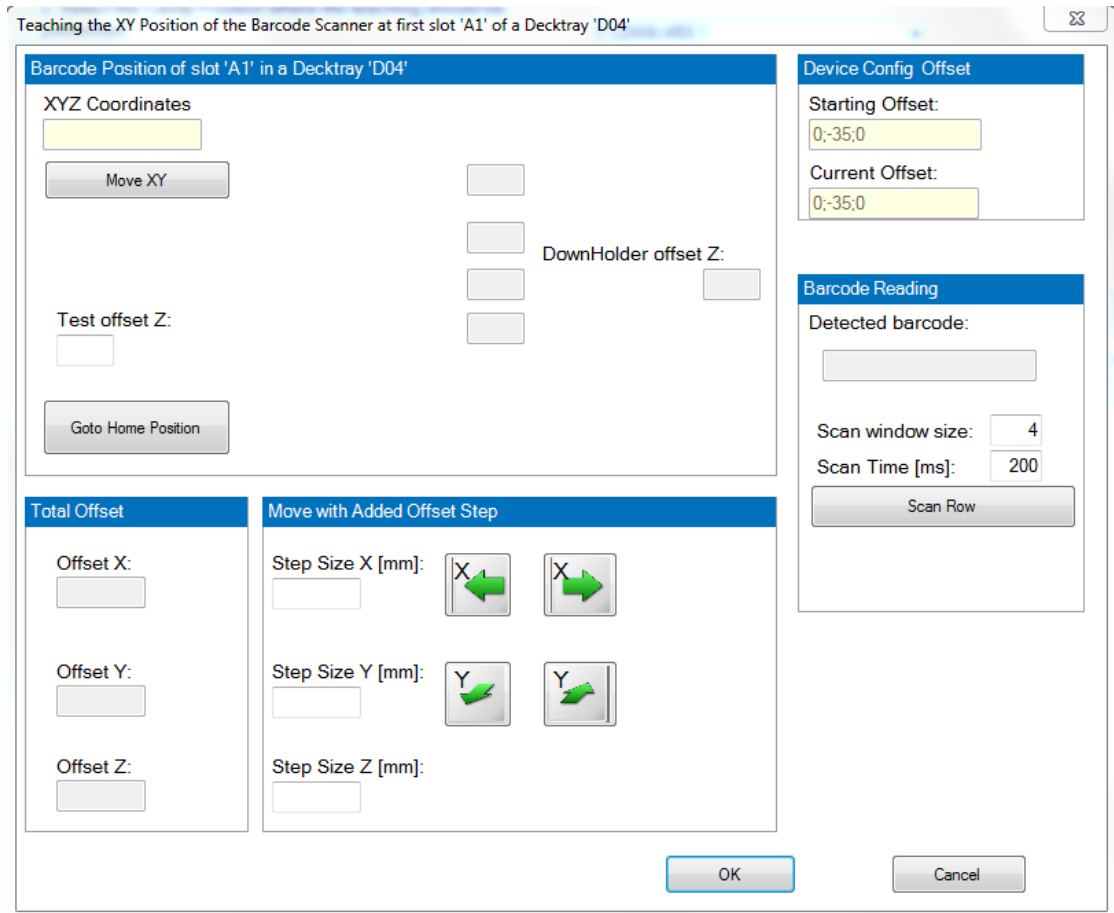


Figure 8.5: Robot Teaching Rack Pin Point

5. Press the **Move XY** button to move to the XY position with the needle up in the Z home position.
6. Press the **Move Z** button to move the needle down to the Z position of the pinpoint.
7. Define the value of the step size for small movements of X, Y, or Z axis in the edit fields “Step Size ...”.



If you are not sure what is the decimal delimiter of your operating system (‘.’ or ‘;’) never check this with a “Z Down” movement to avoid a damage of the needle, check it with “Z Up” using a step size of e.g. 0.5 mm and watch if the real movement is 5mm or 0.5 mm!

8. When you selected a test offset Z of 5mm, use the “**Z Down**” **arrow** button with the selected step size (e.g. 1 mm) to move the needle closer to the top of the pinpoint until the Test offset Z + Offset Z = 0.
9. Then check if the XY position of the top of the needle is inside or on the border of the pinpoint circle.

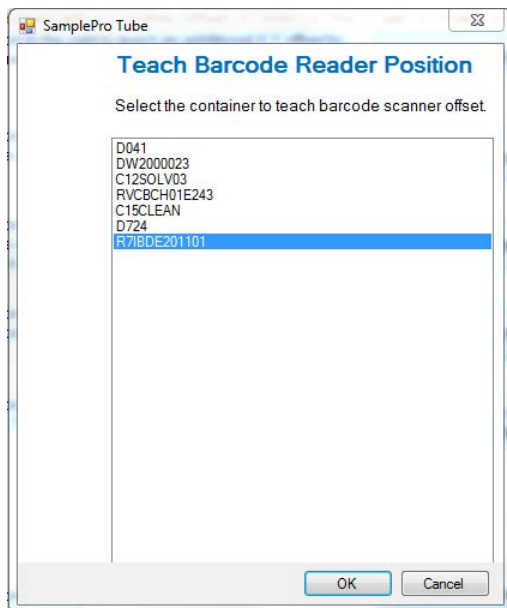
10. Check if the Z position of the top of the needle is in the range of 0.2 mm to 1 mm over the rack pinpoint.
11. When the Z position is within this range, press the **Goto Home Position** button.
12. When the Z position is not within this range, and the rack is correctly placed in the decktray
 - ▶ Continue with the rack pinpoint teaching, small differences can be corrected using the X, Y, and Z arrow buttons and the result saved using with the "OK" button. Especially recheck the Z value to avoid damaging the needle!
 - ▶ Recheck all the base adjustments - see [Pre-Test Checklist \[p. 45\]](#)
 - ▶ When the problem can not be identified or corrected, contact Bruker service.



The X, Y, and Z teaching values are an offset from all the object positions inside the rack, but will be lost if the rack will be removed from the worktable and reinserted!

8.2.5 Teaching the Barcode Reader Position

1. Press the **Teach Barcode Reader Position** in the main teaching dialog to teach the position offset between the needle and the Barcode Reader..
 - ▶ The following window will appear:



2. Select the rack or decktray where the teaching should be performed from the pull-down menu.
 - ▶ The teaching dialog window will appear:

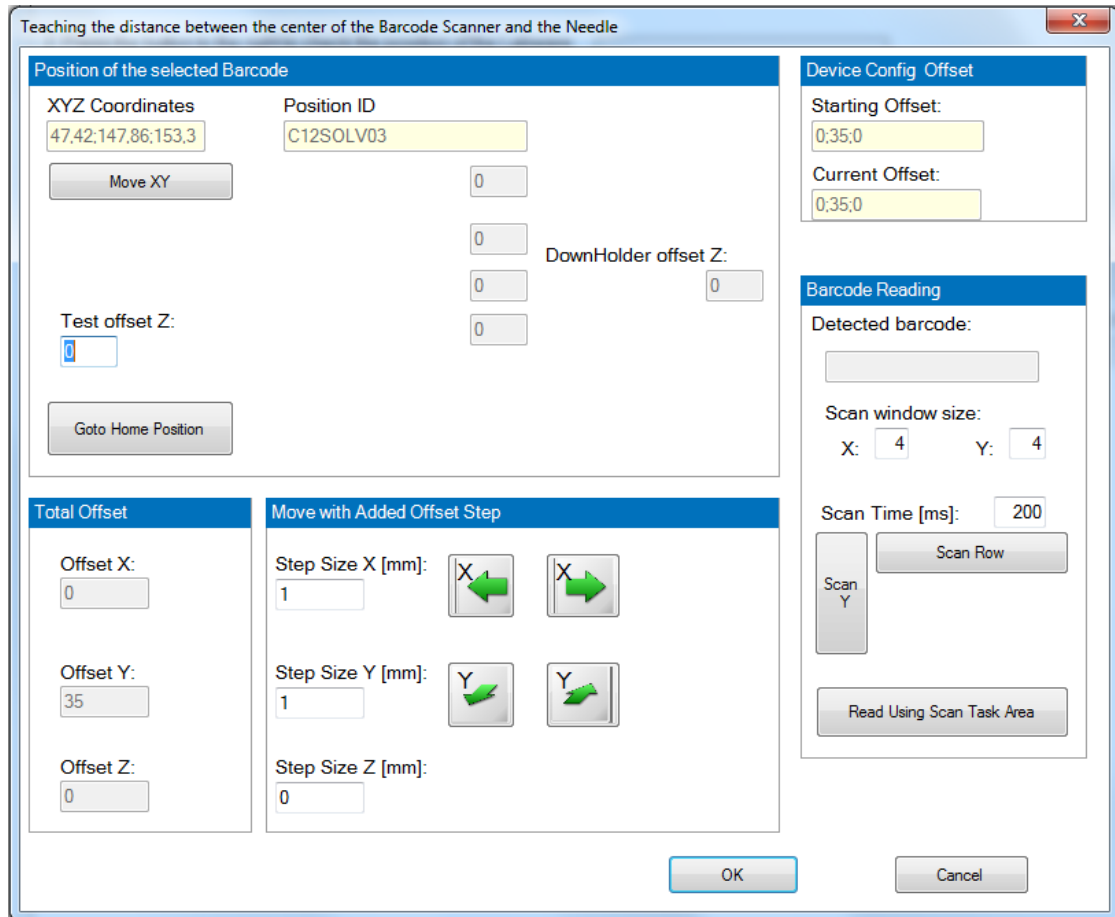


Figure 8.6: Robot Teaching Barcode Scanner

3. Press the **Move XY** button to move the barcode reader over the barcode at the selected rack.
 - The barcode reading result inside the defined Scan Time (default is 200 milliseconds) will be displayed in the field **Detected barcode**. If you hear a “peep” signal on the reader, but no result is displayed in the **Detected barcode** field, you might increase the scan time until the result is displayed.

By using the X and Y arrow buttons you can check if the best reading position needs an X or Y correction offset. This offset is valid for all decktray and rack positions.

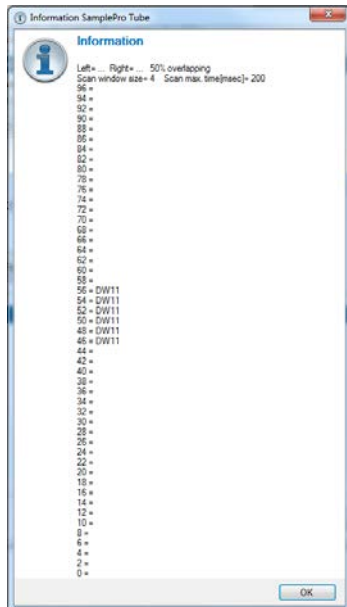
A correction offset can be saved using the **OK** button and with the **Apply** button in the main teaching dialog.

The barcode reading can be checked:

- with different racks or decktrays inserted at the selected position.
- without a rack inserted reading the empty position barcode “X...” on the decktray or worktable.
- or by holding a label in this position.

Special Detail Barcode Reader Tests

If problems occur when reading the rack barcode the **Scan Row** or **Scan Y** button can be used to read with different software defined windows at all Y positions of the visible range of the reader. With a default scan window size of 4% and a 200 ms scan time the hole scan takes about 15 seconds and the results are displayed in the following window:

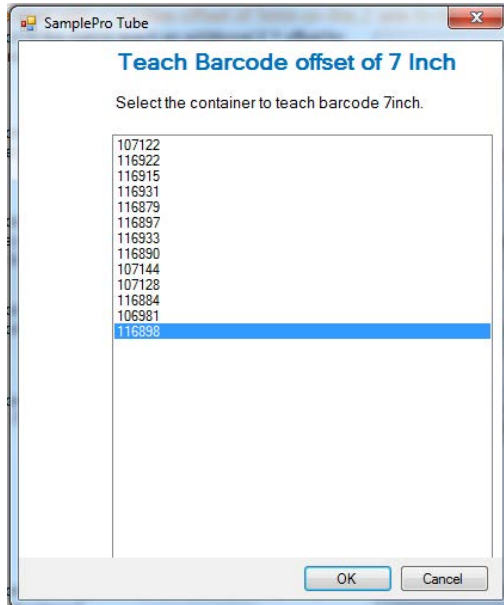


The positions “48”, “50”, and “52” are overlapping windows under the reader and typically the barcode can be read at this positions. When the barcode can only be read in other positions, reflection problems may be the reason. Check the correct position of the barcode on the rack, the barcode quality and perform a test using the button “Read Using Scan Task Area” with a larger scan area window or contact Bruker.

When using the **X** and **Y** arrow buttons or the **Move XY**, **Scan Row** or **ScanY** buttons the selected scan window size (default = 4%) will be used for barcode reading. This small window is good for checking the correct position. In the program task when scanning all objects of the Layout a much larger window will be used to get best reading results. You can check barcode reading with this larger window by pressing the **Read Using Scan Task Area** button . If a Barcode could not be read using this button perhaps a major reflection or barcode quality problem may be the reason. Please try with other new barcodes or contact Bruker.

8.2.6 Teaching the Barcode Offset of 7 Inch Tubes

1. Press the **Teach Barcode offset of 7 Inch Tubes** button in the main teaching dialog.
 - The following window will appear:



2. Select the 7Inch tube position where the teaching should be performed from the pull-down menu.
 - The teaching dialog window will appear

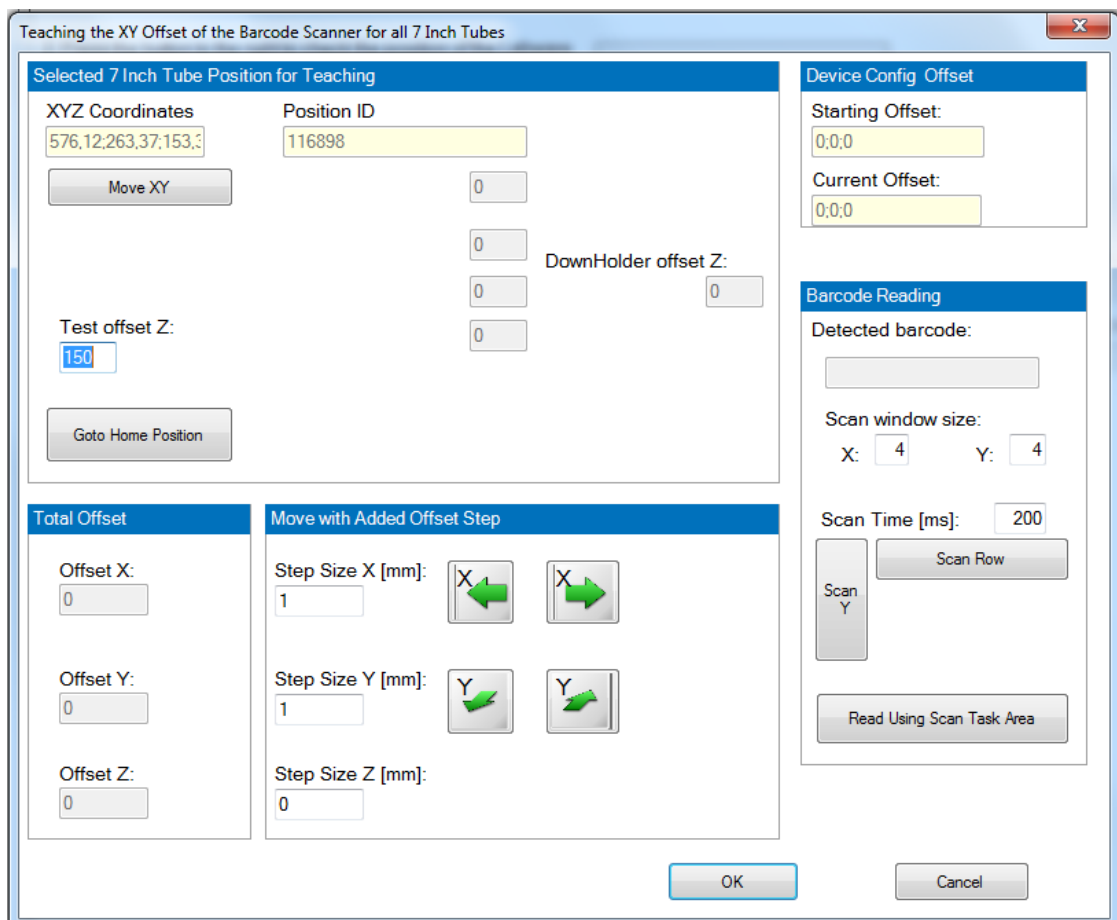


Figure 8.7: Robot Teaching Barcode Scanner 7 Inch Tubes

3. Press the **Move XY** button to move the barcode reader over the barcode reading position of the selected 7 inch tube.

- The barcode reading result inside the defined Scan Time (default is 200 milliseconds) will be displayed in the field **Detected barcode**. If you hear a “peep” signal on the reader, but no result is displayed in the “Detected barcode” field, you can increase the scan time so the result is displayed in the field.

By using the X and Y arrow buttons you can check if the best reading position needs an X or Y correction offset. This offset is valid for 7 inch tubes.

A correction offset can be saved using the **OK** button and with the **Apply** button in the main teaching dialog.

Special Detail Barcode Reader Tests

If problems occur when reading the tube barcode the **Scan Row** or **ScanY** or **Read Using Scan Task Area** buttons can be used – see [Teaching the Barcode Offset of 7 Inch Tubes \[p 56\]](#).

8.2.7 Getting Barcodes of All 7 Inch Tubes

1. Press the **Getting Barcodes of All 7 Inch Tubes** button in the main teaching dialog.
 - All 7 Inch tubes in the current layout will be scanned and the results will be displayed in an information window.

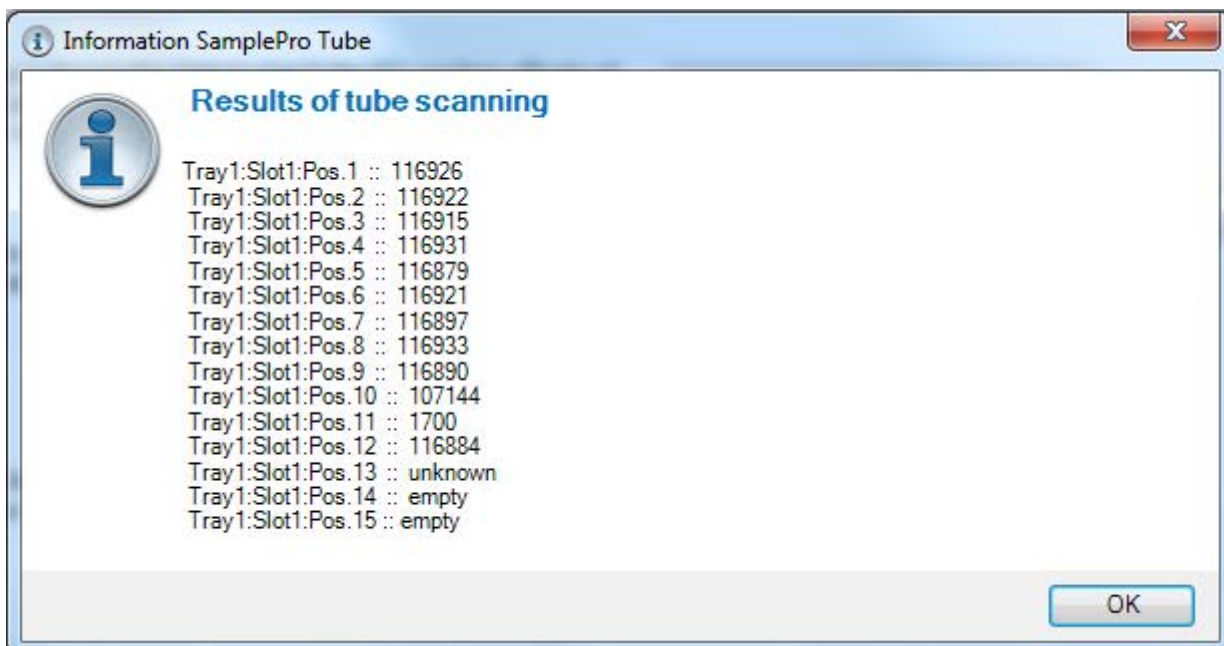


Figure 8.8: Robot Teaching Results 7 Inch Tube Scanning

8.3 Teaching with Sias Alignment Tool

8.3.1 Introduction

The installation check using the Xantus Alignment Tool is part of the Nelson and Software Development Kit (SDK). It is used during the installation of the Xantus to align the layout with the robot. The alignment procedure should be executed if the positioning is inaccurate.



Before using the Xantus Alignment Tool make sure that the arm(s), tip(s) and handler are perfectly adjusted mechanically (perpendicularity and parallelism).

When the instrument has not been used for several days, move the arm(s) several times over the entire X range using an X-Util script in order to recover the X belt flexibility. Ensure that the belt tension is within specifications.



Figure 8.9: Teaching Decktray, Part Number 101525

8.3.2 Installation

8.3.2.1 Standardized Installation Procedure

If you use the standard folder structure:

1. Copy the file "*XantusAlignmentTool.exe*" in the "Nelson base" folder.

8.3.2.2 Customized Installation Procedure

If you use a customized folder structure:

1. Extract "*XantusAlignmentTool.zip*" anywhere on your PC. Ensure that the "PCAN-driver" is already installed.
2. Copy the robot configuration file to be checked into the directory "*XantusAlignmentTool\Data\Devices*".
3. Copy a layout-xml-file into the folder "*XantusAlignmentTool\Data\Layouts*".
 - It should contain some decktrays and at least one MTP in order to test the accuracy after the alignment procedure. Three test layouts are already provided.
4. Change the item `<DefaultRobot>` in the configuration file *sias.config.xml* to the name of your robot configuration file. The current definition is "Default.Robot.xml".
5. Change the item `<DefaultLayout>` in the configuration file *sias.config.xml* to the name of your layout file. The current definition is "Default.Layout.xml".

8.3.3 Verification and Alignment



To achieve the best possible accuracy it is recommended to use the "Teaching Tip for robot alignment" (part # 101484).

1. Remove all modules and accessories from the deck.
2. If a "Teaching Tip for robot alignment" is used, install it at the tip 1 position.
3. Place the Teaching Decktray on the 2nd slot from the left.

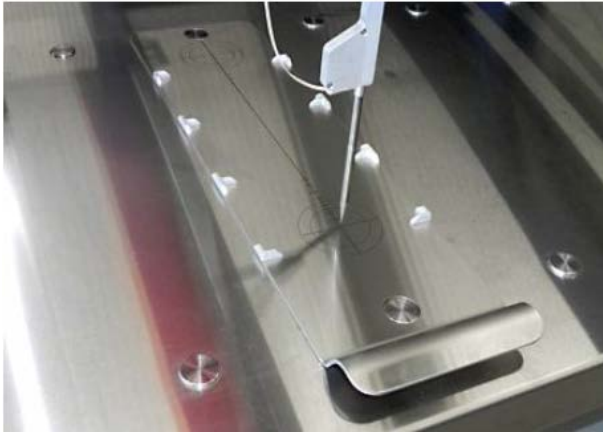


Figure 8.10: Placing the Teaching Decktray on the Deck

CAUTION

Accident hazard

Before starting the alignment verification check that the tip #1 is straight and perpendicular using a square.

4. Browse to the "XantusAlignmentTool.exe" application and create a shortcut on the desktop.
5. Right click on the shortcut icon and select **Properties**.
6. Add " /Service" (no quotes, include the space before the slash) at the end of the path string in the "Target" field.
7. Select the **General** tab and enter "**Service**" in the top field.
 - This renames the shortcut on the desktop.
8. Click **OK**.

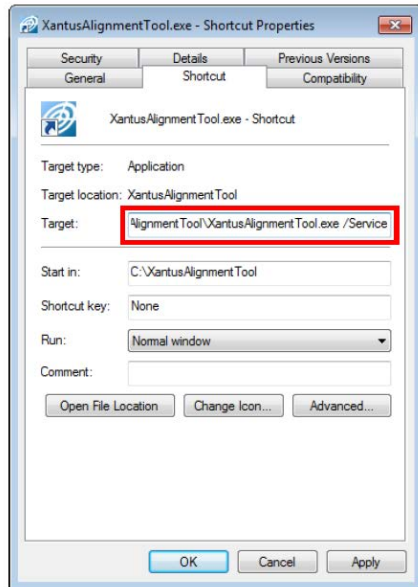


Figure 8.11: Modifying the Target Path

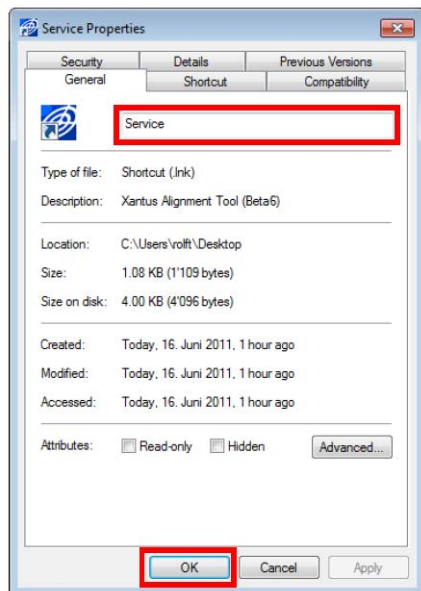
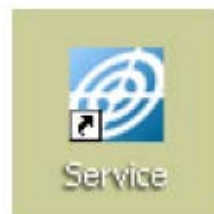


Figure 8.12: Renaming the Shortcut Icon



9. Double click the **Service** icon on the desktop.
10. Click **Open** to continue.

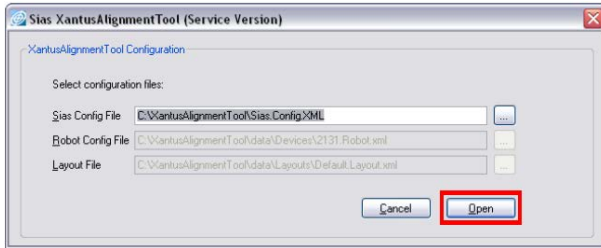


Figure 8.13: Starting the Alignment Tool

8.3.3.1 Measure X-Ranges and Y-Ranges

1. Select tab **Measure X-Ranges and Y- Ranges**.

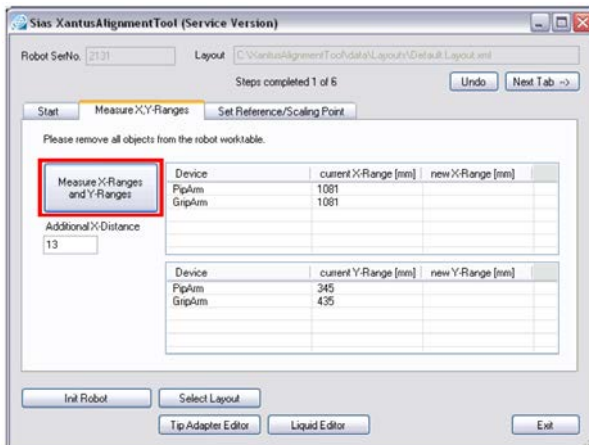


Figure 8.14: Clicking the **Measure** Button

2. Ensure the deck is empty except for the Teaching Decktray in the 2nd slot from the left. Confirm by pressing **Yes**.

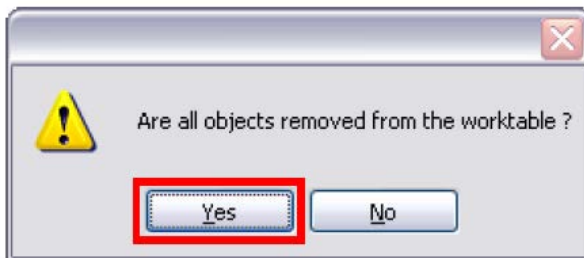


Figure 8.15: Starting the Procedure

8.3.3.2 Set Reference/Scaling Point

1. Select the **Set Reference/Scaling Point** tab.
2. Click **Check Reference Point** to open the **Position Teaching** window.

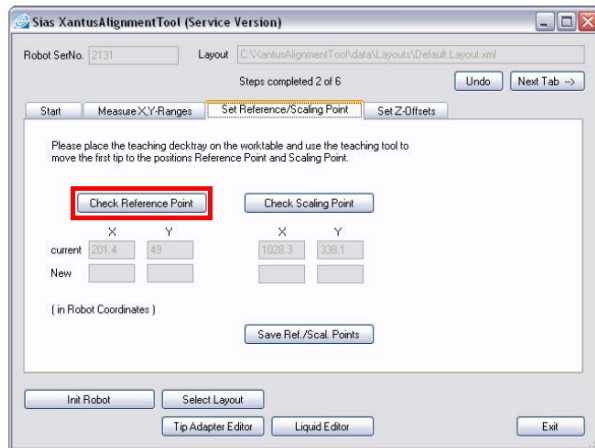


Figure 8.16: Selecting **Check Reference Point**

3. Click **Init**.
4. Click **Move** to Position.
 - The tip moves to position **Reference Point**.
5. Check the position of the tip compared with the rear mark (Reference Point) on the Teaching Decktray.



The setting procedure has to be terminated with Store Position regardless whether the setting has been changed or not. If not the error message shown below is displayed and the procedure has to be repeated.

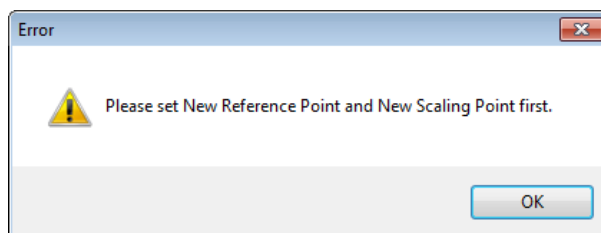


Figure 8.17: Error Message

6. If **OK** click **Store Position**. If not **OK**, click the arrow buttons for X-axis and the Y-axis to move the tip over the cross as precisely as possible. Set the move units to appropriate values (e.g. 0.2 mm) before clicking the arrow keys. Click **Store Position** to save the new position.

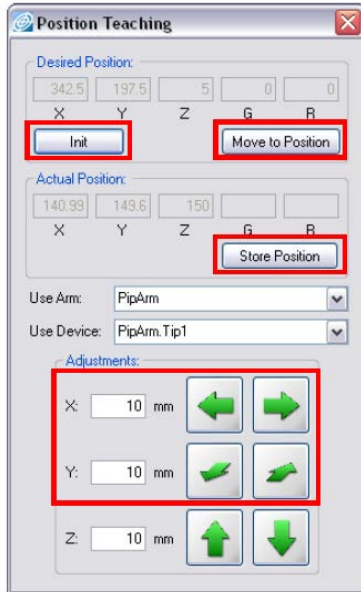


Figure 8.18: Teaching the Reference Point

7. Click **Check Scaling Point** to open the **Position Teaching** window.

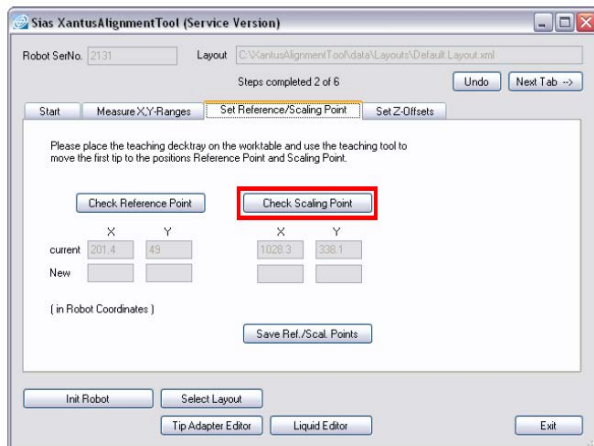


Figure 8.19: Selecting **Check Scaling Point**

8. Click **Init**.
9. Place the Teaching Decktray on the 2nd slot from the right.
10. Click **Move** to Position The tip moves to position "Scaling Point".
11. Check the position of the tip compared with the front mark (Scaling Point) on the Teaching Decktray.



The setting procedure has to be terminated with Store Position regardless whether the setting has been changed or not. If not the error message shown below is displayed and the procedure has to be repeated.

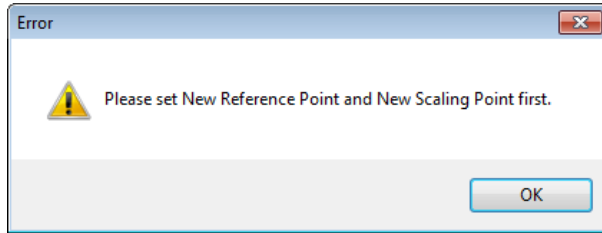


Figure 8.20: Error Message

12. If **OK** click **Store Position**. If not **OK**, click the arrow buttons for X-axis and the Y-axis to move the tip over the cross as precisely as possible. Set the move units to appropriate values (e.g. 0.2 mm) before clicking the arrow keys. Click **Store Position** to save the new position.

13. Click **Save Ref./Scal. Points**.

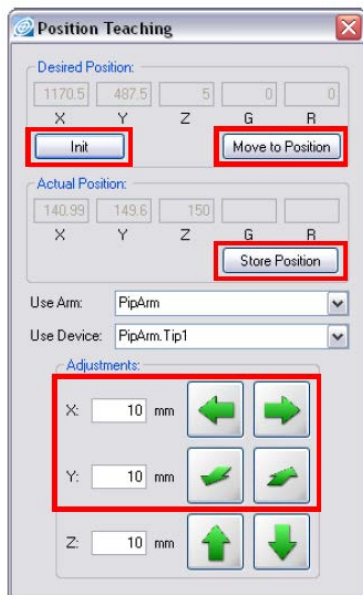


Figure 8.21: Teaching the Scaling Point

8.3.3.3 Set Z-Offsets

1. Select the **Set Z-Offsets** tab.
2. Select a tip (e.g. PipArm.Tip1).
3. Select **Use Reference Point**.
4. Click **Use Teachingtool** to open the Position Teaching window.

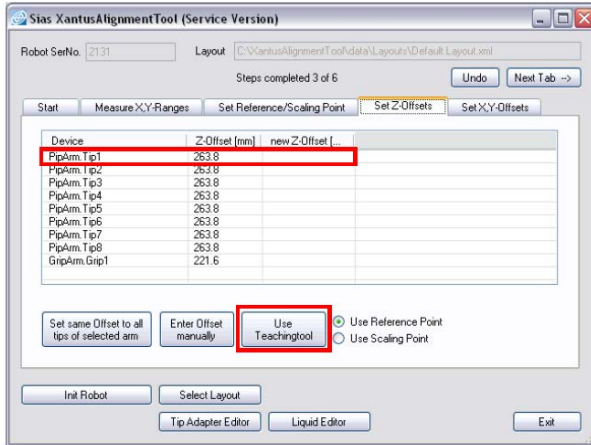


Figure 8.22: Selecting a Tip for Z-Offset Setting

5. Use the arrows to position the tip as close as possible to the Decktray, but without touching it.
6. Enter the height of the Decktray (always 2.5) in the field "Height". Click Store Position.



Figure 8.23: Setting Z-Offset

7. Repeat the individual setting procedure for all other tips or click Set same Offset to all tips of the selected arm for a global setting for all tips.
8. Select the handler (e.g. GripArm.Grip1) and click **Use Teachingtool**. Proceed identically as for the tip(s).

8.3.3.4 Saving the Default.Robot.XML

Select the **Save Default.Robot.XML** tab

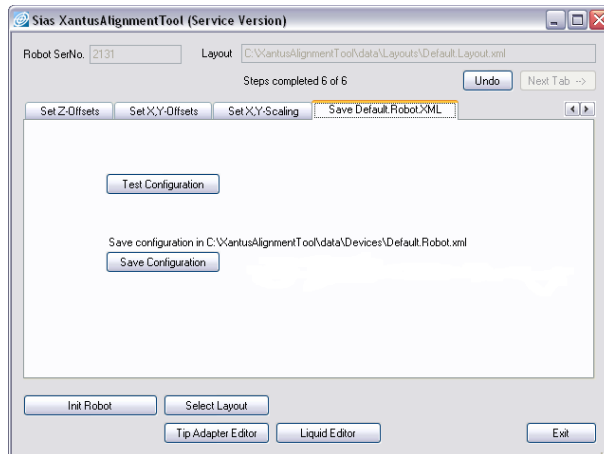


Figure 8.24: Testing the Configuration

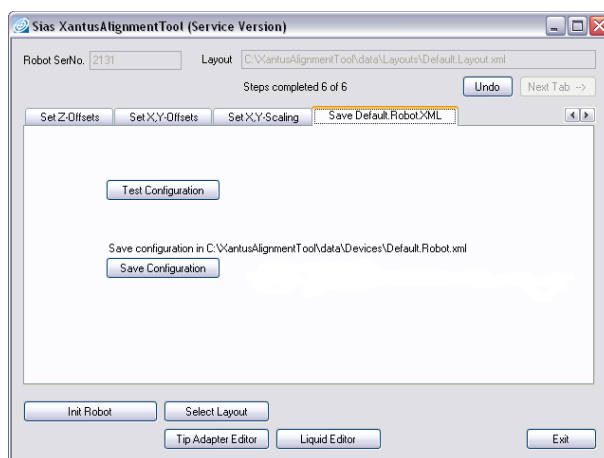


Figure 8.25: Saving the Configuration

Click **Save Configuration**

Prompt: "All setup steps have been completed"

Init Robot

Initialize all Xantus devices. The pumps are initialized over the waste cavities which mean that the Y/Z devices of the pipetting arm do not remain at their home position.

Select Layout

Used to select an alternative layout.

Tip Adapter Editor

Starts the editor to modify or add tip and tip adapter data.

Liquid Editor

Starts the editor to modify or add liquid class data.

9 Operation Overview

9.1 Safety

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

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 chapter 7 and 8 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.



9.1.1 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.

9.2 General Operating, Service and Repair Guidelines

SAFETY INSTRUCTIONS

When removable power cables must be replaced:

Removable power cables must be replaced with adequate measured cables.

SAFETY INSTRUCTIONS

Before the power cable must be disconnected:

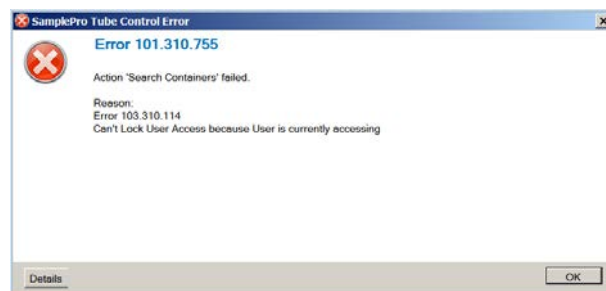
Keep mobile equipment away from the danger and working zone.

Security Relevant Parts

Security relevant parts as the cover, status light and barcode reader may not be inactivated 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**. It must not be possible to open the door and 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.

Robot Movements with Open Door in the Service Mode

Start of movements of the robot with open safety door are only possible from within the service area of the software. The service area is password protected and only for trained staff.

Access to work area of the robot is not allowed while movement of robot was started in service menu.

Only trained BRUKER service personnel is allowed to perform tasks from the service part of the software.

All operations in service mode are signaled with the yellow robot LED to warn the user.

When performing service work in the work area of the robot, power off the instrument.

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.



The device may be damaged by invalid tasks.

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.

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.

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.

There are several general rules and procedures that should be observed while operating the device:

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.

9.2.1 Switching On the Device

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

9.2.2 Switching Off the Device

When the robot is not operated for a longer period of time, it must be cleaned, see the chapter Preventative Maintenance.

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

10 Service - Minor Corrective Actions

10.1 Introduction

The modular design of the SamplePro Tube allows the removal of individual modules by certified Bruker service engineers. Unauthorized personnel should never attempt major service and maintenance actions.

Minor service and maintenance actions can be performed by a certified operator. A trained operator can usually perform minor corrective actions. After completing any actions, it is important to perform the corresponding verification (see chapter [Verification and Calibration \[45\]](#)) before running a significant test run with X-Util or another application. Only then can the device put into operation again.

If there is any doubt, please contact Bruker for advice or assistance.

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

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 chapter 7 and 8 in the Service Manual.

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.

CAUTION

Before Starting any Service and Maintenance

Before starting any service and maintenance action:

- ▶ Ensure that the device is switched off and the power cable is unplugged.
- ▶ Remove all racks and accessories from the work surface.
- ▶ Do not touch unit parts of cooled or heated units.
- ▶ Make sure the device is clean and free from any contamination.
- ▶ Use appropriate tools to avoid damaging parts or modules.



10.2 Securing Screws

Whenever screws have been loosened or removed for corrective actions, they must be cleaned and fastened again using a small amount of Loctite® 222 unless otherwise stated. For correct application please refer to the instruction manual provided with the glue. The following screws must never be fastened with thread locking adhesives:

- Adjusting screws
- Screws mounted with spring lock washers
- Grounding screws

10.2.1 Securing Gear Screws

The following assembly procedure is mandatory to avoid thread locking adhesive from coming in contact with the motor shaft when a gear is mounted.

Turn the grub screw into the threaded hole of the gear until the screw nearly touches the side of the shaft bore. Do not apply force!

1. Apply Loctite® into the threaded hole.

- X-gear screws must be fastened with Loctite® 243.
- For all other gear screws use Loctite® 222.

2. Loosen the screw until the shaft bore is completely open.

3. Put the gear on the motor shaft making sure that the threaded hole faces the notch or the flattened side of the shaft (depending on the motor type).

4. Tighten the screw.

10.3 Mains Fuse (Input)



Before replacing any fuses, ensure that the device is switched off and the power cable is unplugged.



CAUTION

Risk of fire due to incorrect fuses usage

Replace the fuses only with the same type and electrical rating as indicated on the fuse replacement label.

The mains fuse compartment is located in the mains socket on the rear of the device. Check the voltage on the type label to verify that the device is compatible with the AC voltage available at the installation site.

Replace a fuse only with one of the same value (refer to the label next to the fuse compartment):

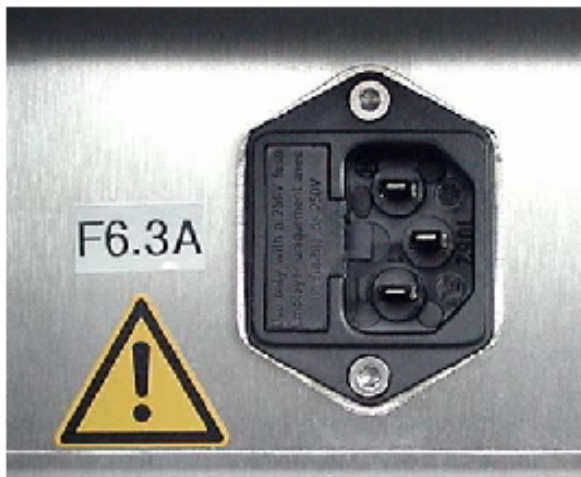


Figure 10.1: Fuse Compartment

Fuse replacement

Ensure that the device is switched off and the power cable is unplugged.

1. Pull the fuse compartment out and replace the fuse(s).
2. Insert the fuse compartment.
3. Plug the power cable in and switch the device on.

10.4 Output Fuses

The output fuses are located on the rear of the PSU. Replace a fuse only with one of the same value (refer to the label above the fuse holder).



The number and value of the fuses depends on the version of the PSU

Required tools

- Flat-head screwdriver #3

Fuse replacement

1. Ensure that the device is switched off and the power cable is unplugged.
2. Open the fuse holder by turning its cap (bayonet socket) counter-clockwise and replace the fuse.
3. Close the fuse holder by turning its cap clockwise.
4. Plug the power cable in and switch the device on.

Power supply with double output (24 V)

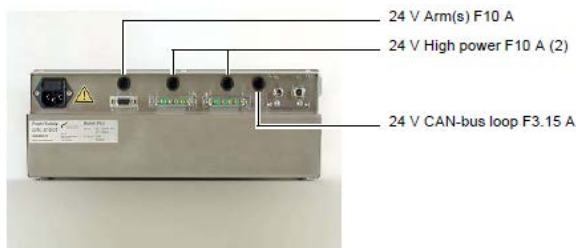


Figure 10.2: Fuses (PSU with single output)

Fuse Ordering Information

See also Required Tools that can be Ordered from Sias.

Part Number	Description
150002	Replacement fuse set for 24 V PSU (4 x F10 A, 2 x F6.3 A. Dimension 5 x 20 mm).
150009	Replacement fuse set for 24 V PSU (4 x F10 A, 2 x F6.3 A. Dimension 5 x 20 mm). Fuse cap (for the use of 5 x 20 mm fuses in a 6 x 32 mm fuse holder).

10.5 CAN-Bus and Extensions (loop)

The CAN-bus connectors must be plugged in properly and securely locked with the screw coupling (see Hardware Installation).

10.6 Deck

The deck must be level within a small tolerance. The horizontal alignment is checked with a spirit level.

Required tools

- Spirit level
- Open-end wrench 13 mm and 14 mm (or adjustable wrench)

Check

- Check the horizontal alignment of the deck by positioning the spirit level along the deck width and depth.

Adjustment

1. Evaluate which feet need to be adjusted to level the deck.
2. Loosen the counter nut by turning it counterclockwise.
3. Adjust the foot. Turning the foot nut counterclockwise moves the deck upward, turning the foot nut clockwise moves the deck downward. Check the level using the spirit-level while adjusting the feet.
4. Adjust the other feet if required.
5. Ensure that the device is not shaky and stands solid on the workbench.
6. Lock all counter nuts by turning them clockwise.

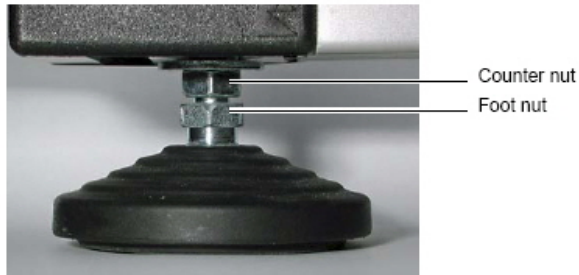


Figure 10.3: Adjusting Device Foot

10.7 Arm Housing

The arm housing consists of three different parts:

- Arm cover.
- Arm side cover plate.
- Arm rear cover plate.

For service and maintenance some or all of the covers/plates must be dismantled.

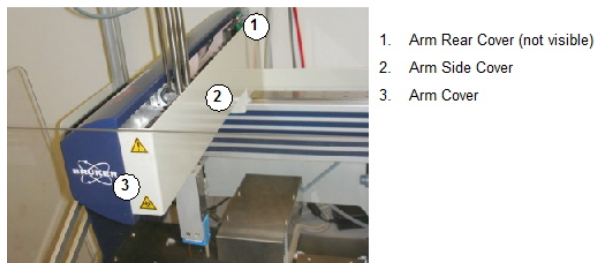


Figure 10.4: Arm Housing

10.7.1 Arm Cover

Required tools

- Torx screwdriver T20

Disassembly

1. Ensure that the device is switched off and the power cable is unplugged.
2. Move the arm to the home position.
3. Remove the two screws at the rear and the one on the bottom side of the front.

4. Slide the arm cover carefully towards the X-rail until the mounting tappet is released from the cut-out on the side or front cover plate. Then take the arm cover off by moving it to the side.



Screw at the Front Bottom Side

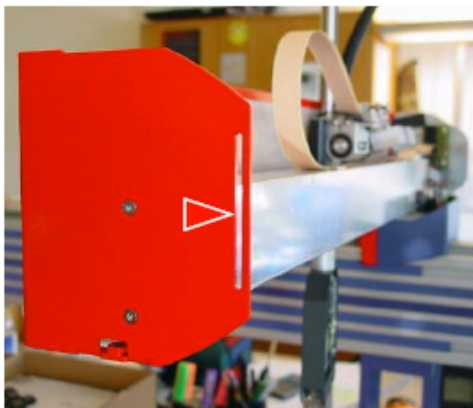


Screws at the Rear Side

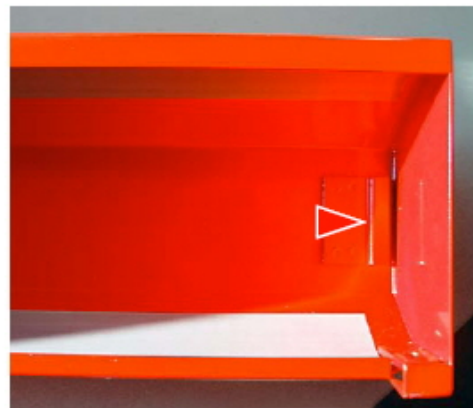
Assembly

To mount the arm cover, the side/front cover plate and the rear cover plate must be already mounted. If not refer to [Side and Front Cover Plate \[85\]](#) and [Rear Cover Plate \[86\]](#).

1. Ensure that the device is switched off and the power cable is unplugged.
2. Move the arm manually to its home position.
3. Carefully push the arm cover from the side towards the arm, making sure that the flat band cables are not pinched between arm cover and arm.
4. Slide the arm cover slowly towards the side, and the front cover plate until the mounting tappet is firmly inserted into the cut-out.
5. Check that the arm cover is not tilted in any direction and is parallel to the deck.
6. Tighten the two screws at the rear of the arm cover and the screw (including washer) on the bottom side of the front.



Cut-out on the Side Cover Plate



Mounting Tappet Inside the Arm Cover

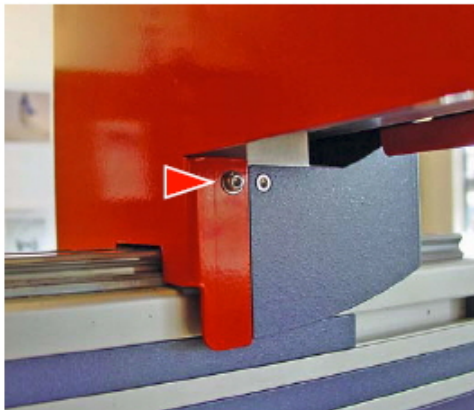
10.7.2 Side and Front Cover Plate

Required Tools

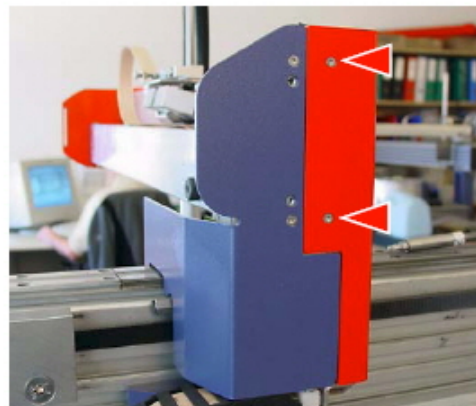
- Torx screwdriver T10

Disassembly

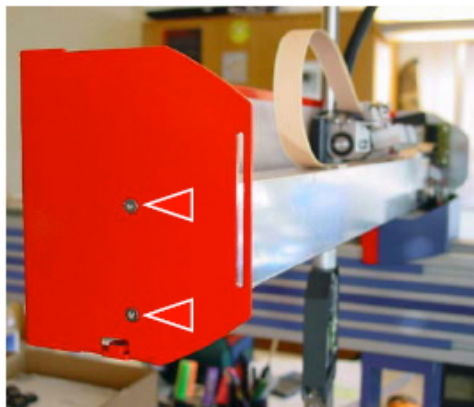
1. Ensure that the device is switched off and the power cable is unplugged.
2. Remove the arm cover (see ["Arm Cover" \[▶ 83\]](#)).
3. Remove the two screws at the rear of the plate.
4. Remove the screw underneath the arm.
5. Remove the two screws at the front of the plate.
6. Remove the side cover plate.



Screw in the Back Underneath the Arm



Screws on the Rear Cover Plate



Screws at the Front Cover Plate

Assembly

1. Ensure that the device is switched off and the power cable is unplugged.
2. Mount the side cover plate.
3. Tighten the screws at the front.
4. Tighten the screw underneath the arm.

5. Tighten the two screws at the rear of the side cover plate.
6. Check that the side cover plate is not touched when the object detector is moved manually along the arm. Otherwise adjust the cover.

10.7.3 Rear Cover Plate

Required tools

- Torx screwdriver T10

Disassembly

1. Ensure that the device is switched off and the power cable is unplugged.
2. Remove the cover (see "[Arm Cover](#)" [83]).
3. Remove the screw underneath the arm.
4. Remove the two screws at the rear of the plate.
5. Remove the rear cover plate.

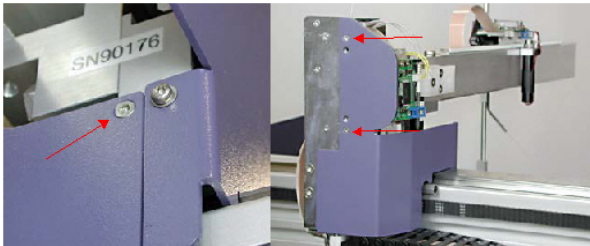


Figure 10.5: Screw on the Back Underneath the Arm and on the Rear Cover Plate

Assembly

1. Ensure that the device is switched off and the power cable is unplugged.
2. Mount the rear cover plate.
3. Tighten the screw underneath the arm.
4. Tighten the two screws at the rear.

10.8 X-Axis Components

10.8.1 MCB X-Motor Board



CAUTION

X-Util must be run to download boot loader.

- ▶ Whenever an MCB X-motor board has been exchanged, X-Util must be run to download boot loader, firmware and parameters.

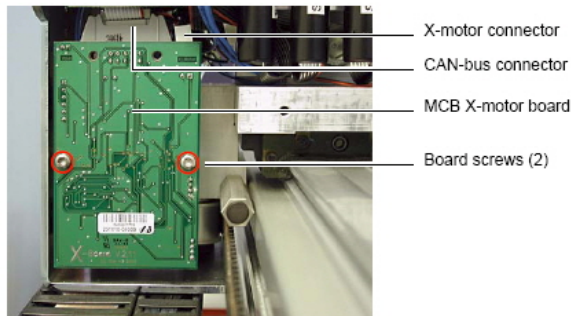


Figure 10.6: MCB X-motor board (arm)

Required tools

- Torx screwdriver T10

Check

1. Ensure that the device is switched off and the power cable is unplugged.
2. Remove the relevant parts of the arm housing (see ["Arm Housing" \[▶ 83\]](#)).
3. Check that all connectors are fully inserted in their sockets on the MCB X-motor board.
4. Install the arm housing (see ["Arm Housing" \[▶ 83\]](#)).

Disassembly

1. Ensure that the device is switched off and the power cable is unplugged.
2. Remove the relevant parts of the arm housing (see ["Arm Housing" \[▶ 83\]](#)).
3. Remove the two board screws.
4. Carefully pull the board out and mark the plugs/sockets on the MCB X-motor board to ease the reconnection.
5. Disconnect the cables.
6. Remove the board.

Assembly

1. Ensure that the device is switched off and the power cable is unplugged.
2. Connect the cables.
3. Mount the MCB X-motor board with the two screws and the spring rings.
4. Install the arm housing (see ["Arm Housing" \[▶ 83\]](#)).

10.8.2 X-Gear

NOTICE

Damage to device due to incorrect belt tension

- ▶ To check the X-gear, the X-belt must be released. Be aware that this procedure might affect the belt tension.
- ▶ It is recommended to check the tension afterwards.

Required Tools

- Torx screwdrivers T10, T20

Check

1. Ensure that the device is switched off and the power cable is unplugged.
2. Remove the relevant parts of the arm housing (see "[Arm Housing](#)" [[↗ 83](#)]).
3. Release the belt tension by removing the belt clamp screw on the X1-stopper.



Never loosen the two blocking screws!

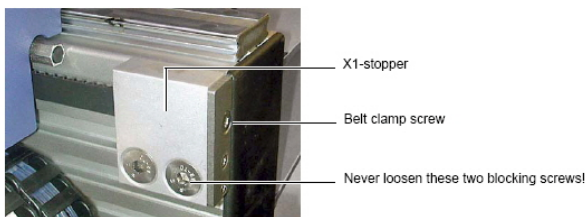


Figure 10.7: Loosening the Belt Clamp

4. Carefully pull the X-belt out away from the X-gear until it can be moved freely.
5. Turn it until you can access the two gear screws.

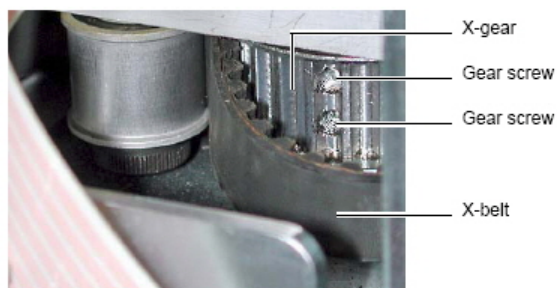


Figure 10.8: X-Gear and Pulley

6. Check if the screws are tightened. If they are loose or can be screwed out easily, proceed with the following corrective action:
 - a) Turn the gear screw in as far as possible. However, do not apply too much force.
 - b) Apply Loctite® 243 into the threaded hole.
 - c) Turn out the screw until its end is well out of the threaded hole.
7. Turn in the screw again and tighten. Repeat with the second screw.



Let it dry for at least 2 hours before applying torque on the X-gear (initializing the device)!

8. Guide the X-belt around the pulley.
9. Insert the belt clamp in the X1-stopper and attach it firmly by tightening the belt clamp screw.

10. Slide the arm carefully to and fro to check that the X-belt moves smoothly around the X-drive.
11. Install the arm housing. See "[Arm Housing](#)" [[▶ 83](#)]).

10.8.3 X-Motor

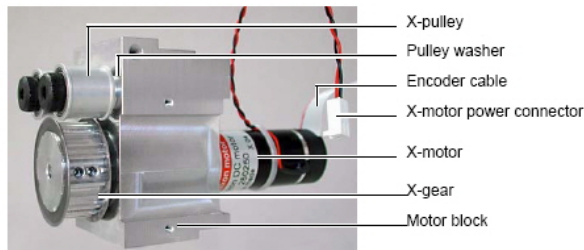


Figure 10.9: X-Motor Assembly

Required tools

- Torx screwdrivers T10, T20, T25
- Allen wrench 4 mm („L“-shape)
- Adjustable torque wrench, Allen bit 4 mm

Disassembly

1. Ensure that the device is switched off and the power cable is unplugged.
2. Remove the relevant parts of the arm housing (see "[Arm Housing](#)" [[▶ 83](#)]).
3. Disassemble the MCB X-board (see "[MCB X-Motor Board](#)" [[▶ 86](#)]).

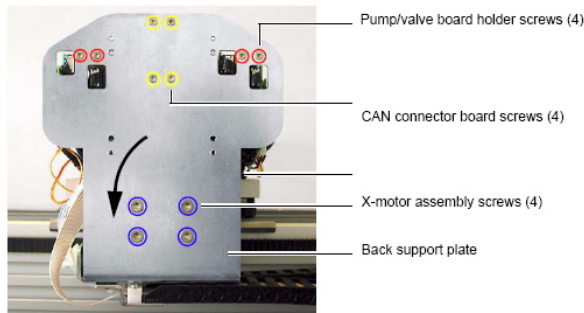


Figure 10.10: Back Support Plate

4. Remove the screws from the CAN connector board(s).
5. Remove the screws from the pump/valve board holder(s) (arm only).
6. Remove the screws from the X-motor assembly and swivel the back support plate downwards in order to get access to the motor block screws.

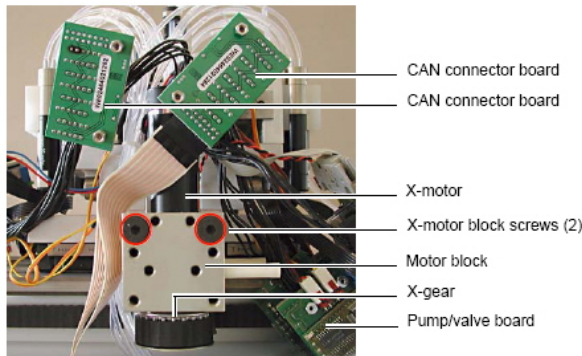


Figure 10.11: Removed Back Support Plate



The caterpillar drive chain remains mounted on the back support plate.

7. Release the belt tension by removing the belt clamp screw on the X1-stopper.

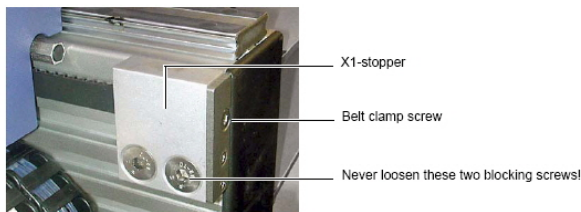


Figure 10.12: Removing the Belt Clamp Screw

8. Dismount the two X-pulleys and the washers from the motor block.
9. Release the belt from the X-gear.
10. Remove the two motor block screws and remove the X-motor assembly.
11. Loosen the two grub screws on the X-gear and remove it.
12. Dismount the X-motor by removing the two screws.

Assembly

1. Ensure that the device is switched off and the power cable is unplugged.
2. Mount the X-motor on the motor block with the two screws. Make sure that the flat ribbon cable points towards the X-pulley bores).
3. Put the X-gear on the motor shaft. Align the gear so that its threaded holes face the flattened side of the motor shaft. Insert the grub screws and tighten them.
4. Mount the motor block on the X-module with the two screws. Make sure that block and module are perfectly aligned before tightening the screws with a torque of 9 Nm.
5. Guide the X-belt around the X-gear.
6. Mount the two pulleys and the washers. Insert the screws and tighten with a torque of 9 Nm. Make sure that the washer aligns perfectly with the screw axis.
7. Insert the belt clamp in the X1-stopper and tense the X-belt by tightening the screw. Check the tension (see [Adjusting the X-Belt Tension \[113 \]](#)).
8. Mount the back support plate on the motor block with the four X-motor assembly screws.
9. Mount the pump/valve board holder(s) (arm only).
10. Mount the CAN connector board(s).

11. Assemble the MCB X-motor board (see "[MCB X-Motor Board](#)" [▶ 86]).
12. Slide the arm carefully to and fro to check that the X-belt smoothly moves around the X-drive. Ensure that the belt is horizontal.
13. Install the arm housing (see "[Arm Housing](#)" [▶ 83]).

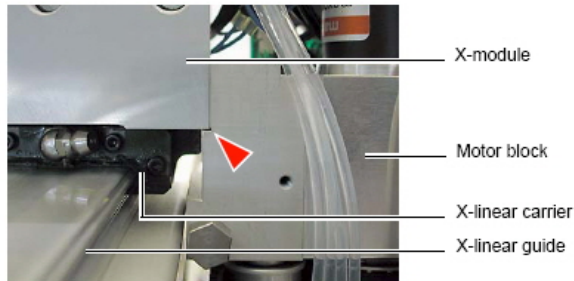


Figure 10.13: Alignment Between Motor Block and X-Module

See also

- 📄 X-Motor [▶ 89]

10.9 CAN Connector Board

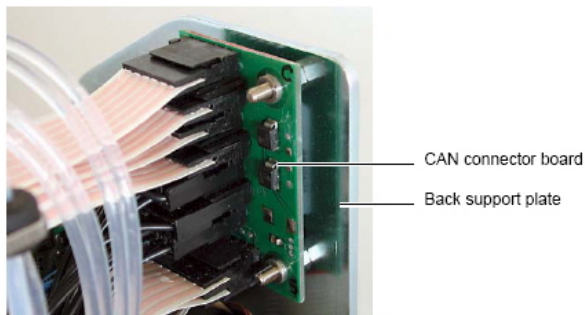


Figure 10.14: CAN Connector Board (arm)

A 4- arm houses one CAN connector board. There is one CAN connector board in the tool arm.

Required Tools

- Torx screwdriver T10

Disassembly

1. Ensure that the device is switched off and the power cable is unplugged.
2. Remove the relevant parts of the arm housing (see "[Arm Housing](#)" [▶ 83]).
3. Loosen the two screws on the back support plate and remove the board.
4. Disconnect the cables.

Assembly

1. Ensure that the device is switched off and the power cable is unplugged.
2. Connect the cables (the order is not important, but the orientation is).



Always fully insert the cables. Ensure that the cables do not touch the moving parts of the arm.

3. Mount the board on the back support plate with the two screws.
4. Install the arm housing (see "[Arm Housing](#)" [▶ 83]).

10.10 Device X-Rail

10.10.1 X-Belt

There is an easy way to check the tension of the X-belt. However, adjusting the belt is a major corrective action and should be done by Bruker certified personnel only

10.10.2 X-Spacers

X-spacers (2 on each side on each arm) must be firmly tightened. A rubber pad must be attached at the front end of each spacer, facing the X-stopper.

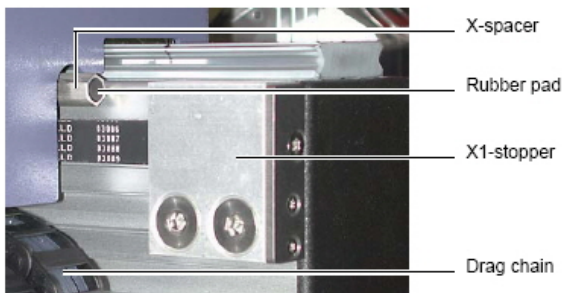


Figure 10.15: The X-Spacer and X1-Stopper

10.10.3 Caterpillar Drive Chain

The shape of the caterpillar drive chain must form a smooth loop without any buckles.



Caterpillar Drive Chain Perfectly Shaped



Buckled Caterpillar Drive Chain

10.10.4 CAN-Bus Wiring

CAN-bus wiring must be checked to ensure each wire is still securely connected.

Required tools

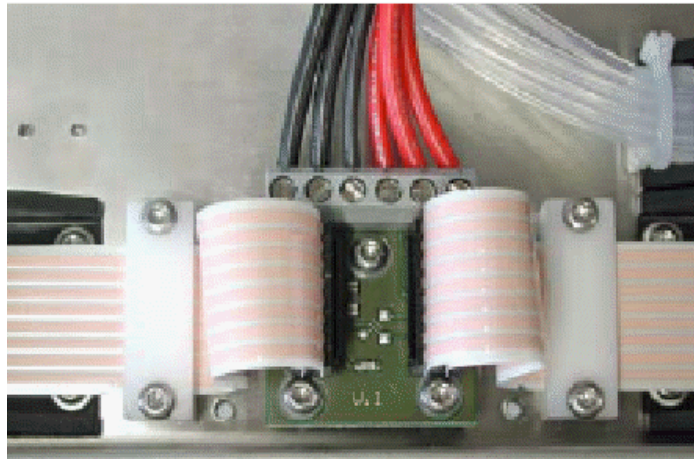
- Torx screwdriver T10
- Slotted screwdriver #1

Check and Corrective Action

1. Ensure that the device is switched off and the power cable is unplugged.
2. Remove the four screws of the CAN-bus cover and lift it off.
3. Check the tightness of the connection by pulling slightly at the wires. Tighten the connector screws if necessary.
4. If the module scan failed under X-Util, check the tracks on the PCB next to the black 16-pin connectors and exchange the X-rail CAN-bus connector if the tracks are damaged.
5. Remount the CAN-bus cover.



X-Rail CAN Bus Cover



X-Rail CAN-bus Connector

10.10.5 Safety Door

The safety door prevents accidental contact with moving components. It must be installed whenever the device is in use. However for maintenance purposes it can be removed to access the arms and other components.



Do not forget to reinstall the safety door after maintenance has been executed!

Required tools

- Adjustable face spanner wrench (safety door tool)

Assembly

1. Ensure that the device is switched off and the power cable is unplugged.
2. Take the safety door in both hands and fasten it in position.
3. Tighten the fixing screws using the special tool supplied.

Disassembly

1. Ensure that the device is switched off and the power cable is unplugged.
2. Fasten the safety door by supporting it with an appropriate HD foam block.
3. Remove the two safety door screws using the special tool supplied.
4. Take the safety door in both hands and remove it.



10.11 Y-Axis Components

10.11.1 YZ-Board



Whenever an YZ-board has been exchanged, X-Util must be run to download boot loader, firmware and parameters.

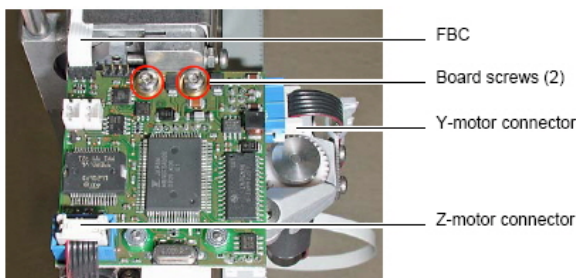


Figure 10.16: YZ-board (BB2)

Required tools

- Torx screwdrivers T8, T10, T20

Check

1. Ensure that the device is switched off and the power cable is unplugged.

2. Remove the relevant parts of the arm housing (see ["Arm Housing" \[▶ 83\]](#)).
3. Check that all connectors are fully inserted in their sockets on the YZ-board.
4. Install the arm housing (see ["Arm Housing" \[▶ 83\]](#)).

Disassembly

1. Ensure that the device is switched off and the power cable is unplugged.
2. Remove the relevant parts of the arm housing (see ["Arm Housing" \[▶ 83\]](#)).
3. Remove the two board screws.
4. Lift the board at the corner which is closest to the FBC connector.
5. Unplug the Z-motor connector.
6. Unplug the Y-motor connector whenever possible without removing the cable tie.
7. Turn the board over and remove the two screws of the FBC strain relief clip.
8. Unplug the CAN-bus FBC connector.

Assembly



MCB BB1 and MCB BB2 boards are different! Make sure you use the correct one!



Depending on the type of the Y-motor support used (see [Spare Parts \[▶ 157\]](#)) the channel/board allocation is different! Please refer to the two tables below.

Board MCB BBx	BB1	BB2	BB2	BB1	BB2	BB1	BB1	BB2
1-Tip Arm Channel #	-	-	-	-	1	-	-	-
2-Tip Arm Channel #	-	-	-	-	1	3	-	-
4-Tip Arm Channel #	-	-	-	-	1	2	3	4
8-Tip Arm Channel #	1	2	3	4	5	6	7	8
Channel/board allocation in devices using fixed Y-motor supports								

Board MCB BBx	BB2	BB1	BB1	BB2	BB2	BB1	BB1	BB2
1-Tip Arm Channel #	1	-	-	-	-	-	-	-
2-Tip Arm Channel #	1	2	-	-	-	-	-	-
4-Tip Arm Channel #	1	2	3	4	-	-	-	-
8-Tip Arm Channel #	1	2	3	4	5	6	7	8
Channel/board allocation in devices using spring-loaded Y-motor supports								



Ensure that the Y-gear does not touch the Y-motor connector or the ribbon cable!

1. Ensure that the device is switched off and the power cable is unplugged.
2. Plug the CAN-bus FBC connector in.

3. Mount the strain-relief with the two screws and turn the board over.
4. Plug the Y-motor connector in, mount a cable tie if it has been previously removed. Do not over tighten the cable tie.
5. Plug the Z-motor connector in.
6. Install the board with the two screws and the spring rings.
7. Plug the power cable in and switch the device on.
8. Check for holding torque.
9. Start X-Util.
 - The „Module Setup“ window will be displayed.
10. Assign board to correct module (refer to the module identification in the firmware setup).
11. Switch the device off.
12. Install the arm housing (see ["Arm Housing" \[▶ 83\]](#)).

10.11.2 Y-Motor Assembly (spring-loaded Y-motor support)

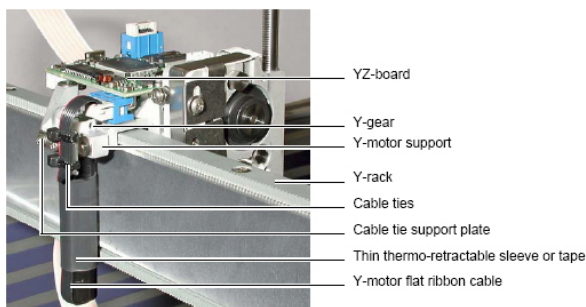


Figure 10.17: Y-motor assembly with spring-loaded Y-motor support



There are two versions of the Y-motor assembly: One using a fixed Y-motor support and another one using a spring-loaded Y-motor support. They require appropriate slotted racks and Y-gears. Never replace a fixed Y-motor assembly with a spring-loaded one or vice versa!

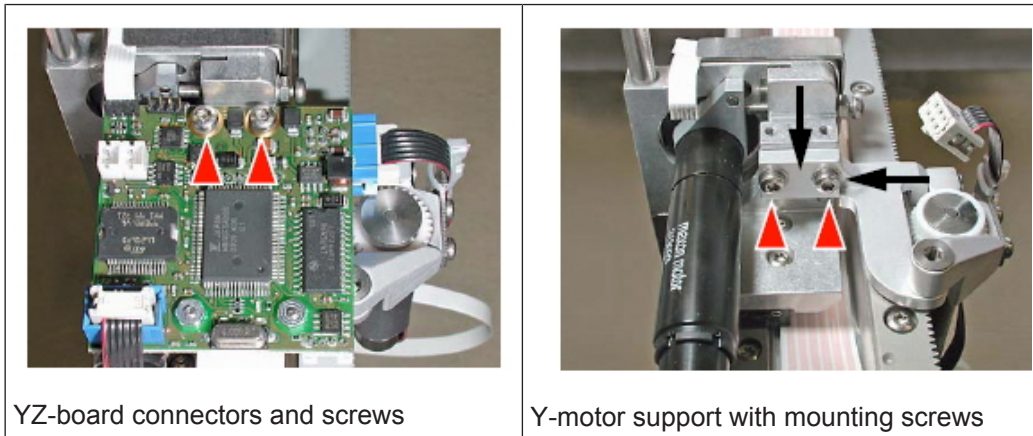
Required tools

- Torx screwdriver T10

Check

1. Ensure that the device is switched off and the power cable is unplugged.
2. Remove the relevant parts of the arm housing (see ["Arm Housing" \[▶ 83\]](#)).
3. Move the Y-motor slowly to and fro. Check that the movement is smooth and does not stick or grind at any points. It is normal that the gear moves very slightly while moving to and fro.
4. Check that the Y-gear and Y-rack are aligned against each other. The slotted wheel should not overhang the slotted rack or vice versa.

Corrective action



YZ-board connectors and screws

Y-motor support with mounting screws

1. Disassemble the YZ-board (see YZ-Board.
2. Loosen the Y-motor support screws.
3. Push the Y-motor support towards the Z-motor and Y-linear guide while tightening the screws.
4. Recheck for smooth movement. If the problem still occurs, the Y-motor (or gear) may be defective, see "[Y-Motor Assembly \(spring-loaded Y-motor support\)](#)" [[▶ 96](#)].
5. Reassemble the YZ-board, see YZ-Board.
6. Remove the relevant parts from the arm housing (see "[Arm Housing](#)" [[▶ 83](#)]).

See also

- ▣ [YZ-Board](#) [[▶ 94](#)]
- ▣ [YZ-Board](#) [[▶ 100](#)]

10.11.3 Y-Motor (spring-loaded Y-motor support)

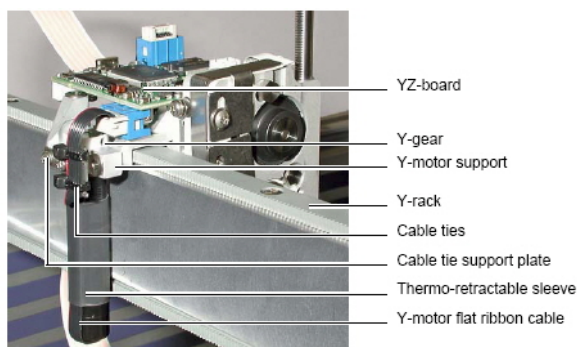


Figure 10.18: Y-motor Assembly with Spring-loaded Y-motor Support

NOTICE

Material damage due to mix-up of two versions of the Y-motor assembly

- ▶ There are two versions of the Y-motor assembly available, one using a fixed Y-motor support and another one using a spring-loaded Y-motor support, mixing the versions may result in material damage.
- ▶ They require appropriate slotted racks and Y-gears.
- ▶ Never replace a fixed Y-motor assembly with a spring-loaded one or vice versa!

Required tools

- Torx screwdrivers T6, T10
- Allen wrench 1.5 mm

Disassembly



If the YZ-module can not be moved because of a seized Y-motor, the Y-motor support must be removed to exchange the Y-motor.

1. Ensure that the device is switched off and the power cable is unplugged.
2. Remove the relevant parts of the arm housing (see "[Arm Housing](#)" [[▶ 83](#)]).
3. Remove the cable ties.
4. Disconnect the motor from the YZ-board.
5. Move the YZ-module to get access to the Y-gear grub screw.
6. Loosen the gear grub screw and remove the Y-gear from the motor shaft.
7. Remove the two screws and dismount the Y-motor.

Assembly

1. Ensure that the device is switched off and the power cable is unplugged.
2. Mount the Y-motor on its support. Make sure that the flat ribbon cable is parallel to the arm.
3. Mount the Y-gear.
4. Fasten the flat ribbon cable to the support plate with the cable ties. Do not over tighten the cable tie.
5. Connect the motor to the YZ-board.
6. Check that the Y-motor assembly can be moved smoothly along the entire Y-rack.
7. Remove the relevant parts of the arm housing (see "[Arm Housing](#)" [[▶ 83](#)]).

See also

- ▣ Y-Motor Assembly (spring-loaded Y-motor support) [[▶ 96](#)]
- ▣ Y-Motor (spring-loaded Y-motor support) [[▶ 97](#)]

10.11.4 Spring-Loaded Y-Motor Support



Do not dismount components of the spring-loaded Y-motor support!

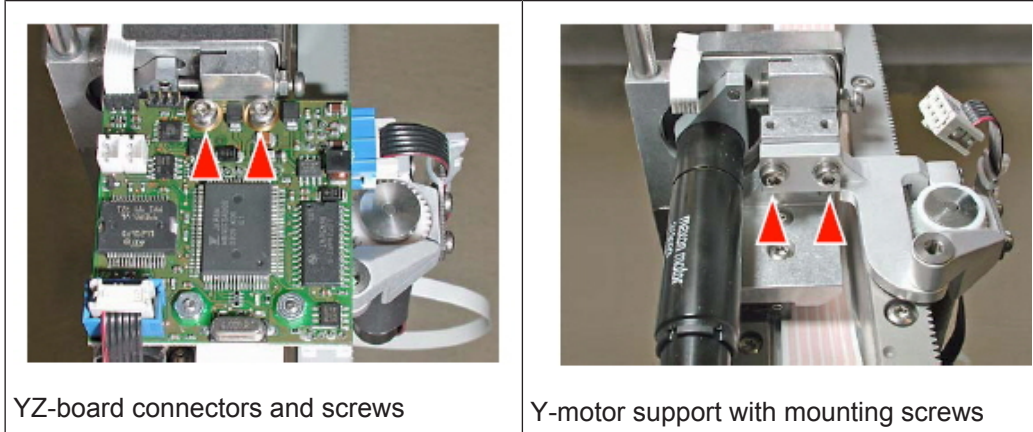
Required Tools

- Torx screwdrivers T6, T10

Disassembly

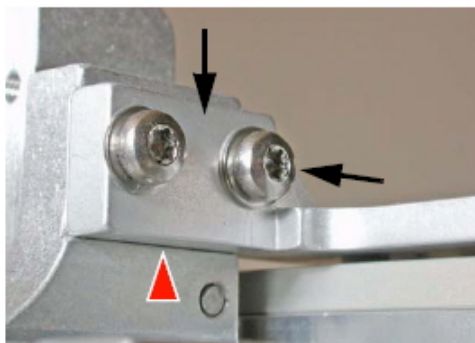
1. Ensure that the device is switched off and the power cable is unplugged.

2. Remove the relevant parts of the arm housing (see ["Arm Housing" \[83\]](#)).
3. Disassemble the YZ-board (see ["YZ-Board" \[100\]](#) - „Disassembly“).
4. Loosen the Y-motor support screws.
5. Remove the Y-motor support.

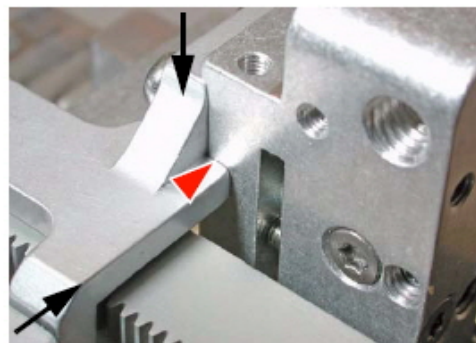


Assembly

1. Ensure that the device is switched off and the power cable is unplugged.
2. Mount the Y-motor support. Insert the two screws but do not tighten them yet.
3. Press the Y-motor assembly against the Z-hub-module in the direction indicated by the arrows.
Keep the vertical and horizontal gaps between Y-motor support and Z-hub module as small as possible:
4. Tighten the screws.
5. Assemble the YZ-board (see ["YZ-Board" \[94\]](#)).
6. Install the arm housing (see ["Arm Housing" \[83\]](#)).



Vertical gap between Y-motor support and Z-hub-module



Horizontal gap between Y-motor support and Z-hub-module

10.11.5 YZ-Module

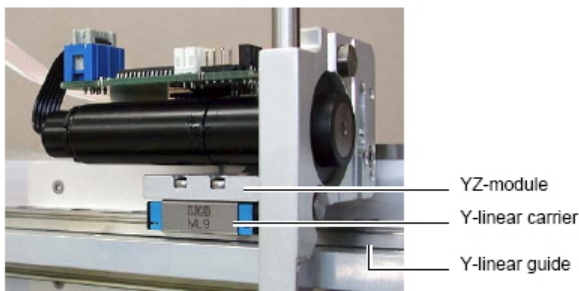


Figure 10.19: YZ-Module

Disassembly

1. Ensure that the device is switched off and the power cable is unplugged.
2. Remove the relevant parts of the arm housing (see ["Arm Housing" \[83\]](#)).
3. Disassemble the YZ-board (see ["YZ-Board" \[94\]](#)).
4. Disassemble the Z-motor (see ["Z-Motor" \[103\]](#)).
5. Remove the screws, securing the YZ-module on the Y-linear carrier.



Never remove the Y-linear carrier from the linear guide!

Assembly

1. Ensure that the device is switched off and the power cable is unplugged.
2. Mount the screws to fasten the YZ-module on the Y-linear carrier.
3. Assemble the Z-motor (see ["Z-Motor" \[103\]](#)).
4. Assemble the YZ-board (see ["YZ-Board" \[100\]](#)).
5. Install the arm housing (see ["Arm Housing" \[83\]](#)).

10.12 Z-Axis Components

10.12.1 YZ-Board

This component is described in ["YZ-Board" \[94\]](#).

10.12.2 Z-Motor Assembly

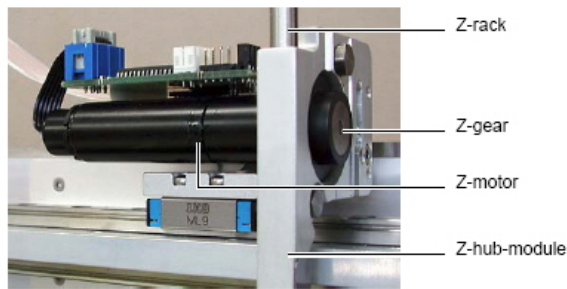


Figure 10.20: Z-Motor Assembly Side View

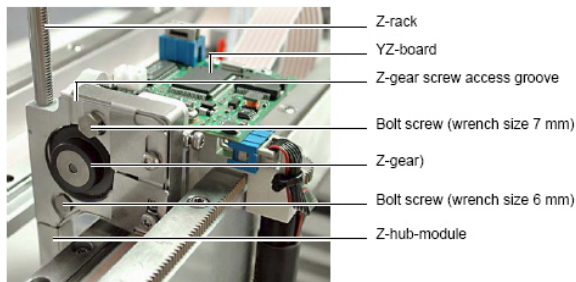


Figure 10.21: Z-Motor Assembly Overview

Required Tools

- Torx screwdriver T8
- Socket wrench 6 mm (thin wall) and 7 mm

Disassembly

1. Ensure that the device is switched off and the power cable is unplugged.
2. Remove the relevant parts of the arm housing (see ["Arm Housing" \[83\]](#)).
3. Remove the object detector, tubing, liquid level detector assembly and Z-rack.
4. Disassemble the YZ-board (see ["YZ-Board" \[94\]](#)).
5. Remove the two bolt screws. Use a socket wrench with extension and hold it parallel to the Y-axis.
6. Remove the Z-motor assembly by swinging it horizontally towards the center of the arm while pulling it either up or down depending on the arm configuration.

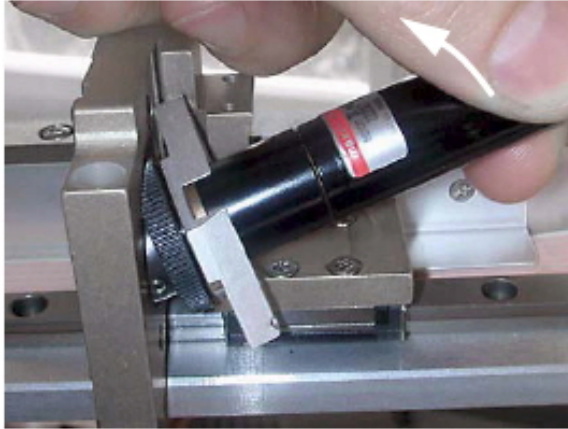


Figure 10.22: Removing the Z-Motor Assembly

Assembly



The larger bolt screw is located close to the groove of the Z-hub-module.

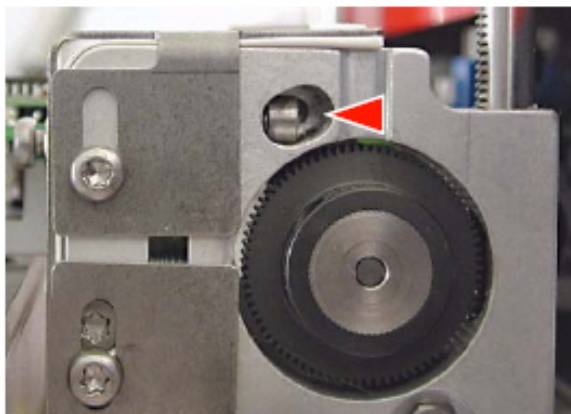


Figure 10.23: Spring-loaded Pin

1. Ensure that the device is switched off and the power cable is unplugged.
2. Install the Z-motor assembly by swinging it horizontally from the center of the arm, while moving it either up or down, depending on the arm configuration.
3. Insert the smaller of the bolt screws (wrench size 6 mm thin wall) and tighten it slightly.
4. In the bore of the larger bolt screw (wrench size 7 mm) there is a spring-loaded pin which generates the contact pressure of the Z-gear against the Z-rack. Push the pin back using a tiny screwdriver while inserting the bolt screw.
5. Tighten the bolt screws.
6. Reassemble the YZ-board (see ["YZ-Board" \[▶ 100\]](#)).
7. Install the Z-rack, liquid level detector assembly, tubing and object detector.
8. Install the arm housing (see ["Arm Housing" \[▶ 83\]](#)).

10.12.3 Z-Motor

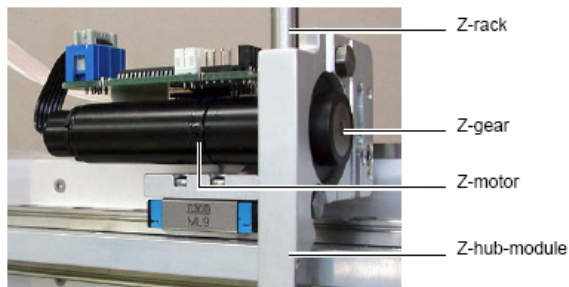


Figure 10.24: Z-motor Assembly Side View

Dismounting a blocked motor on the basis of the following description is possible only when the Z-gear screw is facing the Z-hub-module groove. Otherwise the complete Z-motor assembly must be removed (see "[Z-Motor Assembly](#)" [▶ 101],) to dismount the Z-motor.

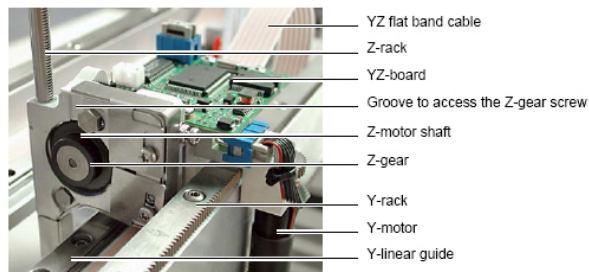


Figure 10.25: YZ-Assembly Overview

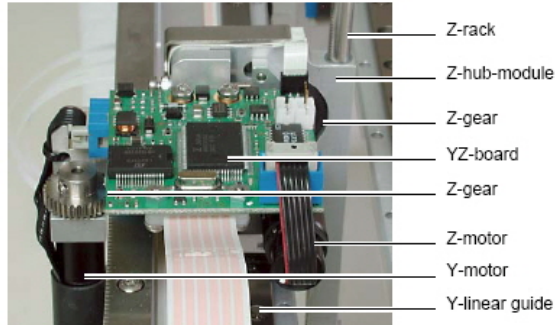


Figure 10.26: YZ-Assembly Overview

Required tools

- Torx screwdrivers T6, T8, T10, T20
- Flat pliers

Disassembly

1. Back flush the pipetting tubing.
2. Ensure that the device is switched off and the power cable is unplugged.
3. Remove the relevant parts of the arm housing (see "[Arm Housing](#)" [▶ 83]).
4. Disconnect the Z-motor from the YZ-board.
5. Remove the object detector and pull the tubing out the Z-rack.

6. Carefully move the Z-rack up or down until the Z-gear screw is facing the groove of the Z-hub module.
7. Loosen the screw and remove the Z-gear while holding the Z-rack to prevent that it glides through the Z-hub module (putting stress on the flat band cable).
8. Pull out the Z-rack with the liquid level detector assembly.
9. Dismount the motor from the Z-motor support plate.

Assembly

Ensure that the device is switched off and the power cable is unplugged.

1. Insert the motor into the Z-motor support plate.
2. Position the motor so that the socket side of the connector faces the corresponding YZ-board.
3. Fasten the motor with the two screws.
4. Connect the Z-motor to the YZ-board.
5. Carefully turn the motor shaft with flat pliers until the bore is facing the groove of the Z-hub-module.
6. Put the gear on the motor shaft.
7. Position the gear so that its threaded hole faces the notch in the motor shaft.
8. Insert the screw into the Z-gear and tighten.
9. Carefully insert the Z-rack with the liquid level detector assembly.
10. Insert the tubing in the Z-rack and install the object detector, see "Object Detector" .
11. Install the arm housing (see "[Arm Housing](#)" [▶ 83]).
12. Plug in the power cable and switch the device on.
13. Flush the system.

10.13 Arm Alignment Check

The arm glides on the X-rail located at the top rear of the device. It supports the Z-axes and integrates all the necessary components Y and Z motors and their electronics.

Manufacturing and assembly of the robot frame and arms are performed according to very strict procedures and tolerances. Before delivery all devices must pass the quality control where the perfect arm alignment is checked. The arm must be adjusted within a tolerance of +/- 0.2 mm over the whole of the deck working area.

The packing procedure provides sufficient protection to the device under normal transport conditions. However, Bruker strongly advises checking the parallelism after transportation before proceeding with the installation. The arm alignment can be easily checked by moving an object detector manually to and fro, checking the distance between object detector end and top side of the deck.

Check

Ensure that the device is switched off and the power cable is unplugged.

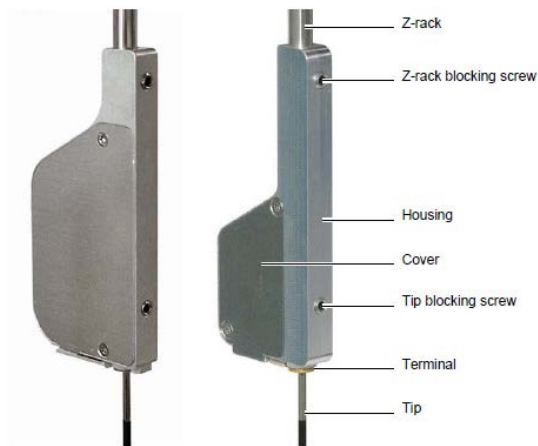
1. Remove all racks.
2. Move the arm manually to the left hand side (home position) of the device and carefully slide the tip adapter with needle to its upper-most position in the back.
3. Lower the tip adapter with needle until it's end nearly touches the deck. Measure the distance between tip adapter with needle end and deck surface.

- Slide the tip adapter with needle slowly towards the front of the device and check the distance between a tip adapter with needle end and deck surface, it should be within a tolerance of 0.2 mm.

When the distance is outside the acceptable tolerance, refer to "Arm Alignment" .

- Repeat the alignment check at the right hand side of the device.

10.14 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!

- Ensure that the instrument is switched off and the power cable is unplugged.
- Remove the tip blocking screw of the liquid level detector assembly.
- Move the pipetting tubing downwards until you can grip its end.
- 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.
- Move the tip upwards until the tappet fits into the recess on the liquid level detector terminal.
- Tighten the screw.
- 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.

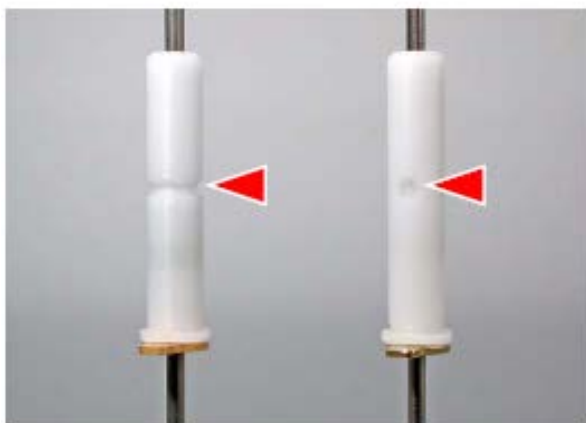


Figure 10.27: Tip fixture characteristic



Figure 10.28: LLD tip mounting and LQS tip mounting

10.15 Downholder

Under construction

10.16 Barcode Reader

The barcode reader is required to read the type and ID of the container.



Required Tools

- Torx screwdriver T 8

Disassembly



Figure 10.29: Assembly

1. Perform the disassembly procedure in the opposite order.
2. Perform a teaching of the barcode reader position (see [Teaching the Barcode Reader Position](#) [54]).
3. Perform action tests to check for the correct reading of the container barcode (when using the cooling rack the isolation cover must be placed on the container for testing).

10.17 Door Lock Actor

A magnetic sensor is indicating if the door is open or closed.

The door lock actor is blocking the closed safety door during movements of the robot.

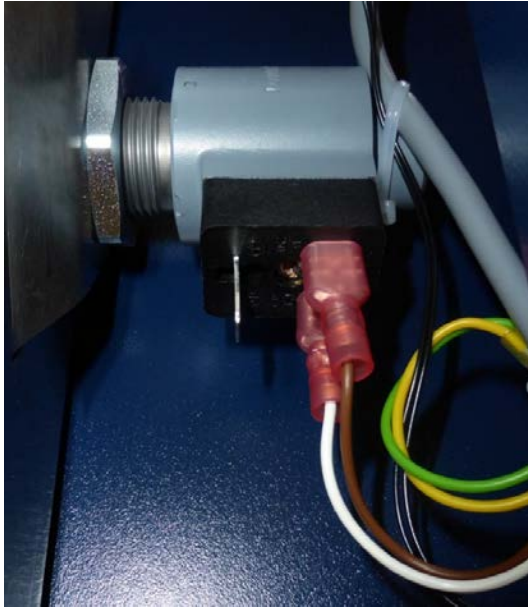
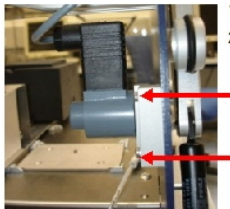


Figure 10.30: The Door Lock Actor

Required Tools

- Torx screwdriver T 20 and T10
- Flat wrench 5.5 mm

Disassembly:



1. Remove the rear cover plate.
2. Remove the two Torx screws T 10 using the flat wrench 5.5 mm to remove the door lock actor and the door open sensor .

3. Remove the cable from the bottom of the back plate.

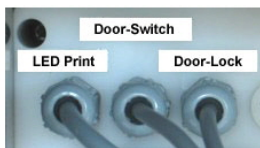


Figure 10.31: Back Plate Cables

Assembly

Perform the assembly procedure in the opposite order as the disassembly procedure above.

10.18 Door Open Sensor

The door open sensor is a switch to tell the software if the door is opened or closed.

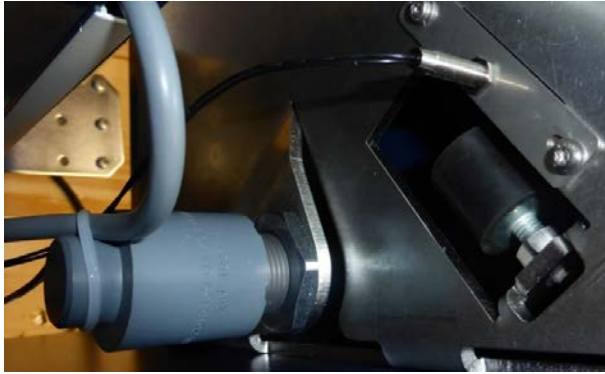


Figure 10.32: Door Open Sensor

Required Tools

Torx screwdriver T 20 and T10
Wrench 5.5 mm

Disassembly:

1. Remove the rear cover plate.
2. Remove the two Torx screws T 10 using the wrench 5.5 mm to remove the door lock actor and the door open sensor.
3. Remove the cable from the back plate at the bottom.

Assembly

1. Perform the assembly procedure in the opposite order as the disassembly procedure above.
2. Check the sensor status in the main view when starting the program.

See also

- 📖 Door Open Sensor [▶ 108]
- 📖 Door Lock Actor [▶ 107]

11 Service - Major Corrective Actions

The modular design of the robotic system allows the removal of individual modules for factory service by Bruker service engineers. Unauthorized personnel should never attempt major corrective action.

After completing any action, it is important to perform the corresponding verification (see [Verification and Calibration \[▶ 45\]](#)) before running a significant test run with X-Util or another application. Only then the device can put into operation again. If there is any doubt, please contact Bruker for advice or assistance.

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 chapter 7 and 8 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.

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.

WARNING



Danger of injury from electrical shock!

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

- ▶ Only qualified personnel should open the housing.
- ▶ Disconnect the device from the electrical power supply before opening the device. Use a voltmeter to verify that the device is not under power!
- ▶ Be sure that the power supply cannot be reconnected without notice.

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 parts of cooled or heated units.
- ▶ Do not use damaged units.
- ▶ After removing any part of the unit, to cool it or thaw before coming in contact.
- ▶ Remove tips and all racks and accessories from the work surface before coming in contact.

Whenever screws have been loosened or removed for corrective action, they must be cleaned and locked again with Loctite® 243 (liquid) or Loctite® 248 (gel stick) unless otherwise stated (see [Securing Screws \[80\]](#)).

The safety door and arm covers must be removed before any maintenance or service on components in the arm can be performed. Detailed descriptions can be found in the section [Arm Cover \[83\]](#) and [Safety Door \[93\]](#).

11.1 Replacing the Power Supply Unit



The illustrations in this section show a power supply unit with a single output. PSU with dual output is mounted in a similar way.

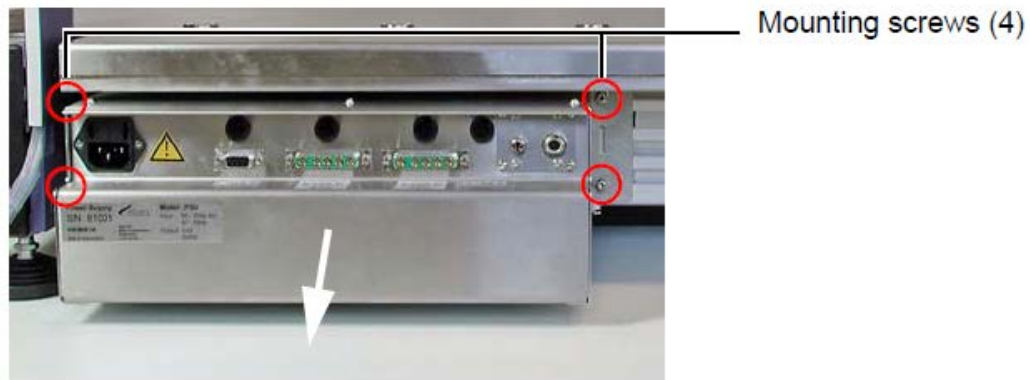


Figure 11.1: Removing power supply unit

Required tools

- Torx screwdriver T25

Disassembly

1. Switch the instrument off and unplug the power cable.
2. Disconnect all CAN-bus and HP cables.
3. Remove the four mounting screws, two on each side.
4. Grab the PSU and pull it out.

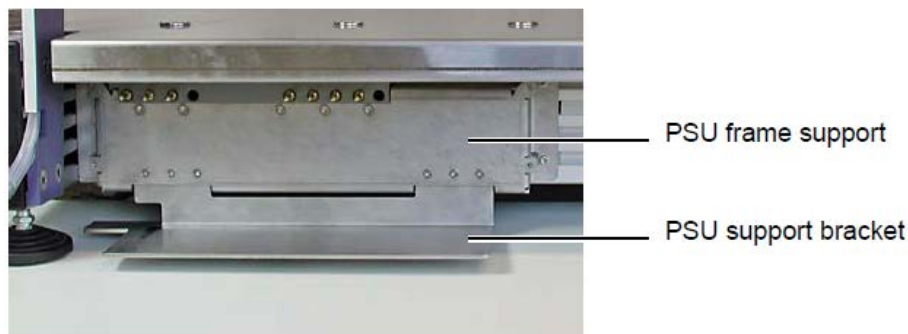


Figure 9-5: PSU support

Figure 11.2: PSU support

Assembly

1. Ensure that the instrument is switched off and the power cable is unplugged.
2. Position the PSU on the support bracket and slide the module towards the frame until fully connected.
3. Secure the PSU with the four screws.
4. Connect the CAN-bus and HP cables.

11.2 Adjusting the X-Belt Tension

The X-belt is a slotted belt along the X-rail, used by the X-drive to move the arm to and fro. Whenever the belt is dismantled (e.g. for the inspection of the X-gear) the tension of the belt should be rechecked.



Incorrect belt tension results in inaccurate X-positioning. With insufficient belt tension, the system might vibrate when idle or make a high pitch noise during initialization. With too much tension, the X-motor bearing assembly could be damaged.

11.2.1 Mechanical Principle of the X-Drive

The X-motor runs along the slotted belt (X-belt), which is held around the motor gear by two counter pulleys, giving the belt an Omega (Ω) shape.

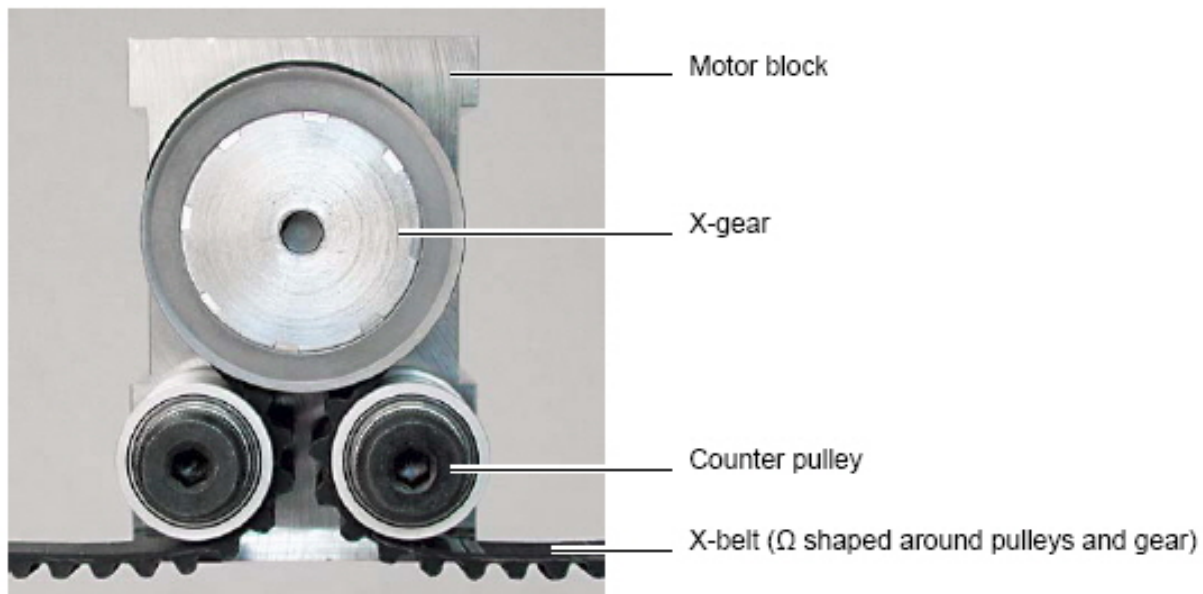


Figure 11.3: X-Spacer and X1-Stopper

The correct setting of the X-belt tension ensures that no drift or tooth skip occurs. It also affects the positioning precision of the arms.



If you check the tension after the device has been idle for a couple of days, the X-belt keeps the Ω shape caused by the X-motor gear and counter pulleys (memory effect). This phenomenon temporarily increases the belt tension. In order to eliminate this effect, first manually move the arms along the X-rail several times.

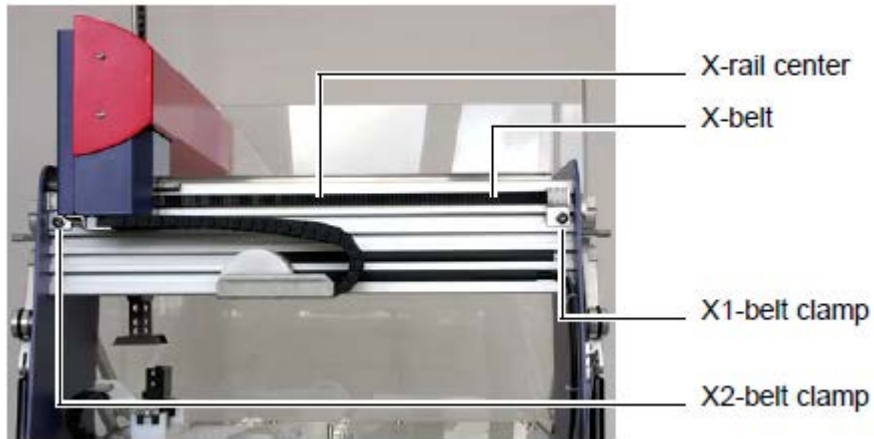
11.2.2 Checking the Tension of the X-Belt

Required Tools

- 2.5 kg precision spring-loaded scale
- 20 cm precision metal rule
- Torx screwdriver T20
- Allen wrench 5 mm

Procedure

1. Ensure that the device is switched off and the power cable is unplugged.
2. Move the arm opposite of its home position.



3. Hook the spring-loaded scale to the center of the X-belt.



Figure 11.4: X-Belt Measurement Setup

4. Pull the spring loaded scale horizontally applying a load of 500 grams.



Figure 11.5: Spring-Loaded Scale Indicator

5. Measure the deflection of the X-belt with a metal ruler, while pulling on the spring-loaded scale.

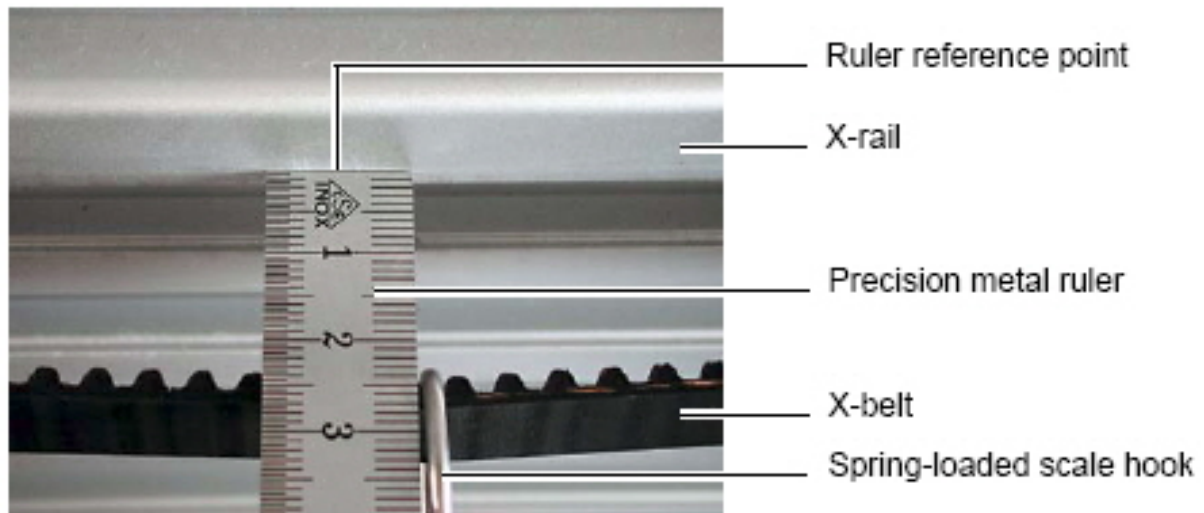


Figure 11.6: Measuring the X-Belt Tension

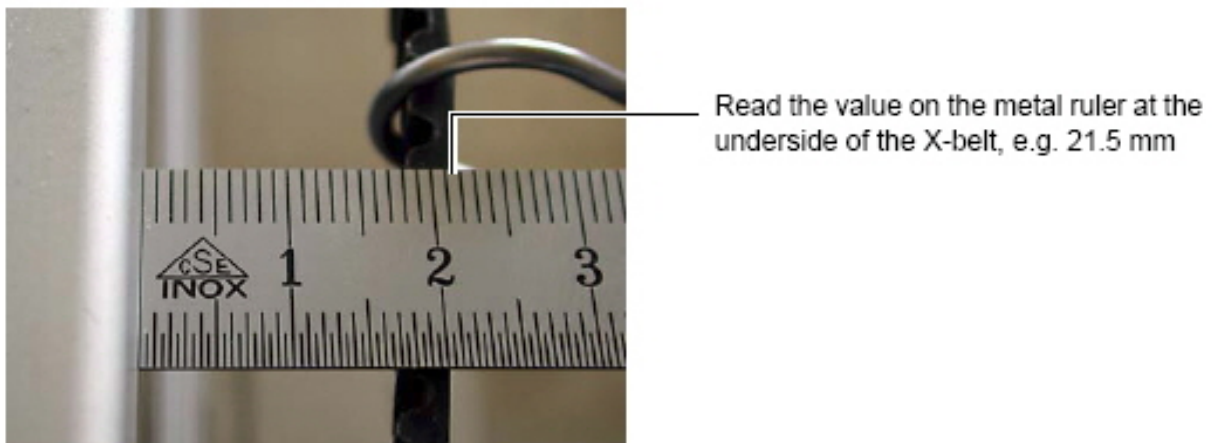


Figure 11.7: Reading the Value on the Metal Ruler

6. Read the value on the metal ruler on the underside of the X-Belt.
7. The resulting value must be between 20 – 21 mm. If the value is not within the range, the tension needs to be adjusted.

11.2.3 Adjusting the Tension of the X-Belt

1. Ensure that the device is switched off and the power cable is unplugged.
2. Ensure that the arm is opposite from its home position.
3. Mark precisely the current position of the X1-belt clamp on the X-rail with a pen.

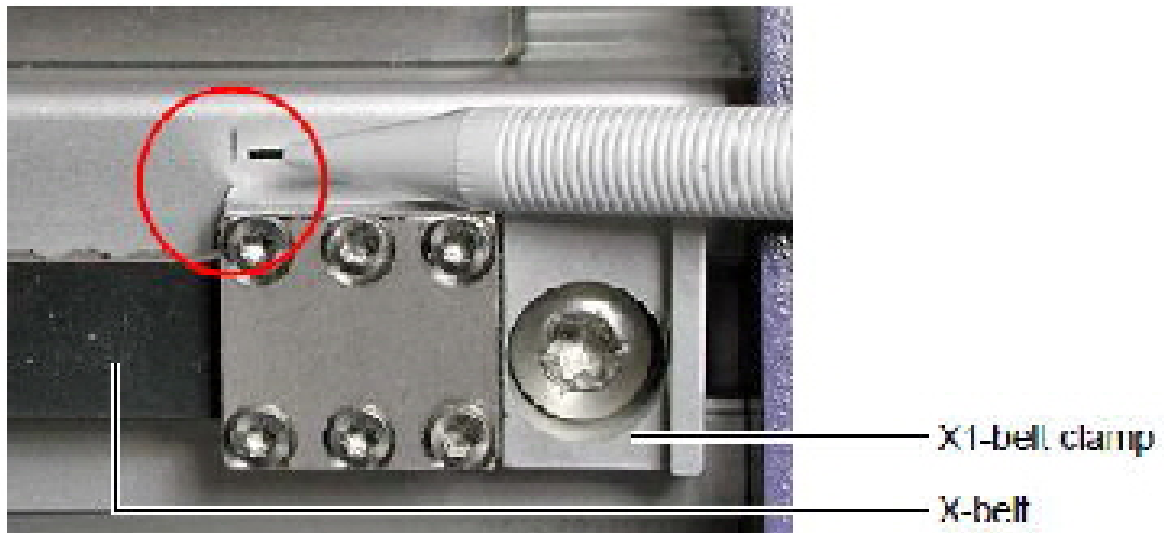


Figure 11.8: Marking the Position of the X1-Belt Clamp

4. Loosen the belt clamp screw on the X1-belt clamp.
5. Slide the belt clamp either towards the X-rail center to reduce, or in the opposite direction to increase, the tension.



Shifting the X1-belt clamp by 1 mm affects the deflection of the x-belt by several mm!

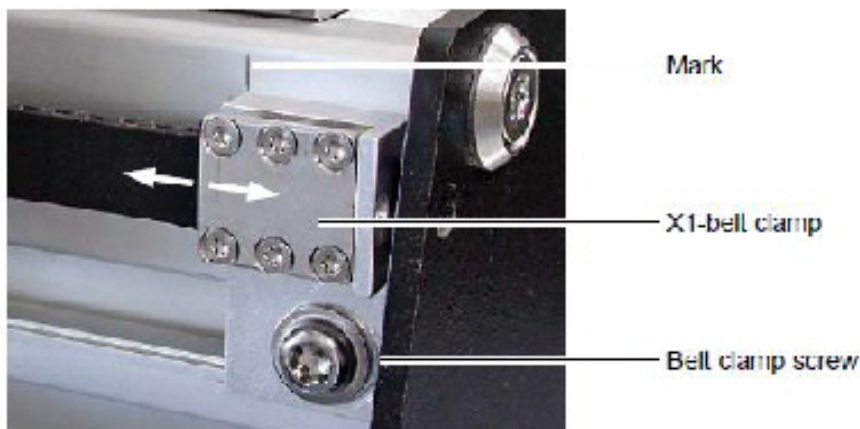


Figure 11.9: Adjusting the X-Belt Tension by Shifting the X1-Belt Clamp

6. Tighten the belt clamp screw.
7. Measure the tension again by measuring the belt deflection. The resulting value must be between 20 – 21 mm. Otherwise repeat the adjustment procedure.



If the belt is too loose a squeaking noise might be heard while initializing the arm.

11.3 Exchanging Boards and Motors

11.3.1 Introduction

To ease reassembly when exchanging boards and motors, and to avoid incorrect connection, plugs should be marked before they are disconnected. This is especially important when the same connector type is used more than once on a board.

11.3.1.1 Exchanging Controller Boards

After a controller board, e.g. X-board or Y/Z-board, has been exchanged, the X-Util must be run to download the boot loader, firmware and parameters. Before starting the procedure, the arm should be moved away from its home positions and the object detector should be positioned in the center of the arm.

Switch the device on.

1. Start X-Util -> window pops up „New hardware“
2. Click „Identify“ -> corresponding motor or pump is moving.
3. Select module.
4. Set flag „Save on module“.
5. Press „Save“.
6. Load firmware and parameters.

11.3.2 Replacing the X-Board

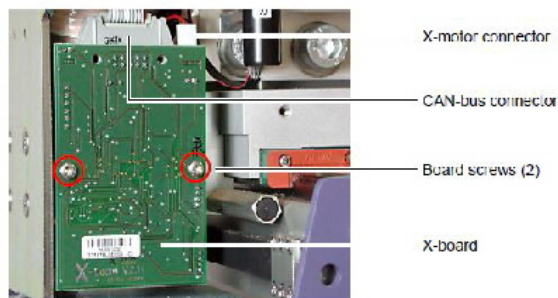


Figure 11.10: X-Board (arm)

Required tools

- Torx screwdriver T10

Disassembly

1. Ensure that the device is switched off and the power cable is unplugged.
2. Remove the arm covers (see [Arm Cover](#) [▶ 83]).
3. Remove the two board screws.
4. Carefully pull the board out and mark plugs/sockets on the X-board to ease the reconnection later on.
5. Disconnect the cables.
6. Remove the board.

Assembly

1. Ensure that the device is switched off and the power cable is unplugged.
2. Connect the cables.
3. Mount the board with the two screws.
4. Install the arm covers (see [Arm Cover](#) [▶ 83]).
5. Download the boot loader, firmware and parameters as described in ["Exchanging Controller Boards"](#) [▶ 118].

11.3.3 Replacing the X-Motor

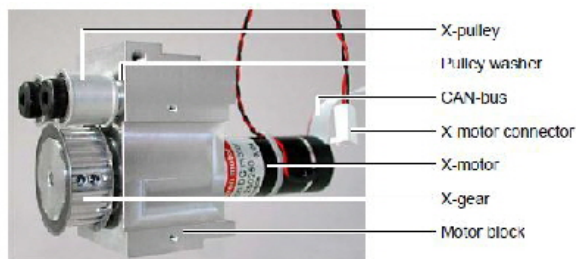


Figure 11.11: X-Motor Assembly

Required tools

- Torx screwdriver T10, T20, T25
- Allen wrench 4 mm („L“-shape)
- Adjustable torque wrench, Allen bit 4 mm

Disassembly

1. Ensure that the device is switched off and the power cable is unplugged.
2. Remove the arm covers (see [Arm Cover](#) [▶ 83]).
3. Disassemble the X-board (see ["Disassembly"](#) [▶ 118]).
4. Remove the CAN connector board screws.
5. Remove the pump/valve board holder screws.
6. Remove the X-motor assembly screws.
7. Swivel the back support plate downwards in order to get access to the motor block screws.
8. Release the belt tension by loosening the belt clamp screw and sliding the X2-belt clamp towards the X-rail center.
9. Dismount the two X-pulleys and the washers from the motor block.
10. Release the belt from the X-gear.
11. Remove the two motor block screws and the X-motor assembly.
12. Loosen the two grub screws on the X-gear and remove the X-gear.
13. Dismount the X-motor by removing the two screws.



The caterpillar chain drive remains mounted on the back support plate.

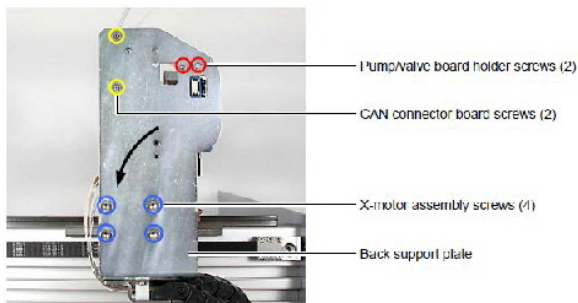


Figure 11.12: Back Support Plate

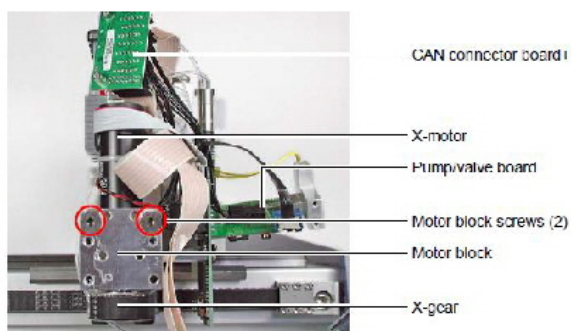


Figure 11.13: The Back Support Plate

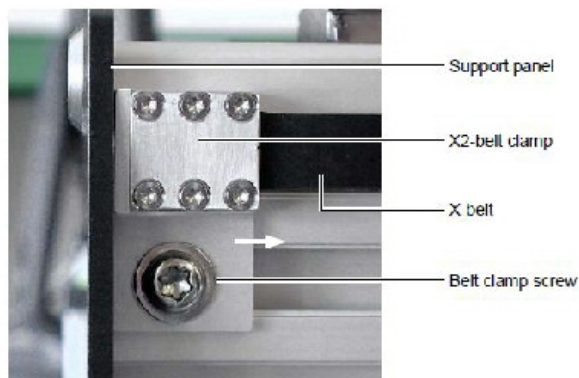


Figure 11.14: Screws for Releasing the X-Belt Tension

Assembly

1. Ensure that the device is switched off and the power cable is unplugged.
2. Mount the X-motor on the motor block with the two screws. Make sure that the flat ribbon cable points towards the X-pulley bores.
3. Put the X-gear on the motor shaft. Align the gear so that its threaded holes face the flattened side of the motor shaft. Insert the grub screws and tighten them.
4. Mount the motor block on the X-module with the two screws. Make sure that block and module are perfectly aligned before tightening the screws with a torque of 9 Nm.
5. Guide the X-belt around the X-gear.
6. Mount the two pulleys and the washers. Insert the screws and tighten with a torque of 9 Nm. Make sure that the washer aligns perfectly with the screw axis.

7. Firmly push the X2-belt clamp against the support panel while tightening the belt clamp screw.
8. Mount the back support plate on the motor block with the four X-motor assembly screws.
9. Mount the pump/valve board holder.
10. Mount the CAN connector board.
11. Assemble the X-board (see ["Assembly" \[▶ 118\]](#)).
12. Slide the arm carefully to and fro to check that the X-belt smoothly moves around the X-drive.
13. Install the arm covers (see [Arm Cover \[▶ 83\]](#)).

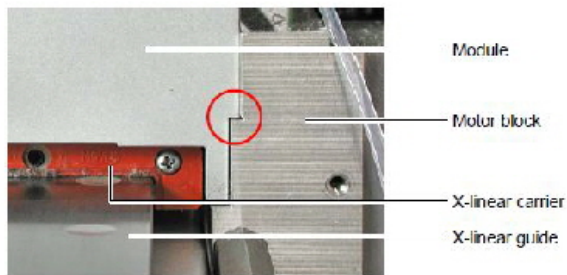


Figure 11.15: Alignment Between Motor Block and X-module

See also

- 📄 [Replacing the X-Motor \[▶ 119\]](#)

11.3.4 Replacing the YZ-Module

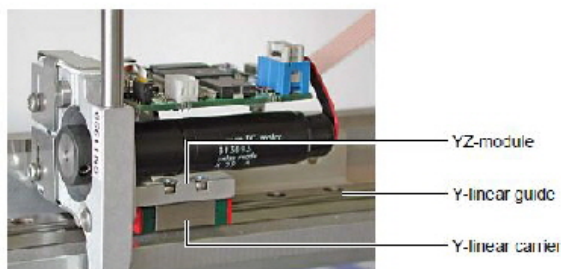


Figure 11.16: YZ-Module

Required tools

- Torx screwdrivers T10

Disassembly

1. Ensure that the device is switched off and the power cable is unplugged.
2. Remove the arm covers (see [Arm Cover \[▶ 83\]](#)).
3. Disassemble the YZ-board (see ["Disassembly" \[▶ 122\]](#)).
4. Disassemble the Z-motor (see ["Assembly" \[▶ 125\]](#)).
5. Remove the screws, securing the YZ-module on the Y-linear carrier. Never remove the Y-linear carrier from the linear guide!

Assembly

Ensure that the device is switched off and the power cable is unplugged.

1. Mount the screws to fasten the YZ-module on the Y-linear carrier.
2. Assemble the Z-motor (see ["Assembly" \[125\]](#)).
3. Assemble the YZ-board (see ["Assembly" \[122\]](#)).
4. Install the arm covers (see [Arm Cover \[83\]](#)).

11.3.5 Replacing the YZ-Board

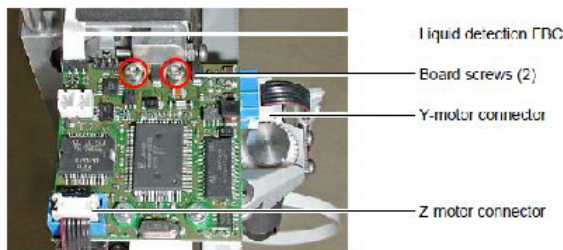


Figure 11.17: YZ-board (BB2)

Required tools

- Torx screwdrivers T8, T10, T20

Disassembly

1. Ensure that the device is switched off and the power cable is unplugged.
2. Remove the arm covers (see [Arm Cover \[83\]](#)).
3. Carefully pull the liquid detection flat band cable (FBC) out.
4. Remove the two board screws.
5. Lift the board at the corner which is closest to the liquid detection FBC connector.
6. Unplug the Z-motor connector.
7. Unplug the Y-motor connector whenever possible without removing the cable tie.
8. Turn the board over and remove the two screws of the strain-relief.
9. Unplug the CAN-bus FBC connector.

Assembly

1. Ensure that the device is switched off and the power cable is unplugged.
2. Plug the CAN-bus FBC connector in.
3. Mount the strain-relief with the two screws and turn the board over.
4. Plug the Y-motor connector in, mount a cable tie if it was previously removed. Do not over tighten the cable tie.
5. Plug the Z-motor connector in.
6. Install the board with the two screws.
7. Carefully insert the liquid detection FBC.
8. Plug the power cable in and switch the device on.
9. Check for holding torque.

10. Start X-Util. The „Module Setup“ window will be displayed.
11. Assign board to correct module (refer to the module identification in the firmware setup).
12. Switch the device off.
13. Install the arm covers (see [Arm Cover \[83\]](#)).

11.3.6 Replacing the Y-Motor (with fixed support)

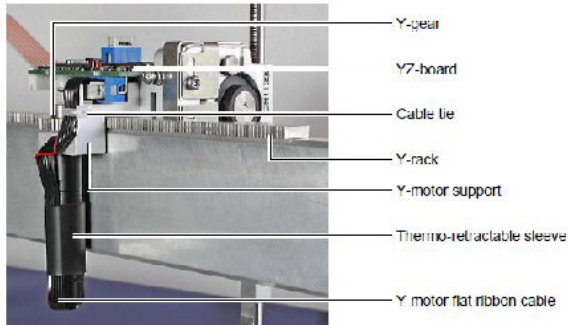


Figure 11.18: Y-Motor Assembly with Fixed Y-Motor Support

Required tools

- Torx screwdriver T6, T10
- Allen wrench 1.5 mm

Disassembly

1. Ensure that the device is switched off and the power cable is unplugged.
2. Remove the arm covers (see [Arm Cover \[83\]](#)).
3. Disassemble the YZ-board (see ["Disassembly" \[122\]](#)).
4. Loosen the two Y-motor support screws and remove the Y-motor assembly.
5. Remove the cable tie.
6. Loosen the gear grub screw and remove the Y-gear from the motor shaft.
7. Remove the two screws and dismount the Y-motor.

Assembly

1. Ensure that the device is switched off and the power cable is unplugged.
2. Mount the Y-motor on its support. Make sure that the flat ribbon cable is as parallel as possible to the arm.
3. Mount the Y-gear.
4. Fasten the flat ribbon cable to the support with the cable tie. Do not over tighten the cable tie.
5. Push the support gently against the Y-rack to prevent play. Ensure that the Y-gear is aligned with the Y-rack. Then tighten the screws. Check that the Y-motor assembly can be moved smoothly along the Y-rack.
6. Assemble the YZ-board (see ["Assembly" \[122\]](#)).
7. Install the arm covers (see [Arm Cover \[83\]](#) - Installation).

11.3.7 Replacing the Y-Motor (with spring-loaded support)



Do not dismount the Y-motor support components!

Disassembly

1. Ensure that the device is switched off and the power cable is unplugged.
2. Remove the arm covers (see [Arm Cover \[83\]](#) - Removal).
3. Disassemble the YZ-board (see ["Disassembly" \[122\]](#)).
4. Loosen the Y-motor support screws.
5. Remove the Y-motor support.

Assembly

Ensure that the device is switched off and the power cable is unplugged.

1. Mount the Y-motor support. Insert the two screws but do not tighten yet.
2. Press the Y-motor assembly against the Z-hub module in the direction indicated by the arrows. Keeping the horizontal and vertical gaps between the Y-motor support and Z-hub module as small as possible
3. Tighten the screws.
4. Assemble the YZ-board (see ["Assembly" \[122\]](#)).
5. Install the arm covers (see [Arm Cover \[83\]](#)).



Figure 11.19: YZ-Board Connectors and Screws (left) and Y-Motor Support with Mounting Screws (right)

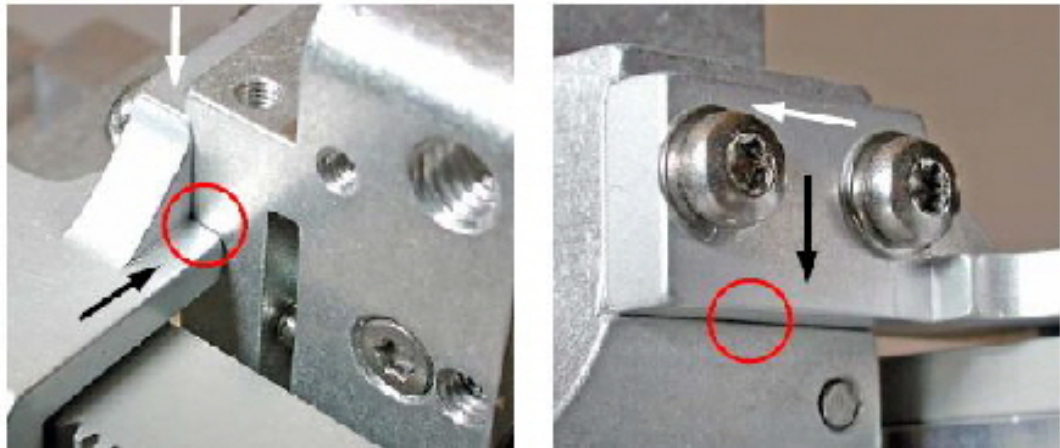


Figure 11.20: Gaps Between Y-Motor Support and the Z-Hub Module

11.3.8 Replacing the Z-Motor

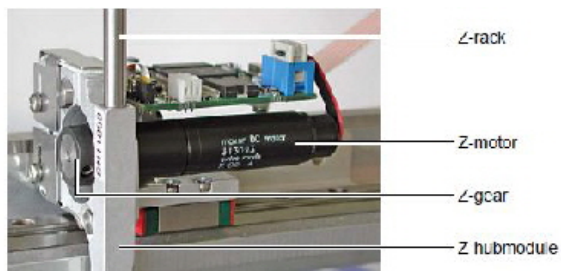


Figure 11.21: Z-Motor Assembly

Required tools

- Torx screwdriver T6, T8

Disassembly

1. Flush back pipetting tubing.
2. Ensure that the device is switched off and the power cable is unplugged.
3. Disassemble the Z-motor assembly.
4. Dismount the Z-gear.
5. Dismount the motor from the Z-support plate.

Assembly

1. Ensure that the device is switched off and the power cable is unplugged.
2. Insert the motor into the Z-support plate. Position the motor so that its flat ribbon cable points towards the smaller threaded hole in the Z-support plate.
3. Fasten the motor with the two screws.
4. Put the gear on the motor shaft. Position the gear so that its threaded hole faces the notch in the motor shaft.
5. Insert the screw into the Z-gear and tighten.

6. Install the Z-motor assembly (see ["Assembly" \[▶ 125\]](#)).
7. Plug in the power cable and switch the device on.
8. Flush the system.

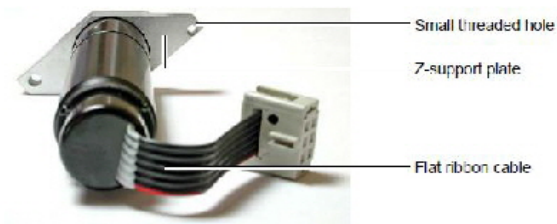


Figure 11.22: Correct position of Z-motor in Z-support plate

11.3.8.1 Z-Motor Check

If the Z-axis fails during operation, check whether the Z-motor channel is recognized and can be initialized in X-Util/Modul_info.

If not, check the motor first with the Sias encoder tester.

Required tools

- Encoder tester (P/N: 150104 - not delivered by Bruker).

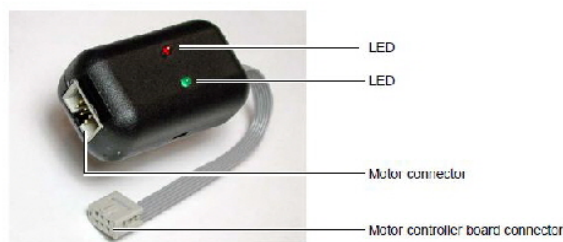


Figure 11.23: Encoder Tester

1. Ensure that the device is switched off and the power cable is unplugged.
2. Remove the arm covers (see [Arm Cover \[▶ 83\]](#)).
3. Loop the encoder tester between motor and motor controller board (MCB).
4. Plug the power cable in and switch the device on.
5. Start X-Util, select the appropriate motor and note the current scaling factor and speed (to restore later).
6. Set scaling factor 1 >> 0.
7. Set speed to 1.
8. Set „new Position“ to 100
9. Click „Move“.
10. Carefully check the LED's repetitive flashing sequence:
 - ▶ The first LED lights up (it is not relevant which one).
 - ▶ The second LED lights up (both are lit).
 - ▶ The first LED switches off.
 - ▶ The second LED switches off.
11. Repeat check if necessary by clicking the Move button. Any other flash sequence pattern indicates that the encoder is defective.

12. Reset the scaling factor and speed to the previous noted values.
13. Ensure that the device is switched off and the power cable is unplugged.
14. Disconnect the encoder tester.
15. Depending on the test result, replace the motor or proceed with the coil resistance test.

11.3.8.2 Coil Resistance Check

If the encoder check did not result in failure, check the coil resistance of the motor with an ohmmeter. This quick check helps determine if the faulty part is the motor or the motor control board.

Required tools

- 6-pin header
- Ohmmeter

Procedure

Ensure that the device is switched off and the power cable is unplugged.

1. Remove the arm cover (see [Arm Cover](#) [▶ 83]).
2. Unplug the Z-motor connector.
3. Plug a 6-pin header into the Z-motor connector.
4. Check the coil resistance of the motor between pin 1 and 6. It must be 5 - 20 Md. If the result is not within this range, the motor is faulty.
5. Check the resistance of the encoder between pin 2 and pin 5. It must be 4 - 20 Md. If the result is not within this range, the motor is faulty.
6. If the results are within the tolerance, the board might be defective. Otherwise dismount the motor (see ["Disassembly"](#) [▶ 125]) and replace it.



A new motor may have a higher coil resistance for a short period but should come back within the range described above.

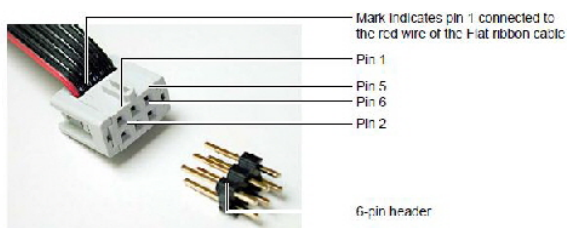


Figure 11.24: Z-motor connector and header



Figure 11.25: Measuring the Inner Coil (left) and Encoder Resistance (right)

11.4 Arm Alignment

Before the arm alignment is performed, the parallelism of the arm should be checked. See [Arm Alignment Check \[104\]](#).



The precision of this adjustment has a direct impact on the positioning precision of the arm across the whole deck area. For safety reasons place a foam spacer underneath the arm. You may need to use force to loosen the blocking screws. Never remove them completely

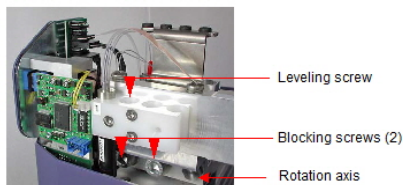


Figure 11.26: Arm Fixation and Adjustment

Required tools

- Allen wrench 4 and 8 mm
- Adjustable torque wrench (20 - 80 Nm; Allen bit 8 mm)
- Torx screwdrivers T10, T20, T30

Disassembly

1. Ensure that the device is switched off and the power cable is unplugged.
2. Remove the arm covers ("Arm Housing" on page 103).
3. Remove the upper and the lower center screws of the pump holder and lift it up to get access to the blocking screws. Do not remove the screw on the left hand side of the holder!
4. Disconnect the CAN-bus flat band cable (FBC) from the CAN connector board and push the FBC aside to provide access to the leveling screw.

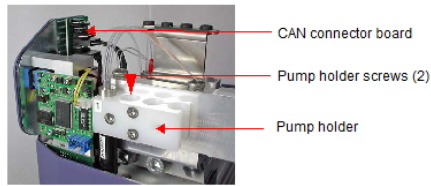


Figure 11.27: The CAN Bus FBC and Pump Holder

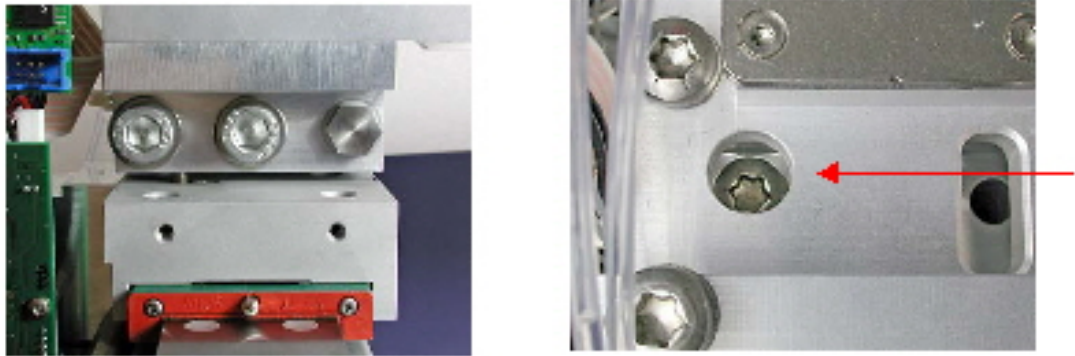


Figure 11.28: Arm Blocking Screws and Rotating Axis (left) and Arm Leveling Screw (right)

11.4.1 Arm Adjustment



Turning the leveling screw a quarter turn lifts or lowers the front of the arm by about 2.25 mm!

1. Loosen the blocking screws with an Allen wrench. Never remove the blocking screws!
2. Adjust the arm alignment by turning the leveling screw. Turning the screw anti-clockwise lowers the front of the arm and decreases the distance to the deck. Turning the screw clockwise lifts the front of the arm and increases the distance to the deck.
3. Tighten the blocking screws a little and check the parallelism of the arm as described in "Arm Alignment Check" on page 131. Repeat the adjustment procedure if necessary.
4. Tighten the blocking screws with an adjustable torque wrench applying a torque of 60 Nm.

11.4.2 Arm Assembly and Testing

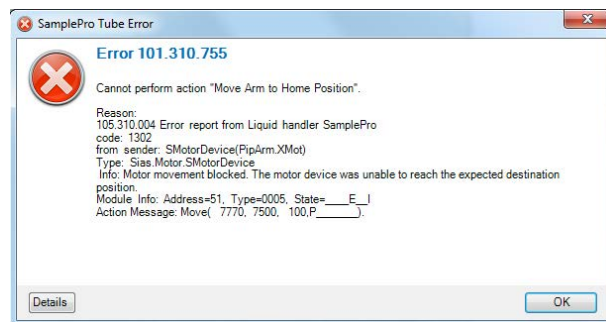
1. Connect the CAN-bus FBC to the CAN connector board (the order is not important, but the orientation is).
2. Mount the pump holder.
3. Install the arm cover (see [Arm Cover \[83\]](#)).
4. Check at least one robot application layout to evaluate the Z-parameters of the slots and racks.

12 Troubleshooting

12.1 Error Reporting Checklist

Before reporting an error to Bruker, the following steps must be taken:

1. Specify on which device (type, name and serial number) the error occurred, see Rating Plate System.
2. Indicate which software type and version is used.
3. Write down the error code.
4. Be ready to e-mail the compressed file containing current settings and logs (see "[History Files and Log Files](#)" [131]).
5. Describe the error (behavior of the device when the error occurred).
6. Report which action has been taken.
7. Contact Bruker support by mail.



12.2 History Files and Log Files

SamplePro Tube assembles data, error messages and settings information in various history and/or log files that are invaluable for troubleshooting purposes.

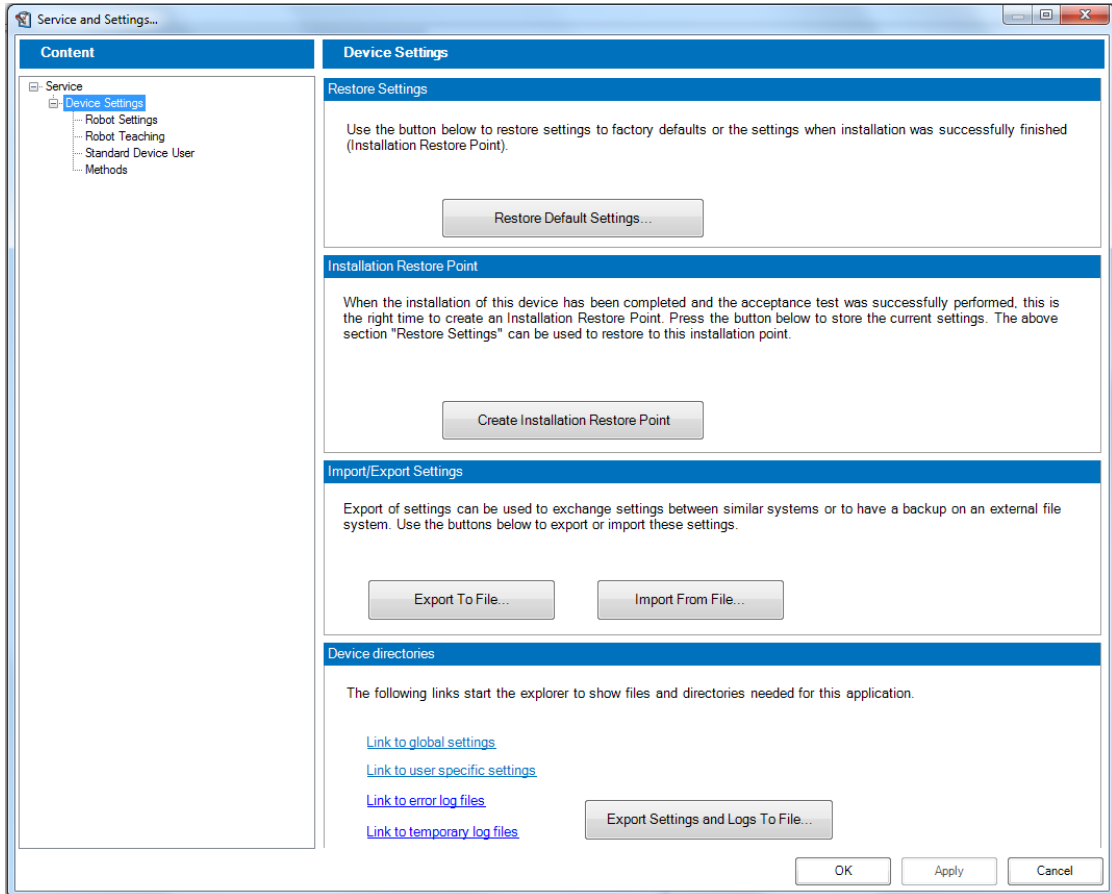
The settings and log files can be exported and viewed or sent to Bruker for troubleshooting purposes.

To export log files:

1. Open the File menu Service and Settings
2. Login with service user rights.
3. Open the page Device Settings in the left tree view.

At the bottom of the page there are links to the error main log file „*SampleProTube.critical.log*” and the temporary main log file „*SampleProTubeGui.log*” that can be used to show the current log files.

The **Export Settings and Logs To File..** button can be used to copy all interesting data (configuration/settings files and log files) into a *.ZIP file to send them to Bruker.



The robotic system software modules from SIAS are creating additional sub-device log files, that will be used to find error details if the error cause cannot be located with the main log files (see "[Robot System Sub-device Log Files](#)" [132]).

12.2.1 History files

For displaying the history data of all actions:

Select in the menu **View** and sub menu **Activity History...**

The data are written in several files in the folder „ActivityHistories“. This folder is located the folder „logs“, where the current main log file is saved.

12.2.2 Robot System Sub-device Log Files

The robotic system sub-device log files are automatically generated and stored in the sub folder „Robot“ of the temporary log file folder.

The first 99 logs are stored sequentially, numbered from „SCan_IO01“ to „SCan_IO99“. After the 99th log, the system loops and overwrites the first file in the loop.

When the robotic system runs service tests under X-Util, log files are automatically generated and stored in the sub folder „\log“ of the X-Util folder.

The size of the log file depends on the length of the run, but may be several megabytes! Opening such a file to investigate module errors or flags is more convenient at Bruker or SIAS site using a special tool, which generates useful information for systematic support.

Bruker may request these additional sub-device log files, if the cause of the error cannot be located using the main log files.

12.3 Error Information Dialogs

The SamplePro Tube program displays errors and warnings in different ways depending on the error type. Typically the error dialog shows an error information description and also displays hints on how to remove the error cause. The operator can continue or abort the application.

12.3.1 Initialization Warning Dialog

When starting the application at initialization time the following warning may occur:

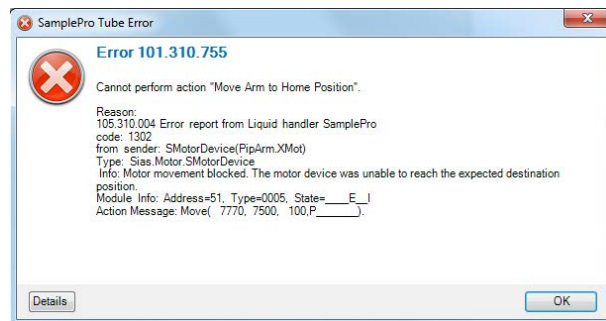


Figure 12.1: After checking the device the operator should retry the initialization.

Service personnel can fix the problem in the service area and then retry the initialization.

12.3.2 Standard Error Dialog at Run Time

After initialization, most of the error messages at run time will display the following error or warning dialog:

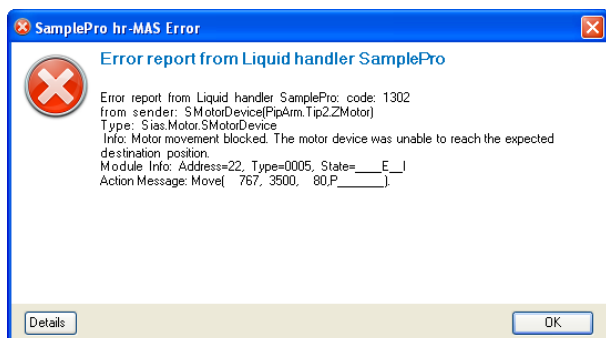


A detailed failure description will be shown at the top of the dialog.

The probable location of the failure is displayed as a red rectangle in the system view.

Finally advice on how to check the device to locate and remove the failure will be displayed. Additional information may also be provided for special error handling.

12.3.3 Robot System Sub-device Error Window



The causes of many operating problems can be identified and corrected by the user. Failures are displayed on the computer screen as error codes and messages, which are described in this chapter.

If an error of the robot system sub-device occurs during the run time of the device, error codes are displayed in the first line of the error description.

Errors originating from the malfunction of individual modules in the robot system are displayed in the description line „from sender“, together with the name of the module that generated the error.

Typically there is no detailed information available. The user should close the error dialog with **OK** and restart the application if the cause of the error is found.



When reporting a malfunction or asking Bruker for assistance, a precise description of the problem should already be provided, including the exact error code, module information, software version and build, as well as the attempted corrective action and the serial number of the device (for robot system sub-device log files see *"Robot System Sub-device Log Files"* [▶ 132]).

Error codes and messages are displayed during run-time.

The following sections describe the errors and give some assistance in locating the cause and possible remedy. Although this information is comprehensive, it is impossible to list every potential cause and remedy for each error. In this case, Bruker relies on the judgment and professionalism of the certified service engineer.

Type of Error	Value hexadecimal	Description	Cause
Syntax error at module	Missing	The telegram is not correct	Software error Wrong configuration
Module error at module	0100	Initialization failed (no block found). The module has not been initialized	Mechanical problem (loose gear) Sensor not found Electronics error Wrong motor range Time-out
	0200	Movement blocked	Mechanical obstruction
	0300	Initialization failed (movement blocked during the init offset step)	Mechanical obstruction

Type of Error	Value hexadecimal	Description	Cause
Module Errors			

Table 12.1: Module Error Groups/ Communication Errors

Type of Error	Description	Cause
Unknown module error	An unknown error has occurred	Translate error code in decimal and see if it matches a known code
Error addressing module	The module can not be addressed	Faulty electronics Module firmware error Wrong firmware identification Wrong configuration in „siascfg.ini“ Cables not properly connected
Error sending to module	The telegram can not be sent to the module	Faulty electronics Module firmware error Cables not properly connected device is switched off
Illegal message from module	The module sends incorrect telegram	Firmware error
Active time-out at module	The module does not complete the action in a given time	Time-out time too short Speed of the module too slow Software error Wrong configuration in „siascfg.ini“ Electronics error device is switched off
CAN error	CAN-bus does not work properly	CAN dongle not installed properly Driver for the CAN-bus faulty Software error - reboot computer USB port power failure
Unable to create CAN thread	Software can not create a CAN thread	Software error
Message answer time-out at module	The module does not answer in the given time	Faulty electronics Firmware error device disconnected from the PC or device is switched off. Wrong connection cable configuration

Table 12.2: Communication Errors

12.4 Start Problems Due to Virus Scanner Setup

In some cases the application program can slow down or even crash when virus scanner software activates and checks all files by default. This annoying behavior is caused by the virus scanner verifying the file whenever the control software writes data in the „log“ file.

Verifying the error cause

To confirm the assumption, rename the „LOG“ directory so the virus scanner software can no longer access the corresponding file. If the program starts immediately or no crash occurs, it's likely that the failure was caused by the virus scanner setting.

Solution

The virus scanner should be configured to exclude the „LOG“ directory from scanning.

12.5 Firmware



Screen shots in this section refer to „sias_io.dll“ version 0.1.7.7; X-Util version 0.1.7.5 and older, firmware version 0.21b2.

Incorrect sequence of action while updating or changing firmware parameters

An incorrect sequence of actions while updating or changing firmware parameters may result in an unstable firmware configuration and, worst case, can lead to an unusable device.

Firmware parameters are vital information for the device. Only Bruker certified engineers are authorized to modify these values and even then only when instructed to do so by Bruker.

Unauthorized changes by customers will invalidate the warranty!

12.5.1 Validating Firmware Parameters

The valid firmware parameter set for each device is produced at the time the device was built and is recorded on the CD delivered with the device.

The „*AllPar.dat*“ file containing all the parameter settings is located in the FW subdirectory by default. Sias suggests renaming this file to „*AllPar_Original.dat*“.

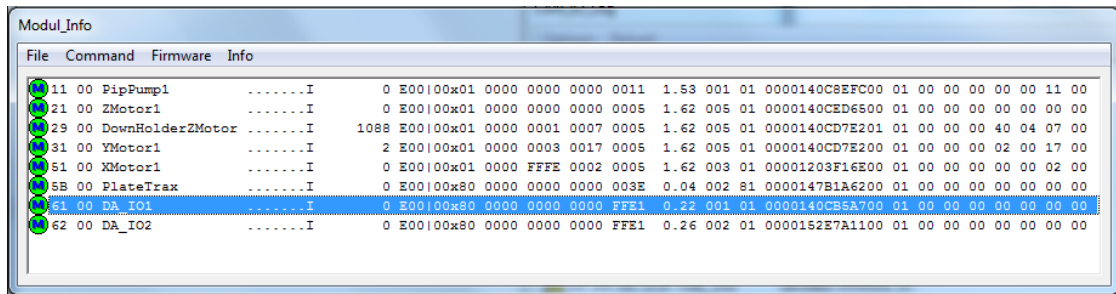
Whenever a backup of the device parameters is necessary, e.g. in case of a module replacement, the default name „*AllPar.dat*“ should be used. This file will always be the current one. When module is changed, first backup the old file as „*AllPar_yymmdd.dat*“ to provide a log history of the service actions done on the robot.

A PDF file containing screen shots of firmware parameters is usually handed out during hardware training courses.



This file should never be used as reference but it can be helpful when used as example! If in doubt, always contact Sias for the latest valid firmware and parameters.

12.5.1.1 Correct Configuration (display)



5B: Barcode Reader

61: Door switch and door sensor

62: LED status device (LEDs in the arm)

Number	Description
1	First Start address
2	Module name
3	Module status flag: D = detected; I = initialized; P = prepared; A = active; W = warning; E = error; other codes = module specific
4	Module position in units 1/10 (i.e. 0.1 mm, 0.1 degree, 0.1° C, 0.1 µl)
5	Firmware type (last 4 digits): 0004= DC motor; (BB1 V1.0, BB2 V1.0, X-board V 1.0) 0010= pump; (BB1 V1.0, BB2 V1.0, X-board V 1.0) 0005= DC motor; (MCB BB1 V2.0, MCB BB2 V2.0, X-board V 2.11) 0011= pump; (MCB BB1 V2.0, MCB BB2 V2.0, X-board V 2.11) FFE1= IO board base 540 other codes = module specific
6	Firmware version
7	Build
8	Module serial number of the CPU chip (first 12 digits)
9	PCB channel number for sub modules (last 2 digits): 00–03
Module Information	

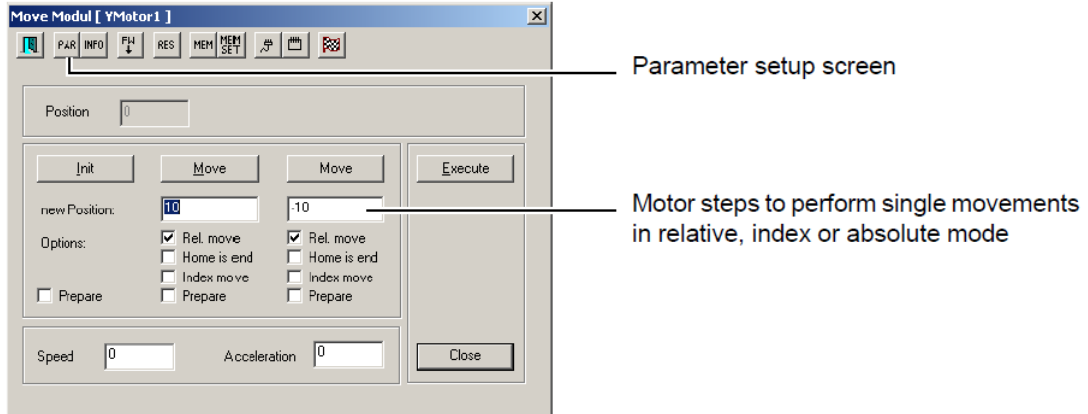


Figure 12.2: Move Module [YMotor1] Window

12.5.1.2 Incorrect Configuration (Display)

If the device is switched off and on while X-Util is starting up, corrupt information may be displayed with an incomplete module list and missing module type information.

Firmware parameters will be displayed as FFFF and/or 65535, meaning that default values were displayed.



Never save an incorrect configuration parameter screen!

In the example below, the module type information for address 31 is missing, resulting in a corrupted „Modul_Info“ list!

File	Command	Firmware	Info
11	00	PipPump1I 0 E00 00xFF 0000 0000 0000 0011 1.53 001 01 0000140C8EFC00 01 00 00 00 00 00 11 00
21	00	ZMotor1I 0 E00 00xFF 0000 0000 0000 0005 1.62 005 01 0000140CED6500 01 00 00 00 00 00 00 00
29	00	DownHolderZMotorI 0 E00 00xFF 0000 0001 0007 0005 1.62 005 01 0000140CD7E201 01 00 00 00 00 00 07 00
31	00	YMotor1	..W....I 2 E00 02xFF 0000 0003 0017 0005 1.62 005 01 0000140CD7E200 01 10 00 02 02 00 17 00
51	00	XMotor1I 1 E00 00xFF 0000 FFE8 0013 0005 1.62 003 01 00001203F16E00 01 00 00 00 01 00 13 00
5B	00	PlateTraxI 0 E00 00xFF 0000 0000 0000 003E 0.04 002 81 0000147B1A6200 01 00 00 00 00 00 00 00
62	00	DA_IO2I 0 E00 00xFF 0000 0000 0000 FFE1 0.26 002 01 0000152E7A1100 01 00 00 00 00 00 00 00

Figure 12.3: Modul_Info Window (example with cooling rack)

61: Door device missing

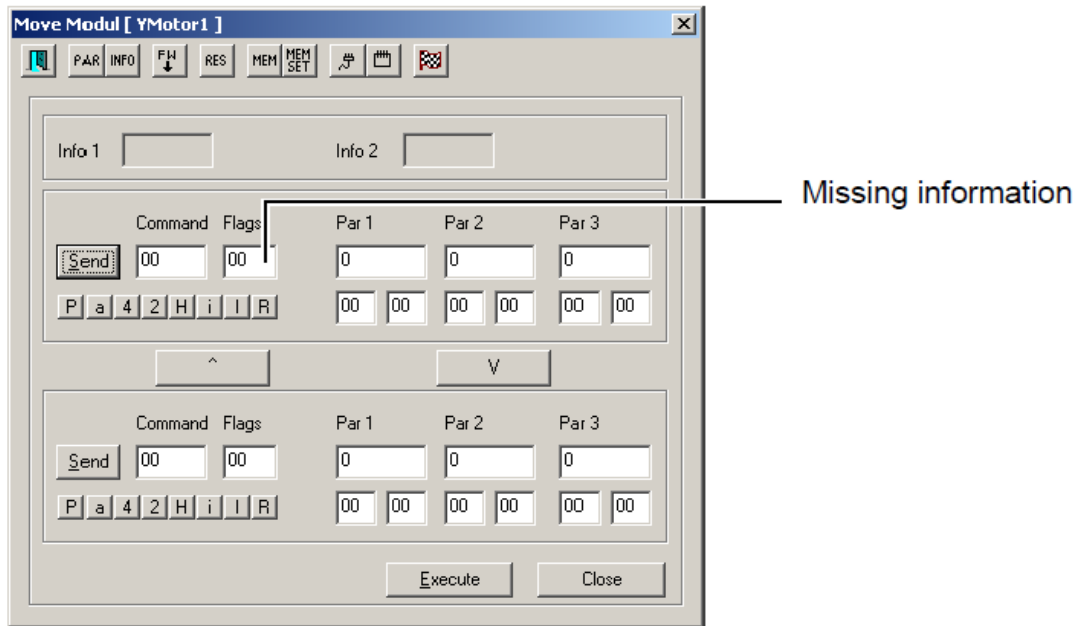


Figure 12.4: Display of an Incorrect Y-motor Move Module Window



Such firmware parameter windows may also appear when the corresponding oxfile is missing or not registered.

12.5.2 Firmware and Parameters



This section describes firmware parameters, not firmware versions. Do not confuse firmware download and parameter setup!

12.5.2.1 Firmware Download

A firmware download allows you to upgrade the current firmware version without changing the firmware parameters. As the same firmware type goes in different modules, e.g. DC motors, it makes sense to use the multi-download option of the firmware menu. Make sure that the firmware file version selected is the correct one!

„**Firmware info from file**“ or „**Firmware info from module**“ can be used to display information in clear text to make sure that the selection is correct.

12.5.2.2 Firmware Parameter Setup

A firmware parameter setup changes the current setting of a module independently of the firmware version. The setup contains the address of the modules and the specific values, which make the difference between a Z-motor and a Y-motor; e.g. liquid detection, default direction of the motor, error limits, home offsets. For pumps, it contains the scaling factor which is different for each pump.



The parameter **MultiSend** button should never be used in the field, as it would send the complete content of the current window to all other selected modules!

12.5.3 Troubleshooting Corrupted Firmware Configuration

The following list is a reference for the correct addresses and module names for robot systems.

Address Number		Module Name	Arm
HEX	DEC		
11-18	17-24	Micro-pump device	Arm
21-28	33-40	Z-motor	Arm
31-38	49-56	Y-motor	Arm
51	81	X-motor	Arm
5B	91	Plate-trax	
5C	92	ID-trax	
61-64	97-100	I/O Board	
72-73	114-115	Shaker 1 and 2	
79	121	Ixon centrifuge	
A1-A5	161-165	Thermo block	
Robot System			

Address Number		Module Name	Arm
HEX	DEC		
11	17	Micro-pump device	Arm
21	33	Z-motor	Arm
31	49	Y-motor	Arm
51	81	X-motor	Arm
Robot Based System			



X-Util and *device.dat* file, the addresses are displayed in hexadecimal; in *siascfg.ini* file in decimal!

12.5.3.1 Configuration Conflict after Module Identification

Whenever a defective board has been replaced with a Sias service part, it comes with the default service address E1 for sub module #1 and F1 for sub module #2. **X-Util** recognizes that there is a new component installed and displays the identification screen.



It is not possible to skip the automatic identification step. Only the manual identification steps illustrated below have a close window button.

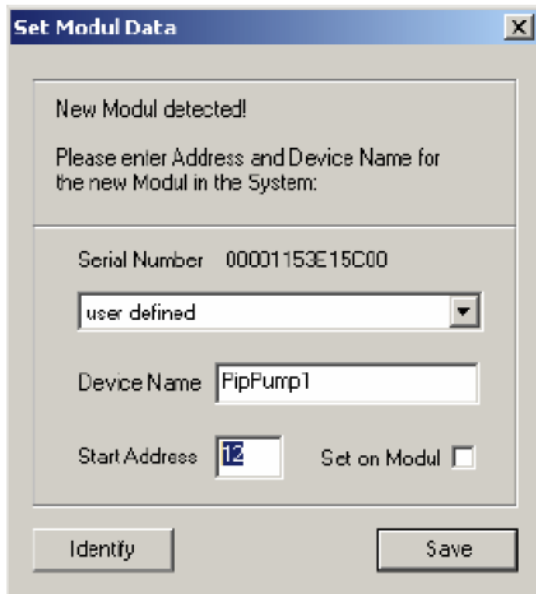


Figure 12.5: Set Module Data Window

Use the „**Identify**“ function for motors and pumps. It does not work with modules without motor or modules driven by IO firmware! Respect Sias rules when selecting **Device Name** and **Start Address**.

Check the **Set on Module** box when you are sure of the identification.

Save stores the start address in the module EEPROM and CPU serial number, name and address in the *device.dat* file. If the flag is unchecked, only the *device.dat* file is updated!

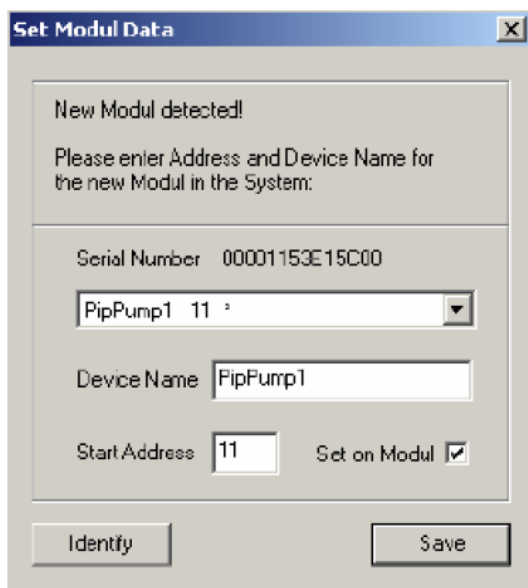


Figure 12.6: Set Module Data Window

Modify the above window using the start address 12.

If the identification procedure fails and the configuration in the EEPROM does not match the configuration in the *device.dat* file, **X-Util** will prompt for configuration troubleshooting with following message:

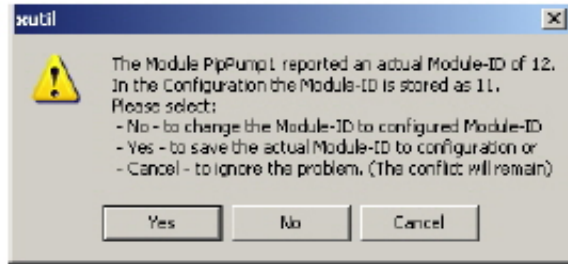


Figure 12.7: Set Module Data Window

In the example above the **Actual Module-ID** stands for information stored in the CPU EEPROM, and **Configured Module-ID** stands for the information stored in the *device.dat* file.



The button labels are not significant, but the explanations to select the appropriate option are. If the problem is not solved, the same prompt will pop up with the next start.

In the example above, the start address of module PipPump1 was set incorrectly to 12 instead of 11. Therefore the **No** button must be selected to save the module ID (EEPROM) to the configured module ID (*device.dat*): 00001153E15C00,011,PipPump1

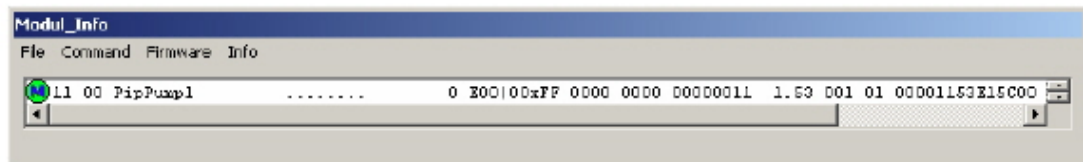


Figure 12.8: Modul_Info Window

12.5.4 Procedure to Restore a Correct FW Parameter Configuration

Restoring FW parameters should be done by Bruker certified engineers only!

12.5.4.1 Software Procedure

1. Switch the device on.
2. Start **X-Util** and check which modules are displayed or not.
3. Select one of the displayed modules.
4. Initialize it to get a visual confirmation of the selection.
5. Compare the address with the one in the **Module Name** list verifying that it matches with the print module number (...00).
6. Correct the address if necessary in the parameter window.
7. Click **Send**.
8. Compare the **Reverse** flag parameter with the one provided by Sias. Modify it if necessary.
9. Click **Send**.
10. Click **Close**.
11. Click **Reset**.
12. Re-initialize the module to check if the motor polarity is correct.
13. Exit **X-Util**.

14. Switch the device off.
15. Repeat these steps for all listed modules. In case some modules are not listed initially, they will be displayed after the first ones have been properly setup.
16. Open **File** menu from the **Modul_Info** screen.
17. Click on **Load parameter of all modules from file**.
18. Select the *AllPar.dat* file located in the *.\few directory*.
19. Click on **Download**.
20. Make a final check to be sure that each module (including pumps) can be addressed (unit, move, pick, disp, ...).
21. If a pump was changed, enter the new volume scaling factors delivered by Sias with the spare part in the „PipPump1.Vol“ firmware parameter page.
22. Click on **Send** and after a few seconds, click on **Close**.
23. Create a new *AllPar.dat* file from the file menu of the **Modul_info** screen in the. directory *. \fw* of X-AP.
24. Make a copy of this file under *yymmdd_hhmm_AllPar.dat* for archive.

12.5.4.2 Emergency Procedure

If identification problems persist, all modules can physically be disconnected except one. Then the only remaining module connected can be identified by init/move and set the right address and parameters.

1. Click **Send**.
2. Click **Exit**.
3. Switch the device off.
4. Connect next module.
5. Switch the device on.
6. Repeat the procedure until all modules are setup correctly.

12.5.5 Communication Error While Reading X-Util FW Parameters



The following error does not indicate defective hardware.

Problems

The following error windows might appear after the device has been switched off while **X-Util** was executing a firmware maintenance process.

1. Switch the device on again.
2. Start **X-Util**
3. Select the module by double clicking in the **Modul_Info** window.

First error message:

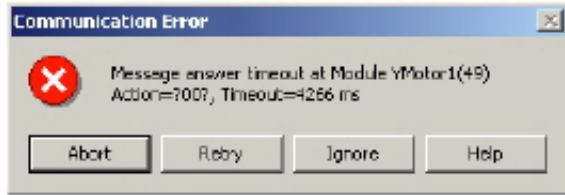


Figure 12.9: Communication Error Window

4. Click **Abort**.

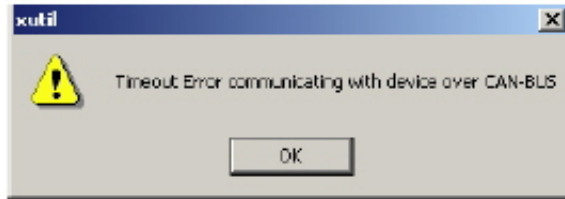


Figure 12.10: X-Util Window

5. Accept this error message as many times as you have installed modules on the robot.

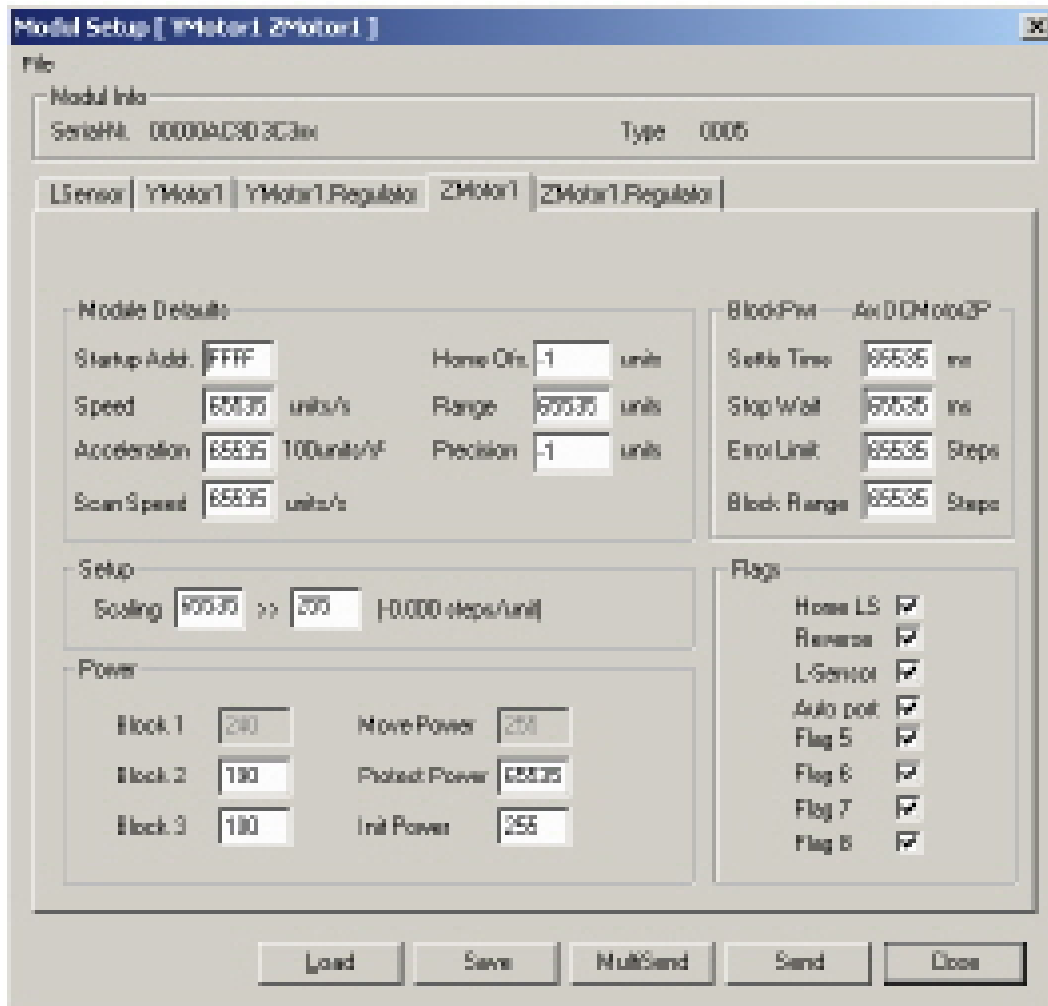


Figure 12.11: Module Setup – Zmotor1 Window

Diagnosis

The software could not read the firmware parameter configuration from the module. All fields which could not be filled in by the values of the *ini*-file are set to „FFFF“ (hexadecimal value „65535“ decimal).

Solution

1. Click **Close**.

The following window appears.

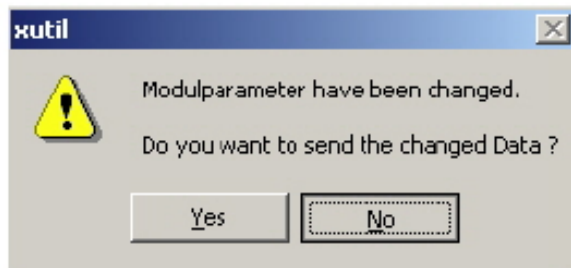


Figure 12.12: X-Util Save module parameter

2. Click **No**.

Do not send the changes to the module yet!

- It is extremely important not to send the changes to the module yet!
- Normal window appearance will be restored as soon as you exit **X-Util**.

3. Make sure the device is switched on, then restart **X-Util** to scan the current modules.

12.6 Y- and Z-Motor and Controller Board

12.6.1 Motor does not Initialize

Problem

The motor is not responding to initialization and there is no resistance when manually moving the pickup adapter up and down or back and forth.

Check: Is the power switched on?

Are power and CAN-bus cables/connectors correctly installed?

Is the CAN-bus looped?

Are software settings („siascfg.ini“), firmware, addresses and parameters correct?

Solution

Does a swap of the controller board affect another motor?

No

Go to section ["Motor Check" \[p. 146\]](#).

Yes

Go to section ["Controller Board Check" \[p. 147\]](#).

12.6.2 Motor Moves in Negative Direction with Positive Values

Problem

According to the firmware „reverse“ flag status, the motor moves in the correct direction while initializing. But other movements are executed in the opposite direction.

Diagnosis

As the initializing has been executed properly, the controller board and motors are working well. The problem is related to the parameters although the reverse flag has not been set and the initializing move was carried out in the correct direction.

Cause

If the motor range is set too high, the firmware can not process the calculated data properly, which results in a negative value for the move direction.

Solution

The motor range must be set according to the value provided in *siascfg.ini* file on the installation CD.

12.6.3 Motor Check

If a controller board exchange does not bring any improvements, the fault must be in the motor. To detect a possible short circuit, the inner resistance of the motor must be tested:

1. Ensure that the device is switched off and the power cable is unplugged.
2. Disconnect the motor from the controller board and measure the resistance with an ohmmeter as follows:
3. Plug a 6-pin header into the motor connector.
4. Check the coil resistance of the motor between pin 1 and 6. It never must be 0 Ω or greater than 50 Ω .
5. Check the resistance of the encoder between pin 2 and pin 5. It must be 3–4 M Ω .

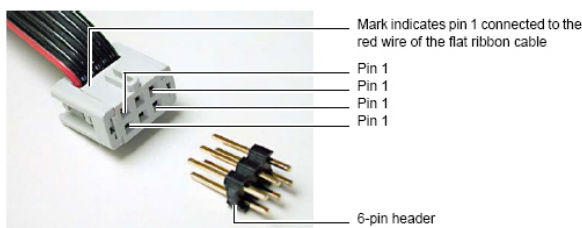


Figure 12.13: Motor connector and 6-pin header

12.6.4 Z-motor Shakes When Sensing for Liquid

1. Switch the device off.
2. Remove arm cover, see [Arm Cover](#) [83].
3. Disconnect the liquid level detector FBC from the motor board.
4. Switch the device on again.
5. Start **X-Util**: “E” flag should appear on ZMotor1.

6. Initialize the Z-motor.
7. Send low level commands in X-Util to move in Z-axis. Does it work?
8. If yes, the FBC is defective (shortcut due to damaged insulation or cable break).
9. Replace the FBC.



The FBC is very sensitive and can only be folded once. Copy the folding of the defective cable and place insulation tape in exactly the same way.

12.6.5 Controller Board Check

If a motor exchange does not bring any improvements, the fault must be on the controller board.

12.6.5.1 Controller Board Troubleshooting

1. Switch the device off and then on again.
2. Start **X-Util**.
3. Check the LED on the controller board. At power on and during operation it flashes slowly (1 Hz).
4. Check if the board is listed with its name during the module scan ("*Validating Firmware Parameters*" [[▶ 136](#)]).
5. Exit **X-Util**.
6. Open Windows® Explorer® and backup the „device.dat“ file located in the „X-Pdata“ subdirectory.
7. Start a text editor and open the *device.dat* file located in the *X-AP\Data* subdirectory.
8. Delete the line(s) which are related to the appropriate modules; e.g. ZMotor1, address 21 and YMotor1, address 31.
9. Save the file and exit text editor.
10. Start **X-Util**.
11. Enter **XUtil/Module Info**.
 - This displays a dialog box to identify new hardware.
12. Ensure the corresponding motor is connected and click „Identify“ button.
 - The motor will move to and fro a few steps, like a shake movement.
1. Select the correct module name (e.g. ZMotor1) and address (e.g. 21) from the pop down menu in the „user defined field“.



Service controller boards come with service start address E1 and F1.

The module name (ZMotor1) and address (21) will automatically be displayed. This means that the controller board has been recognized and that communication is established.

1. Check the **Set on Module** box.
2. Repeat this procedure for the Ymotor1 which is driven by the same controller board.

12.7 USB / CAN-Bus

12.7.1 Communication Problems Linked to USB Devices



After a PC reboot the PCAN USB dongle flashes its red LED once, indicating that the dongle has been recognized by the PC BIOS. After proper setup the red LED should light consistently when no Sias applications are in use.

Some PCs may encounter communication problems linked to Universal Serial Bus (USB) devices. Listed below are some of the common errors:

- USB devices are not detected when you restart the computer.
- USB devices are not detected after you resume the computer from hibernation or standby.
- The computer uses 100% of the CPU time when you move the USB mouse.
- The computer hangs when resumed from standby mode when a USB mouse is connected.
- The computer takes a long time to start or resume when a USB device is connected.
- A yellow exclamation mark with code 28 or 31 is shown on a USB device in device manager.
- USB 2.0 Hi-speed devices are detected as USB 1.1 devices when your computer resumes from hibernation, even though they are plugged into a USB 2.0 capable port.

If any of these problems occur, it may not indicate that the PCAN USB dongle is faulty. But some settings and versions must be checked first.

Checking the OS and the SP version

Operating system (OS) and service pack (SP) version can be checked in **Start/Settings/Configuration Panel/System/General**.

Minimal configuration:

- Microsoft Windows 7 32bit SP1 English
- Microsoft Windows 7 64bit SP1 English



Get in touch with Bruker if you encounter problem with Microsoft Windows XP-SP 3.

Checking the USB port version

The USB port version can be checked in **Start/Settings/Control Panel/System/Hardware/Device Manager/USB Bus Controllers**.

1. Right click **USB Root Hub**.
2. Click **Properties**.

If each USB output provides a current of 500 mA it is an USB V2.0 Hi-speed port, otherwise it is an USB 1.1 port. Dongle current consumption is around 380 mA.



After a PC reboot the PCAN USB dongle flashes its red LED once, indicating that the dongle has been recognized by the PC BIOS.

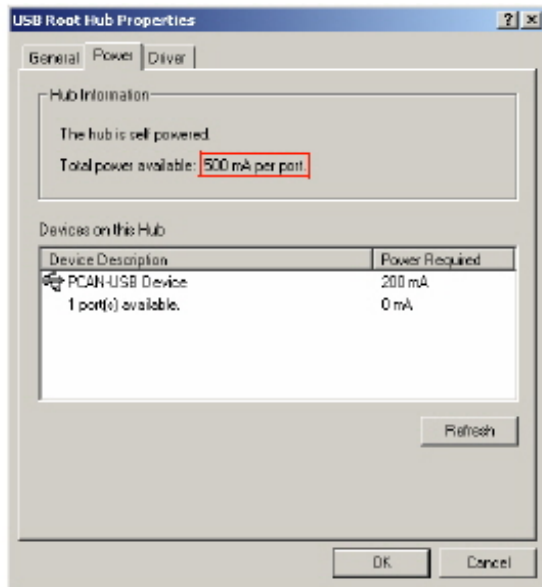


Figure 12.14: USB Root Hub Properties Window

Checking the dongle firmware version

The firmware version can be checked in **Start/Settings/Control Panel/PCAN Hardware**. Right click **PCAN Hardware** icon.

1. Click **Properties**.

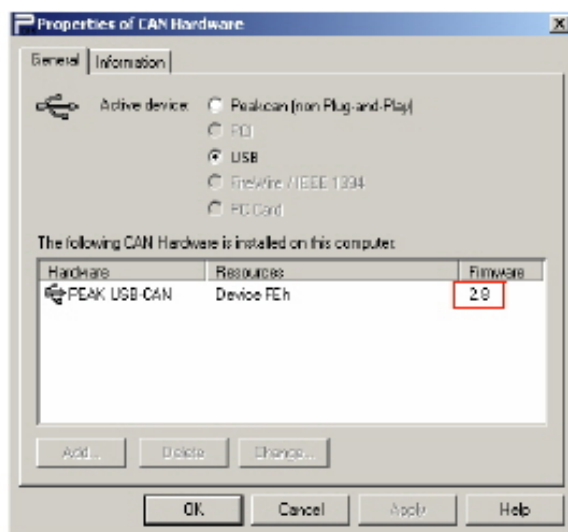


Figure 12.15: Checking the Firmware Version



A dongle upgrade will not be charged as long as the old one is returned to Sias support within one week. Please contact Sias for further support and latest firmware version and driver.

12.7.2 Mixup of USB CAN Adapters

When the computer is rebooted or started it can occur that the SamplePro Tube software does not start correctly and stops with the following error message:

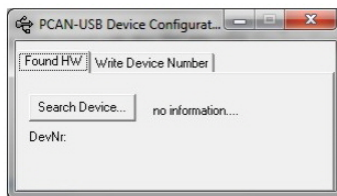


Figure 12.16: Device Failure

Cause: The operating system detects the connected USB adapters in a random scan progress and the CAN Adapter list is sorted depending on which adapter has been detected first.

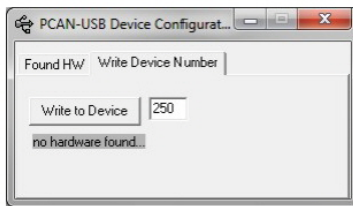
To force a fixed CAN adapter list and to assign a permanent address ID,

1. Open the **PCAN USB Device Configurator** program.

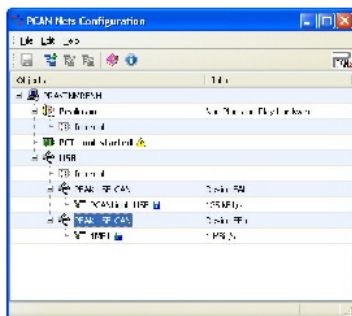


2. Plug off the device that is attached to the robot system. Press the **Search Device...** button to detect the USB adapter of the FEU.

3. Write the address 250 to the adapter.



4. Plug in the device that is attached to the robot system.
5. Reboot the system.
6. Check the PCAN Net settings.



13 Container Types, Labware and Bruker Part Numbers

Container Types







Bruker Part Number	Short Name	Description	Container Type	Figure
	Decktray 3 Slots	Decktray with 3 wellplate formatted slots	D03	
AH0384-01	Decktray 4 Slots	Decktray with 4 wellplate formatted slots	D04	
	8 x Wash Station Standard	Wash station with 8 positions xxx cm height.	DW0	
	8 x Wash Station Deep	Wash station with 8 positions xxx cm height.	DW1	

Table 13.1: Trays and Slots

Bruker Part Number	Short Name	Description	Container Type	Figure
AH0380-50	Decktray two 7" Tube Rack Slots	7" Device with 2 slots.	D72	
H130350	Rack 15 x 5 mm 7" Tubes	7" tube rack with 15 slots for 5 mm tubes	R71	
H100	5.0 mm 7" Tube	5.0 mm 7" tube.	I	
H146401	Rack 48 x 1.8 ml CryoVials	Cryo vial rack with 48 slots.	RVC	

Container Types, Labware and Bruker Part Numbers


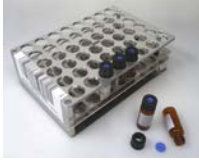

Bruker Part Number	Short Name	Description	Container Type	Figure
1811150+1811151	1.8 ml Cryovial	Cryovial with 1.8 ml content, septum closed.	C	
	Rack 48 x 2 ml AutoSampler Vials	Autosampler vial rack with 48 slots.	RVA	
	2.0 ml Autosampler Vial	2.0 ml Autosampler vial.	V	

Table 13.2: 7" Tubes




Bruker Part Number	Short Name	Description	Container Type	Figure
AH0193	Rack 96 x 3.0 mm SJ Tubes	3.0 mm SampleJet tube block with 96 slots. No data matrix code.	RJF	
AH0184	Rack 96 x 5.0 mm SJ Tubes	5.0 mm SampleJet tube block with 96 slots. No data matrix code.	RJI	
	3.0 mm SampleJet Tube	3.0 mm SampleJet tube	JF	
	5.0 mm SampleJet Tube	5.0 mm SampleJet tube	Jl	

Table 13.3: SampleJet

Bruker Part Number	Short Name	Description	Container Type	Figure
	Rack 24 x 3.0 mm MATCH Tubes	3.0 mm MATCH tube block with 24 slots.	RMF	

Container Types, Labware and Bruker Part Numbers



Bruker Part Number	Short Name	Description	Container Type	Figure
	Rack 24 x 5.0 mm MATCH Tubes	5.0 mm MATCH tube block with 24 slots.	RMI	
AH1160 -30	3.0 mm MATCH tube	3.0 mm MATCH tube.	MF	
AH1160-50	5.0 mm MATCH tube	5.0 mm MATCH tube.	MI	

Table 13.4: Match Tubes


Bruker Part Number	Short Name	Description	Container Type	Figure
68964	Wellplate 96 Round Deep	Wellplate 96 round deep.	W00	
	Wellplate 96 Squared Deep	Wellplate squared deep.	W20	

Table 13.5: Wellplates




Bruker Part Number	Short Name	Description	Container Type	Figure
84761	500 ml glass vessel.	Solvent reservoir, septum closed for additives. Requires plastic adapter	C15	
AH0383-02	225 ml glass vessel	Small glass reservoir, septum closed. Fits directly into well plate format.	C12	
1824336	600ml glass vessel	600ml glass vessel large glass reservoir, septum closed. Fits directly into well plate format.	C16	

Table 13.6: Automation Sample NMR

Container Types, Labware and Bruker Part Numbers

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
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	CD rom with Software SamplePro and Utilities for
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

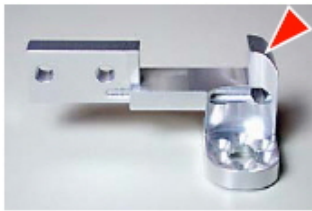

Container Types, Labware and Bruker Part Numbers

Bruker Part Number	Description	Details
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 13.7: Bruker Part Numbers

14 Spare Parts

Y-Motor Support

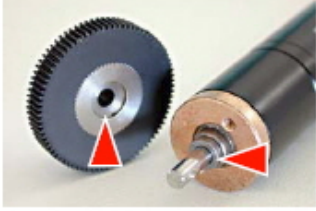
Visual Identification	Description/Part #/ Revision	Specifications/Release Info.
	P/N: 200574-R revision F P/N: 200574-L revision F (pictured)	Vertical part broaden and 45° facet replaced by a radius to optimize ribbon cable guidance. Serial No. up to 1765
	P/N: 101177 revision A, B, C	Spring loaded support. Serial No. 1766 and above
Y-Motor Support		


Y-Gear

Visual Identification	Description/Part #/ Revision	Specifications/Release Info.
	Y-Gear (metal) P/N: 200292 revision B Grub Screw P/N: 201175	Serial No. up to 1752 Serial No. from 1754 to 1761 Serial No. from 1763 to 1768
	Y-Gear (POM) P/N: 202262 revision A Grub Screw P/N: 201175	For Y-motors mounted on the spring-loaded support only, requires the appropriate slotted rack. Serial No. 1753, 1762 Serial No. 1769 and above
Y-Gear		

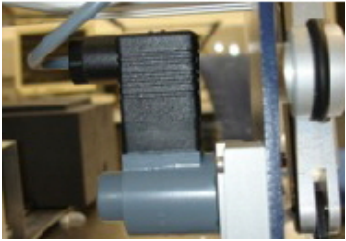
Z-Motor and Z-Gear

Spare Parts

Visual Identification	Description/Part #/ Revision	Specifications/Release Info.
	Z-Motor P/N: 131008 Maxon reference # M040304 and 313093 Z-Gear P/N: 202271 revision A	Z-Motor Sintered steel bearing Z-Gear Additional cut-in Serial No. 1349 and above
Z-Motor and Z-Gear		

Visual Identification	Description/Part #/ Revision	Specifications/Release Info.
	Barcode SICK ICR803 B 0271 SIAS P/N: E0188 Barcode Reader Print: SIAS P/N: 130110	
Barcode reader for container		

Door Lock Actor

Visual Identification	Description/Part #/ Revision	Specifications/Release Info.
	Door Lock Actor SIAS P/N: E0240	
Door lock actor		

15 Electrical Data

15.1 Robotic System PCB Pinout

15.1.1 MCB X-Motor Board V2.11

This board controls the X-motor.

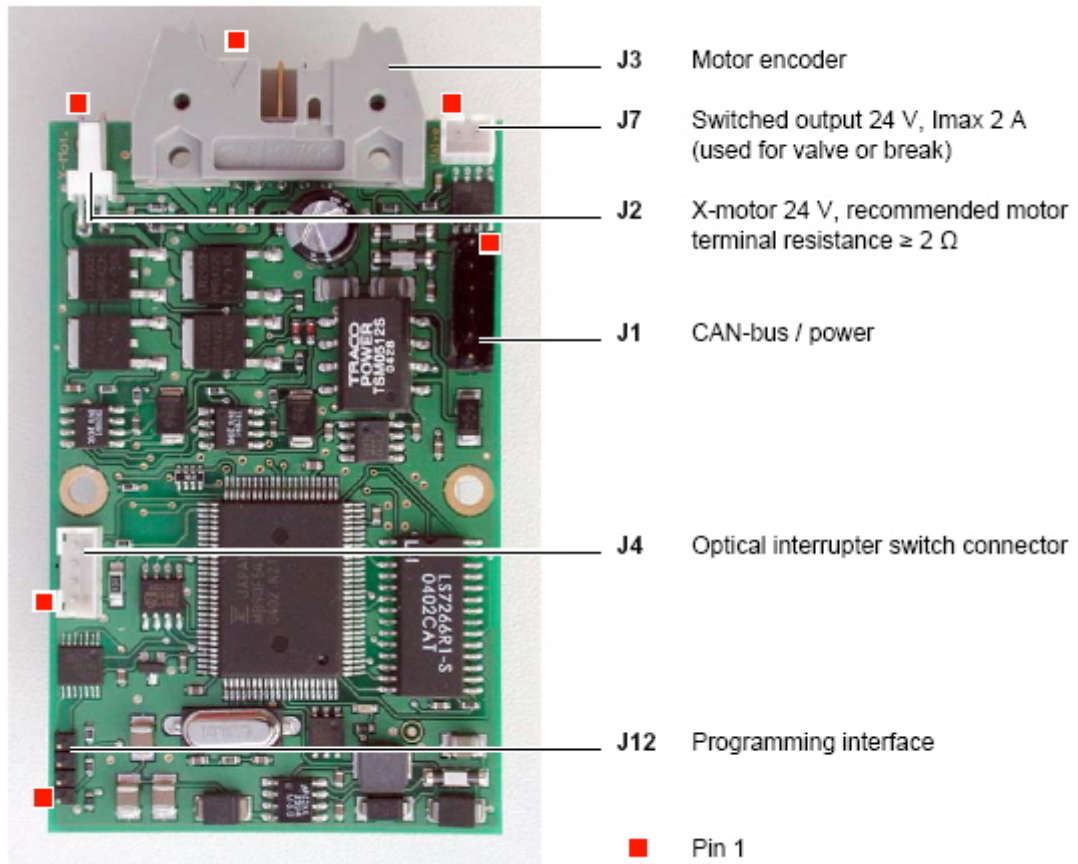


Figure 15.1: MCB X-Motor Board V 2.11

15.1.2 MCB BB1 V2.0

This board controls the Y- and Z-motors, pumps and valves.

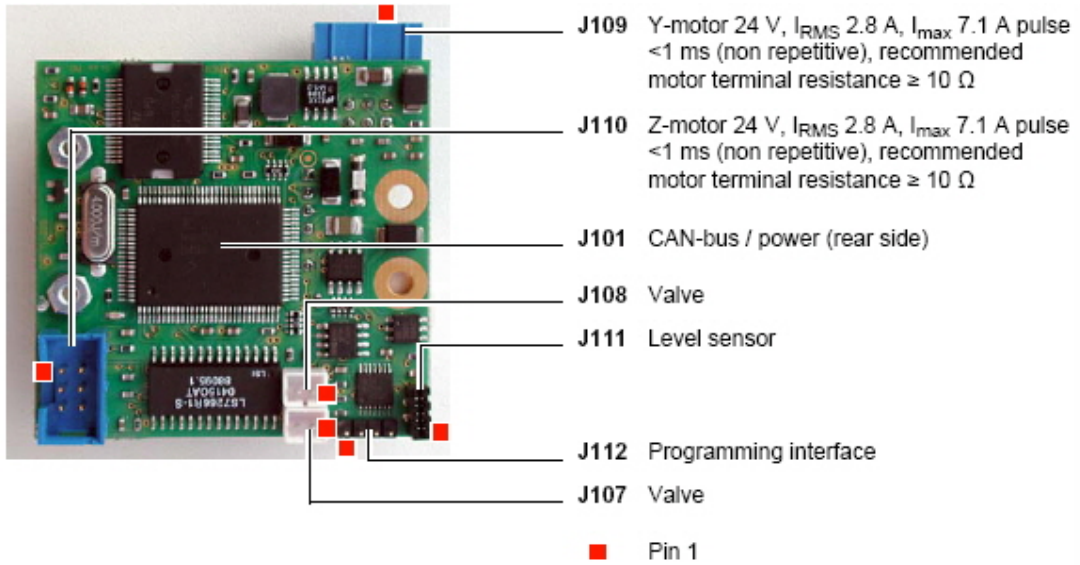


Figure 15.2: MCB BB1 V2.0

15.1.3 MCB BB2 V2.0

This board controls the Y- and Z-motors, pumps and valves.

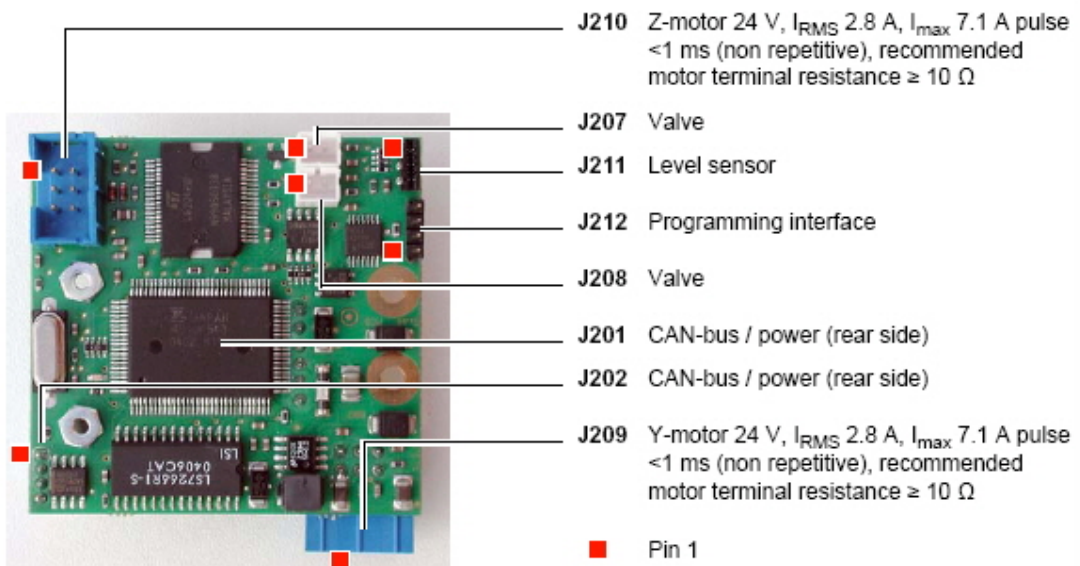


Figure 15.3: MCB BB2 V2.0

16 Preventive Maintenance

There is no service level preventative maintenance required. For user level maintenance information refer to the SamplePro Tube User Manual P/N: Z33091.








17 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.

17.1 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.





<p>Do not Damage Air-tight Packaging</p>		<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>
<p>Component Sensitive to Electrostatic Charge</p>		<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>
<p>Protect from Heat</p>		<p>Protect packages against heat and direct sunlight.</p>
<p>Protect from Heat and Radioactive Sources</p>		<p>Protect packages against heat, direct sunlight and radioactive sources.</p>

Table 17.1: Symbols on the Packaging

17.2 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.

17.3 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.

17.4 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.

17.5 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.

17.5.1 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 \[175\]](#).
7. Complete the *Certificate of Decontamination*. This document is available from Bruker upon request. The completed certificate must be sent with the parts.

17.5.2 Preparing the Robot System for Transport

Dismounting

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

17.5.3 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.

17.5.3.1 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 17.1: Placing Foam Parts to protect Z-module & Y-Arm

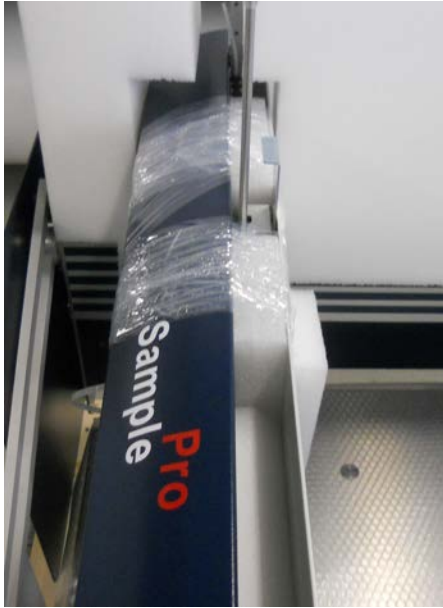


Figure 17.2: Wrapping Foam Parts

17.5.3.2 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 17.3: Wrapping Z-Modules

17.5.3.3 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.

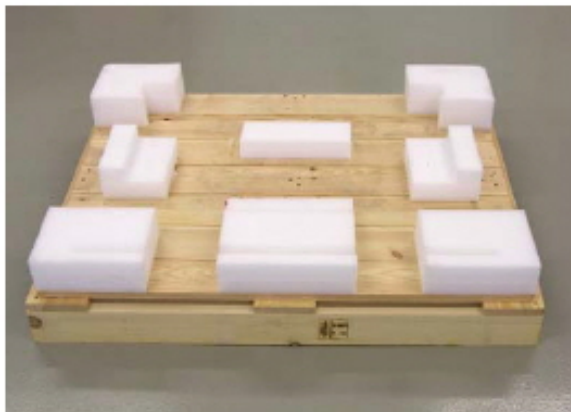


Figure 17.4: Wooden pallet

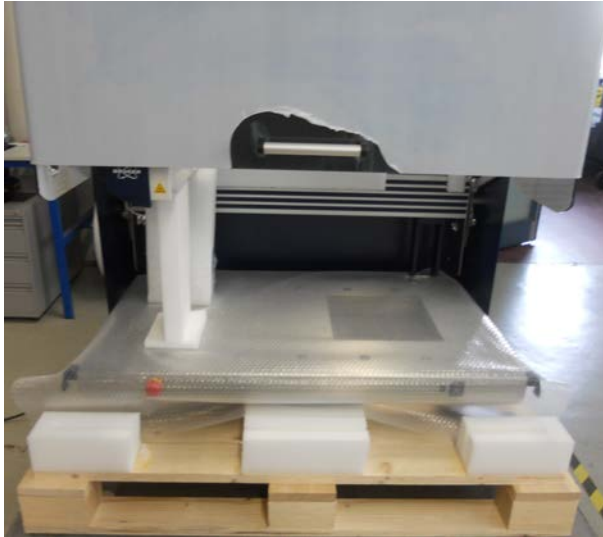


Figure 17.5: Device on the wooden pallet

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

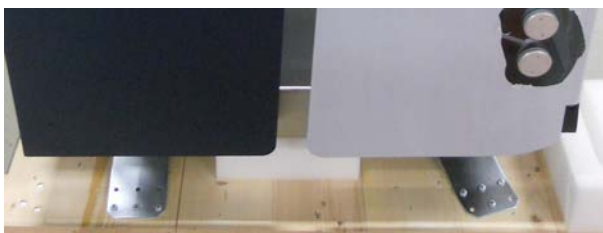


Figure 17.7: Fixing unit on pallet (left side).

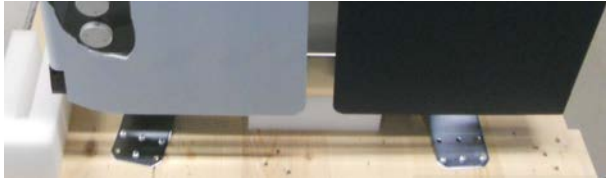


Figure 17.8: Fixing unit on pallette (right side)

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 17.9: 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 17.10: 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 17.11: 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 17.12: 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 17.13: Attaching Shockwatch® indicators

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

18 Safety and Repair Declaration Form

● **Safety and Repair Declaration**

Equipment Clearance Form for Service, Repair, Disposal or Transfer



Use this form, whenever a probe or another unit situated in a magnet room or an analytical instrument might be exposed to hazardous substances by customers, when it is to be returned to Bruker.

Whenever a customer returns a system or its components to Bruker, e.g. for repair, upgrade, loan returns, exchange, etc., the customer accepts the following obligation:

It is the explicit responsibility of the customer to make sure that the returned products are absolutely free of any hazardous substances. In case of omission to do so, Bruker will hold the customer liable for any resulting injuries and/or damages, caused to employees of Bruker and/or to other persons exposed to the hazardous substances. The customer is further liable for all damage caused to Bruker, e.g. decontamination, security measures, etc. The customer is finally liable for all other direct and/or indirect damages caused to Bruker by the hazardous substances.

I ACCEPT THIS OBLIGATION

The repair declaration, completed and signed by the **safety representative**, has to be attached to the returned product. The declaration must be attached to the delivery note on the package exterior. Any returned product without a properly completed and duly signed declaration cannot be repaired. If we think that there is a risk of damage because of a contaminated returned product, we must dispose the hazardous material at the expense of the customer.

The safety & repair declaration form may be signed by a Bruker service engineer if the system was never operated by the customer (e.g. prior to completion of the installation).

The customer/signatory confirms that the returned product is absolutely free of any hazardous substances (e.g. toxic, corrosive, explosive, biologically dangerous or radioactive).

PRODUCT PART NO.:	SERIAL NO.:
FAULT DESCRIPTION (reason for return) :	
DATE FAILURE OCCURRED:	SYSTEM ORDER NO. / DISPATCH NO.:
COMPANY/INSTITUTE:	SIGNATURE: DATE:
NAME:	
MAILING ADDRESS:	
CITY/POSTAL CODE/COUNTRY:	
EMAIL:	

19 Cleaning and Disposal

19.1 Cleaning

CAUTION

Potential hazards may exist to personnel from the liquids being handled by the device.

Infectious clinical samples, toxic or corrosive chemicals, or radioactive substances may be present.



- ▶ Clean and decontaminate device and modules before packing and transporting!
- ▶ Wear protective clothing, gloves and glasses.
- ▶ Pour water into the wash station and drain the waste tubing. Pour 70% ethanol solution in the wash station and rinse thoroughly. Remove the wash station.
- ▶ Decontaminate the extremity of the waste tubing with a lint free tissue impregnated with 0.05% ProClin 950® solution. Use a clean tissue impregnated with 0.05% ProClin 950® solution to wrap the tubing in a plastic bag.
- ▶ Decontaminate all relevant modules and parts with 70% ethanol solution or 0.05% ProClin 950® solution in accordance with „Certificate of Decontamination“. This document is available on request
- ▶ Clean the deck with 70% ethanol solution.

For the cleaning and lubrication intervals refer to the SamplePro Tube user manual.

For the chemical resistance specifications of the SamplePro Tube robot.

19.2 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 the instructions below 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:

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.

Nitrogen gas	Nitrogen 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 substances. They must not be allowed to escape into the environment. Disposal must be carried out by a specialist disposal company.

19.3 Decommissioning, Recycling and Disposal of the Robotic System

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

If your SamplePro Tube is no longer needed, please consider recycling it by transferring it to another lab, either directly or by contacting an device recycling organization. Otherwise it can be disassembled and some parts recycled.

When the SamplePro Tube is permanently taken out of service, first thoroughly clean and decontaminate according to the instructions given in section „Cleaning“.

Prior to recycling, electrical and electronic components, such as power supply units (PSU), printed circuit boards (PCB), cables etc., should be removed and disposed of according to local regulations.

The remainder of the SamplePro Tube can be recycled according to local regulations.

Key components of the SamplePro Tube are made of:

Component	Material
Frame	Aluminum
X-rail	Aluminum
X-rail support	Aluminum
Deck	Stainless steel
Arm housing	Steel
Arm support	Aluminum
Arm frame	Aluminum
Safety door	Tempered or acrylic glass
Safety door rail	Aluminum
Material Used for SamplePro Tube Key Components.	

20 Technical Data

20.1 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 20.1: Part Numbers

Weight

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

Table 20.2: Weight

Dimensions

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

Table 20.3: 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 20.4: 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 [Container Types, Labware and Bruker Part Numbers](#) [▶ 151].

20.2 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 20.5: Electrical Connection Values SamplePro Tube S and L

Components

Components	Value	Unit
Robot SamplePro Tube L and S	100 ¹⁾	Watts
Cooling Rack °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
Cooling Rack -16°C	150 ²⁾	Watts

Table 20.6: 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

20.3 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 20.7: 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 20.8: Bruker Site Planning Guides

20.4 Rating Plate Robot



Figure 20.1: Rating Plate SamplePro Tube S



Figure 20.2: Rating Plate SamplePro Tube L

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

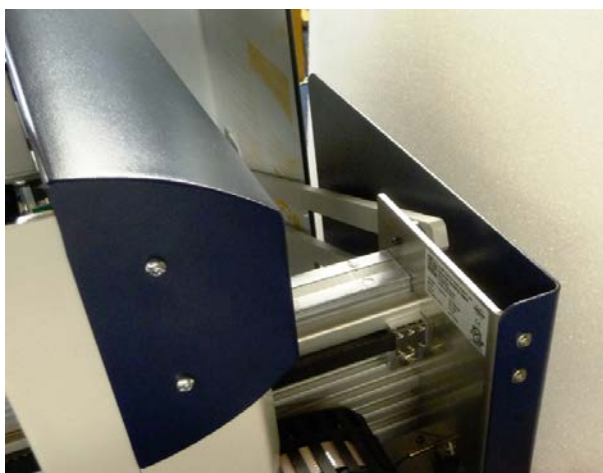


Figure 20.3: Rating Plate Position

21 Specifications

21.1 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

21.2 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 21.1: Electrical and Communication

21.3 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 <i>"Electrical and Communication"</i> on page 245 ▶ 181 .

21.4 Physical Properties

21.4.1 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);

21.5 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)	

21.5.1 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®.

21.5.2 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 Reservoir HDPE	EX EX	EX 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	
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	EX EX	EX NR	PO EX	EX EX	
	Fittings: PP							
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	

22 Contact

Manufacturer:

Bruker BioSpin NMR
Silberstreifen
D-76287 Rheinstetten
Germany
Phone: +49 721-5161-6155

<http://www.bruker.com>

WEEE DE43181702

NMR Hotlines

Contact our NMR service centers.

Bruker BioSpin NMR provide 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:

<http://www.bruker.com/service/information-communication/helpdesk/magnetic-resonance.html>

List of Figures

Figure 2.1:	The SamplePro Tube S System	13
Figure 3.1:	Location of the Emergency Stop Button	18
Figure 3.2:	The Robot System ON/OFF Switch.....	18
Figure 4.1:	Deck Tray Layout	25
Figure 4.2:	The X-Rail.....	25
Figure 4.3:	Y-Arm with Down Holder, Needle Device and Barcode Reader.....	26
Figure 6.1:	Cooling Rack	32
Figure 7.1:	Entering the Service Area.....	38
Figure 7.2:	Service and Settings Window	38
Figure 7.3:	Robot Settings	39
Figure 7.4:	Information: Restart Application.....	40
Figure 7.5:	Robot Teaching	41
Figure 7.6:	Standard Device User.....	42
Figure 8.1:	Robot Teaching Main Window	45
Figure 8.2:	Robot Teaching Alignment 1	47
Figure 8.3:	Checking the XYZ Position of the Robot Needle	49
Figure 8.4:	Checking the XYZ Positions for the Selected Cavity	51
Figure 8.5:	Robot Teaching Rack Pin Point	53
Figure 8.6:	Robot Teaching Barcode Scanner.....	55
Figure 8.7:	Robot Teaching Barcode Scanner 7 Inch Tubes.....	57
Figure 8.8:	Robot Teaching Results 7 Inch Tube Scanning	58
Figure 8.9:	Teaching Decktray, Part Number 101525	59
Figure 8.10:	Placing the Teaching Decktray on the Deck.....	60
Figure 8.11:	Modifying the Target Path	61
Figure 8.12:	Renaming the Shortcut Icon	61
Figure 8.13:	Starting the Alignment Tool	62
Figure 8.14:	Clicking the Measure Button	62
Figure 8.15:	Starting the Procedure	62
Figure 8.16:	Selecting Check Reference Point	63
Figure 8.17:	Error Message	63
Figure 8.18:	Teaching the Reference Point	64
Figure 8.19:	Selecting Check Scaling Point	64
Figure 8.20:	Error Message	65
Figure 8.21:	Teaching the Scaling Point	65
Figure 8.22:	Selecting a Tip for Z-Offset Setting	66
Figure 8.23:	Setting Z-Offset	66
Figure 8.24:	Testing the Configuration	67
Figure 8.25:	Saving the Configuration	67
Figure 10.1:	Fuse Compartment.....	81

List of Figures

Figure 10.2:	Fuses (PSU with single output)	82
Figure 10.3:	Adjusting Device Foot.....	83
Figure 10.4:	Arm Housing	83
Figure 10.5:	Screw on the Back Underneath the Arm and on the Rear Cover Plate.....	86
Figure 10.6:	MCB X-motor board (arm)	87
Figure 10.7:	Loosening the Belt Clamp.....	88
Figure 10.8:	X-Gear and Pulley	88
Figure 10.9:	X-Motor Assembly	89
Figure 10.10:	Back Support Plate	89
Figure 10.11:	Removed Back Support Plate.....	90
Figure 10.12:	Removing the Belt Clamp Screw	90
Figure 10.13:	Alignment Between Motor Block and X-Module	91
Figure 10.14:	CAN Connector Board (arm)	91
Figure 10.15:	The X-Spacer and X1-Stopper	92
Figure 10.16:	YZ-board (BB2).....	94
Figure 10.17:	Y-motor assembly with spring-loaded Y-motor support.....	96
Figure 10.18:	Y-motor Assembly with Spring-loaded Y-motor Support	97
Figure 10.19:	YZ-Module	100
Figure 10.20:	Z-Motor Assembly Side View.....	101
Figure 10.21:	Z-Motor Assembly Overview.....	101
Figure 10.22:	Removing the Z-Motor Assembly	102
Figure 10.23:	Spring-loaded Pin	102
Figure 10.24:	Z-motor Assembly Side View.....	103
Figure 10.25:	YZ-Assembly Overview	103
Figure 10.26:	YZ-Assembly Overview	103
Figure 10.27:	Tip fixture characteristic.....	106
Figure 10.28:	LLD tip mounting and LQS tip mounting.....	106
Figure 10.29:	Assembly	107
Figure 10.30:	The Door Lock Actor.....	108
Figure 10.31:	Back Plate Cables	108
Figure 10.32:	Door Open Sensor.....	109
Figure 11.1:	Removing power supply unit.....	113
Figure 11.2:	PSU support	113
Figure 11.3:	X-Spacer and X1-Stopper.....	114
Figure 11.4:	X-Belt Measurement Setup.....	115
Figure 11.5:	Spring-Loaded Scale Indicator	115
Figure 11.6:	Measuring the X-Belt Tension	116
Figure 11.7:	Reading the Value on the Metal Ruler.....	116
Figure 11.8:	Marking the Position of the X1-Belt Clamp	117
Figure 11.9:	Adjusting the X-Belt Tension by Shifting the X1-Belt Clamp	117
Figure 11.10:	X-Board (arm).....	118
Figure 11.11:	X-Motor Assembly	119
Figure 11.12:	Back Support Plate	120

Figure 11.13:	The Back Support Plate.....	120
Figure 11.14:	Screws for Releasing the X-Belt Tension	120
Figure 11.15:	Alignment Between Motor Block and X-module	121
Figure 11.16:	YZ-Module	121
Figure 11.17:	YZ-board (BB2).....	122
Figure 11.18:	Y-Motor Assembly with Fixed Y-Motor Support.....	123
Figure 11.19:	YZ-Board Connectors and Screws (left) and Y-Motor Support with Mounting Screws (right)	124
Figure 11.20:	Gaps Between Y-Motor Support and the Z-Hub Module	125
Figure 11.21:	Z-Motor Assembly.....	125
Figure 11.22:	Correct position of Z-motor in Z-support plate	126
Figure 11.23:	Encoder Tester	126
Figure 11.24:	Z-motor connector and header	127
Figure 11.25:	Measuring the Inner Coil (left) and Encoder Resistance (right).....	128
Figure 11.26:	Arm Fixation and Adjustment.....	128
Figure 11.27:	The CAN Bus FBC and Pump Holder.....	129
Figure 11.28:	Arm Blocking Screws and Rotating Axis (left) and Arm Leveling Screw (right).....	129
Figure 12.1:	After checking the device the operator should retry the initialization.....	133
Figure 12.2:	Move Module [YMotor1] Window	138
Figure 12.3:	Modul_Info Window (example with cooling rack).....	138
Figure 12.4:	Display of an Incorrect Y-motor Move Module Window	139
Figure 12.5:	Set Module Data Window	141
Figure 12.6:	Set Module Data Window	141
Figure 12.7:	Set Module Data Window	142
Figure 12.8:	Modul_Info Window	142
Figure 12.9:	Communication Error Window	144
Figure 12.10:	X-Util Window	144
Figure 12.11:	Module Setup – Zmotor1 Window	144
Figure 12.12:	X-Util Save module parameter.....	145
Figure 12.13:	Motor connector and 6-pin header.....	146
Figure 12.14:	USB Root Hub Properties Window	149
Figure 12.15:	Checking the Firmware Version.....	149
Figure 12.16:	Device Failure.....	150
Figure 15.1:	MCB X-Motor Board V 2.11	159
Figure 15.2:	MCB BB1 V2.0.....	160
Figure 15.3:	MCB BB2 V2.0.....	160
Figure 17.1:	Placing Foam Parts to protect Z-module & Y-Arm.....	166
Figure 17.2:	Wrapping Foam Parts.....	167
Figure 17.3:	Wrapping Z-Modules	167
Figure 17.4:	Wooden pallet.....	168
Figure 17.5:	Device on the wooden pallet.....	169
Figure 17.6:	Stabilizing the arms and the X-rail with a foam block	169
Figure 17.7:	Fixing unit on palette (left side).....	169

List of Figures

Figure 17.8:	Fixing unit on palette (right side).....	170
Figure 17.9:	Packing accessories	170
Figure 17.10:	Protect front shield with a spacer foam.....	170
Figure 17.11:	Place and fix the accessory box on the deck.....	171
Figure 17.12:	Cover the device with bubble foil.	171
Figure 17.13:	Attaching Shockwatch® indicators	172
Figure 20.1:	Rating Plate SamplePro Tube S.....	179
Figure 20.2:	Rating Plate SamplePro Tube L	179
Figure 20.3:	Rating Plate Position	179

List of Tables

Table 1.1: Font and Format Conventions	11
Table 2.1: Overview Installation and Operation Requirements for Personnel	14
Table 12.1: Module Error Groups/ Communication Errors	134
Table 12.2: Communication Errors	135
Table 13.1: Trays and Slots	151
Table 13.2: 7" Tubes	151
Table 13.3: SampleJet	152
Table 13.4: Match Tubes	152
Table 13.5: Wellplates	153
Table 13.6: Automation Sample NMR	153
Table 13.7: Bruker Part Numbers	154
Table 17.1: Symbols on the Packaging	163
Table 20.1: Part Numbers	177
Table 20.2: Weight	177
Table 20.3: Dimensions	177
Table 20.4: Noise Level SamplePro Tube L and SamplePro Tube S	177
Table 20.5: Electrical Connection Values SamplePro Tube S and L	178
Table 20.6: Maximum Power Consumption SamplePro Tube S and L	178
Table 20.7: Operating Environment SamplePro Tube L and SamplePro Tube S	178
Table 20.8: Bruker Site Planning Guides	179
Table 21.1: Electrical and Communication	181

Index

A

Arm Cover	
Assembly	84
Disassembly	83
Arm Disassembly.....	128

B

Barcode Reader	26
Disassembly	107
Barcodes	76

C

CAN Bus.....	82
CAN Connector Board	
Assembly	91
Disassembly	91
Chemical resistance specifications	175
Cleaning and lubrication intervals	175
Cleaning liquids	22, 176
Coil resistance check	127
Coolants	22, 176

D

Dangerous situations.....	74
DC motors	25
Decommissioning	176
Device settings	
Initial	39
Disposal.....	176
Dongle upgrade.....	149
Door Lock Actor	
Assembly	108
Disassembly	108
Spare parts	158
Door Open Sensor	
Assembly	109
Disassembly	109

E

Emergency Shutdown	74
Error information.....	133

F

Fuse	
Replacement	81
Fuses	
Location	81
Replacement	82

H

Helium	22
Helium inert gas	175

L

Laboratory Personnel	17
Personnel qualifications	16
Loctite.....	80
Lubrication intervals	175

M

MCB X-Motor Board	
Assembly	87
Disassembly	87

N

Nitrogen gas	176
--------------------	-----

O

Operating system	148
------------------------	-----

P

PCAN USB dongle	148
Personal protective equipment.....	17
Power Supply Unit	
Assembly	113
Disassembly	113
Protective equipment.....	17

R

Rear Cover Plate	
Assembly	86
Disassembly	86
Recycling	176
Restart.....	74
Risk assessment	15
Robotic system	
Log files	132

S

Safety Door	26
Assembly	94
Disassembly	94
Door lock actor	107
Maintenance	112
Service pack	148
Shipping	
Inspection	30
Shock indicators	30
Side and Front Cover Plate	
Assembly	85
Side and Front Cover PlateDisassembly	85
Site Planning	179
Software	
Configuration	38
Spring-Loaded Y-Motor Support	
Assembly	99
Disassembly	98
Standard Operating Procedure	16

U

USB devices	148
USB port version	148

V

Virus scanner software	136
------------------------------	-----

W

Weight	29
--------------	----

X

X-belt	
Tension adjustment	113
X-belt tension	114
X-Board	
Assembly	119
Disassembly	118
X-Motor	
Assembly	90, 120
Disassembly	89, 119
X-rail	25
X-Util.....	118
Log files	132

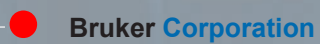
Y

Y-Gear	
Spare parts	157
Y-Motor	
Assembly	98
Disassembly	98
Y-Motor (with fixed support)	
Assembly	123
Disassembly	123
Y-Motor (with spring-loaded support)	
Assembly	124
Disassembly	124
Y-Motor Support	
Spare parts	157
YZ-Board	
Assembly	95, 122
Disassembly	95, 122
YZ-Module	
Assembly	100, 122
Disassembly	100, 121

Z

Z-Motor	
Assembly	104
Disassembly	103
Z-Motor and Z-Gear	
Spare parts	157
Z-Motor Assembly	125
Assembly	102
Disassembly	101
Z-Motor Disassembly.....	125





Bruker Corporation

info@bruker.com
www.bruker.com

Order No: Z33092